

GMN Freewheel-Clutches Series 400

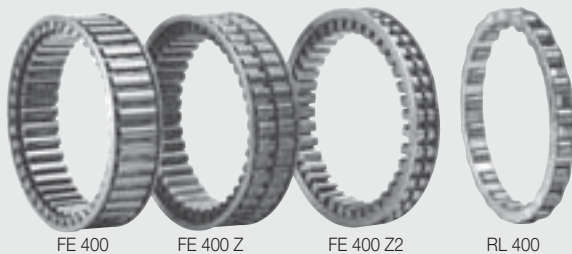


Freewheel-Clutch

as an insert element, unsupported

Roller Bearing RL 400

Clutch support bearing



FE 400 (M)	Shaft diameter of 14 to 80 mm
FE 400 Z	Shaft diameter of 4 to 80 mm
FE 400 Z2	Shaft diameter of 2 to 60 mm
RL 400	Roller Bearing Shaft diameter of 4 to 80 mm

Ball Bearing Freewheel-Clutch

with pressfit at inner and outer ring

Dimensions according to deep groove ball bearings DIN 625 bearing series 62

Clutch-Series FK 62 . .

Same sizes available with keyway too.

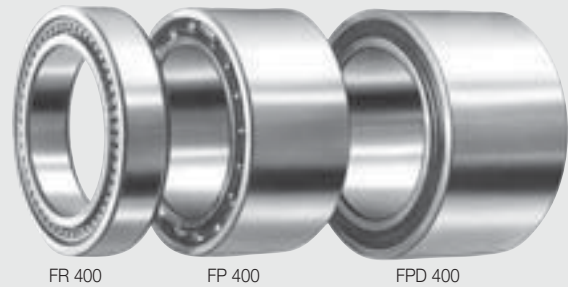
Clutch-Series FKN 62 . .



FK 62..	Shaft diameters 17 to 40 mm	open
FK 62..-RS		sealed on one side
FK 62..-2RS	Shaft diameters 20 to 40 mm	sealed on both sides
FKN 62..	Shaft diameters 17 to 40 mm	open
FKN 62..-RS		sealed on one side
FKN 62..-2RS	Shaft diameters 20 to 40 mm	sealed on both sides
FK 6304-2RS	Shaft diameter 20 mm	sealed on both sides with plain inner ring only
Other sizes and special dimensions on request		

Freewheel-Clutch

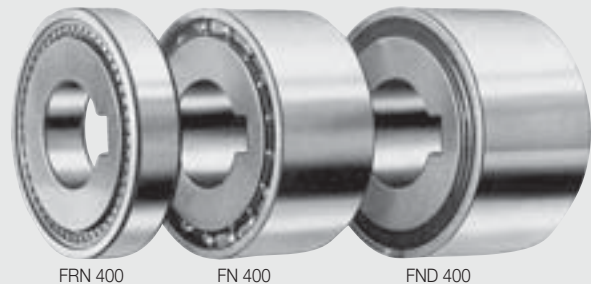
with press fit at inner and outer ring



FR 400	shaft diameter 10 to 60 mm
FP 400	shaft diameter 10 to 60 mm
FPD 400	shaft diameter 30 and 40 mm; sealed

Freewheel-Clutch

with keyway at inner ring and press fit at outer ring

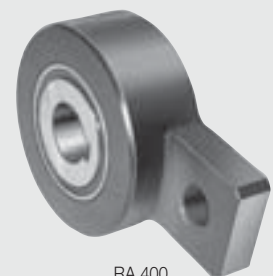


FRN 400	shaft diameter 10 to 45 mm
FN 400	shaft diameter 15 to 40 mm
FND 400	shaft diameter 15 to 40 mm; sealed

Backstop

with momentum lever

RA 400
shaft diameters
15 mm to 40 mm



RA 400

1. Freewheel-Clutches FE 400/Z/Z2/S and Roller Bearing RL 400

1.1. Surface and hardness:

The races of freewheel-clutches and roller bearings must be hardened and ground. The hardening depth (Eht) for surface hardness must be ≥ 1.3 mm for transmitting full torque moments. Lower torque moments require correspondingly lower depths.

Hardness: HRC = 60⁺²
Eht ≥ 1.3 mm
Surface: $R_z \leq 2.5 \mu\text{m}$

1.2. Mounting tolerance

Bore $D_L = H6$
Shaft $d_L = h5$
See page 22

1.3. Freewheel-clutch and roller bearing require a collar, ring or snap ring (round edge towards freewheel-clutch) as a guide.

