



Standard Parts

**FIBRO**

**All products  
are registered in ...**



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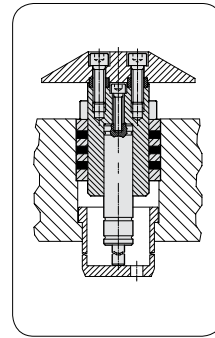
# New and improved Products in the FIBRO Standard Parts Catalogue 2011



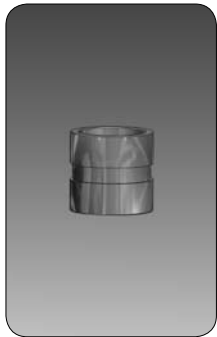
2922.  
2923.  
Precision flat  
square tool steel  
to DIN 59350  
B6, B12



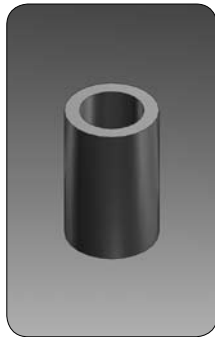
202.93.  
Cage Retainer  
for Ball Cage  
206.71.  
D212



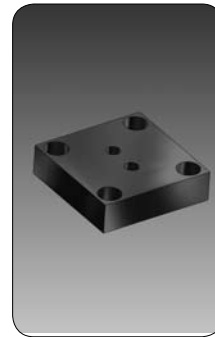
2487.20.15.30.  
Universal  
Lifter Unit  
according to  
BMW standard  
F99



2132.10.03...1  
Bushes for  
Lifting Bolts VDI  
C23



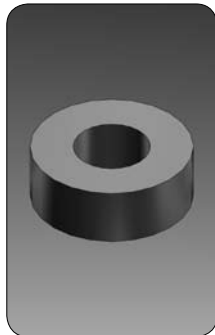
244.9.  
Spacer Tubes  
F65



2480.011.  
Flange Plate  
according to  
Renault  
standard  
F138-F274,  
L66-L68



202.29.  
Guide Pillars  
~DIN 9825/  
~ISO 9182-2  
ECO-LINE  
D19



244.10.  
Stop Washer  
F66



2480.080.  
Concertina  
Shrouds for  
Gas Springs  
F286-F287



202.31.  
Guide Pillars  
Endwise  
Bolt-On Type  
~DIN 9825/  
~ISO 9182-2  
ECO-LINE  
D20



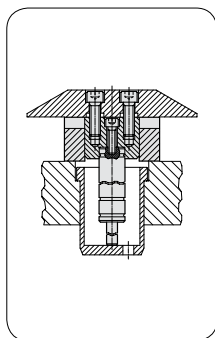
2470.10.020.080.3  
Spring Plungers  
with hexagon  
VDI 3004  
F80



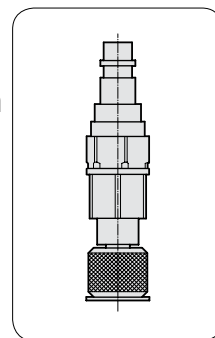
2480.00.90.  
Wireless  
Pressure  
Monitoring  
Wireless  
monitoring of  
gas springs  
F318-F320



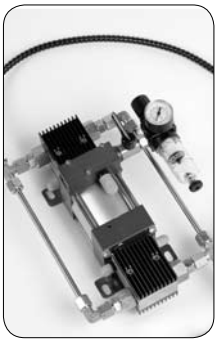
2082.70.55.  
Oilless Guide  
Bushes with col-  
lar to VW  
Bronze with  
Non-Liquid  
Lubricant  
D113



2478.20.15.20.  
Lifter unit  
with installation  
block  
according to  
BMW standard  
F97



2480.00.90.10  
Filling adapter  
for minimess  
connection  
F320



2480.00.32.71.  
Compact Nitro-  
gen Booster  
for Gas Spring  
Filling  
F322-F323



2480.32.71.02  
Holding Plate for  
Compact Nitro-  
gen Boosterr  
F323



2480.00.50.20..  
Service station,  
mobile,  
for gas springs  
F328

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# A Die Sets

Cast Iron, Steel and Aluminium  
Die Set Press Units, Lamination Die Set Units, Tooling Pallet Die Sets

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# B Precision Ground Plates and Flat Bars

Steel and aluminium Plates  
Flat and square Tool Steels

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# C Lifting and Clamping Devices

Shanks, Lifter Studs and Lifting Hooks, Eyebolts  
Clamping Claws, Screws and Bolts

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# D Guide Elements

Pillars, Bushes, Mounting Flanges,  
Ball Cages, Oilless Guide Elements

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# E Ground Precision Components

Punches and Matrixes,  
Pins, Gauge Pins

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# F Springs

Compression Springs, Gas Springs, Elastomer Springs  
Spring and Spacer Units

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# G Elastomer-Bars, -Sheets, -Sections

FIBROFLEX® and FIBROELAST®-Sheets and -Profiles

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# H FIBRO Chemical Tooling Aids

Tooling Resin, Metal Adhesives,  
Degreasing Agent, Corrosion Protection Agent, Oils

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# J Peripheral Equipment

for Presses, Tool Manufacture  
Conveyor Belts, Assembly Aids

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# K Cam Units

Hydraulic Cam System, Cam Slide Units, Roller Slide Units

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# L Standard Parts for Mould Making

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## FIBRO - your production partner

*FIBRO – an internationally successful company.*

*As a market leader in Standard Parts, Rotary Indexing Tables and Automation, FIBRO provides products and solutions to ensure your production keeps moving.*

*So what is the secret of the FIBRO success? Products developed in-house, tailor-made for the market with uncompromising quality.*

*But good products are not enough on their own.*

*FIBRO combines excellent products, the know-how and service competence of an internationally focused company, matched to the actual needs of customers - wherever they are.*



Hassmersheim plant



### Standard Parts

Today the Standard Parts Division operates from the Hassmersheim and Weinsberg works, which manufacture a comprehensive range of standard parts and maintain stocks ready for immediate despatch world-wide. The machine tool, mechanical engineering and systems engineering product ranges have been developed to meet the needs of customers.

They include steel die sets, guide elements, oilless guide elements and precision components such as punches and matrixes, special steel compression springs, gas springs, forming materials, metal bonding agents, moulding resins, peripheral equipment for pressing and tool making, tool slides with cam or roller slides and hydraulic cam systems. FIBRO has become renowned world-wide for its comprehensive range of products in stock and its readiness to deliver.



*FIBRO is customer-focused – world-wide. A well-developed network of sales and service points and strategic partners ensure that help is always at hand. This ensures technical advance, world-wide experience in applications and rapid availability of products.*

*Facts and figures on FIBRO:*

- founded 1958
- approximately 770 staff
- more than 70 representatives and service stations world-wide
- branches in France, USA, India, Switzerland Singapore and China
- ISO 9001:2000 Quality Assurance and VDA 6.4 certification



*Weinsberg plant*



## Rotary Tables

FIBRO – The worldwide pioneer in the field of rotary tables

A comprehensive range of types:

- FIBROPLAN® – NC rotary table with worm drive
- FIBRODYN® – NC rotary table with direct torque drive
- FIBROMAX® – Heavy-duty NC rotary table with Twin Drive
- FIBROTAKT® – Rotary indexing table with Hirth face gear
- FIBROTOR® – Electromechanical rotary indexing table for applications that do not involve machining

Rotary tables for all applications – from flexible workpiece positioning through rotary and multiple-axis machining to assembly automation

Used in all branches of industry – from the automobile industry through solar energy to machine tools

A wide range of sizes – from micro-machining to processing of very large parts

Customer-oriented design – from the standard modular table to customer-specific special solutions



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Rappresentantes  
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Mümessiller  
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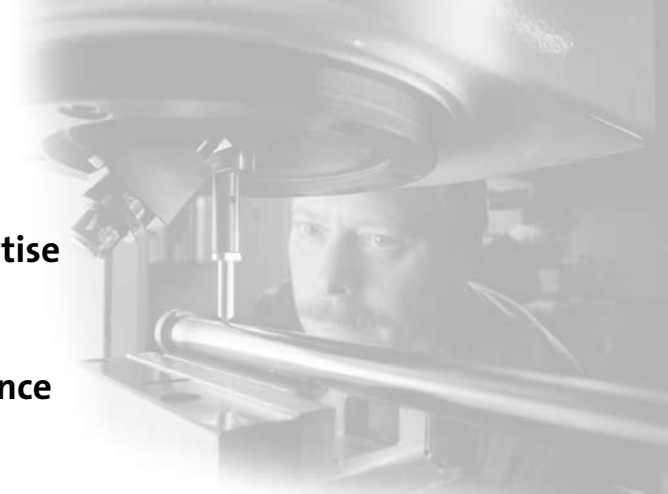
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## Experience and expertise you can rely on FIBRO Quality Assurance



FIBRO is renowned for its quality world-wide. This high quality is achieved through our dedication and commitment to Quality Assurance.

FIBRO testing starts on the raw material and continues right through production to the completed product. The test facilities themselves are also subject to stringent continuous testing. Only by setting itself such stringent standards can a company support its customers long term in safety, cost-effectiveness and quality.

### Tests during production

Precision shape and contour testing equipment is used directly in production. This ensures early confirmation of the quality of the product.

The shape testing equipment tests for qualities such as roundness, concentricity, straightness and rectangularity.

FIBRO state of the art technology provides 3D visualisation of concentricity, coaxiality and cylindricity.

### Materials testing - raw materials to specification.

The FIBRO laboratories carry out microscopic investigation of the raw materials, including enlargement to 2,500 times natural size.

Spectral analysis determines whether the material is correct in terms of chemical composition.

### Hardening – hardness testing

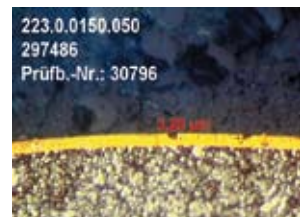
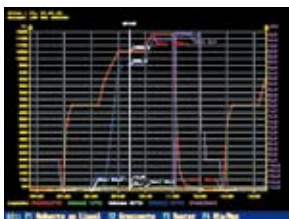
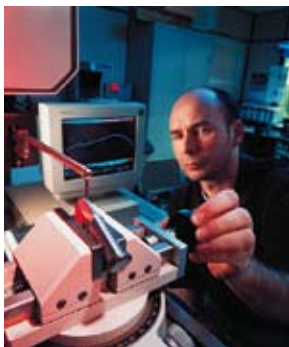
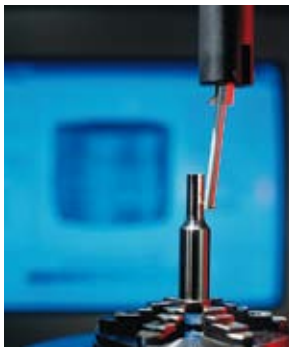
All the process parameters in the hardening process in our own hardening shop are recorded and documented.

Hardness testing is used to monitor the results of the hardening process on every batch.

### Final tests

For precision at micro level if certain basic requirements have to be met.

It goes without saying that the temperature of the measuring room at FIBRO is kept at 20°C. Here the fine precision FIBRO products are measured after production before being released to the customer.



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# A Die Sets

Cast Iron, Steel and Aluminium  
Die Set Press Units, Lamination Die Set Units, Tooling Pallet Die Sets

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## B Precision Ground Plates and Flat Bars

---

## C Lifting and Clamping Devices

---

## D Guide Elements

---

## E Ground Precision Components

---

## F Springs

---

## G Elastomer-Bars, -Sheets, -Sections

---

## H FIBRO Chemical Tooling Aids

---

## J Peripheral Equipment

---

## K Cam Units

---

## L Standard Parts for Mould Making

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# Cast Iron-, All-Steel- and Aluminium Die Sets

**Execution**

Contour faces of FIBRO Steel Die Sets are fully machined. Contour faces of Aluminium Die Sets are sawn, as are those of Aluminium Plates. However, these contour faces can also be machined on request. To all die set plates, a general thickness tolerance of  $\pm 2$  mm applies.

**Guide Elements**

Guide pillars DIN 9825/ISO 9182 (209.19.) and headed guide bushes DIN 9831/ISO 9448 (2081.) are normal equipment on all-steel die sets.

Detailed information under Guide Elements.

**Lifting Aids on Die Sets**

Plate sizes with edges  $a_1+b_1 \geq 1000$  mm, and die sets weighting more than 100 kg, are fitted with threaded holes for two lifter eyebolts per plate. Eyebolts etc. are supplied against special order.

**Special Die Sets and Plates to  
Customers' Drawings**

Die sets and plates up to size  $2200 \times 1100$  mm (external dims.) will be made to customer's drawings, with any special features and highest precision.

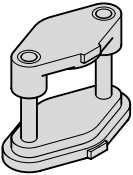
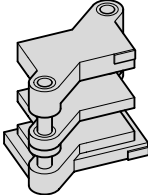
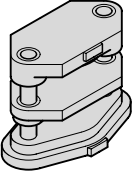
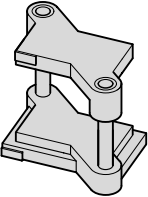
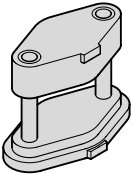
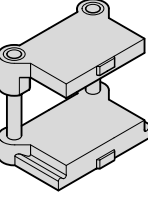
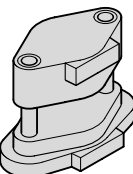
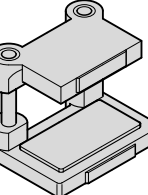
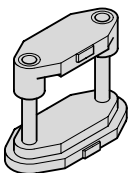
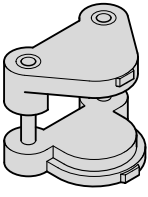
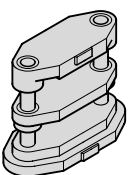
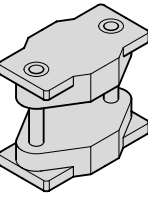
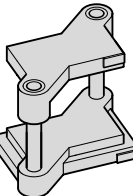
**Special Machining Features**

Wherever possible, all larger apertures or holes should be done by FIBRO before final machining of die sets, for their application at the customer's works must result in die set distortion and impairment of accuracy.

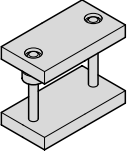
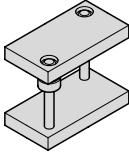
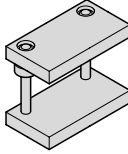
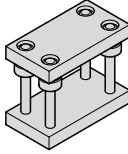
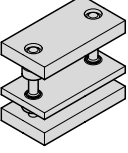
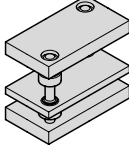
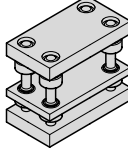
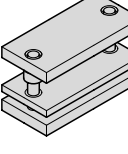
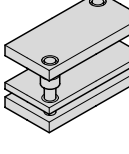
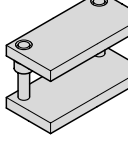
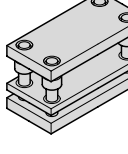
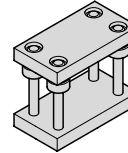
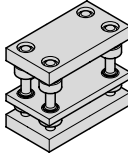
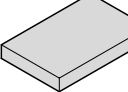
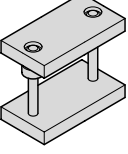
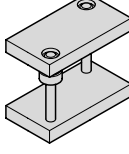
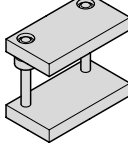
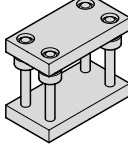
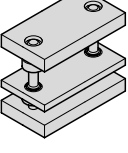
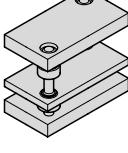
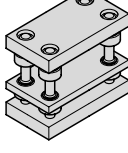
**Enquiry Forms for Special  
Die Sets – also refer to pages  
A30 – A33**

Special pre-printed forms for enquiries and ordering are available on request. All the customer has to do is the filling-in of dimensions and the specifying of guide elements or special machining features where applicable.

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 201.05.		A12	 201.31.	A19
 201.07.		A13	 201.33.	A20
 201.11.		A14	 201.36.	A21
 201.13.		A15	 201.39.	A22
 201.21.		A16		

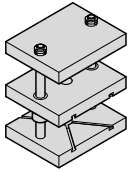


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Standard Aluminium Die Sets – with stripper plates				A39–A43				
	2010.65.		2010.66.				2010.69.	

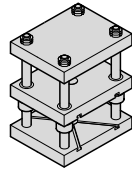
**Contents**

Page

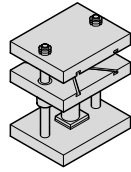
Die Set Press Units



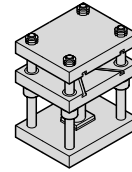
2011.45.



2011.49



201.145.



201.149.

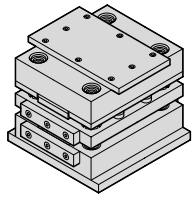
A44–A46

Special Die Sets (All-Steel)  
to Customers' Specifications

A47–A50

FIBRO Progression/  
Lamination Die Sets Units

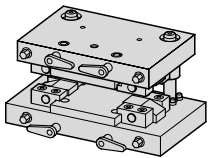
A51–A57



201.50.

FIBRO Tooling Pallet Die Sets for fast exchange of pallet-born press tooling sets

A59–A65



201.95.

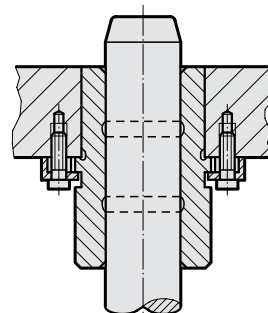
### FIBRO Precision Sliding Guides – Carbonitrided Sintered Ferrite Bushes

These guides employ bushes made from sintered ferrite of high purity with carbonitrided surface. Bearing surfaces are fine-ground.

The sintered ferrite has a porosity content of 18–20 % by volume, vacuum filled with special lubricant FIBROLIT LD. As additional long term lubrication it is recommended to fill up the groove in the bushing with FIBROLIT LD 280.34 – see page H 14. Even under arduous running conditions, this material can be relied upon for good protection against oil film rupture.

Under no circumstances must molybdenum disulfite be added to the lubricant.

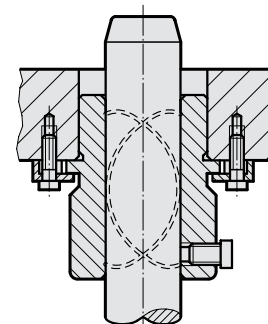
For bearing clearance ranges – see page D11.



### FIBRO Precision Sliding Guides, bronze-coated

consists of a steel body with bronze-coated running surface with helical oil groove and a grease nipple for lubrication.

The steel body guarantees excellent resistance to breaking, even when subject to high loading at the edges.



### FIBRO High Precision Ball Bearing Guides

Careful manufacture at narrowest tolerances, and exactly the right amount of preloading\* result in a play-free guide element of exceptional performance potential.

Our superfinished running surfaces further enhance the advantages of ball bearing guides.

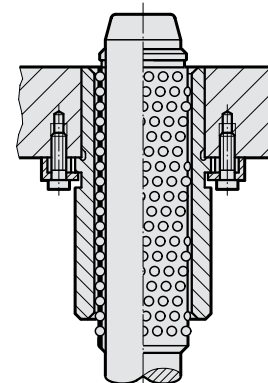
Toolmakers favour ball bearing guides because of their free movement on the bench.

FIBRO ball bearing guides have brass ball cages – a material giving optimum results in stability and ball density.

Despite their unquestionable reliability at high speeds in particular, ball bearing guides with their point contact of the balls remain somewhat sensitive to shock and sustained radial loads. To some extent, generous dimensioning of pillar diameters helps to compensate for this inherent disadvantage.

\* Average preloading:

- 4  $\mu\text{m}$  on pillars from 8 to 12 mm diameter
- 7– 9  $\mu\text{m}$  on pillars from 15 to 16 mm diameter
- 9–11  $\mu\text{m}$  on pillars from 18 to 42 mm diameter
- 11–13  $\mu\text{m}$  on pillars from 50 to 80 mm diameter



### FIBRO Precision Roller Guides

In comparison to ball bearing guides, FIBRO Roller Guide Elements have considerably higher capacities for radial loads.

The much larger contact area of the rollers permits a significant reduction in preload values. This affords a longer service life of the units.

The following preload values apply to FIBRO Roller Guides:

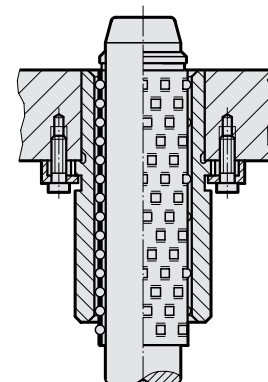
For static loads/low velocities

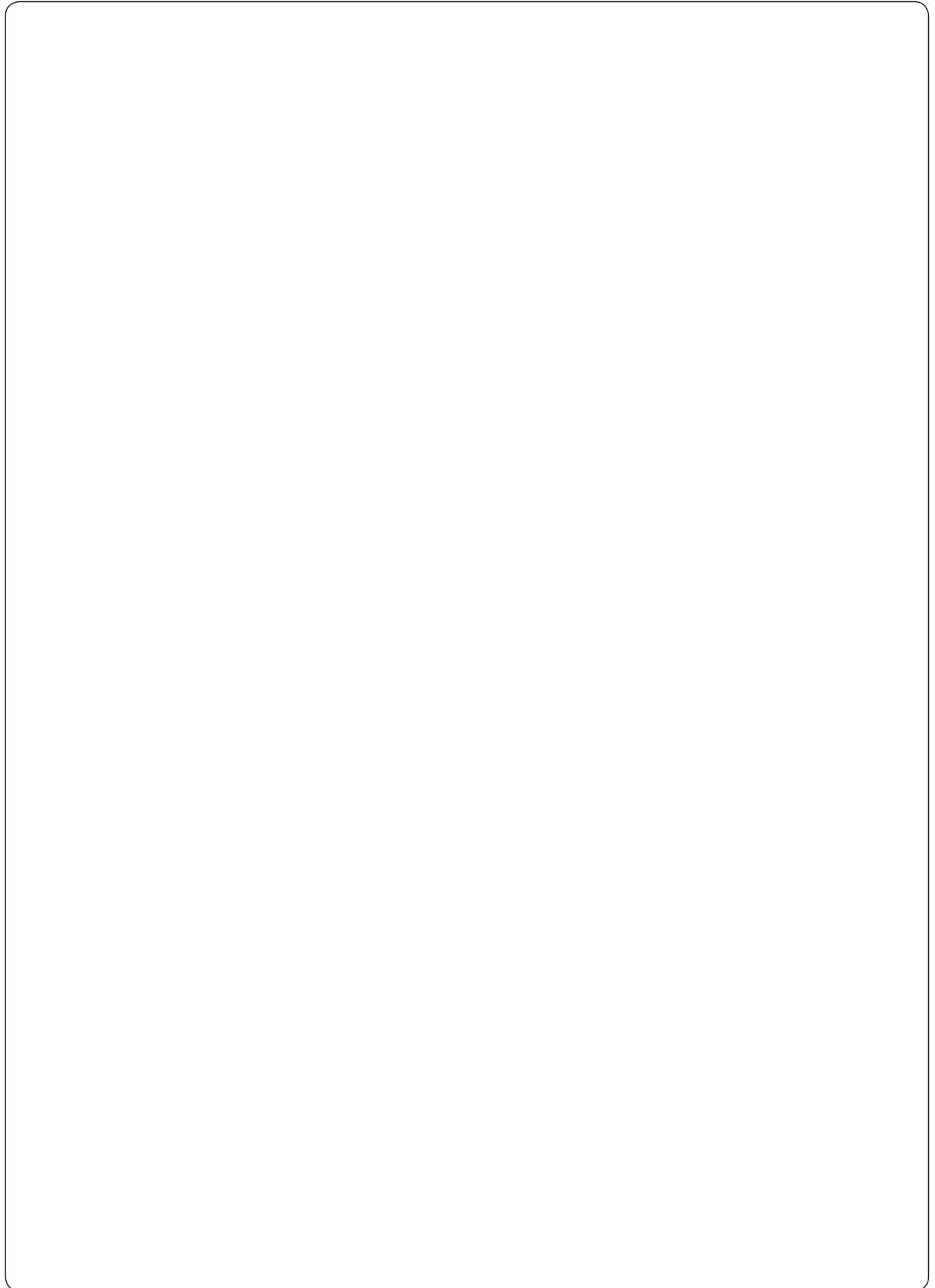
- pillar diameters up to  $\varnothing$  25/32 = 2,5  $\mu\text{m}$
- $\varnothing$  30/32 = 3  $\mu\text{m}$
- $\varnothing$  40–50 = 3,5  $\mu\text{m}$
- $\varnothing$  63 = 4  $\mu\text{m}$

For Dynamic Loads/High Velocities

- pillar diameters up to  $\varnothing$  25/32 = 1,5  $\mu\text{m}$
- $\varnothing$  30/32 = 2  $\mu\text{m}$
- $\varnothing$  40–50 = 2,5  $\mu\text{m}$
- $\varnothing$  63 = 3  $\mu\text{m}$

Use only pairing class  
guide pillar red = .30  
guide bush yellow = .10





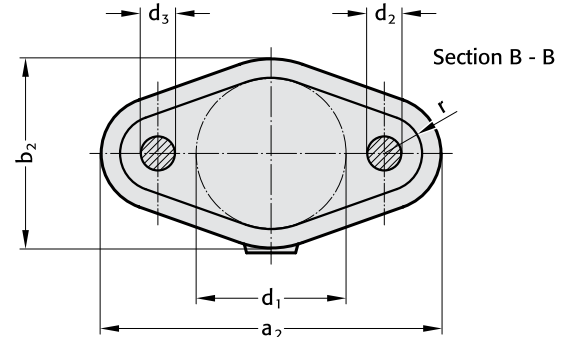
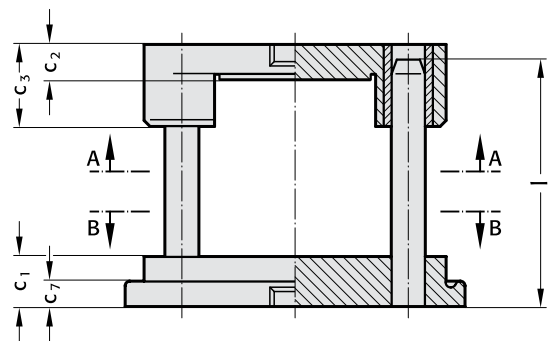
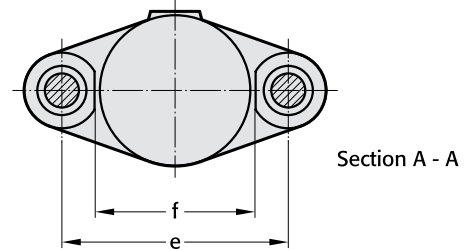
# Cast Iron Die Sets

Die Sets DIN 9812 Shape D and DG

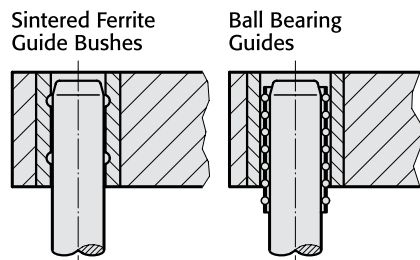
201.01.



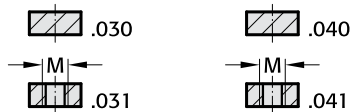
201.01.



Guide Elements



Order No (part II)  
Available with or without shank thread in top bolster



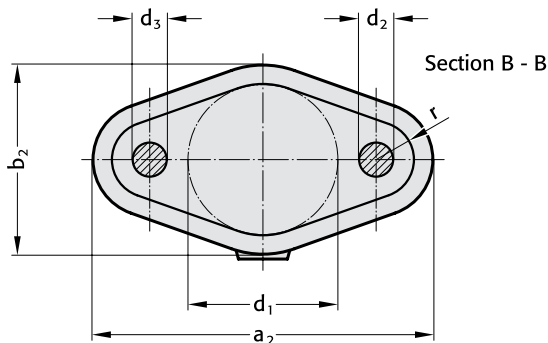
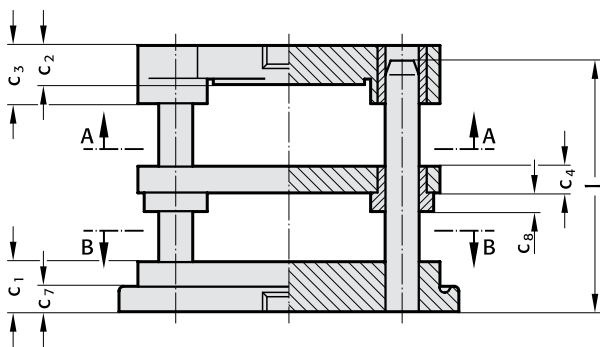
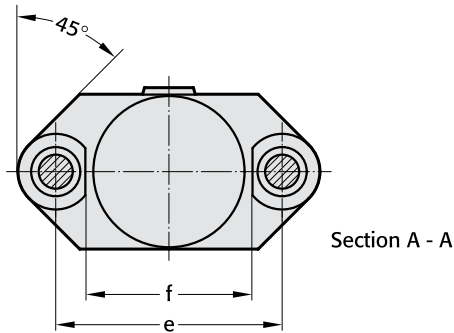
201.01.

Order No	Work area													
Part I	d <sub>1</sub>	a <sub>2</sub>	b <sub>2</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	c <sub>7</sub>	d <sub>2</sub>	d <sub>3</sub>	e	f	l	r	M
201.01.063	63	182	100	40	25	60	20	16	15	106	73	140	20	16x1,5
080	80	236	120	50	30	80	30	20	19	140	90	160	28	20x1,5
100	100	275	140	50	30	80	30	25	24	165	110	160	35	20x1,5
125	125	300	165	50	30	80	30	25	24	190	139	160	35	20x1,5
160	160	360	200	56	40	90	30	32	30	240	174	180	40	24x1,5
180	180	380	220	56	40	90	30	32	30	260	194	180	40	24x1,5
200	200	400	240	56	40	90	30	32	30	280	218	180	40	24x1,5
250	250	496	300	56	50	100	30	40	38	350	268	200	48	30x2
315	315	563	365	63	50	100	30	40	38	417	333	224	48	30x2

Ordering Code (example):

Die set = 201.01.  
 Work area 160 mm = 160.  
 Guide type sintered ferrite = 03  
 Shank thread without = 0  
 Order No = 201.01.160.030

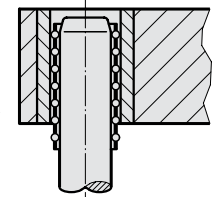
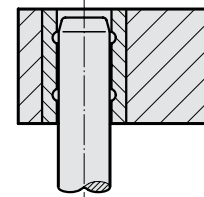
201.03.



**Guide Elements**

Sintered Ferrite Guide Bushes

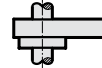
Ball Bearing Guides



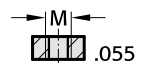
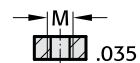
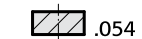
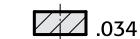
Stripper

Steel

Steel



Order No (part II):  
Available with or  
without shank thread  
in top bolster



201.03.

Order No Part I	work area															
	d <sub>1</sub>	a <sub>2</sub>	b <sub>2</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	c <sub>4</sub>	c <sub>7</sub>	c <sub>8</sub>	d <sub>2</sub>	d <sub>3</sub>	e	f	l	r	M
201.03.100	100	275	140	50	30	50	22	30	18	25	24	165	119	160	35	20x1,5
125	125	300	165	50	30	50	22	30	18	25	24	190	144	160	35	20x1,5
160	160	360	200	56	40	60	27	30	18	32	30	240	184	180	40	24x1,5

**Ordering Code (example):**

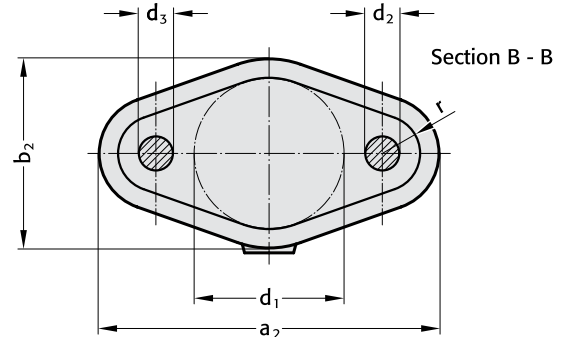
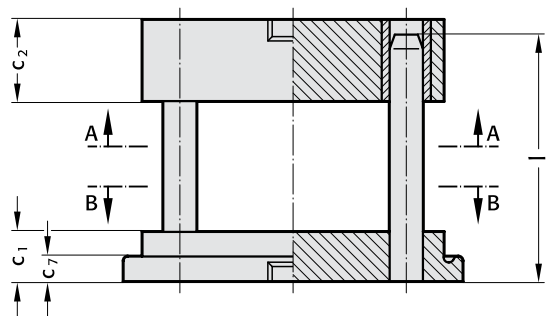
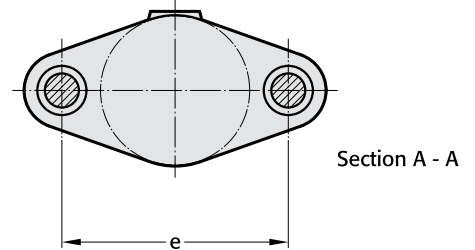
Die set	=	201.03.
Work area	125 mm	= 125.
Guide type	sintered ferrite	= 03
Shank thread	without	= 4
Order No	=	201.03.125.034

Die Sets DIN 9816 Shape D

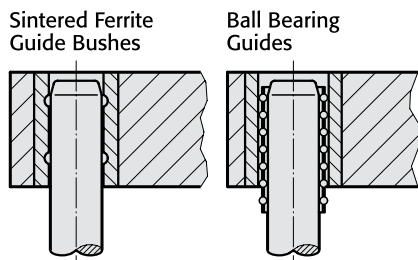
201.05.



201.05.



Guide Elements



Order No (part II):  
Without shank thread in top bolster



201.05.

Order No	work area											
Part I	d <sub>1</sub>	a <sub>2</sub>	b <sub>2</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>7</sub>	d <sub>2</sub>	d <sub>3</sub>	e	l	r	
201.05.063	63	182	100	40	65	20	16	15	106	140	20	
080	80	236	120	50	70	30	20	19	140	160	28	
100	100	275	140	50	75	30	25	24	165	180	35	
125	125	300	165	50	80	30	25	24	190	180	35	
160	160	360	200	56	90	30	32	30	240	224	40	
200	200	400	240	56	100	30	32	30	280	224	40	

Ordering Code (example):

Die set = 201.05.  
 Work area 100 mm = 100.  
 Guide Type sintered ferrite = 030  
 Order No = 201.05.100.030

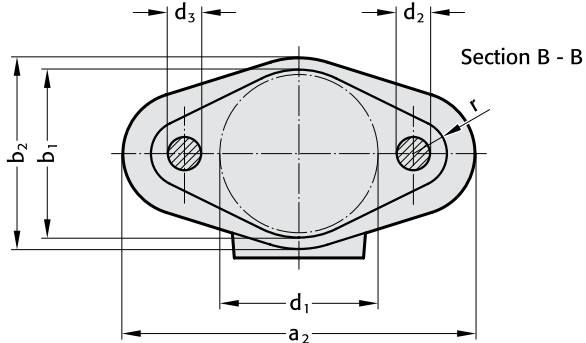
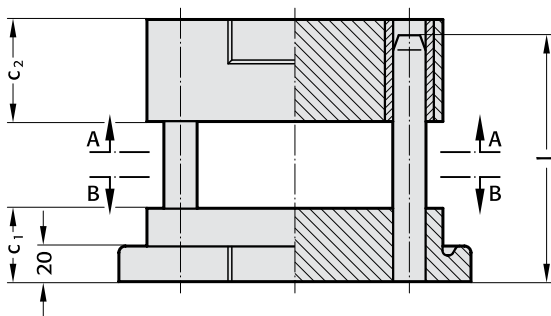
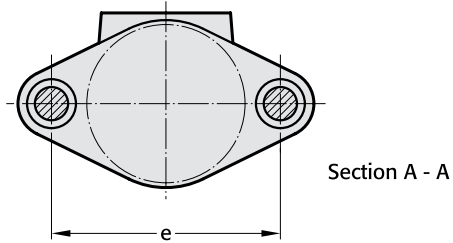


# FIBRO

201.07.

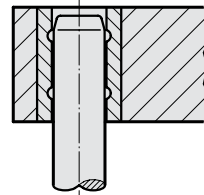
Die Sets similar to DIN 9816 Shape D

201.07.



## Guide Elements

Sintered Ferrite  
Guide Bushes



Order No (part II):  
Without shank thread in top bolster



201.07.

Order No

work area

Part I	d <sub>1</sub>	a <sub>2</sub>	b <sub>1</sub>	b <sub>2</sub>	c <sub>1</sub>	c <sub>2</sub>	d <sub>2</sub>	d <sub>3</sub>	e	l	r
201.07.040.030	40	112	45	55	36	40	16	15	66	100	13
063.030	63	142	68	78	40	55	16	15	90	125	14

## Ordering Code (example):

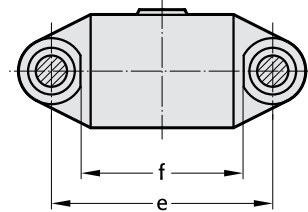
Die set = 201.07.  
Work area 40 mm = 040.  
Guide Type sintered ferrite = 030  
Order No = 201.07.040.030

Die Sets DIN 9812 Shape C and CG

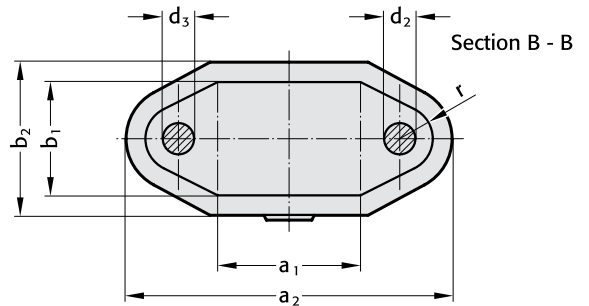
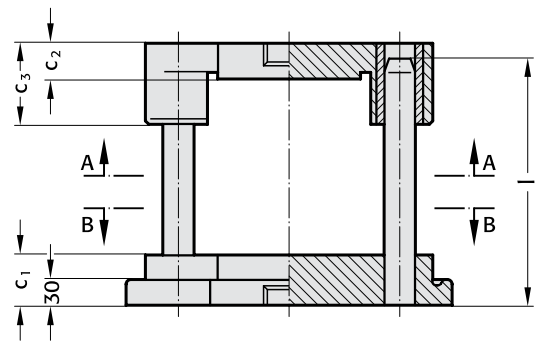
201.11.



201.11.

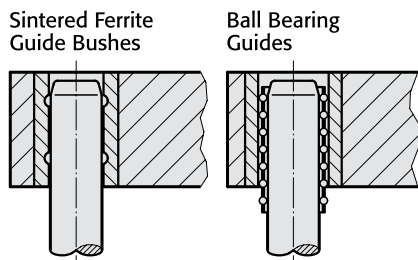


Section A - A

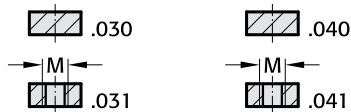


Section B - B

Guide Elements



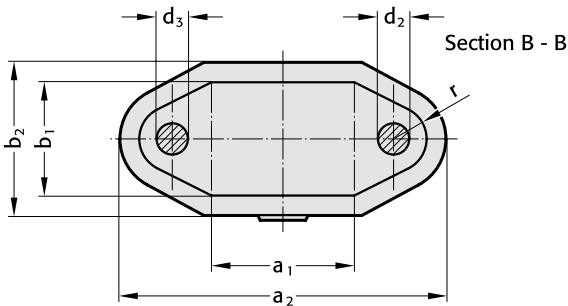
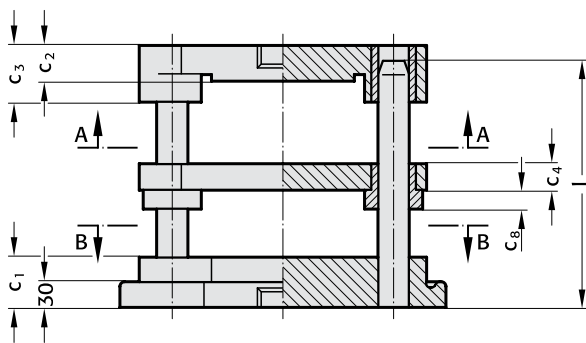
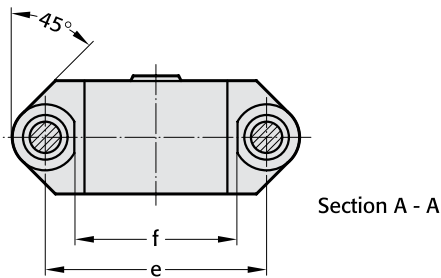
Order No (part II):  
Available with or without shank thread in top bolster



201.11.

Order No	work area	a <sub>2</sub>	b <sub>2</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	d <sub>2</sub>	d <sub>3</sub>	e	f	l	r	M
201.11.070.050	70 x 50	170	70	40	22	50	20	19	110	73	140	20	20x1,5
080.063	80 x 63	235	103	50	30	80	20	19	140	90	160	27	20x1,5
100.063	100 x 63	253	103	50	30	80	20	19	158	110	160	27	20x1,5
080	100 x 80	265	120	50	30	80	25	24	165	110	160	30	20x1,5
201.11.125.080	125 x 80	290	120	50	30	80	25	24	190	139	160	30	20x1,5
160.080	160 x 80	325	120	50	30	80	25	24	225	174	160	30	20x1,5
200.080	200 x 80	365	120	50	30	80	25	24	265	218	160	30	20x1,5
125.100	125 x 100	290	140	50	40	90	25	24	190	139	160	30	24x1,5
160.100	160 x 100	325	140	50	40	90	25	24	225	174	160	30	24x1,5
200.100	200 x 100	395	140	56	40	90	32	30	280	218	180	37	24x1,5
160.125	160 x 125	355	165	56	40	90	32	30	240	174	180	37	24x1,5
200.125	200 x 125	395	165	56	40	90	32	30	280	218	180	37	24x1,5
250.125	250 x 125	445	165	56	40	90	32	30	330	268	180	37	24x1,5
315.125	315 x 125	510	165	56	40	90	32	30	395	333	180	37	24x1,5
200.160	200 x 160	395	200	56	50	100	32	30	280	218	200	37	30x2
250.160	250 x 160	445	200	56	50	100	32	30	330	268	200	37	30x2
200	250 x 200	496	250	63	50	100	40	38	350	268	224	48	30x2
201.11.315.200	315 x 200	563	250	63	50	100	40	38	417	333	224	48	30x2
250	315 x 250	563	300	63	50	100	40	38	417	333	224	48	30x2

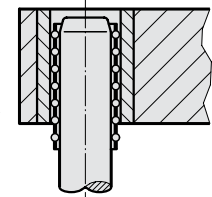
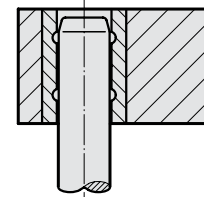
201.13.



**Guide Elements**

Sintered Ferrite Guide Bushes

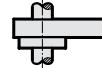
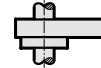
Ball Bearing Guides



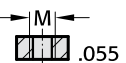
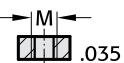
Stripper

Steel

Steel



Order No (part II):  
Available with or  
without shank thread  
in top bolster



201.13.

Order No	work area	a <sub>2</sub>	b <sub>2</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	c <sub>4</sub>	c <sub>8</sub>	d <sub>2</sub>	d <sub>3</sub>	e	f	l	r	M
Part I	a <sub>1</sub> x b <sub>1</sub>														
201.13.080.063	80 x 63	235	103	50	30	50	18	14	20	19	140	104	160	27	20x1,5
100.080	100 x 80	265	120	50	30	50	22	18	25	24	165	119	160	30	20x1,5
125.100	125 x 100	290	140	50	40	60	22	18	25	24	190	144	160	30	24x1,5
160.125	160 x 125	355	165	56	40	60	27	18	32	30	240	184	180	37	24x1,5
200.160	200 x 160	395	200	56	50	70	27	18	32	30	280	224	200	37	30x2

**Ordering Code (example):**

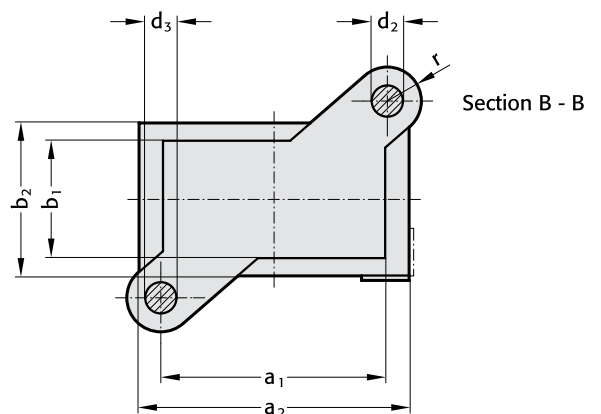
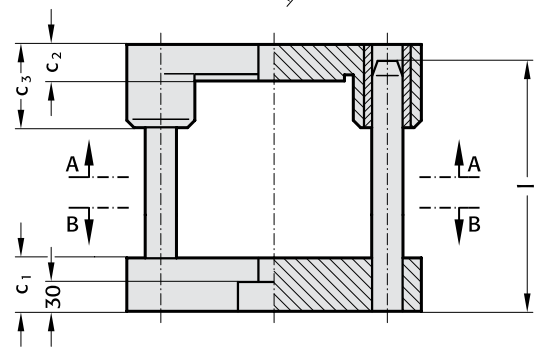
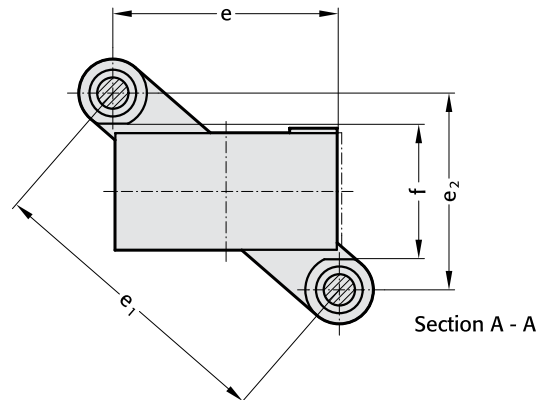
Die set		=	201.13.
Work area length	125 mm	=	125.
Work area width	100 mm	=	100.
Guide type	sintered ferrite	=	03
shank thread	without	=	4
Order No		=	201.13.125.100.034

Die Sets DIN 9819 Shape C and CG

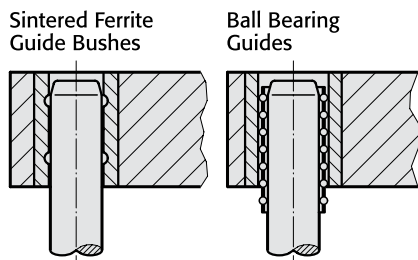
201.21.



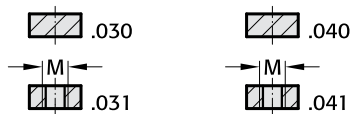
201.21.



Guide Elements



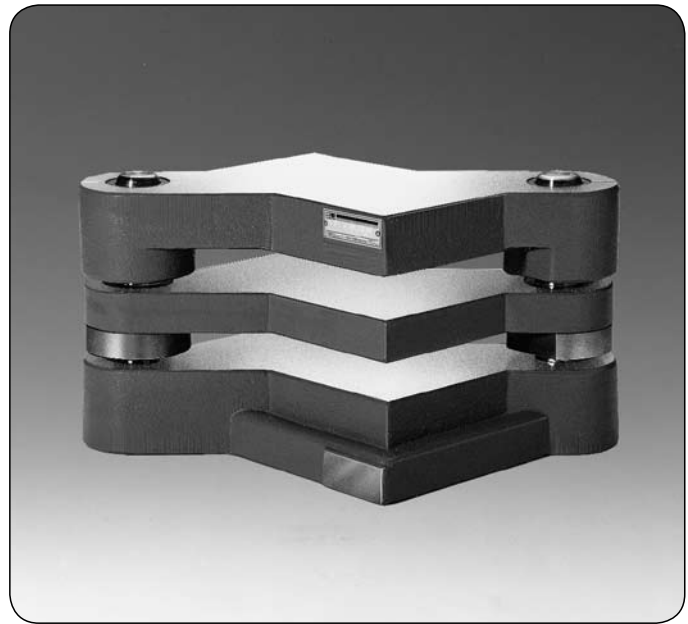
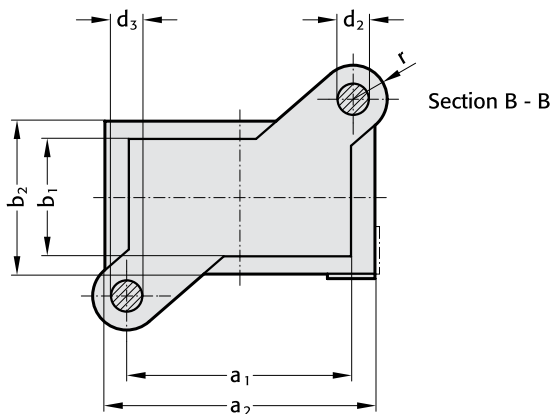
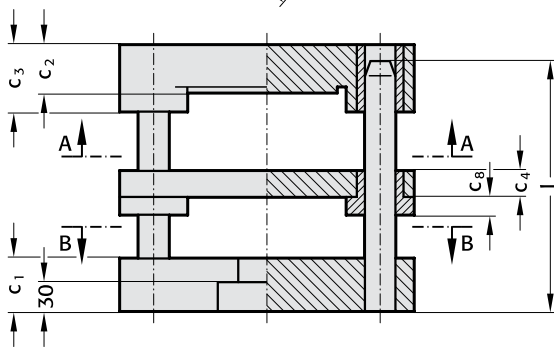
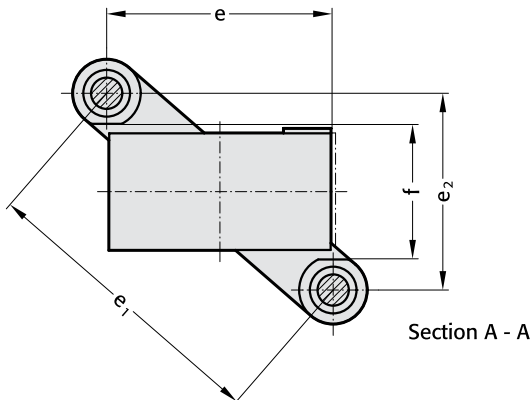
Order No (part II):  
Available with or without shank thread in top bolster



201.21.

Order No	work area	a <sub>2</sub>	b <sub>2</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	d <sub>2</sub>	d <sub>3</sub>	e	e <sub>1</sub>	e <sub>2</sub>	f	l	r	M
201.21.080.063	80 x 63	120	103	50	30	80	20	19	80	145	121	73	160	27	20x1,5
100.063	100 x 63	140	103	50	30	80	20	19	100	157	121	73	160	27	20x1,5
080	100 x 80	140	120	50	30	80	25	24	100	175	144	90	160	30	20x1,5
201.21.125.080	125 x 80	165	120	50	30	80	25	24	125	191	144	90	160	30	20x1,5
100	125 x 100	165	140	50	40	90	25	24	125	206	164	110	160	30	24x1,5
201.21.160.100	160 x 100	200	140	50	40	90	25	24	160	229	164	110	160	30	24x1,5
200.100	200 x 100	240	140	56	40	90	32	30	200	268	179	110	180	37	24x1,5
160.125	160 x 125	200	165	56	40	90	32	30	160	259	204	139	180	37	24x1,5
200.125	200 x 125	240	165	56	40	90	32	30	200	286	204	139	180	37	24x1,5
250.125	250 x 125	290	165	56	40	90	32	30	250	323	204	139	180	37	24x1,5
315.125	315 x 125	355	165	56	40	90	32	30	315	375	204	139	180	37	24x1,5
200.160	200 x 160	240	200	56	50	100	32	30	200	312	240	174	200	37	30x2
250.160	250 x 160	290	200	56	50	100	32	30	250	346	240	174	200	37	30x2
200	250 x 200	300	250	63	50	100	40	38	250	392	302	218	224	48	30x2
201.21.315.200	315 x 200	365	250	63	50	100	40	38	315	436	302	218	224	48	30x2
250	315 x 250	365	300	63	50	100	40	38	315	472	352	268	224	48	30x2

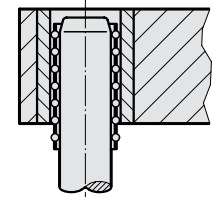
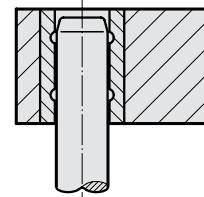
201.23.



**Guide Elements**

Sintered Ferrite Guide Bushes

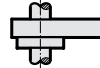
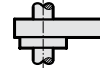
Ball Bearing Guides



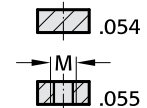
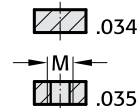
Stripper

Steel

Steel



Order No (part II):  
Available with or  
without shank thread  
in top bolster



**201.23.**

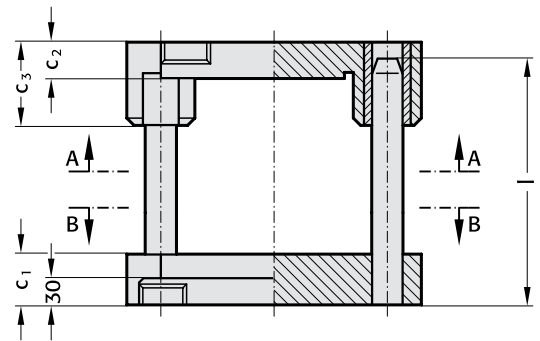
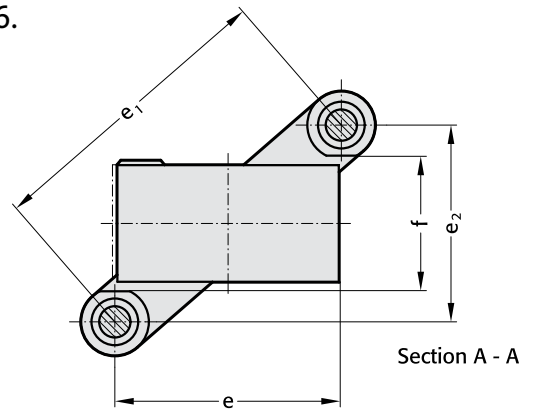
Order No	work area	a <sub>2</sub>	b <sub>2</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	c <sub>4</sub>	c <sub>8</sub>	d <sub>2</sub>	d <sub>3</sub>	e	e <sub>1</sub>	e <sub>2</sub>	f	l	r	M
Part I	a <sub>1</sub> x b <sub>1</sub>																
201.23.100.080	100 x 80	140	120	50	30	50	22	18	25	24	100	175	144	98	160	30	20x1,5
125.100	125 x 100	165	140	50	40	60	22	18	25	24	125	206	164	118	160	30	24x1,5
160.100	160 x 100	200	140	50	40	60	22	18	25	24	160	229	164	118	160	30	24x1,5
125	160 x 125	200	165	56	40	60	27	18	32	30	160	259	204	148	180	37	24x1,5
201.23.200.125	200 x 125	240	165	56	40	60	27	18	32	30	200	286	204	148	180	37	24x1,5
250.160	250 x 160	290	200	56	50	70	27	18	32	30	250	346	240	184	200	37	30x2

**Ordering Code (example):**

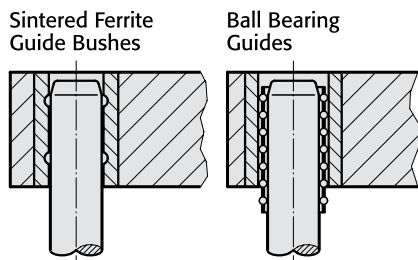
Die set		=	201.23.
Work area length	160 mm	=	160.
Work area width	100 mm	=	100.
Guide type	sintered ferrite	=	03
Shank thread	without	=	4
Order No		=	201.23.160.100.034



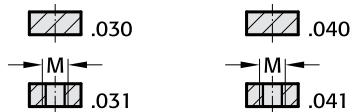
201.26.



Guide Elements



Order No (part II):  
Available with or without shank thread in top bolster



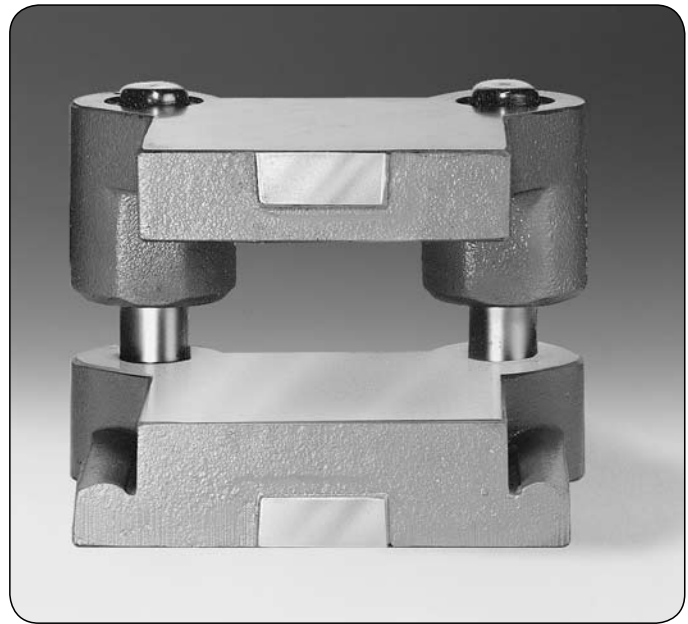
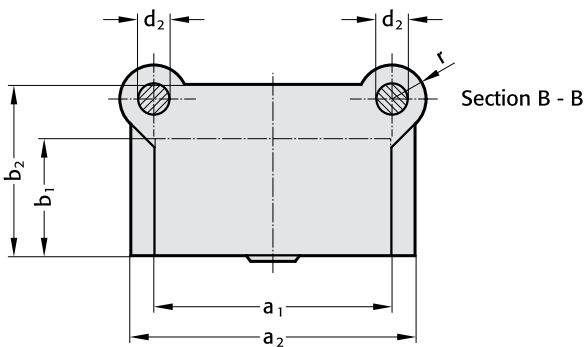
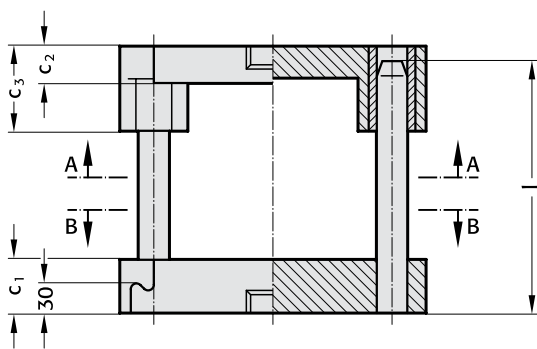
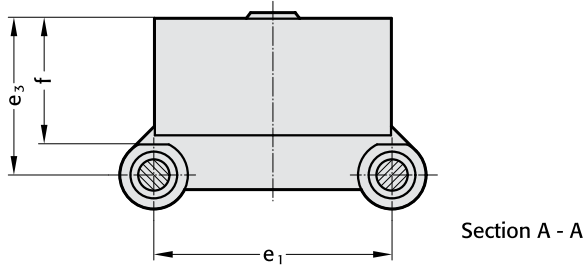
201.26.

Order No	work area	a <sub>2</sub>	b <sub>2</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	d <sub>2</sub>	d <sub>3</sub>	e	e <sub>1</sub>	e <sub>2</sub>	f	l	r	M
Part I	a <sub>1</sub> x b <sub>1</sub>														
201.26.125.100.030	125 x 100	165	140	50	40	90	25	24	125	206	164	110	160	30	24x1,5
160.100.030	160 x 100	200	140	50	40	90	25	24	160	229	164	110	160	30	24x1,5
125.030	160 x 125	200	165	56	40	90	32	30	160	259	204	139	180	37	24x1,5
201.26.200.125.030	200 x 125	240	165	56	40	90	32	30	200	286	204	139	180	37	24x1,5
160.030	200 x 160	240	200	56	50	100	32	30	200	312	240	174	200	37	30x2

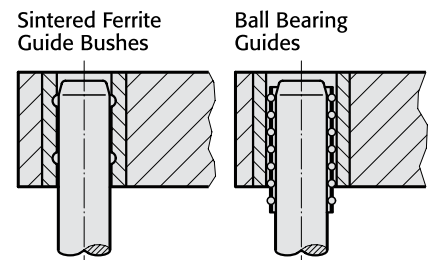
Ordering Code (example):

Die set		=	201.26.
Work area length	160 mm	=	160.
Work area width	125 mm	=	125.
Guide type	sintered ferrite	=	03
Shank thread	without	=	0
Order No		=	201.26.160.125.030

201.31.



**Guide Elements**



Order No (part II):  
Without shank thread in top bolster

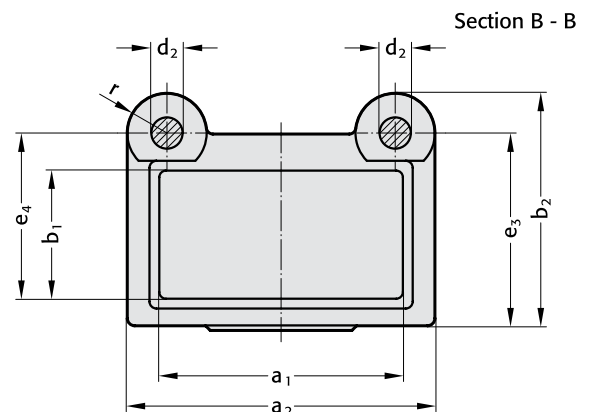
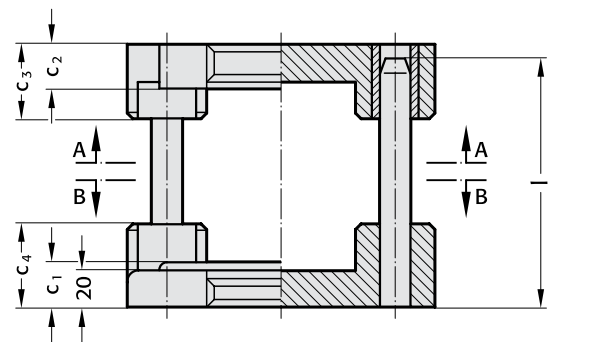
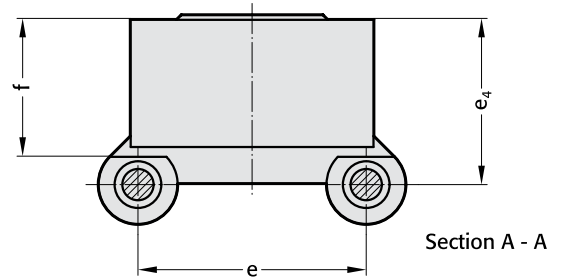


**201.31.**

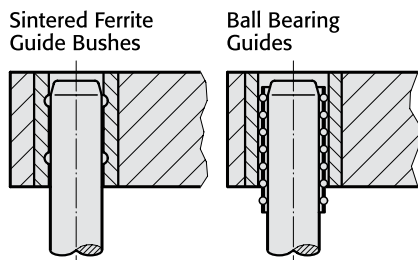
Order No	work area	a <sub>2</sub>	b <sub>2</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	d <sub>2</sub>	e <sub>1</sub>	e <sub>3</sub>	f	l	r
Part I	a <sub>1</sub> x b <sub>1</sub>											
201.31.063.050	63 x 50	95	84	40	25	50	20	72	77	55	140	22
080.063	80 x 63	125	105	45	30	60	20	80	92	68	160	27
100.063	100 x 63	145	105	45	30	60	20	100	92	68	160	27
080	100 x 80	145	130	50	30	70	25	100	112	87	160	30
201.31.125.080	125 x 80	170	130	50	30	70	25	125	112	87	160	30
160.080	160 x 80	205	130	50	30	70	25	160	112	87	160	30
125.100	125 x 100	170	150	56	40	90	32	125	140	107	180	37
160.100	160 x 100	205	150	56	40	90	32	160	140	107	180	37
200.100	200 x 100	245	150	56	40	90	32	200	140	107	180	37
160.125	160 x 125	215	180	56	40	90	32	160	165	132	180	37
200.125	200 x 125	255	180	56	40	90	32	200	165	132	180	37
250.125	250 x 125	305	180	56	40	90	32	250	165	132	180	37
200.160	200 x 160	255	225	63	50	90	40	200	210	167	224	48
250.160	250 x 160	305	225	63	50	120	40	250	210	167	224	48
200	250 x 200	305	270	63	50	120	50	250	260	207	224	56
201.31.315.250	315 x 250	370	320	63	50	120	50	315	310	257	224	56



201.33.



Guide Elements



Order No (part II):  
Without shank thread in top bolster



201.33.

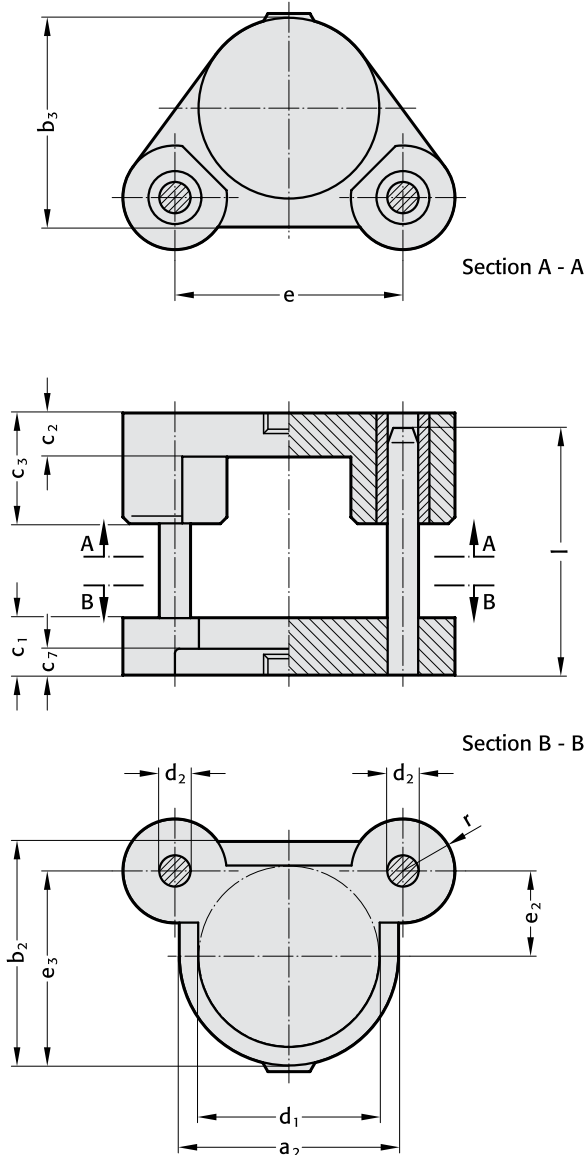
Order No	work area	a <sub>2</sub>	b <sub>2</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	c <sub>4</sub>	d <sub>2</sub>	e	e <sub>3</sub>	e <sub>4</sub>	f	l	r
Part I	a <sub>1</sub> x b <sub>1</sub>													
201.33.063.050	63 x 50	116	110	25	25	40	45	16	72	88	74	57	125	22
080.060	80 x 60	116	117	25	25	40	45	20	72	95	81	62	160	22

Ordering Code (example):

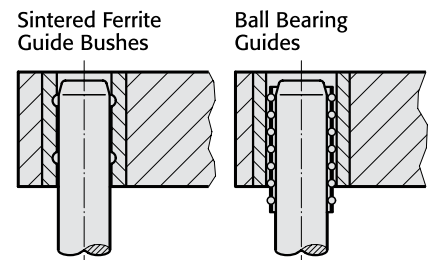
Die set		=	201.33.
Work area length	63 mm	=	063.
Work area width	50 mm	=	050.
Guide type	sintered ferrite	=	030
Order No		=	201.33.063.050.030



201.36.



**Guide Elements**



Order No (part II):  
Without shank thread in top bolster



**201.36.**

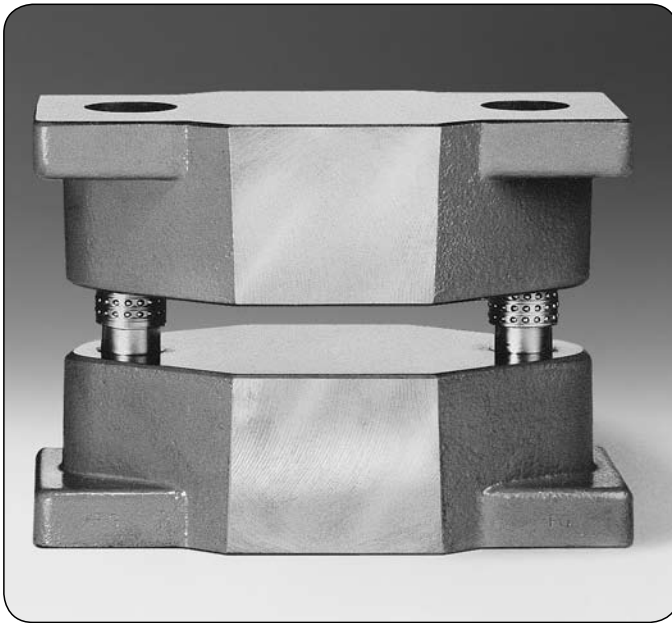
Order No	work area														
Part I	d <sub>1</sub>	a <sub>2</sub>	b <sub>2</sub>	b <sub>3</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	c <sub>7</sub>	d <sub>2</sub>	e	e <sub>2</sub>	e <sub>3</sub>	l	r	
201.36.050	50	80	80	65	40	30	50	25	20	66	33	73	125	20	
063	63	94	94	78	45	30	60	25	20	82	41	88	125	25	
080	80	110	110	95	50	30	70	30	25	105	52	107	160	30	
100	100	140	140	120	50	30	70	30	25	125	57	127	160	30	
125	125	166	166	145	56	40	90	30	32	157	73	156	180	38	
160	160	200	200	180	63	50	120	30	40	200	85	185	224	48	
180	180	220	220	200	63	50	120	30	40	224	90	200	224	48	
200	200	250	250	225	63	50	120	30	50	250	95	220	224	56	
250	250	300	300	275	63	50	120	30	50	300	120	270	224	56	

**Ordering Code (example):**

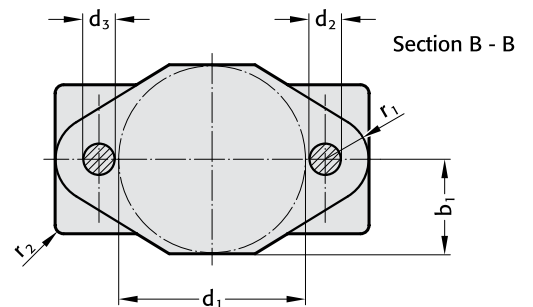
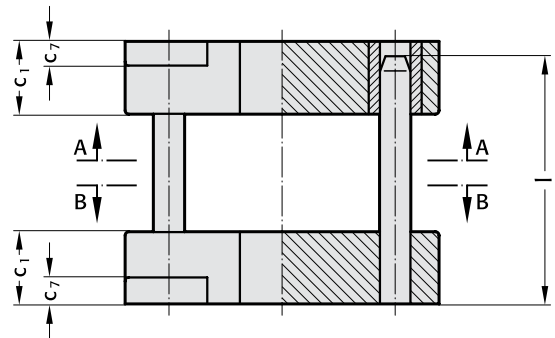
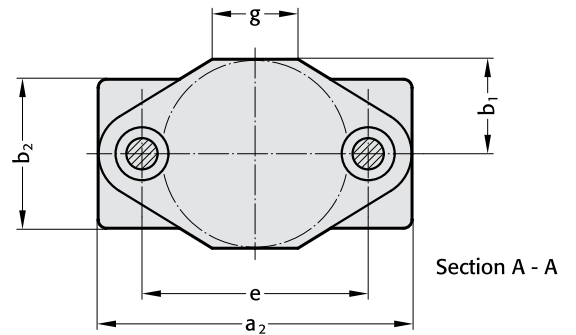
Die set	=	201.36.
Work area 125 mm	=	125.
Guide type sintered ferrite	=	030
Order No	=	201.36.125.030

Fine Blanking Die Sets

201.39.



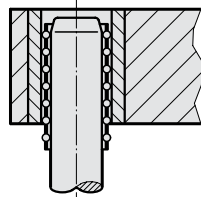
201.39.



Faces front and rear fine machined after assembly – their perfect alignment permits use as datum reference.

Guide Elements

Ball Bearing Guides



Order No (part II):  
Without shank thread in top bolster

.040

201.39.

Order No	work area													
Part I	d <sub>1</sub>	a <sub>2</sub>	b <sub>1</sub>	b <sub>2</sub>	c <sub>1</sub>	c <sub>7</sub>	d <sub>2</sub>	d <sub>3</sub>	e	g	l	r <sub>1</sub>	r <sub>2</sub>	
201.39.100	100	220	50	85	75	22	25	24	140	60	140	27	6	
125	125	245	62	100	75	25	25	24	165	80	140	27	6	
160	160	290	80	140	75	25	32	30	200	80	140	35	6	
200	200	340	100	160	80	30	40	38	250	90	160	45	8	
250	250	400	125	200	85	32	40	38	300	100	180	50	10	

Ordering Code (example):

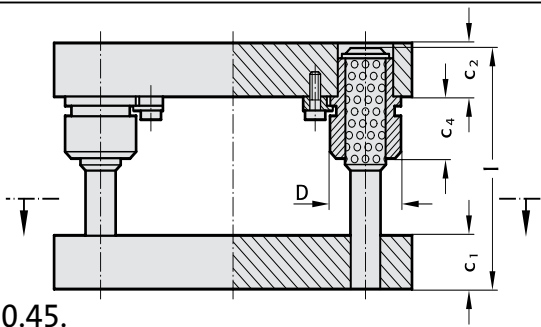
Fine Blanking Die Set	=	201.39.
Work area	160 mm	= 160.
Guide type	balls	= 040
Order No		= 201.39.160.040

# All-Steel- and Aluminium Die Sets

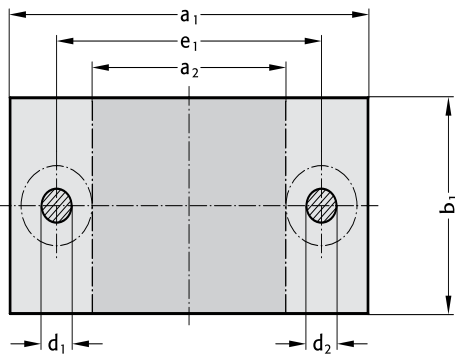
# FIBRO

2010.45. 2010.47.  
2010.46. 2010.49.

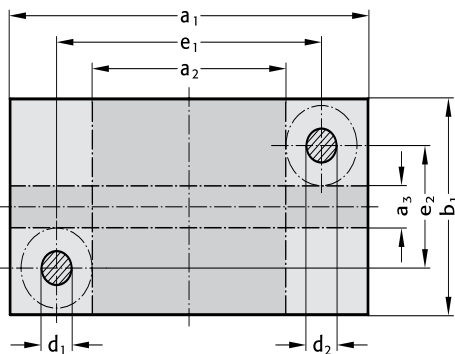
## Standard All-Steel Die Sets similar DIN 9868/ISO 11415 without stripper



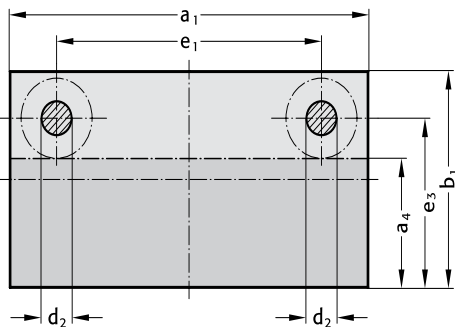
2010.45.



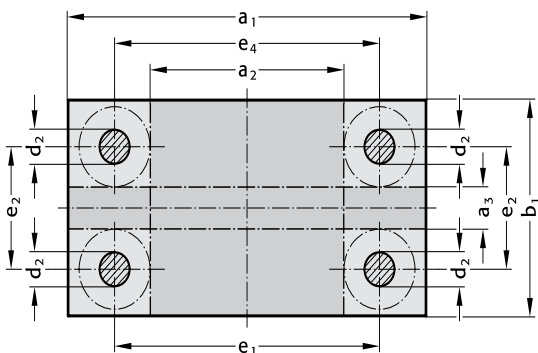
2010.46.



2010.47.



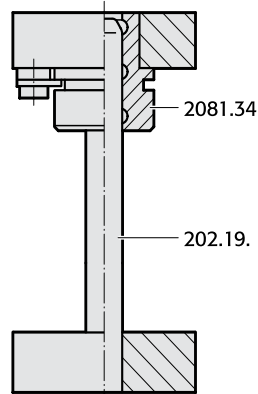
2010.49.



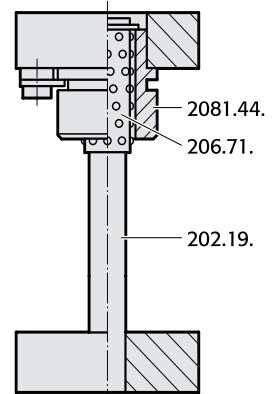
### Standard Guide Systems

Headed Sintered Ferrite Bushes, carbonitrided

Headed Ball Bearing Bushes



2010.□□.□□□□.□.834.



2010.□□.□□□□.□.862.

### Description:

FIBRO Standard All-Steel Die Sets offer the choice between sintered ferrite sliding guides and those of the ball bearing type to DIN-ISO. Both come with headed guide bushes. These are seated in push-fit bolster bores and retained there by screw clamps.

On request, All-Steel Die Sets can also be fitted with any other FIBRO Guide Elements – for combination possibilities see page A 30.

FIBRO will furthermore supply die sets with special machining features to customers' drawings.

### Execution:

External contours milled, thickness surfaces ground

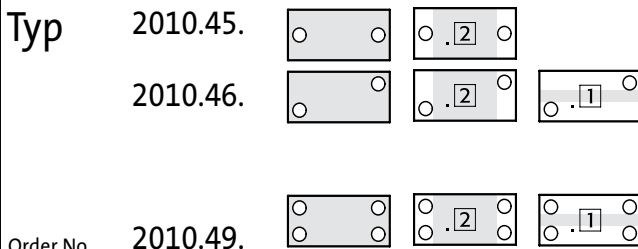
$a_1$  or  $b_1 \leq 630 = \begin{matrix} +0,4 \\ +0,2 \end{matrix}$   
 $a_1$  or  $b_1 > 630 = \begin{matrix} +0,6 \\ +0,2 \end{matrix}$

Ordering example see opposite fold out page

# Standard All-Steel Die Sets similar DIN 9868/ISO 11415 with stripper

**FIBRO**

2010.45. 2010.46.  
2010.49.



Order No **2010.49.**  
Part .I .II .III.IV .V

Type	Size	P.*	Guides type	ext. dims. a <sub>1</sub> × b <sub>1</sub>	work area a <sub>2</sub> × b <sub>1</sub>	work area a <sub>1</sub> × a <sub>3</sub>	C <sub>1</sub> ±2	C <sub>2</sub> ±2	C <sub>3</sub> ±2	C <sub>4</sub>	C <sub>5</sub>	d <sub>1</sub> /d <sub>2</sub> × l	D	e <sub>1</sub>	e <sub>2</sub>	e <sub>4</sub>
2010.	.1608.1.			160 × 80	60 × 80	-	32	32	25	12	12	19/20 × 180	39	100	-	-
	.1610.1.			160 × 100	60 × 100	-	32	32	25	12	12	19/20 × 180	39	100	-	-
	.1612.1.			160 × 125	60 × 125	-	32	32	25	12	12	19/20 × 180	39	100	-	-
	.1616.1.			160 × 160	60 × 160	160 × 60	32	32	25	12	12	19/20 × 180	39	100	100	103
2010.	.2010.1.			200 × 100	70 × 100	-	40	40	25	25	12	24/25 × 200	46	120	-	-
	.2010.2.						40	32								
	.2010.3.						32	40								
	.2010.4.						32	32								
2010.	.2012.1.			200 × 125	70 × 125	-	40	40	25	25	12	24/25 × 200	46	120	-	-
	.2012.2.						40	32								
	.2012.3.						32	40								
	.2012.4.						32	32								
2010.	.2016.1.			200 × 160	70 × 160	-	40	40	25	25	12	24/25 × 200	46	120	-	-
	.2016.2.						40	32								
	.2016.3.						32	40								
	.2016.4.						32	32								
2010.	.2020.1.			200 × 200	70 × 200	200 × 70	40	40	25	25	12	24/25 × 200	46	120	120	123
	.2020.2.						40	32								
	.2020.3.						32	40								
	.2020.4.						32	32								
2010.	.2512.1.			250 × 125	120 × 125	-	40	40	25	25	12	24/25 × 200	46	170	-	-
	.2512.2.						40	32								
	.2512.3.						32	40								
	.2512.4.						32	32								
2010.	.2516.1.			250 × 160	120 × 160	-	40	40	25	25	12	24/25 × 200	46	170	-	-
	.2516.2.						40	32								
	.2516.3.						32	40								
	.2516.4.						32	32								
2010.	.2520.1.			250 × 200	120 × 200	250 × 70	40	40	25	25	12	24/25 × 200	46	170	120	173
	.2520.2.						40	32								
	.2520.3.						32	40								
	.2520.4.						32	32								
2010.	.2525.1.			250 × 250	120 × 250	250 × 120	40	40	25	25	12	24/25 × 200	46	170	170	173
	.2525.2.						40	32								
	.2525.3.						32	40								
	.2525.4.						32	32								
2010.	.3116.1.			315 × 160	165 × 160	-	50	50	32	32	12	30/32 × 224	53	225	-	-
	.3116.2.						50	40								
	.3116.3.						40	50								
	.3116.4.						40	40								
2010.	.3120.1.			315 × 200	165 × 200	315 × 50	50	50	32	32	12	30/32 × 224	53	225	110	228
	.3120.2.						50	40								
	.3120.3.						40	50								
	.3120.4.						40	40								
2010.	.3125.1.			315 × 250	165 × 250	315 × 100	50	50	32	32	12	30/32 × 224	53	225	160	228
	.3125.2.						50	40								
	.3125.3.						40	50								
	.3125.4.						40	40								
2010.	.3131.1.			315 × 315	165 × 315	315 × 165	50	50	32	32	12	30/32 × 224	53	225	225	228
	.3131.2.						50	40								
	.3131.3.						40	50								
	.3131.4.						40	40								
2010.	.4020.1.			400 × 200	250 × 200	400 × 50	50	50	32	32	12	30/32 × 224	53	310	110	313
	.4020.2.						50	40								
	.4020.3.						40	50								
	.4020.4.						40	40								
2010.	.4025.1.			400 × 250	250 × 250	400 × 100	50	50	32	32	12	30/32 × 224	53	310	160	313
	.4025.2.						50	40								
	.4025.3.						40	50								
	.4025.4.						40	40								
2010.	.4031.1.			400 × 315	250 × 315	400 × 165	50	50	32	32	12	30/32 × 224	53	310	225	313
	.4031.2.						50	40								
	.4031.3.						40	50								
	.4031.4.						40	40								

# Standard All-Steel Die Sets similar DIN 9868/ISO 11415 with stripper

**FIBRO**

2010.45. 2010.46.  
2010.49.

Order No	Part				ext. dims.	work area	work area	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	c <sub>4</sub>	c <sub>5</sub>	d <sub>1</sub> /d <sub>2</sub> × l	D	e <sub>1</sub>	e <sub>2</sub>	e <sub>4</sub>
Type	Size	P*	Guides type	a <sub>1</sub> × b <sub>1</sub>	a <sub>2</sub> × b <sub>1</sub>	a <sub>1</sub> × a <sub>3</sub>	± 2	± 2	± 2								
2010.	.4040.1.			400 × 400	250 × 400	400 × 250	50	50	32	32	12	30/32 × 224	53	310	310	313	
	.4040.2.						50	40									
	.4040.3.						40	50									
	.4040.4.						40	40									
2010.	.5025.1.			500 × 250	330 × 250	500 × 80	50	50	32	32	15	38/40 × 224	63	400	150	403	
	.5025.2.						50	40									
	.5025.3.						40	50									
	.5025.4.						40	40									
2010.	.5031.1.			500 × 315	330 × 315	500 × 145	50	50	32	32	15	38/40 × 224	63	400	215	403	
	.5031.2.						50	40									
	.5031.3.						40	50									
	.5031.4.						40	40									
2010.	.5040.1.			500 × 400	330 × 400	500 × 230	50	50	32	32	15	38/40 × 224	63	400	300	403	
	.5040.2.						50	40									
	.5040.3.						40	50									
	.5040.4.						40	40									
2010.	.5050.1.			500 × 500	330 × 500	500 × 330	50	50	32	32	15	38/40 × 224	63	400	400	403	
	.5050.2.						50	40									
	.5050.3.						40	50									
	.5050.4.						40	40									
2010.	.6331.1.			630 × 315	430 × 315	630 × 115	63	63	40	36	18	48/50 × 280	77	510	195	513	
	.6331.2.						63	50				48/50 × 280					
	.6331.3.						50	63				48/50 × 250					
	.6331.4.						50	50				48/50 × 250					
2010.	.6340.1.			630 × 400	430 × 400	630 × 200	63	63	40	36	18	48/50 × 280	77	510	280	513	
	.6340.2.						63	50				48/50 × 280					
	.6340.3.						50	63				48/50 × 250					
	.6340.4.						50	50				48/50 × 250					
2010.	.6350.1.			630 × 500	430 × 500	630 × 300	63	63	40	36	18	48/50 × 280	77	510	380	513	
	.6350.2.						63	50				48/50 × 280					
	.6350.3.						50	63				48/50 × 250					
	.6350.4.						50	50				48/50 × 250					
2010.	.6363.1.			630 × 630	430 × 630	630 × 430	63	63	40	36	18	48/50 × 280	77	510	510	513	
	.6363.2.						63	50				48/50 × 280					
	.6363.3.						50	63				48/50 × 250					
	.6363.4.						50	50				48/50 × 250					
2010.	.7140.1.			710 × 400	510 × 400	710 × 200	63	63	40	36	18	48/50 × 280	77	590	280	593	
	.7140.2.						63	50				48/50 × 280					
	.7140.3.						50	63				48/50 × 250					
	.7140.4.						50	50				48/50 × 250					
2010.	.7150.1.			710 × 500	510 × 500	710 × 300	63	63	40	36	18	48/50 × 280	77	590	380	593	
	.7150.2.						63	50				48/50 × 280					
	.7150.3.						50	63				48/50 × 250					
	.7150.4.						50	50				48/50 × 250					
2010.	.7163.1.			710 × 630	510 × 630	710 × 430	63	63	40	36	18	48/50 × 280	77	590	510	593	
	.7163.2.						63	50				48/50 × 280					
	.7163.3.						50	63				48/50 × 250					
	.7163.4.						50	50				48/50 × 250					
2010.	.8040.1.			800 × 400	600 × 400	800 × 200	63	63	40	36	18	48/50 × 280	77	680	280	683	
	.8040.2.						63	50				48/50 × 280					
	.8040.3.						50	63				48/50 × 250					
	.8040.4.						50	50				48/50 × 250					
2010.	.8050.1.			800 × 500	600 × 500	800 × 300	63	63	40	36	18	48/50 × 280	77	680	380	683	
	.8050.2.						63	50				48/50 × 280					
	.8050.3.						50	63				48/50 × 250					
	.8050.4.						50	50				48/50 × 250					
2010.	.8063.1.			800 × 630	600 × 630	800 × 430	63	63	40	36	18	48/50 × 280	77	680	510	683	
	.8063.2.						63	50				48/50 × 280					
	.8063.3.						50	63				48/50 × 250					
	.8063.4.						50	50				48/50 × 250					

\*P. = thickness combinations

### Ordering Code (example):

Type of Die Set = 2010.45.  
 Ext. Dimensions = 400 × 250 = 4025.  
 Combination P\*: c<sub>1</sub> = 50, c<sub>2</sub> = 50 = 1.  
 Guides: headed sintered guide bushes = 835.  
 Awork area 2 = 2  
 Order No = 2010.45.4025.1.835.2

### Advisory: Ordering Code

Hole pattern for the screw clamps depends on positioning of working surface, determined by part V (five) of the Order No, for example: 2010.49.2520.4.865.1  
 .2

# FIBRO

2010.45. 2010.47.  
2010.46. 2010.49.

Standard All-Steel Die Sets  
similar DIN 9868/ISO 11415  
without stripper

Type	Size P*	Guides type	ext. dims. $a_1 \times b_1$	work area $a_2 \times b_1$	work area $a_1 \times a_3$	work area $a_1 \times a_4$	$C_1$ $\pm 2$	$C_2$ $\pm 2$	$C_4$ S	$C_4$ K	$d_1/d_2 \times l$	D	$e_1$	$e_2$	$e_3$	$e_4$
2010.	.1608.1.	.	160 × 80	60 × 80	-	-	32	32	20	36	19/20 × 160	39	100	-	-	-
	.1610.1.	.	160 × 100	60 × 100	-	160 × 50	32	32	20	36	19/20 × 160	39	100	-	70	-
	.1612.1.	.	160 × 125	60 × 125	-	160 × 75	32	32	20	36	19/20 × 160	39	100	-	95	-
	.1616.1.	.	160 × 160	60 × 160	160 × 60	160 × 110	32	32	20	36	19/20 × 160	39	100	100	130	103
2010.	.2010.1.	.	200 × 100	70 × 100	-	-	40	40	36	56	24/25 × 180	46	120	-	-	-
	.2010.2.	.					40	32								
	.2010.3.	.					32	40								
	.2010.4.	.					32	32								
2010.	.2012.1.	.	200 × 125	70 × 125	-	200 × 60	40	40	36	56	24/25 × 180	46	120	-	85	-
	.2012.2.	.					40	32								
	.2012.3.	.					32	40								
	.2012.4.	.					32	32								
2010.	.2016.1.	.	200 × 160	70 × 160	-	200 × 95	40	40	36	56	24/25 × 180	46	120	-	120	-
	.2016.2.	.					40	32								
	.2016.3.	.					32	40								
	.2016.4.	.					32	32								
2010.	.2020.1.	.	200 × 200	70 × 200	200 × 70	200 × 135	40	40	36	56	24/25 × 180	46	120	120	160	123
	.2020.2.	.					40	32								
	.2020.3.	.					32	40								
	.2020.4.	.					32	32								
2010.	.2512.1.	.	250 × 125	120 × 125	-	250 × 60	40	40	36	56	24/25 × 180	46	170	-	85	-
	.2512.2.	.					40	32								
	.2512.3.	.					32	40								
	.2512.4.	.					32	32								
2010.	.2516.1.	.	250 × 160	120 × 160	-	250 × 95	40	40	36	56	24/25 × 180	46	170	-	120	-
	.2516.2.	.					40	32								
	.2516.3.	.					32	40								
	.2516.4.	.					32	32								
2010.	.2520.1.	.	250 × 200	120 × 200	250 × 70	250 × 135	40	40	36	56	24/25 × 180	46	170	120	160	173
	.2520.2.	.					40	32								
	.2520.3.	.					32	40								
	.2520.4.	.					32	32								
2010.	.2525.1.	.	250 × 250	120 × 250	250 × 120	250 × 185	40	40	36	56	24/25 × 180	46	170	170	210	173
	.2525.2.	.					40	32								
	.2525.3.	.					32	40								
	.2525.4.	.					32	32								
2010.	.3116.1.	.	315 × 160	165 × 160	-	315 × 85	50	50	45	63	30/32 × 200	53	225	-	115	-
	.3116.2.	.					50	40								
	.3116.3.	.					40	50								
	.3116.4.	.					40	40								
2010.	.3120.1.	.	315 × 200	165 × 200	315 × 50	315 × 125	50	50	45	63	30/32 × 200	53	225	110	155	228
	.3120.2.	.					50	40								
	.3120.3.	.					40	50								
	.3120.4.	.					40	40								
2010.	.3125.1.	.	315 × 250	165 × 250	315 × 100	315 × 175	50	50	45	63	30/32 × 200	53	225	160	205	228
	.3125.2.	.					50	40								
	.3125.3.	.					40	50								
	.3125.4.	.					40	40								
2010.	.3131.1.	.	315 × 315	165 × 315	315 × 165	315 × 240	50	50	45	63	30/32 × 200	53	225	225	270	228
	.3131.2.	.					50	40								
	.3131.3.	.					40	50								
	.3131.4.	.					40	40								
2010.	.4020.1.	.	400 × 200	250 × 200	400 × 50	400 × 125	50	50	45	63	30/32 × 200	53	310	110	155	313
	.4020.2.	.					50	40								
	.4020.3.	.					40	50								
	.4020.4.	.					40	40								
2010.	.4025.1.	.	400 × 250	250 × 250	400 × 100	400 × 175	50	50	45	63	30/32 × 200	53	310	160	205	313
	.4025.2.	.					50	40								
	.4025.3.	.					40	50								
	.4025.4.	.					40	40								
2010.	.4031.1.	.	400 × 315	250 × 315	400 × 165	400 × 240	50	50	45	63	30/32 × 200	53	310	225	270	313
	.4031.2.	.					50	40								
	.4031.3.	.					40	50								
	.4031.4.	.					40	40								

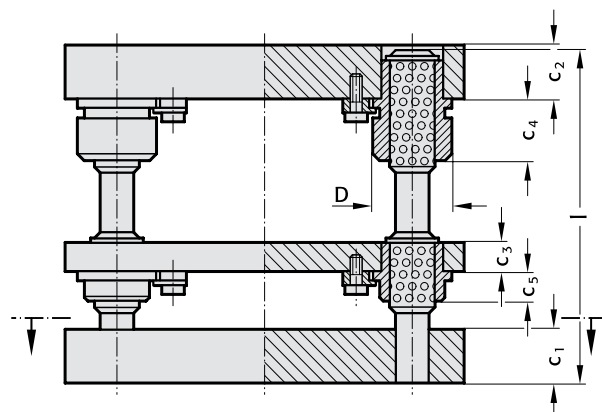




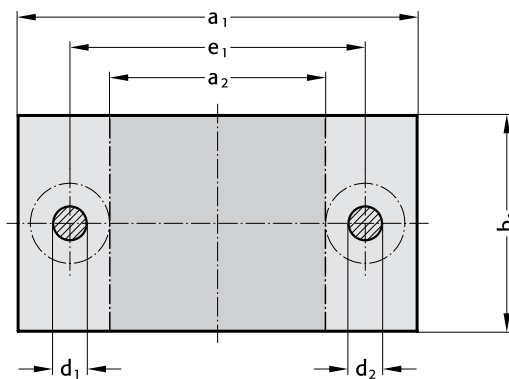
# Standard All-Steel Die Sets similar DIN 9868/ISO 11415 with stripper

**FIBRO**

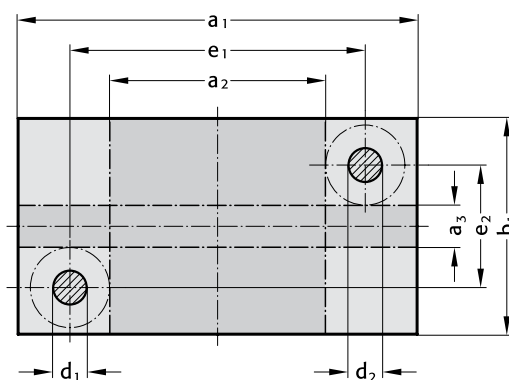
2010.45. 2010.46.  
2010.49.



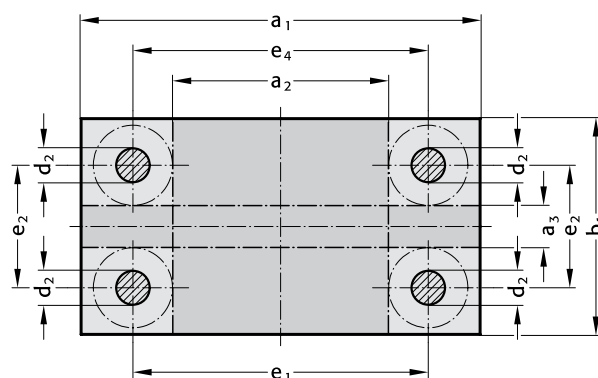
2010.45.



2010.46.



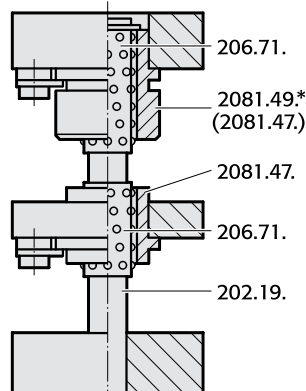
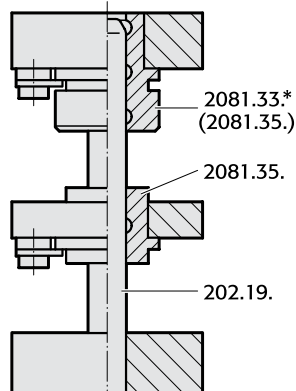
2010.49.



## Standard Guide Systems

Headed Sintered Ferrite Bushes, carbonitrided

Headed Ball Bearing Bushes



Order No (part IV)  
2010.□□.□□□□.□.835.

Order No (part IV)  
2010.□□.□□□□.□.865.

\* up to size 2010.□□.1616. = 2081.35./2081.47.

## Description:

FIBRO Standard All-Steel Die Sets offer the choice between sintered ferrite sliding guides and those of the ball bearing type to DIN/ISO. Both come with headed guide bushes. These are seated in push-fit bolster bores and retained there by screw clamps.

On request, All-Steel Die Sets can also be fitted with any other FIBRO Guide Elements – for combination possibilities see page A 30.

FIBRO will furthermore supply die sets with special machining features to customers' drawings.

## Execution:

External contours milled, thickness surfaces ground

$a_1$  or  $b_1 \leq 630 = \begin{matrix} +0,4 \\ +0,2 \end{matrix}$

$a_1$  or  $b_1 > 630 = \begin{matrix} +0,6 \\ +0,2 \end{matrix}$

Ordering example see opposite fold out page.

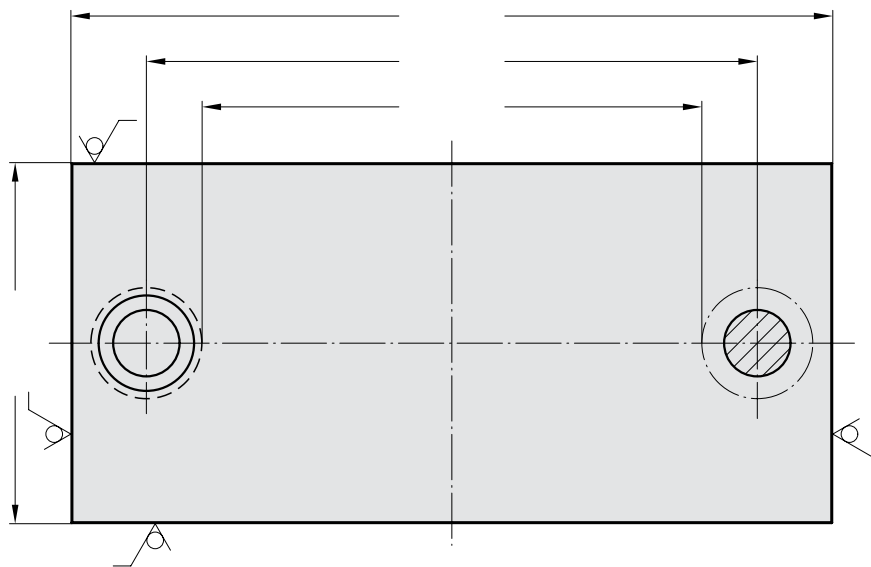
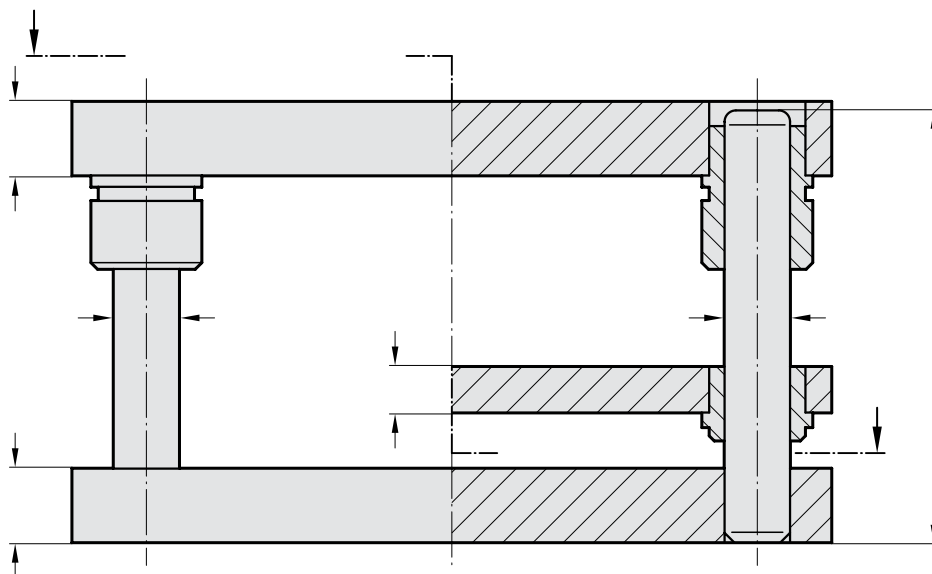
# Die Sets to Costumers' Specifications

Please copy this page, complete questions, and mail to FIBRO GmbH.

201.45.  
201.65.

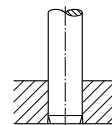
without stripper

with stripper

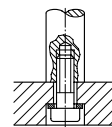


**Guide Pillars**

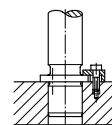
202.19. Guide Pillar  
DIN 9825/ISO 9182-2



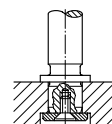
202.21. Guide Pillar  
endwise bolt-on type



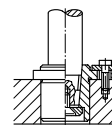
2021.46. Demountable Pillars  
with collar, push fit,  
screw clamp retention



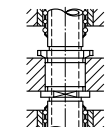
2021.46. Demountable Pillars  
with collar, push fit,  
screw clamp retention  
2021.43. Disc and screw



2021.50. Demountable Pillar,  
conical, central screw  
retention  
2021.39. Liner Bush  
2021.53. Disc and  
Screw

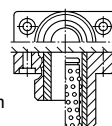


202.60. Stripper-Mounted  
Pillars with Collar,  
demountable, push fit,  
ring nut retention

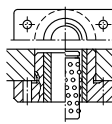


**Guide Bushes**

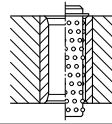
2031.34. Mounting  
Flanges, rectangular;  
sintered guide bush,  
carbonitrided  
2031.42. ditto -  
Ball bearing Guide Bush  
206.71. Ball Cage



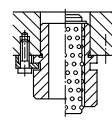
2031.38. Shallow Mounting  
Flanges, rectan-  
gular; sintered guide  
bush, carbonitrided  
2031.44. ditto - Ball  
bearing Guide Bush  
206.71. Ball Cage



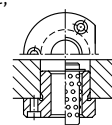
2051.32. Sintered Ferrite Guide  
Bush, carbonitrided,  
bonded  
2061.44. Guide  
Bush for Ball  
Bearing Guide  
206.71. Ball Cage



2081.31./32./33./34./35.  
Headed Guide Bushes,  
Sintered Ferrite,  
carbonitrided  
2081.44./45./46./  
47./49. Guide Bushes  
for Ball Bearing Guide  
206.71. Ball Cage



2091.31./32./34. Flanged Guide  
Bushes, Sintered Ferrite,  
carbonitrided  
2091.44./45./46.  
Guide Bushes for  
Ball Bearing Guide,  
push fit  
206.71. Ball Cage



Enquiry  Order

Material: Aluminium  201.65.

Steel  201.45.

Company

Telephone

Name (ref. for replies)

Signature

# FIBRO

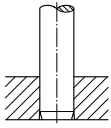
201.46.  
201.66.

## Die Sets to Customers' Specifications

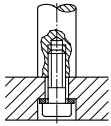
Please copy this page, complete questions, and mail to FIBRO GmbH.

### Guide Pillars

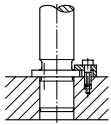
202.19.  
Guide Pillar  
DIN 9825/ISO 9182-2



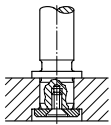
202.21.  
Guide Pillar  
endwise bolt-on type



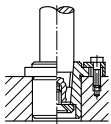
201.46.  
Demountable Pillars  
with collar, push fit,  
screw clamp retention



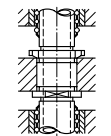
201.46.  
Demountable Pillars  
with collar, push fit,  
screw clamp retention  
201.43.  
Disc and screw



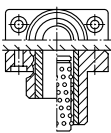
2021.50.  
Demountable Pillar,  
conical, central screw  
retention  
2021.39. Liner Bush  
2021.53. Disc and  
Screw



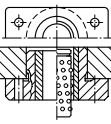
202.60.  
Stripper-Mounted  
Pillars with Collar,  
demountable, push fit,  
ring nut retention



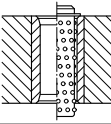
**Guide Bushes**  
2031.34. Mounting  
Flanges, rectangular;  
sintered guide bush,  
carbonitrided  
2031.42. ditto –  
Ball bearing Guide Bush



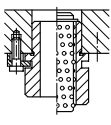
206.71. Ball Cage  
2031.38.  
Shallow Mounting  
Flanges, rectan-  
gular; sintered guide  
bush, carbonitrided  
2031.44. ditto – Ball  
bearing Guide Bush  
206.71. Ball Cage



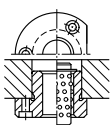
2051.32.  
Sintered Ferrite Guide  
Bush, carbonitrided,  
bonded  
2061.44. Guide  
Bush for Ball  
Bearing Guide  
206.71. Ball Cage



2081.31./32./33./34./35.  
Headed Guide Bushes,  
Sintered Ferrite,  
carbonitrided  
2081.44./45./46./  
47./49. Guide Bushes  
for Ball Bearing Guide  
206.71. Ball Cage

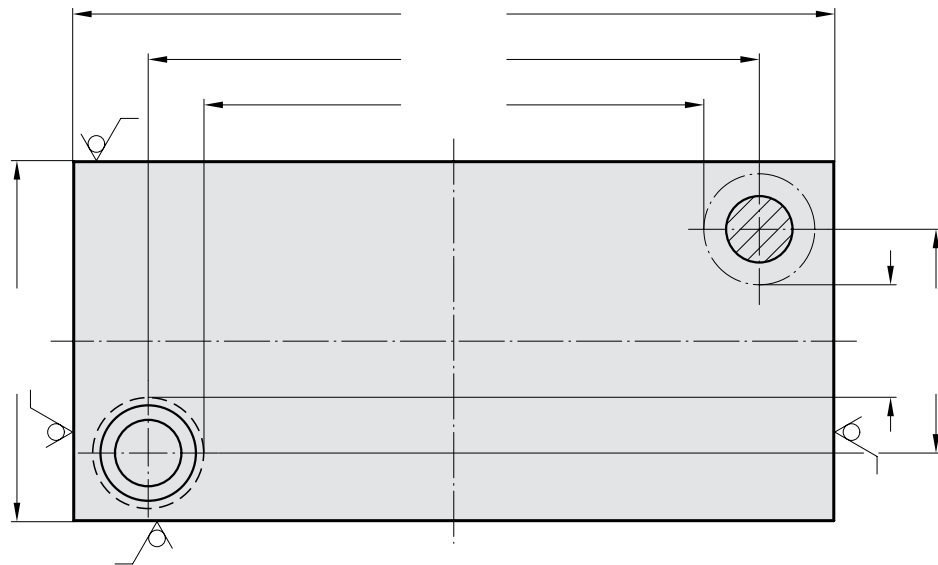
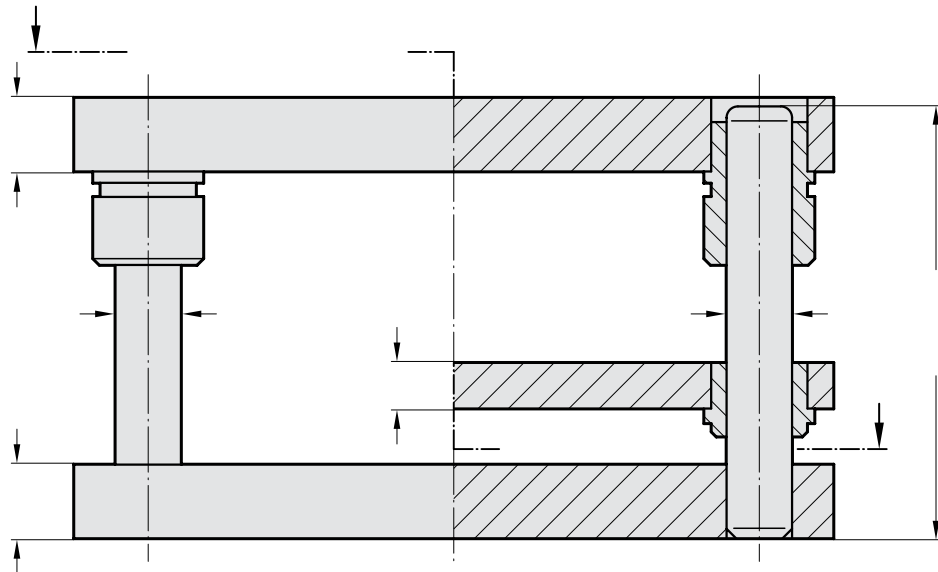


2091.31./32./34. Flanged Guide  
Bushes, Sintered Ferrite,  
carbonitrided  
2091.44./45./46.  
Guide Bushes for  
Ball Bearing Guide,  
push fit  
206.71. Ball Cage



without stripper

with stripper



Enquiry  Order

Material: Aluminium  201.66.

Steel  201.46.

Company

Telephone

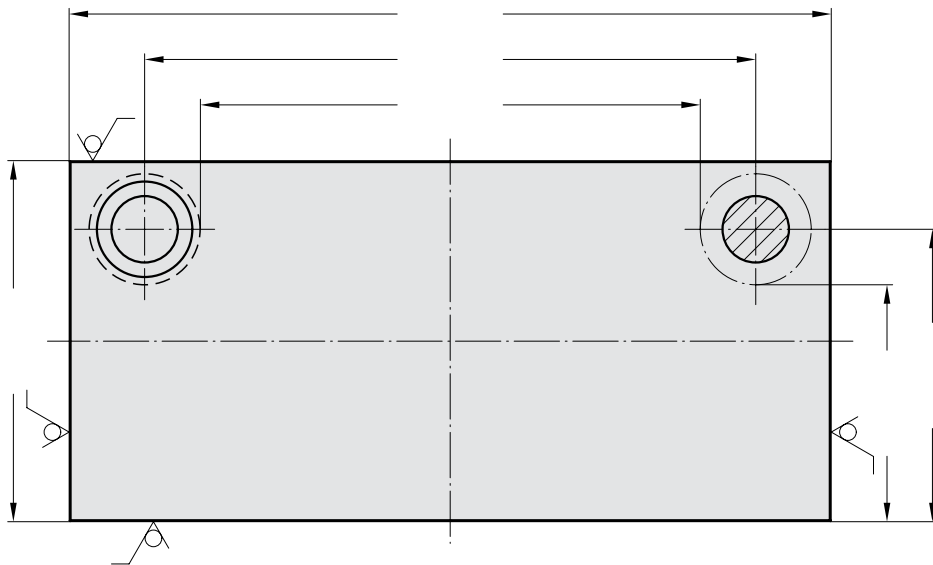
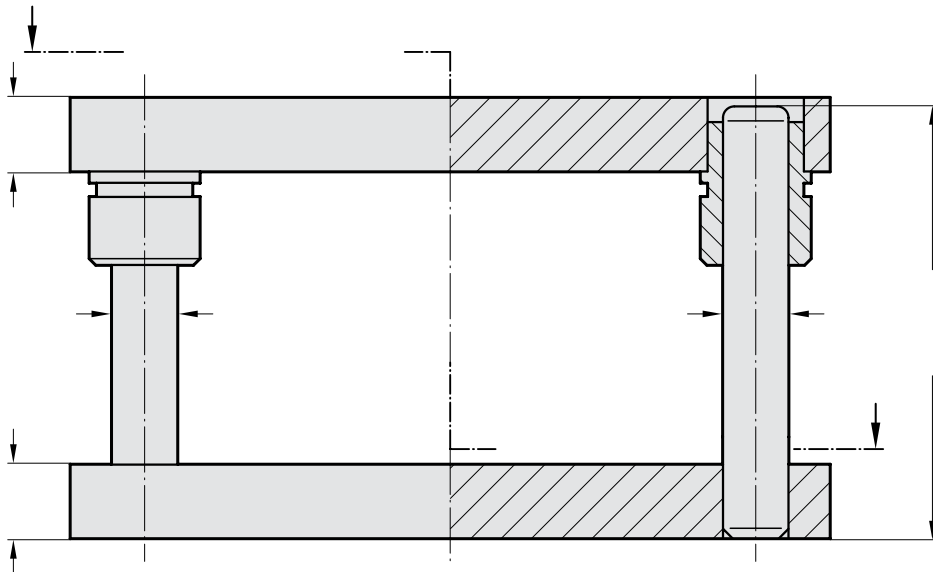
Name (ref. for replies)

Signature

**Die Sets to Customers' Specifications**

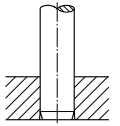
Please copy this page, complete questions, and mail to FIBRO GmbH.

without stripper

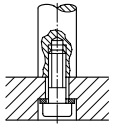


**Guide Pillars**

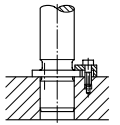
202.19.  
Guide Pillar  
DIN 9825/ISO 9182-2



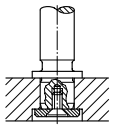
202.21.  
Guide Pillar  
endwise bolt-on type



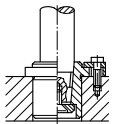
2021.46.  
Demountable Pillars  
with collar, push fit,  
screw clamp retention



2021.46.  
Demountable Pillars  
with collar, push fit,  
screw clamp retention  
2021.43.  
Disc and screw

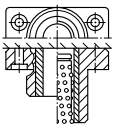


2021.50.  
Demountable Pillar,  
conical, central screw  
retention  
2021.39. Liner Bush  
2021.53. Disc and  
Screw



**Guide Bushes**

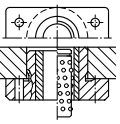
2031.34. Mounting  
Flanges, rectangular;  
sintered guide bush,  
carbonitrided



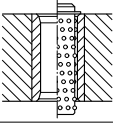
2031.42. ditto –  
Ball bearing Guide Bush

206.71. Ball Cage

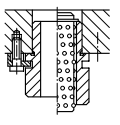
2031.38.  
Shallow Mounting  
Flanges, rectan-  
gular; sintered guide  
bush, carbonitrided  
2031.44. ditto – Ball  
bearing Guide Bush  
206.71. Ball Cage



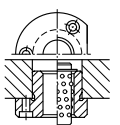
2051.32.  
Sintered Ferrite Guide  
Bush, carbonitrided,  
bonded  
2061.44. Guide  
Bush for Ball  
Bearing Guide  
206.71. Ball Cage



2081.31./32./33./34./35.  
Headed Guide Bushes,  
Sintered Ferrite,  
carbonitrided  
2081.44./45./46./  
47./49. Guide Bushes  
for Ball Bearing Guide  
206.71. Ball Cage



2091.31./32./34. Flanged Guide  
Bushes, Sintered Ferrite,  
carbonitrided  
2091.44./45./46.  
Guide Bushes for  
Ball Bearing Guide,  
push fit  
206.71. Ball Cage



Enquiry  Order

Material: Aluminium  201.67.

Steel  201.47.

Company

Telephone

Name (ref. for replies)

Signature

# FIBRO

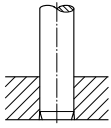
201.49.  
201.69.

## Die Sets to Customers' Specifications

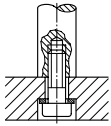
Please copy this page, complete questions, and mail to FIBRO GmbH.

### Guide Pillars

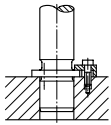
202.19.  
Guide Pillar  
DIN 9825/ISO 9182-2



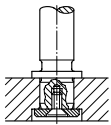
202.21.  
Guide Pillar  
endwise bolt-on type



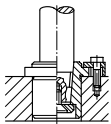
201.46.  
Demountable Pillars  
with collar, push fit,  
screw clamp retention



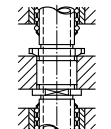
201.46.  
Demountable Pillars  
with collar, push fit,  
screw clamp retention  
201.43.  
Disc and screw



2021.50.  
Demountable Pillar,  
conical, central screw  
retention  
2021.39. Liner Bush  
2021.53. Disc and  
Screw

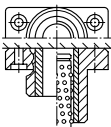


202.60.  
Stripper-Mounted  
Pillars with Collar,  
demountable, push fit,  
ring nut retention



### Guide Bushes

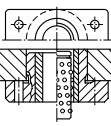
2031.34. Mounting  
Flanges, rectangular;  
sintered guide bush,  
carbonitrided



2031.42. ditto –  
Ball bearing Guide Bush

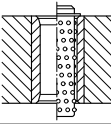
206.71. Ball Cage

2031.38.  
Shallow Mounting  
Flanges, rectan-  
gular; sintered guide  
bush, carbonitrided  
2031.44. ditto – Ball  
bearing Guide Bush  
206.71. Ball Cage

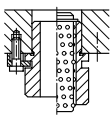


2051.32.  
Sintered Ferrite Guide  
Bush, carbonitrided,  
bonded

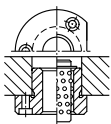
2061.44. Guide  
Bush for Ball  
Bearing Guide  
206.71. Ball Cage



2081.31./32./33./34./35.  
Headed Guide Bushes,  
Sintered Ferrite,  
carbonitrided  
2081.44./45./46./  
47./49. Guide Bushes  
for Ball Bearing Guide  
206.71. Ball Cage

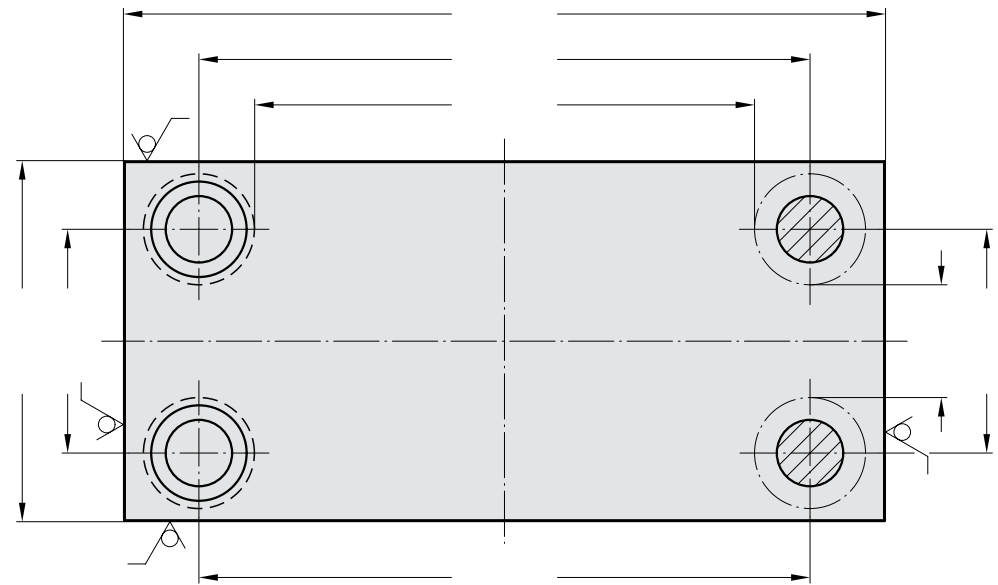
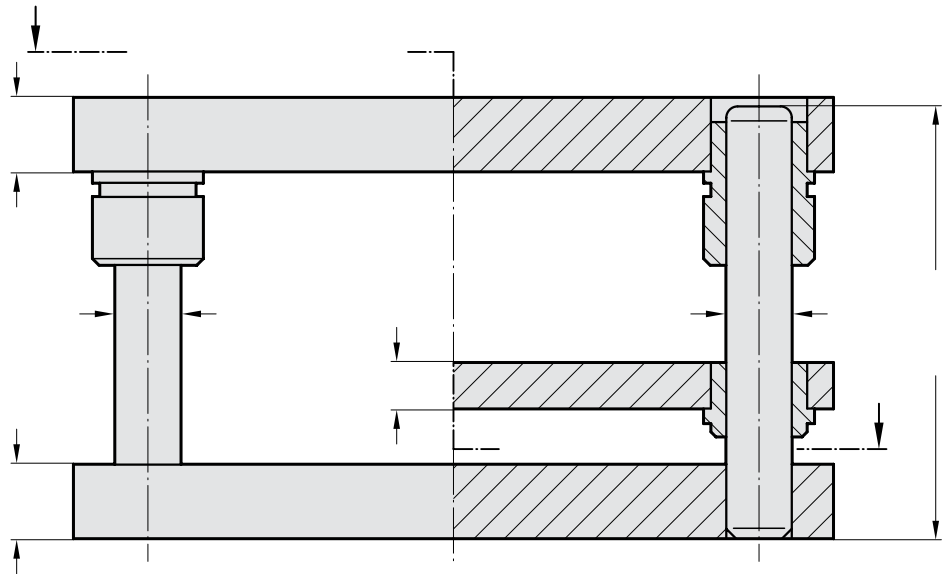


2091.31./32./34. Flanged Guide  
Bushes, Sintered Ferrite,  
carbonitrided  
2091.44./45./46.  
Guide Bushes for  
Ball Bearing Guide,  
push fit  
206.71. Ball Cage



without stripper

with stripper



Enquiry  Order

Material: Aluminium  201.69.

Steel  201.49.

Company

Telephone

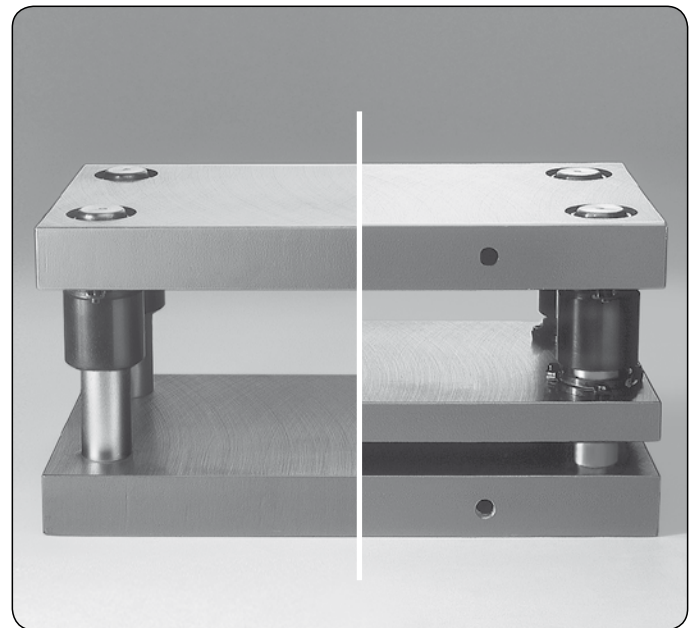
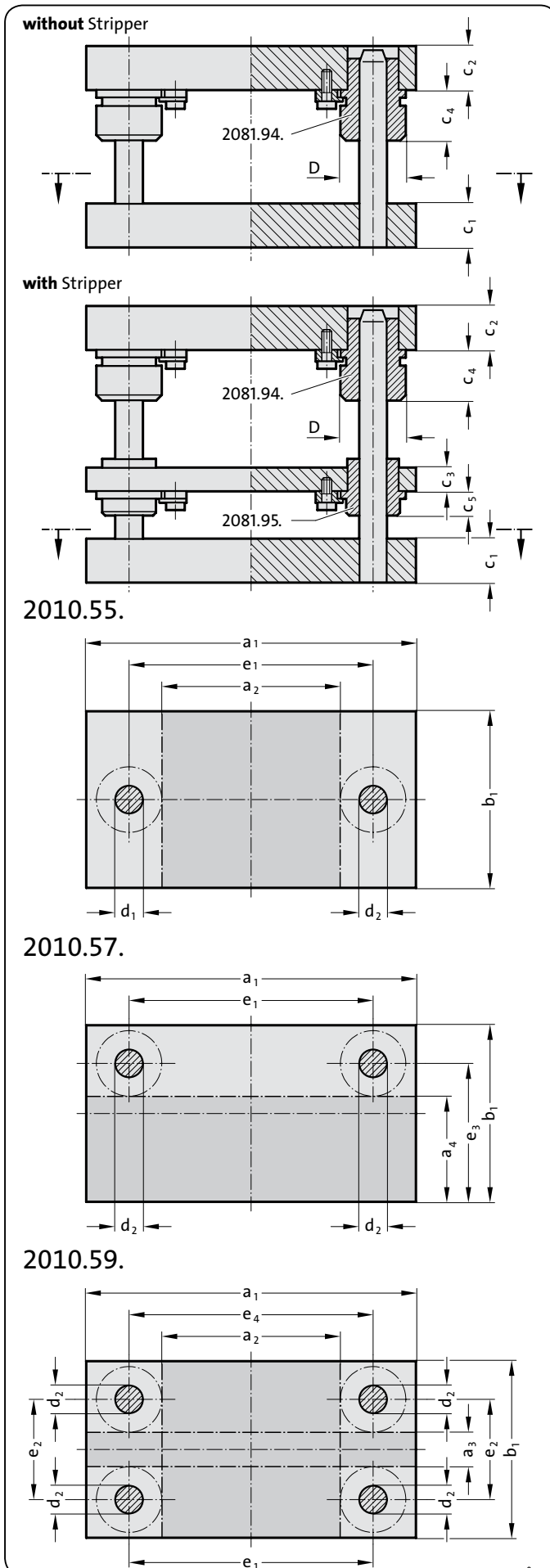
Name (ref. for replies)

Signature

**ECO-LINE**  
**All-Steel Die Sets**  
**with / without Stripper**

**FIBRO**

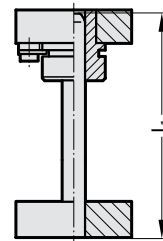
2010.55. 2010.57.  
 2010.59.



**Executions:**

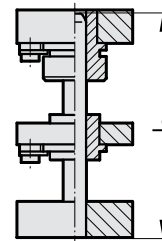
With press-fitted guide pillars 202.29.

Headed Guide Bushes bronze plated **without** stripper



2010.5 □ . □ .894

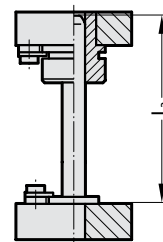
Headed Guide Bushes bronze plated **with** stripper



2010.5 □ . □ .895

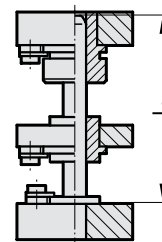
With demountable guide pillars 2021.29.\*\*\*

Headed Guide Bushes bronze plated **without** stripper



2010.5 □ . □ .894.29

Headed Guide Bushes bronze plated **with** stripper



2010.5 □ . □ .895.29

**Description:**

FIBRO 2010.5x all-steel die sets are supplied with bronze plated guide bushes. These are supplied in push-fit bolster bores and retained by screw clamps.

**Execution:**

External contours milled  
 Thickness surfaces ground

**Note:**

\*\*\* to be fixed only with screw clamps

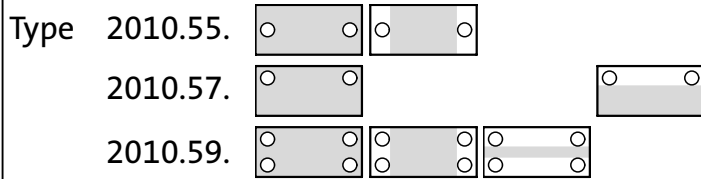
# FIBRO

2010.55. 2010.57.

2010.59.

# ECO-LINE

All-Steel Die Sets  
with / without Stripper



Order No

Type	Size P.*	Execution	Execution***	Ext. dimensions		Work area(s)**		c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	c <sub>4</sub>	c <sub>5</sub>	d <sub>1</sub> /d <sub>2</sub>	l <sub>1</sub> /l <sub>2</sub>	l <sub>3</sub> /l <sub>4</sub>	D	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	e <sub>4</sub>
				a <sub>1</sub> x b <sub>1</sub>	a <sub>2</sub> x b <sub>1</sub>	a <sub>1</sub> x a <sub>3</sub>	a <sub>1</sub> x a <sub>4</sub>	± 2	± 2	± 2										
2010.55.2512.1.				250 x 125	120 x 125	-	-	40	40	32	36	12	24/25	180/200	140/180	46	170	-	-	-
2010.55.2512.4.				250 x 125	120 x 125	-	-	32	32	32	36	12	24/25	180/200	140/180	46	170	-	-	-
2010.57.2520.1.	8 9 4			250 x 200	-	-	250 x 135	40	40	-	36	-	-/25	180/-	140/-	46	170	-	160	-
2010.57.2520.4.	8 9 4			250 x 200	-	-	250 x 135	32	32	-	36	-	-/25	180/-	140/-	46	170	-	160	-
2010.59.2520.4.				250 x 200	120 x 200	250 x 50	-	32	32	32	36	12	-/25	180/200	140/180	46	170	120	-	173
2010.59.2525.4.				250 x 250	120 x 250	250 x 100	-	32	32	32	36	12	-/25	180/200	140/180	46	170	170	-	173
2010.55.3116.1.				315 x 160	165 x 160	-	-	50	50	32	45	12	30/32	200/224	160/200	53	225	-	-	-
2010.55.3116.4.				315 x 160	165 x 160	-	-	40	40	32	45	12	30/32	200/224	160/200	53	225	-	-	-
2010.55.3120.4.				315 x 200	165 x 200	-	-	40	40	32	45	12	30/32	200/224	160/200	53	225	-	-	-
2010.57.3120.4.	8 9 4			315 x 200	-	-	315 x 125	40	40	-	45	-	-/32	200/-	160/-	53	225	-	155	-
2010.59.3120.4.				315 x 200	165 x 200	315 x 30	-	40	40	32	45	12	-/32	200/224	160/200	53	225	110	-	228
2010.57.3125.1.	8 9 4			315 x 250	-	-	315 x 175	50	50	-	45	-	-/32	200/-	160/-	53	225	-	205	-
2010.59.3125.1.				315 x 250	165 x 250	315 x 80	-	50	50	32	45	12	-/32	200/224	160/200	53	225	160	-	228
2010.59.3125.4.				315 x 250	165 x 250	315 x 80	-	40	40	32	45	12	-/32	200/224	160/200	53	225	160	-	228
2010.59.3131.1.				315 x 315	165 x 315	315 x 145	-	50	50	32	45	12	-/32	200/224	160/200	53	225	225	-	228
2010.55.4020.4.				400 x 200	250 x 200	-	-	40	40	32	45	12	30/32	200/224	160/200	53	310	-	-	-
2010.59.4020.4.				400 x 200	250 x 200	400 x 30	-	40	40	32	45	12	-/32	200/224	160/200	53	310	110	-	313
2010.55.4025.1.				400 x 250	250 x 250	-	-	50	50	32	45	12	30/32	200/224	160/200	53	310	-	-	-
2010.57.4025.1.	8 9 4			400 x 250	-	-	400 x 175	50	50	-	45	-	-/32	200/-	160/-	53	310	-	205	-
2010.59.4025.1.				400 x 250	250 x 250	400 x 80	-	50	50	32	45	12	-/32	200/224	160/200	53	310	160	-	313
2010.59.4025.4.				400 x 250	250 x 250	400 x 80	-	40	40	32	45	12	-/32	200/224	160/200	53	310	160	-	313
2010.57.4031.4.	8 9 4			400 x 315	-	-	400 x 240	40	40	-	45	-	-/32	200/-	160/-	53	310	-	270	-
2010.59.4031.1.				400 x 315	250 x 315	400 x 145	-	50	50	32	45	12	-/32	200/224	160/200	53	310	225	-	313
2010.59.4040.1.				400 x 400	250 x 400	400 x 230	-	50	50	32	45	12	-/32	200/224	160/200	53	310	310	-	313
2010.59.4040.4.				400 x 400	250 x 400	400 x 230	-	40	40	32	45	12	-/32	200/224	160/200	53	310	310	-	313
2010.55.5025.1.				500 x 250	325 x 250	-	-	50	50	32	45	15	38/40	200/224	160/200	63	400	-	-	-
2010.59.5025.1.				500 x 250	325 x 250	500 x 75	-	50	50	32	45	15	-/40	200/224	160/200	63	400	150	-	403
2010.59.5025.4.				500 x 250	325 x 250	500 x 75	-	40	40	32	45	15	-/40	200/224	160/200	63	400	150	-	403
2010.55.5031.1.				500 x 315	325 x 315	-	-	50	50	32	45	15	38/40	200/224	160/200	63	400	-	-	-
2010.59.5031.1.				500 x 315	325 x 315	500 x 140	-	50	50	32	45	15	-/40	200/224	160/200	63	400	215	-	403
2010.59.5040.1.				500 x 400	325 x 400	500 x 225	-	50	50	32	45	15	-/40	200/224	160/200	63	400	300	-	403
2010.59.5050.1.				500 x 500	325 x 500	500 x 325	-	50	50	32	45	15	-/40	200/224	160/200	63	400	400	-	403

\*Thickness combinations

\*\*Work area dimensions are not affected by the positions of the screw clamps that retain the bushes!

\*\*\*With demountable guide pillars 2021.29.

**Next day delivery!**

## Ordering Code (example):

Type of Die Set (external dimensions a, x b, = 400 x 250; c<sub>1</sub> = c<sub>2</sub> = 50) = 2010.55.4025.1.  
 Execution with stripper = 895.  
 with demountable guide pillars 2021.29. = 29  
 Order No = 2010.55.4025.1.895.29

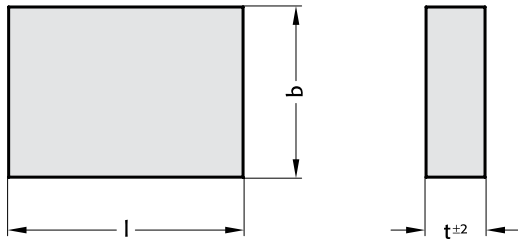
## Ordering Code (example):

Type of Die Set (external dimensions a, x b, = 400 x 250; c<sub>1</sub> = c<sub>2</sub> = 50) = 2010.55.4025.1.  
 Execution with stripper = 895  
 Order No = 2010.55.4025.1.895

Steel plate to ISO 6753-1

2900.

2900.



Execution:

External contours milled, thickness surfaces ground

Note:

l or b ≤ 630 =  $\begin{matrix} +0,4 \\ +0,2 \end{matrix}$

l or b > 630 =  $\begin{matrix} +0,6 \\ +0,2 \end{matrix}$

Bolsters from 500 X 500 mm on are manufactured with a lifting thread.

Ordering Code (example):

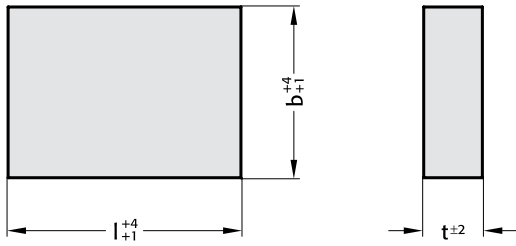
Steel plate	=	2900
length	400 mm	= .40
width	400 mm	= 40
thickness	32 mm	= .32
Order No	=	2900.4040.32

2900.

Order No	Size l x b x t	Order No	Size l x b x t	Order No	Size l x b x t
2900.1608.25	160 x 80 x 25	40	400 x 250 x 40	2900.8040.32	800 x 400 x 32
32	160 x 80 x 32	50	400 x 250 x 50	40	800 x 400 x 40
2900.1610.25	160 x 100 x 25	2900.4031.32	400 x 315 x 32	50	800 x 400 x 50
32	160 x 100 x 32	40	400 x 315 x 40	63	800 x 400 x 63
2900.1612.25	160 x 125 x 25	50	400 x 315 x 50	2900.8050.32	800 x 500 x 32
32	160 x 125 x 32	2900.4040.32	400 x 400 x 32	40	800 x 500 x 40
2900.1616.25	160 x 160 x 25	40	400 x 400 x 40	50	800 x 500 x 50
32	160 x 160 x 32	50	400 x 400 x 50	63	800 x 500 x 63
2900.2010.25	200 x 100 x 25	2900.5025.32	500 x 250 x 32	2900.8063.32	800 x 630 x 32
32	200 x 100 x 32	40	500 x 250 x 40	40	800 x 630 x 40
40	200 x 100 x 40	50	500 x 250 x 50	50	800 x 630 x 50
2900.2012.25	200 x 125 x 25	2900.5031.32	500 x 315 x 32	63	800 x 630 x 63
32	200 x 125 x 32	40	500 x 315 x 40		
40	200 x 125 x 40	50	500 x 315 x 50		
2900.2016.25	200 x 160 x 25	2900.5040.32	500 x 400 x 32		
32	200 x 160 x 32	40	500 x 400 x 40		
40	200 x 160 x 40	50	500 x 400 x 50		
2900.2020.25	200 x 200 x 25	2900.5050.32	500 x 500 x 32		
32	200 x 200 x 32	40	500 x 500 x 40		
40	200 x 200 x 40	50	500 x 500 x 50		
2900.2512.25	250 x 125 x 25	2900.6331.32	630 x 315 x 32		
32	250 x 125 x 32	40	630 x 315 x 40		
40	250 x 125 x 40	50	630 x 315 x 50		
2900.2516.25	250 x 160 x 25	63	630 x 315 x 63		
32	250 x 160 x 32	2900.6340.32	630 x 400 x 32		
40	250 x 160 x 40	40	630 x 400 x 40		
2900.2520.25	250 x 200 x 25	50	630 x 400 x 50		
32	250 x 200 x 32	63	630 x 400 x 63		
40	250 x 200 x 40	2900.6350.32	630 x 500 x 32		
2900.2525.25	250 x 250 x 25	40	630 x 500 x 40		
32	250 x 250 x 32	50	630 x 500 x 50		
40	250 x 250 x 40	63	630 x 500 x 63		
2900.3116.32	315 x 160 x 32	2900.6363.32	630 x 630 x 32		
40	315 x 160 x 40	40	630 x 630 x 40		
50	315 x 160 x 50	50	630 x 630 x 50		
2900.3120.32	315 x 200 x 32	63	630 x 630 x 63		
40	315 x 200 x 40	2900.7140.32	710 x 400 x 32		
50	315 x 200 x 50	40	710 x 400 x 40		
2900.3125.32	315 x 250 x 32	50	710 x 400 x 50		
40	315 x 250 x 40	63	710 x 400 x 63		
50	315 x 250 x 50	2900.7150.32	710 x 500 x 32		
2900.3131.32	315 x 315 x 32	40	710 x 500 x 40		
40	315 x 315 x 40	50	710 x 500 x 50		
50	315 x 315 x 50	63	710 x 500 x 63		
2900.4020.32	400 x 200 x 32	2900.7163.32	710 x 630 x 32		
40	400 x 200 x 40	40	710 x 630 x 40		
50	400 x 200 x 50	50	710 x 630 x 50		
2900.4025.32	400 x 250 x 32	63	710 x 630 x 63		



2910.

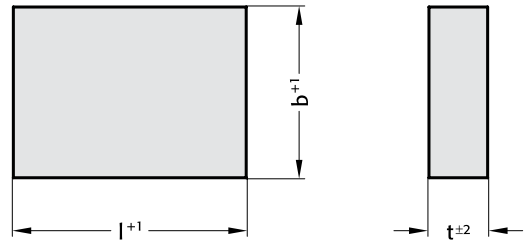


**Execution:**

2910.□□□□.□□.0  
External contours sawed  
Thickness surfaces ground

Bolsters from 500 × 500 mm on are manufactured with a lifting thread.

2910.



**Execution:**

2910.□□□□.□□.2  
Two external contours milled  
Thickness surfaces ground

Bolsters from 500 × 500 mm on are manufactured with a lifting thread.

2910.

Order No	Size l x b x t	Order No	Size l x b x t	Order No	Size l x b x t
2910.1608.25.□	160 x 80 x 25	40.□	400 x 250 x 40	2910.8040.32.□	800 x 400 x 32
32.□	160 x 80 x 32	50.□	400 x 250 x 50	40.□	800 x 400 x 40
2910.1610.25.□	160 x 100 x 25	2910.4031.32.□	400 x 315 x 32	50.□	800 x 400 x 50
32.□	160 x 100 x 32	40.□	400 x 315 x 40	63.□	800 x 400 x 63
2910.1612.25.□	160 x 125 x 25	50.□	400 x 315 x 50	2910.8050.32.□	800 x 500 x 32
32.□	160 x 125 x 32	2910.4040.32.□	400 x 400 x 32	40.□	800 x 500 x 40
2910.1616.25.□	160 x 160 x 25	40.□	400 x 400 x 40	50.□	800 x 500 x 50
32.□	160 x 160 x 32	50.□	400 x 400 x 50	63.□	800 x 500 x 63
2910.2010.25.□	200 x 100 x 25	2910.5025.32.□	500 x 250 x 32	2910.8063.32.□	800 x 630 x 32
32.□	200 x 100 x 32	40.□	500 x 250 x 40	40.□	800 x 630 x 40
40.□	200 x 100 x 40	50.□	500 x 250 x 50	50.□	800 x 630 x 50
2910.2012.25.□	200 x 125 x 25	2910.5031.32.□	500 x 315 x 32	63.□	800 x 630 x 63
32.□	200 x 125 x 32	40.□	500 x 315 x 40		
40.□	200 x 125 x 40	50.□	500 x 315 x 50		
2910.2016.25.□	200 x 160 x 25	2910.5040.32.□	500 x 400 x 32		
32.□	200 x 160 x 32	40.□	500 x 400 x 40		
40.□	200 x 160 x 40	50.□	500 x 400 x 50		
2910.2020.25.□	200 x 200 x 25	2910.5050.32.□	500 x 500 x 32		
32.□	200 x 200 x 32	40.□	500 x 500 x 40		
40.□	200 x 200 x 40	50.□	500 x 500 x 50		
2910.2512.25.□	250 x 125 x 25	2910.6331.32.□	630 x 315 x 32		
32.□	250 x 125 x 32	40.□	630 x 315 x 40		
40.□	250 x 125 x 40	50.□	630 x 315 x 50		
2910.2516.25.□	250 x 160 x 25	63.□	630 x 315 x 63		
32.□	250 x 160 x 32	2910.6340.32.□	630 x 400 x 32		
40.□	250 x 160 x 40	40.□	630 x 400 x 40		
2910.2520.25.□	250 x 200 x 25	50.□	630 x 400 x 50		
32.□	250 x 200 x 32	63.□	630 x 400 x 63		
40.□	250 x 200 x 40	2910.6350.32.□	630 x 500 x 32		
2910.2525.25.□	250 x 250 x 25	40.□	630 x 500 x 40		
32.□	250 x 250 x 32	50.□	630 x 500 x 50		
40.□	250 x 250 x 40	63.□	630 x 500 x 63		
2910.3116.32.□	315 x 160 x 32	2910.6363.32.□	630 x 630 x 32		
40.□	315 x 160 x 40	40.□	630 x 630 x 40		
50.□	315 x 160 x 50	50.□	630 x 630 x 50		
2910.3120.32.□	315 x 200 x 32	63.□	630 x 630 x 63		
40.□	315 x 200 x 40	2910.7140.32.□	710 x 400 x 32		
50.□	315 x 200 x 50	40.□	710 x 400 x 40		
2910.3125.32.□	315 x 250 x 32	50.□	710 x 400 x 50		
40.□	315 x 250 x 40	63.□	710 x 400 x 63		
50.□	315 x 250 x 50	2910.7150.32.□	710 x 500 x 32		
2910.3131.32.□	315 x 315 x 32	40.□	710 x 500 x 40		
40.□	315 x 315 x 40	50.□	710 x 500 x 50		
50.□	315 x 315 x 50	63.□	710 x 500 x 63		
2910.4020.32.□	400 x 200 x 32	2910.7163.32.□	710 x 630 x 32		
40.□	400 x 200 x 40	40.□	710 x 630 x 40		
50.□	400 x 200 x 50	50.□	710 x 630 x 50		
2910.4025.32.□	400 x 250 x 32	63.□	710 x 630 x 63		

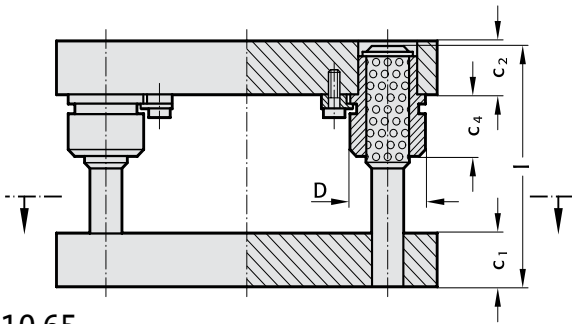
**Ordering Code (example):**

Aluminium Plate = 2910  
length 400 mm = .40  
width 400 mm = 40  
thickness 32 mm = .32  
execution ground = .0  
Order No = 2910.4040.32.0

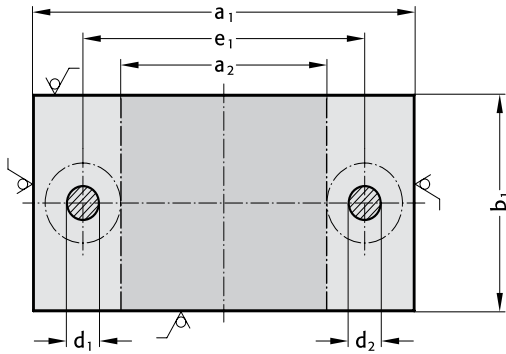
# FIBRO

2010.65. 2010.67.  
2010.66. 2010.69.

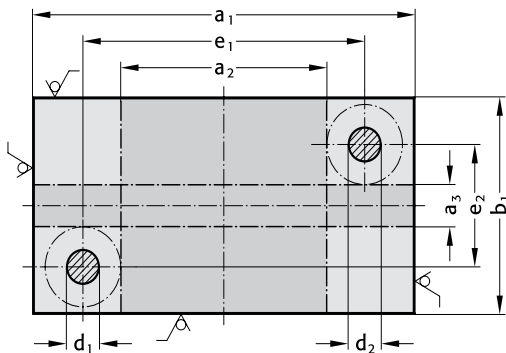
## Standard Aluminium Die Sets similar DIN 9868/ISO 11415 without Stripper



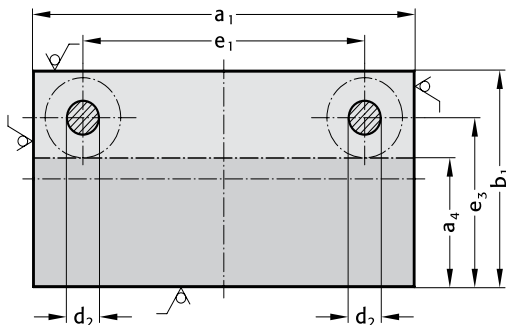
2010.65.



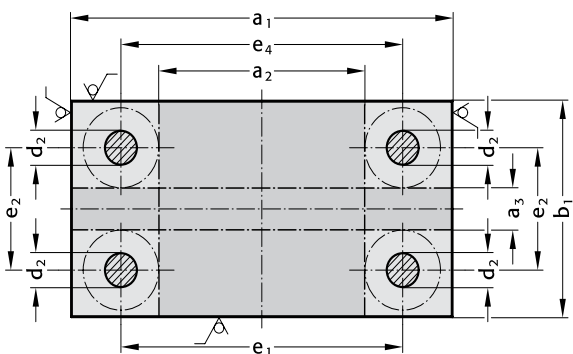
2010.66.



2010.67.



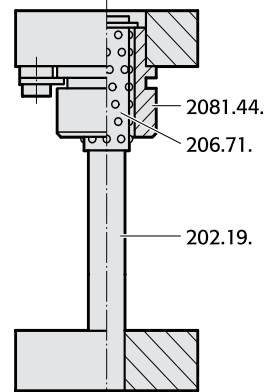
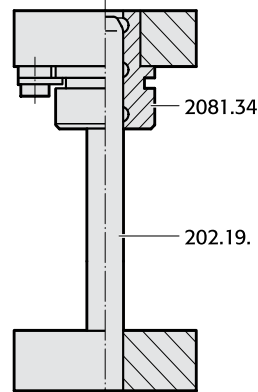
2010.69.



### Standard Guide Systems

Headed Sintered  
Ferrite Bushes,  
carbonitrided

Headed Ball  
Bearing Bushes



Order No (part IV)  
2010.□□.□□□□.□.834.

Order No (part IV)  
2010.□□.□□□□.□.862.

### Description:

FIBRO Standard Aluminium Die Sets offer the choice between sintered ferrite sliding guides and those of the ball bearing type to DIN/ISO. Both come with headed guide bushes. These are seated in push-fit bolster bores and retained there by screw clamps.

On request Aluminium Die Sets can also be fitted with any other FIBRO Guide Elements – for combination possibilities see page A 30.

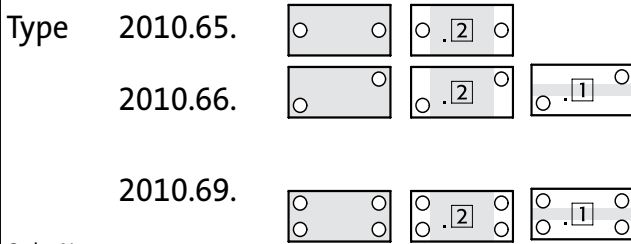
FIBRO will furthermore supply die sets with special machining features to customers' drawings.

Ordering example see opposite fold out page.

# Standard Aluminium Die Sets similar DIN 9868/ISO 11415 with stripper

**FIBRO**

2010.65. 2010.66.  
2010.69.



Order No  
Part .I .II .III.IV .V

Type	Size	P.*	Guides type	ext. dims. a <sub>1</sub> × b <sub>1</sub>	work area a <sub>2</sub> × b <sub>1</sub>	work area a <sub>1</sub> × a <sub>3</sub>	C <sub>1</sub> ±2	C <sub>2</sub> ±2	C <sub>3</sub> ±2	C <sub>4</sub>	C <sub>5</sub>	d <sub>1</sub> /d <sub>2</sub> × l	D	e <sub>1</sub>	e <sub>2</sub>	e <sub>4</sub>
2010.	.1608.1.			160 × 80	60 × 80	-	32	32	25	12	12	19/20 × 180	39	100	-	-
	.1610.1.			160 × 100	60 × 100	-	32	32	25	12	12	19/20 × 180	39	100	-	-
	.1612.1.			160 × 125	60 × 125	-	32	32	25	12	12	19/20 × 180	39	100	-	-
	.1616.1.			160 × 160	60 × 160	160 × 60	32	32	25	12	12	19/20 × 180	39	100	100	103
2010.	.2010.1.			200 × 100	70 × 100	-	40	40	25	25	25	24/25 × 200	46	120	-	-
	.2010.2.						40	32								
	.2010.3.						32	40								
	.2010.4.						32	32								
2010.	.2012.1.			200 × 125	70 × 125	-	40	40	25	25	12	24/25 × 200	46	120	-	-
	.2012.2.						40	32								
	.2012.3.						32	40								
	.2012.4.						32	32								
2010.	.2016.1.			200 × 160	70 × 160	-	40	40	25	25	12	24/25 × 200	46	120	-	-
	.2016.2.						40	32								
	.2016.3.						32	40								
	.2016.4.						32	32								
2010.	.2020.1.			200 × 200	70 × 200	200 × 70	40	40	25	25	12	24/25 × 200	46	120	120	123
	.2020.2.						40	32								
	.2020.3.						32	40								
	.2020.4.						32	32								
2010.	.2512.1.			250 × 125	120 × 125	-	40	40	25	25	12	24/25 × 200	46	170	-	-
	.2512.2.						40	32								
	.2512.3.						32	40								
	.2512.4.						32	32								
2010.	.2516.1.			250 × 160	120 × 160	-	40	40	25	25	12	24/25 × 200	46	170	-	-
	.2516.2.						40	32								
	.2516.3.						32	40								
	.2516.4.						32	32								
2010.	.2520.1.			250 × 200	120 × 200	250 × 70	40	40	25	25	12	24/25 × 200	46	170	120	173
	.2520.2.						40	32								
	.2520.3.						32	40								
	.2520.4.						32	32								
2010.	.2525.1.			250 × 250	120 × 250	250 × 120	40	40	25	25	12	24/25 × 200	46	170	170	173
	.2525.2.						40	32								
	.2525.3.						32	40								
	.2525.4.						32	32								
2010.	.3116.1.			315 × 160	165 × 160	-	50	50	32	32	12	30/32 × 224	53	225	-	-
	.3116.2.						50	40								
	.3116.3.						40	50								
	.3116.4.						40	40								
2010.	.3120.1.			315 × 200	165 × 200	315 × 50	50	50	32	32	12	30/32 × 224	53	225	110	228
	.3120.2.						50	40								
	.3120.3.						40	50								
	.3120.4.						40	40								
2010.	.3125.1.			315 × 250	165 × 250	315 × 100	50	50	32	32	12	30/32 × 224	53	225	160	228
	.3125.2.						50	40								
	.3125.3.						40	50								
	.3125.4.						40	40								
2010.	.3131.1.			315 × 315	165 × 315	315 × 165	50	50	32	32	12	30/32 × 224	53	225	225	228
	.3131.2.						50	40								
	.3131.3.						40	50								
	.3131.4.						40	40								
2010.	.4020.1.			400 × 200	250 × 200	400 × 50	50	50	32	32	12	30/32 × 224	53	310	110	313
	.4020.2.						50	40								
	.4020.3.						40	50								
	.4020.4.						40	40								
2010.	.4025.1.			400 × 250	250 × 250	400 × 100	50	50	32	32	12	30/32 × 224	53	310	160	313
	.4025.2.						50	40								
	.4025.3.						40	50								
	.4025.4.						40	40								
2010.	.4031.1.			400 × 315	250 × 315	400 × 165	50	50	32	32	12	30/32 × 224	53	310	225	313
	.4031.2.						50	40								
	.4031.3.						40	50								
	.4031.4.						40	40								

# Standard Aluminium Die Sets similar DIN 9868/ISO 11415 with stripper

**FIBRO**

2010.65. 2010.66.  
2010.69.



Order No		Part				ext. dims. $a_1 \times b_1$	work area $a_2 \times b_1$	work area $a_1 \times a_3$	$c_1$ $\pm 2$	$c_2$ $\pm 2$	$c_3$ $\pm 2$	$c_4$	$c_5$	$d_1/d_2 \times l$	D	$e_1$	$e_2$	$e_4$
.I	.II	.III	.IV	.V														
Type	Size	P*	Guides type															
2010.	4040.1.				400 × 400	250 × 400	400 × 250	50	50	32	32	12	30/32 × 224	53	310	310	313	
	4040.2.							50	40									
	4040.3.							40	50									
	4040.4.							40	40									
2010.	5025.1.				500 × 250	330 × 250	500 × 80	50	50	32	32	15	38/40 × 224	63	400	150	403	
	5025.2.							50	40									
	5025.3.							40	50									
	5025.4.							40	40									
2010.	5031.1.				500 × 315	330 × 315	500 × 145	50	50	32	32	15	38/40 × 224	63	400	215	403	
	5031.2.							50	40									
	5031.3.							40	50									
	5031.4.							40	40									
2010.	5040.1.				500 × 400	330 × 400	500 × 230	50	50	32	32	15	38/40 × 224	63	400	300	403	
	5040.2.							50	40									
	5040.3.							40	50									
	5040.4.							40	40									
2010.	5050.1.				500 × 500	330 × 500	500 × 330	50	50	32	32	15	38/40 × 224	63	400	400	403	
	5050.2.							50	40									
	5050.3.							40	50									
	5050.4.							40	40									
2010.	6331.1.				630 × 315	430 × 315	630 × 115	63	63	40	36	18	48/50 × 280	77	510	195	513	
	6331.2.							63	50				48/50 × 280					
	6331.3.							50	63				48/50 × 250					
	6331.4.							50	50				48/50 × 250					
2010.	6340.1.				630 × 400	430 × 400	630 × 200	63	63	40	36	18	48/50 × 280	77	510	280	513	
	6340.2.							63	50				48/50 × 280					
	6340.3.							50	63				48/50 × 250					
	6340.4.							50	50				48/50 × 250					
2010.	6350.1.				630 × 500	430 × 500	630 × 300	63	63	40	36	18	48/50 × 280	77	510	380	513	
	6350.2.							63	50				48/50 × 280					
	6350.3.							50	63				48/50 × 250					
	6350.4.							50	50				48/50 × 250					
2010.	6363.1.				630 × 630	430 × 630	630 × 430	63	63	40	36	18	48/50 × 280	77	510	510	513	
	6363.2.							63	50				48/50 × 280					
	6363.3.							50	63				48/50 × 250					
	6363.4.							50	50				48/50 × 250					
2010.	7140.1.				710 × 400	510 × 400	710 × 200	63	63	40	36	18	48/50 × 280	77	590	280	593	
	7140.2.							63	50				48/50 × 280					
	7140.3.							50	63				48/50 × 250					
	7140.4.							50	50				48/50 × 250					
2010.	7150.1.				710 × 500	510 × 500	710 × 300	63	63	40	36	18	48/50 × 280	77	590	380	593	
	7150.2.							63	50				48/50 × 280					
	7150.3.							50	63				48/50 × 250					
	7150.4.							50	50				48/50 × 250					
2010.	7163.1.				710 × 630	510 × 630	710 × 430	63	63	40	36	18	48/50 × 280	77	590	510	593	
	7163.2.							63	50				48/50 × 280					
	7163.3.							50	63				48/50 × 250					
	7163.4.							50	50				48/50 × 250					
2010.	8040.1.				800 × 400	600 × 400	800 × 200	63	63	40	36	18	48/50 × 280	77	680	280	683	
	8040.2.							63	50				48/50 × 280					
	8040.3.							50	63				48/50 × 250					
	8040.4.							50	50				48/50 × 250					
2010.	8050.1.				800 × 500	600 × 500	800 × 300	63	63	40	36	18	48/50 × 280	77	680	380	683	
	8050.2.							63	50				48/50 × 280					
	8050.3.							50	63				48/50 × 250					
	8050.4.							50	50				48/50 × 250					
2010.	8063.1.				800 × 630	600 × 630	800 × 430	63	63	40	36	18	48/50 × 280	77	680	510	683	
	8063.2.							63	50				48/50 × 280					
	8063.3.							50	63				48/50 × 250					
	8063.4.							50	50				48/50 × 250					

\*P. = thickness combination

## Ordering Code (example):

Type of Die Set = 2010.65.  
 Ext. dimensions = 400 × 250 = 4025.  
 Combination\*  $c_1 = 50, c_2 = 50$  = 1.  
 Guides type: headed guide bushes, ferrite = 835.  
 Work area 2 = 2  
 Order No = 2010.65.4025.1.835.2

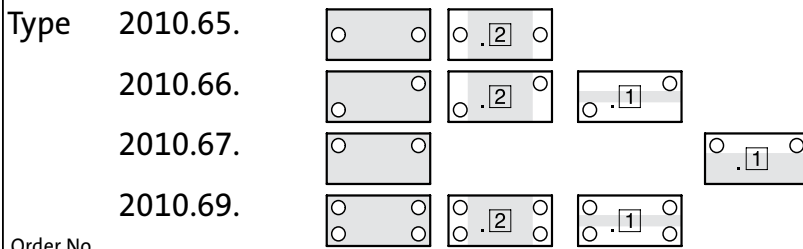
## Advisory: Ordering Code

Hole pattern for the screw clamps depends on positioning of working surface, determined by part V (five) of the Order No, for example: 2010.69.2520.4.865.1   
 .2 

# FIBRO

2010.65. 2010.67.  
2010.66. 2010.69.

## Standard Aluminium Die Sets similar DIN 9868/ISO 11415 without stripper



Order No

Part .I .II .III,IV .V

Type	Size	P* type	Guides type	ext. dims. $a_1 \times b_1$	work area $a_2 \times b_1$	work area $a_1 \times a_3$	work area $a_1 \times a_4$	$c_1$ $\pm 2$	$c_2$ $\pm 2$	$c_4$ S	$c_4$ K	$d_1/d_2 \times l$	D	$e_1$	$e_2$	$e_3$	$e_4$
2010.	.1608.1.			160 × 80	60 × 80	-	-	32	32	20	36	19/20 × 160	39	100	-	-	-
	.1610.1.			160 × 100	60 × 100	-	160 × 50	32	32	20	36	19/20 × 160	39	100	-	70	-
	.1612.1.			160 × 125	60 × 125	-	160 × 75	32	32	20	36	19/20 × 160	39	100	-	95	-
	.1616.1.			160 × 160	60 × 160	160 × 60	160 × 110	32	32	20	36	19/20 × 160	39	100	100	130	103
2010.	.2010.1.			200 × 100	70 × 100	-	-	40	40	36	56	24/25 × 180	46	120	-	-	-
	.2010.2.							40	32								
	.2010.3.							32	40								
	.2010.4.							32	32								
2010.	.2012.1.			200 × 125	70 × 125	-	200 × 60	40	40	36	56	24/25 × 180	46	120	-	85	-
	.2012.2.							40	32								
	.2012.3.							32	40								
	.2012.4.							32	32								
2010.	.2016.1.			200 × 160	70 × 160	-	200 × 95	40	40	36	56	24/25 × 180	46	120	-	120	-
	.2016.2.							40	32								
	.2016.3.							32	40								
	.2016.4.							32	32								
2010.	.2020.1.			200 × 200	70 × 200	200 × 70	200 × 135	40	40	36	56	24/25 × 180	46	120	120	160	123
	.2020.2.							40	32								
	.2020.3.							32	40								
	.2020.4.							32	32								
2010.	.2512.1.			250 × 125	120 × 125	-	250 × 60	40	40	36	56	24/25 × 180	46	170	-	85	-
	.2512.2.							40	32								
	.2512.3.							32	40								
	.2512.4.							32	32								
2010.	.2516.1.			250 × 160	120 × 160	-	250 × 95	40	40	36	56	24/25 × 180	46	170	-	120	-
	.2516.2.							40	32								
	.2516.3.							32	40								
	.2516.4.							32	32								
2010.	.2520.1.			250 × 200	120 × 200	250 × 70	250 × 135	40	40	36	56	24/25 × 180	46	170	120	160	173
	.2520.2.							40	32								
	.2520.3.							32	40								
	.2520.4.							32	32								
2010.	.2525.1.			250 × 250	120 × 250	250 × 120	250 × 185	40	40	36	56	24/25 × 180	46	170	170	210	173
	.2525.2.							40	32								
	.2525.3.							32	40								
	.2525.4.							32	32								
2010.	.3116.1.			315 × 160	165 × 160	-	315 × 85	50	50	45	63	30/32 × 200	53	225	-	115	-
	.3116.2.							50	40								
	.3116.3.							40	50								
	.3116.4.							40	40								
2010.	.3120.1.			315 × 200	165 × 200	315 × 50	315 × 125	50	50	45	63	30/32 × 200	53	225	110	155	228
	.3120.2.							50	40								
	.3120.3.							40	50								
	.3120.4.							40	40								
2010.	.3125.1.			315 × 250	165 × 250	315 × 100	315 × 175	50	50	45	63	30/32 × 200	53	225	160	205	228
	.3125.2.							50	40								
	.3125.3.							40	50								
	.3125.4.							40	40								
2010.	.3131.1.			315 × 315	165 × 315	315 × 165	315 × 240	50	50	45	63	30/32 × 200	53	225	225	270	228
	.3131.2.							50	40								
	.3131.3.							40	50								
	.3131.4.							40	40								
2010.	.4020.1.			400 × 200	250 × 200	400 × 50	400 × 125	50	50	45	63	30/32 × 200	53	310	110	155	313
	.4020.2.							50	40								
	.4020.3.							40	50								
	.4020.4.							40	40								
2010.	.4025.1.			400 × 250	250 × 250	400 × 100	400 × 175	50	50	45	63	30/32 × 200	53	310	160	205	313
	.4025.2.							50	40								
	.4025.3.							40	50								
	.4025.4.							40	40								
2010.	.4031.1.			400 × 315	250 × 315	400 × 165	400 × 240	50	50	45	63	30/32 × 200	53	310	225	270	313
	.4031.2.							50	40								
	.4031.3.							40	50								
	.4031.4.							40	40								

# FIBRO

2010.65. 2010.67.  
2010.66. 2010.69.

## Standard Aluminium Die Sets similar DIN 9868/ISO 11415 without stripper



Order No		Part .I .II .III.IV .V																
Type	Size	P*	Guides		ext. dims. $a_1 \times b_1$	work area $a_2 \times b_1$	work area $a_1 \times a_3$	work area $a_1 \times a_4$	$c_1$ $\pm 2$	$c_2$ $\pm 2$	$c_4$ S	$c_4$ K	$d_1/d_2 \times l$	D	$e_1$	$e_2$	$e_3$	$e_4$
			type															
2010.	.4040.1.				400 × 400	250 × 400	400 × 250	400 × 325	50	50	45	63	30/32 × 200	53	310	310	355	313
	.4040.2.								50	40								
	.4040.3.								40	50								
	.4040.4.								40	40								
2010.	.5025.1.				500 × 250	330 × 250	500 × 80	500 × 165	50	50	45	71	38/40 × 200	63	400	150	200	403
	.5025.2.								50	40								
	.5025.3.								40	50								
	.5025.4.								40	40								
2010.	.5031.1.				500 × 315	330 × 315	500 × 145	500 × 230	50	50	45	71	38/40 × 200	63	400	215	265	403
	.5031.2.								50	40								
	.5031.3.								40	50								
	.5031.4.								40	40								
2010.	.5040.1.				500 × 400	330 × 400	500 × 230	500 × 315	50	50	45	71	38/40 × 200	63	400	300	350	403
	.5040.2.								50	40								
	.5040.3.								40	50								
	.5040.4.								40	40								
2010.	.5050.1.				500 × 500	330 × 500	500 × 330	500 × 415	50	50	45	71	38/40 × 200	63	400	400	450	403
	.5050.2.								50	40								
	.5050.3.								40	50								
	.5050.4.								40	40								
2010.	.6331.1.				630 × 315	430 × 315	630 × 115	630 × 215	63	63	50	80	48/50 × 250	77	510	195	255	513
	.6331.2.								63	50			48/50 × 250					
	.6331.3.								50	63			48/50 × 224					
	.6331.4.								50	50			48/50 × 224					
2010.	.6340.1.				630 × 400	430 × 400	630 × 200	630 × 300	63	63	50	80	48/50 × 250	77	510	280	340	513
	.6340.2.								63	50			48/50 × 250					
	.6340.3.								50	63			48/50 × 224					
	.6340.4.								50	50			48/50 × 224					
2010.	.6350.1.				630 × 500	430 × 500	630 × 300	630 × 400	63	63	50	80	48/50 × 250	77	510	380	440	513
	.6350.2.								63	50			48/50 × 250					
	.6350.3.								50	63			48/50 × 224					
	.6350.4.								50	50			48/50 × 224					
2010.	.6363.1.				630 × 630	430 × 630	630 × 430	630 × 530	63	63	50	80	48/50 × 250	77	510	510	570	513
	.6363.2.								63	50			48/50 × 250					
	.6363.3.								50	63			48/50 × 224					
	.6363.4.								50	50			48/50 × 224					
2010.	.7140.1.				710 × 400	510 × 400	710 × 200	710 × 300	63	63	50	80	48/50 × 250	77	590	280	340	593
	.7140.2.								63	50			48/50 × 250					
	.7140.3.								50	63			48/50 × 224					
	.7140.4.								50	50			48/50 × 224					
2010.	.7150.1.				710 × 500	510 × 500	710 × 300	710 × 400	63	63	50	80	48/50 × 250	77	590	380	440	593
	.7150.2.								63	50			48/50 × 250					
	.7150.3.								50	63			48/50 × 224					
	.7150.4.								50	50			48/50 × 224					
2010.	.7163.1.				710 × 630	510 × 630	710 × 430	710 × 530	63	63	50	80	48/50 × 250	77	590	510	570	593
	.7163.2.								63	50			48/50 × 250					
	.7163.3.								50	63			48/50 × 224					
	.7163.4.								50	50			48/50 × 224					
2010.	.8040.1.				800 × 400	600 × 400	800 × 200	800 × 300	63	63	50	80	48/50 × 250	77	680	280	340	683
	.8040.2.								63	50			48/50 × 250					
	.8040.3.								50	63			48/50 × 224					
	.8040.4.								50	50			48/50 × 224					
2010.	.8050.1.				800 × 500	600 × 500	800 × 300	800 × 400	63	63	50	80	48/50 × 250	77	680	380	440	683
	.8050.2.								63	50			48/50 × 250					
	.8050.3.								50	63			48/50 × 224					
	.8050.4.								50	50			48/50 × 224					
2010.	.8063.1.				800 × 630	600 × 630	800 × 430	800 × 530	63	63	50	80	48/50 × 250	77	680	510	570	683
	.8063.2.								63	50			48/50 × 250					
	.8063.3.								50	63			48/50 × 224					
	.8063.4.								50	50			48/50 × 224					

\*P. = thickness combination

### Ordering Code (example):

Type of Die Set = 2010.65.  
Ext. dimensions = 400 × 250 = 4025.  
Combination\*  $c_1 = 50, c_2 = 50$  = 1.  
Guides type: headed guide bushes, sintered ferrite = 834.  
Work area 2 = 2  
Order No = 2010.65.4025.1.834.2

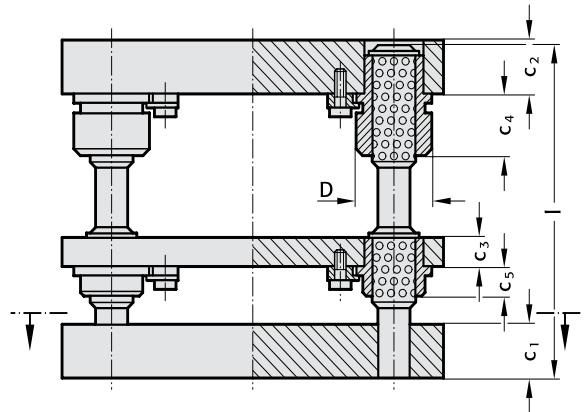
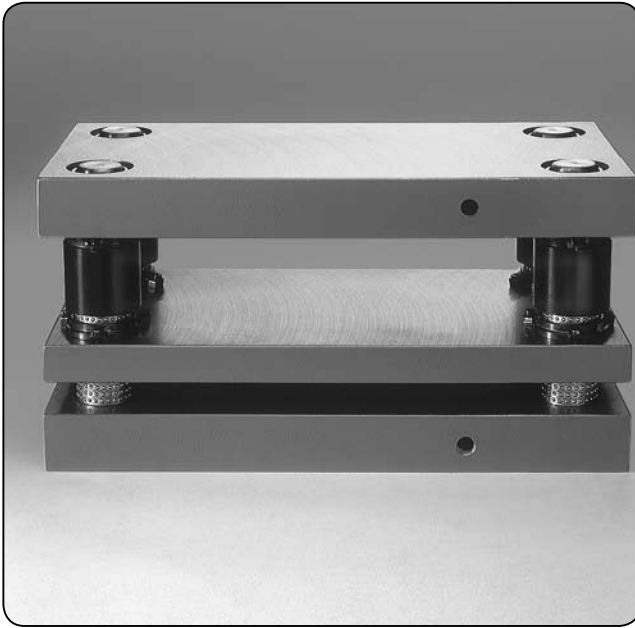
### Advisory: Ordering Code

Hole pattern for the screw clamps depends on positioning of working surface, determined by part V (five) of the Order No, for example: 2010.69.2520.4.862.1   
.2 

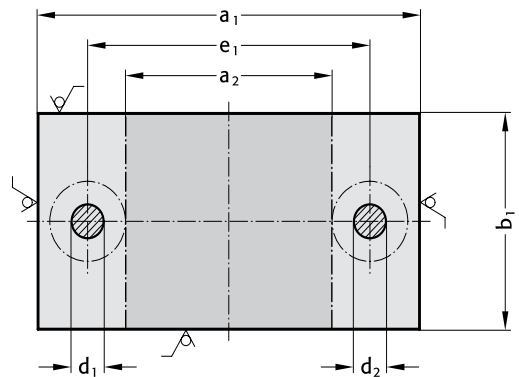
# Standard Aluminium Die Sets similar DIN 9868/ISO 11415 with stripper

**FIBRO**

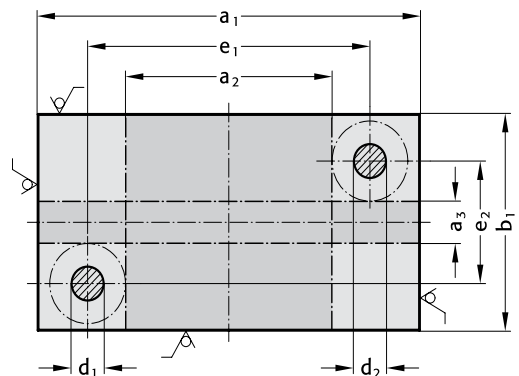
2010.65. 2010.66.  
2010.69.



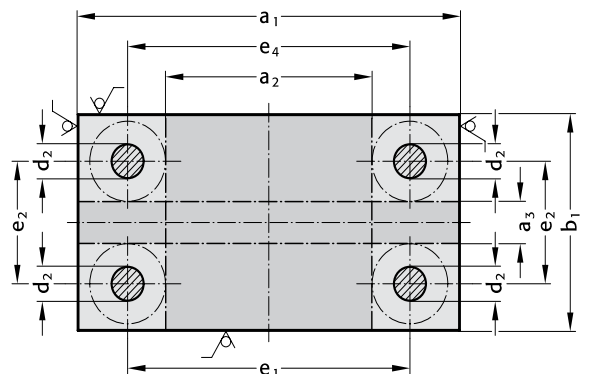
2010.65.



2010.66.



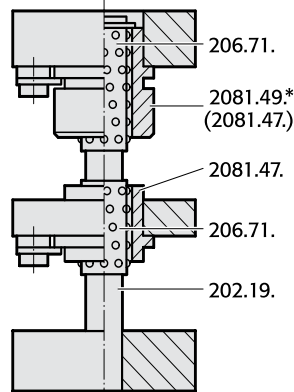
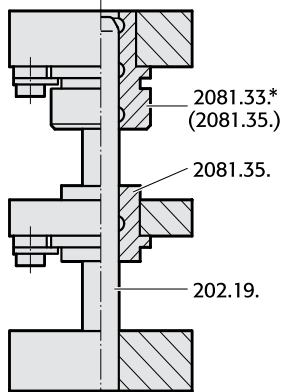
2010.69.



## Standard Guide Systems

Headed Sintered  
Ferrite Bushes,  
carbonitrided

Headed Ball  
Bearing Bushes



Order No (part IV)  
2010.□□.□□□□.□.835.

Order No (part IV)  
2010.□□.□□□□.□.865.

\* up to size 2010.□□.1616. = 2081.35./2081.47.

## Description:

FIBRO Standard All-Steel Die Sets offer the choice between sintered ferrite sliding guides and those of the ball bearing type to DIN-ISO. Both come with headed guide bushes. These are seated in push-fit bolster bores and retained there by screw clamps.

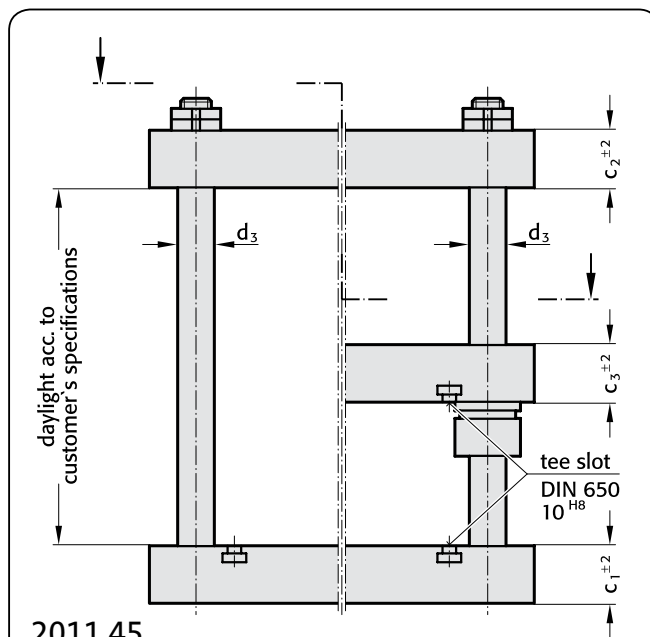
On request, All-Steel Die Sets can also be fitted with any other FIBRO Guide Elements – for combination possibilities see page A 30.

FIBRO will furthermore supply die sets with special machining features to customers' drawings.

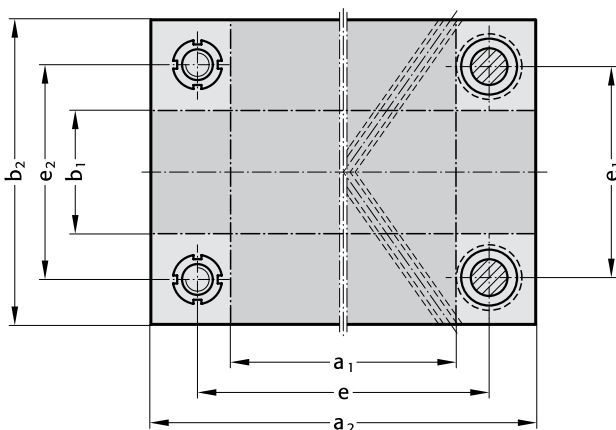
Ordering example see opposite fold out page.

Die Set Press Units  
with/without guided bolster

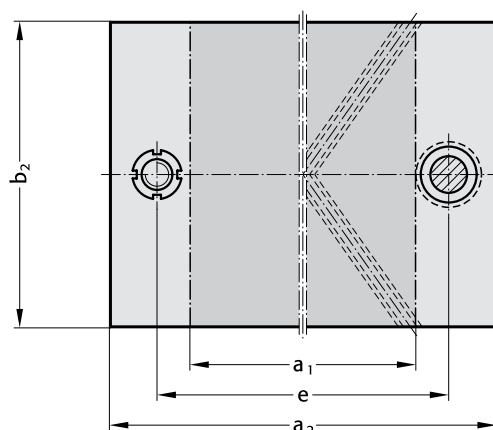
2011.45.  
2011.49.



2011.49.

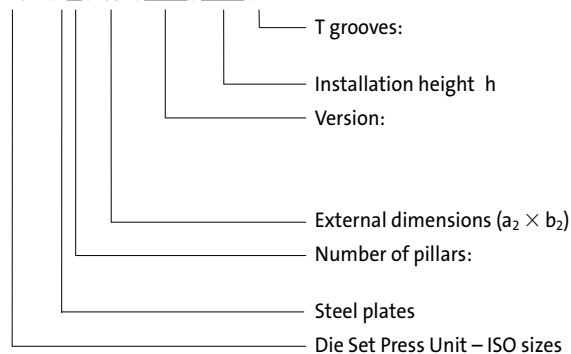


2011.45.



Order number system:

2011.4□.4031.□□□.□□□.1



Coupling spigots and -holders between cylinder and tool: see page A46.

.0 = without  
.1 = in lower part and intermediate plate

000. = without guide bolster  
001. = without guide bolster – tension rod not hardened  
831. = guide bolster with plain bearing  
862. = guide bolster with ball bearing guide  
40: a<sub>2</sub> = 400 mm; 31: b<sub>2</sub> = 315 mm  
5. = two guide pillars  
9. = four guide pillars

2011.

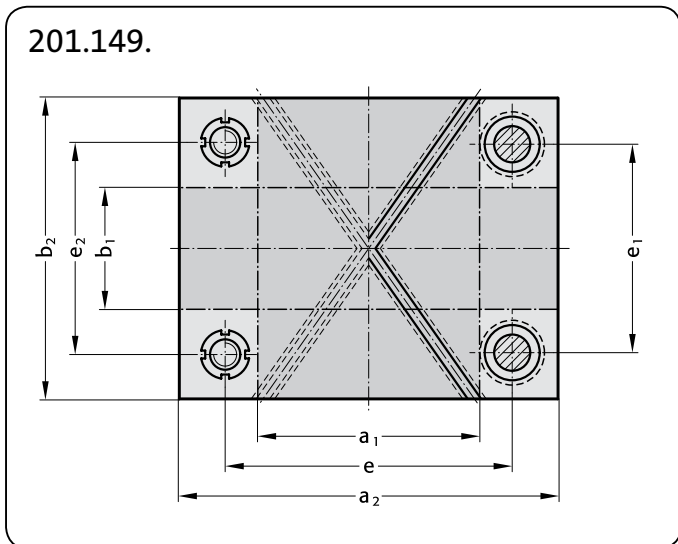
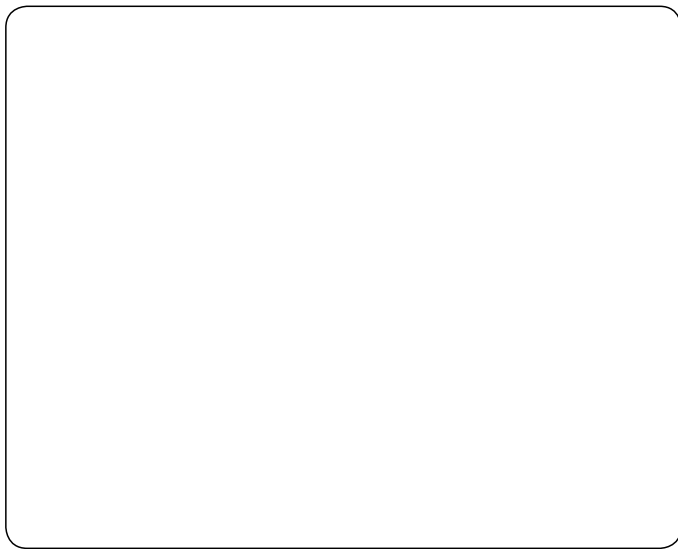
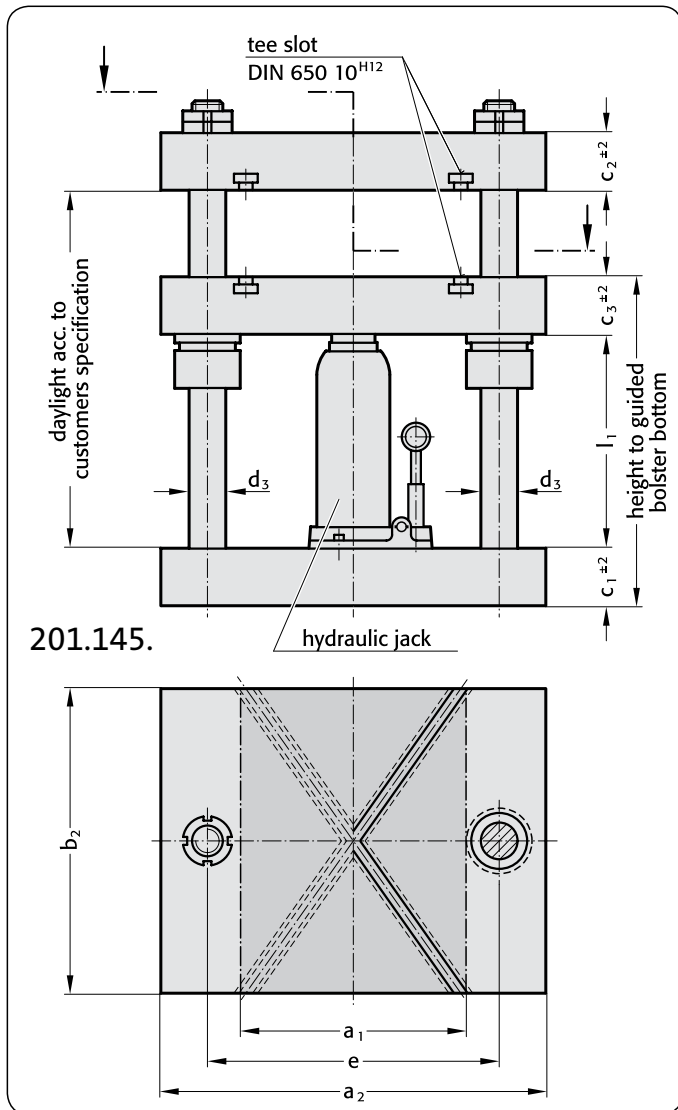
Order No	work area		max. press thrust kN	work area					max. press thrust				
	a <sub>1</sub> × b <sub>2</sub>	a <sub>2</sub> × b <sub>1</sub>		a <sub>2</sub>	b <sub>2</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	d <sub>3</sub>	e	e <sub>1</sub>	e <sub>2</sub>	
2011.	.2020.	86 × 200	200 × 65	20	200	200	32	32	32	25	132	132	129
	.2520.	136 × 200	250 × 64		250	200	32	32	32	25	182	132	129
	.2525.	120 × 250	250 × 100	40	250	250	40	40	40	32	174	174	171
	.3125.	185 × 250	315 × 100		315	250	40	40	40	32	239	174	171
	.3131.	185 × 315	315 × 165		315	315	40	40	40	32	239	239	236
	.4031.	270 × 315	400 × 165	80	400	315	50	50	50	32	324	239	236
	.4040.	270 × 400	400 × 250		400	400	50	50	50	32	324	324	321



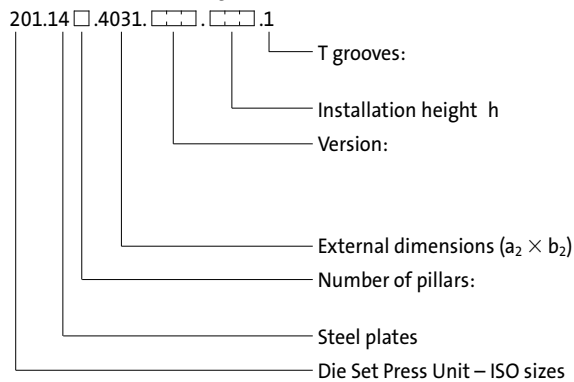
# FIBRO

201.145.  
201.149.

## Die Set Press Units with guided top bolster manual actuation



### Order number system:



Execution: Headed guide bushes, hydraulic jack.

- .0 = without
- .1 = in top bolster and intermediate plate
- 831. = guide bolster with plain bearing
- 862. = guide bolster with ball bearing guide
- 40:  $a_2 = 400$  mm; 31:  $b_2 = 315$  mm
- 5. = two guide pillars
- 9. = four guide pillars

### 201.

Order No	work area $a_1 \times b_2$	work area $a_2 \times b_1$	max. press thrust kN	max. stroke										
				$a_2$	$b_2$	$c_1$	$c_2$	$c_3$	$d_3$	e	$e_1$	$e_2$	$l_1$	stroke
201.14.0.2020.	86 × 200	200 × 65	20	200	200	32	32	32	25	132	132	129	180	130
201.14.0.2520.	136 × 200	250 × 64	20	250	200	32	32	32	25	182	132	129		
201.14.0.2525.	120 × 250	250 × 100	40	250	250	40	40	40	32	174	174	171		
201.14.0.3125.	185 × 250	315 × 100	40	315	250	40	40	40	32	239	174	171	200	130
201.14.0.3131.	185 × 315	315 × 165	40	315	315	40	40	40	32	239	239	236		
201.14.0.4031.	270 × 315	400 × 165	80	400	315	50	50	50	32	324	239	236	245	160
201.14.0.4040.	270 × 400	400 × 250	80	400	400	50	50	50	32	324	324	321		

Die Set Press Units-Accessories  
Coupling Spigot Holders  
Coupling Spigots

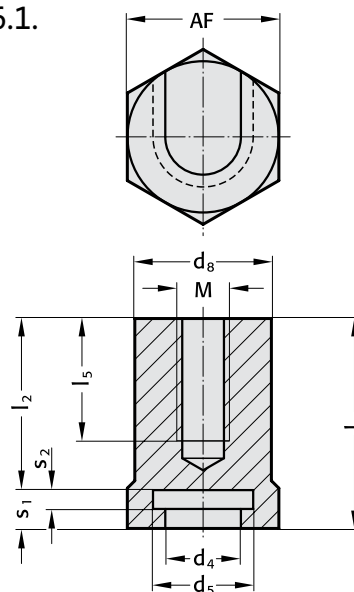
**FIBRO**

212.16.1.

212.11. 212.15.



212.16.1.

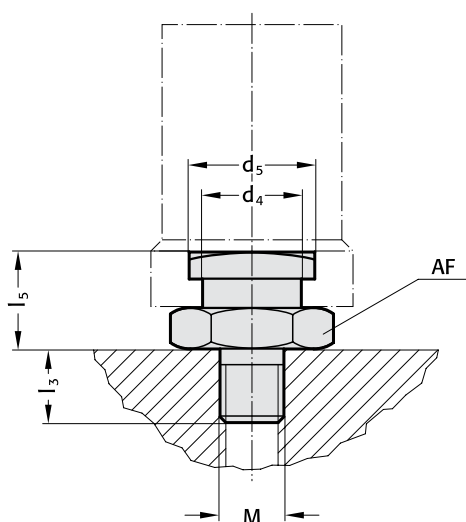


**212.16.1. Coupling Spigot Holders**

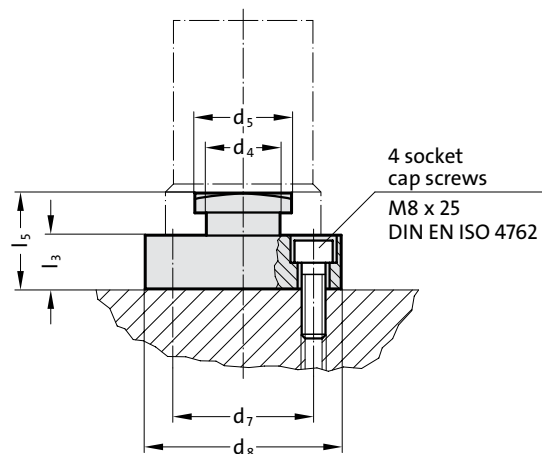
Order No	d <sub>4</sub>	d <sub>5</sub>	d <sub>8</sub>	SW	l <sub>1</sub>	l <sub>2</sub>	l <sub>5</sub>	M	s <sub>1</sub>	s <sub>2</sub>
212.16.1.026	26	33	45	50	70	57,4	*	*	12,6	7
033	33	49	60	65	86	67,4	*	*	18,6	10

\* upon customer's specification

212.11.



212.15.



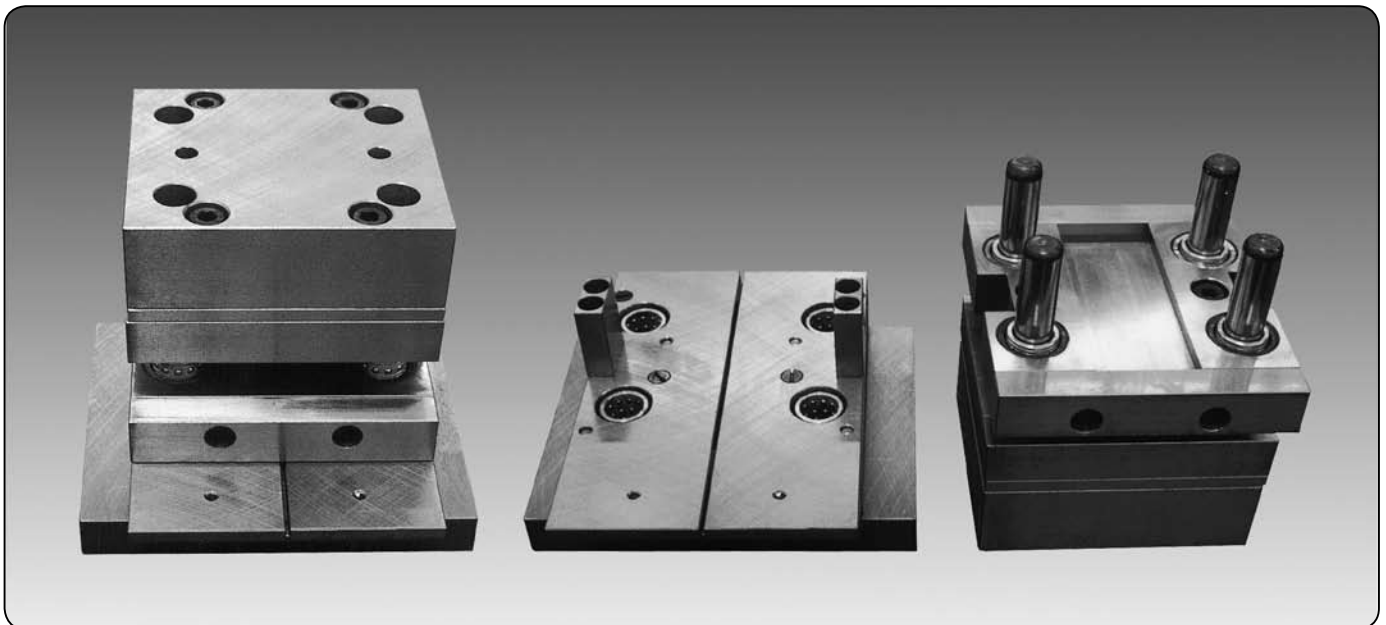
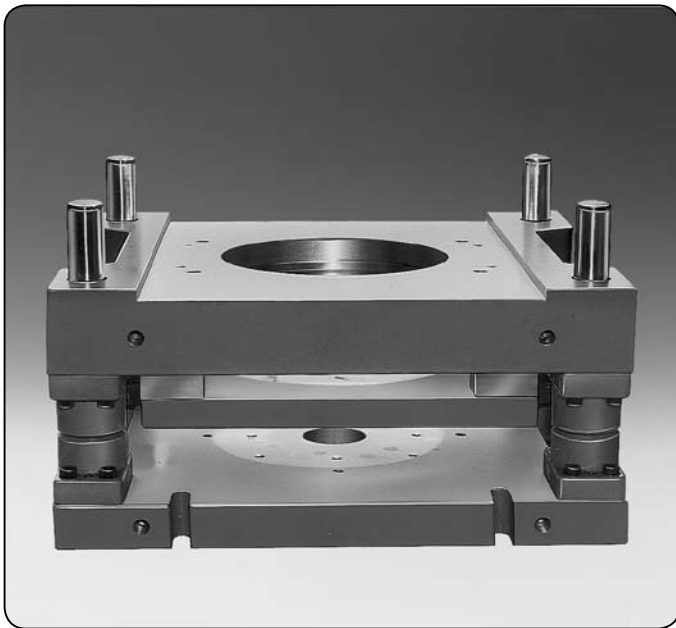
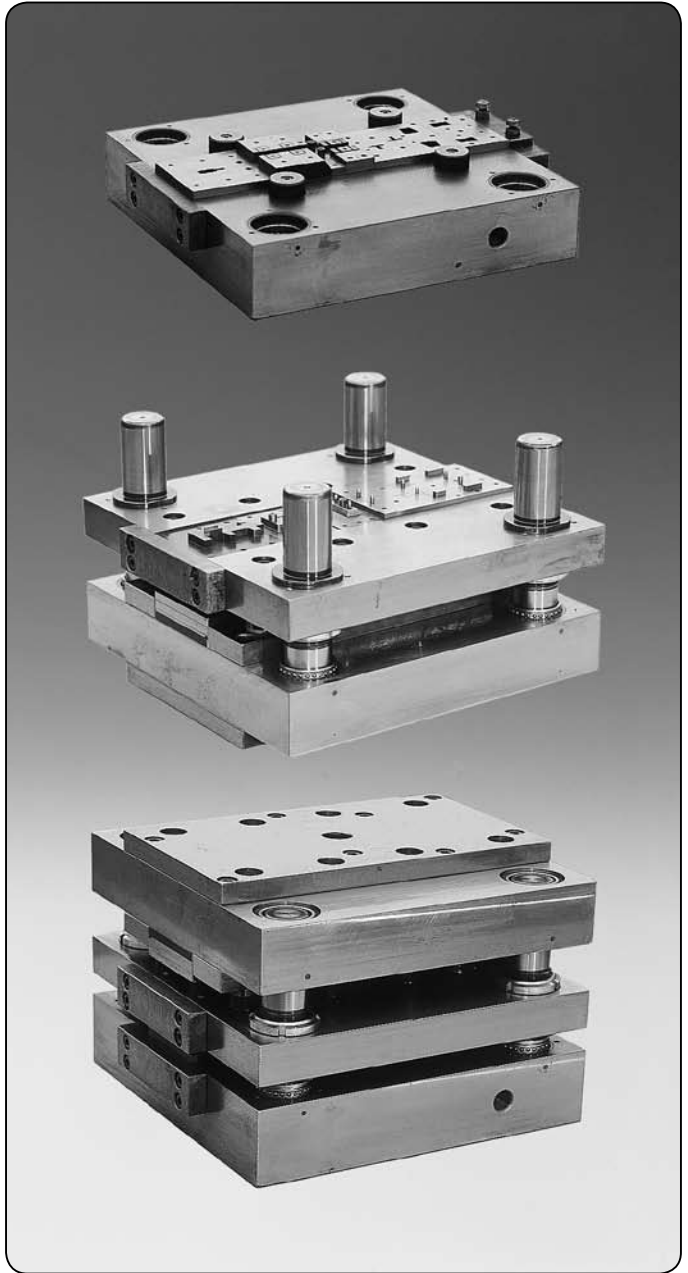
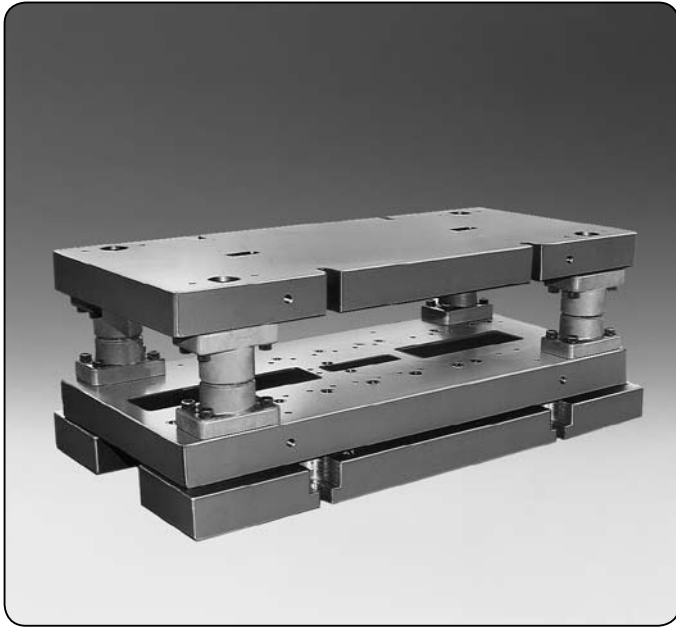
**212.11. Coupling Spigots**

Order No	M	d <sub>4</sub>	d <sub>5</sub>	l <sub>3</sub>	l <sub>5</sub>	SW
212.11.016	M16 × 1.5	25	32	18	23	36
030	M30 × 2	32	48	30	43	60

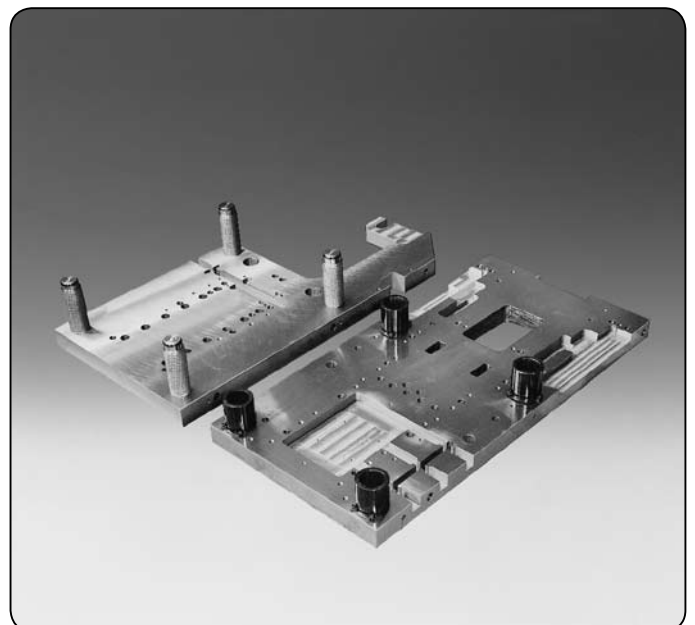
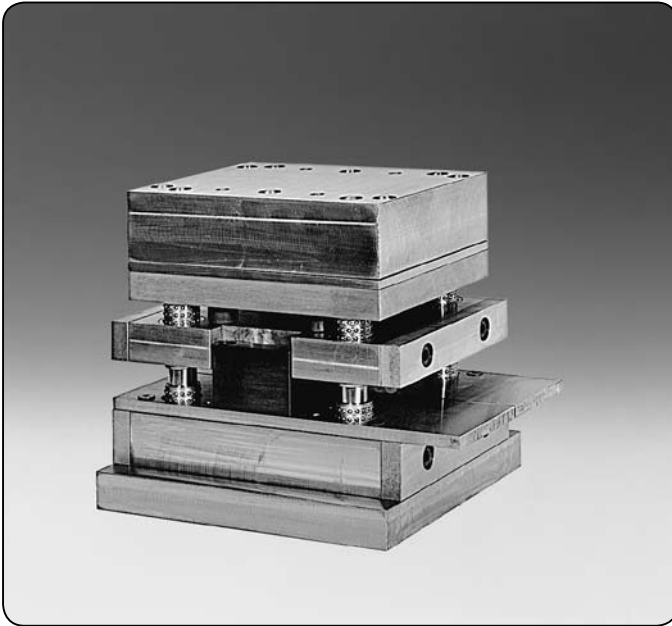
**212.15. Coupling Spigots**

Order No	d <sub>4</sub>	d <sub>5</sub>	d <sub>8</sub>	d <sub>7</sub>	l <sub>3</sub>	l <sub>5</sub>
212.15.063	25	32	63	46	18	31
080	32	48	80	63	18	37

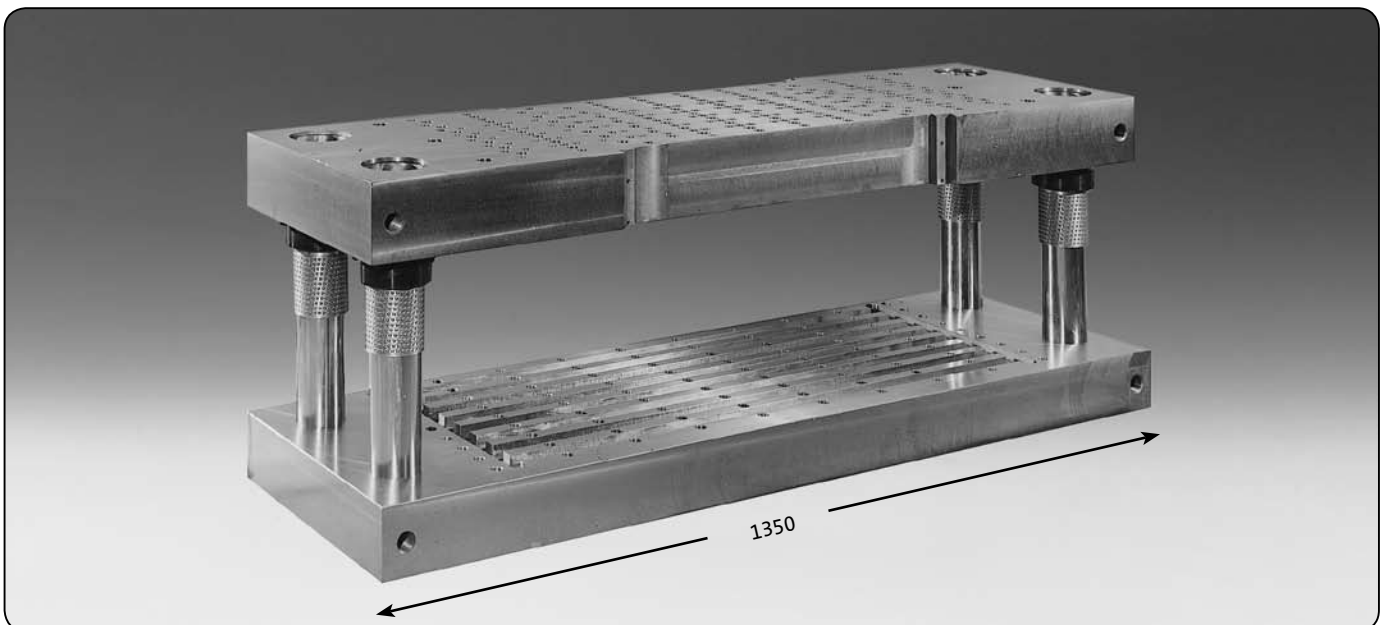
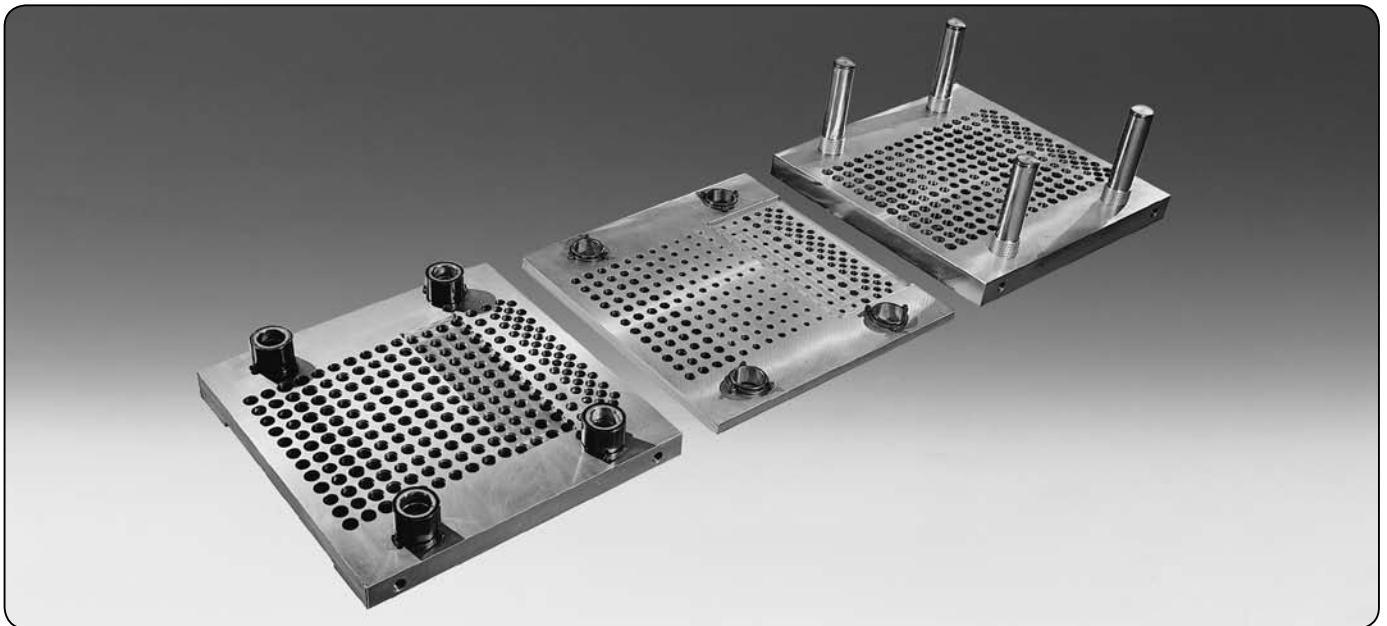
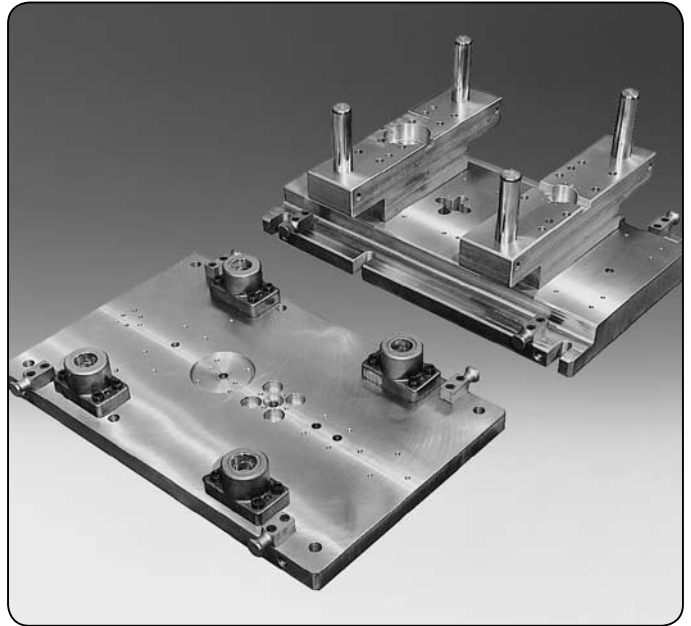
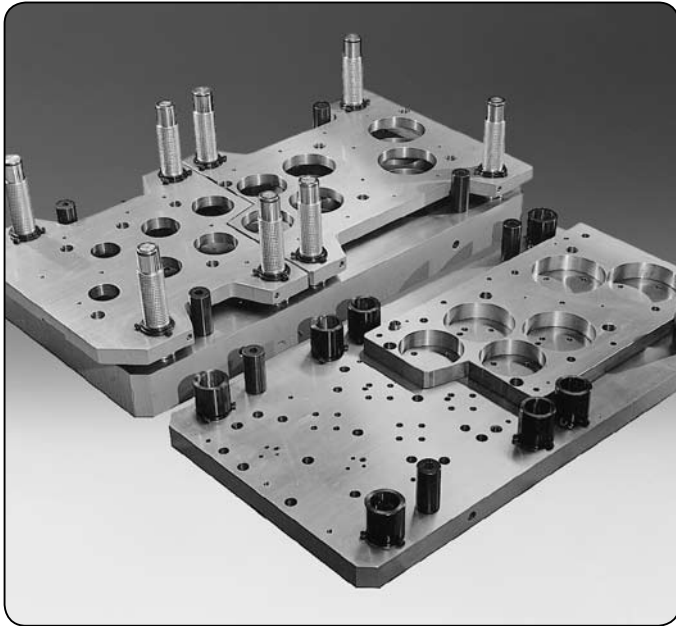
Special Die Sets (All-Steel)  
to Customers, Specifications



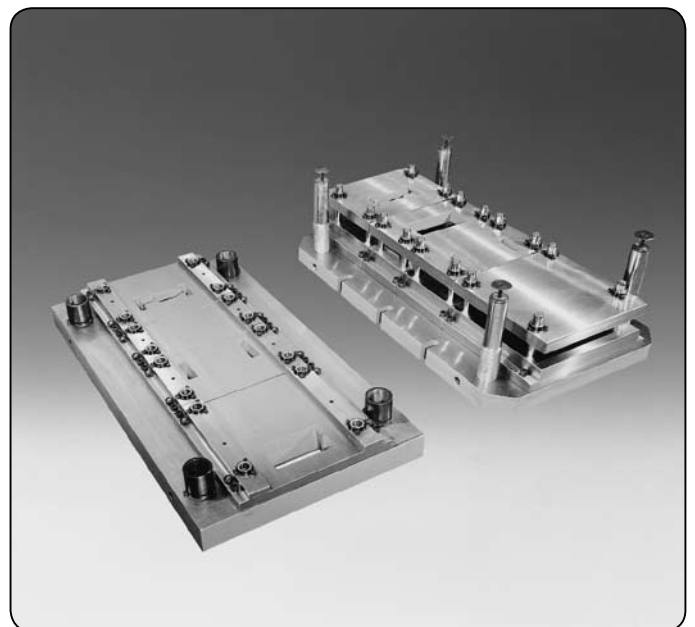
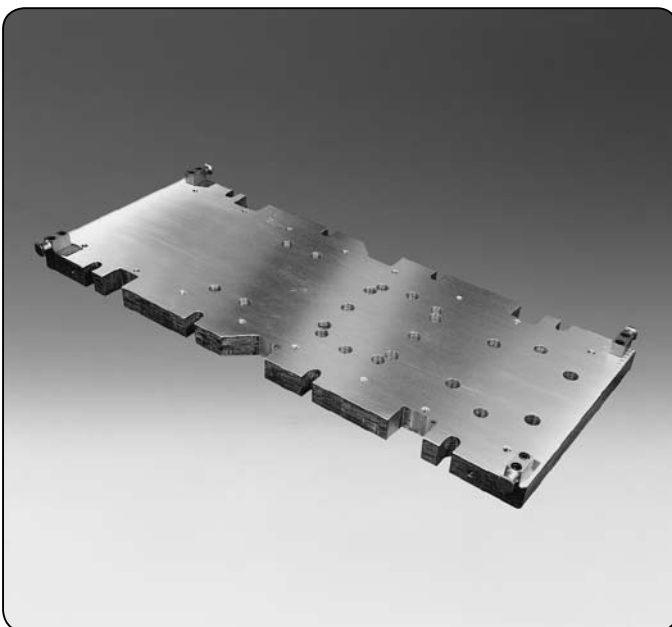
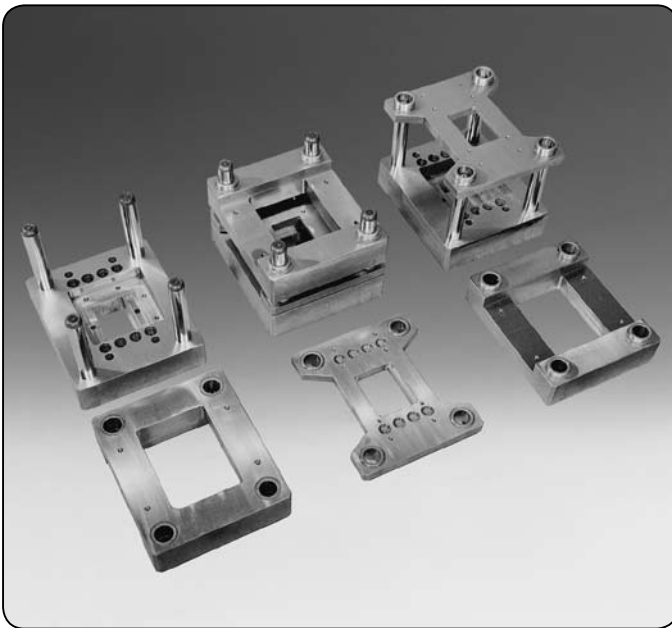
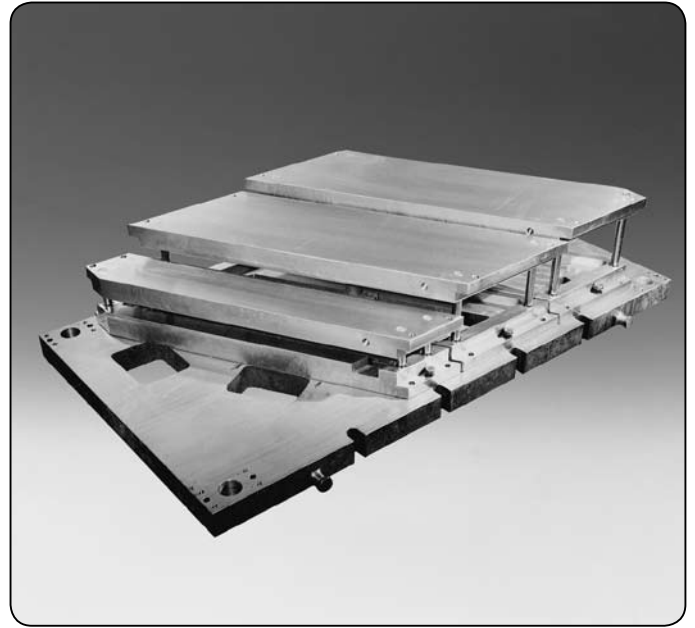
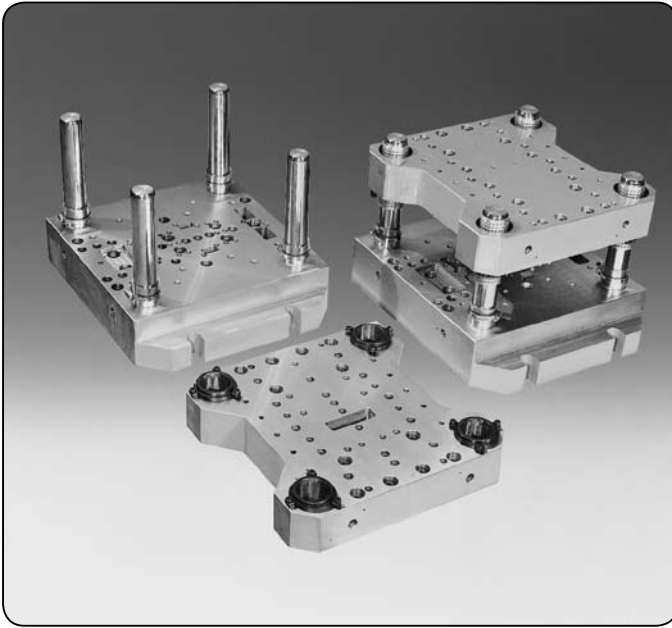
Special Die Sets (All-Steel)  
to Customers, Specifications



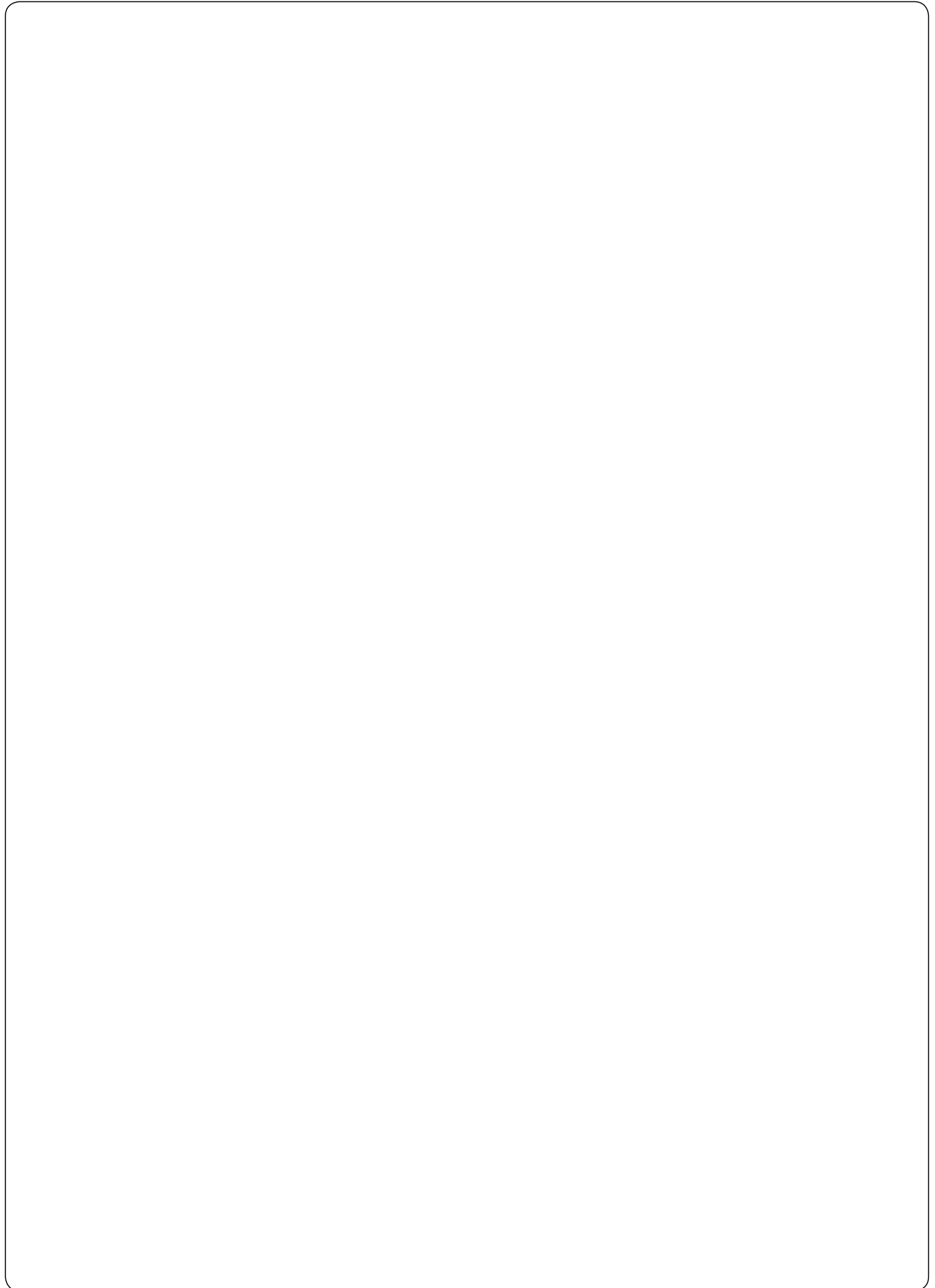
Special Die Sets (All-Steel)  
to Customers, Specifications



Special Die Sets (All-Steel)  
to Customers, Specifications

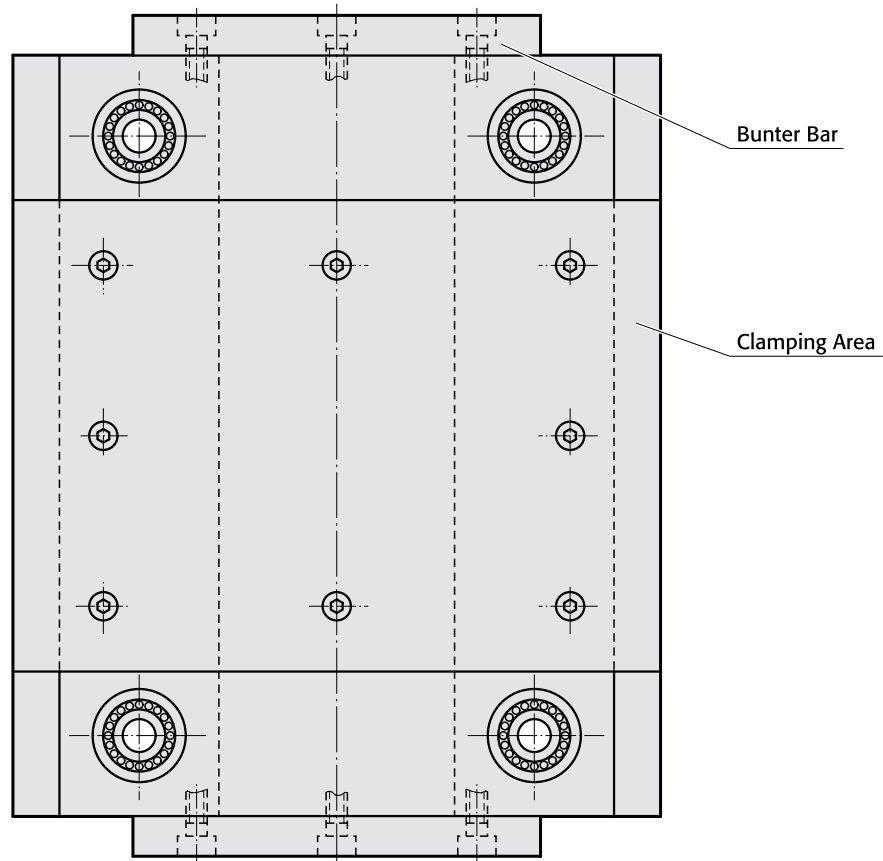
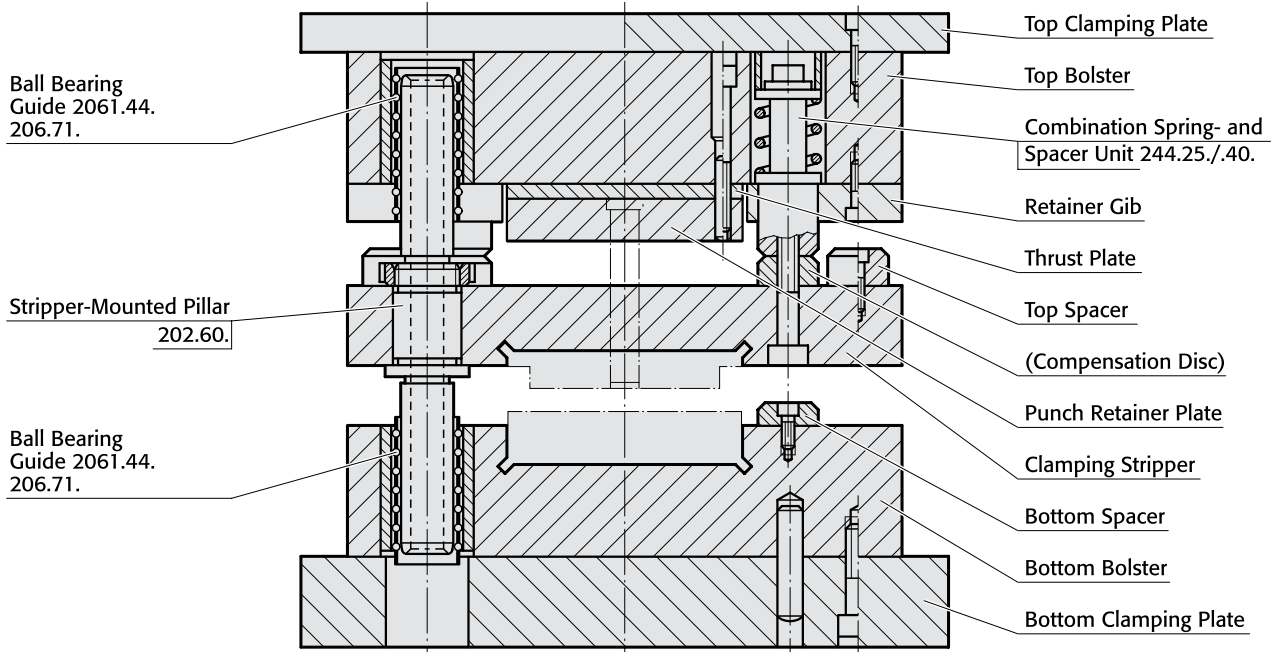




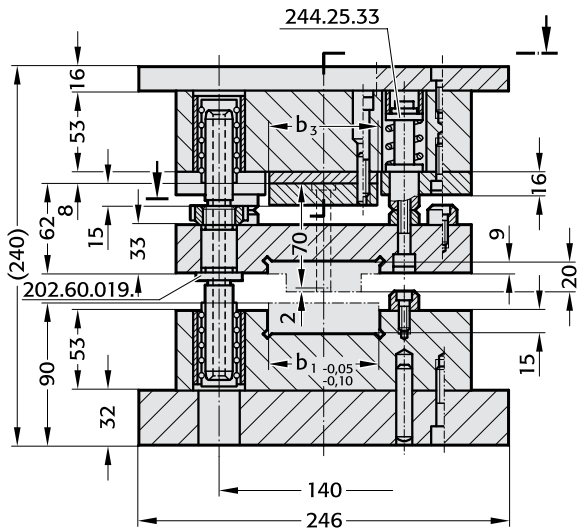




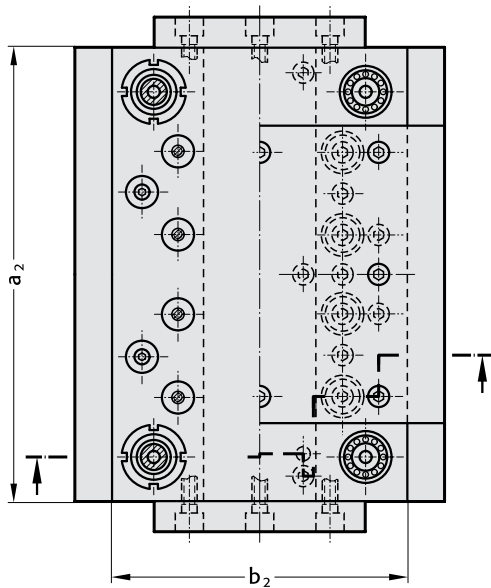
**FIBRO Progression  
Lamination Die Set Units**



201.50.



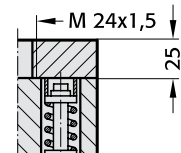
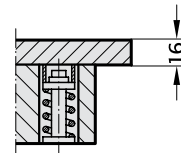
\* For the sizes 201.50.2520 and 3020 guide pillars 202.60.025



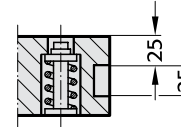
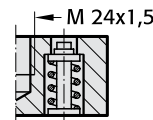
Execution

(mounting of top bolster to ram of press)

201.50. [ ] . [ ] . [ ] .1 201.50. [ ] . [ ] . [ ] .2  
with projecting top clamping plate with threaded hole in top clamping plate, for threaded shank

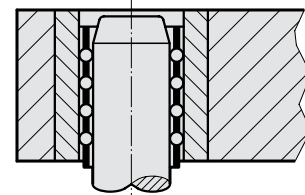


201.50. [ ] . [ ] . [ ] .3 201.50. [ ] . [ ] . [ ] .4  
with threaded hole in top bolster, for threaded shank with clamping pockets milled in top bolster



Guide Elements

Ball Bearing Guides



Width of slot  $b_1$  to be determined by customer!

2D-CAD data are available on request for each Die Set Unit. The designer need only draw the active die elements. Prints can be taken from this master.

Note: Die daylight and strip height can be reduced by up to 3 mm through a reduction in the thickness of the Bottom Clamping Plate.

201.50.

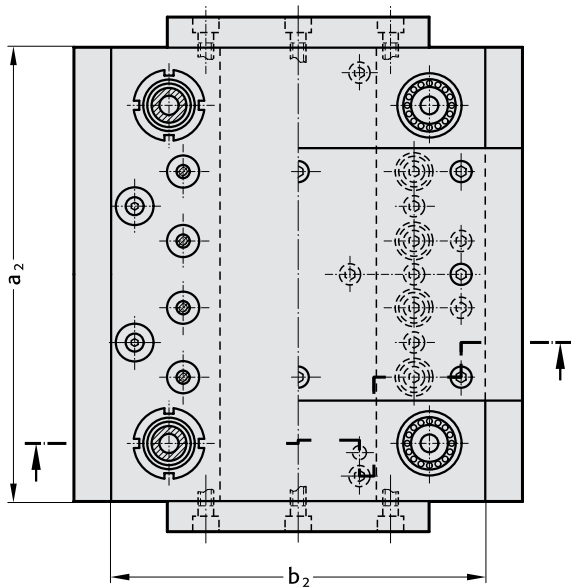
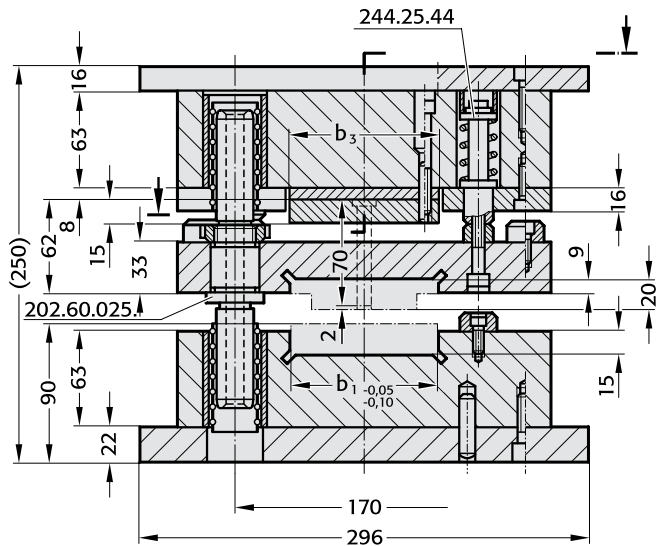
Order No	Spring type	ext. dims.	Comb. spring+ spacer	max. spring compression (without pre load) (mm)	spring preload (mm)	preloading in N (per spring unit)				spring coefficient "c" (N)			
						241...	14	15	16	17	14	15	16
201.50.1320. [ ] . [ ] . [ ]		126 × 196	40 4 40	6,0 6,0 5,0	3	241	354	891	-	80,3	118,1	297	-
1620. [ ] . [ ] . [ ]		156 × 196	50 4 50										
2020. [ ] . [ ] . [ ]		196 × 196	60 6 60										
2520. [ ] . [ ] . [ ]		246 × 196	75 8 75										
3020. [ ] . [ ] . [ ]		296 × 196	75 8 75										

Ordering Code (example):

Die Set Unit	=	201.50.
$a_2 \times b_2 = 296 \times 196$	=	3020.
$b_1 = 75$ mm	=	075.
Springs (type) 241.15.	=	15.
With projecting top clamping plate	=	1
Order No	=	201.50.3020.075.15.1

Die Set Units 201.50. can also be supplied in special sizes as well as special executions, acc. to customers' specifications.

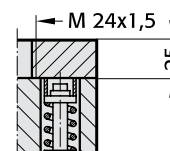
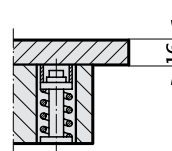
201.50.



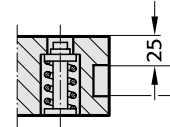
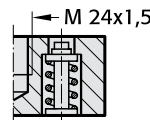
**Execution**

(mounting of top bolster to ram of press)

201.50. [ ] . [ ] . [ ] .1 201.50. [ ] . [ ] . [ ] .2  
with projecting top clamping plate with threaded hole in top clamping plate, for threaded shank

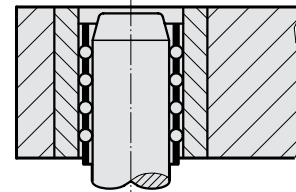


201.50. [ ] . [ ] . [ ] .3 201.50. [ ] . [ ] . [ ] .4  
with threaded hole in top bolster, for threaded shank with clamping pockets milled in top bolster



**Guide Elements**

Ball Bearing Guides



**Width of slot  $b_1$  to be determined by customer!**

2D-CAD data are available on request for each Die Set Unit. The designer need only draw the active die elements. Prints can be taken from this master.

Note: Die daylight and strip height can be reduced by up to 16 mm through a reduction in the thickness of the Bottom Clamping Plate.

201.50.

Order No	Type	Size	Spring type	ext. dimensions $a_2 \times b_2$	$b_1$ max.	Comb. spring+ spacer unit	$b_3$	max. spring compression (without preload) (mm)				spring preload (mm)	preloading in N (per spring unit) 241. [ ] . [ ] .25.045				spring coefficient "c" (N) 241. [ ] . [ ] .25.045			
								14	15	16	17		241...	14	15	16	17	14	15	16
201.50.1625.	[ ] . [ ] . [ ]	156 × 246	60	4	60	8,0	8,0	7,8	5,4	4	212	323	748	977	53	80,8	187	244,2		
2025.	[ ] . [ ] . [ ]	196 × 246	75	6	75															
2525.	[ ] . [ ] . [ ]	246 × 246	90	8	90															
3025.	[ ] . [ ] . [ ]	296 × 246	100	8	100															
3525.	[ ] . [ ] . [ ]	346 × 246	100	10	100															

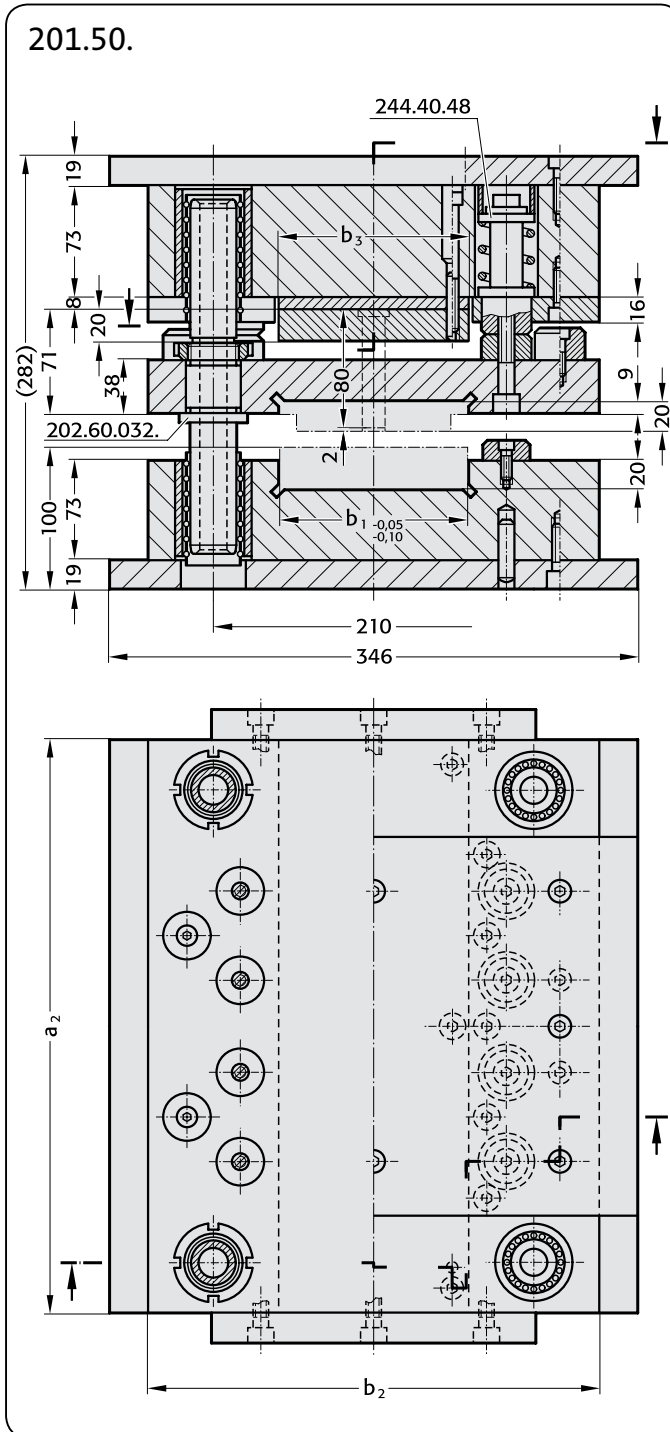
**Ordering Code (example):**

Die Set Unit	=	201.50.
$a_2 \times b_2 = 296 \times 246$	=	3025.
$b_1 = 100$ mm	=	100.
Springs (type) 241.15.	=	15.
With projecting top clamping plate	=	1
Order No	=	201.50.3025.100.15.1

Die Set Units 201.50. can also be supplied in special sizes as well as special executions, acc. to customers' specifications.

FIBRO Progression/  
Lamination Die Set Units

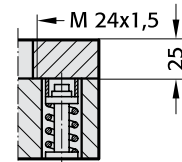
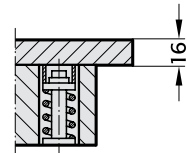
201.50.



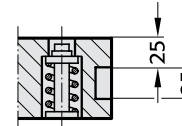
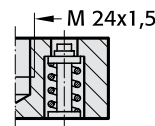
Executions

(mounting of top bolster to ram of press)

201.50. [ ] . [ ] . [ ] .1 201.50. [ ] . [ ] . [ ] .2  
with projecting top clamping plate with threaded hole in top clamping plate, for threaded shank

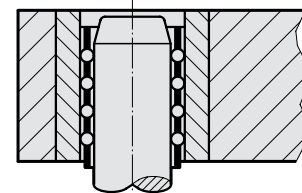


201.50. [ ] . [ ] . [ ] .3 201.50. [ ] . [ ] . [ ] .4  
with threaded hole in top bolster, for threaded shank with clamping pockets milled in top bolster



Guide Elements

Ball Bearing Guides



Width of slot  $b_1$  to be determined by customer!

2D-CAD data are available on request for each Die Set Unit. The designer need only draw the active die elements. Prints can be taken from this master.

Note: Die daylight and strip height can be reduced by up to 16 mm through a reduction in the thickness of the Bottom Clamping Plate.

201.50.

Order No	Spring type	ext. dimensions $a_2 \times b_2$	$b_1$ max.	Comb. spring+ spacer unit.	$b_3$	max.spring compression (without preload) (mm)				preloading in N (per spring unit)				Spring coefficient "c" (N)				
						241...	14	15	16	17	241. [ ] .40.050	14	15	16	17	241. [ ] .40.050	14	15
201.50.2030. [ ] . [ ] . [ ]	[ ] . [ ] . [ ]	196 × 296	75	4	75	7,0	7,0	5,0	4,2	8	736	1432	2800	5027	92	179	350	628,4
2530. [ ] . [ ] . [ ]	[ ] . [ ] . [ ]	246 × 296	100	6	100													
3030. [ ] . [ ] . [ ]	[ ] . [ ] . [ ]	296 × 296	100	8	100													
3530. [ ] . [ ] . [ ]	[ ] . [ ] . [ ]	346 × 296	125	8	125													
4030. [ ] . [ ] . [ ]	[ ] . [ ] . [ ]	396 × 296	125	8	125													

Ordering Code (example):

Die Set Unit	=	201.50.
$a_2 \times b_2 = 296 \times 296$	=	3030.
$b_1 = 100$ mm	=	100.
Springs (type) 241.15.	=	15.
With projecting top clamping plate	=	1
Order No	=	201.50.3030.100.15.1

Die Set Units 201.50. can also be supplied in special sizes as well as special executions, acc. to customers' specifications.

**Die Set Units for Progression/Lamination Dies**

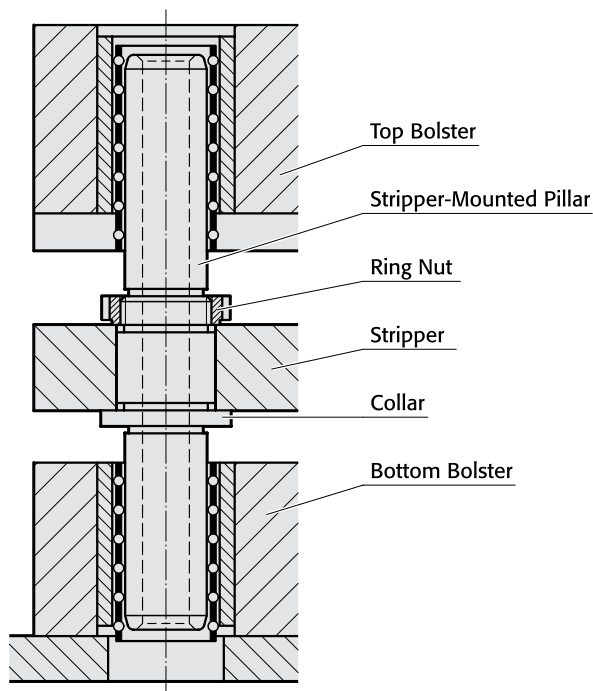
The accuracy of a stamping die starts with the die set! When we designed these new units, special attention was paid to the stability and load capacity of the guide pillars.

The eventual introduction of the stripper-mounted pillar in its present form brought an eightfold increase in transverse load-carrying capacity relative to conventional pillars; under the same radial force, deflection is reduced to one-eighth.

While modern high-speed presses have made ball bearing guides all but mandatory, the limited load capacity of these bearings remains a disadvantage, calling for generous nominal pillar diameters and the use of more than two guide bearings.

Considerable forces of inertia are encountered during the reversal of stroking motion at speeds in excess of 500 SPM. In order to keep these harmful forces to a minimum, FIBRO Stripper-Mounted Pillars are provided with hollow cores.

Considerations such as these formed the basis for the development of our new die set units with stripper-mounted pillars – a concept that has resulted in greatly improved accuracy, overall stability and speed capacity.

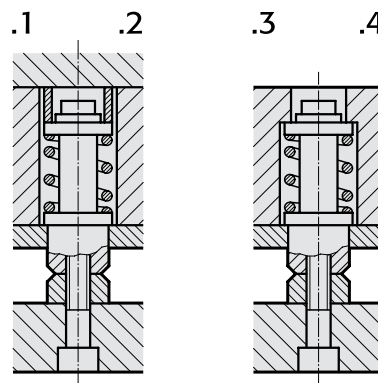


**Combination Spring/Spacer Units**

Strippers on FIBRO Progression/Lamination Die Set Units are laid out for the functions of punch guiding and clamping of the stock, derived from preloaded spring/spacer units of highly compact design.

The advantages of these compact units, in accordance with executions 1 to 4, are as follows:

- a) compactness – the combination of both spring- and spacer functions saves die space
- b) ease of die maintenance – punch regrinding and replacement, as well as dimensional adaptation, can be done without dismantling of the stripper.  
Note: regrinding of punches = regrinding of spacer!
- c) ease of springs maintenance – after removal of only the top clamping plate, the complete spring/spacer unit can be taken out for replacement etc. This feature applies to executions 1 and 2 only.

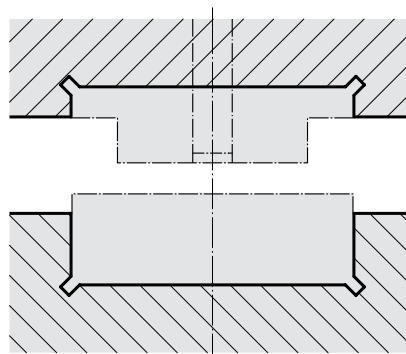


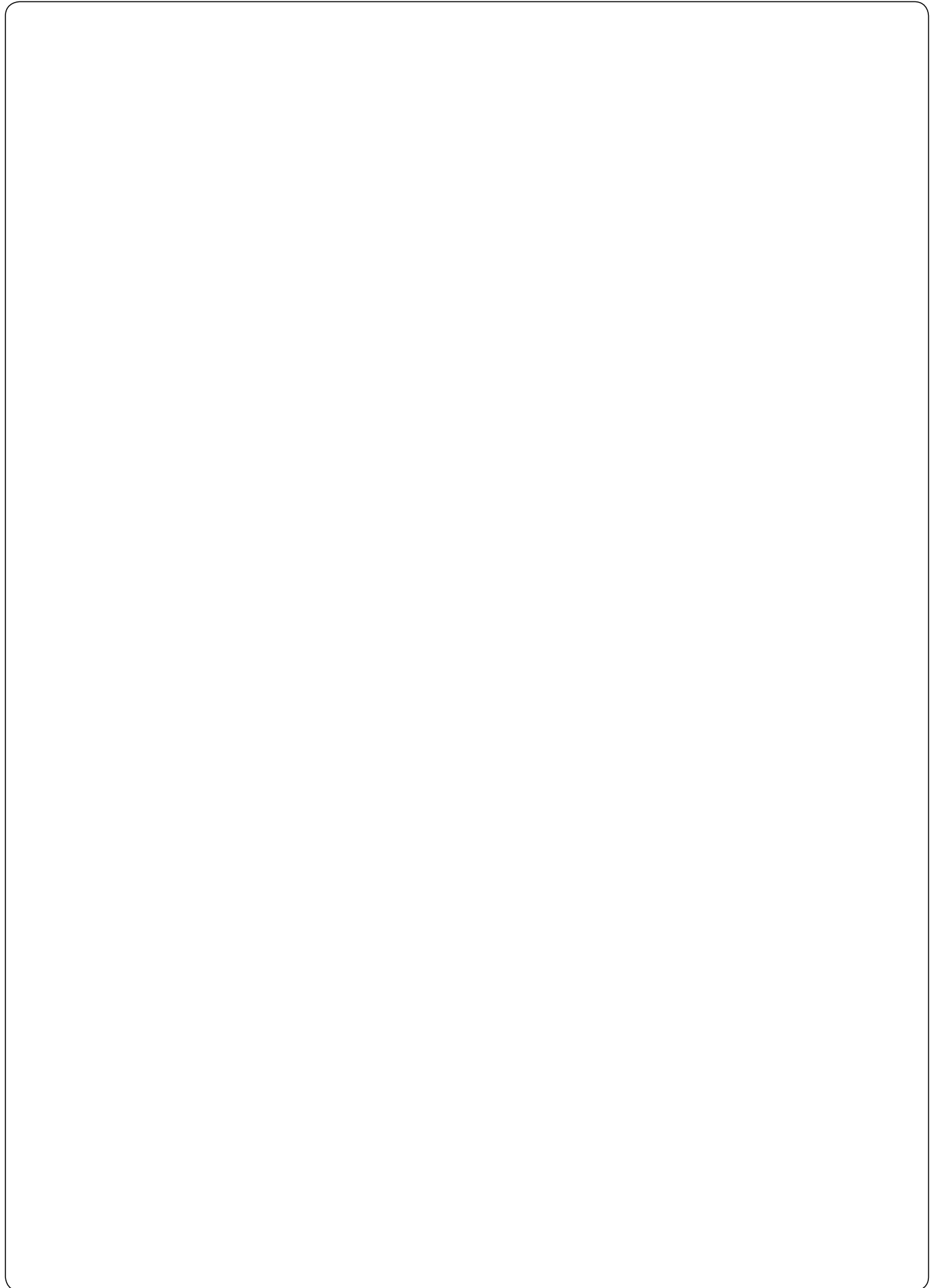
**Retaining Slots for Matrixes and Guiding-Stripper Plate**

It is of paramount importance to the accuracy of the final die assembly that both these slots are in perfect vertical alignment, to within a few mm.

From long experience we know that all heavy machining of die set apertures must precede the finish-machining of the two retainer slots for the matrix inserts and the guiding/clamping stripper plate.

Whenever the machining of such apertures is not entrusted to us we will supply our Die Set Units with pre-ground slots only.







# Tooling Pallet Die Sets

## Description

The fast exchange of pallet-born tooling sets, with the concept of rapid mechanical positioning, meets the demands for:

- lowering of tooling cost
- reduction in setting costs
- faster response to market trends.

Instead of a multitude of complete die set-born press tools, the new system is based on a carrier die set with rapid-exchange features. This die set can remain in the press, while any number of tooling pallet sets can be accommodated expediently and precisely, one at a time. There are no individual guide elements associated with a tooling pallet set – the necessary guiding remains a function of the carrier die set exclusively.

Tooling pallet sets are mounted to standard carrier plates – the top and bottom tooling simply slides into position, where a stop provides the positioning control, to allow entry of the locating pins upon the required half-turn of each of the four pin actuation levers on the die set. With the tooling pallets now positioned accurately, the hexagonal clamping screws at the front of the die set can be turned with a box spanner, each activating one clamp via an internal cam, moved by threading action of the screw. The cam angle is such that self-locking is obtained.

## Press Tool Types

Sets of pallet tooling can be designed as:

- combination progression tools
- compound tools
- draw dies
- bending- and forming dies
- combination tools etc.

## Setting and Tryout Aids

The absence of individual guide elements is a fundamental feature of tooling pallet sets which greatly assists the overall economy of the system. In order to facilitate the aligning of top- and bottom tooling, conical centring units can be fitted, thus providing alignment between both members by direct means – even outside the carrier die set, on the toolmaker's bench.

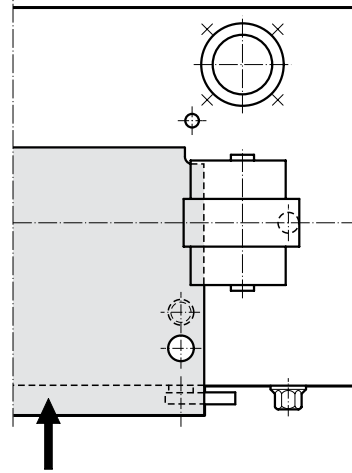
As a further aid for setting and tryout of pallet sets we offer the FIBRO Aligning- and Tryout Press Unit 201.98. with simplified but basically similar positioning- and locking features as the carrier die set.



**Setting**

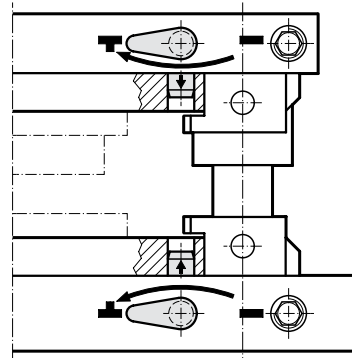
- slide each pallet into its position
- positioning
- clamping

These steps can be completed in a minute.

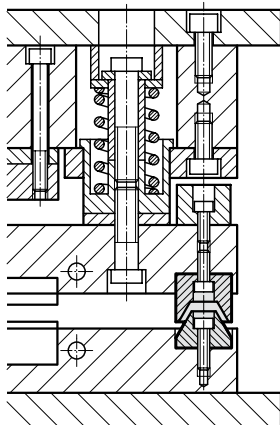
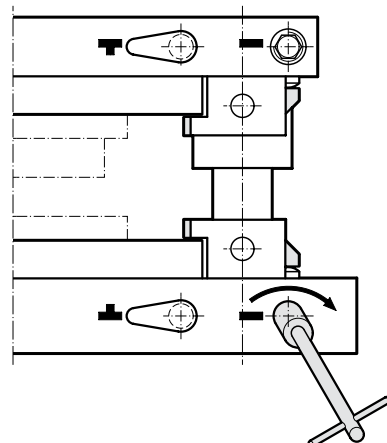
**Slide-In Insertion****Sheet Thicknesses**

Sheet less than 0,4 mm in thickness is normally not recommended for the system – on account of the smaller punch-to-die clearances associated with thin stock materials, where the normal positioning accuracy within the carrier die set (approximately 0,02 mm) becomes insufficient.

However, through fitting of conical centring units the overall alignment accuracy can be improved to an extent where even sheet below 0,4 mm thickness can be processed successfully.

**Positioning****Positioning Aids**

Pallet tooling sets can be equipped with conical centring units.

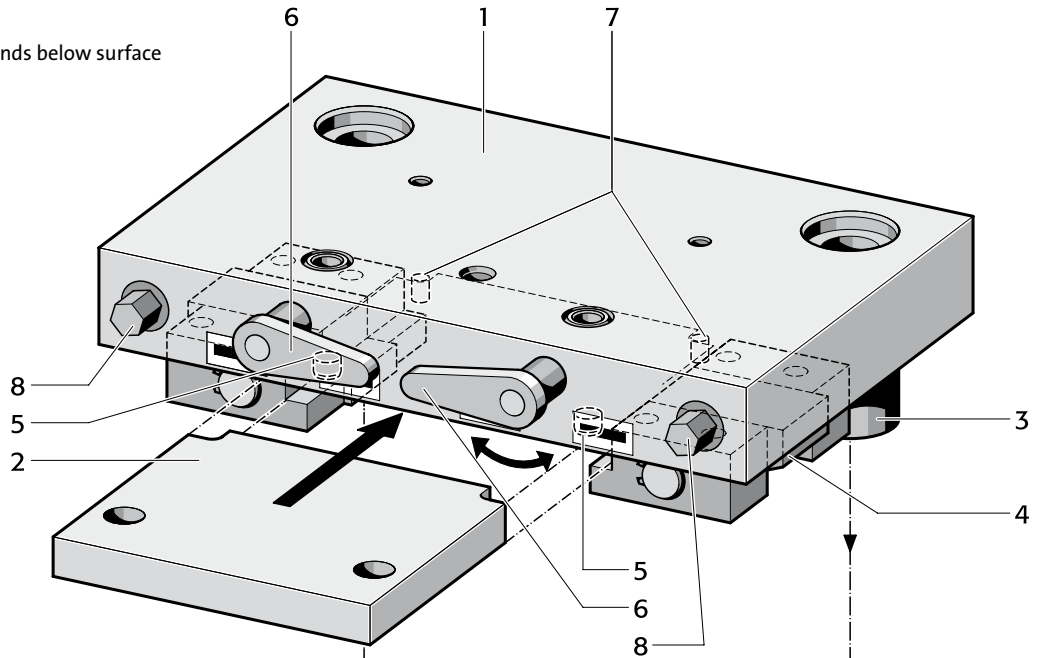
**Clamping**

Overview of Pallet Tooling System

201.95.

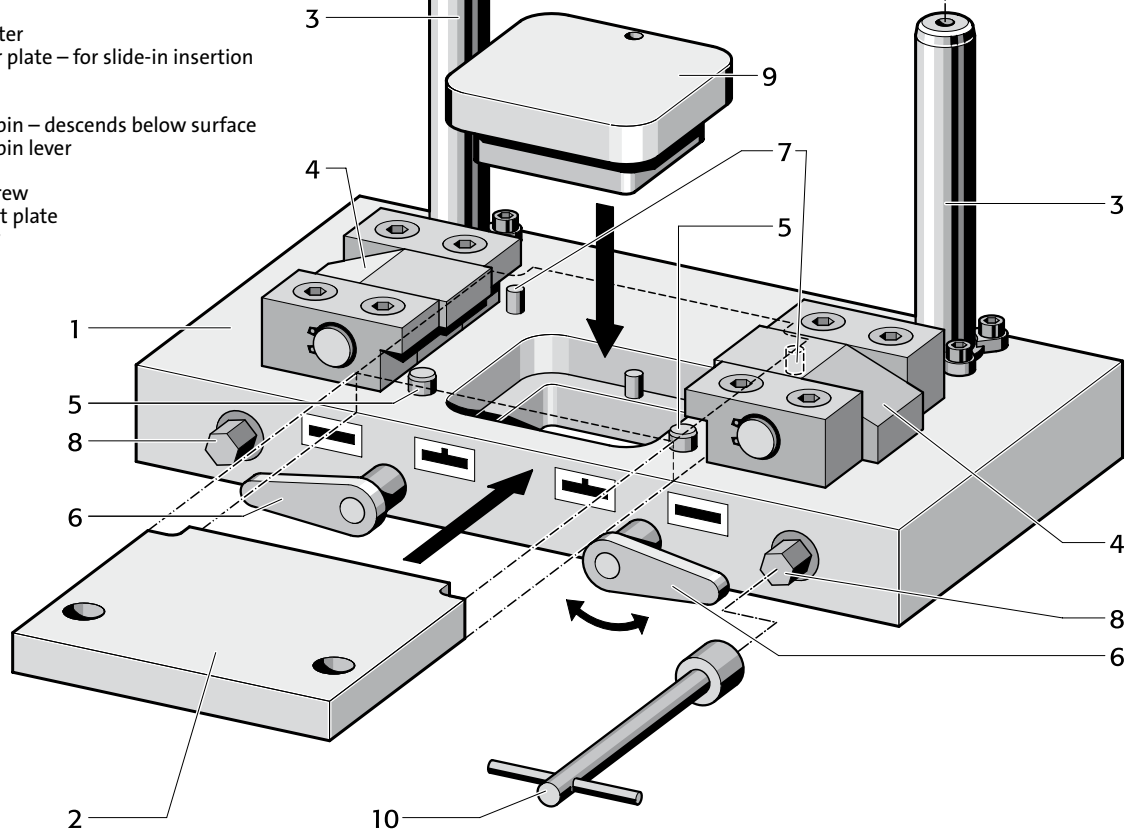
Top Bolster of Pallet Die Set

- 1 top bolster
- 2 pallet carrier plate – for slide-in insertion
- 3 guide bushes – optionally sliding – or ball bearing guides
- 4 clamp
- 5 positioning pin – descends below surface
- 6 positioning pin lever
- 7 stop pin
- 8 clamping screw

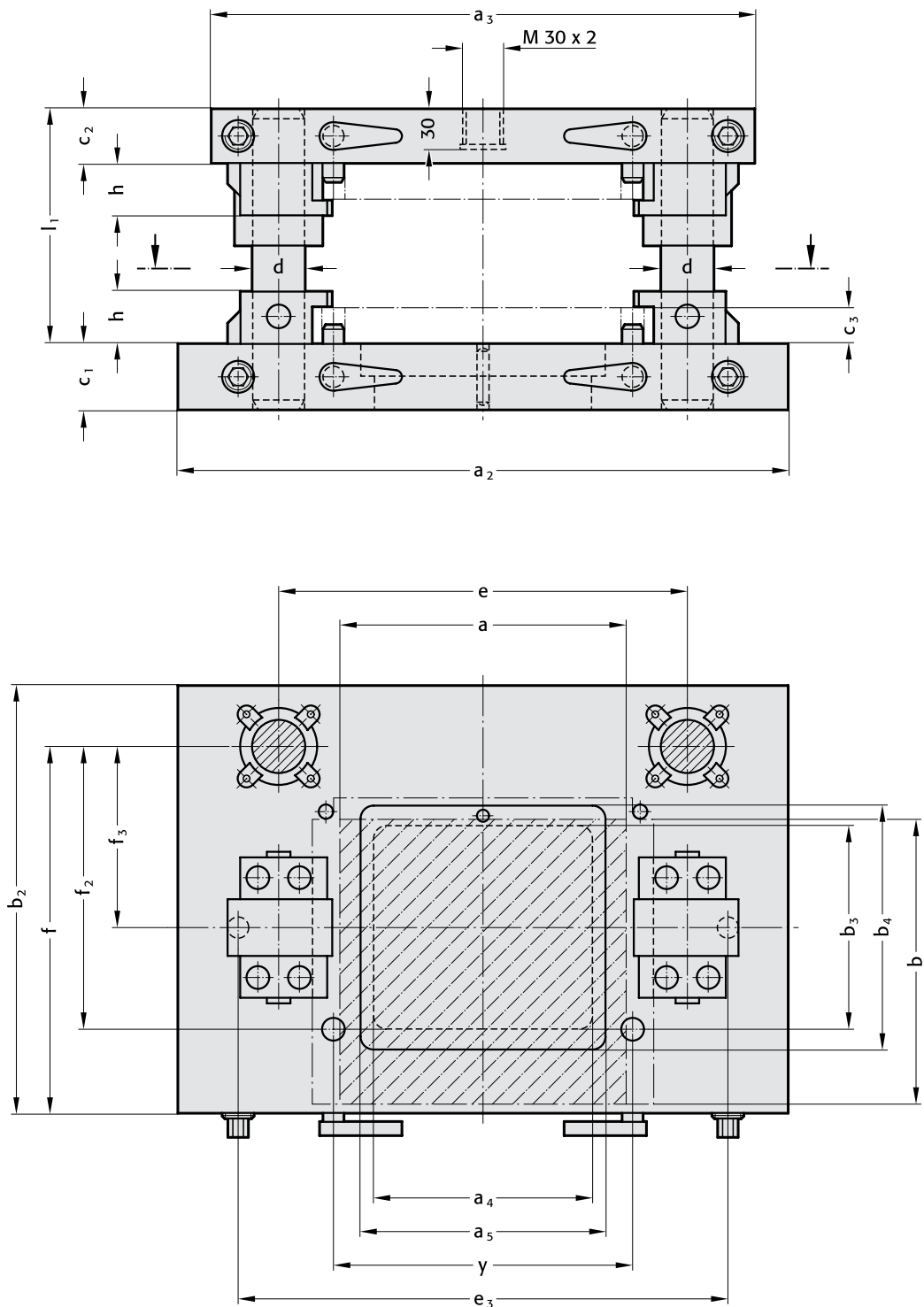


Bottom Bolster of Pallet Die Set

- 1 bottom bolster
- 2 pallet carrier plate – for slide-in insertion
- 3 guide pillar
- 4 clamp
- 5 positioning pin – descends below surface
- 6 positioning pin lever
- 7 stop pin
- 8 clamping screw
- 9 bolster insert plate
- 10 box spanner



201.95.



201.95.

Order No	work area		a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	b <sub>2</sub>	b <sub>3</sub>	b <sub>4</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	d	e	y	e <sub>3</sub>	f	f <sub>2</sub>	f <sub>3</sub>	h	l <sub>1</sub>
	a x b																				
201.95.1010.	100 × 100		350	300	80,5	-	200	60	80,5	40	40	16	25	220	120	260	168	113	93	29	160
201.95.2121.	210 × 210		450	400	161	180,2	315	150	180,2	50	40	25	40	300	220	360	270	208	133	38	180
201.95.3030.	300 × 300		550	500	241	270,5	420	220	250,5	63	40	25	40	380	320	460	365	305	185	38	180
201.95.3521.	350 × 210		600	550	320	-	315	120	150	50	40	25	40	450	370	510	270	208	133	38	180

Complete Order No with type of guides – i.e. .831 for sliding-, .862 for ball guides

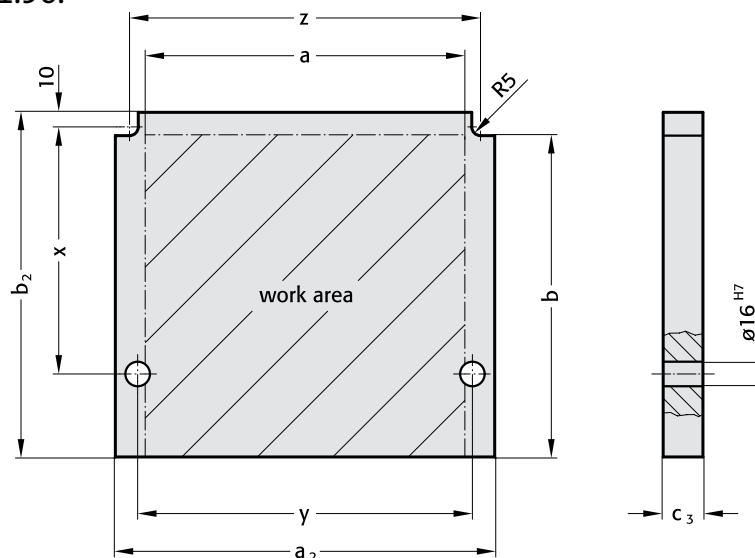
# Pallet Carrier Plates Bolster Insert Plates

## Pallet Carrier Plates

For each pallet tooling set, two carrier plates 201.96. are required – one for mounting the top tooling details, the other for the bottom tooling.

The tooling components are dowed into position.

### 201.96.



### 201.96.

Order No.	work area a x b	a <sub>2</sub>	b <sub>2</sub>	c <sub>3</sub>	x	y	z
201.96.1010	100 u 100	150	115	16	50,1	120	130
201.96.2121	210 u 210	250	225	25	160,1	220	230
201.96.3030	300 u 300	350	315	25	250,1	320	330
201.96.3521	350 u 210	400	225	25	160,1	370	380

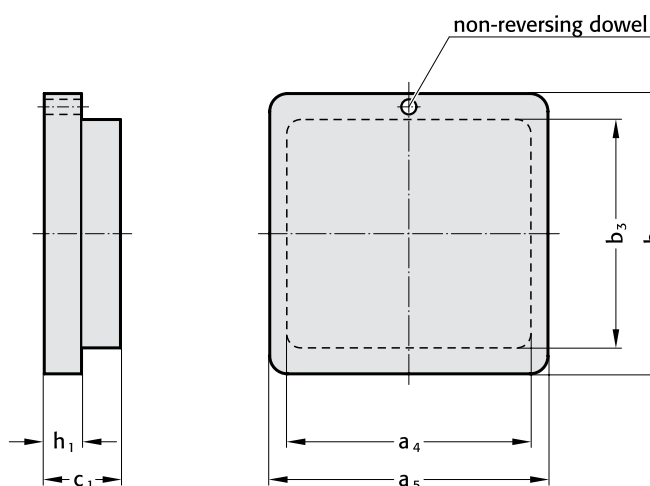
## Bolster Insert Plates

This insert plate has to be added to a tooling pallet set if:

- scrap holes near the centre require additional support
- spring cushions or bottom ejectors have to be employed
- other features of specific die designs require an individual insert plate

Bolster insert plates have a dowel that makes them non-reversible.

### 201.97.



### 201.97.

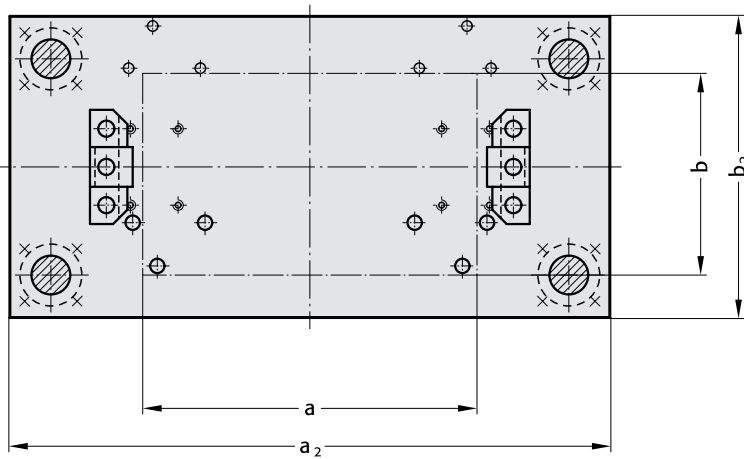
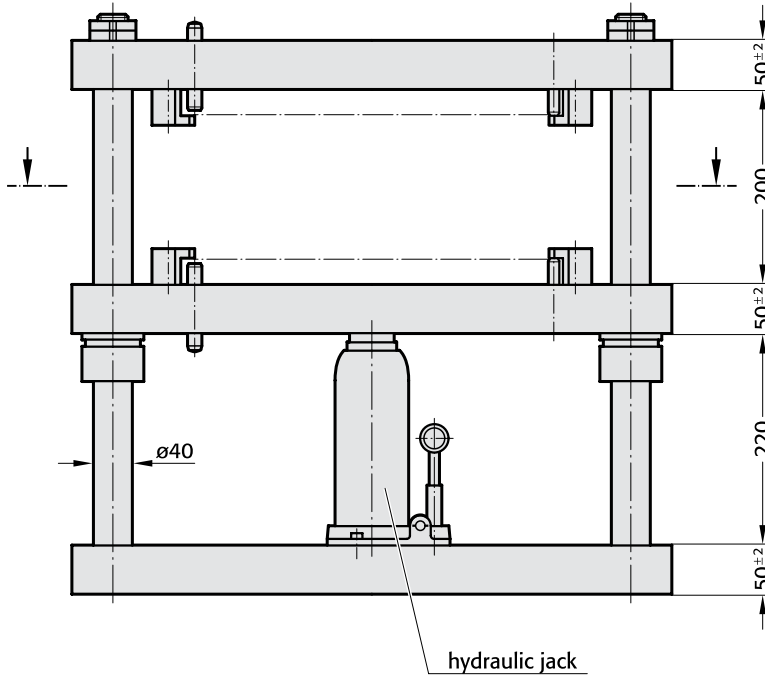
Order No	work area a x b	a <sub>4</sub>	a <sub>5</sub>	b <sub>3</sub>	b <sub>4</sub>	c <sub>1</sub>	h <sub>1</sub>
201.97.1010	100 x 100	80	-	60	80	40	20
201.97.2121	210 x 210	160	180	150	180	50	25
201.97.3030	300 x 300	240	270	220	250	63	30
201.97.3521	350 x 210	320	-	120	150	50	25

**FIBRO**

201.98.

## Aligning- and Tryout Press Units

201.98.



### Description

These press units have manual actuation by way of a hydraulic jack which forces the guided bolster upwards. In the toolroom they serve as tryout- and setting press, especially for tooling pallet sets. For the latter purpose they are equipped with simplified but functionally similar features for positioning and clamping as those in FIBRO Tooling Pallet Die Sets.

Moreover the press units provide ideal facilities for the press-fitting of pillars and bushes etc. – or their removal. For blueing-in and tryout of all sorts of press tools they soon prove themselves as an indispensable workshop facility, with a maximum thrust of 10 tons.

201.98.

Order No	work area a × b	a <sub>2</sub>	b <sub>2</sub>
201.98.1010.863	100 × 100	315	250
3030.863	210 × 210	630	315
	300 × 300		
	350 × 210		

### Material:

Plate: St 52-2

### Execution:

Headed ball bearing guide bushes, hydraulic jack, 10 tons capacity



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**A Die Sets**

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**B Precision Ground Plates and Flat Bars**

Steel and aluminium Plates  
Flat and square Tool Steels

---

**C Lifting and Clamping Devices**

---

**D Guide Elements**

---

**E Ground Precision Components**

---

**F Springs**

---

**G Elastomers**

---

**H FIBRO Chemical**

---

**J Peripheral Equipment**

---

**K Cam Units**

---

**L Standard Parts for Mould Making**





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# Precision Ground Plates and Flat Bars



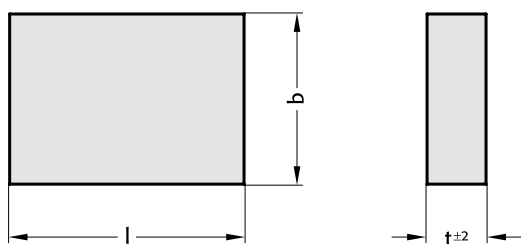
**Contents**

		Page
	<b>2900.</b> Steel plate to ISO 6753-1	<b>B4</b>
	<b>2910.</b> Aluminium Plates similar ISO 6753-1	<b>B5</b>
	<b>2922.1730.</b> Precision flat and square bar steel ~DIN 59350	<b>B6</b>
	<b>2923.0570.</b> Precision flat and square bar	<b>B6-</b>
	<b>2923.2099.</b> steel to DIN 59350 with	<b>B12</b>
	<b>2923.2162.</b> machining allowance	
	<b>2923.2312.</b>	
	<b>2923.2343.</b>	
	<b>2923.2363.</b>	
	<b>2923.2379.</b>	
	<b>2923.2436.</b>	
	<b>2923.2767.</b>	
	<b>2923.2842.</b>	
	<b>2922.2842.</b> Precision flat and square bar steel to DIN 59350	<b>B12</b>
	<b>2925.</b> Precision feeler Gauges Foil shims	<b>B14</b>

Steel plate to ISO 6753-1

2900.

2900.



Execution:

External contours milled, thickness surfaces ground

Note:

l or b ≤ 630 = +0,4  
+0,2

l or b > 630 = +0,6  
+0,2

Plates from 500 × 500 mm on are manufactured with a lifting thread.

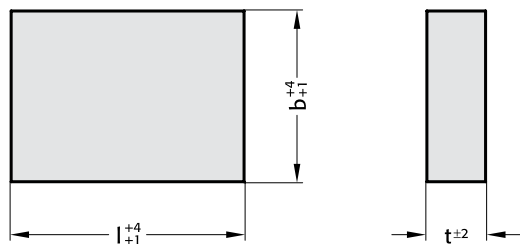
Ordering Code (example):

Steel plate	=	2900
length	400 mm	= .40
width	400 mm	= 40
thickness	32 mm	= .32
Order No	=	2900.4040.32

2900.

Order No	Size l x b x t	Order No	Size l x b x t	Order No	Size l x b x t
2900.1608.25	160 x 80 x 25	40	400 x 250 x 40	2900.8040.32	800 x 400 x 32
32	160 x 80 x 32	50	400 x 250 x 50	40	800 x 400 x 40
2900.1610.25	160 x 100 x 25	2900.4031.32	400 x 315 x 32	50	800 x 400 x 50
32	160 x 100 x 32	40	400 x 315 x 40	63	800 x 400 x 63
2900.1612.25	160 x 125 x 25	50	400 x 315 x 50	2900.8050.32	800 x 500 x 32
32	160 x 125 x 32	2900.4040.32	400 x 400 x 32	40	800 x 500 x 40
2900.1616.25	160 x 160 x 25	40	400 x 400 x 40	50	800 x 500 x 50
32	160 x 160 x 32	50	400 x 400 x 50	63	800 x 500 x 63
2900.2010.25	200 x 100 x 25	2900.5025.32	500 x 250 x 32	2900.8063.32	800 x 630 x 32
32	200 x 100 x 32	40	500 x 250 x 40	40	800 x 630 x 40
40	200 x 100 x 40	50	500 x 250 x 50	50	800 x 630 x 50
2900.2012.25	200 x 125 x 25	2900.5031.32	500 x 315 x 32	63	800 x 630 x 63
32	200 x 125 x 32	40	500 x 315 x 40		
40	200 x 125 x 40	50	500 x 315 x 50		
2900.2016.25	200 x 160 x 25	2900.5040.32	500 x 400 x 32		
32	200 x 160 x 32	40	500 x 400 x 40		
40	200 x 160 x 40	50	500 x 400 x 50		
2900.2020.25	200 x 200 x 25	2900.5050.32	500 x 500 x 32		
32	200 x 200 x 32	40	500 x 500 x 40		
40	200 x 200 x 40	50	500 x 500 x 50		
2900.2512.25	250 x 125 x 25	2900.6331.32	630 x 315 x 32		
32	250 x 125 x 32	40	630 x 315 x 40		
40	250 x 125 x 40	50	630 x 315 x 50		
2900.2516.25	250 x 160 x 25	63	630 x 315 x 63		
32	250 x 160 x 32	2900.6340.32	630 x 400 x 32		
40	250 x 160 x 40	40	630 x 400 x 40		
2900.2520.25	250 x 200 x 25	50	630 x 400 x 50		
32	250 x 200 x 32	63	630 x 400 x 63		
40	250 x 200 x 40	2900.6350.32	630 x 500 x 32		
2900.2525.25	250 x 250 x 25	40	630 x 500 x 40		
32	250 x 250 x 32	50	630 x 500 x 50		
40	250 x 250 x 40	63	630 x 500 x 63		
2900.3116.32	315 x 160 x 32	2900.6363.32	630 x 630 x 32		
40	315 x 160 x 40	40	630 x 630 x 40		
50	315 x 160 x 50	50	630 x 630 x 50		
2900.3120.32	315 x 200 x 32	63	630 x 630 x 63		
40	315 x 200 x 40	2900.7140.32	710 x 400 x 32		
50	315 x 200 x 50	40	710 x 400 x 40		
2900.3125.32	315 x 250 x 32	50	710 x 400 x 50		
40	315 x 250 x 40	63	710 x 400 x 63		
50	315 x 250 x 50	2900.7150.32	710 x 500 x 32		
2900.3131.32	315 x 315 x 32	40	710 x 500 x 40		
40	315 x 315 x 40	50	710 x 500 x 50		
50	315 x 315 x 50	63	710 x 500 x 63		
2900.4020.32	400 x 200 x 32	2900.7163.32	710 x 630 x 32		
40	400 x 200 x 40	40	710 x 630 x 40		
50	400 x 200 x 50	50	710 x 630 x 50		
2900.4025.32	400 x 250 x 32	63	710 x 630 x 63		

2910.

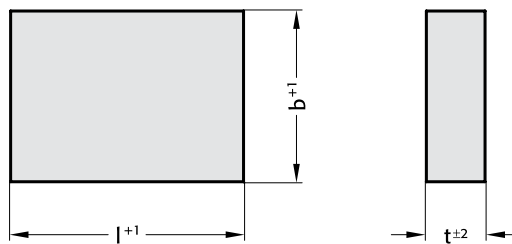


**Execution:**

2910.□□□□.□□.0  
External contours sawed  
Thickness surfaces ground

Bolsters from 500 X 500 mm on  
are manufactured with a lifting  
thread.

2910.



**Execution:**

2910.□□□□.□□.2  
Two external contours milled  
Thickness surfaces ground

Bolsters from 500 X 500 mm on  
are manufactured with a lifting  
thread.

2910.

Order No	Size l x w x h
2910.1608.25.□	160 x 80 x 25
32.□	160 x 80 x 32
2910.1610.25.□	160 x 100 x 25
32.□	160 x 100 x 32
2910.1612.25.□	160 x 125 x 25
32.□	160 x 125 x 32
2910.1616.25.□	160 x 160 x 25
32.□	160 x 160 x 32
2910.2010.25.□	200 x 100 x 25
32.□	200 x 100 x 32
40.□	200 x 100 x 40
2910.2012.25.□	200 x 125 x 25
32.□	200 x 125 x 32
40.□	200 x 125 x 40
2910.2016.25.□	200 x 160 x 25
32.□	200 x 160 x 32
40.□	200 x 160 x 40
2910.2020.25.□	200 x 200 x 25
32.□	200 x 200 x 32
40.□	200 x 200 x 40
2910.2512.25.□	250 x 125 x 25
32.□	250 x 125 x 32
40.□	250 x 125 x 40
2910.2516.25.□	250 x 160 x 25
32.□	250 x 160 x 32
40.□	250 x 160 x 40
2910.2520.25.□	250 x 200 x 25
32.□	250 x 200 x 32
40.□	250 x 200 x 40
2910.2525.25.□	250 x 250 x 25
32.□	250 x 250 x 32
40.□	250 x 250 x 40
2910.3116.32.□	315 x 160 x 32
40.□	315 x 160 x 40
50.□	315 x 160 x 50
2910.3120.32.□	315 x 200 x 32
40.□	315 x 200 x 40
50.□	315 x 200 x 50
2910.3125.32.□	315 x 250 x 32
40.□	315 x 250 x 40
50.□	315 x 250 x 50
2910.3131.32.□	315 x 315 x 32
40.□	315 x 315 x 40
50.□	315 x 315 x 50
2910.4020.32.□	400 x 200 x 32
40.□	400 x 200 x 40
50.□	400 x 200 x 50
2910.4025.32.□	400 x 250 x 32

Order No	Size l x w x h
40.□	400 x 250 x 40
50.□	400 x 250 x 50
2910.4031.32.□	400 x 315 x 32
40.□	400 x 315 x 40
50.□	400 x 315 x 50
2910.4040.32.□	400 x 400 x 32
40.□	400 x 400 x 40
50.□	400 x 400 x 50
2910.5025.32.□	500 x 250 x 32
40.□	500 x 250 x 40
50.□	500 x 250 x 50
2910.5031.32.□	500 x 315 x 32
40.□	500 x 315 x 40
50.□	500 x 315 x 50
2910.5040.32.□	500 x 400 x 32
40.□	500 x 400 x 40
50.□	500 x 400 x 50
2910.5050.32.□	500 x 500 x 32
40.□	500 x 500 x 40
50.□	500 x 500 x 50
2910.6331.32.□	630 x 315 x 32
40.□	630 x 315 x 40
50.□	630 x 315 x 50
63.□	630 x 315 x 63
2910.6340.32.□	630 x 400 x 32
40.□	630 x 400 x 40
50.□	630 x 400 x 50
63.□	630 x 400 x 63
2910.6350.32.□	630 x 500 x 32
40.□	630 x 500 x 40
50.□	630 x 500 x 50
63.□	630 x 500 x 63
2910.6363.32.□	630 x 630 x 32
40.□	630 x 630 x 40
50.□	630 x 630 x 50
63.□	630 x 630 x 63
2910.7140.32.□	710 x 400 x 32
40.□	710 x 400 x 40
50.□	710 x 400 x 50
63.□	710 x 400 x 63
2910.7150.32.□	710 x 500 x 32
40.□	710 x 500 x 40
50.□	710 x 500 x 50
63.□	710 x 500 x 63
2910.7163.32.□	710 x 630 x 32
40.□	710 x 630 x 40
50.□	710 x 630 x 50
63.□	710 x 630 x 63

Order No	Size l x w x h
2910.8040.32.□	800 x 400 x 32
40.□	800 x 400 x 40
50.□	800 x 400 x 50
63.□	800 x 400 x 63
2910.8050.32.□	800 x 500 x 32
40.□	800 x 500 x 40
50.□	800 x 500 x 50
63.□	800 x 500 x 63
2910.8063.32.□	800 x 630 x 32
40.□	800 x 630 x 40
50.□	800 x 630 x 50
63.□	800 x 630 x 63

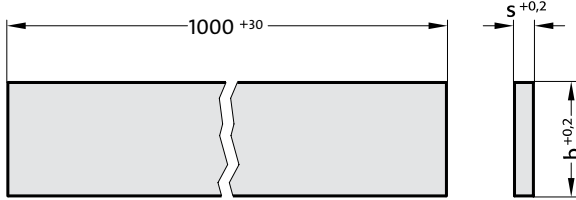
**Ordering Code (example):**

Aluminium Plate	=	2910
length	400 mm	= .40
width	400 mm	= .40
thickness	32 mm	= .32
execution	ground	= .0
Order No		= 2910.4040.32.0

Precision flat and square bar steel to DIN 59350  
with machining allowance  
Precision flat and square bar steel ~DIN 59350

**FIBRO**  
2923.0570.  
2922.1730.

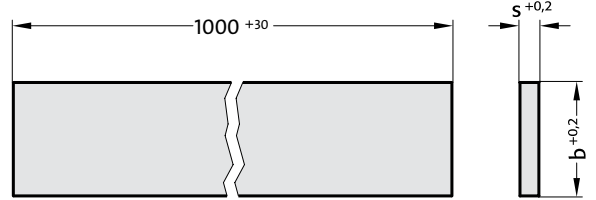
2923.0570.



**Material:** 1.0570 / St 52-3  
Non-alloyed construction steel

**Execution:** Thickness precision ground, width ground or milled, length machined

2922.1730.



**Material:** 1.1730 / C45U  
Unalloyed tool steel

**Execution:** Thickness precision ground, width ground or milled, length machined

2923.0570.

s	4.2	5.2	6.2	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4	40.4	50.4	60.4	63.4	70.4
b																	
20.3			●	●	●	●	●										
25.3	●	●	●	●	●	●	●	●	●								
30.3	●	●	●	●	●	●	●	●	●	●							
32.3								●									
40.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
50.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
60.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
63.3				●	●	●	●	●	●	●	●	●	●	●	●	●	
70.3				●	●	●	●	●	●	●	●	●	●	●	●	●	
80.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
100.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
120.3				●	●	●	●	●	●	●	●	●	●	●	●	●	●
125.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
140.3				●	●	●	●	●	●	●	●	●	●	●	●	●	●
150.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
160.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
180.3				●	●	●	●	●	●	●	●	●	●	●	●	●	●
200.3		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
250.3		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
300.3		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
350.3		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
400.3		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

s	80.4	100.4
b		
100.3	●	
120.3	●	●
125.3	●	●
140.3	●	●
150.3	●	●
160.3	●	●
180.3	●	
200.3	●	●
250.3	●	●
300.3	●	●
350.3	●	●

Square	10.4	12.4	15.4	20.4	25.4	30.4	32.4	40.4	50.4	60.4	63.4	70.4	80.4	100.4
	●	●	●	●	●	●	●	●	●	●	●	●	●	●

**Ordering example:**

Precision flat steel		
with machining allowance	=	2923.0570
Width b	180.3 mm	= .180
Thickness s	12.4 mm	= .012
Length	1000 mm	= .1000
Order Number		= 2922.0570.180.012.1000

2922.1730.

s	4	5	6	8	10	12	15	16	20	25	30	32	40	50	60	63	70	80	100
b																			
20	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
25	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
30	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
32																			
40	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
50	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
60	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
63																			
70	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
80	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
90	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
100	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
120																			
125	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
140																			
150	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
160	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
175																			
180	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
200	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
250	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
300	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
315																			
350	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
400	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
450																			
500																			

Square	10	12	15	16	20	25	30	32	40	50	60	63	70	80	100	120	150
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

**Ordering example:**

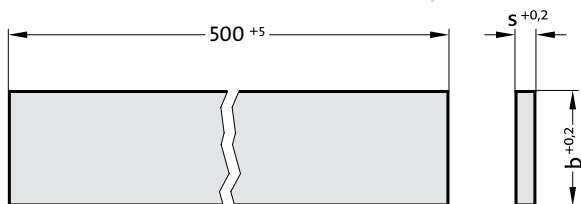
Precision flat steel		
	=	2922.1730
Width b	300 mm	= .300
Thickness s	25 mm	= .025
Length	1000 mm	= .1000
Order Number		= 2922.1730.300.025.1000

# FIBRO

2923.2099.  
2923.2162.

## Precision flat and square bar steel to DIN 59350, with machining allowance

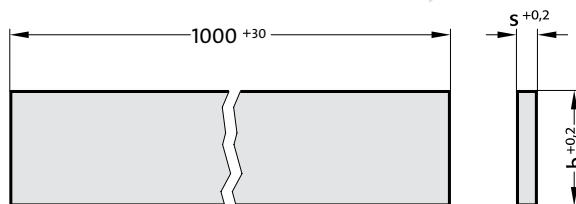
2923.2099.



**Material:** 1.2099 / X 5 CrS 12  
stainless steel for plastic moulding  
tempered to 900-1050 N/mm<sup>2</sup>

**Execution:** Thickness precision ground, width ground  
or milled, length machined

2923.2162.



**Material:** 1.2162 / 21 MnCr 5  
Case hardened steel

**Execution:** Thickness precision ground, width ground  
or milled, length machined

2923.2099.

s	6.2	8.2	10.4	15.4	20.4	25.4	30.4	40.4	50.4
b									
20.3	●	●	●						
25.3	●	●	●	●					
30.3	●	●	●	●	●				
40.3	●	●	●	●	●	●			
50.3	●	●	●	●	●	●	●		
60.3	●	●	●	●	●	●	●	●	
80.3	●	●	●	●	●	●	●	●	●
100.3	●	●	●	●	●	●	●	●	●
125.3	●	●	●	●	●	●	●	●	●
150.3	●	●	●	●	●	●	●	●	●
200.3	●	●	●	●	●	●	●	●	●
250.3	●	●	●	●	●	●	●	●	●
300.3	●	●	●	●	●	●	●	●	●

### Ordering example:

Precision flat steel		
with machining allowance	=	2923.2099
Width b	40.3 mm	= .040
Thickness s	15.4 mm	= .015
Length	500 mm	= .0500
Order Number	=	2923.2099.040.015.0500

2923.2162.

s	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	40.4	50.4	60.4
b											
20.3	●	●	●	●	●						
25.3	●	●	●	●	●	●					
30.3	●	●	●	●	●	●	●				
32.3	●	●	●	●	●	●	●	●			
40.3	●	●	●	●	●	●	●	●	●		
50.3	●	●	●	●	●	●	●	●	●	●	
60.3	●	●	●	●	●	●	●	●	●	●	●
70.3	●	●	●	●	●	●	●	●	●	●	●
80.3	●	●	●	●	●	●	●	●	●	●	●
100.3	●	●	●	●	●	●	●	●	●	●	●
150.3	●	●	●	●	●	●	●	●	●	●	●
200.3	●	●	●	●	●	●	●	●	●	●	●
250.3	●	●	●	●	●	●	●	●	●	●	●
300.3	●	●	●	●	●	●	●	●	●	●	●

Square	20.4	25.4	30.4	32.4	40.4	50.4	60.4	80.4
	●	●	●	●	●	●	●	●

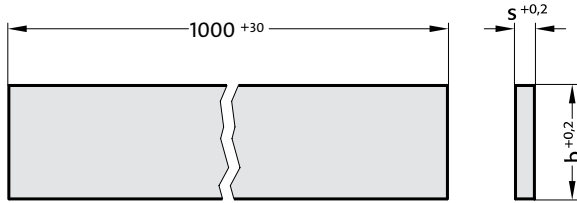
### Ordering example:

Precision flat steel		
with machining allowance	=	2923.2162
Width b	30.3 mm	= .030
Thickness s	12.4 mm	= .012
Length	1000 mm	= .1000
Order Number	=	2923.2162.030.012.1000

# Precision flat and square bar steel to DIN 59350, with machining allowance

**FIBRO**  
2923.2312.  
2923.2343.

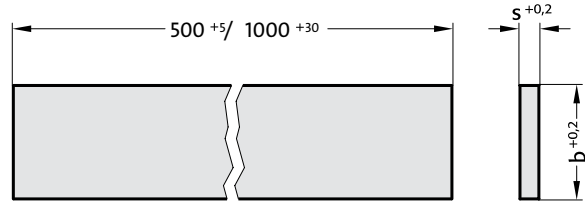
2923.2312.



**Material:** 1.2312 / 40 CrMnMoS 8-6  
Steel for plastic moulding, pre-tempered  
to 900-1050 N/mm<sup>2</sup>

**Execution:** Thickness precision ground, width ground  
or milled, length machined

2923.2343.



**Material:** 1.2343 / X 37 CrMoV 5-1  
Hot work steel

**Execution:** Thickness precision ground, width ground  
or milled, length machined

2923.2312.

s	4.2	5.2	6.2	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4	40.4
b													
20.3				●	●	●	●						
25.3				●	●	●	●	●	●				
30.3				●	●	●	●	●	●	●			
32.3				●	●	●	●	●	●	●			
40.3	●	●	●	●	●	●	●	●	●	●	●		
50.3	●	●	●	●	●	●	●	●	●	●	●	●	●
60.3	●	●	●	●	●	●	●	●	●	●	●	●	●
63.3	●	●	●	●	●	●	●	●	●	●	●	●	●
70.3	●	●	●	●	●	●	●	●	●	●	●	●	●
80.3	●	●	●	●	●	●	●	●	●	●	●	●	●
100.3	●	●	●	●	●	●	●	●	●	●	●	●	●
125.3				●	●	●	●	●	●	●	●	●	●
150.3				●	●	●	●	●	●	●	●	●	●
200.3				●	●	●	●	●	●	●	●	●	●
220.3				●	●	●	●	●	●	●	●	●	●
250.3				●	●	●	●	●	●	●	●	●	●
300.3				●	●	●	●	●	●	●	●	●	●

s	50.4	60.4	70.4	80.4	90.4	100.4
b						
60.3	●					
63.3	●					
70.3	●	●				
80.3	●	●	●			
100.3	●	●	●	●		
125.3	●	●	●	●		
150.3	●	●	●	●	●	
200.3	●	●	●	●	●	●
220.3	●	●	●	●	●	●
250.3	●	●	●	●	●	●
300.3	●	●	●	●	●	●

Square	12.4	15.4	16.4	20.4	25.4	30.4	32.4	40.4	50.4	60.4	70.4	80.4	100.4
	●	●	●	●	●	●	●	●	●	●	●	●	●

**Ordering example:**

Precision flat steel with machining allowance	=	2923.2312
Width b 40.3 mm	=	.040
Thickness s 30.4 mm	=	.030
Length 1000 mm	=	.1000
Order Number	=	2923.2312.040.030.1000

2923.2343.

s	4.2	5.2	6.2	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4
b												
10.3	○	○	○	○								
15.3	○	○	○	○	○	○						
20.3	○	○	○	●	●	●	●	■				
25.3	○	○	○	●	●	●	●	■	●			
30.3	○	○	○	●	●	●	●	■	●	●		
32.3				■	■	■		■	■	■		
40.3	○	○	○	●	●	●	●	■	●	●	●	■
50.3	○	○	○	●	●	●	●	■	●	●	●	■
60.3	○	○	○	●	●	●	●	■	●	●	●	■
63.3				■	■	■		■	■	■		■
80.3	○	○	○	●	●	●	●	■	●	●	●	■
100.3	○	○	○	●	●	●	●	■	●	●	●	■
125.3				■	■	■	■	■	●	●	●	■
150.3				■	■	■	■	■	●	●	●	■
200.3				■	■	■	■	■	●	●	●	■

s	40.4	50.4	60.4	80.4	100.4
b					
50.3	●				
60.3	●	●			
63.3	■	■			
80.3	●	●	■		
100.3	●	●	■	■	
125.3	●	●	■	■	■
150.3	●	●	■	■	■
200.3	●	●	■	■	■

Square	10.4	12.4	15.4	20.4	25.4	30.4	32.4	40.4	50.4	60.4	80.4	100.4
	○	○	○	●	●	●	■	●	●	●	■	■

- = available in 500 mm and 1000 mm lengths
- = only available in 500 mm lengths
- = only available in 1000 mm lengths

**Ordering example:**

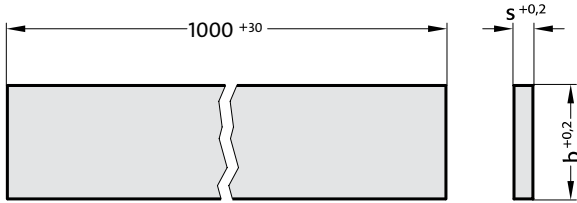
Precision flat steel with machining allowance	=	2923.2343
Width b 60.3 mm	=	.060
Thickness s 50.4 mm	=	.050
Length 500 mm	=	.0500
Order Number	=	2923.2343.060.050.0500

**FIBRO**

2923.2363.

Precision flat and square bar steel  
to DIN 59350,  
with machining allowance

2923.2363.



**Material:** 1.2363 / X 100 CrMoV 5-1  
Cold worked steel

**Execution:** Thickness precision ground, width ground  
or milled, length machined

2923.2363.

s	8.2	10.4	12.4	15.4	20.4	25.4	30.4	40.4
b								
25.3	●	●	●					
30.3	●	●	●	●	●			
40.3	●	●	●	●	●	●	●	
50.3	●	●	●	●	●	●	●	
60.3	●	●	●	●	●	●	●	●
80.3	●	●	●	●	●	●	●	●
100.3	●	●	●	●	●	●	●	●
125.3		●	●	●	●	●	●	●
150.3		●	●	●	●	●	●	●
200.3		●	●	●	●	●	●	●
250.3					●	●	●	●

Square	20.4	25.4	30.4	40.4	50.4	60.4	80.4	100.4
	●	●	●	●	●	●	●	●

**Ordering example:**

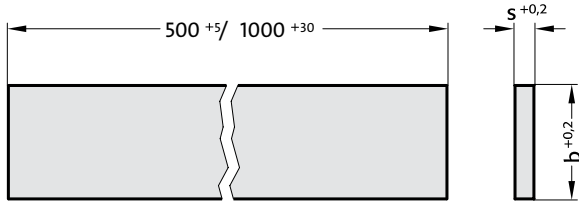
Precision flat steel		
with machining allowance	=	2923.2363
Width b 80.3 mm	=	.080
Thickness s 30.4 mm	=	.030
Length 1000 mm	=	.1000
Order Number	=	2923.2363.080.030.1000

Precision flat and square bar steel  
to DIN 59350,  
with machining allowance

FIBRO

2923.2379.

2923.2379.



**Material:** 1.2379 / X 155 CrVMo 12-1  
Cold worked steel

**Execution:** Thickness precision ground, width ground  
or milled, length machined

2923.2379.

s	2.2	3.2	4.2	5.2	6.2	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4	40.4	50.4	60.4	63.4	70.4	80.4	100.4	
b																						
10.3	●	●	●	●	●	●																
15.3	●	●	●	●	●	●	●	●														
20.3	●	●	●	●	●	●	●	●	●	■												
25.3	●	●	●	●	●	●	●	●	●	■	●											
30.3	●	●	●	●	●	●	●	●	●	■	●	●										
32.3						■	■	■	■	■	■	■										
40.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■								
50.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●							
60.3	●	●	●	●	●	●	●	●	●		●	●	●		●	●						
63.3						■	■	■	■	■	■	■			■	■	■					
70.3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
80.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●	●	■	■	■	■	■	■
90.3										■	■	■	■	■	■	■	■	■	■	■	■	■
100.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●	●	■	■	■	■	■	■
125.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●	●	■	■	■	■	■	■
150.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●	●	■	■	■	■	■	■
160.3										■	■	■	■	■	■	■	■	■	■	■	■	■
175.3										■	■	■	■	■	■	■	■	■	■	■	■	■
200.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●	●	■	■	■	■	■	■
250.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●	●	■	■	■	■	■	■
300.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●	●	■	■	■	■	■	■
350.3										■	■	■	■	■	■	■	■	■	■	■	■	■
400.3										■	■	■	■	■	■	■	■	■	■	■	■	■

Square	6.2	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4	40.4	50.4	60.4	63.4	70.4	80.4	100.4	120.4	150.4	
	○	●	●	●	●	■	●	●	●	■	●	●	■	■	■	■	■	■	■	■

- = available in 500 mm and 1000 mm lengths
- = only available in 500 mm lengths
- = only available in 1000 mm lengths

Ordering example:

Precision flat steel with machining allowance	=	2923.2379
Width b 60.3 mm	=	.060
Thickness s 6.2 mm	=	.006
Length 500 mm	=	.0500
Order Number	=	2923.2379.060.006.0500

Ordering example:

Precision square bar steel with machining allowance	=	2923.2379
Width b 50.4 mm	=	.050
Thickness s 50.4 mm	=	.050
Length 1000 mm	=	.1000
Order Number	=	2923.2379.050.050.1000

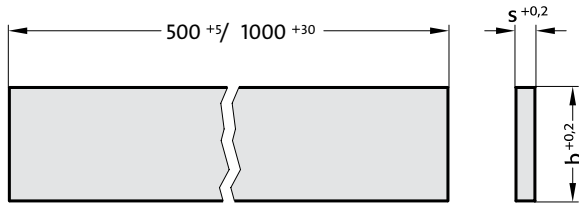


**FIBRO**

2923.2436.  
2923.2767.

Precision flat and square bar steel  
to DIN 59350,  
with machining allowance

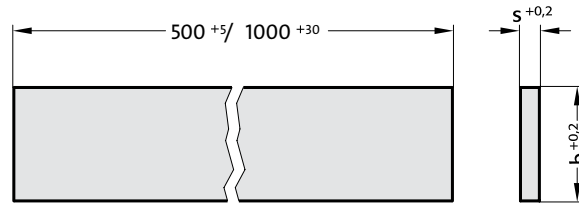
2923.2436.



**Material:** 1.2436 / X 210 CrW 12  
Cold worked steel

**Execution:** Thickness precision ground, width ground or milled, length machined

2923.2767.



**Material:** 1.2767 / X 45 NiCrMo 4  
Cold worked steel

**Execution:** Thickness precision ground, width ground or milled, length machined

2923.2436.

s	2.2	3.2	4.2	5.2	6.2	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4	40.4	50.4
b																
10.3	●	●	●	●	●	●										
15.3	●	●	●	●	●	●	●	○								
20.3	●	●	●	●	●	●	●	●	●							
25.3	●	●	●	●	●	●	●	●	●	●						
30.3	●	●	●	●	●	●	●	●	●	●	●					
32.3							■	■	■	■						
40.3	●	●	●	●	●	●	●	●	●	●	●	●	●			
50.3	●	●	●	●	●	●	●	●	●	●	●	●	●	○		
60.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	
63.3							■	■	■	■	■	■	■	■		
80.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
100.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	■
125.3	○	○	○	○	○	○	●	●	●	●	●	●	●	●	●	■
150.3	○	○	○	○	○	○	●	●	●	●	●	●	●	●	●	■
160.3							■	■	■	■	■	■	■	■	■	■
175.3							■	■	■	■	■	■	■	■	■	■
200.3	○	○	○	○	○	○	●	●	●	●	●	●	●	●	●	■
250.3	○	○	○	○	○	○	●	●	●	●	●	●	●	●	●	■
300.3	○	○	○	○	○	○	●	●	●	●	●	●	●	●	○	
315.3															■	■

Square	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4	40.4	50.4
	○	●	●	○	■	●	●	●	■	●	■

- = available in 500 mm and 1000 mm lengths
- = only available in 500 mm lengths
- = only available in 1000 mm lengths

**Ordering example:**

Precision flat steel			
with machining allowance	=	2923.2436	
Width b 10.3 mm	=	.010	
Thickness s 8.2 mm	=	.008	
Length 1000 mm	=	.1000	
Order Number	=	2923.2436.010.008.1000	

2923.2767.

s	4.2	5.2	6.2	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4	40.4	50.4
b														
10.3	○	○	○	○										
15.3	○	○	○	○	○	○								
20.3	○	○	○	●	●	●	●	■						
25.3	○	○	○	●	●	●	●	■	●					
30.3	○	○	○	●	●	●	●	■	●	●				
32.3				■	■	■			■	■	■			
40.3	○	○	○	●	●	●	●	■	●	●	●	●	■	
50.3	○	○	○	●	●	●	●	■	●	●	●	●	■	●
60.3	○	○	○	●	●	●	●	■	●	●	●	●	■	●
63.3				■	■	■	■	■	■	■	■	■	■	■
70.3				■	■	■			■	■	■	■	■	■
80.3	○	○	○	●	●	●	●	■	●	●	●	●	■	●
100.3	○	○	○	●	●	●	●	■	●	●	●	●	■	●
125.3				●	●	●	●	■	●	●	●	●	■	●
150.3				■	■	■	■	■	■	■	■	■	■	■
200.3				■	■	■	■	■	■	■	■	■	■	■
250.3				■	■	■	■	■	■	■	■	■	■	■
300.3				■	■	■	■	■	■	■	■	■	■	■

s	60.4	63.4	80.4	100.4
b				
70.3			■	
80.3	■	■		
100.3	■	■	■	
125.3	■	■	■	■
150.3	■	■	■	■
200.3	■	■	■	■
250.3	■	■	■	■
300.3	■	■	■	■

Square	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4	40.4	50.4	60.4	63.4	80.4	100.4
	●	●	○	■	●	●	●	●	●	●	■	■	■	■

- = available in 500 mm and 1000 mm lengths
- = only available in 500 mm lengths
- = only available in 1000 mm lengths

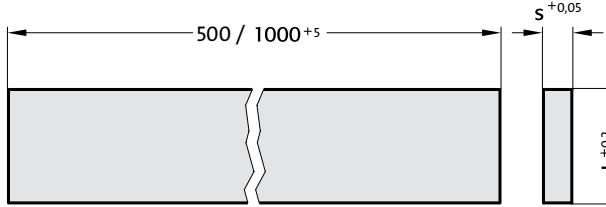
**Ordering example:**

Precision flat steel			
with machining allowance	=	2923.2767	
Width b 80.3 mm	=	.080	
Thickness s 30.4 mm	=	.030	
Length 1000 mm	=	.1000	
Order Number	=	2923.2767.080.030.1000	

Precision flat and square bar steel  
to DIN 59350,  
with machining allowance

**FIBRO**  
2922.2842.  
2923.2842.

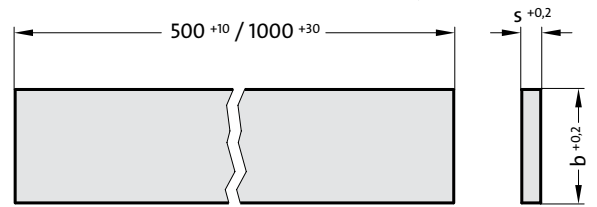
2922.2842.



**Material:** 1.2842 / 90 MnCrV 8  
Cold worked steel

**Execution:** Thickness precision ground, width ground  
or milled, length machined

2923.2842.



**Material:** 1.2842 / 90 MnCrV 8  
Cold worked steel

**Execution:** Thickness precision ground, width ground  
or milled, length machined

2922.2842.

s	1	2	3	4	5	6	8	10	12	15	20	25	30	40	50
b															
10	○	●	●	●	●	●	●	●							
12	○	●	●	●	●	●	●	●	●						
15	○	●	●	●	●	●	●	●	●	●					
20	○	●	●	●	●	●	●	●	●	●	●				
25	○	●	●	●	●	●	●	●	●	●	●	●			
30	○	●	●	●	●	●	●	●	●	●	●	●	●		
35	○	●	●	●	●	●	●	●	●	●	●	●	●	●	
40	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
50	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
60	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
70	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
80	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
100	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
120	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
125	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
150	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
160	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
180	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
200	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
250	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
300	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Square	4	6	8	10	12	15	16	18	20	25	30	40	50	60
	○	●	●	●	●	●	●	●	●	●	●	●	●	●

● = available in 500 mm and 1000 mm lengths  
○ = only available in 500 mm lengths

2923.2842.

s	2.2	3.2	4.2	5.2	6.2	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4
b														
10.3	●	●	●	●	●	●	●							
15.3	●	●	●	●	●	●	●	●						
20.3	●	●	●	●	●	●	●	●	●					
25.3	●	●	●	●	●	●	●	●	●	●				
30.3	●	●	●	●	●	●	●	●	●	●	●			
32.3	●	●	●	●	●	●	●	●	●	●	●	●		
40.3	●	●	●	●	●	●	●	●	●	●	●	●	●	
50.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
60.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
63.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
70.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
80.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
100.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
120.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
125.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
150.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
160.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
180.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
200.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●
250.3						●	●	●	●	●	●	●	●	●
300.3						●	●	●	●	●	●	●	●	●

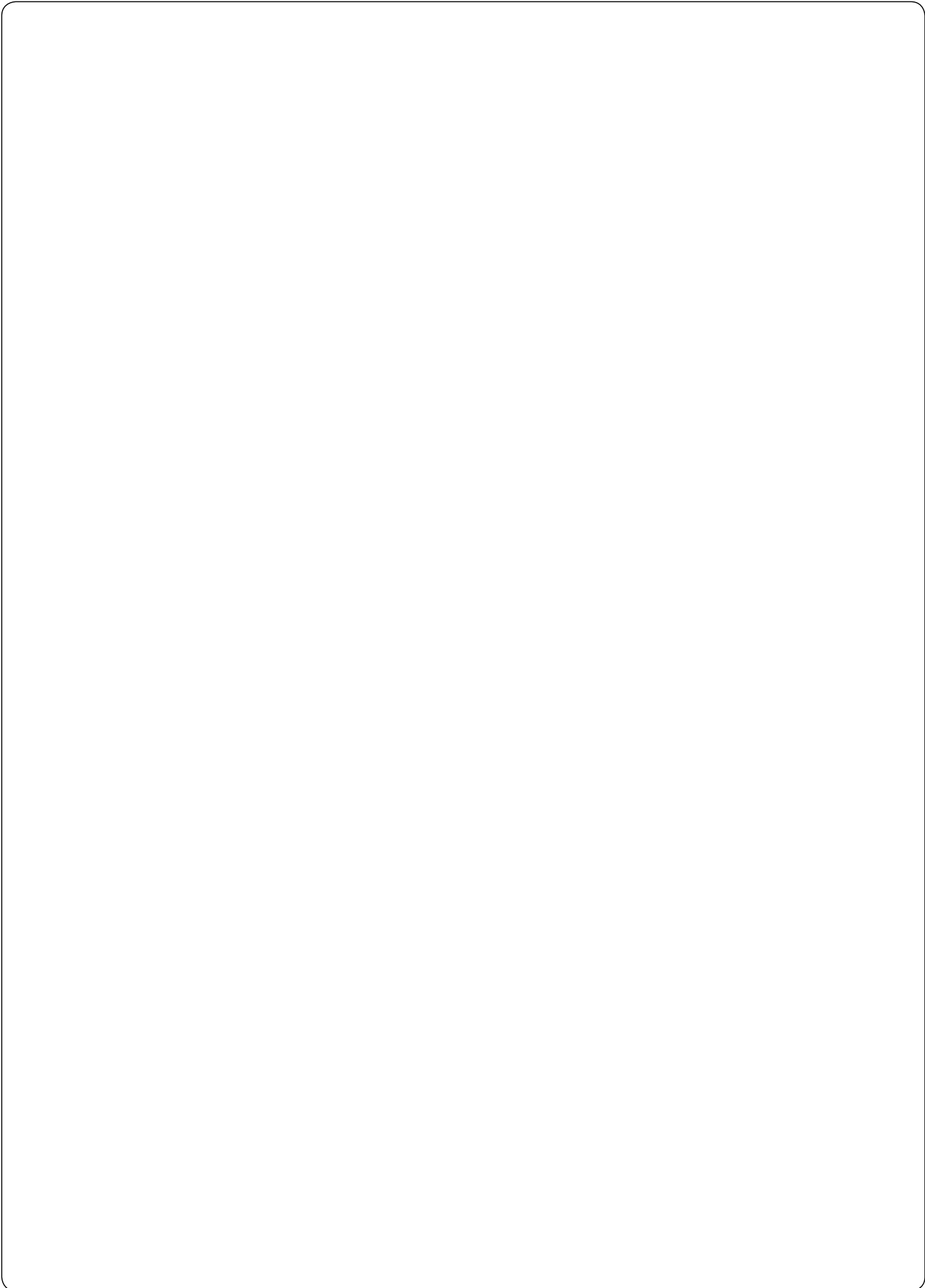
s	40.4	50.4	63.4	80.4	100.4	
b						● = available in 500 mm and 1000 mm lengths

50.3	●					
60.3	●	●				
63.3	●	●				
70.3	●	●	●			
80.3	●	●	●			
100.3	●	●	●	●		
120.3	●	●	●	●	●	
125.3	●	●	●	●	●	
150.3	●	●	●	●	●	
160.3	●	●	●	●	●	
180.3	●	●	●	●	●	
200.3	●	●	●	●	●	
250.3	●	●	●	●	●	

Square	10.4	12.4	16.4	20.4	25.4	30.4	32.4	40.4	50.4	60.4	63.4	80.4	100.4
	●	●	●	●	●	●	●	●	●	●	●	●	●

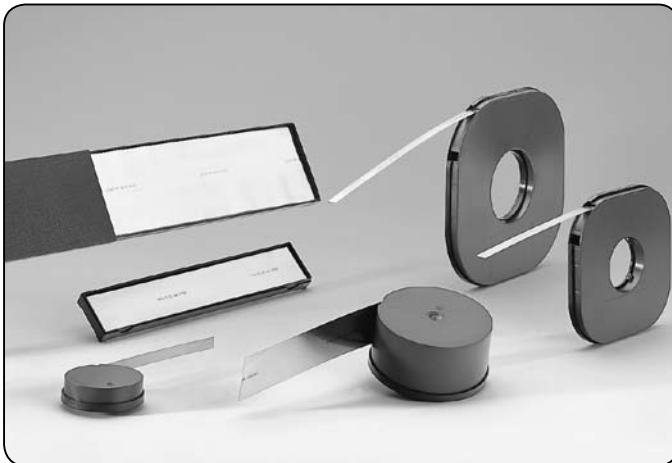
**Ordering example:**

Precision flat steel	=	2922.2842
with machining allowance	=	2923.2842
Width b 80 mm	=	.080
Thickness s 10 mm	=	.010
Length 500 mm	=	.0500
Order Number	=	2922.2842.080.010.0500
Precision flat steel	=	2923.2842
with machining allowance	=	2923.2842
Width b 160.3 mm	=	.160
Thickness s 8.2 mm	=	.008
Length 1000 mm	=	.1000
Order Number	=	2923.2842.160.008.1000



Precision feeler Gauges  
Foil shims

2925.



Typical Applications:

- Tolerance measurement of internal and external dimensions.
- Adjustment of tooling devices and machine parts.
- Testing valve and cylinder clearances.

Material:

- C-Steel 1.1274
- Stainless steel 1.4310

Dimensions available:

Width ▶ Thickness mm ▼	Precision feeler gauge Contents per can/spool						Foil shims Contents: foil shims per pack			Technical specifications tensile strength N/mm <sup>2</sup>		
	5 m 12,7 mm	10 m 12,7 mm	5 m 6 mm	5 m 25 mm	5 m 50 mm	5 m 100 mm	10 Format 50×300 mm	5 Format 100×500 mm	5 Format 150×500 mm	Tolerance ± mm	for carbon steel	for stainless steel
0.005	▲	▲	–	–	–	–	–	–	–	0.001	–	1900
0.01	◆	◆	–	▲	▲	–	▲	–	–	0.002	2000–2200	2000–2200
0.02	◆	◆	–	▲	▲	▲	▲	▲	–	0.002	2000–2200	1850–2100
0.03	◆	◆	–	◆	◆	–	◆	–	–	0.002	2000–2200	–
0.04	◆	◆	–	◆	◆	–	◆	–	–	0.003	2000–2200	–
0.05	◆	◆	◆	◆	◆	▲	◆	▲	▲	0.003	2000–2200	1600–1800
0.06	◆	◆	–	◆	◆	–	◆	–	–	0.003	2000–2200	–
0.07	◆	◆	–	◆	◆	–	◆	–	–	0.004	2000–2200	–
0.08	◆	◆	◆	◆	◆	–	◆	–	–	0.004	2000–2200	–
0.09	◆	◆	–	◆	◆	–	◆	–	–	0.004	2000–2200	–
0.10	◆	◆	◆	◆	◆	▲	◆	▲	▲	0.004	2000–2200	1600–1800
0.12	◆	◆	–	–	◆	–	◆	–	–	0.004	2000–2200	–
0.15	◆	◆	◆	◆	◆	▲	◆	▲	▲	0.005	2000–2200	1600–1800
0.20	◆	◆	◆	◆	◆	▲	◆	▲	▲	0.006	1800–2000	1600–1800
0.25	◆	◆	◆	◆	◆	▲	◆	▲	▲	0.007	1800–2000	1600–1800
0.30	◆	◆	◆	◆	◆	▲	◆	▲	▲	0.007	1800–2000	1600–1800
0.35	◆	◆	–	–	◆	▲	◆	▲	–	0.008	1800–2000	1600–1800
0.40	◆	◆	◆	◆	◆	▲	◆	▲	▲	0.009	1600–1800	1600–1800
0.45	◆	◆	–	–	◆	▲	◆	▲	–	0.009	1600–1800	1600–1800
0.50	◆	◆	◆	◆	◆	▲	◆	▲	▲	0.010	1600–1800	1600–1800
0.55	◆	◆	–	–	–	▲	–	▲	–	0.010	1600–1800	1600–1800
0.60	◆	◆	–	◆	◆	▲	◆	▲	–	0.010	1600–1800	1600–1800
0.70	◆	◆	–	◆	◆	▲	◆	▲	–	0.012	1400–1600	1600–1800
0.80	◆	◆	–	◆	◆	▲	◆	▲	–	0.013	1400–1600	1600–1800
0.90	◆	◆	–	◆	◆	▲	◆	▲	–	0.013	1400–1600	1600–1800
1.00	◆	◆	–	◆	◆	▲	◆	▲	–	0.013	1400–1600	1600–1800

Order No. Part II = Material  
 ◆ C-Steel 1.1274 is 1  
 ▲ Stainless steel 1.4310 is 2

Ordering code (example):

Precision feeler gauge = 2925.  
 Material-No.: 1.1274 = 1.  
 Thickness 0.07 mm = 0070.  
 Width 12.7 mm = 0012.  
 Length 10 m = 10000  
 Order No = 2925.1.0070.0012.10000

Ordering code (example):

Foil shim = 2925.  
 Material-No. : 1.4310 = 2.  
 Thickness 0.02 mm = 0020.  
 Width 50 mm = 050.  
 Length 300 mm = 300  
 Order No = 2925.2.0020.050.300

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A Die Sets

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B Precision Ground Plates and Flat Bars

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**C Lifting and Clamping Devices**

Shanks, Lifter Studs and Lifting Hooks, Eyebolts  
Clamping Claws, Screws and Bolts

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D Guide Elements

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E Ground Precision Components

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F Springs

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G Elastomer-Bars, -Sheets, -Sections

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H FIBRO Chemical Tooling Aids

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J Peripheral Equipment

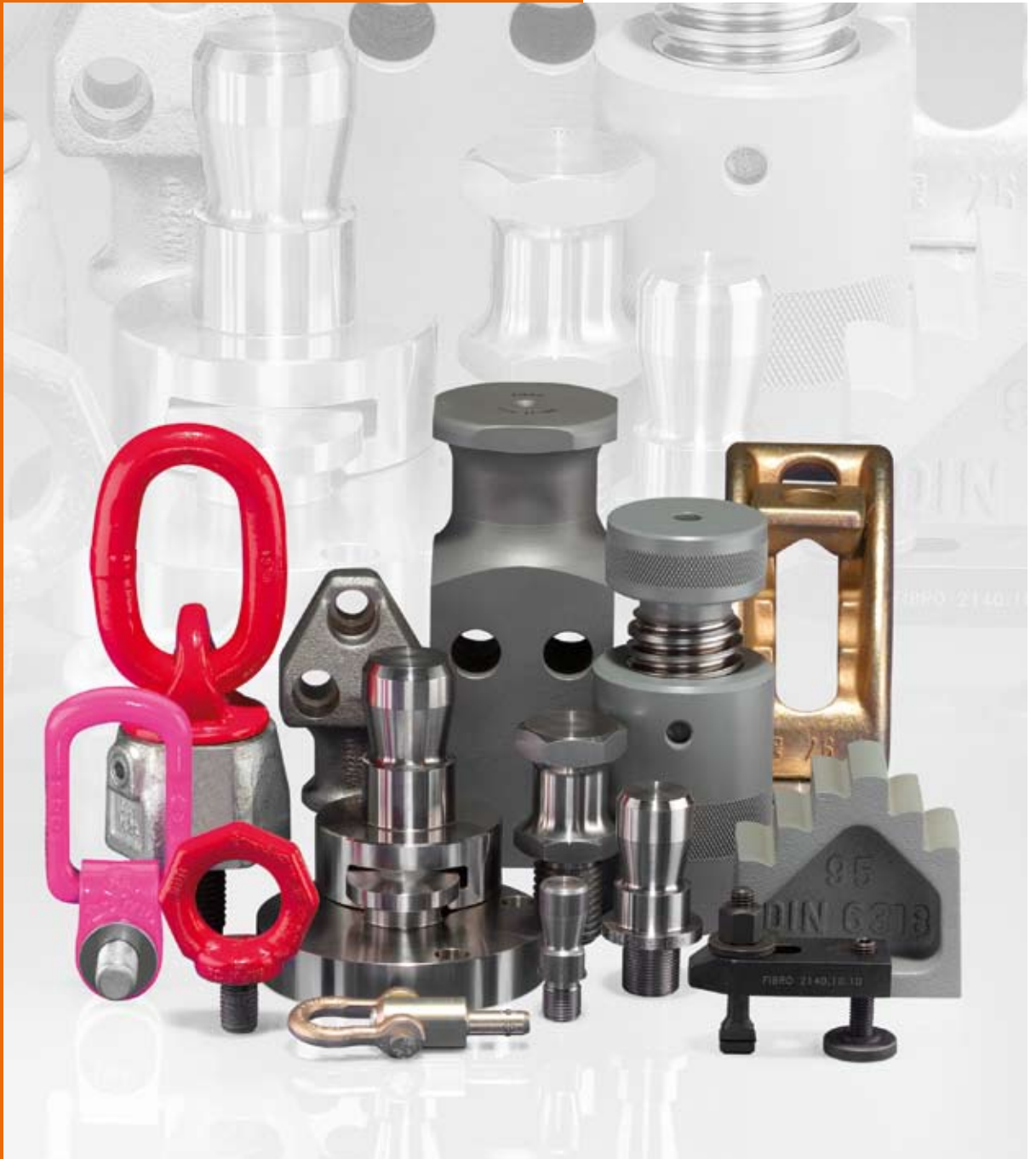
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K Cam Units

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L Standard Parts for Mould Making


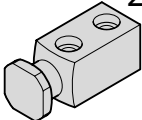

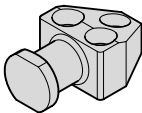

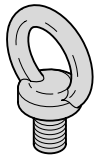
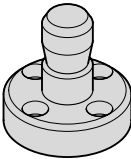

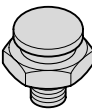
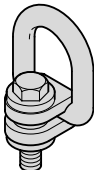
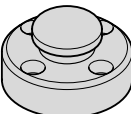

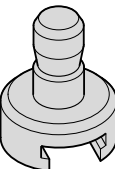

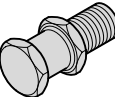

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# Lifting and Clamping Devices

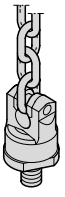
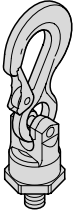
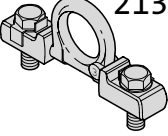
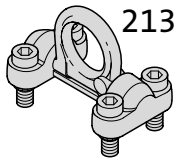
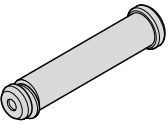
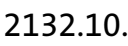


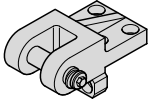
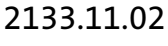


A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.

**Contents**

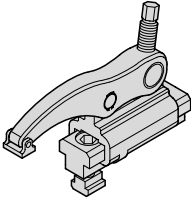
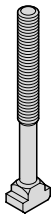
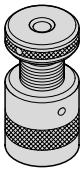
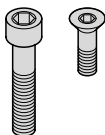
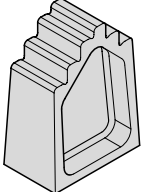
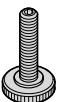




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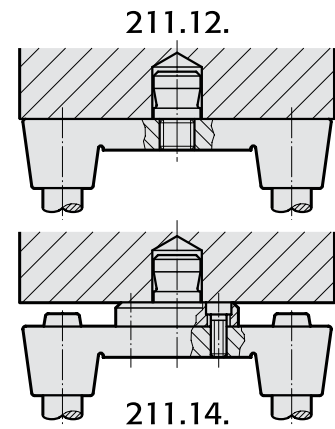
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## Die Set Accessories

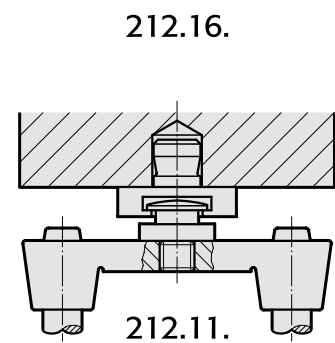
### Threaded Die Set Shanks

Most single-column presses have shank adaptor bores in the ram. Their dimensions are standardized under DIN 810.  
Dies up to medium size are mostly mounted with shanks to DIN ISO 10242.  
FIBRO Shanks are made to highest specifications for concentricity and squareness.



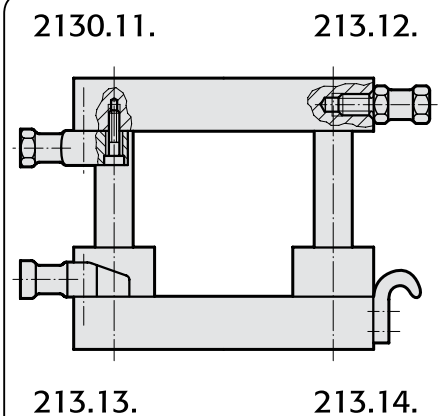
### Die Set Coupling Spigots and Spigot Holders

Where frequent die changes are the rule and stripping forces are moderate, these spigots and holders help to reduce down time in the press shop.



### Lifting Aids for Die Sets etc.

These accessories facilitate the hoisting of medium and heavy dies; their use helps to prevent accidents.



Die Set Shanks  
with and without Collar  
Die Set Shanks, ~DIN ISO 10242

**FIBRO**

211.13.

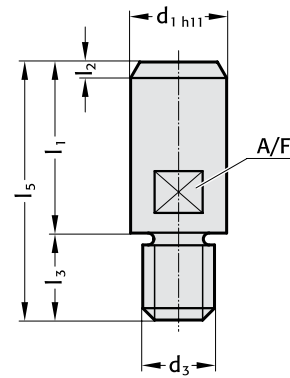
211.11.

211.14.

211.12.



211.11.

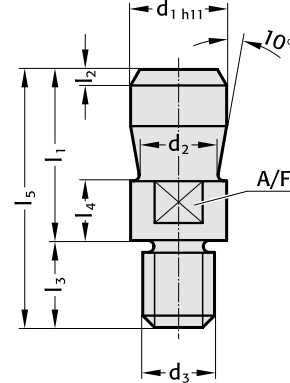


211.11. Threaded Die Set Shanks

Order No	d <sub>1</sub>	d <sub>3</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>5</sub>	A/F
211.11.20.016	20	M16x1,5	40	3	18	58	17
25.016	25	M16x1,5	45	4	23	68	21
020	25	M20x1,5	45	4	23	68	21
211.11.32.020	32	M20x1,5	56	4	23	79	27
024	32	M24x1,5	56	4	23	79	27
211.11.40.024	40	M24x1,5	70	5	23	93	36
030	40	M30x2	70	5	23	93	36
211.11.50.030	50	M30x2	80	6	28	108	41
65.042	65	M42x3	100	8	28	128	55



211.12.

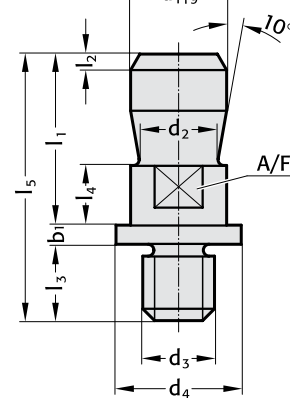


211.12. Threaded Die Set Shanks  
~DIN ISO 10242-1

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	A/F
211.12.20.016	20	15	M16x1,5	40	2	18	12	58	17
25.016	25	20	M16x1,5	45	2,5	23	16	68	21
020	25	20	M20x1,5	45	2,5	23	16	68	21
211.12.32.020	32	25	M20x1,5	56	3	23	16	79	27
024	32	25	M24x1,5	56	3	23	16	79	27
211.12.40.024	40	32	M24x1,5	70	4	23	26	93	36
027	40	32	M27x2	70	4	23	26	93	36
030	40	32	M30x2	70	4	23	26	93	36
211.12.50.030	50	42	M30x2	80	5	28	26	108	41
65.042	65	53	M42x3	100	8	28	26	128	55



211.13.

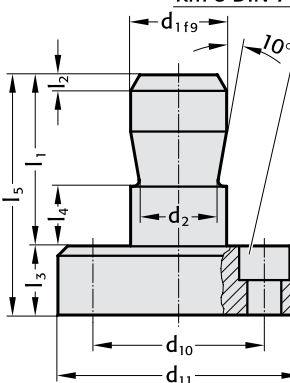


211.13. Threaded Die Set Shanks with Collar

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	A/F
211.13.20.016	20	15	M16x1,5	28	40	2	16	12	61	17
25.016	25	20	M16x1,5	34	45	2,5	16	16	66	21
020	25	20	M20x1,5	34	45	2,5	20	16	70	21
211.13.32.020	32	25	M20x1,5	42	56	3	20	16	82	27
024	32	25	M24x1,5	42	56	3	24	16	86	27
211.13.40.024	40	32	M24x1,5	52	70	4	24	26	102	36
030	40	32	M30x2	52	70	4	30	26	108	36
211.13.50.030	50	42	M30x2	62	80	5	30	26	118	41



211.14.



211.14. Bolt-On Die Set Shanks ~DIN ISO 10242-2

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>10</sub>	d <sub>11</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>
211.14.20.063	20	15	45	63	40	2	18	12	58
25.063	25	20	45	63	45	2,5	18	16	63
080	25	20	63	80	45	2,5	18	16	63
211.14.32.097	32	25	80	97	56	3	23	16	79
122	32	25	105	122	56	3	23	16	79
211.14.40.097	40	32	80	97	70	4	23	26	93
122	40	32	105	122	70	4	23	26	93

# FIBRO

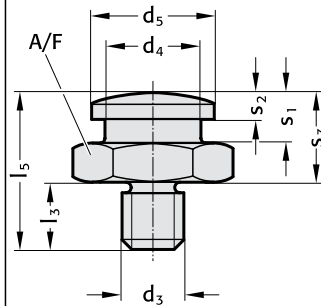
212.11. 212.16.  
212.15. 213.12.

## Die Set Coupling Spigots Spigot Holders Screw-In Lifter Studs, VDI 3366

### 212.11. Die Set Coupling Spigots

Order No	d <sub>3</sub>	d <sub>4</sub>	d <sub>5</sub>	l <sub>3</sub>	l <sub>5</sub>	s <sub>1</sub>	s <sub>2</sub>	s <sub>3</sub>	A/F
212.11.016	M16x1,5	25	32	18	32	13	6.5	23	36
020	M20x1,5	32	48	23	48	19	9.5	41	50
024	M24x1,5	32	48	23	48	19	9.5	41	50
030	M30x2	32	48	23	48	19	9.5	43	60

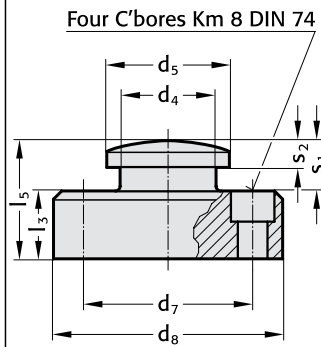
### 212.11.



### 212.15. Die Set Coupling Spigots

Order No	d <sub>4</sub>	d <sub>5</sub>	d <sub>7</sub>	d <sub>8</sub>	l <sub>3</sub>	l <sub>5</sub>	s <sub>1</sub>	s <sub>2</sub>
212.15.063	25	32	46	63	18	31	13	6.5
080	32	48	63	80	18	37	19	9.5
097	32	48	80	97	23	42	19	9.5
122	32	48	105	122	23	42	19	9.5

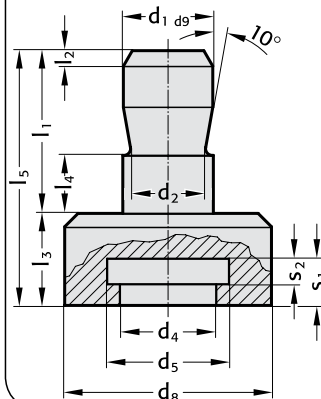
### 212.15.



### 212.16. Spigot Holders

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>4</sub>	d <sub>5</sub>	d <sub>8</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	s <sub>1</sub>	s <sub>2</sub>
212.16.025	25	20	26	33	56	45	4	25	16	12.6	7
032	32	25	33	49	80	56	4	30	16	18.6	10
040	40	32	33	49	80	70	5	30	26	18.6	10

### 212.16.

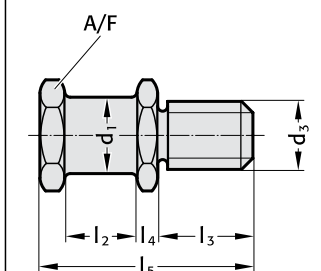


### 213.12. Screw-In Lifter Studs, VDI 3366

Order No	d <sub>1</sub>	d <sub>3</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	A/F	lifting capacity
213.12.016	16	M16	20	28	5	58	24	320
020	20	M20	22	34	6	68	30	500
024	25	M24	25	38	8	78	36	1000
030	32	M30	32	45	10	95	41	1500
036	40	M36	40	56	12	118	50	2500

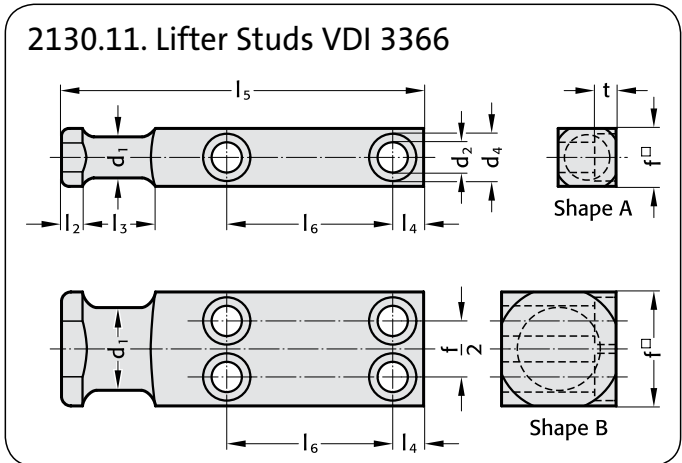
### 213.12.

VDI 3366



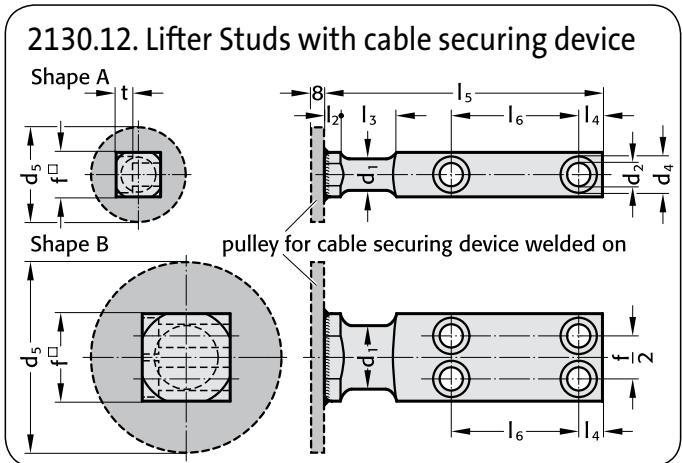
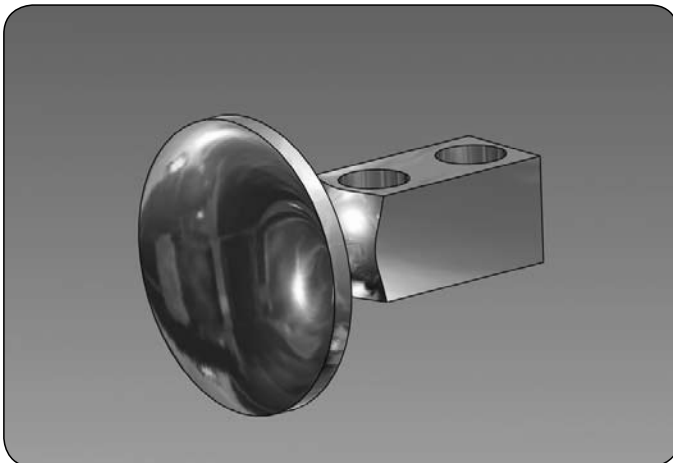
**Lifter Studs VDI 3366**  
**Lifter Studs with cable securing device**

**2130.11.**  
**2130.12.**



**2130.11. Lifter Studs VDI 3366**

Order No	Shape:	d <sub>1</sub>	d <sub>2</sub>	d <sub>4</sub>	f	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	l <sub>6</sub>	t	carrying capacity
												kg
2130.11.020	A	16	9	15	20	6	20	10	80	34	9	320
2130.11.025	A	20	11	18	25	8	25	10	90	37	11	630
2130.11.035	A	25	13.5	20	35	8	30	12	100	38	13	1250
2130.11.040	A	32	17.5	26	40	10	32	16	120	46	17.5	2000
2130.11.050	A	40	22	33	50	10	40	18	140	54	21.5	3200
2130.11.060	A	50	26	40	60	12	45	22	160	59	25.5	5000
2130.11.080	B	63	22	33	80	12	50	20	200	78	21.5	8000
2130.11.100	B	80	26	40	100	15	65	25	250	100	25.5	12500
2130.11.120	B	100	33	48	120	15	80	30	300	125	32	20000



**2130.12. Lifter Studs with cable securing device**

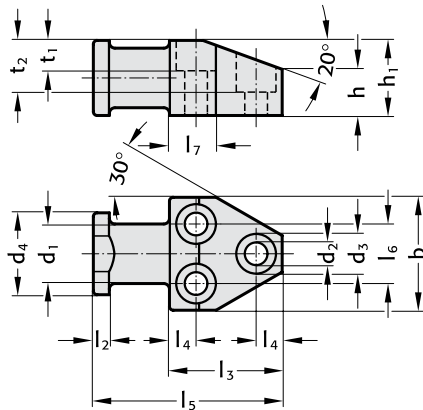
Order No	Shape:	d <sub>1</sub>	d <sub>2</sub>	d <sub>4</sub>	d <sub>5</sub>	f	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	l <sub>6</sub>	t	carrying capacity
													kg
2130.12.020	A	16	9	15	60	20	6	20	10	80	34	9	320
2130.12.025	A	20	11	18	70	25	8	25	10	90	37	11	630
2130.12.035	A	25	13.5	20	70	35	8	30	12	100	38	13	1250
2130.12.040	A	32	17.5	26	110	40	10	32	16	120	46	17.5	2000
2130.12.050	A	40	22	33	110	50	10	40	18	140	54	21.5	3200
2130.12.060	A	50	26	40	150	60	12	45	22	160	59	25.5	5000
2130.12.080	B	63	22	33	150	80	12	50	20	200	78	21.5	8000
2130.12.100	B	80	26	40	150	100	15	65	25	250	100	25.5	12500
2130.12.120	B	100	33	48	150	120	15	80	30	300	125	32	20000

# FIBRO

213.13.  
213.10.

## Lifter Studs Lifting Eyebolts

### 213.13. Lifter Studs

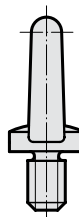
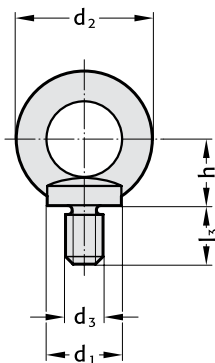


### 213.13. Lifter Studs

Order No	b	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	h	h <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	l <sub>6</sub>	l <sub>7</sub>	t <sub>1</sub>	t <sub>2</sub>	carrying capacity kg
213.13.060	60	32	13.5	20	44	24	40	8	60	14	100	32	24	15	29	2000
080	80	40	17.5	26	60	32	50	10	70	16	120	44	26	20	35.5	3500
100	100	50	22	33	70	40	65	12	88	20	145	56	30	25	46.5	6000

### 213.10. Lifting Eyebolts

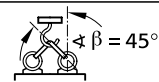
DIN 580



### 213.10. Lifting Eyebolts DIN 580



carrying capacity  
for one screw



carrying capacity  
for two screws altogether

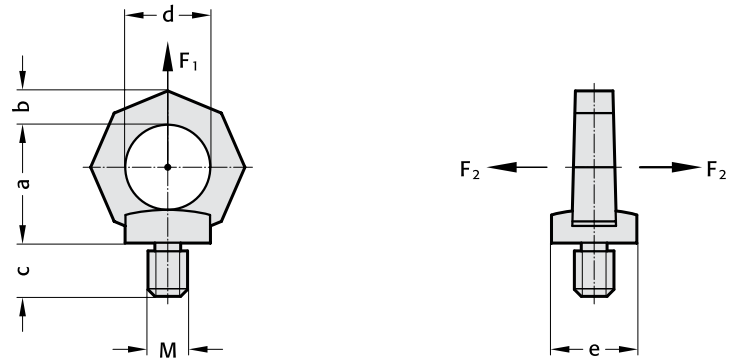
Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	h	l <sub>3</sub>	t	t
213.10.008	20	36	M8	18	13	0.14	0.1
213.10.010	25	45	M10	22	17	0.23	0.17
213.10.012	30	54	M12	26	20.5	0.34	0.24
213.10.016	35	63	M16	30	27	0.7	0.5
213.10.020	40	72	M20	35	30	1.2	0.86
213.10.024	50	90	M24	45	36	1.8	1.29
213.10.030	60	108	M30	55	45	3.2	2.3
213.10.036	70	126	M36	65	54	4.6	3.3

# High-Tensile Eyebolts

2131.10.



2131.10.



## Description:

During use check that the eyebolt is firmly seated.  
 Rotation during the lifting operation must be avoided.  
 It will not rotate automatically to the correct load angle.  
 Not approved for mining applications.

## Note:

Material: 1.6541, heavy duty heat treated, 100% electromagnetically crack tested, to EN 1677-1, safety factor 4:1.  
 Format: = octagonal, Grade 8.  
 Colour: = red, colour coded, Grade 8.  
 Identification: clear indication of permissible load for F<sub>2</sub> category critical loads (not permissible for DIN 580).  
 Minimum screw-in depth: 1 x M into steel (min. St37)  
 1.25 x M into castings (min. GG25)  
 2 x M into aluminium  
 2.5 x M into magnesium alloys

## 2131.10. High-Tensile Eyebolts

Order No	a	b	c	d	M	e
2131.10.006	35	11	12	25	M6	25
008	35	11	12	25	M8	25
010	35	11	15	25	M10	25
012	41	13	18	30	M12	30
014	48	15	21	35	M14	35
016	48	15	24	35	M16	35
020	55	17	30	40	M20	40
024	70	21	36	50	M24	50
030	85	26	45	60	M30	60
036	130	43	54	90	M36	100
042	130	43	63	90	M42	100
048	130	43	67	90	M48	100

## Max. carried load "G" in tonnes for various types of attachment

Type of attachment	F <sub>1</sub>	F <sub>2</sub>	2 symmetrical		3 and 4 symmetrical		3 and 4
Arrangement of the suspension points							
Number of lines	1	1	2	2	2 symmetrical	3 and 4 symmetrical	3 and 4
Angle of inclination/load direction	0°	90°	0°	90°	0-45° 45-60°	0-45° 45-60°	asymmetrical
carried load in tonnes							
Order No	2131.10.006	0,4	0,8				
	008	0,8	1,6				
	010	1	2				
	012	1,6	3,2				
	014	3	6				
	016	4	8				
	020	6	12				
	024	8	16				
	030	12	24				
	036	16	32				
	042	24	48				
	048	32	64				

We recommend that you use the eyebolt that is adjustable in the direction of force for the type of suspension with no details of carried loads!

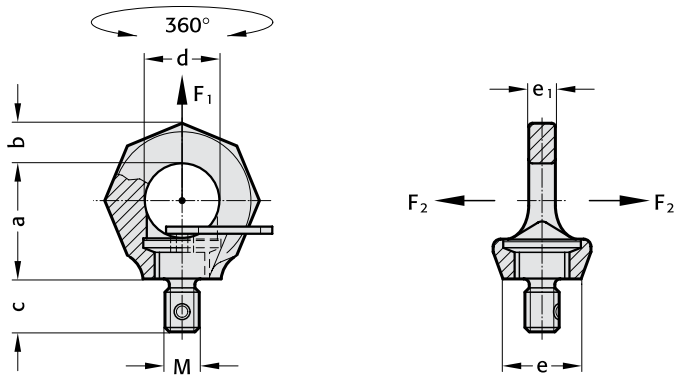


# FIBRO

2131.11.

## Eyebolts, rotatable

2131.11.



### Description:

During use check that the hexagon socket screw is firmly seated. Can be set for the direction of application so that there is no accidental turning and flipping over. Captive hexagon socket screw. No tools are required as the hexagon socket screw is supplied with a hardened star profile key. The star profile key engages in the hexagon socket. It can be screwed and unscrewed by hand.

Make sure that the ring is free to rotate through 360° when the unit is screwed in.

### Note:

Material: 1.6541, forged, heavy duty heat treated.  
100% electromagnetic crack initiation to DIN 5691, EN 1677-4, safety factor 4:1.

Format: stellate – clearly distinguishable to DIN 580, eye bolt

Colour: striking, fluorescent pink powder coating

Identification: clear indication of permissible load for the loading capacity in the plane of the ring.

Minimum screw-in depth: 1 x M into steel (min. St37)  
1.25 x M into castings (min. GG25)  
2 x M into aluminium  
2.5 x M in into magnesium alloys

## 2131.11. Eyebolts rotatable

Order No	a	b	c	d	e	e <sub>1</sub>	M
2131.11.008	34	11	12	25	25	8.5	M8
010	34	11	15	25	25	8.5	M10
012	42	13	18	30	30	10	M12
016	49	15	24	35	35	14	M16
020	57	17	30	40	40	16	M20
024	69	21	36	48	48	19	M24
030	86	26	45	60	60	24	M30
036	103	32	54	72	75	29	M36
042	120	38	63	82	85	34	M42
048	137	43	72	94	100	38	M48

## Max. carried load "G" in tonnes for various types of attachment

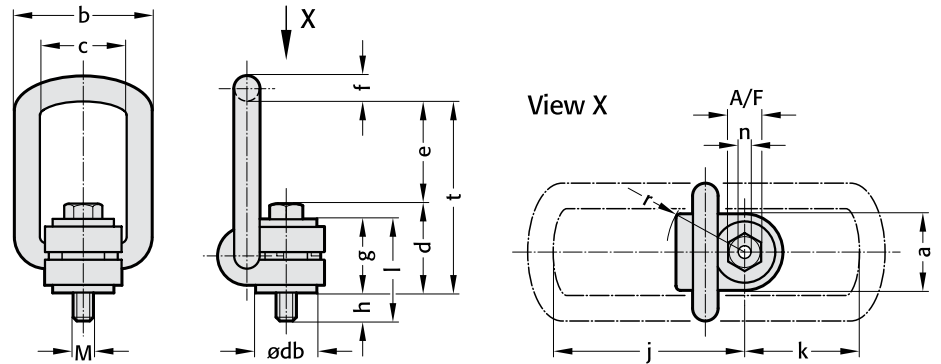
Type of attachment	F <sub>1</sub>	F <sub>2</sub>	0°		0-45°	45-60°	asymmetrical	0-45°	45-60°	asymmetrical
Arrangement of the suspension points										
Number of lines	1	1	2	2	2	2	2	3 and 4	3 and 4	3 and 4
Angle of inclination/load direction	0°	90°	0°	90°	0-45°	45-60°	asymmetrical	0-45°	45-60°	asymmetrical
carried load in tonnes										
Order No 2131.11.008	1	0,4	2	0,8	0,56	0,4	0,4	0,84	0,6	0,4
010	1	0,4	2	0,8	0,56	0,4	0,4	0,84	0,6	0,4
012	2	0,75	4	1,5	1	0,75	0,75	1,6	1,12	0,75
016	4	1,5	8	3	2,1	1,5	1,5	3,15	2,25	1,5
020	6	2,3	12	4,6	3,22	2,3	2,3	4,83	3,45	2,3
024	8	3,2	16	6,4	4,48	3,2	3,2	6,7	4,8	3,2
030	12	4,5	24	9	6,3	4,5	4,5	9,4	6,7	4,5
036	16	7	32	14	9,8	7	7	14,7	10,5	7
042	24	9	48	18	12,6	9	9	18,9	13,5	9
048	32	12	64	24	16,8	12	12	25,2	18	12

Hoisting Snap Links - omnidirectional

2131.15.



2131.15.



Description:

The hinged unit is free to rotate through 360°, self-align with the direction of pull and folding. The hoisting Snap Link must be installed in the stress direction before loading, must be able to move freely and may not be supported at an angle. Do not rotate under load. Full load bearing capacity in any direction. Complete with a 100% crack-checked outer and inner hexagonal bolt for universal tool use.

2131.15. Hoisting Snap Link - omnidirectional

Order No	Weight in kg	b		c	d	e	f	g	h			l		M	n	A/F	r	t	db	tightening torque Nm
		a	max.						Standard	j	k	Standard	M							
2131.15.008.036	0.3	30	54	34	35	40	10	29	11	75	45	40	M8	5	13	32	75	24	30	
2131.15.010.036	0.32	30	54	34	36	39	10	29	16	75	45	45	M10	6	17	32	75	24	60	
2131.15.012.036	0.33	32	54	34	37	38	10	29	21	75	45	50	M12	8	19	32	75	26	100	
2131.15.016.036	0.55	33	56	36	46	39	13.5	36	24	86	47	60	M16	10	24	38	85	30	150	
2131.15.020.050	1.3	50	82	54	55	55	16.5	43	32	113	64	75	M20	12	30	48	110	45	250	
2131.15.024.050	1.5	50	82	54	58	67	18	43	37	130	78	80	M24	14	36	48	125	45	400	
2131.15.027.065	3.1	60	103	65	78	69	22.5	61	39	151	80	100	M27	0	41	67	147	60	400	
2131.15.030.065	3.3	60	103	65	80	67	22.5	61	49	151	80	110	M30	17	46	67	147	60	500	
2131.15.036.065	3.4	60	103	65	72	74	22.5	55	52	151	80	107	M36	0	55	67	146	60	700	
2131.15.036.080	6.2	77	122	82	100	97	26.5	77	63	205	110	140	M36	22	55	87	197	70	800	
2131.15.042.080	6.7	77	122	82	103	94	26.5	77	73	205	110	150	M42	24	65	87	197	70	1000	
2131.15.042.100	11.2	95	156	100	113	109	36	87	63	230	130	150	M42	24	65	100	222	85	1500	
2131.15.048.100	11.6	95	156	100	117	105	36	87	73	230	130	160	M48	27	75	100	222	95	2000	

Max. load "G" in tonnes for various types of attachment

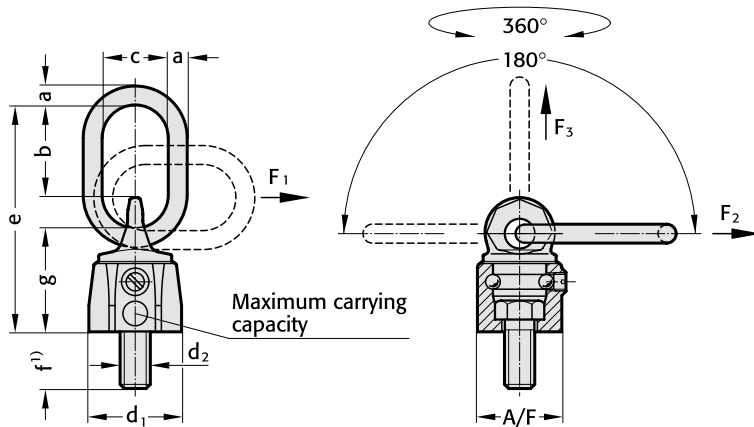
Type of attachment	Arrangement of the suspension points	Carried load in tonnes											
		1		2		2 symmetrical		2 asymmetrical		3 and 4 symmetrical		3 and 4	
Number of lines		1	1	2	2	0-45°	0-60°	2	3 and 4	0-45°	0-60°	3 and 4	3 and 4
Angle of inclination/load direction		0°	90°	0°	90°	0-45°	0-60°	asymmetrical	0-45°	0-60°	symmetrical	0-45°	0-60°
Order No	Thread	Carried load in tonnes											
2131.15.008.036	M 8	0,3	0,3	0,6	0,6	0,42	0,3	0,3	0,63	0,45	0,3	0,63	0,45
2131.15.010.036	M10	0,63	0,63	1,26	1,26	0,88	0,63	0,63	1,32	0,95	0,63	1,32	0,95
2131.15.012.036	M12	1,0	1,0	2,0	2,0	1,4	1,0	1,0	2,1	1,5	1,0	2,1	1,5
2131.15.016.036	M16	1,5	1,5	3,0	3,0	2,1	1,5	1,5	3,15	2,25	1,5	3,15	2,25
2131.15.020.050	M20	2,5	2,5	5,0	5,0	3,5	2,5	2,5	5,25	3,75	2,5	5,25	3,75
2131.15.024.050	M24	4,0	4,0	8,0	8,0	5,6	4,0	4,0	8,4	6,0	4,0	8,4	6,0
2131.15.027.065	M27	4,0	4,0	8,0	8,0	5,6	4,0	4,0	8,4	6,0	4,0	8,4	6,0
2131.15.030.065	M30	5,0	5,0	10,0	10,0	7,0	5,0	5,0	10,5	7,5	5,0	10,5	7,5
2131.15.036.065	M36	7,0	7,0	14,0	14,0	9,8	7,0	7,0	14,7	10,5	7,0	14,7	10,5
2131.15.036.080	M36	8,0	8,0	16,0	16,0	11,2	8,0	8,0	16,8	12,0	8,0	16,8	12,0
2131.15.042.080	M42	10,0	10,0	20,0	20,0	14,0	10,0	10,0	21,0	15,0	10,0	21,0	15,0
2131.15.042.100	M42	15,0	15,0	30,0	30,0	21,0	15,0	15,0	31,5	22,5	15,0	31,5	22,5
2131.15.048.100	M48	20,0	20,0	40,0	40,0	28,0	20,0	20,0	42,0	30,0	20,0	42,0	30,0

**FIBRO**

**2131.20.**

**Rotary Safety Eye Bolts,  
light duty,  
with ball bearings**

2131.20.



**Description:**

For loads that are turned and rotated.  
 Mounted on ball-bearings – can be rotated through 360° under load (F<sub>3</sub>).  
 Cannot be rotated under full load at 90° to the threaded fixing (F<sub>1</sub>, F<sub>2</sub>).  
 Not suitable for extended rotational movement when fully loaded.  
 Can be loaded on all sides with a safety factor 4:1.  
 High-strength suspension eye conforming to EN 1677 part 4, colour: red  
 1) Other thread lengths available upon request.

**Note:**

Ensure that the bolting surface is flat.  
 The threaded connection on the transported load must be suitable for transferring forces.  
 Minimum screw-in depth: 1 x d<sub>2</sub> in steel (min. St37)  
 1,25 x d<sub>2</sub> in cast iron (min. GG25)  
 2 x d<sub>2</sub> in aluminium  
 2,5 x d<sub>2</sub> in aluminium-magnesium alloys.

**2131.20. Rotary Safety Eye Bolts, light duty, with ball bearings**

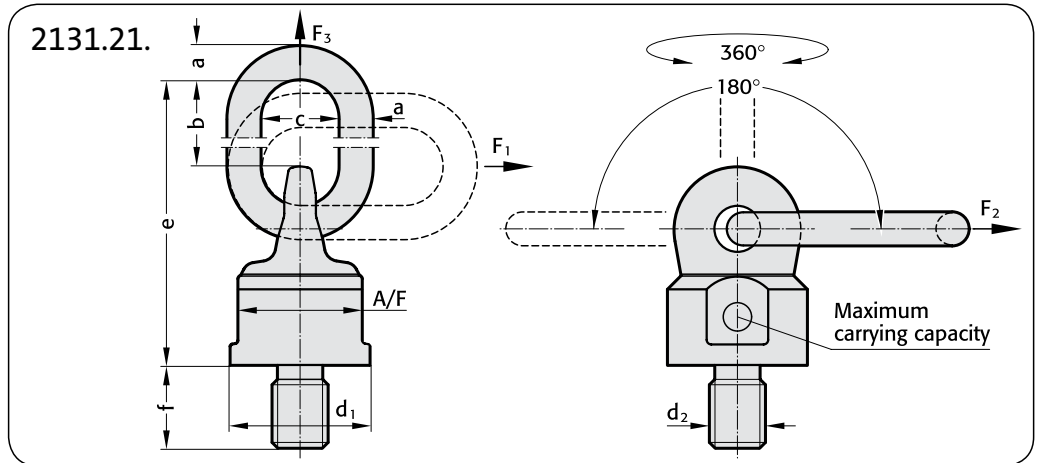
Order No	Rated carrying capacity in t for F <sub>1</sub>	a	b	c	d <sub>1</sub>	d <sub>2</sub>	e	f	g	A/F
2131.20.008.013	0.3	8	33	29	30	8	76	13	36	28
2131.20.010.017	0.45	8	33	29	36	10	78	17	38	30

**Max. load “G” in tonnes for various types of attachment**

Type of attachment	F <sub>3</sub>		F <sub>1</sub> (F <sub>2</sub> )		2 symmetrical		2 asymmetrical	3 and 4 symmetrical		3 and 4 asymmetrical		
Arrangement of the suspension points												
Number of lines	1	1	2	2	2 symmetrical		2	3 and 4 symmetrical		3 and 4		
Angle of inclination/load direction	0°	90°	0°	90°	0-45° 45-60°		asymmetrical	0-45° 45-60°		asymmetrical		
Order No	Thread		carried load in tonnes									
2131.20.008.013	M 8		0,6	0,3 (0,4)	1,2	0,6 (0,8)	0,42 (0,56)	0,3 (0,4)	0,3 (0,4)	0,63 (0,84)	0,45 (0,6)	0,3 (0,4)
2131.20.010.017	M10		0,9	0,45 (0,6)	1,8	0,9 (1,2)	0,63 (0,84)	0,45 (0,6)	0,45 (0,6)	0,95 (1,26)	0,68 (0,9)	0,45 (0,6)

# Rotary Safety Eye Bolts, with ball bearings, heavy duty

2131.21.



### Description:

For loads that are turned and rotated.  
 Mounted on ball-bearings – can be rotated through 360° under load ( $F_3$ ).  
 Cannot be rotated under full load at 90° to the threaded fixing ( $F_1, F_2$ ).  
 Not suitable for extended rotational movement when fully loaded.  
 Can be loaded on all sides with safety factor 4:1.  
 Colour: red.

### Note:

Ensure that the bolting surface is flat.  
 The threaded connection on the transported load must be suitable for transferring forces.  
 Minimum screw-in depth: 1x $d_2$  in steel  
 2x $d_2$  in aluminium  
 1,25x $d_2$  in cast iron  
 2,5x $d_2$  in aluminium-magnesium alloys.

## 2131.21. Rotary Safety Eye Bolts, with ball bearings, heavy duty

Order No	Rated capacity in t									
	$F_1$	a	b	c	$d_1$	$d_2$	e	f	A/F	
2131.21.036	8	22	87	50	90	36	210	54	80	
042	10	26	112	65	98	42	240	63	85	
045	10	26	112	65	98	45	240	67	85	
048	10	26	112	65	98	48	240	68	85	
056	15	32	120	70	120	56	280	84	95	
064	15	32	120	70	120	64	280	95	95	
090	35	40	125	80	170	90	332	135	130	

### Max. load "G" in tonnes for various types of attachment

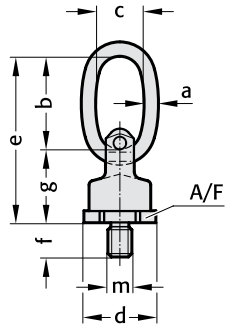
Type of attachment	Arrangement of the suspension point																					
Number of lines	1		2		2 asymmetrical		2 asymmetrical.		3 u. 4 asymmetrical		3 und 4 asymmetrical											
Angle of inclination/load direction	0°	90°	0°	90°	0-45°	45-60°	asymmetrical.	0-45°	45-60°	asymmetrical												
Order No	Thread											carried load in tonnes										
2131.21.036	M36	12,5	8 (10)	25	16 (20)	11,2 (14)	8 (10)	8 (10)	16,8 (21)	12 (15)	8 (10)											
042	M42	16	10 (12,5)	32	20 (25)	14 (17,5)	10 (12,5)	10 (12,5)	21 (26,2)	15 (18,8)	10 (12,5)											
045	[M45]	16	10 (12,5)	32	20 (25)	14 (17,5)	10 (12,5)	10 (12,5)	21 (26,2)	15 (18,8)	10 (12,5)											
048	M48	16	10 (12,5)	32	20 (25)	14 (17,5)	10 (12,5)	10 (12,5)	21 (26,2)	15 (18,8)	10 (12,5)											
056	M56	25	15 (18)	50	30 (36)	21 (25,2)	15 (18)	15 (18)	31,5 (38)	22,5 (27)	15 (18)											
064	M64	25	15 (18)	50	30 (36)	21 (25,2)	15 (18)	15 (18)	31,5 (38)	22,5 (27)	15 (18)											
090	M90	35	35 (40)	70	70 (80)	49 (56)	35 (40)	35 (40)	73,5 (84)	52,5 (60)	35 (40)											

# FIBRO

2131.25.

## Universal Rotary Safety Eyebolts with Oval Ring

2131.25.



### Execution:

The first generation of lifting means with double ball bearing for smooth non-jerking action tipping, rotating and turning.

Also rotates 90° in direction of screwing in with full load.  
Not suitable for extended rotational movement when fully loaded.

The special design avoids damage to lifting elements and the valuable load when turning. For ring hoists, slings, cables, hooks etc.

## 2131.25. Universal Rotary Safety Eyebolts with Oval Ring

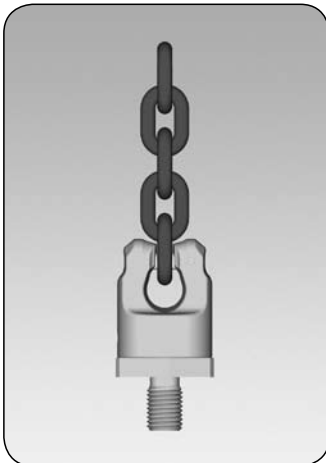
Order No	Rated load capacity in tonnes	a	b	c	d	e	f	g	m	A/F
2131.25.012	0.63	9	65	35	40	105	18	41	M12	36
016	1.5	11	65	35	46	115	24	50	M16	41
020	2.5	13	75	40	61	135	30	61	M20	55
024	4.0	16	95	45	78	172	36	77	M24	70
030	5.0	21	130	60	95	223	45	93	M30	85
036	8.0	24	140	65	100	242	54	102	M36	90

### Max. load "G" in tonnes for various types of attachment

Type of attachment	1		2		2 symmetrical		2 asymmetrical		3 and 4 symmetrical		3 and 4 asymmetrical	
Arrangement of the suspension points												
Number of lines	1	1	2	2	2 symmetrical	2 asymmetrical	2	3 and 4 symmetrical	3 and 4 asymmetrical			
Angle of inclination/load direction	0°	90°	0°	90°	0-45°	45-60°	asymmetrical	0-45°	45-60°	asymmetrical		
Order no	carried load in tonnes											
2131.25.012	0,63	0,63	1,26	1,26	0,88	0,63	0,63	1,32	0,95	0,63		
2131.25.016	1,5	1,5	3,0	3,0	2,1	1,5	1,5	3,15	2,25	1,5		
2131.25.020	2,5	2,5	5,0	5,0	3,5	2,5	2,5	5,25	3,75	2,5		
2131.25.024	4,0	4,0	8,0	8,0	5,6	4,0	4,0	8,4	6,0	4,0		
2131.25.030	6,5	5,0	13,0	10,0	7	5	5	10,5	7,5	5,0		
2131.25.036	10,0	8,0	20,0	16,0	11,2	8,0	8,0	16,8	12,0	8,0		

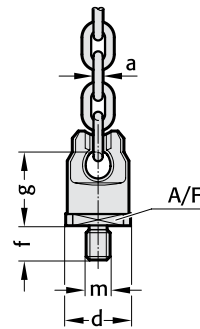
Universal Rotary Safety Eyebolts for Grade 10 chain

2131.26.



2131.26.

Supplied without chain.



**Execution:**

The first generation of lifting means with double ball bearing for smooth non-jerking action tipping, rotating and turning.  
 Also rotates 90° in direction of screwing in with full load.  
 Not suitable for extended rotational movement when fully loaded.  
 The special design avoids damage to lifting elements and the valuable load when turning. For ring hoists, slings, cables, hooks etc.

**Note:**

Universal Rotary Safety Eyebolts for chains: Use only Grade 10 chains.

2131.26. Universal Rotary Safety Eyebolts for Grade 10 chain

Order No	Rated load capacity in tonnes	a Chain connection	d	f	g	m	A/F
2131.26.012	0.63	4	40	18	41	M12	36
016	1.5	6	46	24	50	M16	41
020	2.5	8	61	30	61	M20	55
024	4.0	10	78	36	77	M24	70
030	5.0	13	95	45	93	M30	85
036	8.0	16	100	54	102	M36	90

**Max. load "G" in tonnes for various types of attachment**

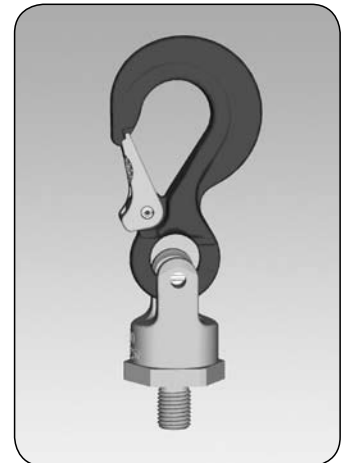
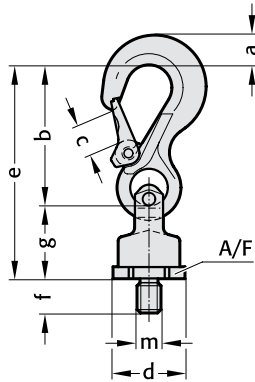
Type of attachment	1		2		2 symmetrical		2 asymmetrical		3 and 4 symmetrical		3 and 4 asymmetrical
Arrangement of the suspension points											
Number of lines	1	1	2	2	2	2	2	3 and 4	3 and 4	3 and 4	3 and 4
Angle of inclination/load direction	0°	90°	0°	90°	0-45°	45-60°	asymmetrical	0-45°	45-60°	asymmetrical	asymmetrical
Order no	carried load in tonnes										
2131.26.012	0,63	0,63	1,26	1,26	0,88	0,63	0,63	1,32	0,95	0,63	
2131.26.016	1,5	1,5	3,0	3,0	2,1	1,5	1,5	3,15	2,25	1,5	
2131.26.020	2,5	2,5	5,0	5,0	3,5	2,5	2,5	5,25	3,75	2,5	
2131.26.024	4,0	4,0	8,0	8,0	5,6	4,0	4,0	8,4	6,0	4,0	
2131.26.030	6,5	5,0	13,0	10,0	7	5	5	10,5	7,5	5,0	
2131.26.036	10,0	8,0	20,0	16,0	11,2	8,0	8,0	16,8	12,0	8,0	

# FIBRO

2131.23.

## Universal Rotary Safety Eyebolts with Eye Hooks

2131.23.



### Execution:

The first generation of lifting means with double ball bearing for smooth non-jerking action tipping, rotating and turning.

Also rotates 90° in direction of screwing in with full load.  
Not suitable for extended rotational movement when fully loaded.

The special design avoids damage to lifting elements and the valuable load when turning. For ring hoists, slings, cables, hooks etc.

### 2131.23. Universal Rotary Safety Eyebolts with Eye Hooks

Order No	Rated load capacity in tonnes	a	b	c	d	e	f	g	m	A/F
2131.23.012	0.63	13	75	18	40	116	18	41	M12	36
016	1.5	20	97	25	46	147	24	50	M16	41
020	2.5	28	126	30	61	187	30	61	M20	55
024	4.0	36	150	35	78	227	36	77	M24	70
030	5.0	37	174	40	95	267	45	93	M30	85
036	8.0	49	208	48	100	310	54	102	M36	90

### Max. load "G" in tonnes for various types of attachment

Type of attachment	1		2		2 symmetrical		2 asymmetrical		3 and 4 symmetrical		3 and 4 asymmetrical
Arrangement of the suspension points											
Number of lines	1	1	2	2	2 symmetrical	2 asymmetrical	2	3 and 4 symmetrical	3 and 4 asymmetrical	3 and 4	3 and 4
Angle of inclination/load direction	0°	90°	0°	90°	0-45°	45-60°	asymmetrical	0-45°	45-60°	asymmetrical	asymmetrical
Order no	carried load in tonnes										
2131.23.012	0,63	0,63	1,26	1,26	0,88	0,63	0,63	1,32	0,95	0,63	
2131.23.016	1,5	1,5	3,0	3,0	2,1	1,5	1,5	3,15	2,25	1,5	
2131.23.020	2,5	2,5	5,0	5,0	3,5	2,5	2,5	5,25	3,75	2,5	
2131.23.024	4,0	4,0	8,0	8,0	5,6	4,0	4,0	8,4	6,0	4,0	
2131.23.030	6,5	5,0	13,0	10,0	7	5,0	5,0	10,5	7,5	5,0	
2131.23.036	10,0	8,0	20,0	16,0	11,2	8,0	8,0	16,8	12,0	8,0	

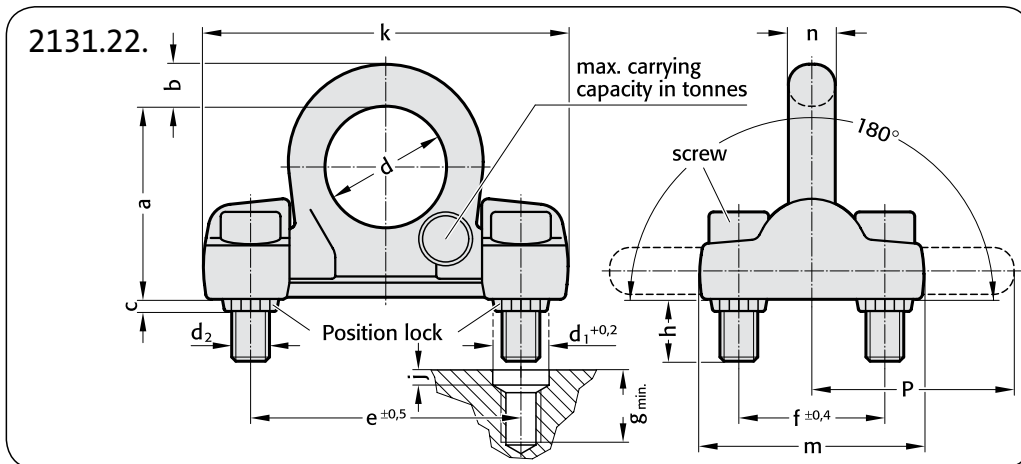
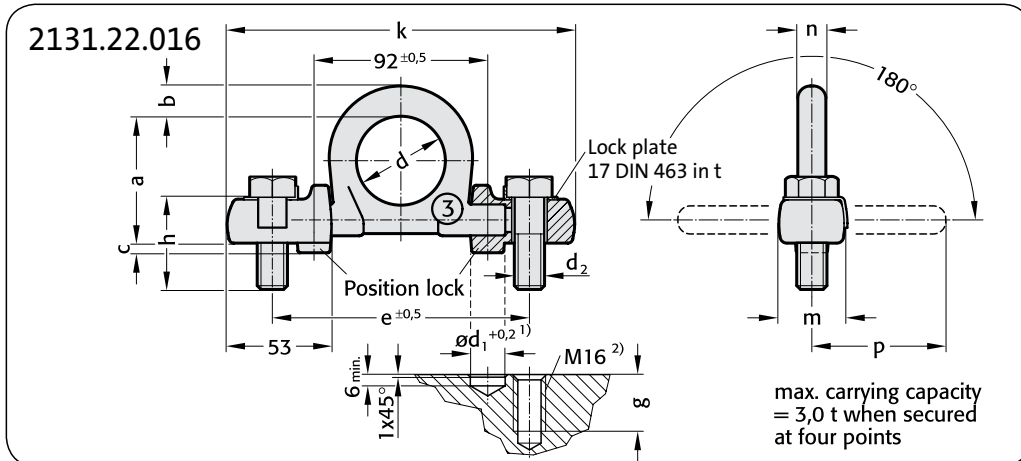




# FIBRO

2131.22.

## Ring Blocks with Position Lock



### Description:

The position locks protect the fixing bolts against bending and shear stresses. The ring can be folded down, red.

### Note:

- 1) Drill the holes for the position locks first.
- 2) Fix the ring block in the position lock and then tap the holes. Ensure that the bolting surface is flat. See also loading of eyebolts.

The threaded connection on the transported load must be suitable for transferring forces.

Minimum thread depth:  
 $1 \times d_2$  in steel (min. St.37)  
 $1.25 \times d_2$  in cast iron (min. GG25)  
 $2 \times d_2$  in aluminium  
 $2.5 \times d_2$  in aluminium-magnesium alloys

### Fixing:

Only use 100% crack tested bolts.  
 Once bolts have been in use for some time, check that they are firmly seated.  
 Minimum grade of screws see table: "Y".  
 2131.22.016: Only use hexagonal bolts to ISO 4014.  
 Fit washers before tightening and securing bolts (tightening torque  $160 \pm 20 \text{ Nm}$ ).  
 2131.22.020/030: Use only Rud marked hexagon socket head screws conforming to ISO 4762.

## 2131.22. Ring Blocks

Order No	carrying capacity in t																
		a	b	c	d	$d_1$	$d_2$	e	f	g	h	j	k	m	n	Y	p
2131.22.016	3	67	16	5	48	18	M16	136	-	30	50	-	178	34	16	10.9	71
020	8	103	22	6	65	30	M20	143	78	50	45	8	194	120	25	8.8	100
030	16	131	30	8	90	46	M30	198	104	70	63	10	270	170	32	12.9	134

## Max. carried load "G" in tonnes for various types of attachment

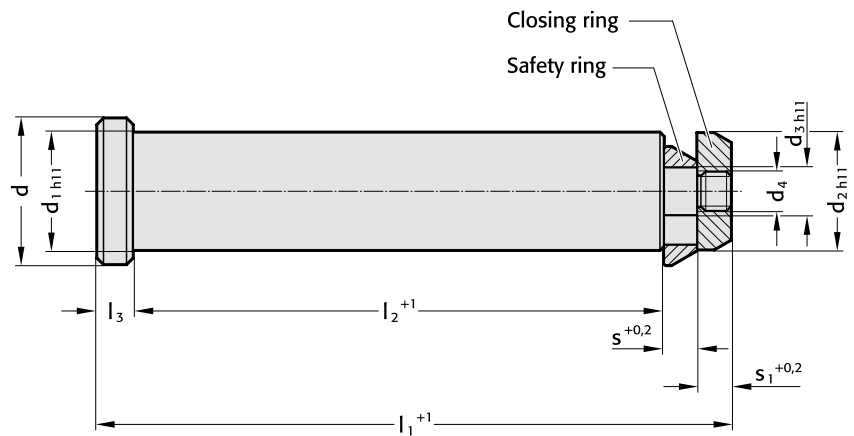
Type of attachment											
Arrangement of the suspension points											
Number of lines	1	1	2	2	2 symmetrical	2	3 and 4 symmetrical	3 and 4			
Angle of inclination/load direction	0°	90°	0°	90°	0-45°	45-60°	asymmetrical	0-45° 45-60°	asymmetrical		
Order No	Thread										
	carried load in tonnes										
2131.22.016	2 × M16	3	3	6	6	4,2	3	3	6,3	4,5	3
020	4 × M20	10	10	20	20	14	10	10	21	15	10
030	4 × M30	16	16	32	32	22,4	16	16	33,6	24	16

Die Lifting Bolts with Safety Ring to VDI 3366

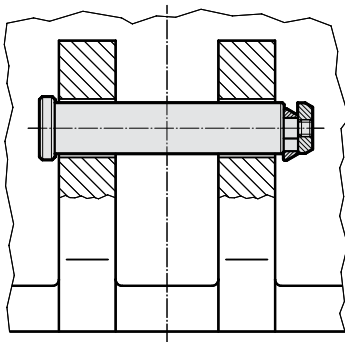
2132.10.



2132.10.



Installation example:



2132.10. Die Lifting Bolts with Safety Ring to VDI 3366

max. carrying capacity\*  
(2 die lifting bolts)

Order No	in kg	d	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	s	s <sub>1</sub>
2132.10.032	6400	40	32	32	13	M10	175	145	10	10	10
2132.10.040	10000	50	40	40	16	M12	225	188	10	14	13
2132.10.050	16000	60	50	50	24	M20	273	230	11	16	16
2132.10.063	25000	75	63	63	30	M24	347	295	14	18	20
2132.10.076	63000	95	76	76	40	M36	422	360	15	20	27

\*The maximum permissible load capacity is to be calculated such that two bolts on their own are capable of carrying or turning the tool.

Ordering Code (example):

Die Lifting Bolt with Safety Ring  
to VDI 3366 = 2132.10.  
d<sub>1</sub> = 32 mm = 032  
Order No = 2132.10.032

Note:

It is important to ensure that there is safety clearance on both outer sides of the cast cheeks and that there is room for installation on one side.

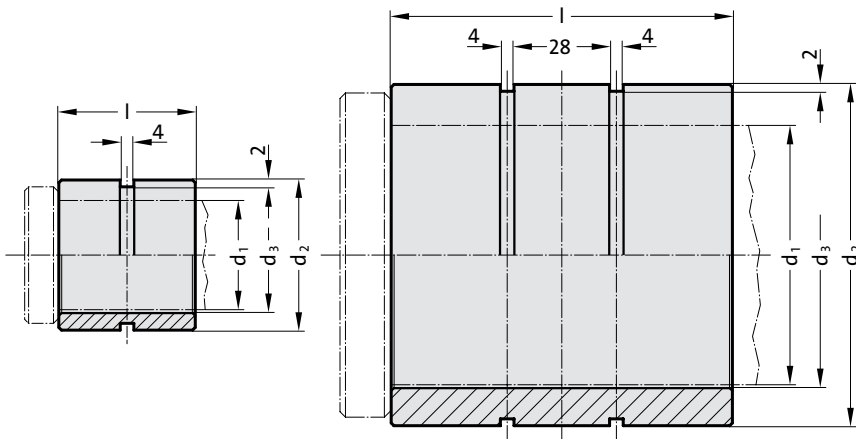
The Lifting bolt must always be introduced from the outside of the tool towards the middle.

# FIBRO

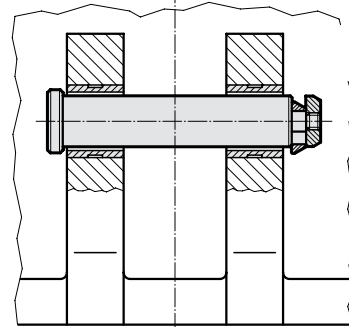
2132.10.03..1

## Bushes for Lifting Bolts VDI

2132.10.03..1



Installation example:



### Description:

Bush for casting-in for lifting bolts 2132.10.

### Material:

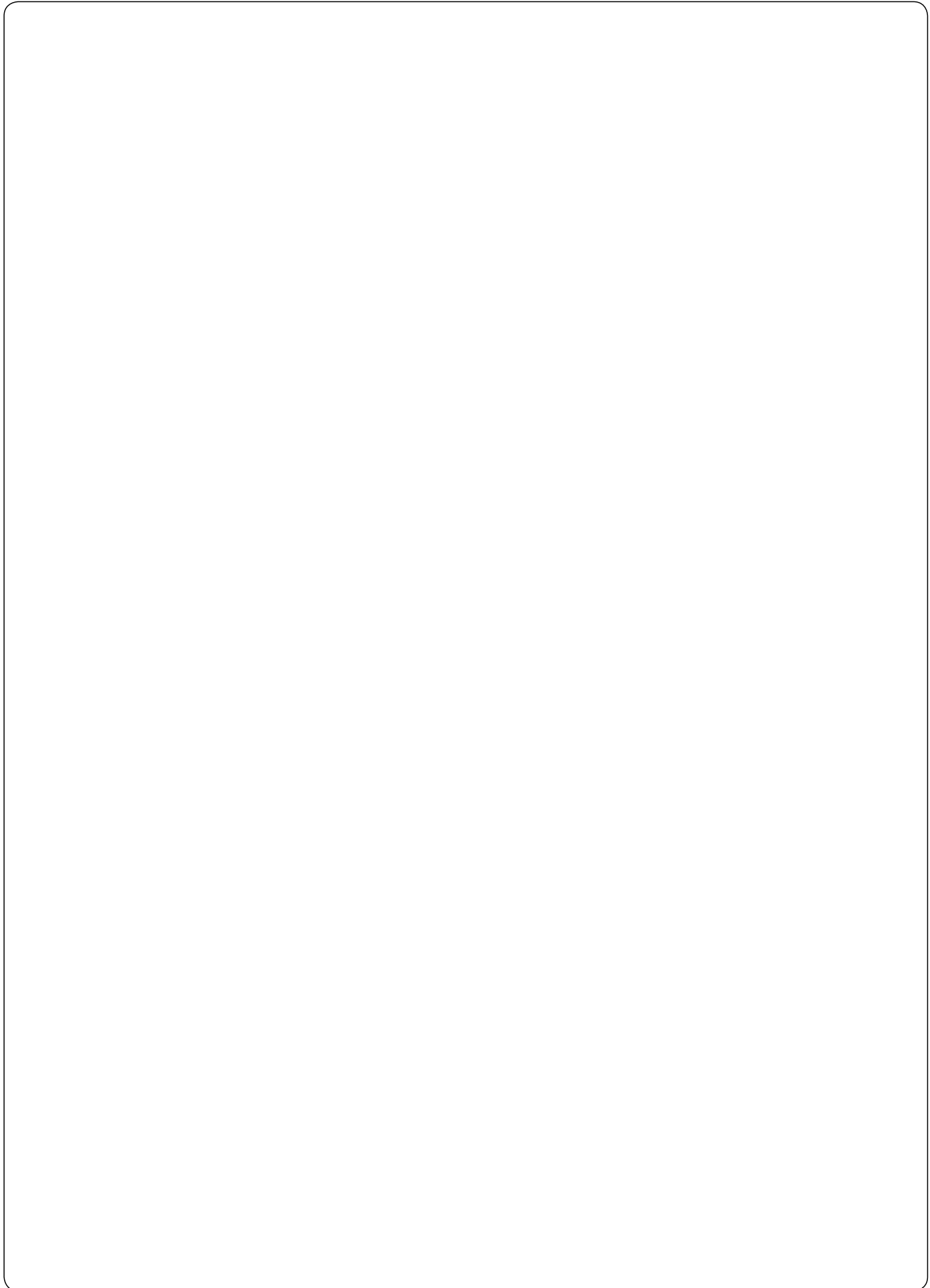
Steel

### 2132.10.03..1 Bushes for Lifting Bolts VDI

Order No	carrying capacity per lifting bolt in kg	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l	Number of grooves
2132.10.03.032.1.1	3200	32	44	34	40	1
2132.10.03.040.2.1	5000	40	52	42	50	1
2132.10.03.050.3.1	8000	50	62	52	60	1
2132.10.03.063.4.1	12000	63	75	65	80	1
2132.10.03.076.5.1	25000	76	100	78	100	2
2132.10.03.076.6.1	31500	76	105	78	100	2

### Ordering Code (example):

Bush for lifting bolt = 2132.10. 1  
 to VDI Standard = 03.  
 Nominal diameter d<sub>1</sub> = 50 mm = 050.  
 Bush Size 3 = 3.  
 Order No = 2132.10.03.050.3.1

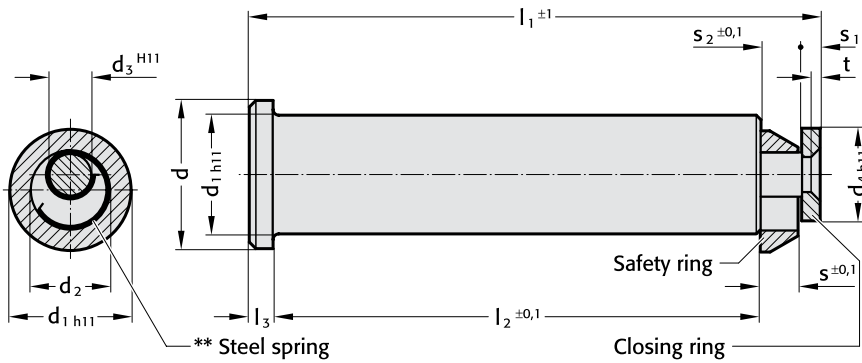


**FIBRO**

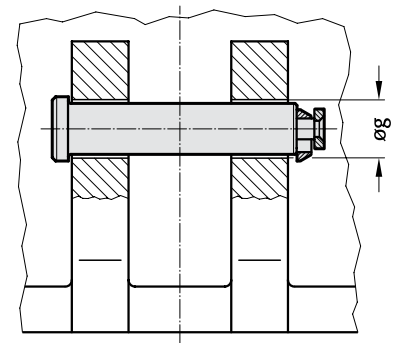
2132.11.

**Die Lifting Bolts with Safety Ring to CNOMO Standard**

2132.11.



**Mounting Examples:**



**Note:**

It is important to ensure that there is safety clearance on both outer sides of the cast cheeks and that there is room for installation on one side.

The lifter bolt must always be introduced from the outside of the tool towards the middle.

**2132.11. Die Lifting Bolts with Safety Ring to CNOMO Standard**

Order No	max. carrying capacity* (2 die lifting bolts) in kg	d	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	s	s <sub>1</sub>	s <sub>2</sub>	t
		2132.11.032	6400	40	32	22	12	25	154	132	6	10	5
040	10000	50	40	28	16	32	197.75	170	8	12.5	6	13.75	3
050	16000	63	50	36	20	40	247.6	212	10	16	8	17.6	4
063	25000	80	63	45	25	50	309	265	12	20	10	22	5

\* The maximum permissible load capacity is to be calculated such that two bolts on their own are capable of carrying or turning the tool.  
 \*\* Steel spring included.

**Ordering Code (example):**

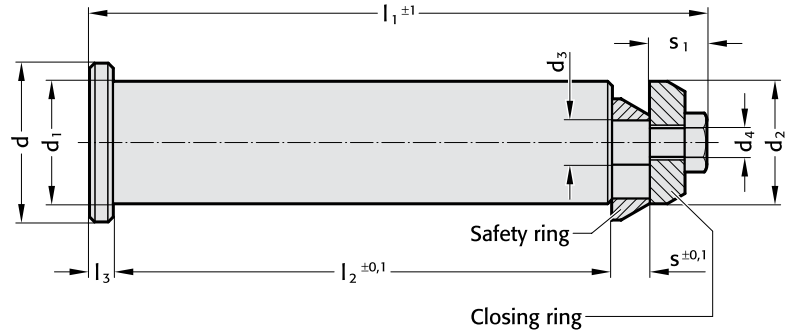
Die Lifting Bolts with Safety Ring to CNOMO-Norm = 2132.11.  
 d<sub>1</sub> = 32 mm = 032  
 Order No = 2132.11.032

Die Lifting Bolts with Safety Ring  
for Lifting Flange 2133.12.

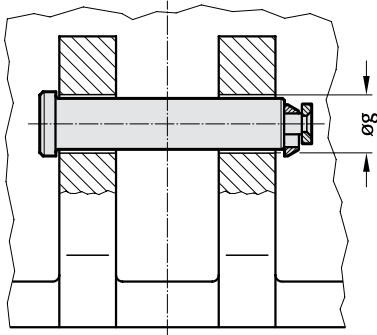
2133.12..1



2133.12..1



Mounting Examples:



2133.12..1 Die Lifting Bolts with Safety Ring for Lifting Flange 2133.12.

Order No	max. carrying capacity* (2 die lifting bolts) in kg	g	d	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	s	s <sub>1</sub>
2133.12.016.1	1200	16	25	15.6	15.6	6	M5	102.5	77	6	8	11.5
021.1	2000	21	30	20.6	20.6	7	M6	113.5	86	6	8	13.5
026.1	4000	26	35	25.6	25.6	9	M6	128.5	100	6	9	13.5
034.1	8000	34	43	33	33	12	M8	166.5	135	6	10	15.5
044.1	14000	44	53	43	43	16	M12	215.5	175	8	12	20.5

\* The maximum permissible load capacity d<sub>1</sub> is to be calculated such that two bolts on their own are capable of carrying or turning the tool

Ordering Code (example):

Die Lifting Bolts with Safety Ring  
for Lifting Flange 2133.12. = 2133.12..1  
g = 16 mm = 016  
Order No = 2133.12.016.1

Note:

It is important to ensure that there is safety clearance on both outer sides of the cast cheeks and that there is room for installation on one side.

The lifter bolt must always be introduced from the outside of the tool towards the middle.

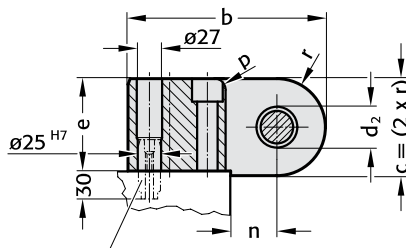
# FIBRO

2133.11.  
2133.11.025.065

## Lifting Flanges with Bolt, with Safety Ring, to BMW Centering Pins

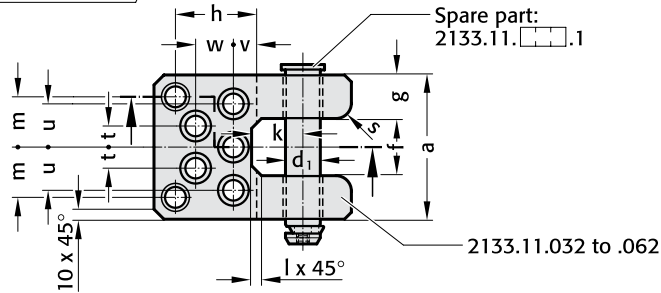
2133.11.

Application:  
for base plate  
and top plate

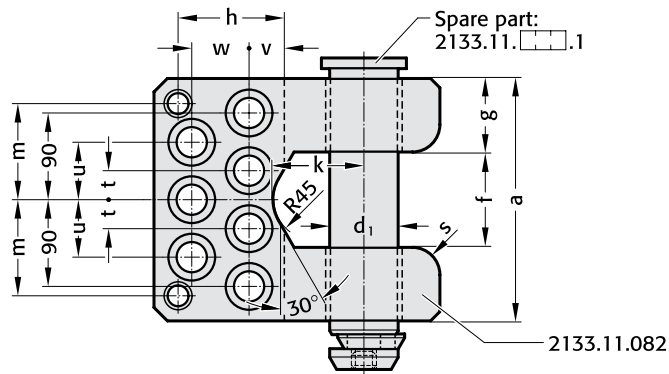


order separately:

Centering pin  
2133.11.025.065



Spare part:  
2133.11. . . . .1

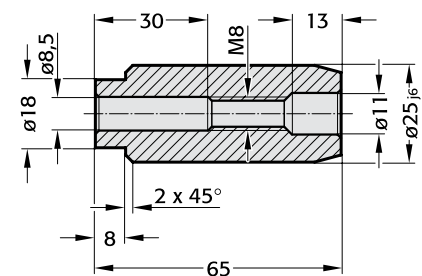


Spare part:  
2133.11. . . . .1



2133.11.025.065

Centering Pin, order separately



Screw not included, use socket head cap screws M6x60 DIN EN ISO 4762.

## 2133.11. Lifting Flanges with Bolt, with Safety Ring, to BMW

Order No	max. carrying capacity* (2 lifting flanges) in kg	d <sub>1</sub>	d <sub>2</sub>	a	b	c	e	f	g	h	k	l	m	n	p	s	t	u	v	w	Socket head cap screw DIN EN ISO 4762
2133.11.032	6400	30	32	126	185	80	75	50	38	85	50	10	45	40	12	16	20	40	30	35	M16x90
042	9000	40	42	150	210	100	95	60	45	87	55	10	52	50	12	20	22.5	45	25	40	M20x120
052	16000	50	52	175	240	120	115	75	50	95	70	15	62.5	60	16	24	25	50	35	45	M24x140
062	20000	60	62	200	280	140	130	80	60	120	80	15	75	65	20	30	30	60	45	60	M30x160
082	36000	80	82	250	300	160	150	100	75	105	95	0	100	90	20	30	30	60	30	60	M30x180

\*The maximum permissible load capacity is to be calculated such that two lifting flanges one their own are capable of carrying or turning the tool.

### Ordering Code (example)

Lifting Flange with Bolt, with Safety Ring, to BMW = 2133.11.

d<sub>2</sub> = 32 mm = 032

Order no = 2133.11.032

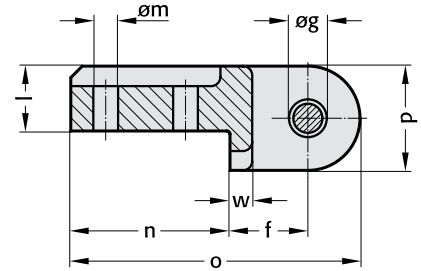
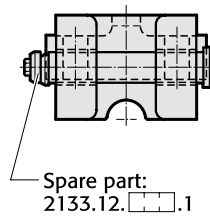
Lifting Flanges with Bolt,  
with Safety Ring

2133.12.



2133.12.

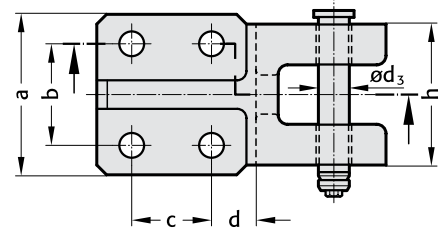
Shape A



Ordering Code  
(example):

Lifting Flange with Bolt,  
with Safety Ring  
Shape A = 2133.12.

g = 21 mm = 021  
Order no = 2133.12.021



2133.12. Lifting Flanges with Bolt, with Safety Ring

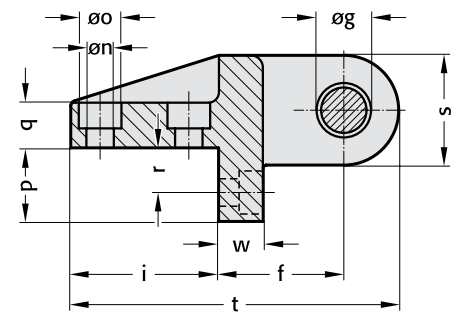
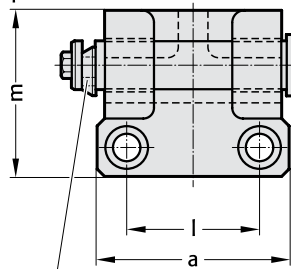
Order No	Shape	max. carrying capacity* (2 lifting flanges) in kg	g													
			a	b	c	d	f	H13	h	l	m	n	o	p	w	d <sub>3</sub>
2133.12.016	A	1200	80	50	40	22.5	39	16	70	32	12.5	80	145	52	11	15.6
021	A	2000	90	60	40	27.5	42	21	79	36	16.5	90	160	56	13	20.6
026	A	4000	100	65	65	32.5	60	26	90	50	21	120	215	70	20	25.6

\* The maximum permissible load capacity is to be calculated such that two lifting flanges on their own are capable of carrying or turning the tool.



2133.12.

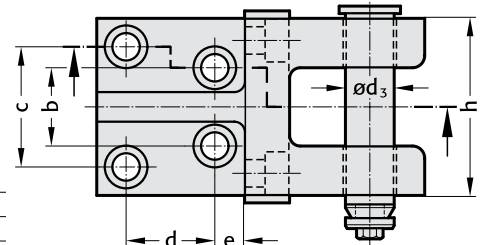
Shape B



Ordering Code (example):

Lifting Flange with Bolt, with Safety  
Ring, Shape B = 2133.12.

g = 34 mm = 034  
Order no = 2133.12.034



2133.12. Lifting Flanges with Bolt, with Safety Ring

Order no	Shape	max. carrying capacity* (2 lifting flanges) in kg	g																			
			a	b	c	d	e	f	H13	h	i	l	m	n	o	p	q	r	s	t	w	d <sub>3</sub>
2133.12.034	B	8000	135	56	84	60	20	85	34	125	100	96	111	18	28	50	30	30	72	221	30	33
2133.12.044	B	14000	180	80	110	70	30	100	44	160	125	130	140	22	36	60	40	35	90	270	40	43

\* The maximum permissible load capacity is to be calculated such that two lifting flanges on their own are capable of carrying or turning the tool.

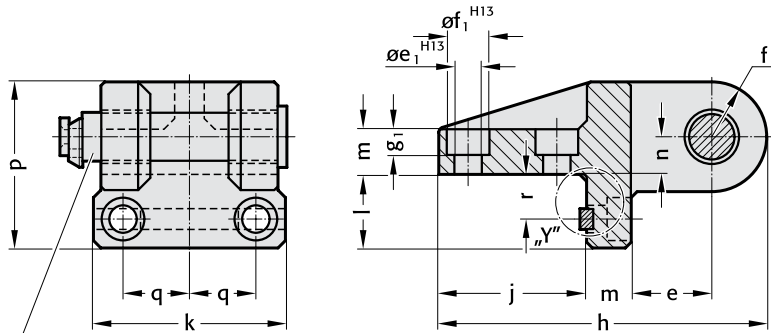


**FIBRO**

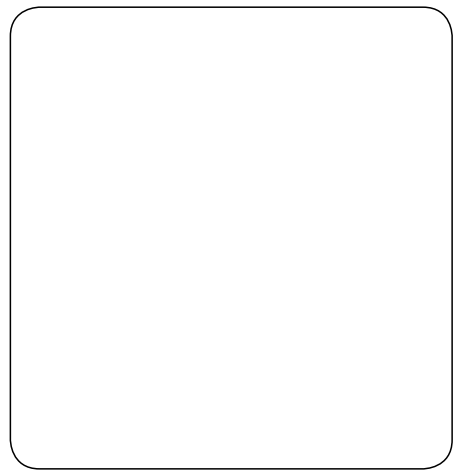
**2133.13.**

**Lifting Flanges with Bolt,  
with Feather Key to CNOMO**

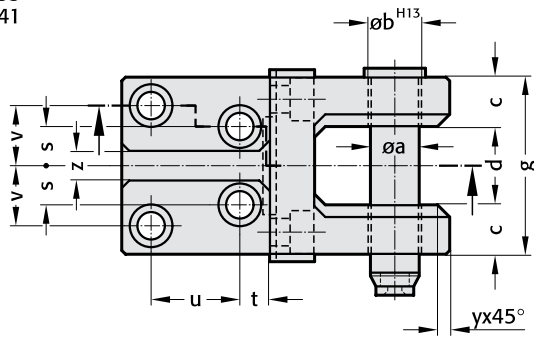
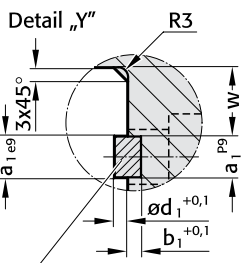
2133.13.



Spare part:  
2132.11.032 up to 2133.13.033  
2132.11.040 up to 2133.13.041



Detail „y“



Feather key 14x 9x 63 to DIN 6885 up to 2133.13.033  
Feather key 16x10x100 to DIN 6885 up to 2133.13.041

**2133.13. Lifting Flanges with Bolt, with Feather Key to CNOMO**

max. carrying  
capacity\*  
(2 lifting flanges)

Order No	in kg	a	b	c	d	e	f	g	h	j	k	l	m	n	p	q	r	s	t	u	v	w	y	z	a <sub>1</sub>	b <sub>1</sub>	d <sub>1</sub>	e <sub>1</sub>	f <sub>1</sub>	g <sub>1</sub>
2133.13.033	8000	32	33	35	55	55	36	125	221	100	135	50	30	25	111	48	30	28	20	60	42	24	10	20	14	4.5	4.5	18	28	17
2133.13.041	12600	40	41	50	60	60	45	160	270	125	180	60	40	35	140	65	35	40	30	70	55	27	12.5	25	16	5	5	22	36	21

\* The maximum permissible load capacity is to be calculated such that two lifting flanges on their own are capable of carrying or turning the tool.

**Ordering Code (example)**

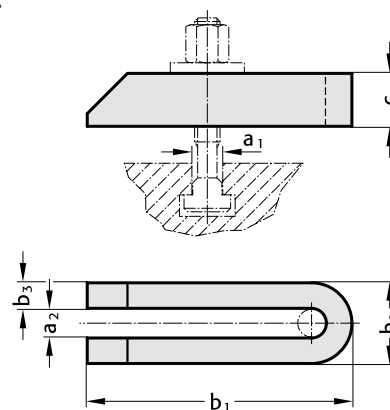
Lifting Flange with Bolt,  
with Feather Key to CNOMO = 2133.13.  
Øb = 33 mm = 033  
Order No. = 2133.13.033

Clamps, forked shape DIN 6315 B  
Clamping Claws, goose neck shape

2140.17.  
2140.15.



2140.17.



**Material:**

Heat-treated steel, painted.

**Note:**

Holding and contact surfaces are plane-parallel.

High clamping forces can be achieved by using high-strength screws conforming to DIN 787. The dimensions of the holding strap should be matched to the strength of the bolts.

Supplied without clamping bolts – see page C39 for suitable clamping bolts.

**Ordering Code (example):**

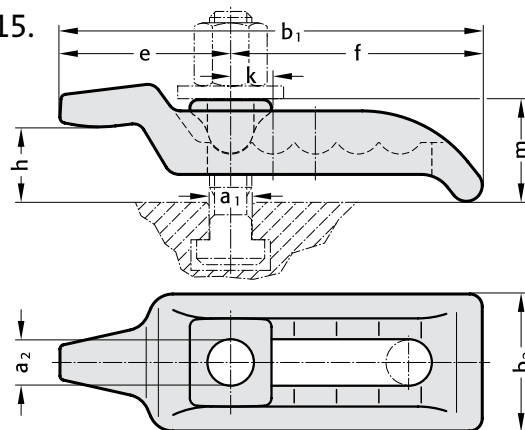
Clamp, forked shape DIN 6315 B	=	2140.17.
a <sub>2</sub> = 14 mm	=	14.
b <sub>1</sub> = 160 mm	=	160
Order No	=	2140.17.14.160

2140.17. Clamps, forked shape DIN 6315 B

a <sub>1</sub>	a <sub>2</sub>	b <sub>1</sub>	b <sub>2</sub>	b <sub>3</sub>	c
8	9	80	25	8	15
10	11	100	31	10	20
12 o. 14	14	125	38	12	25
12 o. 14	14	160	38	12	25
12 o. 14	14	200	38	12	25
16 o. 18	18	160	48	15	30
16 o. 18	18	200	48	15	30
16 o. 18	18	250	48	15	40
20 o. 22	22	200	52	15	40
20 o. 22	22	250	62	20	40
20 o. 22	22	315	62	20	40
24	26	200	66	20	40
24	26	250	66	20	40
24	26	315	66	20	40



2140.15.



**Material:**

Forged and heat-treated steel, galvanised and yellow passivated.

**Note:**

Clamping claws quickly span very different clamping heights without the need for additional supports and take up very little space on the machine table. They are designed for maximum loads and are particularly suitable for clamping cutting and punching tools.

Supplied without clamping bolts – see page C39 for suitable clamping bolts.

**Ordering Code (example):**

Clamping Claw, goose neck shape	=	2140.15.
a <sub>2</sub> = 22 mm	=	22
Order No	=	2140.15.22

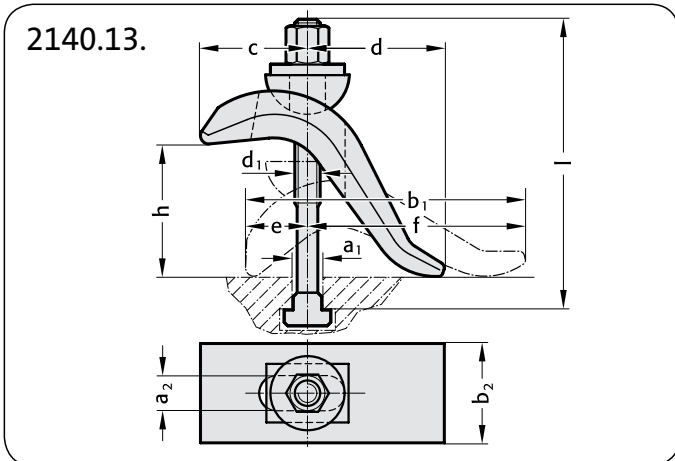
2140.15. Clamping claws, goose neck shape

a <sub>1</sub>	a <sub>2</sub>	b <sub>1</sub>	b <sub>2</sub>	e	f	k	m	Clamping height h
20 o. 22	22	200	66	88	112	20	60	25 - 50
24 o. 26	26	232	76	97	135	24	70	30 - 70
36	32	263	90	107	156	28	80	40 - 75

# FIBRO

2140.13.  
2140.14.

## Clamping Claws, infinitely variable



### 2140.13. Clamping Claws, infinitely variable

a <sub>1</sub>	a <sub>2</sub>	b <sub>1</sub>	b <sub>2</sub>	c	d	e	f	Clamping height h	Clamping bolt d <sub>1</sub> x a <sub>1</sub> x l
12	17	140	50	55	60	30	110	0 - 50	M12x12x125
14	17	140	50	55	60	30	110	0 - 50	M12x14x125
16	17	140	50	55	60	30	110	0 - 75	M16x16x160
18	17	140	50	55	60	30	110	0 - 75	M16x18x160
16	21	175	60	70	80	40	135	0 - 65	M16x16x160
18	21	175	60	70	80	40	135	0 - 65	M16x18x160
22	21	175	60	70	80	40	135	0 - 85	M20x22x200

### Material:

Steel, forged and head-treated tempered in burnishing clay.

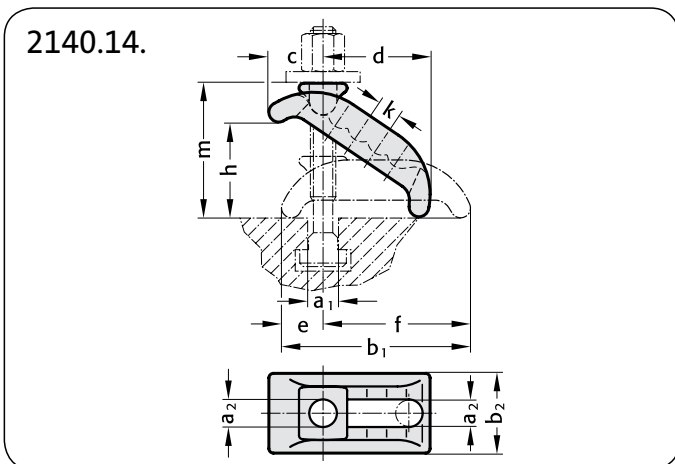
### Note:

Clamping claws quickly span very different clamping heights without the need for additional supports and take up very little space on the machine table. They are designed for maximum loads and are particularly suitable for clamping cutting and punching tools.

Supplied with clamping bolts, see page C39 for suitable clamping bolts.

### Ordering Code (example):

Clamp, infinitely variable	=	2140.13.
a <sub>1</sub> = 12 mm	=	12.
a <sub>2</sub> = 17 mm	=	17
Order No	=	2140.13.12.17



### 2140.14. Clamping Claws, infinitely variable

a <sub>1</sub>	a <sub>2</sub>	b <sub>1</sub>	b <sub>2</sub>	c	d	e	f	k	m	h <sub>max</sub>
12 o. 14	13	88	38	28	48	23	68	14	52	35
16 o. 18	18	130	56	38	74	29	101	18	80	55
20 o. 22	22	140	66	46	80	32	112	20	98	65
24 o. 28	26	174	76	52	100	39	135	24	110	75
36	32	200	90	61	110	44	156	28	118	80

### Material:

Forged and heat-treated steel, galvanised and yellow passivated.

### Note:

Clamping claws quickly span very different clamping heights without the need for additional supports and take up very little space on the machine table. They are designed for maximum loads and are particularly suitable for clamping cutting and punching tools.

Supplied without clamping bolts – see page C39 for suitable clamping bolts.

### Ordering Code (example):

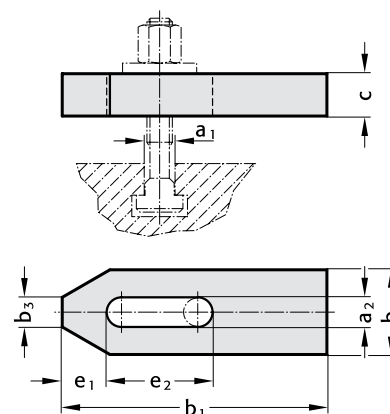
Clamp, infinitely variable	=	2140.14.
a <sub>2</sub> = 18 mm	=	18
Order No	=	2140.14.18

**Clamps, DIN 6314**  
**Clamps, straight, with setscrew**

**2140.16.**  
**2140.10.**



2140.16.



**Material:**

Heat-treated steel, painted.

**Note:**

Holding and contact surfaces are plane-parallel.  
 High clamping forces can be achieved by using high-strength bolts conforming to DIN 787. The dimensions of the holding strap should be matched to the strength of the bolts.

Supplied without clamping bolts – see page C39 for suitable clamping bolts.

**Ordering Code (example):**

Clamp DIN 6314	=	2140.16.
a <sub>2</sub> = 11 mm	=	11.
b <sub>1</sub> = 80 mm	=	080
Order No	=	2140.16.11.080

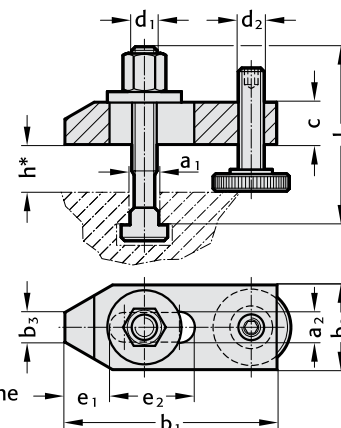
**2140.16. Clamps DIN 6314**

a <sub>1</sub>	a <sub>2</sub>	b <sub>1</sub>	b <sub>2</sub>	b <sub>3</sub>	c	e <sub>1</sub>	e <sub>2</sub>
8	9	60	25	10	12	13	22
10	11	80	30	12	15	15	30
12 o. 14	14	100	40	14	20	21	40
12 o. 14	14	125	40	14	20	21	50
16 o. 18	18	125	50	18	25	26	45
16 o. 18	18	160	50	18	25	26	65
20 o. 22	22	160	60	22	30	30	60
20 o. 22	22	200	60	22	30	30	80
24	26	200	70	26	30	35	80
24	26	250	70	26	35*	35	105

\* does not conform to DIN



2140.10.



\* depends on the groove depth

**Material:**

Heat-treated steel, painted.

**Note:**

Supplied with clamping bolts and setscrews for T grooves conforming to DIN 787 8.8 with nuts and washers.

**Ordering Code (example):**

Clamp, straight, with setscrew	=	2140.10.
a <sub>1</sub> = 12 mm	=	12
Order No	=	2140.10.12

**2140.10. Clamps, straight**

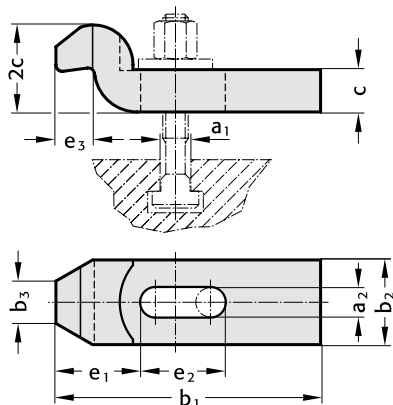
a <sub>1</sub>	a <sub>2</sub>	b <sub>1</sub>	b <sub>2</sub>	b <sub>3</sub>	c	d <sub>1</sub>	d <sub>2</sub>	e <sub>1</sub>	e <sub>2</sub>	h	Clamping bolt d <sub>1</sub> x a <sub>1</sub> x l
10	11	80	30	12	15	M10	M10	15	30	8 - 32	M10x10x80
12	14	100	40	14	20	M12	M12	21	40	10 - 40	M12x12x100
14	14	100	40	14	20	M12	M12	21	40	10 - 38	M12x14x100
16	18	125	50	18	25	M16	M16	26	45	13 - 49	M16x16x125
18	18	125	50	18	25	M16	M16	26	45	13 - 46	M16x18x125
20	22	160	60	22	30	M20	M20	30	60	16 - 65	M20x20x160
22	22	160	60	22	30	M20	M20	30	60	16 - 65	M20x22x160

# FIBRO

2140.18.  
2140.11.

Clamps, goose neck shape DIN 6316  
Clamps, goose neck shape with setscrew

2140.18.



2140.18. Clamps, goose neck shape DIN 6316

a <sub>1</sub>	a <sub>2</sub>	b <sub>1</sub>	b <sub>2</sub>	b <sub>3</sub>	c	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>
8	9	80	25	12	12	25	25	9
10	11	100	30	15	15	32	32	12
12 o. 14	14	125	40	20	20	40	40	16
16 o. 18	18	125	50	25	25	49	40	20
16 o. 18	18	160	50	25	25	49	50	20
20 o. 22	22	160	60	30	30	55	55	24
20 o. 22	22	200	60	30	30	55	70	24
24	26	200	70	35	30	72	60	28
24	26	250	70	35	35*	72	80	28

\* does not conform to DIN

**Material:**

Heat-treated steel, painted.

**Note:**

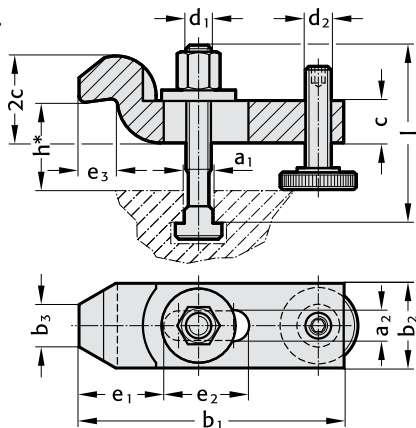
Holding and contact surfaces are plane-parallel.  
High clamping forces can be achieved by using high-strength bolts conforming to DIN 787.  
The dimensions of the holding strap should be matched to the strength of the bolts.

Supplied without clamping bolts – see page C39 for suitable clamping bolts.

**Ordering Code (example):**

Clamp, goose neck shape DIN 6316	=	2140.18.
a <sub>2</sub> = 14 mm	=	14.
b <sub>1</sub> = 125 mm	=	125
Order No	=	2140.18.14.125

2140.11.



\* depends on the groove depth



2140.11. Clamps, goose neck shape

a <sub>1</sub>	a <sub>2</sub>	b <sub>1</sub>	b <sub>2</sub>	b <sub>3</sub>	c	d <sub>1</sub>	d <sub>2</sub>	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	h	Clamping bolt d <sub>1</sub> x a <sub>1</sub> x l
10	11	100	30	15	15	M10	M10	32	32	12	22-46	M10x10x80
12	14	125	40	20	20	M12	M12	40	40	16	28-58	M12x12x100
14	14	125	40	20	20	M12	M12	40	40	16	28-56	M12x14x100
16	18	160	50	25	25	M16	M16	49	50	20	36-72	M16x16x125
18	18	160	50	25	25	M16	M16	49	50	20	36-69	M16x18x125
20	22	200	60	30	30	M20	M20	55	70	24	43-92	M20x20x160
22	22	200	60	30	30	M20	M20	55	70	24	43-92	M20x22x160

**Material:**

Heat-treated steel, painted.

**Note:**

Supplied with clamping bolts and setscrews for T grooves conforming to DIN 787 8.8 with nuts and washers.

**Ordering Code (example):**

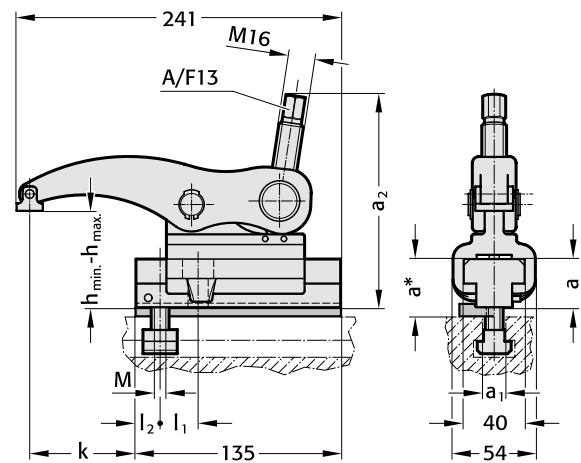
Clamp, goose neck shape, with setscrew	=	2140.11.
a <sub>1</sub> = 14 mm	=	14
Order No	=	2140.11.14

**Power Clamps, sliding .  
Power Clamp Accessories**

**2140.21.  
2140.21.00.**



**2140.21.**



**Description:**

Power Clamp, sliding. Robust clamp for variable sizes and with sliding base.

**Material:**

High tensile steel, forged

**Note:**

- Clamping force 25 kN - tightening torque 100 Nm
- Included, for 0 – 69 mm clamping height:
  - Clamp jaw 2140.21.00.01
  - Sliding block DIN 508 with machine screw, property class 12.9

**Benefits:**

- Clamping force up to 25 kN
- double articulation means less wear
- designed to deflect swarf
- used in T grooves 14 - 28 mm and Grid pallets M12 und M16
- 4 jaw versions
- variable jaw capacity 0 - 69 mm

**2140.21.**

Order No	M	a <sub>1</sub>	h <sub>min.</sub> –h <sub>max.</sub>	a	a <sub>2</sub>	k	l <sub>1</sub>	l <sub>2</sub>
2140.21.14.063	12	14	0 – 63	32	135	32 – 97	16	25
2140.21.16.063	12	16						
2140.21.18.069	16	18	3 – 69*	38*	141		20	30
2140.21.20.069	16	20						
2140.21.22.069	16	22						
2140.21.24.069	16	24						
2140.21.28.069	16	28						

\* for width a<sub>1</sub> from 18 mm on including a foot for safe bridging when used along the groove

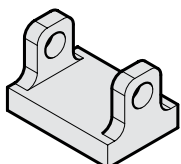
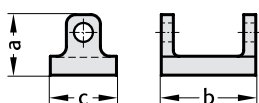
**Ordering Code (example):**

Power clamp, sliding	=	2140.21.
a <sub>1</sub> = 16 mm	=	16.
h <sub>max.</sub> = 69 mm	=	069
Order No	=	2140.21.16.069

**2140.21.00.01**

Clamp jaw, smooth complete with clamping pin ISO 8740 - 4 x 24 stainless steel, Clamping force up to 25 kN

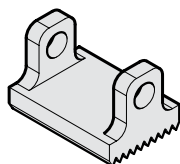
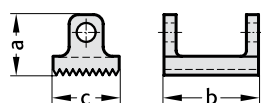
Dimensions: a = 16 mm  
b = 25 mm  
c = 17,5 mm



**2140.21.00.02**

Clamp jaw, grooved complete with clamping pin ISO 8740 - 4 x 24 stainless steel, Clamping force up to 25 kN

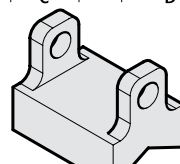
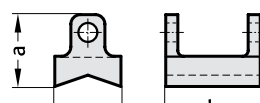
Dimensions: a = 16 mm  
b = 25 mm  
c = 17,5 mm



**2140.21.00.03**

Clamp jaw, V-block, longitudinal Clamping jaw for cylindrical workpieces, complete with clamping pin ISO 8740 - 4 x 24 stainless steel, Clamping force up to 25 kN

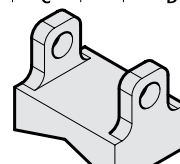
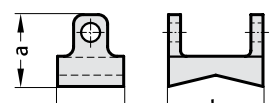
Dimensions: a = 19 mm  
b = 25 mm  
c = 17,5 mm



**2140.21.00.04**

Clamp jaw, V-block, transverse Clamping jaw for cylindrical workpieces, complete with clamping pin ISO 8740 - 4 x 24 stainless steel, Clamping force up to 25 kN

Dimensions: a = 19 mm  
b = 25 mm  
c = 17,5 mm

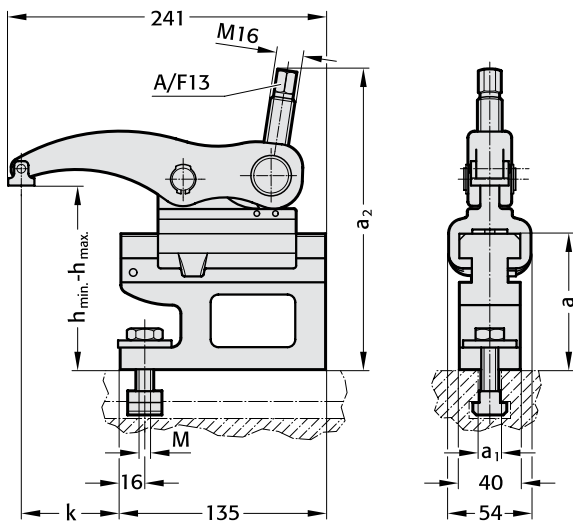


# FIBRO

2140.21.  
2140.21.00.

## Power Clamps, sliding Power Clamp Accessories

2140.21.



2140.21.

Order No	M	a <sub>1</sub>	h <sub>min.</sub> -h <sub>max.</sub>	a	a <sub>2</sub>	k
2140.21.14.120	12	14	60 – 120	90	193	32-97
2140.21.16.120	12	16				
2140.21.18.120	16	18				
2140.21.20.120	16	20				
2140.21.22.120	16	22				
2140.21.24.120	16	24				
2140.21.28.120	16	28				
2140.21.14.180	12	14	120 – 180	150	253	
2140.21.16.180	12	16				
2140.21.18.180	16	18				
2140.21.20.180	16	20				
2140.21.22.180	16	22				
2140.21.24.180	16	24				
2140.21.28.180	16	28				

### Ordering Code (example):

Power clamp, sliding	=	2140.21.
a <sub>1</sub> = 16 mm	=	16.
h <sub>max.</sub> = 120 mm	=	120
Order No	=	2140.21.16.120

### Description:

Power Clamp, sliding. Robust clamp for variable sizes and with sliding base.

### Material:

High tensile steel, forged

### Note:

Clamping force 25 kN - tightening torque 100 Nm

Included, for 60 - 180 mm clamping height:

- Clamp jaw 2140.21.00.01
- Sliding block DIN 508 with machine screw DIN 933 and washer DIN 6340, property class 12.9

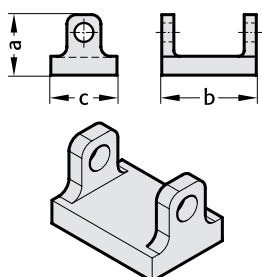
### Benefits:

- Clamping force up to 25 kN
- double articulation means less wear
- designed to deflect swarf
- used in T grooves 14 - 28 mm and Grid pallets M12 und M16
- 4 jaw versions
- variable jaw capacity 60 – 180 mm

2140.21.00.01

Clamp jaw, smooth  
complete with clamping pin  
ISO 8740 -  
4 x 24 stainless steel,  
Clamping force up to 25 kN

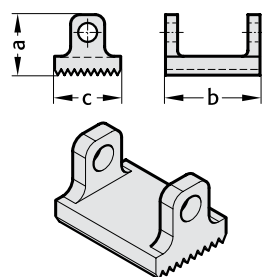
Dimensions: a = 16 mm  
b = 25 mm  
c = 17,5 mm



2140.21.00.02

Clamp jaw, grooved  
complete with clamping pin  
ISO 8740 -  
4 x 24 stainless steel,  
Clamping force up to 25 kN

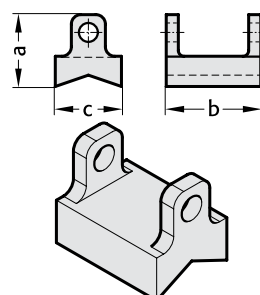
Dimensions: a = 16 mm  
b = 25 mm  
c = 17,5 mm



2140.21.00.03

Clamp jaw, V-block, longitudinal  
Clamping jaw for cylindrical  
workpieces, complete with  
clamping pin ISO 8740 -  
4 x 24 stainless steel,  
Clamping force up to 25 kN

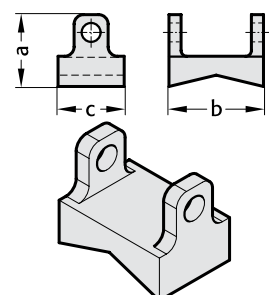
Dimensions: a = 19 mm  
b = 25 mm  
c = 17,5 mm



2140.21.00.04

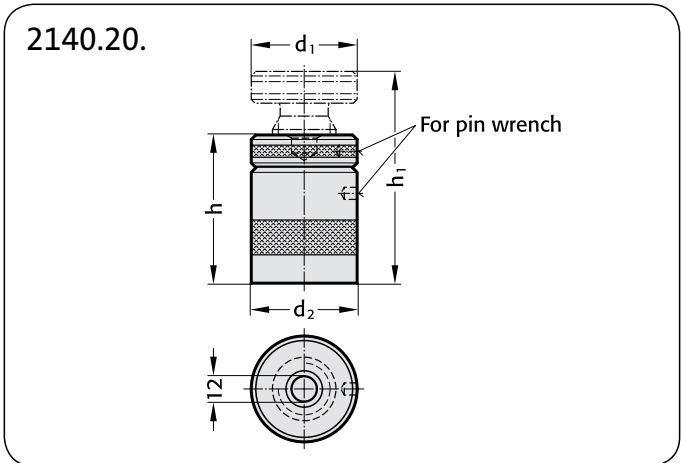
Clamp jaw, V-block, transverse  
Clamping jaw for cylindrical  
workpieces, complete with  
clamping pin ISO 8740 -  
4 x 24 stainless steel,  
Clamping force up to 25 kN

Dimensions: a = 19 mm  
b = 25 mm  
c = 17,5 mm



Supports, adjustable  
Stepped Blocks, DIN 6318/DIN 6318 B

2140.20.  
2140.19.



**Material:**

Heat-treated steel, painted.

**Note:**

Centring hole diameter 12 mm.

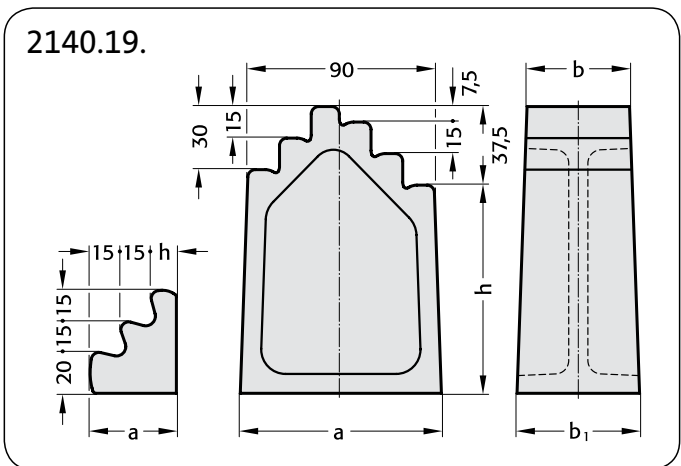
Spindle with self-locking trapezoidal thread and end lock.

