Integrated Freewheels FXM

for bolting to the face
with sprag lift-off X

New generation with 20% higher torques

64-1

Features

Integrated Freewheels FXM are sprag freewheels without bearing support and with sprag lift-off X.

The sprag lift-off X ensures a wear-free freewheeling operation when the inner ring rotates at high speed.

The freewheels FXM are used as:

- Backstops
- Overrunning Clutches

for applications with high speed freewheeling operation and when used as an overrunning clutch with low speed driving operation.
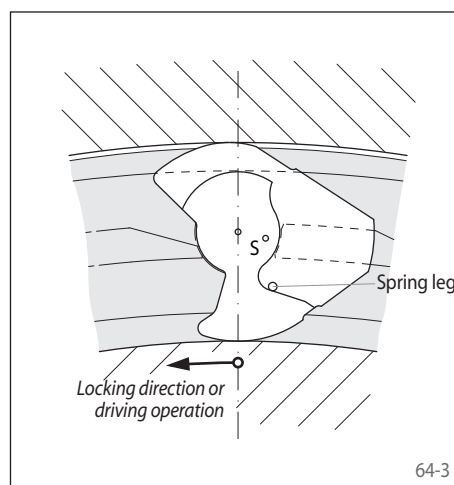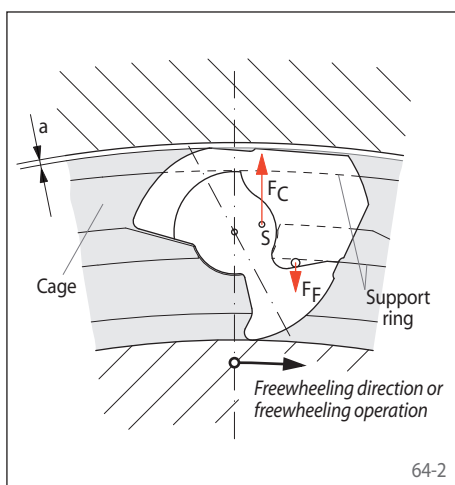
Nominal torques up to 364 000 Nm.

Bores up to 320 mm. Many standard bores are available.

Sprag lift-off X

Integrated Freewheels FXM are equipped with sprag lift-off X. The sprag lift-off X is used for backstops and overrunning clutches, provided that in freewheeling operation the inner ring is rotating at high speed and providing with overrunning clutches that the driving operation is conducted at low speed. In freewheeling operation, the centrifugal force F_C causes the sprag to lift off from the outer track. In this operating state, the freewheel works wear-free, i.e. with unlimited service life.
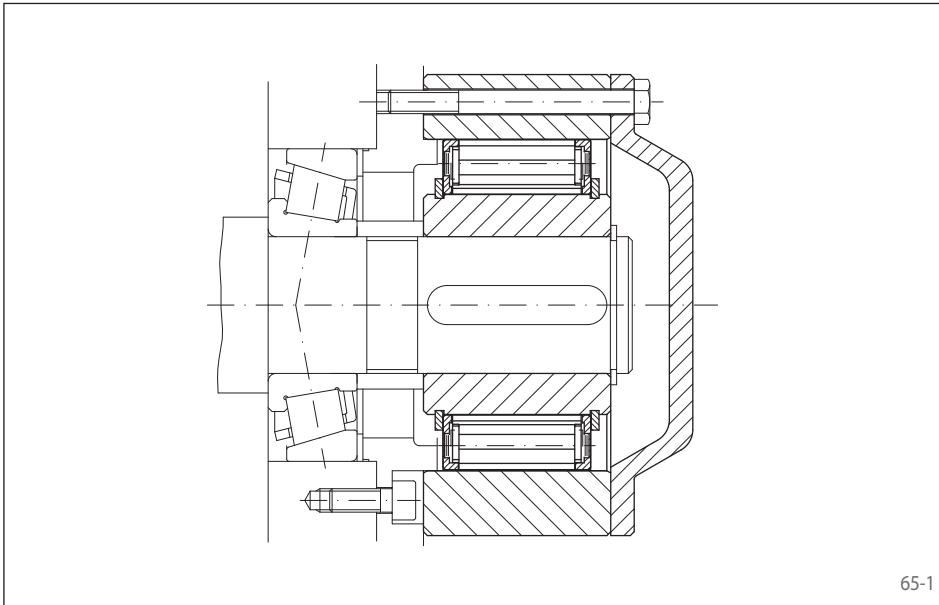
Figure 64-2 shows a freewheel with sprag lift-off X in freewheeling operation. The sprags, which are supported in a cage connected with the inner ring, rotate with the inner ring. The centrifugal force F_C that is applied in the center of gravity S of the sprag turns the sprag counterclockwise and rests against the support ring of the cage. This results in the gap a between the sprag and the outer track; the freewheel works without contact. If the inner ring speed decreases to such an extent that the effect of