1.4. For ease of mounting, shaft and bore should have a chamfered edge.

1.5. The rollers of the roller bearings RL 400 can be ordered in eleven different tolerance classes, in steps of 2 microns ranging from +10 to -10 microns.

Order example:

50 roller bearings with 34 mm diameter x 42 mm diameter and tolerance class of +4 microns:

50 RL 442 + 4.

If there is no tolerance ordered rollers of tolerance -4 microns will be delivered:

50 RL 442

2. Freewheel-Clutches FR/FP/FPD/FRN/FN and FND 400

(M-, Z- and S models)

2.1. Machine parts, in which freewheel-clutches are pressed in or on can be of ferrous or nonferrous material.

2.2. Mounting tolerance:

thin walled ring with pressfit
Bore $D = H6$
thin walled ring with pressfit

Shaft $d = h5$
ring with keyway
Shaft $d = js6 (k5)$
See page 22

2.3. Insert freewheel-clutches of models FR and FRN 400 have to be secured in the axial direction.

2.4. For pressed in or on freewheel-clutch rings, no retainers are necessary for axial or radial security.

2.5. The inner rings of freewheel-clutches FRN 400 have to be secured. The inner rings with keyway on the other models have to be secured in the axial direction only, if the pressed on outer machine part (gear or lever) is not axially secured.

2.6. When mounting freewheel-clutches with bearings do not apply pressure to bearing balls.

2.7. After installation a radial clearance between C2 and C5 will be reached. To create a clearance of C2 you should produce your shaft at the highest point and your housing at the lowest point of the allowed tolerances. bearing balls.

2.8. max. temperature:
FPD, FND, Series 453 110 °C (230 °F)
FP, FN, FR, FRN 170 °C (340 °F)

3. Ball Bearing Sizes FK 62 . . /FKN 62 . .

3.1. Connecting parts like 2.1.

3.2. Mounting tolerance:

Bore $D = N7$
Shaft $d = n6$
See page 22

3.3. For pressed in or on rings, no retainers are necessary for axial or radial security.

3.4. When mounting do not apply pressure to bearing balls.

3.5. The RSR-seals used for these clutches would seal against dust and grease lubrication. Oil lubrication and merging into liquids is not possible.

3.6. Even the keywayed inner rings of series FKN 62.. have to be pressfitted for proper function. Pressfit will be achieved by using the correct tolerance of the shaft "n6"!.

3.7. max. temperature: 110 °C (230 °F)

4. Backstop with Momentum Lever RA 400

4.1. Connecting shaft like 2.1.

4.2. Mounting tolerance:

Shaft $d = js6 (k5)$
See page 20

4.3. The inner ring of the backstop has to be axially secured on the shaft.

4.4. The backstop can only be mounted or disassembled by way of the inner ring so that the bearing balls are not damaged.

4.5. max. temperature: 110 °C (230 °F)

5. Engagement Direction

Different series of freewheel-clutches need to be ordered with the correct engagement direction. The engagement direction can be specified by catalog number.

Engagement direction right:

When the shaft is driving to the right (clockwise) and the outer ring is driven through the sprags, (direction of view from the mounting side) suffix "R" not necessary.

Engagement direction left:

When ordering a freewheel-clutch with opposite engagement, the suffix "L" must be placed after the catalog number.

For example:

FK 6205-RSL; RA 442 L;
RA 453 ZL

6. Lubrication

GMN Clutches (except the sealed clutches of series FND, FPD, FK 62 . . -RS, FK 62 . . -2RS, FKN 62 . . -RS, FKN 62 . . -2RS, RA) are shipped rust protected – not lubricated.

See pages 22/23

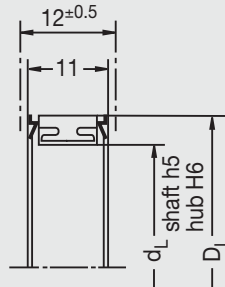
Attention: Please take care for total cleaning of freewheel rings and mating parts before pressfitting (no grease particles left in the pressfit area).