**Ordering Code (example):**

Support, adjustable, with flat contact surface	=	2140.20.
h = 42 mm	=	042
Order No	=	2140.20.042

2140.20. Supports, adjustable

h	h <sub>1</sub>	d <sub>1</sub>	d <sub>2</sub>	F <sub>max</sub> in daN
42	52	50	50	6000
50	70	50	50	6000
70	100	50	50	6000
100	140	65	70	10000
140	210	70	80	17000
190	300	80	100	35000



**Material:**

Engineering cast iron, painted.

**Note:**

Holding and contact surfaces are plane-parallel. High clamping forces can be achieved by using high-strength bolts conforming to DIN 787. The dimensions of the holding strap should be matched to the strength of the bolts.

**Ordering Code (example):**

Stepped Block, DIN 6318	=	2140.19.
Size 95	=	095.
b = 50 mm	=	050
Order No	=	2140.19.095.050

2140.19. Stepped Blocks DIN 6318/DIN 6318 B

Size h + 37,5	a	b	b <sub>1</sub>	h
50	42,5	50	50	12,5
95	95	50	55	57,5
140	100	50	60	102,5
185	105	50	65	147,5
230	110	50	70	192,5
275	115	50	75	237,5
50	42,5	80	80	12,5
95	95	80	85	57,5
140	100	80	90	102,5

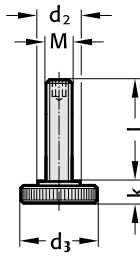


# FIBRO

2140.02.  
2140.32.

## Setscrews Hexagon Nuts, DIN 6330 B

2140.02.



### 2140.02. Setscrews

M	d <sub>2</sub>	d <sub>3</sub>	k	l
M10	16	30	8	39
M12	20	36	10	48
M16	25	42	13	55
M20	25	50	16	69
M24	34	60	20	87

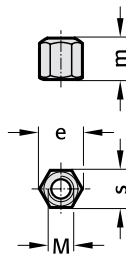
### Material:

Heat-treated  
Strength class 8.8

### Ordering Code (example):

Setscrew = 2140.02.  
M16 = 16  
Order No = 2140.02.16

2140.32.



### 2140.32. Hexagon Nuts, DIN 6330 B

M	e	m	s = A/F
M8	15	12	13
M10	18.4	15	16
M12	20.7	18	18
M14	24.2	21	21
M16	27.7	24	24
M18	31.2	27	27
M20	34.6	30	30
M22	39.2	33	34
M24	41.5	36	36
M30	53.1	45	46

### Material:

Heat-treated  
Strength class 10.9

### Note:

Use washers conforming to DIN 6340.

### Ordering Code (example):

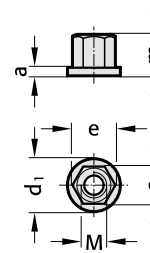
Hexagon Nut, DIN 6330 B = 2140.32.  
M20 = 20  
Order No = 2140.32.20

**Hexagon Collar Nuts, DIN 6331  
Washers, DIN 6340**

**2140.33.  
2140.34.**



2140.33.



**Material:**

Turned and milled  
Heat-treated  
Strength class 10.9  
Thread length 1,5xM

2140.33. Hexagon Collar Nuts, DIN 6331

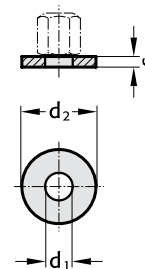
M	a	d <sub>1</sub>	e	m	s
M8	3.5	18	15	12	13
M10	4	22	18.4	15	16
M12	4	25	20.7	18	18
M14	4.5	28	24.2	21	21
M16	5	31	27.7	24	24
M18	5	34	31.2	27	27
M20	6	37	34.6	30	30
M22	6	40	39.2	33	34
M24	6	45	41.5	36	36
M30	6	58	53.1	45	46

**Ordering Code (example):**

Hexagon Collar Nut, DIN 6331 = 2140.33.  
M12 = 12  
Order No = 2140.33.12



2140.34.



**Material:**

Heat-treated  
Strength 1200–1400 N/mm<sup>2</sup>

2140.34. Washers, DIN 6340

M	d <sub>1</sub>	d <sub>2</sub>	s
M8	8.4	23	4
M10	10.5	28	4
M12	13	35	5
M14	15	40	5
M16	17	45	6
M18	19	45	6
M20	21	50	6
M22	23	50	8
M24	25	60	8
M30	31	68	10

**Ordering Code (example):**

Washer, DIN 6340 = 2140.34.  
M10 = 10  
Order No = 2140.34.10

# FIBRO

2140.30.

T-Head Bolts, DIN 787

## 2140.30. T-Head Bolts, DIN 787

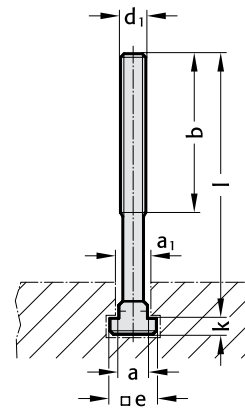
a <sub>1</sub>	a	b	d <sub>1</sub>	e	k	l
8	7.7	22	M8	13	6	32
8	7.7	35	M8	13	6	50
8	7.7	50	M8	13	6	80
10	9.7	30	M10	15	6	40
10	9.7	45	M10	15	6	63
10	9.7	60	M10	15	6	100
12	11.7	35	M12	18	7	50
12	11.7	40	M12	18	7	63
12	11.7	55	M12	18	7	80
12	11.7	75	M12	18	7	125
12	11.7	120	M12	18	7	200
14	13.7	35	M12	22	8	50
14	13.7	45	M12	22	8	63
14	13.7	55	M12	22	8	80
14	13.7	75	M12	22	8	125
14	13.7	120	M12	22	8	200
16	15.7	45	M14	25	9	63
16	15.7	65	M14	25	9	100
16	15.7	125	M14	25	9	160
16	15.7	150	M14	25	9	250
16	15.7	45	M16	25	9	63
16	15.7	55	M16	25	9	80
16	15.7	65	M16	25	9	100
16	15.7	100	M16	25	9	160
16	15.7	125	M16	25	9	200
16	15.7	150	M16	25	9	250
18	17.7	45	M16	28	10	63
18	17.7	55	M16	28	10	80
18	17.7	65	M16	28	10	100
18	17.7	100	M16	28	10	160
18	17.7	125	M16	28	10	200
18	17.7	150	M16	28	10	250
20	19.7	55	M20	32	12	80
20	19.7	65	M20	32	12	100
20	19.7	85	M20	32	12	125
20	19.7	110	M20	32	12	160
20	19.7	125	M20	32	12	200
20	19.7	150	M20	32	12	250
20	19.7	190	M20	32	12	315
22	21.7	55	M20	35	14	80
22	21.7	65	M20	35	14	100
22	21.7	85	M20	35	14	125
22	21.7	110	M20	35	14	160
22	21.7	125	M20	35	14	200
22	21.7	150	M20	35	14	250
22	21.7	190	M20	35	14	315
24	23.7	70	M24	40	16	100
24	23.7	85	M24	40	16	125
24	23.7	110	M24	40	16	160
24	23.7	125	M24	40	16	200
24	23.7	150	M24	40	16	250
24	23.7	190	M24	40	16	315
24	23.7	240	M24	40	16	400
28	27.7	70	M24	44	18	100
28	27.7	85	M24	44	18	125
28	27.7	110	M24	44	18	160
28	27.7	125	M24	44	18	200
28	27.7	150	M24	44	18	250
28	27.7	190	M24	44	18	315
28	27.7	240	M24	44	18	400
36	35.6	80	M30	54	22	125
36	35.6	110	M30	54	22	160
36	35.6	135	M30	54	22	200
36	35.6	150	M30	54	22	250
36	35.6	200	M30	54	22	315
36	35.6	300	M30	54	22	500

### Ordering Code (example):

T-Head Bolt, DIN 787	=	2140.30.
d <sub>1</sub> = M14	=	14.
a <sub>1</sub> = 16 mm	=	16.
l = 160 mm	=	160
Order No	=	2140.30.14.16.160



2140.30.



### Material:

Forged, T-slot milled,  
rolled thread

M 8 – M12 heat-treated to strength class 10.9

M14 – M30 heat-treated to strength class 8.8

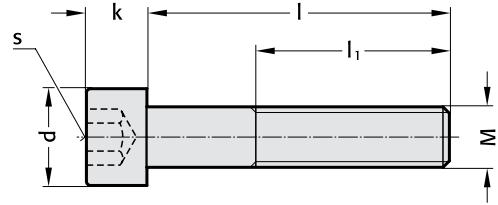
Hexagon Socket Head Cap Screws,  
DIN EN ISO 4762  
Strength class 8.8

FIBRO

2192.10.



2192.10.



2192.10. Cap Screws, DIN EN ISO 4762

Strength class 8.8

M	l	l <sub>1</sub>	d	k	s	M	l	l <sub>1</sub>	d	k	s
4	12	10	7	4	3	16	40	34	24	16	14
4	16	14	7	4	3	16	45	39	24	16	14
4	20	18	7	4	3	16	50	44	24	16	14
4	25	23	7	4	3	16	55	49	24	16	14
5	20	18	8.5	5	4	16	60	54	24	16	14
5	25	23	8.5	5	4	16	100	44	24	16	14
5	30	22	8.5	5	4	20	50	42	30	20	17
6	16	13	10	6	5	20	60	52	30	20	17
6	20	17	10	6	5	20	70	62	30	20	17
6	25	22	10	6	5	20	90	52	30	20	17
6	30	27	10	6	5	20	120	52	30	20	17
6	35	24	10	6	5	24	60	51	36	24	19
6	40	24	10	6	5	24	70	61	36	24	19
6	45	24	10	6	5	24	80	71	36	24	19
6	50	24	10	6	5	24	120	60	36	24	19
6	55	24	10	6	5	24	140	60	36	24	19
6	60	24	10	6	5	30	140	72	72	20	22
6	70	24	10	6	5						
6	80	24	10	6	5						
6	90	24	10	6	5						
8	16	12	13	8	6						
8	20	16	13	8	6						
8	25	21	13	8	6						
8	30	26	13	8	6						
8	35	31	13	8	6						
8	40	28	13	8	6						
8	45	28	13	8	6						
8	50	28	13	8	6						
8	60	28	13	8	6						
10	16	11	16	10	8						
10	20	15	16	10	8						
10	25	20	16	10	8						
10	30	25	16	10	8						
10	35	30	16	10	8						
10	40	35	16	10	8						
10	50	32	16	10	8						
10	60	32	16	10	8						
12	25	20	18	12	10						
12	30	25	18	12	10						
12	35	30	18	12	10						
12	40	35	18	12	10						
12	45	40	18	12	10						
12	50	45	18	12	10						
12	70	36	18	12	10						
12	80	36	18	12	10						
16	30	24	24	16	14						
16	35	29	24	16	14						

Ordering Code (example):

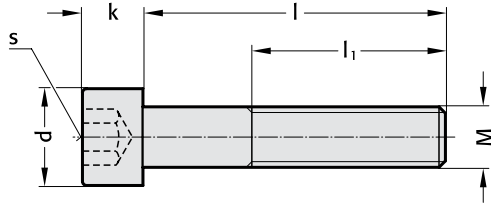
Cap Screw = 2192.10  
 Thread M8 = .08  
 Length 50 mm = .050  
 Order No = 2192.10.08.050

**FIBRO**

2192.12.

Hexagon Socket Head Cap Screws,  
DIN EN ISO 4762  
Strength class 12.9

2192.12.



2192.12. CapScrews, DIN EN ISO 4762

Strength class 12.9

M	l	l <sub>1</sub>	d	k	s	M	l	l <sub>1</sub>	d	k	s	M	l	l <sub>1</sub>	d	k	s
3	8	6	5.5	3	2.5	10	100	32	16	10	8	20	120	52	30	20	17
4	10	8	7	4	3	10	110	32	16	10	8	20	130	52	30	20	17
6	10	7	10	6	5	10	120	32	16	10	8	20	140	52	30	20	17
6	20	17	10	6	5	10	130	32	16	10	8	20	150	52	30	20	17
6	25	22	10	6	5	10	150	32	16	10	8	20	160	52	30	20	17
6	30	27	10	6	5	10	180	32	16	10	8	20	180	52	30	20	17
6	35	24	10	6	5	10	220	32	16	10	8	20	190	52	30	20	17
6	40	24	10	6	5	12	40	35	18	12	10	20	200	52	30	20	17
6	45	24	10	6	5	12	45	40	18	12	10	20	220	52	30	20	17
6	50	24	10	6	5	12	50	45	18	12	10	20	230	52	30	20	17
6	55	24	10	6	5	12	55	36	18	12	10	20	240	52	30	20	17
6	60	24	10	6	5	12	60	36	18	12	10	20	260	52	30	20	17
6	70	24	10	6	5	12	70	36	18	12	10	20	280	52	30	20	17
6	80	24	10	6	5	12	80	36	18	12	10	20	300	52	30	20	17
6	85	24	10	6	5	12	90	36	18	12	10	24	130	60	36	24	19
6	90	24	10	6	5	12	100	36	18	12	10	24	140	60	36	24	19
6	100	24	10	6	5	12	110	36	18	12	10	24	150	60	36	24	19
6	160	24	10	6	5	12	120	36	18	12	10	24	160	60	36	24	19
6	200	24	10	6	5	12	130	36	18	12	10	24	180	60	36	24	19
8	16	12	13	8	6	12	140	36	18	12	10	24	200	60	36	24	19
8	30	26	13	8	6	12	150	36	18	12	10						
8	35	31	13	8	6	12	180	36	18	12	10						
8	40	28	13	8	6	12	220	36	18	12	10						
8	45	28	13	8	6	16	40	34	24	16	14						
8	50	28	13	8	6	16	50	44	24	16	14						
8	55	28	13	8	6	16	60	54	24	16	14						
8	60	28	13	8	6	16	65	44	24	16	14						
8	70	28	13	8	6	16	70	44	24	16	14						
8	75	28	13	8	6	16	80	44	24	16	14						
8	80	28	13	8	6	16	90	44	24	16	14						
8	90	28	13	8	6	16	100	44	24	16	14						
8	100	28	13	8	6	16	110	44	24	16	14						
8	110	28	13	8	6	16	120	44	24	16	14						
8	120	28	13	8	6	16	130	44	24	16	14						
10	30	25	16	10	8	16	140	44	24	16	14						
10	35	30	16	10	8	16	150	44	24	16	14						
10	40	35	16	10	8	16	160	44	24	16	14						
10	45	32	16	10	8	16	180	44	24	16	14						
10	50	32	16	10	8	16	200	44	24	16	14						
10	55	32	16	10	8	16	220	44	24	16	14						
10	60	32	16	10	8	16	240	44	24	16	14						
10	65	32	16	10	8	16	260	44	24	16	14						
10	70	32	16	10	8	16	280	44	24	16	14						
10	75	32	16	10	8	16	300	44	24	16	14						
10	80	32	16	10	8	20	100	52	30	20	17						
10	90	32	16	10	8	20	110	52	30	20	17						

Ordering Code (example):

Cap Screw = 2192.12  
 Thread M8 = .08  
 Length 100 mm = .100  
 Order No = 2192.12.08.100

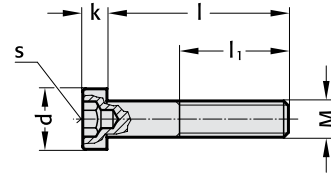
# Hexagon Socket Head Cap Screws, DIN 6912 with low profile head

**FIBRO**

2192.20.



2192.20.



## 2192.20. Cap screws, DIN 6912

Strength class 8.8 = Code No 0.

M	l	l <sub>1</sub>	d	k	s
4	8	6	7	2.8	3
4	10	8	7	2.8	3
4	12	10	7	2.8	3
4	16	14	7	2.8	3
4	20	14	7	2.8	3
4	25	14	7	2.8	3
4	30	14	7	2.8	3
4	35	14	7	2.8	3
4	40	14	7	2.8	3
5	8	5.4	8.5	3.5	4
5	10	7.4	8.5	3.5	4
5	12	9.4	8.5	3.5	4
5	20	17.4	8.5	3.5	4
5	25	16	8.5	3.5	4
5	30	16	8.5	3.5	4
5	35	16	8.5	3.5	4
5	40	16	8.5	3.5	4
6	8	4.3	10	4	5
6	10	6.3	10	4	5
6	12	8.3	10	4	5
6	16	12.3	10	4	5
6	18	14.3	10	4	5
6	20	16.3	10	4	5
6	25	21.3	10	4	5
6	30	18	10	4	5
6	35	18	10	4	5
6	40	18	10	4	5
6	45	18	10	4	5
6	50	18	10	4	5
8	12	7.3	13	5	6
8	16	11.3	13	5	6
8	18	13.3	13	5	6
8	20	15.3	13	5	6
8	25	20.3	13	5	6
8	30	22	13	5	6
8	35	22	13	5	6
8	40	22	13	5	6
8	45	22	13	5	6
8	50	22	13	5	6
8	60	22	13	5	6
10	20	14.5	16	6.5	8
10	25	19.5	16	6.5	8
10	30	25.5	16	6.5	8
10	60	26	16	6.5	8
10	80	26	16	6.5	8
10	90	26	16	6.5	8
12	30	20	18	7.5	10
12	35	25	18	7.5	10

### Ordering Code (example):

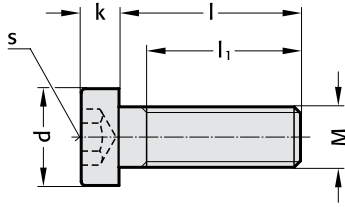
Cap Screw = 2192.20  
 Thread M6 = .06  
 Length 25 mm = .025  
 Order No = 2192.20.06.025

**FIBRO**

2192.40.

Hexagon Socket Head Cap Screw,  
DIN 7984  
with low profile head

2192.40.



### 2192.40. Cap screws, DIN 7984

Strength class 8.8 = Code No 0.

M	l	l <sub>1</sub>	d	k	s
4	8	5.9	7	2.8	2.5
4	10	7.9	7	2.8	2.5
4	12	9.9	7	2.8	2.5
4	16	13.9	7	2.8	2.5
4	20	17.9	7	2.8	2.5
4	25	14	7	2.8	2.5
4	30	14	7	2.8	2.5
4	35	14	7	2.8	2.5
4	40	14	7	2.8	2.5
5	8	5.6	8.5	3.5	3
5	10	7.6	8.5	3.5	3
5	12	9.6	8.5	3.5	3
5	16	13.6	8.5	3.5	3
5	20	17.6	8.5	3.5	3
5	25	22.6	8.5	3.5	3
5	30	16	8.5	3.5	3
5	35	16	8.5	3.5	3
5	40	16	8.5	3.5	3
6	10	7	10	4	4
6	12	9	10	4	4
6	16	13	10	4	4
6	20	17	10	4	4
6	25	22	10	4	4
6	30	18	10	4	4
6	35	18	10	4	4
6	40	18	10	4	4
8	12	8.25	13	5	5
8	16	12.25	13	5	5
8	20	16.25	13	5	5
8	25	21.25	13	5	5
8	30	26.25	13	5	5
8	35	22	13	5	5
8	40	22	13	5	5
8	45	22	13	5	5
8	50	22	13	5	5
8	60	22	13	5	5
10	20	15.5	16	6	7
10	25	20.5	16	6	7
10	30	25.5	16	6	7
10	60	26	16	6	7
10	80	26	16	6	7
10	90	26	16	6	7
12	30	24.75	18	7	8
12	35	29.75	18	7	8

### Ordering Code (example):

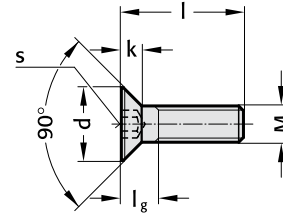
Cap Screw = 2192.40  
Thread M6 = .06  
Length 20 mm = .020  
Order No = 2192.40.06.020

**Hexagon Socket Countersunk Head Cap Screws,  
DIN 7991/ISO 10642**

**2192.30.**



2192.30.



**2192.30. Countersunk Head Cap Screws DIN 7991/ISO 10642**

Strength class 8.8 = Code No 0.

M	l	l <sub>g</sub>	d	k	s
3	6	3.2	6	1.7	2
3	8	3.2	6	1.7	2
3	10	3.2	6	1.7	2
4	8	4.4	8	2.3	2.5
5	10	5.2	10	2.8	3
5	12	5.2	10	2.8	3
6	10	6.3	12	3.3	4
6	12	6.3	12	3.3	4
6	16	6.3	12	3.3	4
6	20	6.3	12	3.3	4
6	25	6.3	12	3.3	4
8	16	8.2	16	4.4	5
8	20	8.2	16	4.4	5
8	25	8.2	16	4.4	5
10	20	10	20	5.5	6
10	25	10	20	5.5	6
12	30	11.8	24	6.5	8

**Ordering Code (example):**

Countersunk = 2192.30  
 Head Cap Screw  
 Thread M6 = .06  
 Length 16 mm = .016  
 Order No = 2192.30.06.016



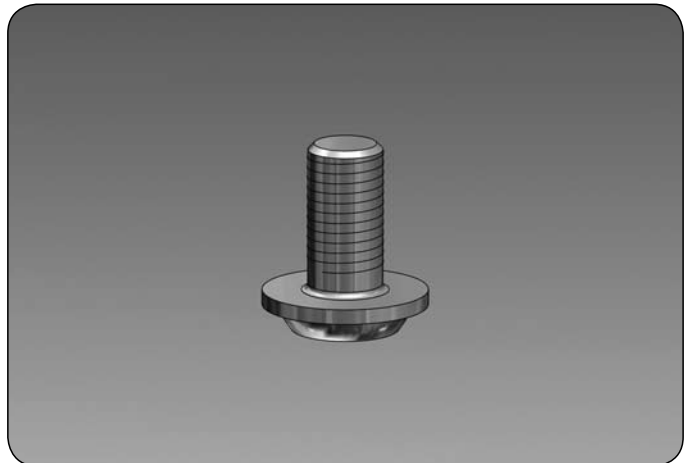
# FIBRO

2192.61.

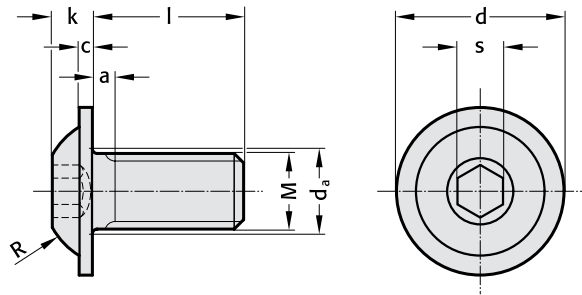
## Flat Mushroom Head Screws with hexagon socket

### 2192.61. Flat mushroom head screws

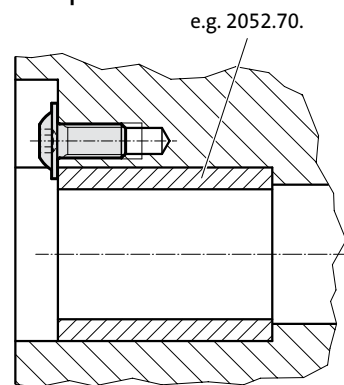
M	l	k	s	c	a	d <sub>a</sub>	d	R
6	12	3.2	4	1.2	2	7	13.27	5.6
6	16	3.2	4	1.2	2	7	13.27	5.6
6	20	3.2	4	1.2	2	7	13.27	5.6
8	16	4.3	5	1.5	2.5	9.2	17.77	7.5
8	20	4.3	5	1.5	2.5	9.2	17.77	7.5
8	25	4.3	5	1.5	2.5	9.2	17.77	7.5
10	20	5.3	6	1.75	3	11.2	22.18	10



2192.61.



### Installation example



### Material:

Strength class 10.9 = Code No 1.

### Ordering Code (example):

Flat mushroom head screw	=	2192.61
Thread	8 mm	= .08
Length	16 mm	= .016
Order No		= 2192.61.08.016

Clamping Tool Sets

2140.01.01.




Clamping tool set

with clamping jaws and screw paste.

The clamping tool sets are designed for machine tools with bedplates that have fixing slots and they contain all the necessary components for fast clamping of tools, devices and workpieces. All parts are interchangeable and complementary to each other. They are made of high tensile steel to DIN or company standards. Bolt items strength class 8 or 10. The wooden box has a detachable hinged cover.

2140.01.01.

Order No		2140. 01.01.10.10			2140. 01.01.12.12			2140. 01.01.12.14			2140. 01.01.14.16			2140. 01.01.16.16			2140. 01.01.16.18				
Contents		M 10×10			M 12×12			M 12×14			M 14×16			M 16×16			M 16×18				
Universal- clamping units	Size	1	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3			
	No.	4	4	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4			
Step clamps	Size	11×80			14×100			14×100			14×100		14×160		18×125			18×125			
	No.	4			4			4			2		4		4			4			
Screws for fixing slots DIN 787 (Order No 2140.30.)	Lenght	100	63	40	125	80	50	125	80	50	63	100	160	160	100	63	160	100	63		
	No.	4	4	2	4	4	2	4	4	2	2	4	4	4	4	2	4	4	2		
Pin screws	Lenght	80			100			100			125			125			125				
	No.	4			4			4			4			4			4				
Hexagonal nuts 1,5 d deep	Size	M10			M12			M12			M14			M16			M16				
	No.	6			6			6			6			6			6				
Conical sockets, similar to DIN	Size	M10			M12			M12			M14			M16			M16				
	No.	6			6			6			6			6			6				
Extension nuts 3 d deep	Size	M10			M12			M12			M14			M16			M16				
	No.	4			4			4			4			4			4				
Clamping jaws, tye Bulle	Size	12			12			14			16			16			18				
	No.	4			4			4			4			4			4				
T-slot scraper	Size	-			-			14-20			14-20			14-20			14-20				
	No.	-			-			1			1			1			1				
Ring/open ended spanners	Size	16×16			18×18			18×18			22×22			24×24			24×24				
	No.	1			1			1			1			1			1				
Screw paste	No.																		1		

**2140.01.02.**


**Clamping Tool Sets**

**Clamping tool sets**

With spring-mounted clamp holder and screw paste.  
Description as 2140.01.01 but without clamping jaws.  
Contains 4 spring-mounted clamp holders instead.



**2140.01.02.**

Order No		2140. 01.02.10.10	2140. 01.02.12.12	2140. 01.02.12.14	2140. 01.02.16.16	2140. 01.02.16.18	2140. 01.02.20.20	2140. 01.02.20.22	2140. 01.02.20.24
Contents		M 10×10	M 12×12	M 12×14	M 16×16	M 16×18	M 20×20	M 20×22	M 20×24
Universal clamping units	Size	1 2 3	2 3	2 3	2 3	2 3	2 3	2 3	2 3
	No.	4 4 2	4 4	4 4	4 4	4 4	4 4	4 4	4 4
Step clamps	Size	11×80	14×100	14×100	18×125	18×125	22×160	22×160	22×160
	No.	4	4	4	4	4	4	4	4
Screws for fixing slots DIN 787 (Order no. 2140.30.)	Lenght	100 63	125 80	125 80	160 100	160 100	200 125	200 125	—
	No.	4 4	4 4	4 4	4 4	4 4	4 4	4 4	—
Pin screws	Lenght	80	100	100	125	125	125	125	200 125
	No.	4	4	4	4	4	4	4	4 8
Hexagonal nuts 1.5 d deep	Size	M10	M12	M12	M16	M16	M20	M20	M20
	No.	6	4	4	4	4	6	6	6
Conical sockets, similar to DIN	Size	M10	M12	M12	M16	M16	M20	M20	M20
	No.	6	6	6	6	6	6	6	6
Extension nuts 3 d deep	Size	M10	M12	M12	M16	M16	M20	M20	M20
	No.	4	4	4	4	4	4	4	4
T-slot scraper	Size	—	—	14-20	14-20	14-20	14-20	22-32	22-32
	No.	—	—	1	1	1	1	1	1
Ring/open ended spanners	Size	16×16	18×18	18×18	24×24	24×24	30×30	30×30	30×30
	No.	1	1	1	1	1	1	1	1
Nuts for fixing slots	Size	—	—	—	—	—	—	—	M 20×24
	No.	—	—	—	—	—	—	—	8
Clamp holders	Size	1	2	2	3	3	4	4	4
	No.	4	4	4	4	4	4	4	4
Screw paste	No.				1				



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A Die Sets

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B Precision Ground Plates and Flat Bars

---

C Lifting and Clamping Devices

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**D Guide Elements**

Pillars, Bushes, Mounting Flanges,  
Ball Cages, Oilless Guide Elements

---

E Ground Precision Components

---

F Springs

---

G Elastomer-Bars, -Sheets, -Sections

---

H FIBRO Chemical Tooling Aids

---

J Peripheral Equipment

---

K Cam Units

---

L Standard Parts for Mould Making

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# Guide Elements

## Guide Elements

The great importance of exact alignment between punches and matrices in stamping dies has been recognized widely. The accuracy and maintenance of this alignment depends entirely on the quality and wear resistance of the guide elements.

As a consequence of recent rapid developments in stamping techniques it has also been accepted that conventional bush-pillar sets of casehardened steel can no longer stand up to the demands of the modern press shop with its more sophisticated dies, ever faster presses and the stresses in today's carbide tools.

The introduction of FIBRO Guide Elements made available an extensive range, principally based on superlative quality, and comprising some new, highly advanced bearing materials as well as novel assembly techniques of superior accuracy.

Recent additions have further broadened this range, especially in regard of demountable guiding components.

All FIBRO Guide Bushes for permanent fixing are laid out for epoxy-bonding. This highly reliable method ensures unparalleled accuracy together with the elimination of shrink allowances and rectification honing.

Ball Bearing Guides principally excel in undemanding maintenance and through the complete absence of bearing play. Their easy movement on the bench makes them very popular with die makers. Highest stroking speeds present no problems. But common to all ball bearings there remains the characteristic weakness to shock loads, the danger of ball impingement. To some extent this can be compensated for by oversized pillar diameters and the use of four-pillar die sets.

The group of Sliding-Type Guides affords much greater stability, partly due to the damping effect of the all-important, vital oil film . . . which in the past used to be threatened always by the vagaries of lubrication service and the propensity to rupture at high frequencies of travel reversal.

Extensive protection against these perils is offered by FIBRO Sintered Ferrite Bushes. Used in most of our sliding guide systems, their advanced technology comprises:

- porous structure, vacuum-filled with oil
- carbonitrided surface of extreme hardness
- outstanding friction properties
- exceptional wear-resistance
- thousands of oil-retaining porosity pockets.

In combination with our mirror-finished pillars, ferrite guide bushes represent a guiding system of altogether superior properties. A system that virtually precludes seizing under all but the most extreme running conditions.









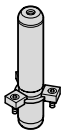





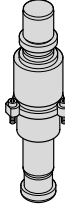
Beyond such limitations there exist combinations of high velocities with very short strokes where even ferrite bushes cannot guarantee permanence of the oil film.

Here, the rigidity of the sliding guide has to be weighed up against the safety of ball bearings: die set guides are not entirely without problems yet! But at FIBRO we find ourselves very busy indeed with the remainder.

Technical progress may incur modifications without notice.

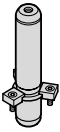

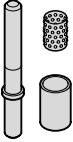
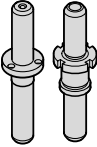



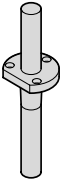

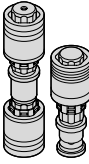






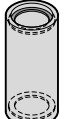








**FIBRO GUIDE ELEMENTS – DESIGNED AND PRODUCED BY PEOPLE IN PURSUIT OF PERFECTION.**

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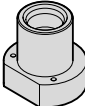


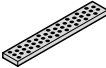
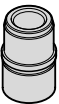
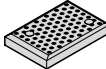



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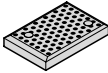
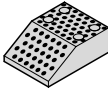
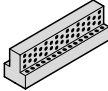
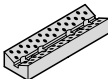
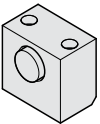
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






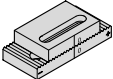

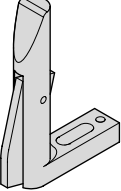


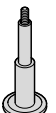
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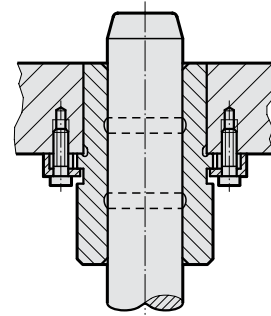
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### FIBRO Precision Sliding Guides – Carbonitrided Sintered Ferrite Bushes

These guides employ bushes made from sintered ferrite of high purity with carbonitrided surface. Bearing surfaces are fine-ground.

The sintered ferrite has a porosity content of 18–20 % by volume, vacuum filled with special lubricant FIBROLIT LD. As additional long term lubrication it is recommended to fill up the groove in the bushing with FIBROLIT LD 280.34 – see page H 14. Even under arduous running conditions, this material can be relied upon for good protection against oil film rupture.

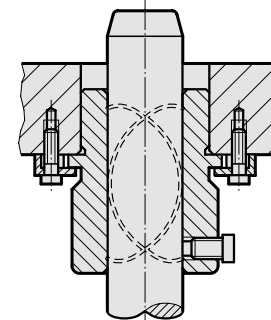
Under no circumstances must molybdenum disulfite be added to the lubricant.  
For bearing clearance ranges – see page D 11.



### FIBRO Precision Sliding Guide, bronze-coated

consists of a steel body with bronze-coated running surface with helical oil groove and a grease nipple for lubrication.

The steel body guarantees excellent resistance to breaking, even when subject to high loading at the edges.



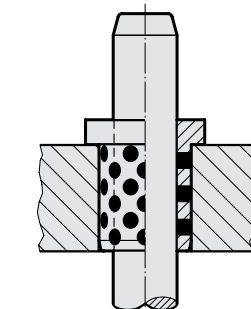
### FIBRO Sliding Bearings with Non-Liquid Lubricant

The pockets containing the non-liquid lubricant occupy some 25 to 30 per cent of the bearing surface consisting of a bronze matrix.

After an initial oil lubrication on assembly, these elements are maintenance-free.

Wherever there is a demand for non-susceptibility against impact, contamination and heat, FIBRO Maintenance-Free Bearings find their ideal application.

We recommend to apply the tolerance classes H7/f6 to bush/pillar combinations using these elements.

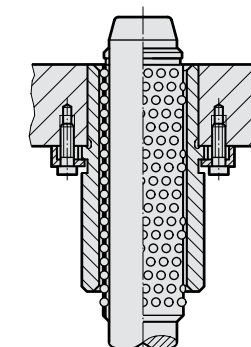


### FIBRO Precision Ball Bearing Guides

Careful manufacture at narrowest tolerances, and exactly the right amount of preloading\* result in a play-free guide element of exceptional performance potential. Our superfinished running surfaces further enhance the advantages of ball bearing guides. Toolmakers favour ball bearing guides because of their free movement on the bench. FIBRO ball bearing guides have brass ball cages – a material giving optimum results in stability and ball density.

Despite their unquestionable reliability at high speeds in particular, ball bearing guides with their point contact of the balls remain somewhat sensitive to shock and sustained radial loads. To some extent, generous dimensioning of pillar diameters helps to compensate for this inherent disadvantage.

\* Average preloading:     4 µm on pillars from 8 to 12 mm diameter  
                                    7– 9 µm on pillars from 15 to 16 mm diameter  
                                    9–11 µm on pillars from 18 to 42 mm diameter  
                                    11–13 µm on pillars from 50 to 80 mm diameter



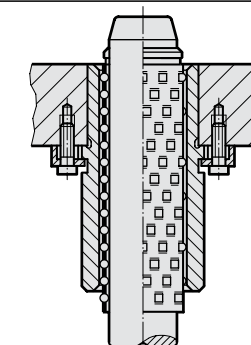
### FIBRO Precision Roller Guides

In comparison to ball bearing guides, FIBRO Roller Guide Elements have considerably higher capacities for radial loads.

The much larger contact area of the rollers permits a significant reduction in preload values. This affords a longer service life of the units.

The following preload values apply to FIBRO Roller Guides:

For static loads/low velocities	or dynamic loads/high velocities	
pillar diameters up to	pillar diameters up to	
Ø 25 = 2,5 µm	Ø 25 = 1,5 µm	
Ø 30/32 = 3 µm	Ø 30/32 = 2 µm	Use only pairing class
Ø 40–50 = 3,5 µm	Ø 40–50 = 2,5 µm	guide pillar red = .30
Ø 63 = 4 µm	Ø 63 = 3 µm	guide bush yellow = .10



# Pairing Classification

## Guide Pillars with sliding sintered

## Guide Pillars with Ball Bearing Bushes

Cutting clearance	Sliding guide bearing clearance	Ball bearing preloading		
small	small	large	Piece parts with small tolerances, closely specified cut edge properties and contours – also parts from thin material	Pairing 1
medium	medium	medium	Piece parts from sheet thicker than 1 mm – also preferably for progression dies	Pairing 2
large	large	small	Where demands on edges and burrs are not stringent; note that large die clearances require smaller shearing forces	Pairing 3

Selection of punch-matrix clearance is largely determined by piece part characteristics such as percentage of sheared land versus breakaway, but also by demands on burr formation. Further criteria are: properties of piece part materials, conditions of the tool as well as the condition of the eccentric press.

Colour coding by painted dots	Sliding guide				Ball bearing			
	Pillar		Bush		Pillar		Bush	
	Colour	Order No	Colour	Order No	Colour	Order No	Colour	Order No
Pairing 1	yellow	.10	yellow	.10	yellow	.10	red	.30
	green	.20	yellow	.10	yellow	.10	green	.20
					green	.20	red	.30
Pairing 2	green	.20	green	.20	yellow	.10	yellow	.10
	red	.30	yellow	.10	green	.20	green	.20
	yellow	.10	green	.20	red	.30	red	.30
Pairing 3	red	.30	red	.30	green	.20	yellow	.10
	green	.20	red	.30	red	.30	green	.20
	yellow	.10	red	.30	red	.30	yellow	.10

Selection Criteria:  
die clearance – stock thickness – material

**Note:**

Please note that tight bearing clearances are normally unsuitable for 4-pillar die sets. In general, wherever retainer bore geometry is not absolutely perfect, pairings 2 and 3 must be chosen. The pairing classification does not signify differences in quality, rather a selection of the necessary bearing clearance in the case of guide pillars or preloading in the case of ball bearings (see also chart on page D 11).

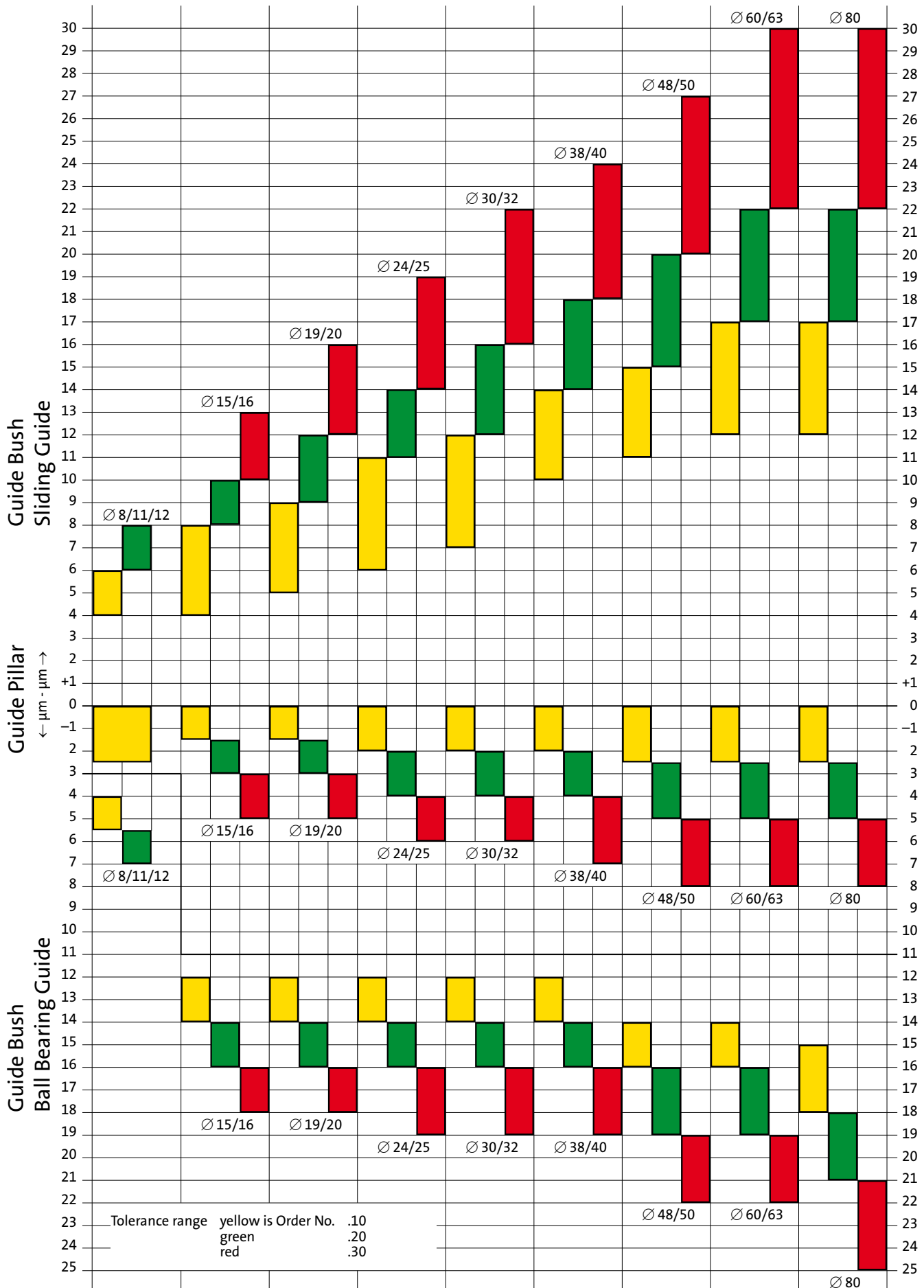
**Ordering Code (example):**

Guide Pillar, tolerance range 1, yellow = 202.19.040.260.10 or green is then .20  
 Sliding guide, tolerance range 1, yellow = 2081.31.040.10

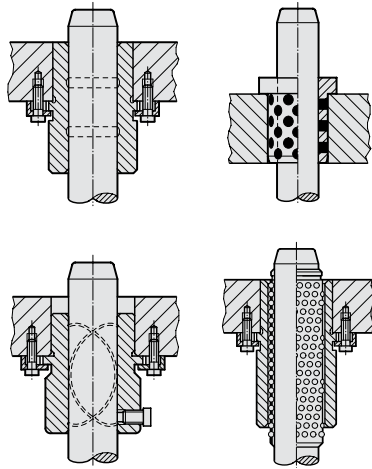
# Pairing Classification

## Guide Pillars with sliding sintered

## Guide Pillars with Ball Bearing Bushes



Selection matrix  
Guide Pillars - Guide Bushes



Guide Bushes			Tolerance range	Guide Pillars											
				2021.50. 2021.19. 2021.58. 2021.39.	2021.44. 2021.46. 2021.55.	2020.64.	2020.60.	2022.25.	2022.16.45.	2022.12. 2022.15. 2022.16. 2022.17. 2022.29.	2021.29. 202.31.				
				.30	.20	.10	h3	.30	.20	.10	h5	-0.010 -0.025	f6	h4	
Ball bearing guide bushes Mounting flanges with ball bearing guide bushes	2061.44.	2081.44.	.10	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	×	×	×	×
	2061.47.	2081.45.		● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	×	×	×	×
	2091.67.	2081.47.	.20	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	×	×	×	×
	2091.44.	2081.49.		● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	×	×	×	×
Guide bushes, sintered ferrite Mounting flanges with guide bushes, sintered ferrite	2031.41.	210.44.	.30	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	×	×	×	×	
	2031.44.	210.45.		● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	×	×	×	×	
	2031.31.	2081.31.	.10	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	×	×	×	×	×	×	×	×	●
	2031.34.	2081.32.		● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	×	×	×	×	×	×	×	×	●
Guide bushes ECO-LINE bronze with solid lubrication rings	2081.71.	2091.71.	H6	●	○	×	×	×	×	×	×	×	×	×	●
	2081.74.	2091.72.		●	○	×	×	×	×	×	×	×	×	×	●
	2081.75.	2091.74.		●	○	×	×	×	×	×	×	×	×	×	●
Guide bushes bronze coated	2081.81.	210.85.	IT5	●	●	○	×	×	×	×	×	×	×	×	●
	2081.84.	2081.85.		●	●	○	×	×	×	×	×	×	×	×	●
Guide bushes ECO-LINE bronzeplated	2081.91.	2081.94.	H5	●	○	×	×	×	×	×	×	×	×	×	●
	2081.95.			●	○	×	×	×	×	×	×	×	×	×	●
Guide bushes with solid lubrication Mounting flanges with Guide bushes with solid lubrication	2085.70.	2031.70.	H7	●	×	×	×	×	×	×	●	●	●	●	
	2085.72.	2087.71.		●	×	×	×	×	×	×	●	●	●	●	
	2087.70.	2087.72.		●	×	×	×	×	×	×	●	●	●	●	
	2087.72.	2087.73.		●	×	×	×	×	×	×	●	●	●	●	
Guide bushes with solid lubrication	2082.70.	2082.71.	E7	●	●	●	×	×	×	×	●	●	●	●	
	2085.71.			●	●	●	×	×	×	×	●	●	●	●	
Guide bushes with solid lubrication	2086.70.	2032.70.	F7	●	●	×	×	×	×	×	●	●	●	●	
	2052.70.			●	●	×	×	×	×	×	●	●	●	●	
Guide bushes with solid lubrication	2102.70.	2102.71.	G7	●	●	×	×	×	×	×	●	●	●	●	
				●	●	×	×	×	×	×	●	●	●	●	
Guide bushes with solid lubrication	2086.71.		C9	●	●	●	×	×	×	×	●	●	●	●	
				●	●	●	×	×	×	×	●	●	●	●	

- = suitable
- <sup>1</sup> = suitable (see page D10/D11)
- = conditionally suitable
- ×

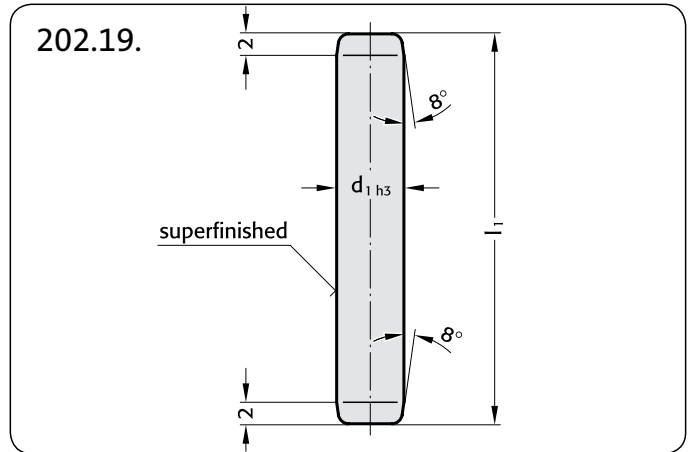
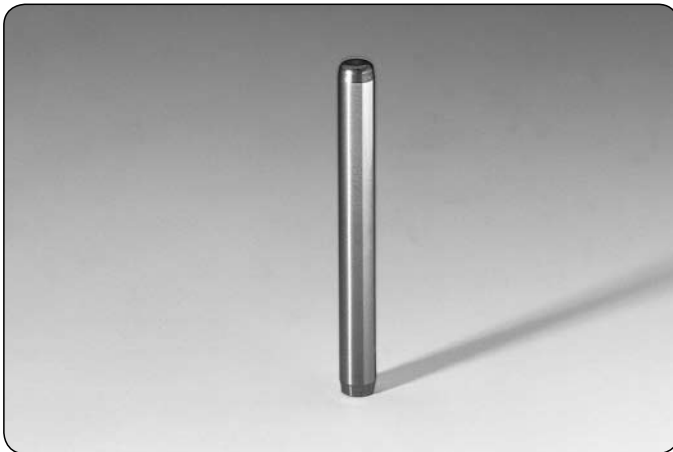
The combinations should be considered as recommendations. Depending on the installation situation and type of use, a previous examination or test is mandatory, since different combinations may result in varying clearance (slide guide) or pretension (ball guides) values.



A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.

Guide Pillars,  
small dimensions

202.19.



**Material:** alloy tool steel  
**Hardness:** hardened to 60 + 4 HRC  
**Remarks:** or from stainless steel on request  
**Hardness:** hardened to 56 + 2 HRC  
**Execution:** fine-ground and superfinished

**Ordering Code (example):**  
 Guide Pillar = 202.19.  
 d<sub>1</sub> = 4 mm = 004.  
 l<sub>1</sub> = 80 mm = 080  
 Order No = 202.19.004.080

202.19.

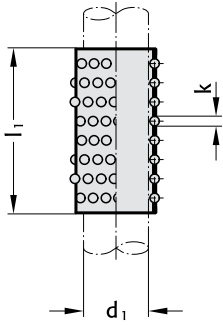
d <sub>1</sub>	3	4	5	6	8
30	●				
40		●	●	●	
50	●	●	●	●	●
60	●	●	●	●	●
80	●	●	●	●	●
100		●	●	●	●
125				●	●
140				●	●
160				●	●

# FIBRO

206.51.  
206.54

## Ball Cages, small dimensions Guide Bushes, small dimensions

206.51.



206.51.

$d_1$	3	4	5	6	8
$k$	1	1	1	1	1
$l_1$	total number of balls				
10	21	21	29	36	
15	35	35	49	61	61
20	49	49	69	69	69
25		64	89	89	89
30			109	109	109
40					149

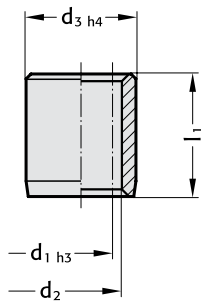
### Material:

Cage: Brass  
Balls: hardened steel (DIN 5401)

### Ordering Code (example):

Ball cage = 206.51.  
 $d_1 = 3$  mm = 003.  
 $l_1 = 15$  mm = 015  
Order No = 206.51.003.015

206.54.



206.54.

$d_1$	3	4	5	6	8
$d_2$	5	6	7	8	10
$d_3$	7	8	10	11	14
$l_1$					
10	●	●	●		
15	●	●	●	●	●
20	●	●	●	●	●
25		●	●	●	●
30			●	●	●
35				●	●
40					●

### Material:

Roller bearing steel 100 Cr 6  
Hardness: hardened to 60 + 4 HRC  
Remarks: available in stainless steel on request

### Execution:

Guide Bush bores  $d_2$   
fine-honed to IT3

### Ordering Code (example):

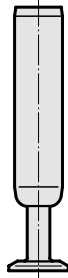
Guide Bush = 206.54.  
 $d_1 = 3$  mm = 003.  
 $l_1 = 20$  mm = 020  
Order No = 206.54.003.020

**Guide Pillars  
DIN 9825/ISO 9182-2**

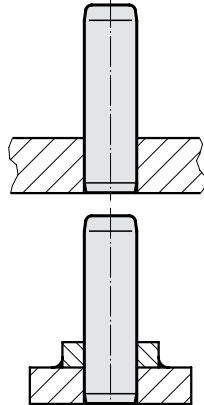
**202.17.  
202.19.**



**202.17.**  
Guide Pillars (∅ 38–63) with Ball Cage Retainer  
Dimensions of ball cage retainer: see page D211.

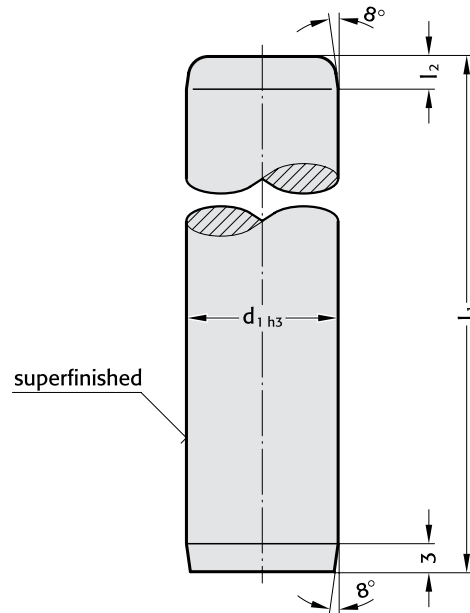


**Mounting Examples**



**202.19.**

**202.17.**  
with Ball Cage Retainer



**Material:** Steel, surface hardened  
**Core strength:**  $\geq 900 \text{ N/mm}^2$   
**Surface Hardness:**  $60 + 3 \text{ HRC}$  (induction hardened)  
**Hardness Penetration:**  $\geq 1,8 \text{ mm}$  (diameter up to 12 mm: throughhardened)

**Execution:** precision ground, superfinished  
**Remarks:** method of manufacturing entails that centre holes are not concentric with O.D.

**202.19.**

$d_1$	10	11	12	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80																			
$l_2$	3	3	3	4	4	4	4	6	6	6	6	6	6	8	8	8	8	8																			
$l_1$	$d_1 < 10$ see page D 12																																				
80																																					
90																				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
100																				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
112																				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
125																				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
140																				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
160																				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
180																				Diameter 10–12 only available in Tolerance range yellow = .10			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
200																							●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
224																							●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
250																							●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
280																							●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
315																							●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
355				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●																			
400				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●																			
450				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●																			
500				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●																			
550				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●																			
600				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●																			
700				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●																			
800				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●																			

**Note:**

Colour Code Combinations/Clearances – see pages D 10 and D 11.

**Ordering Code (example):**

Guide Pillar	= 202.19.	Tolerance range	yellow = .10
$d_1 = 40 \text{ mm}$	= 040.		green = .20
$l_1 = 200 \text{ mm}$	= 200.		red = .30
Tolerance range – yellow	= 10		
Order No	= 202.19.040.200.10		

**Ordering Code (example):**

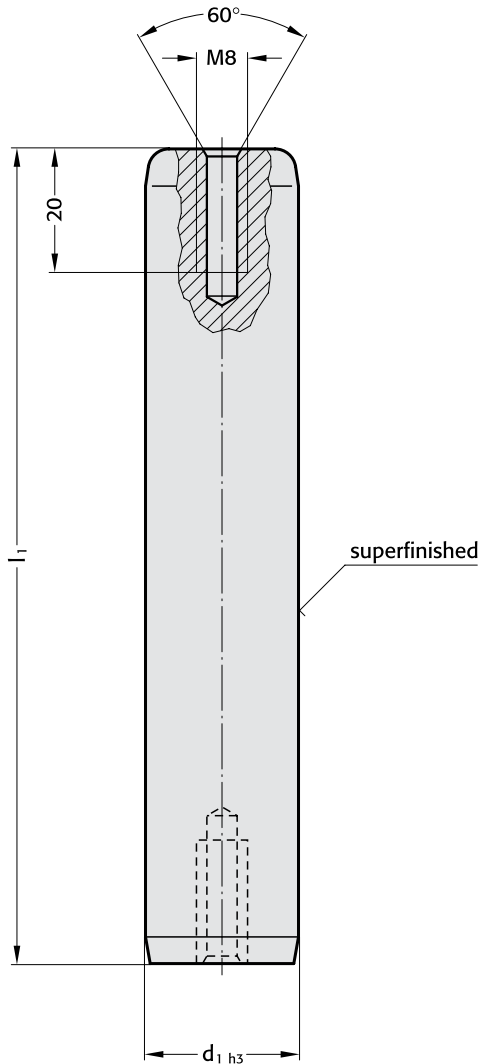
Guide Pillar with Cage retainer	= 202.17.
$d_1 = 40 \text{ mm}$	= 040.
$l_1 = 200 \text{ mm}$	= 200.
Cage holder size 3	= 3.
Tolerance range – yellow	= 10
Order No	= 202.17.040.200.3.10

# FIBRO

202.22. 202.23.  
202.24.

## Guide Pillars ~DIN 9825/~ISO 9182-2 with internal threads

202.22./202.23./202.24.



202.22.



202.23.



202.24.



**Material:** Steel, surface hardened  
**Core strength:**  $\cong 900 \text{ N/mm}^2$   
**Surface Hardness:** 60 + 3 HRC (induction hardened)  
**Hardness Penetration:**  $\cong 1,8 \text{ mm}$

**Execution:** precision ground, superfinished

**Note:** Dimensions of pillar sizes from  $d_1 = 15 \text{ mm}$  see catalogue page D16.  
 Threads identical between the three pillar types.  
 Colour Code Combinations/Clearances – see pages D10 and D11.

Tolerance range – yellow = .10  
 green = .20  
 red = .30

### Ordering Code (example):

Pillar, threaded holes/both ends	=	202.22.
$d_1 = 30 \text{ mm}$	=	030.
$l_1 = 200 \text{ mm}$	=	200.
Tolerance range – green	=	20
Order No	=	202.22.030.200.20

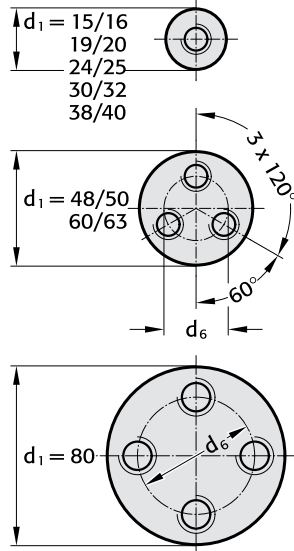
# Guide Pillars Endwise Bolt-On Type ~DIN 9825/~ISO 9182-2 with ball cage retainer

**FIBRO**

202.21.  
202.55.



Hole pattern for column fastening



202.21./202.55. Dimensions on page D16

	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80
d <sub>1</sub>	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80
d <sub>3</sub>	9	11	14	14	18	18	18	18	18	18	18	18	18	18	18
d <sub>4</sub>	17	20	22	22	28	28	28	28	28	28	28	28	28	28	28
d <sub>6</sub>	-	-	-	-	-	-	28	28	34	34	34	34	34	34	34
t	12	14	16	16	20,5	16	20,5	16	20,5	20,5	20,5	20,5	20,5	20,5	20,5
M	8	10	12	12	16	12	16	16	16	16	16	16	16	16	16
cap screw	M8x35	M10x40	M12x40	M12x40	M16x40	3xM12x50	3xM16x60	4xM16x60	3xM12x50	3xM16x60	4xM16x60	3xM12x50	3xM16x60	4xM16x60	4xM16x60
Nm*	21	37	85	85	150	85	150	200	200	200	200	200	200	200	200

\*tightening torque

**Note:**

Colour Code Combinations/Clearances – see pages d 10 and d 11.

Tolerance range – yellow = .10  
green = .20  
red = .30

**Ordering Code (example):**

Guide Pillar similar DIN 9825 = 202.21.

d<sub>1</sub> = 40 mm = 040.

l<sub>1-3</sub> = 200 mm = 200.

Tolerance range – red = 30

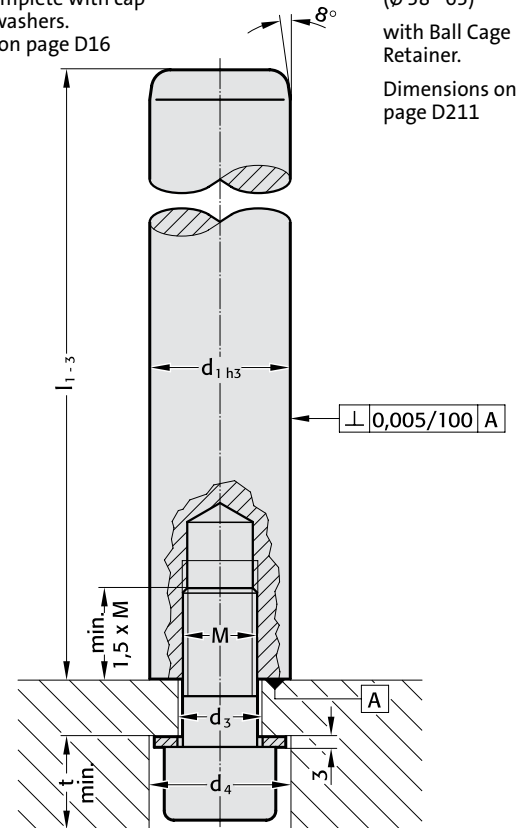
Order No = 202.21.040.200.30

**202.21.**

Guide Pillars for endwise screw retention, complete with cap screws and washers. Dimensions on page D16

**202.55.**

Guide Pillars (Ø 38–63) with Ball Cage Retainer. Dimensions on page D211



**Material:**

Steel, surface hardened

**Core strength:**

≧900 N/mm<sup>2</sup>

**Surface Hardness:**

60+3 HRC (induction hardened)

**Hardness Penetration:**

≧1,8 mm

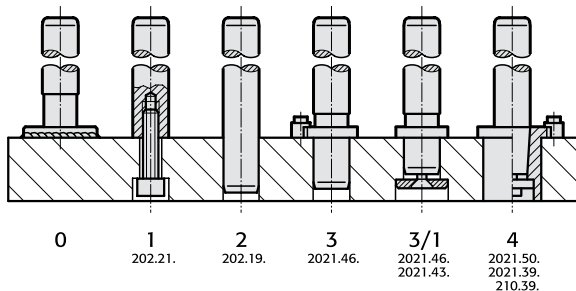
**Execution:**

fine precision ground  
End face square within  
0,005 mm in 100 mm

**Remarks:**

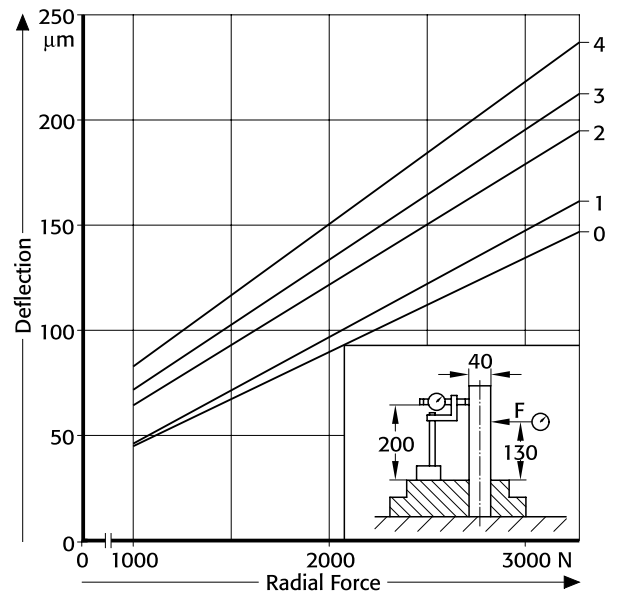
Method of manufacturing entails that centre holes are not concentric with O. D.

The practical application of these pillars demands a certain amount of re-thinking in regard of tool design. Deflection under radially imposed load is shown in the diagram to the right.



**Mounting Instructions:**

Coat head and threads of screws with molybdenum disulfite. Tighten and undo screw twice before final tightening with torque wrench. Tightening torque is shown in the table above.

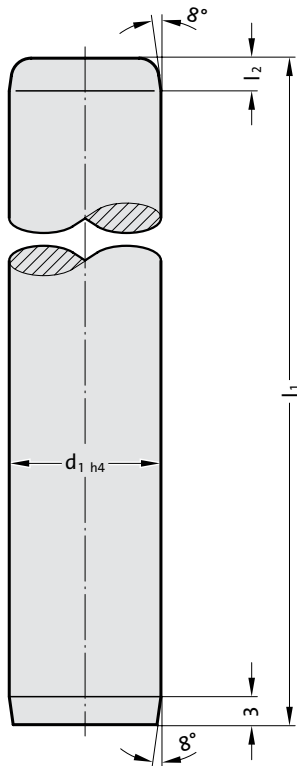


**FIBRO**

*ECO-LINE*  
**Guide Pillars**  
 ~DIN 9825/~ISO 9182-2

202.29.

202.29.



**Material:**

Steel, surface hardened

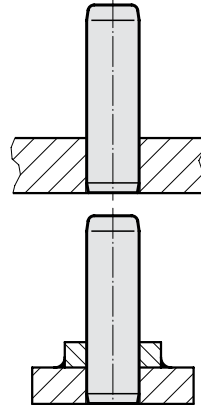
Surface Hardness:  
 60 + 4 HRC (induction hardened)

Hardness Penetration:  
 1,5+1 mm

**Note:**

Guide Pillars only recommended for use with sliding guides.

**Mounting Examples**

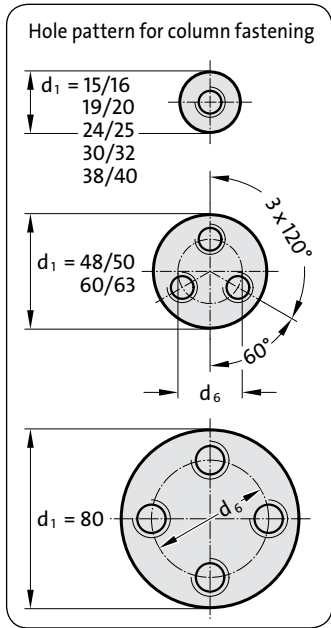


202.29.

d <sub>1</sub>	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
l <sub>2</sub>	4	4	6	6	6	8	8	8
l <sub>1</sub>								
90	●							
100	●							
112	●	●	●					
125	●	●	●	●				
140	●	●	●	●				
160	●	●	●	●	●			
180	●	●	●	●	●	●		
200	●	●	●	●	●	●		
224	●	●	●	●	●	●		
250	●	●	●	●	●	●	●	
280	●	●	●	●	●	●	●	●
315	●	●	●	●	●	●	●	●
355	●	●	●	●	●	●	●	●
400		●	●	●	●	●	●	●
450			●	●	●	●	●	●
500			●	●	●	●	●	●
550					●	●	●	●
600					●	●	●	●
700					●	●	●	●
800					●	●	●	●

**Ordering Code (example):**

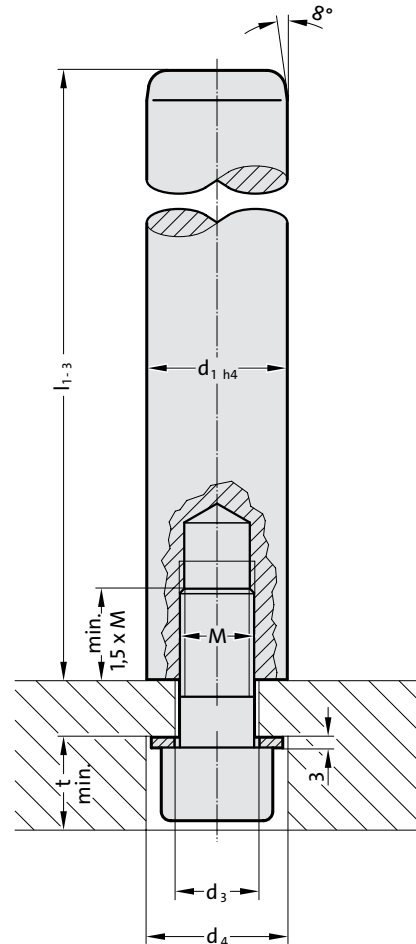
Guide Pillar = 202.29.  
 d<sub>1</sub> = 32 mm = 032.  
 l<sub>1</sub> = 180 mm = 180  
 Order No = 202.29.032.180



202.31.

Guide Pillars for endwise screw retention, complete with cap screws and washers.

Dimensions on page D19



202.31. Dimensions on page D19

						30 32							
d <sub>1</sub>	15	16	19	20	24	25	38	40	48	50	60	63	80
d <sub>3</sub>	9		11		14		18		14		18		18
d <sub>4</sub>	17		20		22		28		22		28		28
d <sub>6</sub>	-		-		-		-		28		34		54
t	12		14		16		20,5		16		20,5		20,5
M	8		10		12		16		12		16		16
cap screw	M8x35		M10x40		M12x40		M16x40		3xM12x50		3xM16x60		4xM16x60
Nm*	21		37		85		150		85		200		200

\* tightening torque

Ordering Code (example):

Guide Pillar bolt-on type	=	202.31.
d <sub>1</sub> = 32 mm	=	032.
l <sub>1</sub> = 180 mm	=	180
Order No	=	202.31.032.180

**Material:** Steel, surface hardened  
 Surface Hardness: 60+4 HRC (induction hardened)  
 Hardness Penetration: 1,5+1 mm

**Note:**  
 Guide Pillars only recommended for use with sliding guides.



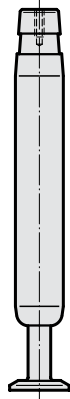
A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.

# Demountable Pillars, conical DIN 9825/ISO 9182-4 AFNOR\* with ball cage retainer

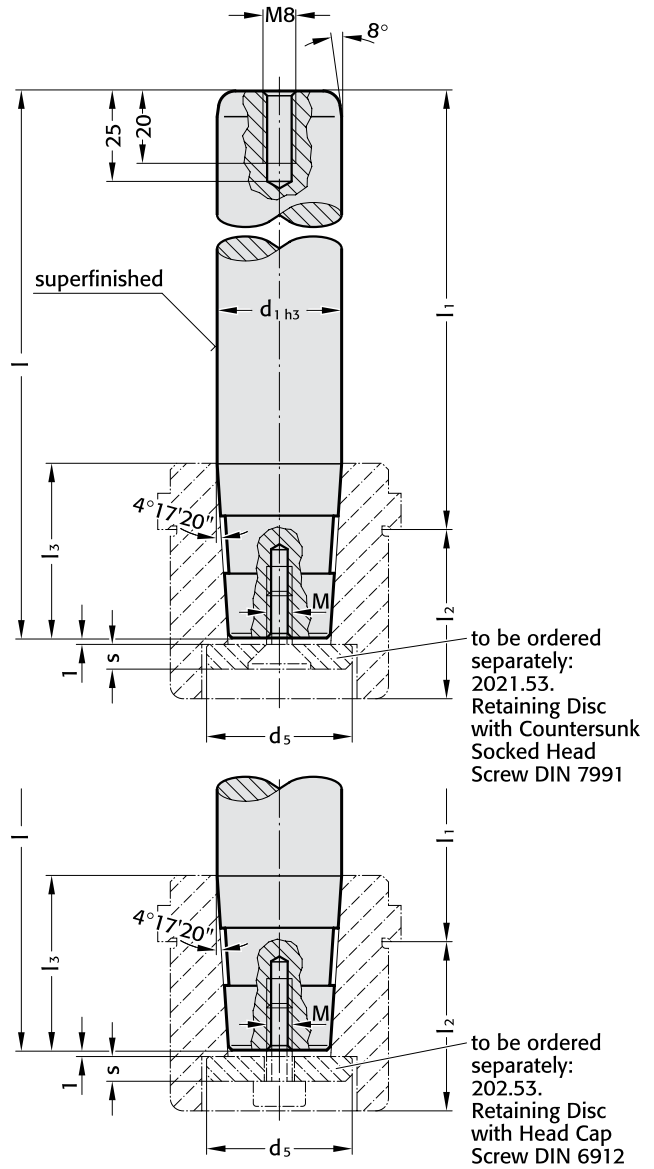
**FIBRO**  
2021.50.  
2021.58.



**2021.58.**  
Demountable Pillar (Ø 38–63)  
with Ball Cage Retainer  
Dimensions of ball cage retainer  
202.91.: see page D211.



**2021.50.** **2021.58.**  
with Ball Cage Retainer



These pillars are recommended where die sharpening etc. demands frequent demounting and re-fitting.

**Execution:** precision ground, superfinished

**Note:** manufacturing methods entail that centre holes are not concentric with O. D.

Hardened liner Bushes with matching internal taper for Demountable Pillars 2021.50. with Retaining Disc and Head Cap Screw 202.53. – see page D25.

Hardened liner Bushes with matching internal taper for Demountable Pillars 2021.50. with Retaining Disc and Countersunk Socket Head Screw 2021.53. – see page D24.

Colour Code Combinations/Clearances – see pages D10 and D11.

**Material:** Steel, surface hardened  
Core strength:  $\geq 900 \text{ N/mm}^2$   
Surface Hardness: 60+3 HRC (induction hardened)  
Penetration:  $\geq 1,8 \text{ mm}$

Tolerance range  
yellow = .10  
green = .20  
red = .30

<b>2021.50.</b>		DIN 9825/ISO 9182-4 / AFNOR*																			
$d_1$	16*	19	20	20*	24	25	25*	30	32	32*	38	40	40*	48	50	50*	60	63	63*		
M	M6×16*	M6×16	M6×16*	M8×20	M8×20	M8×20*	M8×20	M8×20*	M8×20	M8×20*	M8×20	M8×20	M8×20*	M10×20	M10×25*	M12×30	M12×30*				
$l_2$	30*	30 o. 37	38*	37 o. 47	38* o. 48*	37 o. 47	48* o. 61*	47 o. 60	48* o. 61*	47 o. 60	48* o. 61*	47 o. 60	61* o. 78*	60 o. 77	78* o. 98*						
$l_3$	28*	38	38*	35	35* o. 45*	48	48* o. 61*	48	48* o. 61*	58	58* o. 78*	69	77* o. 97*								
$l_1$																					
	82*	100*																			
	95*	113*																			
	100	126	126*	123	123*/	-*															
	112	130*	138	138*	135	135*/	-*	145	145*/	-*											
	125	143*	151	151*	148	148 /158*	158	158*/	-*	158	158*/	-*									
	140	166	166*	163	163*/	-*	173	173*/	186*	173	173*/	-*	180	180*/	-*						
	160	186	186*	183	183 /193*	193	193*/	206*	193	193*/	206*	193	200	200*/	-*	211					
	180	206	206*	203	203*/	213*	213	213*/	226*	213	213*/	226*	220	220*/	-*	231	237*/	-*			
	200	226	226*	223	223*/	233	233	233*/	-*	233	233*/	-*	240	240*/	260*	251	257*/	-*			
	224			247	247*/	-*	257	257*/	270*	257	257*/	270*	264	264*/	-*	275			-*		
	250			273	273*/	-*	283	283*/	-*	283	283*/	296*	290	290*/	310*	301	307*/	327*			
	280	Ordering Code (example):						313	313*		313	313*/	-*	320	320*/	340*	331	337*/	-*		
	315	Demountable Pillar, conical = 2021.50.										348	348*/	-*	355	355*/	375*	366	372*/	392*	
	355	$d_1 = 32 \text{ mm}$			= 032.								395	395*/	-*	406				*/432*	
	400*	$l_1 = 200 \text{ mm}$			= 200.															*/477*	
		$l_3 = 48 \text{ mm}$			= 048.																
		Tolerance range – yellow										= 10									
		Order No										= 2021.50.032.200.048.10									

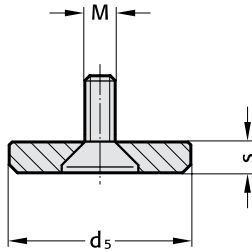
# FIBRO

2021.53.  
202.53.

## Retaining Discs

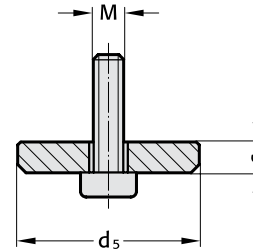
2021.53.

Retaining Disc with Countersunk  
Socket Head Screw DIN 9825/ISO 9182-4



202.53.

Retaining disc with Head cap Screw AFNOR\*



2021.53.

Retaining Disc with Countersunk  
Socket Head Screw DIN 9825/ISO 9182-4

Pillar-Ø

d <sub>1</sub>	19	20	24	25	30	32	38	40	48	50	60	63
d <sub>s</sub>	22	25	32	32	40	40	50	50	63	63		
s	3	3	3	3	5	5	5	5	6	6		
M	M6×16	M8×20	M8×20	M8×20	M8×20	M10×20	M12×30					

202.53.

Retaining disc with Head cap Screw AFNOR\*

Pillar-Ø

d <sub>1</sub>	16	20	25	32	40	50	63
d <sub>s</sub>	18	22	25	32	40	50	63
s	3	3	4	4	4	5	6
M	M6×16	M6×16	M8×20	M8×20	M8×20	M10×25	M12×30

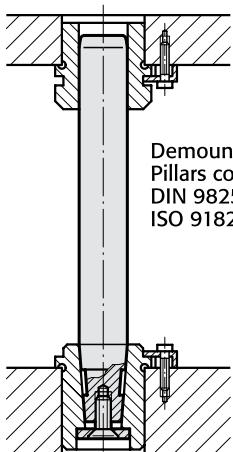
### Ordering Code (example):

Retaining Disc with Countersunk Socket Head Screw  
DIN 9825/ISO 9182-4 = 2021.53.  
Pillar-Ø d<sub>1</sub> = 20 mm = 020  
Order No = 2021.53.020

### Ordering Code (example):

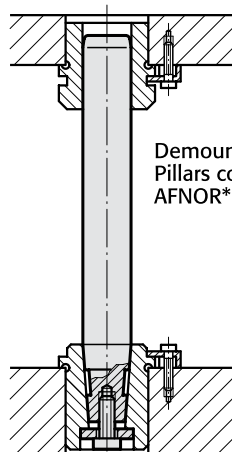
Retaining Disc with Head Cap Screw  
AFNOR = 202.53.  
Pillar-Ø d<sub>1</sub> = 16 mm = 016  
Order No = 202.53.016

### Mounting Example:



Demountable  
Pillars conical  
DIN 9825/  
ISO 9182-4

### Mounting Example:



Demountable  
Pillars conical  
AFNOR\*

### Note:

Not delivered with the demountable Pillar 2021.50., has to be ordered separately:

202.53. Retaining Disc with Head Cap Screw DIN 6912  
resp.

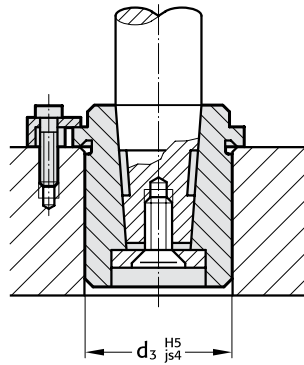
2021.53. Retaining Disc with Countersunk Socket Head  
Screw DIN 7991

Liner Bushes DIN 9825/ISO 9182-4  
for demountable Guide Pillars 2021.50.

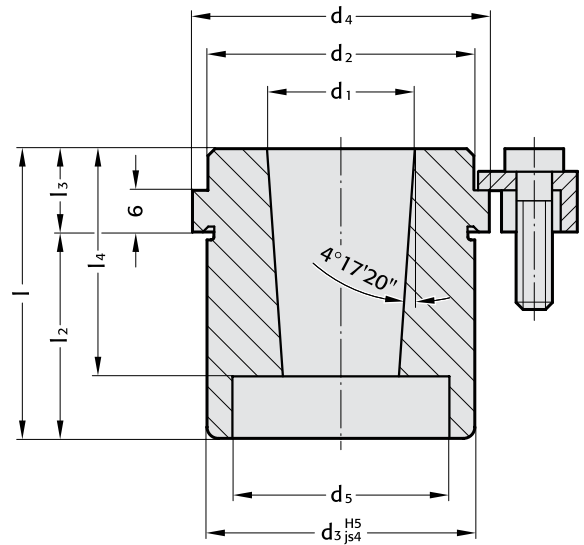
2021.39.



Mounting Example:

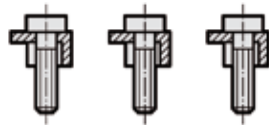


2021.39.



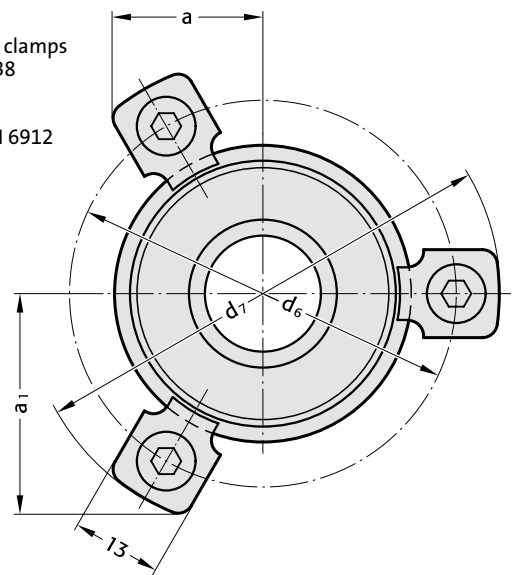
207.45

screw clamps  
order No for  
replacement parts



207.45

Four screw clamps  
for  $\varnothing d_1 = 38$   
and over  
M6  $\times$  20  
similar DIN 6912  
head  $\varnothing 13$



Material:

16 MnCr5  
casehardened  $58 \pm 2$  HRC  
penetration:  $\geq 0,8 - 1,0$  mm

Execution:

Retaining bore, outside diameter and shoulder precision ground.  
Supplied with screw clamps and cap screws similar DIN 6912, head  $\varnothing 13$ .

Note:

Outside diameter  $d_3$  same as that of guide bushes 2081. and 2091.;  
see pages D64-D94.

2021.39.

$d_1$	19	20	24	25	30	32	38	40	48	50	60	63
$d_2$	32		40		48		58		70		85	
$d_3$	32		40		48		58		70		85	
$d_4$	40		48		56		66		80		95	
$d_5$	23		26		33		41		51		64	
$d_6$	53		60		67		77		91		106	
$d_7$	65,7		72,7		79,7		89,7		103,7		118,7	
a	20,9		22,65		24,4		35,3		40,2		45,5	
$a_1$	30,3		33,4		36,4		35,3		40,2		45,5	
l	42 o. 49		49 o. 59		52 o. 62		62 o. 75		65 o. 78		78 o. 95	
$l_2$	30 o. 37		37 o. 47		37 o. 47		47 o. 60		47 o. 60		60 o. 77	
$l_3$	12		12		15		15		18		18	
$l_4$	39		36		49		49		59		70	

Ordering Code (example):

Liner Bush DIN 9825 = 2021.39.  
 $d_1 = 40$  mm = 040.  
 $l_2 = 47$  mm = 047  
 Order No = 2021.39.040.047

# FIBRO

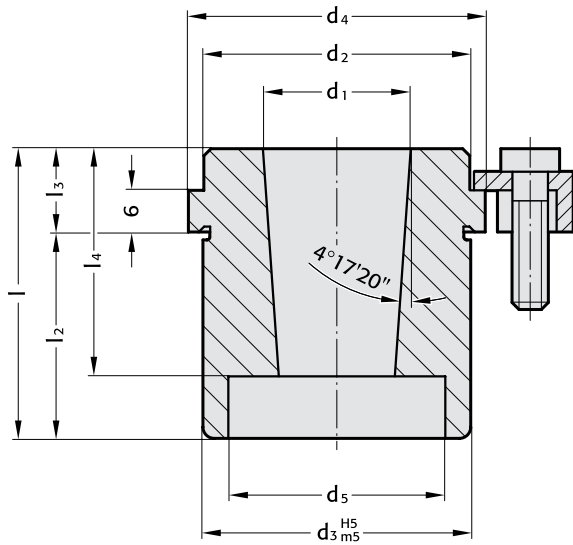
similar AFNOR

**210.39.**

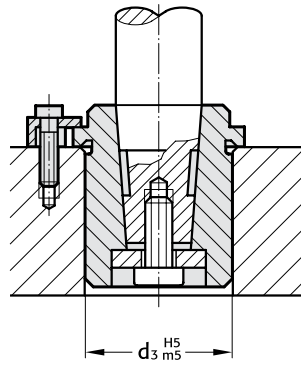
## Liner Bushes

for Demountable Guide Pillars 2021.50.

**210.39.**

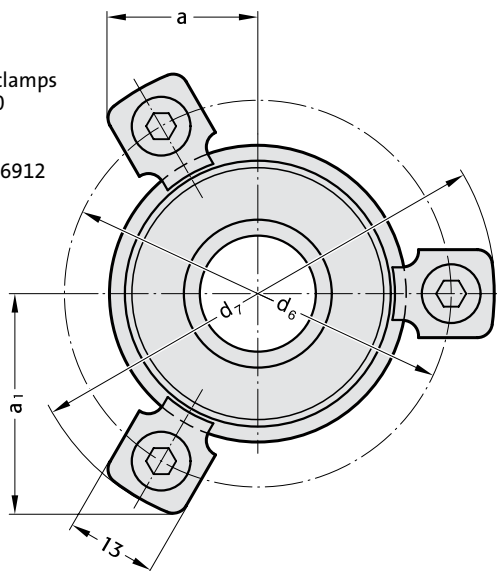


**Mounting Example:**



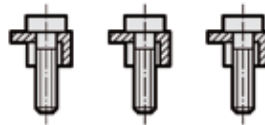
**207.45**

four screw clamps  
ab  $\varnothing d_1 = 40$   
M6  $\times$  20  
and over  
similar DIN 6912  
head  $\varnothing 13$



**207.45**

screw clamps  
Order No for  
replacement parts



**210.39.**

$d_1$	16	20	25	32	40	50	63
$d_2$	29	32	41	51	65	84	100
$d_3$	28	32	40	50	63	80	90
$d_4$	32	36	45	56	70	90	110
$d_5$	19	23	26	33	41	51	64
$d_6$	45	49	57	67	81	101	121
$d_7$	57,7	61,7	69,7	79,7	93,7	113,7	133,7
$a$	18,9	19,9	21,9	24,4	36	43	50,1
$a_1$	26,9	28,6	32,1	36,4	36	43	50,1
$l$	40	50	50/60	63/76	63/76	79/96	98/118
$l_2$	30	38	38/48	48/61	48/61	61/78	78/98
$l_3$	10	12	12	15	15	18	20
$l_4$	30	40	37/47	50/63	50/63	63/80	79/99

**Ordering Code (example):**

Liner Bush, similar AFNOR	=	210.39.
$d_1 = 40$ mm	=	040.
$l_2 = 48$ mm	=	048
Order No	=	210.39.040.048

**Material:**

16 MnCr5  
casehardened  $58 \pm 2$  HRC  
penetration  $\geq 0,8 - 1,0$  mm

**Execution:**

Retaining bore, outside diameter and shoulder precision ground.  
Supplied with screw clamps and cap screws similar DIN 6912,  
head  $\varnothing 13$ .

# Guide Pillars ~AFNOR with Retaining Ring Groove Clamping Flange and Retaining Ring

**FIBRO**

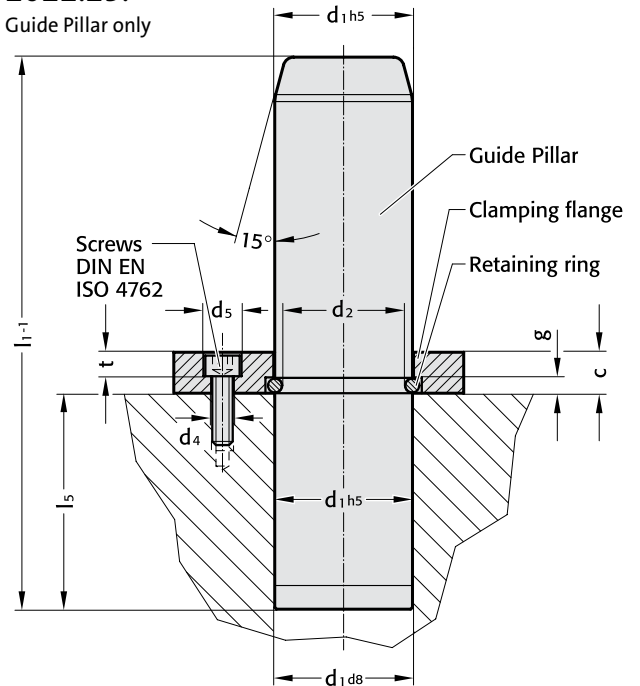
2022.25.

2073.46.



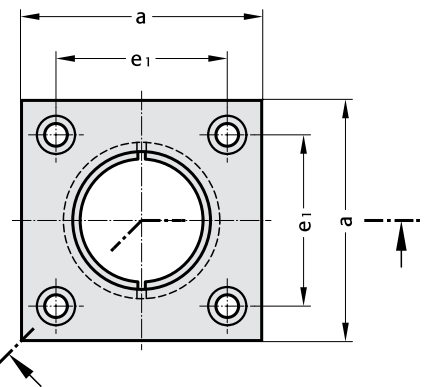
2022.25.

Guide Pillar only



2073.46.

Clamping flange  
with retaining ring



Ordering Code:

Guide Pillar AFNOR without Clamping Flange	= 2022.25.
$d_1 = 40 \text{ mm}$	= 040.
$l_1 = 250 \text{ mm}$	= 250
Order No	= 2022.25.040.250

## Material:

Steel, surface hardened

Surface hardness: 60 + 4 HRC

Hardness penetration depth: 1,5 + 1 mm

## Execution:

Diameter precision ground.

## Note:

Matching guide bushes

2102.70. AFNOR – see page D117.

Fit for receiving bore: M6.

Guide pillar is recommended to be used only with Guide Elements with Non-Liquid Lubricant.

## Fixing:

Clamping flange with retaining ring screws not included 2073.46. [ ] [ ] [ ] [ ]

Retaining ring 2073.46. [ ] [ ] [ ] [ ] .2

2022.25.

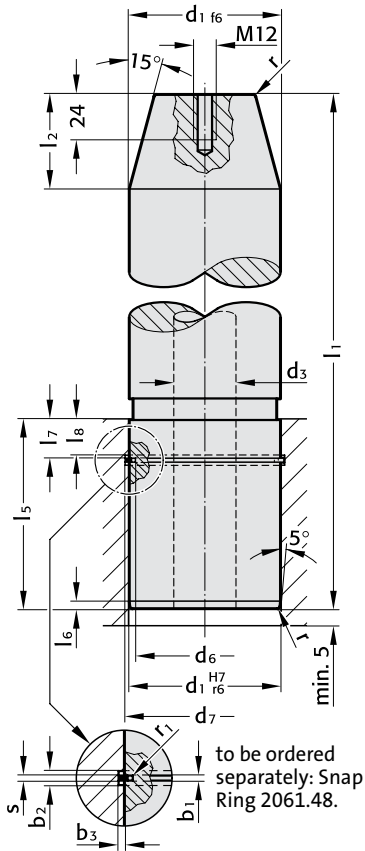
$d_1$	25	32	40	50	63	80	100
$d_2$	22,3	27,8	35,8	45,8	56,8	73,8	93,8
$d_4$	M6	M6	M6	M8	M10	M12	M12
$d_5$	11	11	11	15	18	20	20
a	45	56	70	80	100	110	140
c	10	10	12	14	18	20	20
g	2,7	4,2	4,2	4,2	6,2	6,2	6,2
$e_1$	31	36	50	55	70	80	100
t	7	7	7	9	11	13	13
$l_5$	25	32	63	80	100	125	160
$l_1$ 100	●						
125	●	●					
140	●	●					
160	●	●					
180	●	●	●				
200	●	●	●	●			
220	●	●	●	●	●		
250		●	●	●	●	●	
280			●	●	●	●	
315			●	●	●	●	●
355				●	●	●	●
400				●	●	●	●
450					●	●	●
500					●	●	●

# FIBRO

2022.12.  
2061.48.

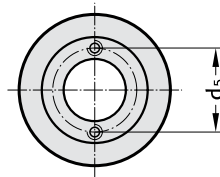
## Guide Pillars for Large Tools with Pilot Taper and Snap Ring Groove to Daimler Standard Snap Rings

2022.12.



1 x Lifting thread M12  
centred only by  $\varnothing d_1 = 80$

2 x Lifting thread M8 from  $\varnothing d_1 = 100$



2022.12.

$d_1$	80	100	125	160
$d_3$	—	50	65	95
$d_5$	—	62	82	119
$d_6$	71,4	89,9	114,9	148,9
$d_7$	83,2	103,8	128,8	164,3
$r$	3	3	4	4
$r_1$	1,05	1,3	1,3	1,3
$l_2$	50	50	50	50
$l_5$	100	125	140	180
$l_6$	4	4	5	5
$l_7$	21	31	31	31
$l_8$	20	30	30	30
$b_1$	2,1	2,6	2,6	2,6
$b_2$	4,2	5,2	5,2	5,2
$b_3$	2,8	3,4	3,4	4
$s$	2,0	2,5	2,5	2,5
Snap ring, outside $\varnothing$ loose	82,6	103,3	128,6	164,3
Snap ring 2061.48.	080	100	125	160
$l_1$				
280	●			
315	●	●		
355	●	●	●	
400	●	●	●	
450	●	●	●	●
500			●	●
560				●

### Ordering Code (example):

Guide Pillar with Groove = 2022.12.  
 $d_1 = 80$  mm = 080.  
 $l_1 = 315$  mm = 315  
 Order No = 2022.12.080.315

### Material:

Steel, surface hardened  
 Surface hardness: 60 + 4 HRC  
 Hardness penetration  
 depth: 1,5 + 1 mm

### Execution: precision ground

$\varnothing 80$  without central hole  
 with 1 lifting thread M12  
 centred  
 from  $\varnothing 100$  with central hole (through) and  
 with 2 lifting threads M8

### Note:

Fit for receiving bore H7  
 Guide pillar is recommended to be used  
 only with Guide Elements with Non-Liquid  
 Lubricant.

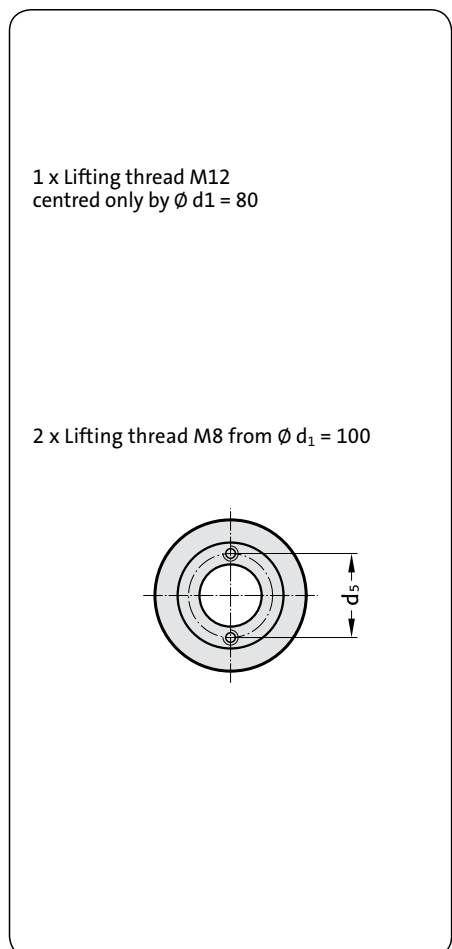
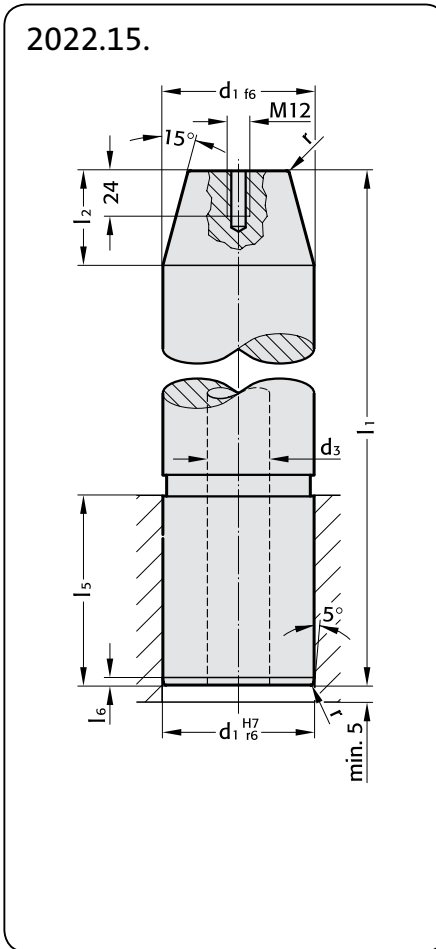
Matching guide bushes:  
 Page D114, D115 and D117.

### Ordering Code (example):

Snap Ring = 2061.48.  
 $d_1 = 80$  mm = 080  
 Order No = 2061.48.080

Guide Pillars for Large Tools  
with Pilot Taper VDI 3356

2022.15.



**Material:**  
Steel, surface hardened  
Surface hardness: 60 + 4 HRC  
Hardness penetration depth: 1,5 + 1 mm

**Execution:** precision ground  
 $\varnothing 80$  without central hole  
with 1 lifting thread M12 centred  
from  $\varnothing 100$  with central hole (through) and with 2 lifting threads M8

**Note:**  
Fit for receiving bore H7  
Guide pillar is recommended to be used only with Guide Elements with Non-Liquid Lubricant.  
Matching guide bushes:  
Page D114, D115 and D117

**Ordering Code (example):**  
Guide Pillar = 2022.15.  
 $d_1 = 80$  mm = 080.  
 $l_1 = 315$  mm = 315  
Order No = 2022.15.080.315

2022.15.

$d_1$	80	100	125	160
$d_3$	-	50	65	95
$d_5$	-	62	82	119
r	3	3	4	4
$l_2$	50	50	50	50
$l_5$	100	125	140	180
$l_6$	4	4	5	5
$l_1$				
280	●			
315	●	●		
355	●	●	●	
400	●	●	●	
450	●	●	●	●
500			●	●
560				●



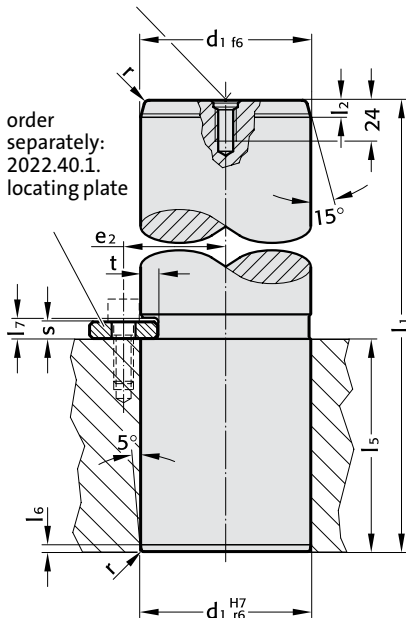
# FIBRO

2022.17.  
2022.40.1.

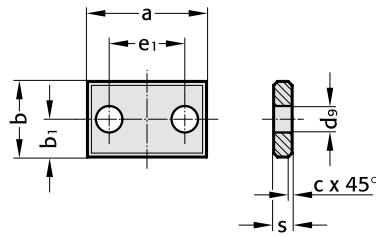
## Guide Pillars for Large Tools with groove to VW Locating plates to VW

### 2022.17.

1 x Lifting thread M12  
centred only by  $\varnothing d_1 = 80$



### 2022.40.1. Locating plate



#### Note:

Screws not included!

#### Fixing:

Use socket cap screws  
DIN EN ISO 4762

- M 8x20
- M10x30
- M12x30.

#### Ordering Code (example):

Locating plate	=	2022.40.1.
$d_1 = 32$ mm	=	02
Order No	=	2022.40.1.02



### 2022.17.

$d_1$	25	32	40	50	63	80
$l_2$	8	8	8	10	10	10
$l_5$	40	45	56	70	80	100
$l_6$	4	4	4	4	4	4
$l_7$	7	7	10	10	12	12
r	2	2	2	2,5	2,5	3
a	40	40	48	48	60	60
s	5	5	8	8	10	10
c	1	1	2	2	2	2
b	20	20	25	25	34	34
$e_1$	20	20	24	24	30	30
t	3	3	4	5	6,5	8
$e_2$	20,5	24	29,5	33,5	43	50
$d_9$	9	9	11	11	14	14

Order No 2022.40.1. for locating plate

2022.40.1. 02	02	04	04	06	06
---------------	----	----	----	----	----

$l_1$						
125	●	●				
140	●	●	●			
160	●	●	●	●		
180	●	●	●	●	●	
200	●	●	●	●	●	
224	●	●	●	●	●	●
250		●	●	●	●	●
280			●	●	●	●
315				●	●	●
355				●	●	●
400					●	●
450						●
500						●

### Material:

Steel, surface hardened  
Surface hardness: 60 + 4 HRC  
Hardness penetration  
depth: 1,5 + 1 mm

### Execution: precision ground

by  $\varnothing d_1 = 80$  with 1 lifting thread  
M12

### Note:

Fit for receiving bore: H7.

Guide pillar is recommended to be used  
only with Guide Elements with Non-Liquid  
Lubricant.

Matching guide bushes:  
Page D114, D115 and D117.

### Ordering Code (example):

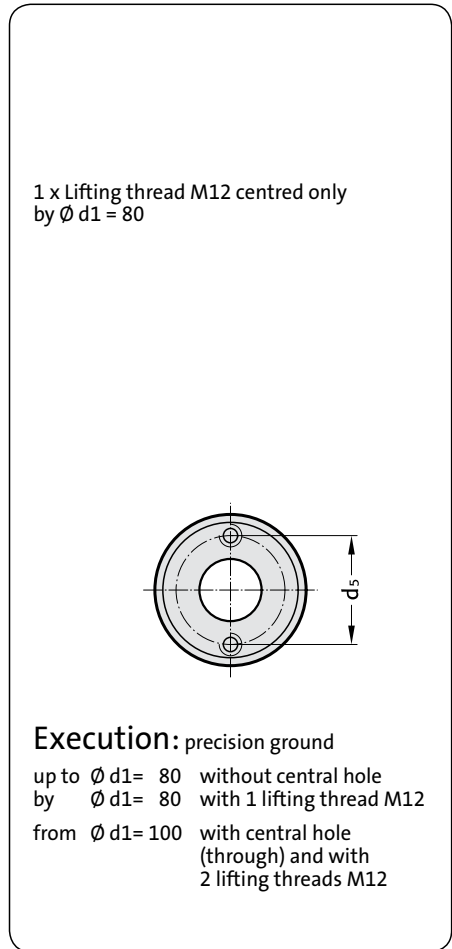
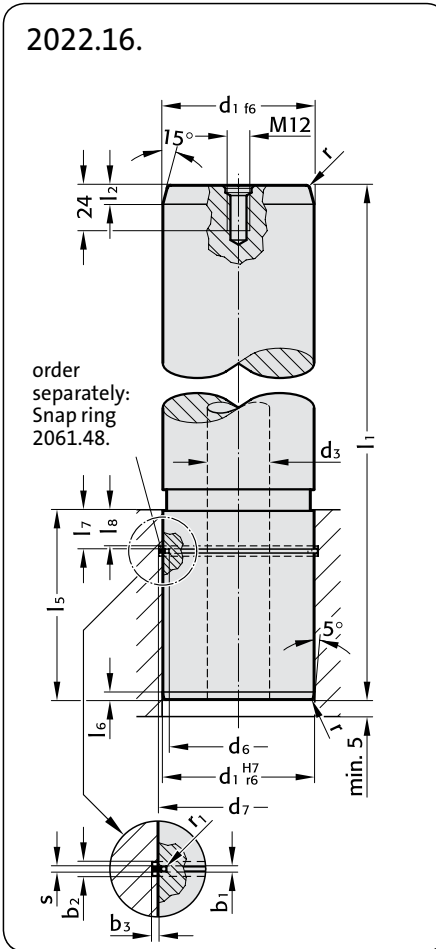
Guide Pillar	=	2022.17.
$d_1 = 80$ mm	=	080.
$l_1 = 315$	=	315
Order No	=	2022.17.080.315

# Guide Pillars for Large Tools with Snap Ring Groove to Daimler Snap Rings

**FIBRO**

2022.16.

2061.48.



**Material:**  
Steel, surface hardened  
Surface hardness: 60 + 4 HRC  
Hardness penetration  
depth: 1,5 + 1 mm

**Execution:**  
Fit for receiving bore: H7.  
Guide pillar is recommended to be used  
only with Guide Elements with Non-Liquid  
Lubricant.

Matching guide bushes:  
Page D114, D115 and D117.

**Ordering Code (example):**

Snap ring	=	2061.48.
$d_1 = 80$ mm	=	080
Order No	=	2061.48.080

**Ordering Code (example):**

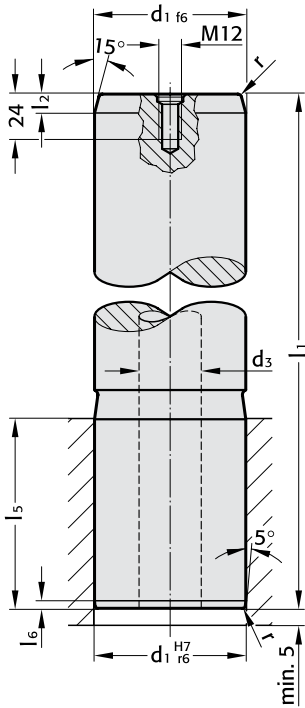
Guide Pillar	=	2022.16.
$d_1 = 40$ mm	=	040.
$l_1 = 200$ mm	=	200
Order No	=	2022.16.040.200

2022.16.

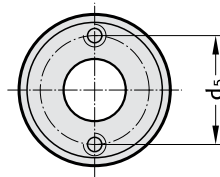
$d_1$	40	50	63	80	100	125	160
$d_3$	-	-	-	-	50	65	95
$d_5$	-	-	-	-	72	90	132
$d_6$	33	43	55,7	71,4	89,9	114,9	148,9
$d_7$	43	53	66	83,2	103,8	128,8	164,3
r	2	2,5	2,5	3	3	4	4
$r_1$	1	1	1	1,05	1,3	1,3	1,3
$l_2$	8	10	10	10	10	12	12
$l_5$	56	70	80	100	125	140	180
$l_6$	4	4	4	4	4	5	5
$l_7$	15	15	15	21	31	31	31
$l_8$	14	14	14	20	30	30	30
$b_1$	2	2	2	2,1	2,6	2,6	2,6
$b_2$	3,2	3,2	3,2	4,2	5,2	5,2	5,2
$b_3$	2,3	2,3	2,3	2,8	3,4	3,4	4
s	1,5	1,5	1,5	2,0	2,5	2,5	2,5
Snap ring, outside $\varnothing$ , loose	41,8	51,8	65,3	82,6	103,3	128,6	164,3
Snap ring 2061.48.	040	050	063	080	100	125	160

$l_1$							
140	●						
160	●	●					
180	●	●	●				
200	●	●	●	●			
224	●	●	●	●	●		
250	●	●	●	●	●	●	
280	●	●	●	●	●	●	
315		●	●	●	●	●	●
355		●	●	●	●	●	●
400			●	●	●	●	●
450				●	●	●	●
500					●	●	●
560							●

2022.19.



1 x Lifting thread M12 centred only  
by  $\varnothing d_1 = 80$



**Execution:** precision ground

up to  $\varnothing d_1 = 80$  without central hole  
by  $\varnothing d_1 = 80$  with 1 lifting thread M12  
from  $\varnothing d_1 = 100$  with central hole  
(through) and with  
2 lifting threads M12



2022.19.

$d_1$	25	32	40	50	63	80	100	125	160
$d_3$	-	-	-	-	-	-	50	65	95
$d_5$	-	-	-	-	-	-	72	90	132
r	2	2	2	2,5	2,5	3	3	4	4
$l_2$	8	8	8	10	10	10	10	12	12
$l_5$	40	45	56	70	80	100	125	140	180
$l_6$	4	4	4	4	4	4	4	5	5
$l_1$									
125	●	●							
140	●	●	●						
160	●	●	●	●					
180	●	●	●	●	●				
200	●	●	●	●	●	●			
224	●	●	●	●	●	●	●		
250		●	●	●	●	●	●	●	
280			●	●	●	●	●	●	●
315				●	●	●	●	●	●
355				●	●	●	●	●	●
400					●	●	●	●	●
450						●	●	●	●
500						●	●	●	●
560									●

**Material:**

Steel, surface hardened  
Surface hardness: 60 + 4 HRC  
Hardness penetration  
depth: 1,5 + 1 mm

**Execution:**

Fit for receiving bore: H7.  
Guide pillar is recommended to be used  
only with Guide Elements with Non-Liquid  
Lubricant.

Matching guide bushes:  
Page D114, D115 and D117.

**Ordering Code (example):**

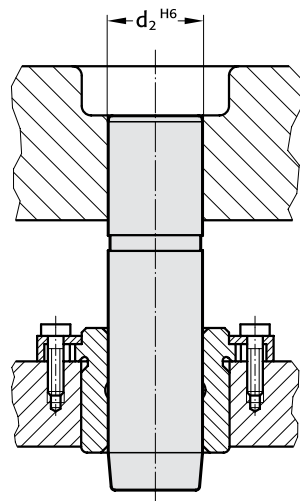
Guide Pillar	= 2022.19.
$d_1 = 40$ mm	= 040.
$l_1 = 200$ mm	= 200
Order No	= 2022.19.040.200

Guide Pillar  
with 5° Pilot Taper to VW Standard

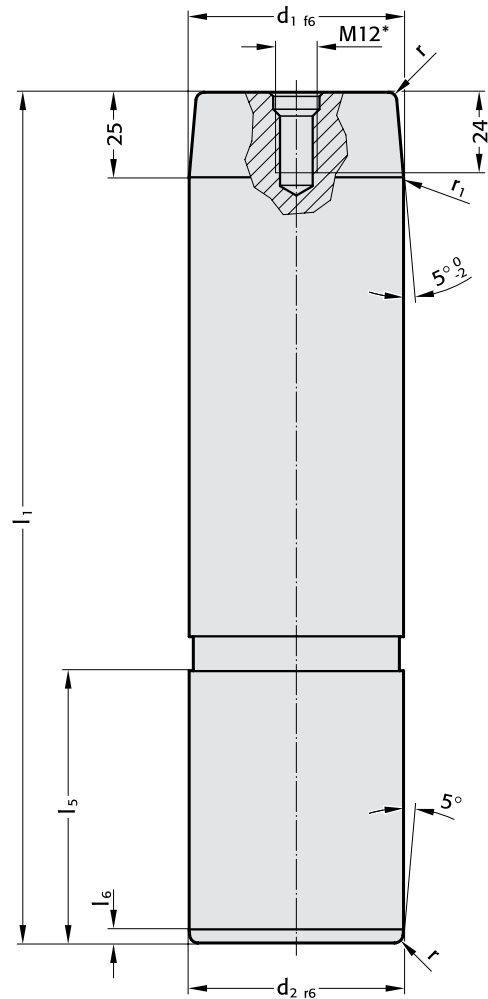
2022.13.



Mounting Example:



2022.13.



Material:

Steel, surface hardened

Surface hardness: 60 + 4 HRC

Hardness penetration depth: 1.5 + 1 mm

Execution:

precision ground

\*by  $\varnothing d_1 = 80$  with 1 centered lifting thread M12

Note:

Fit for receiving bore H6

Guide pillar is recommended to be used only with Guide Elements with Non-Liquid Lubricant.

Matching guide bushes:  
Page D114, D115 and D117.

Application:

floating support in upper half of trimming tools.

Ordering Code (example):

Guide Pillar = 2022.13.  
 $d_1 = 40$  mm = 040.  
 $l_1 = 200$  mm = 200  
 Order No = 2022.13.040.200

2022.13.

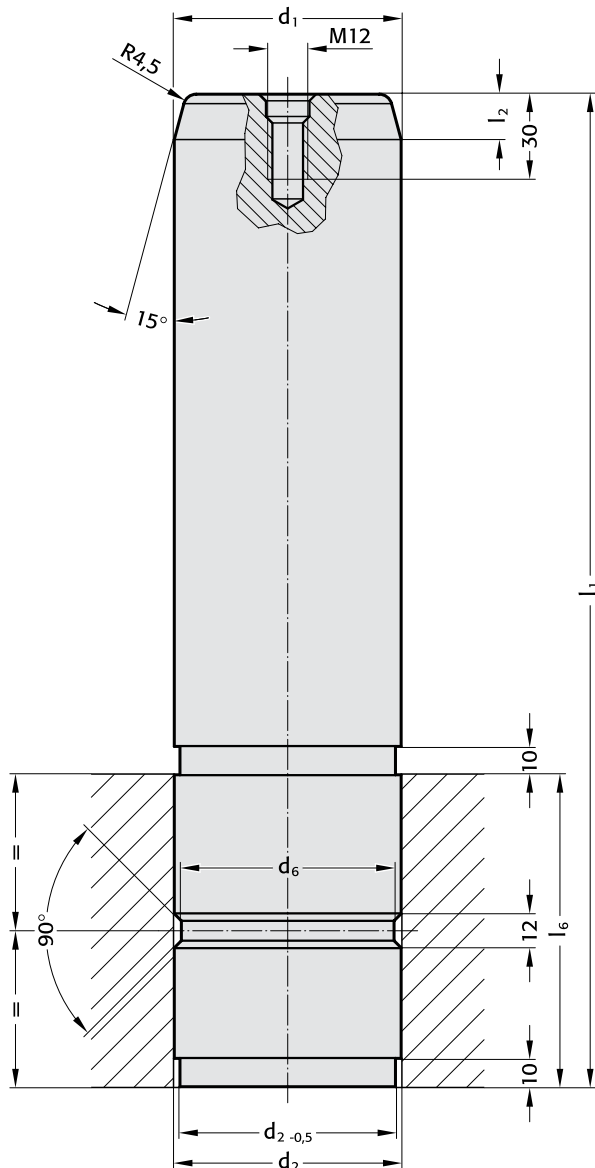
	40	50	63	80
$d_1$	40	50	63	80
$d_2$	40	50	63	80
$l_5$	56	70	80	100
$l_6$	4	4	4	4
r	2	2,5	2,5	3
$r_1$	3	5	6	8
$l_1$				
140	●			
160	●	●		
180	●	●	●	
200	●	●	●	
224	●	●	●	●
250	●	●	●	●
280	●	●	●	●
315		●	●	●
355		●	●	●
400			●	●

**FIBRO**

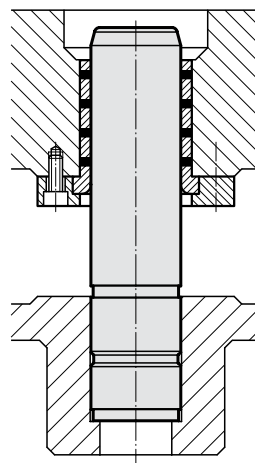
2022.16.45.

Guide Pillar with Groove to CNOMO

2022.16.45.



Mounting Example:



**Material:**

Steel, surface hardened  
 Surface hardness: 60 + 3 HRC  
 Hardness penetration depth: 2 + 1.6 mm

**Execution:**

precision ground

**Note:**

Fit for receiving bore H7  
 Guide pillar is recommended to be used only with Guide Elements with Non-Liquid Lubricant.  
 Matching guide bushes:  
 Page D114, D115 and D117 .

**Ordering Code (example):**

Guide Pillar	=	2022.16.45.
d <sub>1</sub> = 80 mm	=	080.
l <sub>1</sub> = 350 mm	=	350
Order No	=	2022.16.45.080.350

2022.16.45.

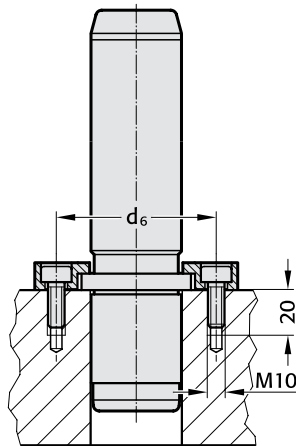
d <sub>1</sub>	80	100
tol.	-0,010	-0,010
	-0,025	-0,025
d <sub>2</sub>	80	100
tol.	+0,050	+0,055
	+0,040	+0,045
d <sub>6</sub>	75	95
l <sub>2</sub>	16	16
l <sub>6</sub>	110	140
l <sub>1</sub>	350	●
	400	●
	450	●

**Guide Pillars with Collar to WDX  
Screw Clamps**

**2022.29.  
2072.46**

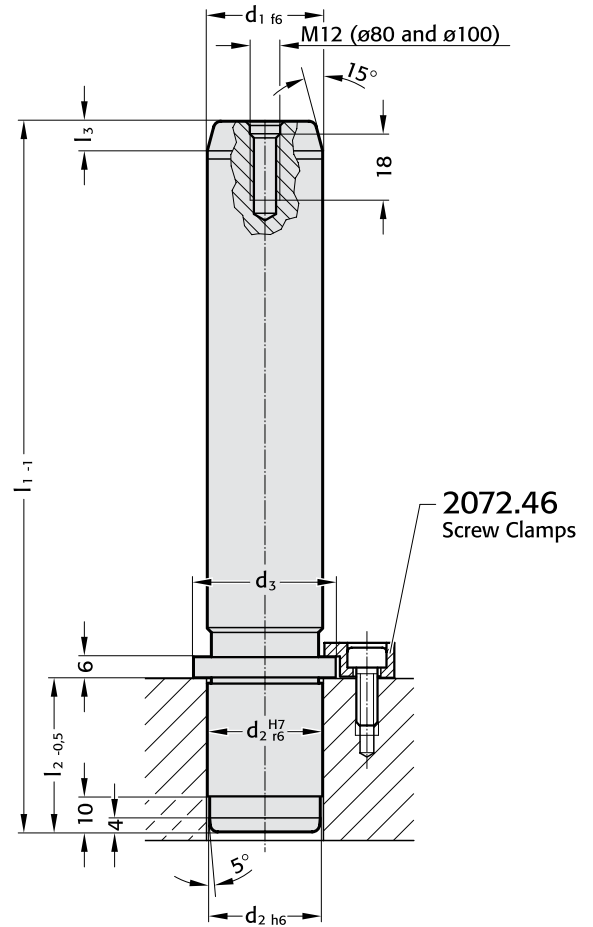


**Mounting Example**



**2022.29.**

without Screw Clamps



**Material:**

Steel, surface hardened  
Surface hardness: 60 + 4 HRC  
Hardness penetration depth: 1,5 + 1 mm

**Execution:** precision ground

**Remark:** method of manufacture entails that centre holes are not concentric with O. D.

Guide pillar is recommended to be used only with Guide Elements with Non-Liquid Lubricant

Fit for receiving bore: H7.

**Fixing:** (to be ordered separately)

Screw Clamps with Screws 2072.46 (M10 x 20 DIN EN ISO 4762), see page D216

up to Ø 50 2 screw clamps

from Ø 63 3 screw clamps

**Ordering Code (example):**

Guide Pillar = 2022.29.  
d<sub>1</sub> = 32 mm = 032.  
l<sub>1</sub> = 140 mm = 140  
Order No = 2022.29.032.140

**2022.29.**

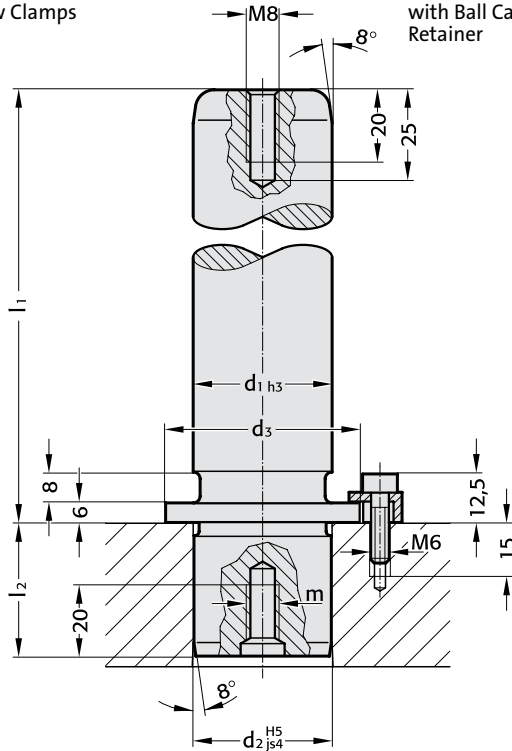
	25	32	40	50	63	80	100
d <sub>1</sub>							
d <sub>2</sub>							
d <sub>3</sub>							
d <sub>6</sub>							
l <sub>2</sub>							
l <sub>3</sub>							
l <sub>1</sub>							
125	●						
140	●	●					
160	●	●	●	●			
180	●	●	●	●			
200	●	●	●	●	●		
224	●	●	●	●	●	●	
250		●	●	●	●	●	
280			●	●	●	●	●
315				●	●	●	●
355					●	●	●
400					●	●	●
500						●	●

# FIBRO

2021.44. 2021.46.  
2021.43.

## Demountable Pillars DIN 9825/~ISO 9182-5 with Collar and Screw Clamp Retention Disc with Screw for Central Retention

2021.46.  
with Screw Clamps

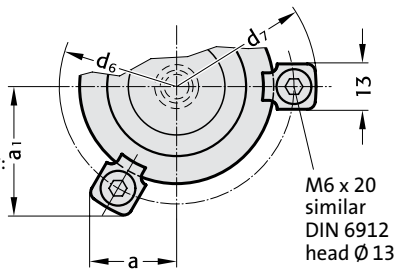


207.45

Screw Clamps,  
incl. Screws

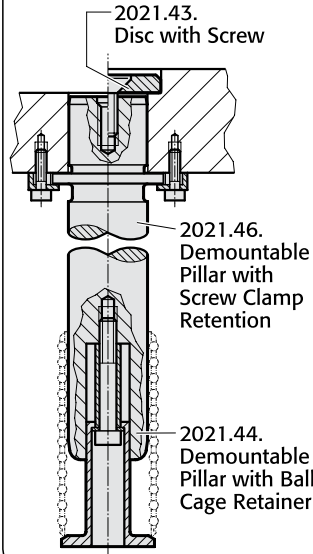
Order-No for  
replacement parts

for  $\varnothing d_1 = 38$  and over:  
4 screw clamps



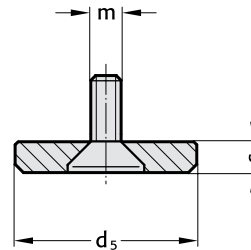
2021.44.  
with Ball Cage  
Retainer

Mounting Example



2021.43.

Disc with Screw

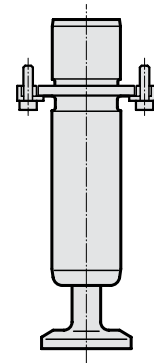


Ordering Code  
(example):

Disc with Screw = 2021.43.  
 $d_1 = 32$  mm = 032  
Order No = 2021.43.032

2021.44.

Demountable Pillar ( $\varnothing 38-63$ )  
with Ball Cage Retainer



Dimensions of ball cage  
retainer:  
See 202.91., page D211.

Ordering Code (example):

Demountable Pillar = 2021.46.  
 $d_1 = 32$  mm = 032.  
 $l_1 = 180$  mm = 180  
Tolerance range red = .30  
Order No = 2021.46.032.180.30

2021.46./2021.44.

**Material:** Steel, surface hardened

**Core strength:**  $\geq 900$  N/mm<sup>2</sup>

**Surface Hardness:** 60 + 3 HRC (induction hardened)

**Hardness Penetration:**  $\geq 1,8$  mm

**Execution:** fine precision ground

**Note:** method of manufacture entails that centre  
holes are not concentric with O. D.

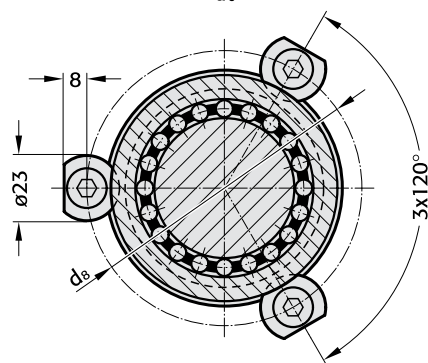
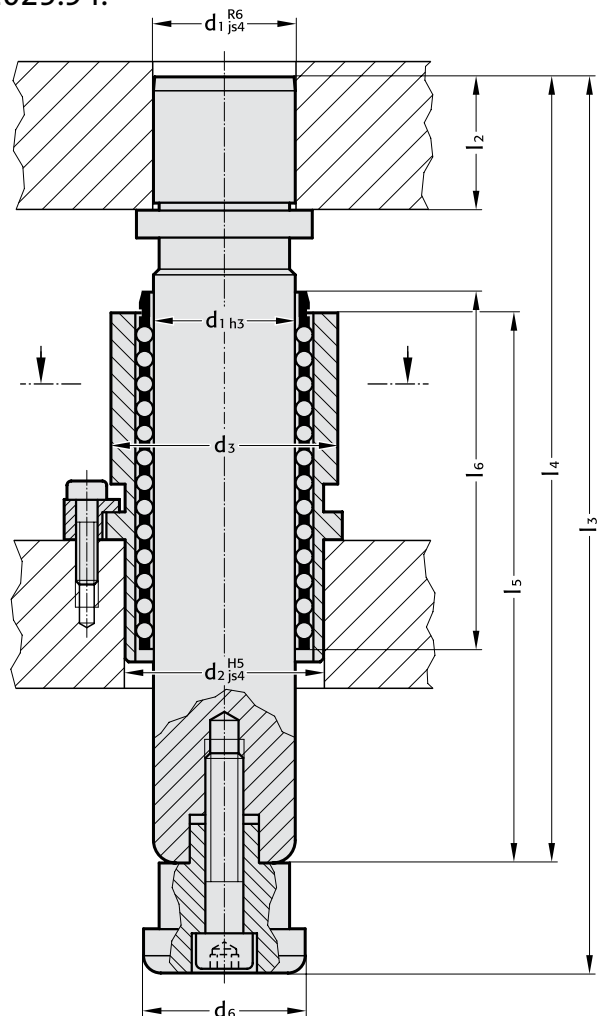
Demountable pillars with collar are suited to applications  
where die sharpening requires dismantling and re-fitting.

Tolerance range – yellow = .10  
green = .20  
red = .30

**Note:**  
Colour Code Combinations/Clearances - see pages D10 and D11.

2021.46./2021.44./2021.43.

$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_2$	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	22	25	32	40	50	63	80	95
$d_5$	22	25	32	40	50	60	70	93
$d_6$	33	36	43	51	61	74	91	106
$d_7$	45,7	48,7	55,7	63,7	73,7	86,7	103,7	118,7
a	15,9	16,6	18,4	20,4	29,2	33,8	39,8	46,2
$a_1$	21,7	23	26	29,5	29,2	33,8	39,8	46,2
m	M8	M8	M8	M8	M8	M8	M8	M12
s	6	6	6	6	6	6	6	12
$l_2$	20	23	30	37	37	47	47	60
$l_1$	100	●	●	●				
112	●	●	●	●	●			
125	●	●	●	●	●	●		
140	●	●	●	●	●	●	●	
160	●	●	●	●	●	●	●	●
180	●	●	●	●	●	●	●	●
200	●	●	●	●	●	●	●	●
224			●	●	●	●	●	●
250			●	●	●	●	●	●
280				●	●	●	●	●
315				●	●	●	●	●
355					●	●	●	●
400						●	●	●

**Ball Guide Units, complete  
to Daimler Standard****2025.94.****2025.94.****2025.94.**

Pillar- $\varnothing d_1$	50	80
$d_2$	70	105
$d_3$	80	118
$d_6$	57	91
$d_8$	97	135
$l_2$	47	75
$l_3$	316	450
$l_4$	271	400
$l_5$	194	280
$l_6$	128	160

**Execution:**

Ball guide unit 2025.94. consisting of:  
Demountable guide pillar, guide bush, ball cage, cage retainer, clamps  
and socket head cap screws to DIN EN ISO 4762.

**Materials:**

Demountable guide pillar: steel, surface hardened  
Guide bush: tooling steel  
Cage retainer: steel  
Ball cage: brass

**Ordering example:**

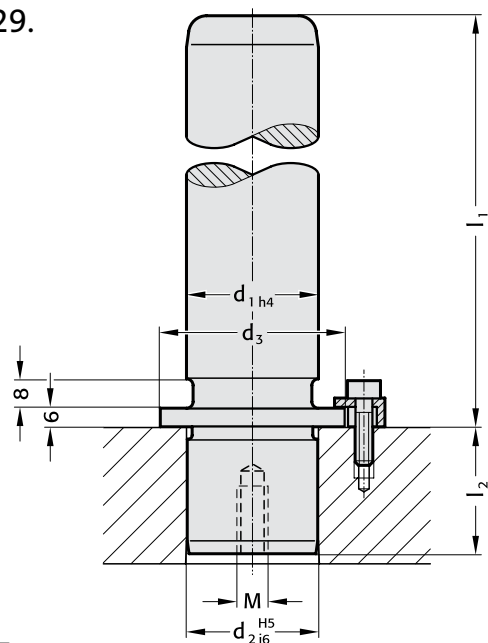
Ball guide unit, complete = 2025.94.  
Pillar  $\varnothing d_1 = 50$  mm = 050  
Order No: = 2025.94.050



**2021.29.**

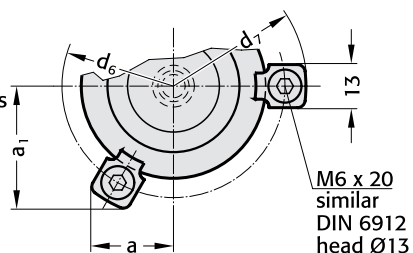
**Guide Pillars with Collar**

2021.29.



207.45

Screw Clamps,  
incl. Screws  
Order-No for  
replacement parts



M6 x 20  
similar  
DIN 6912  
head Ø13



2021.29.

**Material:**

Steel, surface hardened  
Surface hardness: 60 + 4 HRC

Hardness penetration  
depth: 1,5 + 1 mm

**Note:**

Guide Pillar only recommended for use with sliding guides

**Ordering Code (example):**

Guide Pillar with Collar	=	2021.29.
d <sub>1</sub> = 32 mm	=	032.
l <sub>1</sub> = 180 mm	=	180
Order No	=	2021.29.032.180

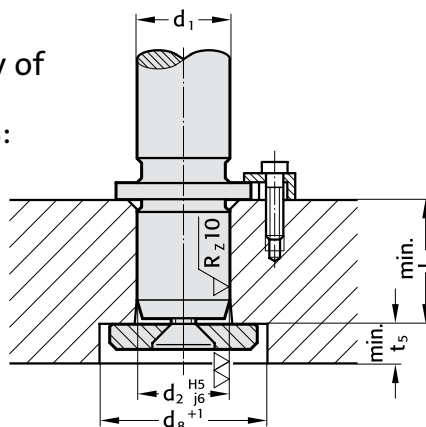
**2021.29. / 2021.43.**

d <sub>1</sub>	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80
d <sub>2</sub>	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80
d <sub>3</sub>	22	25	32	40	50	63	80	95							
d <sub>5</sub>	22	25	32	40	50	60	70	93							
d <sub>6</sub>	33	36	43	51	61	74	91	106							
d <sub>7</sub>	45,7	48,7	55,7	63,7	73,7	86,7	103,7	118,7							
d <sub>8</sub>	24	27	34	42	52	62	72	95							
a	15,9	16,6	18,4	20,4	29,2	33,8	39,8	46,2							
a <sub>1</sub>	21,7	23	26	29,5	29,2	33,8	39,8	46,2							
M	M8	M8	M8	M8	M8	M8	M8	M12							
s	6	6	6	6	6	6	6	12							
l <sub>3</sub>	20,5	23,5	30,5	37,5	37,5	47,5	47,5	60,5							
t <sub>5</sub>	6,5	6,5	6,5	6,5	6,5	6,5	6,5	12,5							
l <sub>2</sub>	20	23	30	37	37	47	47	60							

l <sub>1</sub>	100	●	●	●											
	112	●	●	●	●										
	125	●	●	●	●	●									
	140	●	●	●	●	●	●								
	160	●	●	●	●	●	●	●							
	180	●	●	●	●	●	●	●	●						
	200	●	●	●	●	●	●	●	●	●					
	224			●	●	●	●	●	●	●	●				
	250			●	●	●	●	●	●	●	●	●			
	280				●	●	●	●	●	●	●	●	●		
	315					●	●	●	●	●	●	●	●	●	
	355						●	●	●	●	●	●	●	●	●
	400							●	●	●	●	●	●	●	●

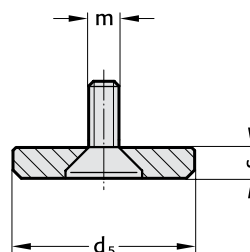
2021.29.

**Assembly of  
Guide  
Elements:**



2021.43.

**Retaining Disc with  
Countersunk Socket  
Head Screw**



**Ordering Code (example):**

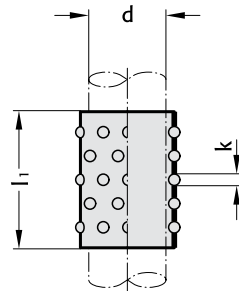
Disc with screw	=	2021.43.
d <sub>1</sub> = 32 mm	=	032
Order No	=	2021.43.032

Ball Guides for highest stroking speeds

206.41. 2061.44./2062.44.  
202.61.



206.41.

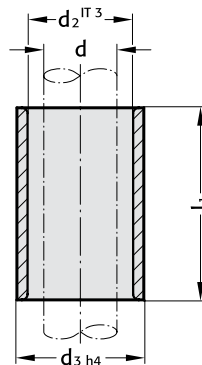


206.41.

Order No	d	l1	k
206.41.012.020.021	12	21	2
206.41.012.020.042	12	42	2
206.41.012.025.021	12	21	2,5
206.41.012.025.042	12	42	2,5
206.41.015.030.045	15	45	3
206.41.015.030.056	15	56	3
206.41.015.030.063	15	63	3
206.41.015.030.071	15	71	3



2062.44.012.  
2061.44.015.



2062.44.012.

Order No	d	d2	d3	l1	for Ball Ø
2062.44.012.016.032	12	16	20	32	2
2062.44.012.017.032		17			2,5

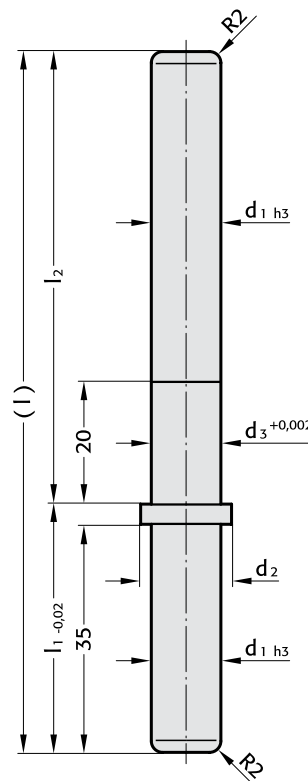
Tolerance range xx  
yellow = .10  
green = .20

2061.44.015.

Order No	d	d2	d3	l1	for Ball Ø
2061.44.015.023.xx	15	21	28	23	3
2061.44.015.030.xx				30	
2061.44.015.037.xx				37	
2061.44.015.047.xx				47	
2061.44.015.060.xx				60	



202.61.



202.61

Order No	d1	d2	d3	l	l1	l2
202.61.012.041.074	12	15,9	12,02	115	41	74
202.61.015.044.080	15	23,5	15,02	124	44	80

**Material:**

- Cage: polyacetal tubing
- Balls: Rolling bearing steel 100 Cr6 Quality Class 1, DIN 5401
- Guide bush: tool steel, hardened to 62±2 HRC
- Guide pillar: Steel, surface hardened
- hardness penetration 1±0,2 mm

**Discription:**

Owing to its much lower inertia, the plastic ball cage of particular advantage in die sets operating at stroking speed of 1000 SPM and more.

The phenomenon of ball-drag at the reversal point of cage travel, set up by the cage inertia, no longer occurs. The negative influence of this drag is eliminated – and so are the wear symptoms associated with it.

On small modular die sets the combination plastic ball cage/collared guide pillar 202.61. has indeed been successful for several years.

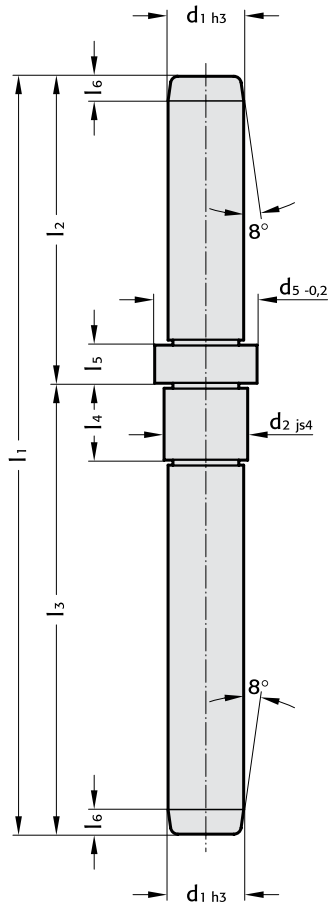
Cages with ball sizes 2 mm, 2,5 and 3 mm are supplied with matching guide bushes.

**FIBRO**

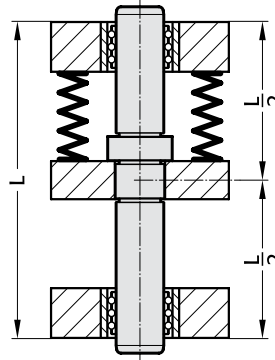
2020.63.

# Demountable Guide Pillars, with centre fixing

2020.63.



## Mounting Example:



## Description:

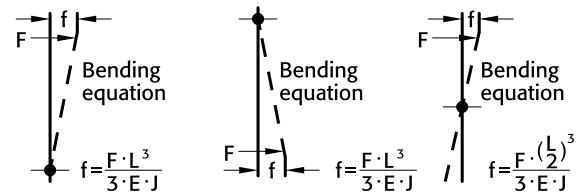
For press fit into register bore N5.

The transverse load resistance of tool guides is greatly influenced by the position of the guide pillar fixing.

For a tool with a spring-mounted die guide plate and pillar fixing at the top or bottom of the tool, the deflection and pillar bending values do not differ when the load is applied at the side since the distance (L) from the point of application of the force is the same.

Significantly better pillar bending values can be achieved by fixing the guide pillars in the die guide plate, i.e. in the centre of the pillar.

Since the distance ( $\frac{L}{2}$ ) between the point of application of the force and the fixing surface is thus halved, the load-bearing capacity is increased by eight times.



2020.63.

$d_1$	12	16
$d_2$	13	18
$d_5$	15,9	21,9
$l_1$	116	158
$l_2$	42	64
$l_3$	74	94
$l_4$	12,5	16
$l_5$	5	8
$l_6$	3	5

## Ordering Code (example):

Demountable Guide Pillars	=	2020.63.
$d_1 = 12$ mm	=	012.
$l_2 = 42$ mm	=	042.
$l_3 = 74$ mm	=	074
Order No	=	2020.63.012.042.074

## Material:

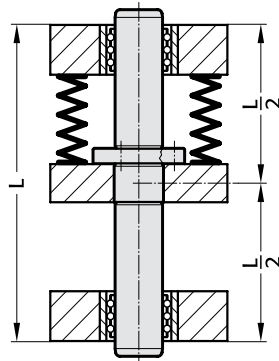
Steel, surface hardened  
 surface hardness: 62+2 HRC case hardened  
 hardness penetration:  $1 \pm 0,2$  mm

# Stripper-Mounted Pillars

2020.62.



## Mounting Example



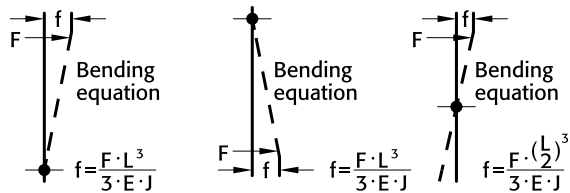
## Description:

The transverse load resistance of tool guides is greatly influenced by the position of the guide pillar fixing.

For a tool with a spring-mounted die guide plate and pillar fixing at the top or bottom of the tool, the deflection and pillar bending values do not differ when the load is applied at the side since the distance (L) from the point of application of the force is the same.

Significantly better pillar bending values can be achieved by fixing the guide pillars in the die guide plate, i.e. in the centre of the pillar.

Since the distance ( $\frac{L}{2}$ ) between the point of application of the force and the fixing surface is thus halved, the load-bearing capacity is increased by eight times.



**Material:** Steel, heat treated  
 Core strength:  $\cong 900 \text{ N/mm}^2$   
 Surface Hardness: 60 + 3 HRC (induction hardened)  
 Hardness Penetration:  $\cong 2,0 + 1,6 \text{ mm}$

**Execution:** precision ground

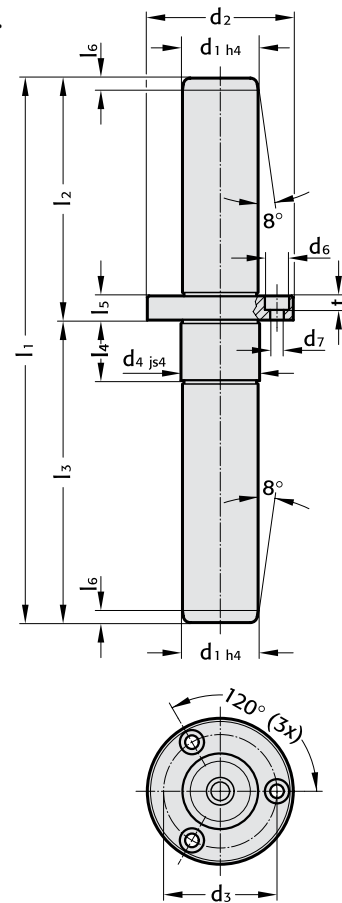
**Note:** Use hexagon socket head cap screws  
 DIN EN ISO 4762 12.9  
 Colour Code Combinations/Clearances – see pages D10 and D11.

Diameter 12 only available in Tolerance range yellow = .10

## Ordering Code (example):

Stripper-Mounted Pillar		Tolerance range
with centre fixing	= 2020.62.	yellow = .10
d <sub>1</sub> = 12 mm	= 012.	green = .20
l <sub>2</sub> = 50 mm	= 050.	red = .30
l <sub>3</sub> = 60 mm	= 060.	
Tolerance range – yellow	= 10	
Order No	= 2020.62.012.050.060.10	

2020.62.



2020.62.

d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>6</sub>	d <sub>7</sub>	t	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	l <sub>6</sub>
12	28	20	13	6	3,4	3,4	90	40	60	12	6	3
							100	50	60			
							110	50	60			
							120	50	70			
							130	60	70			
							140	70	70			
16	38	28	18	8	4,5	4,6	140	60	80	16	8	4
							150	60	90			
							160	70	90			
							170	70	100			
							180	80	100			
							190	90	100			
19	42	32	22	8	4,5	4,6	160	70	90	20	8	4
							170	70	100			
							180	80	100			
							190	80	110			
							200	90	110			
							210	100	110			
25	48	38	26	8	4,5	4,6	180	80	100	22	8	6
							190	80	110			
							200	90	110			
							210	90	120			
							220	100	120			
							230	110	120			
32	60	48	34	10	5,5	5,7	180	80	100	25	10	7
							190	80	110			
							200	90	110			
							210	90	120			
							220	100	120			
							230	100	130			
							240	110	130			
							250	110	140			
40	70	56	42	11	6,6	6,8	200	90	110	27	12	7
							210	90	120			
							220	100	120			
							230	100	130			
							240	110	130			
							250	110	140			
							260	120	140			

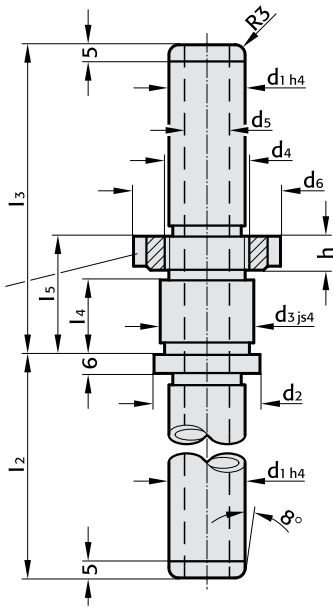
# FIBRO

202.60.

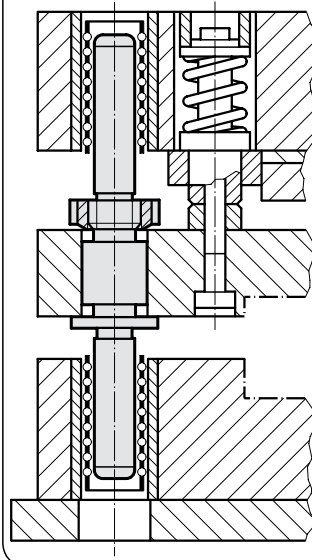
## Stripper-Mounted Pillars

202.60.  
Stripper-Mounted Pillars  
with ring nut

Always use shouldered  
face as bearing surface!



### Mounting Example



### Description:

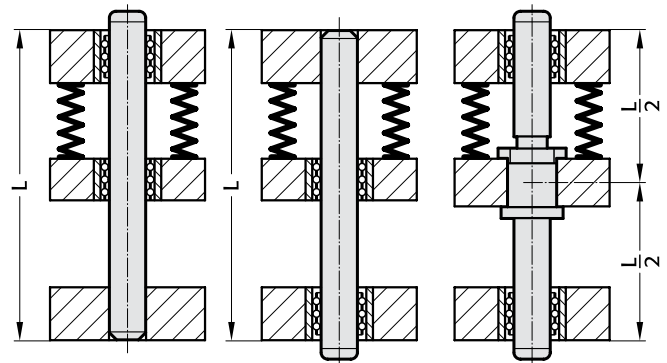
The transverse load resistance of tool guides is greatly influenced by the position of the guide pillar fixing.

For a tool with a spring-mounted die guide plate and pillar fixing at the top or bottom of the tool, the deflection and pillar bending values do not differ when the load is applied at the side since the distance (L) from the point of application of the force is the same.

Significantly better pillar bending values can be achieved by fixing the guide pillars in the die guide plate, i.e. in the centre of the pillar.

Since the distance ( $\frac{L}{2}$ ) between the point of application of the force and the fixing surface is thus halved, the load-bearing capacity is increased by eight times.

In order to keep moving mass to a minimum and thereby minimize detrimental forces of inertia, FIBRO Stripper-Mounted Pillars are made with a hollow core. Rigidity of the die set – of paramount importance – remains unaffected by the hollow design.



Bending equation  
 $f = \frac{F \cdot L^3}{3 \cdot E \cdot J}$

Bending equation  
 $f = \frac{F \cdot L^3}{3 \cdot E \cdot J}$

Bending equation  
 $f = \frac{F \cdot (\frac{L}{2})^3}{3 \cdot E \cdot J}$

### 202.60.

d <sub>1</sub>	19	25	32	40
d <sub>2</sub>	32	38	46	56
d <sub>3</sub>	25	30	36	46
d <sub>4</sub>	M22 × 1,5	M28 × 1,5	M35 × 1,5	M45 × 1,5
d <sub>5</sub>	8	12	20	28
d <sub>6</sub>	40	50	55	68
h	9	10	11	12
l <sub>2</sub>	80	80	100	100
l <sub>3</sub>	120	120	140	140
l <sub>4</sub>	29	29	34	34
l <sub>5</sub>	45	45	50	50

Shorter lengths l<sub>2</sub> and l<sub>3</sub> available on request

### Ordering Code (example):

Stripper-Mounted Pillar with Collar and ring nut retention	= 202.60.
d <sub>1</sub> = 25 mm	= 025.
l <sub>2</sub> = 80 mm	= 080.
l <sub>3</sub> = 120 mm	= 120.
Tolerance range – green	= 20
Order No	= 202.60.025.080.120.20

### Material:

Steel, surface hardened  
Core strength:  $\geq 900 \text{ N/mm}^2$   
Surface Hardness: 60+3 HRC (induction hardened)  
Hardness Penetration:  $\geq 1,8 \text{ mm}$

### Execution:

precision ground

### Note:

Colour Code Combinations/Clearances – see pages D10 and D11.

Tolerance range  
yellow = .10  
green = .20  
red = .30

### Ordering Code (example):

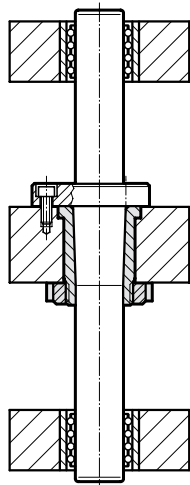
ring nut only  
to DIN 1804-h = 202.60. 0 25 15  
d<sub>1</sub>

Stripper-Mounted Retaining Bushes,  
conical pillar fit

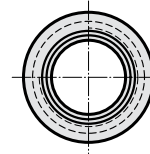
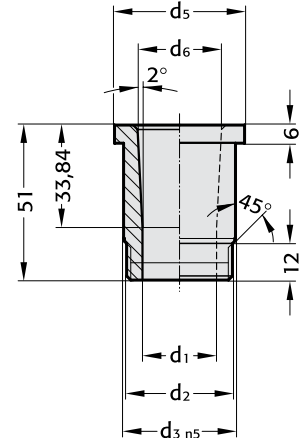
2021.64.



Mounting Example:

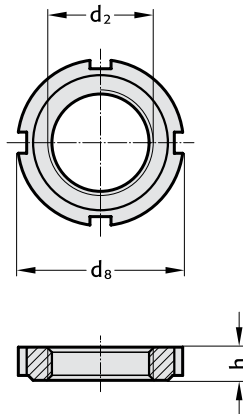


2021.64.



2073.48.

DIN 1804



Ordering Code (example):

Ring Nut = 2073.48.  
 $d_2 = M40 \times 1,5 = 040.15$   
 Order No = 2073.48.040.15

**Material:** Retaining bushes 16 MnCr5

Surface hardness: Case hardened  $60 \pm 2$  HRC

Hardness Penetration:  $\geq 0,8-1$  mm

**Execution:** Thread not hardened

**Note:** Guide pillar 2020.64.

2021.64.

$d_1$	25,5	32,5
$d_2$	M35 × 1,5	M40 × 1,5
$d_3$	37	44
$d_5$	43	50
$d_6$	27,86	34,86
$d_8$	55	62
h	11	12

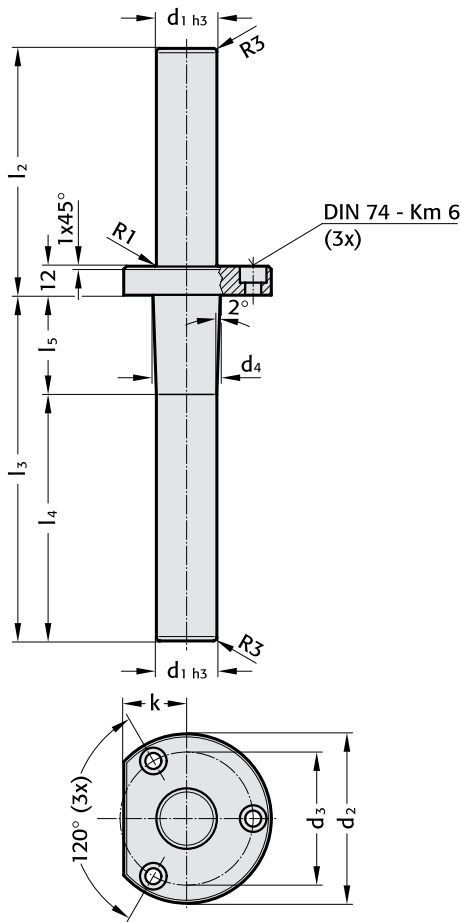
Available upon request!

Ordering Code (example):

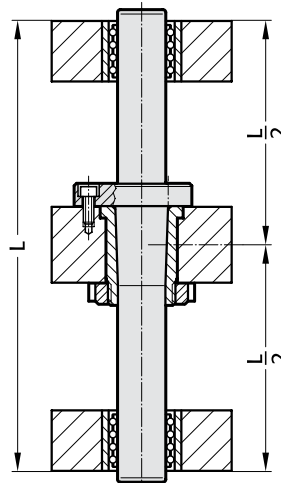
Retaining Bush, conical = 2021.64.  
 $d_1 = 32$  mm = 032  
 Order No = 2021.64.032

**Stripper Mounted Guide Pillars  
conical, with centre fixing**

2020.64.



**Mounting Example:**



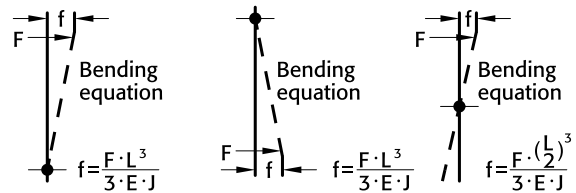
**Description:**

The transverse load resistance of tool guides is greatly influenced by the position of the guide pillar fixing.

For a tool with a spring-mounted die guide plate and pillar fixing at the top or bottom of the tool, the deflection and pillar bending values do not differ when the load is applied at the side since the distance (L) from the point of application of the force is the same.

Significantly better pillar bending values can be achieved by fixing the guide pillars in the die guide plate, i.e. in the centre of the pillar.

Since the distance ( $\frac{L}{2}$ ) between the point of application of the force and the fixing surface is thus halved, the load-bearing capacity is increased by eight times.



2020.64.

d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	k	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>
25	70	55	27,86	26	102	143	102	41
					122	143	102	41
32	76	62	34,86	30	102	143	102	41
					122	143	102	41
					122	153	112	41
					137	153	112	41
					142	153	112	41
					162	153	112	41

Available upon request!

**Ordering Code (example):**

Guide Pillar, conical	
with centre fixing	= 2020.64.
d <sub>1</sub> = 25 mm	= 025.
l <sub>2</sub> = 102 mm	= 102.
l <sub>3</sub> = 143 mm	= 143.
Tolerance range – yellow	= 10
Order No	= 2020.64.025.102.143.10

**Material:**

Steel  
hardened to 62±2 HRC

**Execution:**

Precision ground

**Note:**

Retaining Bush 2021.64.

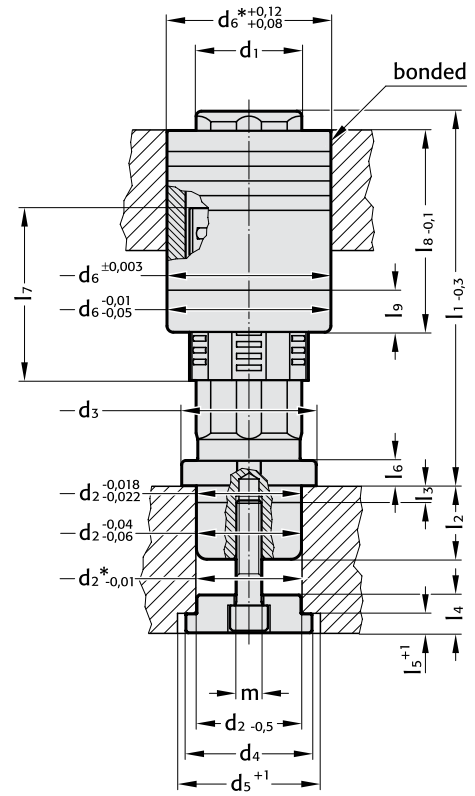
Use screws conforming to DIN EN ISO 4762 12.9

Tolerance range    yellow    = .10  
                                  green     = .20

2024.94.

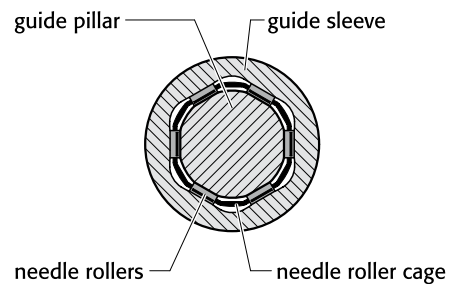


2024.94.



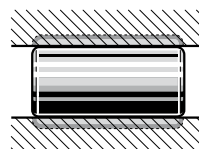
\*mounting bore

Cross section of guide unit



- |                   |                    |
|-------------------|--------------------|
| Ø 16              | 4 Running surfaces |
| Ø 12, Ø 20 - Ø 60 | 6 Running surfaces |
| Ø 80              | 8 Running surfaces |

The secret of the high rigidity, robustness and guide accuracy of FIBRO Million Guide guide units is the large surface area of the needle rollers.





# FIBRO

2024.94.

## Million Guide - Guide Units

### Description:

FIBRO Million Guide guide units are used wherever rigidity, robustness and a precision guide function is required. For stroke speeds up to 50 m/min and temperatures up to 80 °C.

### Version:

Guide unit 2024.94 consisting of paired guide pillar and guide sleeve, needle roller cage and disk for fixing the guide column. The fixing screw is ordered separately (see C40, C41) as the screw required depends on the thickness of the base plate.

### Materials:

Needle roller cage: plastic  
 Needle rollers: steel, hardened  
 Guide sleeve: tool steel alloy, hardened, 60±2 HRC  
 Guide pillar: tool steel alloy, hardened, 60±2 HRC  
 Disk: Steel

### Note:

Guide units must be installed in accordance with the Instructions.

### 2024.94.

d <sub>1</sub>	12	16	20	25	30	32	40	50	60	80
d <sub>2</sub>	12	16	20	25	30	32	40	50	60	80
d <sub>3</sub>	18	24	29	35	40	42	54	64	74	98
d <sub>4</sub>	16	22	26	32	38	40	50	60	72	105
d <sub>5</sub>	18	24	28	34	38	40	50	60	72	105
d <sub>6</sub>	23	30	37	44	50	54	68	78	95	120
m	M5x8	M6x10	M8x20	M8x20	M10x25	M10x25	M12x30	M12x30	M14x30	M16x30
l <sub>2</sub>	12	16	20	25	30	30	35	35	42	45
l <sub>3</sub>	6	6	8	8	8	8	8	8	15	15
l <sub>4</sub>	7	10	13	13	16	16	18	18	20	26
l <sub>5</sub>	3	4	5	5	7	7	9	9	12	13
l <sub>6</sub>	5	6	8	8	9	9	10	12	15	15
l <sub>7</sub>	29,8	30	52	62	68	68	78	82	116	132
l <sub>8</sub>	40	40	60	70	78	78	92	96	120	145
l <sub>9</sub>	-	-	20	20	20	20	20	20	20	25
l <sub>1</sub> 50	●									
60	●									
70	●									
80	●	●	●							
90	●	●	●							
100	●	●	●	●	●	●				
110	●	●	●	●	●	●				
120	●	●	●	●	●	●	●			
130		●	●	●	●	●	●			
140				●	●	●	●			
150				●	●	●	●	●	●	
160				●	●	●	●	●	●	●
170					●	●	●	●	●	●
180					●	●	●	●	●	●
190					●	●	●	●	●	●
200					●	●	●	●	●	●
210							●	●	●	●
220							●	●	●	●
230								●	●	●
240								●	●	●
250								●	●	●
260										●
270										●
280										●

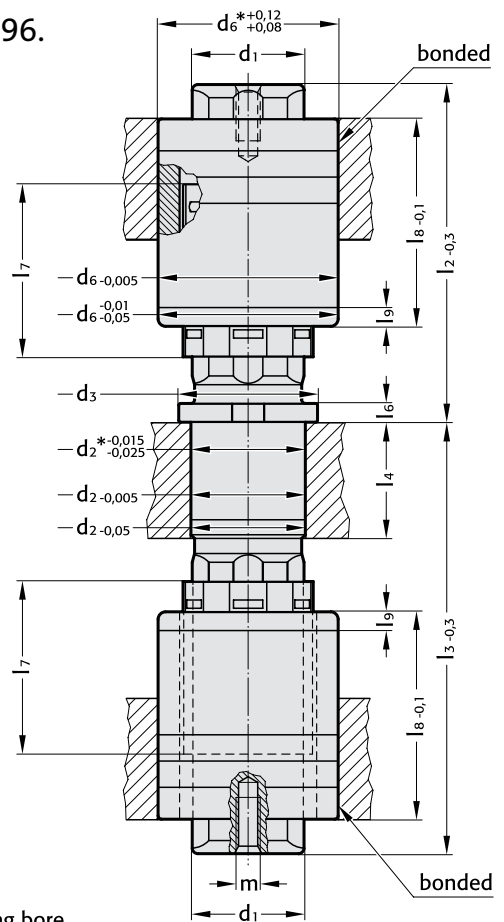
### Ordering Code (example):

Guide unit  
 Million Guide = 2024.94.  
 d<sub>1</sub> = 20 mm = 020.  
 l<sub>1</sub> = 120 mm = 120  
 Order No = 2024.94.020.120

2024.96.

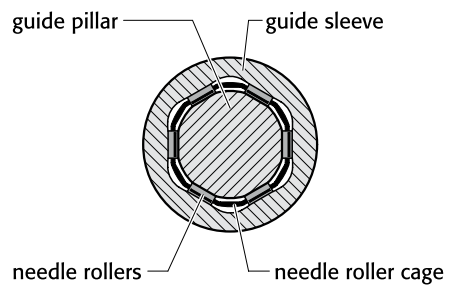


2024.96.



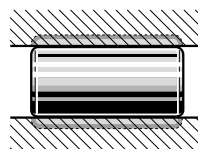
\*mounting bore

Cross section of guide unit



- Ø 16                      4 Running surfaces
- Ø 12, Ø 20 - Ø 30      6 Running surfaces

The secret of the high rigidity, robustness and guide accuracy of FIBRO Million Guide guide units is the large surface area of the needle rollers.



# FIBRO

2024.96.

## Million Guide - Guide Units

### Description:

FIBRO Million Guide guide units are used wherever rigidity, robustness and a precision guide function is required. For stroke speeds up to 50 m/min and temperatures up to 80 °C.

### Version:

Guide unit consisting of a paired guide pillar & guide sleeves and needle roller cages.

### Materials:

Needle roller cage: plastic  
Needle rollers: steel, hardened  
Guide sleeve: tool steel alloy, hardened, 60±2 HRC  
Guide pillar: tool steel alloy, hardened, 60±2 HRC  
Disk: Steel

### Note:

Guide units must be installed in accordance with the Instructions.

## 2024.96.

d <sub>1</sub>	12	16	20	25	30
d <sub>2</sub>	12,5	16,5	20,5	25,5	30,5
d <sub>3</sub>	19	23	27	32	37
d <sub>6</sub>	22	28	34	40	48
m	M5x8	M6x10	M8x20	M8x20	M8x20
l <sub>4</sub>	12	16	20	25	30
l <sub>6</sub>	4	5	5	5	5
l <sub>7</sub>	29,8	30	46	56	68
l <sub>8</sub>	30	40	50	60	70
l <sub>9</sub>	–	–	20	20	20
l <sub>3</sub>	50	l <sub>2</sub>	l <sub>2</sub>	l <sub>2</sub>	l <sub>2</sub>
60	40/50/60				
70	40/50/60	40/50/60			
80		40/50/60/70	50/60/70		
90		50/60/70/80	50/60/70/80	60/70/80	70/80/90
100			60/70/80/90	60/70/80/90	70/80/90
110				70/80/90	70/80/90

### Ordering Code (example):

Million Guide – guide unit  
with centre fixing = 2024.96.

d<sub>1</sub> = 20 mm = 020.

l<sub>3</sub> = 80 mm = 080.

l<sub>2</sub> = 70 mm = 070

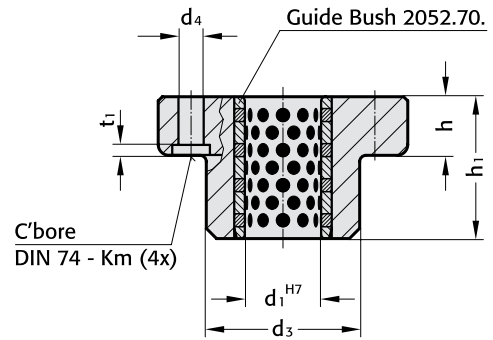
Order No = 2024.96.020.080.070

Rectangular Mounting Flanges  
Bronze with Non-Liquid Lubricant

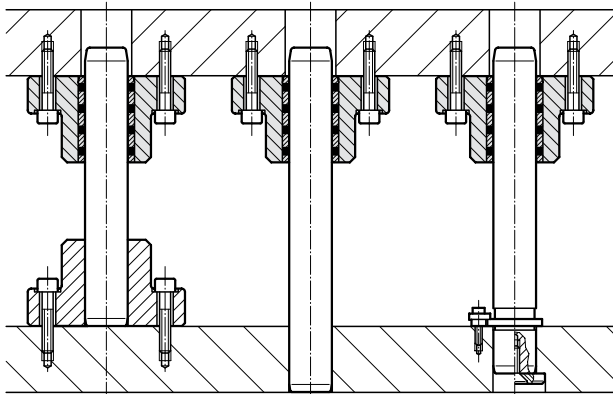
2031.70.



2031.70.

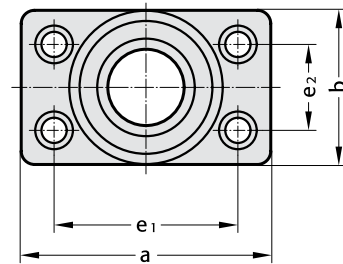


Mounting examples:



Guide pillars  
\* 202.19.                      \* 202.19.  
                                         \* 2022.19.                      \* 2022.19.  
                                         \* 2022.25.                      \* 2022.25.  
                                         \* 2021.46.                      \* 2021.46.  
                                         2021.43.                      2021.43.

\* Guide pillars, to order separately, see pages D16, D26, D31, and D35.



Material:

Mounting flange – special cast iron  
Guide bush 2052.70.  
Bronze, with non-liquid lubricant.

Execution:

Face and top machined.

2031.70.

d <sub>1</sub>	19	20	24	25	30	32	38	40	50	63	80
d <sub>3</sub>	45	45	50	50	65	65	80	80	96	110	130
d <sub>4</sub>	9	9	9	9	11	11	14	14	18	18	22
a	85	85	90	90	115	115	130	130	160	180	215
b	45	45	50	50	65	65	80	80	96	110	130
e <sub>1</sub>	64	64	68	68	83	83	95	95	118	132	160
e <sub>2</sub>	24	24	28	28	34	34	45	45	55	62	75
h	18	18	22	22	25	25	30	30	35	35	40
h <sub>1</sub>	37	37	47	47	60	60	77	77	95	120	120
t <sub>1</sub>	3	3	3	3	3	3	3	3	4	4	10

Ordering Code (example):

Mounting Flange, Guide Bush  
with Non-Liquid Lubricant 2052.70. = 2031.70.  
d<sub>1</sub> = 40 mm = 040  
Order No = 2031.70.040

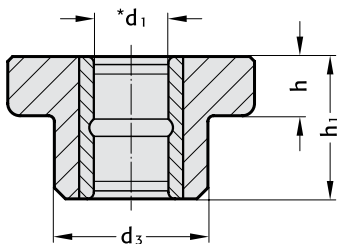
# FIBRO

2031.01./31./41.  
206.71.

## Rectangular Mounting Flanges – without screw holes – Ball Cages

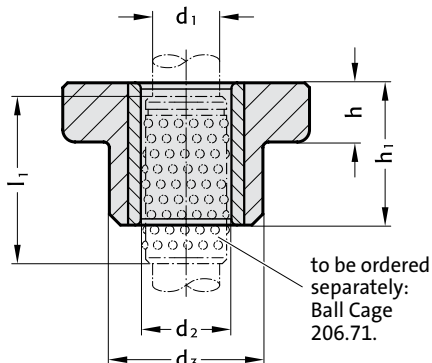
### 2031.31.

Mounting Flange with Sintered Ferrite Guide Bush, carbonitrided



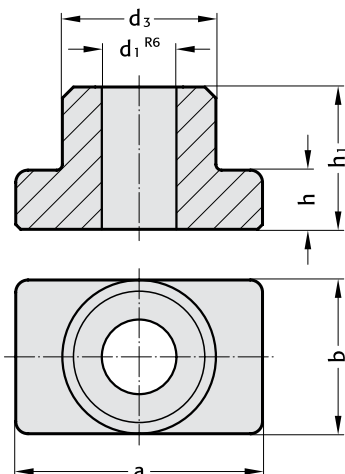
### 2031.41.

Mounting Flange with Ball Bearing Guide Bush



### 2031.01.

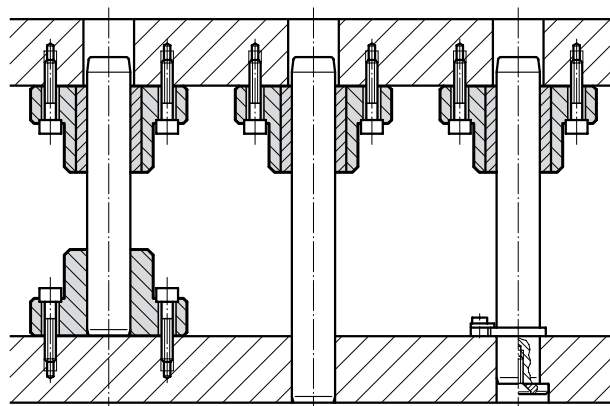
Mounting Flange for Guide Pillars



\*Colour Code Combinations/Clearances – see pages D10 and D11.



### Mounting Examples:



Guide Pillars  
\*202.19.

\*202.19.

\*2021.46.  
2021.43.

\*Guide Pillars, to order separate, see pages D16 and D35.

### 2031.01./2031.31./2031.41.

d <sub>1</sub>	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80
d <sub>2</sub>	21	22	25	26	30	31	38	40	46	48	56	58	68	71	–
d <sub>3</sub>	35	45	50	50	65	65	80	80	96	96	110	110	130	130	–
a	70	85	90	90	115	115	130	130	160	160	180	180	215	215	–
b	35	45	50	50	65	65	80	80	96	96	110	110	130	130	–
h	18	18	22	22	25	25	30	30	35	35	35	35	40	40	–
h <sub>1</sub>	30	37	47	47	60	60	77	77	95	95	120	120	120	120	–
l*	45	45	56	56	71	71	95	95	120	120	140	140	–	–	–
l <sub>1</sub> *	44	44	56	56	70	70	95	95	120	120	140	140	–	–	–

Tolerance range – yellow = .10

green = .20

red = .30

l\* = Nominal ordering length

l<sub>1</sub>\* = Manufacturing length = Preferred lengths of Ball Cages

### Ordering Code (example):

Mounting Flange with sintered ferrite guide bush	= 2031.31.	Ball Cage	= 206.71.	Mounting flange for Guide Pillars	= 2031.01.
d <sub>1</sub> = 32 mm	= 032.	d <sub>1</sub> = 32 mm	= 032.	d <sub>1</sub> = 40 mm	= 040
Tolerance range – red	= 30	l = 71 mm	= 071		
Order No	= 2031.31.032.30	Order No	= 206.71.032.071	Order No	= 2031.01.040

### Material:

Special cast iron

### Execution:

Mounting Flanges for Guide Bushes:  
Face and top machined.  
Bores honed.

Mounting Flanges for Guide Pillars:  
Face and top machined.  
Hole fine bored to d<sub>1</sub><sup>R6</sup> fit.

### Note:

Check squareness of pillars after press-fitting.

Notes on Sliding-/Ball Bearing Guides – see page D9.

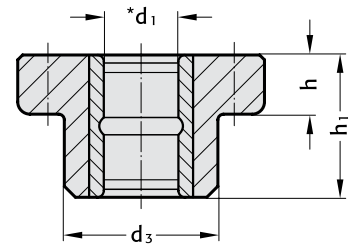
# Rectangular Mounting Flanges Ball Cages

2031.02./34./42.  
206.71.



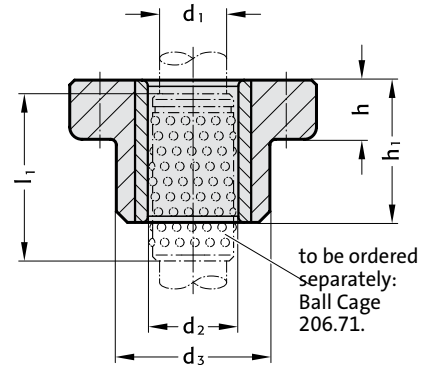
### 2031.34.

Mounting Flange with Sintered Ferrite Guide Bush, carbonitrided

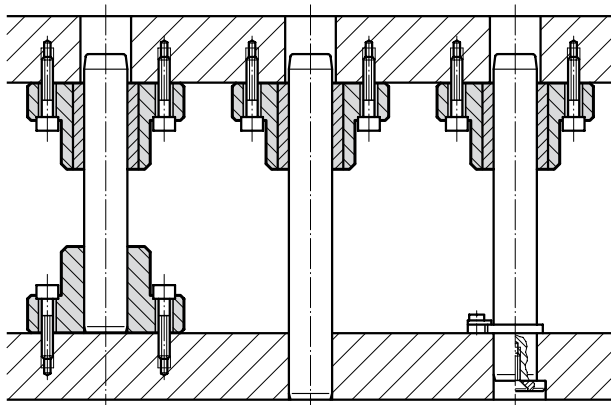


### 2031.42.

Mounting Flange for Ball Bearing Guide



### Mounting Examples:

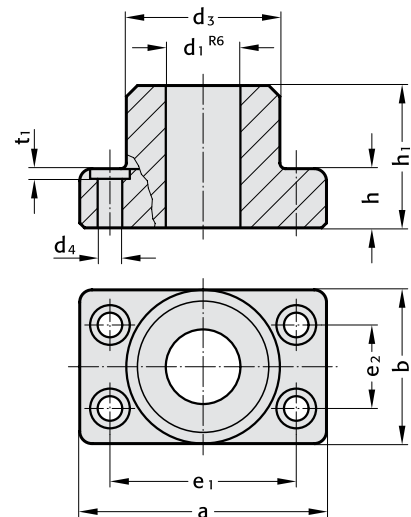


Guide Pillars \*202.19.                      \*202.19.                      \*2021.46.  
2021.43.

\*Guide Pillars, to order separate, see pages D16 and D35.

### 2031.02.

Mounting Flange for Guide Pillars



\*Colour Code Combinations/Clearances – see pages D10 and D11.

### Material:

Special cast iron

### Execution:

Mounting Flanges for Guide Bushes:  
Face and top machined.  
Bores honed.

Mounting Flanges for Guide Pillars:  
Face and top machined.  
Hole fine bored to  $d_1^{R6}$  – fit.

### Note:

Check squareness of pillars after press-fitting.

Notes on Sliding-/Ball Bearing Guides – see page D9.

### 2031.02./2031.34./2031.42.

$d_1$	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80
$d_2$	21	22	25	26	30	31	38	40	46	48	56	58	68	71	–
$d_3$	35	45	50	65	80	96	110	130	140	160	180	215	–	–	–
$d_4$	6,6	9	9	11	14	18	18	22	–	–	–	–	–	–	–
$t_1$	3	3	3	3	3	4	4	10	–	–	–	–	–	–	–
a	70	85	90	115	130	160	180	215	–	–	–	–	–	–	–
b	35	45	50	65	80	96	110	130	–	–	–	–	–	–	–
$e_1$	53	64	68	83	95	118	132	160	–	–	–	–	–	–	–
$e_2$	19	24	28	34	45	55	62	75	–	–	–	–	–	–	–
h	18	18	22	25	30	35	35	40	–	–	–	–	–	–	–
$h_1$	30	37	47	60	77	95	120	120	–	–	–	–	–	–	–
$l^*$	45	45	56	71	95	120	140	–	–	–	–	–	–	–	–
$l_1^*$	44	44	56	70	95	120	140	–	–	–	–	–	–	–	–

Tolerance range – yellow = .10  
green = .20  
red = .30

$l^*$  = Nominal ordering length

$l_1^*$  = Manufacturing length = Preferred lengths of Ball Cages

### Ordering code (example):

Mounting Flange for Ball Bearing Guide	= 2031.42.	Ball Cage	= 206.71.	Mounting flange for Guide Pillars	= 2031.02.
$d_1 = 40$ mm	= 040.	$d_1 = 40$ mm	= 040.	$d_1 = 40$ mm	= 040
Tolerance range – green	= 20	$l = 95$ mm	= 095		
Order No	= 2031.42.040.20	Order No	= 206.71.040.095	Order No	= 2031.02.040

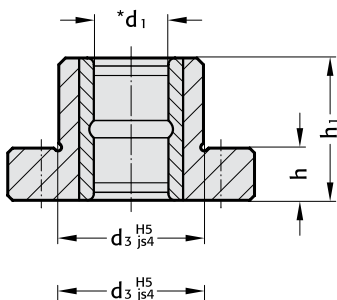
# FIBRO

2031.04./38./44.  
206.71.

## Shallow Mounting Flanges – Rectangular – Ball Cages

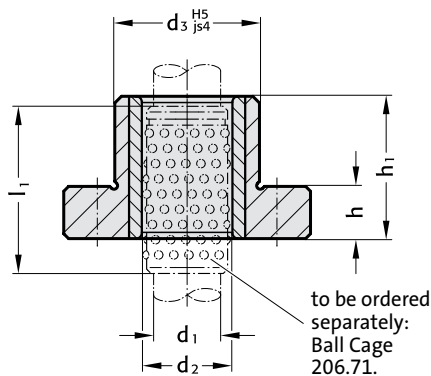
### 2031.38.

Mounting Flange  
with Sintered  
Ferrite Guide Bush,  
carbonitrided



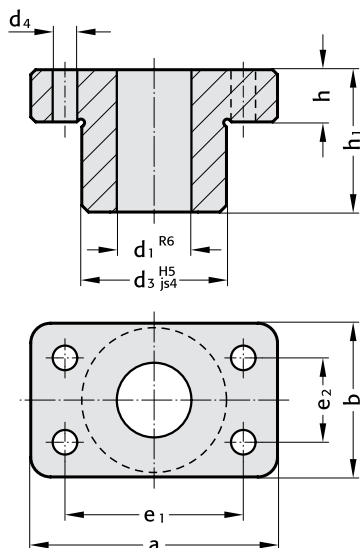
### 2031.44.

Mounting  
Flange for  
Ball Bearing  
Guide



### 2031.04.

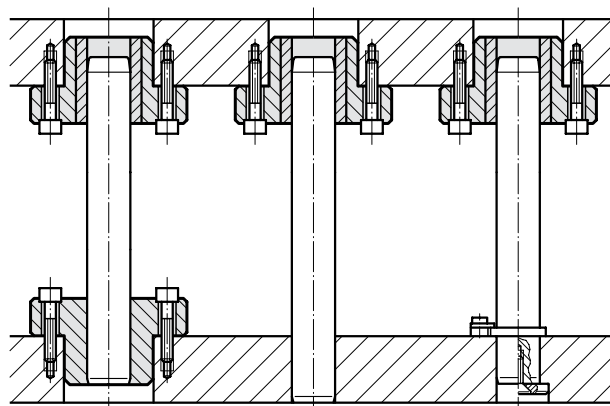
Mounting  
Flange for  
Guide Pillars



\*Colour Code Combinations/Clearances – see pages D10 and D11.



### Mounting Examples:



Guide Pillars  
\*202.19.

\*202.19.

\*2021.46.  
2021.43.

\*Guide Pillars, to order separate, see pages D16 and D35.

### 2031.04./2031.38./2031.44.

d <sub>1</sub>	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80
d <sub>2</sub>	–	–	25	26	30	31	38	40	46	48	56	58	–	–	–
d <sub>3</sub>	32	–	42	–	47	–	62	–	77	–	93	–	107	–	127
d <sub>4</sub>	7	–	9	–	9	–	11	–	14	–	18	–	18	–	22
a	70	–	85	–	90	–	115	–	130	–	160	–	180	–	215
b	35	–	45	–	50	–	65	–	80	–	96	–	110	–	130
e <sub>1</sub>	53	–	64	–	68	–	83	–	95	–	118	–	132	–	160
e <sub>2</sub>	19	–	24	–	28	–	34	–	45	–	55	–	62	–	75
h	16	–	16	–	20	–	23	–	28	–	33	–	33	–	38
h <sub>1</sub>	30	–	37	–	47	–	60	–	77	–	95	–	120	–	120
l*	–	–	45	–	56	–	71	–	95	–	120	–	–	–	–
l <sub>1</sub> *	–	–	44	–	56	–	70	–	95	–	120	–	–	–	–

Tolerance range – yellow = .10

l\* = Nominal ordering length

green = .20

l<sub>1</sub>\* = Manufacturing length = Preferred lengths of Ball Cages

red = .30

### Ordering Code (example):

Mounting Flange for			
Ball Bearing Guide	= 2031.44.	Ball Cage	= 206.71.
d <sub>1</sub> = 40 mm	= 040.	d <sub>1</sub> = 40 mm	= 040.
Tolerance range – yellow	= 10	l = 95 mm	= 095
Order No	= 2031.44.040.10	Order No	= 206.71.040.095
Mounting flange			
for Guide Pillars	= 2031.04.	d <sub>1</sub> = 40 mm	= 040
Order No	= 2031.04.040		

### Material:

Special cast iron

### Execution:

Both faces machined to dims. h;  
O. D. d<sub>3</sub> turned.

Mounting Flange for Guide Bushes:  
Bores honed.

Mounting Flanges for Guide Pillars:  
Hole fine bored to d<sub>1</sub><sup>R6</sup> – fit.

### Note:

Check squareness of pillars  
after press-fitting.

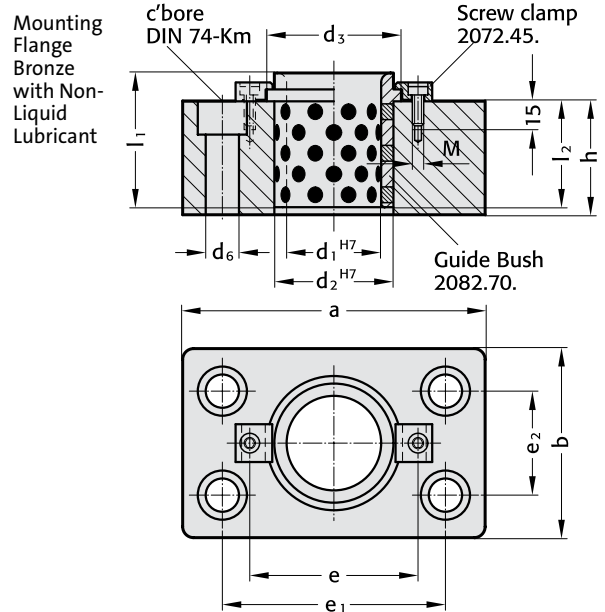
Notes on Sliding-/Ball Bearing Guides –  
see page D9.

**Rectangular Mounting Flanges  
Bronze with Non-Liquid Lubricant**

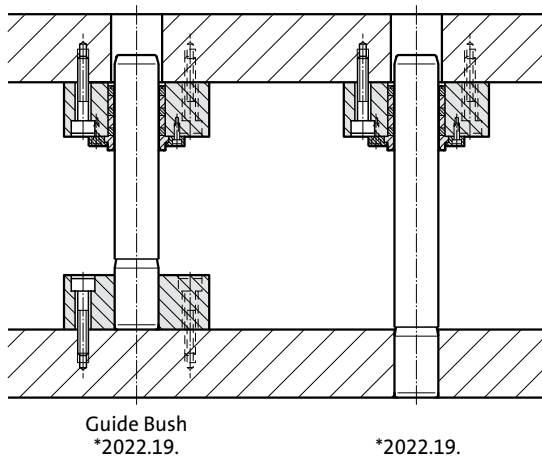
**2032.70.  
2032.02.**



**2032.70.**

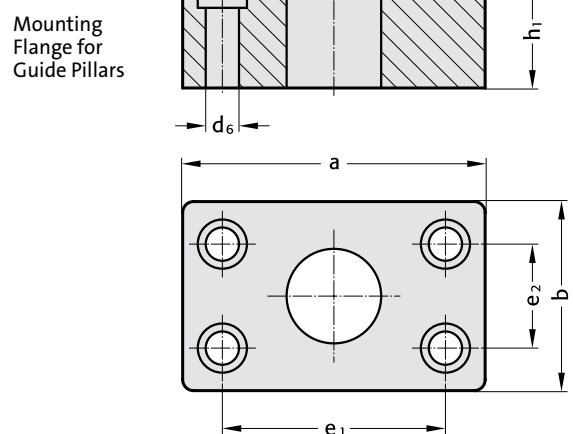


**Mounting Examples:**



\*Guide Pillars, to order separate, see page D31.

**2032.02.**



**2032.02./2032.70**

d <sub>1</sub>	50	63	80	100	125	160
d <sub>2</sub>	63	80	100	125	160	200
d <sub>3</sub>	71	90	112	140	180	220
d <sub>6</sub>	17,5	17,5	21,5	21,5	25,5	25,5
a	160	180	215	230	270	315
b	100	125	145	170	205	250
e	89	123	143	168	203	243
e <sub>1</sub>	118	132	160	168	203	243
e <sub>2</sub>	55	62	75	110	142	170
h	60	70	90	110	140	180
h <sub>1</sub>	70	80	100	125	140	180
l <sub>1</sub>	71	80	100	125	160	200
l <sub>2</sub>	56	63	80	106	132	170
M	M6 x 16	M10 x 16	M10 x 16	M10 x 16	M10 x 16	M10 x 16

**Ordering Code (example):**

Mounting Flange, Bronze with Non-Liquid Lubricant = 2032.70.  
 d<sub>1</sub> = 50 mm = 050  
 Order No = 2032.70.050

**Material:**

St 37.

**Execution:**

Mounting Flange Bronze with Non-Liquid Lubricant: Face and top machined.  
 Guide Bush 2082.70. Bronze with Non-Liquid Lubricant, oilless lubricating.

Mounting Flange for Guide Pillars: Face and top machined.  
 Hole fine bored to d<sub>1</sub><sup>H7</sup> – fit.

**Note:**

Check squareness of pillars after press-fitting.



A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.

Guide Bushes DIN 9831/ISO 9448-2  
Sintered Ferrite, carbonitrided,  
long-term lubrication

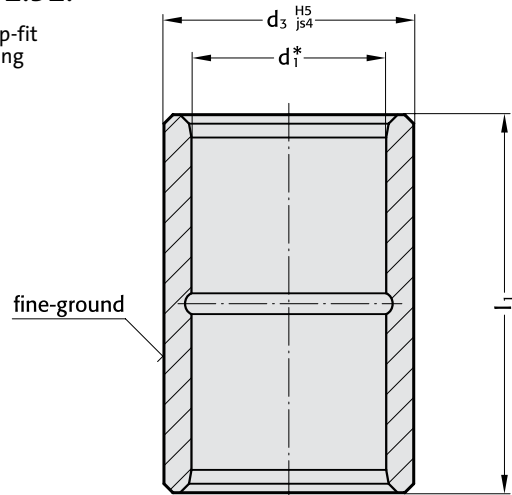
FIBRO

2051.32.



2051.32.

for slip-fit  
bonding



\* Colour Code Combinations/Clearances – see pages d10 and d11.

**Material:**

Sintered ferrite of high purity, carbonitrided

**Execution:**

Bearing surfaces and outside diameter fine-ground.

**Slip-Fit Bonding:**

The position of the bearing is given by push fit holes tolerance H5. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following advantages:

- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned above.

**Note:**

Notes on Sliding- and Ball Bearings Guides: see page D9.

Pillars see pages D14, D16, D17, D18, D22 and D35.

Tolerance range – yellow = .10  
green = .20  
red = .30

**Ordering Code (example):**

Guide Bush DIN 9831/ISO 9448-2	=	2051.32.
d <sub>3</sub> = 40 mm	=	040.
l <sub>1</sub> = 60 mm	=	060.
Tolerance range – red	=	30
Order No	=	2051.32.040.060.30

2051.32.

d <sub>3</sub>	8	11	12	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80
d <sub>3</sub>	13,7	22		28		32		40		48		58		70		85		95,7
l <sub>1</sub>	15	●																
	23		●		●		●		●									
	30		●		●		●		●	●			●					
	37		●		●		●		●	●			●					
	47				●		●		●	●			●					
	60	∅8-∅12			●		●		●	●			●			●		●
	77	not available					●		●	●			●			●		●
	95	in Tolerance range								●			●			●		
	110	red = .30											●					●
	120												●		●			●

## Special Ball Bearing Cages – Brass Made to Customers' Specifications

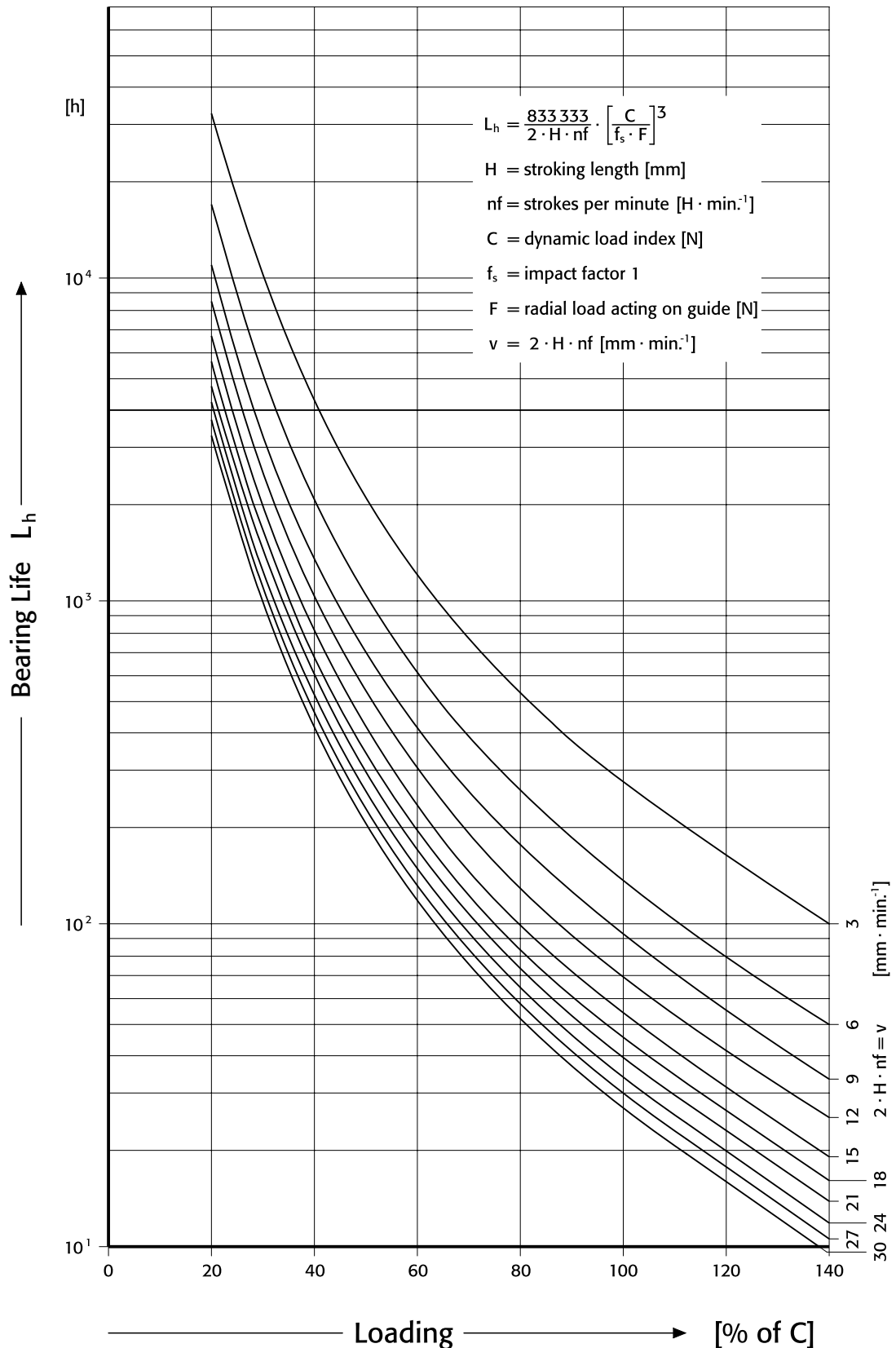
For use in special machine tools, general purpose machines, jigs and fixtures etc. brass ball cages are made to customers' specifications – without limitations to length and ball pattern.



# Loading Diagram for Ball Bearing Guides

Bearing Life versus Loading:

Values shown are based on the Impact Factor of  $f_s = 1$  which is applicable to normal conditions in respect of die set and press, with a maximum bearing temperature of 100 °C.



## Safe Loads for FIBRO Ball Bearing Guides

### Tables of Dynamic Load Indexes

**Definition:**

The dynamic load index C constitutes a constant loading that will allow the respective sizes of ball bearing guides to reach + 105 m without any discernible bearing damage. The load index is shown in N and results from tests executed with batches of sufficient size, subjected to linear travel oscillations and radially imposed loads of constant magnitude and unchanging direction.

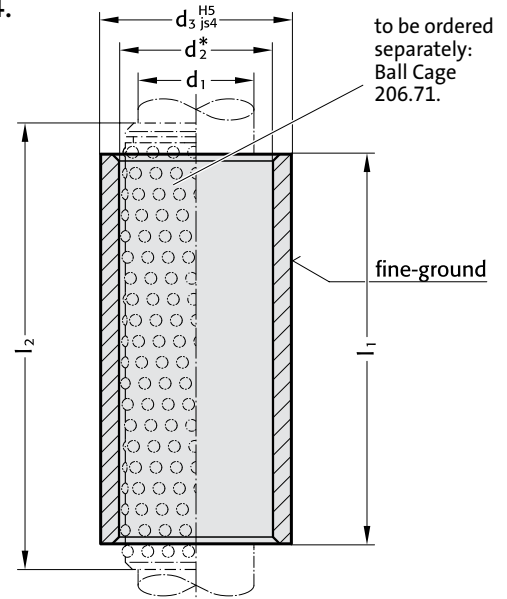
Pillar $\varnothing d_1$	Dynamic Load Index C		Pillar $\varnothing d_1$	Dynamic Load Index C	
	Cage length $l_1$	for whole cage (N)		Cage length $l_1$	for whole cage (N)
8	40	450	38	45	7500
10	40	1630		50	8200
	56	2210		56	8900
11	40	1660		63	10300
	56	2250		80	12100
12	40	1680		95	13900
	56	2280		105	15000
15	45	3300		120	16700
	56	4050		140	18700
	63	4550		160	20700
	71	4950		180	22600
16	24	1910		200	24400
	28	2230		240	28000
	45	3350	40	45	7500
	56	4100		50	8200
	63	4600		56	9000
	71	5000		63	10300
19	31	3050		80	12200
	45	4050		95	14000
	56	4950		105	15100
	71	6100		120	16700
	80	6600		140	18800
	95	7600		160	20800
20	24	2320		180	22700
	28	2700		200	24600
	31	3100		240	28000
	45	4100	48	50	9400
	56	5000		63	11700
	71	6100		80	13800
	80	6600		95	15900
	95	7600		105	17100
24	31	3150		120	19000
	40	3850		140	21400
	45	4200		160	23600
	56	5100		180	26000
	71	6300		200	28000
	80	6800		240	32000
	95	7800	50	50	9400
	120	9300		63	11700
25	31	3200		80	13900
	40	3900		95	15900
	45	4200		105	17200
	56	5200		120	19100
	71	6300		140	21400
	80	6900		160	23700
	95	7900		180	26000
	120	9300		200	28000
30	40	5700		240	32000
	45	6400	60	95	17700
	50	7000		105	19200
	56	7600		120	21300
	71	9300		140	23900
	75	9800		160	26500
	80	10400		180	29000
	95	11900		200	31000
	105	12800		240	35500
	120	14200	63	95	17800
	140	16000		105	19300
	160	17700		120	21300
32	40	5800		140	24000
	45	6400		160	26500
	50	7100		180	29000
	56	7700		200	31500
	71	9400		240	35500
	75	9900	80	120	41000
	80	10500		140	46500
	95	12000		160	52000
	105	12900		180	57000
	120	14300		200	62000
	140	16100		240	70000
	160	17800			

# Ball Bearing Guide Bushes DIN 9831/ISO 9448-3 Ball Cages

**FIBRO**  
2061.44.  
206.71.



2061.44.



## Material:

Bush: tool steel, Hardness: 62 ± 2HRC  
Cage: brass  
Balls: hardened steel (DIN 5401)

## Execution:

Bearing surfaces honed.  
Outside diameter fine-ground.

## Slip-Fit Bonding:

The position of the bearing is given by push fit holes tolerance H5. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following advantages:

- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned above.

## Note:

Notes on sliding- and rolling type guides see page D9.  
Pillars see pages D14, D16, D17, D18, D22 and D35.

\* Preloading see Colour Code Combinations – pages D10 and D11.

\* Ball cages Ø8 supplied without fastening ring groove and assembly aid!

Note: cage travel = one half of stroke length

l\* = Nominal ordering length

l2\* = Manufacturing length = Preferred lengths of Ball Cages

## Ordering Code (example):

Ball Cage	=	206.71.
d <sub>1</sub> = 30 mm	=	030.
l <sub>2</sub> = 120 mm	=	120
Order No	=	206.71.030.120

Tolerance range – yellow = .10  
green = .20  
red = .30

## Ordering Code (example):

Guide Bush	=	2061.44.
d <sub>1</sub> = 30 mm	=	030.
l <sub>1</sub> = 95 mm	=	095.
Tolerance range – yellow	=	10
Order No	=	2061.44.030.095.10

2061.44.

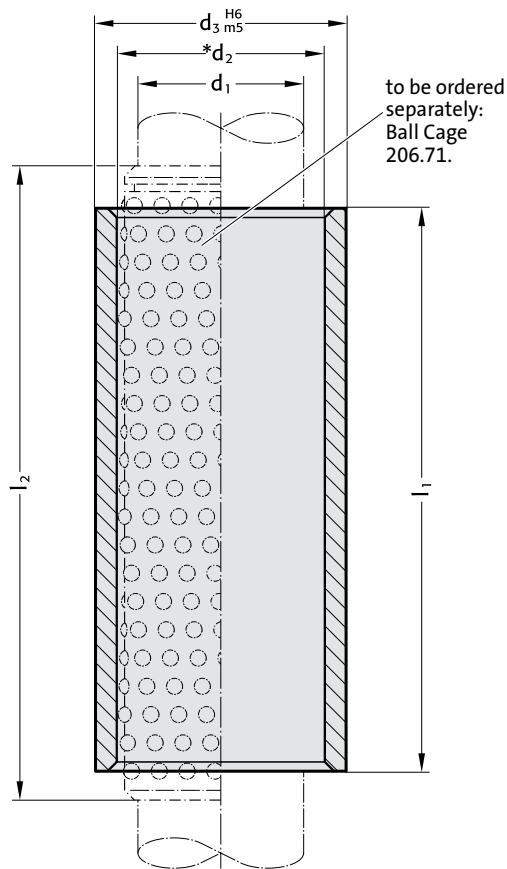
d <sub>1</sub>	8*	10	11	12	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80					
d <sub>2</sub>	11	14	15	16	21	22	25	26	30	31	38	40	46	48	56	58	68	71	92					
d <sub>3</sub>	18	22	22	22	28	28	32	32	40	40	48	48	58	58	70	70	85	85	105					
l <sub>1</sub>	l*	l <sub>2</sub> *																						
23	40	39	●	●	●																			
23	45	44				●	●	●	●	●	●													
30	40	39	●	●	●	●																		
30	45	44					●	●	●	●	●	●												
30	45	45							●	●	●	●												
37	40	39	●	●	●																			
37	45	44					●	●	●	●	●	●												
37	50	50							●	●	●	●	●	●										
47	56	55							●	●														
47	56	56							●	●	●	●	●	●										
47	63	55																			●	●	●	●
60	71	70							●	●														
60	71	72					●	●	●	●	●	●												
60	80	80																			●	●	●	●
60	95	95																			●	●		
77	95	95																			●	●	●	●
77	95	96							●	●	●	●												
95	120	120																			●	●	●	●
120	140	140																			●	●	●	●

# FIBRO

206.49.  
206.71.

## Ball Bearing Guide Bushes similar to AFNOR Ball Cages

206.49.



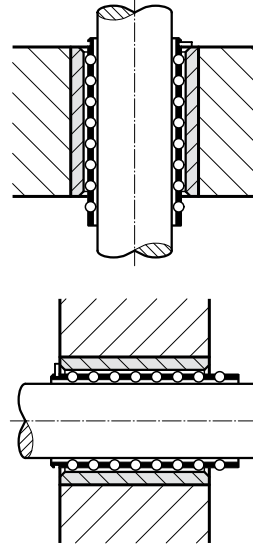
\* Preloading see Colour Code Combinations – pages D 10 and D 11.

Tolerance range – yellow = .10  
green = .20  
red = .30

### Ordering Code (example):

Guide Bush	=	206.49.
$d_1 = 32$ mm	=	032.
$l_1 = 90$ mm	=	090.
Tolerance range green	=	20
Order No	=	206.49.032.090.20

### Mounting Examples



### Material:

Bush: tool steel, Hardness:  $62 \pm 2$  HRC  
Cage: brass  
Balls: hardened steel (DIN 5401)

### Execution:

Bearing surfaces honed.  
Outside diameter fine-ground.

### Note:

Notes on sliding- and rolling type guides see page D9.  
Pillars see pages D16, D17, D18, D22 and D35.

### Slip-Fit Bonding:

The position of the bearing is given by push fit holes tolerance H5. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following advantages:

- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned above.

### 206.49./206.71.

$d_1$		16	20	25	32	40	50	
$d_2$		22	26	31	40	48	58	
$d_{3m5}$		28	32	40	50	63	80	
$l_1$	$l^*$	$l_2^*$						
35	45	44	●	●				<b>Ordering Code (example):</b> Ball Cage = 206.71. $d_1 = 32$ mm = 032. $l_2 = 105$ mm = 105 Order No = 206.71.032.105
40	45	44	●	●	●			
45	56	55			●			
50	56	56	●	●	●			
55	63	65				●		
60	71	70			●			
60	71	72	●	●	●			
70	80	80		●	●	●	●	
80	95	95			●	●	●	
80	95	96		●	●			
90	95	96			●			
90	105	105			●	●	●	
100	120	120			●	●	●	
120	140	140				●	●	

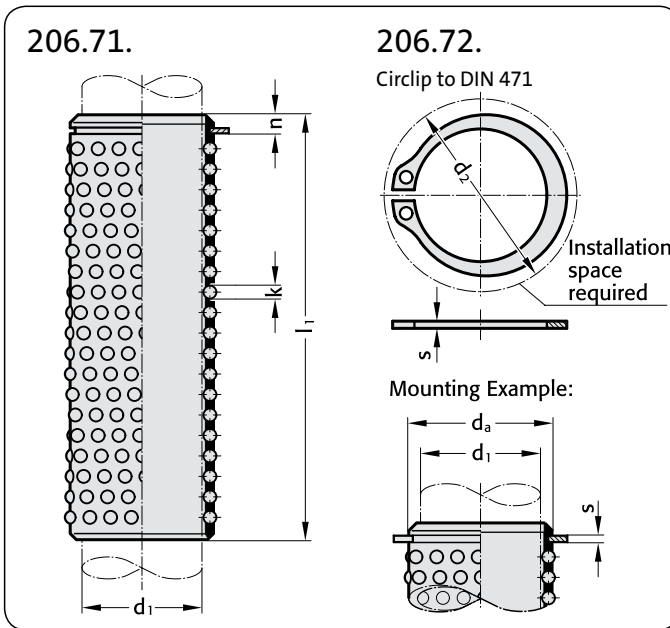
Note: cage travel = one half of stroke length

$l^*$  = Nominal ordering length

$l_2^*$  = Manufacturing length = Preferred lengths of Ball Cages

**Ball Cages with Circlip Groove  
Circlips**

**206.71.  
206.72.**



**Material:**  
Cage: Brass  
Balls: hardened steel (DIN 5401)

**Execution:**  
FIBRO Ball Cages are made from brass. They are distinguished by their stability and dense ball pattern. This makes them the preferred choice in tools and machines of high precision demands and elevated stroking speeds. Ball guides operate free from play because of their accurate preloading.

Each ball cage has a groove for circlip to DIN 471.

**206.72.**

Order No	010	011	012	015	016	018	019	020	024	025	030	032	038	040	042	048	050	052	060	063	080
d <sub>1</sub>	10	11	12	15	16	18	19	20	24	25	30	32	38	40	42	48	50	52	60	63	80
d <sub>a</sub> × s	13×1	14×1	15×1	20×1,2	21×1,2	23×1,2	24×1,2	25×1,2	29×1,5	30×1,5	37×1,75	39×1,75	45×1,75	47×1,75	48×1,75	55×2	57×2	58×2	67×2,5	70×2,5	90×3
d <sub>2</sub>	20,2	21,4	22,6	28,4	29,6	32	33,2	34,2	39,1	40,5	49	51,4	59,1	60,8	62,5	70,2	72,6	73,6	83,1	87	108,5

**206.71.**

d <sub>1</sub>	8*	10	11	12	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80			
k	1,5	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	6			
n	-	2,2	2,2	2,2	2,9	2,9	2,9	2,9	3,2	3,2	3,95	3,95	3,95	3,95	4,25	4,25	4,75	4,75	6,15			
l*	l <sub>1</sub> *	total number of balls																				
24	24							64			80											
28	28							80			100											
31	32									120	120			120								
40	39	80	176	176	176																	
40	40													160	120							
45	44					144	144	180	180	180												
45	45														140	168						
50	50														160	192	224					
56	55														180	216						
56	56						192	192	240	240	240											
56	57		272	272	272																	
63	64						224	224														
63	65																264	308				
71	70													240								
71	72					256	256	320	320	320												
80	80							360	360	360					280	336	392					
95	95														340	408	476	544				
95	96							440	440	440												
105	105														380	456	532	608				
120	119																				540	
120	120											560	440	528	616	704						
140	140												520	624	728	832	648					
160	160												600	720	840	960						
160	161																				756	
180	180																816	952	1088			
180	182																				864	
200	200																912	1064	1216			
200	203																				972	
240	238																				1152	
240	240																1104	1288	1472			

**Ordering Code(example):**

Ball Cage with Circlip Groove = 206.71.  
 d<sub>1</sub> = 32 mm = 032.  
 l<sub>1</sub> = 80 mm = 080  
 Order No = 206.71.032.080

Note: cage travel = one half of stroke length \* Ball cages Ø8 supplied without circlip groove !  
 l\* = Nominal ordering length l<sub>1</sub>\* = Manufacturing length



# FIBRO

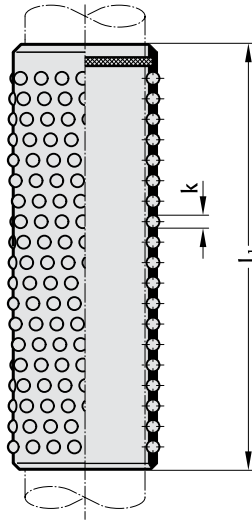
## 206.73.

## Ball Cages with Assembly Aid

### Material:

Cage: Brass  
 Balls: hardened steel  
 (DIN 5401)

### 206.73.



### Execution:

FIBRO Ball Cages are made from brass. They are distinguished by their stability and dense ball pattern. This makes them the preferred choice in tools and machines of high precision demands and elevated stroking speeds. Ball guides operate free from play because of their accurate preloading.

### Note:

Ball cages 206.73. with cage spacing.

These cages are held at the correct height for engaging the top die. These cages are equipped with a suitably positioned brake ring insert – ensuring equal cage spacing especially on die sets with multiple pillars. No assistant is needed for their assembly.

### 206.73.

$d_1$	10	11	12	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80	
k	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	4	4	6	
$l_1^*$	$l_2^*$	total number of balls																	
24	24				64		80												
28	28				80		100												
31	32					120	120	120											
40	39	176	176	176					160	120									
40	40																		
45	44			144	144	180	180	180											
45	45									140	168								
50	50									160	192	224							
56	55									180	216								
56	56			192	192	240	240	240											
56	57	272	272	272															
63	64			224	224														
63	65											264	308						
71	70									240									
71	72			256	256	320	320	320											
80	80					360	360	360		280	336	392							
95	95									340	408	476	544						
95	96					440	440	440											
105	105									380	456	532	608						
120	119																		540
120	120								560	440	528	616	704						
140	140									520	624	728	832	648					
160	160									600	720	840	960						
160	161																		756
180	180										816	952	1088						
180	182																		864
200	200											912	1064	1216					
200	203																		972
240	238																		1152
240	240											1104	1288	1472					

### Ordering Code (example):

Ball Cage with Assembly Aid = 206.73.  
 $d_1 = 32$  mm = 032.  
 $l_1 = 80$  mm = 080  
 Order No = 206.73.032.080

Note: cage travel = one half of stroke length

$l_1^*$  = Nominal ordering length

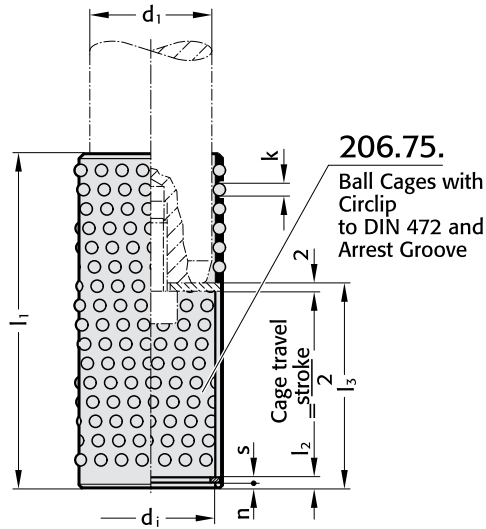
$l_1^*$  = Manufacturing length

# Ball Cages with Circlip and Fastening Ring Groove Circlips

206.75.



206.75.



**Material:**

Cage: Brass  
Balls: hardened steel (DIN 5401)

**Execution:**

FIBRO Ball Cages are made from brass. They are distinguished by their stability and dense ball pattern. This makes them the preferred choice in tools and machines of high precision demands and elevated stroking speeds. Ball guides operate free from play because of their accurate preloading. Each ball cage has a groove for circlip to DIN 472.

**206.75.**

$d_1$	19	20	24	25	30	32	38	40	48	50	60	63
$d_1 \times s$	20×1	21×1	25×1,2	26×1,2	31×1,2	33×1,2	39×1,5	41×1,75	50×2	51×2	60×2	63×2
Order No.												
206.75.	019	020	024	025	030	032	038	040	048	050	060	063
k	3	3	3	3	4	4	4	4	4	4	4	4
n	1,3	1,3	1,3	1,3	1,3	1,3	1,85	1,6	2,15	2,15	2,15	2,15
	$l_1$	$l_2$	$l_3$	$l_1$	$l_2$	$l_3$	$l_1$	$l_2$	$l_3$	$l_1$	$l_2$	$l_3$
	56	2,6	31	56	2,6	31	70	2,6	41	80	3,45	51
	72		41	72		41	80		51	95		61
	80		51	80		51	95		61	105		61
							105		61	120		73
							120		73	120		73
										120		73
												140
												83

**Ordering Code (example):**

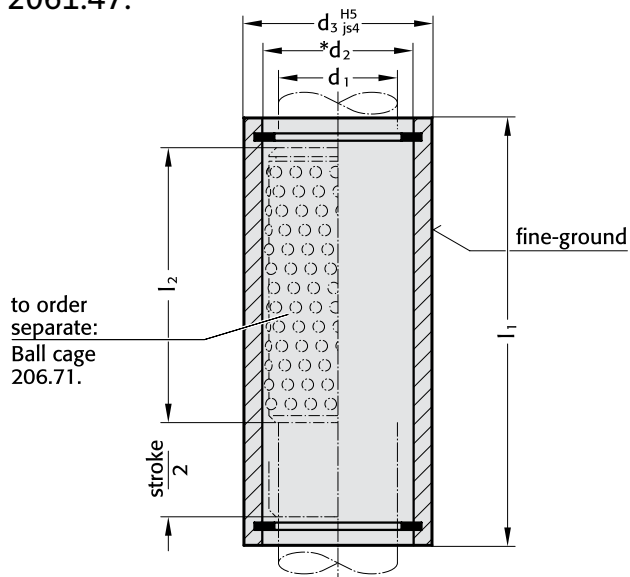
Ball Cages with Circlip  
DIN 472 and Fastening Ring Groove = 206.75.  
 $d_1 = 32$  mm = 032.  
 $l_1 = 80$  mm = 080.  
 $l_3 = 51$  mm = 051  
 Order No = 206.75.032.080.051

# FIBRO

2061.47.  
206.71.

## Ball Bearing Guide Bushes with stroke Limitation Ball Cages

2061.47.



\* Preloading see Colour Code Combinations – pages D10 and D11.

### Ordering Code (example):

Ball cage	=	206.71.
$d_1 = 40$ mm	=	040.
$l = 63$ mm	=	063
Order No	=	206.71.040.063

Tolerance range – yellow = .10  
green = .20  
red = .30

### Ordering Code (example):

Guide Bush	=	2061.47.
$d_1 = 40$ mm	=	040.
$l_1 = 120$ mm	=	120.
Tolerance range – red	=	30
Order No	=	2061.47.040.120.30



### Material:

Bush: tool steel, Hardness: 62±2HRC  
Cage: Brass  
Balls: hardened steel (DIN 5401)

### Slip-Fit Bonding:

The position of the bearing is given by push fit holes tolerance H5. The adhesive order no. 281.648 provides optimum push retention whilst offering the following advantages:

- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fir for the same reasons mentioned above.

### Note:

Notes on sliding- and rolling type guides see page D9.  
Pillars see pages D16, D17, D18, D22 and D35.

2061.47.

$d_1$	15	16	19	20	24	25	30	32	38	40	48	50	60	63
$d_2$	21	22	25	26	30	31	38	40	46	48	56	58	68	71
$d_3$	28	28	32	32	40	40	48	48	58	58	70	70	85	85
$l_2^*$	$l^*$	Stroke max.	$l_1$											
44	45	18	60	●	●									
44	45	52	77		●	●								
44	45	49				●	●							
56	56	27			●	●								
50	50	74	95				●	●						
70	71	32					●	●						
65	63	98	120						●	●				
80	80	64							●	●				
105	105	14							●	●				
80	80	62									●	●		
95	95	32											●	●

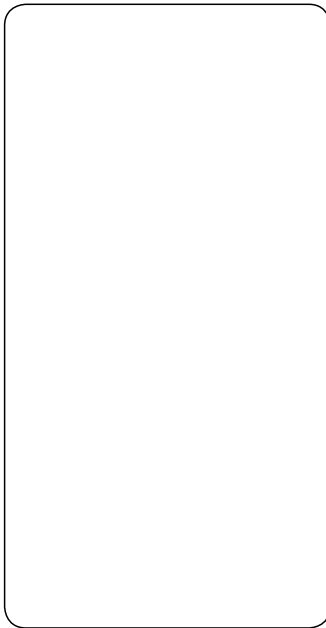
Note: cage travel = one half of stroke length

$l^*$  = Nominal ordering length

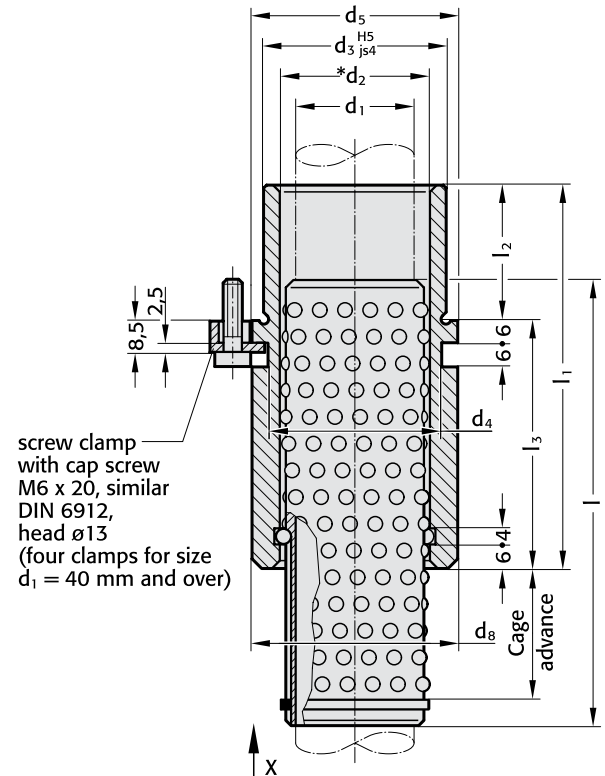
$l_2^*$  = Manufacturing length = Preferred lengths of Ball Cages

Headed Guide Bushes for Ball Bearings

2081.67.

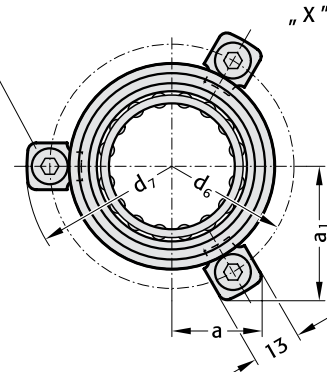


2081.67.



207.45

Order No. for repeat order



\* Preloading see Colour Code Combinations – pages D10 and D11.

Note:

Ball cage position – please specify the required cage advance with order.

FIBRO Ball Cage Retainers ensure optimum starting position of ball cages on inverted die sets – even if pillars retract from guide bushes. The application determines the cage advance. Note that cage travel is half the stroke length.

In this context it is of importance to note the minimum constructional length.

The cage advance should be chosen so that during normal operation of the tool, optimum position is achieved.

Material:

Bush: tool steel      Cage: Brass  
 Hardness: 62±2 HRC      Balls: hardened steel (DIN 5401)

2081.67.

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63
d <sub>2</sub>	25 26	30 31	38 40	46 48	56 58	68 71
d <sub>3</sub>	32	40	48	58	70	85
d <sub>4</sub>	32	40	48	58	70	85
d <sub>5</sub>	40	48	56	66	80	95
d <sub>6</sub>	52	60	67	77	91	106
d <sub>7</sub>	64,7	72,7	79,7	89,7	103,7	118,7
d <sub>8</sub>	39	46	53	63	77	92
a	20,7	22,65	24,4	35,3	40,2	45,5
a <sub>1</sub>	30	33,4	36,4	35,3	40,2	45,5
l <sub>1</sub>	59	79	93	108	127	150
l <sub>2</sub>	23	23	30	37	47	60
l <sub>3</sub>	36	56	63	71	80	90
l	72	96	120	140	140	160

Price and delivery on request!

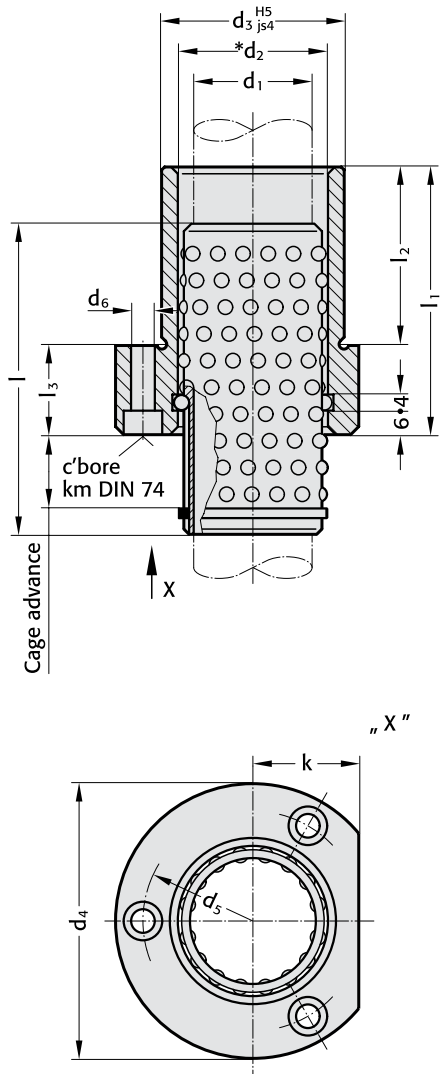
Ordering Code (example):

Headed Guide Bush	=	2081.67.	
d <sub>1</sub> = 50 mm	=	050.	Tolerance range – yellow = .10
cage advance 50 mm	=	050.	green = .20
Tolerance range – green	=	20	red = .30
Order No	=	2081.67.050.050.20	

# Flanged Guide Bushes for Ball Bearings with Ball Cage Retainer

2091.67.

2091.67.



\* Preloading see Colour Code Combinations – pages D 10 and D 11.



**Note:**

Ball cage position – please specify the required cage advance with order.

FIBRO Ball Cage Retainers ensure optimum starting position of ball cages on inverted die sets – even if pillars retract from guide bushes. The application determines the cage advance. Note that cage travel is half the stroke length.

In this context it is of importance to note the minimum constructional length.

The cage advance should be chosen so that during normal operation of the tool, optimum position is achieved.

**Material:**

Bush: tool steel, Hardness: 62±2HRC

Cage: Brass

Balls: hardened steel (DIN 5401)

2091.67.

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>2</sub>	25 26	30 31	38 40	46 48	56 58	68 71	92
d <sub>3</sub>	32	40	48	58	70	85	105
d <sub>4</sub>	50	63	72	85	104	120	148
d <sub>5</sub>	40	50	58	70	86	100	125
d <sub>6</sub>	4,5	5,5	5,5	6,6	9	9	11
Counterbore	Km 4	Km 5	Km 5	Km 6	Km 8	Km 8	Km 10
k	18	23	28	33	38	46	56
l <sub>1</sub>	52	62	72	77	102	102	125
l <sub>2</sub>	37	37	47	47	60	60	75
l <sub>3</sub>	15	25	25	30	42	42	50
l	72	72	80	95	105	120	140

Price and delivery on request!

**Ordering Code (example):**

Flanged Guide Bush with Ball Cage Retainer = 2091.67.

d<sub>1</sub> = 50 mm = 050. Tolerance range – yellow = .10

cage advance 50 mm = 050. green = .20

Tolerance range – green = 20 red = .30

Order No = 2091.67.050.050.20

# Roller cages with Circlip Groove Circlips Roller Cages with Mounting Aid

**FIBRO**

2061.82. 206.72.  
2061.84.



## Description:

Roller cages make linear contact with the guide bush and the guide pillar.

This results in a load carrying capacity for each individual roller which is many times that of a ball of the same diameter.

Roller bearings feature a FIBRO specific seal, similar to the ball bearings.

The profile rollers are arranged in a spiral layout axially, so that every roller has its own path.

The cages are grooved to accept a DIN 471 circlip.

## Note:

FIBRO-Roller Cage 2061.84. with Mounting Aid. This roller cage version can be inserted to the correct position without extra assistance. The cage has a braking ring insert in the holder. It is particularly advantageous in the case of die sets with multiple pillars.

## Material:

Roller Cage: brass

Rollers: hardened steel,  
100 Cr6, DIN 5402

## Note:

Notes on sliding and rolling type guides see page D9.

## Important:

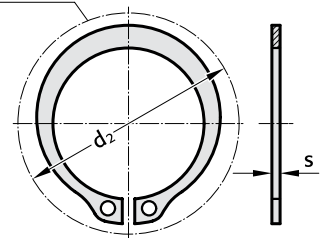
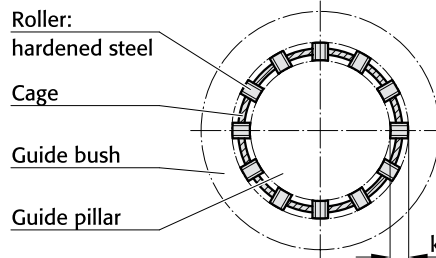
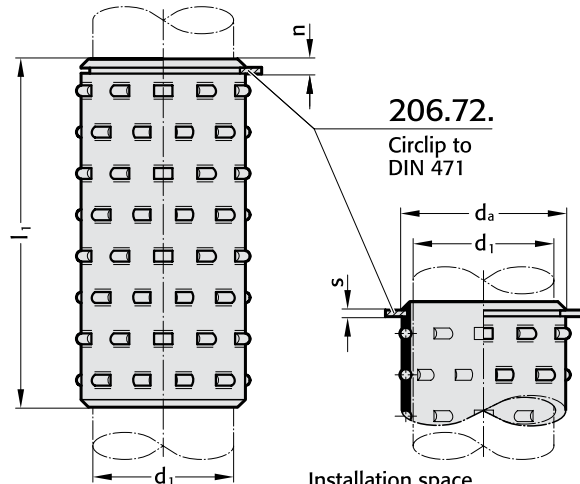
For roller cages use only pairing class  
guide pillar red = .30  
Guide sleeve yellow = .10

## Ordering Code (example):

Roller Cage with Circlip Groove	=	2061.82.
$d_1 = 25$ mm	=	025.
$l_1 = 85$ mm	=	085
Order No	=	2061.82.025.085

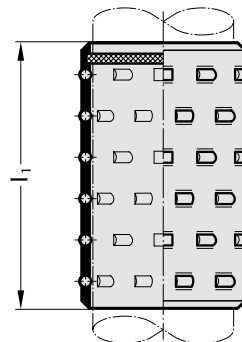
## 2061.82.

Roller Cage with circlip Groove



## 2061.84.

Roller Cage with Mounting Aid



## 206.72.

Circlip to DIN 471

## 2061.82./2061.84.

	19	20	24	25	30	32	38	40	48	50	63
$d_1$	19	20	24	25	30	32	38	40	48	50	63
k	3	3	3	3	4	4	4	4	4	4	4
Number of rollers/peripheral row	8	10	12	14	14	18	18	22	22	22	22
n	2,9	3,2	3,95	3,95	3,95	4,25	4,25	4,75	4,75	4,75	4,75
$l_1$	total number of rollers										
45	32	40	48	48	—	—	—	—	—	—	—
55	40	50	60	60	70	—	—	—	—	—	—
65	48	60	72	72	84	108	—	—	—	—	—
75	56	70	84	84	98	126	154	—	—	—	—
85	64	80	96	96	112	144	176	—	—	—	—
95	72	90	108	108	126	162	198	—	—	—	—
105	80	100	120	120	140	180	220	—	—	—	—
115	—	110	132	132	154	198	242	—	—	—	—
125	—	120	144	144	168	216	264	—	—	—	—
135	—	—	156	156	182	234	286	—	—	—	—
145	—	—	168	168	196	252	308	—	—	—	—
155	—	—	180	180	210	270	330	—	—	—	—
165	—	—	192	192	224	288	352	—	—	—	—
175	—	—	—	—	238	306	374	—	—	—	—
185	—	—	—	—	252	324	396	—	—	—	—
205	—	—	—	—	280	360	440	—	—	—	—

## 206.72.

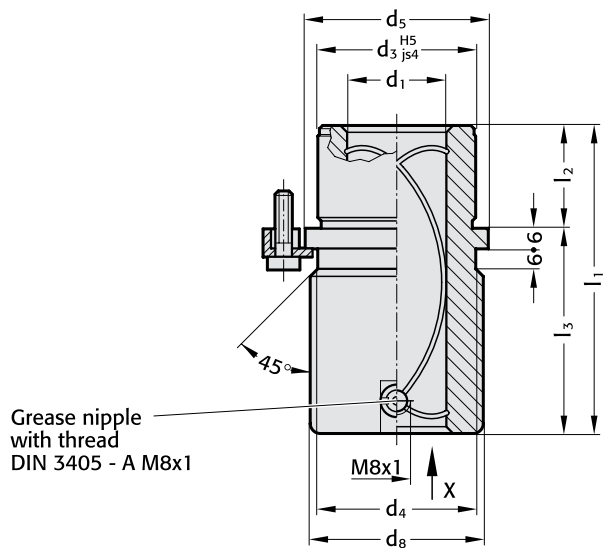
	19	20	24	25	30	32	38	40	48	50	63	
$d_1$	19	20	24	25	30	32	38	40	48	50	63	
$d_2 \times s$	24x1,2	25x1,2	29x1,5	30x1,5	37x1,75	39x1,75	45x1,75	47x1,75	55x2	57x2	70x2,5	
Order No	206.72.	019	020	024	025	030	032	038	040	048	050	063
$d_2$	33,2	34,2	39,1	40,5	49	51,4	59,1	60,8	70,2	72,6	87	

**FIBRO**

2081.81.

**Headed Guide Bushes  
to ISO 9448, Steel,  
with bronze coated internal bore**

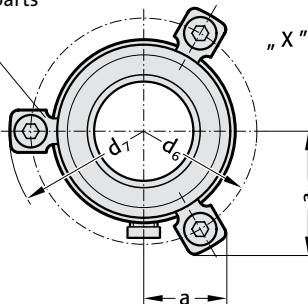
2081.81.



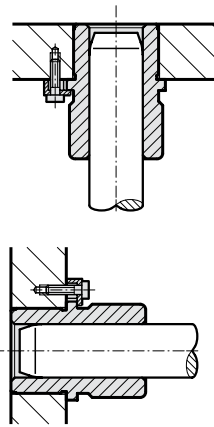
Grease nipple with thread  
DIN 3405 - A M8x1

207.45

Order No. for replacement parts  
Screw clamp with cap screws  
M6 x 20 similar  
DIN 6912,  
head Ø13,  
(four clamps for size  
Ød<sub>1</sub> = 38 mm and over)



**Mounting Examples**



**Note:**

Headed Guide Bushes are to be held in H5-retainer bores. Three screw clamps are provided for fixing; sizes d<sub>1</sub> = 38 mm and over have four.

Guide pairing:

We recommend the use of guide pillars from pairing class .20/.30

These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head Ø 13.

**Material:**

Ø d<sub>3</sub> and d<sub>8</sub> 1.0503  
induction hardened to 500+100 HV 10.

**Execution:**

Bronze coated internal bore.  
Diameter d<sub>3</sub> and collar face precision ground.

2081.81.

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63	80
tol.	+0,012	+0,012	+0,015	+0,015	+0,015	+0,018	+0,018
	+0,003	+0,003	+0,004	+0,004	+0,004	+0,005	+0,005
d <sub>3</sub>	32	40	48	58	70	85	105
d <sub>4</sub>	32	40	48	58	70	85	105
d <sub>5</sub>	40	48	56	66	80	95	118
d <sub>6</sub>	52	60	67	77	91	106	129
d <sub>7</sub>	64,7	72,7	79,7	89,7	103,7	118,7	141,7
d <sub>8</sub>	39	46	53	63	77	92	115
a	20,7	22,65	24,4	35,3	40,2	45,5	54,5
a <sub>1</sub>	30	33,4	36,4	35,3	40,2	45,5	54,5
l <sub>1</sub>	59	79	93	108	127	150	150
l <sub>2</sub>	23	23	30	37	47	60	60
l <sub>3</sub>	36	56	63	71	80	90	90

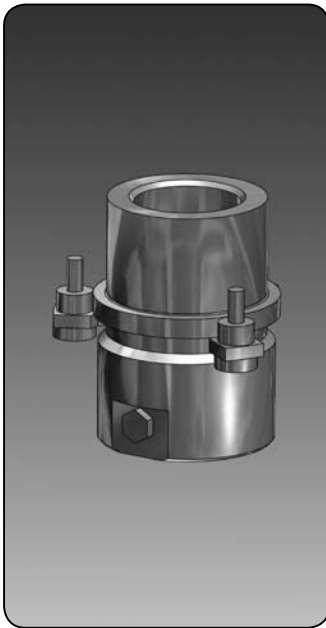
**Ordering code (example):**

Headed guide bush = 2081.81.  
d<sub>1</sub> = 40 mm = 040  
Order No = 2081.81.040

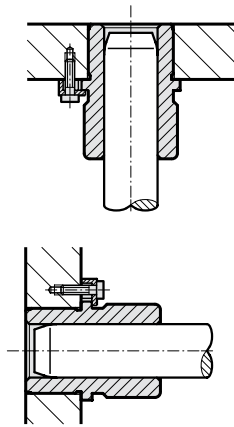
# Headed Guide Bushes to ISO 9448, Steel, with bronze coated internal bore

**FIBRO**

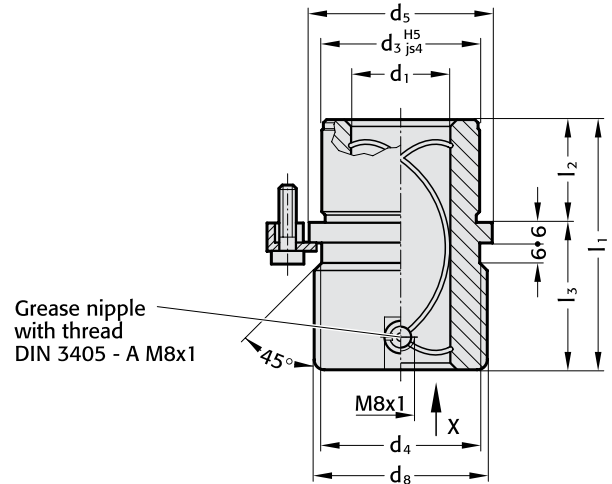
**2081.84.**



## Mounting Examples



**2081.84.**



### Note:

Headed Guide Bushes are to be held in H5-retainer bores. Three screw clamps are provided for fixing; sizes  $d_1 = 38$  mm and over have four.

Guide pairing:

We recommend the use of guide pillars from pairing class .20/.30

These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head  $\varnothing 13$ .

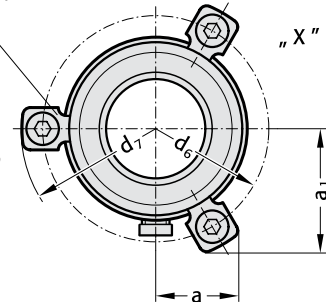
**Material:** 1.0503  
 $\varnothing d_3$  and  $d_8$  induction hardened to 500+100 HV 10.

**Execution:** Bronze coated internal bore.  
Diameter  $d_3$  and collar face precision ground.

**207.45**

Order No. for replacement parts

Screw clamp with cap screws  
M6 x 20 similar  
DIN 6912,  
head  $\varnothing 13$ ,  
(four clamps for size  
 $\varnothing d_1 = 38$  mm and over)



**2081.84.**

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
tol.	+0,012	+0,012	+0,015	+0,015	+0,015	+0,018	+0,018
	+0,003	+0,003	+0,004	+0,004	+0,004	+0,005	+0,005
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64,7	72,7	79,7	89,7	103,7	118,7	141,7
$d_8$	39	46	53	63	77	92	115
a	20,7	22,65	24,4	35,3	40,2	45,5	54,5
$a_1$	30	33,4	36,4	35,3	40,2	45,5	54,5
$l_1$	43	59	75	82	97	116	120
$l_2$	23	23	30	37	47	60	60
$l_3$	20	36	45	45	50	56	60

### Ordering code (example):

Headed guide bush = 2081.84.

$d_1 = 40$  mm = 040

Order No = 2081.84.040

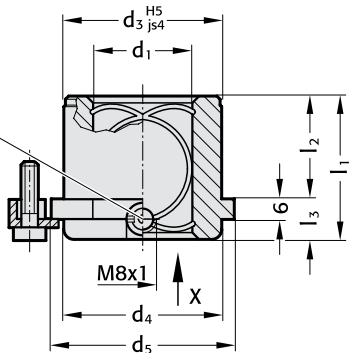


**FIBRO****2081.85.**

# Headed Guide Bushes to ISO 9448, Steel, with bronze coated internal bore

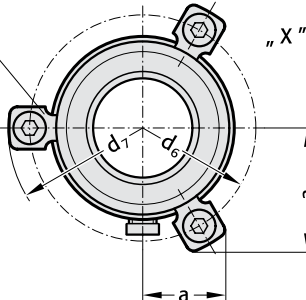
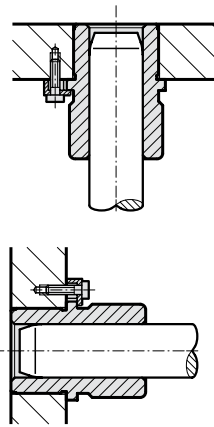
**2081.85.**

Grease nipple  
with thread  
DIN 3405 - A M8x1

**207.45**

Order No. for replacement parts

Screw clamp  
with cap screws  
M6 x 20 similar  
DIN 6912,  
head  $\varnothing 13$ ,  
(four clamps for size  
 $\varnothing d_1 = 38$  mm and over)

**Mounting Examples****Note:**

Headed Guide Bushes are to be held in H5-retainer bores. Three screw clamps are provided for fixing; sizes  $d_1 = 38$  mm and over have four.

Guide pairing:

We recommend the use of guide pillars from pairing class .20/.30

These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head  $\varnothing 13$ .

**Material:** 1.0503  
 $\varnothing d_3$  and  $d_8$  induction hardened to 500+100 HV 10.

**Execution:** Bronze coated internal bore.  
Diameter  $d_3$  and collar face precision ground.

**2081.85.**

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
tol.	+0,012	+0,012	+0,015	+0,015	+0,015	+0,018	+0,018
	+0,003	+0,003	+0,004	+0,004	+0,004	+0,005	+0,005
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64,7	72,7	79,7	89,7	103,7	118,7	141,7
$d_8$	39	46	53	63	77	92	115
$a$	20,7	22,65	24,4	35,3	40,2	45,5	54,5
$a_1$	30	33,4	36,4	35,3	40,2	45,5	54,5
$l_1$	35	35	42	52	65	80	80
$l_2$	23	23	30	37	47	60	60
$l_3$	12	12	12	15	18	20	20

**Ordering code (example):**

Headed guide bush = 2081.85.  
 $d_1 = 40$  mm = 040  
Order No = 2081.85.040

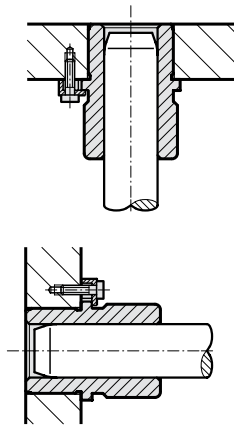
# Headed Guide Bushes to DIN 9831/ISO 9448-6, sintered ferrite, carbonitrided, long-term lubrication

**FIBRO**

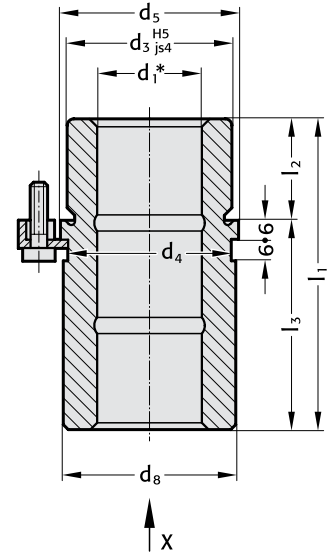
2081.31.



## Mounting examples



2081.31.



## Note:

Headed Guide Bushes are to be held in H5-retainer bores. Three screw clamps are provided for fixing; sizes  $d_1 = 38$  mm and over have four.

FIBRO headed guide bushes of sintered ferrite carbonitrided are fully interchangeable with the corresponding sizes of the FIBRO headed ball bearing guide bushes.

Notes on Sliding- and Ball Bearing Guides: page D9.

Guide Pillars: see pages D16, D17, D18, D22 and D35.

These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head  $\varnothing 13$ .

## Material:

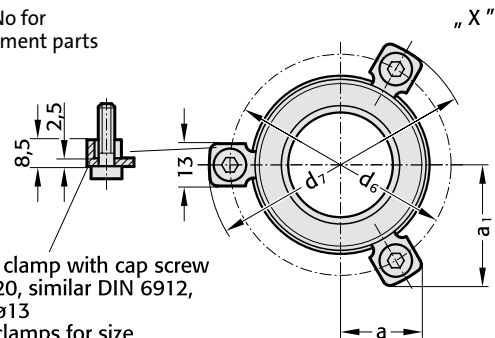
Sintered ferrite of high purity, carbonitrided

## Execution:

Bore, diameter  $d_3$  and collar face precision ground.

207.45

Order No for replacement parts



Screw clamp with cap screw  
M6 x 20, similar DIN 6912,  
head  $\varnothing 13$   
(four clamps for size  
 $d_1 = 38$ mm and over)

\* Colour Code Combinations/Clearances – see pages D10 and D 11.

2081.31.

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63
$d_3$	32	40	48	58	70	85
$d_4$	32	40	48	58	70	85
$d_5$	40	48	56	66	80	95
$d_6$	52	60	67	77	91	106
$d_7$	64,7	72,7	79,7	89,7	103,7	118,7
$d_8$	39	46	53	63	77	92
a	20,7	22,65	24,4	35,3	40,2	45,5
$a_1$	30	33,4	36,4	35,3	40,2	45,5
$l_1$	59	79	93	108	127	150
$l_2$	23	23	30	37	47	60
$l_3$	36	56	63	71	80	90

## Ordering Code (example):

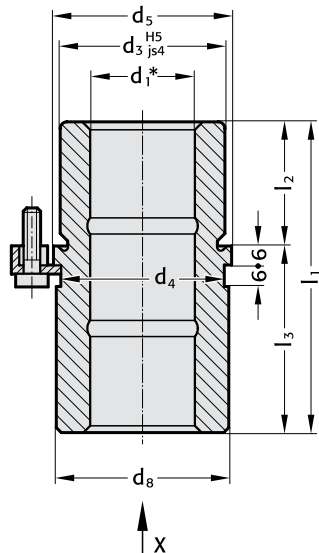
Headed Guide Bush = 2081.31. Tolerance range – yellow = .10  
 $d_1 = 40$  mm = 040. green = .20  
 Tolerance range – yellow = 10 red = .30  
 Order No = 2081.31.040.10

**FIBRO**

2081.32.

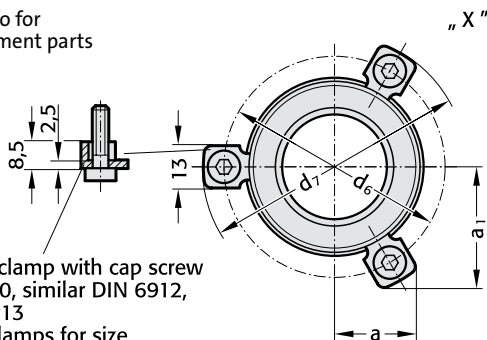
**Headed Guide Bushes**  
to DIN 9831/ISO 9448-6, sintered ferrite,  
carbonitrided, long-term lubrication

2081.32.



207.45

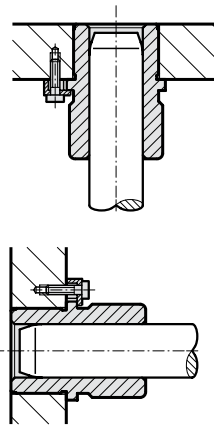
Order No for replacement parts



Screw clamp with cap screw  
M6 x 20, similar DIN 6912,  
head Ø13  
(four clamps for size  
d<sub>1</sub> = 38mm and over)

\* Colour Code Combinations/Clearances – see pages D 10 and D 11.

**Mounting examples**



**Note:**

Headed Guide Bushes are to be held in H5-retainer bores. Three screw clamps are provided for fixing; sizes d<sub>1</sub> = 38 mm and over have four.

FIBRO headed guide bushes of sintered ferrite carbonitrided are fully interchangeable with the corresponding sizes of the FIBRO headed ball bearing guide bushes.

Notes on Sliding- and Ball Bearing Guides: page D9.

Guide Pillars: see pages D16, D17, D18, D22 and D35.

These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head Ø 13.

**Material:**

Sintered ferrite of high purity, carbonitrided

**Execution:**

Bore, diameter d<sub>3</sub> and collar face precision ground.

2081.32.

d <sub>1</sub>	24 25	30 32	38 40	48 50
d <sub>3</sub>	40	48	58	70
d <sub>4</sub>	40	48	58	70
d <sub>5</sub>	48	56	66	80
d <sub>6</sub>	60	67	77	91
d <sub>7</sub>	72,7	79,7	89,7	103,7
d <sub>8</sub>	46	53	63	77
a	22,65	24,4	35,3	40,2
a <sub>1</sub>	33,4	36,4	35,3	40,2
l <sub>1</sub>	80	93	110	131
l <sub>2</sub>	30	37	47	60
l <sub>3</sub>	50	56	63	71

**Ordering Code (example):**

Headed Guide Bush	= 2081.32.	Tolerance range – yellow	= .10
d <sub>1</sub> = 30 mm	= 030.	green	= .20
Tolerance range – green	= 20	red	= .30
Order No	= 2081.32.030.20		

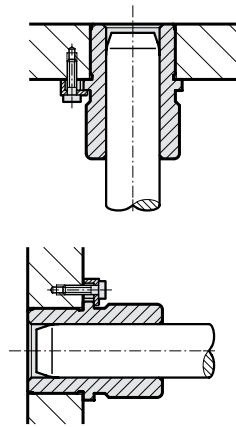
**Headed Guide Bushes**  
to DIN 9831/ISO 9448-6, sintered ferrite,  
carbonitrided, long-term lubrication

**FIBRO**

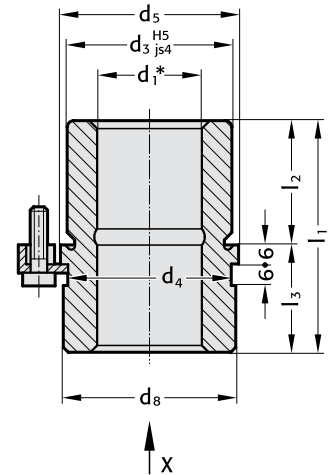
**2081.33.**



**Mounting examples**



**2081.33.**



**Note:**

Headed Guide Bushes are to be held in H5-retainer bores. Three screw clamps are provided for fixing; sizes  $d_1 = 38$  mm and over have four.

FIBRO headed guide bushes of sintered ferrite carbonitrided are fully interchangeable with the corresponding sizes of the FIBRO headed ball bearing guide bushes.

Notes on Sliding- and Ball Bearing Guides: page D 9.

Guide Pillars: see pages D16, D17, D18, D22 and D35.

These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head  $\varnothing 13$ .

**Material:**

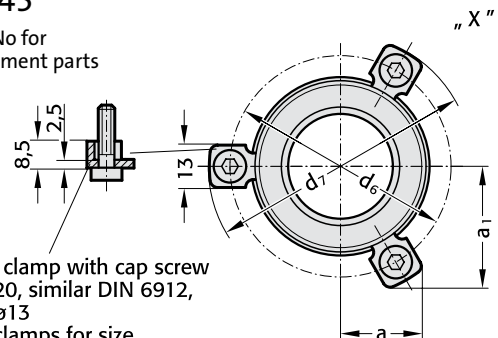
Sintered ferrite of high purity, carbonitrided

**Execution:**

Bore, diameter  $d_3$  and collar face precision ground.

**207.45**

Order No for replacement parts



Screw clamp with cap screw  
M6 x 20, similar DIN 6912,  
head  $\varnothing 13$   
(four clamps for size  
 $d_1 = 38$ mm and over)

\* Colour Code Combinations/Clearances – see pages D10 and D 11.

**2081.33.**

$d_1$	24 25	30 32	38 40	48 50
$d_3$	40	48	58	70
$d_4$	40	48	58	70
$d_5$	48	56	66	80
$d_6$	60	67	77	91
$d_7$	72,7	79,7	89,7	103,7
$d_8$	46	53	63	77
$a$	22,65	24,4	35,3	40,2
$a_1$	33,4	36,4	35,3	40,2
$l_1$	55	69	79	96
$l_2$	30	37	47	60
$l_3$	25	32	32	36

**Ordering Code (example):**

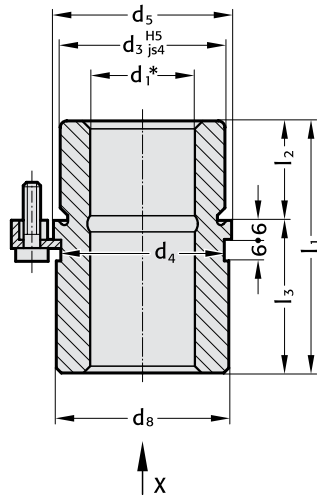
Headed Guide Bush	= 2081.33.	Tolerance range – yellow	= .10
$d_1 = 40$ mm	= 040.	green	= .20
Tolerance range – yellow	= 10	red	= .30
Order No	= 2081.33.040.10		

**FIBRO**

2081.34.

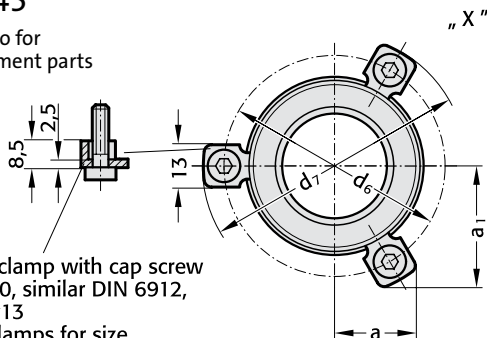
**Headed Guide Bushes  
to DIN 9831/ISO 9448-6, sintered ferrite  
carbonitrided, long-term lubrication**

2081.34.



207.45

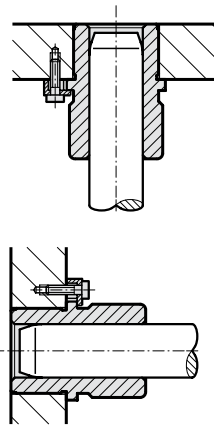
Order No for replacement parts



Screw clamp with cap screw  
M6 x 20, similar DIN 6912,  
head Ø13  
(four clamps for size  
d1 = 38mm and over)

\* Colour Code Combinations/Clearances – see pages D10 and D 11.

**Mounting examples**



**Note:**

Headed Guide Bushes are to be held in H5-retainer bores. Three screw clamps are provided for fixing; sizes d1 = 38 mm and over have four.

FIBRO headed guide bushes of sintered ferrite carbonitrided are fully interchangeable with the corresponding sizes of the FIBRO headed ball bearing guide bushes.

Notes on Sliding- and Ball Bearing Guides: page D9.

Guide Pillars: see pages D16, D17, D18, D22 and D35.

These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head Ø 13.

**Material:**

Sintered ferrite of high purity, carbonitrided

**Execution:**

Bore, diameter d3 and collar face precision ground.

2081.34.

d1	19 20	24 25	30 32	38 40	48 50	60 63
d3	32	40	48	58	70	85
d4	32	40	48	58	70	85
d5	40	48	56	66	80	95
d6	52	60	67	77	91	106
d7	64,7	72,7	79,7	89,7	103,7	118,7
d8	39	46	53	63	77	92
a	20,7	22,65	24,4	35,3	40,2	45,5
a1	30	33,4	36,4	35,3	40,2	45,5
l1	43	59	75	82	97	116
l2	23	23	30	37	47	60
l3	20	36	45	45	50	56

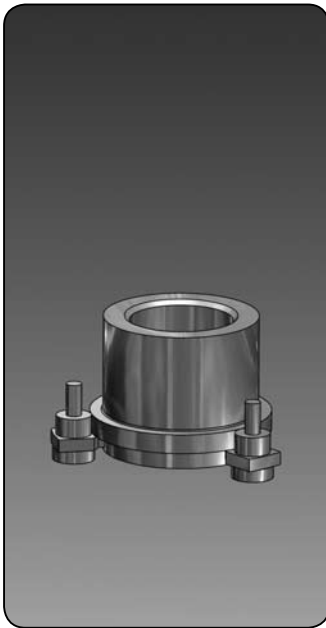
**Ordering Code (example):**

Headed Guide Bush	= 2081.34.	Tolerance range – yellow	= .10
d1 = 30 mm	= 030.	green	= .20
Tolerance range –green	= 20	red	= .30
Order No	= 2081.34.030.20		

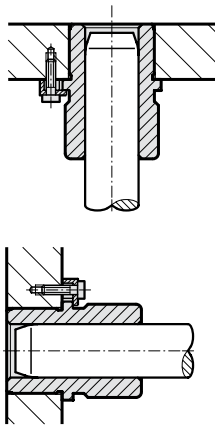
# Headed Guide Bushes to DIN 9831/ISO 9448-6, sintered ferrite, carbonitrided, long-term lubrication

**FIBRO**

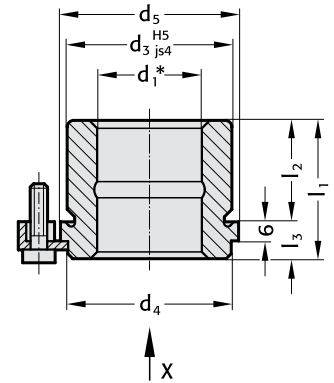
**2081.35.**



### Mounting examples



**2081.35.**



### Note:

Headed Guide Bushes are to be held in H5-retainer bores. Three screw clamps are provided for fixing; sizes  $d_1 = 38$  mm and over have four.

FIBRO headed guide bushes of sintered ferrite carbonitrided are fully interchangeable with the corresponding sizes of the FIBRO headed ball bearing guide bushes.

Notes on Sliding- and Ball Bearing Guides: page D9.

Guide Pillars: see pages D16, D17, D18, D22 and D35.

These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head  $\varnothing 13$ .

### Material:

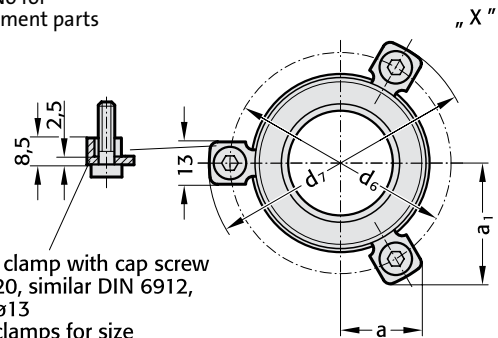
Sintered ferrite of high purity, carbonitrided

### Execution:

Bore, diameter  $d_3$  and collar face precision ground.

**207.45**

Order No for replacement parts



Screw clamp with cap screw  
M6 x 20, similar DIN 6912,  
head  $\varnothing 13$   
(four clamps for size  
 $d_1 = 38$ mm and over)

\* Colour Code Combinations/Clearances – see pages D10 and D 11.

**2081.35.**

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63
$d_3$	32	40	48	58	70	85
$d_4$	32	40	48	58	70	85
$d_5$	40	48	56	66	80	95
$d_6$	52	60	67	77	91	106
$d_7$	64,7	72,7	79,7	89,7	103,7	118,7
a	20,7	22,65	24,4	35,3	40,2	45,5
$a_1$	30	33,4	36,4	35,3	40,2	45,5
$l_1$	35	35	42	52	65	80
$l_2$	23	23	30	37	47	60
$l_3$	12	12	12	15	18	20

### Ordering Code (example):

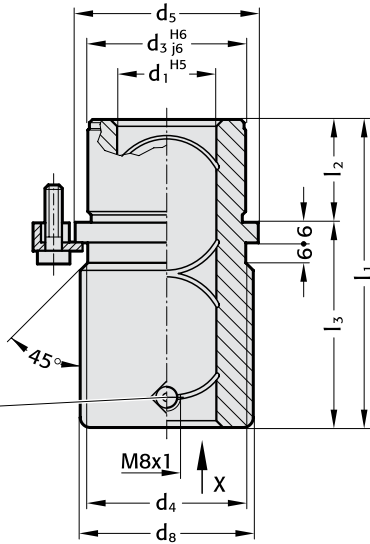
Headed Guide Bush	= 2081.33.	Tolerance range – yellow	= .10
$d_1 = 40$ mm	= 040.	green	= .20
Tolerance range – yellow	= 10	red	= .30
Order No	= 2081.33.040.10		

**FIBRO**

**2081.91.**

*ECO-LINE*  
**Headed Guide Bushes,  
 bronzeplated**

**2081.91.**

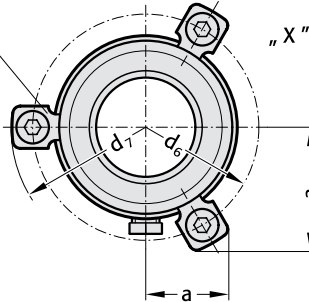


Grease nipple with thread  
 DIN 3405 - A M8x1

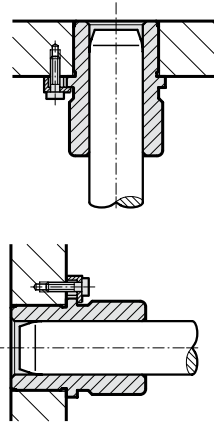
**207.45**

Order No for replacement parts

Screw clamp with cap screws  
 M6 x 20, similar  
 DIN 6912,  
 head  $\varnothing 13$ ,  
 (four clamps for size  
 $\varnothing d_1 = 38$  and over)



**Mounting examples**



**Note:**

Headed Guide Bushes are to be held in H6-retainer bores. Three screw clamps are provided for fixing; sizes  $d_1 = 38$  mm and over have four. These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head  $\varnothing 13$ .

**Material:** Steel  
 $\varnothing d_3$  induction hardened

**Execution:** Bronze plated internal bore.  
 Diameter  $d_3$  and collar face precision ground.

**2081.91.**

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64,7	72,7	79,7	89,7	103,7	118,7	141,7
$d_8$	39	46	53	63	77	92	115
a	20,7	22,65	24,4	35,3	40,2	45,5	54,5
$a_1$	30	33,4	36,4	35,3	40,2	45,5	54,5
$l_1$	59	79	93	108	127	150	150
$l_2$	23	23	30	37	47	60	60
$l_3$	36	56	63	71	80	90	90

**Ordering code (example):**

Headed Guide Bushes, bronzeplated = 2081.91.  
 $d_1 = 40$  mm = 040  
 Order No = 2081.91.040

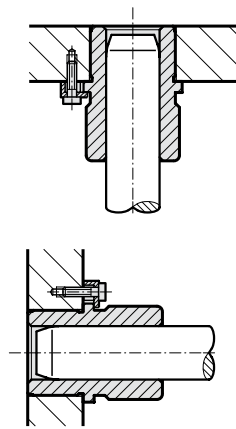
**ECO-LINE**  
**Headed Guide Bushes,**  
**bronzeplated**

**FIBRO**

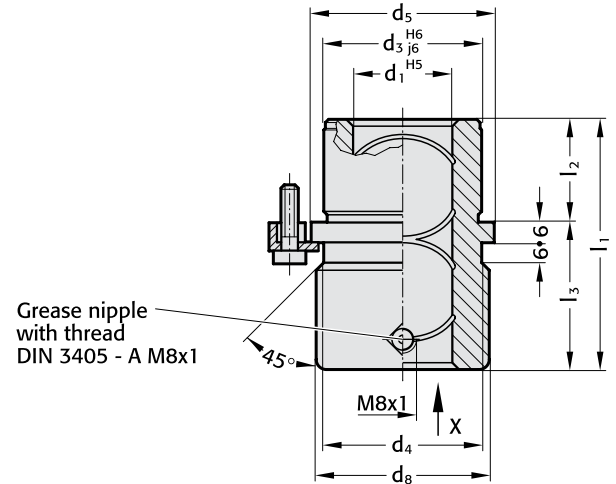
**2081.94.**



**Mounting example**



**2081.94.**



**Note:**

Headed Guide Bushes are to be held in H6-retainer bores. Three screw clamps are provided for fixing; sizes  $d_1 = 38$  mm and over have four.  
 These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head  $\varnothing 13$ .

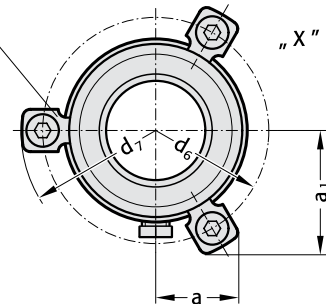
**Material:** Steel  
 $\varnothing d_3$  induction hardened

**Execution:** Bronze plated internal bore.  
 Diameter  $d_3$  and collar face precision ground.

**207.45**

Order No for replacement parts

Screw clamp with cap screws M6 x 20, similar DIN 6912, head  $\varnothing 13$ , (four clamps for size  $\varnothing d_1 = 38$  and over)



**2081.94.**

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64,7	72,7	79,7	89,7	103,7	118,7	141,7
$d_8$	39	46	53	63	77	92	115
a	20,7	22,65	24,4	35,3	40,2	45,5	54,5
$a_1$	30	33,4	36,4	35,3	40,2	45,5	54,5
$l_1$	43	59	75	82	97	116	120
$l_2$	23	23	30	37	47	60	60
$l_3$	20	36	45	45	50	56	60

**Ordering Code (example):**

Headed Guide Bushes, bronzeplated = 2081.94.  
 $d_1 = 63$  mm = 063  
 Order No = 2081.94.063



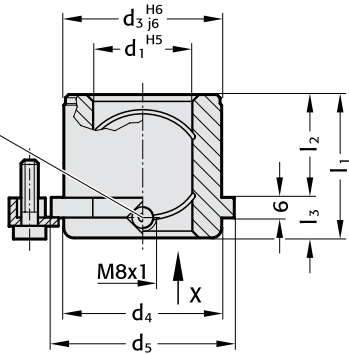
**FIBRO**

2081.95.

*ECO-LINE*  
**Headed Guide Bushes,  
 bronzeplated**

2081.95.

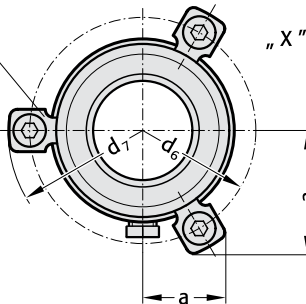
Grease nipple with thread  
 DIN 3405 - A M8x1



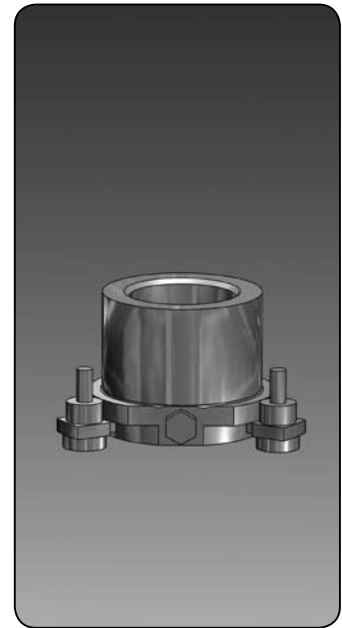
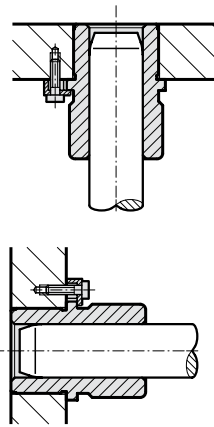
207.45

Order No for replacement parts

Screw clamp with cap screws  
 M6 x 20, similar  
 DIN 6912,  
 head  $\varnothing 13$ ,  
 (four clamps for size  
 $\varnothing d_1 = 38$  and over)



Mounting example



**Note:**

Headed Guide Bushes are to be held in H6-retainer bores. Three screw clamps are provided for fixing; sizes  $d_1 = 38$  mm and over have four. These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head  $\varnothing 13$ .

**Material:** Steel  
 $\varnothing d_3$  induction hardened

**Execution:** Bronze plated internal bore.  
 Diameter  $d_3$  and collar face precision ground.

2081.95.

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64,7	72,7	79,7	89,7	103,7	118,7	141,7
$d_8$	39	46	53	63	77	92	115
a	20,7	22,65	24,4	35,3	40,2	45,5	54,5
$a_1$	30	33,4	36,4	35,3	40,2	45,5	54,5
$l_1$	35	35	42	52	65	80	80
$l_2$	23	23	30	37	47	60	60
$l_3$	12	12	12	15	18	20	20

**Ordering Code (example):**

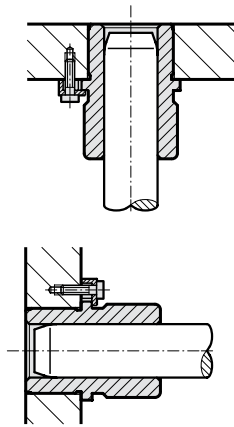
Headed Guide Bushes, bronzeplated = 2081.95.  
 $d_1 = 63$  mm = 063  
 Order No = 2081.95.063

Headed Guide Bushes,  
Bronze with solid lubrication rings

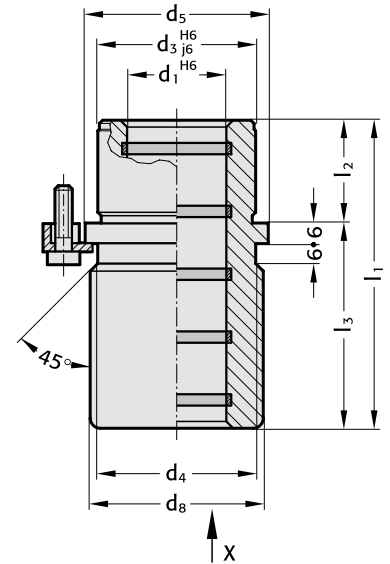
2081.71.



Mounting Example



2081.71.



Note:

Headed Guide Bushes are to be held in H6-retainer bores. Three screw clamps are provided for fixing; sizes  $d_1 = 38$  mm and over have four.  
These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head  $\varnothing 13$ .

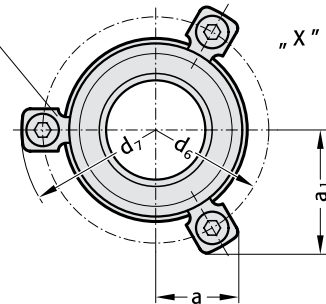
Material: Bronze

Execution: Contact surfaces with solid lubricant rings.  
Diameter  $d_3$  and collar face precision ground.

207.45

Order No for replacement parts

Screw clamp with cap screws M6 x 20, similar DIN 6912, head  $\varnothing 13$ , (four clamps for size  $\varnothing d_1 = 38$  and over)



2081.71.

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64,7	72,7	79,7	89,7	103,7	118,7	141,7
$d_8$	39	46	53	63	77	92	115
a	20,7	22,65	24,4	35,3	40,2	45,5	54,5
$a_1$	30	33,4	36,4	35,3	40,2	45,5	54,5
$l_1$	59	79	93	108	127	150	150
$l_2$	23	23	30	37	47	60	60
$l_3$	36	56	63	71	80	90	90

Ordering Code (example):

Headed Guide Bushes, Bronze = 2081.71.

$d_1 = 40$  mm = 040

Order No = 2081.71.040

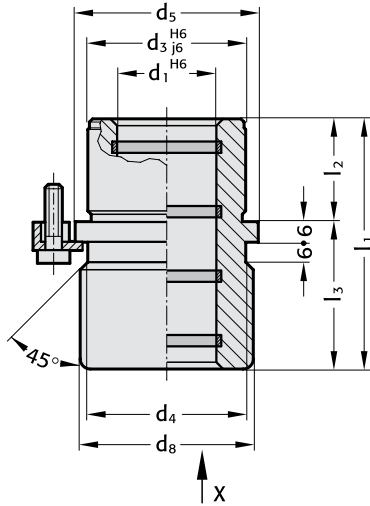
**FIBRO**

2081.74.

*ECO-LINE*

Headed Guide Bushes,  
Bronze with solid lubrication rings

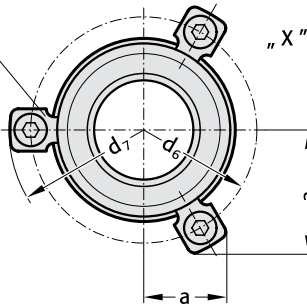
2081.74.



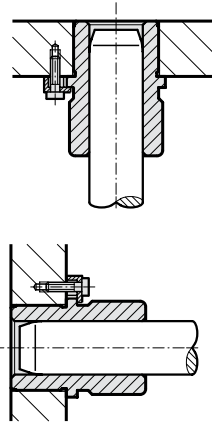
207.45

Order No for replacement parts

Screw clamp with cap screws M6 x 20, similar DIN 6912, head  $\varnothing 13$ , (four clamps for size  $\varnothing d_1 = 38$  and over)



Mounting Example



**Note:**

Headed Guide Bushes are to be held in H6-retainer bores. Three screw clamps are provided for fixing; sizes  $d_1 = 38$  mm and over have four. These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head  $\varnothing 13$ .

**Material:** Bronze

**Execution:** Contact surfaces with solid lubricant rings. Diameter  $d_3$  and collar face precision ground.

2081.74.

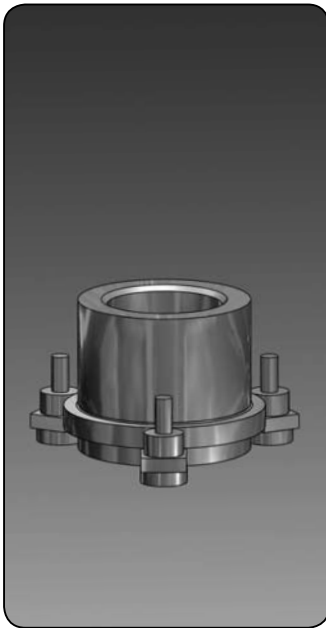
$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64,7	72,7	79,7	89,7	103,7	118,7	141,7
$d_8$	39	46	53	63	77	92	115
a	20,7	22,65	24,4	35,3	40,2	45,5	54,5
$a_1$	30	33,4	36,4	35,3	40,2	45,5	54,5
$l_1$	43	59	75	82	97	116	120
$l_2$	23	23	30	37	47	60	60
$l_3$	20	36	45	45	50	56	60

**Ordering Code (example):**

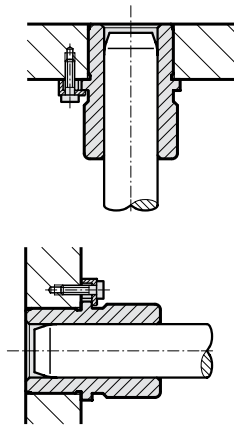
Headed Guide Bushes, Bronze = 2081.74.

$d_1 = 25$  mm = 025

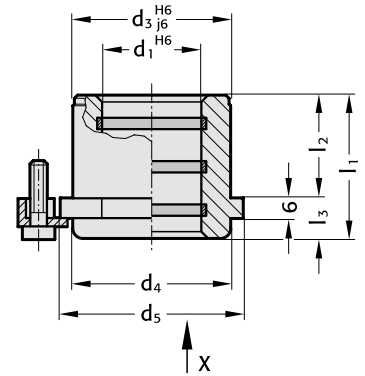
Order No = 2081.74.025



Mounting Example



2081.75.



**Note:**

Headed Guide Bushes are to be held in H6-retainer bores. Three screw clamps are provided for fixing; sizes  $d_1 = 38$  mm and over have four. These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head  $\varnothing 13$ .

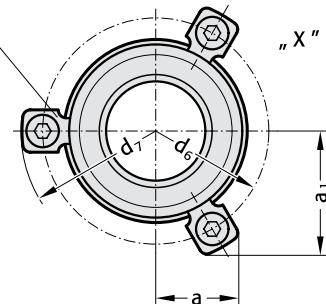
**Material:** Bronze

**Execution:** Contact surfaces with solid lubricant rings.  
Diameter  $d_3$  and collar face precision ground.

**207.45**

Order No for replacement parts

Screw clamp with cap screws M6 x 20, similar DIN 6912, head  $\varnothing 13$ , (four clamps for size  $\varnothing d_1 = 38$  and over)



**2081.75.**

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64,7	72,7	79,7	89,7	103,7	118,7	141,7
$d_8$	39	46	53	63	77	92	115
a	20,7	22,65	24,4	35,3	40,2	45,5	54,5
$a_1$	30	33,4	36,4	35,3	40,2	45,5	54,5
$l_1$	35	35	42	52	65	80	80
$l_2$	23	23	30	37	47	60	60
$l_3$	12	12	12	15	18	20	20

**Ordering Code (example):**

Headed Guide Bushes, Bronze = 2081.75.

$d_1 = 63$  mm = 063

Order No = 2081.75.063

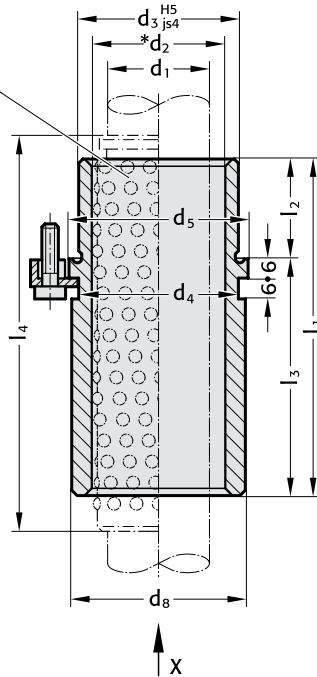
# FIBRO

2081.44.  
206.71.

## Headed Guide Bushes for Ball Bearings DIN 9831/ISO 9448-7 Ball Cages

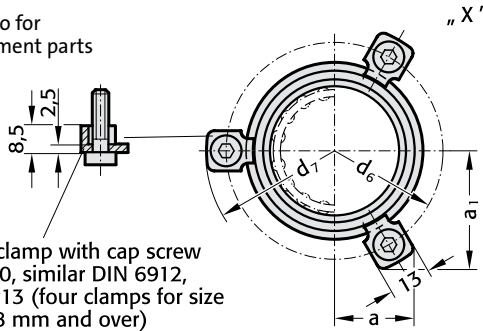
2081.44.

to order separate:  
Ball Cage  
206.71.



207.45

Order No for replacement parts



\* Preloading see Colour Code Combinations – pages D10 and D11.

### Execution:

Bearing surfaces honed.  
Outside diameter fine-ground.

### Note:

Headed Guide Bushes are to be held in H5-retainer bores.

Three screw clamps are provided for fixing; sizes  $\varnothing d_1 = 38$  mm and over have four.

FIBRO headed guide bushes for ball bearings are fully interchangeable with the corresponding sizes of the FIBRO headed guide bushes of sintered ferrite.

Notes on Sliding and Ball Bearing Guides see page D9.

Guide Pillars see pages D16, D17, D18, D22 and D35.

Ball guide capacity calculations see pages D56 and D57.

### Material:

Bush: tool steel, Hardness:  $62 \pm 2$  HRC

Ball Cage: brass

Balls: hardened steel DIN 5401



2081.44.

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_2$	25 26	30 31	38 40	46 48	56 58	68 71	92
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64,7	72,7	79,7	89,7	103,7	118,7	141,7
$d_8$	39	46	53	63	77	92	115
a	20,7	22,65	24,4	35,3	40,2	45,5	54,5
$a_1$	30	33,4	36,4	35,3	40,2	45,5	54,5
$l_1$	59	79	93	108	127	150	150
$l_2$	23	23	30	37	47	60	60
$l_3$	36	56	63	71	80	90	90

206.71. (preferred length)

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
l	71	95	120	120	140	160	160
$l_4$	72	96	120	120	140	160	161

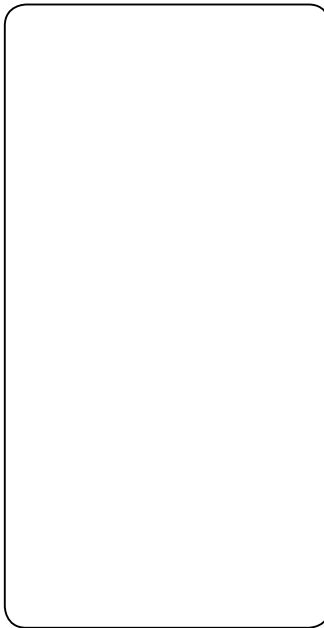
l = Nominal ordering length  
 $l_4$  = Manufacturing length

### Ordering Code (example):

Headed Guide Bush = 2081.44.	Ball Cages = 206.71.	Tolerance range – yellow = .10
$d_1 = 40$ mm = 040.	$d_1 = 40$ mm = 040.	green = .20
Tolerance range – red = 30	l = 120 mm = 120	red = .30
Order No = 2081.44.040.30	Order No = 206.71.040.120	

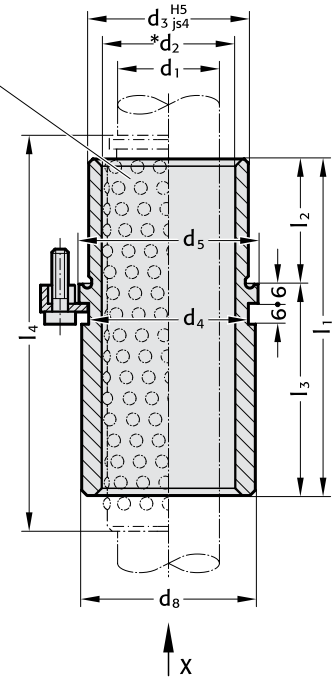
# Headed Guide Bushes for Ball Bearings DIN 9831/ISO 9448-7 Ball Cages

**FIBRO**  
2081.45.  
206.71.



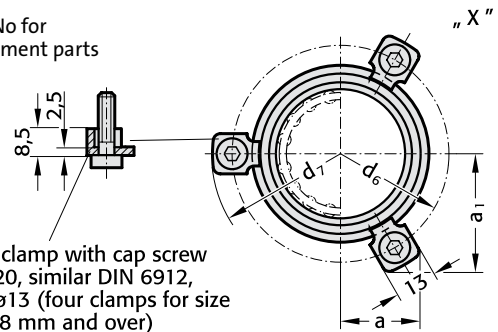
2081.45.

to order  
separate:  
Ball Cage  
206.71.



207.45

Order No for  
replacement parts



screw clamp with cap screw  
M6 x 20, similar DIN 6912,  
head  $\varnothing 13$  (four clamps for size  
 $d_1 = 38$  mm and over)

\* Preloading see Colour Code Combinations – pages D10 and D11.

## Execution:

Bearing surfaces honed.  
Outside diameter fine-ground.

## Note:

Headed Guide Bushes are to be held in H5-retainer bores.

Three screw clamps are provided for fixing; sizes  $\varnothing d_1 = 38$  mm and over have four.

FIBRO headed guide bushes for ball bearings are fully interchangeable with the corresponding sizes of the FIBRO headed guide bushes of sintered ferrite.

Notes on Sliding and Ball Bearing Guides see page D9.

Guide Pillars see pages D16, D17, D18, D22 and D35.

Ball guide capacity calculations see pages D56 and D57.

## Material:

Bush: tool steel, Hardness:  $62 \pm 2$ HRC  
Ball Cage: brass  
Balls: hardened steel DIN 5401

## 2081.45.

$d_1$	24 25	30 32	38 40	48 50
$d_2$	30 31	38 40	46 48	56 58
$d_3$	40	48	58	70
$d_4$	40	48	58	70
$d_5$	48	56	66	80
$d_6$	60	67	77	91
$d_7$	72,7	79,7	89,7	103,7
$d_8$	46	53	63	77
a	22,65	24,4	35,3	40,2
$a_1$	33,4	36,4	35,3	40,2
$l_1$	80	93	110	131
$l_2$	30	37	47	60
$l_3$	50	56	63	71

## 206.71. (preferred length)

$d_1$	24 25	30 32	38 40	48 50	
l	95	120	140	160	l = Nominal ordering length
$l_4$	96	120	140	160	$l_4$ = Manufacturing length

## Ordering Code (example):

Headed Guide Bush = 2081.45.	Ball Cages = 206.71.	Tolerance yellow = .10
$d_1 = 40$ mm = 040.	$d_1 = 40$ mm = 040.	range – green = .20
Tolerance range- red = 30	l = 120 mm = 120	red = .30
Order No = 2081.45.040.30	Order No = 206.71.040.120	

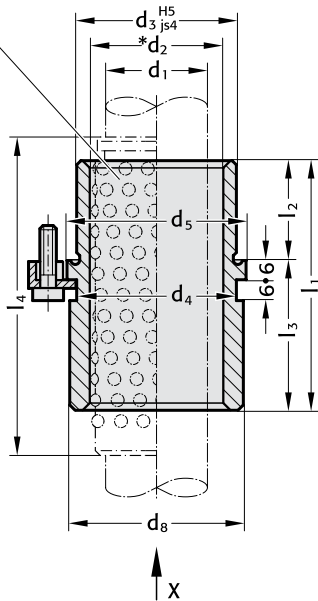
# FIBRO

2081.46.  
206.71.

## Headed Guide Bushes for Ball Bearings DIN 9831/ISO 9448-7 Ball Cages

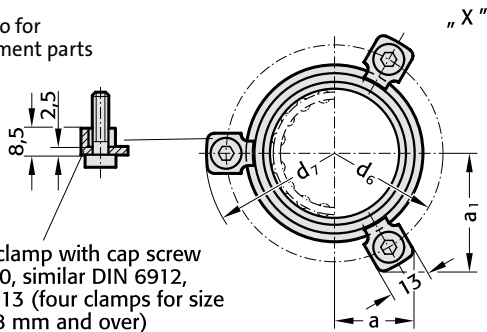
2081.46.

to order  
separate:  
Ball Cage  
206.71.



207.45

Order No for  
replacement parts



screw clamp with cap screw  
M6 x 20, similar DIN 6912,  
head  $\varnothing 13$  (four clamps for size  
 $d_1 = 38$  mm and over)

\* Preloading see Colour Code Combinations – pages D10 and D11.

### Execution:

Bearing surfaces honed.  
Outside diameter fine-ground.

### Note:

Headed Guide Bushes are to be held in H5-retainer bores.

Three screw clamps are provided for fixing; sizes  $\varnothing d_1 = 38$  mm and over have four.

FIBRO headed guide bushes for ball bearings are fully interchangeable with the corresponding sizes of the FIBRO headed guide bushes of sintered ferrite.

Notes on Sliding and Ball Bearing Guides see page D9.

Guide Pillars see pages D16, D17, D18, D22 and D35.

Ball guide capacity calculations see pages D56 and D57.

### Material:

Bush: tool steel, Hardness:  $62 \pm 2$  HRC  
Ball Cage: brass  
Balls: hardened steel DIN 5401



2081.46.

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_2$	25 26	30 31	38 40	46 48	56 58	68 71	92
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64,7	72,7	79,7	89,7	103,7	118,7	141,7
$d_8$	39	46	53	63	77	92	115
a	20,7	22,65	24,4	35,3	40,2	45,5	54,5
$a_1$	30	33,4	36,4	35,3	40,2	45,5	54,5
$l_1$	43	59	75	82	97	116	120
$l_2$	23	23	30	37	47	60	60
$l_3$	20	36	45	45	50	56	60

206.71. (preferred length)

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
l	56	71	95	105	120	140	140
$l_4$	56	72	95	105	120	140	140

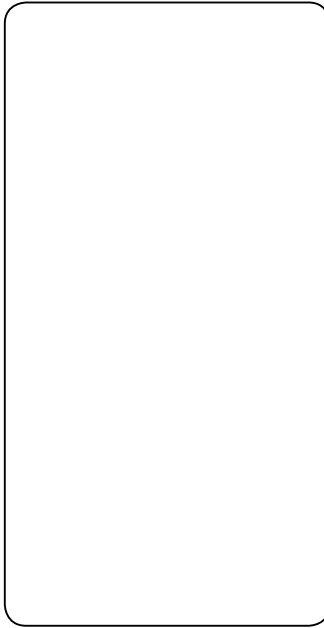
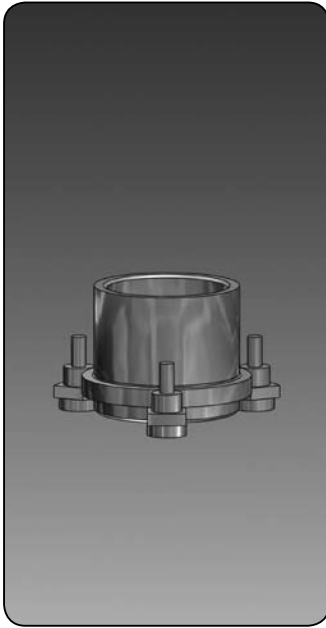
l = Nominal ordering length  
 $l_4$  = Manufacturing length

### Ordering Code (example):

Headed Guide Bush = 2081.46.	Ball Cages = 206.71.	Tolerance yellow = .10
$d_1 = 40$ mm = 040.	$d_1 = 40$ mm = 040.	range – green = .20
Tolerance range-red = 30	l = 120 mm = 120	red = .30
Order No = 2081.46.040.30	Order No = 206.71.040.120	

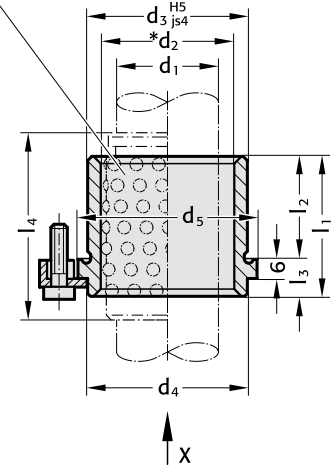
# Headed Guide Bushes for Ball Bearings DIN 9831/ISO 9448-7 Ball Cages

**FIBRO**  
2081.47.  
206.71.



2081.47.

to order  
separate:  
Ball Cage  
206.71.



## Execution:

Bearing surfaces honed.  
Outside diameter fine-ground.

## Note:

Headed Guide Bushes are to be held in H5-retainer bores.

Three screw clamps are provided for fixing; sizes  $\varnothing d_1 = 38$  mm and over have four.

FIBRO headed guide bushes for ball bearings are fully interchangeable with the corresponding sizes of the FIBRO headed guide bushes of sintered ferrite.

Notes on Sliding and Ball Bearing Guides see page D 9.

Guide Pillars see pages D16, D17, D18, D22 and D35.

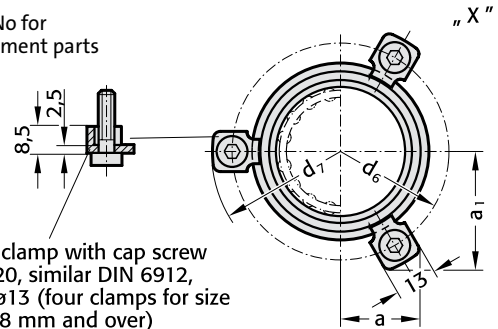
Ball guide capacity calculations see pages D56 and D57.

## Material:

Bush: tool steel  
Hardness:  $62 \pm 2$ HRC  
Ball Cage: brass  
Balls: hardened steel DIN 5401

207.45

Order No for  
replacement parts



screw clamp with cap screw  
M6 x 20, similar DIN 6912,  
head  $\varnothing 13$  (four clamps for size  
 $d_1 = 38$  mm and over)

\* Preloading see Colour Code Combinations – pages D10 and D11..

2081.47.

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_2$	25 26	30 31	38 40	46 48	56 58	68 71	92
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64,7	72,7	79,7	89,7	103,7	118,7	141,7
$d_8$	39	46	53	63	77	92	115
a	20,7	22,65	24,4	35,3	40,2	45,5	54,5
$a_1$	30	33,4	36,4	35,3	40,2	45,5	54,5
$l_1$	35	35	42	52	65	80	80
$l_2$	23	23	30	37	47	60	60
$l_3$	12	12	12	15	18	20	20

206.71. (preferred length)

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
l	45	45	56	63	80	95	120
$l_4$	44	44	55	65	80	95	119

l = Nominal ordering length  
 $l_4$  = Manufacturing length

## Ordering Code (example):

Headed Guide Bush = 2081.47.	Ball Cages = 206.71.	Tolerance yellow = .10
$d_1 = 40$ mm = 040.	$d_1 = 40$ mm = 040.	range – green = .20
Tolerance range- red = 30	l = 120 mm = 120	red = .30
Order No = 2081.47.040.30	Order No = 206.71.040.120	



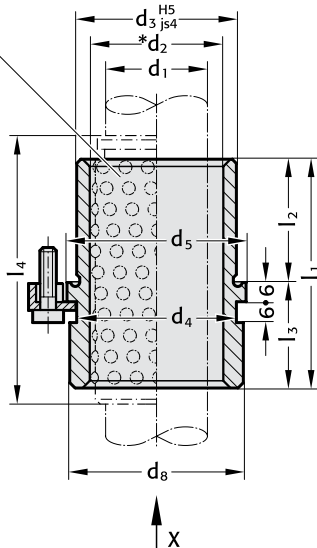
# FIBRO

2081.49.  
206.71.

## Headed Guide Bushes for Ball Bearings DIN 9831/ISO 9448-7 Ball Cages

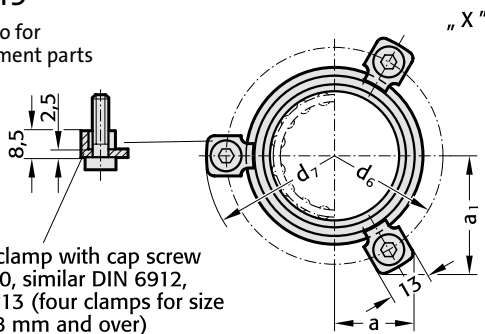
2081.49.

to order  
separate:  
Ball Cage  
206.71.



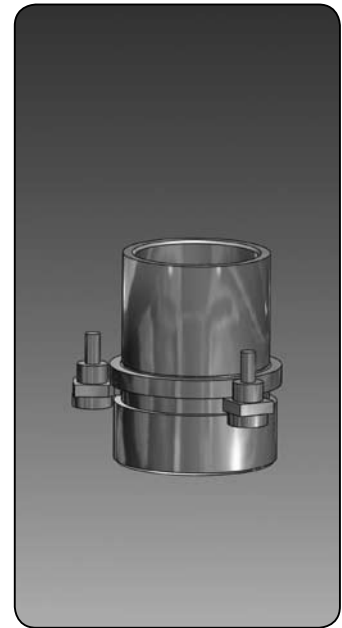
207.45

Order No for  
replacement parts



screw clamp with cap screw  
M6 x 20, similar DIN 6912,  
head  $\varnothing 13$  (four clamps for size  
 $d_1 = 38$  mm and over)

\* Preloading see Colour Code Combinations – pages D10 and D11.



### Execution:

Bearing surfaces honed.  
Outside diameter fine-ground.

### Note:

Headed Guide Bushes are to be held in H5-retainer bores.

Three screw clamps are provided for fixing; sizes  $\varnothing d_1 = 38$  mm and over have four.

FIBRO headed guide bushes for ball bearings are fully interchangeable with the corresponding sizes of the FIBRO headed guide bushes of sintered ferrite.

Notes on Sliding and Ball Bearing Guides see page D 9.

Guide Pillars see pages D16, D17, D18, D22 and D35.

Ball guide capacity calculations see pages D56 and D57.

### Material:

Bush: tool steel  
Hardness:  $62 \pm 2$ HRC  
Ball Cage: brass  
Balls: hardened steel DIN 5401

2081.49.

$d_1$	24 25	30 32	38 40	48 50
$d_2$	30 31	38 40	46 48	56 58
$d_3$	40	48	58	70
$d_4$	40	48	58	70
$d_5$	48	56	66	80
$d_6$	60	67	77	91
$d_7$	72,7	79,7	89,7	103,7
$d_8$	46	53	63	77
$a$	22,65	24,4	35,3	40,2
$a_1$	33,4	36,4	35,3	40,2
$l_1$	55	69	79	96
$l_2$	30	37	47	60
$l_3$	25	32	32	36

206.71. (preferred length)

$d_1$	24 25	30 32	38 40	48 50	
$l$	71	80	95	120	$l$ = Nominal ordering length
$l_4$	72	80	95	120	$l_4$ = Manufacturing length

### Ordering Code(example):

Headed Guide Bush = 2081.49.	Ball Cages = 206.71.	Tolerance yellow = .10
$d_1 = 40$ mm = 040.	$d_1 = 40$ mm = 040.	range – green = .20
Tolerance range- red = 30	$l = 120$ mm = 120	red = .30
Order No = 2081.49.040.30	Order No = 206.71.040.120	

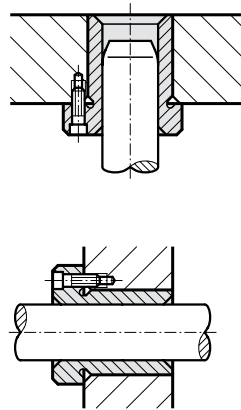
# Flanged Guide Bushes, sintered ferrite, DIN 9831/ISO9448-4, carbonitrided long-term lubrication

**FIBRO**

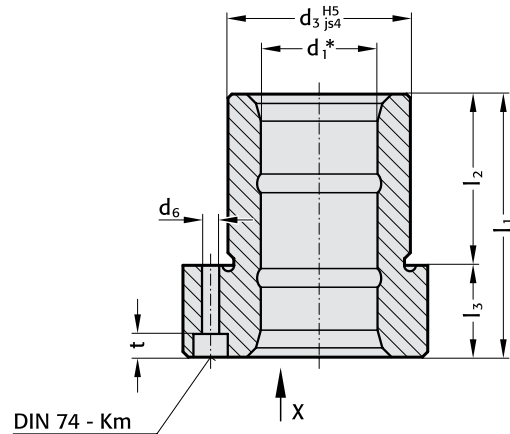
2091.31.



## Mounting Examples



2091.31.



## Material:

Sintered ferrite of high purity, carbonitrided.

## Execution:

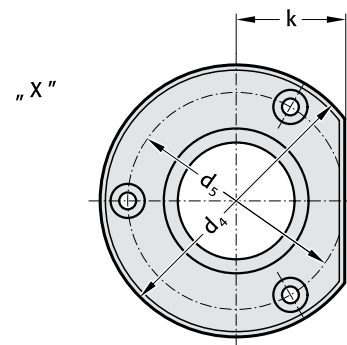
Bearing surfaces and outside diameter fine-ground.

## Note:

Register bore H5.

The guide bush is fixed by means of 3 screws to DIN EN ISO 4762. The screws are not contained in the scope of delivery.

FIBRO flanged guide bushes of sintered ferrite carbonitrided are fully interchangeable with the corresponding sizes of the FIBRO flanged guide bushes for ball bearings.



Notes on Sliding- and Ball Bearing Guides: see page D9.

Guide Pillars: see pages D16, D17, D18, D22 and D35.

\* Colour Code Combinations/Clearances – see pages D10 and D11.

## 2091.31.

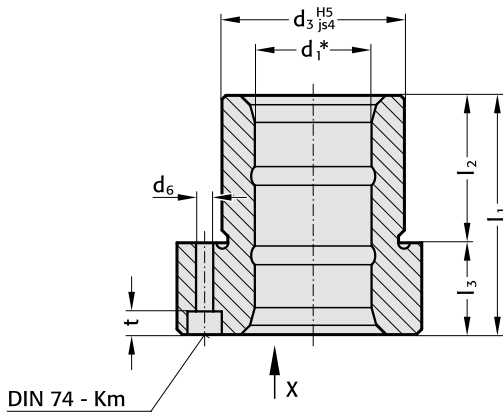
$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	40	48	58	70	85	105
$d_4$	50	63	72	85	104	120	148
$d_5^*$	40	50	58	70	86	100	125
$d_6$	4,5	5,5	5,5	6,6	9	9	11
k	18	23	28	33	38	46	56
$l_1$	52	62	72	77	102	102	125
$l_2$	37	37	47	47	60	60	75
$l_3$	15	25	25	30	42	42	50
t	4,6	5,7	5,7	6,8	9	9	11

## Ordering Code (example):

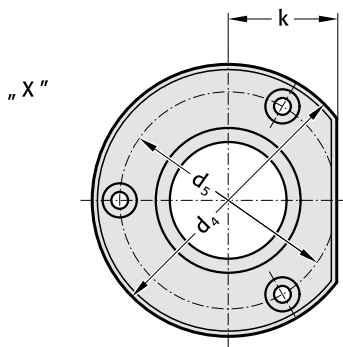
Flanged Guide Bush	= 2091.31.	
$d_3 = 40$ mm	= 040.	Tolerance yellow = .10
Tolerance range – red	= 30	range – green = .20
Order No	= 2091.31.040.30	red = .30

**FIBRO**

# Flanged Guide Bushes, sintered ferrite, DIN 9831/ISO 9448-4, carbonitrided, long-term lubrication

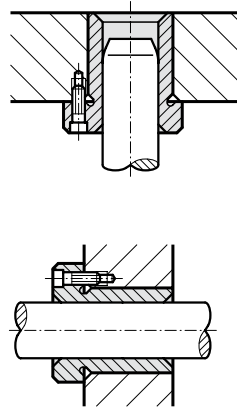
**2091.32.****2091.32.**

DIN 74 - Km



" X "

\* Colour Code Combinations/Clearances – see pages D10 and D11.

**Mounting Examples****Material:**

Sintered ferrite of high purity, carbonitrided

**Execution:**

Bearing surfaces and outside diameter fine-ground.

**Note:**

Register bore H5. The guide bush is fixed by means of 3 screws to DIN EN ISO 4762, except for dias. 15 + 16, which require screws to DIN 6912. The screws are not contained in the scope of delivery.

FIBRO flanged guide bushes of sintered ferrite carbonitrided are fully interchangeable with the corresponding sizes of the FIBRO flanged guide bushes for ball bearings.

Notes on Sliding- and Ball Bearing Guides: see page D9.

Guide Pillars: see pages D16, D17, D18, D22 and D35.

**2091.32.**

d <sub>1</sub>	15* 16*	19 20	24 25	30 32	38 40	48 50	60 63
d <sub>3</sub>	28	32	40	48	58	70	85
d <sub>4</sub>	45	50	63	72	85	104	120
d <sub>5</sub> *	35	40	50	58	70	86	100
d <sub>6</sub>	4,5	4,5	5,5	5,5	6,6	9	9
k	15	18	23	28	33	38	46
l <sub>1</sub>	36	45	55	62	67	89	89
l <sub>2</sub>	30	30	30	37	37	47	47
l <sub>3</sub>	6	15	25	25	30	42	42
t	3,4	4,6	5,7	5,7	6,8	9	9

\* use Shallow Head Cap Screws DIN 6912!

**Ordering Code (example):**

Flanged Guide Bush = 2091.32.

d<sub>1</sub> = 38 mm = 038.

Tolerance range – red = 30

Order No = 2091.32.038.30

Tolerance yellow = .10

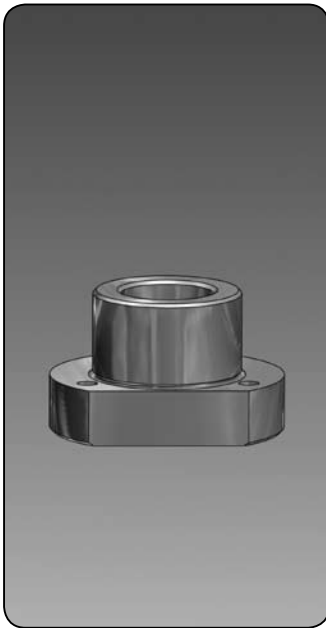
range – green = .20

red = .30

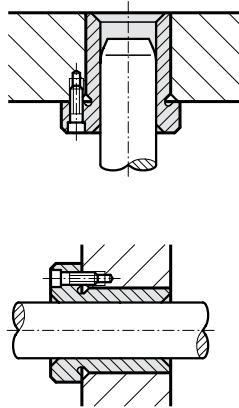
# Flanged Guide Bushes, sintered ferrite, DIN 9831/ISO 9448-4, carbonitrided, long-term lubrication

**FIBRO**

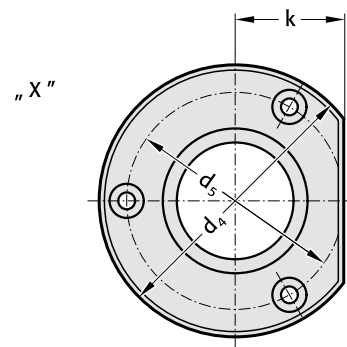
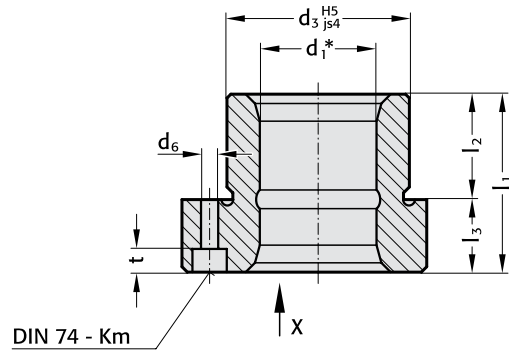
2091.34.



## Mounting Examples



2091.34.



### Material:

Sintered ferrite of high purity, carbonitrided.

### Execution:

Bearing surfaces and outside diameter fine-ground.

### Note:

Register bore H5. The guide bush is fixed by means of 3 screws to DIN EN ISO 4762, except for dias. 15 + 16, which require screws to DIN 6912. The screws are not contained in the scope of delivery.

FIBRO flanged guide bushes of sintered ferrite carbonitrided are fully interchangeable with the corresponding sizes of the FIBRO flanged guide bushes for ball bearings.

Notes on Sliding- and Ball Bearing Guides: see page D9.

Guide Pillars: see pages D16, D17, D18, D22 and D35.

\* Colour Code Combinations/Clearances – see pages D10 and D11.

## 2091.34.

$d_1$	15* 16*	19 20	24 25	30 32	38 40	48 50
$d_3$	28	32	40	48	58	70
$d_4$	45	50	63	72	85	104
$d_5^*$	35	40	50	58	70	86
$d_6$	4,5	4,5	5,5	5,5	6,6	9
k	15	18	23	28	33	38
l1	29	38	38	45	55	62
l2	23	23	23	30	30	37
l3	6	15	15	15	25	25
t	3,4	4,6	5,7	5,7	6,8	9

\* use Shallow Head Cap Screws DIN 6912!

### Ordering Code (example):

Flanged Guide Bush	=	2091.34.	
$d_1 = 40$ mm	=	040.	Tolerance yellow = .10
Tolerance range – red	=	30	range – green = .20
Order No	=	2091.34.040.30	red = .30

**FIBRO**

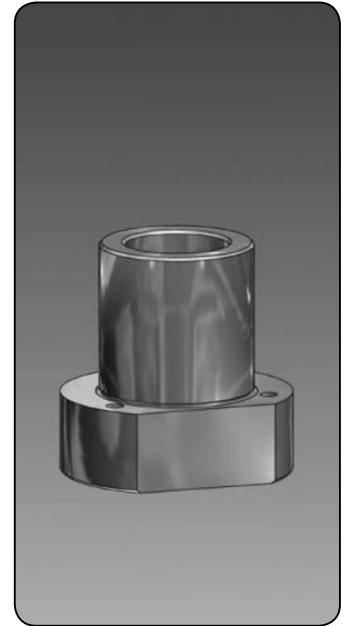
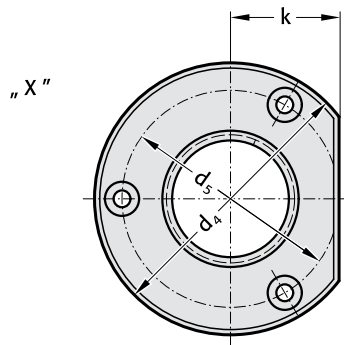
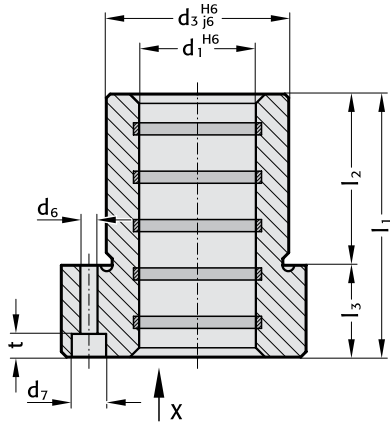
*ECO-LINE* Flanged Guide Bushes

DIN 9831/ISO 9448

Bronze with Solid Lubrication Rings

2091.71.

2091.71.



**Note:**

Register bore H6. The guide bush is fixed by means of 3 screws to DIN EN ISO 4762. The screws are not contained in the scope of delivery.

**Material:**

Bronze

**Execution:**

Contact surfaces with solid lubricant rings. Diameter  $d_3$  and collar face precision ground.

2091.71.

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	40	48	58	70	85	105
$d_4$	50	63	72	85	104	120	148
$d_5$	40	50	58	70	86	100	125
$d_6$	4,5	5,5	5,5	6,6	9	9	11
$d_7$	8	10	10	11	15	15	18
k	18	23	28	33	38	46	56
$l_1$	52	62	72	77	102	102	125
$l_2$	37	37	47	47	60	60	75
$l_3$	15	25	25	30	42	42	50
t	4,6	5,7	5,7	6,8	9	9	11

**Ordering Code (example):**

Flanged Guide Bush = 2091.71.  
 $d_1 = 40$  mm = 040  
 Order No = 2091.71.040

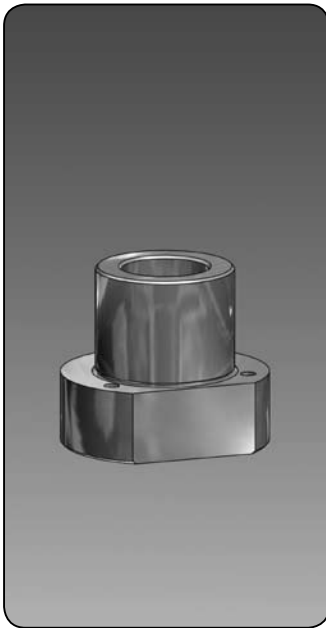
2-100000-7-1

Flanged Guide Bushes  
 DIN 9831/ISO 9448-4  
 Bronze with Solid Lubrication Rings

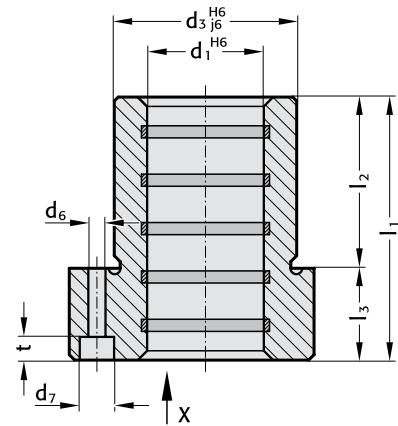
ECO-LINE

FIBRO

2091.72.



2091.72.



**Note:**

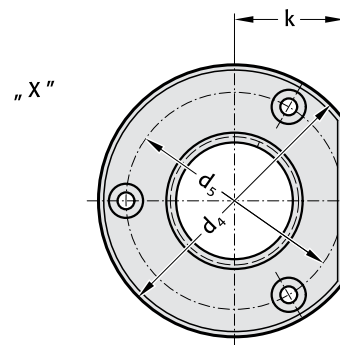
Register bore H6. The guide bush is fixed by means of 3 screws to DIN EN ISO 4762, except for dias. 15 + 16, which require screws to DIN 6912. The screws are not contained in the scope of delivery.

**Material:**

Bronze.

**Execution:**

Contact surfaces with solid lubricant rings.  
 Diameter  $d_3$  and collar face precision ground.



2091.72.

$d_1$	15* 16*	19 20	24 25	30 32	38 40	48 50	60 63
$d_3$	28	32	40	48	58	70	85
$d_4$	45	50	63	72	85	104	120
$d_5$	35	40	50	58	70	86	100
$d_6$	4,5	4,5	5,5	5,5	6,6	9	9
$d_7$	6	8	10	10	11	15	15
k	15	18	23	28	33	38	46
$l_1$	36	45	55	62	67	89	89
$l_2$	30	30	30	37	37	47	47
$l_3$	6	15	25	25	30	42	42
t	3,4	4,6	5,7	5,7	6,8	9	9

\* use Shallow Head Cap Screws DIN 6912!

**Ordering Code (example):**

Flanged Guide Bush = 2091.72.  
 $d_1 = 40$  mm = 040  
 Order No = 2091.72.040

**FIBRO***ECO-LINE*

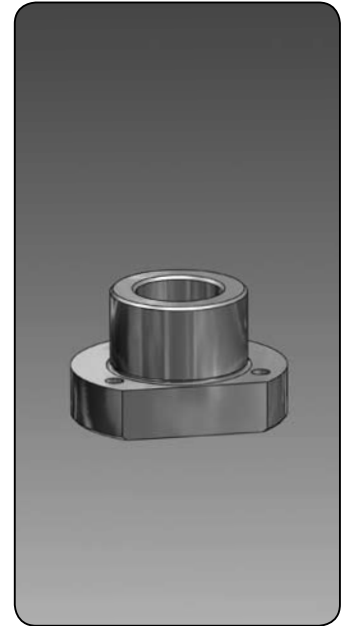
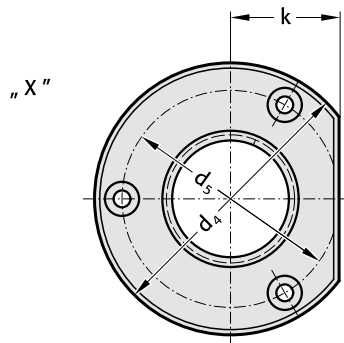
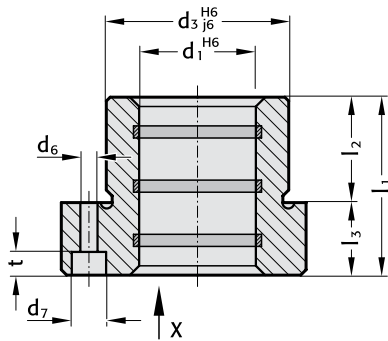
Flanged Guide Bushes

DIN 9831/ISO 9448-4

Bronze with Solid Lubrication Rings

2091.74.

2091.74.

**Note:**

Register bore H6. The guide bush is fixed by means of 3 screws to DIN EN ISO 4762, except for dias. 15 + 16, which require screws to DIN 6912. The screws are not contained in the scope of delivery.

**Material:**

Bronze.

**Execution:**

Contact surfaces with solid lubricant rings.  
Diameter  $d_3$  and collar face precision ground.

2091.74.

$d_1$	15* 16*	19 20	24 25	30 32	38 40	48 50
$d_3$	28	32	40	48	58	70
$d_4$	45	50	63	72	85	104
$d_5$	35	40	50	58	70	86
$d_6$	4,5	4,5	5,5	5,5	6,6	9
$d_7$	6	8	10	10	11	15
k	15	18	23	28	33	38
$l_1$	29	38	38	45	55	62
$l_2$	23	23	23	30	30	37
$l_3$	6	15	15	15	25	25
t	3,4	4,6	5,7	5,7	6,8	9

\* use Shallow Head Cap Screws DIN 6912!

**Ordering Code (example):**

Flanged Guide Bush = 2091.74.  
 $d_1 = 40$  mm = 040  
 Order No = 2091.74.040

# Flanged Guide Bushes for Ball Bearings

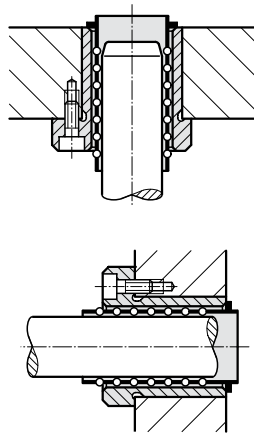
## DIN 9831/ISO 9448-5

### Ball Cages

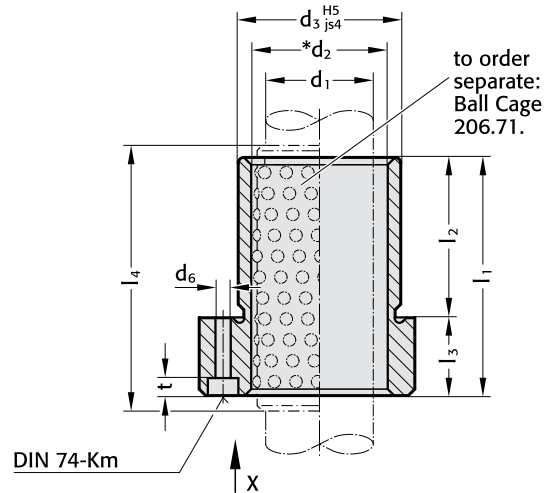
**FIBRO**  
2091.44.  
206.71.



#### Mounting Examples



2091.44.



#### Material:

Bush: tool steel  
Hardness: 62 ± 2 HRC  
Ball Cage: brass  
Balls: hardened steel DIN 5401

#### Execution:

Bearing surfaces honed. Outside diameter fine-ground.

#### Note:

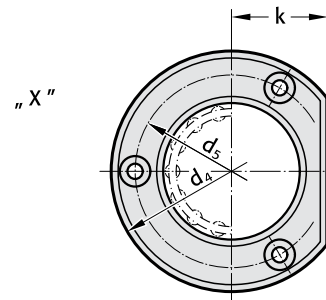
Register bore H5. The guide bush is fixed by means of 3 screws to DIN EN ISO 4762. The screws are not contained in the scope of delivery.

FIBRO flanged guide bushes for ball bearings are fully interchangeable with the corresponding sizes of the FIBRO flanged guide bushes of sintered ferrite.

Notes on Sliding- and Ball Bearing Guides: page D9.

Guide Pillars: see pages D16, D17, D18, D22 and D35.

Ball guide capacity calculations see pages D56 and D57.



\* Preloading see Colour Code Combinations – pages D10 and D11.

#### 2091.44.

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_2$	25 26	30 31	38 40	46 48	56 58	68 71	92
$d_3$	32	40	48	58	70	85	105
$d_4$	50	63	72	85	104	120	148
$d_5$	40	50	58	70	86	100	125
$d_6$	4,5	5,5	5,5	6,6	9	9	11
k	18	23	28	33	38	46	56
$l_1$	52	62	72	77	102	102	125
$l_2$	37	37	47	47	60	60	75
$l_3$	15	25	25	30	42	42	50
t	4,6	5,7	5,7	6,8	9	9	11

#### 206.71. (preferred length)

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
l	71	71	80	95	120	120	140
$l_4$	72	72	80	95	120	120	140

l = Nominal ordering length  
 $l_4$  = Manufacturing length

#### Ordering Code (example):

Flanged Guide Bush	= 2091.44.	Ball Cage	= 206.71.	Tolerance	yellow = .10
$d_1 = 40$ mm	= 040.	$d_1 = 40$ mm	= 040.	range – green	= .20
Tolerance range – green	= 20	l = 80 mm	= 080	red	= .30
Order No	= 2091.44.040.20	Order No	= 206.71.040.080		

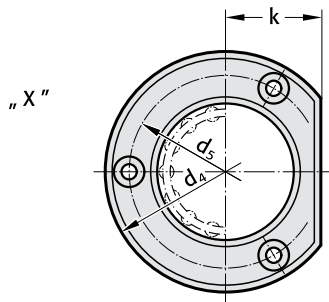
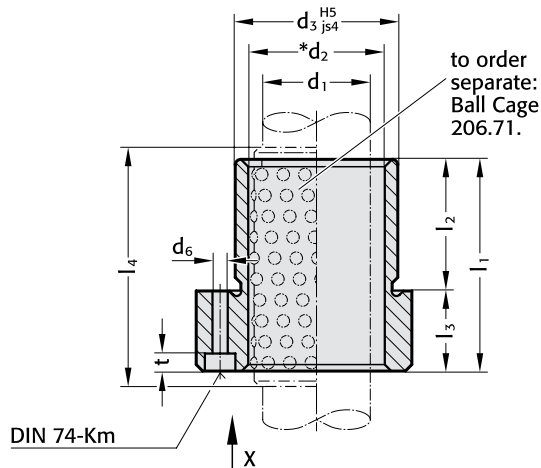


# FIBRO

2091.45.  
206.71.

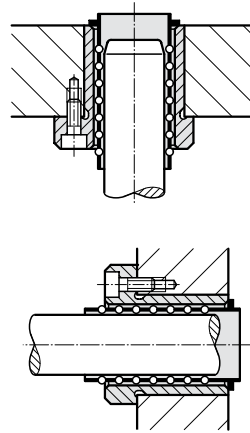
## Flanged Guide Bushes for Ball Bearings DIN 9831/ISO 9448-5 Ball Cages

2091.45.



\* Preloading see Colour Code Combinations – pages D10 and D11.

### Mounting Examples



### Material:

Bush: tool steel  
Hardness: 62 ± 2 HRC  
Ball Cage: brass  
Balls: hardened steel DIN 5401

### Execution:

Bearing surfaces honed. Outside diameter fine-ground.

### Note:

Register bore H5. The guide bush is fixed by means of 3 screws to DIN EN ISO 4762, except for dias. 15 + 16, which require screws to DIN 6912. The screws are not contained in the scope of delivery.

FIBRO flanged guide bushes for ball bearings are fully interchangeable with the corresponding sizes of the FIBRO flanged guide bushes of sintered ferrite.

Notes on Sliding- and Ball Bearing Guides: page D9.

Guide Pillars: see pages D16, D17, D18, D22 and D35.

Ball guide capacity calculations see pages D56 and D57.

2091.45.

d <sub>1</sub>	15* 16*	19 20	24 25	30 32	38 40	48 50	60 63
d <sub>2</sub>	21 22	25 26	30 31	38 40	46 48	56 58	68 71
d <sub>3</sub>	28	32	40	48	58	70	85
d <sub>4</sub>	45	50	63	72	85	104	120
d <sub>5</sub>	35	40	50	58	70	86	100
d <sub>6</sub>	4,5	4,5	5,5	5,5	6,6	9	9
k	15	18	23	28	33	38	46
l <sub>1</sub>	36	45	55	62	67	89	89
l <sub>2</sub>	30	30	30	37	37	47	47
l <sub>3</sub>	6	15	25	25	30	42	42
t	3,4	4,6	5,7	5,7	6,8	9	9

206.71. (preferred length)

d <sub>1</sub>	15* 16*	19 20	24 25	30 32	38 40	48 50	60 63	* use Shallow Head Cap Screws DIN 6912!
l	45	56	71	71	80	95	95	l = Nominal ordering length
l <sub>4</sub>	44	56	72	70	80	95	95	l <sub>4</sub> = Manufacturing length

### Ordering Code (example):

Flanged								Tolerance yellow = .10
Guide Bush	= 2091.45.			Ball Cage	= 206.71.			range – green = .20
d <sub>1</sub> = 40 mm	= 040.			d <sub>1</sub> = 40 mm	= 040.			red = .30
Tolerance range – red	= 30			l = 120 mm	= 120			
Order No	= 2091.45.040.30			Order No	= 206.71.040.120			

# Flanged Guide Bushes for Ball Bearings

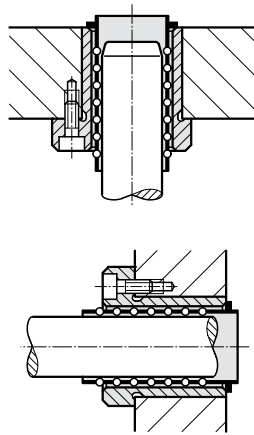
## DIN 9831/ISO 9448-5

### Ball Cages

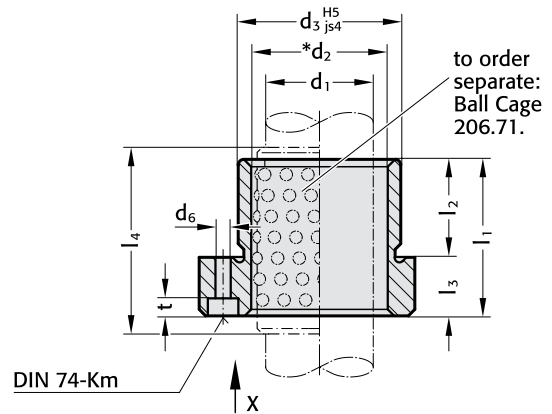
**FIBRO**  
2091.46.  
206.71.



#### Mounting Examples



2091.46.



#### Material:

Bush: tool steel  
Hardness: 62 ± 2 HRC  
Ball Cage: brass  
Balls: hardened steel DIN 5401

#### Execution:

Bearing surfaces honed. Outside diameter fine-ground.

#### Note:

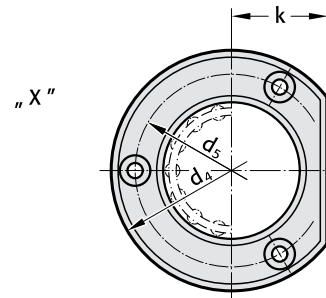
Register bore H5. The guide bush is fixed by means of 3 screws to DIN EN ISO 4762, except for dias. 15 + 16, which require screws to DIN 6912. The screws are not contained in the scope of delivery.

FIBRO flanged guide bushes for ball bearings are fully interchangeable with the corresponding sizes of the FIBRO flanged guide bushes of sintered ferrite.

Notes on Sliding- and Ball Bearing Guides: page D9.

Guide Pillars: see pages D16, D17, D18, D22 and D35.

Ball guide capacity calculations see pages D56 and D57.



\* Preloading see Colour Code Combinations – pages D10 and D11.

2091.46.

d <sub>1</sub>	12	15* 16*	19 20	24 25	30 32	38 40	48 50
d <sub>2</sub>	16	21 22	25 26	30 31	38 40	46 48	56 58
d <sub>3</sub>	26	28	32	40	48	58	70
d <sub>4</sub>	43	45	50	63	72	85	104
d <sub>5</sub>	33	35	40	50	58	70	86
d <sub>6</sub>	4,5	4,5	4,5	5,5	5,5	6,6	9
k	13	15	18	23	28	33	38
l <sub>1</sub>	25	29	38	38	45	55	62
l <sub>2</sub>	16	23	23	23	30	30	37
l <sub>3</sub>	9	6	15	15	15	25	25
t	4,6	3,4	4,6	5,7	5,7	6,8	9

206.71. (preferred length)

d <sub>1</sub>	12	15* 16*	19 20	24 25	30 32	38 40	48 50	* use Shallow Head Cap Screws DIN 6912!
l	40	45	45	45	56	63	80	l = Nominal ordering length
l <sub>4</sub>	39	44	44	44	55	65	80	l <sub>4</sub> = Manufacturing length

#### Ordering Code (example):

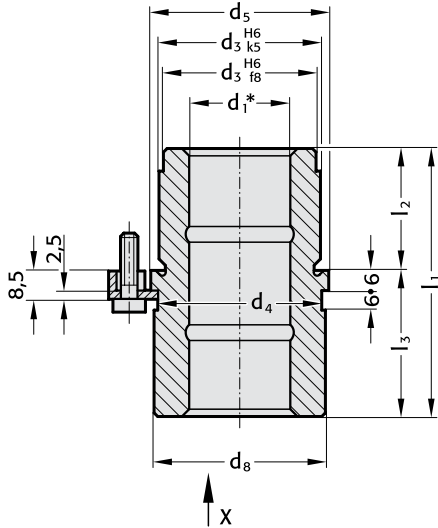
Flanged Guide Bush	= 2091.46.	Ball Cage	= 206.71.	Tolerance yellow	= .10
d <sub>1</sub> = 40 mm	= 040.	d <sub>1</sub> = 40 mm	= 040.	range – green	= .20
Tolerance range – green	= 20	l = 120 mm	= 120	red	= .30
Order No	= 2091.46.040.20	Order No	= 206.71.040.120		

**FIBRO**

**Headed Guide Bushes, sintered ferrite,  
similar AFNOR carbonitrided  
long-term lubrication**

210.31.

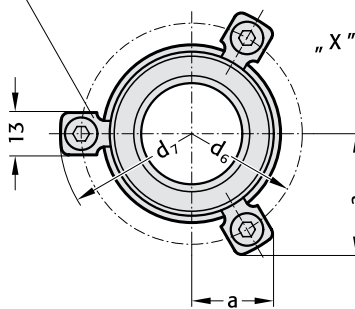
210.31.



207.45

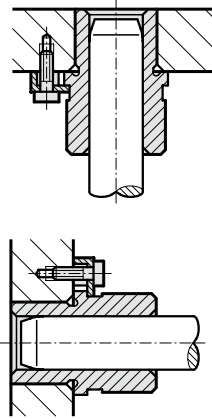
Order No for repeat-order.

Screw clamp with cap screw M6 x 20, similar DIN 6912, head Ø13, (four clamps for size d<sub>1</sub> = 40 mm and over)



\* Colour Code Combinations/Clearances – see pages D10 and D11.

**Mounting Examples**



**Material:**

Sintered ferrite of high purity, carbonitrided.

**Execution:**

Bearing surfaces and outside diameter fine-ground.

**Note:**

Headed Guide Bushes are to be held in H6-retainer bores. Three screw clamps are provided for fixing; sizes d<sub>1</sub> = 40 mm and over have four.

FIBRO headed guide bushes of sintered ferrite carbonitrided are fully interchangeable with the corresponding sizes of the FIBRO guide bushes for ball bearings.

Notes on Sliding- and Ball Bearing Guides: page D9.

Guide Pillars: see pages D16, D17, D18, D22 and D35.

These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head Ø13.

210.31.

d <sub>1</sub>	19	20	25	32	40	50
d <sub>3</sub>	32	40	50	63	80	
d <sub>4</sub>	32	40	50	63	80	
d <sub>5</sub>	36	45	56	70	90	
d <sub>6</sub>	49	57	67	81	101	
d <sub>7</sub>	61,7	69,7	79,7	93,7	113,7	
d <sub>8</sub>	35	43,5	53	67	87	
a	19,9	21,9	24,4	36	43	
a <sub>1</sub>	28,6	32,1	36,4	36	43	
l <sub>1</sub>	66	70	83	98	120	
l <sub>2</sub>	30	30	38	48	61	
l <sub>3</sub>	36	40	45	50	59	

**Ordering Code (example):**

Headed Guide Bush = 210.31.

d<sub>1</sub> = 40 mm = 040.

Tolerance range-green = 20

Order No = 210.31.040.20

Tolerance yellow = .10

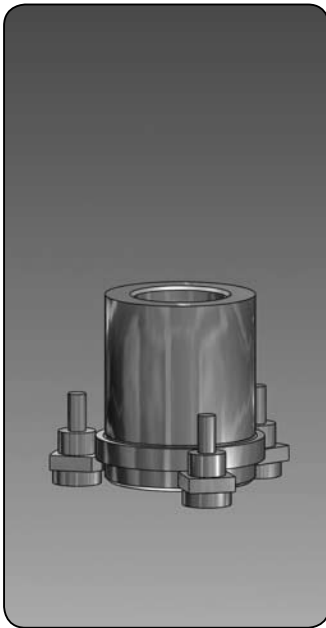
range – green = .20

red = .30

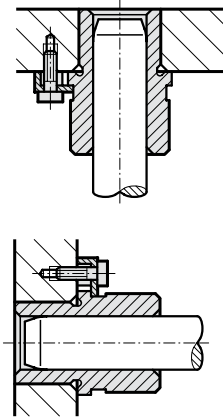
Headed Guide Bushes, sintered ferrite,  
similar AFNOR  
carbonitrided long-term lubrication

FIBRO

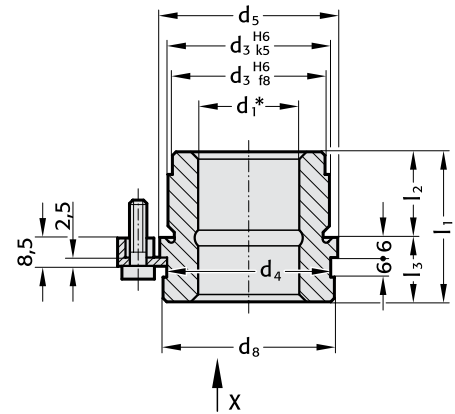
210.34.



Mounting Examples



210.34.



Material:

Sintered ferrite of high purity, carbonitrided.

Execution:

Bearing surfaces and outside diameter fine-ground.

Note:

Headed Guide Bushes are to be held in H6-retainer bores. Three screw clamps are provided for fixing; sizes  $d_1 = 40$  mm and over have four.

FIBRO headed guide bushes of sintered ferrite carbonitrided are fully interchangeable with the corresponding sizes of the FIBRO guide bushes for ball bearings.

Notes on Sliding- and Ball Bearing Guides: page D9.

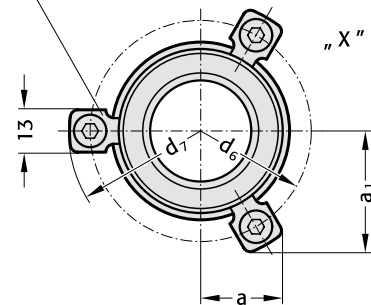
Guide Pillars: see pages D16, D17, D18, D22 and D35.

These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head  $\varnothing 13$ .

207.45

Order No for repeat-order.

Screw clamp with cap screw M6 x 20, similar DIN 6912, head  $\varnothing 13$ , (four clamps for size  $d_1 = 40$  mm and over)



\* Colour Code Combinations/Clearances – see pages D 10 and D 11.

210.34.

$d_1$	19	20	25	32	40	50
$d_3$	32	40	50	63	80	
$d_4$	32	40	50	63	80	
$d_5$	36	45	56	70	90	
$d_6$	49	57	67	81	101	
$d_7$	61,7	69,7	79,7	93,7	113,7	
$d_8$	35	43,5	53	67	87	
a	19,9	21,9	24,4	36	43	
$a_1$	28,6	32,1	36,4	36	43	
$l_1$	42	50	63	76	96	
$l_2$	30	38	48	61	78	
$l_3$	12	12	15	15	18	

Ordering Code (example):

Headed Guide Bush = 210.34.

$d_1 = 40$  mm = 040.  
Tolerance range – red = 30  
Order No = 210.34.040.30

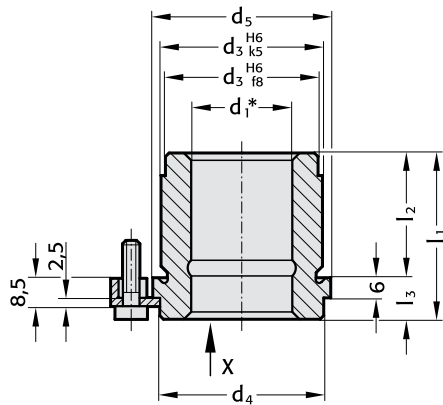
Tolerance yellow = .10  
range – green = .20  
red = .30

**FIBRO**

**Headed Guide Bushes, sintered ferrite,  
similar AFNOR  
carbonitrided long-term lubrication**

**210.35.**

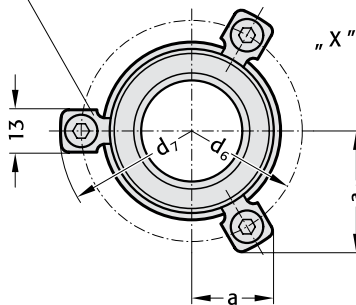
**210.35.**



**207.45**

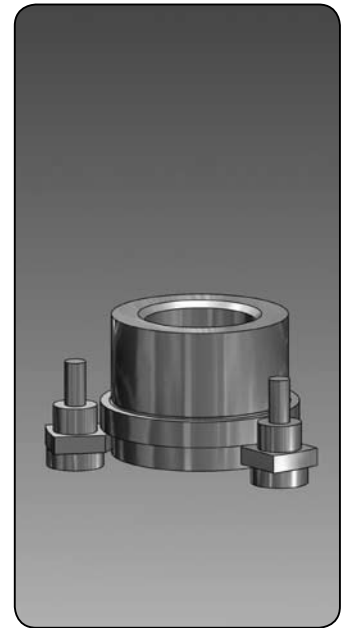
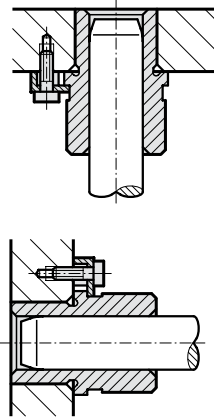
Order No for repeat-order.

Screw clamp with cap screw M6 x 20, similar DIN 6912, head Ø13, (four clamps for size d<sub>1</sub> = 40 mm and over)



\* Colour Code Combinations/Clearances – see pages D 10 and D 11.

**Mounting Examples**



**Material:**

Sintered ferrite of high purity, carbonitrided.

**Execution:**

Bearing surfaces and outside diameter fine-ground.

**Note:**

Headed Guide Bushes are to be held in H6-retainer bores. Three screw clamps are provided for fixing; sizes d<sub>1</sub> = 40 mm and over have four.

FIBRO headed guide bushes of sintered ferrite carbonitrided are fully interchangeable with the corresponding sizes of the FIBRO guide bushes for ball bearings.

Notes on Sliding- and Ball Bearing Guides: page D9.

Guide Pillars: see pages D16, D17, D18, D22 and D35.

These guide bushes are supplied complete with clamps and low-head socket cap screws similar DIN 6912, head Ø13.

**210.35.**

d <sub>1</sub>	19	20	25	32	40	50
d <sub>3</sub>	32	40	50	63	80	
d <sub>4</sub>	32	40	50	63	80	
d <sub>5</sub>	36	45	56	70	90	
d <sub>6</sub>	49	57	67	81	101	
d <sub>7</sub>	61,7	69,7	79,7	93,7	113,7	
a	19,9	21,9	24,4	36	43	
a <sub>1</sub>	28,6	32,1	36,4	36	43	
l <sub>1</sub>	28	32	37	44	44	
l <sub>2</sub>	16	20	25	32	32	
l <sub>3</sub>	12	12	12	12	12	

**Ordering Code (example):**

Headed Guide Bush = 210.35.

d<sub>1</sub> = 40 mm = 040.

Tolerance range – red = 30

Order No = 210.35.040.30

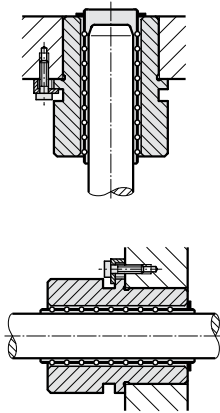
Tolerance yellow = .10  
range – green = .20  
red = .30

# Headed Guide Bushes for Ball Bearings similar AFNOR Ball Cages

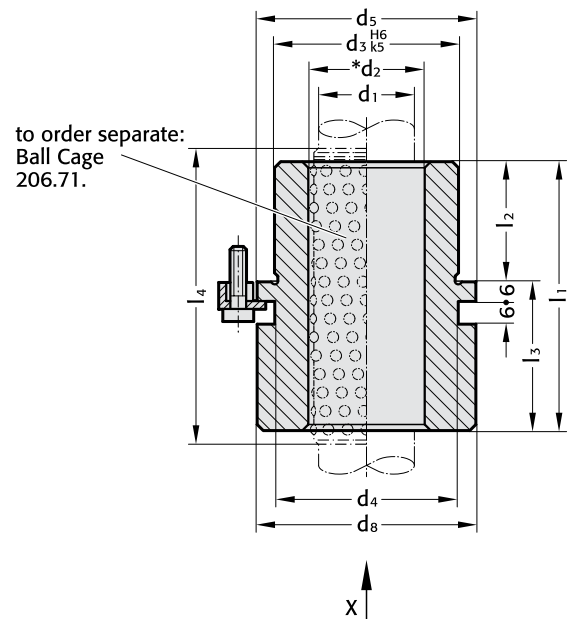
**FIBRO**  
210.44.  
206.71.



## Mounting Examples



210.44.



## Material:

Guide Bush: tool steel  
Hardness: 62 ± 2 HRC  
Ball Cage: brass  
Balls: hardened steel to DIN 5401

## Execution:

Bearing surfaces honed.  
Outside diameter fine-ground.

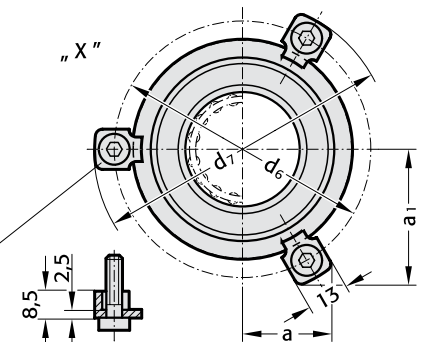
## Note:

Receiving bores: H6 tolerance.  
Guide bushes are retained by three screw clamps – sizes from  $\varnothing d_1 = 40$  mm and over are supplied with four clamps.  
FIBRO guide bushes for ball bearings are fully interchangeable with the corresponding sizes of the FIBRO guide bushes of sintered ferrite.  
Notes on sliding- and rolling type guides see page D9.  
For guide pillars see pages D16, D17, D18, D22 and D35.

207.45

Order No for repeat-order.

screw clamp with cap screws M6 x 20 similar DIN 6912, head  $\varnothing 13$ , (four clamps for size  $d_1 = 40$  mm and over)



\* Preloading see Colour Code Combinations – pages D10 and D11.

210.44.

$d_1$	16	20	25	32	40	50	63
$l_3$	32	36	40	45	50	63	63
$l_2$	$l_1/l_1/l_4$	$l_1/l_1/l_4$	$l_1/l_1/l_4$	$l_1/l_1/l_4$	$l_1/l_1/l_4$	$l_1/l_1/l_4$	$l_1/l_1/l_4$
23	55/63/64		63*/71/72	68*/80/80			
30	62/71/72	66/71/72	70/80/80	75*/80/80	80*/95/95		
38	70*/71/72	74/80/80	78/95/96	83/95/95	88*/95/95	101*/120/120	
48			88/95/96	93/105/105	98/105/105	111*/120/120	
61		101*/120/120	106/120/120	111/120/120	124/140/140		
78			123*/120/140	128/140/140	141/160/160		
98				148*/160/160	161*/180/180	161/180/180	
123						186*/200/200	

\* not available ex-stock – supply on request!

$l$  = Nominal ordering length

$l_4$  = Manufacturing length

## Ordering Code (example):

Headed guide bush = 210.44.

$d_1 = 40$  mm = 040.

$l_2 = 30$  mm = 030.

Tolerance range – red = 30

Order No = 210.44.040.030.30

Ball Cage = 206.71.

$d_1 = 40$  mm = 040.

$l = 120$  mm = 120

Order No = 206.71.040.120

Tolerance yellow = .10

range – green = .20

red = .30

210.44./207.45

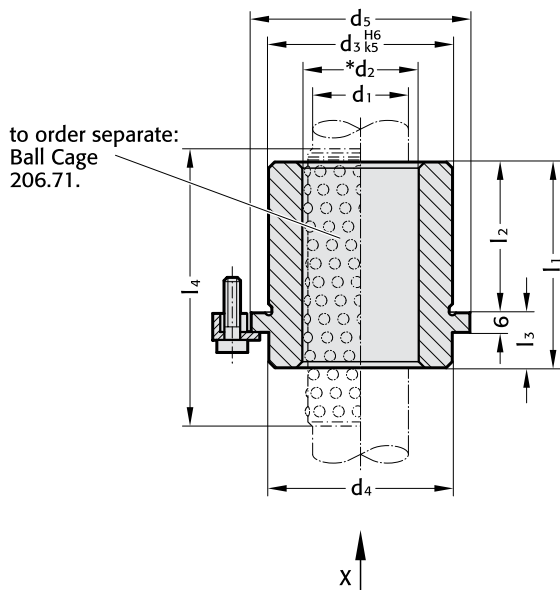
$d_1$	16	20	25	32	40	50	63
$d_2$	22	26	31	40	48	58	71
$d_3$	28	32	40	50	63	80	90
$d_4$	29	32	40	50	63	80	90
$d_5$	32	36	45	56	70	90	110
$d_6$	45	49	57	67	81	101	121
$d_7$	57,7	61,7	69,7	79,7	93,7	13,7	131,7
$d_8$	31	35	43,5	53,5	67	87	107
$a$	18,9	19,9	21,9	24,4	36	43	50,1
$a_1$	26,9	28,6	32,1	36,4	36	43	50,1

# FIBRO

210.46.  
206.71.

## Headed Guide Bushes for Ball Bearings similar AFNOR Ball Cages

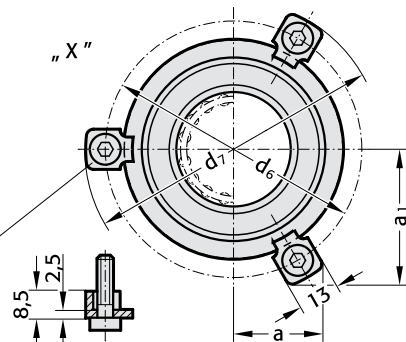
210.46.



207.45

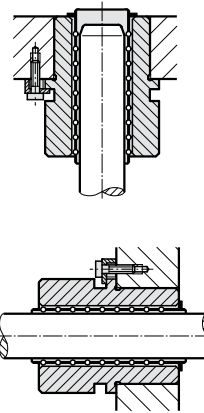
Order No for repeat-order.

screw clamp with cap screws M6 x 20 similar DIN 6912, head ø13, (four clamps for size d<sub>1</sub> = 40 mm and over)



\* Preloading see Colour Code Combinations – pages D10 and D11.

### Mounting Examples



### Material:

Guide Bush: tool steel  
Hardness: 62 ± 2 HRC  
Ball Cage: brass  
Balls: hardened steel to DIN 5401

### Execution:

Bearing surfaces honed.  
Outside diameter fine-ground.

### Note:

Receiving bores: H6 tolerance.  
Guide bushes are retained by three screw clamps – sizes from Ø d<sub>1</sub> = 40 mm and over are supplied with four clamps.  
FIBRO guide bushes for ball bearings are fully interchangeable with the corresponding sizes of the FIBRO guide bushes of sintered ferrite.

Notes on sliding- and rolling type guides see page D9.

For guide pillars see pages D16, D17, D18, D22 and D35.

210.46.

d <sub>1</sub>	16	20	25	32	40	50	63
l <sub>3</sub>	10	12	12	15	15	18	20
l <sub>2</sub>	l <sub>1</sub> /l/l <sub>4</sub>	l <sub>1</sub> /l/l <sub>4</sub>	l <sub>1</sub> /l/l <sub>4</sub>	l <sub>1</sub> /l/l <sub>4</sub>	l <sub>1</sub> /l/l <sub>4</sub>	l <sub>1</sub> /l/l <sub>4</sub>	l <sub>1</sub> /l/l <sub>4</sub>
23	33/45/44						
30	40/45/44	42/45/44	42/45/44	45*/56/55			
38	48*/56/56	50/56/56	50/56/56	53*/71/70			
48	58*/63/64	60/71/72	60/71/72	63/71/70	63/80/80		
61		73*/80/80	76/80/80	76/95/95	79/95/95		
78		90*/105/105	93*/105/105	93*/105/105	96/105/105		
98			113*/120/120	113*/120/120	116*/140/140	118*/120/120	
123						143*/160/160	

\* not available ex-stock – supply on request!

l = Nominal ordering length

l<sub>4</sub> = Manufacturing length

### Ordering Code (example):

Headed guide bush	= 210.46.		
d <sub>1</sub> = 40 mm	= 040.	Ball Cage	= 206.71.
l <sub>2</sub> = 30 mm	= 030.	d <sub>1</sub> = 40 mm	= 040.
Tolerance range – red	= 30	l = 120 mm	= 120
Order No	= 210.46.040.030.30	Order No	= 206.71.040.120
		Tolerance range – yellow	= .10
		green	= .20
		red	= .30

210.46./207.45

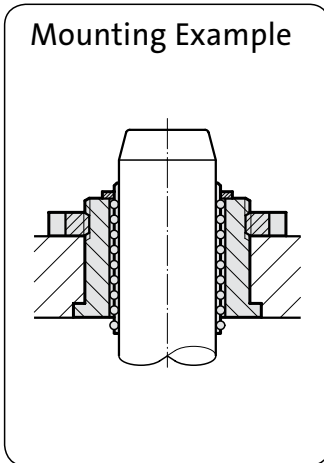
d <sub>1</sub>	16	20	25	32	40	50	63
d <sub>2</sub>	22	26	31	40	48	58	71
d <sub>3</sub>	28	32	40	50	63	80	90
d <sub>4</sub>	29	32	40	50	63	80	90
d <sub>5</sub>	32	36	45	56	70	90	110
d <sub>6</sub>	45	49	57	67	81	101	121
d <sub>7</sub>	57,7	61,7	69,7	79,7	93,7	113,7	131,7
d <sub>8</sub>	31	35	43,5	53,5	67	87	107
a	18,9	9,9	21,9	24,4	36	43	50,1
a <sub>1</sub>	26,9	28,6	32,1	36,4	36	43	50,1

# Guide Bushes with Collar for Ball Bearings similar AFNOR

Ball Cages  
Slotted Nuts

**FIBRO**

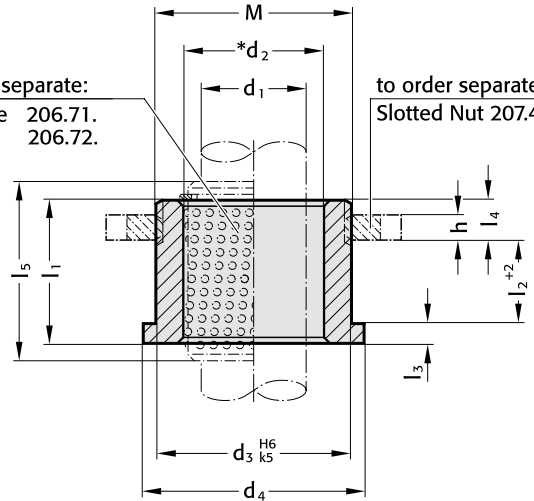
210.45. 206.71.  
207.48.



## 210.45.

to order separate:  
Ball Cage 206.71.  
Circlip 206.72.

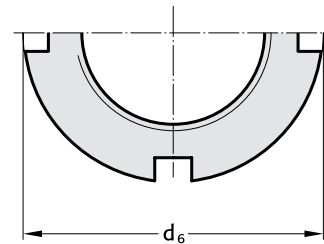
to order separate:  
Slotted Nut 207.48.



\* Preloading see Colour Code Combinations – pages D10 and D11.

## 207.48.

Slotted Nut



### Material:

Guide Bush: tool steel  
Hardness: 62 ± 2 HRC  
Ball Cage: brass  
Balls: hardened steel to DIN 5401

### Execution:

Bearing surfaces fine-ground and honed.  
Outside diameter fine-ground.

### Note:

Receiving bore tolerance: H6.  
The guide bushes are retained by slotted nuts.

## 210.45.

d <sub>1</sub>	16	20	25	32	40	50
d <sub>2</sub>	22	26	31	40	48	58
d <sub>3</sub>	28	32	40	50	63	80
d <sub>4</sub>	32	36	45	56	70	90
d <sub>6</sub>	40	44	55	65	81	100
M	M 27×1	M 30×1	M 39×1	M 48×1	M 60×1	M 76×1
h	3	4	4	5	6	8

l	24	24	31	40	50	50
l <sub>5</sub>	24	24	32	40	50	50
l <sub>1</sub>	16	17	22	26	32	41
l <sub>2</sub>	8	8	12	15	20	26

l	28	28	40	40	50	63
l <sub>5</sub>	28	28	40	40	50	65
l <sub>1</sub>	20	21	26	31	39	49
l <sub>2</sub>	12	12	16	20	27	34

l	–	31	40	50	56	–
l <sub>5</sub>	–	32	40	50	55	–
l <sub>1</sub>	–	25	31	38	47	–
l <sub>2</sub>	–	16	21	27	35	–

l <sub>3</sub>	3	3	3	4	4	5
l <sub>4</sub>	5	6	7	7	8	10

l = Nominal ordering length  
l<sub>5</sub> = Manufacturing length  
l<sub>2</sub> = assembly dimension

### Ordering Code (example):

Guide Bushes	= 210.45.	Tolerance yellow = .10
d <sub>1</sub> = 25 mm	= 025.	range – green = .20
l <sub>1</sub> = 22 mm	= 022.	red = .30
Tolerance range – red	= 30	
Order No	= 210.45.025.022.30	

## 207.48.

### Ordering Code (example):

Slotted Nut	= 207.48.	
d <sub>1</sub> = 40 mm	= 040	
Order No	= 207.48.040	

## 206.71. (Preferred length)

### Ordering Code (example):

Ball Cage	= 206.71.	
d <sub>1</sub> = 40 mm	= 040	
l = 56 mm	= 056	
Order No	= 206.71.040.056	

## 206.72.

### Ordering Code (example):

Circlip	= 206.72.	
d <sub>1</sub> = 40 mm	= 040	
Order No	= 206.72.040	



# FIBRO

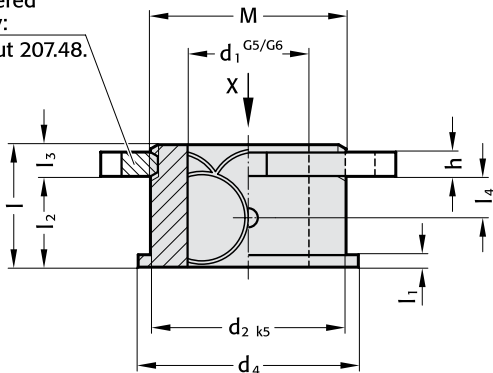
210.85.  
207.48.

## Guide Bushes with Collar, Bronze-coated to AFNOR Slotted Nuts

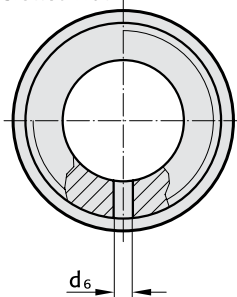
### 210.85.

Guide Bush with Collar

to be ordered  
separately:  
Slotted Nut 207.48.

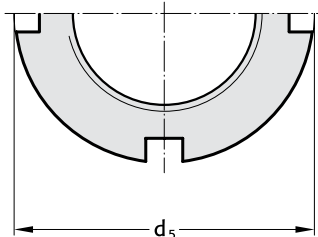


View X  
without Slotted Nut

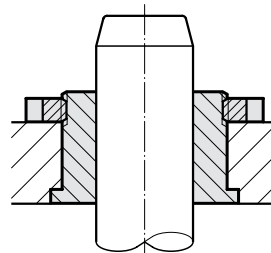


### 207.48.

Slotted Nut



### Mounting example:



### Note:

Receiving bore tolerance: H6

Guide pairing:

We recommend the use of guide pillars from pairing class .20/.30.

### Material:

1.0503 (C45)

$\varnothing d_2$

induction hardened 500+100 HV 10

### Execution:

Bronze coated internal bore  
outside diameter fine ground.

$\varnothing d_1$  up to  $d_1 = 25$  tolerance G6  
from  $d_1 = 32$  tolerance G5

### 210.85.

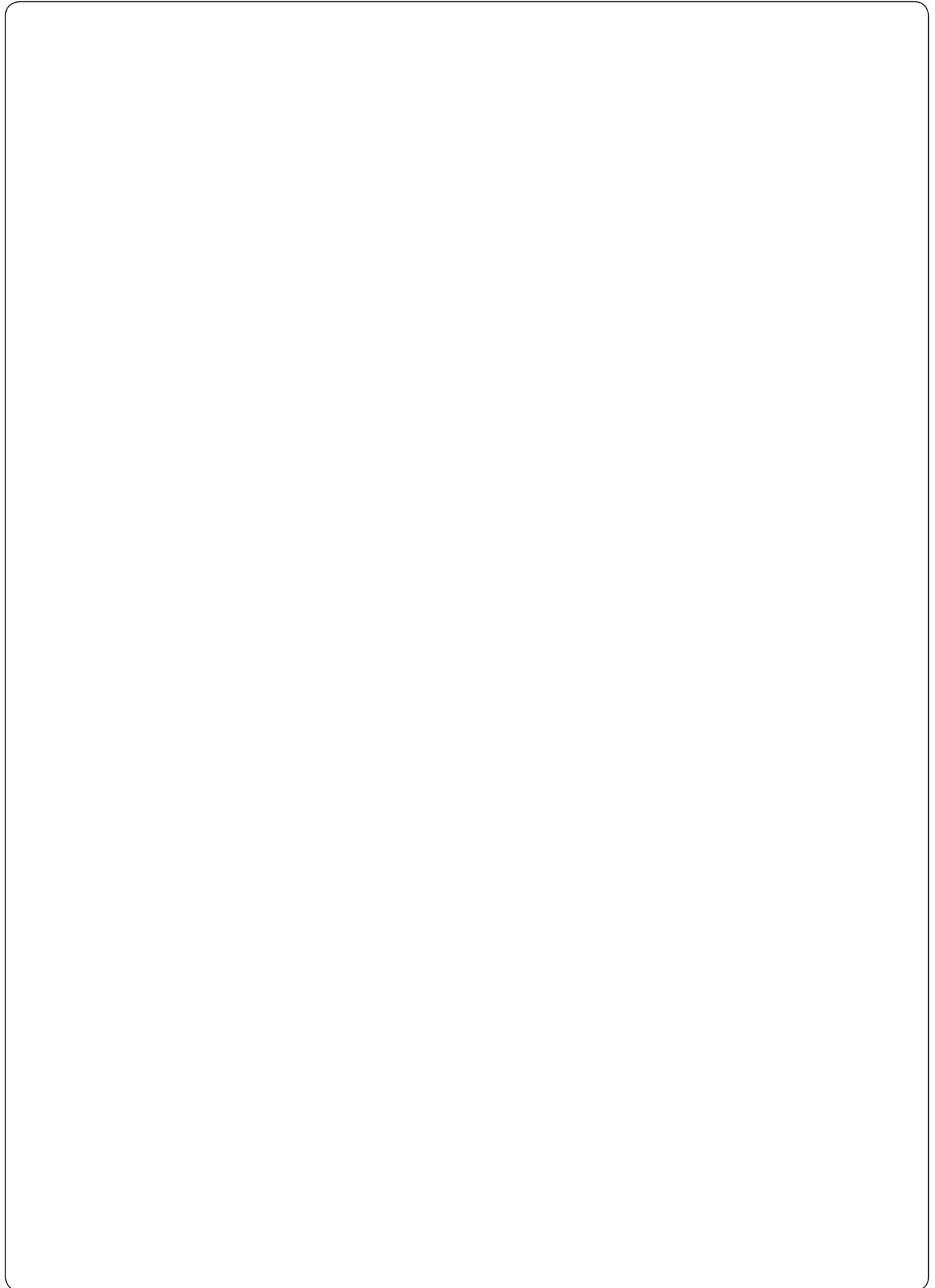
$d_1$	16	20	25	32	40	50
tol.	+0,017 +0,006	+0,020 +0,007	+0,020 +0,007	+0,020 +0,009	+0,020 +0,009	+0,020 +0,009
$d_2$	28	32	40	50	63	80
$d_4$	32	36	45	56	70	90
$d_5$	40	44	55	65	81	100
$d_6$	3	4	4	4	7	7
h	3	4	4	5	6	8
M	M27×1	M30×1	M39×1	M48×1	M60×1	M76×1
$l_1$	3	3	3	4	4	5
$l_2$	11 15	15 19	19 24	24 31	31 39	31 39
$l_3$	5	6	7	7	8	10
$l_4$	5,5 7,5	7,5 9,5	9,5 12	12 15,5	15,5 19,5	15,5 19,5
l	16 20	21 25	26 31	31 38	39 47	41 49

### Ordering Code (example):

Guide Bush = 210.85.  
 $d_1 = 40$  mm = 040.  
 $l = 47$  mm = 047  
 Order No = 210.85.040.047

### Ordering Code (example):

Slotted Nut = 207.48.  
 $d_1 = 40$  mm = 040  
 Order No = 207.48.040





# Oilless Guide Elements

## Oilless Guide Elements General Description

Oilless Guide Elements with embedded solid lubricants are used in applications of linear or rotary motion in toolmaking, general machine construction and similar engineering uses. The structure of the base material provides closely spaced deposits of solid lubricant – properties and specifications as per table below.

The elements satisfy highest demands in terms of load bearing capacity at low sliding speeds, within an extensive temperature band.

The lubricant deposits are arranged in staggered geometrical patterns, thus ensuring optimal lubrication effect along the sliding motion, especially with counter bearings which are hardened and ground.

The sliding surfaces should be lightly greased with lithium grease emulsion, prior to commissioning.

On flat guideways and pillar guides, from 25 to 30 per cent of the sliding surfaces consist of lubricant deposits. Surfaces of counter bearings must have a ground finish, preferably with a lay parallel with the sliding motion.

### Choice of Element-Type

Standard:

- for general uses at temperatures up to 200°C

Special Types on request

### Advantages of Oilless Guide Elements

- good emergency sliding properties
- highest carrying capacity at low speed
- use under water or with chemical solutions
- extremely wide temperature resistance – hot and cold
- damping properties in presence of vibration

### PV value

The permissible bearing load is determined from the pressure and the PV value, which defines the bearing wear.

The PV value is the product of surface pressure (P) and running velocity (V).

The permissible bearing load is determined from the PV value.

$$PV = P \times V \text{ (N/cm}^2 \times \text{m/min.)}$$

$$P = F/A \text{ (N/cm}^2)$$

$$F = \text{max. load (N)}$$

$$A = \text{projected area of the bearing}$$

### Surface pressure, temperature, speed and lubrication

Surface pressure max. (N/cm <sup>2</sup> )	Temp. (°C)	Speed (m/min.)	PV value (N/cm <sup>2</sup> × m/min)	Lubrication
5000	80	15	10000	Initial
3000	150	60	20000	Pressure lubrication

### Oilless Guide Elements – Material Data

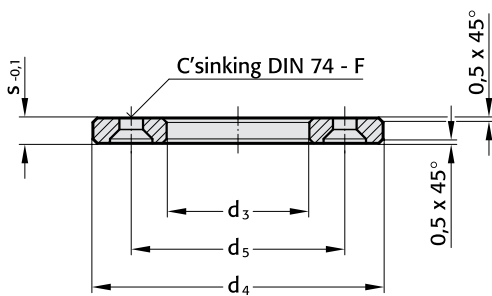
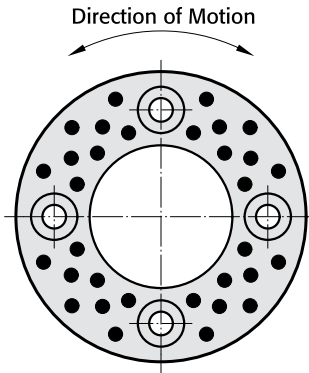
chemical composition %	CU 60–66	Brinell hardness HB 10	180–210	stroking velocity m/min	15	electric conductance	
	Al 5,0–7,5	shear strength N/mm <sup>2</sup>	560	co-efficient of friction	0,04–0,10	m/(Ω × mm <sup>2</sup> )	7–8
	Fe 2,0–4,0	yield limit		temperature conductance		alt. flexural strength	
	Mn 2,5–5,0	Rp 0,2 N/mm <sup>2</sup>	450	W/(m × K)	45–55	N/mm <sup>2</sup>	±150
	balance: Zn	elongation to fracture A5 %	8	temperature resistance °C	+300	ratio sliding surface	
specific density kg/dm <sup>3</sup>	8,2	elongation %	12	co-efficient of thermal		to lubricant	
tensile strength Rm N/mm <sup>2</sup>	770	modulus of elasticity		expansion	1,6–2,0 × 10 <sup>-5</sup> /°C	deposits (%)	25–30
		kN/mm <sup>2</sup>	105–115	co-efficient of shrinkage %	1,8–2,3		

**FIBRO**

2053.70.

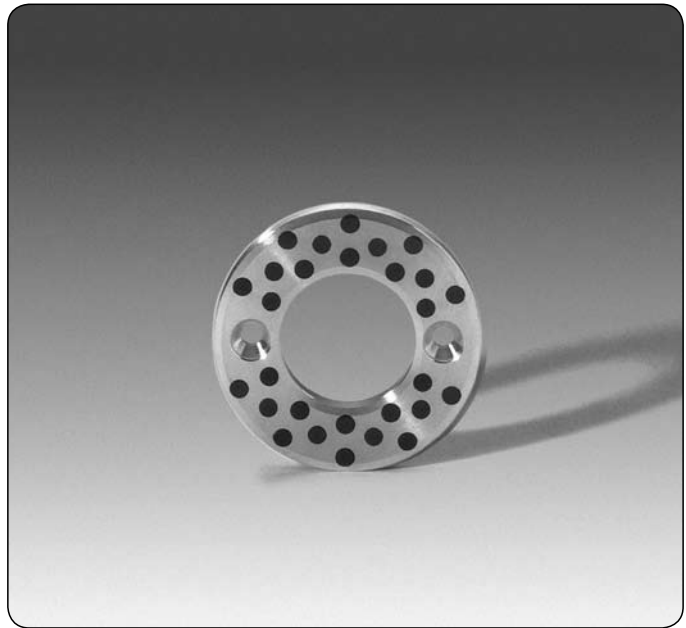
**Thrust Washers  
Bronze with Non-Liquid Lubricant**

2053.70.



**Ordering Code (example):**

Thrust Washer	=	2053.70.
d <sub>3</sub> = 20,2 mm	=	020
Order No	=	2053.70.020



**Material:**

Bronze with Non-Liquid Lubricant, oilless lubricating.

**Note:**

For combination loads use together with Bushes 2052.70.



Direction of Motion  
Embedded non-liquid lubricant (section)

**Fixing:**

- from d<sub>3</sub> = 10,2 2 × M3
- from d<sub>3</sub> = 20,2 2 × M5
- from d<sub>3</sub> = 40,2 2 × M6
- from d<sub>3</sub> = 50,3 4 × M6
- from d<sub>3</sub> = 60,3 4 × M8
- from d<sub>3</sub> = 90,5 4 × M10

Screws not included.

**2053.70.**

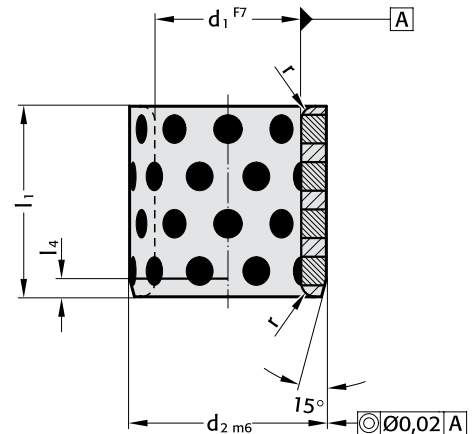
d <sub>3</sub>	10,2	12,2	13,2	14,2	15,2	16,2	18,2	20,2	25,2	30,2	35,2	40,2	45,3	50,3	55,3	60,3	65,3	70,3	75,3	80,3	90,5	100,5	120,5
d <sub>4</sub>	30	40	40	40	50	50	50	50	55	60	70	80	90	100	110	120	125	130	140	150	170	190	200
d <sub>5</sub>	20	28	28	28	28	28	35	35	40	45	50	60	67,5	75	85	90	95	100	110	120	140	160	175
s	3	3	3	3	3	3	3	5	5	5	5	7	7	8	8	8	8	10	10	10	10	10	10
F	3	3	3	3	3	3	3	5	5	5	5	6	6	6	6	8	8	8	8	8	10	10	10

**Oilless Guide Bushes  
Bronze with Non-Liquid Lubricant**

2052.70.



2052.70.



**Material:**

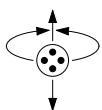
Bronze with Non-Liquid Lubricant, oilless lubricating.

**Note:**

Recommended fits for:  
press fits: H 7 bore  
contact adhesive: G 7 bore  
(if required secure with set screw).

**Notice:**

Note that press fitment reduces inside bush diameter.  
Bushes can be used with radial or axial motion.



Direction of Motion  
Embedded non-liquid  
lubricant (section)

**Ordering Code (example):**

Guide Bush	=	2052.70.
d <sub>1</sub> = 40 mm	=	040.
d <sub>2</sub> = 50 mm	=	050.
l <sub>1</sub> = 60 mm	=	060
Order No	=	2052.70.040.050.060

**2052.70.**

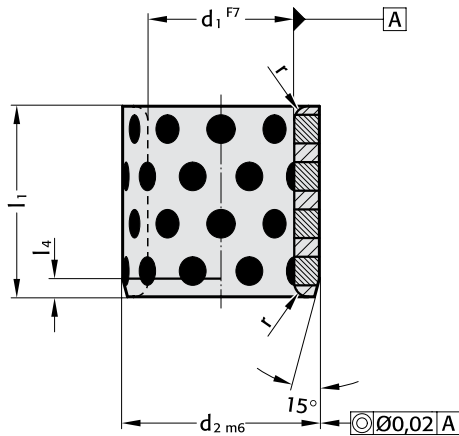
d <sub>1</sub>	8	10	12	13	14	15	16	18	19	20	24	25	28	30	31,5	32	35	38	40	45	
d <sub>2</sub>	12	14/15	18	19	20	21	22	24	25	26/28/30	32	32/33/35	38	38/40/42	40	42	44/45	48	50/55	55/56/60	
r	0,5	0,5	0,5	0,5	0,5	0,75	0,75	0,75	0,75	0,75	0,75	0,75	0,75	0,75	0,75	0,75	0,75	1,5	1,5	1,5	
l <sub>4</sub>	2	2	2	2	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4	
l <sub>1</sub>	8	●	●/-																		
10	●	●/●	●	●	●	●	●														
12	●	●/-	●		●	●	●														
15	●	●/-	●	●	●	●	●	●		-/●/-											
16			●	●		●	●	●		-/●/●		-/●/●									
20		●/-	●	●	●	●	●	●		-/●/●		-/●/●		●/●/-				-/●		●/-	
25			●		●	●	●	●		-/●/●		-/●/●		●/●/-				●/●		●/●	
30			●		●	●	●	●		-/●/●		-/●/●		●/●/-		●		●/●	●	●/●	●/●
35						●	●			-/●/●		-/●/●		●/●/-				●/●		●/●	●/●
37									●	-/●/●											
40							●	●		●/●/●		-/●/●		●/●/-	●	●	●/●	●	●/●	●/●	
47											●	-/●/●									
50										-/●/●				●/●/-			●/●		●/●	●/●	
60												-/●/●		●/●/●		●	●/●		●/●	●/●	
70																			●/-	-/-/●	
77																				●/-	
80																				●/-	-/-/●

# FIBRO

2052.70.

## Oilless Guide Bushes Bronze with Non-Liquid Lubricant

2052.70.



### Material:

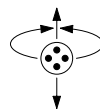
Bronze with Non-Liquid Lubricant, oilless lubricating.

### Note:

Recommended fits for:  
press fits: H 7 bore  
contact adhesive: G 7 bore  
(if required secure with set screw).

### Notice:

Note that press fitment reduces inside bush diameter.  
Bushes can be used with radial or axial motion.



Direction of Motion  
Embedded non-liquid  
lubricant (section)

2052.70.

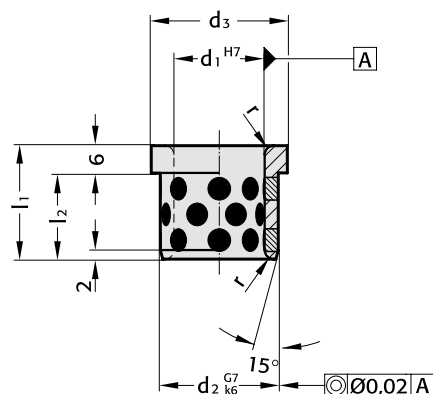
	50	55	60	63	65	70	75	80	85	90	100	110	120	125	130	140	150	160
d <sub>1</sub>	50	55	60	63	65	70	75	80	85	90	100	110	120	125	130	140	150	160
d <sub>2</sub>	60/62/65	70	74/75	75	80	85/90	90/95	96/100	100	110	120	130	140	145	150	160	170	180
r	1,5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
l <sub>4</sub>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
l <sub>1</sub> 30	●/●/●		●/●															
35	●/●/—		●/●			●/—												
37																		
40	●/●/●	●	●/●			●/—		●/●										
47																		
50	●/●/●	●	●/●		●	●/●		●/●										
60	●/●/●	●	●/●	●	●	●/●	●/●	●/●		●	●							
70	●/●/●	●	●/●	●	●	●/●	●/●	●/●		●	●							
77																		
80	●/—/●		●/●	●	●	●/●	●/●	●/●	●	●	●	●	●					
95	●/—/—																	
100	—/—/●		—/●			●/—	●/●	●/●		●	●	●	●	●	●	●	●	●
120				●				●/●		●	●	●	●	●	●	●	●	●
130															●			
140								—/●			●		●			●		
150																	●	●

Oilless Guide Bushes with collar  
Bronze with Non-Liquid Lubricant

2085.70.



2085.70.

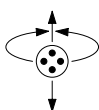


**Material:**

Bronze with Non-Liquid Lubricant,  
oilless lubricating.

**Note:**

Fit for receiving bore: G 7.  
Bushes can also be fitted with Loctite.



Direction of Motion  
Embedded non-liquid lubricant  
(section)

**Ordering Code (example):**

Guide Bush = 2085.70.  
 $d_1 = 16 \text{ mm}$  = 016.  
 $l_1 = 30 \text{ mm}$  = 030  
 Order No = 2085.70.016.030

**2085.70.**

$d_1$		12	16	20	24
$d_2$		16	20	26	30
$d_3$		18	24	28	35
$r$		2	2	2	2
$l_1$	$l_2$				
20	14	●	●	●	●
25	19	●	●	●	●
30	24	●	●	●	●

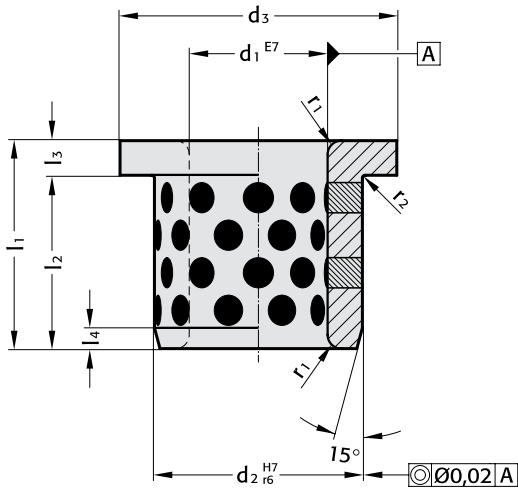


**FIBRO**

2085.71.

**Oilless Guide Bushes with collar  
Bronze with Non-Liquid Lubricant**

2085.71.



**Material:**

Bronze with Non-Liquid Lubricant, oilless lubricating.

**Note:**

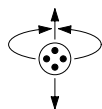
Fit for receiving bore: H7.

**Notice:**

Bushes can be used with radial or axial motion.

**Ordering Code (example):**

Guide bush	=	2085.71.
d <sub>1</sub> = 16 mm	=	016.
l <sub>1</sub> = 25 mm	=	025
Order No	=	2085.71.016.025



Direction of Motion  
Embedded non-liquid lubricant  
(section)

**2085.71.**

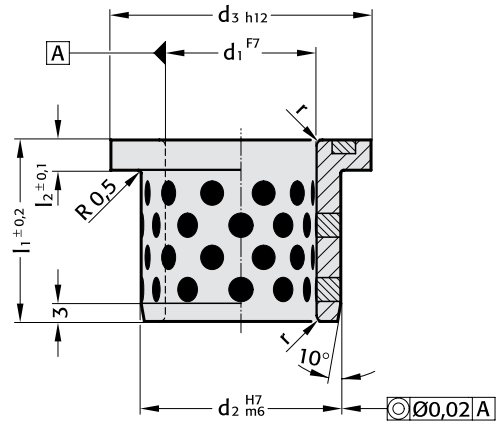
d <sub>1</sub>	10	12	13	14	15	16	20	25	30	31,5	35	40	45	50	55	60	63	70	75	80	90	100	120
d <sub>2</sub>	14	18	19	20	21	22	30	35	40	40	45	50	55	60	65	75	75	85	90	100	110	120	140
d <sub>3</sub>	22	25	26	27	28	29	40	45	50	50	60	65	70	75	80	90	85	105	110	120	130	150	170
l <sub>3</sub>	2	3	3	3	3	3	5	5	5	5	5	5	5	5	5	7,5	7,5	7,5	7,5	10	10	10	10
l <sub>4</sub>	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4
r <sub>1</sub>	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3
r <sub>2</sub>	0,4	0,4	0,4	0,4	0,5	0,5	0,5	0,5	0,5	0,6	0,6	0,6	0,6	0,6	0,6	0,7	0,7	0,7	0,7	0,7	0,8	0,8	0,8
l <sub>1</sub>	15	13	12	12	12	12	10	10															
l <sub>2</sub>	18	17	17	17	17	17	15	15	15	15	15	15											
25					22	22	20	20	20														
30					27	27	25	25	25		25	25	25	25									
35										30	30												
40							35	35	35		35	35	35	35	35								
50										45	45	45	45	45		42,5		42,5					
60													55	55	55					52,5	50	50	
67,5																		60					
80																	72,5	72,5		70	70	70	70
100																				90		90	90

**Oilless Guide Bushes with Collar  
Bronze with Non-Liquid Lubricant**

2086.70.



2086.70.



**Material:**

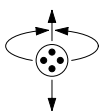
Bronze with non-liquid lubricant, oilless lubricating.

**Note:**

Fit for receiving bore: H7.

**Notice:**

Bushes can be used with radial or axial motion.



Direction of Motion  
Embedded non-liquid lubricant  
(section)

**Ordering Code (example):**

Guide Bush = 2086.70.

$d_1 = 25 \text{ mm}$  = 025.

$l_1 = 30 \text{ mm}$  = 030

Order No = 2086.70.025.030

**2086.70.**

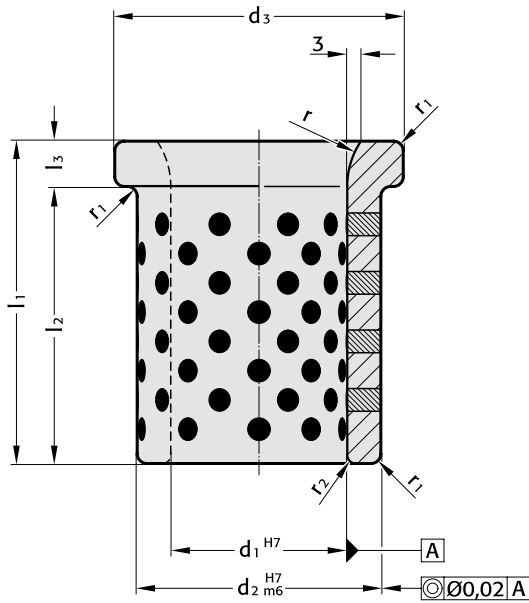
$d_1$	12	16	20	25	30	40	50	60
$d_2$	18	22	28	33	38	50	62	75
$d_3$	25	30	36	43	48	60	75	90
$r$	1	1	1	1	1	2	2	3
$l_1$	15	20	25	30	35	45	55	65
$l_2$	4	5	5	5	5	5	6	7

**FIBRO**

2085.72.

**Oilless Guide Bushes with Collar  
Bronze with Non-Liquid Lubricant**

2085.72.



**Ordering Code(example):**

Guide Bush	=	2085.72.
d <sub>1</sub> = 25 mm	=	025.
l <sub>1</sub> = 40 mm	=	040
Order No	=	2085.72.025.040

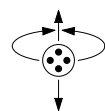


**Material:**

Bronze with non-liquid lubricant, oilless lubricating.

**Note:**

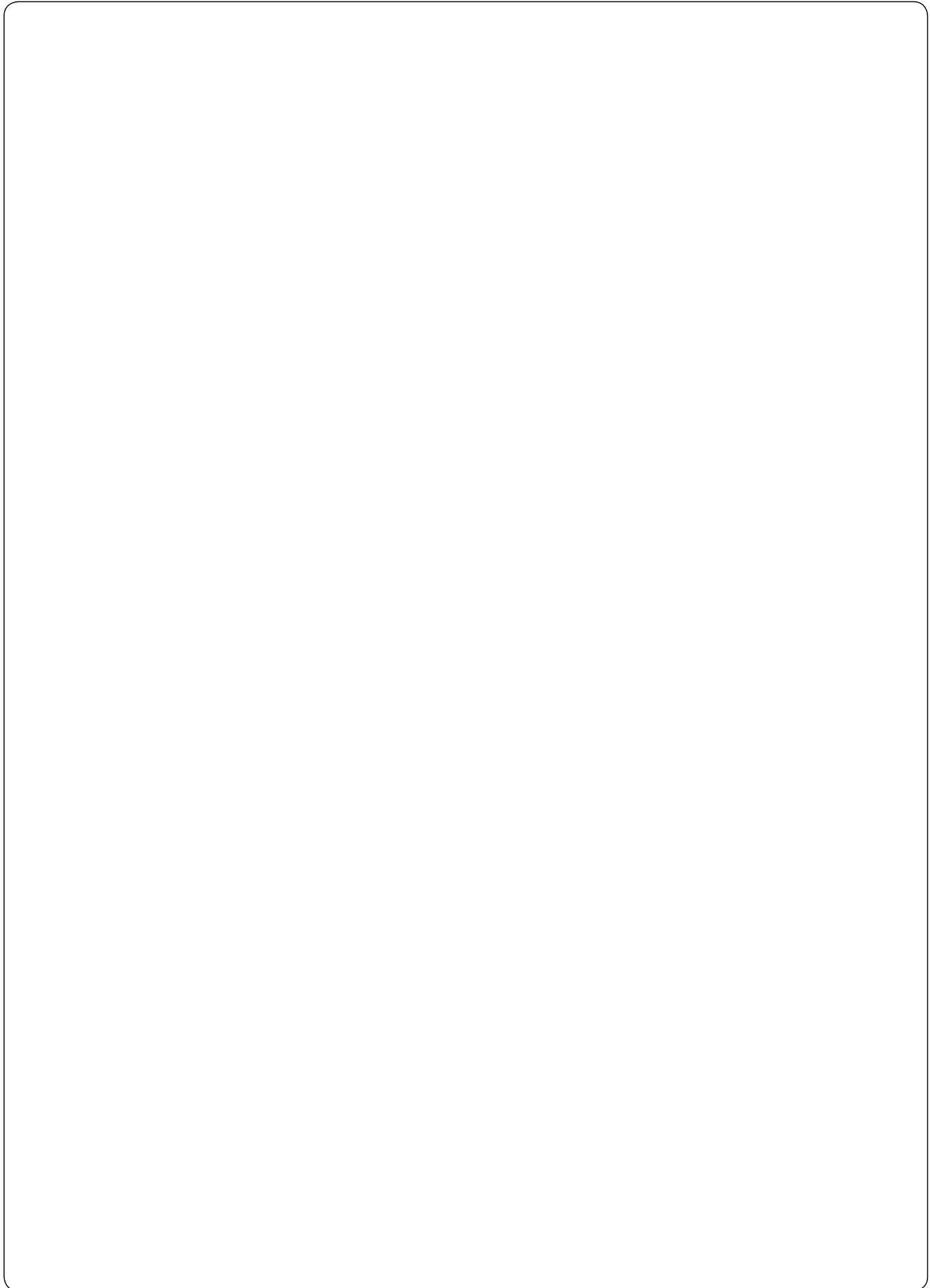
Fit for receiving bore: H7.



Direction of Motion  
Embedded non-liquid  
lubricant (section)

2085.72.

d <sub>1</sub>	25	30	40	50	60	65	80	100
d <sub>2</sub>	35	40	55	65	75	80	100	120
d <sub>3</sub>	45	50	65	75	85	90	110	130
r	10	20	20	20	20	20	20	20
r <sub>1</sub>	1	1	2	2	2	2	2	2
r <sub>2</sub>	2	2	2	2	2	2	2	3
l <sub>3</sub>	7	10	10	10	10	10	10	10
l <sub>2</sub>	33	40	60	70	70	70 110	90 130	90 130
l <sub>1</sub>	40	50	70	80	80	80 120	100 140	100 140

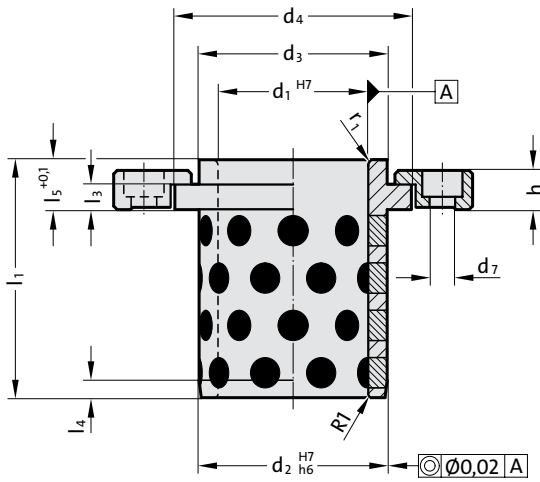


# FIBRO

2082.70.55.  
2072.45.

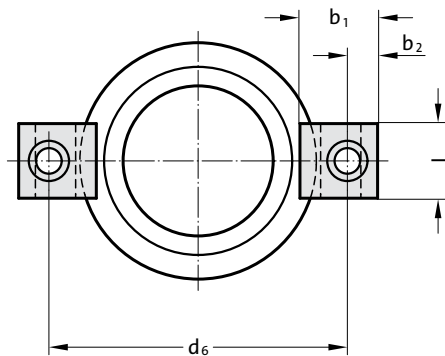
## Oilless Guide Bushes with collar to VW Bronze with Non-Liquid Lubricant Screw Clamps to DIN 9832

2082.70.55.



2072.45.

Screw clamps



### Ordering Code (example):

Guide bush = 2082.70.55.

$d_1 = 40 \text{ mm}$  = 040

Order No = 2082.70.55.040

2082.70.55.

$d_1$	25	32	40	50	63	80	100	125	160
$d_2$	32	40	50	63	80	100	125	160	200
$d_3$	32	40	50	63	80	100	125	160	200
$d_4$	40	50	63	71	90	112	140	180	220
$d_6$	58	66	79	89	123	143	168	203	243
$d_7$	7	7	7	7	11,5	11,5	11,5	11,5	11,5
$l_1$	40	50	63	71	80	100	125	160	200
$l_3$	6,3	6,3	6,3	6,3	10	10	10	10	10
$l_4$	3	4	5	6,3	8	10	12,5	16	16
$l_5$	10	10	10	10	16	16	16	16	16
$l$	20	20	20	20	32	32	32	32	32
$b_1$	20	20	20	20	32	32	32	32	32
$b_2$	7,5	7,5	7,5	7,5	11	11	11	11	11
$h$	10	10	10	10	16	16	16	16	16
$r_1$	3	3	3	5	6	8	10	12	18



### Material:

Bronze with Non-Liquid Lubricant,  
oilless lubricating.

### Note:

Special Guide Pillars

2022.19. to DIN 9833/ISO 9182-3,  
see page D31.

Fit for receiving bore: H 7.

### Screw Clamps, incl. screws

to order separate:

up to  $d_1 = 50$  2072.45.10 (M 6×16 DIN EN ISO 4762)  
from  $d_1 = 63$  2072.45.16 (M 10×20 DIN EN ISO 4762)



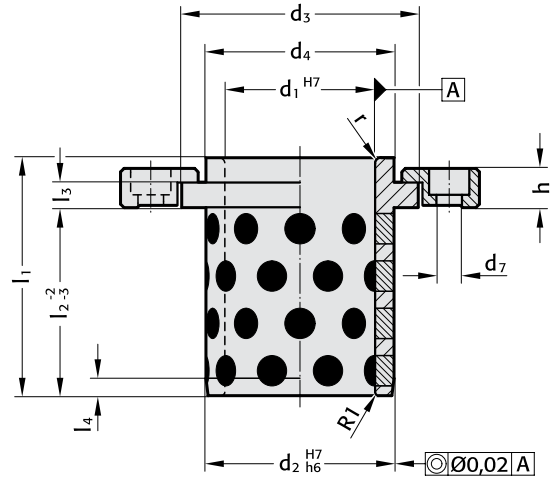
Direction of Motion  
Embedded non-liquid lubricant  
(section)

**Oilless Guide Bushes with collar to DIN 9834/ISO 9448  
Bronze with Non-Liquid Lubricant  
Screw Clamps to DIN 9832**

**FIBRO**  
2082.70.  
2072.45.

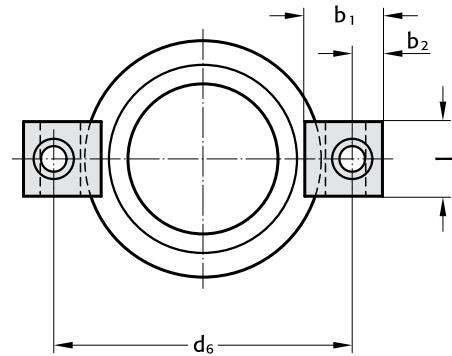


2082.70.



2072.45.

Screw clamps



**Material:**

Bronze with Non-Liquid Lubricant,  
oilless lubricating.

**Note:**

Special Guide Pillars

2022.19. to DIN 9833/ISO 9182-3,  
see page D31 .

Fit for receiving bore: H 7.

**Screw Clamps, incl. screws**

to order separate:

up to  $d_1 = 52$  2072.45.10 (M 6×16 DIN EN ISO 4762)  
from  $d_1 = 60$  2072.45.16 (M 10×20 DIN EN ISO 4762)



Direction of Motion  
Embedded non-liquid lubricant  
(section)

**Ordering Code (example):**

Guide bush = 2082.70.

$d_1 = 40$  = 040

Order No = 2082.70.040

**2082.70.**

$d_1$	24/25	30/32	38/40/42*	48/50/52*	60/63	80	100	125	160
$d_2$	32	40	50	63	80	100	125	160	200
$d_3$	40	50	63	71	90	112	140	180	220
$d_4$	32	40	50	63	80	100	125	160	200
$d_6$	58	66	79	89	123	143	168	203	243
$d_7$	7	7	7	7	11,5	11,5	11,5	11,5	11,5
$l_1$	40	50	63	71	80	100	125	160	200
$l_2$	32	40	50	56	63	80	106	132	170
$l_3$	6,3	6,3	6,3	6,3	10	10	10	10	10
$l_4$	3	4	5	6,3	8	10	12,5	16	16
$l$	20	20	20	20	32	32	32	32	32
$b_1$	20	20	20	20	32	32	32	32	32
$b_2$	7,5	7,5	7,5	7,5	11	11	11	11	11
$h$	10	10	10	10	16	16	16	16	16
$r$	3	3	3	5	6	8	10	12	18

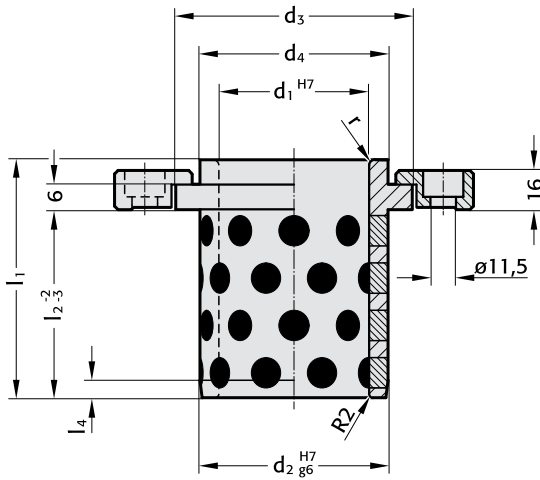
\* phasing out

# FIBRO

2082.71.  
2072.46

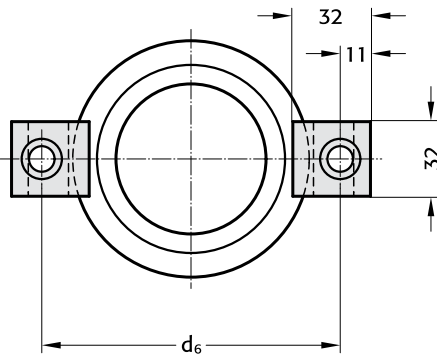
## Oilless Guide Bushes with collar to NAAMS Bronze with Non-Liquid Lubricant Screw Clamps

2082.71.



2072.46

Screw clamps



### Ordering Code (example):

Guide Bush = 2082.71.  
d<sub>1</sub> = 32 mm = 032  
Order No = 2082.71.032



### Material:

Bronze with Non-Liquid Lubricant,  
oilless lubricating.

### Note:

Special Guide Pillars

2022.25. to AFNOR, see page D26 and  
2022.19. to DIN 9833/ISO 9182-3,  
see page D31.

Fit for receiving bore: H 7.

### Screw Clamps, incl. screws

to order separate:

2072.46 (M10 x 20 DIN EN ISO 4762)



Direction of Motion  
Embedded non-liquid lubricant  
(section)

2082.71.

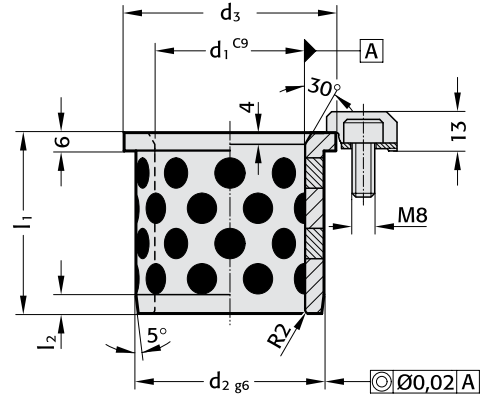
d <sub>1</sub>	25	32	40	50	63	80	100	125
d <sub>2</sub>	32	40	50	63	80	100	125	160
d <sub>3</sub>	40	50	63	71	90	112	140	180
d <sub>4</sub>	32	40	50	63	80	100	125	160
d <sub>6</sub>	75	83	93	106	123	143	168	203
l <sub>1</sub>	40	50	63	71	80	100	125	160
l <sub>2</sub>	30	40	50	56	63	80	106	132
l <sub>4</sub>	4	4	5	6	8	10	12	12
r	3	3	3	5	6	8	10	12

**Oilless Guide Bushes with collar to NAAMS**  
**Bronze with Non-Liquid Lubricant**  
**Screws Clamps to NAAMS**

**FIBRO**  
**2086.71.**  
**2072.47**



2086.71.



**Material:**

Bronze with Non-Liquid Lubricant,  
oilless lubricating.

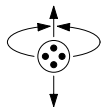
**Note:**

Fit for receiving bore H 7.

**Screw Clamps, (incl. screws)**

to order separate

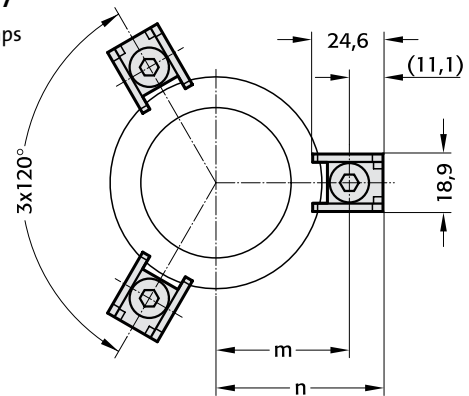
2072.47 (M8 x 20 DIN EN ISO 4762)



Direction of Motion  
Embedded non-liquid lubricant  
(section)

2072.47

Screw clamps



**Ordering Code (example):**

Guide Bush = 2086.71.

d<sub>1</sub> = 32 mm = 032

Order No = 2086.71.032

2086.71.

d <sub>1</sub>	25	32	40	50	63	80	100	125
d <sub>2</sub>	32	40	50	63	80	100	125	160
d <sub>3</sub>	40	50	63	71	90	112	140	180
l <sub>1</sub>	40	50	55	63	75	90	115	138
l <sub>2</sub>	4	4	5	6	8	10	12	12
m	25	34	40,5	44,5	54	65	79	99
n	36,1	45,1	51,6	55,6	65,1	76,1	90,1	110,1

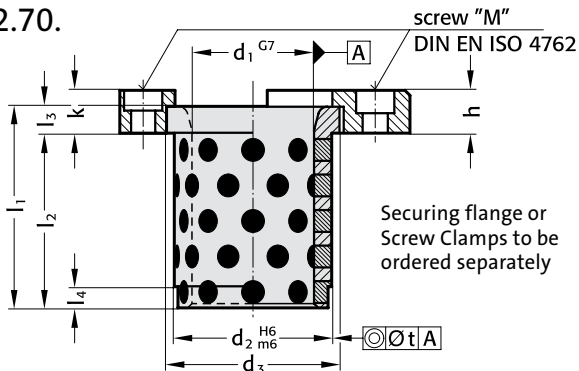


# FIBRO

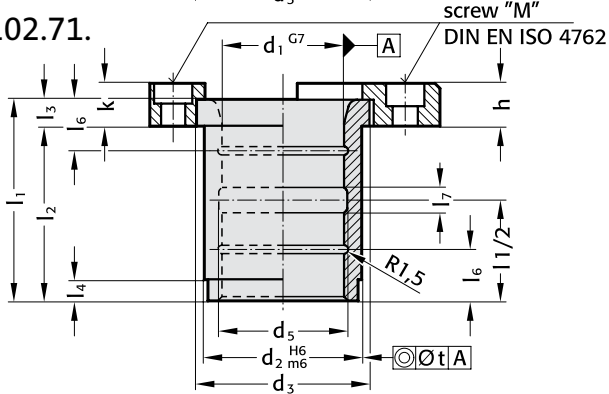
2102.70./2102.71.  
2073.45./2072.48.45.

## Guide Bushes with collar to CNOMO Bronze with or without Non-Liquid Lubricant Securing Flanges, Screw Clamps to CNOMO

2102.70.



2102.71.

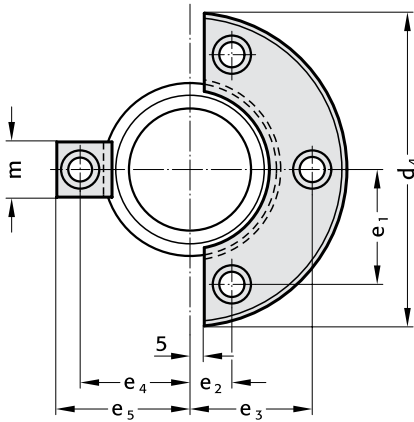


2072.48.45.

Screws Clamps  
to CNOMO

2073.45.

Securing flange



2102.70. / 2102.71.

d <sub>1</sub>	20	25	32	40	50	63	80	100
d <sub>2</sub>	28	35	44	52	63	80	100	125
d <sub>3</sub>	32	40	50	60	71	90	112	140
d <sub>5</sub>	22	27	34	42	52	65	82	102
l <sub>1</sub>	32	40	50	63	80	100	125	160
l <sub>2</sub>	28	35	44	55	70	88	109	140
l <sub>3</sub>	4	5	6	8	10	12	16	20
l <sub>4</sub>	3	5	8	8	8	10	10	10
l <sub>6</sub>	—	—	12	16	20	25	32	40
l <sub>7</sub>	5	5	5	8	10	12	16	20
t	0,01	0,01	0,01	0,02	0,02	0,02	0,02	0,02

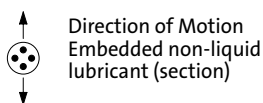
### Material:

2102.70. Bronze with Non-Liquid Lubricant, oilless lubricating.  
2102.71. Bronze.

### Note:

Special Guide Pillars 2022.25. to AFNOR – see page D26,  
and 2022.19. to DIN 9833/ISO 9182-3 – see page D31.

Fit for receiving bore: H6.



### Ordering Code (example):

Guide Bush = 2102.70.  
d<sub>1</sub> = 40 mm = 040  
Order No = 2102.70.040

Guide Bush = 2102.71.  
d<sub>1</sub> = 40 mm = 040  
Order No = 2102.71.040

### 2073.45. Securing flanges

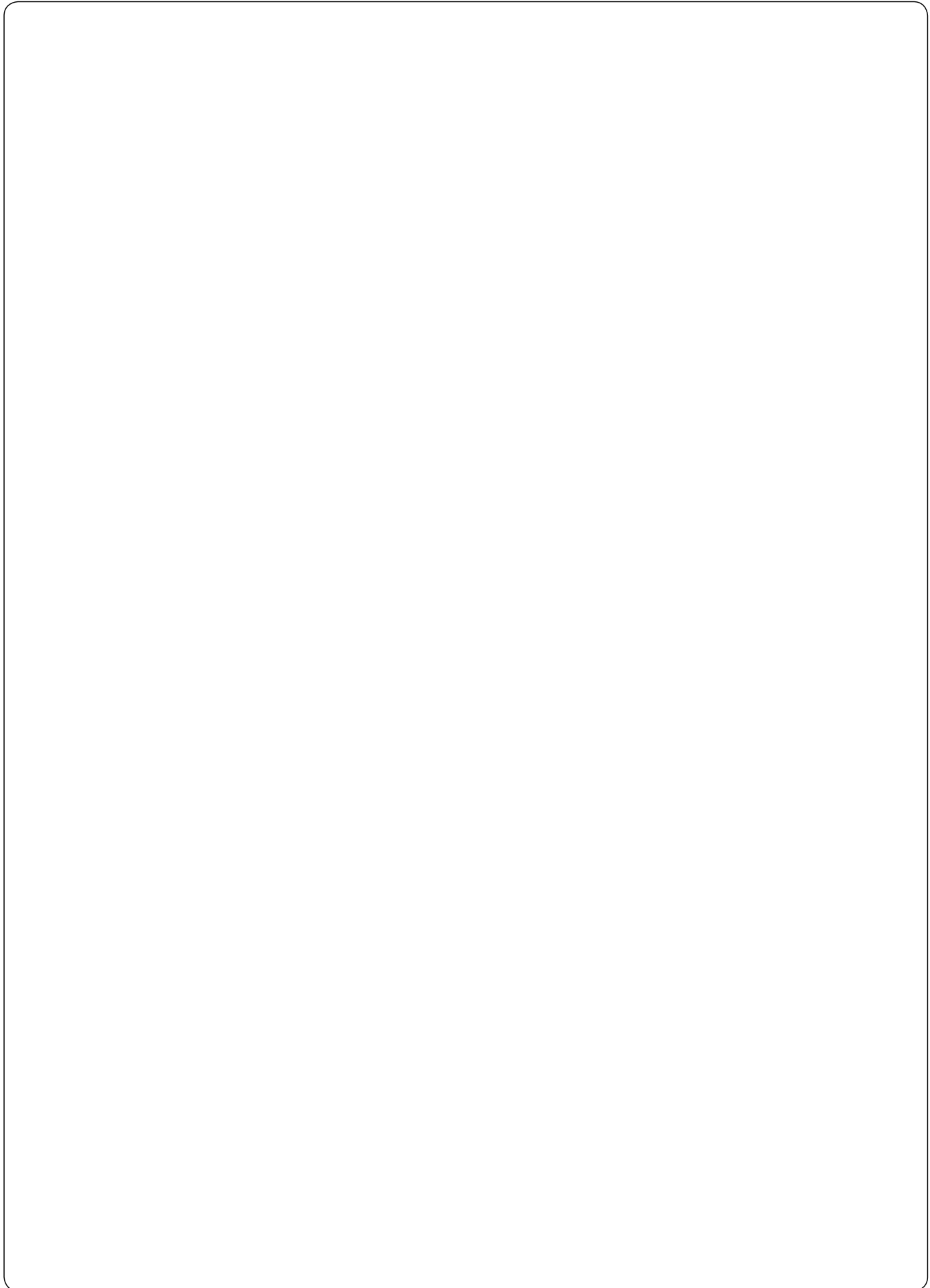
incl. screws, dimensions see page D218

d <sub>1</sub>	20	25	32	40	50	63	80	100
d <sub>4</sub>	63	72	80	100	125	140	180	200
h	10	10	12	12	16	20	25	32
e <sub>1</sub>	16	20	25	38,5	46	55	70	81
e <sub>2</sub>	18	20	21	14	17	17	20	25
e <sub>3</sub>	—	—	—	41	49	57,5	72	85
M	6	6	6	6	8	10	12	12

### 2072.48.45. Screws Clamps to CNOMO

incl. screws dimensions see page D218

Guide Bushes Ø						
Order No	d <sub>1</sub>	M	k	m	e <sub>4</sub>	e <sub>5</sub>
2072.48.45.12	40	6	12	18	37,5	46
16	50	8	16	22	45	55
20	63	10	20	26	55,5	66,5
25	80	10	25	26	66,5	77,5
32	100	10	32	26	80,5	91,5

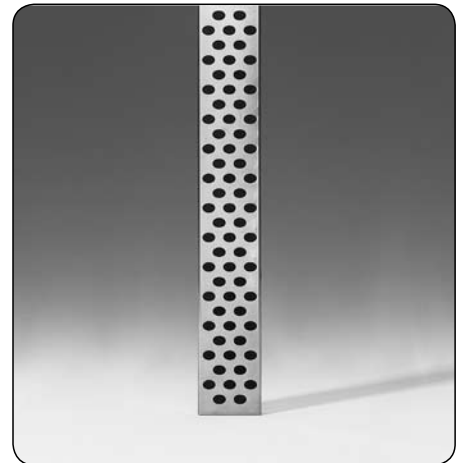
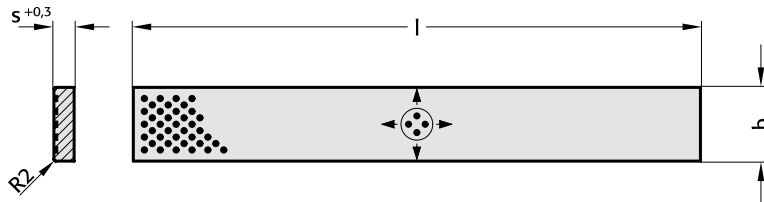


# FIBRO

2961.71.

## Flat Guide Bars Bronze with Non-Liquid Lubricant

2961.71.

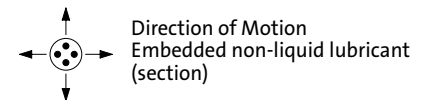


### Material:

Bronze with Non-Liquid Lubricant, oilless lubricating.

### Execution:

Sliding faces ground.



2961.71.

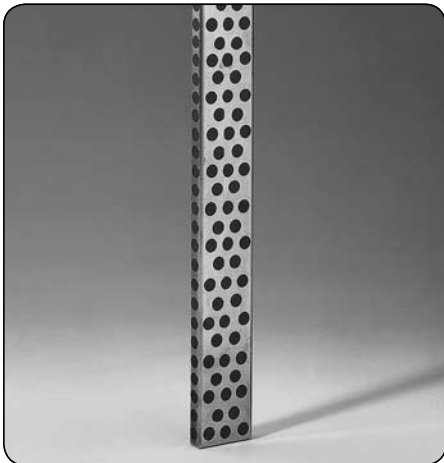
Order No	b	s	l		
			305	605	1005
2961.71.020.004.	20	4	●		
2961.71.030.004.	30	4	●		
2961.71.025.005.	25	5	●		
2961.71.040.005.	40	5	●	●	
2961.71.030.006.	30	6	●	●	
2961.71.040.006.	40	6	●	●	
2961.71.030.008.	30	8	●	●	
2961.71.040.008.	40	8	●	●	●
2961.71.030.010.	30	10	●	●	●
2961.71.035.010.	35	10	●	●	●
2961.71.040.010.	40	10	●	●	●
2961.71.050.010.	50	10	●	●	●
2961.71.080.010.	80	10	●	●	●
2961.71.030.012.	30	12	●	●	●
2961.71.040.012.	40	12		●	●
2961.71.050.012.	50	12		●	●
2961.71.060.012.	60	12		●	●
2961.71.080.012.	80	12		●	●
2961.71.040.016.	40	16		●	●
2961.71.060.016.	60	16		●	●
2961.71.080.016.	80	16		●	●
2961.71.100.016.	100	16		●	●
2961.71.050.020.	50	20		●	●
2961.71.080.020.	80	20		●	●
2961.71.100.020.	100	20		●	●
2961.71.125.020.	125	20		●	●
2961.71.080.025.	80	25		●	●
2961.71.100.025.	100	25		●	●
2961.71.125.025.	125	25		●	●
2961.71.160.025.	160	25		●	●

### Ordering Code (example):

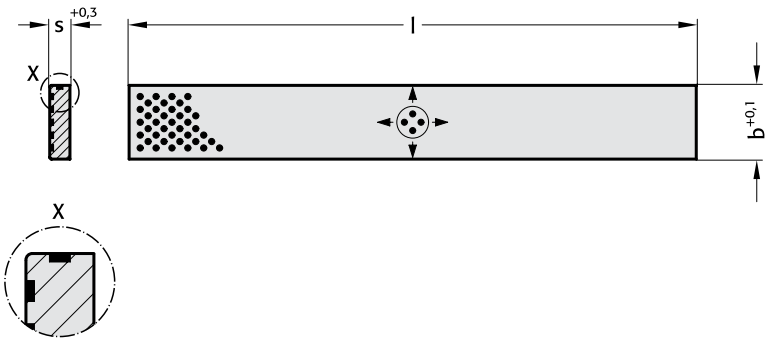
Flat Guide Bar = 2961.71.  
 b = 50 mm = 050.  
 s = 10 mm = 010.  
 l = 605 mm = 0605  
 Order No. = 2961.71.050.010.0605

**Flat Guide Bars  
Bronze with Non-Liquid Lubricant**

2961.73.



2961.73.

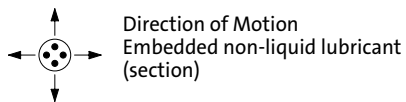


**Material:**

Bronze with Non-Liquid Lubricant, oilless lubricating.

**Execution:**

Sliding faces ground.



2961.73.

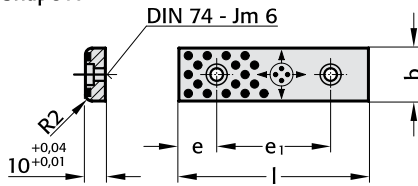
Order No	b	s	l	
			305	605
2961.73.025.005.0305	25	5	●	
2961.73.030.006.0305	30	6	●	
2961.73.040.008.0605	40	8		●
2961.73.035.010.0605	35	10		●
2961.73.050.010.0605	50	10		●
2961.73.040.012.0605	40	12		●
2961.73.080.012.0605	80	12		●
2961.73.060.016.0605	60	16		●
2961.73.080.020.0605	80	20		●
2961.73.100.020.0605	100	20		●

**Ordering Code (example):**

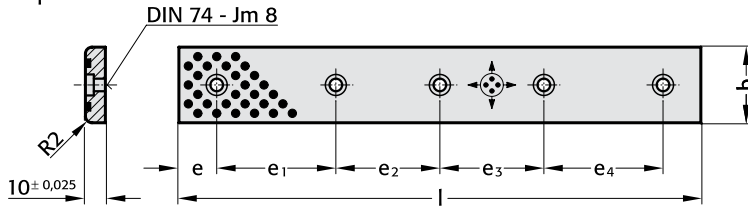
Flat Guide Bar = 2961.73.  
 b = 50 mm = 050.  
 s = 10 mm = 010.  
 l = 605 mm = 0605  
 Order No. = 2961.73.050.010.0605

2961.70.

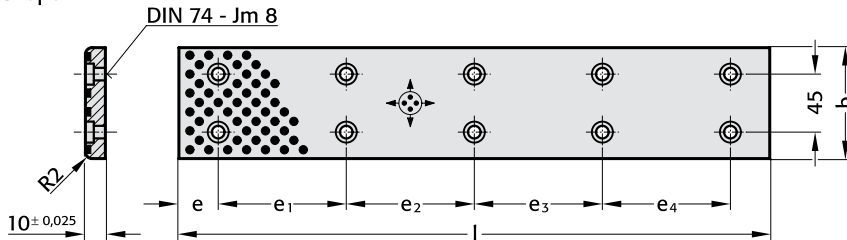
Shape A



Shape F



Shape E



**Material:**

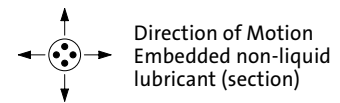
Bronze with Non-Liquid Lubricant, oilless lubricating.

**Execution:**

Sliding faces ground.

**Note:**

Screws not included.

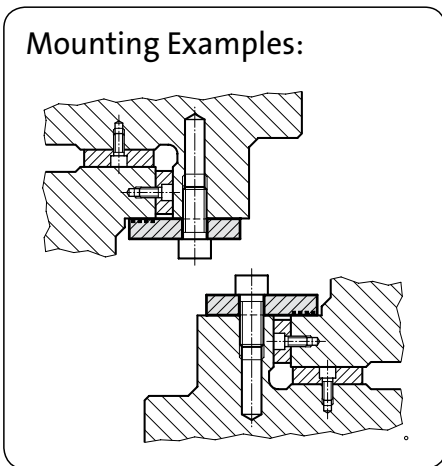
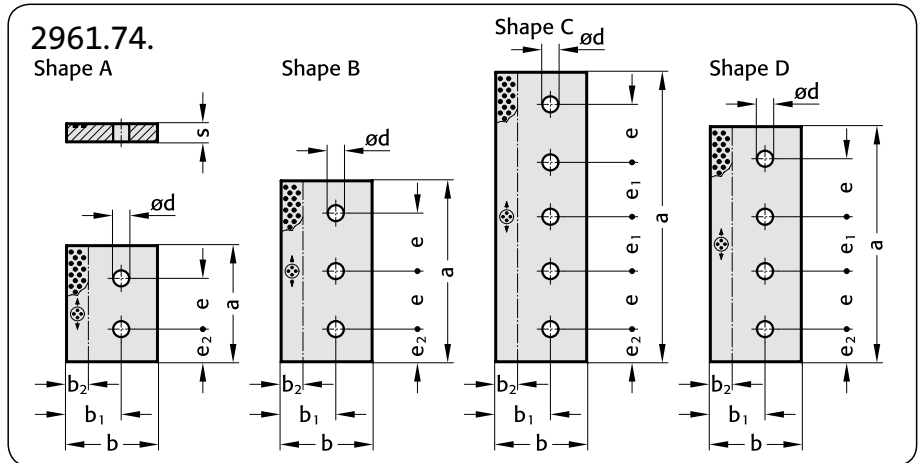


2961.70.

Order No	Shape	b	l	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	e <sub>4</sub>	Screw DIN 7984	Number of screw holes
2961.70.018.075	A	18	75	15	45	-	-	-	M 6×20	2
2961.70.018.100			100	25	50	-	-	-		
2961.70.018.125			125	75	-	-	-	-		
2961.70.018.150			150	100	-	-	-	-		
2961.70.028.075	A	28	75	15	45	-	-	-	M 6×20	2
2961.70.028.100			100	25	50	-	-	-		
2961.70.028.125			125	75	-	-	-	-		
2961.70.028.150			150	100	-	-	-	-		
2961.70.035.100	F	35	100	20	60	-	-	-	M 8×20	2
2961.70.035.150			150	55	55	-	-	-		3
2961.70.035.200			200	55	50	55	-	-		4
2961.70.035.250			250	70	70	70	-	-		
2961.70.035.300			300	65	65	65	65	-		5
2961.70.035.350			350	80	75	75	80	-		
2961.70.038.075	A	38	75	15	45	-	-	-	M 6×20	2
2961.70.038.100			100	25	50	-	-	-		
2961.70.038.125			125	75	-	-	-	-		
2961.70.038.150			150	100	-	-	-	-		
2961.70.048.075	A	48	75	15	45	-	-	-	M 6×20	2
2961.70.048.100			100	25	50	-	-	-		
2961.70.048.125			125	75	-	-	-	-		
2961.70.048.150			150	100	-	-	-	-		
2961.70.050.100	F	50	100	20	60	-	-	-	M 8×20	2
2961.70.050.150			150	55	55	-	-	-		3
2961.70.050.200			200	55	50	55	-	-		4
2961.70.050.250			250	70	70	70	-	-		
2961.70.050.300			300	65	65	65	65	-		5
2961.70.050.350			350	80	75	75	80	-		
2961.70.050.400			400	90	90	90	90	-		
2961.70.075.150	E	75	150	20	110	-	-	-	M 8×20	4
2961.70.075.200			200	80	80	-	-	-		6
2961.70.075.250			250	105	105	-	-	-		
2961.70.075.300			300	85	90	85	-	-		8
2961.70.075.400			400	120	120	120	-	-		
2961.70.075.500			500	115	115	115	115	-		10

Retaining Plates, VDI 3357  
Bronze with Non-Liquid Lubricant

2961.74.



**Material:**  
Bronze with non-liquid lubricant, oilless lubricating.

**Note:**  
Screws not included.

**Fixing:**  
Use socket cap screws DIN EN ISO 4762  
M10x30  
M12x40  
M16x50  
M16x60  
M20x70  
M24x70.

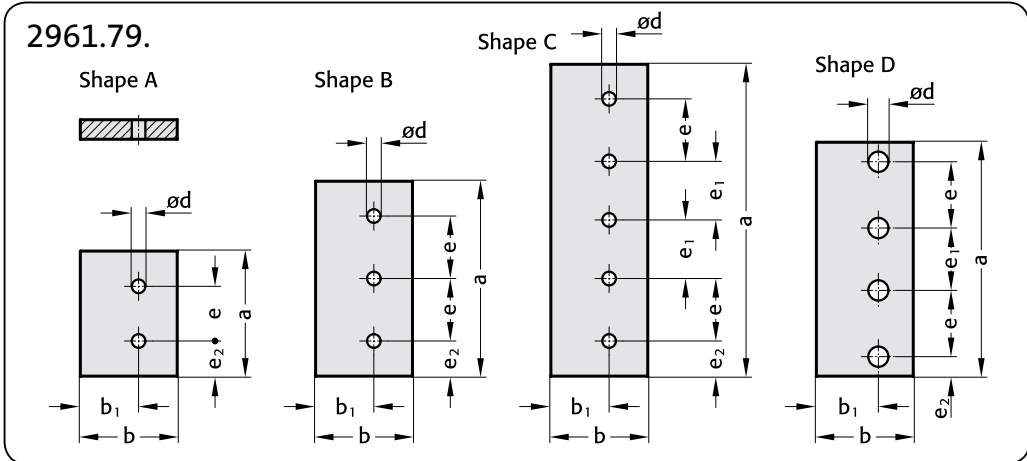
↑ Direction of motion  
↓ Embedded non-liquid lubricant (section)

**Ordering Code (example):**

Retaining Plate	=	2961.74.
b = 125 mm	=	125.
s = 25 mm	=	25.
a = 160 mm	=	160
Order No	=	2961.74.125.25.160

2961.74.

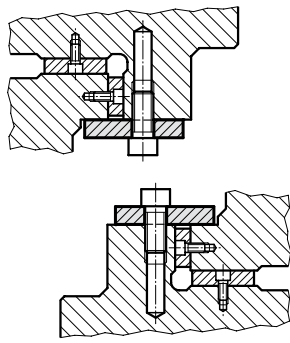
Order No	Shape	b	s	a	b <sub>2</sub>	b <sub>1</sub>	d	e	e <sub>1</sub>	e <sub>2</sub>	Number of screw holes	
2961.74.035.10.160	A	35	10	160	10	20	11	70	-	45	2	
200				200				110	-			
250	B			250				80	-		3	
2961.74.045.15.160	A	45	15	160	15	30	13,5	70	-		2	
200				200				110	-			
250	B			250				80	-		3	
2961.74.055.15.160	A	55	15	160	20	35	17,5	70	-		2	
200				200				110	-			
250	B			250				80	-		3	
2961.74.075.25.160	A	75	25	160	25	40	17,5	70	-		2	
200				200				110	-			
250	B			250				80	-		3	
2961.74.085.28.240	B	85	28	240	30	60	22	95	-	25	3	
300	D			300				85	80		4	
350				350				100	100			
400				400				115	120			
450	C			450				100	100		5	
2961.74.085.30.160	A	85	30	160	30	60	22	70	-	45	2	
200				200				110	-			
250	B			250				80	-		3	
300				300				105	-			
350				350				130	-			
400	C			400				80	75		5	
2961.74.100.25.160	A	100	25	160	30	60	17,5	70	-	45	2	
200				200				110	-			
250	B			250				80	-		3	
400	C			400				80	75		5	
2961.74.100.30.160	A	100	30	160	30	60	22	70	-	45	2	
200				200				110	-			
250	B			250				80	-		3	
400	C			400				80	75		5	
2961.74.125.25.160	A	125	25	160	30	75	17,5	70	-	45	2	
200				200				110	-			
250	B			250				80	-		3	
300	D			300				105	-			
350				350				130	-			
400	C			400				80	75		5	
400.1	D			400				80	26	115	120	4
450	C			450				100	100		5	
500				500				110	115			
2961.74.125.30.160	A	125	30	160	30	75	22	70	-	45	2	
200				200				110	-			
250	B			250				80	-		3	
300				300				105	-			
350				350				130	-			
400	C			400				80	75		5	
450				450				80	95	50		
500				500				80	120			



2961.79.

Order No	Shape	b	s	a	b <sub>1</sub>	d	e	e <sub>1</sub>	e <sub>2</sub>	Number of screw holes
2961.79.035.10.160	A	35	10	160	20	11	70	-	45	2
200				200			110	-		
250	B			250			80	-		3
2961.79.045.15.160	A	45	15	160	30	13,5	70	-		2
200				200			110	-		
250	B			250			80	-		3
2961.79.055.15.160	A	55	15	160	35	17,5	70	-		2
200				200			110	-		
250	B			250			80	-		3
2961.79.075.25.160	A	75	25	160	40	17,5	70	-		2
200				200			110	-		
250	B			250			80	-		3
2961.79.085.28.240	B	85	28	240	60	22	95	-	25	3
300	D			300			85	80		4
350				350			100	100		
400				400			115	120		
450	C			450			100	100		5
2961.79.085.30.160	A	85	30	160	60	22	70	-	45	2
200				200			110	-		
250	B			250			80	-		3
300				300			105	-		
350				350			130	-		
400	C			400			80	75		5
2961.79.100.25.160	A	100	25	160	60	17,5	70	-	45	2
200				200			110	-		
250	B			250			80	-		3
400	C			400			80	75		5
2961.79.100.30.160	A	100	30	160	60	22	70	-	45	2
200				200			110	-		
250	B			250			80	-		3
400	C			400			80	75		5
2961.79.125.25.160	A	125	25	160	75	17,5	70	-	45	2
200				200			110	-		
250	B			250			80	-		3
300	D			300	80	26	85	80	25	4
350				350			100	100		
400	C			400	75	17,5	80	75	45	5
400.1	D			400	80	26	115	120	25	4
450	C			450			100	100		5
500				500			110	115		
2961.79.125.30.160	A	125	30	160	75	22	70	-	45	2
200				200			110	-		
250	B			250			80	-		3
300				300			105	-		
350				350			130	-		
400	C			400			80	75		5
450				450			80	95	50	
500				500			80	120		

**Mounting Examples:**



**Material:**

Steel, surface hardened.

**Note:**

Screws not included.

**Fixing:**

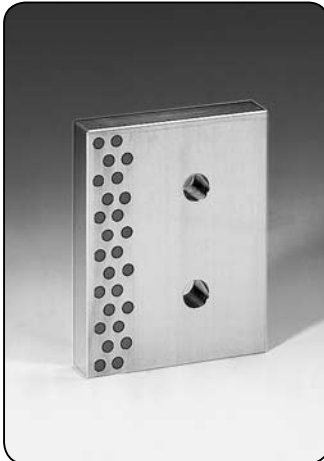
- Use socket cap screws
- DIN EN ISO 4762
- M10x30
- M12x40
- M16x50
- M16x60
- M20x70
- M24x70.

**Ordering Code (example):**

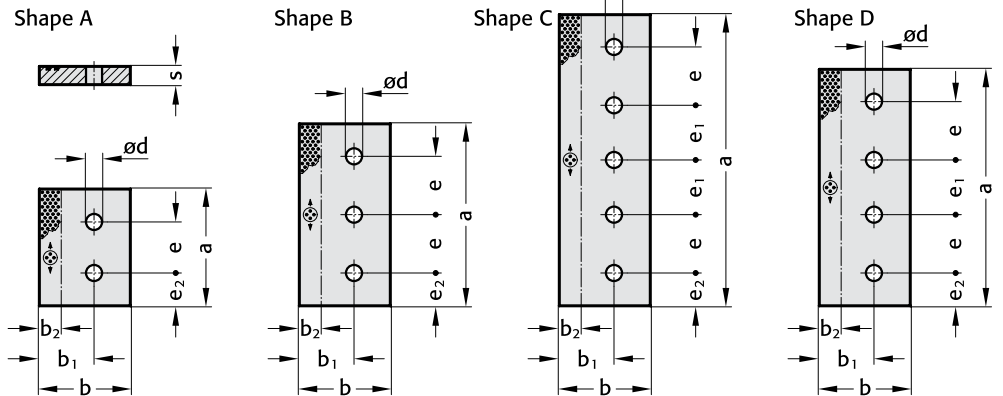
Retaining Plate =	2961.79.
b = 35 mm =	035.
s = 10 mm =	10.
a = 160 mm =	160
Order No =	2961.79.035.10.160

Retaining Plates, VDI 3357  
Steel with Non Liquid Lubricant

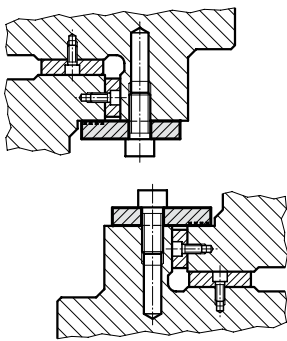
2961.81.



2961.81.



Mounting Examples:



Material:

Steel, surface hardened.  
Sliding Faces with embedded non-liquid lubricant.

Note:

Screws not included.

Fixing:

Use socket cap screws  
DIN EN ISO 4762  
M10x30  
M12x40  
M16x50  
M16x60  
M20x70  
M24x70.



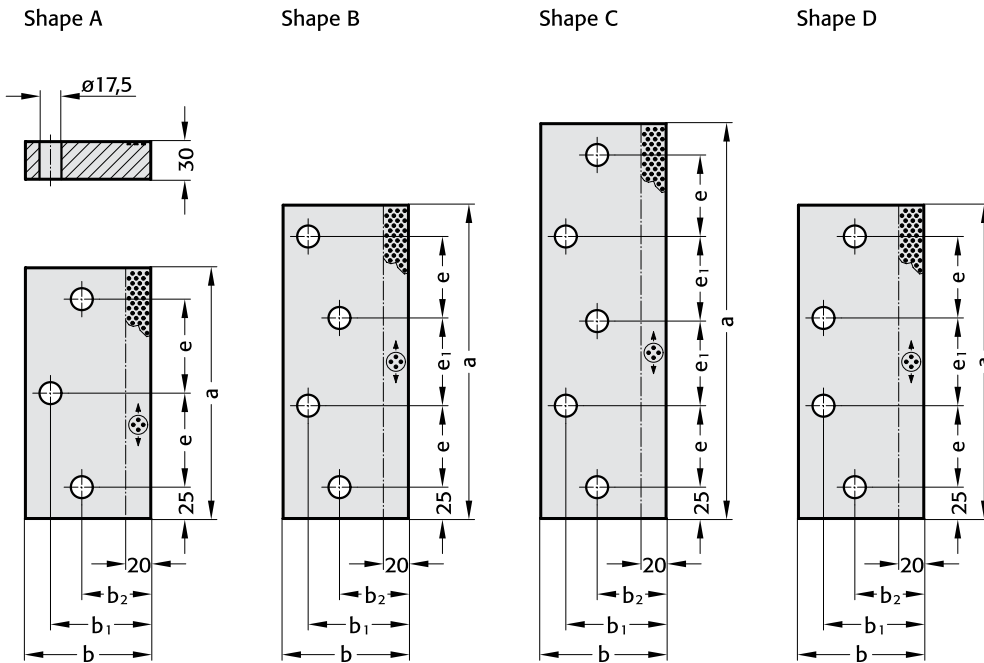
Direction of motion Embedded non-liquid lubricant (section)

2961.81.

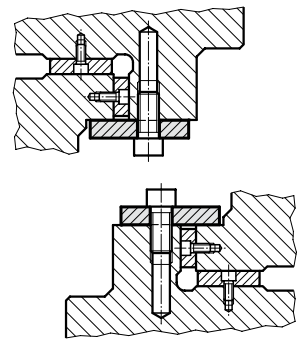
Order No	Shape	b	s	a	b <sub>2</sub>	b <sub>1</sub>	d	e	e <sub>1</sub>	e <sub>2</sub>	Number of screw holes
2961.81.035.10.160	A	35	10	160	10	20	11	70	-	45	2
2961.81.035.10.200	A			200				110	-		2
2961.81.035.10.250	B			250				80	-		3
2961.81.045.15.160	A	45	15	160	15	30	13,5	70	-	45	2
2961.81.045.15.200	A			200				110	-		2
2961.81.045.15.250	B			250				80	-		3
2961.81.055.15.160	A	55	15	160	20	35	17,5	70	-	45	2
2961.81.055.15.200	A			200				110	-		2
2961.81.055.15.250	B			250				80	-		3
2961.81.075.25.160	A	75	25	160	25	40	17,5	70	-	45	2
2961.81.075.25.200	A			200				110	-		2
2961.81.075.25.250	B			250				80	-		3
2961.81.085.28.240	B	85	28	240	30	60	22	95	-	25	3
2961.81.085.28.300	D			300				85	80		4
2961.81.085.28.350	D			350				100	100		4
2961.81.085.28.400	D			400				115	120		4
2961.81.085.28.450	C			450				100	100		5
2961.81.085.30.160	A	85	30	160	30	60	22	70	-	45	2
2961.81.085.30.200	A			200				110	-		2
2961.81.085.30.250	B			250				80	-		3
2961.81.085.30.300	B			300				105	-		3
2961.81.085.30.350	B			350				130	-		3
2961.81.085.30.400	C			400				80	75		5
2961.81.100.25.160	A	100	25	160	30	60	17,5	70	-	45	2
2961.81.100.25.200	A			200				110	-		2
2961.81.100.25.250	B			250				80	-		3
2961.81.100.25.400	C			400				80	75		5
2961.81.100.30.160	A	100	30	160	30	60	22	70	-	45	2
2961.81.100.30.200	A			200				110	-		2
2961.81.100.30.250	B			250				80	-		3
2961.81.100.30.400	C			400				80	75		5
2961.81.125.25.160	A	125	25	160	30	75	17,5	70	-	45	2
2961.81.125.25.200	A			200				110	-		2
2961.81.125.25.250	B			250				80	-		3
2961.81.125.25.300	D			300		80	26	85	80	25	4
2961.81.125.25.350	D			350				100	100		4
2961.81.125.25.400	C			400		75	17,5	80	75	45	5
2961.81.125.25.400.1	D			400		80	26	115	120	25	4
2961.81.125.25.450	C			450				100	100		5
2961.81.125.25.500	C			500				110	115		5
2961.81.125.30.160	A	125	30	160	30	75	22	70	-	45	2
2961.81.125.30.200	A			200				110	-		2
2961.81.125.30.250	B			250				80	-		3
2961.81.125.30.300	B			300				105	-		3
2961.81.125.30.350	B			350				130	-		3
2961.81.125.30.400	C			400				80	75		5
2961.81.125.30.450	C			450				80	95	50	5
2961.81.125.30.500	C			500				80	120		5



2961.82.



**Mounting Examples:**



2961.82.

Order No	Shape	b	a	b <sub>1</sub>	b <sub>2</sub>	e	e <sub>1</sub>	Number of screw holes
2961.82.075.200	A	75	200	55	40	75	–	3
2961.82.075.250	B	75	250			65	70	4
2961.82.075.250.1	D	75	250			65	70	4
2961.82.075.315	C	75	315			65	67,5	5
2961.82.075.350	C	75	350			75	75	5
2961.82.075.400	C	75	400			90	85	5
2961.82.075.450	C	75	450			100	100	5
2961.82.100.200	A	100	200	80	55	75	–	3
2961.82.100.250	B	100	250			65	70	4
2961.82.100.250.1	D	100	250			65	70	4
2961.82.100.315	C	100	315			65	67,5	5
2961.82.100.350	C	100	350			75	75	5
2961.82.100.400	C	100	400			90	85	5
2961.82.100.450	C	100	450			100	100	5
2961.82.125.200	A	125	200	105	65	75	–	3
2961.82.125.250	B	125	250			65	70	4
2961.82.125.250.1	D	125	250			65	70	4
2961.82.125.315	C	125	315			65	67,5	5
2961.82.125.350	C	125	350			75	75	5
2961.82.125.400	C	125	400			90	85	5
2961.82.125.450	C	125	450			100	100	5
2961.82.150.200	A	150	200	130	65	75	–	3
2961.82.150.250	B	150	250			65	70	4
2961.82.150.250.1	D	150	250			65	70	4
2961.82.150.315	C	150	315			65	67,5	5
2961.82.150.350	C	150	350			75	75	5
2961.82.150.400	C	150	400			90	85	5
2961.82.150.450	C	150	450			100	100	5

**Material:**

Steel, surface hardened.  
Sliding Faces with embedded non-liquid lubricant.

**Note:**

Screws not included.

**Fixing:**

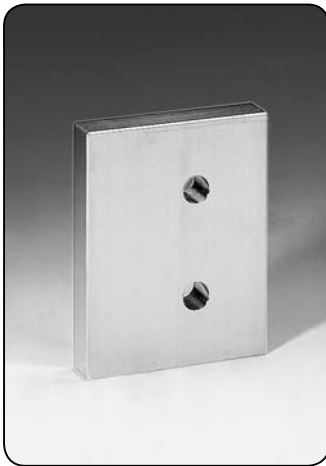
Use socket cap screws  
DIN EN ISO 4762  
M16x50.