the centrifugal force on the sprag is less than that of the spring force F_F, the sprag again rests on the outer ring and the freewheel is ready to lock (figure 64-3). If used as an overrunning clutch, the driving speed must not exceed 40% of the lift-off speed.


Freewheeling direction or freewheeling operation

64-2

Locking direction or driving operation

64-3

65-1

Application example

Integrated Freewheel FXM 170 - 63 MX with end cover as backstop fitted to the end of the first intermediate shaft of a spur gearbox in the drive of an inclined conveyor belt. In the case of a motor stop, the conveyor belt must be held securely so that the conveyor goods do not pull the belt backwards and possibly cause serious damage. Due to the high shaft speeds in normal operation (freewheeling operation), the sprag lift-off X ensures a contactless and hence wear-free continuous operation.
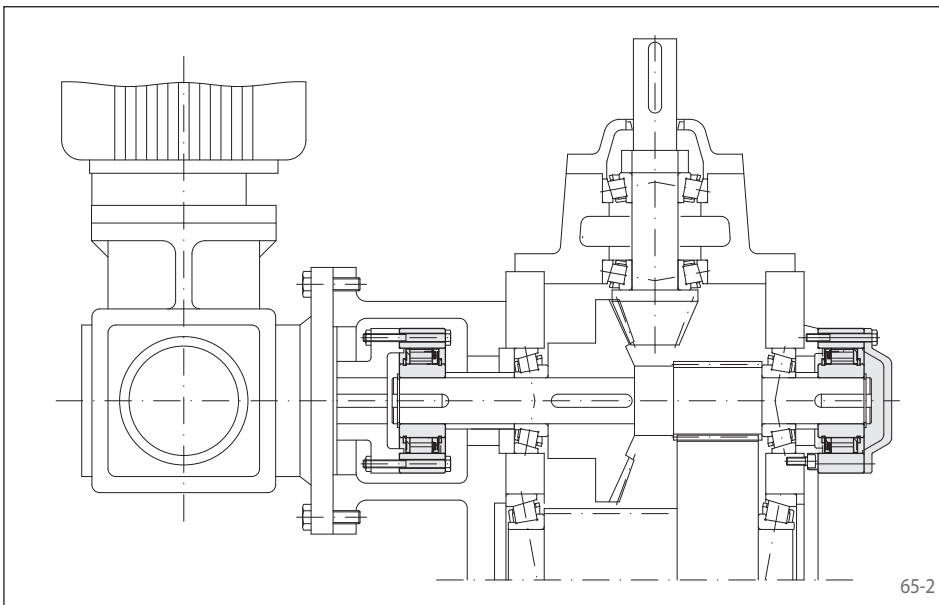
65-2