FE 400

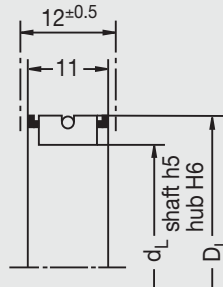
FE 400 Z

FE 400 Z2

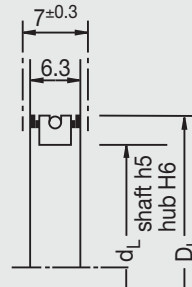
Mounting space



Mounting space



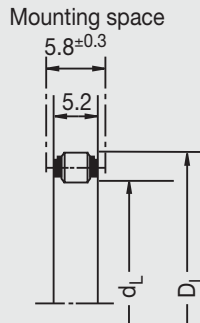
Mounting space



Dimensions [mm]		FE 400		FE 400 Z		FE 400 Z2			Idling speed Clutch n_{max} [RPM]	Dimensions [inch]			
d_L	D_L	Part-number	Torque M [ftlb] [Nm]	Part number	Torque M [ftlb] [Nm]	Part number	Torque M [ftlb] [Nm]			d_L	D_L		
2	10					FE 410 Z2 *	0.2	0.3	10 000	.0787	.3937		
4	12			FE 412 Z	2.2	3	FE 412 Z2 *	1.3	1.8	10 000	.1575	.4724	
5	13						FE 413 Z2	2.1	2.9	9 000	.1969	.5118	
6	14			FE 414 Z	5	7	FE 414 Z2	1.9	2.6	8 500	.2362	.5512	
8	16			FE 416 Z *	9	12	FE 416 Z2	5.6	7.6	7 500	.3150	.6299	
14	22	FE 422	36	48	FE 422 Z *	32	44	FE 422 Z2	16	21	5 300	.5512	.8661
15	23	FE 423	40	55	FE 423 Z	36	48	FE 423 Z2 *	18	24	5 200	.5906	.9055
17	25	FE 425	50	68	FE 425 Z	43	58	FE 425 Z2	22	30	4 700	.6693	.9843
19	27	FE 427	59	80	FE 427 Z	49	66	FE 427 Z2 *	27	36	4 400	.7480	1.0630
20	28	FE 428	64	87	FE 428 Z	55	75	FE 428 Z2	29	39	4 200	.7874	1.1024
22	30	FE 430	75	101	FE 430 Z	64	87	FE 430 Z2 *	34	46	4 000	.8661	1.1811
24	32	FE 432	86	116	FE 432 Z	71	97	FE 432 Z2	39	52	3 700	.9449	1.2598
25	33	FE 433	92	124	FE 433 Z	79	107	FE 433 Z2 *	41	56	3 600	.9843	1.2992
27	35	FE 435	104	141	FE 435 Z	90	121	FE 435 Z2	47	64	3 400	1.0630	1.3780
29	37	FE 437	117	158	FE 437 Z	101	137	FE 437 Z2 *	53	71	3 200	1.1417	1.4567
30	38	FE 438	124	168	FE 438 Z *	106	144	FE 438 Z2 *	56	76	3 100	1.1811	1.4960
34	42	FE 442	152	207	FE 442 Z	131	178	FE 442 Z2	69	93	2 800	1.3386	1.6535
35	43	FE 443	160	217	FE 443 Z	138	187	FE 443 Z2	72	98	2 700	1.3780	1.6929
40	48	FE 448	201	272	FE 448 Z	173	235	FE 448 Z2 *	90	122	2 500	1.5748	1.8898
45	53	FE 453	246	333	FE 453 Z	207	281	FE 453 Z2	108	146	2 200	1.7717	2.0866
50	58	FE 458 *	295	400	FE 458 Z	254	345	FE 458 ZS	131	178	2 000	1.9685	2.2835
51	59	FE 459	305	414	FE 459 Z	263	357						
55	63	FE 463	348	472	FE 463 Z	300	407	FE 463 Z2 *	149	202	1 900	2.1654	2.4803
60	68	FE 468	405	550	FE 468 Z	349	474	FE 468 Z2	179	243	1 750	2.3622	2.6772
62	70	FE 470	429	583	FE 470 Z	370	502			1 700	2.4409	2.7559	
65	73	FE 473	467	633	FE 473 Z	402	545			1 600	2.5590	2.8740	
70	78	FE 478	532	722	FE 478 Z	458	622			1 500	2.7559	3.0709	
80	88	FE 488	674	914	FE 488 Z	581	788			1 300	3.1496	3.4646	

Maximum radial clearance pending application 0.04 mm. * Not a stock item, delivery on request.
Other sizes on request. 10 Nm = 1 kpm, 10 N = 1 kp – Dimensions subject to change!

RL 400



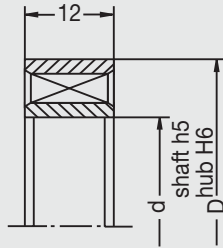
Tolerances of rollers and order example see page 13 paragraph 1.5.

