GMN Paul Müller GmbH & Co. KG
Unternehmensbeteiligungen

Sprag-Type-Clutch Series 8000

The sprag-type freewheel clutches of series 8000 are based on a newly developed sprag with a nominal height of 8.33 mm ($^{21}/_{64}$ in). For shaft sizes of 38 to 150 mm or corresponding inch sizes this series offers alternative options or additional solutions for our famous series FE 400. Similar to FE 400 the new 8000 series provides very high torque capacity in relation to the required mounting space due to the large quantity of sprags. The newly designed clamping curve offers smooth and reliable torque pick up, which guarantees optimum performance for any freewheel clutch application such as indexing, overrunning or backstopping.

Part Number		Bore Dia d		Outer Dia D		Width B		Torque M* (D/D_L = 1,4; AISI 52100)	
		[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[Nm]	[ftlb]
FE 8038	**Z 13**	38,09	1.4996	54,75	2.1555	13	0.5118	333	245
FE 8038	**Z 16**	38,09	1.4996	54,75	2.1555	16	0.6299	479	353
FE 8038	**Z 19**	38,09	1.4996	54,75	2.1555	19	0.7480	627	462
FE 8040	**Z 13**	40,00	1.5748	56,66	2.2307	13	0.5118	361	266
FE 8040	**Z 16**	40,00	1.5748	56,66	2.2307	16	0.6299	517	381
FE 8040	**Z 19**	40,00	1.5748	56,66	2.2307	19	0.7480	677	499
FE 8044	**Z 13**	44,45	1.7500	61,11	2.4059	13	0.5118	427	315
FE 8044	**Z 16**	44,45	1.7500	61,11	2.4059	16	0.6299	614	453
FE 8044	**Z 19**	44,45	1.7500	61,11	2.4059	19	0.7480	803	592
FE 8049	**Z 13**	49,72	1.9574	66,38	2.6134	13	0.5118	515	380
FE 8049	**Z 16**	49,72	1.9574	66,38	2.6134	16	0.6299	741	546
FE 8049	**Z 19**	49,72	1.9574	66,38	2.6134	19	0.7480	970	715
FE 8054	**Z 13**	54,76	2.1559	71,42	2.8118	13	0.5118	606	447
FE 8054	**Z 16**	54,76	2.1559	71,42	2.8118	16	0.6299	874	644
FE 8054	**Z 19**	54,76	2.1559	71,42	2.8118	19	0.7480	1140	840
FE 8054	**Z 25**	54,76	2.1559	71,42	2.8118	25	0.9843	1682	1240
FE 8058	**Z 19**	58,00	2.2835	74,66	2.9394	19	0.7480	1260	929
FE 8068	**Z 16**	68,00	2.6772	84,66	3.3331	16	0.6299	1266	933
FE 8072	**Z 13**	72,21	2.8429	88,87	3.4988	13	0.5118	977	720
FE 8072	**Z 16**	72,21	2.8429	88,87	3.4988	16	0.6299	1411	1040
FE 8072	**Z 19**	72,21	2.8429	88,87	3.4988	19	0.7480	1845	1360
FE 8072	**Z 25**	72,21	2.8429	88,87	3.4988	25	0.9843	2715	2001
FE 8079	**Z 25**	79,69	3.1374	96,36	3.7937	25	0.9843	2619	1930
FE 8083	**Z 25**	83,34	3.2811	100,00	3.9370	25	0.9843	3407	2511
FE 8093	**Z 19**	93,34	3.6748	110,00	4.3307	19	0.7480	2907	2143
FE 8103	**Z 16**	103,23	4.0642	119,89	4.7201	16	0.6299	2674	1971
FE 8103	**Z 19**	103,23	4.0642	119,89	4.7201	19	0.7480	3322	2449
FE 8103	**Z 25**	103,23	4.0642	119,89	4.7201	25	0.9843	4600	3391
FES 8123	**Z 25**	123,34	4.8559	140,00	5.5118	25	0.9843	5965	4397
FE 8123	**Z 25**	123,88	4.8772	140,54	5.5331	25	0.9843	5990	4415
FE 8126	**Z 25**	126,22	4.9693	142,88	5.6252	25	0.9843	5998	4421
FE 8129	**Z 25**	129,39	5.0941	146,05	5.7500	25	0.9843	6244	4602
FE 8140	**Z 25**	140,00	5.5118	156,66	6.1677	25	0.9843	6686	4928
FE 8150	**Z 25**	150,00	5.9055	166,66	6.5614	25	0.9843	7448	5490

* Torque capacities shown in this table of dimensions are based on practically proven theoretic calculations as explained next page.

DRIVING TECHNOLOGY

Mounting Instructions - Hardness - Surface Finish - Mounting Fits

The raceways the series 8000 insert clutches should run on must be hardened and ground. When surface hardening is used, the minimum hardening depth (Eht) at full torque must be 1.3 mm. Lower torque requirements allow lower depths.