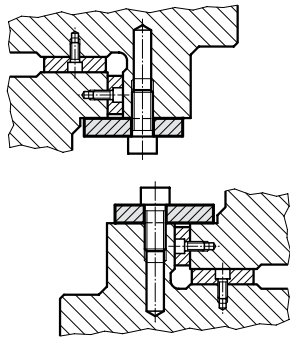
Direction of motion  
Embedded non-liquid lubricant (section)

Retaining Plates, Steel, to CNOMO  
 Retaining Plates, Bronze with Non-Liquid Lubricant  
 to CNOMO

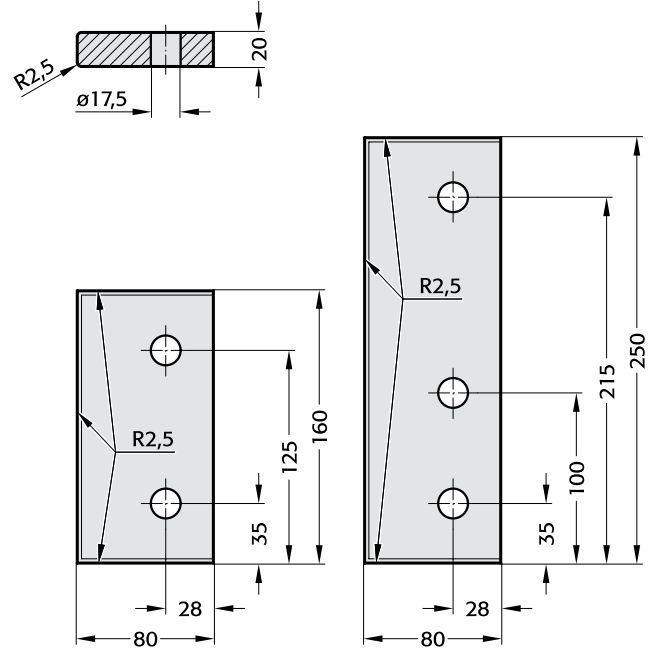
**FIBRO**  
 2961.79.45.  
 2961.81.45.



Mounting Example:



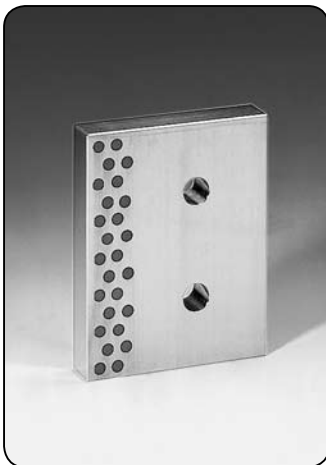
2961.79.45.



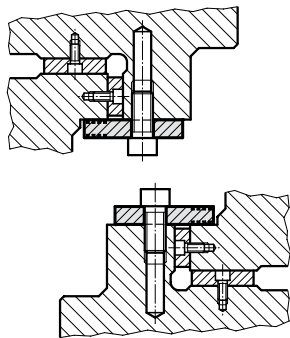
2961.79.45.

Order No	Number of screw holes
2961.79.45.080.20.160	2
2961.79.45.080.20.250	3

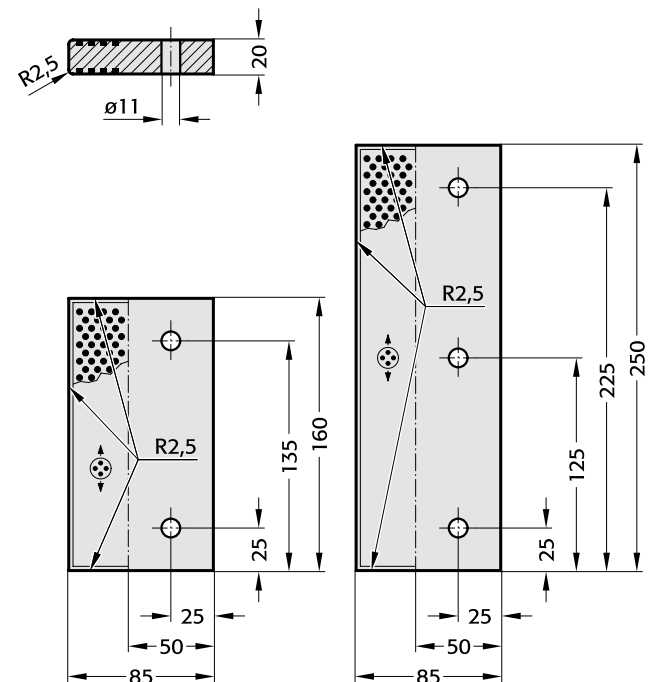
**Material:** Steel, surface hardened  
**Note:** Screws not included.  
**Fixing:** Use socket cap screws DIN EN ISO 4762 M16



Mounting Example:



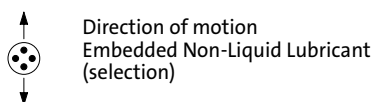
2961.81.45.



2961.81.45.

Order No	Number of screw holes
2961.81.45.085.20.160	2
2961.81.45.085.20.250	3

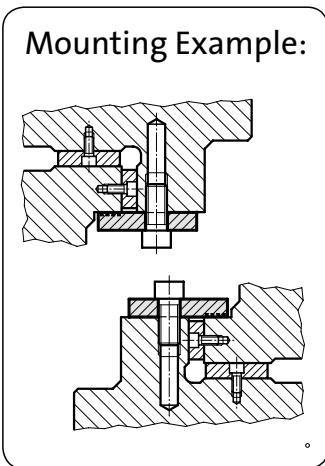
**Material:** Bronze with non-liquid lubricant  
**Note:** Screws not included.  
**Fixing:** Use socket cap screws DIN EN ISO 4762 M10



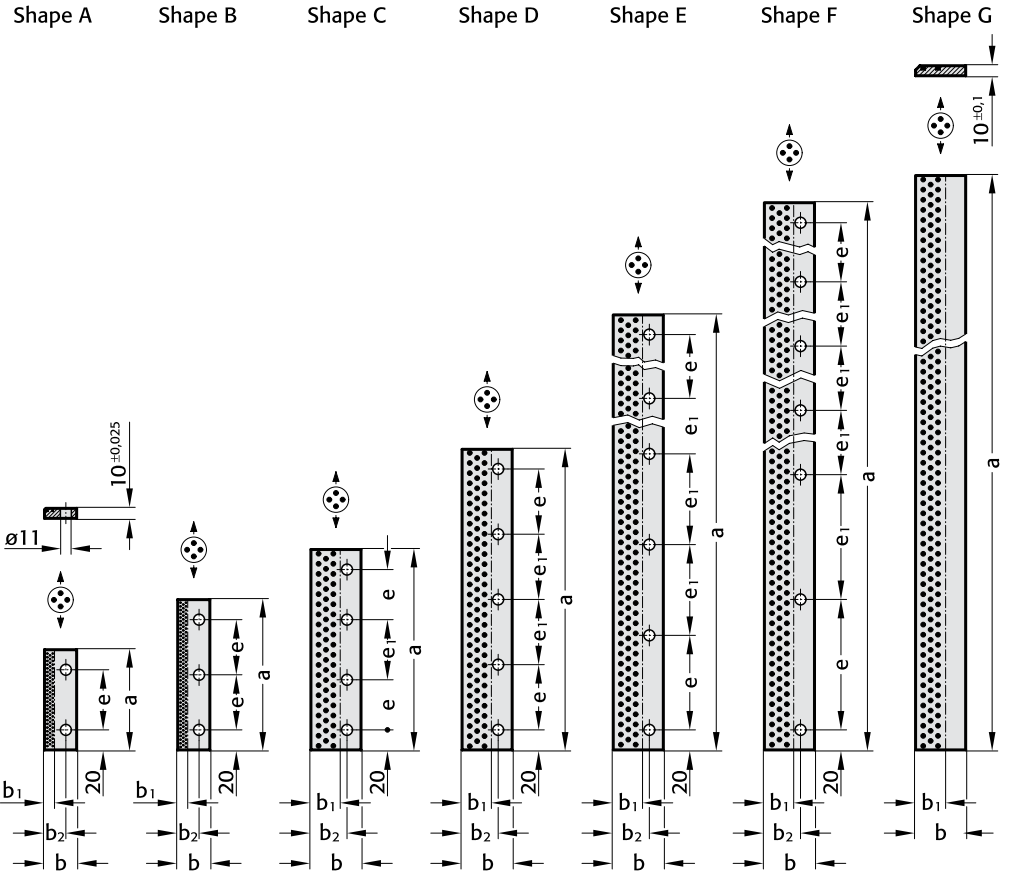
A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.

# Retaining Plates Bronze with Non-Liquid Lubricant

2961.78.



**2961.78.**



**Material:**

Bronze with non-liquid lubricant, oilless lubricating.

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws  
DIN EN ISO 4762 M10x25.



Direction of motion  
Embedded non-liquid  
lubricant (section)

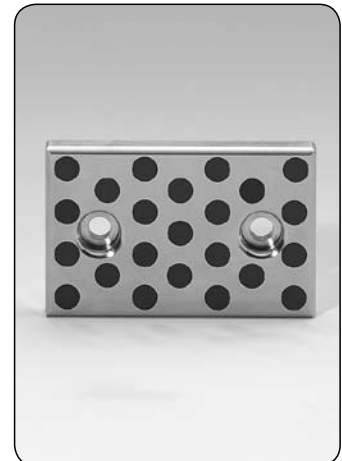
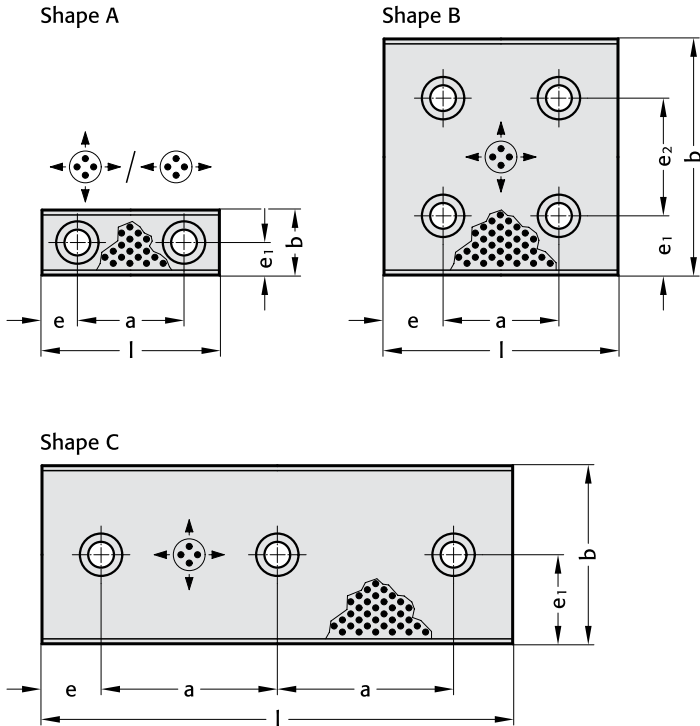
**2961.78.**

Order No	Shape	a	b	b <sub>1</sub>	b <sub>2</sub>	e	e <sub>1</sub>	Number of screw holes
2961.78.032.0100	A	100	32	10	21	60	-	2
0150	B	150				55	-	3
0160	B	160				60	-	3
2961.78.050.0200	C	200	50	30	36	50	60	4
0250	C	250				70	70	4
0300	D	300				65	65	5
0350	D	350				80	75	5
0400	D	400				90	90	5
0500	E	500				95	90	6
0600	E	600				115	110	6
0800	F	800				130	125	7
0605	G	605				-	-	-
1005	G	1005				-	-	-

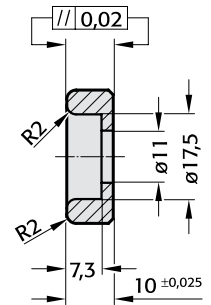
**Ordering Code (example):**

Retaining Plate = 2961.78.  
 b = 32 mm = 032.  
 l = 160 mm = 0160  
 Order No = 2961.78.032.0160

2961.75.



2961.75.



2961.75.

Order No	Shape	b	l	e	a	e <sub>1</sub>	e <sub>2</sub>	Number of screw holes
2961.75.028.075	A	28	75	15	45	14	-	2
100	A		100	25	50			
125	A		125		75			
150	A		150		100			
2961.75.038.075	A	38	75	15	45	19	-	2
100	A		100	25	50			
125	A		125		75			
150	A		150		100			
2961.75.048.075	A	48	75	15	45	24	-	2
100	A		100	25	50			
125	A		125		75			
150	A		150		100			
200	A		200	50	100			
2961.75.058.075	A	58	75	15	45	29	-	2
100	A		100	25	50			
125	A		125		75			
150	A		150		100			
200	A		200	50	100			
2961.75.075.075	A	75	75	15	45	37,5	-	2
100	A		100	25	50			
125	A		125		75			
150	A		150		100			
200	C		200		75			3
2961.75.100.100	B	100	100	25	50	25	50	4
125	B		125		75			
150	B		150		100			
200	B		200		150			
250	B		250		200			
2961.75.125.150	B	125	150	25	100	37,5	50	4
200	B		200		150			
250	B		250		200			
2961.75.150.150	B	150	150	25	100	25	100	4
200	B		200		150			

**Description:**

Flat Guide Bars find preference in large press tools with considerable lateral work forces. Bronze pads with embedded non-liquid lubricant ensure low maintenance, selflubricating service even in aduous multi-shift applications.

**Material:**

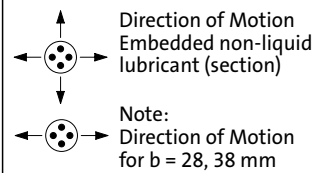
Bronze with Non-Liquid Lubricant, oilless lubricating.

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws DIN 7984 M10x20.



**Ordering Code (examples):**

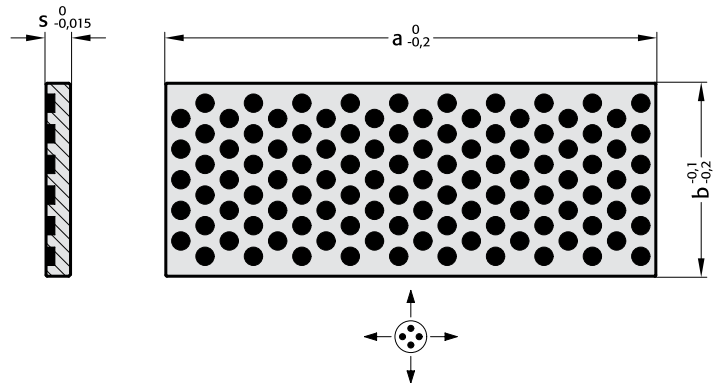
Flat Guide Bar =	2961.75.
b = 28 mm =	028.
l = 100 mm =	100
Order No =	2961.75.028.100

Flat Guide Bars  
Bronze with Non-Liquid Lubricant

2961.76.



2961.76.

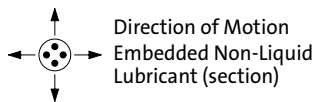


**Material:**

Bronze with Non-Liquid Lubricant, oilless lubricating.

**Execution:**

Sliding faces ground.



2961.76.

Order No	b	s	a
2961.76.025.005.050	25	5	50
2961.76.025.005.071			71
2961.76.025.005.090			90
2961.76.025.006.050	25	6	50
2961.76.025.006.063			63
2961.76.025.006.080			80
2961.76.025.006.100			100
2961.76.025.006.125			125
2961.76.040.005.050	40	5	50
2961.76.040.005.071			71
2961.76.040.005.090			90
2961.76.040.006.080	40	6	80
2961.76.040.006.100			100
2961.76.040.006.125			125
2961.76.040.006.160			160
2961.76.040.006.200			200
2961.76.063.006.080	63	6	80
2961.76.063.006.100			100
2961.76.063.006.125			125
2961.76.063.006.160			160
2961.76.063.008.125	63	8	125
2961.76.063.008.160			160
2961.76.063.008.200			200
2961.76.063.008.250			250
2961.76.063.008.315			315

**Ordering Code (example):**

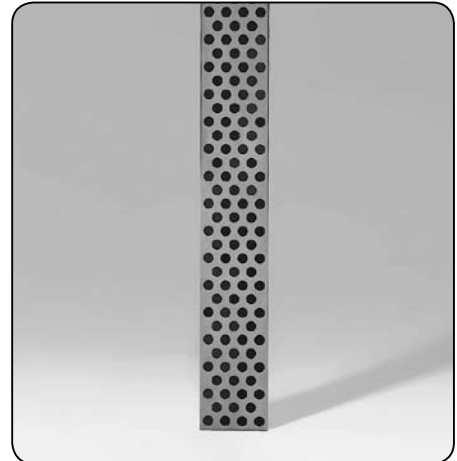
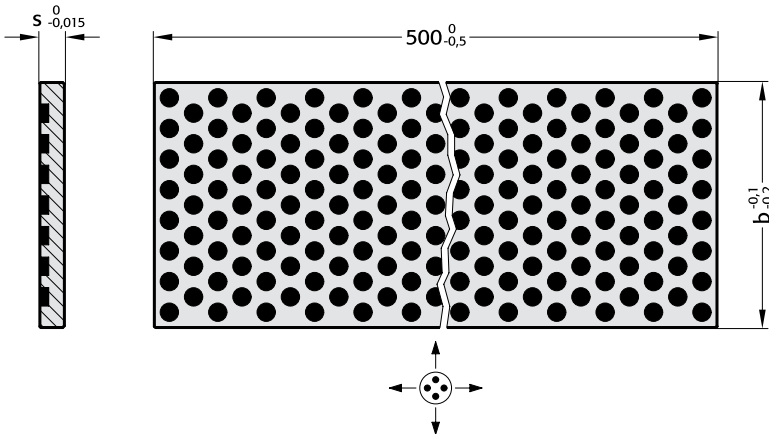
Flat Guide Bar = 2961.76.  
 b = 25 mm = 025.  
 s = 6 mm = 006.  
 a = 50 mm = 050  
 Order No = 2961.76.025.006.050

# FIBRO

2961.77.

## Flat Guide Bars Bronze with Non-Liquid Lubricant

2961.77.

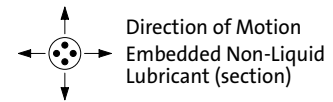


### Material:

Bronze with Non-Liquid Lubricant, oilless lubricating.

### Execution:

Sliding faces ground.



2961.77.

Order No	b	s	l
2961.77.025.006.500	25	6	500
2961.77.040.006.500	40	6	500
2961.77.063.008.500	63	8	500
2961.77.080.010.500	80	10	500

### Ordering Code (example):

Flat Guide Bar = 2961.77.

b = 25 mm = 025.

s = 6 mm = 006.

l = 500 mm = 500

Order No = 2961.77.025.006.500

# Sliding Pads small dimensions Bronze with Non-Liquid Lubricant

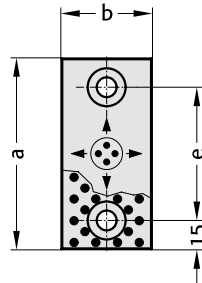
FIBRO

2960.72.

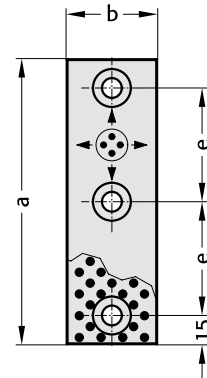


2960.72.

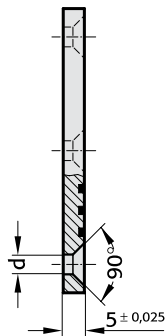
Shape A



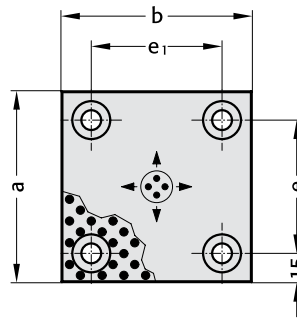
Shape B



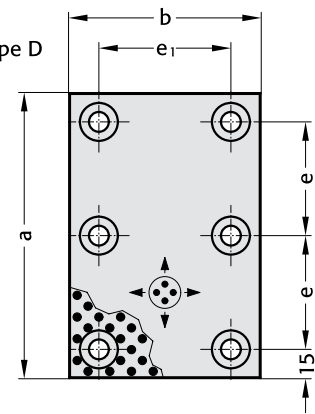
2960.72.



Shape C



Shape D



## Description:

Guide pads find preference in large press tools with considerable lateral work forces. Bronze pads with embedded non-liquid lubricant ensure low maintenance, selflubricating service even in aduous multi-shift applications.

## Material:

Bronze with Non-Liquid Lubricant, oilless lubricating.

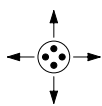
## Note:

Screws not included.

## Fixing:

Use countersunk head screw  
DIN 7991/ISO 10642

$d = \varnothing 6,5$  M 6 × 10  
 $d = \varnothing 9$  M 8 × 16



Direction of Motion  
Embedded non-liquid  
lubricant (section)

2960.72.

Order No	Shape	b	a	e	e <sub>1</sub>	d	Number of screw holes
2960.72.018.050	A	18	50	20	—	6,5	2
075			75	45	—		
100			100	70	—		
150	B		150	60	—		3
2960.72.028.050	A	28	50	20	—	9,0	2
075			75	45	—		
100			100	70	—		
150	B		150	60	—		3
2960.72.038.050	A	38	50	20	—		2
075			75	45	—		
100			100	70	—		
150	B		150	60	—		3
2960.72.048.075	A	48	75	45	—		2
100			100	70	—		
125			125	95	—		
150	B		150	60	—		3
2960.72.075.075	C	75	75	45	45		4
100			100	70			
125			125	95			
150	D		150	60			6
2960.72.100.100	C	100	100	70	70		4
125			125	95			
150	D		150	60			6

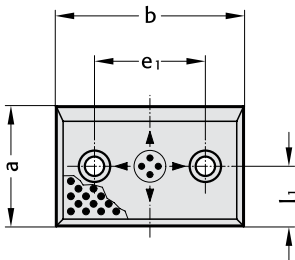
## Ordering Code (example):

Sliding Pad = 2960.72.  
b = 18 mm = 018.  
a = 50 mm = 050  
Order No = 2960.72.018.050

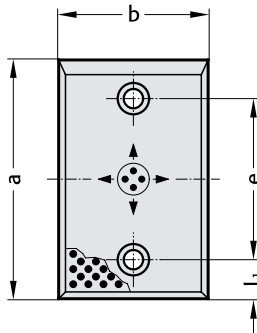


2960.71.

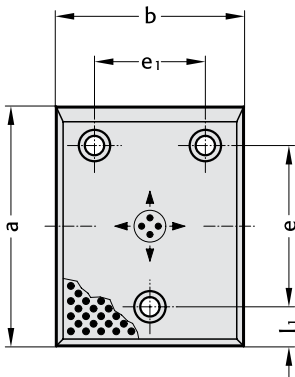
Shape D



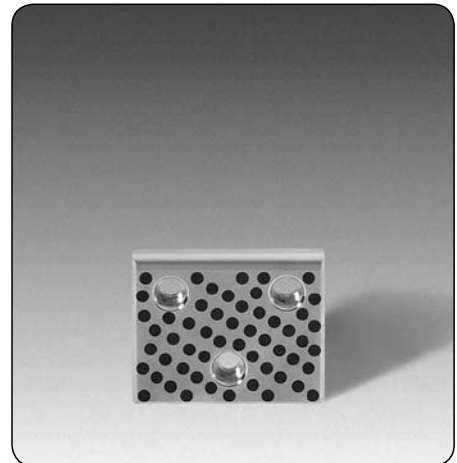
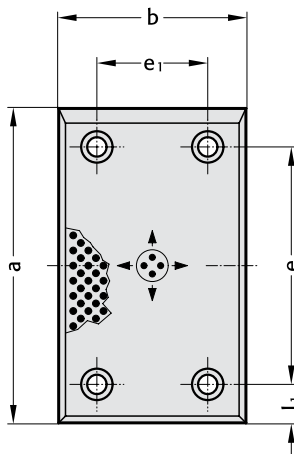
Shape B



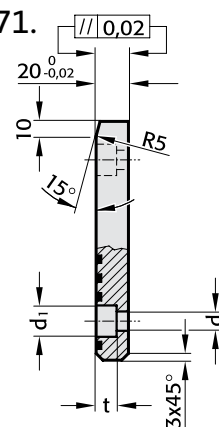
Shape G



Shape H



2960.71.



2960.71.

Order No	Shape	b	a	l <sub>1</sub>	e	e <sub>1</sub>	d	d <sub>1</sub>	t	Number of screw holes
2960.71.050.080	B	50	80	25	30	-	9	15	9	2
2960.71.050.100			100		50	-	13,5	20	13	
2960.71.050.125			125		75	-				
2960.71.050.160			160		110	-				
2960.71.050.200			200		150	-				
2960.71.080.050	D	80	50	25	-	30	9	15	9	2
2960.71.080.080	B	80	80	25	30	-	13,5	20	13	
2960.71.080.100			100		50	-				
2960.71.080.125			125		75	-				
2960.71.080.160			160		110	-				
2960.71.080.200			200		150	-				
2960.71.080.250			250	40	170	-				
2960.71.080.315			315	40	235	-				
2960.71.100.050	D	100	50	25	-	50	13,5	20	13	2
2960.71.100.080			80	40	-					
2960.71.100.100	B	100	100	25	50	-				
2960.71.100.125			125		75	-				
2960.71.100.160			160		110	-				
2960.71.100.200			200		150	-				
2960.71.100.250			250	40	170	-				
2960.71.100.315			315	40	235	-				
2960.71.125.050	D	125	50	25	-	75	13,5	20	13	2
2960.71.125.080			80	40	-					
2960.71.125.100	G	125	100	25	50	-				3
2960.71.125.125			125		75	-				
2960.71.125.160			160		110	-				
2960.71.125.200			200		150	-				
2960.71.125.250			250	40	170	-				
2960.71.125.315			315	40	235	-				
2960.71.160.050	D	160	50	25	-	110	13,5	20	13	2
2960.71.160.080			80	40	-					
2960.71.160.100	G	160	100	25	50	-				3
2960.71.160.125			125		75	-				
2960.71.160.160			160		110	-				
2960.71.160.200			200		150	-				
2960.71.160.250	H	160	250	40	170	-				4
2960.71.160.315			315	40	235	-				

**Description:**

Sliding pads find preference in large press tools with considerable lateral work forces.

Bronze pads with embedded non-liquid lubricant ensure low maintenance, selflubricating service even in arduous multi-shift applications.

**Material:**

Bronze with Non-Liquid Lubricant, oilless lubricating.

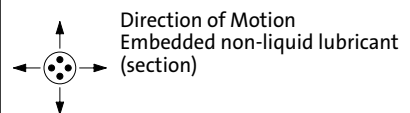
**Note:**

Screws not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762.

d = Ø9 M 8 x 25  
d = Ø13,5 M 12 x 25

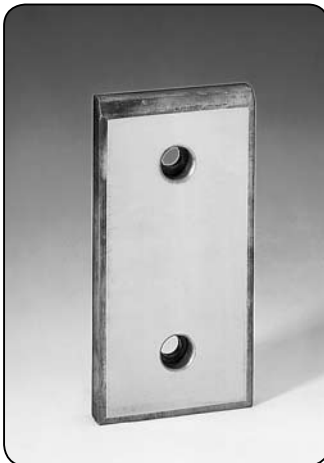


**Ordering Code (example):**

Sliding Pad	=	2960.71.
b = 50 mm	=	050.
a = 80 mm	=	080
Order No	=	2960.71.050.080

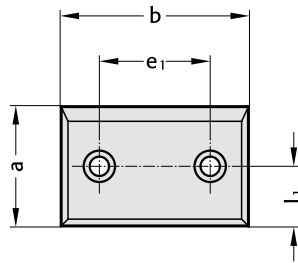
Sliding Pads, VDI 3357  
Steel

2960.87.

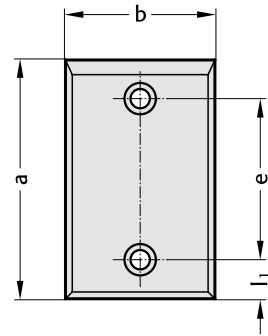


2960.87.

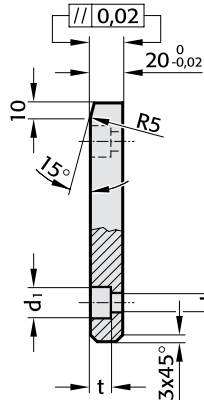
Shape D



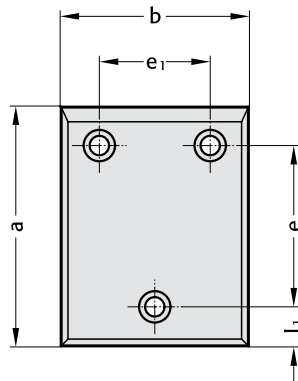
Shape B



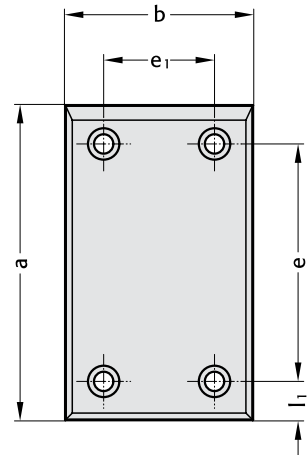
2960.87.



Shape G



Shape H



**Description:**

Sliding pads find preference in large press tools with considerable lateral work forces.

**Material:**

Steel, surface hardened.

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws  
DIN EN ISO 4762

d = Ø 9 M 8 x 25

d = Ø 13,5 M12 x 25

**Ordering Code (example):**

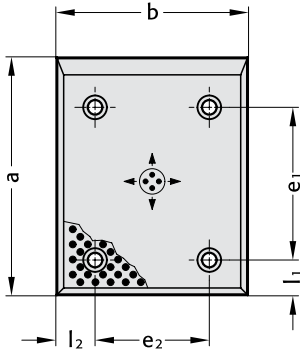
Sliding Pad = 2960.87.  
b = 50 mm = 050.  
a = 80 mm = 080  
Order No. = 2960.87.050.080

**2960.87.**

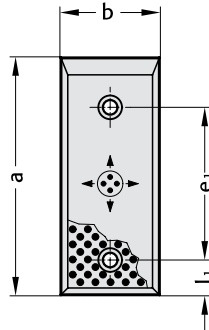
Order No	Shape	b	a	l <sub>1</sub>	e	e <sub>1</sub>	d	d <sub>1</sub>	t	Number of screw holes
2960.87.050.080	B	50	80	25	30	-	9	15	9	2
100			100		50	-	13,5	20	13	
125			125		75	-				
160			160		110	-				
200			200		150	-				
2960.87.080.050	D	80	50	25	-	30	9	15	9	2
080	B	80	80	25	30	-	13,5	20	13	
100			100		50	-				
125			125		75	-				
160			160		110	-				
200			200		150	-				
250			250	40	170	-				
315			315	40	235	-				
2960.87.100.050	D	100	50	25	-	50	13,5	20	13	2
080			80	40	-					
100	B	100	100	25	50	-				
125			125		75	-				
160			160		110	-				
200			200		150	-				
250			250	40	170	-				
315			315	40	235	-				
2960.87.125.050	D	125	50	25	-	75	13,5	20	13	2
080			80	40	-					
100	G	125	100	25	50	-				3
125			125		75	-				
160			160		110	-				
200			200		150	-				
250			250	40	170	-				
315			315	40	235	-				
2960.87.160.050	D	160	50	25	-	110	13,5	20	13	2
080			80	40	-					
100	G	160	100	25	50	-				3
125			125		75	-				
160			160		110	-				
200			200		150	-				
250			250	40	170	-				
315			315	40	235	-				
2960.87.160.050	D	160	50	25	-	110	13,5	20	13	2
080			80	40	-					
100	G	160	100	25	50	-				3
125			125		75	-				
160			160		110	-				
200			200		150	-				
250	H	160	250	40	170	-				4
315			315	40	235	-				

2960.70.

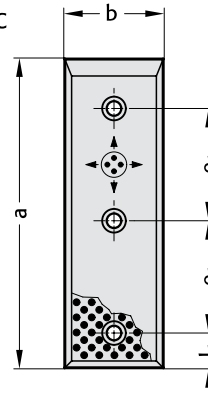
Shape A



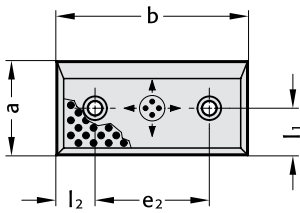
Shape B



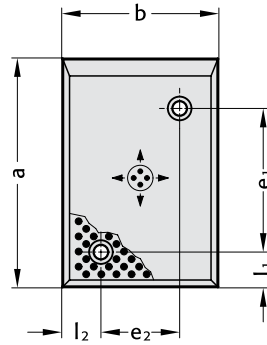
Shape C



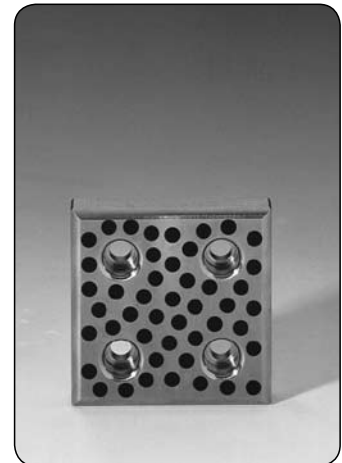
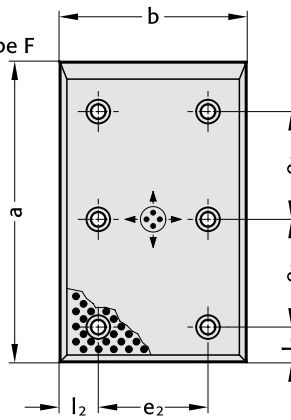
Shape D



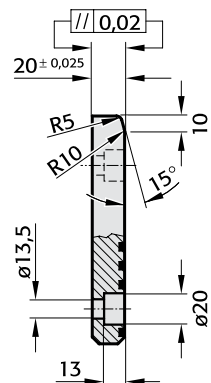
Shape E



Shape F



2960.70.



2960.70.

Order No	Shape	b	a	l <sub>1</sub>	e <sub>1</sub>	l <sub>2</sub>	e <sub>2</sub>	Order No	Shape	b	a	l <sub>1</sub>	e <sub>1</sub>	l <sub>2</sub>	e <sub>2</sub>
2960.70.															
050.080	B	50	80	20	35	25		2960.70.	D	125	50	25	-	20	85
100			100		55			080	E	80	20	35			
125			125		80			100	A	100		55			
160			160		115			125		125		80			
200			200		155			160		160		115			
250	C	250			100			200		200		155			
080.050	D	80	50	25	-	20	40	250	F	250		100			
080	E	80	20	35				315		315		132			
100			100		55			160.050	D	160	50	25	-	20	120
125			125		80			080	A	80	20	35			
160	A	160		115				100		100		55			
200			200		155			125		125		80			
250	F	250		100				160		160		115			
315			315		132			200		200		155			
100.050	D	100	50	25	-	20	60	250	F	250		100			
080	E	80	20	35				315		315		132			
100			100		55										
125	A	125		80											
160			160		115										
200			200		155										
250	F	250		100											
315			315		132										

**Description:**

Sliding pads find preference in large press tools with considerable lateral work forces. Bronze pads with embedded non-liquid lubricant ensure low maintenance, self-lubricating service even in arduous multi-shift applications.

**Material:**

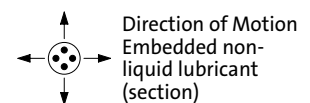
Bronze with Non-Liquid lubricant, oilless lubricating.

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws  
DIN EN ISO 4762 M12 x 25.

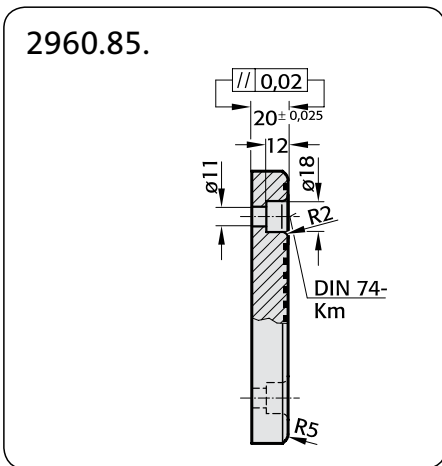
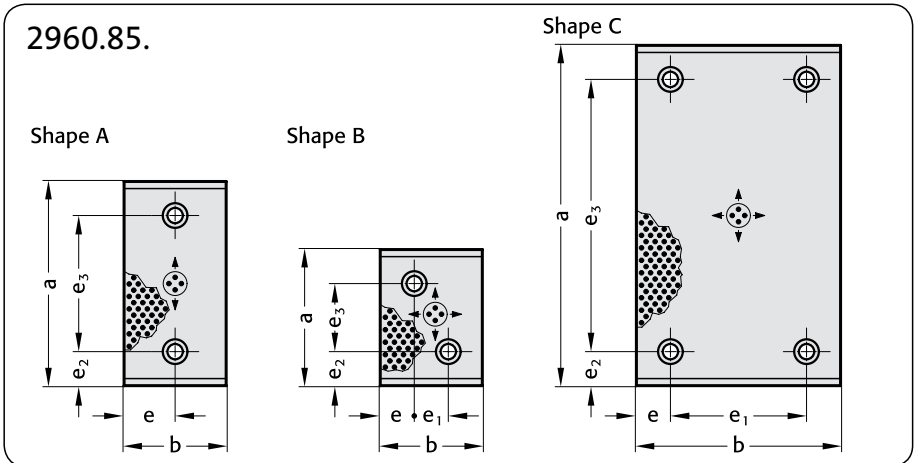


**Ordering Code (example):**

Sliding Pad = 2960.70.  
b = 50 mm = 050.  
a = 80 mm = 080  
Order No = 2960.70.050.080

Sliding Pads  
Bronze with Non-Liquid Lubricant

2960.85.



2960.85.

Order No	Shape	b	a	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	Number of screw holes
2960.85.028.075	A	28	75	14	-	15	45	2
100	A		100		-	25	50	
125	A		125		-		75	
150	A		150		-		100	
2960.85.038.075	A	38	75	19	-	15	45	2
100	A		100		-	25	50	
125	A		125		-		75	
150	A		150		-		100	
200	A		200		-		150	
2960.85.048.075	A	48	75	24	-	15	45	2
100	A		100		-	25	50	
125	A		125		-		75	
150	A		150		-		100	
200	A		200		-		150	
2960.85.058.075	A	58	75	29	-	15	45	2
100	A		100		-	25	50	
150	A		150		-		100	
2960.85.075.075.1	A	75	75	37,5	-	15	45	2
2960.85.075.075	B	75	75	25	25	25	25	2
100.1	A		100	37,5	-		50	
100	B		100	25	25		50	
125	A		125	37,5	-		75	
150	A		150		-		100	
200	A		200		-		150	
2960.85.100.100	C	100	100	25	50	25	50	4
125	C		125				75	
150	C		150				100	
200	C		200				150	
250	C		250				200	
300	C		300				250	
2960.85.125.125	C	125	125	37,5	50	25	75	4
150	C		150				100	
200	C		200				150	
250	C		250				200	
300	C		300				250	
350	C		350				300	
2960.85.150.150	C	150	150	25	100	25	100	4
200	C		200				150	
250	C		250				200	
300	C		300				250	
2960.85.200.200	C	200	200	25	150	25	150	4
250	C		250				200	
300	C		300				250	

Description:

Sliding pads find preference in large press tools with considerable lateral work forces. Bronze pads with embedded non-liquid lubricant ensure low maintenance, selflubricating service even in aduous multi-shift applications.

Material:

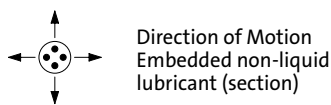
Bronze with Non-Liquid Lubricant, oilless lubricating.

Note:

Screws not included.

Fixing:

Use socket cap screws DIN EN ISO 4762 M10x25.



Ordering Code (example):

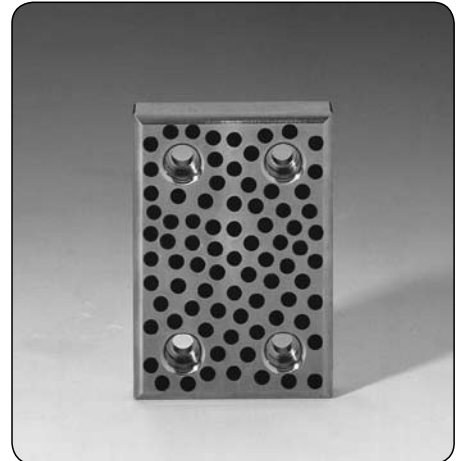
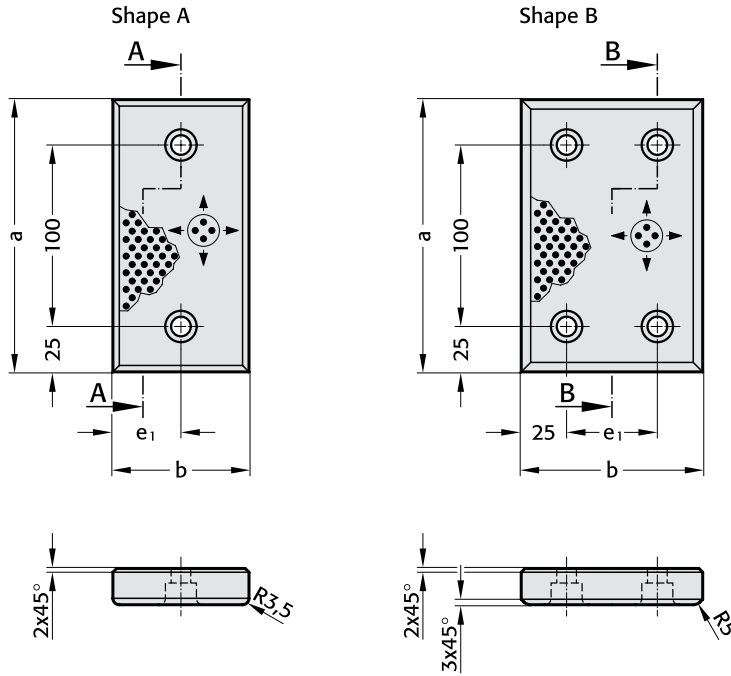
Sliding Pad	=	2960.85.
b = 48 mm	=	048.
a = 150 mm	=	150
Order No	=	2960.85.048.150

**FIBRO**

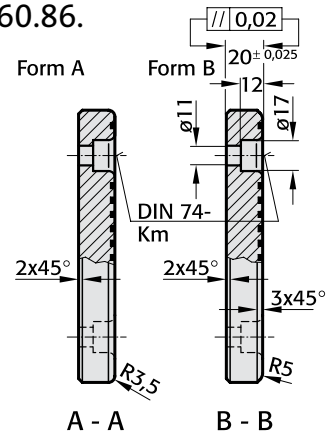
2960.86.

**Sliding Pads  
Bronze with Non-Liquid Lubricant**

2960.86.



2960.86.



2960.86.

Order No	Shape	b	a	e <sub>1</sub>	Number of screw holes
2960.86.038.150	A	38	150	19	2
075.150	A	75	150	37,5	2
100.150	B	100	150	50	4

**Description:**

Sliding pads find preference in large press tools with considerable lateral work forces. Bronze pads with embedded non-liquid lubricant ensure low maintenance, selflubricating service even in aduous multi-shift applications.

**Material:**

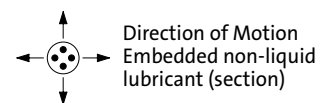
Bronze with Non-Liquid Lubricant, oilless lubricating.

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M10x25.



**Ordering Code (example):**

Sliding Pad = 2960.86.

b = 38 mm = 038.

a = 150 mm = 150

Order No = 2960.86.038.150

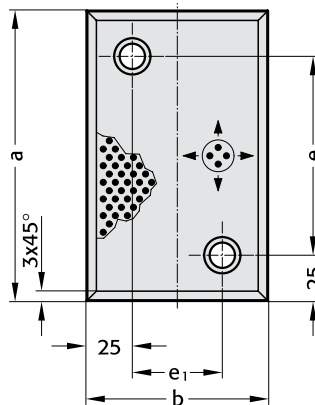
Sliding Pads  
Bronze with Non-Liquid Lubricant

2960.76.

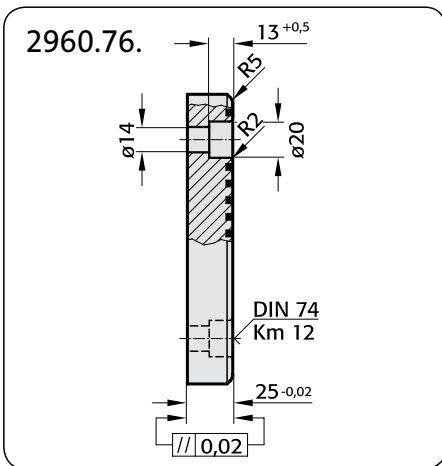
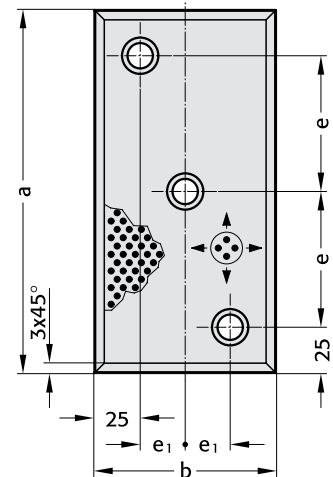


2960.76.

Shape A



Shape B



Description:

Sliding pads find preference in large press tools with considerable lateral work forces. Bronze pads with embedded non-liquid lubricant ensure low maintenance, self-lubricating service even in arduous multi-shift applications.

Material:

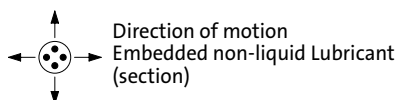
Bronze with non-liquid lubricant, oilless lubricating.

Note:

Screws not included.

Fixing:

Use socket cap screws DIN EN ISO 4762 M12x30.



Ordering Code (example):

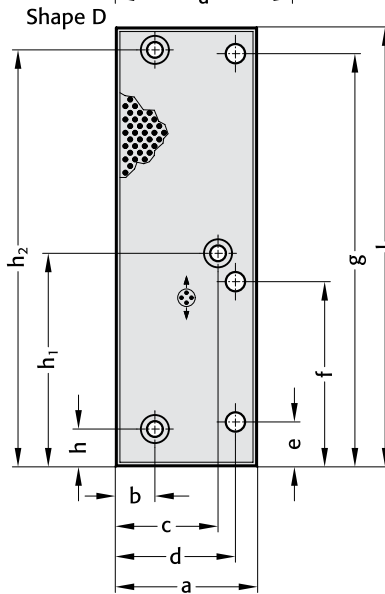
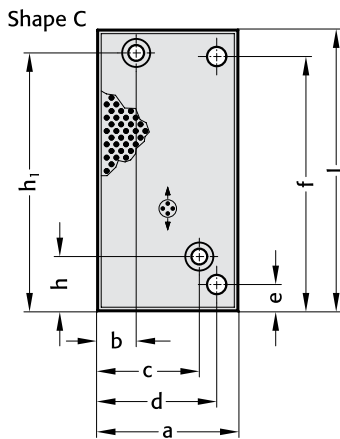
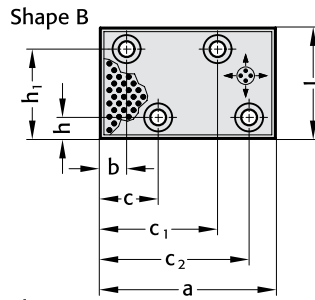
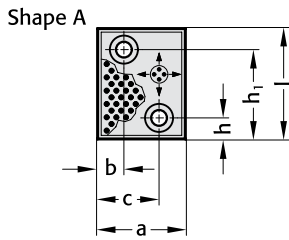
Sliding Pad = 2960.76.  
b = 80 mm = 080.  
a = 200 mm = 200  
Order No = 2960.76.080.200

2960.76.

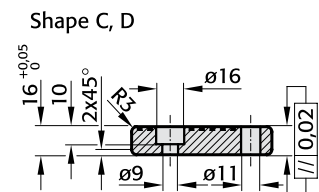
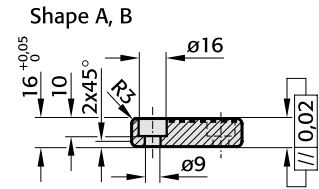
Order No	Shape	b	a	e	e <sub>1</sub>	Number of screw holes
2960.76. 080.100	A	80	100	50	30	2
125	A		125	75	30	2
160	A		160	110	30	2
200	B		200	75	15	3
2960.76. 100.125	A	100	125	75	50	2
160	A		160	110	50	2
200	B		200	75	25	3
2960.76. 125.125	A	125	125	75	75	2

**Sliding Pads  
Bronze with Non-Liquid Lubricant to CNOMO**

2962.78.45.



2962.78.45.



**Description:**

Sliding pads find preference in large press tools with considerable lateral work forces.

Bronze pads with embedded non-liquid lubricant ensure low maintenance, self-lubricating service even in arduous multi-shift applications.

**Material:**

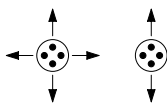
Bronze with non-liquid lubricant, oilless lubricating.

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762, M8x25



Direction of motion  
Embedded non-liquid Lubricant  
(section)

**Ordering Code (example):**

Sliding pad	=	2962.78.45.
a = 50 mm	=	050.
thickness = 16 mm	=	16.
l = 63 mm	=	063
Order No	=	2962.78.45.050.16.063

2962.78.45.

Order No	Shape	a	l	b	c	c <sub>1</sub>	c <sub>2</sub>	d	e	f	g	h	h <sub>1</sub>	h <sub>2</sub>	Number of countersunk	Number of screw holes
2962.78.45.050.16.063	A	50	63	15	35	-	-	-	-	-	-	12	51	-	2	-
2962.78.45.050.16.160	C	50	160	19	31	-	-	-	-	-	-	21	147	-	2	-
2962.78.45.050.16.250	D	50	250	19	31	-	-	-	-	-	-	21	121	237	3	-
2962.78.45.080.16.160	C	80	160	22	58	-	-	68	15	145	-	31	147	-	2	2
2962.78.45.080.16.250	D	80	250	22	58	-	-	68	25	105	235	21	121	237	3	3
2962.78.45.100.16.063	B	100	63	15	33	67	85	-	-	-	-	12	51	-	4	-

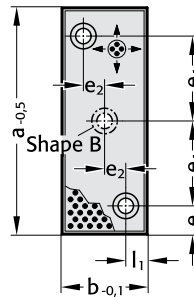
# Sliding Pads Bronze with Non-Liquid Lubricant

2962.78.

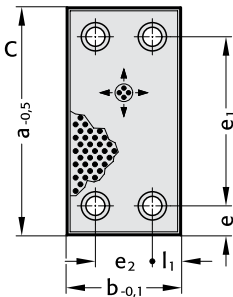


2962.78.

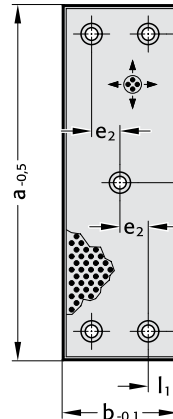
Shape A  
Shape B



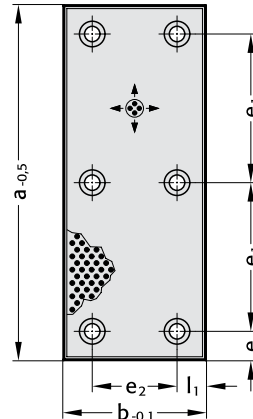
Shape C



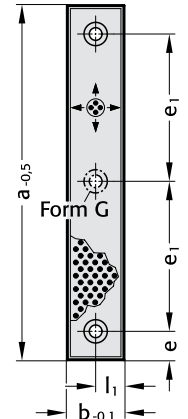
Shape D



Shape E



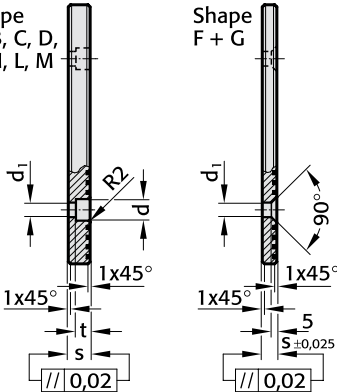
Shape F  
Shape G



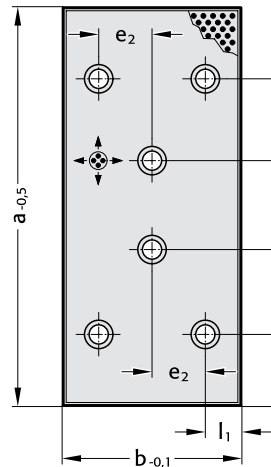
2962.78.

Shape  
A, B, C, D,  
E, H, L, M

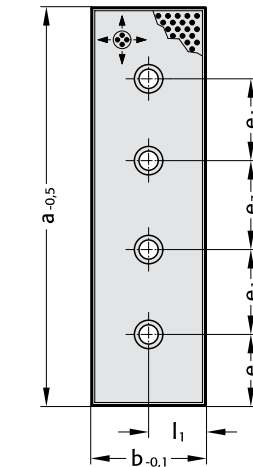
Shape  
F + G



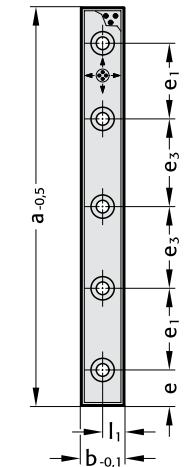
Shape H



Shape L



Shape M



## Description:

Sliding pads find preference in large press tools with considerable lateral work forces.

Bronze pads with embedded non-liquid lubricant ensure low maintenance, self-lubricating service even in arduous multi-shift applications.

## Material:

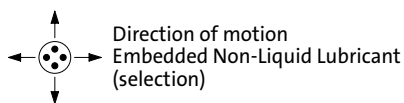
Bronze with non-liquid lubricant, oilless lubricating.

## Note:

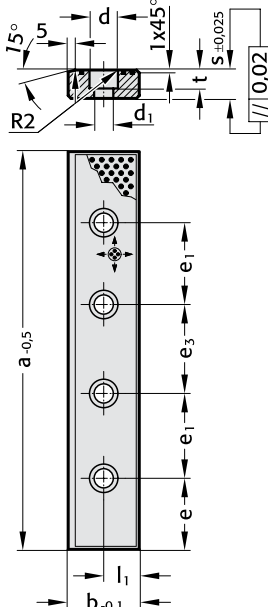
Screws not included.

## Fixing:

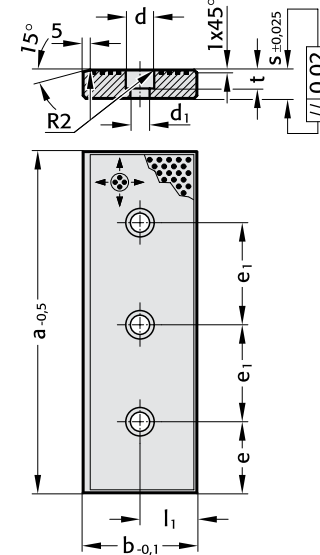
Use socket cap screws DIN EN ISO 4762, or countersunk cap screws DIN 7991/ISO 10642.



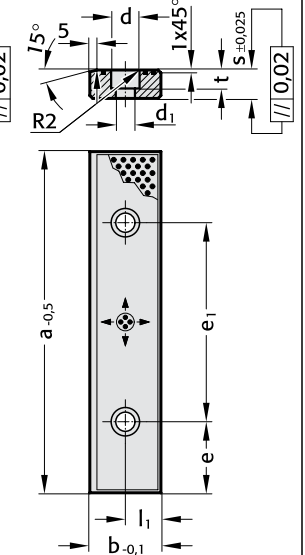
Shape I



Shape J



Shape K





**Sliding Pads  
Bronze with Non-Liquid Lubricant**

**2962.78.**

Order No	Shape	b	s	a	l <sub>1</sub>	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	Number of screw holes	d	d <sub>1</sub>	t
2962.78.030.12.0100	A	30	12	100	15	20	60	-	-	2	15	9	9
.0160	B	30	12	160	15	20	60	-	-	3	15	9	9
.0240	B	30	12	240	15	25	95	-	-	3	15	9	9
.0250	B	30	12	250	15	20	105	-	-	3	15	9	9
.0300	L	30	12	300	15	25	85	-	80	4	15	9	9
.0350	L	30	12	350	15	25	100	-	100	4	15	9	9
.0400	L	30	12	400	15	25	115	-	120	4	15	9	9
.0450	M	30	12	450	15	25	100	-	100	5	15	9	9
.0500	M	30	12	500	15	25	110	-	115	5	15	9	9
2962.78.040.08.0100	F	40	8	100	20	20	60	-	-	2	-	9	5
.0160	G	40	8	160	20	20	60	-	-	3	-	9	5
.0250	G	40	8	250	20	20	105	-	-	3	-	9	5
2962.78.040.12.0100	A	40	12	100	20	20	60	-	-	2	15	9	9
.0160	B	40	12	160	20	20	60	-	-	3	15	9	9
.0250	B	40	12	250	20	20	105	-	-	3	15	9	9
2962.78.040.16.0100	A	40	16	100	20	20	60	-	-	2	18	11	11
.0160	B	40	16	160	20	20	60	-	-	3	18	11	11
.0250	B	40	16	250	20	20	105	-	-	3	18	11	11
2962.78.050.20.0100	A	50	20	100	15	20	60	20	-	2	20	13,5	13
.0160	B	50	20	160	15	20	60	10	-	3	20	13,5	13
.0240	A	50	20	240	25	50	140	-	-	2	20	13,5	13
.0240.1*	K	50	20	240	25	50	140	-	-	2	20	13,5	13
.0250	B	50	20	250	15	20	105	10	-	3	20	13,5	13
.0300	B	50	20	300	25	50	100	-	-	3	20	13,5	13
.0300.1*	J	50	20	300	25	50	100	-	-	3	20	13,5	13
.0350	B	50	20	350	25	50	125	-	-	3	20	13,5	13
.0350.1*	J	50	20	350	25	50	125	-	-	3	20	13,5	13
.0400.1*	J	50	20	400	25	50	150	-	-	3	20	13,5	13
.0450.1*	I	50	20	450	25	50	115	-	120	4	20	13,5	13
.0500.1*	I	50	20	500	25	50	135	-	130	4	20	13,5	13
2962.78.060.16.0100	A	60	16	100	15	20	60	30	-	2	18	11	11
.0160	B	60	16	160	15	20	60	15	-	3	18	11	11
.0250	B	60	16	250	15	20	105	15	-	3	18	11	11
2962.78.080.12.0100	A	80	12	100	20	20	60	40	-	2	15	9	9
.0160	C	80	12	160	20	20	120	40	-	4	15	9	9
.0250	D	80	12	250	20	20	105	20	-	5	15	9	9
2962.78.080.20.0100	A	80	20	100	20	20	60	40	-	2	20	13,5	13
.0160	C	80	20	160	20	20	120	40	-	4	20	13,5	13
.0250	D	80	20	250	20	20	105	20	-	5	20	13,5	13
.0300	B	80	20	300	40	50	100	-	-	3	20	13,5	13
.0300.1*	J	80	20	300	40	50	100	-	-	3	20	13,5	13
.0350	B	80	20	350	40	50	125	-	-	3	20	13,5	13
.0350.1*	J	80	20	350	40	50	125	-	-	3	20	13,5	13
.0400	B	80	20	400	40	50	150	-	-	3	20	13,5	13
.0400.1*	J	80	20	400	40	50	150	-	-	3	20	13,5	13
.0450	L	80	20	450	40	50	115	-	120	4	20	13,5	13
.0450.1*	I	80	20	450	40	50	115	-	120	4	20	13,5	13
.0500	L	80	20	500	40	50	135	-	130	4	20	13,5	13
.0500.1*	I	80	20	500	40	50	135	-	130	4	20	13,5	13
2962.78.100.16.0100	A	100	16	100	20	20	60	60	-	2	18	11	11
.0160	C	100	16	160	20	20	120	60	-	4	18	11	11
.0250	E	100	16	250	20	20	105	60	-	6	18	11	11
2962.78.125.20.0100	C	125	20	100	20	20	60	85	-	4	20	13,5	13
.0160	C	125	20	160	20	20	120	85	-	4	20	13,5	13
.0250	E	125	20	250	20	20	105	85	-	6	20	13,5	13
.0400	D	125	20	400	25	50	150	37,5	-	5	20	13,5	13
.0450	H	125	20	450	25	50	115	37,5	120	6	20	13,5	13
.0500	H	125	20	500	25	50	135	37,5	130	6	20	13,5	13

\* with Pilot Taper

**Ordering Code (example):**

Sliding Pad = 2962.78.  
 b = 125 mm = 125.  
 s = 20 mm = 20.  
 a = 100 mm = 0100  
 Order No = 2962.78.125.20.0100

Sliding Pads, Steel  
to CNOMO

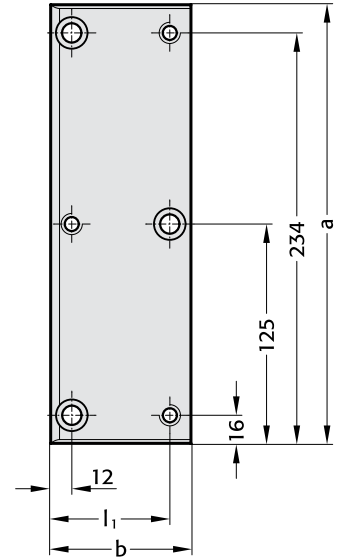
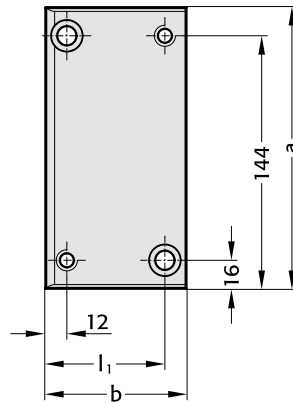
2962.84.45.



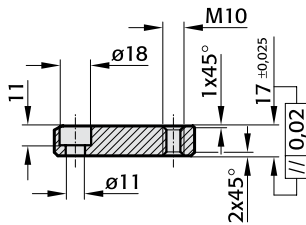
2962.84.45.

Shape B

Shape A



2962.84.45.



Description:

Sliding pads find preference in large press tools with considerable lateral work forces

Material:

Steel, surface hardened.

Note:

Screws not included.

Fixing:

Use socket cap screws DIN EN ISO 4762  
M 10 x 30.

2962.84.45.

Order No	Shape	b	a	l <sub>1</sub>	Number of countersunk	Number of threads
2962.84.45.050.17.160	A	50	160	38	2	2
2962.84.45.050.17.250	B	50	250	38	3	3
2962.84.45.080.17.160	A	80	160	68	2	2
2962.84.45.080.17.250	B	80	250	68	3	3

Ordering Code (example):

Sliding Pad	=	2962.84.45.
b = 50 mm	=	050.
thickness = 17 mm	=	17.
a = 250 mm	=	250
Order No	=	2962.84.45.050.17.250

A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.

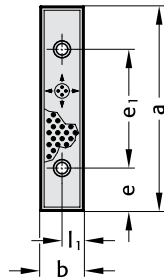
Sliding Pads  
Steel with Non-Liquid Lubricant

2962.85.

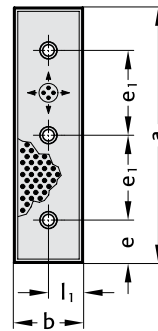


2962.85.

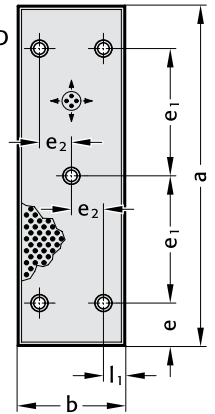
Shape A



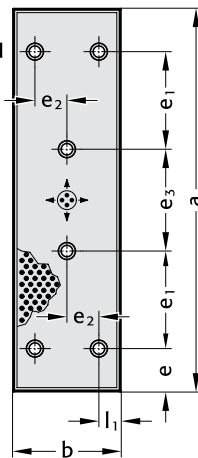
Shape B



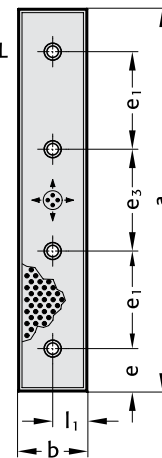
Shape D



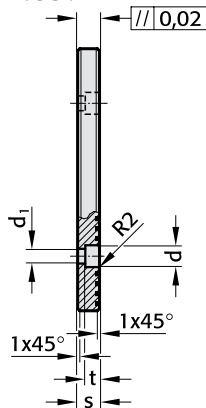
Shape H



Shape L



2962.85.



Material:

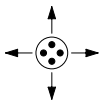
Steel, surface hardened.  
Sliding Pads with embedded  
non-liquid lubricant (non-liquid  
lubricant share 20–25%)

Note:

Screws not included.

Fixing:

Use socket cap screws  
DIN EN ISO 4762  
M12x30.



Direction of motion  
Embedded Non-Liquid  
Lubricant  
(selection)

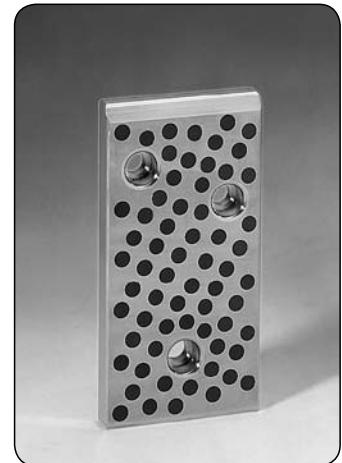
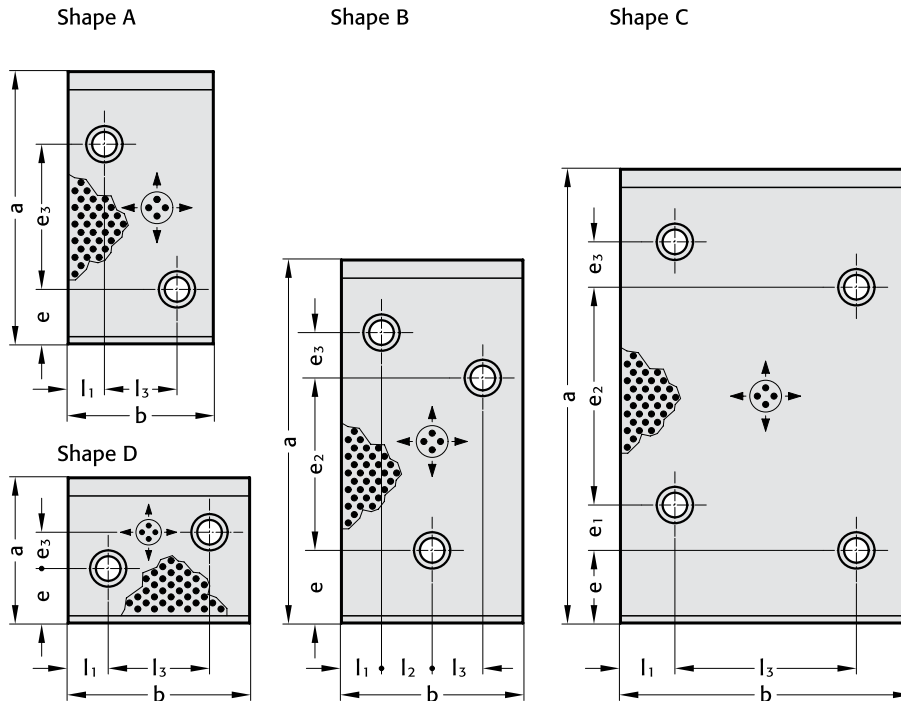
2962.85.

Order No	Shape	b	s	a	l <sub>1</sub>	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	Number of screw holes	d	d <sub>1</sub>	t
2962.85.050.20.0240	A	50	20	240	25	50	140	–	–	2	20	13,5	13
0300	B	50	20	300	25	50	100	–	–	3	20	13,5	13
0350	B	50	20	350	25	50	125	–	–	3	20	13,5	13
2962.85.080.20.0300	B	80	20	300	40	50	100	–	–	3	20	13,5	13
0350	B	80	20	350	40	50	125	–	–	3	20	13,5	13
0400	B	80	20	400	40	50	150	–	–	3	20	13,5	13
0450	L	80	20	450	40	50	115	–	120	4	20	13,5	13
0500	L	80	20	500	40	50	135	–	130	4	20	13,5	13
2962.85.125.20.0400	D	125	20	400	25	50	150	37,5	–	5	20	13,5	13
0450	H	125	20	450	25	50	115	37,5	120	6	20	13,5	13
0500	H	125	20	500	25	50	135	37,5	130	6	20	13,5	13

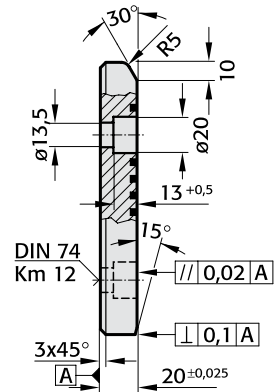
Ordering Code (example):

Sliding Pad = 2962.85.  
b = 125 mm = 125.  
s = 20 mm = 020.  
a = 400 mm = 0400  
Order No = 2962.85.125.020.0400

2960.79.



2960.79.



2960.79.

Order No	Shape	b	a	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	Number of screw holes
2960.79.050.100	A	50	100	25	-	-	30	-	-	30	2
150	A	50	150	25	-	-	30	-	-	80	2
200	A	50	200	25	-	-	40	-	-	120	2
2960.79.080.100	A	80	100	20	-	40	30	-	-	30	2
150	A	80	150	20	-	40	30	-	-	80	2
200	A	80	200	20	-	40	40	-	-	120	2
250	A	80	250	20	-	40	40	-	-	170	2
315	B	80	315	20	20	20	40	-	210	25	3
2960.79.100.050	D	100	50	22	-	56	14	-	-	13	2
080	D	100	80	22	-	56	30	-	-	20	2
100	A	100	100	22	-	56	30	-	-	30	2
150	A	100	150	22	-	56	30	-	-	80	2
200	B	100	200	22	28	28	40	-	95	25	3
250	B	100	250	22	28	28	40	-	145	25	3
315	B	100	315	22	28	28	40	-	210	25	3
2960.79.125.080	D	125	80	25	-	75	30	-	-	20	2
100	A	125	100	25	-	75	30	-	-	30	2
150	A	125	150	25	-	75	30	-	-	80	2
200	B	125	200	25	37	38	40	-	95	25	3
250	B	125	250	25	37	38	40	-	145	25	3
315	C	125	315	25	-	75	40	25	185	25	4
2960.79.160.100	A	160	100	30	-	100	30	-	-	30	2
150	A	160	150	30	-	100	30	-	-	80	2
200	B	160	200	30	50	50	40	-	95	25	3
250	C	160	250	30	-	100	40	25	120	25	4
315	C	160	315	30	-	100	40	25	185	25	4

**Ordering Code (example):**

Sliding Pad	=	2960.79.
b = 160 mm	=	160.
a = 315 mm	=	315
Order No	=	2960.79.160.315

**Description:**

Sliding pads find preference in large press tools with considerable lateral work forces.

Bronze pads with embedded non-liquid lubricant ensure low maintenance, self-lubricating service even in arduous multi-shift applications.

**Material:**

Bronze with non-liquid lubricant, oilless lubricating.

**Execution:**

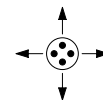
Sliding faces are ground.

**Note:**

Screws not included.

**Fixing:**

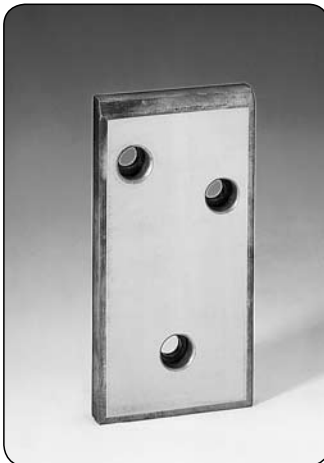
Use socket cap screws  
DIN EN ISO 4762 M12 x 30.



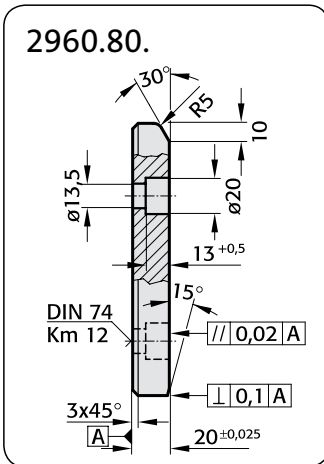
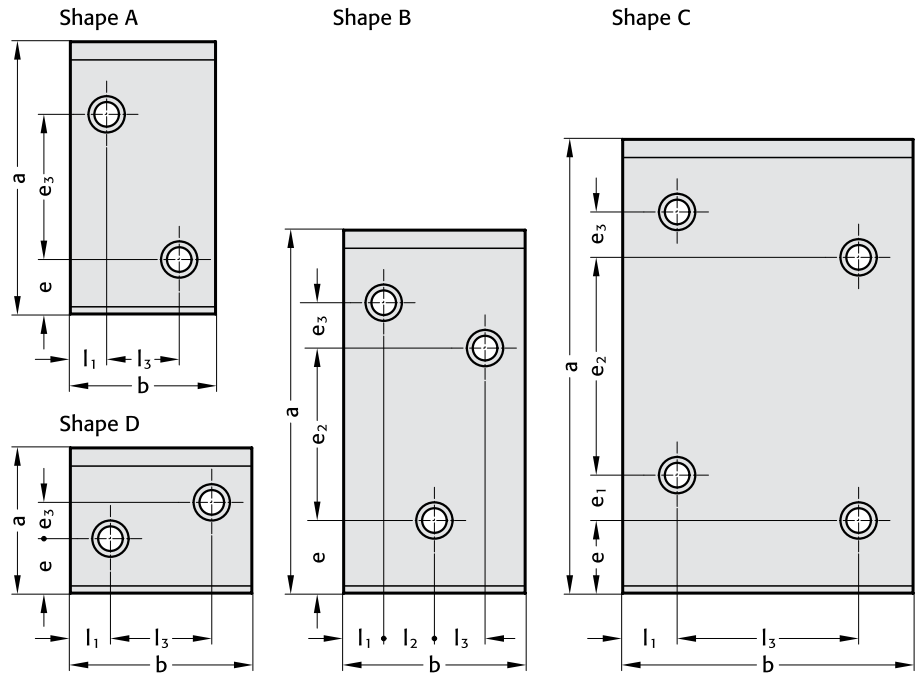
Direction of motion  
Embedded non-liquid lubricant (section)

Sliding Pads to NAAMS Steel

2960.80.



2960.80.



Description:

Sliding pads find preference in large press tools with considerable lateral work forces.

Material:

Steel, surface hardened

Note:

Screws not included.

Fixing:

Use socket cap screws  
DIN EN ISO 4762 M12x30.

2960.80.

Order No	Shape	b	a	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	Number of screw holes
2960.80.050.100	A	50	100	25	-	-	30	-	-	30	2
150	A	50	150	25	-	-	30	-	-	80	2
200	A	50	200	25	-	-	40	-	-	120	2
2960.80.080.100	A	80	100	20	-	40	30	-	-	30	2
150	A	80	150	20	-	40	30	-	-	80	2
200	A	80	200	20	-	40	40	-	-	120	2
250	A	80	250	20	-	40	40	-	-	170	2
315	B	80	315	20	20	20	40	-	210	25	3
2960.80.100.050	D	100	50	22	-	56	14	-	-	13	2
080	D	100	80	22	-	56	30	-	-	20	2
100	A	100	100	22	-	56	30	-	-	30	2
150	A	100	150	22	-	56	30	-	-	80	2
200	B	100	200	22	28	28	40	-	95	25	3
250	B	100	250	22	28	28	40	-	145	25	3
315	B	100	315	22	28	28	40	-	210	25	3
2960.80.125.080	D	125	80	25	-	75	30	-	-	20	2
100	A	125	100	25	-	75	30	-	-	30	2
150	A	125	150	25	-	75	30	-	-	80	2
200	B	125	200	25	37	38	40	-	95	25	3
250	B	125	250	25	37	38	40	-	145	25	3
315	C	125	315	25	-	75	40	25	185	25	4
2960.80.160.100	A	160	100	30	-	100	30	-	-	30	2
150	A	160	150	30	-	100	30	-	-	80	2
200	B	160	200	30	50	50	40	-	95	25	3
250	C	160	250	30	-	100	40	25	120	25	4
315	C	160	315	30	-	100	40	25	185	25	4

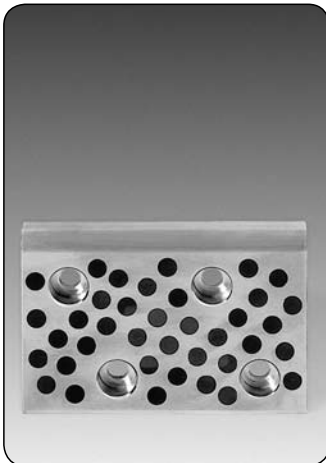
Ordering Code (example):

Sliding Pad = 2960.80.  
 b = 160 mm = 160.  
 a = 315 mm = 315  
 Order No = 2960.80.160.315

A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.

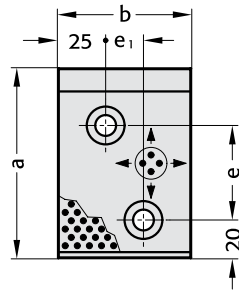
Sliding Pads AFNOR/ISO 9183-2  
Bronze with Non-Liquid Lubricant

2960.74.

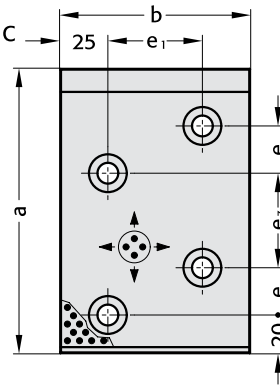


2960.74.

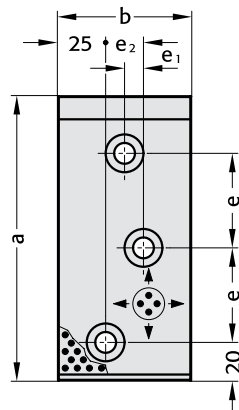
Shape A



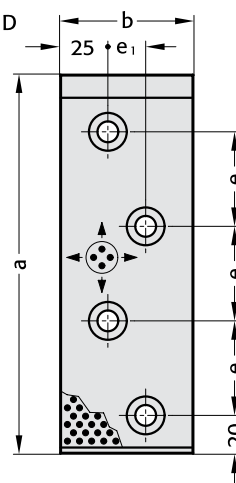
Shape C



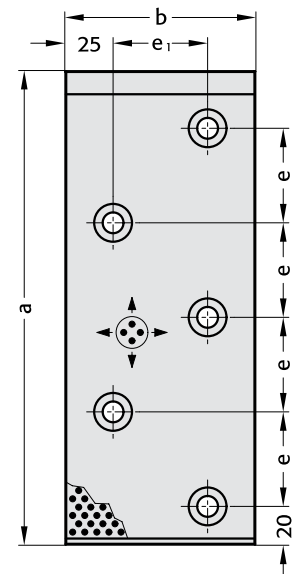
Shape B



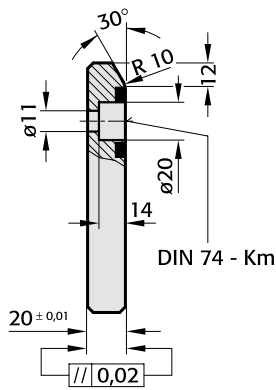
Shape D



Shape E



2960.74.



Description:

Sliding pads find preference in large press tools with considerable lateral work forces. Bronze with integral solid lubricant guarantees low maintenance, even if the plates are in continuous use.

Material:

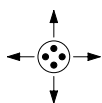
Bronze with non-liquid lubricant, oilless lubricating.

Note:

Screws not included.

Fixing:

Use socket cap screws  
DIN EN ISO 4762 M 10x25.



Direction of motion  
Embedded non-liquid lubricant  
(section)

2960.74.

Order No	Shape	b	a	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	Number of screw holes
2960.74.070.100	A	70	100	50	20	-	-	2
150	B	70	150		10	20	-	3
200	D	70	200		20	-	-	4
2960.74.100.150	C	100	150	25	50	-	50	4
200	D	100	200	50	50	-	-	4
250	E	100	250		50	-	-	5
2960.74.150.200	D	150	200		100	-	-	4
250	E	150	250		100	-	-	5

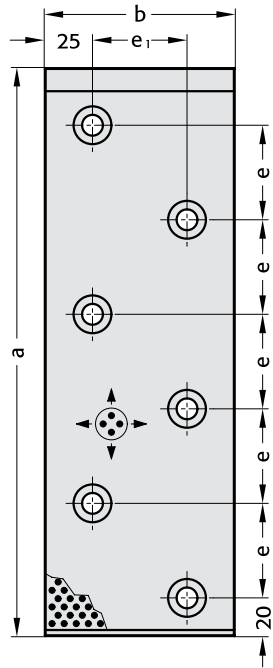
Ordering Code (example):

Sliding Pad = 2960.74.  
 b = 100 mm = 100.  
 a = 200 mm = 200  
 Order No = 2960.74.100.200

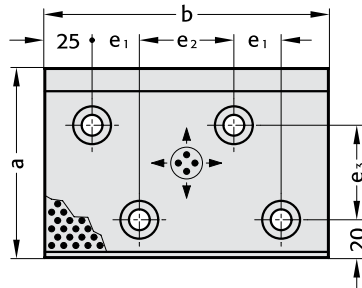


2960.74.

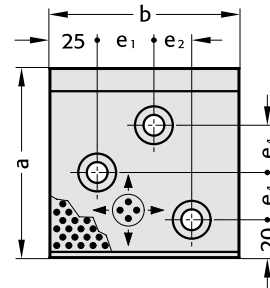
Shape F



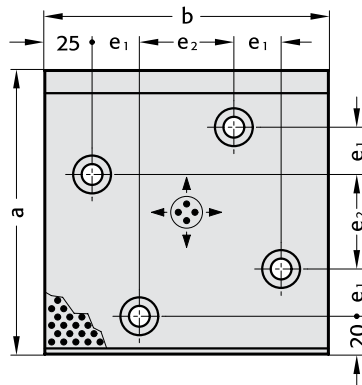
Shape G



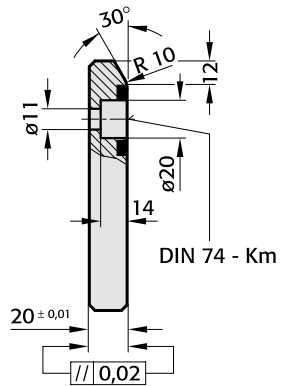
Shape I



Shape H



2960.74.



2960.74.

Order No	Shape	b	a	e <sub>1</sub>	e <sub>4</sub>	e	e <sub>3</sub>	e <sub>2</sub>	Number of screw holes
2960.74.100.100	I	100	100	30	25	—	—	20	3
300	F	100	300	50	—	50	—	—	6
2960.74.150.100	G	150	100	25	—	—	50	50	4
150	H	150	150	25	—	—	—	50	4
300	F	150	300	100	—	50	—	—	6
2960.74.200.100	G	200	100	50	—	—	50	50	4

**Description:**

Sliding pads find preference in large press tools with considerable lateral work forces.

Bronze with integral solid lubricant guarantees low maintenance, even if the plates are in continuous use.

**Material:**

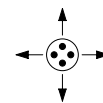
Bronze with non-liquid lubricant, oilless lubricating.

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws  
DIN EN ISO 4762 M 10x25.



Direction of motion  
Embedded non-liquid lubricant (section)

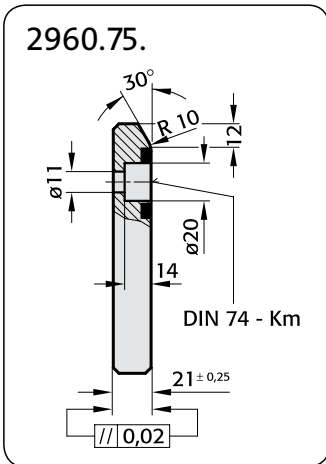
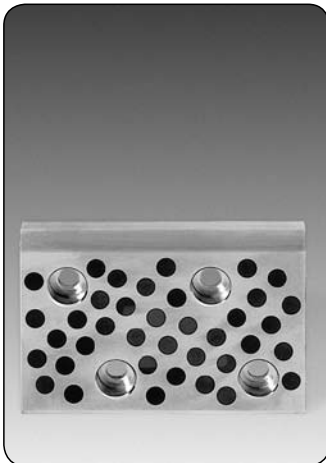
**Ordering Code (example):**

Sliding Pad = 2960.74.  
b = 150 mm = 150.  
a = 100 mm = 100  
Order No = 2960.74.150.100

Sliding Pads AFNOR/ISO 9183-2  
Special cast iron (GG25)  
with Non-Liquid Lubricant

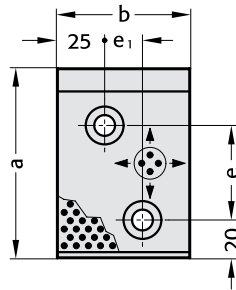
FIBRO

2960.75.

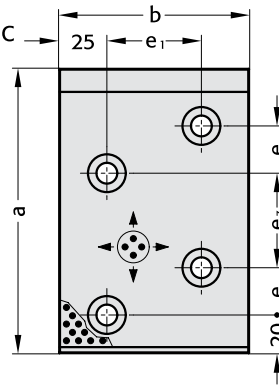


2960.75.

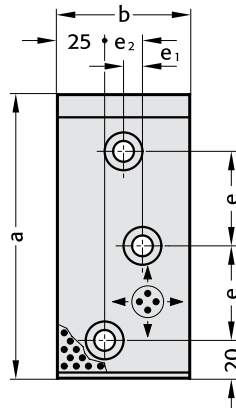
Shape A



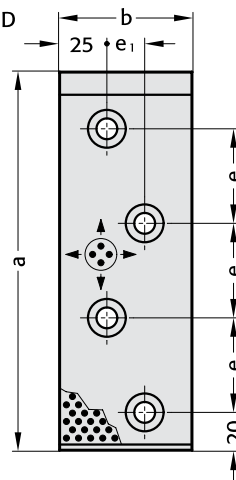
Shape C



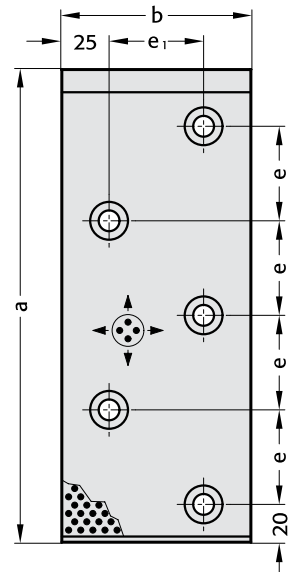
Shape B



Shape D



Shape E



Description:

Sliding pads find preference in large press tools with considerable lateral work forces.

Special cast iron with solid lubricant is a low-cost alternative, although absorption of the surface pressure is reduced by 60%.

Material:

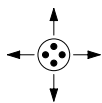
Special cast iron (GG25) with non-liquid lubricant.

Note:

Screws not included.

Fixing:

Use socket cap screws  
DIN EN ISO 4762 M10 x 25.



Direction of motion  
Embedded non-liquid  
lubricant (section)

2960.75.

Order No	Shape	b	a	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	Number of holes
2960.75.070.100	A	70	100	50	20	—	—	2
150	B	70	150		10	20	—	3
200	D	70	200		20	—	—	4
2960.75.100.150	C	100	150	25	50	—	50	4
200	D	100	200	50	50	—	—	4
250	E	100	250		50	—	—	5
2960.75.150.200	D	150	200		100	—	—	4
250	E	150	250		100	—	—	5

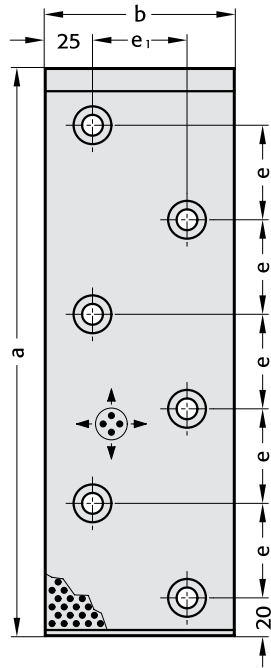
Ordering Code (example):

Sliding Pad = 2960.75.  
b = 100 mm = 100.  
a = 200 mm = 200  
Order No = 2960.75.100.200

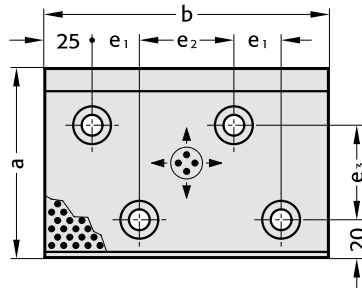
2960.75.

2960.75.

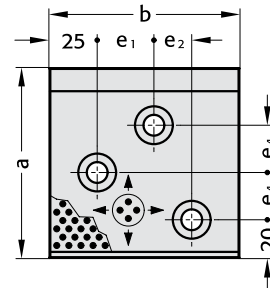
Shape F



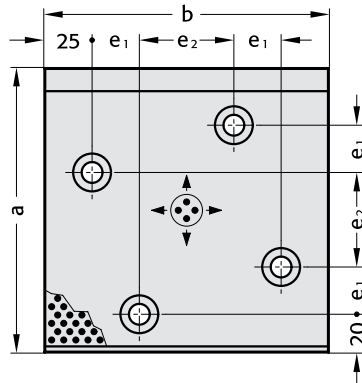
Shape G



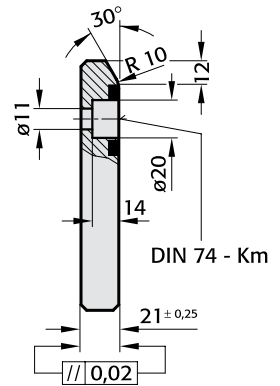
Shape I



Shape H



2960.75.



2960.75.

Order No	Shape	b	a	e <sub>1</sub>	e <sub>4</sub>	e	e <sub>3</sub>	e <sub>2</sub>	Number of holes
2960.75.100.100	I	100	100	30	25	—	—	20	3
300	F	100	300	50	—	50	—	—	6
2960.75.150.100	G	150	100	25	—	—	50	50	4
150	H	150	150	25	—	—	—	50	4
300	F	150	300	100	—	50	—	—	6
2960.75.200.100	G	200	100	50	—	—	50	50	4

**Description:**

Sliding pads find preference in large press tools with considerable lateral work forces. Special cast iron with solid lubricant is a low-cost alternative, although absorption of the surface pressure is reduced by 60%.

**Material:**

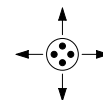
Special cast iron (GG25) with non-liquid lubricant.

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws  
DIN EN ISO 4762 M 10x25.



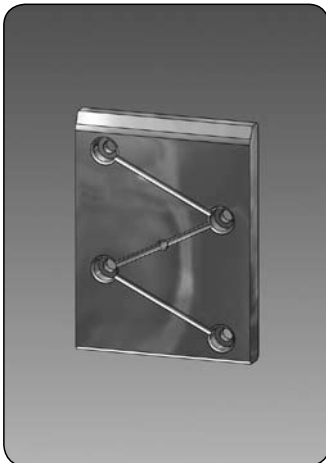
Direction of motion  
Embedded non-liquid  
lubricant (section)

**Ordering Code (example):**

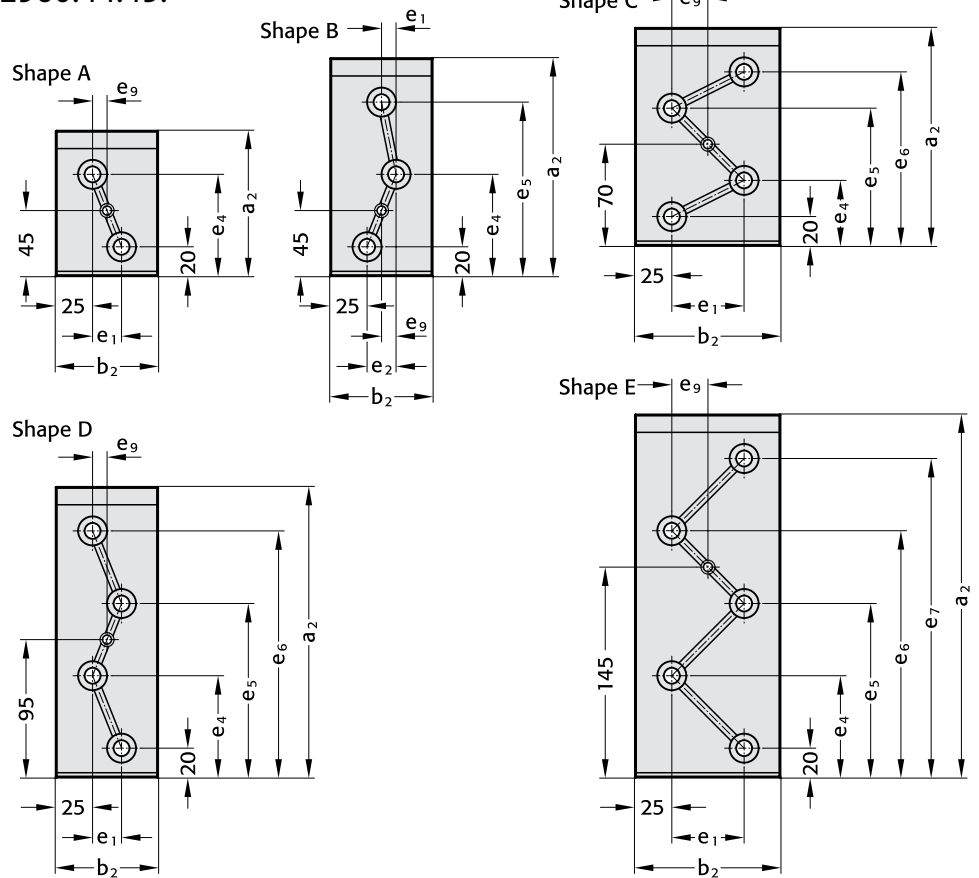
Sliding Pad = 2960.75.  
b = 150 mm = 150.  
a = 100 mm = 100  
Order No = 2960.75.150.100

Sliding Pads to CNOMO  
Steel with oil lubricating grooves

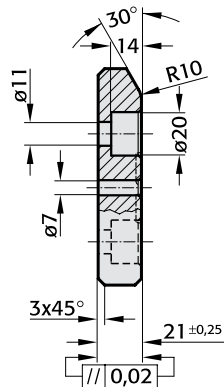
2960.44.45.



2960.44.45.



2960.44.45.



Description:

Sliding pads find preference in large press tools with considerable lateral work forces.

Material:

Steel, surface hardened

Note:

Screws not included.

Fixing:

Use socket cap screws  
DIN EN ISO 4762  
M10 x 25.

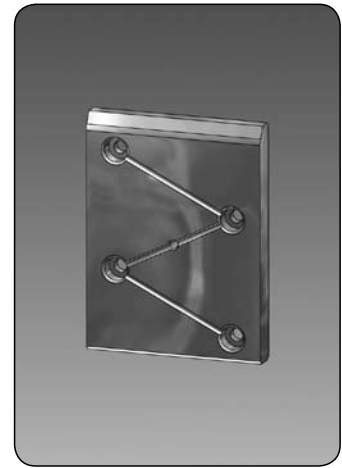
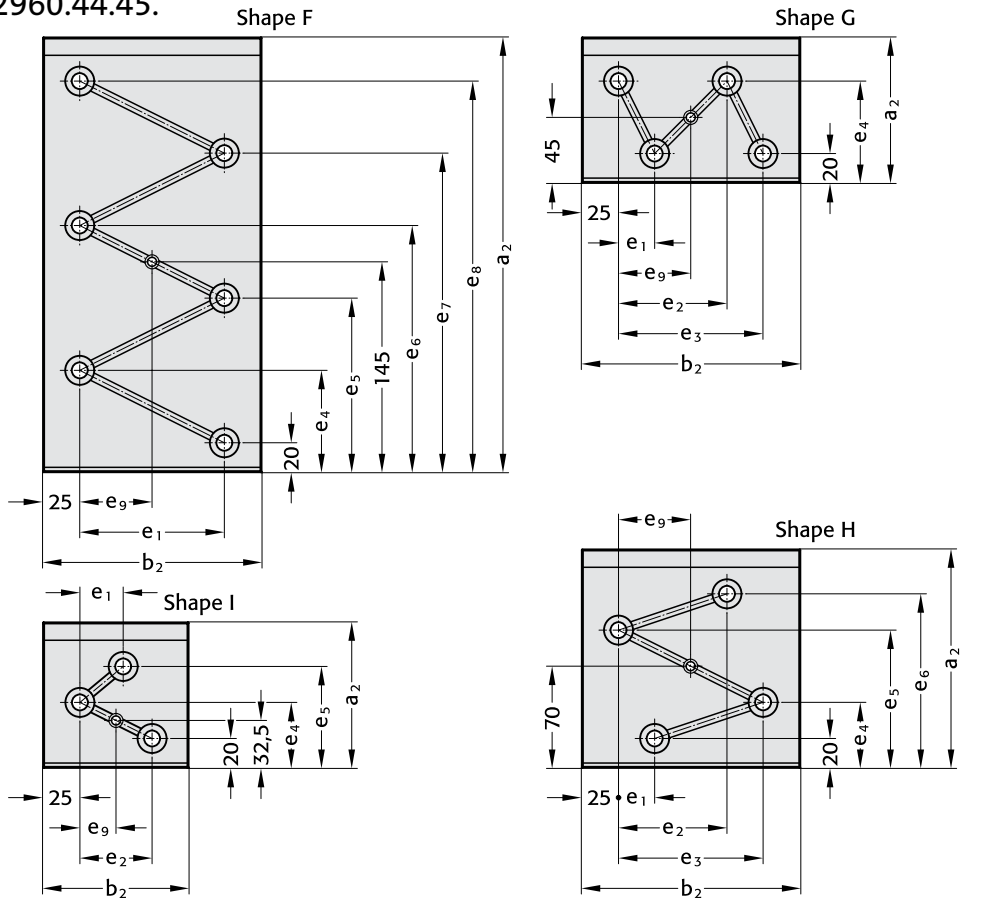
2960.44.45.

Order No	Shape	b <sub>2</sub>	a <sub>2</sub>	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	e <sub>4</sub>	e <sub>5</sub>	e <sub>6</sub>	e <sub>7</sub>	e <sub>8</sub>	e <sub>9</sub>	Number of screw holes
2960.44.45.070.100	A	70	100	20	-	-	70	-	-	-	-	10	2
2960.44.45.070.150	B	70	150	10	20	-	70	120	-	-	-	10	3
2960.44.45.070.200	D	70	200	20	-	-	70	120	170	-	-	10	4
2960.44.45.100.150	C	100	150	50	-	-	45	95	120	-	-	25	4
2960.44.45.100.200	D	100	200	50	-	-	70	120	170	-	-	25	4
2960.44.45.100.250	E	100	250	50	-	-	70	120	170	220	-	25	5
2960.44.45.150.200	D	150	200	100	-	-	70	120	170	-	-	50	4
2960.44.45.150.250	E	150	250	100	-	-	70	120	170	220	-	50	5

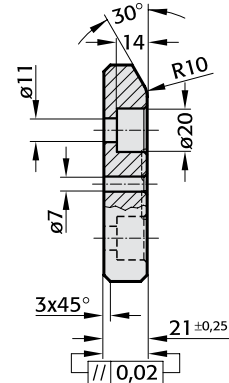
Ordering Code (example):

Sliding Pad = 2960.44.45.  
b<sub>2</sub> = 70 mm = 070.  
a<sub>2</sub> = 200 mm = 200  
Order No = 2960.44.45.070.200

2960.44.45.



2960.44.45.



2960.44.45.

Order No	Shape	b <sub>2</sub>	a <sub>2</sub>	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	e <sub>4</sub>	e <sub>5</sub>	e <sub>6</sub>	e <sub>7</sub>	e <sub>8</sub>	e <sub>9</sub>	Number of screw holes
2960.44.45.100.100	I	100	100	30	50	-	45	70	-	-	-	25	3
2960.44.45.100.300	F	100	300	50	-	-	70	120	170	220	270	25	6
2960.44.45.150.100	G	150	100	25	75	100	70	-	-	-	-	50	4
2960.44.45.150.150	H	150	150	25	75	100	45	95	120	-	-	50	4
2960.44.45.150.300	F	150	300	100	-	-	70	120	170	220	270	50	6
2960.44.45.200.100	G	200	100	50	100	150	70	-	-	-	-	75	4

**Description:**

Sliding pads find preference in large press tools with considerable lateral work forces.

**Material:**

Steel, surface hardened

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws  
DIN EN ISO 4762  
M10 x 25.

**Ordering Code (example):**

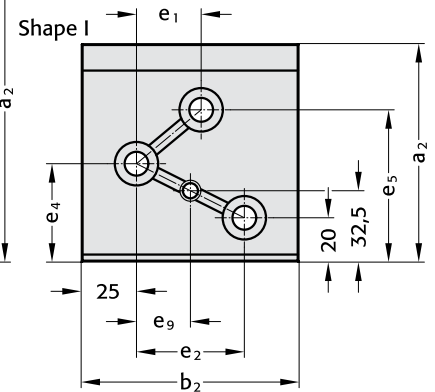
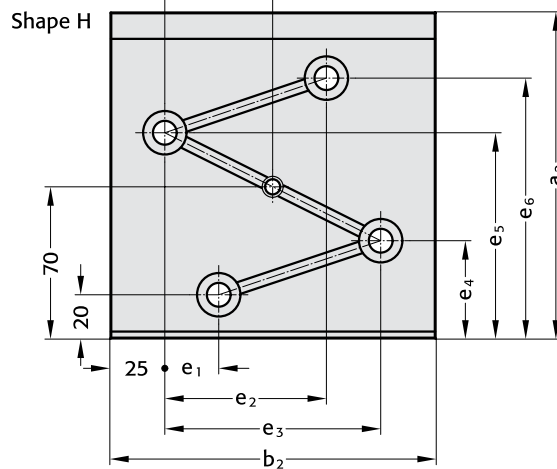
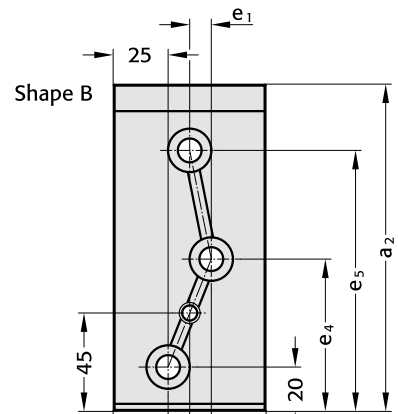
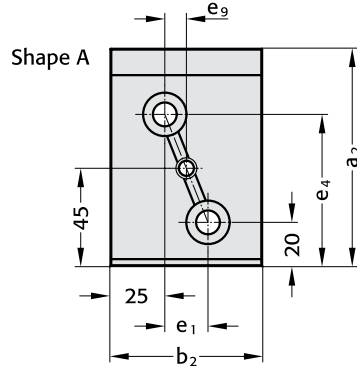
Sliding Pad = 2960.44.45.  
b<sub>2</sub> = 100 mm = 100.  
a<sub>2</sub> = 300 mm = 300  
Order No = 2960.44.45.100.300

Sliding Pads to CNOMO  
Bronze with oil lubricating grooves

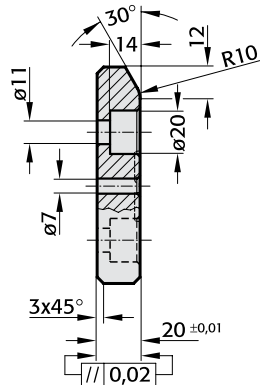
2960.54.45.



2960.54.45.



2960.54.45.



**Description:**

Sliding pads find preference in large press tools with considerable lateral work forces.

**Material:**

Bronze.

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws  
DIN EN ISO 4762  
M10 x 25.

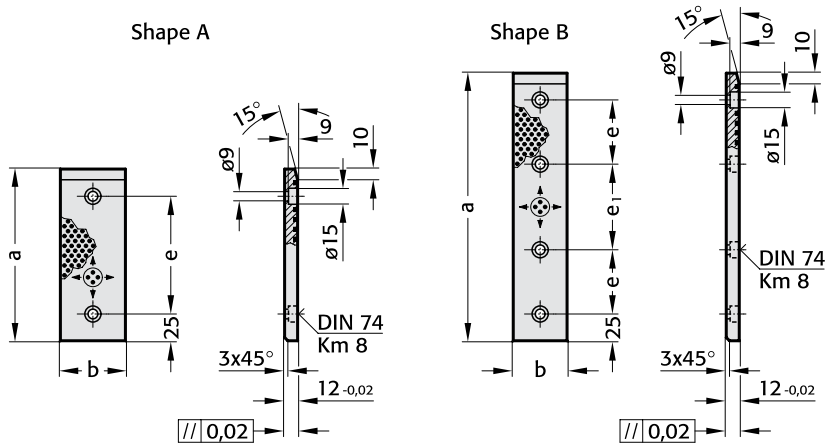
2960.54.45.

Order No.	Shape	b <sub>2</sub>	a <sub>2</sub>	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	e <sub>4</sub>	e <sub>5</sub>	e <sub>6</sub>	e <sub>9</sub>	Number of screw holes
2960.54.45.070.100	A	70	100	20	—	—	70	—	—	10	2
.150	B	150	10	20	—	—	70	120	—	10	3
2960.54.45.100.100	I	100	100	30	50	—	45	70	—	25	3
2960.54.45.150.150	H	150	150	25	75	100	45	95	120	50	4

**Ordering Code (example):**

Sliding pad = 2960.54.45.  
b<sub>2</sub> = 70 mm = 070.  
a<sub>2</sub> = 100 mm = 100  
Order No = 2960.54.45.070.100

2960.81.



2960.81.

Order No	Shape	b	a	e	e <sub>1</sub>	Number of screw holes
2960.81.030.080	A	30	80	30	—	2
100			100	50	—	2
125			125	75	—	2
160			160	110	—	2
200			200	150	—	2
225			225	175	—	2
250	B		250	60	80	4
260			260	60	90	4
280			280	60	110	4
300			300	80	90	4
320			320	80	110	4
2960.81.040.080	A	40	80	30	—	2
100			100	50	—	2
125			125	75	—	2
160			160	110	—	2
200			200	150	—	2
2960.81.050.080		50	80	30	—	2
100			100	50	—	2
125			125	75	—	2
160			160	110	—	2
200			200	150	—	2
225			225	175	—	2
250	B	50	250	60	80	4
300			300	80	90	4
350			350	100	100	4
400			400	120	110	4
2960.81.060.080	A	60	80	30	—	2
100			100	50	—	2
125			125	75	—	2
160			160	110	—	2
200			200	150	—	2
225			225	175	—	2
240	B		240	60	70	4
250			250	60	80	4
260			260	60	90	4
280			280	60	110	4
2960.81.080.080	A	80	80	30	—	2
100			100	50	—	2
125			125	75	—	2
160			160	110	—	2
200			200	150	—	2
225			225	175	—	2
240	B		240	60	70	4
250			250	60	80	4
260			260	60	90	4
280			280	60	110	4
2960.81.100.240		100	240	60	70	4
260			260	60	90	4
280			280	60	110	4

**Description:**

Guide pads find preference in large press tools with considerable lateral work forces. Bronze pads with embedded non-liquid lubricant ensure low maintenance, self lubricating service even in arduous multi-shift applications.

**Material:**

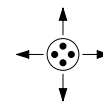
Bronze with non-liquid lubricant, oilless lubricating.

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws  
DIN EN ISO 4762 M8x25.



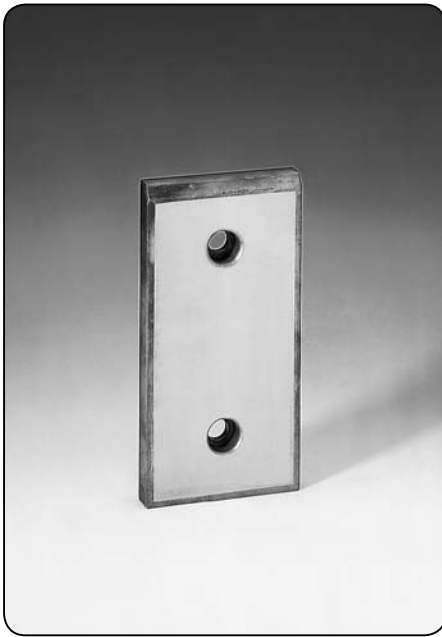
Direction of motion  
Embedded non-liquid lubricant (section)

**Ordering Code (example):**

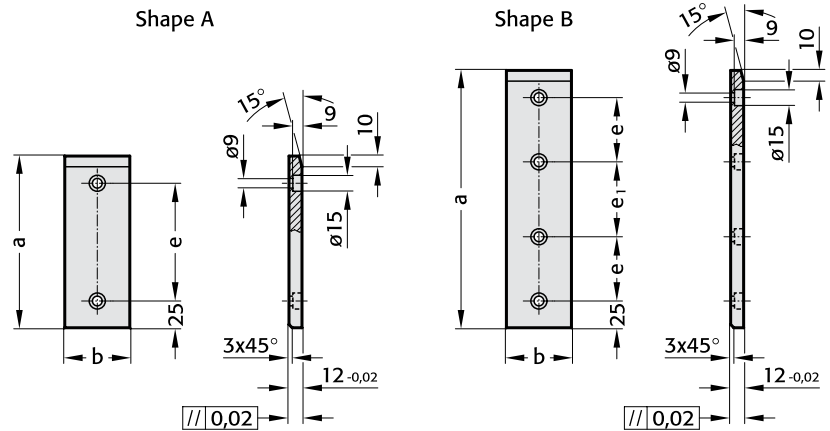
Sliding Pad	=	2960.81.
b = 30 mm	=	030.
a = 80 mm	=	080
Order No	=	2960.81.030.080

Sliding Pads, VDI 3357  
Steel

2960.88.



2960.88.



**Description:**

Sliding pads find preference in large press tools with considerable lateral work forces.

**Material:**

Steel,  
surface hardened

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws  
DIN EN ISO 4762 M8x25.

2960.88.

Order No	Shape	b	a	e	e <sub>1</sub>	Number of screw holes
2960.88.030.080	A	30	80	30	—	2
100			100	50	—	2
125			125	75	—	2
160			160	110	—	2
200			200	150	—	2
2960.88.040.080		40	80	30	—	2
100			100	50	—	2
125			125	75	—	2
160			160	110	—	2
200			200	150	—	2
2960.88.050.080		50	80	30	—	2
100			100	50	—	2
125			125	75	—	2
160			160	110	—	2
180			180	130	—	2
200			200	150	—	2
2960.88.060.080	A	60	80	30	—	2
100			100	50	—	2
125			125	75	—	2
160			160	110	—	2
200			200	150	—	2
225			225	175	—	2
240	B		240	60	70	4
250			250	60	80	4
260			260	60	90	4
280			280	60	110	4
2960.88.080.080	A	80	80	30	—	2
100			100	50	—	2
125			125	75	—	2
160			160	110	—	2
200			200	150	—	2
225			225	175	—	2
240	B		240	60	70	4
250			250	60	80	4
260			260	60	90	4
280			280	60	110	4
300			300	80	90	4
320			320	80	110	4
340			340	80	130	4
350			350	100	100	4
2960.88.100.080	A		80	30	—	2
100			100	50	—	2
125			125	75	—	2
160			160	110	—	2
200			200	150	—	2
225			225	175	—	2
240	B		240	60	70	4
250			250	60	80	4
260			260	60	90	4
280			280	60	110	4
300			300	80	90	4
320			320	80	110	4
340			340	80	130	4
350			350	100	100	4
2960.88.100.250		100	250	60	80	4
280			280	60	110	4
300			300	80	90	4
320			320	80	110	4
340			340	80	130	4
350			350	100	100	4

**Ordering Code (example):**

Sliding Pad	=	2960.88.
b = 30 mm	=	030.
a = 80 mm	=	080
Order No	=	2960.88.030.080

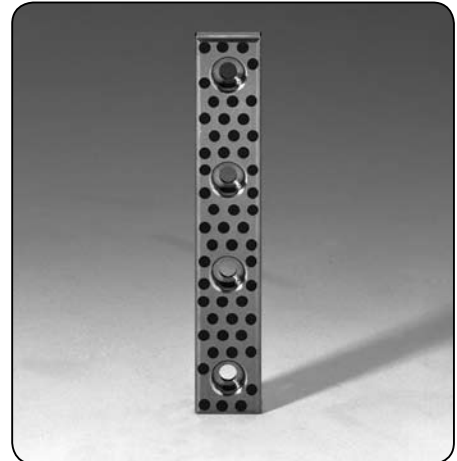
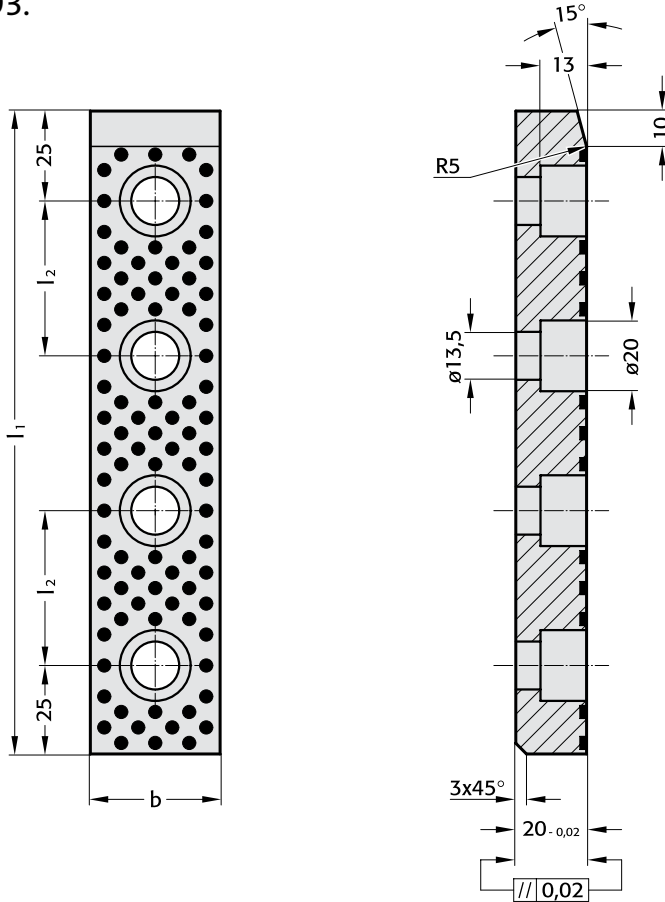


# FIBRO

2960.93.

## Sliding Pads, VDI 3357 Bronze with Non-Liquid Lubricant

2960.93.



2960.93.

Order No	b	l <sub>1</sub>	l <sub>2</sub>	Number of screw holes
2960.93.050.250	50	250	60	4
300		300	80	
350		350	100	
400		400	120	
450		450	140	
500		500	150	
2960.93.080.250	80	250	60	
300		300	80	
350		350	100	
400		400	120	
450		450	140	
500		500	150	
2960.93.100.450	100	450	140	
500		500	150	
2960.93.125.450	125	450	140	
500		500	150	

### Ordering Code (example):

Sliding Pad	=	2960.93.
b = 50 mm	=	050.
l <sub>1</sub> = 250 mm	=	250
Order no	=	2960.93.050.250

### Description:

Sliding pads find preference in large press tools with considerable lateral work forces.

Bronze with integral solid lubricant guarantees low maintenance, even if the plates are in continuous use.

### Material:

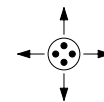
Bronze with non-liquid lubricant, oilless lubricating.

### Note:

Screws not included.

### Fixing:

Use socket cap screws  
DIN EN ISO 4762 M 12x25.

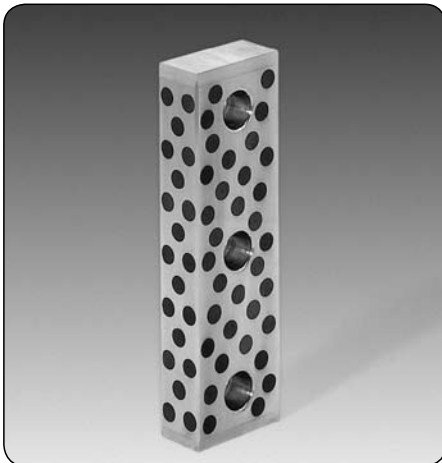


Direction of motion  
Embedded non-liquid lubricant (section)

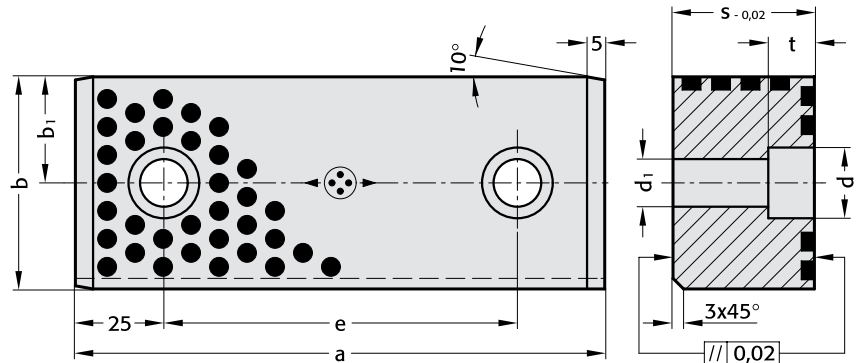
Guide Bars, VDI 3357  
with two Sliding Surfaces  
Bronze with Non-Liquid Lubricant

FIBRO

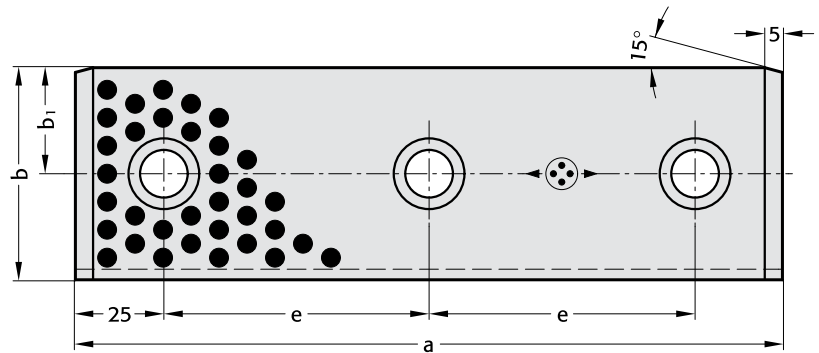
2962.75.



2962.75.  
Shape A



Shape B



**Material:**

Bronze with Non-Liquid Lubricant,  
oilless lubricating.

**Fixing:**

Use socket cap screws DIN EN ISO 4762  
M 8x20  
M10x25  
M12x35  
M12x45



Direction of Motion  
Embedded non-liquid lubricant  
(section)

2962.75.

Order No	Shape	a	b	s	b <sub>1</sub>	e	d	d <sub>1</sub>	t	Number of screw holes
2962.75.025.012.0110	A	110	25	12	12,5	60	15	9	8,5	2
0120		120				70				
2962.75.025.015.0110	A	110	25	15	12,5	60	18	11	10,5	2
0120		120				70				
2962.75.060.030.0125	A	125	60	30	30	75	20	13,5	13	2
0150		150				100				
0160		160				110				
0200	B	200				75				3
2962.75.060.040.0125	A	125	60	40	30	75	20	13,5	13	2
0150		150				100				
0160		160				110				
0200	B	200				75				3

**Ordering Code (example):**

Guide Bar = 2962.75.  
b = 60 mm = 060.  
s = 30 mm = 030.  
a = 200 mm = 0200  
Order No = 2962.75.060.030.0200

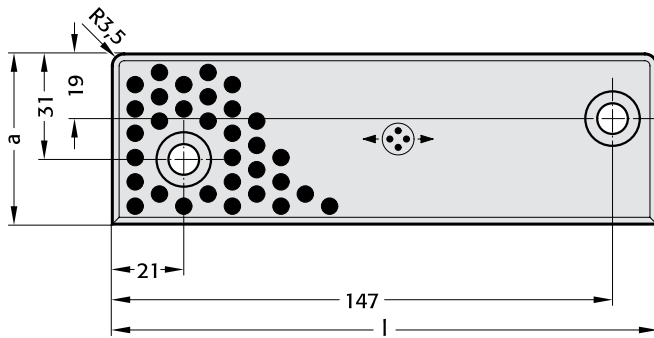
**FIBRO**

**Guide Bars with two Sliding Surfaces  
Bronze with Non-Liquid Lubricant  
to CNOMO**

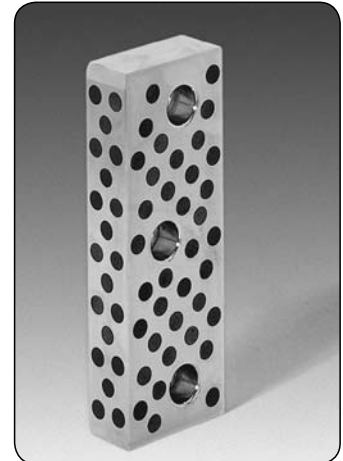
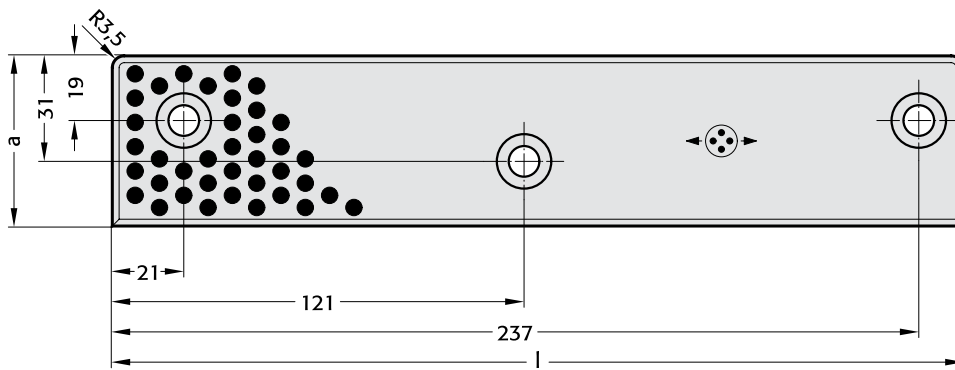
2962.75.45.

2962.75.45.

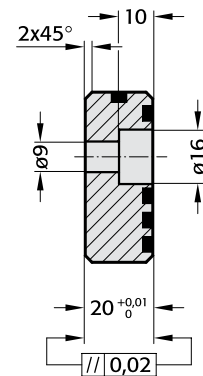
Shape A



Shape B



2962.75.45.



2962.75.45.

Order No	Shape	a	l	Number of screw holes
2962.75.45.050.20.160	A	50	160	2
2962.75.45.050.20.250	B	50	250	3

**Material:**

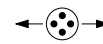
Bronze with Non-Liquid Lubricant, oilless lubricating.

**Note:**

Screws not included.

**Fixing:**

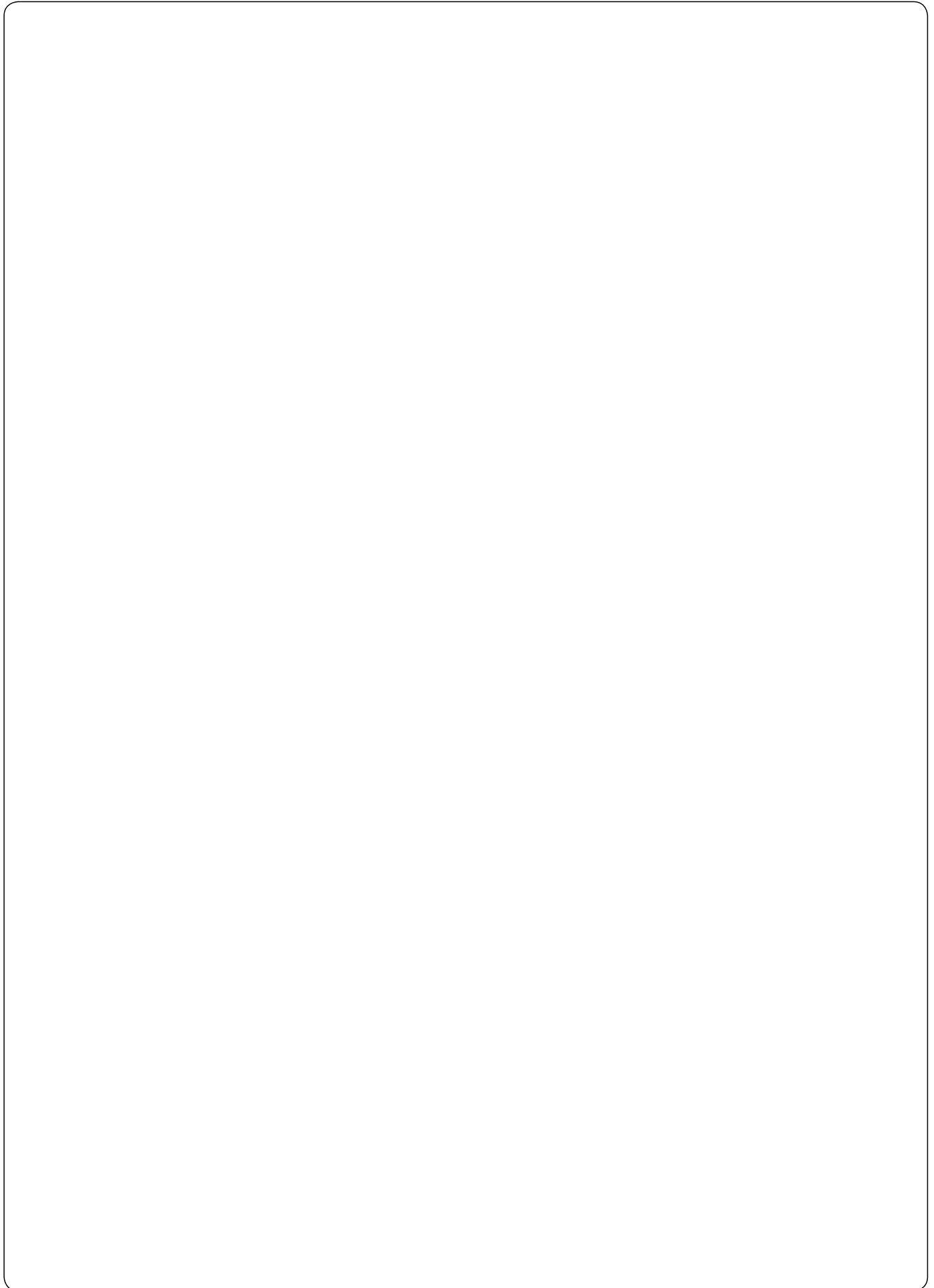
Use socket cap screws  
DIN EN ISO 4762  
M8x25.



Direction of motion  
Embedded non-liquid lubricant  
(section)

**Ordering Code (example):**

Guide Bar	=	2960.75.45.
a = 50 mm	=	050.
thickness = 20 mm	=	20.
l = 250 mm	=	250
Order No	=	2960.75.45.050.20.250

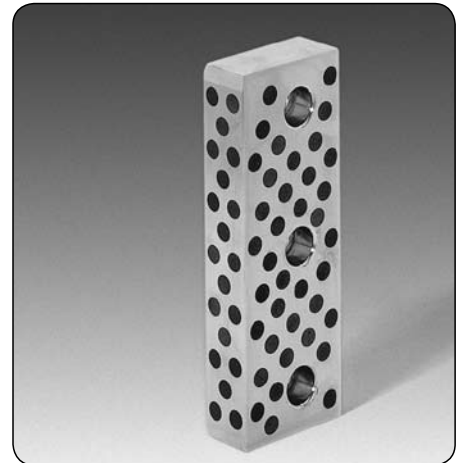
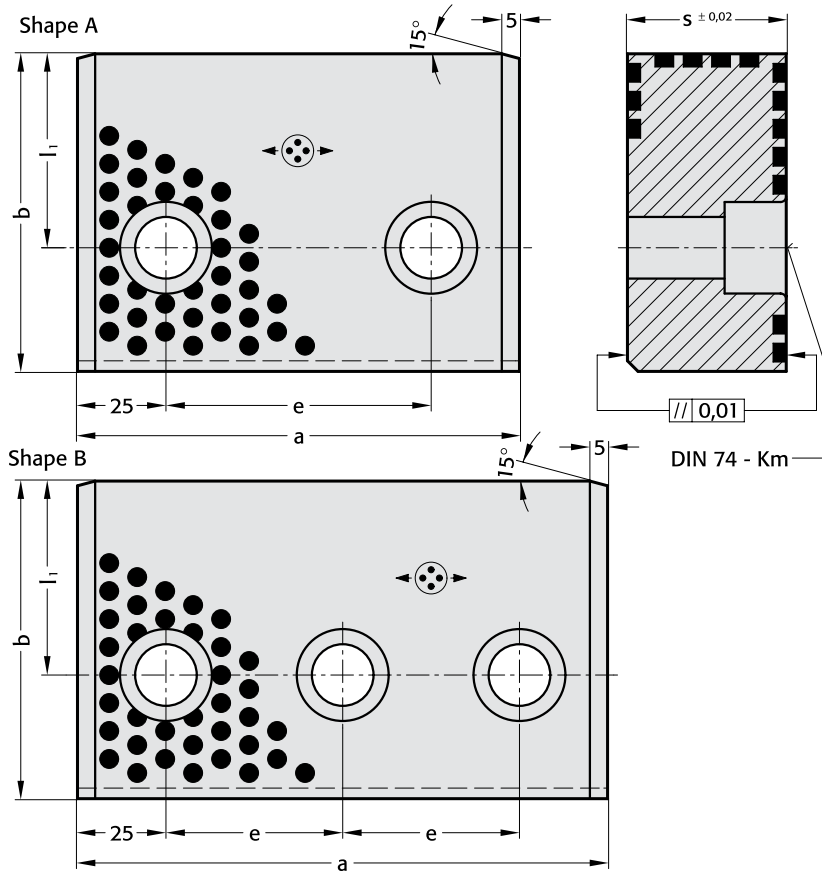


**FIBRO**

2962.76.

**Guide Bars with  
three Sliding Surfaces  
Bronze with Non-Liquid Lubricant**

2962.76.



**Material:**

Bronze with Non-Liquid Lubricant, oilless lubricating.

**Note:**

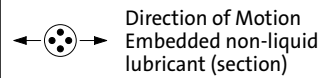
Screws not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762.

2962.76.070. M12

2962.76.090. M16



2962.76.

Order No	Shape	a	b	s	e	$l_1$	DIN 74 Km	Number of screw holes
2962.76.070.032.0125	A	125	70	32	75	40	12	2
0150	A	150	70	32	100	40	12	2
0200	B	200	70	32	75	40	12	3
2962.76.090.045.0125	A	125	90	45	75	55	16	2
0150	B	150	90	45	50	55	16	3
0200	B	200	90	45	75	55	16	3

**Ordering Code (example):**

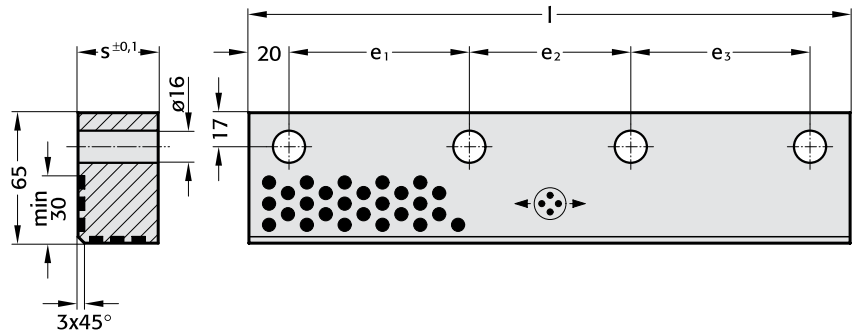
Guide Bar = 2962.76.  
 b = 70 mm = 070.  
 s = 32 mm = 032.  
 a = 200 mm = 0200  
 Order No = 2962.76.070.032.0200

Guide Bars with two Sliding Surfaces,  
Bronze with Non-Liquid Lubricant

2962.77.



2962.77.



**Material:**

Bronze with non-liquid lubricant, oilless lubricating.

**Note:**

Screws not included.



Direction of motion  
Embedded non-liquid lubricant  
(section)

2962.77.

Order No	b	s	l	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	Number of screw holes
2962.77.065.040.0150	65	40	150	110	—	—	2
0200			200	80	80	—	3
0250			250	105	105	—	3
0300			300	90	80	90	4
0350			350	105	100	105	4
2962.77.065.065.0150	65	65	150	110	—	—	2
0200			200	80	80	—	3
0250			250	105	105	—	3
0300			300	90	80	90	4
0350			350	105	100	105	4

**Ordering Code (example):**

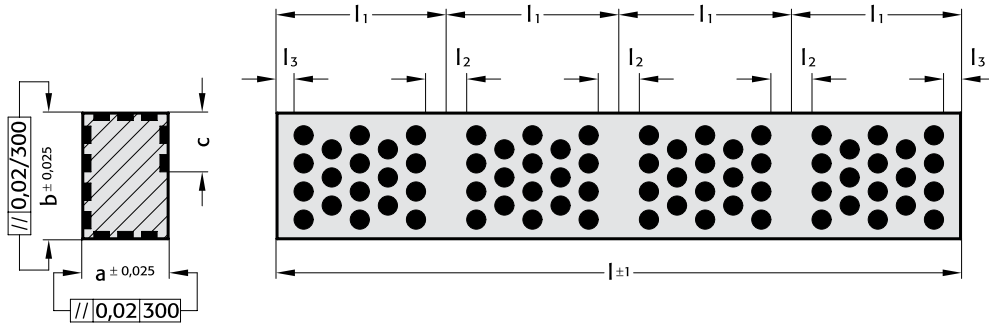
Guide Bar = 2962.77.  
 b = 65 mm = 065.  
 s = 40 mm = 040.  
 l = 250 mm = 0250  
 Order No = 2962.77.065.040.0250

**FIBRO**

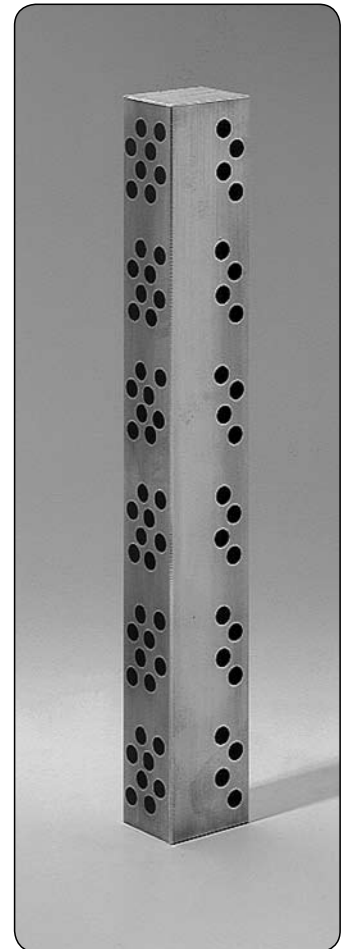
2962.74.

Guide Bars with  
four Sliding Surfaces  
Bronze with Non-Liquid Lubricant

2962.74.



Surfaces without Non-Liquid Lubricant: rotating



2962.74.

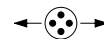
Order No	a	b	c	l	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>
2962.74.015.010.075	10,3	15,3	6	75	25	6	3
100				100			
125				125			
150				150			
175				175			
200				200			
225				225			
250				250			
275				275			
300				300			
2962.74.025.015.105	15,3	25,3	8	105	35	8	4
140				140			
175				175			
210				210			
245				245			
280				280			
315				315			
350				350			
385				385			
420				420			
455				455			
490				490			
2962.74.035.025.135	25,3	35,3	12	135	45	10	5
180				180			
225				225			
270				270			
315				315			
360				360			
405				405			
450				450			
495				495			
2962.74.045.035.165	35,3	45,3	16	165	55	12	6
220				220			
275				275			
330				330			
385				385			
440				440			
495				495			

Ordering Code (example):

Guide Bar = 2962.74.  
 b = 25,3 mm = 025.  
 a = 15,3 mm = 015.  
 l = 105 mm = 105  
 Order No = 2962.74.025.015.105

**Material:**

Bronze with Non-Liquid Lubricant, oilless lubricating.

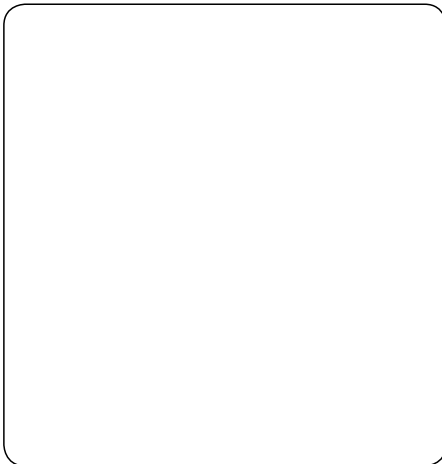


Direction of Motion  
Embedded non-liquid lubricant (section)

# Guide Bars with one Sliding Surface Bronze with Non-Liquid Lubricant

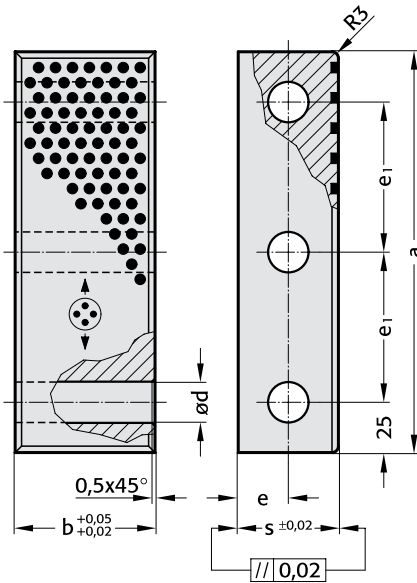
**FIBRO**

2962.79.

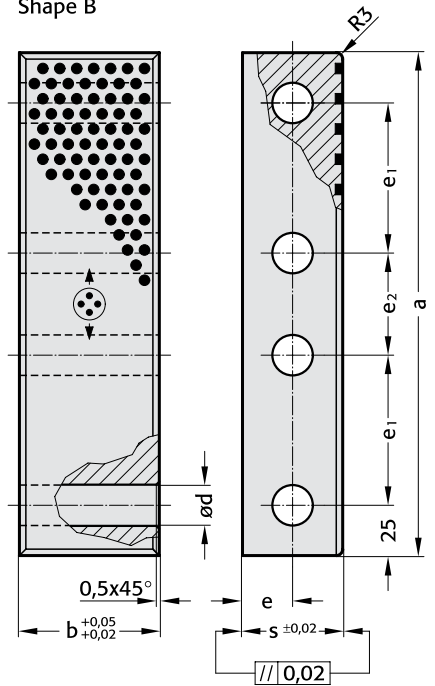


2962.79.

Shape A



Shape B



## Description:

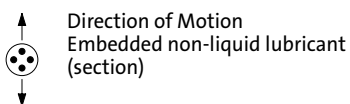
Guide bars find preference in large press tools with considerable lateral work forces. Bronze pads with embedded non-liquid lubricant ensure low maintenance, selflubricating service even in aduous multi-shift applications.

## Material:

Bronze with Non-Liquid Lubricant, oilless lubricating.

## Note:

Screws not included.



2962.79.

Order No	Shape	b	s	a	e	e <sub>1</sub>	e <sub>2</sub>	d	Number of screw holes
2962.79.030.040.150	A	30	40	150	20	50	–	14	3
200	A			200		75	–		3
250	B			250		75	50		4
2962.79.040.040.150	A	40	40	150	20	50	–	14	3
200	A			200		75	–		3
250	B			250		75	50		4
2962.79.045.050.150	A	45	50	150	25	50	–	18	3
200	A			200		75	–		3
250	B			250		75	50		4
2962.79.055.050.150	A	55	50	150	25	50	–	18	3
200	A			200		75	–		3
250	B			250		75	50		4
2962.79.060.050.150	A	60	50	150	25	50	–	18	3
200	A			200		75	–		3
250	B			250		75	50		4
2962.79.070.050.150	A	70	50	150	25	50	–	18	3
200	A			200		75	–		3
250	B			250		75	50		4

## Ordering Code (example):

Guide Bar = 2962.79.  
 b = 40 mm = 040.  
 s = 40 mm = 040.  
 a = 150 mm = 150  
 Order No = 2962.79.040.040.150

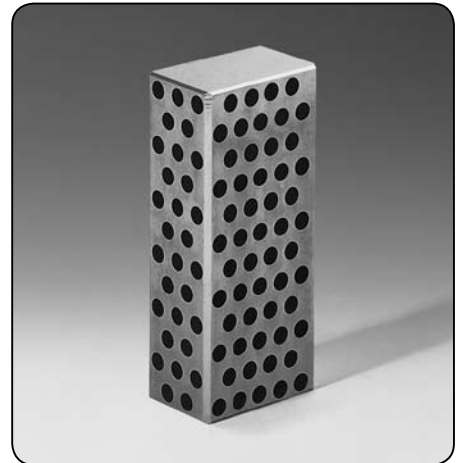
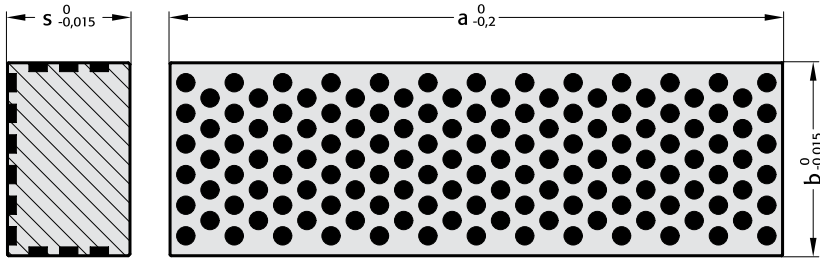


# FIBRO

2962.80.

## Guide Bars with three Sliding Surfaces Bronze with Non-Liquid Lubricant

2962.80.

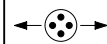


2962.80.

Order No	b	s	a
2962.80.025.016.080	25	16	80
100			100
125			125
2962.80.040.025.125	40	25	125
160			160
200			200
2962.80.063.040.200	63	40	200
250			250
315			315

### Material:

Bronze with Non-Liquid Lubricant, oilless lubricating



Direction of Motion  
Embedded non-liquid  
lubricant (section)

### Ordering Code (example):

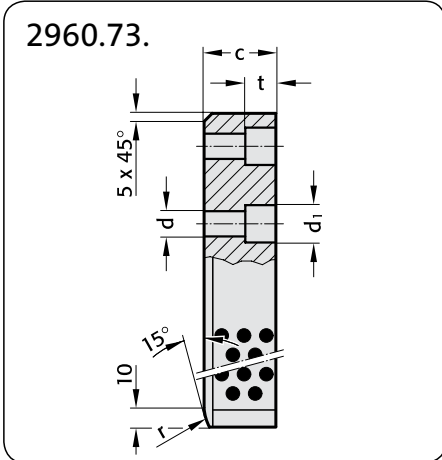
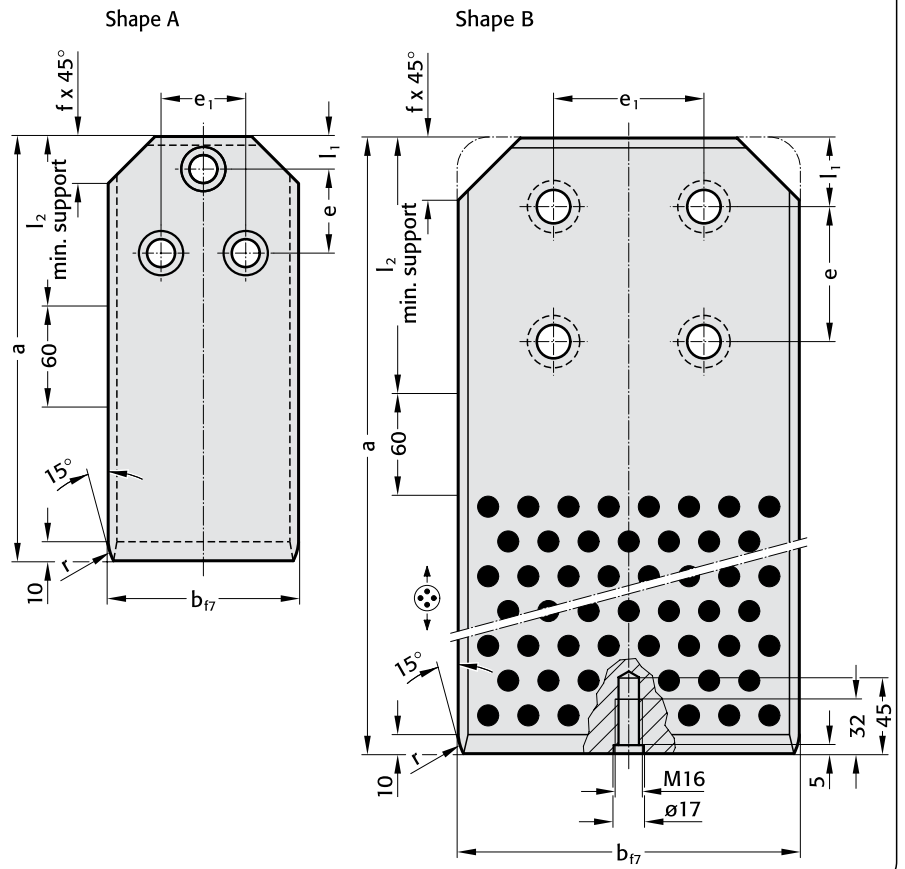
Guide Bar	=	2962.80.
b = 25 mm	=	025.
s = 16 mm	=	016.
l = 80 mm	=	080
Order No.	=	2962.80.025.016.080

Guide Brackets to VDI 3387  
Steel with Non-Liquid Lubricant

2960.73.



2960.73.



**Material:**

Steel,  
surface hardened.  
Guiding surfaces with embedded non-liquid lubricant (non-liquid lubricant share 20–25%)

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762:

- 2960.73.063. M12 x 40
- 2960.73.071. M12 x 40
- 2960.73.090. M16 x 50
- 2960.73.112. M16 x 50
- 2960.73.140. M20 x 50
- 2960.73.190. M20 x 70
- 2960.73.240. M24 x 80



Direction of Motion  
Embedded non-liquid lubricant  
(section)

**Ordering code (example):**

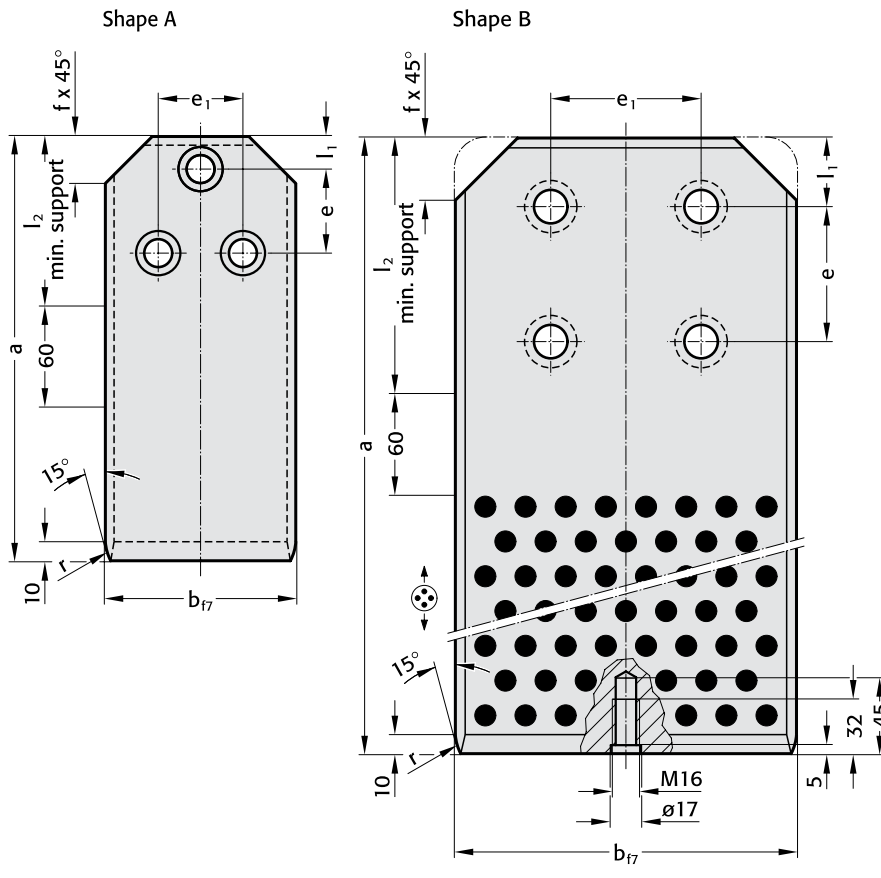
Guide Bracket	=	2960.73.
b = 140 mm	=	140.
a = 315 mm	=	315
Order No	=	2960.73.140.315

**2960.73.**

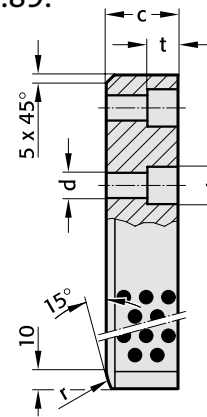
Order No	Shape	b	a	l <sub>1</sub>	l <sub>2</sub>	e	e <sub>1</sub>	d	d <sub>1</sub>	f	c	t	r	Number of screw holes
2960.73.063.	180 A	63	180	20	90	50	36	14	20	18	36	16	16	3
			200											
			224											
2960.73.071.	180 A	71	180	20	90	50	36	14	20	18	36	16	16	3
			200											
			224											
2960.73.090.	200 A	90	200	20	100	50	50	18	26	28	45	21	25	3
			224											
			250											
2960.73.112.	200 A	112	200	20	100	50	50	18	26	28	45	21	25	3
			224											
			250											
2960.73.140.	315* B	140	315	40	150	80	90	22	33	36	45	25,5	31,5	4
2960.73.190.	400*	190	400	40	150	80	90	22	33	36	56	25,5	31,5	4
2960.73.240.	500*	240	500	40	250	160	160	26	40	36	56	30,5	31,5	4
			630*											

\* end face threaded bore M16

2960.89.



2960.89.



2960.89.

Order No	Shape	b	a	l <sub>1</sub>	l <sub>2</sub>	e	e <sub>1</sub>	d	d <sub>1</sub>	f	c	t	r	Number of screw holes
2960.89.063.180	A	63	180	20	90	50	36	14	20	18	36	16	16	3
			200											
			224											
2960.89.071.180	A	71	180	20	90	50	36	14	20	18	36	16	16	3
			200											
			224											
2960.89.090.200	A	90	200	20	100	50	50	18	26	28	45	21	25	3
			224											
			250											
2960.89.112.200	A	112	200	20	100	50	50	18	26	28	45	21	25	3
			224											
			250											
2960.89.140.315*	B	140	315	40	150	80	90	22	33	36	45	25,5	31,5	4
2960.89.190.400*		190	400	40	150	80	90	22	33	36	56	25,5	31,5	4
2960.89.240.500*		240	500	40	250	160	160	26	40	36	56	30,5	31,5	4
		630*	630											

\* end face threaded bore M16

**Material:**

Bronze with Non-Liquid Lubricant.

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762

- 2960.89.063 M12x40
- 2960.89.071 M12x40
- 2960.89.090 M16x50
- 2960.89.112 M16x50
- 2960.89.140 M20x50
- 2960.89.190 M20x70
- 2960.89.240 M24x80.



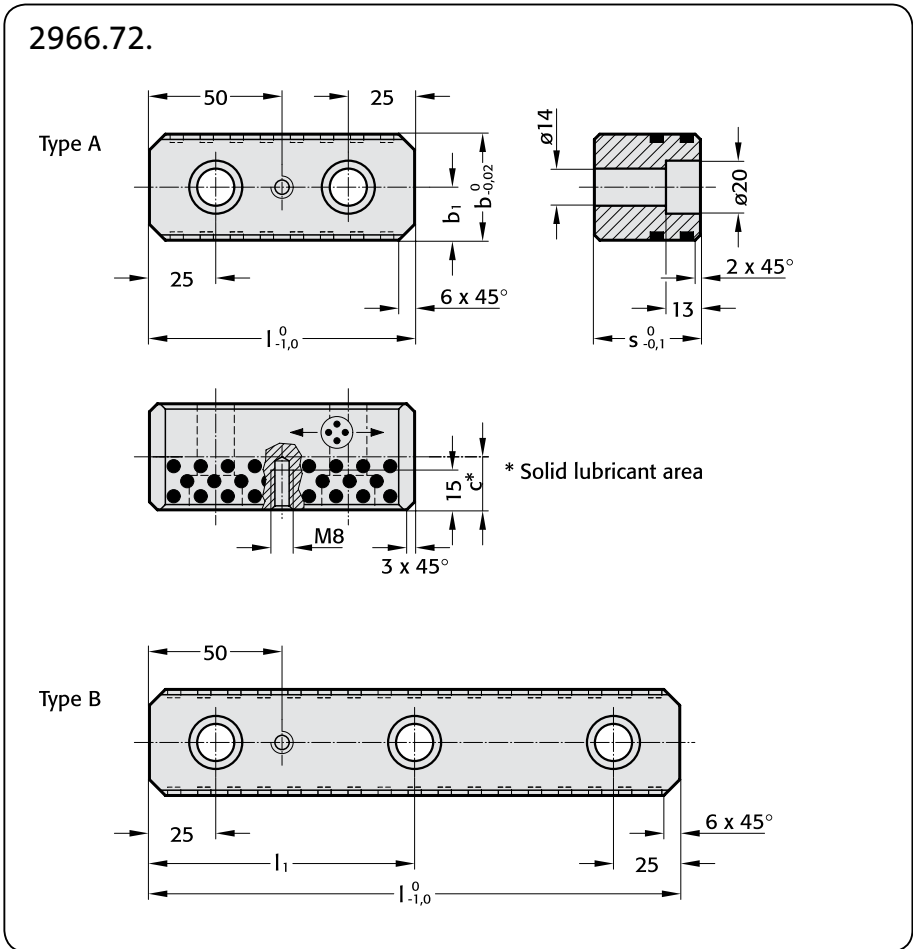
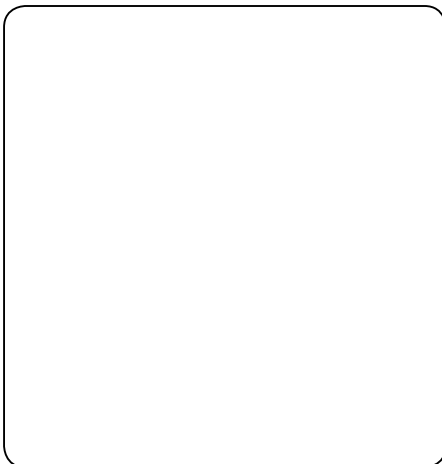
Direction of Motion  
Embedded non-liquid  
lubricant (section)

**Ordering code (example):**

Guide Bracket	=	2960.89.
b = 140 mm	=	140.
a = 315 mm	=	315
Order No	=	2960.89.140.315

Slide Centre Guides  
Bronze with Non-Liquid Lubricant

2966.72.



**Material:**

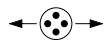
Bronze with solid lubrication  
low maintenance

**Note:**

Supplied without screws.

**Fixing:**

Machine screws DIN EN ISO 4762  
M12x50  
M12x60



Direction of Motion  
Solid lubricant inserts (section)

**Ordering code (example):**

Slide centre guide	=	2966.72.
b = 30 mm	=	030.
l = 100 mm	=	100.
s = 30 mm	=	030
Order No	=	2966.72.030.100.030

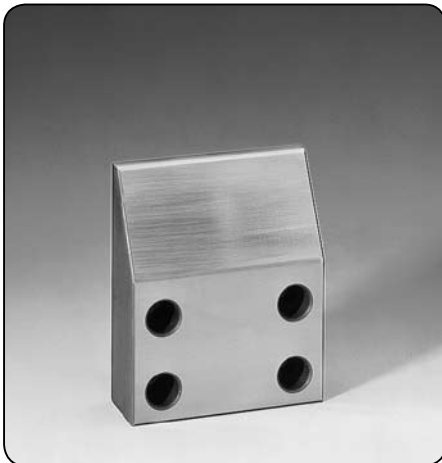
2966.72.

Order No	Shape	b	l	s	b <sub>1</sub>	l <sub>1</sub>	c	Number of screw holes
2966.72.030.100.030	A	30	100	30	15	-	18	2
150			150			-		
200	B		200			100		3
250			250			125		
300			300			150		
350			350			175		
2966.72.040.100.030	A	40	100	30	20	-	18	2
150			150			-		
200	B		200			100		3
250			250			125		
300			300			150		
350			350			175		
2966.72.040.100.040	A	40	100	40	20	-	20	2
150			150			-		
200	B		200			100		3
250			250			125		
300			300			150		
350			350			175		

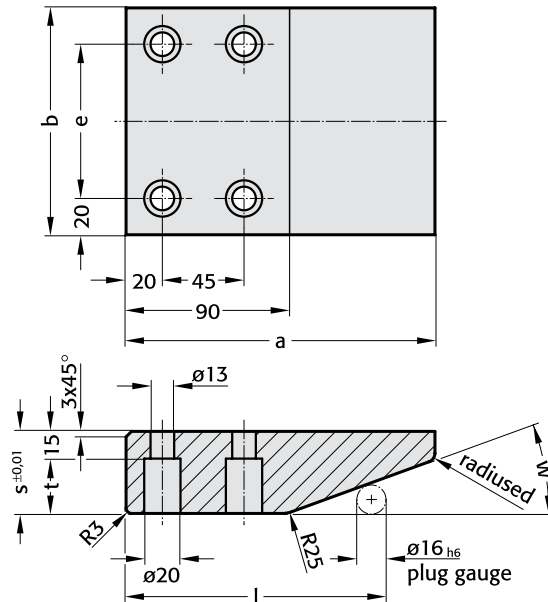
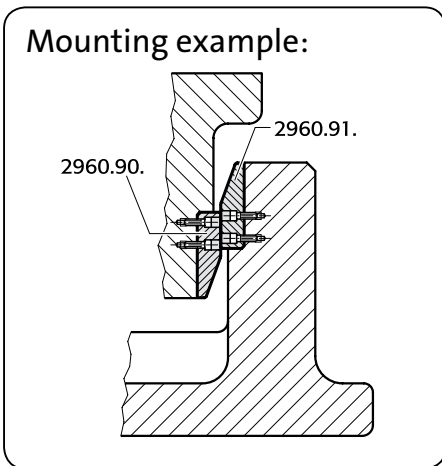
A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.

**Overrun Cams, VDI 3357  
for Cam Drivers and Slides, Steel**

2960.90.  
2960.91.



2960.90. through-hardened  
2960.91. through-hardened and gas nitrided



**Material:**

2960.90. Steel  
through-hardened  
or  
2960.91. Steel  
through-hardened and gas nitrided

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762  
M12x40.

2960.90. through-hardened

2960.91. through-hardened and gas nitrided

Order No	b	a	s	e	t	w	l
2960.100.170.045	100	170	45	60	30	20°	143,37
125.170.045	125			85			
150.170.045	150			110			
2960.100.150.045	100	150	45	60	30	30°	127,86
170.060		170	60		45		
2960.125.150.045	125	150	45	85	30		
170.060		170	60		45		
2960.150.150.045	150	150	45	110	30		
170.060		170	60		45		

**Ordering Code (example)**

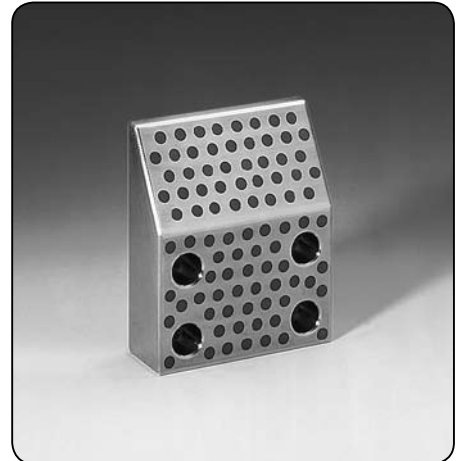
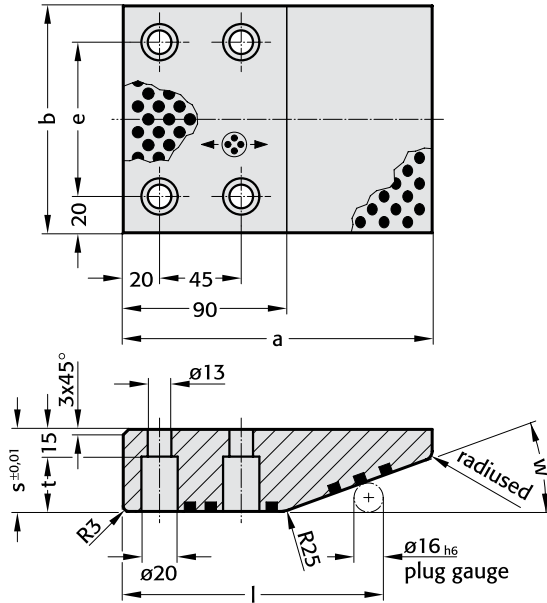
Overrun Cam	=	2960.90.
b = 100 mm	=	100.
a = 150 mm	=	150.
s = 45 mm	=	045
Order No	=	2960.90.100.150.045

**FIBRO**

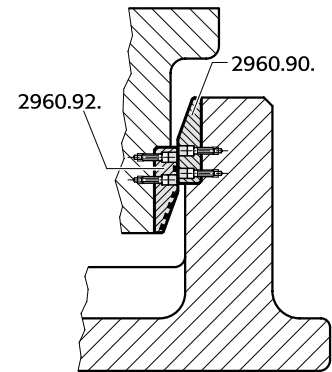
2960.92.

**Overrun Cams, VDI 3357  
for Cam Drivers and Slides  
Bronze with Non-Liquid Lubricant**

2960.92.



**Mounting example:**



2960.92.

Order No	b	a	s	e	t	w	l
2960.92.100.170.045	100	170	45	60	30	20°	143,37
125.170.045	125			85			
150.170.045	150			110			
2960.92.100.150.045	100	150	45	60	30	30°	127,86
170.060		170	60		45		
2960.92.125.150.045	125	150	45	85	30		
170.060		170	60		45		
2960.92.150.150.045	150	150	45	110	30		
170.060		170	60		45		

**Material:**

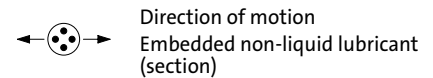
Bronze with non-liquid lubricant, oilless lubricating.

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M12x40.



**Ordering Code (example)**

Overrun Cam	=	2960.92.
b = 100 mm	=	100.
a = 150 mm	=	150.
s = 45 mm	=	045
Order No	=	2960.92.100.150.045

Angled Guide Gibs  
Bronze with Non-Liquid Lubricant

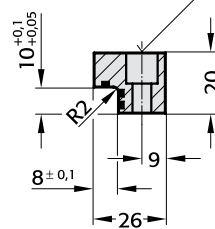
2962.70.



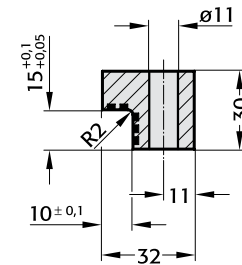
2962.70.

Shape C

Km 8 x 9,6 DIN 74 deep

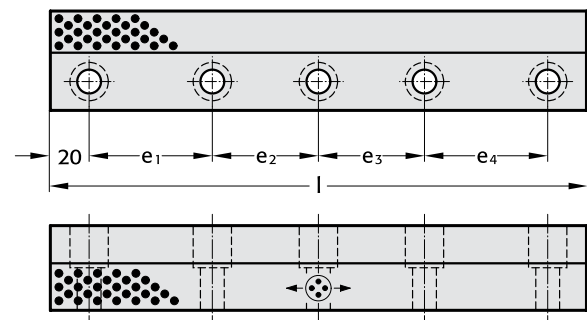
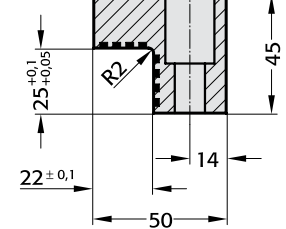


Shape A



Shape B

Km 10 x 25 DIN 74 deep



Material:

Bronze with Non-Liquid Lubricant,  
oilless lubricating.

Note:

Screws not included.



Direction of Motion  
Embedded non-liquid lubricant  
(section)

2962.70.

Order No	Shape	l	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	e <sub>4</sub>	Number of screw holes
2962.70.026.100	C	100	60	-	-	-	2
150		150	55	55	-	-	3
200		200	55	50	55	-	4
2962.70.032.100	A	100	60	-	-	-	2
150		150	55	55	-	-	3
200		200	55	50	55	-	4
250		250	70	70	70	-	4
2962.70.050.200	B	200	55	50	55	-	4
250		250	70	70	70	-	4
300		300	65	65	65	65	5
350		350	80	75	75	80	5

Ordering Code (example):

Angled Guide Gib = 2962.70.  
Shape A = 032.  
l = 150 mm = 150  
Order No = 2962.70.032.150

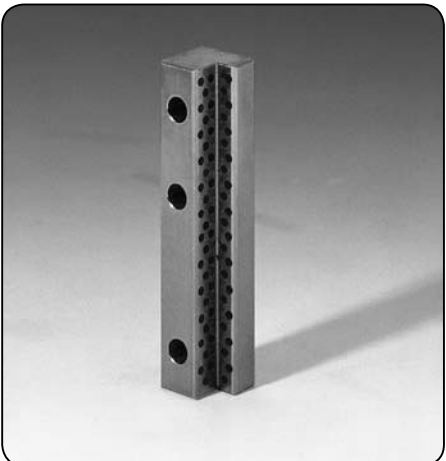
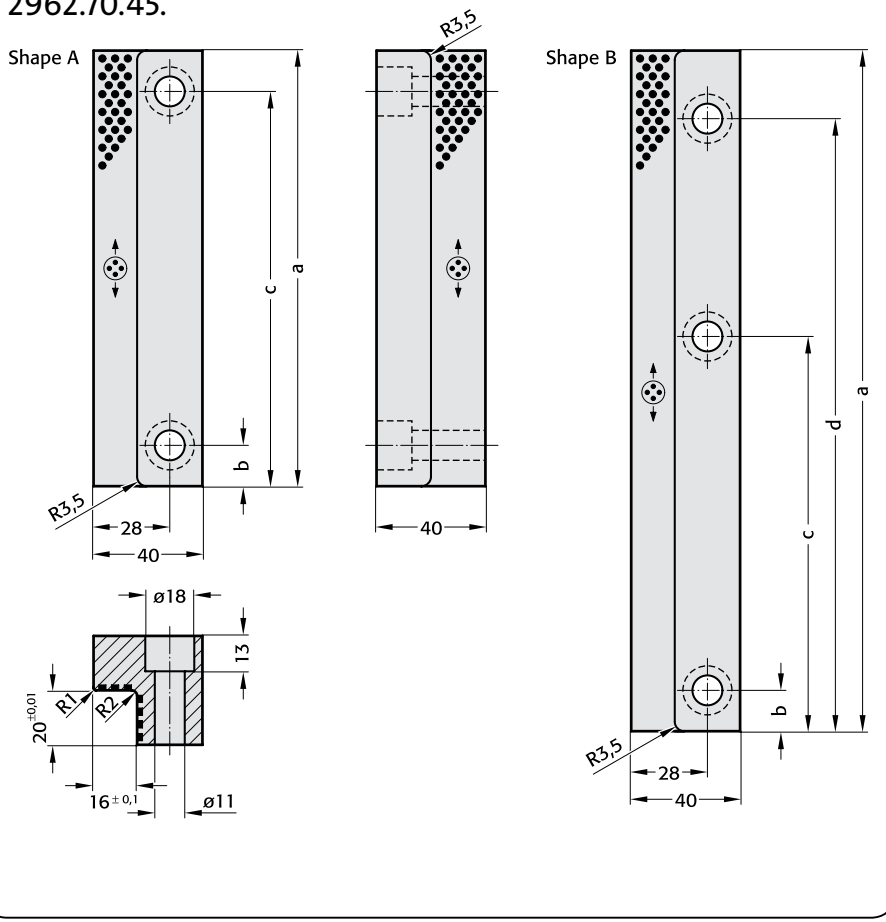


**FIBRO**

**Angled Guide Gibs  
Bronze with Non-Liquid Lubricant  
to CNOMO**

2962.70.45.

2962.70.45.



2962.70.45.

Order No	Shape	a	b	c	d	Number of screw holes
2962.70.45.040.160	A	160	15	145	-	2
2962.70.45.040.250	B	250	15	145	225	3

**Material:**

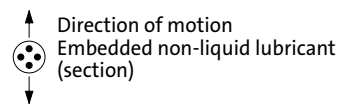
Bronze with non-liquid lubricant, oilless lubricating.

**Note:**

Screws not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M10x40.

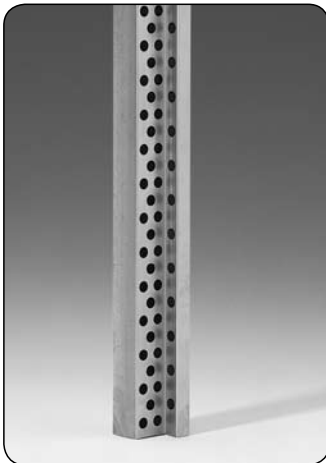


**Ordering Code (example):**

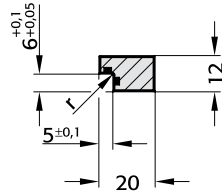
Angled Guide Gib	=	2962.70.
to CNOMO	=	45.
thickness = 40 mm	=	040.
a = 160 mm	=	160
Order No	=	2962.70.45.040.160

**Angled Guide Gibs  
Bronze with Non-Liquid Lubricant**

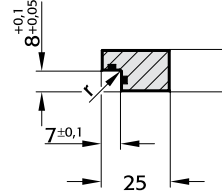
**2962.71.**



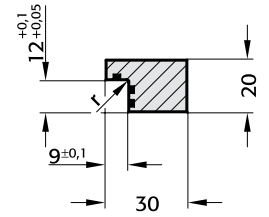
2962.71.020.012.



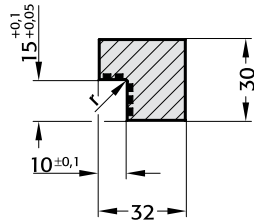
2962.71.025.015.



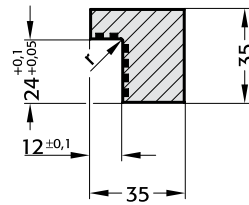
2962.71.030.020.



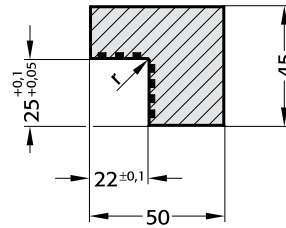
2962.71.032.030.



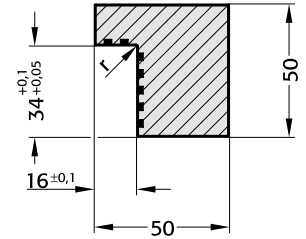
2962.71.035.035.



2962.71.050.045.



2962.71.050.050.



**Material:**

Bronze with Non-Liquid Lubricant, oilless lubricating.

**2962.71.**

Order No	length	
	305	1005
2962.71.020.012.	●	
025.015.	●	
030.020.	●	
032.030.		●
035.035.	●	●
050.045.	●	●
050.050.	●	●

**Ordering Code (example):**

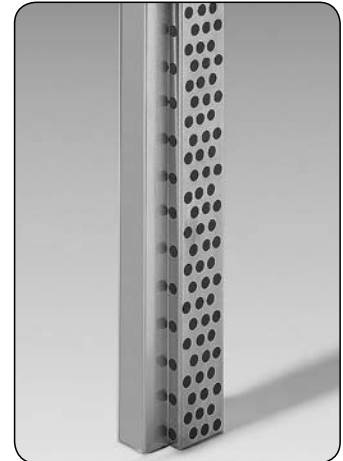
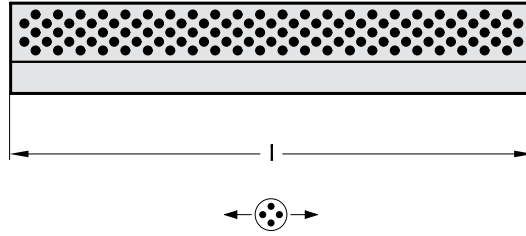
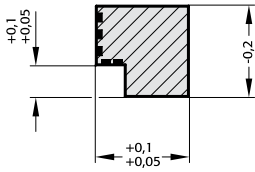
Angled Guide Gib = 2962.71.  
width = 32 mm = 032.  
height = 30 mm = 030.  
length = 605 mm = 0605  
Order No = 2962.71.032.030.0605

# FIBRO

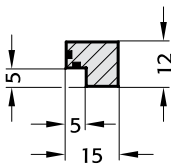
2962.72.

## Angled Guide Gibs Bronze with Non-Liquid Lubricant

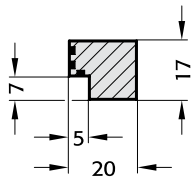
2962.72.



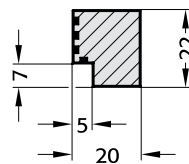
2962.72.015.012.



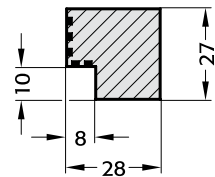
2962.72.020.017.



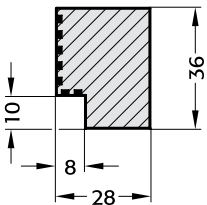
2962.72.020.022.



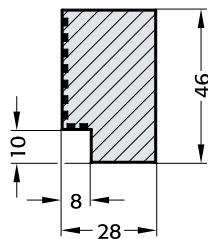
2962.72.028.027.



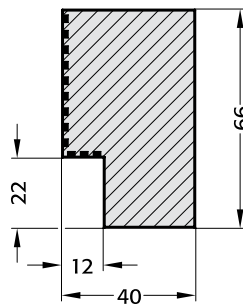
2962.72.028.036.



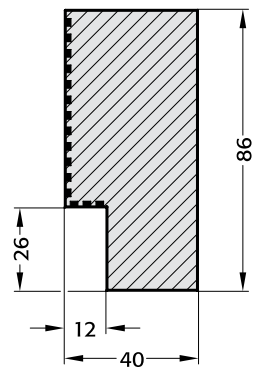
2962.72.028.046.



2962.72.040.066.



2962.72.040.086.

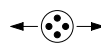


2962.72.

Order No	205	320	605
2962.72.015.012.	•		
020.017.	•	•	
020.022.	•	•	
028.027.	•	•	•
028.036.	•	•	•
028.046.	•	•	•
040.066.	•	•	•
040.086.	•	•	•

### Material:

Bronze with Non-Liquid Lubricant,  
oilless lubricating.



Direction of Motion  
Embedded non-liquid lubricant (section)

### Ordering Code (example):

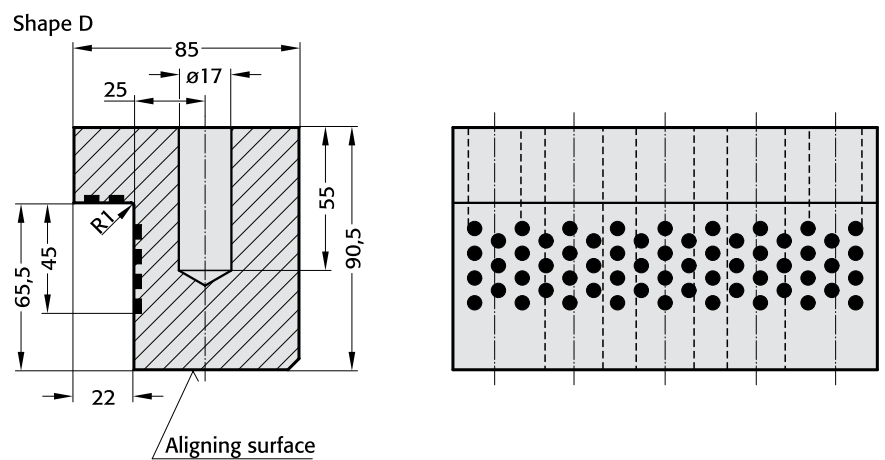
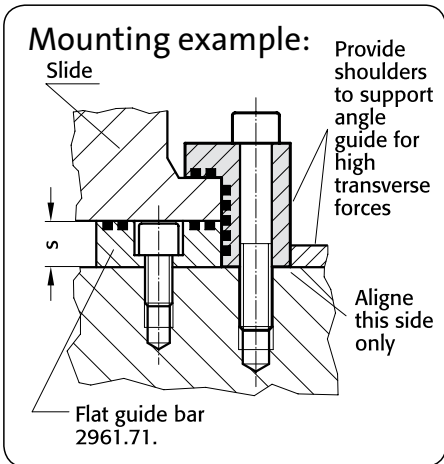
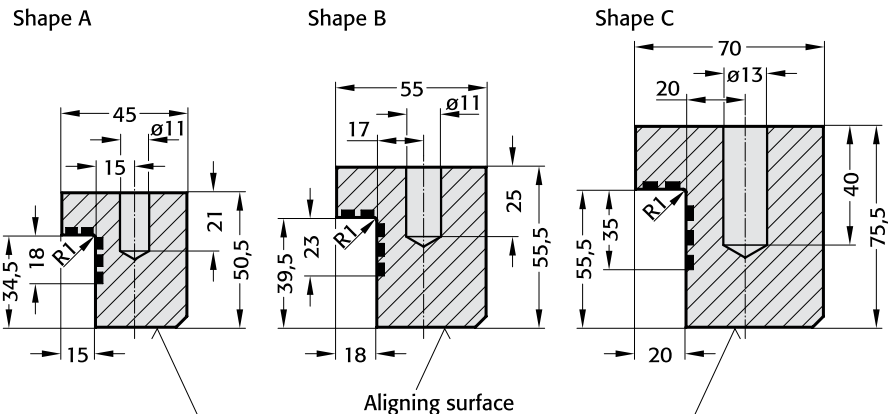
Angled Guide Gib = 2962.72.020.022.  
l = 205 mm = 0205  
Order No = 2962.72.020.022.0205

# Angled Guide Gibs Bronze with Non-Liquid Lubricant

2962.73.



## 2962.73.



### Material:

Bronze with Non-Liquid Lubricant, oilless lubricating.

### Note:

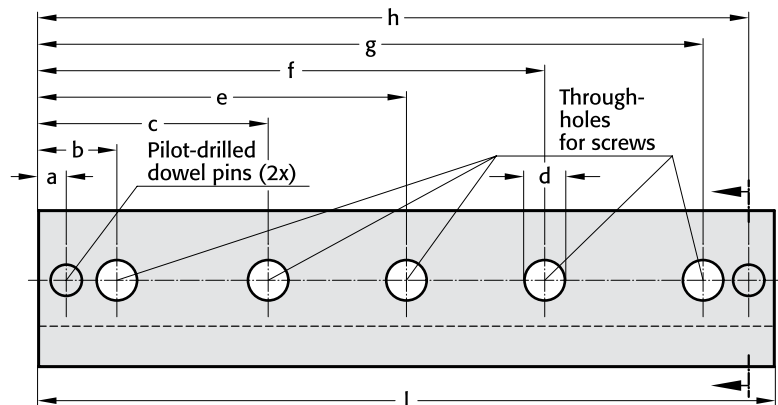
Screws not included.

### Fixing:

Use socket cap screws DIN EN ISO 4762 and dowel pins DIN 7979.

### Ordering Code (example):

Angled Guide Gib	=	2962.73.
Shape A	=	045.
l = 100 mm	=	100
Order No	=	2962.70.045.100



## 2962.73.

Order No	Shape	l	a	b	c	e	f	g	h	d	Screws		Parallel pins		s
											Size	Number	Size	Number	
2962.73.045.100	A	100	10	27,5	-	-	-	72,5	90	13	M12 × 80	2	10 × 60	2	16
2962.73.045.160		160						132,5	150						
2962.73.055.100	B	100						72,5	90						
2962.73.055.160		160						132,5	150						
2962.73.070.160	C	160	12,5	35				125	147,5	17	M16 × 100		12 × 70		20
2962.73.070.200		200						165	187,5						
2962.73.070.250		250				125	200	215	237,5			3			
2962.73.070.400		400			125	200	275	365	387,5			5			
2962.73.085.160	D	160	15	42,5				117,5	145	21	M20 × 120	2	16 × 70		20
2962.73.085.200		200						157,5	185						
2962.73.085.250		250				125	200	207,5	235			3			
2962.73.085.400		400			125	200	275	357,5	385			5			

# FIBRO

2962.81.

## Angled Guide Gibs Bronze with Non-Liquid Lubricant

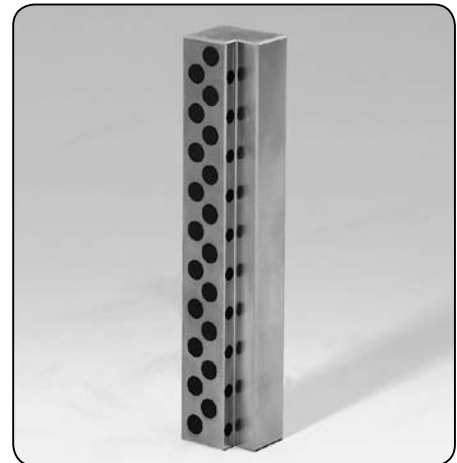
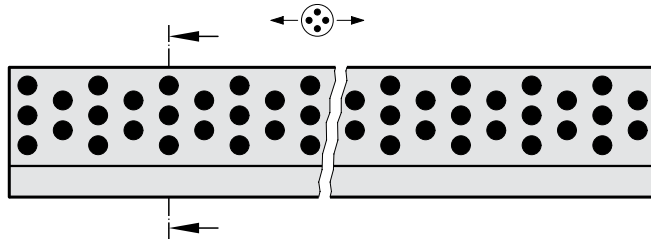
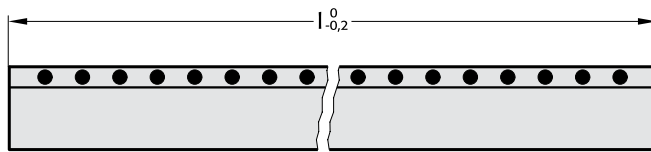
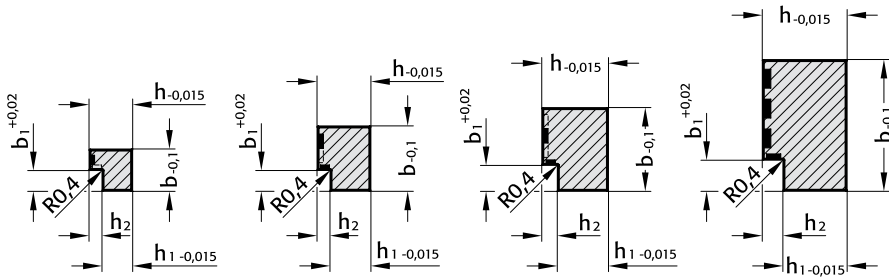
2962.81.

Shape A

Shape B

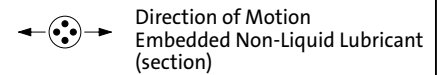
Shape C

Shape D



### Material:

Bronze with Non-Liquid Lubricant,  
oilless lubricating.



2962.81.

Order No	Shape	h	b	l	h <sub>1</sub>	h <sub>2</sub>	b <sub>1</sub>
2962.81.016.115.040	A	16	11,5	40	12	4	6
050	A			50			
063	A			63			
080	A			80			
2962.81.016.155.050	A	16	15,5	50	11	5	8
063	A			63			
080	A			80			
100	A			100			
2962.81.020.195.063	B	20	19,5	63	15	5	8
080	B			80			
100	B			100			
125	B			125			
2962.81.020.245.080	B	20	24,5	80	15	5	8
100	B			100			
125	B			125			
160	B			160			
2962.81.025.315.100	C	25	31,5	100	19	6	10
125	C			125			
160	C			160			
200	C			200			
2962.81.025.395.125	D	25	39,5	125	19	6	10
160	D			160			
200	D			200			
250	D			250			
2962.81.032.495.160	D	32	49,5	160	24	8	12
200	D			200			
250	D			250			
315	D			315			

### Ordering Code (example):

Angled Guide Gib = 2962.81.  
h = 16 mm = 016.  
b = 11,5 mm = 115.  
l = 40 mm = 040  
Order No = 2962.81.016.115.040

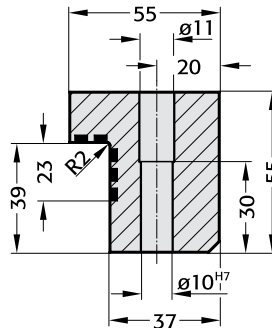
Angled Guide Gibs VDI 3357  
Bronze with Non-Liquid Lubricant

2962.82.

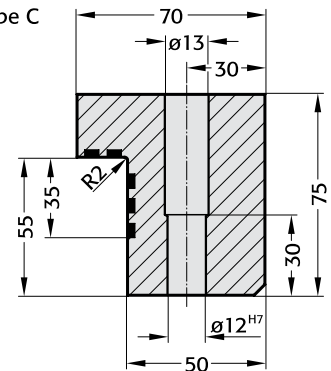


2962.82.

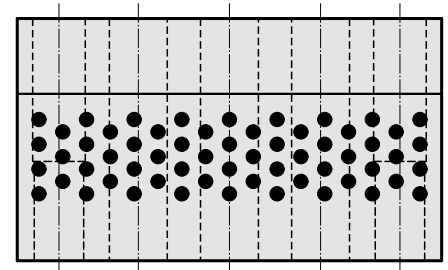
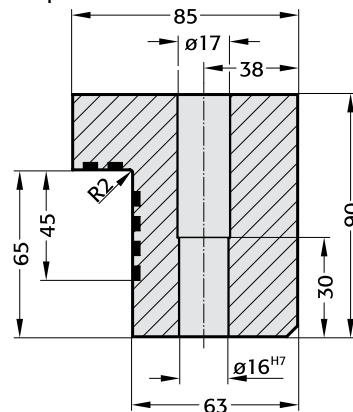
Shape B



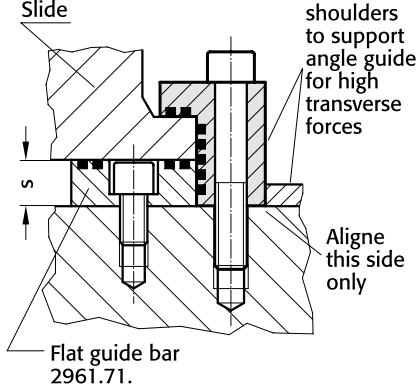
Shape C



Shape D



Mounting example:



Material:

Bronze with Non-Liquid Lubricant, oilless lubricating.

Note:

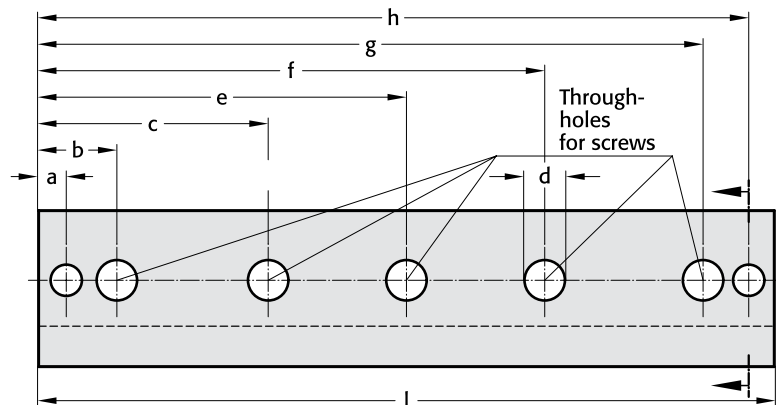
Screws and pins not included.

Fixing:

Use socket cap screws DIN EN ISO 4762 and dowel pins DIN 7979.

Ordering code (example):

Angled Guide Gib	=	2962.82.
Shape B	=	055.
l = 100 mm	=	100
Order No	=	2962.82.055.100



2962.82.

Order No	Shape	l	a	b	c	e	f	g	h	d	Screws		Parallel pins		s
											Size	Number	Size	Number	
2962.82.055.100	B	100	10	27,5	-	-	-	72,5	90	13,5	M12 × 80	2	10 × 60	2	16
160		160						132,5	150						
2962.82.070.160	C	160	12,5	35	-	-	-	125	147,5	17,5	M16 × 100		12 × 70		20
200		200						165	187,5						
250		250				125		215	237,5			3			
400		400			125	200	275	365	387,5			5			
2962.82.085.160	D	160	15	42,5	-	-	-	117,5	145	22	M20 × 120	2	16 × 70		20
200		200						157,5	185						
250		250				125		207,5	235			3			
400		400			125	200	275	357,5	385			5			

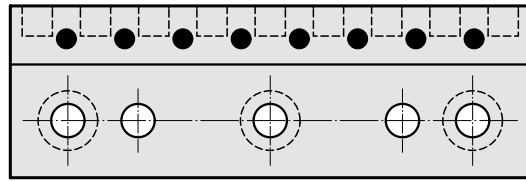
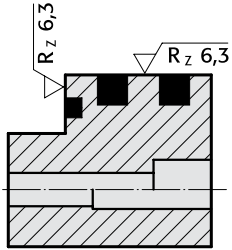
**FIBRO**

2962.83.

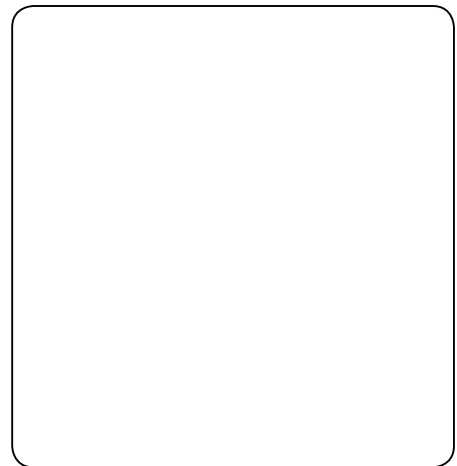
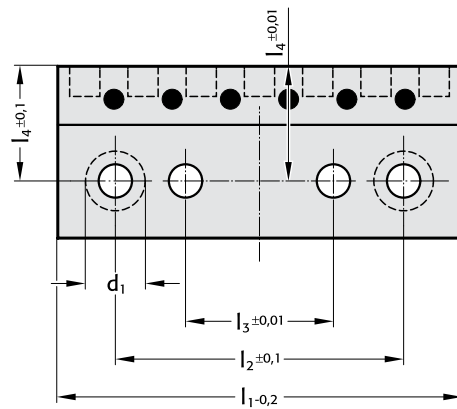
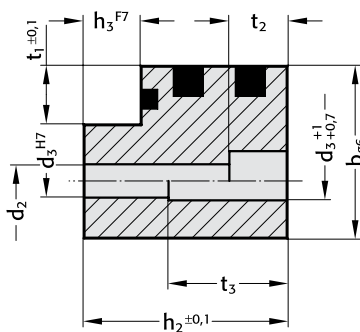
**Angled Guide Gibs  
Bronze with Non-Liquid Lubricant**

2962.83.

Shape B



Shape A



2962.83.

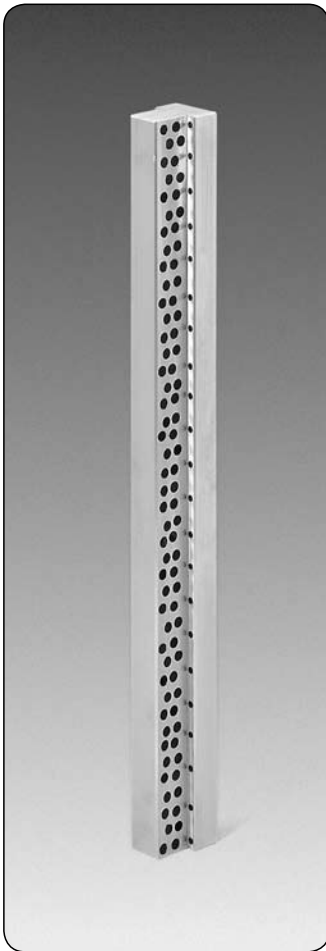
Order No	Shape	b	h1	l1	l2	l3	l4	d1	d2	d3	t1	t2	t3	h2	h3	Number of screw holes
2962.83.016.012.050	A	16	12	50	34	14	9,5	10	5,5	5	5	5,7	-	11	4	2
016.012.071	A			71	55	35										2
016.012.090	B			90	74	54										3
2962.83.020.020.080	A	20	20	80	64	40	12	11	6,6	6	5	6,8	9,5	19	5	2
020.020.100	A			100	84	60										2
020.020.125	B			125	109	85										3
2962.83.025.032.100	A	25	32	100	80	50	15,5	15	9	8	6	9	19	31	6	2
025.032.125	A			125	105	75										2
025.032.160	B			160	140	110										3
2962.83.030.050.125	A	30	50	125	95	55	18	18	11	10	7	11	34	49	8	2
030.050.160	A			160	130	90										2
030.050.200	B			200	170	130										3

**Ordering-code (example):**

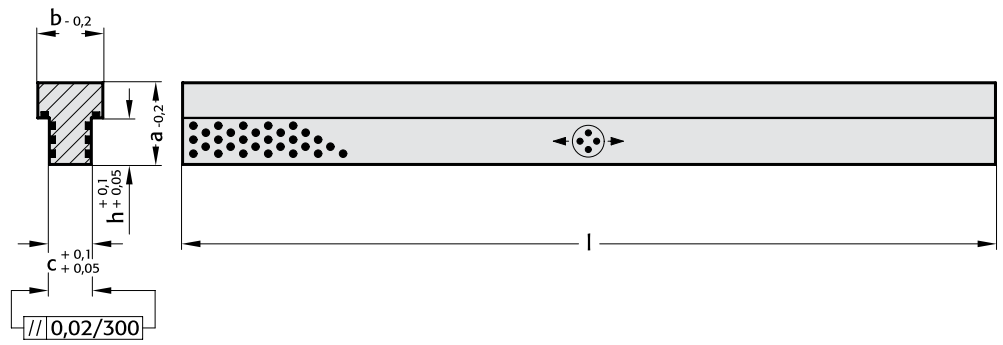
Angled Guide Gib = 2962.83.  
 b = 16 mm = 016.  
 h1 = 12 mm = 012.  
 l1 = 50 mm = 050  
 Order No = 2962.83.016.012.050

**T-Guide Bars  
Bronze with Non-Liquid Lubricant**

2964.77.  
2964.78.

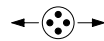


2964.77.



**Material:**

Bronze with Non-Liquid Lubricant, oilless lubricating.



Direction of Motion  
Embedded non-liquid lubricant (section)

2964.77.

Order No	a	b	c	h	l
2964.77.012.018.0350	12	18	8	5	350
2964.77.025.022.0350	25	22	12	15	350
2964.77.035.028.0350	35	28	18	20	350

**Ordering Code (example):**

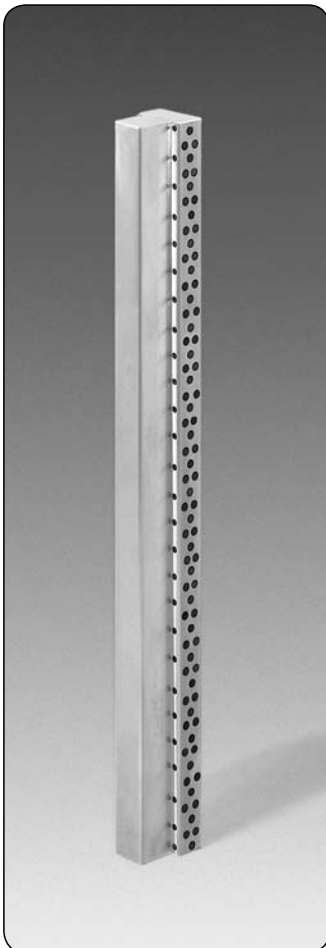
T-Guide Bar = 2964.77.

a = 12 mm = 012.

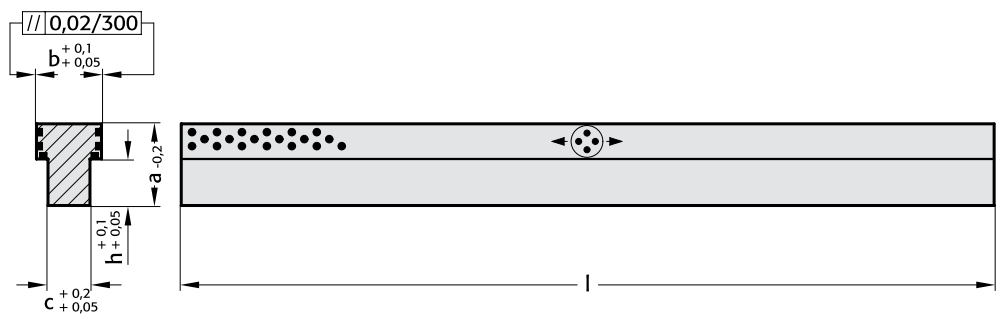
b = 18 mm = 018.

l = 350 mm = 0350

Order No = 2964.77.012.018.0350



2964.78.



**Material:**

Bronze with Non-Liquid Lubricant, oilless lubricating.



Direction of Motion  
Embedded non-liquid lubricant (section)

2964.78.

Order No	a	b	c	h	l
2964.78.012.018.0350	12	18	8	5	350
2964.78.025.022.0350	25	22	12	15	350
2964.78.035.028.0350	35	28	18	20	350

**Ordering Code (example):**

T-Guide Bar = 2964.78.

a = 12 mm = 012.

b = 18 mm = 018.

l = 350 mm = 0350

Order No = 2964.78.012.018.0350



A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.

Sliding Blocks to NAAMS  
Bronze with Non-Liquid Lubricant  
Prismatic Guides, Steel

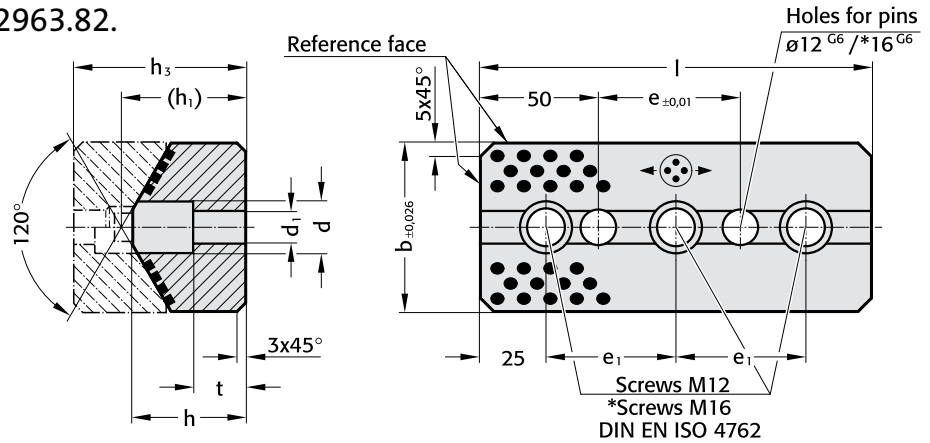
FIBRO

2963.82.

2963.83.



2963.82.



**Material:**

Bronze with Non-Liquid Lubricant, oilless lubricating.

**Execution:**

Sliding faces ground.

**Note:**

Screws and pins not included.

**Ordering Code (example):**

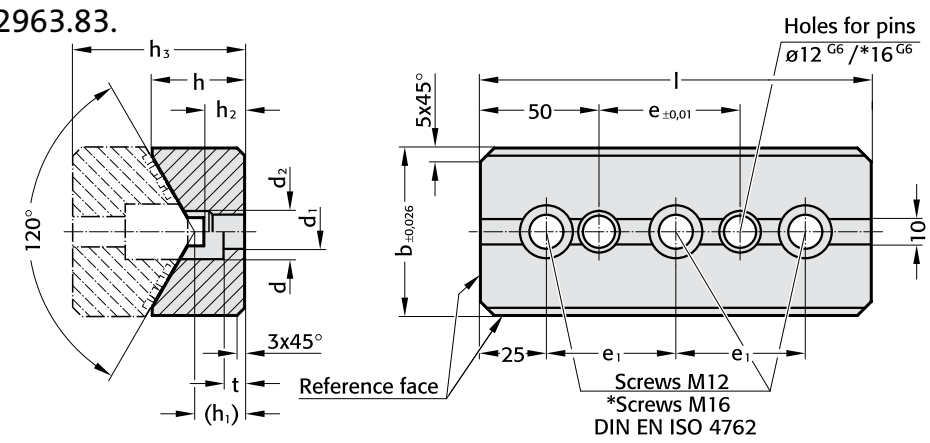
Sliding Block	=	2963.82.
b = 65 mm	=	065.
h = 39 mm	=	039.
l = 200 mm	=	0200
Order No	=	2963.82.065.039.0200

2963.82.

Order No	b	h	(h <sub>1</sub> )	h <sub>3</sub>	l	e	e <sub>1</sub>	d	d <sub>1</sub>	t	Number of screw holes
2963.82.065.039.0150	65	39	(42)	65	150	50	100	20	13,5	13	2
0200					200	100	150				2
0250					250	150	100				3
0300					300	200	125				3
2963.82.075.039.0150	75	39	(42)	65	150	50	100	20	13,5	13	2
0200					200	100	150				2
0250					250	150	100				3
0300					300	200	125				3
2963.82.125.052.0150*	125	52	(57)	85	150	50	100	26	17,5	15	2
0200*					200	100	150				2
0250*					250	150	100				3
0300*					300	200	125				3



2963.83.



**Material:**

Steel  
Sliding faces surface hardened.

**Note:**

Screws and pins not included.

**Ordering Code (example):**

Prismatic Guide	=	2963.83.
b = 65 mm	=	065.
h = 40 mm	=	040.
l = 200 mm	=	0200
Order No	=	2963.83.065.040.0200

2963.83.

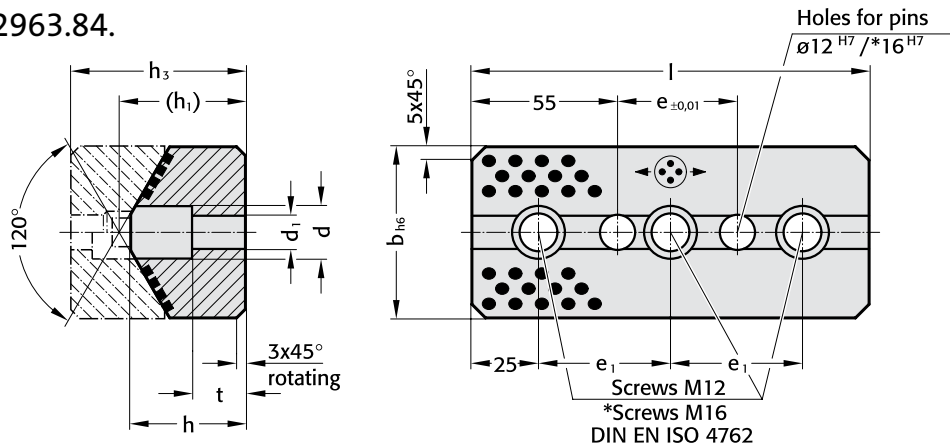
Order No	b	h	(h <sub>1</sub> )	h <sub>2</sub>	h <sub>3</sub>	l	e	e <sub>1</sub>	d	d <sub>1</sub>	d <sub>2</sub>	t	Number of screw holes
2963.83.065.040.0150	65	40	(23)	21	65	150	50	100	20	13,5	14	10	2
0200						200	100	150					2
0250						250	150	100					3
0300						300	200	125					3
2963.83.075.040.0150	75	40	(23)	21	65	150	50	100	20	13,5	14	10	2
0200						200	100	150					2
0250						250	150	100					3
0300						300	200	125					3
2963.83.125.060.0150*	125	60	(28)	27	85	150	50	100	26	17,5	18	15	2
0200*						200	100	150					2
0250*						250	150	100					3
0300*						300	200	125					3

# FIBRO

2963.84.  
2963.85.

## Sliding Blocks, VDI 3357 Bronze with Non-Liquid Lubricant, Prismatic Guides, Steel

2963.84.



2963.84.

Order No	b	h	(h <sub>1</sub> )	h <sub>3</sub>	l	e	e <sub>1</sub>	d	d <sub>1</sub>	t	Number of screw holes
2963.84.065.044.0150	65	44	(47)	65	150	45	100	20	13,5	20	2
0200					200	95	150				2
0250					250	145	100				3
0300					300	195	125				3
2963.84.125.047.0150*	125	47	(52)	85	150	45	100	26	17,5	15	2
0200*					200	95	150				2
0250*					250	145	100				3
0300*					300	195	125				3
2963.84.125.052.0150*	125	52	(57)	85	150	45	100	26	17,5	15	2
0200*					200	95	150				2
0250*					250	145	100				3
0300*					300	195	125				3

### Material:

Bronze with Non-Liquid Lubricant, oilless lubricating.

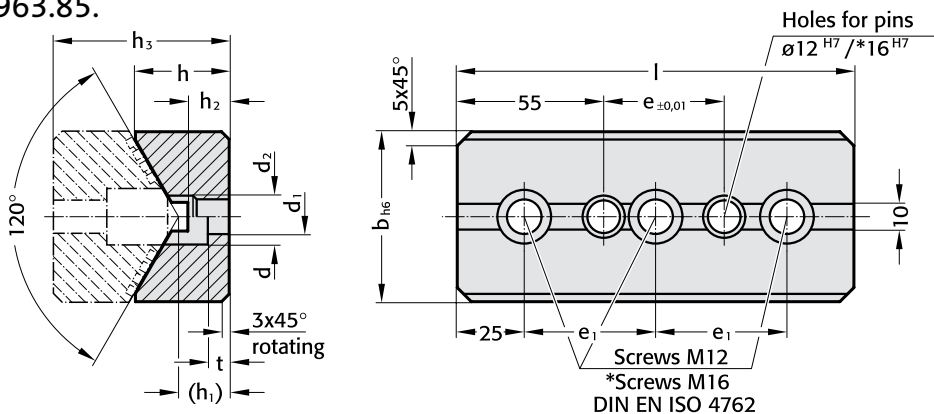
### Note:

Screws and pins not included.

### Ordering Code (example):

Sliding Block	=	2963.84.
b = 65 mm	=	065.
h = 44 mm	=	044.
l = 200 mm	=	0200
Order No	=	2963.84.065.044.0200

2963.85.



2963.85.

Order No	b	h	(h <sub>1</sub> )	h <sub>2</sub>	h <sub>3</sub>	l	e	e <sub>1</sub>	d	d <sub>1</sub>	d <sub>2</sub>	t	Number of screw holes
2963.85.065.035.0150	65	35	(18)	17	65	150	45	100	20	13,5	14	8	2
0200						200	95	150					2
0250						250	145	100					3
0300						300	195	125					3
2963.85.125.060.0150*	125	60	(33)	32	85	150	45	100	26	17,5	18	15	2
0200*						200	95	150					2
0250*						250	145	100					3
0300*						300	195	125					3
2963.85.125.060.0150.1*	125	60	(28)	27	85	150	45	100	26	17,5	18	15	2
0200.1*						200	95	150					2
0250.1*						250	145	100					3
0300.1*						300	195	125					3

### Material:

Steel  
Sliding faces surface hardened.

### Note:

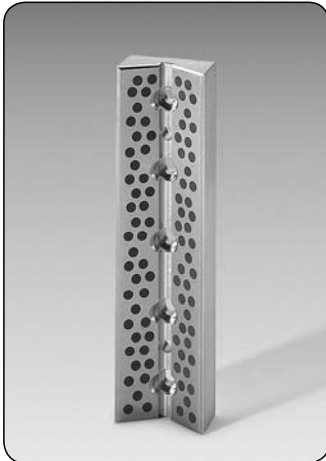
Screws and pins not included.

### Ordering Code (example)

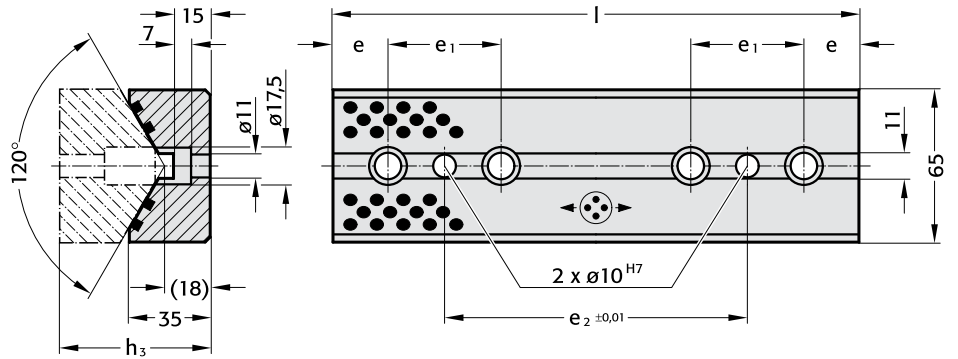
Prismatic Guide	=	2963.85.
b = 65 mm	=	065.
h = 35 mm	=	035.
l = 200 mm	=	0200
Order No	=	2963.85.065.035.0200

**Prismatic Guides**  
**Bronze with Non-Liquid Lubricant**  
**Sliding Blocks, Steel**

**FIBRO**  
**2963.70.**  
**2963.71.**



2963.70.

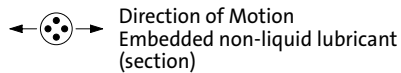


**Material:**

Bronze with Non-Liquid Lubricant,  
 oilless lubricating.

**Note:**

Screws and pins not included.



2963.70.

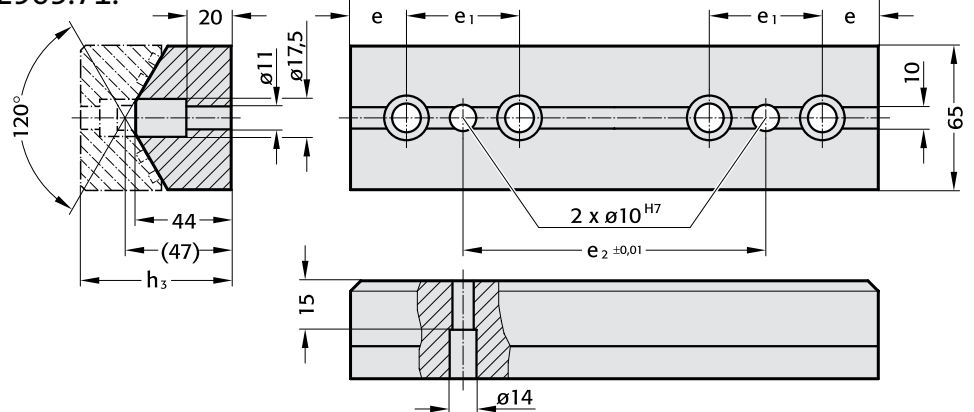
Order No	e	e <sub>1</sub>	e <sub>2</sub>	h <sub>3</sub>	l	Number of screw holes
2963.70.065.035.0100	20	60	20	65	100	2
0150	25	50	50	150	150	3
0200			100	200	200	4
0250			150	250	250	5
0300			200	300	300	6

**Ordering Code (example):**

Prismatic Guide	=	2963.70.
width	= 65 mm =	065.
thickness	= 35 mm =	035.
l	= 250 mm =	0250
Order No	=	2963.70.065.035.0250



2963.71.



**Material:**

Steel  
 Sliding faces surface hardened

**Note:**

Screws and pins not included.

2963.71.

Order No	e	e <sub>1</sub>	e <sub>2</sub>	h <sub>3</sub>	l	Number of screw holes
2963.71.065.044.0100	20	60	20	65	100	2
0150	25	50	50	150	150	3
0200			100	200	200	4
0250			150	250	250	5
0300			200	300	300	6

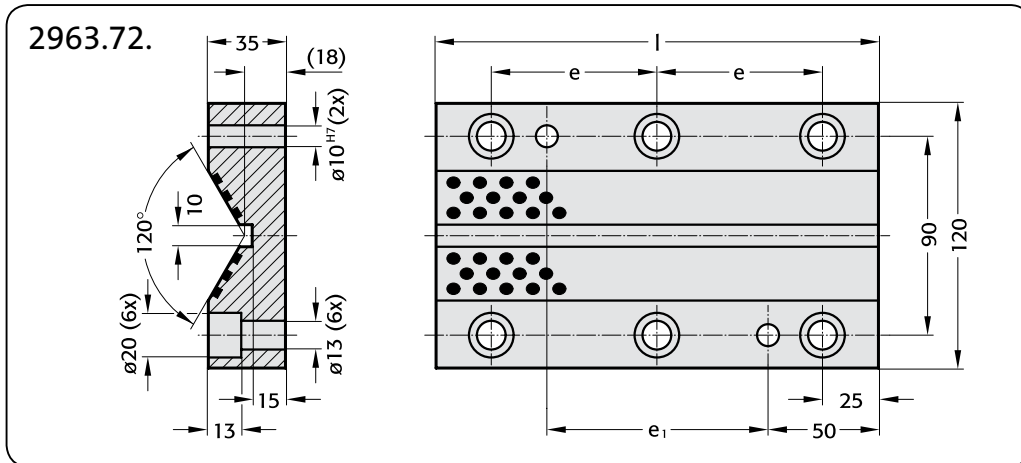
**Ordering Code (example):**

Sliding block	=	2963.71.
width	= 65 mm =	065.
thickness	= 44 mm =	044.
l	= 300 mm =	0300
Order No	=	2963.71.065.044.0300

# FIBRO

2963.72.  
2963.73.

## Prismatic Guides Bronze with Non-Liquid Lubricant Sliding Blocks, Steel



### 2963.72.

Order No	l	e	e <sub>1</sub>	Number of screw holes
2963.72.120.035.0150	150	50	50	6
0200	200	75	100	6
0250	250	100	150	6
0300	300	125	200	6

### Ordering Code (example):

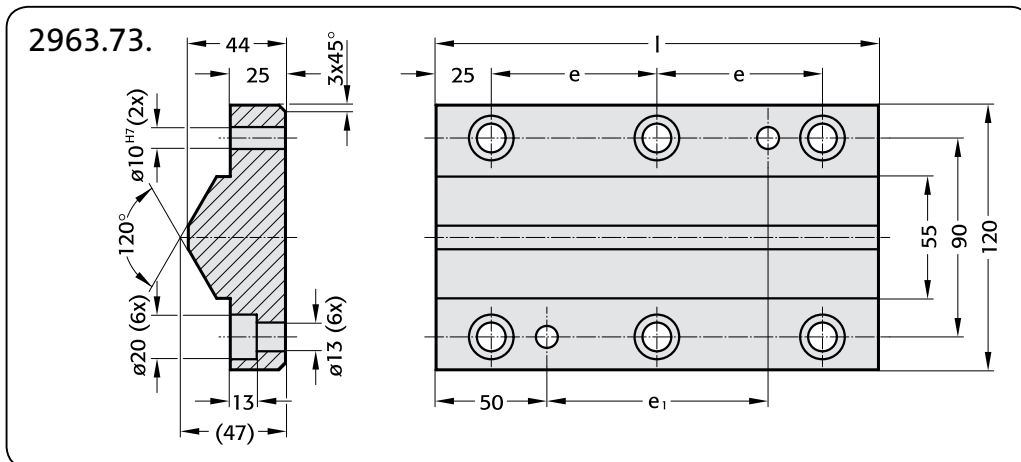
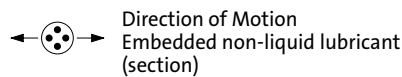
Prismatic Guide	=	2963.72.
Width	= 120 mm =	120.
Thickness	= 35 mm =	035.
l	= 150 mm =	0150
Order No	=	2963.72.120.035.0150

### Material:

Bronze with non-liquid lubricant, oilless lubricating.

### Note:

Screws and pins not included.



### 2963.73.

Order No	l	e	e <sub>1</sub>	Number of screw holes
2963.73.120.044.0150	150	50	50	6
0200	200	75	100	6
0250	250	100	150	6
0300	300	125	200	6

### Ordering Code (example):

Sliding Block	=	2963.73.
Width	= 120 mm =	120.
Thickness	= 44 mm =	044.
l	= 150 mm =	0150
Order No	=	2963.73.120.044.0150

### Material:

Steel  
Sliding faces surface hardened.

### Note:

Screws and pins not included.

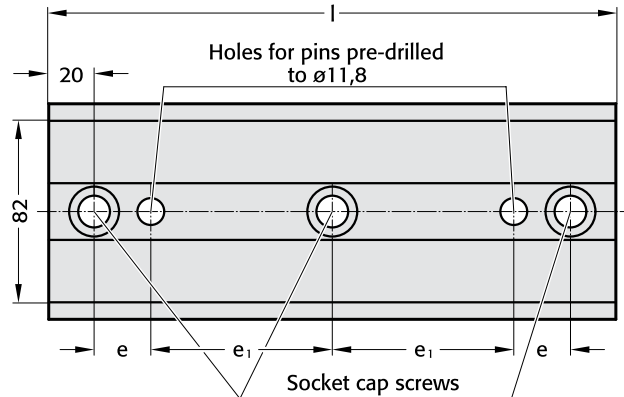
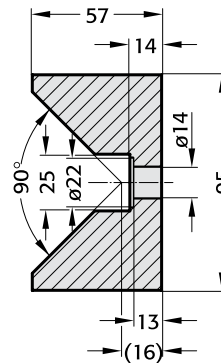
Prismatic Guides  
Steel

2963.81.



2963.81.

Shape A



Material:

Steel  
Sliding faces surface hardened.

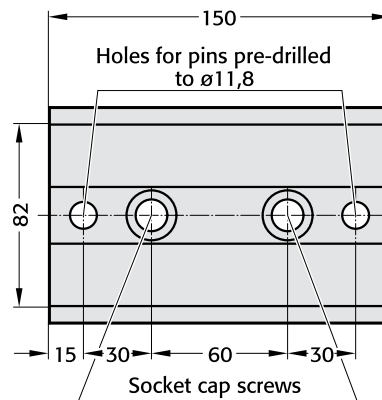
Note:

Screws and pins not included.

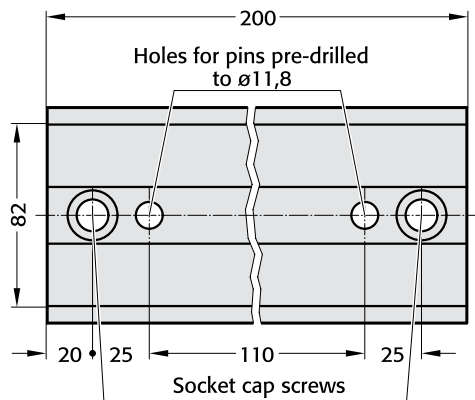
Fixing:

Use socket cap screws M12  
DIN EN ISO 4762.

Shape B



Shape C



2963.81.

Order No	Shape	l	e	e <sub>1</sub>	Number of screw holes
2963.81.095.057.0150	B	150	30	-	2
0200	C	200	25	-	2
0250	A	250	25	80	3
0300	A	300	30	100	3

Ordering Code (example):

Prismatic Guide = 2963.81.  
Width = 95 mm = 095.  
Thickness = 57 mm = 057.  
l = 250 mm = 0250  
Order No = 2963.81.095.057.0250

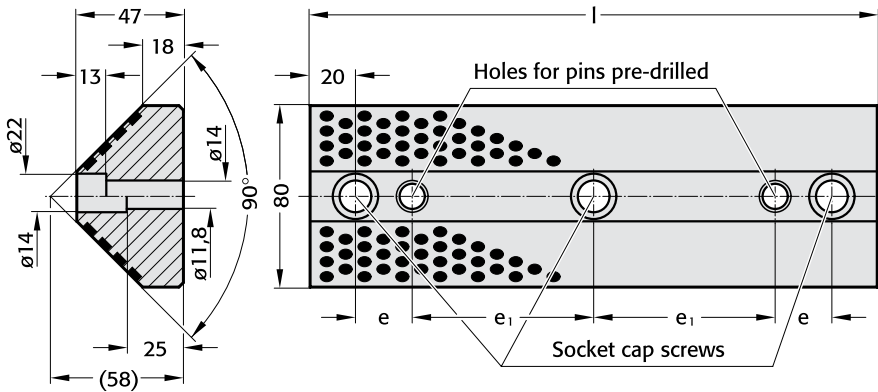
**FIBRO**

2963.80.

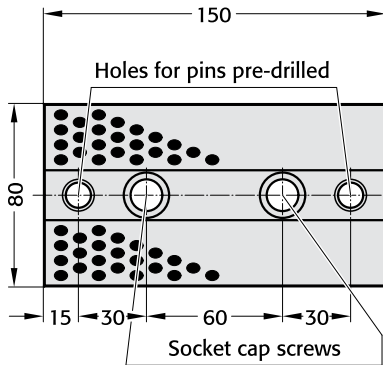
**Sliding Blocks  
Bronze with Non-Liquid Lubricant**

2963.80.

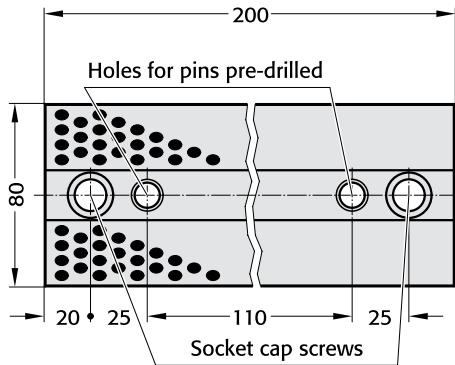
Shape A



Shape B



Shape C



**Material:**

Bronze with non-liquid lubricant, oilless lubricating.

**Note:**

Screws and pins not included.

**Fixing:**

Use socket cap screws M12  
DIN EN ISO 4762.

2963.80.

Order No	Shape	l	e	e <sub>1</sub>	Number of screw holes
2963.80.080.047.0150	B	150	30	-	2
0200	C	200	25	-	2
0250	A	250	25	80	3
0300	A	300	30	100	3

**Ordering Code (example):**

Sliding Block = 2963.80.  
 Width = 80 mm = 080.  
 Thickness = 47 mm = 047.  
 l = 250 mm = 0250  
 Order No = 2963.80.080.047.0250

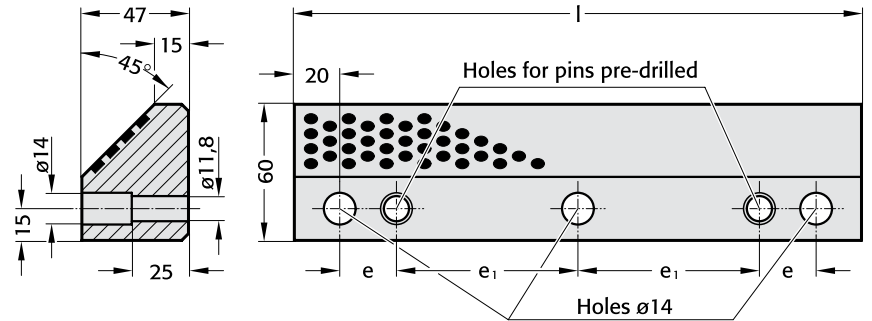
Single-sided Prismatic Guides  
Bronze with Non-Liquid Lubricant

2965.81.

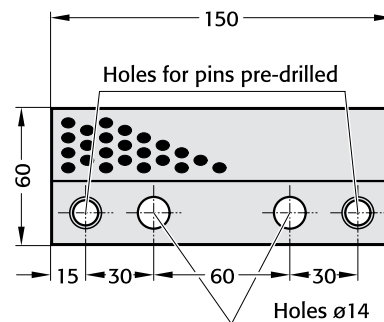


2965.81.

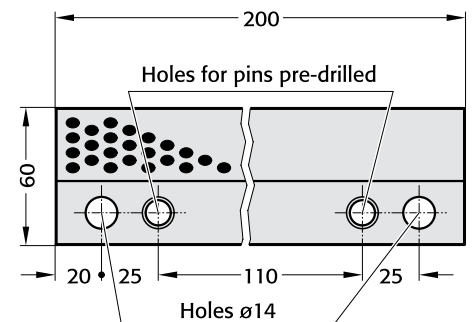
Shape A



Shape B



Shape C



**Material:**

Bronze with non-liquid lubricant, oilless lubricating.

**Note:**

Single-sided prismatic sliding blocks 2965.83. see opposite page  
Screws and pins not included.

2965.81.

Order No	Shape	l	e	e <sub>1</sub>	Number of screw holes
2965.81.060.047.0150	B	150	30	—	2
0200	C	200	25	—	2
0250	A	250	25	80	3
0300	A	300	30	100	3

**Ordering Code (example):**

Single-sided Prismatic Guide = 2965.81.  
Width = 60 mm = 060.  
Thickness = 47 mm = 047.  
l = 250 mm = 0250  
Order No = 2965.81.060.047.0250



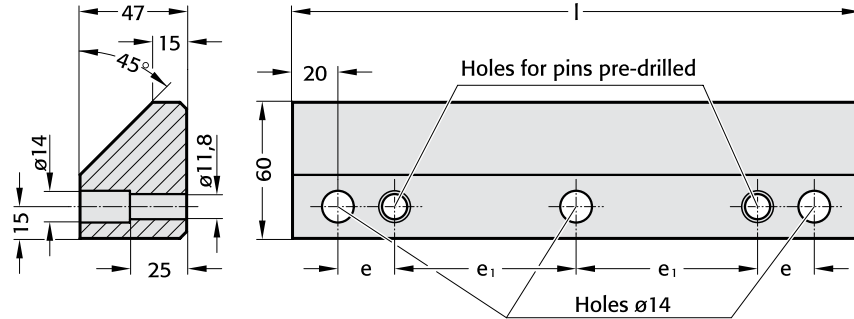
**FIBRO**

2965.83.

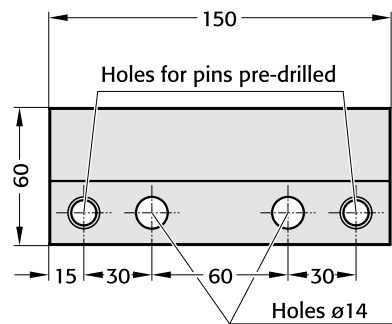
Single-sided Prismatic Sliding Blocks  
Steel

2965.83.

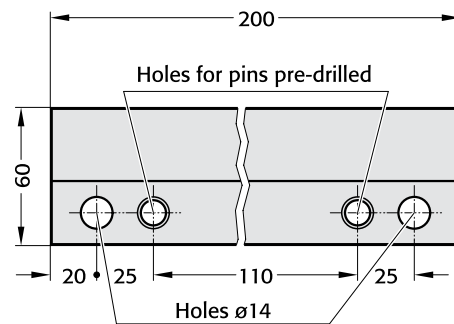
Shape A



Shape B



Shape C



**Material:**

Steel  
Sliding faces surface hardened

**Note:**

Single-sided prismatic guides 2965.81. see opposite page  
Screws and pins not included.

2965.83.

Order No	Shape	l	e	e <sub>1</sub>	Number of screw holes
2965.83.060.047.0150	B	150	30	—	2
0200	C	200	25	—	2
0250	A	250	25	80	3
0300	A	300	30	100	3

**Ordering Code (example):**

Single-sided Prismatic Sliding Block = 2965.83.  
 Width = 60 mm = 060.  
 Thickness = 47 mm = 047.  
 l = 250 mm = 0250  
 Order No = 2965.83.060.047.0250

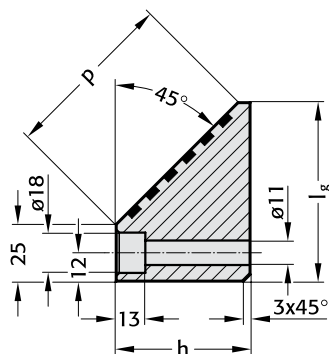
# Single-sided Prismatic Guides Bronze with Non-Liquid Lubricant to CNOMO Standard

**FIBRO**

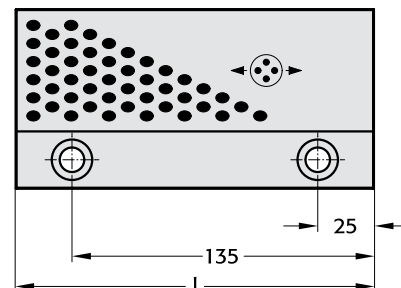
2965.80.45.



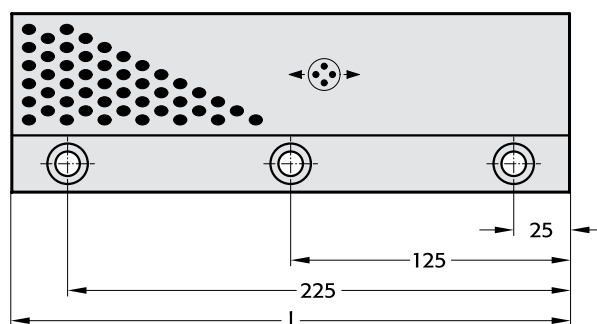
2965.80.45.



Shape A



Shape B



### Material:

Bronze with non-liquid lubricant, oilless lubricating.

### Note:

Single-sided prismatic sliding blocks 2965.82.45. see opposite page

Screws not included.

### Fixing:

Use socket cap screws M10  
DIN EN ISO 4762.

2965.80.45.

Order No	Shape	lg	h	l	p	Number of screw holes
2965.80.45.060.045.160	A	60	45	160	50	2
2965.80.45.060.045.250	B	60	45	250	50	3
2965.80.45.080.060.160	A	80	60	160	80	2
2965.80.45.080.060.250	B	80	60	250	80	3

### Ordering Code (example):

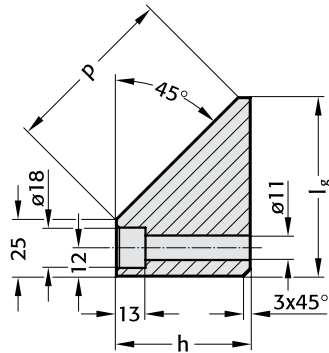
Single-sided Prismatic Guide = 2965.80.45.  
 $l_g$  = 60 mm = 060.  
 $h$  = 45 mm = 045.  
 $l$  = 160 mm = 160  
 Order No = 2965.80.45.060.045.160

**FIBRO**

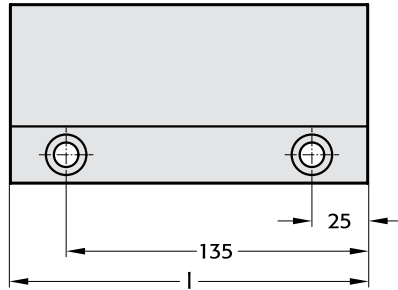
2965.82.45.

Single-sided Prismatic Sliding Blocks  
Steel to CNOMO Standard

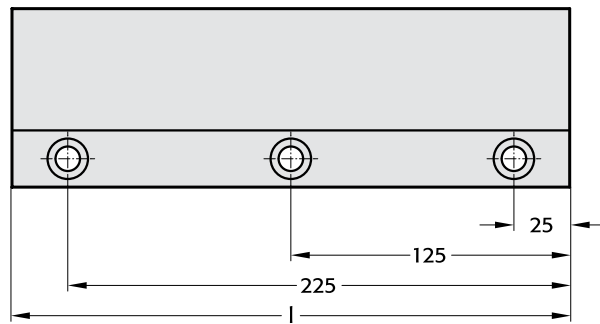
2965.82.45.



Shape A



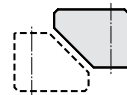
Shape B



**Material:**

Steel  
Sliding faces surface hardened

**Note:**



Single-sided prismatic guides 2965.80.45. see opposite page

Screws not included.

**Fixing:**

Use socket cap screws M10  
DIN EN ISO 4762.

2965.82.45.

Order No	Shape	lg	h	l	p	Number of screw holes
2965.82.45.060.045.160	A	60	45	160	50	2
2965.82.45.060.045.250	B	60	45	250	50	3
2965.82.45.080.060.160	A	80	60	160	80	2
2965.82.45.080.060.250	B	80	60	250	80	3

**Ordering Code (example):**

Single-sided Prismatic Sliding Block = 2965.82.45.  
 lg = 60 mm = 060.  
 h = 45 mm = 045.  
 l = 250 mm = 160  
 Order No = 2965.82.45.060.045.160

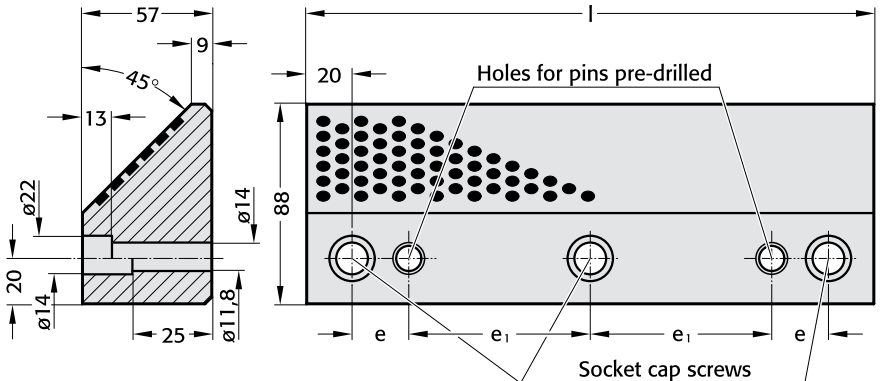
Single-sided Prismatic Guides  
Bronze with Non-Liquid Lubricant

2965.80.

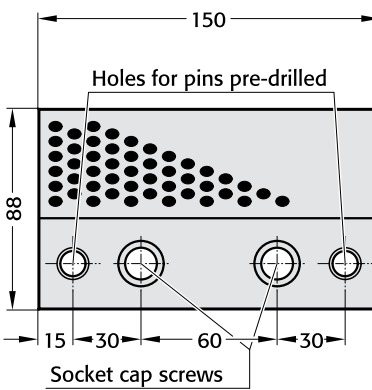


2965.80.

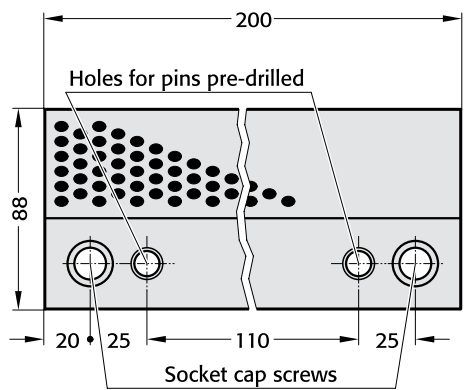
Shape A



Shape B



Shape C



Material:

Bronze with non-liquid lubricant, oilless lubricating.

Note:

Single-sided prismatic sliding blocks 2965.82. see opposite page

Screws and pins not included.

Fixing:

Use socket cap screws M12  
DIN EN ISO 4762.

2965.80.

Order No	Shape	l	e	e <sub>1</sub>	Number of screw holes
2965.80.088.057.0150	B	150	30	-	2
0200	C	200	25	-	2
0250	A	250	25	80	3
0300	A	300	30	100	3

Ordering Code (example):

Single-sided Prismatic Guide = 2965.80.  
 Width = 88 mm = 088.  
 Thickness = 57 mm = 057.  
 l = 250 mm = 0250  
 Order No = 2965.80.088.057.0250

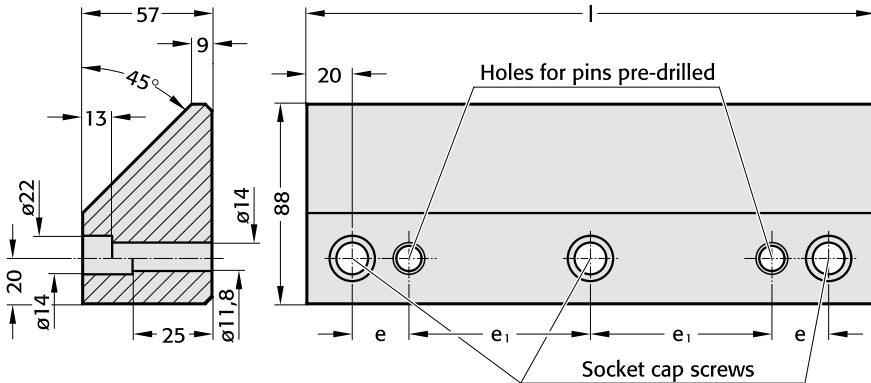
**FIBRO**

2965.82.

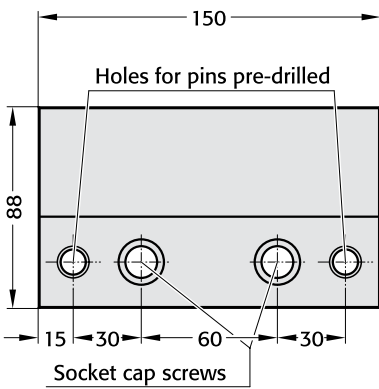
Single-sided Prismatic Sliding Blocks  
Steel

2965.82.

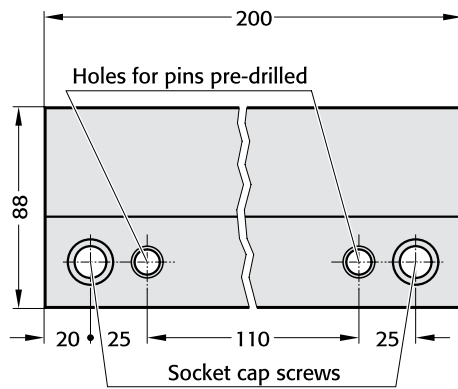
Shape A



Shape B



Shape C



**Material:**

Steel  
Sliding faces surface hardened.

**Note:**

Single-sided prismatic guides 2965.80. see opposite page  
Screws and pins not included.

**Fixing:**

Use socket cap screws M12  
DIN EN ISO 4762.

2965.82.

Order No	Shape	l	e	e <sub>1</sub>	Number of screw holes
2965.82.088.057.0150	B	150	30	–	2
0200	C	200	25	–	2
0250	A	250	25	80	3
0300	A	300	30	100	3

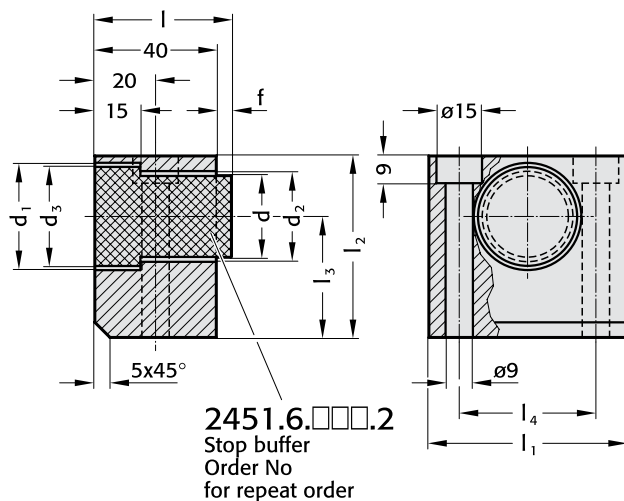
**Ordering Code (example) :**

Single-sided Prismatic Sliding Block = 2965.82.  
 Width = 88 mm = 088.  
 Thickness = 57 mm = 057.  
 l = 250 mm = 0250  
 Order No = 2965.82.088.057.0250

**Slide stop  
Stop buffer**



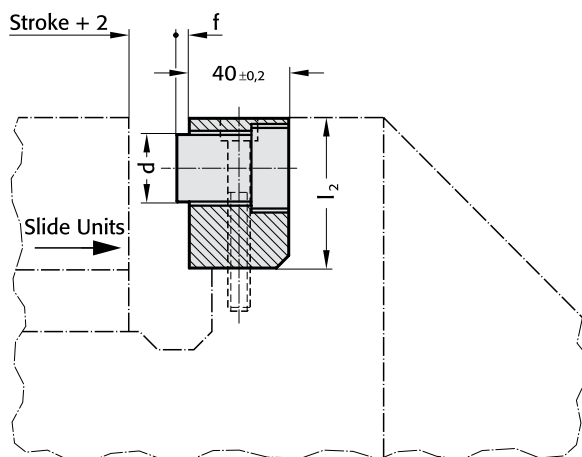
2451.6.



2451.6.

Order No	d	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	f	spring force in N
2451.6.027	27	35	30	34	45	65	60	40	45	5	5200
2451.6.036	36	45	40	44	45	75	70	45	55	5	9800

Installation example:



**Material:**

Location block: Steel  
 Stop buffer: FIBROFLEX,  
 90 Shore A-hardness = 6.

**Note:**

Screws not included.

**Fixing:**

Use socket cap screw to DIN EN ISO 4762 M8 x 80.

**Ordering Code (example):**

Slide stop	= 2451.
Shore A, hardness 90	= 6.
d = 27 mm	= 027
Order No	= 2451.6.027

**Ordering Code (example):**

Slide stop buffer	= 2451.	.2
Shore A, hardness 90	= 6.	
d = 27 mm	= 027.	
Order No	= 2451.6.027.2	



# Mounting Examples Oilless Guide Elements

Pos. 1  
 2960.70. Sliding Pads ISO  
 2960.71. Sliding Pads VDI  
 2960.72. Sliding Pads, small dimensions  
 2960.74. Sliding Pads AFNOR  
 2960.76. Sliding Pads  
 2960.79. Sliding Pads to NAAMS

2960.70.  
 2960.71.  
 2960.72.  
 2960.74.  
 2960.76.  
 2960.79.

2960.70.  
 2960.71.  
 2960.72.  
 2960.74.  
 2960.76.  
 2960.79.

Pos. 1  
 2960.70. Sliding Pads ISO  
 2960.71. Sliding Pads VDI  
 2960.72. Sliding Pads, small dimensions  
 2960.74. Sliding Pads AFNOR  
 2960.76. Sliding Pads  
 2960.79. Sliding Pads to NAAMS  
 2960.87. Sliding Pads VDI

2960.73.

2960.70.  
 2960.71.  
 2960.72.  
 2960.74.  
 2960.76.  
 2960.79.  
 2960.87.

Pos. 2  
 2960.73. Guide Brackets VDI

Pos. 1  
 2960.70. Sliding Pads ISO  
 2960.71. Sliding Pads VDI  
 2960.72. Sliding Pads, small dimensions  
 2960.74. Sliding Pads AFNOR  
 2960.76. Sliding Pads  
 2960.79. Sliding Pads to NAAMS  
 2960.87. Sliding Pads VDI

2960.70.  
 2960.71.  
 2960.72.  
 2960.74.  
 2960.76.  
 2960.79.

2960.70.  
 2960.71.  
 2960.72.  
 2960.74.  
 2960.76.  
 2960.79.  
 2960.87.

Pos. 2  
 2052.70. Oilless Guide Bushes

Pos. 3  
 2102.70. Guide Bushes with collar AFNOR

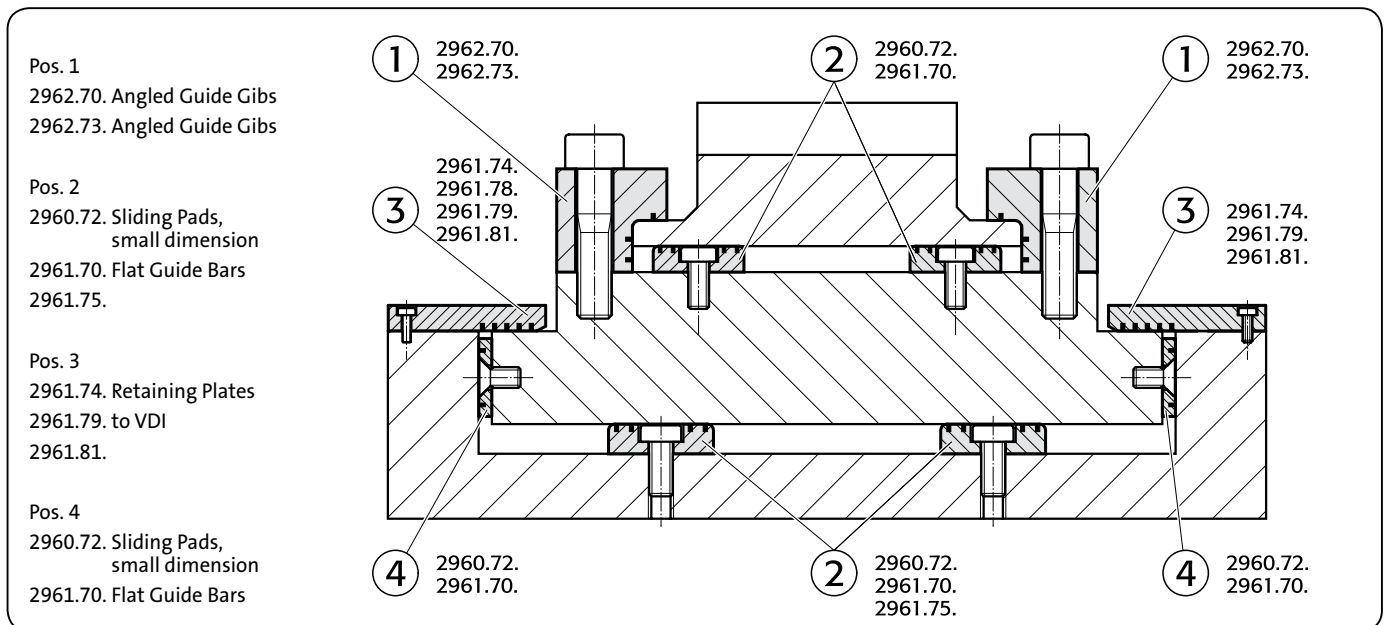
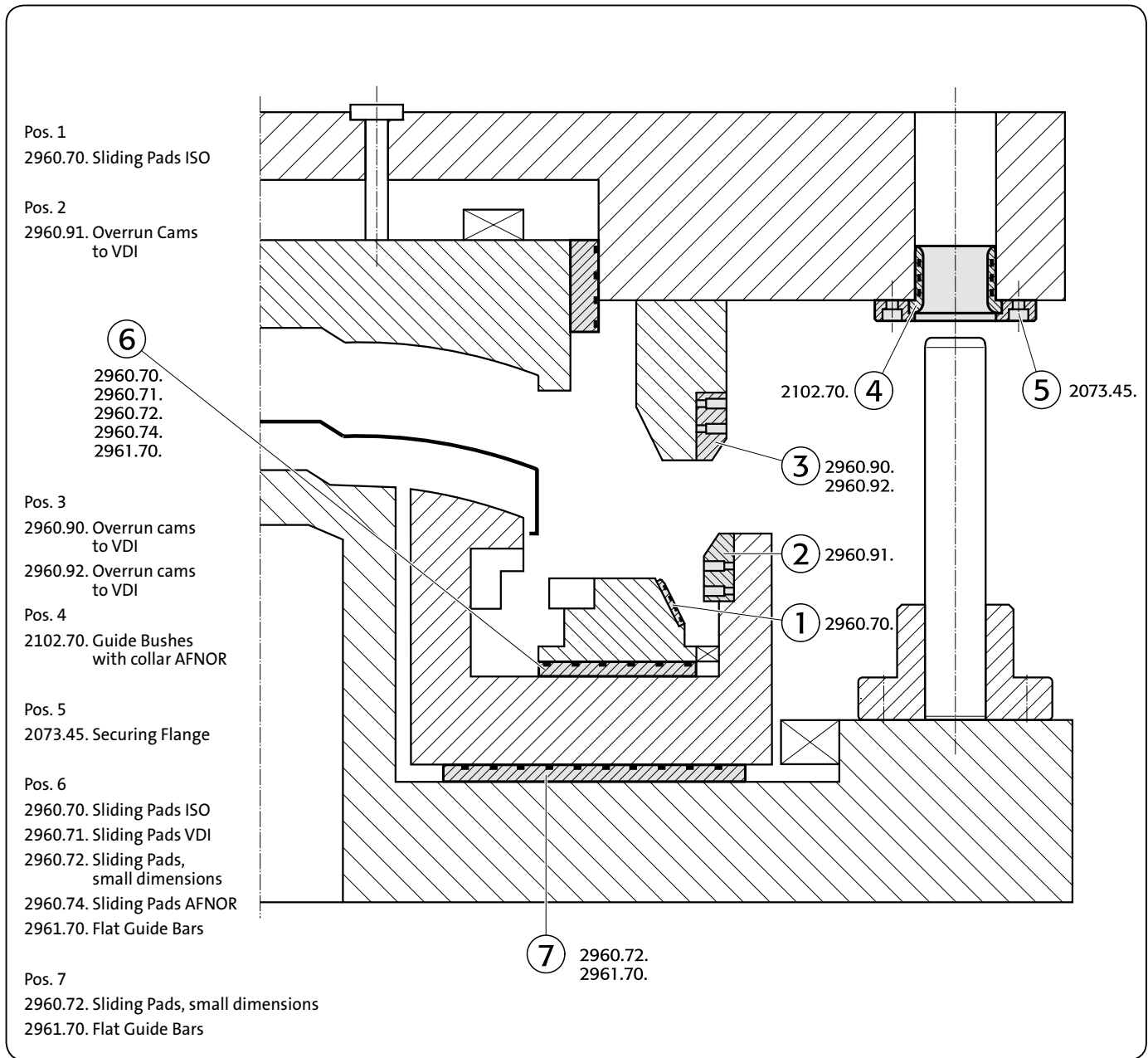
Pos. 4  
 2073.45. Securing Flange

2052.70.

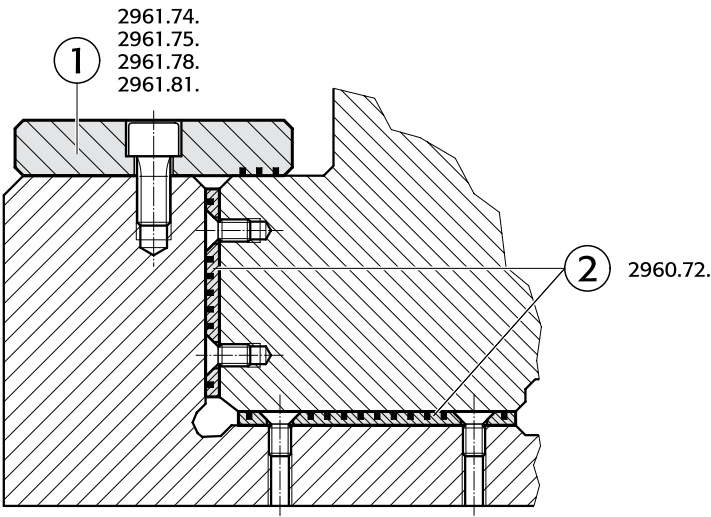
2102.70.  
 2073.45.



## Mounting Examples Oilless Guide Elements



# Mounting Examples Oilless Guide Elements



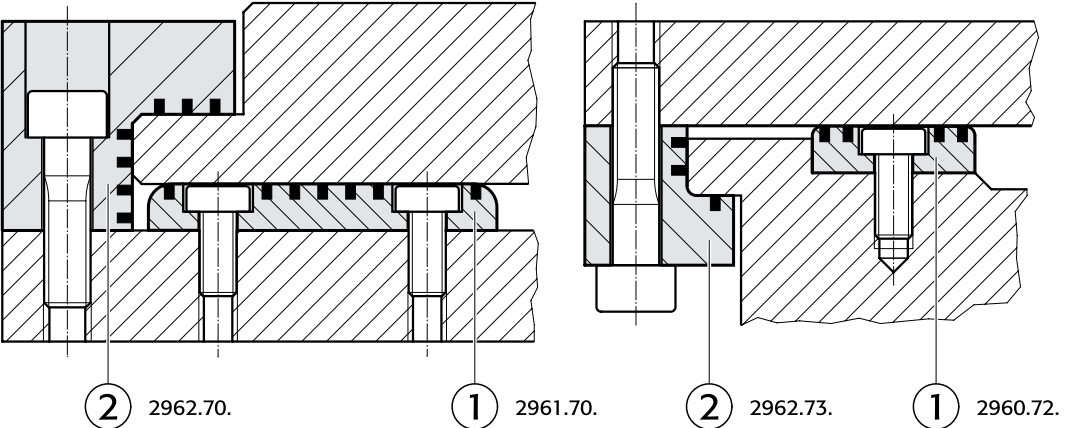
2961.74.  
2961.75.  
2961.78.  
2961.81.

1

2 2960.72.

Pos. 1  
2961.74. Retaining Plates to VDI

Pos. 2  
2960.72. Sliding Pads, small dimensions



Pos. 1  
2961.70. Flat Guide Bars  
2960.72. Sliding Pads, small dimensions

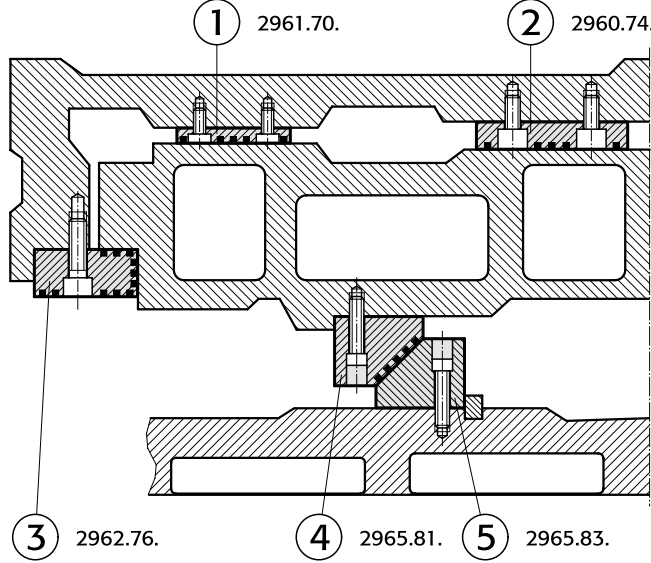
2 2962.70.

1 2961.70.

2 2962.73.

1 2960.72.

Pos. 2  
2962.70. Angled Guide Gibs  
2962.73. Angled Guide Gibs



1 2961.70.

2 2960.74.

Pos. 1  
2961.70. Flat Guide Bars

Pos. 2  
2960.74. Sliding Pads AFNOR

Pos. 3  
2962.76. Guide Bars with three sliding surfaces

Pos. 4  
2965.81. Single-sided prismatic Guides (Bronze)

Pos. 5  
2965.83. Single-sided Prismatic Sliding Blocks (Steel)

3 2962.76.

4 2965.81.

5 2965.83.

## Mounting Examples Oilless Guide Elements

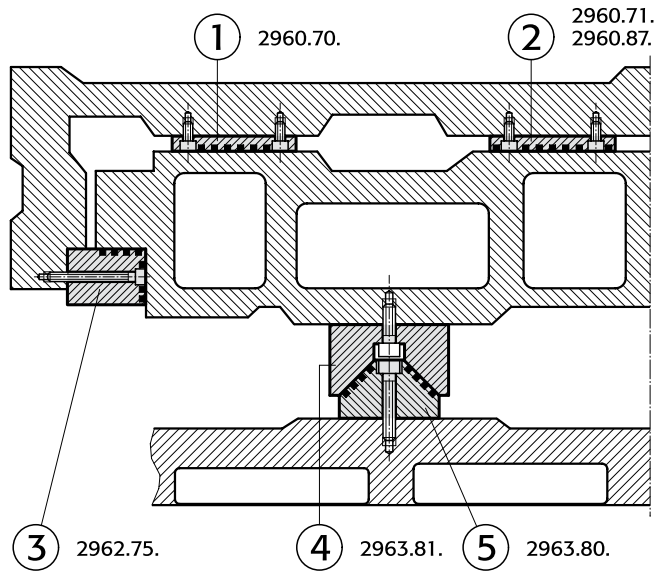
Pos. 1  
2960.70. Sliding Pads ISO

Pos. 2  
2960.71. Sliding Pads VDI  
2960.87.

Pos. 3  
2962.75. Guide Bars with two  
sliding surfaces

Pos. 4  
2963.81. Prismatic Guides

Pos. 5  
2963.80. Sliding Blocks

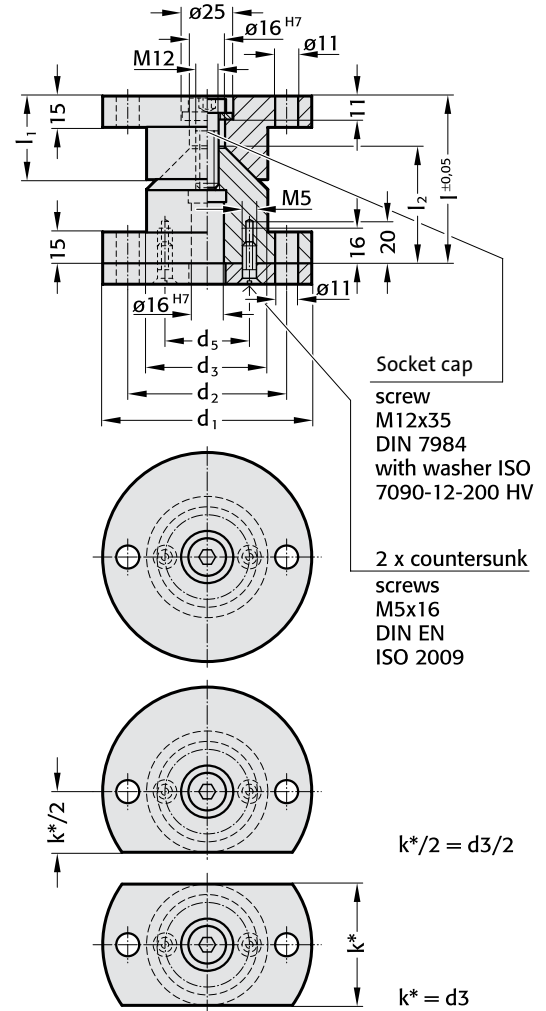


Centring Units with Adjusting Washer

2441.11.0.



2441.11.0.



**Material:**

Centring Units: 16 Mn Cr 5  
nitrited  
600<sup>+50</sup> HV 50

Adjusting Washers: C 45 or similar

**Note:**

Centring unit complete with adjusting washer.  
Screws included.

**2441.11.0.**

Centring unit with adjusting washer.

**2441.11.0. [ ] .1**

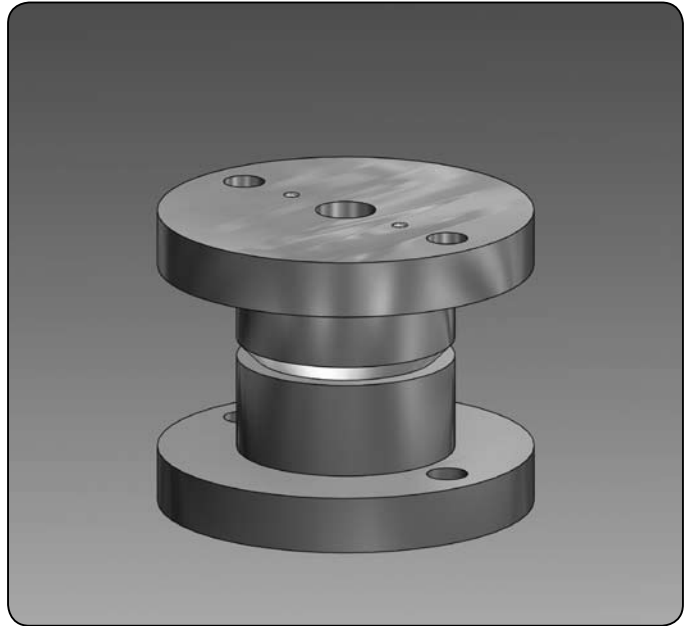
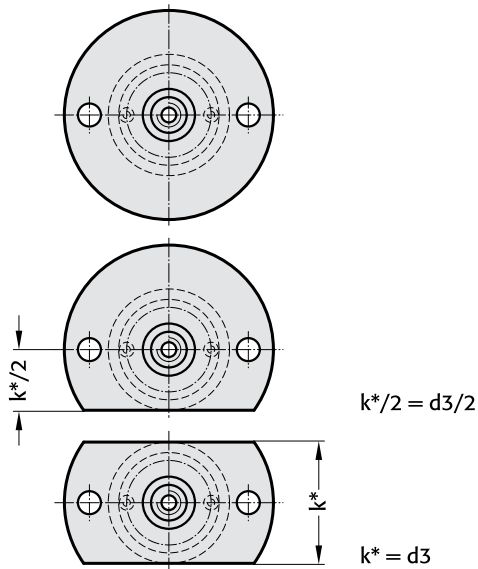
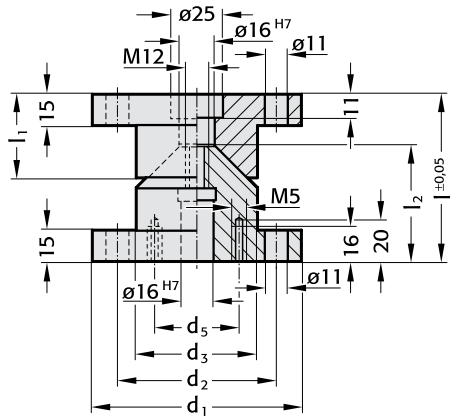
Centring unit with one flat side with adjusting washer.

**2441.11.0. [ ] .2**

Centring unit with two flat sides with adjusting washer.

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l	l <sub>1</sub>	l <sub>2</sub>	d <sub>5</sub>
2441.11.0.100	100	76	58	80	40	55	40,5
120	120	96	78	90	50	65	50,5
100.1	100	76	58	80	40	55	40,5
120.1	120	96	78	90	50	65	50,5
100.2	100	76	58	80	40	55	40,5
120.2	120	96	78	90	50	65	50,5

2441.11.



**Material:**

16 Mn Cr 5  
nitrited  
600<sup>+50</sup> HV 50

**Note:**

Adjusting washer to be ordered separately.  
Screws not included.

**2441.11.**

Centring unit without adjusting washer.

**2441.11.**     .1

Centring unit with one flat side without adjusting washer.

**2441.11.**     .2

Centring unit with two flat sides without adjusting washer

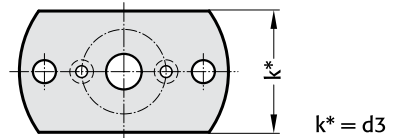
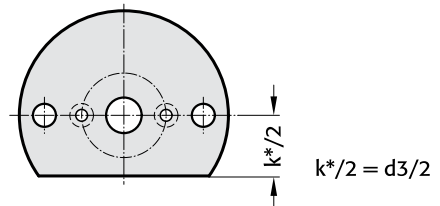
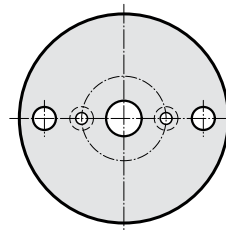
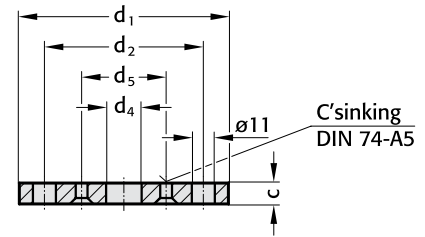
Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l	l <sub>1</sub>	l <sub>2</sub>	d <sub>5</sub>
2441.11.100	100	76	58	80	40	55	40,5
120	120	96	78	90	50	65	50,5
100.1	100	76	58	80	40	55	40,5
120.1	120	96	78	90	50	65	50,5
100.2	100	76	58	80	40	55	40,5
120.2	120	96	78	90	50	65	50,5

Adjusting Washers

2441.11.3.



2441.11.3.



Material:

C45 or similar

2441.11.3.

Adjusting washer without flat side.

2441.11.3.  .1

Adjusting washer with one flat side.

2441.11.3.  .2

Adjusting washer with two flat sides.

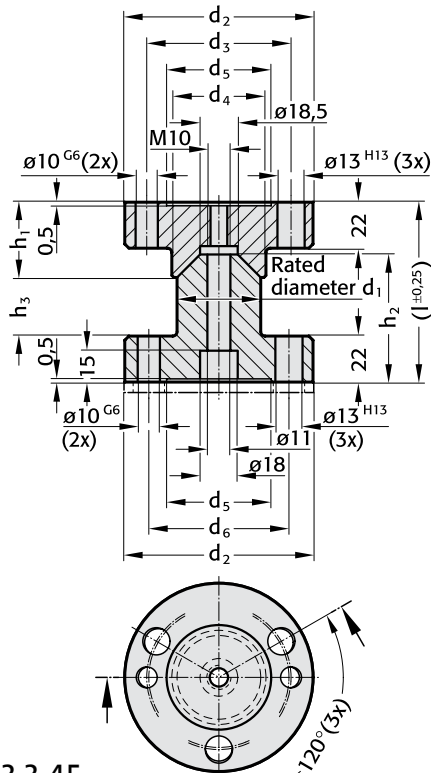
Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	c	d <sub>5</sub>
2441.11.3.100	100	76	58	17	10	40,5
105	105	76	58	18	5,5	40,5
120	120	96	78	17	10	50,5
125	125	96	78	18	5,5	50,5
2441.11.3.100.1	100	76	58	17	10	40,5
120.1	120	96	78	17	10	50,5
2441.11.3.100.2	100	76	58	17	10	40,5
120.2	120	96	78	17	10	50,5

# FIBRO

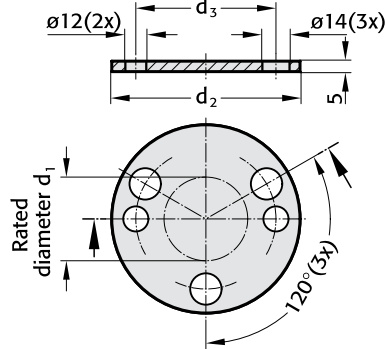
2441.13.45.  
2441.13.3.45.

## Centring Units to CNOMO Adjusting Washers

2441.13.45.



2441.13.3.45.



### Material:

Centring unit: X153CrMoV12 (1.2379)  
hardened 58 ± 2 HRC

Adjusting washer: Cf 70 (1.1249)

### Note:

Order No 2441.13.0.45. centring unit to CNOMO standard with  
adjusting washer.

Screws and pins not included.

### 2441.13.45. Centring Units

Order No	nominal $\varnothing d_1$	$d_2$	$d_3$	$d_4$	$d_5$	$d_6$	$h_1$	$h_2$	$h_3$	(l)
2441.13.45.040	40	90	69	45	50	67	36	61	28	(86)
060	60	110	89	65	70	89	46	61	18	(86)

### 2441.13.3.45. Adjusting Washers

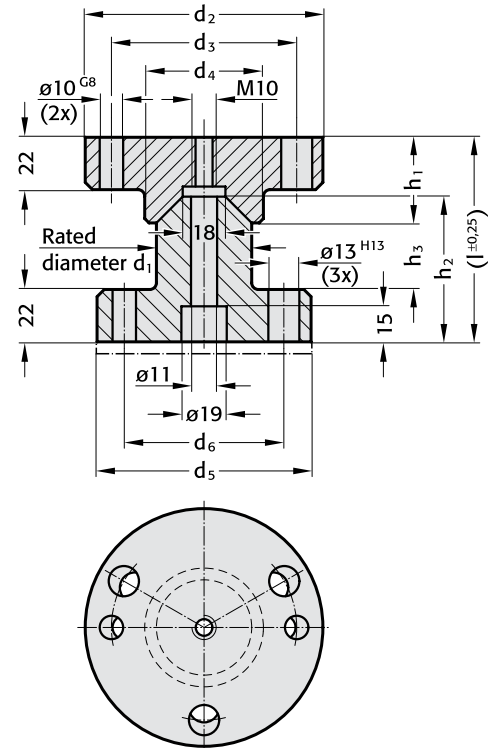
Order No	nominal $\varnothing d_1$	$d_2$	$d_3$
2441.13.3.45.040	40	90	67
060	60	110	89

**Centring Units to CNOMO  
Adjusting Washers**

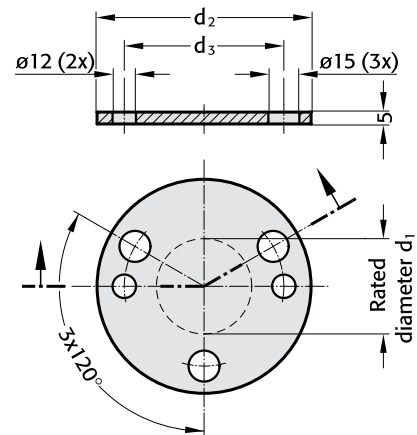
2441.13.  
2441.13.3.



2441.13.



2441.13.3.



**Material:**

Centring unit: 16 Mn Cr 5  
nitriert  
600+50 HV 50  
Adjusting washer 100 Cr 6

**Note:**

2441.13.3. Adjusting Washer, order separately.  
Screws and pins not included.

**2441.13. Centring Units**

Order no	Nominal diameter $d_1$	$d_2$	$d_3$	$d_4$	$d_5$	$d_6$	$h_1$	$h_2$	$h_3$	(l)
2441.13.040	40	100	79	50	90	67	36	61	28	(86)
060	60	125	104	70	110	89	46	61	18	(86)

**2441.13.3. Adjusting washers**

Order no	Nominal diameter $d_1$	$d_2$	$d_3$
2441.13.3.040	40	90	67
060	60	110	89



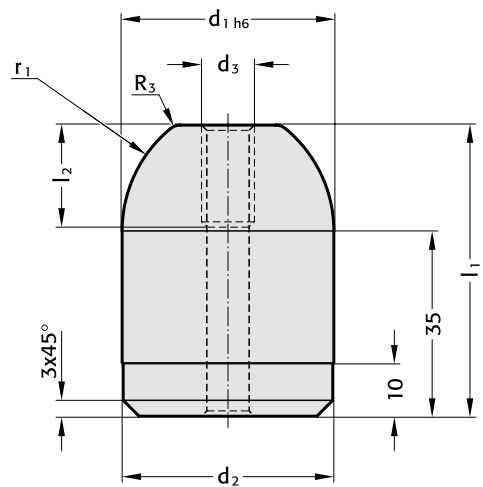


Centring pin to VW standard

2445.10.



2445.10.



Description:

Using locating holes components, assemblies and tools can be repeatedly centred with high precision on processing machines, measuring equipment and tool components.

Material:

Steel, hardened

Note:

Supplied without screws

Fixing:

Use DIN EN ISO 4762 socket cap screws.

M6x60

M8x70

2445.10.

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>1</sub>	l <sub>2</sub>	r <sub>1</sub>
2445.10.022	22	21,95	M 8	45	16	15
032	32	31,95	M10	50	20	20
040	40	39,95	M10	55	20	25
050	50	49,95	M10	55	20	25

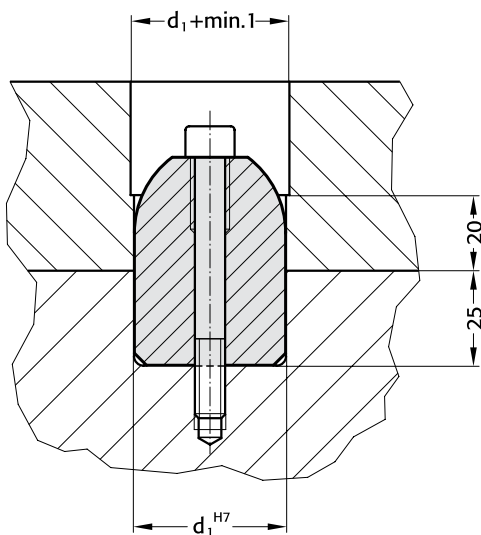
Ordering Code (example):

Centring pin to VW standard = 2445.10.

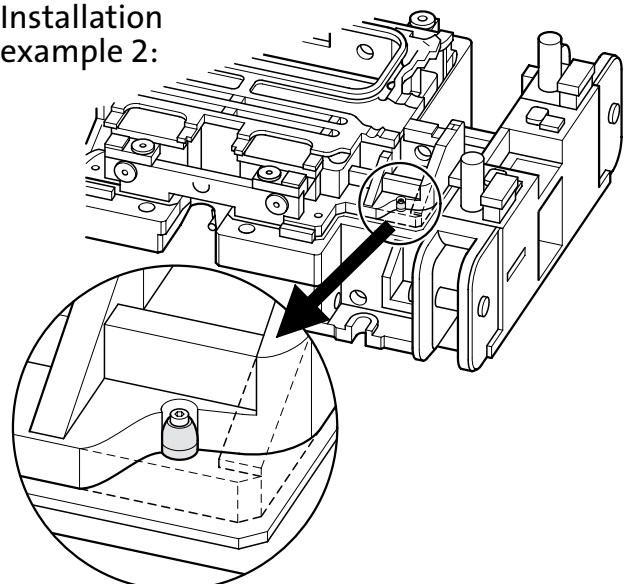
d<sub>1</sub> = 22 mm = 022

Order no = 2445.10.022

Installation example 1:



Installation example 2:

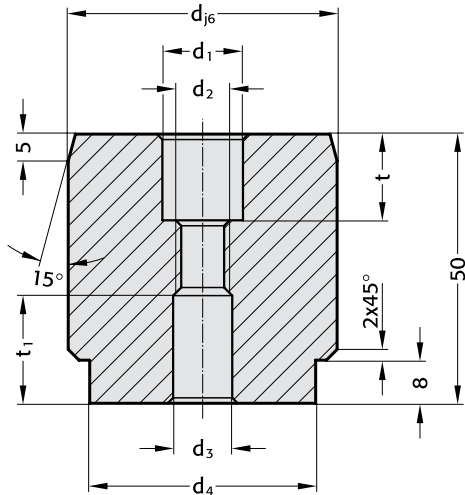


# FIBRO

2445.11.

## Centring pin to Daimler Standard

2445.11.



2445.11.

Order No	d	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	t	t <sub>1</sub>
2445.11.022	22	11	M 8	9	16	13	16
025	25	11	M 8	9	18	13	16
032	32	11	M 8	9	25	13	16
040	40	15	M10	11	32	16	20
050	50	15	M10	11	42	16	20

### Description:

Using locating holes components, assemblies and tools can be repeatedly centred with high precision on processing machines, measuring equipment and tool components.

### Material:

Steel, hardened

### Note:

Supplied without screws

### Fixing:

Use DIN EN ISO 4762 socket cap screws.

M6x50

M8x50

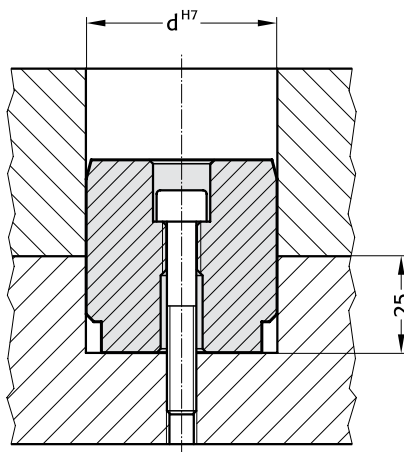
### Ordering Code (example):

Centring pin to Daimler = 2445.11.

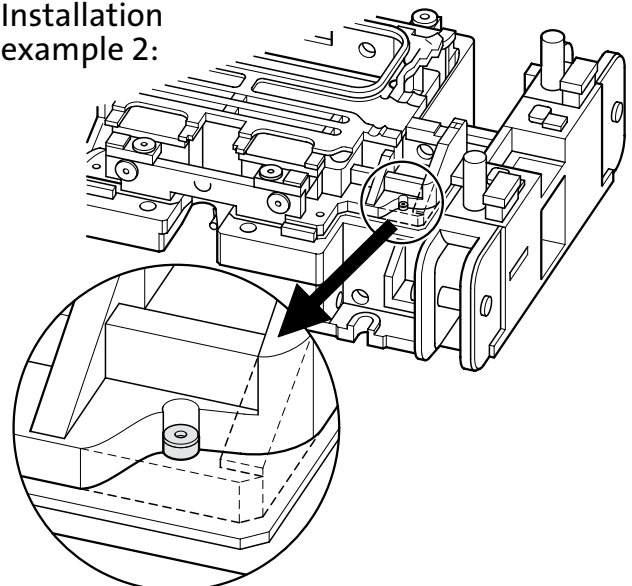
$d_1 = 22$  mm = 022

Order no = 2445.11.022

### Installation example 1:



### Installation example 2:

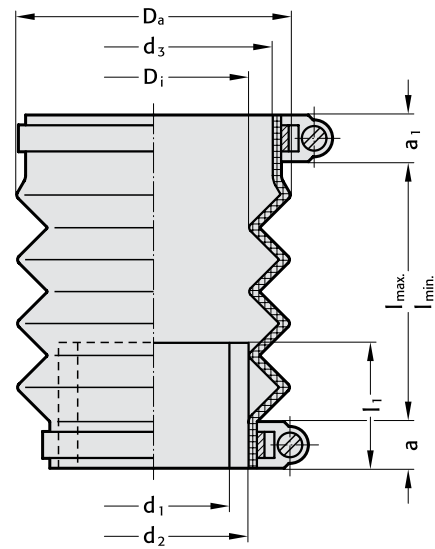


**Concertina Shrouds  
Spacer Bushes**

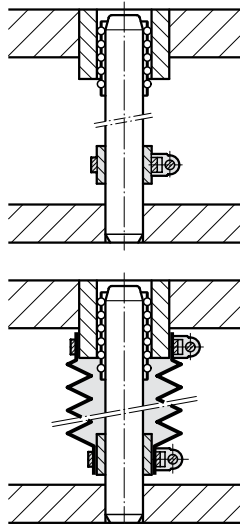
206.91.  
206.93.



206.91.

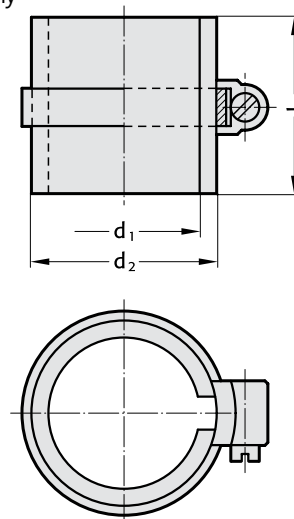


**Mounting Examples**



206.93.

Spacer Bushes only



**206.91.**

Concertina Shrouds for Guide Bushes 2051. and 2061.

d <sub>1</sub>	19	20	24	25	30	32	38	40	48	50	60	63
d <sub>2</sub>	25		30		40		50		60		70	
d <sub>3</sub>	32		38		48		58		68		79	
D <sub>i</sub>	30		30		46		55		62		75	
D <sub>a</sub>	51		56		72		87		86		100	
a	13		13		20		12		12		12	
a <sub>1</sub>	16		13		20		12		12		10	
l <sub>1</sub>	20		30		30		40		40		40	
l <sub>min.</sub>	30		25		20		44		25		30	
l <sub>max.</sub>	170		130		100		119		110		130	

**206.93.** Spacer Bushes only

d <sub>1</sub>	15	16	19	20	24	25	30	32	38	40	48	50	60	63
d <sub>2</sub>	20		25		30		40		50		60		70	
l <sub>1</sub>	20		20		30		30		40		40		40	

**Ordering Code (example):**

Spacer Bush = 206.93.  
d<sub>1</sub> = 25 mm = 025  
Order No = 206.93.025

**206.91.**

Concertina Shrouds for Guide Bushes 2081.

d <sub>1</sub>	19	20	24	25	30	32	38	40	48	50	60	63
d <sub>2</sub>	25		30		40		50		60		70	
d <sub>3</sub>	40		45		54		66		80		95	
D <sub>i</sub>	32		32		45		52		62		75	
D <sub>a</sub>	54		56		63		96		84		104	
a	10		10		10		12		12		10	
a <sub>1</sub>	10		10		10		12		12		10	
l <sub>1</sub>	20		30		30		40		40		40	
l <sub>min.</sub>	37		35		35		25		45		35	
l <sub>max.</sub>	145		110		110		225		165		185	

Concertina Shrouds are supplied complete with spacer bush and two hose clamps.  
Special sizes on request.

**Ordering Code (example):**

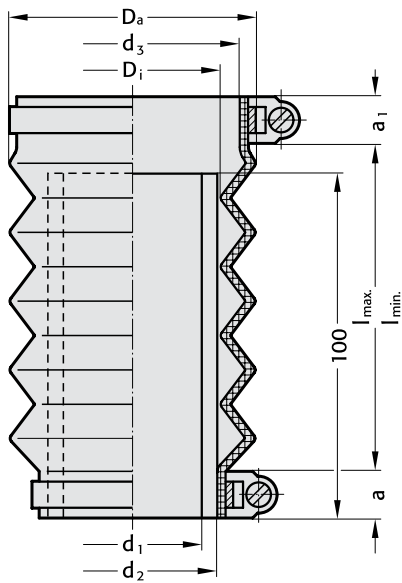
Concertina Shroud = 206.91.  
d<sub>1</sub> = 24 mm = 024.  
d<sub>3</sub> = 45 mm = 045  
Order No = 206.91.024.045

# FIBRO

206.92.  
206.94.

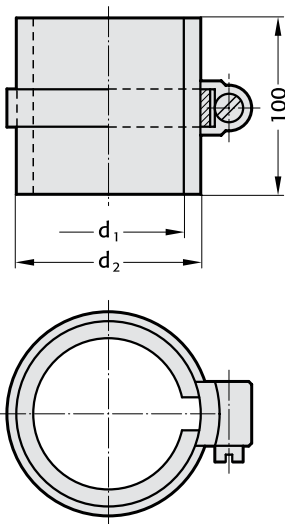
## Concertina Shrouds Spacer Tubes

206.92.

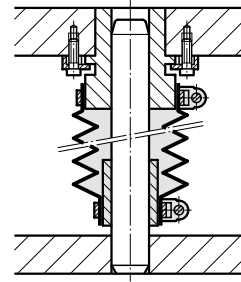


206.94.

Spacer Tubes only



### Mounting Examples



206.92.

Concertina Shrouds for Guide Bushes 2051. and 2061.

$d_1$	19	20	24	25	30	32	38	40	48	50	60	63
$d_2$	25	30	40	50	60	70						
$d_3$	32	38	48	58	68	79						
$D_i$	30	30	46	55	62	75						
$D_a$	51	56	72	87	86	100						
$a$	13	13	20	12	12	12						
$a_1$	16	13	20	12	12	10						
$l_{min.}$	30	25	20	44	25	30						
$l_{max.}$	170	130	100	119	110	130						

### Ordering Code (example):

Concertina Shroud	=	206.92.
$d_1 = 24$ mm	=	024.
$d_3 = 38$ mm	=	038
Order No	=	206.92.024.045

206.92.

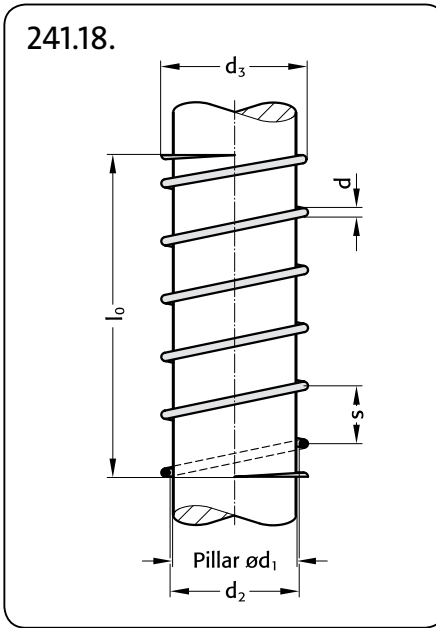
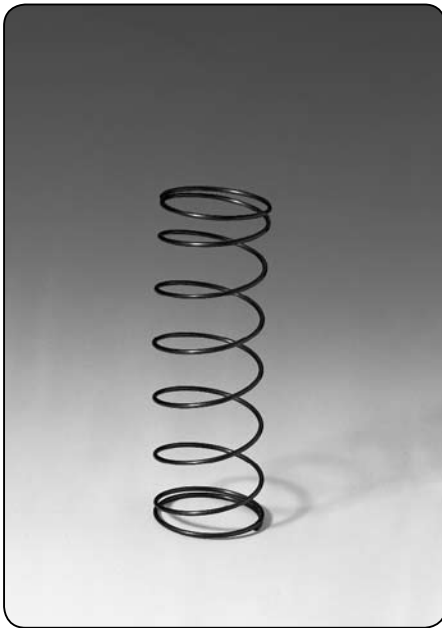
Concertina Shrouds for Guide Bushes 2081.

$d_1$	19	20	24	25	30	32	38	40	48	50	60	63
$d_2$	25	30	40	50	60	70						
$d_3$	40	45	54	66	80	95						
$D_i$	32	32	45	52	62	75						
$D_a$	54	56	63	96	84	104						
$a$	10	10	10	12	12	10						
$a_1$	10	10	10	12	12	10						
$l_{min.}$	37	35	35	25	45	35						
$l_{max.}$	145	110	110	225	165	185						

Concertina Shrouds are supplied complete with spacer tube and two hose clamps.  
Special sizes on request.

**Helical Springs for  
Ball Cage Retention**

**241.18.**  
replaces 241.08.



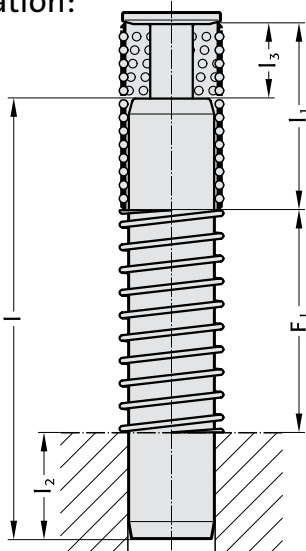
241.18.

Pillar-Ød <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	s	d	l <sub>0</sub> (10 mm gradation)
19/20	20,5	22,5	14	1,0	40-140
24/25	25,5	27,9	14	1,2	40-180
30/32	32,5	35,7	16	1,6	50-230
38	38,5	42,5	18	2,0	60-230
40	40,5	45,1	20	2,3	60-230
48/50	50,5	55,7	20	2,6	70-280
60	60,5	66,9	20	3,2	80-250
63	63,5	69,9	20	3,2	80-250

**Ordering Code (example):**

Helical Spring	=	241.18.
Internal spring Ød <sub>2</sub> = 20,5 mm	=	205.
l <sub>0</sub> = 60 mm	=	060
Order No	=	241.18.205.060

**Calculation:**



Formula for selecting spring 241.18.:

$$F_L = [l - (l_2 + (l_1 - l_3))] \times 1,1$$

Formula for calculating the block length  $L_{BL}$  of the selected spring:

$$L_{BL} = \frac{l_0 \times d}{s} + 2 \times d$$

$F_L$  = Length of compressed spring

$l$  = Length of guide column

(Customer specified)

$l_1$  = Cage length

(Customer specified)

$l_2$  = Compression length of guide column

(Customer specified)

$l_3$  = Ball cage retainer size

(Customer specified)

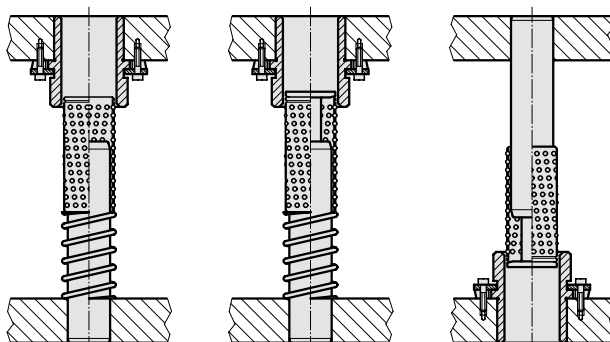
1.1 = Safety factor

$l_0$  = Length of uncompressed spring

$d$  = Spring wire diameter

$s$  = Pitch

**Mounting examples:**

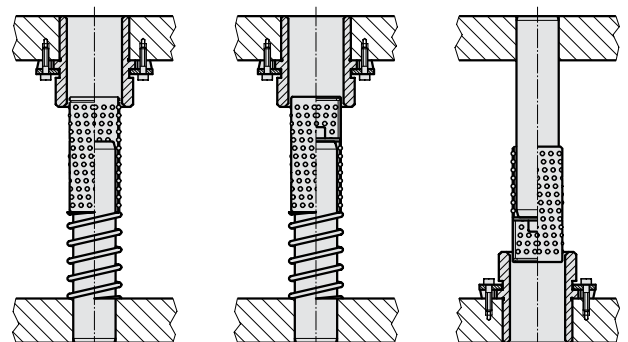


Without ball cage retainer

With ball cage retainer  
202.91.

With ball cage retainer  
202.91.

**Mounting examples:**



Without ball cage retainer

With ball cage retainer  
202.92.1.

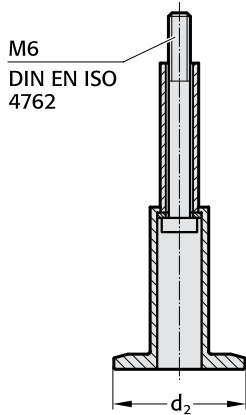
With ball cage retainer  
202.92.1.

# FIBRO

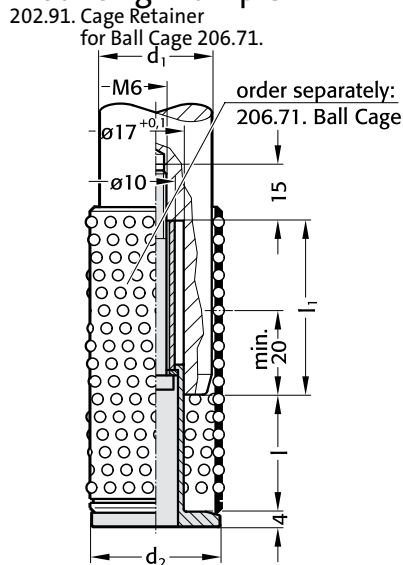
202.91.  
202.92.1.

Cage Retainer for Ball Cage 206.71.  
Cage Retainer for Ball Cage 206.75.

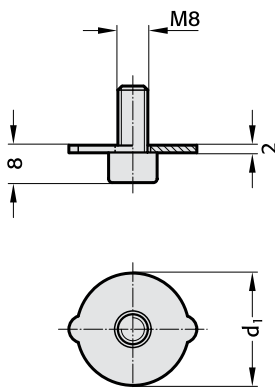
## 202.91. Cage Retainer



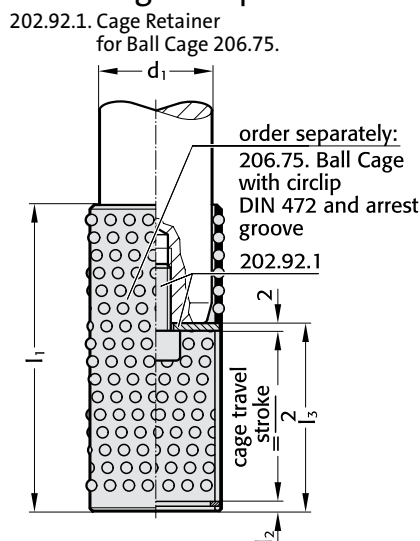
## Mounting Example



## 202.92.1. Cage Retainer



## Mounting Example



## 202.91. Cage Retainer for Ball Cage 206.71.

Cage Retainer	$d_1$	38 40	48 50	60	63
	$d_2$	44	54	64	67
Size	$l_1$				
1	31 46	●	●	●	●
2	41 56	●	●	●	●
3	51 66	●	●	●	●
4	61 76	●	●	●	●
5	73 89	●	●	●	●

The following guide pillars can be equipped with this cage retainer:

Guide pillars without cage retainer	become guide pillars with cage retainer
202.19.	202.17.
202.21.	202.55.
2021.46.	2021.44.
2021.50.	2021.58.

## 202.92.1. Cage Retainer for Ball Cage 206.75.

$d_1$	$l_1$	$l_2$	$l_3$	$d_1$	$l_1$	$l_2$	$l_3$
19/20	56	2,6	31	38/40	80	3,5	51
	72		41		95		61
	80		51		105		61
24/25	56	2,6	31		120		73
	72		41	48/50	80	4,3	51
	80		51		95		61
30/32	70	2,6	41		120		73
	80		51	60/63	95	4,3	61
	95		61		120		73
	105		61		140		83

The following guide pillars can be equipped with this cage retainer:

202.22.	2021.46.
202.24.	2021.50.

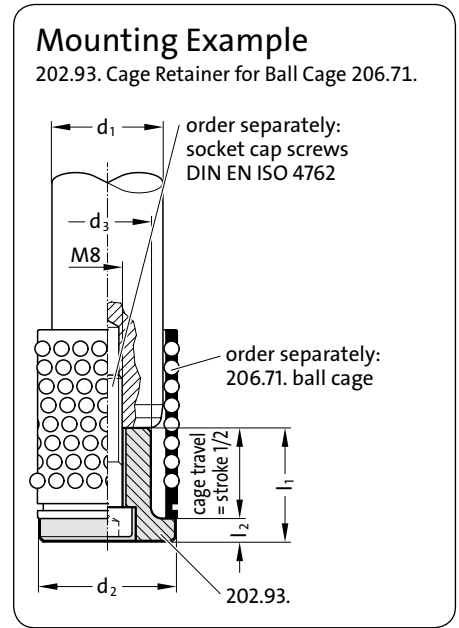
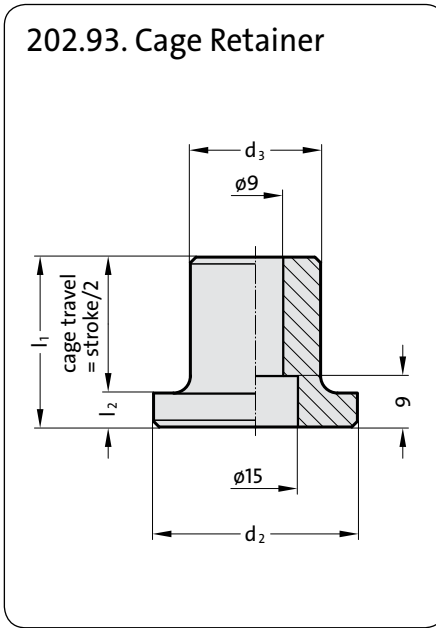
## Ordering Code (example):

Cage Retainer	= 202.91.
Pillar $\varnothing d_1 = 40$ mm	= 040.
Size 3	= 3
Order No	= 202.91.040.3
Guide pillar and ball cage to be ordered separately.	

Cage Retainer	= 202.92.1.
Pillar $\varnothing d_1 = 40$ mm	= 040
Order No	= 202.92.1.040
Guide pillar and ball cage to be ordered separately.	

Cage Retainer for Ball Cage 206.71.

202.93.



**Note:**  
Supplied without screws.

Socket Cap Screw DIN EN ISO 4762	for Ordering Size
2192.12.08.035	03
2192.12.08.045	04
2192.12.08.055	05
2192.12.08.070	06
2192.12.08.090	08

**Ordering Code (example):**

Cage Retainer	= 202.93.
Ordering Size = 03	= 03.
l <sub>1</sub> = 30 mm	= 030
Order No.	= 202.93.03.030

Guide pillar and ball cage to be ordered separately.

202.93. Cage Retainer for Ball Cage 206.71.

Ordering Size	ød <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>1</sub>	l <sub>2</sub>
03	30/32	36	23	30	6
04	38/40	44	31	40	6
05	48/50	54	39	50	8
06	60/63	66	51	60	8
08	80	89	71	80	8

The following guide pillars can be equipped with this cage retainer:

202.22.	2021.46.
202.24.	2021.50.

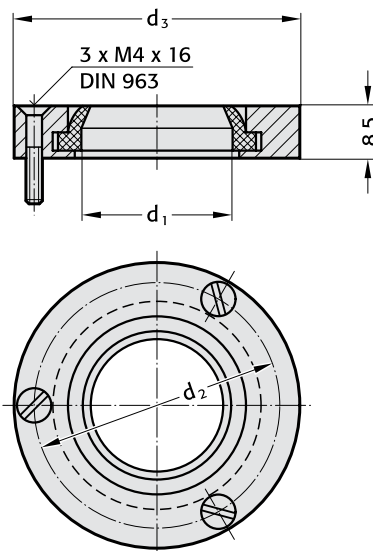


A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.

## Pillar Wipers



206.95.  
2061.95.



### Description:

FIBRO Pillar Wipers protect against premature wear caused by the ingress of dirt into the die set guides.

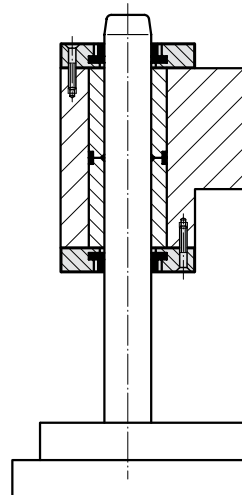
Outside diameters match boss dias. on FIBRO Die Sets (Cast Iron).

They can be fitted onto the bolster, or into a counterbore – flush with the bolster surface.

### Note:

Pillar Wipers come complete with 3 countersunk head screws M 4 × 16 DIN 963.

### Mounting Example:



### 206.95.

$d_1$	24 25	30 32	38 40	48 50	60 63
$d_2$	45	55	65	78	92
$d_3$	55	65	75	94	110

### 2061.95.

$d_1$	24 25
$d_2$	50
$d_3$	60

### Ordering Code (example):

Pillar Wiper = 206.95.

$d_1 = 25$  mm = 025

Order No = 206.95.025

### Ordering Code (example):

Pillar Wiper = 2061.95.

$d_1 = 25$  mm = 025

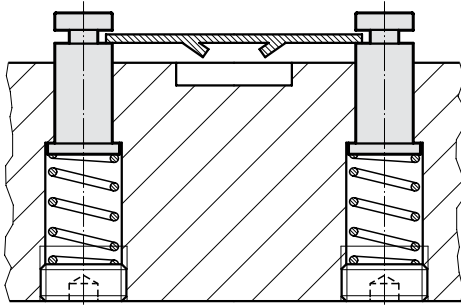
Order No = 2061.95.025

# FIBRO

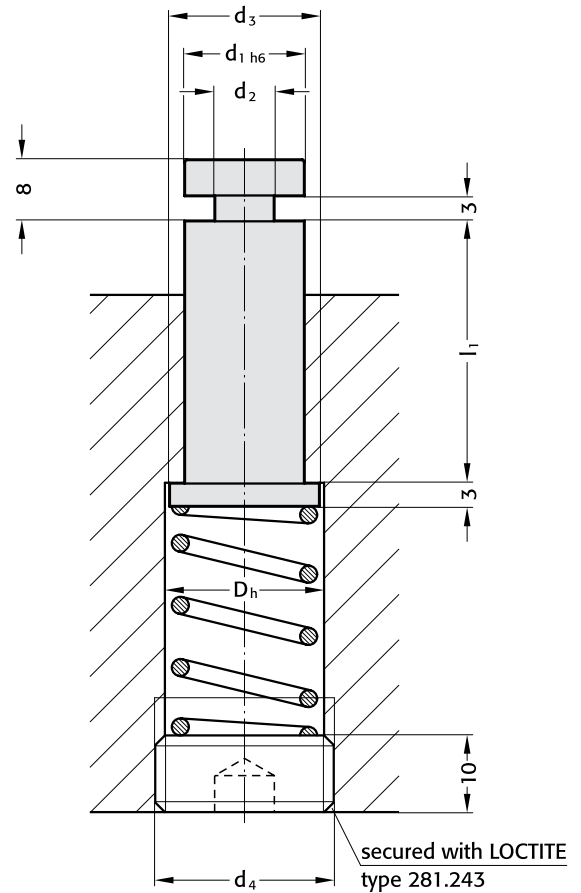
244.00.2.

## Lifter Pins for Press Tool Strips

### Mounting Example:



244.00.2.



### Description:

Combination progression dies with certain forming stages can be equipped advantageously with springloaded lifter pins. FIBRO Lifter Pins 244.00.2., available in four sizes, can be used to assume the double function of lifting and guiding the strip. The amount of lift is a function of the counterbore-depth.

### Execution:

Case-hardened and ground.

Material: No 1.7131

For ordering code of screw plugs see page F73.

For ordering code of helical spring see spring range, pages F10-F41.

244.00.2.

$d_{1h6}$	8	10	13	16
$d_2$	5	6	7	8
$d_3$	10	12	16	20
$D_h$	10,5	12,5	16,5	20,5
$d_4$	M 12 x 1,5	M 14 x 1,5	M 18 x 1,5	M 22 x 1,5
$l_1$				
20	●			
25	●	●	●	
32	●	●	●	●
40	●	●	●	●
50		●	●	●

### Ordering Code (example):

Lifter Pin = 244.00.2.

$d_1 = 8 \text{ mm} = 08.$

$l_1 = 32 \text{ mm} = 032$

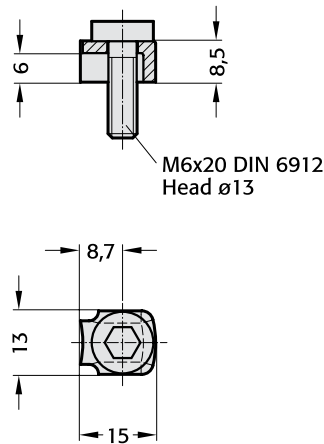
Order No = 244.00.2.08.032

**Screw Clamps  
for guide elements**

**207.45 2072.45.  
2072.46**



**207.45**



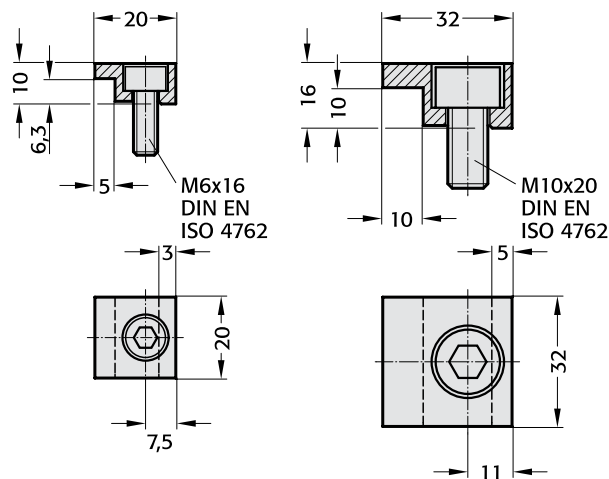
**207.45  
Screw Clamp**

- incl. screw
- steel punched bent component
- clamping height 6-6,3 mm
- M6 screw



**2072.45.10**

**2072.45.16**

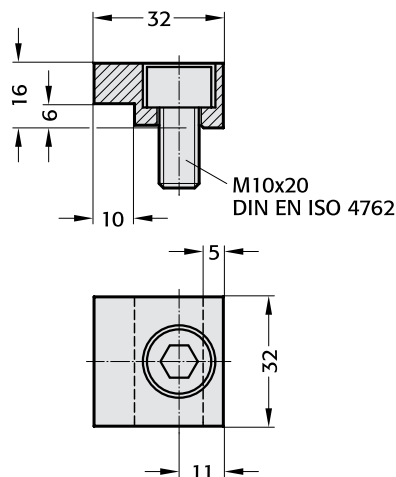


**2072.45.  
Screw Clamps**

- incl. screw
- 2072.45.10
- steel, milled
- clamping height 6-6,3 mm
- M6 screw
- 2072.45.16
- steel, milled
- clamping height 10 mm
- M10 screw



**2072.46**



**2072.46  
Screw Clamp**

- incl. screw
- steel, milled
- clamping height 6-6,3 mm
- M10 screw

# FIBRO

2071.45  
2072.47

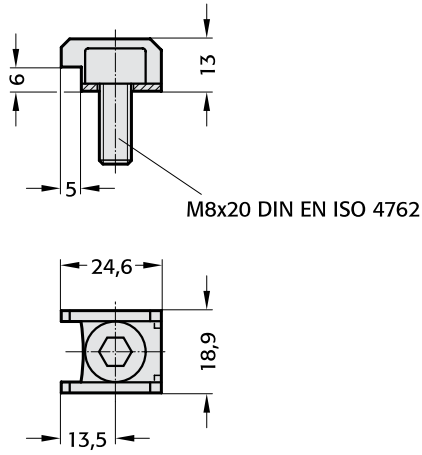
## Screw Clamps for guide elements

### 2072.47 Screw Clamp

incl. screw, NAAMS

- steel punched bent component
- clamping height 6-6,3 mm
- M8 screw

2072.47

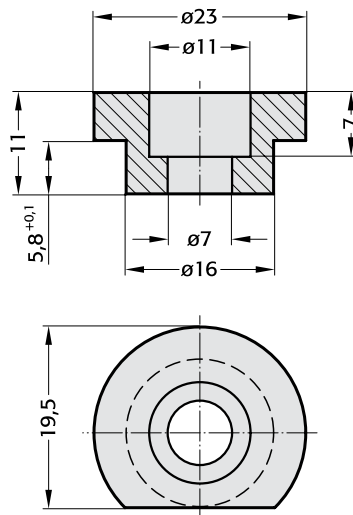


### 2071.45 Screw Clamp

incl. screw

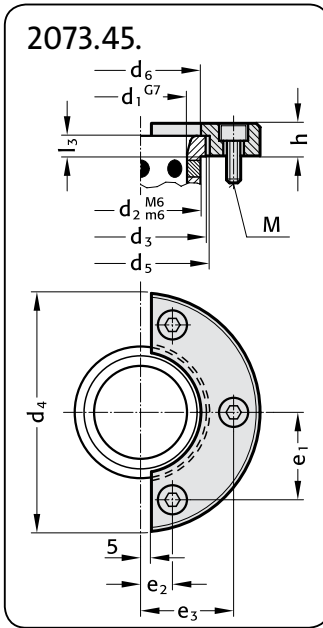
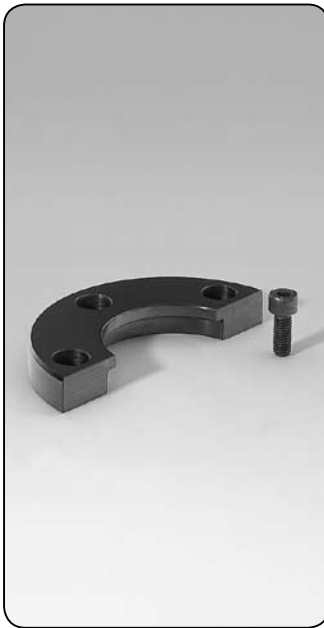
- clamping height 6 mm
- M6 screw

2071.45



**Securing flanges to CNOMO  
Screw Clamps to CNOMO**

**2073.45.  
2072.48.45.**

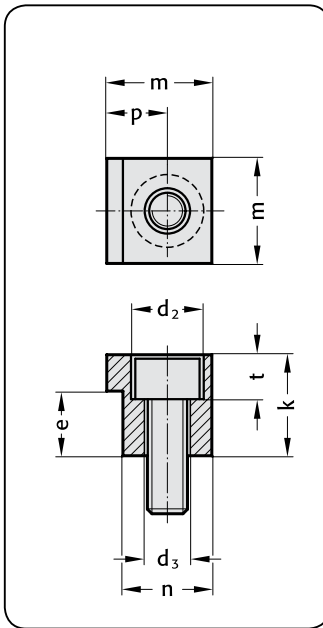


**2073.45. Securing flanges, incl. screws**

- steel, turned
- clamping height 4, 5, 6, 8, 10, 12, 16, 20 mm
- screws M6, M8, M10, M12

Order No  
2073.45

	.020	.025	.032	.040	.050	.063	.080	.100
d <sub>1</sub>	20	25	32	40	50	63	80	100
d <sub>2</sub>	28	35	44	52	63	80	100	125
d <sub>3</sub>	32	40	50	60	71	90	112	140
d <sub>4</sub>	63	72	80	100	125	140	180	200
d <sub>5</sub>	33	41	51	61	72	91	113	141
d <sub>6</sub>	25	32	40	50	63	80	100	125
h	10	10	12	12	16	20	25	32
l <sub>3</sub>	4	5	6	8	10	12	16	20
e <sub>1</sub>	16	20	25	38,5	46	55	70	81
e <sub>2</sub>	18	20	21	14	17	17	20	25
e <sub>3</sub>	-	-	-	41	49	57,5	72	85
M	6×16	6×16	6×16	6×16	8×20	10×25	12×30	12×30



**2072.48.45. Screw Clamps, CNOMO**

incl. screw DIN EN ISO 4762

- steel, milled
- clamping height 8, 10, 12, 16, 20 mm
- screw M6, M8, M10

Order No	k	e	d <sub>2</sub>	d <sub>3</sub>	t	m	p	n	d <sub>1</sub> *	M
2072.48.45.12	12	8	11	6.6	6.8	18	9.5	15.5	40	6×16
2072.48.45.16	16	10	15	9	9	22	12	19	50	8×20
2072.48.45.20	20	12	18	11	11	26	15	21	63	10×25
2072.48.45.25	25	16	18	11	11	26	15	21	80	10×30
2072.48.45.32	32	20	18	11	11	26	15	21	100	10×35

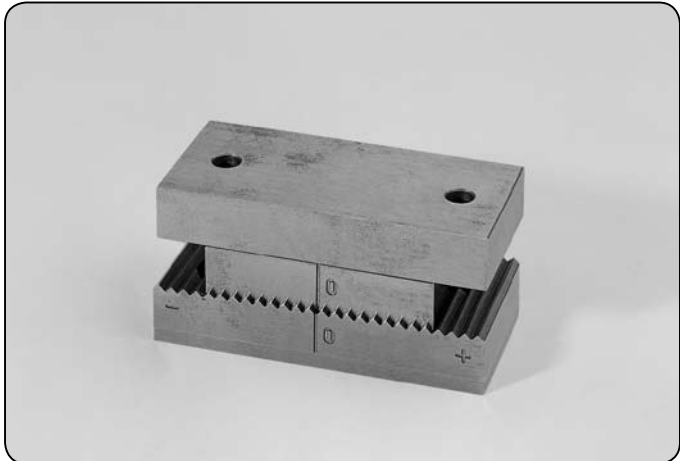
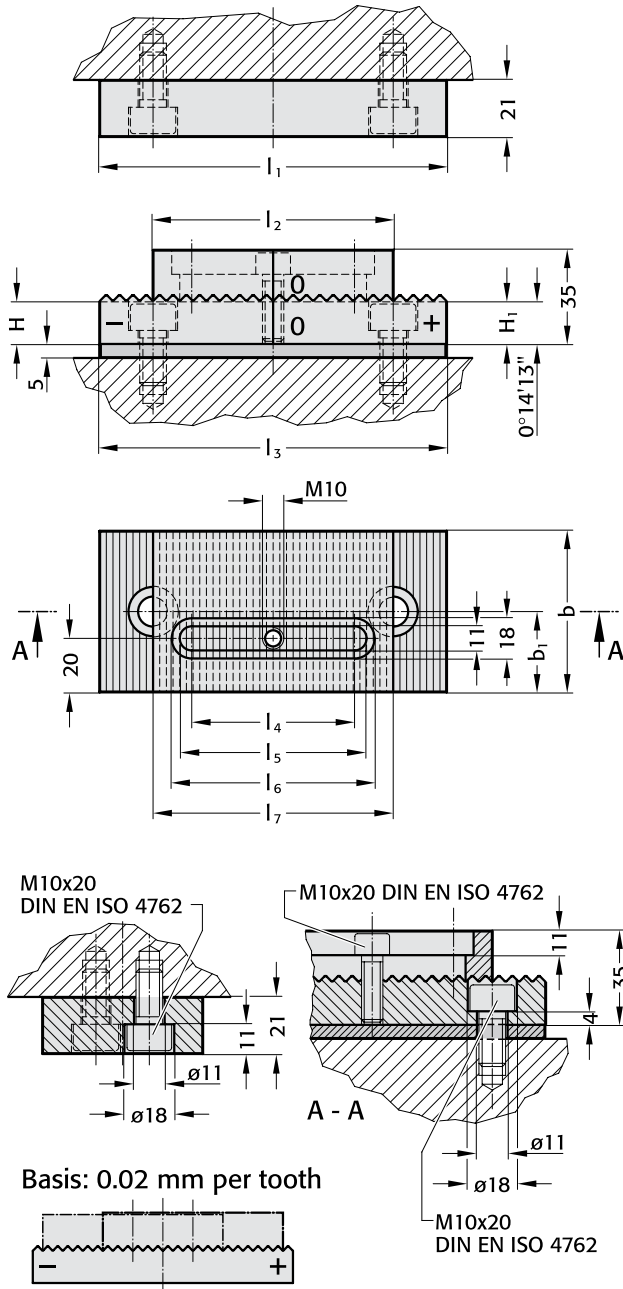
\*d<sub>1</sub> = ∅ Guide Bush

**FIBRO**

2444.12  
2444.13

**Spacer Plates, toothed  
with adjusting plate to BMW standard**

2444.12 / 2444.13



**Material:**

Spacer Plates: X 210 Cr 12 (1.2080), hardened 58+2 HRC  
Adjusting plate: X 153 CrMoV 12 (1.2379)

**Description:**

For spacing out sheet metal retainers in tools for external skin parts

**Note:**

Supplied without screws

„0“ = basic setting in the middle (grinding-in)  
„+“ = adjustment to the right - plus  
„-“ = adjustment to the left - minus

**NB: Hole pattern**

The bolsters are reversible.

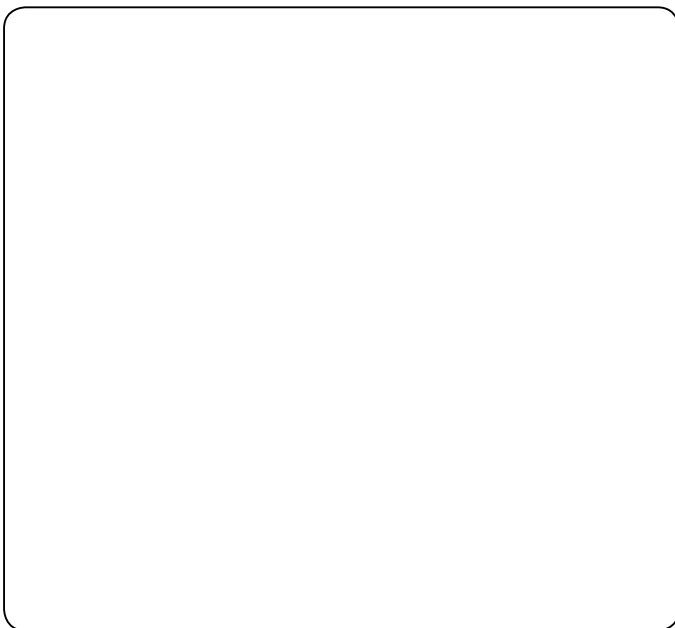
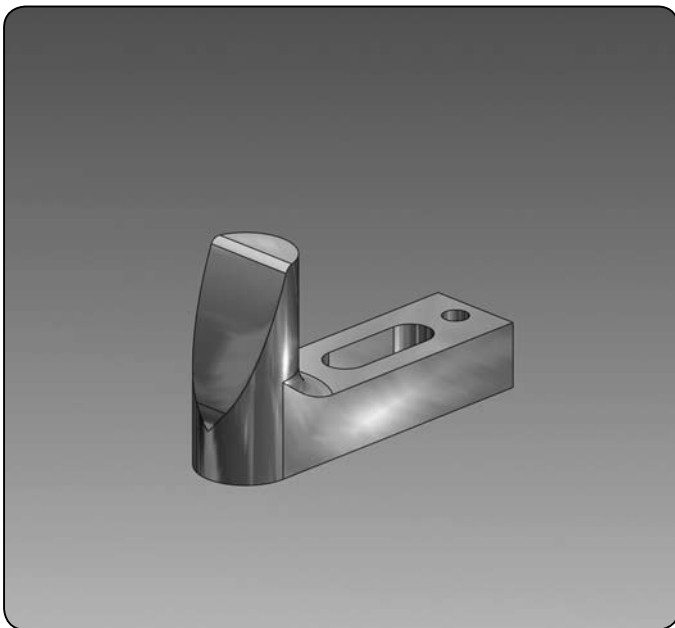
**Adjustment range:**

2444.12  
12 increments each of 0.02 mm means an adjusting range of 0.24 mm with a minimum support area of 80 x 60 mm.

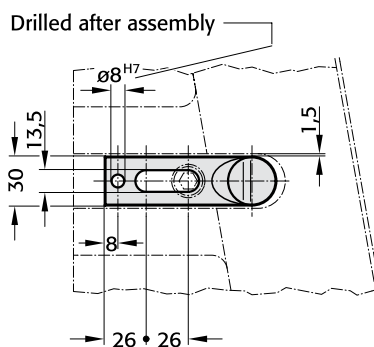
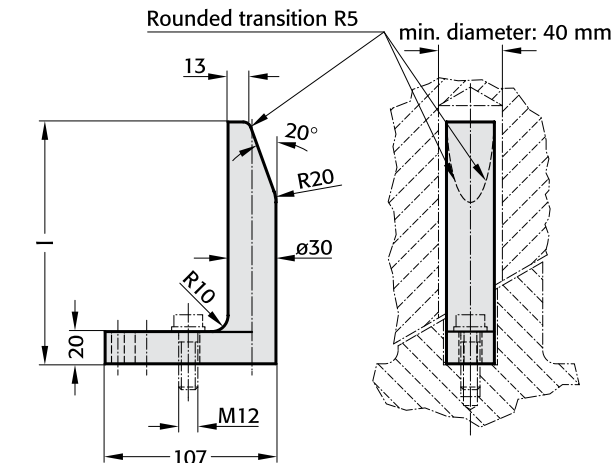
2444.13  
14 increments each of 0.02 mm means an adjusting range of 0.28 mm with a minimum support area of 100 x 80 mm.

2444.12/2444.13

	$l_1$	$l_2$	$l_3$	$l_4$	$l_5$	$l_6$	$l_7$	$b$	$b_1$	$H$	$H_1$
2444.12	130	90	130	61	72	79	90	60	30	15,5	16,04
2444.13	160	110	160	71	82	89	120	80	40	15,5	16,16



2443.10.



2443.10.

Order No	l
2443.10.065	65
090	90
120	120
150	150
180	180
250	250

Ordering Code (example):

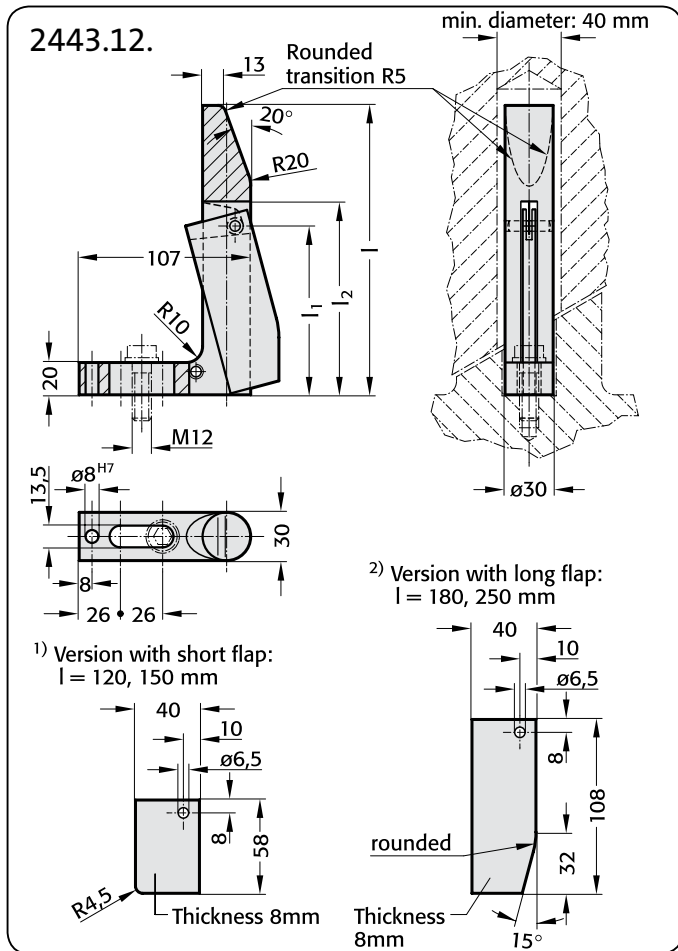
Guide	= 2443.10.
l = 120 mm	= 120
Order No	= 2443.10.120



# FIBRO

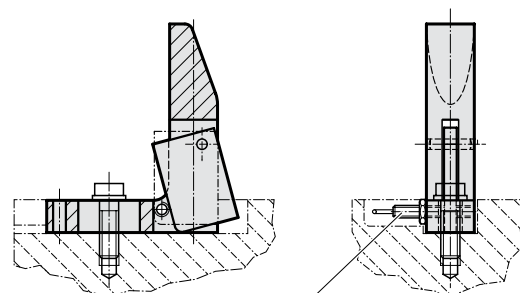
2443.12.

## Guide with part position control and spring



### Installation example:

Plate guide for large tools



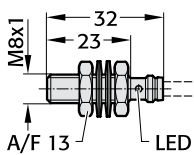
Order separately:

- 2018.00.60.08.032 Inductive proximity switch
- 2018.00.60.23.01.5 Cable - straight
- 2018.00.60.23.02.5 Cable, 90° connector

### 2018.00.60.08.032 inductive proximity switch

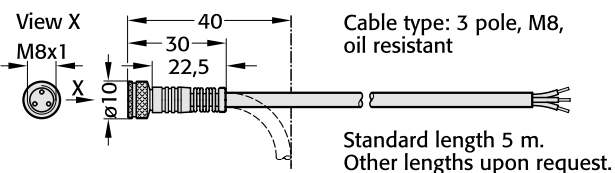
Technical data

Rated operating voltage Ue	24 V DC
Operating Voltage Us	10-30 V DC
No load current to damped/undamped	≤ 8 mA / ≤ 1 mA
Repeat accuracy R	≤ 5%

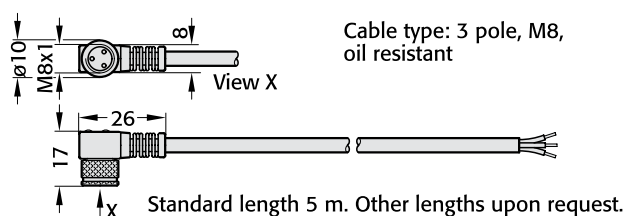


Ambient temperature Ta	-40 to +85 °C
Switching frequency f	3000 Hz
Degree of protection to IEC 529	IP 67
Casing material	Stainless steel
Connection	plug connector
Approvals	UL

### 2018.00.60.23.01.5 Cable – straight



### 2018.00.60.23.02.5 Cable, 90° connector



### 2443.12.

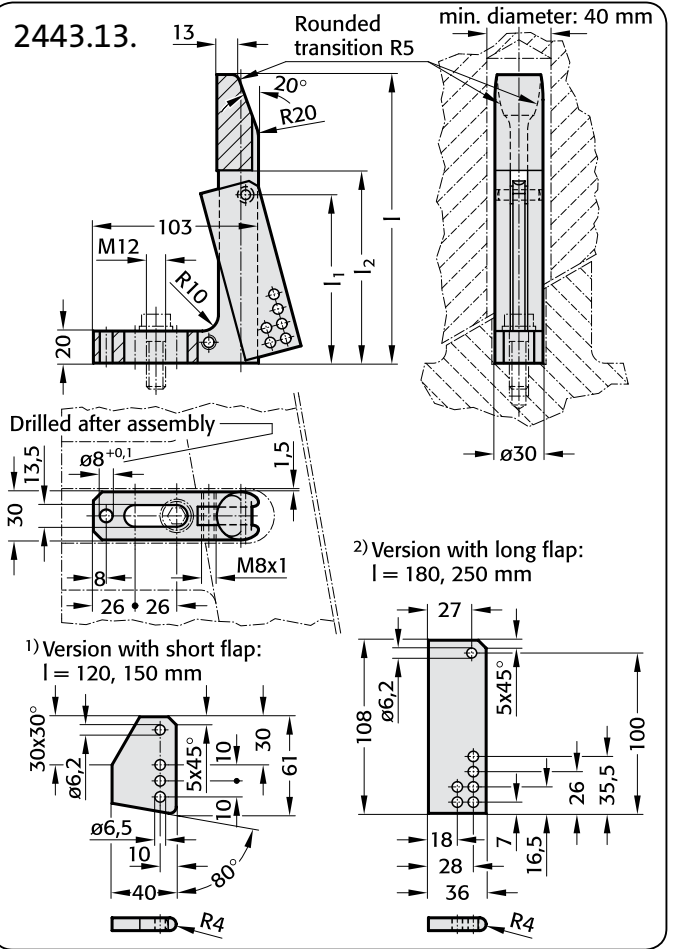
Order No	l	l <sub>1</sub>	l <sub>2</sub>
2443.12.120	120 <sup>1)</sup>	55	70
150	150 <sup>1)</sup>	55	70
180	180 <sup>2)</sup>	105	120
250	250 <sup>2)</sup>	105	120

### Ordering Code (example):

Guide with part position control	= 2443.12.
l = 120 mm	= 120
Order No	= 2443.12.120

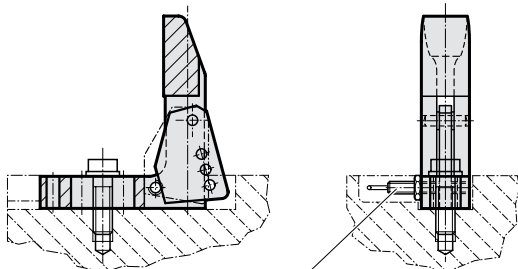
Guide with part position control to VDI

2443.13.

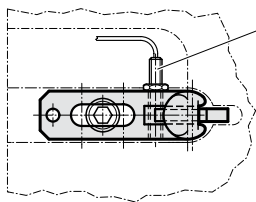


Installation example:

Plate guide for large tools



Order separately:  
 2018.00.60.08.032 Inductive proximity switch  
 2018.00.60.23.01.5 Cable - straight  
 2018.00.60.23.02.5 Cable, 90° connector



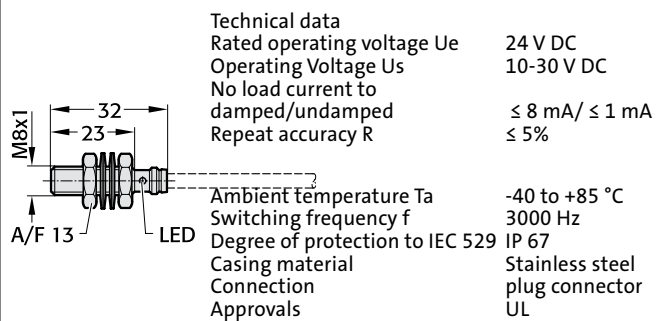
2443.13.

Order No	l	l <sub>1</sub>	l <sub>2</sub>
2443.13.120	120 <sup>1)</sup>	55	70
150	150 <sup>1)</sup>	55	70
180	180 <sup>2)</sup>	105	120
250	250 <sup>2)</sup>	105	120

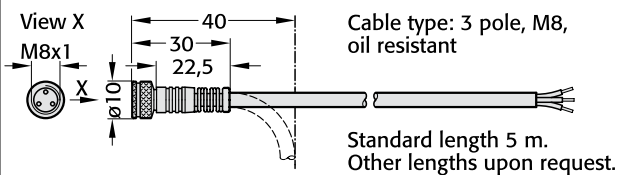
Ordering Code (example):

Guide with part position control	=	2443.13.
l = 120 mm	=	120
Order No	=	2443.13.120

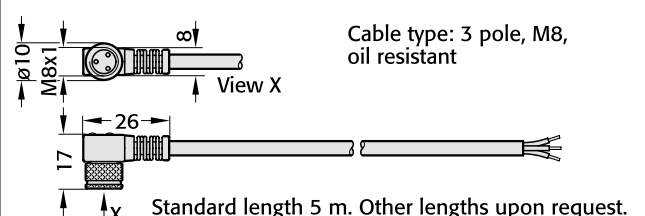
2018.00.60.08.032 inductive proximity switch



2018.00.60.23.01.5 Cable-straight



2018.00.60.23.02.5 Cable, 90° connector

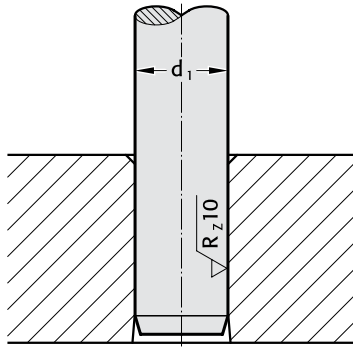




# Assembly of Guide Elements – Dimensional Requirements and Tolerances

## Guide Pillars DIN 9825

(Press fit)



202.19.

22.

23.

24.

202.19./22./23./24.

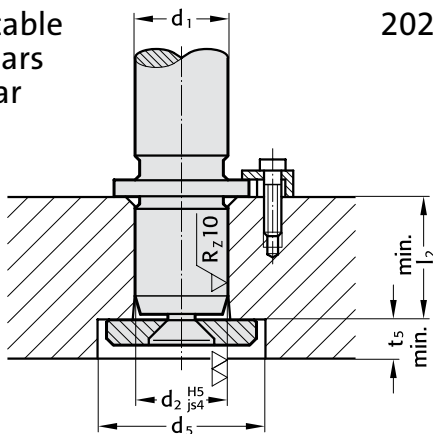
Pillar $\varnothing$ $d_1$	Pillar $\varnothing$ $d_1^*$	Retaining Bore $d_1$
3	30/32	in grey castiron: $d_1$ -0,025
4	38/40	-0,035
5	48/50	in steel: $d_1$ -0,015
6	60/63	-0,025
8	80	recommended values
10		based on experiences
11/12		
15/16		
19/20		
24/25		

pillars of  $d_1 = 50$  mm and larger are best fitted subsequent to subzero cooling in dry ice.

## Demountable Guide Pillars with Collar

DIN 9825

(Slip fit)



2021.46.

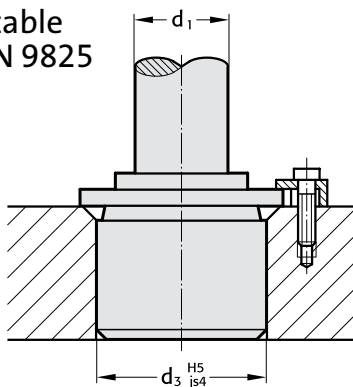
2021.46.

Pillar $\varnothing$ $d_1$	Retaining Bore $d_2^{H5}$	$d_5^{+1}$	$l_2$	$t_s$
15/16	15/16 <sup>+0,008</sup>	24	20,5	6,5
19/20	19/20 <sup>+0,009</sup>	27	23,5	
24/25	24/25 <sup>+0,009</sup>	34	30,5	
30/32	30/32 <sup>+0,011</sup>	42	37,5	
38/40	38/40 <sup>+0,011</sup>	52	37,5	
48/50	48/50 <sup>+0,013</sup>	62	47,5	
60/63	60/63 <sup>+0,013</sup>	72	47,5	
80	80 <sup>+0,013</sup>	95	60,5	12,5

for best results and higher accuracy it is recommended to use the actual pillar journal for final gauging/sizing of retaining bores!

## Liner Bushes for Demountable Pillars DIN 9825

(Slip fit)



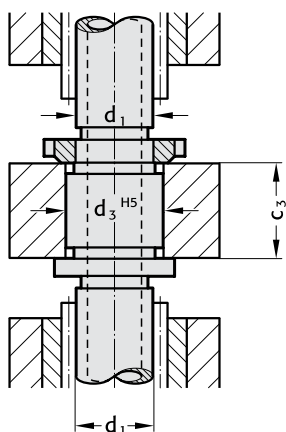
2021.39.

2021.39.

Pillar $\varnothing$ $d_1$	Retaining Bore $d_3^{H5}$
19/20	32 <sup>+0,011</sup>
24/25	40 <sup>+0,011</sup>
30/32	48 <sup>+0,011</sup>
38/40	58 <sup>+0,013</sup>
48/50	70 <sup>+0,013</sup>
60/63	85 <sup>+0,015</sup>

for best results and higher accuracy it is recommended to use the actual bush journal for final gauging/sizing of retaining bores!

## Stripper- Mounted Pillars with Collar



202.60.

202.60.

Pillar $\varnothing$ $d_1$	Retaining Bore $d_3^{H5}$	Thickness of Stripper $c_3^{-1}$
19	25 <sup>+0,009</sup>	33
25	30 <sup>+0,009</sup>	33
32	36 <sup>+0,011</sup>	38
40	46 <sup>+0,011</sup>	38

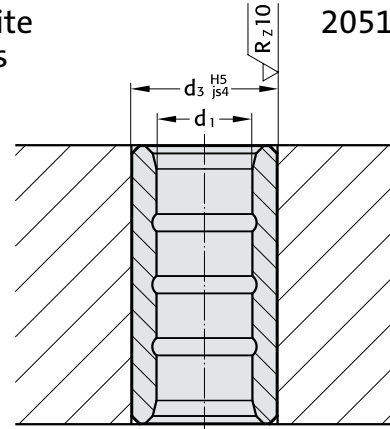
for best results and higher accuracy it is recommended to use the actual pillar journal for final gauging/sizing of retaining bores!

**2051.32.**

Pillar $\varnothing$ $d_1$	Retaining Bore $d_3^{H5}$
8	13,7 <sup>+0,008</sup>
11/12	22 <sup>+0,009</sup>
15/16	28 <sup>+0,009</sup>
19/20	32 <sup>+0,011</sup>
24/25	40 <sup>+0,011</sup>
30/32	48 <sup>+0,011</sup>
38/40	58 <sup>+0,013</sup>
48/50	70 <sup>+0,013</sup>
60/63	85 <sup>+0,015</sup>
80	95,7 <sup>+0,015</sup>

**Sintered Ferrite  
Guide Bushes**

slip-fit bonding\*



**2051.32.**

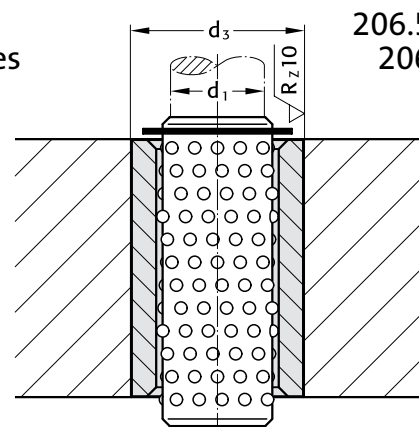
**206.54.**

**2061.**

Pillar $\varnothing$ $d_1$	Retaining Bore $d_3^{H6}$	Pillar $\varnothing$ $d_1$	Retaining Bore $d_3^{H5}$
3	7 <sup>+0,009</sup>	8	18 <sup>+0,008</sup>
4	8 <sup>+0,009</sup>	10	22 <sup>+0,009</sup>
5	10 <sup>+0,009</sup>	11/12	22 <sup>+0,009</sup>
6	11 <sup>+0,011</sup>	15/16	28 <sup>+0,009</sup>
8	14 <sup>+0,011</sup>	19/20	32 <sup>+0,011</sup>
		24/25	40 <sup>+0,011</sup>
		30/32	48 <sup>+0,011</sup>
		38/40	58 <sup>+0,013</sup>
		48/50	70 <sup>+0,013</sup>
		60/63	85 <sup>+0,015</sup>
		80	105 <sup>+0,015</sup>

**Ball Bearing  
Guide Bushes  
for push fit**

slip-fit bonding\*



**206.54.  
2061.**

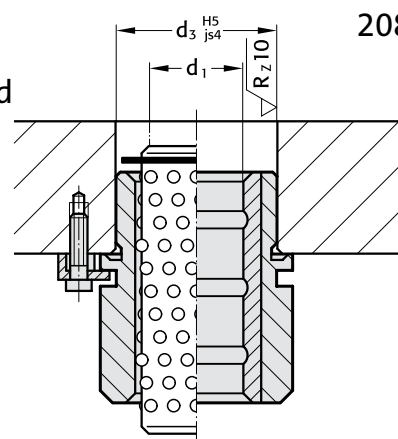
**2081.**

Pillar $\varnothing$ $d_1$	Retaining Bore $d_3^{H5}$
19/20	32 <sup>+0,011</sup>
24/25	40 <sup>+0,011</sup>
30/32	48 <sup>+0,011</sup>
38/40	58 <sup>+0,013</sup>
48/50	70 <sup>+0,013</sup>
60/63	85 <sup>+0,015</sup>

for best results and higher accuracy it is recommended to use the actual bush journal for final gauging/sizing of retaining bores!

**Guide bushes  
Headed  
(Carbonitrided  
or bronze-  
coated  
sintered  
types or  
ball bearing  
type)**

(Slip fit)



**2081.**

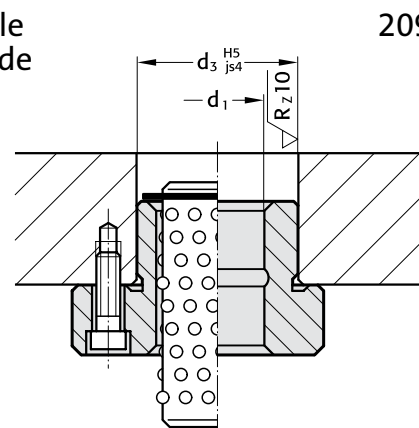
**2091.**

Pillar $\varnothing$ $d_1$	Retaining Bore $d_3^{H5}$
12	26 <sup>+0,009</sup>
15/16	28 <sup>+0,009</sup>
19/20	32 <sup>+0,011</sup>
24/25	40 <sup>+0,011</sup>
30/32	48 <sup>+0,011</sup>
38/40	58 <sup>+0,013</sup>
48/50	70 <sup>+0,013</sup>
60/63	85 <sup>+0,015</sup>
80	105 <sup>+0,015</sup>

for best results and higher accuracy it is recommended to use the actual bush journal for final gauging/sizing of retaining bores!

**Demountable  
Flanged Guide  
Bushes (Ball  
Bearing  
Types and  
Sintered  
Ferrite  
Types)**

(Slip fit)

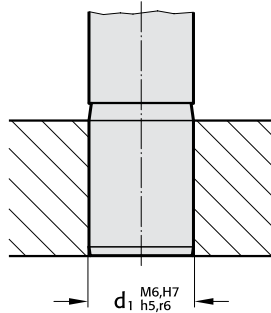


**2091.**

# Assembly of Guide Elements – Dimensional Requirements and Tolerances

Guide Pillars  
DIN 9833/ISO 9182-3  
AFNOR  
WDX

2022.19.  
2022.25.  
2022.29.



$h_5$  = Transition fit  
 $r_6$  = Press fit

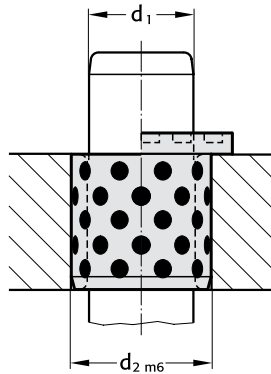
2022.19./2022.25./2022.29.

pillar $\varnothing$ $d_{1h5,r6}$	bore $d_1^{M6}$	bore $d_1^{M6}$
25	+0,021 0	-0,004 -0,017
32	+0,025 0	
40	0	-0,004
50		-0,020
63	+0,03 0	-0,005
80	+0,035 0	-0,024
100	+0,040 0	-0,006 -0,028
125		
160		

pillars of  $d_1 = 50$  and over should be frozen in dry ice before fitting.

Guide Bushes/  
Guide Bushes  
with collar  
Bronze with  
non-liquid  
lubricant

2052.70.  
2086.70.  
2085.72.



Slip-fit bonding\*:  
bore  $d_2 = G 7$   
Transition fit:  
bore  $d_2 = H 7$

2052.70./2086.70/2085.72

pillar $\varnothing$ $d_1$	bore $d_2$	LOCTITE bonding: limits $d_2^{G7}$	Transition fit limits $d_2^{H7}$
8	12	+0,024	+0,018
10	14/15	+0,006	0
12	18		
13	19		
14	20		
15	21	+0,028	+0,021
16	22	+0,007	0
18	24		
20	28/30		
25	33/35		
28	38		
30	38/40		
31,5	40	+0,034	+0,025
32	42	+0,009	0
35	44/45		
38	48		
40	50		
40	55		
45	55/56/60		
50	60/62/65		
55	70	+0,04	+0,03
60	74/75	+0,01	0
63	75		
65	80		
70	85/90		
75	90/95		
80	96/100	+0,047	+0,035
85	100	+0,012	0
90	110		
100	120		
110	130		
120	140		
125	145		
130	150	+0,054	+0,04
140	160	+0,014	0
150	170		
160	180		

## \*Slip-Fit Bonding:

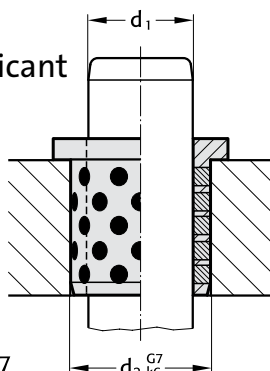
The glue-line gap must not be smaller than 0,005 mm, or the adhesive will be wiped off the contact surfaces upon fitment. This would result in an unreliable bond.

The available component tolerances do not always result in the minimum glue-line gap.

This fact has to be born in mind when machining receiving bores, or alternatively corrections can be made on the assembly bench.

Guide Bushes  
with collar  
Bronze with  
non-liquid lubricant

2085.70.



Receiving bore  $d_2 = G 7$

2085.70.

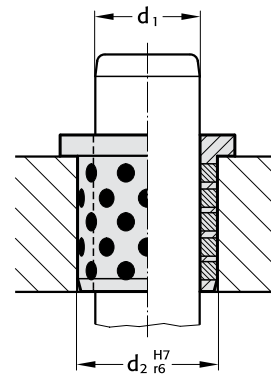
pillar $\varnothing$ $d_1$	bore $d_2^{G7}$	limits $d_2^{G7}$
12	16	+0,024 +0,006
16	20	
20	26	+0,028
24	30	+0,007

**2085.71.**

pillar $\varnothing$ $d_1$	bore $d_2$	limits $d_2^{H7}$	pillar $\varnothing$ $d_1$	bore $d_2$	limits $d_2^{H7}$
10	14	+0,018	45	55	
12	18	0	50	60	
13	19		55	65	+0,03
14	20		60	75	0
15	21	+0,021	63	75	
16	22	+0	70	85	
20	30		75	90	
25	35		80	100	+0,035
30	40		90	110	0
31,5	40	+0,025	100	120	
35	45	+0			
40	50		120	140	+0,04
					0

**Guide Bushes  
with collar  
Bronze with  
non-liquid  
lubricant**

**2085.71.**



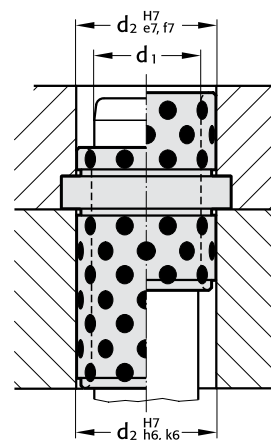
Press fit

**2087.70./2087.71./2087.73.**

pillar $\varnothing$ $d_1$	bore $d_2^{H7}$	limits $d_2^{H7}$
9/10	14	+0,018 +0
14/15	20	
18/20	26	+0,021 +0
22/24	30	
30/32	42	+0,025 +0
40/42	54	+0,03 0

**Guide Bushes  
with centre  
collar/  
Guide Bushes  
with collar  
Bronze with  
non-liquid  
lubricant**

**2087.70.  
2087.71.  
2087.73.**



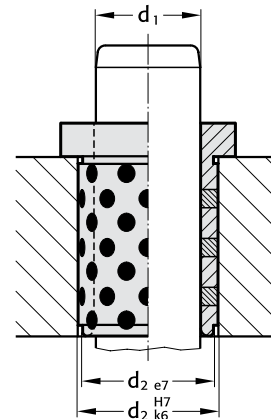
h6 = Slip fit  
k6 = Transition fit

**2087.72.**

pillar $\varnothing$ $d_1$	bore $d_2^{H7}$	limits $d_2^{H7}$
9/10	14	+0,018 0
12	18	
14/15	20	
16	22	+0,021 0
18/20	26	
22/24	30	
25	32	
30/32	42	+0,025 0
40/42	54	+0,030 0

**Guide Bushes  
with collar  
Bronze with  
non-liquid  
lubricant**

**2087.72.**



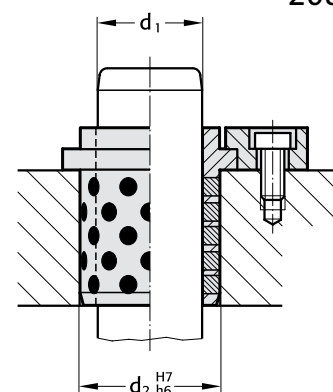
Transition fit

**2082.70.**

pillar $\varnothing$ $d_1$	bore $d_2^{H7}$	limits $d_2^{H7}$
24/25	32/35	
30/32	40/42	+0,025 0
38/40/42	50	
48/50/52	63	+0,03 0
60/63	80	
80	100	+0,035 0
100	125	+0,040 0
125	160	
160	200	+0,046 0

**Guide Bushes  
with collar  
DIN 9834/  
ISO 9448  
Bronze with  
non-liquid  
lubricant**

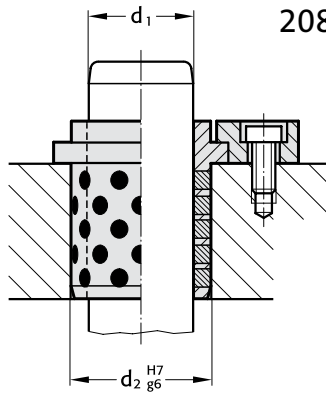
**2082.70.**



Slip fit

# Assembly of Guide Elements – Dimensional Requirements and Tolerances

Guide Bushes  
with collar  
to NAAMS  
Bronze with  
non-liquid  
lubricant



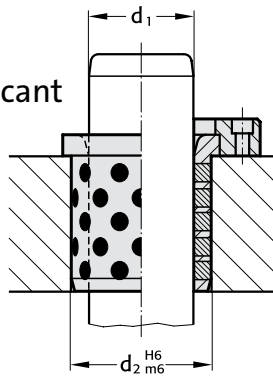
2082.71.  
2086.71.

Slip fit

2082.71./2086.71.

pillar $\varnothing$ $d_1$	bore $d_2^{H7}$	limits $d_2^{H7}$
25/32/40	32/40/50	+0,025 0
50/63	63/80	+0,03 0
80	100	+0,035 0
100/125	125/160	+0,04 0

Guide Bushes  
with collar  
Bronze with  
non-liquid lubricant



2102.70.

Transition fit

2102.70.

pillar $\varnothing$ $d_1$	bore $d_2^{H6}$	limits $d_2^{H6}$
25	35	+0,016 0
32	44	
40	52	
50	63	+0,019 0
63	80	
80	100	+0,022 0
100	125	+0,025 0



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A Die Sets

---

B Precision Ground Plates and Flat Bars

---

C Lifting and Clamping Devices

---

D Guide Elements

---

**E Ground Precision Components**

Punches and Matrixes,  
Pins, Gauge Pins

---

F Springs

---

G Elastomer-Bars, -Sheets, -Sections

---

H FIBRO Chemical Tooling Aids

---

J Peripheral Equipment

---

K Cam Units

---

L Standard Parts for Mould Making

---



# Ground Precision Components

## Ground Precision Components

FIBRO Precision Components cover a very wide range of materials, shapes and sizes and thus permit virtually unrestricted selection even to highly individual requirements.

At Hassmersheim and also abroad, stock levels of Precision Components reach seven-digit figures. It is therefore quite likely that your particular choice will be available for immediate delivery. Should this not be the case then our flexible batch production schedules will ensure that delays are kept to a minimum.

Batch production in our interpretation not only spells prompt delivery but also exceptional quality. Starting with the arrival inspection of raw materials, every single manufacturing operation on FIBRO Precision Components is followed by a quality check. Lastly, an uncompromising final inspection of each and every part guarantees that the trade mark FIBRO is and remains synonymous with Quality.






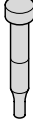

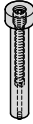


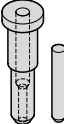

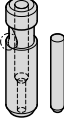







In view of the fact that a large portion of the Precision Components programme consists of punches and matrices, the importance of alignment in the operational die must be emphasized. Unless this requirement can be met to a high degree of accuracy, even the finest efforts in design and in the toolroom must fail! Die alignment ultimately depends on the guides – FIBRO Die Sets and Guide Elements were developed and are made with this postulate in mind.

Tool life, production cost and work quality are to a large extent a function of tooling material selection versus strip stock characteristics and ancillary process conditions. A judicious choice from the wide range of materials for our punches and matrices will be facilitated by the orientation guide in this catalogue. Listing the principal characteristics of each material together with selection criteria, it is intended to help customers make the right choice.

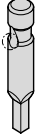


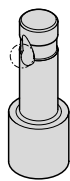
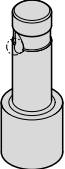
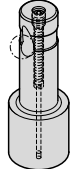
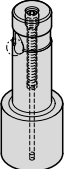

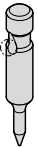




Our experienced tooling specialists will assist you with further detailed information.

In keeping with the basic tenet of our firm, every effort is made to ensure that design, performance potential and quality of FIBRO Precision Components keep well abreast with latest technological developments.

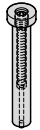









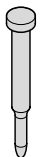
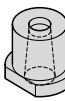


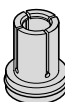






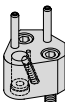









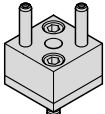







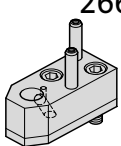
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

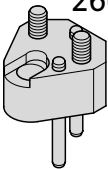


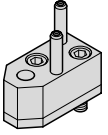


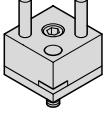





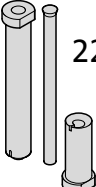
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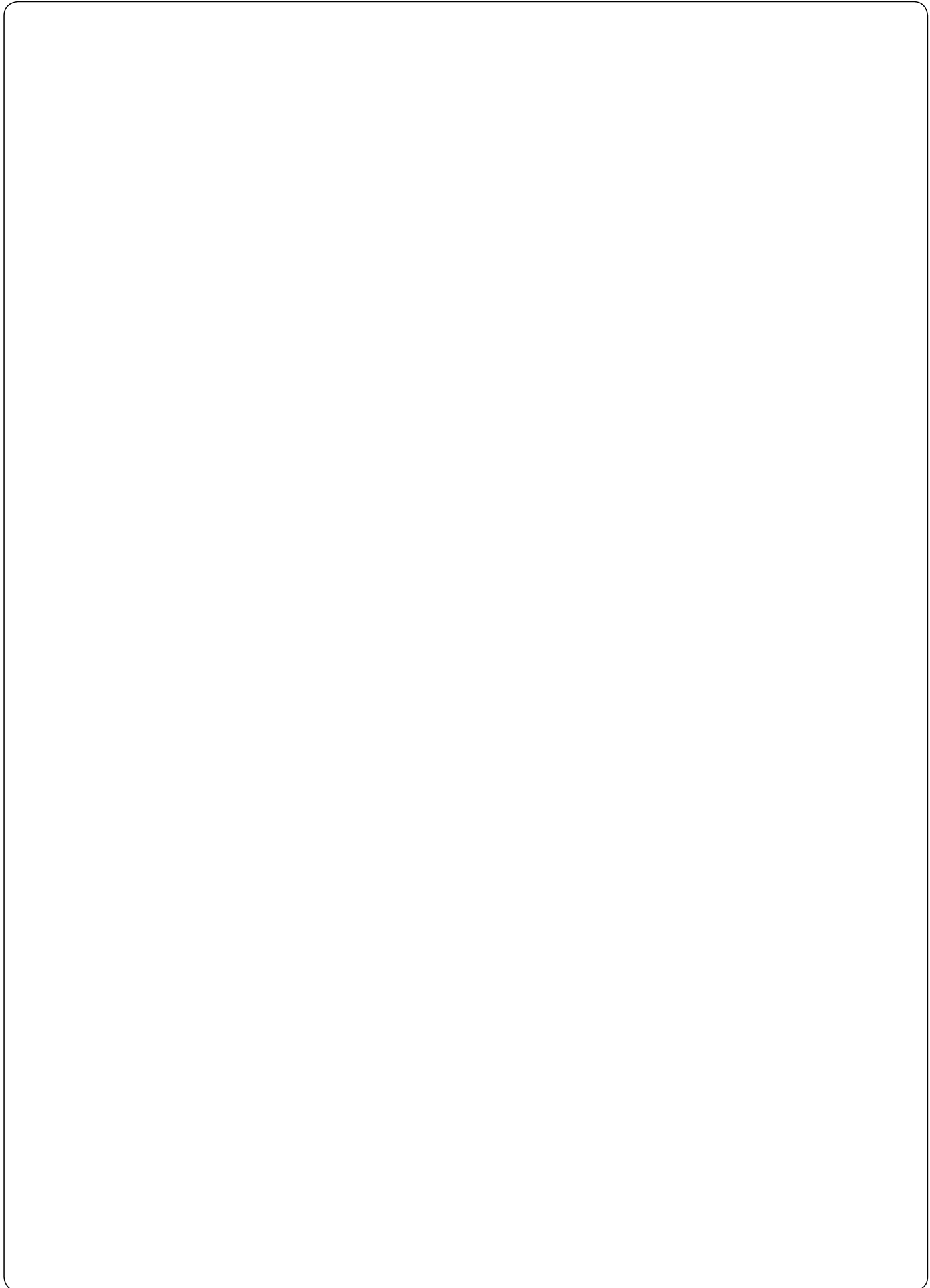
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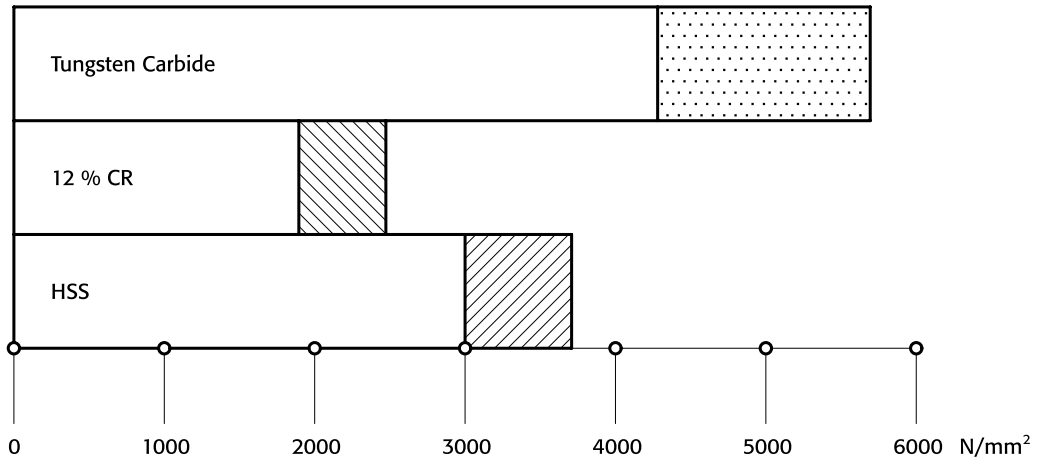
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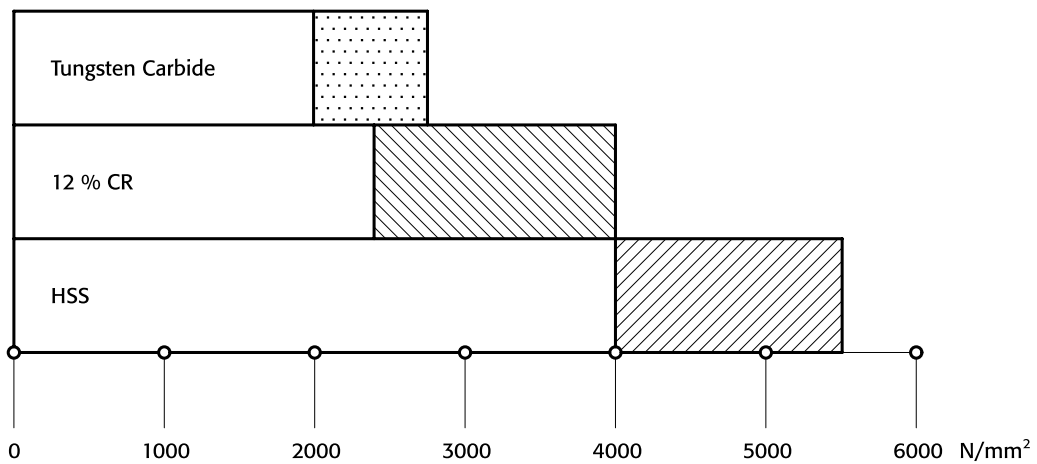


**Comparative Graphs**

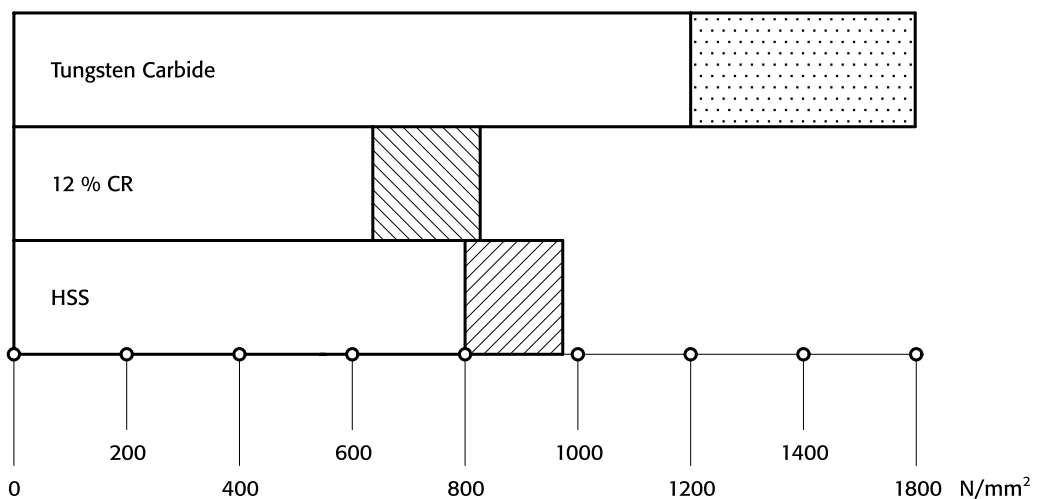
**Compressive Strength (0,2% Proof Stress)**



**Flexural Strength**



**HV 30 - Hardness**



## FIBRO Punches and Matrixes – Description of Materials

<p><b>WS</b></p> <p>Characteristics:</p> <p>Application Field:</p>	<p><b>= Alloy Tool Steel</b></p> <p>Material No 1.2210, 1.2516, 1.2842 or similar.</p> <p>Hard and tough tool steel, medium wear resistance.</p> <p>Piercing/blanking dies for mild steel, low carbon steels, non-ferrous metals, plastics, paper.</p>	<p><b>WS</b> = material code number = "1"</p> <p>e.g. Order No = 239.1 ...</p>
<p><b>HWS</b></p> <p>Characteristics:</p> <p>Application Field:</p>	<p><b>= High Carbon – High Chrome Tool Steel (12% Cr)</b></p> <p>Material No 1.2436, 1.2379 or similar.</p> <p>High resistance to wear.</p> <p>Piercing/blanking dies of all types, trim dies, for all carbon steels, alloy steels, non-ferrous metals, plastics, paper.</p>	<p><b>HWS</b> = material code number = "2"</p> <p>e.g. Order No = 260.2 ...</p>
<p><b>HSS</b></p> <p>Characteristics:</p> <p>Application Field:</p>	<p><b>= High Speed Steel</b></p> <p>Material No 1.3343 or similar.</p> <p>High wear resistance; high tempering curve permits certain surface treatments.</p> <p>Piercing/blanking dies of all types – for tough materials e.g. spring steel, lamination steels, and abrasive papers as well as plastics.</p>	<p><b>HSS</b> = material code number = "3"</p> <p>e.g. Order No = 220.3 ...</p>
<p><b>ASP 23</b> <b>ASP 2023</b></p> <p>Characteristics:</p> <p>Application Field:</p>	<p><b>= High Speed Steel on Powder-Metallurgic Basis</b></p> <p>High wear resistance – greater toughness due to excellent homogeneity.</p> <p>Same as HSS.</p>	<p><b>ASP 23</b> <b>ASP 2023</b> = material code number = "6"</p> <p>e.g. Order No = 223.6 ...</p>
<p><b>HST</b></p> <p>Characteristics:</p> <p>Application Field:</p>	<p><b>= High Speed Steel, Nitrided</b></p> <p>High wear resistance – reduced galling tendency on account of nitrides infused into top layer of material.</p> <p>Piercing/blanking dies of all types – for very hard and abrasive materials.</p>	<p><b>HST</b> = material code number = "4"</p> <p>e.g. Order No = 223.4 ...</p>
<p><b>FT</b></p> <p>Characteristics:</p> <p>Application Field:</p>	<p><b>= Ferro-Tic (Ferro Titanit)</b></p> <p>Between those of HSS and hard metals (tungsten carbides); machinable in the supplied state – hardness conferred by heat treatment.</p> <p>Fine blanking and progression/lamination dies for large quantities of parts from abrasive, hard materials, also silicon steels and stainless steels.</p>	<p><b>FT</b> <b>special manufacture</b> <b>– on request –</b></p>

**HZ = Hard-coated Tooling Components for High-Performance**

HZC Composite Vapour Deposition (CVD) **TIC-TIN** Coating

**Carrier Materials:**

HSS Material No 1.3207 and 1.3343 etc.

HCHC Material No 1.2379 and 1.2436 etc.

**Properties:**

The titanium carbide substrate provides a pressure-resistant bond with the carrier metal, while the outer layer of titanium nitride offers the well-known advantages of optimum tribologic behaviour in contact with the stamping stock. By virtue of its outstanding wear resistance, the TIN-layer largely eliminates seizing and cold welding problems in stamping.

Surface Hardness: approx. 3500 HV 0,05

Coating Thickness: 5 to 8 µm approx.

**Applications:**

All tooling components subject to high demands on wear resistance and performance, especially punches in progression/combination tools, as well as cold extrusion punches etc. Owing to distortion problems, TIC-TIN is not recommended for parts with a length/thickness ratio than 20:1.

**TIC-TIN** = material code number = "5"

e. g. Order No = 223.5. ...

HZN Titanium Nitride Coating **TIN-PVD** (physical vapour deposition).

**Carrier Material:**

HSS Material No 1.3207 and 1.3343 etc.

HCHC Material No 1.2379

(HCHC-steels are of conditional suitability)

**Properties:**

The TIN-coating offers excellent frictional characteristics but its compressive strength remains inferior to TIC-TIN deposits. The TIN-deposition process can be applied to partial, selected areas of the tooling component.

Surface Hardness: approx. 2300 HV 0,05

Coating Thickness: 2–4 µm < Ø 20 = 1,5 µm ± 20 %

**Applications:**

Tooling for thin stamping stock such as cold rolled spring steel, zinc-galvanized sheet and strip, copper-beryllium bronze, german silver, and solenoid lamination steels.

Note that the ratio stock thickness to punch point diameter should not exceed 1:3.

**TIN** = material code number = "0"

e. g. Order No = 223.0. ...

**HM = Tungsten Carbide****Characteristics:**

Hard-sintered carbide on WC-basis and of recognized properties; produced by powder-metallurgic processes, FIBRO's exclusively used HIP-densified carbide exhibits much enhanced flexural strength and reduced residual porosity.

**Application Field:**

Die components for highest performance and very large stamping volumes – for altogether ultimate demands on tool life.

**HM** = material code number = "9"

e. g. Order No = 270.9. ...

**NWA = Hot-Work Tool Steel – Suitable for Nitriding**

Material No 1.2344 or similar.

**Characteristics:**

Chrome-Molybdenum-Vanadium hot working die steel; core strength: > 1400 N/mm<sup>2</sup>; temperature resistant up to 650°C; surface hardness (nitrided) ≥ 950 HV 0,3.

**Application Field:**

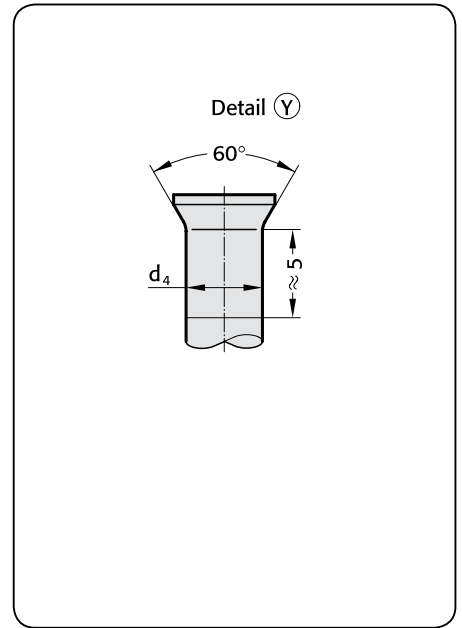
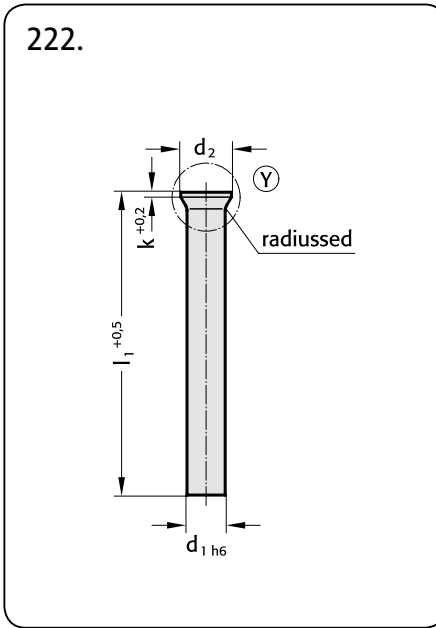
Ejector pins for pressure diecasting, injection- and compression moulding processes, and generally for work at elevated temperatures.

**NWA** = material code number = "8"

e. g. Order No = 237.8. ...

Precision Punches DIN 9861  
Shape DA

222.



**Material:**  
Type DA – Execution:  
Shank precision ground.  
Head hot upset-forged and tempered. Residual upset bulge below head normally much smaller than permissible acc. to DIN 9861.

**Note:**  
Punches are also available without head

**Ordering Code (example):**

Punch	=	222.
Material HSS	=	3.
d <sub>1</sub> = Ø 6,30 mm	=	0630.
l <sub>1</sub> = 71 mm	=	071
Order No	=	222.3.0630.071

**Material:**

HZ – TIN (HSS)		222.0.
Order No:		2300 HV 0,05
Hardness:	Surface Head	52±3 HRC
HSS		222.3.
Order No:		64±2 HRC
Hardness:	Shank Head	52±3 HRC
HST		222.4.
Order No:		≧ 950 HV 0,3
Hardness:	Surface Head	52±3 HRC

Description of FIBRO materials for die components:  
pages E 10–E 11.

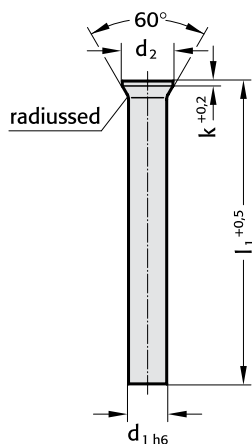
222. diameter steps						
d <sub>1</sub>	d <sub>1</sub>	d <sub>2</sub>	d <sub>4</sub>	k	l <sub>1</sub>	
0,50	0,05	0,9	d <sub>1</sub> <sup>+0,02</sup>	0,2		
0,55		1,0				
0,60		1,1				
0,65		1,2				
0,70 + 0,75		1,3				
0,80 + 0,85		1,4		0,4		
0,90 + 0,95		1,6				
1,0 + 1,1	0,1	1,8	d <sub>1</sub> <sup>+0,03</sup>	0,5		
1,2 + 1,3		2,0				
1,4 + 1,5		2,2				
1,6 + 1,7		2,5				
1,8 + 1,9		2,8				
2,0		3,0				
2,1 + 2,2		3,2				
2,3 – 2,5		3,5				
2,6 – 2,9		4,0				
3,0 – 3,4		4,5				
3,5 – 3,9		5,0				
4,0 – 4,4		5,5				

stock lengths: 71, 80, 100 mm.  
other lengths and diameters on request!

222. diameter steps						
d <sub>1</sub>	d <sub>1</sub>	d <sub>2</sub>	d <sub>4</sub>	k	l <sub>1</sub>	
4,5 – 4,9	0,1	6,0	d <sub>1</sub> <sup>+0,03</sup>	0,5		
5,0 – 5,4		6,5				
5,5 – 5,9		7,0				
6,0 – 6,4		8,0				
6,5 + 7,0	0,5	9,0		1,0		
7,5 + 8,0		10,0				
8,5 + 9,0		11,0				
9,5 + 10,0		12,0				
10,5 + 11,0		13,0				
11,5 + 12,0		14,0				
12,5 + 13,0		15,0				
13,5 + 14,0		16,0		1,5		
14,5 + 15,0		17,0				
15,5 + 16,0		18,0				

stock lengths: 71, 80, 100 mm.  
other lengths and diameters on request!

223.



**Material:**

HSS		
Order No:		223.3.
Hardness:	Shank	64±2 HRC
	Head	52±3 HRC
HST		
Order No:		223.4.
Hardness:	Surface	≥ 950 HV 0,3
	Head	52±3 HRC
HZ – TIN (HSS)		
Order No:		223.0.
Hardness:	Surface	2300 HV 0,05
	Head	52±3 HRC
ASP 23–ASP 2023		
Order No:		223.6.
Hardness:	Shank	64±2 HRC
	Head	52±3 HRC

Description of FIBRO materials for die components:  
pages E 10–E 11.

**Type D – Execution:**

Head hot upset-forged and tempered.  
Shank and head subsequently precision plunge-ground for perfect concentricity and full interchangeability with replacement punches.

**Ordering Code (example):**

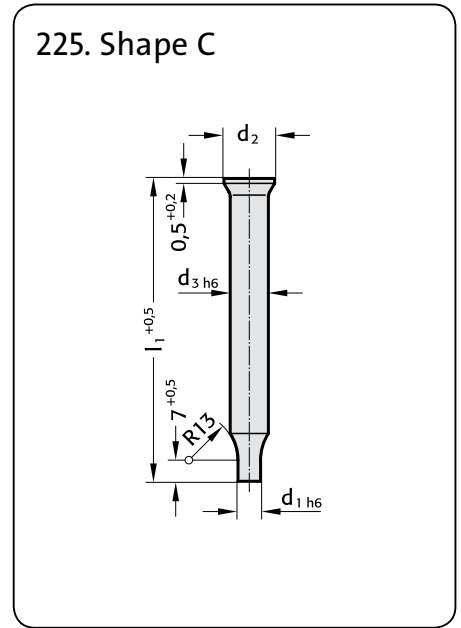
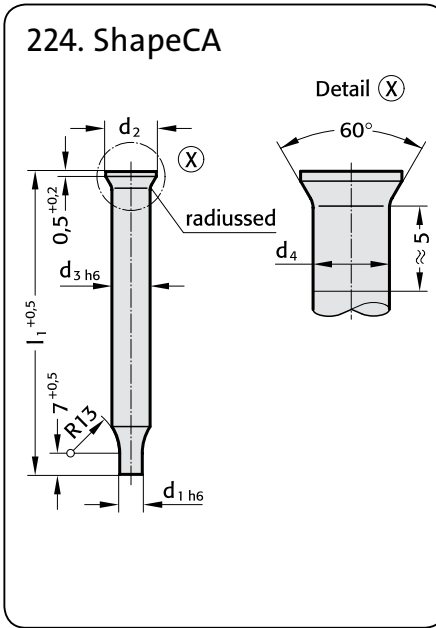
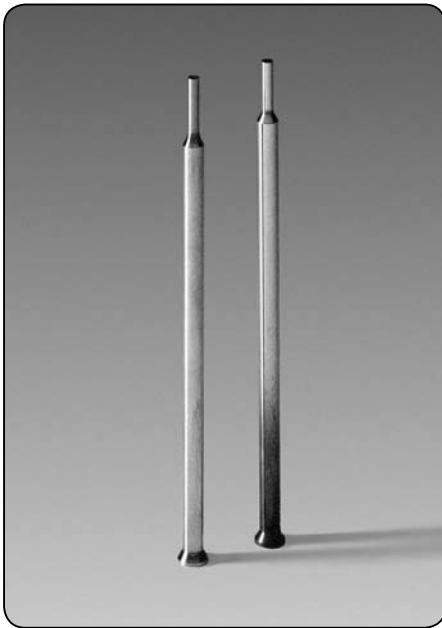
Punch	=	223.
Material HSS	=	3.
d <sub>1</sub> = Ø 16,5 mm	=	1650.
l <sub>1</sub> = 80 mm	=	080
Order No	=	223.3.1650.080

223.	diameter steps			l <sub>1</sub>
	d <sub>1</sub>	d <sub>2</sub>	k	
0,50	0,05	0,9	0,2	stock lengths: 71, 80, 100 mm. other lengths and diameters on request!
0,55		1,0		
0,60		1,1		
0,65		1,2		
0,70 +0,75		1,3		
0,80 +0,85		1,4	0,4	
0,90 +0,95		1,6		
1,0 +1,1	0,1	1,8	0,5	
1,2 +1,3		2,0		
1,4 +1,5		2,2		
1,6 +1,7		2,5		
1,8 +1,9		2,8		
2,0		3,0		
2,1 +2,2		3,2		
2,3 –2,5		3,5		
2,6 –2,9		4,0		
3,0 –3,4		4,5		
3,5 –3,9		5,0		
4,0 –4,4		5,5		
4,5 –4,9	0,1	6,0		
5,0 –5,4		6,5		
5,5 –5,9		7,0		

223.	diameter steps			l <sub>1</sub>	
	d <sub>1</sub> h6	d <sub>2</sub>	k		
6,0 – 6,4	0,1	8,0	0,5	stock lengths: 71, 80, 100 mm. other lengths and diameters on request!	
6,5 + 7,0	0,5	9,0	1,0		
7,5 + 8,0		10,0			
8,5 + 9,0		11,0			
9,5 +10,0		12,0			
10,5 +11,0		13,0			
11,5 +12,0		14,0			
12,5 +13,0		15,0			
13,5 +14,0		16,0	1,5		
14,5 +15,0		17,0			
15,5 +16,0		18,0			
16,5 +17,0		19,0			
17,5 +18,0		20,0			
18,5 +19,0		21,0			
19,5 +20,0		22,0			

Precision Punches DIN 9861  
Shape CA+C

224.  
225.



**Executions:**  
Shape CA  
Shank precision ground, head subsequently hot upset-forged and tempered; residual upset-buge below head normally much smaller than permissible acc. to DIN 9861.  
Shape C  
Head hot upset-forged and tempered.  
Shank and head subsequently precision plunge-ground for perfect concentricity and full interchangeability with replacement punches.

**Ordering Code (example):**

Punch C	=	225.
Material HSS	=	3.
d <sub>1</sub> = ∅ 2,30 mm	=	0230.
l <sub>1</sub> = 71 mm	=	071
Order No	=	225.3.0230.071

**Material:**

HZ – TIN (HSS)	Form CA = 224.0.
Order No:	Form C = 225.0.
Hardness: Surface	2300 HV 0,05
Head	52±3 HRC
HSS	Form CA = 224.3.
Order No:	Form C = 225.3.
Hardness: Shank	64±2 HRC
Head	52±3 HRC
HST	Form C = 225.4.
Order No:	≥ 950 HV 0,3
Hardness: Surface	52±3 HRC
Head	
ASP 23–ASP 2023	Form C = 225.6.
Order No:	64±2 HRC
Hardness: Shank	52±3 HRC
Head	

Description of FIBRO materials for die components:  
pages E 10–E 11.

224.

d <sub>1</sub>	diameter steps			d <sub>4</sub>	l <sub>1</sub>
0,1–0,45	0,05	3	2	d <sub>3</sub> <sup>+0,03</sup>	stock lengths: 71 mm. other lengths and diameters on request.
0,50					
0,55					
0,60					
0,65					
0,70 + 0,75					
0,80 + 0,85					
0,90 + 0,95					
1,00 – 1,10					
1,15 – 1,30					
1,35 – 1,50					
1,55 – 1,70	4,5	3			
1,75 – 1,90					
1,95 – 2,00					
2,05 – 2,20					
2,25 – 2,50					
2,55 – 2,95					

225.

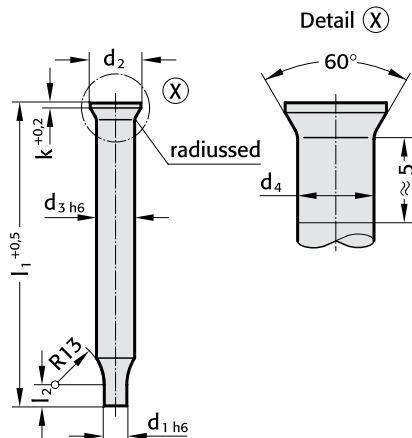
d <sub>1</sub>	diameter steps			d <sub>3</sub>	l <sub>1</sub>
0,1–0,45	0,05	3	2		stock lengths: 71 mm. other lengths and diameters on request.
0,50					
0,55					
0,60					
0,65					
0,70 + 0,75					
0,80 + 0,85					
0,90 + 0,95					
1,00 – 1,10					
1,15 – 1,30					
1,35 – 1,50					
1,55 – 1,70	4,5	3			
1,75 – 1,90					
1,95 – 2,00					
2,05 – 2,20					
2,25 – 2,50					
2,55 – 2,95					

# FIBRO

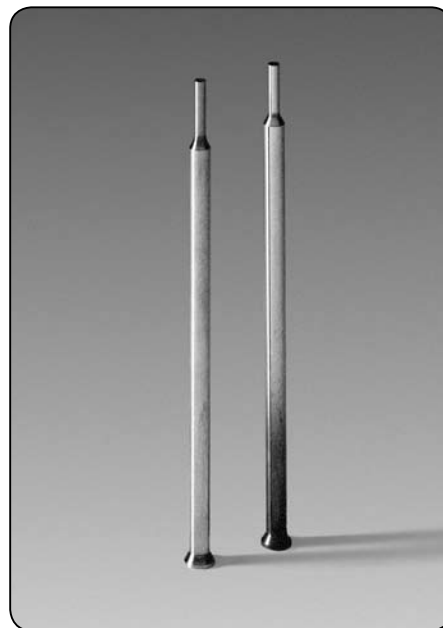
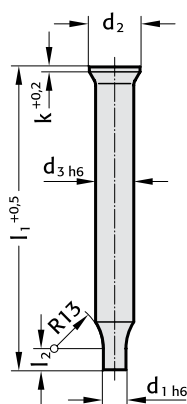
274.  
275.

## Precision Punches Similar to DIN 9861 Shape CA+C

274. Shape CA



275. Shape C



### Material:

HZ – TIN (HSS)

Order No: Form CA = 274.0.  
Form C = 275.0.  
Hardness: Surface 2300 HV 0,05  
Head 52±3 HRC

HSS

Order No: Form CA = 274.3.  
Form C = 275.3.  
Hardness: Shank 64±2 HRC  
Head 52±3 HRC

HST

Order No: Form CA = 274.4.  
Form C = 275.4.  
Hardness: Surface ≥950 HV 0,3  
Head 52±3 HRC

ASP 23 – ASP 2023

Order No: Form C = 275.6.  
Hardness: Shank 64±2 HRC  
Head 52±3 HRC

Description of FIBRO materials for die components:  
pages E 10–E 11.

### Execution:

Shape CA

Shank precision ground, head subsequently hot upset-forged and tempered; residual upset-bulge below head normally much smaller than permissible acc. to DIN 9861.

Shape C

Head hot upset-forged and tempered.

Shank and head subsequently precision plunge-ground for perfect concentricity and full interchangeability with replacement punches.

### Description of Special Series 274. and 275.

DIN 9861 restricts the range of stepped punches with conical head to shanks of 3 mm max. diameter and points of 2,95 mm max. diameter.

Stepped punches of larger size are, however, quite popular owing to their rigidity and ability to sustain considerable stripping forces.

In accommodation of this demand we supply larger sizes which are ground from stock sizes of the 222.-and 223.-series

Please select from those ranges and complete your order in accordance with the example on the right.

### Ordering Code (example):

Punch CA	=	274.
Material HSS	=	3.
$d_3 = \varnothing 8,0$ mm	=	0800.
$l_1 = 71$ mm	=	071.
$d_1 = \varnothing 6,4$ mm	=	0640.
$l_2 = 10$ mm	=	010
Order No	=	274.3.0800.071.0640.010

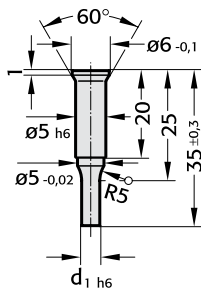
Stepped Quill Punches – Conical Head  
 Head Type Quill Bush and Thrust Pin  
 Ball Lock Type Quill Bush and Thrust Pin VDI 3374

**FIBRO**

232. 233.  
 234.

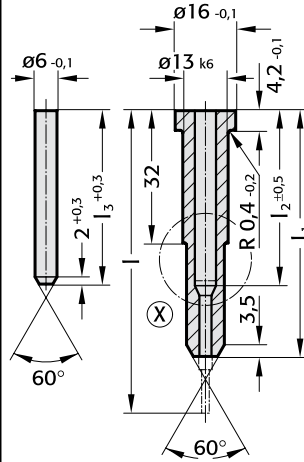


232.



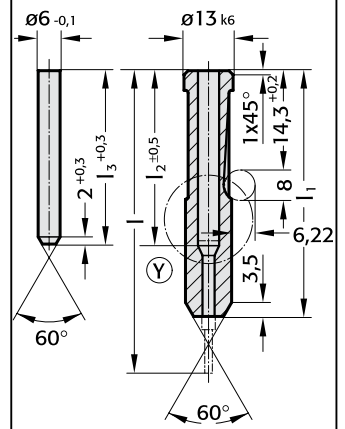
VDI 3374

233. Shape A



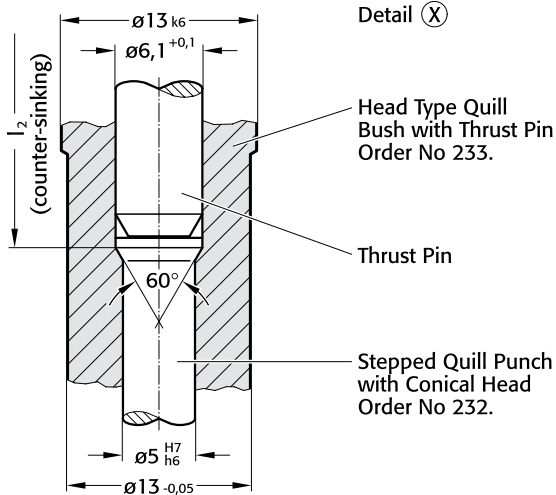
VDI 3374

234. Shape B

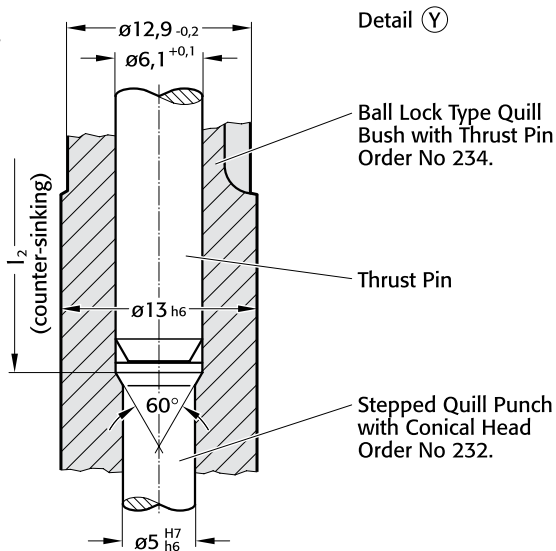


VDI 3374

233.



234.



**Execution:**

Heads of Quill Punches hot upset-forged; shank and head subsequently precision plunge-ground.  
 O. D. of Quill Bushes precision ground.  
 Thrust Pins are hardened, tempered and ground.

**Material:**

Stepped Quill Punches – Conical Head VDI 3374:

HSS  
 Order No: 232.3.  
 Hardness: Shank 62±2 HRC  
 Head 45±5 HRC

Quill Bushes O. No. 233. and 234. – VDI:  
 Steel C 45 heat treated to 800 N/mm2  
 Order No: Shape A = 233.7., Shape B = 234.7.

Thrust Pin:  
 HWS  
 Hardness: 62±2 HRC

Description of FIBRO materials for die components:  
 pages E 10– E 11.

**232./233./234.**

diameter steps					
$d_1$	$d_1$	$l$	$l_1$	$l_2$	$l_3$
from 2,0 bis 5,0	0,1	63	48	29	29
		71	57	37	37
		80	65	46	46

**Ordering Code (example):**

Stepped Quill Punch/Conical Head = 232.  
 Material HSS = 3.  
 $d_1 = \phi 2,2$  mm = 0220  
 Order No = 232.3.0220

**Ordering Code (example):**

Head Shape Quill bush + Thrust Pin = 233.  
 Material C 45 = 7.  
 $l_1 = 48$  mm = 048  
 Order No = 233.7.048

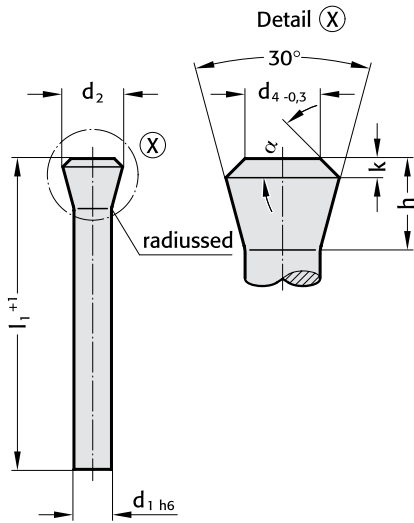


# FIBRO

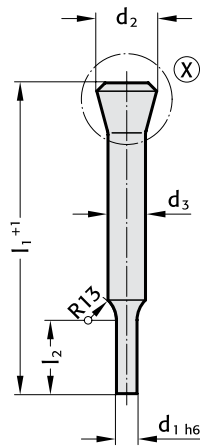
2281.  
2291.

## Round Precision Punches with tapered heads 30°, Shape C+D

2281. Shape D



2291. Shape C



### Material:

HSS  
Order No.: Shape D = 2281.3.  
Shape C = 2291.3.  
Hardness: Shank 58 + 2 HRC  
Head ≤ 50 HRC

### Execution:

Shape C and D  
Head hot upset-forged and tempered.  
Shank and head subsequently precision plunge-ground for perfect concentricity and full interchangeability with replacement punches.

Description of FIBRO materials for die components:  
pages E 10 – E 11.

2281. Shape D

d <sub>1</sub>	d <sub>2</sub>	d <sub>4</sub>	h	k	α ± 1°	l <sub>1</sub>	
						100	120
5,5	8,98	5,5	7,5	1	30	●	●
6	9,75	6	8		28	●	●
8	12,8	8	10		22,5	●	●
9	14,4	9	11		20	●	●
10	15,9	10	12		19	●	●
12	18,7	12	14	1,5	24		●
14	21,8	14	16		21		●
16	24,6	16	18	2	25		●

### Ordering Code (example):

Punch = 2281.  
Material HSS = 3.  
d<sub>1</sub> = 6 mm = 0600.  
l<sub>1</sub> = 100 mm = 100  
Order No = 2281.3.0600.100

2291. Shape C

d <sub>3</sub>	d <sub>2</sub>	d <sub>4</sub>	h	k	α ± 1°	l <sub>1</sub>	
						100	120
5,5	8,98	5,5	7,5	1	30	●	●
6	9,75	6	8		28	●	●
8	12,8	8	10		22,5	●	●
9	14,4	9	11		20	●	●
10	15,9	10	12		19	●	●
12	18,7	12	14	1,5	24		●
14	21,8	14	16		21		●
16	24,6	16	18	2	25		●

d<sub>1</sub> and l<sub>2</sub> to customer's specifications!

### Ordering Code (example):

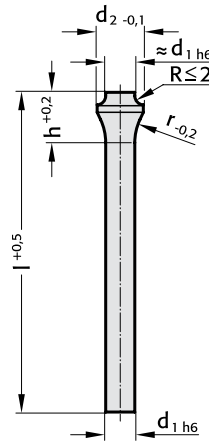
Punch = 2291.  
Material HSS = 3.  
d<sub>3</sub> = 10 mm = 1000.  
l<sub>1</sub> = 120 mm = 120.  
d<sub>1</sub> = 6 mm = 0600.  
l<sub>2</sub> = 15 mm = 015  
Order No = 2291.3.1000.120.0600.015

**Punch with tapered head, Shape D  
Piloted counterbore for tapered-head punch**

**2284.3.  
2284.00.**



**2284.3.**



**2284.3. Shape D**

Material: HSS  
Order Code: 2284.3.  
Hardness: Shaft 62 - 66 HRC  
Head 45 - 55 HRC

**Execution:**

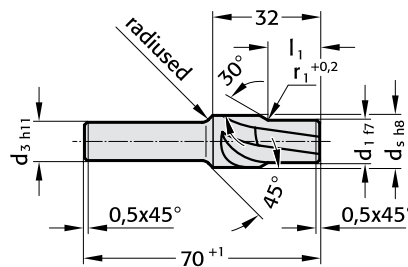
Punch shaft fine ground.  
Punch head warm upset-forged and tempered.

For description of material and other materials see pages E10 - E11.

**Ordering Code (example):**

Punch with tapered head	= 2284.
Material HSS	= 3.
d <sub>1</sub> = 20 mm	= 2000.
l = 100 mm	= 100
Order Code	= 2284.3.2000.100

**2284.00.**



**2284.00.**

Material: HSS  
Hardness: 62 - 66 HRC

**Execution:**

hardened, tempered and ground

**Ordering Code (example):**

Piloted counterbore for tapered-head punch	= 2284.00.
d <sub>1</sub> = 12.5 mm	= 1250
Order Code	= 2284.00.1250

# FIBRO

2284.3.  
2284.00.

Punch with tapered head, Shape D  
Piloted counterbore for tapered-head punch

2284.3.

2284.00.

d <sub>1</sub>	d <sub>2</sub>	h	r	l				d <sub>5</sub>	d <sub>3</sub>	r <sub>1</sub>	l <sub>1</sub>
				71	80	100	110				
2.0	3	4.80	3.5	●	●	●		3.3	3.3	3.5	5.0
2.1	3.2	5.28	5	●	●	●		3.5	3.5	5.0	5.0
2.2	3.2	5.18	5	●	●	●		3.5	3.5	5.0	5.0
2.3	3.5	5.37	5	●	●	●		3.8	3.8	5.0	5.0
2.4	3.5	5.28	5	●	●	●		3.8	3.8	5.0	5.0
2.5	3.5	5.18	5	●	●	●		3.8	3.8	5.0	5.0
2.6	4	5.93	6.5	●	●	●		4.3	4.3	6.5	7.0
2.7	4	5.83	6.5	●	●	●		4.3	4.3	6.5	7.0
2.8	4	5.73	6.5	●	●	●		4.3	4.3	6.5	7.0
2.9	4	5.62	6.5	●	●	●		4.3	4.3	6.5	7.0
3.0	4.5	6.03	6.5	●	●	●		4.9	4.9	6.5	7.0
3.1	4.5	5.93	6.5	●	●	●		4.9	4.9	6.5	7.0
3.2	4.5	5.83	6.5	●	●	●		4.9	4.9	6.5	7.0
3.3	4.5	5.73	6.5	●	●	●		4.9	4.9	6.5	7.0
3.4	4.5	5.62	6.5	●	●	●		4.9	4.9	6.5	7.0
3.5	5	6.38	8	●	●	●		5.4	5.4	8.0	7.0
3.6	5	6.27	8	●	●	●		5.4	5.4	8.0	7.0
3.7	5	6.16	8	●	●	●		5.4	5.4	8.0	7.0
3.8	5	6.04	8	●	●	●		5.4	5.4	8.0	7.0
4.0	5.5	7.38	8	●	●	●		5.9	5.9	8.0	8.0
4.1	5.5	7.27	8	●	●	●		5.9	5.9	8.0	8.0
4.2	5.5	7.16	8	●	●	●		5.9	5.9	8.0	8.0
4.3	5.5	7.04	8	●	●	●		5.9	5.9	8.0	8.0
4.4	5.5	6.92	8	●	●	●		5.9	5.9	8.0	8.0
4.5	6	7.38	8	●	●	●		6.4	6.4	8.0	8.0
4.6	6	7.27	8	●	●	●		6.4	6.4	8.0	8.0
4.7	6	7.16	8	●	●	●		6.4	6.4	8.0	8.0
4.8	6	7.04	8	●	●	●		6.4	6.4	8.0	8.0
4.9	6	6.92	8	●	●	●		6.4	6.4	8.0	8.0
5.0	7	8.36	10	●	●	●		7.4	7.4	10.0	10.0
5.1	7	8.25	10	●	●	●		7.4	7.4	10.0	10.0
5.2	7	8.15	10	●	●	●		7.4	7.4	10.0	10.0
5.5	8	8.84	10	●	●	●		8.5	8.5	10.0	10.0
5.6	8	8.75	10	●	●	●		8.5	8.5	10.0	10.0
6.0	9	9.27	10	●	●	●		9.5	9.5	10.0	10.0
6.1	9	9.19	10	●	●	●		9.5	9.5	10.0	10.0
6.2	9	9.10	10	●	●	●		9.5	9.5	10.0	10.0
6.3	9	9.02	10	●	●	●		9.5	9.5	10.0	10.0
6.4	9	8.93	10	●	●	●		9.5	9.5	10.0	10.0
6.5	10	10.24	12	●	●	●	●	10.5	10.5	12.0	12.0
7.0	10	9.81	12	●	●	●	●	10.5	10.5	12.0	12.0
7.5	11	10.24	12	●	●	●	●	11.5	11.5	12.0	12.0
7.7	11	10.07	12	●	●	●	●	11.5	11.5	12.0	12.0
8.0	11	9.81	12	●	●	●	●	11.5	11.5	12.0	12.0
8.1	11	9.72	12	●	●	●	●	11.5	11.5	12.0	12.0
8.5	13	11.90	15	●	●	●	●	13.5	13.0	15.0	12.0
9.0	13	11.48	15	●	●	●	●	13.5	13.0	15.0	12.0
9.5	14	11.90	15	●	●	●	●	14.5	13.0	15.0	12.0
10.0	14	11.48	15	●	●	●	●	14.5	13.0	15.0	12.0
10.5	15	11.90	15	●	●	●	●	15.5	13.0	15.0	15.0
11.0	15	11.48	15	●	●	●	●	15.5	13.0	15.0	15.0
11.5	16	11.90	15	●	●	●	●	16.5	13.0	15.0	15.0
12.0	16	11.48	15	●	●	●	●	16.5	13.0	15.0	15.0
12.5	17	11.90	15	●	●	●	●	17.5	13.0	15.0	15.0
13.0	17	11.48	15	●	●	●	●	17.5	13.0	15.0	15.0
13.5	18	11.90	15	●	●	●	●	18.5	13.0	15.0	15.0
14.0	18	11.48	15	●	●	●	●	18.5	13.0	15.0	15.0
14.5	19	11.90	15	●	●	●	●	19.5	13.0	15.0	15.0
15.0	19	11.48	15	●	●	●	●	19.5	13.0	15.0	15.0
15.5	20	11.90	15	●	●	●	●	20.5	13.0	15.0	15.0
16.0	20	11.48	15	●	●	●	●	20.5	13.0	15.0	15.0
17.0	21	11.48	15	●	●	●	●	21.5	16.0	15.0	15.0
18.0	22	11.48	15	●	●	●	●	22.5	16.0	15.0	15.0
19.0	23	11.48	15	●	●	●	●	23.5	16.0	15.0	15.0
19.5	25	12.66	15	●	●	●	●	25.5	16.0	15.0	15.0
20.0	25	12.29	15	●	●	●	●	25.5	16.0	15.0	15.0

# Assembly Guide Lines for Head Type Punches with Round Points

## Description:

Head type punches with round point (DIN 9844) are intended for floating assembly in the punch retainer. Radial guiding is to be provided by the stripper.

This type of punch assembly eliminates alignment errors caused by distorted mounting of the die set and faulty press geometry. With punches held in this manner, a clear separation between transmission of perforation force and guiding is achieved.

In order to facilitate assembly of punches of different diameters, the height of the heads is standardized to  $4_{+0,2}$  mm (DIN 9844).

## Guide Lines:

(excerpts from DIN 9844, page 5)

$d_1$  max. = stock thickness

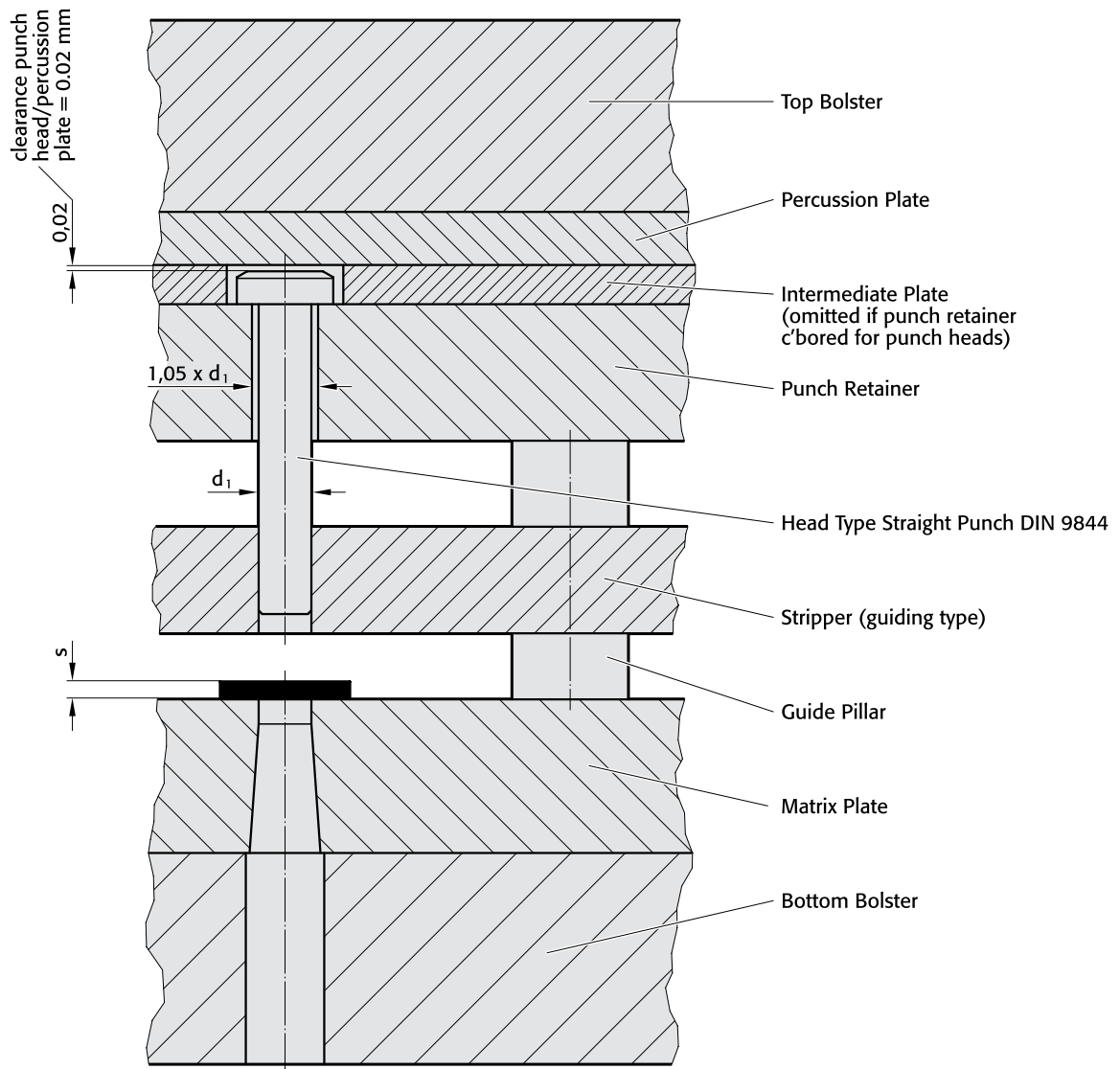
stripping force\*, for  $d_1$  from 1 to 5 mm: approx. 20 % of piercing force  
ditto . . . , for  $d_1$  from 5 to 16 mm: approx. 10 % of piercing force

\*applicable to stock not exceeding 400 N/mm<sup>2</sup> shear strength

Punch retainer: steel of at least 300 N/mm<sup>2</sup> tensile strength

Retaining hole in punch retainer = 1,05 times  $d_1$  or  $d_2$  respectively

Clearance punch head/percussion plate = 0,02 mm.



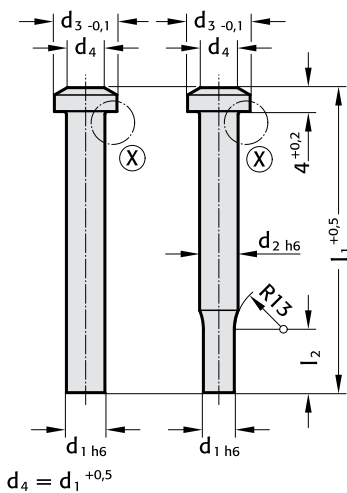
# FIBRO

220.  
221.

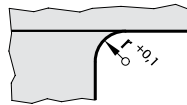
## Precision Punches DIN 9844 Shape A+B

220. Shape A

221. Shape B



Detail (X)  
normal execution  
with radius



### Material:

HSS		Shape A = 220.3.
Order No:		Shape B = 221.3.
Hardness	Shank Head	64±2 HRC 52±3 HRC
HST		Shape A = 220.4.
Order No:		Shape B = 221.4.
Hardness	Surface Head	≧ 950 HV 0,3 52±3 HRC

Description of FIBRO materials for die components:  
pages E 10–E 11.

### Execution:

Head hot upset-forged.  
Shank and shoulder precision plunge-ground.

### Ordering Code (example):

Punch A	=	220.
Punch B	=	221.
Material HSS	=	3.
$d_1 = 7,0$ mm	=	0700.
$l_1 = 71$ mm	=	071
Order No	=	220.3.0700.071
Order No	=	221.3.0700.071

### 220. Shape A

diameter steps		$d_3$	r	$l_1$
$d_1$	$d_1$			
2,0 – 2,2	0,1	3,6	0,2	
2,3 – 2,5		4,0		
2,6 – 2,8		4,5	0,3	
2,9 – 3,2		5,0		
3,3 – 3,5		6,0		
3,6 – 4,0		7,0		
4,1 – 4,5		8,0	0,5	
4,6 – 5,0		8,5		
5,1 – 5,4		9,0		
5,5 – 5,9		9,5		
6,0 – 6,4		10,0		
6,5 + 7,0	0,5	10,8	0,7	
7,5 + 8,0		12,0		
8,5 + 9,0		13,0		
9,5 + 10,0		14,5		
10,5 + 11,0		16,0	1,0	
11,5 – 12,5		18,0		
13,0 – 14,5		20,0		
15,0 – 16,0		22,0		

stock lengths: 71, 90, 112 mm;  
other lengths and diameters on request.

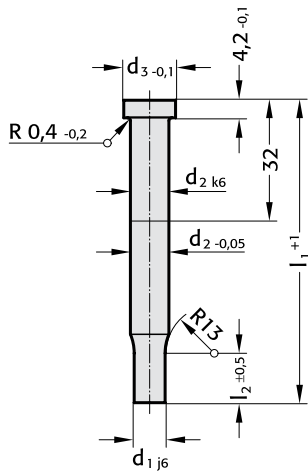
### 221. Shape B

diameter steps						$l_1$
$d_1$	$d_1$	$d_2$	$d_3$	$l_2$	r	
0,1 – 0,45	0,05	2,0	3,6	7	0,2	
0,5 – 1,9						
1,95 – 2,4		2,5	4,0			
2,5 – 3,1	0,1	3,2	5,0		0,3	
3,2 – 3,9		4,0	7,0			
4,0 – 4,9		5,0	8,5		0,5	
5,0 – 6,2		6,3	10,0			
6,3 – 7,9		8,0	12,0	16	0,7	
8,0 – 9,9		10,0	14,5			
10,0 – 12,4		12,5	18,0		1,0	
12,5 – 15,9		16,0	22,0			

lengths 71, 90, 112 mm available  
at short notice; other lengths and  
diameters on request.



266.



**Werkstoff:**

HSS  
Order No.: 266.3.  
Hardness: Shank 62±2 HRC  
Head 45±5 HRC

**Execution:**

Head hot upset-forged; shank and head precision plunge-ground.

**Ordering Code (example):**

Punch	=	266.
Material HSS	=	3.
d <sub>1</sub> = 8,0 mm	=	0800.
l <sub>1</sub> = 71 mm	=	071
Order No	=	266.3.0800.071

Description of FIBRO materials for die components:  
pages E 10 and E 11.

266.

diameter steps

d <sub>1</sub>	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>2</sub>	l <sub>1</sub> <sup>+1</sup>
5-8,9	0,1	10	13	13	
9-11,9		13	16		
12-15,9		16	19		
16-19,9	0,5	20	24		
20-24,9		25	29		

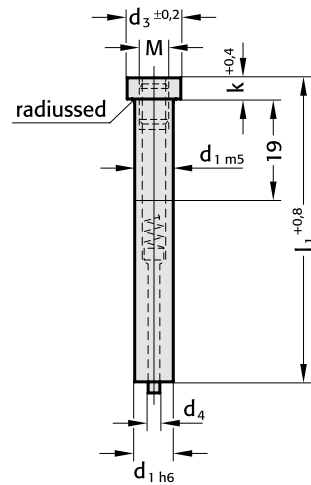
available at short notice in lengths:  
71 and 80 mm; other lengths and dia. on request.

Precision Punches with Ejector Pin

267.



267.



Execution:

Head hot upset-forged.  
Shank and shoulder precision plunge-ground.

Material:

HSS  
Order No: 267.3.  
Hardness: Shank 64±2 HRC  
Head 52±3 HRC

Ordering Code (example):

Punch	=	267.
Material HSS	=	3.
d <sub>1</sub> = 8,0 mm	=	0800.
l <sub>1</sub> = 71 mm	=	071
Order No	=	267.3.0800.071

Description of FIBRO materials for die components:  
pages E 10 and E 11.

267.

d <sub>1-h6</sub>	d <sub>3</sub>	d <sub>4</sub>	k	l <sub>1</sub>				M
				60	71	80	90	
5	8	0,5	5	●	●			M 3
6	9	0,8		●	●	●	●	
8	11	1,3		●	●	●	●	M 4
10	13			●	●	●	●	
13	16	1,6		●	●	●	●	M 5
16	19	2,4	6,4	●	●	●	●	M 6
20	23			●	●	●	●	
25	28	3,2		●	●	●	●	

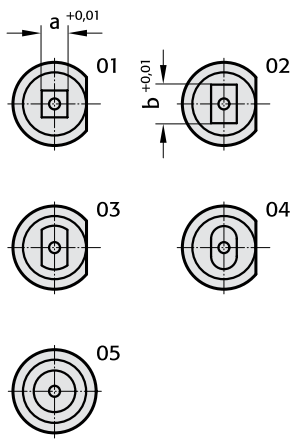


# FIBRO

268.  
269.

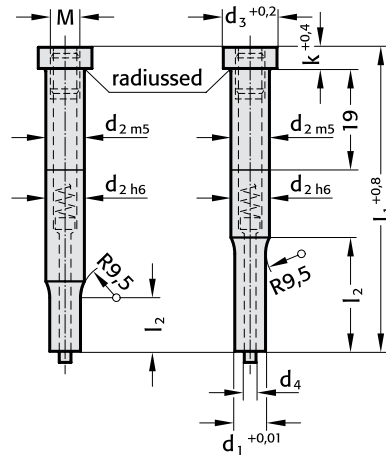
## Precision Punches with Ejector Pin, Stepped, Short/Long Point

### Classified Point Shapes



268.

269.



### Material:

HSS  
Order No: 268.3. (short point)  
Hardness: Shank 64±2 HRC  
Head 52±3 HRC

HSS  
Order No: 269.3. (long point)  
Hardness: Shank 64±2 HRC  
Head 52±3 HRC

Description of FIBRO materials for die components:  
pages E 10 and E 11.

### Execution:

Head hot upset-forged.  
Shank and shoulder precision plunge-ground.

Key flats parallel with longest size of shape, unless otherwise specified.

### Ordering Code (example):

Punch	=	268.
Material HSS	=	3.
d <sub>2</sub> = 8,0 mm	=	0800.
l <sub>1</sub> = 71 mm	=	071.
Classified Point Shape 05	=	05.
d <sub>1</sub> = 6,0 mm	=	0600
Order No	=	268.3.0800.071.05.0600

268./269.

268. 269.

d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	k	l <sub>2</sub>	l <sub>2</sub>	60	71	l <sub>1</sub>	80	90	a min.	M
1,6- 4,9	5	8	0,5	5	7	-	●	●				1,6	M 3
2,3- 5,9	6	9	0,8			17,5	●	●		●	●	2,3	
3,5- 7,9	8	11	1,3		13	25	●	●		●	●	3,2	M 4
5,0- 9,9	10	13				28	●	●		●	●	4,8	
6,0-12,9	13	16	1,6				●	●		●	●		M 5
8,0-15,9	16	19	2,4	6,4			●	●		●	●	5,5	M 6
12,0-19,9	20	23					●	●		●	●		
16,0-24,9	25	28	3,2				●	●		●	●	6,5	

# Sintered Hard Metal HIP-Densified

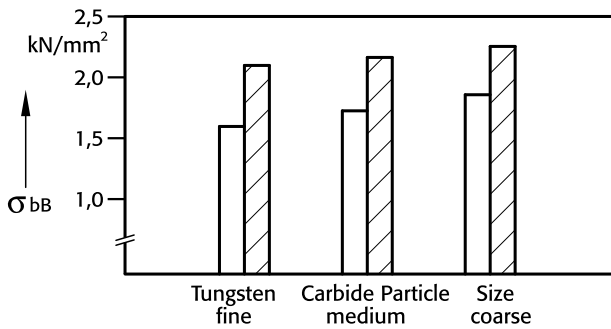
The HIP Process (hot isostatic pressing) consists of a special densification treatment.

Applied after the sintering stage, this widely used process involves compacting, at very high temperature and pressure, of the carbide structure. It yields an appreciable reduction in porosity, better strength properties and thus longer die life of press tool members.

As can be seen from the diagrams and tables, both compressive and flexural strength are improved.

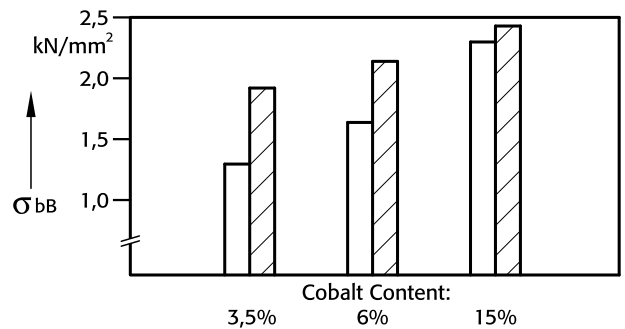
For stamping die tooling, hard metal types of medium tungsten particle size, with a cobalt content of 9 to 12%, have been found successful in a wide field of applications.

Tensile Strength of Tungsten – 6% Cobalt Carbide in the Sintered-Only versus HIP-Densified State, in Dependence of Crystallite Particle Size



a) influence of crystallite size of hard metal phase  
(left: sintered only – right: sintered and HIP-treated)

Tensile Strength of Tungsten – Cobalt Carbide in the Sintered-Only versus HIP-Densified State, in Dependence of total Cobalt Content



b) influence of cobalt content  
(left: sintered only – right: sintered and HIP-treated)

Tungsten carbide-particle size	Co %	HV <sub>30</sub> -Hardness		Flexural Strength N/mm <sup>2</sup>	
		befor	after	befor	after
fine	3	1800	no changes	1200	1700
	6	1650		1500	2300
	9	1400		2000	2600
medium	6	1600		2000	2600
	9	1450		2350	2700
	12	1300		2450	2900
	15	1200		2700	2850
coarse	6	1400		1900	2250
	8	1350		2300	2600
	10	1200	2650	2850	

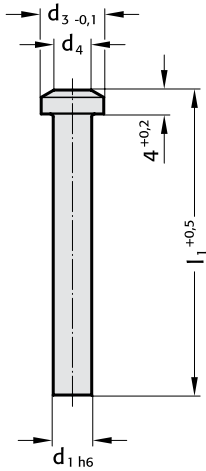
Flexural Strength and HV30-Hardness of Tungsten-Cobalt Carbides with/without HIP-Treatment and in Dependence of Tungsten Carbide Particle Size and Cobalt Content.

# FIBRO

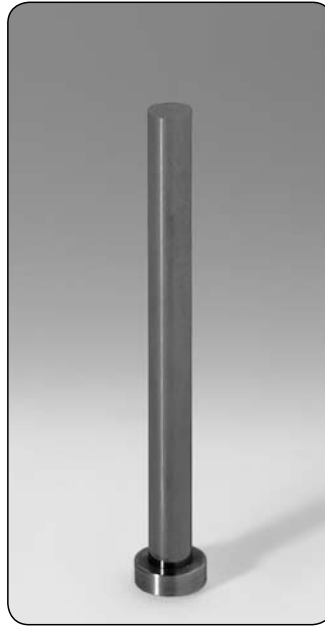
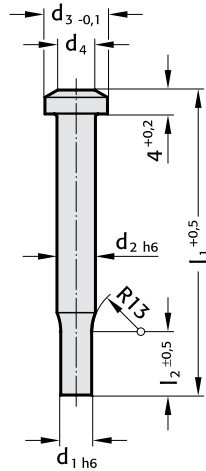
270. 272.  
271. 273.

## Carbide Punches – similar to DIN 9844 + DIN 9861 Cylindrical Head – Straight and Stepped Conical Head – Straight and Stepped

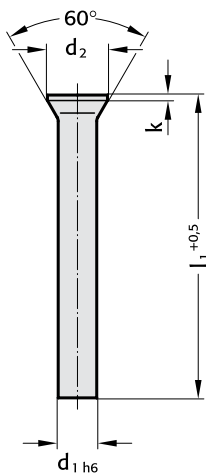
270. Shape A



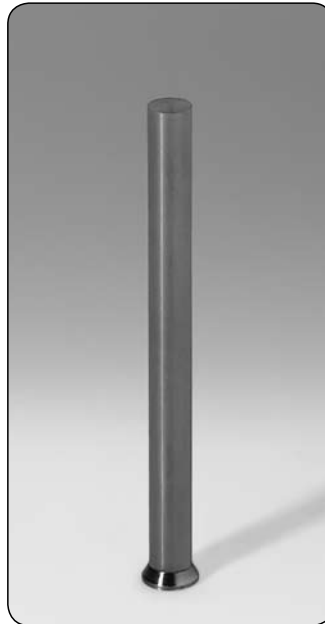
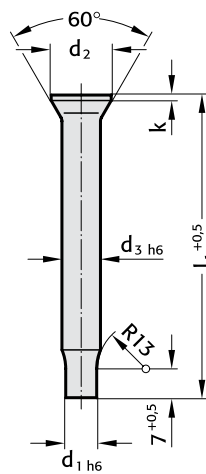
271. Shape B



272. Shape D



273. Shape C



### Material:

Tungsten-Cobalt Carbide

Order No:      Shape A = 270.9., Shape B = 271.9.  
                     Shape D = 272.9., Shape C = 273.9.

### Dimensions:

See DIN 9844 and DIN 9861 on pages E 12, E 13, E 14, E 15 and E 21.  
Other diameters and lengths on request.

### Delivery:

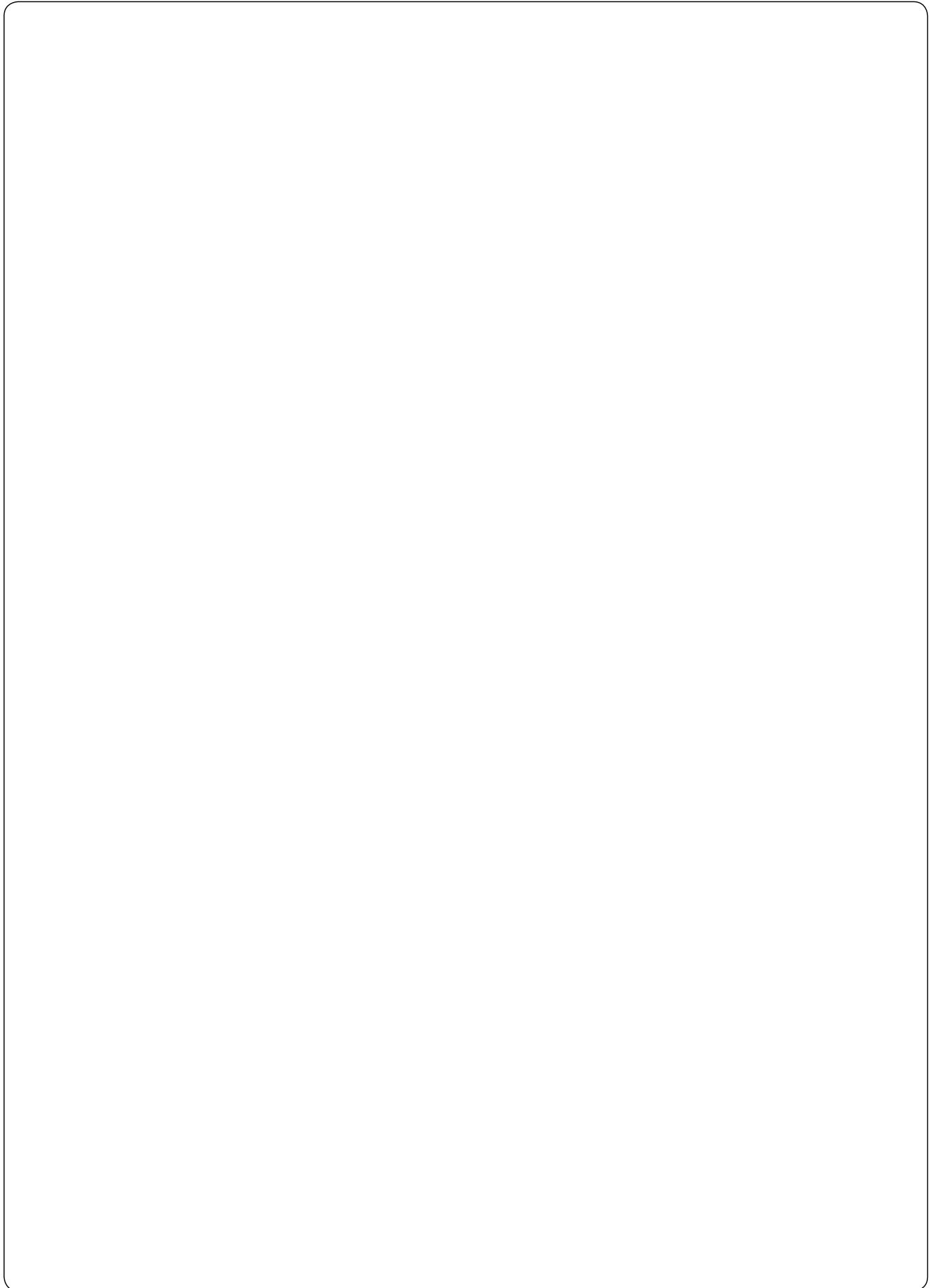
270.  
Shape A from  $d_1 = 1,0$  mm  
272.  
Shape D from  $d_1 = 1,5$  mm

### Execution:

Heads steel, brazed to shanks.  
Shanks precision ground.

### Ordering Code (example):

Carbide Punch	= 272.
Material: Tungsten-Cobalt Carbide	= 9.
$d_1 = 6,0$ mm	= 0600.
$l_1 = 71$ mm	= 071
Order No	= 272.9.0600.071

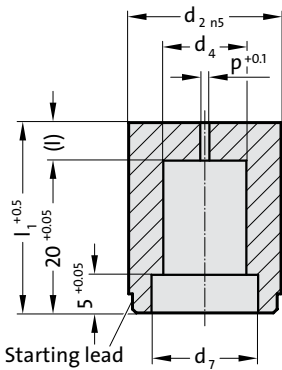


**FIBRO Patent pending**

2618.06.  
2618.16.

**Matrixes without collar  
for Dynamic Stripper (DAE)**

2618.06.



2618.06. with pilot hole bore

$d_2$	$d_4$	$d_7$	P	l	$l_1$
13	8	11	1.2	5	25
16	9	12	1.2	5	25
16	10	13	1.5	5	25
20	11	14	1.5	5	25
20	12	15	1.5	5	25

**Material:**

HSS  
hardened: 62±2HRC

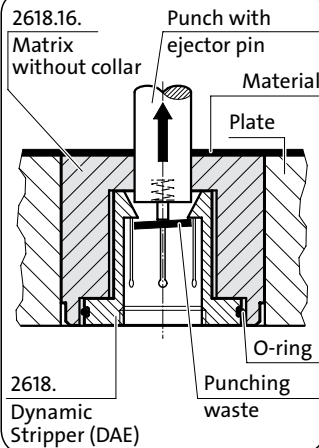
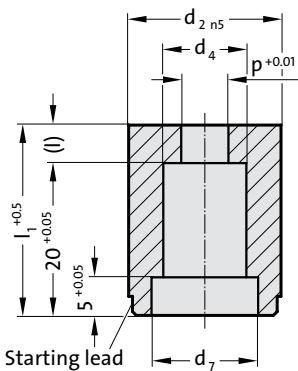
**Execution:**

Diameter  $d_2$ , starting lead and end faces ground.  
Diameter P is a bored pilot hole for wire EDM.

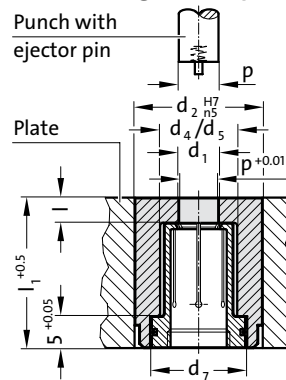
**Ordering Code (example):**

see fold-out page E103

2618.16.



**Mounting Example:**



2618.16.

$d_2$	$d_4$	$d_7$	l	$l_1$	Matrix Gradation 0.01		$d_1$
					DAE	$d_5$	
13	8	11	5	25	3.00 - 4.29	7	3.0 - 4.0
16	9	12	5	25	4.30 - 5.29	8	4.1 - 5.0
16	10	13	5	25	5.30 - 6.29	9	5.1 - 6.0
20	11	14	5	25	6.30 - 7.29	10	6.1 - 7.0
20	12	15	5	25	7.30 - 8.29	11	7.1 - 8.0

**Material:**

Steel (HSS), hardened

**Execution:**

Diameter  $d_2$ , starting lead and end faces ground.

**Note:**

Order Dynamic Stripper (DAE) separately

**Ordering Code (example):**

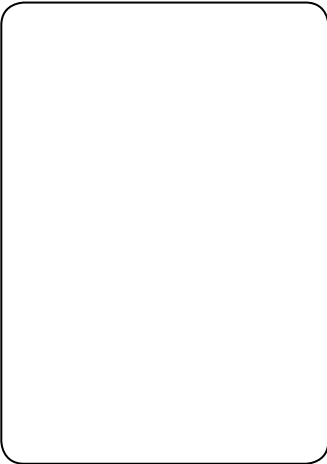
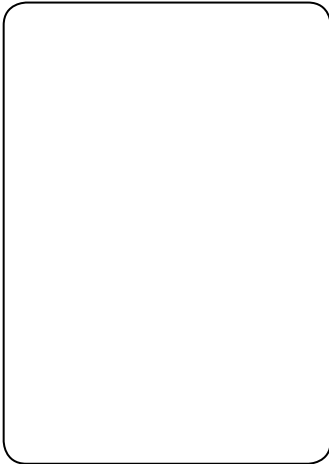
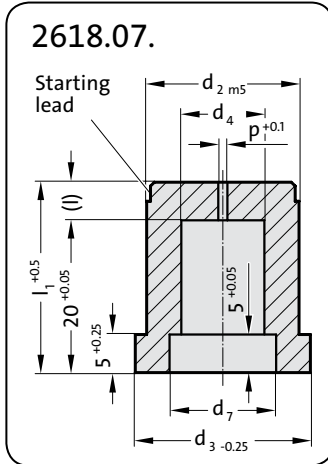
see fold-out page E103

Patent pending

Matrixes with collar  
for Dynamic Stripper (DAE)

FIBRO

2618.07.  
2618.17.



Material:

HSS  
hardened: 62±2HRC

Execution:

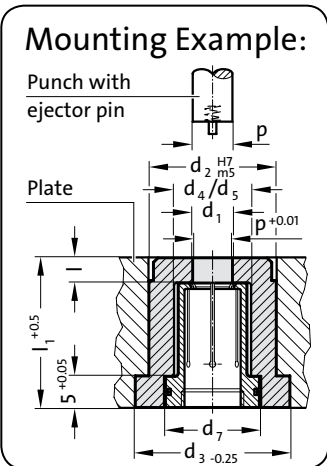
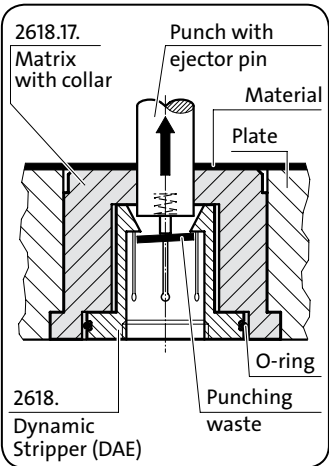
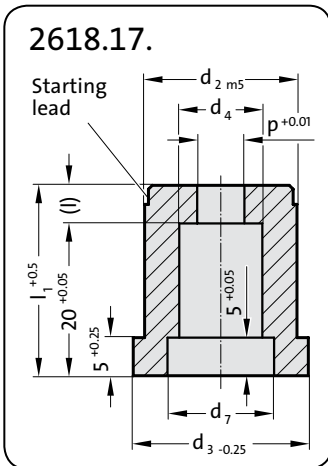
Diameter d<sub>2</sub>, starting lead and end faces ground.  
Diameter P is a bored pilot hole for wire EDM.

Ordering Code (example):

see fold-out page E103

2618.07. with pilot hole bore

d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>7</sub>	P	l	l <sub>1</sub>
13	16	8	11	1.2	5	25
16	19	9	12	1.2	5	25
16	19	10	13	1.5	5	25
20	23	11	14	1.5	5	25
20	23	12	15	1.5	5	25



Material:

Steel (HSS), hardened

Execution:

Diameter d<sub>2</sub>, starting lead and end faces ground.