Application example

Two Integrated Freewheels FXM 120 – 50 MX in the gearbox unit of a vertical bucket conveyor. Alongside the main drive, the bucket conveyor has a creep drive, which can be moved at a low speed if maintenance work needs to be carried out. The freewheel arranged between the creep drive and the main drive works as an overrunning clutch. When the creep drive operates, the freewheel is in driving operation. In normal operation, when driving via the main drive, the inner ring of the freewheel overruns at high speed and automatically disengages the creep drive. The second freewheel that is arranged on the end of the first intermediate shaft of the main gearbox, works as a backstop and prevents the bucket conveyor from running back when the unit is at a standstill.
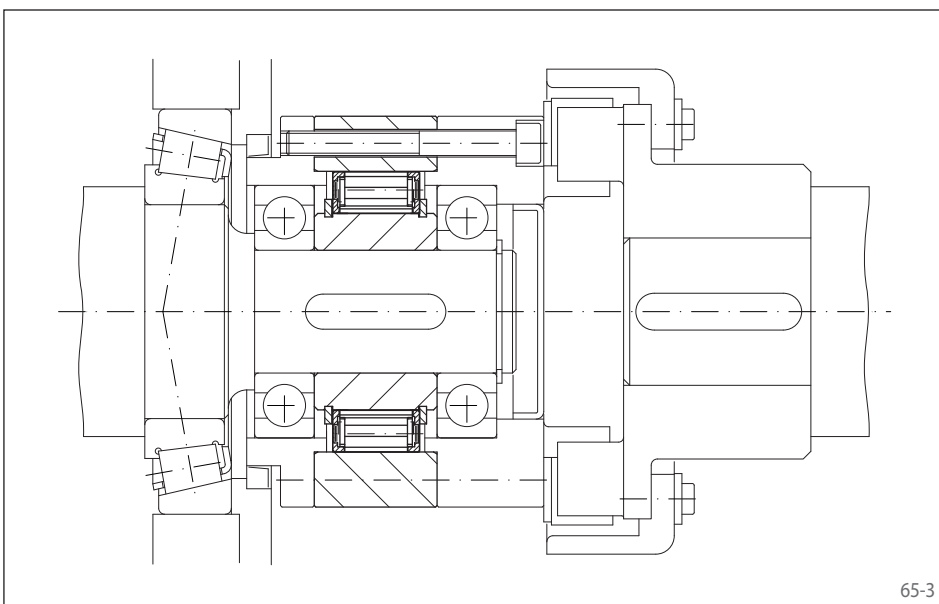
65-3

Application example

Integrated Freewheel FXM 76-25 NX as an overrunning clutch between the creep drive and the main drive of a cement mixer. When the creep drive operates, the outer ring is driven by the shaft coupling. The freewheel works in driving operation and drives the unit at a low speed via the main gearbox. In normal operation (freewheeling operation), the inner ring overruns at high speed and the creep drive is automatically disengaged. With the high shaft speed, the type sprag lift-off X is used; the sprags work in freewheeling operation without contact and hence are wear-free. The arrangement of the seals between the freewheel and the main gearbox is advantageous. In freewheeling operation, this is at a standstill and hence generates no additional friction-related temperature rise.

Integrated Freewheels

65

Integrated Freewheels FXM … NX and FXM … MX

for bolting to the face
with sprag lift-off X

FXM 200 MX	FXM 140 MX	FXM 100 MX	FXM 86 NX

Type with sprag lift-off X
For extended service life using sprag lift-off at high speed rotating inner ring