Dimensions [mm]		RL 400 Part number	Load Capacities				Idling speed Bearing n_{max} [RPM]		Dimensions [inch]	
d_L	D_L		C dyn. [lb]	[N]	C_0 static [lb]	[N]	oil	grease	d_L	D_L
2	10								.0787	.3937
4	12	RL 412	564	2 510	315	1 400	55 000	45 000	.1575	.4724
5	13								.1969	.5118
6	14								.2362	.5512
8	16								.3150	.6299
14	22	RL 422	1 115	4 960	787	3 500	25 000	19 000	.5512	.8661
15	23	RL 423	1 119	4 980	798	3 550	24 000	18 000	.5906	.9055
17	25	RL 425	1 328	5 910	1 023	4 550	21 000	17 000	.6693	.9843
19	27	RL 427	1 427	6 350	1 148	5 110	20 000	15 000	.7480	1.0630
20	28	RL 428	1 425	6 340	1 160	5 160	19 000	15 000	.7874	1.1024
22	30	RL 430	1 515	6 740	1 283	5 710	17 000	14 000	.8661	1.1811
24	32	RL 432	1 508	6 710	1 301	5 790	16 000	13 000	.9449	1.2598
25	33								.9483	1.2992
27	35								1.0630	1.3780
29	37	RL 437	1 663	7 400	1 555	6 920	14 000	11 000	1.1417	1.4567
30	38	RL 438	1 659	7 380	1 562	6 950	13 000	10 000	1.1811	1.4960
34	42	RL 442	1 890	8 410	1 924	8 560	12 000	9 000	1.3386	1.6535
35	43	RL 443	1 883	8 380	1 930	8 590	12 000	9 000	1.3780	1.6929
40	48	RL 448	2 164	9 630	2 416	10 750	10 000	8 000	1.5748	1.8898
42	50								1.6535	1.9685
45	53	RL 453	2 126	9 460	2 441	10 860	9 000	7 000	1.7717	2.0866
50	58	RL 458	2 236	9 950	2 695	11 990	8 500	6 500	1.9685	2.2835
51	59	RL 459	2 373	10 560	2 933	13 050	8 000	6 500	2.0079	2.3228
55	63	RL 463	2 411	10 730	3 068	13 650	7 500	6 000	2.1654	2.4803
60	68								2.3622	2.6772
62	70	RL 470	2 627	11 690	3 566	15 870	7 000	5 000	2.4409	2.7559
65	73	RL 473	2 605	11 590	3 575	15 910	6 500	5 000	2.5590	2.8740
70	78	RL 478 *	2 566	11 420	3 591	15 980	6 000	4 700	2.7559	3.0709
80	88	RL 488 *	2 749	12 230	4 097	18 230	5 300	4 100	3.1496	3.4646

* Not a stock item, delivery on request.

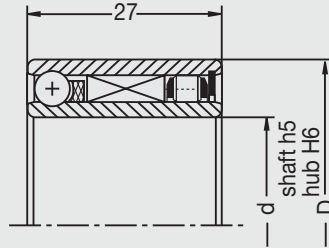
Other sizes on request. 10 Nm \approx 1 kpm, 10 N \approx 1 kp – Dimensions subject to change!