Note:

Order Dynamic Stripper (DAE) separately

Ordering Code (example):

see fold-out page E103

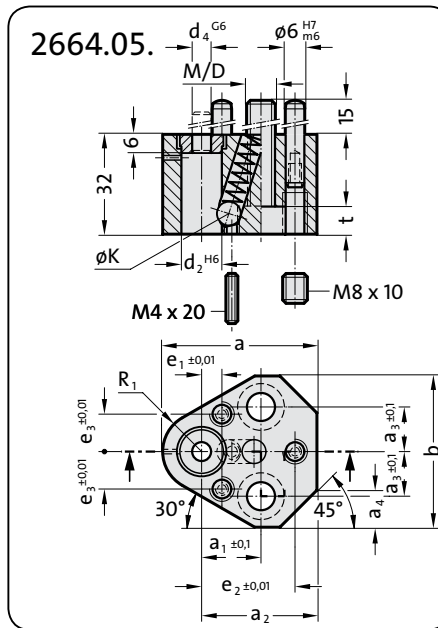
2618.17.

d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>7</sub>	l	l <sub>1</sub>	Matrix		d <sub>1</sub>
						Gradation 0.01	DAE	
13	16	8	11	5	25	3.00 - 4.29	7	3.0 - 4.0
16	19	9	12	5	25	4.30 - 5.29	8	4.1 - 5.0
16	19	10	13	5	25	5.30 - 6.29	9	5.1 - 6.0
20	23	11	14	5	25	6.30 - 7.29	10	6.1 - 7.0
20	23	12	15	5	25	7.30 - 8.29	11	7.1 - 8.0

# Precision Retainers for Ball-Lock Punches

# Triangle Precision Retainers for Ball-Lock Punches, light duty for Ball-Lock Punches, heavy duty

**FIBRO**  
2664.05.  
2664.06.



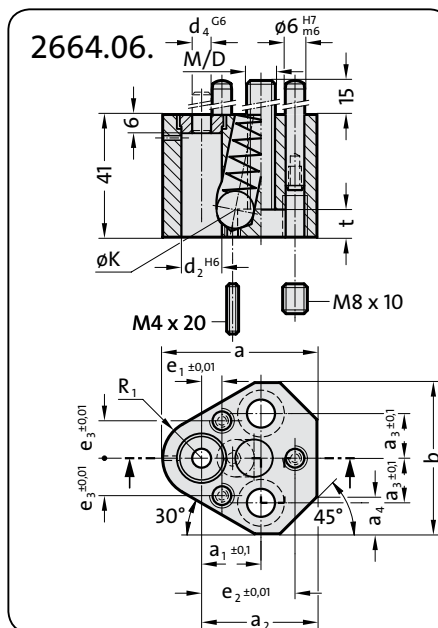
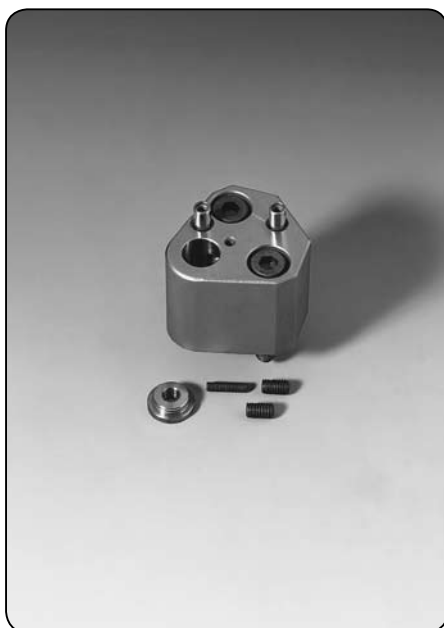
## Execution:

Version for metal thicknesses <3 mm.

The punch locating hole  $d_2$  is manufactured to a tolerance of  $\pm 0.01$  mm relative to the 6 stud holes H7. This ensures the interchangeability of the locating plate with other polygon versions.

## Note:

Special punch retainers available to order.



## Execution:

Version for metal thicknesses >3 mm.

The punch locating hole  $d_2$  is manufactured to a tolerance of  $\pm 0.01$  mm relative to the 6 stud holes H7. This ensures the interchangeability of the locating plate with other polygon versions.

## Note:

Special punch retainers available to order.

### 2664.05.

$d_2$	10	13	16	20	25	32	38
$d_4$	6	6	6	6	6	6	6
M/D	8/9	8/9	8/9	10/11	12/13,5	12/13,5	12/13,5
a	43,5	49,5	52,5	59	68,5	68,5	76
$a_1$	19,05	19,05	19,05	19,05	23,82	23,82	27
$a_2$	34	37	38,5	42	46,5	46,5	50
$a_3$	11,12	14,27	15,87	17,47	19,84	19,84	24
$a_4$	10	12	13	14	16	16	18
b	41	48,5	51,5	56,5	64,5	64,5	72,5
$e_1$	7,5	6,5	6	5	7	7	10
$e_2$	26,92	29,97	31,75	33,53	40,64	40,64	43,99
$e_3$	9	12	13,5	16,5	22	22	26
$\varnothing K$	8	8	8	8	8	8	8
t	9	9	9	11	13	13	13
$R_1$	9,5	12,5	14	17	22	22	26

### Ordering example:

Triangle retainer	= 2664.
for ball-lock punch, light duty	= 05.
$d_2 = \varnothing 13$ mm	= 13
Order number	= 2664.05.13

### 2664.06.

$d_2$	10	13	16	20	25	32	40
$d_4$	6	6	6	6	6	6	6
M/D	8/9	8/9	8/9	10/11	12/13,5	12/13,5	12/13,5
a	43,5	49,5	52,5	59	68,5	68,5	76
$a_1$	19,05	19,05	19,05	19,05	23,82	23,82	27
$a_2$	34	37	38,5	42	46,5	46,5	50
$a_3$	11,12	14,27	15,87	17,47	19,84	19,84	24
$a_4$	10	12	13	14	16	16	18
b	41	48,5	51,5	56,5	64,5	64,5	72,5
$e_1$	7,5	6,5	6	5	7	7	10
$e_2$	26,92	29,97	31,75	33,53	40,64	40,64	43,99
$e_3$	9	12	13,5	16,5	22	22	26
$\varnothing K$	10	12	12	12	12	12	12
t	9	9	9	11	13	13	13
$R_1$	9,5	12,5	14	17	22	22	26

### Ordering example:

Triangle retainer	= 2664.
for ball-lock punch, heavy duty	= 06.
$d_2 = \varnothing 13$ mm	= 13
Order number	= 2664.06.13



# FIBRO

2664.07.  
2664.10.

## Triangle Precision Retainers for Ball-Lock Punches, light duty for Ball-Lock Punches, heavy duty

### Execution:

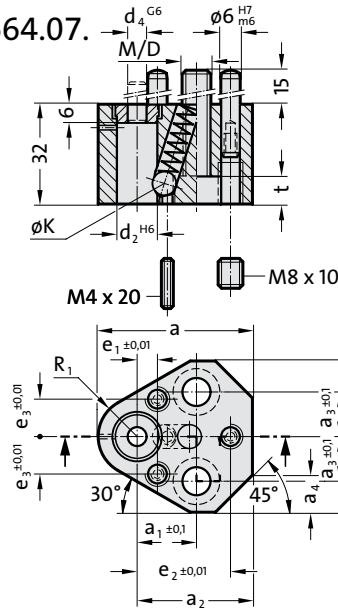
Version for metal thicknesses <3 mm.

The punch locating hole  $d_2$  is manufactured to a tolerance of  $\pm 0.01$  mm relative to the 6 stud holes H7. This ensures the interchangeability of the locating plate with other polygon versions.

### Note:

Special punch retainers available to order.

2664.07.



### Execution:

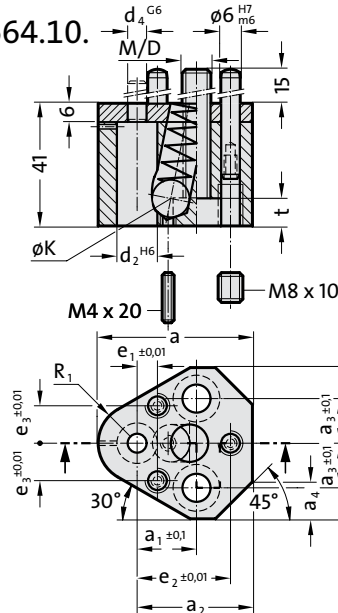
Version for metal thicknesses >3 mm.

The punch locating hole  $d_2$  is manufactured to a tolerance of  $\pm 0.01$  mm relative to the 6 stud holes H7. This ensures the interchangeability of the locating plate with other polygon versions.

### Note:

Special punch retainers available to order.

2664.10.



2664.07.

$d_2$	6
$d_4$	3
M/D	6/6,6
a	35
$a_1$	19,05
$a_2$	27
$a_3$	11,12
$a_4$	6
b	37,5
$e_1$	9,0
$e_2$	23
$e_3$	8
$\varnothing K$	6
t	7
$R_1$	8

### Ordering example:

Triangle retainer	= 2664.
light duty	= 07.
$d_2 = \varnothing 6$ mm	= 06
Order number	= 2664.07.06

2664.10.

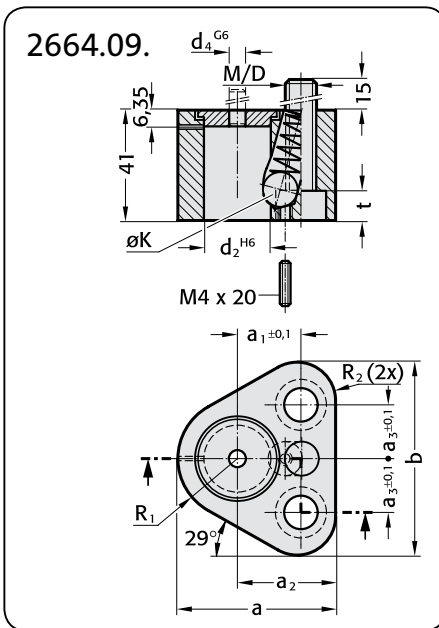
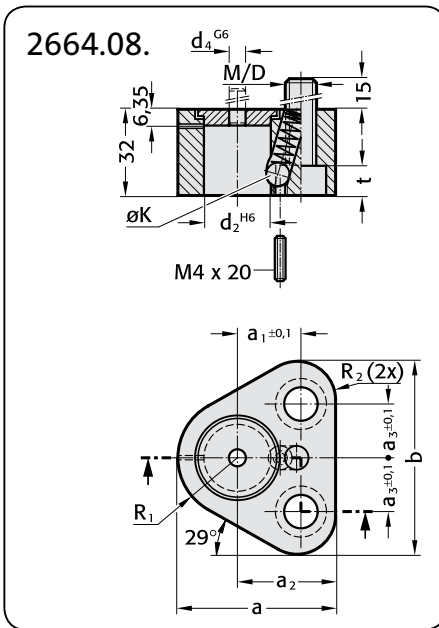
$d_2$	10	13	16	20	25	32	40
$d_4$	6	6	6	6	6	6	6
M/D	8/9	8/9	8/9	10/11	12/13,5	12/13,5	12/13,5
a	43,5	49,5	52,5	59	68,5	68,5	76
$a_1$	19,05	19,05	19,05	19,05	23,82	23,82	27
$a_2$	34	37	38,5	42	46,5	46,5	50
$a_3$	11,12	14,27	15,87	17,47	19,84	19,84	24
$a_4$	10	12	13	14	16	16	18
b	41	48,5	51,5	56,5	64,5	64,5	72,5
$e_1$	7,5	6,5	6	5	7	7	10
$e_2$	26,92	29,97	31,75	33,53	40,64	40,64	43,99
$e_3$	9	12	13,5	16,5	22	22	26
$\varnothing K$	10	12	12	12	12	12	12
t	9	9	9	11	13	13	13
$R_1$	9,5	12,5	14	17	22	22	26

### Ordering example:

Triangle retainer	= 2664.
heavy duty	= 10.
$d_2 = \varnothing 13$ mm	= 13
Order number	= 2664.10.13

Triangle Precision Retainers  
for Ball-Lock Punches, light duty  
for Ball-Lock Punches, heavy duty

**FIBRO**  
2664.08.  
2664.09.



**2664.08.**

d <sub>2</sub>	10	13	16	20	25	32
d <sub>4</sub>	6	6	6	6	6	6
M/D	8	8	8	10	12	12
a	38,5	41,7	43,3	47,5	59,2	59,2
a <sub>1</sub>	19,05	19,05	19,05	19,05	23,82	23,82
a <sub>2</sub>	29	29	29	30	37	37
a <sub>3</sub>	11,12	14,27	15,87	17,47	19,84	19,84
b	40,61	47,93	51,59	57,93	70,85	70,85
ØK	8	8	8	8	8	8
t	9	9	9	11	13	13
R <sub>1</sub>	9,5	12,7	14,3	17,5	22,2	22,2
R <sub>2</sub>	9,5	9,5	9,5	11	15	15

**Ordering example:**

Triangle retainer for ball-lock punch	= 2664.
light duty	= 08.
d <sub>2</sub> = Ø 20 mm	= 20
Order No	= 2664.08.20

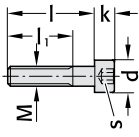
**2664.09.**

d <sub>2</sub>	10	13	16	20	25	32
d <sub>4</sub>	6	6	6	6	6	6
M/D	8	8	8	10	12	12
a	38,5	41,7	43,3	47,5	59,2	59,2
a <sub>1</sub>	19,05	19,05	19,05	19,05	23,82	23,82
a <sub>2</sub>	29	29	29	30	37	37
a <sub>3</sub>	11,12	14,27	15,87	17,47	19,84	19,84
b	40,61	47,93	51,59	57,93	70,85	70,85
ØK	10	12	12	12	12	12
t	9	9	9	11	13	13
R <sub>1</sub>	9,5	12,7	14,3	17,5	22,2	22,2
R <sub>2</sub>	9,5	9,5	9,5	11	15	15

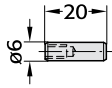
**Ordering example:**

Triangle retainer for ball-lock punch	= 2664.
heavy duty	= 09.
d <sub>2</sub> = Ø 20 mm	= 20
Order No	= 2664.09.20

2192.10. 236.1. 2666.04. 2192.72. 2666.06. 2666.01. 2666.03. 2192.72.



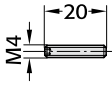
Socket head cap screw



Dowel pin



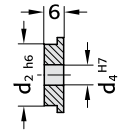
Ball



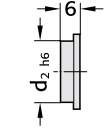
Ball release pin



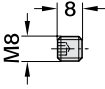
Spring



Pressure disk for centring pin



Pressure Disc



Pin screw

Retainer	Ø d <sub>i</sub>	2192.10.08.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.10	2666.03.10	2192.72.08.008
2664.05.	10	2192.10.08.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.10	2666.03.10	2192.72.08.008
	13	2192.10.08.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.13	2666.03.13	2192.72.08.008
	16	2192.10.08.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.16	2666.03.16	2192.72.08.008
	20	2192.10.10.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.20	2666.03.20	2192.72.08.008
	25	2192.10.12.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.25	2666.03.25	2192.72.08.008
	32	2192.10.12.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.32	2666.03.32	2192.72.08.008
	38	2192.10.12.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.38	2666.03.38	2192.72.08.008
2664.06./10.	10	2192.10.08.040	236.1.0600.020	2666.04.010	2192.72.04.020	2666.06.010	2666.01.10	2666.03.10	2192.72.08.008
	13	2192.10.08.040	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.13	2666.03.13	2192.72.08.008
	16	2192.10.08.040	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.16	2666.03.16	2192.72.08.008
	20	2192.10.10.050	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.20	2666.03.20	2192.72.08.008
	25	2192.10.12.050	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.25	2666.03.25	2192.72.08.008
	32	2192.10.12.050	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.32	2666.03.32	2192.72.08.008
	40	2192.10.12.050	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.40	2666.03.38	2192.72.08.008
2664.07.	6	2192.10.06.035	236.1.0600.020	2666.04.006	2192.72.04.020	2666.06.006	2666.01.06	2666.03.06	2192.72.08.008
2664.08.	10	2192.10.08.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.10	2666.03.10	2192.72.08.008
	13	2192.10.08.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.13	2666.03.13	2192.72.08.008
	16	2192.10.08.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.16	2666.03.16	2192.72.08.008
	20	2192.10.10.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.20	2666.03.20	2192.72.08.008
	25	2192.10.12.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.25	2666.03.25	2192.72.08.008
	32	2192.10.12.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2666.01.32	2666.03.32	2192.72.08.008
2664.09.	10	2192.10.08.040	236.1.0600.020	2666.04.010	2192.72.04.020	2666.06.010	2666.01.10	2666.03.10	2192.72.08.008
	13	2192.10.08.040	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.13	2666.03.13	2192.72.08.008
	16	2192.10.08.040	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.16	2666.03.16	2192.72.08.008
	20	2192.10.10.040	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.20	2666.03.20	2192.72.08.008
	25	2192.10.12.040	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.25	2666.03.25	2192.72.08.008
	32	2192.10.12.040	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2666.01.32	2666.03.32	2192.72.08.008

Ball release tool Hook shape straight threaded tip



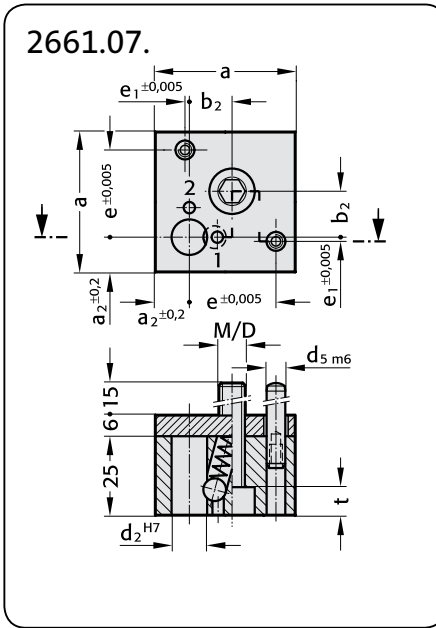
2666.05.01

2666.05.02

2666.05.03

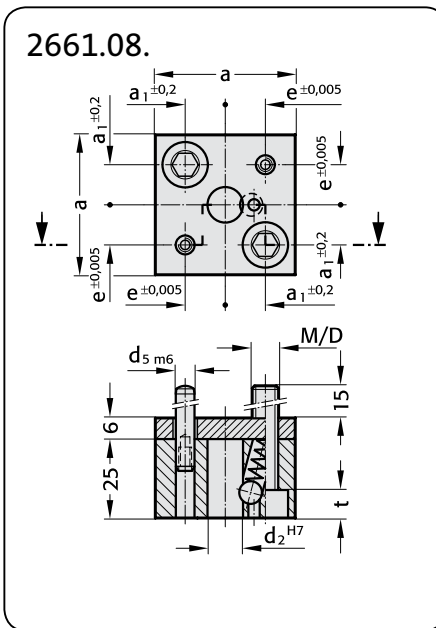
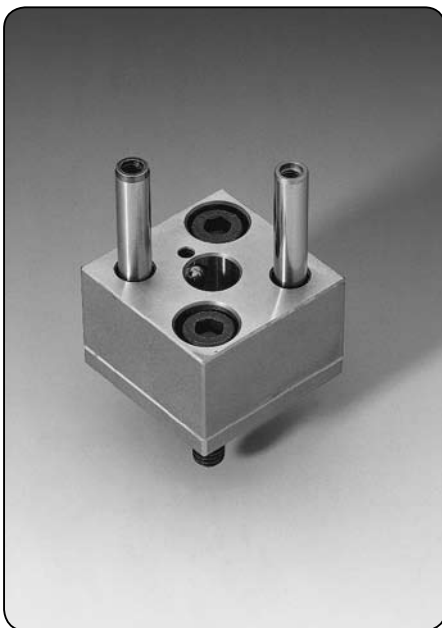
**Square Precision Retainers  
for Ball-Lock Punches, light duty**

**2661.07.  
2661.08.**



**Execution:**  
The centres of the pinholes  $d_5$  are the reference points for the position of the punch bore.  
The dimensions  $e$  and  $e_1$  have a tolerance of  $\pm 0,005$  mm.  
The square ball-lock retainers are interchangeable.  
The order must specify position 1 or 2 for the locking ball.  
Ball channel horizontal = 1  
Ball channel vertical = 2

**Note:**  
Supplied with dowel pins and screws  
DIN EN ISO 4762.



**Execution:**  
The centres of the pinholes  $d_5$  are the reference points for the position of the punch bore.  
The  $e$ -dimensions have a tolerance of  $\pm 0,005$  mm.  
The square ball-lock retainers are interchangeable.

**Note:**  
Supplied with dowel pins and screws  
DIN EN ISO 4762.

**2661.07.**

$d_2$	$d_5$	M/D	a	$a_2$	$b_2$	e	$e_1$	t
10	8	8/9	45	11	15	28	1	9
13								
16								
20	10	10/11	56	17	18	32	5	11
25								

**Ordering code (example):**

Square Retainer	= 2661.
for Ball-Lock Punch	= 07.
$d_2 = \varnothing 20$ mm	= 20.
Vertical ball race	= 2
Order No	= 2661.07.20.2

**2661.08.**

$d_2$	$d_5$	M/D	a	$a_1, e$	t
6	8	8/9	45	13	9
10					
13					
16					
20	10	10/11	56	16	11
25		12/13,5	63	20	13

**Ordering code (example):**

Square Retainer	= 2661.
for Ball-Lock Punch	= 08.
$d_2 = \varnothing 20$ mm	= 20
Order No	= 2661.08.20

**Material:**

Punch plate case-hardened 740±40 HV 10  
Pressure plate hardened 60 +2 HRC

**Execution:**

The centres of the pin holes  $d_5$  are the reference points for the position of the punch bore.

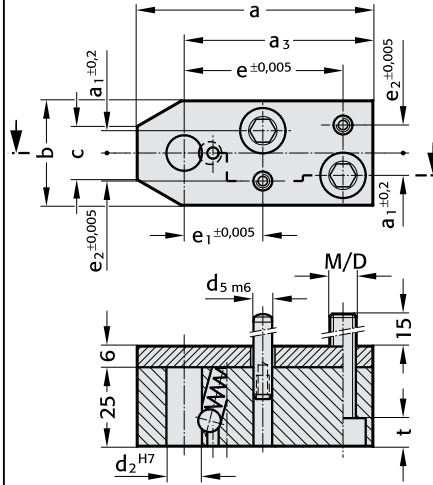
The dimensions  $e$ ,  $e_1$  and  $e_2$  have a tolerance of ± 0,005 mm.

The rectangular ball-lock retainers are interchangeable.

**Note:**

Supplied with dowel pins and screws  
DIN EN ISO 4762.

2662.05.



2662.05.

$d_2$	$d_5$	M/D	a	$a_3$	$a_1$	b	e	$e_1$	$e_2$	c	t
6	8	8/9	75	60	7	32	50	25	9	16	9
10											
13											
16											
20	10	10/11	85	63	9	40	53	28	11	20	11
25											

**Ordering code (example):**

Rectangular Retainer	= 2662.
for Ball-Lock Punch	= 05.
$d_2 = \varnothing 20$ mm	= 20
Order No	= 2662.05.20

# ACCU-LOCK Fixture Device for Ball-Lock Punches

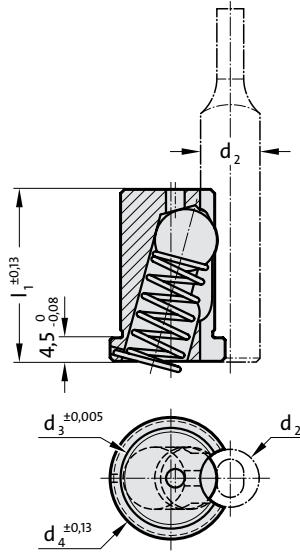
light duty  
heavy duty

**FIBRO**

2668.2.

2668.3.

2668.2./2668.3.



2668.2.

Order code	Cutting punch- $\varnothing$ "d <sub>2</sub> "	d <sub>3</sub>	d <sub>4</sub>	l <sub>1</sub>
2668.2.06	6	12	14.6	25.7
2668.2.10	10	14	16.6	25.7
2668.2.13	13	14	16.6	25.7
2668.2.16	16	14	16.6	25.7
2668.2.20	20	16	18.6	25.7
2668.2.25	25	16	18.6	25.7
2668.2.32	32	16	18.6	25.7
2668.2.38	38	16	18.6	25.7

2666.05.02

Ball release tool, straight

2668.3.

Order code	Cutting punch- $\varnothing$ "d <sub>2</sub> "	d <sub>3</sub>	d <sub>4</sub>	l <sub>1</sub>
2668.3.10	10	16	19.6	34.7
2668.3.13	13	20	24.6	34.7
2668.3.16	16	20	24.6	34.7
2668.3.20	20	20	24.6	34.7
2668.3.25	25	20	24.6	34.7
2668.3.32	32	20	24.6	34.7
2668.3.40	40	20	24.6	34.7

2666.05.02

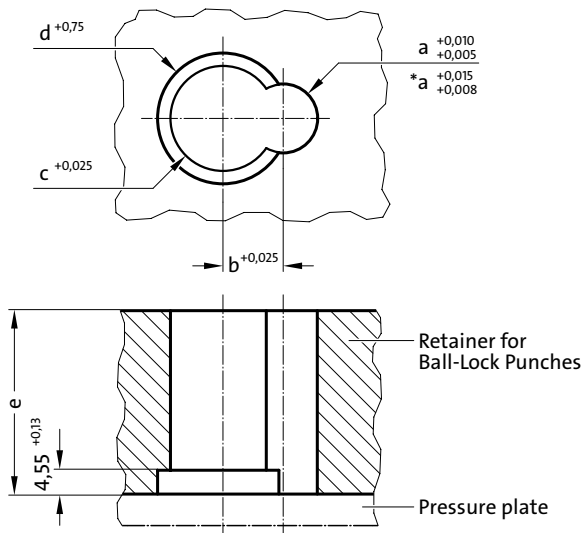
Ball release tool, straight



Typical Application:



Mounting Example:



Mounting dimensions for 2668.2. / 2668.3.

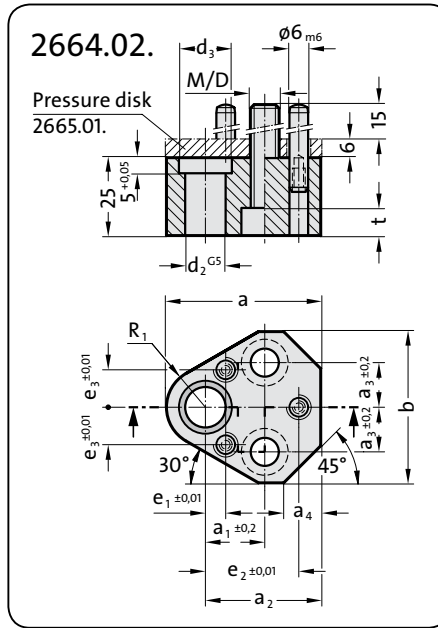
Order-No.	a	b	c	d	e
2668.2.06	6	6.5	12.013	15.0	25.7
2668.2.10	10	9.0	14.013	17.0	25.7
2668.2.13	13	10.5	14.013	17.0	25.7
2668.2.16	16	12.0	14.013	17.0	25.7
2668.2.20	20	14.0	16.013	19.0	25.7
2668.2.25	25	16.5	16.013	19.0	25.7
2668.2.32	*32	20.0	16.013	19.0	25.7
2668.2.38	*38	23.0	16.013	19.0	25.7

2668.3.10	10	10.0	16.013	20.0	34.7
2668.3.13	13	11.5	20.013	25.0	34.7
2668.3.16	16	13.0	20.013	25.0	34.7
2668.3.20	20	15.0	20.013	25.0	34.7
2668.3.25	25	17.5	20.013	25.0	34.7
2668.3.32	*32	21.0	20.013	25.0	34.7
2668.3.40	*40	25.0	20.013	25.0	34.7

# Precision Retainers ISO

# Triangle Precision Retainers, for round Punches, ISO 8020 for Profile Punches, ISO 8020

**FIBRO**  
2664.02.  
2664.04.



## Execution:

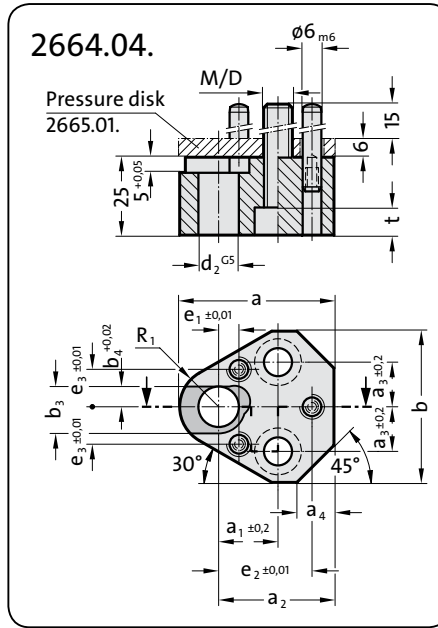
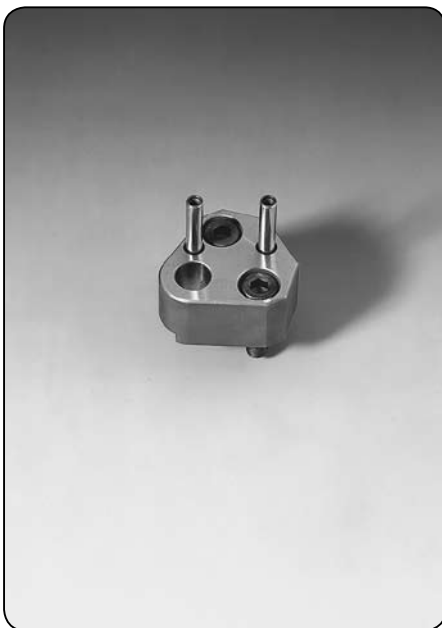
The centres of the pinholes  $d_3$  are the reference points for the position of the punch bore.

The dimensions  $e_1$ ,  $e_2$  and  $e_3$  have a tolerance of  $\pm 0.01$  mm.

The triangle retainers are interchangeable.

## Note:

Pressure plate 2665.01 to be ordered separately for the receiving punch plate.



## Execution:

The centres of the pinholes  $d_3$  are the reference points for the position of the punch bore.

The dimensions  $e_1$ ,  $e_2$  and  $e_3$  have a tolerance of  $\pm 0.01$  mm.

The triangle retainers are interchangeable.

## Note:

Pressure plate 2665.01 to be ordered separately for the receiving punch plate.

### 2664.02.

$d_2$	10	13	16	20	25	32
$d_3$	14	17	20	24	29	36
M/D	8/9	8/9	8/9	10/11	12/13,5	12/13,5
a	43,5	49,5	52,5	59	68,5	68,5
$a_1$	19,05	19,05	19,05	19,05	23,82	23,82
$a_2$	34	37	38,5	42	46,5	46,5
$a_3$	11,12	14,27	15,87	17,47	19,84	19,84
$a_4$	10	12	13	14	16	16
b	41,0	48,5	51,5	56,5	64,5	64,5
$e_1$	7,5	6,5	6	5	7	7
$e_2$	26,92	29,97	31,75	33,53	40,64	40,64
$e_3$	9	12	13,5	16,5	22	22
t	9	9	9	11	13	13
$R_1$	9,5	12,5	14	17	22	22

### Ordering example:

Triangle retainer	= 2664.
for round Punch, ISO 8020	= 02.
$d_2 = \varnothing 13$ mm	= 13
Order number	= 2664.02.13

### 2664.04.

$d_2$	10	13	16	20	25	32
M/D	8/9	8/9	8/9	10/11	12/13,5	12/13,5
a	43,5	49,5	52,5	59	68,5	68,5
$a_1$	19,05	19,05	19,05	19,05	23,82	23,82
$a_2$	34	37	38,5	42	46,5	46,5
$a_3$	11,12	14,27	15,87	17,47	19,84	19,84
$a_4$	10	12	13	14	16	16
b	41,0	48,5	51,5	56,5	64,5	64,5
$b_3$	12	15	18	23	28	35
$b_4$	5	6,5	8	10	12,5	16
$e_1$	7,5	6,5	6	5	7	7
$e_2$	26,92	29,97	31,75	33,53	40,64	40,64
$e_3$	9	12	13,5	16,5	22	22
t	9	9	9	11	13	13
$R_1$	9,5	12,5	14	17	22	22

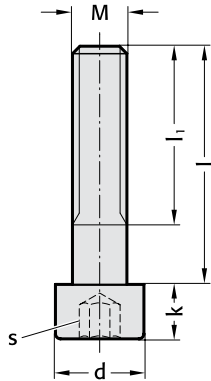
### Ordering example:

Triangle retainer	= 2664.
for Profile Punch, ISO 8020	= 04.
$d_2 = \varnothing 13$ mm	= 13
Order number	= 2664.04.13

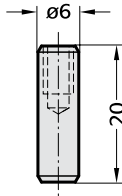


Accessories for Precision Retainers,  
triangular, for Punches, to ISO 8020

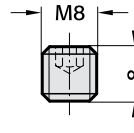
2192.10.



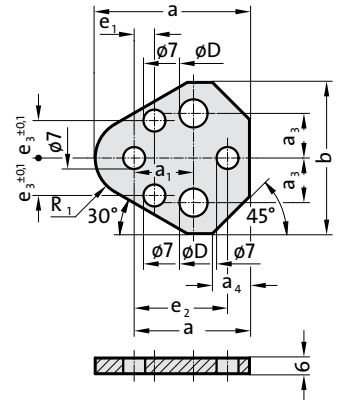
236.1.



2192.72.



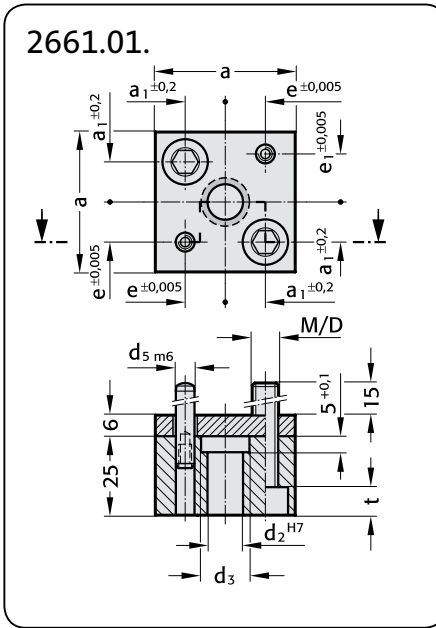
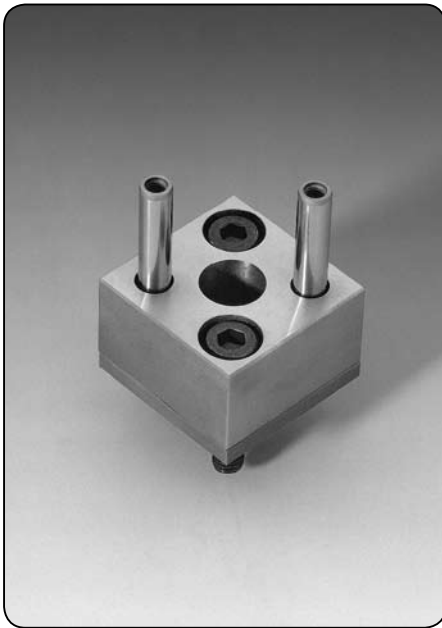
2665.01.



Retainer	Ø d <sub>2</sub>	Socket head cap screw	Dowel pin	Pin screw	Pressure plate
2664.02./04.	10	2192.10.08.035	236.1.0600.020	2192.72.08.008	2665.01.10
	13	2192.10.08.035	236.1.0600.020	2192.72.08.008	2665.01.13
	16	2192.10.08.035	236.1.0600.020	2192.72.08.008	2665.01.16
	20	2192.10.10.035	236.1.0600.020	2192.72.08.008	2665.01.20
	25	2192.10.12.035	236.1.0600.020	2192.72.08.008	2665.01.25
	32	2192.10.12.035	236.1.0600.020	2192.72.08.008	2665.01.32

**Square Precision Retainers  
for Punches to ISO 8020**

**2661.01.  
2661.02.**

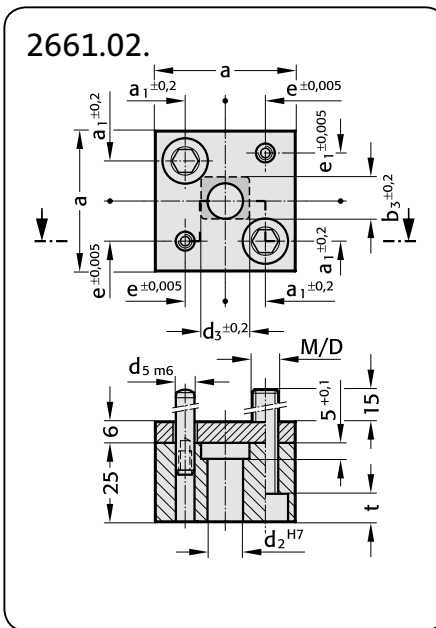
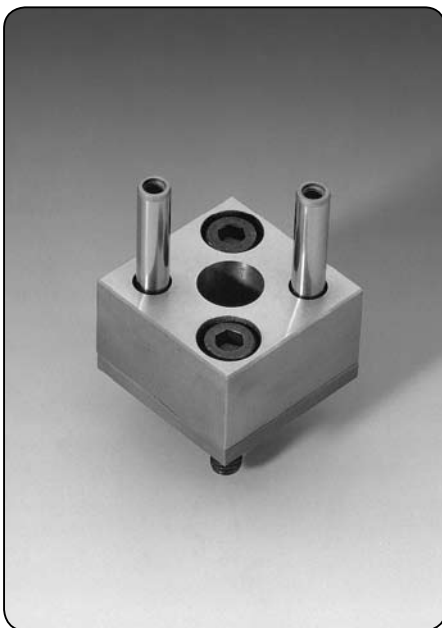


**Execution:**

The centres of the pinholes  $d_5$  are the reference points for the position of the punch bore.  
The dimensions  $e$  and  $e_1$  have a tolerance of  $\pm 0,005$  mm.  
The square retainers are interchangeable.

**Note:**

Supplied with dowel pins and screws  
DIN EN ISO 4762.



**Execution:**

The centres of the pinholes  $d_5$  are the reference points for the position of the punch bore.  
The dimensions  $e$  and  $e_1$  have a tolerance of  $\pm 0,005$  mm.  
The square retainers are interchangeable.

**Note:**

Supplied with dowel pins and screws  
DIN EN ISO 4762.

**2661.01.**

$d_2$	$d_3$	$d_5$	M/D	$a$	$a_1, e$	$e_1$	$t$
6	10	8	8/9	45	13	15,5	9
8	12						
10	14						
13	17						
16	20						
20	25	10	10/11	56	16	19	11
25	30		12/13,5	63	20	22,5	13

**Ordering code (example):**

Square Retainer = 2661.  
for punch to ISO 8020 = 01.  
 $d_2 = \varnothing 13$  mm = 13  
Order No = 2661.01.13

**2661.02.**

$d_2$	$d_3$	$d_5$	M/D	$a$	$a_1, e$	$e_1$	$b_3$	$t$
6	10	8	8/9	45	13	15,5	8	9
8	12						10	
10	14						12	
13	17						15	
16	20						18	
20	25	10	10/11	56	16	19	22,5	11
25	30		12/13,5	63	20	22,5	27,5	13

**Ordering code (example):**

Square Retainer = 2661.  
for punch to ISO 8020 = 02.  
 $d_2 = \varnothing 20$  mm = 20  
Order No = 2661.02.20

# FIBRO

2662.01.  
2662.02.

## Rectangular Precision Retainers for Punches to ISO 8020

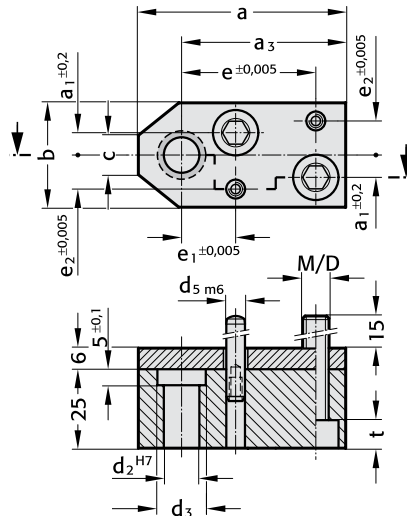
### Execution:

The centres of the pinholes  $d_5$  are the reference points for the position of the punch bore.  
The dimensions  $b$ ,  $e_1$  and  $e_2$  have a tolerance of  $\pm 0,005$  mm.  
The rectangular retainers are interchangeable.

### Note:

Supplied with dowel pins and screws  
DIN EN ISO 4762.

### 2662.01.



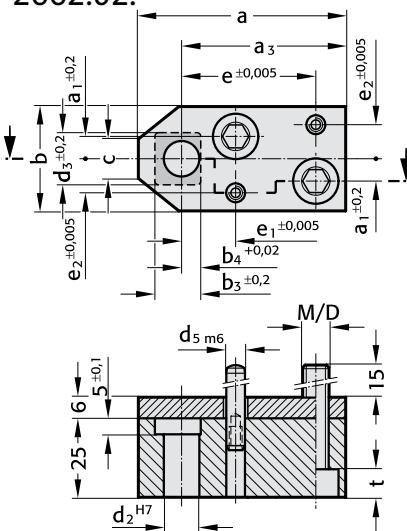
### Execution:

The centres of the pinholes  $d_5$  are the reference points for the position of the punch bore.  
The dimensions  $e$ ,  $e_1$  and  $e_2$  have a tolerance of  $\pm 0,005$  mm.  
The rectangular retainers are interchangeable.

### Note:

Supplied with dowel pins and screws  
DIN EN ISO 4762.

### 2662.02.



### 2662.01.

$d_2$	$d_3$	$d_5$	M/D	a	$a_1$	$a_3$	b	e	$e_1$	$e_2$	c	t
6	10	8	8/9	60	7	50	32	40	15	9	11	9
8	12											
10	14											
13	17			67		53		43	18		16	
16	20											
20	25	10	10/11	80	9	60	40	50	25	11	22	11
25	30											

### 2662.02.

$d_2$	$d_3$	$d_5$	M/D	a	$a_1$	$a_3$	b	$b_3$	$b_4$	e	$e_1$	$e_2$	c	t
6	10	8	8/9	60	7	50	32	8	3	40	15	9	11	9
8	12							10	4					
10	14							12	5					
13	17			67		53		15	6,5	43	18		16	
16	20							18	8					
20	25	10	10/11	80	9	60	40	22,5	10	50	25	11	22	11
25	30							27,5	12,5					

### Ordering code (example):

Rectangular Retainer = 2662.  
for Punch to ISO 8020 = 01.  
 $d_2 = \varnothing 13$  mm = 13  
Order No = 2662.01.13

### Ordering code (example):

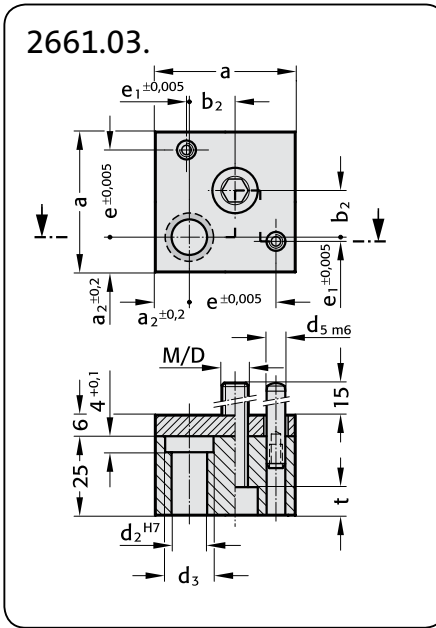
Rectangular Retainer = 2662.  
for Punch to ISO 8020 = 02.  
 $d_2 = \varnothing 20$  mm = 20  
Order No = 2662.02.20



# Precision Retainers VDI

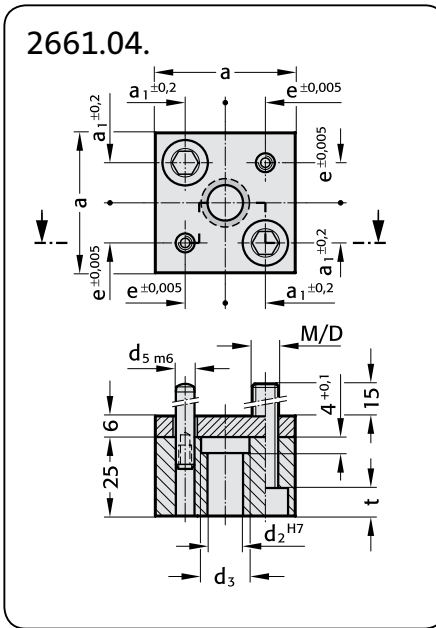
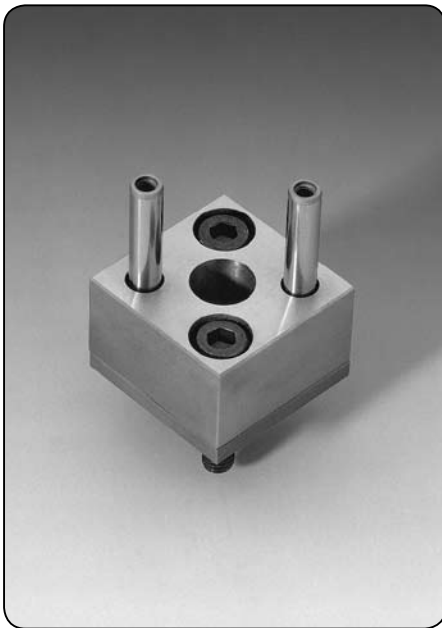
**Square Precision Retainers  
for round Punches to VDI 3374**

**2661.03.  
2661.04.**



**Execution:**  
The centres of the pinholes  $d_5$  are the reference points for the position of the punch bore.  
The e-dimensions have a tolerance of  $\pm 0,005$  mm.  
The square retainers are interchangeable.

**Note:**  
Supplied with dowel pins and screws  
DIN EN ISO 4762.



**Execution:**  
The centres of the pinholes  $d_5$  are the reference points for the position of the punch bore.  
The e-dimensions have a tolerance of  $\pm 0,005$  mm.  
The square retainers are interchangeable.

**Note:**  
Supplied with dowel pins and screws  
DIN EN ISO 4762.

**2661.03.**

$d_2$	$d_3$	$d_5$	M/D	a	$a_2$	$b_2$	e	$e_1$	t
10	14	8	8/ 9	45	11	15	28	1	9
13	17								
16	20								
20	25	10	10/11	56	17	18	32	5	11
25	30								

**Ordering code (example):**  
 Square retainer = 2661.  
 for round Punch to VDI 3374 = 03.  
 $d_2 = \varnothing 10$  mm = 10  
 Order No = 2661.03.10

**2661.04.**

$d_2$	$d_3$	$d_5$	M/D	a	$a_1, e$	t
10	14	8	8/ 9	45	13	9
13	17					
16	20					
20	25	10	10/11	56	16	11
25	30		12/13,5	63	20	13
32	37					

**Ordering code (example):**  
 Square retainer = 2661.  
 for round Punch to VDI 3374 = 04.  
 $d_2 = \varnothing 16$  mm = 16  
 Order No = 2661.04.16

# FIBRO

2661.05  
2661.06.

## Square Precision Retainers for Profile Punches to VDI 3374

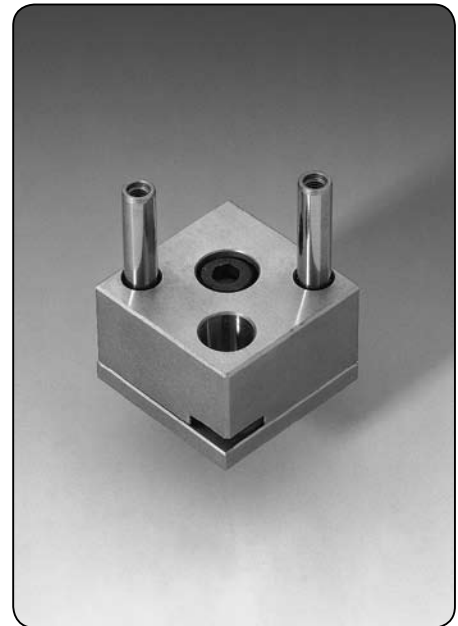
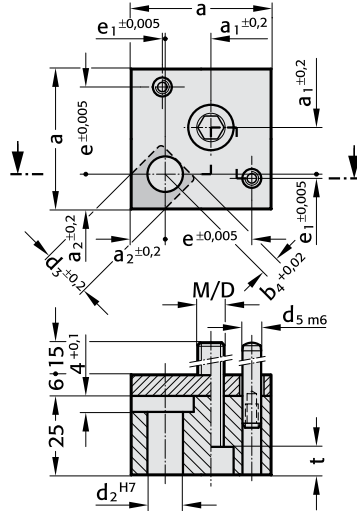
### Execution:

The centres of the pin holes  $d_5$  are the reference points for the position of the punch bore.  
The e-dimensions have a tolerance of  $\pm 0,005$  mm.  
The square retainers are interchangeable.

### Note:

Supplied with dowel pins and screws  
DIN EN ISO 4762.

### 2661.05.



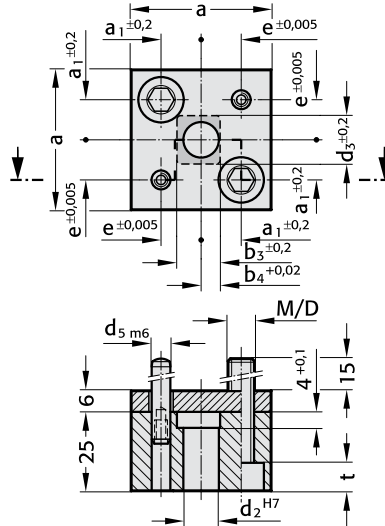
### Execution:

The centres of the pin holes  $d_5$  are the reference points for the position of the punch bore.  
The e-dimensions have a tolerance of  $\pm 0,005$  mm.  
The square retainers are interchangeable.

### Note:

Supplied with dowel pins and screws  
DIN EN ISO 4762.

### 2661.06.



### 2661.05.

$d_2$	$d_3$	$d_5$	M/D	a	$a_2$	$a_1$	e	$e_1$	$b_4$	t
10	14	8	8/ 9	45	11	15	28	1	5	9
13	17								6,5	
16	20								8	
20	25	10	10/11	56	17	18	32	5	10	11
25	30								12,5	

### 2661.06.

$d_2$	$d_3$	$d_5$	M/D	a	$a_1, e$	$b_3$	$b_4$	t
10	14	8	8/ 9	45	13	12	5	9
13	17					15	6,5	
16	20					18	8	
20	25	10	10/11	56	16	22,5	10	11
25	30		12/13,5	63	20	27,5	12,5	

### Ordering code (example):

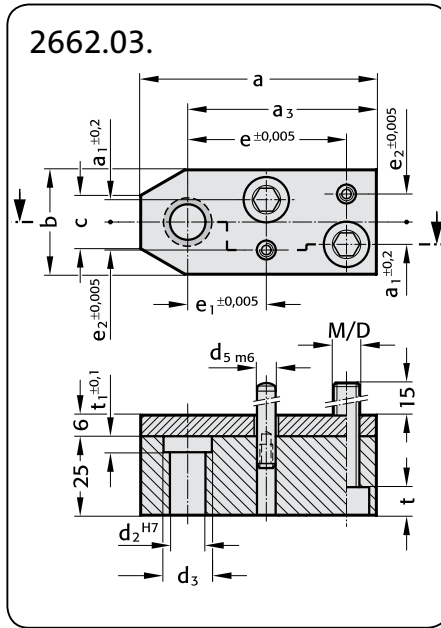
Square retainer = 2661.  
for profile punch to VDI 3374 = 05.  
 $d_2 = \varnothing 13$  mm = 13  
Order No = 2662.05.13

### Ordering code (example):

Square retainer = 2661.  
for profile punch to VDI 3374 = 06.  
 $d_2 = \varnothing 20$  mm = 20  
Order No = 2661.06.20

**Rectangular Precision Retainers  
for Punches to VDI 3374**

**2662.03.  
2662.04.**

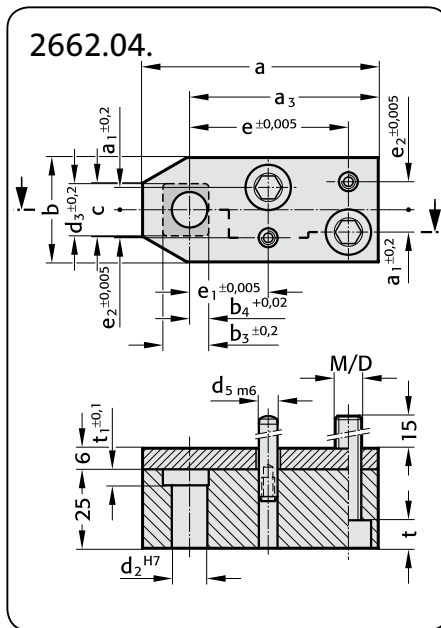


**Execution:**

The centres of the pin holes  $d_5$  are the reference points for the position of the punch bore.  
The e-dimensions have a tolerance of  $\pm 0,005$  mm.  
The rectangular retainers are interchangeable.

**Note:**

Supplied with dowel pins and screws  
DIN EN ISO 4762.



**Execution:**

The centres of the pin holes  $d_5$  are the reference points for the position of the punch bore.  
The e-dimensions have a tolerance of  $\pm 0,005$  mm.  
The rectangular retainers are interchangeable.

**Note:**

Supplied with dowel pins and screws  
DIN EN ISO 4762.

**2662.03.**

$d_2$	$d_3$	$d_5$	M/D	a	$a_1$	$a_3$	b	e	$e_1$	$e_2$	c	t	$t_1$
6	10	8	8/ 9	75	7	60	32	50	25	9	16	9	3
10	14												4
13	17												
16	20												
20	25	10	10/11	85	9	63	40	53	28	11	20	11	
25	30												
32	37		12/13,5	95	13	70	50			15	30	13	

**Ordering code (example):**

Rectangular Retainer	= 2662.
for round punch to VDI 3374	= 03.
$d_2 = \varnothing 10$ mm	= 10
Order No	= 2662.03.10

**2662.04.**

$d_2$	$d_3$	$d_5$	M/D	a	$a_1$	$a_3$	b	$b_3$	$b_4$	e	$e_1$	$e_2$	c	t	$t_1$
6	10	8	8/ 9	75	7	60	32	8	3	50	25	9	16	9	3
10	14							12	5						4
13	17							15	6,5						
16	20							18	8						
20	25	10	10/11	85	9	63	40	22,5	10	53	28	11	20	11	
25	30							27,5	12,5						

**Ordering code (example):**

Rectangular Retainer	= 2662.
for profile punch to VDI 3374	= 04.
$d_2 = \varnothing 16$ mm	= 16
Order No	= 2662.04.16



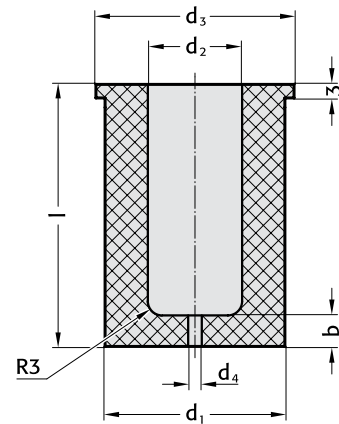
# Accessories

Stripping units

2431.7.



2431.7.



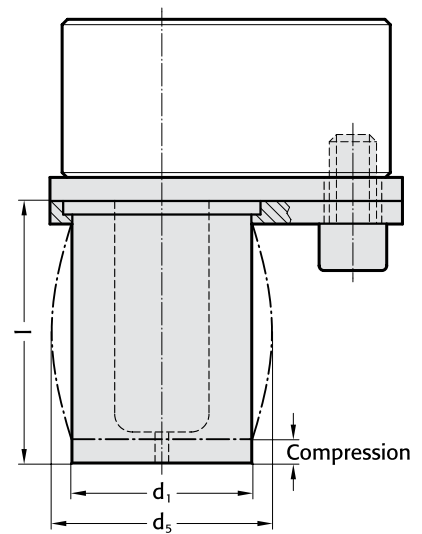
Material:

FIBROFLEX® 95 Shore A

Note:

Stripping units can be used for retainers 2664.02./04./05./06.

Installation example:



d <sub>2</sub>	Stripping unit length l				
	35	43	53	63	73
10	●	●	●	●	
13	●	●	●	●	●
16	●	●	●	●	●
20	●	●	●	●	●
25	●	●	●	●	●
32	●	●	●	●	●
38		●	●	●	●
40		●	●	●	●
Punch lengths in use					
Ball-lock punch, light duty	63	71	80	090	100
Ball-lock punch, heavy duty	71	80	90	100	110
Precision punch ISO 8020	—	71	80	090	100

2431.7.

d <sub>2</sub>	d <sub>1</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>5 max.</sub>	b	35	43	53	63	73
10	18	21	3	22	6	●	●	●	●	
13	23	26	3	26,5	6	●	●	●	●	●
16	30	33	3	34	6	●	●	●	●	●
20	33	36	3	38	7	●	●	●	●	●
25	40	43	3	47,6	7	●	●	●	●	●
32	50	54	4	57,9	7	●	●	●	●	●
38	60	64	4	69,6	8		●	●	●	●
40	60	64	4	69,6	8		●	●	●	●

Ordering example:

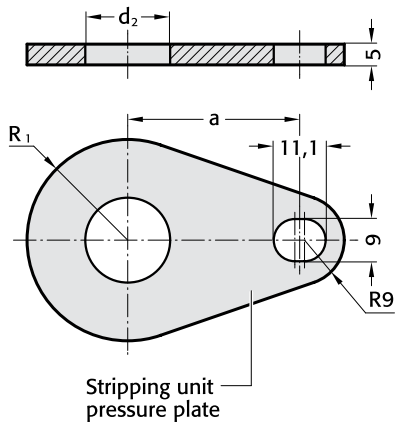
Stripping unit = 2431.7.  
 d<sub>2</sub> = 10 mm = 10.  
 l = 53 mm = 53  
 Order number = 2431.7.10.53

\* values for the stripping force are dependent on a number of parameters (e.g. lubricant, temperature etc.) and may vary from those given here.

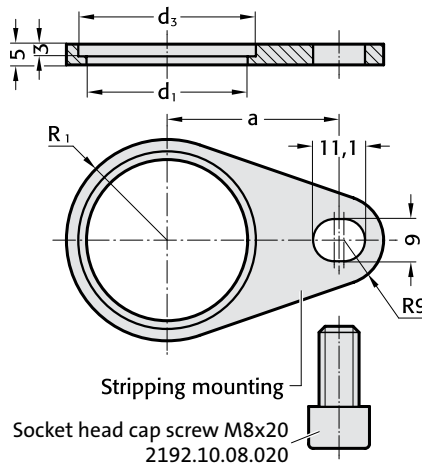
\*\* max spring travel should not exceed 15% of the length

d <sub>2</sub>	Stripping forces (N)*																	
	Spring travel	3mm			6mm			9mm			3mm			6mm			9mm	
Length	35	35	35	43	43	43	53	53	53	63	63	63	73	73	73	73	73	73
10	1300	**	**	1000	1700	**	900	1400	**	700	1200	1600	—	—	—	—	—	—
13	2100	**	**	1700	2700	**	1400	2200	**	1200	1900	2400	1000	1600	2000	—	—	—
16	3000	**	**	2500	4000	**	2000	3200	**	1700	2700	3500	1500	2400	3000	—	—	—
20	3500	**	**	2900	4700	**	2400	3800	**	2000	3200	4100	1700	2700	3600	—	—	—
25	5400	**	**	4400	7100	**	3600	5800	**	3000	4900	6300	2600	4200	5500	—	—	—
32	8400	**	**	6800	10900	**	5500	8800	**	4700	7500	9700	4000	6400	8400	—	—	—
38	—	—	—	—	—	**	7000	10400	**	6100	9200	12300	5000	7600	10100	—	—	—
40	—	—	—	10400	16600	**	8500	13600	**	7000	11300	14800	6000	9800	127000	—	—	—

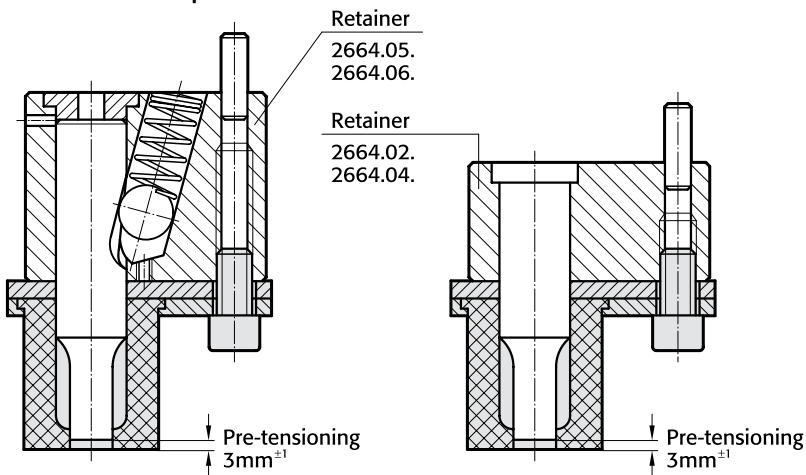
2667.1.



2667.2.



Installation example:



Mounting on retainer for ball-lock punch, multi-sided

Mounting on precision retainer, multi-sided ISO 8020

Note:

Pressure plate, mounting plate and screw must all be ordered individually.

2667.1/2.

d <sub>2</sub>	d <sub>1</sub>	d <sub>3</sub>	R <sub>1</sub>	a
10	18	21	13	28
13	23	26	15,5	31
16	30	33	18	32,9
20	33	36	20,5	34,8
25	40	43	24	39,8
32	50	54	31	41,3
38	60	64	36	44
40	60	64	36	44

Ordering example:

Stripping unit mountings = 2667.

Type = 1.

d<sub>2</sub> = 10mm = 010

Order number = 2667.1.010

Special Punches, Custom made  
High-Precision Special Parts to Customer's Drawings



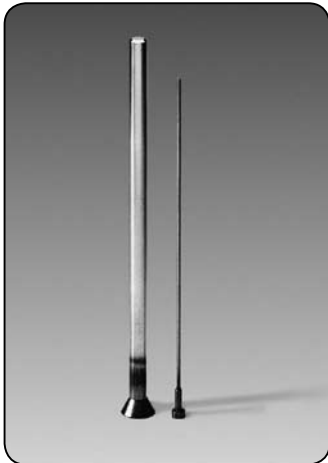
# FIBRO

FIBRO manufactures Special Form Punches and -Matrices on most modern equipment. Projection Form Grinding, Creep Feed Grinding, EDM and Wire-EDM are used acc. to design details.

Many years of experience enable FIBRO to chose best suitable materials and methods. We manufacture to customer´s drawings:

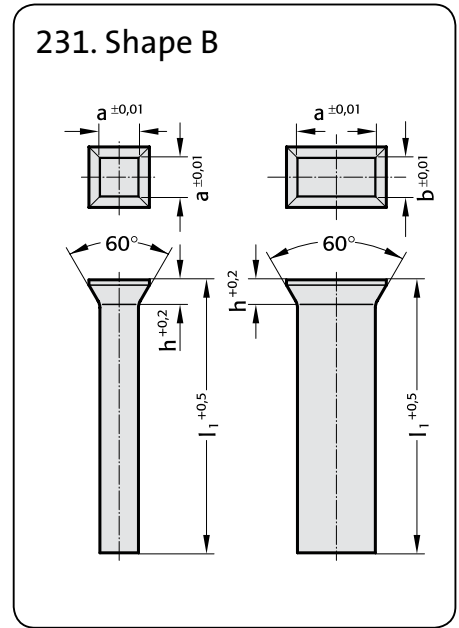
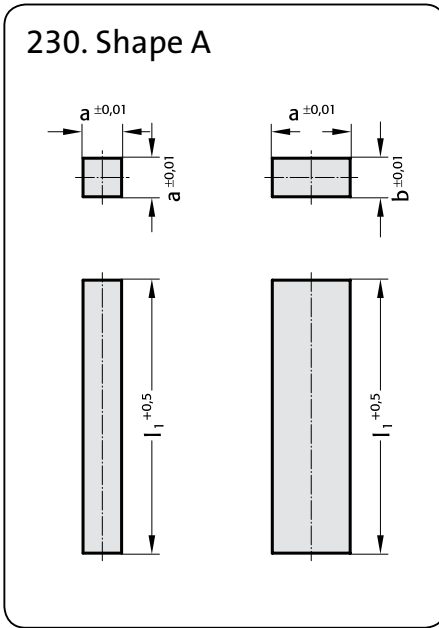
- Piercing Punches
- Draw Punched

- Form Punches
- Pre-Extrusion Punches and Ejectors for Bolt Manufacturing
- Flow-Forming Punches
- Punches with 30°-Conical Heads or other head shapes



**Precision Punches, Square/Rectangular without/with Hot Upset-Forged Head**

**230.  
231.**



**Material:**  
 HSS  
 Order No: Shape A = 230.3., Shape B = 231.3.  
 Hardness: Shank 64±2 HRC  
 Head 52±3 HRC

Description of FIBRO materials for die components:  
 pages E 10 and E 11.

**Execution:**  
 Punch shanks precision ground.  
 Heads hot upset forged – ground on special request.

**230.**

a	b	l <sub>1</sub>
1- 8	1	stock length of square punches: 73,5 mm; other materials and dimensions on request.
2-10	2	
3-12	3	
4-12	4	
5-15	5	
6-20	6	
7-24	7	
8-24	8	
9-28	9	
10-34	10	
12-34	12	

**231.**

a	b	h	l <sub>1</sub>
1- 8	1	1,2	stock length of square punches: 71 mm other materials and dimensions on request.
2-10	2	1,4	
3-12	3	1,8	
4-12	4		
5-15	5		
6-20	6	2,0	
7-24	7	2,8	
8-24	8		
9-28	9		
10-34	10		
12-34	12		

**Ordering Code (example):**

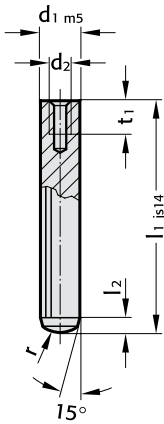
Punch = 231.  
 Material HSS = 3.  
 a = 10 mm = 1000.  
 b = 6 mm = 0600.  
 l<sub>1</sub> = 71 mm = 071  
 Order No = 231.3.1000.0600.071

# FIBRO

236.1.  
236.001

## Precision Dowel Pins (Parallel) with Internal Extracting Thread similar to DIN EN ISO 8735/ISO 8735 Dowel Pin Extractor "FIBROZIPP"

236.1.



### Material:

steel hardened

Order No: 236.1.

Hardness: 60±2 HRC

### Execution:

Hardened and ground to finest finish. FIBRO Dowel Pins are manufactured with the exacting requirements of high class diemaking in mind. Whereas DIN EN ISO 8735 stipulates ISO Class 6 for dowels, we produce our pins to m5.

FIBRO Dowels with internal extracting thread deviate from DIN in that they are case-hardened and that a smaller thread is used. This increases the crosssection around the threaded hole and thus prevents breaking.

### Ordering Code (example):

Dowel Pin with Extracting Thread = 236.1.

$d_1 = \varnothing 12 \text{ mm}$  = 1200.

$l_1 = 100 \text{ mm}$  = 100

Order No = 236.1.1200.100

236.1.

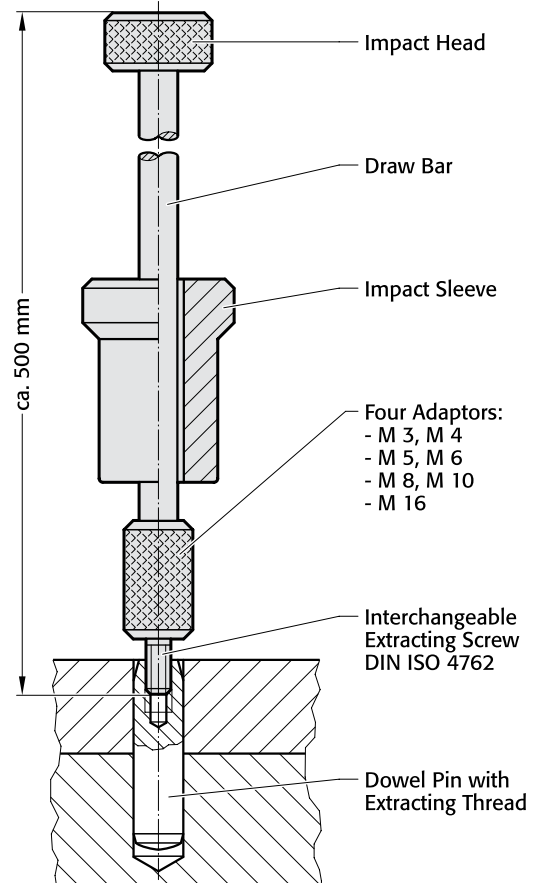
$d_1$	6	8	10	12	14	16	20	25
$d_2$	M 4	M 5	M 6	M 6	M 8	M 8	M 10	M 16
$t_1$	6	8	10	10	12	12	16	24
$l_2$	2,1	2,6	3	3,8	4	4,7	6	6
r	6	8	10	12	14	16	20	25
$l_1$								
16	●							
18	●							
20	●	●						
24	●	●	●					
28	●	●	●	●				
32	●	●	●	●	●	●		
36	●	●	●	●	●	●	●	
40	●	●	●	●	●	●	●	●
45	●	●	●	●	●	●	●	●
50	●	●	●	●	●	●	●	●
55	●	●	●	●	●	●	●	●
60	●	●	●	●	●	●	●	●
70		●	●	●	●	●	●	●
80		●	●	●	●	●	●	●
90		●	●	●	●	●	●	●
100		●	●	●	●	●	●	●
120				●	●	●	●	●

236.001

### FIBROZIPP

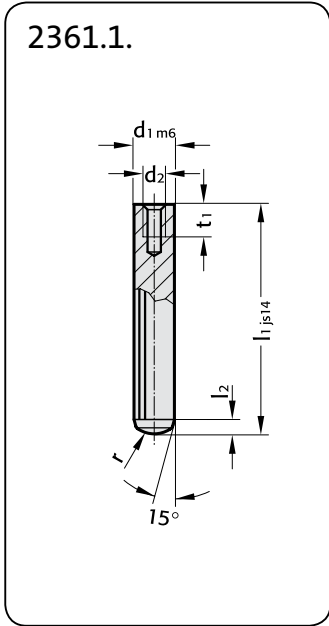
Extraction tool for the fast and convenient removal of dowels with internal extracting thread – also for shafts, plugs and other machine components.

The tool comes with interchangeable adaptors and screws, to fit all threads from M3 to M16.



Precision Dowel Pins (Parallel) with Internal Extracting Thread  
similar to DIN EN ISO 8735/ISO 8735  
Dowel Pin Extractor "FIBROZIPP"

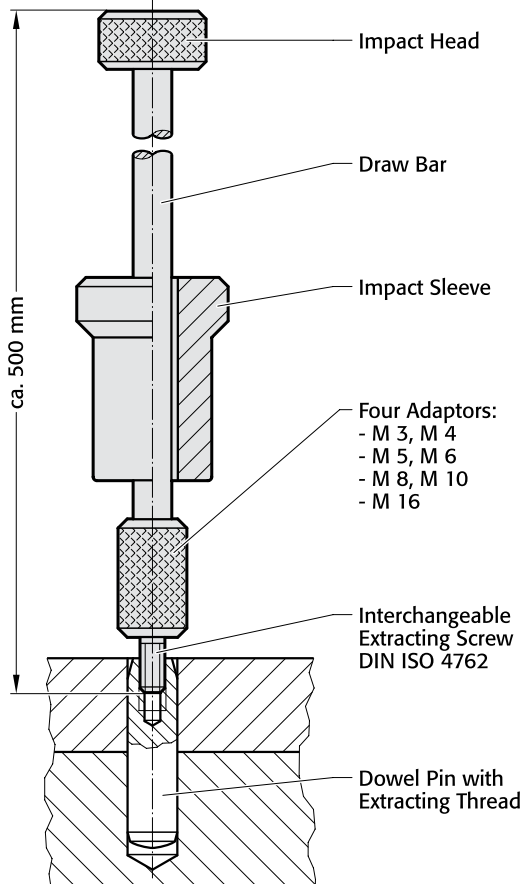
**FIBRO**  
2361.1.  
236.001



**236.001 FIBROZIPP**

Extraction tool for the fast and convenient removal of dowels with internal extracting thread – also for shafts, plugs and other machine components.

The tool comes with interchangeable adaptors and screws, to fit all threads from M3 to M16.



**Ordering Code (example):**

Dowel Pin = 2361.1.  
 $d_1 = \varnothing 10 \text{ mm}$  = 1000.  
 $l_1 = 45 \text{ mm}$  = 045  
 Order No = 2361.1.1000.045

**Material:**

steel hardened

Order No: 2361.1.

Hardness:  $60 \pm 2 \text{ HRC}$

**Execution:**

Hardened and ground to finest finish. FIBRO Dowel Pins are manufactured with the exacting requirements of high class diemaking in mind.

**2361.1.**

$d_1$	4	5	6	8	10	12	14	16	20
$d_2$	M 3	M 3	M 4	M 5	M 6	M 6	M 8	M 8	M 10
$t_1$	4,5	6	6	8	10	10	12	12	16
$l_2$	1,3	1,7	2,1	2,6	3	3,8	4	4,7	6
$r$	4	5	6	8	10	12	14	16	20
$l_1$									
8		●							
10	●	●							
12	●	●	●						
14	●	●	●						
16	●	●	●	●	●				
18	●	●	●	●	●				
20	●	●	●	●	●	●			
22			●	●					
24	●	●	●	●	●	●			
26			●	●					
28	●	●	●	●	●	●	●		
30	●	●	●	●	●	●			
32	●	●	●	●	●	●	●	●	
36	●	●	●	●	●	●	●	●	●
40	●	●	●	●	●	●	●	●	●
45		●	●	●	●	●	●	●	●
50	●	●	●	●	●	●	●	●	●
55		●	●	●	●	●	●	●	●
60		●	●	●	●	●	●	●	●
70			●	●	●	●	●	●	●
80			●	●	●	●	●	●	●
90				●	●	●	●	●	●
100				●	●	●	●	●	●
120				●	●	●	●	●	●



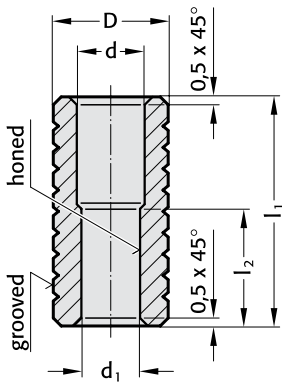
# FIBRO

265.1.  
2650.1.

## High-Precision Liner Bushes for Dowel Pins, for bonding for push fit

265.1.

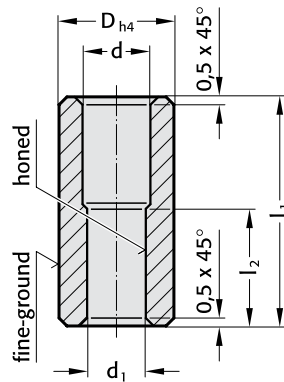
for epoxy bonding



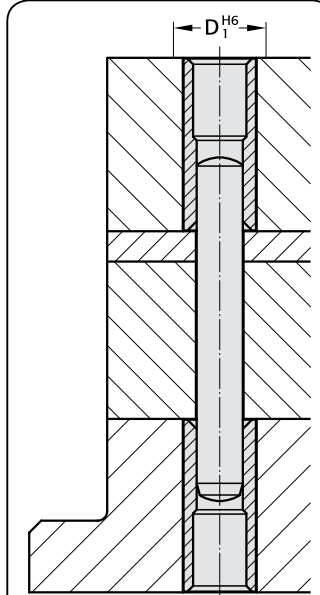
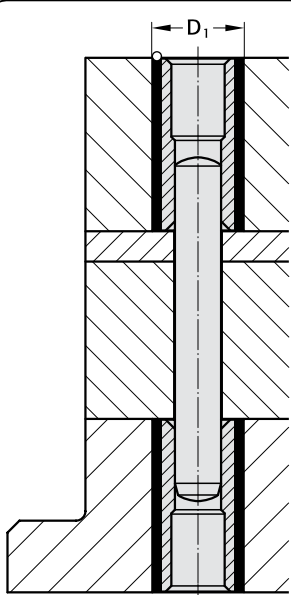
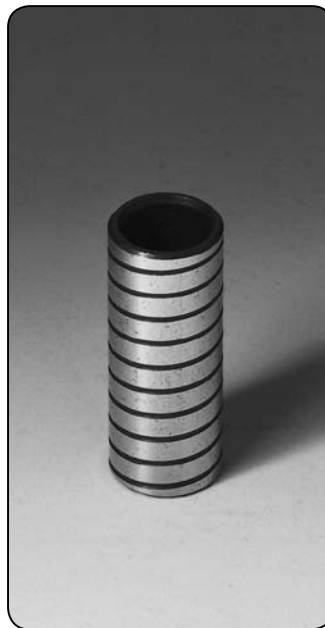
Material:  
Tool Steel, hardened  
Hardness 54±2 HRC

2650.1.

for push fit



Material:  
Tool Steel, hardened  
Hardness 54±2 HRC



### Epoxy-Bonding

FIBRO Hardened Dowel Liner Bushes solve the problem of wear on soft parts subjected to frequent dismantling. Held in perfect co-axial alignment by the close-fitting dowel, they are epoxy-bonded into rough-drilled clearance holes. In hardened parts, Dowel Liner Bushes help to overcome the ever-present toolroom problem of heat treatment distortion – insurmountable except where jig grinding facilities are available and justifiable on cost grounds. Retainer holes for Dowel Liner Bushes should be approximately 2 mm larger in diameter than the bush O.D. – a coarse finish is desirable. Following exact positioning/aligning, FIBROLIT® ZWO or FIBROFIX® SECHS is used for bonding.

### Push Fit

The position of the bush is given by push fit hole tolerance  $h6$ . The adhesive order no. 281.648 provides optimum bush retention whilst offering the following advantages:

- high accuracy and stiffness
- no problems to find position when changing bushings.

We do not recommend to press fit bushings.

### Ordering Code (example):

One Dowel Liner Bush – only –		
Dowel Liner Bush	= 265.	analogous 2650.
Material: Tool Steel	= 1.	
$d_1 = \varnothing 8,0$ mm	= 0800.	
Quantity: one	= 1	
Order No	= 265.1.0800.1	

### Ordering Code (example):

One Dowel Liner Bush + Matching Dowel		
Dowel Liner Bush	= 265.	analogous 2650.
Material: Tool Steel	= 1.	
$d_1 = \varnothing 8,0$ mm	= 0800.	
Quantity: one	= 1.	
Dowel: length= 40 mm	= 040	
Order No	= 265.1.0800.1.040	

### Ordering Code (example):

Two Dowel Liner Bushes + one Dowel		
Dowel Liner Bush	= 265.	analogous 2650.
Material: Tool Steel	= 1.	
$d_1 = \varnothing 8,0$ mm	= 0800.	
Quantity: two	= 2.	
Dowel: length= 50 mm	= 050	
Order No	= 265.1.0800.2.050	

### 265.1.

$d_1$	d	D	$D_1$	$l_1$	$l_2$
6	7	10	12	25	12
8	9	12	14	30	16
10	11	16	18	36	20

### 2650.1.

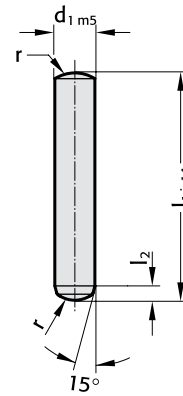
$d_1$	d	D	$D_1^{H6}$	$l_1$	$l_2$
6	7	10	10	25	12
8	9	12	12	30	16
10	11	16	16	36	20

Precision Dowel Pins (Parallel)  
similar to DIN EN ISO 8734/ISO 8734

235.1.



235.1.



Execution:

Hardened and ground to finest finish.  
FIBRO-Dowel Pins are manufactured with the exacting requirements of high class diemaking in mind. Whereas DIN EN ISO 8734 stipulates ISO Class 6 for dowels, we produce our pins to m5.

Material:

Order No: 235.1.  
Hardness: 60±2 HRC  
steel hardened

Ordering Code (example):

Dowel Pin	=	235.1.
$d_1 = \varnothing 10 \text{ mm}$	=	1000.
$l_1 = 80 \text{ mm}$	=	080
Order No	=	235.1.1000.080

235.1.

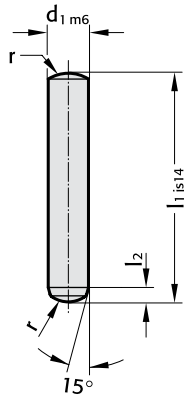
$d_1$	1	1,5	2	2,5	3	4	5	6	8	10	12	14	16	20
$l_2$	0,48	0,62	0,78	0,95	1,1	1,4	1,7	2,1	2,6	3	3,8	3,8	4,7	6
$r$	1	1,6	2	2,5	3	4	5	6	8	10	12	16	16	20
$l_1$														
6		●	●	●	●	●								
8	●	●	●	●	●	●	●							
10	●	●	●	●	●	●	●	●	●					
12	●	●	●	●	●	●	●	●	●	●				
14		●	●	●	●	●	●	●	●	●				
16		●	●	●	●	●	●	●	●	●	●			
18			●	●	●	●	●	●	●	●	●			
20			●	●	●	●	●	●	●	●	●	●		
24			●	●	●	●	●	●	●	●	●	●		
28			●	●	●	●	●	●	●	●	●	●		
32			●	●	●	●	●	●	●	●	●	●		
36		●	●	●	●	●	●	●	●	●	●	●	●	
40				●	●	●	●	●	●	●	●	●	●	●
45					●	●	●	●	●	●	●	●	●	●
50						●	●	●	●	●	●	●	●	●
55							●	●	●	●	●	●	●	●
60								●	●	●	●	●	●	●
70									●	●	●	●	●	●
80										●	●	●	●	●
90											●	●	●	●
100												●	●	●
120													●	●
130														●
140														

# FIBRO

2351.1.

## Precision Dowel Pins (Parallel) similar to DIN EN ISO 8734/ISO 8734

2351.1.



### Material:

steel hardened

Order No: 2351.1.

Hardness: 60±2 HRC

### Execution:

Hardened and ground to finest finish.

FIBRO-Dowel Pins are manufactured with the exacting requirements of high class diemaking in mind.

### Ordering Code (example):

Dowel Pin = 2351.1.

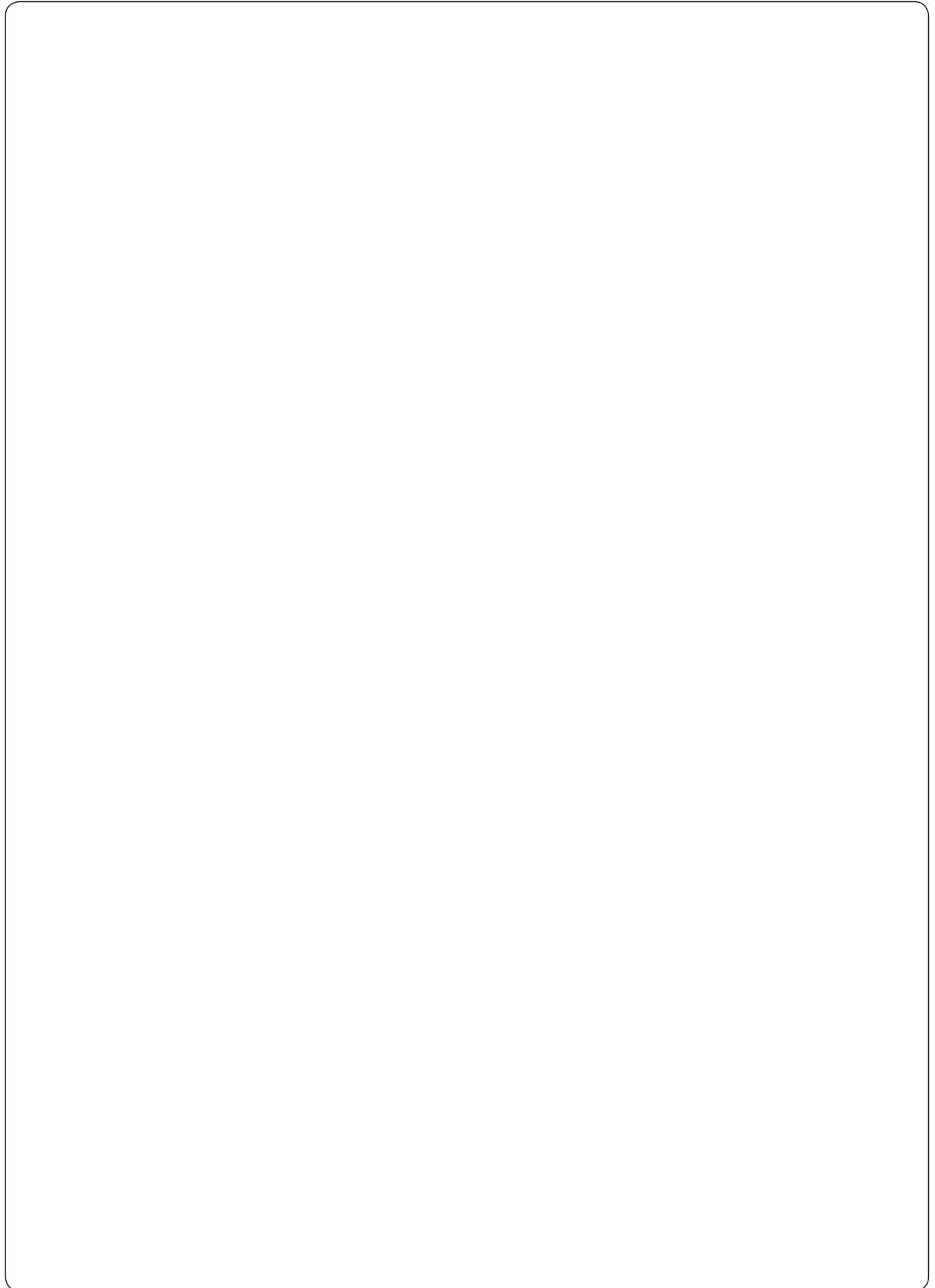
∅ d<sub>1</sub> = 10 mm = 1000.

l<sub>1</sub> = 45 mm = 045

Order No = 2351.1.1000.045

2351.1.

d <sub>1</sub>	1	1,5	2	2,5	3	4	5	6	8	10	12	14	16	20	
l <sub>2</sub>	0,4	0,5	0,6	0,7	0,8	1	1,2	1,5	1,8	2	2,5	2,5	3	4	
r	1	1,6	2	2,5	3	4	5	6	8	10	12	16	16	20	
l <sub>1</sub>															
4	●	●	●												
5	●	●	●	●	●										
6	●	●	●	●	●	●									
8	●	●	●	●	●	●	●	●							
10	●	●	●	●	●	●	●	●	●						
12	●	●	●	●	●	●	●	●	●	●					
14		●	●	●	●	●	●	●	●	●					
16		●	●	●	●	●	●	●	●	●	●				
18			●	●	●	●	●	●	●	●	●				
20		●	●	●	●	●	●	●	●	●	●	●			
22		●	●	●	●	●	●	●	●	●	●	●	●		
24		●	●	●	●	●	●	●	●	●	●	●	●	●	
26			●	●	●	●	●	●	●	●	●	●	●		
28			●	●	●	●	●	●	●	●	●	●	●		
30			●	●	●	●	●	●	●	●	●	●	●		
32			●	●	●	●	●	●	●	●	●	●	●		
36					●	●	●	●	●	●	●	●	●	●	
40			●		●	●	●	●	●	●	●	●	●	●	
45					●	●	●	●	●	●	●	●	●	●	
50					●	●	●	●	●	●	●	●	●	●	
55						●	●	●	●	●	●	●	●	●	
60					●	●	●	●	●	●	●	●	●	●	
70						●	●	●	●	●	●	●	●	●	
80						●	●	●	●	●	●	●	●	●	
90							●	●	●	●	●	●	●	●	
100								●	●	●	●	●	●	●	
120									●	●	●	●	●	●	



# FIBRO

276.  
277.

## Precision Drill Bushes Shape A DIN 172, with collar DIN 179, without collar

### Material:

Special Steel, hardened  
Hardness: 740±40 HV10

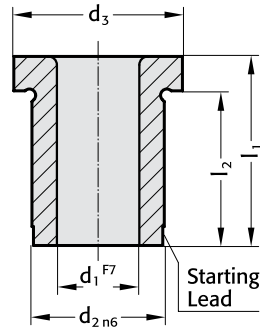
### Execution:

Diameters  $d_1$  and  $d_2$  and shoulder precision ground.

### Ordering Code (example):

Drill Bush	=	276.
Material: Special Steel	=	1.
$d_1 = 8,0$ mm	=	0800.
$l_1 = 20$ mm	=	020
Order No	=	276.1.0800.020

### 276. DIN 172 Shape A



### Material:

Special Steel, hardened  
Hardness: 740±40 HV10

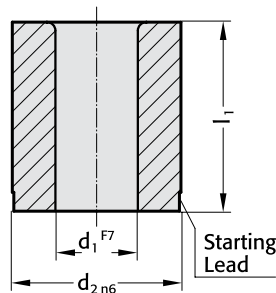
### Execution:

Diameters  $d_1$  and  $d_2$  precision ground.

### Ordering code (example):

Drill Bush	=	277.
Material: Special Steel	=	1.
$d_1 = 9,1$ mm	=	0910.
$l_1 = 25$ mm	=	025
Order No	=	277.1.0910.025

### 277. DIN 179 Shape A



276.	$d_1^*$	$d_2$	$d_3$	short		medium		long	
				$l_1$	$l_2$	$l_1$	$l_2$	$l_1$	$l_2$
	0,4- 1,0	3	6	6	4	9	7	-	-
	1,1- 1,8	4	7	6	4	9	7	-	-
	1,9- 2,6	5	8	6	4	9	7	-	-
	2,7- 3,3	6	9	8	5,5	12	9,5	16	13,5
	3,4- 4,0	7	10	8	5,5	12	9,5	16	13,5
	4,1- 5,0	8	11	8	5,5	12	9,5	16	13,5
	5,1- 6,0	10	13	10	7	16	13	20	17
	6,1- 8,0	12	15	10	7	16	13	20	17
	8,1-10,0	15	18	12	9	20	17	25	22
	10,1-12,0	18	22	12	8	20	16	25	21
	12,1-15,0	22	26	16	12	28	24	36	32
	15,1-18,0	26	30	16	12	28	24	36	32
	18,1-22,0	30	34	20	15	36	31	45	40
	22,1-26,0	35	39	20	15	36	31	45	40
	26,1-30,0	42	46	25	20	45	40	56	51
	30,1-35,0	48	52	25	20	45	40	56	51
	35,1-42,0	55	59	30	25	56	51	67	62
	42,1-48,0	62	66	30	24	56	50	67	61
	48,1-55,0	70	74	30	24	56	50	67	61
	55,1-63,0	78	82	35	29	67	61	78	72

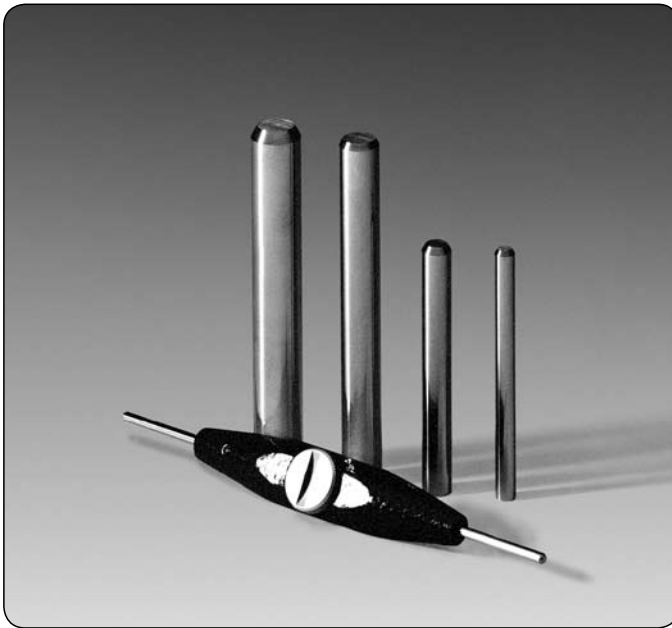
\*diameter steps 0,1 mm

277.	$d_1^*$	$d_2$	short		medium		long	
			$l_1$	$l_2$	$l_1$	$l_2$	$l_1$	$l_2$
	0,4- 1,0	3	6	9	-	-	-	-
	1,1- 1,8	4	6	9	-	-	-	-
	1,9- 2,6	5	6	9	-	-	-	-
	2,7- 3,3	6	8	12	16	16	16	16
	3,4- 4,0	7	8	12	16	16	16	16
	4,1- 5,0	8	8	12	16	16	16	16
	5,1- 6,0	10	10	16	20	20	20	20
	6,1- 8,0	12	10	16	20	20	20	20
	8,1-10,0	15	12	20	25	25	25	25
	10,1-12,0	18	12	20	25	25	25	25
	12,1-15,0	22	16	28	36	36	36	36
	15,1-18,0	26	16	28	36	36	36	36
	18,1-22,0	30	20	36	45	45	45	45
	22,1-26,0	35	20	36	45	45	45	45
	26,1-30,0	42	25	45	56	56	56	56
	30,1-35,0	48	25	45	56	56	56	56
	35,1-42,0	55	30	56	67	67	67	67
	42,1-48,0	62	30	56	67	67	67	67
	48,1-55,0	70	30	56	67	67	67	67
	55,1-63,0	78	35	67	78	78	78	78

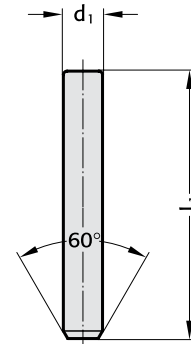
\*diameter steps 0,1 mm

High-Precision Gauge Pins DIN 2269

240.



240.



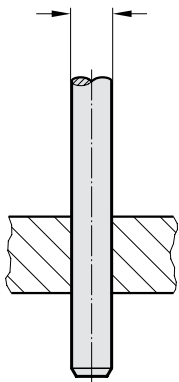
Material:

Alloy Tool Steel, hardened and tempered.  
Age-treated repeatedly  
Hardness: 60 ± 2HRC

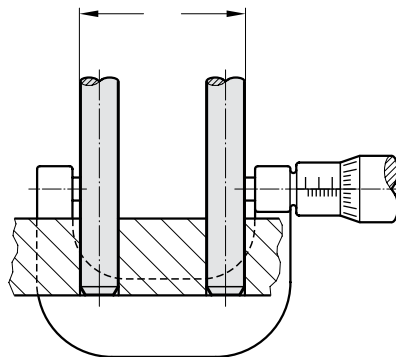
Execution:

Precision ground  
Class I – Accuracy: diameter tolerance ±0,001  
Class II – Accuracy: diameter tolerance ±0,002

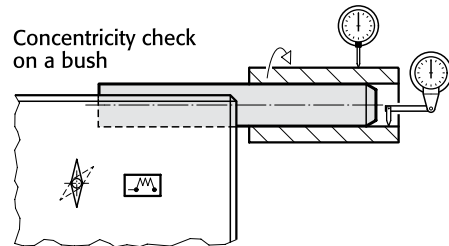
Direct gauging of bore diameters



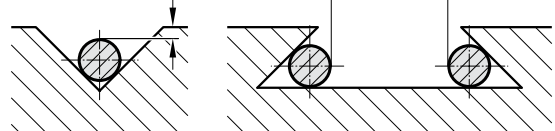
Measurement of centre-distance between two bores



Concentricity check on a bush



Measurements on prismatic faces



Single Pins:	Class I-Accuracy Class II-Accuracy	240.1. 240.2.
Small Set:	91 Gauge Pins from Ø 1-10 mm in steps of 0,1 mm, complete in wooden box Class I-Accuracy Class II-Accuracy	240.51. 240.52.
Large Set:	273 Gauge Pins from Ø 1-10 mm in steps of 0,1 mm, plus one each. 0,01 mm-oversize/undersize pin – complete in wooden box Class I-Accuracy Class II-Accuracy	240.41. 240.42.
Special Sets:	supplied to customer's requirements in respect of assortment and class of accuracy	
All Gauge Pins from 3 mm upward are marked with their actual size.		

240.

d <sub>1</sub>	steps	l <sub>1</sub>
0,30– 1,00	0,01	50
1,01– 3,00		
3,01– 6,00		
6,01– 10,00		70
10,01– 12,00		
12,01– 14,00		
14,01– 16,00		
16,01– 19,00		
19,01– 20,00		

Ordering Code (example):

Gauge Pin = 240.  
Class I-Accuracy = 1.  
d<sub>1</sub> = Ø 4,04 mm = 0404  
Order No = 240.1.0404

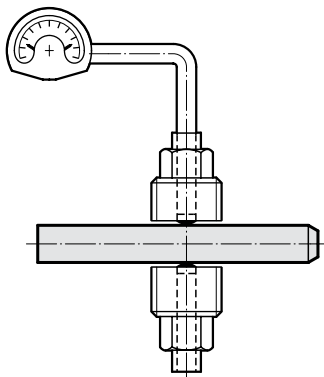
# FIBRO

240.

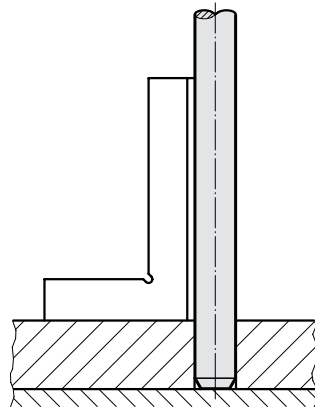
## High-Precision Gauge Pins DIN 2269 Gauge Pin Holders, Wooden Boxes



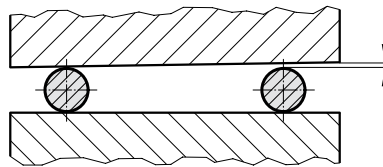
Calibration of a comparator



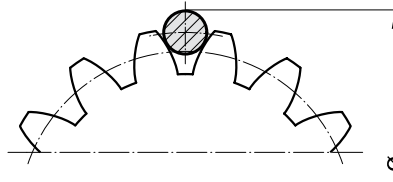
Inspection for squareness of a bore



Check on parallelism



Measuring of gear teeth, threads etc.



240.

Gauge Pin Holders  
(with pins)

for diameters	Order No
from 1– 2	240.45.1
from 2– 4	240.45.2
from 4– 6	240.45.3
from 6– 8	240.45.4
from 8–10	240.45.5

Gauge Pin Holders are double-ended, to carry two pins e.g. for go – no go measurements etc.

Wooden boxes:  
(without pins)

with drilled holes, for the safe and orderly storage of gauge pins – each hole marked with the requisite pin size.

Order No

Large Set of approx. 270 Pins  
size: 390 x 250 x 90 mm

240.91.

Small Set of approx. 90 Pins  
size: 285 x 155 x 90

240.92.

Boxes complete with carrier board inset  
Class I-Accuracy  
Class II-Accuracy

1  
2

### Ordering code (example):

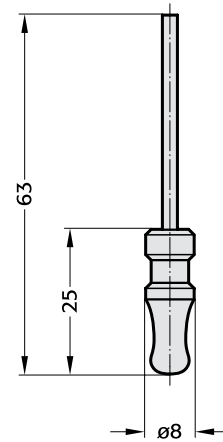
Gauge pin box – approx. 270 pins	=	240.91.
Class I-Accuracy	=	1
Order No	=	240.91.1

**High Precision Gauge Pins with Handle  
High Precision Gauge Pins – Boxed Sets**

240.11./22.  
240.31./32.





240.11.



**240.11. High-Precision Gauge Pins with Handle**

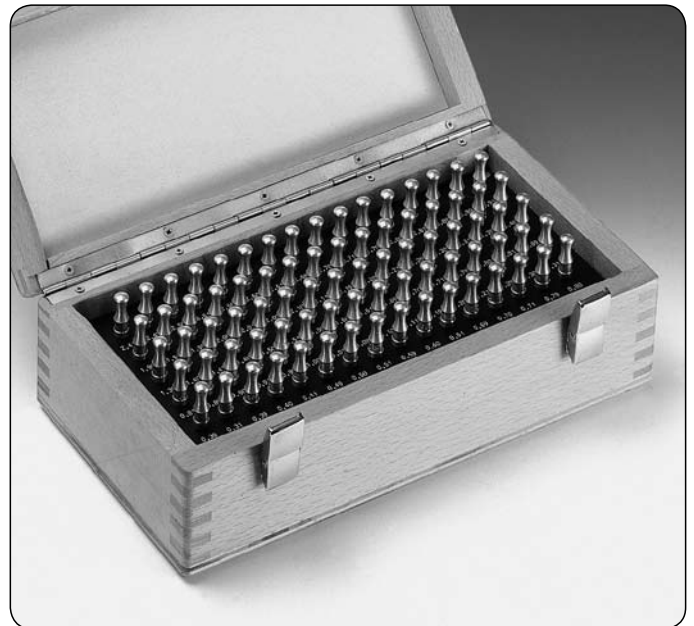
The Gauge Pins are firmly fixed to the handle. Each Pin is marked with its true diameter.

Single Gauge Pins:	Ø 0,3 – 3,0 mm In dia. steps of 0.01 mm Class I -Accuracy Class II-Accuracy	Order No
		240.11. 
		240.22. 

Assortment: 84 Gauge Pins from 0.3 – 3.0 mm, in dia. steps of 0.1 mm plus one each pin with undersize 0.01 and oversize 0.01 mm (for example 0.29 – 0.30 – 0.31 etc.)  
Class I -Accuracy 240.31.  
Class II-Accuracy 240.32.

Special to customer's specifications  
Assortments: in respect of class of accuracy

Execution:  
Wooden boxes for Gauge Pins – with drilled holes in wooden tray insert.  
Each hole marked with true size of pin.  
External dimensions: 155x90x285 mm



**Material:**

Alloy tool steel, hardened and tempered.  
Repeatedly age-treated.  
Hardness 60 ± 2 HRC.  
fine-ground  
Class I -Accuracy ±0.001  
Class II-Accuracy ±0.002  
to DIN 2269

**Ordering Code (example):**

Gauge Pin	= 240.
Class I-Accuracy, with handle	= 11.
d <sub>1</sub> = 1,5 mm	= 0150
Order No	= 240.11.0150



**FIBRO**

**2282.01.**

**Punching and Embossing Unit with Bottom Die for punched holes and self tapping screws**

**Material:**

HSS

**Execution:**

The punching and embossing unit with bottom die consists of:

- 1 x punch die
- 1 x embossing die
- 1 x bottom die

**Sheet metal thickness**

- max. 0,6 mm = 2282.01.035  
= 2282.01.039
- max. 0,8 mm = 2282.01.042
- max. 0,9 mm = 2282.01.048
- max. 1,0 mm = 2282.01.055  
= 2282.01.063

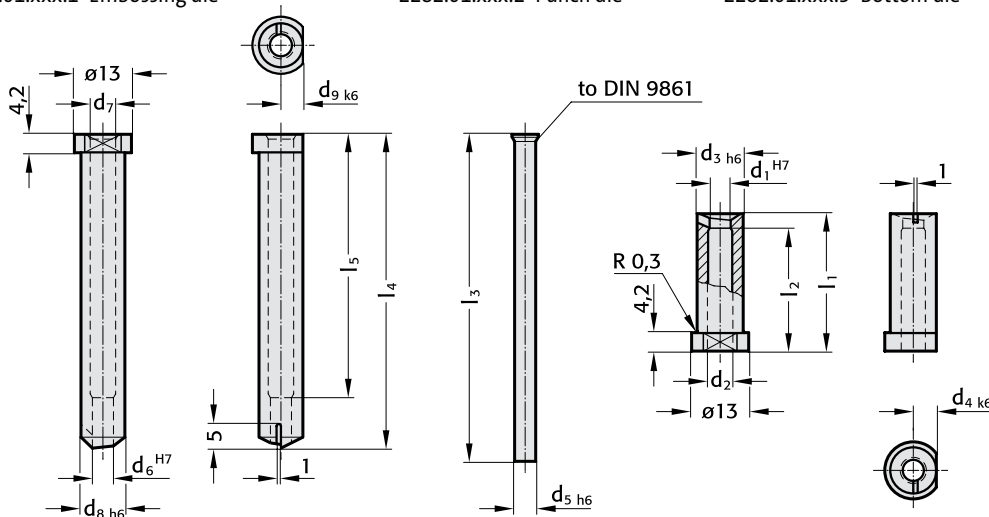


**2282.01.xxx**

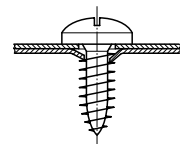
2282.01.xxx.1 Embossing die

2282.01.xxx.2 Punch die

2282.01.xxx.3 Bottom die



Example of application:

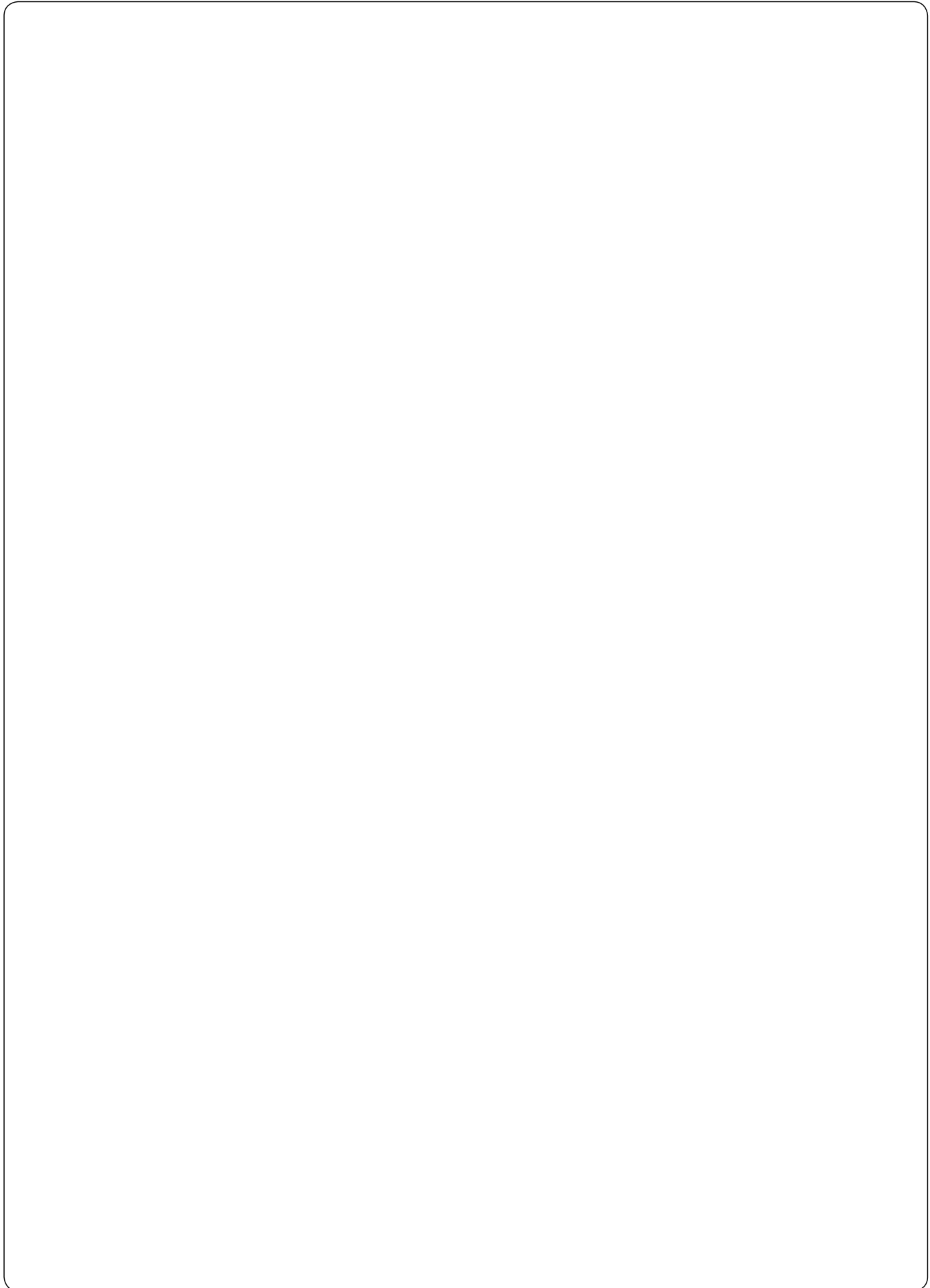


**2282.01.**

Order No	Nominal diameter = thread size	d <sub>1</sub> <sup>H7</sup>	d <sub>2</sub>	d <sub>3h6</sub>	d <sub>4k6</sub>	d <sub>5h6</sub>	d <sub>6</sub> <sup>H7</sup>	d <sub>7</sub>	d <sub>8h6</sub>	d <sub>9k6</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>
2282.01.035	B 3,5	2,75	3,2	7,5	3,75	2,7	2,7	3,1	7,5	3,75	31,3	28	74,5	71,5	60
039	B 3,9	3,05	3,4	7,5	3,75	3,0	3,0	3,6	7,5	3,75					
042	B 4,2	3,15	3,5	8,5	4,25	3,1	3,1	3,7	8,0	4,0					
048	B 4,8	3,85	4,2	9,0	4,50	3,8	3,8	4,5	8,0	4,0					
055	B 5,5	4,35	4,8	9,0	4,50	4,3	4,3	5,0	8,0	4,0					
063	B 6,3	4,85	5,3	10,5	5,25	4,8	4,8	5,5	10,0	5,0					

**Ordering Code (Example)**

Punching and embossing unit with bottom die for punched holes = 2282.01.  
 Nominal diameter = thread size (self tapping screw) = B = 3.5 mm = 035  
 Order No = 2282.01.035

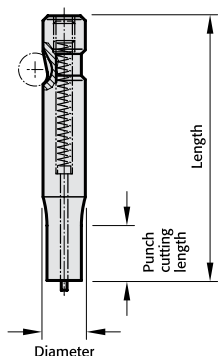


# Ball-Lock Punches

A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.

# Ordering example Ball-Lock Punches

**NB:** See table for standard dimensions  
Special dimensions to order



Punch:  
22 without ejector pin  
27 with ejector pin

2 2 4 2 . 2 F 1 . 0 6 5 0 . 0 4 5 0 B

Punch cutting length: $l_1$	Order No
13	= 1
19	= 2
25	= 3
30	= 4
special	= X

Format: Slot length P = 6,5 mm

Format: Slot width W = 4,5 mm

Version:	Order No
○ blank	= 0
⊙ round	= 1
□ square	= 2
▭ rectangular	= 3
○ slot	= 4
▭ rectangle with radiused corners	= 5
▽ pilot pin with tapered tip	= 6
▽ pilot pin parabolic tip	= 7
special shapes	= 9

Type:	Order No
light	= 2
heavy	= 3
punch larger, light	= 4
punch larger, heavy	= 5

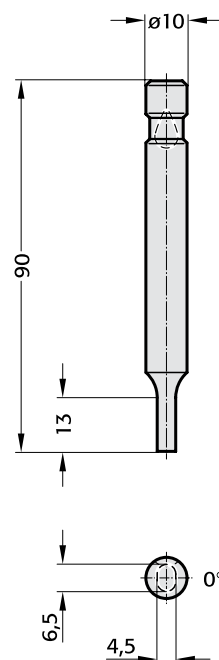
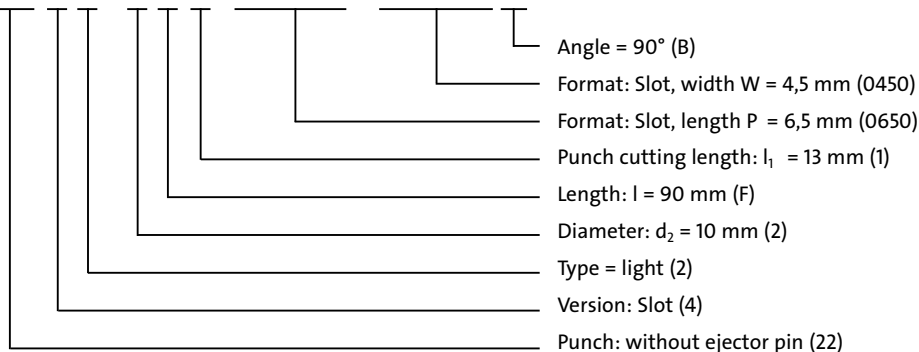
Diameter: $d_2$	Order No
6 (light duty only)	= 1
10	= 2
13	= 3
16	= 4
20	= 5
25	= 6
32	= 7
38 (light duty only)	= 8
40 (heavy duty only)	= 9

Length: $l$	Order Code character
50	= A
56	= B
63	= C
71	= D
80	= E
90	= F
100	= G
110	= H
125	= J
140	= K
150	= L
175	= M
200	= N
special	= X

Angle:	Order Code character
0°	= A
90°	= B
180°	= C
270°	= D
special	= X

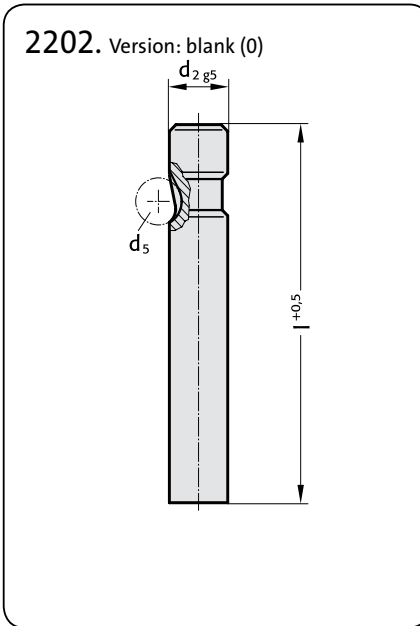
## Ordering Code (Example):

2 2 4 2 . 2 F 1 . 0 6 5 0 . 0 4 5 0 B



Ball-Lock Punches  
blank, light duty

2202.



**Material:**  
HSS  
hardened: 62 ± 2 HRC

**Execution:**  
Shaft fine ground.

**Ordering Code (Example):**  
Synopsis see fold out page E31

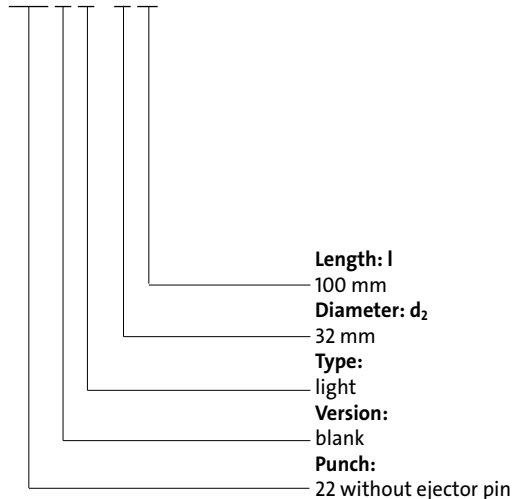
2202.

d <sub>2</sub> / (Order No)	d <sub>5</sub>	l / (Order Code character)										
		63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)	140 (K)	150 (L)	175 (M)	200 (N)
6 (1)	6	●	●	●	●	●						
10 (2)	8	●	●	●	●	●	●	●				
13 (3)	8	●	●	●	●	●	●	●	●	●	●	
16 (4)	8	●	●	●	●	●	●	●	●	●	●	●
20 (5)	8	●	●	●	●	●	●	●	●	●	●	●
25 (6)	8	●	●	●	●	●	●	●	●	●	●	●
32 (7)	8		●	●	●	●	●	●	●	●	●	●
38 (8)	8			●	●	●	●	●	●	●	●	●

Other lengths on request.

Ordering Code (Example):

2 2 0 2 . 7 G



**Order Code character**  
= (G)

**Order No**  
= (7)

**Order No**  
= (2)

**Order No**  
= (0)

**Ball-Lock Punches  
stepped, light duty**

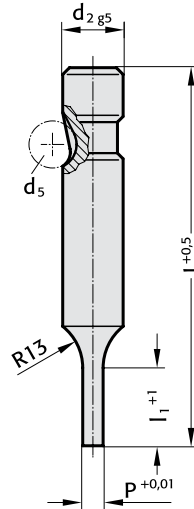
**Material:**

HSS  
hardened: 62 ± 2 HRC

**Execution:**

Shaft and punch diameter fine ground.

**2212. Version: Round (1)**



**Ordering example:**

Synopsis see fold out page E31

**2212.**

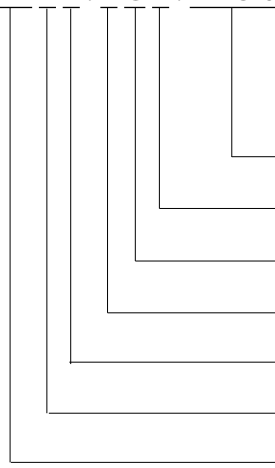
d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	l <sub>1</sub> / (Order No)	l / (Order Code character)				
				63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 (1)	6	1,6 - 5,9	13* (1)	●	●	●	●	●
10 (2)	8	1,6 - 9,9	13* (1) 19*(2)	●	●	●	●	●
13 (3)	8	5,0-12,9	13 (1) 19 (2)	●	●	●	●	●
16 (4)	8	8,0-15,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●
20 (5)	8	12,0-19,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●
25 (6)	8	16,0-24,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●
32 (7)	8	24,0-31,9	13 (1) 19 (2) 25 (3)		●	●	●	●
38 (8)	8	30,0-37,9	19 (2) 25 (3) 30 (4)			●	●	●

\* l<sub>1</sub> = 10 where P < 2,20

Other lengths on request

**Ordering example:**

**2 2 1 2 . 7 G 2 . 2 4 5 0**



**Format: Round**  
P = ø24,5 mm  
**Punch cutting length: l<sub>1</sub>**  
19 mm  
**Length: l**  
100 mm  
**Diameter: d<sub>2</sub>**  
32 mm  
**Type:**  
light  
**Version:**  
Round  
**Punch:**  
without ejector pin (22)

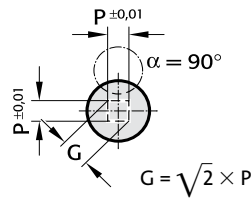
= (2450)  
**Order No**  
= (2)  
**Order Code character**  
= (G)  
**Order No**  
= (7)  
**Order No**  
= (2)  
**Order No**  
= (1)

**Ball-Lock Punches,  
stepped, light duty**

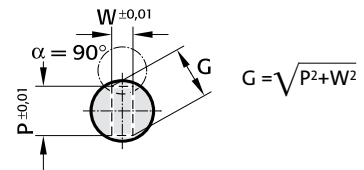
2222. 2232.  
2242. 2252.



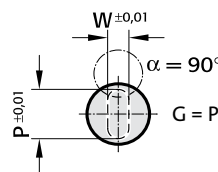
2222. Version: Square (2)



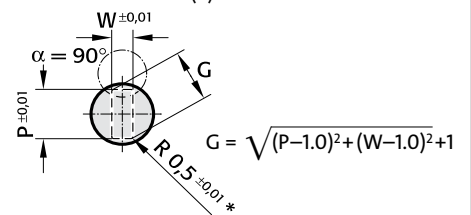
2232. Version: Rectangular (3)



2242. Version: Slot (4)



2252. Version: Rectangle with radiused corners (5)



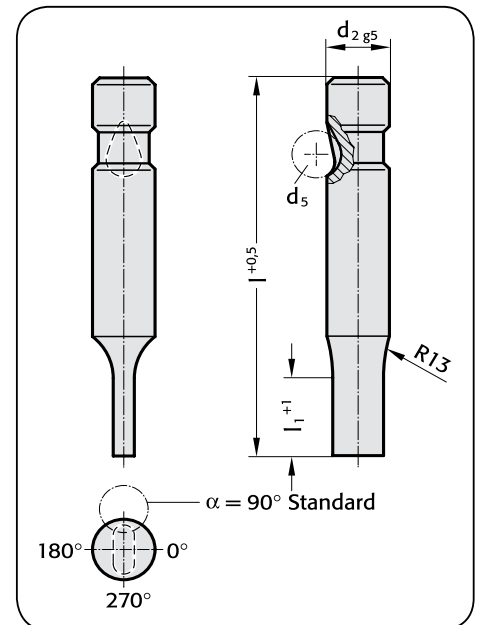
\* For other radius options, see standardised special shapes, pages E 100 – E 101

**2222./ 2232./ 2242. / 2252.**

d <sub>2</sub> / (Order No)	d <sub>5</sub>	W <sub>min.</sub>	G <sub>max.</sub>	l <sub>1</sub> / (Order No)	l / (Order Code character)				
					63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 (1)	6	1,6	5,9	13*(1)	●	●	●	●	●
10 (2)	8	1,6	9,9	13*(1) 19*(2)	●	●	●	●	●
13 (3)	8	4,5	12,9	13 (1) 19 (2)	●	●	●	●	●
16 (4)	8	6,0	15,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●
20 (5)	8	8,0	19,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●
25 (6)	8	10,0	24,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●
32 (7)	8	12,5	31,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●
38 (8)	8	14,0	37,9	19 (2) 25 (3) 30 (4)	●	●	●	●	●

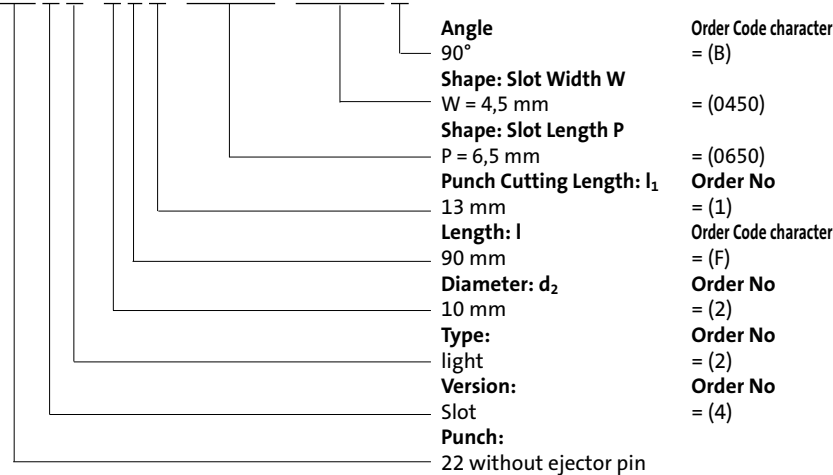
\*l<sub>1</sub> = 10 where P or W < 2,20

Other lengths on request



**Ordering example:**

**2 2 4 2 . 2 F 1 . 0 6 5 0 . 0 4 5 0 B**



**Material:**

HSS  
hardened: 62 ± 2 HRC

**Execution:**

Shaft and punch shape fine ground.

**Ordering example:**

Synopsis see fold out page E31



**FIBRO**

2702.

**Ball-Lock Punches**  
blank with ejector pin, light duty

**Material:**

HSS  
hardened: 62 ± 2 HRC

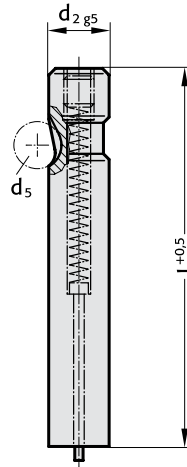
**Execution:**

Shaft fine ground.

**Ordering example:**

Synopsis see fold out page E31

2702. Version: Blank (0)



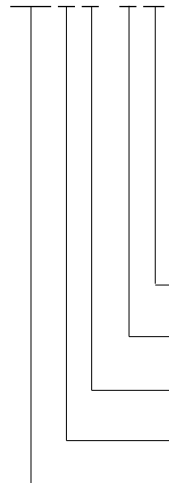
2702.

$d_2$ / (Order No)	$d_5$	l / (Order Code character)				
		63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 (1)	6	●	●	●	●	●
10 (2)	8	●	●	●	●	●
13 (3)	8	●	●	●	●	●
16 (4)	8	●	●	●	●	●
20 (5)	8	●	●	●	●	●
25 (6)	8	●	●	●	●	●
32 (7)	8		●	●	●	●
38 (8)	8			●	●	●

Other lengths on request

**Ordering example:**

2702.7G



**Length: l**  
100 mm  
**Diameter:  $d_2$**   
32 mm  
**Type:**  
light  
**Version:**  
Blank  
**Punch:**  
with ejector pin (27)

**Order Code character**  
= (G)  
**Order No**  
= (7)  
**Order No**  
= (2)  
**Order No**  
= (0)

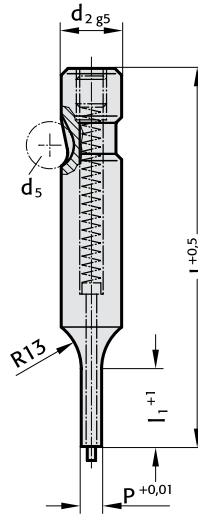
# Ball-Lock Punches stepped with ejector pin, light duty

**FIBRO**

**2712.**



2712. Version: Rund (1)



**Material:**

HSS  
hardened: 62 ± 2 HRC

**Execution:**

Shaft and punch diameter fine ground.

**Ordering example:**

Synopsis see fold out page E31

**2712.**

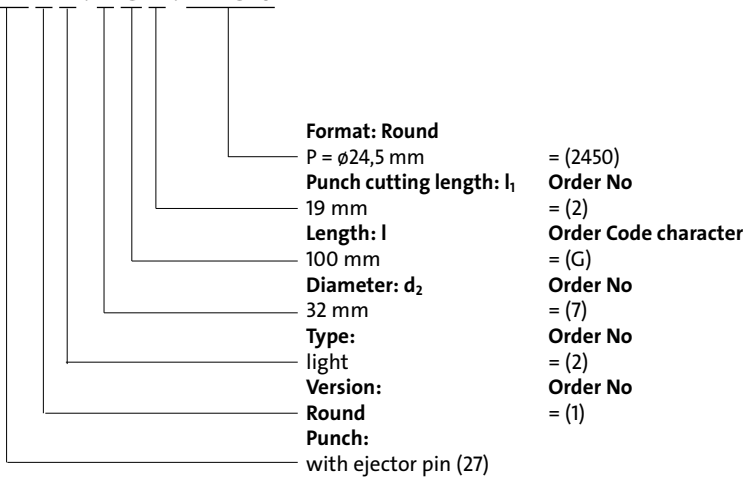
d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	l <sub>1</sub> / (Order No)	l / (Order Code character)				
				63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 (1)	6	1,6 - 5,9	13* (1)	●	●	●	●	●
10 (2)	8	1,6 - 9,9	13* (1) 19* (2)	●	●	●	●	●
13 (3)	8	5,0-12,9	13 (1) 19 (2)	●	●	●	●	●
16 (4)	8	8,0-15,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●
20 (5)	8	12,0-19,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●
25 (6)	8	16,0-24,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●
32 (7)	8	24,0-31,9	13 (1) 19 (2) 25 (3)		●	●	●	●
38 (8)	8	30,0-37,9	19 (2) 25 (3) 30 (4)			●	●	●

\* l<sub>1</sub> = 10 where P < 2,20

Other lengths on request

**Ordering example:**

**2 7 1 2 . 7 G 2 . 2 4 5 0**

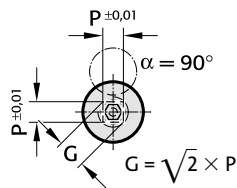


# FIBRO

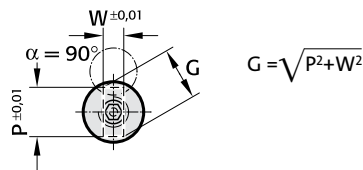
2722. 2732.  
2742. 2752.

## Ball-Lock Punches, stepped with ejector pin, light duty

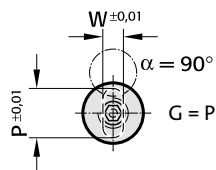
2722. Version: Square (2)



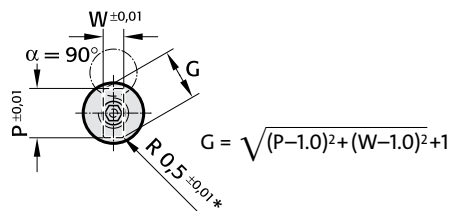
2732. Version: Rectangular (3)



2742. Version: Slot (4)



2752. Rectangle with radiused corners (5)



\* For other radius options, see standardised special shapes, pages E 100 – E 101.

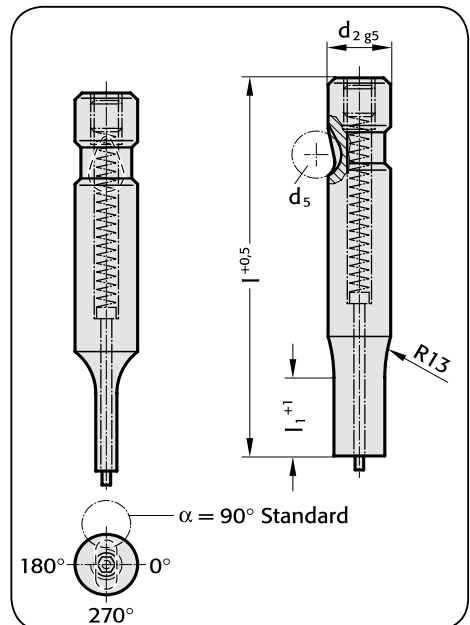


2722./ 2732./ 2742. / 2752.

d <sub>2</sub> / (Order No)	d <sub>5</sub>	W <sub>min.</sub>	G <sub>max.</sub>	l <sub>1</sub> / (Order No)	l / (Order Code character)				
					63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 (1)	6	1,6	5,9	13* (1)	●	●	●	●	●
10 (2)	8	1,6	9,9	13* (1) 19* (2)	●	●	●	●	●
13 (3)	8	4,5	12,9	13 (1) 19 (2)	●	●	●	●	●
16 (4)	8	6,0	15,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●
20 (5)	8	8,0	19,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●
25 (6)	8	10,0	24,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●
32 (7)	8	12,5	31,9	13 (1) 19 (2) 25 (3)		●	●	●	●
38 (8)	8	14,0	37,9	19 (2) 25 (3) 30 (4)			●	●	●

\*l<sub>1</sub> = 10 where P or W < 2,20

Other lengths on request



Ordering example:

2742.2F1.0650.0450B

Angle 90°  
 Format: Slot, width W  
 W = 4,5 mm  
 Format: Slot, length P  
 P = 6,5 mm  
 Punch cutting length: l<sub>1</sub>  
 13 mm  
 Length: l  
 90 mm  
 Diameter: d<sub>2</sub>  
 10 mm  
 Type: light  
 Version: Order Code character = (B)  
 Slot Order No = (0450)  
 Punch: Order No = (0650)  
 with ejector pin (27) Order Code character = (1)  
 Order Code character = (F)  
 Order No = (2)  
 Order No = (2)  
 Order No = (4)

Material:

HSS  
 hardened: 62 ± 2 HRC

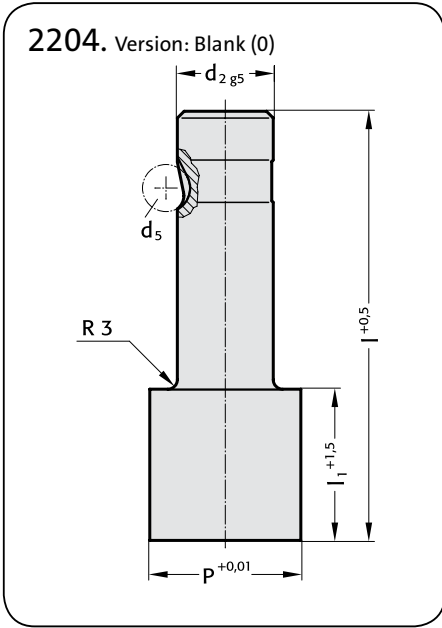
Execution:

Shaft and punch shape fine ground.

Ordering example:

Synopsis see fold out page E31

**Ball-Lock Punches**  
punch larger than shaft,  
light duty



**Material:**

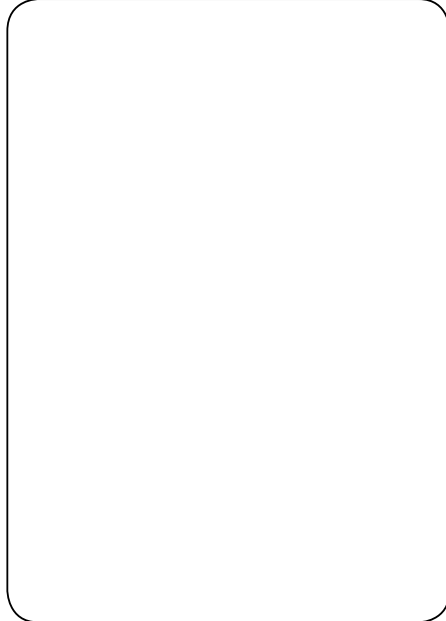
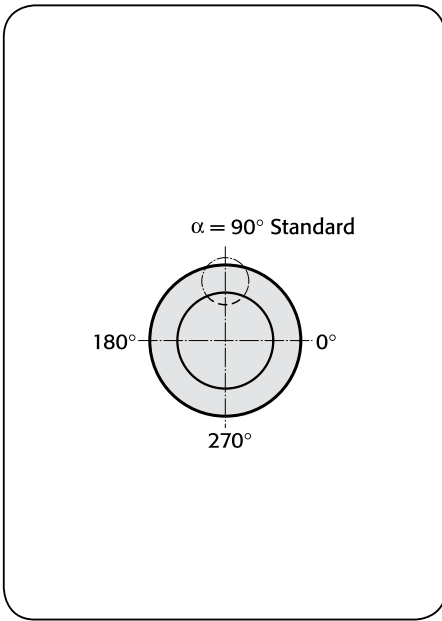
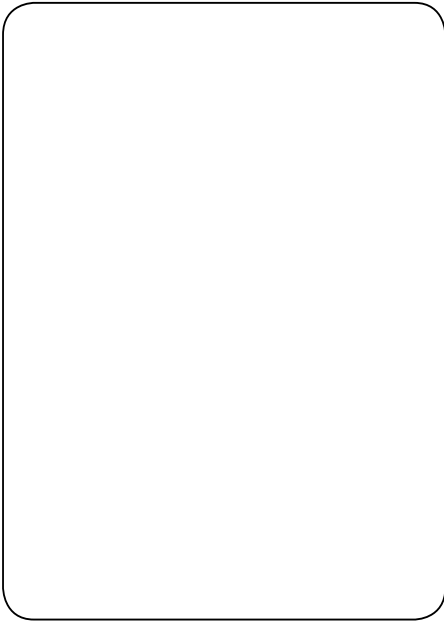
HSS  
hardened: 62 ± 2 HRC

**Execution:**

Shaft and punch diameter fine ground.

**Ordering example:**

Synopsis see fold out page E31



**2204.**

d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	l <sub>1</sub> / (Order No)	l / (Order Code character)		
				80 (E)	90 (F)	100 (G)
13 (3)	8	32,0	19 (2) 30 (4)	●	●	●
16 (4)	8	38,0	19 (2) 30 (4)	●	●	●
20 (5)	8	40,0	19 (2) 30 (4)	●	●	●
25 (6)	8	44,0	19 (2) 30 (4)	●	●	●
32 (7)	8	50,0	19 (2) 30 (4)	●	●	●
Other lengths on request						

**Ordering example:**  
**2204.4F4.3800**

Version: Round  
P = ø38,0 mm = (3800)  
Punch cutting length l<sub>1</sub> = (4)  
30 mm = (4)  
Length: l = (F)  
90 mm = (F)  
Diameter: d<sub>2</sub> = (4)  
16 mm = (4)  
Type: = (4)  
Punch larger, = (4)  
light  
Version: = (4)  
Blank  
Punch: = (0)  
without ejector pin (22)

**FIBRO**

**Ball-Lock Punches**  
punch larger than shaft,  
light duty

2214.

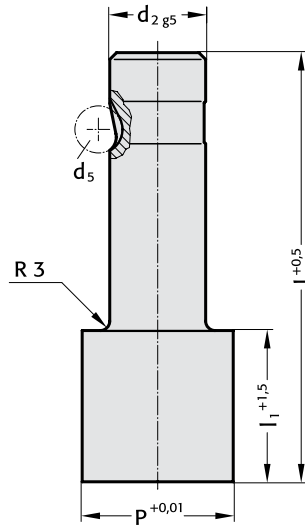
**Material:**

HSS  
hardened: 62 ± 2 HRC

**Execution:**

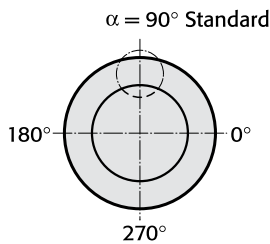
Shaft and punch diameter fine ground.

2214. Version: Round (1)



**Ordering example:**

Synopsis see fold out page E31



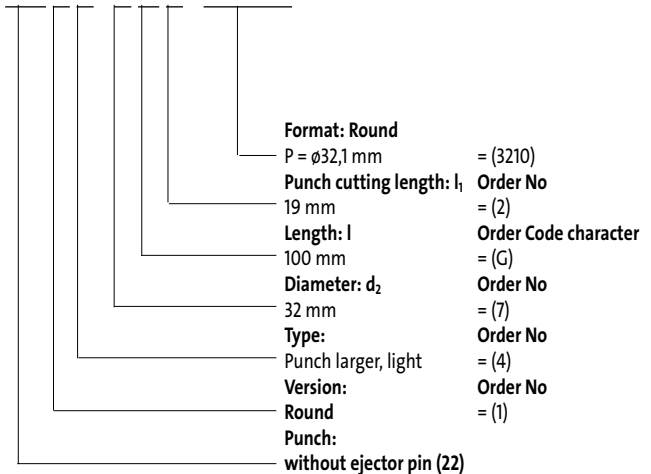
2214.

d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	l <sub>1</sub> / (Order No)	l / (Order Code character)		
				80 (E)	90 (F)	100 (G)
13 (3)	8	13,1-32,0	19 (2) 30 (4)	●	●	●
16 (4)	8	16,1-38,0	19 (2) 30 (4)	●	●	●
20 (5)	8	20,1-40,0	19 (2) 30 (4)	●	●	●
25 (6)	8	25,1-44,0	19 (2) 30 (4)	●	●	●
32 (7)	8	32,1-50,0	19 (2) 30 (4)	●	●	●

Other lengths on request

**Ordering example:**

2 2 1 4 . 7 G 2 . 3 2 1 0



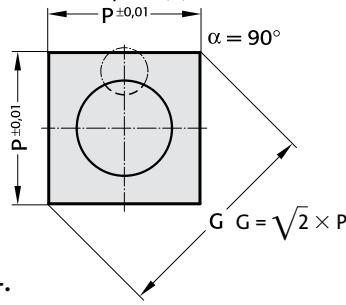
# Ball-Lock Punches,, punch larger than shaft, light duty

**FIBRO**

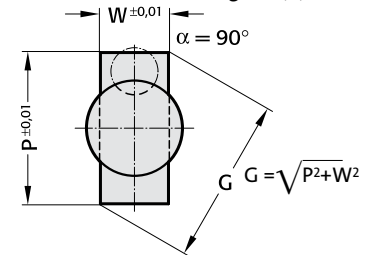
2224. 2234.  
2244. 2254.



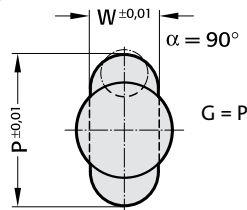
2224. Version: Square (2)



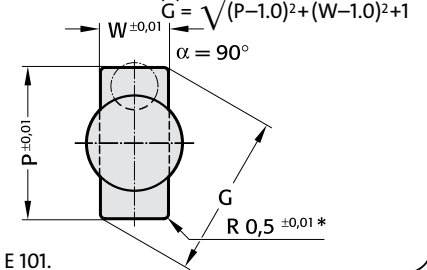
2234. Version: Rectangular (3)



2244. Version: Slot (4)



2254. Version: Rectangle with radiused corners (5)

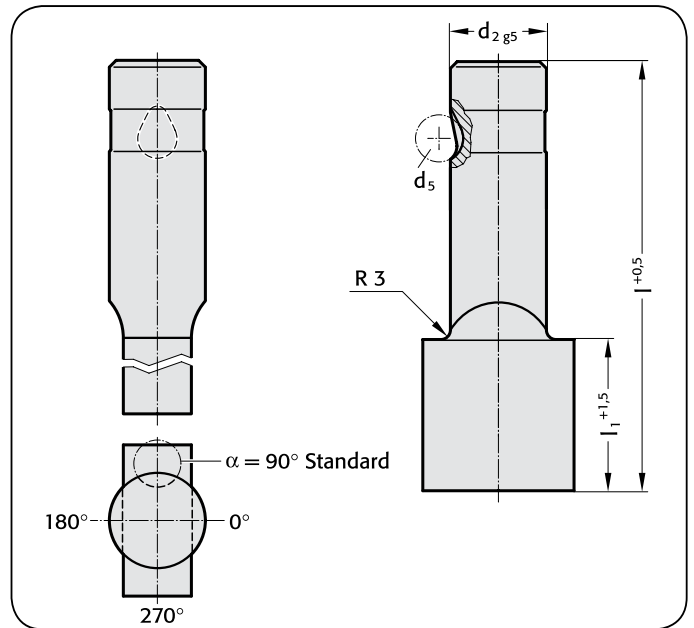


\* For other radius options, see standardised special shapes, pages E 100 – E 101.

## 2224./ 2234./ 2244. / 2254.

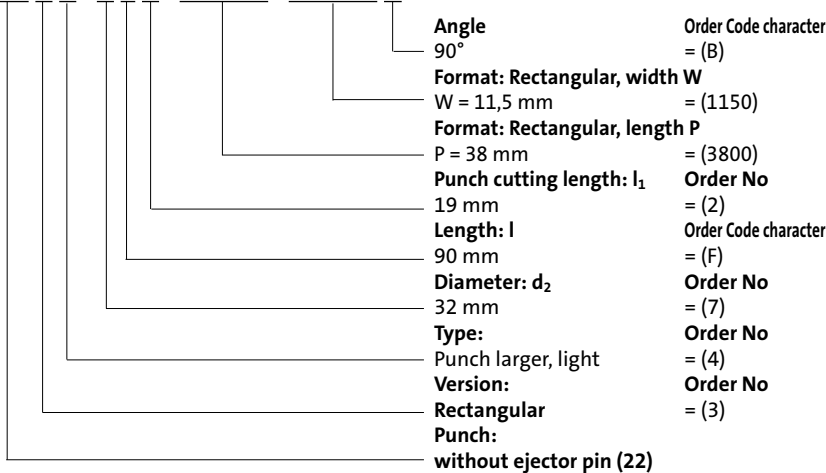
d <sub>2</sub> / (Order No)	d <sub>5</sub>	W <sub>min.</sub>	G <sub>max.</sub>	l <sub>1</sub> / (Order No)	l / (Order Code character)		
					80 (E)	90 (F)	100 (G)
13 (3)	8	5,0	32,0	19 (2) 30 (4)	●	●	●
16 (4)	8	6,5	38,0	19 (2) 30 (4)	●	●	●
20 (5)	8	8,0	40,0	19 (2) 30 (4)	●	●	●
25 (6)	8	10,0	44,0	19 (2) 30 (4)	●	●	●
32 (7)	8	11,5	50,0	19 (2) 30 (4)	●	●	●

Other lengths on request



## Ordering example:

2 2 3 4 . 7 F 2 . 3 8 0 0 . 1 1 5 0 B



## Material:

HSS  
hardened: 62 ± 2 HRC

## Execution:

Shaft and punch shape fine ground.

## Ordering example:

Synopsis see fold out page E31

**FIBRO**

**2704.**

**Ball-Lock Punches,  
punch larger than shaft,  
light duty with ejector pin**

**Material:**

HSS  
hardened: 62 ± 2 HRC

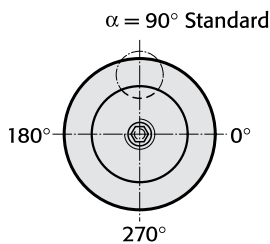
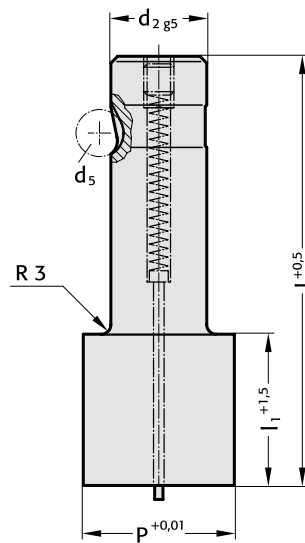
**Execution:**

Shaft and punch diameter fine ground.

**Ordering example:**

Synopsis see fold out page E31

**2704. Version: Blank (0)**



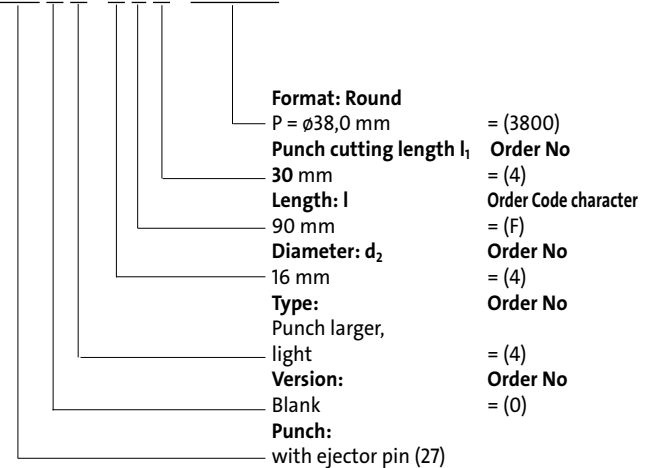
**2704.**

d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	l <sub>1</sub> / (Order No)		l / (Order Code character)		
					80 (E)	90 (F)	100 (G)
13 (3)	8	32,0	19 (2)	30 (4)	●	●	●
16 (4)	8	38,0	19 (2)	30 (4)	●	●	●
20 (5)	8	40,0	19 (2)	30 (4)	●	●	●
25 (6)	8	44,0	19 (2)	30 (4)	●	●	●
32 (7)	8	50,0	19 (2)	30 (4)	●	●	●

Other lengths on request

**Ordering example:**

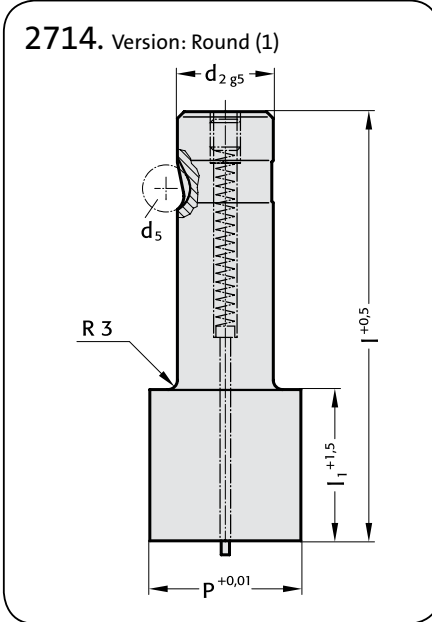
**2704.4F4.3800**



# Ball-Lock Punches, punch larger than shaft, light duty with ejector pin

FIBRO

2714.



**Material:**

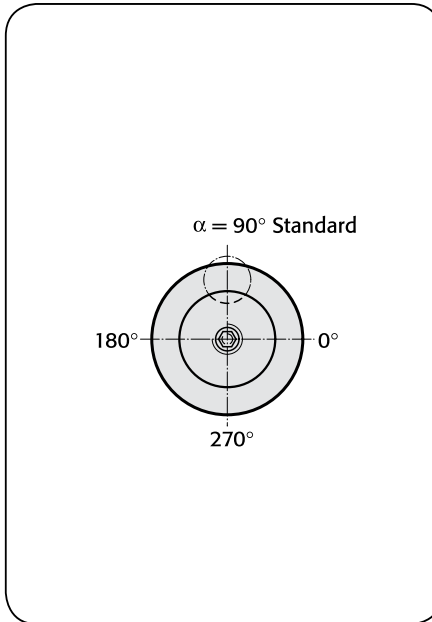
HSS  
hardened: 62 ± 2 HRC

**Execution:**

Shaft and punch diameter fine ground.

**Ordering example:**

Synopsis see fold out page E31



2714.

d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	l <sub>1</sub> / (Order No)	l / (Order Code character)		
				80 (E)	90 (F)	100 (G)
13 (3)	8	13,1-32,0	19 (2) 30 (4)	●	●	●
16 (4)	8	16,1-38,0	19 (2) 30 (4)	●	●	●
20 (5)	8	20,1-38,0	19 (2) 30 (4)	●	●	●
25 (6)	8	25,1-45,0	19 (2) 30 (4)	●	●	●
32 (7)	8	32,1-50,0	19 (2) 30 (4)	●	●	●
Other lengths on request						

**Ordering example:**  
2714.7G2.4250

**Format: Round**  
P =  $\varnothing$ 42,5 mm = (4250)

**Punch cutting length: l<sub>1</sub>**  
19 mm = (2)

**Length: l**  
100 mm = (G)

**Diameter: d<sub>2</sub>**  
32 mm = (7)

**Type:**  
Punch larger, light = (4)

**Version:**  
Round = (2)

**Punch:**  
with ejector pin (27) = (5)

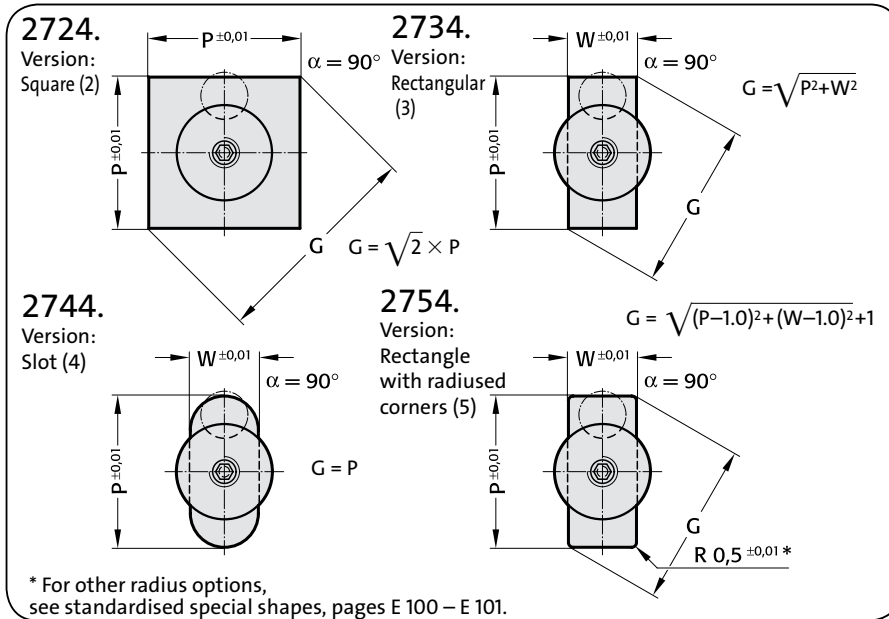
**Order No**  
= (1)



# FIBRO

2724. 2734.  
2744. 2754.

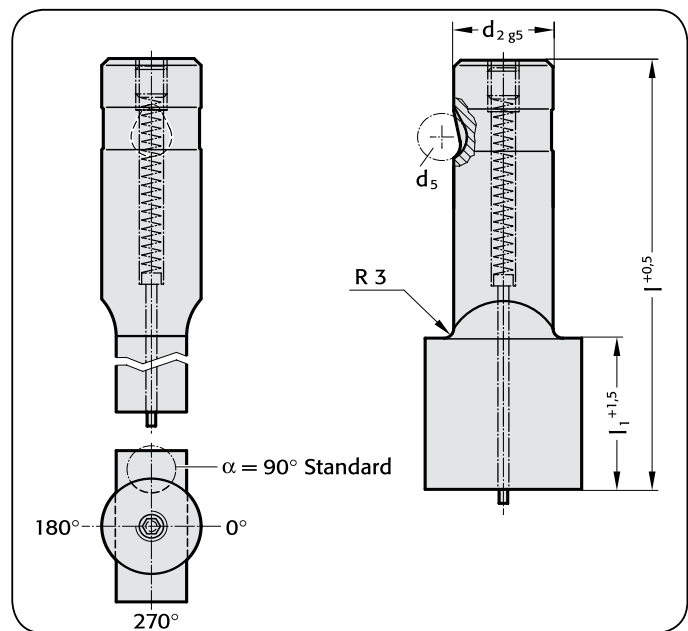
## Ball-Lock Punches, punch larger than shaft, light duty with ejector pin



**2724./ 2734./ 2744. / 2754.**

d <sub>2</sub> / (Order No)	d <sub>5</sub>	W <sub>min.</sub>	G <sub>max.</sub>	l <sub>1</sub> / (Order No)	l / (Order Code character)		
					80 (E)	90 (F)	100 (G)
13 (3)	8	5,0	32,0	19 (2) 30 (4)	●	●	●
16 (4)	8	6,5	38,0	19 (2) 30 (4)	●	●	●
20 (5)	8	8,0	40,0	19 (2) 30 (4)	●	●	●
25 (6)	8	10,0	44,0	19 (2) 30 (4)	●	●	●
32 (7)	8	11,5	50,0	19 (2) 30 (4)	●	●	●

Other lengths on request



**Ordering example:**  
**2 7 3 4 . 7 F 2 . 3 8 0 0 . 1 1 5 0 B**

2	7	3	4	.	7	F	2	.	3	8	0	0	.	1	1	5	0	B	

**Angle** 90°  
**Format: Rectangular, width W** W = 11,5 mm  
**Format: Rectangular, length P** P = 38 mm  
**Punch cutting length: l<sub>1</sub>** 19 mm  
**Length: l** 90 mm  
**Diameter: d<sub>2</sub>** 32 mm  
**Type:** Punch larger, light  
**Version:** Rectangular  
**Punch:** with ejector pin (27)

**Order Code character** = (B)  
**Order No** = (1150)  
**Order No** = (3800)  
**Order No** = (2)  
**Order Code character** = (F)  
**Order No** = (7)  
**Order No** = (4)  
**Order No** = (3)

**Material:**  
 HSS  
 hardened: 62 ± 2 HRC

**Execution:**  
 Shaft and punch shape fine ground.

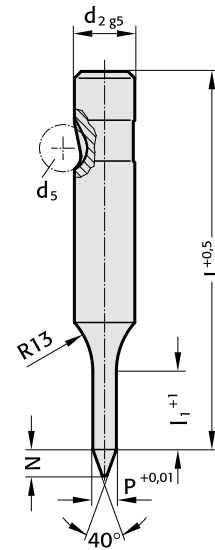
**Ordering example:**  
 Synopsis see fold out page E31

Ball-Lock Pilot Pins,  
with tapered tip, light duty

2262.



2262. Version: Pilot pin with tapered tip (6)



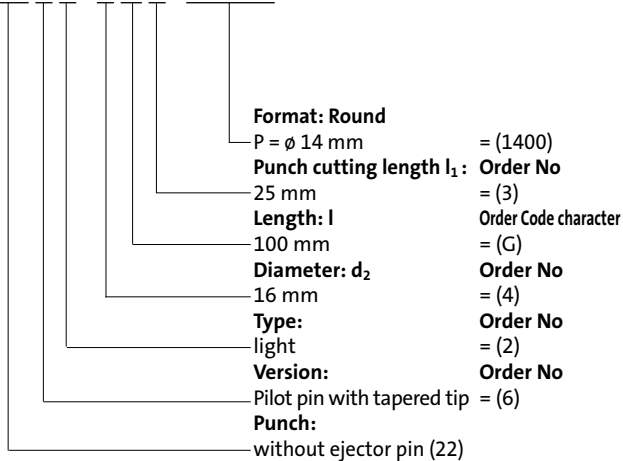
2262.

d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	I <sub>1</sub> / (Order No)	N	I / (Order Code character)								
					71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)	140 (K)	150 (L)	
10 (2)	8	5,9- 9,9	19 (2)	8	●	●	●	●	●				
13 (3)	8	9,9-12,9	19 (2)	10	●	●	●	●	●	●			
16 (4)	8	12,9-15,9	25 (3)	15	●	●	●	●	●	●	●		●
20 (5)	8	15,9-19,9	25 (3)	20	●	●	●	●	●	●	●	●	●
25 (6)	8	19,9-24,9	25 (3)	25	●	●	●	●	●	●	●	●	●
32 (7)	8	24,9-31,9	25 (3)	30		●	●	●	●	●	●	●	●
38 (8)	8	31,9-37,9	30 (4)	35		●	●	●	●	●	●	●	●

Other lengths on request

Ordering example:

2 2 6 2 . 4 G 3 . 1 4 0 0



Material:

HSS  
hardened: 62 ± 2 HRC

Execution:

Shaft and pilot pin fine ground.

Ordering example:

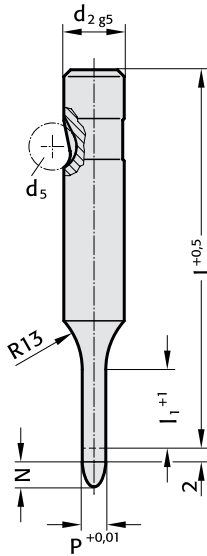
Synopsis see fold out page E31

# FIBRO

2272.

## Ball-Lock Pilot Pins, with parabolic tip, light duty

2272. Version: Pilot pin parabolic tip (7)



2272.

d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	l <sub>1</sub> / (Order No)	l / (Order Code character)						
				50 (A)	56 (B)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 (1)	6	2,9- 5,9	13 (1)	●	●	●	●	●	●	●
10 (2)	8	5,9- 9,9	19 (2)	●	●	●	●	●	●	●
13 (3)	8	9,9-12,9	19 (2)	●	●	●	●	●	●	●
16 (4)	8	12,9-15,9	25 (3)			●	●	●	●	●
20 (5)	8	15,9-19,9	25 (3)			●	●	●	●	●
25 (6)	8	19,9-24,9	25 (3)			●	●	●	●	●
32 (7)	8	24,9-31,9	25 (3)				●	●	●	●
38 (8)	8	31,9-37,9	30 (4)					●	●	●

Other lengths on request

Ordering example:  
2 2 7 2 . 4 G 3 . 1 4 0 0

Format: Round  
P = ø 14 mm = (1400)  
Punch cutting length l<sub>1</sub>: 25 mm = (3)  
Length: l 100 mm = (G)  
Diameter: d<sub>2</sub> 16 mm = (4)  
Type: light = (2)  
Version: Pilot pin parabolic tip = (7)  
Punch: without ejector pin (22)

### Material:

HSS  
hardened: 62 ± 2 HRC

### Execution:

Shaft and pilot pin fine ground.

„l“ length of pilot pin is without tip

**Note:** The 2 mm length provides full guidance before the blanking punch contacts the sheet metal.

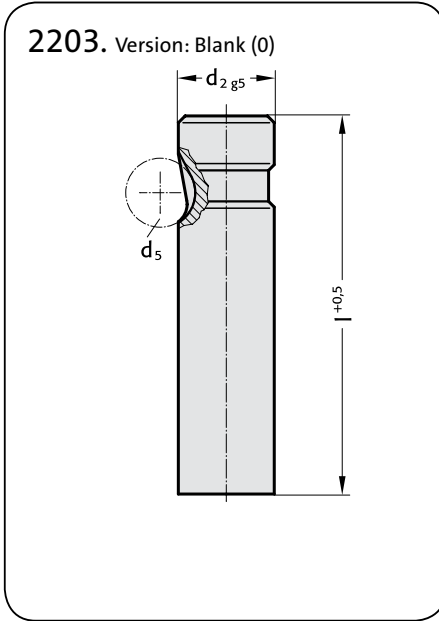
	P	N
	≤ 10 mm	8 mm
10,1 mm	- 15 mm	12 mm
	> 15 mm	15 mm

### Ordering example:

Synopsis see fold out page E31

Ball-Lock Punches,  
blank, heavy duty

2203.



Material:

HSS  
hardened: 62 ± 2 HRC

Execution:

Shaft fine ground.

Ordering example:

Synopsis see fold out page E31

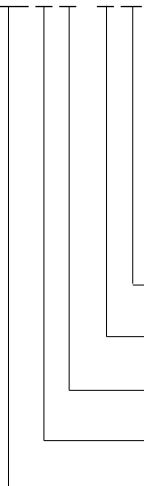
2203.

d <sub>2</sub> / (Order No)	d <sub>5</sub>	l / (Order Code character)										
		63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)	140 (K)	150 (L)	175 (M)	200 (N)
10 (2)	10	●	●	●	●	●	●	●				
13 (3)	12	●	●	●	●	●	●	●	●	●		
16 (4)	12	●	●	●	●	●	●	●	●	●	●	
20 (5)	12	●	●	●	●	●	●	●	●	●	●	
25 (6)	12		●	●	●	●	●	●	●	●	●	●
32 (7)	12		●	●	●	●	●	●	●	●	●	●
40 (9)	12			●	●	●	●	●	●	●	●	●

Other lengths on request

Ordering example:

2 2 0 3 . 7 G



Length: l  
100 mm  
Diameter: d<sub>2</sub>  
32 mm  
Type:  
heavy  
Version:  
Blank  
Punch:  
without ejector pin (22)

Order Code character  
= (G)  
Order No  
= (7)  
Order No  
= (3)  
Order No  
= (0)

# FIBRO

2213.

## Ball-Lock Punches, stepped, heavy duty

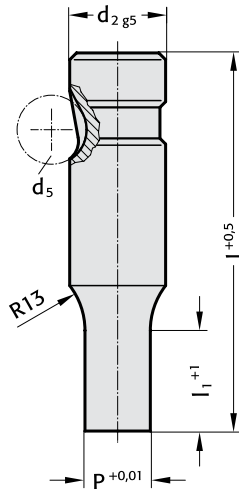
### Material:

HSS  
hardened: 62 ± 2 HRC

### Execution:

Shaft and punch diameter fine ground.

### 2213. Version: Round (1)



### Ordering example:

Synopsis see fold out page E31

### 2213.

d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	I <sub>1</sub> / (Order No)	I / (Order Code character)						
				63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 (2)	10	1,6- 9,9	13* (1) 19*(2)	●	●	●	●	●	●	●
13 (3)	12	5,0-12,9	13 (1) 19 (2)	●	●	●	●	●	●	●
16 (4)	12	8,0-15,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●	●	●
20 (5)	12	12,0-19,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●	●	●
25 (6)	12	16,0-24,9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●
32 (7)	12	24,0-31,9	13 (1) 19 (2) 25 (3)		●	●	●	●	●	●
40 (9)	12	30,0-39,9	19 (2) 25 (3) 30 (4)			●	●	●	●	●

\* I<sub>1</sub> = 10 where P < 2,20

Other lengths on request

### Ordering example:

2 2 1 3 . 7 G 2 . 2 4 5 0

**Format: Round**  
 P = ø24,5 mm  
**Punch cutting length: I<sub>1</sub>**  
 19 mm  
**Length: I**  
 100 mm  
**Diameter: d<sub>2</sub>**  
 32 mm  
**Type:**  
 heavy  
**Version:**  
 Round  
**Punch:**  
 without ejector pin (22)

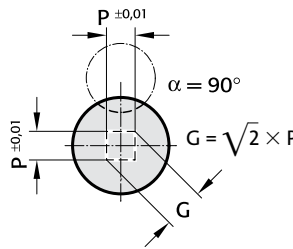
= (2450)  
**Order No**  
 = (2)  
**Order Code character**  
 = (G)  
**Order No**  
 = (7)  
**Order No**  
 = (3)  
**Order No**  
 = (1)

**Ball-Lock Punches,  
stepped, heavy duty**

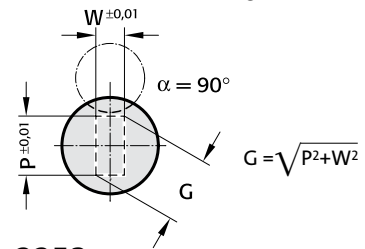
2223. 2233.  
2243. 2253.



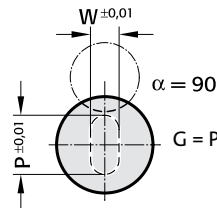
2223. Version: Square (2)



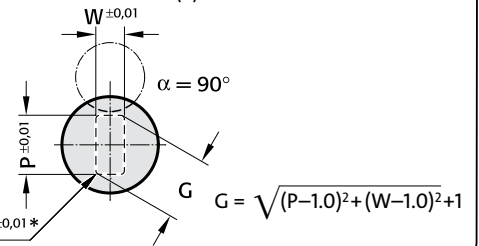
2233. Version: Rectangular (3)



2243. Version: Slot (4)



2253. Version: Rectangle with radiused corners (5)



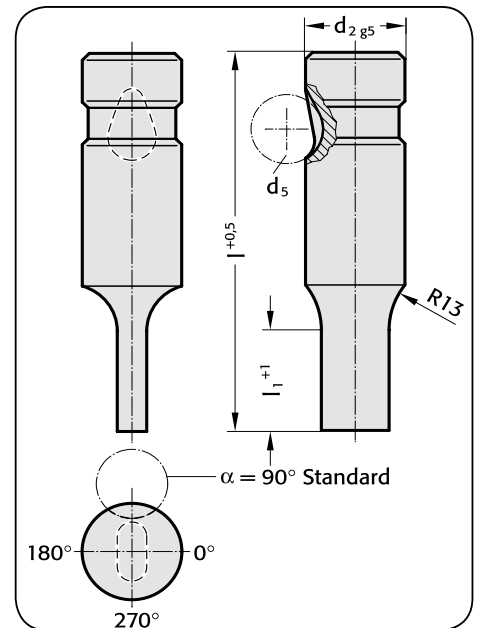
\* For other radius options, see standardised special shapes, pages E 100 – E 101.

**2223./ 2233./ 2243. / 2253.**

d <sub>2</sub> / (Order No)	d <sub>5</sub>	W <sub>min.</sub>	G <sub>max.</sub>	l <sub>1</sub> / (Order No)	l / (Order Code character)						
					63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 (2)	10	1,6	9,9	13* (1) 19* (2)	●	●	●	●	●	●	●
13 (3)	12	4,5	12,9	13 (1) 19 (2)	●	●	●	●	●	●	●
16 (4)	12	6,0	15,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●	●	●
20 (5)	12	8,0	19,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●	●	●
25 (6)	12	10,0	24,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●	●	●
32 (7)	12	12,5	31,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●	●	●
40 (9)	12	14,0	39,9	19 (2) 25 (3) 30 (4)	●	●	●	●	●	●	●

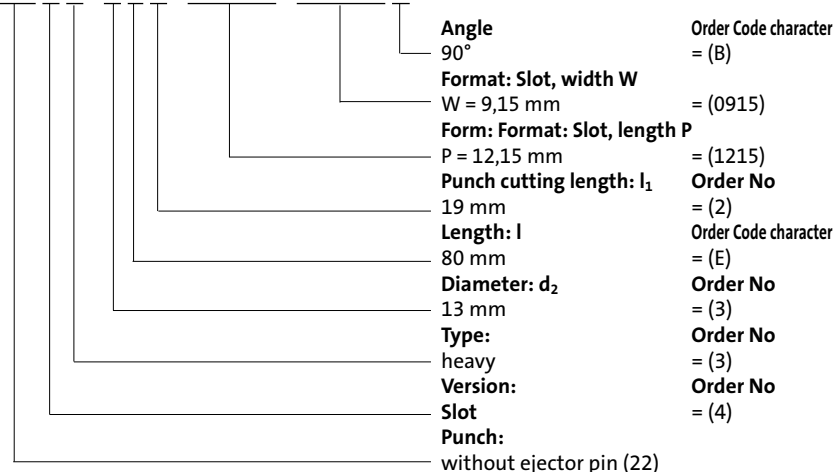
\*l<sub>1</sub> = 10 where P or W < 2,20

Other lengths on request



**Ordering example:**

**2 2 4 3 . 3 E 2 . 1 2 1 5 . 0 9 1 5 B**



**Material:**

HSS  
hardened: 62 ± 2 HRC

**Execution:**

Shaft and punch shape fine ground.

**Ordering example:**

Synopsis see fold out page E31

**FIBRO**

**Ball-Lock Punches  
blank with ejector pin,  
heavy duty**

**2703.**

**Material:**

HSS  
hardened: 62 ± 2 HRC

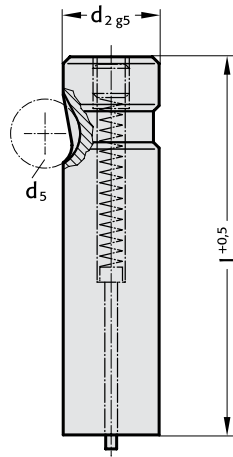
**Execution:**

Shaft fine ground.

**Ordering example:**

Synopsis see fold out page E31

**2703. Version: Blank (0)**



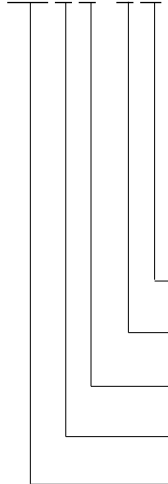
**2703.**

$d_2$ / (Order No)	$d_5$	l / (Order Code character)						
		63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 (2)	10	●	●	●	●	●		
13 (3)	12	●	●	●	●	●	●	●
16 (4)	12	●	●	●	●	●	●	●
20 (5)	12	●	●	●	●	●	●	●
25 (6)	12		●	●	●	●	●	●
32 (7)	12		●	●	●	●	●	●
40 (9)	12			●	●	●	●	●

Other lengths on request

**Ordering example:**

**2703.7G**



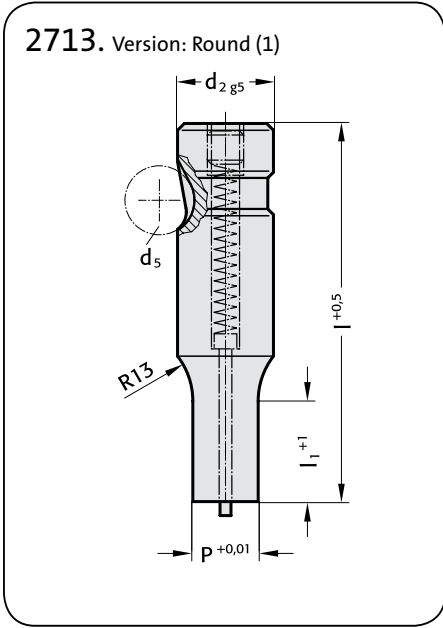
**Length: l**  
100 mm  
**Diameter:  $d_2$**   
32 mm  
**Type:**  
heavy  
**Version:**  
Blank  
**Punch:**  
with ejector pin (27)

**Order Code character**  
= (G)  
**Order No**  
= (7)  
**Order No**  
= (3)  
**Order No**  
= (0)

# Ball-Lock Punches stepped with ejector pin, heavy duty

**FIBRO**

**2713.**



**Material:**

HSS  
hardened: 62 ± 2 HRC

**Execution:**

Shaft and punch diameter fine ground.

**Ordering example:**

Synopsis see fold out page E31

**2713.**

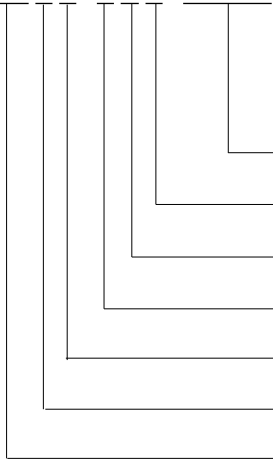
d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	l <sub>1</sub> / (Order No)			l / (Order Code character)					
						63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)
10 (2)	10	1,6- 9,9	13* (1)	19* (2)	●	●	●	●	●	●	●
13 (3)	12	5,0-12,9	13 (1)	19 (2)	●	●	●	●	●	●	●
16 (4)	12	8,0-15,9	13 (1)	19 (2)	25 (3)	●	●	●	●	●	●
20 (5)	12	12,0-19,9	13 (1)	19 (2)	25 (3)	●	●	●	●	●	●
25 (6)	12	16,0-24,9	13 (1)	19 (2)	25 (3)	●	●	●	●	●	●
32 (7)	12	24,0-31,9	13 (1)	19 (2)	25 (3)	●	●	●	●	●	●
40 (9)	12	30,0-39,9	19 (2)	25 (3)	30 (4)	●	●	●	●	●	●

\* l<sub>1</sub> = 10 where P < 2,20

Other lengths on request

**Ordering example:**

**2713.3C1.0550**



- Format: Round**  
P = ø5,5 mm
- Punch cutting length: l<sub>1</sub>**  
13 mm
- Length: l**  
63 mm
- Diameter: d<sub>2</sub>**  
13 mm
- Type:**  
heavy
- Version:**  
Round
- Punch:**  
with ejector pin (27)
- Order No**  
= (0550)
- Order No**  
= (1)
- Order Code character**  
= (C)
- Order No**  
= (3)
- Order No**  
= (3)
- Order No**  
= (1)

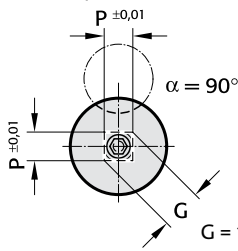


# FIBRO

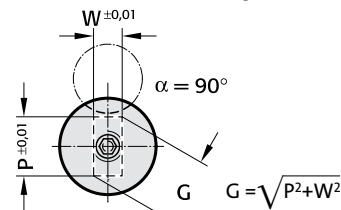
2723. 2733.  
2743. 2753.

## Ball-Lock Punches, stepped with ejector pin, heavy duty

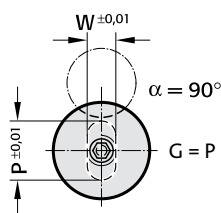
2723. Version: Square (2)



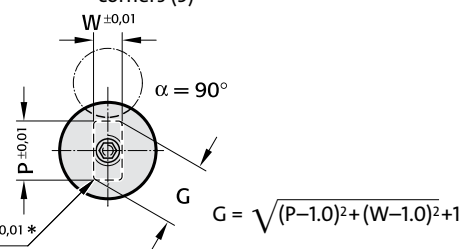
2733. Version: Rectangular (3)



2743. Version: Slot (4)



2753. Version: Rectangle with radiused corners (5)



\* For other radius options, see standardised special shapes, pages E 100 – E 101.

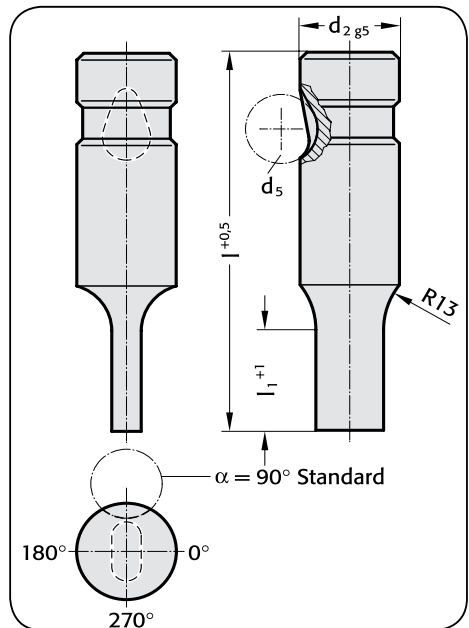


### 2723./ 2733./ 2743. / 2753.

d <sub>2</sub> / (Order No)	d <sub>5</sub>	W <sub>min.</sub>	G <sub>max.</sub>	l <sub>1</sub> / (Order No)	l / (Order Code character)						
					63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 (2)	10	1,6	9,9	13* (1) 19* (2)	●	●	●	●	●	●	●
13 (3)	12	4,5	12,9	13 (1) 19 (2)	●	●	●	●	●	●	●
16 (4)	12	6,0	15,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●	●	●
20 (5)	12	8,0	19,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●	●	●
25 (6)	12	10,0	24,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●	●	●
32 (7)	12	12,5	31,9	13 (1) 19 (2) 25 (3)	●	●	●	●	●	●	●
40 (9)	12	14,0	39,9	19 (2) 25 (3) 30 (4)	●	●	●	●	●	●	●

\*l<sub>1</sub> = 10 where P or W < 2,20

Other lengths on request



### Ordering example:

2743.2F1.0650.0450B

- Angle 90°
- Format: Slot, width W = 4,5 mm
- Format: Slot, length P = 6,5 mm
- Punch cutting length: l<sub>1</sub> = 13 mm
- Length: l = 90 mm
- Diameter: d<sub>2</sub> = 10 mm
- Type: heavy
- Version: Slot
- Punch: with ejector pin (27)

- Order Code character = (B)
- = (0450)
- = (0650)
- Order No = (1)
- Order Code character = (F)
- Order No = (2)
- Order No = (3)
- Order No = (4)

### Material:

HSS  
hardened: 62 ± 2 HRC

### Execution:

Shaft and punch shape fine ground.

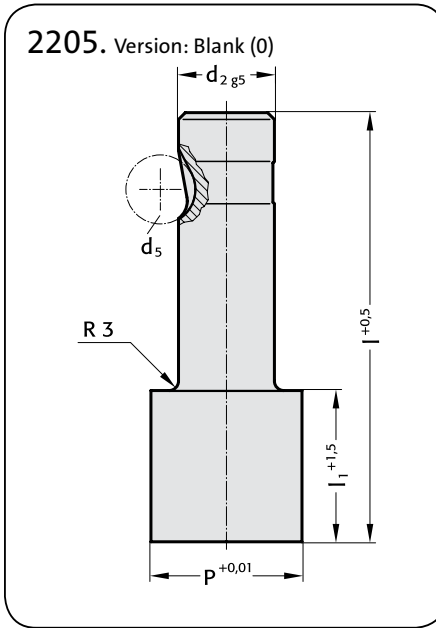
### Ordering example:

Synopsis see fold out page E31

# Ball-Lock Punches, punch larger than shaft, heavy duty

**FIBRO**

**2205.**



**Material:**

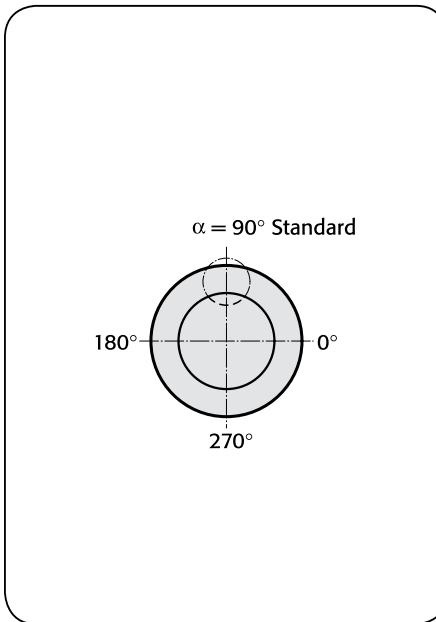
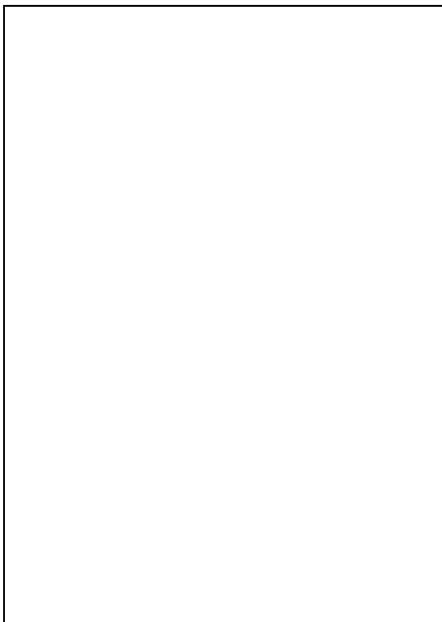
HSS  
hardened: 62 ± 2 HRC

**Execution:**

Shaft and punch diameter fine ground.

**Ordering example:**

Synopsis see fold out page E31



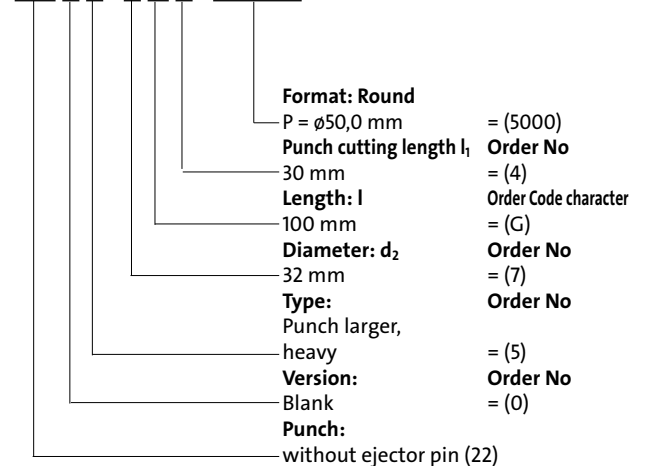
**2205.**

d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	l <sub>1</sub> / (Order No)		l / (Order Code character)		
					80 (E)	90 (F)	100 (G)
13 (3)	12	32,0	19 (2)	30 (4)	●	●	●
16 (4)	12	38,0	19 (2)	30 (4)	●	●	●
20 (5)	12	40,0	19 (2)	30 (4)	●	●	●
25 (6)	12	44,0	19 (2)	30 (4)	●	●	●
32 (7)	12	50,0	19 (2)	30 (4)	●	●	●
40 (9)	12	56,0	19 (2)	30 (4)	●	●	●

Other lengths on request

**Ordering example:**

**2 2 0 5 . 7 G 4 . 5 0 0 0**



**FIBRO**

**Ball-Lock Punches,  
punch larger than shaft,  
heavy duty**

**2215.**

**Material:**

HSS  
hardened: 62 ± 2 HRC

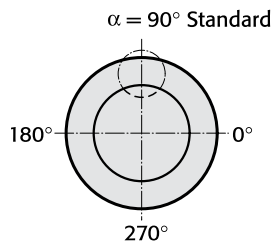
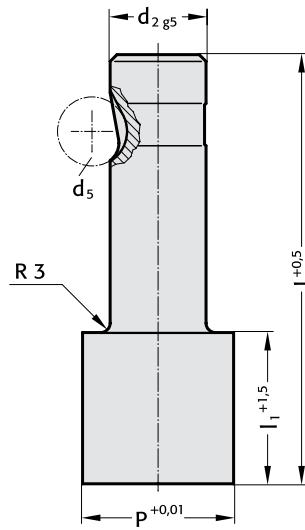
**Execution:**

Shaft and punch diameter fine ground.

**Ordering example:**

Synopsis see fold out page E31

**2215. Version: Round (1)**



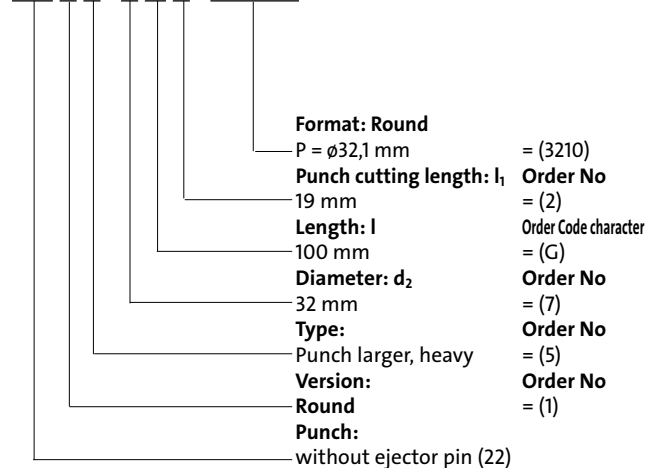
**2215.**

d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	l <sub>1</sub> / (Order No)	30 (4)	l / (Order Code character)		
					80 (E)	90 (F)	100 (G)
13 (3)	12	13,1-32,0	19 (2)	30 (4)	●	●	●
16 (4)	12	16,1-38,0	19 (2)	30 (4)	●	●	●
20 (5)	12	20,1-40,0	19 (2)	30 (4)	●	●	●
25 (6)	12	25,1-44,0	19 (2)	30 (4)	●	●	●
32 (7)	12	32,1-50,0	19 (2)	30 (4)	●	●	●
40 (9)	12	40,1-56,0	19 (2)	30 (4)	●	●	●

Other lengths on request

**Ordering example:**

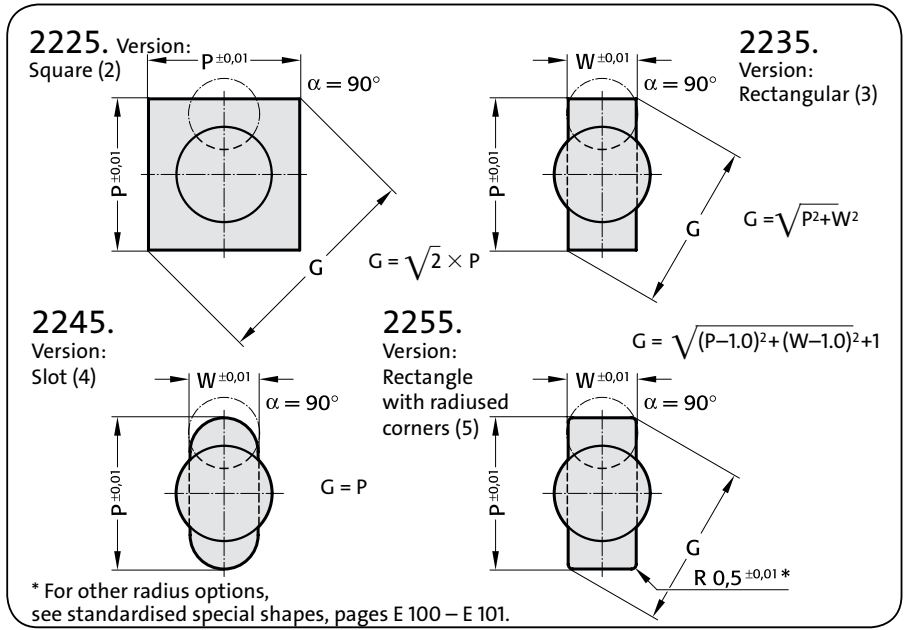
**2 2 1 5 . 7 G 2 . 3 2 1 0**



# Ball-Lock Punches, punch larger than shaft, heavy duty

**FIBRO**

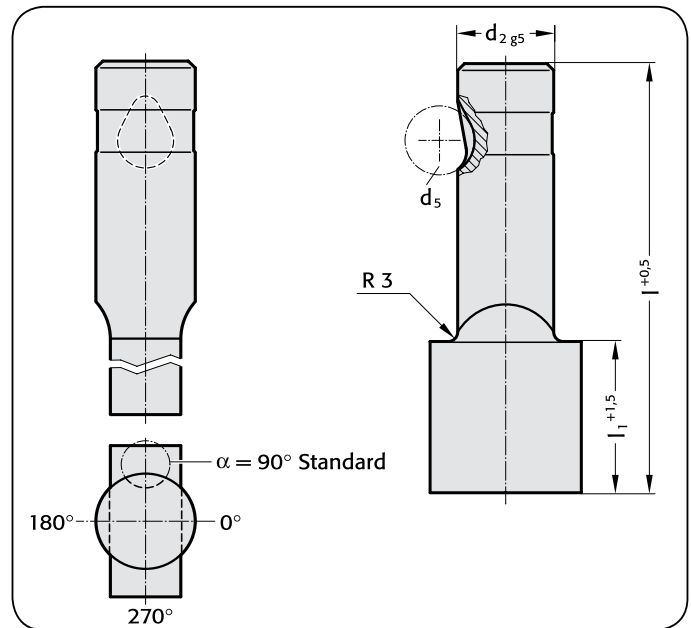
2225. 2235.  
2245. 2255.



## 2225./ 2235./ 2245. / 2255.

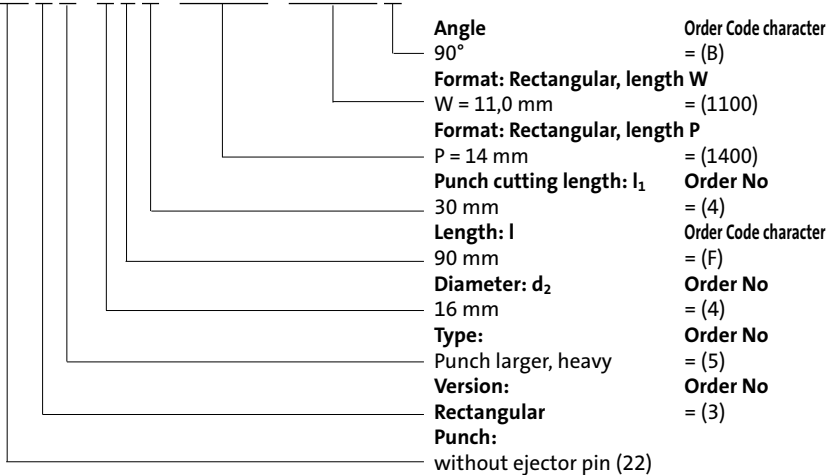
$d_2$ / (Order No)	$d_5$	$W_{min.}$	$G_{max.}$	$l_1$ / (Order No)	I / (Order Code character)		
					80 (E)	90 (F)	100 (G)
13 (3)	12	5,0	32,0	19 (2) 30 (4)	●	●	●
16 (4)	12	6,5	38,0	19 (2) 30 (4)	●	●	●
20 (5)	12	8,0	40,0	19 (2) 30 (4)	●	●	●
25 (6)	12	10,0	44,0	19 (2) 30 (4)	●	●	●
32 (7)	12	11,5	50,0	19 (2) 30 (4)	●	●	●
40 (9)	12	14,0	56,0	19 (2) 30 (4)	●	●	●

Other lengths on request



## Ordering example:

2 2 3 5 . 4 F 4 . 1 4 0 0 . 1 1 0 0 B



## Material:

HSS  
 hardened:  $62 \pm 2$  HRC

## Execution:

Shaft and punch shape fine ground.

## Ordering example:

Synopsis see fold out page E31

**FIBRO**

**2705.**

**Ball-Lock Punches,  
punch larger than shaft,  
heavy duty with ejector pin**

**Material:**

HSS  
hardened: 62 ± 2 HRC

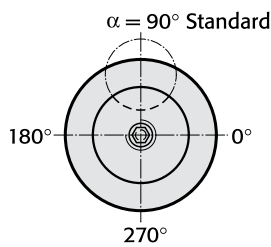
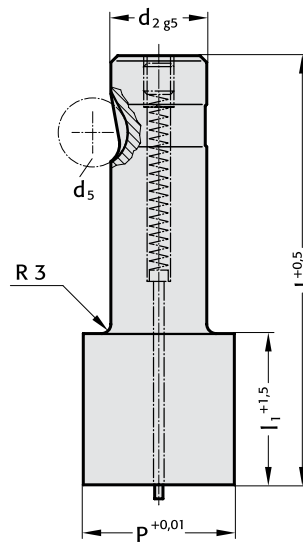
**Execution:**

Shaft and punch diameter fine ground.

**Ordering example:**

Synopsis see fold out page E31

2705. Version: Blank (0)



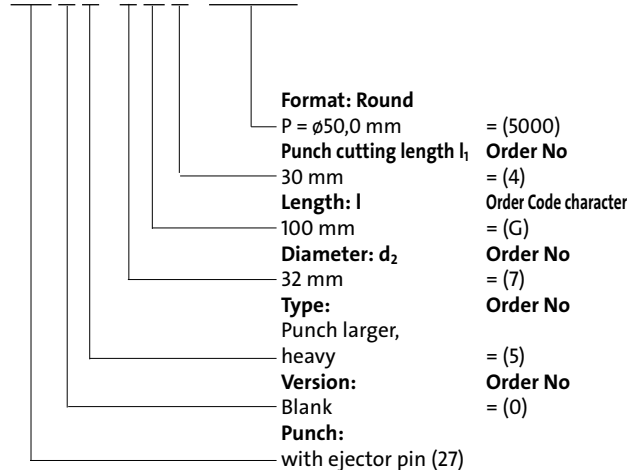
**2705.**

d <sub>2</sub> /(Order No)	d <sub>5</sub>	P	l <sub>1</sub> /(Order No)	l/(Order Code character)			
				80 (E)	90 (F)	100 (G)	
13 (3)	12	32,0	19 (2)	30 (4)	●	●	●
16 (4)	12	38,0	19 (2)	30 (4)	●	●	●
20 (5)	12	40,0	19 (2)	30 (4)	●	●	●
25 (6)	12	44,0	19 (2)	30 (4)	●	●	●
32 (7)	12	50,0	19 (2)	30 (4)	●	●	●
40 (9)	12	56,0	19 (2)	30 (4)	●	●	●

Other lengths on request

**Ordering example:**

**2705.7G4.5000**



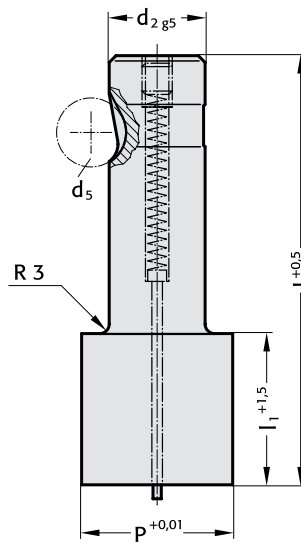
# Ball-Lock Punches, punch larger than shaft, heavy duty with ejector pin

**FIBRO**

**2715.**



2715. Version: Round (1)



**Material:**

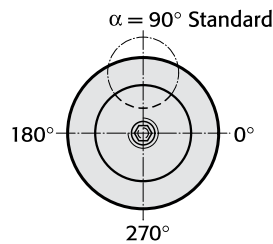
HSS  
hardened: 62 ± 2 HRC

**Execution:**

Shaft and punch diameter fine ground.

**Ordering example:**

Synopsis see fold out page E31



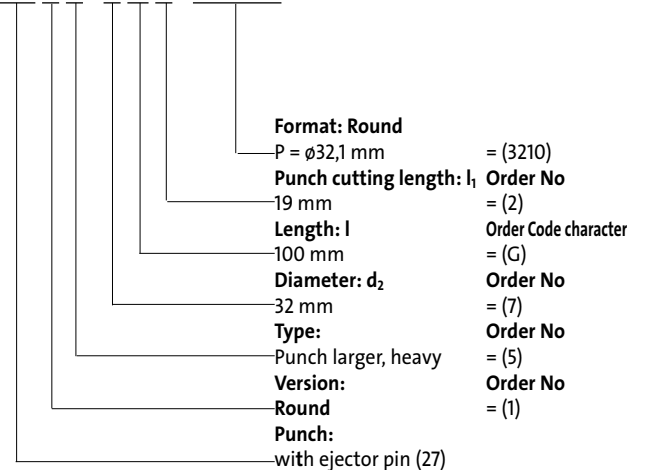
**2715.**

d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	l <sub>1</sub> / (Order No)	l / (Order Code character)		
				80 (E)	90 (F)	100 (G)
13 (3)	12	13,1-32,0	19 (2) 30 (4)	●	●	●
16 (4)	12	16,1-38,0	19 (2) 30 (4)	●	●	●
20 (5)	12	20,1-40,0	19 (2) 30 (4)	●	●	●
25 (6)	12	25,1-44,0	19 (2) 30 (4)	●	●	●
32 (7)	12	32,1-50,0	19 (2) 30 (4)	●	●	●
40 (9)	12	40,1-56,0	19 (2) 30 (4)	●	●	●

Other lengths on request

**Ordering example:**

**2715.7G2.3210**

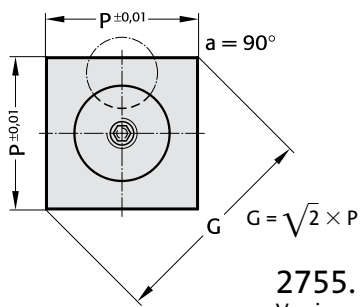


# FIBRO

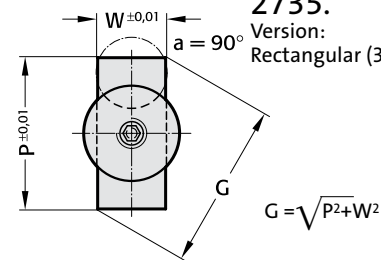
2725. 2735.  
2745. 2755.

## Ball-Lock Punches, punch larger than shaft, heavy duty with ejector pin

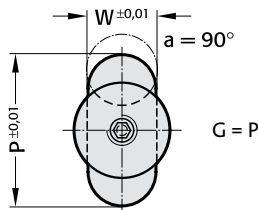
**2725.**  
Version:  
Square (2)



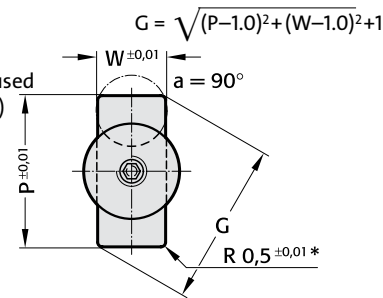
**2735.**  
Version:  
Rectangular (3)



**2745.**  
Version:  
Slot (4)



**2755.**  
Version:  
Rectangle  
with radiused  
corners (5)



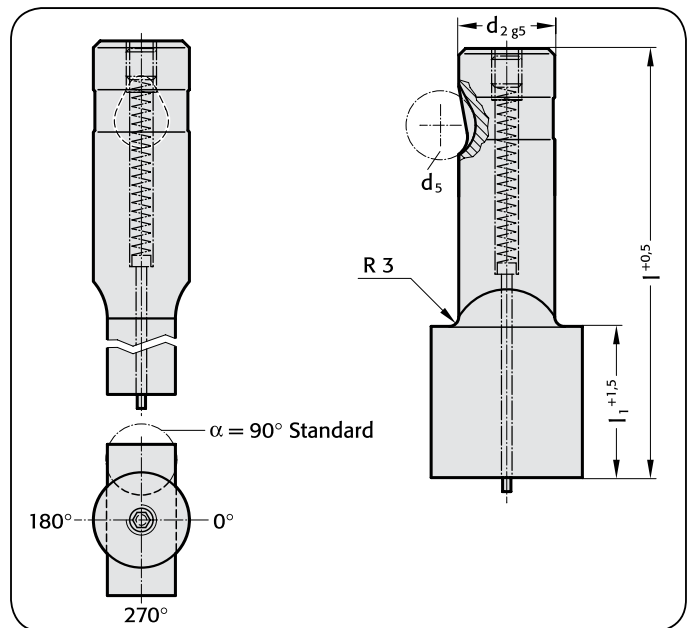
\* For other radius options,  
see standardised special shapes, pages E 100 – E 101.



### 2725./ 2735./ 2745. / 2755.

d <sub>2</sub> / (Order No)	d <sub>5</sub>	W <sub>min.</sub>	G <sub>max.</sub>	l <sub>1</sub> / (Order No)	l / (Order Code character)		
					80 (E)	90 (F)	100 (G)
13 (3)	12	5,0	32,0	19 (2) 30 (4)	●	●	●
16 (4)	12	6,5	38,0	19 (2) 30 (4)	●	●	●
20 (5)	12	8,0	40,0	19 (2) 30 (4)	●	●	●
25 (6)	12	10,0	44,0	19 (2) 30 (4)	●	●	●
32 (7)	12	11,5	50,0	19 (2) 30 (4)	●	●	●
40 (9)	12	14,0	56,0	19 (2) 30 (4)	●	●	●

Other lengths on request



### Ordering example:

**2735.4F4.1400.1100B**

- Angle 90°
- Format: Rectangular, width W = 11,0 mm
- Format: Rectangular, length P = 14,0 mm
- Punch cutting length: l<sub>1</sub> = 30 mm
- Length: l = 90 mm
- Diameter: d<sub>2</sub> = 16 mm
- Type: Punch larger, heavy
- Version: Rectangular
- Punch: with ejector pin (27)

### Material:

HSS  
hardened: 62 ± 2 HRC

### Execution:

Shaft and punch shape fine ground.

### Ordering example:

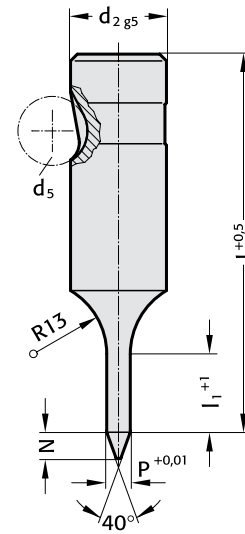
Synopsis see fold out page E31

Ball-Lock Pilot Pins,  
with tapered tip, heavy duty

2263.



2263. Version: Pilot pin with tapered tip (6)

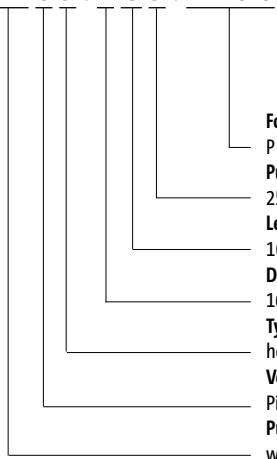


2263.

d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	l <sub>1</sub> / (Order No)	N	l / (Order Code character)								
					71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)	140 (K)	150 (L)	
10 (2)	10	5,9 - 9,9	19 (2)	8	●	●	●	●	●				
13 (3)	12	9,9 - 12,9	19 (2)	10	●	●	●	●	●	●	●		
16 (4)	12	12,9 - 15,9	25 (3)	15	●	●	●	●	●	●	●	●	
20 (5)	12	15,9 - 19,9	25 (3)	20	●	●	●	●	●	●	●	●	●
25 (6)	12	19,9 - 24,9	25 (3)	25		●	●	●	●	●	●	●	●
32 (7)	12	24,9 - 31,9	25 (3)	30		●	●	●	●	●	●	●	●
40 (9)	12	31,9 - 39,9	30 (4)	40		●	●	●	●	●	●	●	●

Other lengths on request

Ordering example:  
2 2 6 3 . 4 G 3 . 1 4 0 0



**Format: Round**  
 P = ø 14 mm = (1400)  
**Punch cutting length l<sub>1</sub>:**  
 25 mm **Order No**  
 = (3)  
**Length: l**  
 100 mm **Order Code character**  
 = (G)  
**Diameter: d<sub>2</sub>**  
 16 mm **Order No**  
 = (4)  
**Type:**  
 heavy **Order No**  
 = (3)  
**Version:**  
 Pilot pin with tapered tip **Order No**  
 = (6)  
**Punch:**  
 without ejector pin (22)

Material:

HSS  
hardened: 62 ± 2 HRC

Execution:

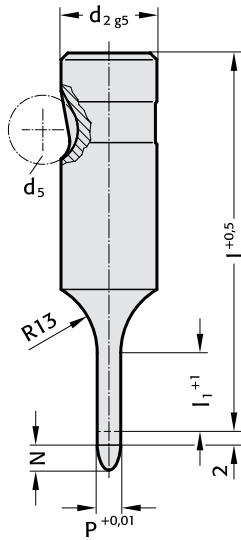
Shaft and pilot pin fine ground.

Ordering example:

Synopsis see fold out page E31



2273. Version: Pilot pin parabolic tip (7)

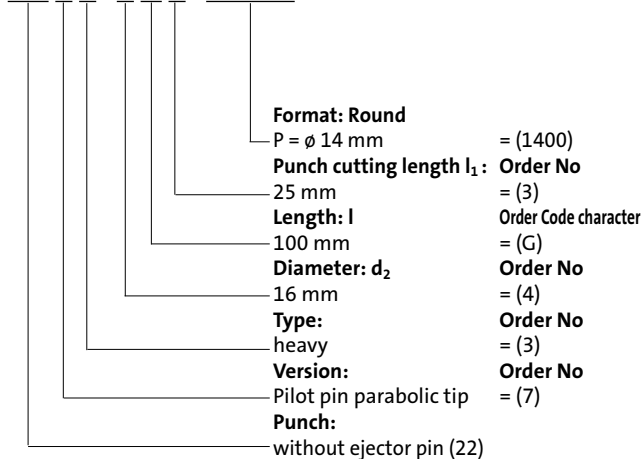


**2273.**

d <sub>2</sub> / (Order No)	d <sub>5</sub>	P	l <sub>1</sub> / (Order No)	l / (Order Code character)						
				63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 (2)	10	5,9 - 9,9	19 (2)	●	●	●	●	●		
13 (3)	12	9,9 - 12,9	19 (2)	●	●	●	●	●	●	●
16 (4)	12	12,9 - 15,9	25 (3)	●	●	●	●	●	●	●
20 (5)	12	15,9 - 19,9	25 (3)	●	●	●	●	●	●	●
25 (6)	12	19,9 - 24,9	25 (3)	●	●	●	●	●	●	●
32 (7)	12	24,9 - 31,9	25 (3)		●	●	●	●	●	●
40 (9)	12	31,9 - 39,9	30 (4)			●	●	●	●	●

Other lengths on request

**Ordering example:  
2 2 7 3 . 4 G 3 . 1 4 0 0**



**Material:**

HSS  
hardened: 62 ± 2 HRC

**Execution:**

„l“ length of pilot pin is without tip  
„l“ Length des Suchers ist ohne Spitze  
**Note:** The 2 mm length provides full guidance before the blanking punch contacts the sheet metal.

	P	N
	≤10 mm	8 mm
10,1 mm	- 15 mm	12 mm
	> 15 mm	15 mm

**Ordering example:**

Synopsis see fold out page E31

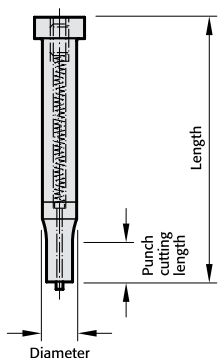


# Precision Punches ISO

A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.

# Ordering example Precision Punches ISO 8020

**NB:** See table for standard dimensions  
Special dimensions to order



2 2 4 1 . 2 G 4 . 0 6 5 0 . 0 4 5 0 A

Punch:  
22 without ejector pin  
27 with ejector pin

Punch cutting length: $l_1$	Order No
8	= 1
10	= 2
13	= 3
19	= 4
25	= 5
30	= 6
special	= x

Format: Slot length P = 6,5 mm

Format: Slot width W = 4,5 mm

Version:	Order No
○ blank	= 0
⊙ round	= 1
□ square	= 2
▭ rectangular	= 3
⊖ slot	= 4
▭ rectangle with radiused corners	= 5
▽ pilot pin with tapered tip	= 6
∩ pilot pin parabolic tip	= 7
special shapes	= 9

Diameter: $d_1$	Order No
3	= 1
4	= 2
5	= 3
6	= 4
8	= 5
10	= 6
13	= 7
16	= 8
20	= 9
25	= 10
32	= 11

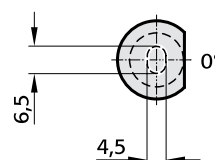
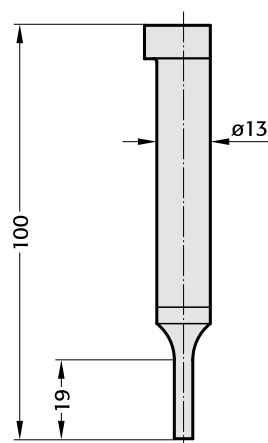
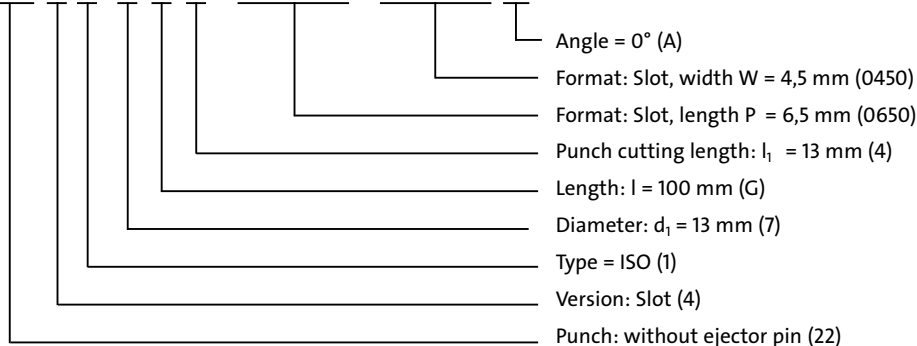
Lenght: l	Order Code character
50	= A
56	= B
63	= C
71	= D
80	= E
90	= F
100	= G
110	= H
120	= J
125	= K
140	= L
150	= M
200	= N
special	= X

Angle:	Order Code character
0°	= A
90°	= B
180°	= C
270°	= D
special	= X

Type:	Order No
ISO	= 1

## Ordering Code (Example):

2241.7G4.0650.0450A

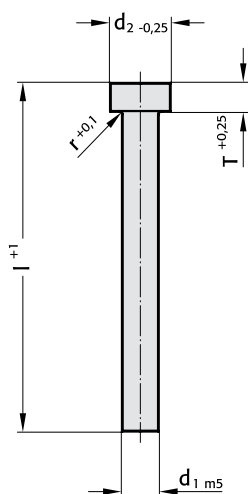


Precision Punches,  
blank, ISO 8020

2201.



2201. Version: blank (0)



Material:

HSS  
Hardness: shaft 64 ± 2 HRC  
          head 52 ± 5 HRC

ASP 23 - ASP 2023  
Hardness: shaft 64 ± 2 HRC  
          head 52 ± 5 HRC

Ordering example: 2201.6D.ASP

Diameter  $d_1$  = 10

Length = 71

(see fold out pages)

Execution:

Punch head hot upset-forged, punch,  
shoulder and punch diameter fine ground.

Ordering example:

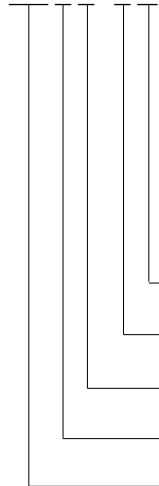
Synopsis see fold out page E63

2201.

$d_1$ / (Order No)	$d_2$	r	T	l / (Order Code character)						
				71 (D)	80 (E)	90 (F)	100 (G)	120 (J)	150 (M)	200 (N)
3 (1)	5	0,25	3	●	●	●	●	●		
4 (2)	6	0,25	3	●	●	●	●	●		
5 (3)	8	0,3	5	●	●	●	●	●		
6 (4)	9	0,3	5	●	●	●	●	●		
8 (5)	11	0,3	5	●	●	●	●	●		
10 (6)	13	0,3	5	●	●	●	●	●	●	
13 (7)	16	0,4	5	●	●	●	●	●	●	
16 (8)	19	0,4	5	●	●	●	●	●	●	●
20 (9)	23	0,4	5	●	●	●	●	●	●	●
25 (10)	28	0,4	5	●	●	●	●	●	●	●
32 (11)	35	0,4	5	●	●	●	●	●	●	●

Ordering example:

2201.7G



Length: l  
100 mm  
Diameter:  $d_1$   
13 mm  
Type:  
ISO  
Version:  
Blank  
Punch:  
without ejector pin (22)

Order Code character  
= (G)  
Order No  
= (7)  
Order No  
= (1)  
Order No  
= (0)

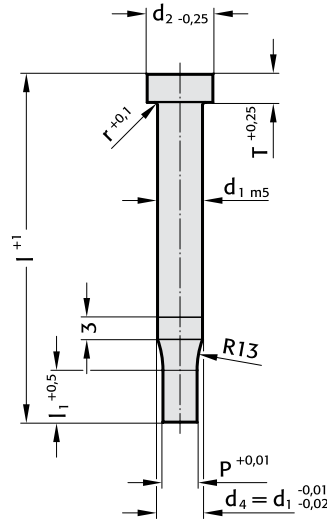
**FIBRO**

2211.

**Precision Punches,  
stepped, ISO 8020**



2211. Version: Round (1)



**Material:**

HSS  
 Hardness: shaft 64±2 HRC  
 head 52±5 HRC  
 ASP 23 – ASP 2023  
 upon request

**Execution:**

Punch head hot upset-forged, punch, shoulder and punch diameter fine ground.

**Ordering example:**

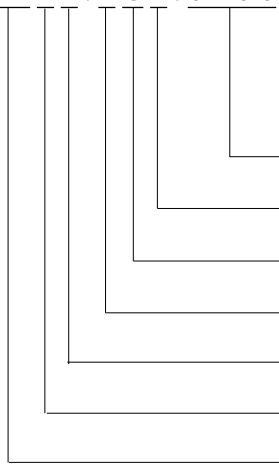
Synopsis see fold out page E63

2211.

d <sub>1</sub> / (Order No)	d <sub>2</sub>	P	l <sub>1</sub> / (Order No)		r	T	l / (Order Code character)				
							71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
3 (1)	5	0,8- 2,9	8 (1)	10 (2)	0,25	3	●	●	●	●	●
4 (2)	6	1,0- 3,9	8 (1)	13 (3)	0,25	3	●	●	●	●	●
5 (3)	8	1,5- 4,9	13 (3)	19 (4)	0,3	5	●	●	●	●	●
6 (4)	9	1,6- 5,9	13 (3)	19 (4)	0,3	5	●	●	●	●	●
8 (5)	11	2,5- 7,9	19 (4)	25 (5)	0,3	5	●	●	●	●	●
10 (6)	13	4,0- 9,9	19 (4)	25 (5)	0,3	5	●	●	●	●	●
13 (7)	16	5,0-12,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
16 (8)	19	8,0-15,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
20 (9)	23	12,0-19,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
25 (10)	28	16,5-24,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
32 (11)	35	20,0-31,9	25 (5)	30 (6)	0,4	5	●	●	●	●	●

**Ordering example:**

2 2 1 1 . 7 G 4 . 0 7 0 0



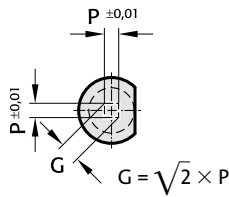
**Version: Round**  
 P = ø7,0 mm  
**Punch cutting length: l<sub>1</sub>**  
 19 mm  
**Length: l**  
 100 mm  
**Diameter: d<sub>1</sub>**  
 13 mm  
**Type:**  
 ISO  
**Version:**  
 Round  
**Punch:**  
 without ejector pin (22)

= (0700)  
**Order No**  
 = (4)  
**Order Code character**  
 = (G)  
**Order No**  
 = (7)  
**Order No**  
 = (1)  
**Order No**  
 = (1)

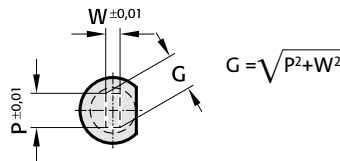
**Precision Punches,  
stepped, ISO 8020**

2221. 2231.  
2241. 2251.

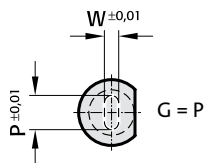
**2221. Version: Square (2)**



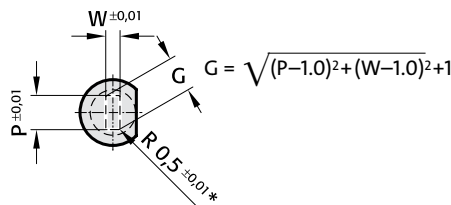
**2231. Version: Rectangular (3)**



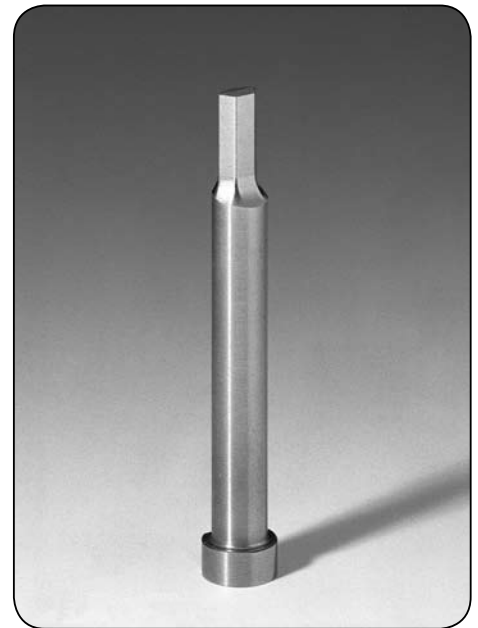
**2241. Version: Slot (4)**



**2251. Rectangle with radiused corners (5)**

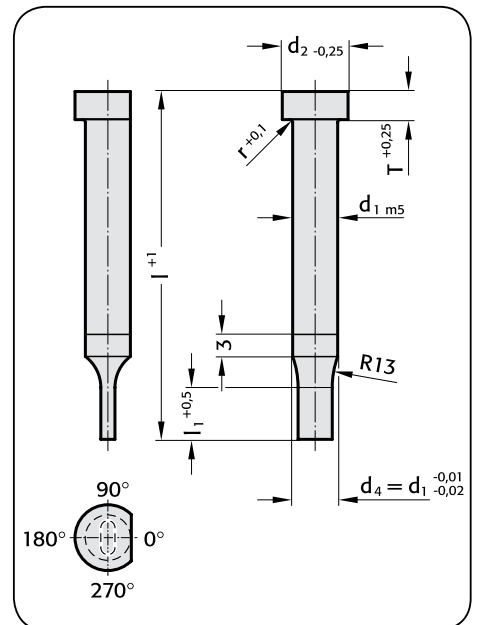


\* For other radius options, see standardised special shapes, pages E 100 – E 101



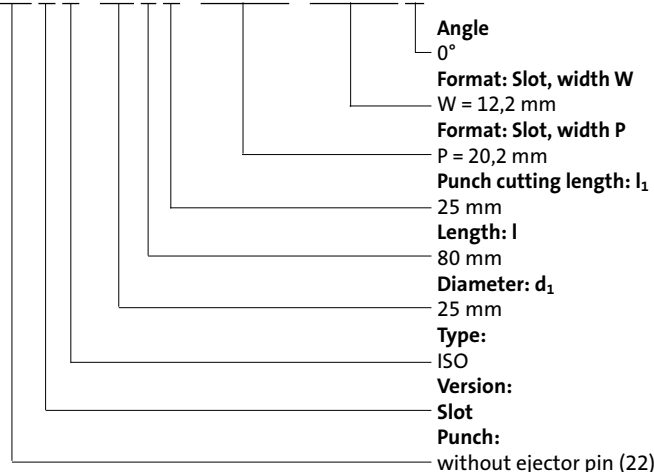
**2221./ 2231./ 2241. / 2251.**

d <sub>1</sub> /(Order No)	d <sub>2</sub>	W <sub>min.</sub>	G <sub>max.</sub>	l <sub>1</sub> /(Order No)	r	T	l/(Order Code character)					
							(D)	(E)	(F)	(G)	(J)	
3 (1)	5	0,5	2,9	8 (1)	10 (2)	0,25	3	●	●	●	●	●
4 (2)	6	0,8	3,9	8 (1)	13 (3)	0,25	3	●	●	●	●	●
5 (3)	8	1,0	4,9	13 (3)	19 (4)	0,3	5	●	●	●	●	●
6 (4)	9	1,6	5,9	13 (3)	19 (4)	0,3	5	●	●	●	●	●
8 (5)	11	2,0	7,9	19 (4)	25 (5)	0,3	5	●	●	●	●	●
10 (6)	13	3,5	9,9	19 (4)	25 (5)	0,3	5	●	●	●	●	●
13 (7)	16	4,5	12,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
16 (8)	19	6,0	15,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
20 (9)	23	8,0	19,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
25 (10)	28	10,0	24,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
32 (11)	35	10,0	31,9	25 (4)	30 (6)	0,4	5	●	●	●	●	●



**Ordering example:**

**2 2 4 1 . 1 0 E 5 . 2 0 2 0 . 1 2 2 0 A**



Order Code character = (A)  
= (1220)  
= (2020)  
Order No = (5)  
Order Code character = (E)  
Order No = (10)  
Order No = (1)  
Order No = (4)

**Material:**

HSS  
Hardness: shaft 64±2 HRC  
head 52±5 HRC

**Execution:**

Punch head hot upset-forged, shaft, shoulder and punch shape fine ground.

The anti-rotation surface parallel to P = 0° as standard.

ASP 23 – ASP 2023 upon request

**Ordering example:**

Synopsis see fold out page E63



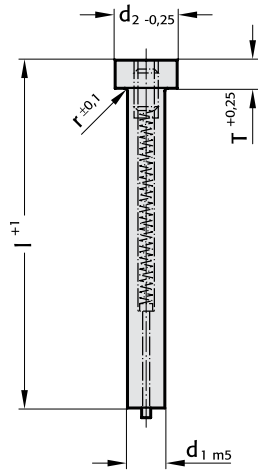
**FIBRO**

2701.

Precision Punches,  
blank, with ejector pin,  
ISO 8020



2701. Version: Blank (0)



**Material:**

HSS  
Hardness: shaft 64±2 HRC  
head 52±5 HRC

**Execution:**

Punch head hot upset-forged, shaft and shoulder fine ground.

**Ordering example:**

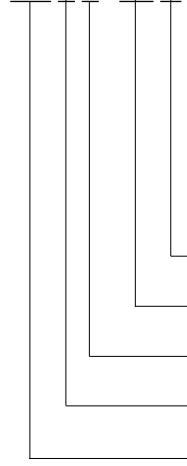
Synopsis see fold out page E63

2701.

d <sub>1</sub> / (Order No)	d <sub>2</sub>	r	T	l / (Order Code character)				
				71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 (3)	8	0,3	5	●	●	●	●	●
6 (4)	9	0,3	5	●	●	●	●	●
8 (5)	11	0,3	5	●	●	●	●	●
10 (6)	13	0,3	5	●	●	●	●	●
13 (7)	16	0,4	5	●	●	●	●	●
16 (8)	19	0,4	5	●	●	●	●	●
20 (9)	23	0,4	5	●	●	●	●	●
25 (10)	28	0,4	5	●	●	●	●	●
32 (11)	35	0,4	5	●	●	●	●	●

**Ordering example:**

2701.11G



**Length: l**  
100 mm  
**Diameter: d<sub>1</sub>**  
32 mm  
**Type:**  
ISO  
**Version:**  
Blank  
**Punch:**  
with ejector pin (27)

**Order Code character**  
= (G)  
**Order No**  
= (11)  
**Order No**  
= (1)  
**Order No**  
= (0)

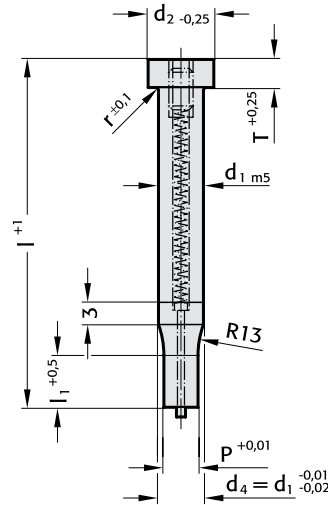
Precision Punches,  
stepped, with ejector pin,  
ISO 8020

FIBRO

2711.



2711. Version: Round (1)



Material:

HSS  
Hardness: shaft 64±2 HRC  
head 52±5 HRC

Execution:

Punch head hot upset-forged, shaft, shoulder and punch diameter fine ground.

Ordering example:

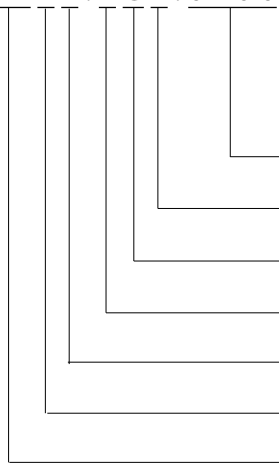
Synopsis see fold out page E63

2711.

d <sub>1</sub> / (Order No)	d <sub>2</sub>	P	l <sub>1</sub> / (Order No)		r	T	l / (Order Code character)				
							71 D)	80 (E)	90 (F)	100 (G)	120 (J)
5 (3)	8	1,6- 4,9	13 (3)	19 (4)	0,3	5	●	●	●	●	●
6 (4)	9	2,5- 5,9	13 (3)	19 (4)	0,3	5	●	●	●	●	●
8 (5)	11	2,5- 7,9	19 (4)	25 (5)	0,3	5	●	●	●	●	●
10 (6)	13	4,0- 9,9	19 (4)	25 (5)	0,3	5	●	●	●	●	●
13 (7)	16	5,0-12,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
16 (8)	19	8,0-15,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
20 (9)	23	12,0-19,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
25 (10)	28	16,5-24,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
32 (11)	35	20,0-31,9	25 (5)	30 (6)	0,4	5	●	●	●	●	●

Ordering example:

2711.7G4.0700



**Format: Round**  
P = ø7,0 mm  
**Punch cutting length: l<sub>1</sub>**  
19 mm  
**Length: l**  
100 mm  
**Diameter: d<sub>1</sub>**  
13 mm  
**Type:**  
ISO  
**Version:**  
Round  
**Punch:**  
with ejector pin (27)

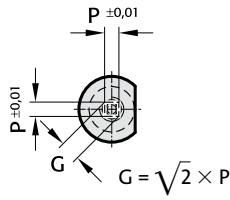
= (0700)  
**Order No**  
= (4)  
**Order Code character**  
= (G)  
**Order No**  
= (7)  
**Order No**  
= (1)  
**Order No**  
= (1)

# FIBRO

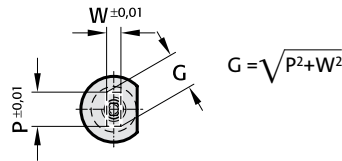
2721. 2731.  
2741. 2751.

## Precision Punches, stepped, with ejector pin, ISO 8020

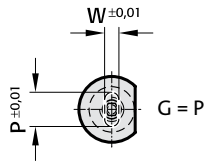
2721. Version: Square (2)



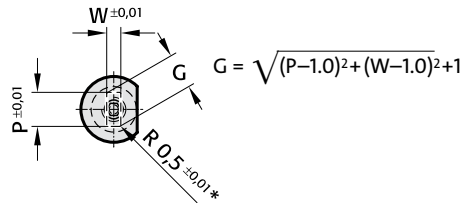
2731. Version: Rectangular (3)



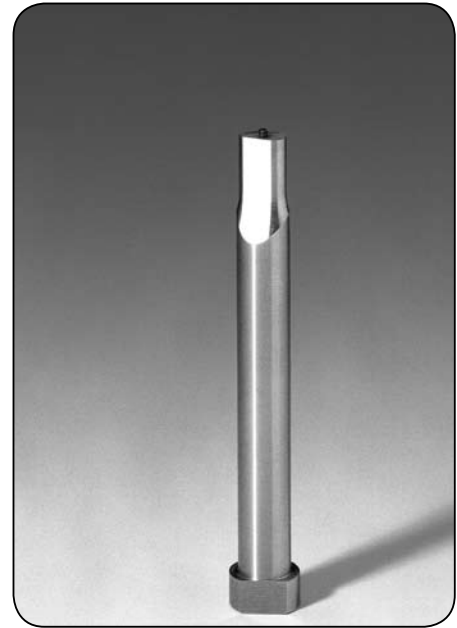
2741. Version: Slot (4)



2751. Rectangle with radiused corners (5)

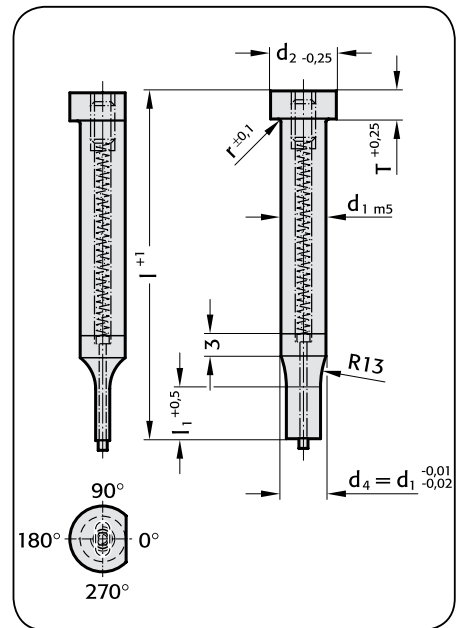


\* For other radius options, see standardised special shapes, pages E 100 – E 101



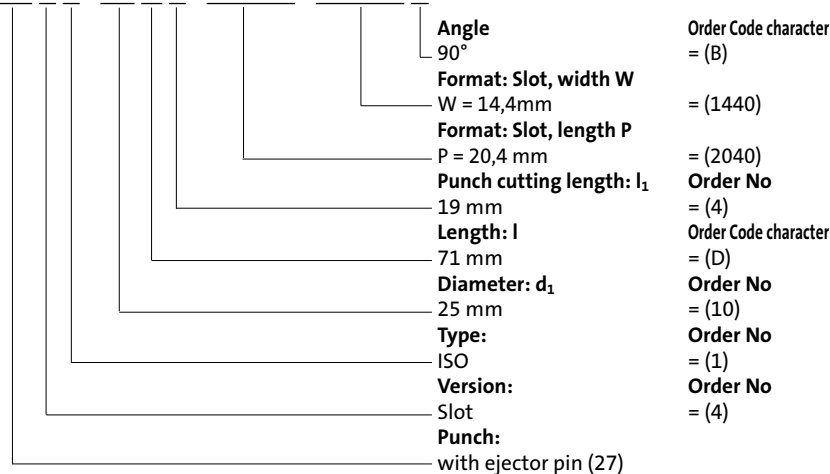
### 2721./ 2731./ 2741./ 2751.

d <sub>1</sub> / (Order No)	d <sub>2</sub>	W <sub>min.</sub>	G <sub>max.</sub>	l <sub>1</sub> / (Order No)	r	T	l / (Order Code character)					
							71 (D)	80 (E)	90 (F)	100 (G)	120 (J)	
5 (3)	8	1,6	4,9	13 (3)	19 (4)	0,3	5	●	●	●	●	●
6 (4)	9	2,5	5,9	13 (3)	19 (4)	0,3	5	●	●	●	●	●
8 (5)	11	2,5	7,9	19 (4)	25 (5)	0,3	5	●	●	●	●	●
10 (6)	13	4,0	9,9	19 (4)	25 (5)	0,3	5	●	●	●	●	●
13 (7)	16	5,0	12,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
16 (8)	19	8,0	15,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
20 (9)	23	12,0	19,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
25 (10)	28	16,5	24,9	19 (4)	25 (5)	0,4	5	●	●	●	●	●
32 (11)	35	20,0	31,9	25 (5)	30 (6)	0,4	5	●	●	●	●	●



### Ordering example:

2741.10D4.2040.1440B



### Material:

HSS  
Hardness: shaft 64±2 HRC  
head 52±5 HRC

### Execution:

Punch head hot upset-forged, shoulder, shaft and punch shape fine ground.

The anti-rotation surface parallel to P = 0° as standard.

### Ordering example:

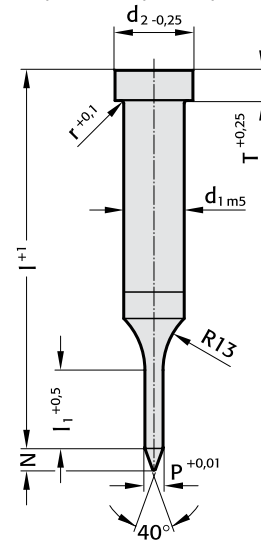
Synopsis see fold out page E63

Pilot Pins with tapered tip,  
ISO 8020

2261.



2261. Version: Pilot pin with tapered tip (6)

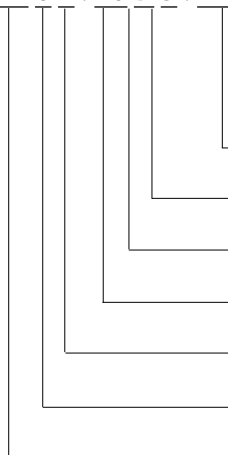


2261.

d <sub>1</sub> / (Order No)	d <sub>2</sub>	T	P	l <sub>1</sub> / (Order No)	N	l / (Order Code character)								
						63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (K)	140 (L)	
5 (3)	8	5	1,0- 4,9	13 (3) -- --	4	●	●							
6 (4)	9	5	1,6- 5,9	13 (3) -- --	5	●	●	●						
8 (5)	11	5	2,5- 7,9	13 (3) -- --	6	●	●	●	●					
10 (6)	13	5	4,0- 9,9	13 (3) 19 (4) --	8	●	●	●	●	●	●			
13 (7)	16	5	5,0-12,9	13 (3) 19 (4) --	10	●	●	●	●	●	●	●		
16 (8)	19	5	8,0-15,9	13 (3) 19 (4) 25 (5)	15		●	●	●	●	●	●	●	
20 (9)	23	5	12,0-19,9	13 (3) 19 (4) 25 (5)	20		●	●	●	●	●	●	●	●
25 (10)	28	5	16,5-24,9	13 (3) 19 (4) 25 (5)	25		●	●	●	●	●	●	●	●
32 (11)	35	5	20,0-31,9	-- 19 (4) 25 (5)	30			●	●	●	●	●	●	●

Ordering example:

2 2 6 1 . 1 0 D 3 . 1 7 5 0



**Format: Round**  
 P = ø 17,5 mm = (1750)  
**Punch cutting length l<sub>1</sub>:** Order No  
 25 mm = (3)  
**Length: l** Order Code character  
 71 mm = (D)  
**Diameter: d<sub>1</sub>** Order No  
 32 mm = (10)  
**Type:** Order No  
 ISO = (1)  
**Version:** Order No  
 Pilot pin with tapered tip = (6)  
**Punch:**  
 without ejector pin (22)

Material:

HSS  
 Hardness: shaft 64±2 HRC  
 head 52±5 HRC

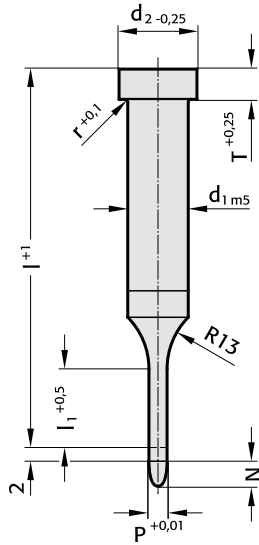
Execution:

Head hot upset-forged, shoulder, shaft and pilot fine ground.

Ordering example:

Synopsis see fold out page E63

**2271.** Version: Pilot pin parabolic tip (7)

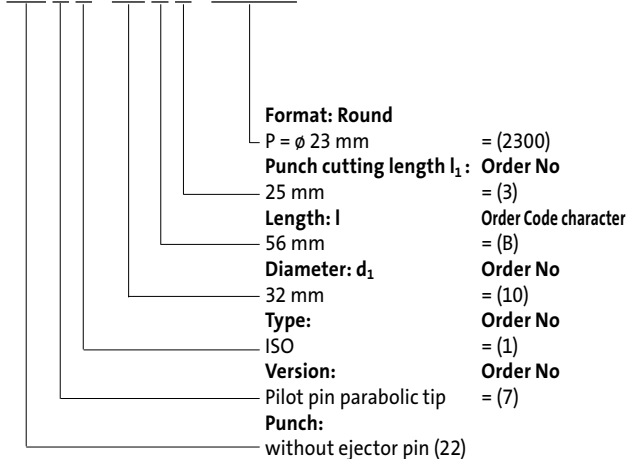


**2271.**

d <sub>1</sub> / (Order No)	d <sub>2</sub>	T	P	l <sub>1</sub> / (Order No)	l / (Order Code character)							
					50 (A)	56 (B)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	
5 (3)	8	5	1,0- 4,9	10 (2) 13 (3) --	●	●	●	●				
6 (4)	9	5	1,6- 5,9	10 (2) 13 (3) --	●	●	●	●	●			
8 (5)	11	5	2,5- 7,9	10 (2) 13 (3) --	●	●	●	●	●			
10 (6)	13	5	4,0- 9,9	10 (2) 13 (3) 19 (4)	●	●	●	●	●	●		●
13 (7)	16	5	5,0-12,9	10 (2) 13 (3) 19 (4)	●	●	●	●	●	●	●	●
16 (8)	19	5	8,0-15,9	-- 13 (3) 19 (4)	●	●	●	●	●	●	●	●
20 (9)	23	5	12,0-19,9	-- 13 (3) 19 (4)		●	●	●	●	●	●	●
25 (10)	28	5	16,5-24,9	-- 13 (3) 19 (4)		●	●	●	●	●	●	●
32 (11)	35	5	20,0-31,9	-- -- 19 (4)				●	●	●	●	●

**Ordering example:**

**2 2 7 1 . 1 0 B 3 . 2 3 0 0**



**Material:**

HSS  
 Hardness: shaft 64±2 HRC  
 head 52±5 HRC

**Execution:**

Head hot upset-forged, shoulder, shaft and pilot fine ground.

„l“ length of pilot pin is without tip

**Note:** The 2 mm length provides full guidance before the blanking punch contacts the sheet metal.

	P	N
	≤ 10 mm	8 mm
10,1 mm	- 15 mm	12 mm
	> 15 mm	15 mm

**Ordering example:**

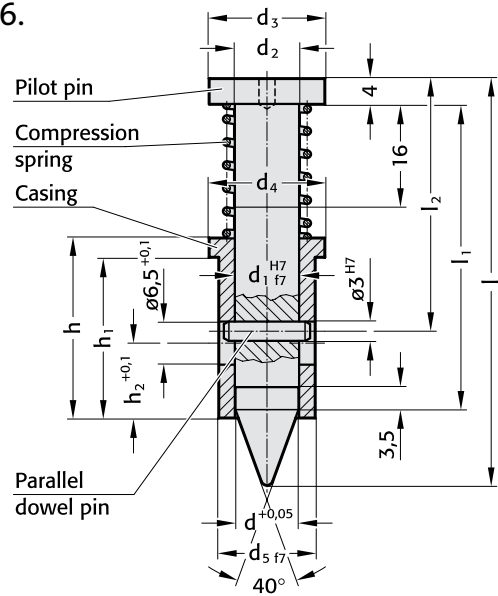
Synopsis see fold out page E63

Pilot Units  
to Daimler Standard

2276.



2276.



Description:

The pilot unit provides exact positioning of sheet metal parts. There are 2 sizes.

The pilot unit 10 can be used for a hole diameter of 5 ~ 10 mm and is available as a finished item, 9.8 mm diameter. Smaller diameters have to be ground by the tool making department.

The pilot unit 16 is used for diameter 10 - 16 mm and is available as a blank, 15.8 mm diameter.

Material:

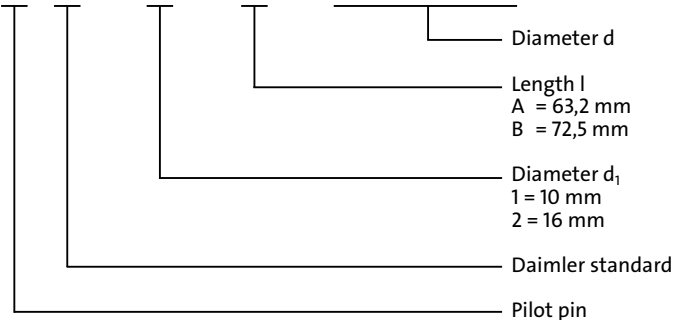
The pilot unit consists of:  
Pilot pin, Casing, Compression spring, Parallel dowel pin.

2276.

Order No	d	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>5</sub>	h	h <sub>1</sub>	h <sub>2</sub>	l <sub>1</sub>	l <sub>2</sub>	l	Spring force in daN	
													preloaded	compressed
2276.1.	9.8	10	10	18	18	15	28	25	12	47.5	39.3	63.2	4.9	6.2
2.	15.8	16	16	24	30	26	28	25	12	54.5	46.3	72.5	4.8	5.6

Ordering example:

2 2 7 6 . 1 . A . 0 9 8 0



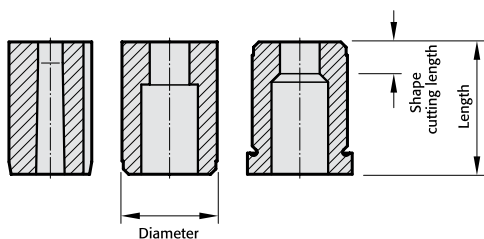
# Precision Matrixes

A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.



# Ordering example Precision Matrixes

NB: See table for standard dimensions  
Special dimensions to order



2 6 4 6 . 10 F 6 . 1 3 5 0 . 0 6 5 0 A 2

Matrixes:  
26 matrixes

Format: Slot length  
P = 13,5 mm

Format:  
Slot width  
W = 6,5 mm

Version:	Order No
⊙ blank (pilot hole bore)	= 0
⊙ round	= 1
⊠ square	= 2
⊡ rectangular	= 3
⊓ slot	= 4
⊔ rectangle with radiused corners	= 5
⊕ special shapes	= 9

Shape cutting length: l	Order No
2	= 1
3	= 2
4	= 3
5	= 4
6	= 5
8	= 6
10	= 7
12	= 8
special	= X

Diameter: d <sub>2</sub>	Order No
5	= 1
6	= 2
8	= 3
10	= 4
13	= 5
16	= 6
20	= 7
22	= 8
25	= 9
32	= 10
38	= 11
40	= 12
45	= 13
50	= 14
56	= 15
63	= 16
71	= 17
76	= 18
86	= 19
90	= 20
100	= 21

Length: l <sub>1</sub>	Order Code character
13	= A
16	= B
20	= C
22	= D
25	= E
28	= F
30	= G
32	= H
35	= J
40	= K
special	= X

Angle:	Order Code character
0°	= A
90°	= B
180°	= C
270°	= D
special	= X

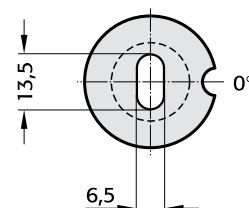
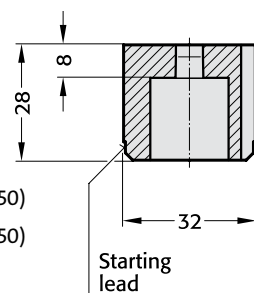
Anti-rotation element:	Order No
pin Ø 3	= 1
pin Ø 4	= 2
pin Ø 6	= 3
polished surface (continuous)	= 4
polished surface, top, 14 mm	= 5
polished surface, bottom, 14 mm	= 6
special	= X

Type:	Order No
automotive standard	= 5
without shoulder ISO 8977	= 6
with shoulder ISO 8977	= 7

## Ordering Code (Example):

2 6 4 6 . 10 F 6 . 1 3 5 0 . 0 6 5 0 A 2

- Anti-rotation element = Pin Ø4 (2)
- Angle = 0° (A)
- Format: Slot, width W = 6,5 mm (0650)
- Format: Slot, length P = 13,5 mm (1350)
- Shape cutting length: l = 8 mm (6)
- Length: l<sub>1</sub> = 28 mm (F)
- Diameter: d<sub>2</sub> = 32 mm (10)
- Type = without shoulder ISO 8977 (6)
- Version: Slot (4)
- Matrixes:  
Matrixes (26)





2606.

**Material:**

HSS  
hardened: 62 ± 2 HRC

**Execution:**

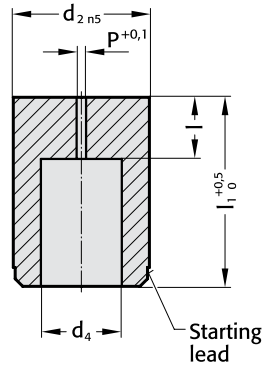
Diameter  $d_2$ , starting lead and face surfaces ground.  
Diameter P is a bored pilot hole for wire EDM.

**Ordering example:**

Synopsis see fold out page E75.

**2606.**

Version: Blank (Pilot hole bore) (0)



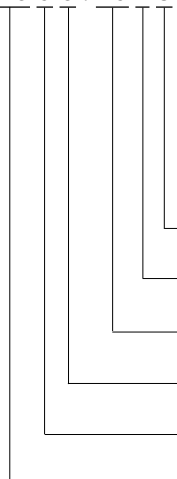
**2606.**

$d_2$ / (Order No)	$d_4$	P	l / (Order No)	$l_1$ / (Order Code character)										
				16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)		
5 (1)	2,8	0,8	2 (1)	●	●	●	●	●	●	●	●	●		
6 (2)	3,5	1,0	3 (2)	●	●	●	●	●	●	●	●	●		
8 (3)	4,0	1,0	4 (3)	●	●	●	●	●	●	●	●	●		
10 (4)	5,8	1,0	4 (3) 8 (6)	●	●	●	●	●	●	●	●	●		
13 (5)	8,0	1,2	5 (4) 8 (6)		●	●	●	●	●	●	●	●		
16 (6)	9,5	1,2	5 (4) 8 (6)		●	●	●	●	●	●	●	●		
20 (7)	12,0	1,5	8 (6) 12 (8)		●	●	●	●	●	●	●	●		
22 (8)	15,0	1,5	8 (6) 12 (8)		●	●	●	●	●	●	●	●		
25 (9)	17,3	1,5	8 (6) 12 (8)		●	●	●	●	●	●	●	●		
32 (10)	20,7	1,5	8 (6) 12 (8)		●	●	●	●	●	●	●	●		
40 (12)	27,7	1,5	8 (6) 12 (8)				●	●	●	●	●	●		
50 (14)	37,0	1,5	8 (6) 12 (8)				●	●	●	●	●	●	●	

Other lengths on request

**Ordering example:**

**2606.10F8**



**Shape cutting length: l**

12 mm

**Length:  $l_1$**

28 mm

**Diameter:  $d_2$**

32 mm

**Type:**

without sholder ISO 8977

**Version:**

Blank (pilot hole bore)

**Matrixes:**

26 Matrixes

**Order No**

= (8)

**Order Code character**

= (F)

**Order No**

= (10)

**Order No**

= (6)

**Order No**

= (0)

Precision Matrixes  
without shoulder, cylindrical  
ISO 8977

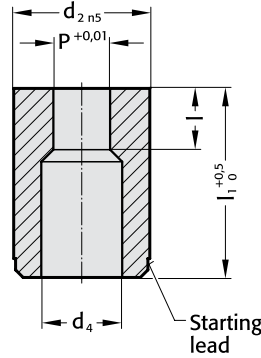
FIBRO

2616.



2616.

Version: Round (1)



Material:

HSS  
hardened: 62 ± 2 HRC

Execution:

Diameter  $d_2$ , starting lead and face surfaces ground.

Ordering example:

Synopsis see fold out page E75.

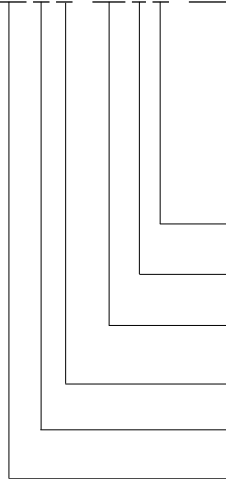
2616.

$d_2$ / (Order No)	$d_4$	P	l / (Order No)	$l_1$ / (Order Code character)									
				16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)	
5 (1)	2,8	1,0- 2,4	2 (1)	●	●	●	●	●	●	●	●	●	●
6 (2)	3,5	1,6- 3,0	3 (2)	●	●	●	●	●	●	●	●	●	●
8 (3)	4,0	2,0- 3,5	4 (3)	●	●	●	●	●	●	●	●	●	●
10 (4)	5,8	2,5- 5,0	4 (3) 8 (6)	●	●	●	●	●	●	●	●	●	●
13 (5)	8,0	4,0- 7,0	5 (4) 8 (6)		●	●	●	●	●	●	●	●	●
16 (6)	9,5	6,0- 9,0	5 (4) 8 (6)		●	●	●	●	●	●	●	●	●
20 (7)	12,0	8,0-11,0	8 (6) 12 (8)		●	●	●	●	●	●	●	●	●
22 (8)	15,0	9,0-14,0	8 (6) 12 (8)		●	●	●	●	●	●	●	●	●
25 (9)	17,3	10,7-16,0	8 (6) 12 (8)		●	●	●	●	●	●	●	●	●
32 (10)	20,7	15,0-20,0	8 (6) 12 (8)		●	●	●	●	●	●	●	●	●
40 (12)	27,7	19,0-27,0	8 (6) 12 (8)				●	●	●	●	●	●	●
50 (14)	37,0	26,0-36,0	8 (6) 12 (8)					●	●	●	●	●	●

Other lengths on request

Ordering example: without anti-rotation element

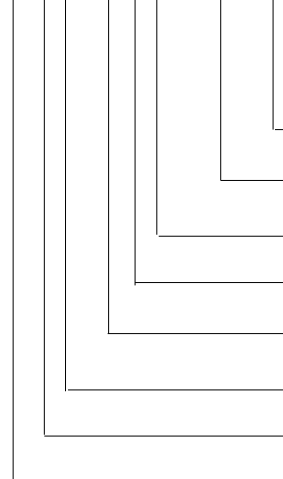
2 6 1 6 . 1 0 F 8 . 1 5 1 0



**Format: Round**  
P =  $\varnothing$  15,1 mm = (1510)  
**Shape cutting length: l** = (8)  
12 mm = (8)  
**Length:  $l_1$**  = (F)  
28 mm = (F)  
**Diameter:  $d_2$**  = (10)  
32 mm = (10)  
**Type:** = (6)  
without sholder ISO 8977 = (6)  
**Version:** = (1)  
Round = (1)  
**Matrixes:**  
26 Matrixes

Ordering example: with anti-rotation element from  $d_2 \geq 10$  mm

2 6 1 6 . 1 0 F 8 . 1 5 1 0 A 4



**Anti-rotation element:** = (4)  
Polished surface (continuous)  
**Angle:** = (A)  
0° = (A)  
**Format: Round**  
P =  $\varnothing$  15,1 mm = (1510)  
**FormschneidLength: l** = (8)  
12 mm = (8)  
**Length:  $l_1$**  = (F)  
28 mm = (F)  
**Diameter:  $d_2$**  = (10)  
32 mm = (10)  
**Type:** = (6)  
without sholder ISO 8977 = (6)  
**Version:** = (1)  
Round = (1)  
**Matrixes:**  
26 Matrixes

anti-rotation element 1 (1)

Pin $\varnothing 3$	
$d_2$	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
40	20
50	25

anti-rotation element 2 (2)

Pin $\varnothing 4$	
$d_2$	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
40	20
50	25

anti-rotation element 3 (3)

Pin $\varnothing 6$	
$d_2$	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
40	20
50	25

anti-rotation element 4 (4)

$d_2$	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
40	18
50	23

anti-rotation element 5 (5)

$d_2$	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
40	18
50	23

anti-rotation element 6 (6)

$d_2$	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
40	18
50	23

Ordering example:  
Synopsis see fold out page E75.

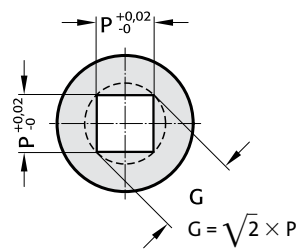
**Precision Matrixes  
without shoulder, cylindrical  
ISO 8977**

**FIBRO**

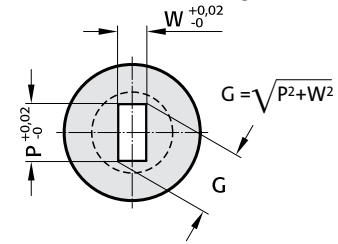
2626. 2636.  
2646. 2656.



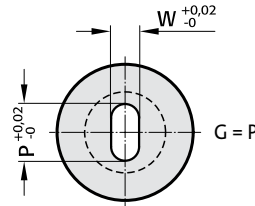
**2626. Version: Square (2)**



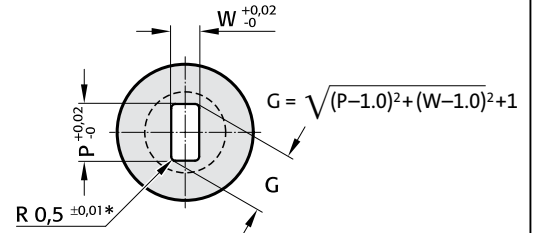
**2636. Version: Rectangular (3)**



**2646. Version: Slot (4)**



**2656. Version: Rectangle with radiused corners (5)**



\* For other radius options, see standardised special shapes, pages E100 – E101.

**Material:**

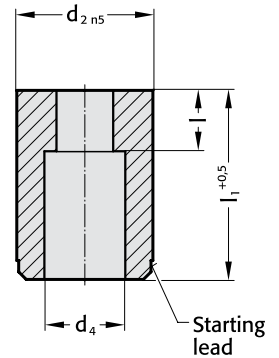
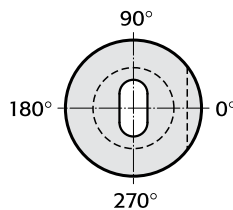
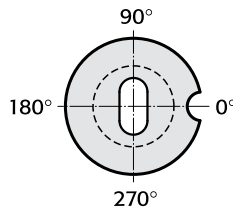
HSS  
hardened: 62 ± 2 HRC

**Execution:**

Diameter  $d_2$ , starting lead and face surfaces ground.

**Ordering example:**

Synopsis see fold out page E75.



**2626./ 2636./ 2646./ 2456.**

$d_2$ / (Order No)	$d_4$	$W_{min.}$	$G_{max.}$	l / (Order No)		$l_1$ / (Order Code character)											
						16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)			
10 (4)	5,8	1,2	5,0	4 (3)	8 (6)	●	●	●	●	●	●	●	●	●	●	●	●
13 (5)	8,0	2,0	7,0	5 (4)	8 (6)		●	●	●	●	●	●	●	●	●	●	●
16 (6)	9,5	2,4	9,0	5 (4)	8 (6)		●	●	●	●	●	●	●	●	●	●	●
20 (7)	12,0	3,2	11,0	8 (6)	12 (8)		●	●	●	●	●	●	●	●	●	●	●
22 (8)	15,0	4,0	14,0	8 (6)	12 (8)		●	●	●	●	●	●	●	●	●	●	●
25 (9)	17,3	4,8	16,0	8 (6)	12 (8)		●	●	●	●	●	●	●	●	●	●	●
32 (10)	20,7	5,5	20,0	8 (6)	12 (8)			●	●	●	●	●	●	●	●	●	●
40 (12)	27,7	6,4	27,0	8 (6)	12 (8)				●	●	●	●	●	●	●	●	●
50 (14)	37,0	9,0	36,0	8 (6)	12 (8)				●	●	●	●	●	●	●	●	●

Other lengths on request

anti-rotation element 1 (1)

Pin $\varnothing 3$	
$d_2$	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
40	20
50	25

Starting lead

$d_{2\ ns}$

F

90°

180°

0°

270°

anti-rotation element 2 (2)

Pin $\varnothing 4$	
$d_2$	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
40	20
50	25

Starting lead

$d_{2\ ns}$

F

90°

180°

0°

270°

anti-rotation element 3 (3)

Pin $\varnothing 6$	
$d_2$	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
40	20
50	25

Starting lead

$d_{2\ ns}$

F

90°

180°

0°

270°

anti-rotation element 4 (4)

$d_2$	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
40	18
50	23

Starting lead

$d_{2\ ns}$

F

90°

180°

0°

270°

anti-rotation element 5 (5)

$d_2$	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
40	18
50	23

Starting lead

$d_{2\ ns}$

F

90°

180°

0°

270°

anti-rotation element 6 (6)

$d_2$	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
40	18
50	23

Starting lead

$d_{2\ ns}$

F

90°

180°

0°

270°

**Ordering example:**

2636.10F8.1350.0650A4

Anti-rotation element:

Polished surface  
(continuous)

Angle:  
0°

Format: Rectangular, width W

W = 6,5 mm

Format: Rectangular, length P

P = 13,5 mm

Shape cutting length: l

12 mm

Length:  $l_1$

28 mm

Diameter:  $d_2$

32 mm

Type:  
without sholder ISO 8977

Version:

Rectangular

Matrixes:

26 Matrixes

Order No

= (4)

Order Code character

= (A)

= (0650)

= (1350)

Order No

= (8)

Order Code character

= (F)

Order No

= (10)

Order No

= (6)

Order No

= (3)

**Ordering example:**

Synopsis see fold out page E75.





# FIBRO

2607.

## Precision Matrixes with shoulder, cylindrical, ISO 8977

### Material:

HSS  
hardened: 62 ± 2 HRC

### Execution:

Diameter  $d_2$ , and end faces ground.

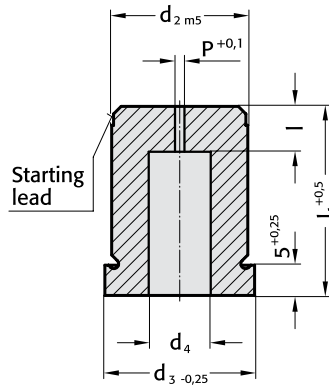
Diameter P is a bored pilot hole for wire EDM.

### Ordering example:

Synopsis see fold out page E75.

### 2607.

Version: Blank (pilot hole bore) (0)



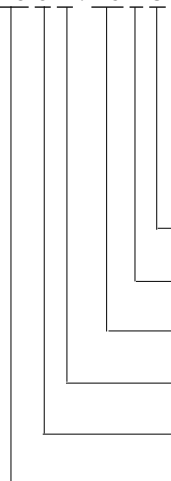
### 2607.

$d_2$ /(Order No)	$d_3$	$d_4$	P	l/(Order No)	$l_1$ /(Order Code character)							
					16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)
5 (1)	8	2,8	0,8	2 (1)	●	●	●	●	●	●	●	●
6 (2)	9	3,5	1,0	3 (2)	●	●	●	●	●	●	●	●
8 (3)	11	4,0	1,0	4 (3)	●	●	●	●	●	●	●	●
10 (4)	13	5,8	1,0	4 (3) 8 (6)	●	●	●	●	●	●	●	●
13 (5)	16	8,0	1,2	5 (4) 8 (6)		●	●	●	●	●	●	●
16 (6)	19	9,5	1,2	5 (4) 8 (6)		●	●	●	●	●	●	●
20 (7)	23	12,0	1,5	8 (6) 12 (8)		●	●	●	●	●	●	●
22 (8)	25	15,0	1,5	8 (6) 12 (8)		●	●	●	●	●	●	●
25 (9)	28	17,3	1,5	8 (6) 12 (8)		●	●	●	●	●	●	●
32 (10)	35	20,7	1,5	8 (6) 12 (8)		●	●	●	●	●	●	●
40 (12)	43	27,7	1,5	8 (6) 12 (8)		●	●	●	●	●	●	●
50 (14)	53	37,0	1,5	8 (6) 12 (8)		●	●	●	●	●	●	●

Other lengths on request

### Ordering example:

2607.10F8



Shape cutting length: l

12 mm

Length:  $l_1$

28 mm

Diameter:  $d_2$

32 mm

Type:

with sholder ISO 8977

Version:

Blank (pilot hole bore)

Matrixes:

26 Matrixes

Order No

= (8)

Order Code character

= (F)

Order No

= (10)

Order No

= (7)

Order No

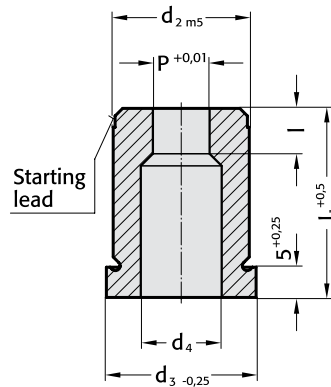
= (0)

Precision Matrixes with shoulder, cylindrical, ISO 8977

2617.



2617. Version: Round (1)



Material:

HSS  
hardened: 62 ± 2 HRC

Execution:

Diameter  $d_2$ , and end faces ground.

Ordering example:

Synopsis see fold out page E75.

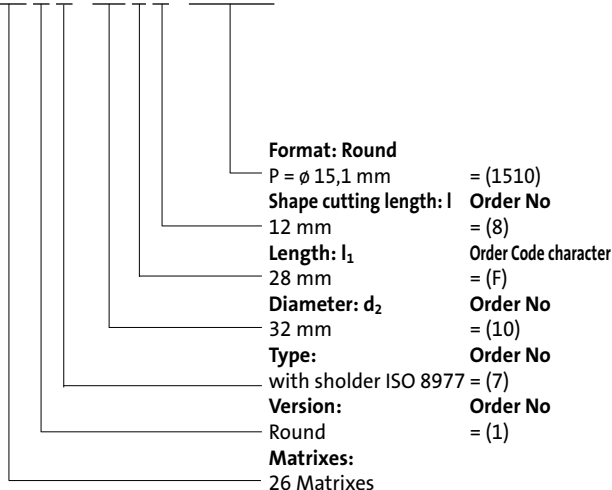
2617.

$d_2$ / (Order No)	$d_3$	$d_4$	P	l / (Order No)	$l_1$ / (Order Code character)							
					16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)
5 (1)	8	2,8	1,0- 2,4	2 (1)	●	●	●	●	●	●	●	●
6 (2)	9	3,5	1,6- 3,0	3 (2)	●	●	●	●	●	●	●	●
8 (3)	11	4,0	2,0- 3,5	4 (3)	●	●	●	●	●	●	●	●
10 (4)	13	5,8	2,5- 5,0	4 (3) 8 (6)	●	●	●	●	●	●	●	●
13 (5)	16	8,0	4,0- 7,0	5 (4) 8 (6)		●	●	●	●	●	●	●
16 (6)	19	9,5	6,0- 9,0	5 (4) 8 (6)		●	●	●	●	●	●	●
20 (7)	23	12,0	8,0-11,0	8 (6) 12 (8)		●	●	●	●	●	●	●
22 (8)	25	15,0	9,0-14,0	8 (6) 12 (8)		●	●	●	●	●	●	●
25 (9)	28	17,3	10,7-16,0	8 (6) 12 (8)		●	●	●	●	●	●	●
32 (10)	35	20,7	15,0-20,0	8 (6) 12 (8)		●	●	●	●	●	●	●
40 (12)	43	27,7	19,0-27,0	8 (6) 12 (8)		●	●	●	●	●	●	●
50 (14)	53	37,0	26,0-36,0	8 (6) 12 (8)		●	●	●	●	●	●	●

Other lengths on request

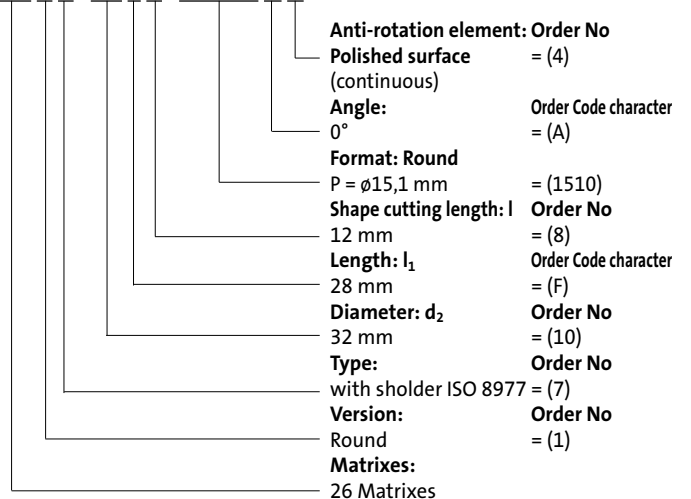
Ordering example: without anti-rotation element

2617.10F8.1510



Ordering example: with anti-rotation element from  $d_2 \geq 8$  mm

2617.10F8.1510A4



Anti-rotation element 1 (1)

Starting lead

Pin $\varnothing 3$	
$d_2$	F
8	5,5
10	6,5
13	8
16	9,5
20	11,5
22	12,5
25	14
32	17,5
40	21,5
50	26,5

Anti-rotation element 2 (2)

Starting lead

Pin $\varnothing 4$	
$d_2$	F
8	6
10	7
13	8,5
16	10
20	12
22	13
25	14,5
32	18
40	22
50	27

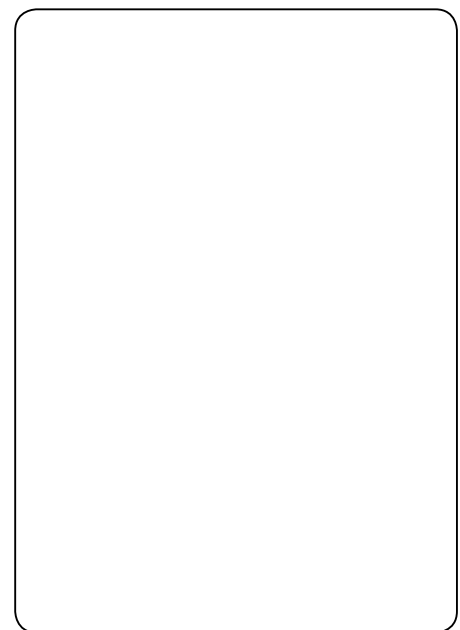
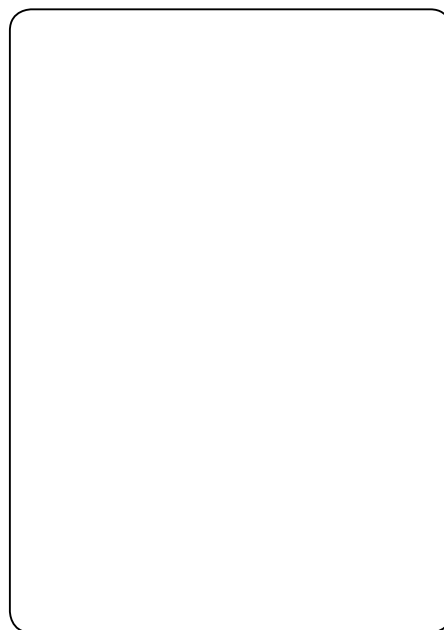
Anti-rotation element 3 (3)

Starting lead

Pin $\varnothing 6$	
$d_2$	F
8	7
10	8
13	9,5
16	11
20	13
22	14
25	15,5
32	19
40	23
50	28

Anti-rotation element 4 (4)

Starting lead



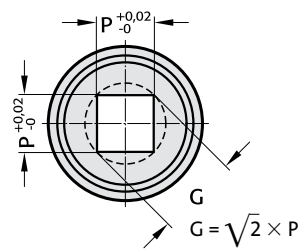
**Ordering example:**  
Synopsis see fold out page E75.

Precision Matrixes with shoulder,  
cylindrical ISO 8977

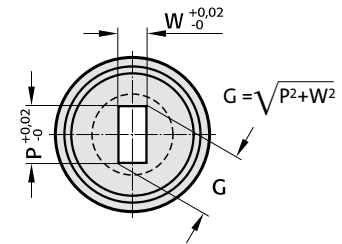
2627. 2637.  
2647. 2657.



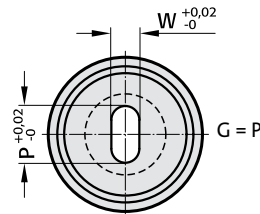
2627. Version: Square (2)



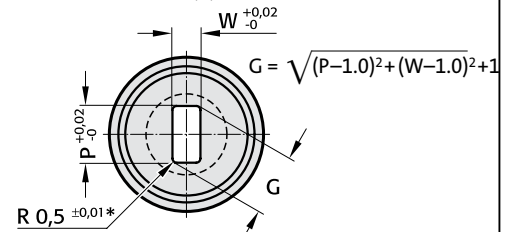
2637. Version: Rectangular (3)



2647. Version: Slot (4)



2657. Version: Rectangle with radiused corners (5)



\* For other radius options, see standardised special shapes, pages E100 – E101.

**Material:**

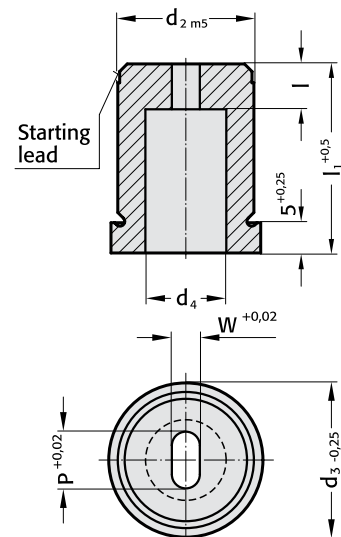
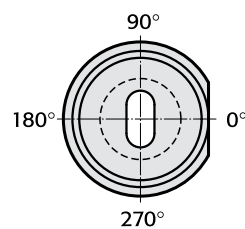
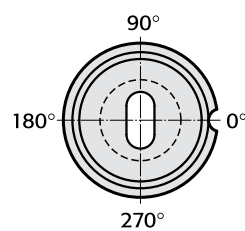
HSS  
hardened: 62 ± 2 HRC

**Execution:**

Diameter  $d_2$ , and end faces ground.

**Ordering example:**

Synopsis see fold out page E75.



2627./ 2637./ 2647./ 2457.

$d_2$ /(Order No)	$d_3$	$d_4$	$W_{min.}$	$G_{max.}$	I/(Order No)	$l_1$ /(Order Code character)										
						16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)			
8 (3)	11	4,0	1,2	3,5	4 (3)	●	●	●	●	●	●	●	●	●	●	●
10 (4)	13	5,8	1,2	5,0	4 (3) 8 (6)	●	●	●	●	●	●	●	●	●	●	●
13 (5)	16	8,0	2,0	7,0	5 (4) 8 (6)		●	●	●	●	●	●	●	●	●	●
16 (6)	19	9,5	2,4	9,0	5 (4) 8 (6)		●	●	●	●	●	●	●	●	●	●
20 (7)	23	12,0	3,2	11,0	8 (6) 12 (8)		●	●	●	●	●	●	●	●	●	●
22 (8)	25	15,0	4,0	14,0	8 (6) 12 (8)		●	●	●	●	●	●	●	●	●	●
25 (9)	28	17,3	4,8	16,0	8 (6) 12 (8)		●	●	●	●	●	●	●	●	●	●
32 (10)	35	20,7	5,5	20,0	8 (6) 12 (8)		●	●	●	●	●	●	●	●	●	●
40 (12)	43	27,7	6,4	27,0	8 (6) 12 (8)		●	●	●	●	●	●	●	●	●	●
50 (14)	53	37,0	6,4	36,0	8 (6) 12 (8)		●	●	●	●	●	●	●	●	●	●

Other lengths on request

Anti-rotation element 1 (1)

Starting lead

Pin $\varnothing 3$	
$d_2$	F
8	5,5
10	6,5
13	8
16	9,5
20	11,5
22	12,5
25	14
32	17,5
40	21,5
50	26,5

Anti-rotation element 2 (2)

Starting lead

Pin $\varnothing 4$	
$d_2$	F
8	6
10	7
13	8,5
16	10
20	12
22	13
25	14,5
32	18
40	22
50	27

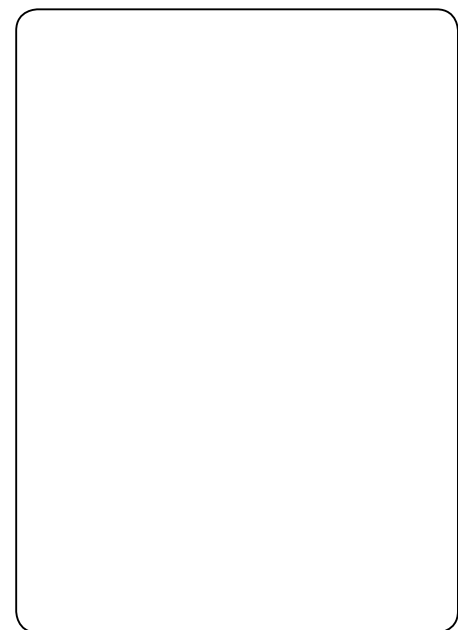
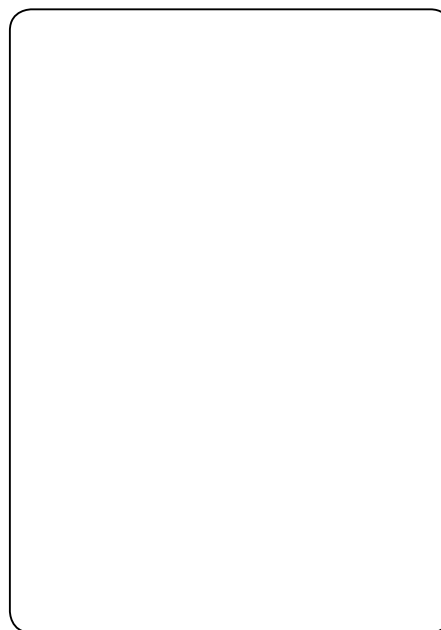
Anti-rotation element 3 (3)

Starting lead

Pin $\varnothing 6$	
$d_2$	F
8	7
10	8
13	9,5
16	11
20	13
22	14
25	15,5
32	19
40	23
50	28

Anti-rotation element 4 (4)

Starting lead



**Ordering example:**

2 6 3 7 . 10 F 8 . 13 5 0 . 06 5 0 A 4

- Anti-rotation element: Order No = (4)
- Polished surface (continuous)
- Angle: Order Code character = (A)
- 0°
- Format: Rectangular, width W = (0650)
- W = 6,5 mm
- Format: Rectangular, length P = (1350)
- P = 13,5 mm
- Shape cutting length: l = (8)
- 12 mm
- Length:  $l_1$  = (F)
- 28 mm
- Diameter:  $d_2$  = (10)
- 32 mm
- Type: Order No = (7)
- with sholder ISO 8977
- Version: Order No = (3)
- Rectangular
- Matrixes: 26 Matrixes

**Ordering example:**

Synopsis see fold out page E75.

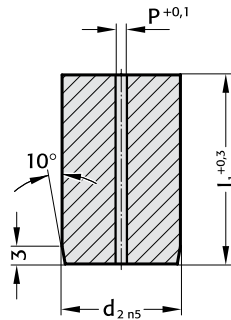
Matrixes without shoulder,  
automotive standard

2605.



2605.

Version: Blank (pilot hole bore) (0)



Material:

HSS  
hardened: 62±2 HRC

Execution:

Diameter  $d_2$ , and end faces ground.  
Diameter P is a bored pilot hole for wire EDM

Ordering example:

Synopsis see fold out page E75.

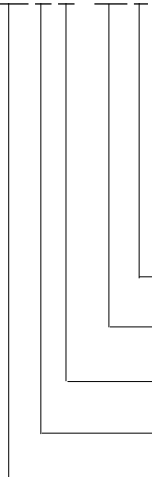
2605.

$d_2$ / (Order No)	P	$l_1$ / (Order Code character)										
		13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)	
10 (4)	0,8	●	●	●	●	●	●	●	●	●	●	●
13 (5)	0,8	●	●	●	●	●	●	●	●	●	●	●
16 (6)	1,5			●	●	●	●	●	●	●	●	●
20 (7)	2,4			●	●	●	●	●	●	●	●	●
22 (8)	3,0			●	●	●	●	●	●	●	●	●
25 (9)	3,0			●	●	●	●	●	●	●	●	●
32 (10)	3,0			●	●	●	●	●	●	●	●	●
38 (11)	3,0			●	●	●	●	●	●	●	●	●
40 (12)	3,0				●	●	●	●	●	●	●	●
45 (13)	3,0				●	●	●	●	●	●	●	●
50 (14)	3,0				●	●	●	●	●	●	●	●
56 (15)	3,0				●	●	●	●	●	●	●	●
63 (16)	3,0				●	●	●	●	●	●	●	●
71 (17)	3,0				●	●	●	●	●	●	●	●
76 (18)	3,0				●	●	●	●	●	●	●	●
86 (19)	3,0				●	●	●	●	●	●	●	●
90 (20)	3,0				●	●	●	●	●	●	●	●
100 (21)	3,0				●	●	●	●	●	●	●	●

Other lengths on request

Ordering example:

2605.10F



Length:  $l_1$   
28 mm  
Diameter:  $d_2$   
32 mm  
Type:  
without sholder Automotive Standaard  
Version:  
Blank (pilot hole bore)  
Matrixes:  
26 Matrixes

Order Code character  
= (F)  
Order No  
= (10)  
Order No  
= (5)  
Order No  
= (0)

**Material:**

HSS  
hardened: 62±2 HRC

**Execution:**

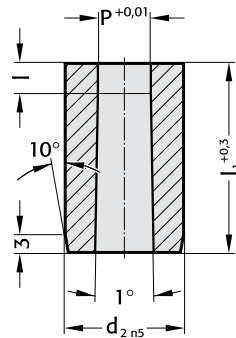
Diameter  $d_2$ , and end faces ground.

**Ordering example:**

Synopsis see fold out page E75.

**2615.**

Version: Round (1)



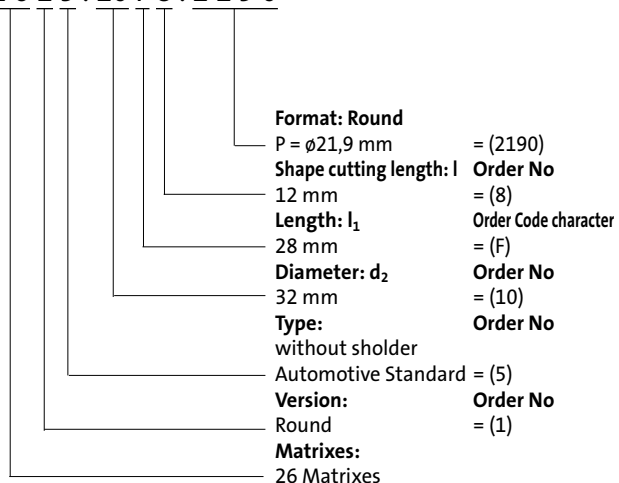
**2615.**

$d_2$ / (Order No)	P	l / (Order No)	$l_1$ / (Order Code character)									
			13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 (4)	1,6- 6,8	3 (2) 4 (3) 5 (4)	●	●	●	●	●	●	●	●	●	●
13 (5)	3,0- 8,8	3 (2) 5 (4) 8 (6)	●	●	●	●	●	●	●	●	●	●
16 (6)	7,4-10,8	3 (2) 5 (4) 8 (6)			●	●	●	●	●	●	●	●
20 (7)	9,5-13,6	3 (2) 5 (4) 10 (7)			●	●	●	●	●	●	●	●
22 (8)	10,5-15,0	3 (2) 6 (5) 10 (7)			●	●	●	●	●	●	●	●
25 (9)	12,0-17,0	3 (2) 6 (5) 10 (7)			●	●	●	●	●	●	●	●
32 (10)	16,0-22,0	3 (2) 6 (5) 12 (8)			●	●	●	●	●	●	●	●
38 (11)	18,0-27,0	3 (2) 8 (6) 12 (8)			●	●	●	●	●	●	●	●
40 (12)	18,0-27,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●
45 (13)	18,0-35,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●
50 (14)	18,0-40,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●
56 (15)	18,0-45,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●
63 (16)	18,0-50,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●
71 (17)	18,0-56,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●
76 (18)	25,0-60,0	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●
86 (19)	25,0-66,0	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●
90 (20)	32,0-70,0	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●
100 (21)	32,0-78,0	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●

Other lengths on request

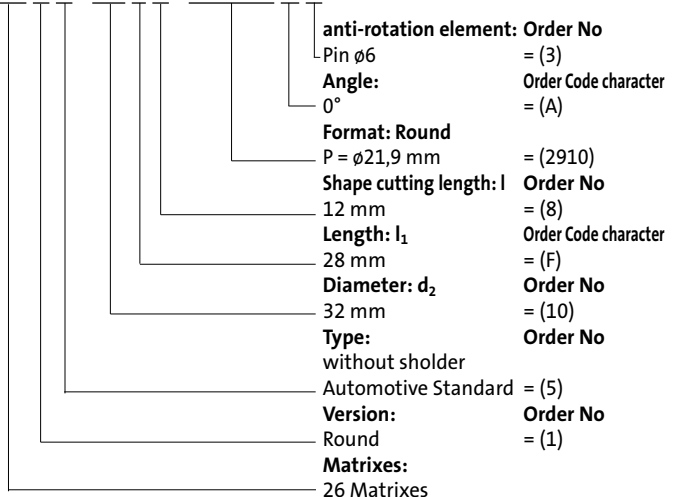
**Ordering example: without anti-rotation element**

**2 6 1 5 . 1 0 F 8 . 2 1 9 0**



**Ordering example: with anti-rotation element**

**2 6 1 5 . 1 0 F 8 . 2 1 9 0 A 3**

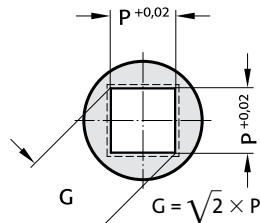


**Matrixes without shoulder, automotive standard**

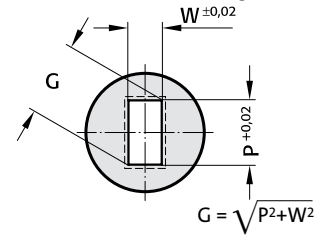
2625. 2635.  
2645. 2655.



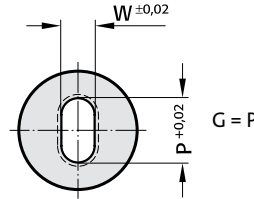
**2625. Version: Square (2)**



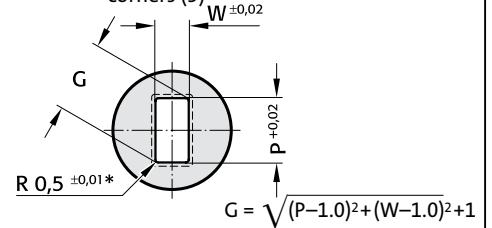
**2635. Version: Rectangular (3)**



**2645. Version: Slot (4)**



**2655. Version: Rectangle with radiused corners (5)**



\* For other radius options, see standardised special shapes, pages E100 – E101.

**2625./ 2635./ 2645./ 2655.**

d <sub>2</sub> /(Order No)	W <sub>min</sub>	G <sub>max</sub>	l/(Order No)	l <sub>1</sub> /(Order Code character)											
				13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)		
10 (4)	1,3	6,8	3 (2) 4 (3) 5 (4)	●	●	●	●	●	●	●	●	●	●	●	●
13 (5)	1,9	8,8	3 (2) 5 (4) 8 (6)	●	●	●	●	●	●	●	●	●	●	●	●
16 (6)	1,9	10,8	3 (2) 5 (4) 8 (6)			●	●	●	●	●	●	●	●	●	●
20 (7)	1,9	13,6	3 (2) 5 (4) 10 (7)			●	●	●	●	●	●	●	●	●	●
22 (8)	1,9	15,0	3 (2) 6 (5) 10 (7)			●	●	●	●	●	●	●	●	●	●
25 (9)	1,9	17,0	3 (2) 6 (5) 10 (7)			●	●	●	●	●	●	●	●	●	●
32 (10)	1,9	22,0	3 (2) 6 (5) 12 (8)			●	●	●	●	●	●	●	●	●	●
38 (11)	1,9	27,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●	●
40 (12)	1,9	27,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●	●
45 (13)	2,4	35,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●	●
50 (14)	4,0	40,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●	●
56 (15)	4,0	45,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●	●
63 (16)	4,0	50,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●	●
71 (17)	4,0	56,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●	●
76 (18)	5,6	60,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●	●
86 (19)	5,6	66,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●	●
90 (20)	5,6	70,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●	●
100 (21)	5,6	78,0	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●	●

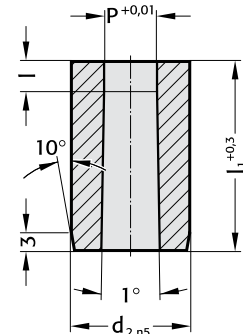
Other lengths on request

**Material:**

HSS hardened 62±2

**Execution:**

Diameter d<sub>2</sub> and end faces ground.

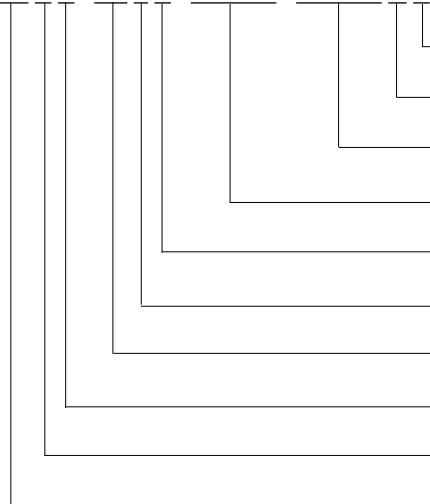


**Ordering example:**

Synopsis see fold out page E75.

**Ordering example: without anti-rotation element**

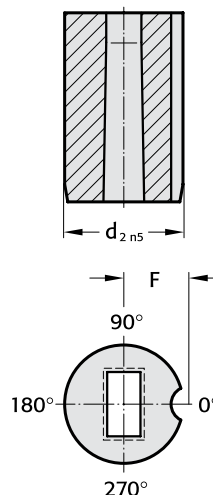
**2635.10F8.1350.0650A3**



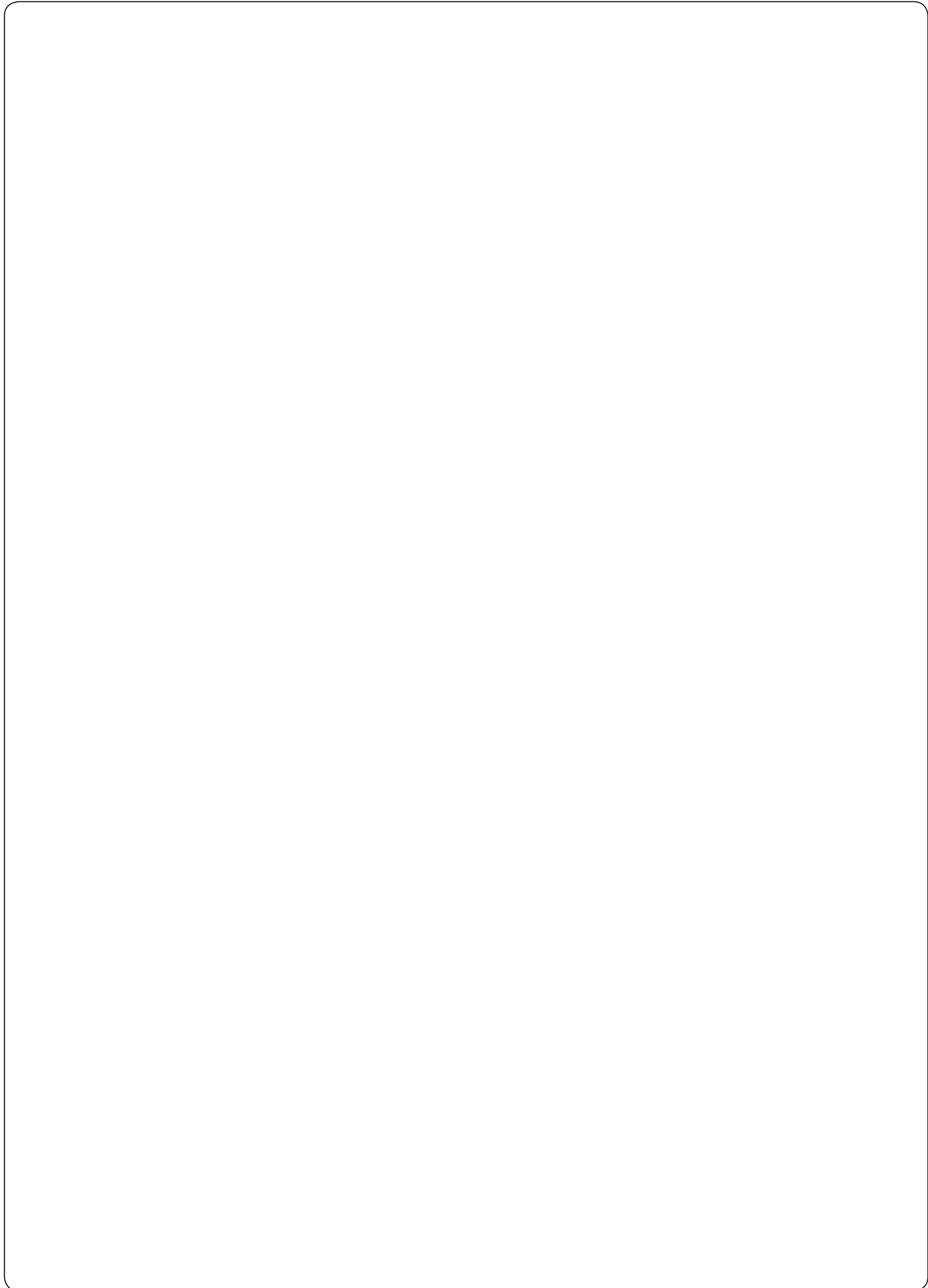
- Anti-rotation element:** Order No = (3)  
Pin ø6
- Angle:** Order Code character = (A)  
0°
- Format: Rectangular, width W**  
W = 6,5 mm = (0650)
- Format: Rectangular, length P**  
P = 13,5 mm = (1350)
- Shape cutting length: l** Order No = (8)  
12 mm
- Length: l<sub>1</sub>** Order Code character = (F)  
28 mm
- Diameter: d<sub>2</sub>** Order No = (10)  
32 mm
- Type:** Order No = (5)  
without sholder Automotive Standard
- Version:** Order No = (3)  
Square
- Matrixes:**  
26 Matrixes

**Anti-rotation element 3 (3)**

d <sub>2</sub>	Pin Ø6	F
13	8,2	
16	9	
20	11	
22	12	
25	13,5	
32	16	
38	19	
40	20	
45	22,5	
50	25	
56	28	
63	31,5	
71	35,5	
76	38	
85	42,5	
90	45	
100	50	







Precision Guide Bushes for Punches  
DIN 9845, Shape C  
ISO 8978

FIBRO

262.  
2621.



Material:

262.  
Case hardened steel  
Order No. 262.1.  
Hardness 740 ± 40 HV 10

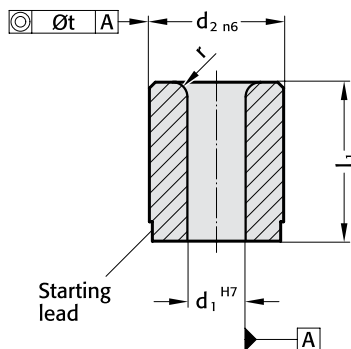
2621.  
WS, hardened  
Order No 2621.1.  
Hardness HRC 60 ± 2

Execution:

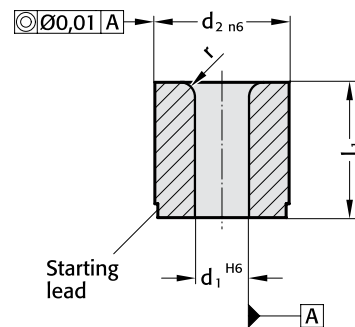
Diameters  $d_1$ ,  $d_2$  and starting lead ground.

Description of FIBRO materials for die components:  
pages E 10–E 11.

262. Shape C DIN 9845



2621. ISO 8978



262.

$d_1$	Diameter steps	$d_2$	t	$l_1$	r
0,5– 1,0	0,1	5	0,01	9	1
1,1– 2,0		6		12	
2,1– 3,0		7			
3,1– 4,0		8			
4,1– 5,0		10		16	
5,1– 6,0		12	0,02		1,5
6,1– 8,0		15		20	
8,1–10,0		18			2
10,1–12,0		22		28	
12,1–15,0		26			
15,1–18,0	0,5	30		36	

Other diameters on request.

Ordering Code (example):

Guide Bush for punches DIN 9845 = 262.  
Material case hardened steel = 1.  
 $d_1 = \varnothing 2,4$  mm = 0240.  
 $l_1 = 12$  mm = 012  
Order No = 262.1.0240.012

2621.

$d_1$	Diameter steps	$d_2$	$l_1$	r
1,0– 2,4	0,1	5	8	1
1,6– 3,0		6	12,5	1
2,0– 3,5		8	12,5	1,5
3,0– 5,0		10	16	2
4,0– 7,2		13	16	2
6,0– 8,8		16	20	2
7,5–11,3		20	20	2,5
11,0–16,6		25	25	2,5
15,0–20,0	0,5	32	25	4
18,0–27,0		40	32	4
26,0–36,0		50	40	4

Ordering Code (example):

Guide Bush for punches ISO 8978 = 2621.  
Material WS = 1.  
 $d_1 = \varnothing 2,0$  mm = 0200.  
 $d_2 = \varnothing 6$  mm = 0600  
Order No = 2621.1.0200.0600

# FIBRO

260.  
261.

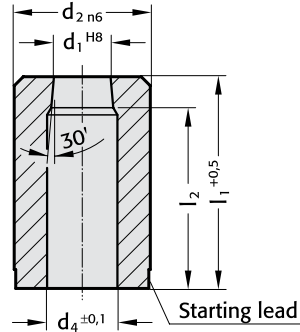
## Precision Matrixes with and without collar DIN 9845 Shape A, Shape B

### Material:

HSS  
Order No:        Shape A = 260.3.  
                      Shape B = 261.3.  
Hardness:         $62 \pm 2$  HRC

Description of FIBRO materials for die components: pages E 10–E 11.

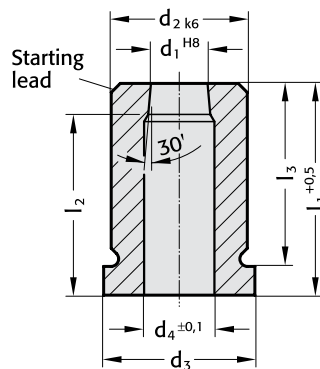
### 260. Shape A



### Execution:

Diameters  $d_1$ ,  $d_2$  and face surfaces ground.

### 261. Shape B



### 260.

Diameter $d_1$	steps	$d_2$	$d_4$	short		long	
				$l_1$	$l_2$	$l_1$	$l_2$
0,5– 1,0	0,1	5	$d_1^{+0,3}$	20	18	–	–
1,1– 2,0		6			17	28	25
2,1– 3,0		7	$d_1^{+0,5}$				
3,1– 4,0		8					
4,1 –5,0		10	$d_1^{+0,7}$		16		24
5,1– 6,0		12					
6,1– 8,0		15					
8,1–10,0		18	$d_1^{+1}$				
10,1–12,0		22			15		23
12,1–15,0		26					
15,1–18,0		30		–	–		

Other diameters on request.

### 261.

Diameter $d_1$	steps	$d_2$	$d_3$	$d_4$	short			long		
					$l_1$	$l_2$	$l_3$	$l_1$	$l_2$	$l_3$
0,5– 1,0	0,1	5	7	$d_1^{+0,3}$	20	18	16	–	–	–
1,1– 2,0		6	8			17		28	25	24
2,1– 3,0		7	9	$d_1^{+0,5}$						
3,1– 4,0		8	10							
4,1 –5,0		10	12	$d_1^{+0,7}$			16		24	
5,1– 6,0		12	14							
6,1– 8,0		15	17							
8,1–10,0		18	20	$d_1^{+1}$						
10,1–12,0		22	24			15			23	
12,1–15,0		26	28							
15,1–18,0		30	32		–	–	–			

### Ordering Code (example):

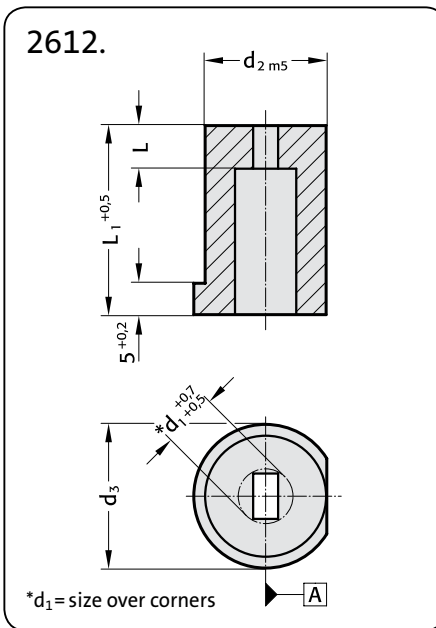
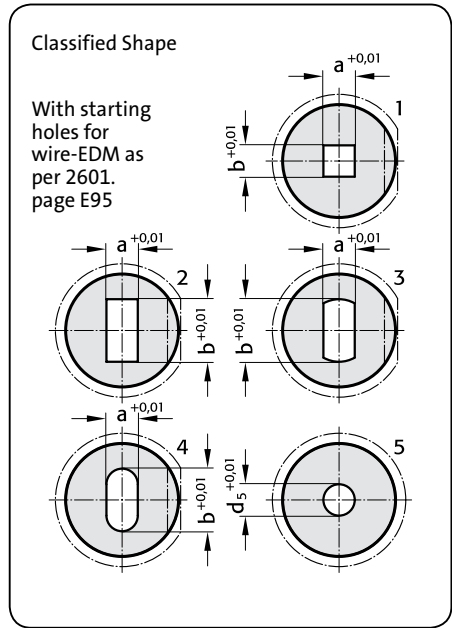
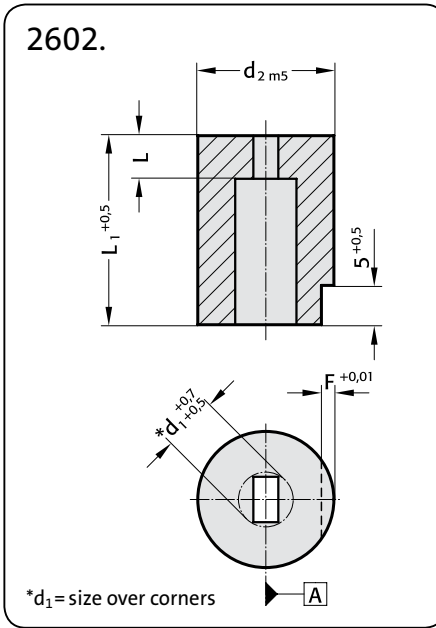
Matrix = 261.  
Material HSS = 3.  
 $d_1 = \varnothing 2,20$  mm = 0220.  
 $l_1 = 28$  mm = 028  
Order No = 261.3.0220.028

# Precision Matrixes with and without collar cylindrical

**FIBRO**

2602.

2612.



**Material:**  
HSS  
Order No.: 2602. o. 2612.3.  
Hardness: 64±2 HRC

**Execution:**  
Diameters d<sub>2</sub> and face surfaces ground.  
Key flats parallel with **A** unless otherwise specified.

**2602.**

Size over corners		L <sub>1</sub>								
d <sub>1</sub> , d <sub>5</sub>	d <sub>2</sub>	L	F	16	19	22	25	28	32	
1,8 – 3,2	8	3	1,0	●	●	●	●	●	●	
2,0 – 5,0	10			●	●	●	●	●	●	
3,0 – 7,0	13		1,5	●	●	●	●	●	●	
5,0 – 8,0	16	5		●	●	●	●	●	●	
7,0 – 11,0	20			●	●	●	●	●	●	
11,0 – 16,0	25		2,5	●	●	●	●	●	●	
16,0 – 19,0	32	7		●	●	●	●	●	●	
19,0 – 28,0	40			●	●	●	●	●	●	

**Ordering code (example):**

Matrix = 2602.  
Material HSS = 3.  
d<sub>2</sub> = 16 mm = 016.  
L<sub>1</sub> = 32 mm = 032.  
Shape 2 = 2.  
a = 3,96 mm = 0396.  
b = 5,16 mm = 0516  
Order No = 2602.3.016.032.2.0396.0516

**2612.**

Size over corners				L <sub>1</sub>						
d <sub>1</sub> , d <sub>5</sub>	d <sub>2</sub>	d <sub>3</sub>	L	16	19	22	25	28	32	
1,8 – 3,2	8	11	3	●	●	●	●	●	●	
2,0 – 5,0	10	13		●	●	●	●	●	●	
3,0 – 7,0	13	16		●	●	●	●	●	●	
5,0 – 8,0	16	19	5	●	●	●	●	●	●	
7,0 – 11,0	20	23		●	●	●	●	●	●	
11,0 – 16,0	25	28		●	●	●	●	●	●	
16,0 – 19,0	32	35	7	●	●	●	●	●	●	
19,0 – 28,0	40	43		●	●	●	●	●	●	

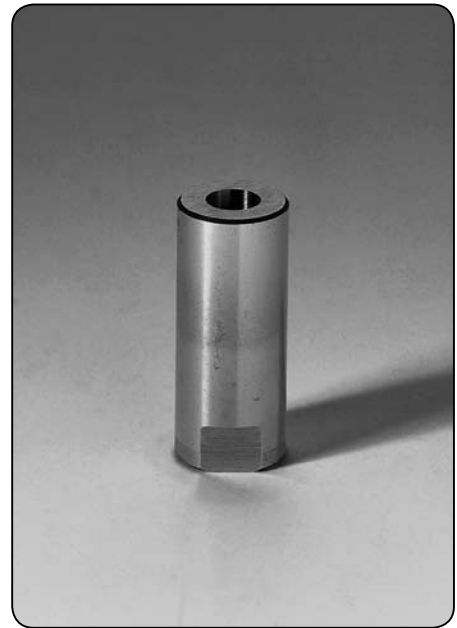
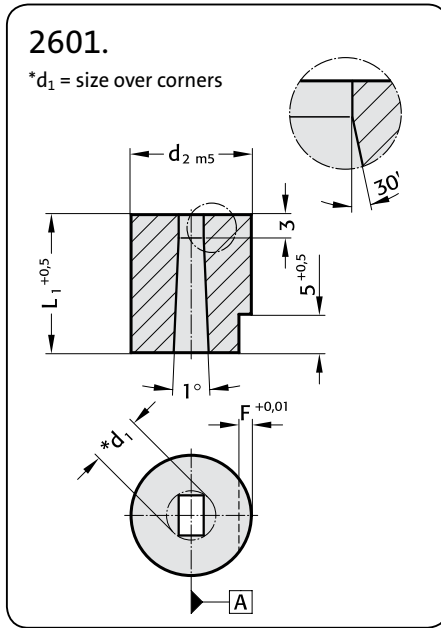
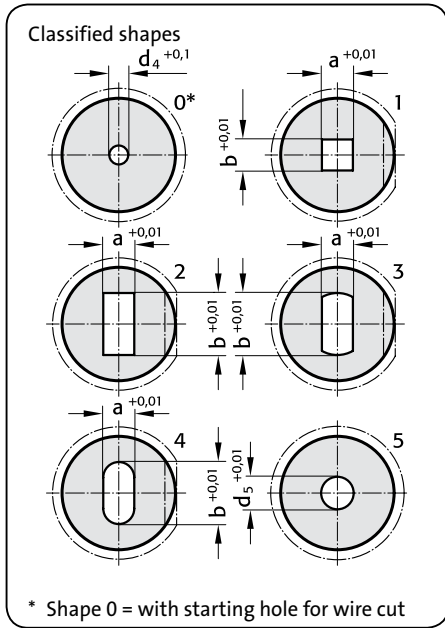
**Ordering code (example):**

Matrix = 2612.  
Material HSS = 3.  
d<sub>2</sub> = 16 mm = 016.  
L<sub>1</sub> = 28 mm = 028.  
Shape 2 = 2.  
a = 3,96 mm = 0396.  
b = 5,16 mm = 0516  
Order No = 2612.3.016.028.2.0396.0516

# FIBRO

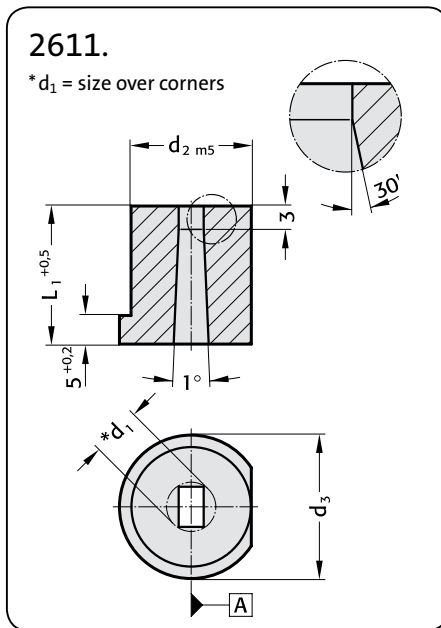
2601.  
2611.

# Precision Matrixes with and without collar conical



**Material:**  
HS  
Order No.: 2601. o. 2611.3.  
Hardness: 64 ± 2 HRC

**Execution:**  
Diameters d<sub>2</sub> precision ground;  
face surfaces ground.  
Key flats parallel with **A**  
unless otherwise specified.



2601.

Size over corners				L <sub>1</sub>					
d <sub>1</sub> , d <sub>5</sub>	d <sub>2</sub>	d <sub>4</sub>	F	16	19	22	25	28	32
1,8– 3,2	8	1,0	1,0	●	●	●	●	●	●
2,0– 5,0	10			●	●	●	●	●	●
3,0– 7,0	13	1,5	1,5	●	●	●	●	●	●
5,0– 8,0	16			●	●	●	●	●	●
7,0–11,0	20			●	●	●	●	●	●
11,0–16,0	25	2,5	2,5	●	●	●	●	●	●
16,0–19,0	32			●	●	●	●	●	●
19,0–28,0	40			●	●	●	●	●	●

**Ordering Code (example):**

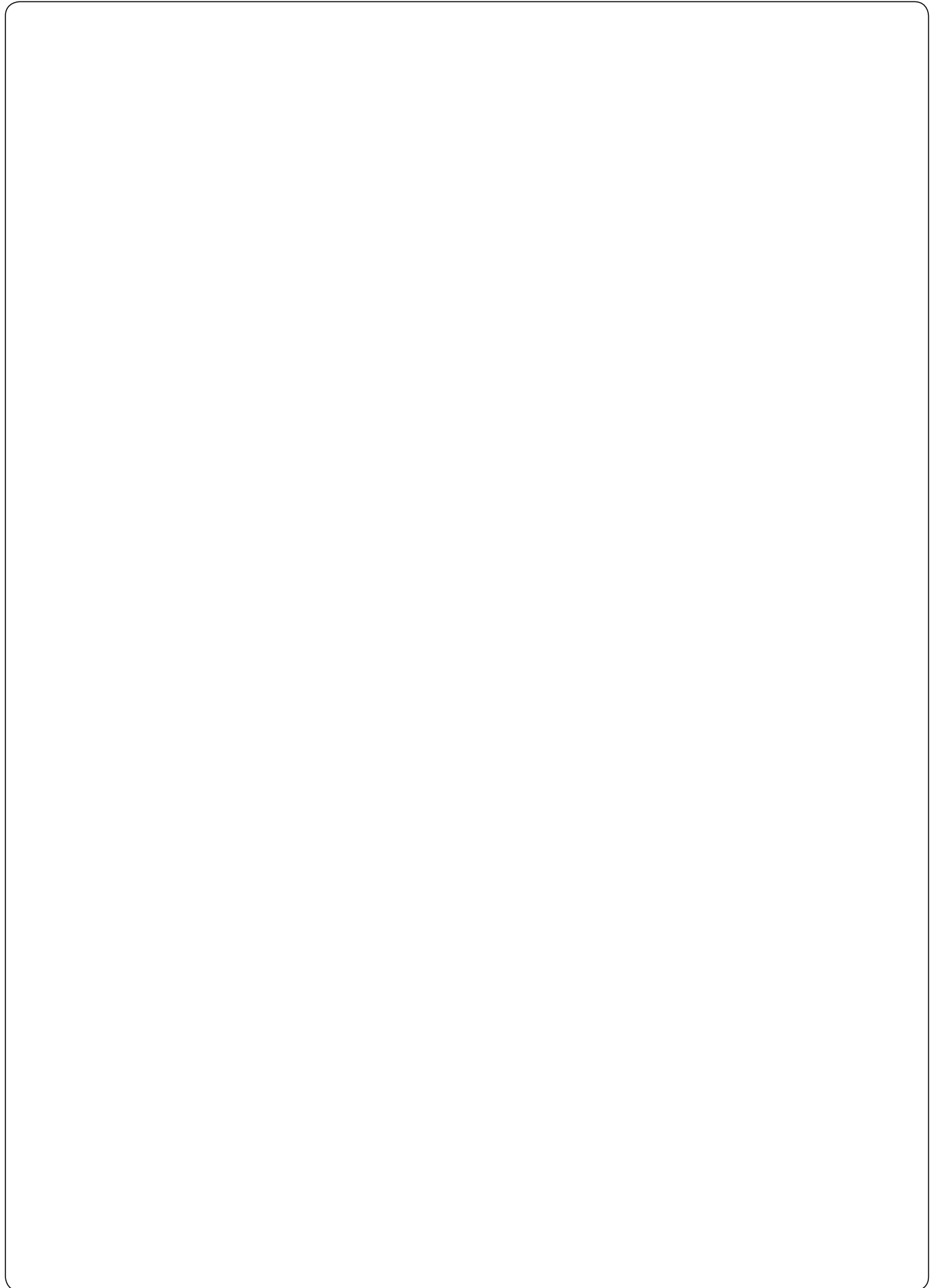
Matrix = 2601.  
Material HSS = 3.  
d<sub>2</sub> = 16 mm = 016.  
L<sub>1</sub> = 32 mm = 032.  
Shape 2 = 2.  
a = 3,96 mm = 0396.  
b = 5,16 mm = 0516  
Order No = 2601.3.016.032.2.0396.0516

2611.

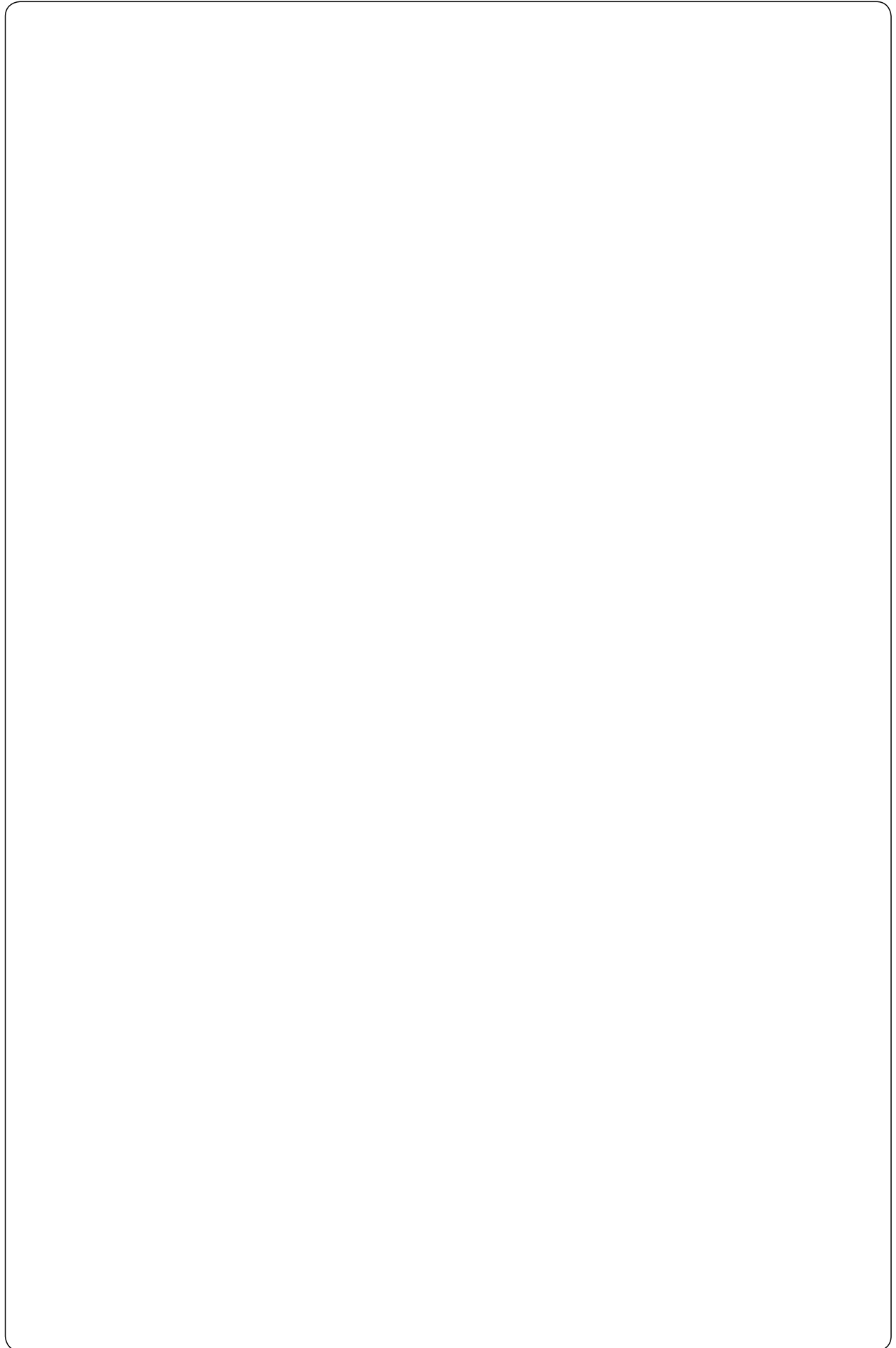
Size over corners					L <sub>1</sub>					
d <sub>1</sub> , d <sub>5</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	F	16	19	22	25	28	32
1,8– 3,2	8	11	1,0		●	●	●	●	●	●
2,0– 5,0	10	13			●	●	●	●	●	●
3,0– 7,0	13	16	1,5		●	●	●	●	●	●
5,0– 8,0	16	19			●	●	●	●	●	●
7,0–11,0	20	23			●	●	●	●	●	●
11,0–16,0	25	28	2,5		●	●	●	●	●	●
16,0–19,0	32	35			●	●	●	●	●	●
19,0–28,0	40	43			●	●	●	●	●	●

**Ordering Code (example):**

Matrix = 2611.  
Material HSS = 3.  
d<sub>2</sub> = 16 mm = 016.  
L<sub>1</sub> = 32 mm = 032.  
Shape 2 = 2.  
a = 3,96 mm = 0396.  
b = 5,16 mm = 0516  
Order No = 2611.3.016.032.2.0396.0516



# Standardised Special Shapes





Ordering examples  
Special shapes  
Punches/Cutting bushes

2 2 9 2 . . F 2 4 . . .

Punch:  
22 without ejector pin

Special shape

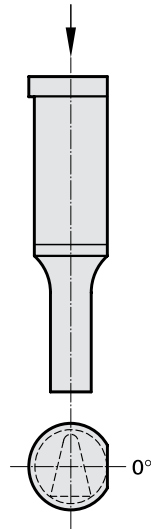
NB:  
All the parameters  
must be given for  
special shapes!

Special shape F 24

You will find diameters and  
lengths on the pages of  
punches you have selected.

Type:	Order No
ISO 8020	= 1
ball-lock, light duty	= 2
ball-lock, heavy duty	= 3
ball-lock, larger cutting edge, light duty	= 4
ball-lock, larger cutting edge, heavy duty	= 5

View Punch



2 6 9 5 . . F 2 4 . . .

Matrixes

Special shape

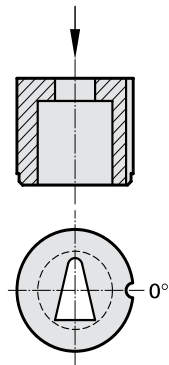
NB:  
All the parameters  
must be given for  
special shapes!

Special shape F 24

You will find diameters  
and lengths on the pages  
of cutting bushes you have  
selected.

Type:	Order No
automotive	= 5
without shoulder ISO 8977	= 6
with shoulder ISO 8977	= 7

View Matrix

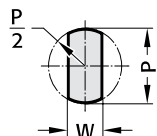


# Standardised special shapes

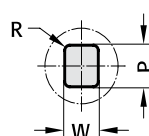
90°

## Round, flattened

F10

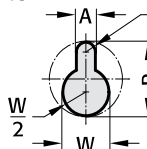


F11

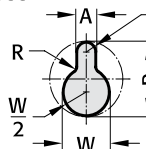


## Key-hole shapes

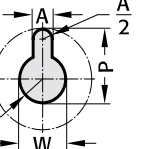
F13



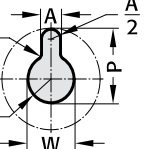
F53



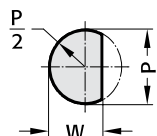
F54



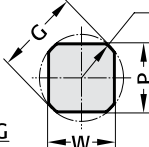
F55



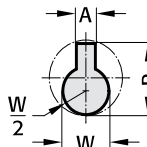
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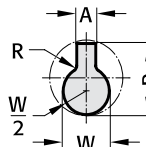
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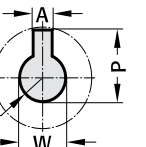
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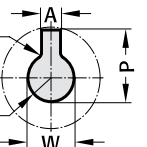
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F57

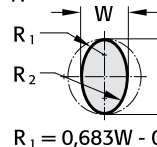


F58



## Various

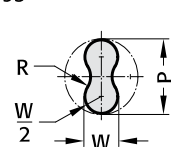
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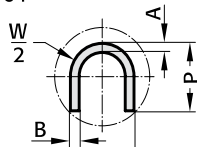
$$R_1 = 0,683W - 0,183P$$

$$R_2 = 1,183P - 0,683W$$

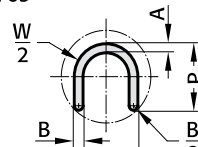
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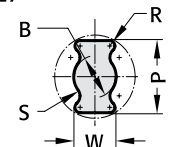
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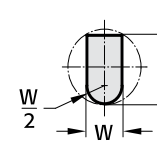
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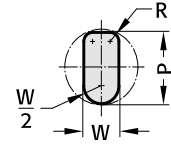
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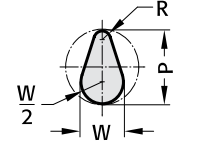
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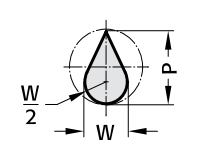
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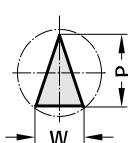


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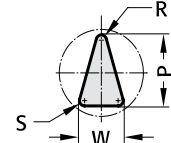


## 180° Triangles, trapezes

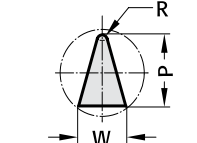
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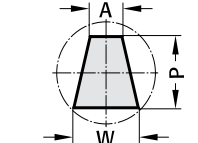
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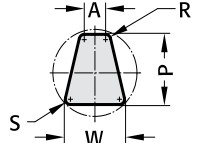
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F25

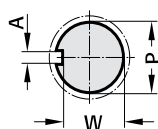


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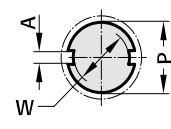


## Key-hole

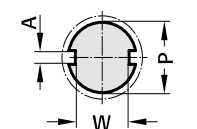
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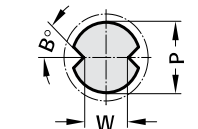
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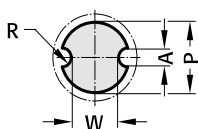
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F61

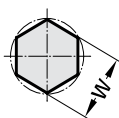


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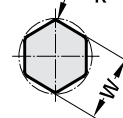


## Polygons

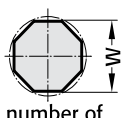
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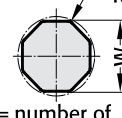
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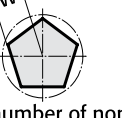
F35



F86



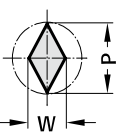
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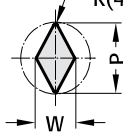
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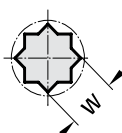
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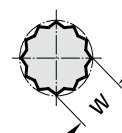
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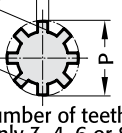
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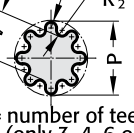
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F39



F90

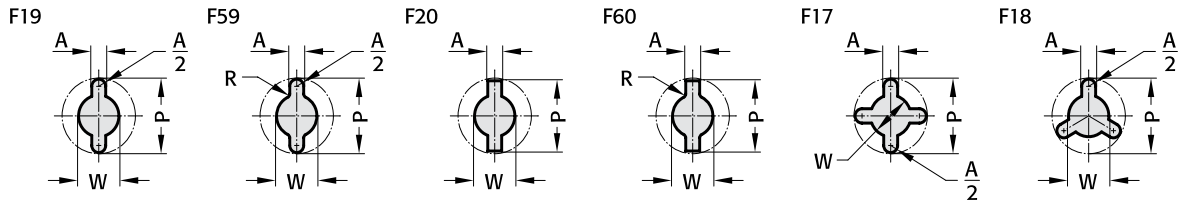


270°

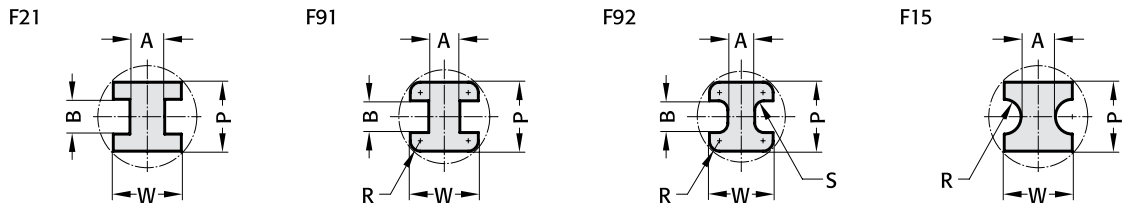
0°

90°

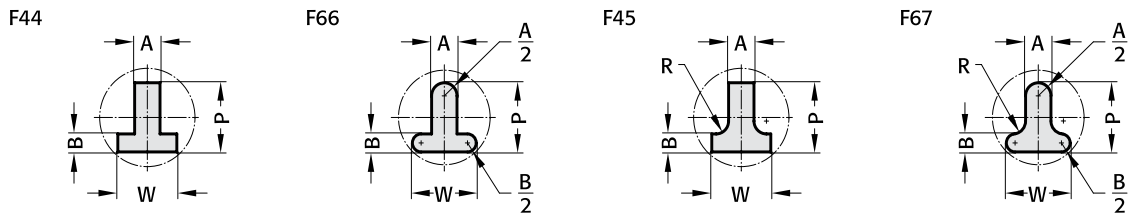
Multi key-hole shapes



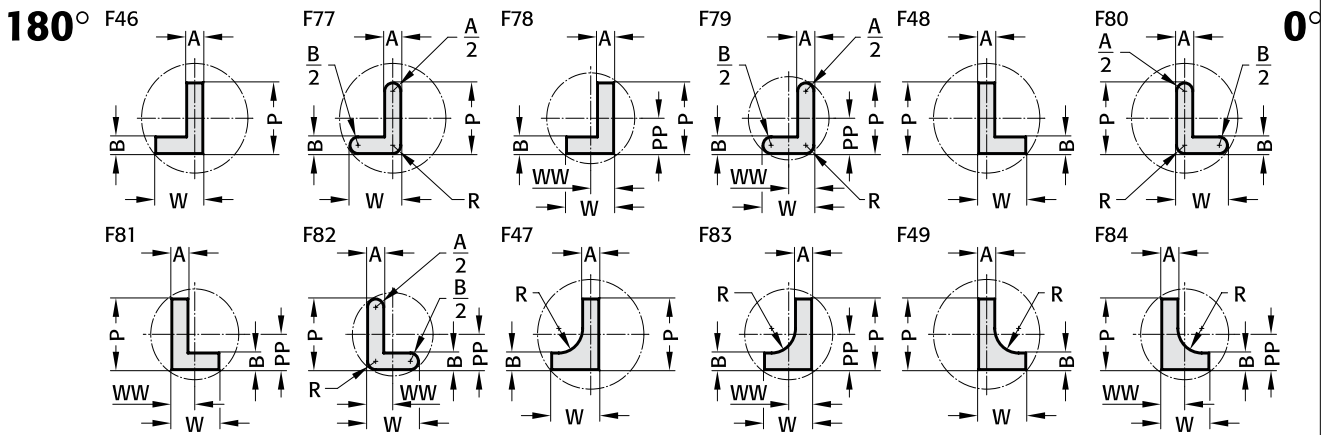
Double T-shapes



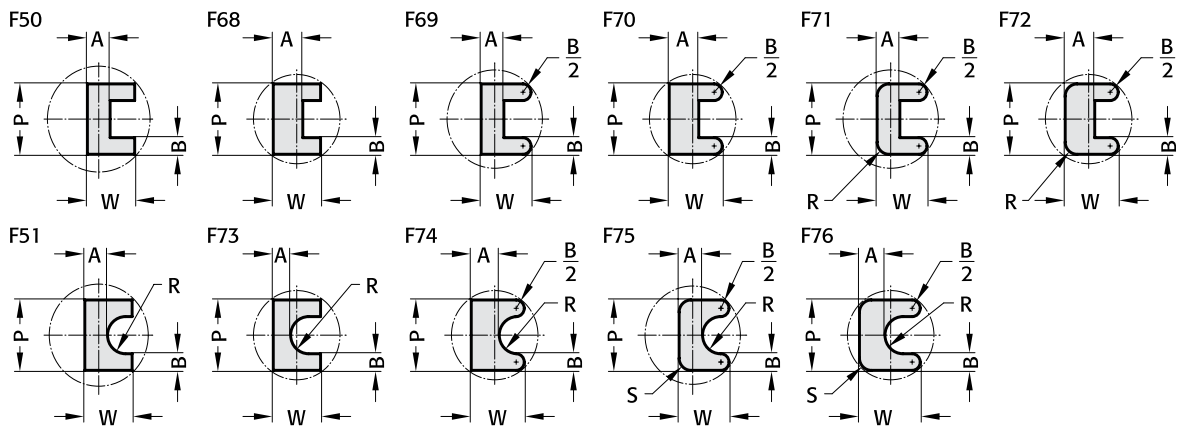
Simple T-shapes



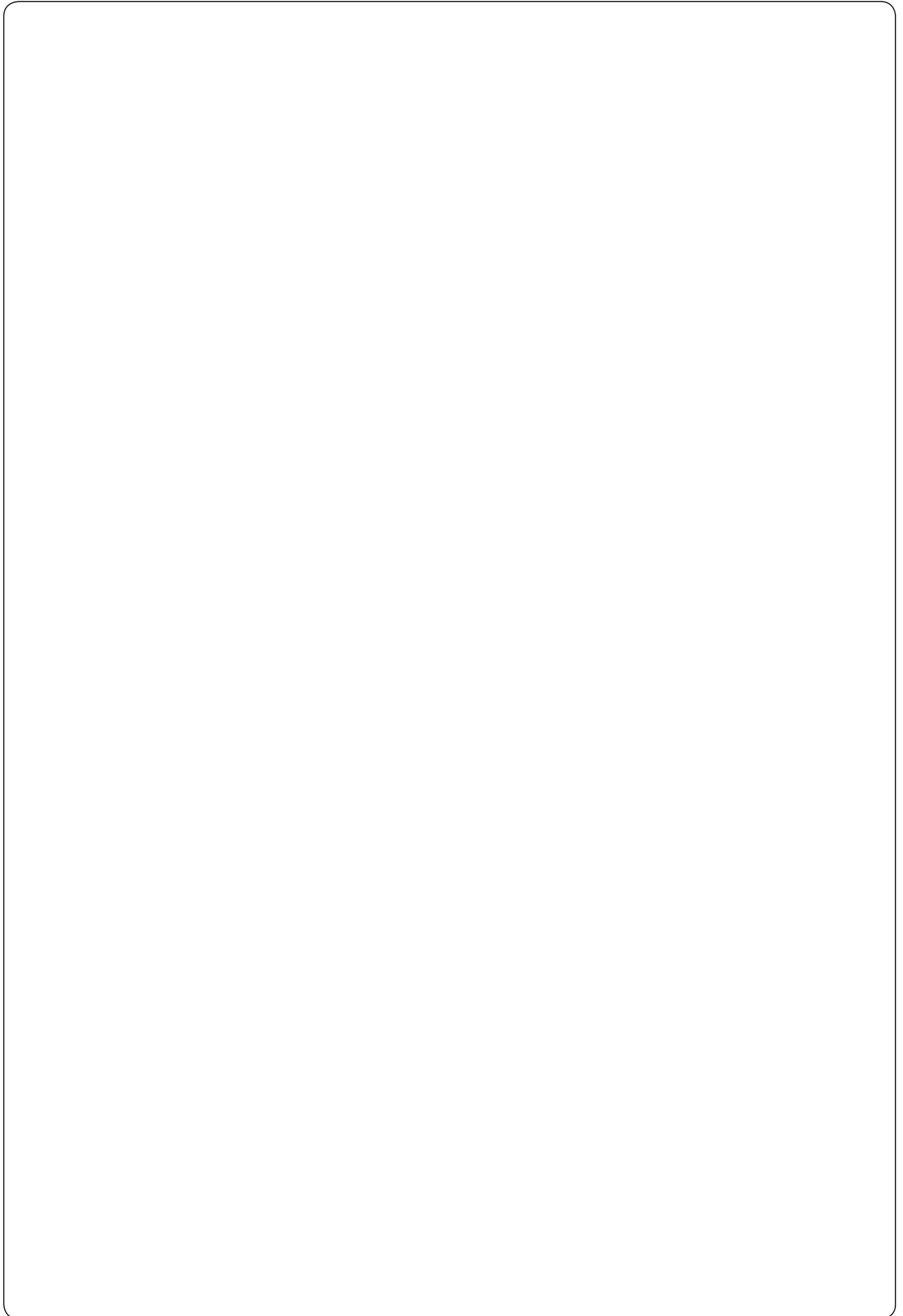
L-shapes



U-shapes



270°



# Ordering Code (example) Matrixes for Dynamic Stripper (DAE)

Note: See table for standard dimensions

**Ordering Code (example):**  
2618.06.6E4.09

- Matrixes for Dynamic Stripper (DAE) (2618)
- Version: blank (pilot hole bore) (0)
- Type: without collar for Dynamic Stripper (DAE) (6)
- Diameter  $d_2$  = 16 mm (6)
- Length:  $l_1$  = 25 mm (E)
- Shape cutting length:  $l$  = 5 mm (4)
- $d_4$  = 9 mm (09)

Version	Order No
blank (pilot hole bore)	= 0

Type	Order No
without collar for Dynamic Stripper (DAE)	= 6
with collar for Dynamic Stripper (DAE)	= 7

Diameter $d_2$	Order No
13	= 5
16	= 6
20	= 7

Length $l_1$	Order Code character
25	= E

Shape cutting length $l$	Order No
5	= 4

Starting lead:  $\phi 16$ , 5 mm

**Ordering Code (example):**  
2618.16.6E4.0431

- Matrixes for Dynamic Stripper (DAE) (2618)
- Version: Round (1)
- Type: without collar for Dynamic Stripper (DAE) (6)
- Diameter  $d_2$  = 16 mm (6)
- Length:  $l_1$  = 25 mm (E)
- Shape cutting length:  $l$  = 5 mm (4)
- Shape: Round  $P$  = 4.31 mm (0431)

Version	Order No
Round	= 1

Type	Order No
without collar for Dynamic Stripper (DAE)	= 6
with collar for Dynamic Stripper (DAE)	= 7

Diameter $d_2$	Order No
13	= 5
16	= 6
20	= 7

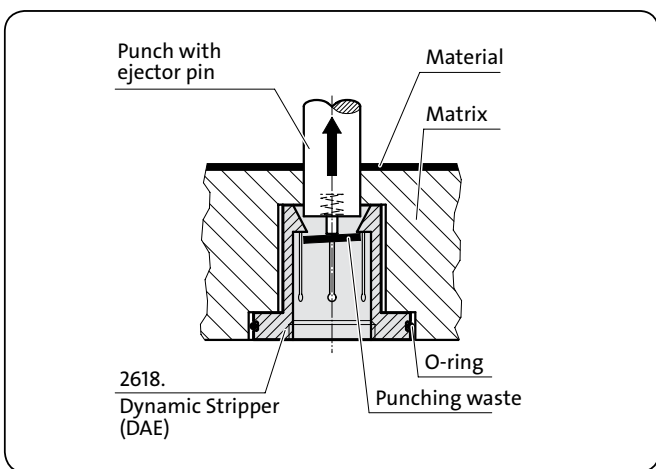
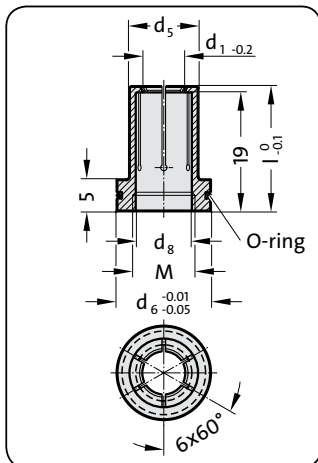
Length $l_1$	Order Code character
25	= E

Shape cutting length $l$	Order No
5	= 4

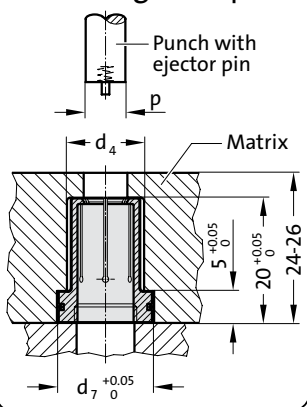
Starting lead:  $\phi 16$ , 5 mm

Dynamic Stripper (DAE)

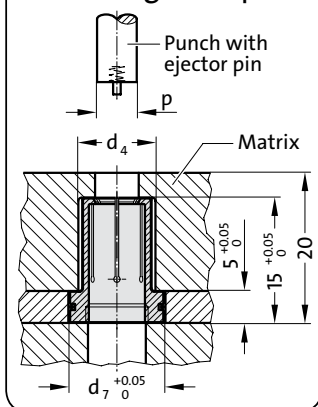
2618.



Mounting Example:



Mounting Example:



**Material:** Steel, hardened

**Description:**

The Dynamic Stripper is used in blanking tools for punching operations using material up to 2 mm thick. The Stripper is below the die. It is similar in shape to a segmented chuck. After the punching operation the punch enters the Stripper with the punch waste still attached.

The Dynamic Stripper opens up to receive the punch. On the return stroke the Dynamic Stripper strips the punch waste from the punch.

The stripping element diameter is manufactured 0.2 mm smaller than the diameter P of the punch. To ensure reliable stripping the minimum entry depth into the Dynamic Stripper must be no less than 1 mm.

The Dynamic Stripper can help to protect both the tool and the product from damage and also accelerate the production rate.

2618.

Cutting punch „P“ Gradation 0.01	Stripper „d1“ (Order ø)	Matrix					
		d5	d6	l	M	d4	d7
3.00 - 3.09	3.0	7	11	19.95	M6	8	11
3.10 - 3.19	3.1						
3.20 - 3.29	3.2						
3.30 - 3.39	3.3						
3.40 - 3.49	3.4						
3.50 - 3.59	3.5						
3.60 - 3.69	3.6						
3.70 - 3.79	3.7						
3.80 - 3.89	3.8						
3.90 - 3.99	3.9						
4.00 - 4.09	4.0						
4.10 - 4.19	4.1	8	12	19.95	M8	9	12
4.20 - 4.29	4.2						
4.30 - 4.39	4.3						
4.40 - 4.49	4.4						
4.50 - 4.59	4.5						
4.60 - 4.69	4.6						
4.70 - 4.79	4.7						
4.80 - 4.89	4.8						
4.90 - 4.99	4.9						
5.00 - 5.09	5.0						
5.10 - 5.19	5.1	9	13	19.95	M8	10	13
5.20 - 5.29	5.2						
5.30 - 5.39	5.3						
5.40 - 5.49	5.4						
5.50 - 5.59	5.5						
5.60 - 5.69	5.6						
5.70 - 5.79	5.7						
5.80 - 5.89	5.8						
5.90 - 5.99	5.9						
6.00 - 6.09	6.0						
6.10 - 6.19	6.1	10	14	19.95	M10	11	14
6.20 - 6.29	6.2						
6.30 - 6.39	6.3						
6.40 - 6.49	6.4						
6.50 - 6.59	6.5						
6.60 - 6.69	6.6						
6.70 - 6.79	6.7						
6.80 - 6.89	6.8						
6.90 - 6.99	6.9						
7.00 - 7.09	7.0						
7.10 - 7.19	7.1	11	15	19.95	M10	12	15
7.20 - 7.29	7.2						
7.30 - 7.39	7.3						
7.40 - 7.49	7.4						
7.50 - 7.59	7.5						
7.60 - 7.69	7.6						
7.70 - 7.79	7.7						
7.80 - 7.89	7.8						
7.90 - 7.99	7.9						
8.00 - 8.09	8.0						

Ordering Code (example):

Dynamic Stripper (DAE)	= 2618.
d5 = Ø 7 mm	= 07.
l = 19.95 mm	= 020.
d1 = 3.0 mm	= 0300
Order No	= 2618.07.020.0300

---

A Die Sets

---

B Precision Ground Plates and Flat Bars

---

C Lifting and Clamping Devices

---

D Guide Elements

---

E Ground Precision Components

---

**F Springs**

Compression Springs, Gas Springs, Elastomer Springs  
Spring and Spacer Units

---

G Elastomer-Bars, -Sheets, -Sections

---

H FIBRO Chemical Tooling Aids

---

J Peripheral Equipment

---

K Cam Units

---

L Standard Parts for Mould Making

---



# Springs



## Springs

Springs for dies, fixtures, moulds, machines, mechanisms. For various industrial uses. FIBRO Compression Springs – a comprehensive range, rooted in the resolute quality consciousness on which our reputation was built. Applied equally to the selection and inspection of raw materials as well as to every step in manufacture.

Springs – a simple product by comparison. But a demanding one also if new standards are to be set by its reliability and performance.

A product whose failure in service always is very expensive, even disastrous in some cases.

A product therefore where it pays . . . to pay for the difference. Whose faults or qualities remain hidden at first.

They prove themselves in the long run –!

FIBRO high performance springs – in four duty ranges. Made from selected grades of chrome-vanadium spring steel.

Cold-formed from special rolled wire sections. Capable of sustaining service loadings of exceptional severity.

Identical fitting dimensions for all springs of common nominal size, facilitating development work. Packing a maximum of spring action into a minimum of design space

Up and down in endless repetition: FIBRO Compression Springs. From the tough stable of tool- and diemaking, where no quarters are given.

A spring range of almost 400 sizes. Each spring strictly to specification. Ends flattened and ground parallel. Surfaces ball shot peened for even greater spring resilience.

FIBRO Springs – for fit-and-forget performance. For confined spaces. For virtually no space at all.

For aircraft · tractors · harvesters · dies jigs · fixtures · for machines from A to Z.

For all uses where the going is hard. A choice without regrets.

A special spring range for demanding applications in the manufacture of tools, machinery and jigs & fixtures.

Our spring systems are constantly being developed to cover the most varied requirements.

The spring type is selected to match specific customer requirements.

### Special helical springs

Manufactured to DIN ISO 10243, the springs are available in four grades for high cyclic and constant loads.

The specially rolled wire profile is manufactured from high quality heat treated alloy steel.

### FIBROFLEX® Springs

These rubber-elastic spring elements in Shore hardness ratings 80, 90, 95, are made from polyurethane elastomers. Benefits include high spring forces and good resilient damping behaviour.


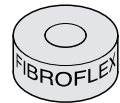
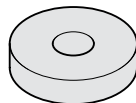
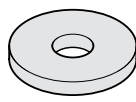


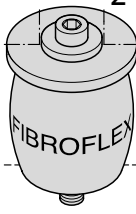
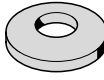
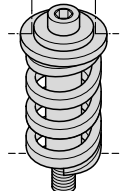
### FIBROELAST® Springs

As a superior alternative to rubber springs we offer polyurethane elastomer springs in Shore A hardness rating of 70.

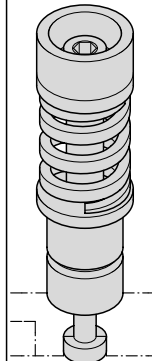
### Disc Springs

The required spring characteristics result from various laminations with multiple settings and combinations.



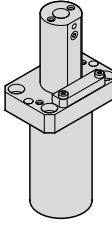

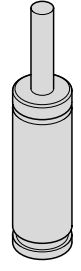
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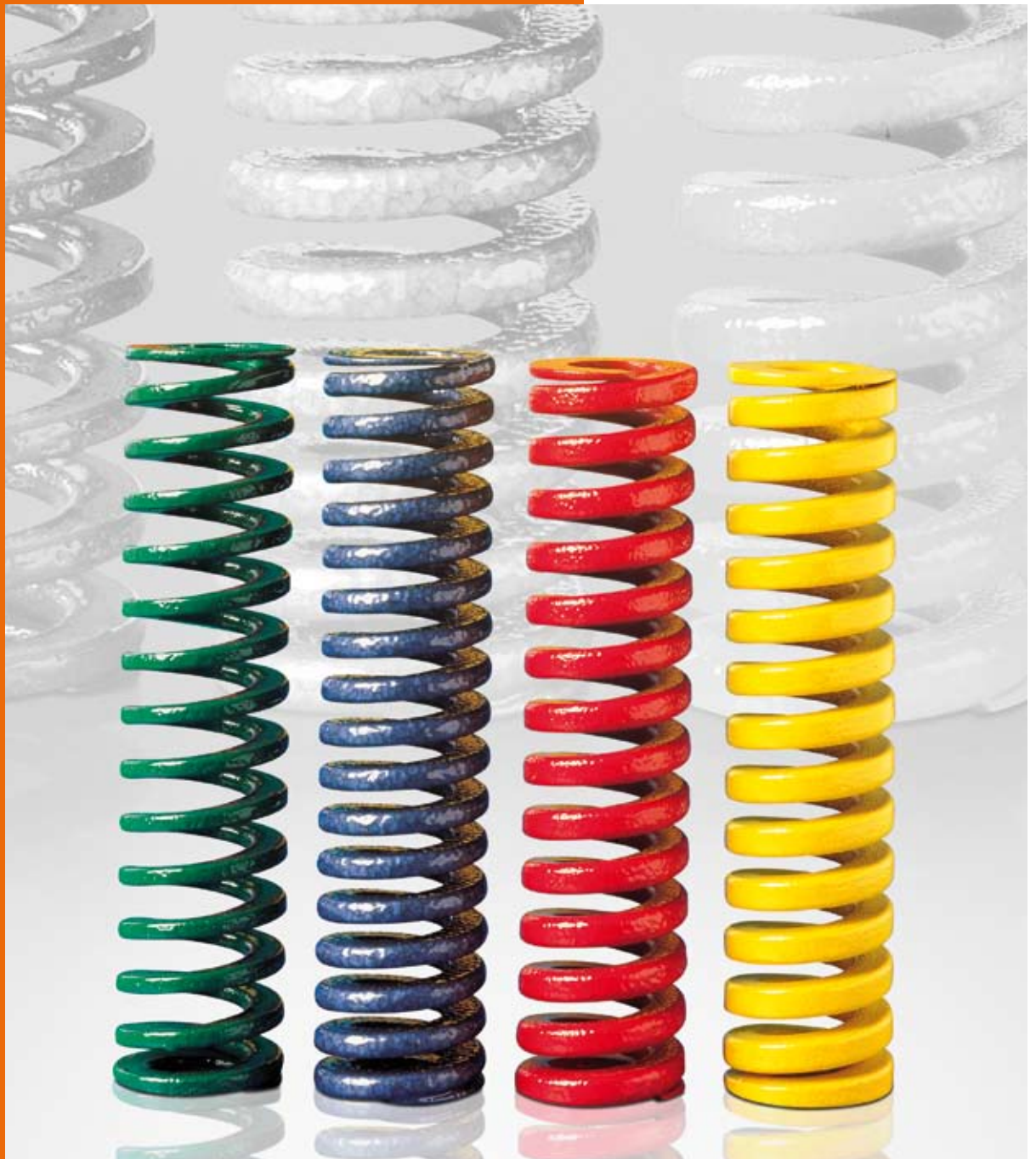
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# Compression Springs DIN/ISO 10243

## Service Data for Limited-/Extended Spring Life

The achievable service life of helical compression springs depends to a large extent on the composition of the spring wire, the operating conditions, and on design parameters.

In all applications with oscillating spring displacement, careful selection of both preload values and compressive displacement are prerequisites for extended spring life, as confirmed by the permissible stress values in the loading data tables and the stress/spring life diagram.

Shear stress maxima and spring oscillation stress differentials are a direct function of the quality of the spring wire.

FIBRO High Performance Compression Springs are made exclusively from special 50 Cr V4. The superlative characteristics of this material are further enhanced by heat treatment under optimal conditions, followed by a ball shot peening process.

For extended spring life under oscillating load changes, the maximal shear stress  $t_{zul.}$  is  $800 \text{ N/mm}^2$ , of which some  $400 \text{ N/mm}^2 = (\tau_h)$  may be taken up by the stress differential between spring oscillations.

Higher stress levels are permissible only under the proviso of limited life expectancy, or in cases of static and quasi-static load conditions.

Springs subjected to dynamic load conditions also suffer impairment to their life expectancy through influences such as extreme operating temperatures, transversal stress components, shock loads, and resonant vibration frequencies. In all these instances, a lowering of the stress levels assists towards better spring life.

## Working temperature

The spring material has a working temperature of up to  $250 \text{ }^\circ\text{C}$ . This rating is an approximation since the actual approved working temperature will also depend on factors such as load. It is worth noting that above  $100 \text{ }^\circ\text{C}$  the modulus of elasticity decreases and with a reduction in tension setting starts to occur.

## Extended Spring Life: Spring Displacement Values

The largest permissible displacement is indicated by  $S_6$  – offering about 62 % of the “total” displacement of the wire-to-wire compacted spring ( $= S_n$ ). This displacement will induce a shear stress of  $t_{zul.}$  of  $800 \text{ N/mm}^2$ . The associated stress differential during oscillations should not exceed  $400 \text{ N/mm}^2 (= \tau_h)$ .

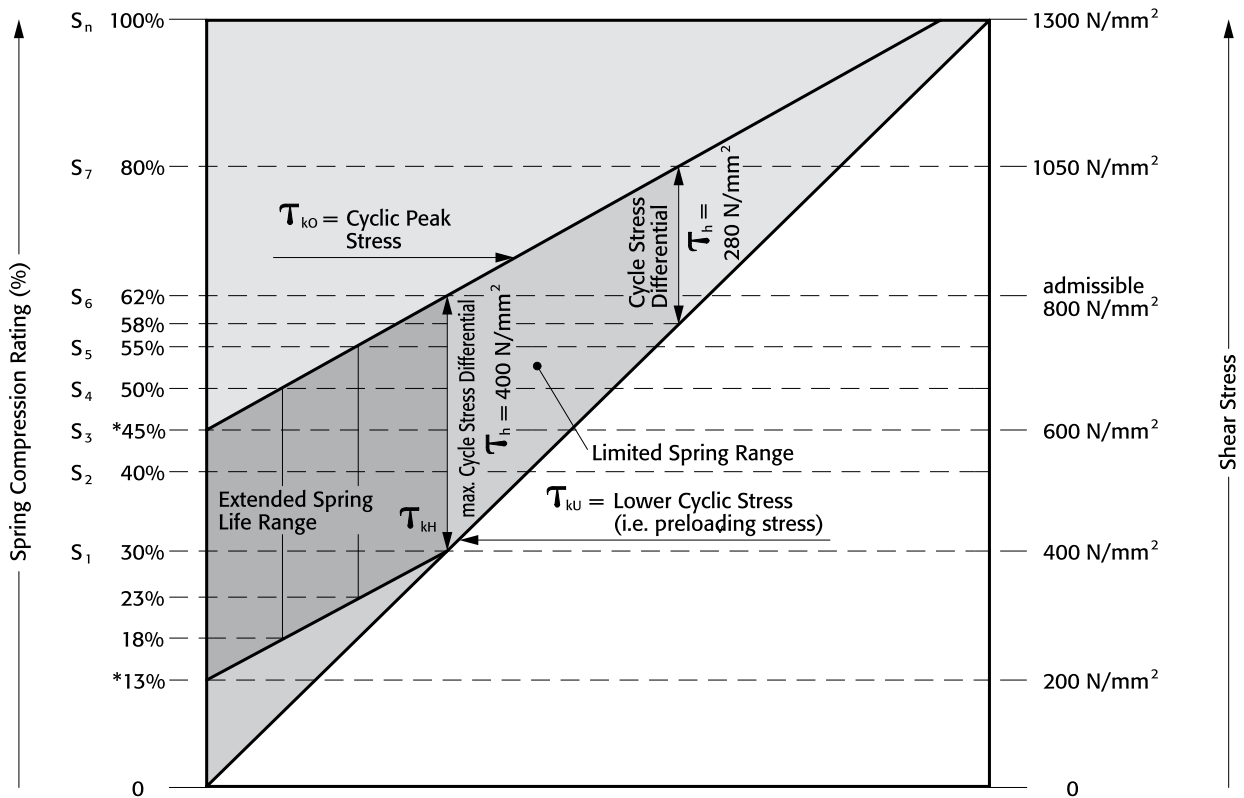
## Calculation of Spring Forces

Simple multiplication of the spring coefficient  $R$  with the applicable displacement  $S$  (mm) yields the spring force value (N).

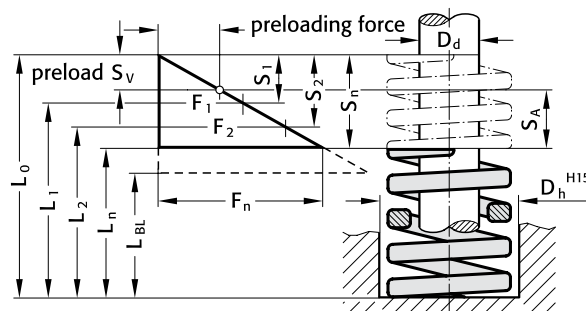
## Spring Force versus Spring Displacement

The relevant tables show the force values for selected displacements of 30, 40, 45, 55, 62, 80 and 100 % compression, designated by  $S_1 \dots S_7$ .

Intermediate force values can be extra-polated from the Stress/Spring Life Diagram.



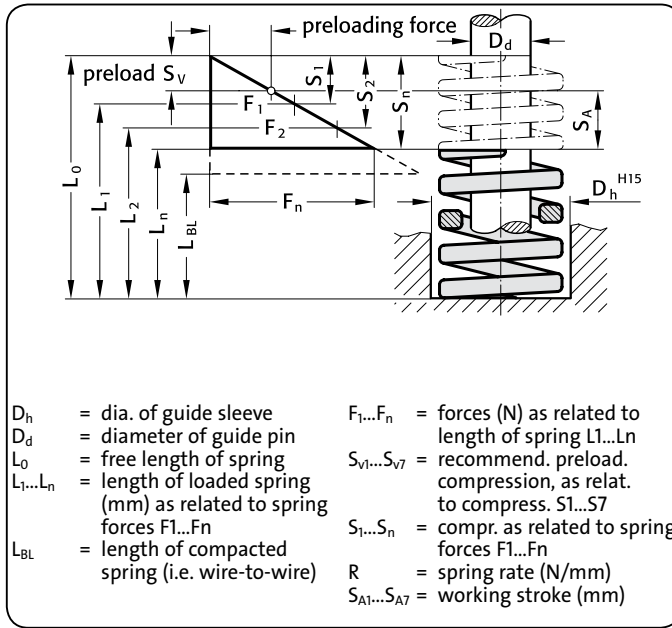
\* For application within Extended Spring Life:  
 up to a compression rating of 45%, a preloading compression of 13% applies.  
 e. g.: up to a compression rating of 55% a preloading compression of 23% is required.



- |             |                                                      |                   |                                                                        |
|-------------|------------------------------------------------------|-------------------|------------------------------------------------------------------------|
| $D_h$       | = diameter of guide sleeve                           | $F_1...F_n$       | = forces (N) as related to length of spring $L_1...L_n$                |
| $D_d$       | = diameter of guide pin                              | $S_{v1}...S_{v7}$ | = recommended preload compression, as related to compress. $S_1...S_7$ |
| $L_0$       | = free length of spring                              | $S_1...S_n$       | = compression, as related to spring forces $F_1...F_n$                 |
| $L_1...L_n$ | = length of loaded spring (mm), as related to spring | R                 | = spring rate (N/mm)                                                   |
| $L_{BL}$    | = length of compacted spring (i.e. wire-to-wire)     | $S_{A1}...S_{A7}$ | = working stroke (mm)                                                  |

Working strokes  $S_{A1}...S_{A7}$  = compress. ( $S_1...S_7$ ) – minus preloading compression ( $S_{v1}...S_{v7}$ )  
 Notice: 80% compression must not be exceeded!

# High Performance Compression Springs



**241.14.**  
Colour "Green"

**241.15.**  
Colour "Blue"

- $D_h$  = dia. of guide sleeve
- $D_d$  = diameter of guide pin
- $L_0$  = free length of spring
- $L_1...L_n$  = length of loaded spring (mm) as related to spring forces  $F_1...F_n$
- $L_{BL}$  = length of compacted spring (i.e. wire-to-wire)
- $F_1...F_n$  = forces (N) as related to length of spring  $L_1...L_n$
- $S_{v1}...S_{v7}$  = recommend. preload. compression, as relat. to compress.  $S_1...S_7$
- $S_1...S_n$  = compr. as related to spring forces  $F_1...F_n$
- $R$  = spring rate (N/mm)
- $S_{A1}...S_{A7}$  = working stroke (mm)

## 241.14.

Order No green	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.14.10.025	10,0	5,0	25	10,0	3,9	1,7	2,2	39	5,2	1,7	3,5	52	5,9	1,7	4,2	59	6,5	2,3	4,2	65
241.14.10.032			32	8,5	4,8	2,1	2,7	41	6,4	2,1	4,3	54	7,2	2,1	5,1	61	8,0	2,9	5,1	68
241.14.10.038			38	6,8	6,0	2,6	3,4	41	8,0	2,6	5,4	54	9,0	2,6	6,4	61	10,0	3,6	6,4	68
241.14.10.044			44	6,0	6,9	3,0	3,9	41	9,2	3,0	6,2	55	10,4	3,0	7,4	62	11,5	4,1	7,4	69
241.14.10.051			51	5,0	8,1	3,5	4,6	41	10,8	3,5	7,3	54	12,2	3,5	8,7	61	13,5	4,9	8,6	68
241.14.10.064			64	4,3	10,2	4,4	5,8	44	13,6	4,4	9,2	58	15,3	4,4	10,9	66	17,0	6,1	10,9	73
241.14.10.076			76	3,2	12,0	5,2	6,8	38	16,0	5,2	10,8	51	18,0	5,2	12,8	58	20,0	7,2	12,8	64
241.14.10.305			305	1,1	48,9	21,2	27,7	54	65,2	21,2	44,0	72	73,4	21,2	52,2	81	81,5	29,3	52,2	90

Order No green	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.14.10.025	10,0	5,0	25	10,0	7,2	3,0	4,2	72	8,1	3,9	4,2	81	10,4	7,5	2,9	104	13,0	12,0	130,0
241.14.10.032			32	8,5	8,8	3,7	5,1	75	9,9	4,8	5,1	84	12,8	9,3	3,5	109	16,0	16,0	136,0
241.14.10.038			38	6,8	11,0	4,6	6,4	75	12,4	6,0	6,4	84	16,0	11,6	4,4	109	20,0	18,0	136,0
241.14.10.044			44	6,0	12,7	5,3	7,4	76	14,3	6,9	7,4	86	18,4	13,3	5,1	110	23,0	21,0	138,0
241.14.10.051			51	5,0	14,9	6,2	8,7	75	16,7	8,1	8,6	84	21,6	15,7	5,9	108	27,0	24,0	135,0
241.14.10.064			64	4,3	18,7	7,8	10,9	80	21,1	10,2	10,9	91	27,2	19,7	7,5	117	34,0	30,0	146,2
241.14.10.076			76	3,2	22,0	9,2	12,8	70	24,8	12,0	12,8	79	32,0	23,2	8,8	102	40,0	36,0	128,0
241.14.10.305			305	1,1	89,7	37,5	52,2	99	101,0	48,9	52,2	111	130,4	94,5	35,9	143	163,0	142,0	179,3

## 241.15.

Order No blue	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.15.10.025	10,0	5,0	25	16,0	3,3	1,4	1,9	53	4,4	1,4	3,0	70	5,0	1,4	3,6	80	5,5	2,0	3,5	88
241.15.10.032			32	13,1	3,9	1,7	2,2	51	5,2	1,7	3,5	68	5,9	1,7	4,2	77	6,5	2,3	4,2	85
241.15.10.038			38	11,9	4,8	2,1	2,7	57	6,4	2,1	4,3	76	7,2	2,1	5,1	86	8,0	2,9	5,1	95
241.15.10.044			44	10,3	5,7	2,5	3,2	59	7,6	2,5	5,1	78	8,6	2,5	6,1	89	9,5	3,4	6,1	98
241.15.10.051			51	8,9	6,3	2,7	3,6	56	8,4	2,7	5,7	75	9,5	2,7	6,8	85	10,5	3,8	6,7	93
241.15.10.064			64	7,6	8,1	3,5	4,6	62	10,8	3,5	7,3	82	12,2	3,5	8,7	93	13,5	4,9	8,6	103
241.15.10.076			76	5,3	9,9	4,3	5,6	52	13,2	4,3	8,9	70	14,9	4,3	10,6	79	16,5	5,9	10,6	87
241.15.10.305			305	1,6	40,8	17,7	23,1	65	54,4	17,7	36,7	87	61,2	17,7	43,5	98	68,0	24,5	43,5	109

Order No blue	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.15.10.025	10,0	5,0	25	16,0	6,1	2,5	3,6	98	6,8	3,3	3,5	109	8,8	6,4	2,4	141	11,0	14,0	176,0
241.15.10.032			32	13,1	7,2	3,0	4,2	94	8,1	3,9	4,2	106	10,4	7,5	2,9	136	13,0	19,0	170,3
241.15.10.038			38	11,9	8,8	3,7	5,1	105	9,9	4,8	5,1	118	12,8	9,3	3,5	152	16,0	22,0	190,4
241.15.10.044			44	10,3	10,5	4,4	6,1	108	11,8	5,7	6,1	122	15,2	11,0	4,2	157	19,0	25,0	195,7
241.15.10.051			51	8,9	11,6	4,8	6,8	103	13,0	6,3	6,7	116	16,8	12,2	4,6	150	21,0	30,0	186,9
241.15.10.064			64	7,6	14,9	6,2	8,7	113	16,7	8,1	8,6	127	21,6	15,7	5,9	164	27,0	37,0	205,2
241.15.10.076			76	5,3	18,2	7,6	10,6	96	20,5	9,9	10,6	109	26,4	19,1	7,3	140	33,0	43,0	174,9
241.15.10.305			305	1,6	74,8	31,3	43,5	120	84,3	40,8	43,5	135	108,8	78,9	29,9	174	136,0	169,0	217,6

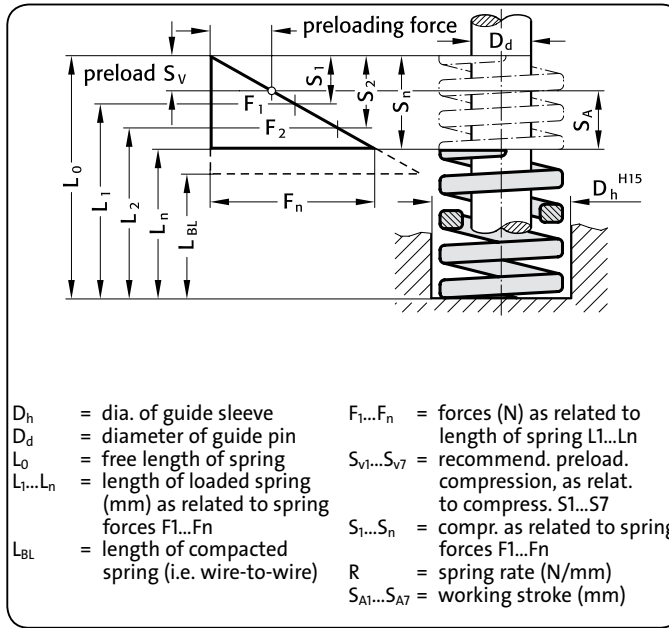


**241.16.**  
**241.17.**

**High Performance Compression Springs**

**241.16.**  
**Colour: "Red"**

**241.17.**  
**Colour: "Yellow"**



**241.16.**

Order No red	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.16.10.025	10,0	5,0	25	22,6	2,7	1,2	1,5	61	3,6	1,2	2,4	81	4,0	1,2	2,8	90	4,5	1,6	2,9	102
241.16.10.032			32	17,7	3,5	1,5	2,0	62	4,7	1,5	3,2	83	5,3	1,5	3,8	94	5,9	2,1	3,8	104
241.16.10.038			38	16,7	4,2	1,8	2,4	70	5,6	1,8	3,8	94	6,3	1,8	4,5	105	7,0	2,5	4,5	117
241.16.10.044			44	14,7	5,1	2,2	2,9	75	6,8	2,2	4,6	100	7,7	2,2	5,5	113	8,5	3,1	5,4	125
241.16.10.051			51	12,8	5,7	2,5	3,2	73	7,6	2,5	5,1	97	8,6	2,5	6,1	110	9,5	3,4	6,1	122
241.16.10.064			64	10,8	7,5	3,3	4,2	81	10,0	3,3	6,7	108	11,3	3,3	8,0	122	12,5	4,5	8,0	135
241.16.10.076			76	7,8	8,7	3,8	4,9	68	11,6	3,8	7,8	90	13,1	3,8	9,3	102	14,5	5,2	9,3	113
241.16.10.305			305	2,0	36,0	15,6	20,4	72	48,0	15,6	32,4	96	54,0	15,6	38,4	108	60,0	21,6	38,4	120

Order No red	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.16.10.025	10,0	5,0	25	22,6	4,9	2,0	2,9	111	5,5	2,7	2,8	124	7,1	5,2	1,9	160	8,9	16,1	201,1
241.16.10.032			32	17,7	6,4	2,7	3,7	113	7,3	3,5	3,8	129	9,4	6,8	2,6	166	11,7	20,3	207,1
241.16.10.038			38	16,7	7,7	3,2	4,5	129	8,7	4,2	4,5	145	11,2	8,1	3,1	187	14,0	24,0	233,8
241.16.10.044			44	14,7	9,4	3,9	5,5	138	10,5	5,1	5,4	154	13,6	9,9	3,7	200	17,0	27,0	249,9
241.16.10.051			51	12,8	10,5	4,4	6,1	134	11,8	5,7	6,1	151	15,2	11,0	4,2	195	19,0	32,0	243,2
241.16.10.064			64	10,8	13,8	5,8	8,0	149	15,5	7,5	8,0	167	20,0	14,5	5,5	216	25,0	39,0	270,0
241.16.10.076			76	7,8	16,0	6,7	9,3	125	18,0	8,7	9,3	140	23,2	16,8	6,4	181	29,0	47,0	226,2
241.16.10.305			305	2,0	66,0	27,6	38,4	132	74,4	36,0	38,4	149	96,0	69,6	26,4	192	120,0	185,0	240,0

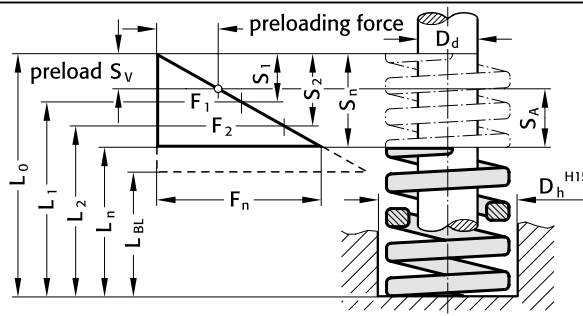
**241.17.**

Order No yellow	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.17.10.025	10,0	5,0	25	34,3	2,1	0,9	1,2	72	2,8	0,9	1,9	96	3,1	0,9	2,2	106	3,5	1,4	2,1	120
241.17.10.032			32	25,5	2,4	1,0	1,4	61	3,2	1,0	2,2	82	3,6	1,0	2,6	92	4,0	1,5	2,5	102
241.17.10.038			38	21,6	3,5	1,5	2,0	76	4,6	1,5	3,1	99	5,2	1,5	3,7	112	5,8	2,2	3,6	125
241.17.10.044			44	17,9	3,9	1,7	2,2	70	5,2	1,7	3,5	93	5,8	1,7	4,1	104	6,5	2,5	4,0	116
241.17.10.051			51	15,1	4,5	1,9	2,6	68	6,0	1,9	4,1	91	6,7	1,9	4,8	101	7,5	2,9	4,6	113
241.17.10.064			64	12,3	6,4	2,8	3,6	78	8,5	2,8	5,7	104	9,6	2,8	6,8	118	10,7	4,1	6,6	131
241.17.10.076			76	10,2	7,4	3,2	4,2	75	9,8	3,2	6,6	100	11,1	3,2	7,9	113	12,3	4,7	7,6	125
241.17.10.305			305	2,5	31,2	13,5	17,7	76	41,6	13,5	28,1	102	46,8	13,5	33,3	115	52,0	20,0	32,0	127

Order No yellow	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.17.10.025	10,0	5,0	25	34,3	3,8	1,7	2,1	130	4,3	2,2	2,1	148	5,6	4,1	1,5	192	7,0	18,0	240,4
241.17.10.032			32	25,5	4,4	1,9	2,5	112	5,0	2,5	2,5	128	6,4	4,7	1,7	163	8,0	24,0	204,1
241.17.10.038			38	21,6	6,4	2,8	3,6	138	7,2	3,6	3,6	155	9,3	6,8	2,5	201	11,6	26,4	250,3
241.17.10.044			44	17,9	7,2	3,1	4,1	129	8,1	4,1	4,0	145	10,4	7,6	2,8	186	13,0	31,0	232,1
241.17.10.051			51	15,1	8,2	3,6	4,6	124	9,3	4,7	4,6	141	12,0	8,8	3,2	181	15,0	36,0	226,7
241.17.10.064			64	12,3	11,7	5,2	6,5	143	13,2	6,7	6,5	162	17,0	12,4	4,6	208	21,3	42,7	261,1
241.17.10.076			76	10,2	13,5	6,0	7,5	138	15,2	7,7	7,5	155	19,7	14,4	5,3	201	24,6	51,4	250,9
241.17.10.305			305	2,5	57,2	25,2	32,0	140	64,5	32,5	32,0	158	83,2	60,8	22,4	204	104,0	201,0	254,8

**High Performance Compression Springs**

Ø 12,5



- $D_h$  = dia. of guide sleeve
- $D_d$  = diameter of guide pin
- $L_0$  = free length of spring
- $L_1...L_n$  = length of loaded spring (mm) as related to spring forces  $F_1...F_n$
- $L_{BL}$  = length of compacted spring (i.e. wire-to-wire)
- $F_1...F_n$  = forces (N) as related to length of spring  $L_1...L_n$
- $S_{v1}...S_{v7}$  = recommend. preload. compression, as relat. to compress.  $S_1...S_7$
- $S_1...S_n$  = compr. as related to spring forces  $F_1...F_n$
- $R$  = spring rate (N/mm)
- $S_{A1}...S_{A7}$  = working stroke (mm)

241.14.

Colour: "Green"

241.15.

"Colour: "Blue"

**241.14.**

Order No green	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.14.13.025	12,5	6,3	25	18,0	3,9	1,7	2,2	70	5,2	1,7	3,5	94	5,9	1,7	4,2	106	6,5	2,3	4,2	117
241.14.13.032			32	16,4	5,1	2,2	2,9	84	6,8	2,2	4,6	112	7,7	2,2	5,5	126	8,5	3,1	5,4	139
241.14.13.038			38	13,6	6,0	2,6	3,4	82	8,0	2,6	5,4	109	9,0	2,6	6,4	122	10,0	3,6	6,4	136
241.14.13.044			44	12,1	6,9	3,0	3,9	83	9,2	3,0	6,2	111	10,4	3,0	7,4	126	11,5	4,1	7,4	139
241.14.13.051			51	11,4	8,1	3,5	4,6	92	10,8	3,5	7,3	123	12,2	3,5	8,7	139	13,5	4,9	8,6	154
241.14.13.064			64	9,3	10,5	4,6	5,9	98	14,0	4,6	9,4	130	15,8	4,6	11,2	147	17,5	6,3	11,2	163
241.14.13.076			76	7,1	12,3	5,3	7,0	87	16,4	5,3	11,1	116	18,5	5,3	13,2	131	20,5	7,4	13,1	146
241.14.13.089			89	5,4	14,7	6,4	8,3	79	19,6	6,4	13,2	106	22,1	6,4	15,7	119	24,5	8,8	15,7	132
241.14.13.305			305	1,4	49,8	21,6	28,2	70	66,4	21,6	44,8	93	74,7	21,6	53,1	105	83,0	29,9	53,1	116

Order No green	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.14.13.025	12,5	6,3	25	18,0	7,2	3,0	4,2	130	8,1	3,9	4,2	146	10,4	7,5	2,9	187	13,0	12,0	234,0
241.14.13.032			32	16,4	9,4	3,9	5,5	154	10,5	5,1	5,4	172	13,6	9,9	3,7	223	17,0	15,0	278,8
241.14.13.038			38	13,6	11,0	4,6	6,4	150	12,4	6,0	6,4	169	16,0	11,6	4,4	218	20,0	18,0	272,0
241.14.13.044			44	12,1	12,7	5,3	7,4	154	14,3	6,9	7,4	173	18,4	13,3	5,1	223	23,0	21,0	278,3
241.14.13.051			51	11,4	14,9	6,2	8,7	170	16,7	8,1	8,6	190	21,6	15,7	5,9	246	27,0	24,0	307,8
241.14.13.064			64	9,3	19,3	8,1	11,2	179	21,7	10,5	11,2	202	28,0	20,3	7,7	260	35,0	29,0	325,5
241.14.13.076			76	7,1	22,6	9,4	13,2	160	25,4	12,3	13,1	180	32,8	23,8	9,0	233	41,0	35,0	291,1
241.14.13.089			89	5,4	27,0	11,3	15,7	146	30,4	14,7	15,7	164	39,2	28,4	10,8	212	49,0	40,0	264,6
241.14.13.305			305	1,4	91,3	38,2	53,1	128	103,0	49,8	53,1	144	132,8	96,3	36,5	186	166,0	139,0	232,4

**241.15.**

Order No blue	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.15.13.025	12,5	6,3	25	30,0	3,3	1,4	1,9	99	4,4	1,4	3,0	132	5,0	1,4	3,6	150	5,5	2,0	3,5	165
241.15.13.032			32	24,8	3,9	1,7	2,2	97	5,2	1,7	3,5	129	5,9	1,7	4,2	146	6,5	2,3	4,2	161
241.15.13.038			38	21,4	4,8	2,1	2,7	103	6,4	2,1	4,3	137	7,2	2,1	5,1	154	8,0	2,9	5,1	171
241.15.13.044			44	18,5	5,7	2,5	3,2	105	7,6	2,5	5,1	141	8,6	2,5	6,1	159	9,5	3,4	6,1	176
241.15.13.051			51	15,5	6,6	2,9	3,7	102	8,8	2,9	5,9	136	9,9	2,9	7,0	153	11,0	4,0	7,0	171
241.15.13.064			64	12,1	8,4	3,6	4,8	102	11,2	3,6	7,6	136	12,6	3,6	9,0	152	14,0	5,0	9,0	169
241.15.13.076			76	10,2	10,2	4,4	5,8	104	13,6	4,4	9,2	139	15,3	4,4	10,9	156	17,0	6,1	10,9	173
241.15.13.089			89	8,4	12,3	5,3	7,0	103	16,4	5,3	11,1	138	18,5	5,3	13,2	155	20,5	7,4	13,1	172
241.15.13.305			305	2,1	43,2	18,7	24,5	91	57,6	18,7	38,9	121	64,8	18,7	46,1	136	72,0	25,9	46,1	151

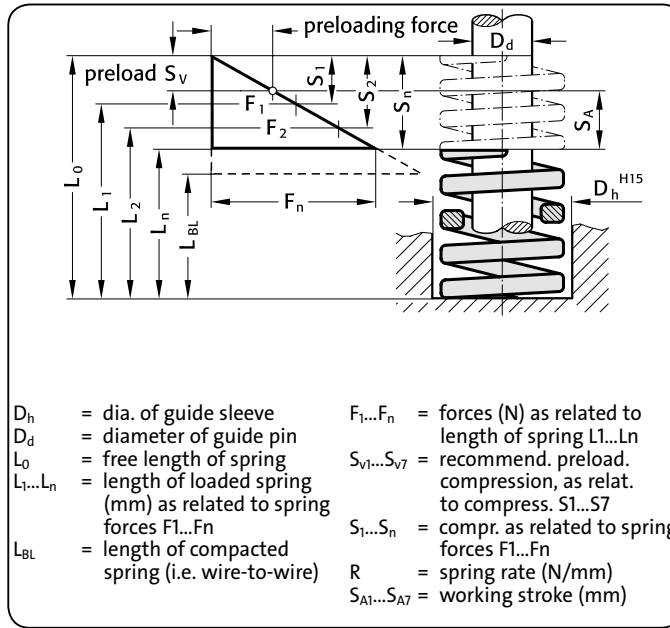
Order No blue	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.15.13.025	12,5	6,3	25	30,0	6,1	2,5	3,6	183	6,8	3,3	3,5	204	8,8	6,4	2,4	264	11,0	14,0	330,0
241.15.13.032			32	24,8	7,2	3,0	4,2	179	8,1	3,9	4,2	201	10,4	7,5	2,9	258	13,0	19,0	322,4
241.15.13.038			38	21,4	8,8	3,7	5,1	188	9,9	4,8	5,1	212	12,8	9,3	3,5	274	16,0	22,0	342,4
241.15.13.044			44	18,5	10,5	4,4	6,1	194	11,8	5,7	6,1	218	15,2	11,0	4,2	281	19,0	25,0	351,5
241.15.13.051			51	15,5	12,1	5,1	7,0	188	13,6	6,6	7,0	211	17,6	12,8	4,8	273	22,0	29,0	341,0
241.15.13.064			64	12,1	15,4	6,4	9,0	186	17,4	8,4	9,0	211	22,4	16,2	6,2	271	28,0	36,0	338,8
241.15.13.076			76	10,2	18,7	7,8	10,9	191	21,1	10,2	10,9	215	27,2	19,7	7,5	277	34,0	42,0	346,8
241.15.13.089			89	8,4	22,6	9,4	13,2	190	25,4	12,3	13,1	213	32,8	23,8	9,0	276	41,0	48,0	344,4
241.15.13.305			305	2,1	79,2	33,1	46,1	166	89,3	43,2	46,1	188	115,2	83,5	31,7	242	144,0	161,0	302,4

**241.16.**  
**241.17.**

**High Performance Compression Springs**

**241.16.**  
**Colour: "Red"**

**241.17.**  
**Colour: "Yellow"**



**241.16.**

Order No red	$D_h$	$D_d$	$L_0$	$R$	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.16.13.025	12,5	6,3	25	42,2	2,6	1,1	1,5	110	3,5	1,1	2,4	148	3,9	1,1	2,8	165	4,4	1,6	2,8	186
241.16.13.032			32	33,4	3,3	1,4	1,9	110	4,4	1,4	3,0	147	5,0	1,4	3,6	167	5,5	2,0	3,5	184
241.16.13.038			38	29,4	4,1	1,8	2,3	121	5,4	1,8	3,6	159	6,1	1,8	4,3	179	6,8	2,4	4,4	200
241.16.13.044			44	24,5	4,8	2,1	2,7	118	6,4	2,1	4,3	157	7,2	2,1	5,1	176	8,0	2,9	5,1	196
241.16.13.051			51	19,6	5,7	2,5	3,2	112	7,6	2,5	5,1	149	8,6	2,5	6,1	169	9,5	3,4	6,1	186
241.16.13.064			64	14,7	7,2	3,1	4,1	106	9,6	3,1	6,5	141	10,8	3,1	7,7	159	12,0	4,3	7,7	176
241.16.13.076			76	13,7	8,7	3,8	4,9	119	11,6	3,8	7,8	159	13,1	3,8	9,3	179	14,5	5,2	9,3	199
241.16.13.089			89	11,8	9,9	4,3	5,6	117	13,2	4,3	8,9	156	14,9	4,3	10,6	176	16,5	5,9	10,6	195
241.16.13.305			305	2,9	36,0	15,6	20,4	104	48,0	15,6	32,4	139	54,0	15,6	38,4	157	60,0	21,6	38,4	174

Order No red	$D_h$	$D_d$	$L_0$	$R$	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.16.13.025	12,5	6,3	25	42,2	4,8	2,0	2,8	203	5,4	2,6	2,8	228	7,0	5,0	2,0	295	8,7	16,3	367,1
241.16.13.032			32	33,4	6,1	2,5	3,6	204	6,8	3,3	3,5	227	8,8	6,4	2,4	294	11,0	21,0	367,4
241.16.13.038			38	29,4	7,4	3,1	4,3	218	8,4	4,1	4,3	247	10,8	7,8	3,0	318	13,5	24,5	396,9
241.16.13.044			44	24,5	8,8	3,7	5,1	216	9,9	4,8	5,1	243	12,8	9,3	3,5	314	16,0	28,0	392,0
241.16.13.051			51	19,6	10,5	4,4	6,1	206	11,8	5,7	6,1	231	15,2	11,0	4,2	298	19,0	32,0	372,4
241.16.13.064			64	14,7	13,2	5,5	7,7	194	14,9	7,2	7,7	219	19,2	13,9	5,3	282	24,0	40,0	352,8
241.16.13.076			76	13,7	16,0	6,7	9,3	219	18,0	8,7	9,3	247	23,2	16,8	6,4	318	29,0	47,0	397,3
241.16.13.089			89	11,8	18,2	7,6	10,6	215	20,5	9,9	10,6	242	26,4	19,1	7,3	312	33,0	56,0	389,4
241.16.13.305			305	2,9	66,0	27,6	38,4	191	74,4	36,0	38,4	216	96,0	69,6	26,4	278	120,0	185,0	348,0

**241.17.**

Order No yellow	$D_h$	$D_d$	$L_0$	$R$	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.17.13.025	12,5	6,3	25	58,6	2,7	1,2	1,5	158	3,6	1,2	2,4	211	4,1	1,2	2,9	237	4,5	1,6	2,9	264
241.17.13.032			32	43,9	3,2	1,4	1,8	140	4,2	1,4	2,9	186	4,8	1,4	3,4	209	5,3	1,9	3,4	233
241.17.13.038			38	36,0	3,9	1,7	2,2	140	5,2	1,7	3,5	187	5,9	1,7	4,2	211	6,5	2,3	4,2	234
241.17.13.044			44	30,3	4,7	2,0	2,6	141	6,2	2,0	4,2	188	7,0	2,0	5,0	211	7,8	2,8	5,0	235
241.17.13.051			51	26,2	5,4	2,3	3,1	141	7,2	2,3	4,9	189	8,1	2,3	5,8	212	9,0	3,2	5,8	236
241.17.13.064			64	21,2	6,6	2,9	3,7	140	8,8	2,9	5,9	187	9,9	2,9	7,0	210	11,0	4,0	7,0	233
241.17.13.076			76	17,1	8,1	3,5	4,6	139	10,8	3,5	7,3	185	12,2	3,5	8,6	208	13,5	4,9	8,6	231
241.17.13.089			89	14,5	9,9	4,3	5,6	144	13,2	4,3	8,9	191	14,9	4,3	10,6	215	16,5	5,9	10,6	239
241.17.13.305			305	4,3	33,6	14,6	19,0	144	44,8	14,6	30,2	193	50,4	14,6	35,8	217	56,0	20,2	35,8	241

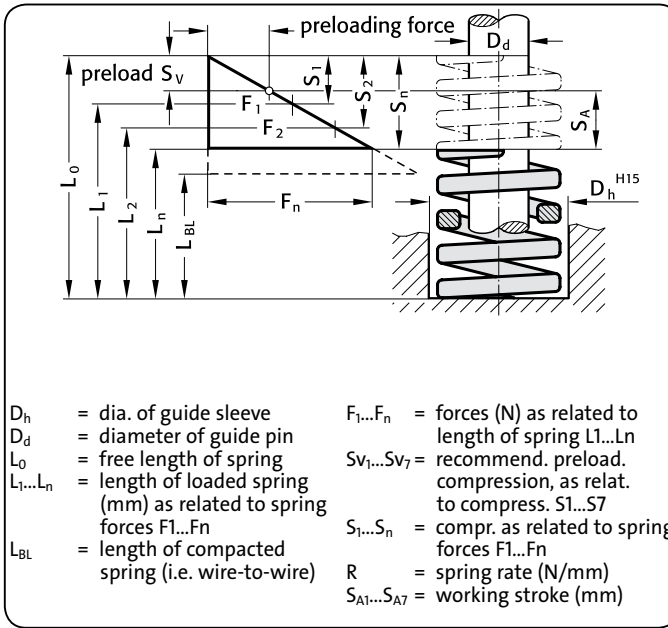
Order No yellow	$D_h$	$D_d$	$L_0$	$R$	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.17.13.025	12,5	6,3	25	58,6	5,0	2,1	2,9	290	5,6	2,7	2,9	327	7,2	5,2	2,0	422	9,0	16,0	527,1
241.17.13.032			32	43,9	5,8	2,4	3,4	256	6,6	3,2	3,4	289	8,5	6,1	2,3	372	10,6	21,4	465,3
241.17.13.038			38	36,0	7,2	3,0	4,2	257	8,1	3,9	4,2	290	10,4	7,5	2,9	374	13,0	25,0	468,0
241.17.13.044			44	30,3	8,5	3,6	5,0	258	9,6	4,7	5,0	291	12,4	9,0	3,4	376	15,5	28,5	469,7
241.17.13.051			51	26,2	9,9	4,1	5,8	259	11,2	5,4	5,8	292	14,4	10,4	4,0	377	18,0	33,0	471,6
241.17.13.064			64	21,2	12,1	5,1	7,0	257	13,6	6,6	7,0	289	17,6	12,8	4,8	373	22,0	42,0	466,4
241.17.13.076			76	17,1	14,9	6,2	8,6	254	16,7	8,1	8,6	286	21,6	15,7	5,9	369	27,0	49,0	461,7
241.17.13.089			89	14,5	18,2	7,6	10,6	263	20,5	9,9	10,6	297	26,4	19,1	7,3	383	33,0	56,0	478,5
241.17.13.305			305	4,3	61,6	25,8	35,8	265	69,4	33,6	35,8	299	89,6	65,0	24,6	385	112,0	193,0	481,6

# High Performance Compression Springs

241.14.



Ø 16



241.14.  
Colour: "Green"

## 241.14.

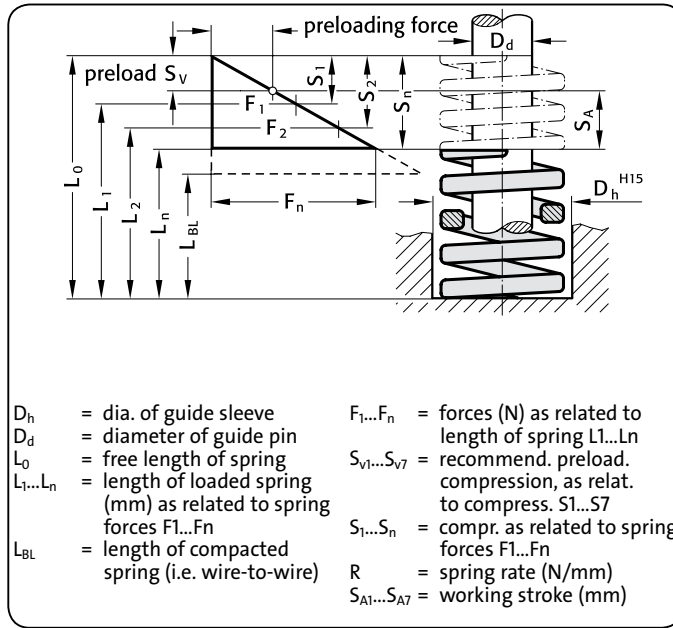
Order No green	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{V1}$	$S_{A1}$	$F_1$	$S_2$	$S_{V2}$	$S_{A2}$	$F_2$	$S_3$	$S_{V3}$	$S_{A3}$	$F_3$	$S_4$	$S_{V4}$	$S_{A4}$	$F_4$
241.14.16.025	16,0	8,0	25	23,5	3,9	1,7	2,2	92	5,2	1,7	3,5	122	5,9	1,7	4,2	139	6,5	2,3	4,2	153
241.14.16.032			32	23,0	4,8	2,1	2,7	110	6,4	2,1	4,3	147	7,2	2,1	5,1	166	8,0	2,9	5,1	184
241.14.16.038			38	19,3	6,0	2,6	3,4	116	8,0	2,6	5,4	154	9,0	2,6	6,4	174	10,0	3,6	6,4	193
241.14.16.044			44	17,1	6,9	3,0	3,9	118	9,2	3,0	6,2	157	10,4	3,0	7,4	178	11,5	4,1	7,4	197
241.14.16.051			51	15,7	8,1	3,5	4,6	127	10,8	3,5	7,3	170	12,2	3,5	8,7	192	13,5	4,9	8,6	212
241.14.16.064			64	10,7	10,2	4,4	5,8	109	13,6	4,4	9,2	146	15,3	4,4	10,9	164	17,0	6,1	10,9	182
241.14.16.076			76	10,0	12,3	5,3	7,0	123	16,4	5,3	11,1	164	18,5	5,3	13,2	185	20,5	7,4	13,1	205
241.14.16.089			89	8,6	14,7	6,4	8,3	126	19,6	6,4	13,2	169	22,1	6,4	15,7	190	24,5	8,8	15,7	211
241.14.16.102			102	7,9	16,8	7,3	9,5	133	22,4	7,3	15,1	177	25,2	7,3	17,9	199	28,0	10,1	17,9	221
241.14.16.305			305	2,6	51,0	22,1	28,9	133	68,0	22,1	45,9	177	76,5	22,1	54,4	199	85,0	30,6	54,4	221

Order No green	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{V5}$	$S_{A5}$	$F_5$	$S_6$	$S_{V6}$	$S_{A6}$	$F_6$	$S_7$	$S_{V7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.14.16.025	16,0	8,0	25	23,5	7,2	3,0	4,2	169	8,1	3,9	4,2	190	10,4	7,5	2,9	244	13,0	12,0	305,5
241.14.16.032			32	23,0	8,8	3,7	5,1	202	9,9	4,8	5,1	228	12,8	9,3	3,5	294	16,0	16,0	368,0
241.14.16.038			38	19,3	11,0	4,6	6,4	212	12,4	6,0	6,4	239	16,0	11,6	4,4	309	20,0	18,0	386,0
241.14.16.044			44	17,1	12,7	5,3	7,4	217	14,3	6,9	7,4	245	18,4	13,3	5,1	315	23,0	21,0	393,3
241.14.16.051			51	15,7	14,9	6,2	8,7	234	16,7	8,1	8,6	262	21,6	15,7	5,9	339	27,0	24,0	423,9
241.14.16.064			64	10,7	18,7	7,8	10,9	200	21,1	10,2	10,9	226	27,2	19,7	7,5	291	34,0	30,0	363,8
241.14.16.076			76	10,0	22,6	9,4	13,2	226	25,4	12,3	13,1	254	32,8	23,8	9,0	328	41,0	35,0	410,0
241.14.16.089			89	8,6	27,0	11,3	15,7	232	30,4	14,7	15,7	261	39,2	28,4	10,8	337	49,0	40,0	421,4
241.14.16.102			102	7,9	30,8	12,9	17,9	243	34,7	16,8	17,9	274	44,8	32,5	12,3	354	56,0	46,0	442,4
241.14.16.305			305	2,6	93,5	39,1	54,4	243	105,0	51,0	54,4	274	136,0	98,6	37,4	354	170,0	135,0	442,0

241.15.

High Performance Compression Springs

241.15.  
Colour: "Blue"



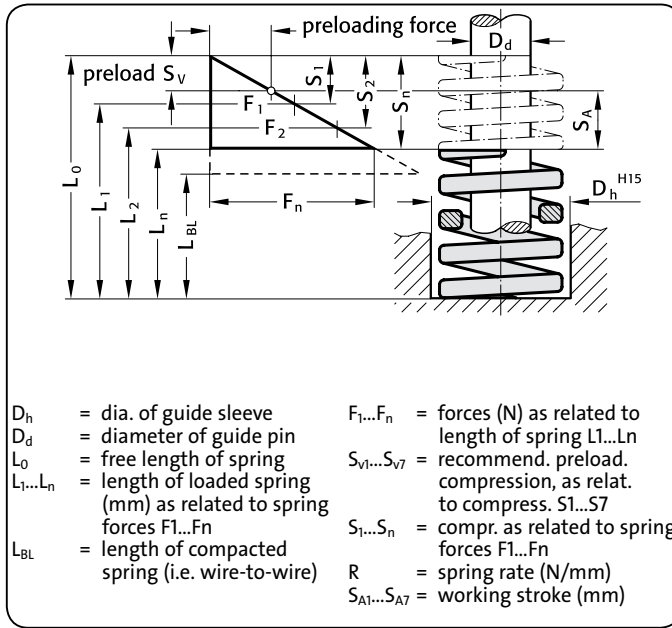
241.15.

Order No blue	$D_h$	$D_d$	$L_0$	R	30% Federweg			40% Federweg			45% Federweg			50% Federweg						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.15.16.025	16,0	8,0	25	49,4	3,3	1,4	1,9	163	4,4	1,4	3,0	217	5,0	1,4	3,6	247	5,5	2,0	3,5	272
241.15.16.032			32	37,1	3,9	1,7	2,2	145	5,2	1,7	3,5	193	5,9	1,7	4,2	219	6,5	2,3	4,2	241
241.15.16.038			38	33,9	4,8	2,1	2,7	163	6,4	2,1	4,3	217	7,2	2,1	5,1	244	8,0	2,9	5,1	271
241.15.16.044			44	30,0	5,7	2,5	3,2	171	7,6	2,5	5,1	228	8,6	2,5	6,1	258	9,5	3,4	6,1	285
241.15.16.051			51	26,4	6,3	2,7	3,6	166	8,4	2,7	5,7	222	9,5	2,7	6,8	251	10,5	3,8	6,7	277
241.15.16.064			64	20,2	8,1	3,5	4,6	164	10,8	3,5	7,3	218	12,2	3,5	8,7	246	13,5	4,9	8,6	273
241.15.16.076			76	17,9	9,9	4,3	5,6	177	13,2	4,3	8,9	236	14,9	4,3	10,6	267	16,5	5,9	10,6	295
241.15.16.089			89	15,2	11,7	5,1	6,6	178	15,6	5,1	10,5	237	17,6	5,1	12,5	268	19,5	7,0	12,5	296
241.15.16.102			102	13,5	13,5	5,9	7,6	182	18,0	5,9	12,1	243	20,3	5,9	14,4	274	22,5	8,1	14,4	304
241.15.16.305			305	4,8	41,4	17,9	23,5	199	55,2	17,9	37,3	265	62,1	17,9	44,2	298	69,0	24,8	44,2	331

Order No blue	$D_h$	$D_d$	$L_0$	R	55% Federweg			62% Federweg			80% Federweg			100% Federweg					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.15.16.025	16,0	8,0	25	49,4	6,1	2,5	3,6	301	6,8	3,3	3,5	336	8,8	6,4	2,4	435	11,0	14,0	543,4
241.15.16.032			32	37,1	7,2	3,0	4,2	267	8,1	3,9	4,2	301	10,4	7,5	2,9	386	13,0	19,0	482,3
241.15.16.038			38	33,9	8,8	3,7	5,1	298	9,9	4,8	5,1	336	12,8	9,3	3,5	434	16,0	22,0	542,4
241.15.16.044			44	30,0	10,5	4,4	6,1	315	11,8	5,7	6,1	354	15,2	11,0	4,2	456	19,0	25,0	570,0
241.15.16.051			51	26,4	11,6	4,8	6,8	306	13,0	6,3	6,7	343	16,8	12,2	4,6	444	21,0	30,0	554,4
241.15.16.064			64	20,2	14,9	6,2	8,7	301	16,7	8,1	8,6	337	21,6	15,7	5,9	436	27,0	37,0	545,4
241.15.16.076			76	17,9	18,2	7,6	10,6	326	20,5	9,9	10,6	367	26,4	19,1	7,3	473	33,0	43,0	590,7
241.15.16.089			89	15,2	21,5	9,0	12,5	327	24,2	11,7	12,5	368	31,2	22,6	8,6	474	39,0	50,0	592,8
241.15.16.102			102	13,5	24,8	10,4	14,4	335	27,9	13,5	14,4	377	36,0	26,1	9,9	486	45,0	57,0	607,5
241.15.16.305			305	4,8	75,9	31,7	44,2	364	85,6	41,4	44,2	411	110,4	80,0	30,4	530	138,0	167,0	662,4

# High Performance Compression Springs

241.16.



241.16.  
Colour: „Red“

- $D_h$  = dia. of guide sleeve
- $D_d$  = diameter of guide pin
- $L_0$  = free length of spring
- $L_1...L_n$  = length of loaded spring (mm) as related to spring forces  $F_1...F_n$
- $L_{BL}$  = length of compacted spring (i.e. wire-to-wire)
- $F_1...F_n$  = forces (N) as related to length of spring  $L_1...L_n$
- $S_{V1}...S_{V7}$  = recommend. preload. compression, as relat. to compress.  $S_1...S_7$
- $S_1...S_n$  = compr. as related to spring forces  $F_1...F_n$
- $R$  = spring rate (N/mm)
- $S_{A1}...S_{A7}$  = working stroke (mm)

## 241.16.

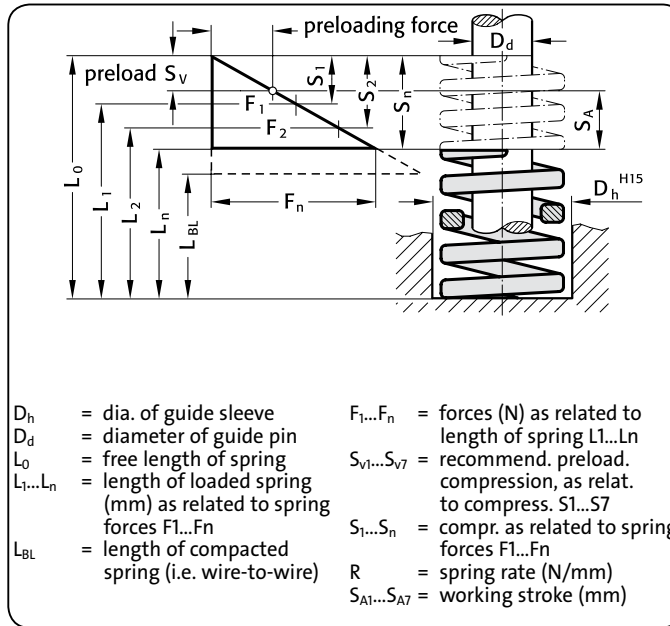
Order No red	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{V1}$	$S_{A1}$	$F_1$	$S_2$	$S_{V2}$	$S_{A2}$	$F_2$	$S_3$	$S_{V3}$	$S_{A3}$	$F_3$	$S_4$	$S_{V4}$	$S_{A4}$	$F_4$
241.16.16.025	16,0	8,0	25	75,5	2,6	1,1	1,5	196	3,5	1,1	2,4	264	3,9	1,1	2,8	294	4,4	1,6	2,8	332
241.16.16.032			32	53,0	3,3	1,4	1,9	175	4,4	1,4	3,0	233	5,0	1,4	3,6	265	5,5	2,0	3,5	292
241.16.16.038			38	49,1	4,1	1,8	2,3	201	5,5	1,8	3,7	270	6,2	1,8	4,4	304	6,9	2,5	4,4	339
241.16.16.044			44	43,2	4,7	2,0	2,7	203	6,3	2,0	4,3	272	7,1	2,0	5,1	307	7,9	2,8	5,1	341
241.16.16.051			51	37,3	5,6	2,4	3,2	209	7,4	2,4	5,0	276	8,3	2,4	5,9	310	9,3	3,3	6,0	347
241.16.16.064			64	30,4	7,1	3,1	4,0	216	9,4	3,1	6,3	286	10,6	3,1	7,5	322	11,8	4,2	7,6	359
241.16.16.076			76	25,5	8,7	3,8	4,9	222	11,6	3,8	7,8	296	13,1	3,8	9,3	334	14,5	5,2	9,3	370
241.16.16.089			89	21,6	10,4	4,5	5,9	225	13,8	4,5	9,3	298	15,5	4,5	11,0	335	17,3	6,2	11,1	374
241.16.16.102			102	19,6	12,0	5,2	6,8	235	16,0	5,2	10,8	314	18,0	5,2	12,8	353	20,0	7,2	12,8	392
241.16.16.305			305	6,9	36,6	15,9	20,7	253	48,8	15,9	32,9	337	54,9	15,9	39,0	379	61,0	22,0	39,0	421

Order No red	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{V5}$	$S_{A5}$	$F_5$	$S_6$	$S_{V6}$	$S_{A6}$	$F_6$	$S_7$	$S_{V7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.16.16.025	16,0	8,0	25	75,5	4,8	2,0	2,8	362	5,4	2,6	2,8	408	7,0	5,0	2,0	529	8,7	16,3	656,9
241.16.16.032			32	53,0	6,1	2,5	3,6	323	6,8	3,3	3,5	360	8,8	6,4	2,4	466	11,0	21,0	583,0
241.16.16.038			38	49,1	7,5	3,2	4,3	368	8,5	4,1	4,4	417	11,0	7,9	3,1	540	13,7	24,3	672,7
241.16.16.044			44	43,2	8,6	3,6	5,0	372	9,7	4,7	5,0	419	12,6	9,1	3,5	544	15,7	28,3	678,2
241.16.16.051			51	37,3	10,2	4,3	5,9	380	11,5	5,6	5,9	429	14,8	10,7	4,1	552	18,5	32,5	690,1
241.16.16.064			64	30,4	12,9	5,4	7,5	392	14,6	7,1	7,5	444	18,8	13,6	5,2	572	23,5	40,5	714,4
241.16.16.076			76	25,5	16,0	6,7	9,3	408	18,0	8,7	9,3	459	23,2	16,8	6,4	592	29,0	47,0	739,5
241.16.16.089			89	21,6	19,0	7,9	11,1	410	21,4	10,4	11,0	462	27,6	20,0	7,6	596	34,5	54,5	745,2
241.16.16.102			102	19,6	22,0	9,2	12,8	431	24,8	12,0	12,8	486	32,0	23,2	8,8	627	40,0	62,0	784,0
241.16.16.305			305	6,9	67,1	28,1	39,0	463	75,6	36,6	39,0	522	97,6	70,8	26,8	673	122,0	183,0	841,8

241.17.

High Performance Compression Springs

241.17.  
Colour "Yellow"



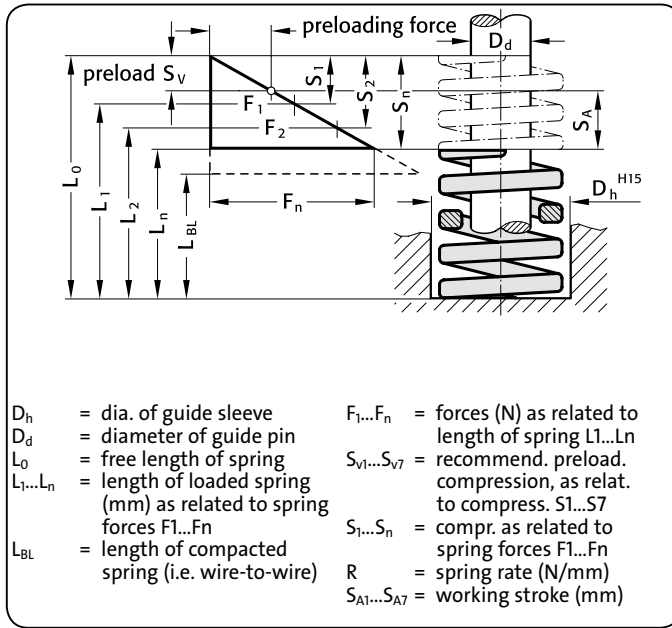
241.17.

Order No yellow	$D_h$	$D_d$	$L_0$	R	30% stroke				40% stroke				45% stroke				50% stroke			
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.17.16.025	16,0	8,0	25	118	2,7	1,2	1,5	319	3,6	1,2	2,4	425	4,1	1,2	2,9	484	4,5	1,6	2,9	531
241.17.16.032			32	89,1	3,2	1,4	1,8	285	4,3	1,4	2,9	383	4,9	1,4	3,5	437	5,4	1,9	3,5	481
241.17.16.038			38	72,1	3,9	1,7	2,2	281	5,2	1,7	3,5	375	5,9	1,7	4,2	425	6,5	2,3	4,2	469
241.17.16.044			44	60,9	4,5	2,0	2,5	274	6,0	2,0	4,0	365	6,8	2,0	4,8	414	7,5	2,7	4,8	457
241.17.16.051			51	52,3	5,4	2,3	3,1	282	7,2	2,3	4,9	377	8,1	2,3	5,8	424	9,0	3,2	5,8	471
241.17.16.064			64	41,2	6,6	2,9	3,7	272	8,8	2,9	5,9	363	9,9	2,9	7,0	408	11,0	4,0	7,0	453
241.17.16.076			76	34,1	8,0	3,4	4,6	273	10,6	3,4	7,2	361	11,9	3,4	8,5	406	13,3	4,8	8,5	454
241.17.16.089			89	29,5	9,5	4,1	5,4	280	12,6	4,1	8,5	372	14,2	4,1	10,1	419	15,8	5,7	10,1	466
241.17.16.102			102	25,6	11,0	4,7	6,3	282	14,6	4,7	9,9	374	16,4	4,7	11,7	420	18,3	6,6	11,7	468
241.17.16.305			305	8,4	33,0	14,3	18,7	277	44,0	14,3	29,7	370	49,5	14,3	35,2	416	55,0	19,8	35,2	462

Order No yellow	$D_h$	$D_d$	$L_0$	R	55% stroke				62% stroke				80% stroke				100% stroke		
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.17.16.025	16,0	8,0	25	118	5,0	2,1	2,9	590	5,6	2,7	2,9	661	7,2	5,2	2,0	850	9,0	16,0	1062,0
241.17.16.032			32	89,1	5,9	2,5	3,4	526	6,7	3,2	3,5	597	8,6	6,3	2,3	766	10,8	21,2	962,3
241.17.16.038			38	72,1	7,2	3,0	4,2	519	8,1	3,9	4,2	584	10,4	7,5	2,9	750	13,0	25,0	937,3
241.17.16.044			44	60,9	8,3	3,5	4,8	505	9,3	4,5	4,8	566	12,0	8,7	3,3	731	15,0	29,0	913,5
241.17.16.051			51	52,3	9,9	4,1	5,8	518	11,2	5,4	5,8	586	14,4	10,4	4,0	753	18,0	33,0	941,4
241.17.16.064			64	41,2	12,1	5,1	7,0	499	13,6	6,6	7,0	560	17,6	12,8	4,8	725	22,0	42,0	906,4
241.17.16.076			76	34,1	14,6	6,1	8,5	498	16,4	8,0	8,4	559	21,2	15,4	5,8	723	26,5	49,5	903,7
241.17.16.089			89	29,5	17,3	7,2	10,1	510	19,5	9,5	10,0	575	25,2	18,3	6,9	743	31,5	57,5	929,3
241.17.16.102			102	25,6	20,1	8,4	11,7	515	22,6	11,0	11,6	579	29,2	21,2	8,0	748	36,5	65,5	934,4
241.17.16.305			305	8,4	60,5	25,3	35,2	508	68,2	33,0	35,2	573	88,0	63,8	24,2	739	110,0	195,0	924,0

# High Performance Compression Springs

241.14.



241.14.  
Colour "Green"

## 241.14.

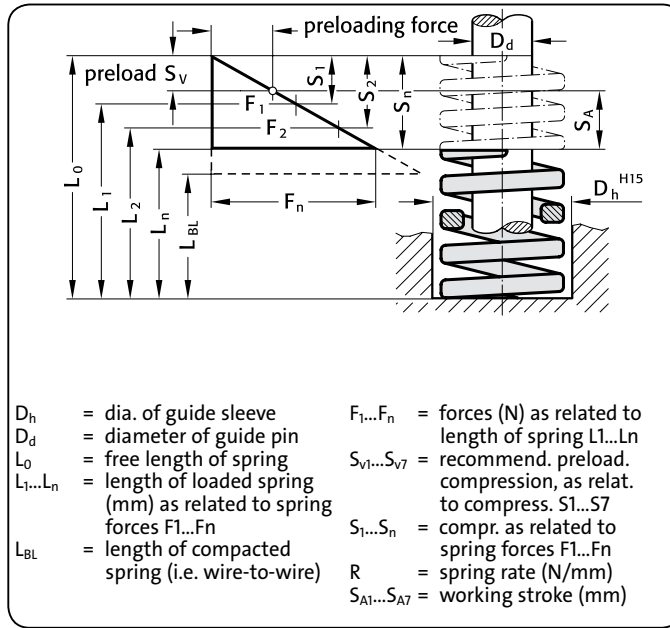
Order No green	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.14.20.025	20,0	10,0	25	55,8	3,9	1,7	2,2	218	5,2	1,7	3,5	290	5,9	1,7	4,2	329	6,5	2,3	4,2	363
241.14.20.032			32	45,0	4,8	2,1	2,7	216	6,4	2,1	4,3	288	7,2	2,1	5,1	324	8,0	2,9	5,1	360
241.14.20.038			38	33,4	5,7	2,5	3,2	190	7,6	2,5	5,1	254	8,6	2,5	6,1	287	9,5	3,4	6,1	317
241.14.20.044			44	30,0	6,9	3,0	3,9	207	9,2	3,0	6,2	276	10,4	3,0	7,4	312	11,5	4,1	7,4	345
241.14.20.051			51	24,5	7,8	3,4	4,4	191	10,4	3,4	7,0	255	11,7	3,4	8,3	287	13,0	4,7	8,3	319
241.14.20.064			64	20,0	9,6	4,2	5,4	192	12,8	4,2	8,6	256	14,4	4,2	10,2	288	16,0	5,8	10,2	320
241.14.20.076			76	16,0	12,0	5,2	6,8	192	16,0	5,2	10,8	256	18,0	5,2	12,8	288	20,0	7,2	12,8	320
241.14.20.089			89	14,0	13,8	6,0	7,8	193	18,4	6,0	12,4	258	20,7	6,0	14,7	290	23,0	8,3	14,7	322
241.14.20.102			102	12,0	15,9	6,9	9,0	191	21,2	6,9	14,3	254	23,9	6,9	17,0	287	26,5	9,5	17,0	318
241.14.20.115			115	10,9	18,0	7,8	10,2	196	24,0	7,8	16,2	262	27,0	7,8	19,2	294	30,0	10,8	19,2	327
241.14.20.127			127	9,5	20,1	8,7	11,4	191	26,8	8,7	18,1	255	30,2	8,7	21,5	287	33,5	12,1	21,4	318
241.14.20.139			139	8,4	21,9	9,5	12,4	184	29,2	9,5	19,7	245	32,9	9,5	23,4	276	36,5	13,1	23,4	307
241.14.20.152			152	7,6	24,3	10,5	13,8	185	32,4	10,5	21,9	246	36,5	10,5	26,0	277	40,5	14,6	25,9	308
241.14.20.305			305	4,0	48,6	21,1	27,5	194	64,8	21,1	43,7	259	72,9	21,1	51,8	292	81,0	29,2	51,8	324
Order No green	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke						
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$	
241.14.20.025	20,0	10,0	25	55,8	7,2	3,0	4,2	402	8,1	3,9	4,2	452	10,4	7,5	2,9	580	13,0	12,0	725,4	
241.14.20.032			32	45,0	8,8	3,7	5,1	396	9,9	4,8	5,1	446	12,8	9,3	3,5	576	16,0	16,0	720,0	
241.14.20.038			38	33,4	10,5	4,4	6,1	351	11,8	5,7	6,1	394	15,2	11,0	4,2	508	19,0	19,0	634,6	
241.14.20.044			44	30,0	12,7	5,3	7,4	381	14,3	6,9	7,4	429	18,4	13,3	5,1	552	23,0	21,0	690,0	
241.14.20.051			51	24,5	14,3	6,0	8,3	350	16,1	7,8	8,3	394	20,8	15,1	5,7	510	26,0	25,0	637,0	
241.14.20.064			64	20,0	17,6	7,4	10,2	352	19,8	9,6	10,2	396	25,6	18,6	7,0	512	32,0	32,0	640,0	
241.14.20.076			76	16,0	22,0	9,2	12,8	352	24,8	12,0	12,8	397	32,0	23,2	8,8	512	40,0	36,0	640,0	
241.14.20.089			89	14,0	25,3	10,6	14,7	354	28,5	13,8	14,7	399	36,8	26,7	10,1	515	46,0	43,0	644,0	
241.14.20.102			102	12,0	29,2	12,2	17,0	350	32,9	15,9	17,0	395	42,4	30,7	11,7	509	53,0	49,0	636,0	
241.14.20.115			115	10,9	33,0	13,8	19,2	360	37,2	18,0	19,2	405	48,0	34,8	13,2	523	60,0	55,0	654,0	
241.14.20.127			127	9,5	36,9	15,4	21,5	351	41,5	20,1	21,4	394	53,6	38,9	14,7	509	67,0	60,0	636,5	
241.14.20.139			139	8,4	40,2	16,8	23,4	338	45,3	21,9	23,4	381	58,4	42,3	16,1	491	73,0	66,0	613,2	
241.14.20.152			152	7,6	44,6	18,6	26,0	339	50,2	24,3	25,9	382	64,8	47,0	17,8	492	81,0	71,0	615,6	
241.14.20.305			305	4,0	89,1	37,3	51,8	356	100,0	48,6	51,8	402	129,6	94,0	35,6	518	162,0	143,0	648,0	



**241.15.**

**High Performance Compression Springs**

241.15.  
Colour "Blue"



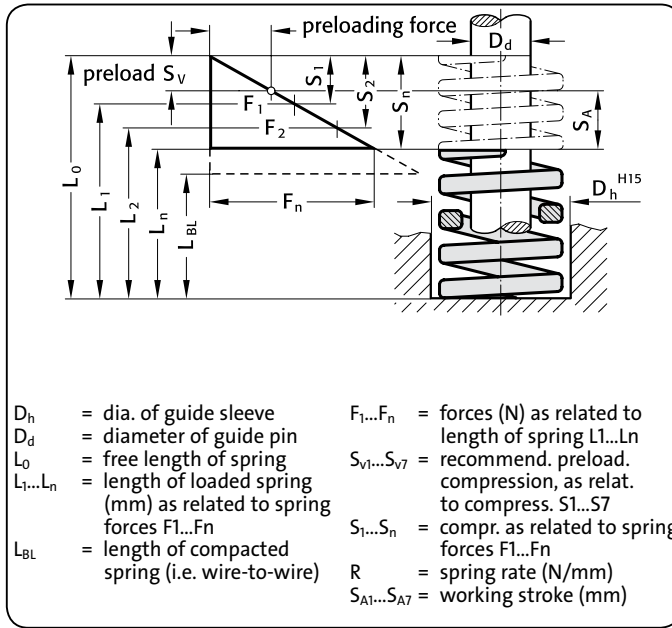
**241.15.**

Order No blue	$D_h$	$D_d$	$L_0$	R	30% stroke				40% stroke				45% stroke				50% stroke			
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.15.20.025	20,0	10,0	25	98,1	3,3	1,4	1,9	324	4,4	1,4	3,0	432	5,0	1,4	3,6	491	5,5	2,0	3,5	540
241.15.20.032			32	72,7	3,9	1,7	2,2	284	5,2	1,7	3,5	378	5,9	1,7	4,2	429	6,5	2,3	4,2	473
241.15.20.038			38	56,0	4,8	2,1	2,7	269	6,4	2,1	4,3	358	7,2	2,1	5,1	403	8,0	2,9	5,1	448
241.15.20.044			44	47,6	5,7	2,5	3,2	271	7,6	2,5	5,1	362	8,6	2,5	6,1	409	9,5	3,4	6,1	452
241.15.20.051			51	41,7	6,3	2,7	3,6	263	8,4	2,7	5,7	350	9,5	2,7	6,8	396	10,5	3,8	6,7	438
241.15.20.064			64	32,3	8,1	3,5	4,6	262	10,8	3,5	7,3	349	12,2	3,5	8,7	394	13,5	4,9	8,6	436
241.15.20.076			76	25,1	9,9	4,3	5,6	248	13,2	4,3	8,9	331	14,9	4,3	10,6	374	16,5	5,9	10,6	414
241.15.20.089			89	22,0	11,7	5,1	6,6	257	15,6	5,1	10,5	343	17,6	5,1	12,5	387	19,5	7,0	12,5	429
241.15.20.102			102	19,8	13,2	5,7	7,5	261	17,6	5,7	11,9	348	19,8	5,7	14,1	392	22,0	7,9	14,1	436
241.15.20.115			115	18,2	14,7	6,4	8,3	268	19,6	6,4	13,2	357	22,1	6,4	15,7	402	24,5	8,8	15,7	446
241.15.20.127			127	16,6	16,5	7,2	9,3	274	22,0	7,2	14,8	365	24,8	7,2	17,6	412	27,5	9,9	17,6	457
241.15.20.139			139	15,1	18,3	7,9	10,4	276	24,4	7,9	16,5	368	27,5	7,9	19,6	415	30,5	11,0	19,5	461
241.15.20.152			152	13,2	19,8	8,6	11,2	261	26,4	8,6	17,8	348	29,7	8,6	21,1	392	33,0	11,9	21,1	436
241.15.20.305			305	6,1	40,8	17,7	23,1	249	54,4	17,7	36,7	332	61,2	17,7	43,5	373	68,0	24,5	43,5	415

Order No blue	$D_h$	$D_d$	$L_0$	R	55% stroke				62% stroke				80% stroke				100% stroke		
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.15.20.025	20,0	10,0	25	98,1	6,1	2,5	3,6	598	6,8	3,3	3,5	667	8,8	6,4	2,4	863	11,0	14,0	1079,1
241.15.20.032			32	72,7	7,2	3,0	4,2	523	8,1	3,9	4,2	589	10,4	7,5	2,9	756	13,0	19,0	945,1
241.15.20.038			38	56,0	8,8	3,7	5,1	493	9,9	4,8	5,1	554	12,8	9,3	3,5	717	16,0	22,0	896,0
241.15.20.044			44	47,6	10,5	4,4	6,1	500	11,8	5,7	6,1	562	15,2	11,0	4,2	724	19,0	25,0	904,4
241.15.20.051			51	41,7	11,6	4,8	6,8	484	13,0	6,3	6,7	542	16,8	12,2	4,6	701	21,0	30,0	875,7
241.15.20.064			64	32,3	14,9	6,2	8,7	481	16,7	8,1	8,6	539	21,6	15,7	5,9	698	27,0	37,0	872,1
241.15.20.076			76	25,1	18,2	7,6	10,6	457	20,5	9,9	10,6	515	26,4	19,1	7,3	663	33,0	43,0	828,3
241.15.20.089			89	22,0	21,5	9,0	12,5	473	24,2	11,7	12,5	532	31,2	22,6	8,6	686	39,0	50,0	858,0
241.15.20.102			102	19,8	24,2	10,1	14,1	479	27,3	13,2	14,1	541	35,2	25,5	9,7	697	44,0	58,0	871,2
241.15.20.115			115	18,2	27,0	11,3	15,7	491	30,4	14,7	15,7	553	39,2	28,4	10,8	713	49,0	66,0	891,8
241.15.20.127			127	16,6	30,3	12,7	17,6	503	34,1	16,5	17,6	566	44,0	31,9	12,1	730	55,0	72,0	913,0
241.15.20.139			139	15,1	33,6	14,0	19,6	507	37,8	18,3	19,5	571	48,8	35,4	13,4	737	61,0	78,0	921,1
241.15.20.152			152	13,2	36,3	15,2	21,1	479	40,9	19,8	21,1	540	52,8	38,3	14,5	697	66,0	86,0	871,2
241.15.20.305			305	6,1	74,8	31,3	43,5	456	84,3	40,8	43,5	514	108,8	78,9	29,9	664	136,0	169,0	829,6

# High Performance Compression Springs

241.16.



241.16.  
Colour "Red"

## 241.16.

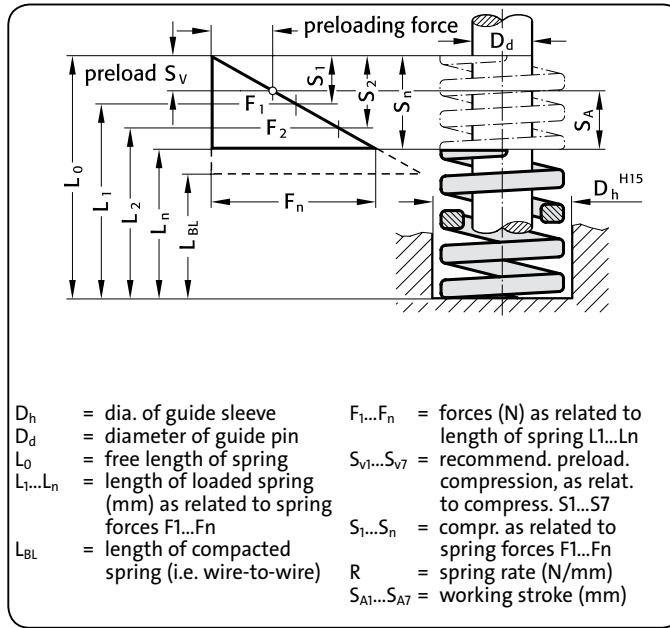
Order No red	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.16.20.025	20,0	10,0	25	215,8	2,5	1,1	1,4	540	3,4	1,1	2,3	734	3,8	1,1	2,7	820	4,2	1,5	2,7	906
241.16.20.032			32	167,8	3,2	1,4	1,8	537	4,2	1,4	2,8	705	4,7	1,4	3,3	789	5,3	1,9	3,4	889
241.16.20.038			38	133,4	3,8	1,6	2,2	507	5,0	1,6	3,4	667	5,6	1,6	4,0	747	6,3	2,3	4,0	840
241.16.20.044			44	111,8	4,4	1,9	2,5	492	5,8	1,9	3,9	648	6,5	1,9	4,6	727	7,3	2,6	4,7	816
241.16.20.051			51	94,2	5,0	2,1	2,9	471	6,6	2,1	4,5	622	7,4	2,1	5,3	697	8,3	3,0	5,3	782
241.16.20.064			64	72,6	6,3	2,7	3,6	457	8,4	2,7	5,7	610	9,5	2,7	6,8	690	10,5	3,8	6,7	762
241.16.20.076			76	59,8	7,8	3,4	4,4	466	10,4	3,4	7,0	622	11,7	3,4	8,3	700	13,0	4,7	8,3	777
241.16.20.089			89	51,0	9,0	3,9	5,1	459	12,0	3,9	8,1	612	13,5	3,9	9,6	689	15,0	5,4	9,6	765
241.16.20.102			102	44,1	10,5	4,6	5,9	463	14,0	4,6	9,4	617	15,8	4,6	11,2	697	17,5	6,3	11,2	772
241.16.20.115			115	38,3	12,0	5,2	6,8	460	16,0	5,2	10,8	613	18,0	5,2	12,8	689	20,0	7,2	12,8	766
241.16.20.127			127	34,3	13,2	5,7	7,5	453	17,6	5,7	11,9	604	19,8	5,7	14,1	679	22,0	7,9	14,1	755
241.16.20.139			139	31,4	14,7	6,4	8,3	462	19,6	6,4	13,2	615	22,1	6,4	15,7	694	24,5	8,8	15,7	769
241.16.20.152			152	28,4	15,9	6,9	9,0	452	21,2	6,9	14,3	602	23,9	6,9	17,0	679	26,5	9,5	17,0	753
241.16.20.305			305	14,7	32,4	14,0	18,4	476	43,2	14,0	29,2	635	48,6	14,0	34,6	714	54,0	19,4	34,6	794

Order No red	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.16.20.025	20,0	10,0	25	215,8	4,6	1,9	2,7	993	5,2	2,5	2,7	1122	6,7	4,9	1,8	1446	8,4	16,6	1812,7
241.16.20.032			32	167,8	5,8	2,4	3,4	973	6,5	3,2	3,3	1091	8,4	6,1	2,3	1410	10,5	21,5	1761,9
241.16.20.038			38	133,4	6,9	2,9	4,0	920	7,8	3,8	4,0	1041	10,0	7,3	2,7	1334	12,5	25,5	1667,5
241.16.20.044			44	111,8	8,0	3,3	4,7	894	9,0	4,4	4,6	1006	11,6	8,4	3,2	1297	14,5	29,5	1621,1
241.16.20.051			51	94,2	9,1	3,8	5,3	857	10,2	5,0	5,2	961	13,2	9,6	3,6	1243	16,5	34,5	1554,3
241.16.20.064			64	72,6	11,6	4,8	6,8	842	13,0	6,3	6,7	944	16,8	12,2	4,6	1220	21,0	43,0	1524,6
241.16.20.076			76	59,8	14,3	6,0	8,3	855	16,1	7,8	8,3	963	20,8	15,1	5,7	1244	26,0	50,0	1554,8
241.16.20.089			89	51,0	16,5	6,9	9,6	842	18,6	9,0	9,6	949	24,0	17,4	6,6	1224	30,0	59,0	1530,0
241.16.20.102			102	44,1	19,3	8,1	11,2	851	21,7	10,5	11,2	957	28,0	20,3	7,7	1235	35,0	67,0	1543,5
241.16.20.115			115	38,3	22,0	9,2	12,8	843	24,8	12,0	12,8	950	32,0	23,2	8,8	1226	40,0	75,0	1532,0
241.16.20.127			127	34,3	24,2	10,1	14,1	830	27,3	13,2	14,1	936	35,2	25,5	9,7	1207	44,0	83,0	1509,2
241.16.20.139			139	31,4	27,0	11,3	15,7	848	30,4	14,7	15,7	955	39,2	28,4	10,8	1231	49,0	90,0	1538,6
241.16.20.152			152	28,4	29,2	12,2	17,0	829	32,9	15,9	17,0	934	42,4	30,7	11,7	1204	53,0	99,0	1505,2
241.16.20.305			305	14,7	59,4	24,8	34,6	873	67,0	32,4	34,6	985	86,4	62,6	23,8	1270	108,0	197,0	1587,6

241.17.

High Performance Compression Springs

241.17.  
Colour: "Yellow"

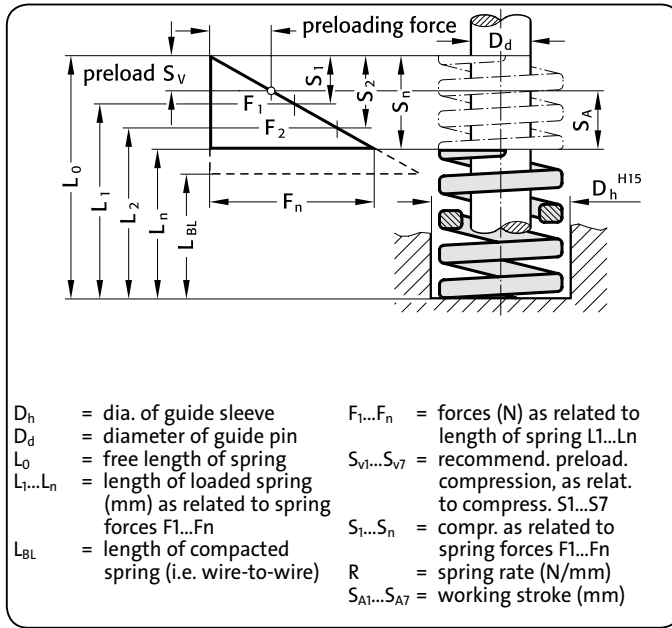


241.17.

Order No yellow	$D_h$	$D_d$	$L_0$	R	30% stroke				40% stroke				45% stroke				50% stroke			
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.17.20.025	20,0	10,0	25	293	2,3	1,0	1,3	674	3,1	1,0	2,1	908	3,5	1,0	2,5	1026	3,9	1,4	2,5	1143
241.17.20.032			32	224	2,9	1,3	1,6	650	3,9	1,3	2,6	874	4,4	1,3	3,1	986	4,9	1,8	3,1	1098
241.17.20.038			38	177	3,6	1,6	2,0	637	4,8	1,6	3,2	850	5,4	1,6	3,8	956	6,0	2,2	3,8	1062
241.17.20.044			44	149	4,2	1,8	2,4	626	5,6	1,8	3,8	834	6,3	1,8	4,5	939	7,0	2,5	4,5	1043
241.17.20.051			51	128	4,8	2,1	2,7	614	6,4	2,1	4,3	819	7,2	2,1	5,1	922	8,0	2,9	5,1	1024
241.17.20.064			64	99,1	6,3	2,7	3,6	624	8,4	2,7	5,7	832	9,5	2,7	6,8	941	10,5	3,8	6,7	1041
241.17.20.076			76	86,6	7,5	3,3	4,2	650	10,0	3,3	6,7	866	11,3	3,3	8,0	979	12,5	4,5	8,0	1083
241.17.20.089			89	69,6	9,0	3,9	5,1	626	12,0	3,9	8,1	835	13,5	3,9	9,6	940	15,0	5,4	9,6	1044
241.17.20.102			102	60,6	10,2	4,4	5,8	618	13,6	4,4	9,2	824	15,3	4,4	10,9	927	17,0	6,1	10,9	1030
241.17.20.115			115	53,1	11,4	4,9	6,5	605	15,2	4,9	10,3	807	17,1	4,9	12,2	908	19,0	6,8	12,2	1009
241.17.20.127			127	47,6	12,9	5,6	7,3	614	17,2	5,6	11,6	819	19,4	5,6	13,8	923	21,5	7,7	13,8	1023
241.17.20.139			139	43,1	14,1	6,1	8,0	608	18,8	6,1	12,7	810	21,2	6,1	15,1	914	23,5	8,5	15,0	1013
241.17.20.152			152	39,0	15,3	6,6	8,7	597	20,4	6,6	13,8	796	23,0	6,6	16,4	897	25,5	9,2	16,3	995
241.17.20.305			305	21,2	31,5	13,7	17,8	668	42,0	13,7	28,3	890	47,3	13,7	33,6	1003	52,5	18,9	33,6	1113
Order No yellow	$D_h$	$D_d$	$L_0$	R	55% stroke				62% stroke				80% stroke				100% stroke			
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$	
241.17.20.025	20,0	10,0	25	293	4,2	1,8	2,4	1231	4,8	2,3	2,5	1406	6,2	4,5	1,7	1817	7,7	17,3	2256,1	
241.17.20.032			32	224	5,4	2,3	3,1	1210	6,1	2,9	3,2	1366	7,8	5,7	2,1	1747	9,8	22,2	2195,2	
241.17.20.038			38	177	6,6	2,8	3,8	1168	7,4	3,6	3,8	1310	9,6	7,0	2,6	1699	12,0	26,0	2124,0	
241.17.20.044			44	149	7,7	3,2	4,5	1147	8,7	4,2	4,5	1296	11,2	8,1	3,1	1669	14,0	30,0	2086,0	
241.17.20.051			51	128	8,8	3,7	5,1	1126	9,9	4,8	5,1	1267	12,8	9,3	3,5	1638	16,0	35,0	2048,0	
241.17.20.064			64	99,1	11,6	4,8	6,8	1150	13,0	6,3	6,7	1288	16,8	12,2	4,6	1665	21,0	43,0	2081,1	
241.17.20.076			76	86,6	13,8	5,8	8,0	1195	15,5	7,5	8,0	1342	20,0	14,5	5,5	1732	25,0	51,0	2165,0	
241.17.20.089			89	69,6	16,5	6,9	9,6	1148	18,6	9,0	9,6	1295	24,0	17,4	6,6	1670	30,0	59,0	2088,0	
241.17.20.102			102	60,6	18,7	7,8	10,9	1133	21,1	10,2	10,9	1279	27,2	19,7	7,5	1648	34,0	68,0	2060,4	
241.17.20.115			115	53,1	20,9	8,7	12,2	1110	23,6	11,4	12,2	1253	30,4	22,0	8,4	1614	38,0	77,0	2017,8	
241.17.20.127			127	47,6	23,7	9,9	13,8	1128	26,7	12,9	13,8	1271	34,4	24,9	9,5	1637	43,0	84,0	2046,8	
241.17.20.139			139	43,1	25,9	10,8	15,1	1116	29,1	14,1	15,0	1254	37,6	27,3	10,3	1621	47,0	92,0	2025,7	
241.17.20.152			152	39,0	28,1	11,7	16,4	1096	31,6	15,3	16,3	1232	40,8	29,6	11,2	1591	51,0	101,0	1989,0	
241.17.20.305			305	21,2	57,8	24,2	33,6	1225	65,1	31,5	33,6	1380	84,0	60,9	23,1	1781	105,0	200,0	2226,0	

# High Performance Compression Springs

241.14.