Backstop

Overrunning Clutch

Freewheel Size	Type	Theoretical nominal torque ↗ 0 A Nm	Nominal torque at existing run out (T.I.R.) ↗ 0,1 A Nm	↗ 0,2 A Nm	↗ 0,3 A Nm	↗ 0,4 A Nm	↗ 0,5 A Nm	Sprag lift-off at inner ring speed min⁻¹	Inner ring freewheels/ overruns min⁻¹	Outer ring drives min⁻¹
FXM 31 - 17	NX	110	110	105	100			890	5 000	356
FXM 38 - 17	NX	180	170	160	150			860	5 000	344
FXM 46 - 25	NX	460	450	440	430			820	5 000	328
FXM 51 - 25	NX	560	550	540	530			750	5 000	300
FXM 56 - 25	NX	660	650	640	630			730	5 000	292
FXM 61 - 19	NX	520	500	480	460			750	5 000	300
FXM 66 - 25	NX	950	930	910	890			700	5 000	280
FXM 76 - 25	NX	1 200	1 170	1 140	1 110			670	5 000	268
FXM 86 - 25	NX	1 600	1 550	1 500	1 450			630	5 000	252
FXM 101 - 25	NX	2 100	2 050	2 000	1 950			610	5 000	244
FXM 85 - 40	MX	2 500	2 400	2 300	2 300	2 200	1 850	430	6 000	172
FXM 100 - 40	MX	3 700	3 600	3 400	3 400	2 900	2 400	400	4 500	160
FXM 120 - 50	MX	7 700	7 600	7 500	6 100	5 100	4 200	320	4 000	128
FXM 140 - 50	MX	10 100	10 000	9 800	8 400	7 000	5 800	320	3 000	128
FXM 170 - 63	MX	20 500	20 500	19 500	15 500	13 000	12 000	250	2 700	100
FXM 200 - 63	MX	31 000	27 500	22 000	18 000	15 500	14 000	240	2 100	96

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.
The theoretical nominal torque applies only for ideal concentricity between the inner and outer ring. In practice, the concentricity is affected by the bearing play and centering errors of the neighbouring parts. Then the nominal torques specified in the table apply, whilst taking into consideration the existing run out (T.I.R.).
Higher speeds upon request.

Mounting

Integrated Freewheels FXM are without bearing support. Concentric alignment of inner and outer ring must be provided by the customer. The permissible run out (T.I.R.) must be observed.

The Integrated Freewheel FXM is centered via the outer track F on the customer attachment part and bolted to this (refer to figure 67-1). The tolerance of the pilot diameter of the attachment part must be ISO h6 or h7.

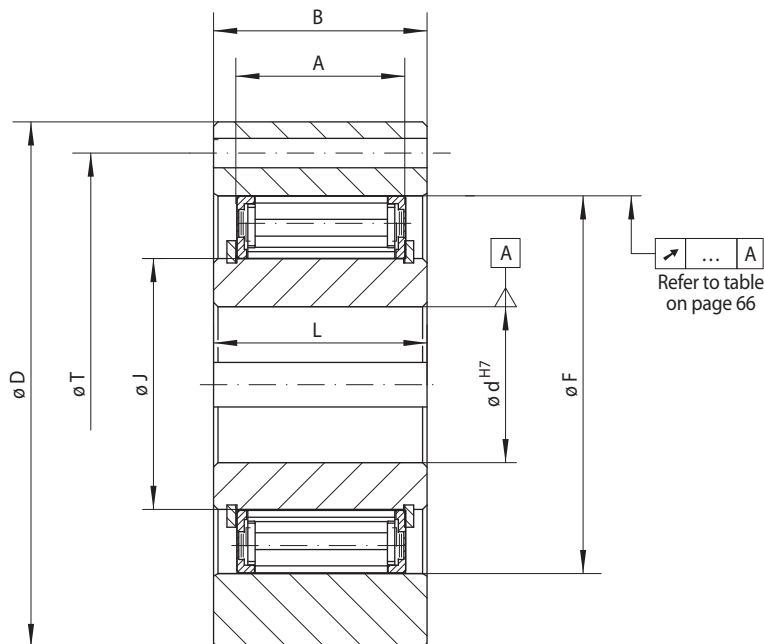The tolerance of the shaft must be ISO h6 or j6.