Mounting fits:

Shaft: d_L = h6 Hardness: HRC = 60^{+4}
Housing: D_L = H6 Hardening Depth: Eht ≥ 1.3 mm

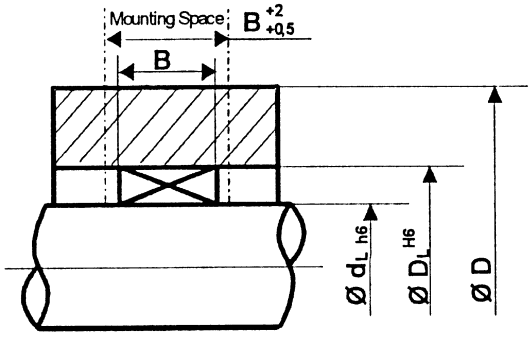
Excentricity: e ≤ 0.09 mm
Surface Finish: R_Z ≤ 1.6 microns

Axial limitation for the insert clutch will be necessary and can be arranged by a shoulder, a washer or snapring (round edge towards the clutch). For ease of mounting we recommend chamfered shafts and housings.

Torque Capacities

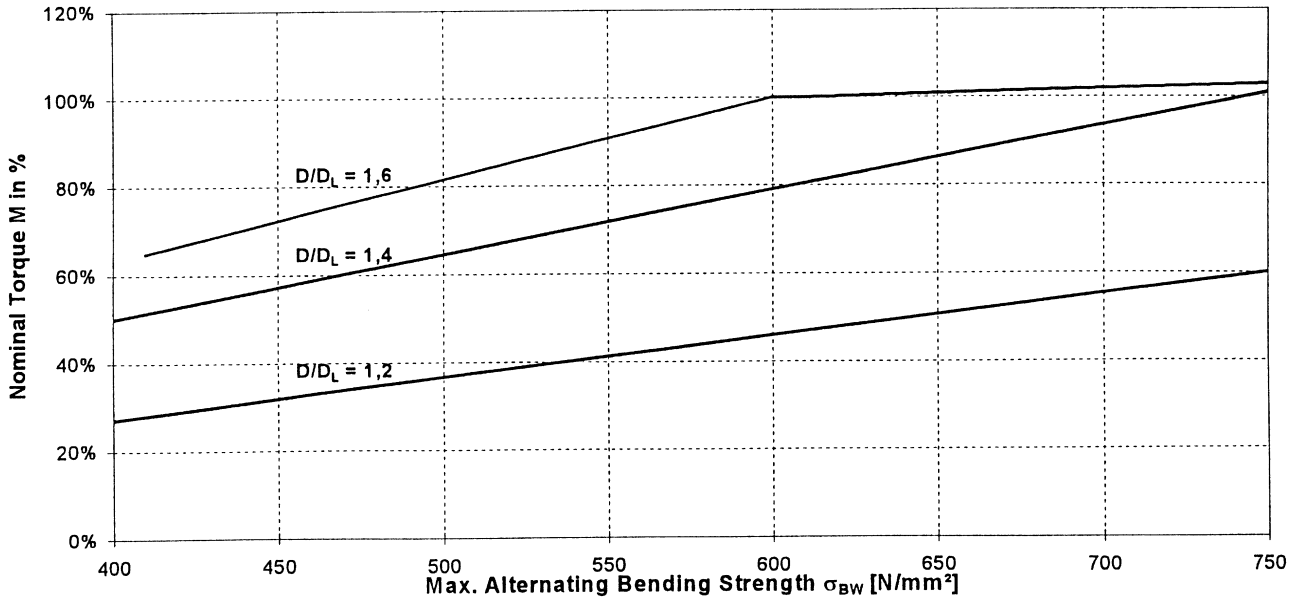
It is important to note that design plays an influencial role, as does the structure of the mating parts for defining the torque capacity of any freewheel clutch. There is no standard torque capacity for a clutch valid at any design. The most important parameters for defining the torque capacity of a clutch are the material to be used for customers parts (shaft and housing) and their wall thickness. The values of torque capacities shown in the table of dimensions reflect the following situation:

- solid shaft
- wall thickness of housing:
  factor D/D_L = 1.4
- material of shaft and housing:
  ball bearing steel 100 Cr 6 eq. AISI 52100;
  code 1.3505; hardened and drawn
  HRC = 60^{+4}; martensite structure



Torque depending on wall thickness and material

The diagram below shows the influence of the material on the nominal torque depending on the wall thickness factors D/D_L = 1.2 / 1.4 / 1.6



Here are some examples:

σ_{bw} = 400 N/mm²	34 CrMo 4V	(eq. AISI 4135);	- case hardened HRC = 60^{+4}; Eht = 1.3 mm
	16 MnCr 5	(eq. AISI 5115);	- case hardened HRC = 60^{+4}; Eht = 1.3 mm
σ_{bw} = 540 N/mm²	42 CrMo 4V	(eq. AISI 4140);	- case hardened HRC = 60^{+4}; Eht = 1.3 mm
σ_{bw} = 600 N/mm²	20 MnCr 5	(eq. AISI 5120);	- case hardened HRC = 60^{+4}; Eht = 1.3 mm
σ_{bw} = 750 N/mm²	100 Cr 6	(eq. AISI 52100);	- hardened and tempered; HRC = 60^{+4}

Idling Requirements

When torque is transmitted the sprags are in a fixed position between inner- and outer race. Under these conditons – theoretically – there is no speed limit. In backstopping and overrunning applications the influence of centrifugal forces has to be considered.