241.14.  
Colour: "Green"

- $D_h$  = dia. of guide sleeve
- $D_d$  = diameter of guide pin
- $L_0$  = free length of spring
- $L_1...L_n$  = length of loaded spring (mm) as related to spring forces  $F_1...F_n$
- $L_{BL}$  = length of compacted spring (i.e. wire-to-wire)
- $F_1...F_n$  = forces (N) as related to length of spring  $L_1...L_n$
- $S_{v1}...S_{v7}$  = recommend. preload. compression, as relat. to compress.  $S_1...S_7$
- $S_1...S_n$  = compr. as related to spring forces  $F_1...F_n$
- $R$  = spring rate (N/mm)
- $S_{A1}...S_{A7}$  = working stroke (mm)

## 241.14.

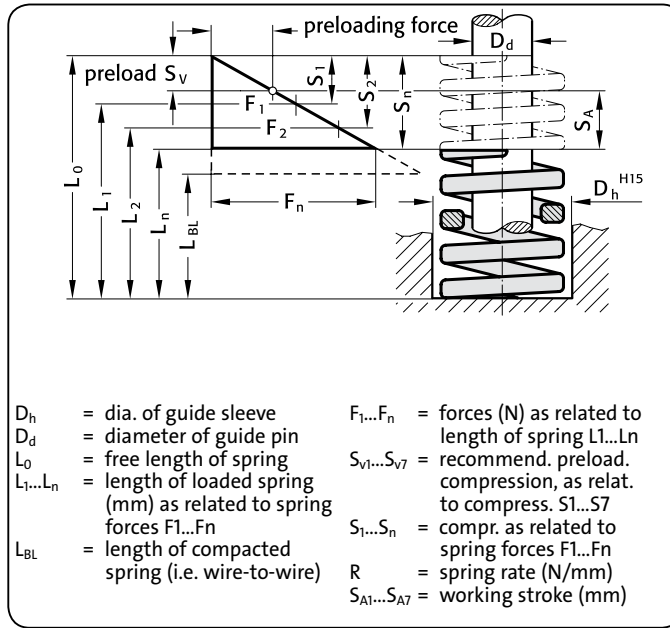
Order No green	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.14.25.025	25,0	12,5	25	100,0	3,9	1,7	2,2	390	5,2	1,7	3,5	520	5,9	1,7	4,2	590	6,5	2,3	4,2	650
241.14.25.032			32	80,3	4,8	2,1	2,7	385	6,4	2,1	4,3	514	7,2	2,1	5,1	578	8,0	2,9	5,1	642
241.14.25.038			38	62,0	5,7	2,5	3,2	353	7,6	2,5	5,1	471	8,6	2,5	6,1	533	9,5	3,4	6,1	589
241.14.25.044			44	53,0	6,9	3,0	3,9	366	9,2	3,0	6,2	488	10,4	3,0	7,4	551	11,5	4,1	7,4	610
241.14.25.051			51	44,1	7,5	3,3	4,2	331	10,0	3,3	6,7	441	11,3	3,3	8,0	498	12,5	4,5	8,0	551
241.14.25.064			64	35,2	9,3	4,0	5,3	327	12,4	4,0	8,4	436	14,0	4,0	10,0	493	15,5	5,6	9,9	546
241.14.25.076			76	28,1	11,7	5,1	6,6	329	15,6	5,1	10,5	438	17,6	5,1	12,5	495	19,5	7,0	12,5	548
241.14.25.089			89	24,0	13,8	6,0	7,8	331	18,4	6,0	12,4	442	20,7	6,0	14,7	497	23,0	8,3	14,7	552
241.14.25.102			102	21,1	15,6	6,8	8,8	329	20,8	6,8	14,0	439	23,4	6,8	16,6	494	26,0	9,4	16,6	549
241.14.25.115			115	18,7	17,7	7,7	10,0	331	23,6	7,7	15,9	441	26,6	7,7	18,9	497	29,5	10,6	18,9	552
241.14.25.127			127	16,7	19,8	8,6	11,2	331	26,4	8,6	17,8	441	29,7	8,6	21,1	496	33,0	11,9	21,1	551
241.14.25.139			139	15,3	22,2	9,6	12,6	340	29,6	9,6	20,0	453	33,3	9,6	23,7	509	37,0	13,3	23,7	566
241.14.25.152			152	14,0	24,0	10,4	13,6	336	32,0	10,4	21,6	448	36,0	10,4	25,6	504	40,0	14,4	25,6	560
241.14.25.178			178	12,6	27,9	12,1	15,8	352	37,2	12,1	25,1	469	41,9	12,1	29,8	528	46,5	16,7	29,8	586
241.14.25.203			203	10,4	32,1	13,9	18,2	334	42,8	13,9	28,9	445	48,2	13,9	34,3	501	53,5	19,3	34,2	556
241.14.25.305			305	7,0	48,0	20,8	27,2	336	64,0	20,8	43,2	448	72,0	20,8	51,2	504	80,0	28,8	51,2	560

Order No green	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.14.25.025	25,0	12,5	25	100,0	7,2	3,0	4,2	720	8,1	3,9	4,2	810	10,4	7,5	2,9	1040	13,0	12,0	1300,0
241.14.25.032			32	80,3	8,8	3,7	5,1	707	9,9	4,8	5,1	795	12,8	9,3	3,5	1028	16,0	16,0	1284,8
241.14.25.038			38	62,0	10,5	4,4	6,1	651	11,8	5,7	6,1	732	15,2	11,0	4,2	942	19,0	19,0	1178,0
241.14.25.044			44	53,0	12,7	5,3	7,4	673	14,3	6,9	7,4	758	18,4	13,3	5,1	975	23,0	21,0	1219,0
241.14.25.051			51	44,1	13,8	5,8	8,0	609	15,5	7,5	8,0	684	20,0	14,5	5,5	882	25,0	26,0	1102,5
241.14.25.064			64	35,2	17,1	7,1	10,0	602	19,2	9,3	9,9	676	24,8	18,0	6,8	873	31,0	33,0	1091,2
241.14.25.076			76	28,1	21,5	9,0	12,5	604	24,2	11,7	12,5	680	31,2	22,6	8,6	877	39,0	37,0	1095,9
241.14.25.089			89	24,0	25,3	10,6	14,7	607	28,5	13,8	14,7	684	36,8	26,7	10,1	883	46,0	43,0	1104,0
241.14.25.102			102	21,1	28,6	12,0	16,6	603	32,2	15,6	16,6	679	41,6	30,2	11,4	878	52,0	50,0	1097,2
241.14.25.115			115	18,7	32,5	13,6	18,9	608	36,6	17,7	18,9	684	47,2	34,2	13,0	883	59,0	56,0	1103,3
241.14.25.127			127	16,7	36,3	15,2	21,1	606	40,9	19,8	21,1	683	52,8	38,3	14,5	882	66,0	61,0	1102,2
241.14.25.139			139	15,3	40,7	17,0	23,7	623	45,9	22,2	23,7	702	59,2	42,9	16,3	906	74,0	65,0	1132,2
241.14.25.152			152	14,0	44,0	18,4	25,6	616	49,6	24,0	25,6	694	64,0	46,4	17,6	896	80,0	72,0	1120,0
241.14.25.178			178	12,6	51,2	21,4	29,8	645	57,7	27,9	29,8	727	74,4	53,9	20,5	937	93,0	85,0	1171,8
241.14.25.203			203	10,4	58,9	24,6	34,3	613	66,3	32,1	34,2	690	85,6	62,1	23,5	890	107,0	96,0	1112,8
241.14.25.305			305	7,0	88,0	36,8	51,2	616	99,2	48,0	51,2	694	128,0	92,8	35,2	896	160,0	145,0	1120,0

**241.15.**

**High Performance Compression Springs**

241.15.  
Colour: "Blue"



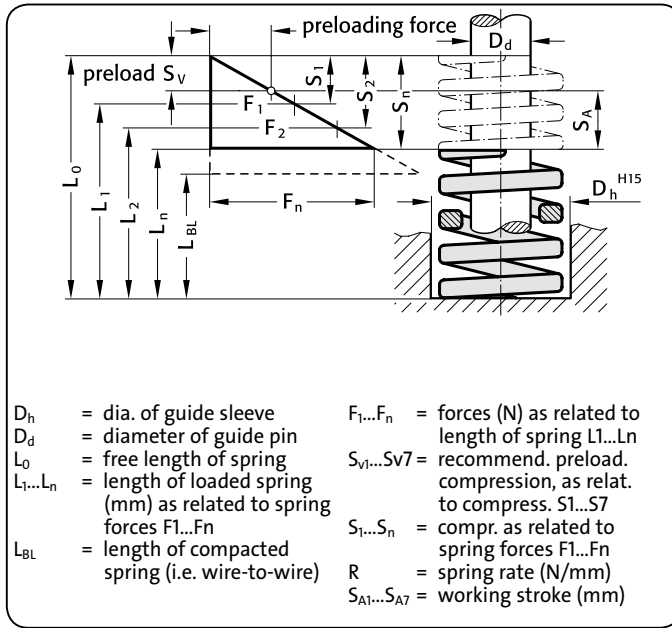
**241.15.**

Order No blue	D <sub>h</sub>	D <sub>d</sub>	L <sub>0</sub>	R	30% stroke				40% stroke				45% stroke				50% stroke			
					S <sub>1</sub>	S <sub>v1</sub>	S <sub>A1</sub>	F <sub>1</sub>	S <sub>2</sub>	S <sub>v2</sub>	S <sub>A2</sub>	F <sub>2</sub>	S <sub>3</sub>	S <sub>v3</sub>	S <sub>A3</sub>	F <sub>3</sub>	S <sub>4</sub>	S <sub>v4</sub>	S <sub>A4</sub>	F <sub>4</sub>
241.15.25.025	25,0	12,5	25	147,0	3,3	1,4	1,9	485	4,4	1,4	3,0	647	5,0	1,4	3,6	735	5,5	2,0	3,5	809
241.15.25.032			32	118,1	3,9	1,7	2,2	461	5,2	1,7	3,5	614	5,9	1,7	4,2	697	6,5	2,3	4,2	768
241.15.25.038			38	93,1	4,8	2,1	2,7	447	6,4	2,1	4,3	596	7,2	2,1	5,1	670	8,0	2,9	5,1	745
241.15.25.044			44	80,8	5,7	2,5	3,2	461	7,6	2,5	5,1	614	8,6	2,5	6,1	695	9,5	3,4	6,1	768
241.15.25.051			51	68,7	6,3	2,7	3,6	433	8,4	2,7	5,7	577	9,5	2,7	6,8	653	10,5	3,8	6,7	721
241.15.25.064			64	53,1	8,1	3,5	4,6	430	10,8	3,5	7,3	573	12,2	3,5	8,7	648	13,5	4,9	8,6	717
241.15.25.076			76	43,3	9,9	4,3	5,6	429	13,2	4,3	8,9	572	14,9	4,3	10,6	645	16,5	5,9	10,6	714
241.15.25.089			89	38,3	11,7	5,1	6,6	448	15,6	5,1	10,5	597	17,6	5,1	12,5	674	19,5	7,0	12,5	747
241.15.25.102			102	33,1	13,2	5,7	7,5	437	17,6	5,7	11,9	583	19,8	5,7	14,1	655	22,0	7,9	14,1	728
241.15.25.115			115	28,1	15,0	6,5	8,5	422	20,0	6,5	13,5	562	22,5	6,5	16,0	632	25,0	9,0	16,0	703
241.15.25.127			127	25,9	16,8	7,3	9,5	435	22,4	7,3	15,1	580	25,2	7,3	17,9	653	28,0	10,1	17,9	725
241.15.25.139			139	23,3	18,9	8,2	10,7	440	25,2	8,2	17,0	587	28,4	8,2	20,2	662	31,5	11,3	20,2	734
241.15.25.152			152	20,8	20,1	8,7	11,4	418	26,8	8,7	18,1	557	30,2	8,7	21,5	628	33,5	12,1	21,4	697
241.15.25.178			178	17,9	23,7	10,3	13,4	424	31,6	10,3	21,3	566	35,6	10,3	25,3	637	39,5	14,2	25,3	707
241.15.25.203			203	15,8	27,0	11,7	15,3	427	36,0	11,7	24,3	569	40,5	11,7	28,8	640	45,0	16,2	28,8	711
241.15.25.305			305	10,2	40,5	17,6	22,9	413	54,0	17,6	36,4	551	60,8	17,6	43,2	620	67,5	24,3	43,2	689

Order No blue	D <sub>h</sub>	D <sub>d</sub>	L <sub>0</sub>	R	55% stroke				62% stroke				80% stroke				100% stroke			
					S <sub>5</sub>	S <sub>v5</sub>	S <sub>A5</sub>	F <sub>5</sub>	S <sub>6</sub>	S <sub>v6</sub>	S <sub>A6</sub>	F <sub>6</sub>	S <sub>7</sub>	S <sub>v7</sub>	S <sub>A7</sub>	F <sub>7</sub>	S <sub>n</sub>	L <sub>n</sub>	F <sub>n</sub>	
241.15.25.025	25,0	12,5	25	147,0	6,1	2,5	3,6	897	6,8	3,3	3,5	1000	8,8	6,4	2,4	1294	11,0	14,0	1617,0	
241.15.25.032			32	118,1	7,2	3,0	4,2	850	8,1	3,9	4,2	957	10,4	7,5	2,9	1228	13,0	19,0	1535,3	
241.15.25.038			38	93,1	8,8	3,7	5,1	819	9,9	4,8	5,1	922	12,8	9,3	3,5	1192	16,0	22,0	1489,6	
241.15.25.044			44	80,8	10,5	4,4	6,1	848	11,8	5,7	6,1	953	15,2	11,0	4,2	1228	19,0	25,0	1535,2	
241.15.25.051			51	68,7	11,6	4,8	6,8	797	13,0	6,3	6,7	893	16,8	12,2	4,6	1154	21,0	30,0	1442,7	
241.15.25.064			64	53,1	14,9	6,2	8,7	791	16,7	8,1	8,6	887	21,6	15,7	5,9	1147	27,0	37,0	1433,7	
241.15.25.076			76	43,3	18,2	7,6	10,6	788	20,5	9,9	10,6	888	26,4	19,1	7,3	1143	33,0	43,0	1428,9	
241.15.25.089			89	38,3	21,5	9,0	12,5	823	24,2	11,7	12,5	927	31,2	22,6	8,6	1195	39,0	50,0	1493,7	
241.15.25.102			102	33,1	24,2	10,1	14,1	801	27,3	13,2	14,1	904	35,2	25,5	9,7	1165	44,0	58,0	1456,4	
241.15.25.115			115	28,1	27,5	11,5	16,0	773	31,0	15,0	16,0	871	40,0	29,0	11,0	1124	50,0	65,0	1405,0	
241.15.25.127			127	25,9	30,8	12,9	17,9	798	34,7	16,8	17,9	899	44,8	32,5	12,3	1160	56,0	71,0	1450,4	
241.15.25.139			139	23,3	34,7	14,5	20,2	809	39,1	18,9	20,2	911	50,4	36,5	13,9	1174	63,0	76,0	1467,9	
241.15.25.152			152	20,8	36,9	15,4	21,5	768	41,5	20,1	21,4	863	53,6	38,9	14,7	1115	67,0	85,0	1393,6	
241.15.25.178			178	17,9	43,5	18,2	25,3	779	49,0	23,7	25,3	877	63,2	45,8	17,4	1131	79,0	99,0	1414,1	
241.15.25.203			203	15,8	49,5	20,7	28,8	782	55,8	27,0	28,8	882	72,0	52,2	19,8	1138	90,0	113,0	1422,0	
241.15.25.305			305	10,2	74,3	31,1	43,2	758	83,7	40,5	43,2	854	108,0	78,3	29,7	1102	135,0	170,0	1377,0	

# High Performance Compression Springs

241.16.



241.16.  
Colour: "Red"

## 241.16.

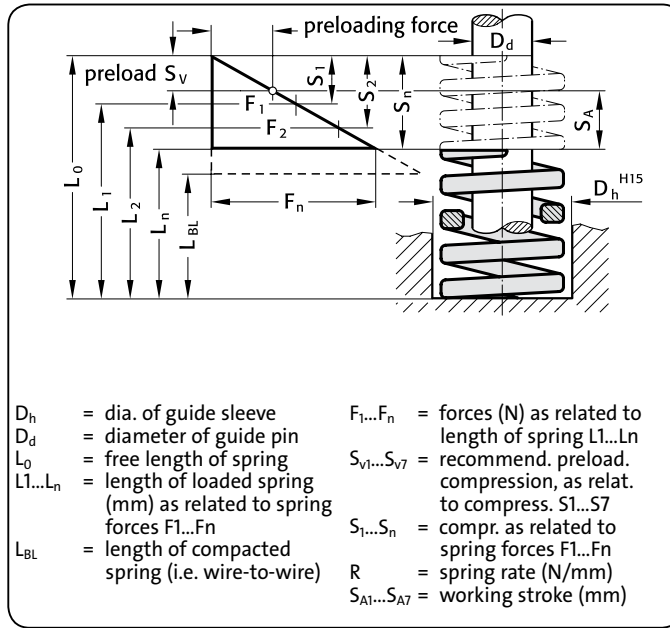
Order No red	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.16.25.025	25,0	12,5	25	375,7	2,7	1,2	1,5	1014	3,6	1,2	2,4	1353	4,1	1,2	2,9	1540	4,5	1,6	2,9	1691
241.16.25.032			32	297,2	3,2	1,4	1,8	951	4,2	1,4	2,8	1248	4,7	1,4	3,3	1397	5,3	1,9	3,4	1575
241.16.25.038			38	218,8	3,9	1,7	2,2	853	5,2	1,7	3,5	1138	5,9	1,7	4,2	1291	6,5	2,3	4,2	1422
241.16.25.044			44	187,4	4,7	2,0	2,7	881	6,2	2,0	4,2	1162	7,0	2,0	5,0	1312	7,8	2,8	5,0	1462
241.16.25.051			51	156,0	5,4	2,3	3,1	842	7,2	2,3	4,9	1123	8,1	2,3	5,8	1264	9,0	3,2	5,8	1404
241.16.25.064			64	123,6	6,8	2,9	3,9	840	9,0	2,9	6,1	1112	10,1	2,9	7,2	1248	11,3	4,1	7,2	1397
241.16.25.076			76	99,1	8,3	3,6	4,7	823	11,0	3,6	7,4	1090	12,4	3,6	8,8	1229	13,8	5,0	8,8	1368
241.16.25.089			89	84,4	9,8	4,2	5,6	827	13,0	4,2	8,8	1097	14,6	4,2	10,4	1232	16,3	5,9	10,4	1376
241.16.25.102			102	73,6	11,3	4,9	6,4	832	15,0	4,9	10,1	1104	16,9	4,9	12,0	1244	18,8	6,8	12,0	1384
241.16.25.115			115	64,7	12,8	5,6	7,2	828	17,1	5,6	11,5	1106	19,2	5,6	13,6	1242	21,4	7,7	13,7	1385
241.16.25.127			127	57,9	14,1	6,1	8,0	816	18,8	6,1	12,7	1089	21,2	6,1	15,1	1227	23,5	8,5	15,0	1361
241.16.25.139			139	53,0	15,6	6,8	8,8	827	20,8	6,8	14,0	1102	23,4	6,8	16,6	1240	26,0	9,4	16,6	1378
241.16.25.152			152	48,1	17,3	7,5	9,8	832	23,0	7,5	15,5	1106	25,9	7,5	18,4	1246	28,8	10,4	18,4	1385
241.16.25.178			178	41,2	20,4	8,8	11,6	840	27,2	8,8	18,4	1121	30,6	8,8	21,8	1261	34,0	12,2	21,8	1401
241.16.25.203			203	36,3	23,1	10,0	13,1	839	30,8	10,0	20,8	1118	34,7	10,0	24,7	1260	38,5	13,9	24,6	1398
241.16.25.305			305	22,6	34,5	15,0	19,5	780	46,0	15,0	31,0	1040	51,8	15,0	36,8	1171	57,5	20,7	36,8	1300

Order No red	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.16.25.025	25,0	12,5	25	375,7	5,0	2,1	2,9	1879	5,6	2,7	2,9	2104	7,2	5,2	2,0	2705	9,0	16,0	3381,3
241.16.25.032			32	297,2	5,8	2,4	3,4	1724	6,5	3,2	3,3	1932	8,4	6,1	2,3	2496	10,5	21,5	3120,6
241.16.25.038			38	218,8	7,2	3,0	4,2	1575	8,1	3,9	4,2	1772	10,4	7,5	2,9	2276	13,0	25,0	2844,4
241.16.25.044			44	187,4	8,5	3,6	4,9	1593	9,6	4,7	4,9	1799	12,4	9,0	3,4	2324	15,5	28,5	2904,7
241.16.25.051			51	156,0	9,9	4,1	5,8	1544	11,2	5,4	5,8	1747	14,4	10,4	4,0	2246	18,0	33,0	2808,0
241.16.25.064			64	123,6	12,4	5,2	7,2	1533	14,0	6,8	7,2	1730	18,0	13,1	4,9	2225	22,5	41,5	2781,0
241.16.25.076			76	99,1	15,1	6,3	8,8	1496	17,1	8,3	8,8	1695	22,0	16,0	6,0	2180	27,5	48,5	2725,3
241.16.25.089			89	84,4	17,9	7,5	10,4	1511	20,2	9,8	10,4	1705	26,0	18,9	7,1	2194	32,5	56,5	2743,0
241.16.25.102			102	73,6	20,6	8,6	12,0	1516	23,3	11,3	12,0	1715	30,0	21,8	8,2	2208	37,5	64,5	2760,0
241.16.25.115			115	64,7	23,5	9,8	13,7	1520	26,5	12,8	13,7	1715	34,2	24,8	9,4	2213	42,7	72,3	2762,7
241.16.25.127			127	57,9	25,9	10,8	15,1	1500	29,1	14,1	15,0	1685	37,6	27,3	10,3	2177	47,0	80,0	2721,3
241.16.25.139			139	53,0	28,6	12,0	16,6	1516	32,2	15,6	16,6	1707	41,6	30,2	11,4	2205	52,0	87,0	2756,0
241.16.25.152			152	48,1	31,6	13,2	18,4	1520	35,7	17,3	18,4	1717	46,0	33,4	12,6	2213	57,5	94,5	2765,8
241.16.25.178			178	41,2	37,4	15,6	21,8	1541	42,2	20,4	21,8	1739	54,4	39,4	15,0	2241	68,0	110,0	2801,6
241.16.25.203			203	36,3	42,4	17,7	24,7	1539	47,7	23,1	24,6	1732	61,6	44,7	16,9	2236	77,0	126,0	2795,1
241.16.25.305			305	22,6	63,3	26,5	36,8	1431	71,3	34,5	36,8	1611	92,0	66,7	25,3	2079	115,0	190,0	2599,0

241.17.

High Performance Compression Springs

241.17.  
Colour: "Yellow"



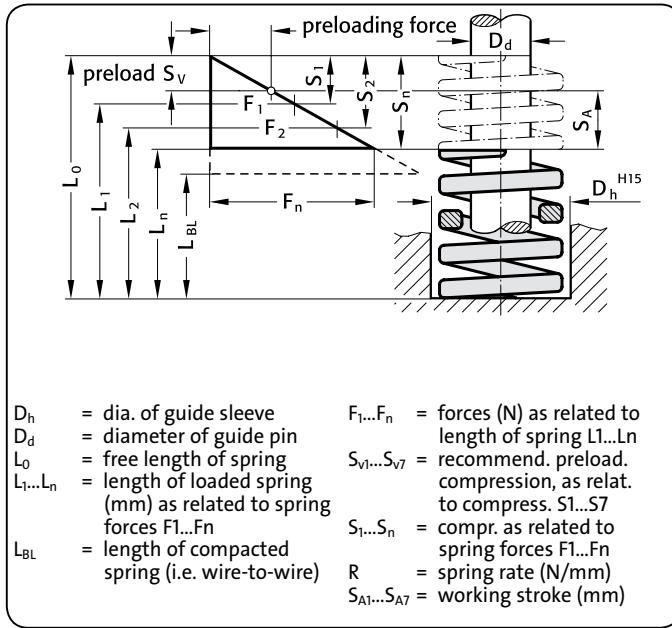
241.17.

Order No yellow	$D_h$	$D_d$	$L_0$	R	30% stroke				40% stroke				45% stroke				50% stroke			
					$S_1$	$S_{V1}$	$S_{A1}$	$F_1$	$S_2$	$S_{V2}$	$S_{A2}$	$F_2$	$S_3$	$S_{V3}$	$S_{A3}$	$F_3$	$S_4$	$S_{V4}$	$S_{A4}$	$F_4$
241.17.25.032	25,0	12,5	32	375	3,0	1,3	1,7	1125	4,0	1,3	2,7	1500	4,5	1,3	3,2	1688	5,0	1,8	3,2	1875
241.17.25.038			38	346	3,6	1,6	2,0	1246	4,8	1,6	3,2	1661	5,4	1,6	3,8	1868	6,0	2,2	3,8	2076
241.17.25.044			44	244	4,2	1,8	2,4	1025	5,6	1,8	3,8	1366	6,3	1,8	4,5	1537	7,0	2,5	4,5	1708
241.17.25.051			51	208	4,8	2,1	2,7	998	6,4	2,1	4,3	1331	7,2	2,1	5,1	1498	8,0	2,9	5,1	1664
241.17.25.064			64	161	6,3	2,7	3,6	1014	8,4	2,7	5,7	1352	9,5	2,7	6,8	1530	10,5	3,8	6,7	1691
241.17.25.076			76	131	7,5	3,3	4,2	983	10,0	3,3	6,7	1310	11,3	3,3	8,0	1480	12,5	4,5	8,0	1638
241.17.25.089			89	111	8,7	3,8	4,9	966	11,6	3,8	7,8	1288	13,1	3,8	9,3	1454	14,5	5,2	9,3	1610
241.17.25.102			102	96,3	10,2	4,4	5,8	982	13,6	4,4	9,2	1310	15,3	4,4	10,9	1473	17,0	6,1	10,9	1637
241.17.25.115			115	85,7	11,7	5,1	6,6	1003	15,6	5,1	10,5	1337	17,6	5,1	12,5	1508	19,5	7,0	12,5	1671
241.17.25.127			127	76,3	12,9	5,6	7,3	984	17,2	5,6	11,6	1312	19,4	5,6	13,8	1480	21,5	7,7	13,8	1640
241.17.25.152			152	63,6	15,9	6,9	9,0	1011	21,2	6,9	14,3	1348	23,9	6,9	17,0	1520	26,5	9,5	17,0	1685
241.17.25.178			178	54,0	18,6	8,1	10,5	1004	24,8	8,1	16,7	1339	27,9	8,1	19,8	1507	31,0	11,2	19,8	1674
241.17.25.203			203	47,0	21,0	9,1	11,9	987	28,0	9,1	18,9	1316	31,5	9,1	22,4	1481	35,0	12,6	22,4	1645
241.17.25.305			305	30,9	32,4	14,0	18,4	1001	43,2	14,0	29,2	1335	48,6	14,0	34,6	1502	54,0	19,4	34,6	1669

Order No yellow	$D_h$	$D_d$	$L_0$	R	55% stroke				62% stroke				80% stroke				100% stroke		
					$S_5$	$S_{V5}$	$S_{A5}$	$F_5$	$S_6$	$S_{V6}$	$S_{A6}$	$F_6$	$S_7$	$S_{V7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.17.25.032	25,0	12,5	32	375	5,5	2,3	3,2	2063	6,2	3,0	3,2	2325	8,0	5,8	2,2	3000	10,0	22,0	3750,0
241.17.25.038			38	346	6,6	2,8	3,8	2284	7,4	3,6	3,8	2560	9,6	7,0	2,6	3322	12,0	26,0	4152,0
241.17.25.044			44	244	7,7	3,2	4,5	1879	8,7	4,2	4,5	2123	11,2	8,1	3,1	2733	14,0	30,0	3416,0
241.17.25.051			51	208	8,8	3,7	5,1	1830	9,9	4,8	5,1	2059	12,8	9,3	3,5	2662	16,0	35,0	3328,0
241.17.25.064			64	161	11,6	4,8	6,8	1868	13,0	6,3	6,7	2093	16,8	12,2	4,6	2705	21,0	43,0	3381,0
241.17.25.076			76	131	13,8	5,8	8,0	1808	15,5	7,5	8,0	2031	20,0	14,5	5,5	2620	25,0	51,0	3275,0
241.17.25.089			89	111	16,0	6,7	9,3	1776	18,0	8,7	9,3	1998	23,2	16,8	6,4	2575	29,0	60,0	3219,0
241.17.25.102			102	96,3	18,7	7,8	10,9	1801	21,1	10,2	10,9	2032	27,2	19,7	7,5	2619	34,0	68,0	3274,2
241.17.25.115			115	85,7	21,5	9,0	12,5	1843	24,2	11,7	12,5	2074	31,2	22,6	8,6	2674	39,0	76,0	3342,3
241.17.25.127			127	76,3	23,7	9,9	13,8	1808	26,7	12,9	13,8	2037	34,4	24,9	9,5	2625	43,0	84,0	3280,9
241.17.25.152			152	63,6	29,2	12,2	17,0	1857	32,9	15,9	17,0	2092	42,4	30,7	11,7	2697	53,0	99,0	3370,8
241.17.25.178			178	54,0	34,1	14,3	19,8	1841	38,4	18,6	19,8	2074	49,6	36,0	13,6	2678	62,0	116,0	3348,0
241.17.25.203			203	47,0	38,5	16,1	22,4	1810	43,4	21,0	22,4	2040	56,0	40,6	15,4	2632	70,0	133,0	3290,0
241.17.25.305			305	30,9	59,4	24,8	34,6	1835	67,0	32,4	34,6	2070	86,4	62,6	23,8	2670	108,0	197,0	3337,2

# High Performance Compression Springs

241.14.



241.14.  
Colour: "Green"

## 241.14.

Order No green	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.14.32.038	32,0	16,0	38	94,1	5,7	2,5	3,2	536	7,6	2,5	5,1	715	8,6	2,5	6,1	809	9,5	3,4	6,1	894
241.14.32.044			44	79,6	6,6	2,9	3,7	525	8,8	2,9	5,9	700	9,9	2,9	7,0	788	11,0	4,0	7,0	876
241.14.32.051			51	67,0	7,5	3,3	4,2	503	10,0	3,3	6,7	670	11,3	3,3	8,0	757	12,5	4,5	8,0	838
241.14.32.064			64	53,0	9,6	4,2	5,4	509	12,8	4,2	8,6	678	14,4	4,2	10,2	763	16,0	5,8	10,2	848
241.14.32.076			76	44,1	11,7	5,1	6,6	516	15,6	5,1	10,5	688	17,6	5,1	12,5	776	19,5	7,0	12,5	860
241.14.32.089			89	37,2	13,5	5,9	7,6	502	18,0	5,9	12,1	670	20,3	5,9	14,4	755	22,5	8,1	14,4	837
241.14.32.102			102	32,0	15,6	6,8	8,8	499	20,8	6,8	14,0	666	23,4	6,8	16,6	749	26,0	9,4	16,6	832
241.14.32.115			115	29,0	17,4	7,5	9,9	505	23,2	7,5	15,7	673	26,1	7,5	18,6	757	29,0	10,4	18,6	841
241.14.32.127			127	25,0	19,5	8,5	11,0	488	26,0	8,5	17,5	650	29,3	8,5	20,8	733	32,5	11,7	20,8	813
241.14.32.139			139	23,1	21,6	9,4	12,2	499	28,8	9,4	19,4	665	32,4	9,4	23,0	748	36,0	13,0	23,0	832
241.14.32.152			152	21,5	23,4	10,1	13,3	503	31,2	10,1	21,1	671	35,1	10,1	25,0	755	39,0	14,0	25,0	839
241.14.32.178			178	18,3	26,4	11,4	15,0	483	35,2	11,4	23,8	644	39,6	11,4	28,2	725	44,0	15,8	28,2	805
241.14.32.203			203	15,8	31,2	13,5	17,7	493	41,6	13,5	28,1	657	46,8	13,5	33,3	739	52,0	18,7	33,3	822
241.14.32.254			254	12,6	39,0	16,9	22,1	491	52,0	16,9	35,1	655	58,5	16,9	41,6	737	65,0	23,4	41,6	819
241.14.32.305			305	10,3	46,5	20,2	26,3	479	62,0	20,2	41,8	639	69,8	20,2	49,6	719	77,5	27,9	49,6	798

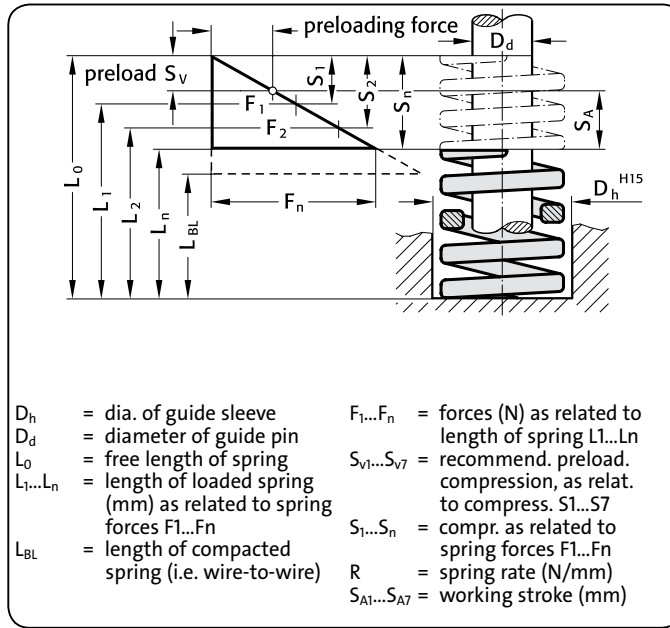
Order No green	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.14.32.038	32,0	16,0	38	94,1	10,5	4,4	6,1	988	11,8	5,7	6,1	1110	15,2	11,0	4,2	1430	19,0	19,0	1787,9
241.14.32.044			44	79,6	12,1	5,1	7,0	963	13,6	6,6	7,0	1083	17,6	12,8	4,8	1401	22,0	22,0	1751,2
241.14.32.051			51	67,0	13,8	5,8	8,0	925	15,5	7,5	8,0	1039	20,0	14,5	5,5	1340	25,0	26,0	1675,0
241.14.32.064			64	53,0	17,6	7,4	10,2	933	19,8	9,6	10,2	1049	25,6	18,6	7,0	1357	32,0	32,0	1696,0
241.14.32.076			76	44,1	21,5	9,0	12,5	948	24,2	11,7	12,5	1067	31,2	22,6	8,6	1376	39,0	37,0	1719,9
241.14.32.089			89	37,2	24,8	10,4	14,4	923	27,9	13,5	14,4	1038	36,0	26,1	9,9	1339	45,0	44,0	1674,0
241.14.32.102			102	32,0	28,6	12,0	16,6	915	32,2	15,6	16,6	1030	41,6	30,2	11,4	1331	52,0	50,0	1664,0
241.14.32.115			115	29,0	31,9	13,3	18,6	925	36,0	17,4	18,6	1044	46,4	33,6	12,8	1346	58,0	57,0	1682,0
241.14.32.127			127	25,0	35,8	15,0	20,8	895	40,3	19,5	20,8	1008	52,0	37,7	14,3	1300	65,0	62,0	1625,0
241.14.32.139			139	23,1	39,6	16,6	23,0	915	44,6	21,6	23,0	1030	57,6	41,8	15,8	1331	72,0	67,0	1663,2
241.14.32.152			152	21,5	42,9	17,9	25,0	922	48,4	23,4	25,0	1041	62,4	45,2	17,2	1342	78,0	74,0	1677,0
241.14.32.178			178	18,3	48,4	20,2	28,2	886	54,6	26,4	28,2	999	70,4	51,0	19,4	1288	88,0	90,0	1610,4
241.14.32.203			203	15,8	57,2	23,9	33,3	904	64,5	31,2	33,3	1019	83,2	60,3	22,9	1315	104,0	99,0	1643,2
241.14.32.254			254	12,6	71,5	29,9	41,6	901	80,6	39,0	41,6	1016	104,0	75,4	28,6	1310	130,0	124,0	1638,0
241.14.32.305			305	10,3	85,3	35,7	49,6	879	96,1	46,5	49,6	990	124,0	89,9	34,1	1277	155,0	150,0	1596,5



241.15.

High Performance Compression Springs

241.15.  
Colour: "Blue"



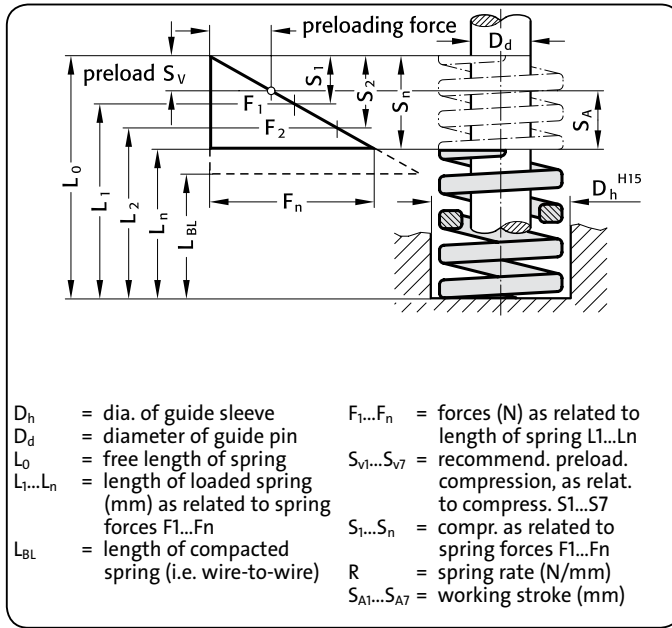
241.15.

Order No blue	D <sub>h</sub>	D <sub>d</sub>	L <sub>0</sub>	R	30% stroke			40% stroke			45% stroke			50% stroke						
					S <sub>1</sub>	S <sub>v1</sub>	S <sub>A1</sub>	F <sub>1</sub>	S <sub>2</sub>	S <sub>v2</sub>	S <sub>A2</sub>	F <sub>2</sub>	S <sub>3</sub>	S <sub>v3</sub>	S <sub>A3</sub>	F <sub>3</sub>	S <sub>4</sub>	S <sub>v4</sub>	S <sub>A4</sub>	F <sub>4</sub>
241.15.32.038	32,0	16,0	38	185,1	4,8	2,1	2,7	888	6,4	2,1	4,3	1185	7,2	2,1	5,1	1333	8,0	2,9	5,1	1481
241.15.32.044			44	158,1	5,7	2,5	3,2	901	7,6	2,5	5,1	1202	8,6	2,5	6,1	1360	9,5	3,4	6,1	1502
241.15.32.051			51	134,1	6,3	2,7	3,6	845	8,4	2,7	5,7	1126	9,5	2,7	6,8	1274	10,5	3,8	6,7	1408
241.15.32.064			64	99,1	8,1	3,5	4,6	803	10,8	3,5	7,3	1070	12,2	3,5	8,7	1209	13,5	4,9	8,6	1338
241.15.32.076			76	80,5	9,6	4,2	5,4	773	12,8	4,2	8,6	1030	14,4	4,2	10,2	1159	16,0	5,8	10,2	1288
241.15.32.089			89	69,2	11,1	4,8	6,3	768	14,8	4,8	10,0	1024	16,7	4,8	11,9	1156	18,5	6,7	11,8	1280
241.15.32.102			102	58,9	12,9	5,6	7,3	760	17,2	5,6	11,6	1013	19,4	5,6	13,8	1143	21,5	7,7	13,8	1266
241.15.32.115			115	51,5	14,7	6,4	8,3	757	19,6	6,4	13,2	1009	22,1	6,4	15,7	1138	24,5	8,8	15,7	1262
241.15.32.127			127	44,8	16,5	7,2	9,3	739	22,0	7,2	14,8	986	24,8	7,2	17,6	1111	27,5	9,9	17,6	1232
241.15.32.139			139	42,3	18,0	7,8	10,2	761	24,0	7,8	16,2	1015	27,0	7,8	19,2	1142	30,0	10,8	19,2	1269
241.15.32.152			152	37,9	19,8	8,6	11,2	750	26,4	8,6	17,8	1001	29,7	8,6	21,1	1126	33,0	11,9	21,1	1251
241.15.32.178			178	32,6	23,1	10,0	13,1	753	30,8	10,0	20,8	1004	34,7	10,0	24,7	1131	38,5	13,9	24,6	1255
241.15.32.203			203	28,9	26,4	11,4	15,0	763	35,2	11,4	23,8	1017	39,6	11,4	28,2	1144	44,0	15,8	28,2	1272
241.15.32.254			254	21,4	33,0	14,3	18,7	706	44,0	14,3	29,7	942	49,5	14,3	35,2	1059	55,0	19,8	35,2	1177
241.15.32.305			305	18,3	39,9	17,3	22,6	730	53,2	17,3	35,9	974	59,9	17,3	42,6	1096	66,5	23,9	42,6	1217

Order No blue	D <sub>h</sub>	D <sub>d</sub>	L <sub>0</sub>	R	55% stroke			62% stroke			80% stroke			100% stroke					
					S <sub>5</sub>	S <sub>v5</sub>	S <sub>A5</sub>	F <sub>5</sub>	S <sub>6</sub>	S <sub>v6</sub>	S <sub>A6</sub>	F <sub>6</sub>	S <sub>7</sub>	S <sub>v7</sub>	S <sub>A7</sub>	F <sub>7</sub>	S <sub>n</sub>	L <sub>n</sub>	F <sub>n</sub>
241.15.32.038	32,0	16,0	38	185,1	8,8	3,7	5,1	1629	9,9	4,8	5,1	1832	12,8	9,3	3,5	2369	16,0	22,0	2961,6
241.15.32.044			44	158,1	10,5	4,4	6,1	1660	11,8	5,7	6,1	1866	15,2	11,0	4,2	2403	19,0	25,0	3003,9
241.15.32.051			51	134,1	11,6	4,8	6,8	1556	13,0	6,3	6,7	1743	16,8	12,2	4,6	2253	21,0	30,0	2816,1
241.15.32.064			64	99,1	14,9	6,2	8,7	1477	16,7	8,1	8,6	1655	21,6	15,7	5,9	2141	27,0	37,0	2675,7
241.15.32.076			76	80,5	17,6	7,4	10,2	1417	19,8	9,6	10,2	1594	25,6	18,6	7,0	2061	32,0	44,0	2576,0
241.15.32.089			89	69,2	20,4	8,5	11,9	1412	22,9	11,1	11,8	1585	29,6	21,5	8,1	2048	37,0	52,0	2560,4
241.15.32.102			102	58,9	23,7	9,9	13,8	1396	26,7	12,9	13,8	1573	34,4	24,9	9,5	2026	43,0	59,0	2532,7
241.15.32.115			115	51,5	27,0	11,3	15,7	1391	30,4	14,7	15,7	1566	39,2	28,4	10,8	2019	49,0	66,0	2523,5
241.15.32.127			127	44,8	30,3	12,7	17,6	1357	34,1	16,5	17,6	1528	44,0	31,9	12,1	1971	55,0	72,0	2464,0
241.15.32.139			139	42,3	33,0	13,8	19,2	1396	37,2	18,0	19,2	1574	48,0	34,8	13,2	2030	60,0	79,0	2538,0
241.15.32.152			152	37,9	36,3	15,2	21,1	1376	40,9	19,8	21,1	1550	52,8	38,3	14,5	2001	66,0	86,0	2501,4
241.15.32.178			178	32,6	42,4	17,7	24,7	1382	47,7	23,1	24,6	1555	61,6	44,7	16,9	2008	77,0	101,0	2510,2
241.15.32.203			203	28,9	48,4	20,2	28,2	1399	54,6	26,4	28,2	1578	70,4	51,0	19,4	2035	88,0	115,0	2543,2
241.15.32.254			254	21,4	60,5	25,3	35,2	1295	68,2	33,0	35,2	1459	88,0	63,8	24,2	1883	110,0	144,0	2354,0
241.15.32.305			305	18,3	73,2	30,6	42,6	1340	82,5	39,9	42,6	1510	106,4	77,1	29,3	1947	133,0	172,0	2433,9

# High Performance Compression Springs

241.16.



241.16.  
Colour: "Red"

## 241.16.

Order No red	$D_h$	$D_d$	$L_0$	R	30% stroke				40% stroke				45% stroke				50% stroke			
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.16.32.038	32,0	16,0	38	388,5	3,6	1,6	2,0	1399	4,8	1,6	3,2	1865	5,4	1,6	3,8	2098	6,0	2,2	3,8	2331
241.16.32.044			44	324,7	4,2	1,8	2,4	1364	5,6	1,8	3,8	1818	6,3	1,8	4,5	2046	7,0	2,5	4,5	2273
241.16.32.051			51	271,7	5,0	2,1	2,9	1359	6,6	2,1	4,5	1793	7,4	2,1	5,3	2011	8,3	3,0	5,3	2255
241.16.32.064			64	211,9	6,5	2,8	3,7	1377	8,6	2,8	5,8	1822	9,7	2,8	6,9	2055	10,8	3,9	6,9	2289
241.16.32.076			76	171,7	7,8	3,4	4,4	1339	10,4	3,4	7,0	1786	11,7	3,4	8,3	2009	13,0	4,7	8,3	2232
241.16.32.089			89	141,3	9,2	4,0	5,2	1300	12,2	4,0	8,2	1724	13,7	4,0	9,7	1936	15,3	5,5	9,8	2162
241.16.32.102			102	121,6	10,7	4,6	6,1	1301	14,2	4,6	9,6	1727	16,0	4,6	11,4	1946	17,8	6,4	11,4	2164
241.16.32.115			115	106,9	12,2	5,3	6,9	1304	16,2	5,3	10,9	1732	18,2	5,3	12,9	1946	20,3	7,3	13,0	2170
241.16.32.127			127	93,2	13,5	5,9	7,6	1258	18,0	5,9	12,1	1678	20,3	5,9	14,4	1892	22,5	8,1	14,4	2097
241.16.32.139			139	86,3	15,0	6,5	8,5	1295	20,0	6,5	13,5	1726	22,5	6,5	16,0	1942	25,0	9,0	16,0	2158
241.16.32.152			152	78,5	16,2	7,0	9,2	1272	21,6	7,0	14,6	1696	24,3	7,0	17,3	1908	27,0	9,7	17,3	2120
241.16.32.178			178	67,7	18,9	8,2	10,7	1280	25,2	8,2	17,0	1706	28,4	8,2	20,2	1923	31,5	11,3	20,2	2133
241.16.32.203			203	58,9	21,6	9,4	12,2	1272	28,8	9,4	19,4	1696	32,4	9,4	23,0	1908	36,0	13,0	23,0	2120
241.16.32.254			254	46,1	27,6	12,0	15,6	1272	36,8	12,0	24,8	1696	41,4	12,0	29,4	1909	46,0	16,6	29,4	2121
241.16.32.305			305	38,3	33,0	14,3	18,7	1264	44,0	14,3	29,7	1685	49,5	14,3	35,2	1896	55,0	19,8	35,2	2107

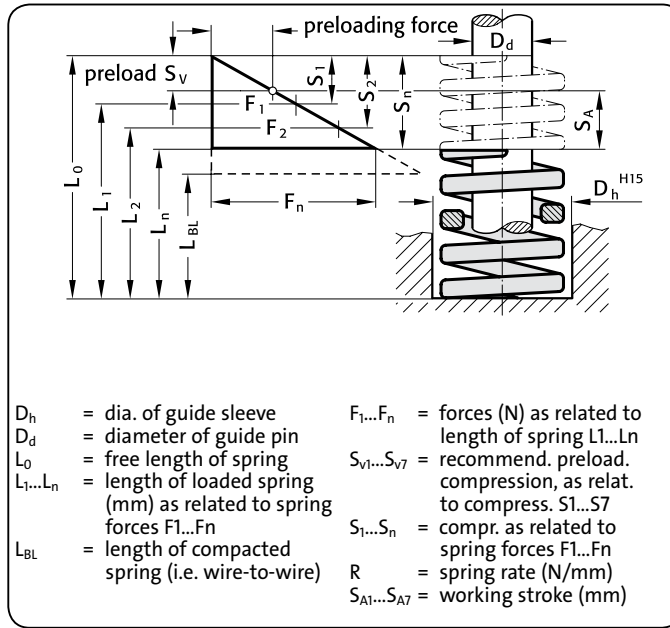
Order No red	$D_h$	$D_d$	$L_0$	R	55% stroke				62% stroke				80% stroke				100% stroke		
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.16.32.038	32,0	16,0	38	388,5	6,6	2,8	3,8	2564	7,4	3,6	3,8	2875	9,6	7,0	2,6	3730	12,0	26,0	4662,0
241.16.32.044			44	324,7	7,7	3,2	4,5	2500	8,7	4,2	4,5	2825	11,2	8,1	3,1	3637	14,0	30,0	4545,8
241.16.32.051			51	271,7	9,1	3,8	5,3	2472	10,2	5,0	5,2	2771	13,2	9,6	3,6	3586	16,5	34,5	4483,1
241.16.32.064			64	211,9	11,8	4,9	6,9	2500	13,3	6,5	6,8	2818	17,2	12,5	4,7	3645	21,5	42,5	4555,9
241.16.32.076			76	171,7	14,3	6,0	8,3	2455	16,1	7,8	8,3	2764	20,8	15,1	5,7	3571	26,0	50,0	4464,2
241.16.32.089			89	141,3	16,8	7,0	9,8	2374	18,9	9,2	9,7	2671	24,4	17,7	6,7	3448	30,5	58,5	4309,7
241.16.32.102			102	121,6	19,5	8,2	11,3	2371	22,0	10,7	11,3	2675	28,4	20,6	7,8	3453	35,5	66,5	4316,8
241.16.32.115			115	106,9	22,3	9,3	13,0	2384	25,1	12,2	12,9	2683	32,4	23,5	8,9	3464	40,5	74,5	4329,5
241.16.32.127			127	93,2	24,8	10,4	14,4	2311	27,9	13,5	14,4	2600	36,0	26,1	9,9	3355	45,0	82,0	4194,0
241.16.32.139			139	86,3	27,5	11,5	16,0	2373	31,0	15,0	16,0	2675	40,0	29,0	11,0	3452	50,0	89,0	4315,0
241.16.32.152			152	78,5	29,7	12,4	17,3	2331	33,5	16,2	17,3	2630	43,2	31,3	11,9	3391	54,0	98,0	4239,0
241.16.32.178			178	67,7	34,7	14,5	20,2	2349	39,1	18,9	20,2	2647	50,4	36,5	13,9	3412	63,0	115,0	4265,1
241.16.32.203			203	58,9	39,6	16,6	23,0	2332	44,6	21,6	23,0	2627	57,6	41,8	15,8	3393	72,0	131,0	4240,8
241.16.32.254			254	46,1	50,6	21,2	29,4	2333	57,0	27,6	29,4	2628	73,6	53,4	20,2	3393	92,0	162,0	4241,2
241.16.32.305			305	38,3	60,5	25,3	35,2	2317	68,2	33,0	35,2	2612	88,0	63,8	24,2	3370	110,0	195,0	4213,0

**241.17.**

**High Performance Compression Springs**

241.17.

Colour: "Yellow"

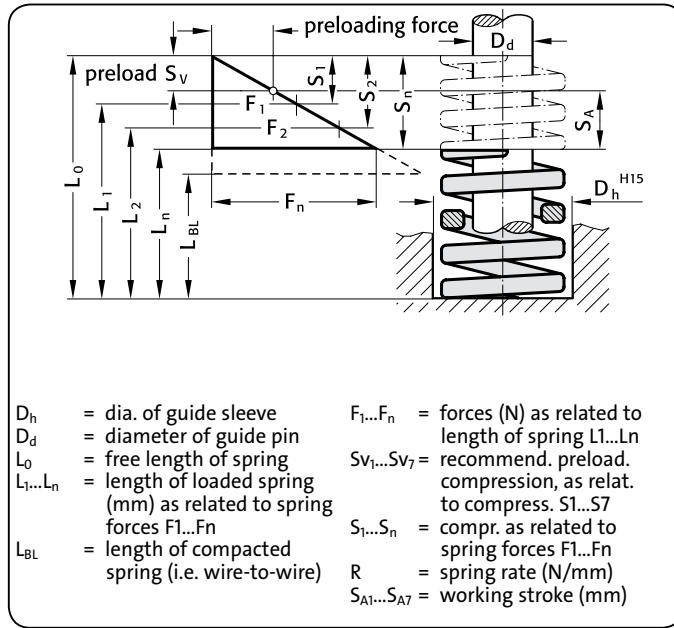


**241.17.**

Order No yellow	$D_h$	$D_d$	$L_0$	R	30% stroke				40% stroke				45%stroke				50% stroke			
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.17.32.038	32,0	16,0	38	529	3,3	1,4	1,9	1746	4,4	1,4	3,0	2328	5,0	1,4	3,6	2645	5,5	2,0	3,5	2910
241.17.32.044			44	425	3,9	1,7	2,2	1958	5,2	1,7	3,5	2210	5,9	1,7	4,2	2508	6,5	2,3	4,2	2763
241.17.32.051			51	353	4,5	2,0	2,5	1589	6,0	2,0	4,0	2118	6,8	2,0	4,8	2400	7,5	2,7	4,8	2648
241.17.32.064			64	269	6,0	2,6	3,4	1614	8,0	2,6	5,4	2152	9,0	2,6	6,4	2421	10,0	3,6	6,4	2690
241.17.32.076			76	219	7,2	3,1	4,1	1577	9,6	3,1	6,5	2102	10,8	3,1	7,7	2365	12,0	4,3	7,7	2628
241.17.32.089			89	180	8,7	3,8	4,9	1566	11,6	3,8	7,8	2088	13,1	3,8	9,3	2358	14,5	5,2	9,3	2610
241.17.32.102			102	155	9,9	4,3	5,6	1535	13,2	4,3	8,9	2046	14,9	4,3	10,6	2310	16,5	5,9	10,6	2558
241.17.32.115			115	140	10,8	4,7	6,1	1512	14,4	4,7	9,7	2016	16,2	4,7	11,5	2268	18,0	6,5	11,5	2520
241.17.32.127			127	124	12,3	5,3	7,0	1525	16,4	5,3	11,1	2034	18,5	5,3	13,2	2294	20,5	7,4	13,1	2542
241.17.32.152			152	102	15,0	6,5	8,5	1530	20,0	6,5	13,5	2040	22,5	6,5	16,0	2295	25,0	9,0	16,0	2550
241.17.32.178			178	88,3	17,7	7,7	10,0	1563	23,6	7,8	15,9	2084	26,6	7,7	18,9	2349	29,5	10,6	18,9	2605
241.17.32.203			203	76,0	20,4	8,8	11,6	1550	27,2	8,8	18,4	2067	30,6	8,8	21,8	2326	34,0	12,2	21,8	2584
241.17.32.254			254	60,8	25,5	11,1	14,4	1550	34,0	11,1	22,9	2067	38,3	11,1	27,2	2329	42,5	15,3	27,2	2584
241.17.32.305			305	49,1	30,9	13,4	17,5	1517	41,2	13,4	27,8	2023	46,4	13,4	33,0	2278	51,5	18,5	33,0	2529
Order No yellow	$D_h$	$D_d$	$L_0$	R	55% stroke				62% stroke				80% stroke				100% stroke			
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$	
241.17.32.038	32,0	16,0	38	529	6,1	2,5	3,6	3227	6,8	3,3	3,5	3597	8,8	6,4	2,4	4655	11,0	27,0	5819,0	
241.17.32.044			44	425	7,2	3,0	4,2	3060	8,1	3,9	4,2	3443	10,4	7,5	2,9	4420	13,0	31,0	5525,0	
241.17.32.051			51	353	8,3	3,5	4,8	2930	9,3	4,5	4,8	3283	12,0	8,7	3,3	4236	15,0	36,0	5295,0	
241.17.32.064			64	269	11,0	4,6	6,4	2959	12,4	6,0	6,4	3336	16,0	11,6	4,4	4304	20,0	44,0	5380,0	
241.17.32.076			76	219	13,2	5,5	7,7	2891	14,9	7,2	7,7	3263	19,2	13,9	5,3	4205	24,0	52,0	5256,0	
241.17.32.089			89	180	16,0	6,7	9,3	2880	18,0	8,7	9,3	3240	23,2	16,8	6,4	4176	29,0	60,0	5220,0	
241.17.32.102			102	155	18,2	7,6	10,6	2821	20,5	9,9	10,6	3178	26,4	19,1	7,3	4092	33,0	69,0	5115,0	
241.17.32.115			115	140	19,8	8,3	11,5	2772	22,3	10,8	11,5	3122	28,8	20,9	7,9	4032	36,0	79,0	5040,0	
241.17.32.127			127	124	22,6	9,4	13,2	2802	25,4	12,3	13,1	3150	32,8	23,8	9,0	4067	41,0	86,0	5084,0	
241.17.32.152			152	102	27,5	11,5	16,0	2805	31,0	15,0	16,0	3162	40,0	29,0	11,0	4080	50,0	102,0	5100,0	
241.17.32.178			178	88,3	32,5	13,6	18,9	2870	36,6	17,7	18,9	3232	47,2	34,2	13,0	4168	59,0	119,0	5209,7	
241.17.32.203			203	76,0	37,4	15,6	21,8	2842	42,2	20,4	21,8	3207	54,4	39,4	15,0	4134	68,0	135,0	5168,0	
241.17.32.254			254	60,8	46,8	19,6	27,2	2845	52,7	25,5	27,2	3204	68,0	49,3	18,7	4134	85,0	169,0	5168,0	
241.17.32.305			305	49,1	56,7	23,7	33,0	2784	63,9	30,9	33,0	3137	82,4	59,7	22,7	4046	103,0	202,0	5057,3	

# High Performance Compression Springs

241.14.



241.14.  
Colour: "Green"

- $D_h$  = dia. of guide sleeve
- $D_d$  = diameter of guide pin
- $L_0$  = free length of spring
- $L_1...L_n$  = length of loaded spring (mm) as related to spring forces  $F_1...F_n$
- $L_{BL}$  = length of compacted spring (i.e. wire-to-wire)
- $F_1...F_n$  = forces (N) as related to length of spring  $L_1...L_n$
- $S_{V1}...S_{V7}$  = recommend. preload. compression, as relat. to compress.  $S_1...S_7$
- $S_1...S_n$  = compr. as related to spring forces  $F_1...F_n$
- $R$  = spring rate (N/mm)
- $S_{A1}...S_{A7}$  = working stroke (mm)

## 241.14.

Order No green	$D_h$	$D_d$	$L_0$	$R$	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{V1}$	$S_{A1}$	$F_1$	$S_2$	$S_{V2}$	$S_{A2}$	$F_2$	$S_3$	$S_{V3}$	$S_{A3}$	$F_3$	$S_4$	$S_{V4}$	$S_{A4}$	$F_4$
241.14.40.051	40,0	20,0	51	92,0	7,5	3,3	4,2	690	10,0	3,3	6,7	920	11,3	3,3	8,0	1040	12,5	4,5	8,0	1150
241.14.40.064			64	73,1	9,6	4,2	5,4	702	12,8	4,2	8,6	936	14,4	4,2	10,2	1053	16,0	5,8	10,2	1170
241.14.40.076			76	63,1	11,4	4,9	6,5	719	15,2	4,9	10,3	959	17,1	4,9	12,2	1079	19,0	6,8	12,2	1199
241.14.40.089			89	51,0	13,5	5,9	7,6	689	18,0	5,9	12,1	918	20,3	5,9	14,4	1035	22,5	8,1	14,4	1148
241.14.40.102			102	43,1	15,3	6,6	8,7	659	20,4	6,6	13,8	879	23,0	6,6	16,4	991	25,5	9,2	16,3	1099
241.14.40.115			115	39,6	17,4	7,5	9,9	689	23,2	7,5	15,7	919	26,1	7,5	18,6	1034	29,0	10,4	18,6	1148
241.14.40.127			127	37,0	19,5	8,5	11,0	722	26,0	8,5	17,5	962	29,3	8,5	20,8	1084	32,5	11,7	20,8	1203
241.14.40.139			139	32,0	21,3	9,2	12,1	682	28,4	9,2	19,2	909	32,0	9,2	22,8	1024	35,5	12,8	22,7	1136
241.14.40.152			152	28,1	23,4	10,1	13,3	658	31,2	10,1	21,1	877	35,1	10,1	25,0	986	39,0	14,0	25,0	1096
241.14.40.178			178	25,2	27,6	12,0	15,6	696	36,8	12,0	24,8	927	41,4	12,0	29,4	1043	46,0	16,6	29,4	1159
241.14.40.203			203	22,7	31,5	13,7	17,8	715	42,0	13,7	28,3	953	47,3	13,7	33,6	1074	52,5	18,9	33,6	1192
241.14.40.254			254	17,0	39,3	17,0	22,3	668	52,4	17,0	35,4	891	59,0	17,0	42,0	1003	65,5	23,6	41,9	1114
241.14.40.305			305	14,8	47,1	20,4	26,7	697	62,8	20,4	42,4	929	70,7	20,4	50,3	1046	78,5	28,3	50,2	1162

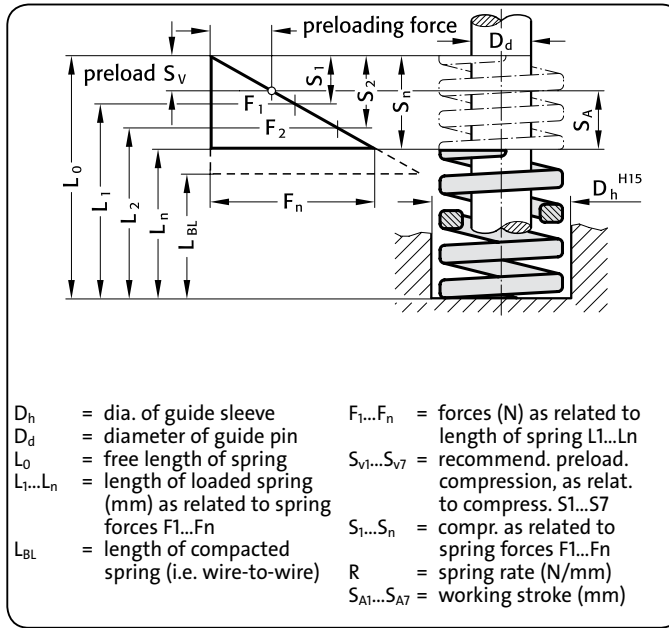
  

Order No green	$D_h$	$D_d$	$L_0$	$R$	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{V5}$	$S_{A5}$	$F_5$	$S_6$	$S_{V6}$	$S_{A6}$	$F_6$	$S_7$	$S_{V7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.14.40.051	40,0	20,0	51	92,0	13,8	5,8	8,0	1270	15,5	7,5	8,0	1426	20,0	14,5	5,5	1840	25,0	26,0	2300,0
241.14.40.064			64	73,1	17,6	7,4	10,2	1287	19,8	9,6	10,2	1447	25,6	18,6	7,0	1871	32,0	32,0	2339,2
241.14.40.076			76	63,1	20,9	8,7	12,2	1319	23,6	11,4	12,2	1489	30,4	22,0	8,4	1918	38,0	38,0	2397,8
241.14.40.089			89	51,0	24,8	10,4	14,4	1265	27,9	13,5	14,4	1423	36,0	26,1	9,9	1836	45,0	44,0	2295,0
241.14.40.102			102	43,1	28,1	11,7	16,4	1211	31,6	15,3	16,3	1362	40,8	29,6	11,2	1758	51,0	51,0	2198,1
241.14.40.115			115	39,6	31,9	13,3	18,6	1263	36,0	17,4	18,6	1426	46,4	33,6	12,8	1837	58,0	57,0	2296,8
241.14.40.127			127	37,0	35,8	15,0	20,8	1325	40,3	19,5	20,8	1491	52,0	37,7	14,3	1924	65,0	62,0	2405,0
241.14.40.139			139	32,0	39,1	16,3	22,8	1251	44,0	21,3	22,7	1408	56,8	41,2	15,6	1818	71,0	68,0	2272,0
241.14.40.152			152	28,1	42,9	17,9	25,0	1205	48,4	23,4	25,0	1360	62,4	45,2	17,2	1753	78,0	74,0	2191,8
241.14.40.178			178	25,2	50,6	21,2	29,4	1275	57,0	27,6	29,4	1436	73,6	53,4	20,2	1855	92,0	86,0	2318,4
241.14.40.203			203	22,7	57,8	24,2	33,6	1312	65,1	31,5	33,6	1478	84,0	60,9	23,1	1907	105,0	98,0	2383,5
241.14.40.254			254	17,0	72,1	30,1	42,0	1226	81,2	39,3	41,9	1380	104,8	76,0	28,8	1782	131,0	123,0	2227,0
241.14.40.305			305	14,8	86,4	36,1	50,3	1279	97,3	47,1	50,2	1440	125,6	91,1	34,5	1859	157,0	148,0	2323,6

241.15.

High Performance Compression Springs

241.15.  
Colour: "Blue"



241.15.

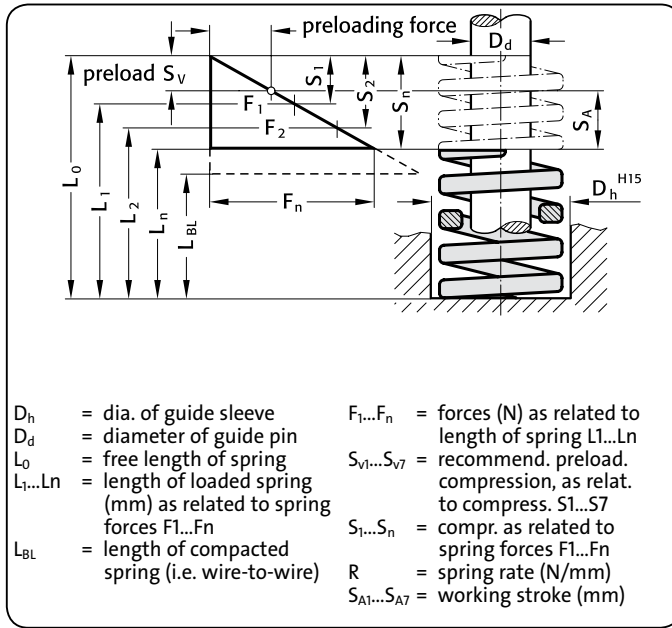
Order No blue	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.15.40.051	40,0	20,0	51	179,0	6,3	2,7	3,6	1128	8,4	2,7	5,7	1504	9,5	2,7	6,8	1701	10,5	3,8	6,7	1880
241.15.40.064			64	140,0	7,8	3,4	4,4	1092	10,4	3,4	7,0	1456	11,7	3,4	8,3	1638	13,0	4,7	8,3	1820
241.15.40.076			76	108,1	9,6	4,2	5,4	1038	12,8	4,2	8,6	1384	14,4	4,2	10,2	1557	16,0	5,8	10,2	1730
241.15.40.089			89	90,7	11,1	4,8	6,3	1007	14,8	4,8	10,0	1342	16,7	4,8	11,9	1515	18,5	6,7	11,8	1678
241.15.40.102			102	81,0	12,9	5,6	7,3	1045	17,2	5,6	11,6	1393	19,4	5,6	13,8	1571	21,5	7,7	13,8	1742
241.15.40.115			115	71,8	14,4	6,2	8,2	1034	19,2	6,2	13,0	1379	21,6	6,2	15,4	1551	24,0	8,6	15,4	1723
241.15.40.127			127	62,8	16,2	7,0	9,2	1017	21,6	7,0	14,6	1356	24,3	7,0	17,3	1526	27,0	9,7	17,3	1696
241.15.40.139			139	57,6	17,7	7,7	10,0	1020	23,6	7,7	15,9	1359	26,6	7,7	18,9	1532	29,5	10,6	18,9	1699
241.15.40.152			152	51,6	19,5	8,5	11,0	1006	26,0	8,5	17,5	1342	29,3	8,5	20,8	1512	32,5	11,7	20,8	1677
241.15.40.178			178	44,2	22,8	9,9	12,9	1008	30,4	9,9	20,5	1344	34,2	9,9	24,3	1512	38,0	13,7	24,3	1680
241.15.40.203			203	36,7	26,1	11,3	14,8	958	34,8	11,3	23,5	1277	39,2	11,3	27,9	1439	43,5	15,7	27,8	1596
241.15.40.254			254	30,1	33,0	14,3	18,7	993	44,0	14,3	29,7	1324	49,5	14,3	35,2	1490	55,0	19,8	35,2	1656
241.15.40.305			305	24,6	39,3	17,0	22,3	967	52,4	17,0	35,4	1289	59,0	17,0	42,0	1451	65,5	23,6	41,9	1611

Order No blue	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.15.40.051	40,0	20,0	51	179,0	11,6	4,8	6,8	2076	13,0	6,3	6,7	2327	16,8	12,2	4,6	3007	21,0	30,0	3759,0
241.15.40.064			64	140,0	14,3	6,0	8,3	2002	16,1	7,8	8,3	2254	20,8	15,1	5,7	2912	26,0	38,0	3640,0
241.15.40.076			76	108,1	17,6	7,4	10,2	1903	19,8	9,6	10,2	2140	25,6	18,6	7,0	2767	32,0	44,0	3459,2
241.15.40.089			89	90,7	20,4	8,5	11,9	1850	22,9	11,1	11,8	2077	29,6	21,5	8,1	2685	37,0	52,0	3355,9
241.15.40.102			102	81,0	23,7	9,9	13,8	1920	26,7	12,9	13,8	2163	34,4	24,9	9,5	2786	43,0	59,0	3483,0
241.15.40.115			115	71,8	26,4	11,0	15,4	1896	29,8	14,4	15,4	2140	38,4	27,8	10,6	2757	48,0	67,0	3446,4
241.15.40.127			127	62,8	29,7	12,4	17,3	1865	33,5	16,2	17,3	2104	43,2	31,3	11,9	2713	54,0	73,0	3391,2
241.15.40.139			139	57,6	32,5	13,6	18,9	1872	36,6	17,7	18,9	2108	47,2	34,2	13,0	2719	59,0	80,0	3398,4
241.15.40.152			152	51,6	35,8	15,0	20,8	1847	40,3	19,5	20,8	2079	52,0	37,7	14,3	2683	65,0	87,0	3354,0
241.15.40.178			178	44,2	41,8	17,5	24,3	1848	47,1	22,8	24,3	2082	60,8	44,1	16,7	2687	76,0	102,0	3359,2
241.15.40.203			203	36,7	47,9	20,0	27,9	1758	53,9	26,1	27,8	1978	69,6	50,5	19,1	2554	87,0	116,0	3192,9
241.15.40.254			254	30,1	60,5	25,3	35,2	1821	68,2	33,0	35,2	2053	88,0	63,8	24,2	2649	110,0	144,0	3311,0
241.15.40.305			305	24,6	72,1	30,1	42,0	1774	81,2	39,3	41,9	1998	104,8	76,0	28,8	2578	131,0	174,0	3222,6

# High Performance Compression Springs

241.16.



241.16.  
Colour: "Red"

- $D_h$  = dia. of guide sleeve
- $D_d$  = diameter of guide pin
- $L_0$  = free length of spring
- $L_1...L_n$  = length of loaded spring (mm) as related to spring forces  $F_1...F_n$
- $L_{BL}$  = length of compacted spring (i.e. wire-to-wire)
- $F_1...F_n$  = forces (N) as related to length of spring  $L_1...L_n$
- $S_{V1}...S_{V7}$  = recommend. preload. compression, as relat. to compress.  $S_1...S_7$
- $S_1...S_n$  = compr. as related to spring forces  $F_1...F_n$
- $R$  = spring rate (N/mm)
- $S_{A1}...S_{A7}$  = working stroke (mm)

## 241.16.

Order No red	$D_h$	$D_d$	$L_0$	$R$	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{V1}$	$S_{A1}$	$F_1$	$S_2$	$S_{V2}$	$S_{A2}$	$F_2$	$S_3$	$S_{V3}$	$S_{A3}$	$F_3$	$S_4$	$S_{V4}$	$S_{A4}$	$F_4$
241.16.40.051	40,0	20,0	51	350,2	5,1	2,2	2,9	1786	6,8	2,2	4,6	2381	7,7	2,2	5,5	2697	8,5	3,1	5,4	2977
241.16.40.064			64	268,8	6,6	2,9	3,7	1774	8,8	2,9	5,9	2365	9,9	2,9	7,0	2661	11,0	4,0	7,0	2957
241.16.40.076			76	218,8	8,1	3,5	4,6	1772	10,8	3,5	7,3	2363	12,2	3,5	8,7	2669	13,5	4,9	8,6	2954
241.16.40.089			89	190,3	9,6	4,2	5,4	1827	12,8	4,2	8,6	2436	14,4	4,2	10,2	2740	16,0	5,8	10,2	3045
241.16.40.102			102	162,8	11,1	4,8	6,3	1807	14,8	4,8	10,0	2409	16,7	4,8	11,9	2719	18,5	6,7	11,8	3012
241.16.40.115			115	142,2	12,6	5,5	7,1	1792	16,8	5,5	11,3	2389	18,9	5,5	13,4	2688	21,0	7,6	13,4	2986
241.16.40.127			127	128,5	14,1	6,1	8,0	1812	18,8	6,1	12,7	2416	21,2	6,1	15,1	2724	23,5	8,5	15,0	3020
241.16.40.139			139	114,8	15,6	6,8	8,8	1791	20,8	6,8	14,0	2388	23,4	6,8	16,6	2686	26,0	9,4	16,6	2985
241.16.40.152			152	105,0	17,3	7,5	9,8	1817	23,0	7,5	15,5	2415	25,9	7,5	18,4	2720	28,8	10,4	18,4	3024
241.16.40.178			178	89,3	20,1	8,7	11,4	1795	26,8	8,7	18,1	2393	30,2	8,7	21,5	2697	33,5	12,1	21,4	2992
241.16.40.203			203	77,5	22,8	9,9	12,9	1767	30,4	9,9	20,5	2356	34,2	9,9	24,3	2651	38,0	13,7	24,3	2945
241.16.40.254			254	60,8	29,1	12,6	16,5	1769	38,8	12,6	26,2	2359	43,7	12,6	31,1	2657	48,5	17,5	31,0	2949
241.16.40.305			305	51,0	34,8	15,1	19,7	1775	46,4	15,1	31,3	2366	52,2	15,1	37,1	2662	58,0	20,9	37,1	2958

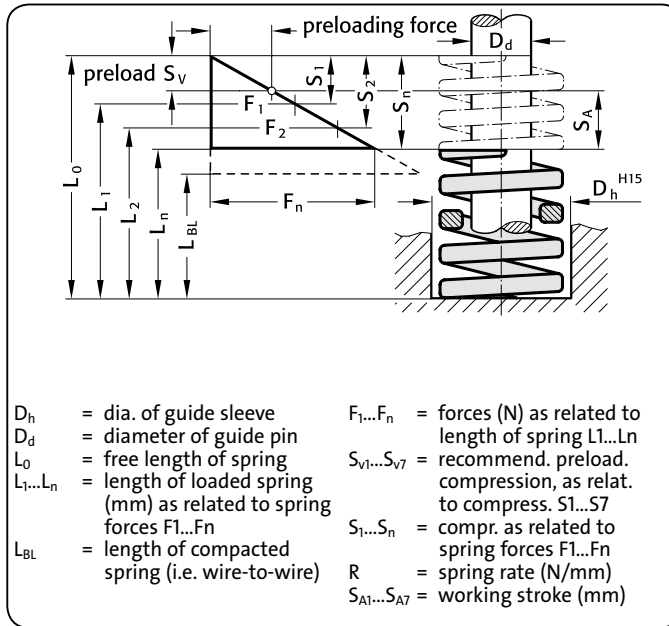
  

Order No red	$D_h$	$D_d$	$L_0$	$R$	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{V5}$	$S_{A5}$	$F_5$	$S_6$	$S_{V6}$	$S_{A6}$	$F_6$	$S_7$	$S_{V7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.16.40.051	40,0	20,0	51	350,2	9,4	3,9	5,5	3292	10,5	5,1	5,4	3677	13,6	9,9	3,7	4763	17,0	34,0	5953,4
241.16.40.064			64	268,8	12,1	5,1	7,0	3252	13,6	6,6	7,0	3656	17,6	12,8	4,8	4731	22,0	42,0	5913,6
241.16.40.076			76	218,8	14,9	6,2	8,7	3260	16,7	8,1	8,6	3654	21,6	15,7	5,9	4726	27,0	49,0	5907,6
241.16.40.089			89	190,3	17,6	7,4	10,2	3349	19,8	9,6	10,2	3768	25,6	18,6	7,0	4872	32,0	57,0	6089,6
241.16.40.102			102	162,8	20,4	8,5	11,9	3321	22,9	11,1	11,8	3728	29,6	21,5	8,1	4819	37,0	65,0	6023,6
241.16.40.115			115	142,2	23,1	9,7	13,4	3285	26,0	12,6	13,4	3697	33,6	24,4	9,2	4778	42,0	73,0	5972,4
241.16.40.127			127	128,5	25,9	10,8	15,1	3328	29,1	14,1	15,0	3739	37,6	27,3	10,3	4832	47,0	80,0	6039,5
241.16.40.139			139	114,8	28,6	12,0	16,6	3283	32,2	15,6	16,6	3697	41,6	30,2	11,4	4776	52,0	87,0	5969,6
241.16.40.152			152	105,0	31,6	13,2	18,4	3318	35,7	17,3	18,4	3749	46,0	33,4	12,6	4830	57,5	94,5	6037,5
241.16.40.178			178	89,3	36,9	15,4	21,5	3295	41,5	20,1	21,4	3706	53,6	38,9	14,7	4786	67,0	111,0	5983,1
241.16.40.203			203	77,5	41,8	17,5	24,3	3240	47,1	22,8	24,3	3650	60,8	44,1	16,7	4712	76,0	127,0	5890,0
241.16.40.254			254	60,8	53,4	22,3	31,1	3247	60,1	29,1	31,0	3654	77,6	56,3	21,3	4718	97,0	157,0	5897,6
241.16.40.305			305	51,0	63,8	26,7	37,1	3254	71,9	34,8	37,1	3667	92,8	67,3	25,5	4733	116,0	189,0	5916,0

**241.17.**

**High Performance Compression Springs**

241.17.  
Colour: "Yellow"



**241.17.**

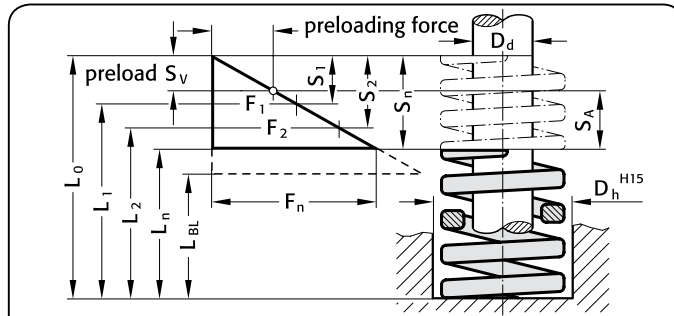
Order No yellow	D <sub>h</sub>	D <sub>d</sub>	L <sub>0</sub>	R	30% stroke				40% stroke				45% stroke				50% stroke			
					S <sub>1</sub>	S <sub>v1</sub>	S <sub>A1</sub>	F <sub>1</sub>	S <sub>2</sub>	S <sub>v2</sub>	S <sub>A2</sub>	F <sub>2</sub>	S <sub>3</sub>	S <sub>v3</sub>	S <sub>A3</sub>	F <sub>3</sub>	S <sub>4</sub>	S <sub>v4</sub>	S <sub>A4</sub>	F <sub>4</sub>
241.17.40.051	40,0	20,0	51	628	4,5	2,0	2,5	2826	6,0	2,0	4,0	3768	6,8	2,0	4,8	4270	7,5	2,7	4,8	4710
241.17.40.064			64	488	5,7	2,5	3,2	2782	7,6	2,5	5,1	3709	8,6	2,5	6,1	4197	9,5	3,4	6,1	4636
241.17.40.076			76	379	7,2	3,1	4,1	2729	9,6	3,1	6,5	3638	10,8	3,1	7,7	4093	12,0	4,3	7,7	4548
241.17.40.089			89	321	8,4	3,6	4,8	2696	11,2	3,6	7,6	3595	12,6	3,6	9,0	4045	14,0	5,0	9,0	4494
241.17.40.102			102	281	9,9	4,3	5,6	2782	13,2	4,3	8,9	3709	14,9	4,3	10,6	4187	16,5	5,9	10,6	4637
241.17.40.115			115	245	11,1	4,8	6,3	2720	14,8	4,8	10,0	3626	16,7	4,8	11,9	4092	18,5	6,7	11,8	4533
241.17.40.127			127	221	12,3	5,3	7,0	2718	16,4	5,3	11,1	3624	18,5	5,3	13,2	4089	20,5	7,4	13,1	4531
241.17.40.152			152	168	15,0	6,5	8,5	2520	20,0	6,5	13,5	3360	22,5	6,5	16,0	3780	25,0	9,0	16,0	4200
241.17.40.203			203	132	20,1	8,7	11,4	2653	26,8	8,7	18,1	3538	30,2	8,7	21,5	3986	33,5	12,1	21,4	4422
241.17.40.254			254	107	25,5	11,1	14,4	2729	34,0	11,1	22,9	3638	38,3	11,1	27,2	4098	42,5	15,3	27,2	4548
241.17.40.305			305	87,9	30,6	13,3	17,3	2690	40,8	13,3	27,5	3586	45,9	13,3	32,6	4035	51,0	18,4	32,6	4483

Order No yellow	D <sub>h</sub>	D <sub>d</sub>	L <sub>0</sub>	R	55% stroke				62% stroke				80% stroke				100% stroke		
					S <sub>5</sub>	S <sub>v5</sub>	S <sub>A5</sub>	F <sub>5</sub>	S <sub>6</sub>	S <sub>v6</sub>	S <sub>A6</sub>	F <sub>6</sub>	S <sub>7</sub>	S <sub>v7</sub>	S <sub>A7</sub>	F <sub>7</sub>	S <sub>n</sub>	L <sub>n</sub>	F <sub>n</sub>
241.17.40.051	40,0	20,0	51	628	8,3	3,5	4,8	5212	9,3	4,5	4,8	5840	12,0	8,7	3,3	7536	15,0	36,0	9420,0
241.17.40.064			64	488	10,5	4,4	6,1	5124	11,8	5,7	6,1	5758	15,2	11,0	4,2	7418	19,0	45,0	9272,0
241.17.40.076			76	379	13,2	5,5	7,7	5003	14,9	7,2	7,7	5647	19,2	13,9	5,3	7277	24,0	52,0	9096,0
241.17.40.089			89	321	15,4	6,4	9,0	4943	17,4	8,4	9,0	5585	22,4	16,2	6,2	7190	28,0	61,0	8988,0
241.17.40.102			102	281	18,2	7,6	10,6	5114	20,5	9,9	10,6	5761	26,4	19,1	7,3	7418	33,0	69,0	9273,0
241.17.40.115			115	245	20,4	8,5	11,9	4998	22,9	11,1	11,8	5611	29,6	21,5	8,1	7252	37,0	78,0	9065,0
241.17.40.127			127	221	22,6	9,4	13,2	4995	25,4	12,3	13,1	5613	32,8	23,8	9,0	7249	41,0	86,0	9061,0
241.17.40.152			152	168	27,5	11,5	16,0	4620	31,0	15,0	16,0	5208	40,0	29,0	11,0	6720	50,0	102,0	8400,0
241.17.40.203			203	132	36,9	15,4	21,5	4871	41,5	20,1	21,4	5478	53,6	38,9	14,7	7075	67,0	136,0	8844,0
241.17.40.254			254	107	46,8	19,6	27,2	5008	52,7	25,5	27,2	5639	68,0	49,3	18,7	7276	85,0	169,0	9095,0
241.17.40.305			305	87,9	56,1	23,5	32,6	4931	63,2	30,6	32,6	5555	81,6	59,2	22,4	7173	102,0	203,0	8965,8

# High Performance Compression Springs

241.14.



- $D_h$  = dia. of guide sleeve
- $D_d$  = diameter of guide pin
- $L_0$  = free length of spring
- $L_1...L_n$  = length of loaded spring (mm) as related to spring forces  $F_1...F_n$
- $L_{BL}$  = length of compacted spring (i.e. wire-to-wire)
- $F_1...F_n$  = forces (N) as related to length of spring  $L_1...L_n$
- $S_{v1}...S_{v7}$  = recommend. preload. compression, as relat. to compress.  $S_1...S_7$
- $S_1...S_n$  = compr. as related to spring forces  $F_1...F_n$
- $R$  = spring rate (N/mm)
- $S_{A1}...S_{A7}$  = working stroke (mm)

241.14.

Colour: "Green"

## 241.14.

Order No green	$D_h$	$D_d$	$L_0$	$R$	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.14.50.064	50,0	25,0	64	156,0	9,6	4,2	5,4	1498	12,8	4,2	8,6	1997	14,4	4,2	10,2	2246	16,0	5,8	10,2	2496
241.14.50.076			76	125,0	11,7	5,1	6,6	1463	15,6	5,1	10,5	1950	17,6	5,1	12,5	2200	19,5	7,0	12,5	2438
241.14.50.089			89	109,0	13,5	5,9	7,6	1472	18,0	5,9	12,1	1962	20,3	5,9	14,4	2213	22,5	8,1	14,4	2453
241.14.50.102			102	94,1	15,6	6,8	8,8	1468	20,8	6,8	14,0	1957	23,4	6,8	16,6	2202	26,0	9,4	16,6	2447
241.14.50.115			115	81,0	17,4	7,5	9,9	1409	23,2	7,5	15,7	1879	26,1	7,5	18,6	2114	29,0	10,4	18,6	2349
241.14.50.127			127	71,0	19,5	8,5	11,0	1385	26,0	8,5	17,5	1846	29,3	8,5	20,8	2080	32,5	11,7	20,8	2308
241.14.50.139			139	66,5	21,6	9,4	12,2	1436	28,8	9,4	19,4	1915	32,4	9,4	23,0	2155	36,0	13,0	23,0	2394
241.14.50.152			152	60,0	23,4	10,1	13,3	1404	31,2	10,1	21,1	1872	35,1	10,1	25,0	2106	39,0	14,0	25,0	2340
241.14.50.178			178	52,0	27,6	12,0	15,6	1435	36,8	12,0	24,8	1914	41,4	12,0	29,4	2153	46,0	16,6	29,4	2392
241.14.50.203			203	44,1	31,2	13,5	17,7	1376	41,6	13,5	28,1	1835	46,8	13,5	33,3	2064	52,0	18,7	33,3	2293
241.14.50.254			254	35,0	39,0	16,9	22,1	1365	52,0	16,9	35,1	1820	58,5	16,9	41,6	2048	65,0	23,4	41,6	2275
241.14.50.305			305	28,6	46,8	20,3	26,5	1338	62,4	20,3	42,1	1785	70,2	20,3	49,9	2008	78,0	28,1	49,9	2231

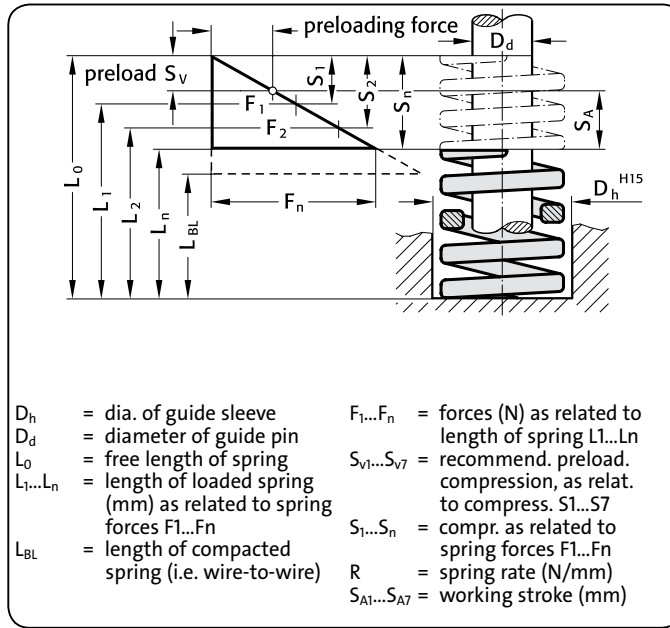
Order No green	$D_h$	$D_d$	$L_0$	$R$	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.14.50.064	50,0	25,0	64	156,0	17,6	7,4	10,2	2746	19,8	9,6	10,2	3089	25,6	18,6	7,0	3994	32,0	32,0	4992,0
241.14.50.076			76	125,0	21,5	9,0	12,5	2688	24,2	11,7	12,5	3025	31,2	22,6	8,6	3900	39,0	37,0	4875,0
241.14.50.089			89	109,0	24,8	10,4	14,4	2703	27,9	13,5	14,4	3041	36,0	26,1	9,9	3924	45,0	44,0	4905,0
241.14.50.102			102	94,1	28,6	12,0	16,6	2691	32,2	15,6	16,6	3030	41,6	30,2	11,4	3915	52,0	50,0	4893,2
241.14.50.115			115	81,0	31,9	13,3	18,6	2584	36,0	17,4	18,6	2916	46,4	33,6	12,8	3758	58,0	57,0	4698,0
241.14.50.127			127	71,0	35,8	15,0	20,8	2542	40,3	19,5	20,8	2861	52,0	37,7	14,3	3692	65,0	62,0	4615,0
241.14.50.139			139	66,5	39,6	16,6	23,0	2633	44,6	21,6	23,0	2966	57,6	41,8	15,8	3830	72,0	67,0	4788,0
241.14.50.152			152	60,0	42,9	17,9	25,0	2574	48,4	23,4	25,0	2904	62,4	45,2	17,2	3744	78,0	74,0	4680,0
241.14.50.178			178	52,0	50,6	21,2	29,4	2631	57,0	27,6	29,4	2964	73,6	53,4	20,2	3827	92,0	86,0	4784,0
241.14.50.203			203	44,1	57,2	23,9	33,3	2523	64,5	31,2	33,3	2844	83,2	60,3	22,9	3669	104,0	99,0	4586,4
241.14.50.254			254	35,0	71,5	29,9	41,6	2503	80,6	39,0	41,6	2821	104,0	75,4	28,6	3640	130,0	124,0	4550,0
241.14.50.305			305	28,6	85,8	35,9	49,9	2454	96,7	46,8	49,9	2766	124,8	90,5	34,3	3569	156,0	149,0	4461,6



241.15.

High Performance Compression Spring

241.15.  
Colour "Blue"



241.15.

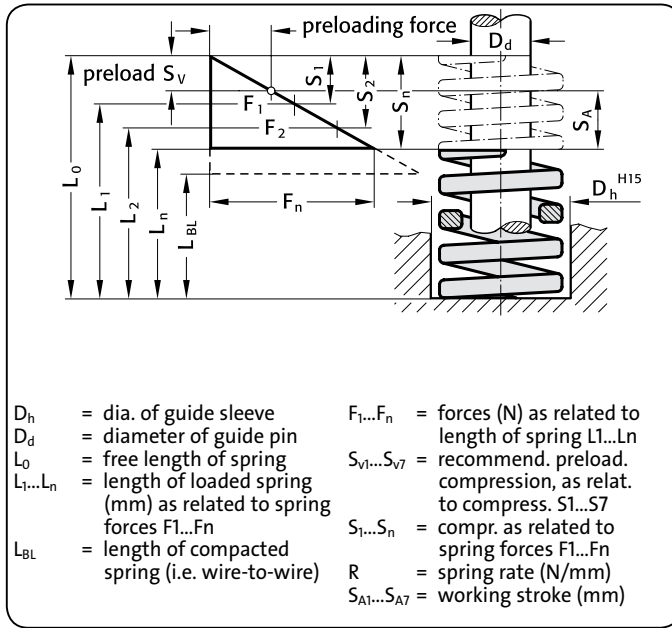
Order No blue	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{V1}$	$S_{A1}$	$F_1$	$S_2$	$S_{V2}$	$S_{A2}$	$F_2$	$S_3$	$S_{V3}$	$S_{A3}$	$F_3$	$S_4$	$S_{V4}$	$S_{A4}$	$F_4$
241.15.50.064	50,0	25,0	64	209,1	8,1	3,5	4,6	1694	10,8	3,5	7,3	2258	12,2	3,5	8,7	2551	13,5	4,9	8,6	2823
241.15.50.076			76	168,1	9,6	4,2	5,4	1614	12,8	4,2	8,6	2152	14,4	4,2	10,2	2421	16,0	5,8	10,2	2690
241.15.50.089			89	140,0	11,1	4,8	6,3	1554	14,8	4,8	10,0	2072	16,7	4,8	11,9	2338	18,5	6,7	11,8	2590
241.15.50.102			102	119,0	12,9	5,6	7,3	1535	17,2	5,6	11,6	2047	19,4	5,6	13,8	2309	21,5	7,7	13,8	2559
241.15.50.115			115	106,0	14,7	6,4	8,3	1558	19,6	6,4	13,2	2078	22,1	6,4	15,7	2343	24,5	8,8	15,7	2597
241.15.50.127			127	97,0	16,2	7,0	9,2	1571	21,6	7,0	14,6	2095	24,3	7,0	17,3	2357	27,0	9,7	17,3	2619
241.15.50.139			139	87,0	17,7	7,7	10,0	1540	23,6	7,7	15,9	2053	26,6	7,7	18,9	2314	29,5	10,6	18,9	2567
241.15.50.152			152	80,1	19,8	8,6	11,2	1586	26,4	8,6	17,8	2115	29,7	8,6	21,1	2379	33,0	11,9	21,1	2643
241.15.50.178			178	69,6	23,1	10,0	13,1	1608	30,8	10,0	20,8	2144	34,7	10,0	24,7	2415	38,5	13,9	24,6	2680
241.15.50.203			203	59,8	26,4	11,4	15,0	1579	35,2	11,4	23,8	2105	39,6	11,4	28,2	2368	44,0	15,8	28,2	2631
241.15.50.229			229	50,9	30,0	13,0	17,0	1527	40,0	13,0	27,0	2036	45,0	13,0	32,0	2291	50,0	18,0	32,0	2545
241.15.50.254			254	44,0	35,1	15,2	19,9	1544	46,8	15,2	31,6	2059	52,7	15,2	37,5	2319	58,5	21,1	37,4	2574
241.15.50.305			305	38,7	40,2	17,4	22,8	1556	53,6	17,4	36,2	2074	60,3	17,4	42,9	2334	67,0	24,1	42,9	2593

Order No blue	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{V5}$	$S_{A5}$	$F_5$	$S_6$	$S_{V6}$	$S_{A6}$	$F_6$	$S_7$	$S_{V7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.15.50.064	50,0	25,0	64	209,1	14,9	6,2	8,7	3116	16,7	8,1	8,6	3492	21,6	15,7	5,9	4517	27,0	37,0	5645,7
241.15.50.076			76	168,1	17,6	7,4	10,2	2959	19,8	9,6	10,2	3328	25,6	18,6	7,0	4303	32,0	44,0	5379,2
241.15.50.089			89	140,0	20,4	8,5	11,9	2856	22,9	11,1	11,8	3206	29,6	21,5	8,1	4144	37,0	52,0	5180,0
241.15.50.102			102	119,0	23,7	9,9	13,8	2820	26,7	12,9	13,8	3177	34,4	24,9	9,5	4094	43,0	59,0	5117,0
241.15.50.115			115	106,0	27,0	11,3	15,7	2862	30,4	14,7	15,7	3222	39,2	28,4	10,8	4155	49,0	66,0	5194,0
241.15.50.127			127	97,0	29,7	12,4	17,3	2881	33,5	16,2	17,3	3250	43,2	31,3	11,9	4190	54,0	73,0	5238,0
241.15.50.139			139	87,0	32,5	13,6	18,9	2828	36,6	17,7	18,9	3184	47,2	34,2	13,0	4106	59,0	80,0	5133,0
241.15.50.152			152	80,1	36,3	15,2	21,1	2908	40,9	19,8	21,1	3276	52,8	38,3	14,5	4229	66,0	86,0	5286,6
241.15.50.178			178	69,6	42,4	17,7	24,7	2951	47,7	23,1	24,6	3320	61,6	44,7	16,9	4287	77,0	101,0	5359,2
241.15.50.203			203	59,8	48,4	20,2	28,2	2894	54,6	26,4	28,2	3265	70,4	51,0	19,4	4210	88,0	115,0	5262,4
241.15.50.229			229	50,9	55,0	23,0	32,0	2800	62,0	30,0	32,0	3156	80,0	58,0	22,0	4072	100,0	129,0	5090,0
241.15.50.254			254	44,0	64,4	26,9	37,5	2834	72,5	35,1	37,4	3190	93,6	67,9	25,7	4118	117,0	137,0	5148,0
241.15.50.305			305	38,7	73,7	30,8	42,9	2852	83,1	40,2	42,9	3216	107,2	77,7	29,5	4149	134,0	171,0	5185,8

# High Performance Compression Springs

241.16.



241.16.  
Colour "Red"

- $D_h$  = dia. of guide sleeve
- $D_d$  = diameter of guide pin
- $L_0$  = free length of spring
- $L_1...L_n$  = length of loaded spring (mm) as related to spring forces  $F_1...F_n$
- $L_{BL}$  = length of compacted spring (i.e. wire-to-wire)
- $F_1...F_n$  = forces (N) as related to length of spring  $L_1...L_n$
- $S_{v1}...S_{v7}$  = recommend. preload. compression, as relat. to compress.  $S_1...S_7$
- $S_1...S_n$  = compr. as related to spring forces  $F_1...F_n$
- $R$  = spring rate (N/mm)
- $S_{A1}...S_{A7}$  = working stroke (mm)

241.16.

Order No red	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.16.50.064	50,0	25,0	64	413,0	6,5	2,8	3,7	2685	8,6	2,8	5,8	3552	9,7	2,8	6,9	4006	10,8	3,9	6,9	4460
241.16.50.076			76	339,4	7,8	3,4	4,4	2647	10,4	3,4	7,0	3530	11,7	3,4	8,3	3971	13,0	4,7	8,3	4412
241.16.50.089			89	288,4	9,2	4,0	5,2	2653	12,2	4,0	8,2	3518	13,7	4,0	9,7	3951	15,3	5,5	9,8	4413
241.16.50.102			102	245,3	10,5	4,6	5,9	2576	14,0	4,6	9,4	3434	15,8	4,6	11,2	3876	17,5	6,3	11,2	4293
241.16.50.115			115	214,8	12,0	5,2	6,8	2578	16,0	5,2	10,8	3437	18,0	5,2	12,8	3866	20,0	7,2	12,8	4296
241.16.50.127			127	192,3	13,5	5,9	7,6	2596	18,0	5,9	12,1	3461	20,3	5,9	14,4	3904	22,5	8,1	14,4	4327
241.16.50.139			139	170,7	15,0	6,5	8,5	2561	20,0	6,5	13,5	3414	22,5	6,5	16,0	3841	25,0	9,0	16,0	4268
241.16.50.152			152	154,0	16,2	7,0	9,2	2495	21,6	7,0	14,6	3326	24,3	7,0	17,3	3742	27,0	9,7	17,3	4158
241.16.50.178			178	134,4	19,2	8,3	10,9	2580	25,6	8,3	17,3	3441	28,8	8,3	20,5	3871	32,0	11,5	20,5	4301
241.16.50.203			203	116,7	21,8	9,4	12,4	2544	29,0	9,4	19,6	3384	32,6	9,4	23,2	3804	36,3	13,1	23,2	4236
241.16.50.254			254	89,3	27,6	12,0	15,6	2465	36,8	12,0	24,8	3286	41,4	12,0	29,4	3697	46,0	16,6	29,4	4108
241.16.50.305			305	73,6	33,6	14,6	19,0	2473	44,8	14,6	30,2	3297	50,4	14,6	35,8	3709	56,0	20,2	35,8	4122

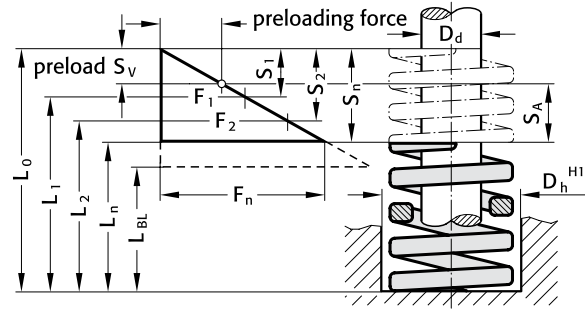
  

Order No red	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.16.50.064	50,0	25,0	64	413,0	11,8	4,9	6,9	4873	13,3	6,5	6,8	5493	17,2	12,5	4,7	7104	21,5	42,5	8879,5
241.16.50.076			76	339,4	14,3	6,0	8,3	4853	16,1	7,8	8,3	5464	20,8	15,1	5,7	7060	26,0	50,0	8824,4
241.16.50.089			89	288,4	16,8	7,0	9,8	4845	18,9	9,2	9,7	5451	24,4	17,7	6,7	7037	30,5	58,5	8796,2
241.16.50.102			102	245,3	19,3	8,1	11,2	4734	21,7	10,5	11,2	5323	28,0	20,3	7,7	6868	35,0	67,0	8585,5
241.16.50.115			115	214,8	22,0	9,2	12,8	4726	24,8	12,0	12,8	5327	32,0	23,2	8,8	6874	40,0	75,0	8592,0
241.16.50.127			127	192,3	24,8	10,4	14,4	4769	27,9	13,5	14,4	5365	36,0	26,1	9,9	6923	45,0	82,0	8653,5
241.16.50.139			139	170,7	27,5	11,5	16,0	4694	31,0	15,0	16,0	5292	40,0	29,0	11,0	6828	50,0	89,0	8535,0
241.16.50.152			152	154,0	29,7	12,4	17,3	4574	33,5	16,2	17,3	5159	43,2	31,3	11,9	6653	54,0	98,0	8316,0
241.16.50.178			178	134,4	35,2	14,7	20,5	4731	39,7	19,2	20,5	5336	51,2	37,1	14,1	6881	64,0	114,0	8601,6
241.16.50.203			203	116,7	39,9	16,7	23,2	4656	45,0	21,8	23,2	5252	58,0	42,1	15,9	6769	72,5	130,5	8460,8
241.16.50.254			254	89,3	50,6	21,2	29,4	4519	57,0	27,6	29,4	5090	73,6	53,4	20,2	6572	92,0	162,0	8215,6
241.16.50.305			305	73,6	61,6	25,8	35,8	4534	69,4	33,6	35,8	5108	89,6	65,0	24,6	6595	112,0	193,0	8243,2

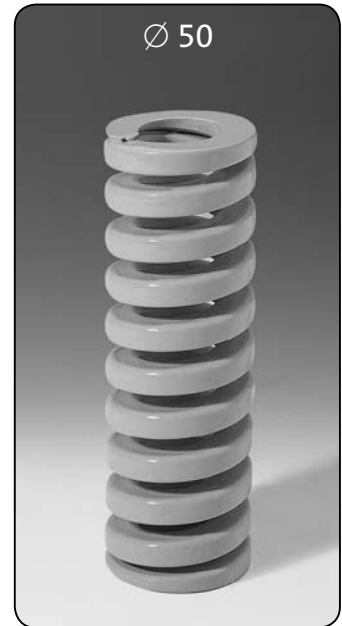
241.17.

High Performance Compression Springs

241.17.  
Colour "Yellow"



- $D_h$  = dia. of guide sleeve
- $D_d$  = diameter of guide pin
- $L_0$  = free length of spring
- $L_1...L_n$  = length of loaded spring (mm) as related to spring forces  $F_1...F_n$
- $L_{BL}$  = length of compacted spring (i.e. wire-to-wire)
- $F_1...F_n$  = forces (N) as related to length of spring  $L_1...L_n$
- $S_{v1}...S_{v7}$  = recommend. preload. compression, as relat. to compress.  $S_1...S_7$
- $S_1...S_n$  = compr. as related to spring forces  $F_1...F_n$
- $R$  = spring rate (N/mm)
- $S_{A1}...S_{A7}$  = working stroke (mm)



241.17.

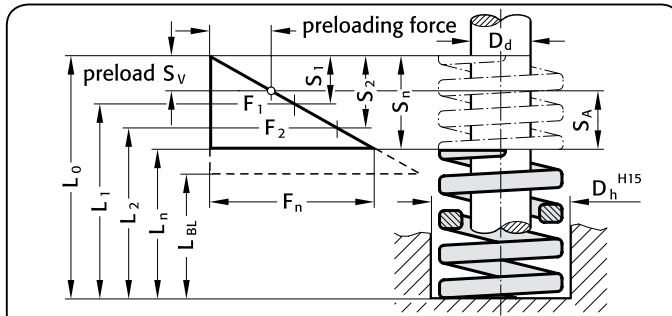
Order No yellow	$D_h$	$D_d$	$L_0$	$R$	30% stroke				40% stroke				45% stroke				50% stroke			
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.17.50.064	50,0	25,0	64	709	5,7	2,5	3,2	4041	7,6	2,5	5,1	5388	8,6	2,5	6,1	6097	9,5	3,4	6,1	6736
241.17.50.076			76	572	6,9	3,0	3,9	3947	9,2	3,0	6,2	5262	10,4	3,0	7,4	5949	11,5	4,1	7,4	6578
241.17.50.089			89	475	8,1	3,5	4,6	3848	10,8	3,5	7,3	5130	12,2	3,5	8,7	5795	13,5	4,9	8,6	6413
241.17.50.102			102	405	9,3	4,0	5,3	3767	12,4	4,0	8,4	5022	14,0	4,0	10,0	5670	15,5	5,6	9,9	6278
241.17.50.115			115	352	10,5	4,6	5,9	3696	14,0	4,6	9,4	4928	15,8	4,6	11,2	5562	17,5	6,3	11,2	6160
241.17.50.127			127	316	11,7	5,1	6,6	3697	15,6	5,1	10,5	4930	17,6	5,1	12,5	5562	19,5	7,0	12,5	6162
241.17.50.152			152	239	14,1	6,1	8,0	3370	18,8	6,1	12,7	4493	21,2	6,1	15,1	5067	23,5	8,5	15,0	5617
241.17.50.203			203	187	22,2	9,6	12,6	4151	29,6	9,6	20,0	5535	33,3	9,6	23,7	6227	37,0	13,3	23,7	6919
241.17.50.254			254	153	24,0	10,4	13,6	3672	32,0	10,4	21,6	4896	36,0	10,4	25,6	5508	40,0	14,4	25,6	6120
241.17.50.305			305	127	29,1	12,6	16,5	3696	38,8	12,6	26,2	4928	43,7	12,6	31,1	5550	48,5	17,5	31,0	6160

Order No yellow	$D_h$	$D_d$	$L_0$	$R$	55% stroke				62% stroke				80% stroke				100% stroke		
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.17.50.064	50,0	25,0	64	709	10,5	4,4	6,1	7445	11,8	5,7	6,1	8366	15,2	11,0	4,2	10777	19,0	45,0	13471,0
241.17.50.076			76	572	12,7	5,3	7,4	7264	14,3	6,9	7,4	8180	18,4	13,3	5,1	10525	23,0	53,0	13156,0
241.17.50.089			89	475	14,9	6,2	8,7	7078	16,7	8,1	8,6	7933	21,6	15,7	5,9	10260	27,0	62,0	12825,0
241.17.50.102			102	405	17,1	7,1	10,0	6926	19,2	9,3	9,9	7776	24,8	18,0	6,8	10044	31,0	71,0	12555,0
241.17.50.115			115	352	19,3	8,1	11,2	6794	21,7	10,5	11,2	7638	28,0	20,3	7,7	9856	35,0	80,0	12320,0
241.17.50.127			127	316	21,5	9,0	12,5	6794	24,2	11,7	12,5	7647	31,2	22,6	8,6	9859	39,0	88,0	12324,0
241.17.50.152			152	239	25,9	10,8	15,1	6190	29,1	14,1	15,0	6955	37,6	27,3	10,3	8986	47,0	105,0	11233,0
241.17.50.203			203	187	40,7	17,0	23,7	7611	45,9	22,2	23,7	8583	59,2	42,9	16,3	11070	74,0	129,0	13838,0
241.17.50.254			254	153	44,0	18,4	25,6	6732	49,6	24,0	25,6	7589	64,0	46,4	17,6	9792	80,0	174,0	12240,0
241.17.50.305			305	127	53,4	22,3	31,1	6782	60,1	29,1	31,0	7633	77,6	56,3	21,3	9855	97,0	208,0	12319,0

# High Performance Compression Springs

241.14.



- $D_h$  = dia. of guide sleeve
- $D_d$  = diameter of guide pin
- $L_0$  = free length of spring
- $L_1...L_n$  = length of loaded spring (mm) as related to spring forces  $F_1...F_n$
- $L_{BL}$  = length of compacted spring (i.e. wire-to-wire)
- $F_1...F_n$  = forces (N) as related to length of spring  $L_1...L_n$
- $S_{v1}...S_{v7}$  = recommend. preload. compression, as relat. to compress.  $S_1...S_7$
- $S_1...S_n$  = compr. as related to spring forces  $F_1...F_n$
- $R$  = spring rate (N/mm)
- $S_{A1}...S_{A7}$  = working stroke (mm)

241.14.  
Colour "Green"

## 241.14.

Order No green	$D_h$	$D_d$	$L_0$	$R$	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.14.63.076	63,0	38,0	76	189,1	11,4	4,9	6,5	2156	15,2	4,9	10,3	2874	17,1	4,9	12,2	3234	19,0	6,8	12,2	3593
241.14.63.089			89	158,1	13,2	5,7	7,5	2087	17,6	5,7	11,9	2783	19,8	5,7	14,1	3130	22,0	7,9	14,1	3478
241.14.63.102			102	131,0	15,0	6,5	8,5	1965	20,0	6,5	13,5	2620	22,5	6,5	16,0	2948	25,0	9,0	16,0	3275
241.14.63.115			115	116,0	17,1	7,4	9,7	1984	22,8	7,4	15,4	2645	25,7	7,4	18,3	2981	28,5	10,3	18,2	3306
241.14.63.127			127	103,1	19,2	8,3	10,9	1980	25,6	8,3	17,3	2639	28,8	8,3	20,5	2969	32,0	11,5	20,5	3299
241.14.63.152			152	84,4	22,8	9,9	12,9	1924	30,4	9,9	20,5	2566	34,2	9,9	24,3	2886	38,0	13,7	24,3	3207
241.14.63.178			178	71,5	26,7	11,6	15,1	1909	35,6	11,6	24,0	2545	40,1	11,6	28,5	2867	44,5	16,0	28,5	3182
241.14.63.203			203	61,7	30,6	13,3	17,3	1888	40,8	13,3	27,5	2517	45,9	13,3	32,6	2832	51,0	18,4	32,6	3147
241.14.63.254			254	47,0	38,4	16,6	21,8	1805	51,2	16,6	34,6	2406	57,6	16,6	41,0	2707	64,0	23,0	41,0	3008
241.14.63.305			305	38,3	45,6	19,8	25,8	1746	60,8	19,8	41,0	2329	68,4	19,8	48,6	2620	76,0	27,4	48,6	2911

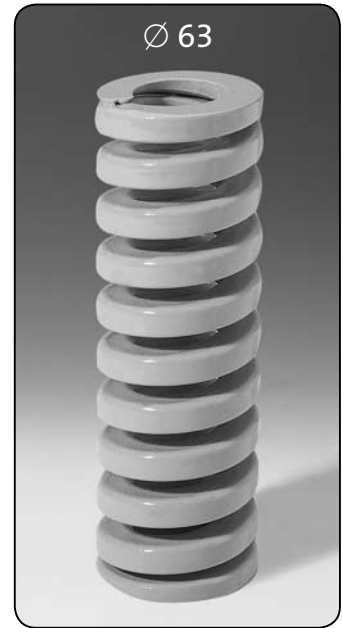
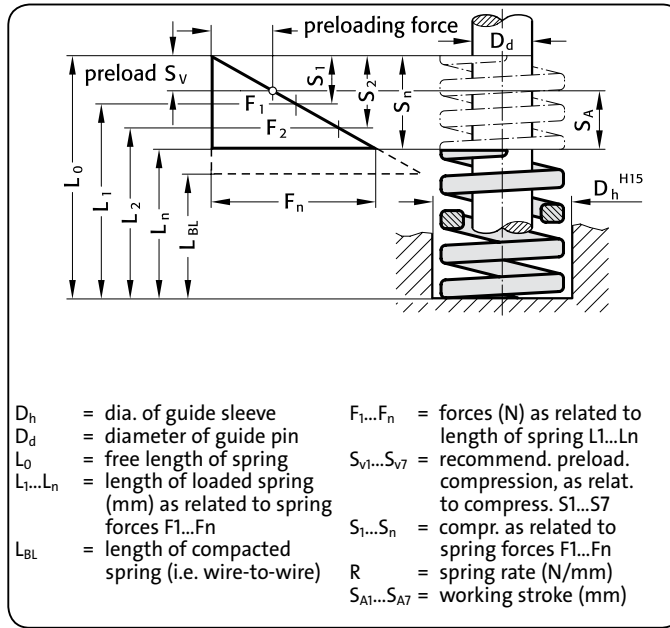
  

Order No green	$D_h$	$D_d$	$L_0$	$R$	55% stroke			62% stroke			80% stroke			100%stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.14.63.076	63,0	38,0	76	189,1	20,9	8,7	12,2	3952	23,6	11,4	12,2	4463	30,4	22,0	8,4	5749	38,0	38,0	7185,8
241.14.63.089			89	158,1	24,2	10,1	14,1	3826	27,3	13,2	14,1	4316	35,2	25,5	9,7	5565	44,0	45,0	6956,4
241.14.63.102			102	131,0	27,5	11,5	16,0	3603	31,0	15,0	16,0	4061	40,0	29,0	11,0	5240	50,0	52,0	6550,0
241.14.63.115			115	116,0	31,4	13,1	18,3	3642	35,3	17,1	18,2	4095	45,6	33,1	12,5	5290	57,0	58,0	6612,0
241.14.63.127			127	103,1	35,2	14,7	20,5	3629	39,7	19,2	20,5	4093	51,2	37,1	14,1	5279	64,0	63,0	6598,4
241.14.63.152			152	84,4	41,8	17,5	24,3	3528	47,1	22,8	24,3	3975	60,8	44,1	16,7	5132	76,0	76,0	6414,4
241.14.63.178			178	71,5	49,0	20,5	28,5	3504	55,2	26,7	28,5	3947	71,2	51,6	19,6	5091	89,0	89,0	6363,5
241.14.63.203			203	61,7	56,1	23,5	32,6	3461	63,2	30,6	32,6	3899	81,6	59,2	22,4	5035	102,0	101,0	6293,4
241.14.63.254			254	47,0	70,4	29,4	41,0	3309	79,4	38,4	41,0	3732	102,4	74,2	28,2	4813	128,0	126,0	6016,0
241.14.63.305			305	38,3	83,6	35,0	48,6	3202	94,2	45,6	48,6	3608	121,6	88,2	33,4	4657	152,0	153,0	5821,6

241.15.

High Performance Compression Springs

241.15.  
Colour "Blue"



241.15.

Order No blue	$D_h$	$D_d$	$L_0$	R	30% stroke			40% stroke			45% stroke			50% stroke						
					$S_1$	$S_{v1}$	$S_{A1}$	$F_1$	$S_2$	$S_{v2}$	$S_{A2}$	$F_2$	$S_3$	$S_{v3}$	$S_{A3}$	$F_3$	$S_4$	$S_{v4}$	$S_{A4}$	$F_4$
241.15.63.076	63,0	38,0	76	312,1	9,6	4,2	5,4	2996	12,8	4,2	8,6	3995	14,4	4,2	10,2	4494	16,0	5,8	10,2	4994
241.15.63.089			89	260,1	11,4	4,9	6,5	2965	15,2	4,9	10,3	3954	17,1	4,9	12,2	4448	19,0	6,8	12,2	4942
241.15.63.102			102	221,1	13,2	5,7	7,5	2919	17,6	5,7	11,9	3891	19,8	5,7	14,1	4378	22,0	7,9	14,1	4864
241.15.63.115			115	187,0	15,0	6,5	8,5	2805	20,0	6,5	13,5	3740	22,5	6,5	16,0	4208	25,0	9,0	16,0	4675
241.15.63.127			127	168,1	16,5	7,3	9,5	2824	22,4	7,3	15,1	3765	25,2	7,3	17,9	4236	28,0	10,1	17,9	4707
241.15.63.152			152	136,0	20,1	8,7	11,4	2734	26,8	8,7	18,1	3645	30,2	8,7	21,5	4107	33,5	12,1	21,4	4556
241.15.63.178			178	114,0	23,4	10,1	13,3	2668	31,2	10,1	21,1	3557	35,1	10,1	25,0	4001	39,0	14,0	25,0	4446
241.15.63.203			203	100,0	27,0	11,7	15,3	2700	36,0	11,7	24,3	3600	40,5	11,7	28,8	4050	45,0	16,2	28,8	4500
241.15.63.229			229	89,3	30,6	13,1	17,3	2733	40,8	13,3	27,5	3643	45,9	13,3	32,6	4099	51,0	18,4	32,6	4554
241.15.63.254			254	78,5	34,5	15,0	19,5	2708	46,0	15,0	31,0	3611	51,8	15,0	36,8	4066	57,5	20,7	36,8	4514
241.15.63.305			305	64,8	41,4	17,9	23,5	2683	55,2	17,9	37,3	3577	62,1	17,9	44,2	4024	69,0	24,8	44,2	4471

Order No blue	$D_h$	$D_d$	$L_0$	R	55% stroke			62% stroke			80% stroke			100% stroke					
					$S_5$	$S_{v5}$	$S_{A5}$	$F_5$	$S_6$	$S_{v6}$	$S_{A6}$	$F_6$	$S_7$	$S_{v7}$	$S_{A7}$	$F_7$	$S_n$	$L_n$	$F_n$
241.15.63.076	63,0	38,0	76	312,1	17,6	7,4	10,2	5493	19,8	9,6	10,2	6180	25,6	18,6	7,0	7990	32,0	44,0	9987,2
241.15.63.089			89	260,1	20,4	8,7	12,2	5436	23,6	11,4	12,2	6138	30,4	22,0	8,4	7907	38,0	51,0	9883,8
241.15.63.102			102	221,1	23,7	10,1	14,1	5351	27,3	13,2	14,1	6036	35,2	25,5	9,7	7783	44,0	58,0	9728,4
241.15.63.115			115	187,0	27,0	11,5	16,0	5143	31,0	15,0	16,0	5797	40,0	29,0	11,0	7480	50,0	65,0	9350,0
241.15.63.127			127	168,1	30,3	12,9	17,9	5177	34,7	16,8	17,9	5833	44,8	32,5	12,3	7531	56,0	71,0	9413,6
241.15.63.152			139	136,0	33,0	15,4	21,5	5018	41,5	20,1	21,4	5644	53,6	38,9	14,7	7290	67,0	85,0	9112,0
241.15.63.178			152	114,0	36,3	17,9	25,0	4891	48,4	23,4	25,0	5518	62,4	45,2	17,2	7114	78,0	100,0	8892,0
241.15.63.203			178	100,0	42,4	20,7	28,8	4950	55,8	27,0	28,8	5580	72,0	52,2	19,8	7200	90,0	113,0	9000,0
241.15.63.229			203	89,3	48,4	23,5	32,6	5010	63,2	30,6	32,6	5644	81,6	59,2	22,4	7287	102,0	127,0	9108,6
241.15.63.254			254	78,5	60,5	26,5	36,8	4969	71,3	34,5	36,8	5597	92,0	66,7	25,3	7222	115,0	139,0	9027,5
241.15.63.305			305	64,8	73,2	31,7	44,2	4918	85,6	41,4	44,2	5547	110,4	80,0	30,4	7154	138,0	167,0	8942,4

# Round Wire Compression Springs

241.02.

**Material:**

Spring Steel class C DIN 17.223 sheet 1, drawn and patented.

**Manufacturing Tolerances:**

to DIN 2095 class 2.

**Applications:**

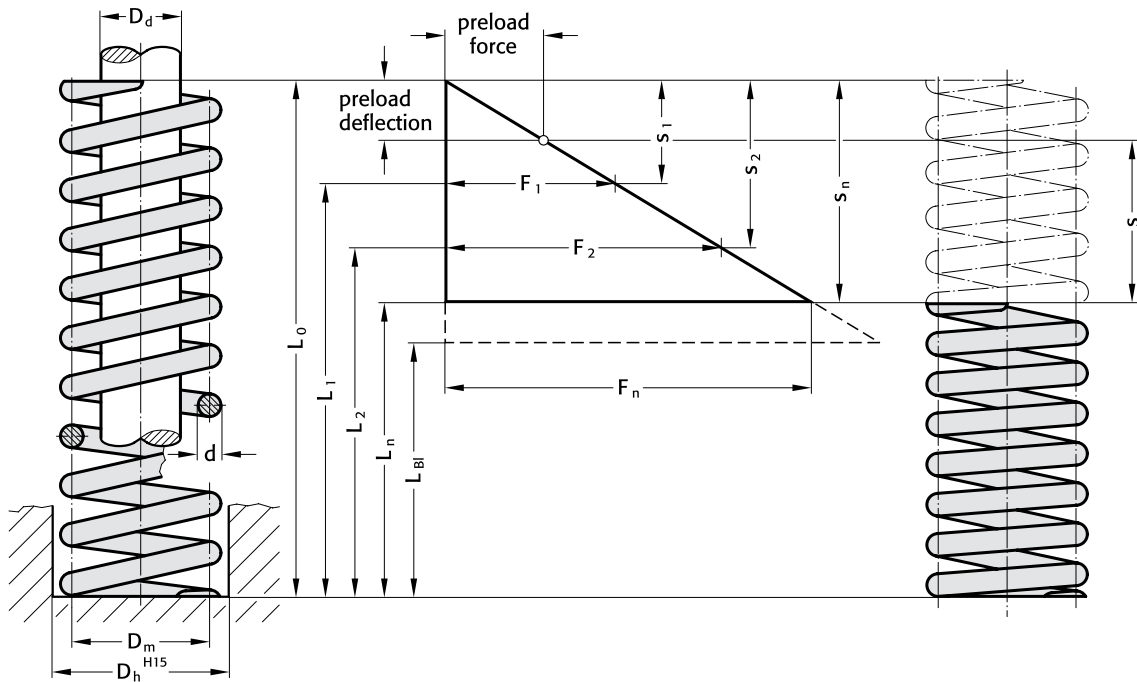
as highly stressed compression springs and for loads both static and oscillating.

**End coils:**

Flattened and ground end coils.

**Surface treatment:**

Ball shot treatment for surface homogenization. All springs are supplied oiled.



- $D_h$  = inside diameter of guide bush (mm)
- $D_m$  = mean diameter of coils (mm)
- $D_d$  = diameter of guide pin (mm)
- $L_0$  = free length of spring (mm)
- $L_1...L_n$  = compressed lengths (mm), under respective loads  $F_1...F_n$
- $L_{BI}$  = length of compacted spring (mm) (wire against wire)

- $d$  = diameter of spring wire
- $F_1...F_n$  = loads (N) causing compressed lengths  $L_1...L_n$
- $s_1...s_n$  = deflection (mm), caused by loads  $F_1...F_n$
- $c$  = spring coefficient (N/mm) – i. e. the force that causes deflection of 1 mm
- $s$  = working stroke of spring – i. e. working deflection

Preloading force and -deflection to be determined by the designer.

**241.02.**

**Round Wire Compression Springs**

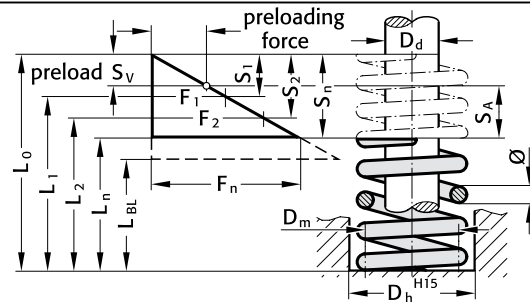
**241.02. Material:**

Spring Steel Class C  
DIN 17223 Sheet 1  
drawn and patented

Manufacturing Tolerances:  
to DIN 2095; load-stabilized,  
surface homogenized by  
ball-shot

max. working temperature:  
100 °C

Applications: as highly stressed  
springs, for static and oscillating  
loads.



- D<sub>h</sub> = diameter of guide sleeve
- D<sub>m</sub> = mean coil diameter (mm)
- D<sub>d</sub> = diameter of guide pin
- d = diameter of spring wire
- L<sub>0</sub> = free length of spring
- L<sub>1...L<sub>n</sub></sub> = length of loaded spring (mm) as related to spring forces F<sub>1...F<sub>n</sub></sub>
- R = spring rate (N/mm)
- L<sub>Bl</sub> = length of compacted spring (i.e. wire-to-wire)
- F<sub>1...F<sub>n</sub></sub> = forces (N) as related to length of spring L<sub>1...L<sub>n</sub></sub>
- s<sub>1...s<sub>n</sub></sub> = compression as related to spring forces F<sub>1...F<sub>n</sub></sub>
- i<sub>f</sub> = number of active coils



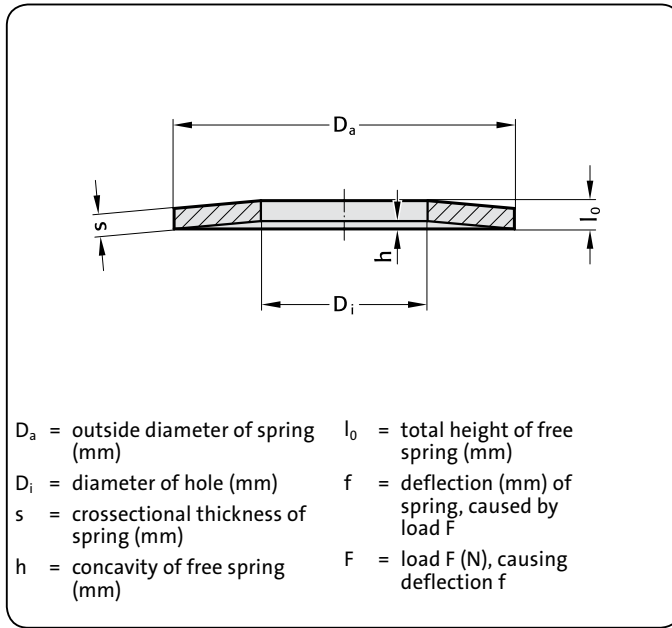
**241.02.**

Order No	D <sub>h</sub>	D <sub>d</sub>	D <sub>m</sub>	d	L <sub>0</sub>	R	long spring life			medium spring life			max. spring loading			i <sub>f</sub>
							s <sub>1</sub>	F <sub>1</sub> (N)	L <sub>1</sub>	s <sub>2</sub>	F <sub>2</sub> (N)	L <sub>2</sub>	s <sub>n</sub>	F <sub>n</sub> (N)	L <sub>n</sub>	
241.02.11.040	11	6,5	8,5	1,5	40	8,08	11,3	91	28,7	13,7	110	26,3	16,1	130	23,9	10,5
13.055	13	8,5	10,5	1,5	55	3,8	20,8	79	34,2	25,2	95	29,8	29,7	112	25,3	12
15.040	15	9,5	12	2	40	11,93	12,3	146	27,7	15	178	25	17,6	210	22,4	8
15.050	15	9,5	12	2	50	10	17,5	175	32,5	21,2	212	28,8	25	250	25	9,5
16.040	16	10,5	13	2	40	11	14	154	26	17	187	23	20	220	20	7
18.085	18	12	14,75	2,25	85	5,92	30,8	182	54,2	37,4	221	47,6	44	260	41	14
19.045	19	11	14,5	3	45	35	9,8	343	35,2	11,9	416	33,1	14	490	31	8
19.050	19	11	14,5	3	50	30	11,2	336	38,8	13,6	408	36,4	16	480	34	8,5
19.083	19,5	9	14	4	83	75	12,6	945	70,4	15,3	1147	67,7	18	1350	65	16
20.035	20,5	10	15	4	35	170	5,6	952	29,4	6,8	1156	28,2	8	1360	27	4,5
20.090	20,5	9	14,5	4,5	90	97,8	12,3	1202	77,7	15	1467	75	17,6	1714	72,4	4
21.035	21	13,5	17	2,5	35	13,32	10,5	139	24,5	12,7	169	22,3	15	200	20	6
21.040	21	12	16,25	3	40	32,1	9,8	314	30,2	11,9	381	28,1	14	450	26	5,5
22.095	22	14,5	18	2,5	95	4,1	34,2	140	60,8	41,5	170	53,5	48,8	200	46,2	17
22.040	22,5	12	17	4	40	105,5	7,7	812	32,3	9,3	981	30,7	11	1160	29	5
23.045	23	14,5	18,5	3	45	25,7	15	385	30	18,2	467	26,8	21,4	550	23,6	5
23.050	23	12,5	17,5	4	50	74,3	11	817	39	13,3	988	36,7	15,6	1160	34,4	6,5
26.024	26,5	16	21	4	24	133,2	5	666	19	6,1	812	17,9	7,2	960	16,8	2
30.070	30	13	20,8	7	70	341	7,7	2625	62,3	9,3	3171	60,7	11	3750	59	8
32.070	32	21	26	4	70	24,2	23,8	575	46,2	28,9	700	41,1	34	822	36	6
32.150	32	16	23,5	6,5	150	103,6	19,6	2030	130,4	23,8	2465	126	28	2900	122	14
34.125	34	19	26	6	125	67,2	22,4	1505	102,6	27,2	1827	97,8	32	2150	93	11,5
44.130	44	25	34	8	130	108,2	25,2	2726	104,8	30,6	3310	99,4	36	3895	94	10
44.200	44	25	34	8	200	62,7	43,4	2721	156,6	52,7	3304	147,3	62	3887	137,7	17
48.067	48	25	36	10	67	640	6,3	4032	60,7	7,6	4864	59,4	9	5760	58	3,5
49.050	49	29	38,5	8,5	50	337	7,7	2594	42,3	9,3	3134	40,7	11	3707	39	2,5
55.200	55	30	42	11	200	157	30,1	4725	169,9	36,6	5746	163,4	43	6750	157	13
58.050	58	39	48	8	50	151,2	9,8	1481	40,2	11,9	1799	38,1	14	2117	36	2,5
63.180	63	38	50	11	180	121	30,1	3642	149,9	36,6	4428	143,4	43	5203	137	10

All spring sizes listed also available in "making-up"-lengths of 500 mm. When ordering these, please add "500" at the end of the order number – e. g. 241.02.11.040.500

Disc Springs DIN 2093

242.01.



Material:

50 CrV 4 Vanadium Spring Steel

Note:

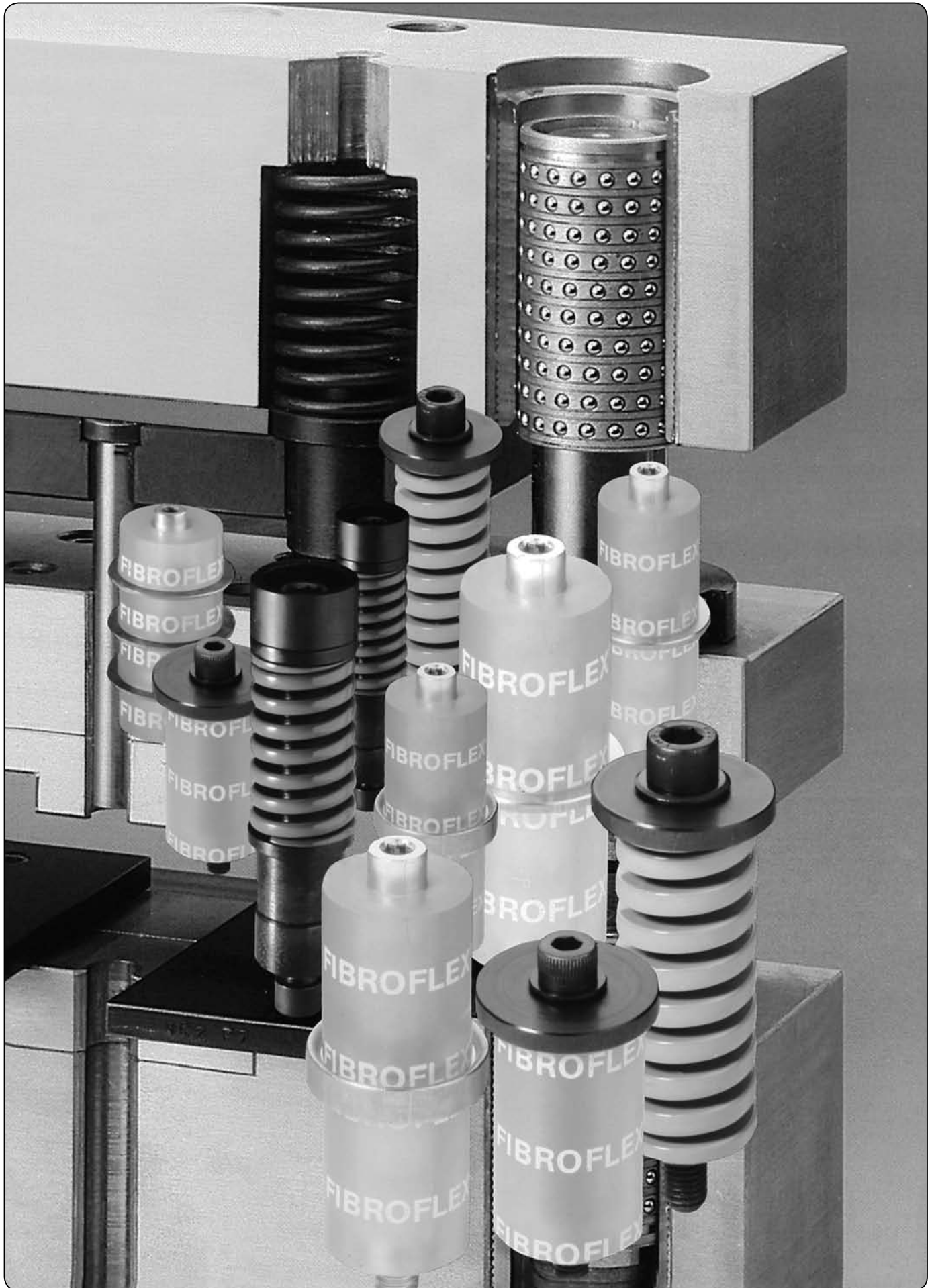
FIBRO Disc Springs 242.01. are made from 50 CrV 4 premier grade spring steel. This "classic" spring material guarantes optimal performance levels within the temperature range from -15 °C to +150 °C. "Hot pressetting" allows working temperatures from -25 °C to +200 °C.

- $D_a$  = outside diameter of spring (mm)
- $D_i$  = diameter of hole (mm)
- $s$  = crosssectional thickness of spring (mm)
- $h$  = concavity of free spring (mm)
- $l_0$  = total height of free spring (mm)
- $f$  = deflection (mm) of spring, caused by load F
- $F$  = load F (N), causing deflection f

242.01.

Order No	in accordance with DIN 2093 Series	$D_a$	$D_i$	$s$	$h$	$l_0$	$f$	$F$	$f$	$F$	$f$	$F$	$f$	$F$	$f$	$F$
		h 12 mm	H 12 mm													
242.01.080.032.040		8	3,2	0,4	0,2	0,6	0,04	58	0,08	110	0,12	160	0,14	180	0,16	200
100.052.040	B	10	5,2	0,4	0,3	0,7	0,06	73	0,12	134	0,18	180	0,21	200	0,24	220
125.062.050	B	12,5	6,2	0,5	0,35	0,85	0,07	100	0,14	180	0,21	250	0,24	280	0,28	310
140.072.080	A	14	7,2	0,8	0,3	1,1	0,06	230	0,12	450	0,18	660	0,21	770	0,24	870
150.052.070		15	5,2	0,7	0,4	1,1	0,08	180	0,16	340	0,24	470	0,28	540	0,32	610
160.082.060	B	16	8,2	0,6	0,45	1,05	0,09	145	0,18	260	0,27	360	0,31	400	0,36	440
160.082.090	A	16	8,2	0,9	0,35	1,25	0,07	300	0,14	580	0,21	850	0,24	970	0,28	1100
180.092.100	A	18	9,2	1,0	0,4	1,4	0,08	370	0,16	720	0,24	1050	0,28	1200	0,32	1350
200.102.080	B	20	10,2	0,8	0,55	1,35	0,11	250	0,22	470	0,33	650	0,38	730	0,44	800
200.102.090		20	10,2	0,9	0,55	1,45	0,11	340	0,22	640	0,33	900	0,38	1000	0,44	1150
200.102.110	A	20	10,2	1,1	0,45	1,55	0,09	450	0,18	870	0,27	1350	0,31	1450	0,36	1650
230.122.125		23	12,2	1,25	0,6	1,85	0,12	710	0,24	1360	0,36	1960	0,42	2240	0,48	2520
250.122.150	A	25	12,2	1,5	0,55	2,05	0,11	860	0,22	1650	0,33	2450	0,38	2800	0,44	3100
250.122.100		25	12,2	1,0	0,6	1,6	0,12	320	0,24	600	0,36	840	0,42	950	0,48	1050
280.142.100	B	28	14,2	1,0	0,8	1,8	0,16	400	0,32	720	0,48	970	0,56	1100	0,64	1200
280.142.150	A	28	14,2	1,5	0,65	2,15	0,13	850	0,26	1650	0,39	2400	0,45	2700	0,52	3100
315.163.125	B	31,5	16,3	1,25	0,9	2,15	0,18	660	0,36	1200	0,54	1650	0,63	1850	0,72	2000
315.163.175	A	31,5	16,3	1,75	0,7	2,45	0,14	1150	0,28	2200	0,42	3200	0,49	3700	0,56	4200
355.183.200	A	35,5	18,3	2,0	0,8	2,8	0,16	1550	0,32	3000	0,48	4300	0,56	5000	0,64	5600
400.143.150		40	14,3	1,5	1,25	2,75	0,25	950	0,50	1700	0,75	2200	0,87	2500	1,00	2700
400.204.225	A	40	20,4	2,25	0,9	3,15	0,18	1900	0,36	3700	0,54	5400	0,63	5200	0,72	7000
450.224.250	A	45	22,4	2,5	1	3,5	0,20	2300	0,40	4500	0,60	6400	0,70	7400	0,80	8500
500.183.150		50	18,3	1,5	1,8	3,3	0,36	1200	0,72	2000	1,08	2400	1,26	2600	1,44	2700
500.254.250		50	25,4	2,5	1,4	3,9	0,28	2850	0,56	5350	0,84	7600	0,98	8650	1,12	9650
500.254.300	A	50	25,4	3	1,1	4,1	0,22	3500	0,44	6800	0,66	10000	0,77	11500	0,88	13000
560.285.200	B	56	28,5	2	1,6	3,6	0,32	1600	0,64	2900	0,96	3900	1,12	4300	1,28	4700
600.204.200		60	20,4	2	2,1	4,1	0,42	2000	0,84	3400	1,26	4300	1,47	4700	1,68	5000



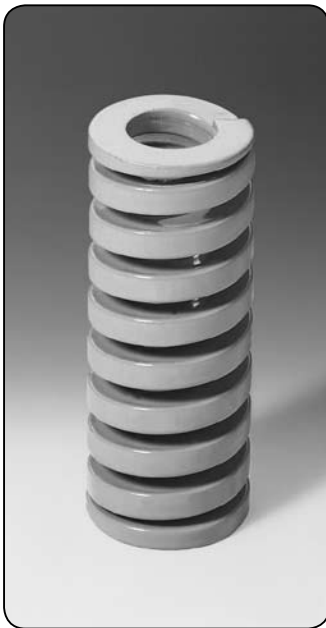


**Individual Spring Unit Elements  
Combination Spring- and Spacer Units – Complete**



- 246.**  
FIBROFLEX®-Springs
- 244.4.**  
Stacking Washer, flat
- 2441.3.**  
Stacking Washer, dished
- 244.5.**  
Guide Pin

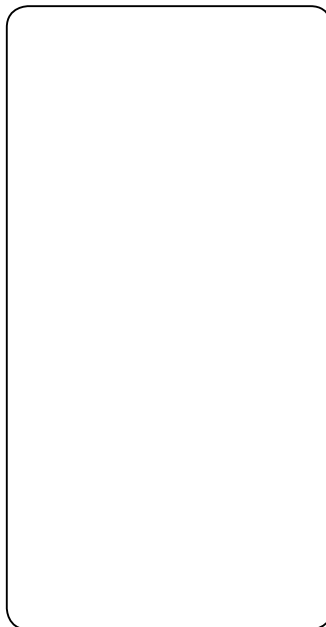
Order Nos and technical data – see page F 48– F 62



- 244.14.**  
Preloaded Spring Units for Dies, employing FIBROFLEX®-Springs
- 244.15.**  
Preloaded Spring Units for Dies, employing High-Performance Compression Springs

- 246.**  
FIBROFLEX®-Springs
- 241.14.–17.**  
High-Performance Compression Springs
- FIBROFLEX®-Springs and High-Performance Compression Springs have to be ordered separately.

Order Nos and technical data – see F 63.

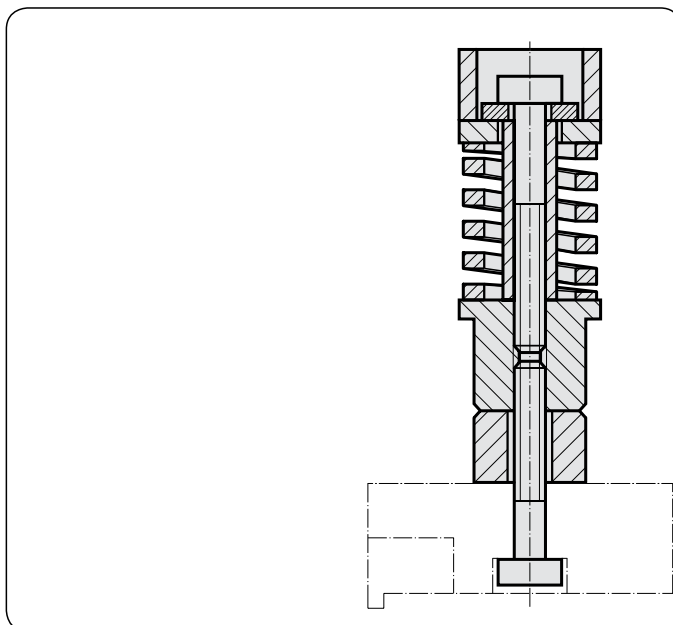
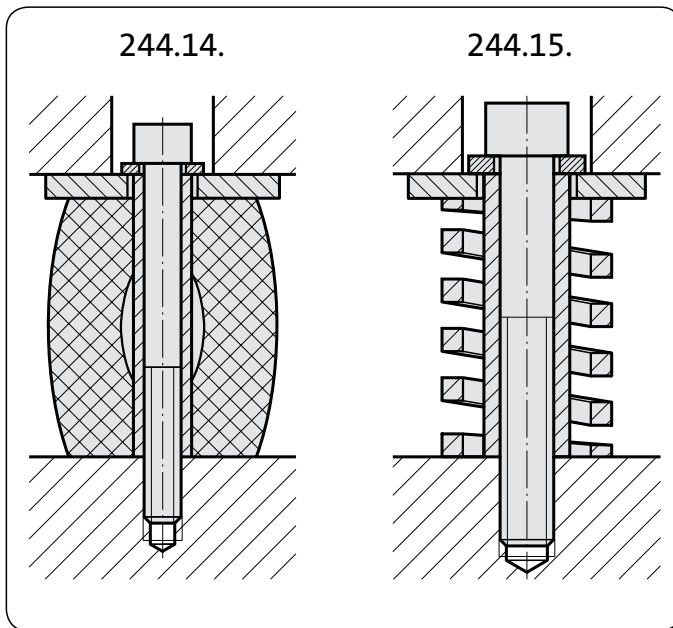
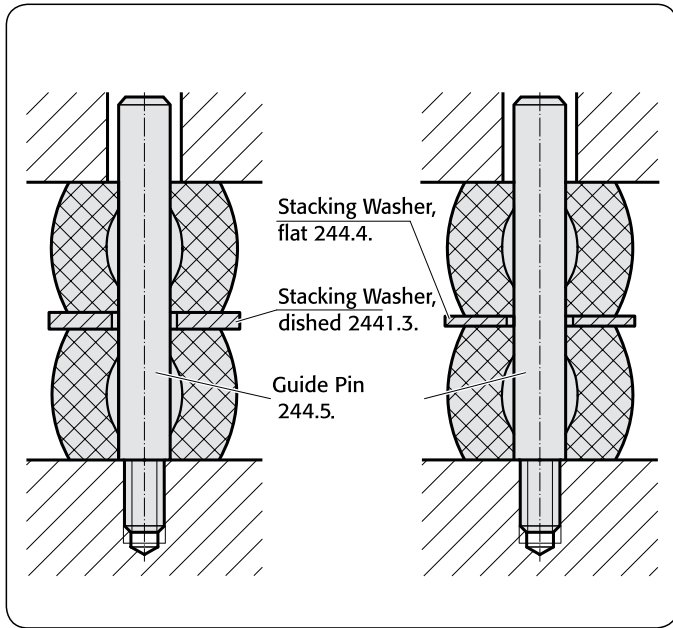


- 244.20.–25.**  
**244.32.–40.**  
Combination Spring- and Spacer Unit
- 241.14.–17.**  
High-Performance Compression Springs

Order Nos and technical data – see F 64.

# FIBRO

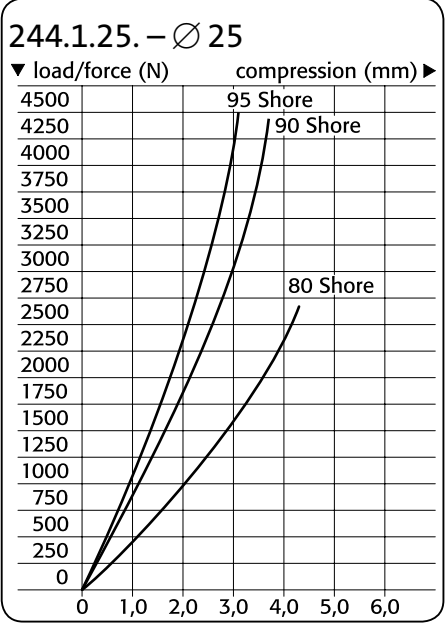
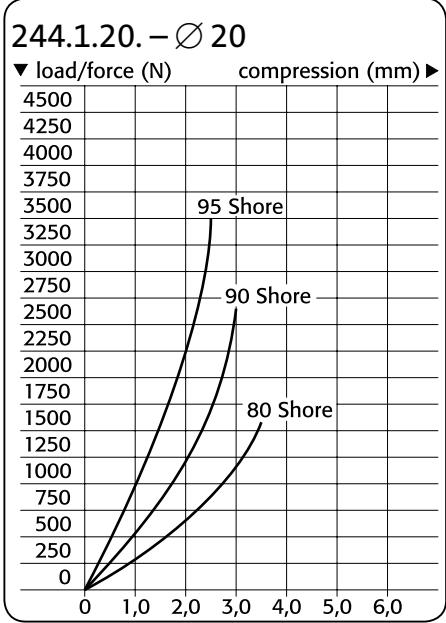
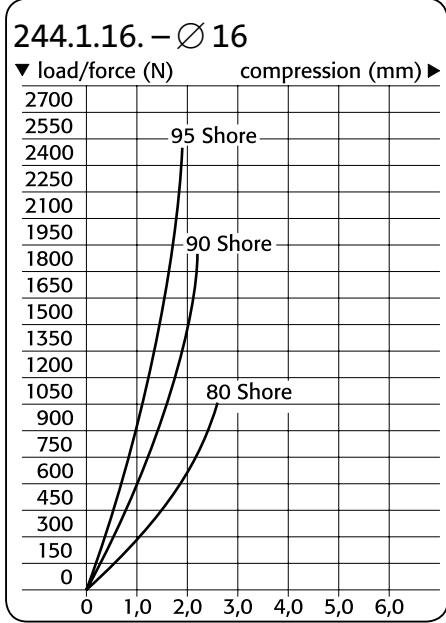
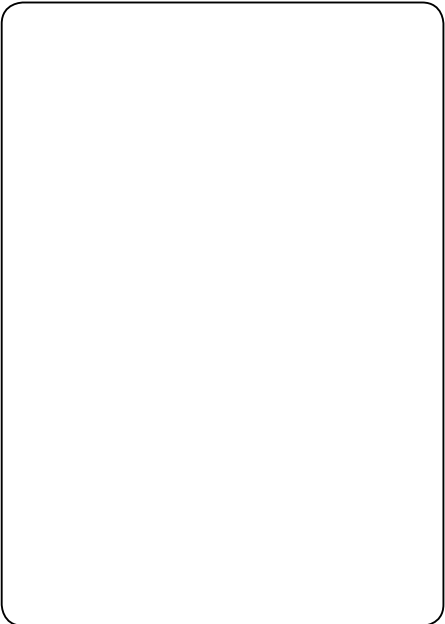
## Examples of Applications: Spring Units Combination Spring- and Spacer Units



# FIBROFLEX® Spring Systems: Stacking Washers Guide Pins

**FIBRO**

244.1. 244.4.  
244.5.



**244.1.**

Order No		d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	L <sub>0</sub>	f max.	F max. N
244.1.16.5	80 Shore A	6,5	16	20	7,5	2,6	1060
	20.5 green	8,5	20	26	10	3,5	1580
	25.5	10,5	25	32	12,5	4,3	2670
	32.5	13,5	32	40	15	5,2	4500
	40.5	13,5	40	50	17,5	6,1	7200
244.1.16.6	90 Shore A	6,5	16	20	7,5	2,2	1900
	20.6 yellow	8,5	20	26	10	3	2650
	25.6	10,5	25	32	12,5	3,7	4400
	32.6	13,5	32	40	15	4,5	6550
	40.6	13,5	40	50	17,5	5,2	11200
244.1.16.7	95 Shore A	6,5	16	20	7,5	1,9	2500
	20.7 red	8,5	20	26	10	2,5	3500
	25.7	10,5	25	32	12,5	3,1	4500
	32.7	13,5	32	40	15	3,9	7800
	40.7	13,5	40	50	17,5	4,4	13500

Physical and chemical properties of FIBROFLEX® Elastomer – see pages G 6 and G 7.

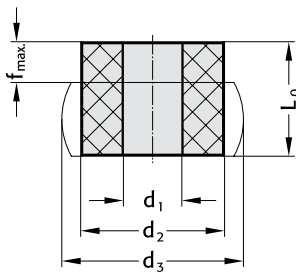
Dowel Pins 235.1, or Guide Pins 244.5, recommended for stacks higher than 1,5×d<sub>2</sub>.

# FIBRO

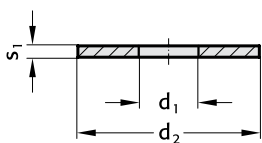
244.1. 244.4.  
244.5.

## FIBROFLEX® Spring Systems: Stacking Washers Guide Pins

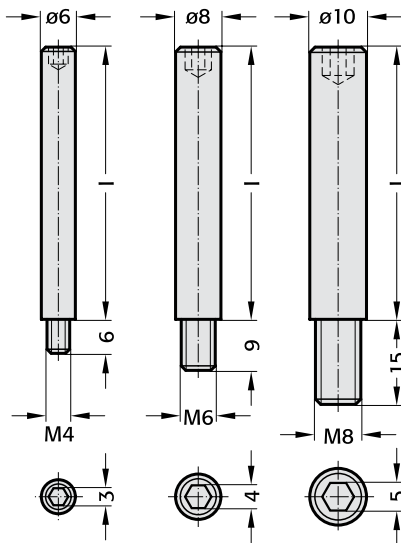
244.1.



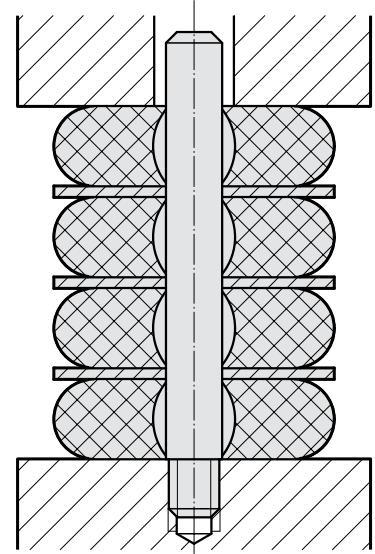
244.4.



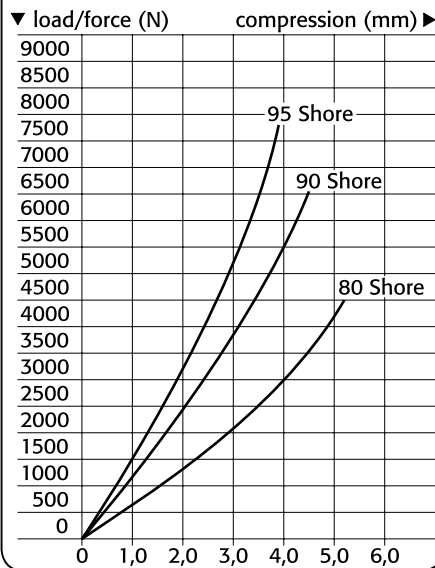
244.5.06. 244.5.08. 244.5.10.



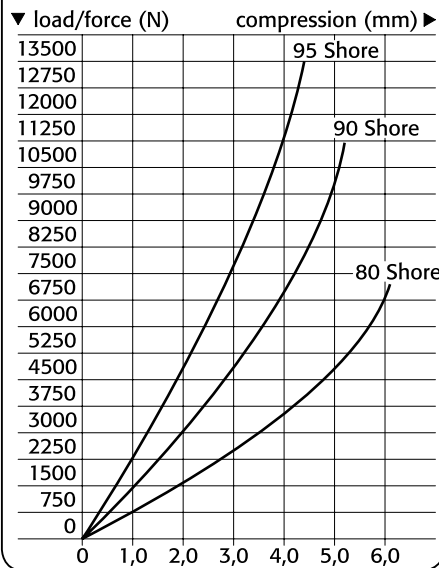
Application Example:



244.1.32. – Ø 32



244.1.40. – Ø 40



Description:

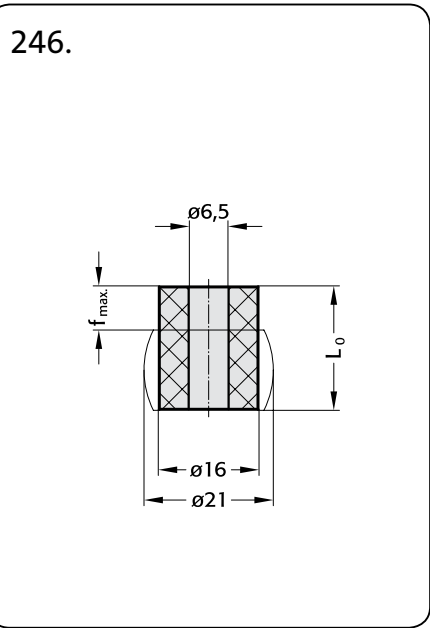
FIBROFLEX® Spring Systems represent a finely graded range of elastomer spring units (material: polyurethane) exhibiting particular suitability for all stamping dies and related tools.

The 244.-Systems comprise FIBROFLEX® Spring Elements 244.1., available in three Shore hardnesses. With the aid of Stacking Washers 244.4. and Guide Pins 244.5., the elements can be stacked.

Note that stacking with interposed stacking washers results in the addition of the individual spring deflections – without addition of the spring forces.

244.4./244.5.

	Order No	d <sub>1</sub>	d <sub>2</sub>	s <sub>1</sub>
Stacking Washer	244.4.016	6,5	20	1
	244.4.020	8,5	26	1,5
	244.4.025	10,5	32	2
	244.4.032	13,5	40	2,5
	244.4.040	13,5	50	2,5
	Order No	l		
Guide Pin	244.5.06.020	20		
	244.5.06.025	25		
	244.5.06.032	32		
	244.5.06.040	40		
Guide Pin	244.5.08.025	25		
	244.5.08.032	32		
	244.5.08.040	40		
	244.5.08.050	50		
Guide Pin	244.5.10.032	32		
	244.5.10.040	40		
	244.5.10.050	50		
	244.5.10.063	63		



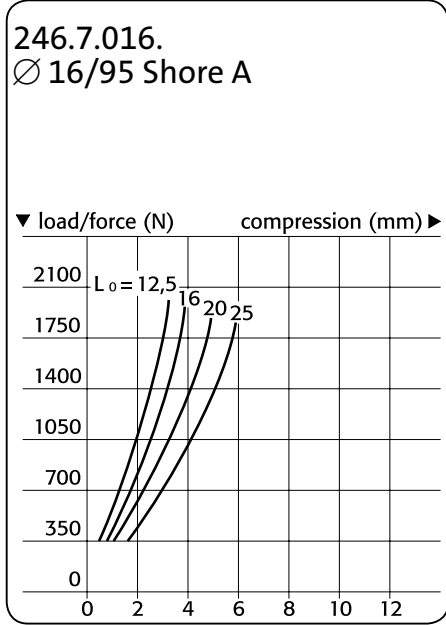
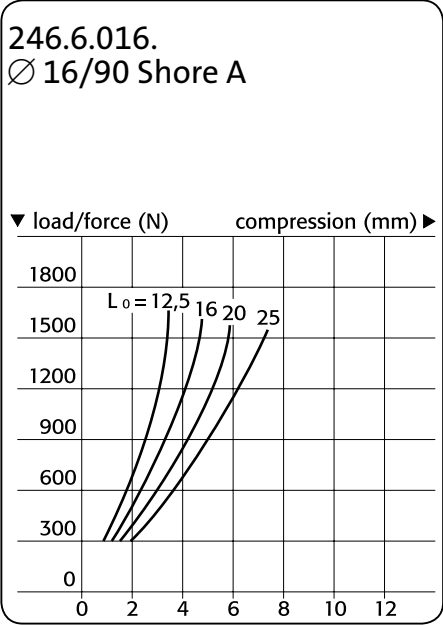
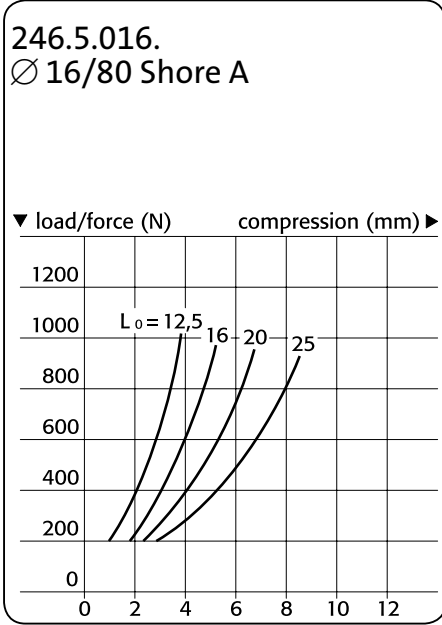
**FIBROFLEX® Spring Elements are made from highly elastic polyurethane elastomers**

Shore hardness is the most significant rating of the various FIBROFLEX® elements. Shore hardness ratings are symbolized by distinctive colour coding.

Correct selection of Shore hardness has a fundamental bearing on the success of FIBROFLEX®-applications.

Because of their physical properties, polyurethane elastomers exhibit a certain tendency towards initial sagging.

Depending on such factors as internal working temperature, frequency and number of load changes etc., sagging may amount to 4-7 % of the original spring length.



**246.**

Order No		F max. in N	L <sub>0</sub>	f max.
246.5.016.012	80 Shore A	1020	12,5	4,3
246.5.016.016	green	980	16	5,6
246.5.016.020		950	20	7
246.5.016.025		940	25	8,7
246.6.016.012	90 Shore A	1680	12,5	3,6
246.6.016.016	yellow	1650	16	4,8
246.6.016.020		1620	20	6
246.6.016.025		1580	25	7,5
246.7.016.012	95 Shore A	2000	12,5	3,1
246.7.016.016	red	1920	16	4
246.7.016.020		1900	20	5
246.7.016.025		1870	25	6,2

Accessories	Order No.	see Spring Accessories, page F62.
Stacking Washer	2441.3.016	
Stacking Washer	244.4.016	
Guide Pins	244.5.06.020	
	025	
	032	
	040	

**FIBROFLEX® Spring Elements are made from highly elastic polyurethane elastomers.**

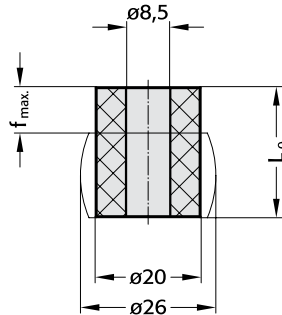
Shore hardness is the most significant rating of the various FIBROFLEX® Elements. Shore hardness ratings are symbolized by distinctive colour coding.

Correct selection of Shore hardness has a fundamental bearing on the success of FIBROFLEX®-applications.

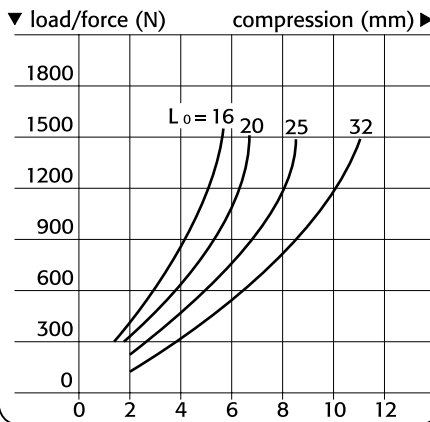
Because of their physical properties, polyurethane elastomers exhibit a certain tendency towards initial sagging.

Depending on such factors as internal working temperature, frequency and number of load changes etc., sagging may amount to 4-7 % of the original spring length.

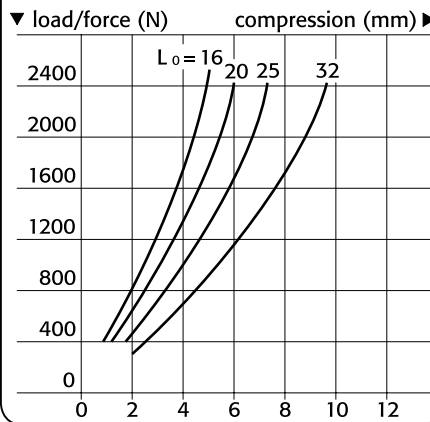
246.



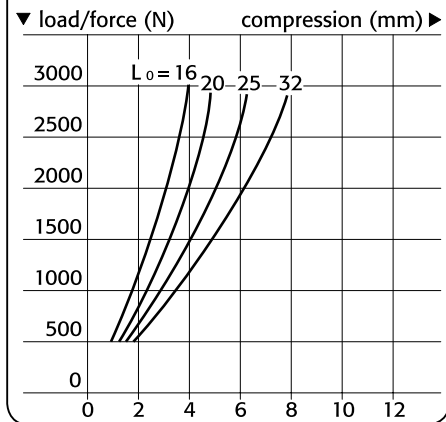
**246.5.020.**  
 Ø 20/80 Shore A



**246.6.020.**  
 Ø 20/90 Shore A



**246.7.020.**  
 Ø 20/95 Shore A



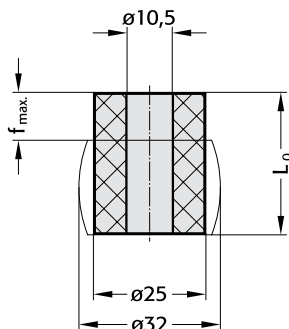
**246.**

Order No		F max. in N	L <sub>0</sub>	f max.
246.5.020. 016	80 Shore A	1530	16	5,6
020	green	1510	20	7
025		1500	25	8,7
032		1490	32	10,6
246.6.020. 016	90 Shore A	2600	16	4,8
020	yellow	2550	20	6
025		2530	25	7,5
032		2500	32	9,6
246.7.020. 016	95 Shore A	3050	16	4
020	red	3000	20	5
025		2980	25	6,2
032		2950	32	8

Accessories	Order No	see spring accessories page F62.
Stacking Washer	2441.3.020	
Stacking Washer	244.4.020	
Guide Pins	244.5.08. 025	
	032	
	040	
	050	



246.



**FIBROFLEX® Spring Elements are made from highly elastic polyurethane elastomers.**

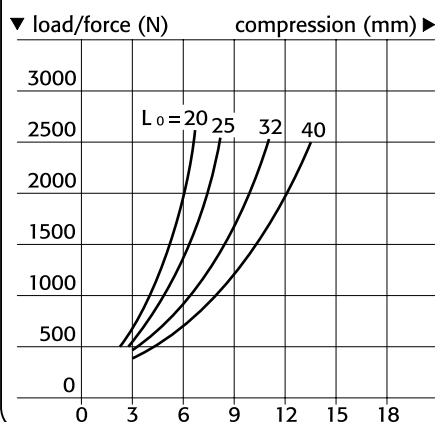
Shore hardness is the most significant rating of the various FIBROFLEX® Elements. Shore hardness ratings are symbolized by distinctive colour coding.

Correct selection of Shore hardness has a fundamental bearing on the success of FIBROFLEX®-applications.

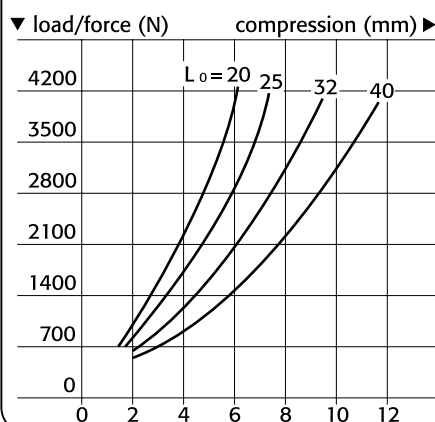
Because of their physical properties, polyurethane elastomers exhibit a certain tendency towards initial sagging.

Depending on such factors as internal working temperature, frequency and number of load changes etc., sagging may amount to 4–7 % of the original spring length.

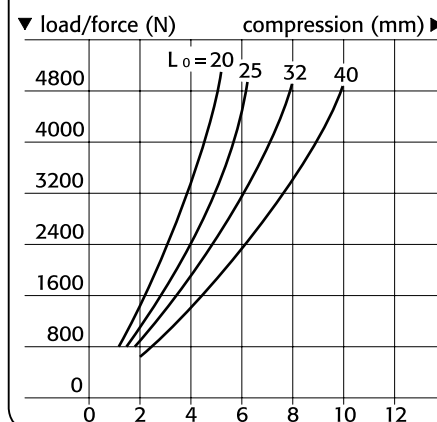
**246.5.025.**  
∅ 25/80 Shore A



**246.6.025.**  
∅ 25/90 Shore A



**246.7.025.**  
∅ 25/95 Shore A



**246.**

Order No		F max. in N	L <sub>0</sub>	f max.
246.5.025.020	80 Shore A	2600	20	7
025	green	2550	25	8,7
032		2520	32	10,6
040		2500	40	14
246.6.025.020	90 Shore A	4300	20	6
025	yellow	4200	25	7,5
032		4150	32	9,6
040		4120	40	12
246.7.025.020	95 Shore A	5100	20	5
025	red	5080	25	6,2
032		5020	32	8
040		5000	40	10

Accessories	Order No	see Spring Accessories page F62.
Stacking Washer	2441.3.025	
Stacking Washer	244.4.025	
Guide Pins	244.5.10.032	
	040	
	050	
	063	



# FIBRO

246.

# FIBROFLEX® Tubular Spring Elements DIN ISO 10069-1

FIBROFLEX® Spring Elements are made from highly elastic polyurethane elastomers.

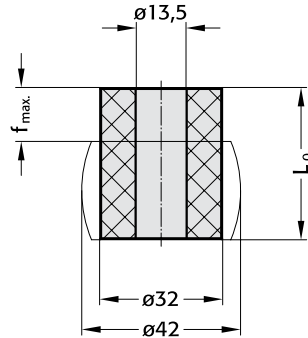
Shore hardness is the most significant rating of the various FIBROFLEX® Elements. Shore hardness ratings are symbolized by distinctive colour coding.

Correct selection of Shore hardness has a fundamental bearing on the success of FIBROFLEX®-applications.

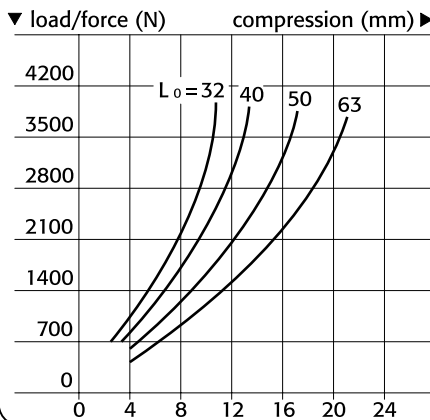
Because of their physical properties, polyurethane elastomers exhibit a certain tendency towards initial sagging.

Depending on such factors as internal working temperature, frequency and number of load changes etc., sagging may amount to 4–7 % of the original spring length.

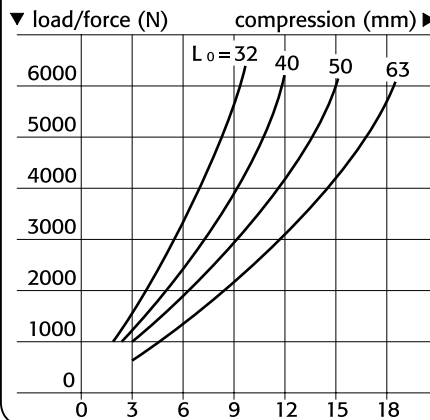
246.



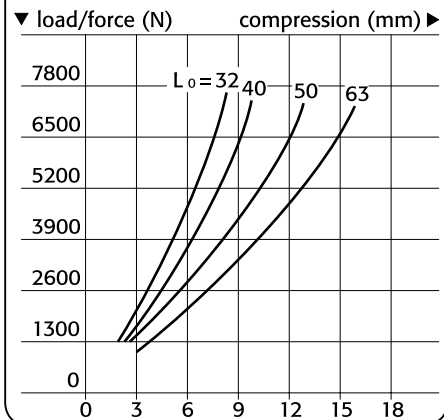
246.5.032.  
∅ 32/80 Shore A



246.6.032.  
∅ 32/90 Shore A



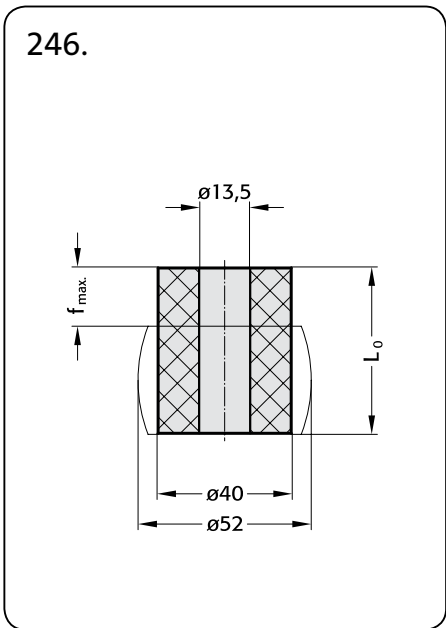
246.7.032.  
∅ 32/95 Shore A



246.

Order No		F max. in N	L <sub>0</sub>	f max.
246.5.032.032	80 Shore A	3900	32	10,6
040	green	3850	40	14
050		3820	50	17,5
063		3800	63	22
246.6.032.032	90 Shore A	6400	32	9,6
040	yellow	6350	40	12
050		6300	50	15
063		6250	63	18,9
246.7.032.032	95 Shore A	7600	32	8
040	red	7500	40	10
050		7480	50	12
063		7450	63	15,7

Accessories	Order No	see Spring Accessories page F62.
Stacking Washer	2441.3.032	
Stacking Washer	244.4.032	
Guide Pins	244.5.13.040	
	050	
	063	
	080	
	095	



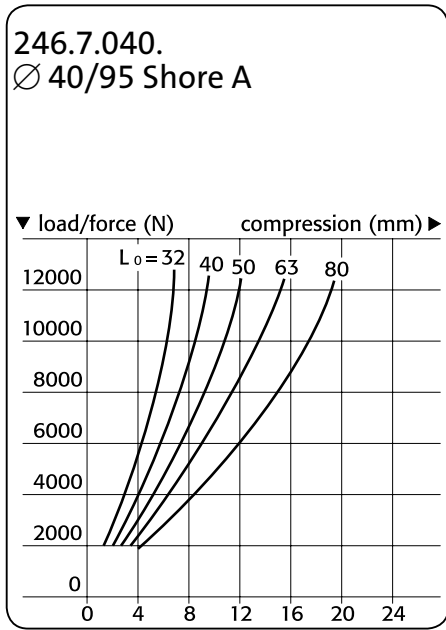
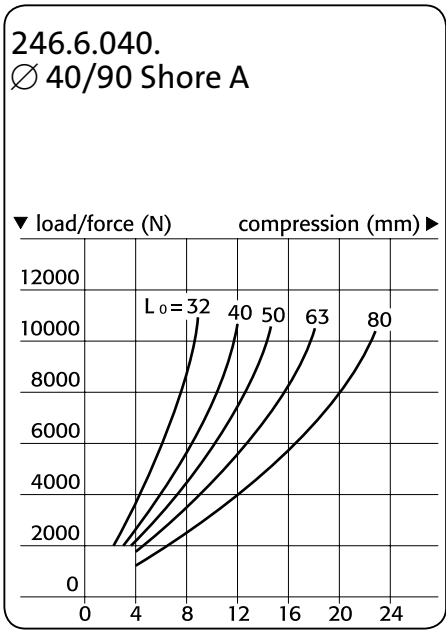
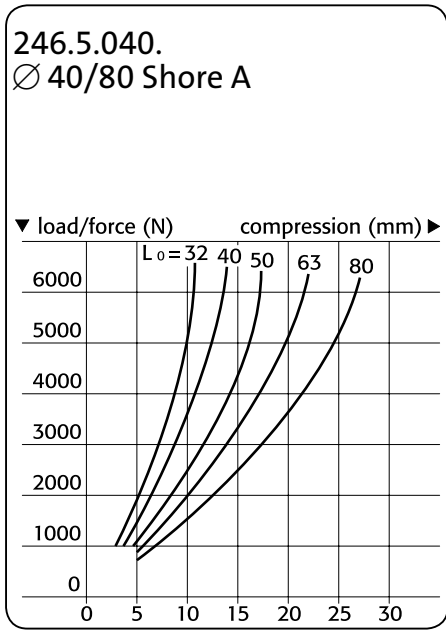
**FIBROFLEX® Spring Elements are made from highly elastic polyurethane elastomers.**

Shore hardness is the most significant rating of the various FIBROFLEX® Elements. Shore hardness ratings are symbolized by distinctive colour coding.

Correct selection of Shore hardness has a fundamental bearing on the success of FIBROFLEX®-applications.

Because of their physical properties, polyurethane elastomers exhibit a certain tendency towards initial sagging.

Depending on such factors as internal working temperature, frequency and number of load changes etc., sagging may amount to 4–7 % of the original spring length.



**246.**

Order No		F max. in N	L <sub>0</sub>	f max.
246.5.040.032	80 Shore A	6700	32	10,6
040	green	6600	40	14
050		6550	50	17,5
063		6500	63	22
080		6480	80	28
246.6.040.032	90 Shore A	11000	32	9,6
040	yellow	10900	40	12
050		10800	50	15
063		10750	63	18,9
080		10700	80	24
246.7.040.032	95 Shore A	13000	32	8
040	red	12700	40	10
050		12500	50	12,5
063		12450	63	15,7
080		12430	80	20

Accessories	Order No	see Spring Accessories page F62.
Stacking Washer	2441.3.040	
Stacking Washer	244.4.040	
Guide Pins	244.5.13.040	
	050	
	063	
	080	
	095	

246.

**FIBROFLEX® Spring Elements are made from highly elastic polyurethane elastomers.**

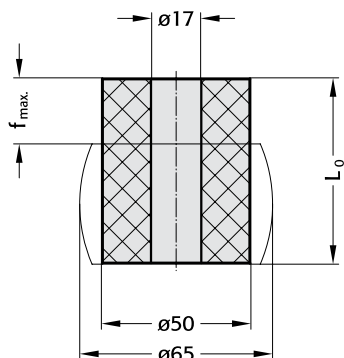
Shore hardness is the most significant rating of the various FIBROFLEX® Elements. Shore hardness ratings are symbolized by distinctive colour coding.

Correct selection of Shore hardness has a fundamental bearing on the success of FIBROFLEX®-applications.

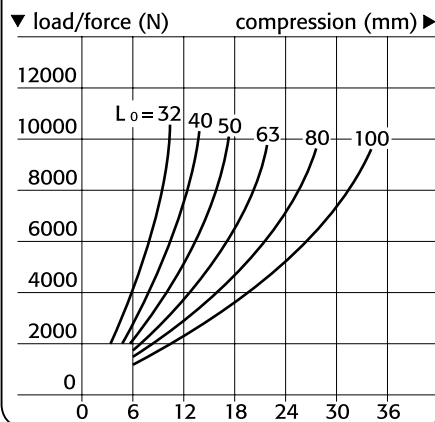
Because of their physical properties, polyurethane elastomers exhibit a certain tendency towards initial sagging.

Depending on such factors as internal working temperature, frequency and number of load changes etc., sagging may amount to 4–7% of the original spring length.

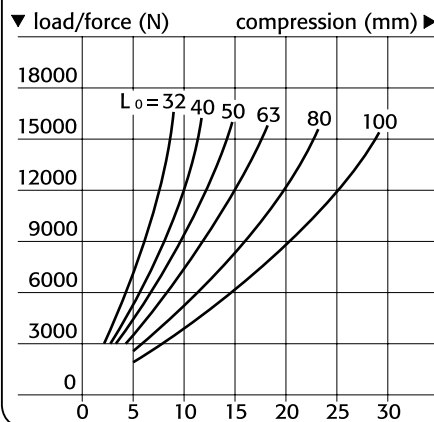
246.



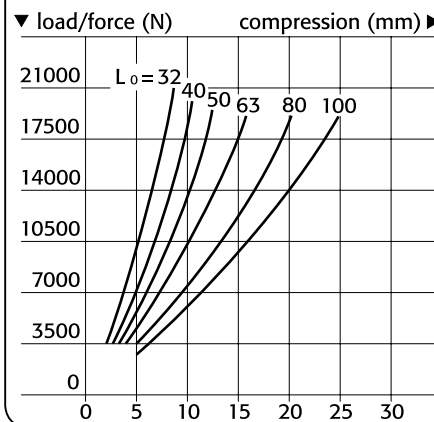
**246.5.050.**  
∅ 50/80 Shore A



**246.6.050.**  
∅ 50/90 Shore A



**246.7.050.**  
∅ 50/95 Shore A



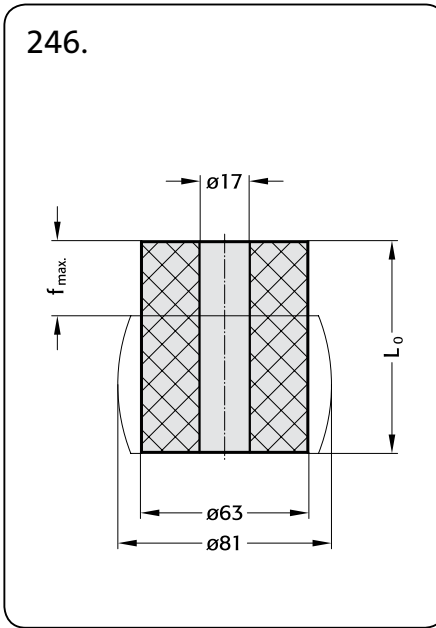
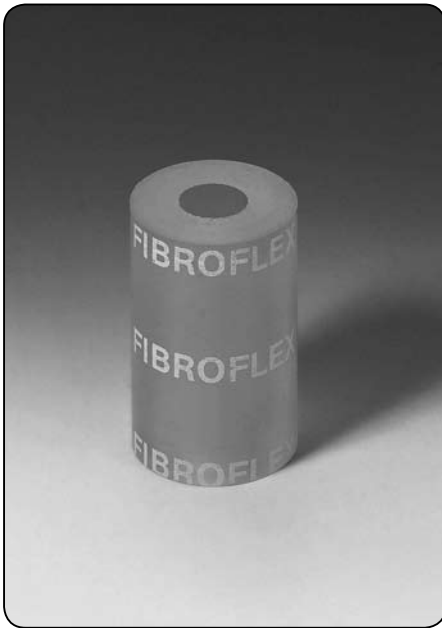
**246.**

Order No		F max. in N	L <sub>0</sub>	f max.
246.5.050. 032	80 Shore A	10800	32	10,6
040	green	10400	40	14
050		10200	50	17,5
063		10000	63	22
080		9950	80	28
100		9900	100	35
246.6.050. 032	90 Shore A	17400	32	9,6
040	yellow	17300	40	12
050		17000	50	15
063		16650	63	18,9
080		16500	80	24
100		16400	100	30
246.7.050. 032	95 Shore A	21000	32	8
040	red	20100	40	10
050		19600	50	12,5
063		19200	63	15,7
080		19100	80	20
100		19050	100	25

Accessories	Order No	see Spring Accessories page F62.
Stacking Washer	2441.3.050	
Stacking Washer	244.4.050	
Guide Pins	244.5.16. 063	
	080	
	095	
	118	
	140	

FIBROFLEX®  
Tubular Spring Elements

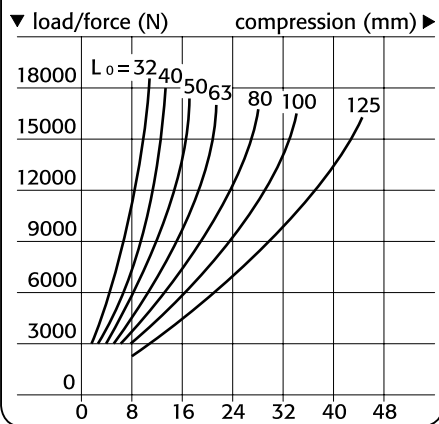
246.



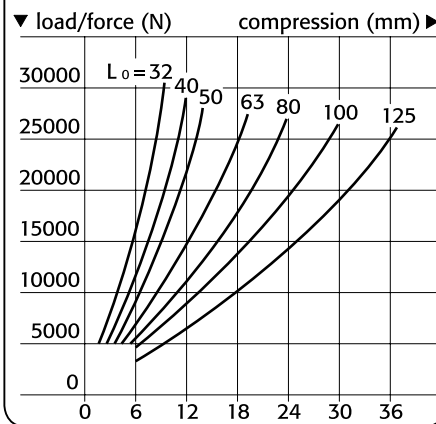
FIBROFLEX® Spring Elements are made from highly elastic polyurethane elastomers

Shore hardness is the most significant rating of the various FIBROFLEX® Elements. Shore hardness ratings are symbolized by distinctive colour coding. Correct selection of Shore hardness has a fundamental bearing on the success of FIBROFLEX®-applications. Because of their physical properties, polyurethane elastomers exhibit a certain tendency towards initial sagging. Depending on such factors as internal working temperature, frequency and number of load changes etc., sagging may amount to 4–7 % of the original spring length.

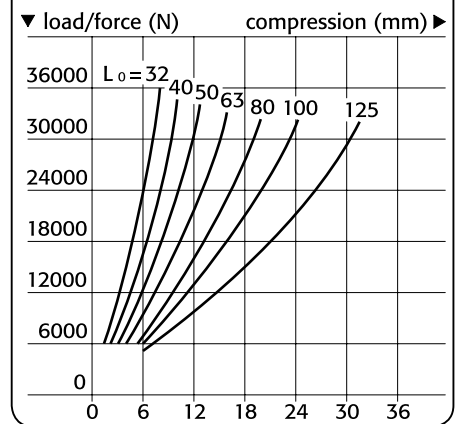
246.5.063.  
Ø 63/80 Shore A



246.6.063.  
Ø 63/90 Shore A



246.7.063.  
Ø 63/95 Shore A



246.

Order No		F max. in N	L <sub>0</sub>	f max.
246.5.063.032	80 Shore A	18650	32	11,2
	040 green	18000	40	14
	050	17500	50	17,5
	063	17000	63	22
	080	16500	80	28
	100	16200	100	35
	125	16000	125	43,7
246.6.063.032	90 Shore A	30100	32	9,6
	040 yellow	29500	40	12
	050	28900	50	15
	063	28000	63	18,9
	080	27500	80	24
	100	27300	100	30
	125	26800	125	37,5

Order No		F max. in N	L <sub>0</sub>	f max.
246.7.063.032	95 Shore A	37000	32	8
	040 red	35900	40	10
	050	34000	50	12,5
	063	33000	63	15,7
	080	32000	80	20
	100	31800	100	25
	125	31600	125	31,2

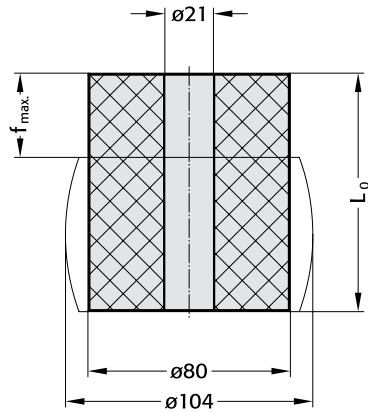
Accessories	Order No	see Spring Accessories page F62.
Stacking Washer	2441.3.063	
Stacking Washer	244.4.063	
Guide Pins	244.5.16.063	
	080	
	095	
	118	
	140	

246.

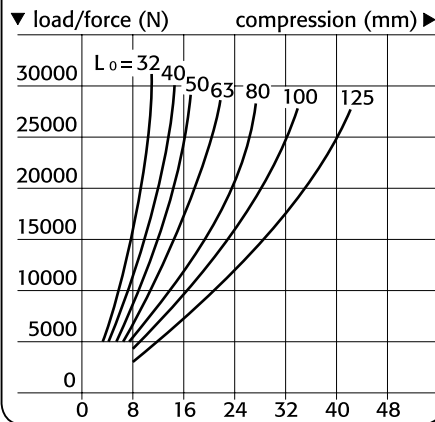
**FIBROFLEX® Spring Elements are made from highly elastic polyurethane elastomers**

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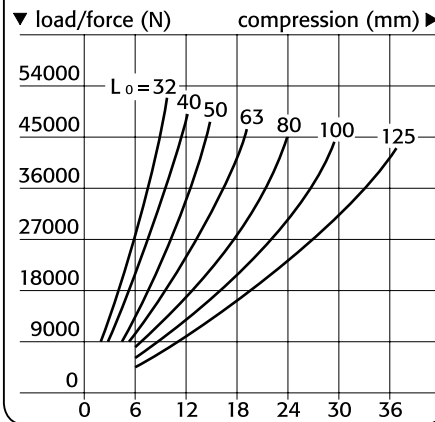
246.



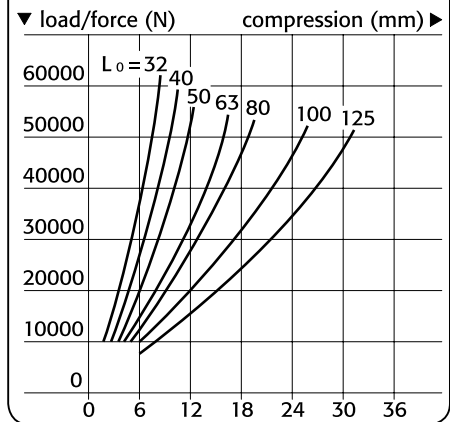
**246.5.080.**  
**Ø 80/80 Shore A**



**246.6.080.**  
**Ø 80/90 Shore A**



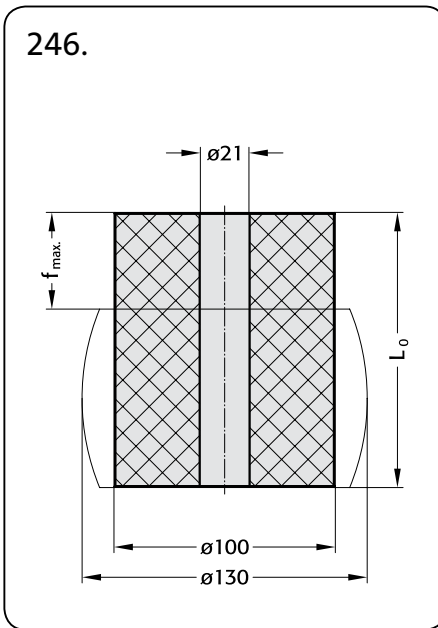
**246.7.080.**  
**Ø 80/95 Shore A**



246.

Order No		F max. in N	L <sub>0</sub>	f max.
246.5.080.032	80 Shore A	31500	32	11,2
040	green	30100	40	14
050		29900	50	17,5
063		28800	63	22
080		28300	80	28
100		28100	100	35
125		28000	125	43,7
246.6.080.032	90 Shore A	53000	32	9,6
040	yellow	50500	40	12
050		48000	50	15
063		46500	63	18,9
080		45500	80	24
100		44900	100	30
125		44000	125	37,5

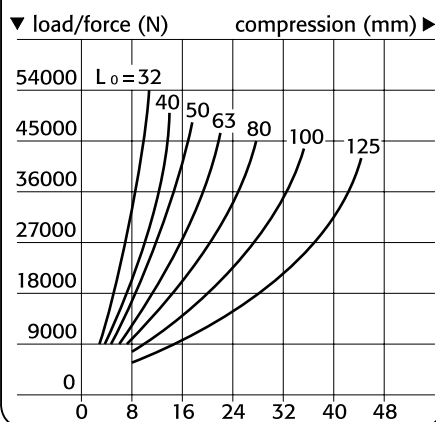
Order No		F max. in N	L <sub>0</sub>	f max.
246.7.080.032	95 Shore A	62500	32	8
040	red	59000	40	10
050		58000	50	12,5
063		55000	63	15,7
080		54000	80	20
100		53000	100	25
125		52000	125	31,2
Accessories	Order No	see Spring Accessories. page F62		
Stacking Washer	2441.3.080			
Stacking Washer	244.4.080			
Guide Pins	244.5.20.095			
	118			
	140			



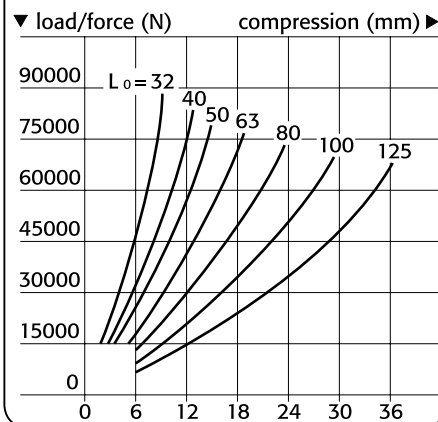
**FIBROFLEX® Spring Elements are made from highly elastic polyurethane elastomers**

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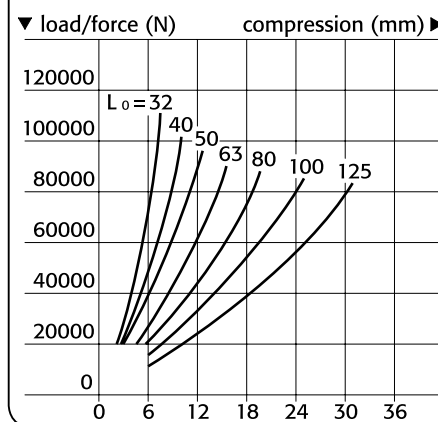
**246.5.100.**  
**∅ 100/80 Shore A**



**246.6.100.**  
**∅ 100/90 Shore A**



**246.7.100.**  
**∅ 100/95 Shore A**



**246.**

Order No		F max. in N	L <sub>0</sub>	f max.
246.5.100.032	80 Shore A	56000	32	10,6
040	green	52000	40	14
050		50000	50	17,5
063		47500	63	22
080		45000	80	28
100		43300	100	35
125		41500	125	43,7
246.6.100.032	90 Shore A	90000	32	9,6
040	yellow	84800	40	12
050		81000	50	15
063		78000	63	18,9
080		75000	80	24
100		73000	100	30
125		71000	125	37,5

Order No		F max in N	L <sub>0</sub>	f max
246.7.100.032	95 Shore A	110000	32	8
040	red	102500	40	10
050		95000	50	12,5
063		92000	63	15,7
080		89000	80	20
100		87000	100	25
125		86000	125	31,2

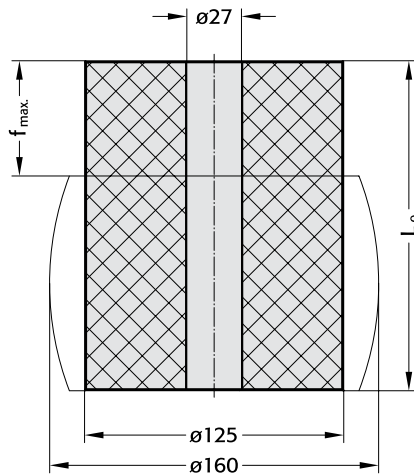
Accessories	Order No	see Spring Accessories page F62.
Stacking Washer	2441.3.100	
Stacking Washer	244.4.100	
Guide Pins	244.5.20.095	
	118	
	140	

246.

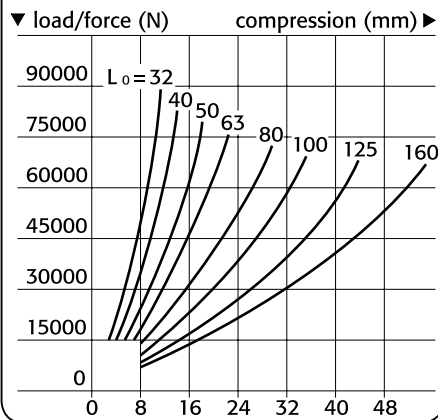
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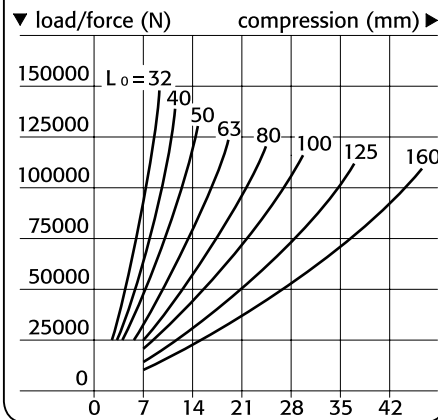
246.



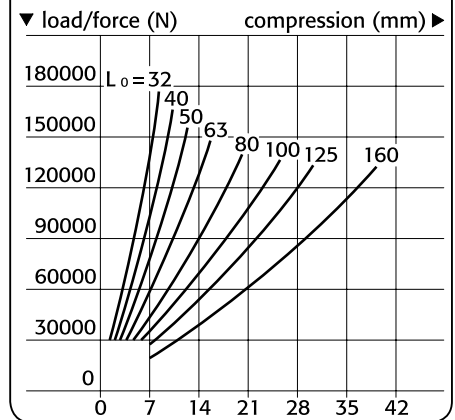
**246.5.125.**  
**Ø 125/80 Shore A**



**246.6.125.**  
**Ø 125/90 Shore A**



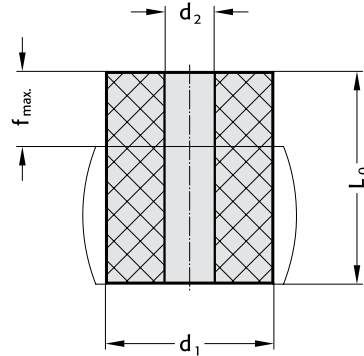
**246.7.125.**  
**Ø 125/95 Shore A**



246.

Order No		F max. N	L <sub>0</sub>	f max.
246.5.125.032	80 Shore A	92000	32	10,6
040	green	85000	40	14
050		80000	50	17,5
063		75000	63	22
080		71000	80	28
100		70500	100	35
125		70000	125	43,7
160		68000	160	56
246.6.125.032	90 Shore A	150000	32	9,6
040	yellow	142500	40	12
050		132000	50	15
063		125000	63	18,9
080		118000	80	24
100		115000	100	30
125		113000	125	37,5
160		111300	160	48

Order No		F max. N	L <sub>0</sub>	f max.
246.7.125.032	95 Shore A	178000	32	8
040	red	168000	40	10
050		157000	50	12,5
063		150000	63	15,7
080		142000	80	20
100		135000	100	25
125		133000	125	31,2
160		130000	160	40
Accessories	Order No	see Spring Accessories. page F62		
Stacking Washer	2441.3.125			
Stacking Washer	244.4.125			
Guide Pins	244.5.25.140			
	180			

**FIBROELAST® Tubular Spring Elements****2461.4.****2461.4.****Material:**Polyester-based polyurethane  
Shore hardness A 70

Colour: white

**Note:**

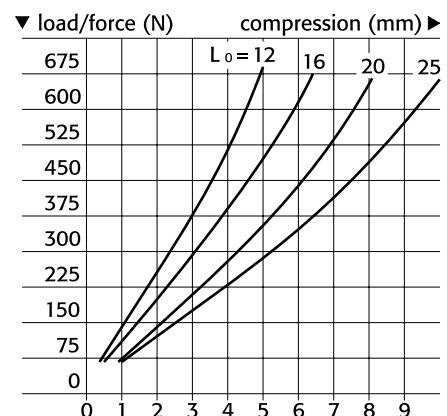
The physical properties of polyurethane elastomers means that they have a tendency to settle. The extent of such settlement is dependent on the internal heat of friction, speed and number of load changes, the spring travel and the Shore hardness.

Settlement may be as much as 4 to 7% of the spring length  $L_0$

**2461.4.**

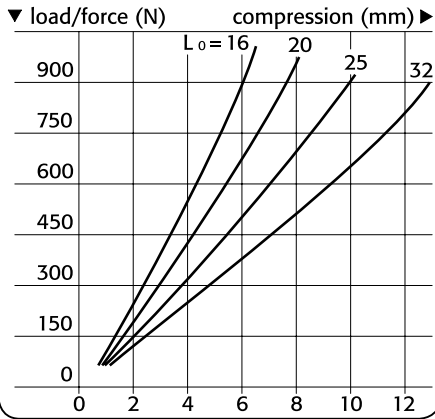
Order No	$L_0$	$d_1$	$d_2$	$f_{max.}$
2461.4.016.012	12	16	6,5	4,8
016	16			6,4
020	20			8,0
025	25			10,0
2461.4.020.016	16	20	8,5	6,4
020	20			8,0
025	25			10,0
032	32			12,8
2461.4.025.020	20	25	10,5	8,0
025	25			10,0
032	32			12,8
040	40			16,0
2461.4.032.032	32	32	13,5	12,8
040	40			16,0
050	50			20,0
063	63			25,2
2461.4.040.032	32	40	13,5	12,8
040	40			16,0
050	50			20,0
063	63			25,2
080	80			32,0
2461.4.050.032	32	50	17	12,8
040	40			16,0
050	50			20,0
063	63			25,2
080	80			32,0
100	100			40,0
2461.4.063.032	32	63	17	12,8
040	40			16,0
050	50			20,0
063	63			25,2
080	80			32,0
100	100			40,0
125	125			50,0
2461.4.080.032	32	80	21	12,8
040	40			16,0
050	50			20,0
063	63			25,2
080	80			32,0
100	100			40,0
125	125			50,0
2461.4.100.032	32	100	21	12,8
040	40			16,0
050	50			20,0
063	63			25,2
080	80			32,0
100	100			40,0
125	125			50,0

Order No	$L_0$	$d_1$	$d_2$	$f_{max.}$
2461.4.125.032	32	125	27	12,8
040	40			16,0
050	50			20,0
063	63			25,2
080	80			32,0
100	100			40,0
125	125			50,0
160	160			64,0

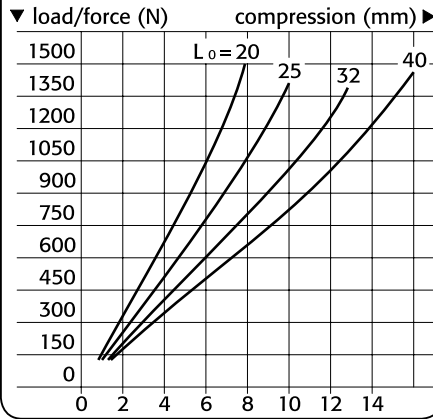
**2461.4.016.** $\varnothing 16$ 



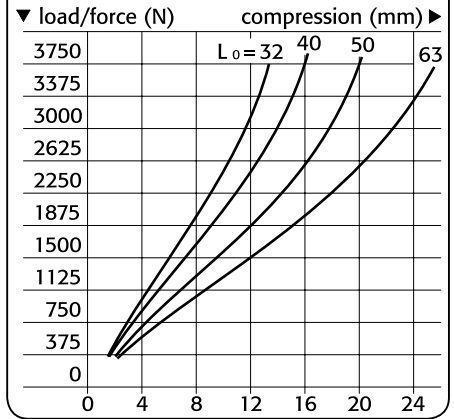
2461.4.020.  
Ø20



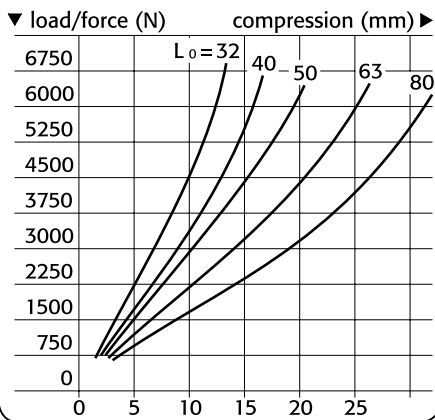
2461.4.025.  
Ø25



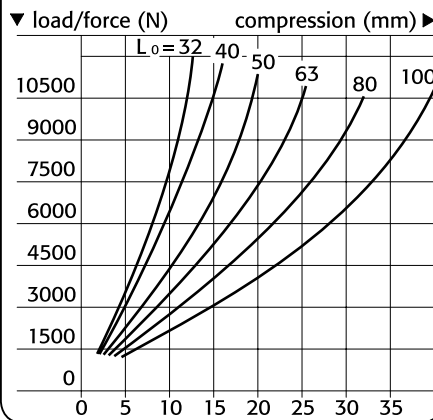
2461.4.032.  
Ø32



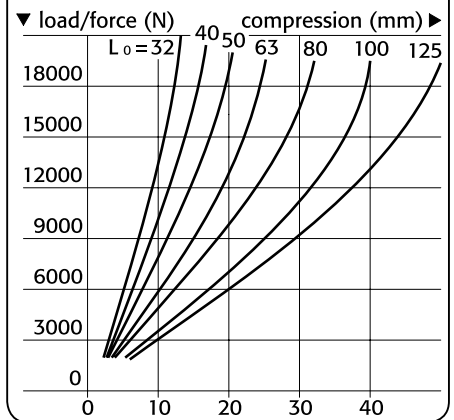
2461.4.040.  
Ø40



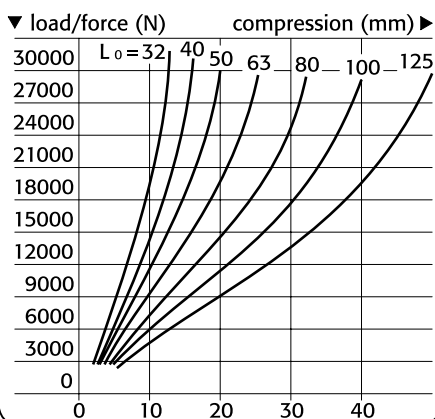
2461.4.050.  
Ø50



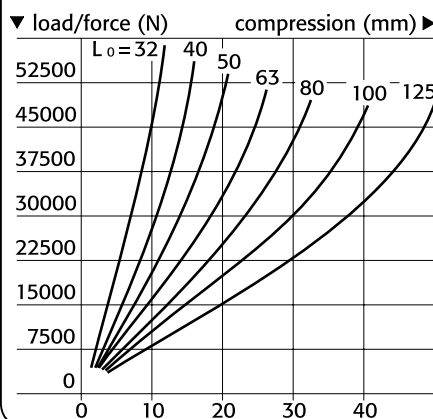
2461.4.063.  
Ø63



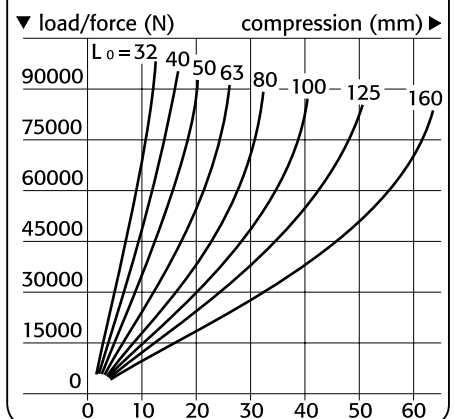
2461.4.080.  
Ø80



2461.4.100.  
Ø100

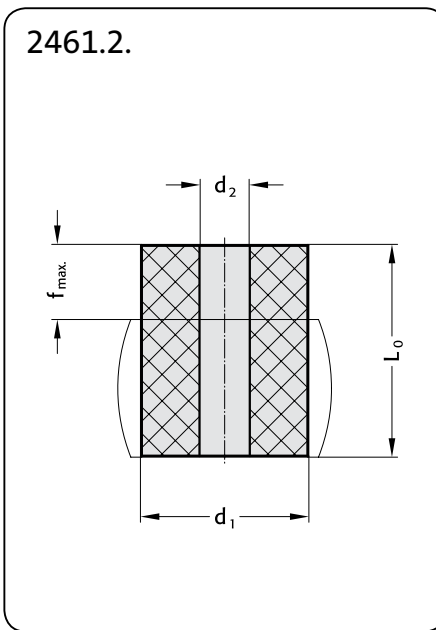
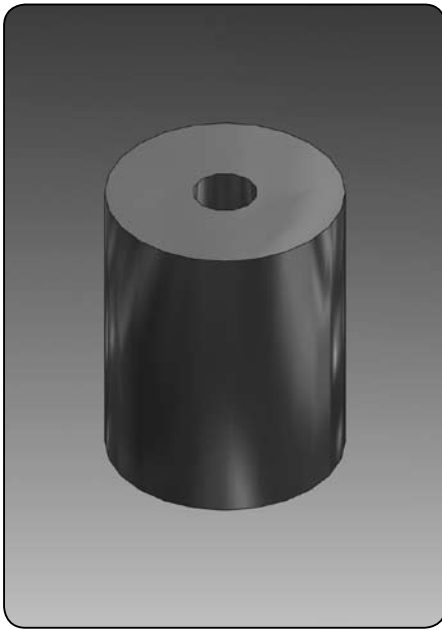


2461.4.125.  
Ø125



Tubular Spring Elements, Rubber

2461.2.



**Material:**

Chloroprene rubber  
70 shore A  
colour: black

**Note:**

Due to their physical characteristics, elastomere springs tend to settle.

This process is dependent on internal friction heat, the speed and number of load changes, and shore hardness.

It can amount to 3-5 % of spring length  $L_0$ .

**Physical characteristics:**

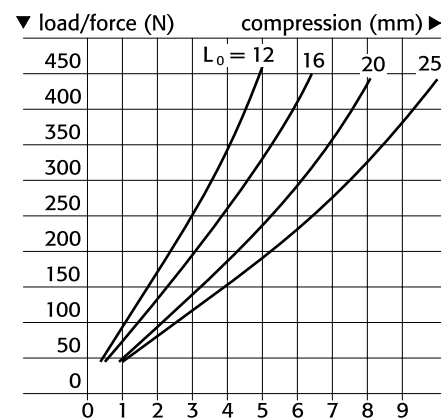
Tensile strength according to DIN 53504  $\geq 12 \text{ N/mm}^2$   
 elongation at break (DIN 53504)  $\geq 250 \%$   
 Bulk density (DIN 53479)  $1.37 \text{ g/cm}^3$   
 Compression set (DIN 53517)  $\leq 20 \%$  (24 h/70 °C)  
 Temperature scope:  $-20 \text{ °C}$  to  $80 \text{ °C}$  short-term to max.  $120 \text{ °C}$

2461.2.

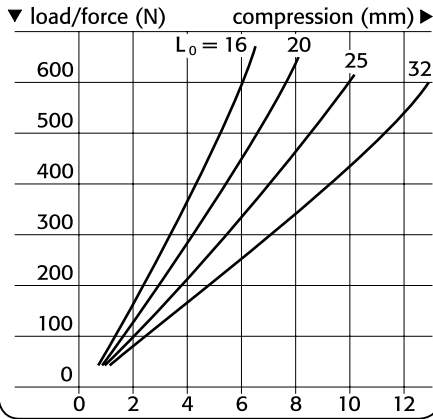
Order No	$L_0$	$d_1$	$d_2$	$f_{max.}$
2461.2.016.012	12	16	6.5	4.8
2461.2.016.016	16	16	6.5	6.4
2461.2.016.020	20	16	6.5	8.0
2461.2.016.025	25	16	6.5	10.0
2461.2.020.016	16	20	8.5	6.4
2461.2.020.020	20	20	8.5	8.0
2461.2.020.025	25	20	8.5	10.0
2461.2.020.032	32	20	8.5	12.8
2461.2.025.020	20	25	10.5	8.0
2461.2.025.025	25	25	10.5	10.0
2461.2.025.032	32	25	10.5	12.8
2461.2.025.040	40	25	10.5	16.0
2461.2.032.032	32	32	13.5	12.8
2461.2.032.040	40	32	13.5	16.0
2461.2.032.050	50	32	13.5	20.0
2461.2.032.063	63	32	13.5	25.2
2461.2.040.032	32	40	13.5	12.8
2461.2.040.040	40	40	13.5	16.0
2461.2.040.050	50	40	13.5	20.0
2461.2.040.063	63	40	13.5	25.2
2461.2.040.080	80	40	13.5	32.0
2461.2.050.032	32	50	17	12.8
2461.2.050.040	40	50	17	16.0
2461.2.050.050	50	50	17	20.0
2461.2.050.063	63	50	17	25.2
2461.2.050.080	80	50	17	32.0
2461.2.050.100	100	50	17	40.0
2461.2.063.032	32	63	17	12.8
2461.2.063.040	40	63	17	16.0
2461.2.063.050	50	63	17	20.0
2461.2.063.063	63	63	17	25.2
2461.2.063.080	80	63	17	32.0
2461.2.063.100	100	63	17	40.0
2461.2.063.125	125	63	17	50.0
2461.2.080.032	32	80	21	12.8
2461.2.080.040	40	80	21	16.0
2461.2.080.050	50	80	21	20.0
2461.2.080.063	63	80	21	25.2
2461.2.080.080	80	80	21	32.0
2461.2.080.100	100	80	21	40.0
2461.2.080.125	125	80	21	50.0

Order No	$L_0$	$d_1$	$d_2$	$f_{max.}$
2461.2.100.032	32	100	21	12.8
2461.2.100.040	40	100	21	16.0
2461.2.100.050	50	100	21	20.0
2461.2.100.063	63	100	21	25.2
2461.2.100.080	80	100	21	32.0
2461.2.100.100	100	100	21	40.0
2461.2.100.125	125	100	21	50.0
2461.2.125.032	32	125	27	12.8
2461.2.125.040	40	125	27	16.0
2461.2.125.050	50	125	27	20.0
2461.2.125.063	63	125	27	25.2
2461.2.125.080	80	125	27	32.0
2461.2.125.100	100	125	27	40.0
2461.2.125.125	125	125	27	50.0
2461.2.125.160	160	125	27	64.0

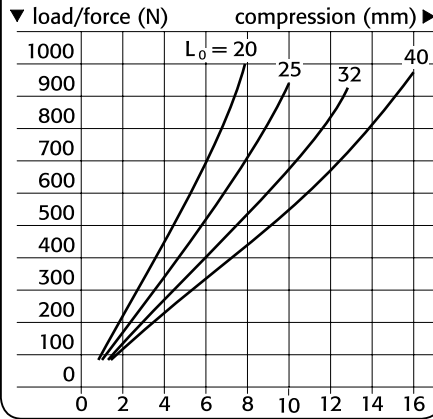
2461.2.016.  
Ø16



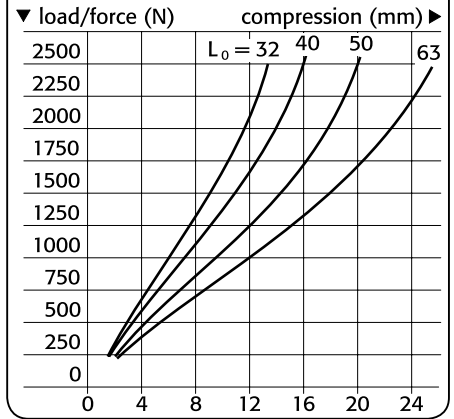
2461.2.020.  
Ø20



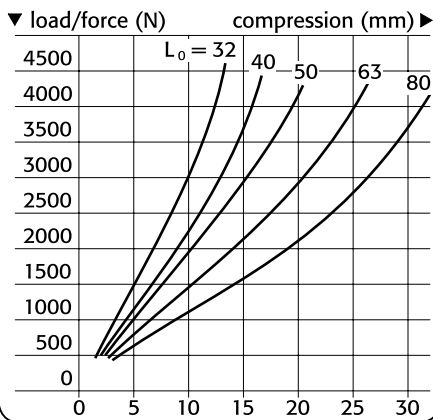
2461.2.025.  
Ø25



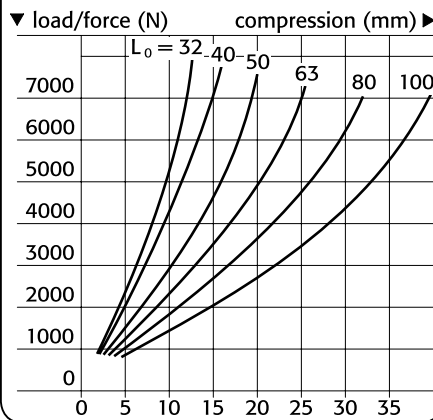
2461.2.032.  
Ø32



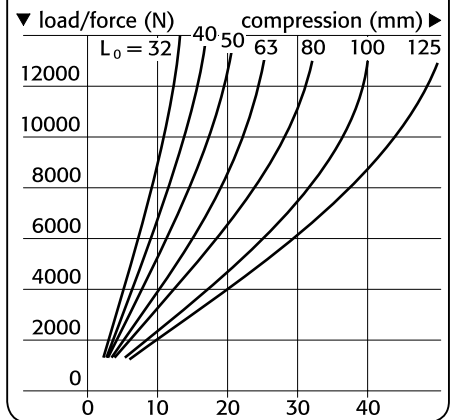
2461.2.040.  
Ø40



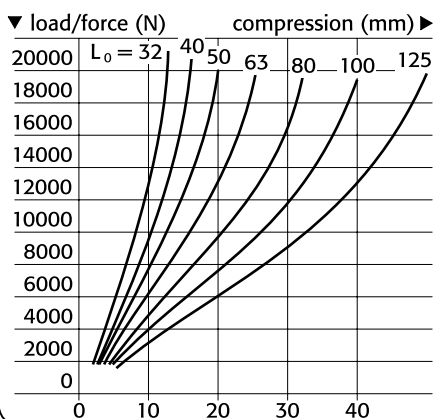
2461.2.050.  
Ø50



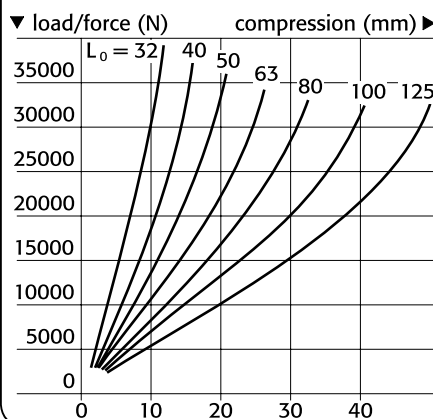
2461.2.063.  
Ø63



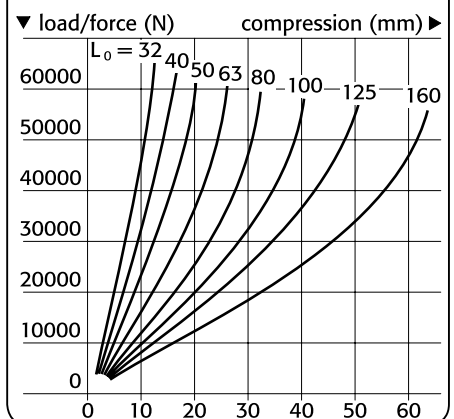
2461.2.080.  
Ø80



2461.2.100.  
Ø100



2461.2.125.  
Ø125



# Stacking Washers, DIN ISO 10069-2

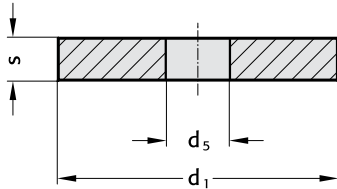
## Stacking Washers

### Guide Pins

**FIBRO**

2441.3. 244.4.  
244.5.

2441.3.



### 2441.3. Stacking Washers, DIN ISO 10069-2

Material: Brass

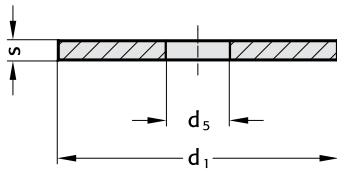
Spring Element

∅	16	20	25	32	40	50	63	80	100	125
d <sub>1</sub>	20	25	32	40	50	60	80	100	120	150
d <sub>5</sub>	6,5	8,5	10,5	13,5	13,5	16,5	16,5	20,5	20,5	26
s	4	4	5	5	5	6	6	8	8	8

#### Ordering Code (example):

Stacking Washer = 2441.3.  
Spring Element = ∅ 40 mm = 040  
Order No = 2441.3.040

244.4.



### 244.4. Stacking Washers

Material: St 37

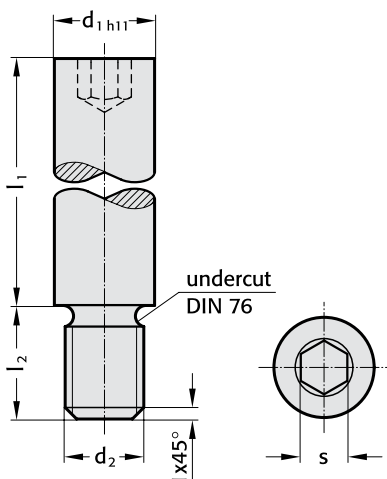
Spring Element

∅	16	20	25	32	40	50	63	80	100	125
d <sub>1</sub>	20	25	32	40	50	60	80	100	120	150
d <sub>5</sub>	6,5	8,5	10,5	13,5	13,5	16,5	16,5	20,5	20,5	26
s	1	1,5	2	2,5	2,5	3	3	4	4	5

#### Ordering Code (example):

Stacking Washer = 244.4.  
Spring Element = ∅ 20 mm = 020  
Order No = 244.4.020

244.5.



### 244.5. Guide Pins Material: C 15

d <sub>1</sub>	6	8	10	13	16	20	25
d <sub>2</sub>	M4	M6	M8	M10	M12	M16	M20
l <sub>2</sub>	6	9	15	15	18	25	30
s	3	4	5	6	8	10	14
l <sub>1</sub>	20	●	●	●			
	25	●	●	●			
	32	●	●	●			
	40	●	●	●	●		
	50		●	●	●	●	●
	63		●	●	●	●	●
	80			●	●	●	●
	95			●	●	●	●
	118				●	●	●
	140				●	●	●
	180				●	●	●

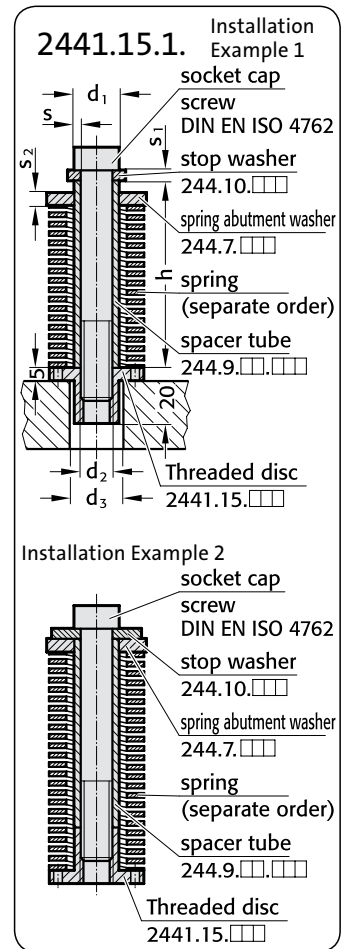
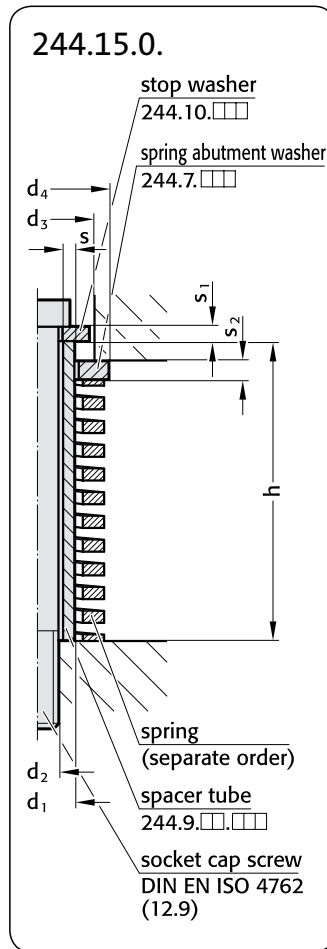
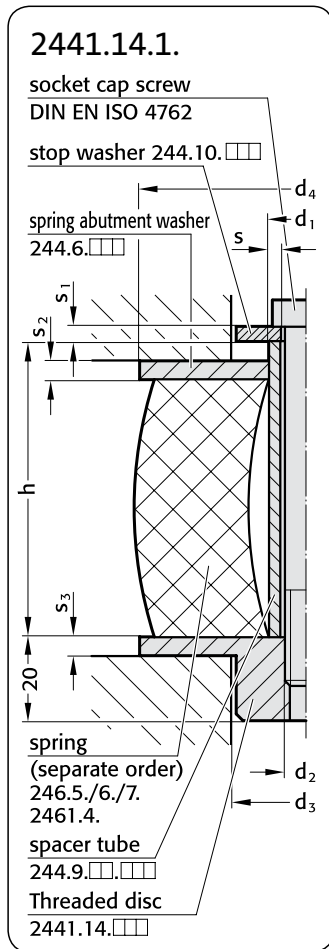
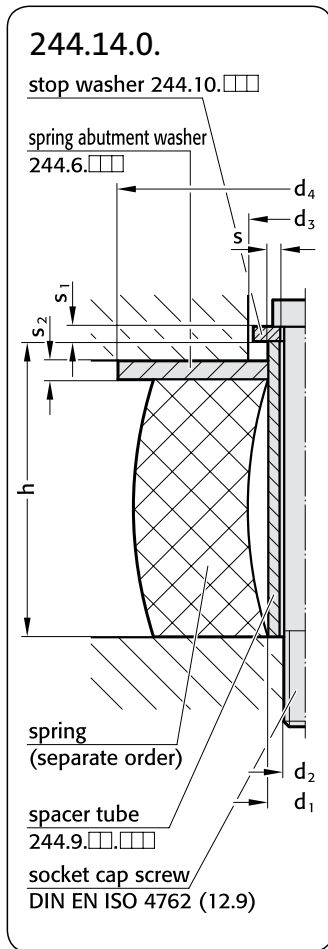
#### Ordering Code (example):

Guide Pins = 244.5.  
d<sub>1</sub> = 16 mm = 16.  
l<sub>1</sub> = 80 mm = 080  
Order No = 244.5.16.080

# FIBRO

244.14.0. 2441.14.1.  
244.15.0. 2441.15.1.

## Spring Units



### 244.14.0.

spring dia.	$d_1 \times s$	h	$d_2$	$d_3$	$d_4$	$s_1$	$s_2$
25	10 × 1,8	see selection chart 244.9. page F65 and Spring Data	M 6	18	32	3	4
32	12 × 1,8		M 8		40		5
40				30	50	4	
50	16 × 2,5		M 10		60		6
63					80		8
80	20 × 3,5		M 12		100		10
100					120		12
125	25 × 4,5	M 16	39	150	6	15	

### Ordering Code (example):

Spring Unit (FIBROFLEX-Spring)	=	244.14.
not loaded	=	0.
for spring dia. = 40 mm	=	040.
spacer tube length h = 48 mm	=	048
Order No	=	244.14.0.040.048

### 244.15.0.

spring dia.	$d_1 \times s$	h	$d_2$	$d_3$	$d_4$	$s_1$	$s_2$
20	10 × 1,8	see selection chart 244.9. page F65 and Spring Data	M 6	18	25	3	4
25	12 × 1,8		M 8		38	4	5
32	16 × 2,5		M 10		50	6	6
40	20 × 3,5		M 12		65	8	8
50	25 × 4,0		M 16	39	80	10	10
63	35 × 6,0		M 20	52	100	12	12
					120	15	15

### Ordering Code (example):

Spring Unit (Steel comp. spring)	=	244.15.
not loaded	=	0.
for spring dia. = 40 mm	=	040.
spacer tube length h = 61 mm	=	061
Order No	=	244.15.0.040.061

### 2441.14.1.

spring dia	$d_1 \times s$	h	$d_2$	$d_3$	$d_4$	$s_1$	$s_2$	$s_3$
25	10 × 1,8	see selection chart 244.9. page F65 and Spring Data	M 6	20	32	3	4	5
32	12 × 1,8		M 8	20	40		5	
40				20	50	4		
50	16 × 2,5		M 10	22	60		6	6
63				22	80		8	8
80	20 × 3,5		M 12	28	100		10	10
100				28	120		12	12

### Ordering Code (example):

Spring Unit (FIBROFLEX-Spring)	=	244.14.
preloaded	=	1.
for spring dia. = 40 mm	=	040.
spacer tube length h = 48 mm	=	048
Order No	=	2441.4.1.040.048

### 2441.15.1.

spring dia.	$d_1 \times s$	h	$d_2$	$d_3$	$d_4$	$s_1$	$s_2$
20	10 × 1,8	see selection chart 244.9. page F65 and Spring Data	M 6	11	25	3	4
25	12 × 1,8		M 8	14	38	4	5
32	16 × 2,5		M 10	18	50	6	6
40	20 × 3,5		M 12	22	65	8	8
50	25 × 4,0		M 16	27	80	10	10
					100	12	12
					120	15	15

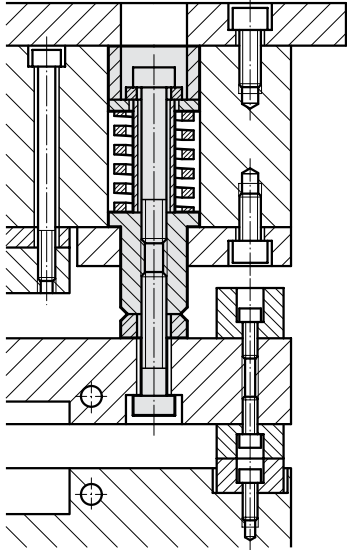
### Ordering Code (example):

Spring Unit (Steel comp. spring)	=	2441.15.
preloaded	=	1.
for spring dia. = 40 mm	=	040.
spacer tube length h = 48 mm	=	048
Order No	=	2441.15.1.040.048

# Combination Spring- and Spacer Units

244.20./25.  
244.32./40.

## Installation Example:



## Note:

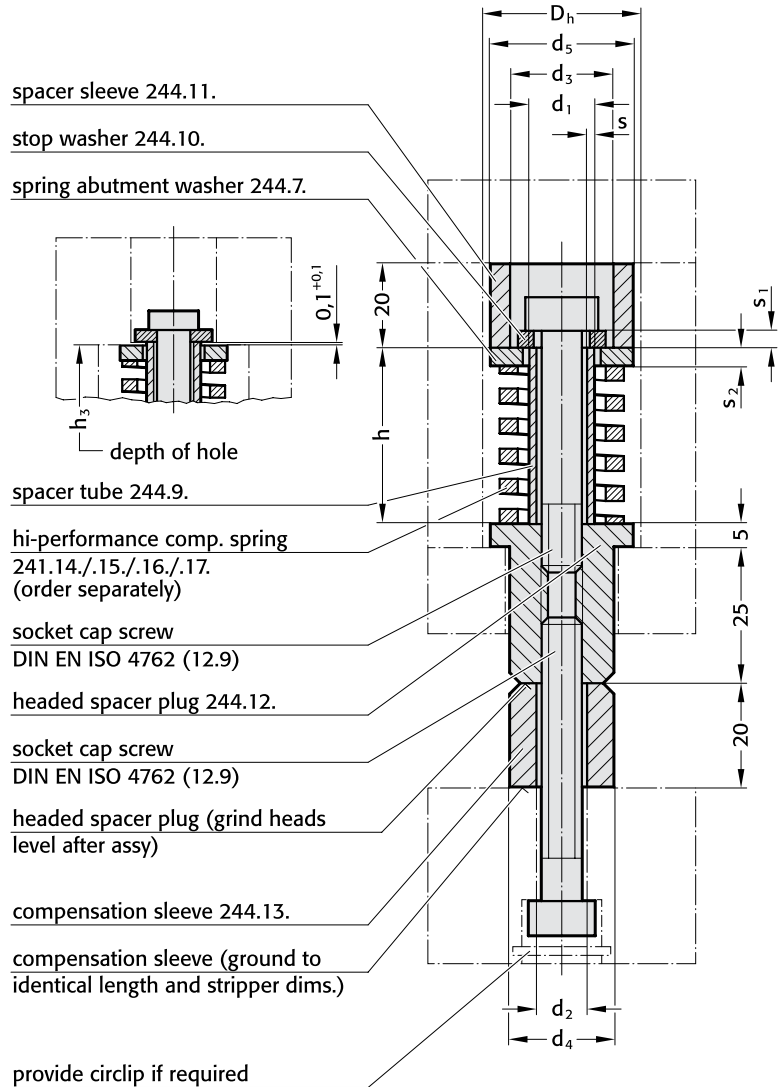
The headed spacer plugs are ground equal after assembly in the punch holder.  
Note that regrinding on punch points must be compensated by grinding an equal amount off the compensation sleeves.  
Adjust depth of c'bore  $h_3$  or height of spacer sleeve so that spacer tube cap screw is relieved by about 0,1 mm.

## 244. . .10

Application without Spacer Sleeve (c'bored hole)

## 244. . .11

Application with Spacer Sleeve (straight hole)



## 244.20./25./32./40.

spring dia.	socket cap screw $d_1 \times s$	h spacer tube length 244.9. on page F65	$d_2$	$d_3$	$d_4$	$d_5$	$D_h$	$s_1$	$d_2$
20	10 × 1,8	spring selection chart on pages F18-F33	M 6	18	20	25	26	3	4
25	12 × 1,8		M 8						
32	16 × 2,5		M 10	30	32	38	40	4	5
40	20 × 3,5		M 12						

## Ordering Code (example):

Spring + Spacer unit for spring dia. = 20 mm = 244.20.  
spacer tube length h = 38 mm with screw = 038.  
with spacer sleeve 244.11. = 11  
Order No = 244.20.038.11

# FIBRO

244.6. 244.7.  
244.9.

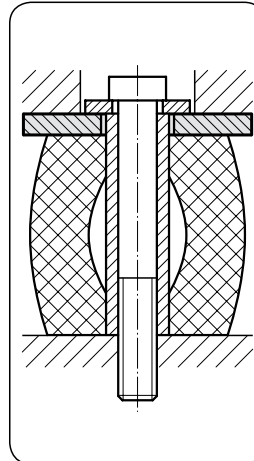
## Spring Accessories

### 244.6. Thrust Washer Material: St 37

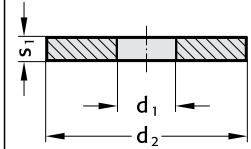
Spring $\varnothing$	25	32	40	50	63	80	100	125
$d_1$	10,5	13,5	13,5	16,5	16,5	20,5	20,5	26
$d_2$	32	40	50	60	80	100	120	150
$s_1$	4	5	5	6	8	10	12	15

#### Ordering Code (example):

Thrust washer for FIBROFLEX-springs = 244.6.  
Spring- $\varnothing$  = 25 mm = 025  
Order No = 244.6.025



244.6.

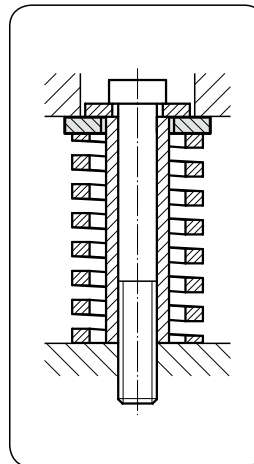


### 244.7. Thrust Washers Material: No 1.7131 case-hardened

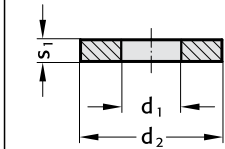
Spring $\varnothing$	20	25	32	40	50	63
$d_1$	10,5	12,5	16,5	20,5	25,5	35,5
$d_2$	25	25	38	38	50	65
$s_1$	4	4	5	5	6	8

#### Ordering Code (example):

Thrust washer for FIBROFLEX-springs = 244.7.  
Spring- $\varnothing$  = 25 mm = 025  
Order No = 244.7.025

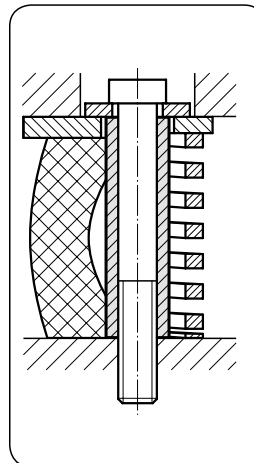


244.7.

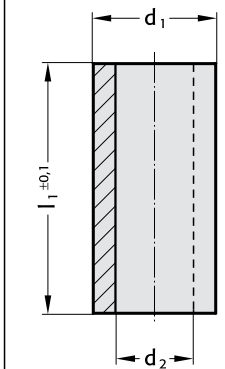


### 244.9. Spacer Tubes Material: St 35.4 case-hardened

$d_1$	10	12	13	16	19	20	25	30	32	35	36
$d_2$	6,4	8,4	9	11	13	13	17	22	22	23	26
$l_1$	27	●	●								
	30		●	●	●						
	33	●	●	●	●	●					
	38	●	●	●	●	●					
	40		●	●	●						
	44	●	●	●	●	●					
	48	●	●	●	●	●	●				
	50		●	●	●	●	●	●			
	61	●	●	●	●	●	●	●	●		
	63		●	●	●	●	●	●	●		
	70						●	●	●		
	72	●	●	●	●	●	●	●	●	●	●
	80	●	●	●	●	●	●	●	●	●	●
	90		●	●	●	●	●	●	●	●	●
	95						●	●	●		
	100		●	●	●	●	●	●	●	●	●
	105						●	●	●		
	115						●	●	●	●	●
	125			●	●	●	●	●	●	●	●
	135						●	●	●		
	145						●	●	●	●	●
	150			●		●	●	●	●	●	●
	155						●	●	●		
	165							●	●		
	175						●	●	●	●	●
	185							●	●		
	195						●	●	●	●	●
	200		●		●	●	●	●	●	●	●
	205							●	●		
	215						●	●	●	●	●
	225						●	●	●	●	●
	235						●	●	●		
	245							●	●		
	250						●	●	●	●	●
	255						●				



244.9.

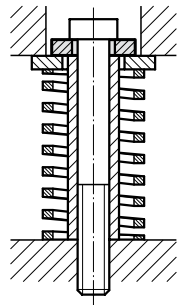
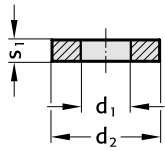


#### Ordering Code (example):

Spacer Tube = 244.9.  
 $d_1$  = 16 mm = 16.  
 $l_1$  = 38 mm = 038  
Order No = 244.9.16.038

**Spring Accessories**

**244.10.**



**244.10. Stop Washer** Material: C 45, heat treated

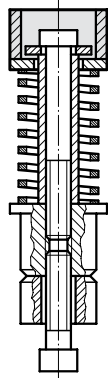
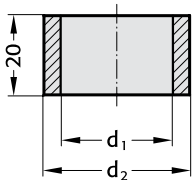
d <sub>1</sub>	6,4	8,4	8,4	8,5	9	10,5	10,5	10,5	10,5	11	12,5	13	13	13	13,4	16,4	17	17	17	17
d <sub>2</sub>	17	17	23	20	26	25	25	26	28	36	28	30	30	46	23	26	35	35	36	36
s <sub>1</sub>	3	3	4	4	4	4	5	4	4	6	4	5	6	8	4	4	4	6	4	13

d <sub>1</sub>	17	17	17	17	20,4	21	21	21	21	21	21	22	25	25	25	26	26	31	37
d <sub>2</sub>	37	38	40	58	30	42	44	45	45	46	49	68	46	55	56	58	80	68	80
s <sub>1</sub>	6	6	6	10	5	8	8	8	16	6	6	12	10	10	10	6	12	8	8

**Ordering Code (example):**

Stop Washer	= 244.10.
d <sub>1</sub> = 8,4 mm	= 084.
d <sub>2</sub> = 23 mm	= 23.
s <sub>1</sub> = 4 mm	= 04
Order No	= 244.10.084.23.04

**244.11.**



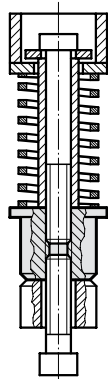
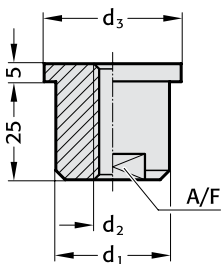
**244.11. Spacer Sleeve** Material: St 35.4, case-hardened

Spring Ø	20 u. 25	32 u. 40	50	63
d <sub>1</sub>	20	30	-	-
d <sub>2</sub>	25	38	-	-

**Ordering Code (example):**

Spacer Sleeve	= 244.11.
Spring Ø = 25 mm or 20 mm resp.	= 25
Order No	= 244.11.25

**244.12.**



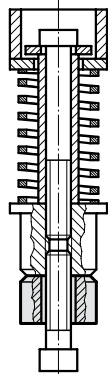
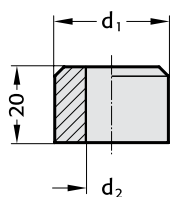
**244.12. Spacer Plug** Material: No. 1.7131, case-hardened

Spring Ø	20	25	32	40	50	63
d <sub>1</sub>	20	20	32	32	-	-
d <sub>2</sub>	M6	M8	M10	M12	-	-
d <sub>3</sub>	25,3	25,3	38	38	-	-
sw	15	15	27	27	-	-

**Ordering Code (example):**

Spacer Plug	= 244.12.
Spring-Ø = 25 mm	= 25
Order No	= 244.12.25

**244.13.**



**244.13. Compensation Disc** Material: No. 1.7131

Spring-Ø	20	25	32	40	50	63
d <sub>1</sub>	20	20	32	32	-	-
d <sub>2</sub>	7	9	11	14	-	-

**Ordering Code (example):**

Compensation Disc	= 244.13.
Spring-Ø = 20 mm	= 20
Order No	= 244.13.20



# FIBRO

2441.14. 2441.15.  
2450.

## Spring Accessories

### 2441.14. Threaded disc

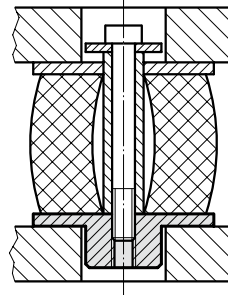
for FIBROFLEX®-/FIBROELAST®-Springs  
Material: St 60

Spring-∅	25	32	40	50	63	80	100
d <sub>1</sub>	32	40	50	60	78	98	120
d <sub>2</sub>	18	18	18	20	20	26	26
d <sub>3</sub>	M6	M8	M8	M10	M10	M12	M12
A/F	14	14	14	17	17	22	22
s	5	5	5	6	8	10	12

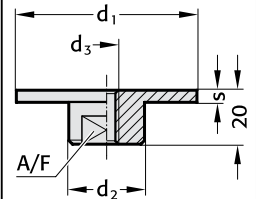
#### Ordering Code (example):

Threaded disc für FIBROFLEX®-Springs	=	2441.14.
Spring-∅ = 25 mm	=	025
Order No	=	2441.14.025

#### Mounting example:



### 2441.14.



### 2441.15. Threaded disc

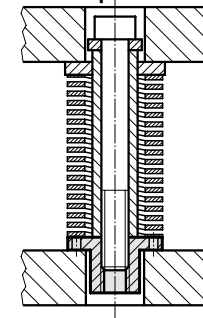
for helical Springs  
Material: Ck 45 heat treated

Spring-∅ d <sub>1</sub>	20	25	32	40	50
d <sub>2</sub>	10	12,5	16	20	25
d <sub>3</sub>	M6	M8	M10	M12	M16
d <sub>4</sub>	3,2	4,2	4,2	4,2	4,2
d <sub>5</sub>	14	20	25	30	40

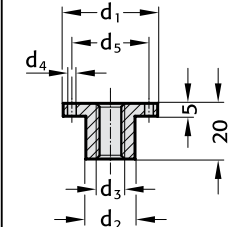
#### Ordering Code (example):

Threaded disc for helical Springs	=	2441.14.
Spring-∅ = 25 mm	=	025
Order No	=	2441.14.025

#### Mounting example:



### 2441.15.



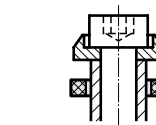
### 2450. Damping Discs Material: FIBROFLEX®

d <sub>1</sub>	10,5	6,4	11	13	8,5	14	15,5	12	10,5	13	14	17	18	22	21	13,5	25	18	23,5	21	26	17
d <sub>2</sub>	15	16	17	19	20	23	23	24	25	25	26	26	27	28	30	32	32	32	34	35	35	38
s	4	3	3	4	3	4	4	5	4	4	5	4	4	6	5	4	6	7	4	7	6	5

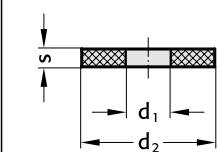
d <sub>1</sub>	21	13,5	32	27	31	37	32	17	26	37	32	17	37	42	21	21	27
d <sub>2</sub>	38	40	40	41	42	46	49	50	50	53	60	63	65	70	80	100	125
s	6	5	6	7	6	6	8	6	6	8	10	6	10	10	10	10	

#### Ordering Code (example):

Damping Disc	=	2450.
Hardness Shore (90 Shore A = 6.)	=	6. (80 Shore A = 5.)
d <sub>1</sub> = 21 mm	=	21. (95 Shore A = 7.)
d <sub>2</sub> = 80 mm	=	080. on request
s = 10 mm	=	10
Order No	=	2450.6.21.080.10



### 2450.





# FIBRO

244.16.

## Spring-, Fit- and Spacer Units

### Description:

These units can be used as an alternative to shoulder screws.

### Advantages:

Precision length adjustments by way of grinding. The units have many uses – as can be seen from the installation examples below.

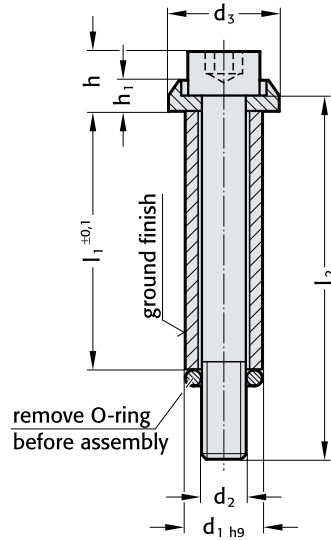
### Execution:

Spacer tube:  
tensile strength 1200–1300 N/mm<sup>2</sup>  
Outside diameter ground to tolerance  $h_9$   
Supplied with socket cap screw  
DIN EN ISO 4762 (12.9)

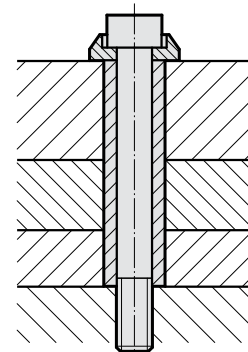
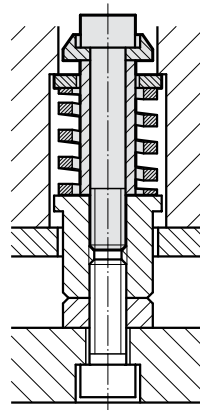
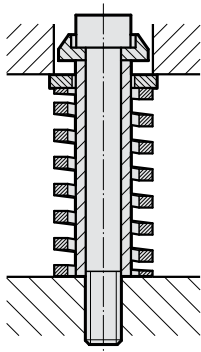
### Note:

The units are supplied with a retaining O-ring which must be removed before application.

244.16.



### Installation Examples:



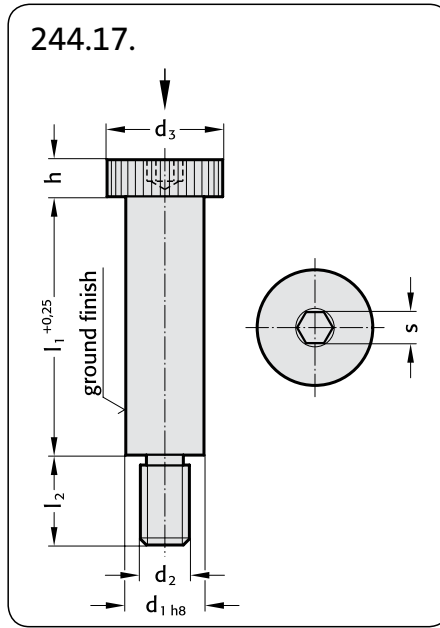
$d_1$	10	12,5	15	17,5	23
$d_2$	M 6	M 8	M 10	M 12	M 16
$d_3$	15	19	23	27	34
$h$	10	13	15	18	24
$h_1$	5,5	$l_2$ 6,5	$l_2$ 7,5	$l_2$ 9	$l_2$ 11
$l_1$	20 ● 35	● 35			
	25 ● 40				
	30 ● 45	● 45	● 50	● 50	
	35 ● 50	● 50	● 55		
	40 ● 55	● 55	● 60	● 60	
	45 ● 60	● 60	● 65	● 65	
	50 ● 65	● 65	● 70	● 70	● 80
	55 ● 70	● 70	● 75	● 80	
	60 ● 80	● 80	● 80	● 90	● 90
	70 ● 90	● 90	● 90	● 100	● 100
	80 ● 100	● 100	● 100	● 110	● 110
	90 ● 110	● 110	● 110	● 120	● 120
	100	● 120	● 120	● 130	● 130
	110			● 140	● 140
	120		● 140	● 150	● 150
	140			● 180	● 180
	150				● 180
	160				● 200
tightening torque Nm	13	32	65	120	290

### Ordering Code (example):

Spring-, Fit- and spacer Unit = 244.16.  
 $d_1 = 12,5$  mm = 125.  
 $l_1 = 55$  mm = 055  
 Order No = 244.16.125.055

Shoulder Screws

244.17.



Execution:

Material:  
high tensile steel  
heat treated to 12.9 ISO 898-1.  
Heads knurled.

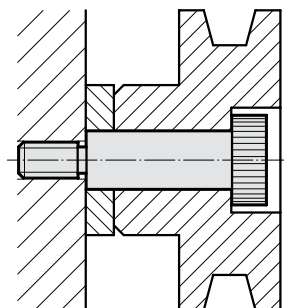
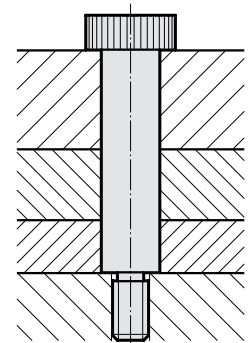
Ordering Code (example):

Shoulder Screw	=	244.17.
$d_1 = 12$ mm	=	120.
$l_1 = 60$ mm	=	060
Order No	=	244.17.120.060

244.17.

$d_1$	6	8	10	12	16	20	24
$d_2$	M 5	M 6	M 8	M 10	M 12	M 16	M 20
$d_3$	10	13	16	18	24	30	36
h	4,5	5,5	7	9	11	14	16
s	3	4	5	6	8	10	12
$l_2$	9,5	11	13	16	18	22	27
$l_1$	10	●	●				
	12	●	●				
	16	●	●	●	●		
	20	●	●	●	●		
	25	●	●	●	●	●	
	30	●	●	●	●	●	
	35	●	●	●	●	●	
	40	●	●	●	●	●	●
	45		●	●	●	●	●
	50		●	●	●	●	●
	55		●	●	●	●	●
	60		●	●	●	●	●
	65		●	●	●	●	●
	70		●	●	●	●	●
	80		●	●	●	●	●
	90			●	●	●	●
	100			●	●	●	●
	120				●	●	●
tightening torque Nm	7	13	32	65	120	290	500

Installation Examples:



# FIBRO

244.20. 244.32.  
244.25. 244.40.

## Combination Spring- and Spacer Units: Application Examples Spring Characteristics

### Description:

The preloaded Combination Spring- and Spacer Unit combines the functions of providing the spring force and of spacing the stripper in one constructional element, whilst conventional designs employed two.

The resulting advantages therefore consist of space savings and reduced machining cost with regard to the various die members.

The execution with spacer sleeve makes it possible to exchange the whole unit by simply removing the top clamping plate. Removal of the compensation disc gives unimpeded access to the punches – for the purpose of sharpening/grinding.

### Important Notice:

In order to preserve pre-existing conditions in regard of spring force and displacement, it is essential that regrinding of the punches equals regrinding of the compensation disc – i. e. the metal removal from either component must be kept the same.

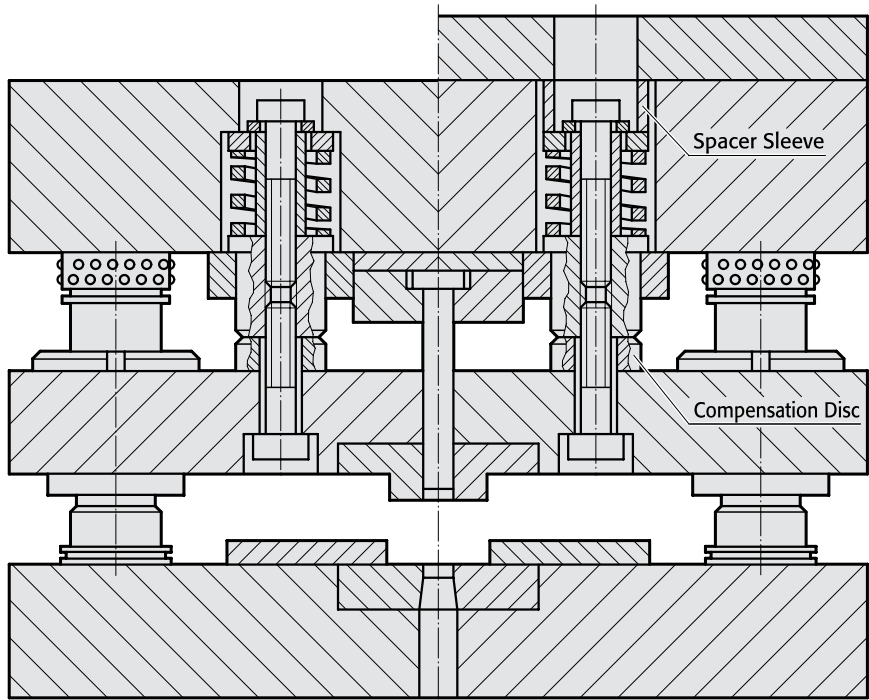
Helical compression springs must be ordered separately, see pages F 10 – F 39.

### With Spacer Sleeve

(with c' bored hole)  
244. □□ . □□□ .10

### With Spacer Sleeve

(with straight hole)  
244. □□ . □□□ .11



### Spring Characteristics:

Order No	spring sizes D <sub>h</sub> × l <sub>0</sub>	preload Com pres- sion	spring preload forces (N) Typ				max. working stroke of spring (excl. preload) Typ				spring coefficient (N/mm) Typ			max. spring forces (N) at 80% max. deflection s <sub>2</sub> Type				
			241.14	241.15	241.16	241.17	.14	.15	.16	.17	.14	.15	.16	.17	.14	.15	.16	.17
244.20.027.	20 × 25	2	111,6	196,2	432,0	586,4	10,4	8,8	6,7	6,2	55,8	98,1	216,0	293,2	580	863	1447	1818
033.	32	3	135,0	218,1	504,0	672,6	12,8	10,4	8,4	7,8	45,0	72,7	168,0	224,2	576	756	1411	1749
038.	38	4	133,6	224,0	516,0	708,4	15,2	12,8	10,0	9,6	33,4	56,0	129,0	177,1	508	717	1290	1700
044.	44	4	120,0	190,4	448,0	596,4	18,4	15,2	11,6	11,2	30,0	47,6	112,0	149,1	552	724	1299	1670
048.	51	7	171,5	291,9	658,0	896,7	20,8	16,8	13,2	12,8	24,5	41,7	94,0	128,1	510	701	1241	1640
244.25.027.	25 × 25	2	200,0	294,0	750,0	–	10,4	8,8	7,2	–	100,0	147,0	375,0	–	1040	1294	2700	–
033.	32	3	240,9	354,3	891,0	1123,8	12,8	10,4	8,4	8,0	80,3	118,1	297,0	374,6	1028	1228	2495	2997
038.	38	4	248,0	372,4	876,0	1384,8	15,2	12,8	10,4	9,6	62,0	93,1	219,0	346,2	942	1192	2278	3324
044.	44	4	212,0	323,2	748,0	976,8	18,4	15,2	12,4	11,2	53,0	80,9	187,0	244,2	975	1228	2319	2735
048.	51	7	308,7	480,9	1092,0	1453,9	20,0	16,8	14,4	12,8	44,1	68,7	156,0	207,7	882	1154	2246	2659
244.32.038.	32 × 38	5	470,5	925,5	1940,0	2643,0	15,2	12,8	9,6	8,8	94,1	185,1	388,0	528,6	1430	2369	3725	4652
044.	44	5	398,0	790,5	1620,0	2135,5	17,6	15,2	11,2	10,4	79,6	158,1	324,0	424,7	1401	2403	3629	4417
048.	51	8	536,0	1072,8	2176,0	2826,4	20,0	16,8	13,2	12,0	67,0	134,1	272,0	353,3	1340	2253	3590	4240
061.	64	8	424,0	792,8	1696,0	2155,2	25,6	21,6	17,2	16,0	53,0	99,1	212,0	269,4	1357	2141	3646	4310
072.	76	9	396,9	724,5	1548,0	1968,3	31,2	25,6	20,8	19,2	44,1	80,5	172,0	218,7	1376	2061	3578	4199
244.40.048.	40 × 51	8	736,0	1432,0	2801,6	5027,2	20,0	16,8	13,6	12,0	92,0	179,0	350,2	628,4	1840	3007	4763	7541
061.	64	8	584,8	1120,0	2152,0	3905,6	25,6	20,8	17,6	15,2	73,1	140,0	269,0	488,2	1871	2912	4734	7421
072.	76	9	567,9	972,9	1971,0	3413,7	30,4	25,6	21,6	19,2	63,1	108,1	219,0	379,3	1918	2767	4730	7283

### Ordering Code (example):

Spring and spacer Unit

Spring dia. = 20 mm = 244.20.

spacer tube length h = 38 mm, with screw = 038.

with spacer sleeve 244.11. = 11

Order No = 244.20.038.11

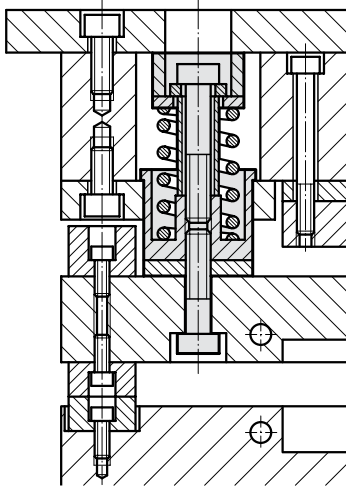
# Combination Spring- and Spacer Units for low Installation Space and long Displacement

**FIBRO**

244.20.3. 244.25.3.  
244.32.3. 244.40.3.

## Installation Example:

with spacer sleeve



## Note:

After fitting, the flange bushings are ground to the same length.

Note that regrind allowance on punch points must equal that taken off the compensation washers.

Adjust depth of c' bore or spacer sleeve length resp. so that spacer tube cap screw is relieved by about 0,1 mm.

244.  .3.  .10

Application without spacer sleeve  
(c' bored hole)

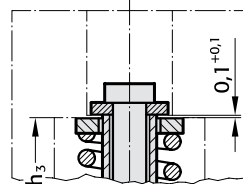
244.  .3.  .11

Application with spacer sleeve  
(through-hole)

stop washer 244.10.

spacer sleeve 244.11.

spring abutment washer  
244.7.



depth of hole

spacer tube 244.9.

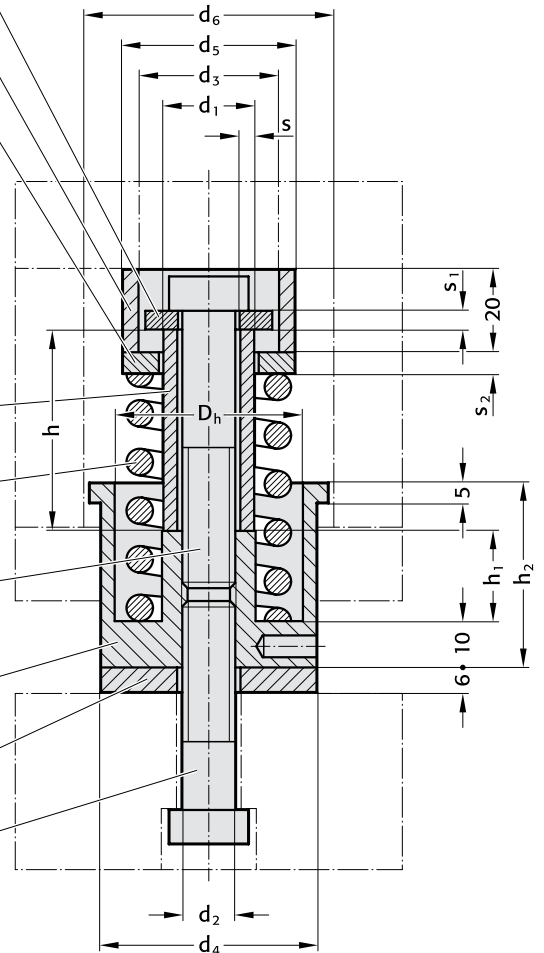
round wire compression  
spring (per separate order)

socket cap screw  
DIN EN ISO 4762 (12.9)

Flange Bushing  
244.12.2.

compensation washer  
244.13.2.

socket cap screw  
DIN EN ISO 4762 (12.9)



## 244.20.3./244.25.3./244.32.3./244.40.3.

Spring dia	$d_1 \times s$	h	$d_2$	$d_3$	$d_4$	$d_5$	$d_6$	$D_h$	$s_1$	$s_2$	$h_1$	$h_2$
20	$10 \times 1,8$	spacer tube length 244.9. on page F65.	M 6	18	25	25	31	20	3	4	5	36
25	$12 \times 1,8$		M 8		32		38	25			10	
32	$16 \times 2,5$	Spring selection on pages F18 – F33	M 10	30	38	38	44	32	4	5	16	40
40	$20 \times 3,5$		M 12		47		54	40			18	

## Ordering Code (example):

Spring- and Spacer Unit - for low installation space

for spring- $\varnothing = 20$  mm = 244.20.3.

spacer tube length h = 33 mm = 033.

with spacer sleeve 244.11. = 11

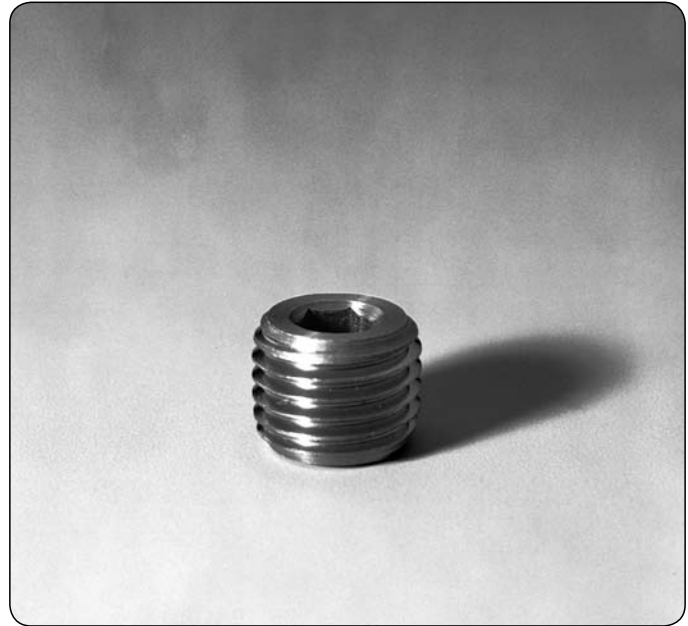
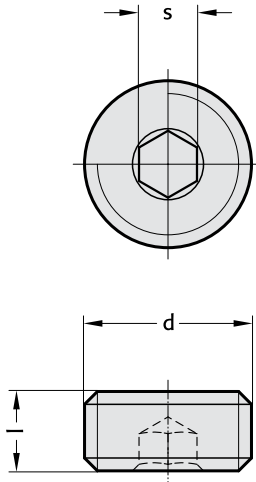
Order No = 244.20.3.033.11

# FIBRO

241.00.1.

## Set Screws for Compression Spring Adjustment

241.00.1.



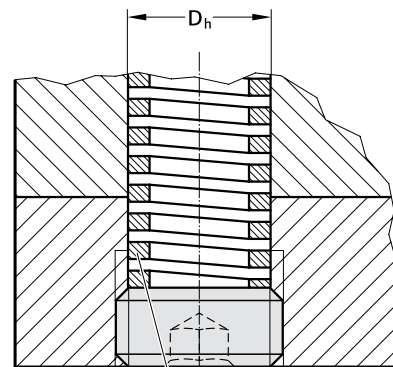
### Description:

These set screws can be used as adjustable spring stops. They are available for all customary spring sizes from  $\varnothing 10$  to  $\varnothing 40$ . The set screws are suitable for springs 241.14. to .26.

Their use offers the following advantages:

- Adjustable spring tension from under the bottom bolster, without any dismantling.
- Exchange of springs without dismantling.
- Through-holes instead of blind holes for spring accommodation.

### Installation Example:



secured with  
LOCTITE 281.243

compression spring to separate  
order - see High Performance  
Compression Springs

241.00.1.

d	M 12 × 1,5	M 14 × 1,5	M 18 × 1,5	M 22 × 1,5	M 28 × 1,5	M 35 × 1,5	M 42 × 1,5
l	10	10	10	10	12	12	12
s	6	6	8	8	10	10	10
spring dia.	10	12,5	16	20	25	32	40
D <sub>h</sub>	10,5	12,5	16,5	20,5	26,5	33,5	40,5

### Ordering Code (example):

Compression Spring Set Screw = 241.00.1.  
Thread size M 12 x 1,5 = 12  
Order No = 241.00.1.12

# FIBROFLEX® Elastomer Strippers

## Disc

## FIBROFLEX® Shedder Inserts

**FIBRO**

243.7. / 243.7. .... 1.

247.6.

**243.7.**  
Elastomer Strippers

order separately Disc 243.7. .... 1 from  $\varnothing d_1 = 8 \text{ mm}$  on

**243.7. .... 1**  
Disc, steel:

**243.7.**  
Installation Example

**243.7.**

**Advantages:**  
Repairs, sharpening and modifications on dies equipped with elastomer strippers do not necessitate the dismantling of a stripper plate, thus becoming very expedient. Any marring of delicate part surfaces is precluded. This makes elastomer strippers ideal for all painted, anodized, plastic-coated and polished parts. FIBROFLEX® Elastomer Strippers are resistant against oils and greases.

**Installation:**  
Push stripper over punch, where it will stay put on account of its elasticity. No other form of retention will be required. A single press stroke will then pierce a hole through the bottom portion of the stripper that matches the punch shape exactly.

**Applications:**  
especially in large dies, where the use of elastomer strippers does away with the need of huge stripper plates.

**243.7.**

$d_1$	$d_2$	$d_3$	$L_0$
			stock length
4	17	1,6	39 – 47 – 56
5	17		
6	19		other length are available on request
6,3	19		(max. 56 mm)
8	21	3	
10	23		
12,5	26		
13	26		
16	30		
20	38		
25	50		
32	55		
38	60		
40	63		95 Shore A

**Ordering Code (example):**

FIBROFLEX®-Stripper	= 243.7.
$d_1 = 8 \text{ mm}$	= 080.
$L_0 = 56 \text{ mm}$	= 056
Order No	= 243.7.080.056

**243.7. .... 1**

$d_4$	$d_5$
8,5	21
10,5	23
13	26
13,5	26
16,5	30
20,5	38
25,5	50
32,5	55
38,5	60
40,5	63

**Ordering Code (example):**

Disc	= 243.7.	.1
$d_4 = 32,5 \text{ mm}$	= 325	
Order No	= 243.7.325.1	

**247.6.**  
Shedder Inserts

**247.6.**  
Installation Example

**247.6.**  
Instead of conventional shedder pins and their springs as well as set screws, FIBROFLEX® Shedder Inserts are simply pressed into matching holes. They are made from material with a hardness of 90 Shore A.

Order No	$d_1$	$d_2$	stripping force (kg)
247.6.008.016	8	4	20
247.6.010.016	10	6	25
247.6.012.016	12	8	30



# FIBRO

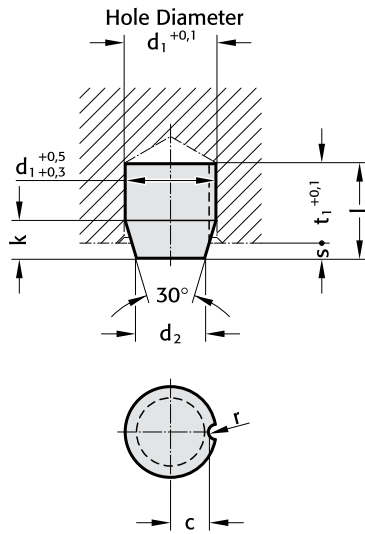
2471.6.

## FIBROFLEX®-Compression Pads

### Material:

FIBROFLEX®  
Hardness 90 Shore A

2471.6.



2471.6.

Order No	d <sub>1</sub>	d <sub>2</sub>	l	k	t <sub>1</sub>	r	c	Compressive force (N)	at s
2471.6.006	6	3,6	9,5	4,5	8	-	-	100	1,5
010	10	6	15,5	7,5	13	1	4	450	2,5
016	16	9,5	25	12	21	1,5	6,5	1500	4
024	24	18	25	10	21	2	10	3000	4
030	30	20	35	19	30	2,5	12,5	3000	5
032	32	24	32	14	26	3	13	12000	6
039	39,5	30	40	16	34	3	16,8	25000	6

### Ordering Code (example):

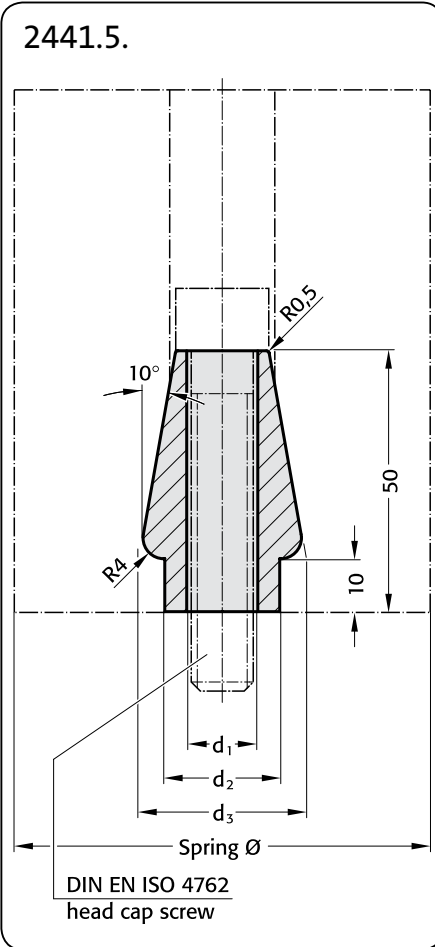
FIBROFLEX® Compression Pad = 2471.6.  
d<sub>1</sub> = 16 mm = 016  
Order No = 2471.6.016

**Locating Bolts**  
**Locating Bolts, threaded**  
**for FIBROFLEX® round Springs and FIBROELAST®**

**FIBRO**

**2441.5.**

**2441.6.**

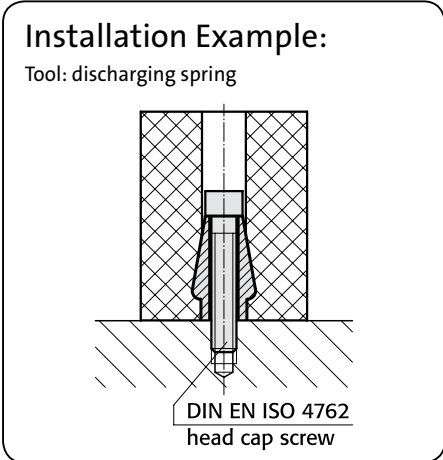


**2441.5.**

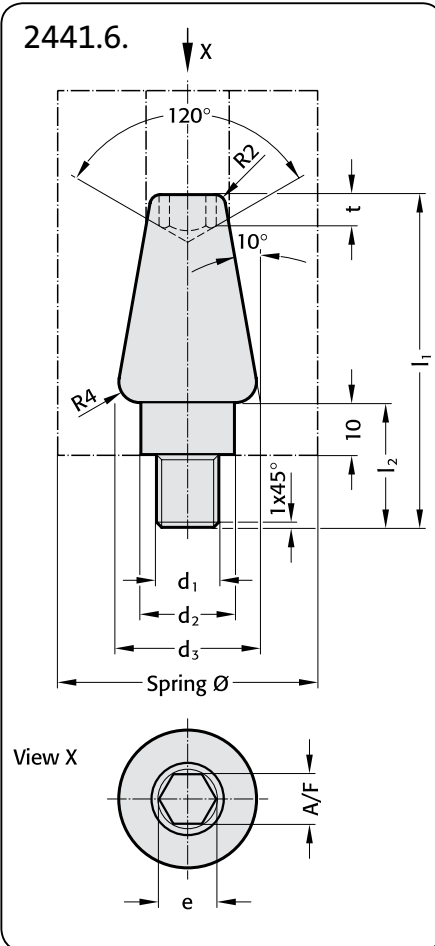
Order No	Spring			DIN EN ISO 4762 head cap screw	
	∅	d <sub>1</sub>	d <sub>2</sub>		d <sub>3</sub>
2441.5.10	63	11	18	28	M10 × 65
12	80	13,5	22	32	M12 × 70
	100				
16	125	17,5	28	38	M16 × 70

**Ordering Code (example):**

Locating bolts	=	2441.5.
Screw size M16	=	16
Order No	=	2441.5.16



**Note:**  
 Elastomeric round springs are positioned and secured in place by the locating bolts.  
 Supplied without screws.

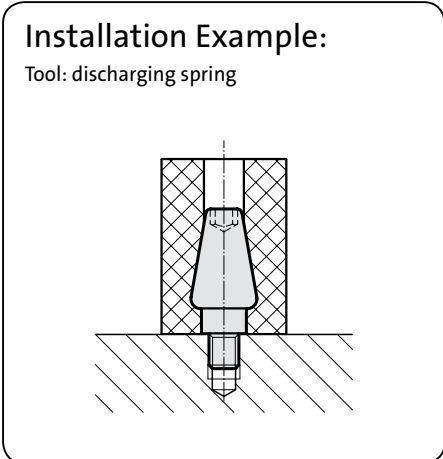


**2441.6.**

Order No	Spring								
	∅	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>1</sub>	l <sub>2</sub>	SW	e	t
2441.6.12	63	M12	18	28	64	24	10	11,4	6
16	80	M16	22	32	68	28	10	11,4	6
	100								
20	125	M20	28	38	72	32	14	16	8
	140								

**Ordering Code (example):**

Locating bolts, threaded	=	2441.6.
d <sub>1</sub> = M16	=	16
Order No	=	2441.6.16



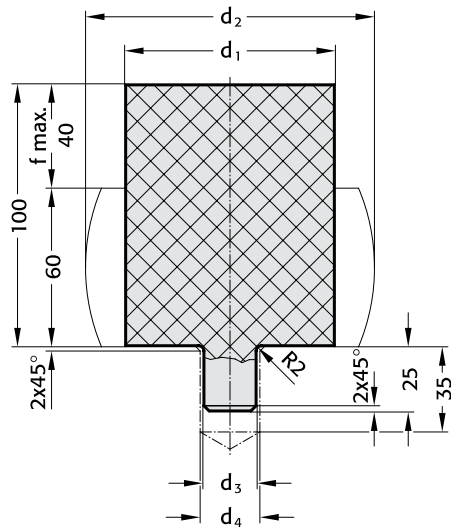
**Note:**  
 Elastomeric round springs are positioned and secured in place by the threads locating bolts.

# FIBRO

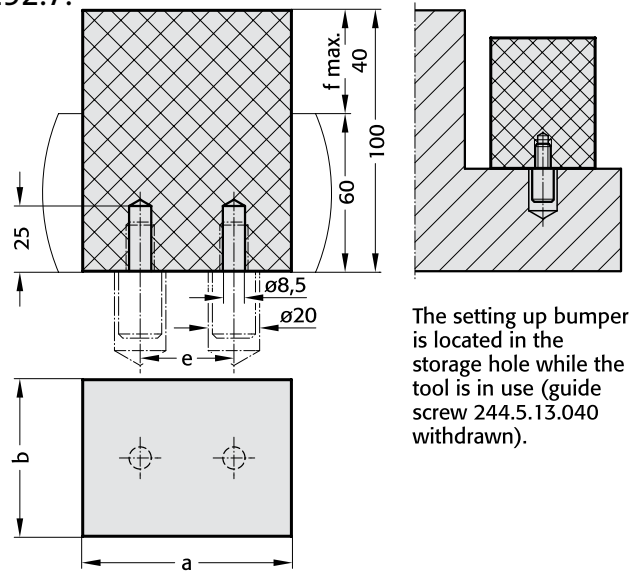
2531.7.  
252.7.

## FIBROFLEX® Setting-up Bumpers, round FIBROFLEX® Setting-up Bumpers, square

2531.7.



252.7.



The setting up bumper is located in the storage hole while the tool is in use (guide screw 244.5.13.040 withdrawn).

### Application

Setting up bumpers are used for setting down and setting up tools and replace shear pins.

### Implementation

1. When setting up slowly move the ram into the bottom position.
2. Clamp the tool, then move the ram back to the top position (with the setting up bumper compressed to a height of 60 mm).
3. After setting up, remove the setting up bumpers and place them in the storage hole on the tool (e.g. guide screw, order no 244.5.13.040, see diagram).

### Warning!

Setting up bumpers are not suitable for continuous use. To prevent damage when setting down tools, ensure that the setting up bumpers are large enough to withstand 1.5 times the weight of the tool (see table).

2531.7.

Shore hardness 95 A

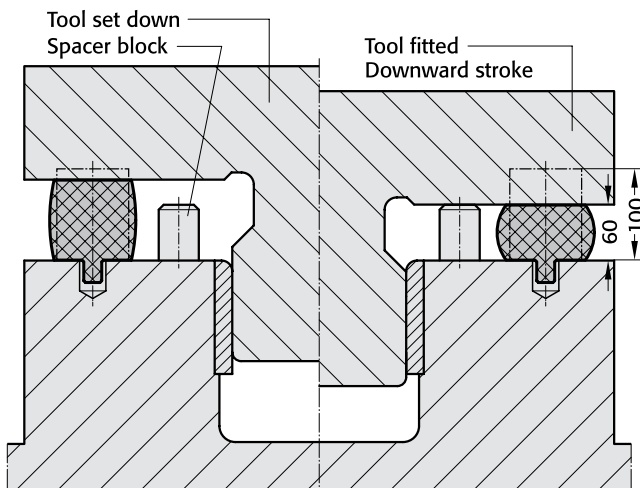
Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	Load-bearing capacity in daN for			Admissible tool weight in kg for 4 setting up bumpers
					f=20	f=25	f=40	in kg for 4 setting up bumpers f=20/Safety factor 1,5
2531.7.063	63	86	16	18	2200	2800	4800	5800
080	80	111	20	22	3500	4600	8500	9300
100	100	136	20	22	5000	6700	11700	13300
125	125	171	25	28	7600	9400	18900	20200

252.7.

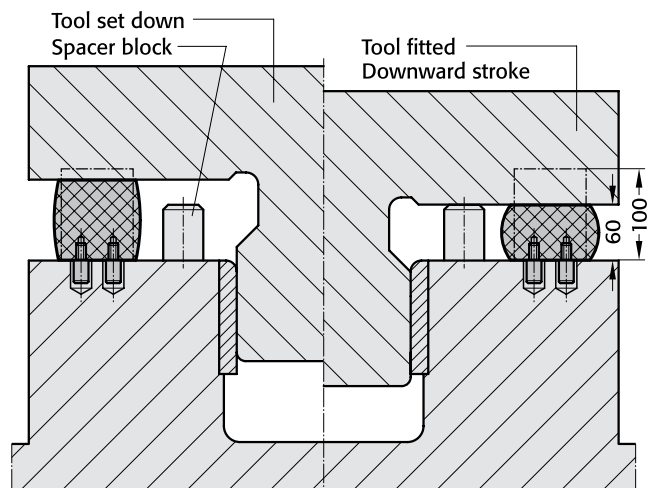
Shore hardness 95 A

Order No	a	b	e	Load-bearing capacity in daN for		Admissible tool weight in kg for 4 setting up bumpers
				f = 20 mm	Safety factor 1,5	
252.7.080.060	80	60	36	2700	7100	7100
100.080	100	80	50	6200	16500	16500
125.100	125	100	60	8600	22900	22900
180.100	180	100	100	13600	36200	36200

2531.7. Installation Example:



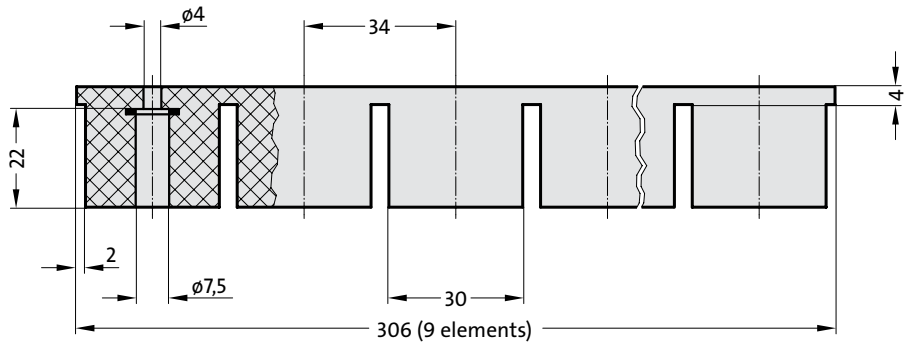
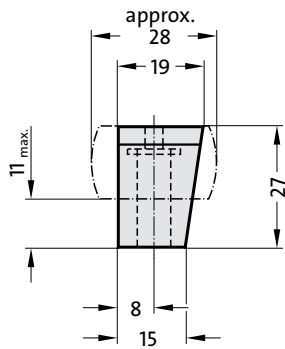
252.7. Installation Example:



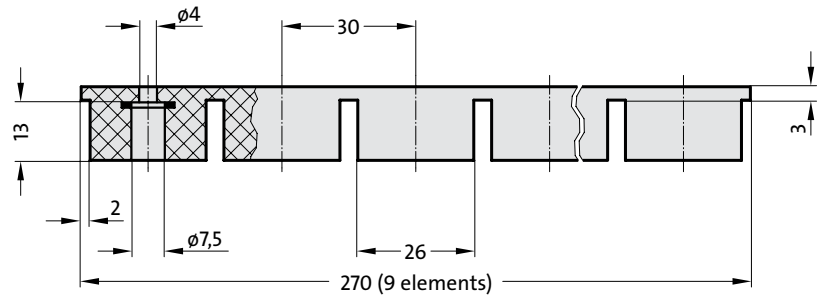
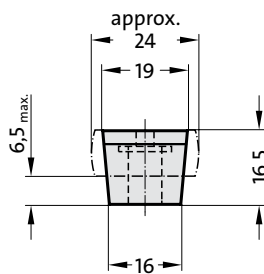
Strippers for Blanking Dies  
to Daimler / VW Standard / VDI 3362

2532.2.

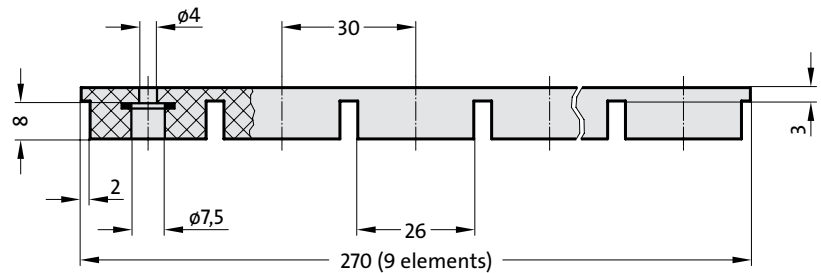
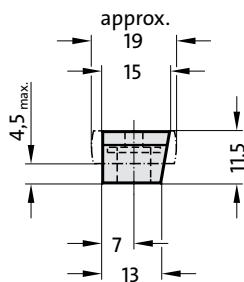
2532.2.190.270.0306



2532.2.190.165.0270



2532.2.150.115.0270



**Material:**

Perbunan  
Hardness to DIN 53505: Shore A65±5

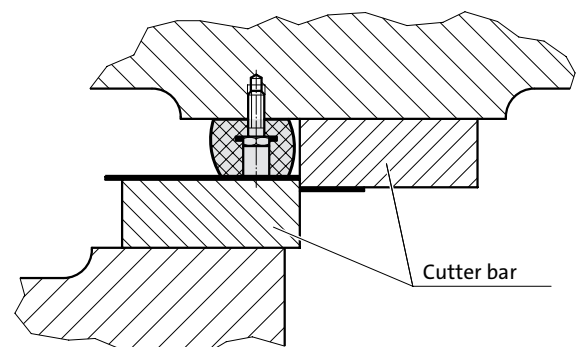
**Construction:**

Surface quality to DIN ISO 3302-1

**Application:**

For blanking die tools  
Supplied without screws

**Installation example:**

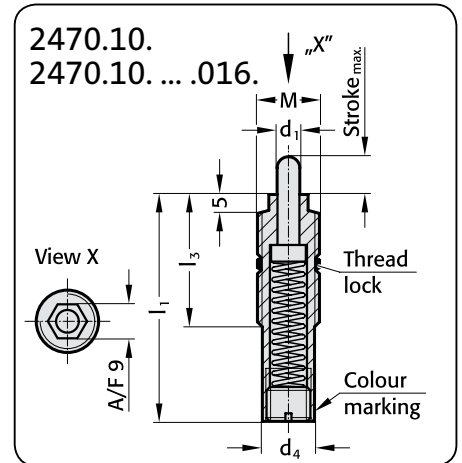
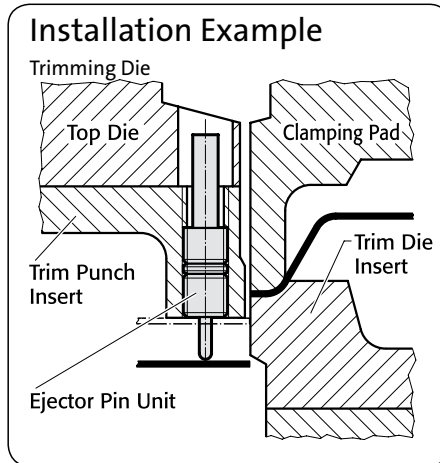




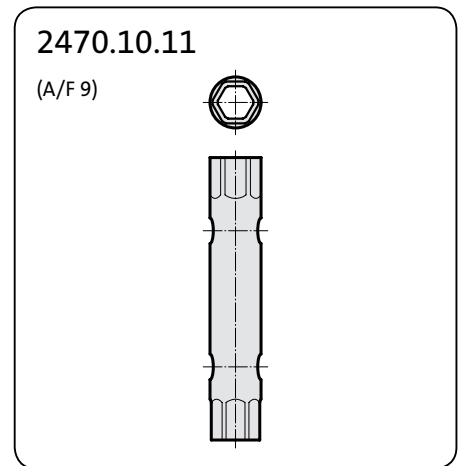
# Spring Plungers with hexagon VDI 3004 Insertion Tool

**FIBRO**

2470.10. 2470.10....016.  
2470.10.11



**Description:**  
Spring ejectors are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool.  
The spring-loaded pins are hardened.



**2470.10. Colour marking: yellow**

Order No	d <sub>1</sub>	d <sub>4</sub>	M	l <sub>1</sub>	l <sub>3</sub>	stroke max.	spring rate		spring force N	
							N/mm	initial	initial	final
2470.10.010.060.1	6	13,4	M16	60	35	10	0,95	3,8	13,3	
2470.10.015.060.1						15	2	10	40,0	
2470.10.020.080.1				80		20	1,38	6,9	34,5	
2470.10.030.080.1						30	1,30	6,5	45,5	
2470.10.030.120.1				120			0,73	18	40,0	
2470.10.040.150.1				150		40	0,6	13,2	37,2	
2470.10.050.150.1						50			43,2	
2470.10.060.150.1						60			49,2	
2470.10.070.200.1				200		70	0,44	9,68	40,5	
2470.10.080.200.1						80			44,8	

**2470.10. Colour marking: red**

Order No	d <sub>1</sub>	d <sub>4</sub>	M	l <sub>1</sub>	l <sub>3</sub>	stroke max.	spring rate		spring force N	
							N/mm	initial	initial	final
2470.10.010.060.2	6	13,4	M16	60	35	10	3,25	13	45,5	
2470.10.015.060.2						15	2,60	15	56,0	
2470.10.020.080.2				80		20	6,90	34,5	172,5	
2470.10.030.120.2				120		30	2,90	20	80,0	
2470.10.030.150.2				150			2,55	56,1	132,2	
2470.10.040.150.2				150		40			158,1	
2470.10.050.200.2				200		50	1,61	19,3	99,9	
2470.10.060.200.2						60			116,1	
2470.10.070.200.2						70			132,1	
2470.10.080.200.2						80	0,94	25	100,1	

**2470.10. Colour marking: white**

Order No	d <sub>1</sub>	d <sub>4</sub>	M	l <sub>1</sub>	l <sub>3</sub>	stroke max.	spring rate		spring force N	
							N/mm	initial	initial	final
2470.10.020.080.3	6	13,4	M16	80	35	20	3,02	15,1	75,6	

**2470.10. ... 016. Colour marking: yellow**

Order No	d <sub>1</sub>	d <sub>4</sub>	M	l <sub>1</sub>	l <sub>3</sub>	stroke max.	spring rate		spring force N	
							N/mm	initial	initial	final
2470.10.010.016.060.1	6	13,4	M16×1,5	60	35	10	0,95	3,8	13,3	
2470.10.015.016.060.1						15	2	10	40,0	
2470.10.020.016.080.1				80		20	1,38	6,9	34,5	
2470.10.030.016.080.1						30	1,30	6,5	45,5	
2470.10.030.016.120.1				120			0,73	18	40,0	
2470.10.040.016.150.1				150		40	0,6	13,2	37,2	
2470.10.050.016.150.1						50			43,2	
2470.10.060.016.150.1						60			49,2	
2470.10.070.016.200.1				200		70	0,44	9,68	40,5	
2470.10.080.016.200.1						80			44,8	

**2470.10. ... 016. Colour marking: red**

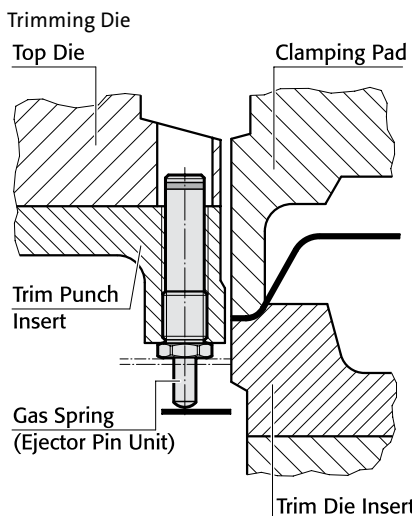
Order No	d <sub>1</sub>	d <sub>4</sub>	M	l <sub>1</sub>	l <sub>3</sub>	stroke max.	spring rate		spring force N	
							N/mm	initial	initial	final
2470.10.010.016.060.2	6	13,4	M16×1,5	60	35	10	3,25	13	45,5	
2470.10.015.016.060.2						15	2,60	15	56,0	
2470.10.020.016.080.2				80		20	6,90	34,5	172,5	
2470.10.030.016.120.2				120		30	2,90	20	80,0	
2470.10.030.016.150.2				150			2,55	56,1	132,6	
2470.10.040.016.150.2				150		40			158,1	
2470.10.050.016.200.2				200		50	1,61	19,3	99,9	
2470.10.060.016.200.2						60			116,1	
2470.10.070.016.200.2						70			132,1	
2470.10.080.016.200.2						80	0,94	25	100,1	

**2470.10. ... 016. Colour marking: white**

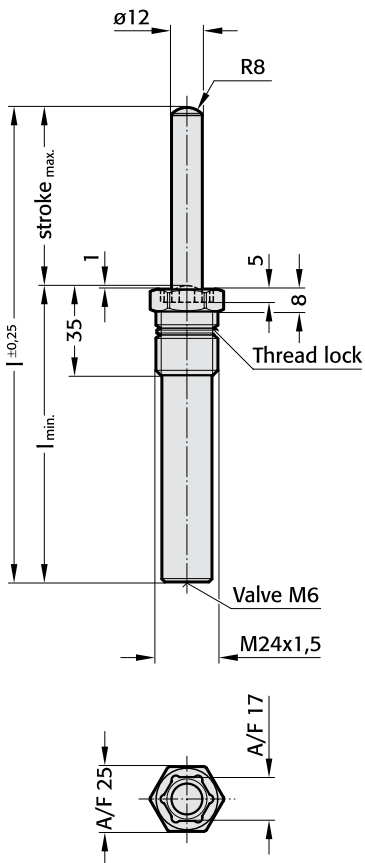
Order No	d <sub>1</sub>	d <sub>4</sub>	M	l <sub>1</sub>	l <sub>3</sub>	stroke max.	spring rate		spring force N	
							N/mm	initial	initial	final
2470.10.020.016.080.3	6	13,4	M16×1,5	80	35	20	3,02	15,1	75,6	

2479.034.

**Installation Example**



2479.034.



**Description:**

Spring ejectors are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries.

**Note:**

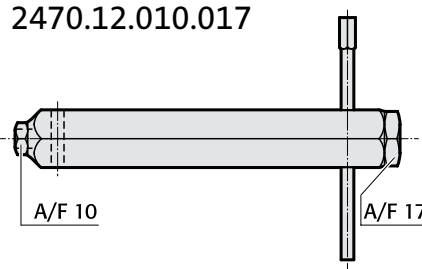
Do not repair worn springs; they have to be replaced completely

- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar (at 20°C)
- Min. filling pressure: 20 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 30 to 80 (at 20°C)
- Max. piston speed: 1.6 m/s

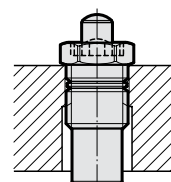
**Warning:**

Different colour coding for spring force used in WDX standard

2470.12.010.017



**Mounting example**



2479.034.00020./00040./00080./00170.

Order No	stroke	max.	I <sub>min.</sub>	I	spring force (daN)							
					.00020.		.00040.		.00080.		.00170.	
					initial	final	initial	final	initial	final	initial	final
2479.034.	.010	10	55	65	23	32,5	45	65,0	85	122,0	170	243,5
	.016	16	61	77		36,6		73,3		137,4		274,8
	.020	20	65	85		36,0		72,0		134,5		269,0
	.025	25	70	95		38,9		77,8		145,9		291,8
	.030	30	75	105		37,5		75,0		141,0		281,5
	.038	38	83	121		40,7		81,4		152,7		305,4
	.040	40	85	125		38,5		77,0		144,5		289,0
	.050	50	95	145		42,0		83,5		156,5		313,0
	.060	60	105	165		42,0		84,0		157,0		314,0
	.070	70	115	185		42,0		84,0		157,5		315,0
	.080	80	125	205		42,0		84,0		158,0		315,5
	.100	100	145	245		42,0		84,5		158,0		316,5
	.125	125	170	295		42,0		84,5		158,5		317,0

**Ordering Code (example):**

Spring Plunger with Gas Spring (Ejector Pin Unit)  
M24 X 1,5 to WDX = 2479.034.  
Force 20 daN = 00020.  
Stroke 20 mm = 020  
Order No = 2479.034.00020.020

**Spring Force Colour Markings:**

Order No	Colour	initial spring force daN	pressure (bar)
2479.034. 00020.	green	23	20
00040.	blue	45	40
00080.	red	85	75
00170.	yellow	170	150
00000.	black, upon customers request; also available unfilled		

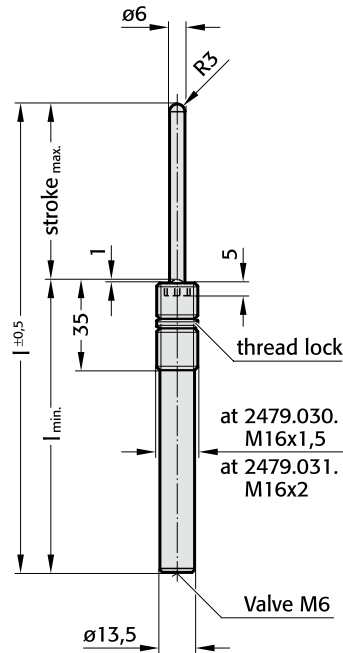


# Spring Plungers with Gas Spring (Ejector Pin Units) with hexagon socket VDI 3004

**FIBRO**  
2479.030.  
2479.031.

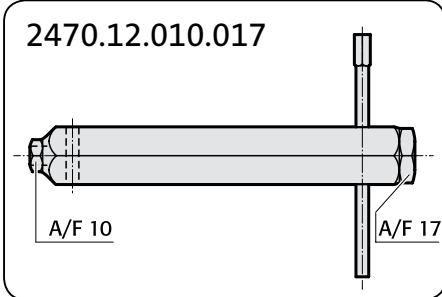
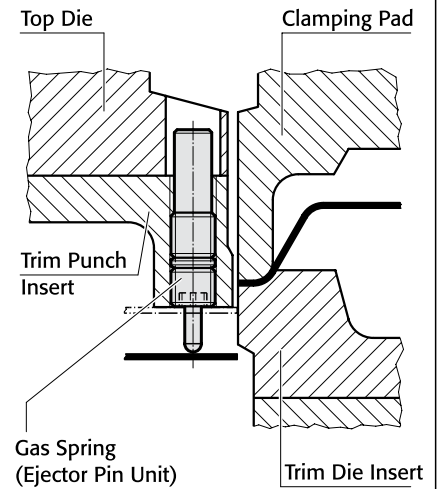


2479.030.  
2479.031.



## Installation Example

Trimming Die



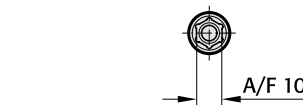
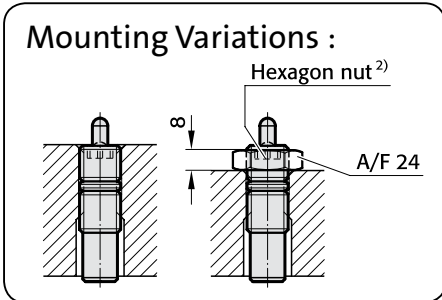
## Description:

Spring ejectors are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries.

Assembly requires the use of special FIBRO insertion tool (2470.12.010.017)

## Note:

Do not repair worn springs; they have to be replaced completely



2) Hexagon nut order supplementary:  
2480.004.00040.1 (M16 x 1,5)  
2480.004.00040.2 (M16 x 2)

Pressure medium:	Nitrogen N <sub>2</sub>
Max. filling pressure:	150 bar (at 20 °C)
Min. filling pressure:	6 bar
Working temperature:	0 °C to +80 °C
Temperature related force increase:	±0.3%/°C
Max. recommended extensions per minute:	approx. 100 (at 20 °C)
Max. piston speed:	1.6 m/s

2479.030.00005./ 00010./ 00020./ 00040.  
2479.031.00004.<sup>1)</sup>/ 00005./ 00010./ 00020./ 00040.

<sup>1)</sup> Spring forces for 2479.031. only

Order No	stroke max.	l <sub>min.</sub>	l	spring force (daN)										
				(violet) .00004. <sup>1)</sup>		(green) .00005.		(blue) .00010.		(red) .00020.		(yellow) .00040.		
				initial	final	initial	final	initial	final	initial	final	initial	final	
2479.	.010	10	55	65	3,4	6,0	6	10,3	11	19,0	21	36,1	42	73,0
	020	20	65	85		5,2		9,4		17,2		32,8		66,1
	030	30	75	105		5,2		9,1		16,7		31,9		64,5
	040	40	85	125		5,2		9,0		16,5		31,5		63,7
	050	50	95	145		5,4		9,6		17,6		33,6		67,7
	060	60	105	165		5,4		9,4		17,3		33,0		66,5
	070	70	115	185		5,4		9,3		17,0		32,5		65,7
	080	80	125	205		5,2		9,2		16,8		32,1		65,1
	100	100	145	245		5,2		9,1		16,7		31,9		64,3
	125	125	170	295		5,2		9,0		16,5		31,5		63,8

Ordering Code (example):

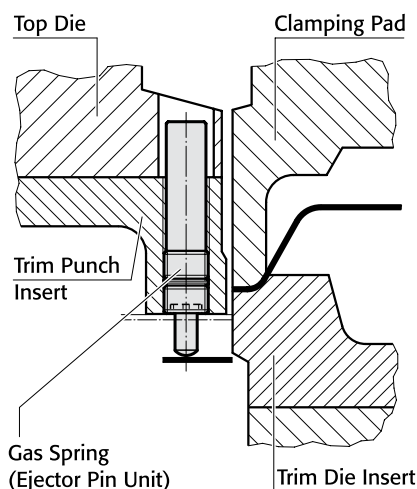
Gas Spring (Ejector Pin Unit)	Order No	Spring Force Colour Markings:	initial spring force daN	pressure (bar)
M16 x 1,5 = 2479.030.	2479.031.00004.	violet	4	12
Force 6 daN = 00005.	2479.	green	6	20
Stroke 10 mm = 010		blue	11	40
Order No = 2479.030.00005.010		red	21	75
		yellow	42	150
		00000.	black, upon customers request; also available unfilled	



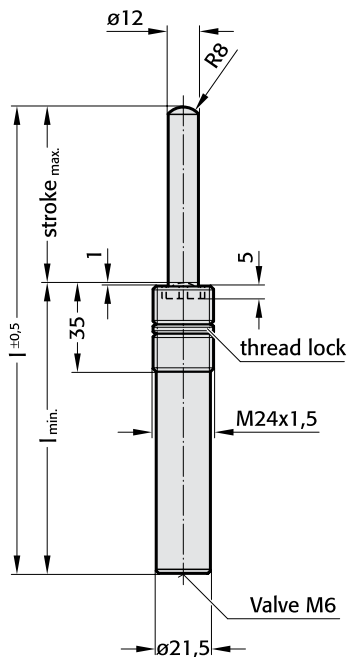
2479.032.

**Installation Example**

Trimming Die



2479.032.



**Description:**

Spring ejectors are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries.

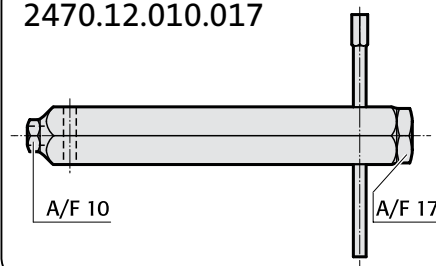
Assembly requires the use of special FIBRO insertion tool (2470.12.010.017)

**Note:**

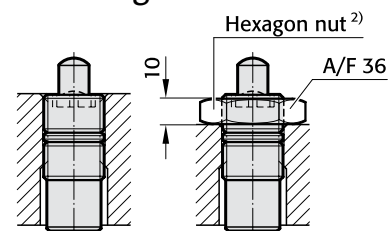
Do not repair worn springs; they have to be replaced completely

- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar (at 20 °C)
- Min. filling pressure: 20 bar
- Working temperature: 0 °C to +80 °C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 100 (at 20 °C)
- Max. piston speed: 1.6 m/s

2470.12.010.017



**Mounting Variations :**



<sup>2)</sup> Hexagon nut order supplementary: 2480.004.00170

2479.032.00020./ 00040./ 00080./ 00170.

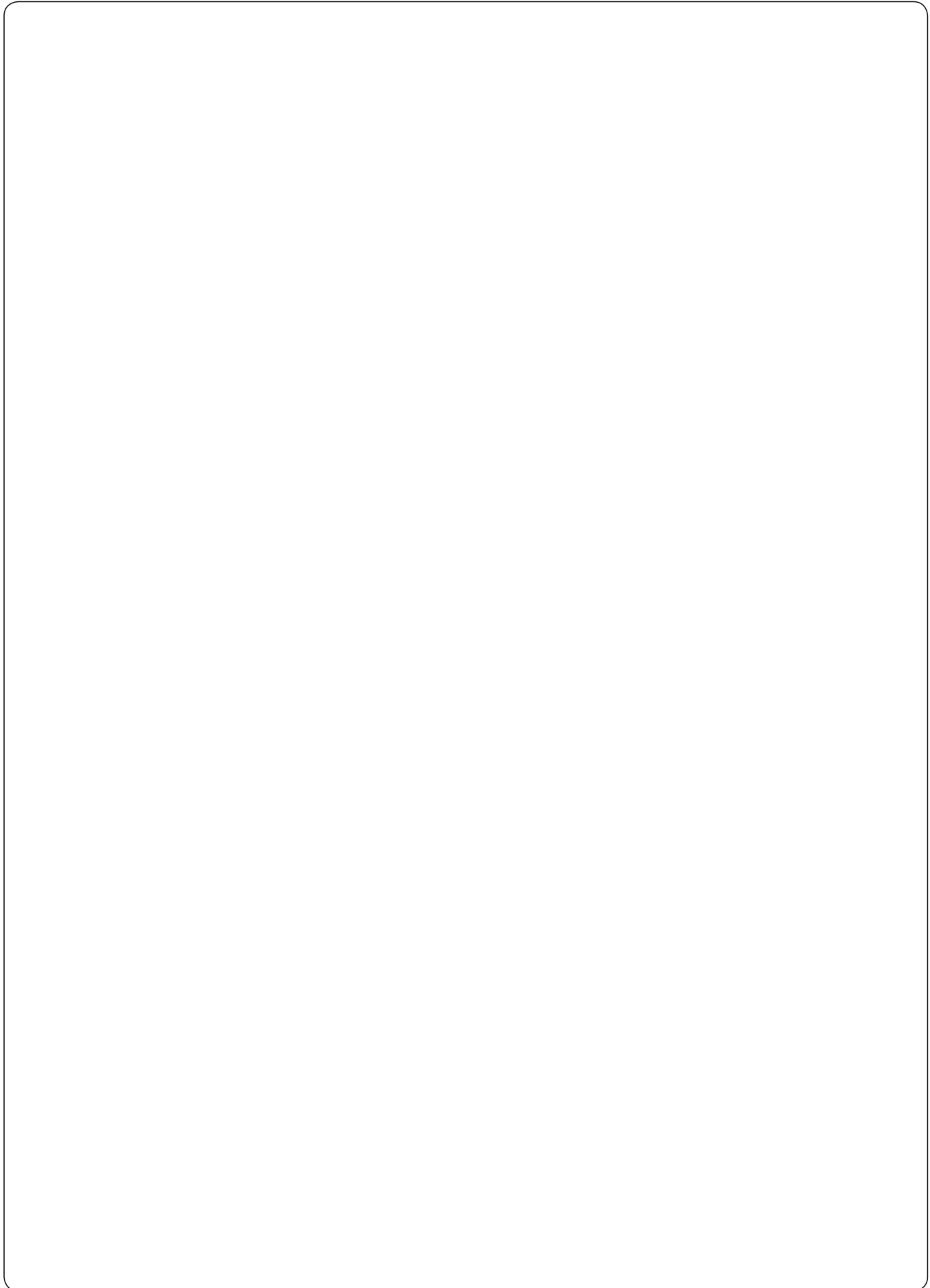
Order No	stroke max.	I <sub>min.</sub>	I	spring force (daN)								
				.00020.		.00040.		.00080.		.00170.		
				initial	final	initial	final	initial	final	initial	final	
2479.032.	010	10	55	65	23	33,1	45	64,8	85	122,4	170	244,8
	020	20	65	85		36,3		71,1		134,3		268,6
	030	30	75	105		38,2		74,7		141,1		282,2
	040	40	85	125		39,3		76,9		145,4		290,7
	050	50	95	145		42,5		83,2		157,3		314,5
	060	60	105	165		42,5		83,2		157,3		314,5
	070	70	115	185		42,8		83,7		158,1		316,2
	080	80	125	205		42,8		83,7		158,1		316,2
	100	100	145	245		43,0		84,1		159,0		318,0
	125	125	170	295		43,0		84,1		159,0		318,0

**Ordering Code (example):**

Gas Spring with hexagon socket (Ejector Pin Unit) M24 × 1,5	= 2479.032.
Force 20 daN	= 00020.
Stroke 20 mm	= 020
Order No	= 2479.032.00020.020

**Spring Force Colour Markings:**

Order No	Colour	initial spring force daN	pressure (bar)
2479.032. 00020.	green	23	20
00040.	blue	45	40
00080.	redt	85	75
00170.	yellow	170	150
00000.	black, upon customers request; also available unfilled		



# FIBRO

2471.01./02. 2471.31./32.  
2471.03./04. 2471.33./34.

## Spring Plungers with Spring Loaded Ball with slot with hexagon socket head

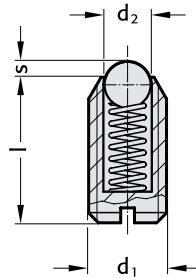
### Material:

- 2471.01. Sleeve: Free-maching steel, burnished  
Ball: Hardened ball bearing steel  
Spring: Nirosta
- 2471.02. Sleeve: Free-maching steel, burnished  
Ball: Hardened ball bearing steel/  
ball yellow  
Spring: Nirosta
- 2471.31. Sleeve: Nirosta 1.4305  
Ball: Nirosta, hardened  
Spring: Nirosta
- 2471.32. Sleeve: Nirosta 1.4305/end of sleeve yellow  
Ball: Nirosta, hardened  
Spring: Nirosta

### Note:

For locking and for pressing upwards or downwards.  
Admissible temperature range: max. 250 °C

2471.01./2471.02.  
2471.31./2471.32.



2471.01./31. Normal spring force

Order No	d <sub>1</sub>	l	s	d <sub>2</sub>	Spring force in N*	
					Start	End
2471.003	M 3	7	0,4	1,5	3	4,5
004	M 4	9	0,8	2,5	8,5	14
005	M 5	12	0,9	3	8	14
006	M 6	14	1	3,5	11	18
008	M 8	16	1,5	4,5	18	31
010	M 10	19	2	6	24	45
012	M 12	22	2,5	8	26	49
016	M 16	24	3,5	10	41	86
020	M 20	30	4,5	12	56	111
024	M 24	34	5,5	15	81	151

\* statistical average

2471.02./32. Increased spring force

Order No	d <sub>1</sub>	l	s	d <sub>2</sub>	Spring force in N*	
					Start	End
2471.005	M 5	12	0,9	3	15	22
006	M 6	14	1	3,5	19	28
008	M 8	16	1,5	4,5	36	62
010	M 10	19	2	6	57	104
012	M 12	22	2,5	8	61	110
016	M 16	24	3,5	10	68	142
020	M 20	30	4,5	12	84	166
024	M 24	34	5,5	15	127	237

\* statistical average

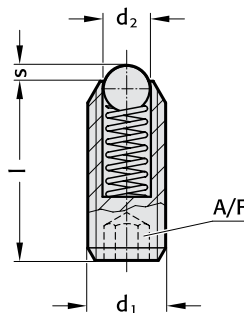
### Material:

- 2471.03. Sleeve: Free-maching steel, burnished  
Ball: Hardened ball bearing steel  
Spring: Nirosta
- 2471.04. Sleeve: Free-maching steel, burnished  
Ball: Hardened ball bearing steel/  
ball yellow  
Spring: Nirosta
- 2471.33. Sleeve: Nirosta 1.4305  
Ball: Nirosta, hardened  
Spring: Nirosta
- 2471.34. Sleeve: Nirosta 1.4305/  
end of sleeve yellow  
Ball: Nirosta, hardened  
Spring: Nirosta

### Note:

For locking and for pressing upwards or downwards.  
Admissible temperature range: max. 250 °C

2471.03./2471.04.  
2471.33./2471.34.



2471.03./33. Normal spring force

Order No	d <sub>1</sub>	d <sub>2</sub>	l	s	A/F	Spring force in N*	
						Start	End
2471.003	M 3	1,5	8	0,4	1,5	3	4,5
004	M 4	2,5	12	0,8	2	8,5	14
005	M 5	3	14	0,9	2,5	8	14
006	M 6	3,5	15	1	3	11	18
008	M 8	4,5	18	1,5	4	18	31
010	M 10	6	23	2	5	24	45
012	M 12	8	26	2,5	6	26	49
016	M 16	10	33	3,5	8	41	86
020	M 20	12	43	4,5	10	56	111
024	M 24	15	48	5,5	12	81	151

\* statistical average

2471.04./34. Increased spring force

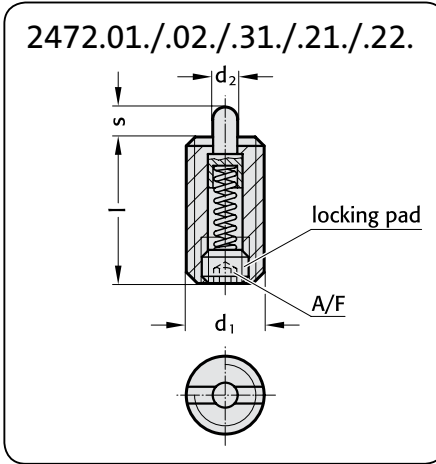
Order No	d <sub>1</sub>	d <sub>2</sub>	l	s	A/F	Spring force in N*	
						Start	End
2471.005	M 5	3	14	0,9	2,5	15	22
006	M 6	3,5	15	1	3	19	28
008	M 8	4,5	18	1,5	4	36	62
010	M 10	6	23	2	5	57	104
012	M 12	8	26	2,5	6	61	110
016	M 16	10	33	3,5	8	68	142
020	M 20	12	43	4,5	10	84	166
024	M 24	15	48	5,5	12	127	237

\* statistical average

# Spring Plungers with Spring Loaded Pin, with slot, with hexagon socket head

**FIBRO**

2472.01./02. 2472.31./21./22.  
2472.03./04./33./34.



**Material:**  
 2472.01. Sleeve: Free-maching steel, burnished  
 Pin: Free machining steel hardened, burnished  
 Spring: Nirosa  
 2472.02. Sleeve: Free-maching steel, burnished  
 Pin: Free machining steel hardened, burnished/  
 threaded pin shining  
 Spring: Nirosa  
 2472.31. Sleeve: Nirosa 1.4305  
 Pin: Nirosa 1.4305  
 Spring: Nirosa  
 2472.21. Sleeve: Free-maching steel, burnished  
 Pin: Delrin white (FOM)  
 Spring: Nirosa  
 2472.22. Sleeve: Nirosa 1.4305  
 Pin: Delrin white(FOM)  
 Spring: Nirosa

**Note:**  
 For locking and for pressing upwards or downwards.  
 Removable with hexagon socket screw key or slotted screwdriver.

2472.01./31./21./22. Normal spring force

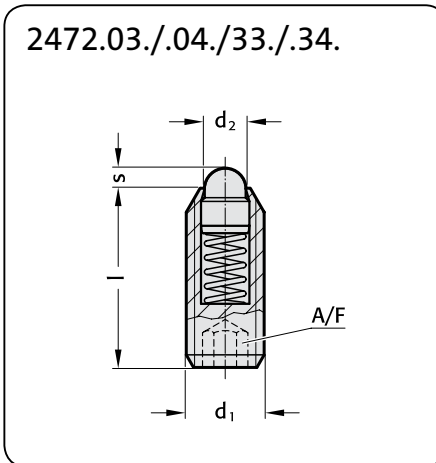
Order No	d <sub>1</sub>	d <sub>2</sub>	l	s	A/F	Spring force in N*	
						Start	End
2472.003	M 3	1	12	1	0,7	2,0	4
004	M 4	1,5	15	1,5	1,3	4,5	16
005	M 5	2,4	18	2,3	1,5	6,0	19
006	M 6	2,7	20	2,5	2	6,0	19
008	M 8	3,5	22	3	2,5	10	39
010	M 10	4	22	3	3	10	39
012	M 12	6	28	4	4	12	53
016	M 16	7,5	32	5	5	45	100
020	M 20	10	40	7	6	52	125
024	M 24	12	52	10	8	70	170

\* statistical average  
 Execution: 2472.31.- d<sub>1</sub> = M4 to M20  
 2472.21.- d<sub>1</sub> = M4 to M16  
 2472.22.- d<sub>1</sub> = M4 to M16

2472.02. Increased spring force

Order No	d <sub>1</sub>	d <sub>2</sub>	l	s	A/F	Spring force in N*	
						Start	End
2472.02.005	M 5	2,4	18	2,3	1,5	11	40
006	M 6	2,7	20	2,5	2	15	43
008	M 8	3,5	22	3	2,5	20	75
010	M 10	4	22	3	3	20	75
012	M 12	6	28	4	4	45	120
016	M 16	7,5	32	5	5	64	160
020	M 20	10	40	7	6	75	195
024	M 24	12	52	10	8	75	245

\* statistical average



**Material:**  
 2472.03. Sleeve: Free-maching steel, burnished  
 Pin: Free machining steel hardened, burnished  
 Spring: Nirosa  
 2472.04. Sleeve: Free-maching steel, burnished  
 Pin: Free machining steel hardened, burnished/  
 pin - blue galvanised  
 Spring: Nirosa  
 2472.33. Sleeve: Nirosa 1.4305  
 Pin: Nirosa 1.4305  
 Spring: Nirosa  
 2472.34. Sleeve: Nirosa 1.4305/end of sleeve yellow  
 Pin: Nirosa 1.4305  
 Spring: Nirosa

**Note:**  
 For locking and for pressing upwards or downwards.  
 Admissible temperature range: max. 250°C

2472.03./33. Normal spring force

Order No	d <sub>1</sub>	d <sub>2</sub>	l	s	A/F	Spring force in N*	
						Start	End
2472.004	M 4	1,8	12	1,5	2	4,5	12,5
005	M 5	2,4	14	2	2,5	5	13
006	M 6	2,7	15	2	3	6	17
008	M 8	3,8	18	2	4	16	33
010	M 10	4,5	23	2,5	5	19	42
012	M 12	6,2	26	3,5	6	22	57
016	M 16	8,5	33	4,5	8	38	78
020	M 20	10,0	43	6,5	10	39	81
024	M 24	13,0	48	8	12	72	155

\* statistical average

2472.04./34. Increased spring force

Order No	d <sub>1</sub>	d <sub>2</sub>	l	s	A/F	Spring force in N*	
						Start	End
2472.006	M 6	2,7	15	2	3	11	25
008	M 8	3,8	18	2	4	23	59
010	M 10	4,5	23	2,5	5	20	54
012	M 12	6,2	26	3,5	6	38	96
016	M 16	8,5	33	4,5	8	50	100
020	M 20	10,0	43	6,5	10	52	133
024	M 24	13,0	48	8	12	91	223

\* statistical average

# FIBRO

2472.05./06./35./36.  
2471.05. 2471.35.

## Spring Plungers with Spring Loaded Pin, with slot Plastic, with Spring Loaded Ball, with slot

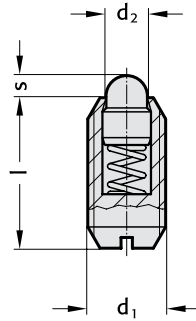
### Material:

- 2472.05. Sleeve: Free machining steel, burnished  
Pin: Free machining steel, burnished  
Spring: Nirosta
- 2472.06. Sleeve: Free machining steel, burnished  
Pin: Free machining steel, hardened, burnished/Pin blue galvanised  
Spring: Nirosta
- 2472.35. Sleeve: Nirosta 1.4305  
Pin: Nirosta 1.4305  
Spring: Nirosta
- 2472.36. Sleeve: Nirosta 1.4305  
Pin: Nirosta 1.4305/end of sleeve yellow  
Spring: Nirosta

### Note:

For locking and for pressing upwards or downwards.  
Admissible temperature range: max. 250°C

2472.05./2472.06.  
2472.35./2472.36.



2472.05./35. Normal spring force

Order No	d1	d2	l	s	Spring force in N*	
					Start	End
2472.004	M 4	1,8	9	1,5	4,5	12,5
005	M 5	2,4	12	2	5	13,0
006	M 6	2,7	14	2	6	17
008	M 8	3,8	16	2	16	33
010	M 10	4,5	19	2,5	19	42
012	M 12	6,2	22	3,5	22	57
016	M 16	8,5	24	4,5	38	78
020	M 20	10	30	6,5	39	81
024	M 24	13	34	8	72	155

\* statistical average

2472.06./36. Increased spring force

Order No	d1	d2	l	s	Spring force in N*	
					Start	End
2472.006	M 6	2,7	14	2	11	25
008	M 8	3,8	16	2	23	59
010	M 10	4,5	19	2,5	20	54
012	M 12	6,2	22	3,5	38	96
016	M 16	8,5	24	4,5	50	100
020	M 20	10	30	6,5	52	133
024	M 24	13	34	8	91	223

\* statistical average

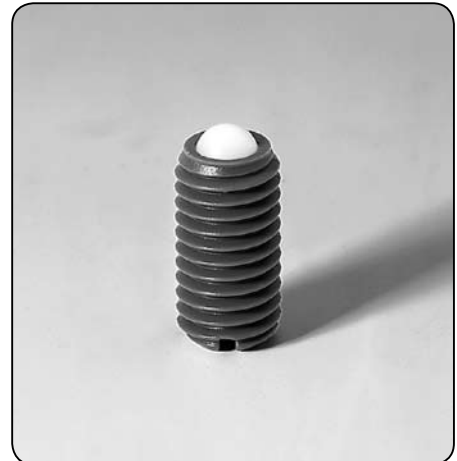
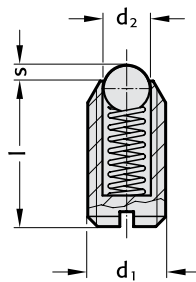
### Material:

- 2471.05. Sleeve: Delrin blue (POM)  
Ball: Delrin white (POM)  
Spring: Nirosta
- 2471.35. Sleeve: Delrin blue (POM)  
Ball: Nirosta, hardened  
Spring: Nirosta

### Note:

For locking and for pressing upwards or downwards.  
Admissible temperature range  
-30°C to +50°C.

2471.05./2471.35.



2471.05./35.

Order No	d1	d2	l	s	Spring force in N*	
					Start	End
2471.006	M 6	14	0,9	3,5	12	17
008	M 8	16	1,5	5	20	35
010	M 10	19	1,9	6	25	45

\* statistical average

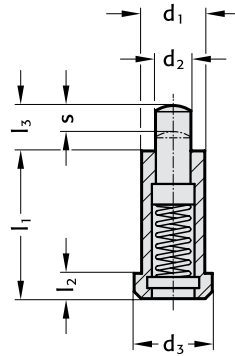
# Spring Plungers straight version with shoulder Thrust pad driver

**FIBRO**

2473.01. 2475.01./02./03./04.  
2472.11.



2473.01.



**Material:**

2473.01.  
Sleeve: Free-machining steel, burnished  
Pin: Steel, case hardened, burnished  
Spring: Nirosta

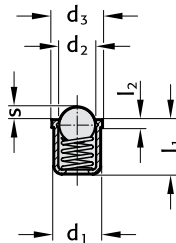
**Note:**

For use in toolmaking as forcing pins and spring loaded limit stops. Neither the threaded cartridge nor any of its components can escape from the mounting.

Temperature operating range: max. 250 °C



2475.01./02.  
2475.03./04.



**Material:**

2475.01. Sleeve: Delrin blue (POM)  
Ball: Delrin white (POM)  
Spring: Nirosta  
2475.02. Sleeve: Delrin blue (POM)  
Ball: Nirosta, hardened  
Spring: Nirosta  
2475.03. Sleeve: Brass  
Ball: Nirosta, hardened  
Spring: Nirosta  
2475.04. Sleeve: Nirosta 1.4303  
Ball: Nirosta, hardened  
Spring: Nirosta

**Note:**

For locking and for pressing upwards or downwards.  
Admissible temperature range: -30°C to +50°C (2475.01./02.)  
max. 250°C (2475.03./04.)

2473.01/ 2475.01./02.

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	s	Spring force*	
								Start	End
2473.01.006	6	2,7	8	20	3,2	6	3,5	10	22
008	8	3,9	10	24	3,2	8	4,5	30	88
010	10	5,9	13	30	4	10	5,5	42	110
012	12	7,9	16	36	5	12	6,5	50	130
2475.01.004	4	3	4,6	5	1		0,8	2,5	6,5
005	5	4	5,6	6	1		1	4,5	9
006	6	5	6,5	7	1		1,6	6,5	13
008	8	6,5	8,5	9	1		1,9	8	18
010	10	8	11	13,5	1,5		2,4	12	23
012	12	10	13	16	1,5		3,3	13	25

\* statistical average

2475.03./04.

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>1</sub>	l <sub>2</sub>	s	Spring force*	
							Start	End
2475.03.004	4	2,5	4,5	5	1	0,8	2,5	6
005	5	3,5	5,5	6	1	1	3	6,5
006	6	4,5	6,5	7	1	1,6	5,5	11,5
008	8	6	8,5	9	1	1,9	7	12,5
2475.04.004	4	3	4,6	5	0,9	1	2,5	6
005	5	4	5,6	6	0,9	1,4	3	6,5
006	6	5	6,5	7	1	1,8	5,5	11,5
008	8	6,5	8,5	9	1,1	2,4	7	12,5
010	10	8,5	11	13	1,7	3,3	8,5	18,5
012	12	10	13	16	2,3	4,0	12	26,5

\* statistical average

2472.11.003 up to  
2472.11.020



2472.11.024



2472.11. Thrust pad driver  
for 2472.01./02.

Order No	for thread
2472.11.003	M 3
004	M 4
005	M 5
006	M 6
008	M 8
010	M 10
012	M 12
016	M 16
020	M 20
024	M 24

# FIBRO

2472.07./08./37.  
2473.02.

## Spring Plungers with hexagon socket head and seal straight version without shoulder

### Material:

2472.07.

Sleeve: Free-machining steel, burnished  
Pin: Free-machining steel hardened, burnished

Spring: Nirosta

2472.08.

Sleeve: Free-machining steel, burnished  
Pin: Free-machining steel hardened, burnished/threaded pin shinning

Spring: Nirosta

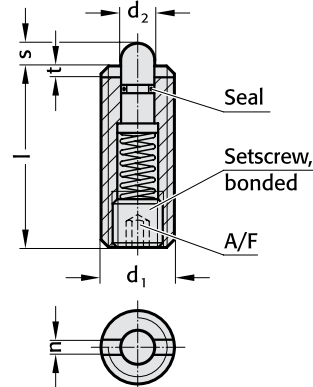
2472.37.

Sleeve: Nirosta 1.4305

Pin: Nirosta 1.4305

Spring: Nirosta

2472.07./08./37.



2472.07./08./37.

Order No	d <sub>1</sub>	d <sub>2</sub>	l	n	s	t	A/F	Spring force*	
								Start	End
2472.07.008	M 8	3,8	26	1,5	3	1,4	2,5	9	24
010	M10	4	28	1,5	3,5	1,4	3	15	30
012	M12	6	35	2,7	4	2	4	24	50
016	M16	7,5	40	3,2	5	2,5	5	36	58
2472.08.008	M 8	3,8	26	1,5	3	1,4	2,5	17	39
010	M10	4	28	1,5	3,5	1,4	3	22	43
012	M12	6	35	2,7	4	2	4	40	80
016	M16	7,5	40	3,2	5	2,5	5	44	113

\* statistical average

### Note:

For locking and for pressing upwards or downwards.

The seal prevents the ingress of liquids into the forcing pin.

Assembly and dismantling using hexagon socket key and slotted screwdriver.

Temperature operating range: -30°C up to 80°C

### Material:

2473.02.

Sleeve: Nirosta 1.4305

Ball: Nirosta, hardened

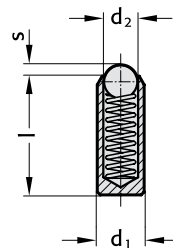
Spring: Nirosta

### Note:

For locking and for pressing upwards or downwards.

Admissible temperature range: max. 250°C

2473.02.



2473.02.

Order No	d <sub>1</sub>	d <sub>2</sub>	l	s	Spring force	
					Start	Ende
2473.02.030	3	2	7	0,65	4,5	7,5
035	3,5	2,5	9	0,80	6	14,5
040	4	3	11	0,90	8	14
045	4,5	3,2	12	0,95	9,5	16,5
050	5	3,5	13	1	11	18
055	5,5	4	14	1,20	15,5	25
060	6	4,5	15	1,5	18	31

\* statistical average

# Stripping Units

## Wall and Bottom mounting

### Flanged mounting

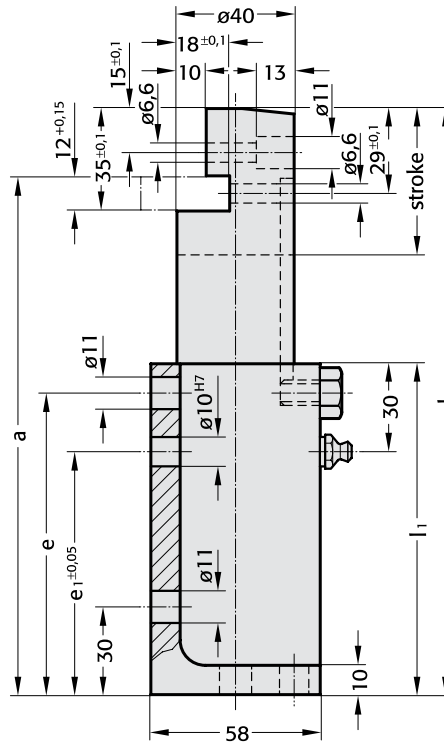
**FIBRO**

2477.  .  .  .1.01

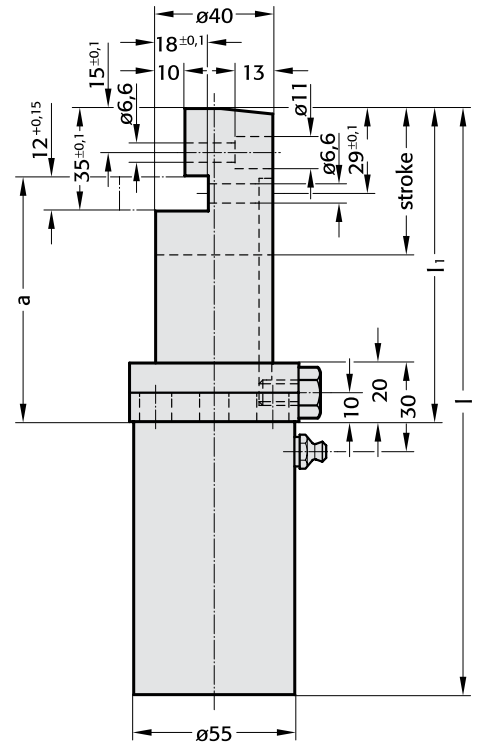
2477.  .  .  .1.02



2477.  .  .  .1.01



2477.  .  .  .1.02



2477.  .  .  .1.01

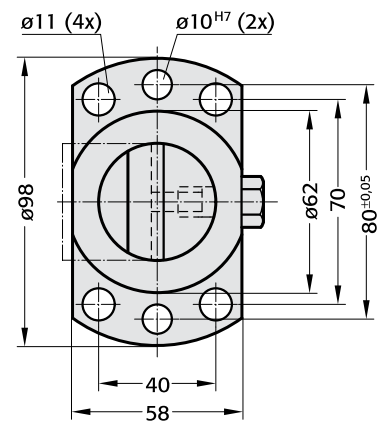
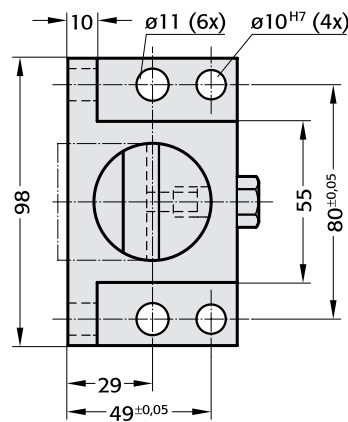
Stroke	l	l <sub>1</sub>	a	e	e <sub>1</sub>
50	200	113	177	103	83
80	260	143	237	133	113

with four different initial spring forces in daN =

00050
00100
00150
00200

### Ordering Code (example):

Stripping Unit	=	2477.
Stroke 50 mm	=	050.
Force 200 daN	=	00200.
Gas Spring	=	1.
W-B-mounting.	=	01
Order No	=	2477.050.00200.1.01



2477.  .  .  .1.02

Stroke	l	l <sub>1</sub>	a
50	200	107	84
80	260	137	114

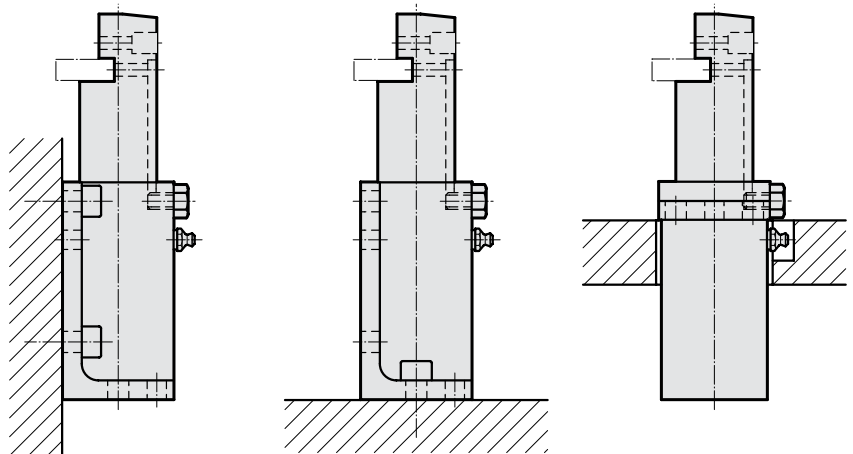
with four different initial spring forces in daN =

00050
00100
00150
00200

### Ordering Code (example):

Stripping Unit	=	2477.
Stroke 50 mm	=	050.
Force 200 daN	=	00200.
Gas spring	=	1.
Flanged mounting	=	02
Order No	=	2477.050.00200.1.02

### Mounting Examples





# FIBRO

2478.10.

## Stock lifters

2478.10. 00050.  
00100.  
00150.  
00200.  
00250.  
00320.

Order No	Stroke	$l_{min.}$	l
2478.10. 00050.	25	121	146
00100.	50	146	196
00150.	80	176	256
00200.	100	196	296
00250.	125	221	346
00320.	150	246	396

Spring forces as per Spring Diagram

Order No for spare parts kit:  
2478.10.00320

### Description:

All component lifters in the various gas spring classes are of the same design and the different spring forces are achieved solely by means of different gas pressures. The pressure can be topped up or reduced via the piston rod.

### Spring Force Colour Markings

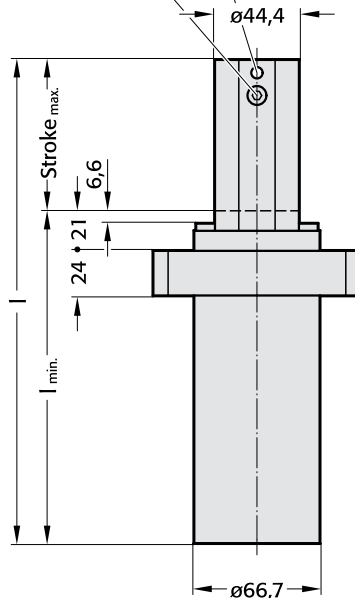
Order No	initial spring force daN	pressure bar
2478.10.00050.	50	28
00100.	100	56
00150.	150	84
00200.	200	113
00250.	250	141
00320.	320	180
00000.*		

\* upon customers request, also available unfilled

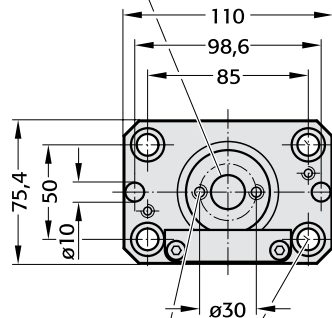
2478.10.

for 8 mm spring pin

G $\frac{1}{8}$  Connection



ø18 x 14,6 deep



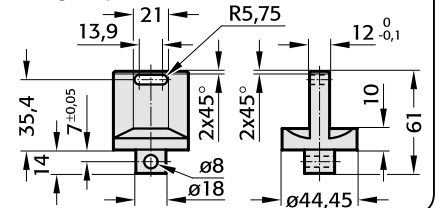
M8 x 16 deep (2x)

Counterbore for socket cap screw M10 (4x)



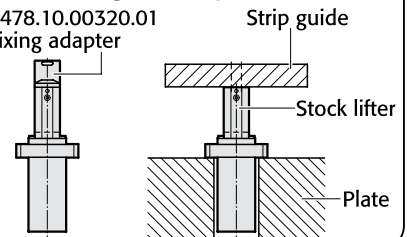
2478.10.00320.01

Fixing adapter



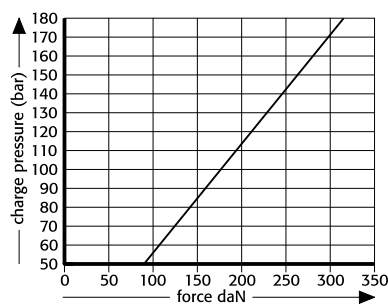
### Mounting example:

2478.10.00320.01  
Fixing adapter



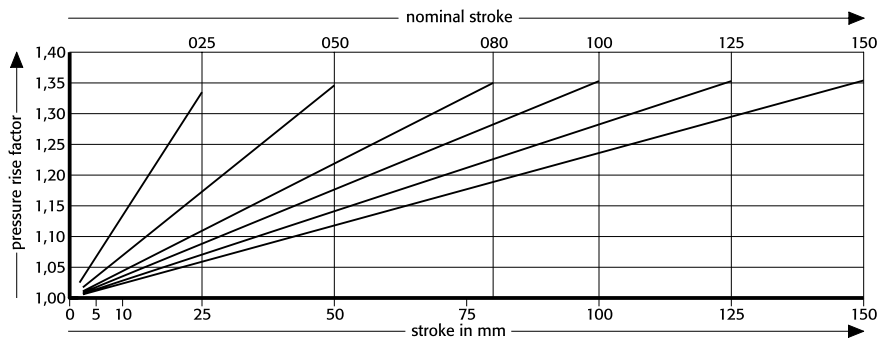
2478.10.

Initial spring force versus charge pressure



2478.10.

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

Pressure medium: Nitrogen N<sub>2</sub>  
Max. filling pressure: 180 bar  
Min. filling pressure: 25 bar  
Working temperature: 0°C to +80°C  
Temp. related force increase: ±0.3 %/°C  
Max. recommended extensions per minute: approx. 80 to 100 (at 20°C)  
Max. piston speed: 1.6 m/s

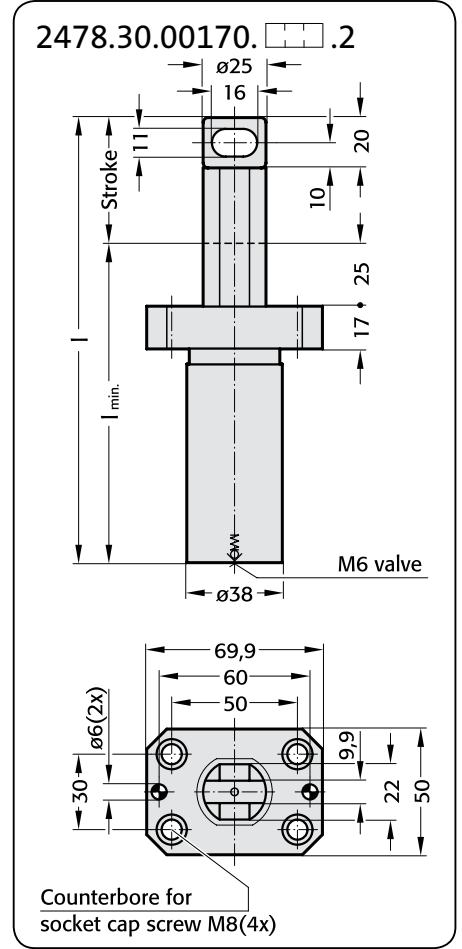
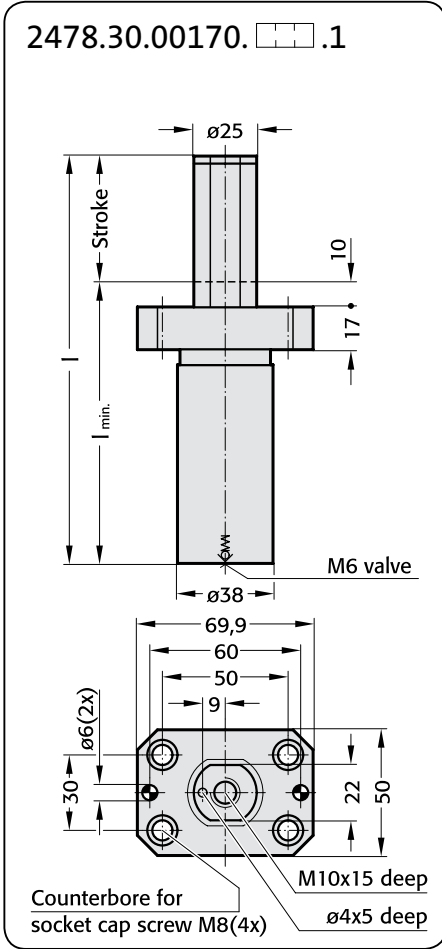


# Stock lifters Stock lifters with attachment lug

**FIBRO**

2478.30.00170.  .1

2478.30.00170.  .2



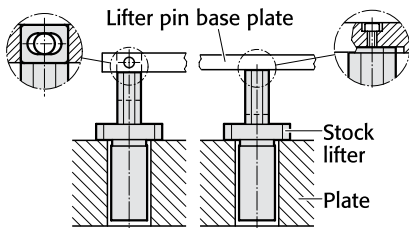
### Description:

The cylinder base can be used for topping up and reducing gas pressure and for interconnection arrangements.

### Note:

Stocklifters are equipped with a "Power Line" 2487.12.00170. gas spring with no option for wear compensation, so complete replacement is required.

### Mounting examples:



2478.30.00170.  .1

Order No	Stroke	$l_{min}$	l
2478.30.00170.025.1	25	87	112
038.1	38	100	138
050.1	50	112	162
080.1	80	145	225
100.1	100	165	265
125.1	125	190	315

Refer to diagrams for spring forces

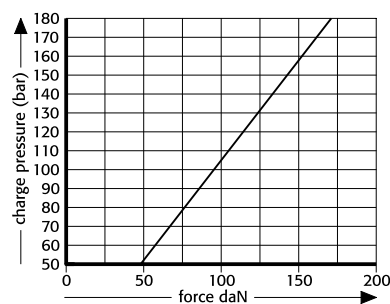
2478.30.00170.  .2

Order No	Stroke	$l_{min}$	l
2478.30.00170.025.2	25	102	127
038.2	38	115	153
050.2	50	127	177
080.2	80	160	240
100.2	100	180	280
125.2	125	205	330

Refer to diagrams for spring forces

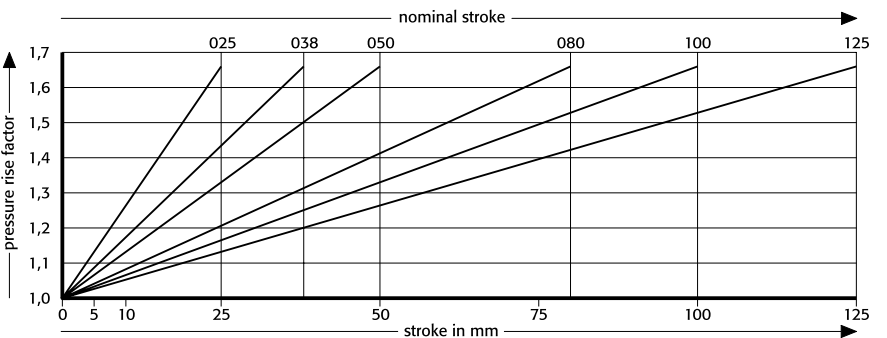
### 2478.30.

Initial spring force versus charge pressure



### 2478.30.

Spring force Diagram displacement versus stroke rise



Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 180 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0°C to +80°C  
 Temp. related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 40 to 100 (at 20°C)  
 Max. piston speed: 1.6 m/s  
 Max. effective travel: 100%

Pressure rise factor accounts for displacement but not external influences!

A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.

Lifting units to Daimler standard

2478.20.20.

Mounting example:

2082.70.  
Guide bush with collar  
as per DIN 9834/ISO 9448  
Bronze with solid lubricant  
(see page D114)

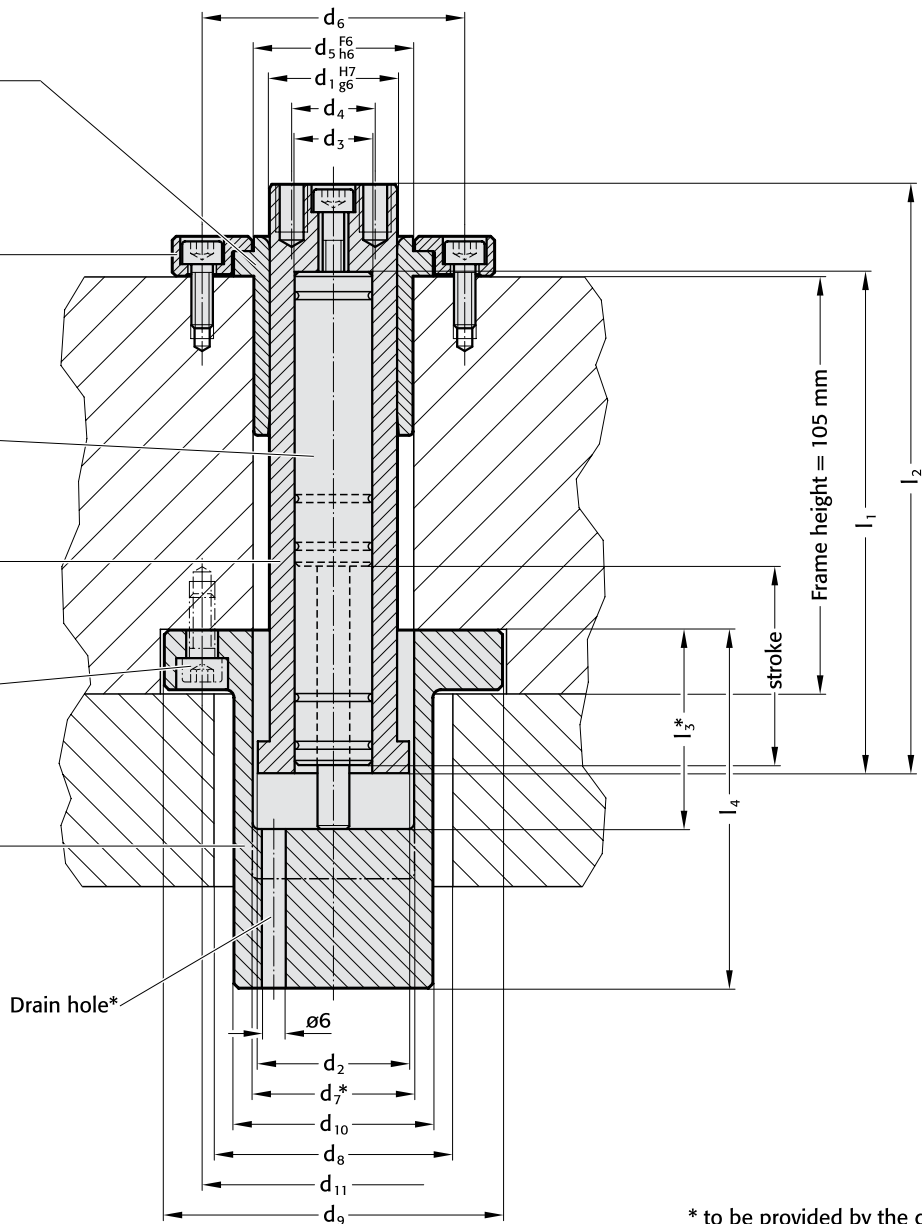
2072.45.10  
Holding piece (2x)  
incl. socket head screw M6x16  
as per DIN EN ISO 4762  
(see page D216)

2482.74.  
Gas spring  
(see page F129)

2478.20.20.1  
Guide pillar  
(see opp. page)

2192.12.08.020 (3x)  
Socket head screw M8x20  
as per DIN EN ISO 4762  
(order separately)

2478.20.20.2  
Sleeve  
(see opp. page)



\* to be provided by the customer

Note:

Frame height = 105 mm

Depending on the frame height and the installation type of the sleeve 2478.20.20.2. ( $l_3$  - tapped bore in the frame or cut-out in the cast), the countersink varies for the determination of the lifting path.

Size	Stroke	$d_1$	$d_2$	$d_3$	$d_4$	$d_5$	$d_6$	$d_7^*$	$d_8$	$d_9$	$d_{10}$	$d_{11}$	$l_1$	$l_2$	$l_3^*$	$l_4$
1	min. 5 max. 35	32	38	19.5	21	40	66	40	60	85	50	67	81	113	-	-
2	min. 40 max. 70	32	38	19.5	21	40	66	40	60	85	50	67	126	148	-	90
3	min. 75 max. 115	32	38	19.5	21	40	66	40	60	85	50	67	176	208	-	150

\* to be provided by the customer

The lifting unit must be ordered in three sizes with the respective order numbers of the individual parts:

Size	1	2	3
Guide pillar	2478.20.20.1.01	2478.20.20.1.02	2478.20.20.1.03
Sleeve	-	2478.20.20.2.02	2478.20.20.2.03
Guide bush	2082.70.032	2082.70.032	2082.70.032
Gas spring	2482.74.00090.038	2482.74.00090.080.1	2482.74.00090.125
Holding piece (2x) incl. socket head screw M6x16 DIN EN ISO 4762	2072.45.10	2072.45.10	2072.45.10

# FIBRO

2478.20.20.1  
2478.20.20.2

## Guide pillars and Sleeves for lifting units to Daimler standard

### Material:

Steel, surface hardened  
Induction hardened 60+3 HRC  
Hardness penetration depth > 1.8 mm

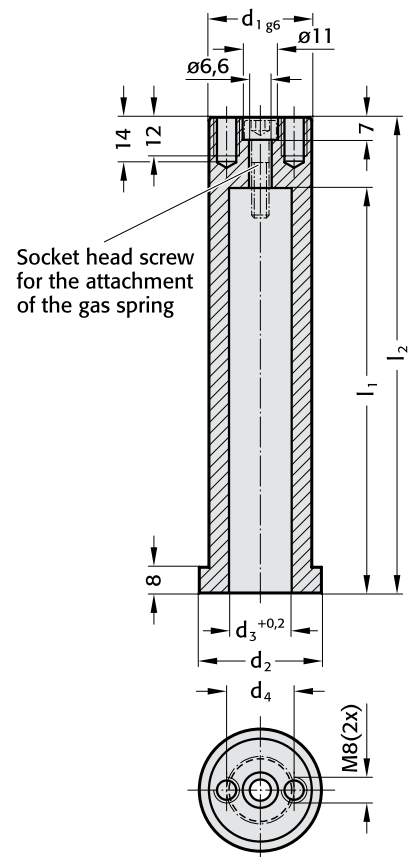
### Note:

The socket head screw for the attachment of the gas spring is included with delivery.

### 2478.20.20.1

Order No	Size	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	l <sub>1</sub>	l <sub>2</sub>
2478.20.20.1.01	1	32	38	19.5	21	81	113
2478.20.20.1.02	2	32	38	19.5	21	126	148
2478.20.20.1.03	3	32	38	19.5	21	176	208

### 2478.20.20.1



### Material:

Steel

### Note:

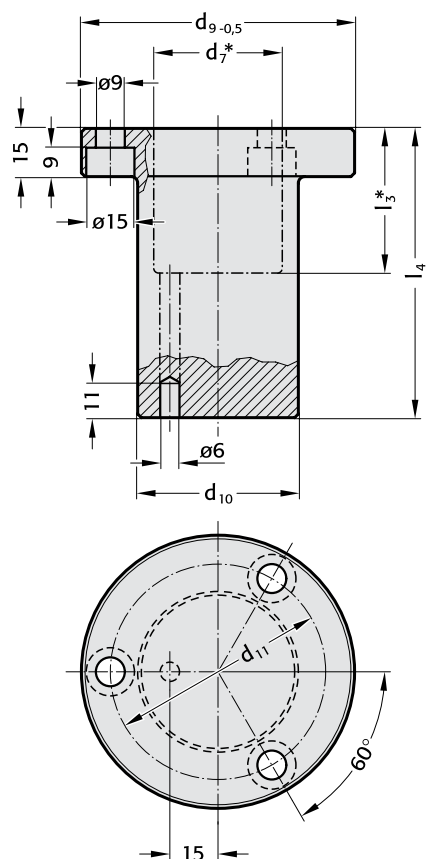
The sleeve is supplied without countersink. Integrating countersink  $l_3$  (to be provided by the customer) determines the lifting path.

The drain hole is pre-drilled as a blind hole with a  $\varnothing$  of 6 mm and must also be modified.

### 2478.20.20.2

Order No	Size	d <sub>7</sub> *	d <sub>9</sub>	d <sub>10</sub>	d <sub>11</sub>	l <sub>3</sub> *	l <sub>4</sub>
2478.20.20.2.02	2	40	85	50	67	-	90
2478.20.20.2.03	3	40	85	50	67	-	150

### 2478.20.20.2

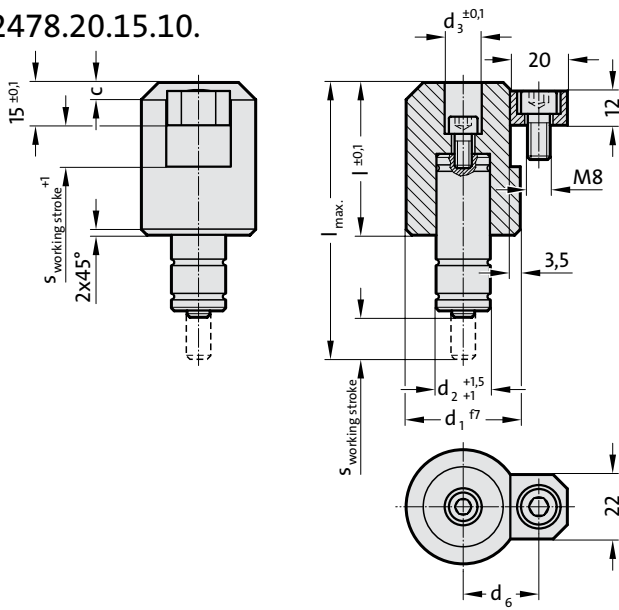


\* to be provided by the customer

Lifters, round with pilot pin hole to BMW Standard

2478.20.15.10.

2478.20.15.10.



Execution:

Assembly consisting of:

- Lifter
- Gas spring
  - Ø 19 mm (1) = 2482.74.00030.  
Spring force 30 daN  
Filling pressure 60 bar
  - or
  - Ø 25 mm (2) = 2480.21.00050.  
Spring force 50 daN  
Filling pressure 45 bar
- Screw clamp with screw M6x12 (ISO 4762)
- Socket cap screw M8x16 (ISO 4762)

Note:

\* $s_{working\ stroke}$  suitable = max. allowable spring stroke minus 10 % stroke reserve of nominal stroke length, from stroke of 50 mm only max. 5 mm.

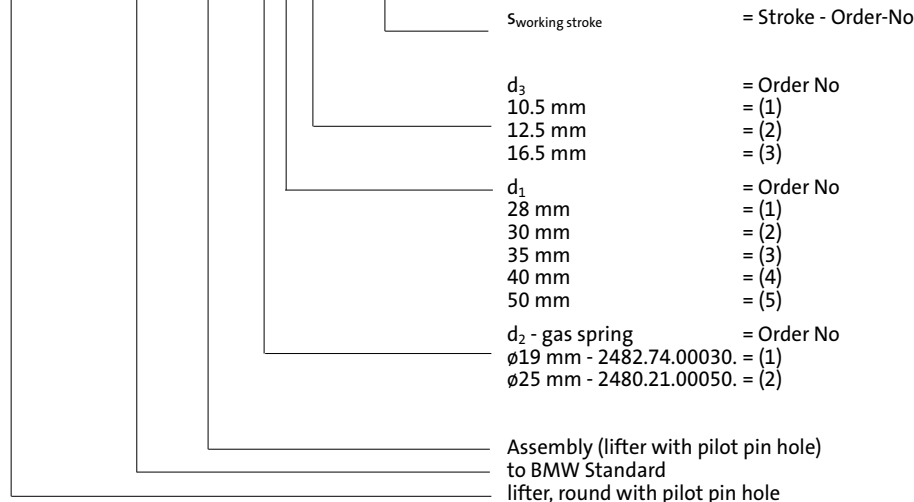
2478.20.15.10.

$d_1$	28	28	30	30	35	35	40	40	40	40	40	50	50	50	50			
$d_2$	19	19	19	19	25	25	19	19	19	25	25	19	19	25	25			
$d_3$	10.5	12.5	10.5	12.5	12.5	16.5	10.5	12.5	16.5	12.5	16.5	12.5	16.5	12.5	16.5			
$d_6$	20.5	20.5	21.5	21.5	24	24	26.5	26.5	26.5	26.5	26.5	31.5	31.5	31.5	31.5			
c	4x45°	4x45°	5x45°	5x45°	5x45°	5x45°	6x45°	6x45°	6x45°	6x45°	6x45°	8x45°	8x45°	8x45°	8x45°			
l	$l_{max}$	* $s_{working\ stroke}$	stroke Order No (Part 3)	(Part 2)														
49	87	9	009	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	.152.	.153.	.252.	.253.
53.5	97	13.5	014	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	152.	.153.	.252.	.253.
62.5	117	22.5	023	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	152.	.153.	.252.	.253.
74	143	34	034	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	152.	.153.	.252.	.253.
85	167	45	045	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	152.	.153.	.252.	.253.
98.5	197	58.5	059	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	152.	.153.	.252.	.253.
115	230	75	075	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	152.	.153.	.252.	.253.
135	270	95	095	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	152.	.153.	.252.	.253.
160	320	120	120	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	152.	.153.	.252.	.253.

Ordering Code (example):

Order No:

Part 1                      Part 2      Part 3  
**2 4 7 8 . 2 0 . 1 5 . 1 0 . 1 5 3 . 0 0 9**



**Lifter Units with Installation Block according to BMW standard**

**Material:**

Steel

**Execution:**

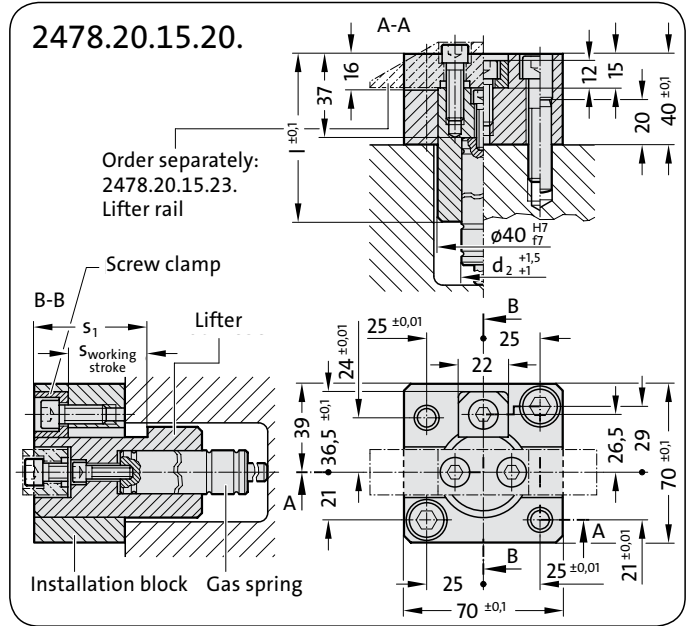
Lifter unit with installation block comprises:

- Installation block
- Lifter
- Screw clamp
- Gas spring 2482.74.00030. or 2480.21.00050.
- Socket cap screw according to ISO 4762  
M6 x 20 (1x), M8 x 20 (1x), M8 x 25 (2x), M10 x 45 (2x)
- Dowel pin according to ISO 8735  $\varnothing 10 \times 40$  (2x)

**Note:**

Order separately (see installation example)

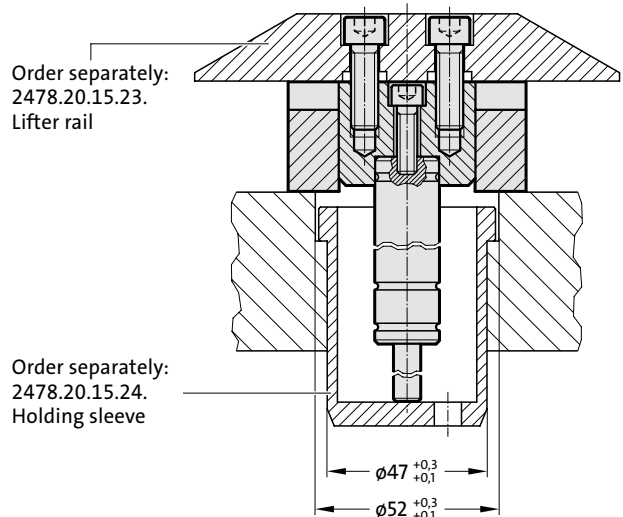
- 2478.20.15.23.: Lifter rail
- 2478.20.15.24.: Holding sleeve



**2478.20.15.20.**

l	s <sub>working stroke</sub>	s <sub>1</sub>	d <sub>2</sub> = $\varnothing 19$ gas spring	Order No.	d <sub>2</sub> = $\varnothing 25$ gas spring	Order No.
49	9	25	2482.74.00030.010	2478.20.15.20.14.009	2480.21.00050.010	2478.20.15.20.24.009
53.5	13.5	29.5	2482.74.00030.015	2478.20.15.20.14.014	2480.21.00050.015	2478.20.15.20.24.014
62.5	22.5	38.5	2482.74.00030.025	2478.20.15.20.14.023	2480.21.00050.025	2478.20.15.20.24.023
74	34	50	2482.74.00030.038	2478.20.15.20.14.034	2480.21.00050.038	2478.20.15.20.24.034
85	45	61	2482.74.00030.050	2478.20.15.20.14.045	2480.21.00050.050	2478.20.15.20.24.045
98.5	58.5	74.5	2482.74.00030.063.1	2478.20.15.20.14.059	2480.21.00050.063	2478.20.15.20.24.059
115	75	91	2482.74.00030.080.1	2478.20.15.20.14.075	2480.21.00050.080	2478.20.15.20.24.075
135	95	111	2482.74.00030.100	2478.20.15.20.14.095	2480.21.00050.100	2478.20.15.20.24.095
160	120	136	2482.74.00030.125	2478.20.15.20.14.120	2480.21.00050.125	2478.20.15.20.24.120

**Installation example:**

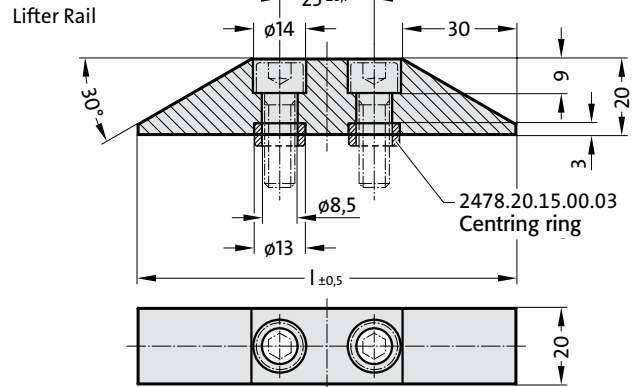


# Lifter Rails and Holding Sleeves for Lifter Units with Installation Block and Universal Lifter Units according to BMW Standard

**FIBRO**

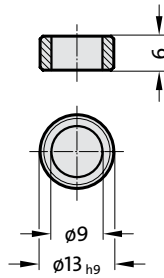
2478.20.15.23.  
2478.20.15.24.

## 2478.20.15.23.



## 2478.20.15.00.03

Centring ring  
(Order No. for reordering)



### Material:

Steel

### Note:

Delivery without screws and centring rings

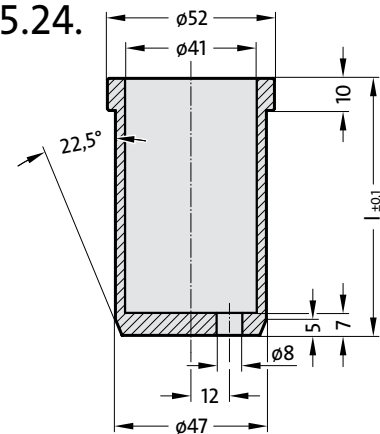
Screws and centring rings are already included in the scope of delivery for the lifter units 2478.20.15.20./30.

## 2478.20.15.23.

Order No.	l
2478.20.15.23.2020.100	100
2478.20.15.23.2020.125	125
2478.20.15.23.2020.150	150
2478.20.15.23.2020.175	175
2478.20.15.23.2020.200	200
2478.20.15.23.2020.250	250
2478.20.15.23.2020.300	300
2478.20.15.23.2020.350	350
2478.20.15.23.2020.400	400
2478.20.15.23.2020.450	450
2478.20.15.23.2020.500	500
2478.20.15.23.2020.550	550
2478.20.15.23.2020.600	600

## 2478.20.15.24.

Holding sleeve



### Material:

Steel

### Note:

Holding sleeve 2478.20.15.24. can only be used for lifter 2478.20.15.20. / 2478.20.15.30. Ø40 mm.

This is required when the panel is not thick enough. (see installation example 2478.20.15.20. / .30.)

## 2478.20.15.24.

Order No.	l
2478.20.15.24.04.040	40
2478.20.15.24.04.050	50
2478.20.15.24.04.060	60
2478.20.15.24.04.070	70
2478.20.15.24.04.080	80
2478.20.15.24.04.090	90
2478.20.15.24.04.100	100
2478.20.15.24.04.110	110
2478.20.15.24.04.120	120
2478.20.15.24.04.130	130
2478.20.15.24.04.140	140
2478.20.15.24.04.150	150
2478.20.15.24.04.160	160
2478.20.15.24.04.170	170
2478.20.15.24.04.180	180
2478.20.15.24.04.190	190
2478.20.15.24.04.200	200



**Material:** Steel

**Design:**

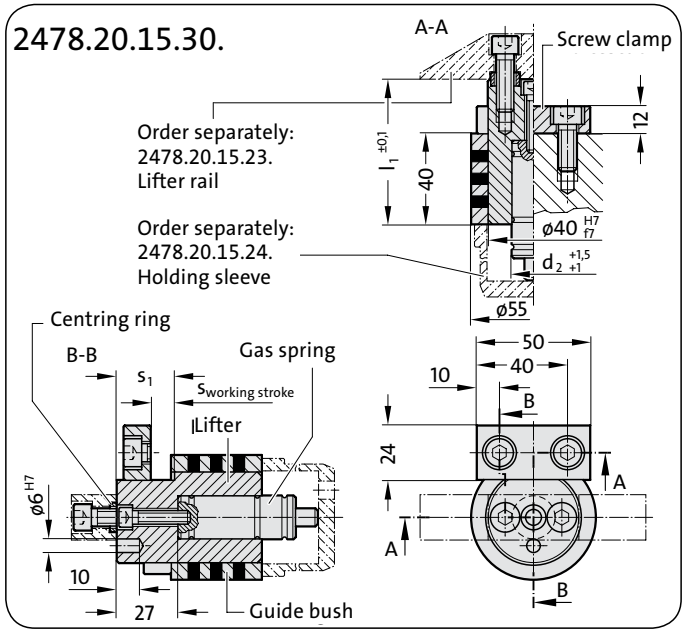
Universal lifter unit comprises

- Lifter
- Screw clamp
- Centring rings
- Guide bush
- Gas spring 2482.74.00030. or 2480.21.00050.
- Socket cap screw according to ISO 4762  
M6 x 25 (1x), M8 x 20 (2x), M8 x 25 (2x)

**Note:**

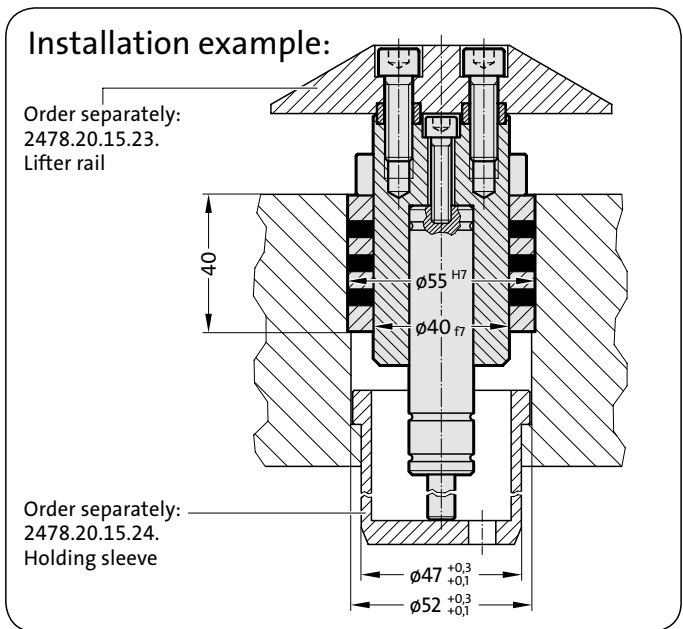
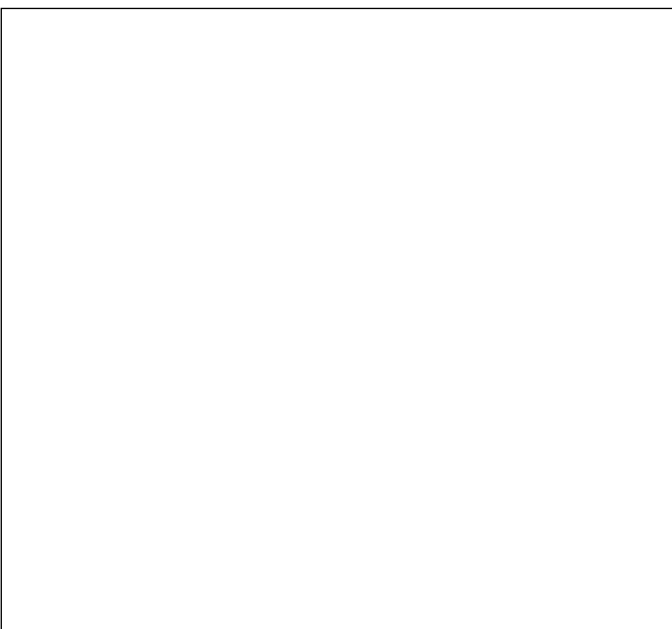
Order separately (see installation example)

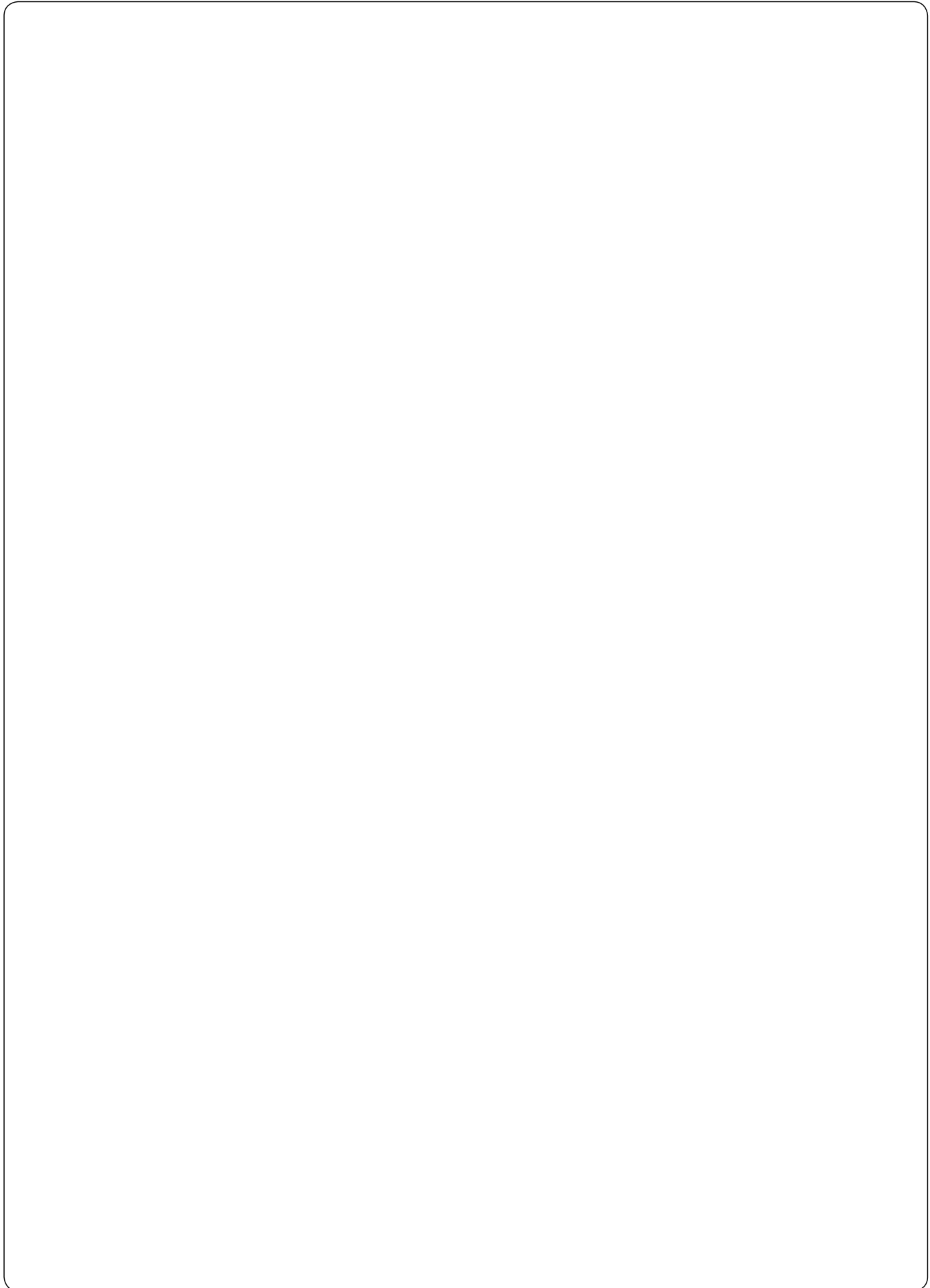
- 2478.20.15.23.: Lifter rail
- 2478.20.15.24.: Holding sleeve



**2478.20.15.30.**

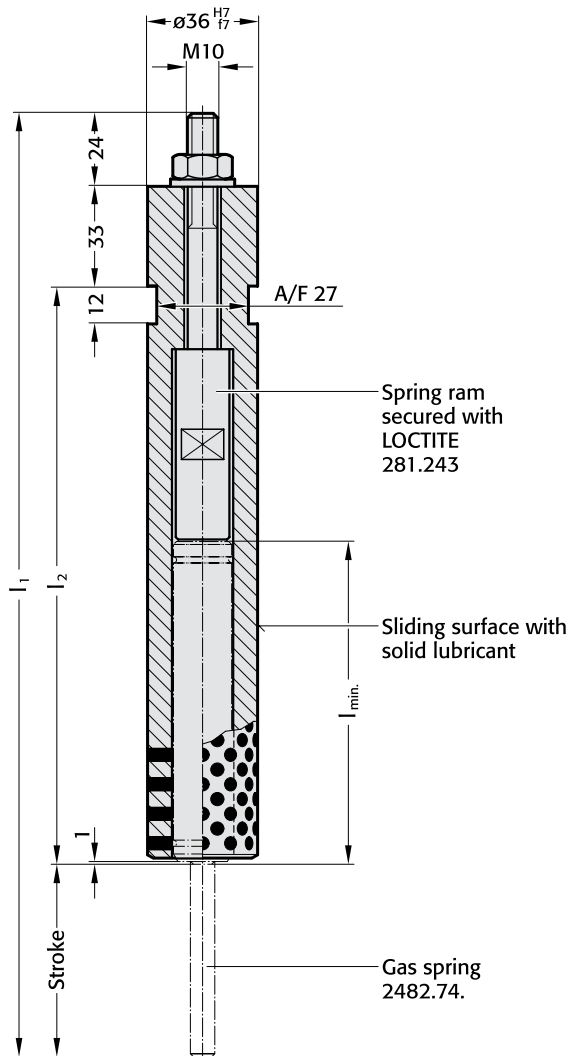
l	S <sub>working stroke</sub>	s <sub>1</sub>	d <sub>2</sub> = Ø 19		d <sub>2</sub> = Ø 25	
			Gas spring	Order No.	Gas spring	Order No.
64	9	25	2482.74.00030.010	2478.20.15.30.14.009	2480.21.00050.010	2478.20.15.30.24.009
68.5	13.5	29.5	2482.74.00030.015	2478.20.15.30.14.014	2480.21.00050.015	2478.20.15.30.24.014
77.5	22.5	38.5	2482.74.00030.025	2478.20.15.30.14.023	2480.21.00050.025	2478.20.15.30.24.023
89	34	50	2482.74.00030.038	2478.20.15.30.14.034	2480.21.00050.038	2478.20.15.30.24.034
100	45	61	2482.74.00030.050	2478.20.15.30.14.045	2480.21.00050.050	2478.20.15.30.24.045
113.5	58.5	74.5	2482.74.00030.063.1	2478.20.15.30.14.059	2480.21.00050.063	2478.20.15.30.24.059
130	75	91	2482.74.00030.080.1	2478.20.15.30.14.075	2480.21.00050.080	2478.20.15.30.24.075
150	95	111	2482.74.00030.100	2478.20.15.30.14.095	2480.21.00050.100	2478.20.15.30.24.095
175	120	136	2482.74.00030.125	2478.20.15.30.14.120	2480.21.00050.125	2478.20.15.30.24.120



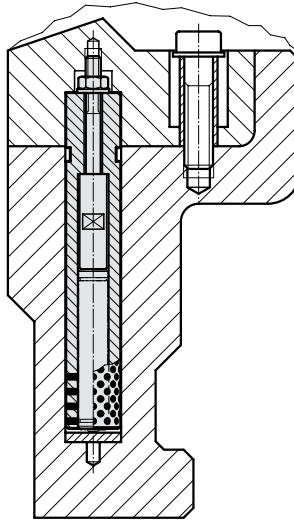


**Spring Rams for Workpiece Lifters  
(Gas Springs)**

2478.



Mounting example:



**Material:**

Spring ram:  
C45  
induction hardened to HRC 58+4  
Hardness penetration  $\cong 0,8+0,4$   
Sleeve:  
Sliding surface with non-liquid lubricant

**2478. Spring Rams for Workpiece Lifters (Gas Springs)**

Order No	stroke	$l_{min.}$	$l_1$	$l_2$	Initial spring force in daN	Final spring force in daN	Gas spring	Spring force colour markings of gas spring
2478.050.00030.1	50	92	257	150	30	40	2482.74.00030.050	green
00050.1					50	67	00050.050	blue
00070.1					70	94	00070.050	red
00090.1					90	120	00090.050	yellow
2478.063.00030.1	63	109	310	190	30	40	00030.063.1	green
00050.1					50	67	00050.063.1	blue
00070.1					70	94	00070.063.1	red
00090.1					90	120	00090.063.1	yellow
2478.080.00030.1	80	125	360	223	30	40	00030.080.1	green
00050.1					50	67	00050.080.1	blue
00070.1					70	94	00070.080.1	red
00090.1					90	120	00090.080.1	yellow

**Order Code (example):**

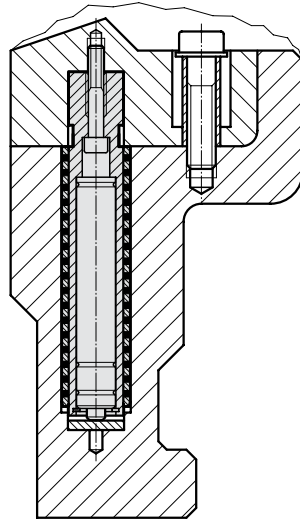
Spring Ram for Workpiece Lifter (Gas Spring) = 2478.  
Stroke = 50 mm = 050.  
Initial spring force = 30 daN = 00030.  
Gas spring = 1  
Order No = 2478.050.00030.1

# Spring Rams with Gas Springs to VW standard Guide Bushes for Spring Rams

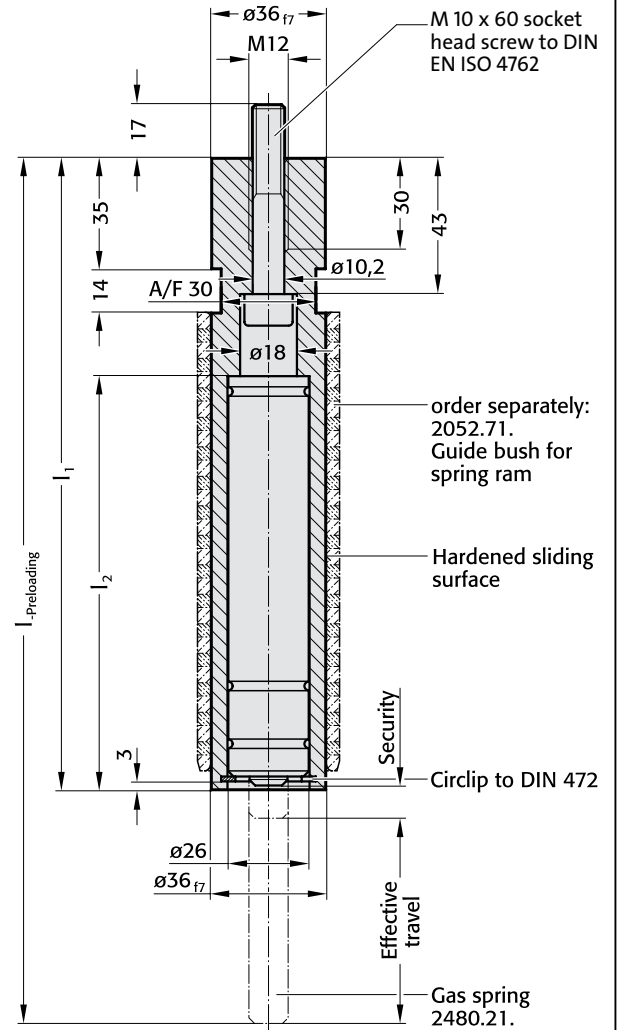
**FIBRO**  
2478.20.  
2052.71.



Mounting example:



2478.20. Spring Rams



**Note:**

Spring bolt installed preloaded.

## Material:

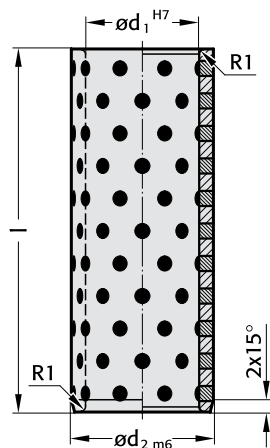
Spring ram:  
C 45  
Induction hardened  
to 58+4 HRC  
Hardness penetration depth  
= 0,8+0,4

Guide bushes:  
Bronze with non-liquid  
lubricant, oilless lubricating.

## Note:

Recommended locating socket  
for bonding G7

2052.71. Guide bushes



## 2478.20. Spring Rams with Gas Springs

Order No	Effective travel	l	l <sub>1</sub>	l <sub>2</sub>	Initial spring force in daN	Final spring force in daN	Gas spring	Spring force colour markings of gas spring
2478.20.050.00050.1	50	240	182	114	50	68	2480.21.00050.063	grün
00100.1					100	137	00100.063	blau
00150.1					150	206	00150.063	rot
00200.1					200	275	00200.063	gelb
2478.20.065.00050.1	65	274	200	131	50	69	00050.080	grün
00100.1					100	139	00100.080	blau
00150.1					150	208	00150.080	rot
00200.1					200	278	00200.080	gelb
2478.20.080.00050.1	80	314	220	151	50	69	00050.100	grün
00100.1					100	138	00100.100	blau
00150.1					150	207	00150.100	rot
00200.1					200	276	00200.100	gelb

## Ordering Code (example):

Spring Ram with Gas Spring = 2478.20

Effective travel = 50 mm = 050.

Initial spring force = 150 daN = 00150.

Gas spring = 1

Order No = 2478.20.050.00150.1

## Guide bushes

Order No	d <sub>1</sub>	d <sub>2</sub>	l
2052.71.036.045.115	36	45	115
	145	36	45
	170	36	45



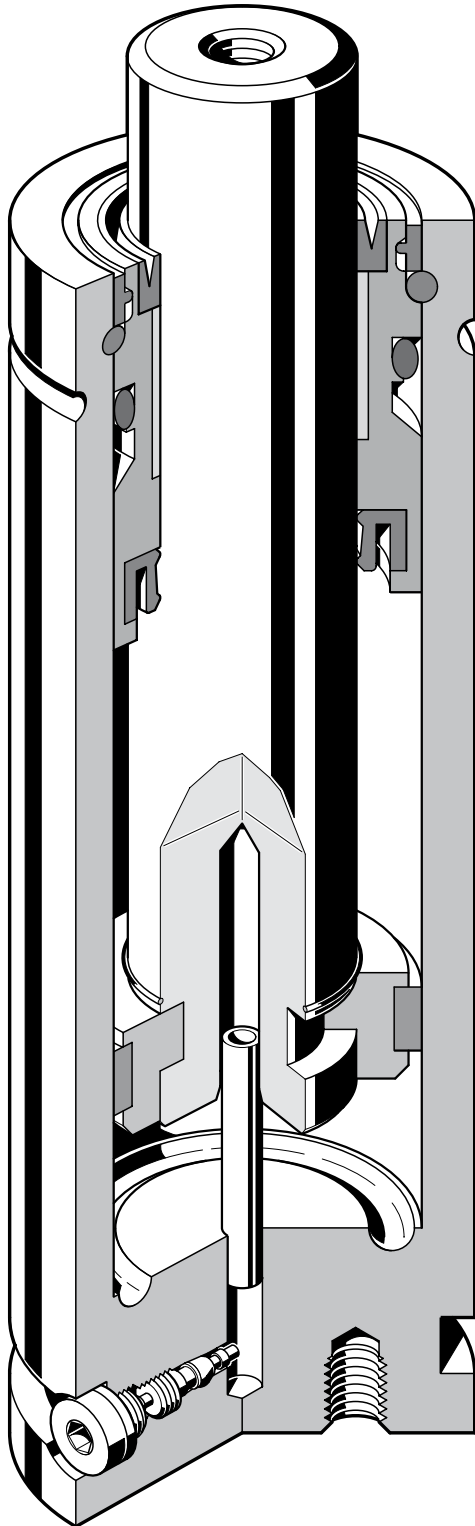
# Nitrogen Gas Springs



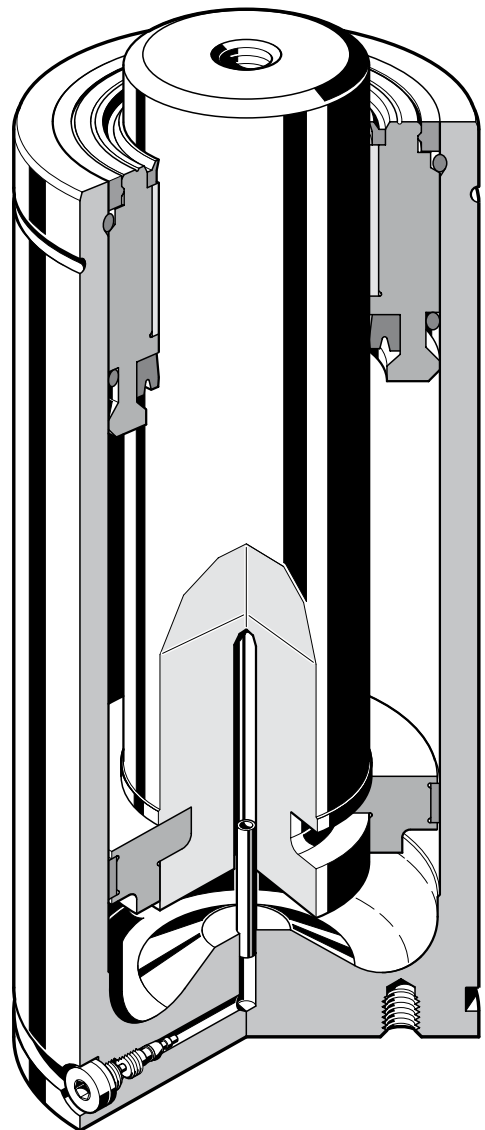
Gas Springs  
Two-Chamber System

FIBRO

2480.



2480.12.

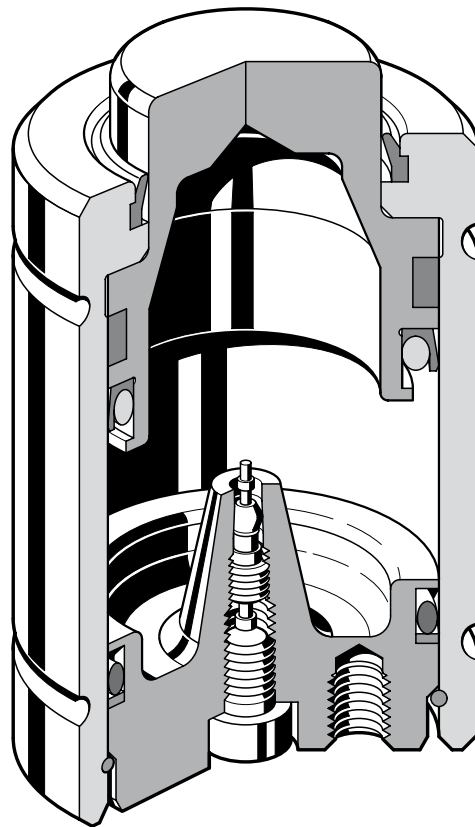


2480.13.

**FIBRO**

2490.

Compact-Gas Springs  
Single-Chamber System



## Gas Springs

### FIBRO Gas Springs

The extensive range of FIBRO Gas Springs constitutes an ideal supplement to and expansion of the traditional programmes of spring elements such as helical springs, disc springs and elastomer units. With their minimal space requirement, Gas Springs close a gap where ever the accent is on accommodation of the utmost force component within a minimum of space – or where exceedingly large travel is demanded: FIBRO Gas Springs take care of both demands, even in combination.

Their self-contained nitrogen charge makes FIBRO Gas Springs completely autonomous devices. Feeder pipes or storage vessel are not required.

Monitoring of charge pressure, however, is necessary in certain special cases. Suitable equipment for in-situ pressure control can be found in the Accessories Section.

As long as all mounting detail is laid out with due circumspection, removal and installation of the units presents no problems whatsoever.

Instructions are included with every delivery of gas springs.

On pages F 329 to F 336 a number of interesting installation examples are illustrated in detail.



All FIBRO Gas Springs meet the requirements of the Pressure Equipment Directive 97/23/EC.

The Pressure Equipment Directive (97/23/EC) has been ratified by the European Parliament and the Council of Europe. The requirements of the Pressure Equipment Directive came into force throughout the EC on 29 May 2002.

The directive defines pressure equipment as vessels, pipework, safety devices and pressure accessories. In terms of the Directive a vessel is a casing which is designed and manufactured to contain fluids under pressure.

It follows from this definition that nitrogen gas springs of all sizes are deemed to be pressure vessels and must in this respect comply with the Pressure Equipment Directive (97/23/EC) from 29 May 2002.

### Functioning

The pressure medium is a commercially available, environment-friendly nitrogen. FIBRO Gas Springs have a standard charge pressure of max. 150 bar (180 bar). Depending on spring size and type, this pressure offers initial force ratings of 2 daN to 20,000 daN.

### Pressure Build-Up

In operation the piston rod enters the spring space whose volume is progressively reduced. The resulting pressure rise can be plotted on the Gas Spring Diagram as a multiplication factor. The spring force is the product of initial force times that pressure-rise factor and can therefore be calculated easily.

### Working Temperature

The spring temperature should not exceed +80 °C.

### Charge Pressure

Modification of charge pressure allows variation of the force rating and can be predetermined from the spring Diagram.

### Installation

FIBRO Gas Springs can be used in any installation position. Whether or not external forces act on them when at rest is of no consequence.



## Gas Springs

### Maintenance

FIBRO Gas Springs were designed for maintenance-free continual operation. It is recommended to oil the piston rod lightly from time to time.

Guide- and sealing elements can be exchanged easily and expeditiously. They are available as a kit. Each kit comes with detailed instructions for maintenance of FIBRO Gas Springs.

### Warning

FIBRO Gas Springs may be charged only with commercial Grade 5.0 nitrogen gas.

### Accessories

The accessories range for Gas Springs comprises fastening devices, charge- and control units, screw connections for these, and connecting lines for compound installations.

### Warning Signs

These are available on request. The signs should be affixed near the springs in as prominent a position as possible.

**FIBRO**

**WARNING**

This tool is equipped with \_\_\_ Gas Springs with a max. pressure of 150 or 180 bar, depending on spring type.  
Working pressure \_\_\_\_\_ bar.  
**Read maintenance instructions before working on gas springs.**

FIBRO GmbH · Business Area Standard Parts  
DE-74851 Hassmersheim · Postfach 1120  
Phone +49 (0) 6266-73-0\* · Fax -237

#### Size 35 × 50 mm

Language	Order No
german	2480.00.035.050.1
english	2480.00.035.050.2
french	2480.00.035.050.3
italien	2480.00.035.050.4
spanish	2480.00.035.050.5

**FIBRO**

**WARNING**

This tool is equipped with \_\_\_ Gas Springs with a max. pressure of 150 or 180 bar, depending on spring type.

No.	pcs.	spring type	fill.press./bar	force/daN
1	___	_____	_____	_____
2	___	_____	_____	_____
3	___	_____	_____	_____
4	___	_____	_____	_____
5	___	_____	_____	_____

Read maintenance instructions **before** working on gas springs.

**FIBRO GmbH · Business Area Standard Parts**  
DE-74851 Hassmersheim · Postfach 1120  
Phone +49 (0) 6266-73-0\* · Fax +49 (0) 6266-73-237

#### Size 75 × 105 mm

language	Order No
german	2480.00.075.105.1
english	2480.00.075.105.2
french	2480.00.075.105.3
italian	2480.00.075.105.4
spanish	2480.00.075.105.5

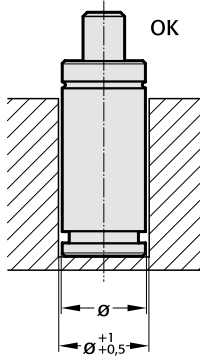
#### Size 110 × 150 mm

language	Order No
german	2480.00.110.150.1
english	2480.00.110.150.2
french	2480.00.110.150.3
italian	2480.00.110.150.4
spanish	2480.00.110.150.5

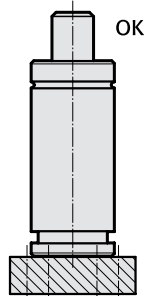
# Mounting Directions for Gas Springs

## Mounting Examples

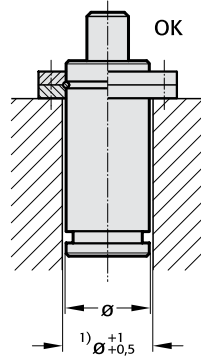
Below are the various gas spring mounting possibilities, which differ from model to model.



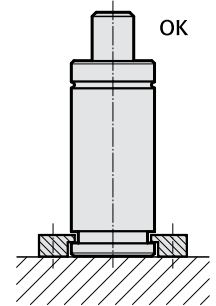
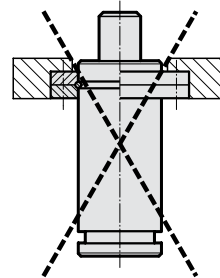
Installed loose in the bore.



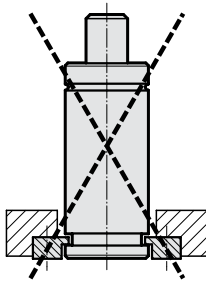
Screw mounted at the base with 2480.011.



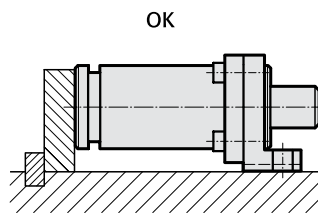
Fixed with 2480.055./057./058./064.  
<sup>1)</sup>from  $\varnothing 38 - \varnothing_{+0,5}^{+2}$



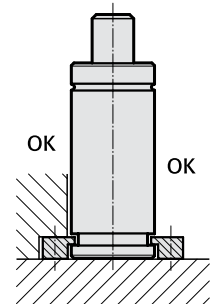
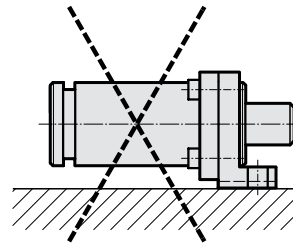
Fixed with 2480.007./008.



Fixed with 2480.007./008.



Fixed with 2480.044./045./047.

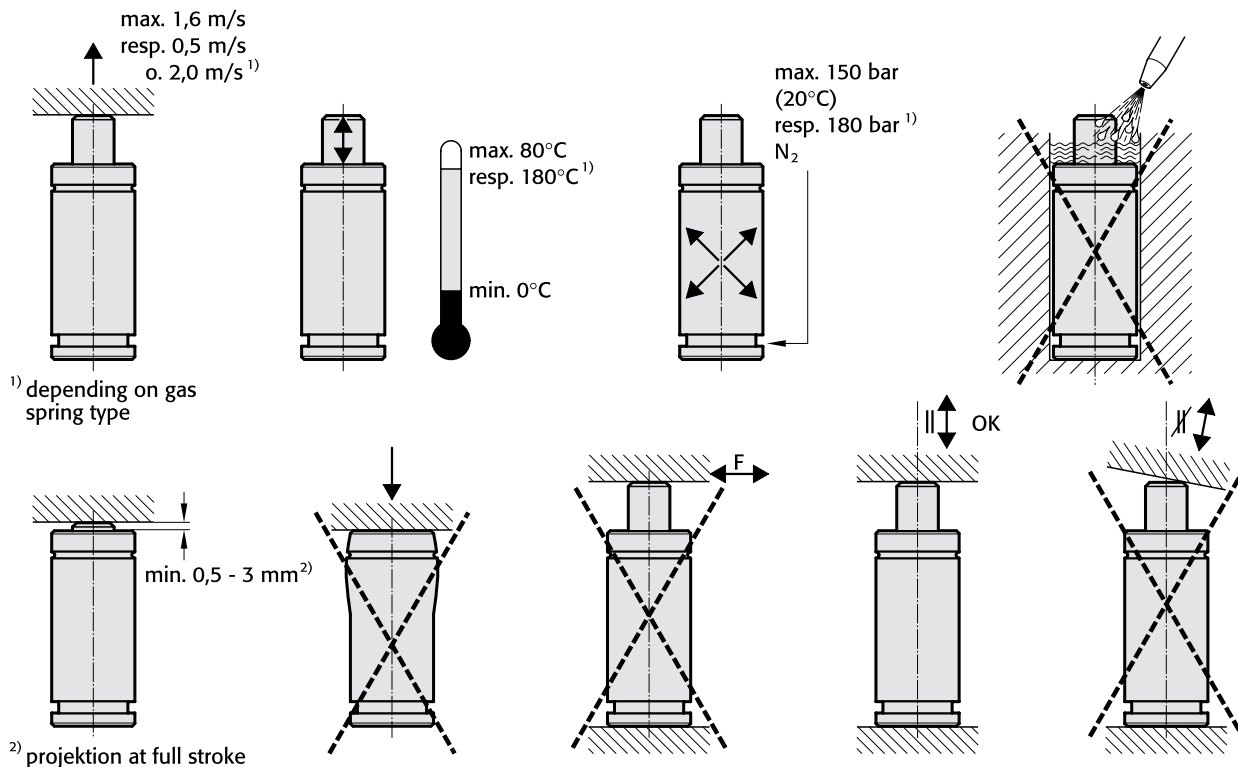


Fixed with 2480.022.

## Mounting Directions for Gas Springs

To achieve the best possible service-life and safety from the gas spring, the directions below must be followed.

### Mounting instructions



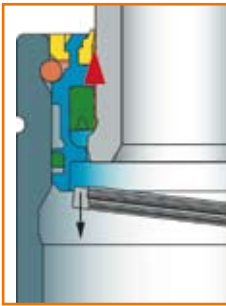
- Secure the gas spring to the tool/machine whenever possible, using the threaded hole(s) in the base of the gas spring or a suitable flange. Never exceed the maximum torque values for the threads in the base of the gas spring: (M6 = 10 Nm; M8 = 24 Nm; M10 = 45 Nm; M12 = 80 Nm)
- The threaded hole in the piston rod top should not be used for mounting purposes. It is only to be used when servicing the gas spring.
- Do not use the gas spring in such a way that the piston rod is realised freely from its compressed position, as this could cause internal damage to the gas spring.
- Make sure the gas spring is mounted parallel to the direction of the compression stroke.
- Ensure the contact surface of the piston rod top is perpendicular to the direction of the compression stroke and is sufficiently hardened.
- The gas spring should not be subjected to the side loads.
- Protect the piston rod against mechanical damage and contact with fluids.
- We do not recommend the last 5 mm or 10-% of the nominal stroke be utilised.
- The maximum charging pressure (at 20°C) must not be exceeded as it may effect the safety of the product.
- Exceeding the gas spring's recommended operating temperature will shorten the service-life of the gas spring.
- The entire contact surface of the piston rod / piston should be used.
- Do not remove bottom 2480.00.20 from spring 2490.12. until all gas pressure has been discharged.

# FIBRO Gas Springs – The Safer Choice

At FIBRO, safety has always been a top priority. Below is what we do to help you provide a safer working environment.

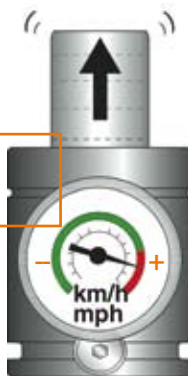
## FIBRO Safety Features

### Excessive Return Speed Protection System



Designed for controlled gas venting through piston rods with integral safety stops and specially designed guides.

Excessive Return Speed



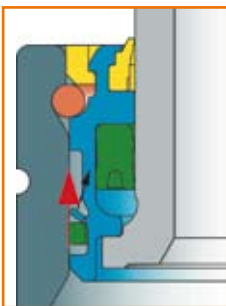
## Advice to Gas Spring Buyers

Safety should have always be a top priority. Therefore, we believe gas springs for metal forming tools should (unless the maximum allowable pressure PS is less than or equal to 0.5 bar) be ordered with the following **safety requirements**:

- 1) **Piston rods with an integral safety stop.**
  - 2) **Designed, produced and tested according to Pressure Equipment Directive, PED 97/23/EC for a minimum of 2'000'000 full cycles\*:**
    - **at highest allowed charging pressure**
    - **at highest allowed running temperature**
    - **for all specified mounting methods\*\***
- \*\* including top mount, Type C Flange Mounts, according to ISO 11901-2**

Please Note: Unless the maximum pressure is less than or equal to 0.5 bar, all gas springs produced, sold, installed and/or used within the EU should be designed, produced and tested in accordance with PED 97/23/EC.

### Over-Pressure Protection System



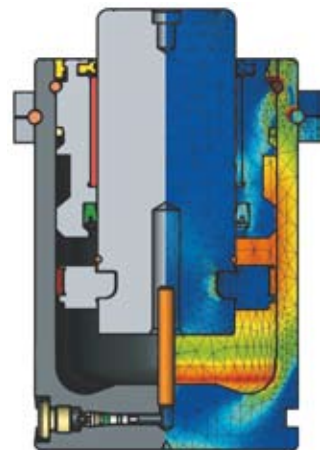
FIBRO Over-Pressure Protection System is designed to vent excessive gas pressure in a controlled manner.

Over-Pressure Condition



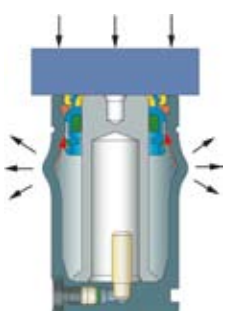
## Pressure Vessel Approval

FIBRO Gas Springs are designed, produced and tested according to PED 97/23/EC for 2'000'000 full cycles\* at the highest allowed charging pressure, the highest allowed running temperature, and for all specified mounting methods.



\* unless other value stated on the springs

### Over-Stroke Protection System



FIBRO has a developed unique System. The cylinder wall is designed to deform in a predefined way, venting the internal gas pressure in a controlled manner.

Over-Pressure Condition

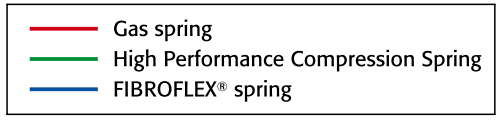
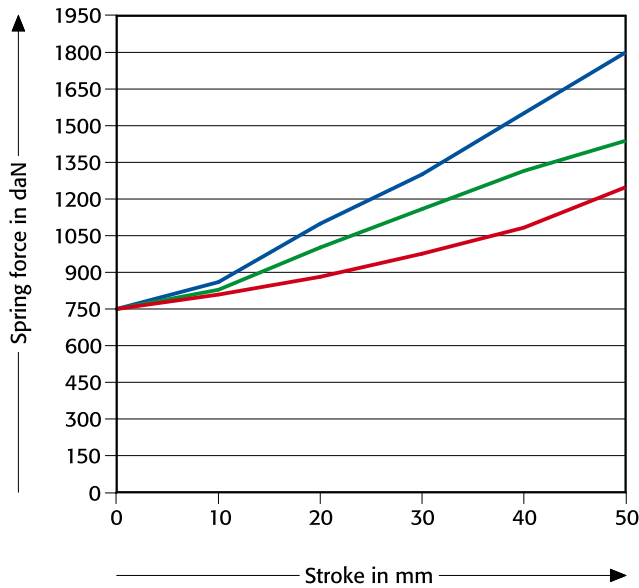


**Please note!!! – The safety features mentioned here have not been realized for all FIBRO gas springs to date. By consulting the respective data sheets, please make certain you have the accurate safety standard of the gas spring available that you are interested in; otherwise, direct your inquiry to FIBRO GmbH.**

General overview of

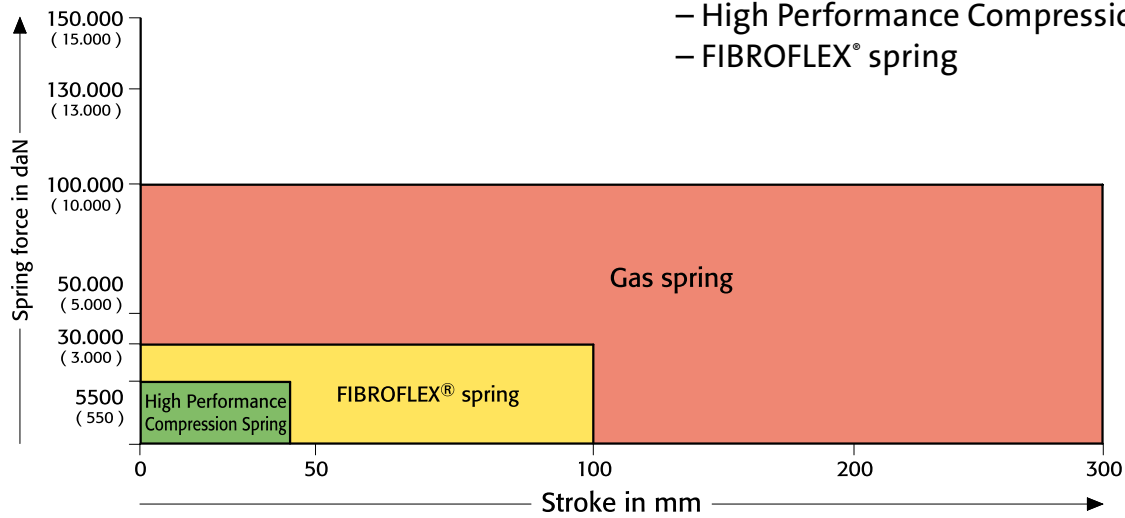
Force increase diagram:  
Initial spring force 750 daN

- Gas spring
- High Performance Compression Spring
- FIBROFLEX® spring



Range of applications

- Gas spring
- High Performance Compression Spring
- FIBROFLEX® spring



# Gas Springs Synopsis

Nominal force in daN	Outside-Ø in mm	Stroke in mm	Built-in length in mm	Standard	Note	Order No	Page
<b>Gas Springs, Ejector Pin Units</b>							<b>F117-121</b>
20	M24x1,5	10 – 125	65 – 295	WDX		2479.034.00020.	F119
40	M24x1,5	10 – 125	65 – 295	WDX		2479.034.00040.	F119
80	M24x1,5	10 – 125	65 – 295	WDX		2479.034.00080.	F119
170	M24x1,5	10 – 125	65 – 295	WDX		2479.034.00170.	F119
5	M16x1,5	10 – 125	65 – 295	VDI		2479.030.00005.	F120
10	M16x1,5	10 – 125	65 – 295	VDI		2479.030.00010.	F120
20	M16x1,5	10 – 125	65 – 295	VDI		2479.030.00020.	F120
40	M16x1,5	10 – 125	65 – 295	VDI		2479.030.00040.	F120
4	M16x2	10 – 125	65 – 295	VDI		2479.031.00004.	F120
5	M16x2	10 – 125	65 – 295	VDI		2479.031.00005.	F120
10	M16x2	10 – 125	65 – 295	VDI		2479.031.00010.	F120
20	M16x2	10 – 125	65 – 295	VDI		2479.031.00020.	F120
40	M16x2	10 – 125	65 – 295	VDI		2479.031.00040.	F120
20	M24x1,5	10 – 125	65 – 295	VDI		2479.032.00020.	F125
40	M24x1,5	10 – 125	65 – 295	VDI		2479.032.00040.	F125
80	M24x1,5	10 – 125	65 – 295	VDI		2479.032.00080.	F125
170	M24x1,5	10 – 125	65 – 295	VDI		2479.032.00170.	F125
<b>Gas springs, small dimensions</b>							<b>F123-129</b>
13	12	7 – 125	56 – 295			2482.72.00013.	F124-125
25	12	7 – 125	56 – 295			2482.72.00025.	F124-125
38	12	7 – 125	56 – 295			2482.72.00038.	F124-125
50	12	7 – 125	56 – 295			2482.72.00050.	F124-125
18	15	7 – 125	56 – 295			2482.73.00018.	F126-127
35	15	7 – 125	56 – 295			2482.73.00035.	F126-127
50	15	7 – 125	56 – 295			2482.73.00050.	F126-127
70	15	7 – 125	56 – 295			2482.73.00070.	F126-127
30	19	7 – 125	56 – 295			2482.74.00030.	F128-129
50	19	7 – 125	56 – 295			2482.74.00050.	F128-129
70	19	7 – 125	56 – 295			2482.74.00070.	F128-129
90	19	7 – 125	56 – 295			2482.74.00090.	F128-129
50	24,9	10 – 125	62 – 295			2480.21.00050.	F130-131
50	32	10 – 125	70 – 300			2480.22.00050.	F130-131
100	24,9	10 – 125	62 – 295			2480.21.00100.	F130-131
100	32	10 – 125	70 – 300			2480.22.00100.	F130-131
150	24,9	10 – 125	62 – 295			2480.21.00150.	F130-131
150	32	10 – 125	70 – 300			2480.22.00150.	F130-131
200	24,9	10 – 125	62 – 295			2480.21.00200.	F130-131
200	32	10 – 125	70 – 300			2480.22.00200.	F130-131
	24,9	10 – 125	62 – 295			2480.23.	F132-133
<b>Standard-Gas Springs</b>							<b>F135-151</b>
250	38	10 – 125	70 – 300	V, I, C*		2480.12.00250.	F136-137
500	45,2	10 – 160	105 – 405	V, I, C*		2480.12.00500.	F138-139
750	50,2	13 – 300	120,4 – 695	V, I, C*		2480.13.00750.	F140-141
1500	75,2	25 – 300	160 – 710	V, I, C*		2480.12.01500.	F142-143
3000	95,2	25 – 300	170 – 720	V, I, C*		2480.13.03000.	F144-145
5000	120,2	25 – 300	190 – 740	V, I, C*		2480.13.05000.	F146-147
7500	150,2	25 – 300	205 – 755	V, I, C*		2480.13.07500.	F148-149
10000	195	25 – 300	210 – 760	V, I, C*		2480.12.10000.	F150-151
<b>Standard-Gas Springs – HEAVY DUTY</b>							<b>F152-163</b>
1000	50,2	13 – 300	121 – 695			2488.13.01000.	F154-155
2400	75,2	25 – 300	160 – 710			2488.13.02400.	F156-157
4200	95,2	25 – 300	170 – 720			2488.13.04200.	F158-159
6600	120,2	25 – 300	190 – 740			2488.13.06600.	F160-161
9500	150,2	25 – 300	205 – 755			2488.13.09500.	F162-163
<b>Gas Springs with Reduced Pressure Rise</b>							<b>F165-173</b>
750	75,2	13 – 300	120,4 – 695			2481.12.00750.	F166-167
1500	95,2	25 – 300	160 – 710			2481.13.01500.	F168-169
3000	120,2	25 – 300	170 – 720			2481.13.03000.	F170-171
5000	150,2	25 – 300	190 – 740			2481.13.05000.	F172-173
<b>Gas Springs with through bore passage</b>							<b>F175-181</b>
270	38	16 – 80	108 – 236			2496.12.00270.	F176-177
490	50,2	16 – 80	112 – 240			2496.12.00490.	F178-179
1060	75,2	16 – 100	122 – 290			2496.12.01060.	F180-181

# Gas Springs Synopsis

Nominal force in daN	Outside-Ø in mm	Stroke in mm	Built-in length in mm	Standard	Note	Order No	Page
<b>Gas Springs with Increased Spring Force-Power Line</b>							<b>F183–207</b>
170	19	7 – 125	44 – 285			2487.12.00170.	F184–185
320	24,9	7 – 125	44 – 285			2487.12.00320.	F186–187
350	32	10 – 125	50 – 280			2487.12.00350.	F188–189
500	38	10 – 125	50 – 280			2487.12.00500.	F190–191
750	45,2	10 – 125	52 – 282			2487.12.00750.	F192–193
1000	50,2	13 – 125	64 – 288			2487.12.01000.	F194–195
1500	63,2	13 – 125	70 – 294			2487.12.01500.	F196–197
2400	75,2	16 – 125	77 – 295			2487.12.02400.	F198–199
4200	95,2	16 – 125	90 – 308			2487.12.04200.	F200–201
6600	120,2	16 – 125	100 – 318			2487.12.06600.	F202–203
9500	150,2	19 – 125	116 – 328			2487.12.09500.	F204–205
20000	195	19 – 125	148 – 360			2487.12.20000.	F206–207
<b>Compact-Gas Springs</b>							<b>F209–227</b>
420	24,9	6 – 50	56 – 195			2490.12.00420.	F210–211
750	32	6 – 50	63 – 195			2490.12.00750.	F212–213
1000	38	6 – 50	61 – 230			2490.12.01000.	F214–215
1800	50,2	6 – 50	66 – 220			2490.12.01800.	F216–217
3000	63,2	10 – 50	85 – 205			2490.12.03000.	F218–219
4700	75,2	10 – 50	80 – 240			2490.13.04700.	F220–221
7500	95,2	10 – 50	90 – 255			2490.13.07500.	F222–223
11800	120,2	10 – 50	100 – 260			2490.12.11800.	F224–225
18300	150,2	10 – 50	110 – 270			2490.12.18300.	F226–227
<b>Gas Springs Low Build Height</b>							<b>F229–235</b>
500	45,2	6 – 125	62 – 300			2485.12.00500.	F230–231
750	50,2	6 – 125	62 – 300			2485.12.00750.	F232–233
1500	75,2	25 – 100	110 – 260			2485.12.01500.	F234–235
<b>»Speed Control TM«, Gas Springs, SPC, cushioned</b>							<b>F237–247</b>
750	75,2	125 – 300	360 – 710			2486.12.00750.	F240–241
1500	95,2	125 – 300	370 – 720			2486.12.01500.	F242–243
3000	120,2	125 – 300	390 – 740			2486.12.03000.	F244–245
5000	150,2	125 – 300	405 – 755			2486.12.05000.	F246–247
<b>Gas Springs to WDX Standard/Request your catalogue</b>							<b>F249</b>
<b>Gas Springs, Threaded</b>							<b>F251–260</b>
	M28×1,5	10 – 125	62 – 292		external thread	2480.32.00050.–00200.	F252–253
250	M38×1,5	13 – 100	75,4 – 250		external thread	2480.32.00250.	F254–255
250	38	13 – 100	75,4 – 250		with male fixing thread	2480.82.00250.	F256–257
750	50,2	13 – 125	64 – 288		with male fixing thread	2487.82.01000.	F258–259
15	M28×1,5	125	292		with hexagonal flange	2480.33.00015.125	F260
50	M28×1,5	125	292		with hexagonal flange	2480.33.00050.125	F260
100	M28×1,5	125	292		with hexagonal flange	2480.33.00100.125	F260
150	M28×1,5	125	292		with hexagonal flange	2480.33.00150.125	F260
200	M28×1,5	125	292		with hexagonal flange	2480.33.00200.125	F260
<b>LCF Gas Springs, damped</b>							<b>F261–275</b>
750	50,2	13 – 300	120,4 – 695			2484.13.00750.	F266–267
1500	75,2	25 – 300	160 – 710			2484.12.01500.	F268–269
3000	95,2	25 – 300	170 – 720			2484.13.03000.	F270–271
5000	120,2	25 – 300	190 – 740			2484.13.05000.	F272–273
7500	150,2	25 – 300	205 – 755			2484.13.07500.	F274–275
<b>Controllable Gas Springs/Request your catalogue</b>							<b>F276</b>
<b>Air Springs, to VW Standard/Request your catalogue</b>							<b>F277</b>
<b>Manifoldsystem/Request your catalogue</b>							<b>F278</b>

# Gas Springs and Accessories Synopsis

	Order No	Page
<b>Gas Spring accessories</b>		<b>F279–336</b>
Pressure reservoir for reduced pressure rise	2480.00.70.	F280–281
Mounting clamps for pressure reservoir	2480.00.70.	F282
Pressure Plate, shock absorbing	2480.015.	F283
Thrust pad	2480.004.	F284
Thrust plate	2480.009.	F284
	2480.018.	F285
	2480.019.	F285
Concertina Shrouds for Gas Springs	2480.080.	F286–F287
Gas spring connection systems		F288
Instructions for hose assembling		F289
Mounting arrangement for gas springs in the minimess system		F290–F293
Compound Threaded Joints, Hoses	2480.00.23.01.	F294
	2480.00.23.02.	F294
	2480.00.23.03.	F294
Anti-scuff spiral	2480.00.23.13	F295–F300
Hose clamp for gauging hose	2480.00.23.	F295–F300
Self-tapping screw	2192.50.	F295–F300
Minimess – Compound Threaded Joints	2480.00.24.01	F295, F299
	2480.00.24.02	F295
	2480.00.24.03	F295
	2480.00.24.04	F295
	2480.00.24.10	F295, F299
	2480.00.24.11	F295, F299
	2480.00.24.12	F295, F299
	2480.00.24.13	F295
	2480.00.24.14	F295
	2480.00.24.15	F295
	2480.00.24.16	F295
	2480.00.24.17	F295
	2480.00.24.18	F295
	2480.00.24.53	F296
	2480.00.24.54	F296
	2480.00.24.56	F296
	2480.00.24.57	F296
	2480.00.24.30	F298
	2480.00.24.31	F298
	2480.00.24.33	F298
	2480.00.24.34	F298
Charging Adapter	2480.00.40	F298
Compression Fitting Compound Threaded Joints	2480.00.10.01	F300
	2480.00.10.03	F300
	2480.00.10.10	F300
	2480.00.10.11	F300
	2480.00.10.12	F300
Expansion punch for hosing	2480.00.54.01	F301
Vice jaws for holding high-pressure hose	2480.00.54.02	F301
Hose shears	2480.00.54.03	F301
High-pressure hose	2480.00.10.20.	F301
Hose screw fitting (female)	2480.00.10.21	F301
Hose screw fitting (male)	2480.00.10.22	F301
Mounting arrangement for gas springs in the compression fitting system		F302
24°-cone-threaded joints	2480.00.26.	F303
24°-cone-connecting hoses	2480.00.25.	F304
Direct connection dimensions	2480.00.26.	F305
Connector system, 24° conus micro	2480.00.27.01.	F306
	2480.00.27.	F307
	2480.00.28.	F308
	2480.00.22.	F309
	2480.00.28.	F310



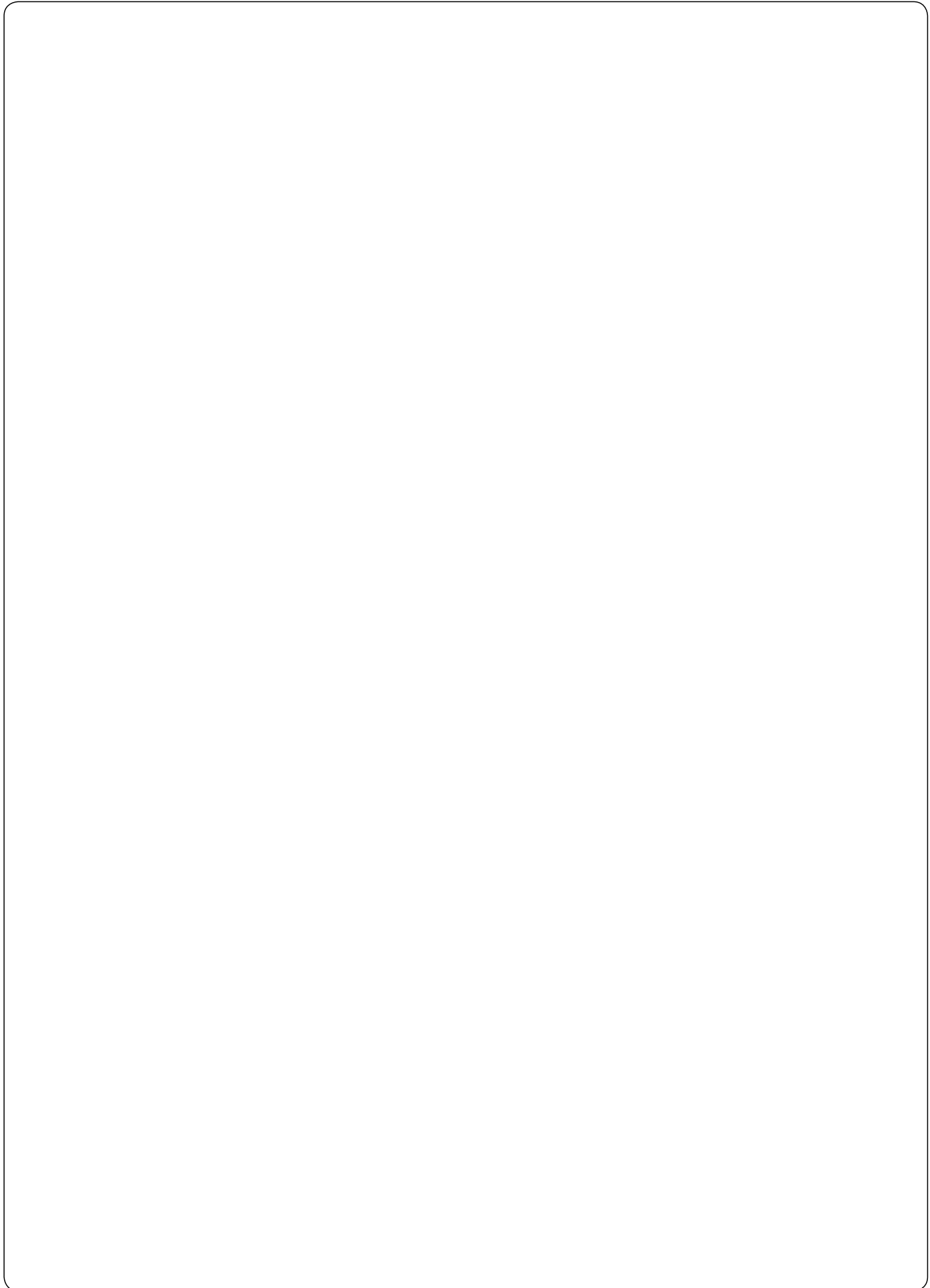
**Gas Springs and Accessories  
Synopsis**

	Order No	Page
Micro Control Fitting without pressure relief	2480.00.34.11	F311
Micro Control Fitting with pressure relief	2480.00.34.13	F311
Control Fitting without pressure switch, without pressure relief	2480.00.30.01	F312
Control Fitting with pressure switch, without pressure relief	2480.00.30.02	F312
Control Fitting without pressure switch, with pressure relief	2480.00.30.03	F312
Control Fitting with pressure switch, with pressure relief	2480.00.30.04	F312
Control Fitting without pressure switch	2480.00.31.01	F312
Control Fitting with pressure switch	2480.00.31.06	F312
Control Fitting without pressure switch, with pressure relief	2480.00.31.07	F312
Control Fitting without pressure switch, with pressure relief	2480.00.30.13	F313
Stacked Control Fitting	2480.00.39.04.	F314
Threaded Connector	2480.00.39.04.00.01	F314
Control fitting with pressure relief	2480.00.31.11	F315
Stacked Control Fitting for individual control	2480.00.39.01.	F316
<b>Diaphragm Pressure Switch</b>		
		<b>F317</b>
Diaphragm Pressure Switch	2480.00.45.01	F317
	2480.00.45.02	F317
Diaphragm Pressure Switch Adapter Block	2480.00.45.10	F317
<b>Wireless Pressure Monitoring</b>		
		<b>F318–320</b>
Receiver	2480.00.90.20.01	F319
Software	2480.00.90.51.01.0	F319
Sensor	2480.00.90.10.01	F320
Filling Adapter	2480.00.90.10	F320
Battery	2480.00.90.10.00.1	F320
<b>Control Armatures</b>		
		<b>F321</b>
Filling hose	2480.00.31.02	F321
Charge- and Pressure Control Unit	2480.00.32.21	F321
Gas cylinder pressure regulator	2480.00.32.07.01	F321
Gas cylinder connector 200 bar	2480.00.32.07.02	F321
Gas cylinder connector 300 bar	2480.00.32.07.03	F321
Connector adaptor	2480.00.32.07.04	F321
<b>Compact Nitrogen Booster</b>		
		<b>F322–323</b>
Compact Nitrogen Booster for Gas Spring Filling	2480.00.32.71	F322-F323
Holding Plate	2480.00.32.71.02	F323
<b>Dynamometers for Gas Spring</b>		
		<b>F324–325</b>
	2480.00.35.021	F324
	2480.00.35.032	F324
	2480.00.35.04	F325
<b>Toolkits for assembling gas springs, Socket spanners</b>		
		<b>F326–327</b>
Toolkit for all gas springs	2480.00.50.11	F326
Assembling cone for gas springs with through bore passage	2480.00.50.04.	F327
<b>Service Station, mobile, for Gas Springs</b>		
	2480.00.50.20.	<b>F328</b>
<b>Application Examples</b>		
		<b>F329–336</b>

**Gas Springs and accessories  
Synopsis, numerical**

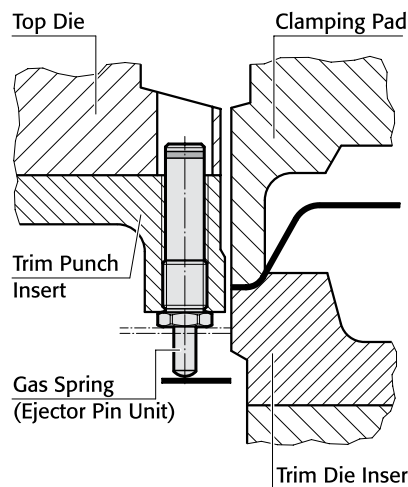
Order No	Page	Order No	Page	Order No	Page	Order No	Page
2192.50.	F295-F306	2480.00.10	F300, F302	2480.004.	F120, F121,	2480.12.00250.	F136-F137
2470.12.	F119-F121	2480.00.22.	F309		F284	2480.12.00500.	F138-F139
2479.030.	F120	2480.00.23.	F294-F306	2480.005.	F252-F254	2480.12.01500.	F142-F143
2479.031.	F120	2480.00.24.	F295-F296,	2480.006.	F254	2480.12.10000.	F150-F151
2479.032.	F121		F298-F299	2480.007.	F136-F274	2480.13.00750.	F140-F141
2479.034.	F119	2480.00.25.	F304-F305	2480.008.	F136-F274	2480.13.03000.	F144-F145
		2480.00.26.	F303, F305	2480.009.	F284	2480.13.05000.	F146-F147
		2480.00.27.	F306-F307	2480.010.	F136-F272	2480.13.07500.	F148-F149
		2480.00.28.	F308, F310	2480.011.	F138-F274	2480.21.	F130-F131
		2480.00.30.01/02/03/04	F312	2480.015.	F283	2480.22.	F130
		2480.00.30.13	F313	2480.018.	F285	2480.22. .1	F131
		2480.00.31.01/06/07	F312	2480.019.	F285	2480.23.	F132-F133
		2480.00.31.02	F321	2480.022.	F130-F274	2480.32.	F252-F253
		2480.00.31.11	F315	2480.044.	F130-F274	2480.32.00250.	F254-F255
		2480.00.32.07.	F321	2480.045.	F140-F272	2480.33.	F260
		2480.00.32.21	F321	2480.047.	F140-F272	2480.82.00250.	F256-F257
		2480.00.32.71	F322-F323	2480.051.	F124-F210	2481.12.00750.	F166-F167
		2480.00.32.71.02	F323	2480.052.	F128-F226	2481.13.01500.	F168-F169
		2480.00.34.11	F311	2480.053.	F130-F132,	2481.13.03000.	F170-F171
		2480.00.34.13	F311		F210	2481.13.05000.	F172-F173
		2480.00.35.021	F324	2480.055.	F130-F274	2482.72.	F124-F125
		2480.00.35.032	F324	2480.057.	F130-F274	2482.73. .1	F126-F127
		2480.00.35.04	F325	2480.058.	F220-F222,	2482.74.	F128-F129
		2480.00.39.01.	F316		F234	2484.12.01500.	F268-F269
		2480.00.39.04.	F314	2480.064.	F140-F274	2484.13.	F262-F264
		2480.00.39.04.00.01	F314	2480.080.	F286-F287	2484.13.00750.	F266-F267
		2480.00.40	F298			2484.13.03000.	F270-F271
		2480.00.45.01	F317			2484.13.05000.	F272-F273
		2480.00.45.02	F317			2484.13.07500.	F274-F275
		2480.00.45.10	F317			2485.12.00500.	F230-F231
		2480.00.50.04	F327			2485.12.00750.	F232-F233
		2480.00.50.11	F326			2485.12.01500.	F234-F235
		2480.00.50.20.	F328			2486.12.	F238-F239
		2480.00.51.	F250-F258			2486.12.00750.	F240-F241
		2480.00.54.	F301			2486.12.01500.	F242-F243
		2480.00.70.	F280-F282			2486.12.03000.	F244-F245
		2480.00.90.	F318			2486.12.05000.	F246-F247
		2480.00.90.10	F320			2487.12.00170.	F184-F185
		2480.00.90.10.00.1	F320			2487.12.00320.	F186-F187
		2480.00.90.10.01	F320			2487.12.00350.	F188-F189
		2480.00.90.20.01	F319			2487.12.00500.	F190-F191
		2480.00.90.51.01.0	F319			2487.12.00750. .1	F192-F193
						2487.12.01000. .1	F194-F195
						2487.12.01500.	F196-F197
						2487.12.02400.	F198-F199
						2487.12.04200.	F200-F201
						2487.12.06600.	F202-F203
						2487.12.09500.	F204-F205
						2487.12.20000.	F206-F207
						2487.82.01000.	F258-F259
						2488.13.01000.	F154-F155
						2488.13.02400.	F156-F157
						2488.13.04200.	F158-F159
						2488.13.06600.	F160-F161
						2488.13.09500.	F162-F163
						2489.	F276
						2490.12.00420.	F210-F211
						2490.12.00750.	F212-F213
						2490.12.01000.	F214-F215
						2490.12.01800.	F216-F217
						2490.12.03000.	F218-F219
						2490.12.11800.	F224-F225
						2490.12.18300.	F226-F227
						2490.13.04700.	F220-F221
						2490.13.07500.	F222-F223
						2491.	F277
						2495.	F278
						2496.12.00270.	F176-F177
						2496.12.00490.	F178-F179
						2496.12.01060.	F180-F181

# Spring Plungers with Gas Spring (Ejector Pin Units)

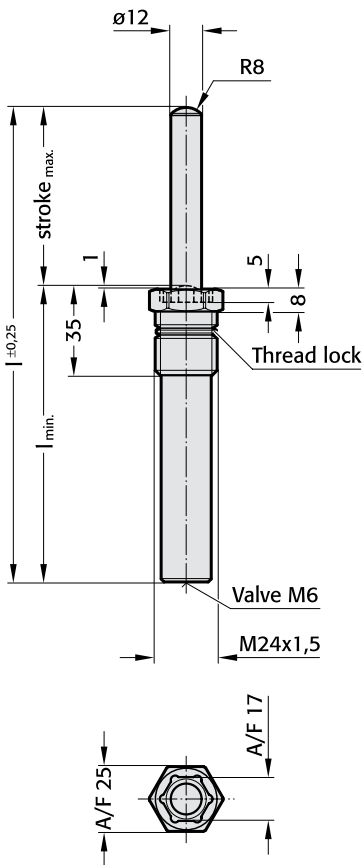


**Installation Example**

Trimming Die



2479.034.