For fitting to shaft ends, end covers can be supplied upon request (refer to figure 67-3).
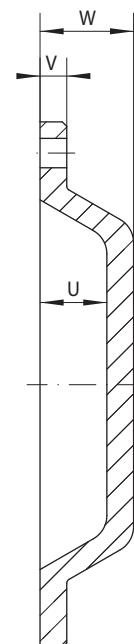
Integrated Freewheels FXM … NX and FXM … MX

for bolting to the face
with sprag lift-off X
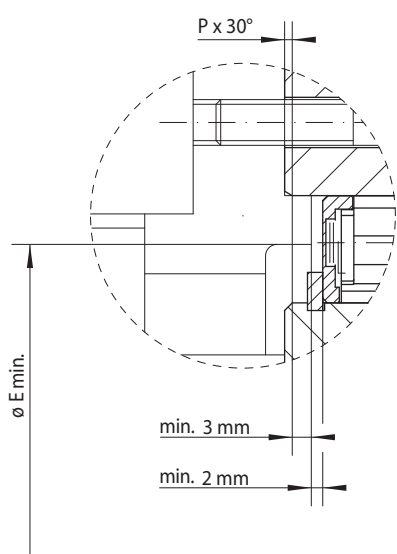
67-1

67-2

67-3

Freewheel Size	Bore d Standard						max.	A	B	D	E min.	F	G	J	L	P	T	U	V	W	Z**	Weight
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm		mm	mm	mm	mm	mm	mm	mm		kg
FXM 31 -17	20*						20*	17	25	85	41	55	M6	31	24	1,0	70	15	6	21	6	0,8
FXM 38 -17	25*						25*	17	25	90	48	62	M6	38	24	1,0	75	15	6	21	6	0,9
FXM 46 -25	25						30	25	35	95	56	70	M6	46	35	1,0	82	15	6	21	6	1,3
FXM 51 -25	25	30	35				36	25	35	105	62	75	M6	51	35	1,0	90	15	6	21	6	1,7
FXM 56 -25	35						40	25	35	110	66	80	M6	56	35	1,0	96	15	6	21	8	1,8
FXM 61 -19	30	35	40				45*	19	27	120	74	85	M8	61	25	1,0	105	15	6	21	6	1,8
FXM 66 -25	35	40	45				48*	25	35	132	82	90	M8	66	35	1,0	115	15	8	23	8	2,8
FXM 76 -25	45	55					60*	25	35	140	92	100	M8	76	35	1,0	125	15	8	23	8	3,1
FXM 86 -25	40	45	50	60	65		70*	25	40	150	102	110	M8	86	40	1,0	132	15	8	23	8	4,2
FXM 101 -25	55	70					80*	25	50	175	117	125	M10	101	50	1,0	155	20	8	28	8	6,9
FXM 85 -40	45	50	60	65			65	40	50	175	102	125	M10	85	60	1,0	155	20	8	28	8	7,4
FXM 100 -40	45	50	55	60	70	75	80*	40	50	190	130	140	M10	100	60	1,5	165	25	10	35	12	8,8
FXM 120 -50	60	65	70	75	80	95	95	50	60	210	150	160	M10	120	70	1,5	185	25	10	35	12	12,7
FXM 140 -50	65	90	100	110			110	50	70	245	170	180	M12	140	70	2,0	218	25	12	35	12	19,8
FXM 170 -63	70	85	90	100	120		130	63	80	290	200	210	M16	170	80	2,0	258	28	12	38	12	33,0
FXM 200 -63	130						155	63	80	310	230	240	M16	200	80	2,0	278	32	12	42	12	32,0

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.
* Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.
** Z = Number of fastening holes for screws G on pitch circle T.

Lubrication

At speeds in excess of the sprag lift-off speed, no special lubrication is required; the freewheel functions maintenance-free.