FR 400



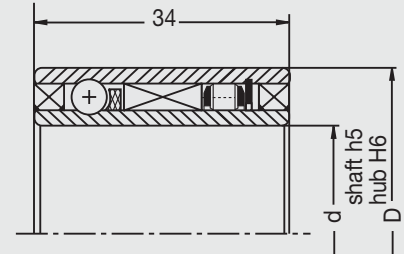
without bearing support

FP 400



with bearing

FPD 400



with bearing and double seal

Dimensions [mm] [inch]		FR 400	FP 400	FPD400	Torque M		Idling speed clutch n_{max} [RPM]	Load Capacities [N] [lb]			
d	D	Part number			[ftlb]	[Nm]		C dynamic		C ₀ static	
							Ball	Roller	Ball	Roller	
10 .3937	26 1.0236	FR 422	FP 422		36	48	5 300	4 935	4 960	2 085	3 500
		FR 422 Z	FP 422 Z		32	42		1 109	1 115	469	787
15 .5906	31 1.2205	FR 427	FP 427		59	80	4 400	6 080	6 350	2 785	5 110
		FR 427 Z	FP 427 Z		49	66		1 366	1 427	626	1 148
20 .7874	36 1.4173	FR 432	FP 432		86	116	3 700	6 555	6 710	3 175	5 790
		FR 432 Z	FP 432 Z		71	97		1 473	1 508	714	1 301
25 .9843	41 1.6142	FR 437	FP 437		117	158	3 200	7 325	7 400	3 870	6 920
		FR 437 Z	FP 437 Z		101	137		1 646	1 663	870	1 555
30 1.1811	46 1.8110	FR 442	FP 442	FPD 442	152	207	2 800 *(1 500)	7 980	8 410	4 570	8 560
		FR 442 Z	FP 442 Z	FPD 442 Z	131	178		1 793	1 890	1 027	1 924
35 1.3780	53 2.0866	FR 448			201	272	2 500				
		FR 448 Z			173	235					
40 1.5748	58 2.2835	FR 453	FP 453		246	333	2 200 *(1 200)	8 690	9 460	5 640	10 860
		FR 453 Z	FP 453 Z	FPD 453 Z	207	281		1 953	2 126	1 267	2 441
50 1.9685	68 2.6772	FR 463	FP 463		348	472	1 900	9 295	10 730	6 700	13 650
		FR 463 Z	FP 463 Z		300	407		2 089	2 411	1 506	3 068
60 2.3622	78 3.0709	FR 473	FP 473		467	633	1 600	9 535	11 590	7 420	15 910
		FR 473 Z	FP 473 Z		402	545		2 143	2 605	1 667	3 575

The load capacities "C" and "C₀" are not valid for the FR 400 series!

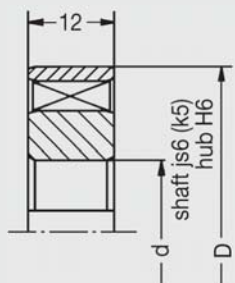
Maximum radial clearance for the FR 400 series pending application 0.02 mm.

◆ Arrow on inner ring shows: idling direction of outer ring = locking direction of inner ring.

* Idling speed for series FPD

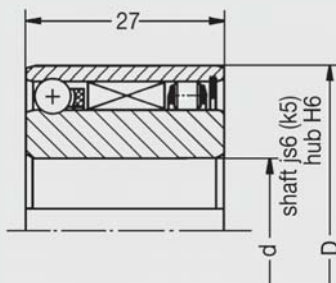
Other sizes on request.
Dimensions subject to change!
10 Nm ≈ 1 kpm; 10 N ≈ 1 kp

FRN 400*



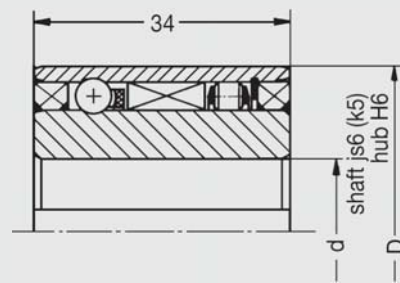
without bearing support

FN 400



with bearing

FND 400



with bearing and double seal

Dimensions [mm] [inch]		FRN 400+	FN 400	FND400♦	Torque M		Idling speed clutch n_{max} [RPM]	Load Capacities [N] [lb]			
d	D	Part number			[ftlb]	[Nm]		C dynamic		C ₀ static	
							Ball	Roller	Ball	Roller	
10 .3937	31 1.2205	FRN 427			59	80	4 400				
		FRN 427 Z			49	66					
12 .4724	36 1.4173	FRN 432			86	116	3 700				
		FRN 432 Z			71	97					
15 .5906	41 1.6142	FRN 437	FN 437	FND 437	117	158	3 200	7 325	7 400	3 870	6 920
		FRN 437 Z	FN 437 Z	FND 437 Z	101	137	*(1 700)	1 646	1 663	870	1 555
20 .7874	46 1.8110	FRN 442	FN 442	FND 442	152	207	2 800	7 980	8 410	4 570	8 560
		FRN 442 Z	FN 442 Z	FND 442 Z	131	178	*(1 500)	1 793	1 890	1 027	1 924
25 .9843	58 2.2835	FRN 453	FN 453	FND 453	246	333	2 200	8 690	9 460	5 640	10 860
		FRN 453 Z	FN 453 Z	FND 453 Z	207	281	*(1 200)	1 953	2 126	1 267	2 441
30 1.1811	64 2.5197	FRN 459	FN 459	FND 459	305	414	2 000	8 805	10 560	6 010	13 050
		FRN 459 Z	FN 459 Z	FND 459 Z	263	357	*(1 100)	1 979	2 373	1 351	2 933
35 1.3780	68 2.6772	FRN 463			348	472	1 900				
		FRN 463 Z			300	407					
40 1.5748	75 2.9528	FRN 470	FN 470	FND 470	429	583	1 700	9 645	11 690	7 405	15 870
		FRN 470 Z	FN 470 Z	FND 470 Z	370	502	*(1 000)	2 168	2 627	1 664	3 566
45 1.7717	78 3.0709	FRN 473			467	633	1 600				
		FRN 473 Z			402	545					

The load capacities "C" and "C₀" are not valid for the FRN 400 series!