**Description:**

Spring ejectors are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries.

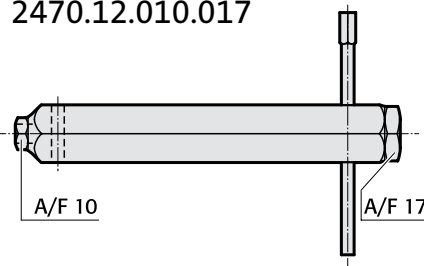
**Note:**

Do not repair worn springs; they have to be replaced completely

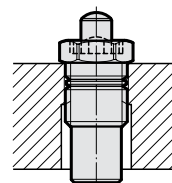
- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar (at 20°C)
- Min. filling pressure: 20 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 30 to 80 (at 20°C)
- Max. piston speed: 1.6 m/s

**Warning:**  
Different colour coding for spring force used in WDX standard

2470.12.010.017



**Mounting variations**



2479.034.00020./00040./00080./00170.

Order No	max.	stroke		spring force (daN)								
		l <sub>min.</sub>	l	.00020.		.00040.		.00080.		.00170.		
				initial	finish	initial	finish	initial	finish	initial	finish	
2479.034.	010	10	55	65	23	32,5	45	65,0	85	122,0	170	243,5
	016	16	61	77		36,6		73,3		137,4		274,8
	020	20	65	85		36,0		72,0		134,5		269,0
	025	25	70	95		38,9		77,8		145,9		291,8
	030	30	75	105		37,5		75,0		141,0		281,5
	038	38	83	121		40,7		81,4		152,7		305,4
	040	40	85	125		38,5		77,0		144,5		289,0
	050	50	95	145		42,0		83,5		156,5		313,0
	060	60	105	165		42,0		84,0		157,0		314,0
	070	70	115	185		42,0		84,0		157,5		315,0
	080	80	125	205		42,0		84,0		158,0		315,5
	100	100	145	245		42,0		84,5		158,0		316,5
	125	125	170	295		42,0		84,5		158,5		317,0

**Ordering Code (example):**

Spring Plunger with Gas Spring (Ejector Pin Unit)  
M24 × 1,5 nach WDX-Norm = 2479.034.  
Force 20 daN = 00020.  
Stroke 20 mm = 020  
Order No = 2479.034.00020.020

**Spring Force Colour Markings:**

Order No	Colour	initial spring force daN	pressure (bar)
2479.034. 00020.	green	23	20
00040.	blue	45	40
00080.	red	85	75
00170.	yellow	170	150
00000.	black, upon customers request; also available unfilled		



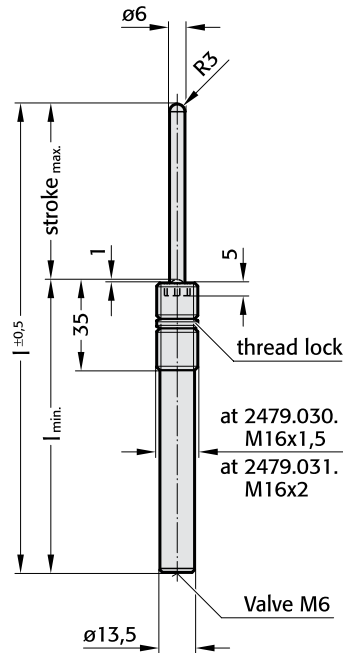
# Spring Plungers with Gas Spring (Ejector Pin Units) with hexagon socket VDI 3004

**FIBRO**

2479.030.  
2479.031.

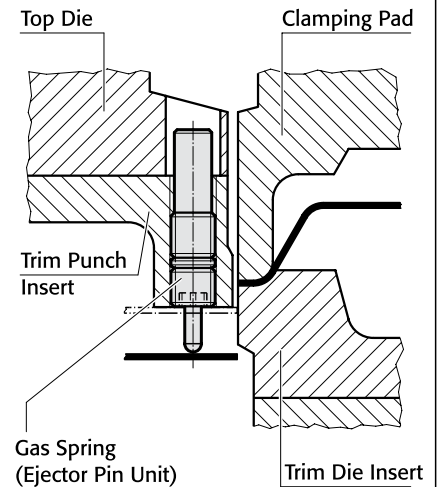


2479.030.  
2479.031.

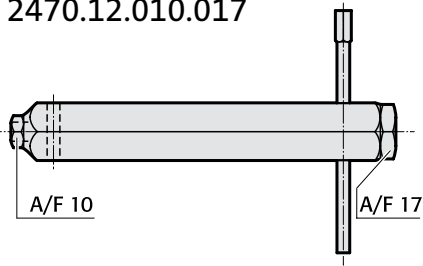


## Installation Example

Trimming Die



2470.12.010.017



## Description:

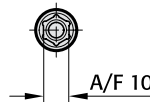
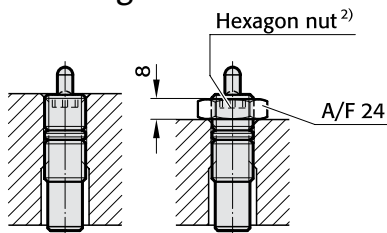
Spring ejectors are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries.

Assembly requires the use of special FIBRO insertion tool (2470.12.010.017)

## Note:

Do not repair worn springs; they have to be replaced completely

## Mounting Variations:



<sup>2)</sup> Hexagon nut order supplementary:  
2480.004.00040.1 (M16 x 1,5)  
2480.004.00040.2 (M16 x 2)

Pressure medium:	Nitrogen N <sub>2</sub>
Max. filling pressure:	150 bar (at 20 °C)
Min. filling pressure:	6 bar
Working temperature:	0 °C to +80 °C
Temperature related force increase:	±0.3%/°C
Max. recommended extensions per minute:	approx. 100 (at 20 °C)
Max. piston speed:	1.6 m/s

2479.030.00005./ 00010./ 00020./ 00040.  
2479.031.00004.<sup>1)</sup>/ 00005./ 00010./ 00020./ 00040.

<sup>1)</sup> Spring forces for 2479.031. only

Order No	stroke max.	l <sub>min.</sub>	l	spring force (daN)									
				(violet) .00004. <sup>1)</sup>		(green) .00005.		(blue) .00010.		(red) .00020.		(yellow) .00040.	
				initial	final	initial	final	initial	final	initial	final	initial	final
2479.	.010	10	55	65	3,4	6,0	10,3	11	19,0	21	36,1	42	73,0
	020	20	65	85		5,2	9,4		17,2		32,8		66,1
	030	30	75	105		5,2	9,1		16,7		31,9		64,5
	040	40	85	125		5,2	9,0		16,5		31,5		63,7
	050	50	95	145		5,4	9,6		17,6		33,6		67,7
	060	60	105	165		5,4	9,4		17,3		33,0		66,5
	070	70	115	185		5,4	9,3		17,0		32,5		65,7
	080	80	125	205		5,2	9,2		16,8		32,1		65,1
	100	100	145	245		5,2	9,1		16,7		31,9		64,3
	125	125	170	295		5,2	9,0		16,5		31,5		63,8

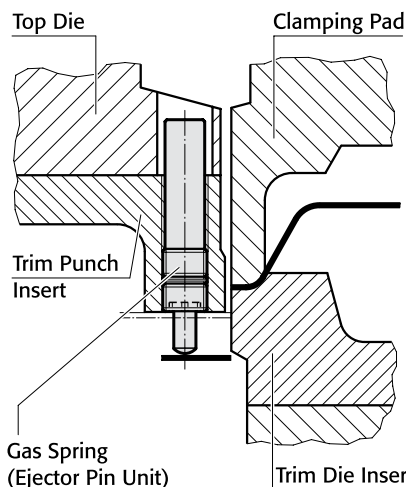
## Ordering Code (example):

Gas Spring (Ejector Pin Unit) M16 x 1,5	Force	Stroke	Order No	Spring Force Colour Markings:	initial spring force daN	pressure (bar)
	6 daN	10 mm	2479.030.00005.010	violet	4	12
				green	6	20
				blue	11	40
				red	21	75
				yellow	42	150
				black, upon customers request; also available unfilled		

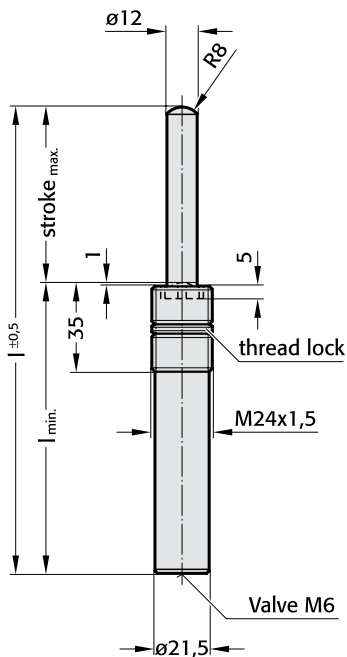
2479.032.

**Installation Example**

Trimming Die



2479.032.



**Description:**

Spring ejectors are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries.

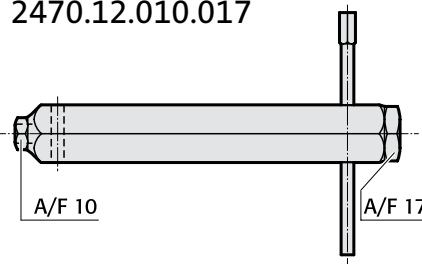
Assembly requires the use of special FIBRO insertion tool (2470.12.010.017)

**Note:**

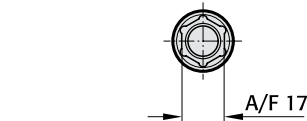
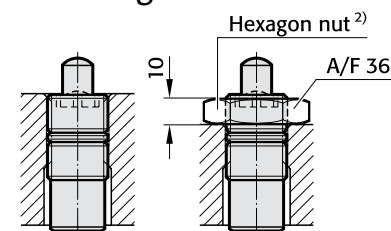
Do not repair worn springs; they have to be replaced completely

- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar (at 20°C)
- Min. filling pressure: 20 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 100 (at 20°C)
- Max. piston speed: 1.6 m/s

2470.12.010.017



**Mounting Variations :**



2) Hexagon nut order supplementary: 2480.004.00170

2479.032.00020./ 00040./ 00080./ 00170.

Order No	stroke max.	l <sub>min.</sub>	l	spring force (daN)								
				.00020.		.00040.		.00080.		.00170.		
				initial	finish	initial	finish	initial	finish	initial	finish	
2479.032.	010	10	55	65	23	33,1	45	64,8	85	122,4	170	244,8
	020	20	65	85		36,3		71,1		134,3		268,6
	030	30	75	105		38,2		74,7		141,1		282,2
	040	40	85	125		39,3		76,9		145,4		290,7
	050	50	95	145		42,5		83,2		157,3		314,5
	060	60	105	165		42,5		83,2		157,3		314,5
	070	70	115	185		42,8		83,7		158,1		316,2
	080	80	125	205		42,8		83,7		158,1		316,2
	100	100	145	245		43,0		84,1		159,0		318,0
	125	125	170	295		43,0		84,1		159,0		318,0

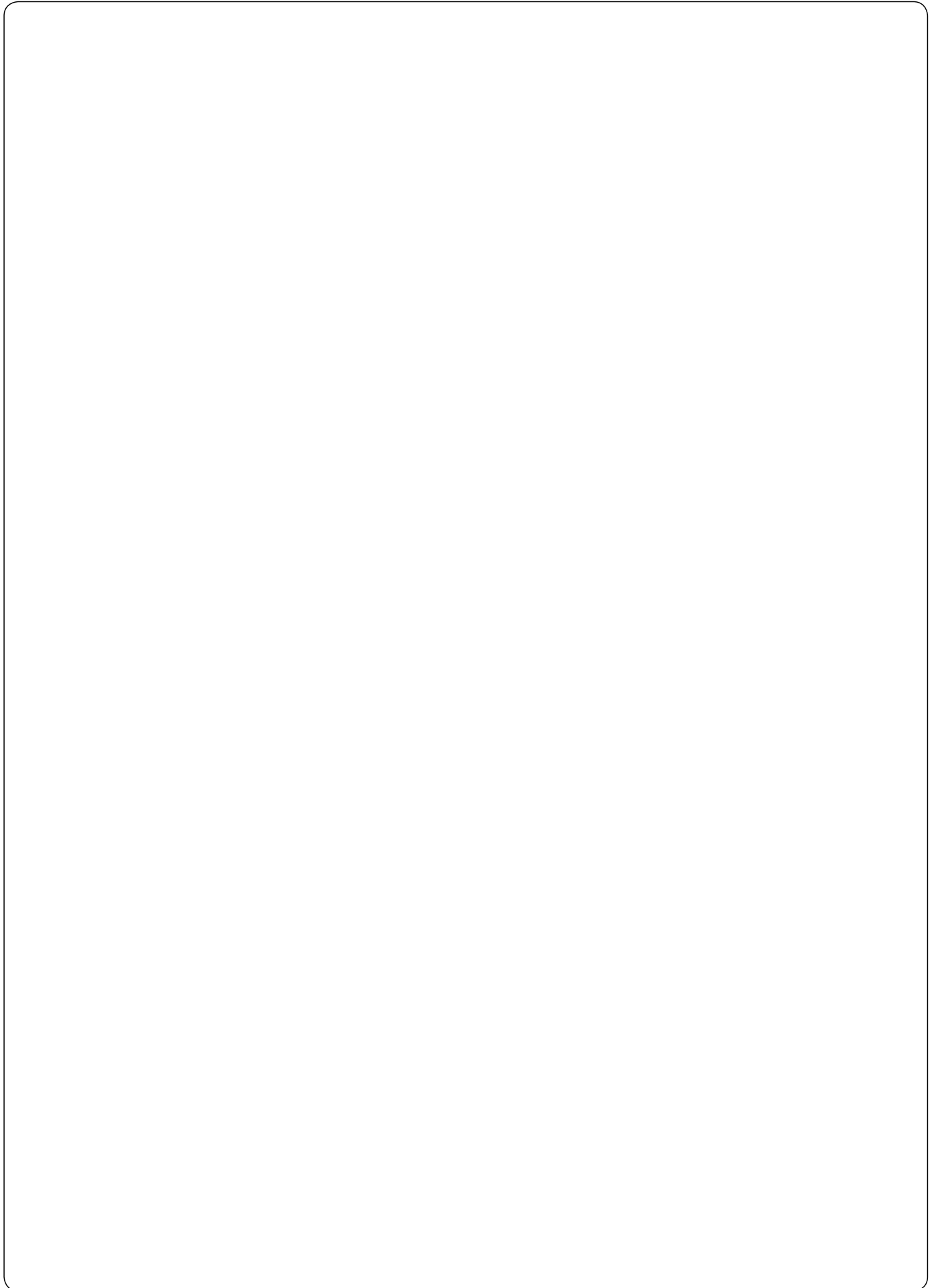
**Ordering Code (example):**

Gas Spring with hexagon socket  
(Ejector Pin Unit) M24 × 1,5

= 2479.032.  
Force 20 daN = 00020.  
stroke 20 mm = 020  
Order No = 2479.032.00020.020

**Spring Force Colour Markings:**

Order No	Colour	initial spring force daN	pressure(bar)
2479.032. 00020.	green	23	20
00040.	blue	45	40
00080.	red	85	75
00170.	yellow	170	150
00000.	black, upon customers request; also available unfilled		





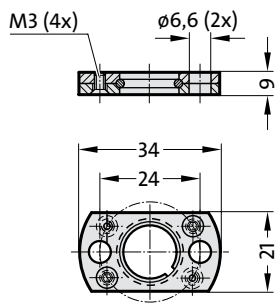
# Gas Springs small dimensions

Gas Springs  
small dimensions and low forces  
Mounting variations

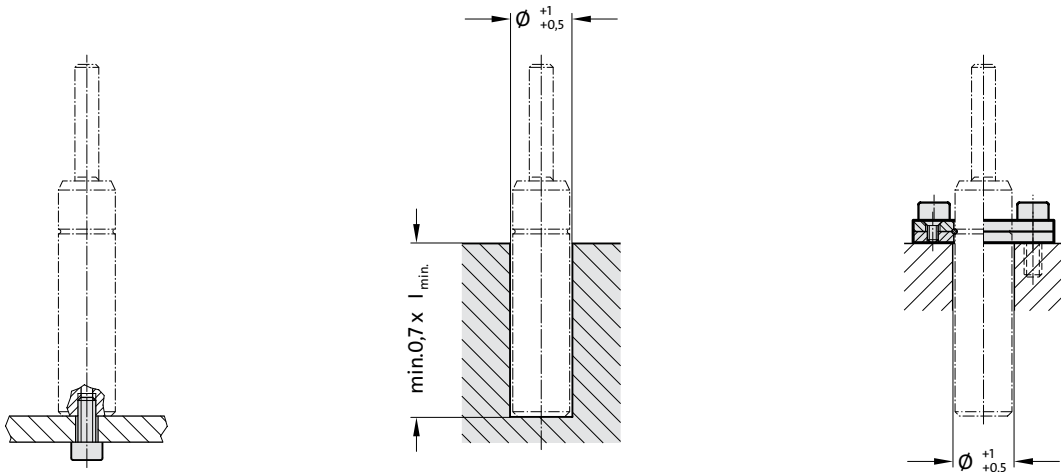
FIBRO

2482.72.

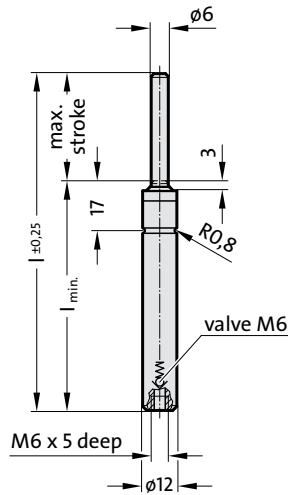
2480.051.00013



Mounting Examples:



2482.72.



**Spring Force Colour Markings**

Order No	initial spring force daN	pressure bar	Colour
2482.72.00013.	13	45	green
00025.	25	90	blue
00038.	38	135	red
00050.	50	180	yellow
00000.*			black

\* upon customers request; also available unfilled!

2482.72. 00013.  
00025.  
00038.  
00050.

Order No	stroke max.	l <sub>min.</sub>	l
2482.72.	007	7	49
	010	10	52
	013	12,7	54,7
	015	15	57
	019	19	61
	025	25	67
	038	38	80
	050	50	92
	063	63,5	108,5
	075	75	120
	080	80	125
	100	100	145
	125	125	170

Spring forces as per Spring Diagram

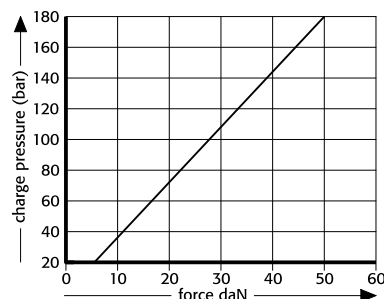
**Description:**

The gas springs are colour-coded according to the spring force rating ranges 13-25-38-50 daN. All springs, regardless of their spring force ratings, are of the same design. The differing force ratings result exclusively from the differing charge pressures. Gas can be added or reduced from below. Do not repair worn springs; they have to be replaced completely.

Pressure medium: Nitrogen – N<sub>2</sub>  
 Max. filling pressure: 180 bar  
 Min. filling pressure: 20 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0,3%/°C  
 Max. recommended extensions per min.: approx. 40 to 100 (at 20 °C)  
 Max. piston speed 1.6 m/s

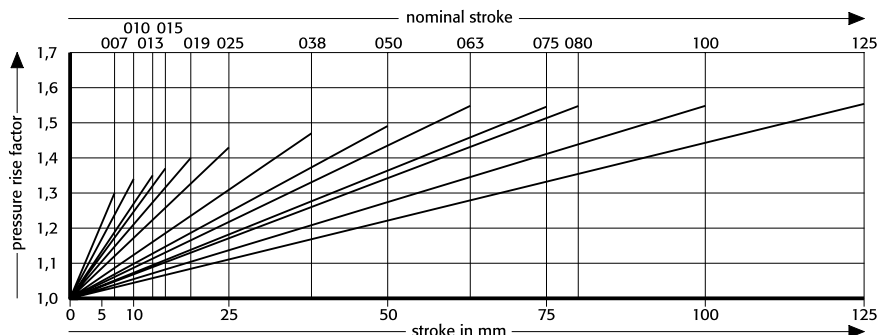
2482.72.

Initial spring force versus charge pressure



2482.72.

Spring force Diagram displacement versus stroke rise



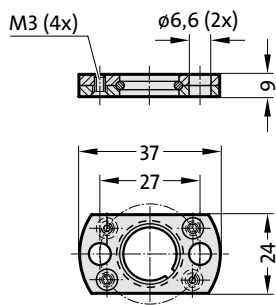
Pressure rise factor accounts for displacement but not external influences!

Gas Springs  
small dimensions and low forces  
Mounting variations

FIBRO

2482.73. .1

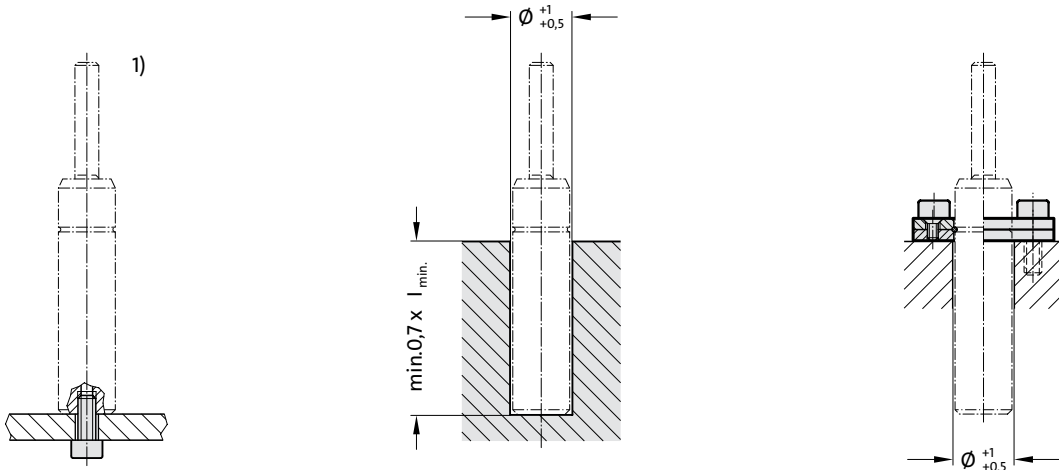
2480.051.00018



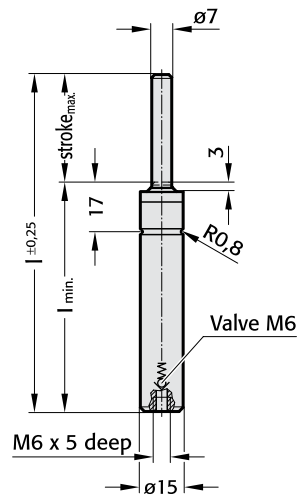
Note:

<sup>1)</sup> Fixing at bottom thread only  
recommended for stroke length up to 25  
mm.

Mounting Examples:



2482.73. .1



Spring Force Colour Markings

Order No	initial spring force daN	pressure bar	Colour
2482.73.00018. .1	18	45	green
00035. .1	35	90	blue
00050. .1	50	135	red
00070. .1	70	180	yellow
00000. .1*			black

\* upon customers request; also available unfilled!

2482.73.00018. .1  
00035. .1  
00050. .1  
00070. .1

Order No	stroke max.	I <sub>min.</sub>	I
2482.73.00018. .1	7	49	56
00035. .1	10	52	62
00050. .1	12,7	54,7	67,4
00070. .1	15	57	72
00000. .1*	19	61	80
	25	67	92
	38,1	80,1	118,2
	50	92	142
	63,5	108,5	172
	75	120	195
	80	125	205
	100	145	245
	125	170	295

Spring forces as per Spring Diagram

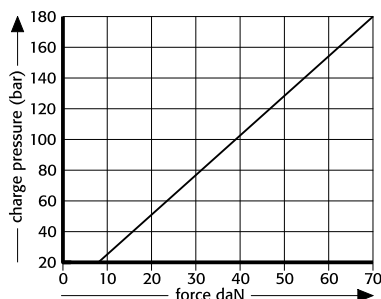
Description:

The gas springs are colour-coded according to the spring force rating ranges 18-35-50-70 daN. All springs, regardless of their spring force ratings, are of the same design. The differing force ratings result exclusively from the differing charge pressures. Gas can be added or reduced from below. Do not repair worn springs; they have to be replaced completely.

Pressure medium: Nitrogen – N<sub>2</sub>  
 Max. filling pressure: 180 bar  
 Min. filling pressure: 20 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0,3%/°C  
 Max. recommended extensions per min.: approx. 40 to 100 (at 20°C)  
 Max. piston speed: 1.6 m/s

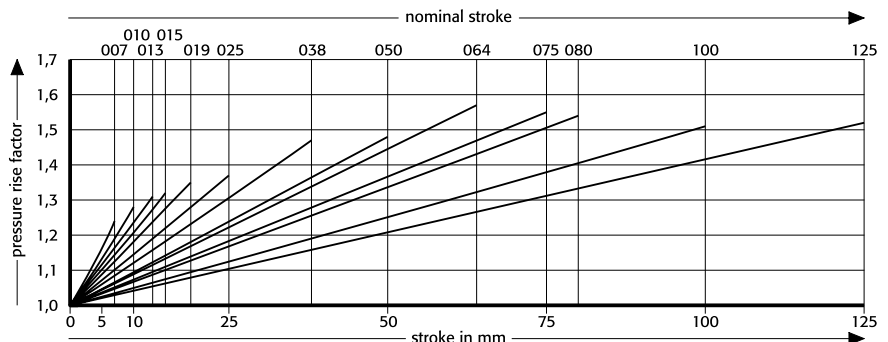
2482.73. .1

Initial spring force versus charge pressure



2482.73. .1

Spring force Diagram displacement versus stroke rise



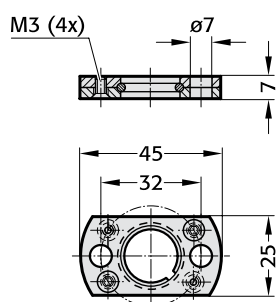
Pressure rise factor accounts for displacement but not external influences!

Gas Springs  
small dimensions and low forces  
Mounting variations

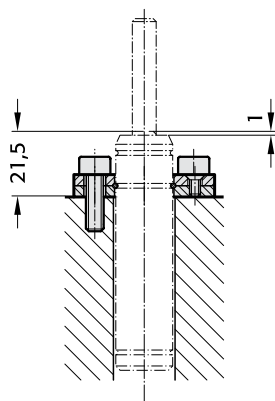
FIBRO

2482.74.

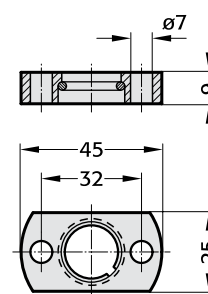
2480.051.00030



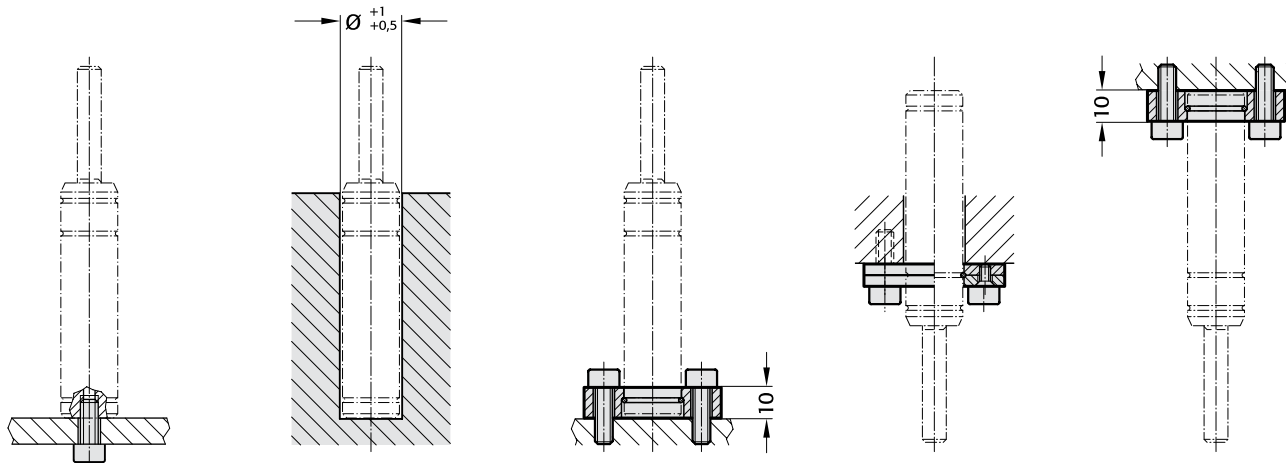
2480.051.00030



2480.052.00030

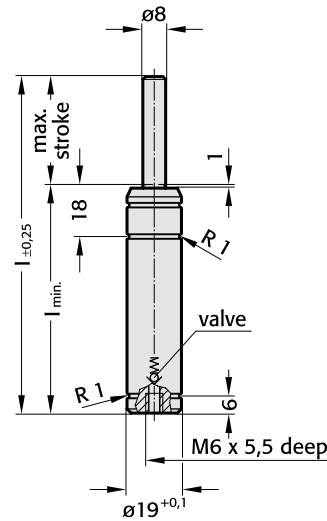


Mounting Examples:



2482.74.

2482.74.



Spring Force Colour Markings

Order No	initial spring force daN	pressure bar	Colour
2482.74.00030.	30	60	green
00050.	50	100	blue
00070.	70	140	red
00090.	90	180	yellow
00000.*			black

2482.74.00030.  
00050.  
00070.  
00090.

Order No	stroke max.	l <sub>min.</sub>	l
2482.74.	.007	7	49
	010	10	52
	015	15	57
	025	25	67
	038	38,1	79,9
	050	50	92
	063.1	63,5	108,5
	080.1	80	125
	100	100	145
	125	125	170

Description:

The gas springs are colour-coded according to the spring force rating ranges 30–50–70–90 daN. All springs, regardless of their spring force ratings, are of the same design. The differing force ratings result exclusively from the differing charge pressures. Gas can be added from below.

Do not repair worn springs; they have to be replaced completely.

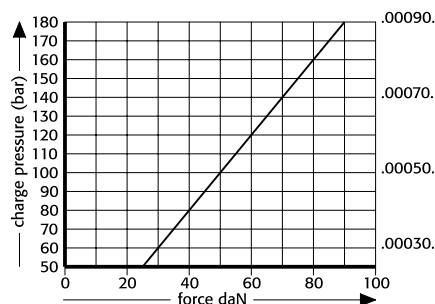
Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 180 bar  
 Min. filling pressure: 45 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 100 to 150 (at 20°C)  
 Max. piston speed: 1.6 m/s

\* upon customers request; also available unfilled!

Spring forces as per Spring Diagram

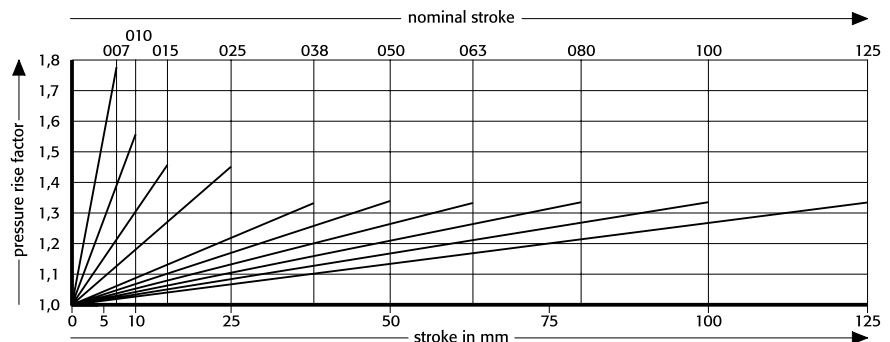
2482.74.

Initial spring force versus charge pressure



2482.74.

Spring force Diagram displacement versus stroke rise

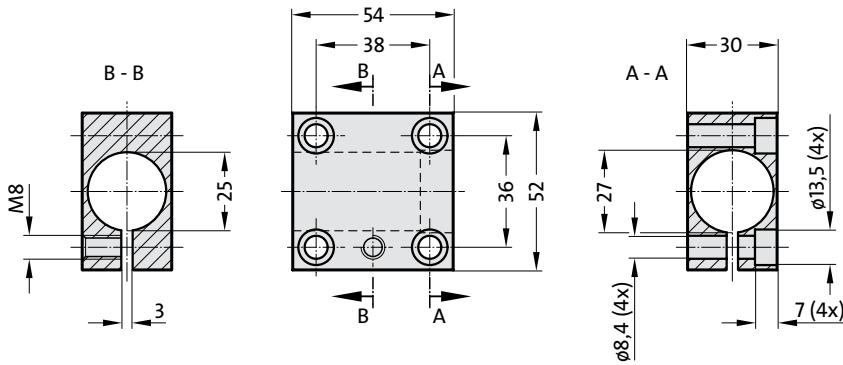


Pressure rise factor accounts for displacement but not external influences!

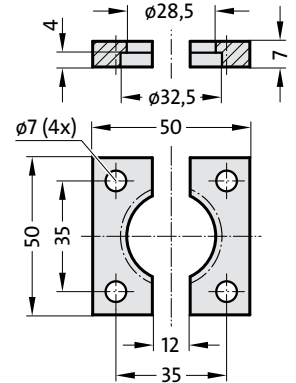
# Gas Springs small dimensions and low forces Mounting Variations

**FIBRO**  
2480.21.  
2480.22.

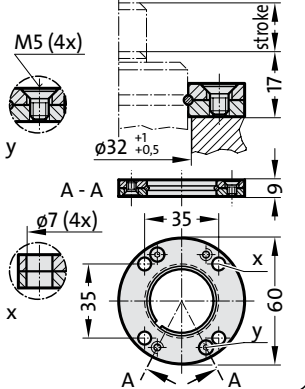
2480.053.00150  
for 2480.21.



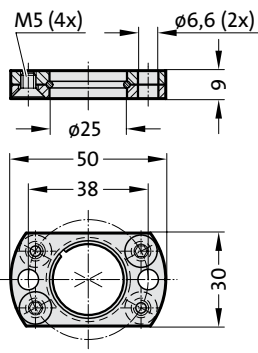
2480.022.00150  
for 2480.22.



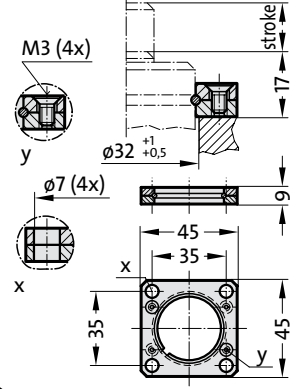
2480.055.00150  
for 2480.22.



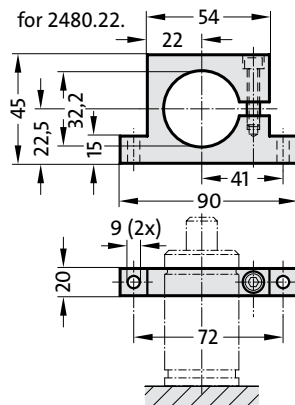
2480.051.00150  
for 2480.21.



2480.057.00150  
for 2480.22.

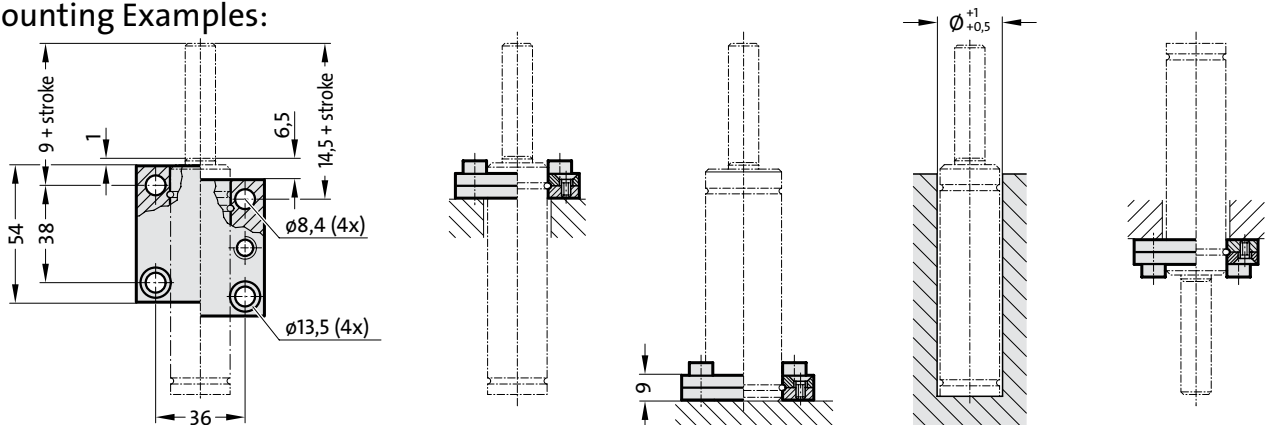


2480.044.00150<sup>2)</sup>  
for 2480.22.



<sup>2)</sup> Attention:  
The spring force must be  
absorbed by the stop surface.

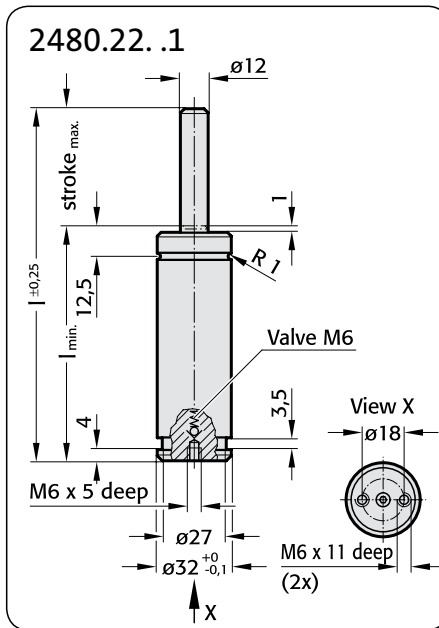
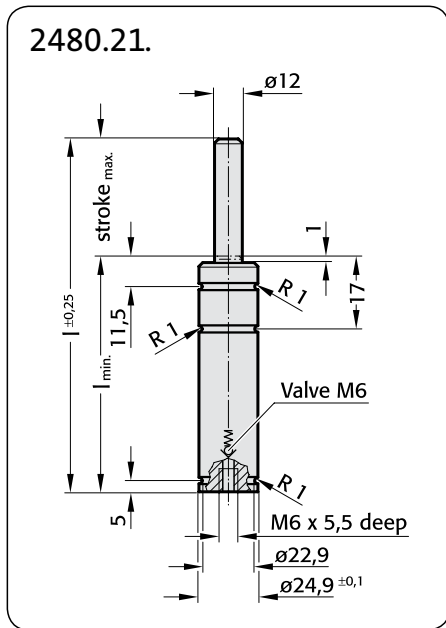
## Mounting Examples:





2480.21.  
2480.22. .1

Gas Springs  
small dimensions  
and low forces



2480.21. 00050.  
00100.  
00150.  
00200.

Order No	stroke max.	l <sub>min.</sub>	l	
2480.21.	.010	10	52	62
	013	12,7	54,7	67,4
	015	15	57	72
	016	16	58	74
	025	25	67	92
	038	38,1	80,1	118,2
	050	50	92	142
	063	63,5	108,5	172
	080	80	125	205
	100	100	145	245
	125	125	170	295

Spring forces as per Spring Diagram

Order No for spare parts kit:  
2480.21.00150

2480.22. 00050. .1  
00100. .1  
00150. .1  
00200. .1

Order No	stroke max.	l <sub>min.</sub>	l	
2480.22.	.010.1	10	60	70
	013.1	12,7	62,7	75,4
	016.1	16	66	82
	025.1	25	75	100
	038.1	38,1	88,1	126,2
	050.1	50	100	150
	063.1	63,5	113,5	177
	080.1	80	130	210
	100.1	100	150	250
	125.1	125	175	300

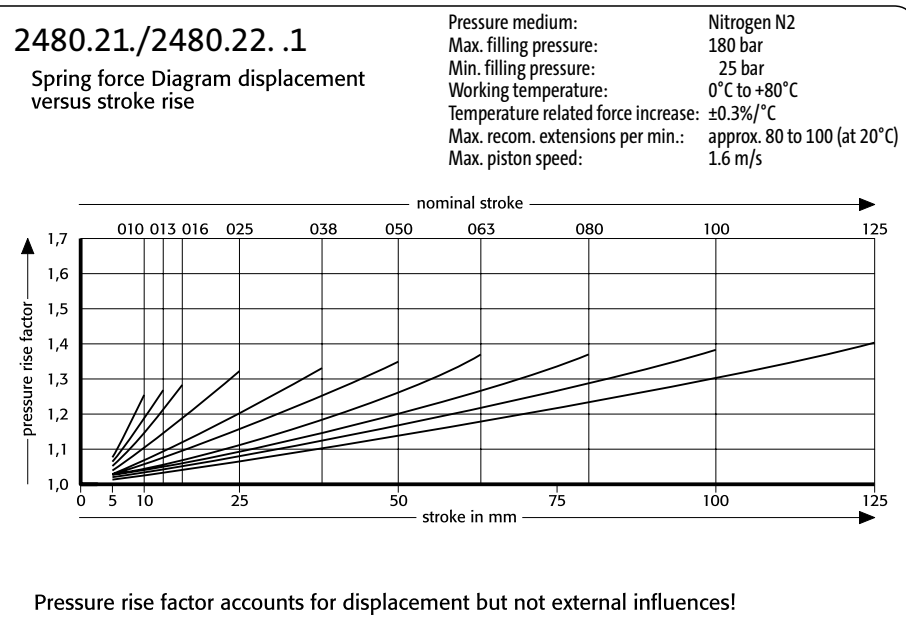
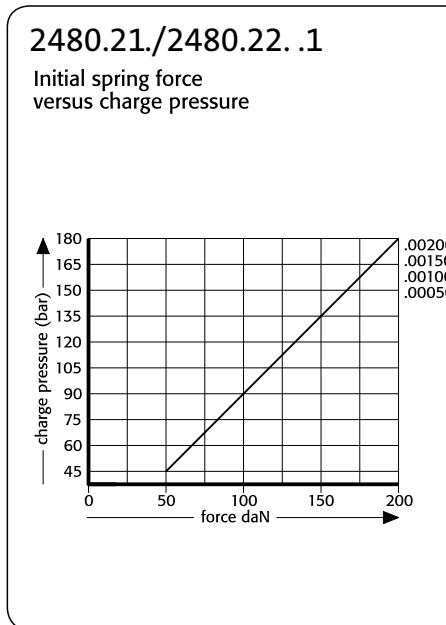
Order No for spare parts kit:  
2480.21.00150

**Description:**  
The gas springs are colour-coded according to the spring force rating ranges 50–100–150–200 daN.  
All springs, regardless of their spring force ratings, are of the same design. The differing force ratings result exclusively from the differing charge pressures. Do take into consideration the colour-coded pressure rating during repair work and recharging.

**Spring Force Colour Markings**

Order No	initial spring force daN	pressure (bar)	Colour	
2480.	.00050.	50	45	green
	00100.	100	90	blue
	00150.	150	135	red
	00200.	200	180	yellow
	00000.			black*

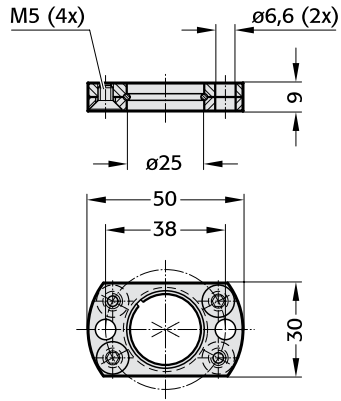
\* upon customers request; also available unfilled!



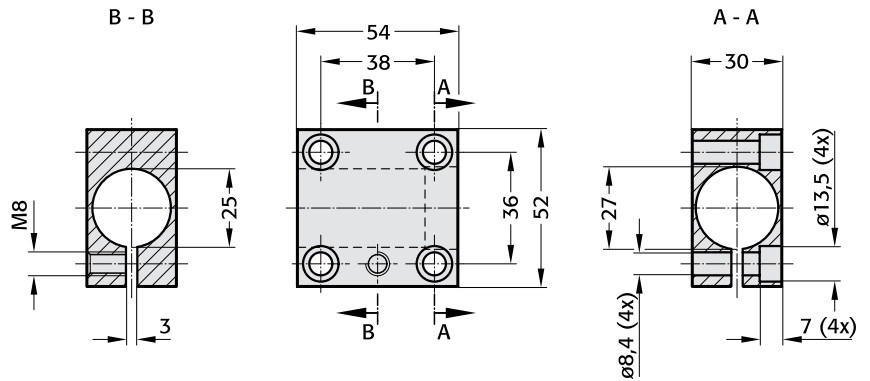
Gas Springs  
Mounting Variations

2480.23.

2480.051.00150

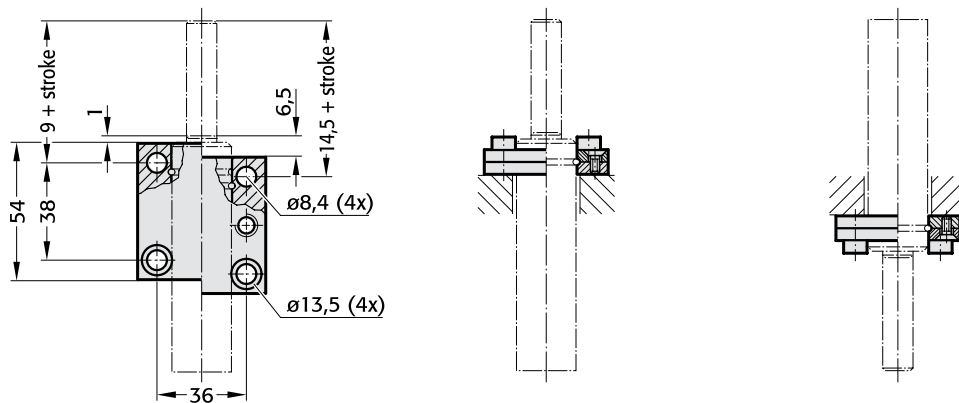


2480.053.00150



Note:  
Only gas spring with a stroke of 25 mm or greater can be attached using the upper groove.  
Only gas spring with a stroke of 38,1 mm or greater can be attached using the lower groove.

Mounting example:

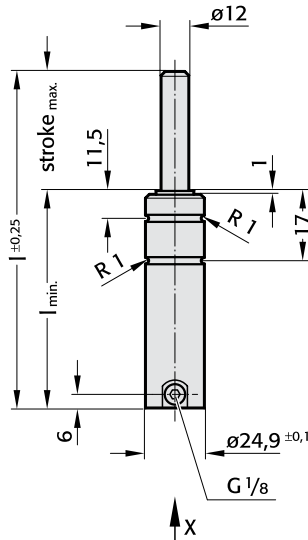


**2480.23.**

Initial spring force at 180 bar = 200 daN

Order No	stroke			
	max.	$l_{min.}$	$l$	
2480.23.00000.	010	10	52	62
	013	12,7	54,7	67,4
	016	16	58	74
	025	25	67	92
	038	38,1	80,1	118,2
	050	50	91	142
	063	63,5	108,5	172
	080	80	125	205
	100	100	145	245
	125	125	170	295

**2480.23.**



View X



**Note:**

Order No for spare parts kit:  
2480.21.00150

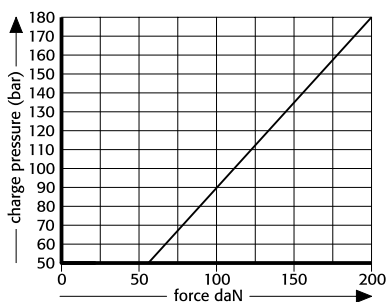
max. charge pressure 180 bar

Gas spring will be delivered unfilled and can only be used in a permanent connection (valveless)

- Pressure medium: Nitrogen  $N_2$
- Max. filling pressure: 180 bar
- Min. filling pressure: 25 bar
- Working temperature:  $0^\circ C$  to  $+80^\circ C$
- Temperature related force increase:  $\pm 0.3\%/^\circ C$
- Max. recommended extensions per minute: approx. 80 to 100 (at  $20^\circ C$ )
- Max. piston speed: 1.6 m/s

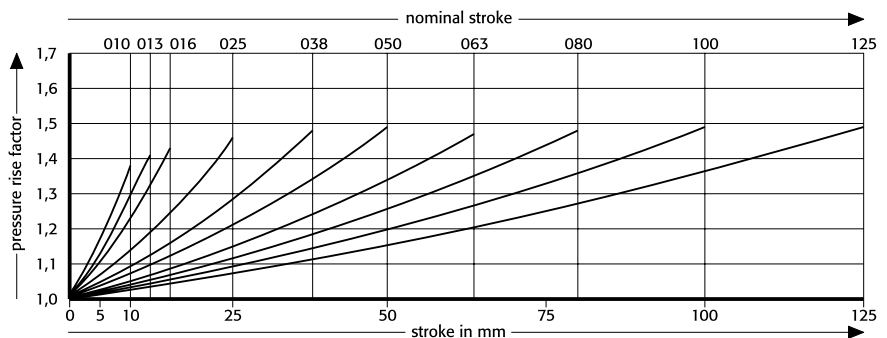
**2480.23.**

Initial spring force versus charge pressure

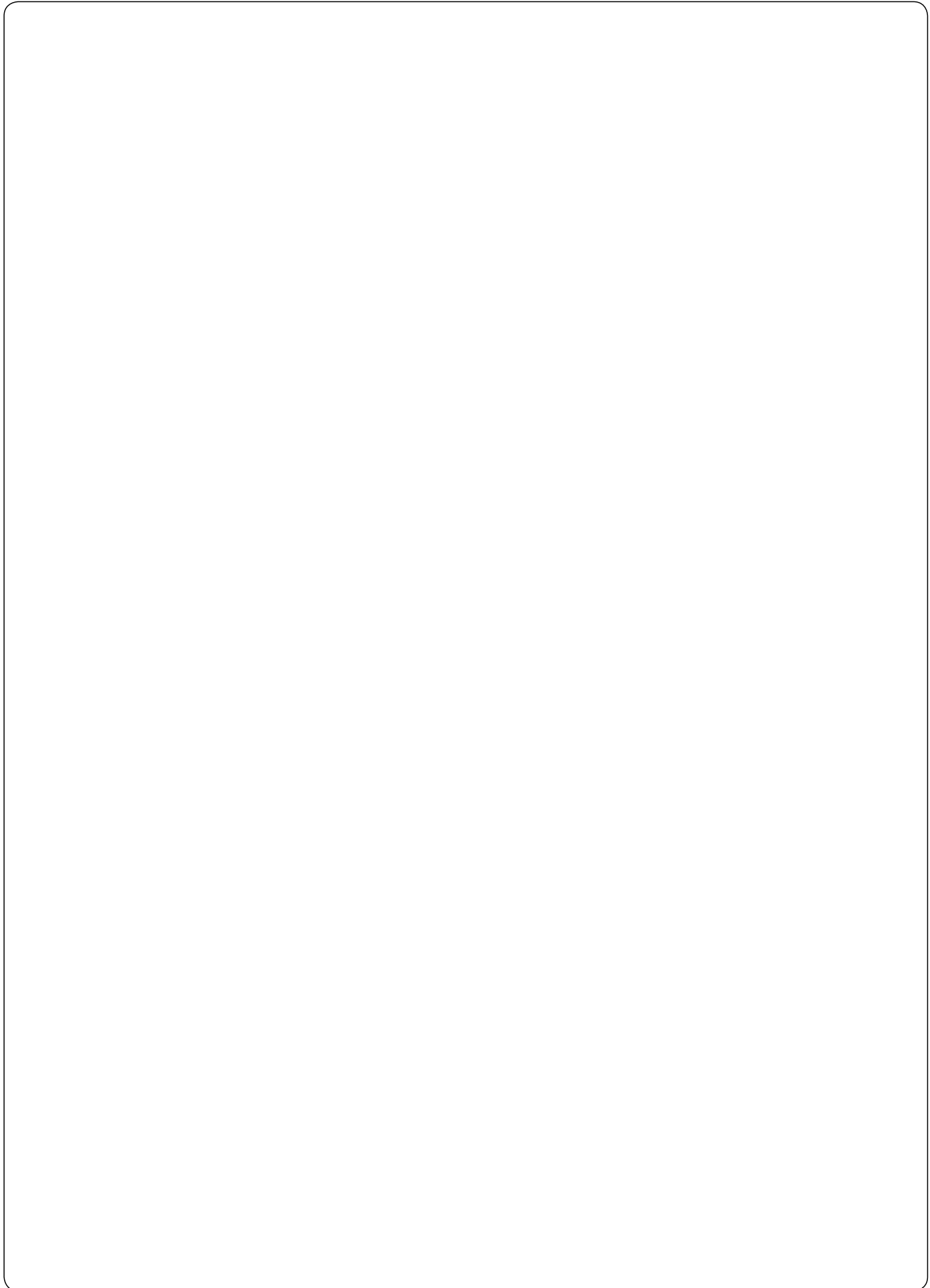


**2480.23.**

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

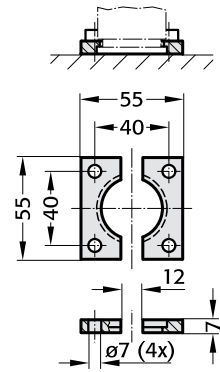


# Gas Springs Standard

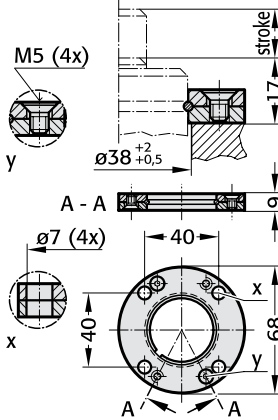
Gas Springs  
Mounting Variations

2480.12.00250.

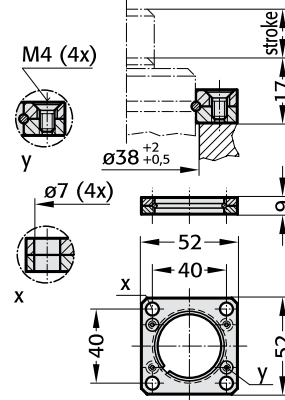
2480.022.00250



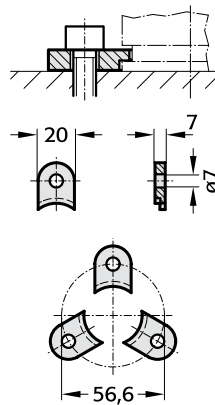
2480.055.00250



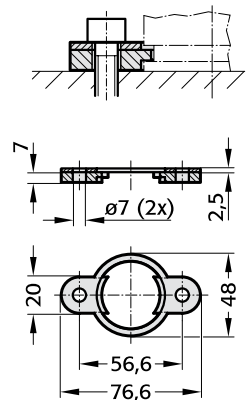
2480.057.00250



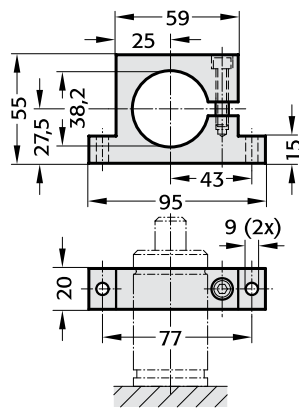
2480.007.00250



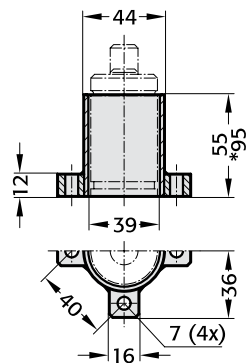
2480.008.00250<sup>3)</sup>



2480.044.00250<sup>2)</sup>



2480.010.00250.055<sup>3)</sup>  
2480.010.00250.095\*<sup>3)</sup>



<sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.

<sup>3)</sup> Note:  
Not for use with composite connection.

2480.12.00250.

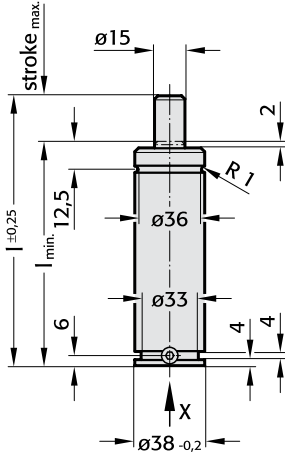
Gas Springs

2480.12.00250.

Initial spring force at 150 bar = 250 daN

Order No	stroke max.	$l_{min}$	$l$
2480.12.00250. 010	10	60	70
013	12,7	62,7	75,4
016	16	66	82
019	19	69	88
025	25	75	100
038	38,1	88,1	126,2
050	50	100	150
063	63,5	113,5	177
080	80	130	210
100	100	150	250
125	125	175	300

2480.12.00250.

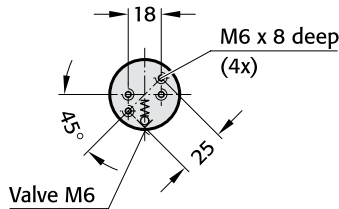


Note:

Order No for spare parts kit:  
2480.12.00250

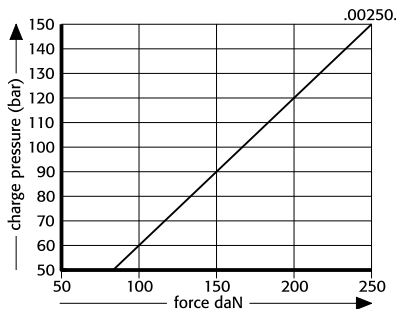
Pressure medium: Nitrogen  $N_2$   
 Max. filling pressure: 150 bar  
 Min. filling pressure: 50 bar  
 Working temperature:  $0^\circ C$  to  $+80^\circ C$   
 Temperature related force increase:  $\pm 0.3\%/^\circ C$   
 Max. recommended extensions per minute: approx. 80 to 100 (at  $20^\circ C$ )  
 Max. piston speed: 1.6 m/s

View X



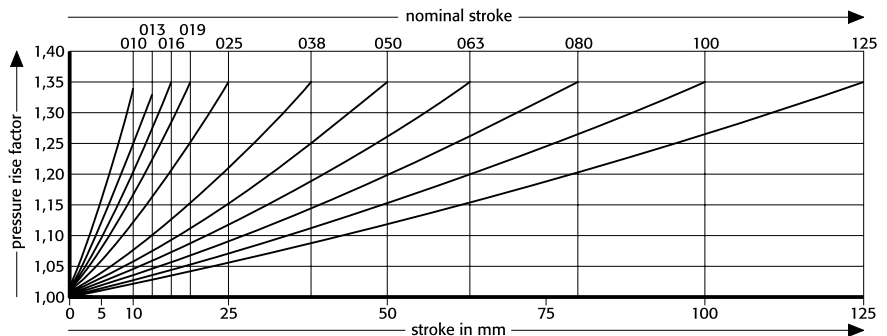
2480.12.00250.

Initial spring force versus charge pressure



2480.12.00250.

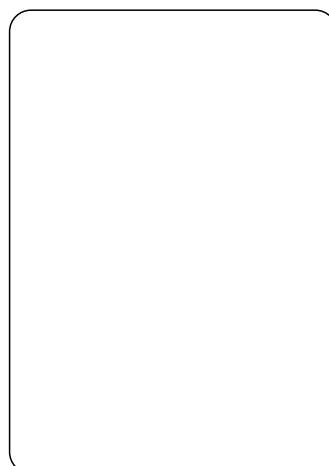
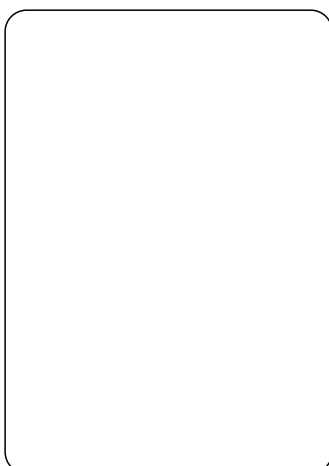
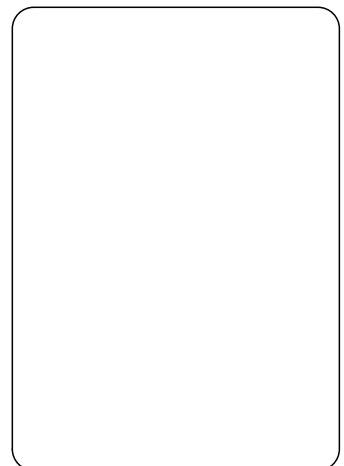
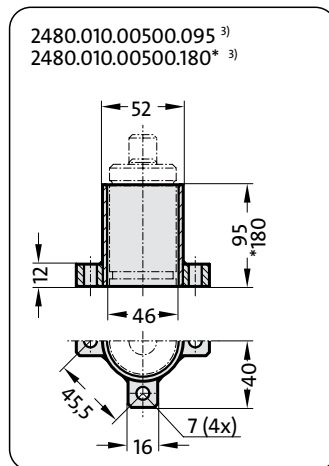
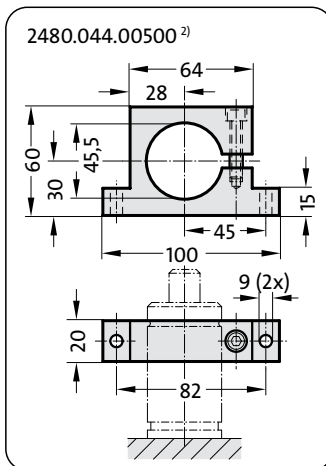
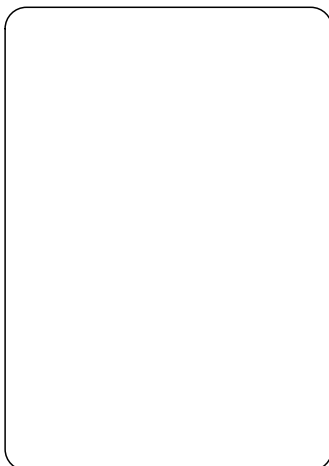
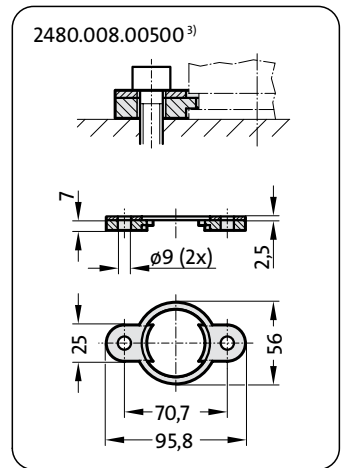
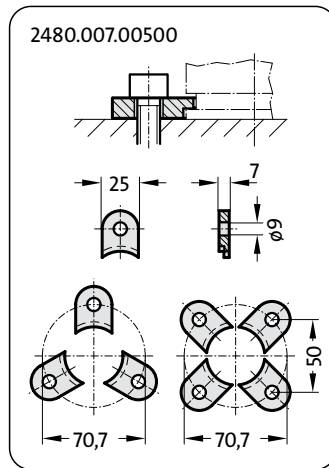
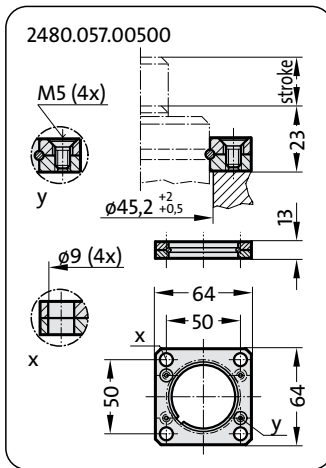
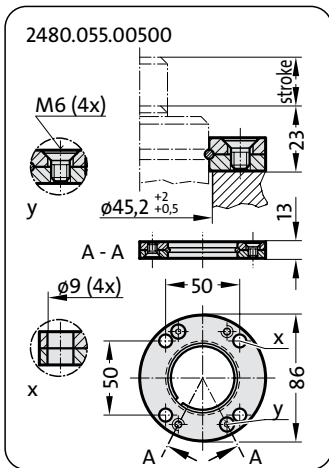
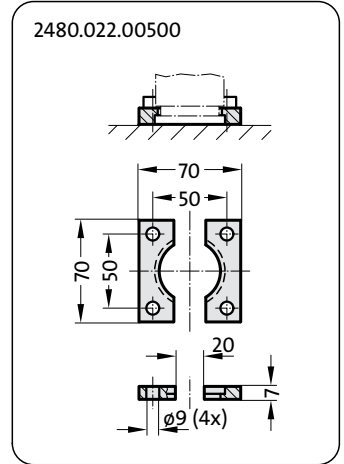
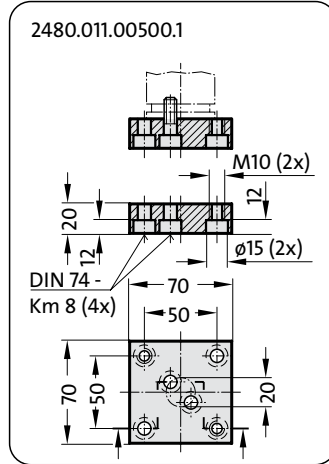
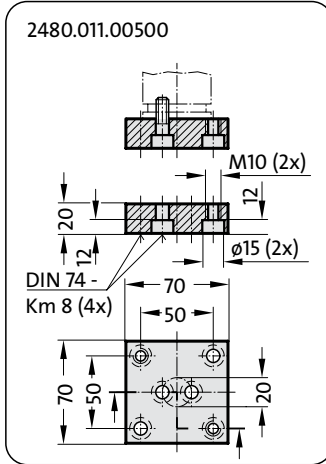
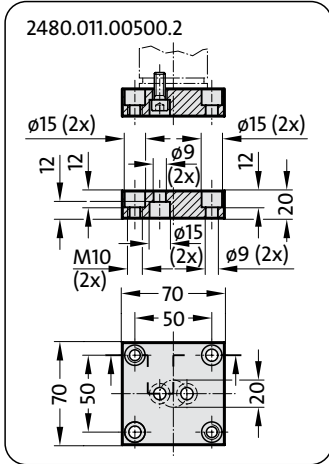
Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

Gas Springs  
Mounting Variations

2480.12.00500.



<sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.

<sup>3)</sup> Note:  
Not for use with composite connection.



2480.12.00500.

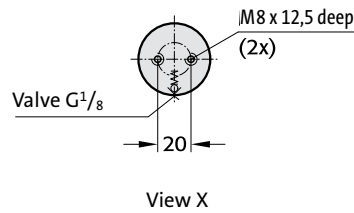
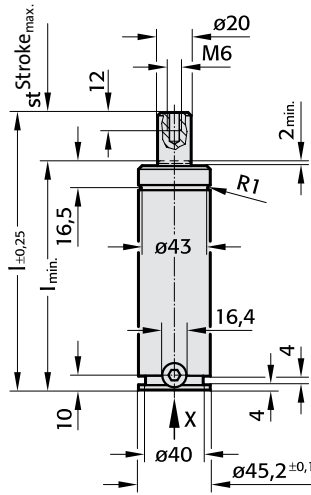
Gas Springs

2480.12.00500.

Initial spring force at 150 bar = 500 daN

Order No	stroke max.	$l_{min}$	$l$
2480.12.00500.010	10	95	105
013	12,7	97,7	110,4
025	25	110	135
038	38,1	123,1	161,2
050	50	135	185
063	63,5	148,5	212
080	80	165	245
100	100	185	285
125	125	210	335
160	160	245	405

2480.12.00500.



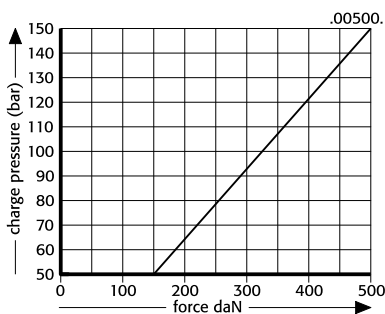
Note:

Order No for spare parts kit  
2480.12.00500

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 50 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 40 to 80 (at 20°C)  
 Max. piston speed: 1.6 m/s

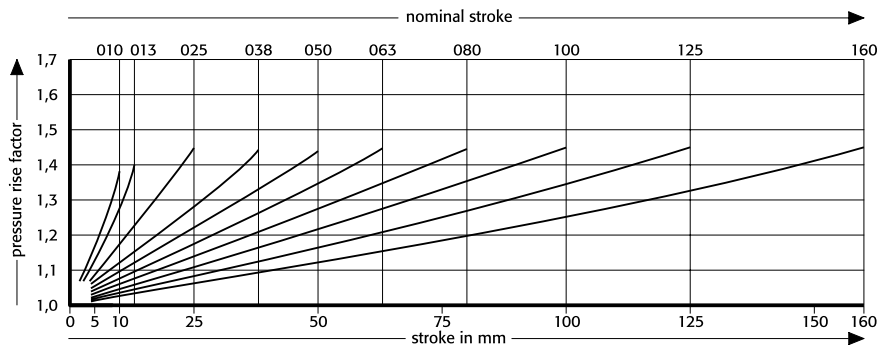
2480.12.00500.

Initial spring force versus charge pressure



2480.12.00500.

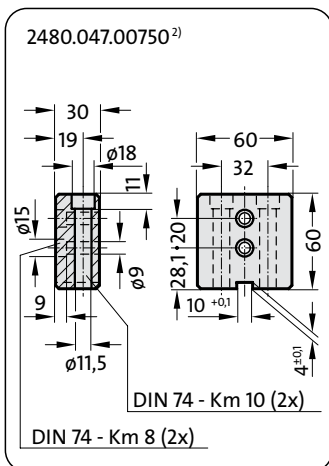
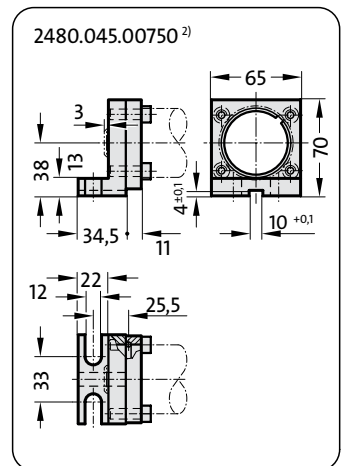
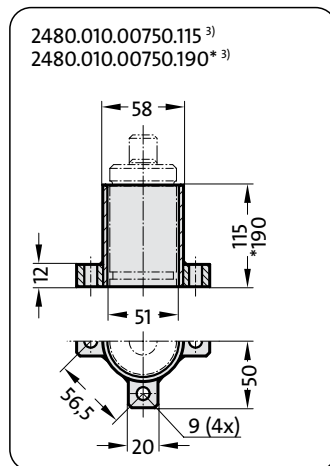
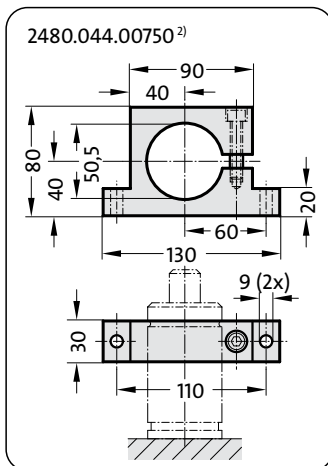
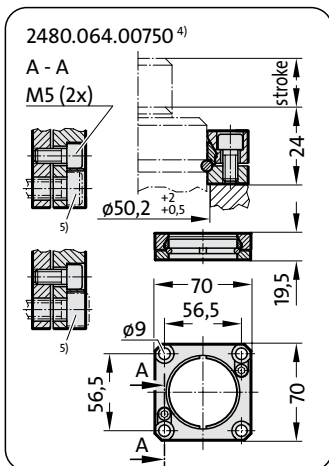
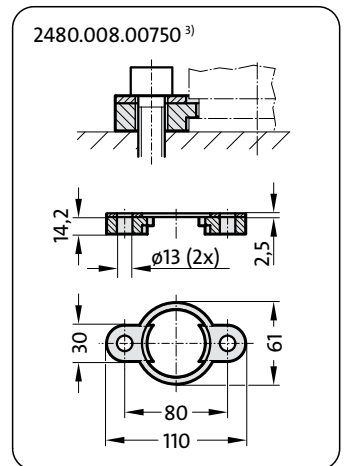
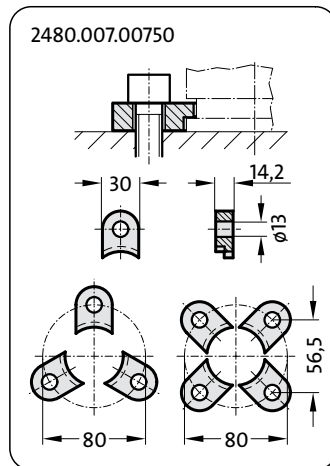
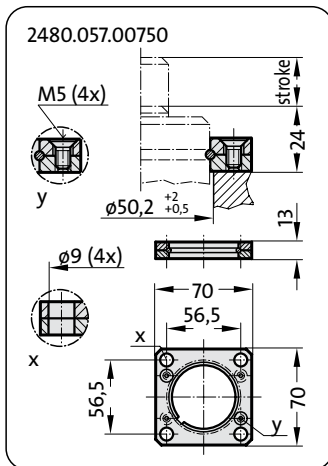
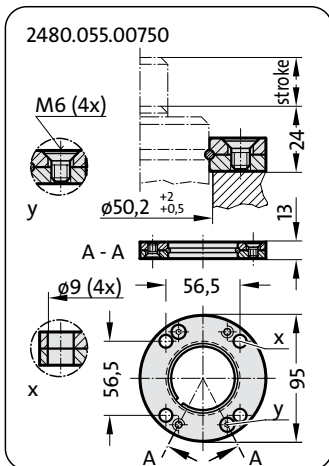
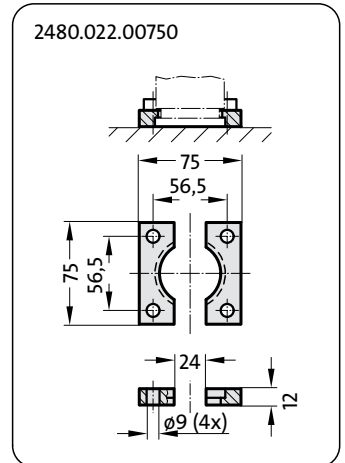
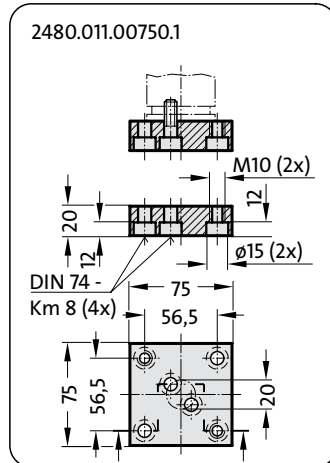
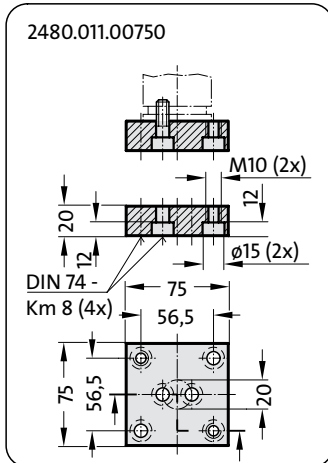
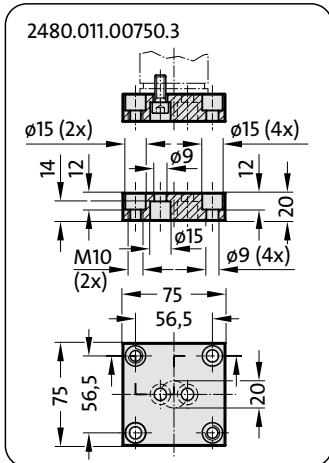
Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

Gas Springs  
Mounting Variations

2480.13.00750.



**Notes:**

- 2) Attention:  
The spring force must be absorbed by the stop surface.
- 3) Not for use with composite connection.
- 4) Square collar flange, non-rotating, fixing for composite connection.
- 5) Machine screws with hexagonal socket (compact head recommended).

**2480.13.00750.**

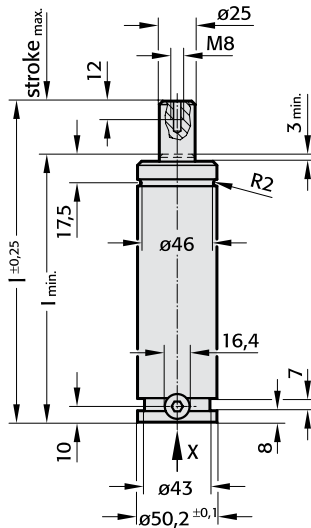
**Gas Springs**

**2480.13.00750.**

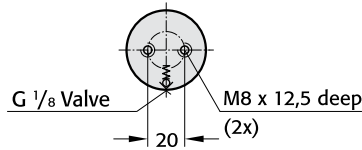
Initial spring force at 150 bar = 750 daN

Order No	stroke max.	$l_{min}$	$l$
2480.13.00750.013	12,7	107,7	120,4
025	25	120	145
038	38,1	133,1	171,2
050	50	145	195
063	63,5	158,5	222
075 <sup>1)</sup>	75	170	245
080	80	175	255
088 <sup>1)</sup>	87,5	182,5	270
100	100	195	295
113 <sup>1)</sup>	112,5	207,5	320
125	125	220	345
138 <sup>1)</sup>	137,5	232,5	370
150 <sup>1)</sup>	150	245	395
160	160	255	415
175 <sup>1)</sup>	175	270	445
200	200	295	495
225 <sup>1)</sup>	225	320	545
250	250	345	595
275 <sup>1)</sup>	275	370	645
300	300	395	695

**2480.13.00750.**



View X - Gas spring



<sup>1)</sup> Special stroke lengths

Not for gas springs to Renault Standard EM24.54.700.

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)  
 Max. piston speed: 1.6 m/s for 2480. ... R  
 2.0 m/s

**Note:**

Order No for spare parts kit: 2480.13.00750

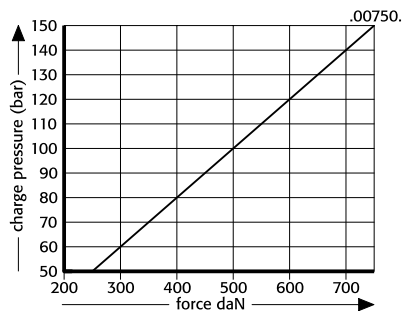
Order No for spare parts kit: to Renault standard EM24.54.700 2480.13.00750.R

Gas spring to Renault standard EM24.54.700\*  
 Ordering-code (example) 2480.13.00750.  .R

\* Attention: The gas spring cannot be repaired if the overtravel protection is triggered.

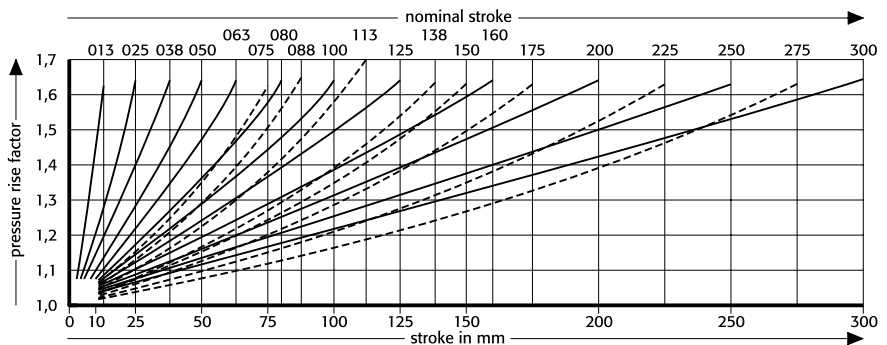
**2480.13.00750.**

Initial spring force versus charge pressure



**2480.13.00750.**

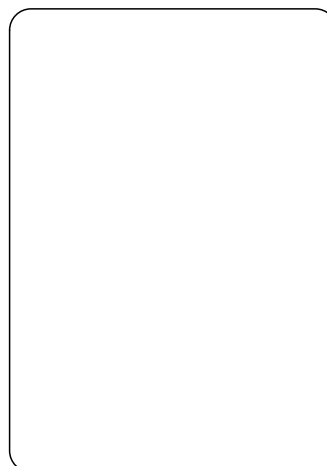
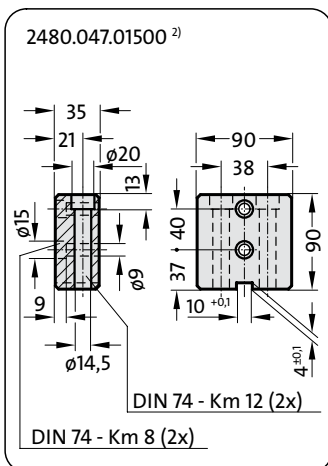
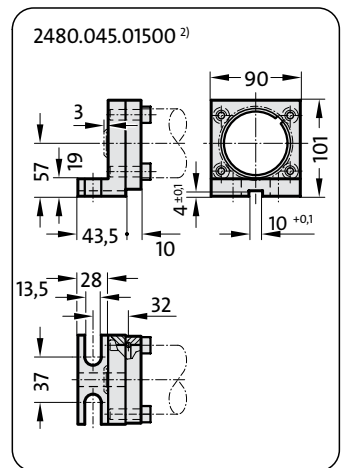
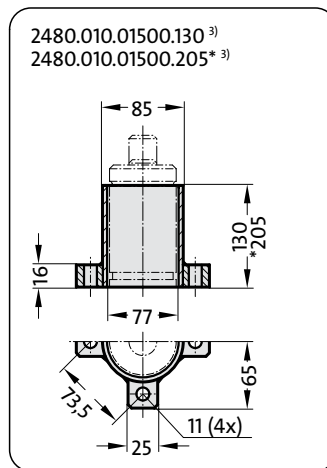
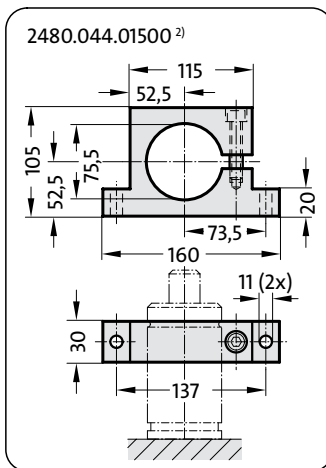
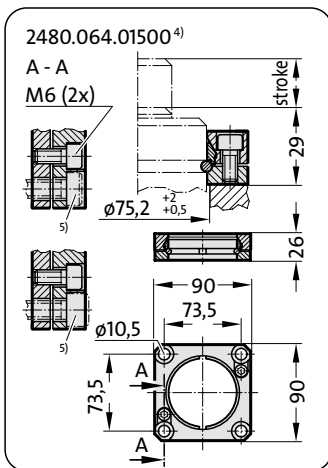
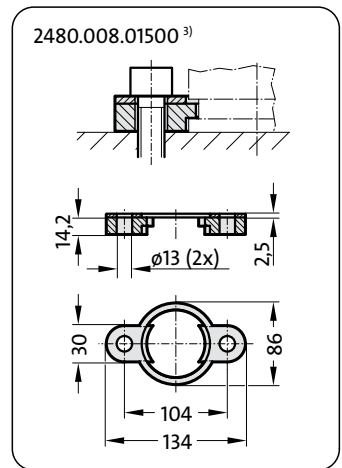
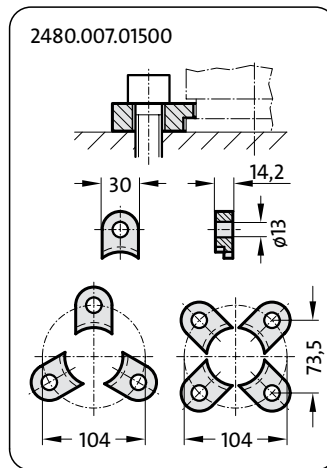
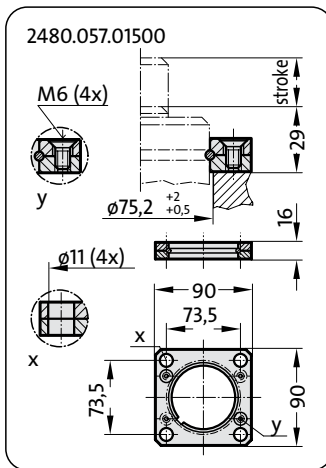
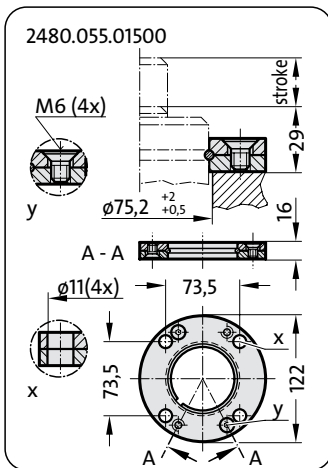
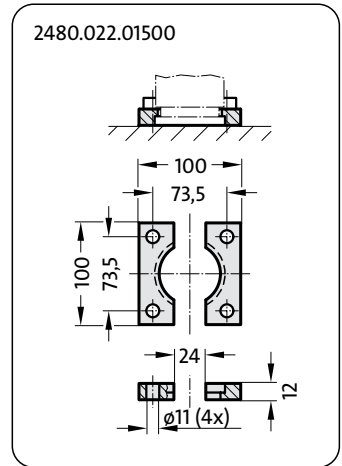
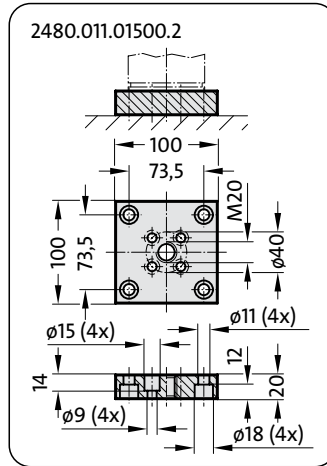
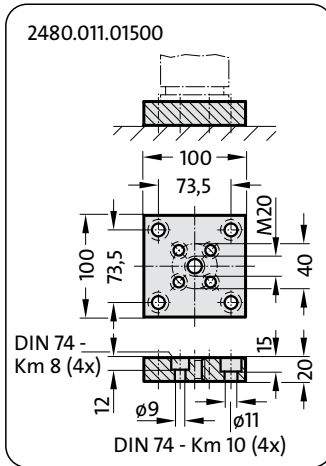
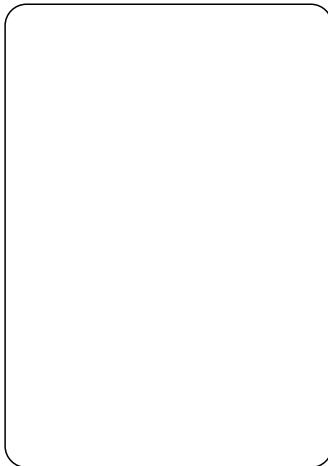
Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

Gas Springs  
Mounting Variations

2480.12.01500.



**Notes:**

- 2) Attention:  
The spring force must be absorbed by the stop surface.
- 3) Not for use with composite connection.
- 4) Square collar flange, non-rotating, fixing for composite connection.
- 5) Machine screws with hexagonal socket (compact head recommended).

**2480.12.01500.**

**Gas Springs**

**2480.12.01500.**

Initial spring force at 150 bar = 1500 daN

Order No.	stroke		
	max.	l <sub>min</sub>	l
2480.12.01500. 013 <sup>1)</sup>	12,7	122,3	135
025	25	135	160
038	38,1	148,1	186,2
050	50	160	210
063	63,5	173,5	237
075 <sup>1)</sup>	75	185	260
080	80	190	270
088 <sup>1)</sup>	87,5	197,5	285
100	100	210	310
113 <sup>1)</sup>	112,5	222,5	335
125	125	235	360
138 <sup>1)</sup>	137,5	247,5	385
150 <sup>1)</sup>	150	260	410
160	160	270	430
175 <sup>1)</sup>	175	285	460
200	200	310	510
225 <sup>1)</sup>	225	335	560
250	250	360	610
275 <sup>1)</sup>	275	385	660
300	300	410	710

**Note:**

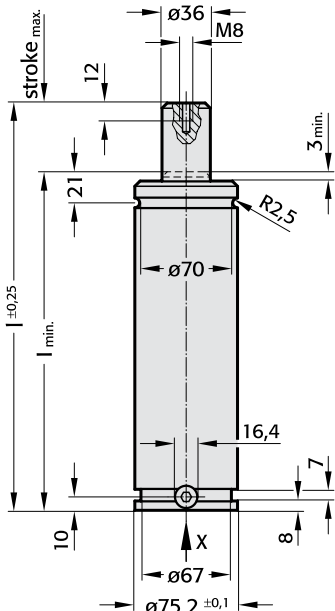
Order No for spare parts kit:  
2480.12.01500

Order No for spare parts kit:  
to Renault standard EM24.54.700  
2480.12.01500.R

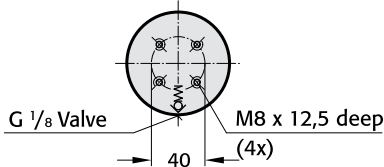
Gas spring  
to Renault standard EM24.54.700\*  
Ordering-code (example)  
2480.12.01500.    .R

\* Attention: The gas spring cannot be repaired if  
the overtravel protection is triggered.

**2480.12.01500.**



View X - Gas spring

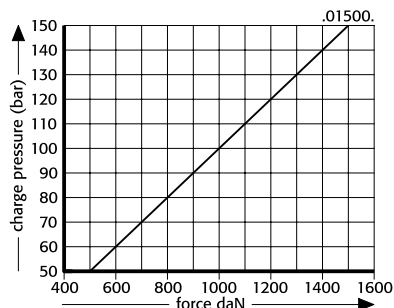


<sup>1)</sup> Special stroke lengths  
Not for gas springs  
to Renault Standard EM24.54.700.

Pressure medium: Nitrogen N<sub>2</sub>  
Max. filling pressure: 150 bar  
Min. filling pressure: 25 bar  
Working temperature: 0 °C to +80 °C  
Temperature related force increase: ±0.3%/°C  
Max. recommended extensions per minute: approx. 15 to 40 (at 20 °C)  
Max. piston speed: 1.6 m/s for 2480. ... R  
2.0 m/s

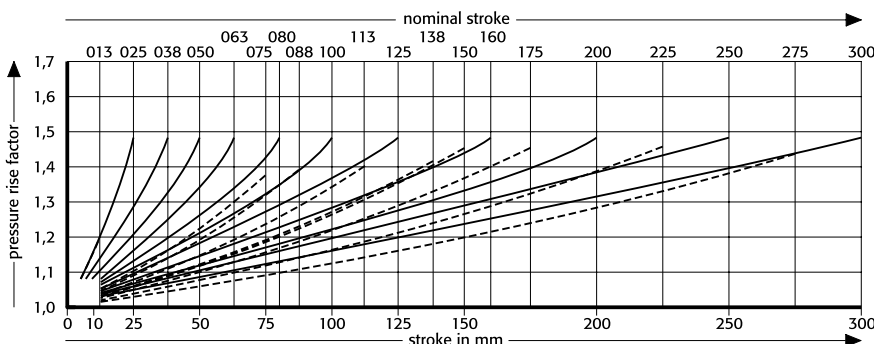
**2480.12.01500.**

Initial spring force  
versus charge pressure



**2480.12.01500.**

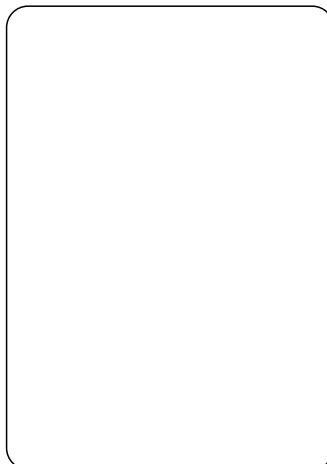
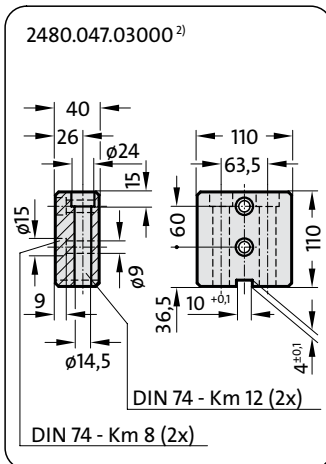
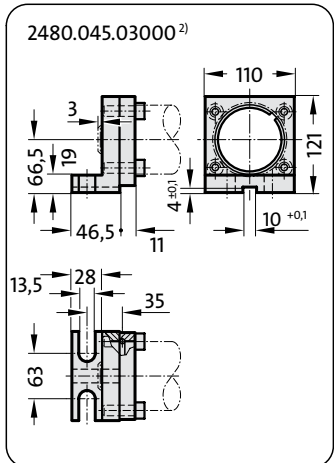
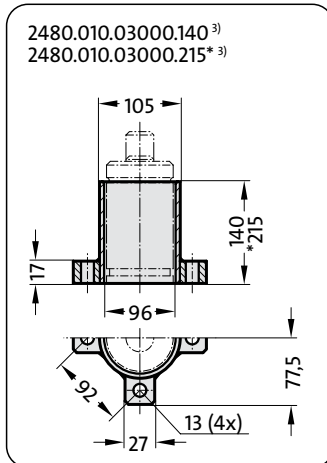
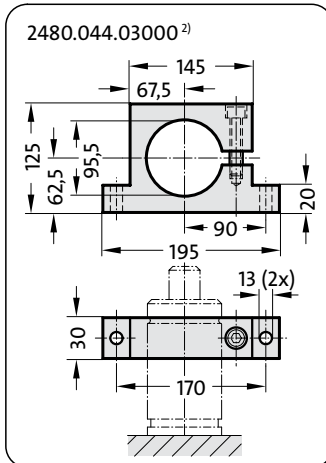
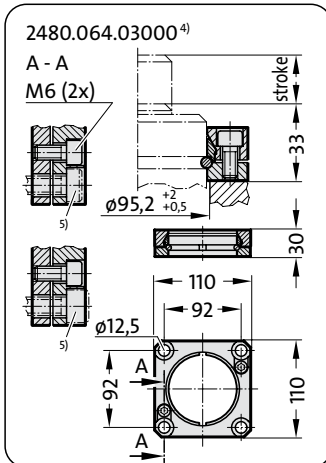
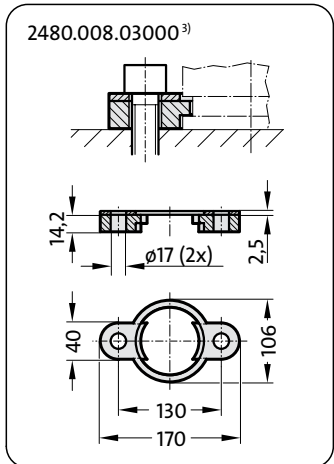
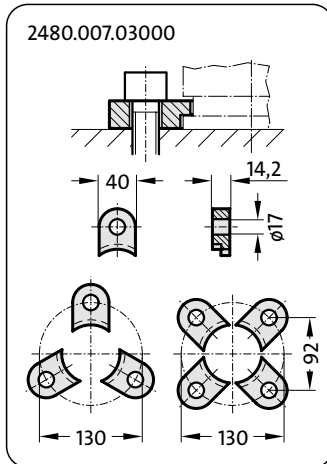
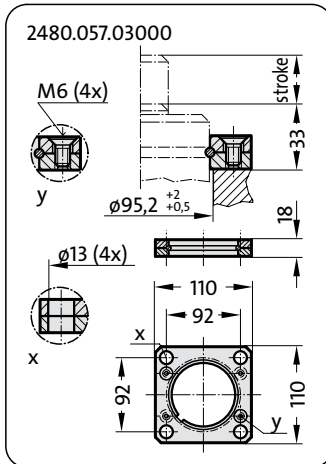
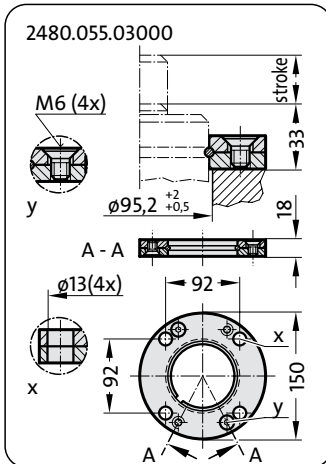
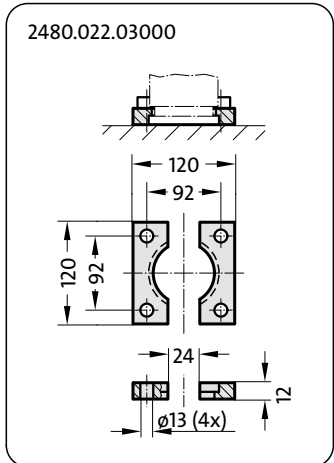
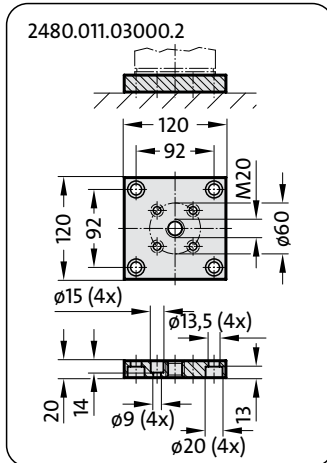
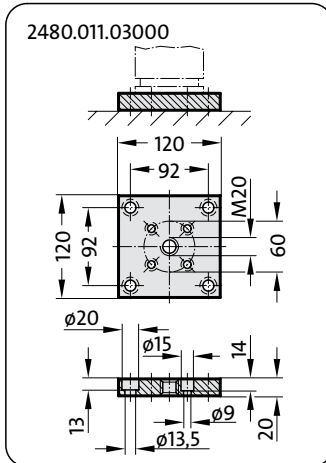
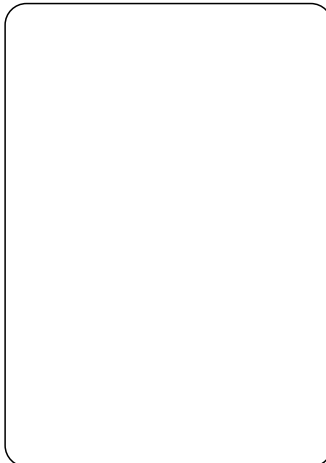
Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

Gas Springs  
Mounting Variations

2480.13.03000.



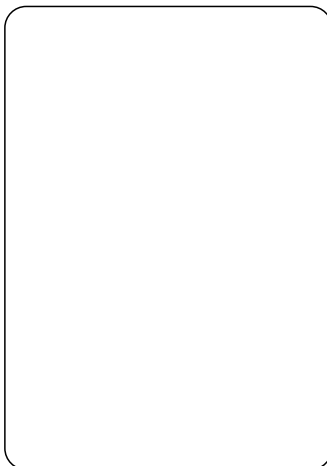
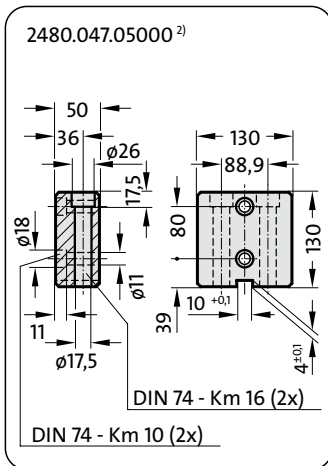
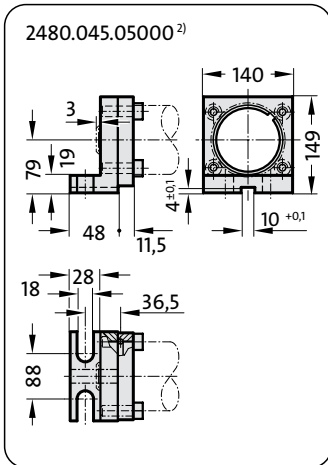
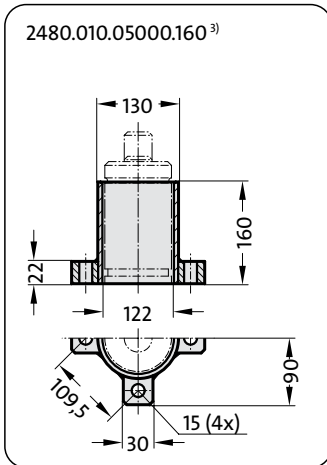
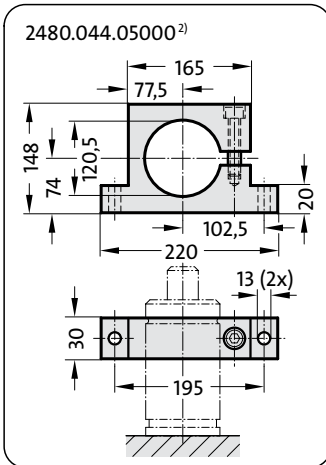
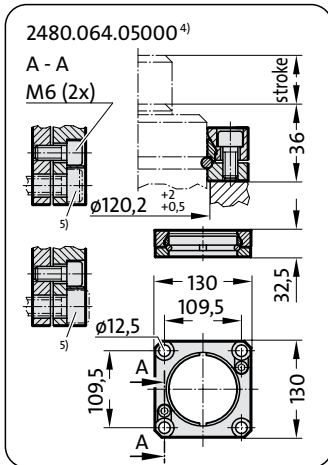
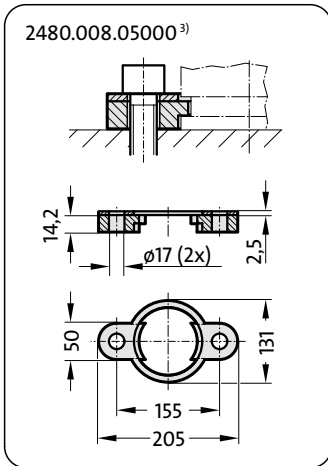
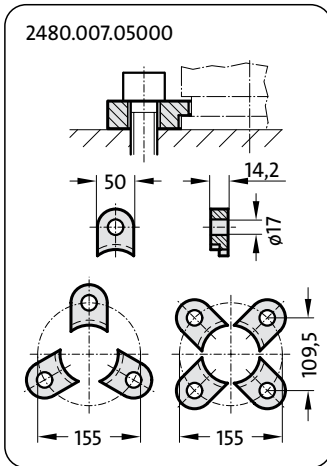
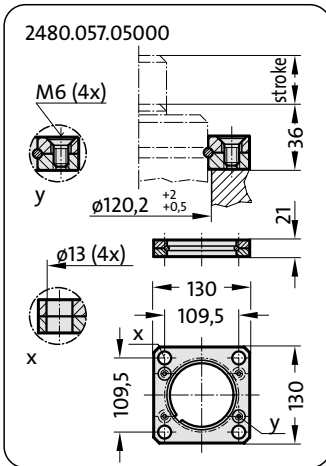
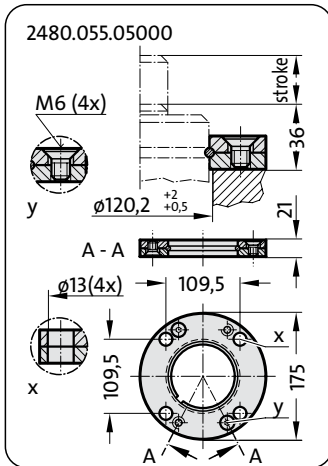
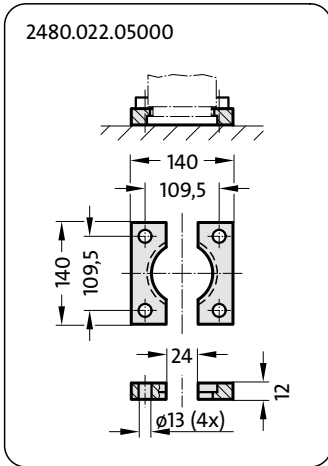
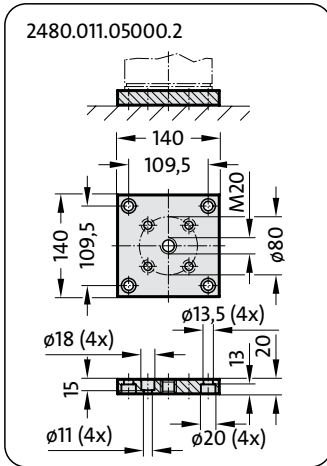
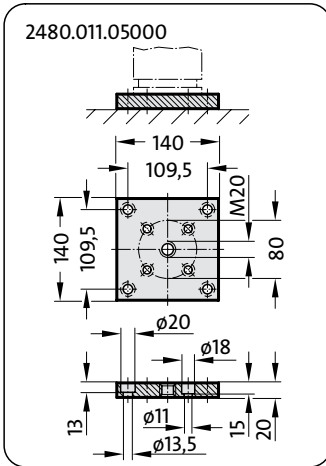
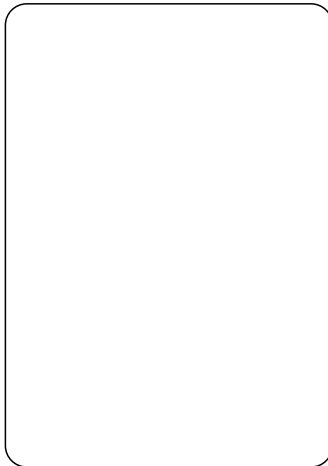
**Notes:**

- 2) Attention:  
The spring force must be absorbed by the stop surface.
- 3) Not for use with composite connection.
- 4) Square collar flange, non-rotating, fixing for composite connection.
- 5) Machine screws with hexagonal socket (compact head recommended).



Gas Springs  
Mounting Variations

2480.13.05000.



**Notes:**

- 2) Attention:  
The spring force must be absorbed by the stop surface.
- 3) Not for use with composite connection.
- 4) Square collar flange, non-rotating, fixing for composite connection.
- 5) Machine screws with hexagonal socket (compact head recommended).



**2480.13.05000.**

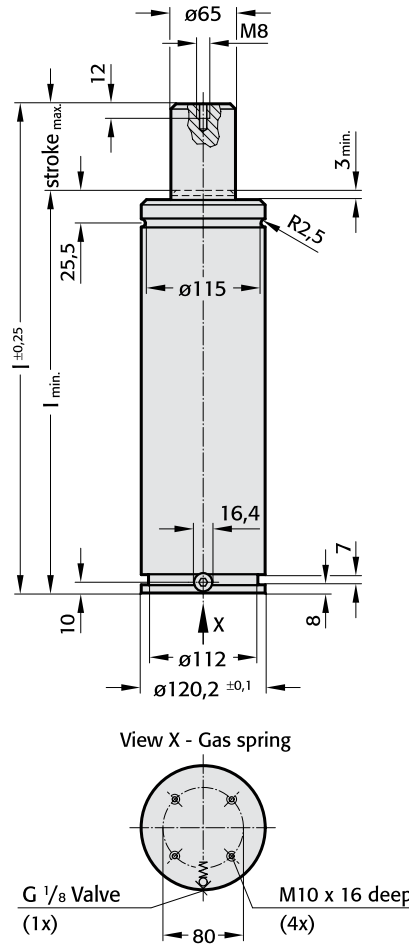
**Gas Springs**

**2480.13.05000.**

Initial spring force at 150 bar = 5000 daN

Order No.	Stroke max.	$l_{min}$	$l$
2480.13.05000.025	25	165	190
038	38,1	178,1	216,2
050	50	190	240
063	63,5	203,5	267
075 <sup>1)</sup>	75	215	290
080	80	220	300
088 <sup>1)</sup>	87,5	227,5	315
100	100	240	340
113 <sup>1)</sup>	112,5	252,5	365
125	125	265	390
138 <sup>1)</sup>	137,5	277,5	415
150 <sup>1)</sup>	150	290	440
160	160	300	460
175 <sup>1)</sup>	175	315	490
200	200	340	540
225 <sup>1)</sup>	225	365	590
250	250	390	640
275 <sup>1)</sup>	275	415	690
300	300	440	740

**2480.13.05000.**



**Note:**

Order No for spare parts kit:  
2480.13.05000

Order No for spare parts kit:  
to Renault standard EM24.54.700  
2480.13.05000.R

Gas Spring  
to Renault standard EM24.54.700\*  
Order No (example):  
2480.13.05000.□□□.R

\*Attention: The gas spring cannot be repaired if the overtravel protection is triggered.

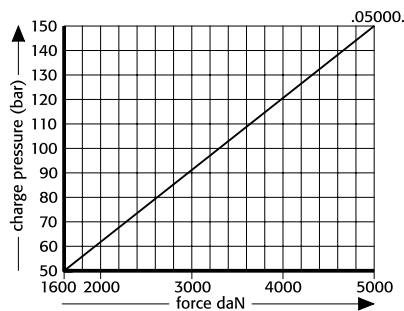
<sup>1)</sup> Special stroke lengths

Not for gas springs  
to Renault Standard EM24.54.700.

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0 °C to +80 °C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 15 to 40 (at 20 °C)  
 Max. piston speed: 1.6 m/s for 2480. ... R  
 2.0 m/s

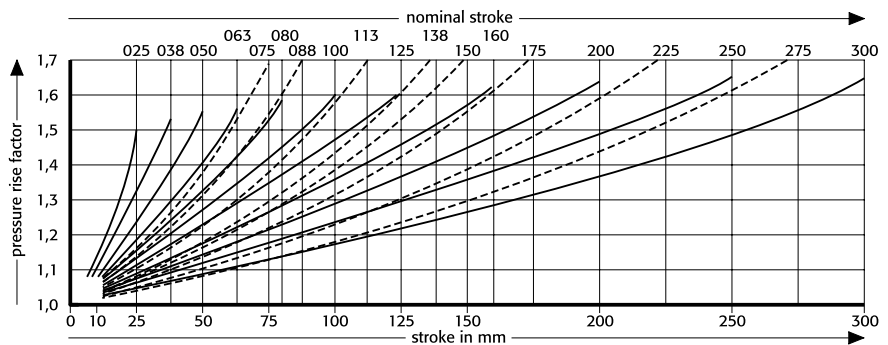
**2480.13.05000.**

Initial spring force versus charge pressure



**2480.13.05000.**

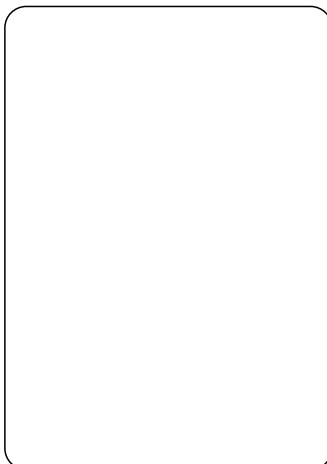
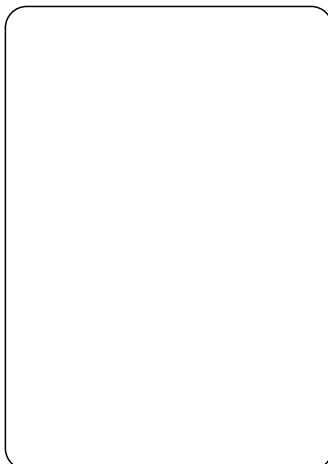
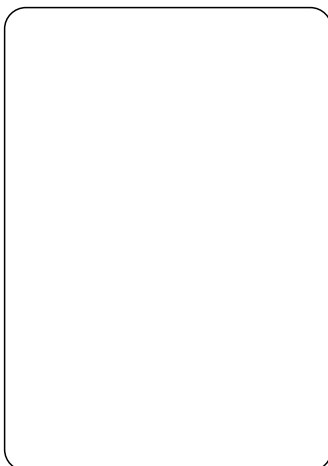
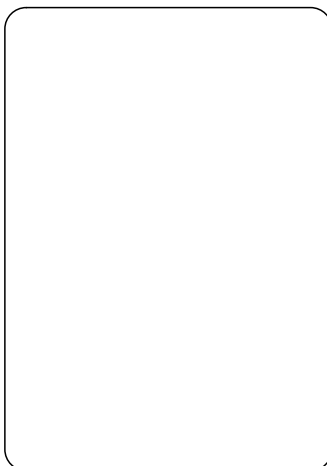
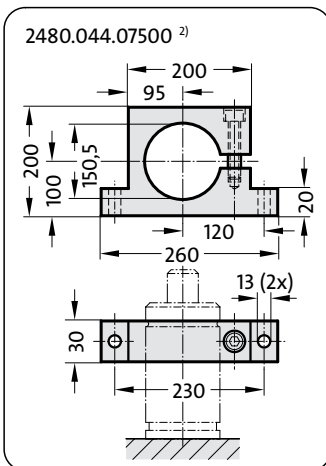
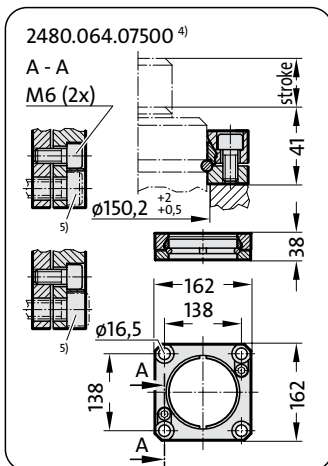
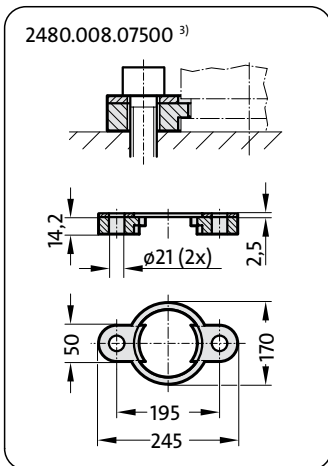
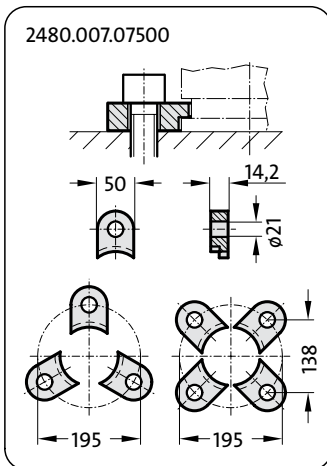
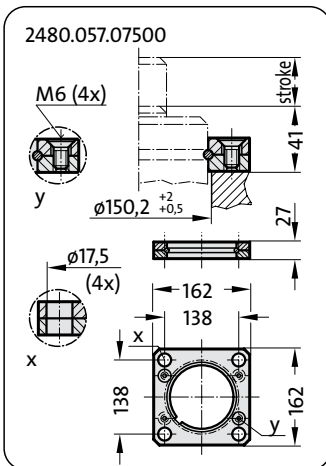
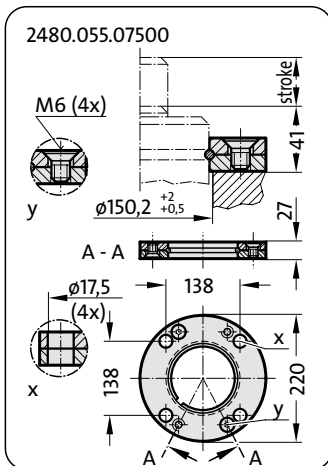
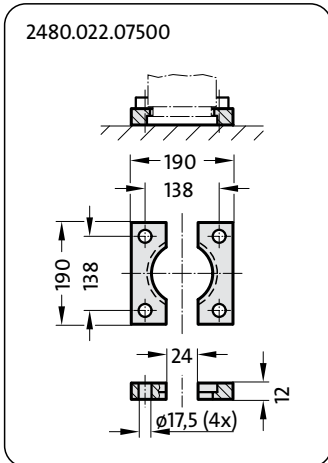
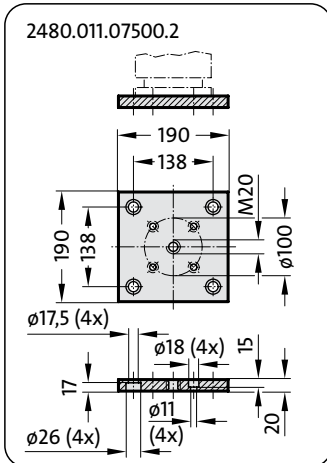
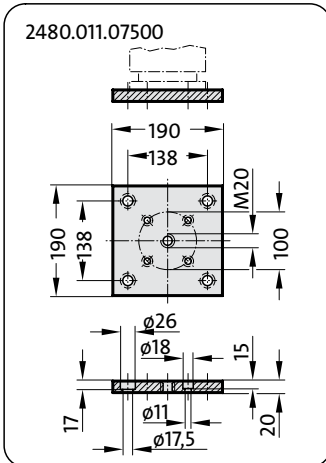
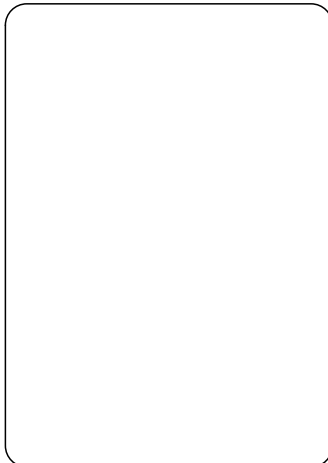
Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

Gas Springs  
Mounting Variations

2480.13.07500.



**Notes:**

- 2) Attention:  
The spring force must be absorbed by the stop surface.
- 3) Not for use with composite connection.
- 4) Square collar flange, non-rotating, fixing for composite connection.
- 5) Machine screws with hexagonal socket (compact head recommended).

**2480.13.07500.**

**Gas Springs**

**2480.13.07500.**

Initial spring force at 150 bar = 7500 daN

Order No	stroke max.	$l_{min}$	$l$
2480.13.07500.025	25	180	205
038	38,1	193,1	231,2
050	50	205	255
063	63,5	218,5	282
075 <sup>1)</sup>	75	230	305
080	80	235	315
088.1 <sup>1)</sup>	87,5	242,5	330
100	100	255	355
113 <sup>1)</sup>	112,5	267,5	380
125	125	280	405
138 <sup>1)</sup>	137,5	292,5	430
150 <sup>1)</sup>	150	305	455
160	160	315	475
175 <sup>1)</sup>	175	330	505
200	200	355	555
225 <sup>1)</sup>	225	380	605
250	250	405	655
275 <sup>1)</sup>	275	430	705
300	300	455	755

**Note:**

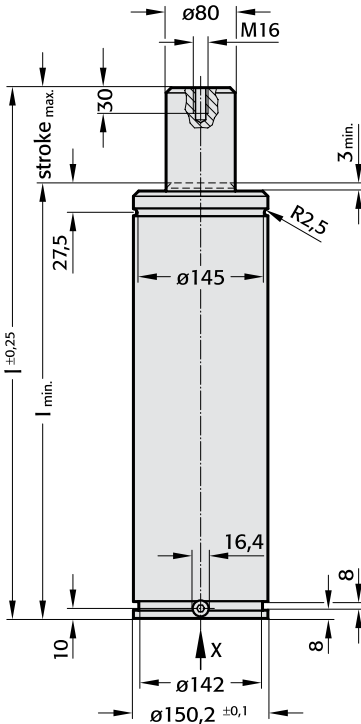
Order No for spare parts kit:  
2480.13.07500

Order No for spare parts kit:  
to Renault standard EM24.54.700  
2480.13.07500.R

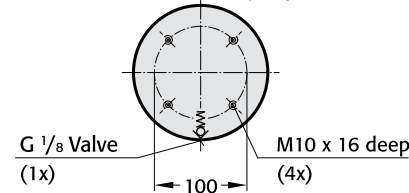
Gas spring  
to Renault standard EM24.54.700  
Ordering-code (example):  
2480.13.07500.□□□.R

\* Attention: The gas spring cannot be repaired if the overtravel protection is triggered.

**2480.13.07500.**



View X - Gas spring



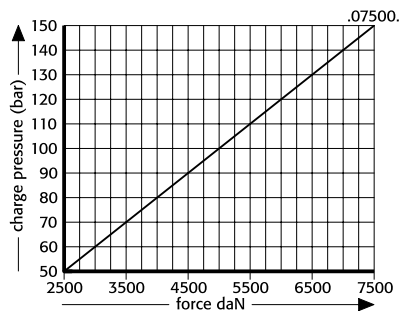
<sup>1)</sup> Special stroke lengths

Not for gas springs  
to Renault Standard EM24.54.700.

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0 °C to +80 °C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 15 to 40 (at 20 °C)  
 Max. piston speed: 1.6 m/s for 2480. ... R, 2.0 m/s

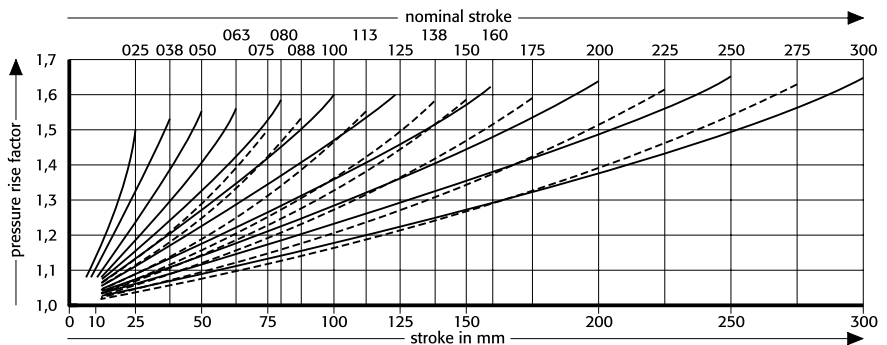
**2480.13.07500.**

Initial spring force versus charge pressure



**2480.13.07500.**

Spring force Diagram displacement versus stroke rise

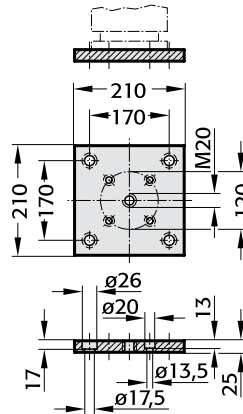


Pressure rise factor accounts for displacement but not external influences!

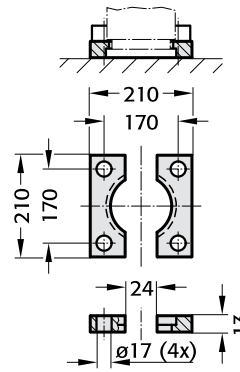
Gas Springs  
Mounting Variations

2480.12.10000.

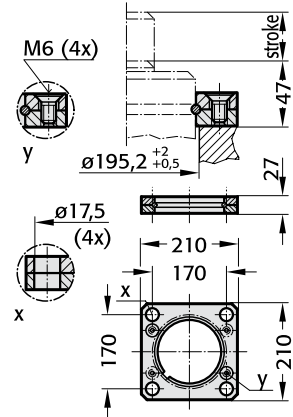
2480.011.10000



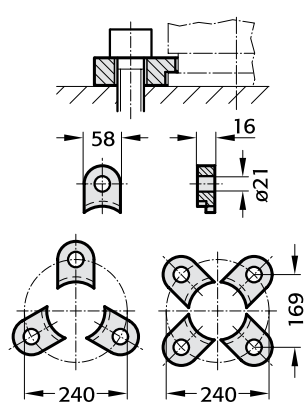
2480.022.10000



2480.057.10000



2480.007.10000



2480.12.10000.

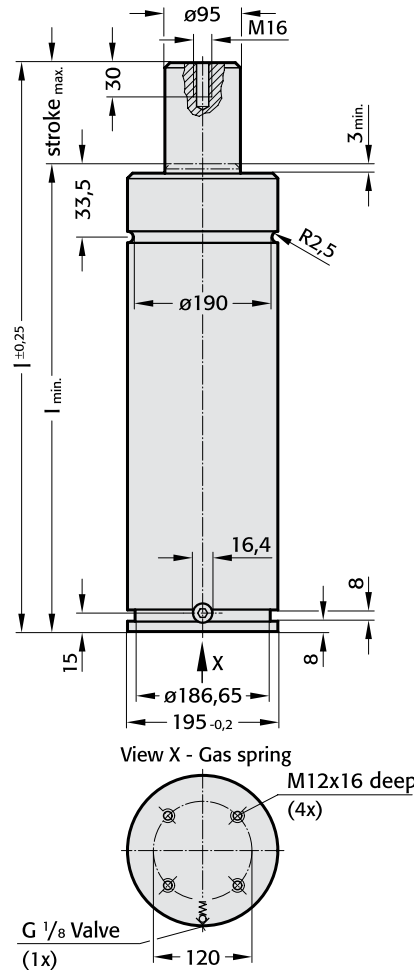
Gas Springs

2480.12.10000.

Initial spring force at 150 bar = 10000 daN

Order No	Stroke max.	$l_{min}$	$l$
2480.12.10000.025	25	185	210
038	38,1	198,1	236,2
050	50	210	260
063	63,5	223,5	287
080	80	240	320
100	100	260	360
125	125	285	410
160	160	320	480
200	200	360	560
250	250	410	660
300	300	460	760

2480.12.10000.



Note:

Order No for spare parts kit:  
2480.12.10000

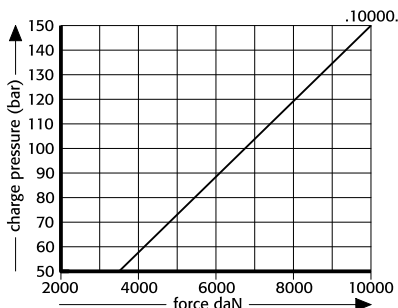
Gas spring  
to Renault standard EM24.54.700\*  
Ordering-code (example)  
2480.12.10000. .R

\*Attention: The gas spring cannot be repaired if the overtravel protection is triggered.

Pressure medium: Nitrogen N<sub>2</sub>  
Max. filling pressure: 150 bar  
Min. filling pressure: 25 bar  
Working temperature: 0°C to +80°C  
Temperature related force increase: ±0.3%/°C  
Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)  
Max. piston speed: 1.6 m/s

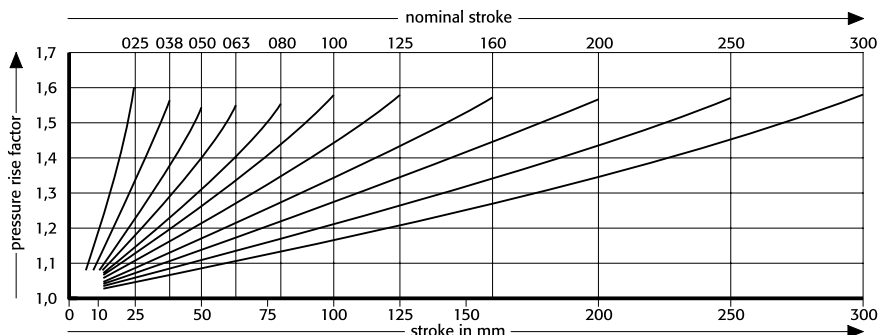
2480.12.10000.

Initial spring force versus charge pressure



2480.12.10000.

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

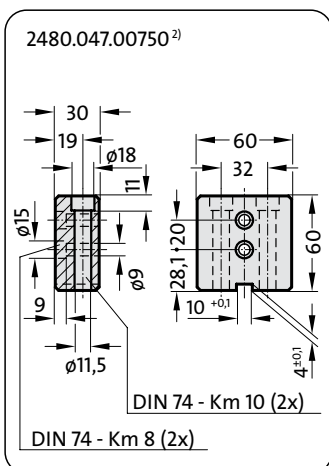
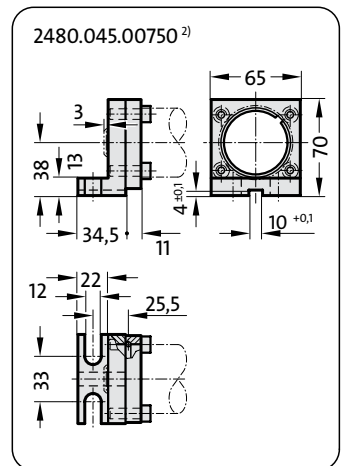
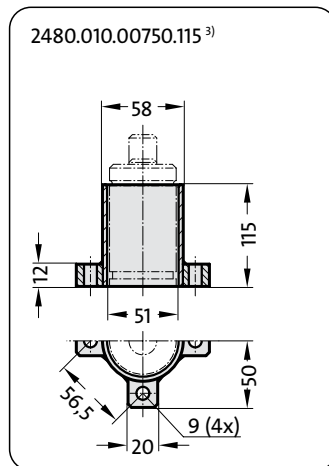
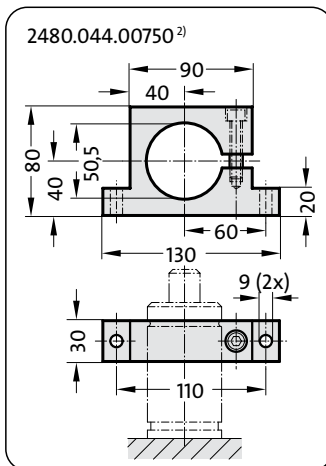
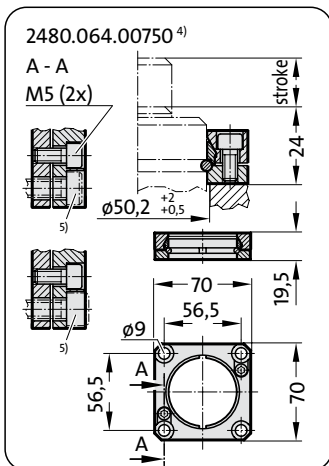
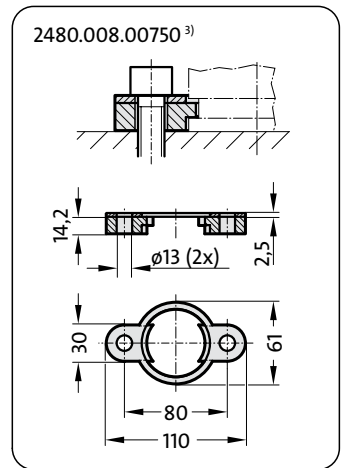
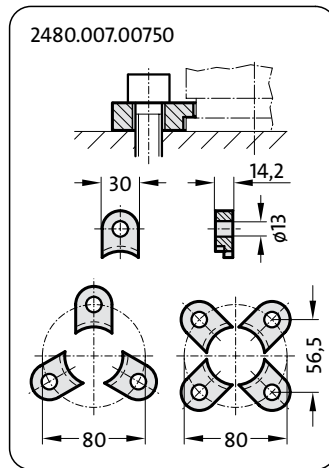
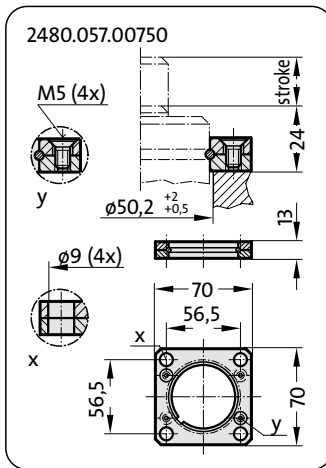
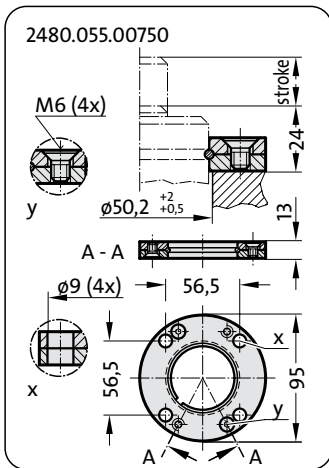
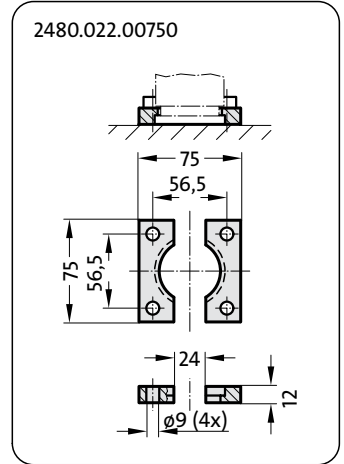
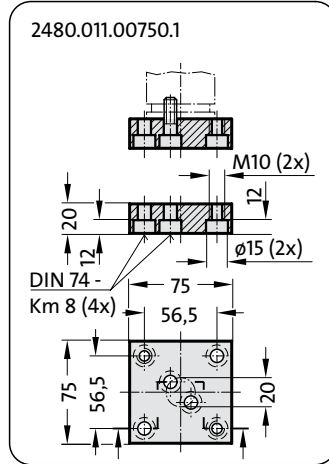
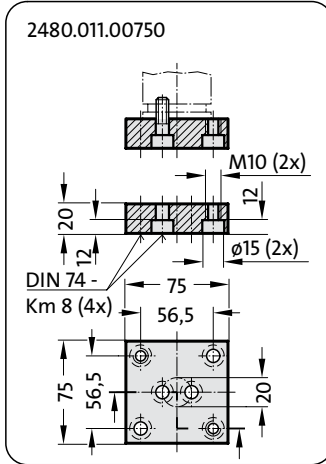
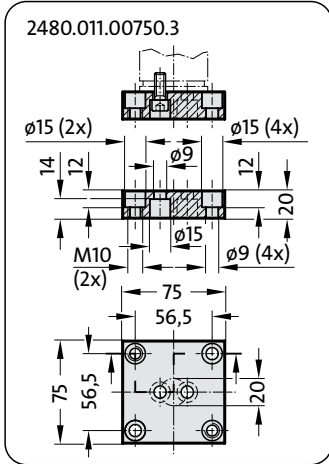


Gas Springs  
Standard  
**HEAVY DUTY**

# Gas Springs HEAVY DUTY Mounting Variations

FIBRO

2488.13.01000.



- Notes:**
- 2) Attention:  
The spring force must be absorbed by the stop surface.
  - 3) Not for use with composite connection.
  - 4) Square collar flange, non-rotating, fixing for composite connection.
  - 5) Machine screws with hexagonal socket (compact head recommended).

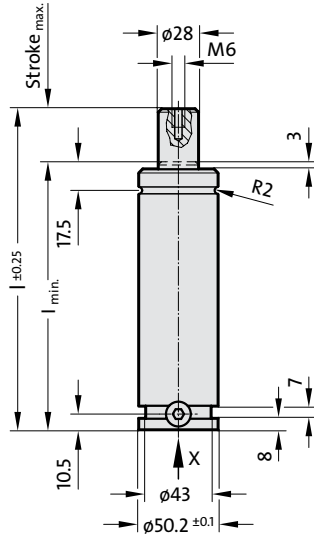


**2488.13.01000.**

Initial spring force at 150 bar = 1000 daN

Order No	Stroke max.	$l_{min}$	$l$
2488.13.01000.013	13	108	121
025	25	120	145
038	38	133	171
050	50	145	195
063	63	158	221
075	75	170	245
080	80	175	255
100	100	195	295
125	125	220	345
150	150	245	395
160	160	255	415
175	175	270	445
200	200	295	495
250	250	345	595
300	300	395	695

**2488.13.01000.**

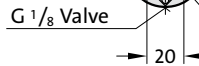


**Note:**

Order No for spare parts kit:  
2488.13.01000

Pressure medium: Nitrogen  $N_2$   
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature:  $0^\circ C$  to  $+80^\circ C$   
 Temperature related force increase:  $\pm 0.3\%/^\circ C$   
 Max. recommended extensions per minute: approx. 15 to 100 (at  $20^\circ C$ )  
 Max. piston speed: 1.6 m/s

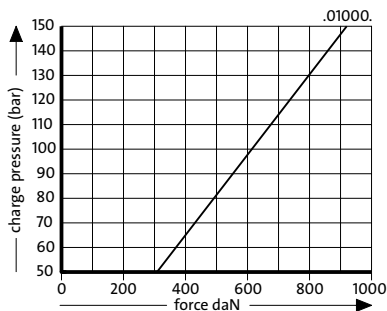
View X  
M8x16 deep (2x)



Optional gas connection for hose interconnection or connection of interconnecting plates

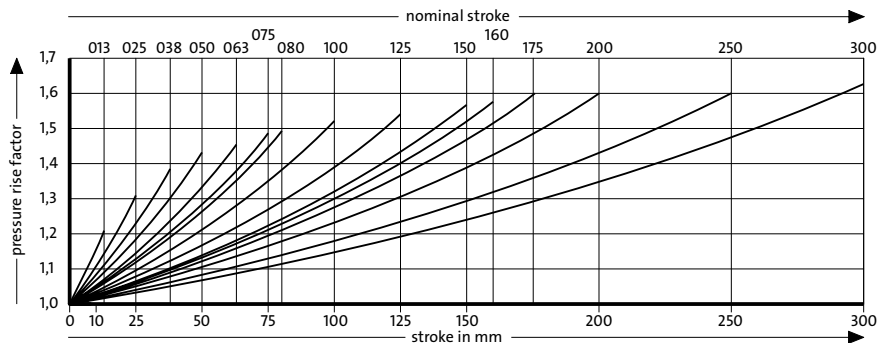
**2488.13.01000.**

Initial spring force versus charge pressure



**2488.13.01000.**

Spring force Diagram displacement versus stroke rise

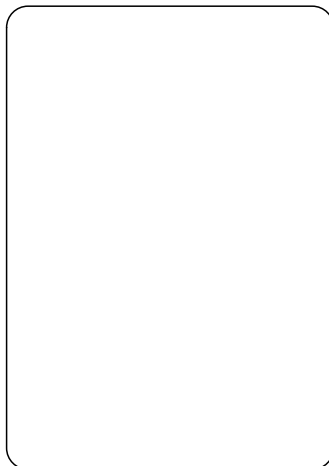
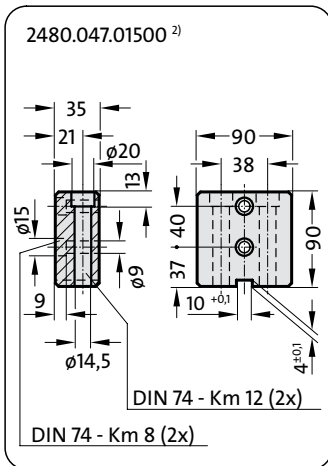
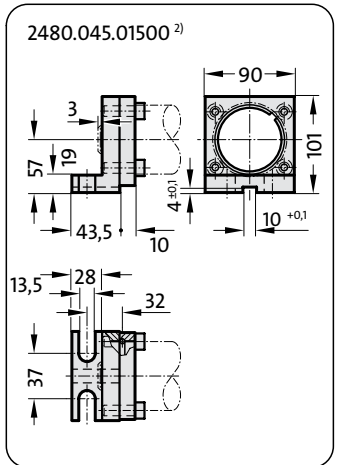
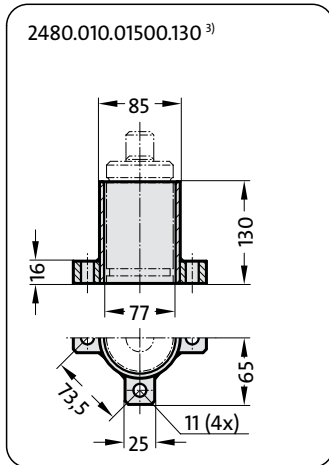
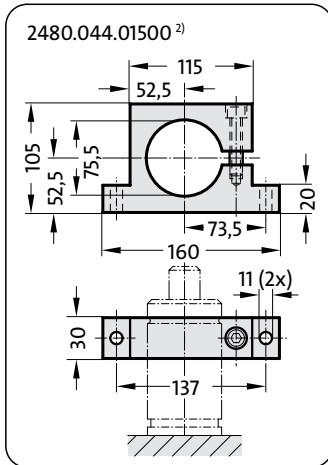
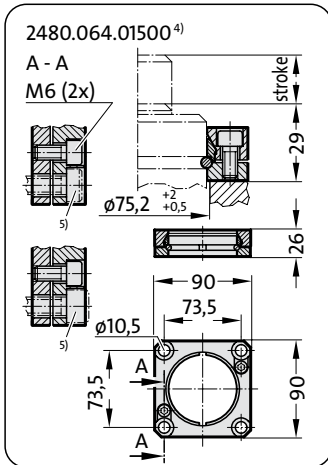
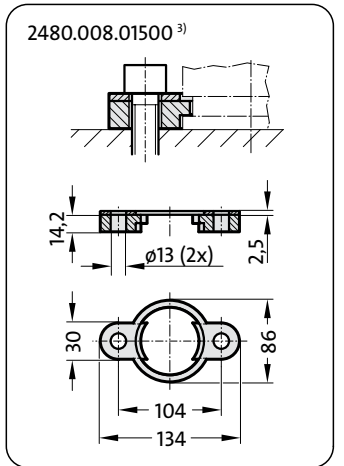
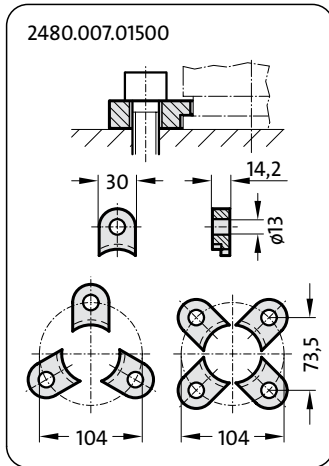
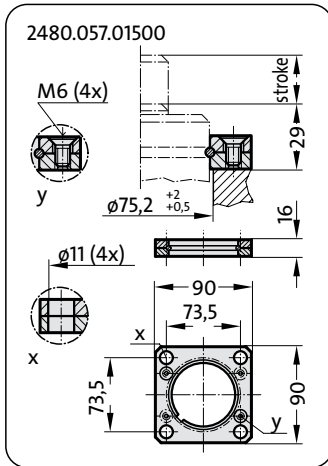
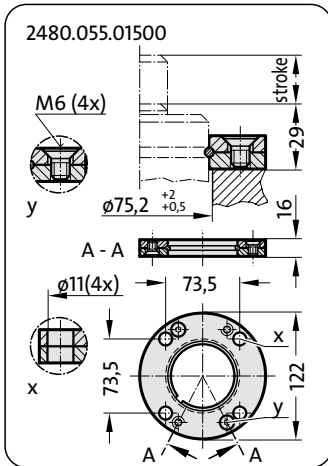
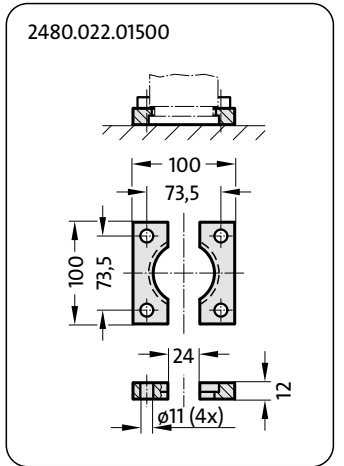
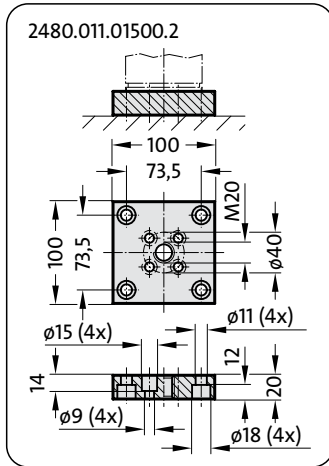
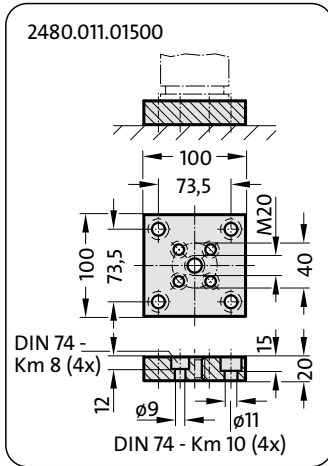
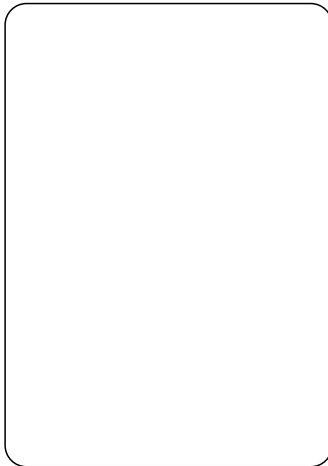


Pressure rise factor accounts for displacement but not external influences!

# Gas Springs HEAVY DUTY Mounting Variations

**FIBRO**

2488.13.02400.



**Notes:**

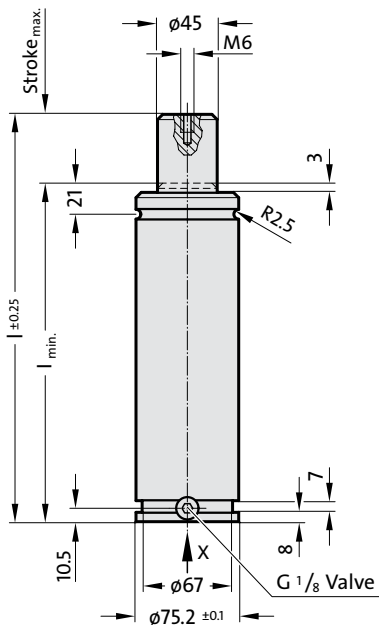
- 2) Attention:  
The spring force must be absorbed by the stop surface.
- 3) Not for use with composite connection.
- 4) Square collar flange, non-rotating, fixing for composite connection.
- 5) Machine screws with hexagonal socket (compact head recommended).

**2488.13.02400.**

Initial spring force at 150 bar = 2400 daN

Order No	Stroke		l
	max.	l <sub>min</sub>	
2488.13.02400.025	25	135	160
038	38	148	186
050	50	160	210
063	63	173	236
075	75	185	260
080	80	190	270
100	100	210	310
125	125	235	360
150	150	260	410
160	160	270	430
175	175	285	460
200	200	310	510
250	250	360	610
300	300	410	710

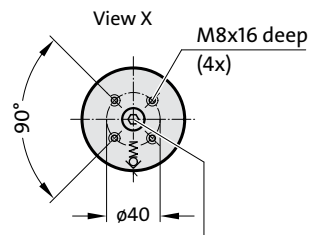
**2488.13.02400.**



**Note:**

Order No for spare parts kit:  
2488.13.02400

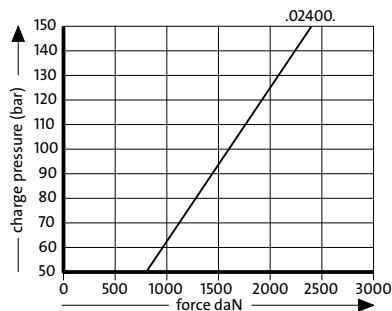
Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 15 to 100 (at 20°C)  
 Max. piston speed: 1.6 m/s



Optional gas connection for hose interconnection or connection of interconnecting plates

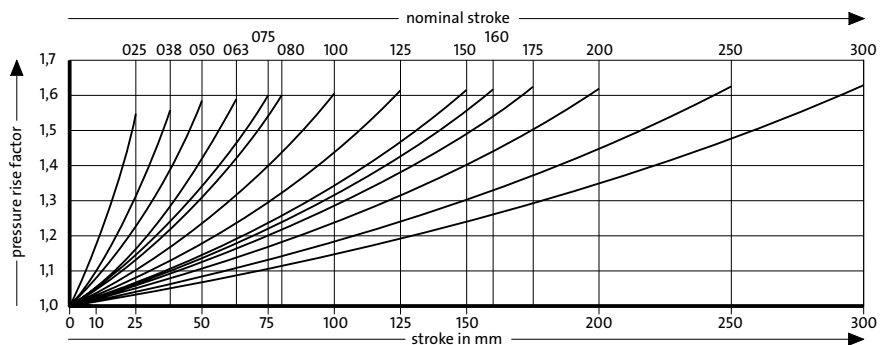
**2488.13.02400.**

Initial spring force versus charge pressure

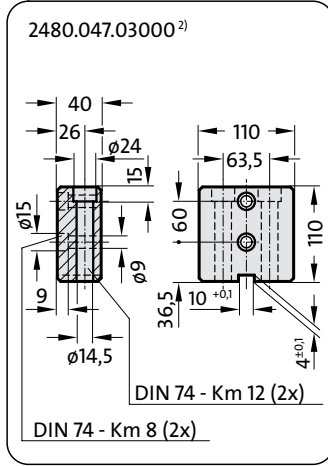
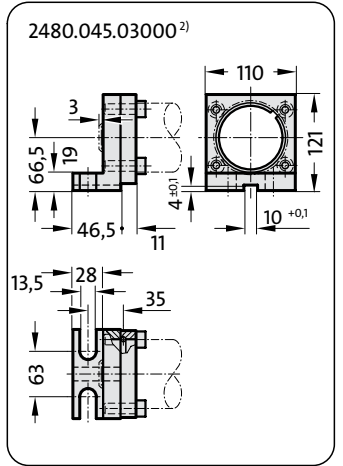
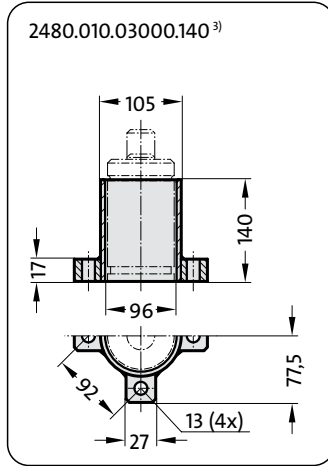
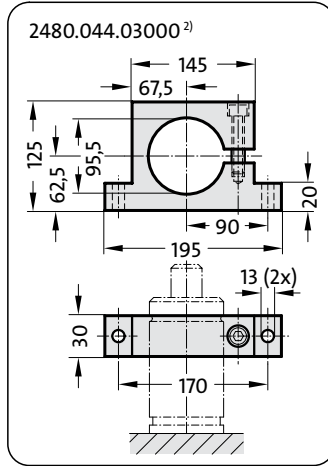
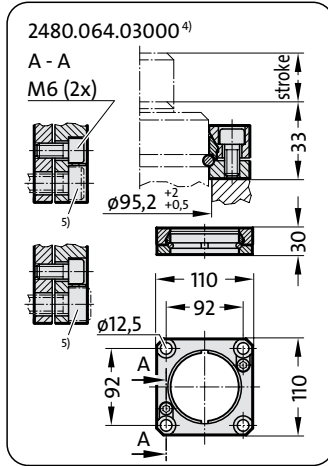
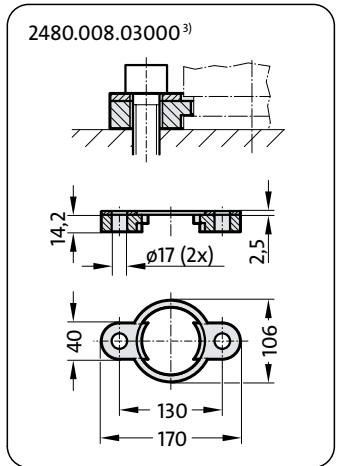
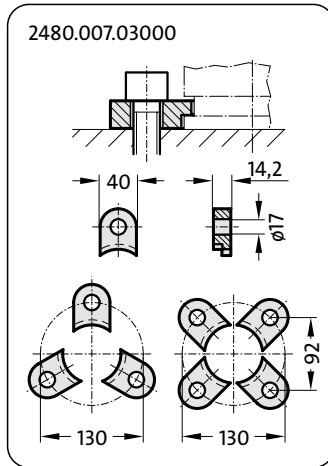
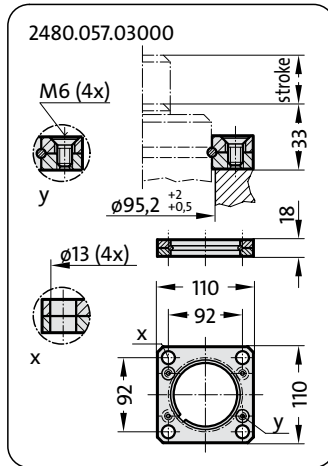
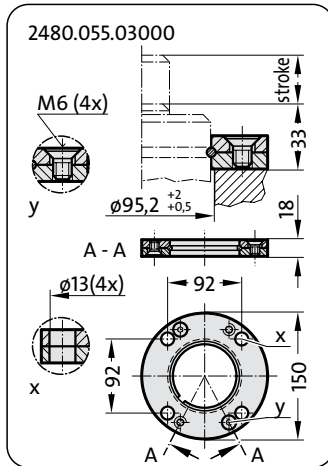
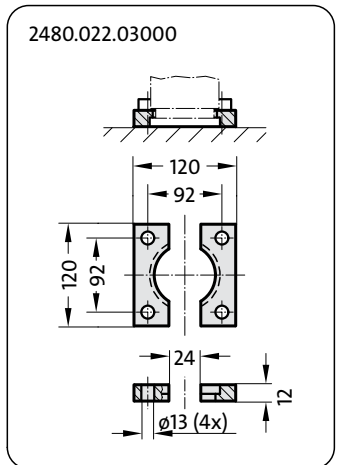
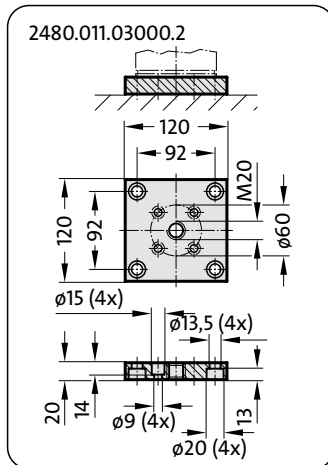
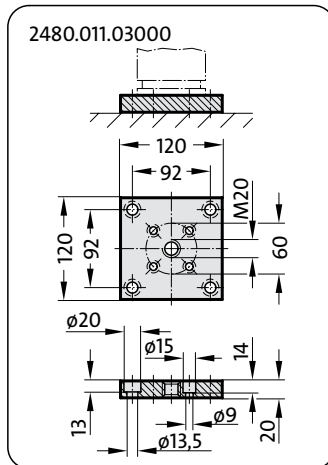
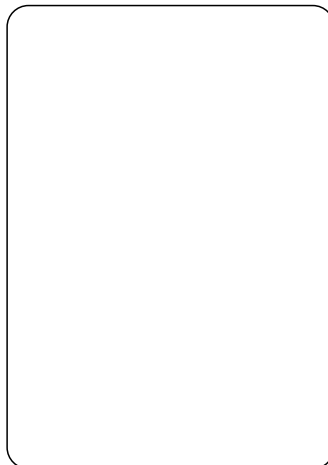


**2488.13.02400.**

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!



**Notes:**

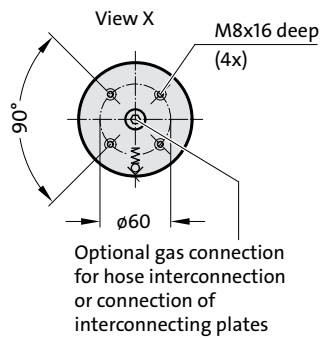
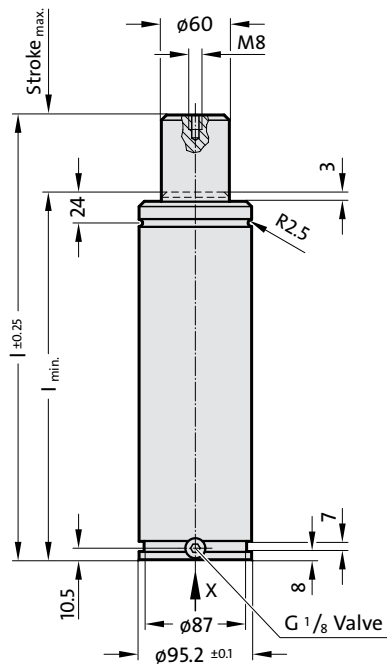
- 2) Attention:  
The spring force must be absorbed by the stop surface.
- 3) Not for use with composite connection.
- 4) Square collar flange, non-rotating, fixing for composite connection.
- 5) Machine screws with hexagonal socket (compact head recommended).

**2488.13.04200.**

Initial spring force at 150 bar = 4200 daN

Order No	Stroke		l
	max.	l <sub>min</sub>	
2488.13.04200.025	25	145	170
038	38	158	196
050	50	170	220
063	63	183	246
075	75	195	270
080	80	200	280
100	100	220	320
125	125	245	370
150	150	270	420
160	160	280	440
175	175	295	470
200	200	320	520
250	250	370	620
300	300	420	720

**2488.13.04200.**



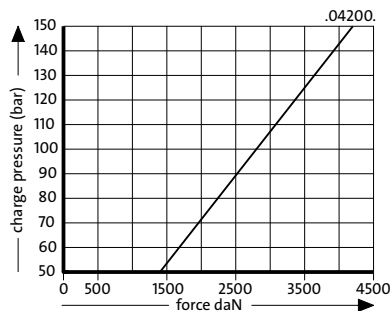
**Note:**

Order No for spare parts kit:  
2488.13.04200

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 15 to 100 (at 20°C)  
 Max. piston speed: 1.6 m/s

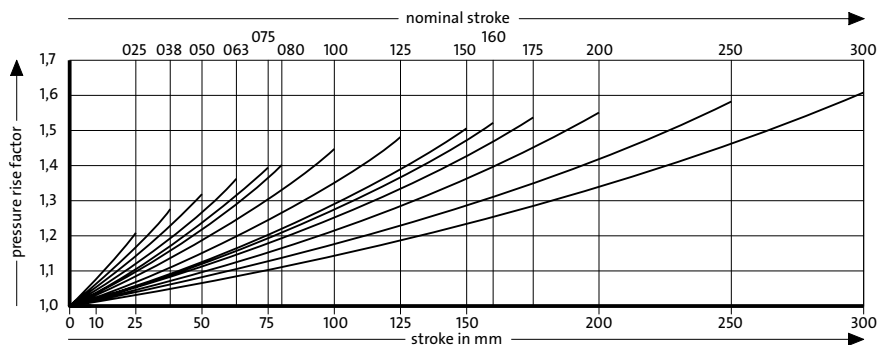
**2488.13.04200.**

Initial spring force versus charge pressure



**2488.13.04200.**

Spring force Diagram displacement versus stroke rise

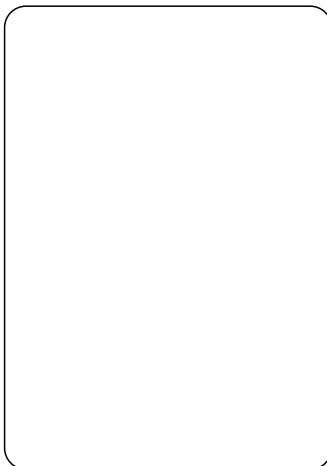
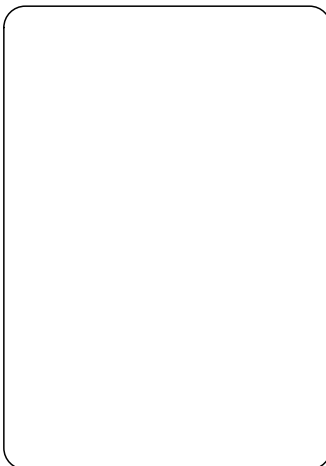
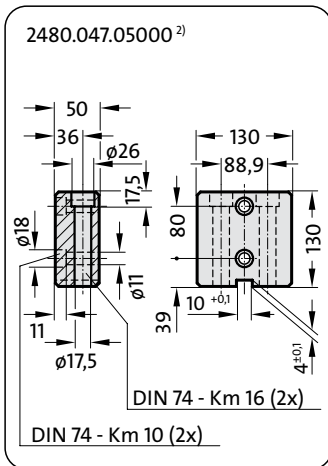
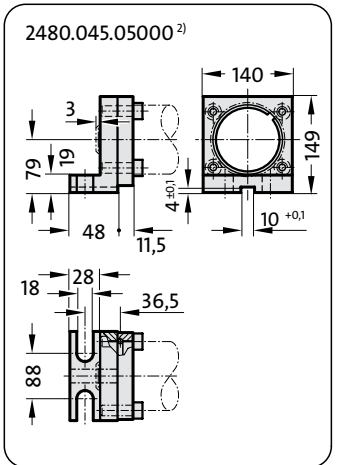
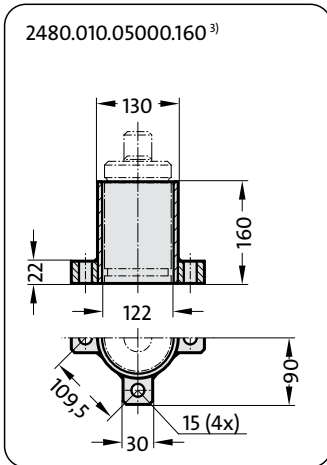
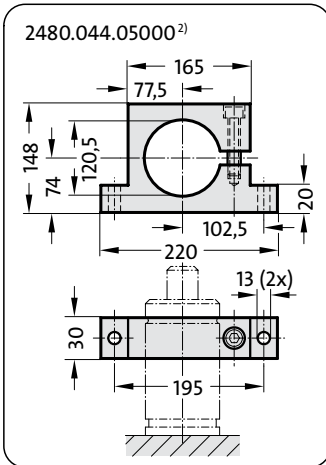
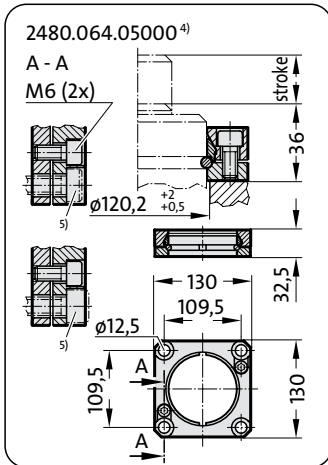
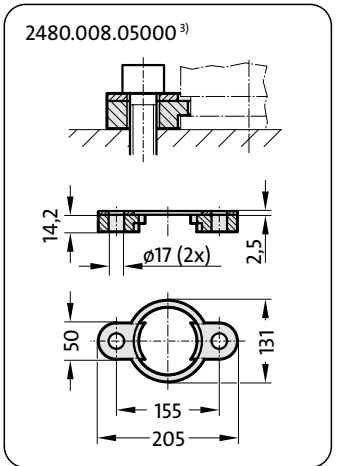
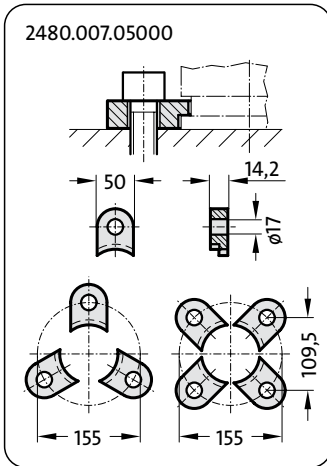
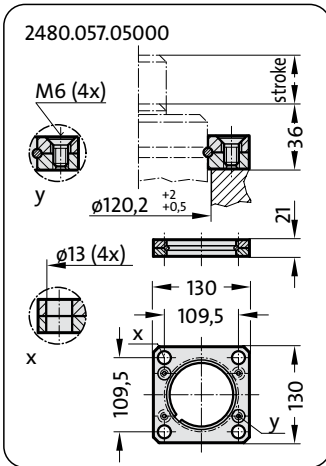
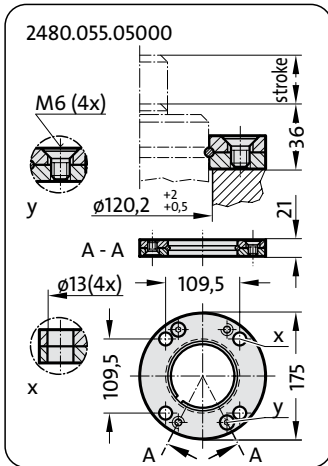
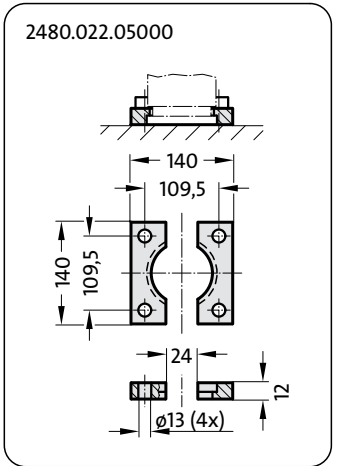
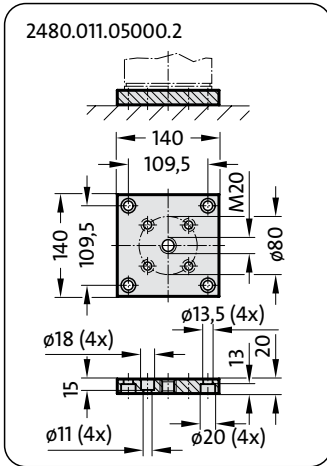
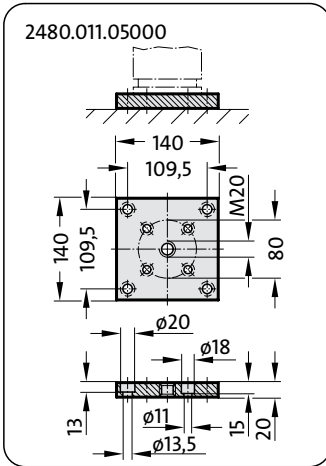
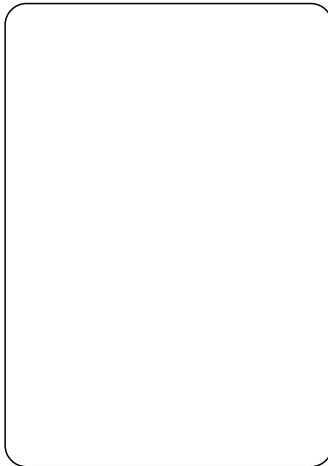


Pressure rise factor accounts for displacement but not external influences!

# Gas Springs HEAVY DUTY Mounting Variations

**FIBRO**

2488.13.06600.



**Notes:**

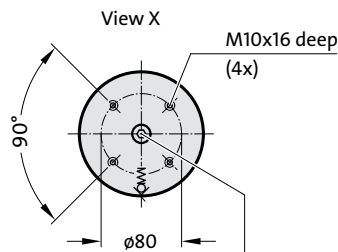
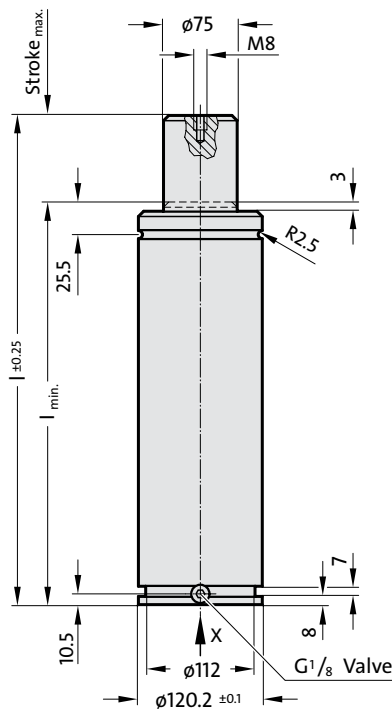
- 2) Attention:  
The spring force must be absorbed by the stop surface.
- 3) Not for use with composite connection.
- 4) Square collar flange, non-rotating, fixing for composite connection.
- 5) Machine screws with hexagonal socket (compact head recommended).

**2488.13.06600.**

Initial spring force at 150 bar = 6600 daN

Order No	Stroke		l
	max.	l <sub>min</sub>	
2488.13.06600.025	25	165	190
038	38	178	216
050	50	190	240
063	63	203	266
075	75	215	290
080	80	220	300
100	100	240	340
125	125	265	390
150	150	290	440
160	160	300	460
175	175	315	490
200	200	340	540
250	250	390	640
300	300	440	740

**2488.13.06600.**



Optional gas connection for hose interconnection or connection of interconnecting plates



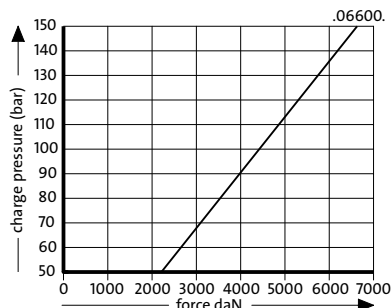
**Note:**

Order No for spare parts kit:  
2488.13.06600

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 15 to 100 (at 20°C)  
 Max. piston speed: 1.6 m/s

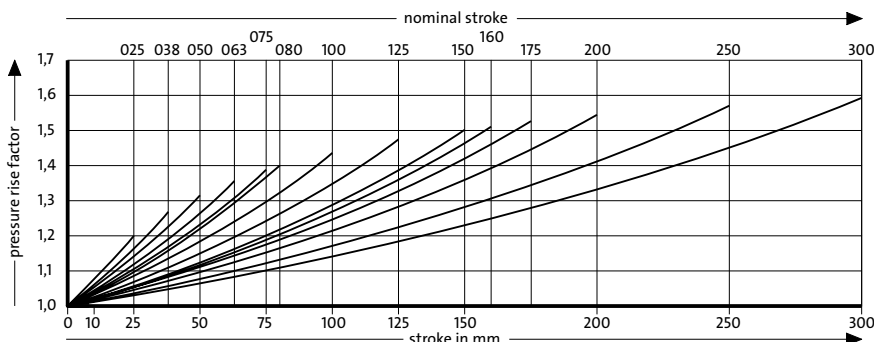
**2488.13.06600.**

Initial spring force versus charge pressure



**2488.13.06600.**

Spring force Diagram displacement versus stroke rise



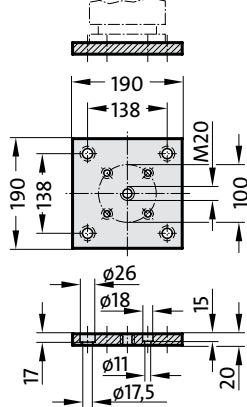
Pressure rise factor accounts for displacement but not external influences!

# Gas Springs HEAVY DUTY Mounting Variations

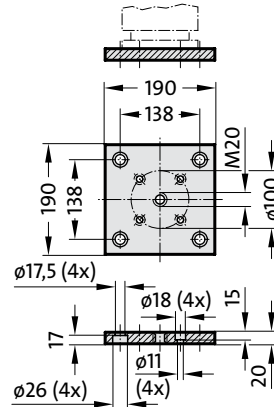
**FIBRO**

2488.13.09500.

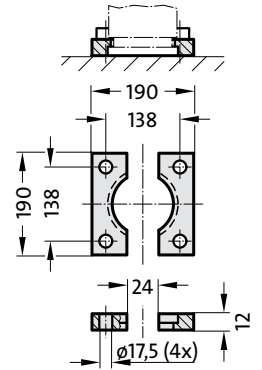
2480.011.07500



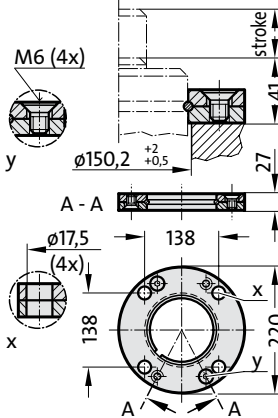
2480.011.07500.2



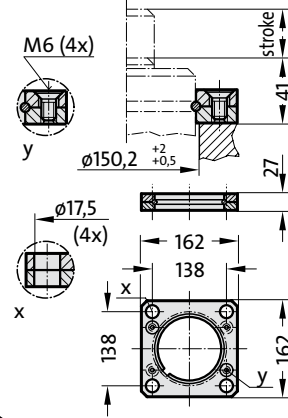
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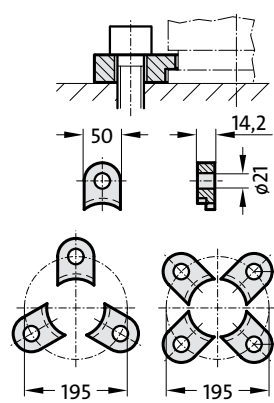
2480.055.07500



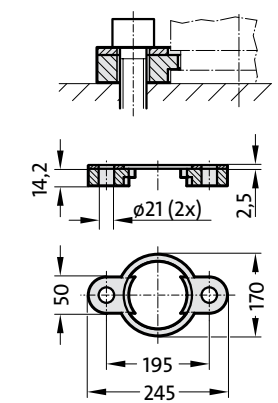
2480.057.07500



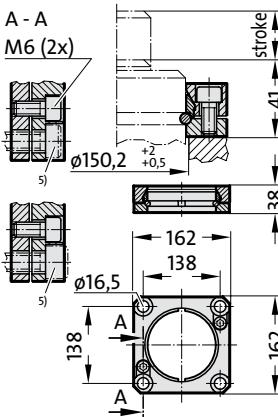
2480.007.07500



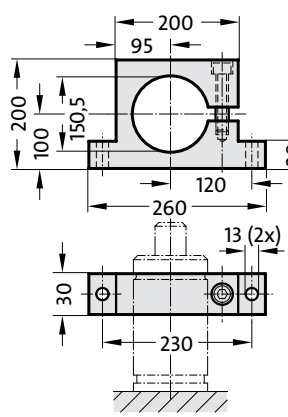
2480.008.07500<sup>3)</sup>



2480.064.07500<sup>4)</sup>



2480.044.07500<sup>2)</sup>



## Notes:

- 2) Attention:  
The spring force must be absorbed by the stop surface.
- 3) Not for use with composite connection.
- 4) Square collar flange, non-rotating, fixing for composite connection.
- 5) Machine screws with hexagonal socket (compact head recommended).

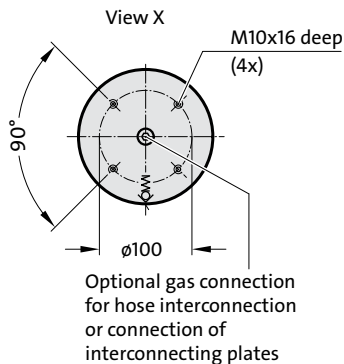
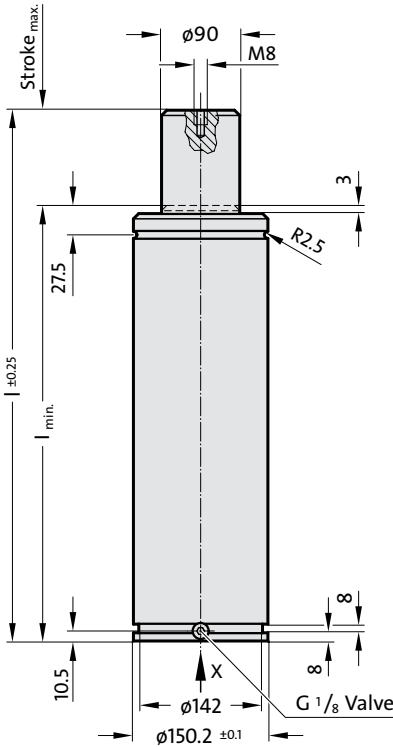


**2488.13.09500.**

Initial spring force at 150 bar = 9500 daN

Order No	Stroke		l
	max.	l <sub>min</sub>	
2488.13.09500.025	25	180	205
038	38	193	231
050	50	205	255
063	63	218	281
075	75	230	305
080	80	235	315
100	100	255	355
125	125	280	405
150	150	305	455
160	160	315	475
175	175	330	505
200	200	355	555
250	250	405	655
300	300	455	755

**2488.13.09500.**



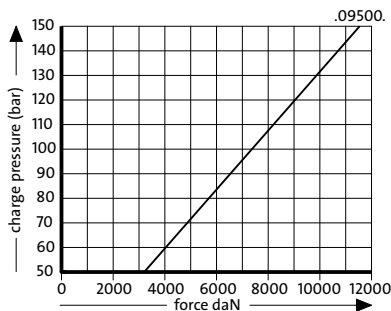
**Note:**

Order No for spare parts kit:  
2488.13.09500

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 15 to 100 (at 20°C)  
 Max. piston speed: 1.6 m/s

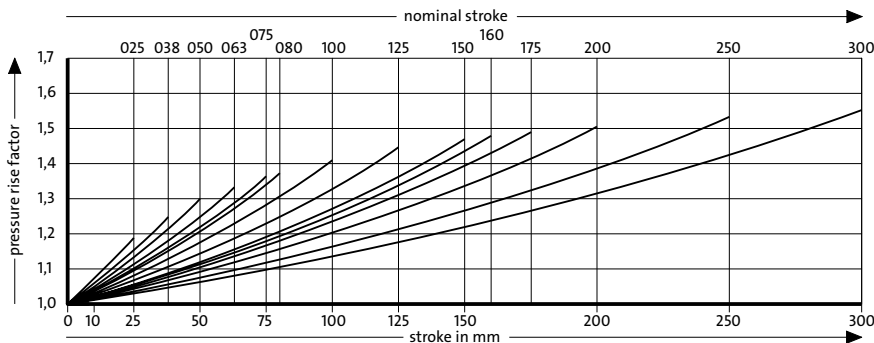
**2488.13.09500.**

Initial spring force versus charge pressure

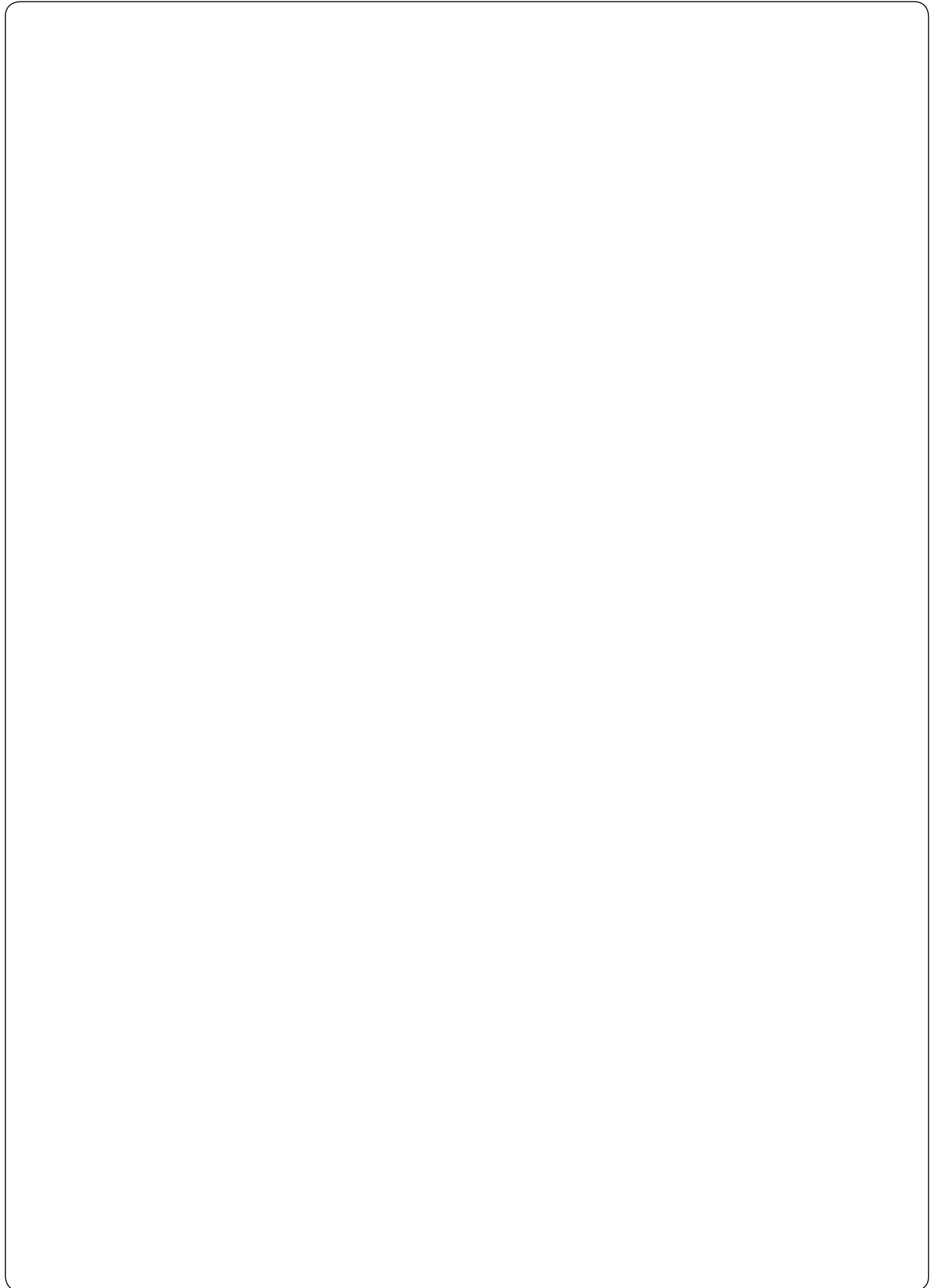


**2488.13.09500.**

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

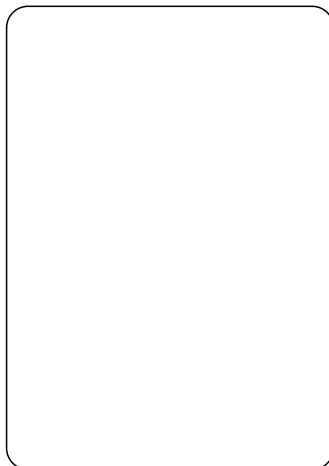
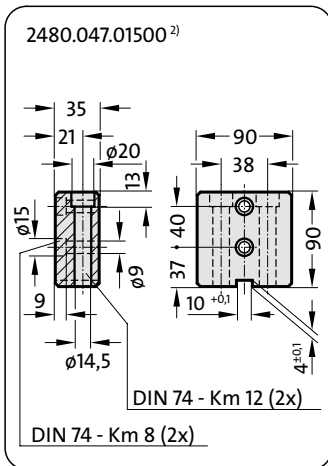
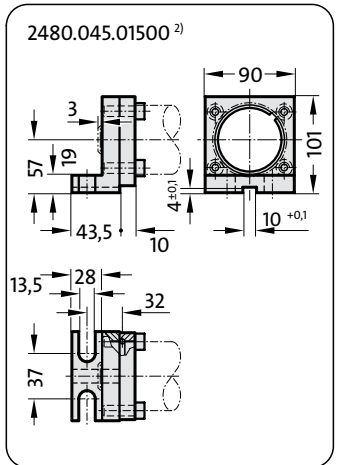
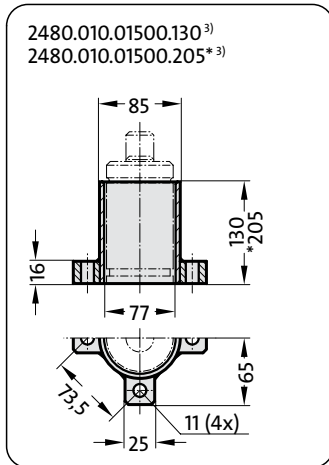
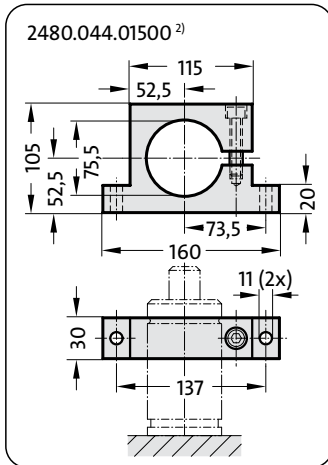
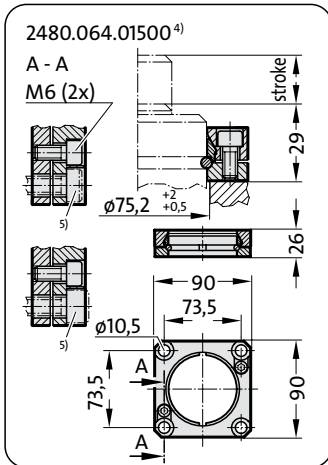
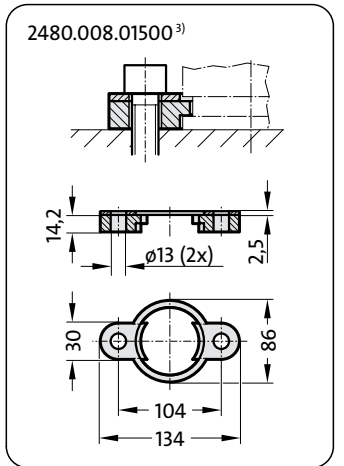
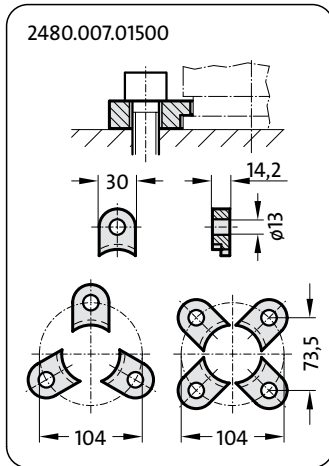
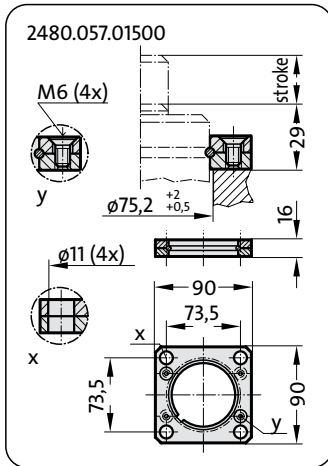
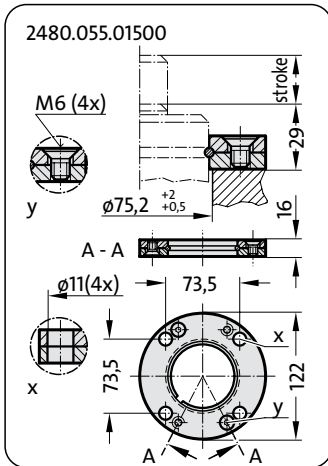
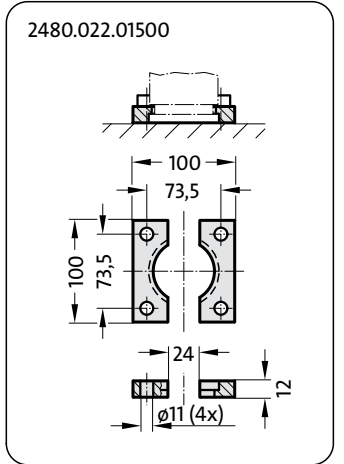
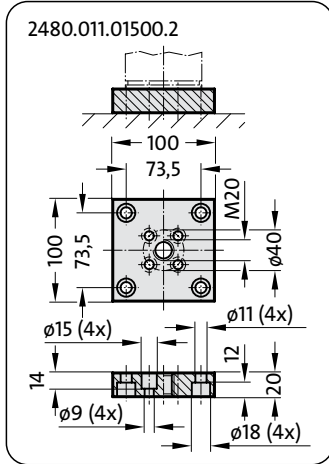
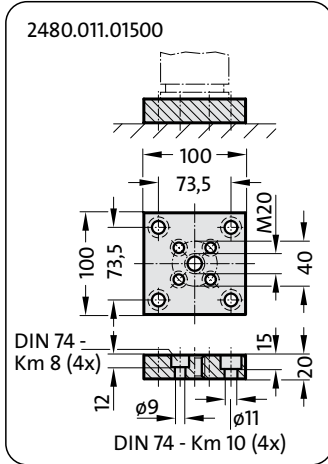
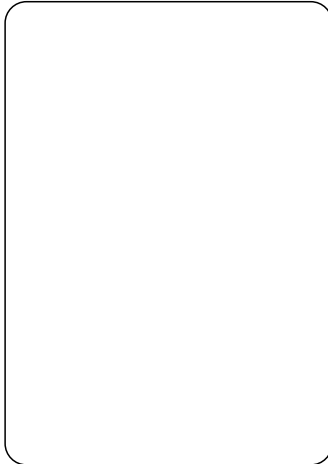


# Gas Springs with Reduced Pressure Rise

# Gas Springs with Reduced Pressure Rise Mounting Variations

**FIBRO**

2481.12.00750.



**Notes:**

- 2) Attention:  
The spring force must be absorbed by the stop surface.
- 3) Not for use with composite connection.
- 4) Square collar flange, non-rotating, fixing for composite connection.
- 5) Machine screws with hexagonal socket (compact head recommended).

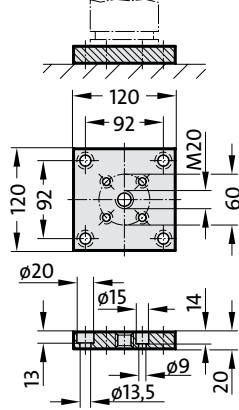


# Gas Springs with Reduced Pressure Rise Mounting Variations

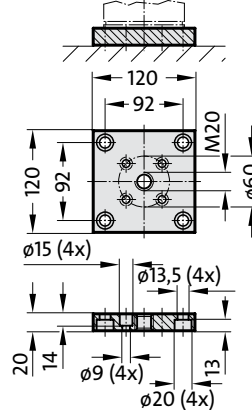
**FIBRO**

2481.13.01500.

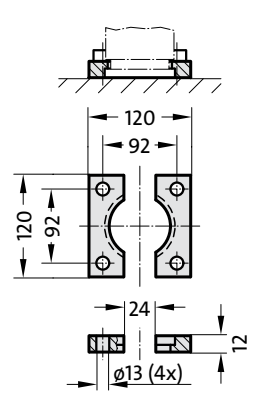
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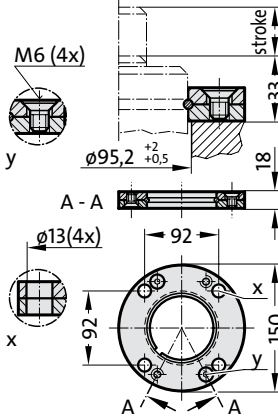
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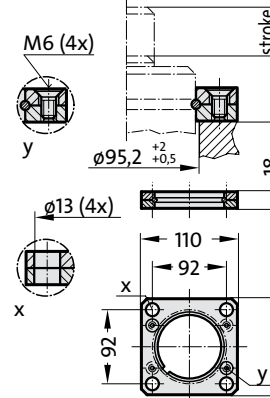
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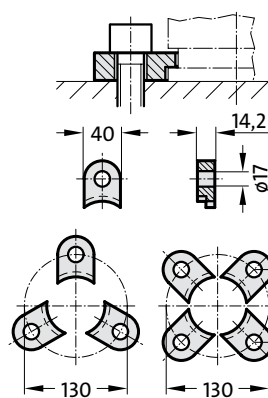
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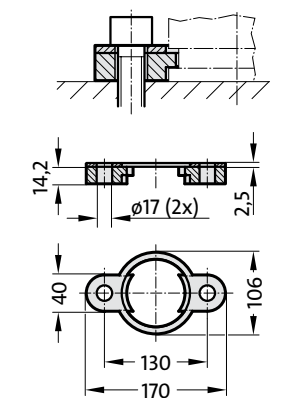
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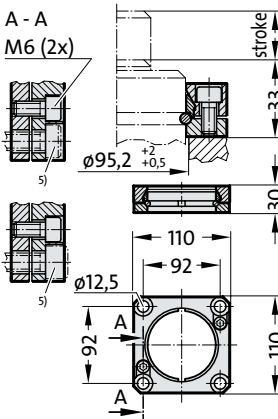
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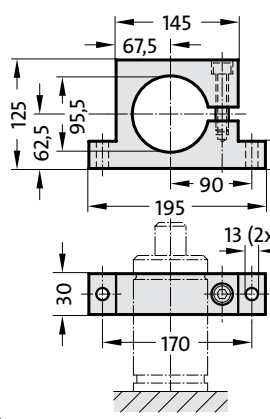
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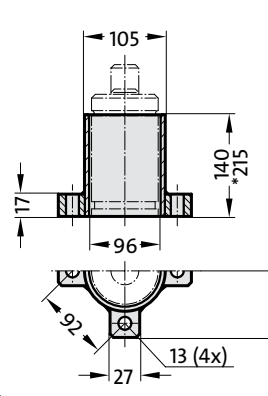
2480.064.03000<sup>4)</sup>



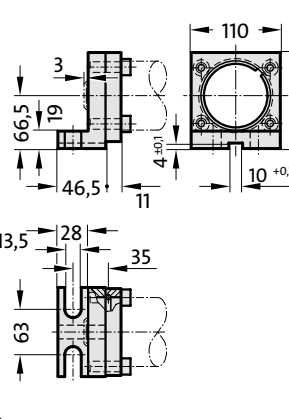
2480.044.03000<sup>2)</sup>



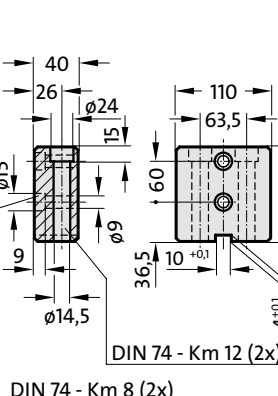
2480.010.03000.140<sup>3)</sup>  
2480.010.03000.215\*<sup>3)</sup>



2480.045.03000<sup>2)</sup>



2480.047.03000<sup>2)</sup>



## Notes:

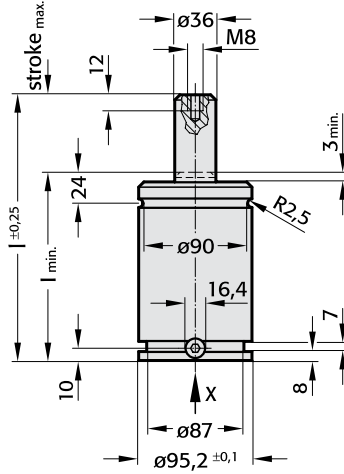
- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>3)</sup> Not for use with composite connection.
- <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
- <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).

**2481.13.01500.**

Initial spring force at 150 bar = 1500 daN

Order No	stroke max.	$l_{min}$	$l$
2481.13.01500.025	25	135	160
038	38,1	148,1	186,2
050	50	160	210
063	63,5	173,5	237
080	80	190	270
100	100	210	310
125	125	235	360
160	160	270	430
200	200	310	510
250	250	360	610
300	300	410	710

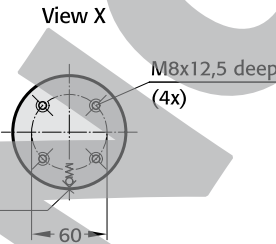
**2481.13.01500.**



**Note:**

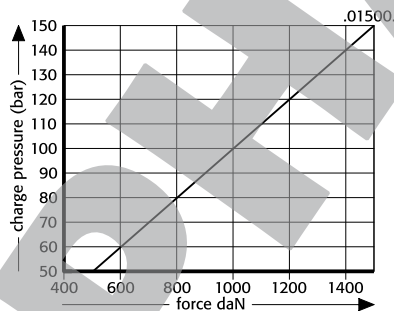
Order No for spare parts kit:  
2481.13.01500

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 40 to 80 (at 20°C)  
 Max. piston speed: 1.6 m/s



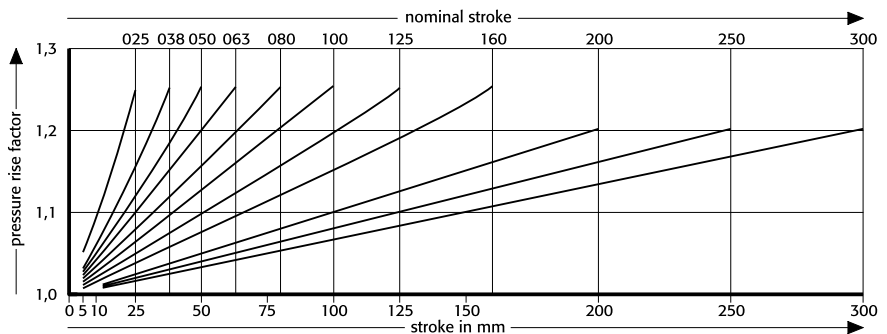
**2481.13.01500**

Initial spring force  
versus charge pressure



**2481.13.01500.**

Spring force Diagram displacement versus stroke rise

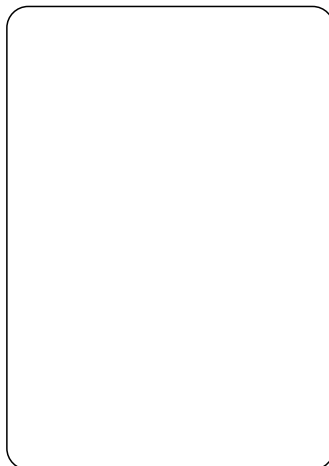
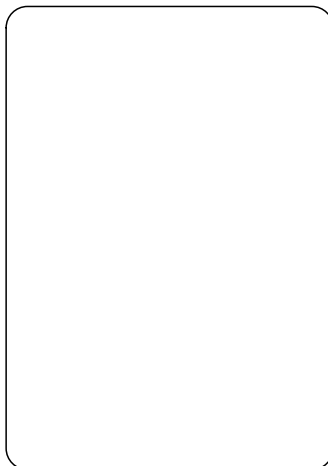
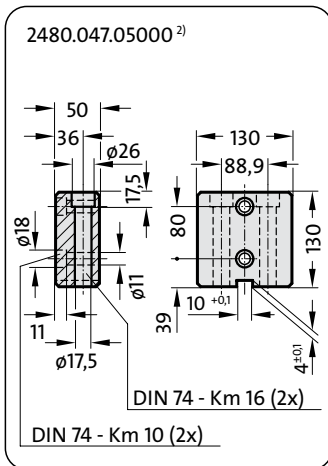
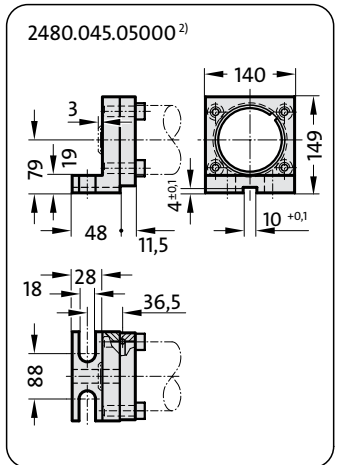
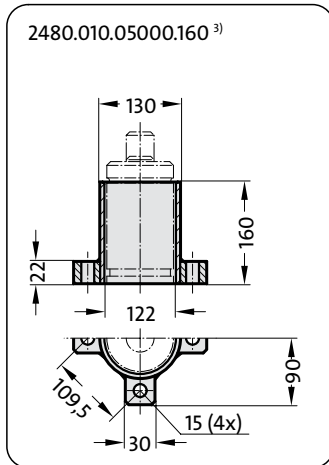
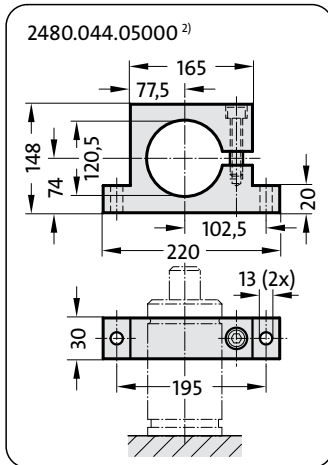
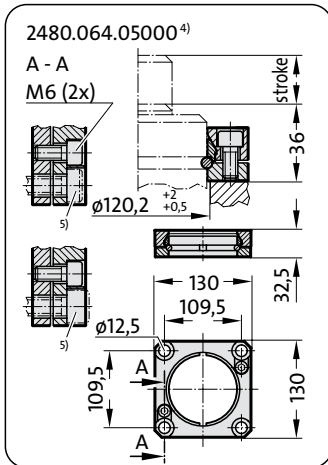
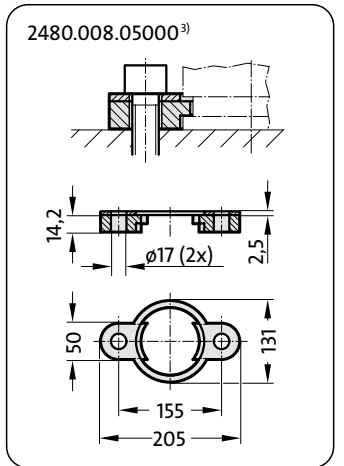
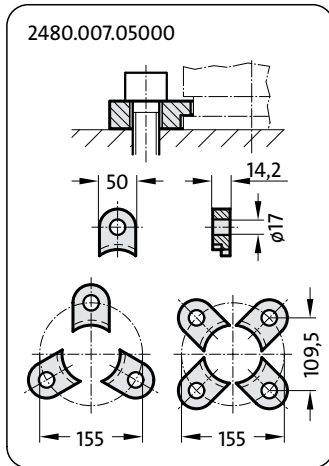
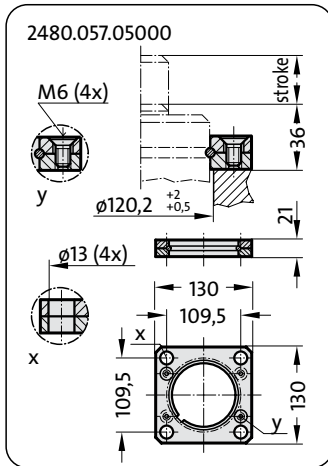
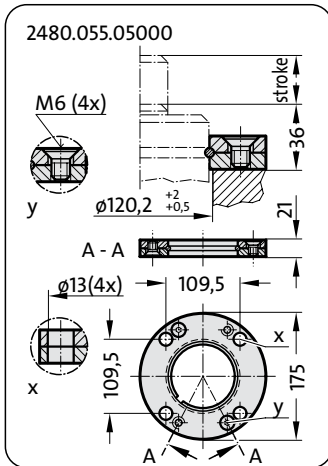
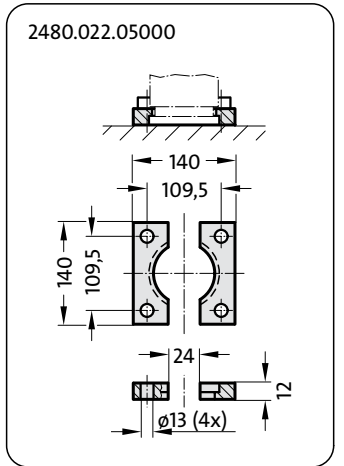
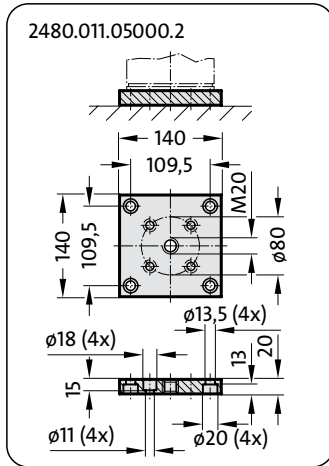
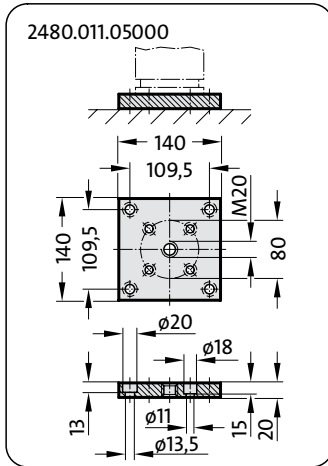
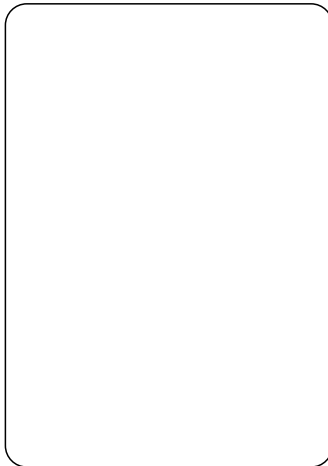


Pressure rise factor accounts for displacement but not external influences!

# Gas Springs with Reduced Pressure Rise Mounting Variations

**FIBRO**

2481.13.03000.



**Notes:**

- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>3)</sup> Not for use with composite connection.
- <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
- <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).

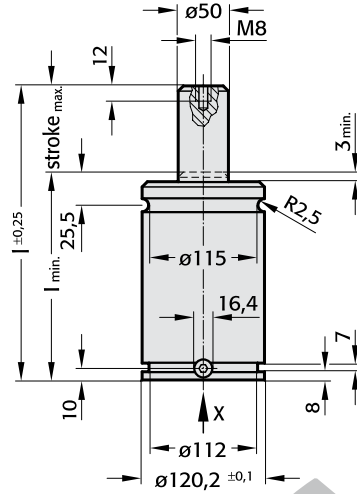


**2481.13.03000.**

Initial spring force at 150 bar = 3000 daN

Order No	stroke max.	$l_{min}$	$l$
2481.13.03000.025	25	145	170
038	38,1	158,1	196,2
050	50	170	220
063	63,5	183,5	247
080	80	200	280
100	100	220	320
125	125	245	370
160	160	280	440
200	200	320	520
250	250	370	620
300	300	420	720

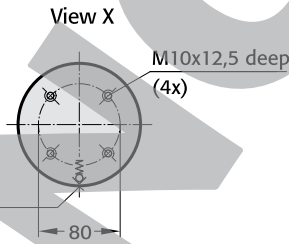
**2481.13.03000.**



**Note:**

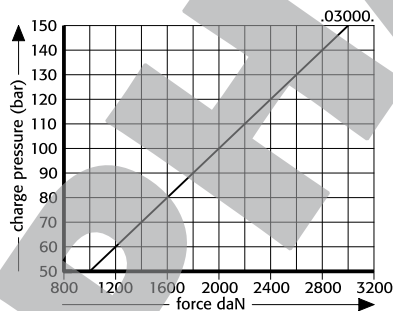
Order No for spare parts kit:  
2481.13.03000

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 40 to 80 (at 20°C)  
 Max. piston speed: 1.6 m/s



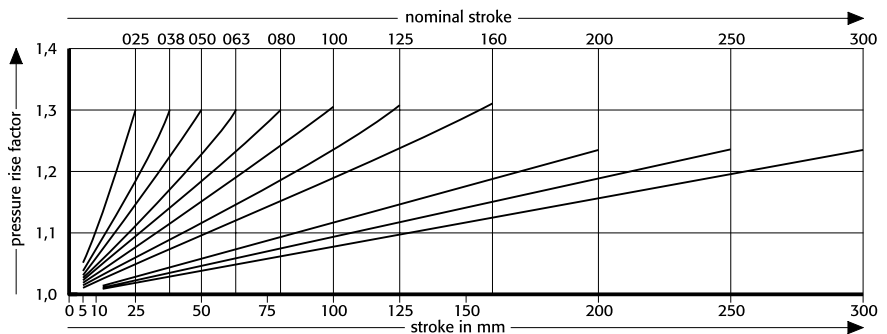
**2481.13.03000.**

Initial spring force versus charge pressure



**2481.13.03000.**

Spring force Diagram displacement versus stroke rise

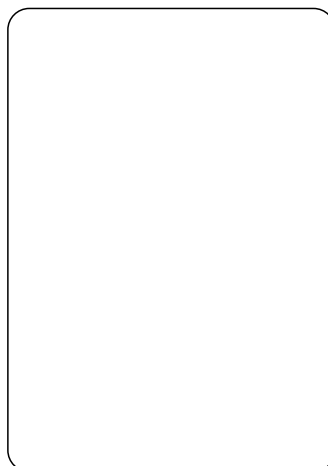
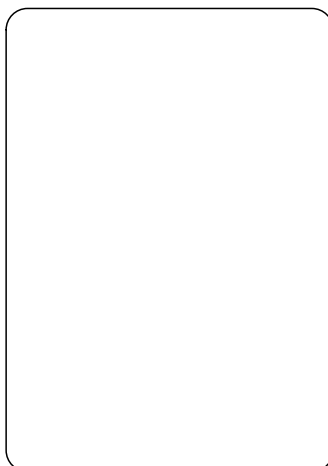
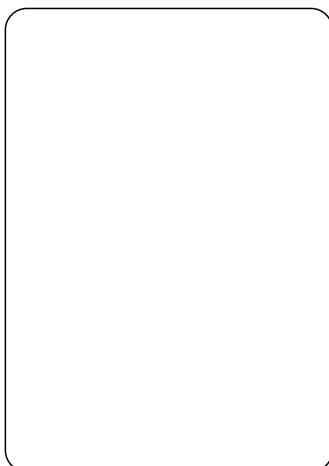
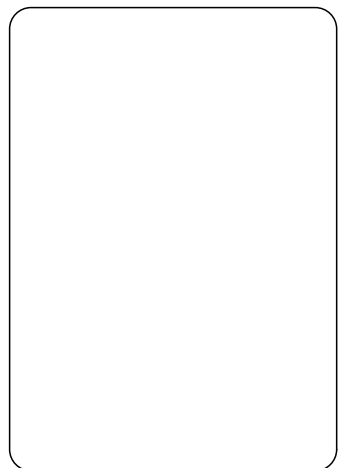
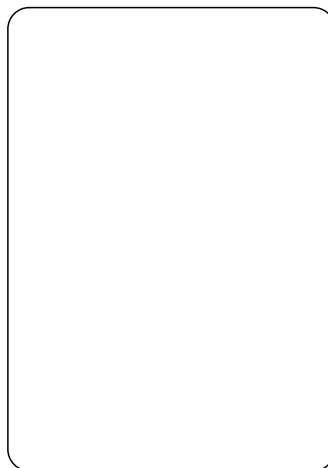
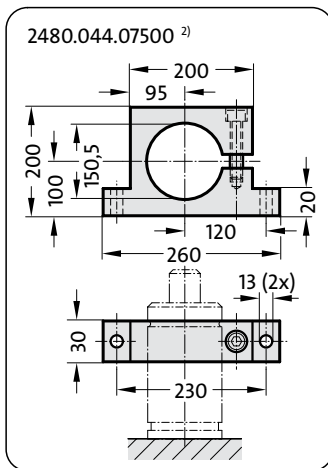
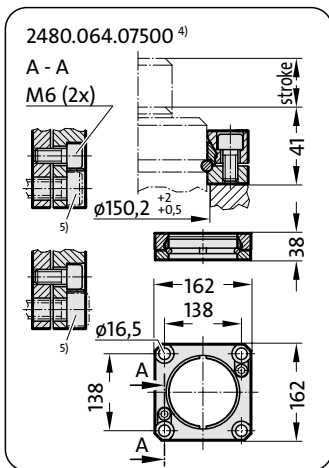
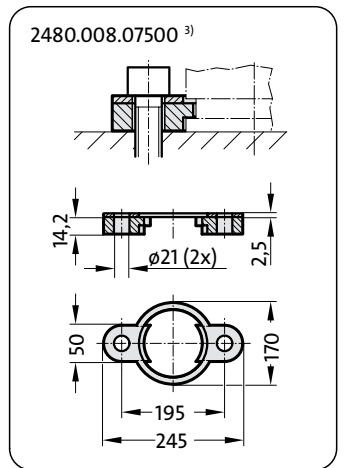
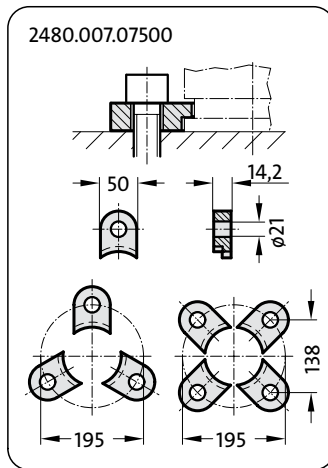
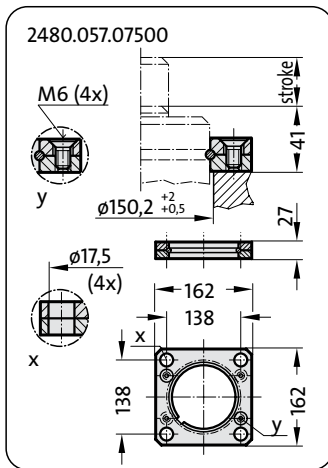
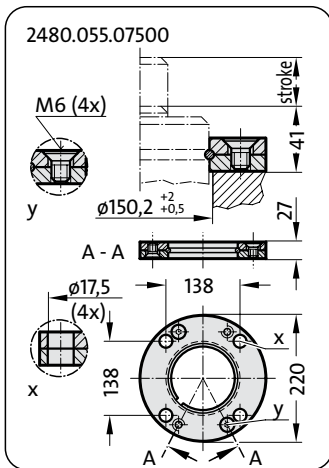
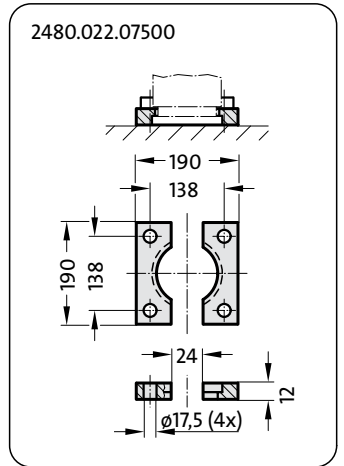
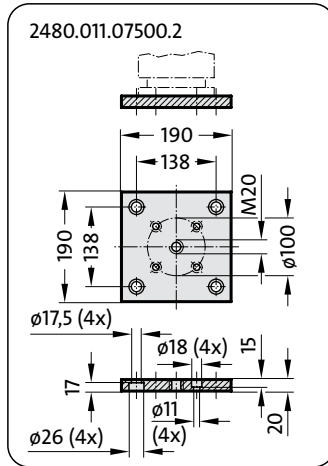
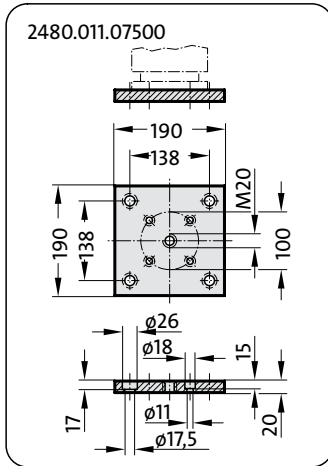
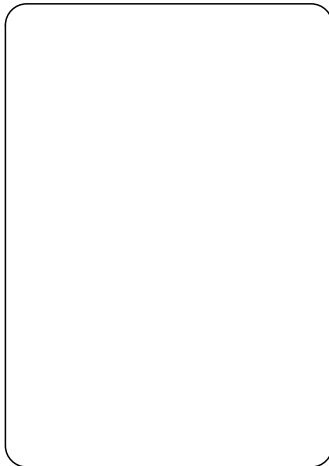


Pressure rise factor accounts for displacement but not external influences!

# Gas Springs with Reduced Pressure Rise Mounting Variations

**FIBRO**

2481.13.05000.



**Notes:**

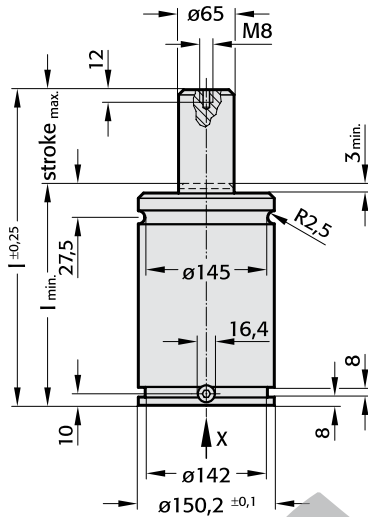
- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>3)</sup> Not for use with composite connection.
- <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
- <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).

2481.13.05000.

Initial spring force at 150 bar = 5000 daN

Order No	stroke		l
	max.	l <sub>min</sub>	
2481.13.05000.025	25	165	190
038	38,1	178,1	216,2
050	50	190	240
063	63,5	203,5	267
080	80	220	300
100	100	240	340
125	125	265	390
160	160	300	460
200	200	340	540
250	250	390	640
300	300	440	740

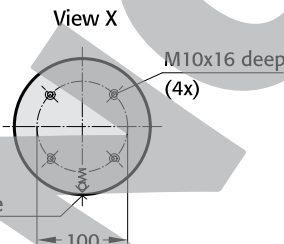
2481.13.05000.



**Note:**

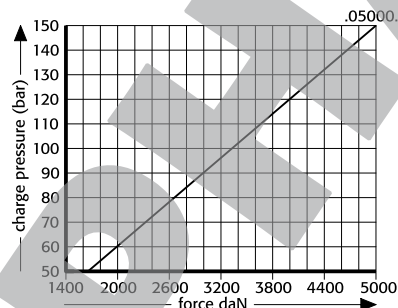
Order No for spare parts kit:  
2481.13.05000

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 40 to 80 (at 20°C)  
 Max. piston speed: 1.6 m/s



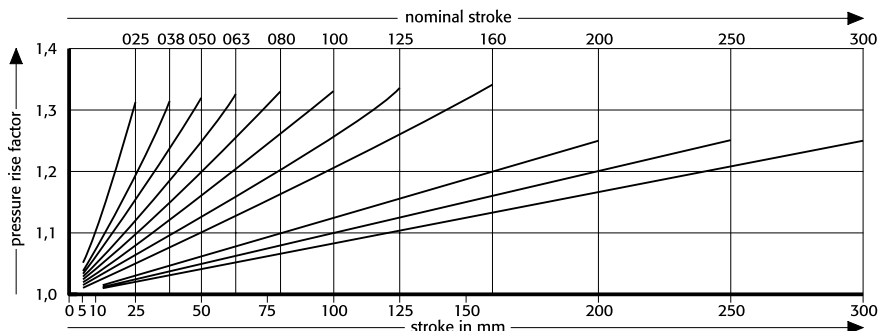
2481.13.05000.

Initial spring force versus charge pressure

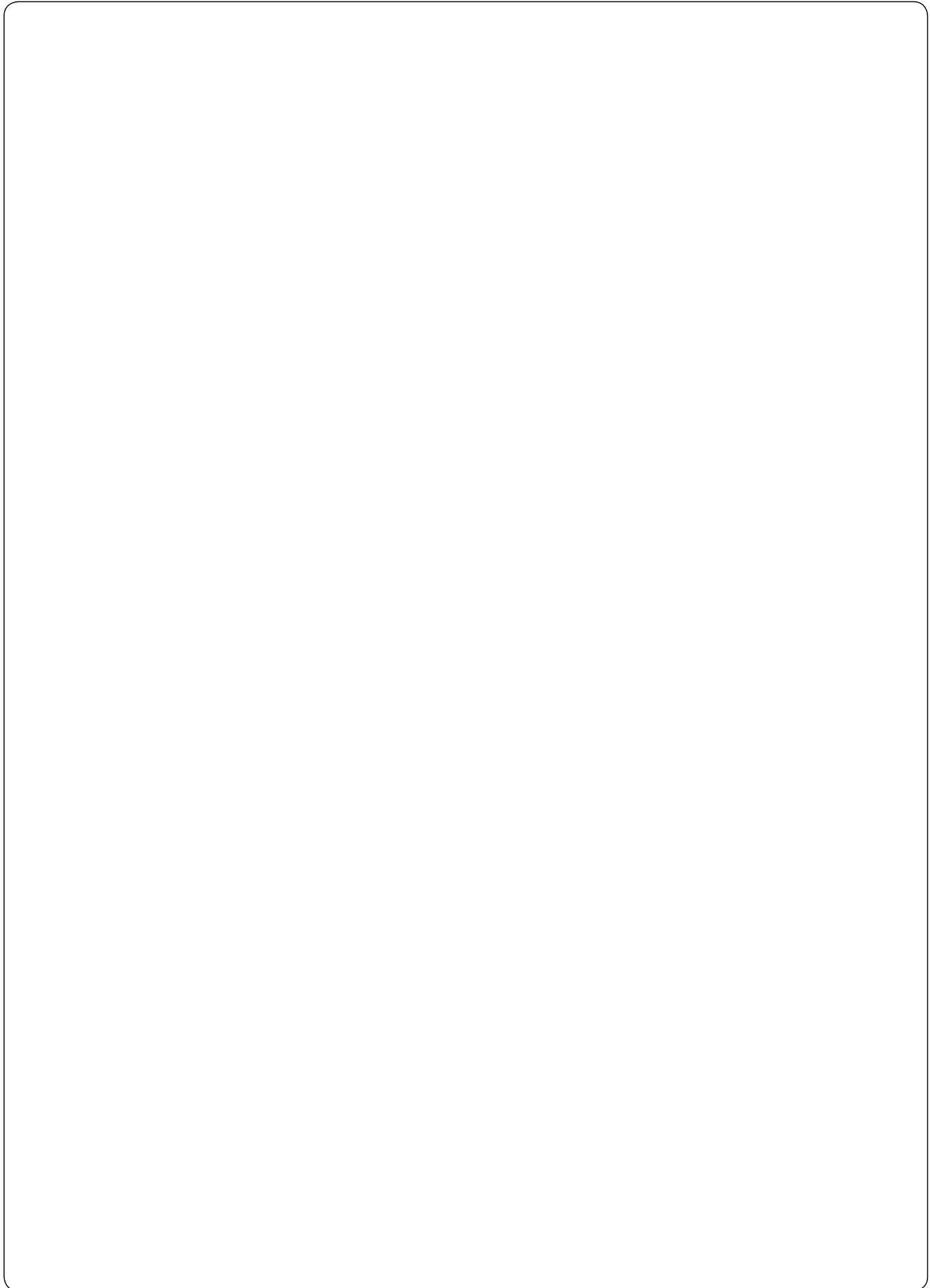


2481.13.05000.

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

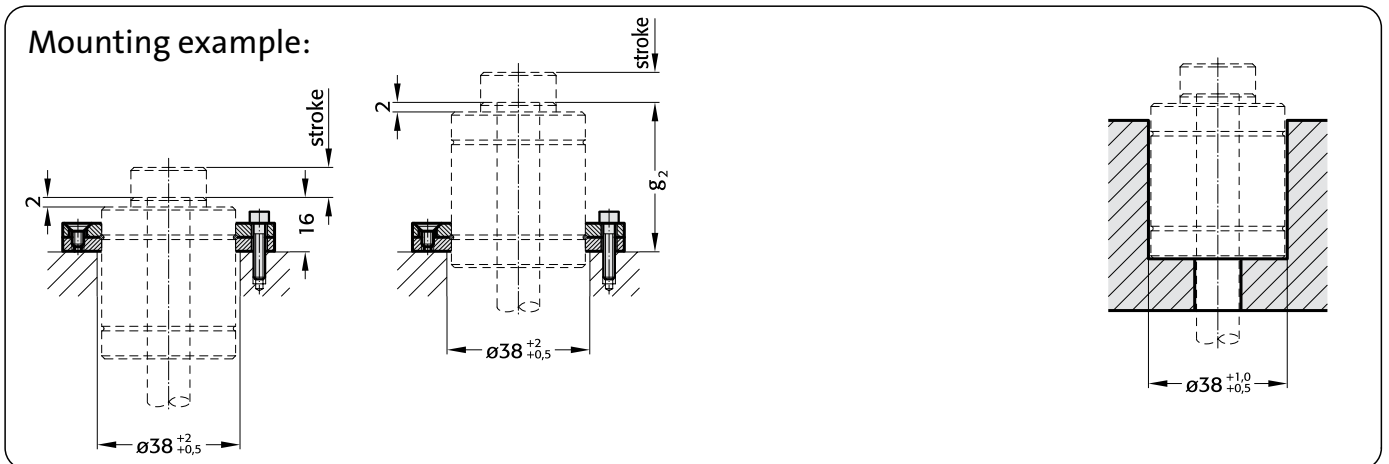
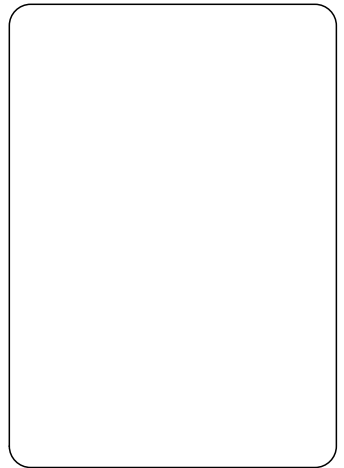
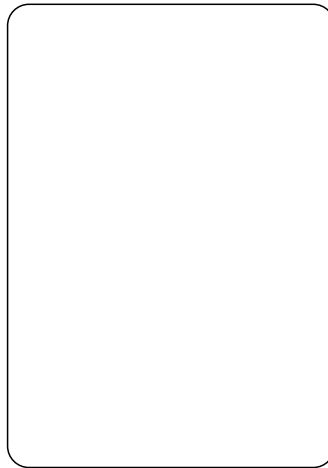
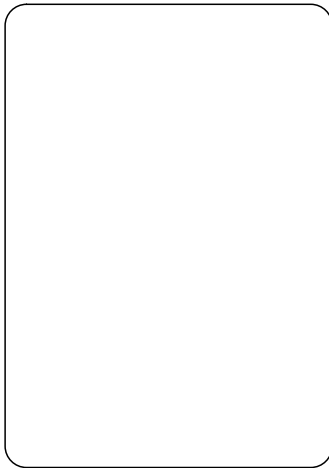
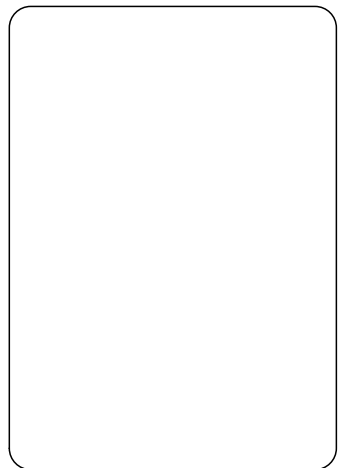
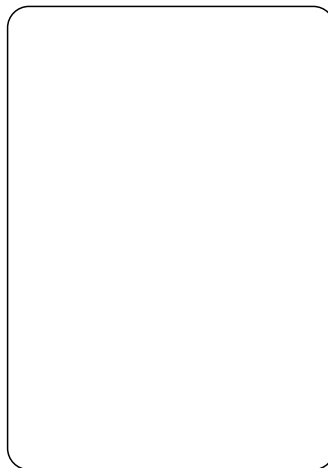
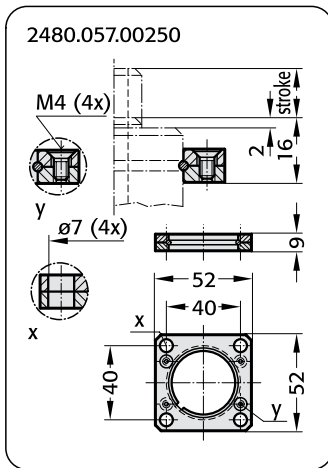
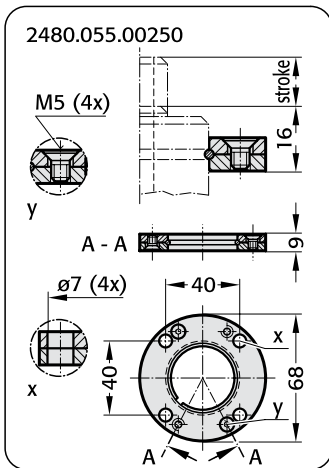
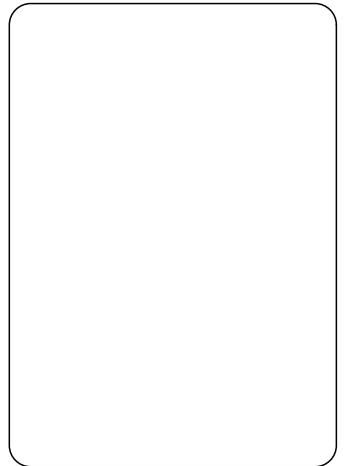
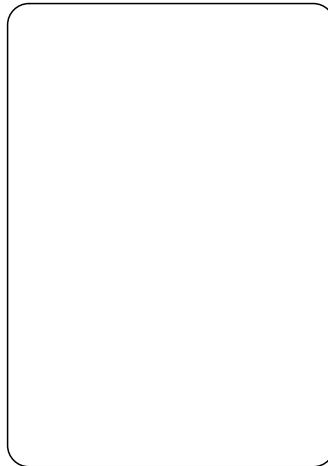
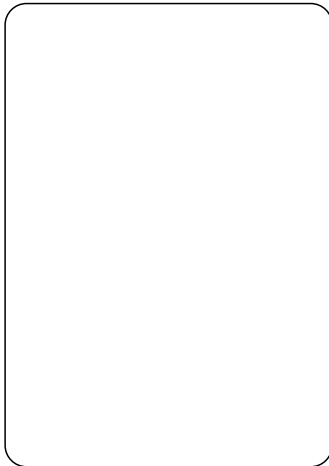


# Gas Springs with through bore passage

Gas Springs  
with through bore passage  
Mounting Variations

FIBRO

2496.12.00270.

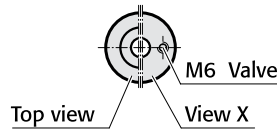
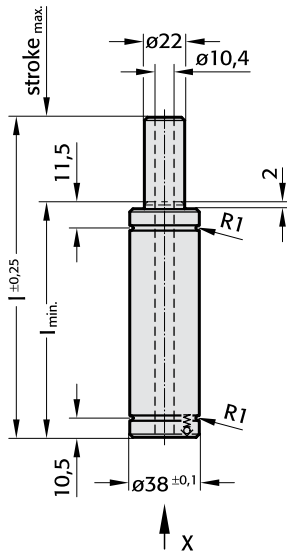


2496.12.00270.

Initial spring force at 150 bar = 270 daN

Order No	stroke		l	g <sub>2</sub>
	max.	l <sub>min</sub>		
2496.12.00270.016	16	92	108	86
	025	101	126	95
	050	126	176	120
	080	156	236	150

2496.12.00270.



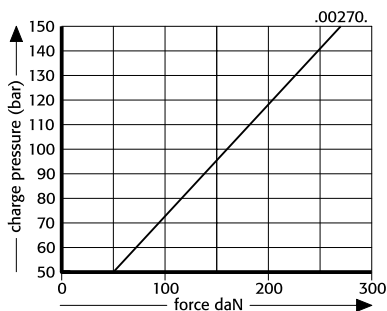
**Note:**

Order No for spare parts kit:  
2496.12.00270

- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar
- Min. filling pressure: 50 bar
- Working temperature: 20°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
- Max. piston speed: 0.5 m/s

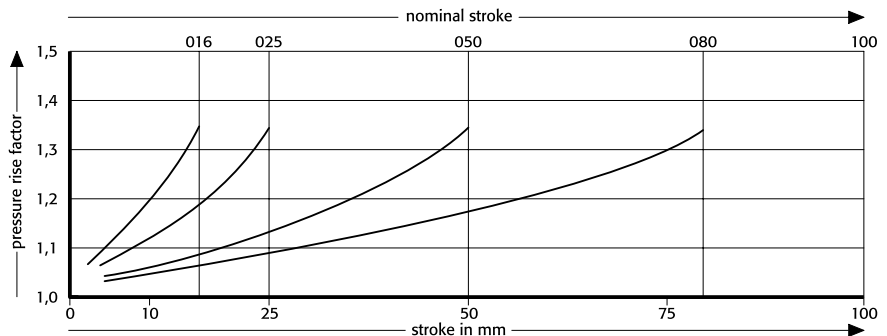
2496.12.00270.

Initial spring force  
versus charge pressure



2496.12.00270.

Spring force Diagram displacement versus stroke rise

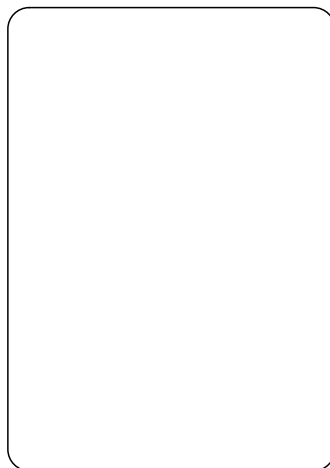
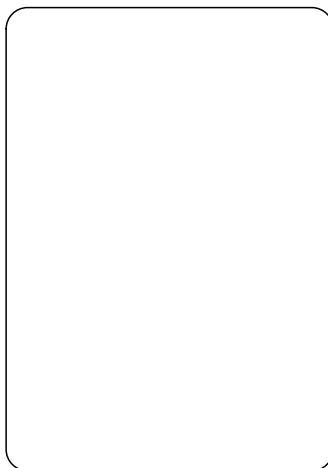
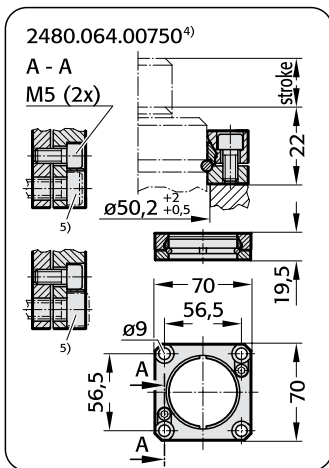
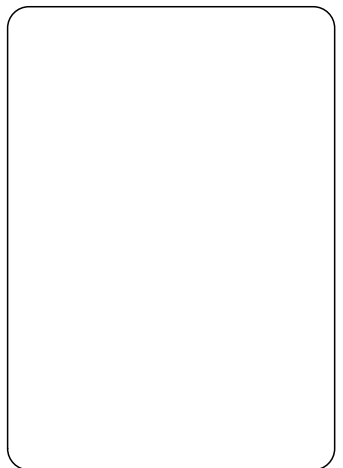
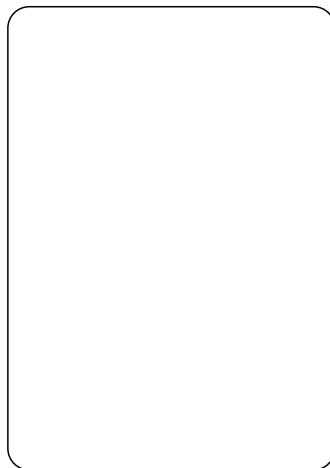
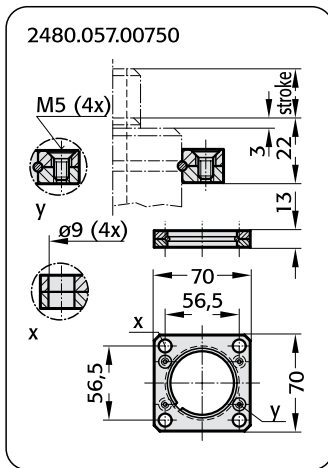
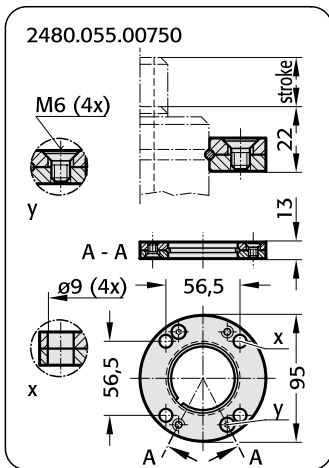
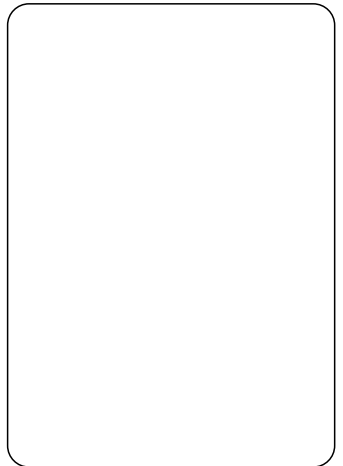
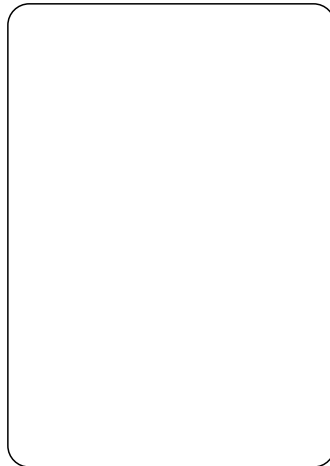
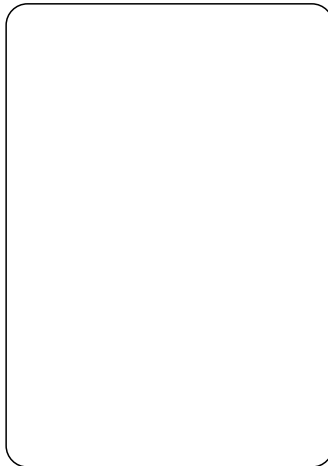
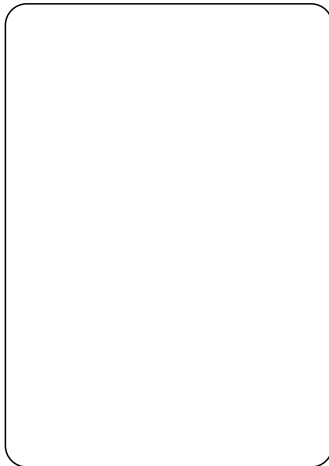


Pressure rise factor accounts for displacement but not external influences!

# Gas Springs with through bore passage Mounting Variations

**FIBRO**

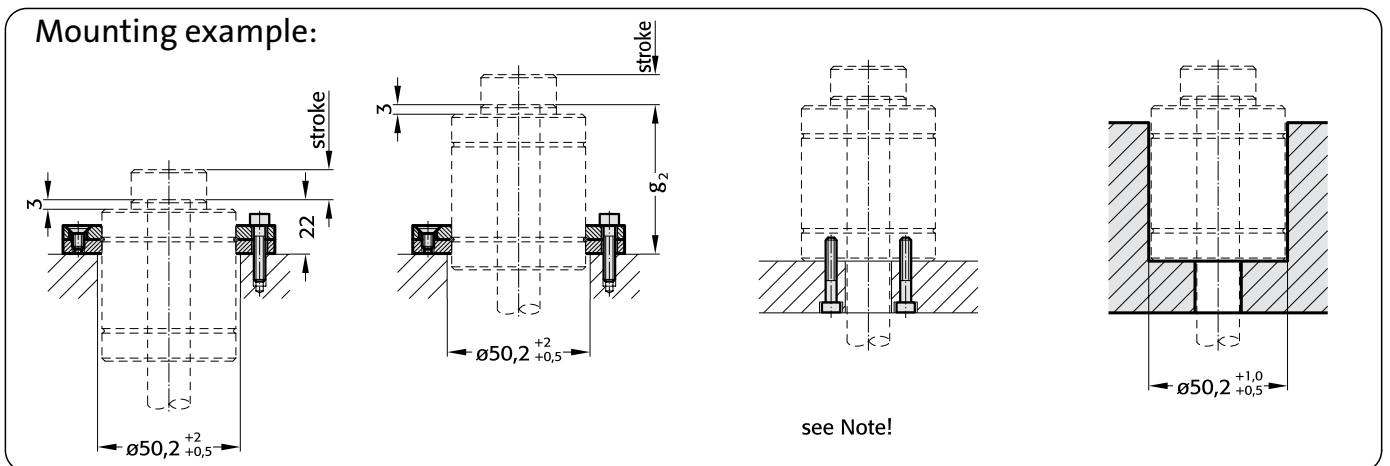
2496.12.00490.



**Notes:**

4) Square collar flange, non-rotating, fixing for composite connection.

5) Machine screws with hexagonal socket (compact head recommended).



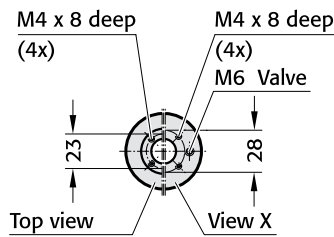
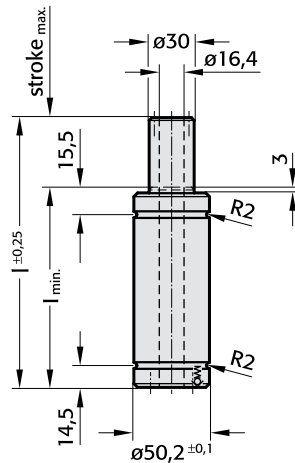


2496.12.00490.

Initial spring force at 150 bar = 490 daN

Order No	stroke		l	g <sub>2</sub>
	max.	l <sub>min.</sub>		
2496.12.00490. 016	16	96	112	88
025	25	105	130	97
050	50	130	180	122
080	80	160	240	152

2496.12.00490.



**Note:**

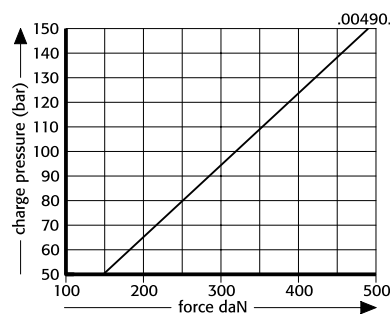
When mounting to floor, contact over the entire floor of the cylinder tube must be ensured!

Order No for spare parts kit:  
2496.12.00490

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 50 bar  
 Working temperature: 20 °C to +80 °C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 15 to 40 (at 20 °C)  
 Max. piston speed: 0.5 m/s

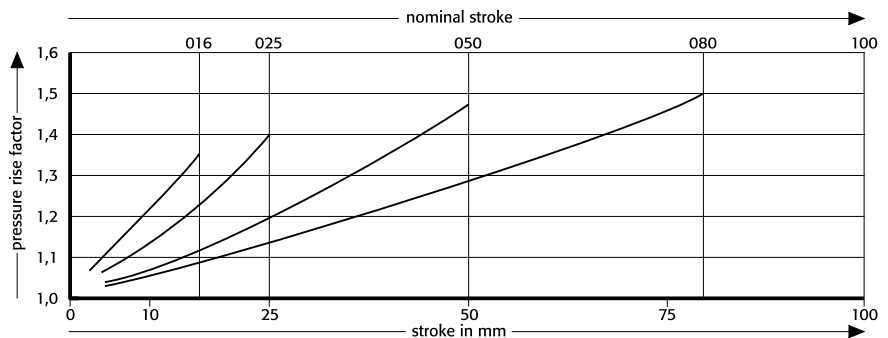
2496.12.00490.

Initial spring force versus charge pressure



2496.12.00490.

Spring force Diagram displacement versus stroke rise

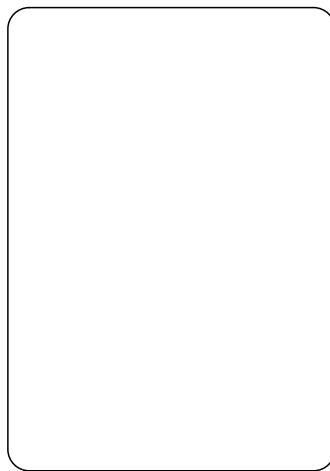
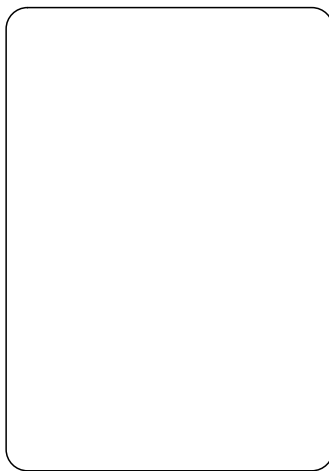
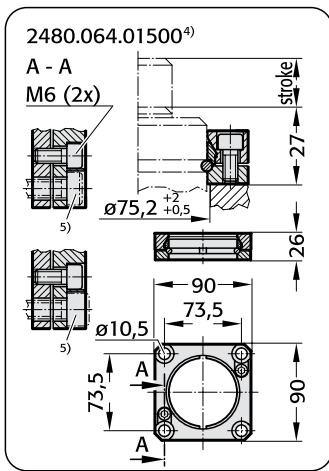
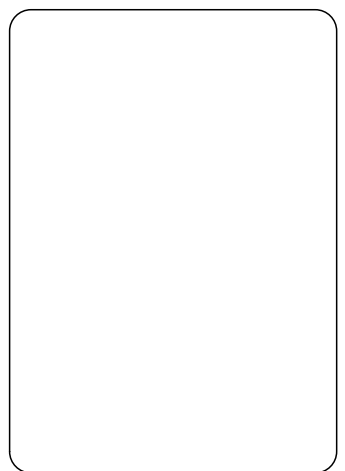
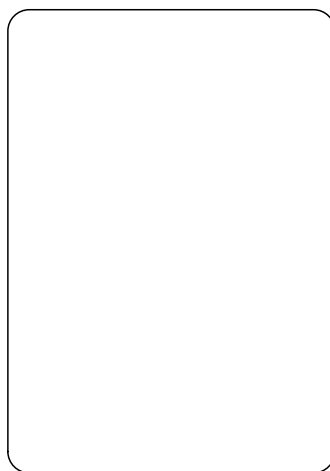
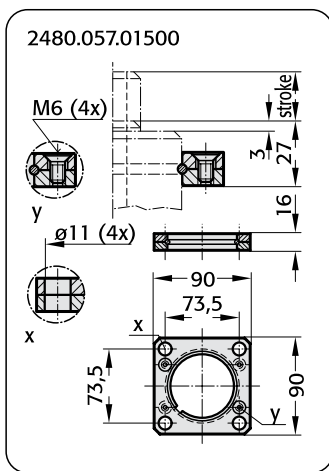
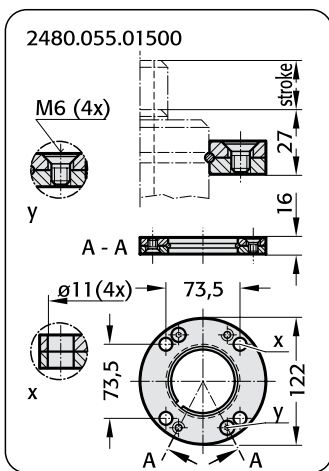
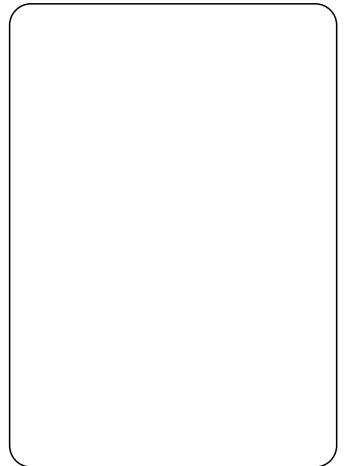
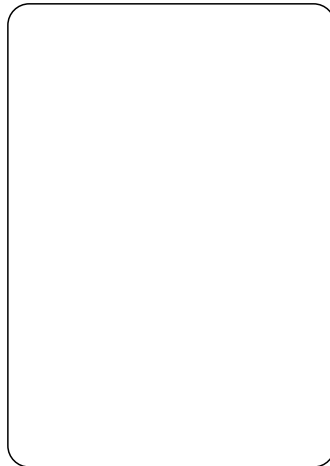
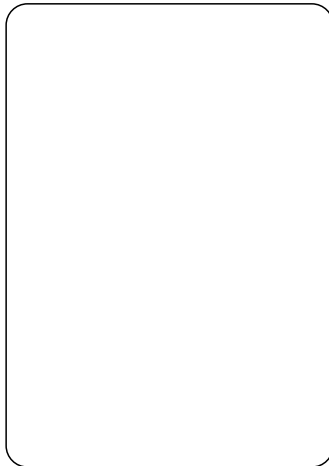
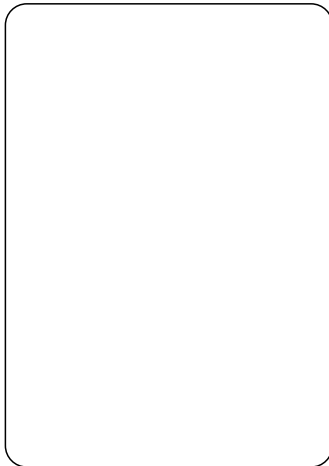


Pressure rise factor accounts for displacement but not external influences!

# Gas Springs with through bore passage Mounting Variations

**FIBRO**

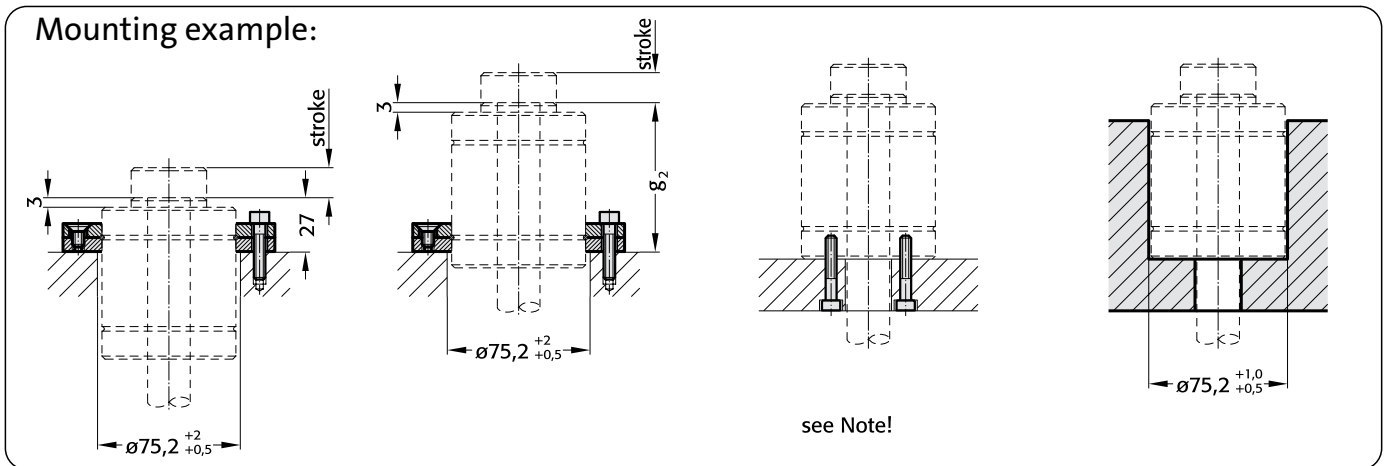
2496.12.01060.



**Notes:**

4) Square collar flange, non-rotating, fixing for composite connection.

5) Machine screws with hexagonal socket (compact head recommended).

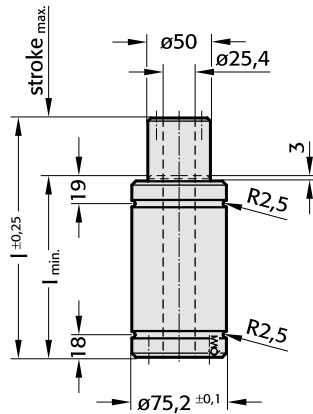


**2496.12.01060.**

Initial spring force at 150 bar = 1060 daN

Order No	stroke		l	g <sub>2</sub>
	max.	l <sub>min.</sub>		
2496.12.01060.016	16	106	122	96
025	25	115	140	105
050	50	140	190	130
080	80	170	250	160
100	100	190	290	180

**2496.12.01060.**

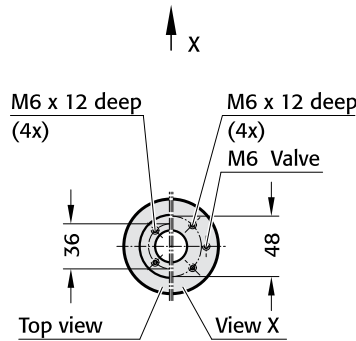


**Note:**

When mounting to floor, contact over the entire floor of the cylinder tube must be ensured!

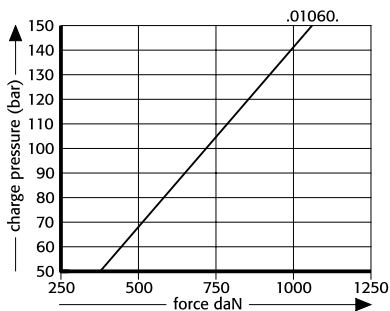
Order No for spare parts kit:  
2496.12.01060

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 50 bar  
 Working temperature: 20°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)  
 Max. piston speed: 0.5 m/s



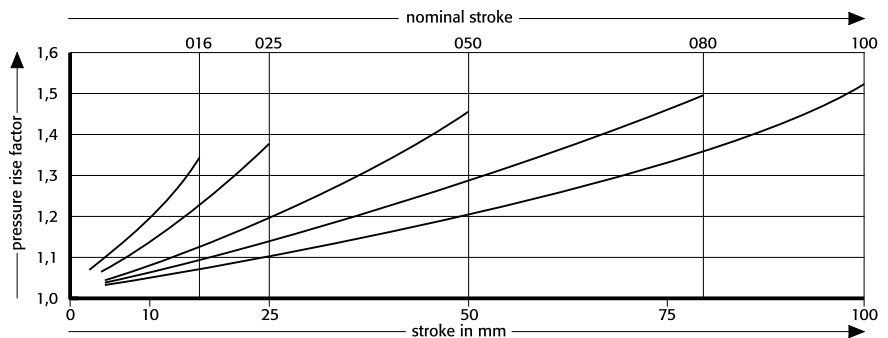
**2496.12.01060.**

Initial spring force versus charge pressure

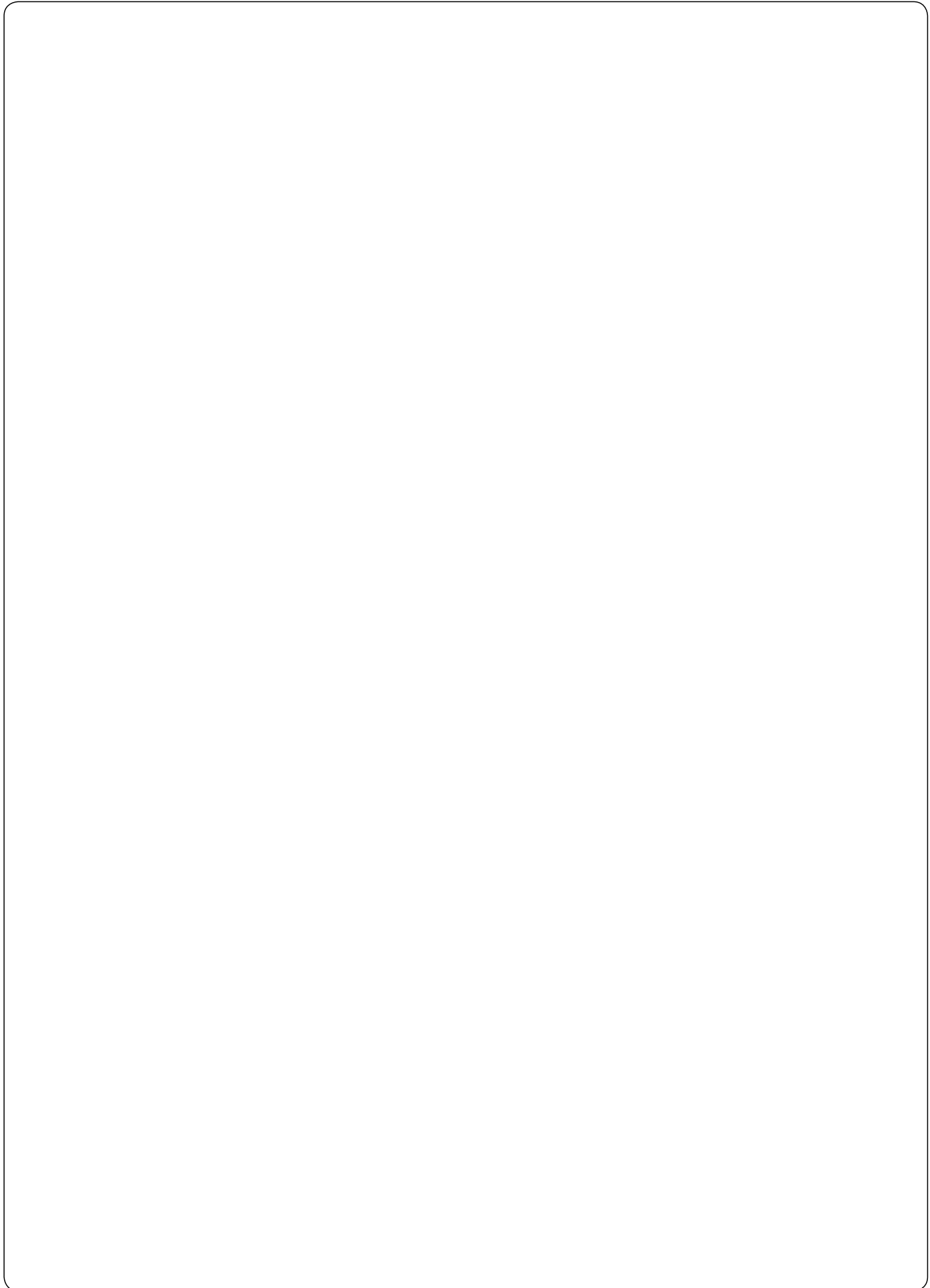


**2496.12.01060.**

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!



# Gas Springs with Increased Spring Force

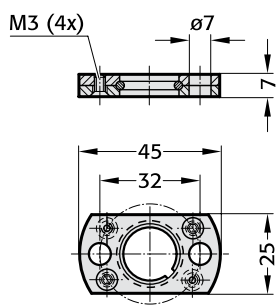
## **Power Line**

# Gas Springs with Increased Spring Force Mounting Variations

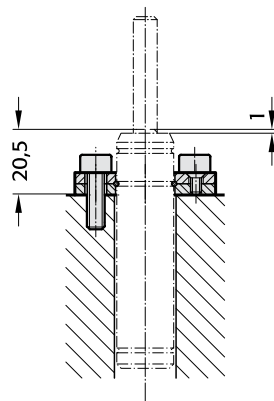
FIBRO

2487.12.00170.

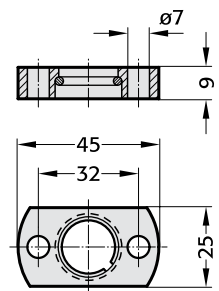
2480.051.00030



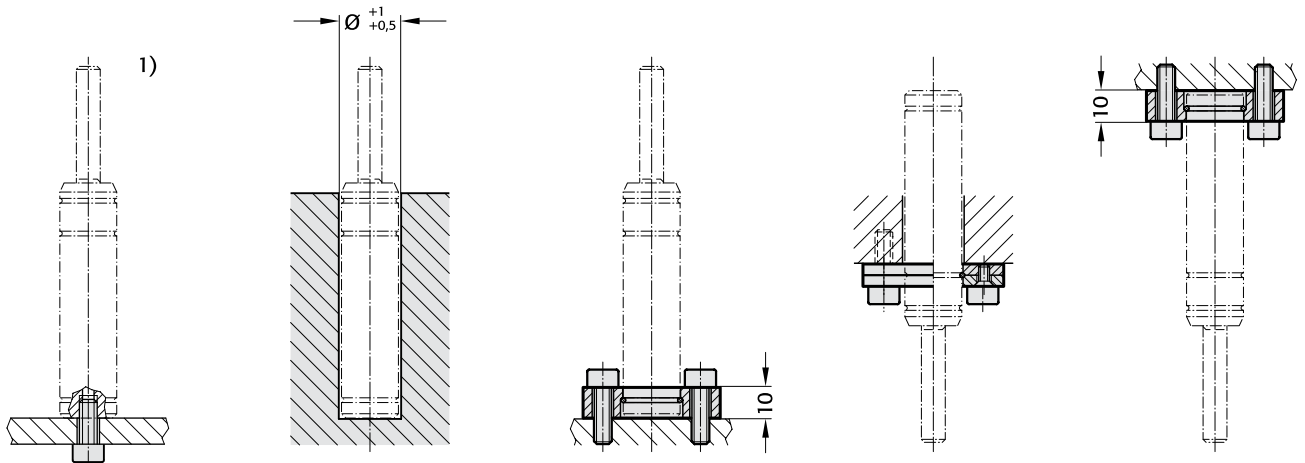
2480.051.00030



2480.052.00030



## Mounting example:



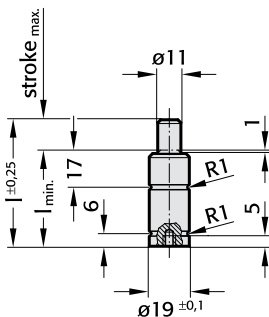
2487.12.00170.

2487.12.00170.

Initial spring force at 180 bar = 170 daN

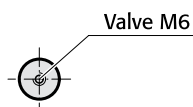
Order No	stroke		
	max.	$l_{min.}$	$l$
2487.12.00170.007	7	37	44
010	10	40	50
015	15	45	60
019	19	49	68
025	25	55	80
038	38	68	106
050	50	80	130
063	63	93	156
075	75	110	185
080	80	115	195
100	100	135	235
125	125	160	285

2487.12.00170.



↑ X

View X



**Note:**

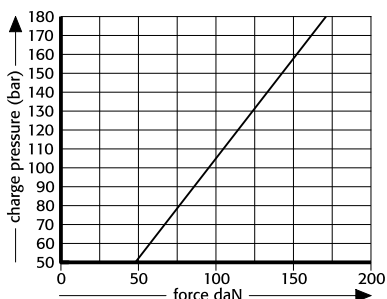
Worn gas springs cannot be repaired, they have to be replaced completely.

<sup>1)</sup> Fixing at bottom thread only recommended for stroke length up to 50 mm.

- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 180 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 40 to 100 (at 20°C)
- Max. piston speed: 1.6 m/s

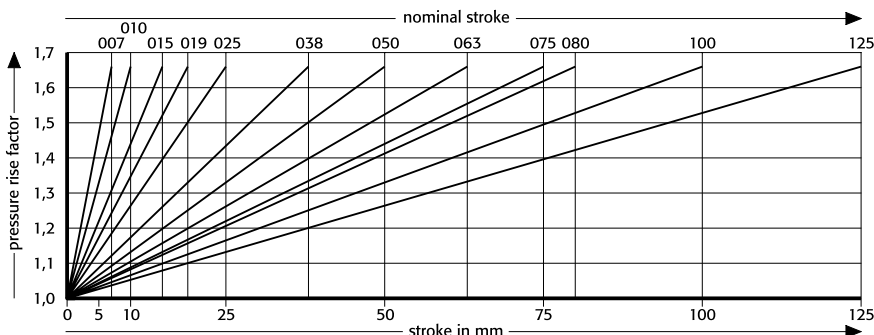
2487.12.00170.

Initial spring force versus charge pressure



2487.12.00170.

Spring force Diagram displacement versus stroke rise



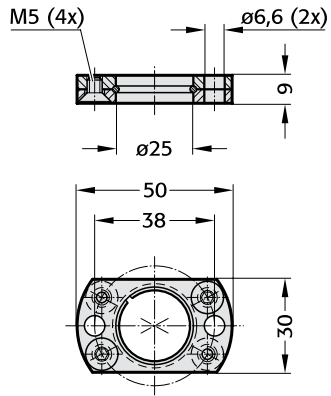
Pressure rise factor accounts for displacement but not external influences!

# Gas Springs with Increased Spring Force Mounting Variations

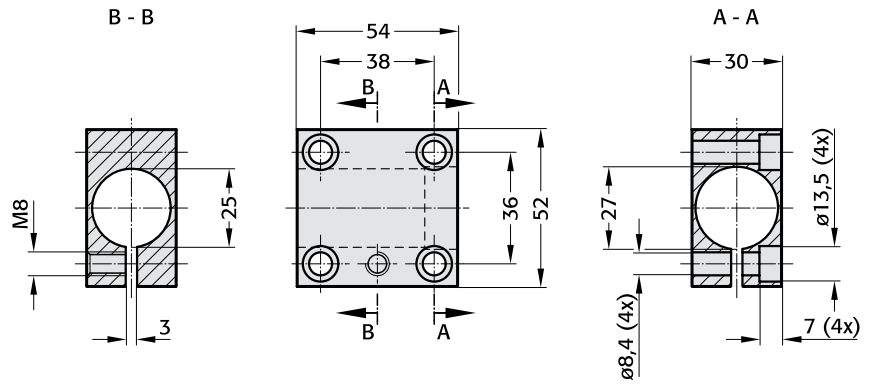
**FIBRO**

2487.12.00320.

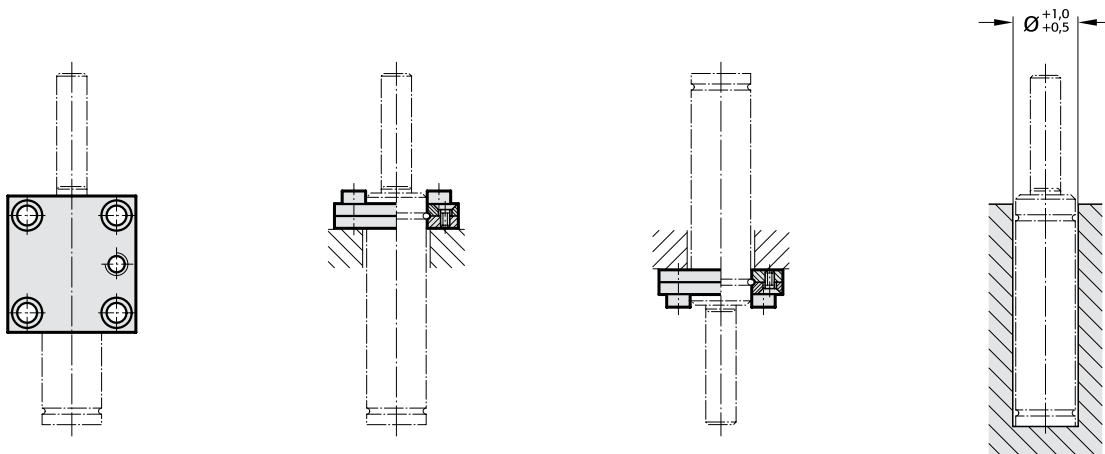
2480.051.00150



2480.053.00150



## Mounting example:





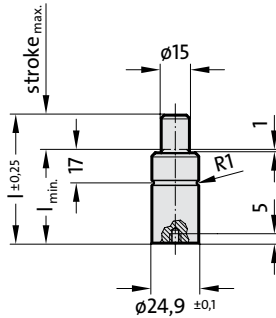
2487.12.00320.

2487.12.00320.

Initial spring force at 180 bar = 320 daN

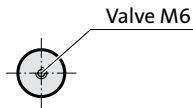
Order No	stroke max.	$l_{min.}$	$l$
2487.12.00320.007	7	37	44
010	10	40	50
015	15	45	60
019	19	49	68
025	25	55	80
038	38	68	106
050	50	80	130
063	63	93	156
075	75	110	185
080	80	115	195
100	100	135	235
125	125	160	285

2487.12.00320.



↑ X

View X



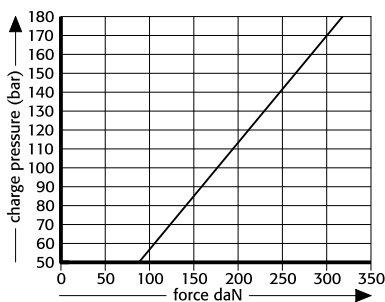
**Note:**

Worn gas springs cannot be repaired, they have to be replaced completely.

- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 180 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 40 to 100 (at 20°C)
- Max. piston speed: 1.6 m/s

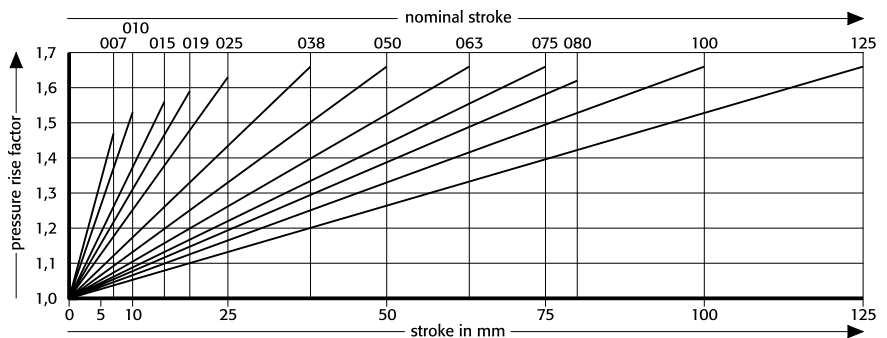
2487.12.00320.

Initial spring force versus charge pressure



2487.12.00320.

Spring force Diagram displacement versus stroke rise



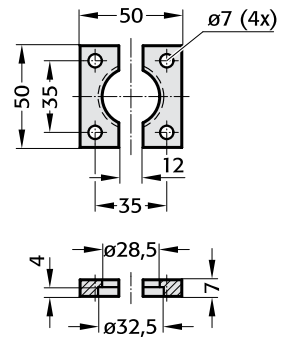
Pressure rise factor accounts for displacement but not external influences!

# Gas Springs with Increased Spring Force Mounting Variations

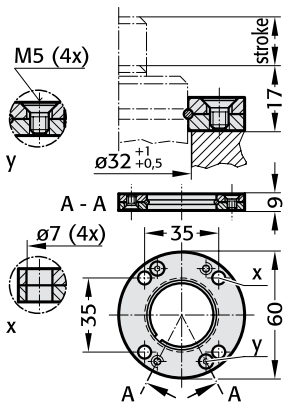
**FIBRO**

2487.12.00350.

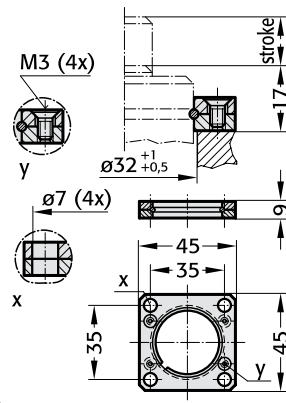
2480.022.00150



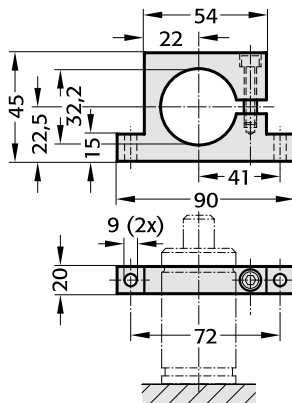
2480.055.00150



2480.057.00150



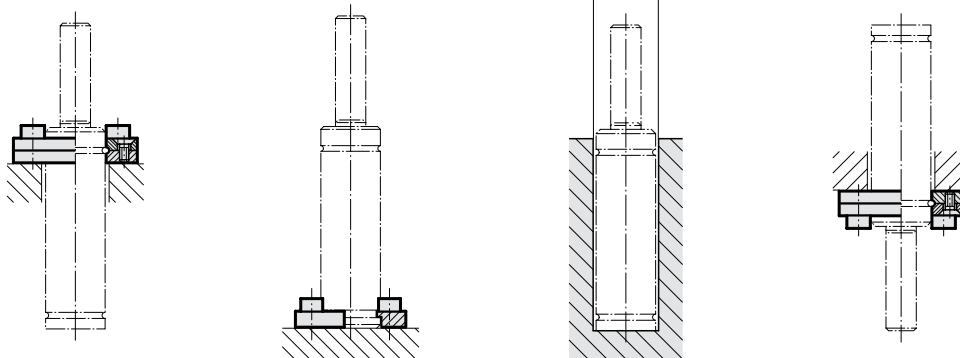
2480.044.00150<sup>2)</sup>



**Note:**

<sup>2)</sup> Attention:  
The spring force must be  
absorbed by the stop  
surface.

**Mounting example:**



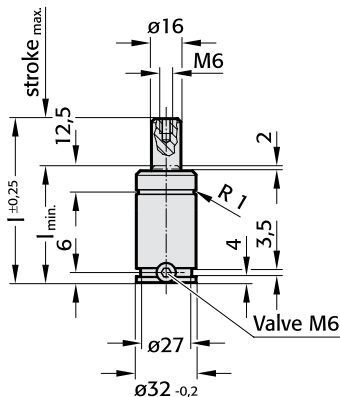
2487.12.00350.

2487.12.00350.

Initial spring force at 180 bar = 350 daN

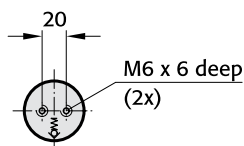
Order No	stroke max.	$l_{min.}$	$l$
2487.12.00350.010	10	40	50
013	13	43	56
016	16	46	62
019	19	49	68
025	25	55	80
032	32	62	94
038	38	68	106
050	50	80	130
063	63	93	156
075	75	105	180
080	80	110	190
100	100	130	230
125	125	155	280

2487.12.00350.



↑ X

View X



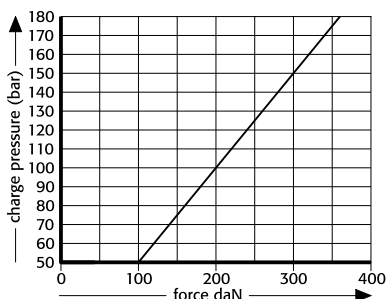
**Note:**

Order No for spare parts kit:  
2487.12.00350

- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 180 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 20 to 100 (at 20°C)
- Max. piston speed: 1.6 m/s

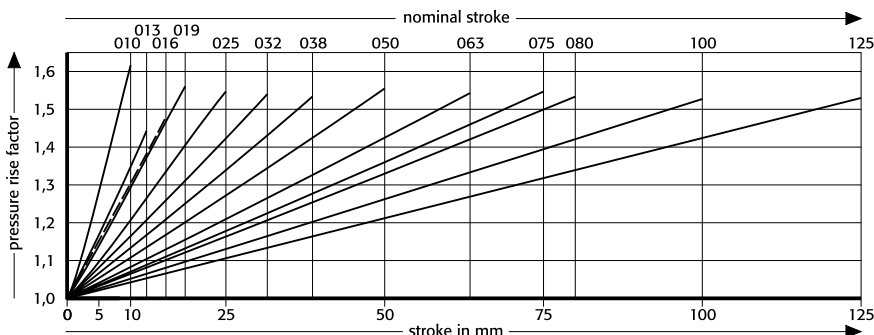
2487.12.00350.

Initial spring force  
versus charge pressure



2487.12.00350.

Spring force Diagram displacement versus stroke rise



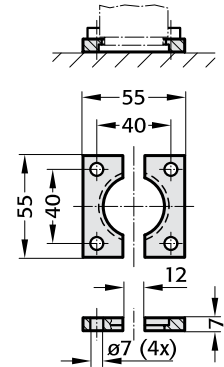
Pressure rise factor accounts for displacement but not external influences!

# Gas Springs with Increased Spring Force Mounting Variations

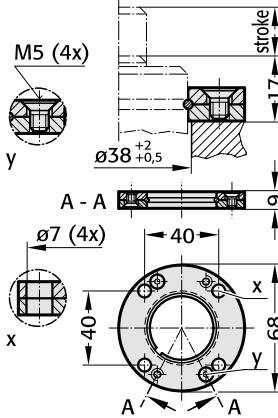
**FIBRO**

2487.12.00500.

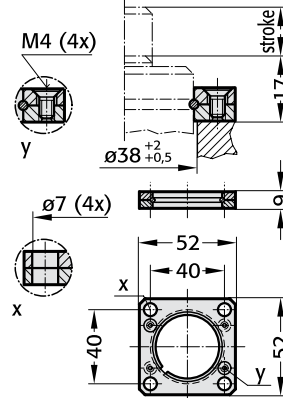
2480.022.00250



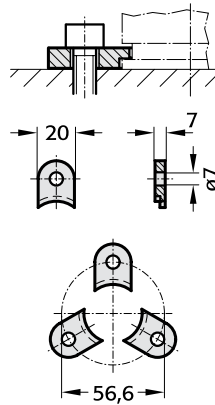
2480.055.00250



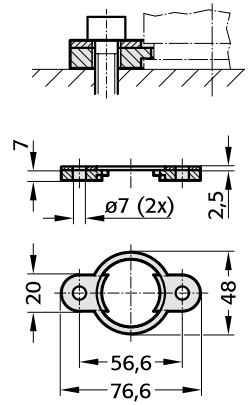
2480.057.00250



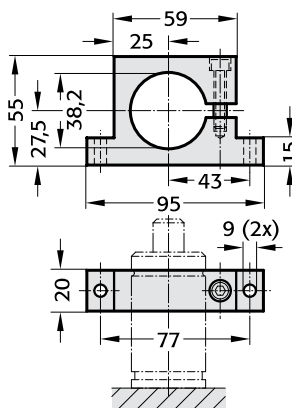
2480.007.00250



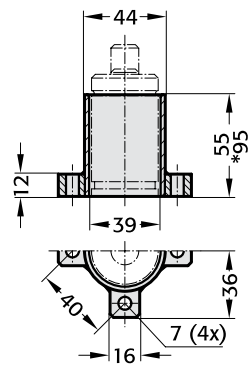
2480.008.00250<sup>3)</sup>



2480.044.00250<sup>2)</sup>



2480.010.00250.055<sup>3)</sup>  
2480.010.00250.095\*<sup>3)</sup>



## Notes:

- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>3)</sup> Not for use with composite connection.

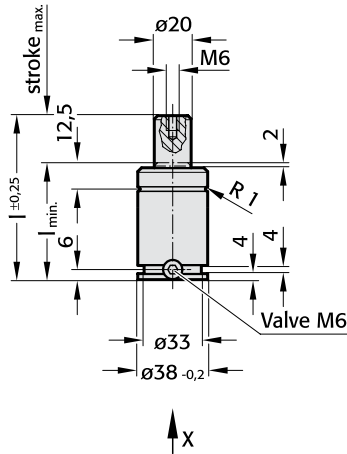
2487.12.00500.

2487.12.00500.

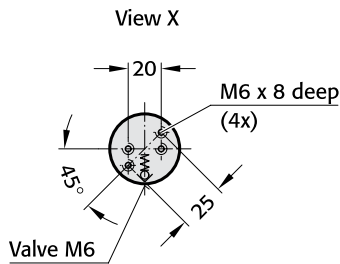
Initial spring force at 150 bar = 500 daN

Order No	stroke max.	$l_{min.}$	$l$
2487.12.00500.010	10	40	50
013	13	43	56
016	16	46	62
019	19	49	68
025	25	55	80
032	32	62	94
038	38	68	106
050	50	80	130
063	63	93	156
075	75	105	180
080	80	110	190
100	100	130	230
125	125	155	280

2487.12.00500.



↑ X



**Note:**

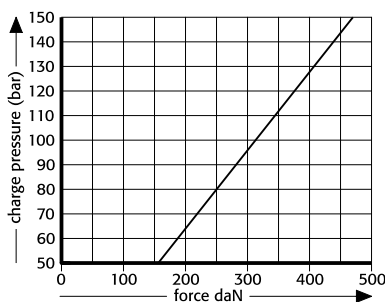
Order No for spare parts kit:

2487.12.00500

- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 20 to 100 (at 20°C)
- Max. piston speed: 1.6 m/s

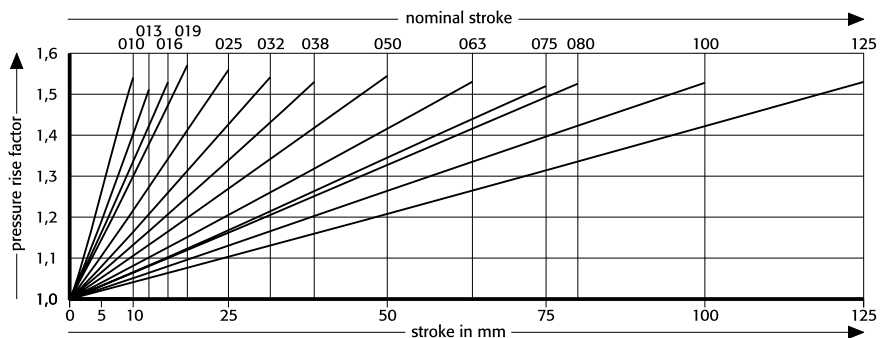
2487.12.00500.

Initial spring force versus charge pressure



2487.12.00500.

Spring force Diagram displacement versus stroke rise

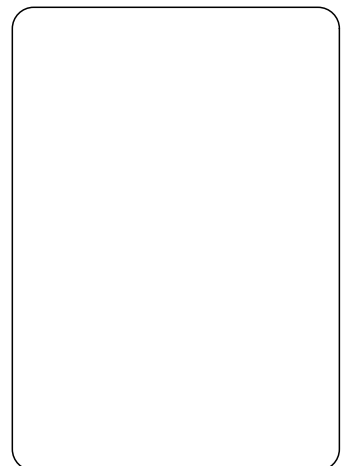
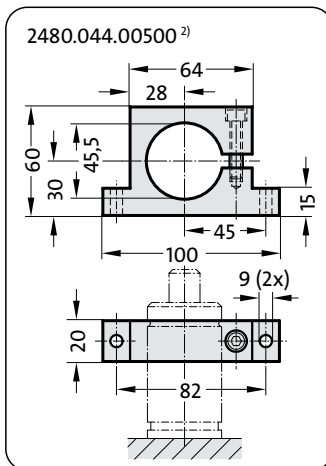
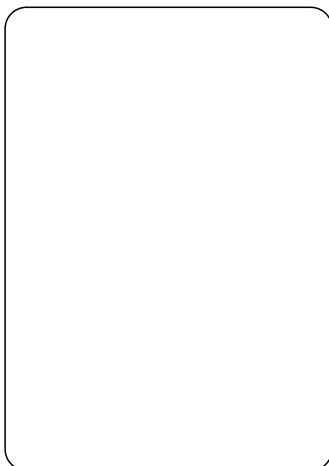
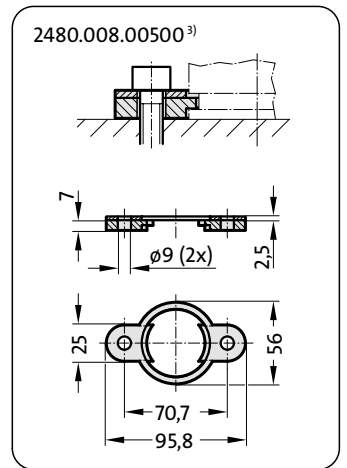
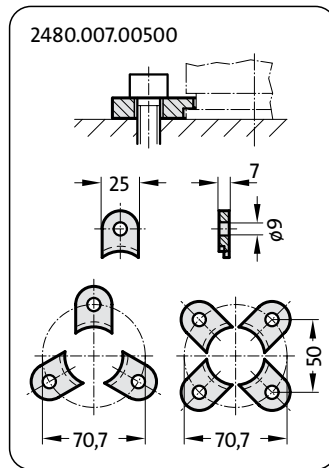
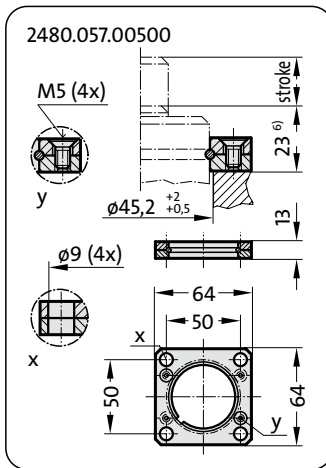
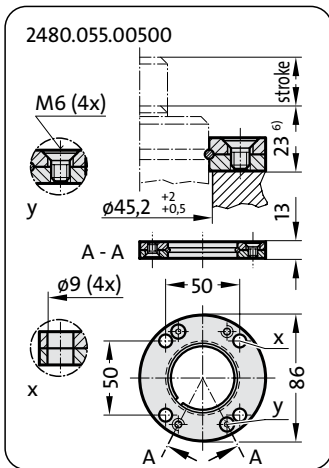
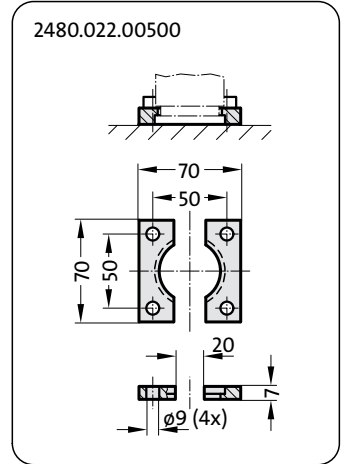
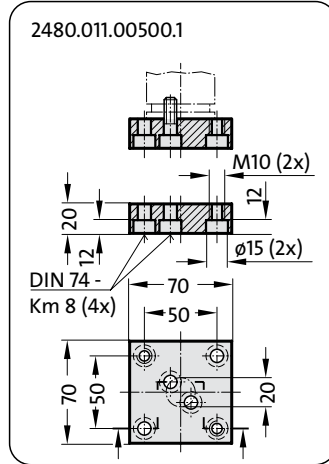
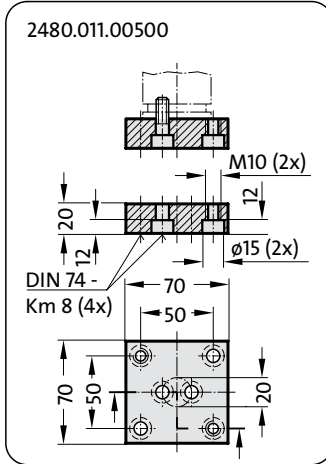
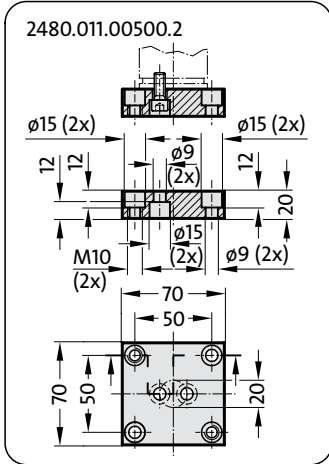


Pressure rise factor accounts for displacement but not external influences!

# Gas Springs with Increased Spring Force Mounting Variations

**FIBRO**

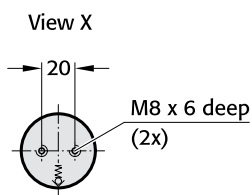
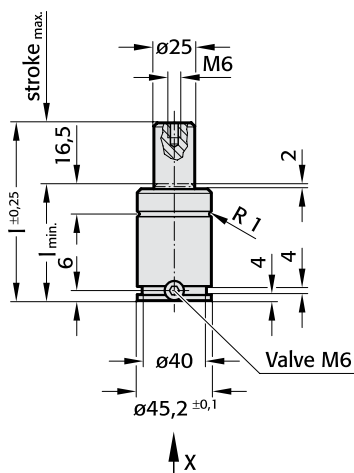
2487.12.00750. .1



**2487.12.00750. .1**  
 Initial spring force at 150 bar = 750 daN

Order No	stroke max.	$l_{min.}$	$l$
2487.12.00750. 010.1	10	42	52
013.1	13	45	58
016.1	16	48	64
019.1	19	51	70
025.1	25	57	82
032.1	32	64	96
038.1	38	70	108
050.1	50	82	132
063.1	63	95	158
075.1	75	107	182
080.1	80	112	192
100.1	100	132	232
125.1	125	157	282

**2487.12.00750. .1**



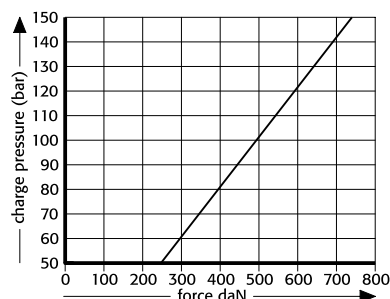
**Note:**

Order No for spare parts kit:  
 2487.12.00750

- Pressure medium: Nitrogen  $N_2$
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature:  $0^\circ C$  to  $+80^\circ C$
- Temperature related force increase:  $\pm 0.3\%/^\circ C$
- Max. recommended extensions per minute: approx. 20 to 100 (at  $20^\circ C$ )
- Max. piston speed: 1.6 m/s

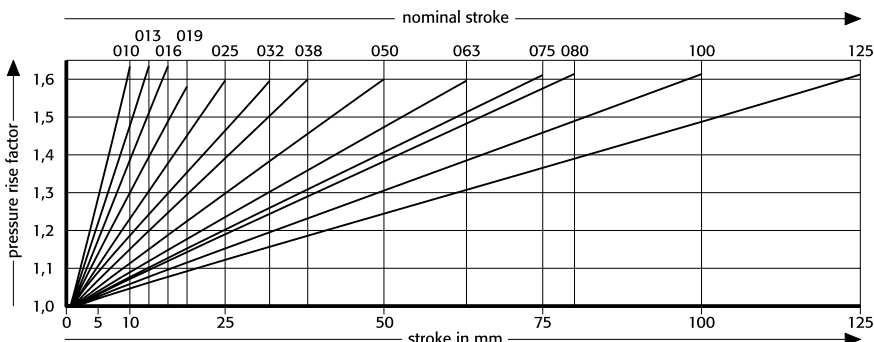
**2487.12.00750. .1**

Initial spring force versus charge pressure



**2487.12.00750. .1**

Spring force Diagram displacement versus stroke rise

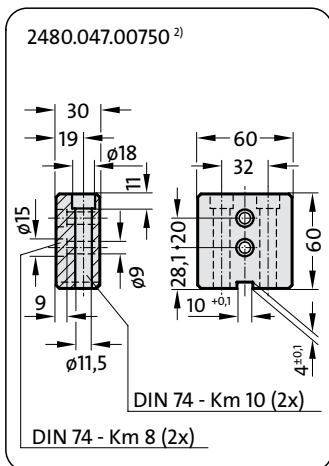
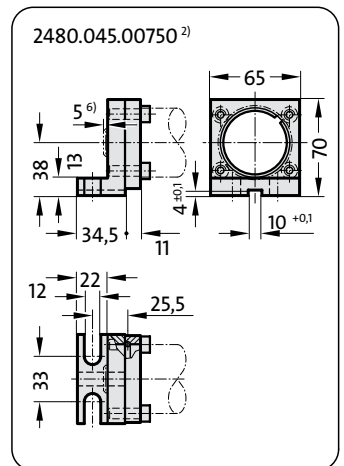
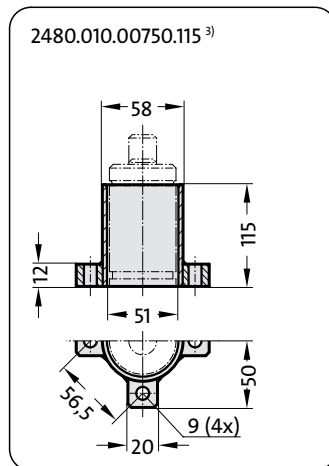
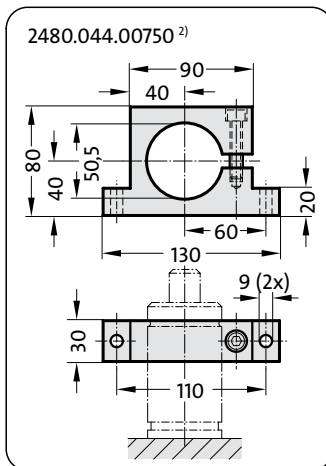
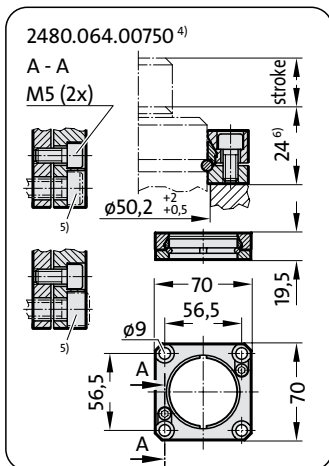
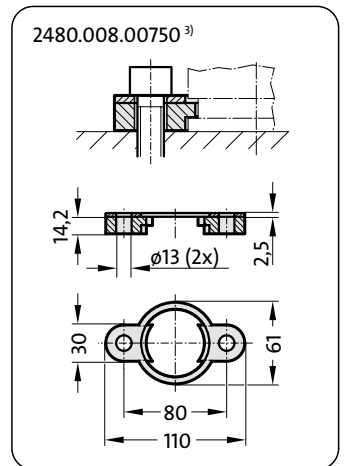
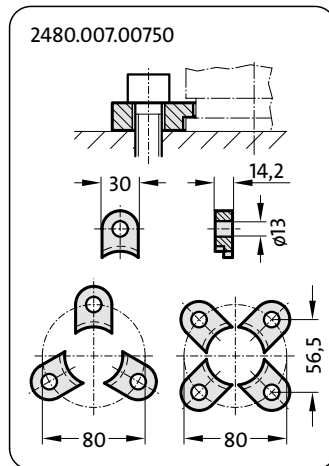
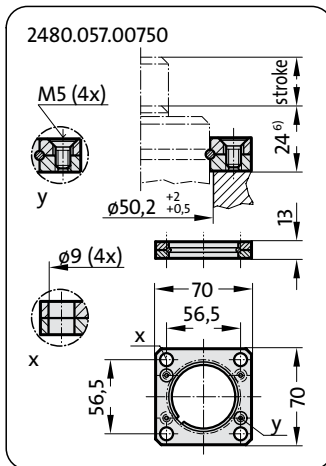
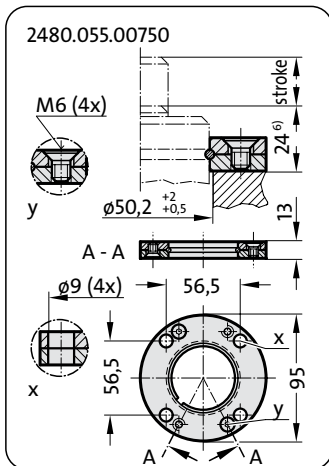
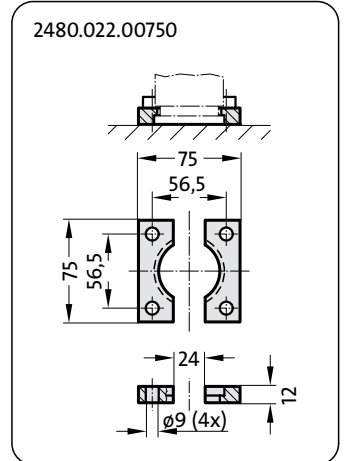
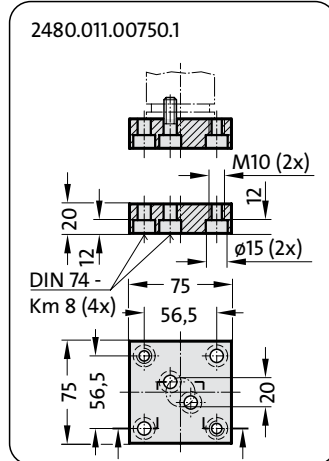
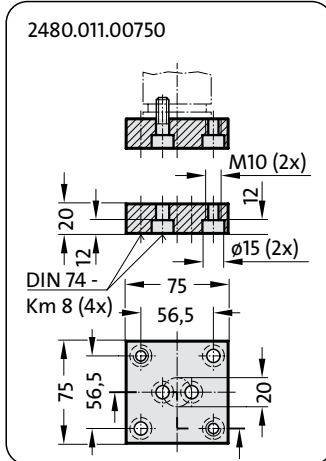
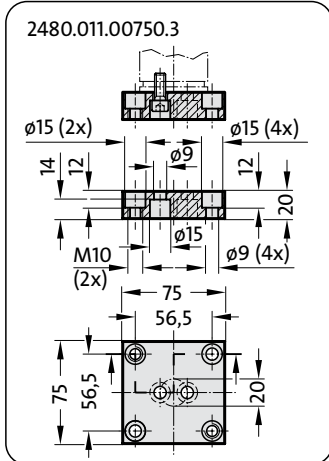


Pressure rise factor accounts for displacement but not external influences!

# Gas Springs with Increased Spring Force Mounting Variations

**FIBRO**

2487.12.01000. .1



**Notes:**

- 2) Attention:  
The spring force must be absorbed by the stop surface.
- 3) Not for use with composite connection.
- 4) Square collar flange, non-rotating, fixing for composite connection.
- 5) Machine screws with hexagonal socket (compact head recommended).
- 6) Installation height increased from 22 mm to 24 mm, installation position from 3 mm to 5 mm according to VDI 3003

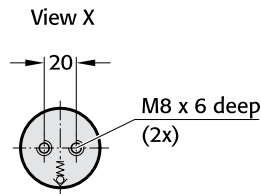
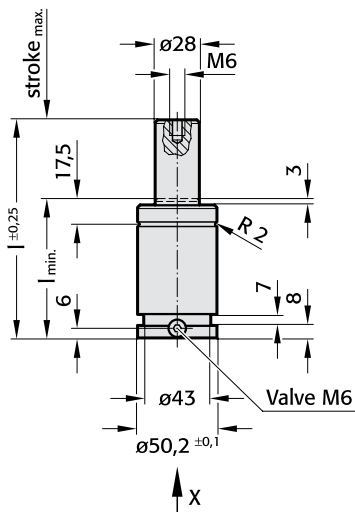


**2487.12.01000. .1**

Initial spring force at 150 bar = 1000 daN

Order No	stroke max.	$l_{min.}$	$l$
2487.12.01000. 013.1	13	51	64
016.1	16	54	70
019.1	19	57	76
025.1	25	63	88
032.1	32	70	102
038.1	38	76	114
050.1	50	88	138
063.1	63	101	164
075.1	75	113	188
080.1	80	118	198
100.1	100	138	238
125.1	125	163	288

**2487.12.01000. .1**



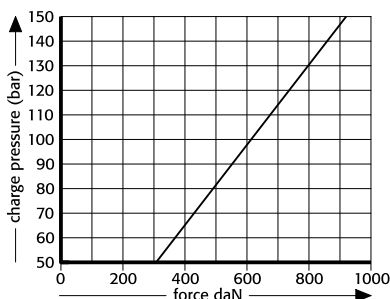
**Note:**

Order No for spare parts kit:  
2487.12.01000

- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 20 to 100 (at 20°C)
- Max. piston speed: 1.6 m/s

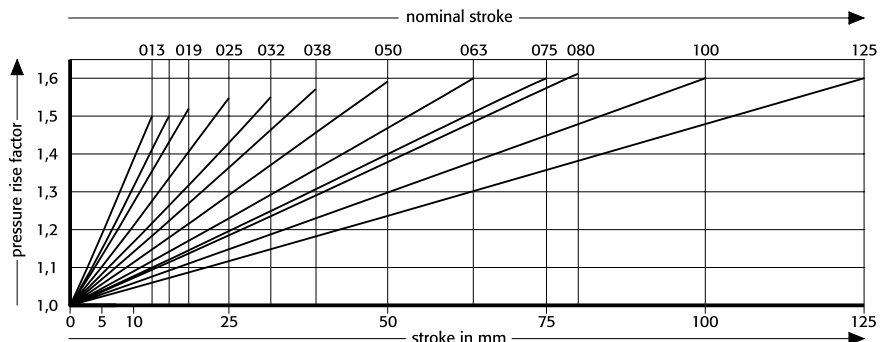
**2487.12.01000. .1**

Initial spring force versus charge pressure



**2487.12.01000. .1**

Spring force Diagram displacement versus stroke rise

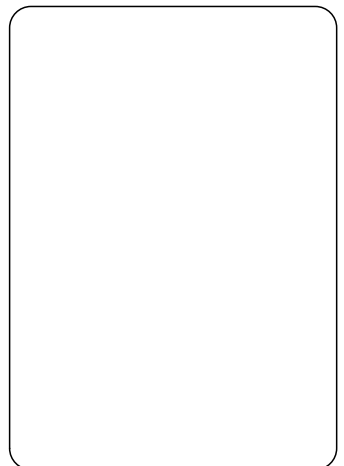
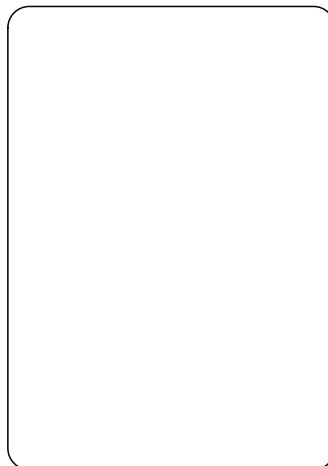
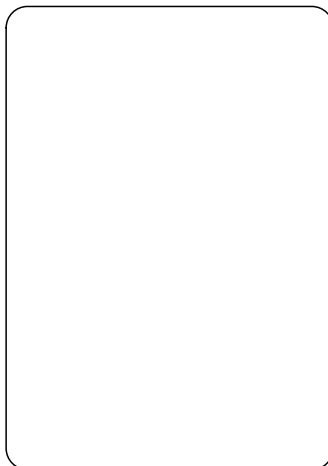
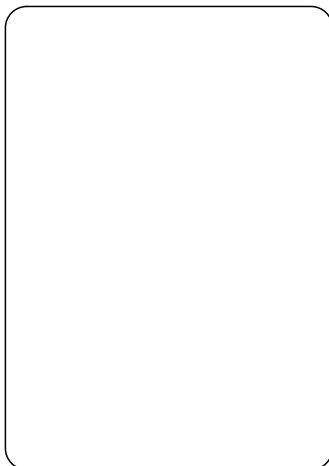
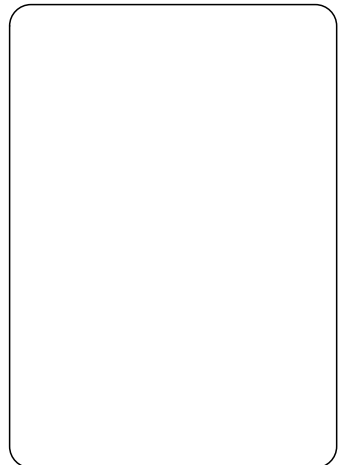
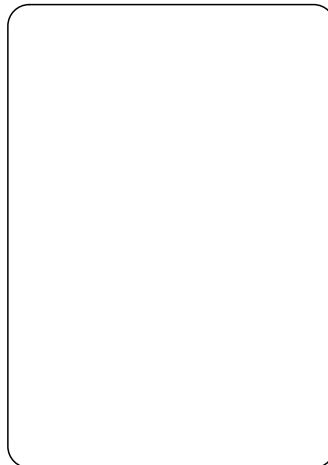
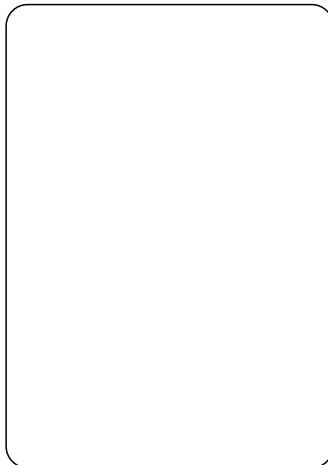
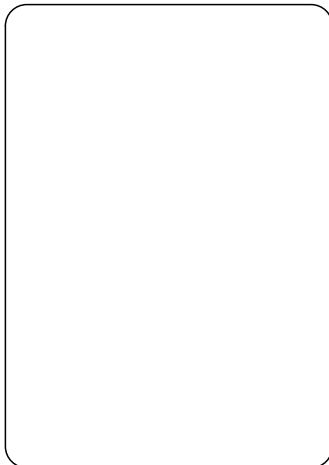
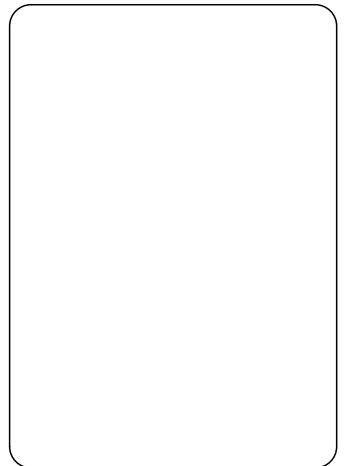
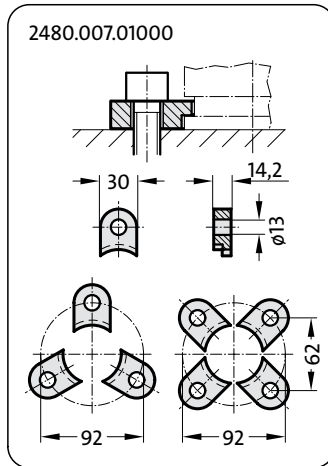
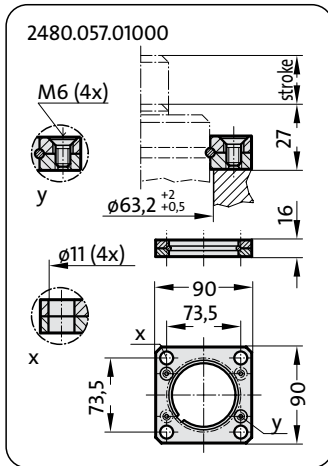
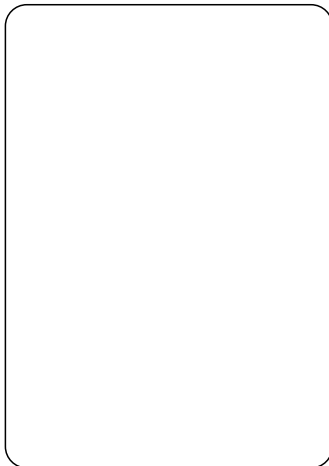
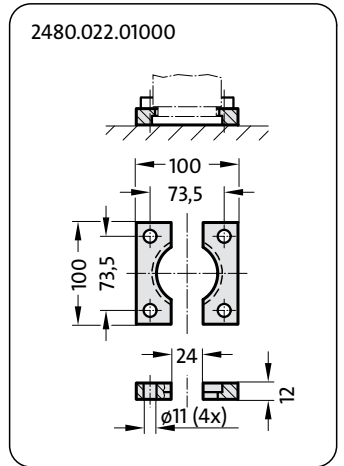
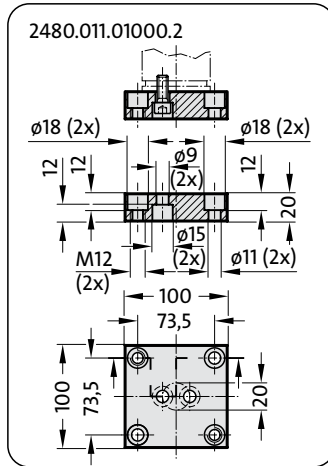
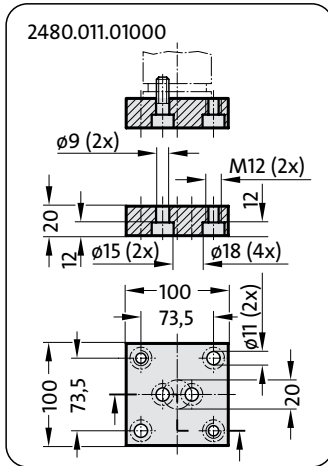
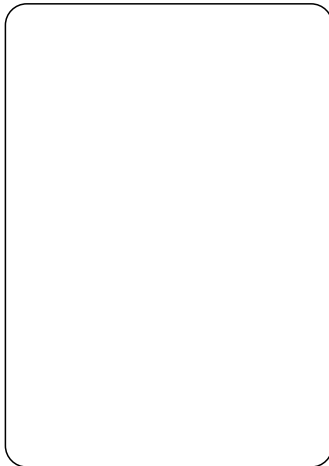


Pressure rise factor accounts for displacement but not external influences!

# Gas Springs with Increased Spring Force Mounting Variations

**FIBRO**

2487.12.01500.



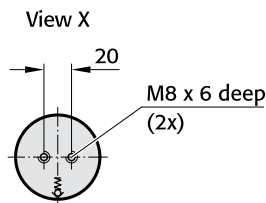
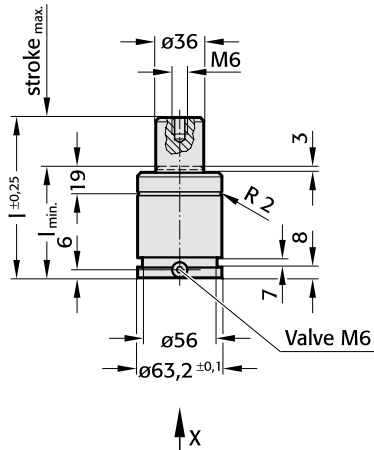
2487.12.01500.

2487.12.01500.

Initial spring force at 150 bar = 1500 daN

Order No	stroke		
	max.	$l_{min.}$	$l$
2487.12.01500.013	13	57	70
016	16	60	76
019	19	63	82
025	25	69	94
032	32	76	108
038	38	82	120
050	50	94	144
063	63	107	170
075	75	119	194
080	80	124	204
100	100	144	244
125	125	169	294

2487.12.01500.



**Note:**

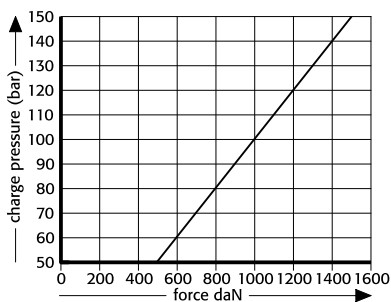
Order No for spare parts kit:

2487.12.01500

- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 50 to 100 (at 20°C)
- Max. piston speed: 1.6 m/s

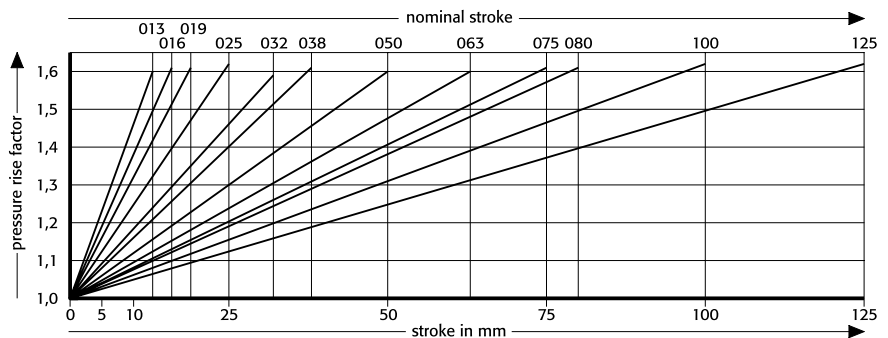
2487.12.01500.

Initial spring force versus charge pressure



2487.12.01500.

Spring force Diagram displacement versus stroke rise

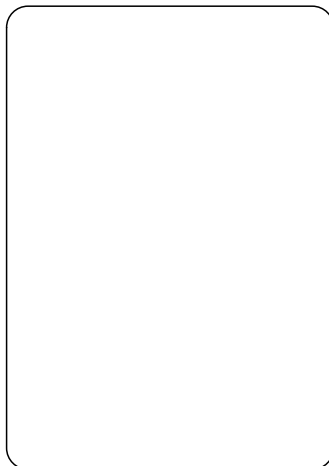
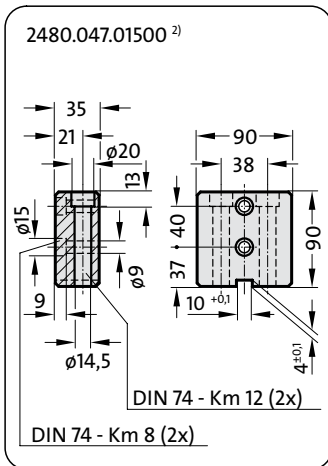
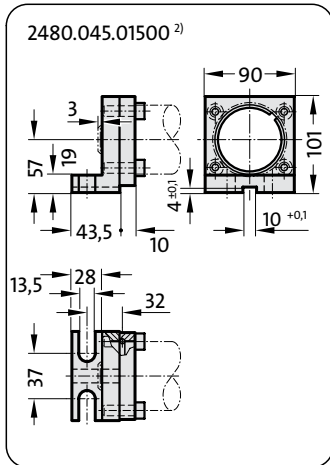
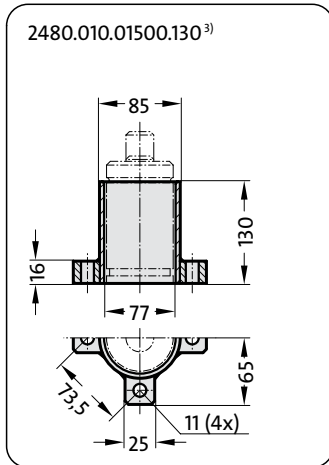
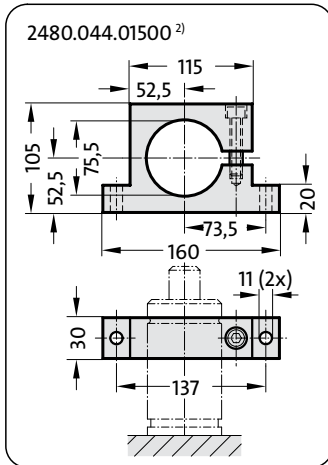
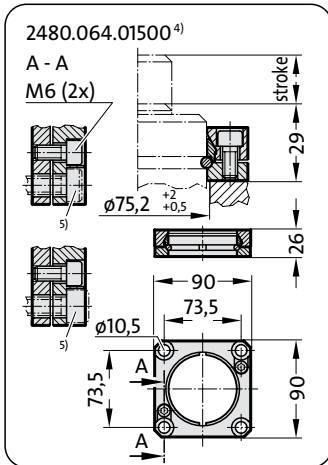
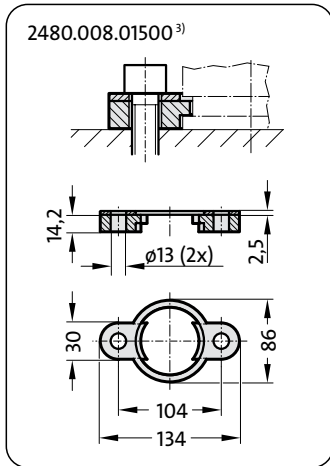
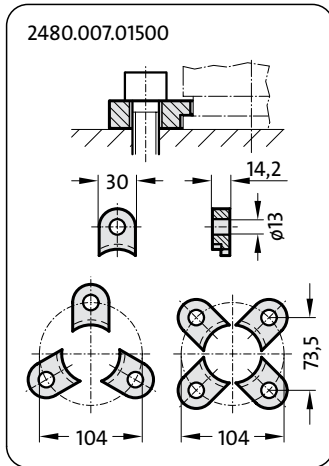
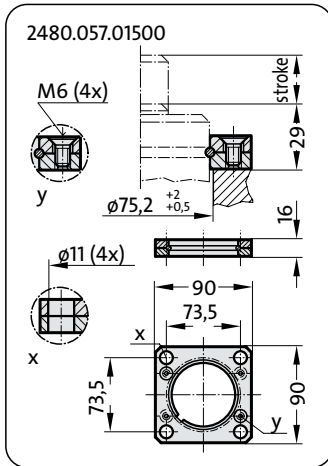
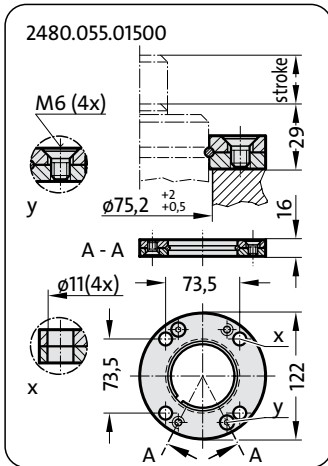
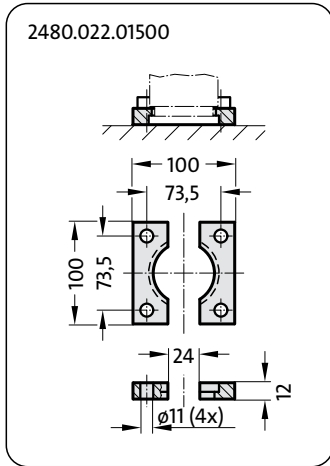
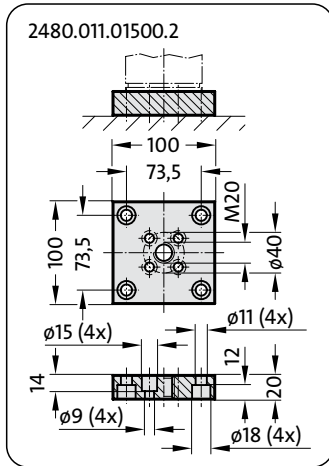
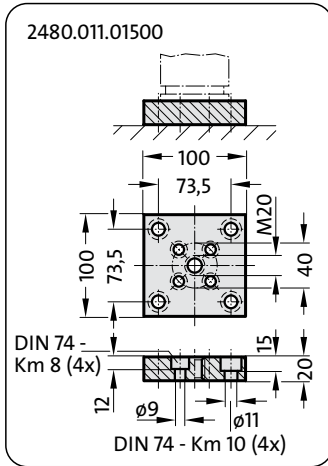
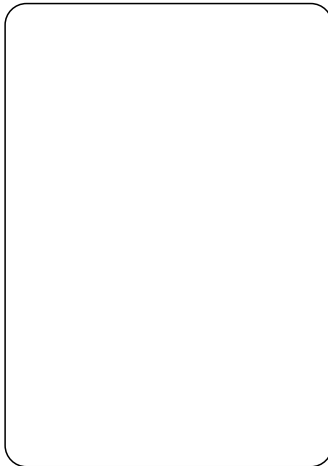


Pressure rise factor accounts for displacement but not external influences!

# Gas Springs with Increased Spring Force Mounting Variations

**FIBRO**

2487.12.02400.



**Notes:**

- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>3)</sup> Not for use with composite connection.
- <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
- <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).

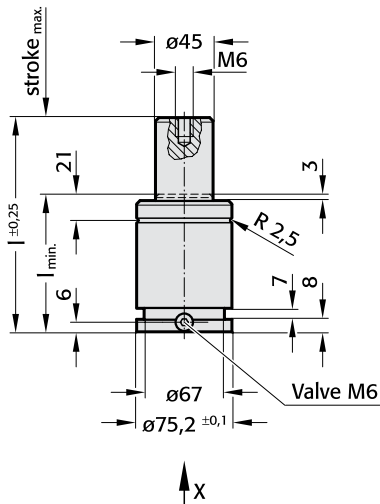
2487.12.02400.

2487.12.02400.

Initial spring force at 150 bar = 2400 daN

Order No	stroke max.	$l_{min.}$	$l$
2487.12.02400.016	16	61	77
019	19	64	83
025	25	70	95
032	32	77	109
038	38	83	121
050	50	95	145
063	63	108	171
075	75	120	195
080	80	125	205
100	100	145	245
125	125	170	295

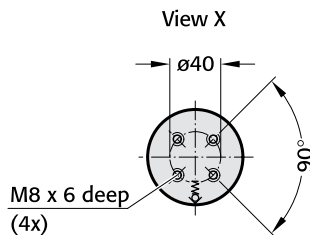
2487.12.02400.



Note:

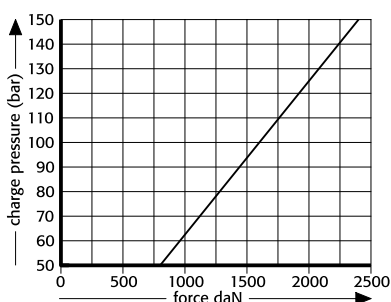
Order No for spare parts kit:  
2487.12.02400

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 20 to 100 (at 20°C)  
 Max. piston speed: 1.6 m/s



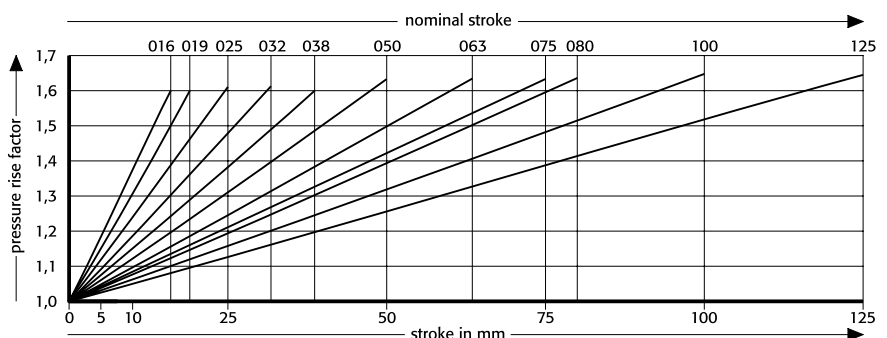
2487.12.02400.

Initial spring force versus charge pressure



2487.12.02400.

Spring force Diagram displacement versus stroke rise

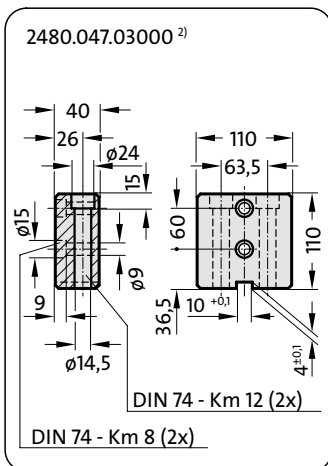
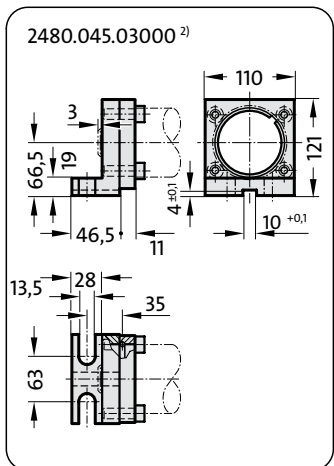
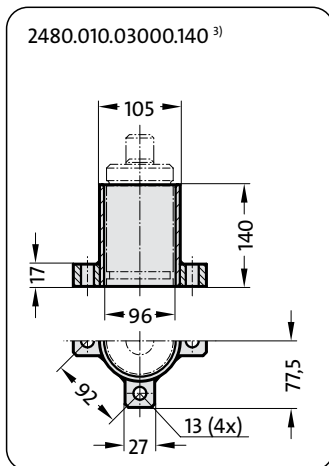
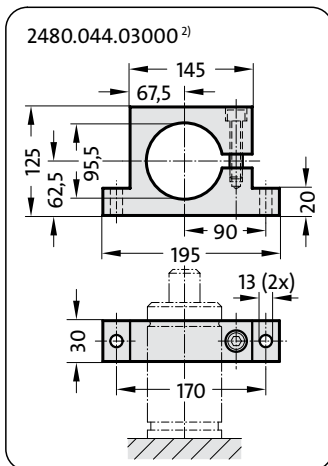
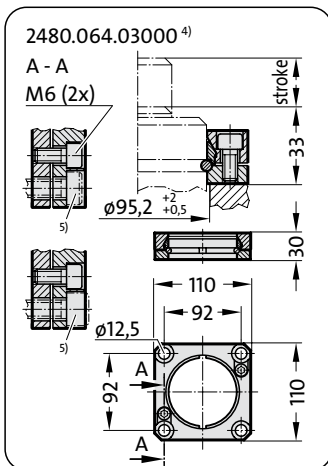
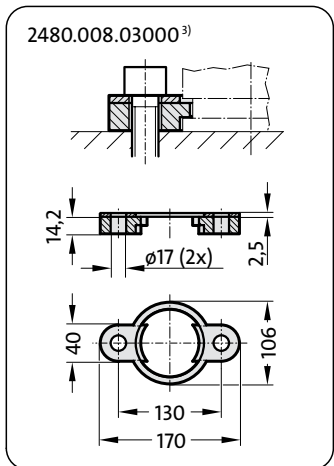
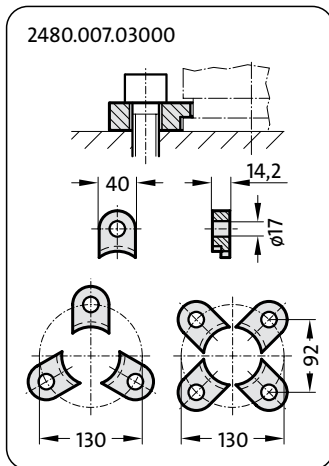
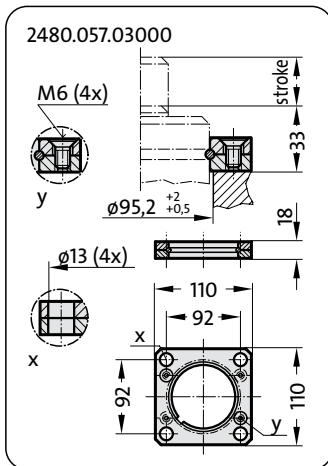
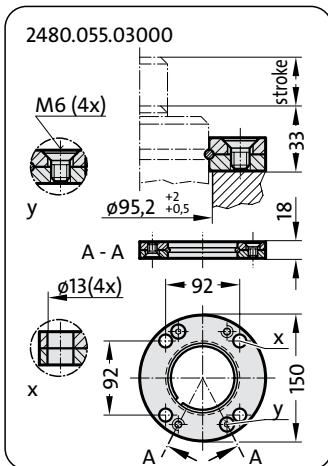
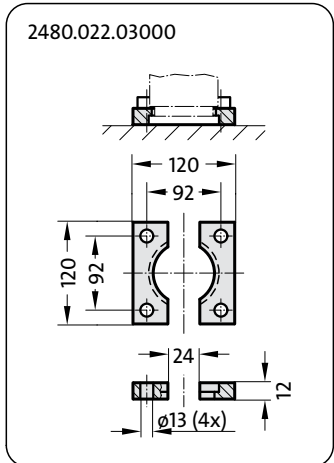
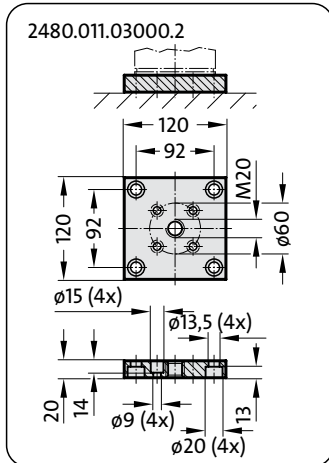
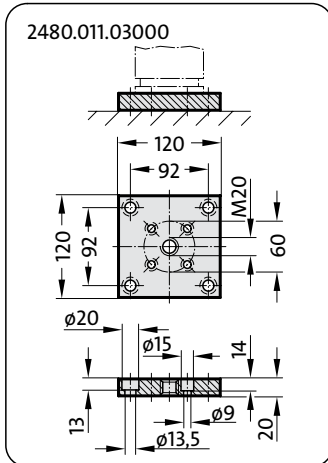
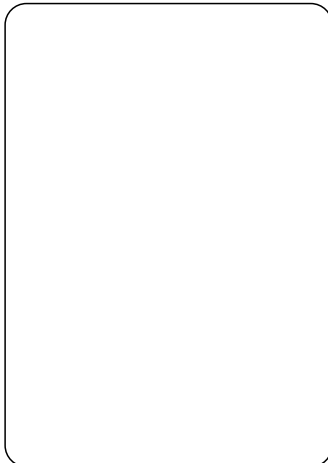


Pressure rise factor accounts for displacement but not external influences!

# Gas Springs with Increased Spring Force Mounting Variations

**FIBRO**

2487.12.04200.



**Notes:**

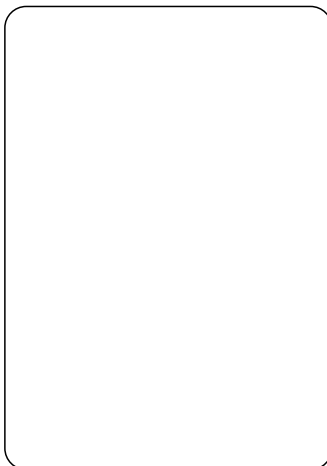
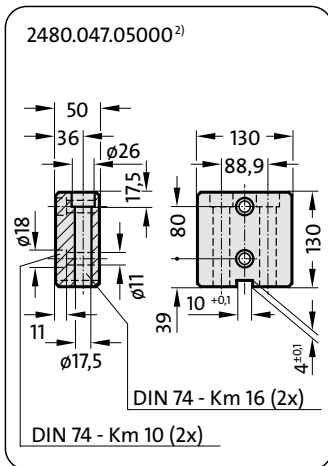
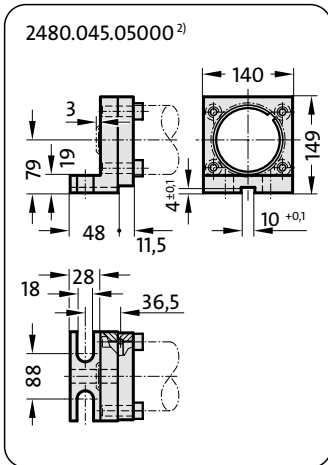
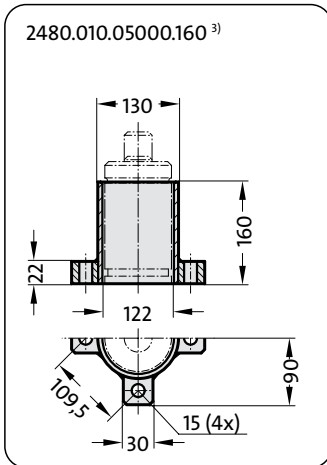
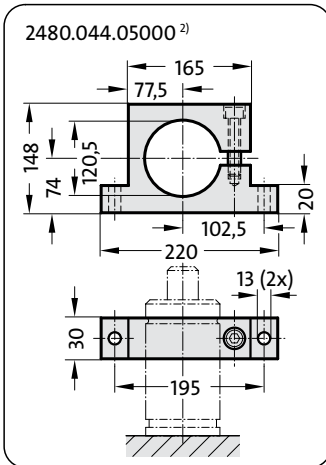
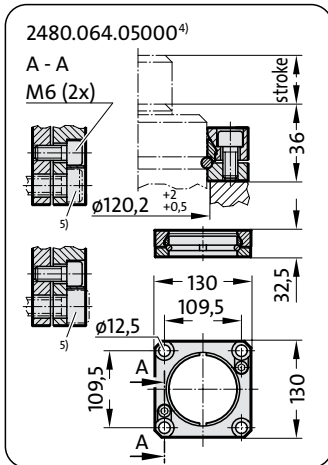
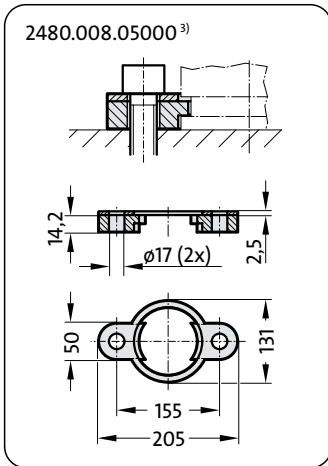
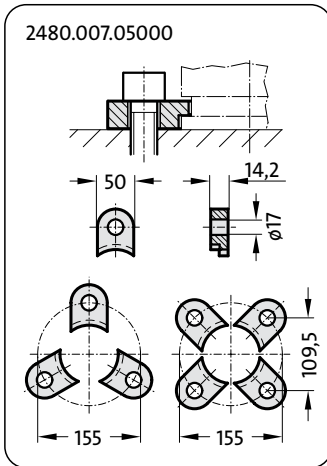
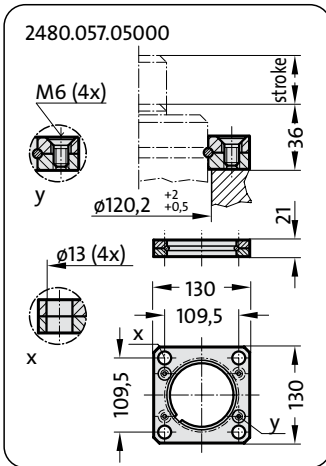
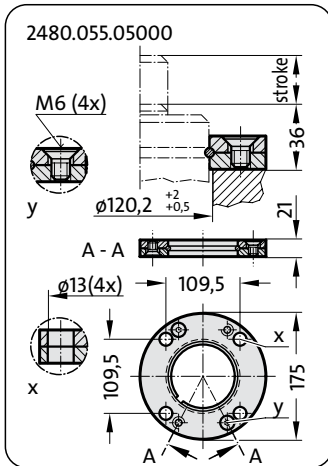
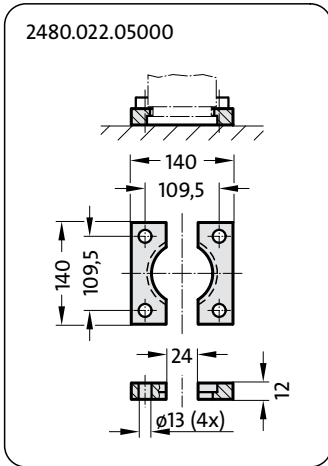
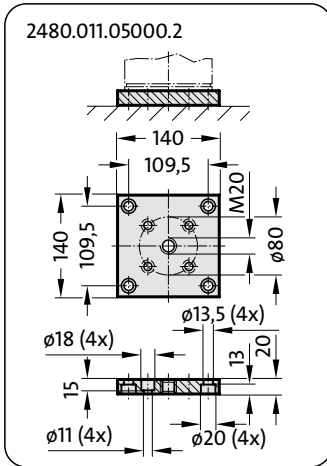
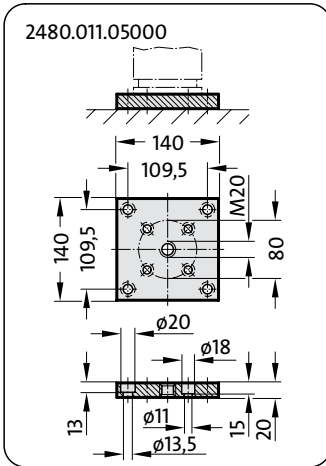
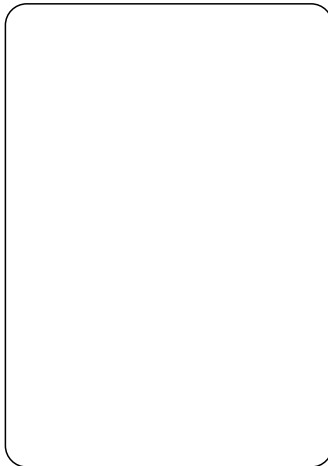
- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>3)</sup> Not for use with composite connection.
- <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
- <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).



# Gas Springs with Increased Spring Force Mounting Variations

**FIBRO**

2487.12.06600.



**Notes:**

- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>3)</sup> Not for use with composite connection.
- <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
- <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).



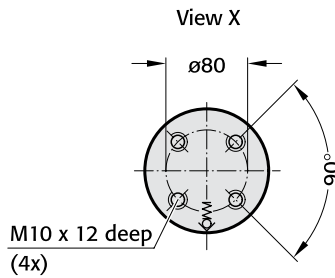
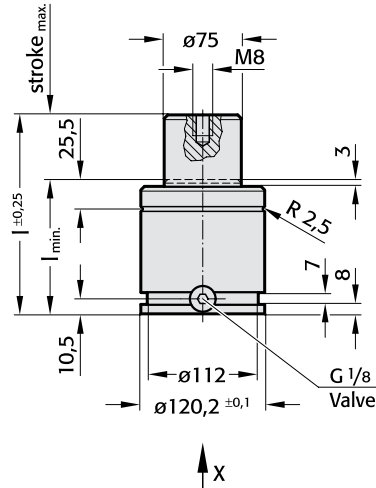
2487.12.06600.

2487.12.06600.

Initial spring force at 150 bar = 6630 daN

Order No	stroke max.	$l_{min.}$	$l$
2487.12.06600.016	16	84	100
019	19	87	106
025	25	93	118
032	32	100	132
038	38	106	144
050	50	118	168
063	63	131	194
075	75	143	218
080	80	148	228
100	100	168	268
125	125	193	318

2487.12.06600.



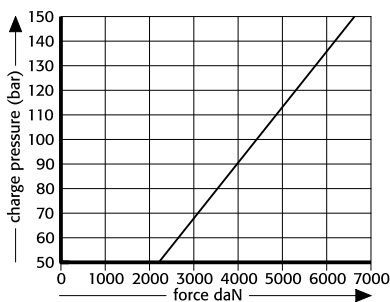
**Note:**

Order No for spare parts kit:  
2487.12.06600

Pressure medium: Nitrogen  $N_2$   
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase:  $\pm 0.3\%/^{\circ}C$   
 Max. recommended extensions per minute: approx. 20 to 100 (at 20°C)  
 Max. piston speed: 1.6 m/s

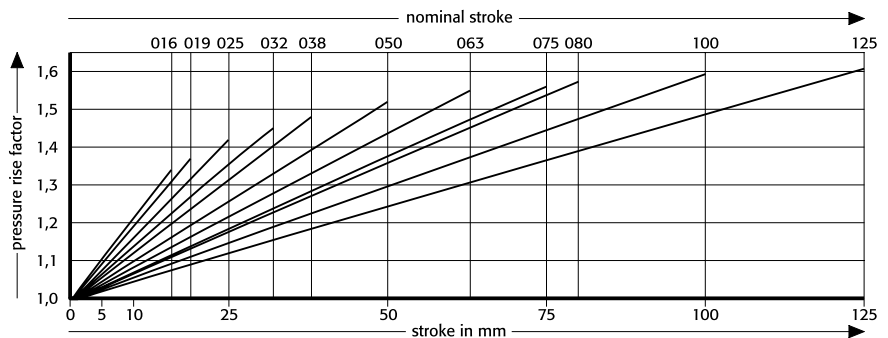
2487.12.06600.

Initial spring force versus charge pressure



2487.12.06600.

Spring force Diagram displacement versus stroke rise

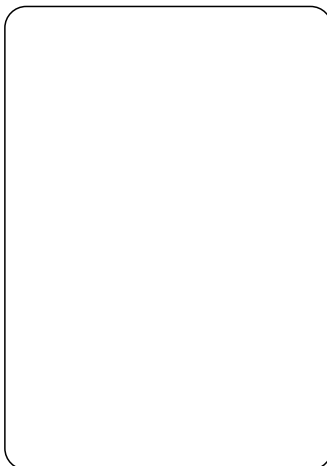
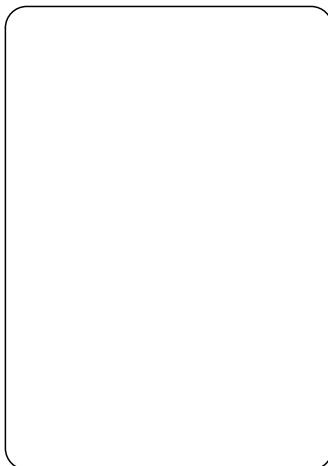
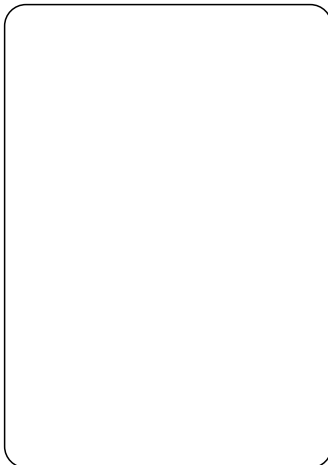
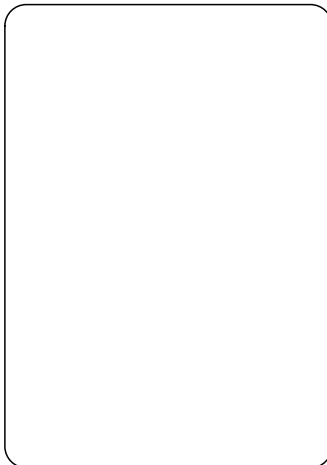
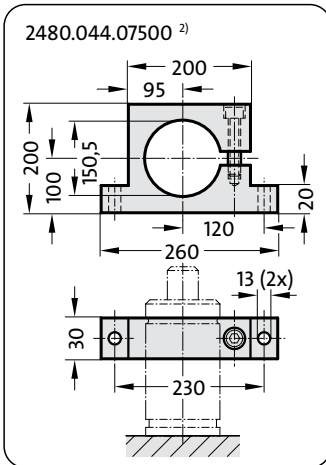
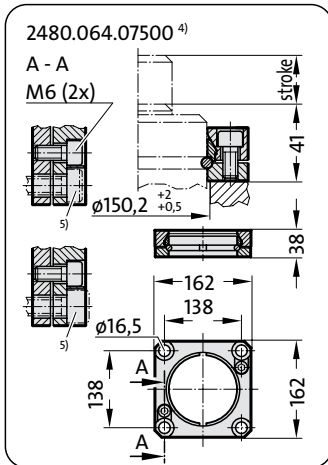
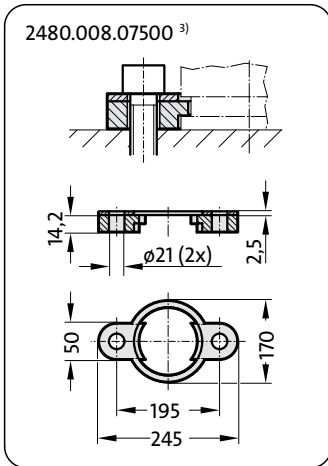
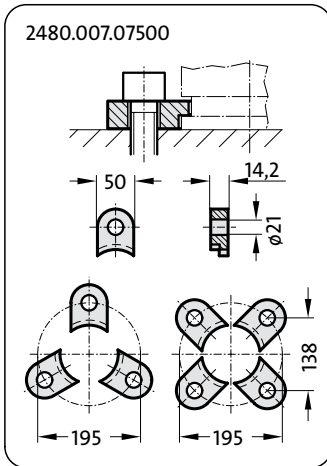
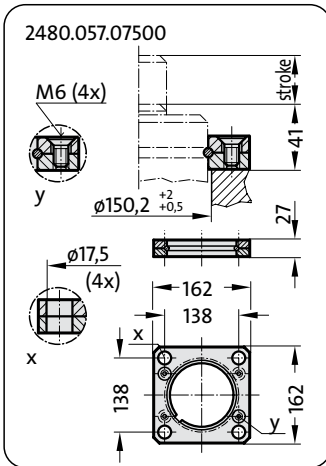
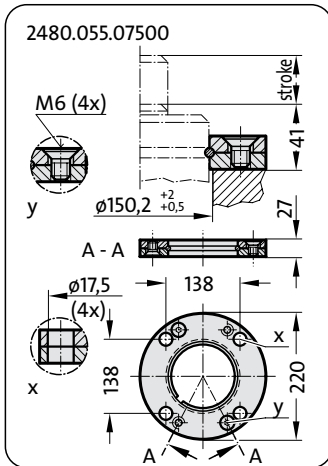
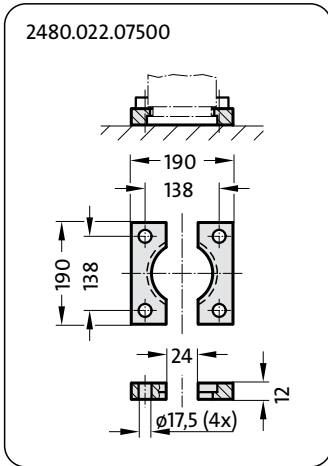
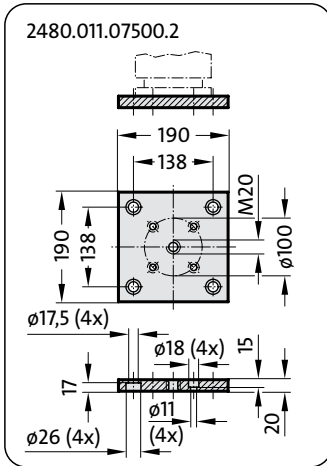
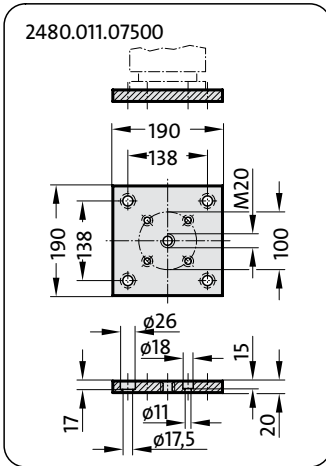
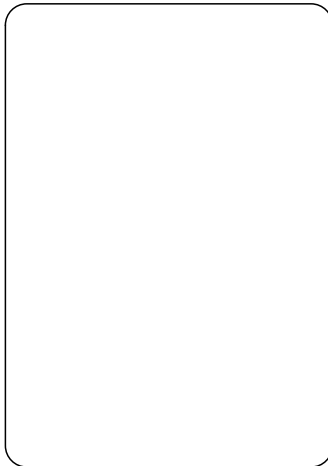


Pressure rise factor accounts for displacement but not external influences!

# Gas Springs with Increased Spring Force Mounting Variations

**FIBRO**

2487.12.09500.



**Notes:**

- 2) Attention:  
The spring force must be absorbed by the stop surface.
- 3) Not for use with composite connection.
- 4) Square collar flange, non-rotating, fixing for composite connection.
- 5) Machine screws with hexagonal socket (compact head recommended).

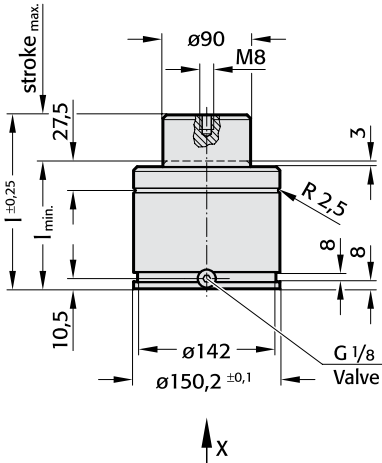
2487.12.09500.

2487.12.09500.

Initial spring force at 150 bar = 9500 daN

Order No	stroke max.	$l_{min}$	$l$
2487.12.09500. 019	19	97	116
025	25	103	128
032	32	110	142
038	38	116	154
050	50	128	178
063	63	141	204
075	75	153	228
080	80	158	238
100	100	178	278
125	125	203	328

2487.12.09500.

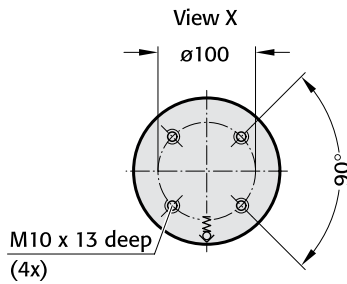


**Note:**

Order No for spare parts kit:

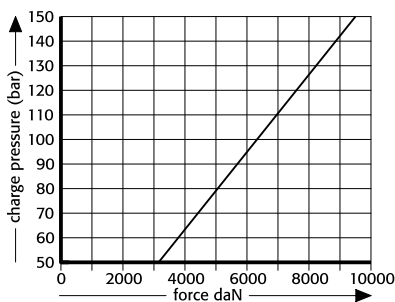
2487.12.09500

- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 20 to 100 (at 20°C)
- Max. piston speed: 1.6 m/s



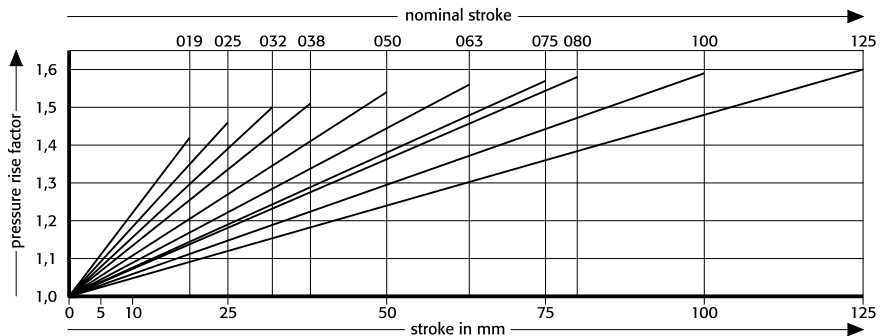
2487.12.09500.

Initial spring force versus charge pressure



2487.12.09500.

Spring force Diagram displacement versus stroke rise



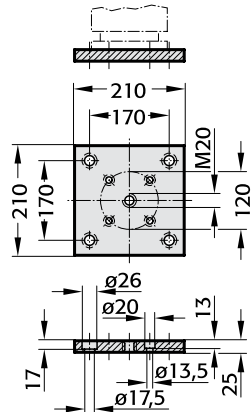
Pressure rise factor accounts for displacement but not external influences!

Gas Springs  
with Increased Spring Force  
Mounting Variations

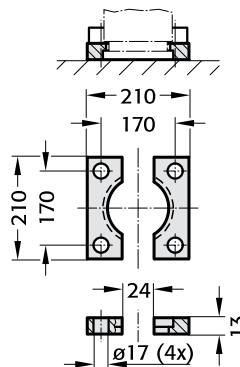
FIBRO

2487.12.20000.

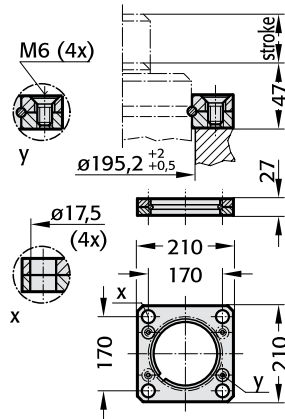
2480.011.10000



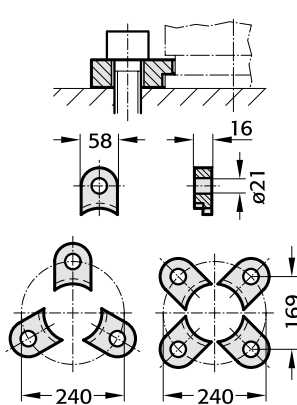
2480.022.10000



2480.057.10000



2480.007.10000



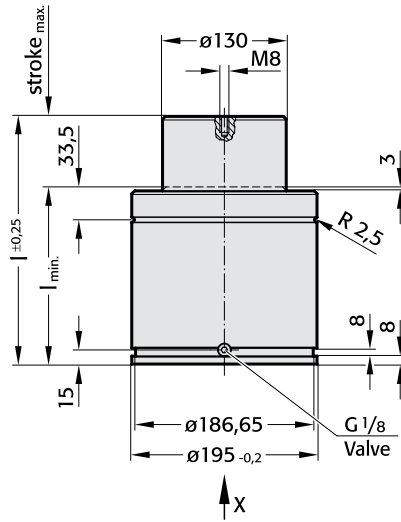
2487.12.20000.

2487.12.20000.

Initial spring force at 150 bar = 20000 daN

Order No	stroke max.	$l_{min.}$	$l$
2487.12.20000.019	19	129	148
025	25	135	160
032	32	142	174
038	38	148	186
050	50	160	210
063	63	173	236
075	75	185	260
080	80	190	270
100	100	210	310
125	125	235	360

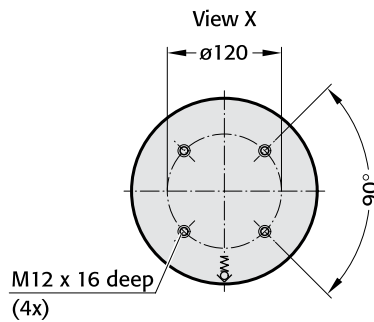
2487.12.20000.



**Note:**

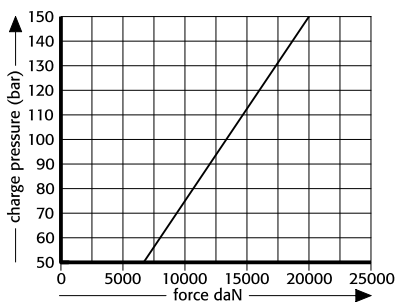
Order No for spare parts kit:  
 2487.12.20000

- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 10 to 100 (at 20°C)
- Max. piston speed: 1.6 m/s



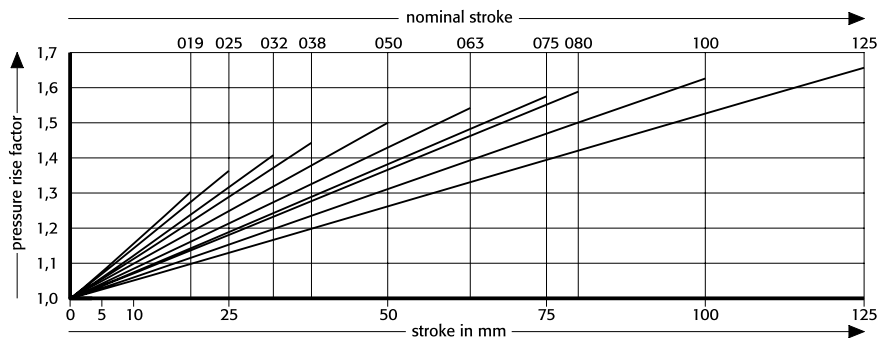
2487.12.20000.

Initial spring force versus charge pressure

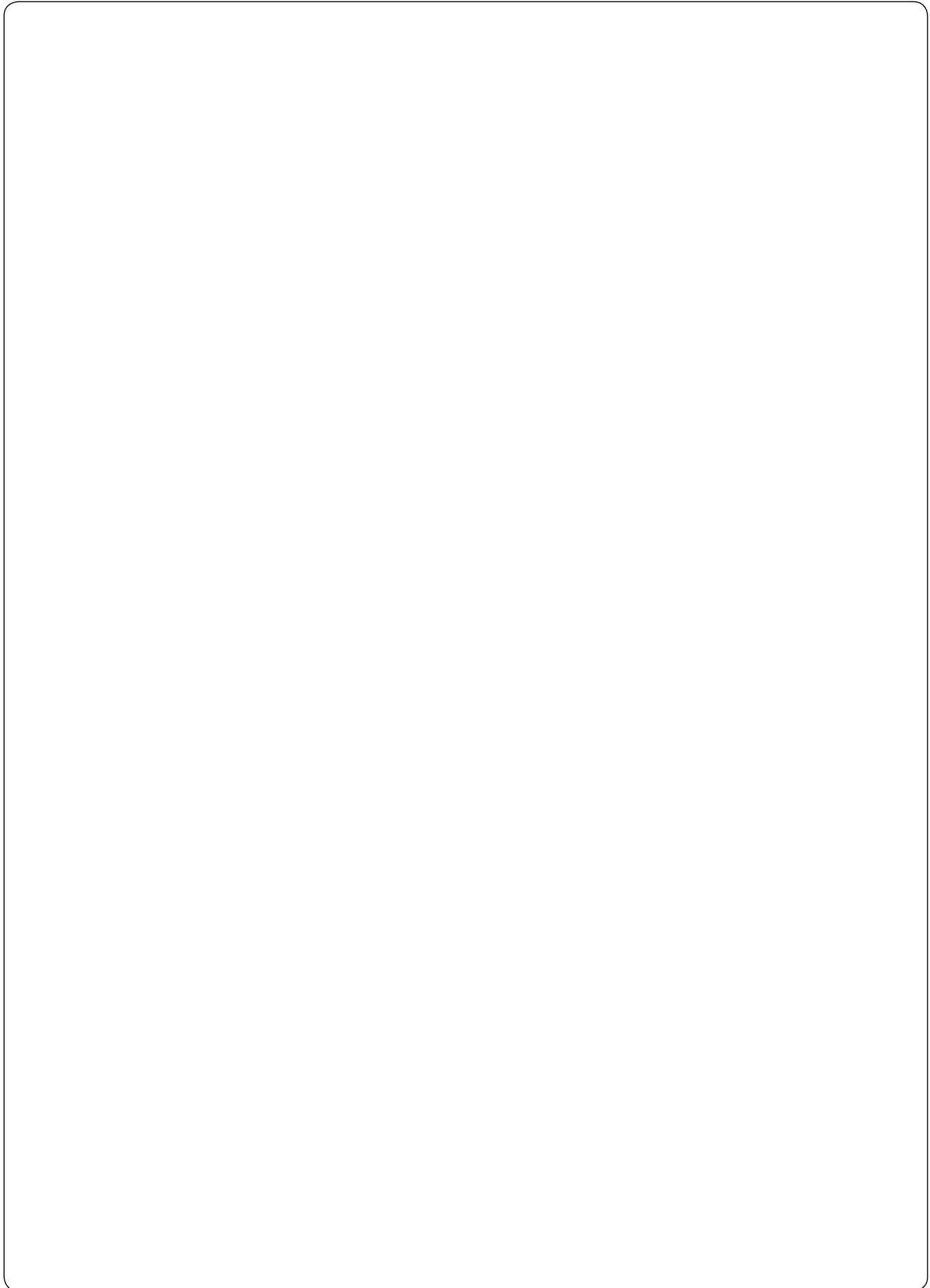


2487.12.20000.

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!



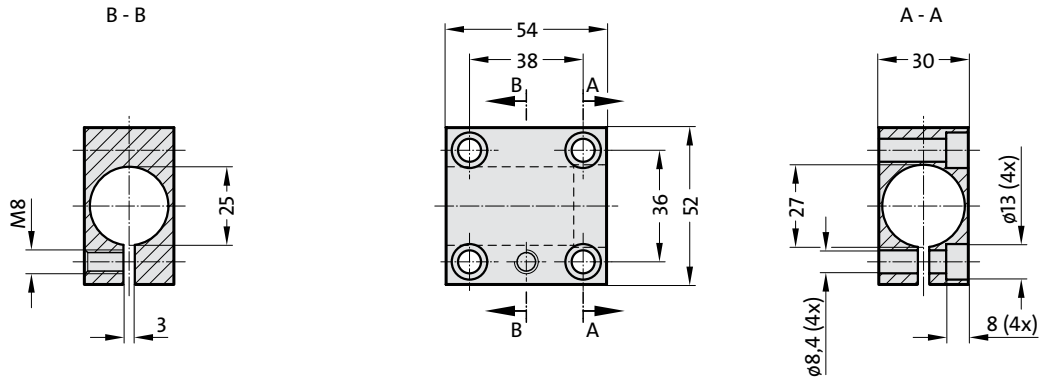
# Compact Gas Springs

Compact Gas Springs  
for small displacement and high forces  
Mounting variations

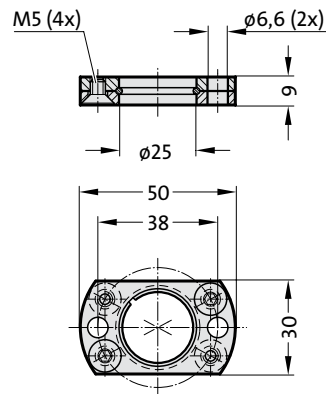
FIBRO

2490.12.00420.

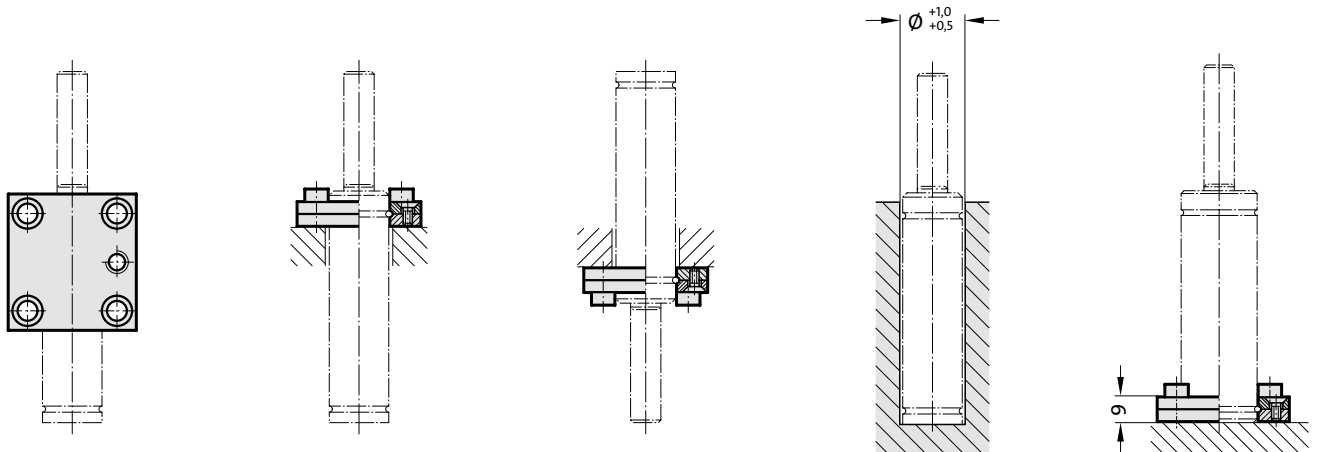
2480.053.00150



2480.051.00150



Mounting example:



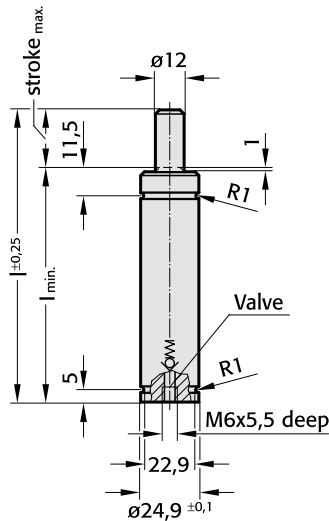


**2490.12.00420.**

Initial spring force at 150 bar = 420 daN

Order No	stroke max.	$l_{min}$	$l$
2490.12.00420.006	6	50	56
010	10	60	70
016	16	75	91
025	25	95	120
032	32	108	140
040	40	125	165
050	50	145	195

**2490.12.00420.**



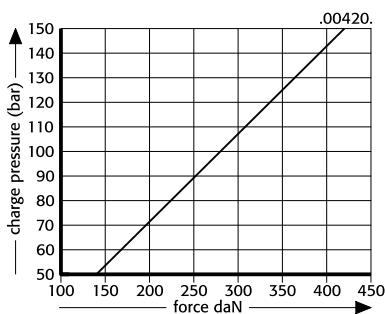
**Note:**

Worn gas springs cannot be repaired, they have to be replaced completely.

- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 50–100 (at 20°C)
- Max. piston speed: 0.5 m/s

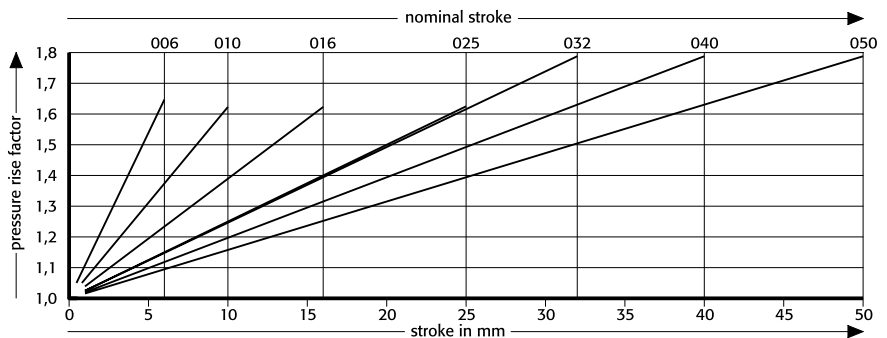
**2490.12.00420.**

Initial spring force versus charge pressure



**2490.12.00420.**

Spring force Diagram displacement versus stroke rise

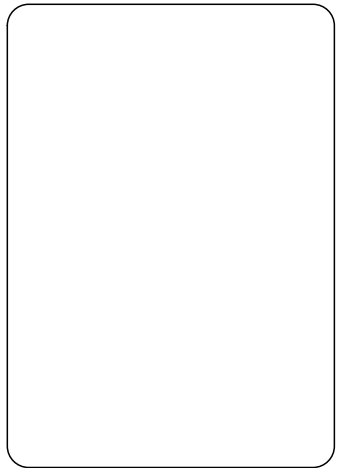
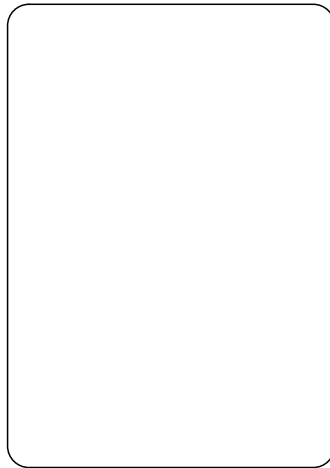
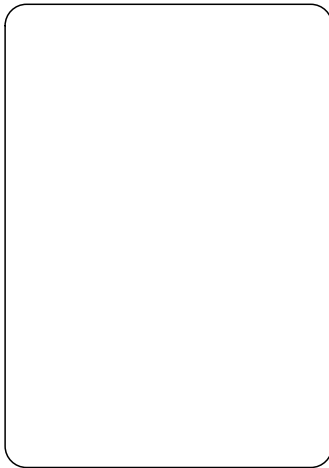
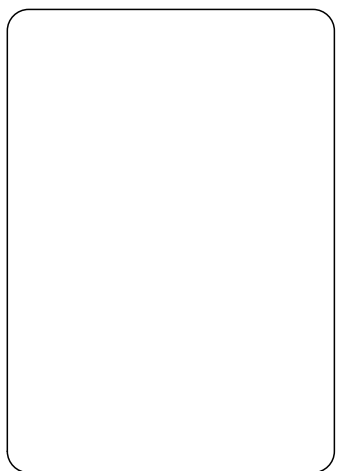
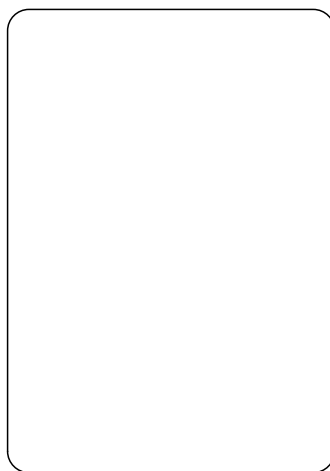
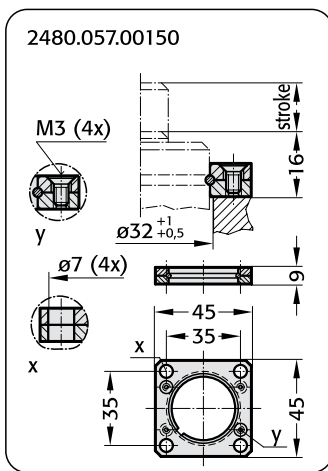
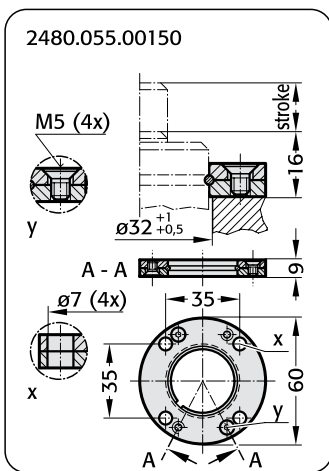
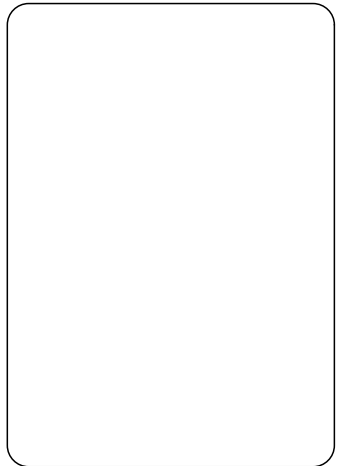
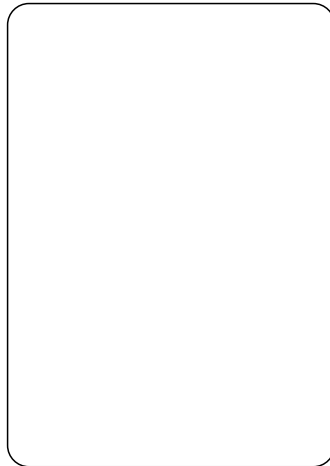
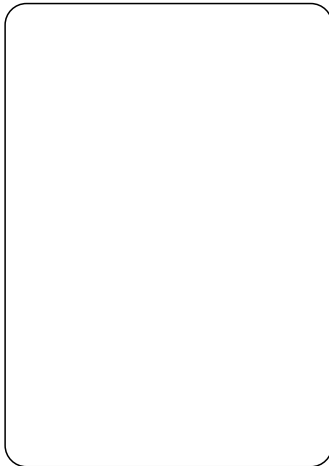


Pressure rise factor accounts for displacement but not external influences!

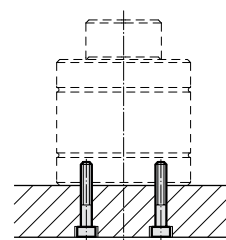
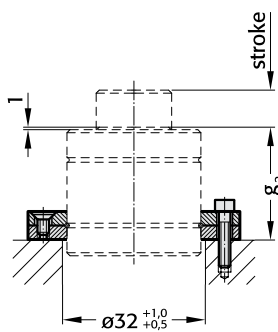
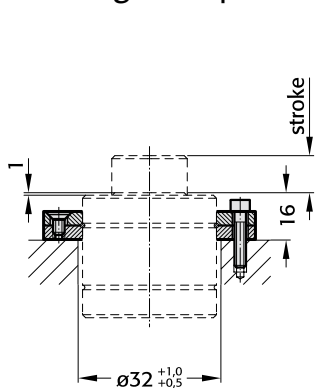
# Compact Gas Springs for small displacement and high forces Mounting Variations

**FIBRO**

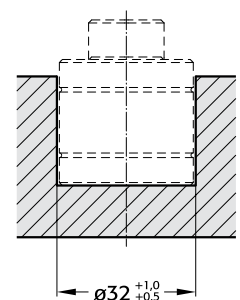
2490.12.00750.



## Mounting example:



see Note!



**2490.12.00750.**

Initial spring force at 150 bar = 750 daN

Order No	stroke max.	l <sub>min.</sub>	l	g <sub>2</sub> *
2490.12.00750.006	6	56,75	63	51
010	10	64,75	75	59
016	16	76,75	93	71
025	25	94,75	120	89
032	32	107,75	140	102
040	40	124,75	165	119
050	50	144,75	195	139

g<sub>2</sub>\* see mounting example

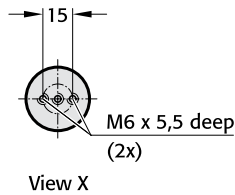
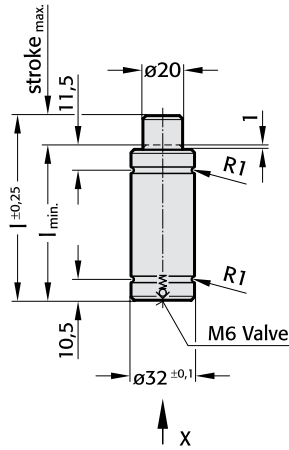
**Note:**

Worn gas springs cannot be repaired, they have to be replaced completely.

When mounting to floor, contact over the entire floor of the cylinder tube must be ensured!

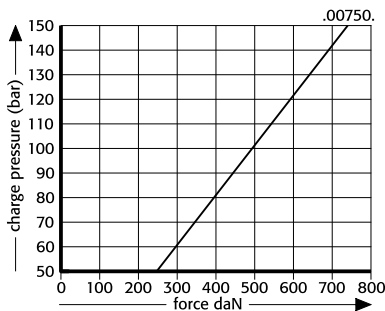
- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 50–100 (at 20°C)
- Max. piston speed: 0.5 m/s

**2490.12.00750.**



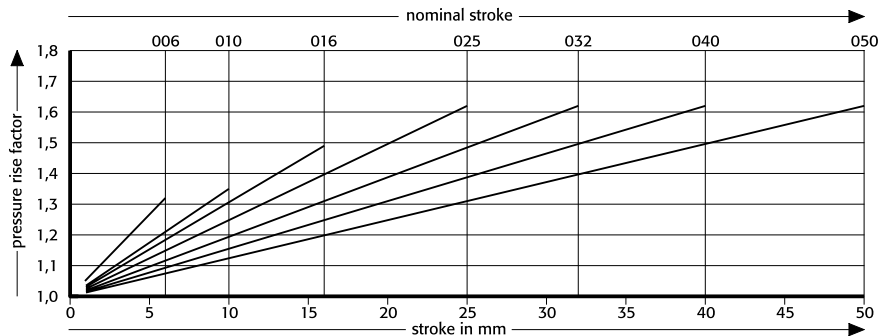
**2490.12.00750.**

Initial spring force versus charge pressure



**2490.12.00750.**

Spring force Diagram displacement versus stroke rise

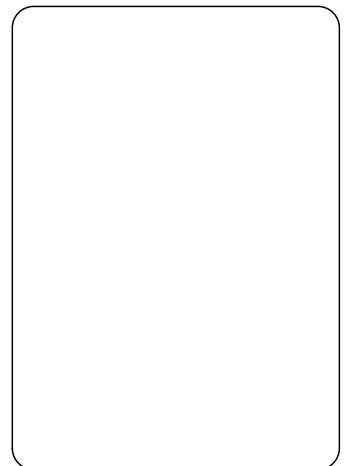
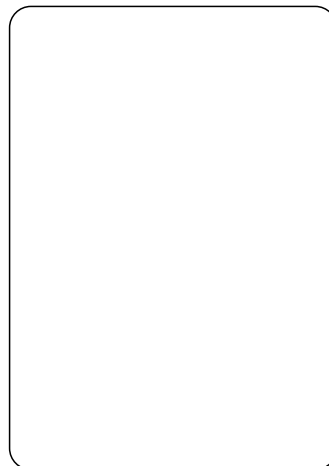
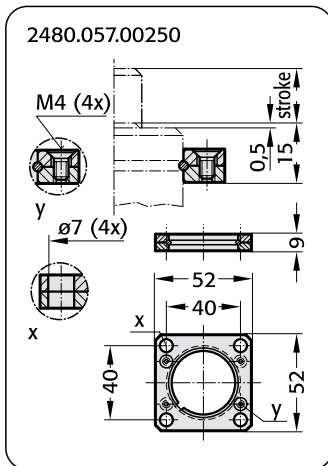
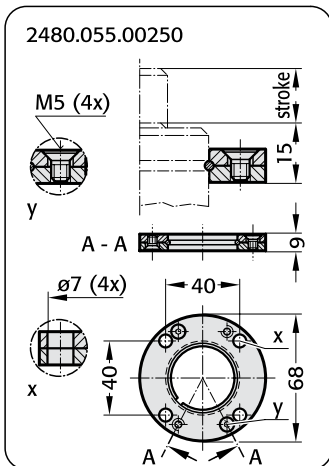
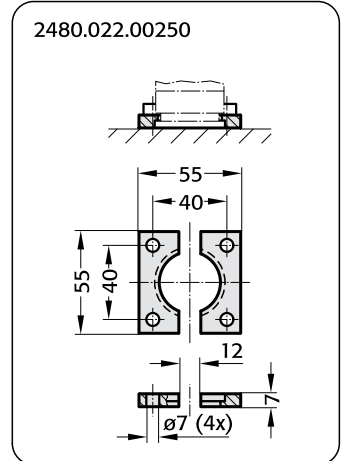
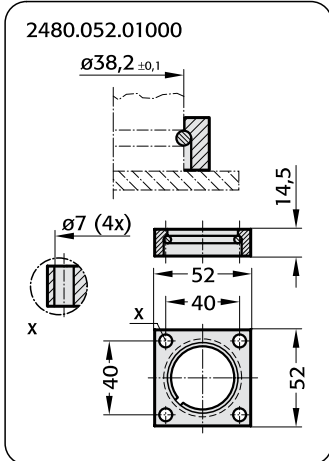


Pressure rise factor accounts for displacement but not external influences!

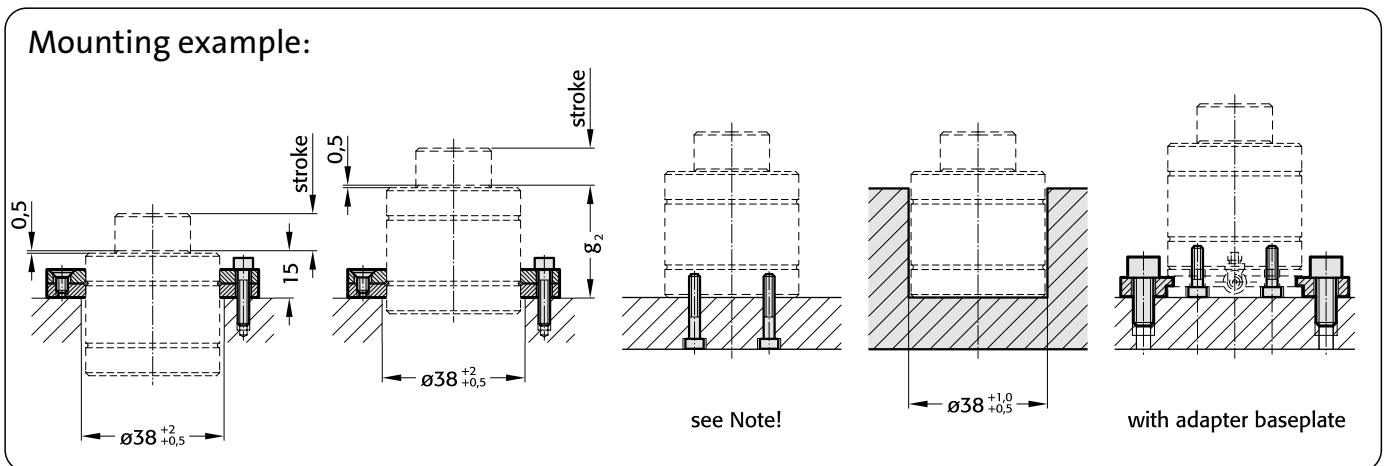
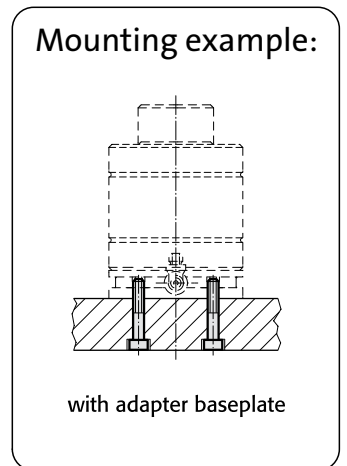
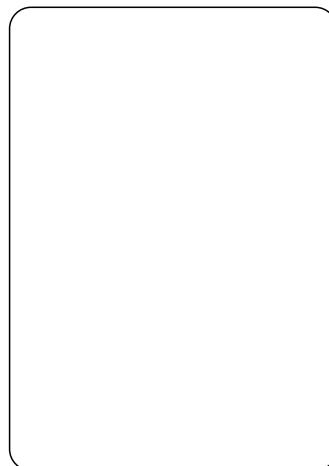
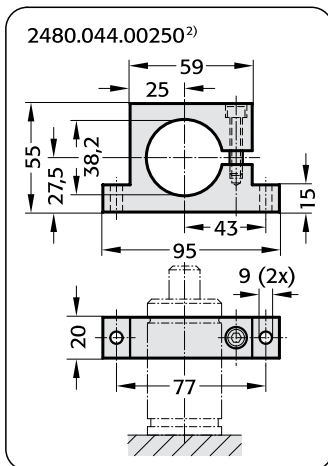
# Compact Gas Springs for small displacement and high forces Mounting Variations

**FIBRO**

2490.12.01000.



**Note:**  
<sup>2)</sup> Attention:  
 The spring force must be absorbed by the stop surface.



**2490.12.01000.**

Initial spring force at 150 bar = 1000 daN

Order No	stroke max.	$l_{min.}$	$l$	$g_2^*$
2490.12.01000.006	6	54,75	61	49
010	10	67,75	78	62
016	16	83,75	100	78
025	25	109,75	135	104
032	32	134,75	167	129
040	40	154,75	195	149
050	50	179,75	230	174

$g_2^*$  see mounting example

**Note:**

Order No for spare parts kit:  
2490.12.01000

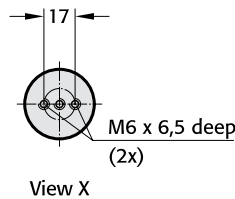
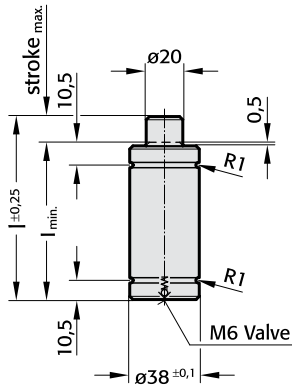
When mounting to floor, contact over the entire floor of the cylinder tube must be ensured!

Before fitting the adapter base plate remove the valve from the gas spring.

If vibration occurs, tighten the fixing screws accordingly.

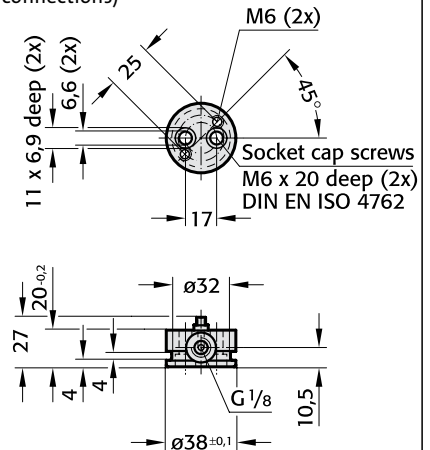
- Pressure medium: Nitrogen  $N_2$
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase:  $\pm 0.3\%/^{\circ}C$
- Max. recommended extensions per minute: approx. 100 (at 20°C)
- Max. piston speed: 0.5 m/s

**2490.12.01000.**



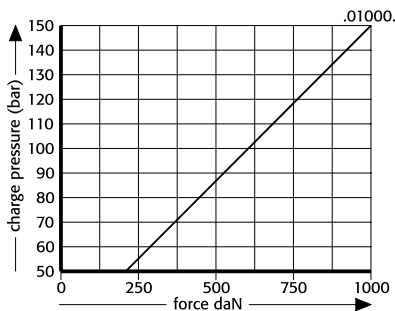
**2480.00.20.01000**

Adapter baseplate with connecting fitting, without valve (only for use with composite connections)



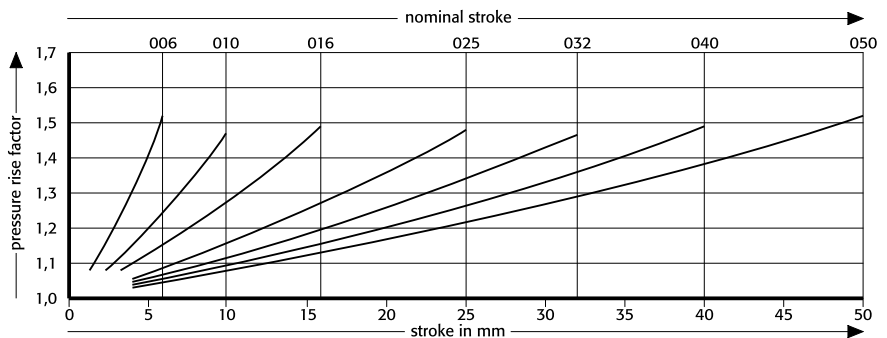
**2490.12.01000.**

Initial spring force versus charge pressure



**2490.12.01000.**

Spring force Diagram displacement versus stroke rise

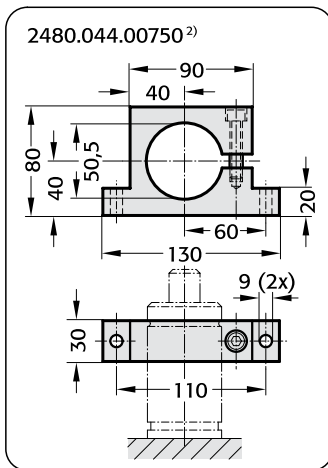
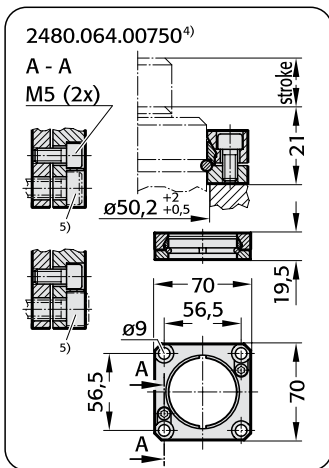
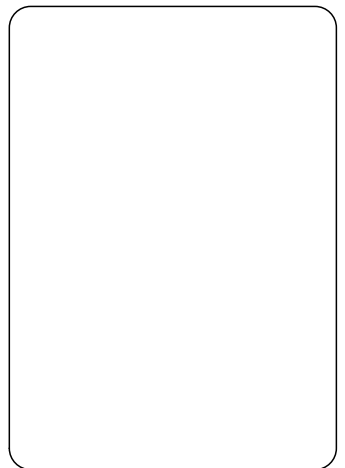
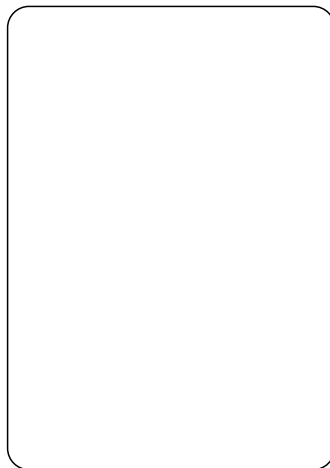
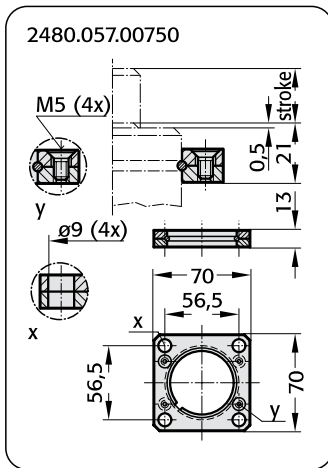
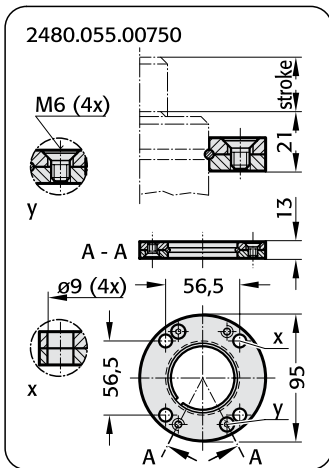
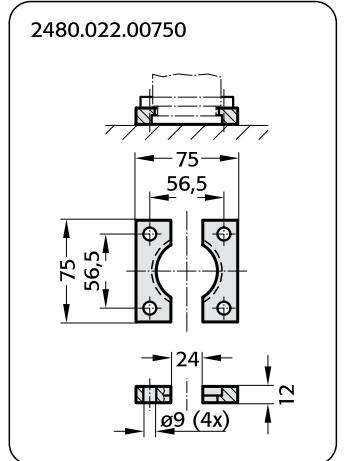
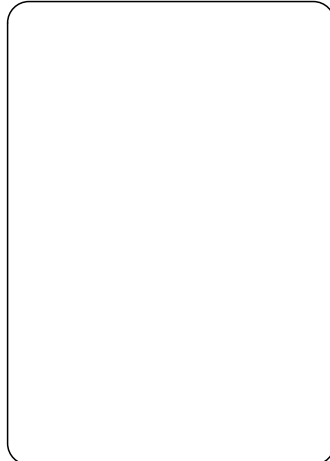
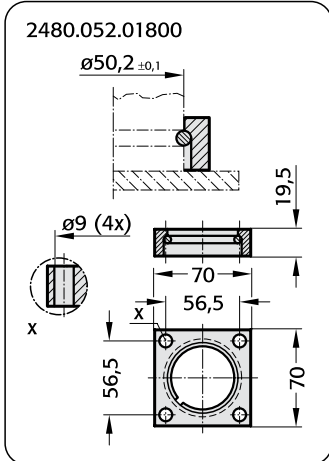


Pressure rise factor accounts for displacement but not external influences!

# Compact Gas Springs for small displacement and high forces Mounting Variations

FIBRO

2490.12.01800.

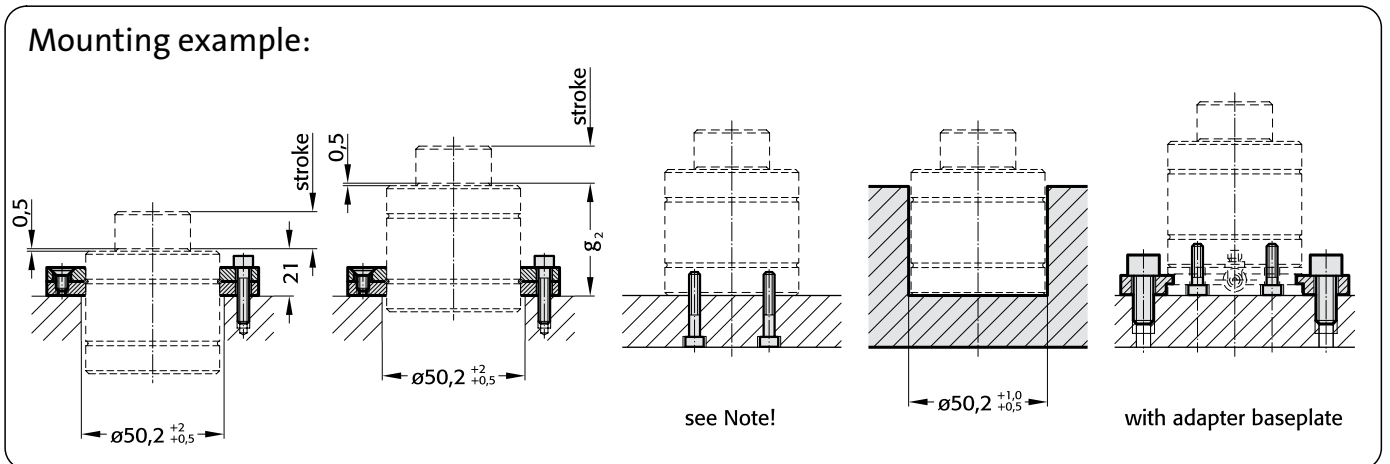
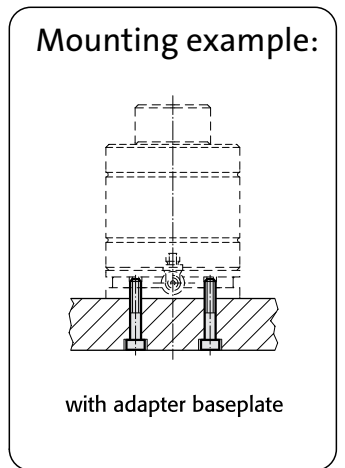


**Notes:**

2) Attention:  
The spring force must be absorbed by the stop surface.

4) Square collar flange, non-rotating, fixing for composite connection.

5) Machine screws with hexagonal socket (compact head recommended).



**2490.12.01800.**

Initial spring force at 150 bar = 1800 daN

Order No	stroke max.	$l_{min.}$	$l$	$g_2^*$
2490.12.01800.006	6	59,75	66	52
010	10	69,75	80	62
016	16	89,75	106	82
025	25	109,75	135	102
032	32	129,75	162	122
040	40	149,75	190	142
050	50	169,75	220	162

$g_2^*$  see mounting example

**Note:**

Order No for spare parts kit:  
2490.12.01800

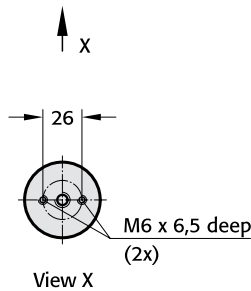
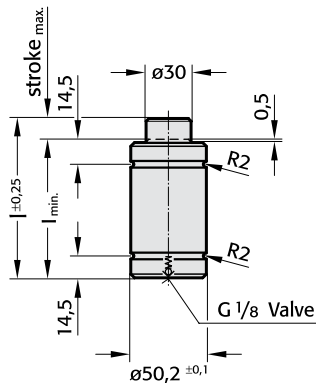
When mounting to floor, contact over the entire floor of the cylinder tube must be ensured!

Before fitting the adapter base plate remove the valve from the gas spring.

If vibration occurs, tighten the fixing screws accordingly.

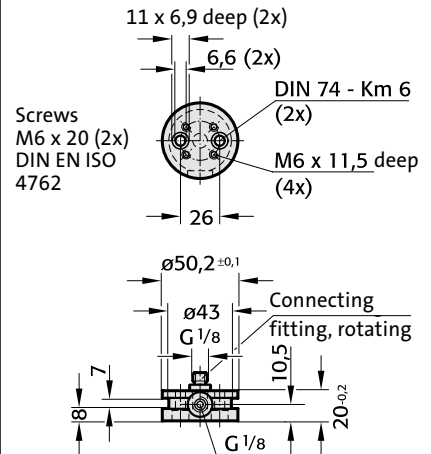
- Pressure medium: Nitrogen  $N_2$
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase:  $\pm 0.3\%/^{\circ}C$
- Max. recommended extensions per minute: approx. 100 (at 20°C)
- Max. piston speed: 0.5 m/s

**2490.12.01800.**



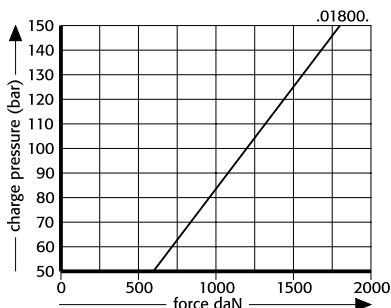
**2480.00.20.01800**

Adapter baseplate with connecting fitting, without valve (only for use with composite connections)



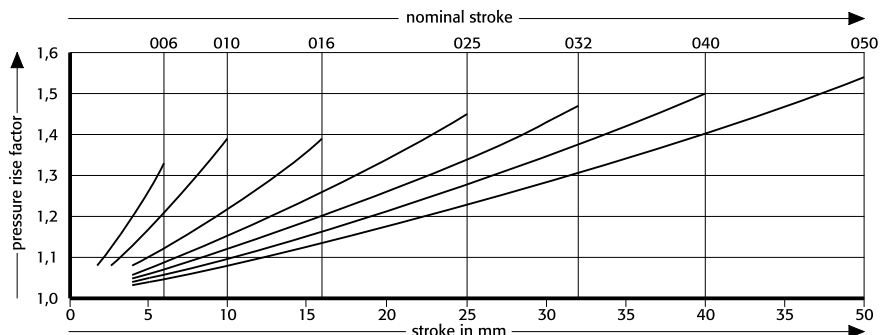
**2490.12.01800.**

Initial spring force versus charge pressure



**2490.12.01800.**

Spring force Diagram displacement versus stroke rise



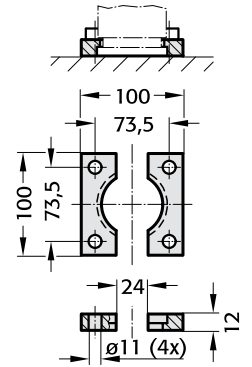
Pressure rise factor accounts for displacement but not external influences!

Compact Gas Springs  
for small displacement and high forces  
Mounting Variations

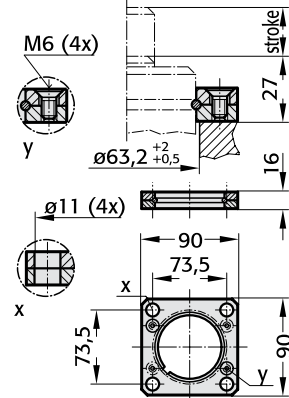
FIBRO

2490.12.03000.

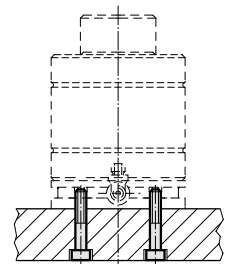
2480.022.01000



2480.057.01000

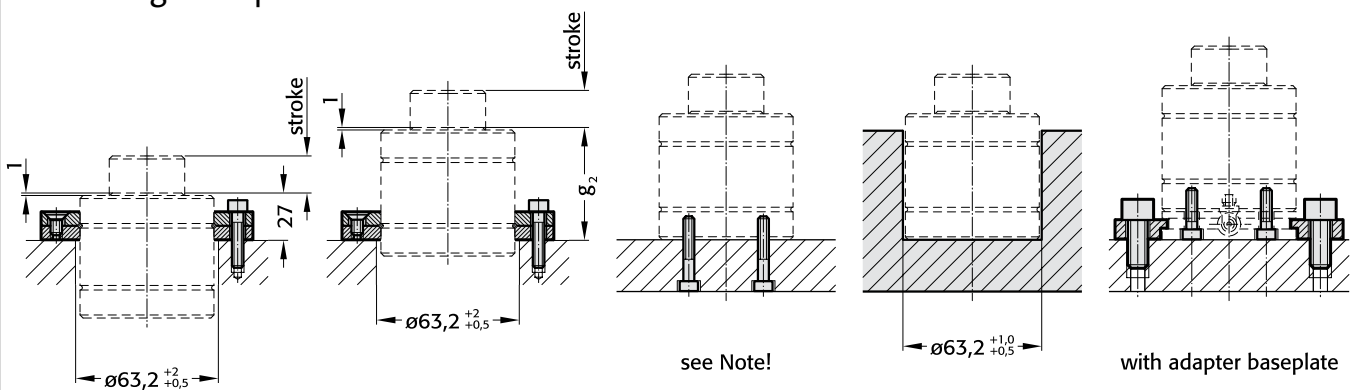


Mounting example:



with adapter baseplate

Mounting example:





**2490.12.03000.**

Initial spring force at 150 bar = 3000 daN

Order No	stroke max.	$l_{min.}$	$l$	$g_2^*$
2490.12.03000.	010	10	74,75	85 65
	016	16	86,75	103 77
	025	25	104,75	130 95
	032	32	117,75	150 108
	040	40	134,75	175 125
	050	50	154,75	205 145

$g_2^*$  see mounting example

**Note:**

Order No for spare parts kit:  
2490.12.03000

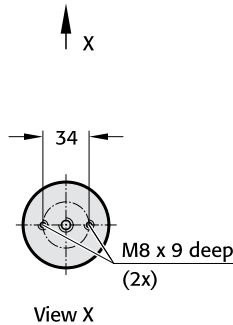
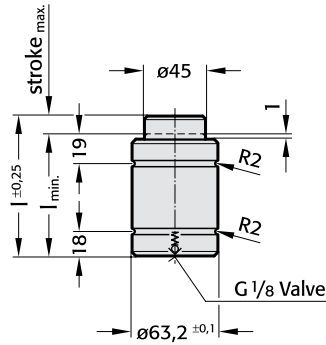
When mounting to floor, contact over the entire floor of the cylinder tube must be ensured!

Before fitting the adapter base plate remove the valve from the gas spring.

If vibration occurs, tighten the fixing screws accordingly.

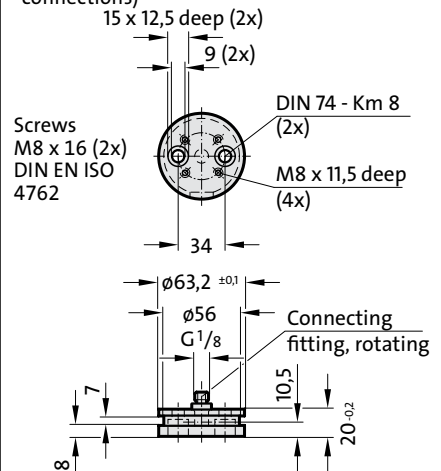
- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 100 (at 20°C)
- Max. piston speed: 0.5 m/s

**2490.12.03000.**



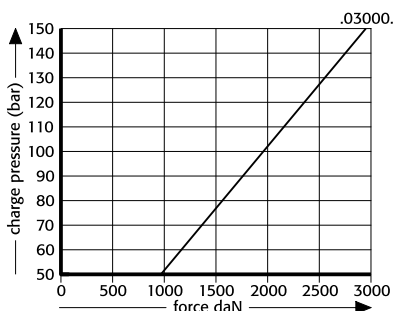
**2480.00.20.03000**

Adapter baseplate with connecting fitting, without valve (only for use with composite connections)



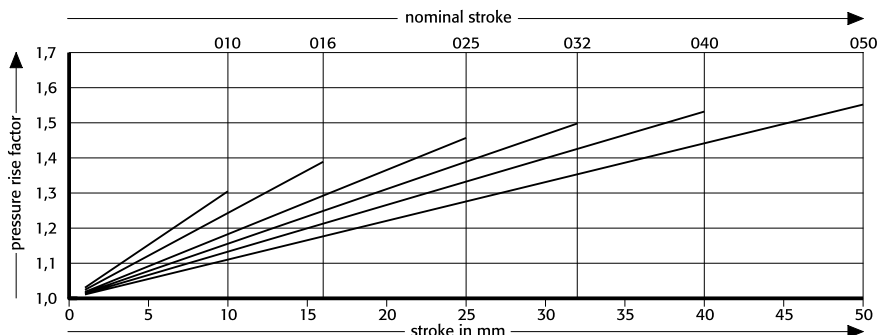
**2490.12.03000.**

Initial spring force versus charge pressure



**2490.12.03000.**

Spring force Diagram displacement versus stroke rise

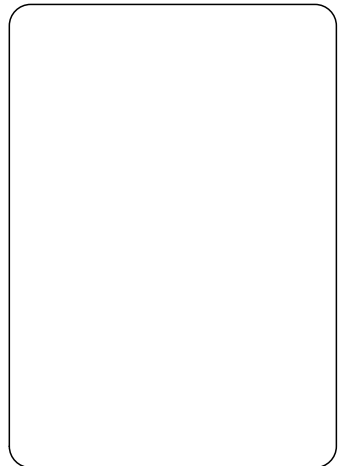
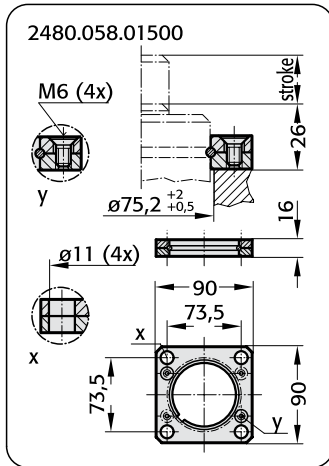
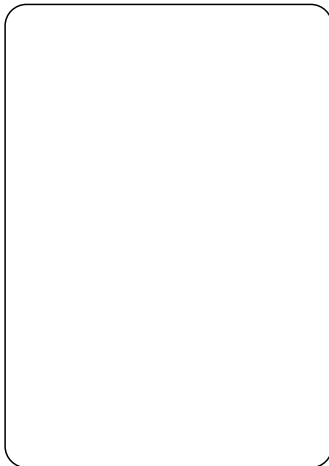
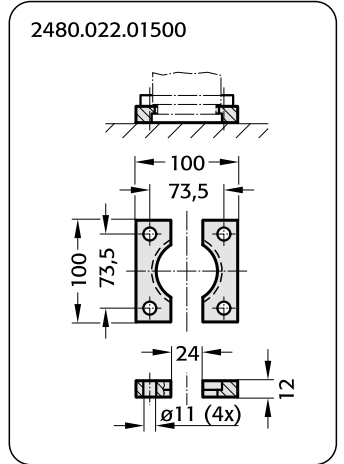
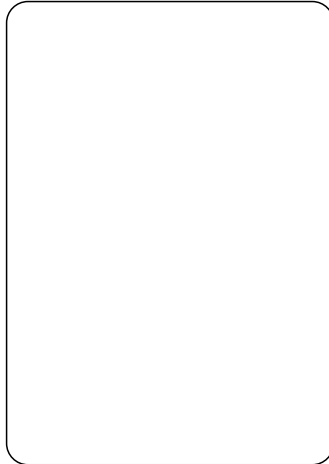
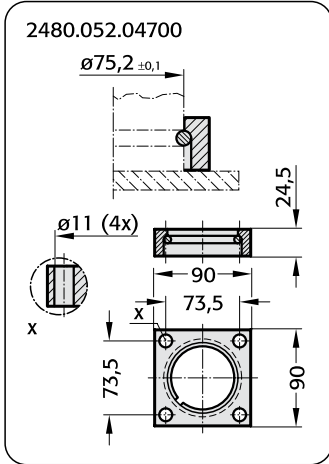


Pressure rise factor accounts for displacement but not external influences!

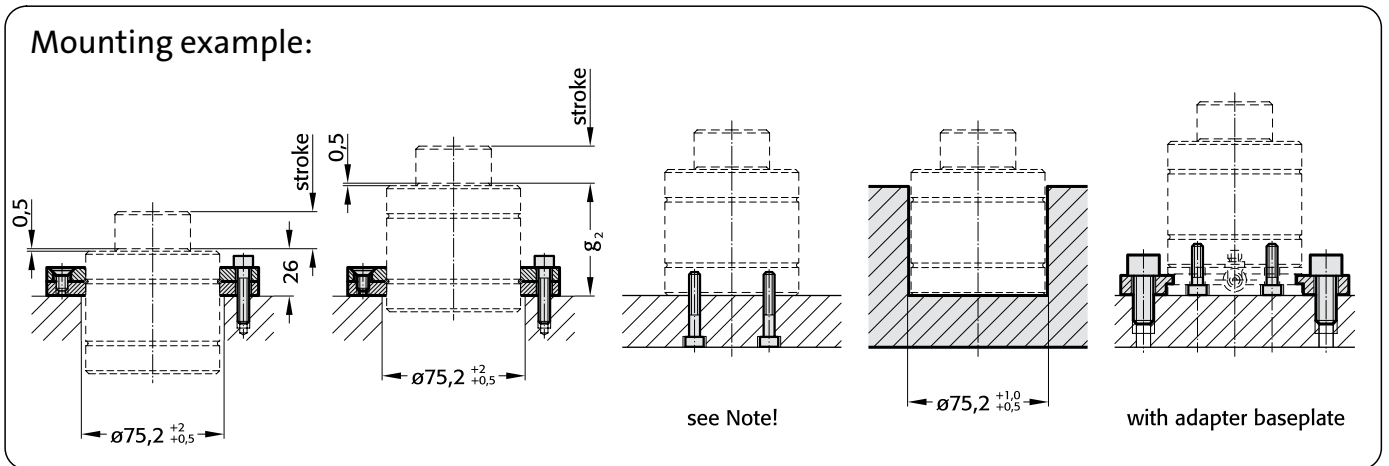
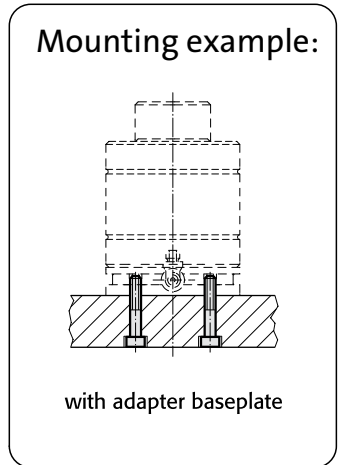
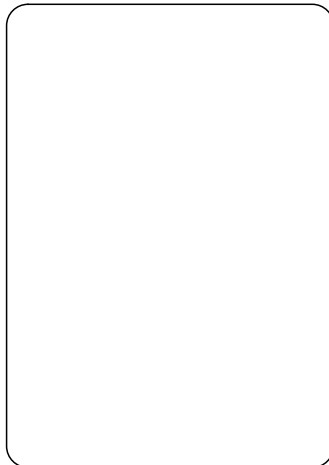
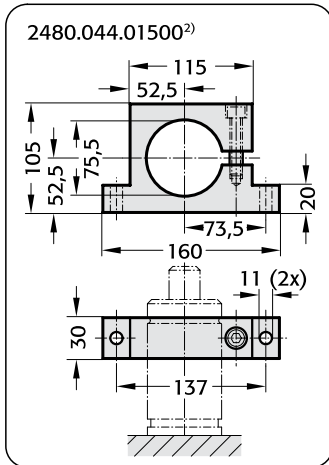
# Compact Gas Springs for small displacement and high forces Mounting Variations

**FIBRO**

2490.13.04700.



2) Attention:  
The spring force must  
be absorbed by the stop  
surface.



**2490.13.04700.**

Initial spring force at 150 bar = 4700 daN

Order No	stroke max.	$l_{min.}$	$l$	$g_2^*$
2490.13.04700.010	10	69,75	80	60
016	16	89,75	106	80
025	25	109,75	135	100
032	32	134,75	167	125
040	40	159,75	200	150
050	50	189,75	240	180

$g_2^*$  see mounting example

**Note:**

Order No for spare parts kit:  
2490.12.04700

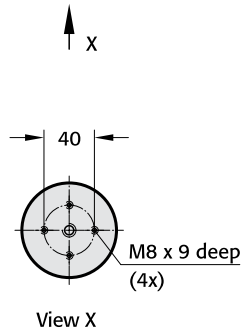
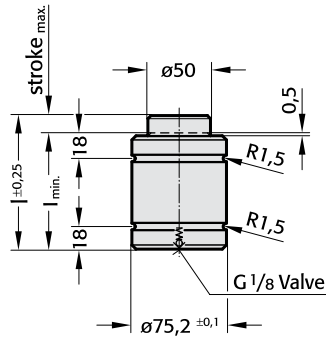
When mounting to floor, contact over the entire floor of the cylinder tube must be ensured!

Before fitting the adapter base plate remove the valve from the gas spring.

If vibration occurs, tighten the fixing screws accordingly.

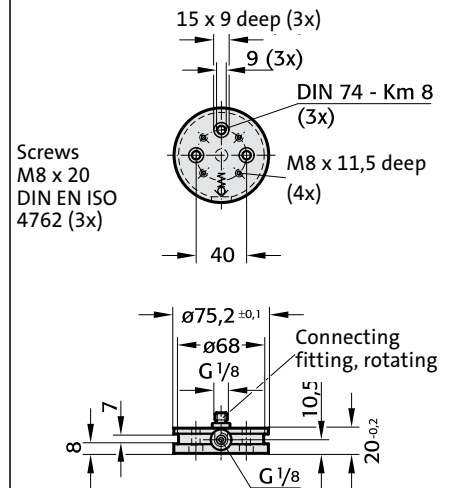
- Pressure medium: Nitrogen  $N_2$
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase:  $\pm 0.3\%/^{\circ}C$
- Max. recommended extensions per minute: approx. 100 (at 20°C)
- Max. piston speed: 0.5 m/s

**2490.13.04700.**



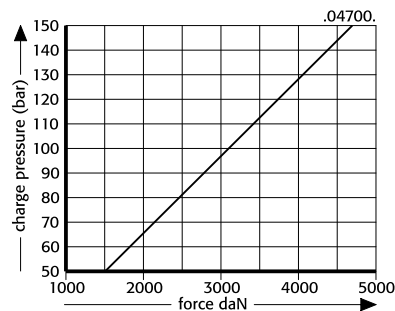
**2480.00.20.04700**

Adapter baseplate with connecting Fitting



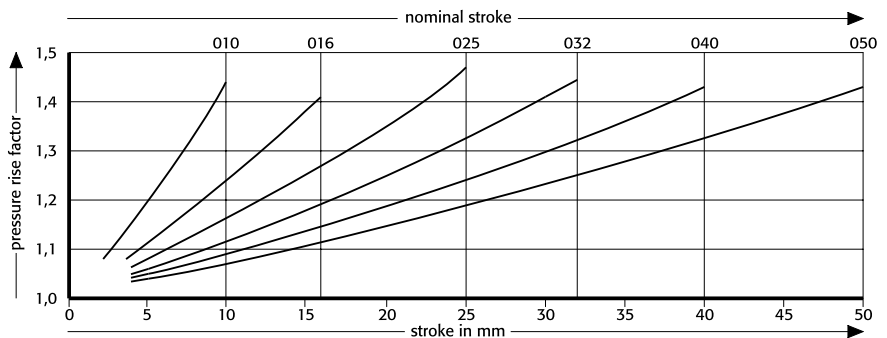
**2490.13.04700.**

Initial spring force versus charge pressure



**2490.13.04700.**

Spring force Diagram displacement versus stroke rise

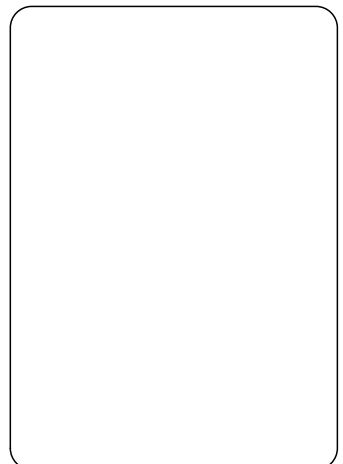
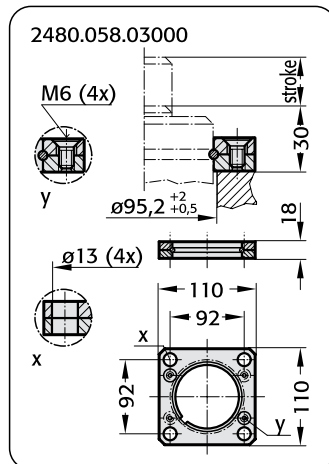
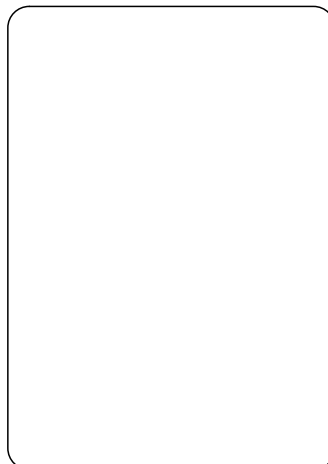
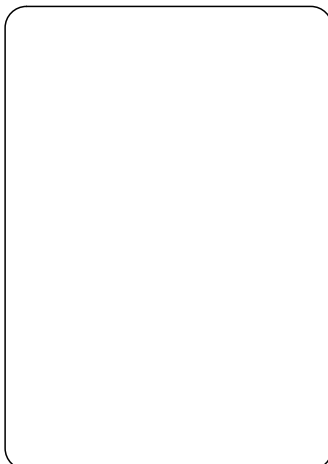
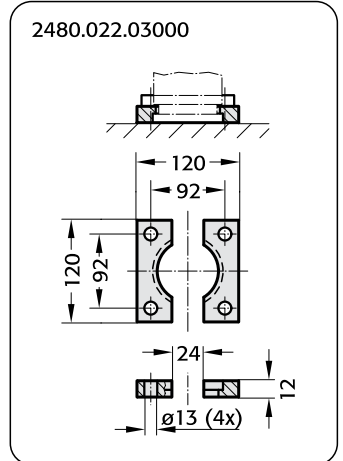
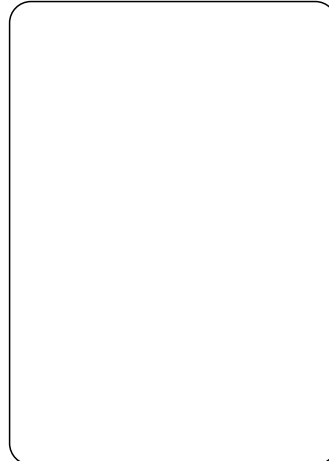
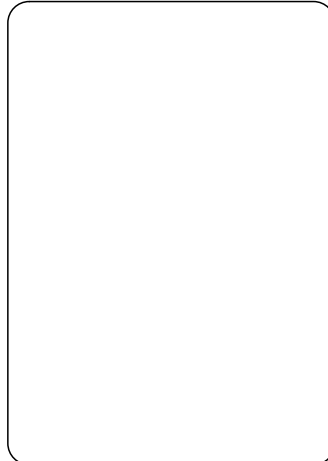
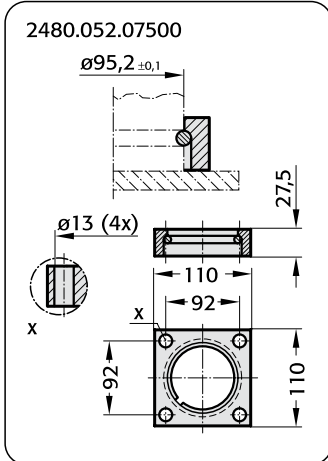


Pressure rise factor accounts for displacement but not external influences!

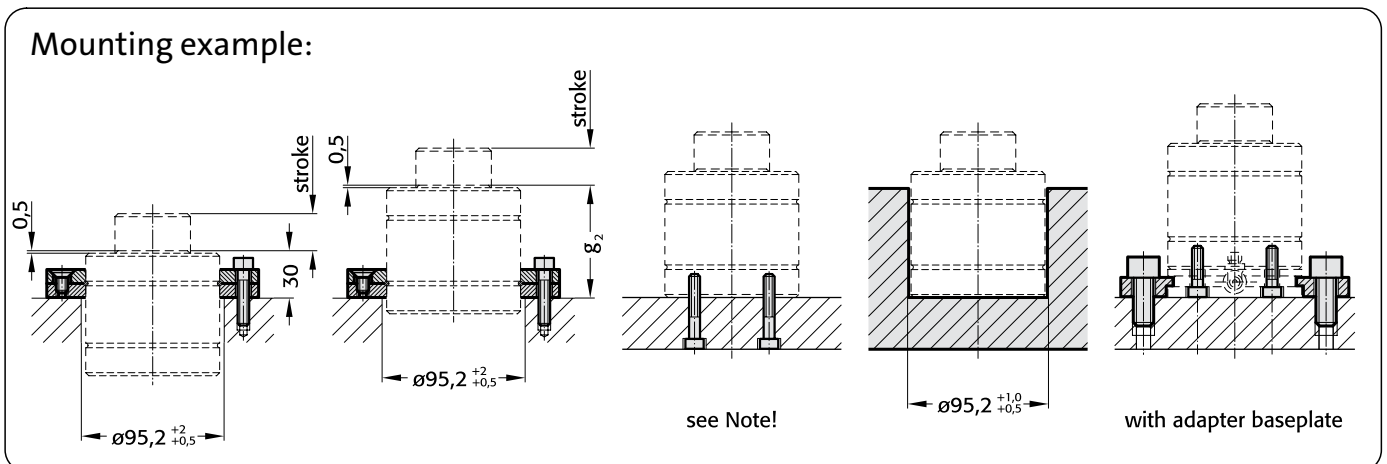
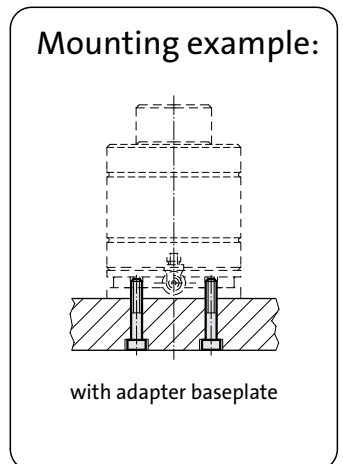
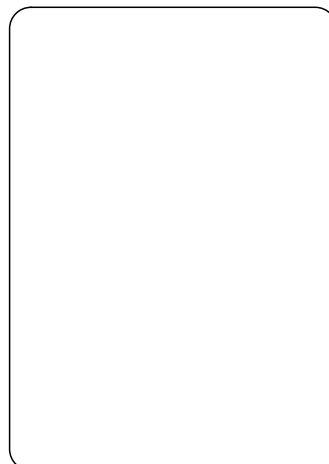
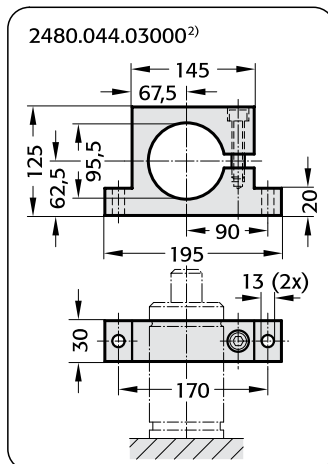
# Compact Gas Springs for small displacement and high forces Mounting Variations

**FIBRO**

2490.13.07500.



2) Attention:  
The spring force must  
be absorbed by the stop  
surface.



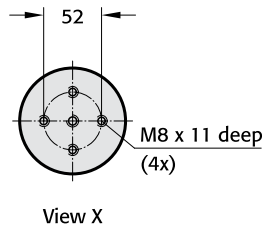
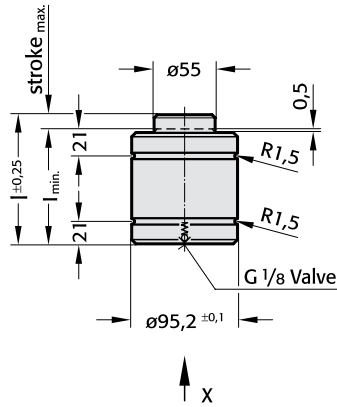
**2490.13.07500.**

Initial spring force at 150 bar = 7500 daN

Order No	stroke max.	$l_{min.}$	$l$	$g_2^*$
2490.13.07500.010	10	79,75	90	68
016	16	99,75	116	88
025	25	119,75	145	108
032	32	149,75	182	138
040	40	169,75	210	158
050	50	204,75	255	193

$g_2^*$  see mounting example

**2490.13.07500.**



**Note:**

Order No for spare parts kit:  
2490.12.07500

When mounting to floor, contact over the entire floor of the cylinder tube must be ensured!

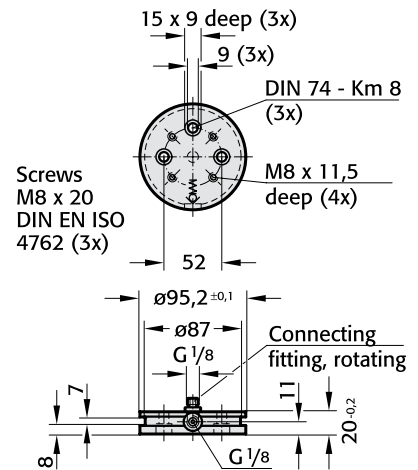
Before fitting the adapter base plate remove the valve from the gas spring.

If vibration occurs, tighten the fixing screws accordingly.