Tests showed that with oil lubrication series 8000 sprags surf on a hydrodynamic lubricating film under constant conditions (v = const.) with rotating shaft. The clutch itself turns very slowly under these conditions and so centrifugal forces do not become effective. The same situation could be expected with grease lubrication at a slightly higher speed level.

The rotating speed of the clutch itself depends on size, viscosity and temperature. With a hydrodynamic lubricating film only minimal wear could be expected.

Please note that in indexing applications due to alternating conditions a hydrodynamic lubricating film cannot be created. Please contact our technical staff for some advise if this kind of applications should arise.

Indications of lubrication

Proper lubrication with only qualified lubricants is the prerequisite for achievement of highest efficiency and long life of our high quality clutches. Only with use of oil or grease lubricants specified in the tables below, GMN will warrant their freewheel-clutches and their trouble free function. Whenever possible, use only oil or oil mist lubrication rather than grease lubrication.

FE 8000 insert elements are shipped rust protected only – not lubricated. Please contact our technical staff if operating temperatures are in the upper or lower temperature tolerance range, if the clutch has to be mounted in vertical position or if there should be any other special conditions.

Oil

	Operating Temperature Range		
Oil Type	**-15 °C to 30 °C 5 °F to 86 °F**	**15 °C to 90 °C 59 °F to 194 °F**	**60 °C to 120 °C 140 °F to 248 °F**
Hydraulic Oil	Hydraulic Oil HM 10	Hydraulic Oil HM 32 D	Hydraulic Oil HM 100
Motor Oil		HD-Motor Oil SAE 10 W ATF-Dextron III	HD-Motor Oil SAE 30

Important: Oils shown in the table are only to be mixed with oils of the same qualification.That means ATF oil with ATF oil, HD-motor oil with HD-motor oil etc. If there is any change of oil from one qualification to the other, it is necessary to clean the freewheel-clutch and mating parts with cleaning or test benzine. Never use trichloroethylene or perchloroethylene.

The oil level should be in relation to the size of the freewheel-clutch. In normal installation position, not operating, one third of the clutch should be submerged in oil.

For oil mist lubrication please use hydraulic oil HM 10 or HM 32. We recommend ample clean oil, free of moisture, to be sprayed directly onto clutches. Open or unsealed housings should be inspected frequently – at least daily – for proper lubrication level.

The use of lubricants with additives that decrease the coefficient of friction, i.e. MoS_2 or graphite is not possible.

Grease

Producer	Grease	Saponification	Oilbase	Operating Temperature at GMN Freewheel Clutches	Characteristics
Klüber Lubrication	ISOFLEX LDS 18 Special A	Lithium	Ester/ Mineral	-30 °C... 130 °C -22 °F... 266 °F	Deep temperature and longterm grease with high resistance to aging and corrosion.
Shell	Alvania RS	Lithium	Mineral	-10 °C... 120 °C 14 °F... 248 °F	Long term grease with high resistance to aging and corrosion.
Klüber Lubrication	Klüberbio BM 72-501	Polyurea	Ester	-20 °C... 120 °C -4 °F... 248 °F	Biological grease especially for overrunning and backstopping.
Klüber Lubrication	Klübersynth HB 72-102	Polyurea	Ester	-40 °C... 180 °C -40 °F... 356 °F	Full-Synthetic grease especially for overrunning and backstopping.

There is no universal grease for all service and operating conditions. The table above lists suitable grease types and characteristics for GMN freewheel-clutches. The amount of grease should cover approximately 60% of the free volume inside the clutch. Homogene dispersion of the grease all over the clutch is highly recommended.

GMN uses ball and roller bearing grease which is continually monitored for maximum quality and maximum clutch life. GMN can not endorse or guarantee the quality of lubricants purchased by their customers to be used with GMN clutches. Last update of the qualifications: May 1999

Standard Sizes and Specials

The sizes shown in the table of dimensions are the current standard size range, which can be supplied from stock or within short term deliveries. Intermediate sizes and sizes exceeding 150 mm shaft diameter can be produced on request if your requirement is based on reasonable quantities to justify new tooling costs. Please just ask for details. The standard sizes are based on inch sizes, however it is also possible to produce specials for either metric shafts or metric housings as per your requirements.

Technical advice

If you have a clutch problem, please contact our local representative or our technical staff in Nürnberg. Please note also our detailed information on the Internet.

www.gmn.de

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Unternehmensbeteiligungen

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