Maximum radial clearance for the FRN 400 series pending application 0.02 mm.

+ Torque capacity stated is valid for the clutch but not for the keyway!

Keyway specifications according to DIN 6885 Bl. 1 (P9) with back clearance (connecting dimensions on page 20).

♦ Arrow on inner ring shows: idling direction of outer ring = locking direction of inner ring

* Idling speed for series FND

Other sizes on request.

Dimensions subject to change.

10 Nm = 1 kpm; 10 N = 1 kp

FK 62 . .

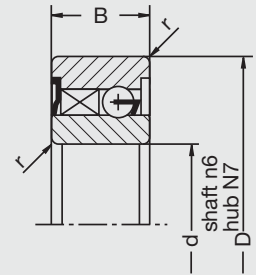
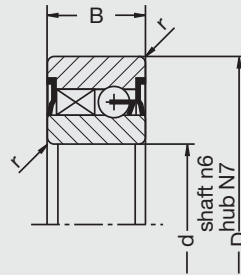
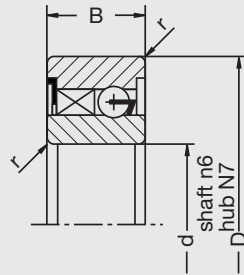
FK 62 . .-2RS

FK 62 . .-RS

Engagement direction of inner ring
only important for type FK 62 . .-RS



direction of view



Dimensions in accordance with DIN 625, series 62, row 02

The “open” and “2RS” style are the standard program. With these types it is not necessary to specify clutch engagement direction. With the “RS” style it is necessary to specify clutch engagement direction as shown beside. The “RS” and “2RS” style are shipped grease lubricated for the life-time. Specification DIN 620 states that the radial clearance will be C2 to C5 after installation is completed. Should C2 be desired, it is necessary that the shaft diameter is manufactured at the high limit of the tolerance zone and the diameter of the housing bore is manufactured at the lowest limit.

with Keyway

FKN 62 . .

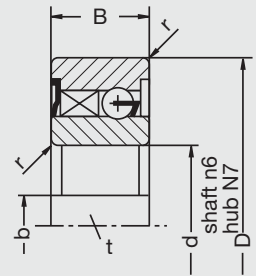
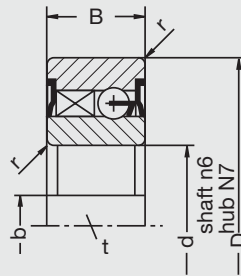
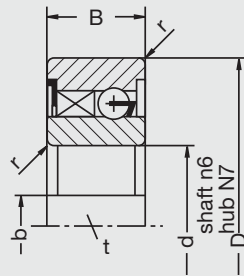
FKN 62 . .-2RS

FKN 62 . .-RS

Engagement direction of inner ring
only important for type FKN 62 . .-RS



direction of view



Dimensions in accordance with DIN 625, series 62, row 02

Dimensions [mm] [inch]						Part Number			M [Nm] [ftlb]	Idling speed clutch n_{max} [RPM]	Load Capacities [N] [lb]	
d	D	B	r	b ^{P9}	t						C dyn.	C ₀ static
17 .6693	40 1.5748	12 .4724	1 .04	5 .1968	1.2 .0472	FK 6203		FK 6203-RS	40	3 700	6 555	3 175
						FKN 6203		FKN 6203-RS	29.5		1.473	0.714
20 .7874	47 1.8504	14 .5512	1.5 .06	6 .2362	1.6 .063	FK 6204	FK 6204-2RS	FK 6204-RS	55	3 200	7 325	3 870
						FKN 6204	FKN 6204-2RS	FKN 6204-RS	40.5		1.646	0.870
25 .9843	52 2.0472	15 .5906	1.5 .06	8 .315	2 .0787	FK 6205	FK 6205-2RS	FK 6205-RS	93	2 800	7 980	4 570
						FKN 6205	FKN 6205-2RS	FKN 6205-RS	69		1.793	1.027
30 1.1811	62 2.4409	16 .6299	1.5 .06	8 .315	2 .0787	FK 6206	FK 6206-2RS	FK 6206-RS	130	2 400	8 450	5 290
						FKN 6206	FKN 6206-2RS	FKN 6206-RS	96		1.899	1.189
35 1.3780	72 2.8346	17 .6693	2.7 .10	10 .3937	3.3 .130	FK 6207	FK 6207-2RS	FK 6207-RS	202	1 900	9 295	6 700
						FKN 6207	FKN 6207-2RS	FKN 6207-RS	149		2.089	1.506
40 1.3780	80 2.8346	18 .6693	2.7 .10	12 .3937	3.3 .130	FK 6208	FK 6208-2RS	FK 6208-RS	200	1 900	9 295	6 700
						FKN 6208	FKN 6208-2RS	FKN 6208-RS	149		2.089	1.506
20 .7874	52 2.0472	15 .5906	1.5 .06					FK 6304-2RS	93	2 800	7 980	4 570
									69		1.793	1.027