- Pressure medium: Nitrogen  $N_2$
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature:  $0^\circ C$  to  $+80^\circ C$
- Temperature related force increase:  $\pm 0.3\%/^\circ C$
- Max. recommended extensions per minute: approx. 100 (at  $20^\circ C$ )
- Max. piston speed: 0.5 m/s

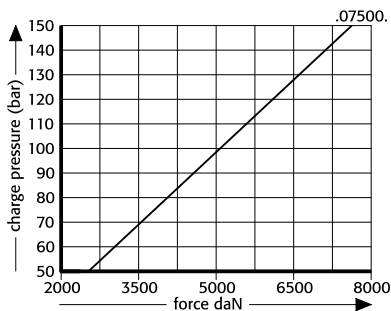
**2480.00.20.07500**

Adapter baseplate with connecting Fitting



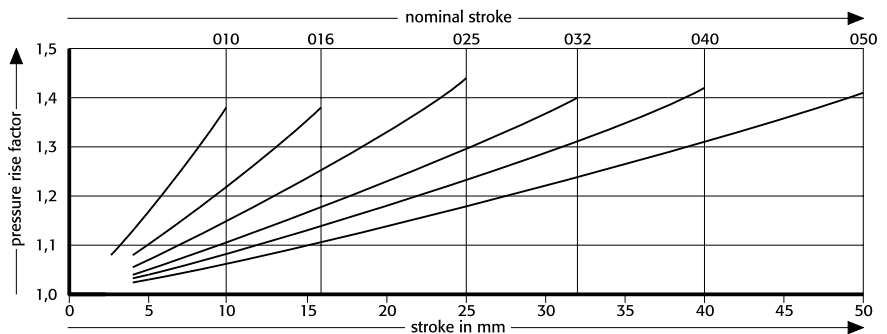
**2490.13.07500.**

Initial spring force versus charge pressure



**2490.13.07500.**

Spring force Diagram displacement versus stroke rise

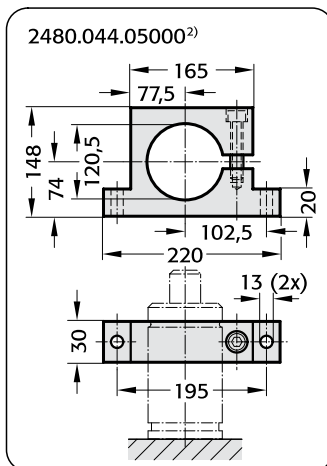
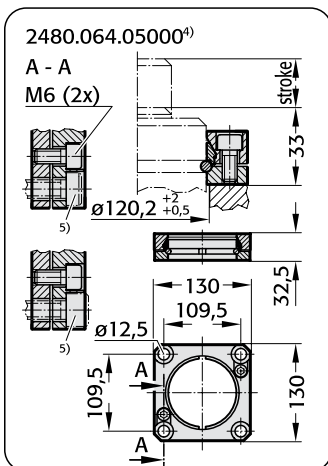
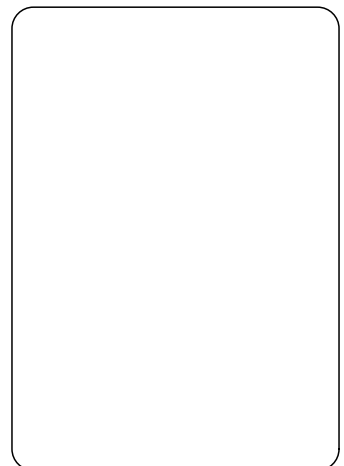
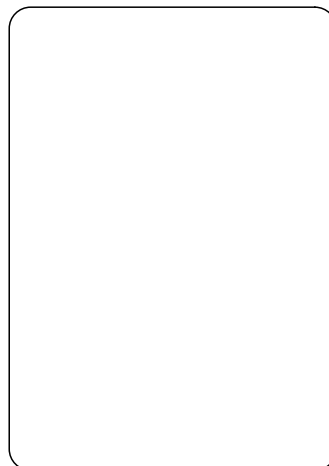
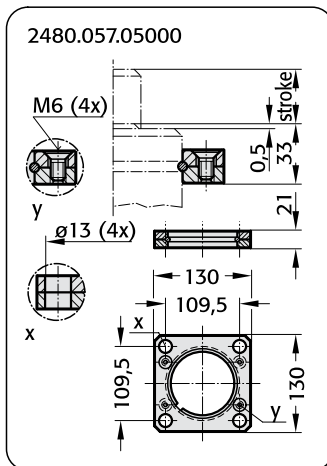
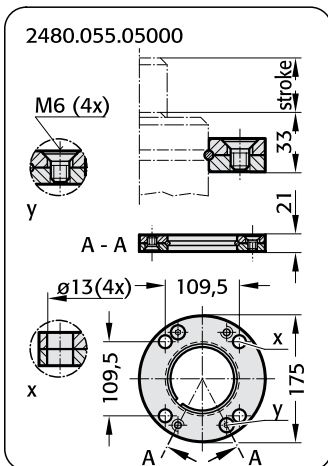
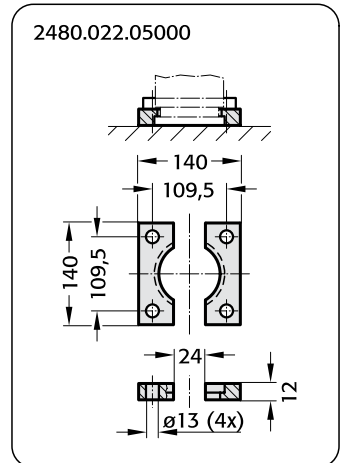
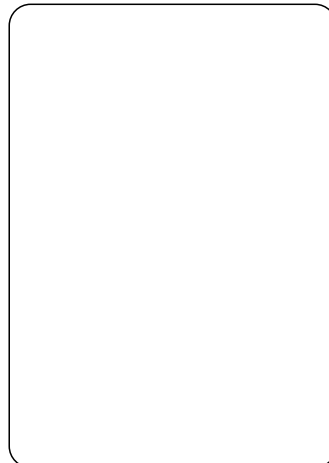
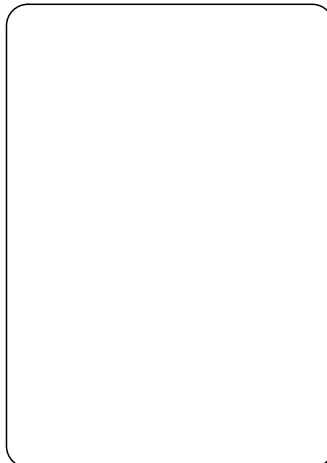
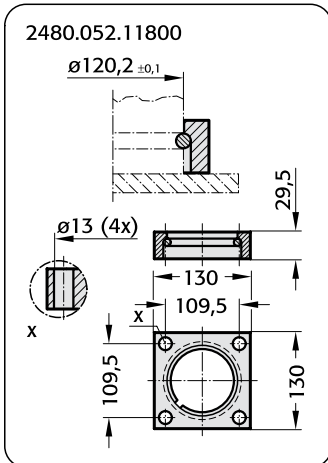


Pressure rise factor accounts for displacement but not external influences!

# Compact Gas Springs for small displacement and high forces Mounting Variations

**FIBRO**

2490.12.11800.

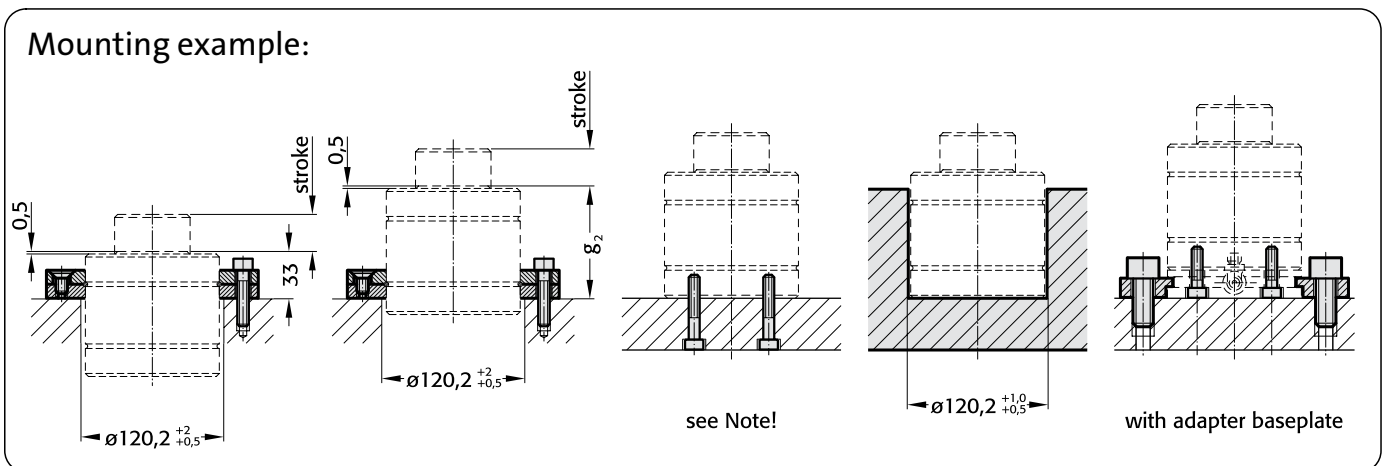
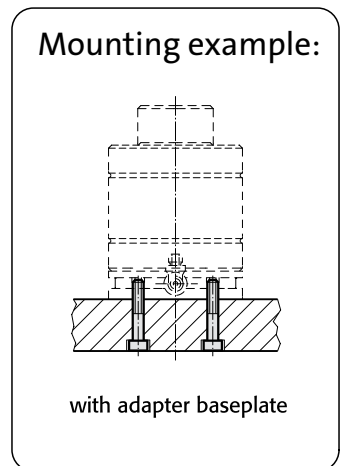


**Notes:**

2) Attention:  
The spring force must be absorbed by the stop surface.

4) Square collar flange, non-rotating, fixing for composite connection.

5) Machine screws with hexagonal socket (compact head recommended).



**2490.12.11800.**

Initial spring force at 150 bar = 11800 daN

Order No	stroke max.	l <sub>min.</sub>	l	g <sub>2</sub> *
016	16	109,75	126	98
025	25	129,75	155	118
032	32	154,75	187	143
040	40	179,75	220	168
050	50	209,75	260	198

g<sub>2</sub>\* see mounting example

**Note:**

Order No for spare parts kit:  
2490.12.11800

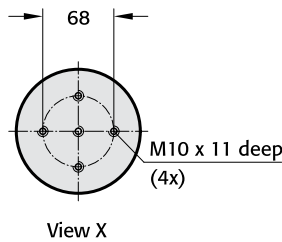
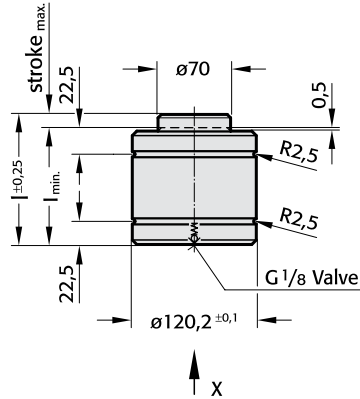
When mounting to floor, contact over the entire floor of the cylinder tube must be ensured!

Before fitting the adapter base plate remove the valve from the gas spring.

If vibration occurs, tighten the fixing screws accordingly.

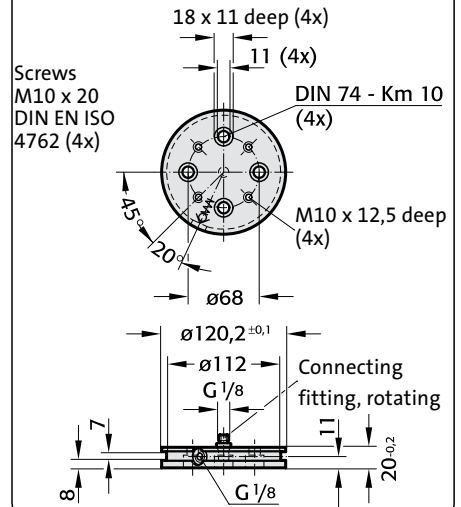
- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 100 (at 20°C)
- Max. piston speed: 0.5 m/s

**2490.12.11800.**



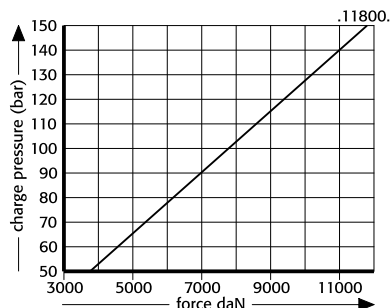
**2480.00.20.11800**

Adapter baseplate with connecting Fitting



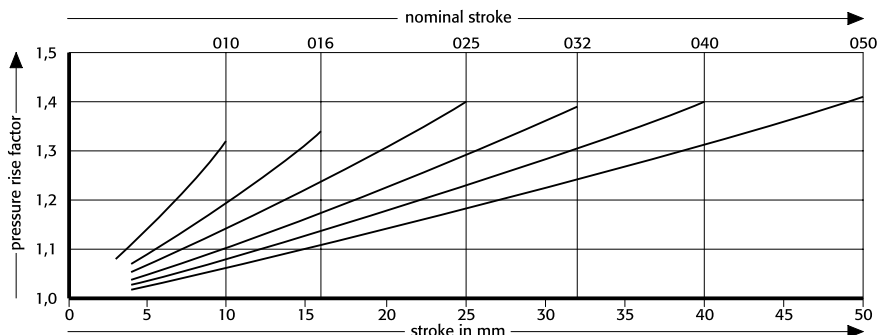
**2490.12.11800.**

Initial spring force versus charge pressure



**2490.12.11800.**

Spring force Diagram displacement versus stroke rise

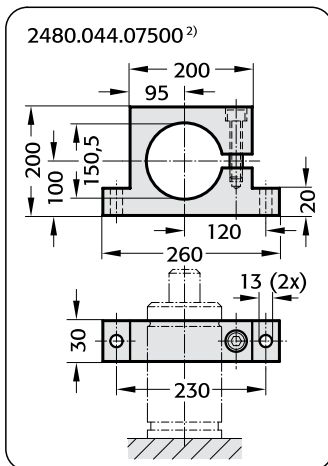
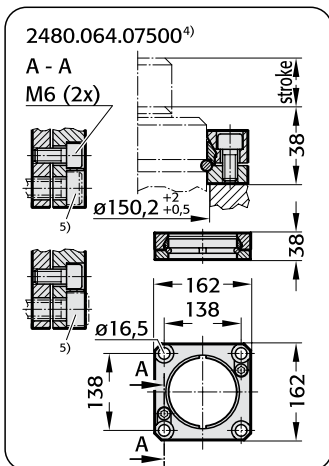
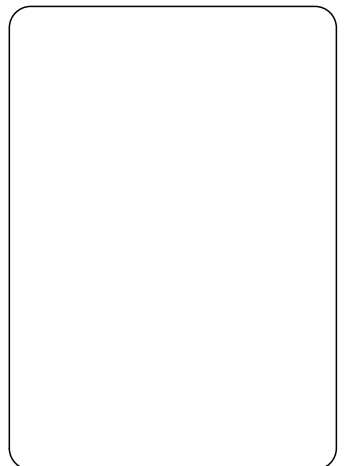
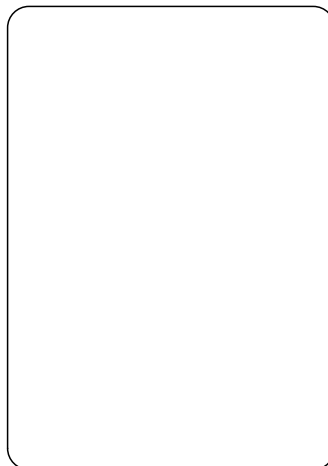
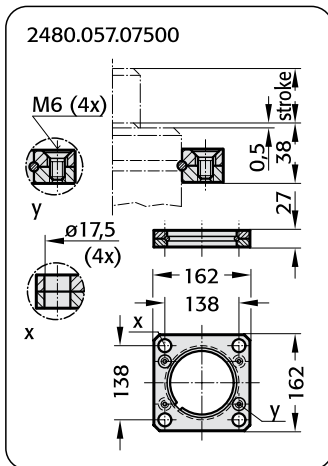
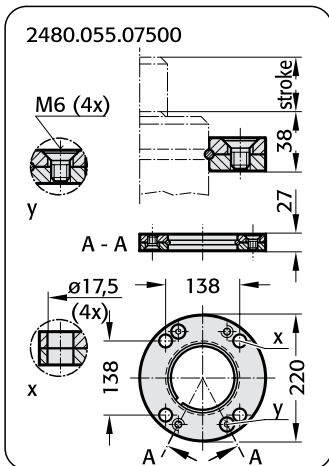
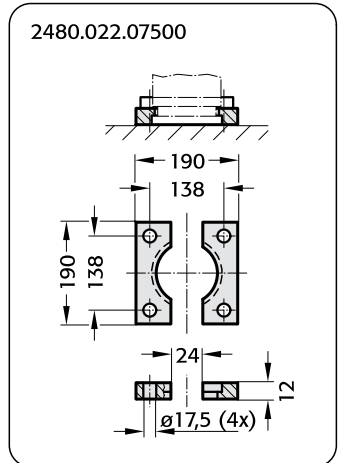
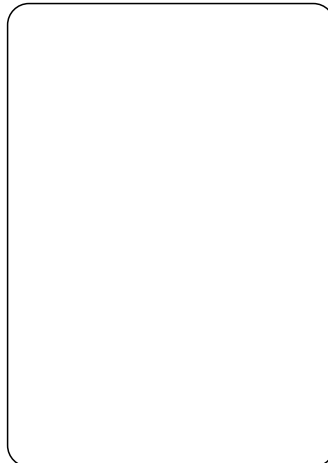
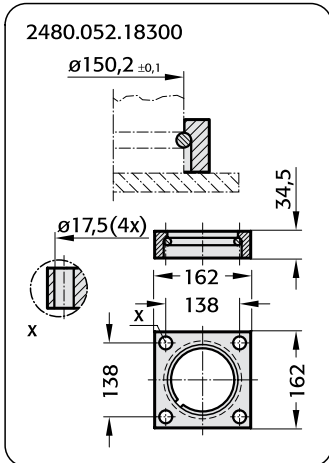


Pressure rise factor accounts for displacement but not external influences!

# Compact Gas Springs for small displacement and high forces Mounting Variations

**FIBRO**

2490.12.18300.

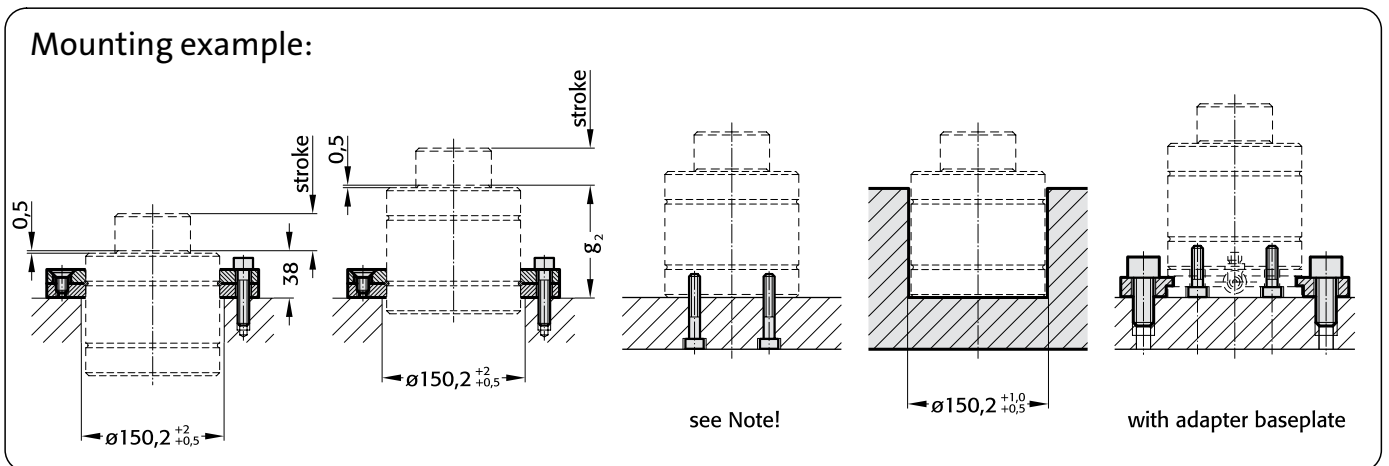
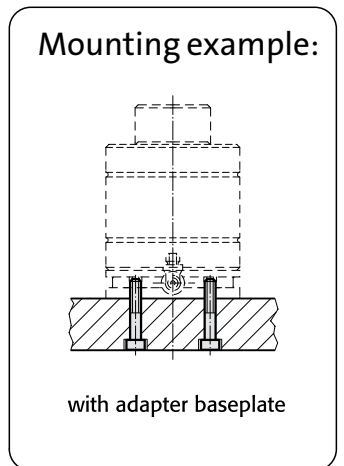


**Notes:**

2) Attention:  
The spring force must be absorbed by the stop surface.

4) Square collar flange, non-rotating, fixing for composite connection.

5) Machine screws with hexagonal socket (compact head recommended).





**2490.12.18300.**

Initial spring force at 150 bar = 18300 daN

Order No	stroke max.	$l_{min.}$	$l$	$g_2^*$
2490.12.18300.010	10	99,75	110	89
016	16	119,75	136	109
025	25	139,75	165	129
032	32	164,75	197	154
040	40	194,75	235	184
050	50	219,75	270	209

$g_2^*$  see mounting example

**Note:**

Order No for spare parts kit:  
2490.12.18300

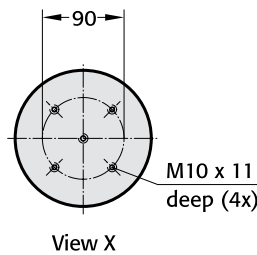
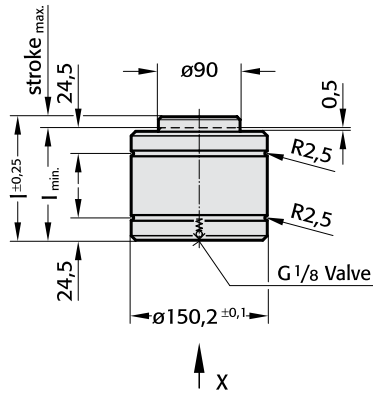
When mounting to floor, contact over the entire floor of the cylinder tube must be ensured!

Before fitting the adapter base plate remove the valve from the gas spring.

If vibration occurs, tighten the fixing screws accordingly.

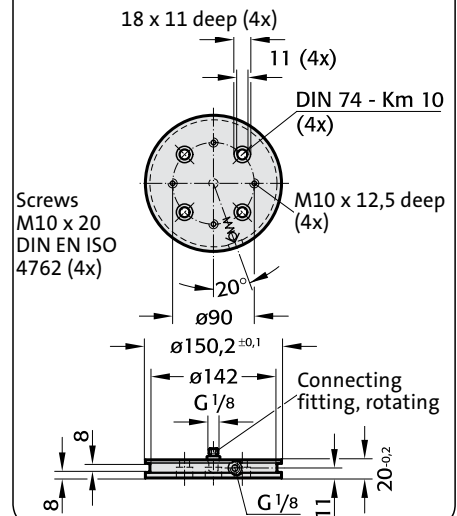
- Pressure medium: Nitrogen  $N_2$
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase:  $\pm 0.3\%/^{\circ}C$
- Max. recommended extensions per minute: approx. 100 (at 20°C)
- Max. piston speed: 0.5 m/s

**2490.12.18300.**



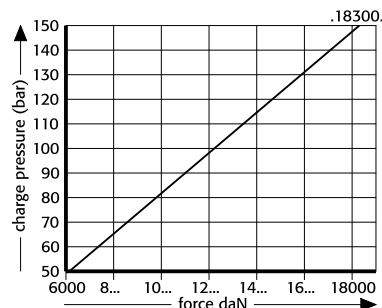
**2480.00.20.18300**

Adapter baseplate with connecting Fitting



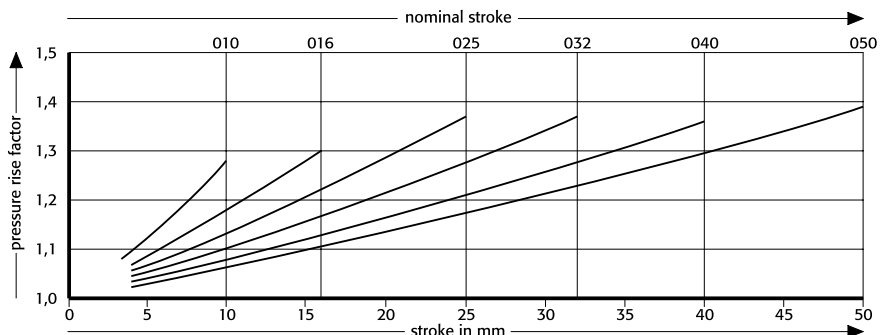
**2490.12.18300.**

Initial spring force versus charge pressure



**2490.12.18300.**

Spring force Diagram displacement versus stroke rise

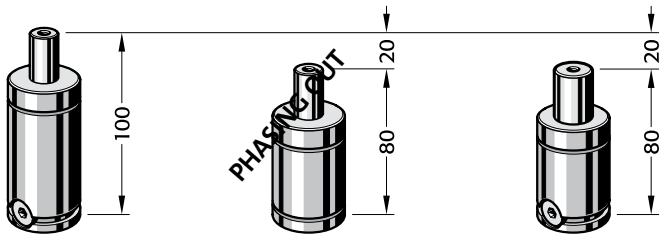


Pressure rise factor accounts for displacement but not external influences!

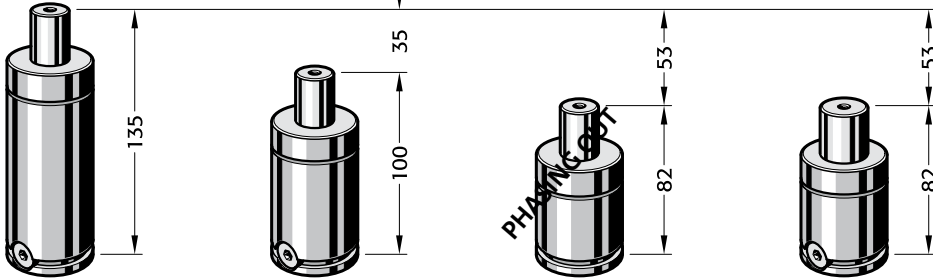
A large, empty rectangular area with rounded corners, intended for drawing or writing. It occupies the majority of the page below the header and above the footer.

# Gas Springs with Low Build Height

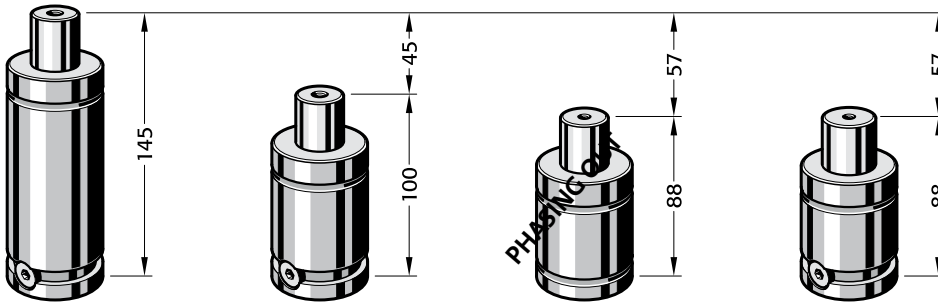
Construction heights with the same stroke and the same/increased spring force



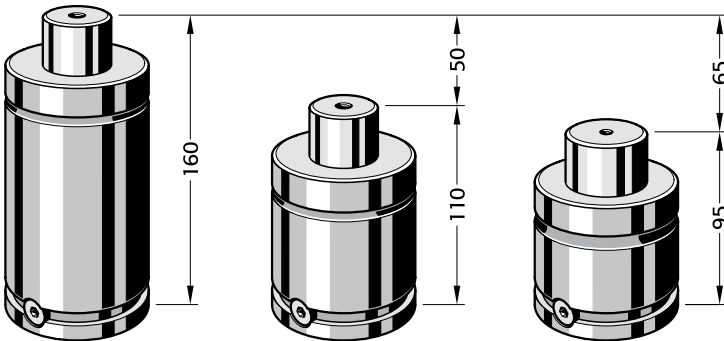
Normal construction heights 2480.12.00250.025  
 Compact construction heights 2485.71.00250.025  
 Power Line 2487.12.00500.025



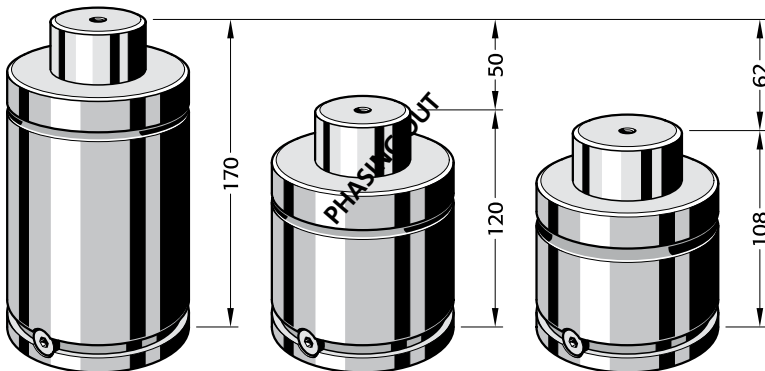
Normal construction heights 2480.12.00500.025  
 Low construction heights 2485.12.00500.025  
 Low construction heights 2485.71.00500.025  
 Power Line 2487.12.00750.025



Normal construction heights 2480.13.00750.025  
 Low construction heights 2485.12.00750.025  
 Low construction heights 2485.71.00750.025  
 Power Line 2487.12.01000.025



Normal construction heights 2480.12.01500.025  
 Low construction heights 2485.12.01500.025  
 Power Line 2487.12.02400.025

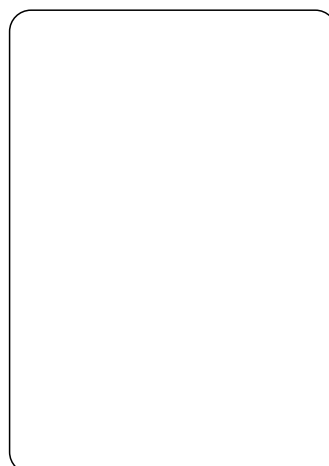
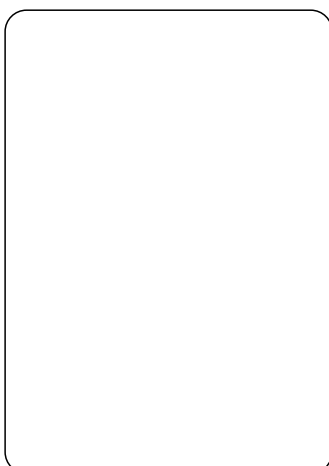
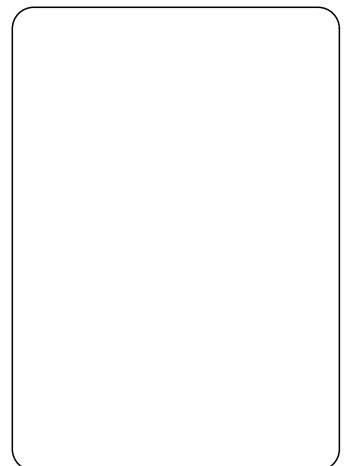
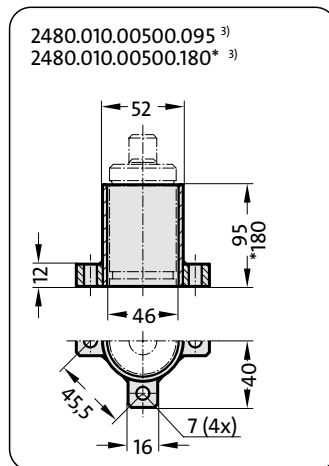
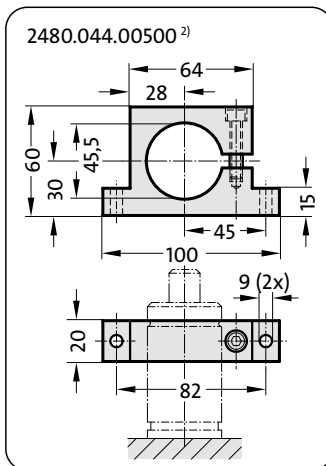
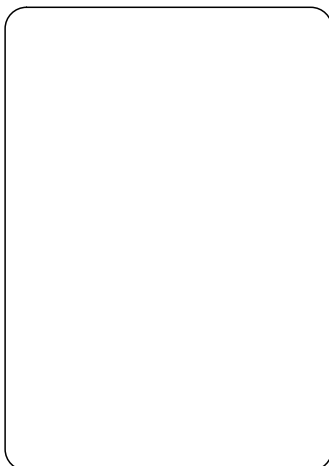
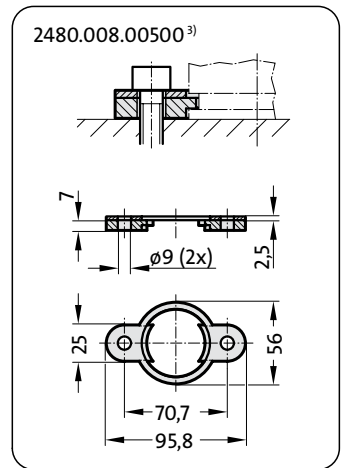
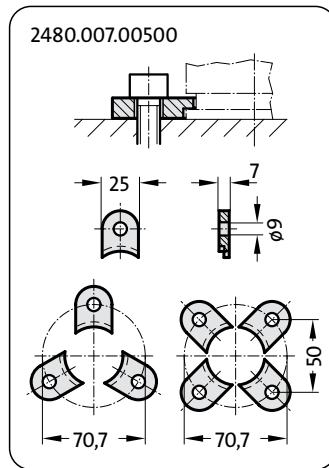
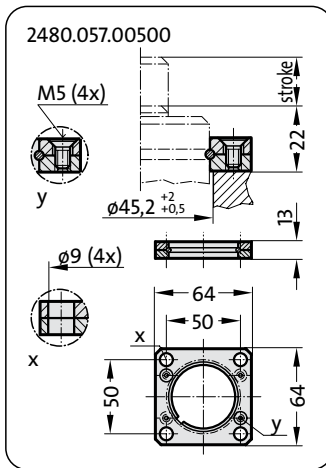
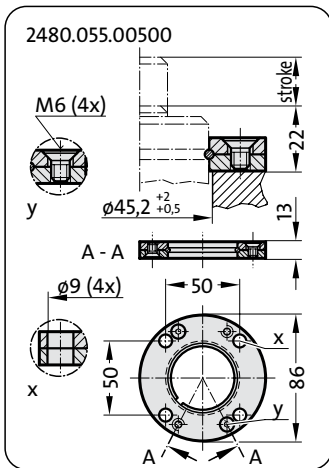
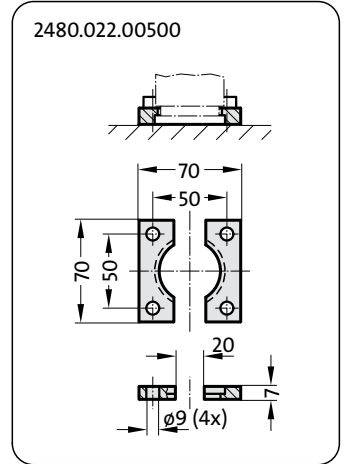
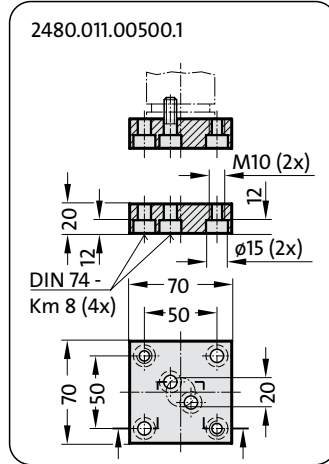
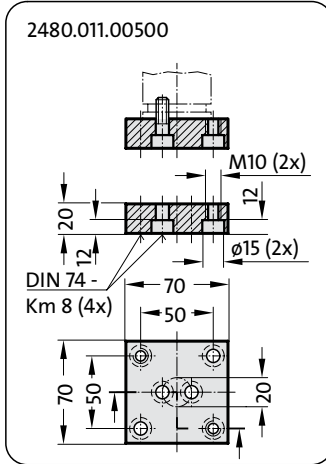
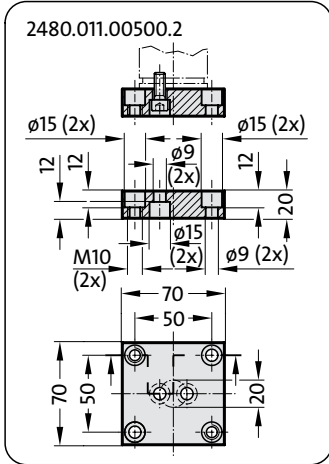


Normal construction heights 2480.13.03000.025  
 Low construction heights 2485.12.03000.025  
 Power Line 2487.12.04200.025

# Gas Springs with Low Build Height Mounting Variations

**FIBRO**

2485.12.00500.



**Notes:**

<sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.

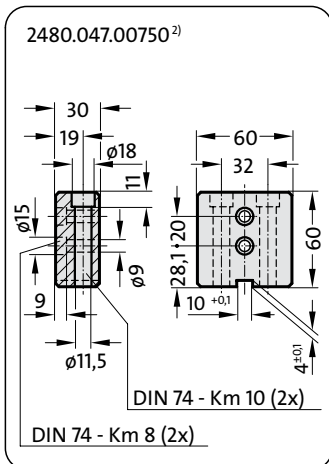
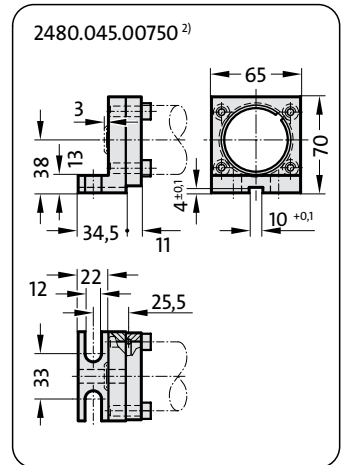
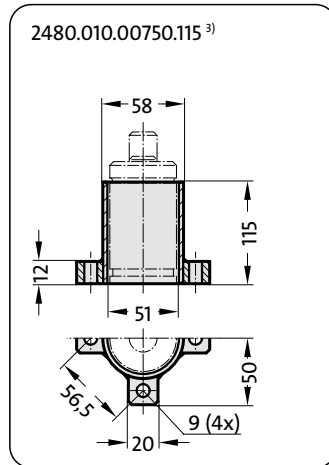
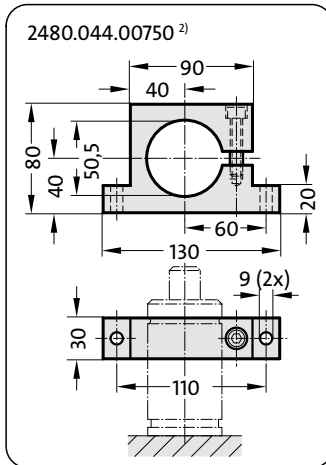
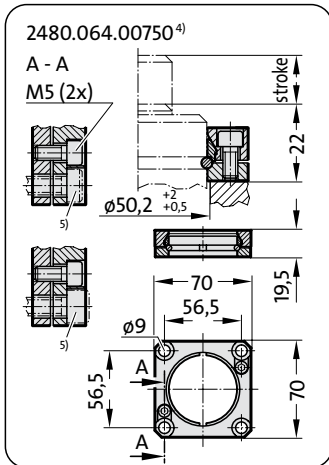
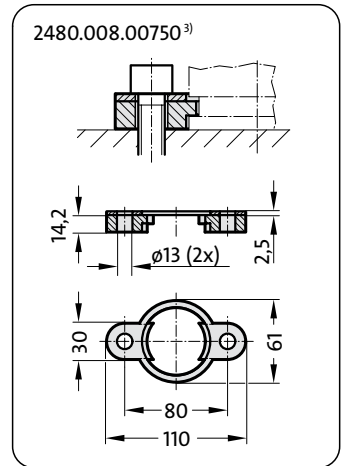
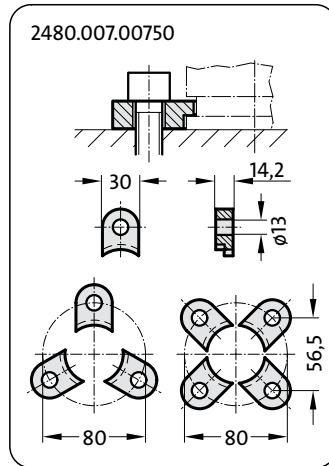
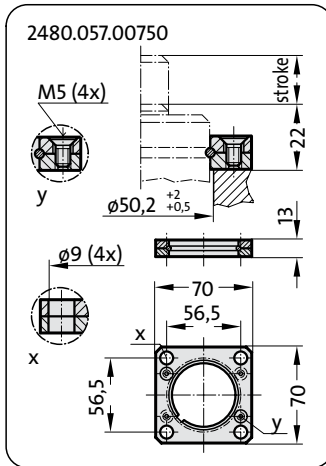
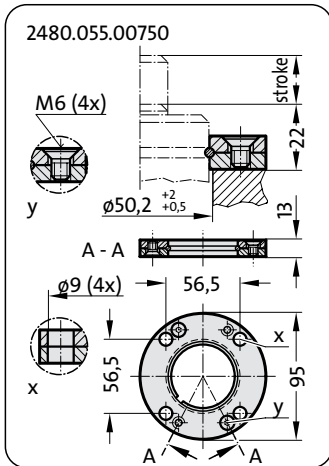
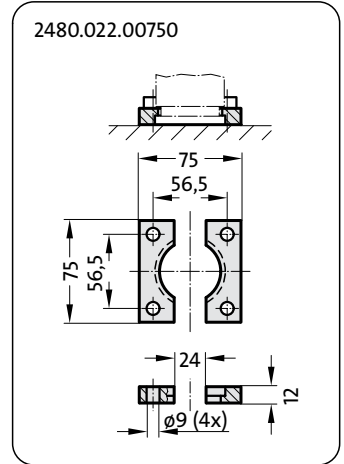
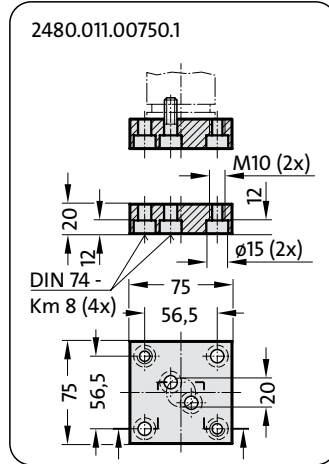
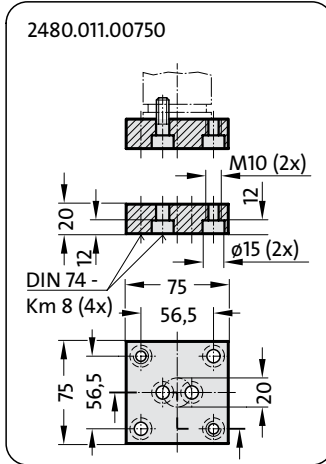
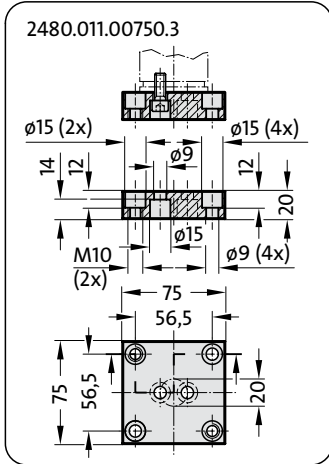
<sup>3)</sup> Not for use with composite connection.



# Gas Springs with Low Build Height Mounting Variations

**FIBRO**

2485.12.00750.



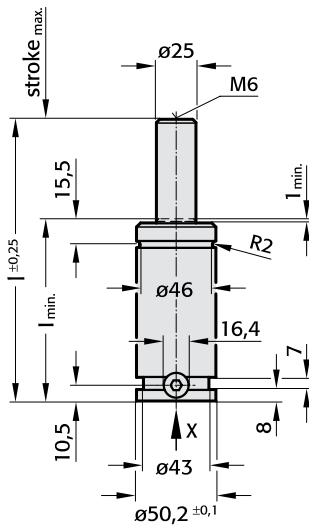
- Notes:**
- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
  - <sup>3)</sup> Not for use with composite connection.
  - <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
  - <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).

2485.12.00750.

Initial spring force at 150 bar = 750 daN

Order No	stroke max.	$l_{min}$	$l$
2485.12.00750.006	6	56	62
013	12,7	62,7	75,4
019	19	69,1	88,1
025	25	75	100
038	38,1	88,1	126,2
050	50	100	150
063	63,5	113,5	177
080	80	130	210
100	100	150	250
125	125	175	300

2485.12.00750.

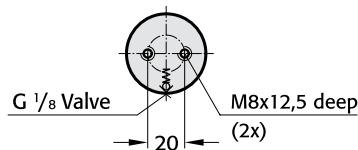


**Note:**

Order No for spare parts kit:  
2485.12.00750

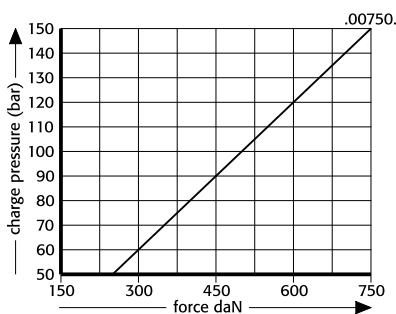
- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar
- Min. filling pressure: 25 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
- Max. piston speed: 1.6 m/s

View X



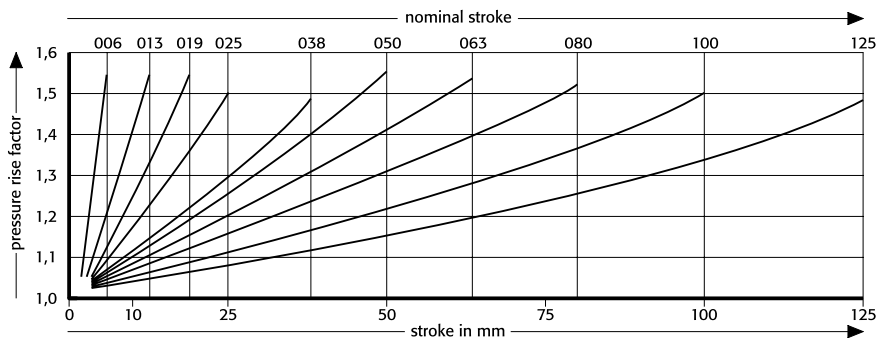
2485.12.00750.

Initial spring force  
versus charge pressure



2485.12.00750.

Spring force Diagram displacement versus stroke rise

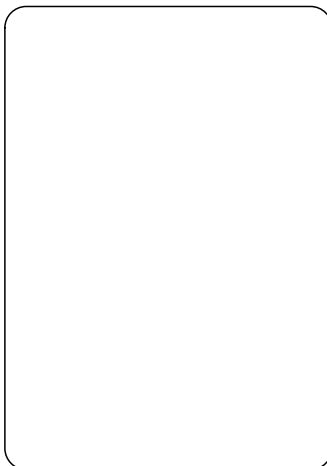
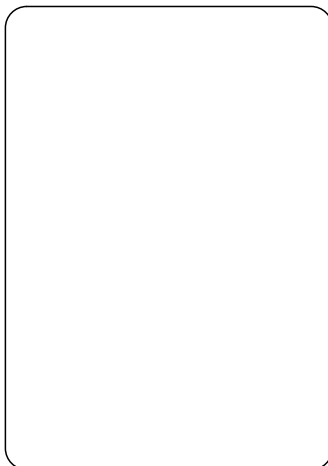
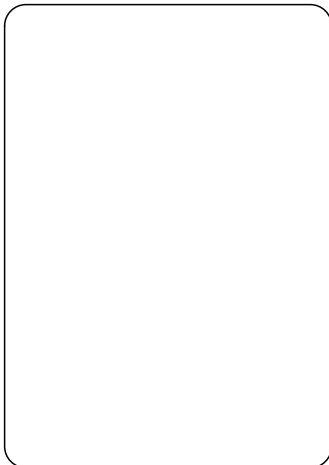
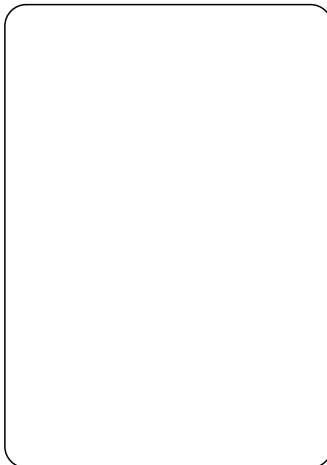
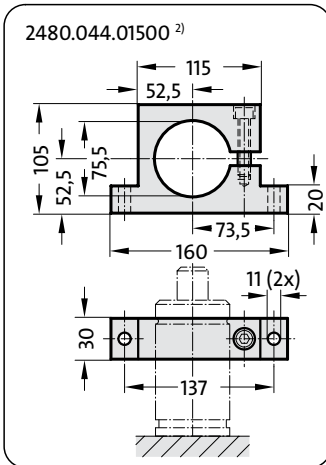
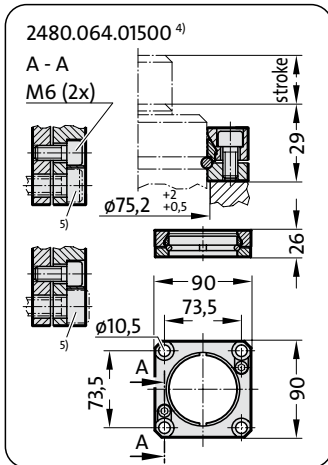
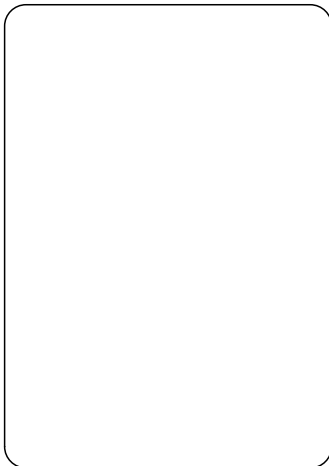
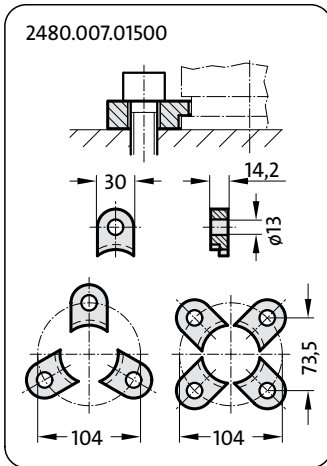
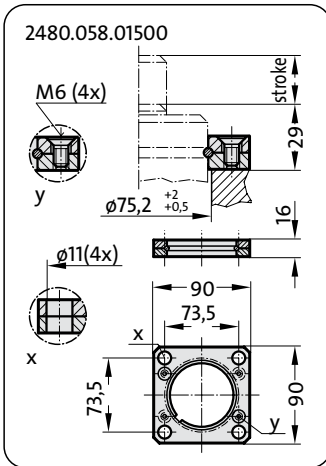
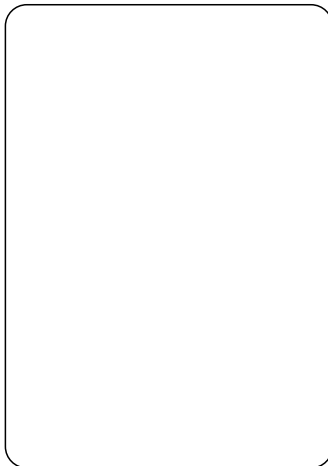
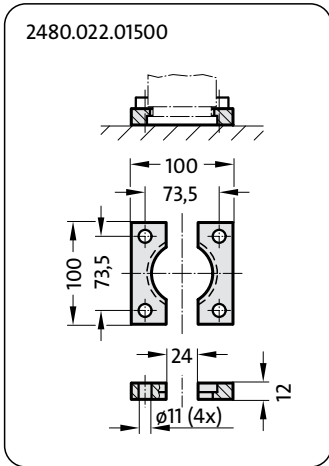
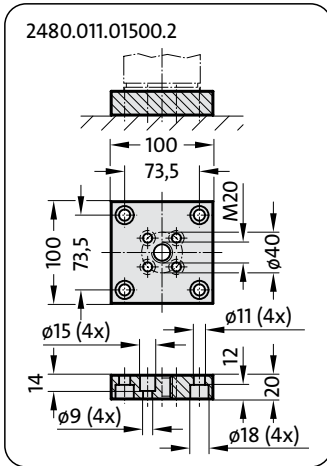
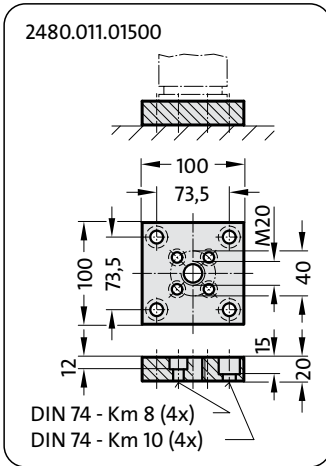
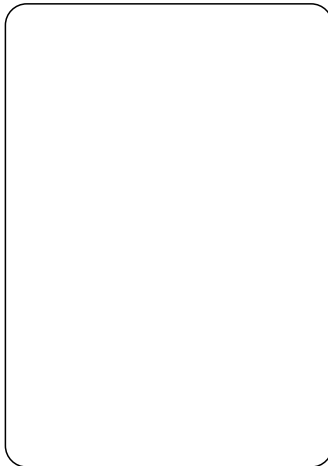


Pressure rise factor accounts for displacement but not external influences!

# Gas Springs with Low Build Height Mounting Variations

**FIBRO**

2485.12.01500.



**Notes:**

- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
- <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).

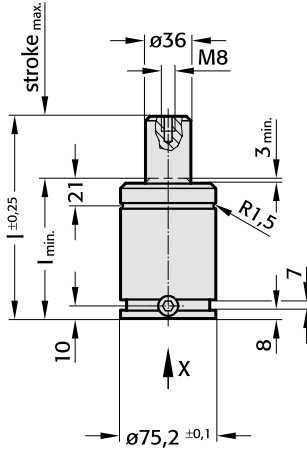


2485.12.01500.

Initial spring force at 150 bar = 1500 daN

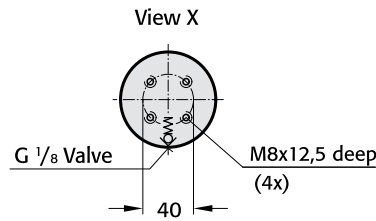
Order No	stroke max.	$l_{min}$	$l$
2485.12.01500.025	25	85	110
038	38,1	98,1	136,2
050	50	110	160
063	63,5	123,5	187
080	80	140	220
100	100	160	260

2485.12.01500.



**Note:**

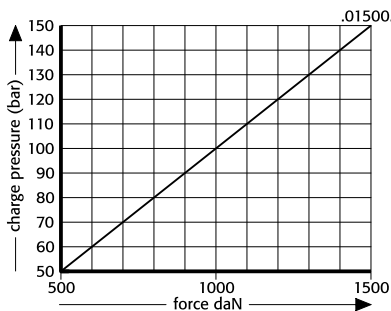
Order No for spare parts kit:  
2485.12.01500



Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)  
 Max. piston speed: 1.6 m/s

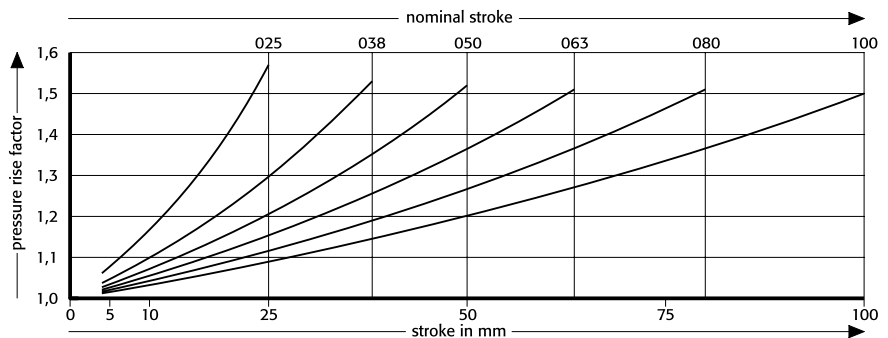
2485.12.01500.

Initial spring force versus charge pressure

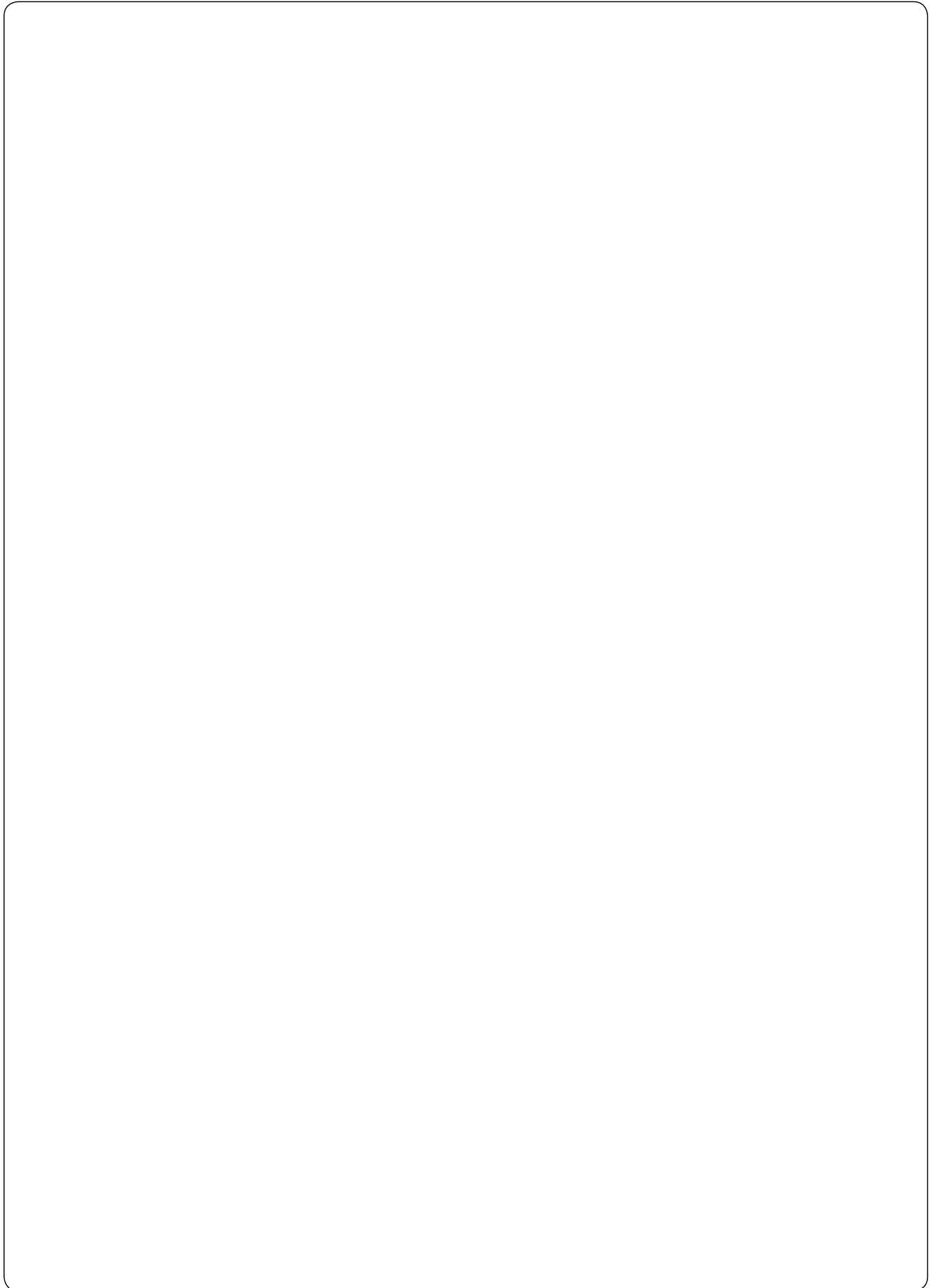


2485.12.01500.

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!



»»Speed Control™««  
SPC GAS SPRINGS,  
cushioned





## »Speed Control™«, SPC Gas Springs, cushioned

FIBRO

2486.12.

### Description

FIBRO SPC Gas Springs »Speed Control™« have been engineered to reduce or eliminate blank holder bounce; commonly associated with increased return stroke speeds form link drive presses.

SPC Gas Springs have inbuilt return stroke speed dampening, which decelerates the last 30 mm of piston rod stroke to 0.4 m/s, helping to bring the blank holder to a smooth stop.

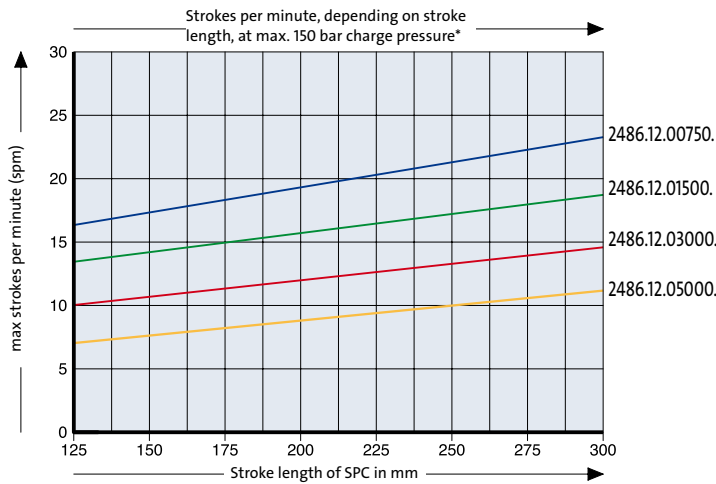
Benefits of the »Speed Control™« SPC Gas Springs, cushioned:

- Eliminates blank holder bounce.
- Increases productivity by more increasing part transfer efficiency.
- Easily retrofitted to existing dies.
- Stroke lengths 125 to 300 mm.
- Linkable using hose system.



Performance:

The diagram shows the max. possible number of strokes per minutes [min-1] of SPC gas springs with a max. filling pressure (150 bar) and max. used stroke lengths before there is a risk of excessive heating.



Note !

The number of strokes per minutes can be doubled by halving the initial filling pressure.



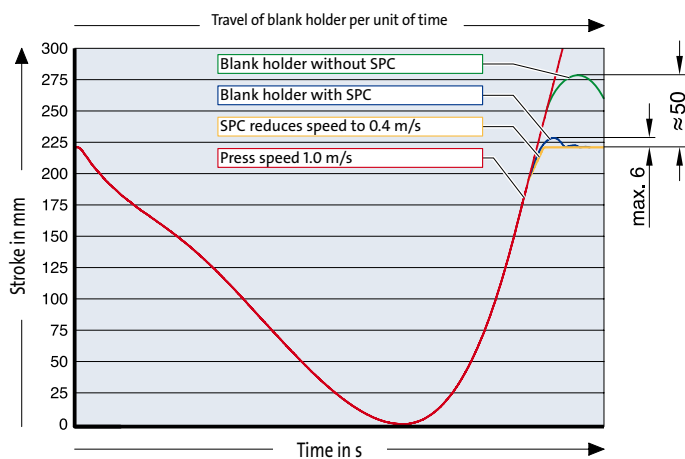
Caution !

SPC gas springs are subject to a higher heating than standard gas springs.

For this reason, please ensure adequate ventilation of the SPC gas springs in the tool.

\*At ambient room temperature with free air flow

Function Example



»Speed Control™« SPC Gas Springs gave a 90% reduction of blank holder bounce.

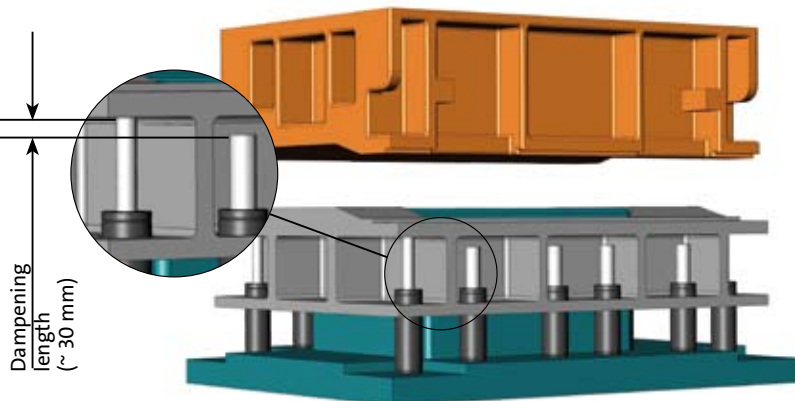
Installation

It is important that approx. 25 to 30 mm before the sheet metal retainer has reached its home position, only SPC gas springs are applied. Therefore, for the retrofitting of existing tools with SPC gas springs we recommend the following two options:

**Option 1** – replace all gas springs with SPC gas springs

**Option 2** – corner solution (see below)

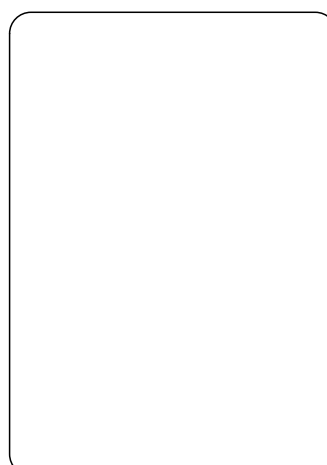
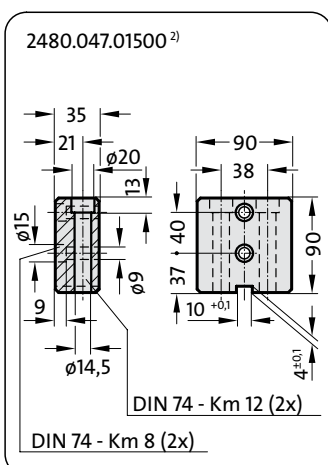
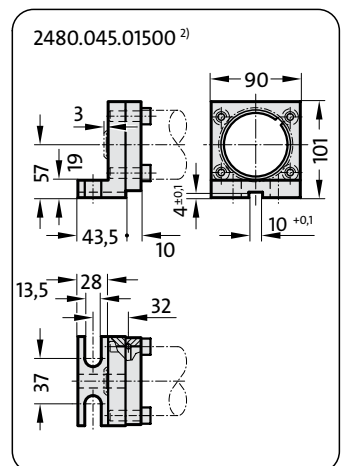
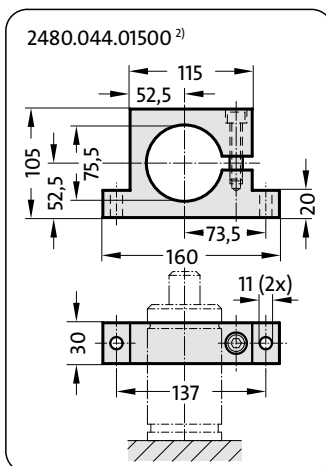
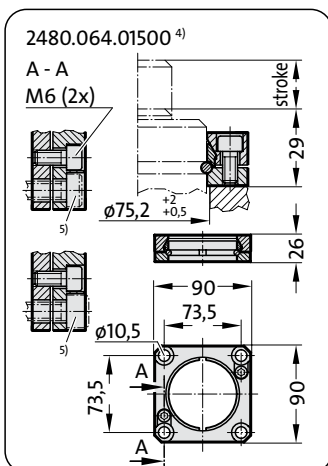
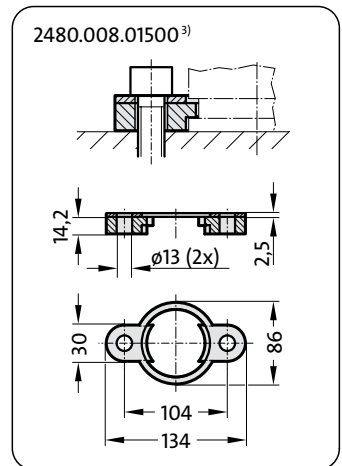
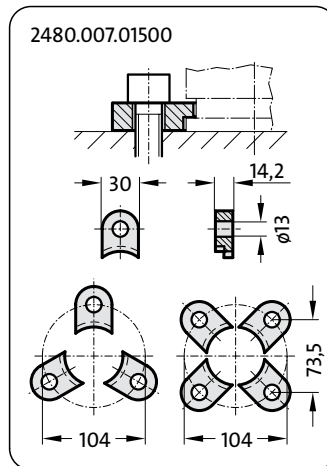
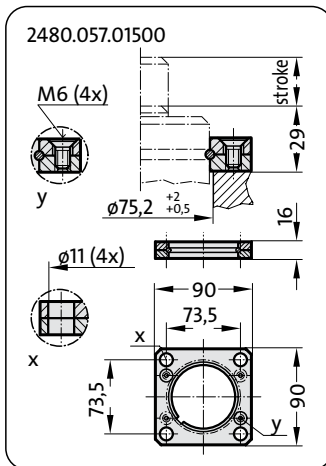
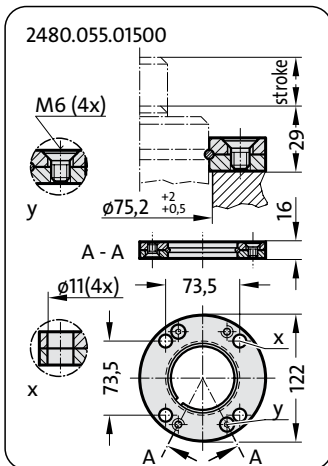
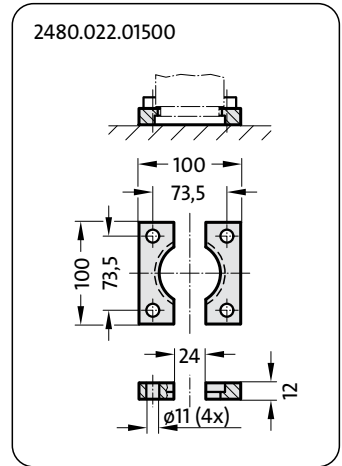
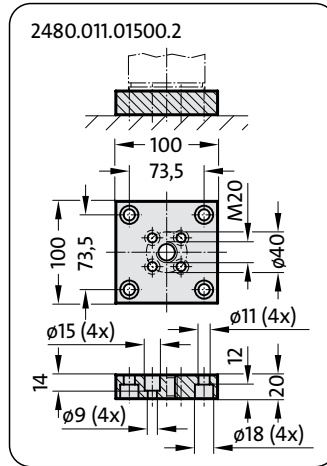
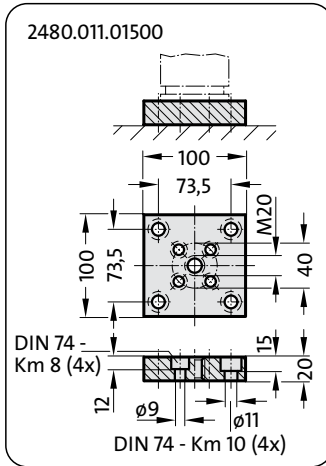
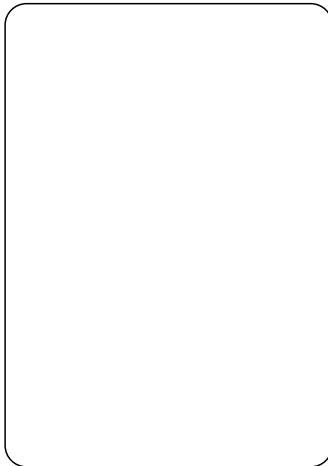
**Please note:** Springs must be installed with a recess of 25 mm to balance the total length difference (2 x stroke length = 50 mm). Alternatively, the contact surface of the sheet metal retainer can be recessed in order to achieve the same effect.



»Speed Control™«,  
SPC Gas Springs, cushioned  
Mounting Variations

FIBRO

2486.12.00750.



**Notes:**

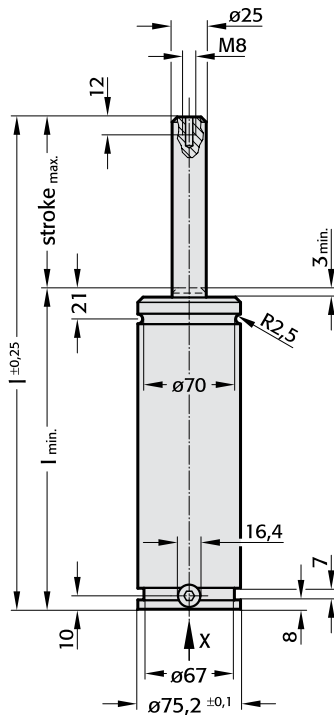
- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>3)</sup> Not for use with composite connection.
- <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
- <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).

2486.12.00750.

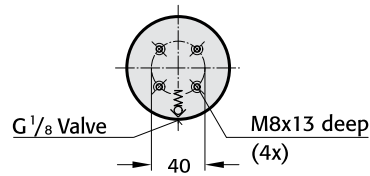
Initial spring force at 150 bar = 750 daN

Order No	stroke max.	$l_{min}$	$l$
2486.12.00750. 125	125	235	360
160	160	270	430
200	200	310	510
250	250	360	610
300	300	410	710

2486.12.00750.



View X



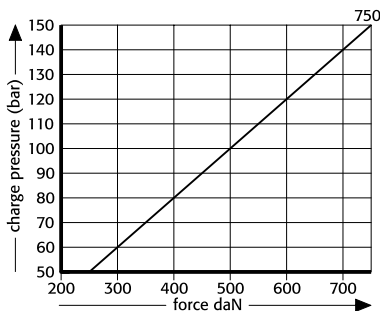
**Note:**

Order No for spare parts kit:  
2486.12.00750

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Recommended max. strokes/min: approx. 16 to 24 (at 20°C)  
 Dampening length: ~ 30 mm  
 Piston rod speed, decelerated: 0.4 m/s

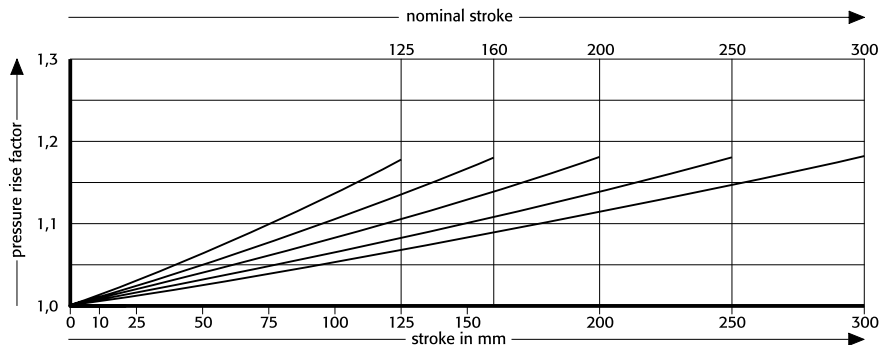
2486.12.00750.

Initial spring force versus charge pressure



2486.12.00750.

Spring force Diagram displacement versus stroke rise

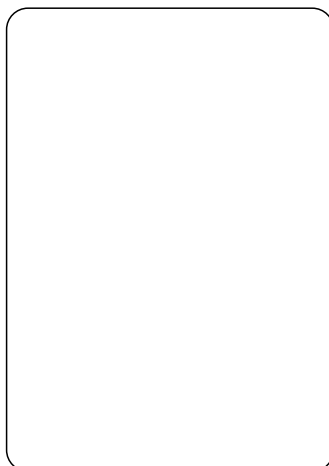
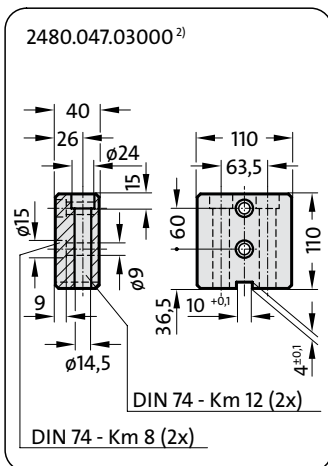
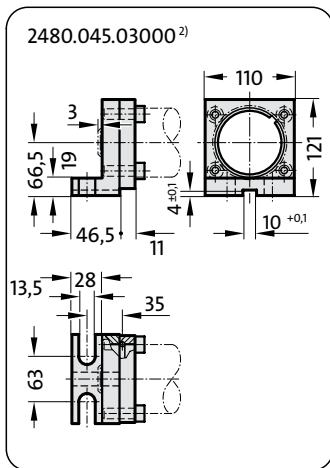
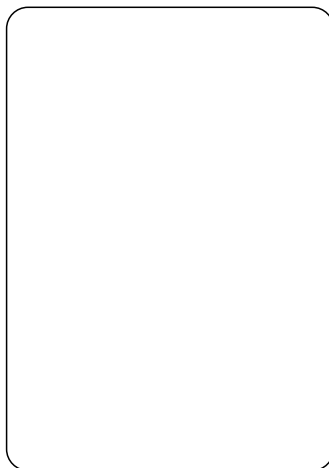
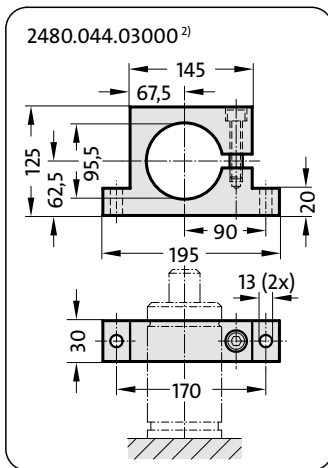
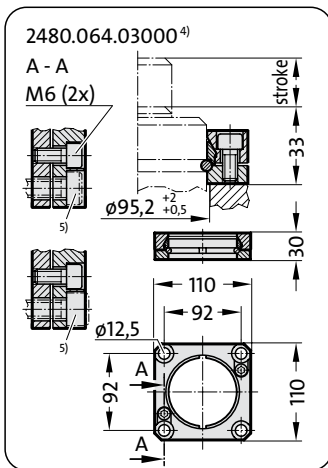
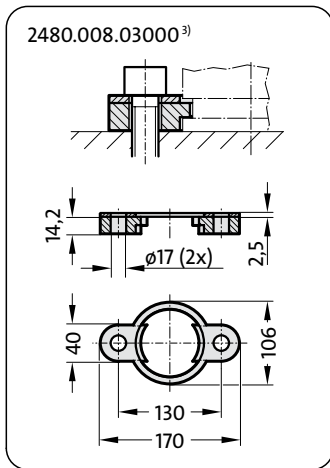
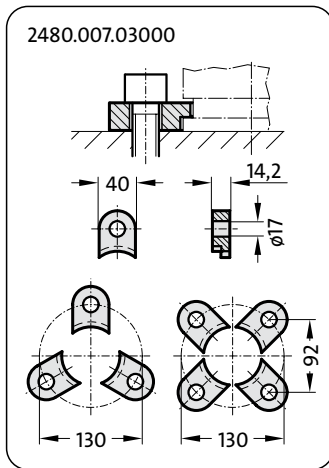
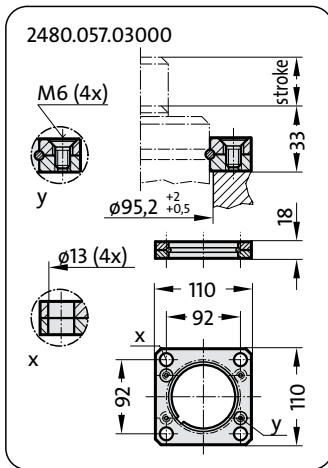
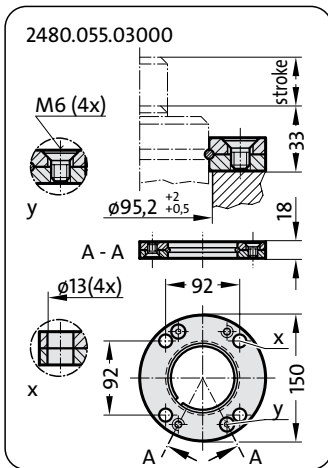
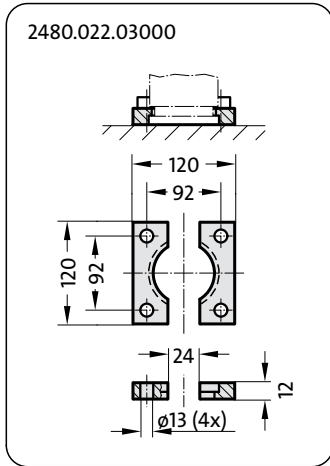
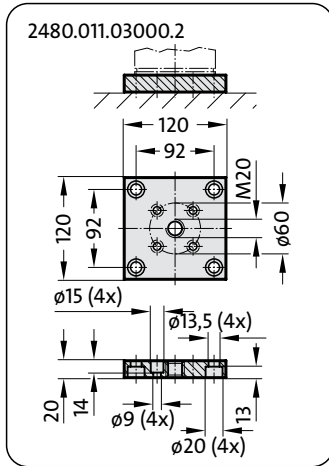
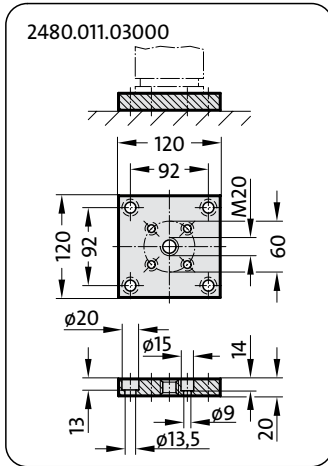
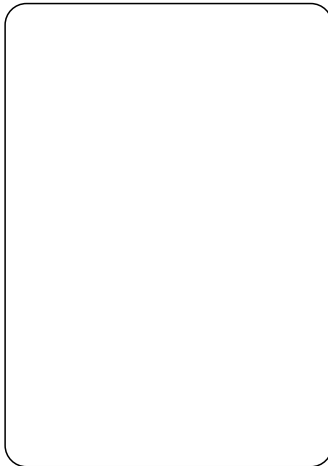


Pressure rise factor accounts for displacement but not external influences!

»Speed Control™«,  
SPC Gas Springs, cushioned  
Mounting Variations

FIBRO

2486.12.01500.



**Notes:**

- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>3)</sup> Not for use with composite connection.
- <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
- <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).

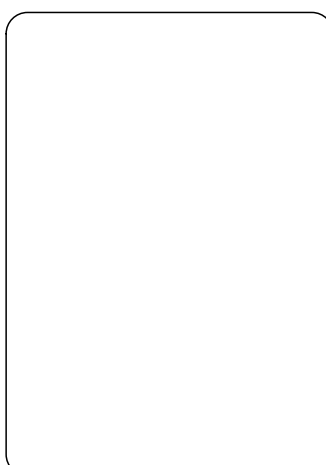
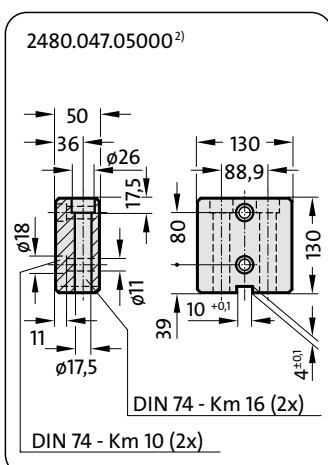
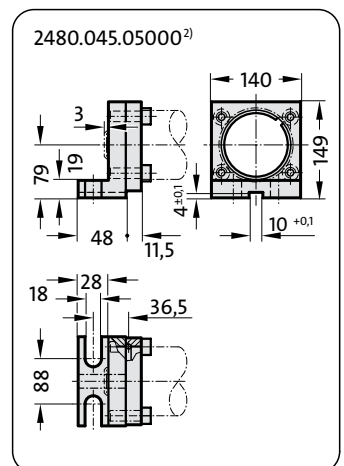
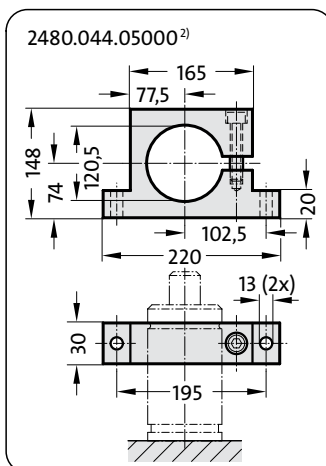
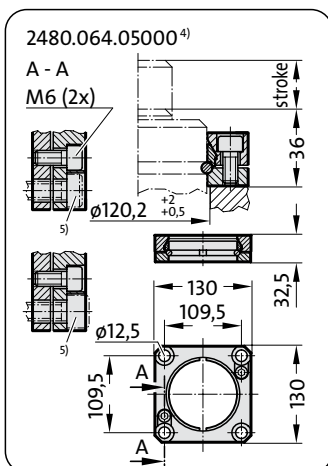
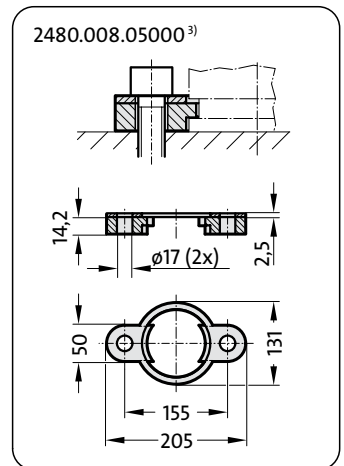
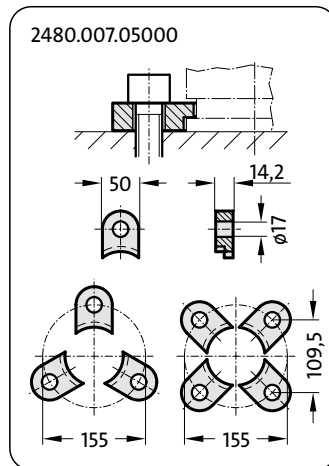
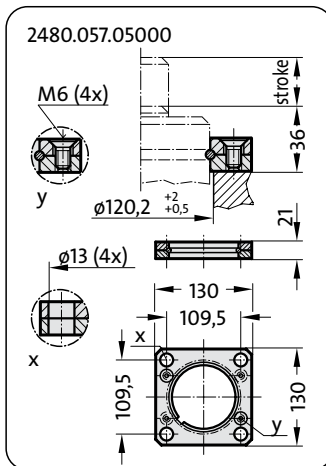
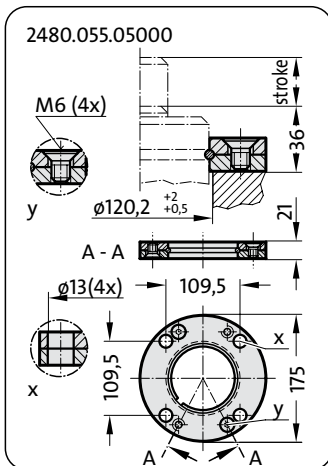
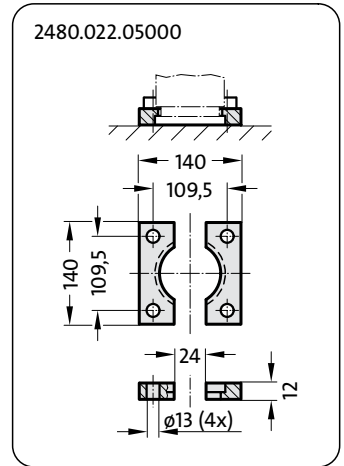
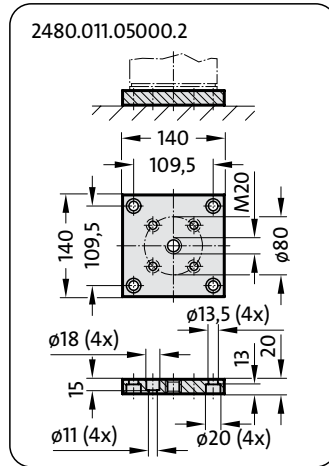
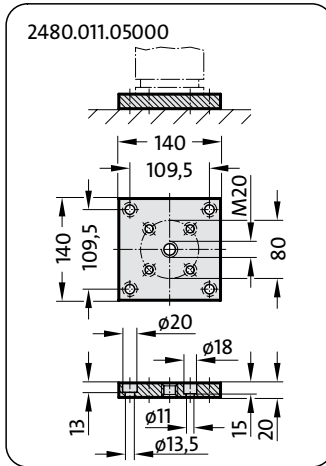
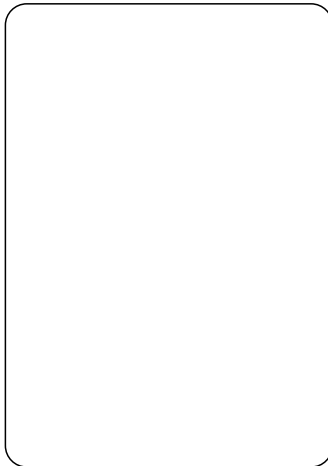




»Speed Control™«,  
SPC Gas Springs, cushioned  
Mounting Variations

FIBRO

2486.12.03000.



**Notes:**

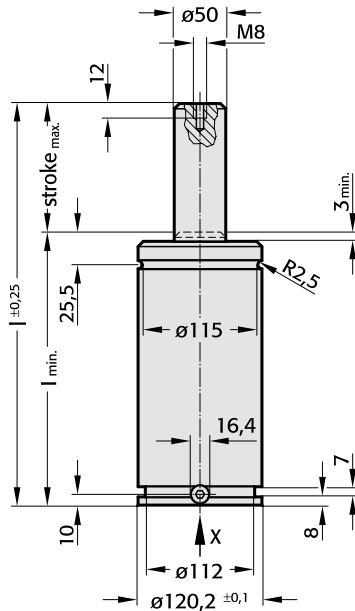
- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>3)</sup> Not for use with composite connection.
- <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
- <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).

2486.12.03000.

Initial spring force at 150 bar = 3000 daN

Order No	stroke max.	$l_{min}$	$l$
2486.12.03000.125	125	265	390
160	160	300	460
200	200	340	540
250	250	390	640
300	300	440	740

2486.12.03000.

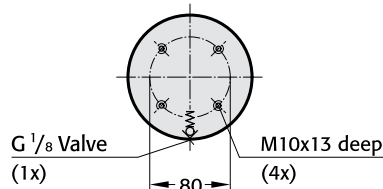


**Note:**

Order No for spare parts kit:  
2486.12.03000

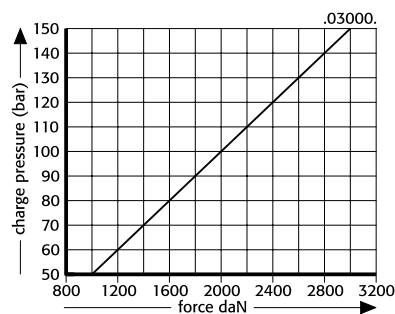
Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Operating temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Recommended max. strokes/min: approx. 10 to 13 (at 20°C)  
 Dampening length: ~ 30 mm  
 Piston rod speed, decelerated: 0.4 m/s

View X



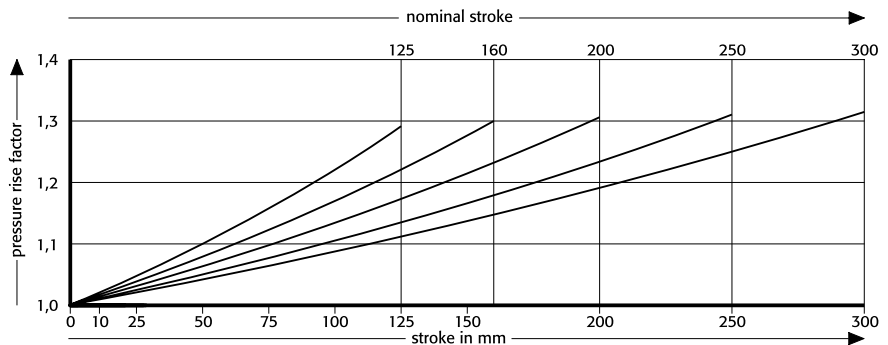
2486.12.03000.

Initial spring force versus charge pressure



2486.12.03000.

Spring force Diagram displacement versus stroke rise

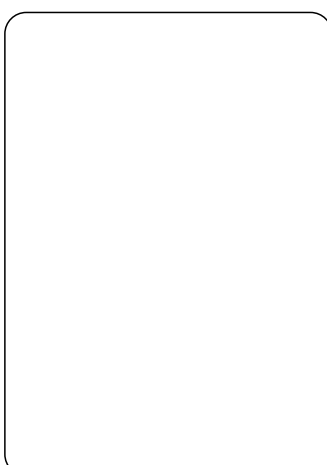
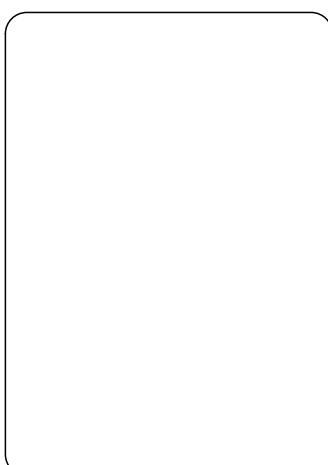
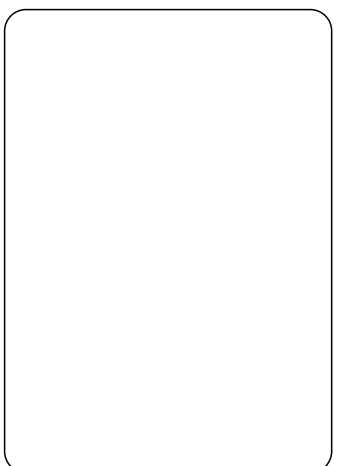
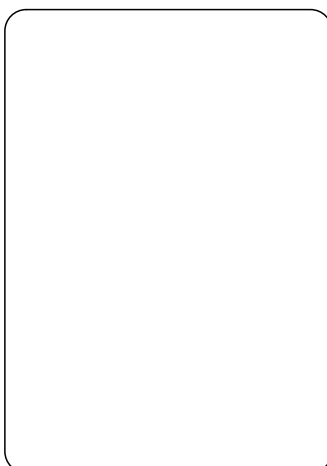
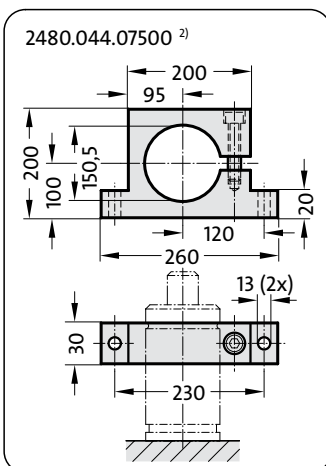
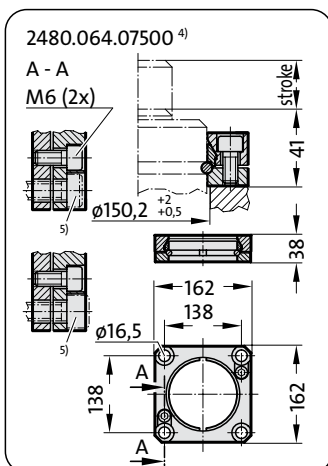
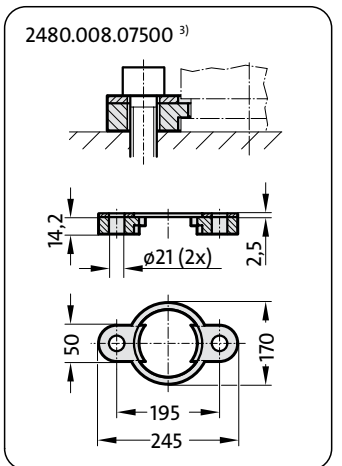
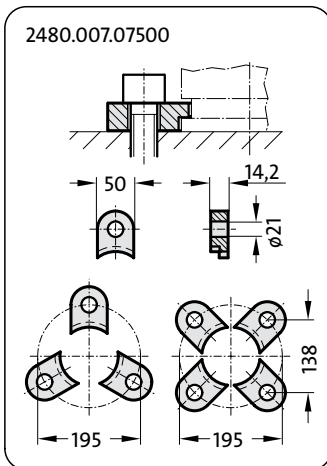
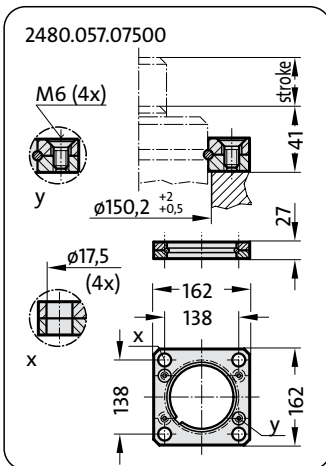
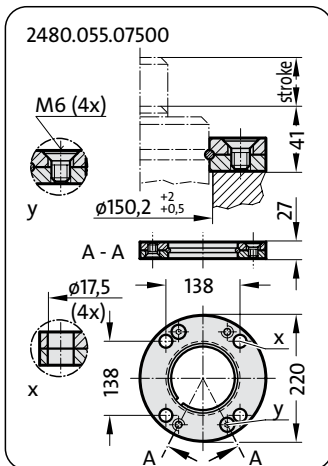
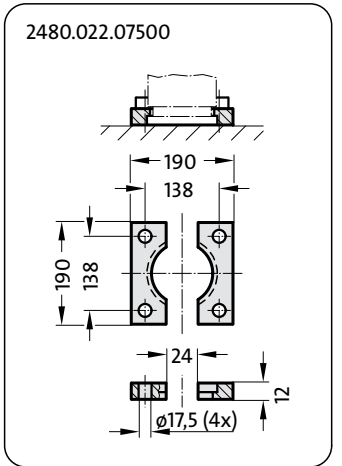
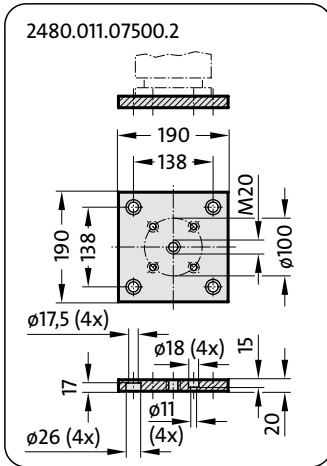
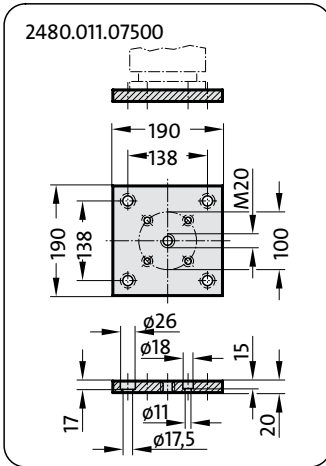
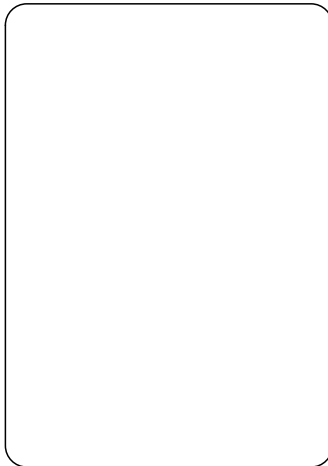


Pressure rise factor accounts for displacement but not external influences!

»Speed Control™«  
 SPC Gas Springs, cushioned  
 Mounting Variations

FIBRO

2486.12.05000.



**Notes:**

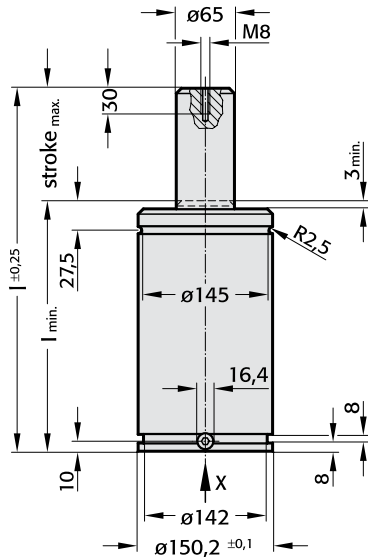
- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>3)</sup> Not for use with composite connection.
- <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
- <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).

**2486.12.05000.**

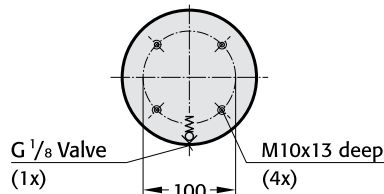
Initial spring force at 150 bar = 5000 daN

Order No	stroke max.	$l_{min}$	$l$
2486.12.05000.125	125	280	405
160	160	315	475
200	200	355	555
250	250	405	655
300	300	455	755

**2486.12.05000.**



View X



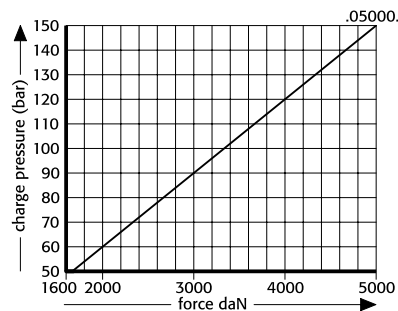
**Note:**

Order No for spare parts kit:  
2486.12.05000

Pressure medium: Nitrogen N<sub>2</sub>  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Operating temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Recommended max. strokes/min: approx. 6 to 11 (at 20°C)  
 Dampening length: ~ 30 mm  
 Piston rod speed, decelerated: 0.4 m/s

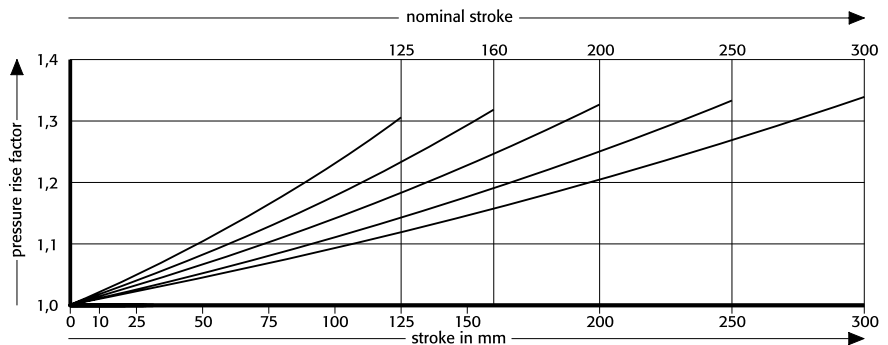
**2486.12.05000.**

Initial spring force versus charge pressure



**2486.12.05000.**

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!



# Gas Springs with Fastening to Ford Standard WDX



Please request your catalogue

A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.



# Gas Springs, threaded

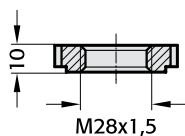
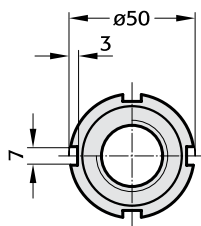
Gas Springs with external thread  
small dimensions and low forces  
Mounting Variation

FIBRO

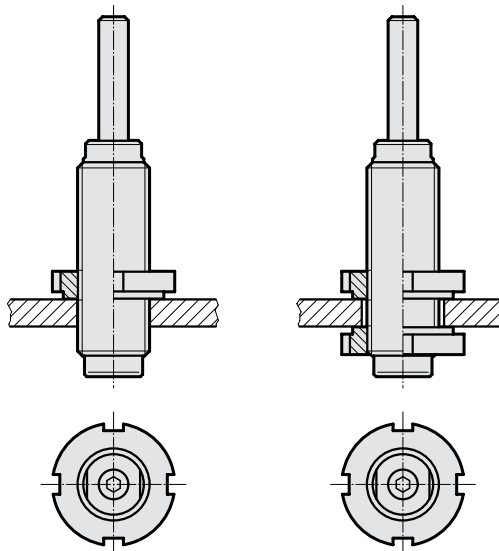
2480.32.

2480.005.00200

Slotted nut



Mounting example:

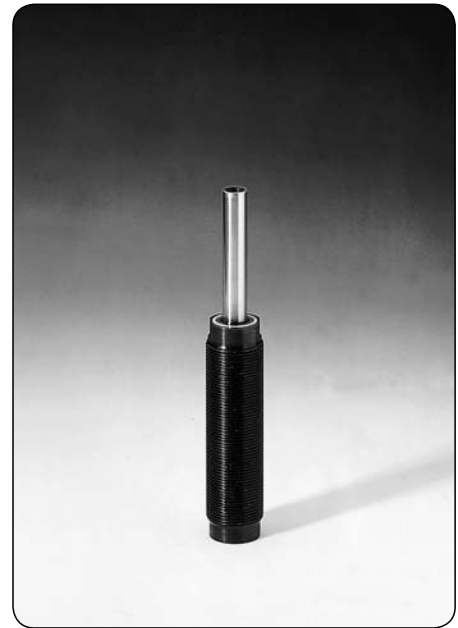
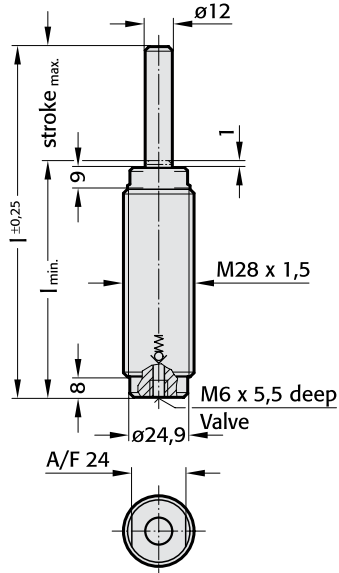


2480.32.00050.  
00100.  
00150.  
00200.

Order No	stroke		l	
	max.	l <sub>min.</sub>		
2480.32.	.010	10	52	62
	013	12,7	54,7	67,4
	016	16	58	74
	025	25	67	92
	038	38,1	80,1	118,2
	050	50	92	142
	063	63,5	105,5	169
	080	80	122	202
	100	100	142	242
	125	125	167	292

Order No for spare parts kit: 2480.21.00150

2480.32.



**Springs Force Colour Markings**

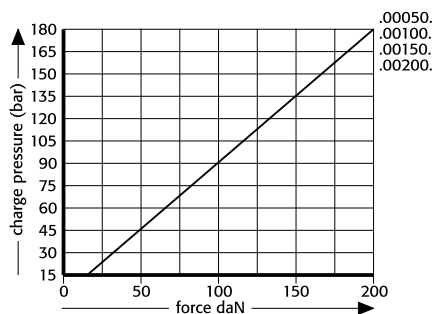
Order No	Initial spring force		Colour
	daN	bar	
2480.32.00050	50	45	green
00100.	100	90	blue
00150.	150	135	red
00200.	200	180	yellow
00000.*			black

\*As required by customer.  
Can also be supplied unfilled.

Pressure medium: Nitrogen N2  
Max. filling pressure: 180 bar  
Min. filling pressure: 25 bar  
Working temperature: 0°C to +80°C  
Temperature related force increase: ±0.3%/°C  
Max. recommended extensions per min.: approx. 80 to 100 (at 20°C)  
Max. piston speed: 1.6 m/s

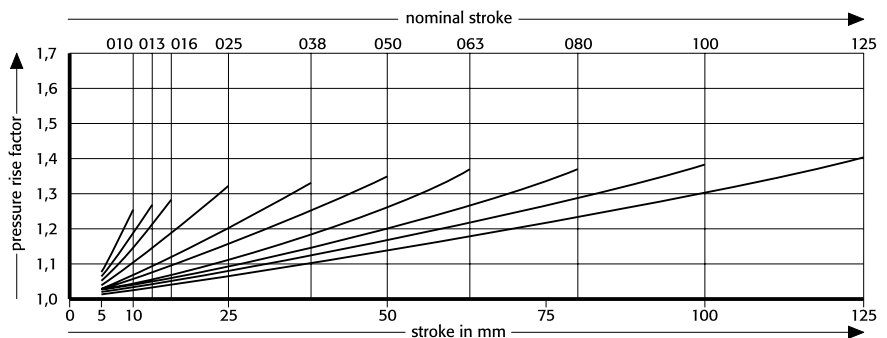
2480.32.

Initial spring force versus charge pressure



2480.32.

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

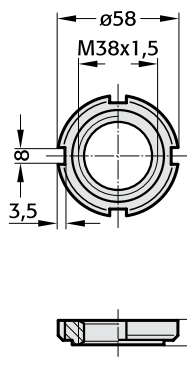
# Gas Springs with external thread Mounting Variations

**FIBRO**

2480.32.00250.

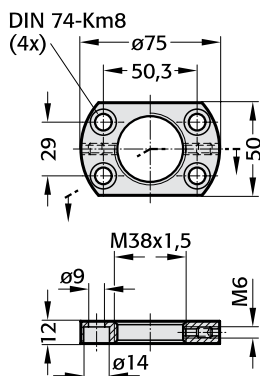
2480.005.00250

Slotted nut



2480.006.00250

Clamped flange

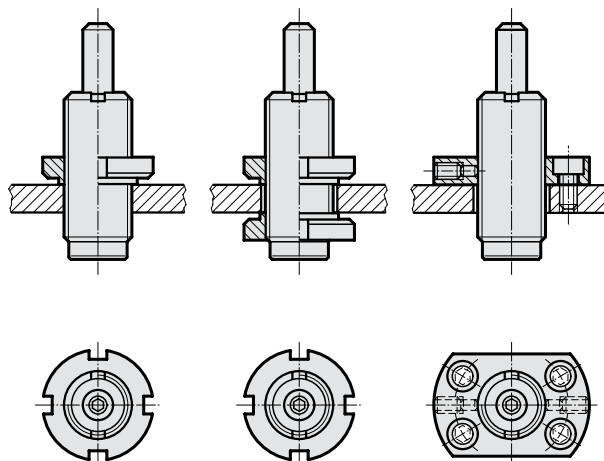


2480.00.51.01

Box spanner for assembling/disassembling  
of gas springs



Mounting example:



**2480.32.**

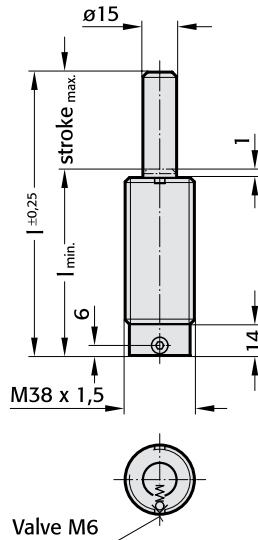
Initial spring force at 150 bar = 250 daN

Order No	stroke max.	$l_{min.}$	$l$
2480.32.00250.013	12,7	62,7	75,4
025	25	75	100
038	38,1	88,1	126,2
050	50	100	150
063	63,5	113,5	177
080	80	130	210
100	100	150	250

Order No for spare parts kit: 2480.12.00250

Pressure medium: Nitrogen N2  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 50 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per min.: approx. 80 to 100 (at 20°C)  
 Max. piston speed: 1.6 m/s

**2480.32.00250.**



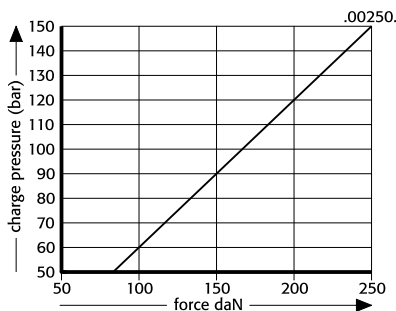
Installation with ring nut(s) 2480.005.00250 can be done with one or two ring nuts. If the hole in the bolster plate is not threaded, two ring nuts are needed. Holes threaded M 38 × 1,5 require one only ring nut for mounting of the Gas Springs.

Mounting with a threaded flange plate has the advantage of a degree of adjustability as far as the flange screws permit. Moreover it is often found easier to make do with a clearance hole in the tool plate. Locking is by way of two lock screws with thrust plugs, provided in the threaded flange.

Diameter of through-hole in tool plate = 38 mm – plus four tapped holes M 8.

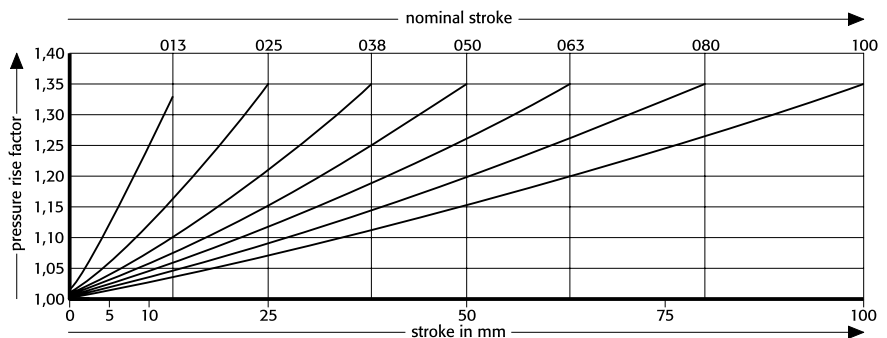
**2480.32.00250.**

Initial spring force versus charge pressure



**2480.32.00250.**

Spring force Diagram displacement versus stroke rise

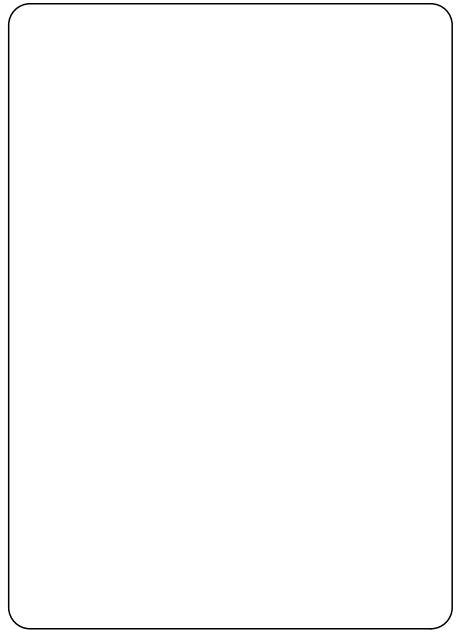
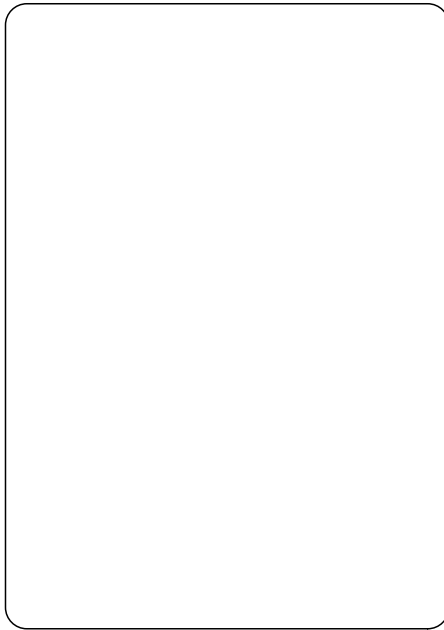
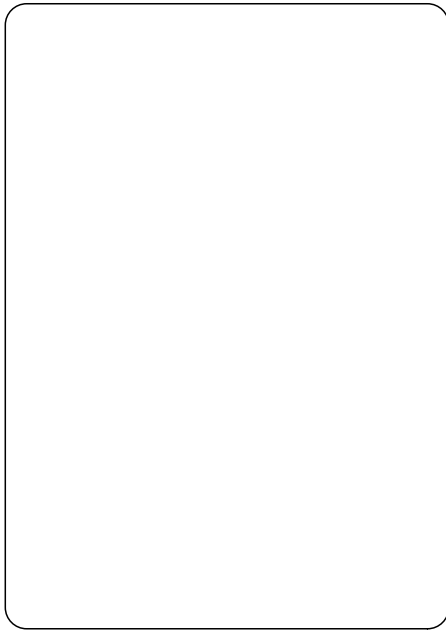


Pressure rise factor accounts for displacement but not external influences!

Gas Springs  
with male fixing thread, small dimensions  
Mounting Variations

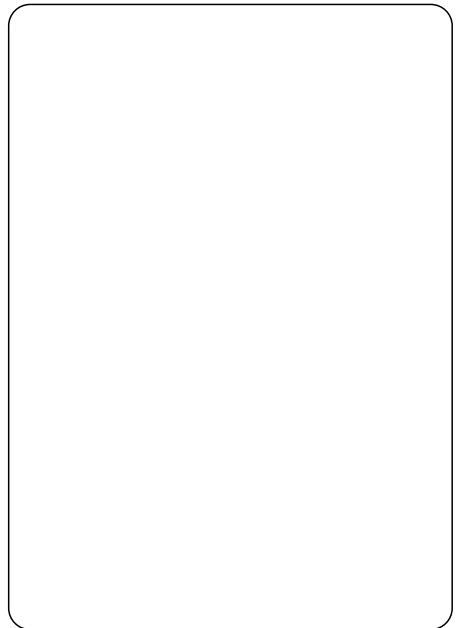
FIBRO

2480.82.00250.

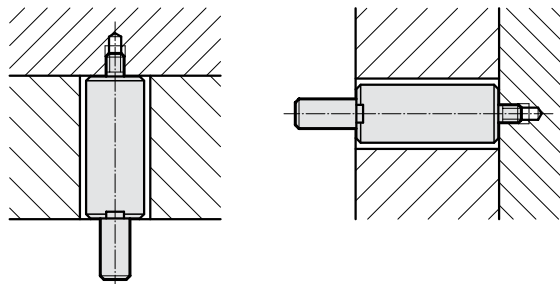


2480.00.51.01

Box spanner for assembling/disassembling  
of gas springs



Mounting example:



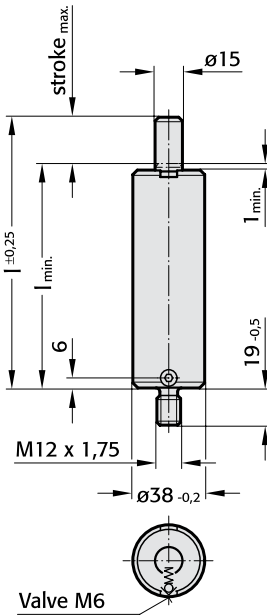
2480.82.00250.

Initial spring force at 150 bar = 250 daN

Order No	stroke max.	$l_{min.}$	$l$
2480.82.00250.013	12,7	62,7	75,4
025	25	75	100
038	38,1	88,1	126,2
050	50	100	150
063	63,5	113,5	177
080	80	130	210
100	100	150	250

Order No for spare parts kit: 2480.12.00250

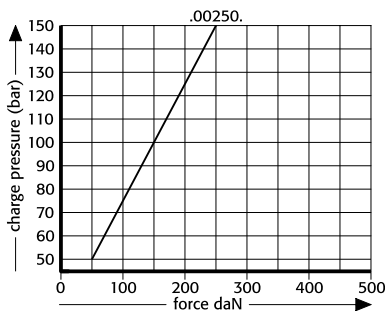
2480.82.00250.



Pressure medium: Nitrogen N2  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 50 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per min.: approx. 80 to 100 (at 20°C)  
 Max. piston speed: 1.6 m/s

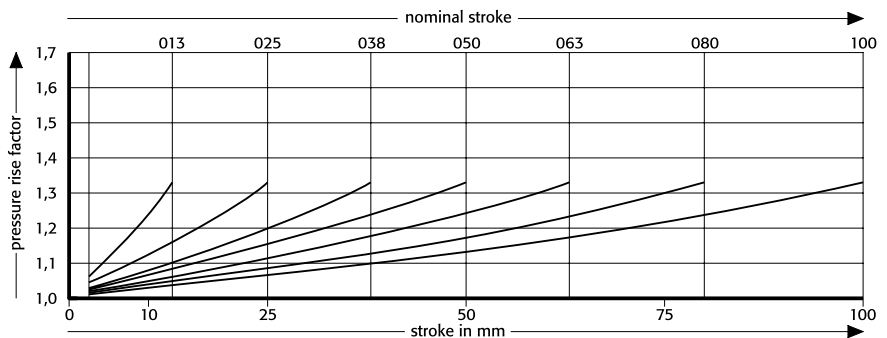
2480.82.00250.

Initial spring force versus charge pressure



2480.82.00250.

Spring force Diagram displacement versus stroke rise

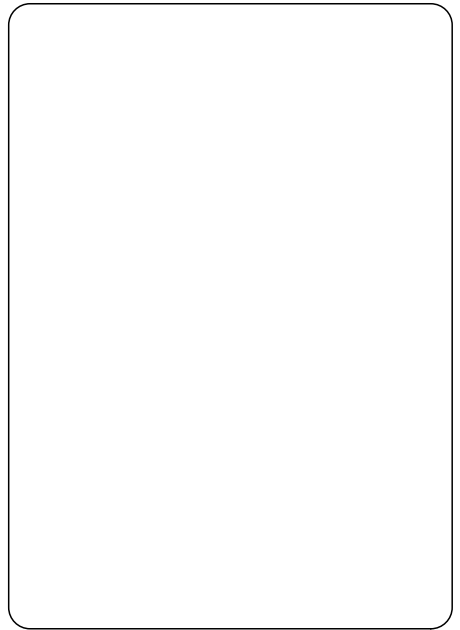
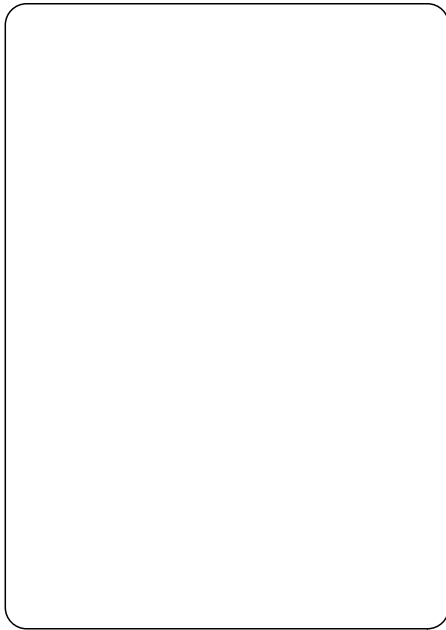


Pressure rise factor accounts for displacement but not external influences!

**POWER LINE Gas Springs**  
with male fixing thread and increased spring force  
Mounting Variations

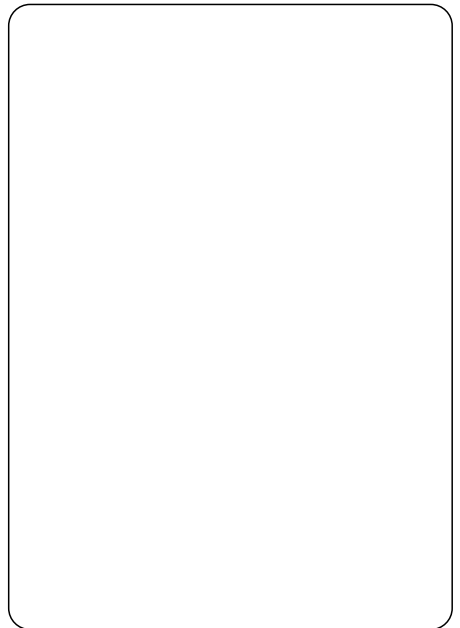
**FIBRO**

2487.82.01000.

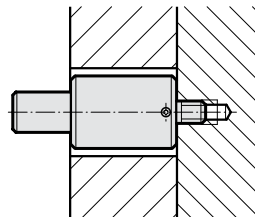
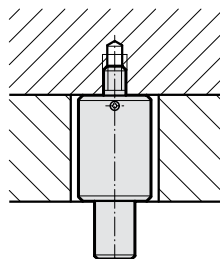


**2480.00.51.05**

Box spanner for assembling/disassembling  
of gas springs



**Mounting example:**





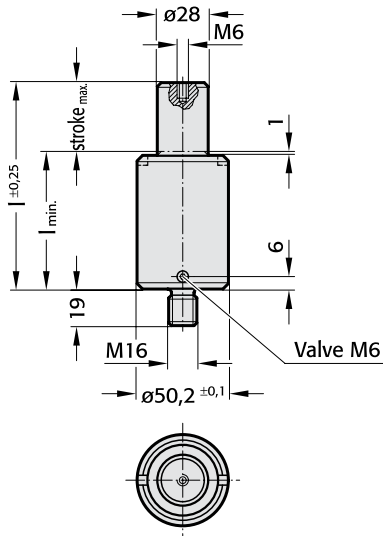
**2487.82.01000.**

Initial spring force at 150 bar = 920 daN

Order No	stroke max.	$l_{min.}$	$l$
2487.82.01000.013	13	51	64
016	16	54	70
019	19	57	76
025	25	63	88
032	32	70	102
038	38	76	114
050	50	88	138
063	63	101	164
075	75	113	188
080	80	118	198
100	100	138	238
125	125	163	288

Order No for spare parts kit: 2487.12.01000

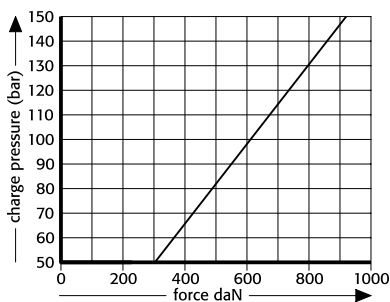
**2487.82.01000.**



Pressure medium: Nitrogen N2  
 Max. filling pressure: 150 bar  
 Min. filling pressure: 25 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per min.: approx. 50 to 100 (at 20°C)  
 Max. piston speed: 1.6 m/s

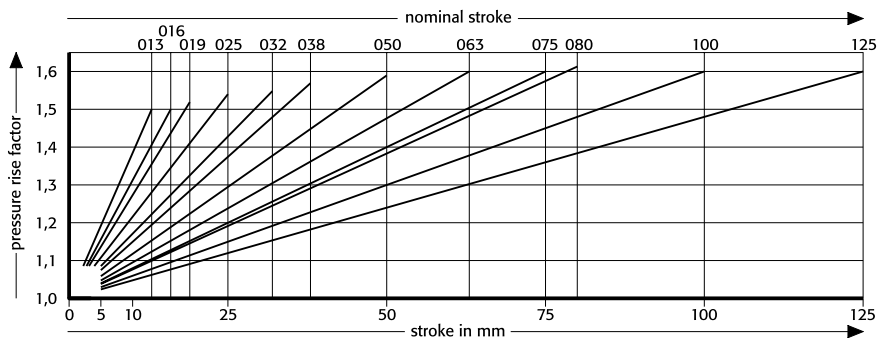
**2487.82.01000.**

Initial spring force versus charge pressure



**2487.82.01000.**

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!



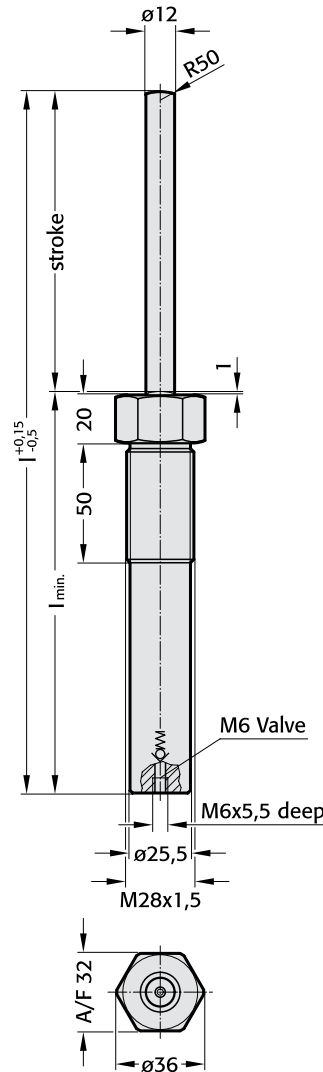
# Gas Springs with hexagonal flange (Stabiliser)

**FIBRO**

**2480.33.**



2480.33.



2480.33.00015.125  
00050.125  
00100.125  
00150.125  
00200.125

Order No	stroke	$l_{min}$	$l$
2480.33.	.125	125	167 292

Pressure medium: Nitrogen N2  
 Max. filling pressure: 180 bar  
 Min. filling pressure: 13 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase: ±0.3%/°C  
 Max. recommended extensions per min.: approx. 80 to 100 (at 20°C)  
 Max. piston speed: 1.6 m/s

### Springs Force Colour Markings

Order No	pressure bar	Initial spring force daN	Colour
2480.33.00015.	13	15	Black
00050.	45	50	Green
00100.	90	100	Blue
00150.	135	150	Red
00200.	180	200	Yellow

### Description:

The gas springs are colour-coded according to the spring force rating ranges 15-50-100-150-200 daN. All springs, regardless of their spring force ratings, are of the same design. The differing force ratings result exclusively from the differing charge pressures. Do take into consideration the colour-coded pressure rating during repair work and recharging.

### Note:

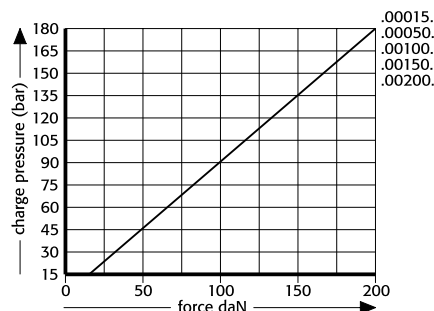
Other stroke lengths available on request! See Gas Springs 2480.32.  
 Order No for spare parts kit: 2480.21.00150

### Ordering code (example):

Gas spring = 2480.33.  
 Force 50 daN = 00050.  
 Stroke 125 mm = 125  
 Order No = 2480.33.00050.125

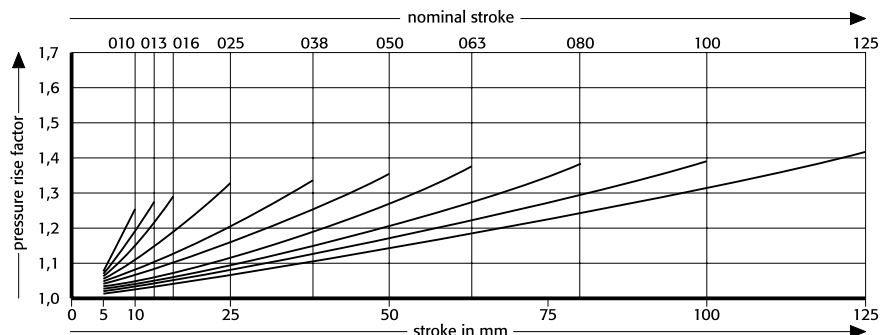
2480.33.

Initial spring force versus charge pressure



2480.33.

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

# LCF gas springs, damped

## Description

The LCF series represents a whole new generation of nitrogen-filled gas springs developed to meet the needs of the machine tool and press-making industries.

Negative factors such as

- high impact stresses
  - excessive noise
  - extreme bounce off the pad
- are all minimised by LCF springs.

Characteristics such as

- dimensions
  - fixing methods
  - filling with gas and purging
  - working in interconnected systems
- are identical to those for standard ISO or type 2480.13 gas springs.



\* LCF Force Manager is a trade mark of Associated Spring

The springs from the LCF series reduce impact stresses by 50% compared to conventional gas springs.

The force builds up gradually and acceleration is uniform, reducing wear on both tool and press. As a result, less maintenance is required.

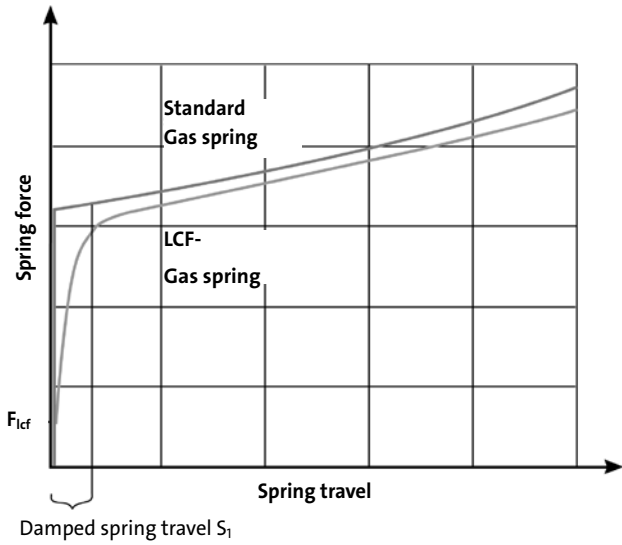
LCF springs are at least 20% quieter than standard gas springs.

The reduced noise level is due to the lower impact force, making these springs a cost-effective alternative to soundproofing panels. They are thus more economical and environmentally-friendly.

The LCF springs reduce the extreme bounce off the pad during the return stroke, thus lessening vibration on the workpiece and allowing the workpiece to be transported more effectively.

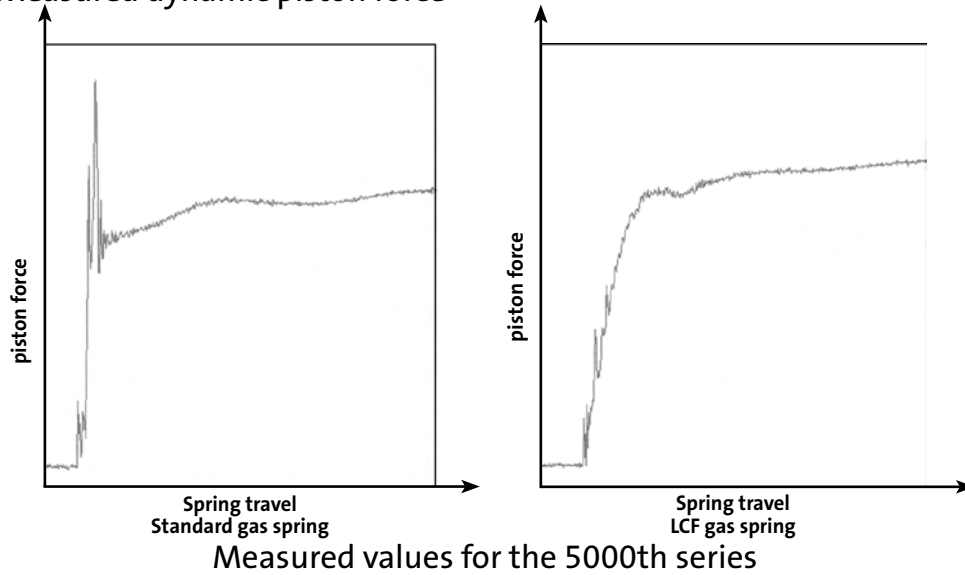
Since the spring travel is damped, the pad motion is more uniform, so in many cases the press stroke rate and thus productivity can be increased.

Force diagram for gas springs

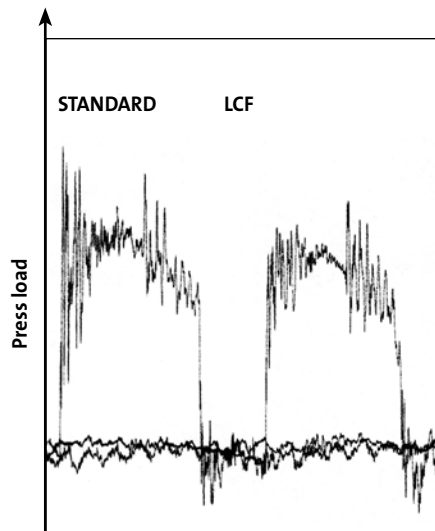


With the springs from the LCF series, the force builds up gradually and acceleration is uniform.

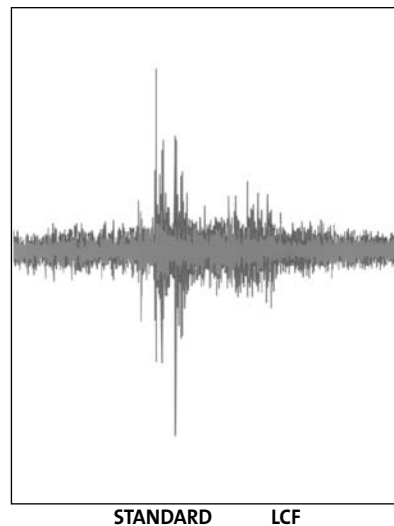
Measured dynamic piston force



Comparative press load diagram

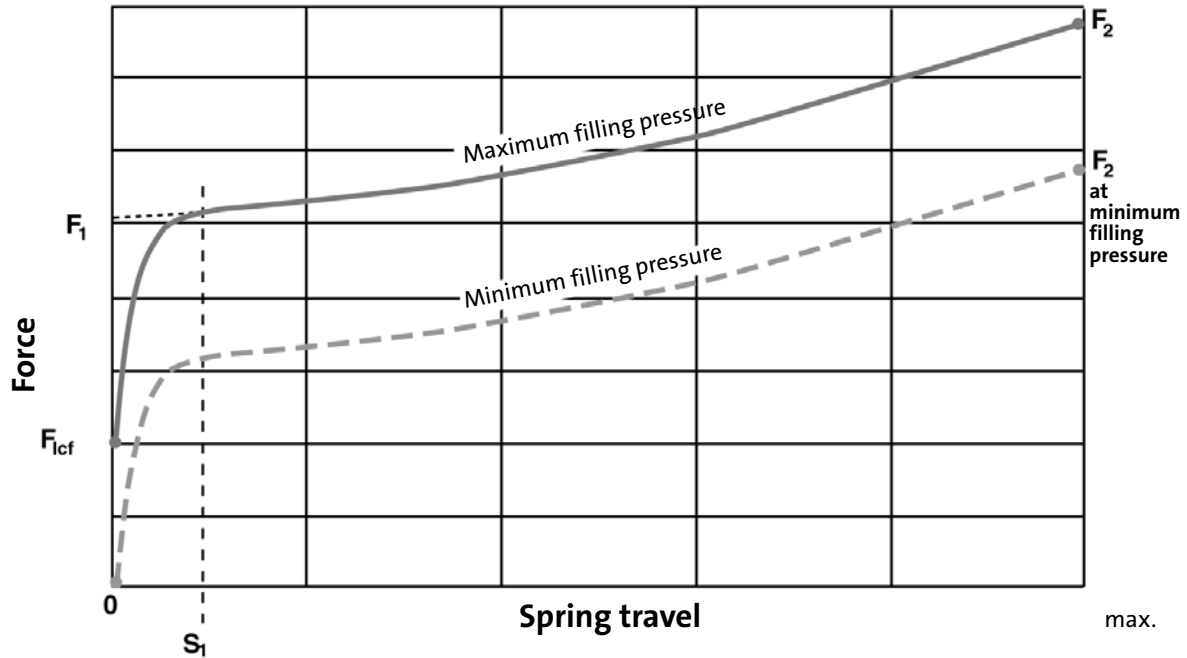


Noise reduction



The springs from the LCF series are quieter due to the reduced impact force.

Force diagram for gas springs



Note: Maximum pressure for LCF gas springs: 150 bar. Observe minimum filling pressure.

Guidelines for the use of LCF gas springs

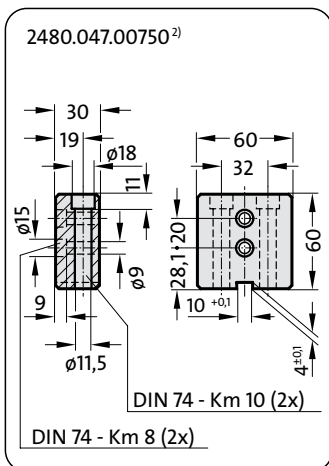
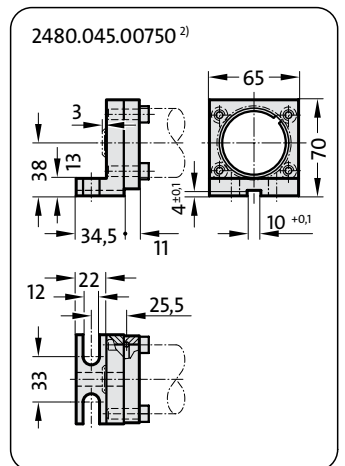
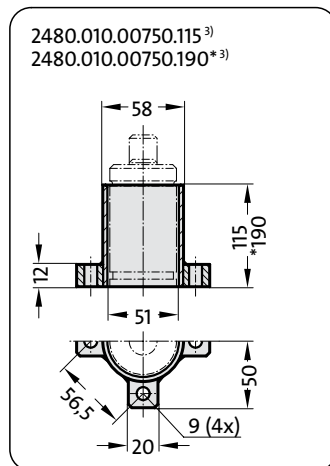
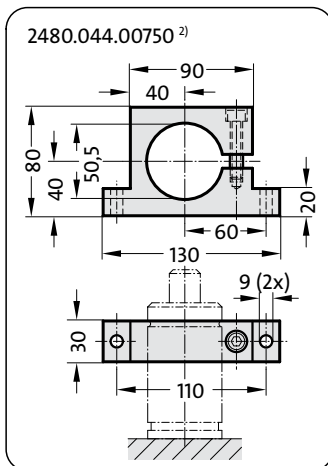
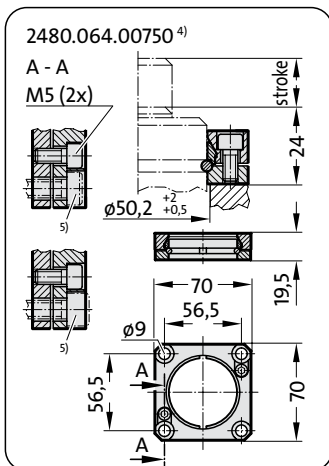
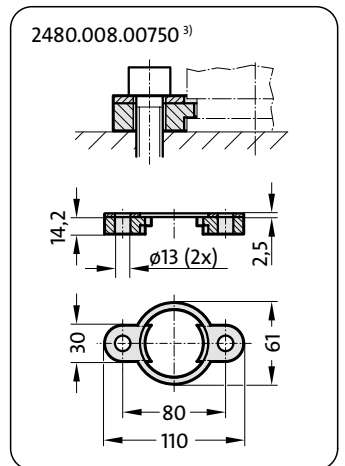
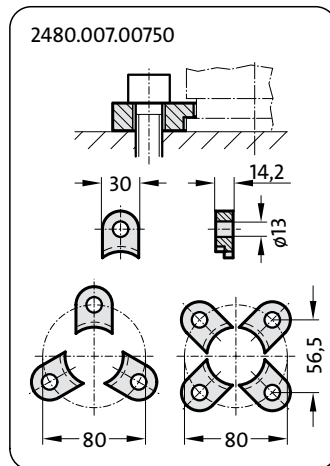
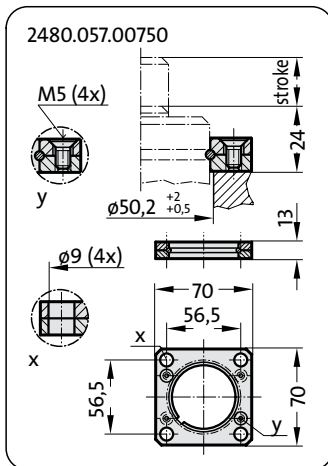
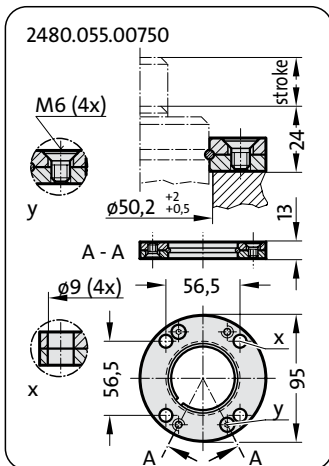
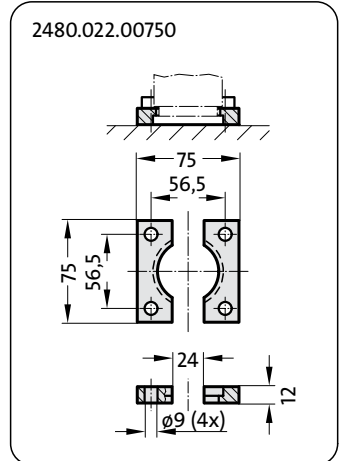
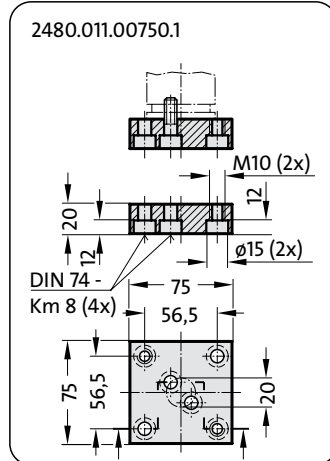
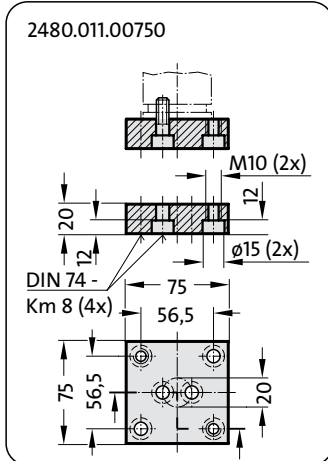
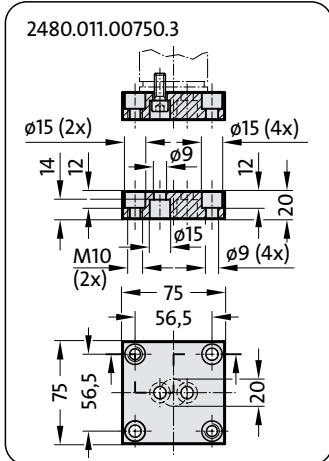
1. After the damped spring travel ( $S_1$ ) the LCF gas spring achieves the same initial spring force ( $F_1$ ) and pressure build up as the standard gas spring (to ISO).
2. The spring force ( $F_{lcf}$ ) should exceed the weight (e.g. the pad) by at least 15% so that it is held in the correct position (this does not apply in the case of minimum filling pressure).

Spring Size	$F_{lcf}$ at 150 bar in daN	Damped spring travel $S_1$	Minimum filling pressure in bar
2484.13.00750.	470	3,1	70
2484.12.01500.	700	4,6	105
2484.13.03000.	1600	3,8	69
2484.13.05000.	2500	7,7	76
2484.13.07500.	3000	10,4	90



Gas Springs  
Mounting Variations

2484.13.00750.



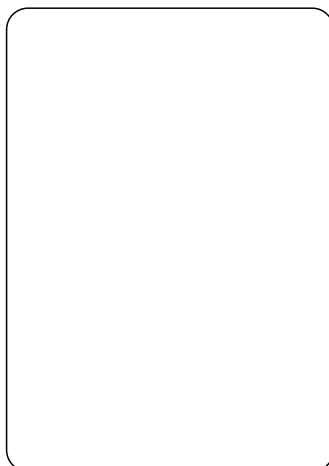
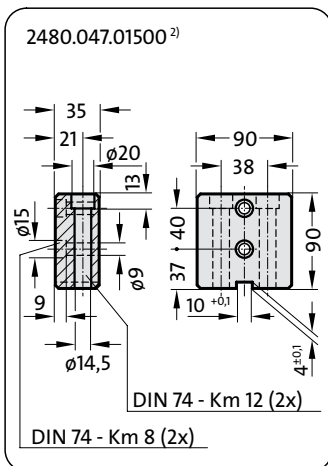
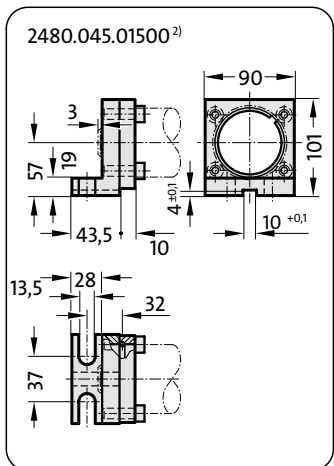
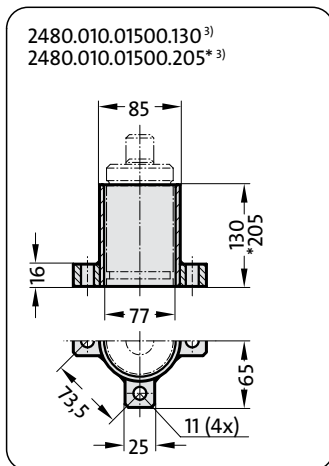
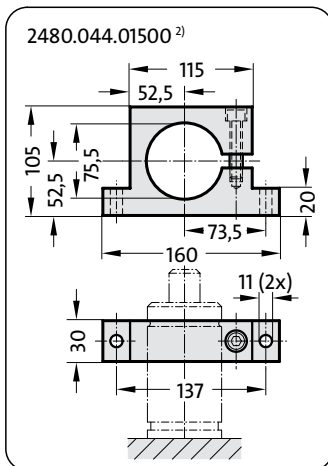
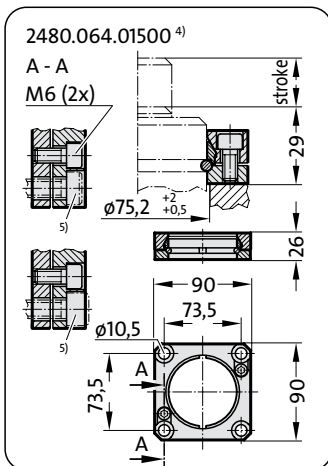
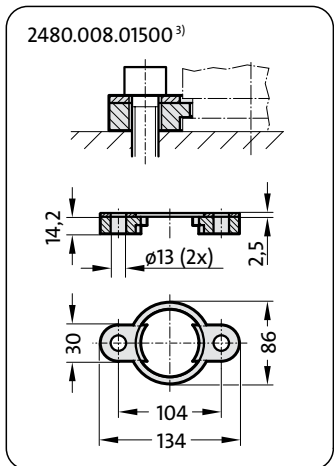
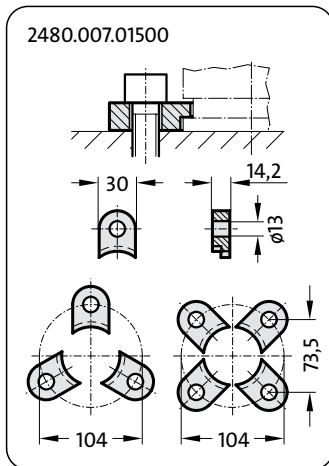
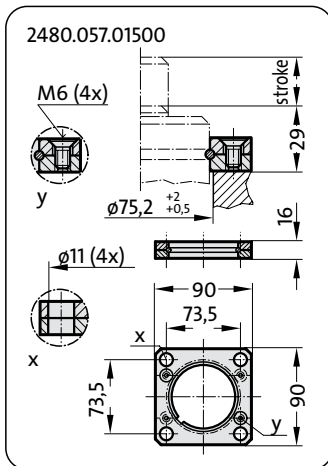
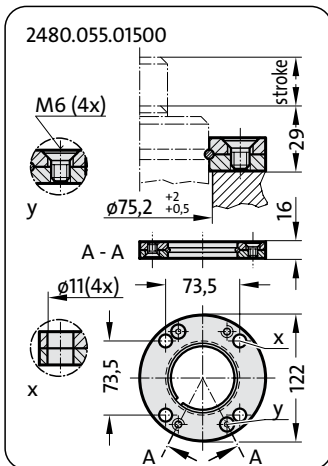
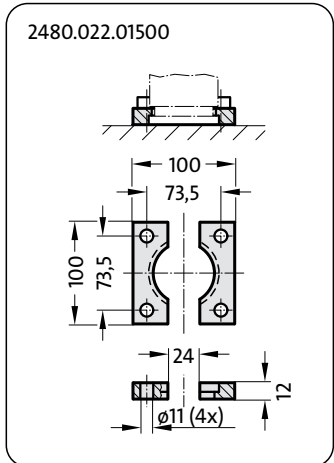
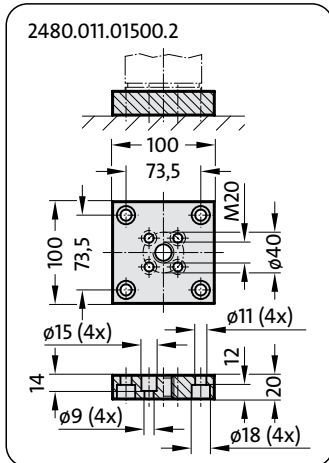
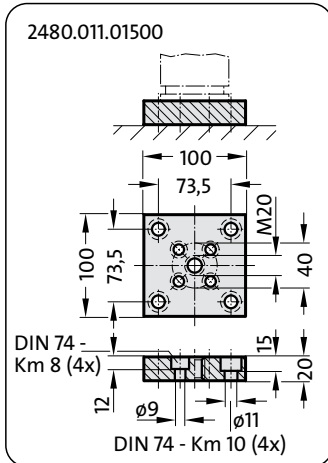
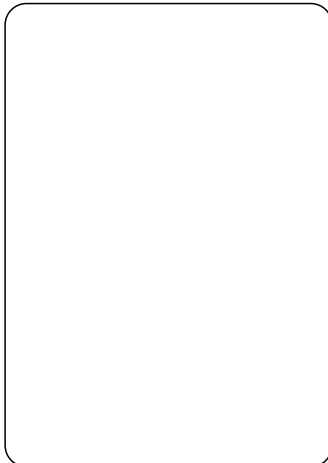
- Notes:**
- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
  - <sup>3)</sup> Not for use with composite connection.
  - <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
  - <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).





Gas Springs  
Mounting Variations

2484.12.01500.



**Notes:**

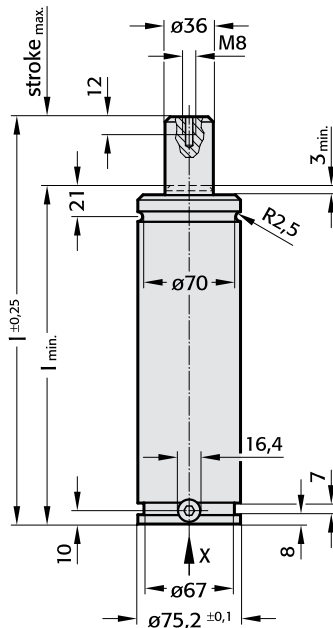
- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>3)</sup> Not for use with composite connection.
- <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
- <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).

**2484.12.01500.**

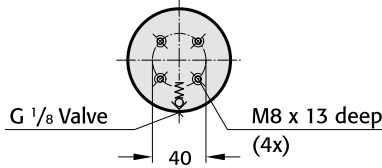
Initial spring force  $F_{LCF}$  at 150 bar = 700 daN  
Full spring force after 4.6 mm damped spring travel

Order No	stroke max.	$l_{min}$	$l$
2484.12.01500.025	25	135	160
038	38,1	148,1	186,2
050	50	160	210
063	63,5	173,5	237
080	80	190	270
100	100	210	310
125	125	235	360
160	160	270	430
200	200	310	510
250	250	360	610
300	300	410	710

**2484.12.01500.**



View X - Gas spring



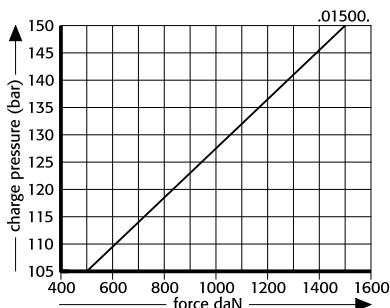
**Note:**

Order No for spare parts kit:  
2484.12.01500

- Pressure medium: Nitrogen N<sub>2</sub>
- Max. filling pressure: 150 bar
- Min. filling pressure: 105 bar
- Working temperature: 0°C to +80°C
- Temperature related force increase: ±0.3%/°C
- Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
- Max. piston speed: 1.6 m/s

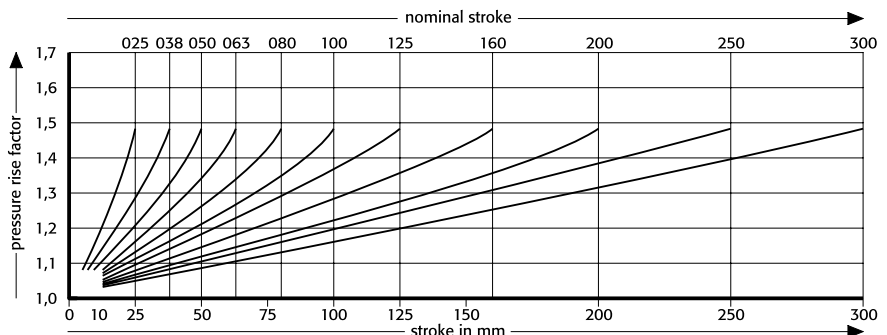
**2484.12.01500.**

Initial spring force versus charge pressure



**2484.12.01500.**

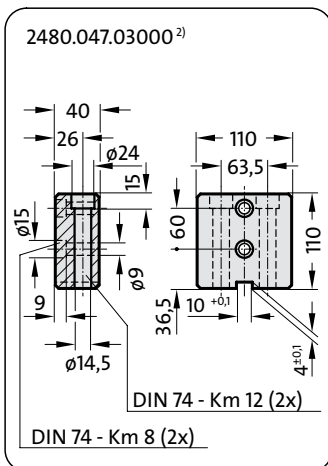
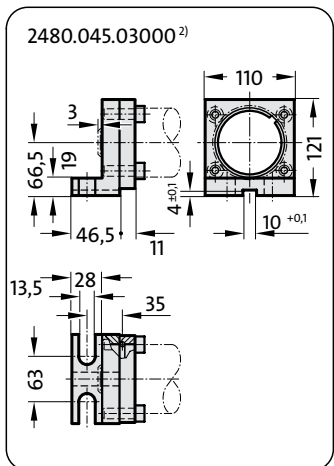
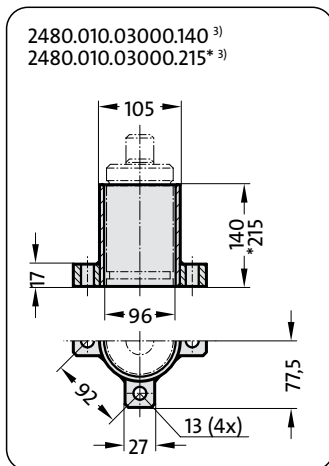
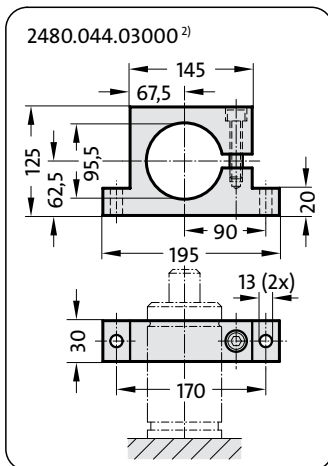
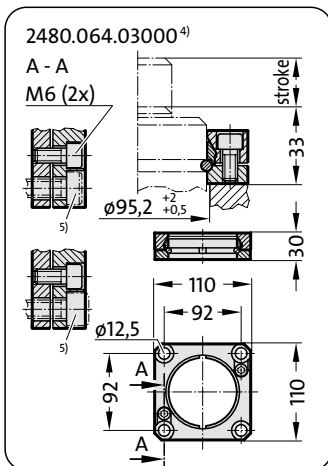
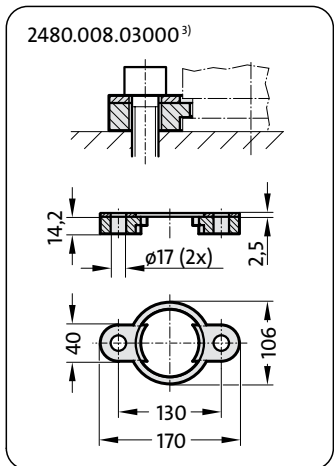
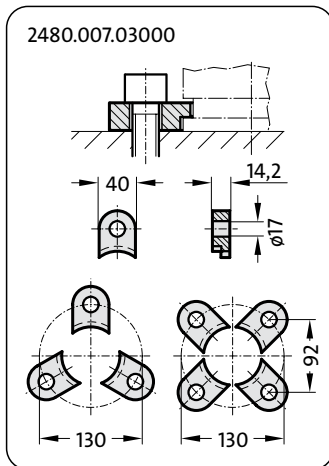
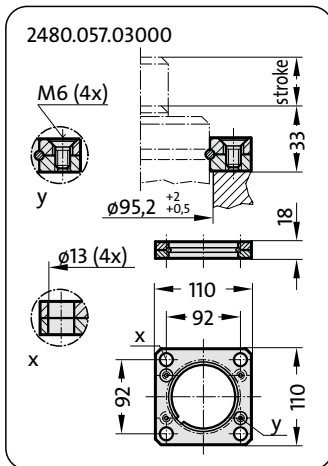
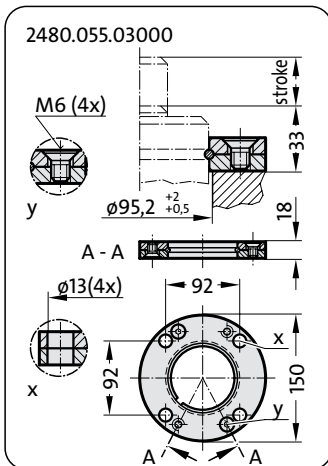
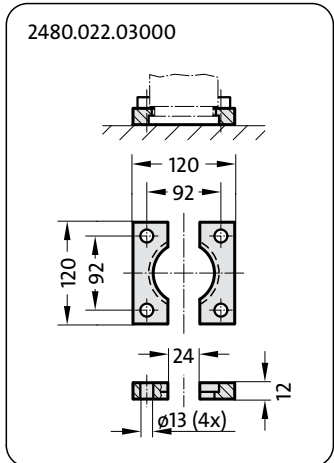
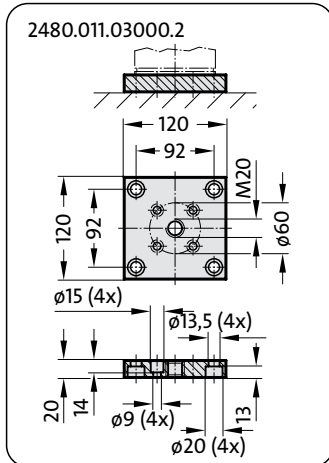
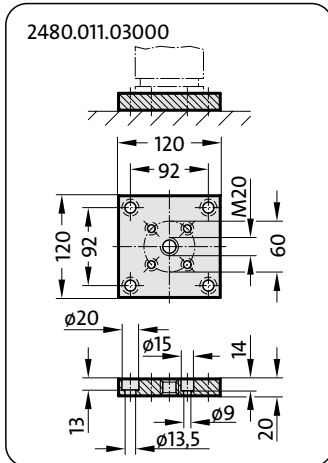
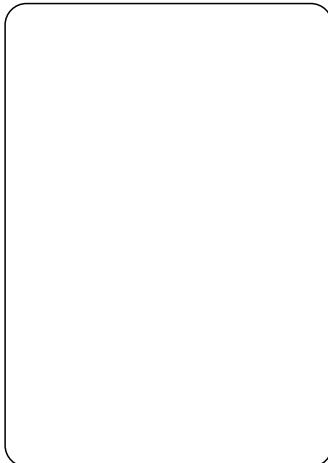
Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

Gas Springs  
Mounting Variations

2484.13.03000.



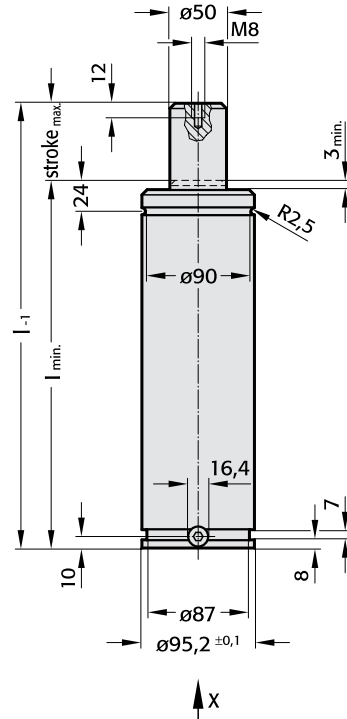
- Notes:**
- 2) Attention:  
The spring force must be absorbed by the stop surface.
  - 3) Not for use with composite connection.
  - 4) Square collar flange, non-rotating, fixing for composite connection.
  - 5) Machine screws with hexagonal socket (compact head recommended).

### 2484.13.03000.

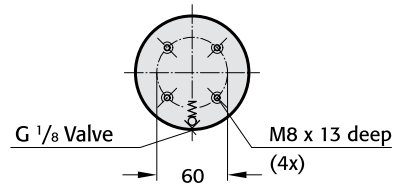
Initial spring force  $F_{LCF}$  at 150 bar = 1600 daN  
Full spring force after 3.8 mm damped spring travel

Order No	stroke max.	$l_{min}$	$l$
2484.13.03000.025	25	145	170
038	38,1	158,1	196,2
050	50	170	220
063	63,5	183,5	247
080	80	200	280
100	100	220	320
125	125	245	370
160	160	280	440
200	200	320	520
250	250	370	620
300	300	420	720

### 2484.13.03000.



View X - Gas spring



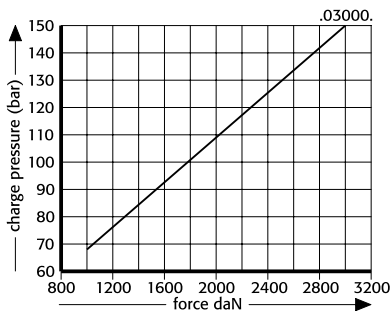
### Note:

Order No for spare parts kit:  
2484.13.03000

Pressure medium: Nitrogen  $N_2$   
 Max. filling pressure: 150 bar  
 Min. filling pressure: 68 bar  
 Working temperature:  $0^\circ C$  to  $+80^\circ C$   
 Temperature related force increase:  $\pm 0.3\%/^\circ C$   
 Max. recommended extensions per minute: approx. 15 to 40 (at  $20^\circ C$ )  
 Max. piston speed: 1.6 m/s

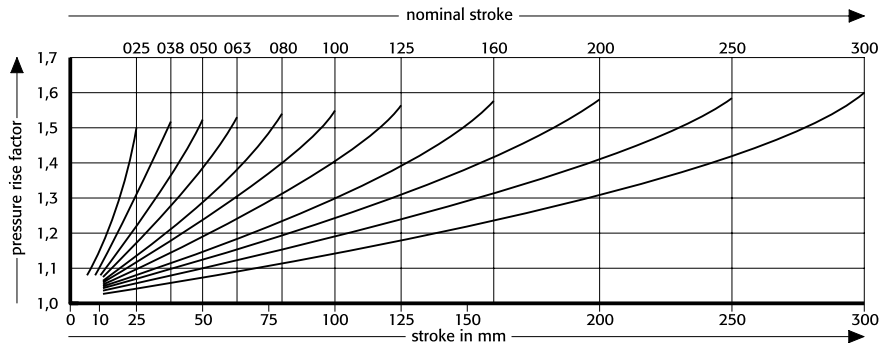
### 2484.13.03000.

Initial spring force versus charge pressure



### 2484.13.03000.

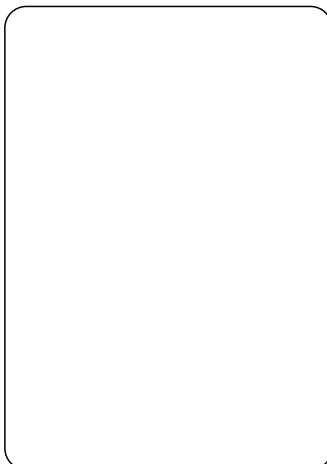
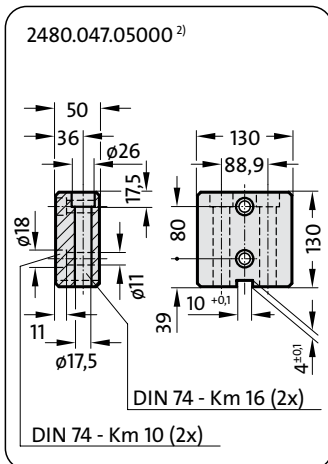
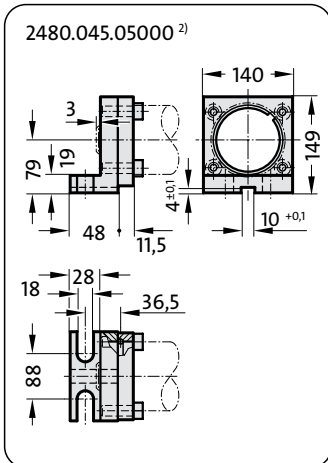
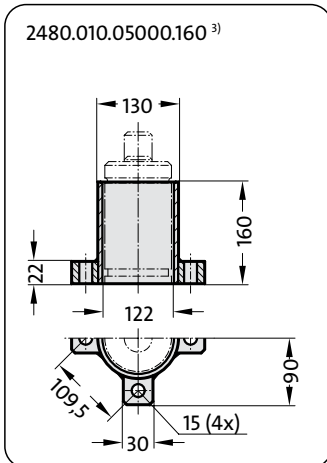
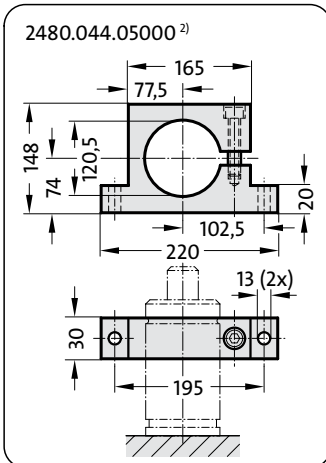
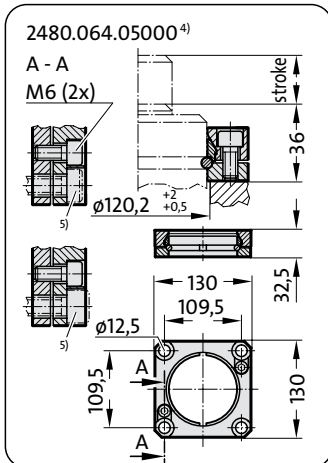
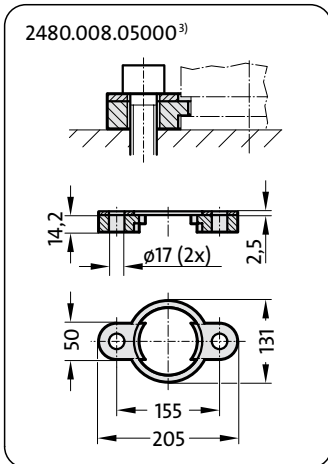
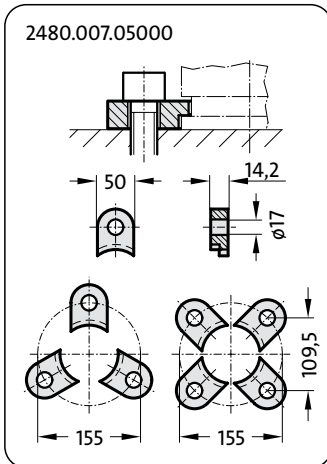
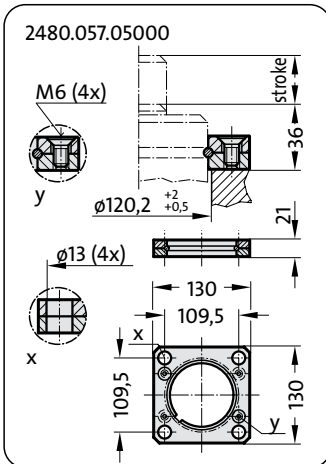
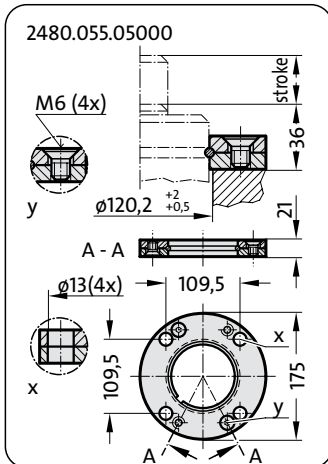
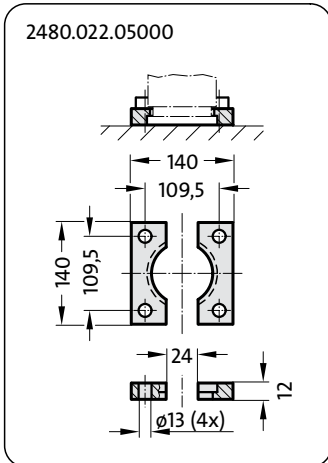
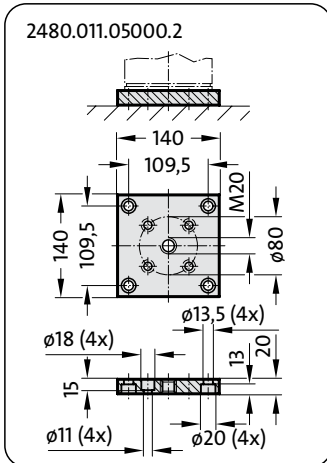
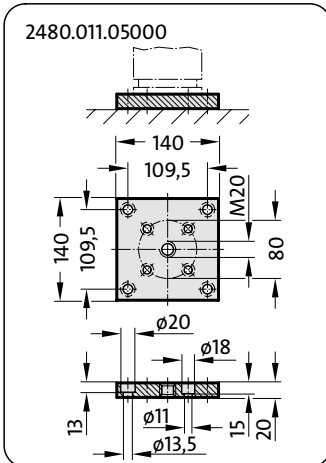
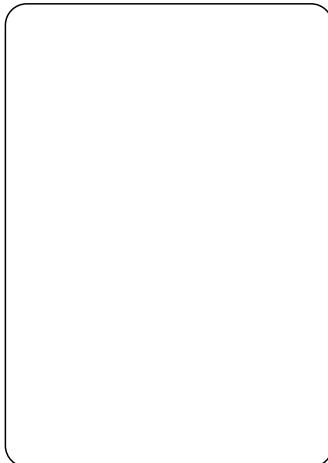
Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

Gas Springs  
Mounting Variations

2484.13.05000.



**Notes:**

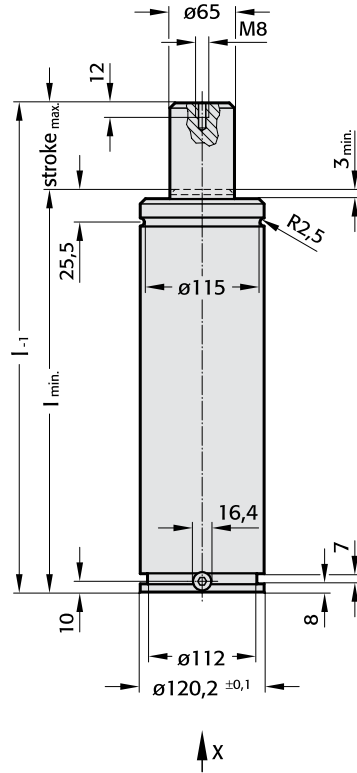
- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>3)</sup> Not for use with composite connection.
- <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
- <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).

**2484.13.05000.**

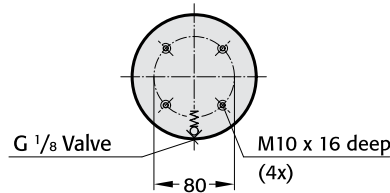
Initial spring force  $F_{LCF}$  at 150 bar = 2500 daN  
Full spring force after 7.7 mm damped spring travel

Order No	stroke max.	$l_{min}$	$l$
2484.13.05000.025	25	165	190
038	38,1	178,1	216,2
050	50	190	240
063	63,5	203,5	267
080	80	220	300
100	100	240	340
125	125	265	390
160	160	300	460
200	200	340	540
250	250	390	640
300	300	440	740

**2484.13.05000.**



View X - Gas spring



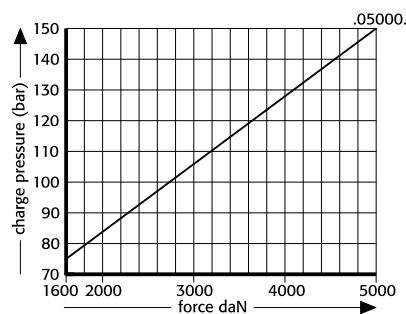
**Note:**

Order No for spare parts kit:  
2484.13.05000

- Pressure medium: Nitrogen  $N_2$
- Max. filling pressure: 150 bar
- Min. filling pressure: 75 bar
- Working temperature:  $0^\circ C$  to  $+80^\circ C$
- Temperature related force increase:  $\pm 0.3\%/^\circ C$
- Max. recommended extensions per minute: approx. 15 to 40 (at  $20^\circ C$ )
- Max. piston speed: 1.6 m/s

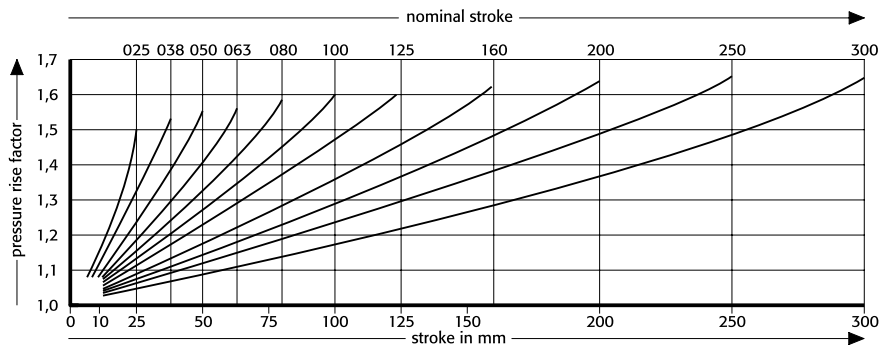
**2484.13.05000.**

Initial spring force versus charge pressure



**2484.13.05000.**

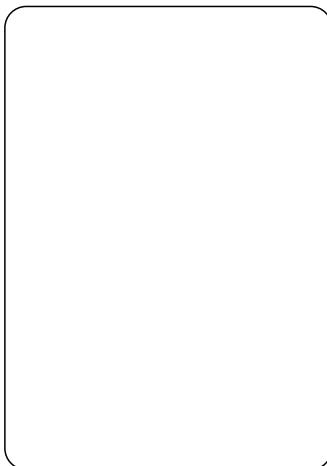
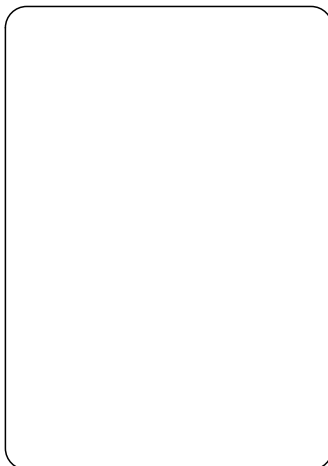
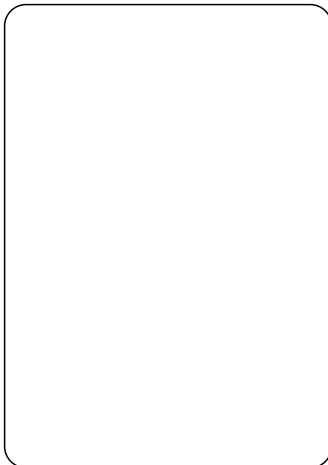
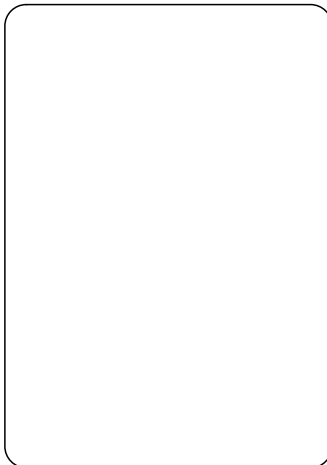
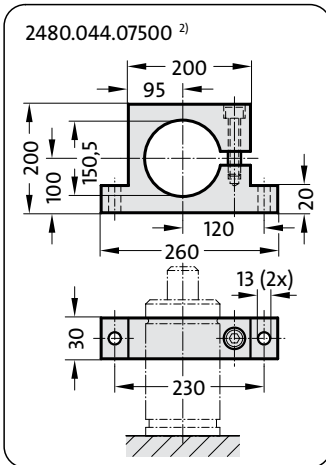
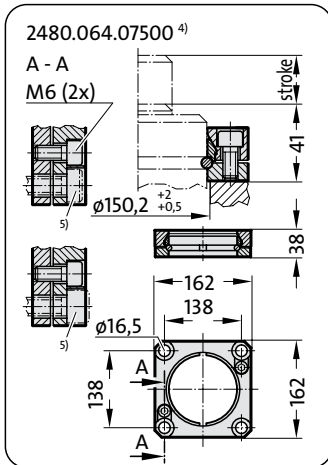
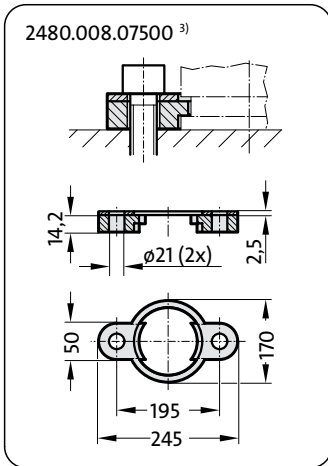
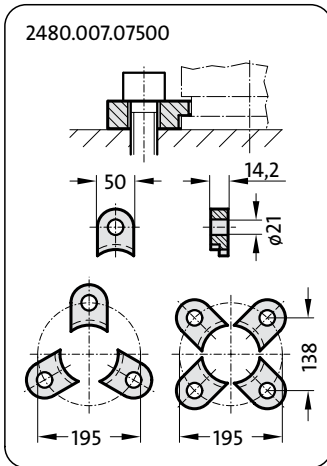
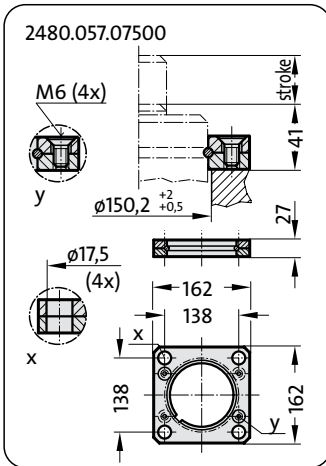
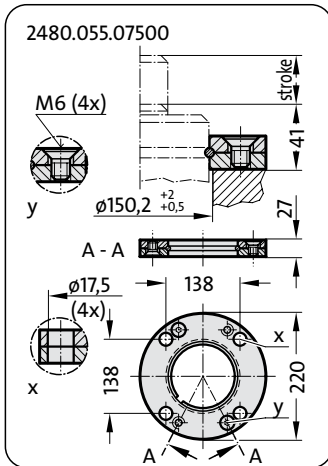
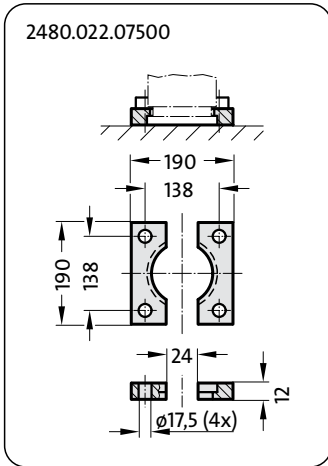
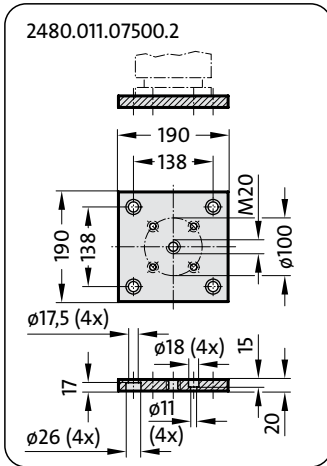
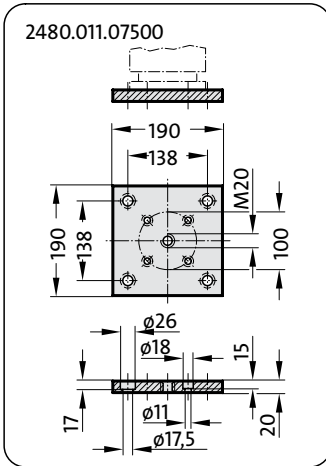
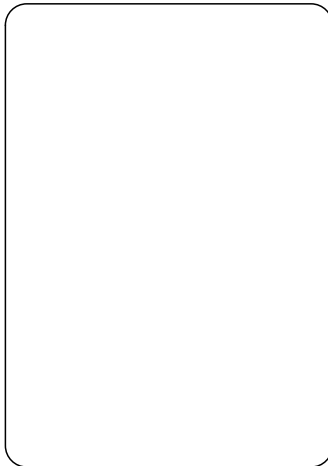
Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

Gas Springs  
Mounting Variations

2484.13.07500.



**Notes:**

- <sup>2)</sup> Attention:  
The spring force must be absorbed by the stop surface.
- <sup>3)</sup> Not for use with composite connection.
- <sup>4)</sup> Square collar flange, non-rotating, fixing for composite connection.
- <sup>5)</sup> Machine screws with hexagonal socket (compact head recommended).



**2484.13.07500.**

Initial spring force  $F_{LCF}$  at 150 bar = 3000 daN  
Full spring force after 10.4 mm damped spring travel

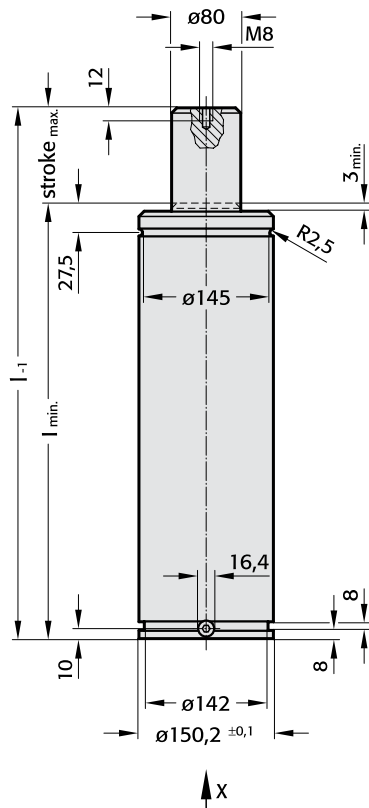
Order No	stroke max.	$l_{min}$	$l$
2484.13.07500.025	25	180	205
038	38,1	193,1	231,2
050	50	205	255
063	63,5	218,5	282
080	80	235	315
100	100	255	355
125	125	280	405
160	160	315	475
200	200	355	555
250	250	405	655
300	300	455	755

**Note:**

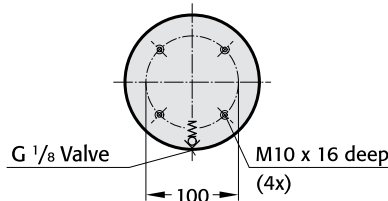
Order No for spare parts kit:  
2484.13.07500

Pressure medium: Nitrogen  $N_2$   
 Max. filling pressure: 150 bar  
 Min. filling pressure: 89 bar  
 Working temperature: 0°C to +80°C  
 Temperature related force increase:  $\pm 0.3\%/^{\circ}C$   
 Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)  
 Max. piston speed: 1.6 m/s

**2484.13.07500.**

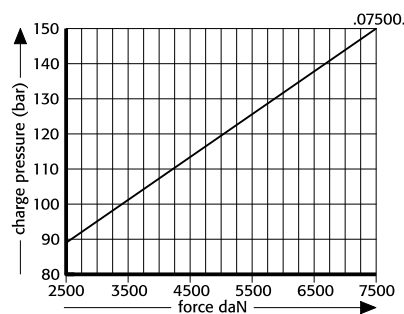


View X - Gas spring



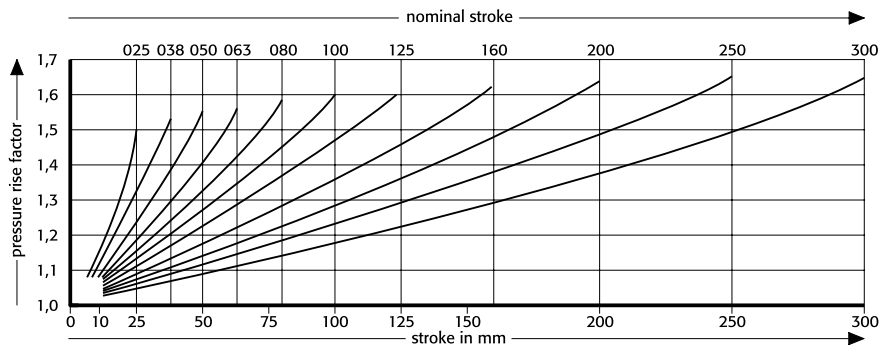
**2484.13.07500.**

Initial spring force versus charge pressure



**2484.13.07500.**

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!



# Controllable Gas Springs

Patented

Please request your catalogue



# Air Springs to VW Standard

Please request your catalogue

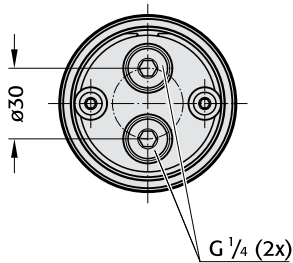
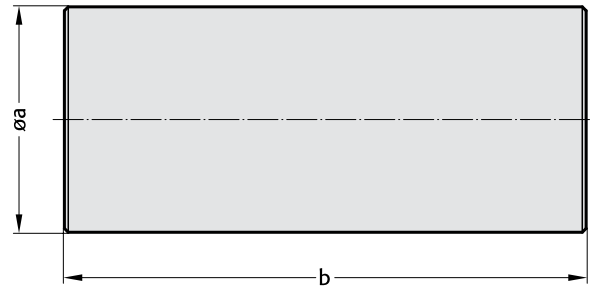
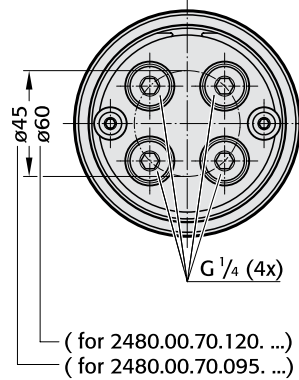


# Manifold- systems

Please request your catalogue

# Gas Spring Accessories

**2480.00.70.**

 Base plate for  
for 2480.00.70.075. ...

 Base plate for  
for 2480.00.70.095. ...  
for 2480.00.70.120. ...

**Description:**

The pressure reservoir and its base plates are manufactured from the same high grade steel als FIBRO gas springs. The advantage of including a pressure reservoir in the system is that in operation the gas pressure rises to a lesser extent. Apart from the purely technical pressure factors, a reduced pressure rise is beneficial to the service life of the system.

**Function:**

The pressure reservoir has two or four mounting holes with G $\frac{1}{4}$ " at both sides, which are designed for connection to the control fitting or gas spring.

**Note:**

If a pressure reservoir is to be installed, we recommend the 24<sup>o</sup>-cone-system, which ensures that the gas flow is not inhibited. Mounting clamps should be ordered separately. At least 2 are required for each pressure reservoir, see page F282.

**2480.00.70.**

Order No	Volumen in l (litres)	diameter a	b
2480.00.70.075.0170	0,25	75	170
0250	0,50	75	250
0410	1,0	75	410
2480.00.70.095.0300	1,0	95	300
0500	2,0	95	500
0700	3,0	95	700
0900	4,0	95	900
2480.00.70.120.0360	2,0	120	360
0615	4,0	120	615
1125	8,0	120	1125

**Ordering Code (example):**

Pressure reservoir	=	2480.00.70.
Øa = 75 mm	=	075.
b = 170 mm	=	0170
Order No	=	2480.00.70.075.0170

Gas spring size/daN	Piston rod area/dm <sup>2</sup>
.00500	0,031
.00750	0,049
.01500	0,102
.03000	0,196
.05000	0,332
.07500	0,503
.10000	0,709

**Calculating the isothermic increase in pressure\***

(\*by approximation)

$$\text{Pressure increase} = \frac{V_a + (n \times V_g^{1})}{V_a + (n \times (V_g^{1} - \text{Stroke} \times A))}$$

V <sub>a</sub>	[l]	Volume of pressure reservoir, see Table
V <sub>g</sub> <sup>1)</sup>	[l]	Gas volume of gas springs, appropriate spring types
		<sup>1)</sup> Note: When designing gas volume of spring types, please contact us at FIBRO.
Stroke	[dm]	Travel of gas springs, appropriate spring types
A	[dm <sup>2</sup> ]	For area of piston rods of the gas spring, see Table
n		Number of gas springs

**Calculation example:**

10 gas springs, type 248.13.05000.050 with a travel of 50 mm (0,5 dm) are connected to a system with an 8 litre pressure reservoir.

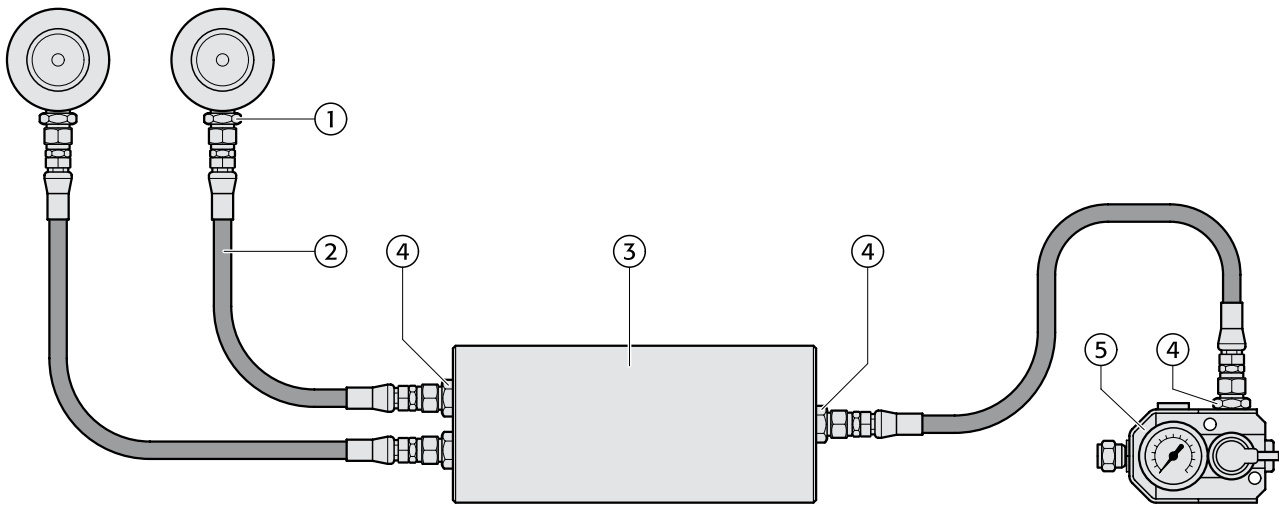
$$\text{Pressure increase} = \frac{8 \text{ l} + (10 \times 0,51 \text{ l})}{8 \text{ l} + (10 \times (0,51 \text{ l} - 0,5 \text{ dm} \times 0,332 \text{ dm}^2))} = 1,145$$

**FIBRO**

2480.00.70.

Pressure reservoir  
for reduced pressure rise

Installaton example: 24°-cone-system

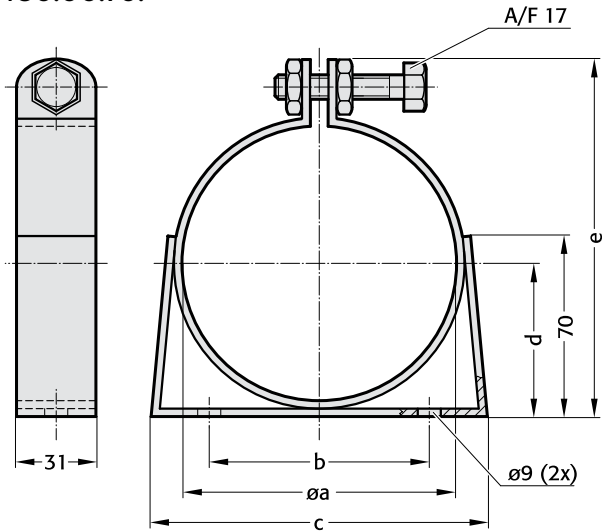


Item	Quantity	Description	Order No
1	2	Connection thread G <sup>1</sup> / <sub>8</sub>	2480.00.26.03
2	3	24°-cone-hose	2480.00.25.01.
3	1	Pressure reservoir	2480.00.70.
4	4	Connection thread G <sup>1</sup> / <sub>4</sub>	2480.00.26.04
5	1	Monitoring unit	2480.00.31.01

# Mounting clamps for pressure reservoir

2480.00.70.

2480.00.70.



2480.00.70.

Order No	∅a	b	c	d	e
2480.00.70.075	75	80	105	41,5	102
095	95	100	145	51,5	122
120	120	100	145	64	147

## Ordering Code (example):

Mounting clamp (1)  
for pressure reservoir = 2480.00.70.  
∅a = 75 mm = 075  
Order No = 2480.00.70.075

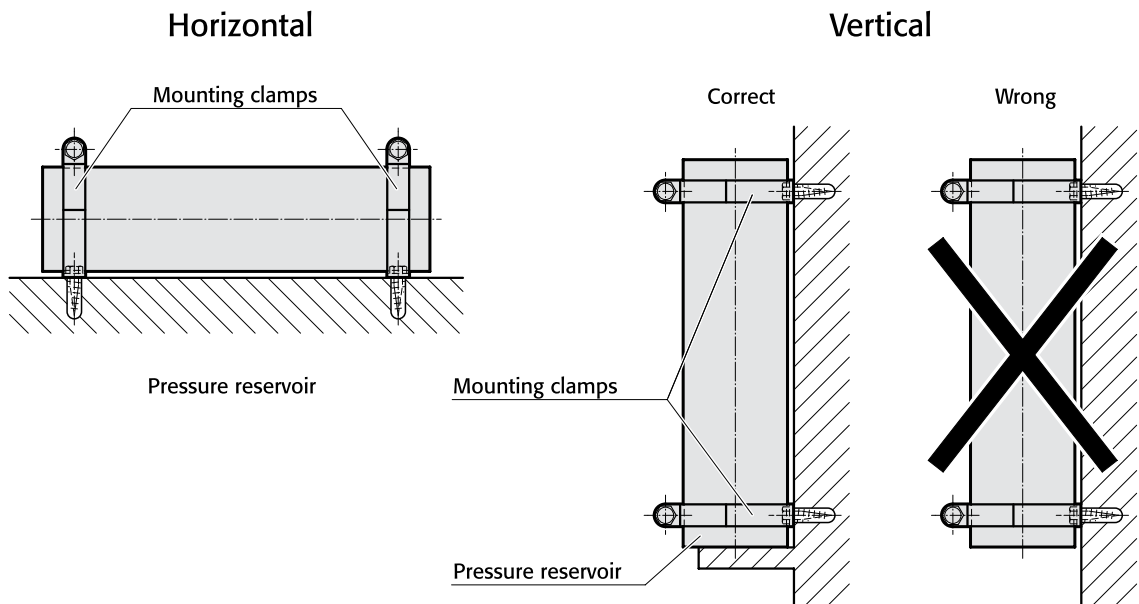
## Mounting clamp for pressure reservoir

The mounting clamp is a rubber coated galvanised sheet steel ring and is used for mounting the FIBRO pressure reservoir.

### Important:

At least 2 fixing clamps are required per pressure reservoir. If the pressure tank is to be mounted vertically, it should be seated on a robust base.

## Installation Example:





# FIBRO

2480.015.

## Pressure Plates, shock absorbing

### Description:

Shock Absorbing Pressure Plate is designed to minimise the main problems in the metal forming industry.

A specially designed shock absorbing unit is designed to reduce:

- extreme impact loads
- consequent high costs for press maintenance
- high noise levels
- risk of production of lower quality parts.

Guidelines for using Shock Absorbing Pressure Plates with gas springs:

1. After the maximum shock absorbing travel of 3 mm the gas spring will reach the same initial spring force as it would without the Shock Absorbing Pressure Plate.
2. The Shock Absorbing Pressure Plate is mounted between the tool and the piston rod of the gas spring.

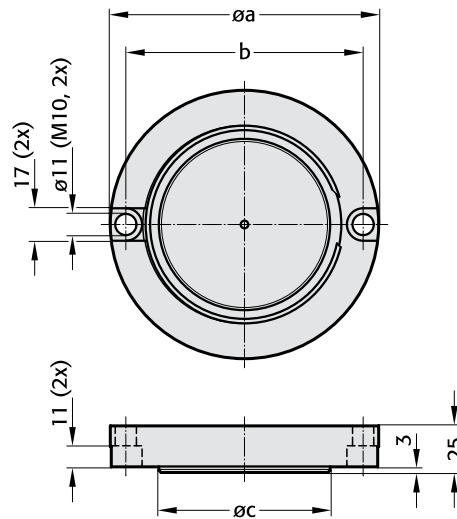
### Material:

Steel, nitride  
Polyurethane

### Note:

Working temperature: 0 °C to 80 °C  
Recommended max. strokes/min: 20  
Max. press speed: 1.6 m/s  
Max. shock absorbing travel: 3 mm

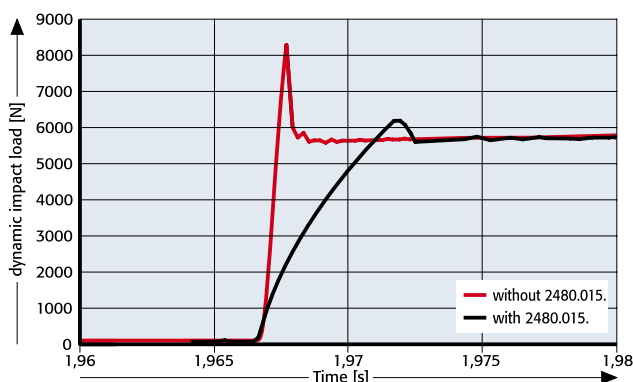
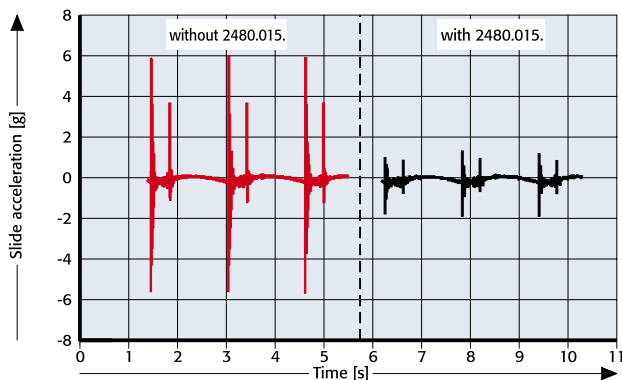
2480.015.



2480.015.

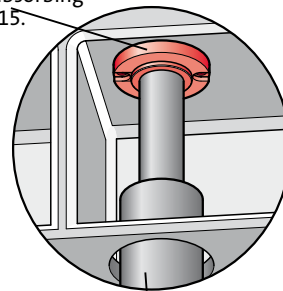
Order No	Gas spring strength	a	b	c
2480.015.01500	750 – 1500	108	91	58
2480.015.05000	> 1500 – 6600	143	126	92
2480.015.10000	> 6600 – 10000	167	150	112

### Function



### Installation example

Pressure Plate, shock absorbing 2480.015.



Top of tool



Sheet metal retainer



Pressure Plate, shock absorbing 2480.015.

Gas spring

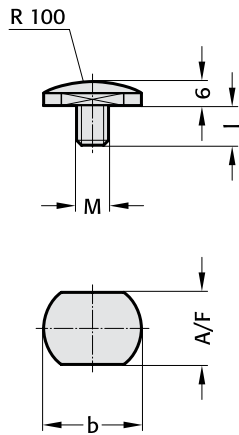


Bottom of tool

# Thrust Pads and Thrust Plates for Gas Springs

## 2480.004. Thrust Pad

for gas springs with M6 and M8 thread in the piston rod



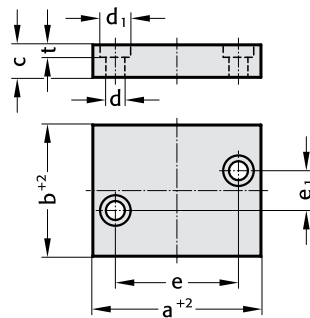
## 2480.004.

Order No	M	A/F	b	l
2480.004.06	M6	17	20	6
08	M8	19	22,5	11

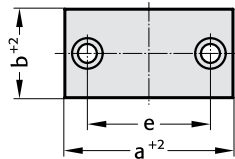
### Material:

steel 1.1731, case-hardened

## 2480.009. Thrust Plate



## 2480.009. .1 Thrust Plate



## 2480.009.

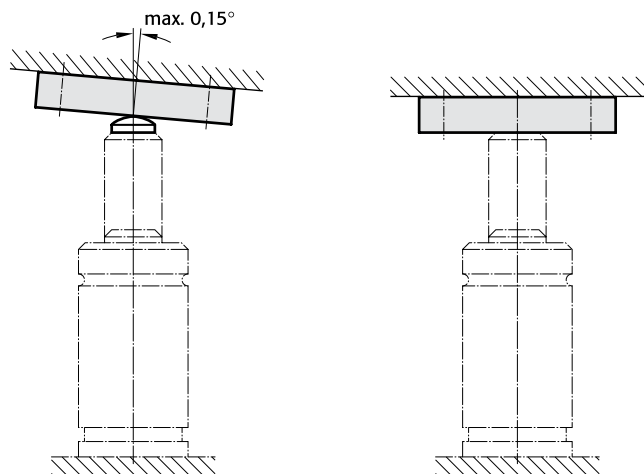
Order No	max. piston rod									
	diameter	a	b	c	d	d <sub>1</sub>	e	e <sub>1</sub>	t	
2480.009.00250	15	50	25	12	7	11	32	8	7	
00500	20	55	30	12	7	11	40	14	7	
00500.1*	20	55	32	16	9	15	37	-	10	
00750	25	70	35	15	9	15	48	14	9	
00750.1*	36	65	50	16	9	15	47	-	10	
01500	36	75	50	15	9	15	56	30	9	
03000	50	85	60	15	9	15	66	40	9	
03000.1*	50	80	60	16	9	15	62	-	10	
05000	65	100	80	20	11	18	72	56	11	
05000.1*	65	80	80	16	9	15	62	-	10	
07500	80	110	100	20	11	18	85	75	11	
07500.1*	80	100	100	16	9	15	82	-	10	

\* to Volvo standard

### Material:

steel 1.2842, hardened

## Installation Examples:



## Description:

The hardened thrust pad 2480.004. reduces side forces in cases of skew thrust vaces or lateral displacement component.

In conjunction with the thrust pads, the hardened thrust plates 2480.009., 2480.018. and 2480.019. further helps to protect the gas spring from lateral forces, through reduction of friction – even when used without the thrust pad.

## Note:

Especially with gas springs of large stroking capacity we recommend the use of the pad plate combination!

# FIBRO

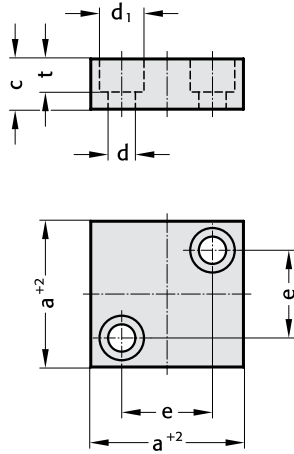
2480.018.

2480.019.

## Thrust Plates for Gas Springs

2480.018. Thrust Plate

2480.019. Thrust Plate



2480.018./2480.019.

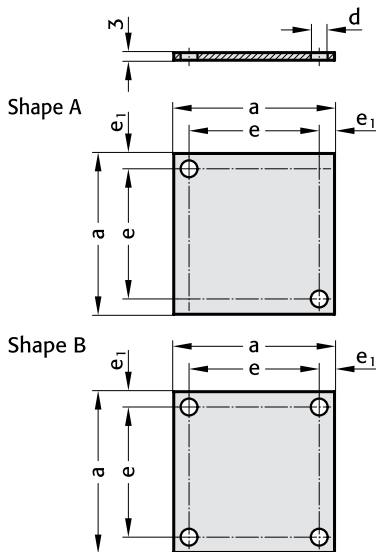
Order No	max. piston rod diameter	a	c	d	d <sub>1</sub>	e	t
2480.018.01500	65	90	12	9	15	64	9
2480.019.00100	15	40	15	9	15	21	10
00100.2*	15	40	15	7	11	24	7
00750	25	56	20	11	18	32	13
03000	50	71	20	11	18	48	13
03000.2*	50	70	15	9	15	50	9
03000.1	80	90	20	11	18	67	13
07500.2*	80	90	15	9	15	70	9
07500	95	140	20	11	18	110	13

\* to VDI 3003

**Material:**

steel 1.2842, hardened

2480.019.45. Thrust Plate



2480.019.45.

Order No	shape	max. piston rod diameter	a	e <sub>1</sub>	e	d
2480.019.45.00750	A	50	70	10	50	11
2480.019.45.01500	A	80	90	10	70	11
2480.019.45.03000	B	95	105	10	85	11
2480.019.45.05000	B	95	125	10	105	11
2480.019.45.07500	B	95	150	12,5	125	13
2480.019.45.10000	B	95	190	12,5	165	13

**Material:**

steel 1.2842, hardened

Concertina Shrouds

2480.080.



Description:

The concertina shroud protects the piston rod of the gas spring against negative influences, such as e.g.:

- drawing in dirt
- damage to the surface of the piston rod
- adhesion of dirt particles
- drawing in of oil and/or emulsion

The concertina shroud is internally (cylinder tube side) fastened and is free of any obstructing contours, such as externally mounted tube clamps. This enables fastening and installation of the gas spring inside the tool without any restrictions.

The concertina shroud for gas springs prolongs the lifetime of the gas springs under rough operating conditions.

Technical Data

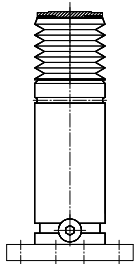
Material	Concertina Shroud:	CSM-Rubber 65 ±3
		Shore A
	Disc:	Steel burnished
	Ring:	stainless Steel
Temperature range:		0-90 °C
Chemical resistance	Acids:	very good
	Alkaline solutions:	very good
	Solvents:	sufficient
Weather resistance	Sun light (UV):	good
	Ozone:	very good
	Water:	sufficient
Oil resistance	Mineral:	good
	Synthetic:	sufficient

Delivery:

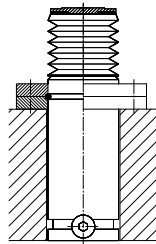
Concertina shroud incl. rotatable disk and countersunk screw.

Custom dimensions/materials available on request.

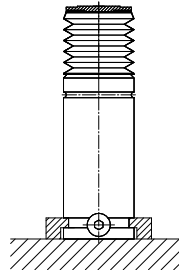
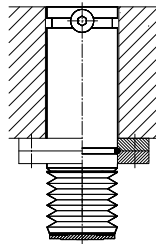
Mounting Examples: Concertina Shroud



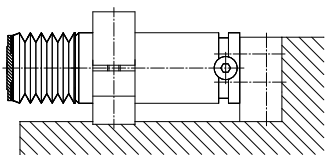
screw mounted at the bottom with 2480.011.



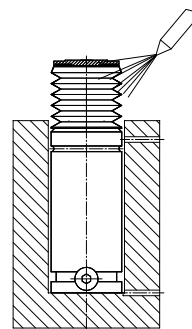
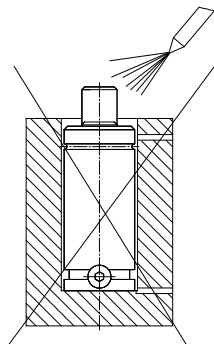
fixed with 2480.055./057./064.



fixed with 2480.007./008.



fixed with 2480.044./045./047.

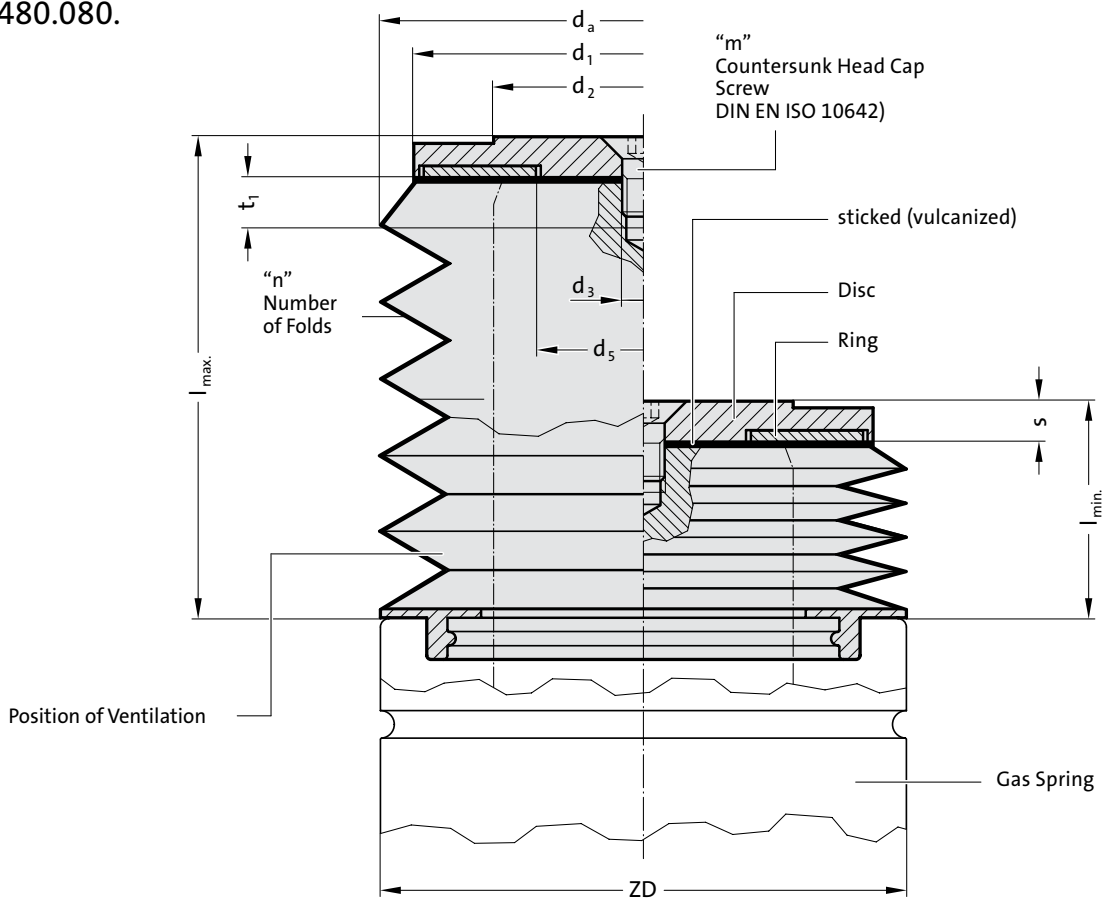


installed loose in the bore

More mounting examples for Gas Springs see page „Mounting Directions for Gas Springs“



2480.080.



Type of Gas Spring	2487.12.00350.	2487.12.00500.	2480.12.00500.	2487.12.00750..1	2480.13.00750.	2487.12.01000..1	2488.12.01000.	2487.12.01500.	2488.13.01500.	2480.12.01500.	2487.12.02400.	2488.13.02400.	2480.13.03000.	2487.12.04200.	2488.13.04200.	2480.13.05000.	2487.12.06600.	2488.13.06600.	2480.13.07500.	2487.12.09500.	2488.13.09500.	
ZD	32	38	45	45	50	50	63	75	75	95	95	120	120	120	150	150	150	150	150	150	150	
da	45	50	50	55	55	65	65	75	75	95	95	120	120	120	150	150	150	150	150	150	150	
d1	32	38	45	45	50	50	63	75	75	95	95	120	120	120	150	150	150	150	150	150	150	
d2 / KD	16	20	20	25	25	28	36	36	45	50	60	65	75	80	90	90	90	90	90	90	90	
s	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	
d3	6.6	6.6	6.6	6.6	9	6.6	6.6	9	6.6	9	9	9	9	9	17	9	9	9	9	9	9	
d5	10	14	14	17	17	20	28	28	37	42	51	57	66	71	81	81	81	81	81	81	81	
t1	5	5	10	5	10	5	5	10	5	10	5.5	10	5.5	20	5.5	20	5.5	20	5.5	20	5.5	
m	M6 x 8	M6 x 8	M6 x 12	M6 x 8	M8x12	M6x10	M6x10	M8x12	M6x10	M8x12	M8x12	M8x12	M8x12	M8x12	M16x25	M8x12	M8x12	M8x12	M8x12	M8x12	M8x12	
Stroke	125 (Stroke ≤ 125)																					
l min.	28	28	28	28	28	28	28	28	28	28	28	23	23	24	21	21	21	21	21	21	21	
l max.	133	133	133	133	134	134	134	134	134	134	134	134	134	134	137	134	134	134	137	134	134	
n	10	10	10	10	10	10	10	10	10	8	8	6	6	5	5	5	5	5	5	5	5	
Stroke	300 (Stroke > 125), not for 2487.12.*																					
l min.	-	-	-	-	52	--*/52	--*/52	52	--*/52	54	--*/54	41	--*/41	37	--*/34	37	--*/34	37	--*/34	37	--*/34	
l max.	-	-	-	-	309	309	309	309	309	309	309	309	309	309	402	309	309	309	402	309	309	
n	-	-	-	-	22	--*/22	--*/22	22	--*/22	19	--*/19	14	--*/14	11	--*/11	11	--*/11	11	--*/11	11	--*/11	

**Ordering Code (example):**

Concertina Shroud	= 2480.080.	Concertina Shroud	= 2480.080.
ZD = 120 mm	= 120.	ZD = 120 mm	= 120.
d2/KD = 65 mm	= 065.	d2/KD = 65 mm	= 065.
Stroke = 125 (Stroke ≤ 125 mm)	= 125	Stroke = 300 (Stroke > 125 mm)	= 300
Order No.	= 2480.080.120.065.125	Order No.	= 2480.080.120.065.300

# Gas spring connection systems

## Introduction

Connecting gas springs in one more systems enables the user to monitor gas spring pressure from outside the tool, to adjust it if necessary, to fill it and to drain it. The connector system has many advantages including ease of maintenance, reliability and improvement in the quality of gas spring use in the tool.

FIBRO offers four different systems for hose connections for gas springs: Minimes system, Compression fitting system, JIC system (24° flare) and Micro connector system. The hoses, screwed connectors and other components are selected to meet the most stringent standards and undergo a series of tests including service life, static seal and robustness after repeated assembly and disassembly.

### Minimes system 2480.00.23./24.

Page F289–F299

- + Small external diameter of hose 0,5 mm
- + Small external diameter of hose 0,5 mm  $R_{min} = 20$
- + High pressure resistance
- + Vibration-proof measurement couplings
- + Connector with valve
- + No tools needed for connecting hose to adapter, and disconnecting
- ± Swaged non-detachable hose fitting
- Not for use with a pressure reservoir

**Technical data:**

Hose:	polyamide 11, black, dimpled
Hose fitting:	free cutting steel, galvanised
Measurement couplings:	free cutting steel, galvanised
Adapter:	steel, gunmetal finish
Max. pressure:	630 bar
Temperature range:	0–100°C

**Recommended application:**

Most used system for all gas springs with  $G^{1/8}$  gas connection.  
Not suitable for use with a pressure reservoir because of the small internal diameter which reduces the flow.

### Compression fitting system 2480.00.10.

Page F300–F302

- + Assemble on-site system
- + Reusable hose fitting
- + High pressure resistance
- ± Suitable for connecting to a pressure reservoir under certain conditions
- Larger bending radius  $R_{min} = 40$
- Not suitable for gas springs with M6 connection thread
- Extra time required for preparing hose and fitting it

**Technical data:**

Hose:	polyurethane/polyamide, black, dimpled
Hose fitting:	steel, galvanised
Adapter:	steel, galvanised
Max. pressure:	380 bar
Temperature range:	0–100°C

**Recommended application:**

For all gas springs with  $G^{1/8}$  gas connection.  
Mainly used for self-assembly in small numbers.

### 24°-cone-system 2480.00.25./26.

Page F303–F305

- + Suitable for connecting to a pressure reservoir
- + Wide range of connection adapters
- + Vibration-proof (O-ring seal)
- + High pressure resistance
- ± Swaged non-detachable hose fitting
- Larger bending radius  $R_{min} = 40$
- Not suitable for gas springs with M6 connection thread

**Technical data:**

Hose:	polyurethane/polyamide, black, dimpled
Hose fitting:	steel, galvanised
Adapter:	steel, galvanised
Max. pressure:	315 bar
Temperature range:	0–100°C

**Recommended application:**

For all gas springs with  $G^{1/8}$  gas connection.  
Mainly used for connection to pressure reservoir.

### Connector system, 24° conus micro 2480.00.27./28.

Page F306–F309

- + small external hose diameter  $\phi 5$  mm
- + hose: small bending radius  $R_{min} = 20$  mm
- + pipe: Min. bending radius = 12 mm (3x da)
- + high pressure resistance
- + small connection adapter
- + vibration-safe due to O-ring seal
- + tightly pressed, non-detachable hose fitting
- not suitable for use with a pressure reservoir
- limited suitability for gas springs with thread connection  $G^{1/8}$

**Technical data:**

Hose:	Polyamide 11, black, dimpled
Hose adapter:	free cutting steel, galvanised
Adapter:	steel, galvanised
Max. perm. pressure:	475 bar
Temperature range:	0 to +80 °C
Pipe:	steel
Pipe external diameter (da):	$\phi 4$ mm
Pipe internal diameter (di):	$\phi 2$ mm
max. dynamic pressure:	430 bar
Temperature range:	0 to +100 °C

**Recommendation application:**

For all gas springs with M6 gas connection.  
Not suitable for use with a pressure reservoir due to small internal diameter (reduced flow volume).

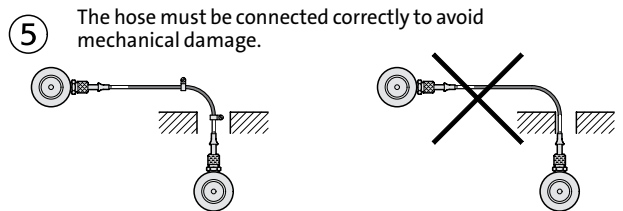
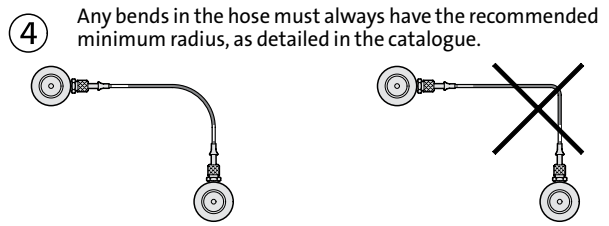
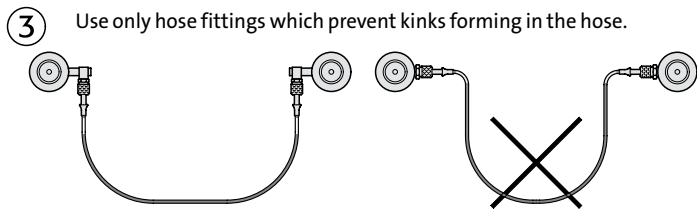
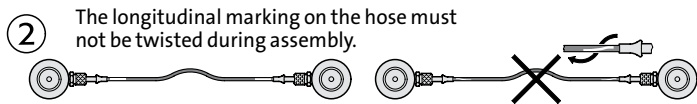
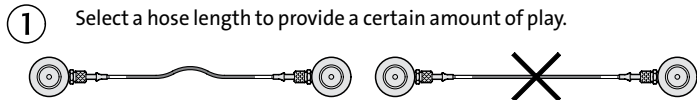
Note: Pipe system, 24° conus micro for higher temps on request.

# Instruction for Hose Assembly Mounting arrangement for gas springs in the Minimes system

Never exceed the maximum pressures and temperatures for the hoses. Ensure that all hoses and adaptors are perfectly clean prior to assembly.

To be suitable for use with compressed gas the hose sheath must be perforated. We recommend the use of the 24°-cone-hose system for pressure reservoir to ensure an unrestricted gas flow.

Follow the instructions below to ensure functionality and maximum service life for the hose connection:



Refer to DIN 20066 for further details on installing hose connections.

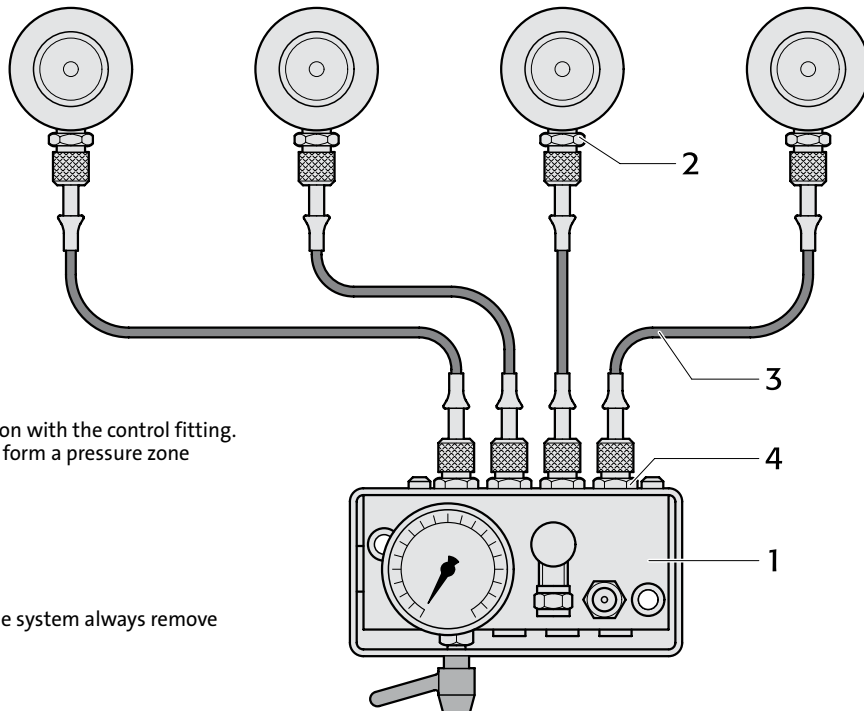
**Warning:**

Any modifications whatsoever to the product are prohibited.

For further information refer to the FIBRO Gas Spring Catalogue, visit [www.fibro.com](http://www.fibro.com) or contact your FIBRO agent.

**Example 1:**

Direct connection for group



**Function:**

Each spring has a direct connection with the control fitting. They are not interconnected and form a pressure zone

Page F 312

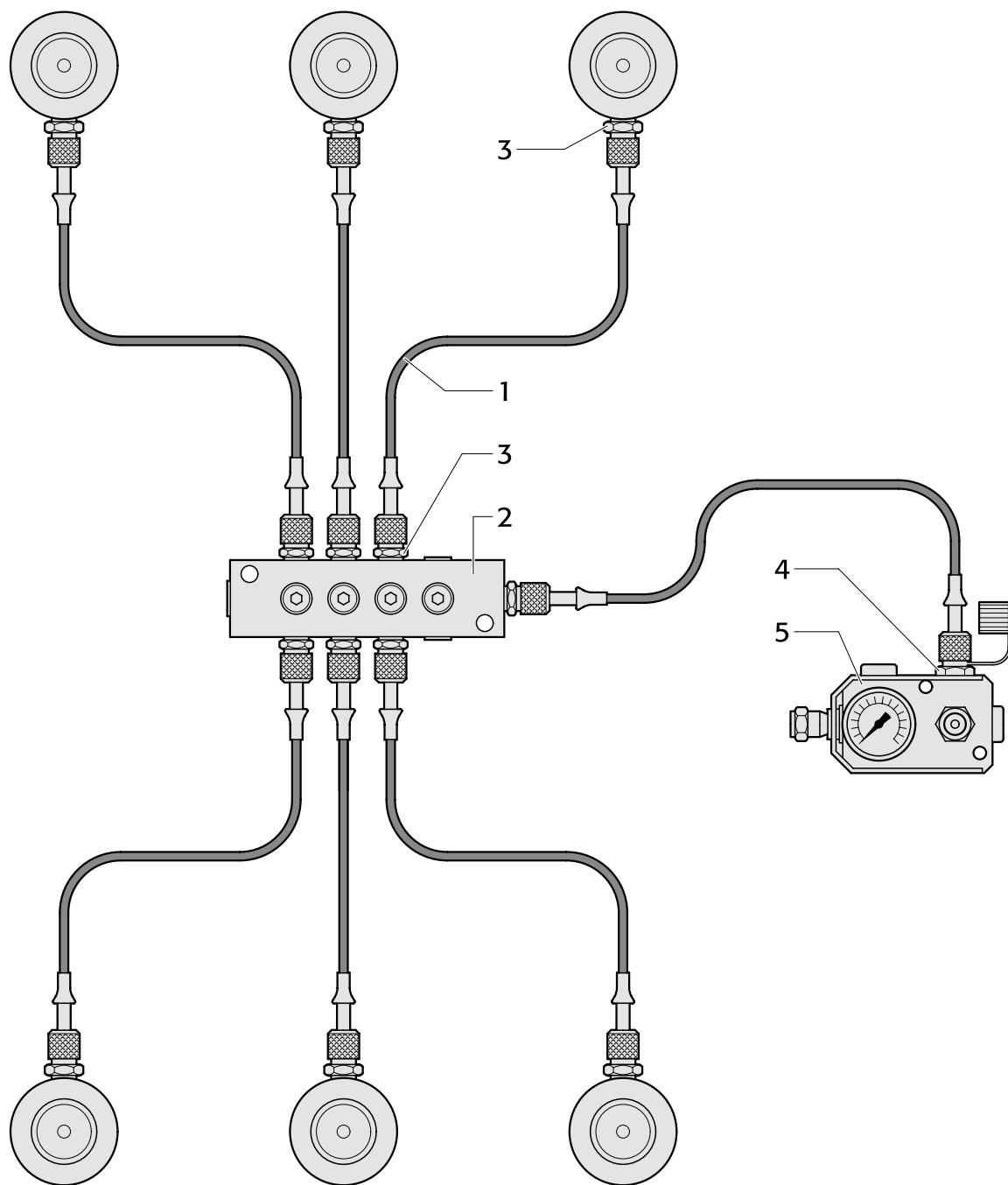
**Note:**

When installing gas springs in the system always remove the valve from the gas spring.

Item	Designation	Number	Order No	Comment
1	Control fitting	1	2480.00.30.01	Optionally with diaphragm pressure switch 2480.00.30.02
2	Gauging coupling	4	2480.00.24.01	
3	Measuring hose	4	2480.00.23.	Type of connection and length as required
4	Gauging coupling	4	2480.00.24.02	

Example 2:

Group series connection



Function:

The springs are interconnected and there is just one test line to the control fitting.

Note:

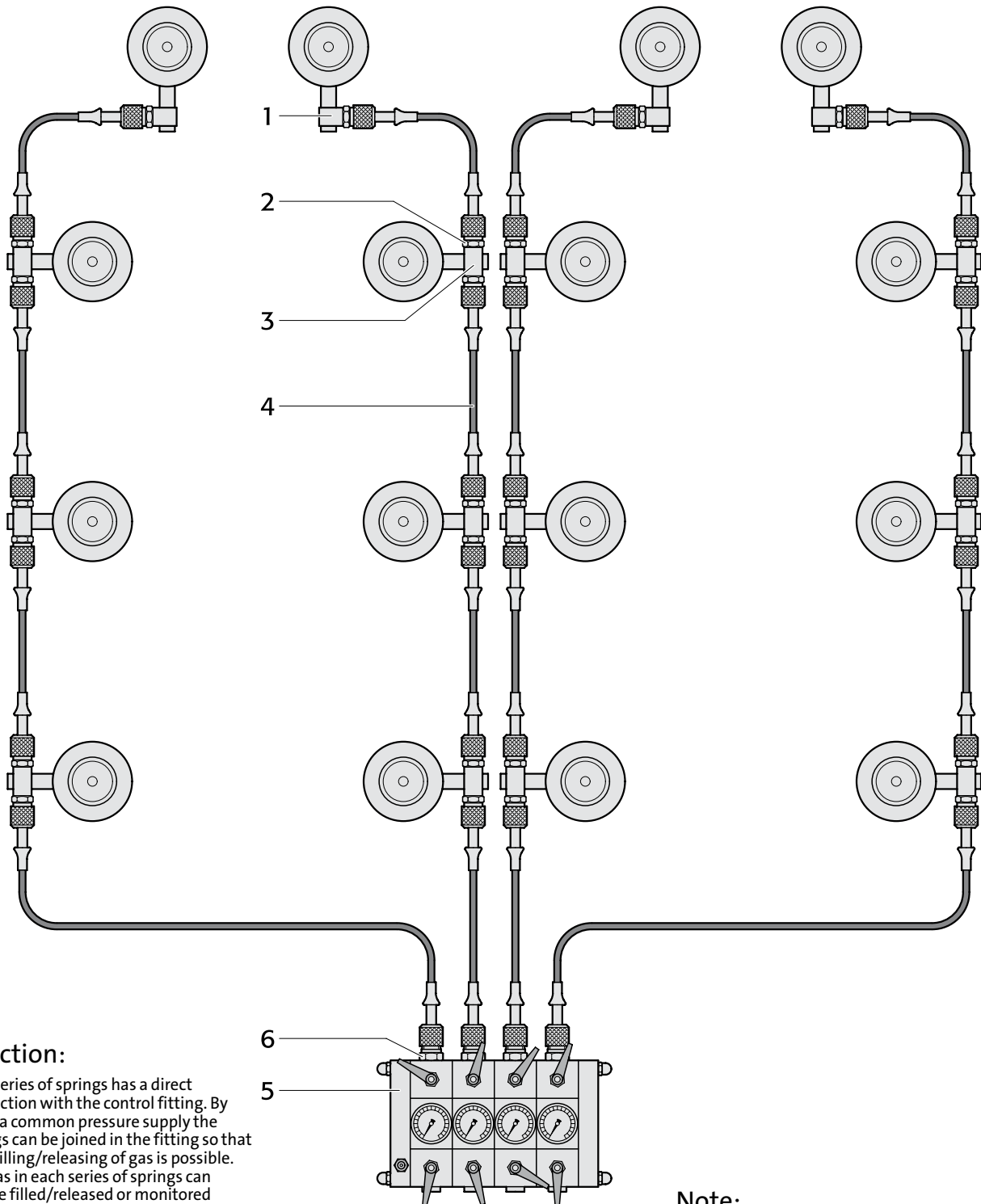
When installing gas springs in the system always remove the valve from the gas spring.

Item	Designation	Number	Order No	Comment
1	Measuring hose	7	2480.00.23. . . . .	Type of connection and length as required
2	Distributor	1	2480.00.24.33	
3	Gauging coupling	13	2480.00.24.01	
4	Gauging coupling	1	2480.00.24.02	
5	Control fitting	1	2480.00.31.01	



**Example 3:**

Multiple connections with independent functioning



**Function:**

Each series of springs has a direct connection with the control fitting. By using a common pressure supply the springs can be joined in the fitting so that joint filling/releasing of gas is possible. The gas in each series of springs can also be filled/released or monitored individually.

Page F 316.

**Note:**

When installing gas springs always remove the valve from the gas spring.

Item	Designation	Number	Order No	Comment
1	Simple adaptor, short	4	2480.00.24.17	Choice of "long" or "very long" depending on the specific mounting arrangements.
2	Gauging coupling	28	2480.00.24.01	
3	Multi adapter	12	2480.00.24.11	Choice of "long" or "very long" depending on the specific mounting arrangements.
4	Measuring hose	16	2480.00.23.	Type of connection and length as required
5	Multi control fitting	1	2480.00.39.01.004.1	Options: floor or wall mounted
6	Gauging coupling	4	2480.00.24.02	

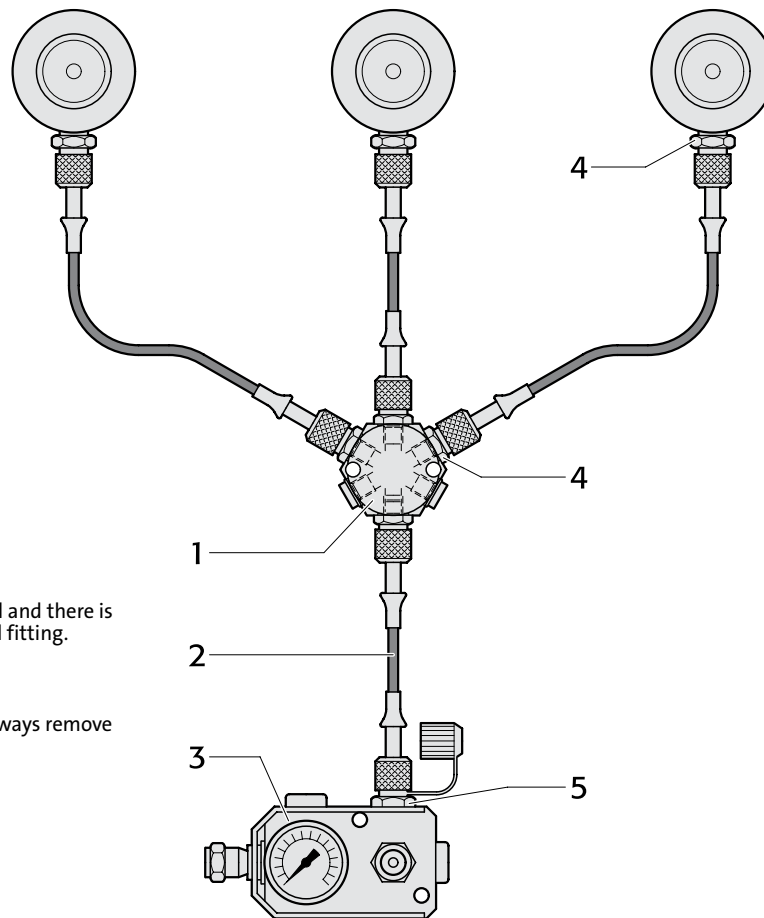
# Mounting arrangement for gas springs in the Minimes system

FIBRO

2480.

## Example 4.1:

Group series connection



### Function:

The springs are interconnected and there is just one test line to the control fitting.

### Note:

When installing gas springs always remove the valve from the gas spring.

Item	Designation	Number	Order No	Comment
1	Coupling	1	2480.00.24.31	
2	Measuring hose	4	2480.00.23. . . . .	Type of connection and length as required
3	Control fitting	1	2480.00.31.01	
4	Gauging coupling	7	2480.00.24.01	
5	Gauging coupling	1	2480.00.24.02	

## Example 4.2:

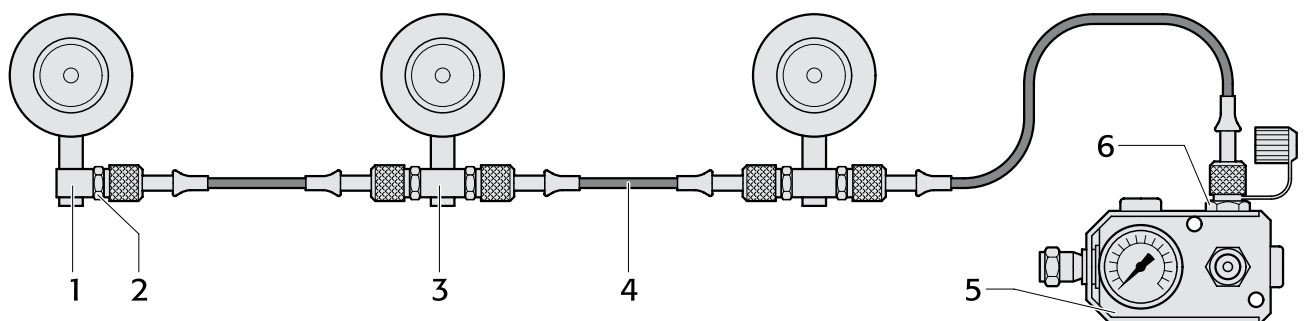
Group series connection

### Function:

The springs are interconnected and there is just one test line to the control fitting.

### Note:

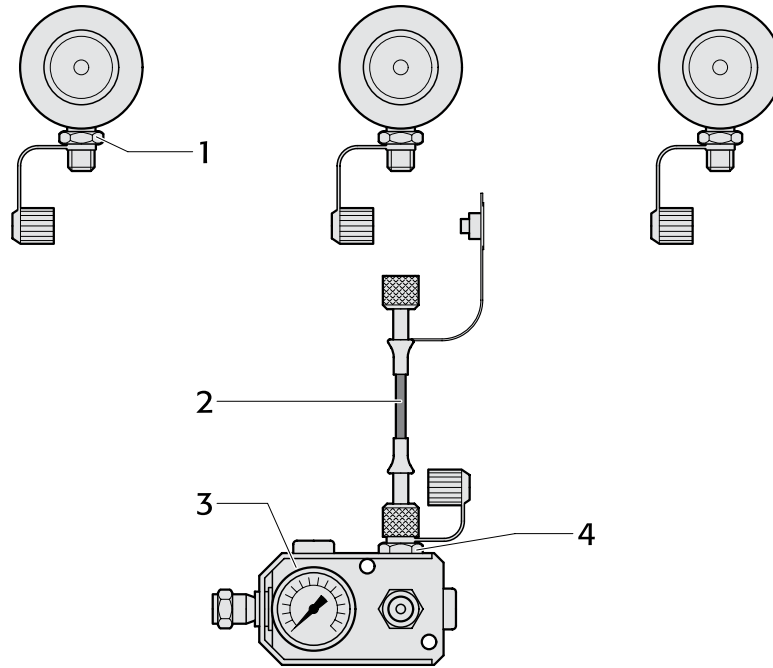
When installing gas springs always remove the valve from the gas spring.



Item	Designation	Number	Order No	Comment
1	Simple adaptor, short	1	2480.00.24.17	Choice of "long" or "very long" depending on the specific mounting arrangements.
2	Gauging coupling	5	2480.00.24.01	
3	Multi adaptor	2	2480.00.24.11	Choice of "long" or "very long" depending on the specific mounting arrangements.
4	Measuring hose	3	2480.00.23. . . . .	Type of connection and length as required
5	Control fitting	1	2480.00.31.01	
6	Gauging coupling	1	2480.00.24.02	

**Example 5:**

Independent test connection



**Function:**

The springs work independently and have a gauging coupling (2480.00.24.01) with valve.

If required the springs can be tested and pressure adjusted individually. A control fitting (2480.00.31.01) is used for the purpose.

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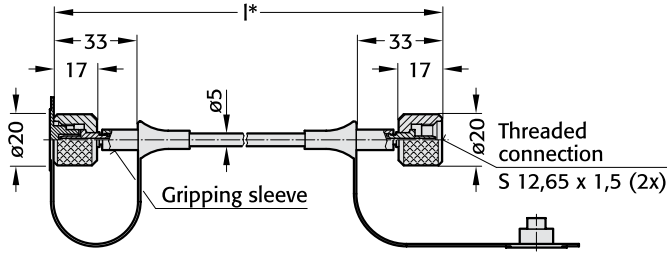
Item	Designation	Number	Order No	Comment
1	Gauging coupling	3	2480.00.24.01	
2	Measuring hose	1	2480.00.23.	Type of connection and length as required
3	Control fitting	1	2480.00.31.01	
4	Gauging coupling	1	2480.00.24.02	

**Gas Spring Accessories**  
**Minimess – Compound Threaded Joints**

2480.00.23.

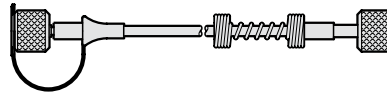
**2480.00.23.01.**

Gauging hose –  
both ends straight



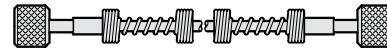
**2480.00.23.01.----.1**

Antikink spiral, at one end



**2480.00.23.01.----.2**

Antikink spiral, at both ends



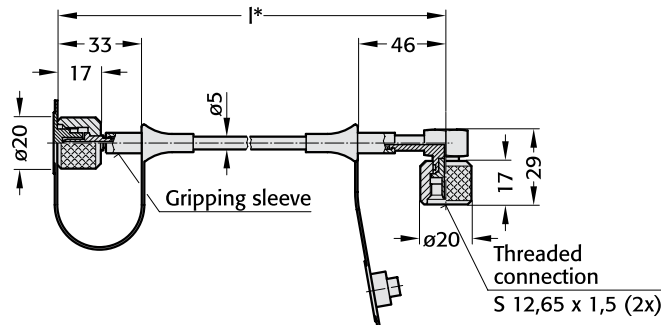
**2480.00.23.01.**

Order No	l*
2480.00.23.01. 0200	200
0300	300
0400	400
0500	500
0630	630
0800	800
1000	1000
1200	1200
1500	1500
2000	2000
2500	2500
3000	3000

\* other lengths available  
shortest factory lengths:  
without antikink protection: 90 mm  
antikink protection at one end: 150 mm  
antikink protection at both ends: 300 mm

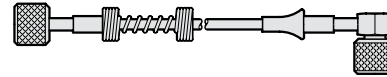
**2480.00.23.02.**

Gauging hose –  
one end straight  
90°-angle



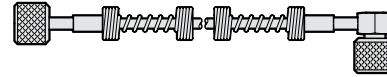
**2480.00.23.02.----.1**

Antikink spiral, at one end, straight



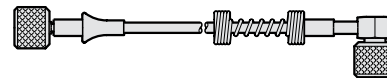
**2480.00.23.02.----.2**

Antikink spiral, at both ends



**2480.00.23.02.----.3**

Antikink spiral, at one end, 90°



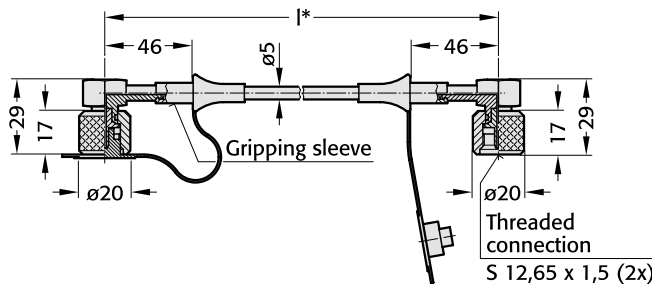
**2480.00.23.02.**

Order No	l*
2480.00.23.02. 0200	200
0300	300
0400	400
0500	500
0630	630
0800	800
1000	1000
1200	1200
1500	1500
2000	2000
2500	2500
3000	3000

\* other lengths available  
shortest factory lengths:  
without antikink protection: 90 mm  
antikink protection at one end: 150 mm  
antikink protection at both ends: 300 mm

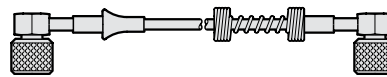
**2480.00.23.03.**

Gauging hose –  
both ends  
90°-angle



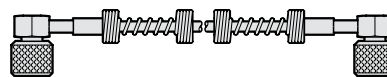
**2480.00.23.03.----.3**

Antikink spiral, at one end



**2480.00.23.03.----.2**

Antikink spiral, at both ends



**2480.00.23.03.**

Order No	l*
2480.00.23.03. 0200	200
0300	300
0400	400
0500	500
0630	630
0800	800
1000	1000
1200	1200
1500	1500
2000	2000
2500	2500
3000	3000

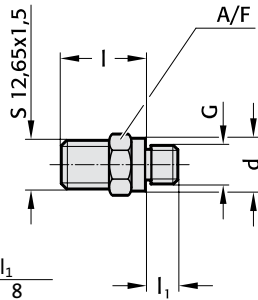
\* other lengths available  
shortest factory lengths:  
without antikink protection: 105 mm  
antikink protection at one end: 150 mm  
antikink protection at both ends: 300 mm

Gauging coupling

**2480.00.24.01** with valve  
**2480.00.24.03** without valve  
for connection to gas spring

Gauging coupling

**2480.00.24.02** with valve  
**2480.00.24.04** without valve  
for connection to control fitting

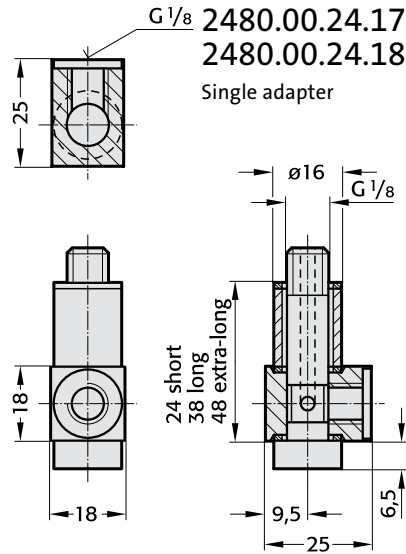


Order No	G	d	A/F	l	l <sub>1</sub>
2480.00.24.01	G 1/8	14	14	22	8
2480.00.24.02	G 1/4	19	19	21	10
2480.00.24.03	G 1/8	14	14	22	8
2480.00.24.04	G 1/4	19	19	21	10

Note:

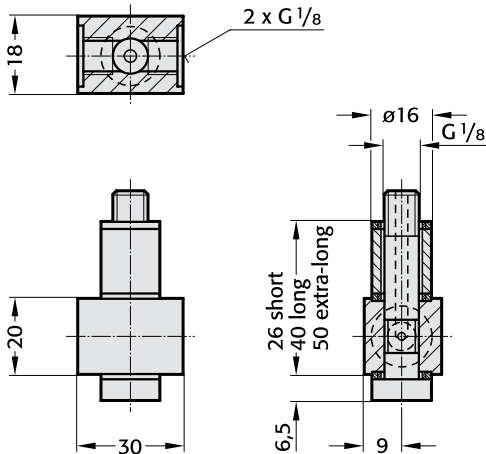
The gauging coupling with valve is used in standard permanent connections. The valveless gauging coupling is used in systems where changes to the filling pressure are necessary on a regular basis (e.g. die cushions).

**2480.00.24.16** long  
**2480.00.24.17** short  
**2480.00.24.18** extra-long  
Single adapter



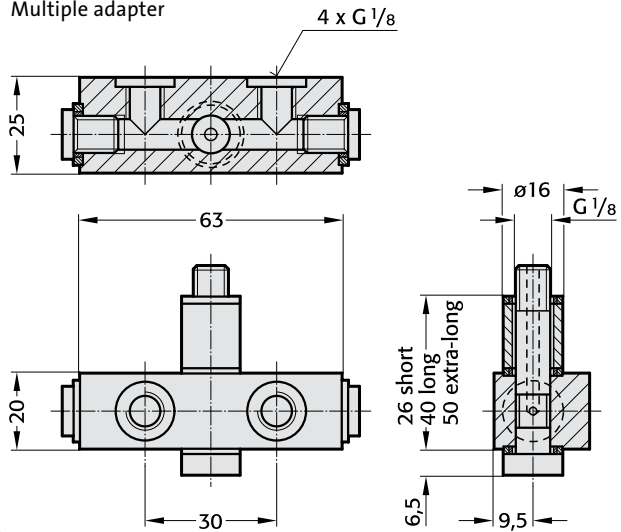
**2480.00.24.13** long      **2480.00.24.14** short  
**2480.00.24.15** extra-long

Dual adapter



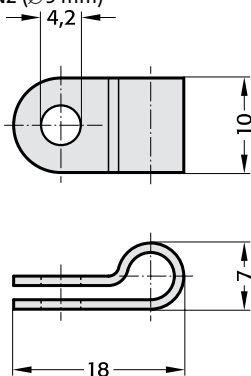
**2480.00.24.10** long      **2480.00.24.11** short  
**2480.00.24.12** extra-long

Multiple adapter



**2480.00.23.12.01**

Hose clamp for gauging hose  
DN2 (∅5 mm)

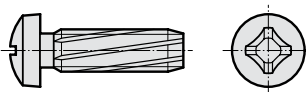


Material: Polyamide

Note:  
Supplied without screws

**2192.50.04.012**

self-tapping screw  
A M4x12 DIN 7516



Note: self-tapping  
Diameter of hole for self-tapping screw = 3,6 mm

**2480.00.23.13.**

Anti-scuff spiral  
for subsequent installation over hoses and tubing



Order No	l in mm
2480.00.23.13.0001	1000
2480.00.23.13.0002	2000
2480.00.23.13.0005	5000
2480.00.23.13.0010	10000

Inner-∅	7 mm
For hose/tubing outer-∅	max. 5-25 mm
Temperature range	-30 °C to +100 °C

Material:  
Polyamide

Description:

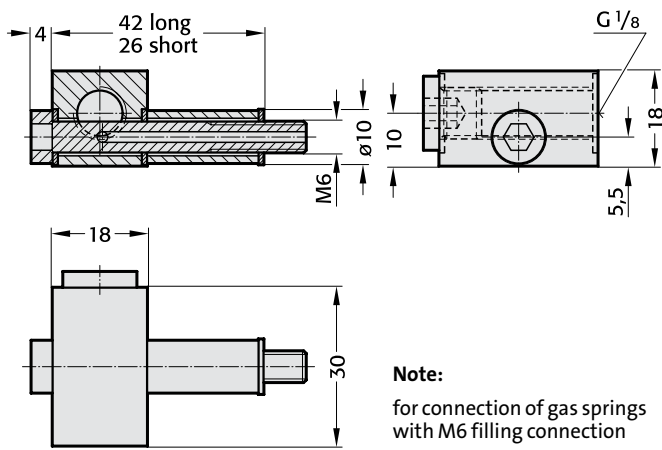
The anti-scuff spiral is used to protect against abrasion, is resistant to air, water, oil, hydraulic fluids petrol and other liquids.

Gas Spring Accessories  
Minimess – Compound Threaded Joints

2480.00.24.

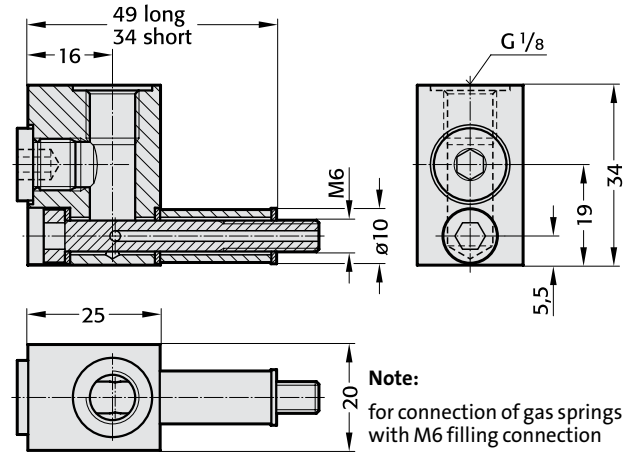
2480.00.24.53 horizontal, long  
2480.00.24.54 horizontal, short

Double adapter



2480.00.24.56 vertical, long  
2480.00.24.57 vertical, short

Double adapter



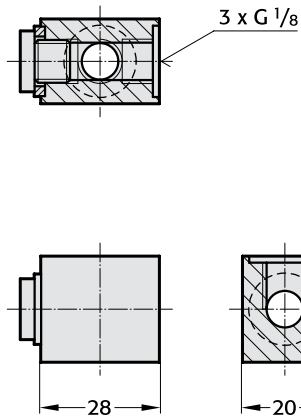
A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or writing.

**Gas Spring Accessories**  
**Minimess – Compound Threaded Joints**

**2480.00.24.**

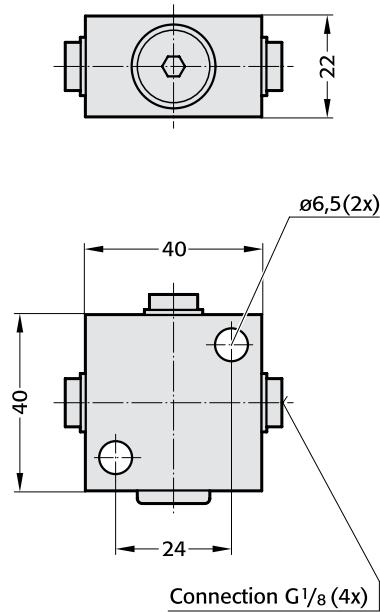
**2480.00.24.30**

Distributor block G 1/8  
 3 ports



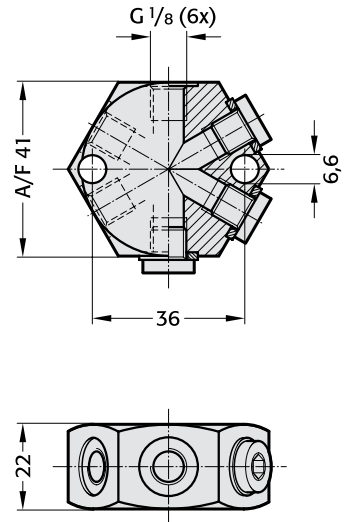
**2480.00.24.34**

Distributor block G 1/8  
 4 ports



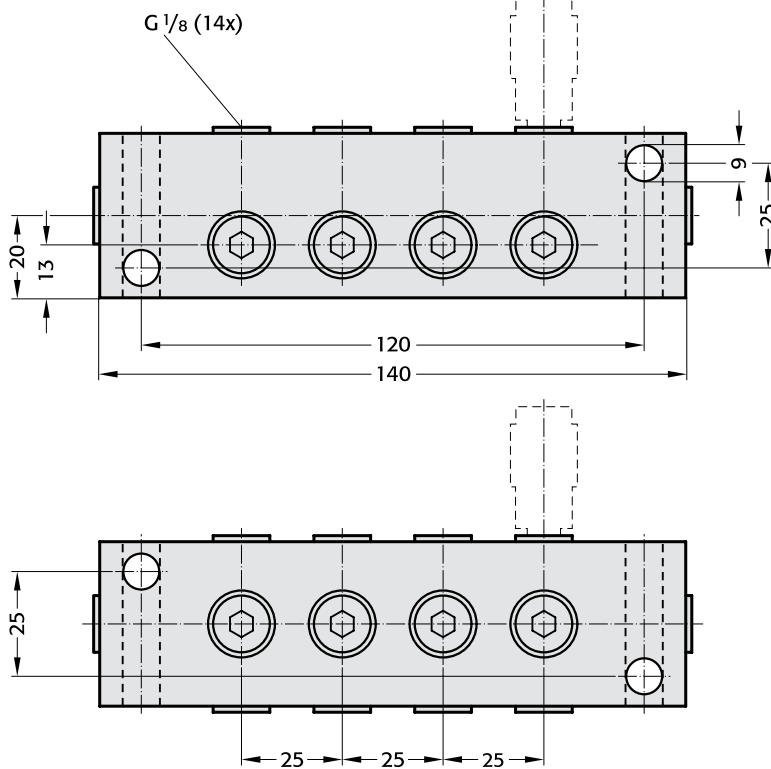
**2480.00.24.31**

Distributor block G 1/8  
 6 ports



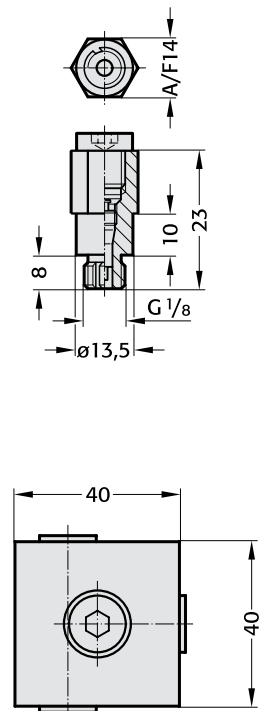
**2480.00.24.33**

Distributor G 1/8  
 14 ports



**2480.00.40**

Charging Adapter

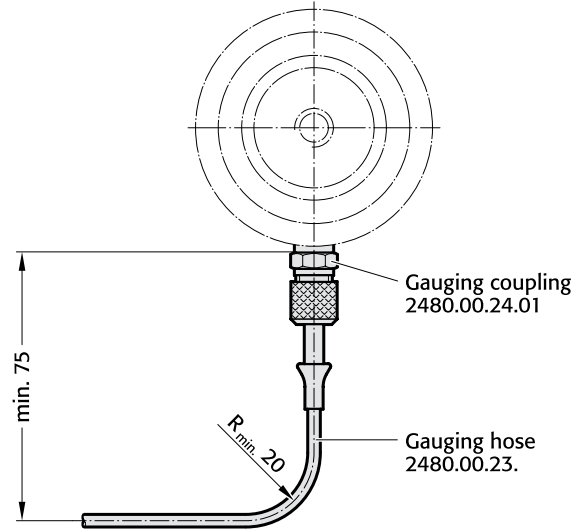
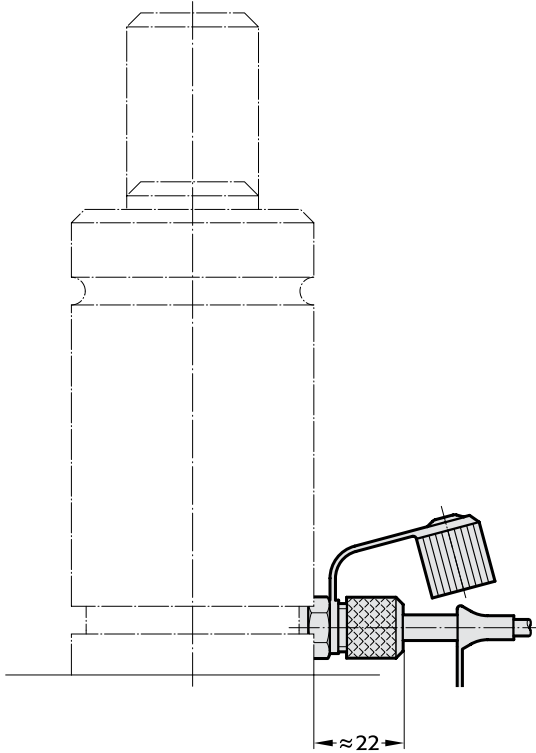




2480.00.24.

2480.00.24.01

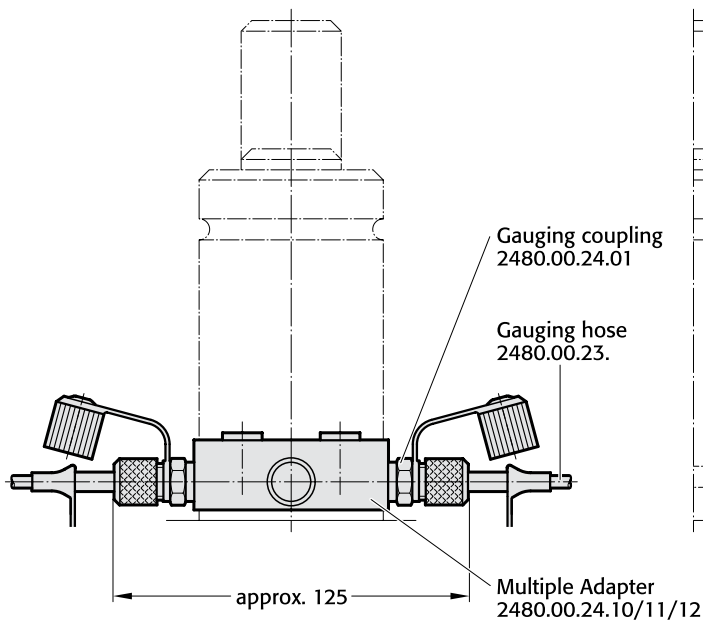
Gauging coupling with valve installed



2480.00.24.10 long  
 11 short  
 12 extra-long

Multiple adapter with two gauging couplings

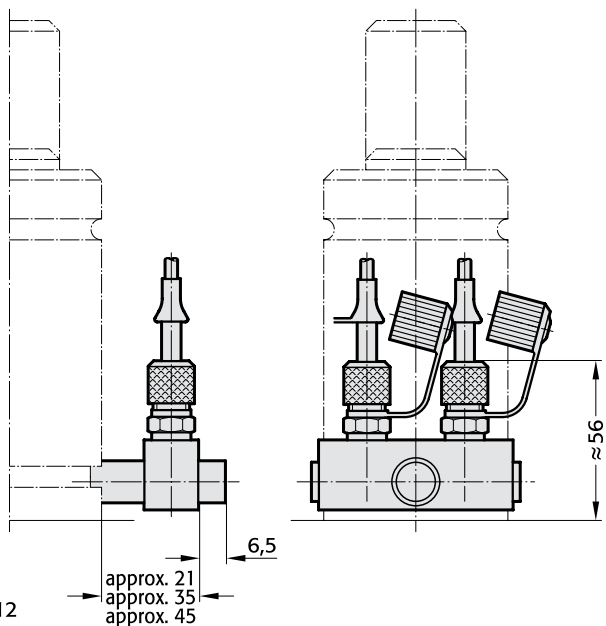
connected horizontally



**Note:**

When installing or fitting a gauging coupling the valve must be removed from the gas spring.

connected vertically



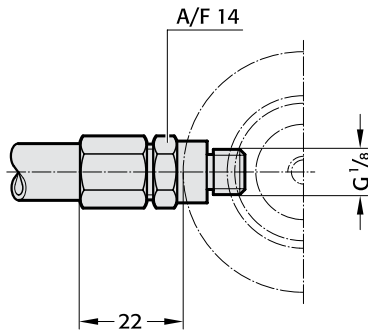
Gas Spring Accessories  
Compression Fitting  
Compound Threaded Joints

FIBRO

2480.00.10.

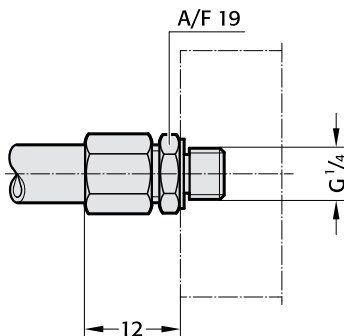
2480.00.10.01

Direct connector to gas spring



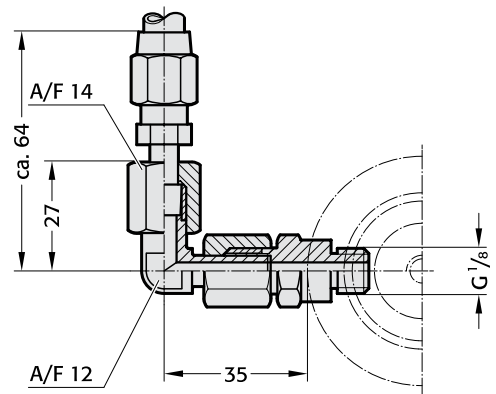
2480.00.10.03

Direct connector to control fitting



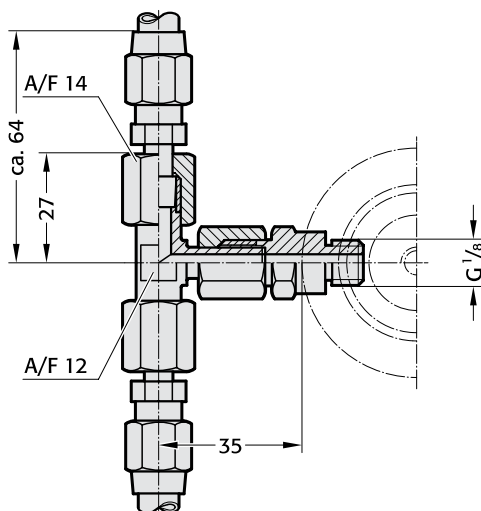
2480.00.10.10

angle connector, adjustable



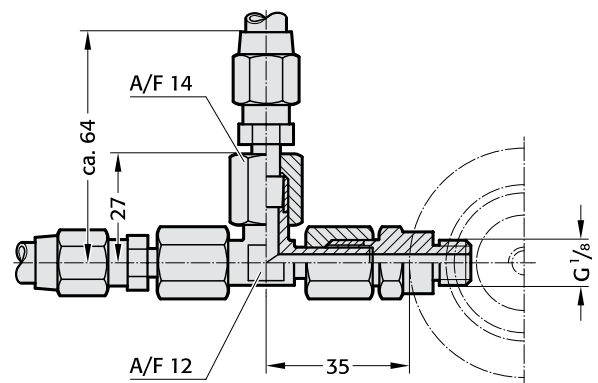
2480.00.10.11

T-connector, adjustable



2480.00.10.12

L-connector, adjustable



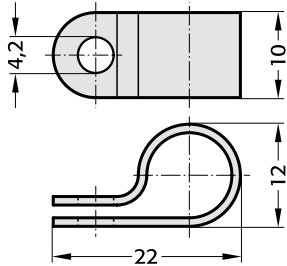
# FIBRO

2480.00.

## Gas Springs Accessoires Compression Fitting Compound Threaded Joints

2480.00.10.20.12.01

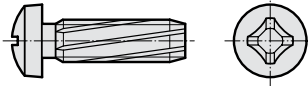
Hose clamp for gauging hose  
DN4 (ø9 mm)



**Material:** Polyamide  
**Note:** Supplied without screws

2192.50.04.012

self-tapping screw  
A M4x12 DIN 7516



**Note:** self-tapping  
Diameter of hole for self-tapping screw = 3.6 mm

2480.00.23.13.

Anti-scuff spiral  
for subsequent installation over hoses and tubing



Order No	l in mm
2480.00.23.13.0001	1000
2480.00.23.13.0002	2000
2480.00.23.13.0005	5000
2480.00.23.13.0010	10000
Inner-ø	7 mm
For hose/tubing	
outer-ø	max. 5-25 mm
Temperature range	-30 °C to +100 °C

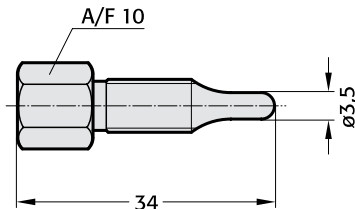
**Material:**  
Polyamide

**Description:**

The anti-scuff spiral is used to protect against abrasion, is resistant to air, water, oil, hydraulic fluids petrol and other liquids.

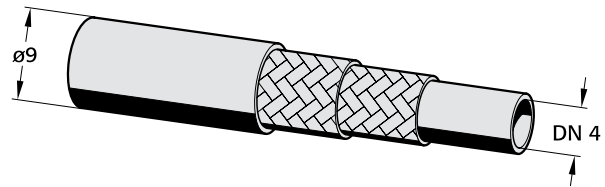
2480.00.54.01

Expansion punch for hosing



2480.00.10.20.

High-pressure hose

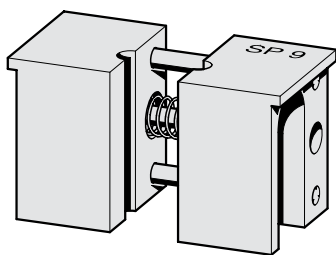


**Ordering Code (example):**

High pressure	=	2480.00.10.20.
length 10 m	=	0010
Order No	=	2480.00.10.20.0010

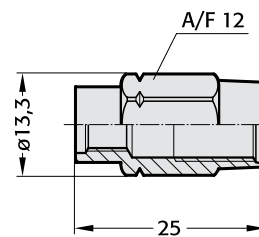
2480.00.54.02

Vice jaws for holding high-pressure hose



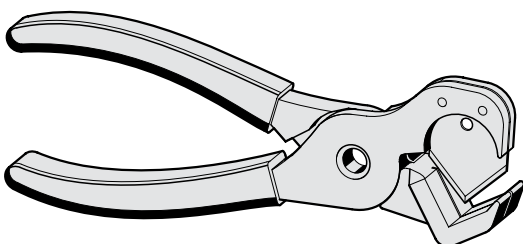
2480.00.10.21

Hose screw fitting (female)



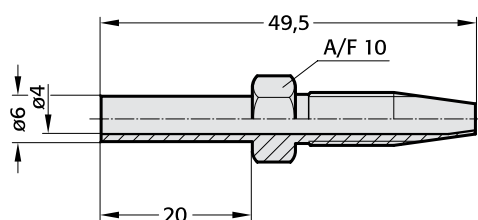
2480.00.54.03

Hose shears



2480.00.10.22

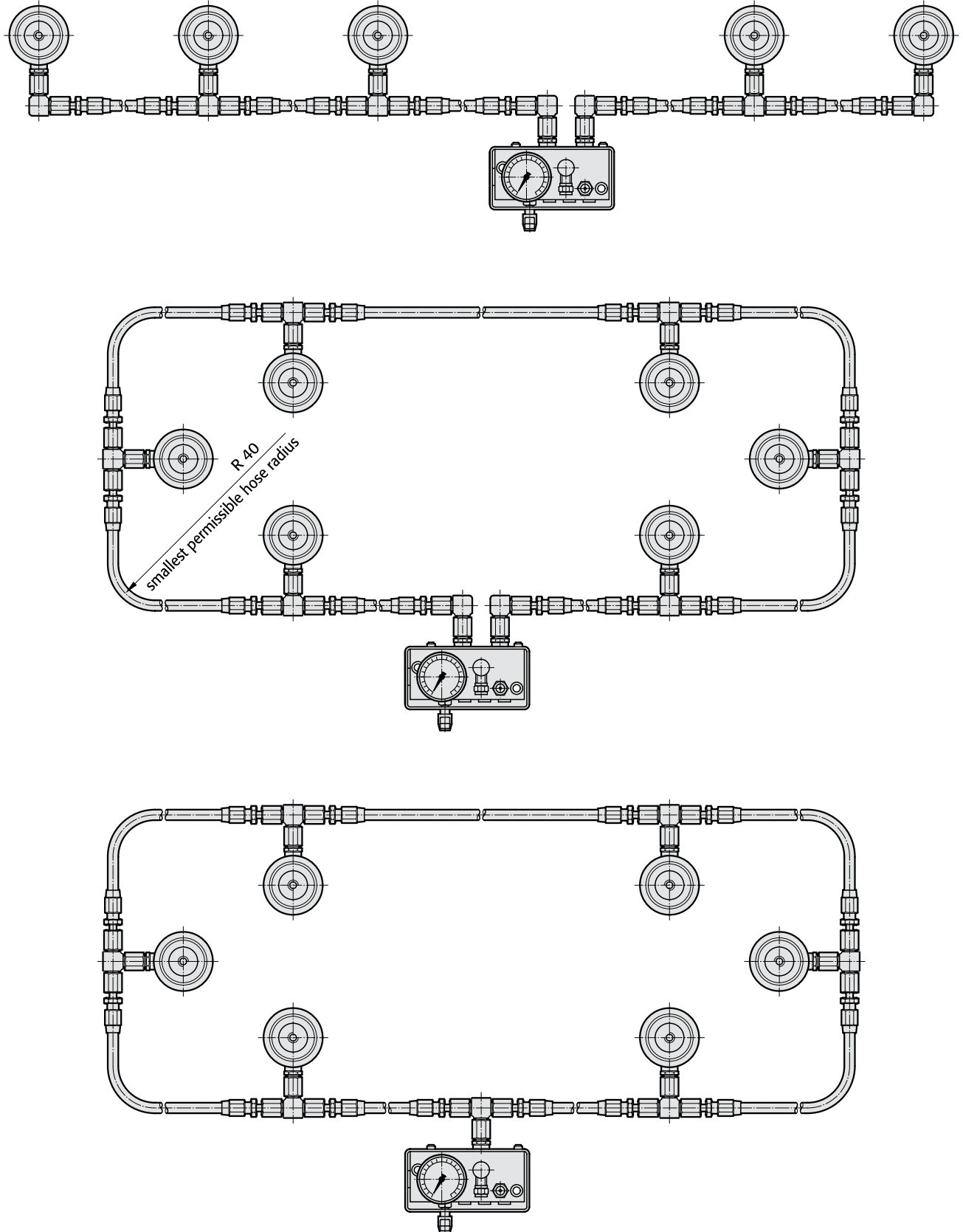
Hose screw fitting (male)



# Assembly Arrangement of Gas Springs in Serial Connection Compression Fitting

FIBRO

2480.00.10

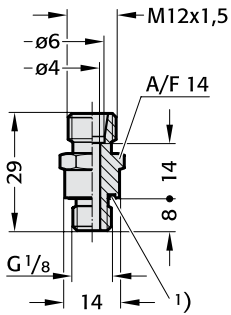


**Note:** When installing gas springs always remove the valve from the gas spring.

2480.00.26.

2480.00.26.03

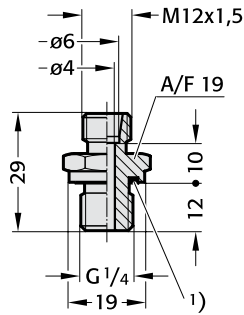
Threaded Joint G<sup>1</sup>/<sub>8</sub>



1) Eolastic-Seal ED

2480.00.26.04

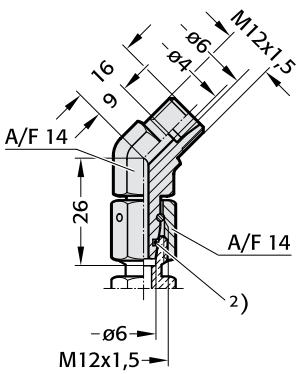
Threaded Joint G<sup>1</sup>/<sub>4</sub>



1) Eolastic-Seal ED

2480.00.26.21

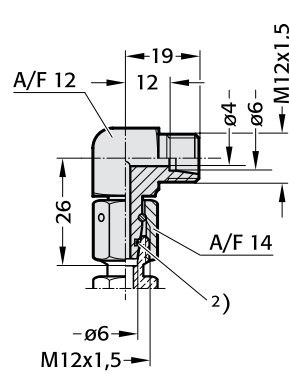
Adjustable threaded joint 45°, complete



2) O-ring

2480.00.26.22

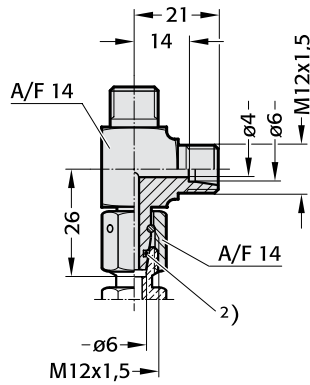
Adjustable threaded joint 90°, complete



2) O-ring

2480.00.26.23

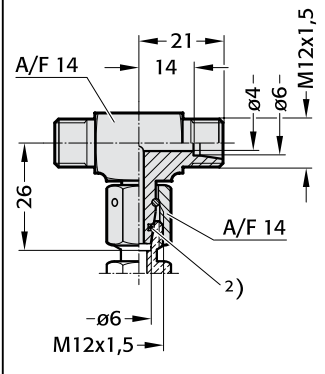
Adjustable L-Coupling, complete



2) O-ring

2480.00.26.24

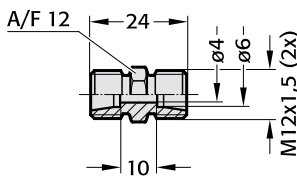
Adjustable T-Coupling, complete



2) O-ring

2480.00.26.25

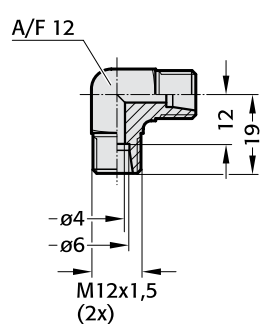
Adapter straight, hose to hose



subject to alterations

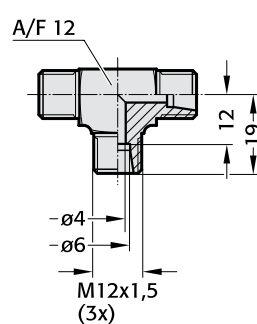
2480.00.26.26

Adapter, 90°, hose to hose



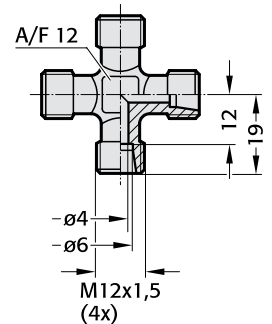
2480.00.26.27

Adapter, T, hose to hose



2480.00.26.28

Adapter, K, hose to hose



# Gas springs accessories

## Connecting hoses with 24° cone

(DIN 2353 / DIN EN ISO 8434-1)

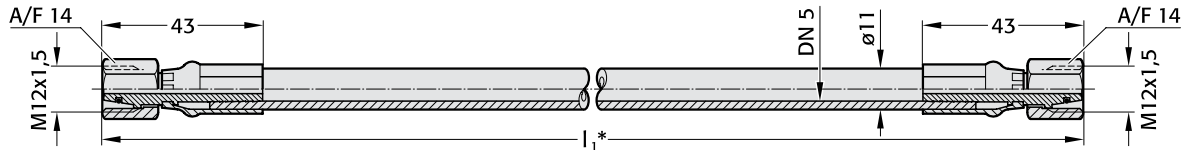
**FIBRO**

2480.00.25.

### 2480.00.25.01.

Hose - conical seals with union nuts and O-ring (straight/straight)

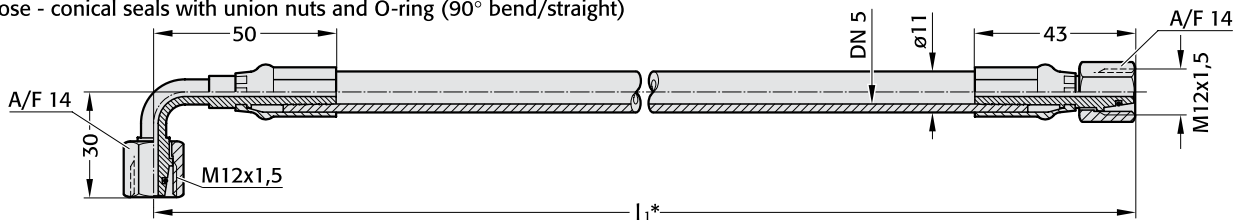
\* Shortest factory lengths: 140 mm  
minimum bending radius R40



Dimension  $l_1$  specified in the order, e.g. 765 mm, gives order no 2480.00.25.01.0765

### 2480.00.25.02.

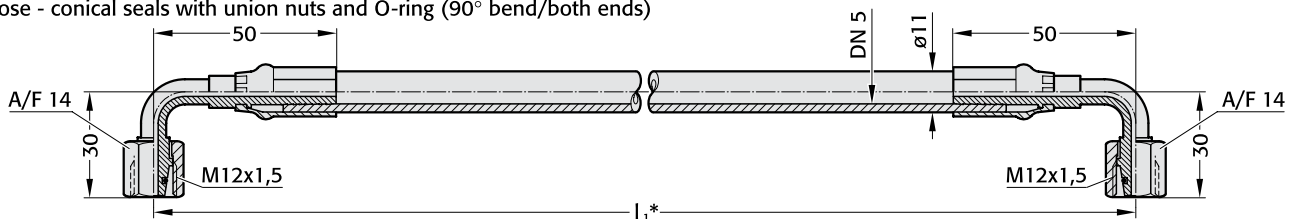
Hose - conical seals with union nuts and O-ring (90° bend/straight)



Dimension  $l_1$  specified in the order, e.g. 765 mm, gives order no 2480.00.25.02.0765

### 2480.00.25.03.

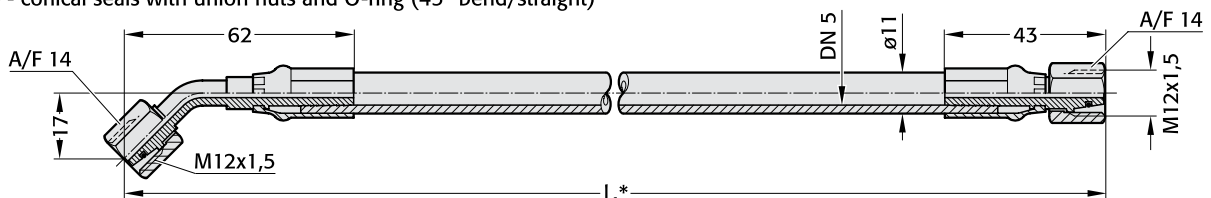
Hose - conical seals with union nuts and O-ring (90° bend/both ends)



Dimension  $l_1$  specified in the order, e.g. 765 mm, gives order no 2480.00.25.03.0765

### 2480.00.25.04.

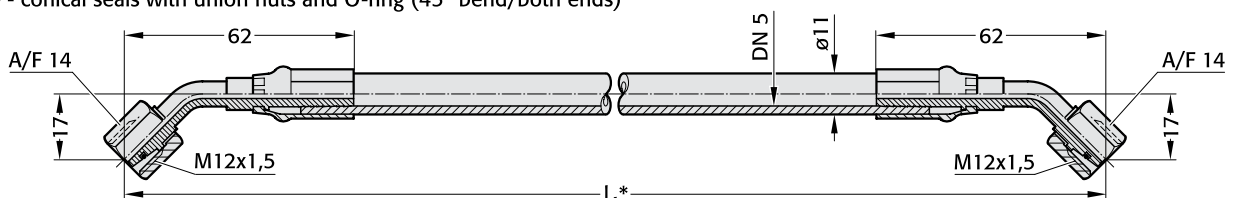
Hose - conical seals with union nuts and O-ring (45° bend/straight)



Dimension  $l_1$  specified in the order, e.g. 765 mm, gives order no 2480.00.25.04.0765

### 2480.00.25.05.

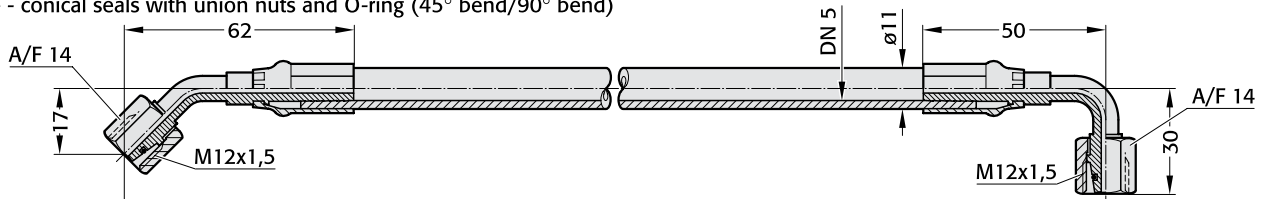
Hose - conical seals with union nuts and O-ring (45° bend/both ends)



Dimension  $l_1$  specified in the order, e.g. 765 mm, gives order no 2480.00.25.05.0765

### 2480.00.25.06.

Hose - conical seals with union nuts and O-ring (45° bend/90° bend)



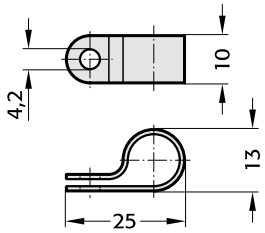
Dimension  $l_1$  specified in the order, e.g. 765 mm, gives order no 2480.00.25.06.0765

**Gas springs accessories**  
**Direct connection dimensions**  
**24°-cone threaded joint (DIN 2353 / DIN EN ISO 8434-1)**

2480.00.26.

**2480.00.25.12.01**

Hose clamp for gauging hose  
 DN5 (∅ 11 mm)

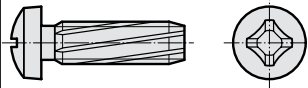


**Material:** Polyamide

**Note:**  
 Supplied without screws

**2192.50.04.012**

self-tapping screw  
 A M4×12 DIN 7516



**Note:** self-tapping,  
 Diameter of hole for self-tapping  
 screw = 3,6 mm

**2480.00.23.13.**

Anti-suff scuff spiral  
 for subsequent installation over hoses and tubing



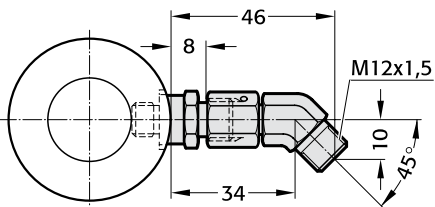
Order No	l in mm
2480.00.23.13.0001	1000
2480.00.23.13.0002	2000
2480.00.23.13.0005	5000
2480.00.23.13.0010	10000
Inner-∅	7 mm
For hose/tubing	
outer-∅	max. 5-25 mm
Temperature range	-30 °C to +100 °C

**Material:**  
 Polyamide

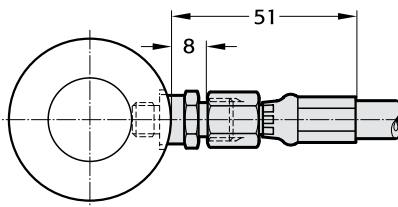
**Description:**

The anti-suff scuff spiral is used to protect against abrasion, is resistant to air, water, oil, hydraulic fluids petrol and other liquids.

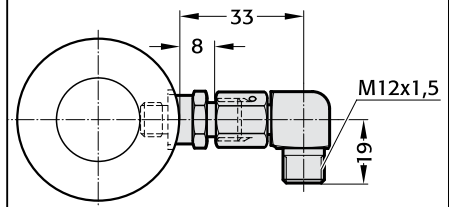
Direct connection  
 with 45°-elbow adaptor  
 2480.00.26.21



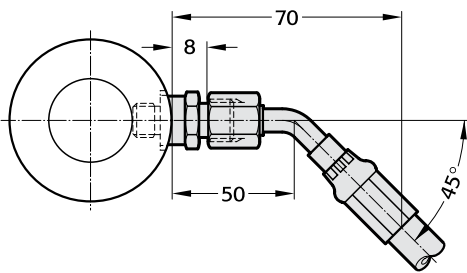
Direct connection  
 hose straight  
 adaptor 2480.00.26.03



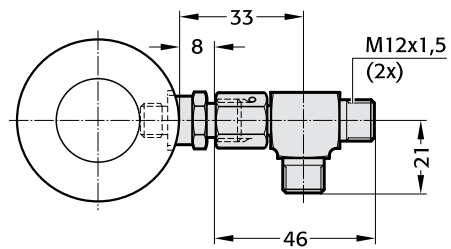
Direct connection  
 with 90°-elbow adaptor  
 2480.00.26.22



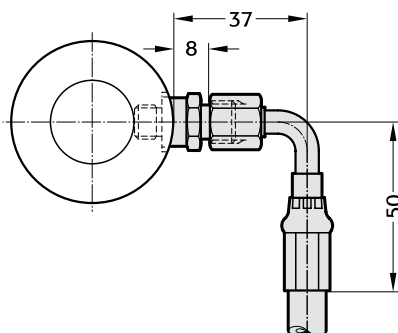
Direct connection  
 45° hose with  
 adaptor 2480.00.26.03



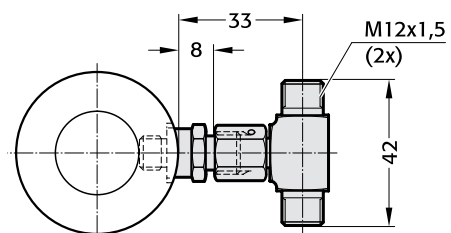
Direct connection  
 with L-coupling  
 2480.00.26.23



Direct connection  
 90° hose with  
 adaptor 2480.00.26.03



Direct connection  
 with T-coupling  
 2480.00.26.24



**Gas Spring Accessories**  
**Connector system, 24° conus micro**

**2480.00.27.**

**2480.00.27.01.**

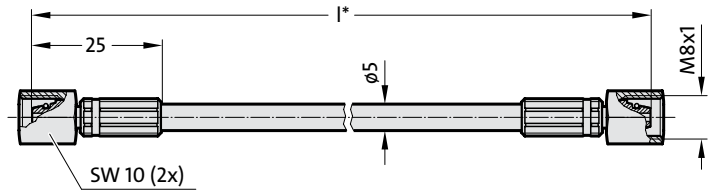
Order No	l*
2480.00.27.01.0200	200
0300	300
0400	400
0500	500
0630	630
0800	800
1000	1000
1200	1200
1500	1500
2000	2000
2500	2500
3000	3000

\* Other lengths available in 5 mm steps.  
 Shortest factory length:  
 without antikink protection: 90 mm  
 antikink protection at one end: 150 mm  
 antikink protection at both ends: 300 mm

**2480.00.27.01.**

Min. bending radius R20 mm

Connection hose, 24° conus micro, straight on both sides (connection hose, sealing cone with union nut and O ring)



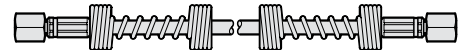
**2480.00.27.01.....1**

Antikink spiral, at one end



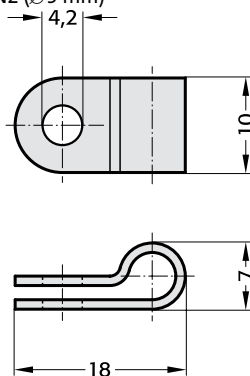
**2480.00.27.01.....2**

Antikink spiral, at both ends



**2480.00.23.12.01**

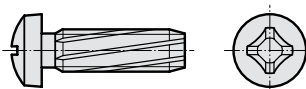
Hose clamp for gauging hose  
 DN2 (ø5 mm)



**Material:** Polyamide  
**Note:**  
 Supplied without screws

**2192.50.04.012**

self-tapping screw  
 A M4x12 DIN 7516



**Note:** self-tapping  
 Diameter of hole for self-tapping screw = 3,6 mm

**2480.00.23.13.**

Anti-scuff spiral  
 for subsequent installation over hoses and tubing



Order No	l in mm
2480.00.23.13.0001	1000
2480.00.23.13.0002	2000
2480.00.23.13.0005	5000
2480.00.23.13.0010	10000

Inner-Ø 7 mm  
 For hose/tubing outer-Ø max. 5-25 mm  
 Temperature range -30 °C to +100 °C

**Material:**  
 Polyamide  
**Description:**  
 The anti-scuff spiral is used to protect against abrasion, is resistant to air, water, oil, hydraulic fluids petrol and other liquids.



**FIBRO**

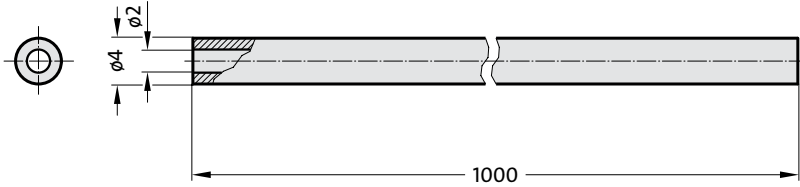
**2480.00.27.**

# Gas Spring Accessories Connector system, 24° conus micro

**2480.00.27.11**

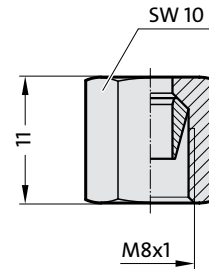
Pipe for 24° conus micro  
Delivery length: 1 m

Min. bending radius R12 mm  
(3x exterior diameter)



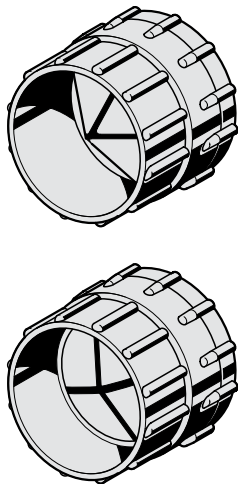
**2480.00.27.11.01**

Cutting ring screw connection, 24° conus micro



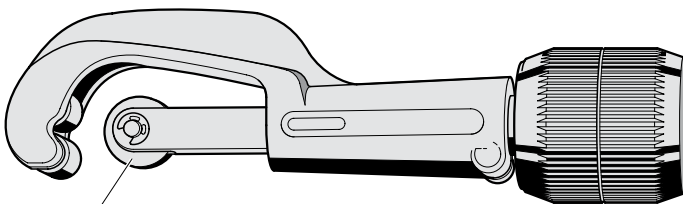
**2480.00.27.00.01**

Deburring tool for 24° conus micro



**2480.00.27.00.02**

Pipe cutter for 24° conus micro



**2480.00.27.00.02.1**

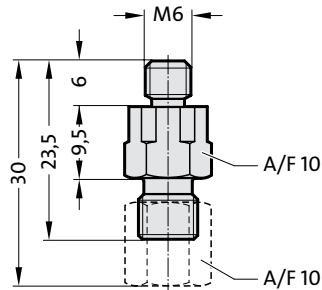
Replacement cutting wheel for  
pipe cutter

**Gas Spring Accessories**  
**Connector system, 24° conus micro**

**2480.00.28.**

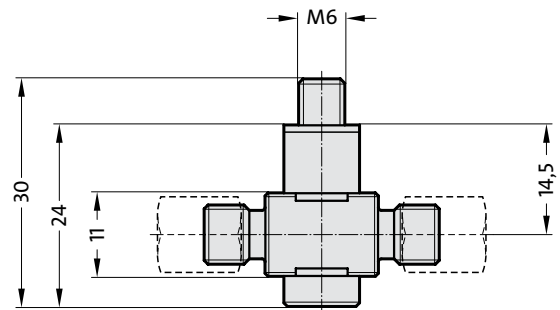
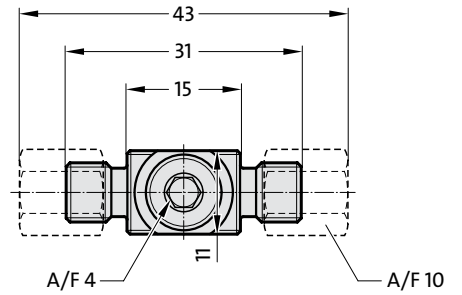
**2480.00.28.01**

Screw connection GE-M6-24° conus micro



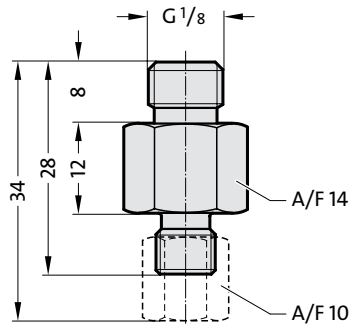
**2480.00.28.14**

Screw connection T-24° conus micro



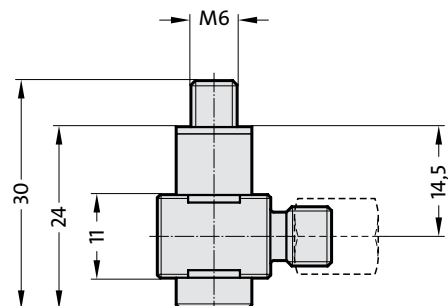
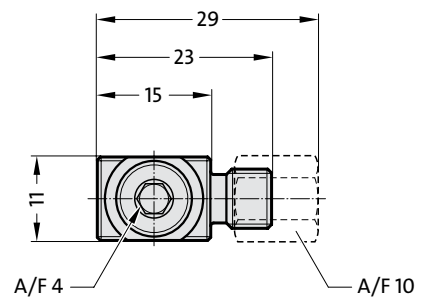
**2480.00.28.02**

Screw connection GE-G<sup>1</sup>/<sub>8</sub>-24° conus micro



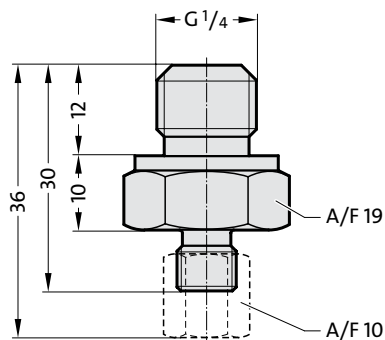
**2480.00.28.17**

Screw connection W-24° conus micro



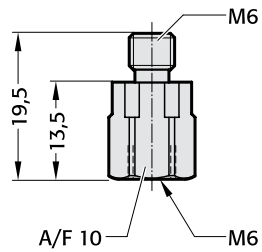
**2480.00.28.03**

Screw connection GE-G<sup>1</sup>/<sub>4</sub>-24° conus micro

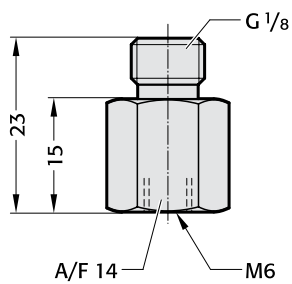


**2480.00.22.06.06**

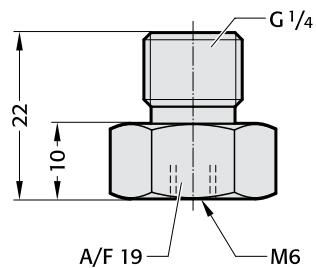
Screw connection, GE-M6-M6 micro for connection to gas spring with divided wheel flange 2480.022.

**2480.00.22.18.06**

Screw connection, GE-G<sup>1</sup>/<sub>8</sub>-M6 micro for 2480.00.28.14 / 2480.00.28.17

**2480.00.22.14.06**

Screw connection, GE-G<sup>1</sup>/<sub>4</sub>-M6 micro for 2480.00.28.14 / 2480.00.28.17

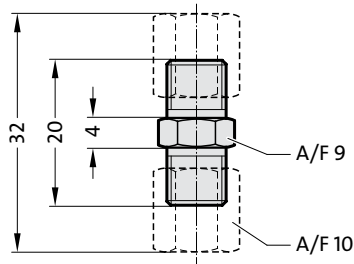


**Gas Spring Accessories**  
**Connector system, 24° conus micro**

**2480.00.28.**

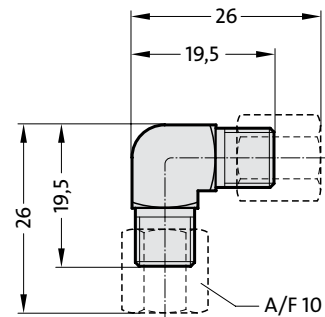
**2480.00.28.25**

Adapter, GE-24° conus micro  
 hose – hose



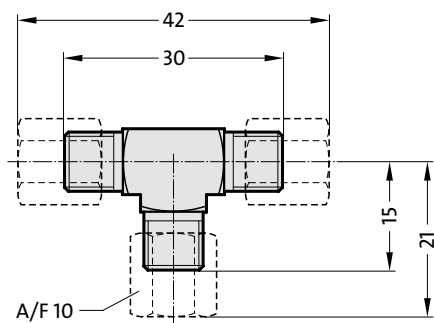
**2480.00.28.26**

Adapter, W-24° conus micro  
 hose – hose



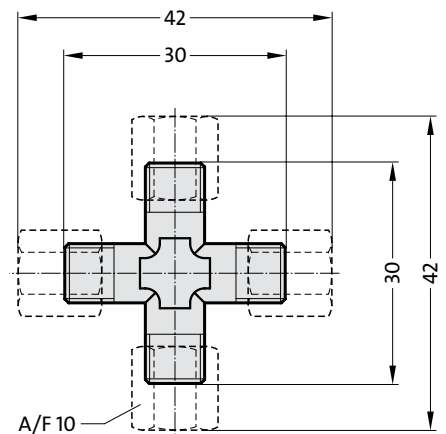
**2480.00.28.27**

Adapter, T-24° conus micro  
 hose – hose



**2480.00.28.28**

Adapter, K-24° conus micro  
 hose – hose



# FIBRO

2480.00.34.11  
2480.00.34.13

## Micro Control Fitting without pressure relief with pressure relief

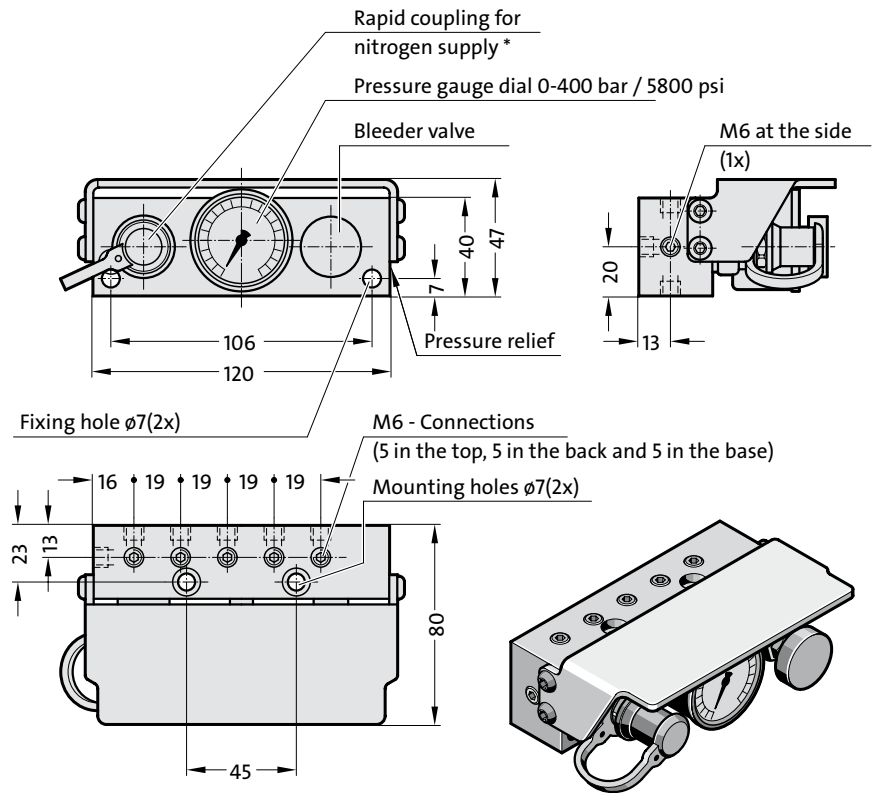
### Description:

The micro control fitting 2480.00.34.11/13 is used to constantly monitor the charge pressure of one or more Gas Springs (3x5 connections M6, top, bottom, back and 1x at the side).

### Note:

\* 2 m long filling hose with rapid coupling, shutoff valve and gas bottle connector Order no: 2480.00.31.02 (to be ordered separately)

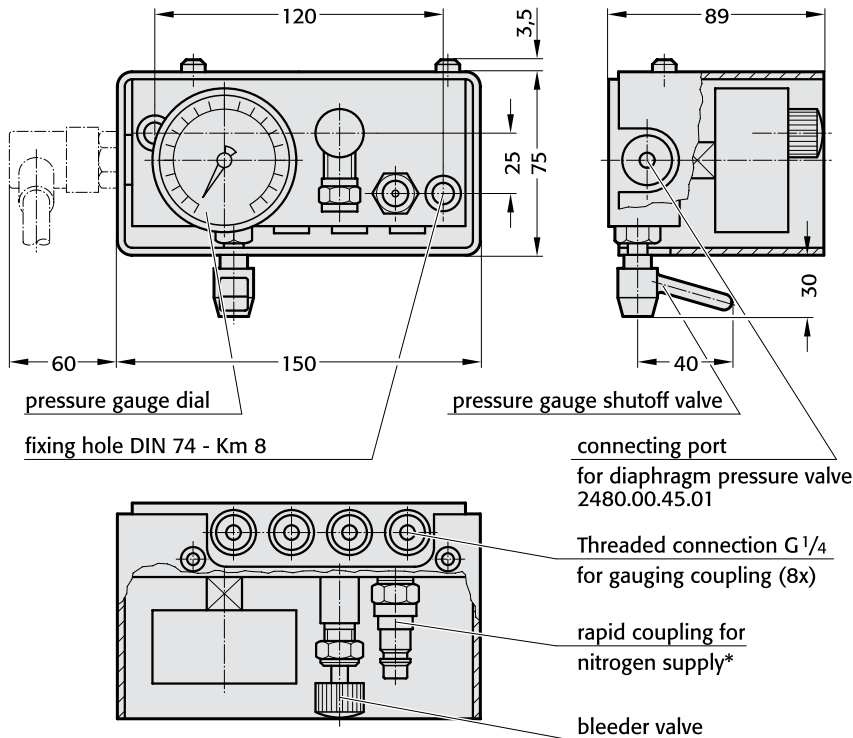
2480.00.34.11 without pressure relief  
2480.00.34.13 with pressure relief



**Control Fitting  
for Gas Springs**

2480.00.30.01/.02/.03/.04  
2480.00.31.01/.06/.07

- 2480.00.30.01 without pressure switch, without pressure relief
- 2480.00.30.02 with pressure switch, without pressure relief
- 2480.00.30.03 without pressure switch, with pressure relief
- 2480.00.30.04 with pressure switch, with pressure relief



**Description:**

The control fitting 2480.00.30.01/02/03/04 serves to control the charge pressure of up to eight connected gas springs.

Pressure checks during operation can be effected in two ways:

- a) by visual monitoring of the gauge dials.
- b) automatically, by means of diaphragm pressure switch 248.00.15 The switch will stop the associated machine as soon as the charge pressure drops below the value set.

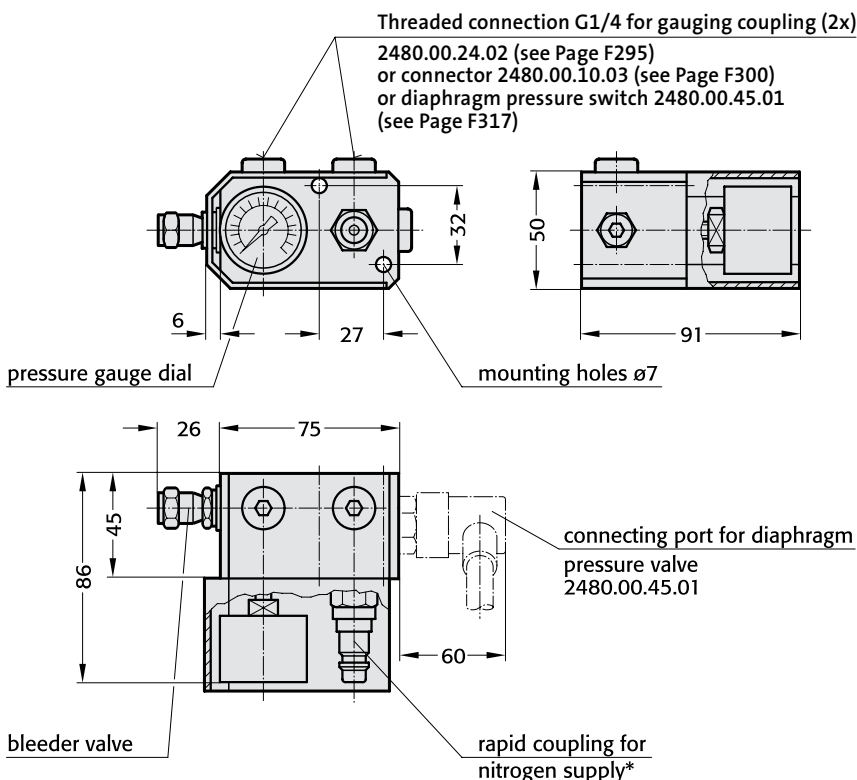
**Note:**

The shutoff valve may be open or closed during operation.

The closing of the pressure gauge shutoff valve ensures that no pressure peaks from the gas spring act on the pressure gauge.

\* 2-m long filling hose with rapid coupling, shutoff valve and gas bottle connector, Order No. 2480.00.31.02 (to be ordered separately)

- 2480.00.31.01 without pressure switch
- 2480.00.31.06 with pressure switch
- 2480.00.31.07 without pressure switch, with pressure relief

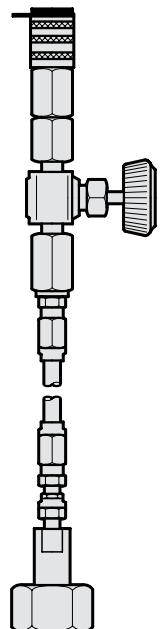


**Description:**

The control fitting 2480.00.31.01 performs the same function as the control armature 2480.00.30.01.

**Note:**

\* 2-m long filling hose with rapid coupling, shutoff valve and gas bottle connector, Order No. 2480.00.31.02 (to be ordered separately)

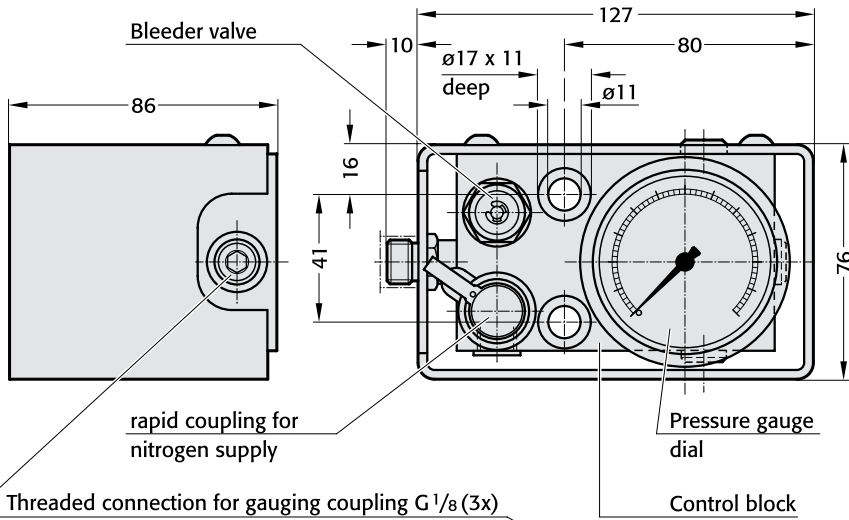


**FIBRO**

2480.00.30.13

# Control fitting without pressure switch, including pressure relief

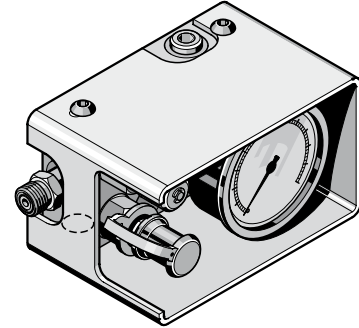
2480.00.30.13 without pressure switch, with pressure relief



2480.00.24.01 (see page F295)  
or connector 2480.00.10.01 (see page F300)

Threaded Connector  
 $9/16-18$  UNF

2480.00.30.13



## Description:

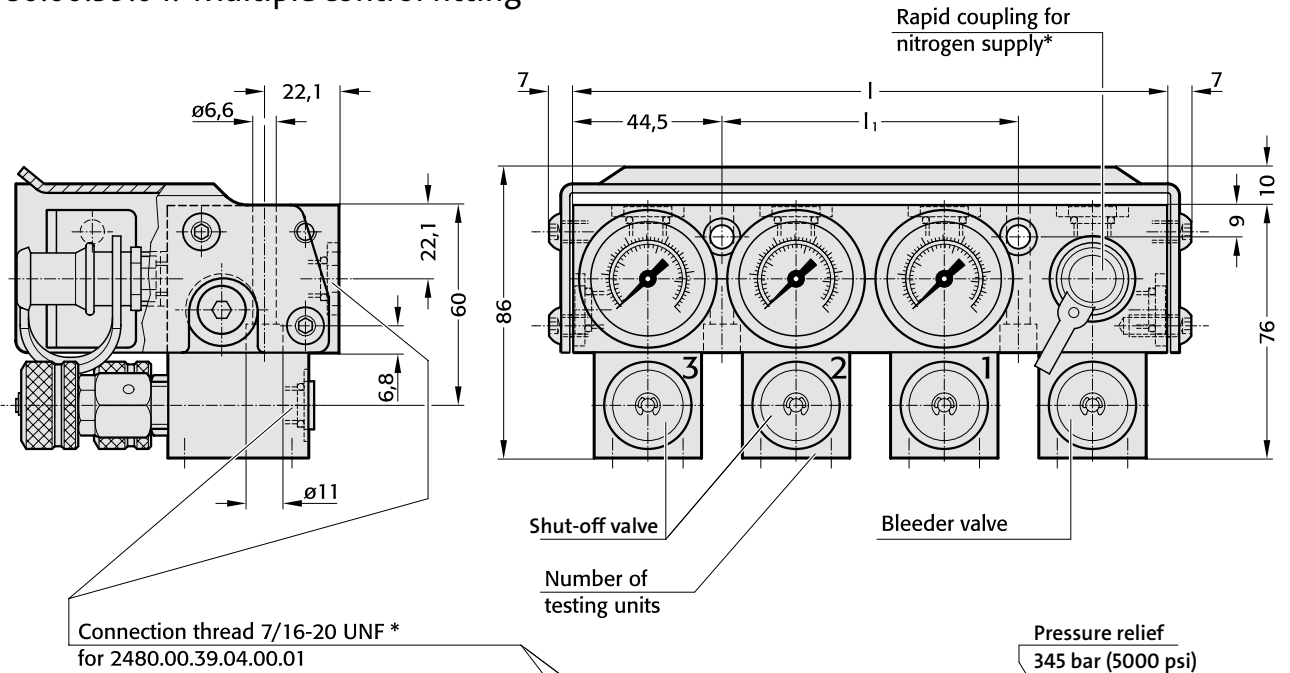
The control fitting 2480.00.30.13 is used to constantly monitor the filling pressure of one or more gas springs. The control fitting is equipped with rapid coupling for nitrogen supply and a bleeder valve. There are three  $G^{1/8}$  ports for simultaneous pressure checking at the control fitting.

Measuring range from  
0 - 400 bar / 5800 psi.

**Multiple control fitting  
Connection adaptor**

**2480.00.39.04.  
2480.00.39.04.00.01**

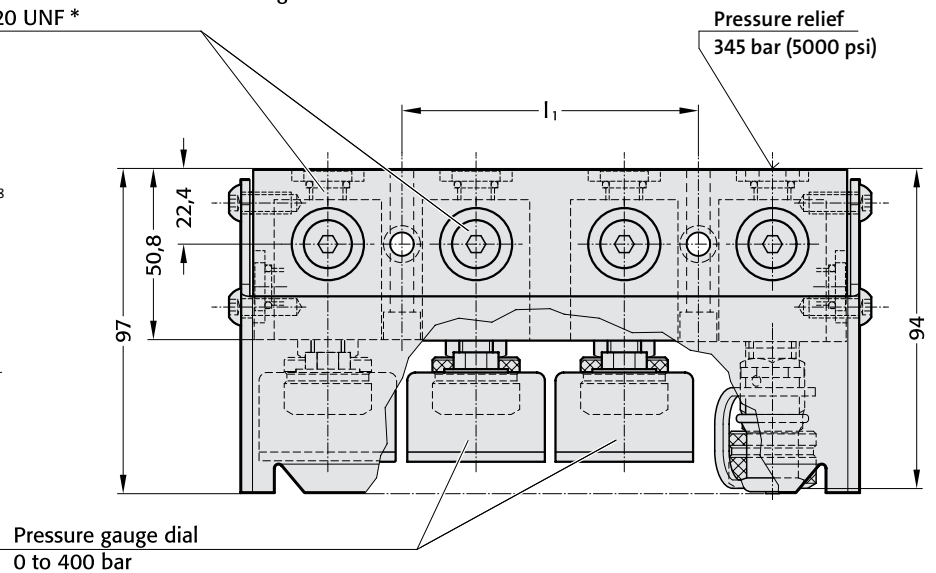
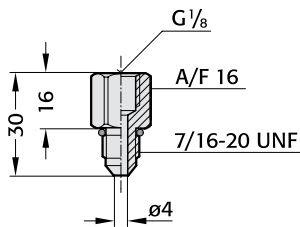
**2480.00.39.04. Multiple control fitting**



Connection thread 7/16-20 UNF \*  
for 2480.00.39.04.00.01

**2480.00.39.04.00.01**

Connection adaptor 7/16-20 UNF – G<sup>1</sup>/<sub>8</sub>



**Description:**

The multiple control fitting is required if it is necessary to check or set the filling pressure of each spring or spring assembly individually.

The filling of the springs is done at a central position using the rapid coupling for nitrogen supply. Each testing unit is provided with three threaded connections for the optional hose connection. The cover protects against mechanical damages.

**Note:**

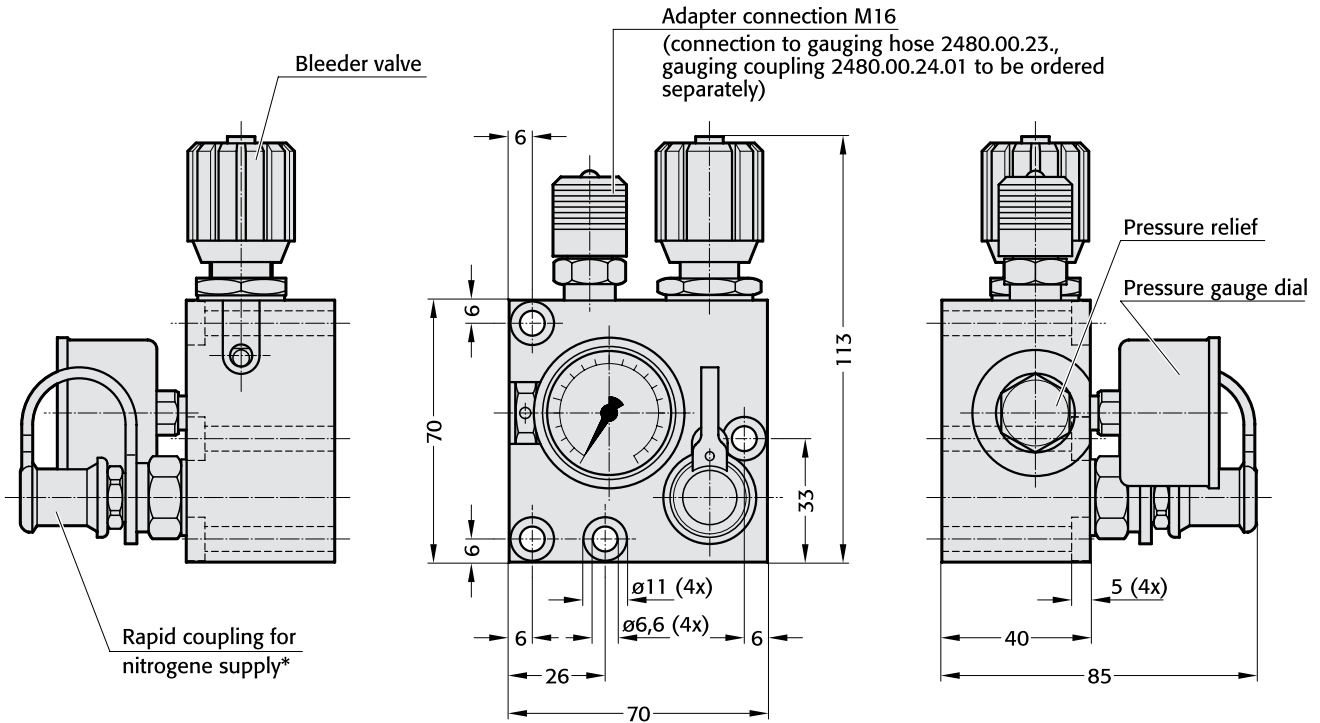
\* For the connection of hose connections G<sup>1</sup>/<sub>8</sub>, the adaptor 2480.00.39.04.00.01 must be ordered separately.

**2480.00.39.04.**

Order no.	Qty. testing units	l	l <sub>1</sub>
2480.00.39.04.02	2	133.5	44.5
2480.00.39.04.03	3	178.0	89.0
2480.00.39.04.04	4	222.5	133.5
2480.00.39.04.05	5	267.0	178.0
2480.00.39.04.06	6	311.5	222.5
2480.00.39.04.08	8	400.5	311.5
2480.00.39.04.10	10	489.5	400.5



2480.00.31.11



**Description:**

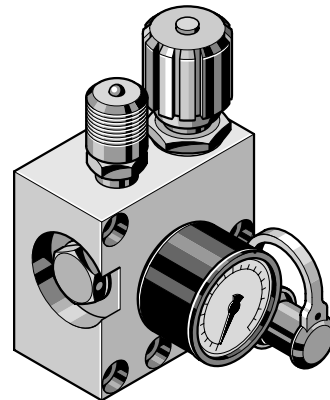
The control fitting with pressure relief 2480.00.31.11 (Faure) is used for continuous monitoring of the filling pressure of one or more gas springs (one connection G<sup>1/8</sup>-M16). During operation the pressure can be checked by visual monitoring of the pressure gauge.

**Note:**

To connect the measuring hose system 2480.00.23, remove M16 connection adapter and screw in the gauging coupling with valve 2480.00.24.01 (to be ordered separately).

When installing gas springs always remove the valve from the gas spring.

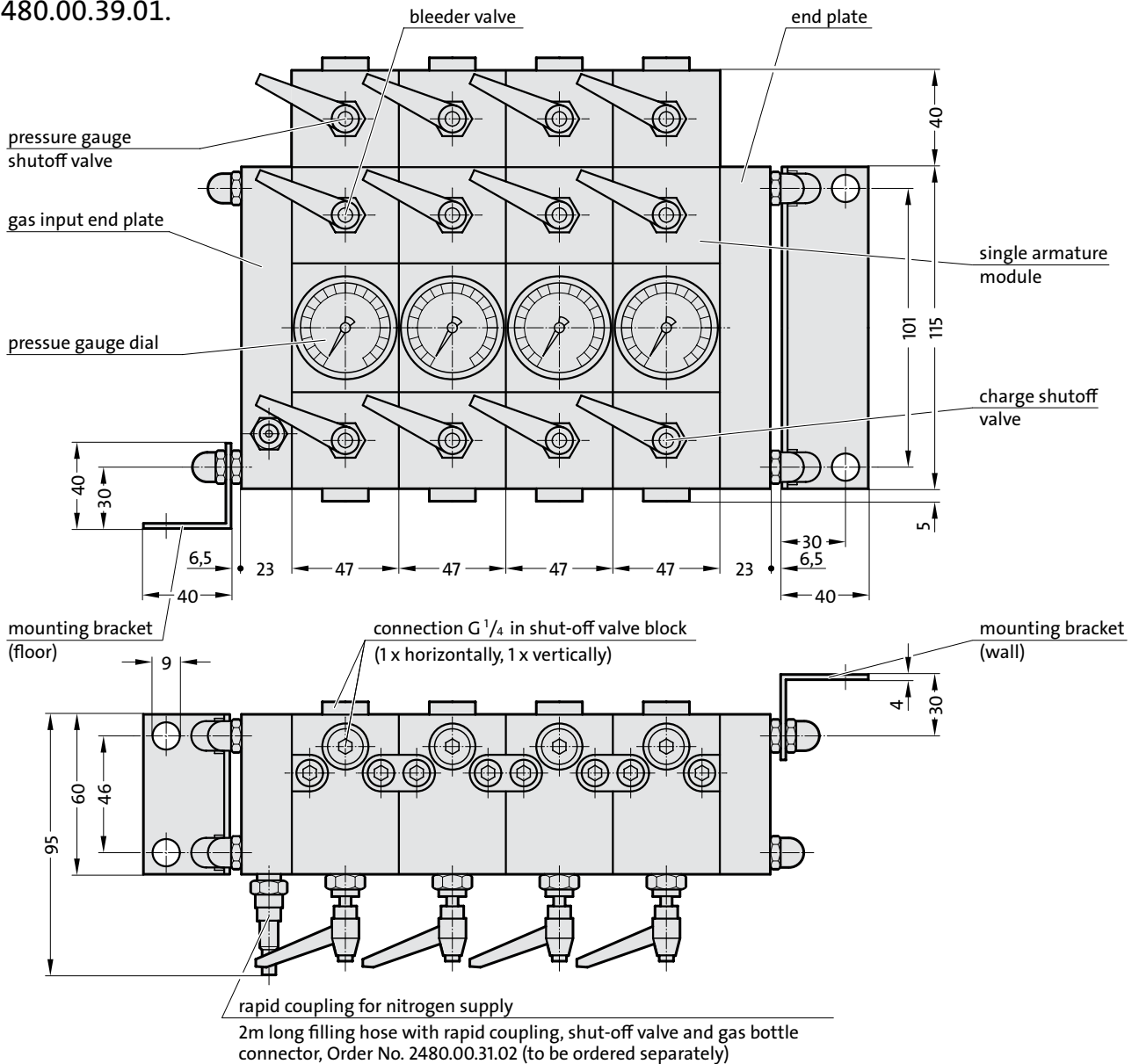
\* 2 m long filling hose with rapid coupling, shut-off valve and gas bottle connector, Order no. 2480.00.31.02 (to be ordered separately)



Stacked Control Fittings  
for individual control

2480.00.39.01.

2480.00.39.01.



**Description:**

Stacked Control fittings are required where it is necessary to control the charge pressure of each gas spring individually. The fitting models can be stacked together ad libitum. Recharging of any to the spring units connected can be effected centrally via the rapid couplings and the appropriate charging valves. Each stack is equipped with an input end plate with rapid coupling, and an end plate sealing off the opposite side. The number of armature modules depends on the number of gas springs in question. The stack can be supplied for wall mounting or for installation on the floor.

**Note:**

When all charge valves are opened the springs are interconnected with one another.

**Ordering Code (example):**

Stacked Control fitting	=	2480.00.39.01.
5 modules	=	005.
with floor-mount	=	1
with wall-mount	=	2
Order No	=	2480.00.39.01. 005. 1 or 2

# FIBRO

2480.00.45.01 2480.00.45.02  
2480.00.45.10

## Diaphragm Pressure Switch Adapter Block

### Technical Data of Diaphragm

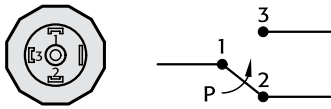
2480.00.45.01  
switching range, adjustable 20–200 bar  
switching tolerance  $\pm 3$ –5 bar  
overpressure protection 300 bar  
voltage (max.) 250 V

2480.00.45.02  
switching range, adjustable 5–50 bar  
switching tolerance  $\pm 3,0$  bar  
overpressure protection 200 bar  
voltage (max.) 250 V

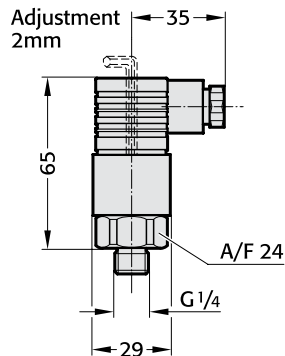
#### Note:

for monitoring pressure of single gas springs  
see adapter 2480.00.45.10

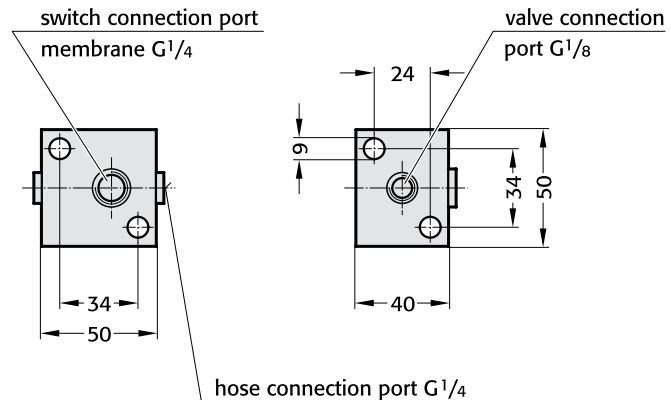
Circuit diagram for  
diaphragm pressure switch



### 2480.00.45.01 2480.00.45.02 Diaphragm Pressure Switch



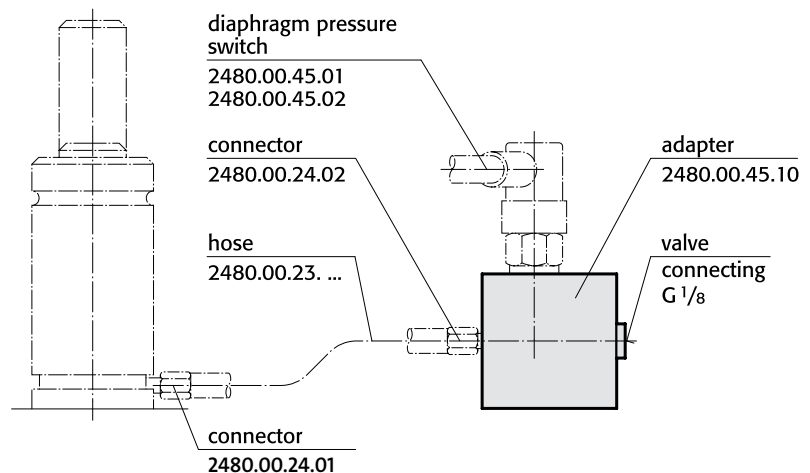
### 2480.00.45.10



### Description:

In conjunction with diaphragm pressure switch 2480.00.45.01 or .02, the adapter 2480.00.45.10 permits the monitoring of the charge pressure: if the pressure drops below a set value, the diaphragm pressure switch operates and emits a signal or stops the machine.

### Installation Example:



### Wireless Pressure Monitoring (WPM)

Wireless monitoring of gas springs

The core requirements on any pressing plant are: Automation and zero-defect production.

Prerequisite is also real-time process control.

The FIBRO Wireless Pressure Monitoring (WPM) system monitors gas springs in all areas in which cable or hose-reliant systems reach their technical limitations, or are simply uneconomical.

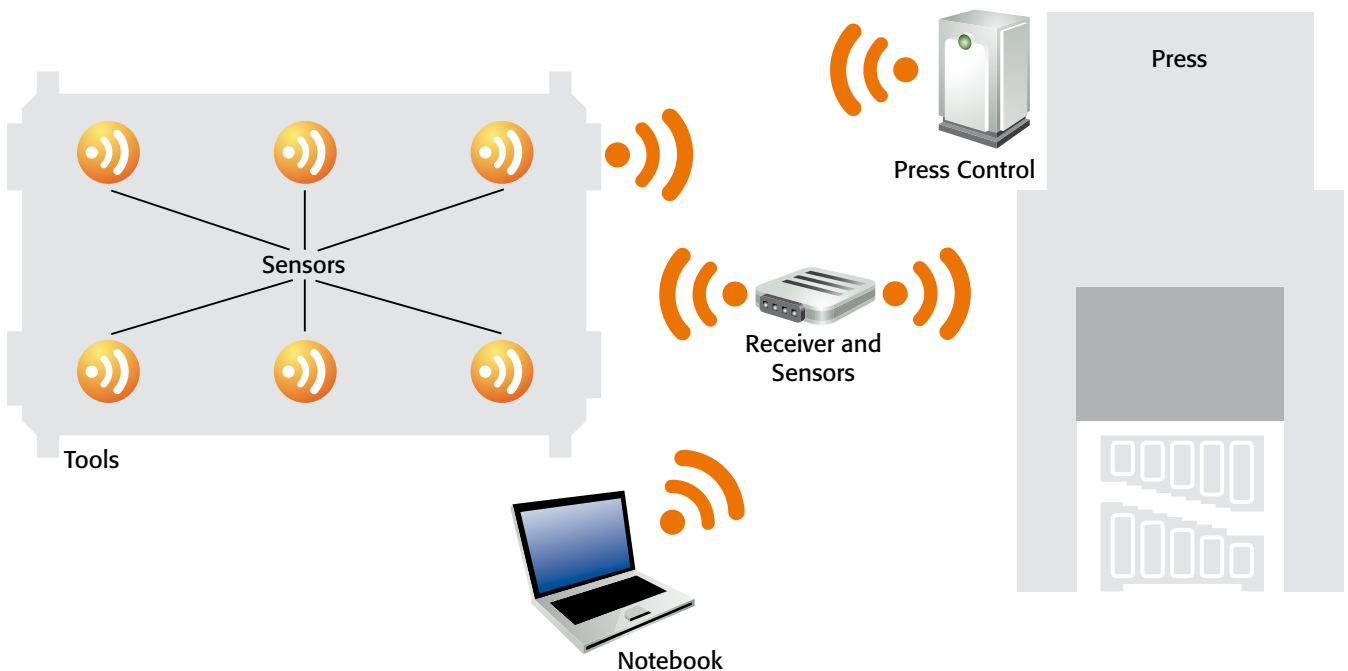
The WPM system monitors temperature and pressure in gas springs.

It consists of a coordinator and a sensor, which transmit wireless data to any designated Windows-based system. Custom software analyses the data and initialises the necessary process control and pre-emptive maintenance steps accordingly.

#### Advantages:

- Around-the-clock monitoring and documentation
- Alert to defects avoiding production of faulty parts
- Pre-emptive wear detection and targeted troubleshooting
- Prevention of downtime and secondary failures
- Minimisation of leakage points
- Streamlined construction and assembly
- Optimised maintenance intervals and reduction of maintenance and repair costs

#### Monitoring System - Method of Operation



#### The WPM system contains up to four components:

- Sensors in the pressing tool. These form a PAN (Personal Area Network).
- PC with receiver:  
A device for setting up the PAN and for initial parameterisation of the tool sensors.
- Press coordinator COO, which is permanently installed on the press, and which communicates with the tool sensors and the press controller. (Customer-specific)
- Press control connection. There are various connection options available. (Customer-specific)

# FIBRO

2480.00.90.20.01  
2480.00.90.51.01.0

# Wireless Pressure Monitoring (WPM) Receiver Software

## 2480.00.90.20.01

(in the scope of delivery)  
Receiver, PC - USB2.0  
incl. software CD for the PC



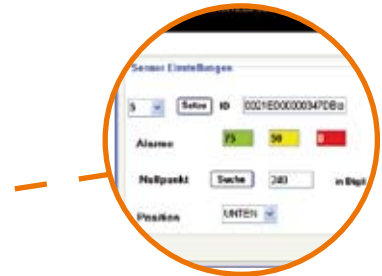
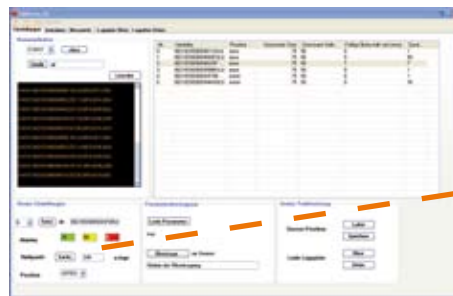
2480.00.90.20.01  
Receiver, PC - USB2.0



2480.00.90.51.01.0  
Software CD for PC

## Measuring example

Setting and display options for pressure and temperature variance



## Zero-defect production

Before and during the use of tools in the press, the WPM monitors the level of pressure of all gas springs.  
The system reports defects pre-emptively before a faulty part can be manufactured. Definable warning and alarm value limits.

## Gas spring location and status control via tool sensors



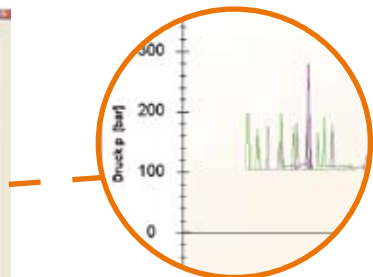
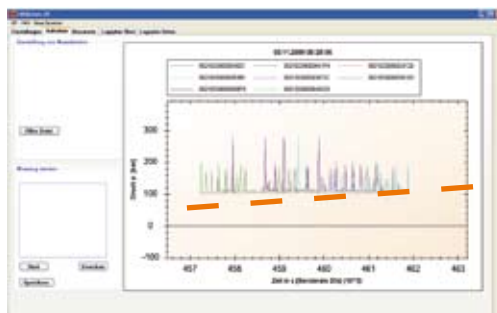
## Targeted Maintenance

Temperature monitoring detects erosion before any drop of pressure occurs in the spring. System locates defective spring in case of malfunction. Downtime can be pre-emptively reduced or avoided.  
The WPM system enables wear-specific maintenance intervals that significantly reduce maintenance and repair compared to fixed intervals.

## Streamlined construction and assembly

Tool manufacturers need solely consider the position of sensors and springs. No need to install tube lines during assembly which means leakages are a thing of the past.

## Process control documentation (Pressure/Time diagram)



# Wireless Pressure Monitoring (WPM)

Sensor

Filling adapter, Battery

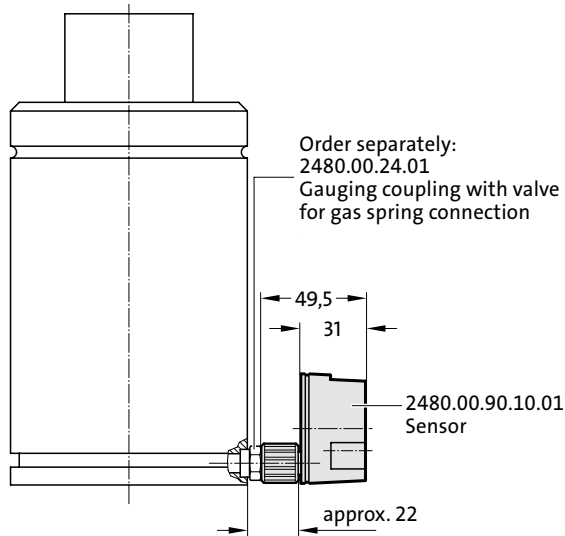
**FIBRO**

2480.00.90.10.01

2480.00.90.10

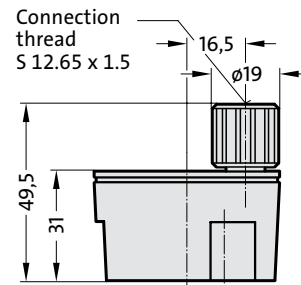
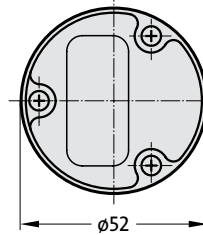
2480.00.90.10.00.1

## Mounting Example: Sensor - Gas spring connection



## 2480.00.90.10.01

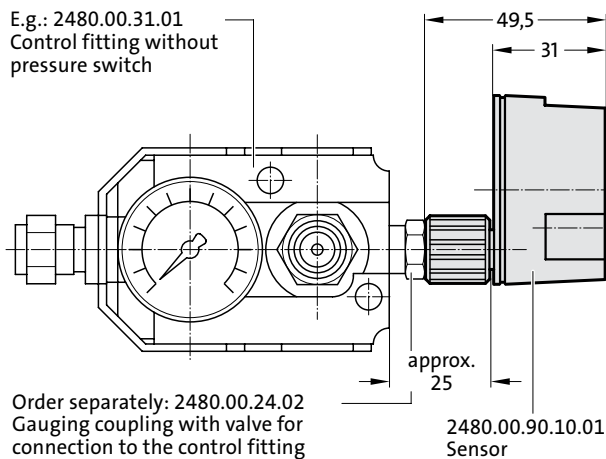
Sensor



## Mounting Example:

Sensor - Control fitting connection

E.g.: 2480.00.31.01  
Control fitting without  
pressure switch



Order separately: 2480.00.24.02  
Gauging coupling with valve for  
connection to the control fitting

## 2480.00.90.10.01

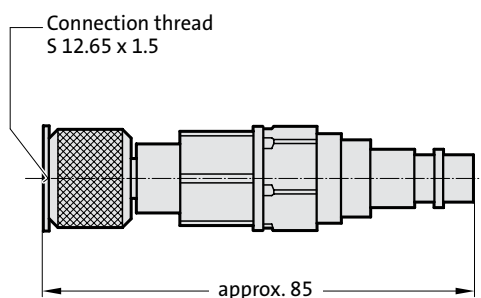
Sensor

### Technical data:

Installation location:	any
Pressure medium:	Nitrogen - N <sub>2</sub>
Ambient and operating temperature range:	0° C to +80° C
Storage temperature range:	-25 to 80° C
Protection type:	IP 67
Pressure range:	0 - 500 bar
Per. overload:	Factor 1.5
Hysteresis:	+/- 0.5% v. EW
Linearity:	+/- 1% of max. Setup pressure
Repeatability:	+/- 0.5% v. EW
Bursting pressure:	Factor 2.5
Seals:	FKM (Viton)
Material:	Floor plate: VA steel, with welded in sensor Housing: Plastic ABS, Colour: black
Temperature drift:	< 0.2% / 10k (0° C to 80° C)
Temperature measuring range:	0 to 85° C
Mechanical connection:	Minimes connection for Gauging coupling 2480.00.24.01/.03 S 12.65 x 1.5
Energy supply sensor unit:	3.6V DC via Battery
Digital interface	
Sensor unit and wireless module:	SPI /I2C

## 2480.00.90.10

Filling adapter for minimes connection



## 2480.00.90.10.00.1

Battery for reordering  
(Battery is included in the sensor's scope of delivery.)  
Battery capacity 3-4 years with "normal" tool use

# FIBRO

2480.00.32.21 2480.00.31.02  
2480.00.32.07.

## Filling and control fitting Filling hose Cylinder pressure regulator

### Description:

The filling and control fitting 2480.00.32.21 is used to fill, vary the pressure setting (e.g. when testing tools) and measure the gas pressure.

The coupling enables the filling hose 2480.00.31.02 to be connected directly to the gas cylinder valve or the pressure regulator.

If the fitting is used solely for checking purposes, a simplified arrangement without the filling hose 2480.00.31.02 is also possible.

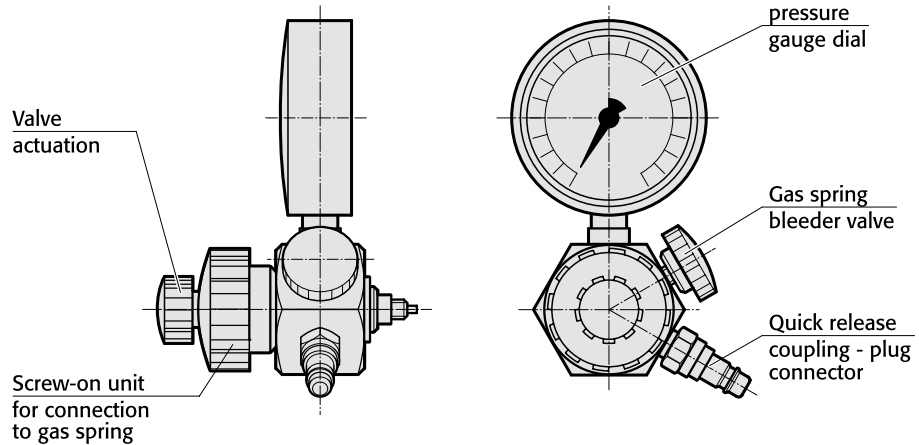
The fitting is equipped with an additional adapter 2480.00.32.11 for connecting to gas springs with G 1/8 valve connection as standard.

### Note:

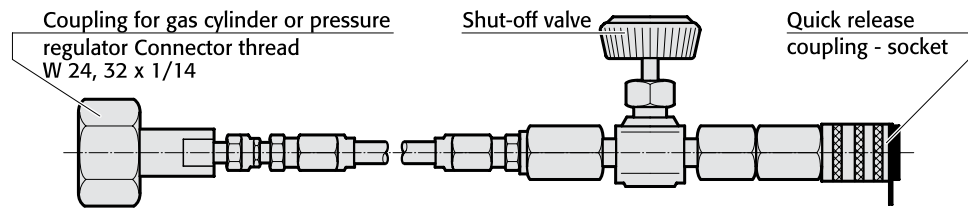
2 m long filling hose with quick release coupling, shut-off valve and gas bottle connector, order no. 2480.00.31.02 (order separately).

Other filling hose lengths to order.

### 2480.00.32.21 Filling and control fitting



### 2480.00.31.02 Filling hose



### Description:

The pressure regulator 2480.00.32.07. is designed for 200 bar connections and for 300 bar gas cylinders.

The filling and control fitting 2480.00.32.21 is connected to the cylinder pressure regulator for filling gas springs using filling hose 2480.00.31.02 and connector adaptor 2480.00.32.07.04.

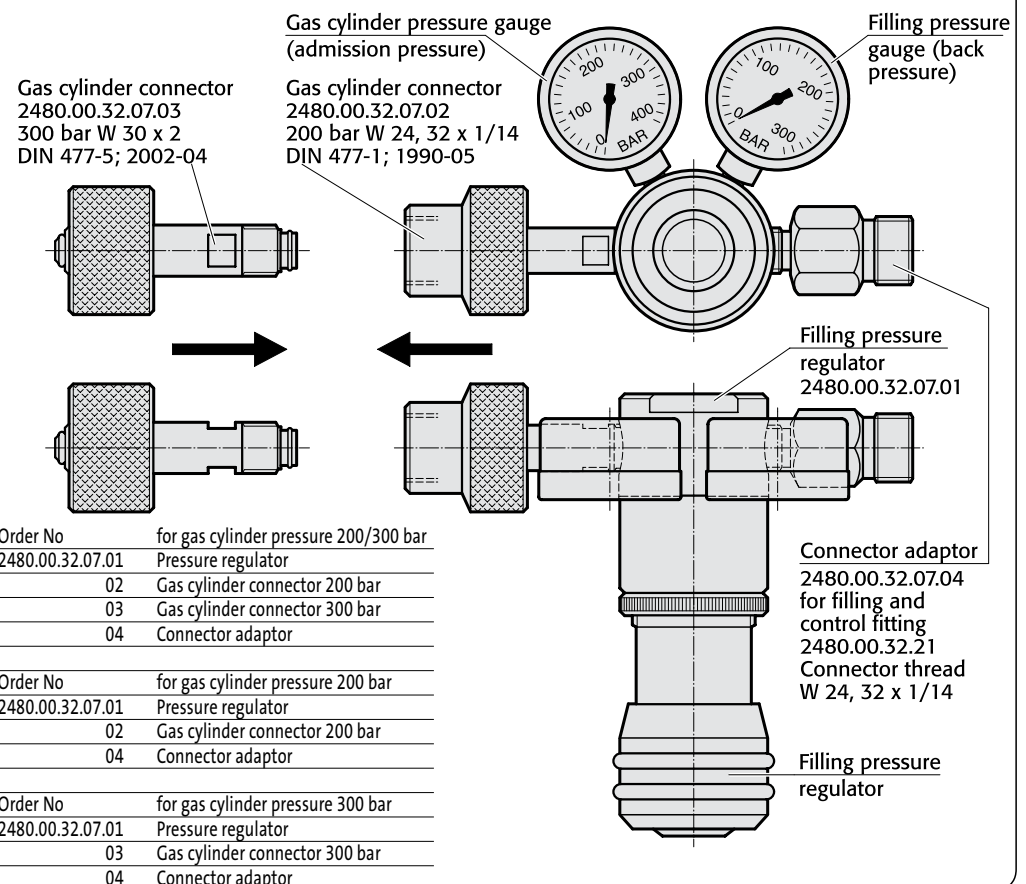
Depending on the type of gas cylinder, the gas cylinder connector used can either be the 2480.00.32.07.02 for 200 bar cylinders or the 2480.00.32.07.03 for 300 bar cylinders.

Max. admission pressure 300 bar  
Back pressure 10-200 bar

### Other benefits:

- Hasty opening of the gate valve on the filling and control fitting 2480.00.32.21 cannot result in overfilling.
- It is not necessary to have the pressure display of the filling and control fitting 2480.00.32.21 in view.

### 2480.00.32.07. Gas cylinder pressure regulator



Order No	for gas cylinder pressure 200/300 bar
2480.00.32.07.01	Pressure regulator
02	Gas cylinder connector 200 bar
03	Gas cylinder connector 300 bar
04	Connector adaptor

Order No	for gas cylinder pressure 200 bar
2480.00.32.07.01	Pressure regulator
02	Gas cylinder connector 200 bar
04	Connector adaptor

Order No	for gas cylinder pressure 300 bar
2480.00.32.07.01	Pressure regulator
03	Gas cylinder connector 300 bar
04	Connector adaptor

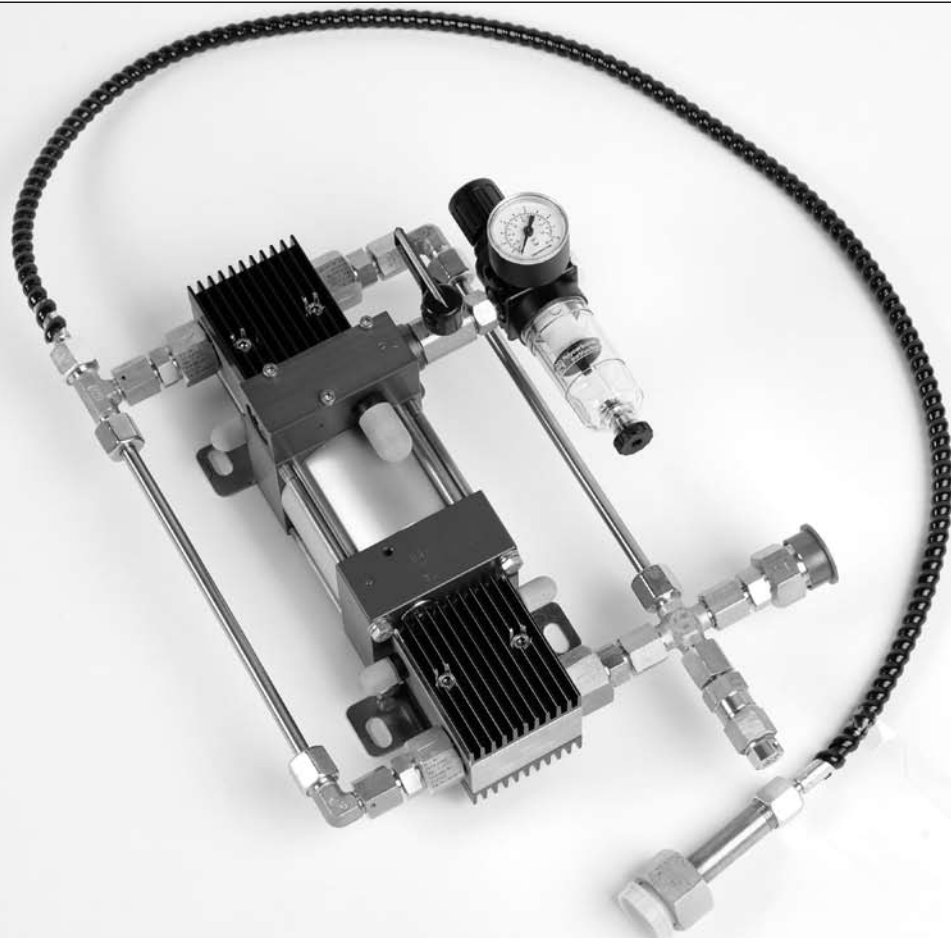
Connector adaptor 2480.00.32.07.04 for filling and control fitting 2480.00.32.21 Connector thread W 24, 32 x 1/14

Filling pressure regulator

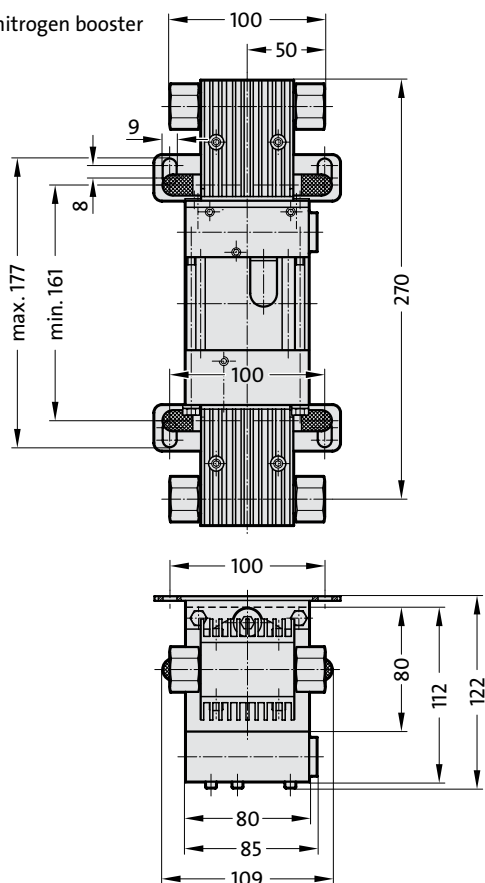
**Compact Nitrogen Booster  
for Gas Spring Filling**

2480.00.32.71

2480.00.32.71  
Compact Nitrogen Booster  
for Gas Spring Filling



2480.00.32.71  
Compact nitrogen booster



**Description:**

The FIBRO compact nitrogen booster 2480.00.32.71 was developed to compress nitrogen gas. It increases the output pressure of the nitrogen cylinders considerably. For example, when filling gas springs, the N<sub>2</sub> cylinders can be used up to a residual pressure of 30 bar.

**Advantages:**

- Increased usage capacity
- Reduction of bottle replacement times
- Minimisation of bottle quantities
- Less weight (7.2 kg)
- Compact design
- Suitable for simple installation directly on all standard nitrogen cylinders (200 bar)

**Function:**

The FIBRO compact nitrogen booster works according to the principle of a pressure relay valve. Low pressure is applied to a large surface, which in turn applies high pressure to a small surface. Continuous delivery is achieved by means of an internally actuated 4/2-way valve. Compressed air is used as the drive mechanism.

**Accessories:**

A holding plate is available (2480.00.32.71.02) to secure the compact nitrogen booster to the nitrogen cylinder. The compact nitrogen booster is simply hung over the nitrogen cylinder connection.



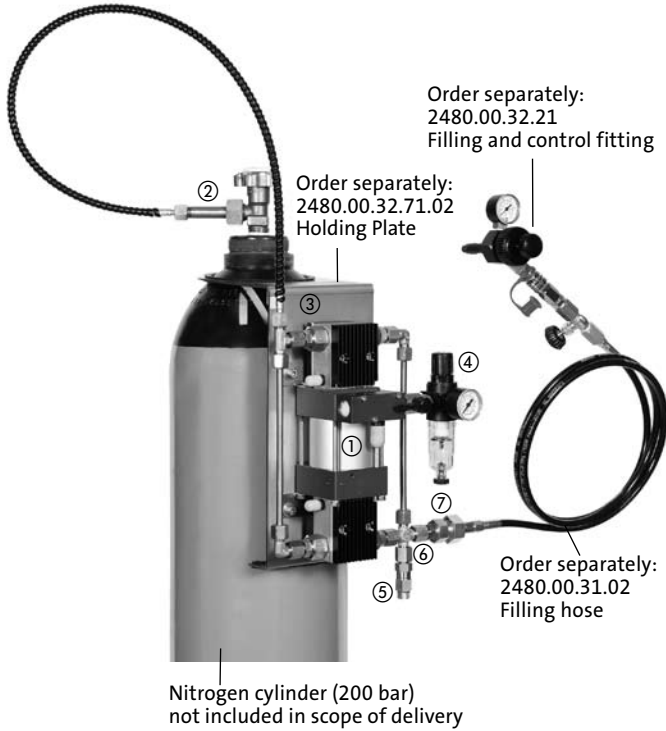
# FIBRO

2480.00.32.71  
2480.00.32.71.02

## Compact Nitrogen Booster for Gas Spring Filling Holding Plate

### Connection diagram

Compact nitrogen booster



### 2480.00.32.71.02

Holding Plate



- ① 2480.00.32.71 Compact nitrogen booster
- ② Gas cylinder connection W24, 32 x 1/14 for 200 bar nitrogen cylinder
- ③ Nitrogen N<sub>2</sub> inlet
- ④ Compressed air inlet G1/4 max. 10 bar
- ⑤ Overpressure protection 400 bar
- ③ Nitrogen N<sub>2</sub> outlet
- ⑦ Connecting thread W24, 32 x 1/14

### Technical data:

Drive compressed air: 1-10 bar

Calculated operating pressure at 10 bar air drive pressure:  
300 bar

Transmission ratio: 1:32

Displaced volume/double stroke: 11.6 cm<sup>3</sup>

### Connections:

Compressed air: G 1/4" thread

Nitrogen inlet:

Hose DN4, 1 m long with N2 cylinder connection 200 bar

Nitrogen outlet:

N2 cylinder connection 200 bar W24, 32 x 1/14

Max. operating temperature: 60°C

Weight: approx. 7.2 kg

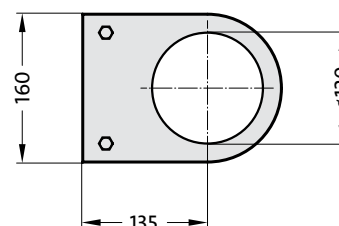
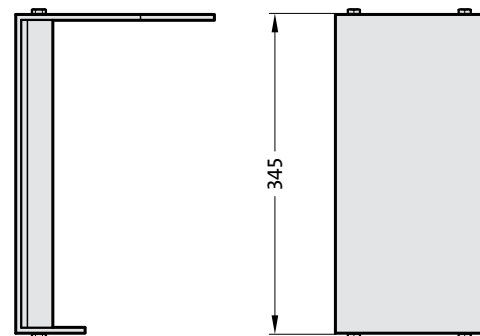
Inlet pressure: 30-300 bar

Average supply rate\*: 280 NL/min

\* The delivery rate is dependent on the air drive and inlet pressure.

### 2480.00.32.71.02

Holding Plate



**Dynamometers  
for Gas Springs**

2480.00.35.021  
2480.00.35.032

2480.00.35.021

Analogue display



2480.00.35.032

Digital display



**Description:**

The dynamometer with mechanical measuring device can be used to test the spring force of gas springs up to 8000 daN.

The dynamometer with digital measuring device can be used to test the spring force of gas springs up to 10 000 daN.

The dynamometer 2480.00.35.021 with analogue display is supplied with three interchangeable pressure measuring nozzles different ranges of values.

Up to	300 daN
From	300 to 1750 daN
From	1750 to 8000 daN

The dynamometer 2480.00.35.032 with digital display has a pressure measuring nozzle for forces ranging from 0 to 10 000 daN.

Maximum spring installation height	analogue	= 700 mm
	digital	= 760 mm

**FIBRO**

2480.00.35.04

## Dynamometers for Gas Springs

2480.00.35.04



**2480.00.35.04**

The dynamometer with digital measuring device can be used to test the spring force of gas springs up to 2000 daN.

Max. spring installation height: 488 mm.

Max. spring diameter: 150 mm.

Toolkits for assembling gas springs

2480.00.50.11



2480.00.50.11

Toolkit for all gas springs

The toolkit contains:

Pos.	Order No	Term	
1	2480.00.50.01.001	Assembly sleeve	Mini
2	2480.00.50.01.002	Assembly sleeve	00250
3	2480.00.50.01.003	Assembly sleeve	00500
3-1	2480.00.50.01.031	Assembly sleeve (2487.12.00500.)	X500
4	2480.00.50.01.004	Assembly sleeve	00750
5	2480.00.50.01.005	Assembly sleeve	01500
5-1	2480.00.50.01.051	Assembly sleeve (2487.12.01500.)	X1500
6	2480.00.50.01.006	Assembly sleeve	03000
7	2480.00.50.01.007	Assembly sleeve	05000
8	2480.00.50.01.008	Assembly sleeve	07500
9	2480.00.50.01.009	Assembly sleeve	10000
10-1	2480.00.50.01.101	Circlip tool	
13	2480.00.50.01.013	T-lever	M8
14-1	2480.00.50.01.141	T-lever	M16
15	2480.00.50.01.015	T-lever	G 1/8"
16-1	2480.00.50.01.161	T-lever with heel	M6
17	2480.00.50.01.017	Valve pliers	
18	2480.00.50.01.018	Valve tool	M6
19	2480.00.50.01.019	Valve tool	G 1/8"
29	2480.00.50.01.029	Special valve spanner	
30	2480.00.50.01.030	Valve tool	VG 5
33	2480.00.50.01.033	Valve tool (2480.00.41.1)	M6
34	2480.00.50.01.034	Handle for disassembling	M3
39-1	2480.00.50.01.391	Tool case	

Description:

Toolkit for assembling and disassembling gas springs.

Note:

Read instructions for use before working on it.  
Every tool can be ordered separately.

# FIBRO

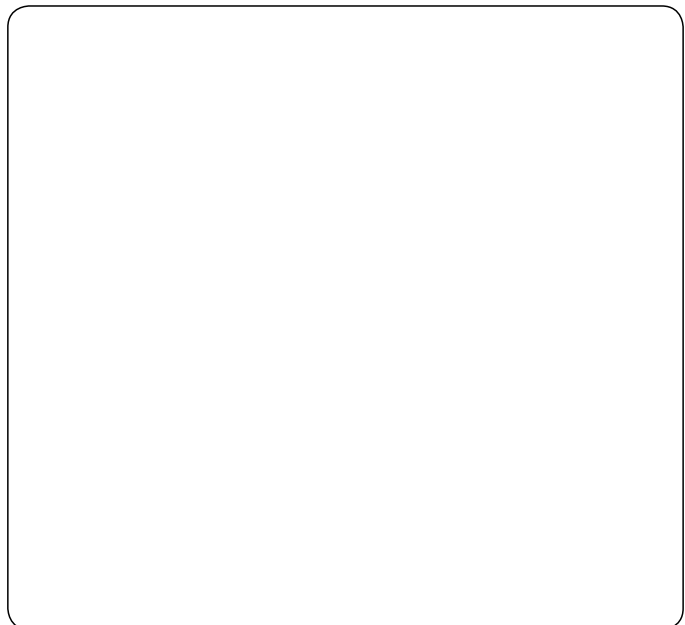
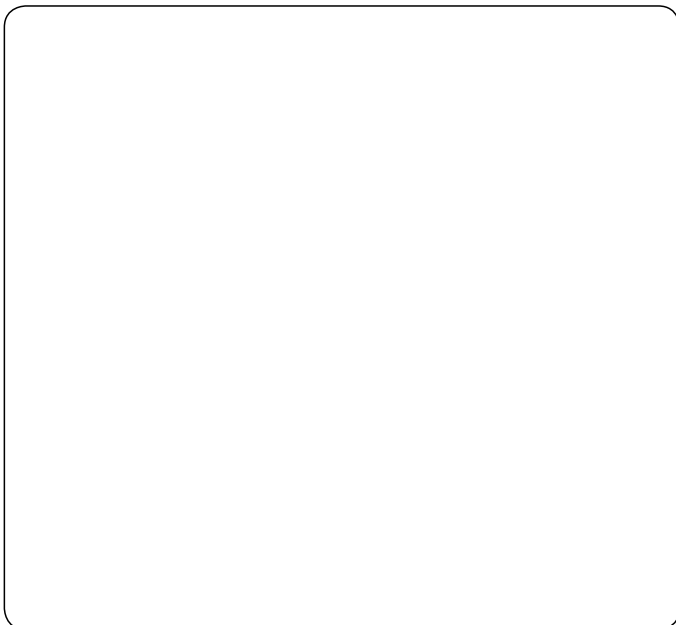
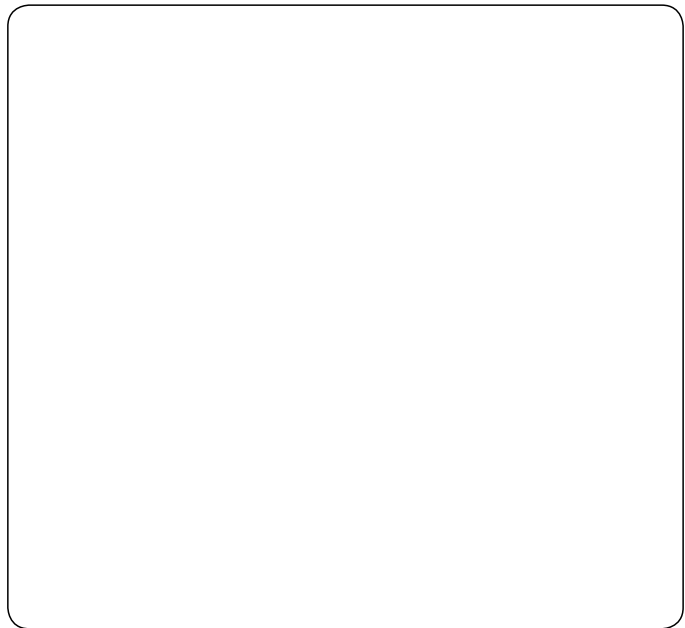
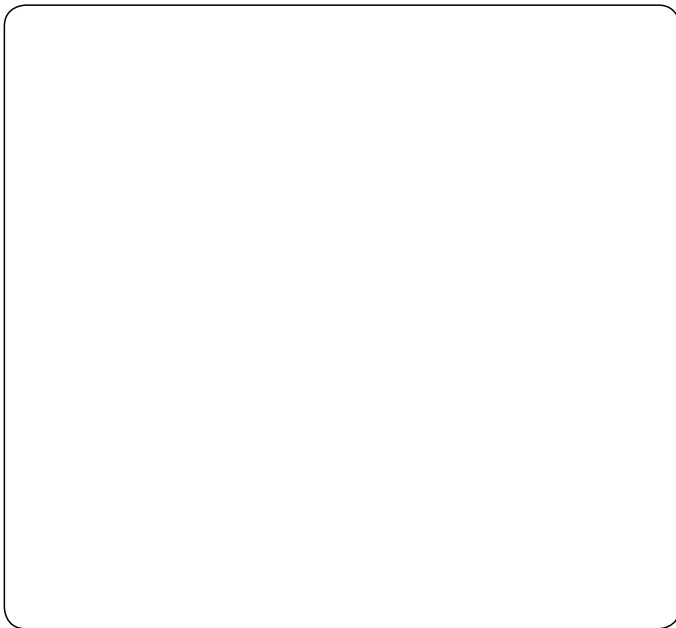
2480.00.50.04.

Assembling cone

2480.00.50.04.

Assembling cone for gas springs with through bore passage 2496.12.

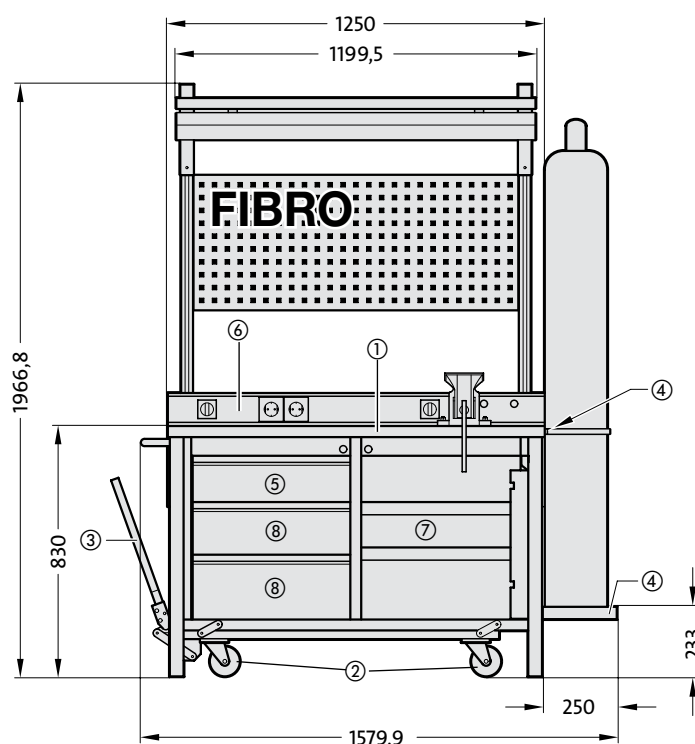
Pos.	Order No	Term
001	2480.00.50.04.001	Assembling cone 00270
002	2480.00.50.04.002	Assembling conel 00490
003	2480.00.50.04.003	Assembling conel 01060
004	2480.00.50.04.004	Assembling cone 01750
005	2480.00.50.04.005	Assembling cone 03300
006	2480.00.50.04.006	Assembling cone 04250



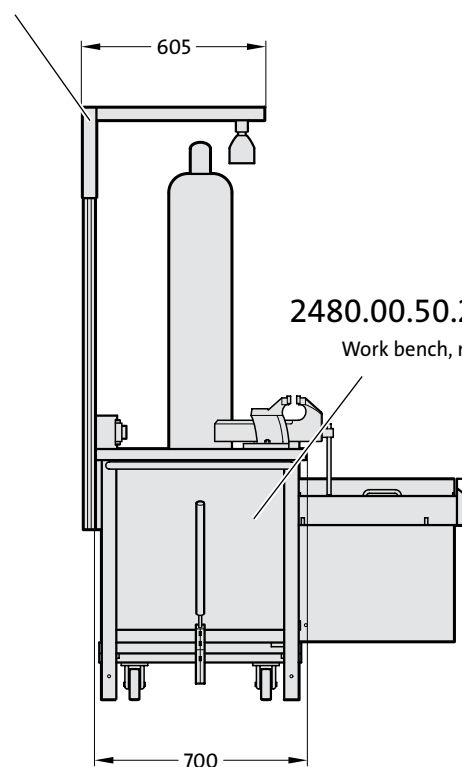
# Service station, mobile, for gas springs

**2480.00.50.20.**
**2480.00.50.20.**

Service station, mobile, for gas springs


**2480.00.50.20.2**

Lighting unit, removable


**2480.00.50.20.1**

Work bench, mobile

## Description:

The mobile service station for gas springs is an optimised solution for the filling/maintenance of gas springs directly on the press or tool. The service station consists of a mobile work bench 2480.00.50.20.1 and a removable light unit 2480.00.50.20.2.

## Advantages:

- "All in One" solution
- High mobility coupled with secure stability
- Clean handling of the gas spring components
- High user comfort

The mobile work bench 2480.00.50.20.1 is equipped with a 40 mm thick Trovidur work surface ①. The surface is hard-wearing and very easy to keep clean.

The height adjustable chassis with 4 castors ② allows for high mobility and provides secure stability for the service station. The chassis is easily moved up and down by way of an excenter lever ③ located on the left of the unit.

At the right of the unit, a loading receptacle with a locking clip ④ is located for 200 bar bottles.

A removable oil sump with a grate in the upper drawer ⑤ will ensure clean handling of the internal gas spring components.

The energy panel ⑥ offers great user comfort because of its integrated operating elements, like the compressed air connection, light switch and 3 x 230 V electric outlet.

The removable lighting unit 2480.00.50.20.2 is height adjustable to cater to the individual requirements of the user.

## Technical data:

2480.00.50.20.1 Work bench, mobile:

Work surface, Trovidur (mm) 1250 x 700 x 40  
Work bench chassis made from profile steel tubing (mm) 45 x 45 x 2  
Parallel vices, jaw width = 100 mm

2480.00.50.20.2 Lighting unit, removable:

Elongated light (w = 1200 mm) with connection cable and plug  
2 x 45 W, strip louvre with reflector  
Electronic ballast  
Protection type IP20

## Connections

Input:

Central supply line on the right side of the cabinet (bottom rear) with electric supply line (protected energy supply plug)

1/4" internal thread for air infeed

Energy panel:

1 x 1/4" internal thread for air connection

1 x On/OFF switch for air supply, rotary switch for Nitrogen Compact Booster

3 x 230 V socket (with hinged lid)

1 x ON/OFF switch for power supply, rotary switch

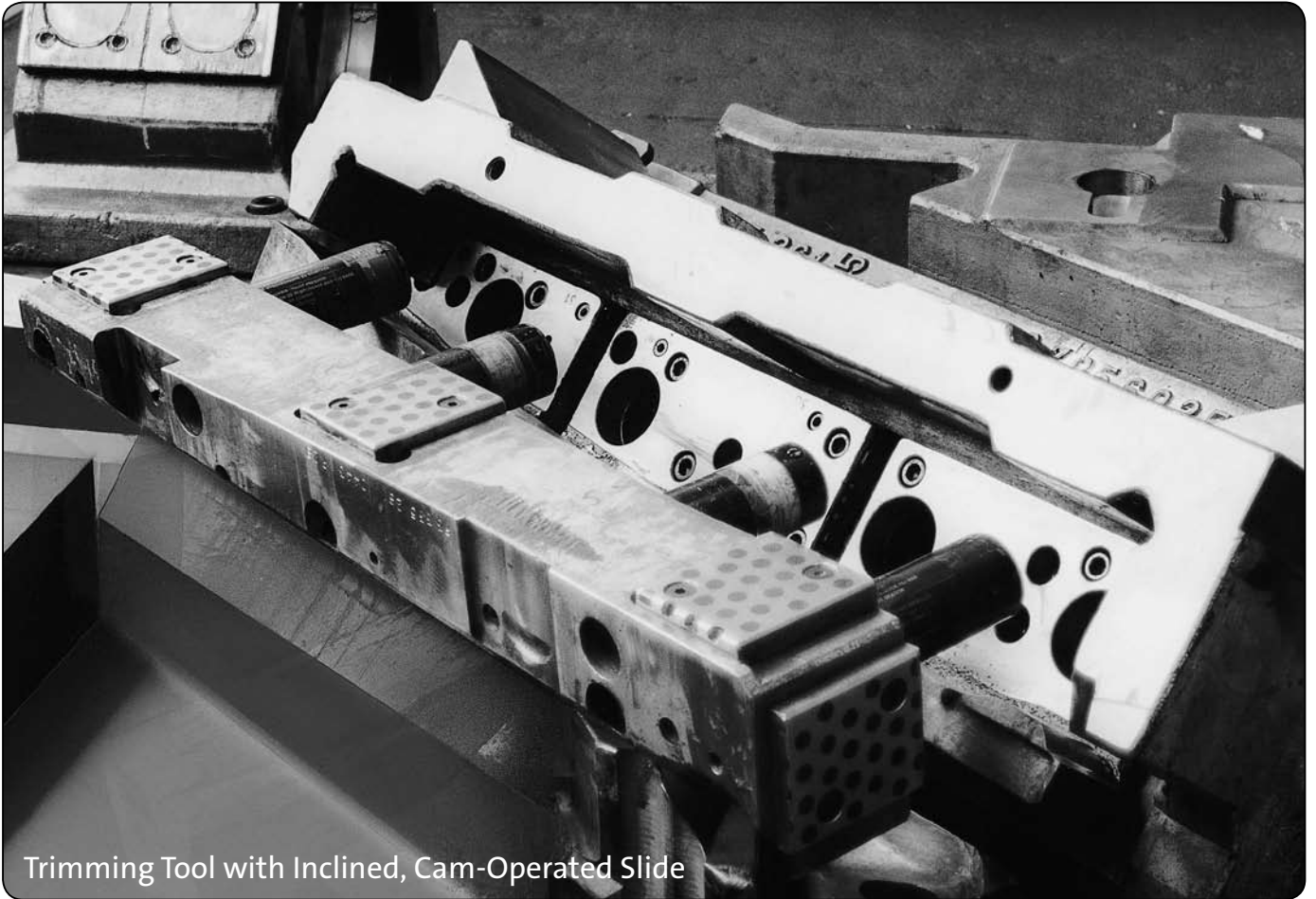
## Accessory:

For optimised utilisation of the nitrogen bottle fill amount, a Compact Booster 2480.00.32.71 and a hose line DN4, 3 m 2480.00.32.71.05.03 can be integrated in specifically provided receiving braces in the cabinet ⑦.

The two free drawers ⑧ offer additional space for specialist tool sets 2480.00.50.11 for the repair of gas springs.

# Applicaton Examples

Application Examples



Trimming Tool with Inclined, Cam-Operated Slide



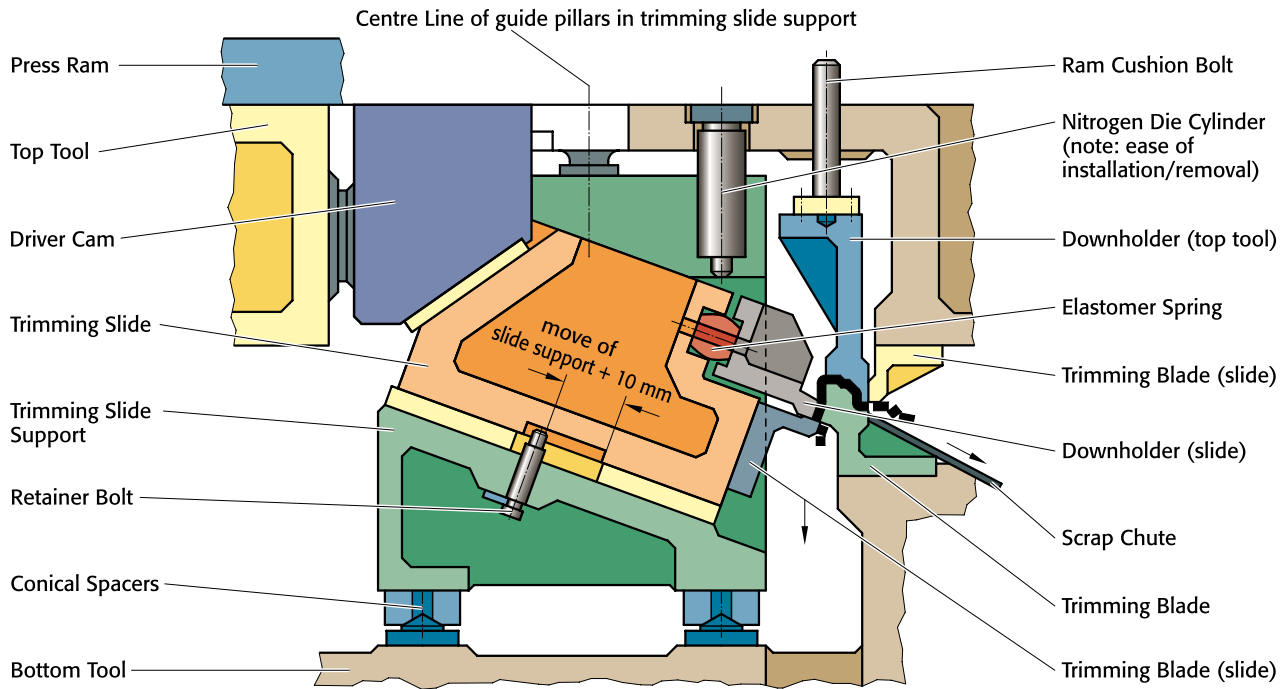
Drawing Slide of Large Forming Tool



## Application Examples

### Trimming Tool with Inclined Cam Slide

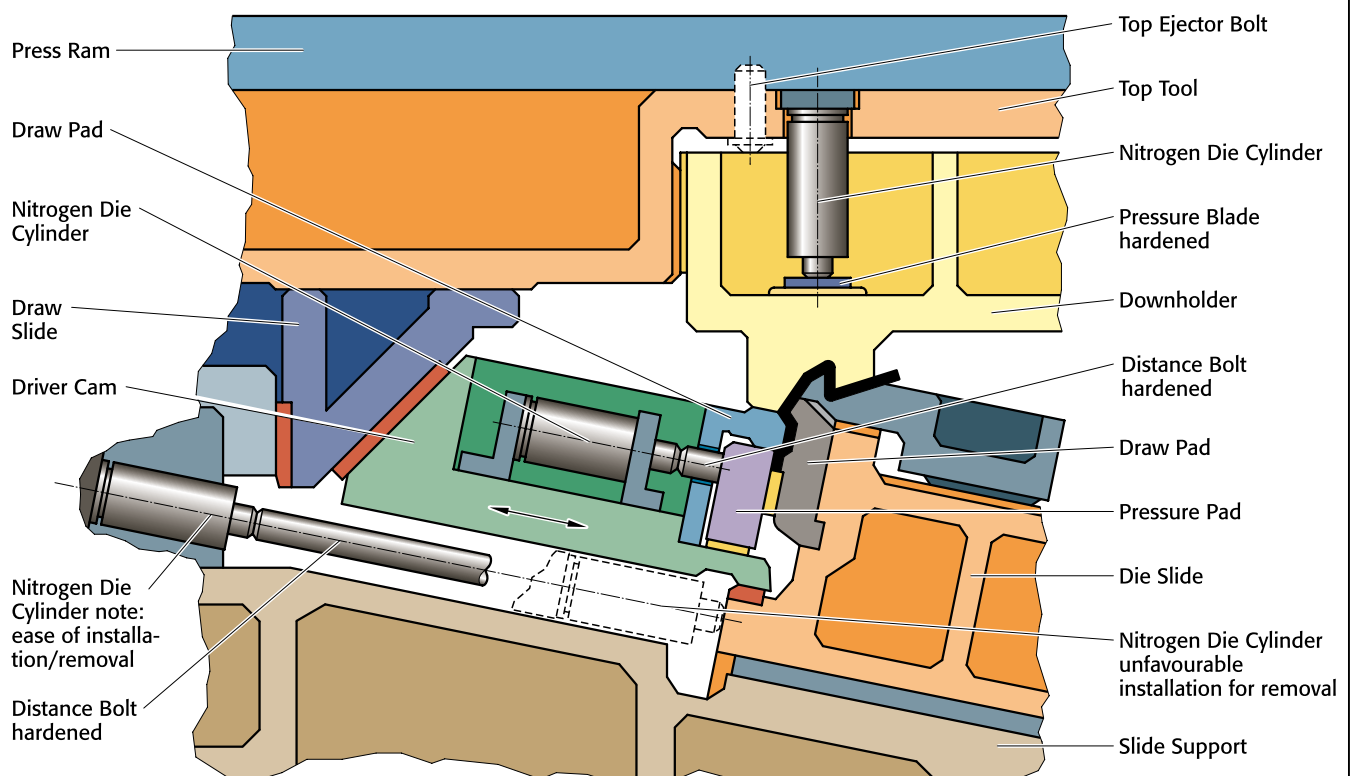
Nitrogen Die Cylinders in the top ensure the positive centering of the trimming slide on the centering cones in the bottom tool section.



### Drawing Tool

The nitrogen die cylinder for the drawing slide is easily placed into position; the safety lid secures it. Very high forces are required in this tool for the draw pad in the slide.

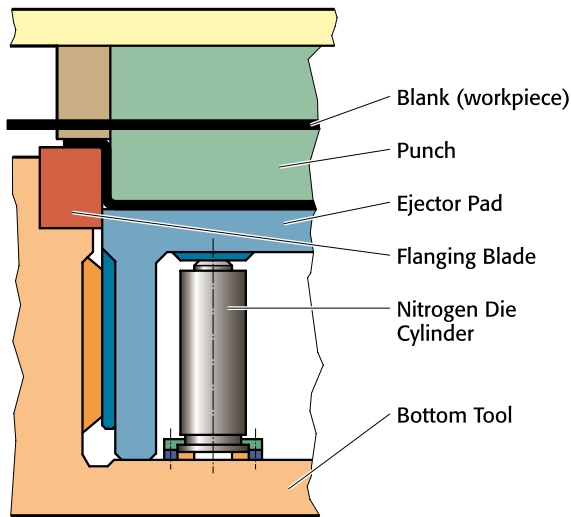
The nitrogen die cylinders in the top tool serve as boosters for the insufficient ram cushion.



## Application Examples

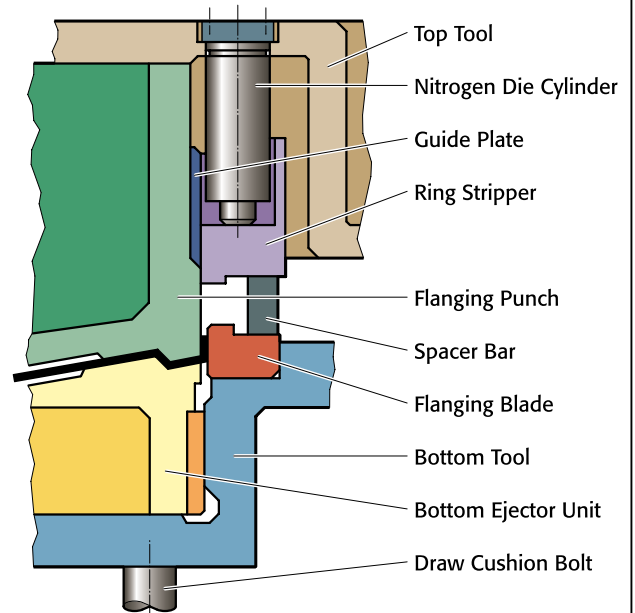
### Flanging Tool with Nitrogen Die Cylinders

Where bottom ejection facilities are lacking, FIBRO Nitrogen Die Cylinders will provide reliable actuation of piece part ejectors.



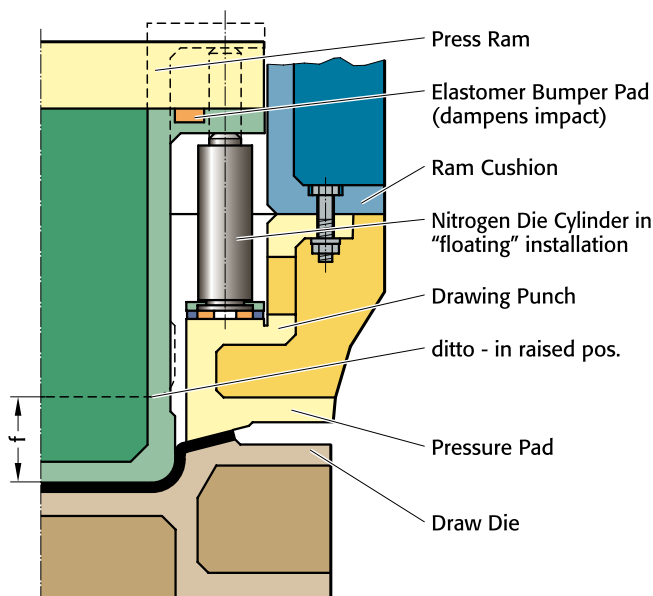
### Flanging Tool with Ring Stripper

The ring stripper is actuated by nitrogen die cylinders.



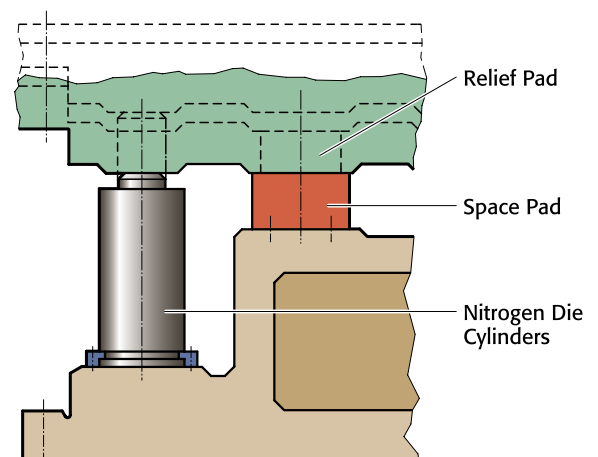
### Double-Acting Drawing Tool

In order to obtain shorter setting times, only the downholder is bolted to the ram cushion. The drawing punch is raised through  $f + 20$  mm by nitrogen die cylinders.



### Blanking and Piercing Tool

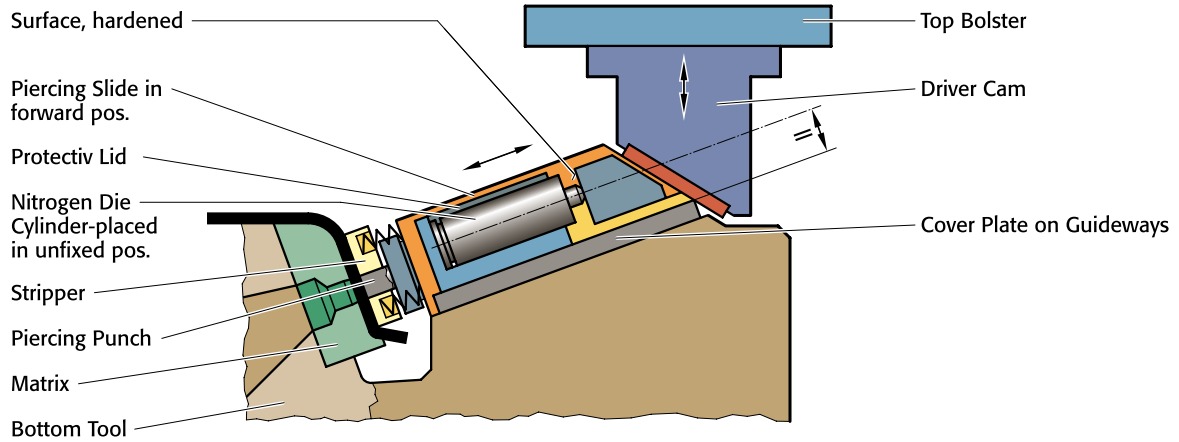
The application of nitrogen die cylinders instead of the usual elastomer bumpers results in a significant reduction of setting time. Moreover, injuries caused by "fly-out" elastomer bumpers are eliminated.



## Application Examples

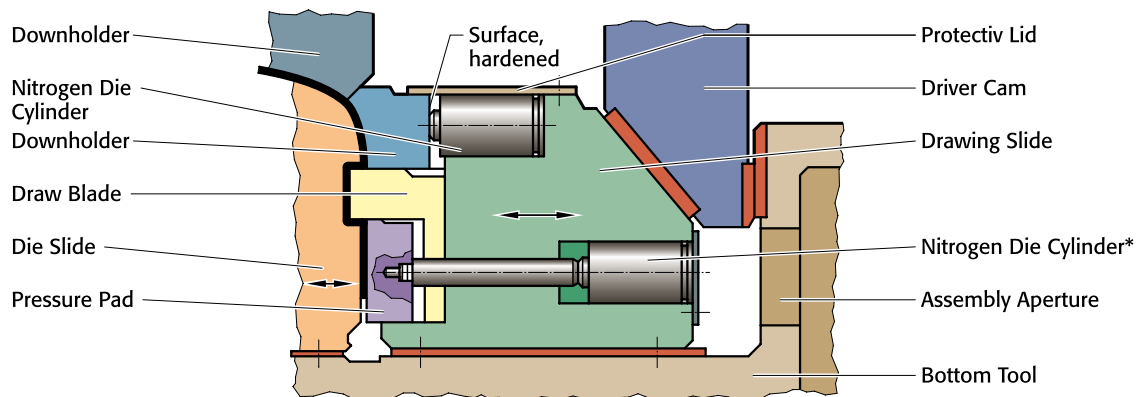
### Retraction of Piercing Slide by Nitrogen Die Cylinder

Die cylinder is mounted to bottom tool. It retracts the slide after completion of the piercing operation. We recommend a "soft"-start on the cam shape in order to reduce impact and acceleration on the die cylinder.



### Drawing Slide

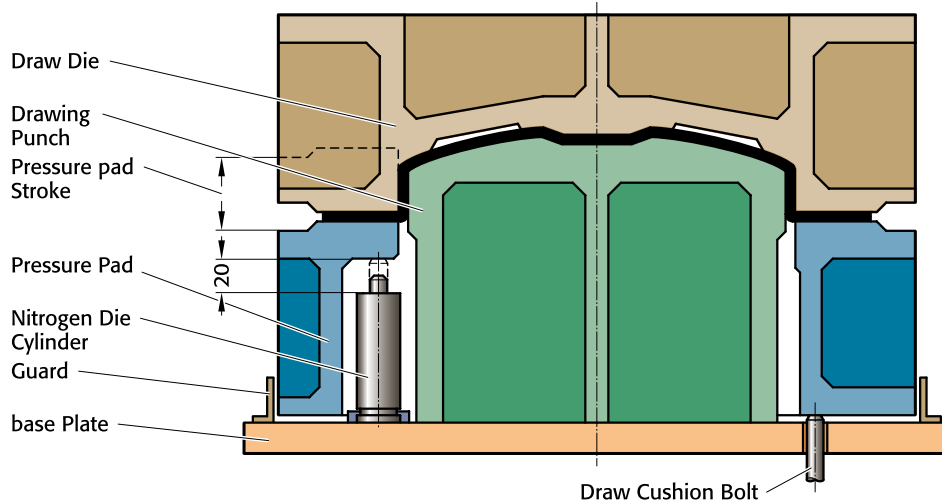
In order to prevent wrinkling, this tool requires high forces on the downholder and pressure pad. An elegant solution was achieved with nitrogen die cylinders. Ease of cylinder installation was ensured.



\*Must be secured with special flange.

### Drawing Tool

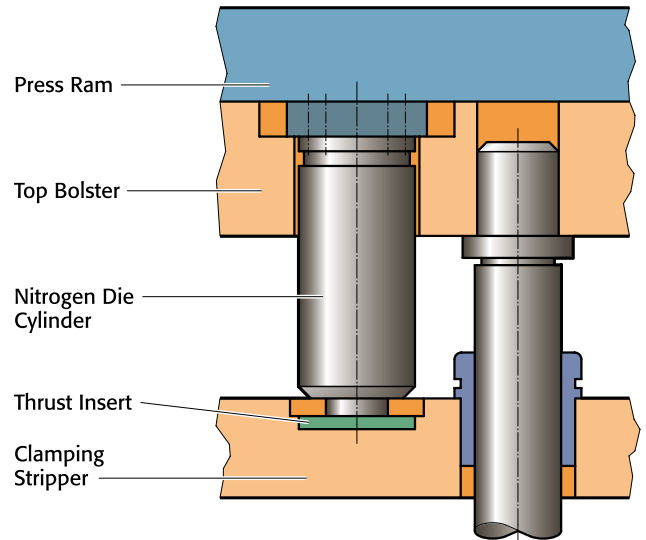
The pressure pad is actuated by nitrogen die cylinders during the final 20 mm of the draw.



## Application Examples

### Detail of Progression Compound Tool

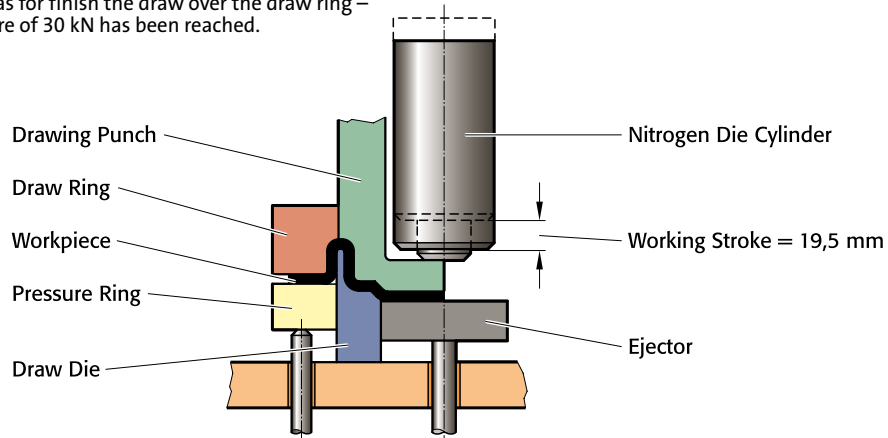
The clamping stripper is actuated by two nitrogen die cylinders 2480.12.01500.025. The units provide an initial cylinder force of 15 kN each and a stroke capacity of 25 mm – of which 20 mm are utilized.



### Drawing Tool

Intended for use in a 100 ton hydraulic press, with one nitrogen die cylinder 2480.12.03000.025 mounted in the drawing punch. In this application the die cylinder serves to accomplish the initial pre-draw of the internal shape, as well as for finish the draw over the draw ring – after the bottoming pressure of 30 kN has been reached.

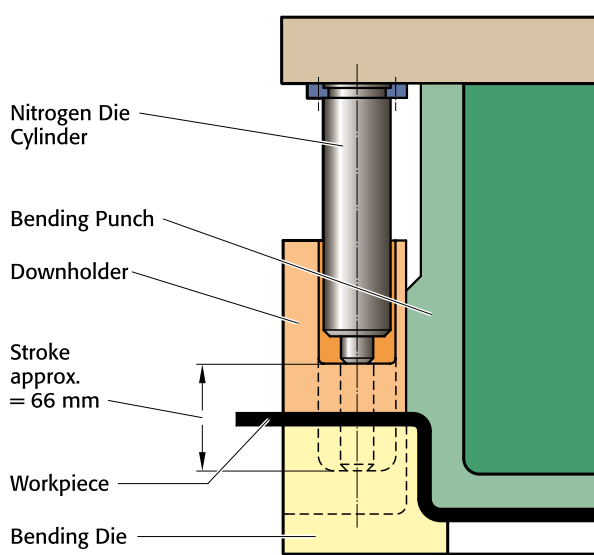
The nitrogen die cylinder has an initial cylinder force of 30 kN, a stroke capacity of 25 mm – of which 19,5 mm are utilized in operation. Stroking speed is 4 SPM.



### Bending Tool for Round Bars

This tool employs two nitrogen die cylinders 2480.13.00750.080 for actuating the downholder. Press stroke is 92 mm. The stroke of the downholder is approx. 66 mm.

Because of manual loading, press strokes vary from 36 to 40 SPM. Part ejection is automatic. The nitrogen die cylinders provide an initial force of 7,5 kN each, and a stroke capacity of 80 mm.

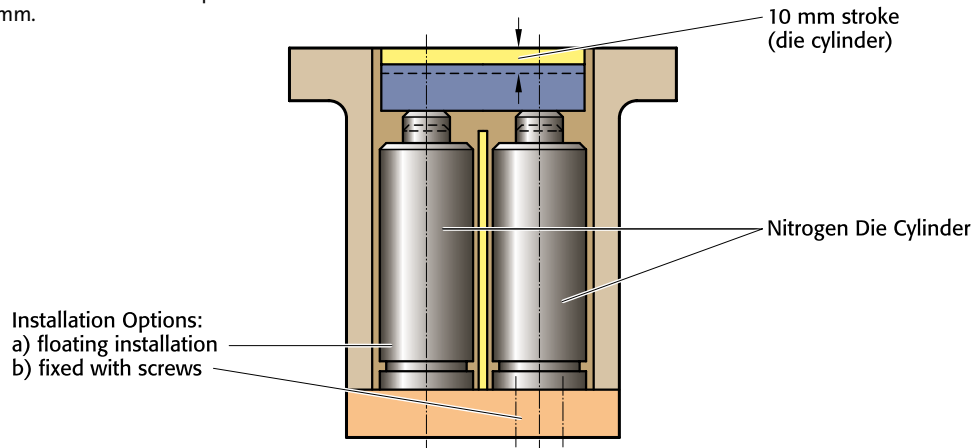


## Application Examples

### Bottom Ejector in Progression Compound Tool

Two nitrogen die cylinders 2480.13.00750.025 are used, providing an initial force of 7,5 kN each, and a stroke capacity of 25 mm.

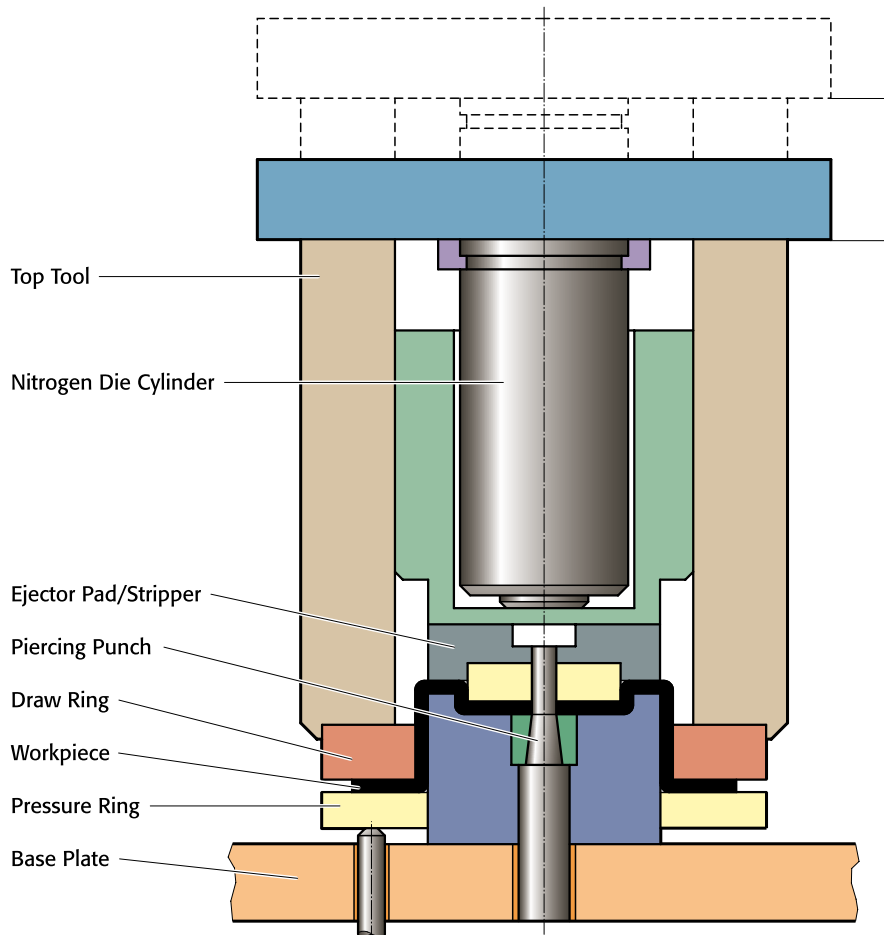
The actual working stroke is 10 mm. The tool is run at a speed of 150 SPM, with a ram stroke of 48 mm.



### Drawing- and Piercing Tool

This tool is used in a 100 ton hydraulic press.

The nitrogen die cylinder is a 2480.13.03000.080, with a charge pressure of 130 bar – giving an initial cylinder force of 26 kN. Stroke capacity is 80 mm. The actual working stroke is 76 mm. The press is run at 14 SPM.



# Application Example of Gas Springs

## Gas Springs facilitate Tools Storage and Tools Preparation for Production

Gas Springs find increasing use in large press tools - in the sole role of aiding their storage and production preparation.

The springs are bolted to either the upper or lower bolsters. They are activated only when the tool is being taken out of the press.

Application examples 1 and 2 show that special spacer caps are inserted prior to the tool being let down onto the gas springs – this being done whilst still in the press. During removal from the press and subsequent storage, the springs will keep the top tool elevated.

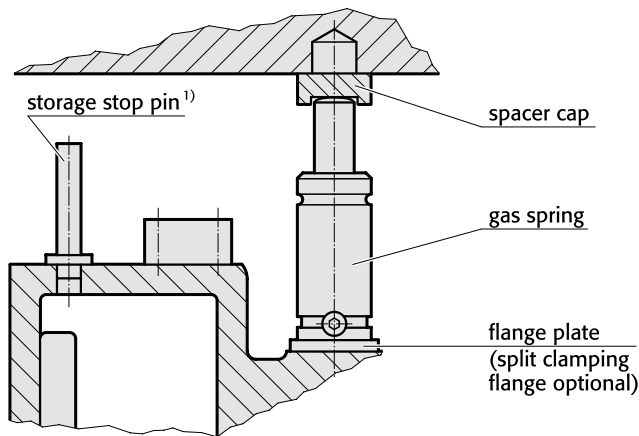
Storage stop pins are provided next to the springs; when tools are stacked one on top of the other, the increasing mass will force the springs to recede – and the tops will eventually abut against the storage pins. Once the stack is removed, the springs take over again and push the top tool up.

Upon being prepared for production, the springs facilitate access to

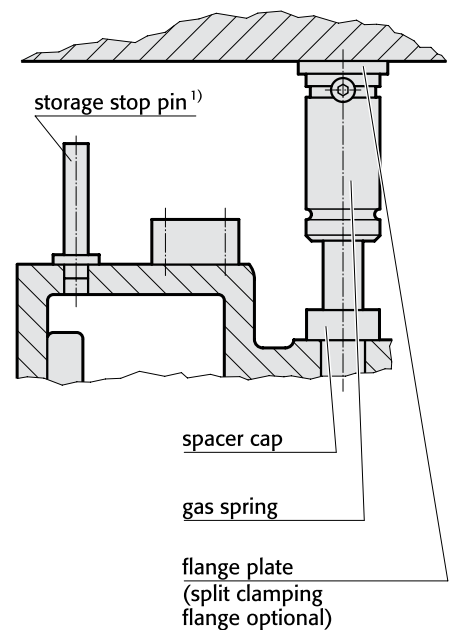
the tool. Once back in the press, the spacer caps are removed and the storage springs remain inactive during the production run.

It is recommended to affix warning signs to the tools in a prominent position: the presence of gas springs in the tool often cannot be seen from the outside.

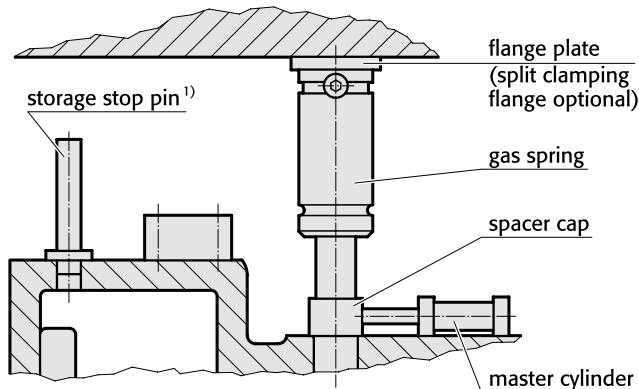
**Example 1: Gas Spring fixed to bottom bolster**



**Example 2: Gas Spring fixed to top tool**



**Example 3: Gas Spring fixed to bottom bolster**



1) storage stop pins are reversible - they are turned round and pushed down into their holes during getting the tool ready for production

---

A Die Sets

---

B Precision Ground Plates and Flat Bars

---

C Lifting and Clamping Devices

---

D Guide Elements

---

E Ground Precision Components

---

F Springs

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**G Elastomer-Bars, -Sheets, -Sections**

FIBROFLEX® and FIBROELAST®-Sheets and -Profiles

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H FIBRO Chemical Tooling Aids

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J Peripheral Equipment

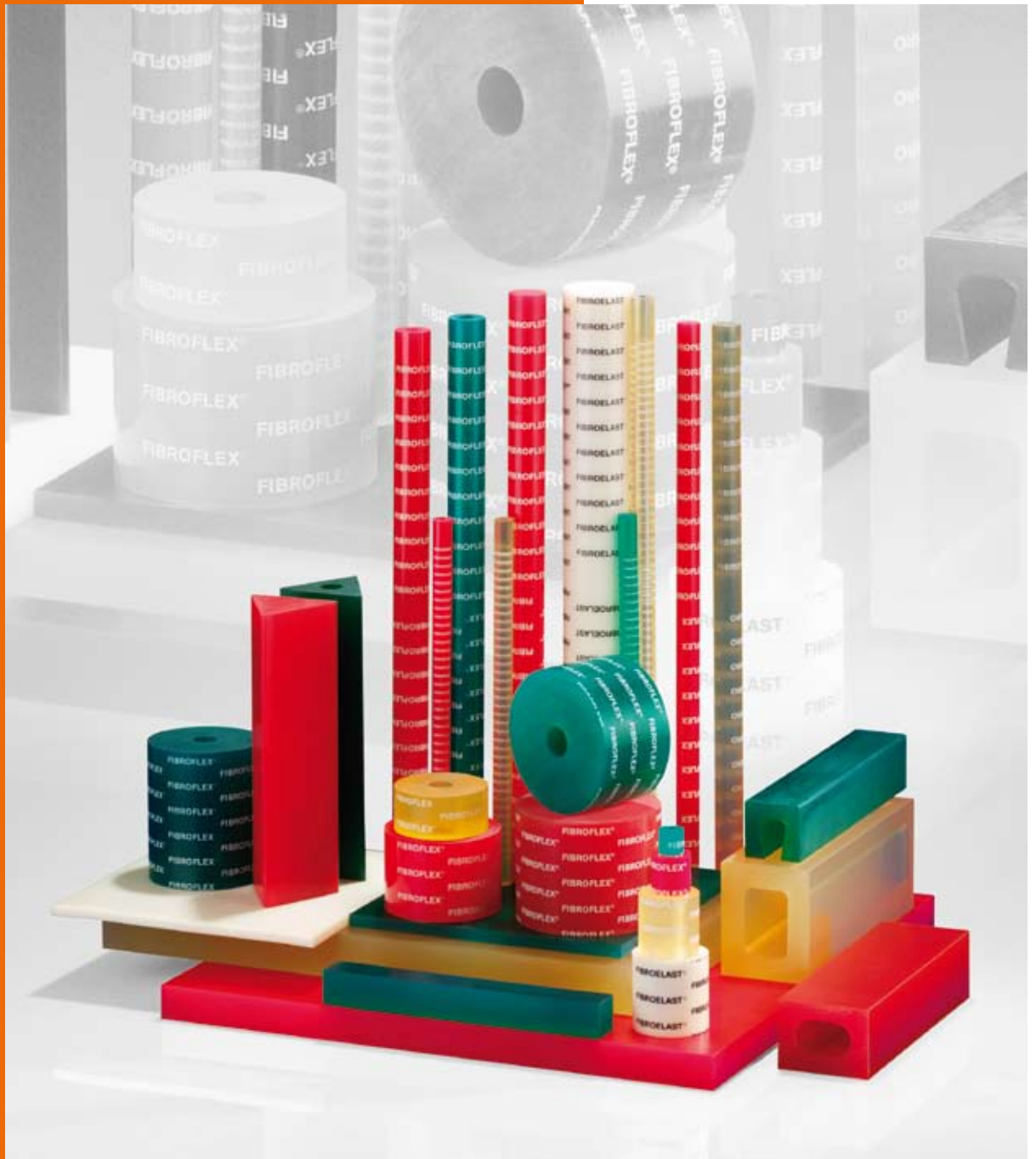
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K Cam Units

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L Standard Parts for Mould Making

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# Elastomer

- Bars
- Sheets
- Sections



**FIBROFLEX® Forming Elastomers**

The occurrence of small batch lots in the press shop generally makes the more expensive dies of conventional design unadvisable – and it is in this sector in particular that FIBROFLEX® Forming Elastomers can offer economical alternatives.

Over many years in the past, rubber was used for metal forming work, mostly with indifferent results because of insufficient mechanical resilience and susceptibility to damage by workshop lubricants.

FIBROFLEX®, a polyurethane elastomer of very special properties, represents a synthetic material of significant advantages over all conventional rubber substances. It provides:

- highest resistance to rupturing
- outstanding elastic properties
- extensive life span when used correctly
- good thermal resilience
- inertness to all lubricants used in metal forming operations.

To the designer of forming- and shearing dies, FIBROFLEX® offers highly attractive solutions to many a tooling problem – as for instance the completion in one operation of intricate return flanges etc. Special mention ought to be made here of the specific suitability this elastomer exhibits in the forming of delicate surface-coated or surface-refined sheet metal.

The quite outstanding elastic properties of FIBROFLEX® have made it an almost indispensable material in toolrooms everywhere and also in many sectors of general engineering. Its numerous successful uses comprise bumper stops, strippers, ejector- and forming pads, spring elements as well as noise suppression applications.

FIBROFLEX® Forming Elastomers, available in three Shore hardnesses to suit different conditions, are supplied in a comprehensive range of sections hollow and solid, also in sheet form of many dimensions.

Intended as suggestions for the solution of forming problems, a number of illustrated application examples are contained in this catalogue. Further detailed information on elastomer tooling can be found in our free publication “Elastomers in Sheet Metal Forming and the Toolroom”, which we shall gladly mail to interested customers.

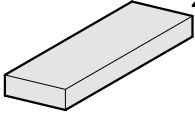
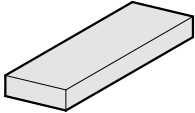
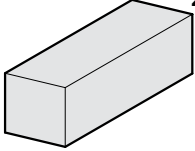
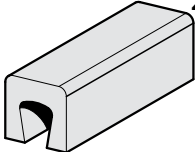
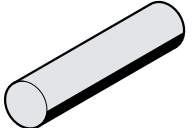
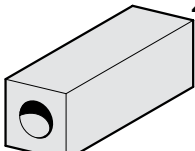
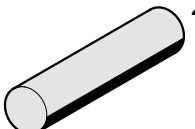
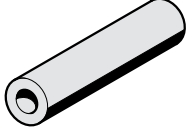
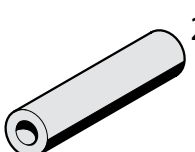
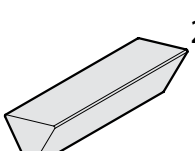

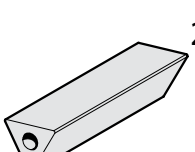


**FIBROFLEX\***

accurate parts  
to customers  
specifications

\*Polyurethan

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	Technical Data on FIBROFLEX®	G6-G7		
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	251. FIBROFLEX® Sheets and Pads	G8		
	252. FIBROFLEX® Square Sections	G8	2531.4. FIBROELAST® Round Sections	G13
	250. FIBROFLEX® Channel Sections	G9		
	255. FIBROFLEX® Hollow Square Sections	G9	2541.4. FIBROELAST® Hollow Round Sections	G13
	253. FIBROFLEX® Round Sections	G10		
	254. FIBROFLEX® Hollow Round Sections	G10	2450. Shock Absorbing Washers FIBROFLEX®	G9
	256. FIBROFLEX® Equilateral Triangle Sections	G11		
	257. FIBROFLEX® Equilateral Hollow Triangle Sections	G11		Example of FIBROFLEX® Application: Combination Blanking-, Embossing and Forming Die
				G17-G19
			Blanking and forming with FIBROFLEX®-Elastomers	G21-G27

# Technical Data on FIBROFLEX® Forming Elastomer

## Physical Properties:

FIBROFLEX® Type	DIN	5	6	7
Shore-A-Hardness	53505	80	90	95
Density g/cm <sup>3</sup>	53479	1,07	1,11	1,14
max. deformation in %		35	30	25
Impact resistance value N/cm (ASTM D 470)		124	150	270
Elongation to tear in %	53504	490	430	380
Tearing strength in N/mm <sup>2</sup>	53504	34,4	38	44,8
Working temperature, max. °C		+70	+70	+70
Embrittlement temperature °C		below -68	below -68	below -63
Modulus of elasticity N/mm <sup>2</sup>		38	70	133
Electric puncture strength (per mm thickness)			400 Volt	
Rebound elasticity %	53512	58	42	40
At 100 % elongation MPa	53504	5,5	5,6	12,4
At 300 % elongation MPa	53504	10,3	15,2	29,6
Coefficient of friction of FIBROFLEX®			dry 0,35 any Shore hardness wet 0,25 any Shore hardness	
Tensile strength MPa	53504	34	38	45
Elongation %	53504	490	430	380
Tear strength kN/m	53515	36	42	58
Abrasion resistance mm <sup>3</sup>	53516	48	32	41
Torsional stiffness at 24°C in MPa		17,9	17,9	19,8
Compressive Set				
70h/22°C in %	53517	not available	not available	not available
Compressive Set				
70h/22°C in % – Methode B –	53517	25	27	36
Resistance to Sea Water (saline) approximately 6 months				
Resistivity (direct current) at			24° C 4,8 × 10 <sup>11</sup> 70° C 3,8 × 10 <sup>10</sup> 100° C 2,3 × 10 <sup>10</sup>	
Coefficient of expansion			0 up to -36° C = 1,43 <sup>-4</sup> 0 up to 24° C = 1,01 <sup>-4</sup> 25 up to 100° C = 0,95 <sup>-4</sup>	

## Guide Lines for the Machining of FIBROFLEX®:

FIBROFLEX® Forming Elastomers can be machined on ordinary machine tools and with conventional cutters.  
A keen cutting edge is mandatory.

FIBROFLEX® Type	5	6	7
Identification Colour	green	yellow	red
Shore-A-Hardness	80	90	95
Sawing	V <sub>c</sub> = approx. 1600 m/min.		
Circular saw, carbide-tipped, coarse toothed			
Rake angle 25°–30°			
Clearance angle 12°–15°			
Drilling	V <sub>c</sub> = approx. 30 m/min.		
Turning	V <sub>c</sub> = approx. 140 m/min.		
Rake angle 25°			
Clearance angle 12°–15°			
Milling	V <sub>c</sub> = approx. 100 m/min.		
Rake angle 25°			
Clearance angle 12°–15°			

Please note that we can supply form parts, required in larger quantities, in the ready-cast condition. Enquiries are invited.

V<sub>c</sub> = cutting speed

**Temperature Resistance**

FIBROFLEX® can be used safely at temperatures up to +70°C.  
FIBROFLEX® will retain most of its flexibility at temperatures as low as -62°C. A gradual increase in rigidity sets in below -18°C.  
Resistance to thermal shock is excellent.

**Resistance to Oxygen and Ozone**

No traceable influences are incurred at normal atmospheric concentrations.

**Resistance to Aging**

Aging shows no discernable effects in conditions of normal ambient temperatures and generally constant environmental surroundings.

**Water Resistance**

FIBROFLEX® exhibits outstanding long-term stability under exposure to water of up to +50°C. Swelling and/or destructive influences remain absent.

This typical resistance against hydrolysis is characteristic for the specific molecular structure of the elastomer.

Water-Oil emulsions present no problems either.

These are clear advantages of FIBROFLEX® over other polyurethane elastomer structures.

**Resistance to oil, chemicals, and solvents**

FIBROFLEX® is presenting an excellent resistance to oil and solvents and is, particularly, suiting applications in connection with lubricating oil and fuel.

Typical data of chemical resistance are shown in the following table.

**Table No 1 – Resistance to some Chemicals**

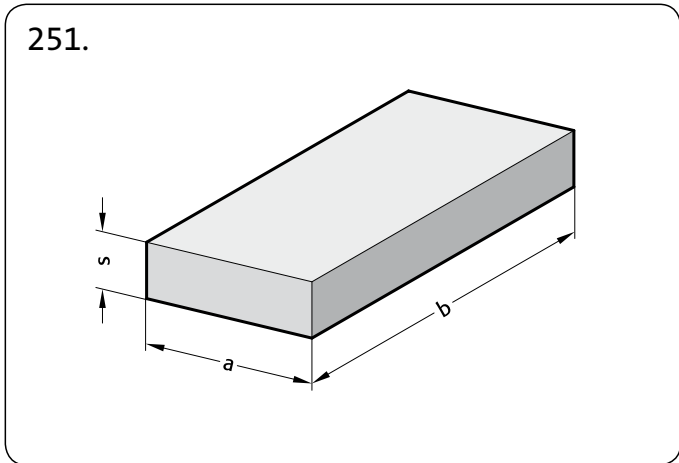
Diesel Fuel	○
Mineral Fats, acc. to additives	+ to -
Vegetabilic Fats	+
Animal Fats	+
Petrol (free of alcohols)	○
Mineral Oils – depending on additives	+
Paraffin	+ to -
Rape Seed Oil	+
Lubrificants on Mineral Oil Basis	○
Soap Emulsions	-
Vaseline	+
Water at +95°C	-
Water at +20°C	+ to ○

- + resistant = can be used
- conditionally resistant = conditional use
- not resistant = not recommended

Please note that blended oils and fats may have detrimental influence due to their various additives. In order to eliminate any risk, it is recommended to test the elastomer under exposure to any specific oily and/or fatty substance. Such tests ought to be run for several weeks.

**FIBROFLEX®-Sheets and Pads**  
**FIBROFLEX®-Square Sections**

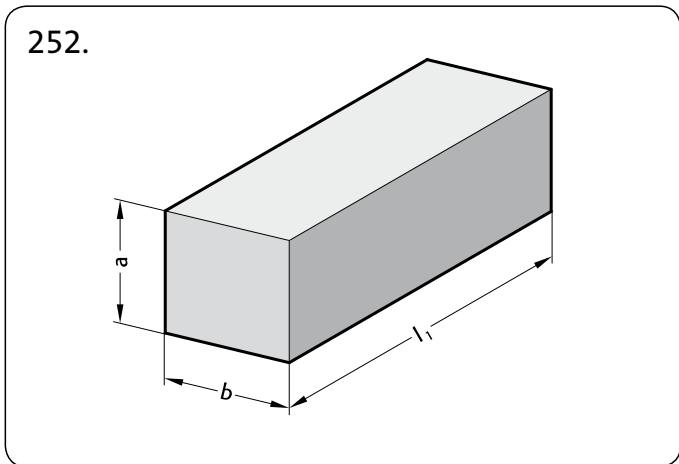
251.  
252.



251.			a × b		a × b		Part III		a × b		a × b	
Order No	Part I	Part II	s	250 × 250	250 × 500	a × b	500 × 500	a × b	500 × 1000	a × b	1000 × 1000	
251.	.	.	1-7	●	●	●	●	●	●	●	●	
			increasing in steps of 1 mm									
			008. 8	●	●	●	●	●	●	●	●	
			010. 10	●	●	●	●	●	●	●	●	
			012. 12	●	●	●	●	●	●	●	●	
			015. 15	●	●	●	●	●	●	●	●	
			020. 20	●	●	●	●	●	●	●	●	
			025. 25									
			30-80 increasing in steps of 10 mm									

**Execution:**  
 FIBROFLEX® is avail. in 3 Shore hardnesses:  
 .5. = 80 Shore A = colour: Green  
 .6. = 90 Shore A = colour: Yellow  
 .7. = 95 Shore A = colour: Red  
 Further technical data: see pages G 6 – G 7

**Ordering Code (example):**  
 FIBROFLEX® Sheet = 251.  
 Hardness 95 Shore-A = 7.  
 s = 1 mm = 001.  
 a × b = 500 × 500 mm = 0500.0500  
 Order No = 251.7.001.0500.0500



252.				252.				252.			
Order No	a × b	250	l <sub>1</sub>	a × b	250	l <sub>1</sub>	1000	a × b	250	l <sub>1</sub>	1000
252.	008.008.▽		●	252.	020.020.▽		●	252.	060.080.	●	●
	008.015.▽		●		020.030.▽		●		080.080.	●	●
	008.025.▽		●		020.040.▽		●		080.100.	●	●
	008.050.▽		●		020.050.▽		●		100.100.	●	●
	010.010.▽		●		022.022.	●	●		100.125.	●	●
	010.015.▽		●		025.025.▽		●		100.180.	●	●
	010.025.▽		●		025.040.▽		●		125.125.	●	●
	010.050.▽		●		025.060.▽		●				
	012.012.▽		●		025.080.▽		●				
	012.020.▽		●		030.030.	●	●				
	012.030.▽		●		040.040.▽		●				
	012.050.▽		●		040.060.	●	●				
	015.015.	●	●		045.045.	●	●				
	015.025.▽		●		050.050.	●	●				
	015.040.▽		●		050.180.	●	●				
	015.050.▽		●		060.060.	●	●				

▽ = machined dimensional edge

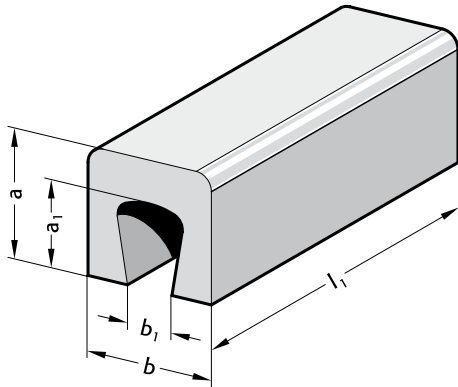
**Execution:**  
 FIBROFLEX® is available in 3 Shorehardnesses:  
 .5. = 80 Shore A = colour: Green  
 .6. = 90 Shore A = colour: Yellow  
 .7. = 95 Shore A = colour: Red  
 Further technical data : see pages G 6 – G 7

# FIBRO

250.  
255.

## FIBROFLEX® Channel Sections FIBROFLEX® Hollow Square Sections

250.



250.

Order No	Part I	Part II	a × b	a <sub>1</sub> × b <sub>1</sub>	Part III	
					l <sub>1</sub>	l <sub>1</sub>
250.		.050.050.	50 × 50	35 × 20	250	500
		.050.075.	50 × 75	35 × 30	●	●
		.075.100.	75 × 100	50 × 40	●	●
		.100.200.	100 × 200	60 × 120	●	●

### Execution:

FIBROFLEX® is avail. in 3 Shore hardnesses:

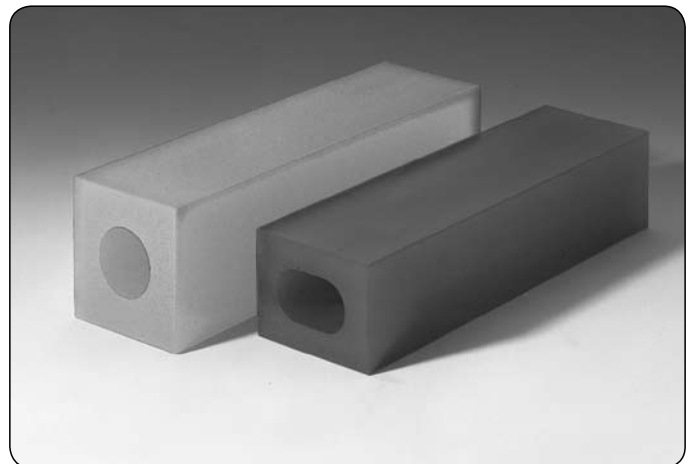
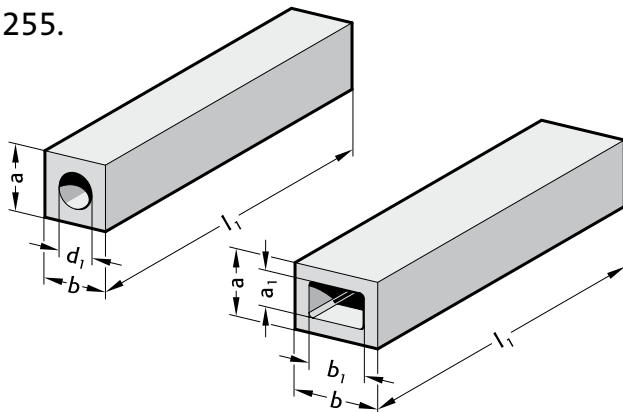
.5.	= 80 Shore A = colour: Green
.6.	= 90 Shore A = colour: Yellow
.7.	= 95 Shore A = colour: Red

Further technical data: see pages G 6 – G 7

### —Ordering Code (example):

FIBROFLEX® Channel Section	= 250.
Hardness 90 Shore A	= 6.
a × b = 50 × 50 mm	= 050.050.
l <sub>1</sub> = 250 mm	= 0250
Order No	= 250.6.050.050.0250

255.



255.

Order No	Part I	Part II	a × b	a <sub>1</sub> × b <sub>1</sub>	d <sub>1</sub>	Part III		
						l <sub>1</sub>	l <sub>1</sub>	l <sub>1</sub>
255.		.040.060.	40 × 60	20 × 35		250	500	1000
		.045.045.	45 × 45		20	●	●	●
		.050.050.	50 × 50		25	●	●	●
		.050.180.	50 × 180	20 × 120		●	●	●
		.060.060.	60 × 60		30	●	●	●
		.060.080.	60 × 80	30 × 50		●	●	●
		.080.080.	80 × 80		40	●	●	●
		.080.100.	80 × 100	40 × 60		●	●	●
		.100.100.	100 × 100	50 × 50		●	●	●
		.100.125.	100 × 125	50 × 70		●	●	●
		.100.180.	100 × 180	50 × 123		●	●	●
		.125.125.	125 × 125	75 × 75		●	●	●

### Execution:

FIBROFLEX® is avail. in 3 Shore hardnesses:

.5.	= 80 Shore A = colour: Green
.6.	= 90 Shore A = colour: Yellow
.7.	= 95 Shore A = colour: Red

Further technical data: see pages G 6 – G 7

### Ordering Code (example):

FIBROFLEX® Hollow Square Section	= 255.
Hardness 80 Shore A	= 5.
a × b = 50 × 50 mm	= 050.050.
l <sub>1</sub> = 500 mm	= 0500
Order No	= 255.5.050.050.0500

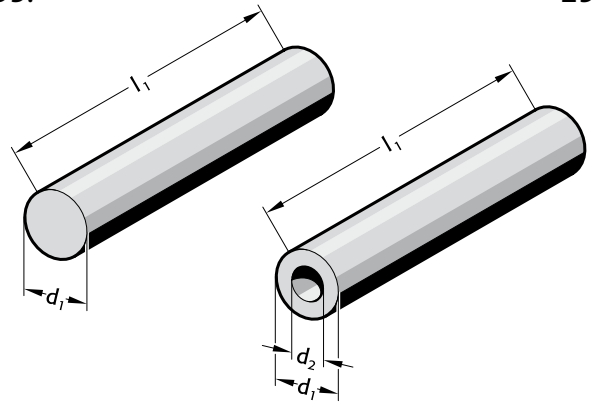
**FIBROFLEX®-Round Sections**  
**FIBROFLEX®-Hollow Round Sections**

253.  
254.



253.

254.



253.

Order No	Part I	Part II	d <sub>1</sub>	330	Part III l <sub>1</sub>	500	1000
253.□.002			2	●			
003			3				●
004			4				●
005			5				●
006			6				●
007			7				●
008			8				●
010			10				●
012			12				●
016			16	●			
020			20		●		
025			25		●		
032			32		●		
040			40		●		
050			50		●		
063			63		●		
080			80		●		
100			100		●		
125			125		●		
140			140		●		
150			150		●		
160			160		●		
180			180		●		
200			200		●		

**Ordering Code (example):**

FIBROFLEX® Round Section = 253.  
 Hardness 95 Shore-A = 7.  
 d<sub>1</sub> = 40 mm = 040  
 Order No = 253.7.040

254.