When operating below the sprag lift-off speed, an oil lubrication of the specified oil quality must be provided.
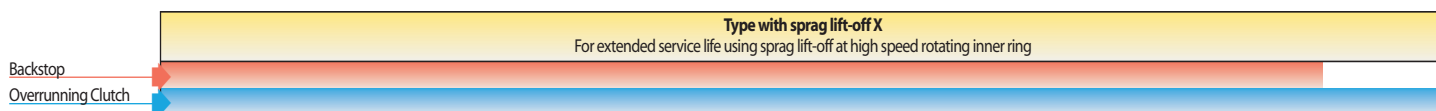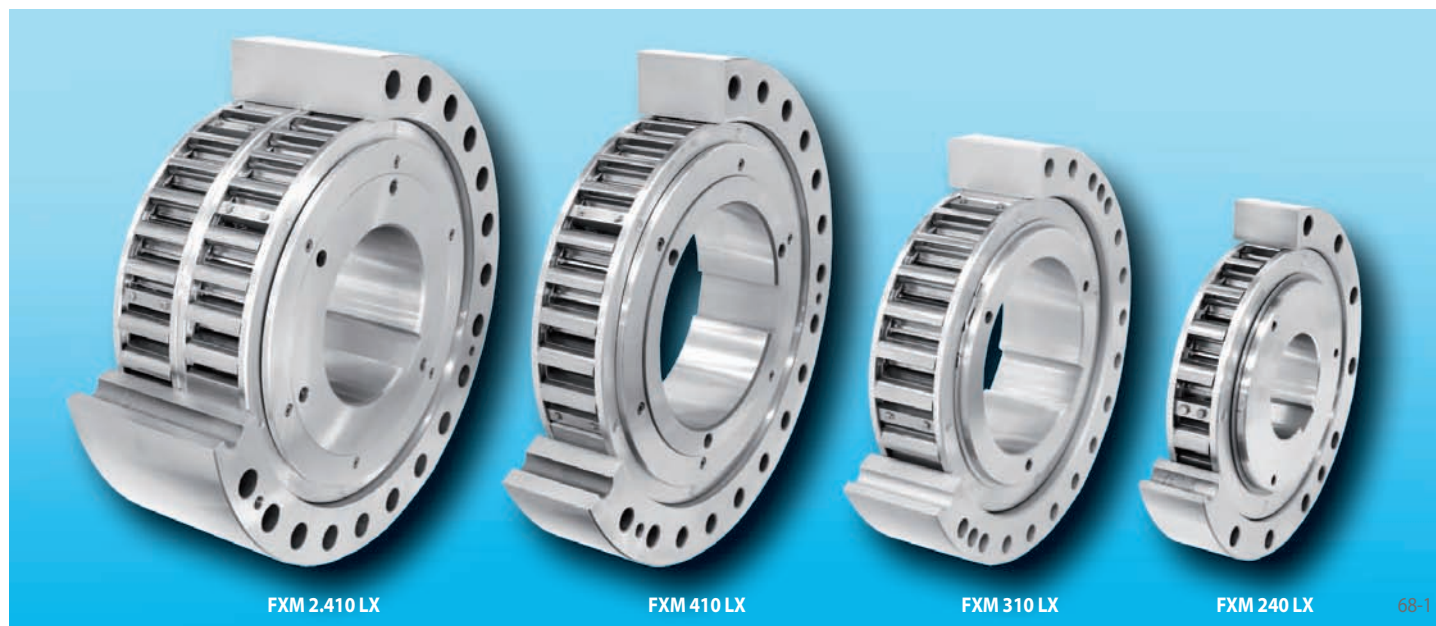
Example for ordering

Freewheel size FXM 140 – 50, type with sprag lift-off X and 100 mm bore and end cover:

- FXM 140 - 50 MX, d = 100 mm, with end cover

Integrated Freewheels FXM … LX

for bolting to the face
with sprag lift-off X

| FXM 2.410 LX | FXM 410 LX | FXM 310 LX | FXM 240 LX | 68-1 |

	Type with sprag lift-off X
	For extended service life using sprag lift-off at high speed rotating inner ring
Backstop	
Overrunning Clutch	