The torque capacities for the FKN 62 . . series are only valid for the clutches, but not for the keyways!

Keyway specifications according to DIN 6885 Bl. 3 P9 with back clearance. (Conversion factors see page 20).

Arrow at inner ring shows: idling direction of outer ring = locking direction of inner ring.

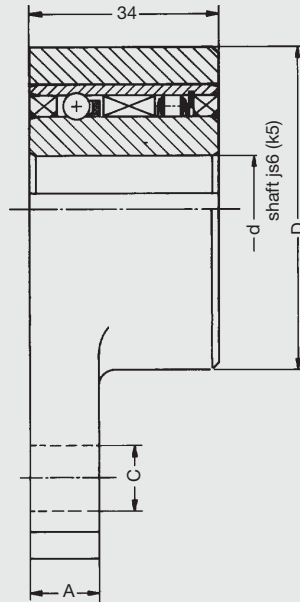
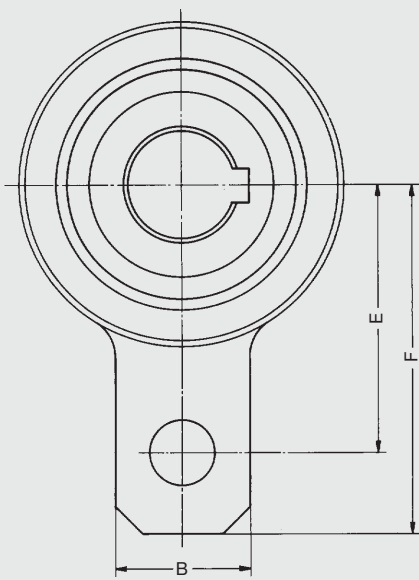
◆ Sizes 6207, 6208: Housing tolerance N6; keyway depth according DIN 6885 Bl. 1

Other sizes on request.

Dimensions subject to change!

10 Nm = 1 kpm; 10 N = 1 kp

RA 400



backstop direction at inner ring



direction of view

Backstops of series RA 400 can be used as indexing elements too.

Dimensions [mm] [inch]							Part Number	Torque M		Idling speed clutch n_{max} [RPM]	Load Capacities [N] [lb]			
d	D	A	B	C	E	F		[ftlb]	[Nm]		C dynamic		C ₀ static	
										Ball	Roller	Ball	Roller	
15 .5906	65 2.5590	12 .4724	32 1.2598	10 .3937	47 1.8504	62 2.4409	RA 437	117	158	1 700	7 325 1 640	7 400 1 663	3 870 870	6 920 1 555
							RA 437 Z	101	137					
20 .7874	75 2.9528	16 .6299	36 1.4173	12 .4724	54 2.1260	72 2.8346	RA 442	152	207	1 500	7 980 1 793	8 410 1 890	4 570 1 027	8 560 1 924
							RA 442 Z	131	178					
25 .9843	90 3.5433	16 .6299	45 1.7717	16 .6299	62 2.4409	84 3.3070	RA 453	246	333	1 200	8 690 1 953	9 460 2 126	5 640 1 267	10 860 2 441
							RA 453 Z	207	281					
30 1.1811	100 3.9370	16 .6299	50 1.9685	16 .6299	68 2.6772	92 3.6220	RA 459	305	414	1 100	8 805 1 979	10 560 2 373	6 010 1 351	13 050 2 933
							RA 459 Z	263	357					
40 1.5748	110 4.3307	20 .7844	50 1.9685	20 .7874	85 3.3465	112 4.4494	RA 470	429	583	1 000	9 645 2 168	11 690 2 627	7 405 1 664	15 870 3 566
							RA 470 Z	370	502					

Keyway specifications according to DIN 6885 Bl. 1 (P9) with back clearance. (connecting dimensions on page 20).
Hole C in momentum lever may be ordered threaded, with pivot stud or as a slotted hole at extra cost.
Arrow at inner ring shows locking direction of inner ring.