Order No	Part I	Part II	d <sub>1</sub>	d <sub>2</sub>	330	Part III l <sub>1</sub>	500
254.□.016			16	6,5	●		
020			20	8,5			●
025			25	10,5			●
032			32	13,5			●
040			40	13,5			●
050			50	17,0			●
063			63	17,0			●
080			80	21,0			●
100			100	21,0			●
125			125	27,0			●
140			140	50,0			●
150			150	50,0			●
160			160	50,0			●
180			180	50,0			●
200			200	50,0			●

**Ordering Code (example):**

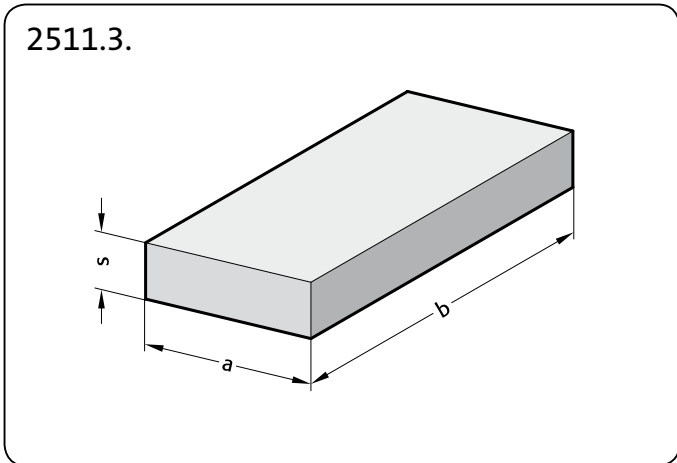
FIBROFLEX® Hollow Round Section = 254.  
 Hardness 90 Shore-A = 6.  
 d<sub>1</sub> = 50 mm = 050  
 Order No = 254.6.050

**Execution:**

FIBROFLEX® is avail. in 3 Shore hardnesses:  
 □.5. = 80 Shore A = colour: Green  
 □.6. = 90 Shore A = colour: Yellow  
 □.7. = 95 Shore A = colour: Red  
 Further technical data: see pages G 6 – G 7







**2511.3.**

Order No		s	Part III			
Part I	Part II		a × b 250 × 250	a × b 250 × 500	a × b 500 × 500	a × b 500 × 1000
2511.3.		1-7	●	●	●	●
		increasing in steps of 1 mm				
008.		8	●	●	●	●
010.		10	●	●	●	●
012.		12	●	●	●	●
015.		15	●	●	●	●

**Ordering Code (example):**

FIBROELAST® Sheet	=	2511.
Hardness 65 Shore A	=	3.
s = 15 mm	=	015.
a = 250 mm	=	0250.
b = 500 mm	=	0500
Order No	=	2511.3.015.0250.0500

**Material:**  
Polyester-based polyurethane  
Hardness 65 Shore A

**Colour:**  
White

**Note:**  
Other sheet thicknesses available upon request.

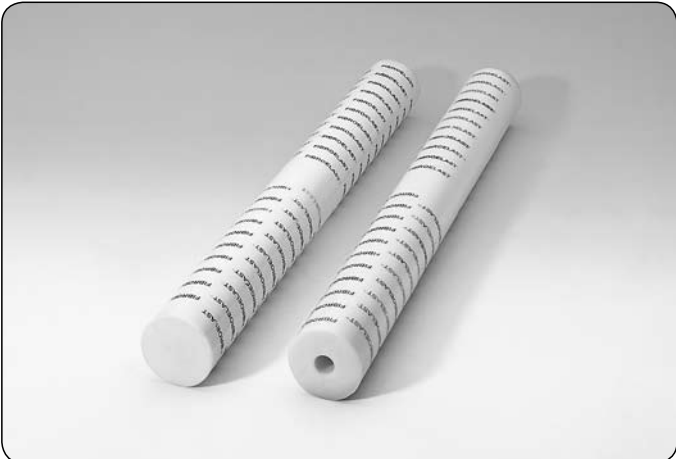
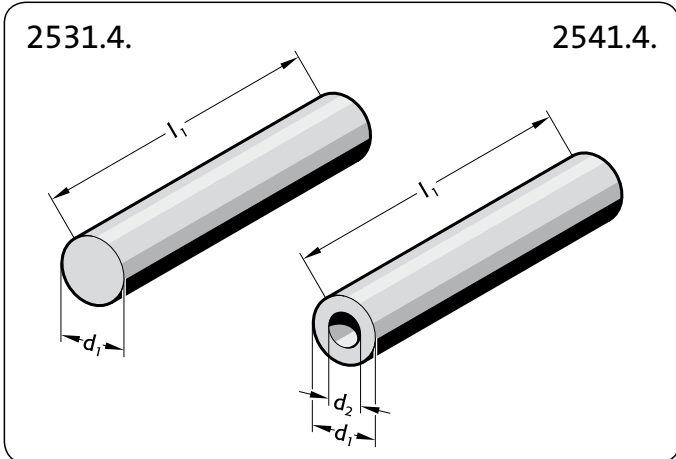
**Physical properties:**

Shore hardness A	65
100% modulus of elasticity (MN/m <sup>2</sup> )	2,4
300% modulus of elasticity (MN/m <sup>2</sup> )	4,6
Tensile strength (MN/m <sup>2</sup> )	26
Elongation (%)	550
Tear resistance (kN/m)	46
Permanent set (%)70°C	45
Rebound elasticity (%)	58
Maximum deformation (%)	40

# FIBRO

2531.4.  
2541.4.

FIBROELAST®-Round Sections  
FIBROELAST®-Hollow Round Sections



**2531.4.**

Order No		d1	l1	
Part I	Part II		330	500
2531.4.	016	16	●	
	020	20		●
	025	25		●
	032	32		●
	040	40		●
	050	50		●
	063	63		●
	080	80		●
	100	100		●
	125	125		●

**Ordering Code (example):**

FIBROELAST® Round Section	=	2531.
Hardness 70 Shore A	=	4.
d1 = 40 mm	=	040
Order No	=	2531.4.040

**2541.4.**

Order No		d1	d2	l1	
Part I	Part II			330	500
2541.4.	016	16	6,5	●	
	020	20	8,5		●
	025	25	10,5		●
	032	32	13,5		●
	040	40	13,5		●
	050	50	17,0		●
	063	63	17,0		●
	080	80	21,0		●
	100	100	21,0		●
	125	125	27,0		●

**Ordering Code (example):**

FIBROELAST® Hollow Round Section	=	2541.
Hardness 70 Shore A	=	4.
d1 = 40 mm	=	040
Order No	=	2541.4.040

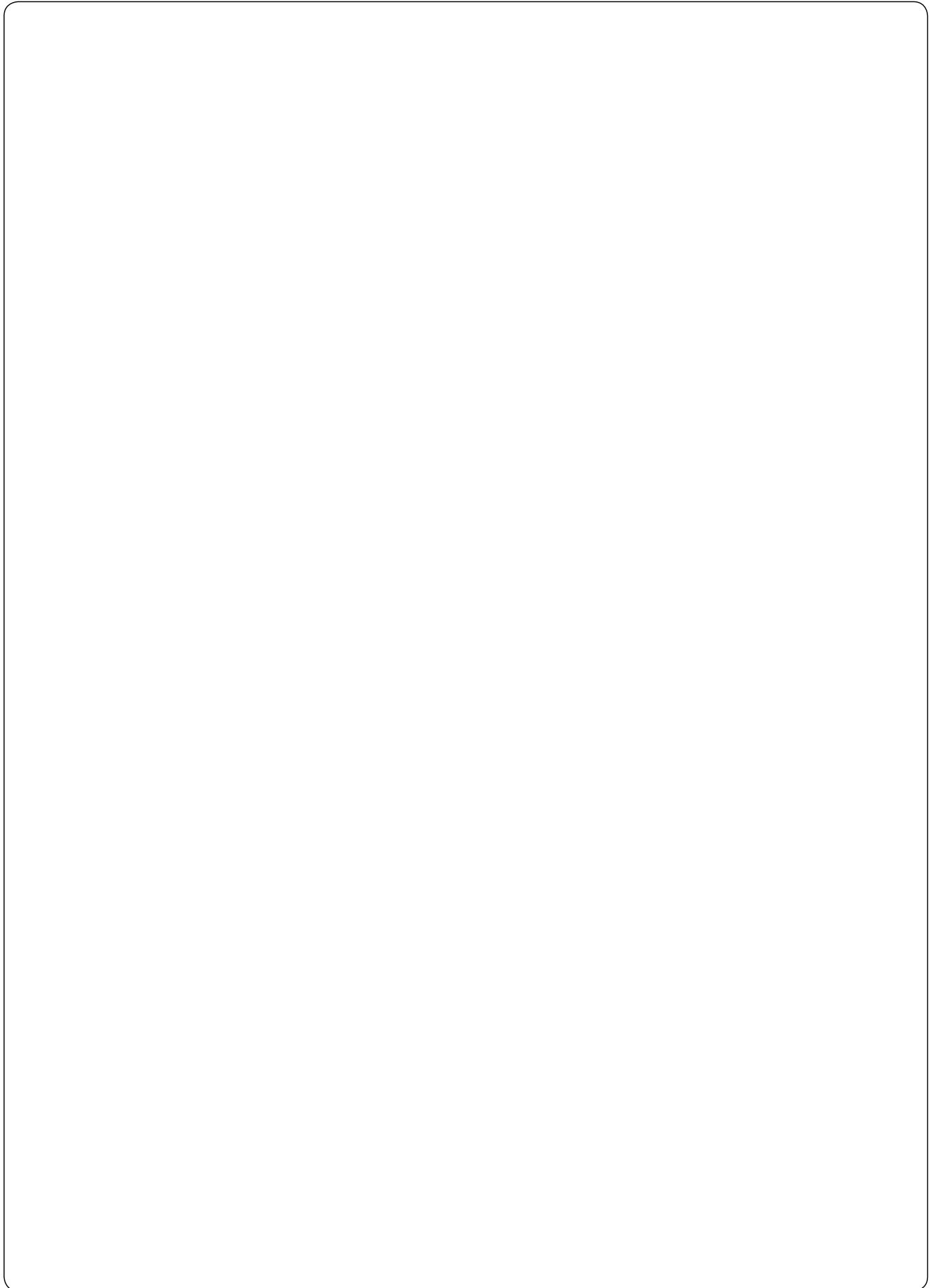
**Material:**  
Polyester-based polyurethane  
Hardness 70 Shore A

**Colour:**  
White

**Note:**  
FIBROELAST® hollow round sections can also be used as springs. See page F58.

**Physical properties:**

Shore hardness A	70
100% modulus of elasticity (MN/m²)	3,0
300% modulus of elasticity (MN/m²)	6,0
Tensile strength (MN/m²)	28
Elongation (%)	550
Tear resistance (kN/m)	58
Permanent set (%) 70°C	45
Rebound elasticity (%)	55
Maximum deformation (%)	40

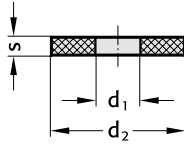


# FIBRO

2450.

## Shock Absorbing Washers

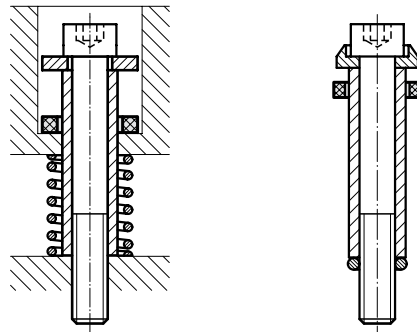
2450.



2450.

$d_1$	$d_2$	$s$
6,4	16	3
10,5	15	4
11	17	3
13	19	4
8,5	20	3
14	23	4
15,5	23	4
12	24	5
10,5	25	4
13	25	4
14	26	5
17	26	4
18	27	4
22	28	6
21	30	5
13,5	32	4
25	32	6
18	32	7
23,5	34	4
21	35	7
26	35	6
17	38	5
21	38	6
13,5	40	5
32	40	6
27	41	7
31	42	6
37	46	6
32	49	8
17	50	6
26	50	6
37	53	8
32	60	10
17	63	6
37	65	10
42	70	10
21	80	10
21	100	10
27	125	10

### Mounting Example:

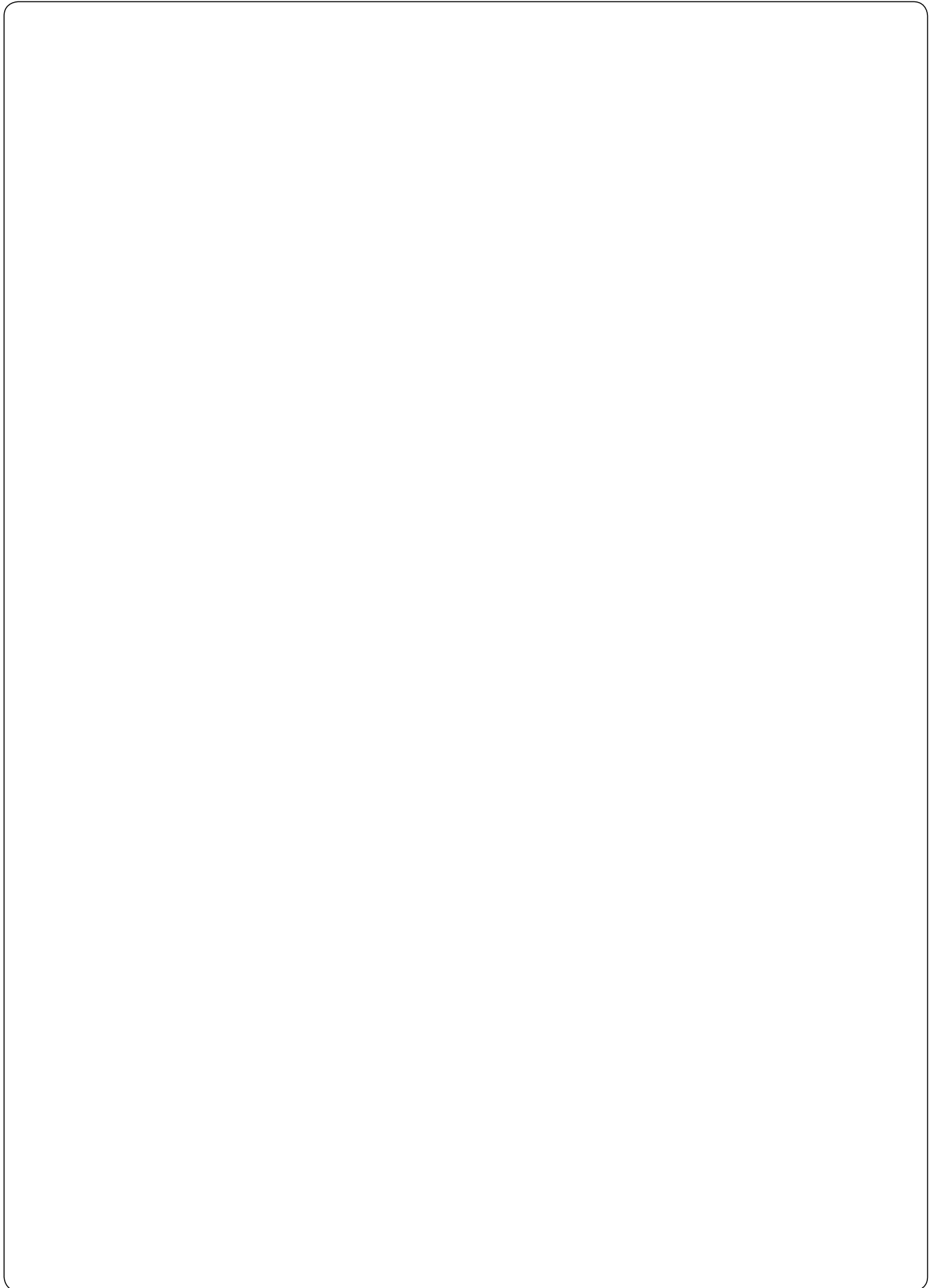


### Execution:

2450.6. (90 Shore A) available ex stock.  
80 and 95 Shore A available upon request.

### Ordering Code (example):

Shock Absorbing Washer	= 2450.	Shore A 80 = .5
Shore A hardness of 90 = 6.	= 6.	90 = .6
$d_1 = 21$ mm	= 21.	95 = .7
$d_2 = 80$ mm	= 080.	
$s = 10$ mm	= 10	
Order No	= 2450.6.21.080.10	



Blanking, forming and embossing with FIBROFLEX® Tooling Elastomer holds quite particular attraction for small to medium batches where, in comparison with conventional tooling, time and cost can be saved in the toolroom.

Conventional dies always depend on the highly accurate relationship between punch and matrix. This does not apply to elastomer dies. Only one part – punch or matrix – will be required. The “opposite member” is provided by the elastomer cushion. This means that elastomer dies are usually made very quickly and therefore cost less. Moreover they afford great flexibility in regard of component modification at a later stage.

Whereas the foregoing considerations left the choice of an alternative solution, presswork with surface-coated or surface-refined material usually does not: with any operational blemishes firmly ruled out, more often than not the “soft touch” of a FIBROFLEX® die is the only answer.

#### FIBROFLEX® Blanking Dies

In the actual working cycle of an elastomer blanking die, the ram force is initially absorbed by the resistance of the deforming elastomer cushion. As the limit of deformability is reached, shearing and stock breakaway must have taken place. As a general rule it can be stated that stock of high ductility has a detrimental effect on elastomer blanking. The brittle materials on the other hand, such as spring steels, lamination quality strip and certain aluminium alloys are blanked in elastomer dies on quite a large scale. Soft materials like deep drawing steel etc. are unsuitable for the process.

Steel stock of up to 2–2,5 mm thickness can today be handled on FIBROFLEX® blanking dies, while highly accurate blanks of intricate contour can be processed from thin sheet of 0,2 to 0,01 mm thickness. It is here that the inherently uniform clamping pressure of the elastomer cushion proves its beneficial influence – as vindicated by achievable part tolerances of  $\pm 0,01$  mm.

#### Metal Forming with FIBROFLEX®

Projects of metal forming with FIBROFLEX® must always be based on the rule that an elastomer can be displaced but cannot be compressed. Consequently it is of paramount importance to ensure that sufficient space is provided in an elastomer forming die for the accommodation of the displaced FIBROFLEX®

#### Press Selection

Due to the normally somewhat greater bulk of elastomer dies, the availability of ample die space in the press has to be assured.

Hydraulic presses with their characteristic slow pressure rise are eminently suitable for elastomer tooling because this feature matches the somewhat delayed deformation behaviour of FIBROFLEX®.

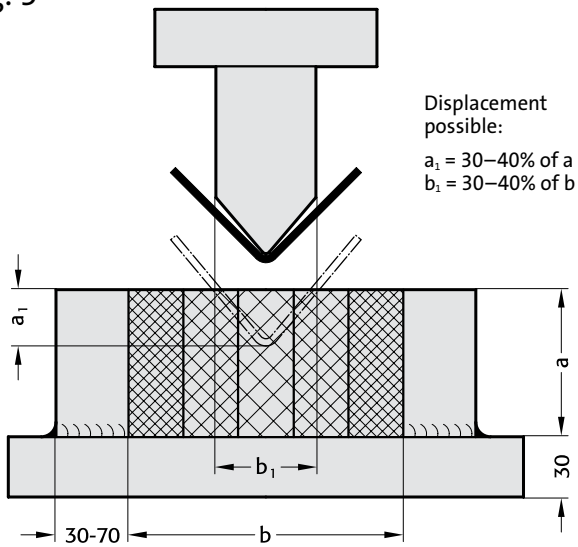
For the same reason, mechanical presses may give a certain amount of trouble because of overloading.

Since no demands need be made on press accuracy, older machines can often be put to good use again with FIBROFLEX® tooling.

Provided applications follow these general guide lines, FIBROFLEX® Tooling Elastomer will prove its enormous resilience time and again – giving shape to workpieces without losing its own.

# Application Examples of Forming Operations with FIBROFLEX® Elastomers

Fig. 5



## Vee-Bending

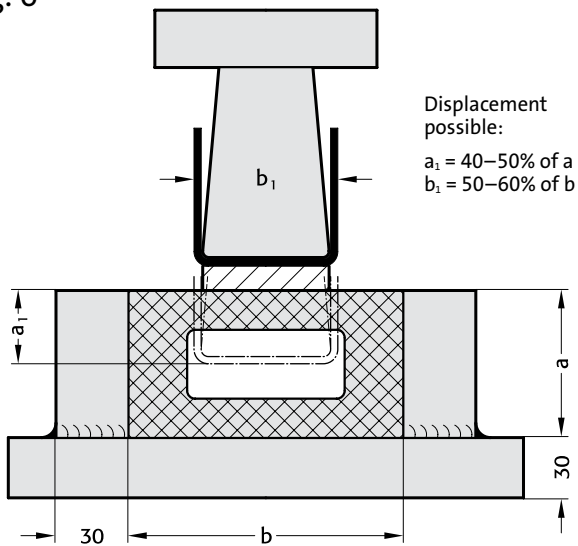
One of the easiest elastomer-forming operations is that of Vee-bending off a solid punch and into a die cushion of stacked FIBROFLEX® pads.

The necessary penetration of the punch and the amount of over-bending depend on the thickness, hardness and type of the material – and furthermore on the bending radius, the length of the free legs on the piece part, and lastly on the Shore hardness of the cushion.

Applicable to all kinds of bending operations is the general rule: the smaller the bending radius, the less will be the spring-back of the bend and the shallower is the required penetration of the punch.

Especially with larger batch quantities it is advisable to ensure all-round retention of the stacked elastomer cushion; it also pays to make punch and cushion identical in length.

Fig. 6



## Bending of Vee- and U-Shapes

Bending of Vee- and U-shapes can be achieved either with stacked FIBROFLEX® pads of different hardness (Fig. 5), or with the aid of solid and hollow FIBROFLEX® Sections. These may consist of squares, channels or triangular sections.

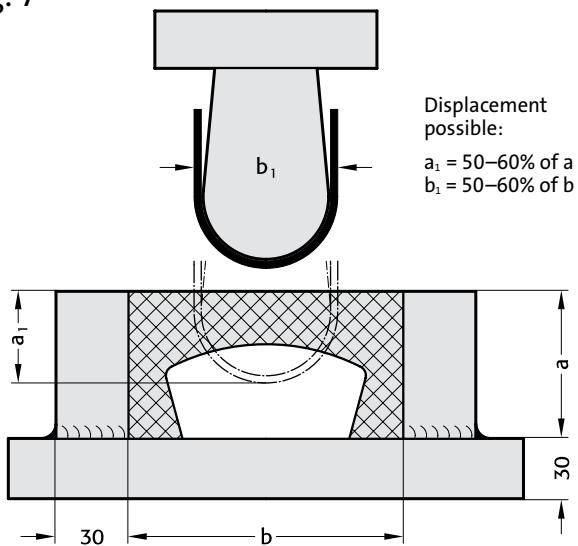
Where solid sections or sheet is used as a cushion, wear of the elastomer material can be reduced through creation of an additional displacement space at the bottom of the cushion retainer box, similar to Fig. 11, where gib inserts are placed along the corners.

Hollow cushions, as well as those of a channel configuration, exhibit greater die life and are therefore the preferred choice for bending operations.

In the case of a U-shaped bend with straight bottom it may be advisable to insert a packing of 3–5 mm thickness, and of the same width as the flat bottom of the bend, underneath the cushion. This measure increases the forming pressure and helps to achieve a flat bottom on the workpiece.

The punch should be relieved on both sides in order to avail compensation possibilities for springback.

Fig. 7



## U-Bends with large radius

U-bends with a large bottom radius are difficult to accomplish. Punch penetration must of need be large; springback can be quite considerable.

In order to achieve good results, the use of hollow FIBROFLEX® sections or of channels becomes almost mandatory. This is illustrated in Figs. 7 and 12. Another alternative consists of machined form cushions in accordance with Fig. 13.

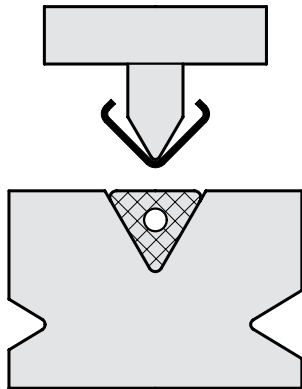
The hollow space of the channel-shaped cushion has the effect of increasing the horizontal pressure component in the die; this also holds true for hollow die cushions.

In all cases is it necessary to ensure that the cushion retainer box is sufficiently rigid.



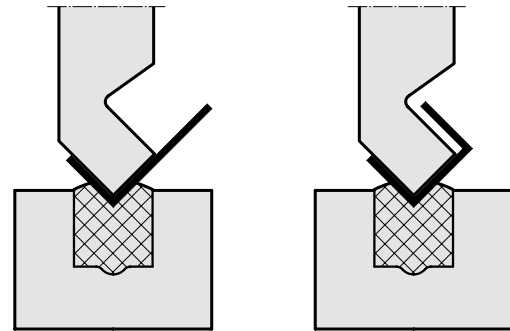
## Application Examples of Forming Operations with FIBROFLEX® Elastomers

Fig. 8



FIBROFLEX® Triangular Sections are shaped to fit into the existing forming grooves of bending brake dies, thus eliminating die changes and/or the provision of a die cushion retainer box as required with square cushion configurations.

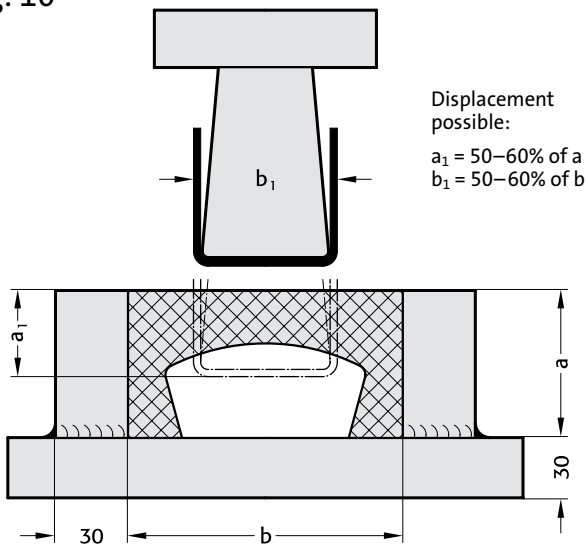
Fig. 9



Depending on stock specifications the bending of a channel section may either be done off a Vee-shaped punch as a voluntary choice – or it may become an absolute necessity.

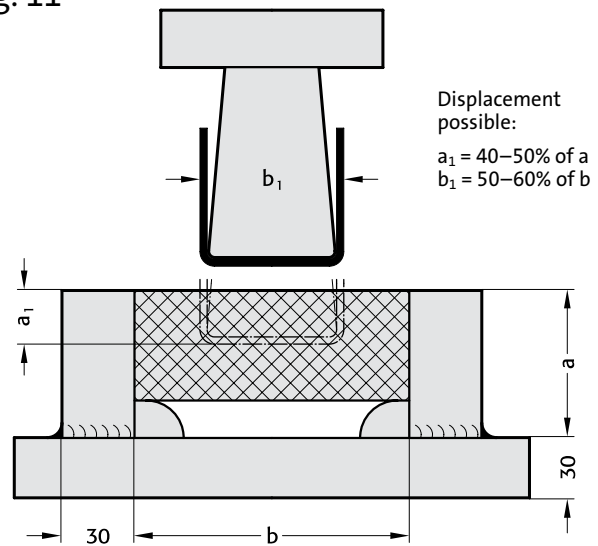
Two operational sequences are required, and a goose-necked punch configuration is essential.

Fig. 10



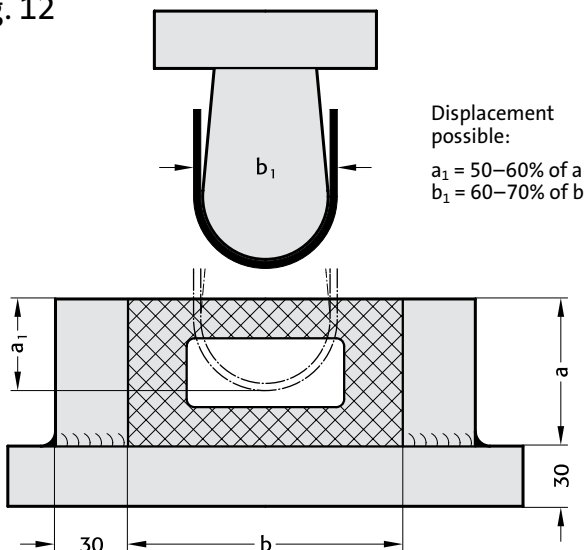
Displacement possible:  
 $a_1 = 50-60\%$  of  $a$   
 $b_1 = 50-60\%$  of  $b$

Fig. 11



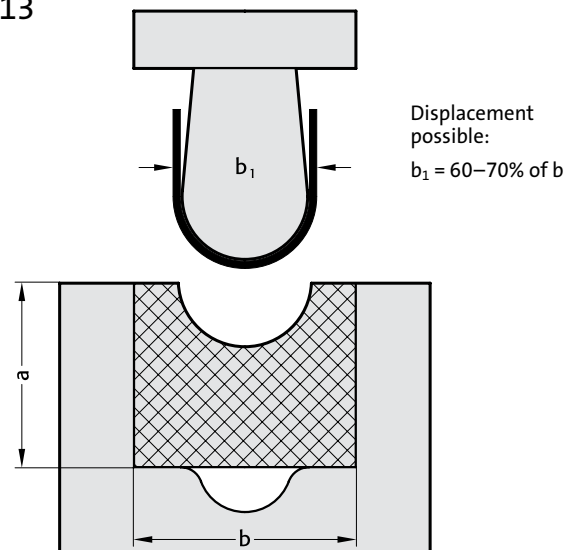
Displacement possible:  
 $a_1 = 40-50\%$  of  $a$   
 $b_1 = 50-60\%$  of  $b$

Fig. 12



Displacement possible:  
 $a_1 = 50-60\%$  of  $a$   
 $b_1 = 60-70\%$  of  $b$

Fig. 13



Displacement possible:  
 $b_1 = 60-70\%$  of  $b$

A large, empty rectangular box with rounded corners, occupying most of the page. It is intended for drawing or content.



# Blanking and forming with FIBROFLEX® - Elastomers

## Blanking and forming with FIBROFLEX®-Elastomers

### Description

FIBROFLEX® forming materials for blanking, embossing and forming are eminently suitable for use in small and medium series production. The main advantage is the reduction in tooling costs compared with traditional production methods.

This means that, even with considerable workpiece changes or with prototypes, you can respond quickly to changing market requirements and delivery times.

You can avoid scratching or damaging the increasingly common coated and highly polished sheet metals by using the gentle touch of elastomers for the forming process.

### Forming with FIBROFLEX®

When forming using elastomers, always remember the golden rule: whatever the extent of the deformation, the elastic FIBROFLEX® forming material remains constant, i.e. it can be displaced, but not compressed. The design must allow the elastomer to “flow” into a relief gap – that is the secret of success.

### Choice of Machine

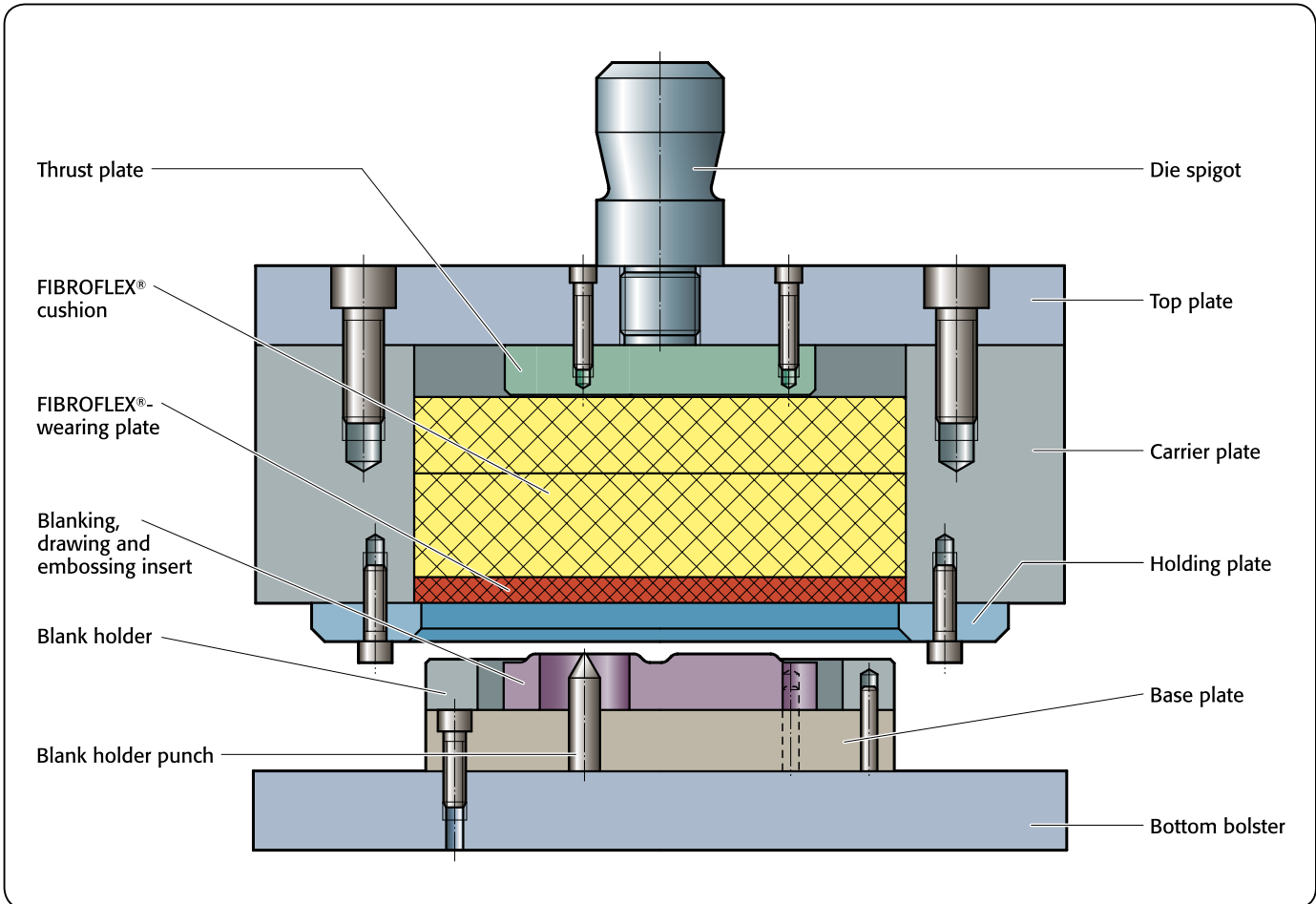
When FIBROFLEX® matrices are used for blanking, embossing and forming the machine must be able to accommodate the displacement.

Hydraulic presses are preferable to mechanical presses because of their gradual pressure build-up which suits the characteristics of the FIBROFLEX® forming material as it changes shape.

If a mechanical press is overloaded as it approaches bottom dead centre (which is also the cutting point), there is a risk of the press being damaged.

With FIBROFLEX® the machine is not subjected to any stresses, so even old machines can be used.

**FIBROFLEX® Forming tool blanking – drawing – embossing**



**Combined blanking – embossing – punching**

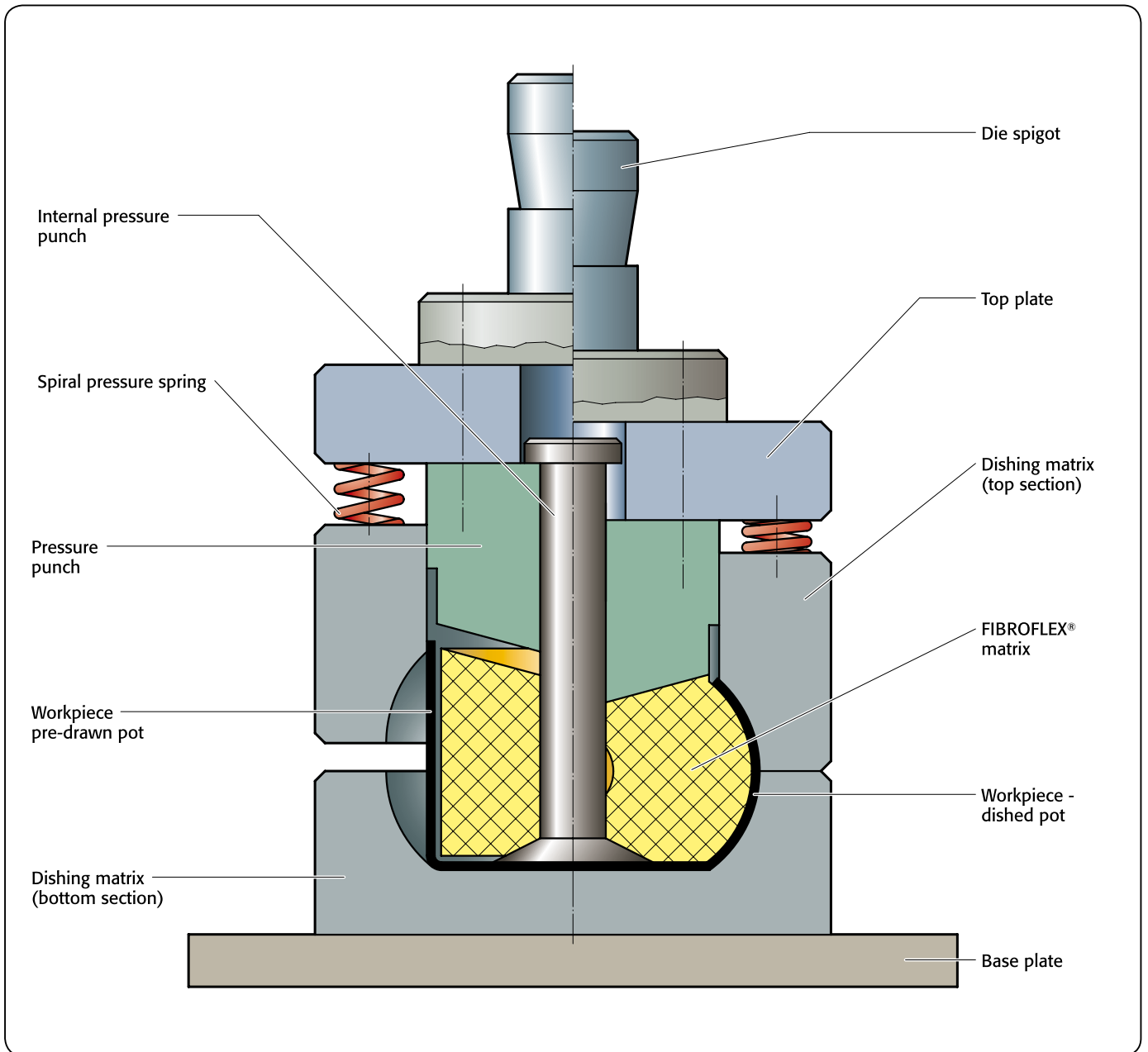
The workpiece is completed at one pass. The shape is determined by the combined blanking, hole cutting and embossing matrix blank holder punch, without a reverse shape mould on the cushion side.

The thrust plate in the carrier produces a concentration of pressure which produces a better result in the active tool range. The thrust plate also provides the necessary compensation for constant volume.

When producing workpieces of a different shape, only the tool elements in the lower section which produce the shape have to be exchanged.



FIBROFLEX® Forming tool dishing



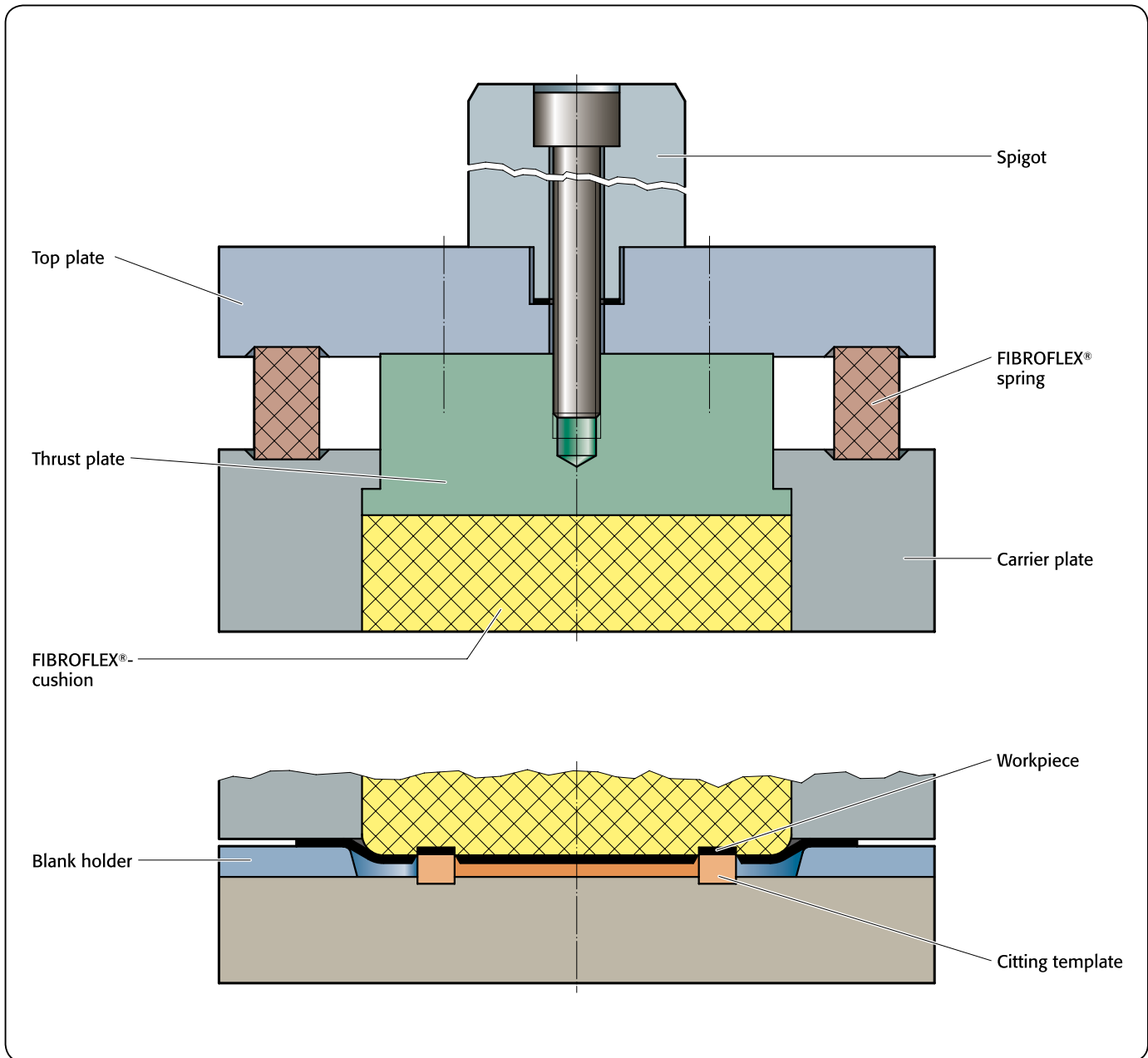
**Bulging a pot**

For flaring and bulging operations we recommend the use of FIBROFLEX® concave profiles wherever possible.

The wedge shape of the elastomer and the shape of the pressure and counter pressure punches both encourage the elastomer to deform in the required direction.

For bulging work it is worth taking into account the basic principle for FIBROFLEX®, namely that it maintains a constant volume. (Displaced volume equals bulging volume – see also description on page G17).

**FIBROFLEX®  
Universal Blanking and Forming Carrier**



**FIBROFLEX® blanking matrices**

When blanking with Elastomers, the workpiece materials, in contrast to the traditional blanking of workpiece materials, are subjected to their elastic limits, beyond which the material breaks.

The thickness of sheet steel which can be cut using FIBROFLEX® is currently up to 2.5 mm.

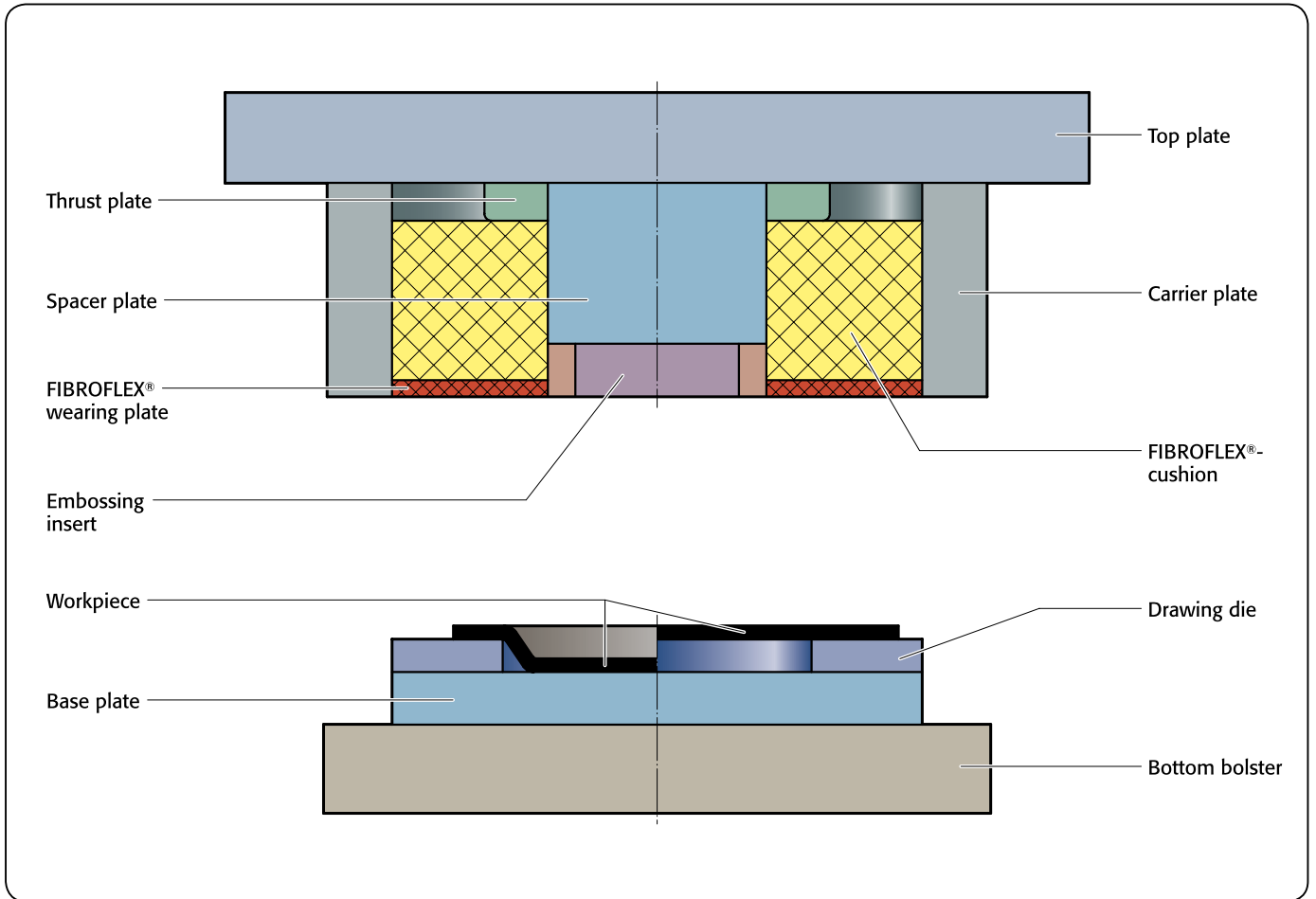
The even clamping pressure which is excellent for pressing also means that parts with intricate contours can be manufactured.

It is possible to achieve workpiece accuracy of  $\pm 0,01$  mm.

During the blanking process the press pressure first deforms the elastomer. As soon as the elastomer reaches the limits of its deformation the workpiece is cut.

The less the stretch of the sheet metal, the easier it can be cut using the elastomer blanking process. Spring band steels, electric sheets and sheet aluminium all cut well using this process. Deep-drawing sheet steel is unsuitable for the elastomer blanking process.

**FIBROFLEX®**  
Forming tool drawing – embossing



**Drawing and embossing**

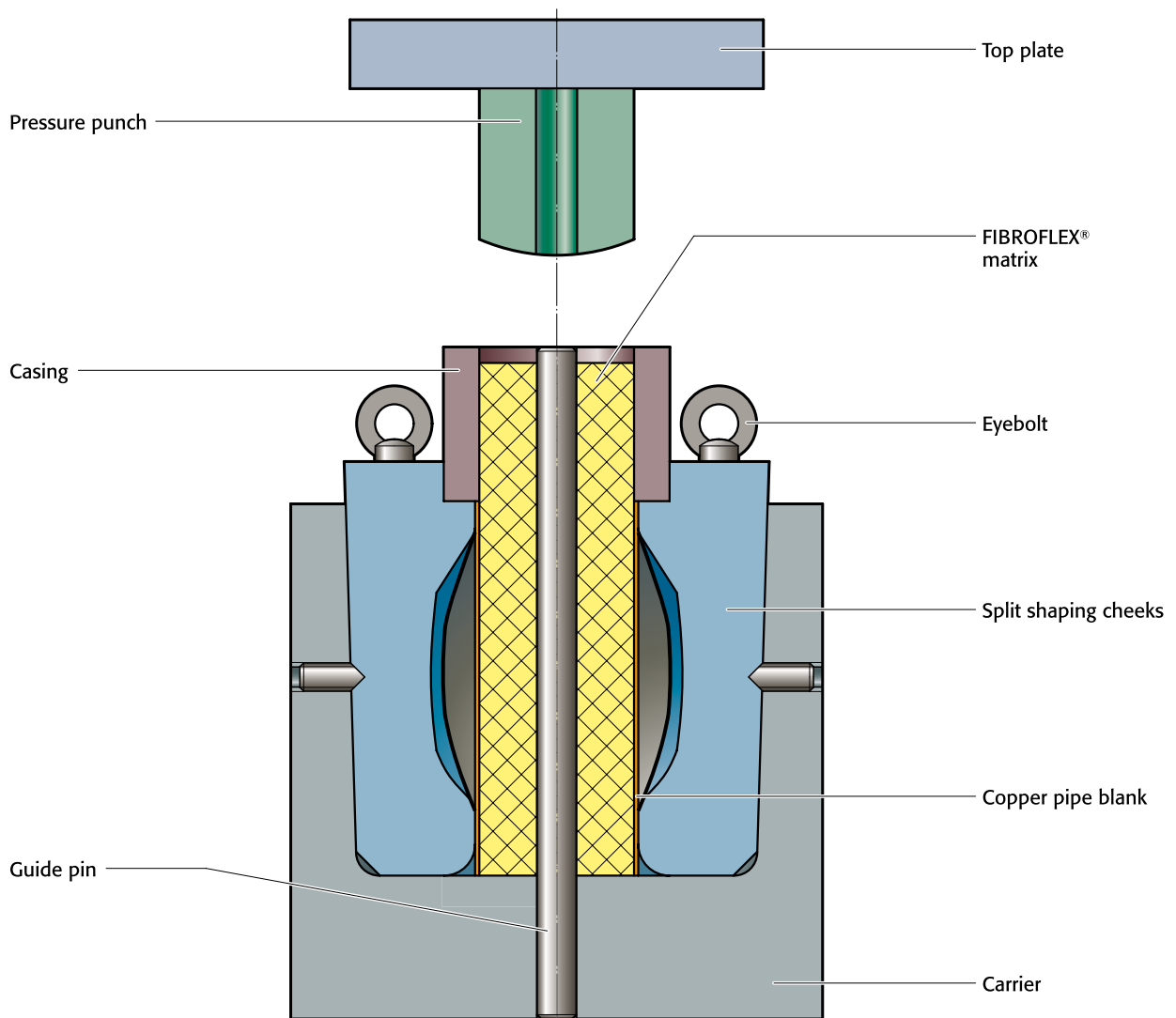
The limits for flaring and bulging depend on the workpiece material, its thickness and hardness and also the height of the FIBROFLEX® cushion.

Maximum permissible deformation of the FIBROFLEX® cushion:

- 80 Shore A – 35%
- 90 Shore A – 30%
- 95 Shore A – 25%



## FIBROFLEX® Forming tool for flaring pipes

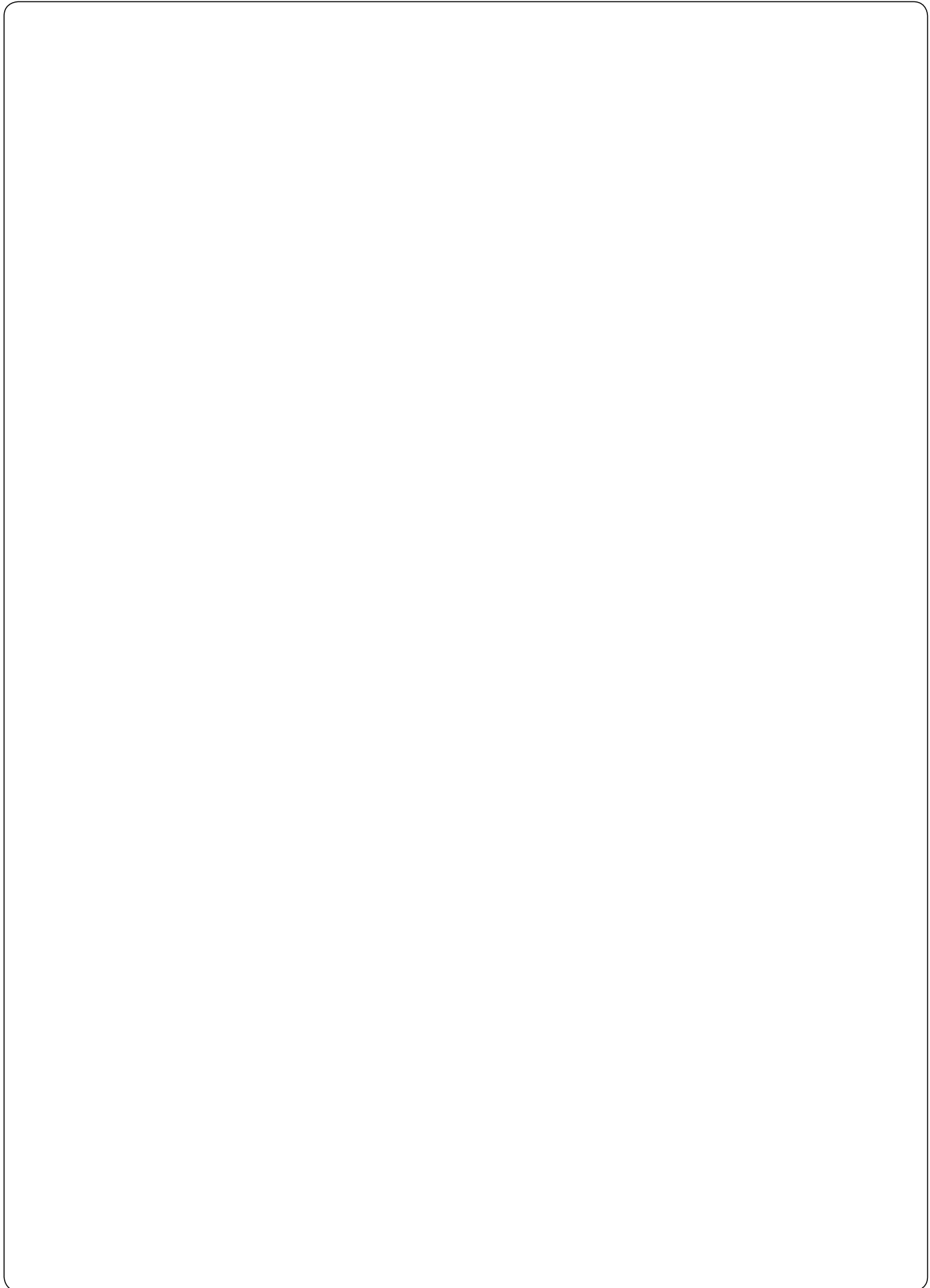


### Flaring pipes

When flaring using FIBROFLEX®, split cheeks with a conical external surround are required to allow the workpiece to be released.

Depending on wall thickness, flaring ratios of 1.2 can be achieved. Above a workpiece diameter-to-length ratio of 2 : 1 it is advisable to use concave cushions with bolt guides.





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A Die Sets

---

B Precision Ground Plates and Flat Bars

---

C Lifting and Clamping Devices

---

D Guide Elements

---

E Ground Precision Components

---

F Springs

---

G Elastomer-Bars, -Sheets, -Sections

---

**H FIBRO Chemical Tooling Aids**

Tooling Resin, Metal Adhesives,  
Degreasing Agent, Corrosion Protection Agent, Oils

---

J Peripheral Equipment

---

K Cam Units

---

L Standard Parts for Mould Making

---



# Chemical Tooling Aids

FIBROLIT® Chemical Tooling Aids are offered as a comprehensive range of reliable agents, specifically developed for the requirements of the toolmaking trade, and closely integrated with other FIBRO products.

Quite categorically the FIBROLIT® bonding technique relies on first principles only for the attainment of absolute alignment accuracy. Which could be called the very criterion of modern high-precision toolmaking but often in the past involved the accumulation of many small errors from conventional diemaking steps. And attempts at compensation on the bench. Compromises.

The FIBROLIT®-Concept achieves perfect die alignment by way of epoxy-bonding of vital die components, free from clamping stress and heat distortion, press fit shrinkages and errors arising from faulty machine tool geometry. And without recourse to sophisticated, expensive toolroom machines, thus saving both capacity and costs.

Successful application of the FIBROLIT® bonding technique however does depend on the observance of a few guide lines. These are fully explained in this section.

A quaint obstacle makes itself felt at times: conservatism, rooted deeply in the traditions of the toolmaking trade, sceptical of new ideas that often promise much ... but keep little!

In convincing contrast, the FIBROLIT®-Concept offers uncompromising success indeed. This is borne out by the unreserved acclaim from toolmaking experts all over the world.

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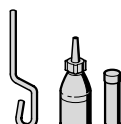
Technical Data: FIBROLIT®-ZWO and FIBROFIX®-SECHS

H6



**280.02** FIBROLIT®-ZWO 280.02 and Hardener 280.05 – a two component casting resin on epoxy resin basis, exhibiting high strength and excellent sliding properties

H7



**280.08** FIBROFIX®-SECHS 280.08 – properties identical with those of 280.02 6 Injection Cartridges and hardener ampoules and stirring rod

H7



**280.09** Injection Gun – for the injecting of casting resin FIBROFIX®-SECHS 280.08

H7

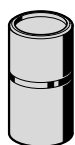
Technical Data: FIBROLIT® MK Thinning Agent for FIBROLIT® ZWO

H8



**280.24** Thinning Agent 280.24 – for reducing viscosity of FIBROLIT®-ZWO

H9



**281.01** FIBROLIT®-MK 281.01 – two component metal adhesive on epoxy resin basis

H9



**281.243** Nutlock medium strength

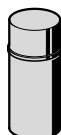
H10

**281.270** Nutlock high strength

H10

**281.648** Heat Resistant Retainer for bushings, bearings, sleeves

H10

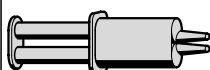


**281.706** Cleaner

H11

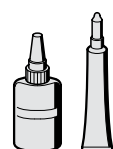
**280.20** Leak Detector Spray

H11



**281.147** Quick Metal

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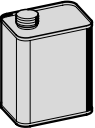



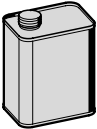
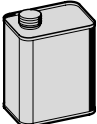
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## Technical Data: FIBROLIT®-ZWO – FIBROFIX®-SECHS

### Physical Properties

viscosity at 25 °C	approx. 9000 m Pas
pot life at 25 °C (mixed mass = 100 g)	approx. 25 min.
curing time at 20–25 °C*	approx. 24 h
storage life at 20 °C	approx. 1 year
thermal resistance (Martens) DIN 53458	approx. 50–55 °C (75–80 °C*)
flashpoint of resin	approx. 210 °C
flashpoint of hardener	approx. 207 °C
decomposition temperature (ISO/R 871–68)	> 300 °C
thermal conductivity, within range of 14–38 °C (VDE 0304 section 1/7.59)	0,531 $\frac{W}{km}$
density (resin)	approx. 2,5 g/ml
density (hardener)	approx. 1,06 g/ml
compressive strength DIN EN ISO 604	approx. 130–140 N/mm <sup>2</sup>
tensile strength DIN EN ISO 527-1, -2, -3	approx. 50 N/mm <sup>2</sup>
flexural strength DIN EN ISO 178	approx. 70 N/mm <sup>2</sup>
ball indentation test DIN EN ISO 2039-1	approx. 213 N/mm <sup>2</sup>
impact test	3,57 $\frac{KJ}{m^2}$
modulus of elasticity (ex tensile test)	approx. 8760 N/mm <sup>2</sup>
linear shrinkage	approx. 0,05–0,12 %

\* cured at ambient room temperature for 24 h, or 15 h at 50 °C

### Chemical Resistance

Chemical Substance	Note	Chemical Substance	Note
Acetone	C	Chlophen T 64	A
Formaline 30 %	B	Water	B
Xylol	A	Sea Water	B
Silicone Solution DC 20	A	Solution of NaCl 5 %	A
Dieselene	A	Formic Acid	C
White Spirits	C	Lactic Acid 10 %	C
Tetrachloroethylene	A	Sulphuric Acid	C
Perchloroethylene	A	Acetic Acid 10 %	C
Ethylacetate	C	Ammonia 25 %	B
Epichlorohydrene	C	Aniline	C
Fluoric Acid 10 %	C	Phenol 90	C
		Hydrochloric Acid 10 %	B

A = no effect

B = small effect

C = destructive effect



## FIBRO

280.02 280.08  
280.05 280.09

## Tooling Resin FIBROLIT®-ZWO Tooling Resin FIBROFIX®-SECHS

280.02

280.05

(hardener  
only)



### FIBROLIT®-ZWO Tooling Epoxy Resin

resin: 365 ml, hardener: 50 ml

A well-trying epoxy resin, chiefly for casting purposes. Size and shape of container permit easy stirring and mixing therein. Important: resin must be stirred thoroughly prior to addition of hardener, whereupon complete intermixing requires further vigorous stirring which is a pre-requisite for even hardening.



### FIBROLIT®-ZWO Consignment Pack (Styrofoam)

1 can of casting resin + 1 cartridge hardener

Full instruction printed on package. Best results are obtained if ambient temperature and temperature of steel components etc. are about 20 °C. Curing completed in 24 hours.

Especially when smaller portions of resin are spooned out, (for the mixing of small quantities of casting resin) it is important that removal is preceded by thorough stirring: fillers tend to settle at the bottom of the can and must therefore be mixed evenly.

Mixing ratio by weight: 18 to 1 (resin : hardener).

Physical Properties: page H 6

Optional Thinning Agent: page H 9

280.08



### FIBROFIX®-SECHS Tooling Epoxy Resin

six packs of ready-to-mix resin + hardener, 40 ml each

Six packs of tooling resin/hardener, for the expedient, clean use of tooling resin in small volume. FIBROFIX® SECHS contains the same resin as FIBROLIT® ZWO – therefore identical instructions apply. FIBROFIX® SECHS is specifically suited for use in our Injection Gun 280.09 – see details on page H 17.

### Styrofoam Consignment Package

Contents: 6 resin cartridges + 6 ampoules hardener  
+ 1 stirring rod

280.09



### Injection Gun

For the fast, tidy application of FIBROFIX® SECHS, especially where small gaps or inaccessible locations are involved. Gun accepts throw-away cartridge with mixed resin or adhesive. Forced injection through compressing of cartridge by means of screw plunger. Empty cartridge is removed from gun and thrown away. Gun remains clean at all times.

**Technical Data:**  
**Metal Adhesive FIBROLIT® MK**  
**Thinning Agent for FIBROLIT® ZWO**

**FIBRO**

**Physical Properties: FIBROLIT® Metal Adhesive**

density of Resin MK	1,16±0,01 g/ml
density of Hardener MK	1,13±0,01 g/ml
tensile shear strength	40–50 N/mm²
thermal resistance (Martens)	45–50 °C
pot life (100 g-mixture)	15–20 min.
shelf life at 20–25 °C	approx. 1 year
time for complete curing, at 20–25 °C	24 h approx.

**Physical Properties: Thinning Agent**

density	1,16±0,02 g/ml
flash point (DIN 51584)	97 °C
shelf life at 20–25 °C	approx. 1 year
viscosity at 25 °C	1000±100 mPas

**Chemical Resistance**

Chemical	rating	Chemical	rating
Acetone	C	Chlophene T 64	A
Formaline 30%	B	Water	B
Xylon	A	Sea Water	B
Silicon solution DC 20	A	NaCl-solution 5%	A
Dieselene	A	Formic Acid	C
White Spirits	C	Lactic Acid 10%	C
Tetrachloroethylene	A	Sulphuric Acid	C
Perchloroethylene	A	Acetic Acid 10%	C
Ethyl Acetate	C	Ammonia 25%	B
Epichlorohydrene	C	Anilin	C
Fluoric Acid 10%	C	Phenol 90	C
		Hydrochloric Acid 10%	B

A = no effect  
 B = small effect  
 C = destructive effect

**FIBRO**

281.01  
280.24

Metal Adhesive FIBROLIT® MK  
Thinning Agent for FIBROLIT®-ZWO

281.01



**FIBROLIT® MK Metal Adhesive**

two-component tin, containing altogether 325 ml

Two-component adhesive on epoxy resin basis. Mixing ratio is 2:1 by weight. Parts to be joined must be thoroughly degreased. Coarse surfaces improve adhesion. Glue line should not exceed 0,6 to 0,7 mm in thickness. Application with brush or other suitable tool. The adhesive hardens out completely after 24 hours, but reaches a tensile shear strength of 30 N/mm<sup>2</sup> after 6<sup>1</sup>/<sub>2</sub> hours. Bushes epoxy-bonded with FIBROLIT® MK remain their geometry and size after hardening of the adhesive.

280.24



**Thinning Agent for FIBROLIT® ZWO**

container of 500 ml

A pure epoxy resin, this agent may be added at a certain ratio to FIBROLIT® ZWO in order to reduce the viscosity of the resin mix. Maximum admixture = 5%. It must be noted that the addition of thinning agent will extend the curing time. Together with hardener 280.05, the thinning agent can be used as a casting resin – the correct mixing ratio is 5:1 by weight.

# Anaerobic Metal Adhesives for Securing of Screws and Bearing Bushes

**FIBRO**

281.243 281.270  
281.648

281.243  
LOCTITE 243



## For Screws and Nuts

For the securing of screws and bolts with medium bonding strength. Protects against vibrations, corrosion and leakage, up to M 36. Normal hand tools will suffice for dismantling.

Temperature resistant from  $-55^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$ .

Bonding strength:  $6-14\text{ N/mm}^2$

Contents of Bottle: 50 ml

281.270  
LOCTITE 2701



## For Screws and Nuts

For the securing of screws and bolts with high bonding strength, also for studs and nuts. Suitable for threads up to M 20. Reliably seals hydraulic/pneumatic lines up to  $\frac{1}{2}''$  BSP.

Temperature resistant from  $-55^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$ .

Secured parts cannot be dismantled easily.

Seals gaps up to 0,15 mm max.

Bonding strength:  $11-20\text{ N/mm}^2$

Contents of Bottle: 50 ml

281.648  
LOCTITE 648



## For Securing Bushes and Ball Bearings

For bonding of bearings, bushes, bolts and other machine components. Very fast bonding to handling strength. Temperature resistant from  $-55$  to  $+175^{\circ}\text{C}$ .

Where oil-impregnated sintered bushes are to be secured, the special instructions must be observed.

Seals gaps up to 0,15 mm max.

Bonding strength:  $16-30\text{ N/mm}^2$

Contents of Bottle 50 ml

## FIBRO

281.706

280.20

## Cleaner Leak Detector Spray

281.706  
LOCTITE 7061 Spray Can



### Rapid-Cleaning Spray

Spray Can 400 ml

In order to achieve optimum results in bonding work, the affected surfaces should be thoroughly cleaned beforehand. LOCTITE 706 Spray removes oil, grease and contamination from metal surfaces treated with it. Upon evaporation, no residue remains.

280.20  
FIBROLIT®-LSP



### Leak Detector Spray

400 ml

For fast and reliable detection of gas leaks and compressed air leaks:

Spray on to the suspect areas and foaming bubbles will appear at the location of any leaks.

The valve also allows you to spray upwards.

FIBRO Leak Detector Spray tests connections, whether they are brazed, screwed or welded, it tests fittings, valves, pressure vessels, hoses, pipework – in short, anything that needs a good seal.

You can use FIBRO Leak Detector Spray for all gases:

compressed air, oxygen, nitrogen, hydrogen, town gas, natural gas, liquid gas, carbon dioxide, nitrous oxide, acetylene, propane, butane, other flammable gases, etc.

FIBRO Leak Detector Spray is non flammable, non corrosive, non toxic and does not damage or crack plastics such as polyethylene, PVC etc.

## Fluid Metal Cyanoacrylate adhesive

281.147  
281.401 281.454

281.147  
LOCTITE 147 twin syringe resin  
LOCTITE 147 twin syringe hardener



### Fluid Metal for fast repairs

Twin syringe 25 ml

Epoxy Metal Product for high resistance repairs on steel and cast iron. Sticks on metal, glass, ceramics and other materials.

To be used e. g. for repairing of substandard working on tools and machine parts. Suitable as quick filler.

Potlife	8 min.
Fixturing strength	30 min.
Full curing	72 h.

281.401  
LOCTITE 401

281.454  
LOCTITE 454



### LOCTITE cyanoacrylate adhesive 401/454

50 g

20 g

Loctite 401 is a high performance cyanoacrylate adhesive. It bonds extremely rapidly to a wide variety of materials, including porous surfaces such as metal, plastics and rubber.

Type 454 is as above but formulated to a thick, gel consistency. Will not flow into unwanted areas. Remains stationary on vertical or overhead surfaces. Fixturing strength depending to material between 20–120 sec.

# FIBRO

280.15  
280.131 280.23

FIBROLIT® RL  
FIBROLIT® ARF

280.15



## FIBROLIT® RL Penetration Lubricant Spray

300 ml aerosol spray can

Of enormous penetrating capability, spray deposit enters tiniest joint gaps and thus releases corroded and seized parts such as nuts, bolts and press fits. Acts as long-lasting rust protective and lubricant.

280.131



280.23



## FIBROLIT® ARF Marking Out Blue

300 ml aerosol spray can – 500 ml liquid container

A fast-drying marking out blue of outstanding intensity.

Colour: dark blue.

Degrease before application.

Silicon oil	280.8021	Replaces: 280.10
Oil	280.8001/280.8000	Replaces: 280.12/280.32
FIBROLIT®-TW Release Agent	280.11/280.27	
FIBROLIT®-Oil-LD Grase-LD	280.34/280.35	

**FIBRO**

280.8021  
LOCTITE 8021



**Silicon oil**

400 ml aerosol spray can

A release agent on silicon oil basis – for the attainment of tight clearances in connection with epoxy casting resins.

Applications include: cast guides on die set pillars, cast-in punches etc.

It is important to observe that components intended for above operations must have smoothly finished surfaces in order to be released without force after curing of the epoxy resins FIBROLIT® ZWO or FIBROFIX® SECHS.

FIBROLIT® TS is applied by spraying or with a rag; it should be rubbed in well before casting of the resin.

280.11



280.27



**FIBROLIT® TW Release Agent**

150 ml aerosol spray can – 500 ml liquid container

A release agent on wax basis- for the attainment of larger clearances in connection with epoxy casting resins. Applications include: cast guides on die set pillars, punches, cast-in bushes etc.

It is important to observe that components intended for above operations must have smoothly finished surfaces in order to be released without force after curing of the epoxy resins FIBROLIT® ZWO or FIBROFIX® SECHS.

FIBROLIT® TW is applied by spraying or with a rag. It should be rubbed in well. Repeated application will increase the clearance obtained.

280.8001  
LOCTITE 8001



280.8000  
LOCTITE 8000



**Oil**

400 ml aerosol spray can, container of 1000 ml

280.8000 und 280.8001 is a low viscosity oil with good penetrating properties.

It is an excellent tool lubricant.

280.34



**FIBROLIT® Grease LD**

400 ml

280.35



**FIBROLIT® Oil LD**

1000 ml

Sintered guide bushings are filled under vacuum with special oil 280.35.

As additional long term lubrication use FIBROLIT® Grease 280.34. It replaces lost oil in the sintered guiding systems.

Further information see page H 15.



## FIBRO

280.34 FIBROLIT®-LD

280.35 Long-term lubrication for sintered metal plain bearings

### New lubrication concept

FIBROLIT®-LD is a new lubrication concept for sintered metal plain bearings in order to achieve even longer running times.

FIBROLIT®-LD means that sintered bearing impregnation oils are kept in micro-cells for long-term and permanent lubrication in the form of a plastic oil reservoir.

Optimum results are achieved if the bushes have already been impregnated with the matched oil.

The plastic FIBROLIT® Grease-LD is provided in the oil supply grooves of the sintered bush. The supply groove is a advantage and is recommended but not absolutely necessary for additional lubrication, A capillary bridge to the surface of the sintered bearing is essential.

FIBROLIT®-LD-Lubrication has a number of crucial advantages over previous methods such as grease depot lubrication or felts.

Type of additional lubrication	Felt	Grease depot	FIBROLIT® Grease-LD
Provision of lubricating film Wetting of shaft though unimpregnated bearing	Very good	Satisfactory	Good
Storability Prevention of leaking and bleeding of oil	Poor	Very good	Very good
Oil output Use of oil supply	Very good	Poor	Satisfactory
Effectivity Longer life of bearing	Satisfactory	Satisfactory	Good
Automation Automated application	Difficult, expensive	Good	Very Good
<b>Overall assessment</b>	<b>Satisfactory</b>	<b>Satisfactory</b>	<b>Good</b>

### Lubricability

FIBROLIT®-LD is a gelled lubricant and has double the oil discharge capacity of conventional soap lubrication depot grease. An oil excess as with felts is not encountered. The guide slot is therefore better dised and so supplied for a longer period. The service life of the guide is prolonged.

FIBROLIT®-LD-additional ubrication offers longest service life.

### Temperature and Rvibration-stable

FIBROLIT®-LD is temperature-stable (-50 to +150°C) and does not flow off under the effect of heat. The plastic oil reservoir retains its strength and remains in place even under vibration forces.

The FIBROLIT®-LD lubrication concept opens up a new dimension of possible stroke speeds for tools with sintered guides.



## Application of FIBROFIX® SECHS with the FIBRO Injection Gun

- 1 Injection Gun
- 2 Injection Cartridge
- 3 Glass Ampoule with Hardener
- 4 Stirring Rod

1



2



Unscrew nozzle from Injection Cartridge. Stir up resin. Open Ampoule and hold over Cartridge. Use suitable rod to push Hardener down into Cartridge.

3



Stirring and mixing can be done with the aid of a drilling machine, Stirring Rod held in the chuck. Select slow revs in order to prevent air bubbles from forming in the resin.

4



Open bayonet lock on Injection Gun and remove screw plunger. Screw nozzle back onto Injection Cartridge. Place Cartridge inside Gun – nozzle to front.

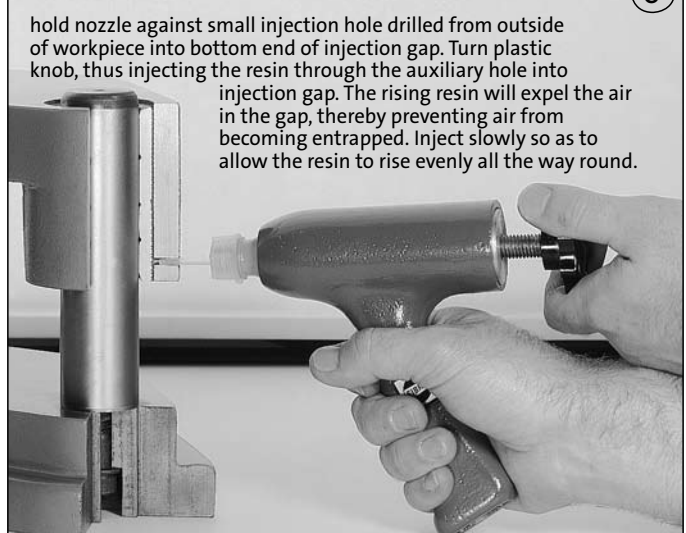
5



Place screw plunger into Injection Gun and lock the bayonet mechanism. Holding nozzle upwards, cut off its tip.

6

And this is how it's done --:



hold nozzle against small injection hole drilled from outside of workpiece into bottom end of injection gap. Turn plastic knob, thus injecting the resin through the auxiliary hole into injection gap. The rising resin will expel the air in the gap, thereby preventing air from becoming entrapped. Inject slowly so as to allow the resin to rise evenly all the way round.

### Casting of Punch Guides in Guiding Strippers

Suitable apertures in the stripper can be marked out from finished matrix. Allowance must be made for a casting gap of 1–3 mm around the punch.

Prolonged storage and cold can cause the resin to become stiff and unworkable. Place resin container in hot water of about 60 °C, then stir thoroughly and let cool down to room temperature.

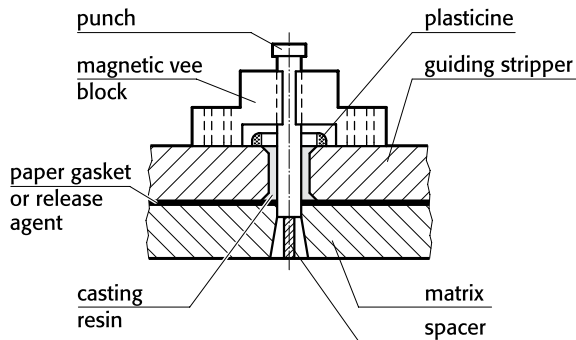


Fig. 1:  
Casting of punch guide in guiding stripper

Quite often it will suffice to drill a hole in approximation of a shaped aperture – as shown in fig. 2.

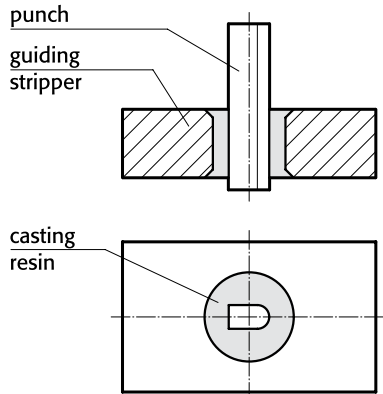


Fig. 2:  
Cast guide for form punch

Where extremely thin casting gaps cannot be avoided, admixture of FIBROLIT® Thinning Agent 280.24 will reduce the viscosity of the epoxy mixture, thus facilitating casting or injection.

The casting aperture/hole in the stripper requires thorough degreasing. Apply a coating of release agent to both the punch and the matrix. Bring stripper and matrix into accurate alignment, then clamp together.

Various methods exist for the exact positioning of the punch prior to casting. A magnetic vee block can be used for assuring verticality. Metal foil or plastic shims may help in providing equal clearance with the matrix. Segmented matrices are best made initially to zero clearance – relief and clearance to be ground after casting; this method ensures correct centring of the punch versus the matrix inserts.

A ring of plasticine helps to confine the poured resin, also acts as a casting funnel. Often the use of the FIBRO Injection Gun 280.09 will be found much easier, especially where access is obstructed.

With simple dies, the following execution leads to expedient and good results –:

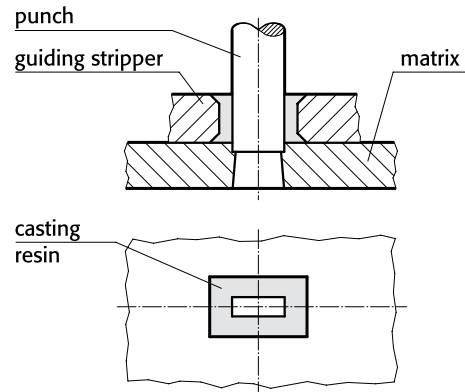


Fig. 3:  
Casting of the punch guide in a simple piercing/blanking die

The punch is set up squarely and positioned dimensionally correct relative to the matrix. The punch guide is then cast in the prepared stripper aperture – the stripper being dowelled to the matrix, of course. After hardening, the punch is forced lightly into the soft matrix, this being facilitated by the usual undersized preliminary matrix aperture. The matrix is then worked to the impressed contours, finished and finally hardened.

Where stripping forces are considerable and/or where large runs are anticipated, the cast epoxy resin guides in the stripper can be protected against wear by a wear plate. This plate is fitted to the underside of the stripper – before or after casting.

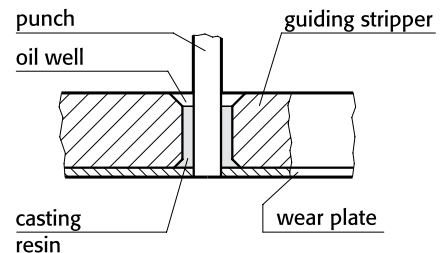


Fig. 4:  
Cast punch guide with oil well and wear plate underneath stripper

Fast-running dies require lubrication of the punch guide; an oil well is easily formed at the top end of the cast resin guide – as shown in fig. 4.

Quill punches ought to be given maximum support over their length; a typical cast stripper guide for such thin punches is shown in fig. 5.

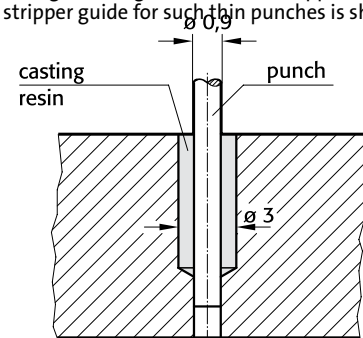


Fig. 5:  
Cast guide for thin Quill-Type Punch

Fig. 6 shows a guiding stripper with jig-bored holes for a number of dowel pins. The aperture was sawn. After driving in of the dowel pins the punch is inserted and then the guide is cast around it. The line contact with the hardened dowels makes the punch guide more durable, and the lining up of the punch (prior to casting) is eliminated.

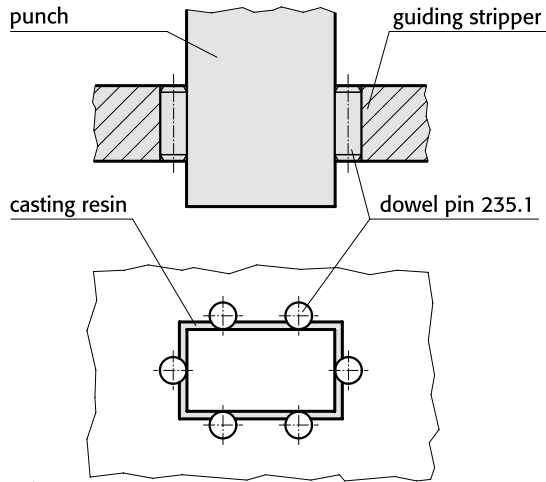


Fig. 6:  
Cast punch guide with jig-bored positioning dowel pins

A complicated guiding stripper with many intricately-shaped punch guiding holes is shown in fig. 7. All apertures in the stripper were drilled, sawn or milled, and the punch guides were cast with FIBRO tooling resin.

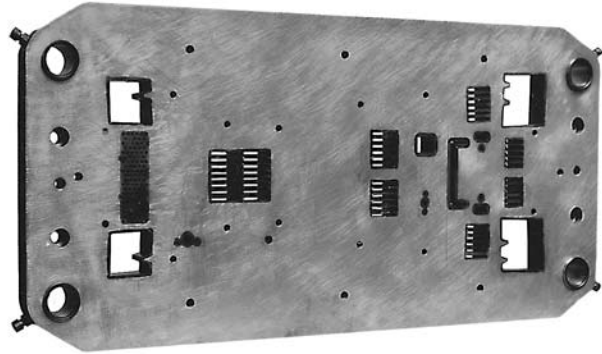
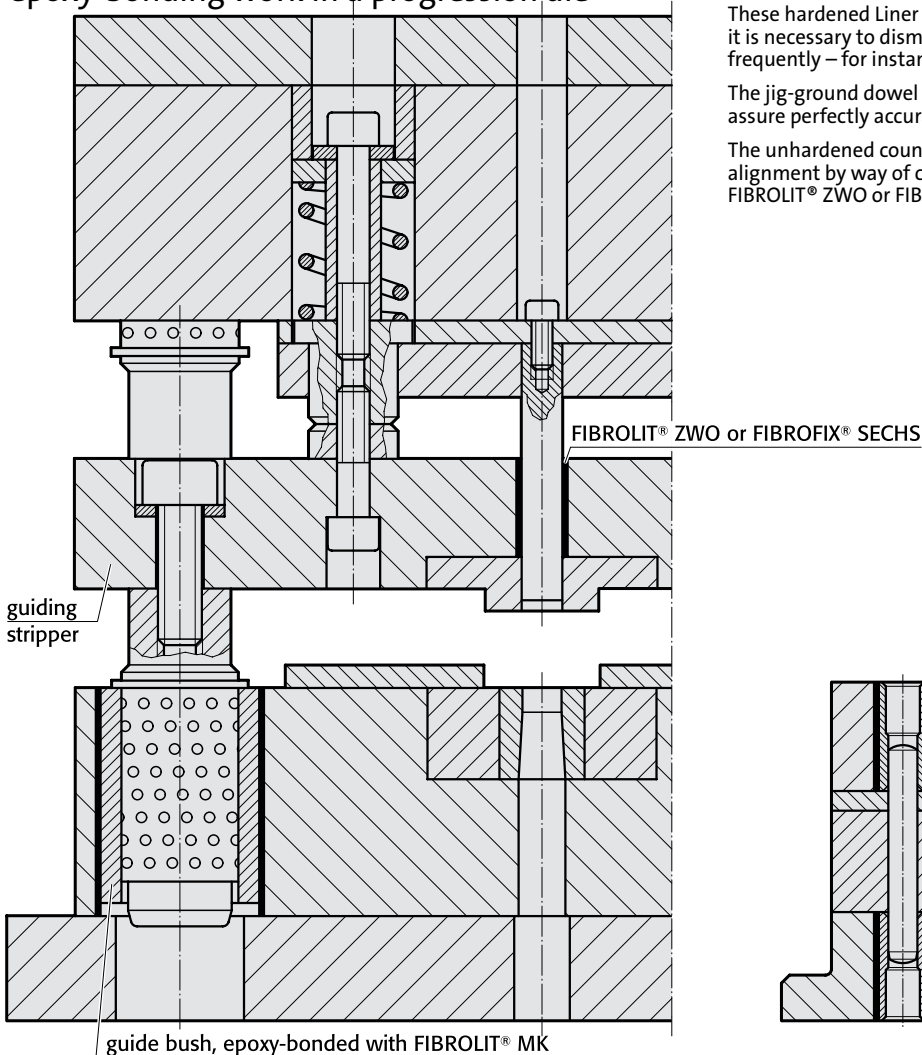


Fig. 7:  
Guiding stripper with numerous punch guides, cast with FIBRO tooling resin

The cost savings (in comparison with a conventional stripper) will be obvious to any toolmaking expert.

**Examples of epoxy-casting and epoxy-bonding work in a progression die**

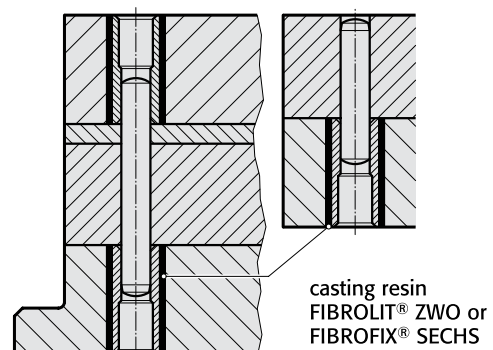


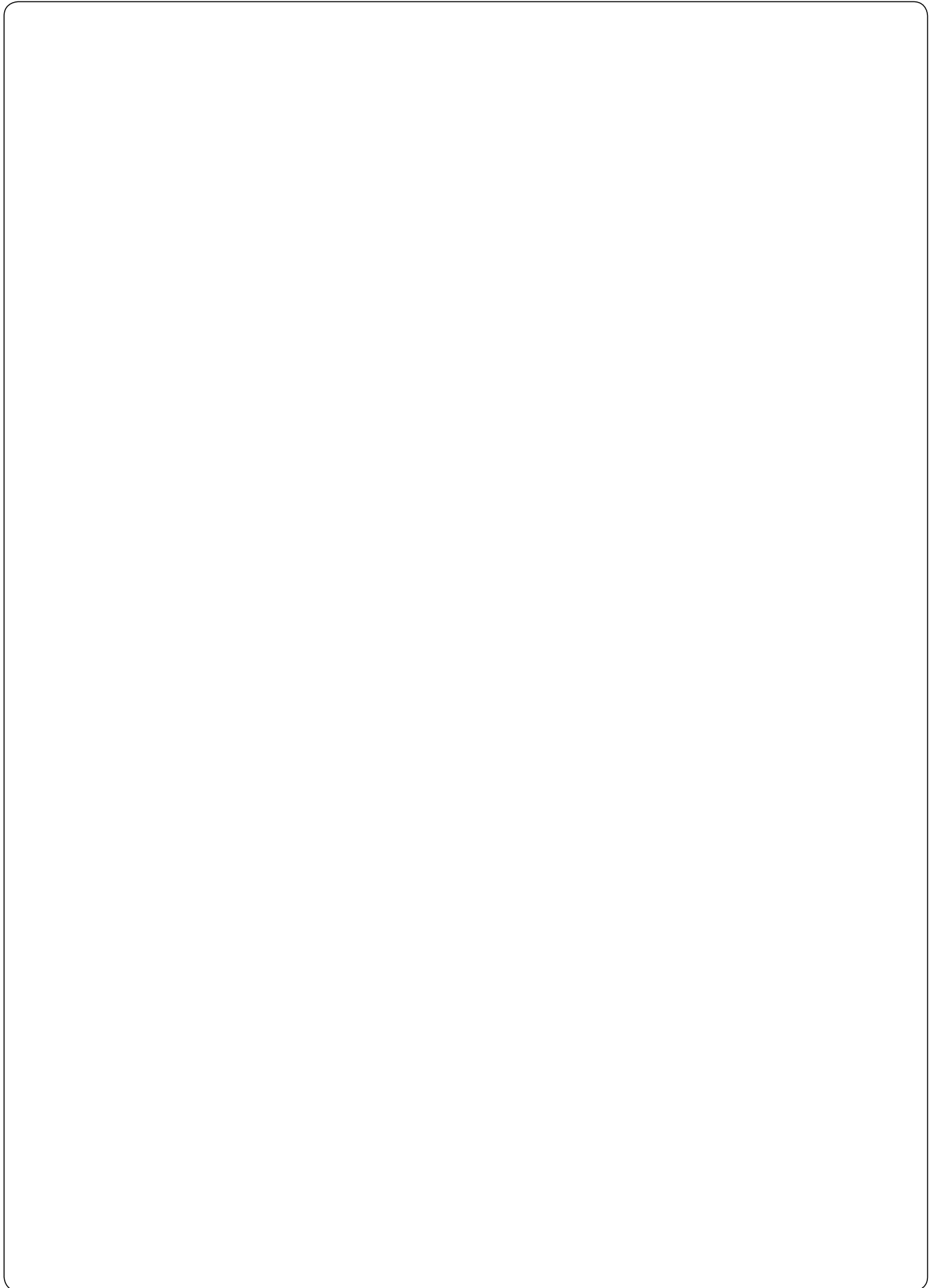
**Cast-in Liner Bushes for Dowel Pins**

These hardened Liner Bushes are used to great advantage where it is necessary to dismantle or replace unhardened components frequently – for instance in precision stamping dies etc.

The jig-ground dowel pin holes in the hardened and ground plates assure perfectly accurate interchangeability.

The unhardened counterpart is brought into precise position and alignment by way of casting-in of the hardened liner bushes. Either FIBROLIT® ZWO or FIBROFIX® SECHS is used for casting.





---

A Die Sets

---

B Precision Ground Plates and Flat Bars

---

C Lifting and Clamping Devices

---

D Guide Elements

---

E Ground Precision Components

---

F Springs

---

G Elastomer-Bars, -Sheets, -Sections

---

H FIBRO Chemical Tooling Aids

---

**J Peripheral Equipment**

for Presses, Tool Manufacture  
Conveyor Belts, Assembly Aids

---

K Cam Units

---

L Standard Parts for Mould Making

---



# Peripheral Equipment



### **Press and Tools Products**

#### **Ball Bearing Inserts and Rails**

If you need fast and reliable tool changing, you will find that equipping or updating your press with ball bearing inserts and rails is the ideal solution.

With ball bearing inserts and rails you can move or change tools fast, and above all accurately - even if they weigh several tons. In the past this has often been an awkward, inconvenient and sometimes even critical process.

Equipping and retrofitting press tables with ball bearing rails is extremely straightforward as virtually every press table has fixing slots. The ball bearing rails are simply inserted and fixed in these slots.

Ball bearing inserts can be used for press tables which do not have fixing slots. These are fitted in the locating sockets.

The ball bearings of the inserts and rails will move in any direction and project only slightly above the surface of the press table. The result is that only slight force is required for movement on the table. When the tool is clamped in place it sits on the table and the clamping pressure causes the ball bearings to retract into their sockets.

#### **Roller Inserts and Roller Rails**

Roller inserts and rails will carry twice the load of ball bearing inserts and rails and ensure precise linear movement of the tool. This linear technology requires precise positioning of the tool when it is transferred to the tool bench.

Roller rails are used especially on presses with stationary mounting devices. The special roller bearing technology operates reliably at high temperatures (200 °C).

Unlike ball bearing rails, roller rails can be used in tool base plates, i.e. installed upside down.

### **Conveyor Belts**

Our conveyor belts are designed for use in a wide variety of production applications.

There is a belt width and length to suit almost every application.

The conveyor belts are powered by an electric motor, which is electronically regulated to provide belt speeds from 0.02 to 30 metres per minute.

The motor can be mounted horizontally or vertically, on either side of the belt for either direction of movement. Conveyor belts are available with or without profiles across the belt. Conveyor edge rails are also available in a range of designs.

### **Pneumatic Conveyors**

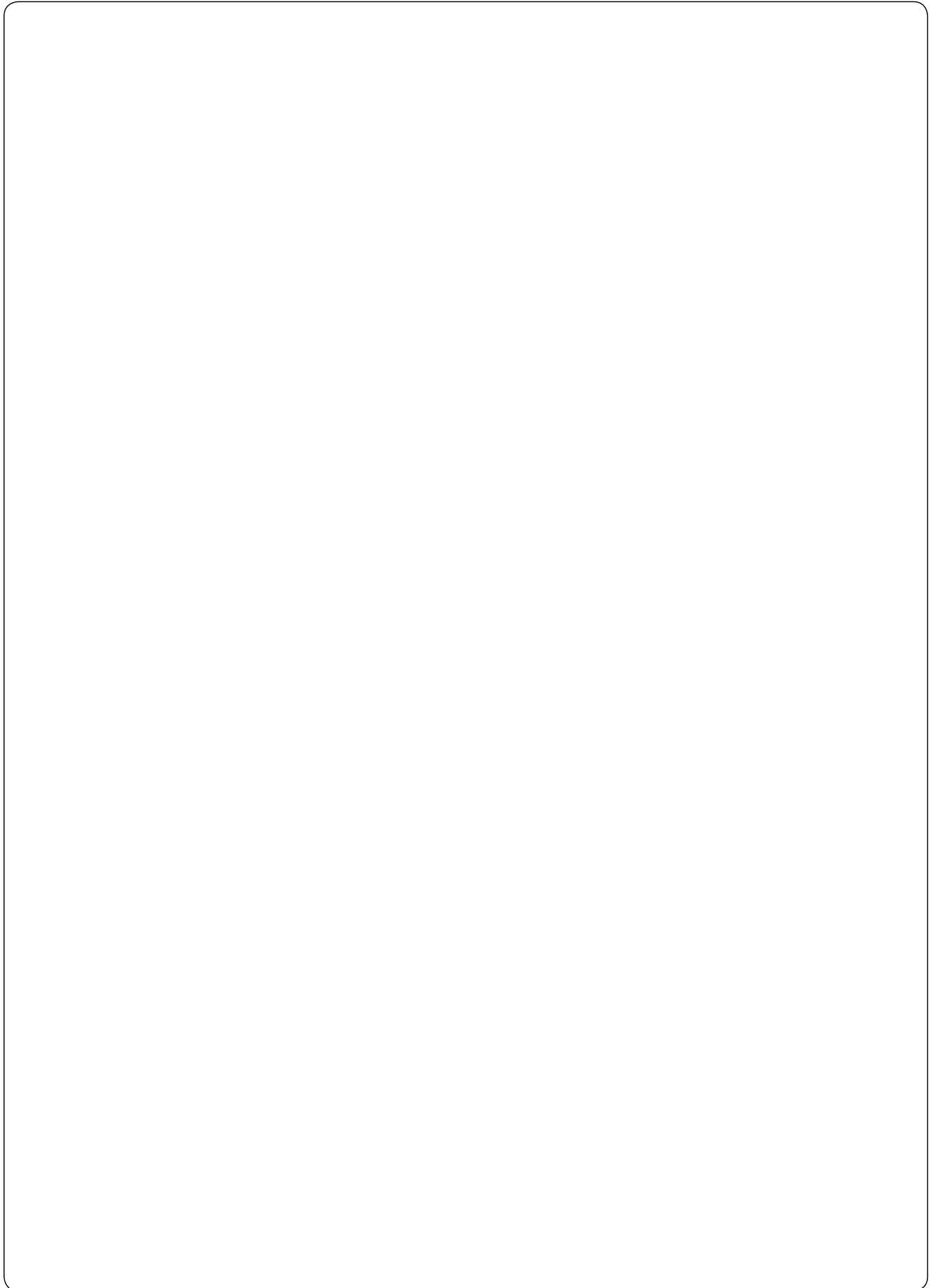
This pneumatic conveyor is unique and is patented. It was designed to provide an effective and affordable solution to the problems of conveying parts and disposing of waste.



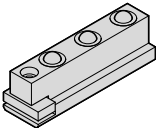


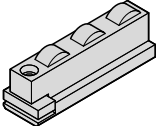
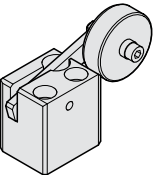
This beltless system conveys stampings and waste from the tool area by vibration alone.

### **Electro-mechanical Transporters**

The FIBRO electro-mechanical transporters have been developed to effectively and inexpensively solve the problems of transporting parts and the removal of stamping and cutting residues from presses.

The principle behind the electro-mechanical transporter is the so-called „table cloth effect“. The slow acceleration during the forward stroke pushes the parts or offcuts forwards. The fast return stroke of the guiding system results in a transport movement in only one direction.

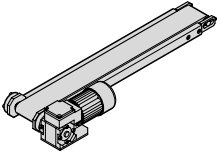


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 <b>2198.42.</b> Ball Bearing Rails	J7
 <b>2198.34.</b> Roller inserts without collar	J8
 <b>2198.35.</b> Roller inserts with collar	J8
 <b>2198.44.</b> Roller rails	J8
 <b>2198.50.55.</b> Spring mounted Rollers to VW Standard	J9
<b>3710.12.01</b> Counter View, mechanical	J10
<b>3710.00.12.01</b> Installation frame for counter view, mechanical	J11

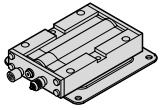
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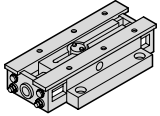
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- 2195.302. Belts
- 2195.401.
- 2195.402.



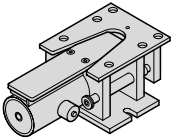
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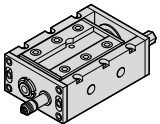
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- 2199.70



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- 2299.530

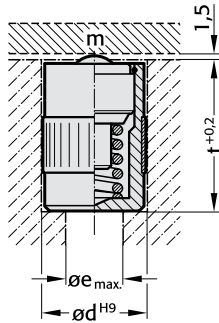
# FIBRO

2198.32./33.  
2198.42.

## Ball Bearing Inserts Ball Bearing Rails

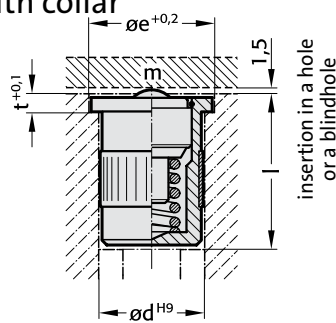
2198.32.

Ball Bearing Inserts without collar



2198.33.

Ball Bearing Inserts with collar



2198.32.

d	Load capacity		Ball Ø	e	t
	m	[daN]			
20	25		10	10	30
24	40		12	14	38
30	63		15	20	44
40	100		20	30	53

Ordering Code (example):

Ball Bearing Insert without collar	=	2198.32.
d = 20 mm	=	020
Order No	=	2198.32.020

2198.33.

d	Load capacity			e	t	l
	m	[daN]	Ball Ø			
20	25		10	25	3,5	31
24	40		12	30	4	39
30	63		15	35	5	45
40	100		20	50	6	54

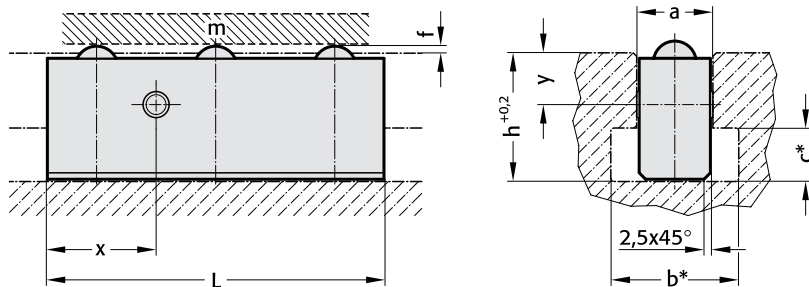
Ordering Code (example):

Ball Bearing Insert with collar	=	2198.33.
d = 24 mm	=	024
Order No	=	2198.33.024

Note:

The supporting ball bearings raise the object to be moved (tool) away from the table surface and replace the surface friction with rolling friction. This significantly reduces the force required to move the tool.

2198.42. Ball Bearing Rails



\* T-shaped grooves are not absolutely necessary.



2198.42.

a	Load capacity		Balls	Number	Ø	f	b*	c*	h	x	y	a	Load capacity		Balls	Number	Ø	f	b*	c*	h	x	y
	m	[daN]											L	m									
18	75	105	3	10	1,5	30	12	30	35	14,5		28	190	135	3	15	1,5	46	20	48	45	19	
	100	140	4										250	180	4								
	125	175	5										320	225	5								
	150	210	6										380	270	6								
	200	280	8										500	360	8								
	250	350	10										630	450	10								

a	Load capacity		Balls	Number	Ø	f	b*	c*	h	x	y	a	Load capacity		Balls	Number	Ø	f	b*	c*	h	x	y
	m	[daN]											L	m									
22	120	120	3	12	1,5	37	16	38	40	14,5		36	300	150	3	20	1,5	56	25	61	50	24,5	
	160	160	4										400	200	4								
	200	200	5										500	250	5								
	240	240	6										600	300	6								
	320	320	8										800	400	8								
	400	400	10										1000	500	10								

Note:

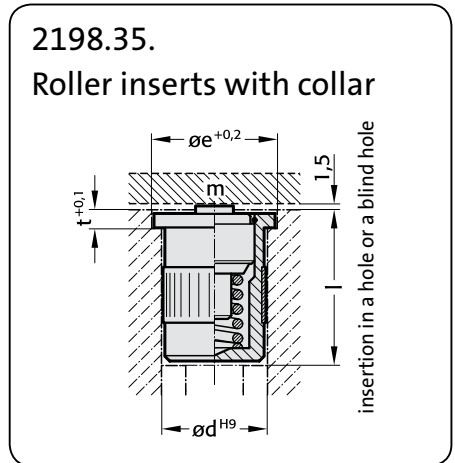
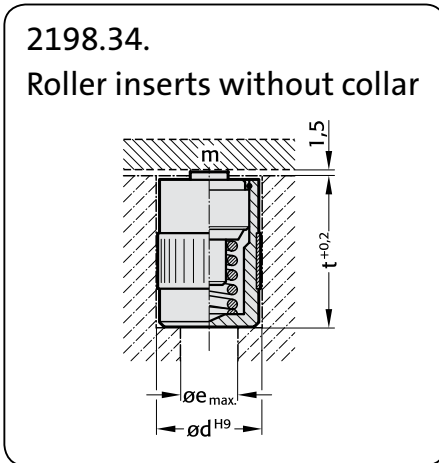
The ball bearing rails are pushed into the DIN 650 T-shaped grooves in the press table and are fixed in place by the clamping piece. The size and number of the ball bearing rails is determined by the size of the T-shaped groove and the load-bearing capacity required. Once the tool is clamped in place, it lies on the press table and the clamping pressure presses the ball bearings into the holes.

Ordering Code (example):

Ball Bearing Rail	=	2198.42.
for DIN 650 T-shaped groove	=	18.
L = 105 mm	=	105
Order No	=	2198.42.18.105

**Roller inserts  
Roller rails**

**2198.34./35.  
2198.44.**



**Note:**  
Roller inserts provide double the capacity of ball bearing inserts.  
Torsion protection is provided by the customer.

**2198.34.**

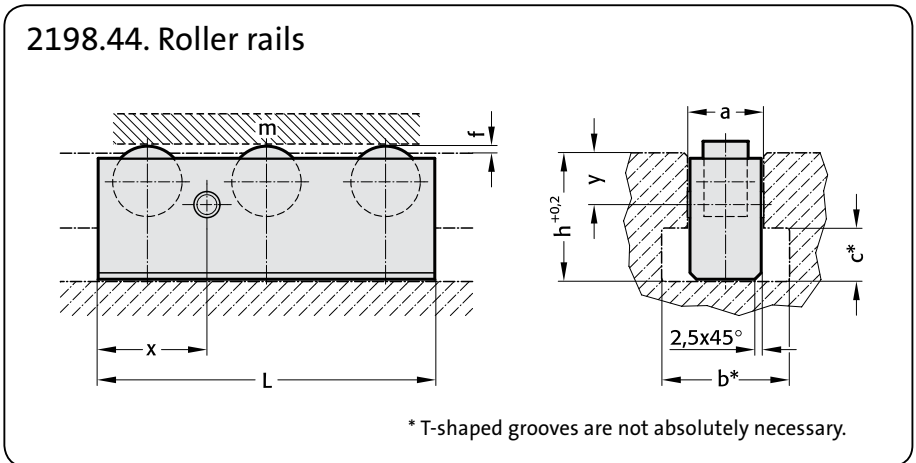
d	Load capacity		Roller Ø	e	t
	m [daN]				
20	50		10	10	30
24	80		13	14	38
30	125		16	20	44
40	200		19	30	53

**Ordering Code (example):**  
Roller inserts without collar = 2198.34.  
d = 20 mm = 020  
Order No = 2198.34.020

**2198.35.**

d	Load capacity		Roller Ø	e	t	l
	m [daN]					
20	50		10	25	3,5	31
24	80		13	30	4	39
30	125		16	35	5	45
40	200		19	50	6	54

**Ordering Code (example):**  
Roller inserts with collar = 2198.35.  
d = 24 mm = 024  
Order No = 2198.35.024



**Note:**  
Roller rails provide double the capacity of ball bearing rails. They ensure precise linear movement of the tool.  
Unlike ball bearing rails, roller rails can be used in tool base plates, i.e. installed upside down.

**Ordering Code (example):**  
Roller rails = 2198.44.  
for T-Nut 18 mm DIN 650 = 18.  
L = 105 mm = 105  
Order No = 2198.44.18.105

**2198.44.**

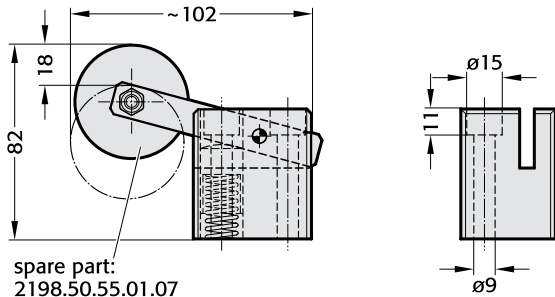
a	Load capacity		Rollers-		a	Load capacity		Rollers	
	m [daN]	L	Number	Ø		m [daN]	L	Number	Ø
18	150	105	3	10	28	380	135	3	16
	200	140	4	1,5		500	180	4	1,5
	250	175	5	30		630	225	5	46
	300	210	6	12		750	270	6	20
	400	280	8	35		1000	360	8	48
	500	350	10	14,5		1250	450	10	45

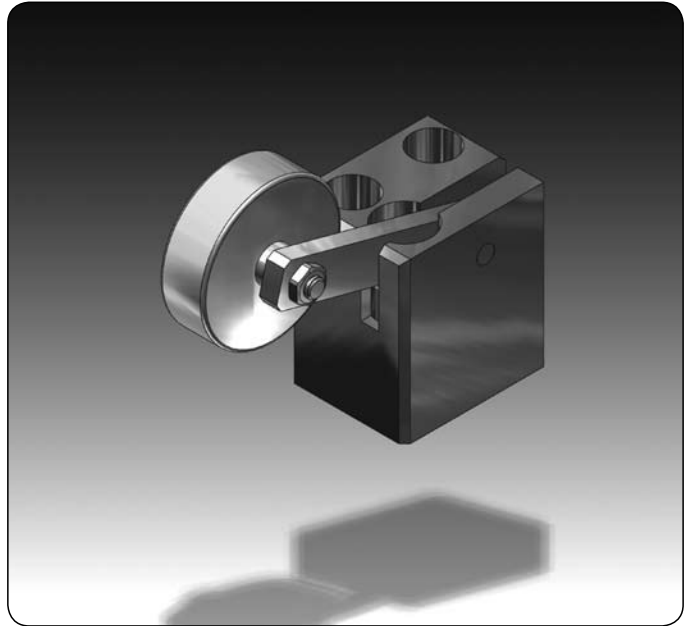
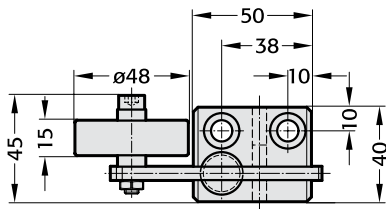
a	Load capacity		Rollers		a	Load capacity		Rollers	
	m [daN]	L	Number	Ø		m [daN]	L	Number	Ø
22	240	120	3	13	36	600	150	3	19
	320	160	4	1,5		800	200	4	1,5
	400	200	5	37		1000	250	5	56
	480	240	6	16		1200	300	6	25
	640	320	8	38		1600	400	8	61
	800	400	10	40		2000	500	10	50

2198.50.55.01 Execution 1

Material: Steel

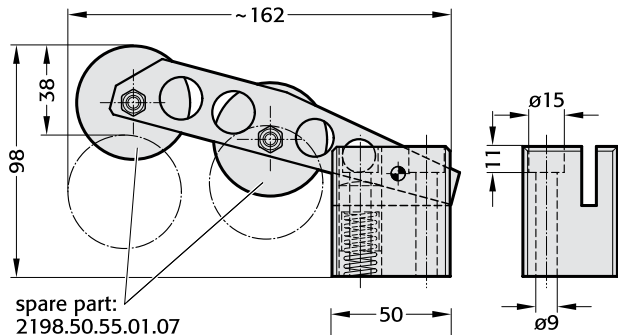


spare part:  
2198.50.55.01.07

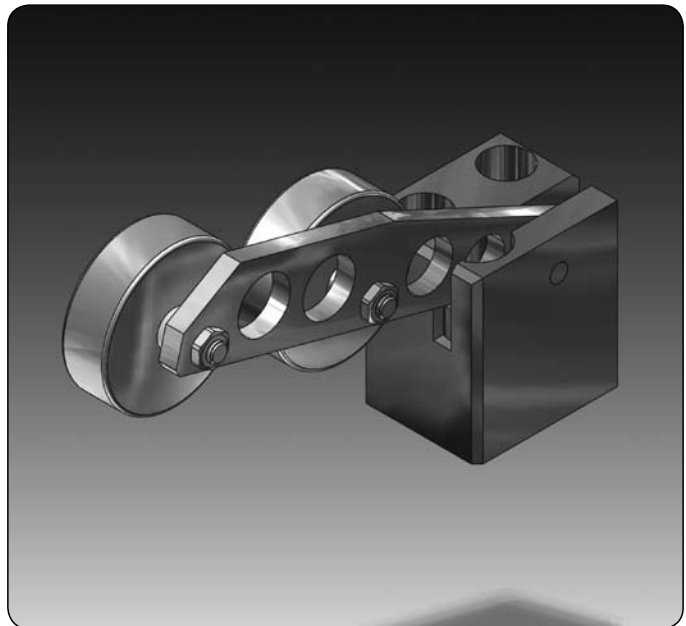
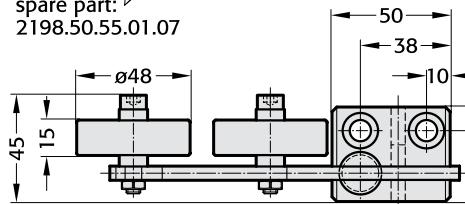


2198.50.55.02 Execution 2

Material: Steel

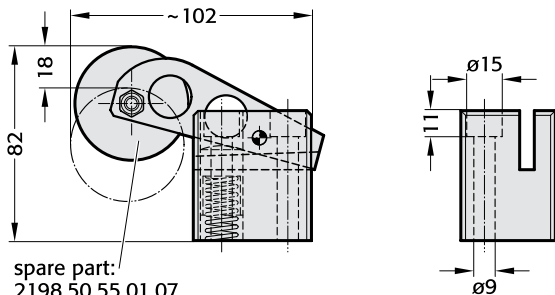


spare part:  
2198.50.55.01.07

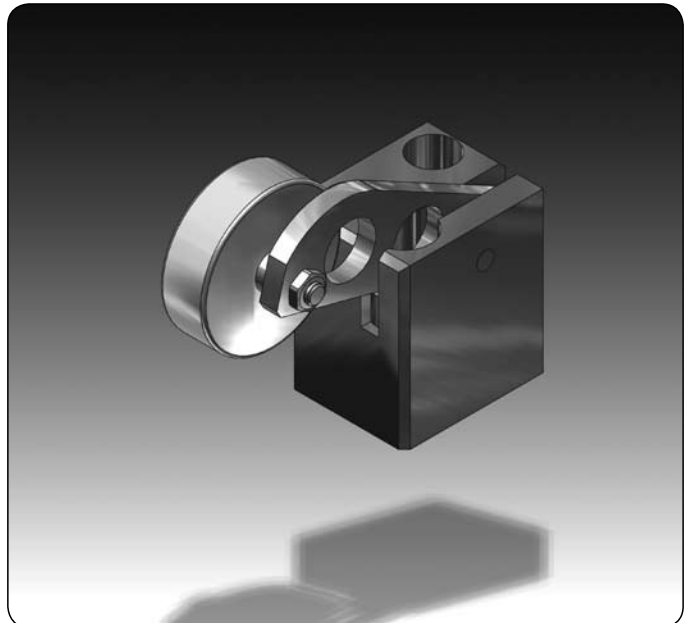
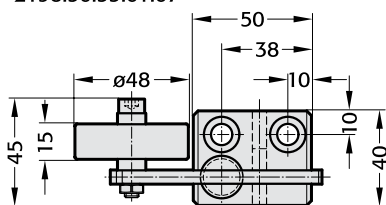


2198.50.55.03 Execution 3

Material: Steel



spare part:  
2198.50.55.01.07

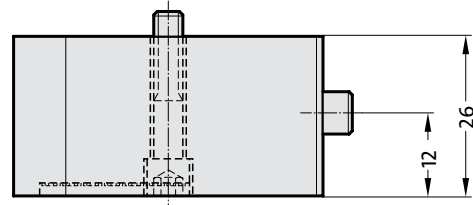
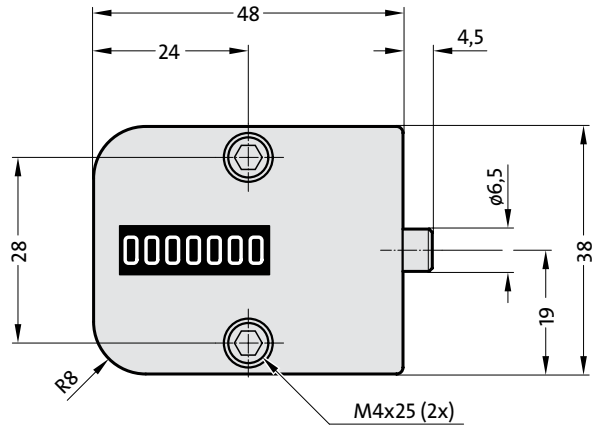


Counter View, mechanical

3710.12.01



3710.12.01



Description:

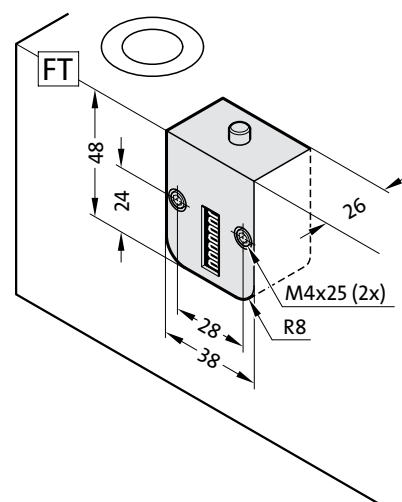
- monitors the productivity of a moulding tool

Note:

- max. operational temperature 120° C
- seven digit display, non-resettable, allows recording up to 10 million cycles
- splash resistant, corrosion resistant
- incl. mounting screws M4x25

Patent

Mounting example



Installation into mould parting surface

with 2 cylinder screws M4 x 25 DIN EN ISO 4762

- An installation in the mould parting surface provides a good reading of the counted values.

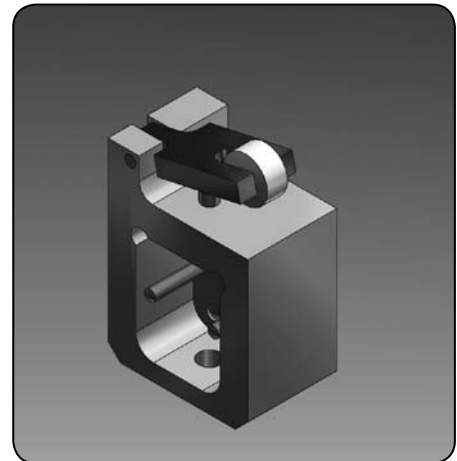
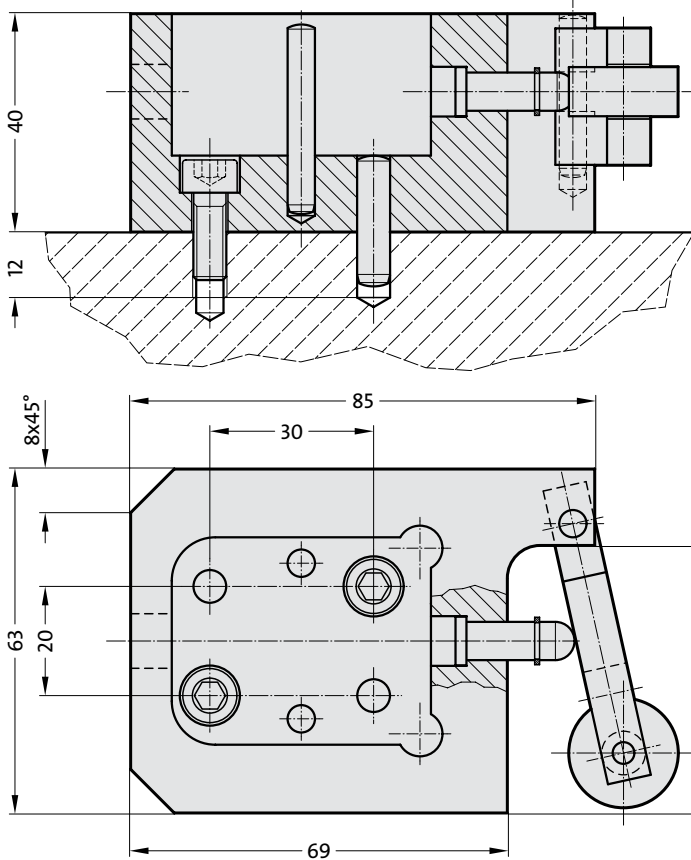


**FIBRO**

3710.00.12.01

# Installation Frame for Counter View, mechanical

3710.00.12.01



**Note:**

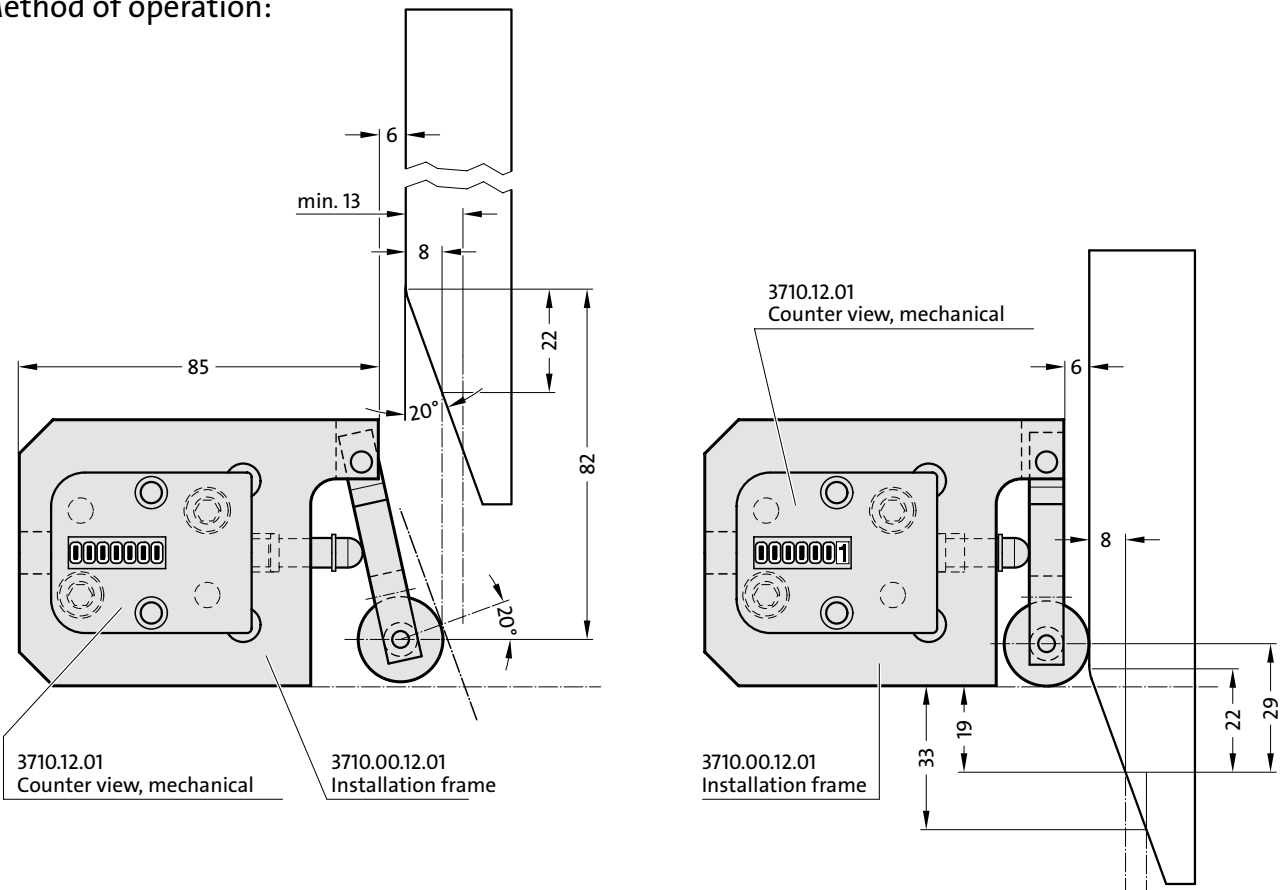
Fasten the installation frame on the tool, then insert the counter view.

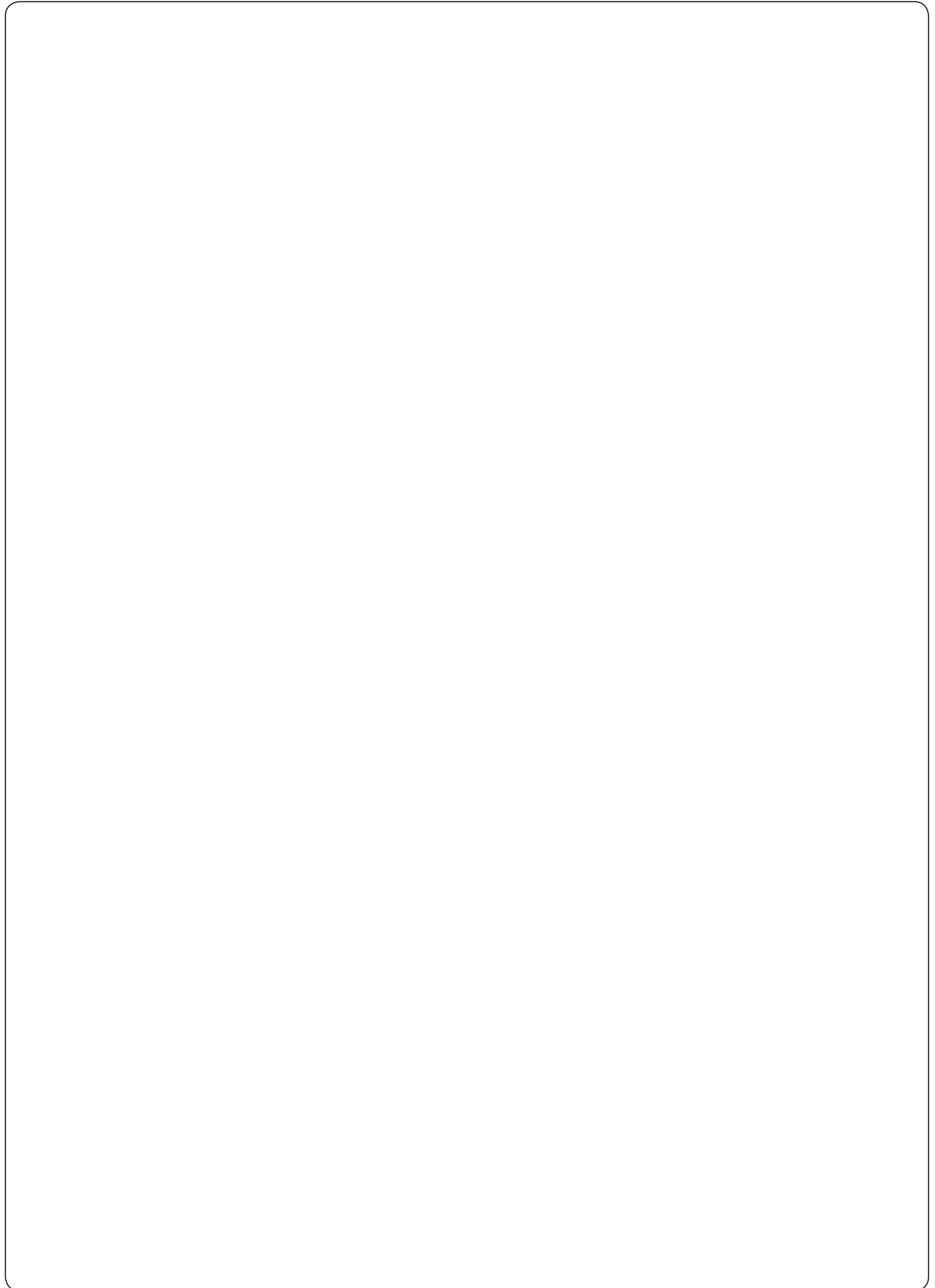
Delivery includes:  
2 socket head cap screws M6x16 to DIN EN ISO 4762 and  
2 precision parallel pins 2351.0600.024

**Attention:**

After installing the counter view into the installation frame, disassembly is no longer possible (manipulation proof).

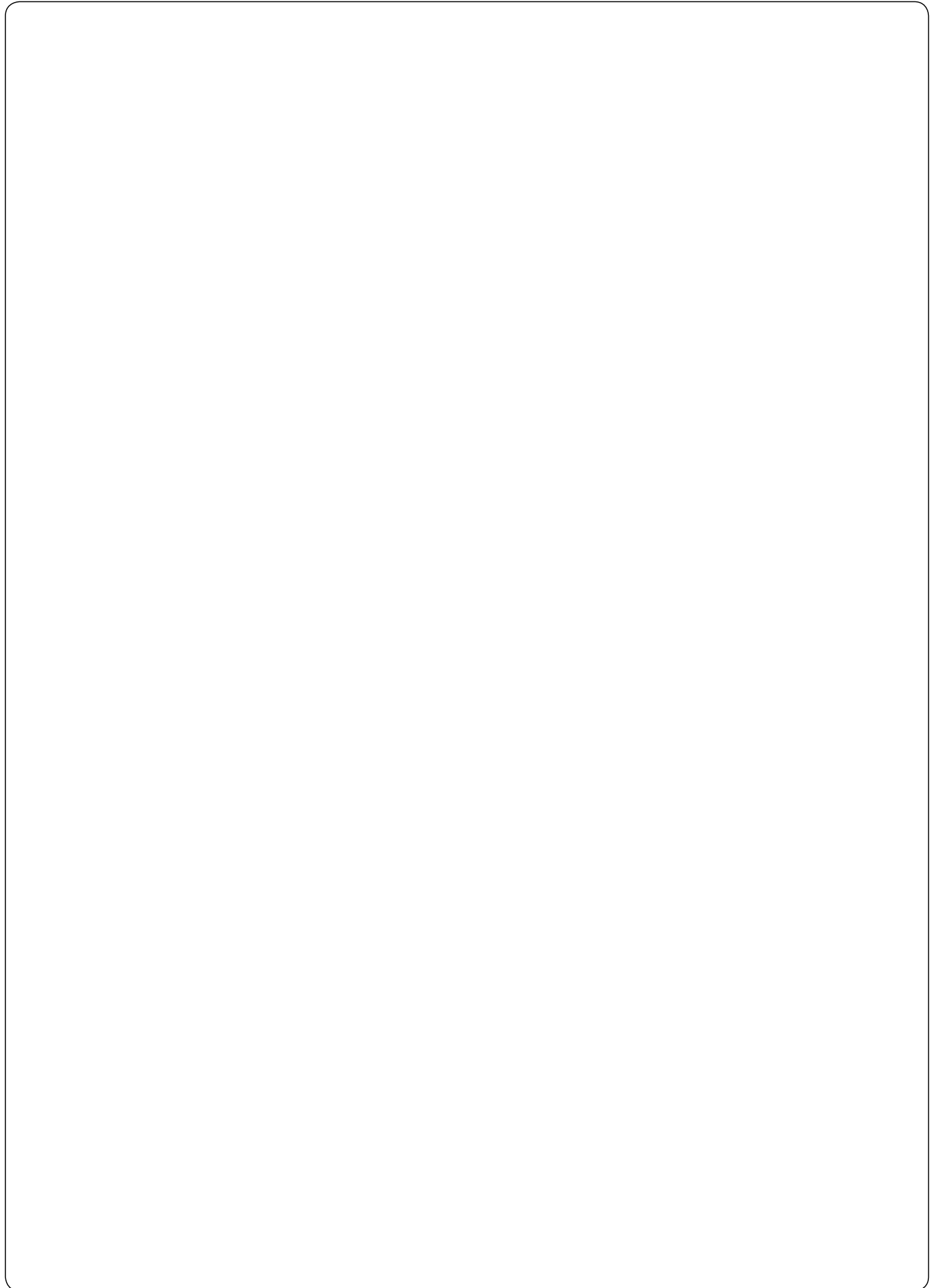
**Method of operation:**







# Electrically controlled Conveyor Belts



**Conveyor Belts**



**Belt speed:**

The standard speed is 5,5 m/min.  
Speeds of 2,7–7,5–11–20 m/min are available on request.

- 5,5 m/min.
- 2,7 m/min.
- 7,5 m/min.
- 11 m/min.
- 20 m/min.

An electrical controller enables the belt speed to be set to between

- 0,02 – 10 m/min. (Types 302 and 402 only)
- 10 – 20 m/min.
- 20 – 30 m/min.
- 0,02 – 30 m/min. (Types 302 and 402 only)

with limited control precision.

**Motors: (supply voltage)**

- Single-phase-motor 230 V–50 HZ
- Three-phase-motor 230 V–50 HZ (star delta control)
- Three-phase-motor 400 V–50 HZ

**Motor position with gearbox:**

- Motor axis horizontal relative to direction of belt travel, right
- Motor axis horizontal relative to direction of belt travel, left
- Motor axis vertical relative to direction of belt travel, right, above
- Motor axis vertical relative to direction of belt travel, right, below
- Motor axis vertical relative to direction of belt travel, left, above
- Motor axis vertical relative to direction of belt travel, left, below

**Controller:**

- Excluding electrical installation
- With manual ON/OFF switch and motor circuit-breaker
- With manual ON/OFF switch and motor circuit-breaker, additional emergency stop switch and 3 m cable with IEC 309 plug connector.
- Fittings as for 2 + Motor frequency controller to regulate the belt speed, 230 V AC, single phased, with IEC 309 plug connector.
- Fittings as for 2 + Motor frequency controller to regulate the belt speed, 400 V AC, three phased, with IEC 309 plug connector.

Code	<input type="text" value="1"/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="2"/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="3"/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="4"/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="5"/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="6"/>	<input type="text" value="3"/>	<input type="text" value="6"/>	<input type="text" value="4"/>
Code	<input type="text" value="7"/>	<input type="text" value="3"/>	<input type="text" value="7"/>	<input type="text" value="4"/>
Code	<input type="text" value="8"/>	<input type="text" value="3"/>	<input type="text" value="8"/>	<input type="text" value="4"/>
Code	<input type="text" value="9"/>	<input type="text" value="3"/>	<input type="text" value="9"/>	<input type="text" value="4"/>
	230 V AC		400 V AC	
	1-ph.		3-ph.	

Code	<input type="text" value="1"/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="2"/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="3"/>	<input type="text" value=""/>	<input type="text" value=""/>

Code	<input type="text" value="1"/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="2"/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="3"/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="4"/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="5"/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="6"/>	<input type="text" value=""/>	<input type="text" value=""/>

Code	<input type="text" value="0"/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="1"/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="2"/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="3"/>	<input type="text" value=""/>	<input type="text" value=""/>
Code	<input type="text" value="4"/>	<input type="text" value=""/>	<input type="text" value=""/>

**Description:**

The conveyor belts are used to move parts and waste out of the press. They are suitable for any other application involving the movement of parts or waste.

The belt consists of a woven glass fibre fabric with a polyurethane coating.

The drives are designed for both continuous and intermittent operation.

**Accessories:**

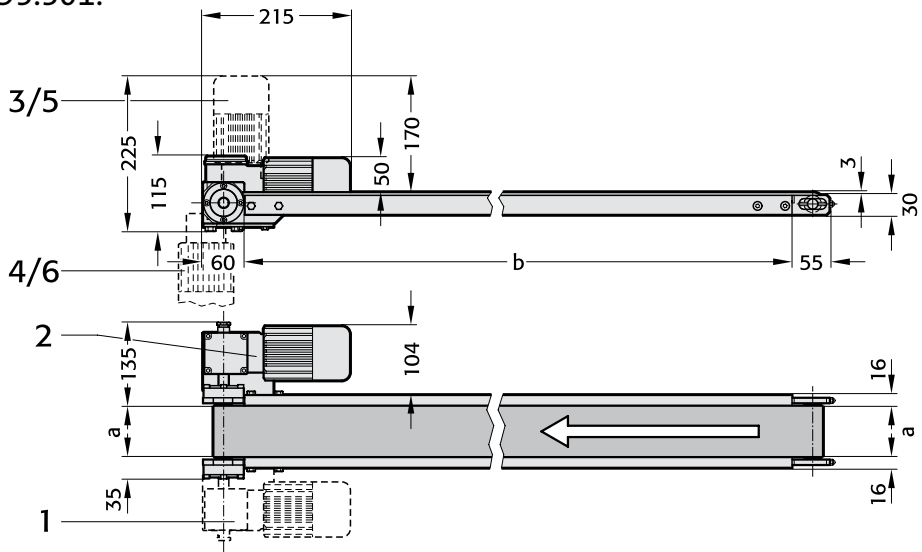
only in conjunction with a conveyor belt order.

Delimiting Guides	Page J 20
Loss prevention	Page J 21
Stands	Page J 22

Conveyor Belts

2195.301.

2195.301.



2195.301.

a	b	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000
030		●	●	●	●	●	●	●	●	●						
050		●	●	●	●	●	●	●	●	●						
075		●	●	●	●	●	●	●	●	●						
100		●	●	●	●	●	●	●	●	●						
125		●	●	●	●	●	●	●	●	●						
150		●	●	●	●	●	●	●	●	●						
175		●	●	●	●	●	●	●	●	●						
200		●	●	●	●	●	●	●	●	●						
225		●	●	●	●	●	●	●	●	●						
250		●	●	●	●	●	●	●	●	●						
275		●	●	●	●	●	●	●	●	●						
300		●	●	●	●	●	●	●	●	●						

**Belt load:**

Belt width a	kg per meter conveyed
30- 50- 75	4
100-125-150	7
175-200-225	10
250-275-300	15

For details of ordering instructions see page J 15.

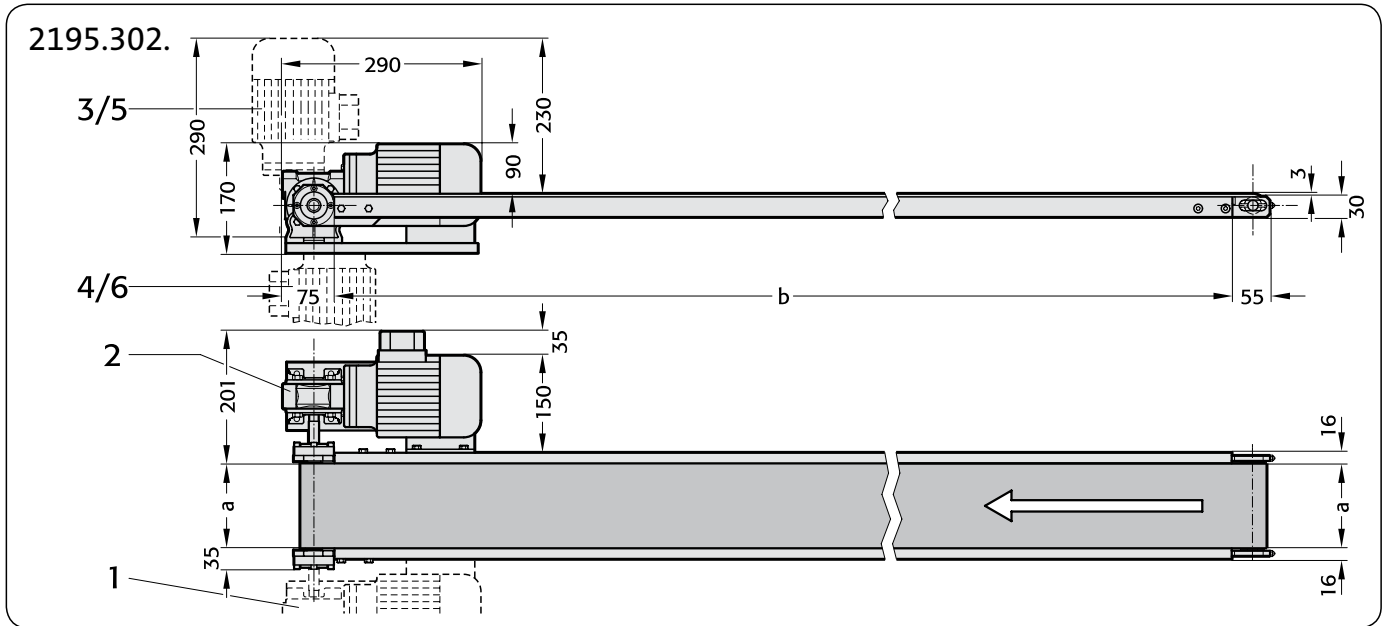
**Ordering Code (example):**

Conveyor Belt	= 2195.
Type 301	= 301.
Belt width a = 100 mm	= 100.
Nominal belt length b = 1750 mm	= 1750.
Belt speed	= 1
Motor voltage 400 V	= 3
Motor position	= 1
Motor controller	= 1
Order No	= 2195.301.100.1750.1311

# FIBRO

2195.302.

## Conveyor Belts



2195.302.

a	b	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000
030											●	●	●	●	●	●
050											●	●	●	●	●	●
075									●	●	●	●	●	●	●	●
100								●	●	●	●	●	●	●	●	●
125							●	●	●	●	●	●	●	●	●	●
150							●	●	●	●	●	●	●	●	●	●
175						●	●	●	●	●	●	●	●	●	●	●
200						●	●	●	●	●	●	●	●	●	●	●
225					●	●	●	●	●	●	●	●	●	●	●	●
250					●	●	●	●	●	●	●	●	●	●	●	●
275				●	●	●	●	●	●	●	●	●	●	●	●	●
300				●	●	●	●	●	●	●	●	●	●	●	●	●

### Belt load:

Belt width a	kg per meter conveyed
30– 50– 75	4
100–125–150	7
175–200–225	10
250–275–300	15

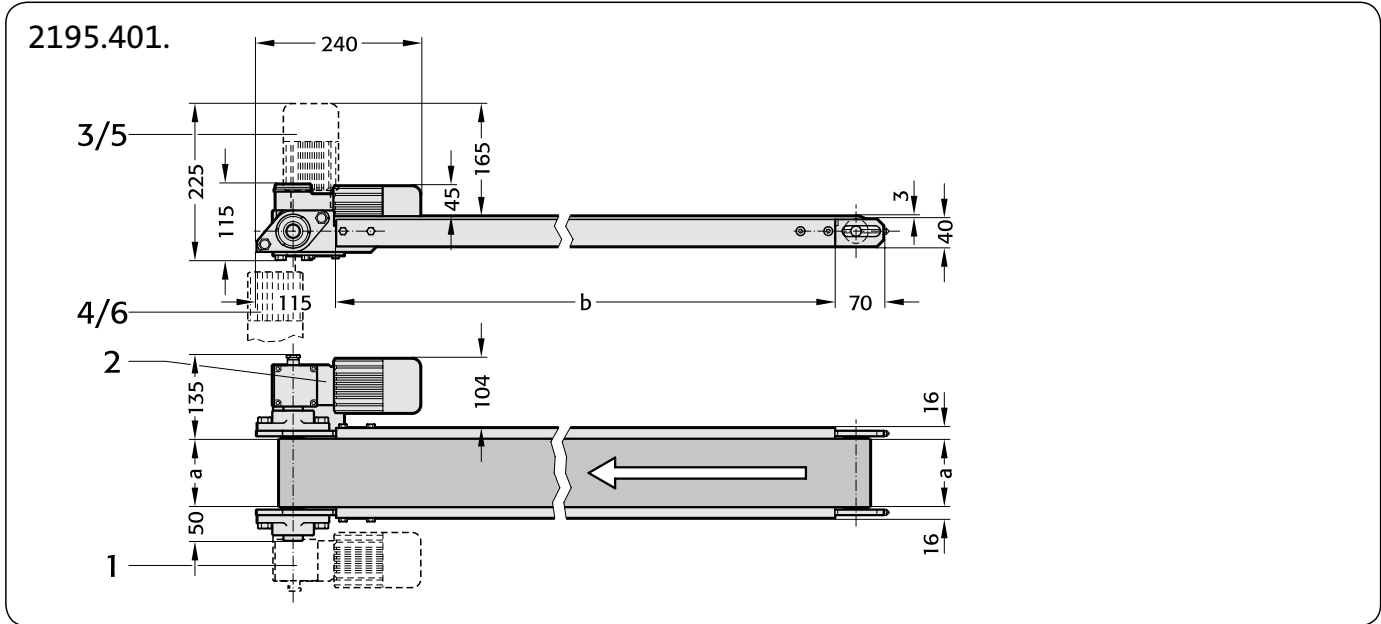
For details of ordering instructions see page 15.

### Ordering Code (example):

Conveyor Belt	= 2195.
Type 302	= 302.
Belt width a = 100 mm	= 100.
Nominal belt length b = 25000 mm	= 2500.
Belt speed	= 1
Motor 400 V	= 3
Motor position	= 1
Motor controller	= 1
Order No	= 2195.302.100.1750.1311

Conveyor Belts

2195.401.



2195.401.

a	b	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000
030		●	●	●	●	●	●	●	●	●						
050		●	●	●	●	●	●	●	●	●						
075		●	●	●	●	●	●	●	●	●						
100		●	●	●	●	●	●	●	●	●						
125		●	●	●	●	●	●	●	●	●						
150		●	●	●	●	●	●	●	●	●						
175		●	●	●	●	●	●	●	●	●						
200		●	●	●	●	●	●	●	●	●						
225		●	●	●	●	●	●	●	●	●						
250		●	●	●	●	●	●	●	●	●						
275		●	●	●	●	●	●	●	●	●						
300		●	●	●	●	●	●	●	●	●						

Belt load:

Belt width a	kg per meter conveyed
30- 50- 75	5
100-125-150	10
175-200-225	14
250-275-300	17

For details of ordering instructions see page J 15.

Ordering Code (example):

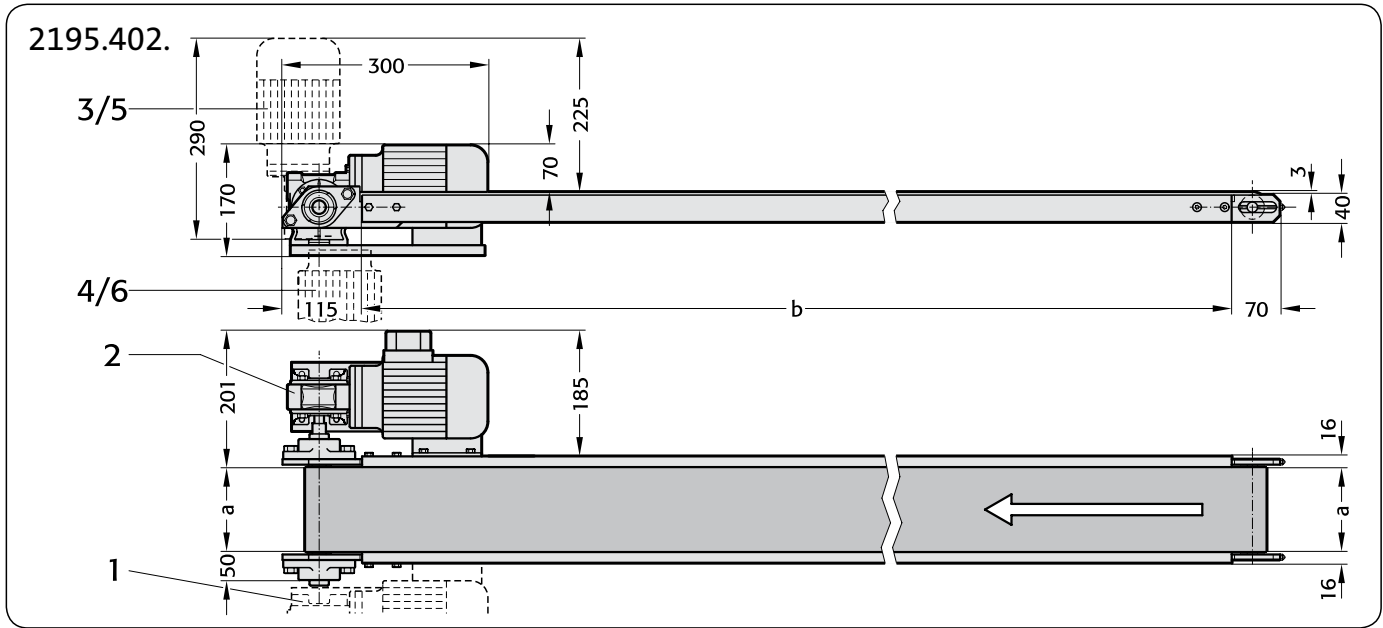
Conveyor Belt	=	2195.
Type 401	=	401.
Belt width a = 100 mm	=	100.
Nominal belt length b = 1750 mm	=	1750.
Belt speed	=	1
Motor voltage 400 V	=	3
Motor position	=	1
Motor controller	=	1
Order No	=	2195.401.100.1750.1311



# FIBRO

2195.402.

## Conveyor Belts



2195.402.

a	b	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000
030											●	●	●	●	●	●
050											●	●	●	●	●	●
075									●	●	●	●	●	●	●	●
100								●	●	●	●	●	●	●	●	●
125								●	●	●	●	●	●	●	●	●
150								●	●	●	●	●	●	●	●	●
175							●	●	●	●	●	●	●	●	●	●
200							●	●	●	●	●	●	●	●	●	●
225						●	●	●	●	●	●	●	●	●	●	●
250					●	●	●	●	●	●	●	●	●	●	●	●
275				●	●	●	●	●	●	●	●	●	●	●	●	●
300				●	●	●	●	●	●	●	●	●	●	●	●	●
350	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
400	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
450	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
500	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

### Belt load:

Belt width a	kg per meter conveyed
30- 50- 75	5
100-125-150	10
175-200-225	14
250-275-300	17
350-400-450	20
500	24

For details of ordering instructions see page 15.

### Ordering Code (example):

Conveyor Belt	= 2195.
Type 402	= 402.
Belt width a = 100 mm	= 100.
Nominal belt length b = 2500 mm	= 2500.
Belt speed	= 1
Motor 400 V	= 3
Motor position	= 1
Motor controller	= 1
Order No	= 2195.402.100.2500.1311

**Delimiting Guides  
for Conveyor Belts**

2195.114. 2195.115.  
2195.116. 2195.117.

**2195.114.**

**Description:**

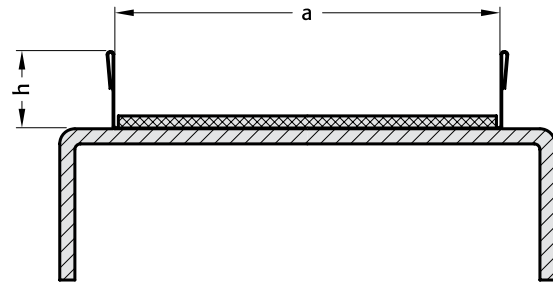
Delimiting guides made of stainless steel  
Standard height  $h = 20$  mm  
 $h_{min} = 15$  mm

**Note:**

Only in conjunction with a conveyor belt order.

**Ordering Code (example):**

Conveyor Belt	=	2195.
Delimiting guide type	=	114.
$h_{min} = 15$ mm	=	015.
Belt width $a = 100$ mm	=	100.
Frame length $b = 1500$ mm	=	1500
Order No	=	2195.114.015.100.1500



**2195.115.**

**Description:**

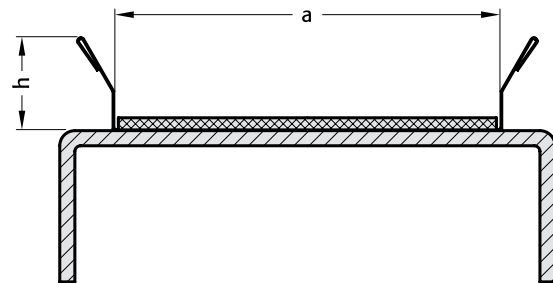
Delimiting guides made of stainless steel  
 $h_{min} = 25$  mm

**Note:**

Only in conjunction with a conveyor belt order.

**Ordering Code (example):**

Conveyor Belt	=	2195.
Delimiting guide type	=	115.
$h_{min} = 25$ mm	=	025.
Belt width $a = 150$ mm	=	150.
Frame length $b = 1500$ mm	=	1500
Order No	=	2195.115.025.150.1500



**2195.116. conveyor edge rails**

**Description:**

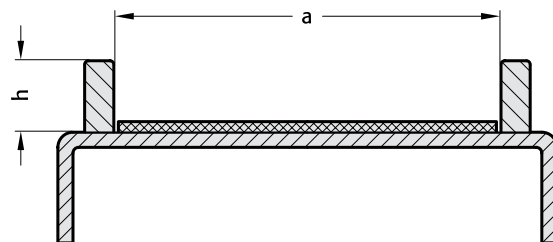
Conveyor edge rails of steel, brazed  
 $h_{min} = 10$  mm

**Note:**

Only in conjunction with a conveyor belt order.

**Ordering Code (example):**

Conveyor Belt	=	2195.
Delimiting guide type	=	116.
$h_{min} = 10$ mm	=	010.
Belt width $a = 100$ mm	=	100.
Frame length $b = 1500$ mm	=	1500
Order No	=	2195.116.010.100.1500



**2195.117.**

**Description:**

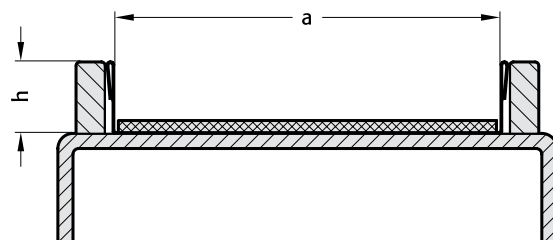
Trough conveyor edge rails of stainless steel, with brazed  
on steel reinforcement walls  $h_{min} = 15$  mm

**Note:**

Only in conjunction with a conveyor belt order.

**Ordering Code (example):**

Conveyor Belt	=	2195.
Delimiting guide type	=	117.
$h_{min} = 15$ mm	=	015.
Belt width $a = 100$ mm	=	100.
Frame length $b = 1500$ mm	=	1500
Order No	=	2195.117.015.100.1500



# FIBRO

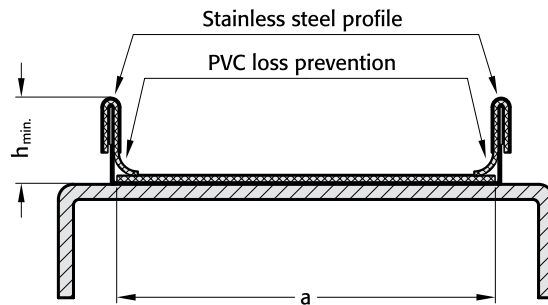
2195.218. 2195.219.  
2195.220. 2195.221.

## Delimiting Guides for Conveyor Belts with loss prevention

### 2195.218.

#### Installation Example:

with profile on conveyor edge rail 2195.114.



#### Ordering Code (example):

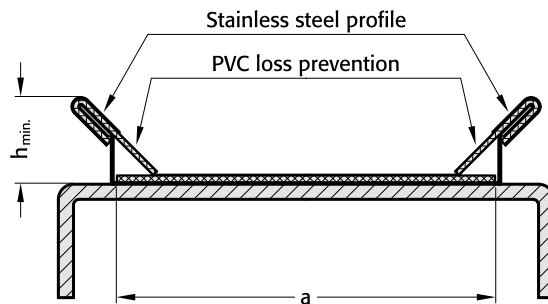
Conveyor Belt	= 2195.
Delimiting guide type 114 with loss prevention type 218	= 218.
$h_{min} = 23 \text{ mm}$	= 023.
Belt width $a = 150 \text{ mm}$	= 150.
Frame length $b = 1500 \text{ mm}$	= 1500
Order No	= 2195.218.023.150.1500

### 2195.219.

#### Installation Example:

with profile on conveyor edge rail 2195.115.

with loss prevention.



#### Ordering Code (example):

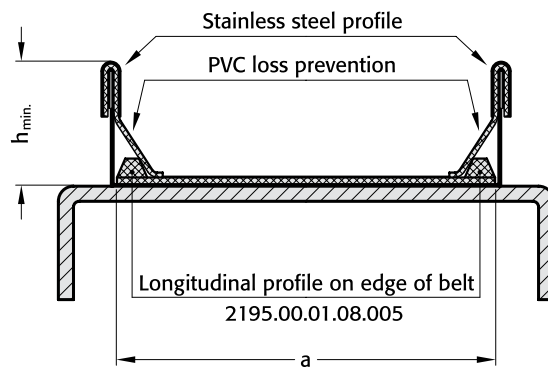
Conveyor Belt	= 2195.
Delimiting guide type 115 with loss prevention type 219	= 219.
$h_{min} = 23 \text{ mm}$	= 023.
Belt width $a = 150 \text{ mm}$	= 150.
Frame length $b = 1500 \text{ mm}$	= 1500
Order No	= 2195.219.023.150.1500

### 2195.220.

#### Installation Example:

with profile on conveyor edge rail 2195.114.

and longitudinal profile on edge of belt, with loss prevention.



#### Ordering Code (example):

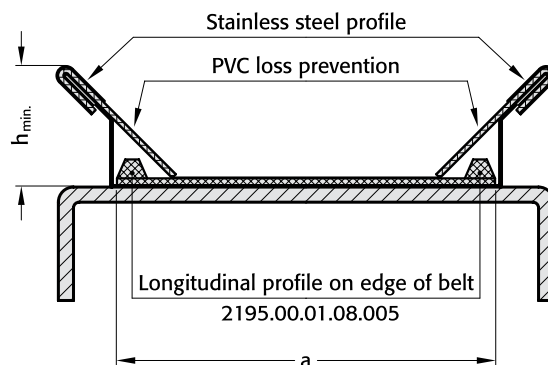
Conveyor Belt	= 2195.
Delimiting guide type 114 with loss prevention and longitudinal profile 2195.00.01.08.005	= 220.
$h_{min} = 33 \text{ mm}$	= 033.
Belt width $a = 150 \text{ mm}$	= 150.
Frame length $b = 1500 \text{ mm}$	= 1500
Order No	= 2195.220.033.150.1500

### 2195.221.

#### Installation Example:

with profile on conveyor edge rail 2195.115.

and longitudinal profile on edge of belt, with loss prevention.



#### Ordering Code (example):

Conveyor Belt	= 2195.
Delimiting guide type 115 with loss prevention and longitudinal profile 2195.00.01.08.005	= 221.
$h_{min} = 33 \text{ mm}$	= 033.
Belt width $a = 150 \text{ mm}$	= 150.
Frame length $b = 1500 \text{ mm}$	= 1500
Order No	= 2195.221.033.150.1500

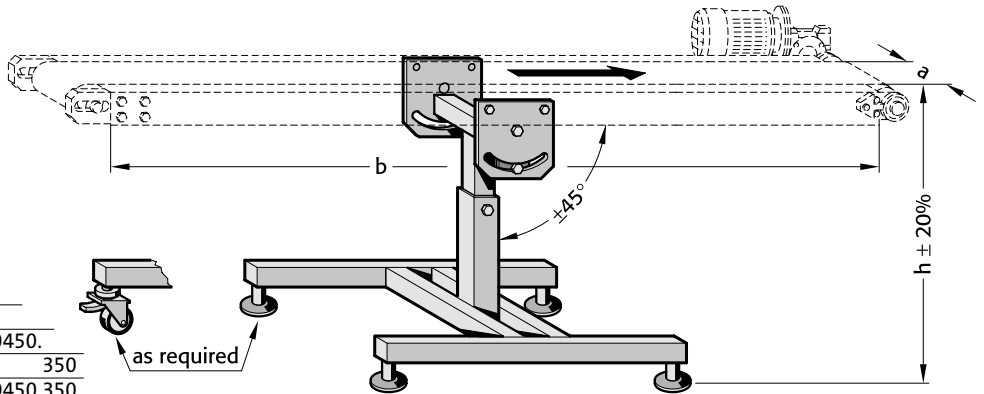
**Stands for Conveyor Belts**

2195.120./121. 2195.130./131.  
2195.140./141. 2195.150./151.

**2195.120./2195.121.**

**Description:**

Stand, tilting with adjustable feet .120.  
Stand, tilting with adjustable castors .121.  
h = height to customer's requirements, min. 450 mm  
±20% h = adjustable height range  
a = max. 350 mm  
b = max. 2000 mm



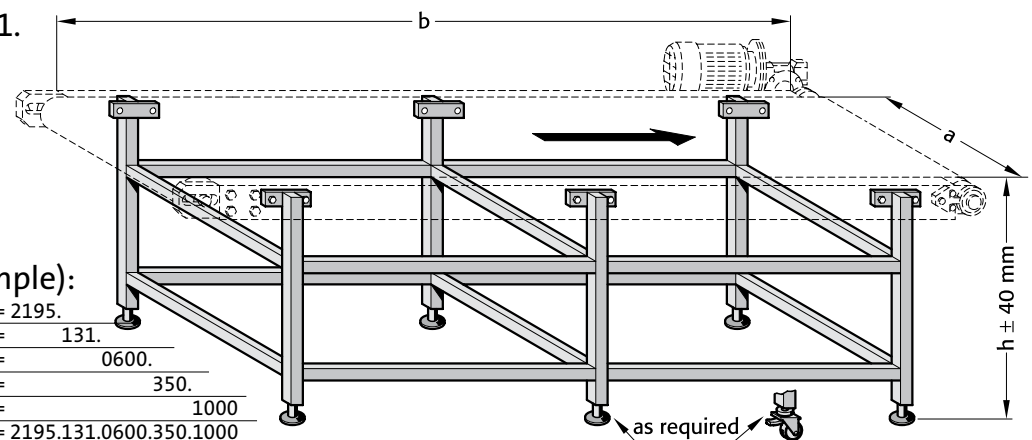
**Ordering Code (example):**

Conveyor Belt	=	2195.
Stand with adjustable feet	=	120.
h = 450 mm	=	0450.
Belt Width a = 350 mm	=	350
Order no	=	2195.120.0450.350

**2195.130./2195.131.**

**Description:**

Table format with adjustable feet .130.  
Table format with adjustable castors .131.  
h = height to customer's requirements, min. 450 mm  
For use with beltwidths a  
For use with frame length b



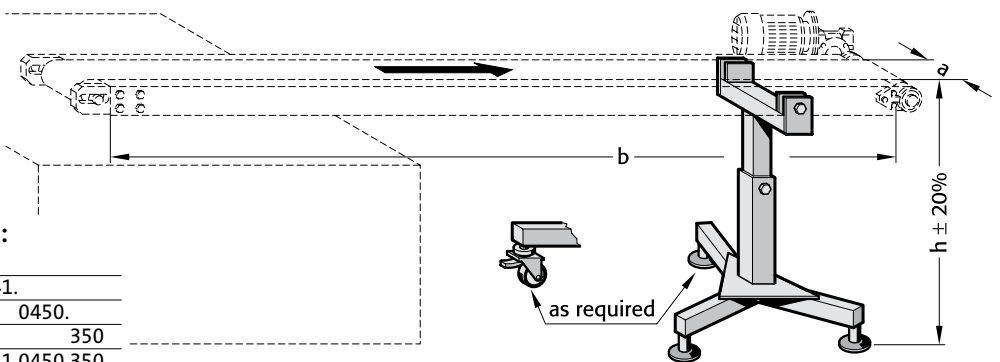
**Ordering Code (example):**

Conveyor Belt	=	2195.
Stand with adjustable castors	=	131.
h = 600 mm	=	0600.
Belt Width a = 350 mm	=	350.
Nominal Belt Length b = 1000 mm	=	1000
Order No	=	2195.131.0600.350.1000

**2195.140./2195.141.**

**Description**

Stand, with adjustable feet .140.  
Stand, with adjustable castors .141.  
h = height to customer's requirements, min. 450 mm  
±20% h = adjustable height range  
a = max. 350 mm



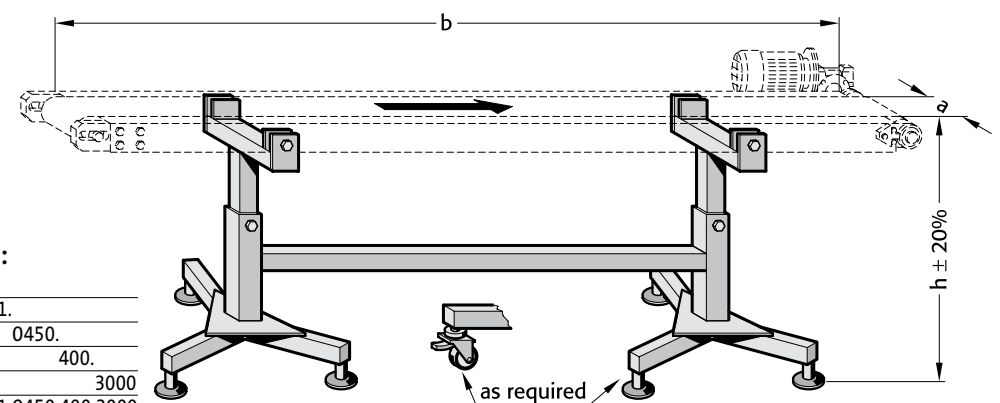
**Ordering Code (example):**

Conveyor Belt	=	2195.
Stand with adjustable castors	=	141.
h = 450 mm	=	0450.
Belt Width a = 350 mm	=	350
Order No	=	2195.141.0450.350

**2195.150./2195.151.**

**Description**

double adjustment with adjustable feet .150.  
double adjustment with adjustable castors .151.  
h = height to customer's requirements, min. 450 mm  
±20% h = adjustable height range  
a<sub>max.</sub> 400 mm  
b<sub>max.</sub> 3000 mm



**Ordering Code (example):**

Conveyor Belt	=	2195.
Stand with adjustable castors	=	151.
h = 450 mm	=	0450.
Belt Width a = 400 mm	=	400.
Nominal Belt Length b = 3000 mm	=	3000
Order No	=	2195.151.0450.400.3000



# Pneumatic Conveyors

## Pneumatic conveyors

### Description

This pneumatic conveyor is unique and is patented. It was designed to provide an effective and affordable solution to the problems of conveying parts and disposing of waste. This beltless system conveys stampings and waste from the tool area by vibration alone.

A specially designed guide channel which is screwed to the body of the conveyor vibrates rhythmically slowly forwards and fast backwards. The mass inertia of the parts is used to move them forwards. In this way the parts in the guide channel progress gently towards the storage containers.

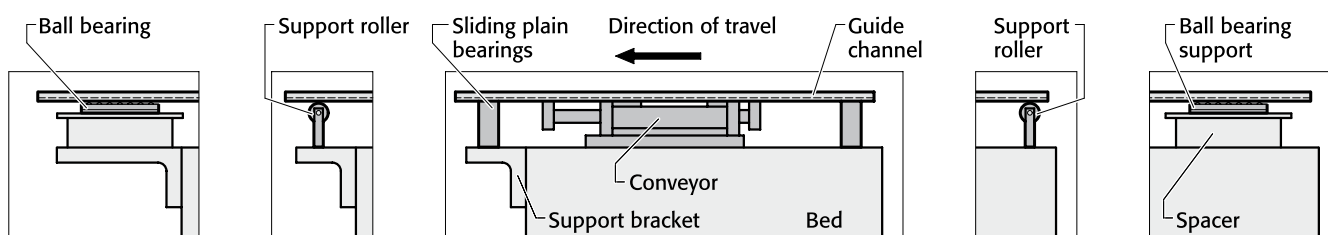
The conveyor is maintenance-free and has a very low air consumption so is extremely economical in operation. The pneumatic conveyor is quiet running and very user friendly.

The conveyor was originally designed for press room use but can be used as a conveyor with any tool. Blockages are a thing of the past whether the conveyor is feeding parts for assembly or removing and disposing of stampings and waste parts.

### Guides

We recommend three options for supporting a long guide channel:

- 1) Ball bearings 2) Roller supports 3) Sliding plain bearings



### Technical data:

Model	load, max. (kg)	air consumption (l/min.)	sound level (db-A)	stroke length (mm)	guide channel weight max. (kg)	despatch weight (kg)
2199.03	3	0,55	68	20	1,4	1,4
2199.10	10	1,25	68	25	2,7	2,8
2199.40	40	5,42	70	27	5,4	7,2
2199.70	70	5,42	70	27	11,3	5,5

1. Recommended rate of vibration: 120 per minute · 2. Speed of travel: 8–10 m / min. · 3. Operating pressure: 4–5.5 bar  
4. Slope of guide channel: max. 8°



#### Note:

Do not exceed 5.5 bar as excess pressure will damage the transporter.

Additional protection for the transporter can be provided by including a service unit in the circuit.

This consists of a filter, pressure control valve and lubricator.

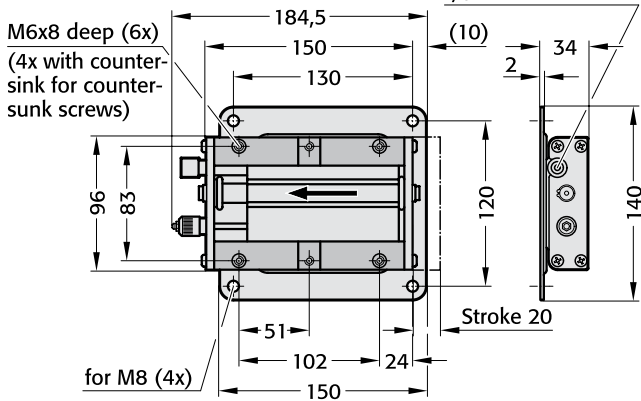
# FIBRO

2199.03/2199.10

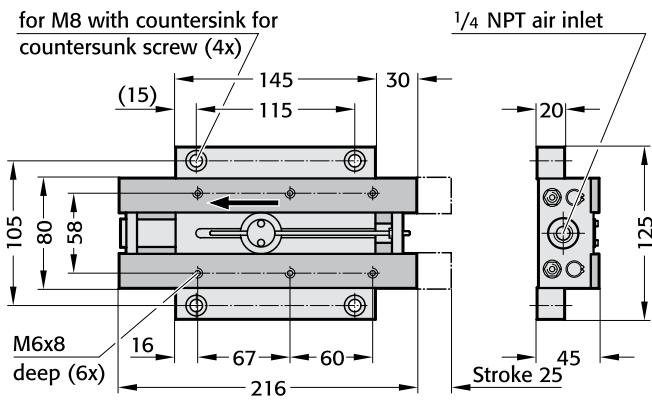
2199.40/2199.70

## Pneumatic conveyors

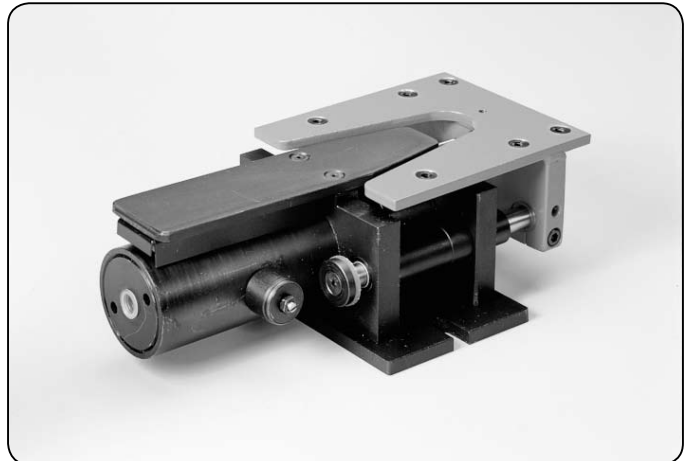
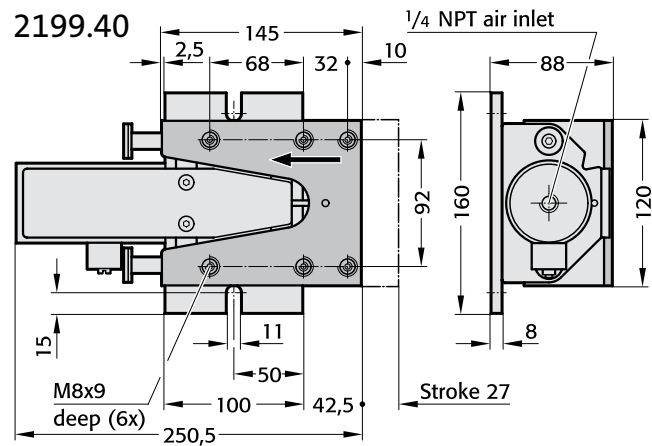
### 2199.03



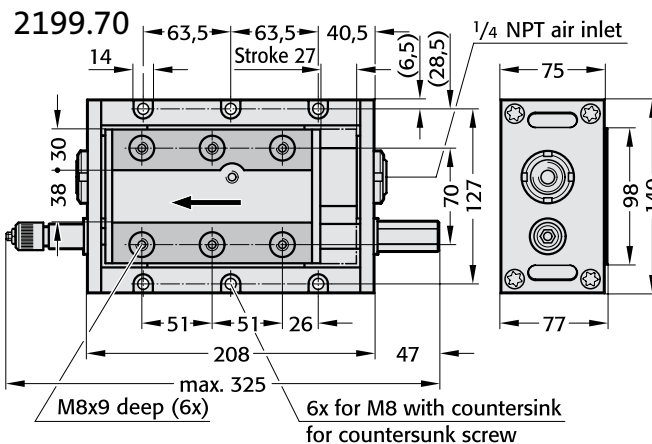
### 2199.10



### 2199.40



### 2199.70

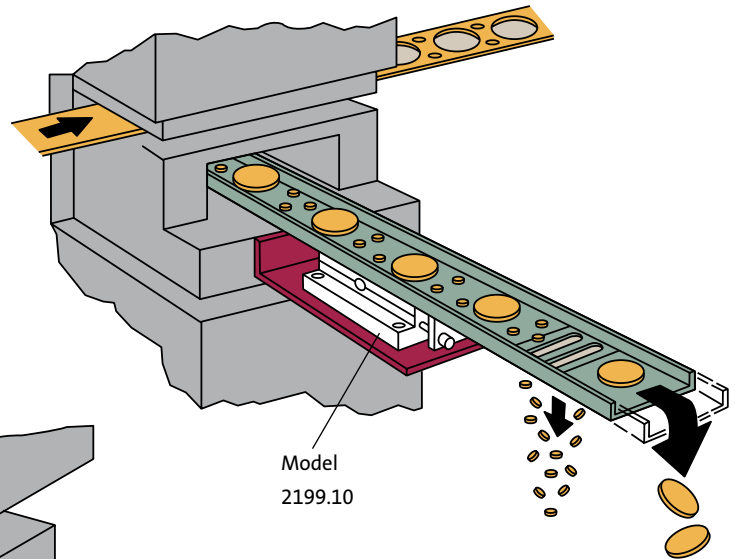


**Pneumatic conveyors**

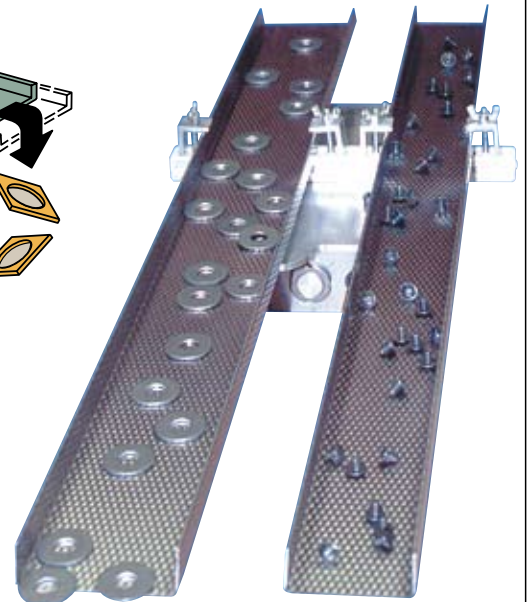
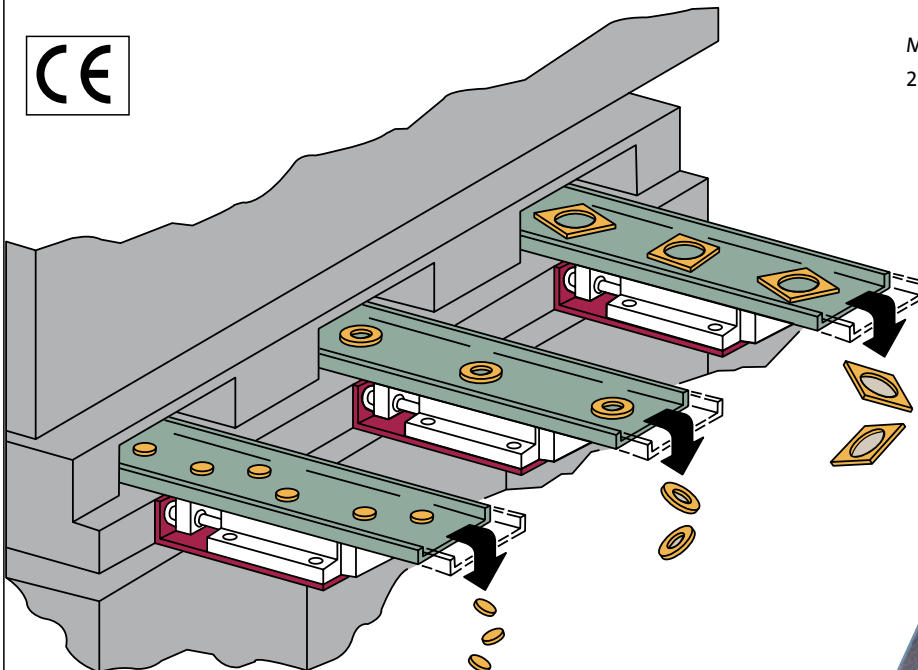
2199.03/.10/.40/.70

**How does the pneumatic conveyor work?**

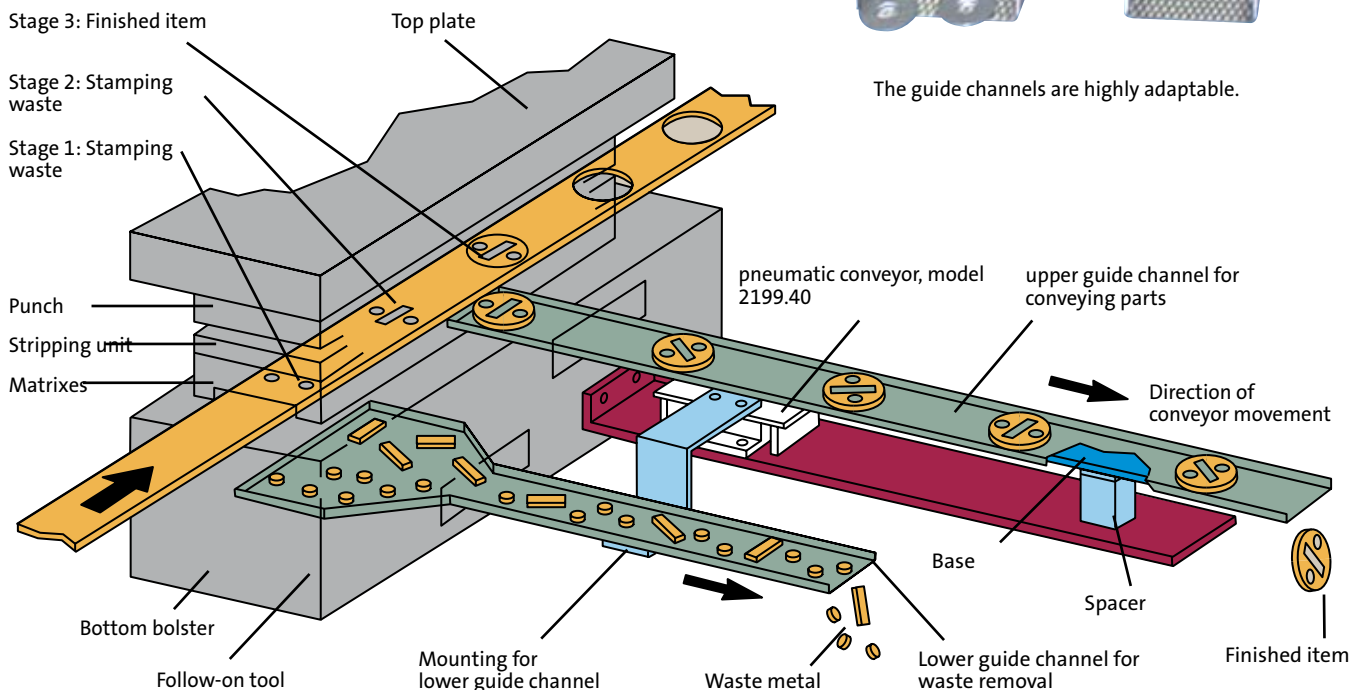
This compact pneumatic conveyor is driven by compressed air. The vibrating rhythmic motion conveys stampings and stamping waste whilst reducing your costs. Guide channels can be matched to any tool opening and used for sorting various types of waste.



Model 2199.10



The guide channels are highly adaptable.







# Electro- mechanical transporters

## Electro-mechanical transporters

### General Information

2299.

The FIBRO electro-mechanical transporters have been developed to effectively and inexpensively solve the problems of transporting parts and the removal of stamping and cutting residues from presses.

The principle behind the electro-mechanical transporter is the so-called "table cloth effect". The slow acceleration during the forward stroke pushes the parts or offcuts forwards. The fast return stroke of the guiding system results in a transport movement in only one direction.

Due to its compact design, the FIBRO electro-mechanical transporter is also suitable for applications where only limited space is available. The simple, sturdy and flexible design provides a safe, reliable, efficient and a cost efficient solution.

### Basic advantages:

- compact design
- low maintenance
- low noise level ( < 70 dB)

### Designs:

- 2299.001 vertical gear position
- 2299.002 horizontal gear position
- 2299.011 vertical gear position, with profile and support
- 2299.012 horizontal gear position with profile and support
- 2299.121 vertical gear position, with two slides, profile and support
- 2299.122 horizontal gear position with two slides, profile and support
- 2299.221 vertical centre gear position, two slides, with profile and support
- 2299.222 horizontal centre gear position, two slides, with profile and support

### Technical data:

Drive: Alternating current (3 phases)  
1375 min<sup>-1</sup>  
0.09 kW rated capacity  
0.51 A nominal current at 400 V  
Weight 4.4 kg  
Protection class IP55  
(DIN EN 60529)

Delivery stroke:  
20 mm

Conveying speed:  
approx. 4.5m/min

Stroke frequency:  
4 strokes/second  
max. guiding system weight (incl. profile):  
35 kg  
max. bulk weight (guiding system weight, profile, transport items):  
100 kg

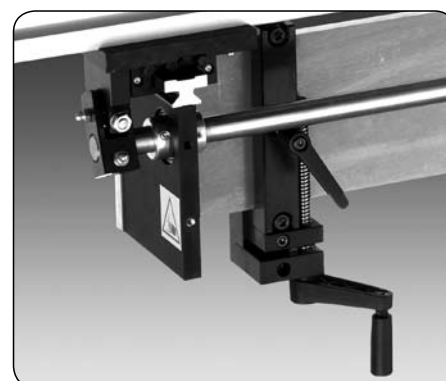
Temperature range  
(permissible ambient temperature):  
-20 to +60 °C

### Scope of delivery:

The transporters are supplied without connection cable.

### Design data (CAD):

2D + 3D CAD data for various CAD systems as well as system-neutral interfaces are available on the internet at:  
<http://fibro.partserver.de>

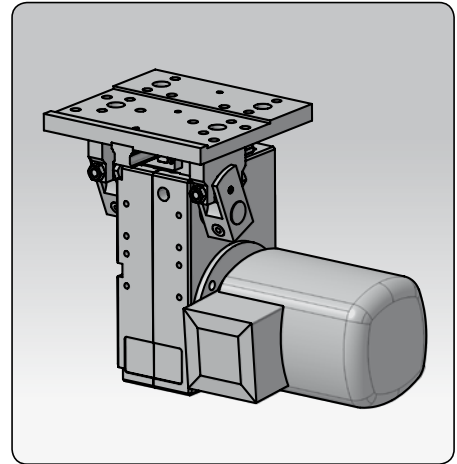
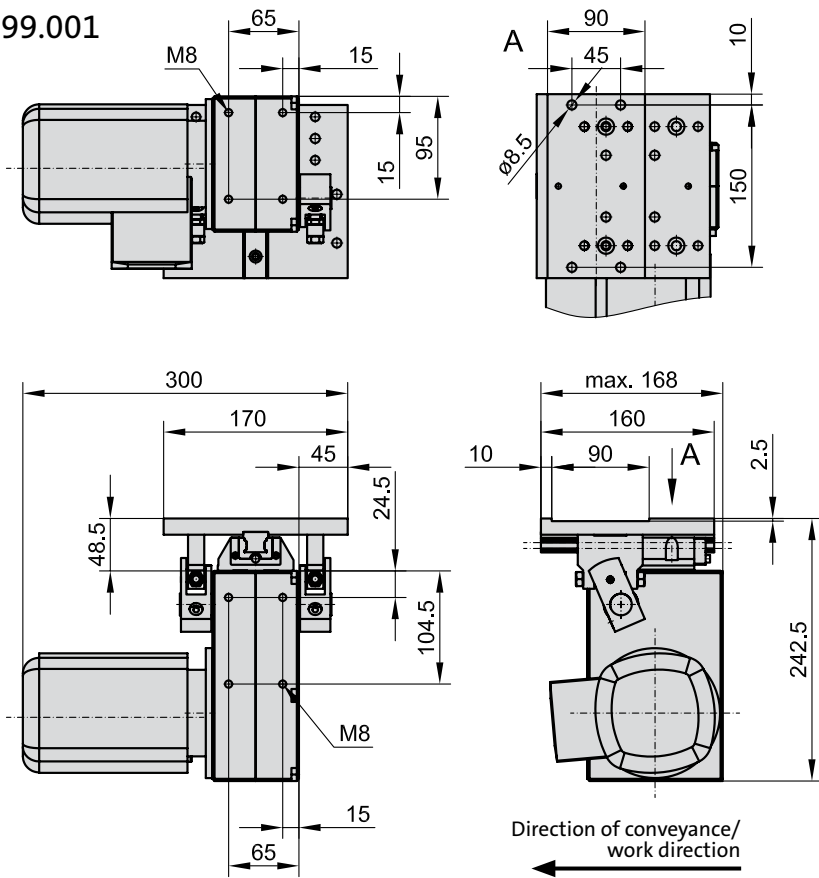


# FIBRO

2299.001  
2299.002

## Electro-mechanical transporters vertical gear position horizontal gear position

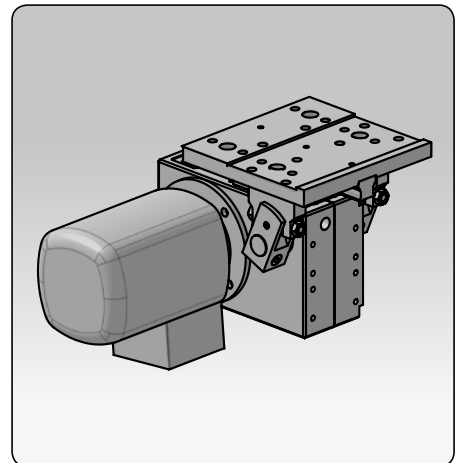
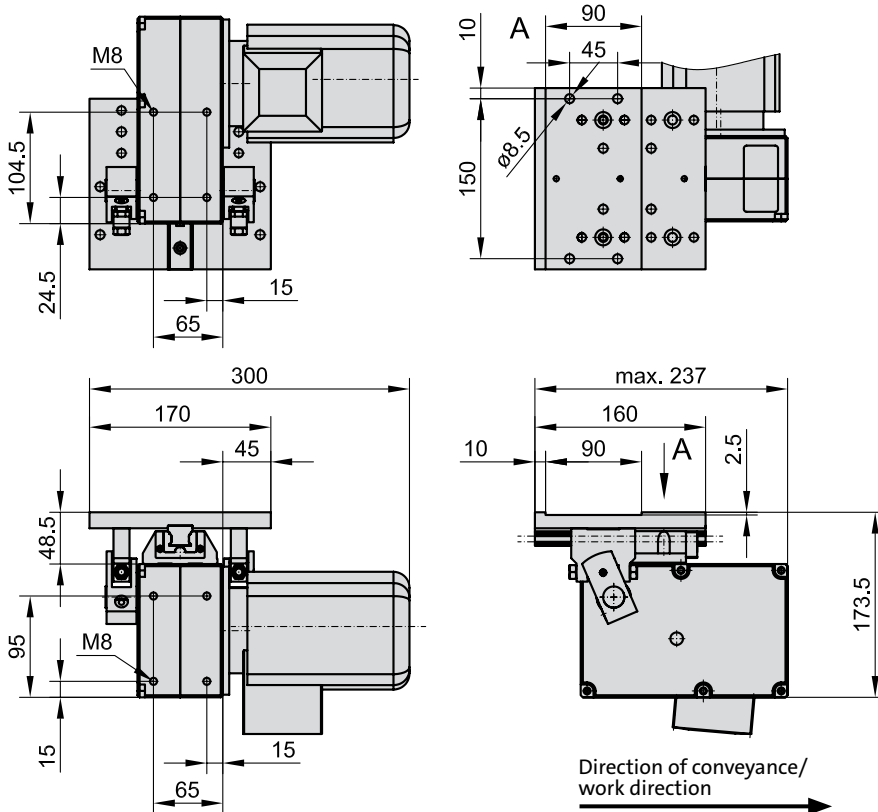
2299.001



**Note:**

The transporter can be attached at two levels.

2299.002



**Note:**

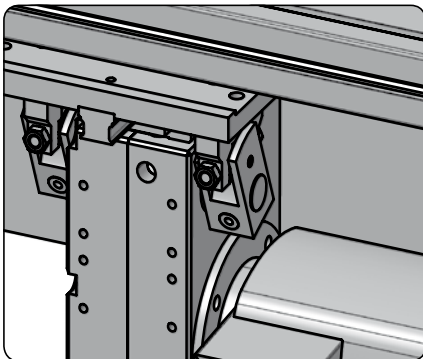
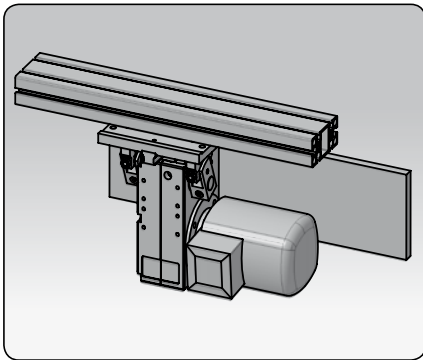
The transporter can be attached at two levels.

Electro-mechanical transporters  
vertical gear position, with profile and support  
horizontal gear position, with profile and support

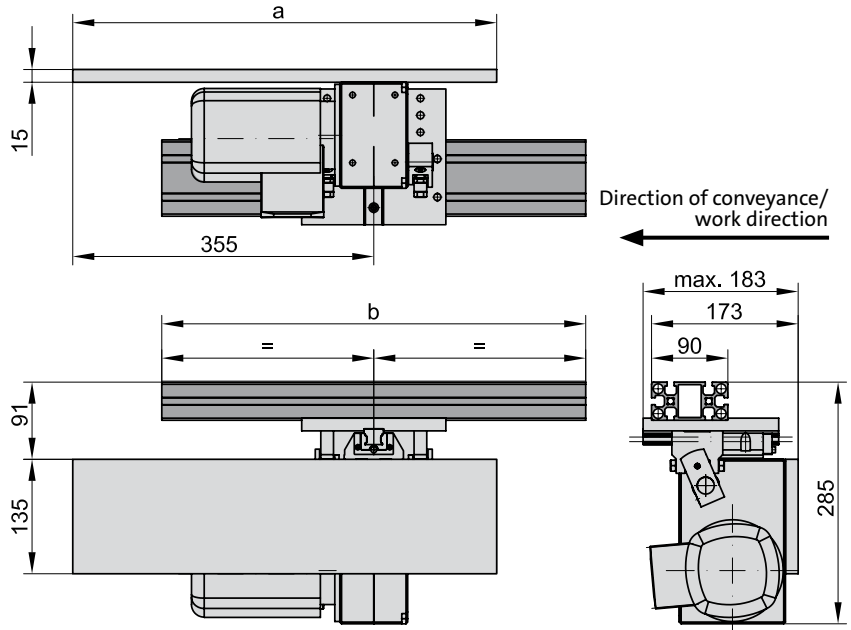
**FIBRO**

2299.011.

2299.012.



2299.011.

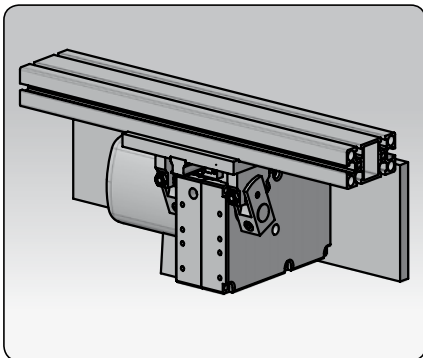


2299.011.

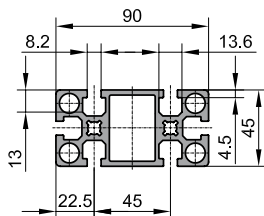
b	500	600	700	800	900	1000	1100	1200
a	500							

Ordering example:

Transporter	= 2299.
Type 011	= 011.
b = 1100 mm	= 1100.
a = 500 mm	= 0500
Order No	= 2299.011.1100.0500

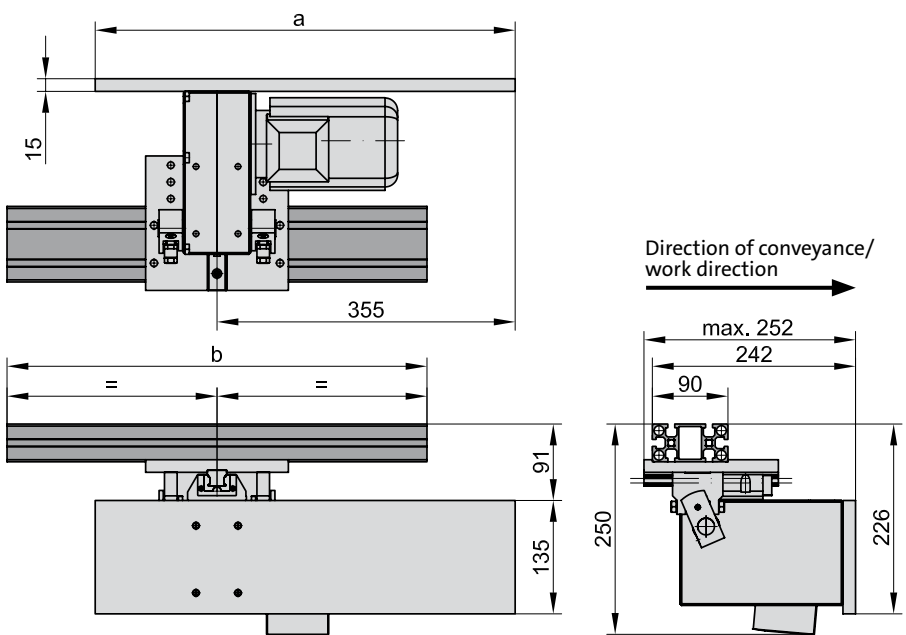


Profile cross-section



Suitable screw for T-slot  
2140.30.08.08.□□

2299.012.



2299.012.

b	500	600	700	800	900	1000	1100	1200
a	500							

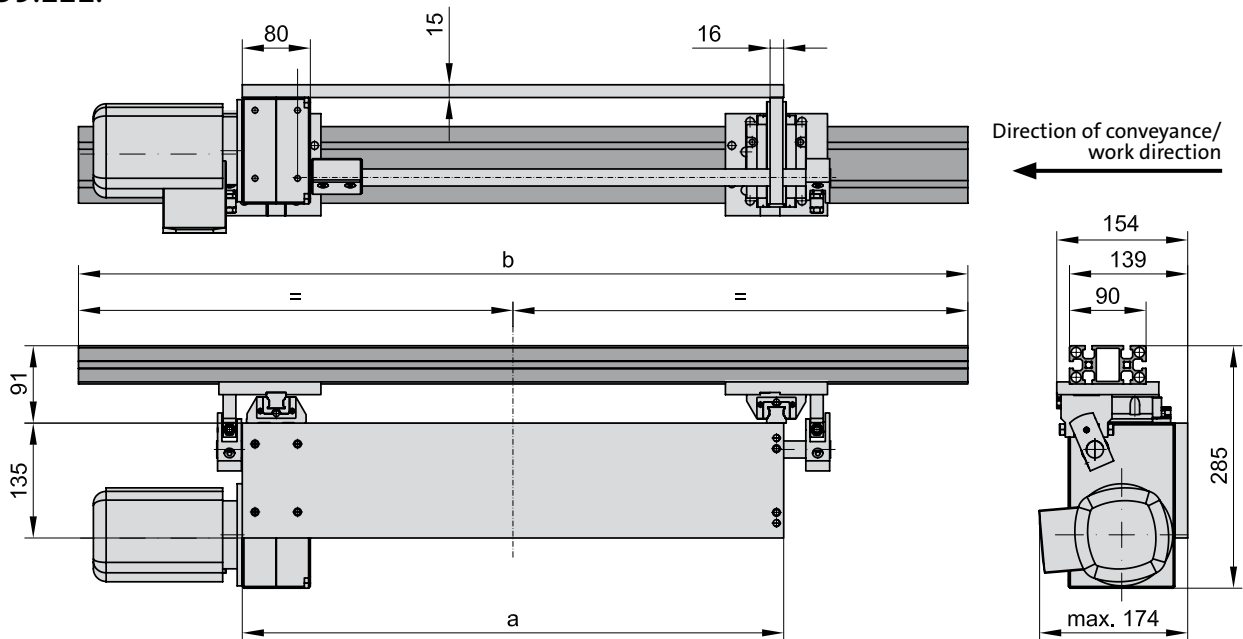
Ordering example:

Transporter	= 2299.
Type 012	= 012.
b = 1100 mm	= 1100.
a = 500 mm	= 0500
Order No	= 2299.012.1100.0500

# FIBRO

Electro-mechanical transporters  
 2299.121. vertical gear position, two slides, with profile and support  
 2299.122. horizontal gear position, two slides, with profile and support

2299.121.



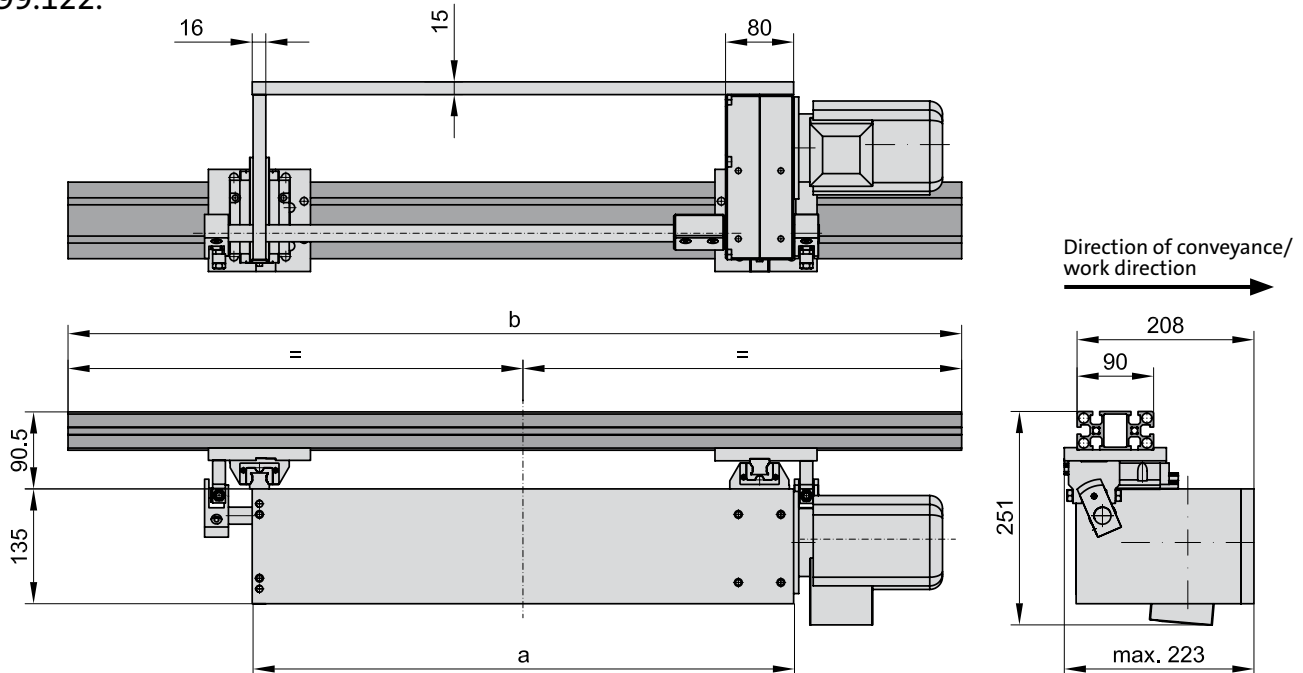
2299.121.

b	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	
a	900	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1200							●	●	●	●	●	●	●	●	●	●	●	●	●
1500													●	●	●	●	●	●	●

Ordering example:

Transporter	=	2299.
Type 121	=	121.
b = 1400 mm	=	1400.
a = 900 mm	=	0900
Order No	=	2299.121.1400.0900

2299.122.



2299.122.

b	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	
a	900	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1200							●	●	●	●	●	●	●	●	●	●	●	●	●
1500													●	●	●	●	●	●	●

Ordering example:

Transporter	=	2299.
Type 121	=	122.
b = 1400 mm	=	2200.
a = 900 mm	=	1200
Order No	=	2299.121.2200.1200

# Electro-mechanical transporters

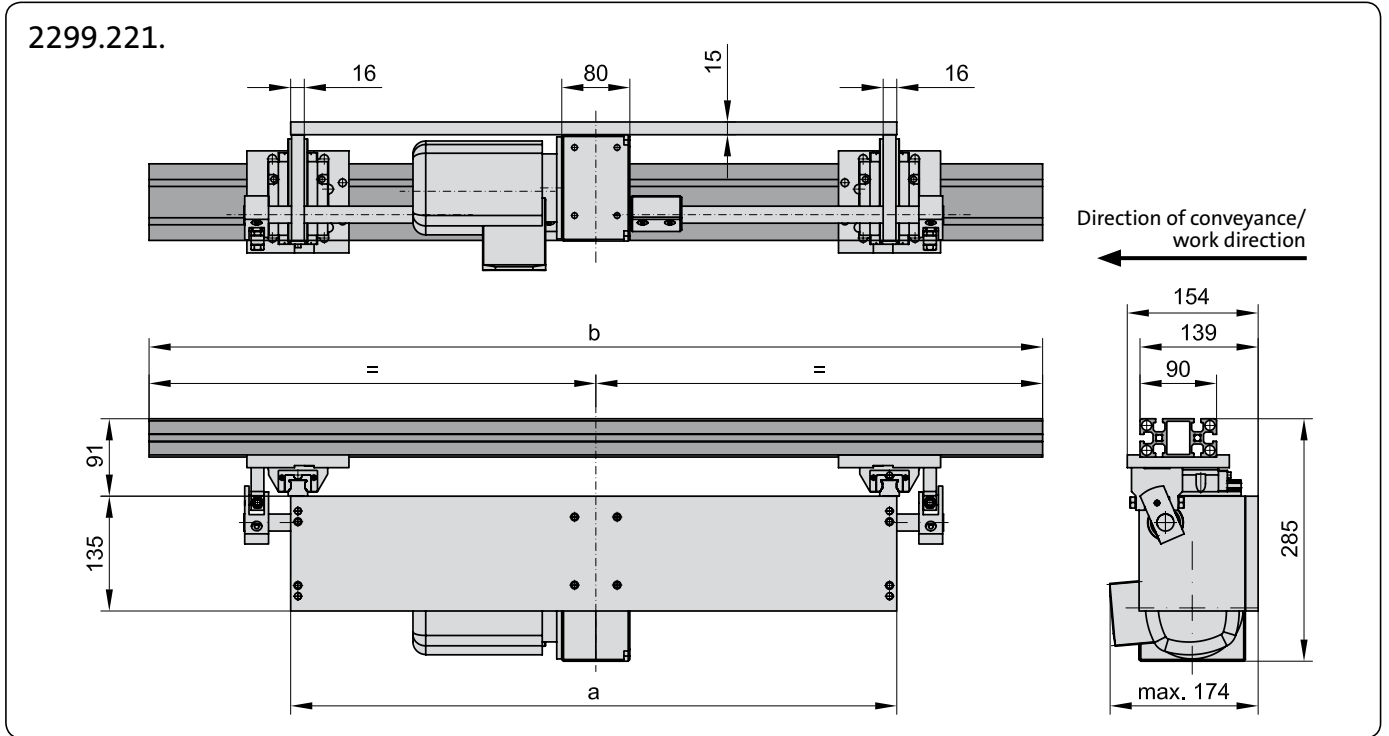
**FIBRO**

vertical centre gear position, two slides, with profile and support

2299.221.

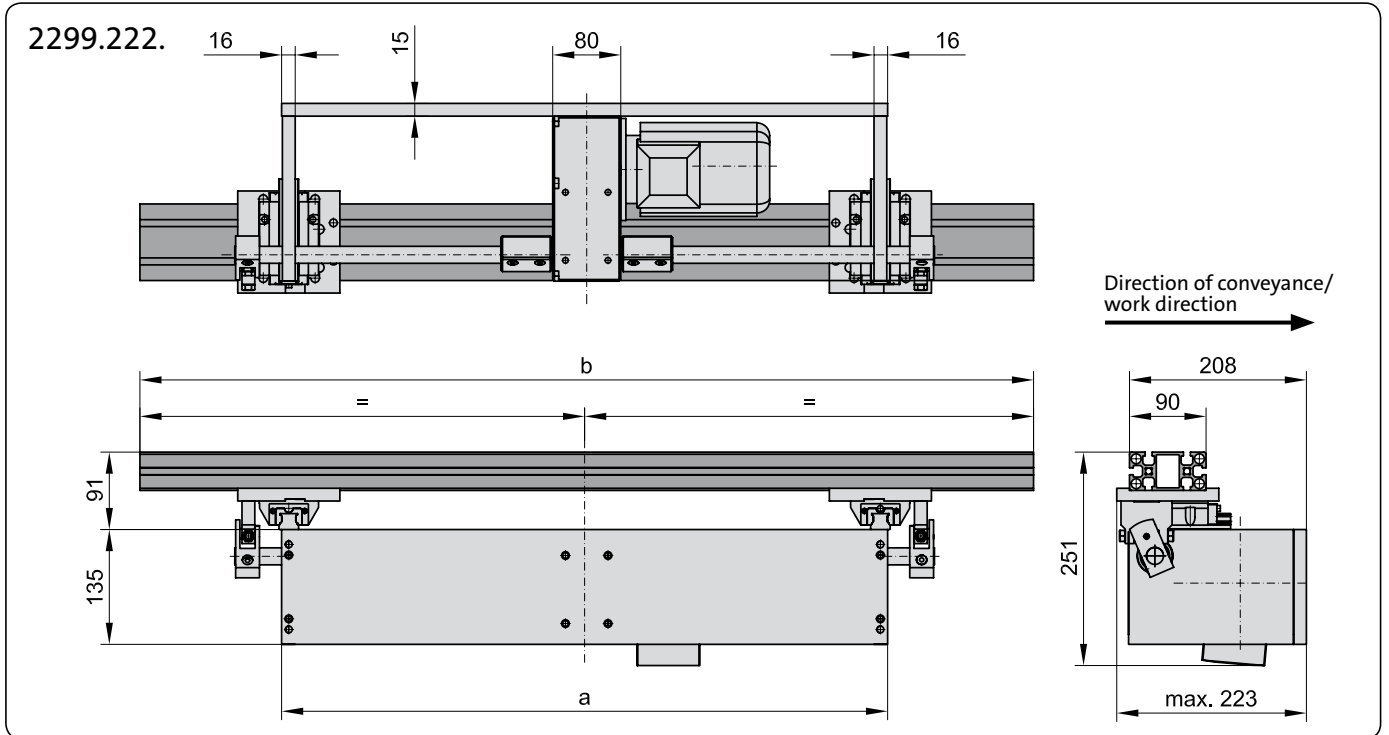
horizontal centre gear position, two slides, with profile and support

2299.222.



2299.221.

b	3100 3200 3300 3400 3500 3600 3700 3800 3900 4000 4100 4200 4300 4400 4500 4600 4700 4800 4900 5000	Transporter	= 2299.
a		Type 221	= 221.
1720	● ● ● ● ● ●	b = 3400 mm	= 3400.
2320	● ● ● ● ● ● ● ●	a = 1720 mm	= 1720
2920	● ● ● ● ● ● ● ● ● ●	Order No	= 2299.221.3400.1720



2299.222.

b	3100 3200 3300 3400 3500 3600 3700 3800 3900 4000 4100 4200 4300 4400 4500 4600 4700 4800 4900 5000	Transporter	= 2299.
a		Type 221	= 222.
1720	● ● ● ● ● ●	b = 3400 mm	= 3400.
2320	● ● ● ● ● ● ● ●	a = 1720 mm	= 1720
2920	● ● ● ● ● ● ● ● ● ●	Order No	= 2299.222.3400.1720

**FIBRO**

2299.510

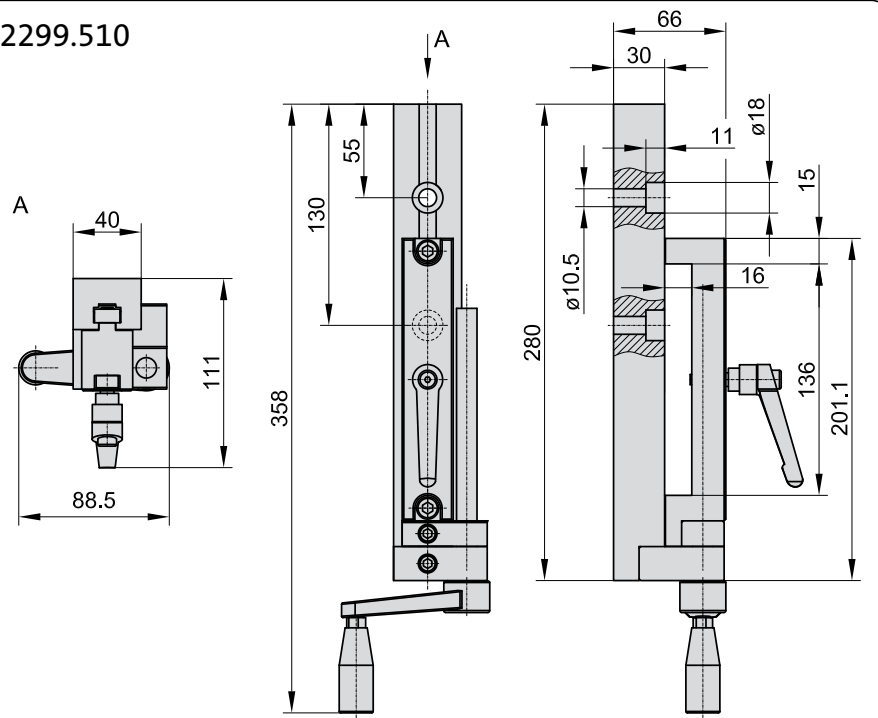
2299.511

# Electro-mechanical transporters

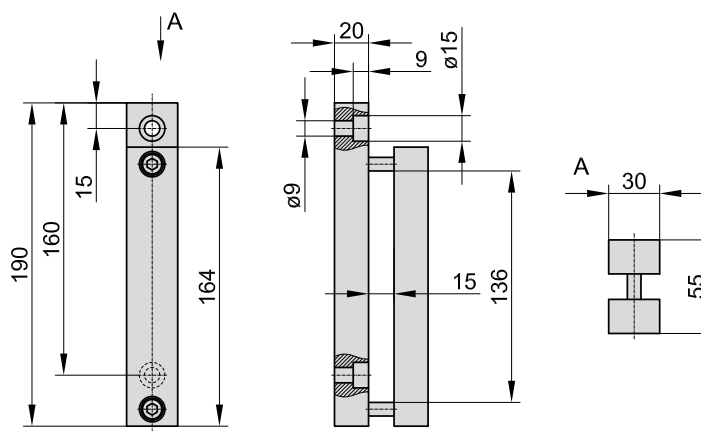
## Fastening element with height adjustment system

### Fastening element

2299.510



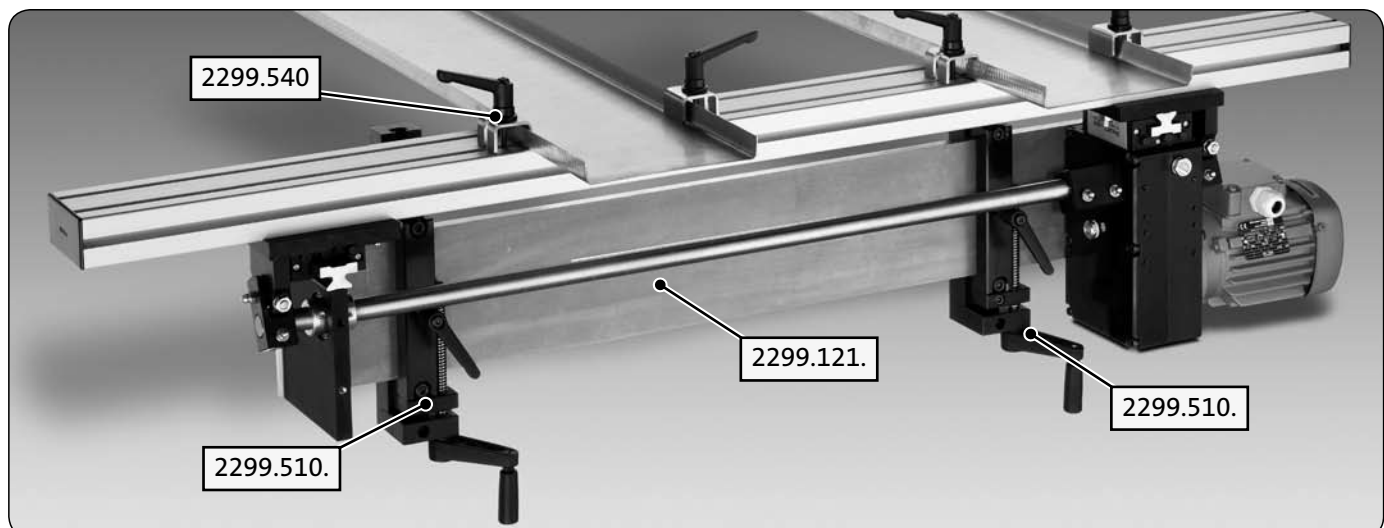
2299.511

**Note:**

Fastening of the transporters  
2299.011./012./121./122./221./222.  
with or without height adjustment system.

2299.510	2x M10
2299.511	2x M8

Fastening screws are not included in scope  
of delivery.



Electro-mechanical transporters  
 Distance  
 Quick clamp for guiding system

**FIBRO**

2299.520

2299.540 2299.541

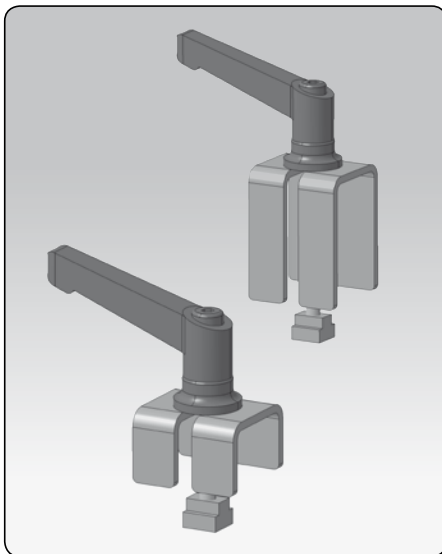
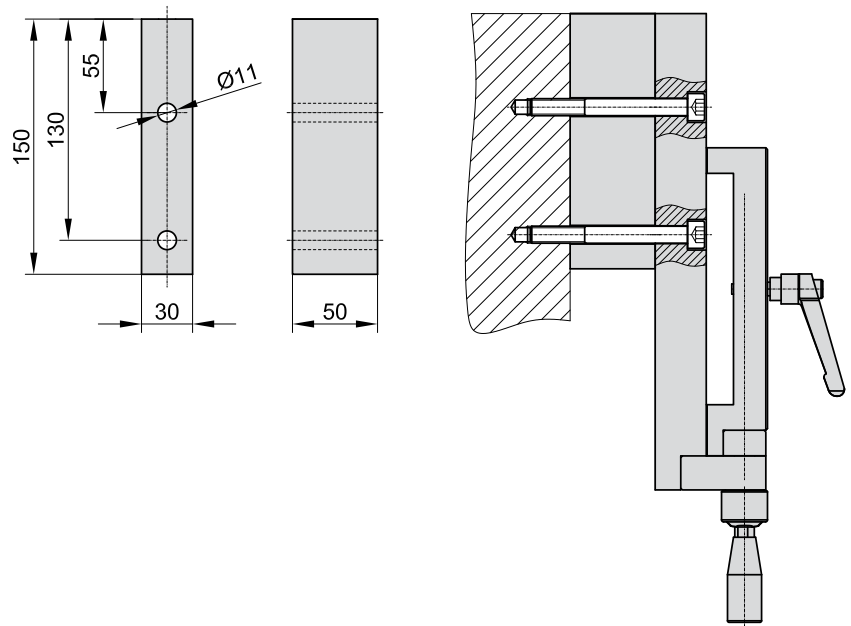
**Note:**

Distance for fastening element with height adjustment system 2299.510

Fastening screws are not included in scope of delivery.

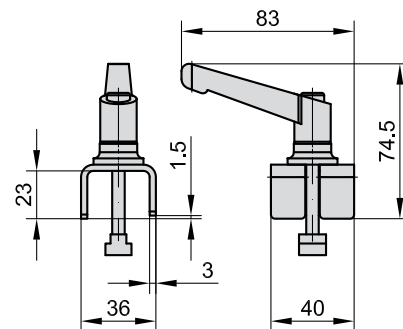
2299.520

Application example



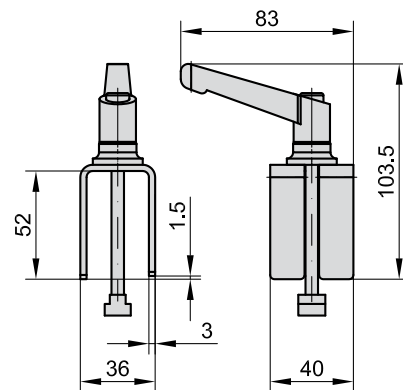
2299.540

Quick clamp for guiding system  
 low version



2299.541

Quick clamp for guiding system  
 high version



**Note:**

The guiding system tensioners fit the T-slots of the profile used for the transporters.

Max. side wall height of the guiding system ( l<sub>1</sub> ): 2299.540 = 23 mm  
 2299.541 = 52 mm

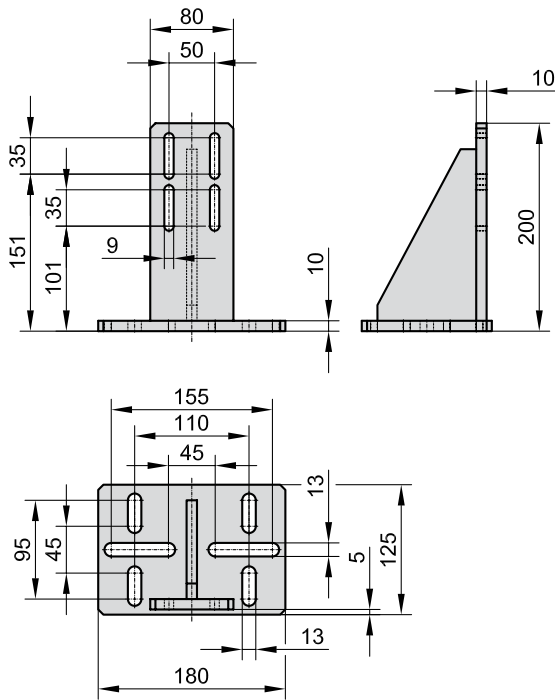


**FIBRO**

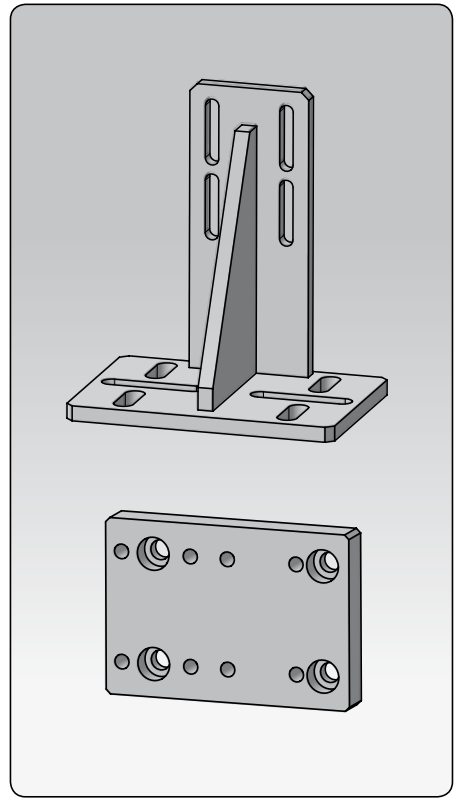
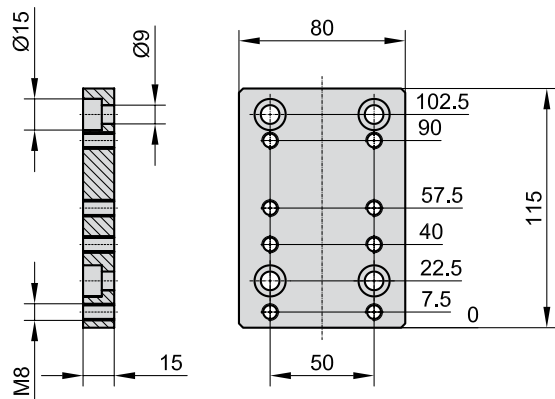
**2299.530**

# Electro-mechanical transporters Angled mounting with adapter plate

**2299.530**  
Angeled mounting



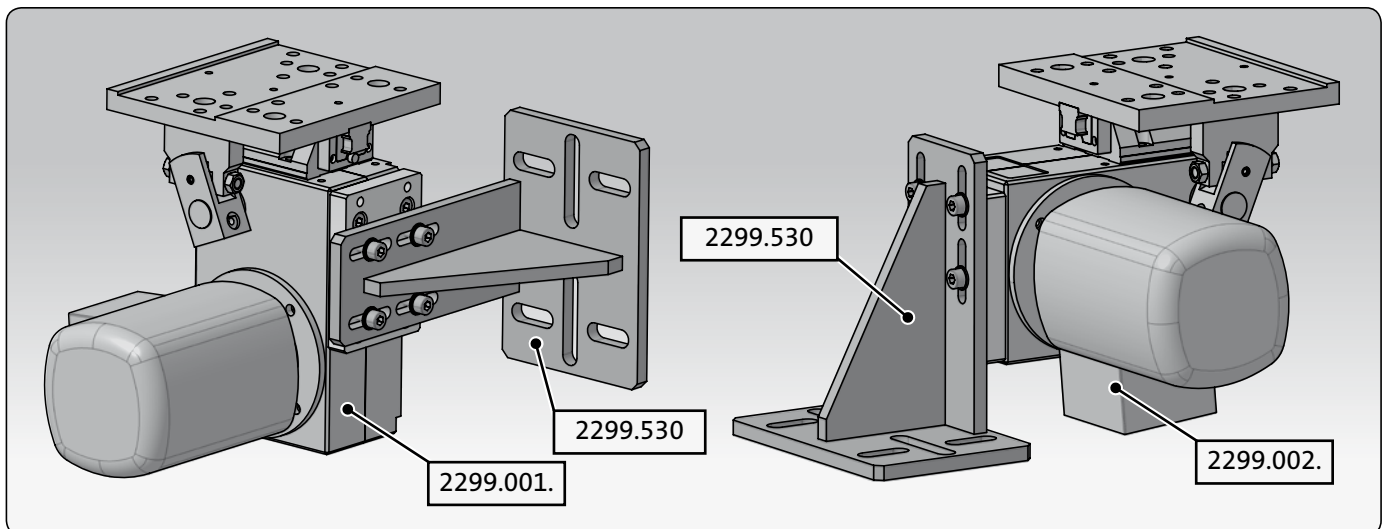
Adapter plate

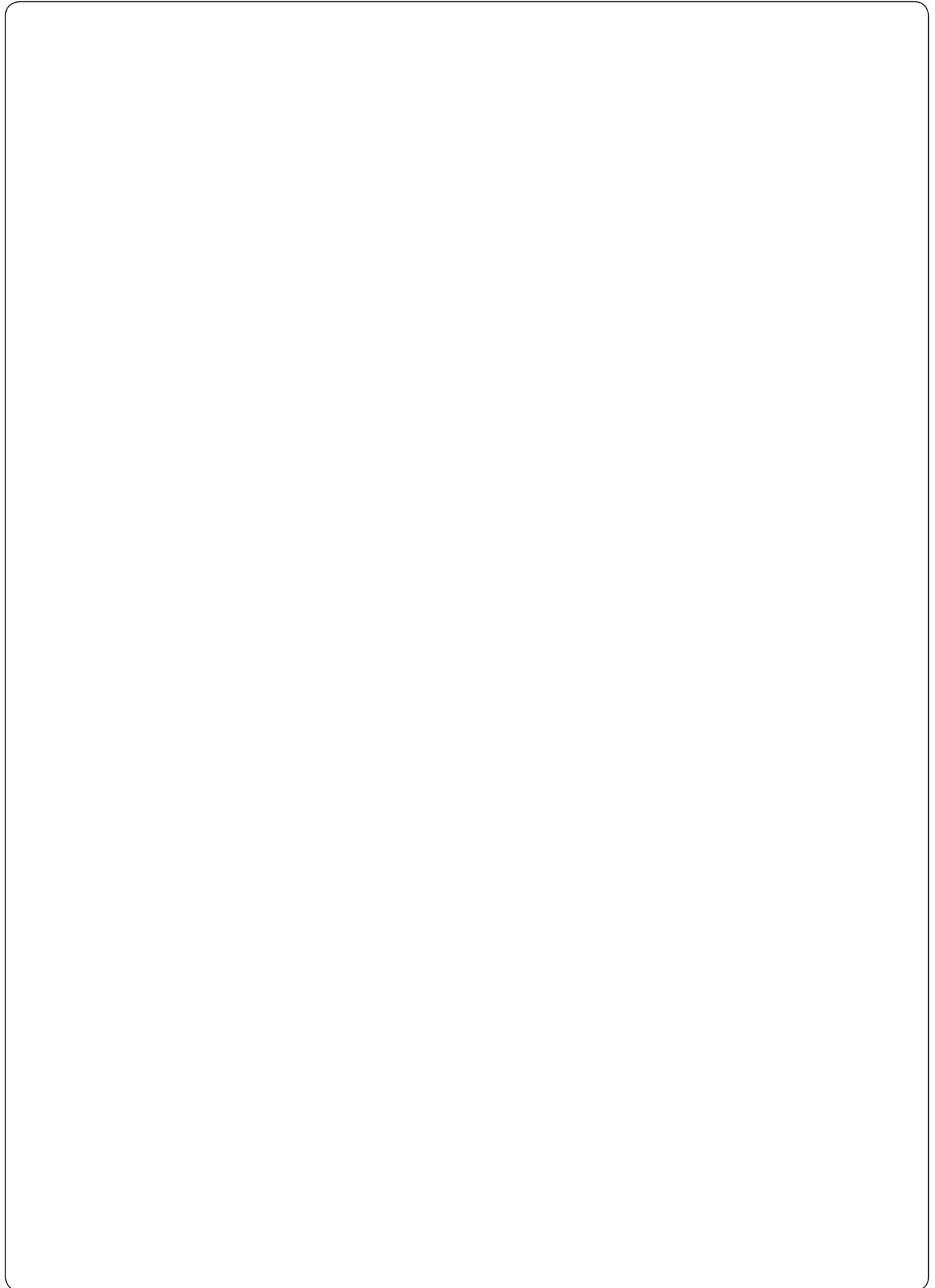


**Note:**

The angled mounting and the adapter together allow individual mounting of the transporters 2299.001 and 2299.002.

Fastening screws are not included in scope of delivery.





---

A Die Sets

---

B Precision Ground Plates and Flat Bars

---

C Lifting and Clamping Devices

---

D Guide Elements

---

E Ground Precision Components

---

F Springs

---

G Elastomer-Bars, -Sheets, -Sections

---

H FIBRO Chemical Tooling Aids

---

J Peripheral Equipment

---

**K Cam Units**

Hydraulic Cam System, Cam Slide Units, Roller Slide Units

---

L Standard Parts for Mould Making

---



# Cam Units



# Hydraulic Cam System

Please request your catalogue



## Standard Cam Slide Units

Please request your catalogue



# Roller Slide Units

Please request your catalogue



# Cam Slide Units KBV1 with Gas Spring

Please request your catalogue





# Cam Slide Units KBV2 with Gas Spring

Please request your catalogue



# **FIBRO Compact Cam (FCC) Tool slides**

Please request your catalogue

---

A Die Sets

---

B Precision Ground Plates and Flat Bars

---

C Lifting and Clamping Devices

---

D Guide Elements

---

E Ground Precision Components

---

F Springs

---

G Elastomer-Bars, -Sheets, -Sections

---

H FIBRO Chemical Tooling Aids

---

J Peripheral Equipment

---

K Cam Units

---

**L Standard Parts for Mould Making**

---



# Standard Parts for Mould Making

**Guide Elements**

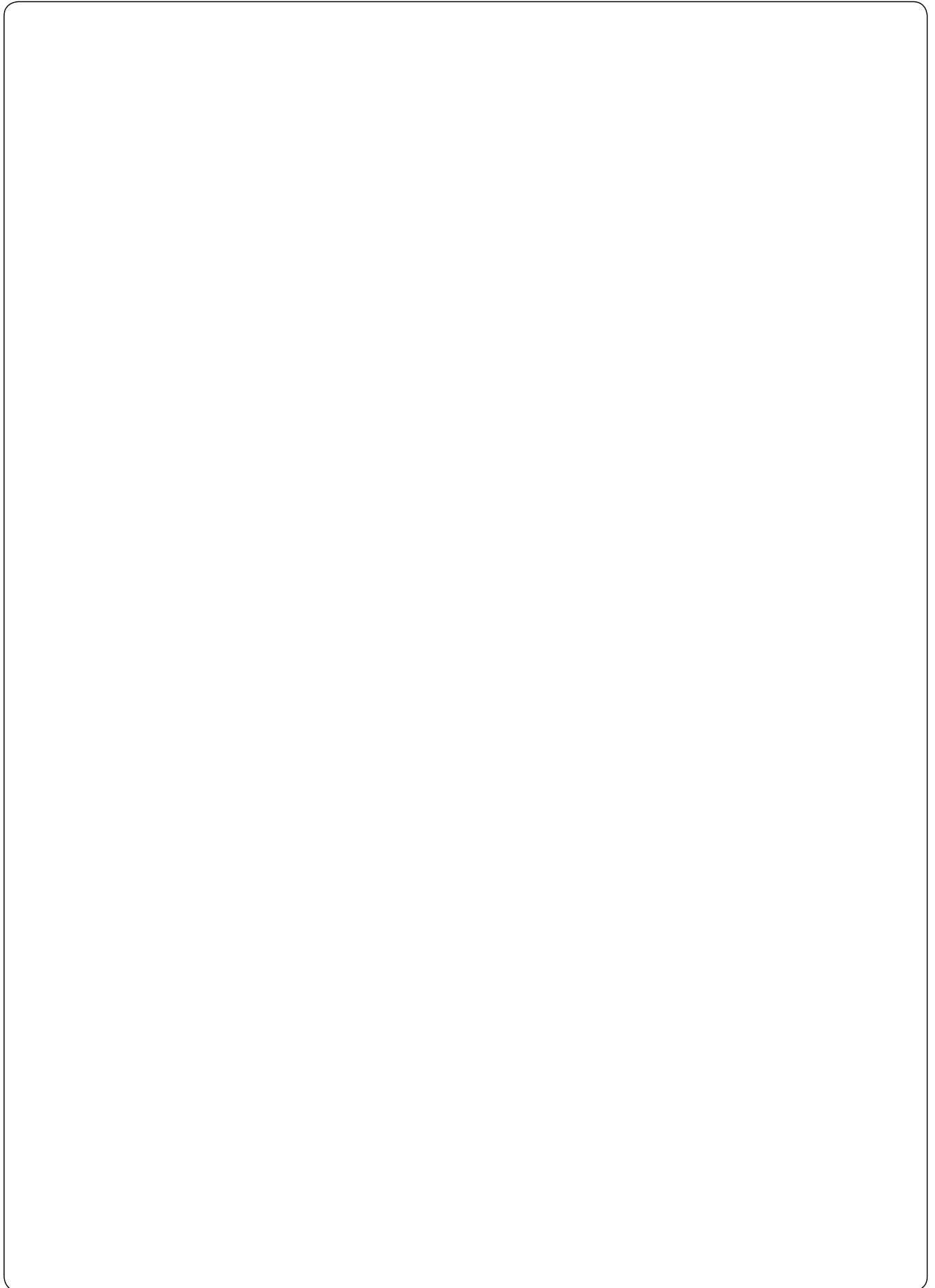
Locating units, round	Locating units, flat	L6
Compensation Discs		L7
Adjusting washers		L7
Ejector rods		L8
Centering sleeves		L9
Guide pillars		L10-L11
Guide pillars, shouldered		L12-L15
Locating guide pillars, shouldered		L16-L19
Guide pillars with flange		L20
Guide pillars (diagonal load pillars)		L21
Guide sleeves		L22
Guide bushes		L23
Locating guide bushes		L24
Ball Bearing Guides		L25
Oilless Guide Bushes with collar, Bronze with Non-Liquid Lubricant		L26-L29
Oilless Guide bushes Bronze with and without Non-Liquid lubricant		L30-L31
Rectangular Guides		L32
Rectangular Guides with rollers		L33

**Forming / Demoulding**

Sliders for transverse bolt guides	L36
Bolt Guides	L37
Hardened Ejector Pins - DIN ISO 6751	L38
Hotwork Precision Ejector Pins - Nitrided DIN ISO 6751	L39
Hardened Ejector Pins DIN ISO 8694	L40
Hotwork Precision Ejector Pins Nitrided DIN ISO 8694	L41
Hardened Ejector Pins - Conical Head similar to DIN 1530 Shape D	L42
Hotwork Precision Ejector Pins Nitrided - similar to DIN 1530 Shape D	L43
Blade Precision Ejectors -Hardened similar to DIN ISO 8693	L44
Hotwork Blade Precision Ejectors - Nitrided similar to DIN ISO 8693	L45
Precision-Ejector Sleeves - Hardened - DIN ISO 8405	L46
Hotwork Precision Ejector Sleeves - Nitrided - DIN ISO 8405	L47
Date insert, complete –(standard version) embossed lettering	L48
Date insert, complete –(short version)embossed lettering	L49
Quill holders for core tempering	L50
O-Rings	L51

**Gas Springs**

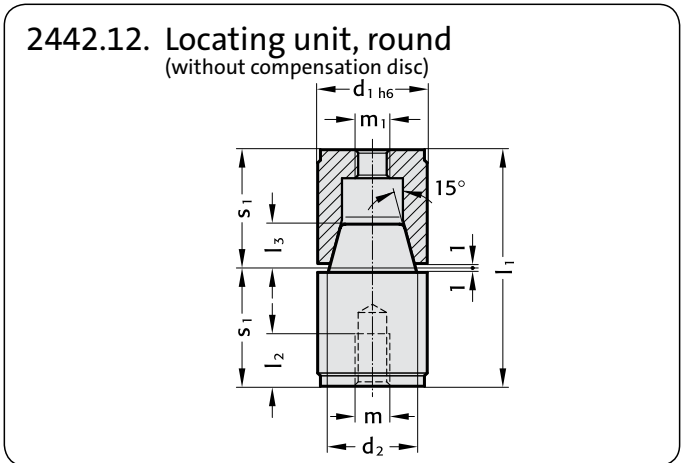
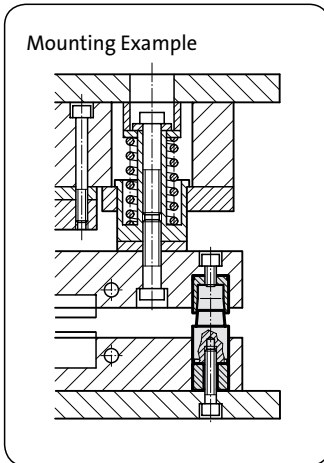
FML Gas Springs for Mould Making	L53-L69
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# Guide Elements

Locating units, round  
Locating units, flat

2442.12.  
2442.13.



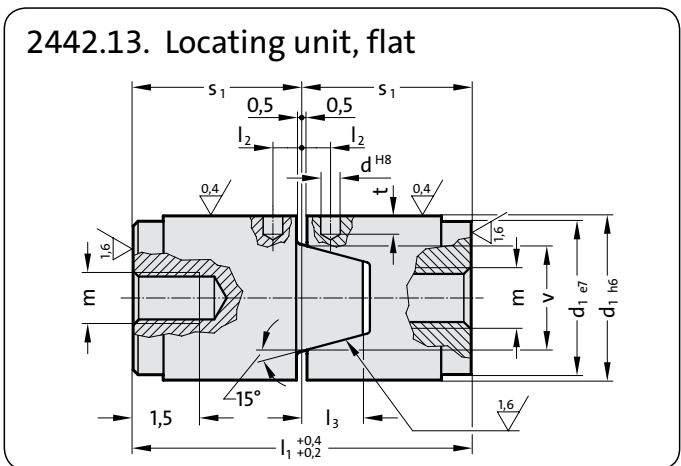
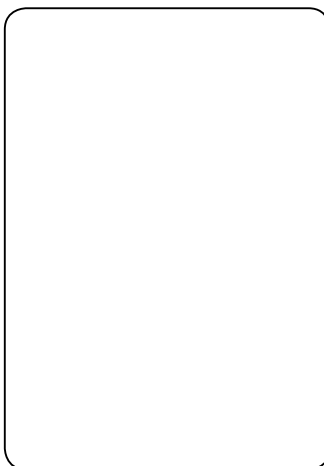
2442.12. Locating unit, round

d <sub>1</sub>	d <sub>2</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	m	m <sub>1</sub>	s <sub>1</sub>
12	8	34	6	4	4	4	17
14	10	34	7,5	6	5	5	17
16	10	34	7,5	6	5	5	17
20	15	54	12	9	8	8	27
25	20	54	12	10	8	8	27
26	20	54	12	10	8	8	27
30	25	72	15	14	10	10	36
32	25	72	15	14	10	10	36
42	35	92	15	18	10	10	46

**Description:**  
Conical centring inserts are used to increase repeat accuracy in mould, die and machine-making.

**Ordering Code (example):**

Locating unit, round, two-part = 2442.  
Conical angle = 15° = 12.  
d<sub>1</sub> = 25 mm = 025.  
l<sub>1</sub> = 54 mm = 054  
Order No = 2442.12.025.054



2442.13. Locating unit, flat

d <sub>1</sub>	d	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	v	s <sub>1</sub>	t	m
30	4	72	5	10	18	36	5	10
42	5	92	6	14	23	46	7	10
54	6	112	8	17	30	56	8	12
80	8	152	8	27	42	76	11	16

**Ordering Code (example):**

Locating unit = 2442.  
flat = 13.  
d<sub>1</sub> = 42 mm = 042.  
l<sub>1</sub> = 92 mm = 092  
Order No = 2442.13.042.092

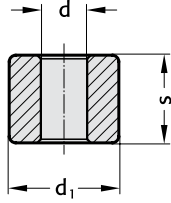


# FIBRO

2442.12.3.  
2442.12.4.

## Compensation Discs Adjusting washers

### 2442.12.3. Compensation Discs



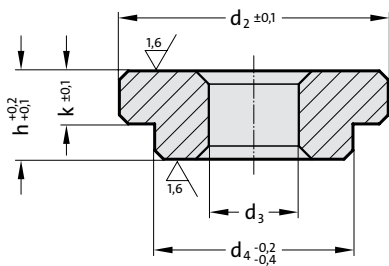
### 2442.12.3. Compensation Discs

$d_1$	$s$	$d$	$d_1$	$s$	$d$	$d_1$	$s$	$d$	$d_1$	$s$	$d$
12	10	4,5	20	9	8,5	26	9	8,5	42	10	10,5
			10			10			20		
			15			20			30		
14	5	5,5	20			30					
	10		30			30	10	12,5			
	14		40			20					
	19		25	9	10,5	30					
16	5	6,5	10			40					
	10		15			50					
	15		20			32	10	12,5			
	19		25			20					
	20		35			30					
	25		45			40					
			55			50					

### Ordering Code (example):

Locating unit, round = 2442.12.  
 Compensation Disc = 3.  
 $d_1 = 25 \text{ mm}$  = 025.  
 $s = 10 \text{ mm}$  = 010  
 Order No = 2442.12.3.025.010

### 2442.12.4. Adjusting washers



### 2442.12.4. Adjusting washers

$d_4$	$d_3$	$d_2$	$h$	$k$
14	5,5	16	5	3,2
20	8,5	25,5	9	6,3
26	8,5	31,5	9	6,3
30	11	35,5	10	6,3
42	11	47,5	10	6,3

### Ordering Code (example):

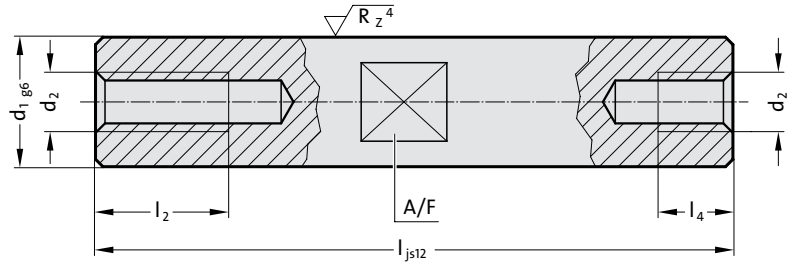
Locating unit, round = 2442.12.  
 Adjusting washer = 4.  
 $d_4 = 30 \text{ mm}$  = 030  
 Order No = 2442.12.4.030

Ejector rods

3300.10.



3300.10. Ejector rods



3300.10. Ejector rods

$d_1$	$l$	$d_2$	$l_2$	$l_4$	A/F
10	60	M 6	16	9	9
	70				
	80				
	100				
	120				
	140				
14	60	M 8	16	11	12
	70				
	80				
	100				
	120				
	140				
	160				
	180				
18	100	M10	20	12	14
	120				
	140				
	160				
	180				
	200				
	220				
	240				
20	100	M12	25	14	16
	120				
	140				
	160				
	180				
	200				
	220				
	240				

$d_1$	$l$	$d_2$	$l_2$	$l_4$	A/F
24	120	M12	25	14	19
	140				
	160				
	180				
	200				
	240				
30	180	M16	30	16	24
	220				
	260				
	300				

Ordering Code (example):

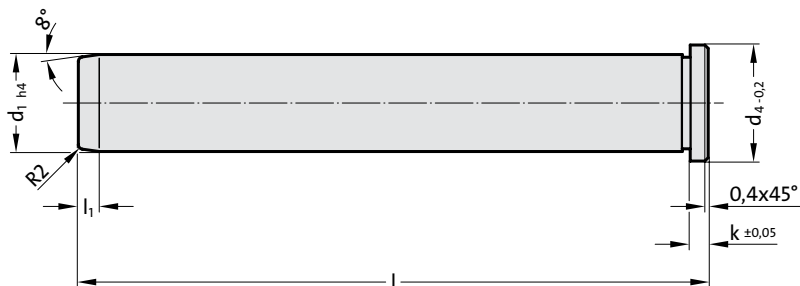
Ejector rod = 3300.10.  
 $d_1 = 20$  mm = 020.  
 $l = 140$  mm = 140  
 Order No = 3300.10.020.140



Guide pillars



3202.12. Guide pillars



3202.12. Guide pillars

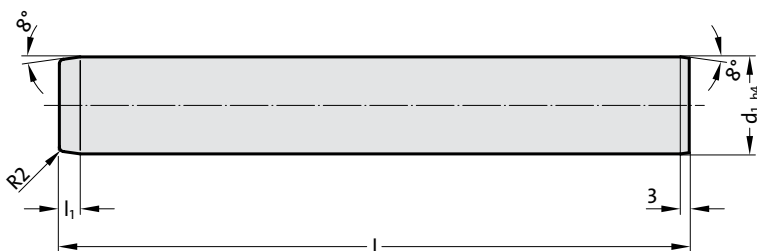
$d_1$	$l$	$d_4$	$k$	$l_1$
12	80	16	4	4
	100			
	120			
18	120	22	6	7
	140			
	160			
30	160	36	6	7
	200			
	240			

Ordering Code (example):

Guide pillar = 3202.12.  
 $d_1 = 18 \text{ mm}$  = 018.  
 $l = 160 \text{ mm}$  = 160  
 Order No = 3202.12.018.160



3202.13. Guide pillars



3202.13. Guide pillars

$d_1$	$l$	$l_1$
12	100	3
	125	
18	125	6
	160	
30	160	6
	240	

Ordering Code (example):

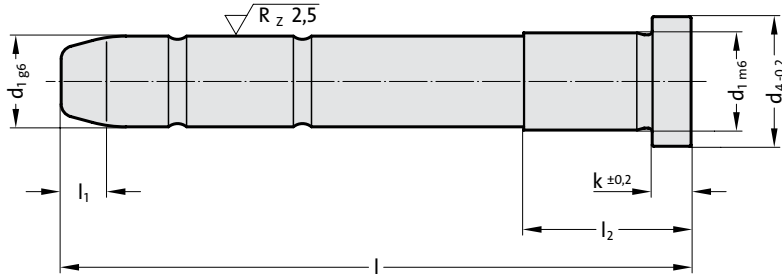
Guide pillar = 3202.13.  
 $d_1 = 18 \text{ mm}$  = 018.  
 $l = 160 \text{ mm}$  = 160  
 Order No = 3202.13.018.160

# FIBRO

3111.10.

## Guide pillars

3111.10. Guide pillars



3111.10. Guide pillars

$d_1$	$l$	$d_4$	$k$	$l_1$	$l_2$
10	40	12	3	4	17
	60				
	80				22
	100				27
12	60	16	6	7	17
	80				22
	100				27
	120				36
14	60	18	8	7	17
	80				22
	100				27
	120				36
	140				46
	160				
16	60	20	8	7	22
	80				27
	100				
	120				36
	140				46
	160				
18	80	22	8	7	27
	100				
	120				36
	140				46
	160				
	180				56
	200				
20	80	24	8	7	27
	100				
	120				36
	140				46
	160				
	180				56
	200				
22	100	26	15	7	36
	120				46
	140				
	160				56
	180				
	200				76
	220				
24	100	28	15	7	36
	120				46
	140				
	160				56
	180				
	200				76
	220				
30	160	36	15	7	56
	200				
	240				76

$d_1$	$l$	$d_4$	$k$	$l_1$	$l_2$
32	160	36	15	7	56
	200				
	240				76
40	200	48	15	10	56
	240				76
	300				96
50	200	58	15	10	56
	240				76
	300				96
60	240	68	20	12	76
	300				96
	360				116

Ordering Code (example):

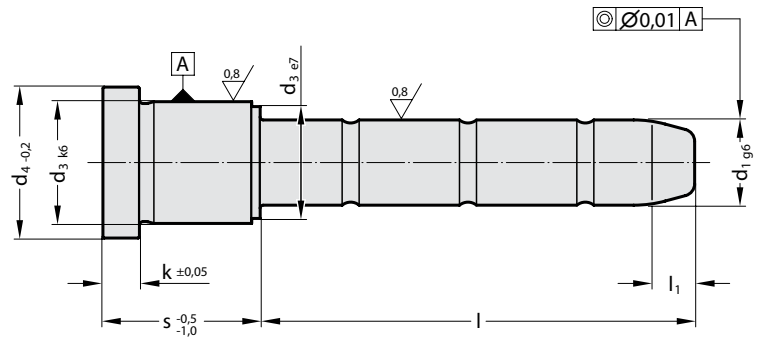
Guide pillar = 3111.10.  
 $d_1 = 22$  mm = 022.  
 $l = 140$  mm = 140  
 Order No = 3111.10.022.140

Guide pillars, shouldered

3111.20.



3111.20. Guide pillars, shouldered



3111.20. Guide pillars, shouldered

$d_1$	$s$	$l$	$d_3$	$d_4$	$l_1$	$k$	$d_1$	$s$	$l$	$d_3$	$d_4$	$l_1$	$k$
9/10	12	45	14	16	4	3	14/15	56	20	20	25	7	6
	17	20							35				
		30							55				
		35							75				
	22	25							95				
		35						66	55				
		55							65				
	27	25							95				
		30						76	55				
		35							95				
		50						86	55				
	36	25							95				
		35					18/20	22	20	26	31	7	6
		45							35				
	46	30							40				
		45							45				
		55							50				
		75							55				
14/15	22	20	20	25	7	6			60				
		35							65				
		40							70				
		45							80				
		50							85				
		55							115				
		65						27	20				
		70							35				
		90							40				
		110							45				
	27	20							50				
		35							55				
		40							60				
		45							65				
		55							70				
		65							80				
		85							85				
		105							105				
	36	20							125				
		35											
		40											
		45											
		55											
		65											
		75											
		95											
	46	20											
		35											
		45											
		65											
		85											
		105											

Ordering Code (example):

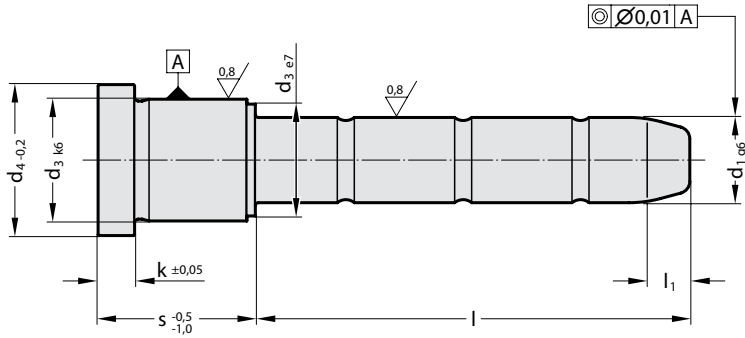
Guide pillar, shouldered	=	3111.20.
$d_1 = 14$ mm	=	014.
$s = 36$ mm	=	036.
$l = 75$ mm	=	075
Order No	=	3111.20.014.036.075

# FIBRO

3111.20.

Guide pillars, shouldered

3111.20. Guide pillars, shouldered



3111.20. Guide pillars, shouldered

d <sub>1</sub>	s	l	d <sub>3</sub>	d <sub>4</sub>	l <sub>1</sub>	k
18/20	36	20	26	31	7	3
		35				
		40				
		45				
		50				
		55				
		60				
		65				
		70				
		75				
		80				
		95				
		115				
		135				
	46	20				
		45				
		65				
		85				
		105				
		135				
		165				
	56	20	26	31	7	6
		35				
		55				
		75				
		95				
	66	55				
		75				
		95				
	76	55				
		75				
		95				
	86	55				
		75				
		95				
	96	55				
		95				
	116	115				
22/24	27	25	30	35	7	6
		45				
		50				
		60				
		65				
		70				
		80				
		85				
		105				
		125				
		165				

d <sub>1</sub>	s	l	d <sub>3</sub>	d <sub>4</sub>	l <sub>1</sub>	k
22/24	36	25	30	35	7	6
		45				
		50				
		55				
		60				
		70				
		75				
		80				
		95				
		115				
		135				
		165				
	46	25				
		45				
		50				
		60				
		65				
		70				
		80				
		85				
		105				
		125				
		165				
	56	25				
		45				
		55				
		75				
		95				
		115				
		165				
	66	55				
		75				
		95				
	76	25				
		45				
		55				
		75				
		95				
		115				

Ordering Code (example):

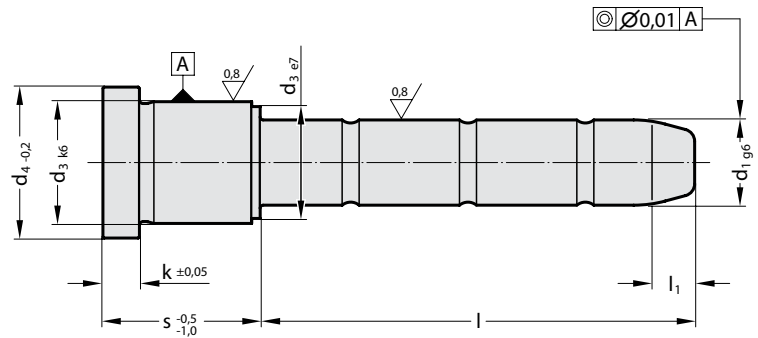
Guide pillar, shouldered = 3111.20.  
d<sub>1</sub> = 24 mm = 024.  
s = 76 mm = 076.  
l = 115 mm = 115  
Order No = 3111.20.024.076.115

Guide pillars, shouldered

3111.20.



3111.20. Guide pillars, shouldered



3111.20. Guide pillars, shouldered

$d_1$	s	l	$d_3$	$d_4$	$l_1$	k	$d_1$	s	l	$d_3$	$d_4$	$l_1$	k
22/24	86	55	30	35	7	6	30/32	116	75	42	47	7	6
		75							115				
		95							155				
	96	55						136	95				
		75							115				
		95							155				
	116	75						156	115				
		115							155				
		155						196	155				
	136	135							195				
30/32	27	45	42	47	7	6	40/42	56	75	54	60	7	10
		65							115				
		105							155				
		165							195				
	36	55						66	75				
		75							135				
		95						76	75				
		115							115				
		155							175				
	46	45						86	75				
		65							135				
		85						96	75				
		105							115				
		125							155				
		165						116	95				
	56	55							135				
		75							195				
		95						136	95				
		115							135				
		135							215				
		175						156	115				
	66	55							155				
		75							215				
		95						196	155				
		115							195				
		135							235				
		175											
	76	55											
		75											
		95											
		115											
		155											
	86	55											
		75											
		95											
		115											
		155											
	96	55											
		75											
		95											
		115											
		155											

Ordering Code (example):

Guide pillar, shouldered	=	3111.20.
$d_1 = 32$ mm	=	032.
s = 116 mm	=	116.
l = 115 mma	=	115
Order No	=	3111.20.032.116.115

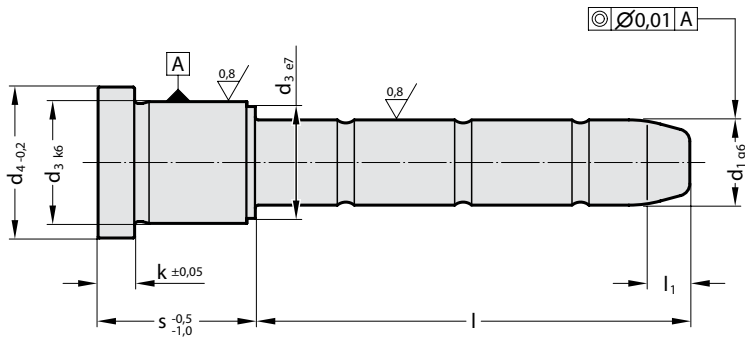


# FIBRO

3111.20.

Guide pillars, shouldered

3111.20. Guide pillars, shouldered



3111.20. Guide pillars, shouldered

$d_1$	$s$	$l$	$d_3$	$d_4$	$l_1$	$k$
50	96	115	66	72	10	10
		155				
		195				
		116				135
		155				
		195				
		136				135
		155				
		195				
		156				135
155						
195						
196	175	195	80	86	10	20
		235				
		116				135
		155				
		195				
		136				135
		155				
		195				
		156				155
		195				
235						
196	175	175	80	86	10	20
		195				
		235				
		246				195
		235				
		275				
		315				

Ordering Code (example):

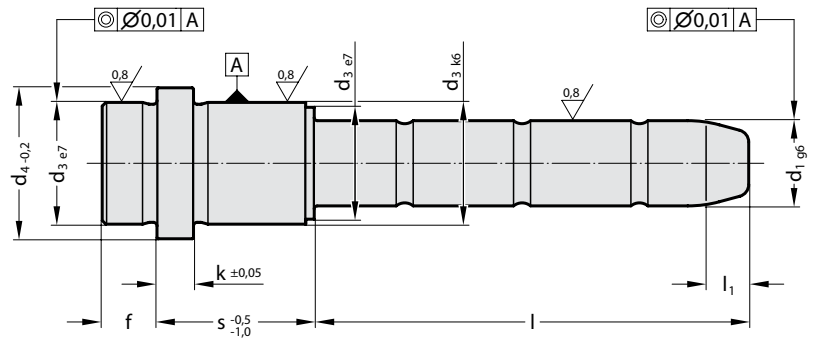
Guide pillar, shouldered	=	3111.20.
$d_1 = 60$ mm	=	060.
$s = 96$ mm	=	096.
$l = 195$ mm	=	195
Order No	=	3111.20.060.096.195

Locating guide pillars, shouldered

3111.21.



3111.21. Locating guide pillars, shouldered



3111.21. Locating guide pillars, shouldered

$d_1$	$s$	$l$	$d_3$	$d_4$	$l_1$	$k$	$f$
9/10	12	25	14	16	7	3	3
		45					
		65					
	17	20					
		25					
		30					
		35					
		50					
		55					
		70					
		75					
	22	25					
		35					
		55					
		75					
		95					
	27	20					
		25					
		30					
		45					
		50					
		70					
		90					
	36	25					
		35					
		45					
		65					
		85					
	46	30					
		35					
		45					
		70					
	56	35					
		60					
14/15	17	35	20	25	7	6	9
		55					
		75					
		95					
	22	30					
		50					
		70					
		90					
		110					
		125					
		150					
	27	30					
		45					
		65					
		85					
		105					
		125					
		145					
		165					

$d_1$	$s$	$l$	$d_3$	$d_4$	$l_1$	$k$	$f$
14/15	36	35	20	25	7	6	9
		55					
		75					
		95					
		125					
		155					
	46	35					
		45					
		65					
		85					
		105					
		125					
		145					
	56	35					
		55					
		75					
		95					
		135					
	66	55					
		65					
		95					
		125					
	76	55					
		95					
	86	55					
		95					
	96	55					
		95					
	116	75					
18/20	17	35	26	31	7	6	9
		55					
		75					
		120					
	22	35					
		45					
		65					
		85					
		115					

Ordering Code (example):

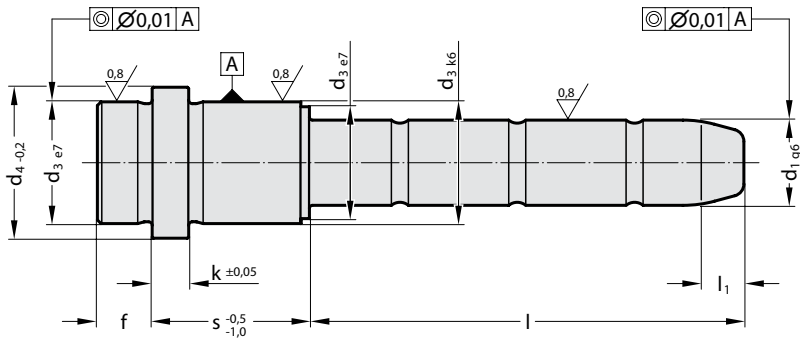
Locating guide pillar, shouldered	=	3111.21.
$d_1 = 15 \text{ mm}$	=	015.
$s = 27 \text{ mm}$	=	027.
$l = 85 \text{ mm}$	=	085
Order No	=	3111.21.015.027.085

# FIBRO

3111.21.

Locating guide pillars, shouldered

3111.21. Locating guide pillars, shouldered



3111.21. Locating guide pillars, shouldered

$d_1$	s	l	$d_3$	$d_4$	$l_1$	k	f
18/20	27	35	26	31	7	6	9
		45					
		65					
		85					
		105					
		125					
		165					
		225					
		245					
	36	35					
		55					
		75					
		95					
		115					
		135					
		165					
		225					
		255					
	46	35					
		45					
		65					
		85					
		105					
		135					
		165					
		245					
	56	35					
		55					
		75					
		95					
		155					
	66	35					
		55					
		75					
		95					
		145					
	76	55					
		75					
		95					
		135					
	86	55					
		75					
		95					
		125					
	96	55					
		95					
	116	75					
		115					
	136	135					

$d_1$	s	l	$d_3$	$d_4$	$l_1$	k	f
22/24	17	35	30	35	7	6	9
		55					
		75					
	22	35					
		55					
		75					
		105					
		130					
	27	35					
		45					
		65					
		85					
		105					
		125					
		165					
		205					
		245					
		285					
	36	35					
		55					
		75					
		95					
		115					
		135					
		165					
		205					
		245					
		285					
	46	35					
		45					
		65					
		85					
		105					
		125					
		165					
		205					
	56	35					
		55					
		75					
		95					
		115					
		165					
		205					

Ordering Code (example):

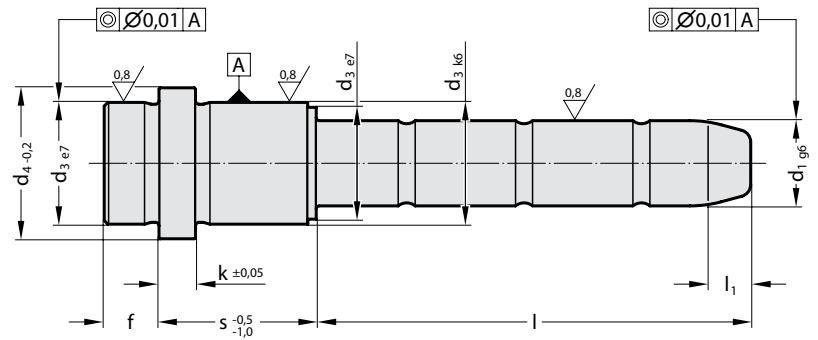
Locating guide pillar, shouldered	=	3111.21.
$d_1 = 20$ mm	=	020.
s = 46 mm	=	046.
l = 105 mm	=	105
Order No	=	3111.21.020.046.105

Locating guide pillars, shouldered

3111.21.



3111.21. Locating guide pillars, shouldered



3111.21. Locating guide pillars, shouldered

$d_1$	$s$	$l$	$d_3$	$d_4$	$l_1$	$k$	$f$
22/24	66	35	30	35	7	6	9
		55					
		75					
		95					
		155					
	76	55					
		75					
		95					
		115					
		145					
	86	55					
		75					
		95					
		135					
	96	55					
		75					
		95					
		125					
	116	75					
		115					
		155					
	136	95					
		135					
	156	155					
30/32	27	45	42	47	7	6	9
		65					
		105					
		165					
		185					
		245					
		285					
	36	55					
		75					
		95					
		115					
		155					
		245					
		285					
	46	45					
		65					
		85					
		105					
		125					
		165					
		245					
		285					
	56	55					
		75					
		95					
		115					
		135					
		175					
		245					
		295					

$d_1$	$s$	$l$	$d_3$	$d_4$	$l_1$	$k$	$f$
30/32	66	55	42	47	7	6	9
		75					
		95					
		115					
		135					
		175					
		245					
		295					
	76	55					
		75					
		95					
		115					
		155					
		225					
	86	55					
		75					
		95					
		115					
		155					
		225					
	96	55					
		75					
		95					
		115					
		155					
		205					
	116	75					
		115					
		155					
	136	95					
		115					
		155					
	156	115					
		155					
	196	155					
		195					

Ordering Code (example):

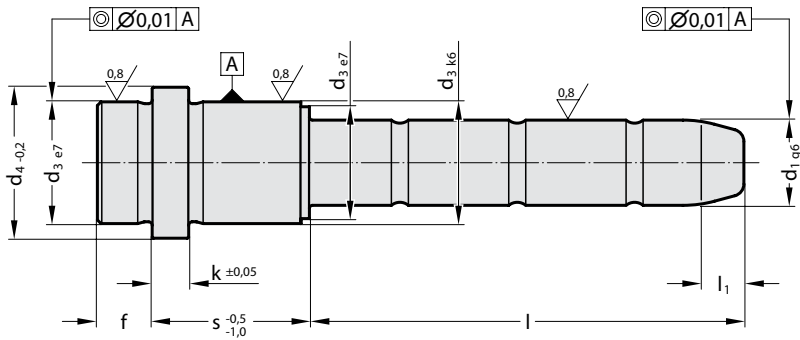
Locating guide pillar, shouldered	=	3111.21.
$d_1 = 32$ mm	=	032.
$s = 86$ mm	=	086.
$l = 95$ mm	=	095
Order No	=	3111.21.032.086.095

# FIBRO

3111.21.

Locating guide pillars, shouldered

3111.21. Locating guide pillars, shouldered



3111.21. Locating guide pillars, shouldered

d <sub>1</sub>	s	l	d <sub>3</sub>	d <sub>4</sub>	l <sub>1</sub>	k	f
40/42	46	95	54	60	7	10	12
		165					
	56	75					
		115					
		155					
		195					
66	75	75					
		135					
76	75	75					
		115					
		175					
86	75	75					
		135					
96	75	75					
		115					
		155					
116	95	95					
		135					
		195					
136	95	95					
		135					
		215					
156	115	115					
		155					
		215					
196	155	155					
		195					
		235					
246	165	165					
		245					

Ordering Code (example):

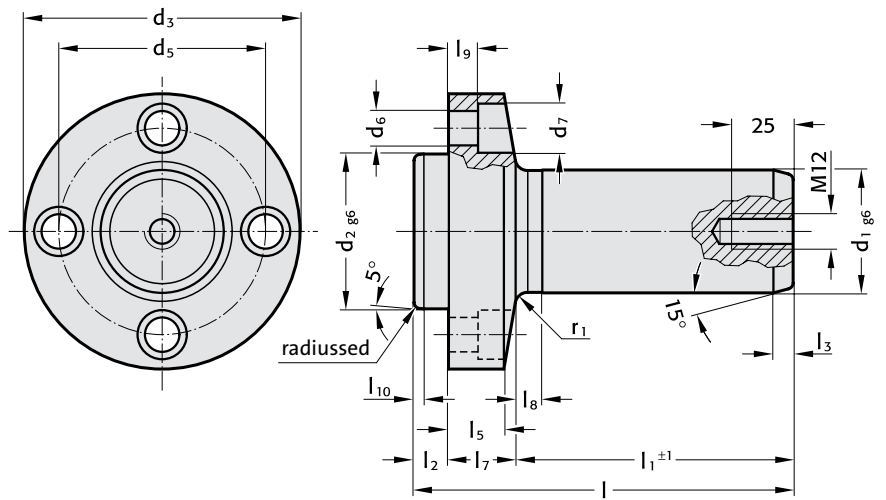
Locating guide pillar, shouldered	=	3111.21.
d <sub>1</sub> = 42 mm	=	042.
s = 96 mm	=	096.
l = 115 mm	=	115
Order No	=	3111.21.042.096.115

Guide pillars with flange

3111.31.



3111.31. Guide pillars with flange



Material:

Steel  
 Surface hardness: case hardened 62+2 HRC  
 Hardness penetration depth: 1.2 mm

Execution:

Ground

Note:

Holding fixture bore H7.  
 Delivery does not include screws.

Fixing:

socket head screw DIN EN ISO 4762  
 M 8 x 20  
 M 10 x 25  
 M 12 x 30  
 M 14 x 35  
 M 16 x 40  
 should be used

3111.31. Guide pillars with flange

d <sub>1</sub>	32	40	50	63	80
d <sub>2</sub>	40	50	63	80	100
d <sub>3</sub>	76	92	112	138	170
d <sub>5</sub>	55	68	84	105	130
d <sub>6</sub>	9	11	14	16	18
d <sub>7</sub>	15	18	20	24	26
r	1,6	2	2,5	2,5	3
r <sub>1</sub>	4	4	5	6	8
l <sub>2</sub>	11	13	14	16	20
l <sub>3</sub>	6	6	8	8	10
l <sub>5</sub>	15,1	18,4	22,5	27,4	32,1
l <sub>6</sub>	11	13	14	16	20
l <sub>7</sub>	19	23	28	34	40
l <sub>8</sub>	8	9	10	13	15
l <sub>9</sub>	9	10	12	15	18
l <sub>10</sub>	1,5	1,5	2	3	4
l <sub>1</sub>	(l)	(l)	(l)	(l)	(l)
67	97				
80	110	116			
95	125	131	137		
112	142	148	154	162	
132		168	174	182	192
160			202	210	220
190				240	250
224					284
436				486	

Ordering code (example):

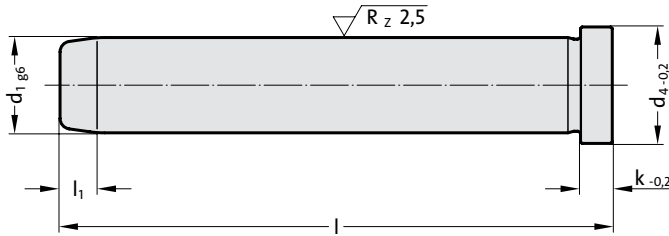
Guide pillar with flange	=	3111.31.
d <sub>1</sub> = 32 mm	=	032.
l <sub>1</sub> = 112 mm	=	112
Order no.	=	3111.31.032.112

# FIBRO

3110.11.

## Guide pillars (diagonal load pillars)

3110.11. Guide pillars (diagonal load pillars)



3110.11. Guide pillars (diagonal load pillars)

$d_1$	8	9	10	12	14	15	16	18	20	22	24	30	32	40	50
$d_4$	10	12	12	16	18	18	20	22	24	26	28	36	36	48	58
$k$	3	3	3	6	8	8	8	8	8	15	15	15	15	15	15
$l_1$	4	4	4	7	7	7	7	7	7	7	7	7	7	10	10

$l$																
40	●	●	●	●			●									
60	●	●	●	●	●	●	●	●	●							
80	●	●	●	●	●	●	●	●	●	●	●					
100	●	●	●	●	●	●	●	●	●	●	●	●	●			
120		●	●	●	●	●	●	●	●	●	●	●	●			
140				●	●	●	●	●	●	●	●	●	●			
160				●	●	●	●	●	●	●	●	●	●	●	●	●
180					●	●	●	●	●	●	●	●	●			
200							●	●	●	●	●	●	●	●	●	●
220									●	●	●	●	●			
240								●	●	●	●	●	●	●	●	●
300										●	●	●	●	●	●	●
360												●	●	●	●	●

### Ordering Code (example):

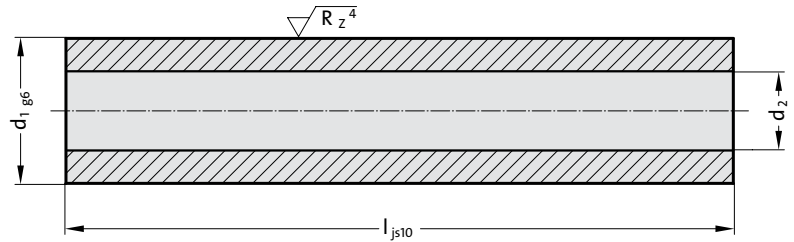
Guide pillar (diagonal load pillar) = 3110.11.  
 $d_1 = 20$  mm = 020.  
 $l = 180$  mm = 180  
 Order No = 3110.11.020.180

Guide sleeves

3100.09.



3100.09. Guide sleeves



3100.09. Guide sleeves

d <sub>1</sub>	10	14	18	24	30
d <sub>2</sub>	6,2	8,3	10,4	12,5	16,5

l	10	14	18	24	30
20	●				
30	●	●			
40	●	●	●		
50	●	●			
60	●	●	●	●	
70	●	●			
80	●	●	●	●	●
100	●	●	●	●	●
120	●	●	●	●	●
140	●	●	●	●	●
160		●	●	●	●
180		●	●	●	●
200			●	●	
220			●		●
240			●	●	
260					●
300					●

Ordering Code (example):

Guide sleeve	=	3100.09.
d <sub>1</sub> = 10 mm	=	010.
l = 100 mm	=	100
Order No	=	3100.09.010.100

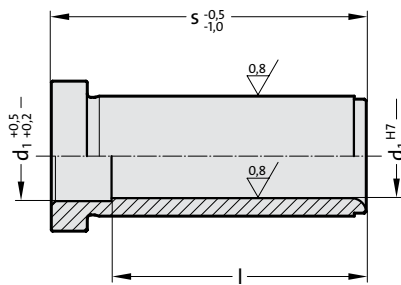
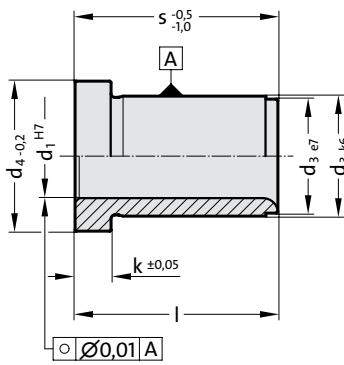


# FIBRO

3120.40.

## Guide bushes

### 3120.40. Guide bushes



### 3120.40. Guide bushes

d <sub>1</sub>	s	l	d <sub>3</sub>	d <sub>4</sub>	k
9/10	9	9	14	16	3
	12	12			
	17	17			
	22	22			
	27	27			
	36	36			
	46	46			
	56	46			
	66	46			
12	17	17	18	23	6
	22	22			
	27	27			
	36	36			
	46	46			
	56	56			
14/15	12	12	20	25	6
	17	17			
	22	22			
	27	27			
	36	36			
	46	46			
	56	56			
	66	56			
	76	56			
	86	56			
	96	56			
16	17	17	22	25	6
	22	22			
	27	27			
	36	36			
	46	46			
	56	56			
18/20	17	17	26	31	6
	22	22			
	27	27			
	36	36			
	46	46			
	56	56			
	66	66			
	76	76			
	86	76			
	96	76			
	116	76			
22/24	17	17	30	35	6
	22	22			
	27	27			
	36	36			
	46	46			
	56	56			
	66	66			
	76	76			
	86	86			
	96	96			

d <sub>1</sub>	s	l	d <sub>3</sub>	d <sub>4</sub>	k
22/24	116	96	30	35	6
	136	96			
	156	96			
30/32	27	27	42	47	6
	36	36			
	46	46			
	56	56			
	66	66			
	76	76			
	86	86			
	96	96			
	116	116			
	136	116			
	156	116			
	176	116			
40/42	46	46	54	60	10
	56	56			
	66	66			
	76	76			
	86	86			
	96	96			
	116	116			
	136	136			
	156	136			
	196	136			
	246	136			
50	76	76	66	72	10
	96	96			
	116	116			
	136	136			
	156	136			
	196	136			
60	76	76	80	86	20
	96	96			
	116	116			
	136	136			
	156	136			
	196	136			
	246	136			

### Ordering Code (example):

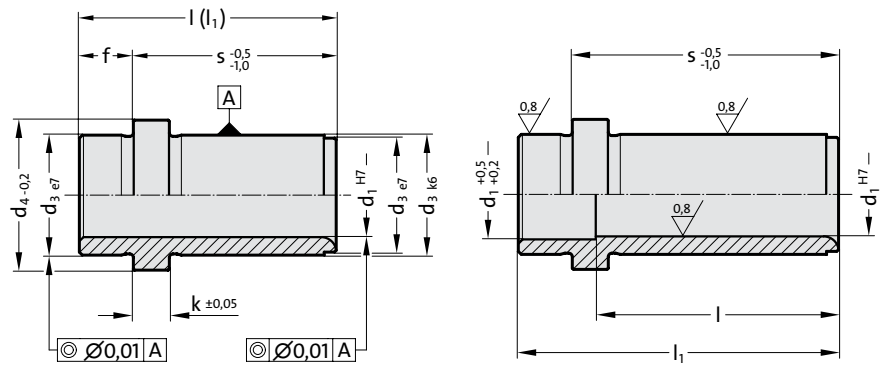
Guide bush	=	3120.40.
d <sub>1</sub> = 32 mm	=	032.
s = 116 mm	=	116
Order No	=	3120.40.032.116

Locating guide bushes

3120.42.



3120.42. Locating guide bushes



3120.42. Locating guide bushes

d <sub>1</sub>	s	l	l <sub>1</sub>	d <sub>3</sub>	d <sub>4</sub>	f	k
9/10	12	15	15	14	16	3	3
	17	20	20				
	22	25	25				
	27	30	30				
	36	39	39				
	46	46	49				
	56	46	59				
	66	46	69				
14/15	17	26	26	20	25	9	6
	22	31	31				
	27	36	36				
	36	45	45				
	46	55	55				
	56	56	65				
	66	56	75				
	76	56	85				
	86	56	95				
	96	56	105				
	116	56	125				
18/20	17	26	26	26	31	9	6
	22	31	31				
	27	36	36				
	36	45	45				
	46	55	55				
	56	65	65				
	66	75	75				
	76	76	85				
	86	76	95				
	96	76	105				
	116	76	125				
	136	76	145				
22/24	17	26	26	30	35	9	6
	22	31	31				
	27	36	36				
	36	45	45				
	46	55	55				
	56	65	65				
	66	75	75				
	76	85	85				
	86	95	95				
	96	105	105				
	116	96	125				
	136	96	145				
	156	96	165				

d <sub>1</sub>	s	l	l <sub>1</sub>	d <sub>3</sub>	d <sub>4</sub>	f	k
30/32	27	36	36	42	47	9	6
	36	45	45				
	46	55	55				
	56	65	65				
	66	75	75				
	76	85	85				
	86	95	95				
	96	105	105				
	116	125	125				
	136	116	145				
	156	116	165				
	176	116	185				
	196	116	205				
40/42	46	58	58	54	60	12	10
	56	68	68				
	66	78	78				
	76	88	88				
	86	98	98				
	96	108	108				
	116	128	128				
	136	136	148				
	156	136	168				
	196	136	208				
	246	136	258				

Ordering Code (example):

Locating guide bush	=	3120.42.
d <sub>1</sub> = 24 mm	=	024.
s = 96 mm	=	096
Order No	=	3120.42.024.096

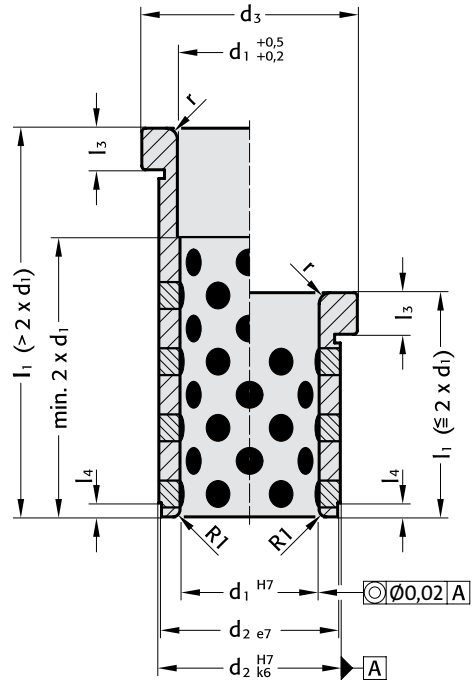


Oilless Guide Bushes with collar  
Bronze with Non-Liquid Lubricant

2087.72.



2087.72.



**Material:**

Bronze with Non-Liquid Lubricant,  
oilless lubricating.

**Note:**

Fit for receiving bore: H 7.



Direction of Motion  
Embedded non-liquid lubricant  
(section)

**Ordering code (Example):**

Guide bush	=	2087.72.
d <sub>1</sub> = 18 mm	=	018.
l <sub>1</sub> = 27 mm	=	027
Order No	=	2087.72.018.027

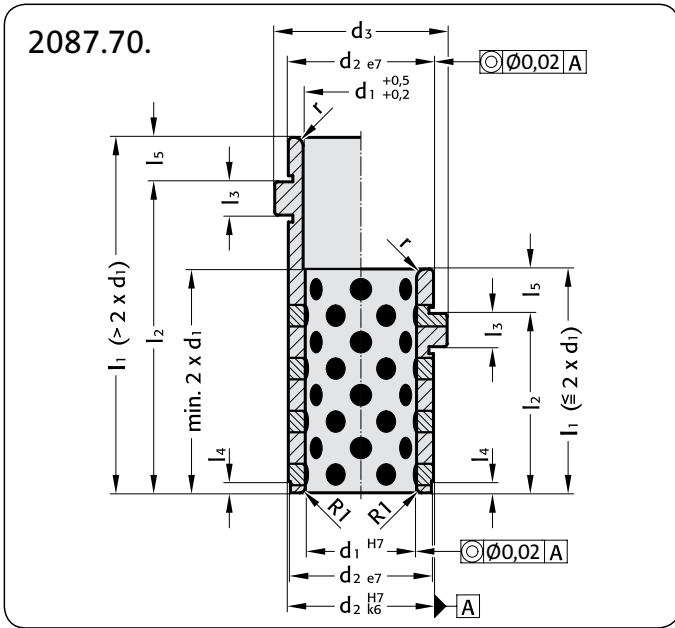
2087.72.

d <sub>1</sub>	9/10	12	14/15	16	18/20	22/24	25	30/32	40/42	50	60
d <sub>2</sub>	14	18	20	22	26	30	32	42	54	66	80
d <sub>3</sub>	16	23	25	27	31	35	38	47	60	72	86
r	0,5	1	1	2	2	3	3	3	3	3	3
l <sub>3</sub>	3	6	6	6	6	6	6	6	10	10	20
l <sub>4</sub>	1,5	2	2	2	2	3	3	4	5	5	5
l <sub>1</sub>											
12	●										
17	●	●	●	●	●	●					
22	●	●	●	●	●	●					
27	●	●	●	●	●	●		●			
36	●	●	●	●	●	●		●			
46	●	●	●	●	●	●	●	●	●		
56	●	●	●	●	●	●	●	●	●	●	
66					●	●	●	●	●		
76					●	●	●	●	●	●	
86						●	●	●	●	●	●
96						●		●	●	●	●
116								●	●	●	●
136									●	●	●
156									●	●	●
196										●	●

# FIBRO

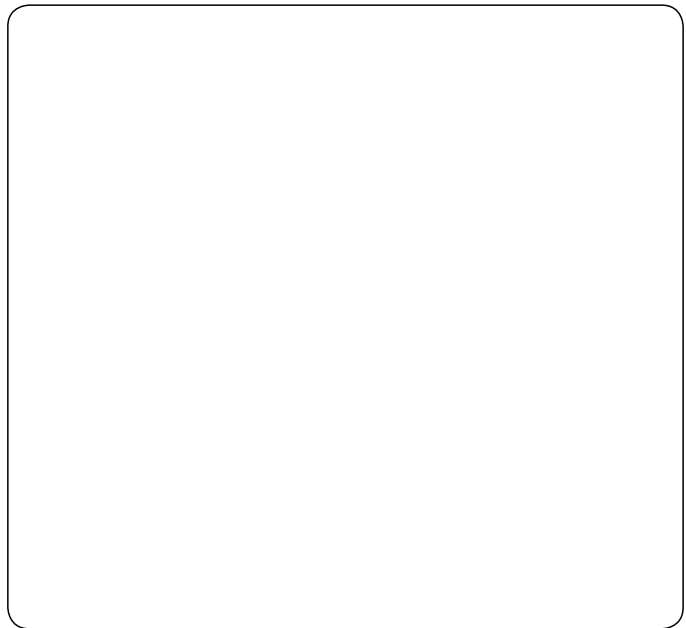
2087.70.

## Oilless Guide Bushes with collar Bronze with Non-Liquid Lubricant



2087.70.

d <sub>1</sub>	9	10	14	15	18	20	22	24	30	32	40	42
d <sub>2</sub>		14		20		26		30		42		54
d <sub>3</sub>		16		25		31		35		47		60
l <sub>3</sub>		3		6		6		6		6		10
l <sub>4</sub>		1,5		2		2		3		4		5
l <sub>5</sub>		3		6		8		8		8		12
r		0,5		1		2		3		3		3
l <sub>1</sub>	l <sub>2</sub>											
15	12	•										
20	17	•										
23	17		•									
25	17			•								
25	22	•										
28	22			•								
30	22				•							
30	27	•										
33	27			•								
35	27				•							
39	36	•										
42	36			•								
44	36				•							
49	46	•										
52	46			•								
54	46				•							
58	46											•
59	56	•										
62	56			•								
64	56				•							
68	56					•						
69	66	•										
72	66			•								
74	66				•							
78	66					•						
82	76			•								
84	76				•							
88	76					•						
92	86			•								
94	86				•							
98	86					•						
104	96				•							
108	96					•						
124	116				•							
128	116					•						
144	136						•					
148	136							•				
164	156								•			
168	156									•		
208	196										•	



**Material:**  
Bronze with Non-Liquid Lubricant, oilless lubricating.

**Note:**  
Fit for receiving bore: H7.

↑ Direction of Motion  
↓ Embedded non-liquid lubricant (section)

**Ordering Code (example):**

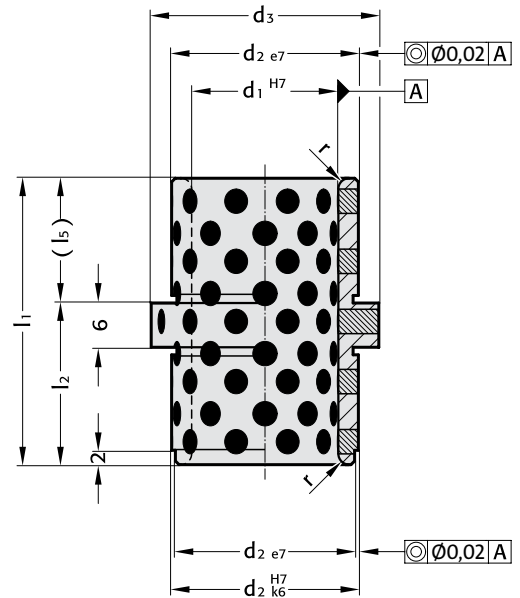
Guide bush	=	2087.70.
d <sub>1</sub> = 18 mm	=	018.
l <sub>2</sub> = 27 mm	=	027
Order No	=	2087.70.018.027

**Oilless Guide Bushes with collar  
Bronze with Non-Liquid Lubricant**

2087.71.



2087.71.



**Material:**

Bronze with Non-Liquid Lubricant,  
oilless lubricating.

**Note:**

Fit for receiving bore: H7.



Direction of Motion  
Embedded non-liquid lubricant  
(section)

**Ordering Code (example):**

Guide bush = 2087.71.  
 $d_1 = 20 \text{ mm}$  = 020.  
 $l_2 = 22 \text{ mm}$  = 022  
 Order No = 2087.71.020.022

**2087.71.**

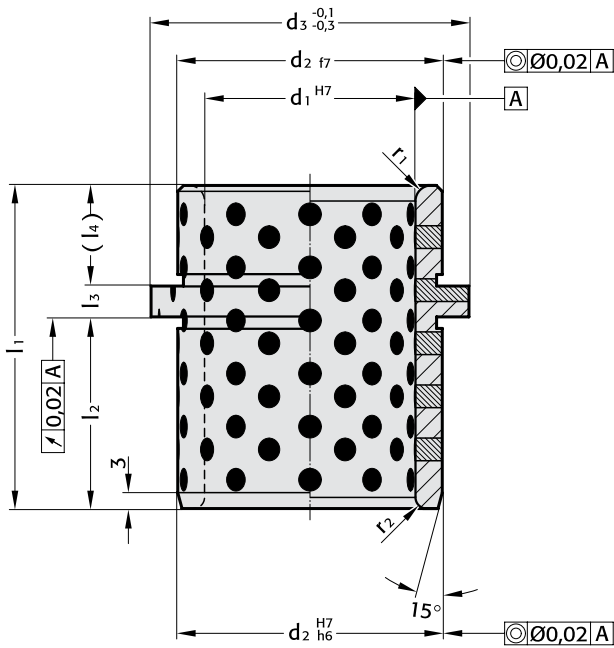
$d_1$	14 15	18 20	22 24	30 32
$d_2$	20	26	30	42
$d_3$	25	31	35	47
$r$	1	1,5	2	2
$l_1$	26	39	49	63
$l_2$	17	22	27	36
$l_3$	9	17	22	27

# FIBRO

2087.73.

## Oilless Guide Bushes with centre collar Bronze with Non-Liquid Lubricant

2087.73.



### Ordering Code (example):

Guide Bush	=	2087.73.
d <sub>1</sub> = 25 mm	=	025.
l <sub>1</sub> = 43 mm	=	043
Order No	=	2087.73.025.043



### Material:

Bronze with non-liquid lubricant,  
oilless lubricating.

### Note:

Fit for receiving bore: H7.



Direction of Motion  
Embedded non-liquid lubricant  
(section)

2087.73.

d <sub>1</sub>	25	30	40	50	60	63				
d <sub>2</sub>	35	42	50	63	80	80				
d <sub>3</sub>	40	47	60	72	86	90				
r <sub>1</sub>	3	3	4	4	3	4				
r <sub>2</sub>	2	2	2	3	3	3				
l <sub>4</sub>	11,5	11,5	18,5	18,5	24,5	28,5	21,5	31,5	29,5	37,5
l <sub>3</sub>	7,5	7,5	6		8		7,5		8	
l <sub>2</sub>	24	24	35,5	39,5	44,5	55,5	49	55,5	62,5	62,5
l <sub>1</sub>	43	43	60	64	77	92	78	95	100	108

**Oilless Guide bushes  
Bronze with Non-Liquid lubricant  
Bronze**

**FIBRO**  
3120.70.  
3120.71.



**Material:**

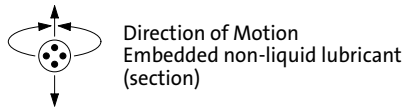
3120.70. Bronze with Non-Liquid lubricant, oilless lubricating  
3120.71. Bronze

**Note:**

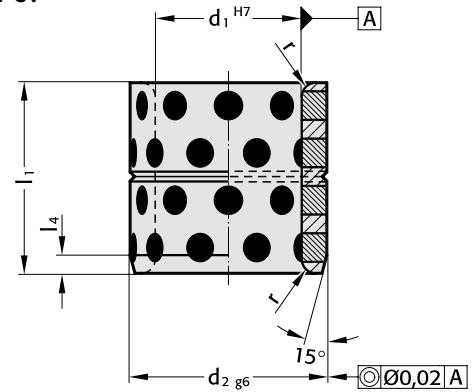
Recommended holding fixture bore H7.  
Bushes can be used radially and axially.

**Fixing:**

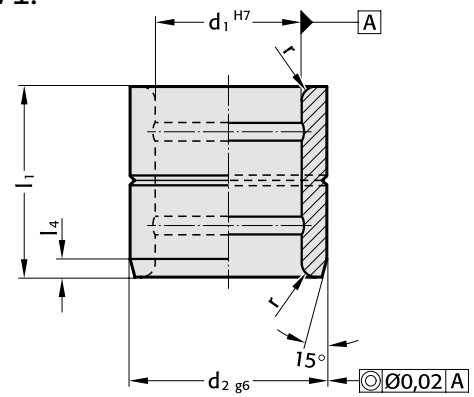
Connecting with adhesive or if needed secure with threaded pin or flat mushroom head screw 2192.61.



3120.70.



3120.71.



**Ordering Code (example):**

Guide bush	=	3120.70.
d1 = 40 mm	=	040.
d2 = 50 mm	=	050
l1 = 80 mm	=	080
Order number	=	3120.70.040.050.080

**Ordering Code (example):**

Guide bush	=	3120.71.
d1 = 40 mm	=	040.
d2 = 50 mm	=	050
l1 = 80 mm	=	080
Order number	=	3120.71.040.050.080

**3120.70. / 3120.71.**

d1	8	10	12	13	14	15	16	18	19	20	24	25	28	30	31,5	32	35	38	40	45
d2	12	14/15	18	19	20	21	22	24	25	26/28/30	32	32/33/35	38	38/40/42	40	42	44/45	48	50/55	55/56/60
r	0,5	0,5	0,5	0,5	0,5	0,75	0,75	0,75	0,75	0,75	0,75	0,75	0,75	0,75	0,75	0,75	0,75	1,5	1,5	1,5
l4	2	2	2	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4	4
l1	8	●	●/-																	
10	●	●/●	●	●	●	●	●													
12	●	●/-	●	●	●	●	●													
15	●	●/-	●	●	●	●	●	●		-/●/-										
16			●	●	●	●	●	●		-/●/●		-/●/●								
20		●/-	●	●	●	●	●	●		-/●/●		-/●/●		●/●/-			-/●		●/-	
25			●	●	●	●	●	●		-/●/●		-/●/●		●/●/-			●/●		●/●	
30			●	●	●	●	●	●		-/●/●		-/●/●	●	●/●/-	●	●	●/●	●	●/●	●/●/●
35										-/●/●		-/●/●		●/●/-			●/●		●/●	●/●/●
37									●	-/●/●										
40							●	●		●/●/●		-/●/●	●	●/●/-	●	●	●/●	●	●/●	●/●/●
47											●	-/●/●								
50										-/●/●		●/●/●		●/●/-			●/●		●/●	●/●/●
60												-/●/●		●/●/●		●	●/●		●/●	●/●/●
70																			●/-	-/-/●
77																			●	●/-
80																			●/-	-/-/●

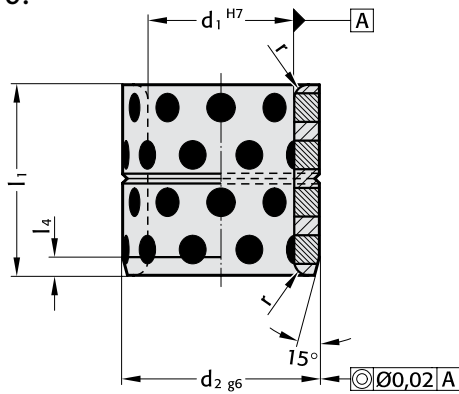


# FIBRO

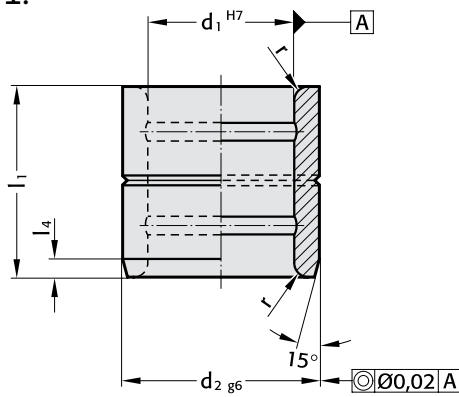
3120.70.  
3120.71.

## Guide bushes Bronze with Non-Liquid lubricant Bronze

3120.70.



3120.71.



### Ordering Code (example):

Guide bush	=	3120.70.
d <sub>1</sub> = 40 mm	=	040.
d <sub>2</sub> = 50 mm	=	050
l <sub>1</sub> = 80 mm	=	080
Order number	=	3120.70.040.050.080

### Ordering Code (example):

Guide bush	=	3120.71.
d <sub>1</sub> = 40 mm	=	040.
d <sub>2</sub> = 50 mm	=	050
l <sub>1</sub> = 80 mm	=	080
Order number	=	3120.71.040.050.080



### Material:

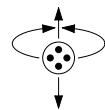
3120.70. Bronze with Non-Liquid lubricant, low maintenance.  
3120.71. Bronze

### Note:

Recommended holding fixture bore H7.  
Bushes can be used radially and axially.

### Fixing:

Connecting with adhesive or if needed secure with threaded pin or flat mushroom head screw 2192.61.



Direction of Motion  
Embedded non-liquid lubricant  
(section)

### 3120.70. / 3120.71.

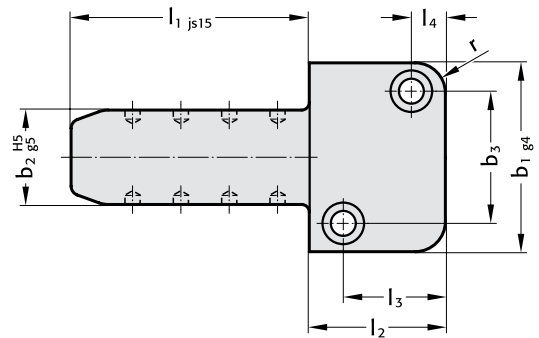
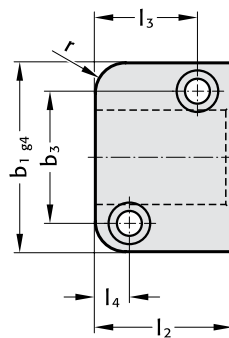
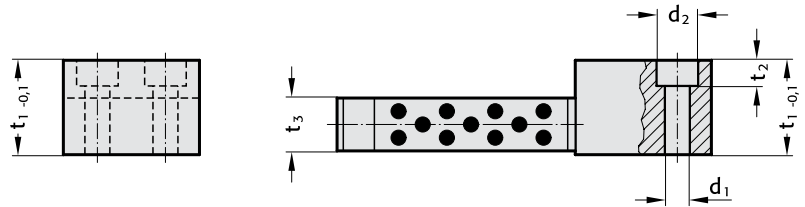
d <sub>1</sub>	50	55	60	63	65	70	75	80	85	90	100	110	120	125	130	140	150	160
d <sub>2</sub>	60/62/65	70	74/75	75	80	85/90	90/95	96/100	100	110	120	130	140	145	150	160	170	180
r	1,5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
l <sub>4</sub>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
l <sub>1</sub> 30	●/●/●		●/●															
35	●/●/—		●/●			●/—												
37																		
40	●/●/●	●	●/●			●/—		●/●										
47																		
50	●/●/●	●	●/●		●	●/●		●/●										
60	●/●/●	●	●/●	●	●	●/●	●/●	●/●		●	●							
70	●/●/●	●	●/●	●	●	●/●	●/●	●/●		●	●							
77																		
80	●/—/●		●/●	●	●	●/●	●/●	●/●	●	●	●	●	●					
95	●/—/—																	
100	—/—/●		—/●			●/—	●/●	●/●		●	●	●	●	●	●	●	●	●
120				●				●/●		●	●	●	●	●	●	●	●	●
130															●			
140								—/●			●		●			●		
150																	●	●

Rectangular Guides

3131.40.



3131.40.



Material:

Steel with solid lubricant surface: case hardened 580+40 HV 30

Steel surface: case hardened 700+60 HV 30

Operating temperature up to 200°C.

3131.40.

Order No	l <sub>2</sub>	b <sub>2</sub>	l <sub>1</sub>	r	t <sub>3</sub>	t <sub>2</sub>	t <sub>1</sub>	d <sub>2</sub>	d <sub>1</sub>	l <sub>4</sub>	l <sub>3</sub>	b <sub>3</sub>	b <sub>1</sub>
3131.40.022.016.020	22	16	20	6	11	6,8	20	11	6,6	7	15	26	40
.040			40										
3131.40.027.020.025	27	20	25	6	13	6,8	22	11	6,6	7	19	31	45
.025			50										
3131.40.036.025.032	36	25	32	8	14	6,8	25	11	6,6	9	27	35	50
.063			63										
3131.40.046.032.040	46	32	40	8	19	9	32	15	9	11	35	45	63
.080			80										
3131.40.056.040.050	56	40	50	10	22	11	36	18	11	15	40	60	85
.100			100										
3131.40.066.050.056	66	50	56	10	24	13	40	20	14	18	48	74	100
.112			112										

Ordering Code (example):

Rectangular guide = 3131.40.

l<sub>2</sub> = 22 mm = 022.

b<sub>2</sub> = 16 mm = 016.

l<sub>1</sub> = 40 mm = 040

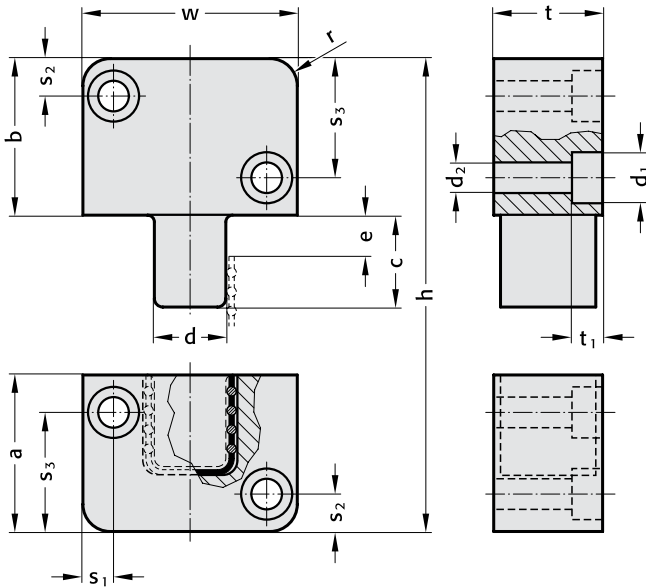
Order no. = 3131.40.022.016.040

# FIBRO

3131.80.

## Rectangular Guides with Rollers

3131.80.



### Material:

Steel  
 Hardness: ~56-58 HRC  
 Surface: burnished

### Description:

The rectangular guides with rollers guarantee the greatest precision when their mould is moved together. The rectangular guides must always be installed in the outer area of the mould plates to ensure problem-free functionality.

The maximum operating temperature is 150°C.

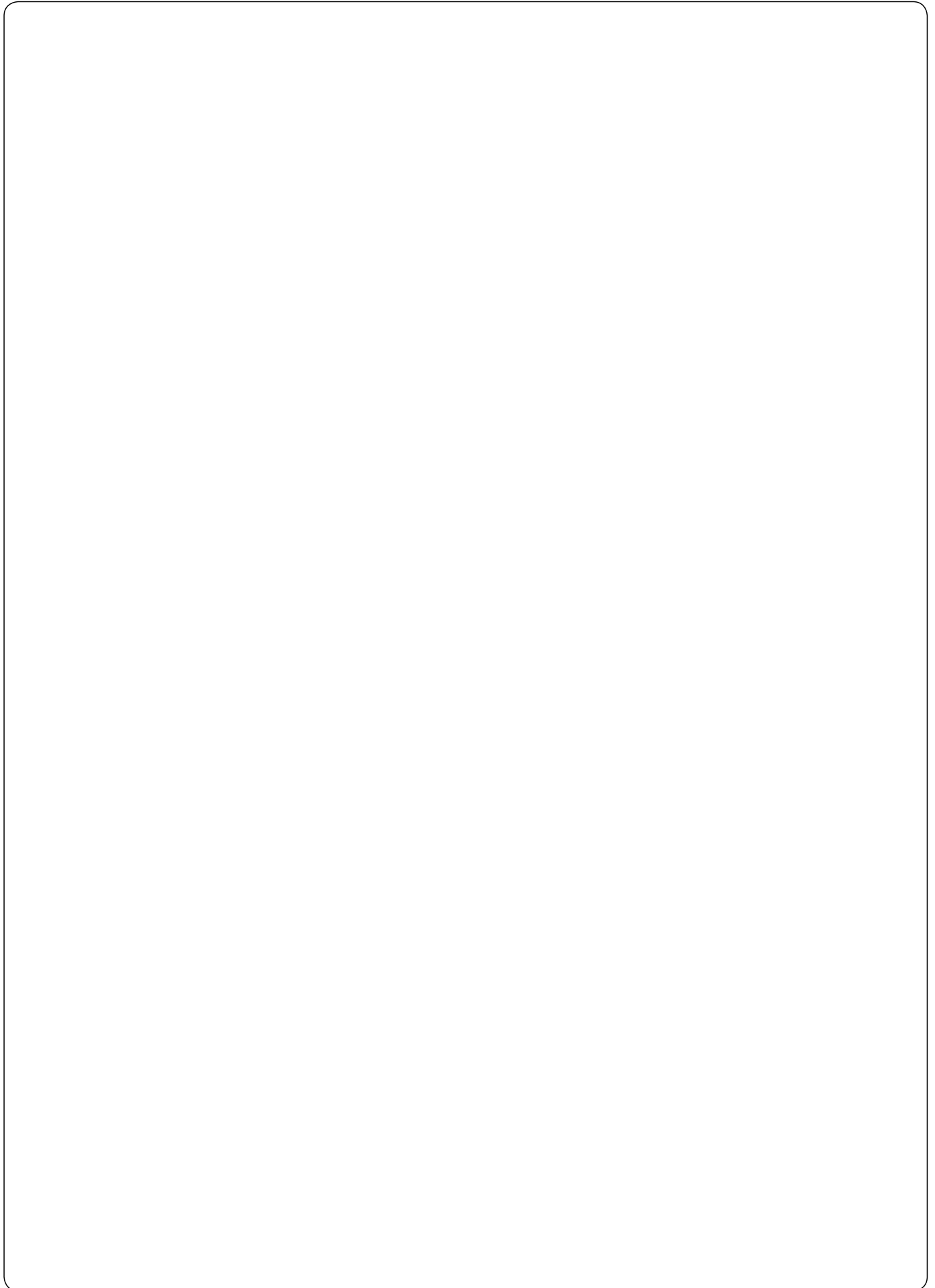
Advantages: no play or friction, low maintenance and no lubrication

3131.80.

Order No	t	w	a	b	c	d	e	h	r	s <sub>1</sub>	s <sub>2</sub>	s <sub>3</sub>	d <sub>1</sub>	d <sub>2</sub>	t <sub>1</sub>
3131.80.032.063	32	63	46	46	27	21	12,1	92	8	9	11	35	15	9	9
3131.80.040.100	40	100	66	66	36	33	19,5	132	10	13	18	48	20	13,5	13

### Ordering Code (example):

Rectangular guide with rollers = 3131.80.  
 t = 32 mm = 032.  
 w = 63 mm = 063  
 Order number = 3131.80.032.063

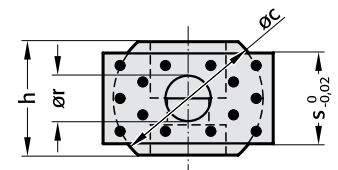
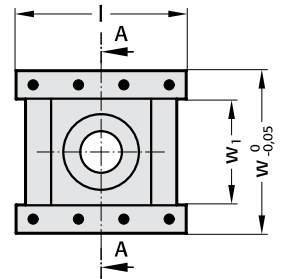
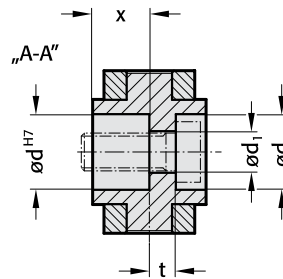


# Forming / Demoulding

Sliders for transverse bolt guides



2967.11.□□.00.1 Standard



Ordering Code (example):

Profiled guide	=	2967.11.
$\varnothing d$	= 8 mm	= 08.
Slide angle = 0°	=	00.
Standard	= 1	= 1
Order number	=	2967.11.08.00.1

**Material:**

Guide strips: Bronze with non-liquid lubrication  
 bolt fixture: C45, burnished

**Description:**

Profiled guide for individual assembly of inclined bolt guides, low maintenance.

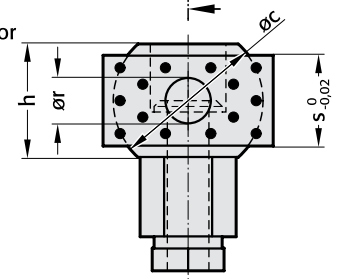
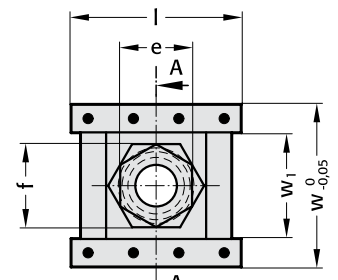
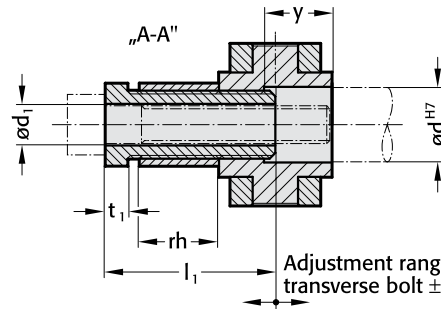
Bolt fixture with rotating bearing for work angle up to max. 30°.

Model 2967.11.□□.00.2 with adjusting mechanism for inclined bolts.

Order socket head screws ISO 4762 separately.

Delivery includes a locking pin as a guide piece anti-twist protection of guide pillar.

2967.11.□□.00.2 with adjusting screw



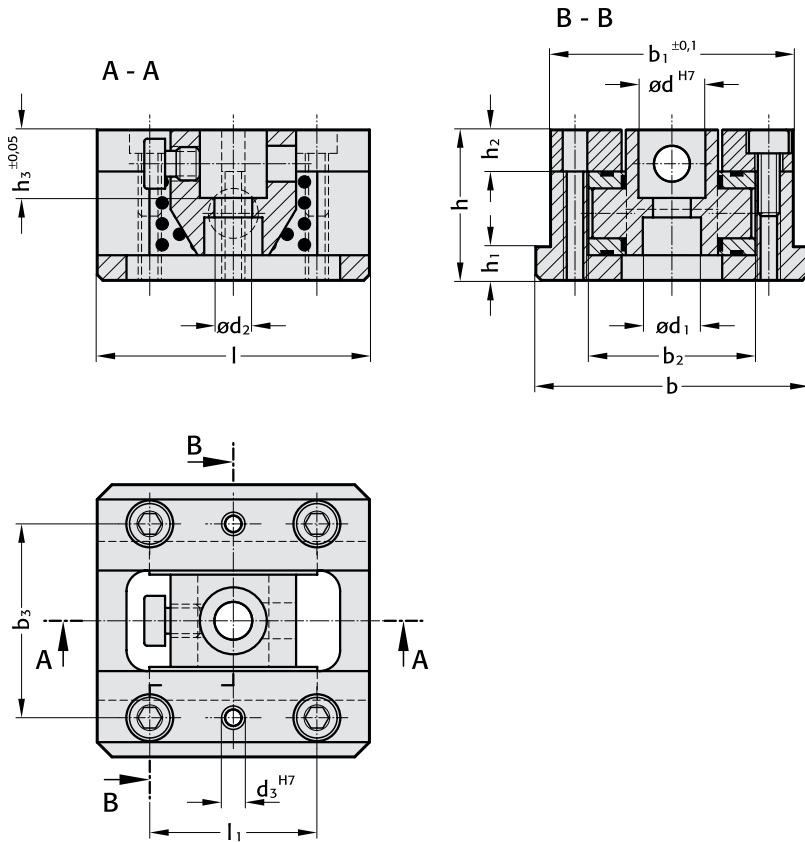
Ordering Code (example):

Profiled guide	=	2967.11.
$\varnothing d$	= 16 mm	= .16
Slide angle = 0°	=	.00
with adjusting screw	= 2	= .2
Order number	=	2967.11.16.00.2

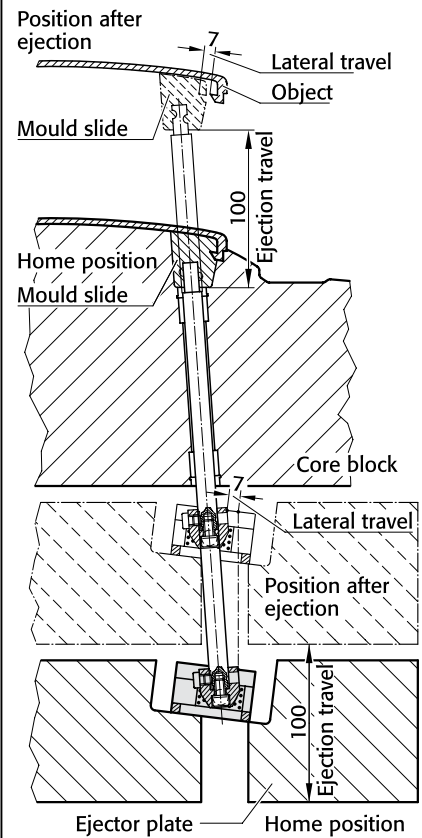
2967.11.□□.00.1 / 2967.11.□□.00.2

Order No	$\varnothing d$	w	w <sub>1</sub>	l	l <sub>1</sub>	s	h	$\varnothing c$	$\varnothing r$	d <sub>1</sub>	d <sub>2</sub>	t	t <sub>1</sub>	e	f	rh	x	y	Socket head screw
2967.11.08.00.1	8	24	12	25	-	13	16	20	7	5	8	3,5	-	-	-	-	8	-	M 4x10
2967.11.10.00.1	10	28	14	32	-	17	16	20	8	6	10	3	-	-	-	-	8	-	M 5x12
2967.11.12.00.1	12	31	17	40	-	20	20	25	10	7	12	3,5	-	-	-	-	10	-	M 6x16
2967.11.16.00.1	16	36	21	45	-	24	24	30	14	9	16	5	-	-	-	-	12	-	M 8x20
2967.11.20.00.1	20	43	28	45	-	24	30	40	14	11	20	7	-	-	-	-	15	-	M10x25
2967.11.25.00.1	25	48	33	50	-	26	35	45	14	14	25	8	-	-	-	-	17,5	-	M12x30
2967.11.30.00.1	30	55	38	60	-	30	38	50	16	14	25	7,5	-	-	-	-	19	-	M12x30
2967.11.35.00.1	35	64	44	70	-	34	40	55	18	14	25	8	-	-	-	-	20	-	M12x30
2967.11.40.00.1	40	72	50	80	-	38	43	60	20	18	32	8	-	-	-	-	21,5	-	M16x35
2967.11.16.00.2	16	36	21	45	42	24	24	30	14	9	-	-	6	14	17	21	12	15	M 8x60
2967.11.20.00.2	20	43	28	45	45	24	30	40	13	11	-	-	6	19	22	21	15	18,5	M10x60
2967.11.25.00.2	25	48	33	50	49	26	35	45	16	13	-	-	7	22	27	21,5	17,5	20,5	M12x70
2967.11.30.00.2	30	55	38	60	55	30	38	50	18	13	-	-	7	27	32	26	19	22	M12x70
2967.11.35.00.2	35	64	44	70	58	34	40	55	18	14	-	-	7	32	36	28	20	23	M12x80
2967.11.40.00.2	40	72	50	80	60,5	38	43	60	20	17	-	-	7	38	41	29	21,5	24,5	M16x90

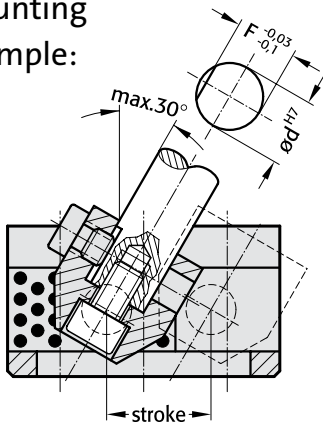
2967.10.



**Application examples:**



**Mounting example:**



**Ordering Code (example):**

Bolt Guide = 2967.10.  
 $\varnothing = 8 \text{ mm}$  = 08.  
 Stroke = 10 mm = 010  
 Order No = 2967.10.08.010

2967.10.

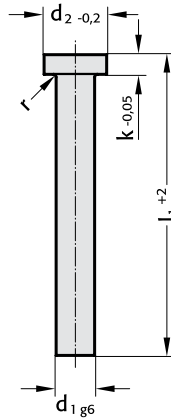
Order No	$\varnothing$	Stroke	b	l	h	b <sub>1</sub>	b <sub>2</sub>	b <sub>3</sub>	l <sub>1</sub>	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	$\varnothing_1$	$\varnothing_2$	$\varnothing_3$	F
2967.10.08.010	8	10	33	32	22	30	19	24	20	5	7	8	8	4	3	7
10.018	10	18	45	45	27	40	25	32	30		8	10	10	5	4	9
12.020	12	20	57	50	32	51	31	39	35	7	10	12	11	7	6	11
16.025	16	25	65	65	36	58	38	46	40	8		16	14	9		14,5
20.030	20	30	80	80	42	72	44	56	55	11	12	20	17	11	8	18
25.035	25	35	93	90	50	85	52	66	65	15	15	25	20	14	10	22,5
30.040	30	40	101	100	55	93	60	74	70			30				27
35.045	35	45	120	120	62	110	70	85	80		18	35				32
40.050	40	50	130	135	70	120	80	95	90			40	26	17,5		36
45.055	45	55	140	150	80	130	90	105	110		20	45				40

Hardened Ejector Pins -  
DIN ISO 6751

237.1.



237.1.



Description of FIBRO materials for tool and die components see pages E 10–E 11.

Material:

WS  
Order No: 237.1.  
Hardness: Shaft 60±2 HRC  
Head 45±5 HRC

Execution:

DIN ISO 6751  
Shank hardened and precision ground.  
Head hot upset-forged.

Ordering Code (example):

Ejector Pin	=	237.
Material WS	=	1.
d1 = Ø 4,0 mm	=	0400.
l1 = 200 mm	=	200
Order No	=	237.1.0400.200

237.1.

d <sub>1</sub>	d <sub>2</sub>	k	r	40	63	80	100	125	160	200	250	315	l <sub>1</sub>				400	500	630	800	1000	1250	1600
1	2,5	1,2	0,2	●	●	●	●	●	●	●													
1,1				●	●	●	●	●	●	●													
1,2				●	●	●	●	●	●	●													
1,3	3	1,5		●	●	●	●	●	●	●													
1,4				●	●	●	●	●	●	●													
1,5				●	●	●	●	●	●	●													
1,6				●	●	●	●	●	●	●													
1,7				●	●	●	●	●	●	●													
1,8				●	●	●	●	●	●	●													
1,9				●	●	●	●	●	●	●													
2	4	2		●	●	●	●	●	●	●	●	●											
2,2							●	●	●	●	●	●	●										
2,5	5		0,3	●	●	●	●	●	●	●	●	●	●										
2,7							●	●	●	●	●	●	●										
3	6	3		●	●	●	●	●	●	●	●	●	●	●									
3,2							●	●	●	●	●	●	●	●									
3,5	7						●	●	●	●	●	●	●	●									
3,7							●	●	●	●	●	●	●	●									
4	8			●	●	●	●	●	●	●	●	●	●	●	●								
4,2							●	●	●	●	●	●	●	●	●								
4,5							●	●	●	●	●	●	●	●	●								
4,7							●	●	●	●	●	●	●	●	●								
5	10			●	●	●	●	●	●	●	●	●	●	●	●	●							
5,2							●	●	●	●	●	●	●	●	●	●							
5,5							●	●	●	●	●	●	●	●	●	●							
6	12	5	0,5	●	●	●	●	●	●	●	●	●	●	●	●	●							
6,2							●	●	●	●	●	●	●	●	●	●							
6,5							●	●	●	●	●	●	●	●	●	●							
7							●	●	●	●	●	●	●	●	●	●							
8	14				●	●	●	●	●	●	●	●	●	●	●	●	●						
8,2							●	●	●	●	●	●	●	●	●	●	●						
8,5							●	●	●	●	●	●	●	●	●	●	●						
9							●	●	●	●	●	●	●	●	●	●	●						
10	16					●	●	●	●	●	●	●	●	●	●	●	●						
10,2							●	●	●	●	●	●	●	●	●	●	●						
10,5							●	●	●	●	●	●	●	●	●	●	●						
11							●	●	●	●	●	●	●	●	●	●	●						
12	18	7	0,8			●	●	●	●	●	●	●	●	●	●	●	●						
12,2							●	●	●	●	●	●	●	●	●	●	●						
12,5							●	●	●	●	●	●	●	●	●	●	●						
14	22					●	●	●	●	●	●	●	●	●	●	●	●						
16							●	●	●	●	●	●	●	●	●	●	●						
18	24						●	●	●	●	●	●	●	●	●	●	●						
20	26	8	1,0				●	●	●	●	●	●	●	●	●	●	●						



# FIBRO

237.8.

## Hotwork Precision Ejector Pins - Nitrided DIN ISO 6751

### Material:

NWA  
 Order No: 237.8  
 Hardness: Shaft\*  $\geq 950$  HV 0,3  
 Head  $45 \pm 5$  HRC  
 Tensile Strength (core)  $> 1400$  N/mm<sup>2</sup>

### Execution:

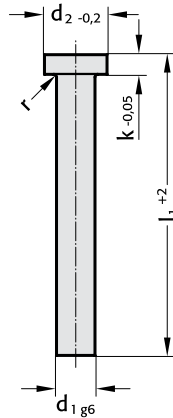
DIN ISO 6751  
 Shank nitrided and precision ground.  
 Head hot upset-forged.

\* Owing to thinness of nitrided skin, hardness testing on shank restricted to Vickers only. Test load = 3 N max.

### Ordering Code (example):

Ejector Pin	= 237.
Material NWA	= 8.
$d_1 = \varnothing 2,50$ mm	= 0250.
$l_1 = 160$ mm	= 160
Order No	= 237.8.0250.160

237.8.



Description of FIBRO materials for tool and die components see pages E 10–E 11.

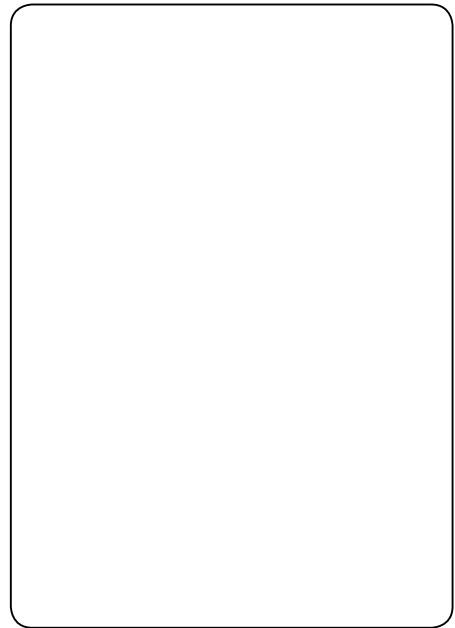
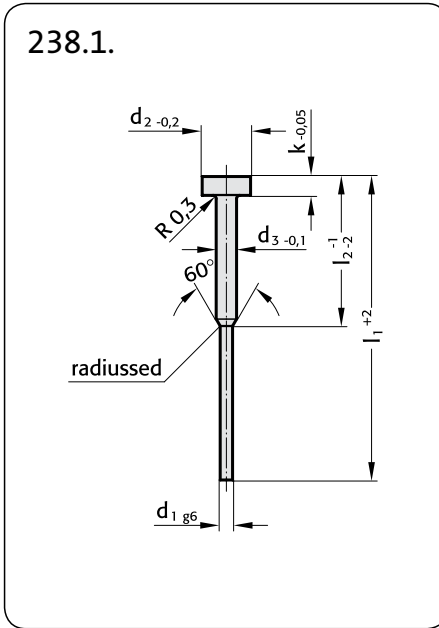
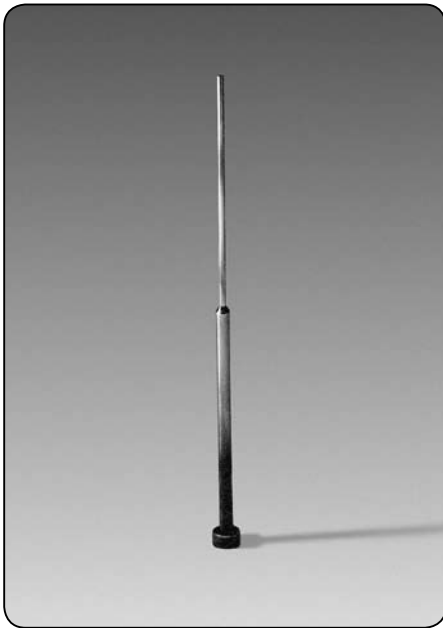


237.8.

$d_1$	$d_2$	k	r	100	125	160	200	250	$l_1$	400	500	630	800	1000
1,5	3	1,5	0,2	●	●	●	●		315					
2	4	2		●	●	●	●	●						
2,2				●	●	●	●							
2,4	5	2		●	●	●	●	●						
2,5			0,3	●	●	●	●	●						
2,7				●	●	●	●							
2,9				●	●	●	●	●						
3	6	3		●	●	●	●	●		●	●			
3,2				●	●	●	●	●		●				
3,4				●	●	●	●	●						
3,5	7			●	●	●	●	●		●				
3,7				●	●	●	●	●						
3,9				●	●	●	●	●						
4	8			●	●	●	●	●		●	●			
4,2				●	●	●	●	●		●				
4,4				●	●	●	●	●						
4,5				●	●	●	●	●		●				
4,7				●	●	●	●	●						
4,9				●	●	●	●	●						
5	10			●	●	●	●	●		●	●	●	●	
5,2				●	●	●	●	●		●	●			
5,4				●	●	●	●	●						
5,5				●	●	●	●	●		●	●			
5,7				●	●	●	●	●						
5,9				●	●	●	●	●						
6	12	5	0,5	●	●	●	●	●		●	●	●	●	
6,2				●	●	●	●	●		●	●	●		
6,5				●	●	●	●	●		●	●			
6,7				●	●	●	●	●						
6,9				●	●	●	●	●						
7				●	●	●	●	●		●	●	●		
7,2				●	●	●	●	●						
7,8				●	●	●	●	●						
8	14			●	●	●	●	●		●	●	●	●	●
8,2				●	●	●	●	●		●	●	●	●	
8,4				●	●	●	●	●						
8,5				●	●	●	●	●		●	●	●		
9				●	●	●	●	●		●	●	●		
9,7				●	●	●	●	●						
10	16			●	●	●	●	●		●	●	●	●	●
10,2				●	●	●	●	●		●	●	●	●	
10,5				●	●	●	●	●		●	●	●	●	
11				●	●	●	●	●		●	●	●		
12	18	7	0,8	●	●	●	●	●		●	●	●	●	●
12,2				●	●	●	●	●		●	●	●	●	
12,5				●	●	●	●	●		●	●	●	●	
14	22			●	●	●	●	●		●	●	●	●	●
16				●	●	●	●	●		●	●	●	●	●
18	24			●	●	●	●	●		●	●	●	●	●
20	26	8	1,0		●	●	●	●		●	●	●	●	●
25	32	10			●	●	●	●		●	●	●	●	●
32	40				●	●	●	●		●	●	●	●	●

Hardened Ejector Pins  
DIN ISO 8694

238.1.



Execution:

DIN ISO 8694,  
Shank hardened and precision ground.  
Head hot upset-forged.

Material:

WS  
Order No: 238.1.  
Hardness: Shaft 60±2 HRC  
Head 45±5 HRC

Ordering Code (example):

Ejector Pin	=	238.
Material WS	=	1.
d <sub>1</sub> = Ø 1,5 mm	=	0150.
l <sub>1</sub> = 125 mm	=	125
Order No	=	238.1.0150.125

Description of FIBRO materials for tool and die components  
see pages E 10–E 11.

238.1.

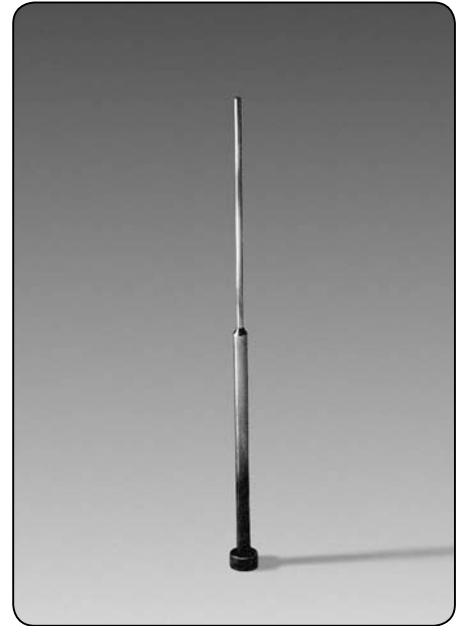
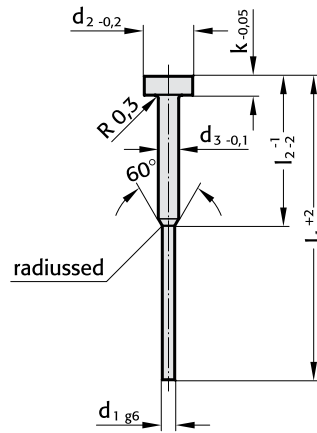
d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	k	l <sub>1</sub> l <sub>2</sub>	63	80	100	125	160	200
					30	32	50	50	63	80
0,8	4	2	2		●	●	●	●	●	
0,9					●	●	●	●	●	
1					●	●	●	●	●	●
1,1					●	●	●	●	●	●
1,2					●	●	●	●	●	●
1,3					●	●	●	●	●	●
1,4					●	●	●	●	●	●
1,5	6	3	3		●	●	●	●	●	●
1,6						●	●	●	●	●
1,7						●	●	●	●	●
1,8						●	●	●	●	●
1,9						●	●	●	●	●
2						●	●	●	●	●
2,1						●	●	●	●	●
2,2							●	●	●	●
2,3							●	●	●	●
2,4							●	●	●	●
2,5							●	●	●	●

**FIBRO**

238.8.

**Hotwork Precision Ejector Pins  
Nitrided DIN ISO 8694**

238.8.



**Material:**

NWA  
 Order No: 238.8.  
 Hardness: Shaft\*  $\cong 950$  HV 0,3  
 Head  $45 \pm 5$  HRC  
 Tensile Strength (core)  $>1400$  N/mm<sup>2</sup>

\* Owing to thinness of nitrided skin, hardness testing on shank restricted to Vickers only. Test load = 3 N max.

Description of FIBRO materials for tool and die components see pages E 10–E 11.

**Execution:**

DIN ISO 8694,  
 Shank precision ground, nitrided.  
 Head hot upset-forged.

238.8.

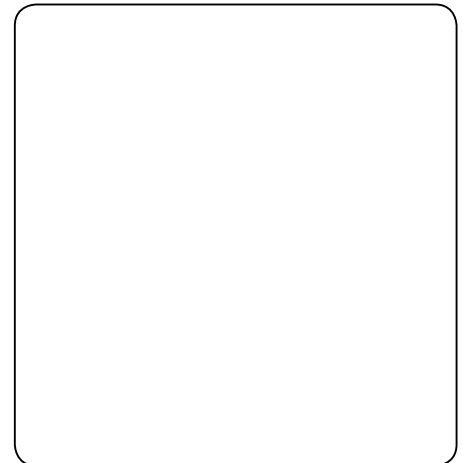
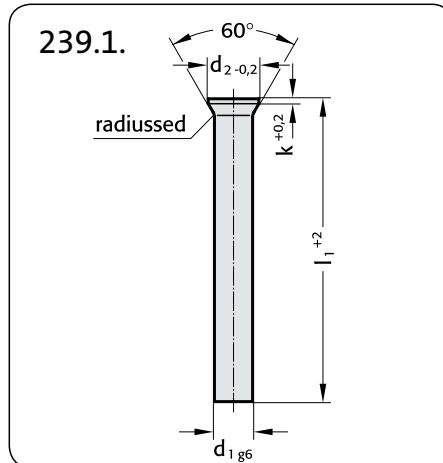
$d_1$	$d_2$	$d_3$	k	$l_1$ $l_2$	63 30	80 32	100 50	125 50	160 63	200 80
0,8	4	2	2		●	●	●	●	●	
0,9					●	●	●	●	●	
1					●	●	●	●	●	
1,1					●	●	●	●	●	
1,2					●	●	●	●	●	
1,3					●	●	●	●	●	
1,4					●	●	●	●	●	
1,5	6	3	3		●	●	●	●	●	●
1,6						●	●	●	●	●
1,7						●	●	●	●	●
1,8						●	●	●	●	●
1,9						●	●	●	●	●
2						●	●	●	●	●
2,2							●	●	●	●
2,5							●	●	●	●

**Ordering Code (example):**

Ejector Pin = 238.  
 Material NWA = 8.  
 $d_1 = \varnothing 1,5$  mm = 0150.  
 $l_1 = 125$  mm = 125  
 Order No = 238.8.0150.125

Hardened Ejector Pins - Conical Head  
similar to DIN 1530 Shape D

239.1.



Execution:

similar to DIN 1530 Shape D,  
Shank hardened and precision ground.  
Head hot upset-forged.

Material:

WS  
Order No: 239.1.  
Hardness: Shaft 60±2 HRC  
Head 45±5 HRC

Description of FIBRO materials for tool and die components  
see pages E 10–E 11.

239.1.

d <sub>1</sub>	d <sub>2</sub>	k	l <sub>1</sub>								
			40	60	71	80	100	125	160	200	250
0,8	1,4	0,5					●	●	●	●	
0,9	1,6						●	●	●	●	
1	1,8		●	●	●	●	●	●	●	●	
1,1					●		●	●	●	●	
1,2	2				●		●	●	●	●	
1,25							●	●	●	●	
1,3					●		●	●	●	●	
1,4	2,2				●		●	●	●	●	
1,5		●	●	●	●	●	●	●	●	●	
1,6	2,5				●		●	●	●	●	
1,7					●		●	●	●	●	
1,75	2,8				●		●	●	●	●	
1,8					●		●	●	●	●	
1,9					●		●	●	●	●	
2	3		●	●	●	●	●	●	●	●	●
2,1	3,2				●		●	●	●	●	
2,2					●		●	●	●	●	●
2,25							●	●	●	●	
2,3	3,5				●		●	●	●	●	
2,4					●		●	●	●	●	
2,5		●	●	●	●	●	●	●	●	●	●
2,6	4				●		●	●	●	●	
2,7					●		●	●	●	●	●
2,75					●		●	●	●	●	
2,8					●		●	●	●	●	
2,9					●		●	●	●	●	

Ordering Code (example):

Ejector Pin = 239.  
Material WS = 1.  
d<sub>1</sub> = ∅ 1,5 mm = 0150.  
l<sub>1</sub> = 160 mm = 160  
Order No = 239.1.0150.160

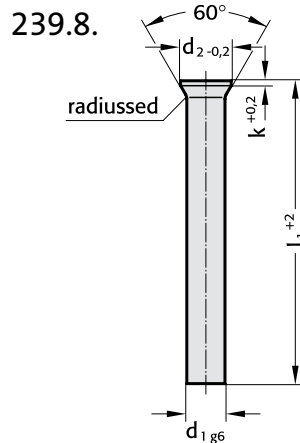
239.1.

d <sub>1</sub>	d <sub>2</sub>	k	l <sub>1</sub>									
			40	60	71	80	100	125	160	200	250	315
3	4,5	0,5	●	●	●	●	●	●	●	●	●	●
3,1					●		●	●	●	●		
3,2					●		●	●	●	●		
3,25					●		●	●	●	●		
3,5	5,0				●	●	●	●	●	●	●	●
3,6					●		●	●	●	●		
3,75							●	●	●	●		
4	5,5		●	●	●	●	●	●	●	●	●	●
4,1					●		●	●	●	●		
4,2					●		●	●	●	●		
4,25							●	●	●	●		
4,5	6				●		●	●	●	●		
4,6					●		●	●	●	●		
5	6,5		●	●	●	●	●	●	●	●	●	●
5,1					●		●	●	●	●		
5,2					●		●	●	●	●		
5,25							●	●	●	●		
5,5	7				●	●	●	●	●	●	●	●
6	8		●	●	●	●	●	●	●	●	●	●
6,2	8	1				●	●	●	●	●	●	●
6,5	9	1				●	●	●	●	●	●	●
7						●	●	●	●	●	●	●
7,5	10					●	●	●	●	●	●	●
8					●		●	●	●	●	●	●
8,2	10						●	●	●	●	●	●
8,5	11					●		●	●	●	●	●
9						●		●	●	●	●	●
10	12					●	●	●	●	●	●	●
12	14						●	●	●	●	●	●
14	16	1,5					●	●	●	●	●	●
16	18							●	●	●	●	●

# FIBRO

239.8.

## Hotwork Precision Ejector Pins Nitrided - similar to DIN 1530 Shape D



### Material:

NWA  
Order No: 239.8.  
Hardness: Shaft\*  $\geq 950$  HV 0,3  
Head 45 $\pm$ 5 HRC  
Tensile Strength (core): >1400 N/mm<sup>2</sup>

\* Owing to thinness of nitrided skin, hardness testing on shank restricted to Vickers only. Test load = 3 N max.

Description of FIBRO materials for tool and die components  
see pages E 10–E 11.

### Execution:

similar to DIN 1530 Shape D.  
Shank precision ground, nitrided.  
Head hot upset-forged.

239.8.

d <sub>1</sub>	d <sub>2</sub>	k	l <sub>1</sub>					
			100	125	160	200	250	315
3	4,5	0,5	●	●	●	●	●	
4	5,5		●	●	●	●	●	●
5	6,5		●	●	●	●	●	●
6	8		●	●	●	●	●	●
8	10	1	●	●	●	●	●	●
10	12		●	●	●	●	●	●
12	14		●	●	●	●	●	●
14	16	1,5			●	●	●	●
16	18				●	●	●	●

### Ordering Code (example):

Ejector Pin = 239.  
Material NWA = 8.  
d<sub>1</sub> =  $\varnothing$  6,0 mm = 0600.  
l<sub>1</sub> = 160 mm = 160  
Order No = 239.8.0600.160

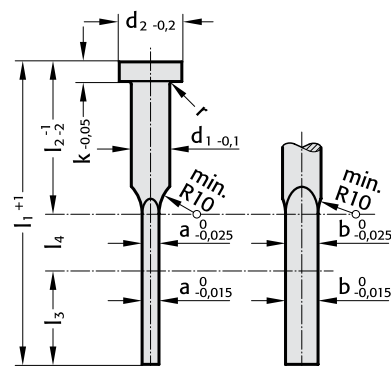
# Blade Precision Ejectors - Hardened similar to DIN ISO 8693

**FIBRO**

263.1.



263.1.



## Execution:

Blade and Shank hardened and precision ground.  
Head hot upset-forged.

## Material:

WS  
Order No: 263.1.  
Hardness: Shaft 60±2 HRC  
Head 45±5 HRC

## Ordering Code (example):

Blade Ejector	=	263.
Material WS	=	1.
a × b = 1,5 × 5,5 mm	=	15.055.
l <sub>1</sub> = 125 mm	=	125
Order No	=	263.1.15.055.125

Description of FIBRO materials for tool and die components  
see pages E 10–E 11.

## 263.1.

d <sub>1</sub>	4	4,2	4,2	4,2	5	5	5	6	6	6	6	8	8	8	10	10	12	12
d <sub>2</sub>	8	8	8	8	10	10	10	12	12	12	12	14	14	14	16	16	18	18
k	3	3	3	3	3	3	3	5	5	5	5	5	5	5	5	5	7	7
r	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,8	0,8
a	1	0,8	1	1,2	1	1,2	1,5	1,0	1,2	1,5	2	1,2	1,5	2	1,5	2	2	2,5
b	3,5	3,8	3,8	3,8	4,5	4,5	4,5	5,5	5,5	5,5	5,5	7,5	7,5	7,5	9,5	9,5	11,5	11,5
l <sub>1</sub>	63	80	100	125	160	200	250	315										
l <sub>2</sub>	30	40	50	60	80	100	125	160										
l <sub>3</sub>	25	30	40	50	50	60	65	70										
l <sub>4</sub>	10	10	10	15	30	40	40	40										

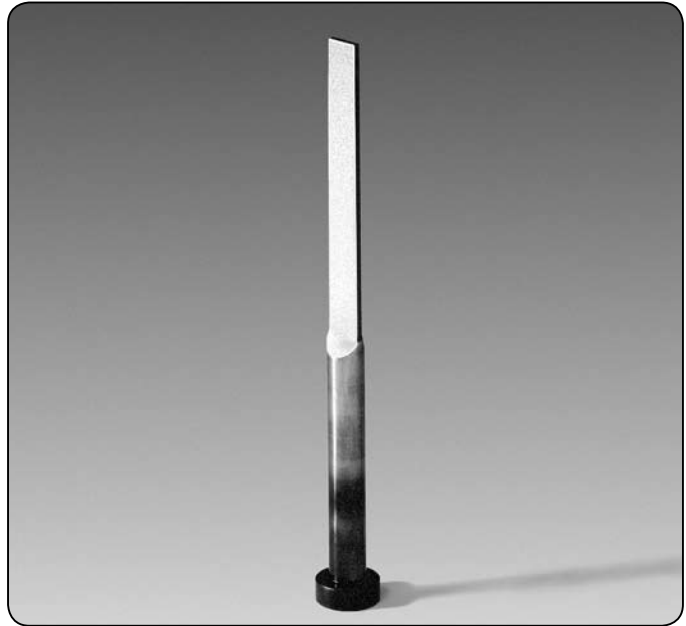
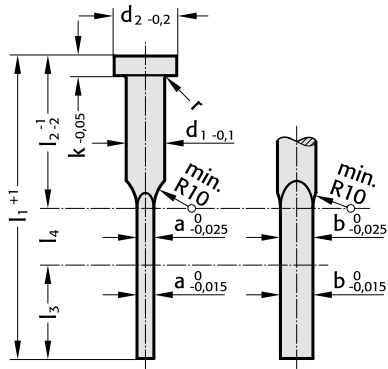
Special dimensions a and b available on request.

**FIBRO**

263.8.

**Hotwork Blade Precision Ejectors - Nitrided**  
similar to DIN ISO 8693

263.8



**Material:**

NWA  
Order No: 263.8.  
Hardness: Shaft\*  $\cong$  950 HV 0,3  
Head 45 $\pm$ 5 HRC  
Tensile Strength (core): > 1400 N/mm<sup>2</sup>

\* Owing to thinness of nitrided skin, hardness testing on shank restricted to Vickers only. Test load = 3 N max.

Description of FIBRO materials for tool and die components see pages E 10–E 11.

**Execution:**

Blade and Shank precision ground and nitrided.  
Head hot upset-forged.

**Ordering Code (example):**

Blade Ejector = 263.  
Material NWA = 8.  
a  $\times$  b = 1,0  $\times$  3,5 mm = 10.035.  
l<sub>1</sub> = 100 mm = 100  
Order No = 263.8.10.035.100

263.8.

d <sub>1</sub>	4	4,2	4,2	4,2	5	5	5	6	6	6	6	8	8	8	10	10	12	12	16	16
d <sub>2</sub>	8	8	8	8	10	10	10	12	12	12	12	14	14	14	16	16	18	18	22	22
k	3	3	3	3	3	3	3	5	5	5	5	5	5	5	5	5	7	7	7	7
r	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,8	0,8	0,8	0,8
a	1	0,8	1	1,2	1	1,2	1,5	1,0	1,2	1,5	2	1,2	1,5	2	1,5	2	2	2,5	2	2,5
b	3,5	3,8	3,8	3,8	4,5	4,5	4,5	5,5	5,5	5,5	5,5	7,5	7,5	7,5	9,5	9,5	11,5	11,5	15,5	15,5
l <sub>1</sub>	63	80	100	125	160	200	250	315	400											
l <sub>2</sub>	30	40	50	60	80	100	125	160	200											
l <sub>3</sub>	25	30	40	50	50	60	65	70	95											
l <sub>4</sub>	10	10	10	15	30	40	65	85	105											

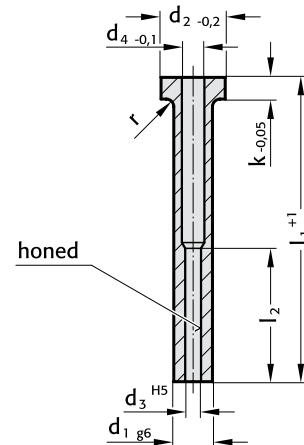
Special dimensions a and b available on request.

Precision-Ejector Sleeves -  
Hardened - DIN ISO 8405

264.1.



264.1.



Execution:

Body hardened and precision ground on O.D.  
Head hot upset-forged,  
Guide bore precision ground and honed.

Material:

WS  
Order No: 264.1.  
Hardness: Shaft 60±2 HRC  
Head 45±5 HRC

Description of FIBRO materials for tool and die components  
see pages E 10–E 11.

264.1.

d <sub>1</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>2</sub>	k	r	l <sub>2</sub>	70	75	80	90	100	125	l <sub>1</sub>	150	175	200	225	250	275
2,5	1,25	1,6	5	2	0,3	20	●		●	●	●	●	150						
3	1,5	1,8	6	3		35		●			●	●	150						
	1,6	1,9						●			●	●	150						
4	2	2,4	8					●			●	●	150						
	2,2							●			●	●	150						
5	2,5	3	10					●			●	●	150						
	2,7					45		●			●	●	150						
	3	3,3						●			●	●	150						●
	3,2	3,5						●			●	●	150						●
6	3,5	4	12	5	0,5			●			●	●	150						●
	3,7							●			●	●	150						●
	4	4,3						●			●	●	150						●
8	4,2	5	14					●			●	●	150						●
	5	5,3						●			●	●	150						●
	5,2	5,5						●			●	●	150						●
10	6	6,3	16					●			●	●	150						●
	6,2	6,5						●			●	●	150						●
12	8	8,3	20	7	0,8			●			●	●	150						●
	8,2	8,5						●			●	●	150						●
14	10	10,3	22					●			●	●	150						●
	10,5	11						●			●	●	150						●
16	12	12,3						●			●	●	150						●
	12,5	13						●			●	●	150						●

Ordering Code (example):

Ejector Sleeve = 264.  
Material WS = 1.  
d<sub>3</sub> = Ø 3,2 mm = 0320.  
l<sub>1</sub> = 150 mm = 150  
Order No = 264.1.0320.150

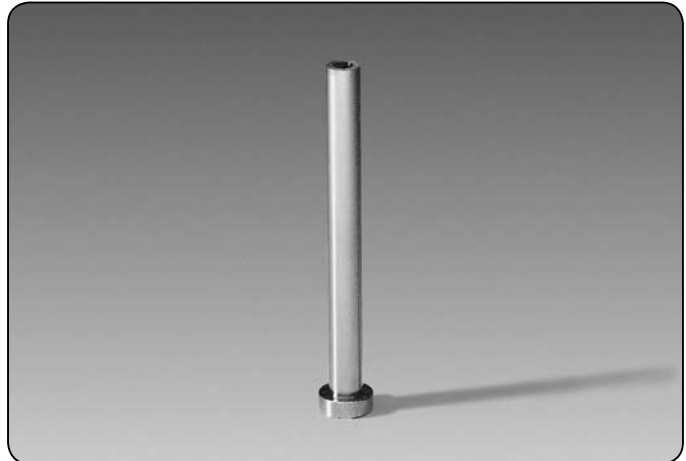
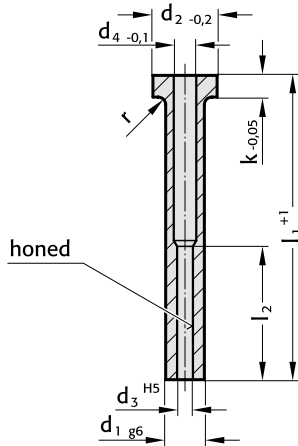


# FIBRO

264.8.

## Hotwork Precision Ejector Sleeves - Nitrided - DIN ISO 8405

264.8.



### Material:

NWA  
 Order No 264.8.  
 Hardness: Shaft\* and Bore  $\geq 950$  HV 0,3  
 Head 45 $\pm$ 5 HRC  
 Tensile Strength (core): >1400 N/mm<sup>2</sup>

\* Owing to thinness of nitrided skin, hardness testing on shank restricted to Vickers only. Test load = 3 N max.

Description of FIBRO materials for tool and die components see pages E 10–E 11.

### Execution:

Body nitrided and precision ground on O.D.  
 Head hot upset-forged.  
 Guide bore precision ground and honed.

264.8.

d <sub>1</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>2</sub>	k	r	l <sub>2</sub>	75	100	125	150	l <sub>1</sub>	175	200	225	250	275
3	1,5	1,8	6	3	0,3	35	●	●	●	●						
	1,6	1,9					●	●	●	●						
4	2	2,4	8				●	●	●	●						
	2,2						●	●	●	●						
5	2,5	3	10				●	●	●	●						
	2,7					45	●	●	●	●						
	3	3,3					●	●	●	●	●					
	3,2	3,5					●	●	●	●	●					
6	3,5	4	12	5	0,5		●	●	●	●						
	3,7						●	●	●	●						
	4	4,3					●	●	●	●	●					
8	4,2	5	14				●	●	●	●						
	5	5,3					●	●	●	●	●					
	5,2	5,5					●	●	●	●	●					
10	6	6,3	16				●	●	●	●						
	6,2	6,5					●	●	●	●	●					
12	8	8,3	20	7	0,8		●	●	●	●						
	8,2	8,5					●	●	●	●	●					
14	10	10,3	22					●	●	●						
	10,2	10,5						●	●	●	●					
16	12	12,3						●	●	●	●					

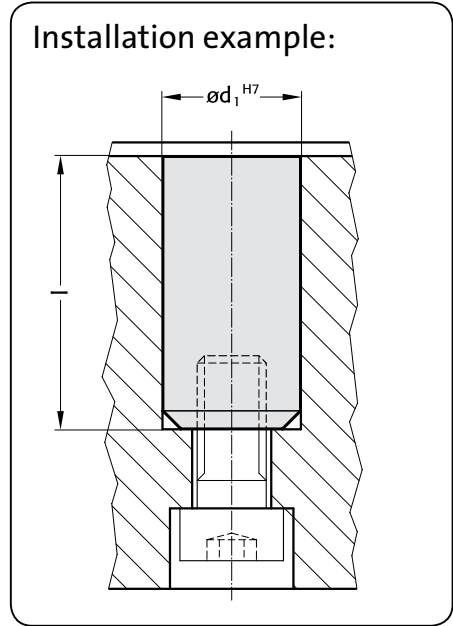
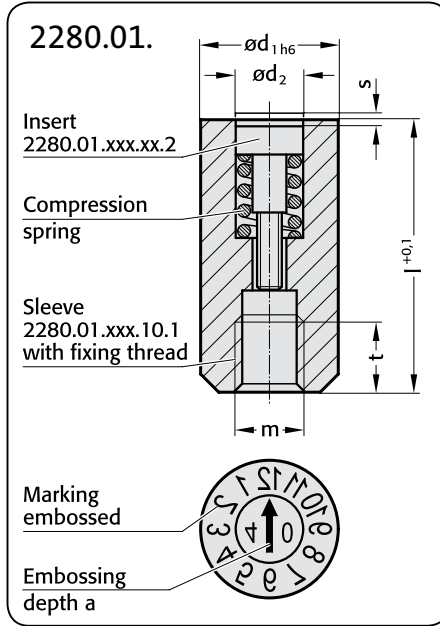
### Ordering Code (example):

Ejector Sleeve, nitrided = 264.  
 Material NWA = 8.  
 d<sub>3</sub> =  $\varnothing$  3,2 mm = 0320.  
 l = 150 mm = 150  
 Order No = 264.8.0320.150

# Date insert, complete – (standard version) embossed lettering

**FIBRO**

**2280.01.**

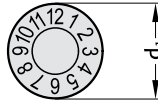


## 2280.01.

d <sub>1</sub>	d <sub>2</sub>	l	m	t	s	a
4	2,5	14	2	2	0,2	0,3
5	3,1	17	3	3	0,2	0,4
6	3,1	17	3	3	0,2	0,4
8	4,6	20	4	4	0,35	0,4
10	4,6	20	5	4	0,35	0,4
12	6,4	25	6	6	0,5	0,6
16	8,4	33	8	8	0,6	0,6



.10.1 = Sleeve with display: Months (1-12)



.xx.2 = Insert with display: Arrow + year (variable) e.g. for 2004



## Ordering examples:

Date insert, complete	= 2280.
Standard version	= 01.
Sleeve diameter d <sub>1</sub> = 5	= 050.
Sleeve with display: Months (1-12)	= 10.
Insert with display: Arrow + year (variable) e.g. 2004	= 04
Order No	= 2280.01.050.10.04

Date insert, Sleeve	= 2280.
Standard version	= 01.
Sleeve diameter d <sub>1</sub> = 5	= 050.
Sleeve with display: Months (1-12)	= 10.
Sleeve	= 1
Order No	= 2280.01.050.10.1

Date insert, Insert	= 2280.
Standard version	= 01.
Sleeve diameter d <sub>1</sub> = 5	= 050.
Sleeve with display: Arrow + year (variable) e.g. 2004	= 04.
Insert	= 2
Order No	= 2280.01.050.04.2

## Description:

- sleeve with engraving
- adjustable insert with display arrow and year (can be rotated using an ordinary screwdriver)
- metric thread for fixing
- mirror image engraving

## Material:

1.2767, hardened HRC 54±2, ground

## Note:

Sleeve and Insert can be ordered separately, see Ordering Code example.

## Mounting/dismantling:

Screw in the insert in a clockwise direction until it is flush with the top edge and set to the required position.

## Setting:

Set the insert by turning clockwise or anti-clockwise. When correctly set, the insert of a stamp with d<sub>1</sub> = 6 mm (.060.) is typically a maximum of 0.1 mm above or below the top edge of the sleeve.

## Changing:

To change the insert turn it anti-clockwise to remove.

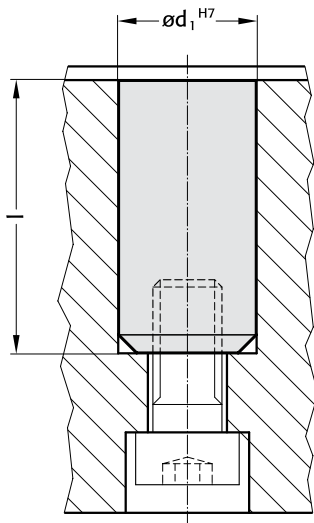


**FIBRO**

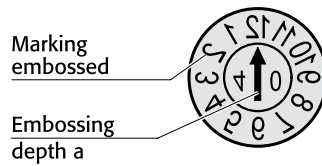
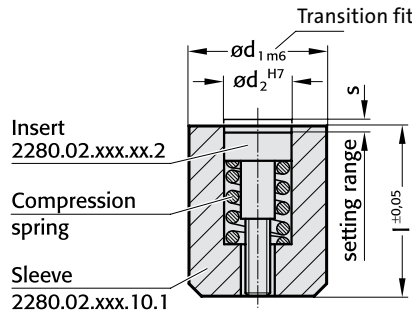
2280.02.

Date insert, complete –  
(short version)  
embossed lettering

Installation example:



2280.02.



2280.02.

$d_1$	$d_2$	$l$	$s$	$a$
2,6	1,4	4	0,2	0,3
3	1,5	4	0,2	0,3
4	2,1	5	0,25	0,3
5	3,1	8	0,2	0,4
6	3,1	8	0,2	0,4
8	4,4	10	0,25	0,4
10	5,2	12	0,35	0,4
12	6,2	14	0,35	0,6



.10.1 = Sleeve with display: Months (1-12)



.xx.2 = Insert with display: Arrow + year (variable) e.g. for 2004



Ordering examples:

Date insert, complete	= 2280.
short version	= 02.
Sleeve diameter $d_1 = 5$	= 050.
Sleeve with display: Months (1-12)	= 10.
Insert with display: Arrow + year (variable) e.g. 2004	= 04
Order No	= 2280.02.050.10.04

Date insert, Sleeve	= 2280.
short version	= 02.
Sleeve diameter $d_1 = 5$	= 050.
Sleeve with display: Months (1-12)	= 10.
Sleeve	= 1
Order No	= 2280.02.050.10.1

Date insert, Insert	= 2280.
short version	= 02.
Sleeve diameter $d_1 = 5$	= 050.
Sleeve with display: Arrow + year (variable) e.g. 2004	= 04.
Insert	= 2
Order No	= 2280.02.050.04.2

Description:

- sleeve with engraving
- adjustable insert with display arrow and year (can be rotated using an ordinary screwdriver)
- metric thread for fixing
- mirror image engraving

Material:

1.2767, hardened HRC 54±2, ground

Note:

Sleeve and Insert can be ordered separately, see Ordering Code example.

Mounting/dismantling:

Fixing:

Screw in the insert in a clockwise direction until it is flush with the top edge and set to the required position.

Setting:

Set the insert by turning clockwise or anti-clockwise. When correctly set, the insert of a stamp with  $d_1 = 6$  mm (.060.) is typically a maximum of 0.1 mm above or below the top edge of the sleeve.

Changing:

To change the insert turn it anti-clockwise to remove.



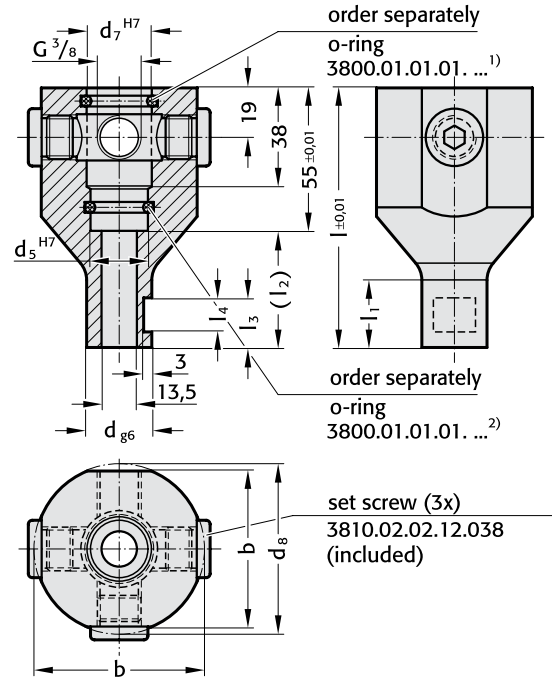
Quill holders for core tempering

3820.10.



3820.10.

Quill holder for core tempering



Material:

3820.10.

Quill holder: stainless steel

Description:

The quill holder is preferably used with bolt guide 2967.10. and quills with internal bore for slider tempering. 4 connections make it possible to implement tempering circuits either directly or in series.

3820.10.

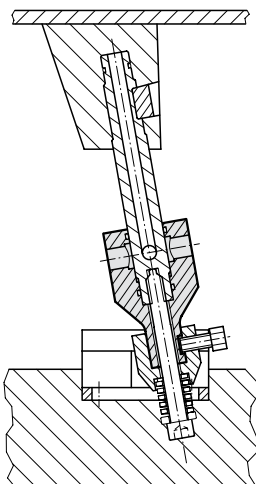
Order No	d	d <sub>7</sub>	d <sub>8</sub>	d <sub>5</sub>	b	l	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>
3820.01.025.025	25	25	65	22	60	100	26	45	19	13
3820.01.030.030	30	30	70	27	65	105	31	50	22	14,5
3820.01.040.040	40	40	80	37	70	115	41	60	28	16,5

Ordering code (example):

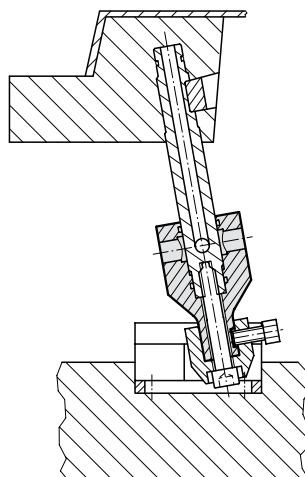
Quill holder = 3820.10.  
 d = 25 mm = 025.  
 d<sub>7</sub> = 25 mm = 025  
 Order No = 3820.10.025.025

Installation options

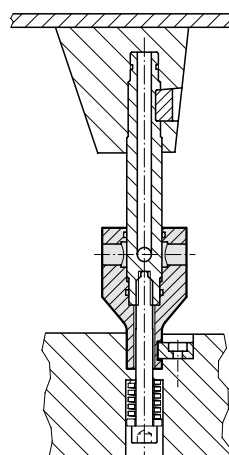
1. Swivelled Slider without sealing surfaces



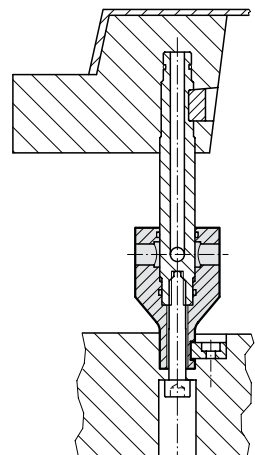
2. Swivelled Slider with sealing surfaces



3. Not swivelled Slider without sealing surfaces



4. Not swivelled Slider with sealing surfaces

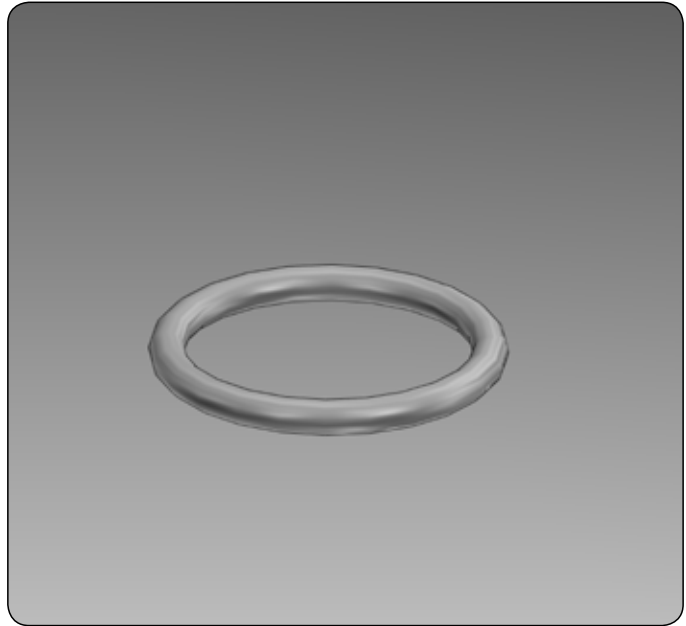
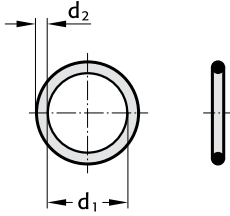


# FIBRO

3800.01.01.01.

O-Rings

3800.01.01.01.



3800.01.01.01.

Order No	$d_1$	$d_2$	for
3800.01.01.01.0240.30 <sup>1)</sup>	24	3	3820.10.025.025
3800.01.01.01.0210.30 <sup>2)</sup>	21	3	
3800.01.01.01.0292.30 <sup>1)</sup>	29,2	3	3820.10.030.030
3800.01.01.01.0260.30 <sup>2)</sup>	26	3	
3800.01.01.01.0392.30 <sup>1)</sup>	39,2	3	3820.10.040.040
3800.01.01.01.0360.30 <sup>2)</sup>	36	3	

Ordering code (example):

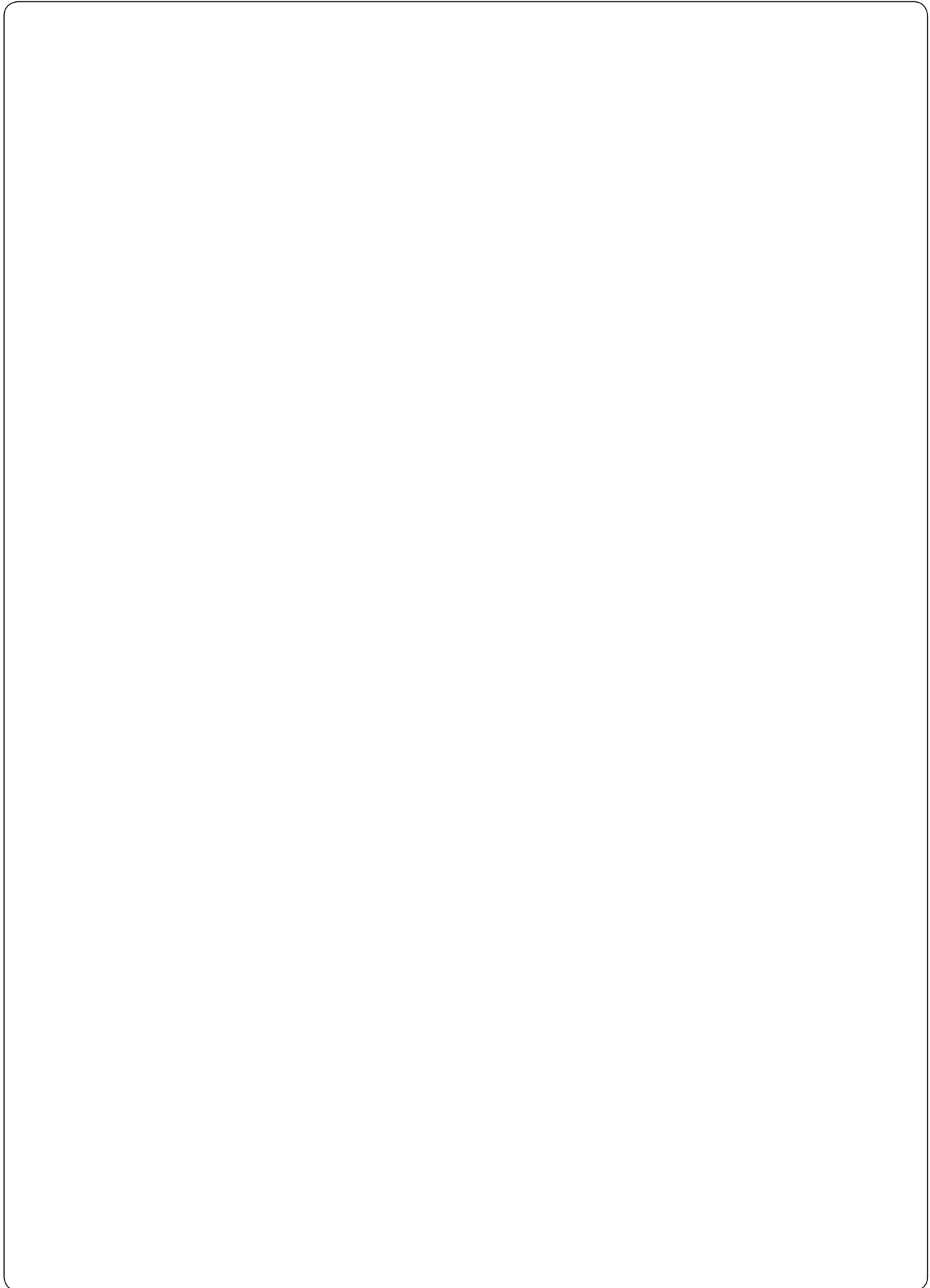
O-ring	=	3800.01.01.01.
$d_1 = 24 \text{ mm}$	=	0240.
$d_2 = 3 \text{ mm}$	=	30
Order No	=	3800.01.01.01.0240.30

Material:

Viton® (FPM)

Note:

Operating temperature  $-15^\circ\text{C}$  to  $+200^\circ\text{C}$





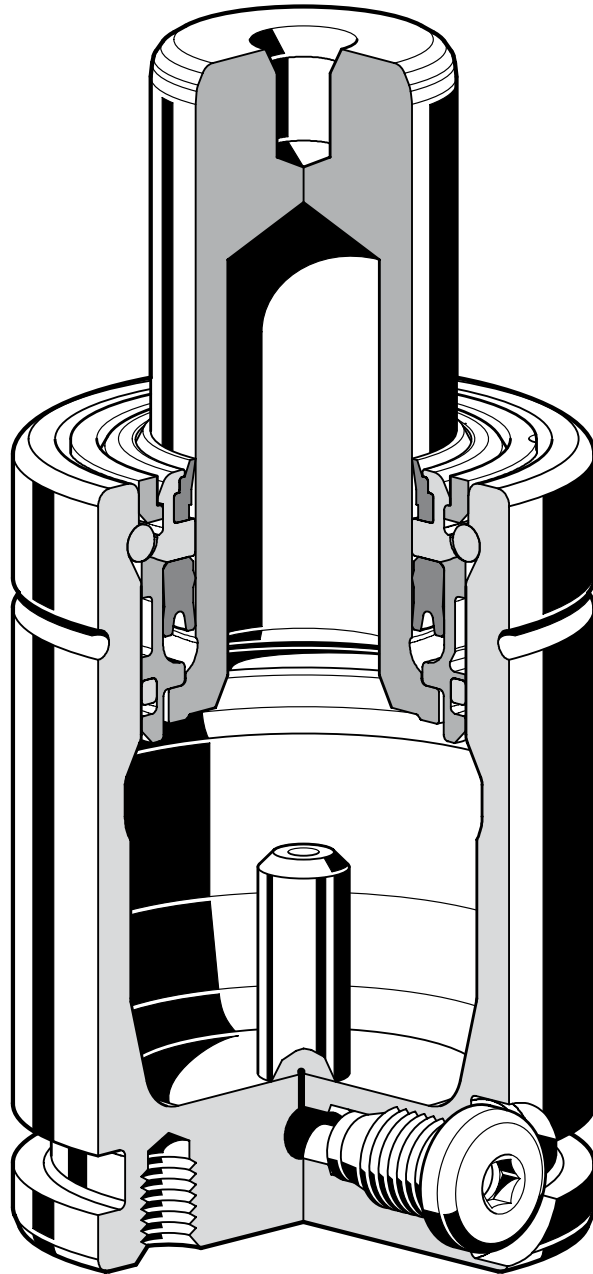
# Mould Line Gas Springs and Spring Plungers for Mould Making



FML Gas Springs  
for Mould Making

FIBRO

3487.





## FIBRO Mould Line Gas Springs (FML)

FIBRO FML Gas Springs are an ideal supplement to and expansion of the traditional FIBRO product lines of helical, disc and elastomer springs for manufacturing tools, devices, moulds and machines.

Gas Springs can be used for all applications where lift movements are required in parallel to mould opening.

FIBRO Mould Line Gas Springs (FML), which were specially developed for mould making, are characterised by their high force, small size, long service life and a constant operating temperature of 120°C.

Of course, FIBRO FML Gas Springs are approved as per European Pressure Equipment Directive 97/23/EC (14th GSGV ordinance on pressure vessels). FIBRO FML Gas Springs are filled with nitrogen and do not require any pressure space that is positioned externally or in tool plates. They also require no gas supply lines.

In certain special cases, however, monitoring of charge pressure in the installed state is required. These may be found in the list of accessory products if needed. As long as all mounting details are laid out with due circumspection, it is no problem at all to remove and install FIBRO FML Gas Springs.

Operating instructions are included with every delivery of FIBRO FML Gas Springs. An application example is shown on page L57.

## Functioning

The pressure medium is a commercially available, environment-friendly nitrogen. FIBRO FML Gas Springs have a standard charge pressure of max. 150 bar.

## Pressure Build-Up

In operation the piston rod enters the spring space whose volume is progressively reduced. The resulting pressure rise can be plotted on the Gas Spring Diagram as a multiplication factor. The spring force is the product of initial force times that pressure-rise factor and can therefore be calculated easily.

## Working Temperature

The spring temperature should not exceed +120°C.

## Charge Pressure

Modification of charge pressure allows variation of the force rating and can be predetermined from the spring Diagram.

## Installation

FIBRO FML Gas Springs can be used in any installation position. Whether or not external forces act on them when at rest is of no consequence and can therefore be calculated easily.



## All FIBRO Gas Springs meet the requirements of the Pressure Equipment Directive 97/23/EC.

The Pressure Equipment Directive (97/23/EC) has been ratified by the European Parliament and the Council of Europe. The requirements of the Pressure Equipment Directive came into force throughout the EC on 29 May 2002.

The directive defines pressure equipment as vessels, pipework, safety devices and pressure accessories. In terms of the Directive a vessel is a casing which is designed and manufactured to contain fluids under pressure.

It follows from this definition that nitrogen Gas Springs of all sizes are deemed to be pressure vessels and must in this respect comply with the Pressure Equipment Directive (97/23/EC) from 29 May 2002.



**Maintenance**

FIBRO FML Gas Springs are designed for long-term maintenance-free operation. We recommend lightly oiling the piston rod before using. Sealing and guide elements can be replaced easily in very little time. They are available in a spare parts kit. Each spare parts kit comes with detailed instructions for maintenance of Gas Springs.

**Caution!**

Gas Springs may only be charged with commercial Grade 5.0 nitrogen gas.

**Accessories**

The range of accessories for Gas Springs includes fastening devices, charging and control units, screw connections and lines for setting up compound systems.

**Advantages of the**

**FIBRO Mould Line series:**

- Very little calibration work required in the tool
- No lubrication required
- No maintenance required for up to 1,000,000 strokes<sup>1</sup>
- Variably adjustable forces
- For mould temperatures of up to 120°C
- Approved as per the European Pressure Equipment Directive 97/23/EC (14th GSGV regulation for pressure vessels)
- Standard safety features (FIBRO Safer Choice)<sup>2</sup>  
Safety piston rod  
Excess pressure protection  
Overstroke protection
- A pressure monitoring system makes it possible to recognise an impending failure at an early point (prevention)
- No tool breakage if the 2nd separation level is locked (the plate comes to a standstill; after the jam is removed, production can be resumed)
- Used worldwide in one million FIBRO Gas Springs
- Cost savings: approximately 60-70% (e.g. compared to a latch-locking unit)

<sup>1</sup> At 80°C to 120°C/ 500,000 strokes

<sup>2</sup> Depending on type of spring

**Warning Signs**

These are available on request. The signs should be affixed near the springs in as prominent a position as possible.

**FIBRO**

**WARNING**

This tool is equipped with \_\_\_ Gas Springs with a max. pressure of 150 or 180 bar, depending on spring type. Working pressure \_\_\_\_\_ bar.  
**Read maintenance instructions before working on gas springs.**

FIBRO GmbH · Business Area Standard Parts  
DE-74851 Hassmersheim · Postfach 1120  
Phone +49 (0) 6266-73-0\* · Fax -237

**Size 35x50 mm**

Language	Order No
german	2480.00.035.050.1
english	2480.00.035.050.2
french	2480.00.035.050.3
italien	2480.00.035.050.4
spanish	2480.00.035.050.5

**FIBRO**

**WARNING**

This tool is equipped with \_\_\_ Gas Springs with a max. pressure of 150 or 180 bar, depending on spring type.

No.	pcs.	spring type	fill.press./bar	force/daN
1	_____	_____	_____	_____
2	_____	_____	_____	_____
3	_____	_____	_____	_____
4	_____	_____	_____	_____
5	_____	_____	_____	_____

Read maintenance instructions **before** working on gas springs.

**FIBRO GmbH · Business Area Standard Parts**  
DE-74851 Hassmersheim · Postfach 1120  
Phone +49 (0) 6266-73-0\* · Fax +49 (0) 6266-73-237

**Size 75x105 mm**

language	Order No
german	2480.00.075.105.1
english	2480.00.075.105.2
french	2480.00.075.105.3
italian	2480.00.075.105.4
spanish	2480.00.075.105.5

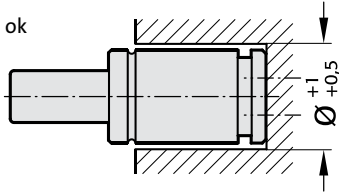
**Size 110x150 mm**

language	Order No
german	2480.00.110.150.1
english	2480.00.110.150.2
french	2480.00.110.150.3
italian	2480.00.110.150.4
spanish	2480.00.110.150.5

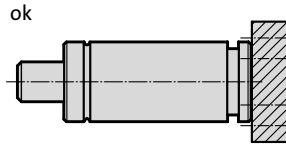
**Mounting examples**

Mounting possibilities for Gas Springs are listed below.

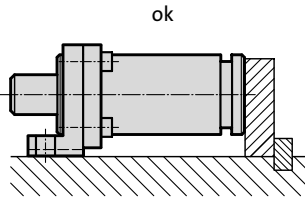
For additional information on mounting, see the corresponding pages in the catalogue.



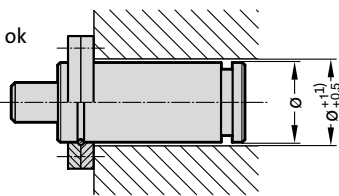
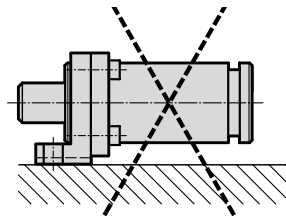
Screw mounted at the base



Screw mounted at the base with 2480.011.

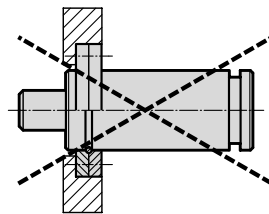


Fastened with 2480.044./045./047.

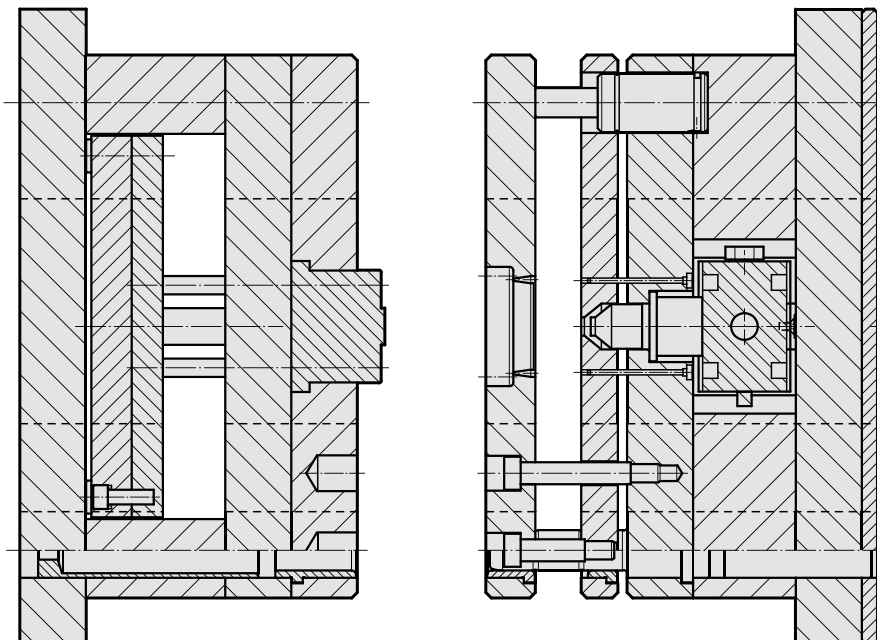


Fastened with 2480.055./057./064.

<sup>1)</sup> from  $\varnothing 38$ :  $\varnothing +0.5$

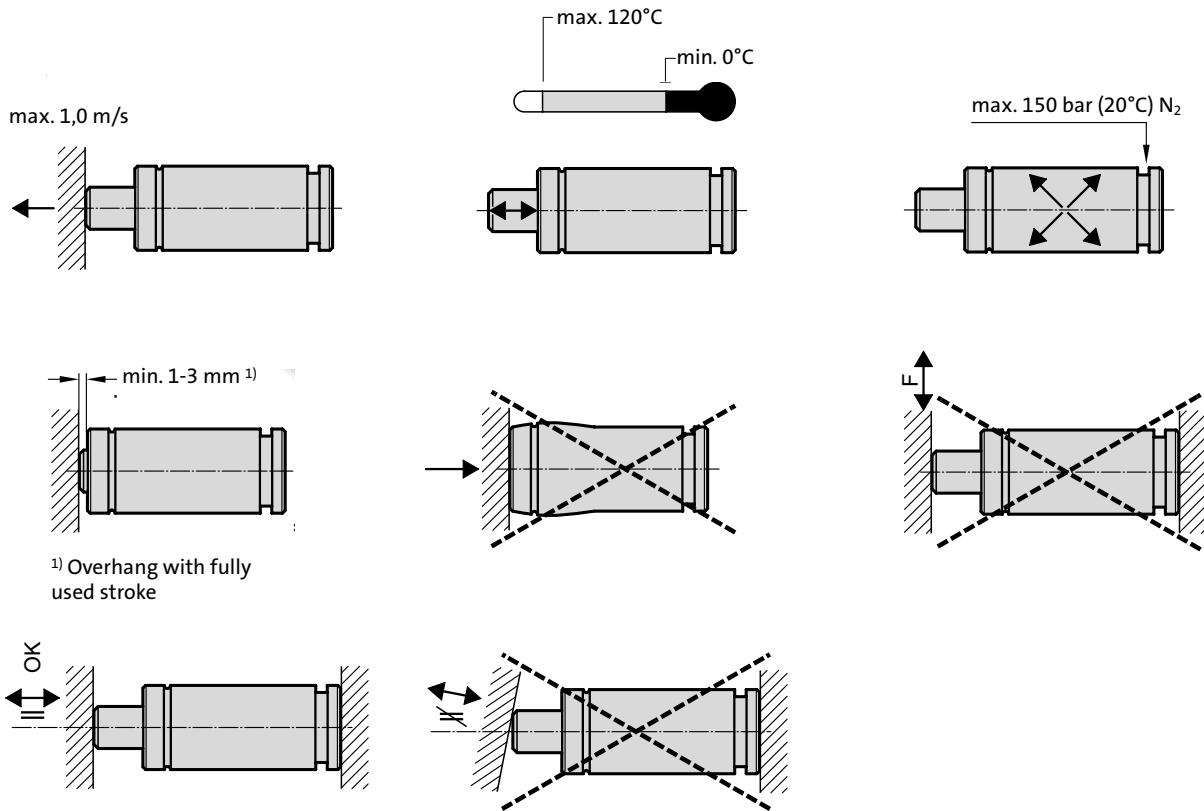


**Installation principle:**



To achieve the best possible service life and safety for the Gas Springs, the installation instructions must be followed.

### Mounting instructions

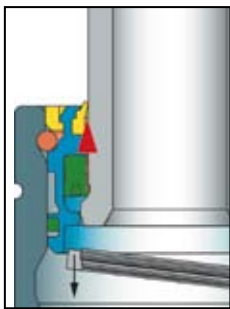


- Secure the gas spring in the tool/machine whenever possible using the threaded holes in the base of the spring or clamping elements.  
Do not exceed the maximum tightening torques for the threads in the base of the gas spring:  
(M6 = 10 Nm; M8 = 24 Nm; M10 = 45 Nm; M12 = 80 Nm)
- The threaded hole in the piston rod must not be used for fastening gas spring. It must only be used for servicing the gas spring.
- Do not use the gas spring in such a way that the piston rod is released abruptly from the position in which it is pressed down (internal damage to the gas spring).
- Install the gas spring parallel to the direction of the compression stroke.
- The contact surface for activating the piston rod must be perpendicular to the direction of the compression stroke and must be sufficiently hardened.
- The gas spring must not be subjected to any forces acting from the side.
- Protect the piston rod against mechanical damage and contact with liquids.
- We recommend leaving an unused stroke reserve of 10% of the nominal stroke length or 5 mm.
- The maximum charging pressure as a function of the working temperature must not be exceeded.  
If it is, the safety of the system cannot be guaranteed.
- Exceeding the maximum permissible working temperature will reduce the service life of the gas spring significantly.
- The surface of the piston rod/piston should be completely charged.

At FIBRO, safety has always been a top priority. Below is what we do to help you provide a safer working environment.

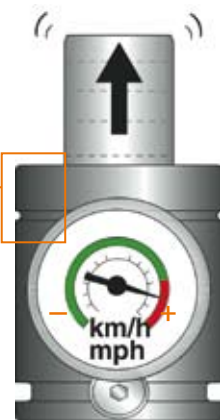
**FIBRO Safety Features**

**Excessive Return Speed Protection System**

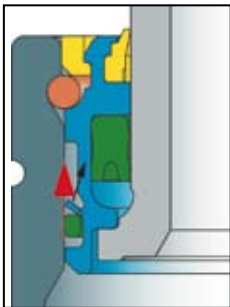


Designed for controlled gas venting through piston rods with integral safety stops and specially designed guides.

**Excessive Return Speed**



**Over-Pressure Protection System**

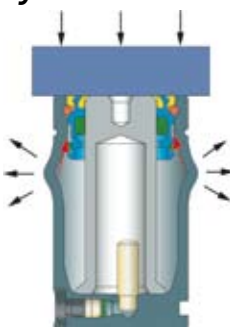


FIBRO Over-Pressure Protection System is designed to vent excessive gas pressure in a controlled manner.

**Over-Pressure Condition**

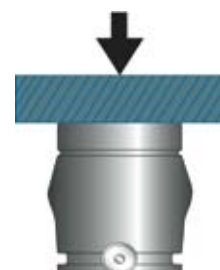


**Over-Stroke Protection System**



FIBRO has a developed unique System. The cylinder wall is designed to deform in a predefined way, venting the internal gas pressure in a controlled manner.

**Over-Stroke Condition**



**Advice to Gas Spring Buyers**

Safety should have always be a top priority. Therefore, we believe Gas Springs for metal forming tools should (unless the maximum allowable pressure PS is less than or equal to 0.5 bar) be ordered with the following **safety requirements**:

- 1) Piston rods with an integral safety stop.
- 2) Designed, produced and tested according to Pressure Equipment Directive, PED 97/23/EC for a minimum of 2'000'000 full cycles\*:

- at highest allowed charging pressure
- at highest allowed running temperature
- for all specified mounting methods\*\*

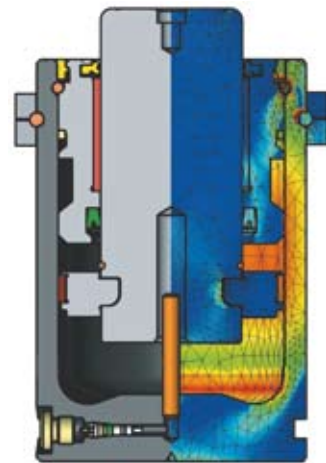
\*\*including top mount, Type C Flange Mounts, according to ISO 11901-2

Please Note: Unless the maximum pressure is less than or equal to 0.5 bar, all Gas Springs produced, sold, installed and/or used within the EU should be designed, produced and tested in accordance with PED 97/23/EC.

**Pressure Vessel Approval**

FIBRO Gas Springs are designed, produced and tested according to PED 97/23/EC for 2'000'000 full cycles\* at the highest allowed charging pressure, the highest allowed running temperature, and for all specified mounting methods.

\*unless other value stated on the springs



Please note!!! – The safety features mentioned here have not been realized for all FIBRO Gas Springs to date. By consulting the respective data sheets, please make certain you have the accurate safety standard of the gas spring available that you are interested in; otherwise, direct your inquiry to FIBRO GmbH.



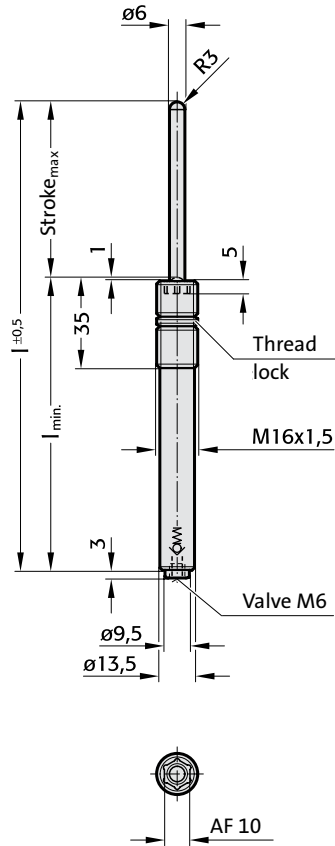
# Gas Springs (spring-loaded plungers) Mould Line with hexagon socket

**FIBRO**

**3479.030.**



**3479.030.**



**3479.030.**

The initial spring force at 150 bar/20°C is 42 daN

Order no.	Stroke <sub>max.</sub>	l <sub>min.</sub>	l
3479.030.00040.010	10	55	65
020	20	65	85
030	30	75	105
040	40	85	125
050	50	95	145
060	60	105	165
070	70	115	185
080	80	125	205

Longer stroke lengths on request

## Description:

Spring-loaded plungers are used as ejectors, vibration damping bolts, position holding devices and ejector pins in various areas of engineering involving tools, devices, moulds and machines. Assembly is performed with a FIBRO insertion tool (2470.12.010.017.)

## Note:

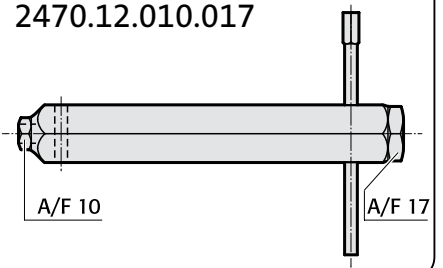
Do not repair worn springs; they have to be replaced completely

Pressure medium: Nitrogen – N<sub>2</sub>  
 max. filling pressure: see table  
 min. filling pressure: 25 bar (20°C)  
 Working temperature: 0°C to +120°C  
 temperature-dependent force increase:  $\pm 0.3\%/^{\circ}\text{C}$

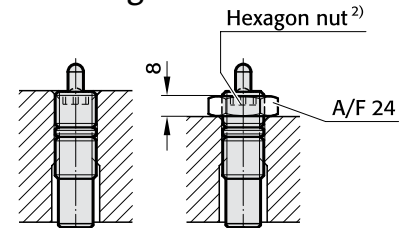
Recommended max. strokes/min.	Working temperature range	Max. filling pressure at 20°C in bar
20	at 0°C- 80°C	150
15	at 80°C-100°C	125
10	at 100°C-120°C	115

Max. piston speed: 1.0 m/s

**2470.12.010.017**

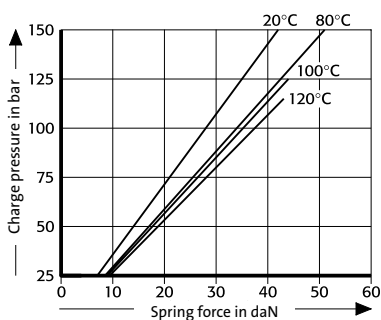


## Mounting variations:



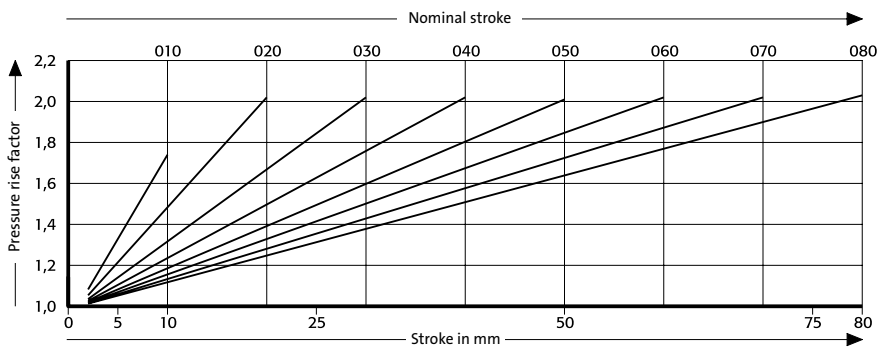
**3479.030.**

Initial spring force versus charge pressure and working temperature



**3479.030.**

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

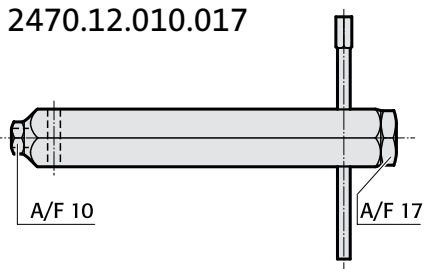
**3479.032.**

The initial spring force at 150 bar/20°C is 170 daN

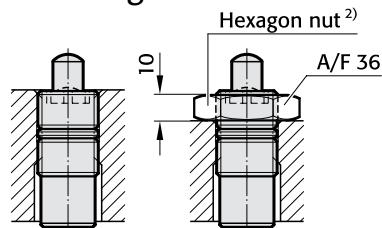
Order no.	Stroke <sub>max.</sub>	l <sub>min.</sub>	l
3479.032.00170.010	10	55	65
020	20	65	85
030	30	75	105
040	40	85	125
050	50	95	145
060	60	105	165
070	70	115	185
080	80	125	205

Longer stroke lengths on request

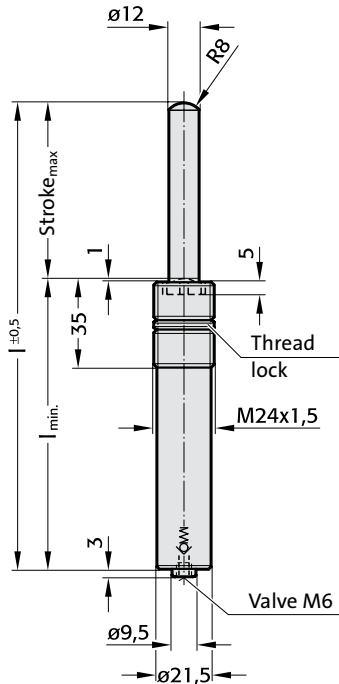
**2470.12.010.017**



**Mounting variations:**



**3479.032.**



<sup>2)</sup> Hexagon nut order supplementary: 2480.004.00170



**Description:**

Spring-loaded plungers are used as ejectors, vibration damping bolts, position holding devices and ejector pins in various areas of engineering involving tools, devices, moulds and machines.  
Assembly is performed with a FIBRO insertion tool (2470.12.010.017.)

**Note:**

Do not repair worn springs; they have to be replaced completely

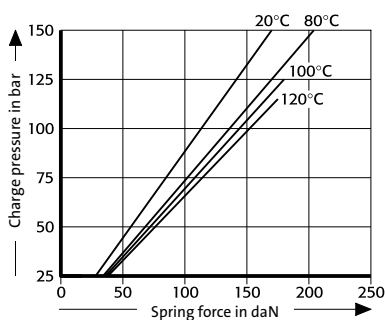
Pressure medium: Nitrogen – N<sub>2</sub>  
 max. filling pressure: see table  
 min. filling pressure: 25 bar (20°C)  
 Working temperature: 0°C to +120°C  
 temperature-dependent force increase: ±0.3%/°C

Recommended max. strokes/min.	Working temperature range	Max. filling pressure at 20°C in bar
20	at 0°C- 80°C	150
15	at 80°C-100°C	125
10	at 100°C-120°C	115

Max. piston speed: 1.0 m/s

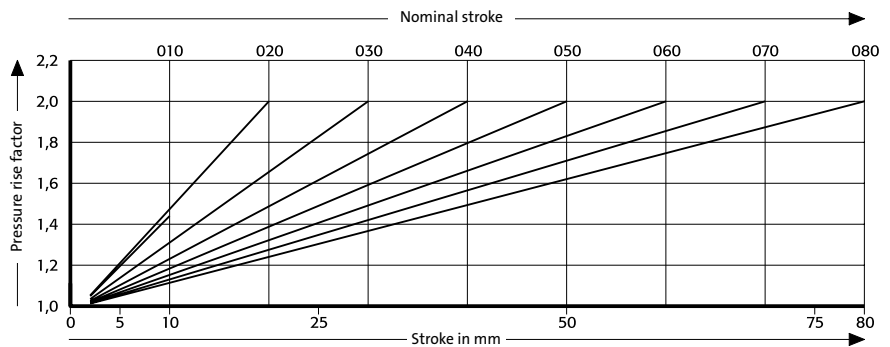
**3479.032.**

Initial spring force versus charge pressure and working temperature

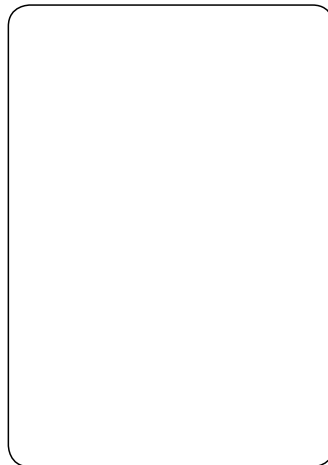
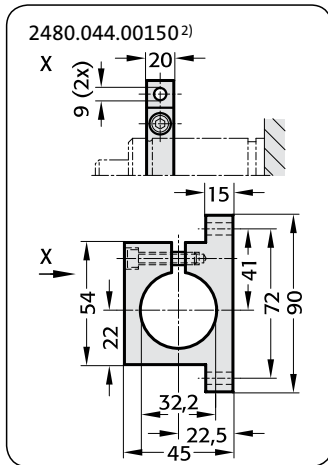
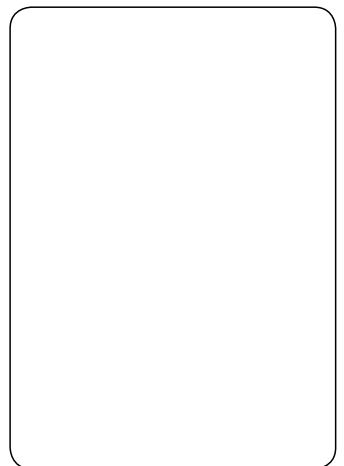
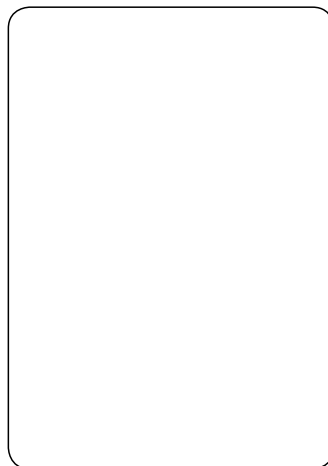
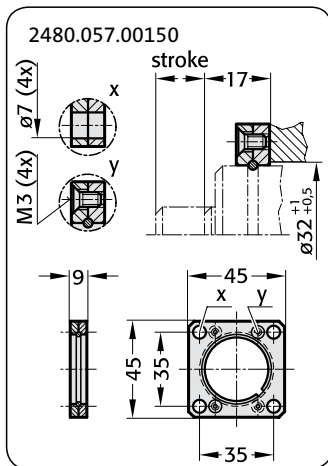
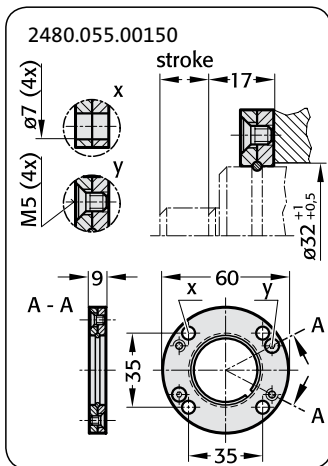
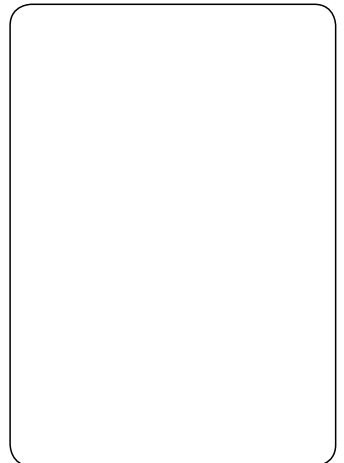
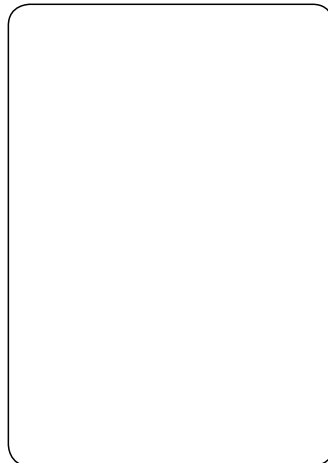
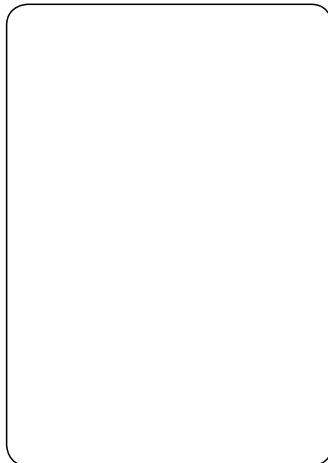


**3479.032.**

Spring force Diagram displacement versus stroke rise

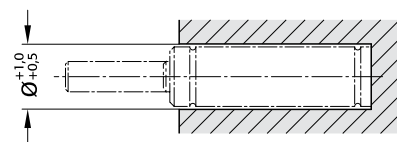
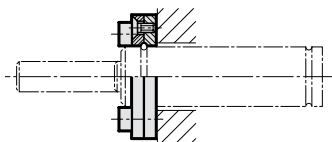


Pressure rise factor accounts for displacement but not external influences!



**Note:**  
<sup>2)</sup> Caution:  
 Spring force must be absorbed  
 by stop surface!

Mounting examples:





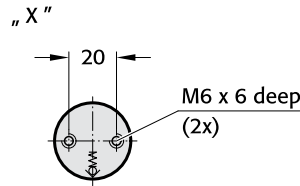
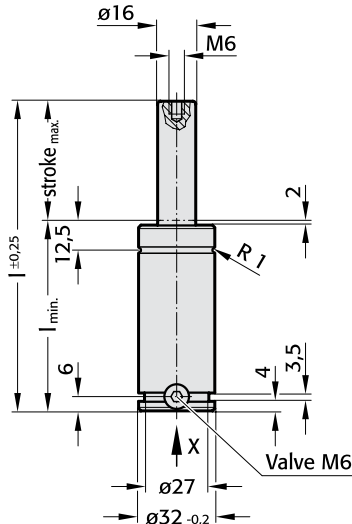
**3487.12.00300.**

The initial spring force at 150 bar/20°C is 300 daN

Order no.	Stroke		l
	max.	l <sub>min.</sub>	
3487.12.00300.010	10	40	50
013	13	43	56
016	16	46	62
019	19	49	68
025	25	55	80
032	32	62	94
038	38	68	106
050	50	80	130
063	63	93	156
075	75	105	180
080	80	110	190
100*	100	130	230
125*	125	155	280

\*On request

**3487.12.00300.**



**Note:**

Order No. for spare parts kit:  
3487.12.00300

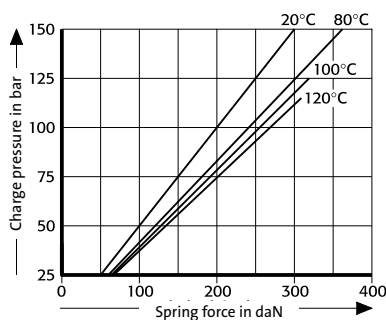
Pressure medium: Nitrogen – N<sub>2</sub>  
 max. filling pressure: see table  
 min. filling pressure: 25 bar (20°C)  
 Working temperature: 0°C to +120°C  
 temperature-dependent force increase: ±0.3%/°C

Recommended max. Strokes/min.	working temperature range	Max. filling pressure at 20°C in bar
20	at 0°C- 80°C	150
15	at 80°C-100°C	125
10	at 100°C-120°C	115

Max. piston speed: 1.0 m/s

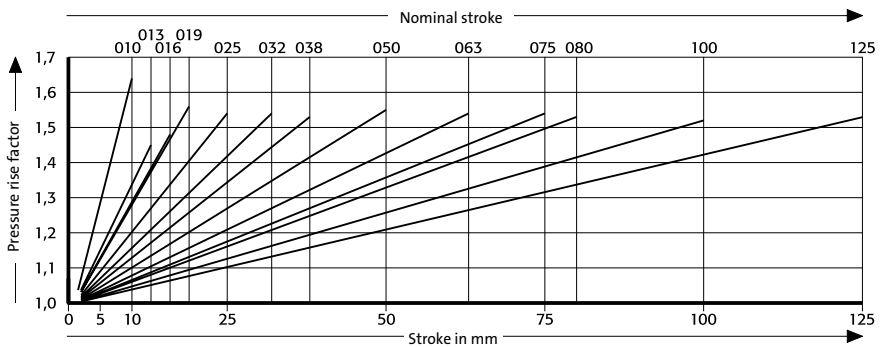
**3487.12.00300.**

Initial spring force versus charge pressure and working temperature



**3487.12.00300.**

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!



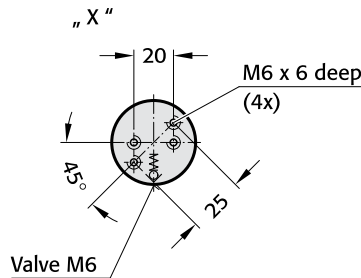
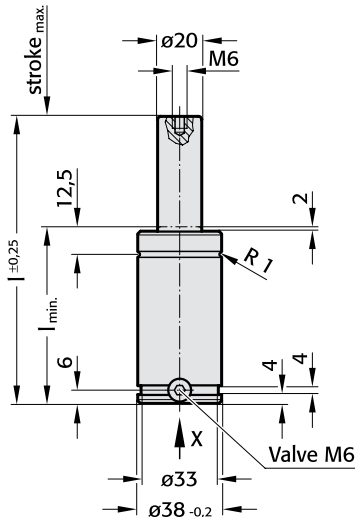
**3487.12.00500.**

The initial spring force at 150 bar/20°C is 500 daN

Order no.	Stroke <sub>max.</sub>	l <sub>min.</sub>	l
3487.12.00500.010	10	40	50
013	13	43	56
016	16	46	62
019	19	49	68
025	25	55	80
032	32	62	94
038	38	68	106
050	50	80	130
063	63	93	156
075	75	105	180
080	80	110	190
100*	100	130	230
125*	125	155	280

\*On request

**3487.12.00500.**



**Note:**

Order No. for spare parts kit:  
3487.12.00500

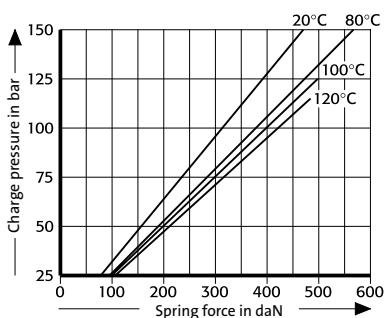
Pressure medium: Nitrogen – N<sub>2</sub>  
 max. filling pressure: see table  
 min. filling pressure: 25 bar (20°C)  
 Working temperature: 0°C to +120°C  
 temperature-dependent  
 force increase: ±0.3%/°C

Recommended max. Strokes/min.	working temperature range	Max. filling pressure at 20°C in bar
20	at 0°C-80°C	150
15	at 80°C-100°C	125
10	at 100°C-120°C	115

Max. piston speed: 1.0 m/s

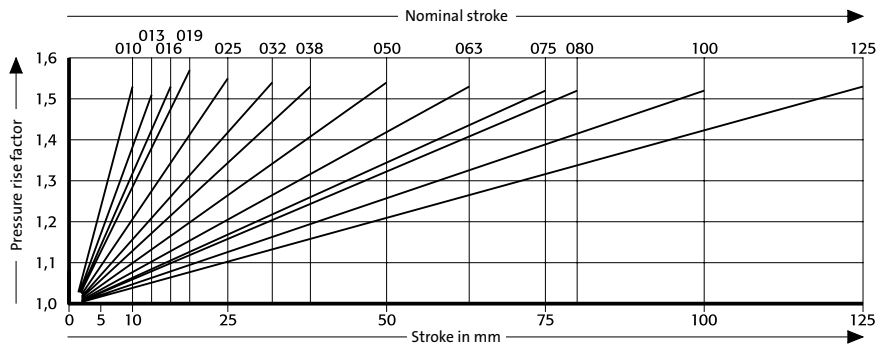
**3487.12.00500.**

Initial spring force versus charge pressure and working temperature



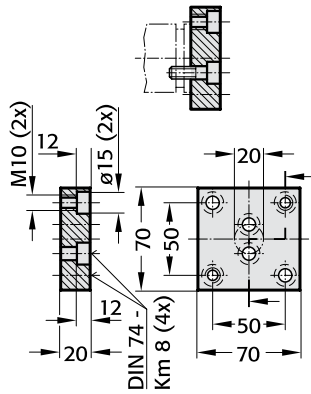
**3487.12.00500.**

Spring force Diagram displacement versus stroke rise

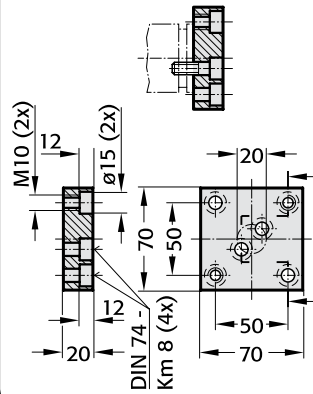


Pressure rise factor accounts for displacement but not external influences!

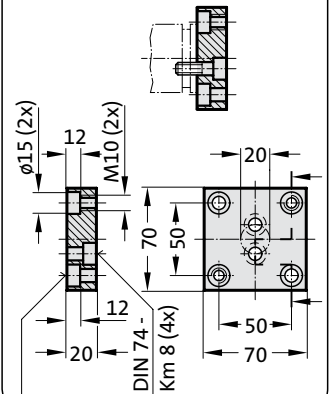
2480.011.00500



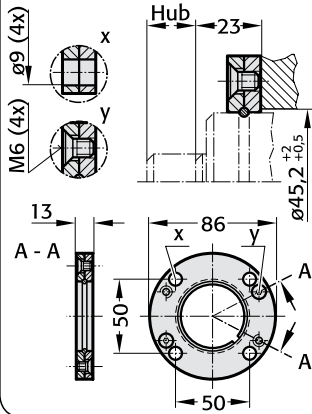
2480.011.00500.1



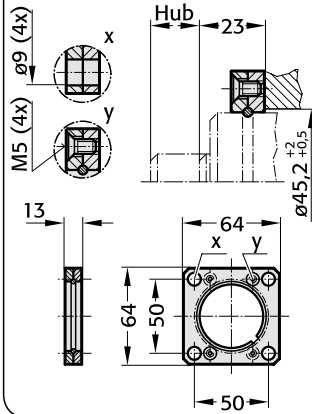
2480.011.00500.2



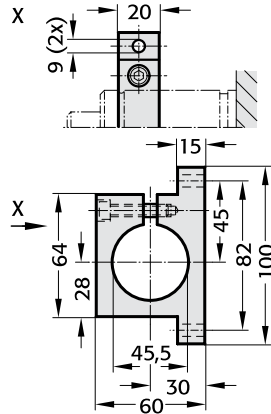
2480.055.00500



2480.057.00500



2480.044.00500<sup>2)</sup>



**Note:**

<sup>2)</sup> Caution:  
Spring force must be absorbed  
by stop surface!

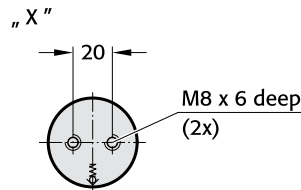
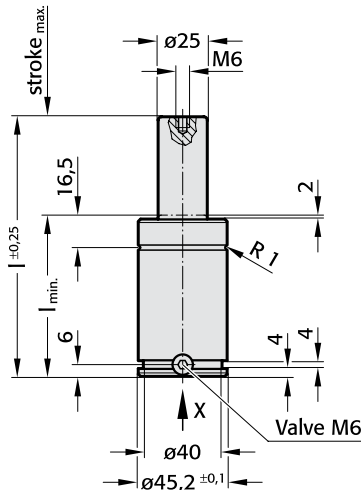
**3487.12.00750.**

The initial spring force at 150 bar/20°C is 750 daN

Order no.	Stroke <sub>max.</sub>	l <sub>min.</sub>	l
3487.12.00750.010	10	42	52
013	13	45	58
016	16	48	62
019	19	51	70
025	25	57	82
032	32	64	96
038	38	70	108
050	50	82	132
063	63	95	158
075	75	107	182
080	80	112	192
100*	100	132	232
125*	125	157	282

\*On request

**3487.12.00750.**



**Note:**

Order No. for spare parts kit:  
3487.12.00750

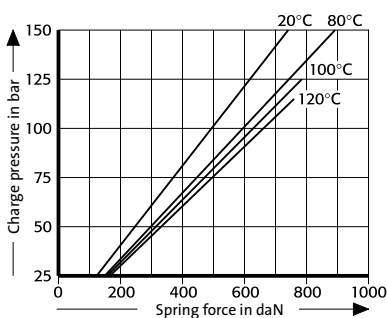
Pressure medium: Nitrogen – N<sub>2</sub>  
 max. filling pressure: see table  
 min. filling pressure: 25 bar (20°C)  
 Working temperature: 0°C to +120°C  
 temperature-dependent force increase: ±0.3%/°C

Recommended max. Strokes/min.	working temperature range	Max. filling pressure at 20°C in bar
20	at 0°C- 80°C	150
15	at 80°C-100°C	125
10	at 100°C-120°C	115

Max. piston speed: 1.0 m/s

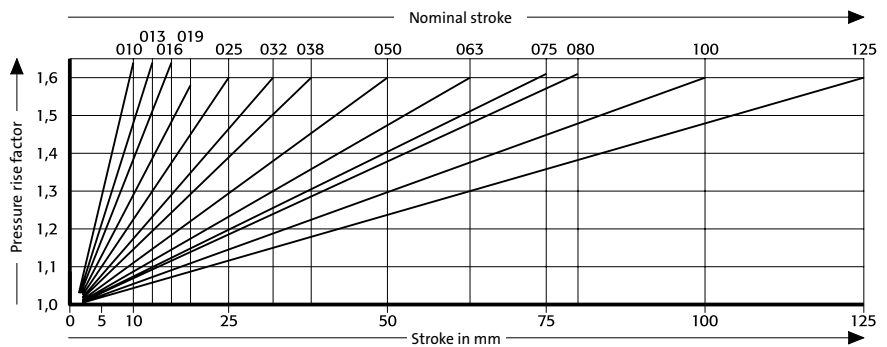
**3487.12.00750.**

Initial spring force versus charge pressure and working temperature

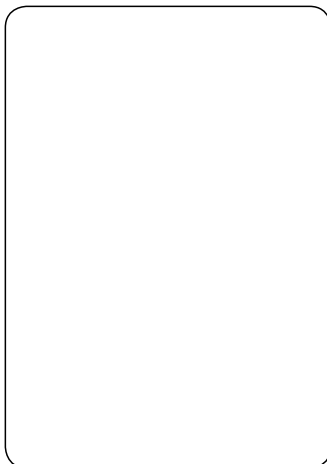
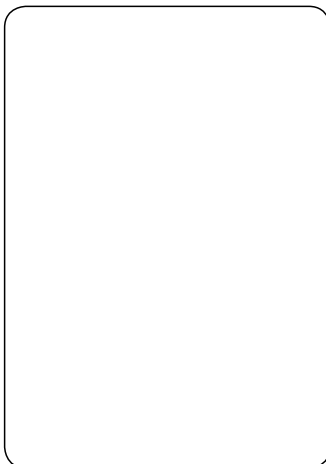
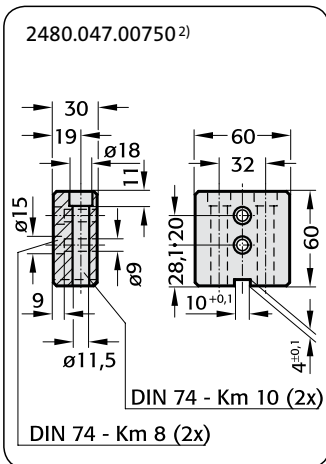
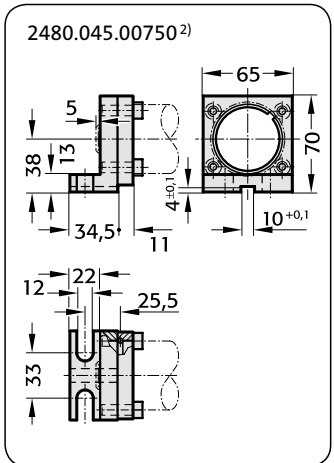
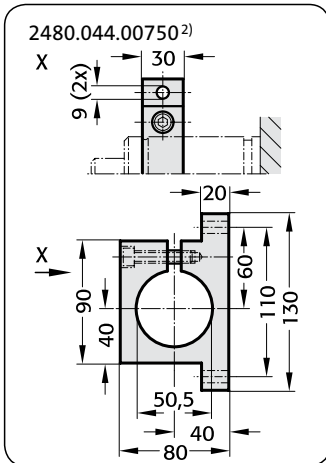
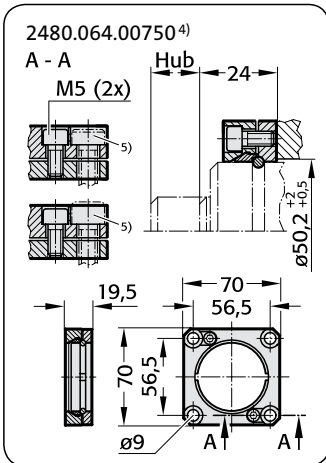
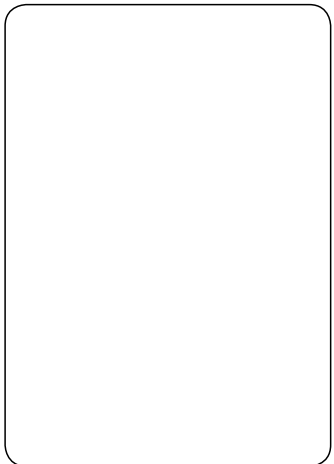
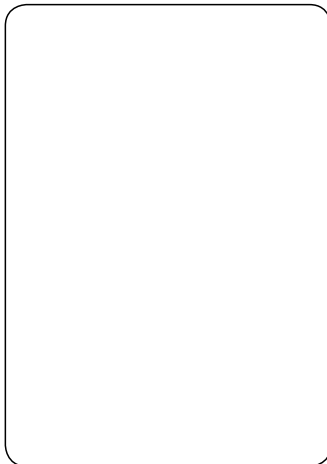
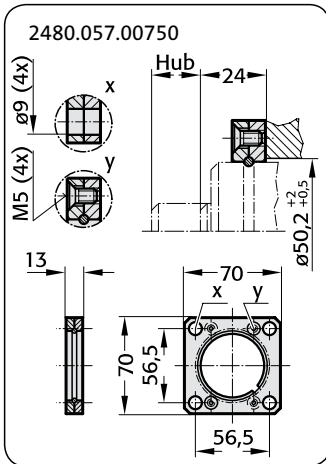
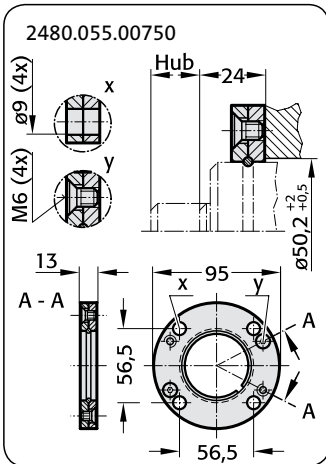
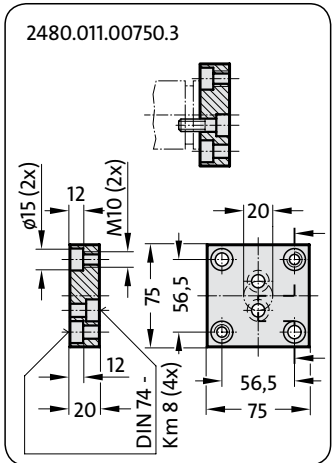
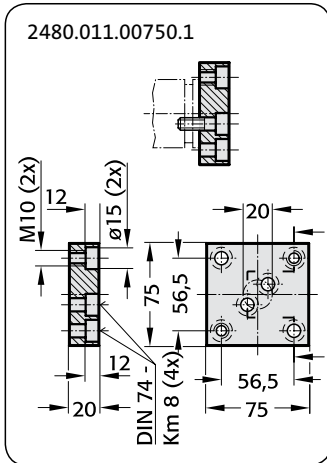
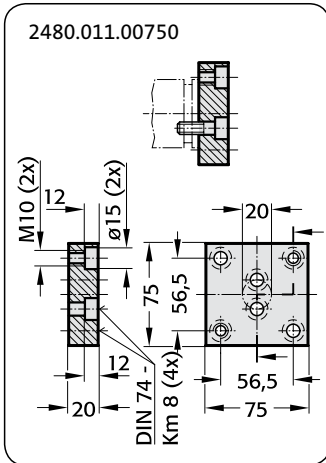
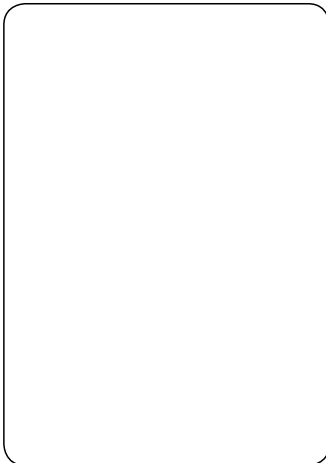


**3487.12.00750.**

Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!



**Note:**

- <sup>2)</sup> Caution: Spring force must be absorbed by stop surface!
- <sup>4)</sup> Square collar flange, anti-twist, fixing for collar connection.
- <sup>5)</sup> Socket head screws with internal hex (recommended: with low head).

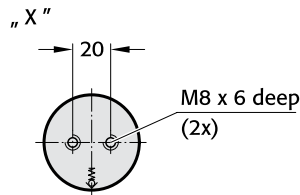
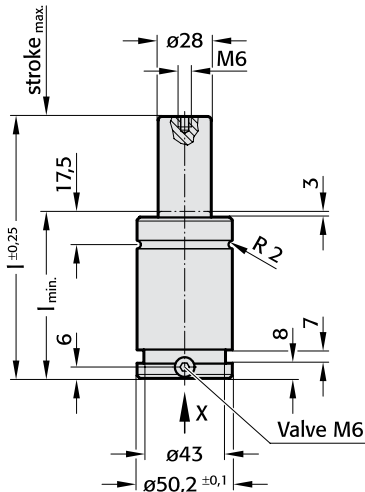
**3487.12.01000.**

The initial spring force at 150 bar/20°C is 1000 daN

Order no.	Stroke <sub>max.</sub>	l <sub>min.</sub>	l
3487.12.01000.013	13	51	64
016	16	54	70
019	19	57	76
025	25	63	88
032	32	70	102
038	38	76	114
050	50	88	138
063	63	101	164
075	75	113	188
080	80	118	198
100*	100	138	238
125*	125	163	288

\*On request

**3487.12.01000.**



**Note:**

Order No. for spare parts kit:  
3487.12.01000

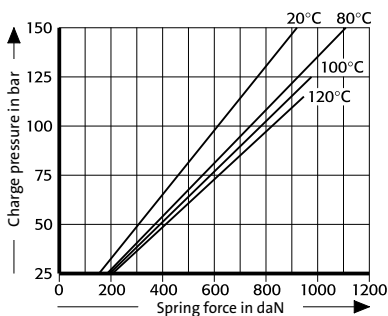
Pressure medium: Nitrogen – N<sub>2</sub>  
 max. filling pressure: see table  
 min. filling pressure: 25 bar (20°C)  
 Working temperature: 0°C to +120°C  
 temperature-dependent force increase: ±0.3%/°C

Recommended max. Strokes/min.	working temperature range	Max. filling pressure at 20°C in bar
20	at 0°C-80°C	150
15	at 80°C-100°C	125
10	at 100°C-120°C	115

Max. piston speed: 1.0 m/s

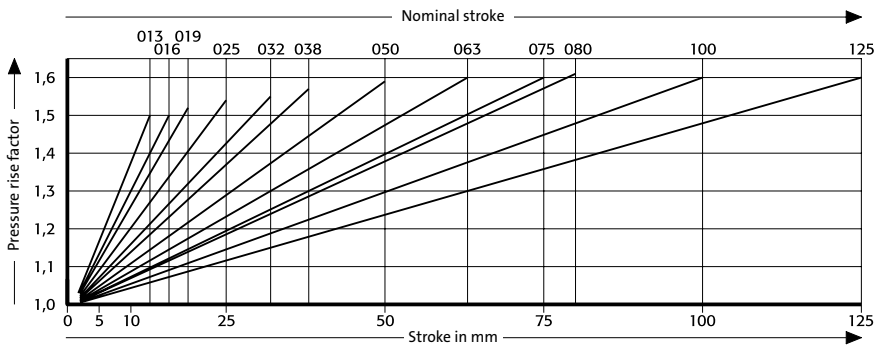
**3487.12.01000.**

Initial spring force versus charge pressure and working temperature



**3487.12.01000.**

Spring force Diagram displacement versus stroke rise

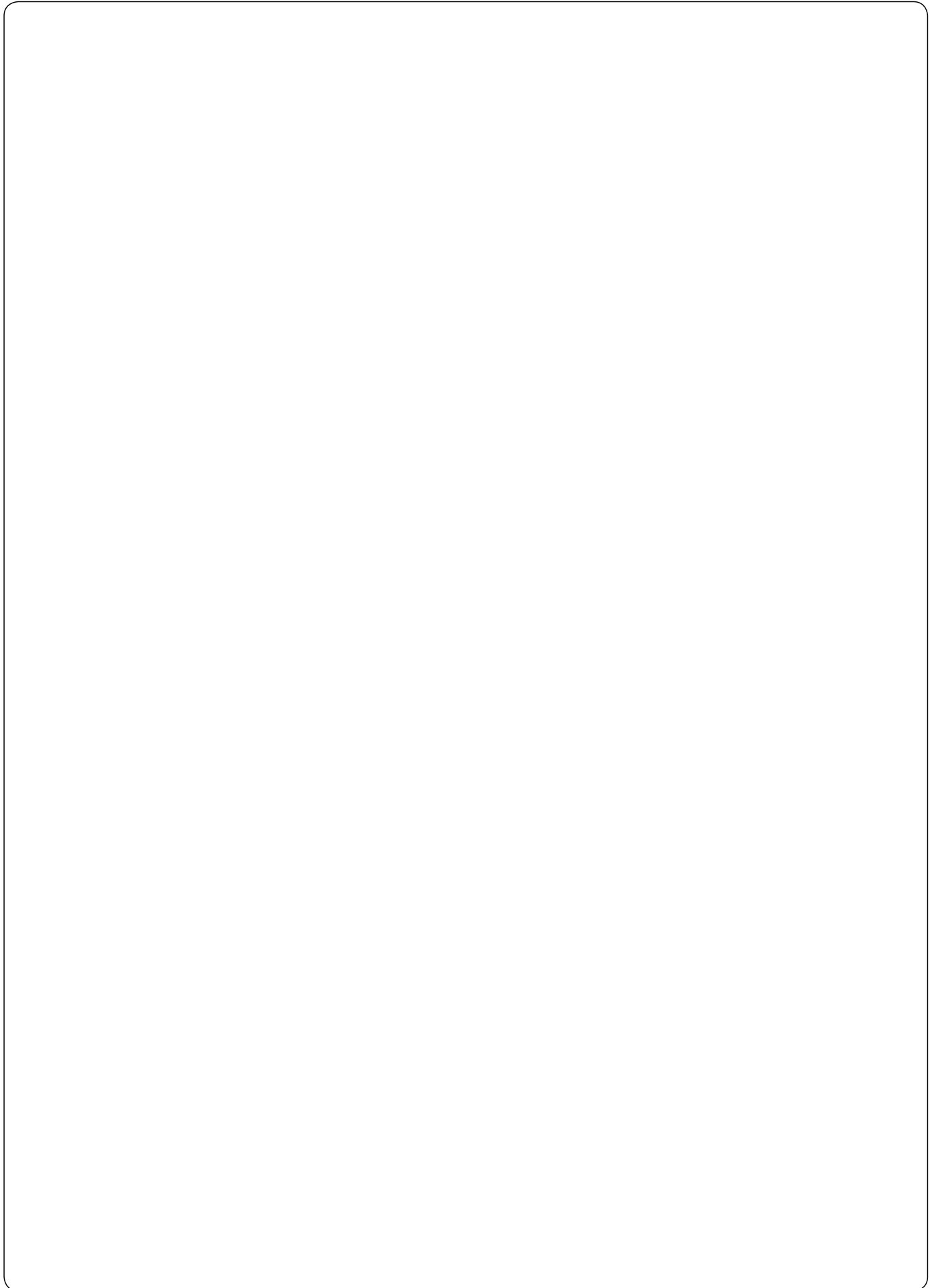


Pressure rise factor accounts for displacement but not external influences!

Gas Spring Accessories  
see Registry F:  
Gas Spring Accessories



**Auxiliary Equipment  
see Registry H:  
Chemical Tooling Aids  
and Registry J:  
Peripheral Equipment**





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# FIBRO

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