Freewheel Size	Type	Theoretical nominal torque ↗ 0 A Nm	Nominal torque at existing run out (T.I.R.) ↗ 0,1 A Nm	↗ 0,2 A Nm	↗ 0,3 A Nm	↗ 0,4 A Nm	↗ 0,5 A Nm	↗ 0,8 A Nm	Sprag lift-off at inner ring speed min⁻¹	Inner ring freewheels/ overruns min⁻¹	Outer ring drives min⁻¹
FXM 240 - 63	LX	36 500	36 000	35 500	35 500	34 000	30 500	22 500	220	3 000	88
FXM 240 - 96	LX	59 000	58 500	58 500	57 500	56 500	53 000	39 000	220	2 500	88
FXM 2.240 - 70	LX	81 000	80 500	80 000	79 500	77 000	73 000	54 000	220	2 500	88
FXM 2.240 - 96	LX	117 500	116 500	116 000	114 500	111 500	108 500	80 000	220	2 500	88
FXM 260 - 63	LX	44 500	44 000	44 000	43 500	41 000	36 000	27 000	210	2 250	84
FXM 290 - 70	LX	65 000	64 500	64 000	60 500	52 500	46 500	37 000	200	2 250	80
FXM 290 - 96	LX	95 500	95 000	94 500	84 500	74 000	65 500	55 000	200	2 250	80
FXM 2.290 - 70	LX	125 500	124 500	123 500	122 500	117 000	103 000	77 000	200	2 250	80
FXM 2.290 - 96	LX	183 000	181 500	180 000	178 500	169 500	149 500	112 000	200	2 250	80
FXM 310 - 70	LX	76 000	75 000	74 500	72 500	63 000	56 000	43 000	195	2 250	78
FXM 310 - 96	LX	112 000	111 000	110 500	101 000	88 000	78 000	68 000	195	2 100	78
FXM 320 - 70	LX	81 000	80 500	76 000	67 500	59 000	52 000	43 000	195	2 000	78
FXM 320 - 96	LX	114 000	113 500	112 500	110 000	95 500	84 500	67 000	195	2 000	78
FXM 2.320 - 70	LX	158 000	156 500	155 500	147 500	128 500	113 500	87 000	195	2 000	78
FXM 2.320 - 96	LX	225 000	223 500	221 500	220 000	198 500	175 000	133 000	195	2 000	78
FXM 360 - 100	LX	156 000	145 000	129 500	119 500	103 500	90 000	80 500	180	1 800	72
FXM 2.360 - 73	LX	208 000	206 500	196 500	173 500	152 000	133 500	108 500	180	1 800	72
FXM 2.360 - 100	LX	294 500	292 500	290 000	273 500	242 000	212 000	171 500	180	1 800	72
FXM 410 - 100	LX	194 500	193 500	178 500	158 000	138 500	121 500	111 500	170	1 500	68
FXM 2.410 - 73	LX	263 000	261 000	259 000	230 000	202 000	176 500	142 000	170	1 500	68
FXM 2.410 - 100	LX	389 500	387 000	357 000	316 500	277 500	243 000	223 000	170	1 500	68

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.
The theoretical nominal torque applies only for ideal concentricity between the inner and outer ring. In practice, the concentricity is affected by the bearing play and centering errors of the neighbouring parts. Then the nominal torques specified in the table apply, whilst taking into consideration the existing run out (T.I.R.).
Higher speeds upon request.

Mounting

Integrated Freewheels FXM are without bearing support. Concentric alignment of inner and outer ring must be provided by the customer. The permissible run out (T.I.R.) must be observed.

The Integrated Freewheel FXM is centered via the outer track F on the customer attachment part and bolted to this (refer to figure 69-1). The tolerance of the pilot diameter of the attachment part must be ISO h6 or h7.
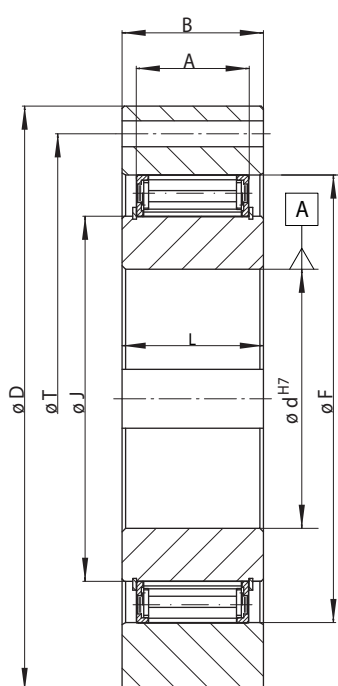
The tolerance of the shaft must be ISO h6 or j6.