Other sizes on request.
Dimensions subject to change.
10 Nm = 1 kpm; 10 N = 1 kp

Shaft		Extract of DIN 7160										
Normal Size mm	Above To	Shaft Tolerance in 0.001 mm = .000039 inch										
		3	6	10	18	30	50	80	120	180	250	315
Tolerance Zone	h	5	-5	-6	-8	-9	-11	-13	-15	-18	-20	-23
	6	-8	-9	-11	-13	-16	-19	-22	-25	-29	-32	
js	6	+4	+4.5	+5.5	+6.5	+8	+9.5	+11	+12.5	+14.5	+16	
	7	-4	-4.5	-5.5	-6.5	-8	-9.5	-11	-12.5	-14.5	-16	
k	5	+6	+7	+9	+11	+13	+15	+18	+21	+24	+27	
	6	+1	+1	+1	+2	+2	+2	+3	+3	+4	+4	
n	6	+9	+10	+12	+15	+18	+21	+25	+28	+33	+36	
	7	+1	+1	+1	+2	+2	+2	+3	+3	+4	+4	
	6	+16	+19	+23	+28	+33	+39	+45	+52	+60	+66	
	7	+8	+10	+12	+15	+17	+20	+23	+27	+31	+34	
	6	+20	+25	+30	+36	+42	+50	+58	+67	+77	+86	
	7	+8	+10	+12	+15	+17	+20	+23	+27	+31	+34	

Housing		Extract of DIN 7161										
Normal Size mm	Above To	Housing Tolerance in 0.001 mm = .000039 inch										
		3	6	10	18	30	50	80	120	180	250	315
Tolerance Zone	H	6	+8	+9	+11	+13	+16	+19	+22	+25	+29	+32
	6	0	0	0	0	0	0	0	0	0	0	0
N	6	-5	-7	-9	-11	-12	-14	-16	-20	-22	-25	
	7	-13	-16	-20	-24	-28	-33	-38	-45	-51	-57	
	6	-4	-4	-5	-7	-8	-9	-10	-12	-14	-14	
	7	-16	-19	-23	-28	-33	-39	-45	-52	-60	-66	

Keyway and Key		Extract of DIN 6885 Bl. 1														
Normal Size mm	Above To	Keyway Tolerance in 0.001 mm = .000039 inch														
		8	10	12	17	22	30	38	44	50	58	65	75	85	95	110
Keysize (Width x Height)		3x3	4x4	5x5	6x6	8x7	10x8	12x8	14x9	16x10	18x11	20x12	22x14	25x14	28x16	32x18
Tolerance Zone P9 for keyway width		-6		-12		-15		-18		-22		-26		-31		-38
		-31		-42		-51		-61		-74		-88				
Depth of Keyway (shaft)		1.8	2.5	3	3.5	4	5	5	5.5	6	7	7.5	9	9	10	11
Tolerance		+100					+200									
Depth of Keyway (hub)		1.4	1.8	2.3	2.8	3.3	3.3	3.3	3.8	4.3	4.4	4.9	5.4	5.4	6.4	7.4
Tolerance		+100					+200									

Keyway and Key		Extract of DIN 6885 Bl. 3														
Normal Size mm	Above To	Keyway Tolerance in 0.001 mm = .000039 inch														
		8	10	12	17	22	30	38	44	50	58	65	75	85	95	110
Keysize (Width x Height)				5x3	6x4	8x5	10x6	12x6	14x6	16x7	18x7	20x8	22x9	25x9	28x10	32x11
Tolerance Zone P9 for keyway width				-12		-15		-18		-22		-26		-31		-38
				-42		-51		-61		-74		-88				
Depth of Keyway (shaft)				1.9	2.5	3.1	3.7	3.9	4	4.7	4.8	5.4	6	6.2	6.9	7.6
Tolerance		+100					+200									
Depth of Keyway (hub)				1.2	1.6	2	2.4	2.2	2.1	2.4	2.3	2.7	3.1	2.9	3.2	3.5
Tolerance		+100					+200									