Integrated Freewheels FXM … LX

**for bolting to the face
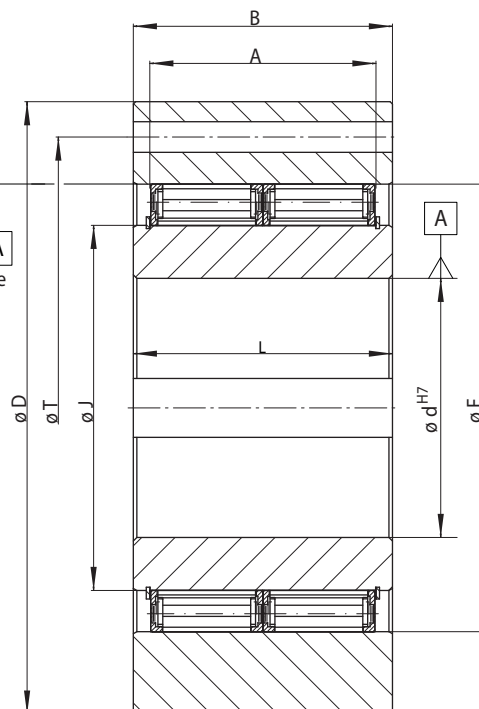with sprag lift-off X**
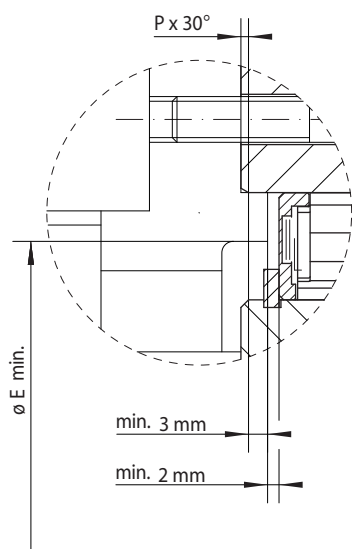
69-1

69-2

Refer to table
on page 68

69-3

Freewheel Size	Bore d max. mm	A mm	B mm	D mm	E min. mm	F mm	G	J mm	L mm	P mm	T mm	Z**	Weight kg
FXM 240 - 63	185	63	80	400	280	310	M20	240	90	2,0	360	12	60
FXM 240 - 96	185	96	125	420	280	310	M24	240	120	2,0	370	16	95
FXM 2.240 - 70	185	140	160	412	280	310	M20	240	160	2,0	360	24	120
FXM 2.240 - 96	185	192	240	425	280	310	M24	240	240	2,0	370	24	200
FXM 260 - 63	205	63	80	430	300	330	M20	260	105	2,0	380	16	75
FXM 290 - 70	230	70	80	460	330	360	M20	290	105	2,0	410	16	90
FXM 290 - 96	230	96	110	460	330	360	M20	290	120	2,0	410	16	91
FXM 2.290 - 70	230	140	160	480	330	360	M24	290	160	2,0	410	18	170
FXM 2.290 - 96	230	192	240	490	330	360	M30	290	240	2,0	425	20	260
FXM 310 - 70	240	70	125	497	360	380	M20	310	110	3,0	450	24	135
FXM 310 - 96	240	96	125	497	360	380	M20	310	120	3,0	450	24	145
FXM 320 - 70	250	70	80	490	360	390	M24	320	105	3,0	440	16	105
FXM 320 - 96	250	96	120	520	360	390	M24	320	120	3,0	440	16	150
FXM 2.320 - 70	250	140	180	505	360	390	M24	320	180	3,0	440	24	200
FXM 2.320 - 96	250	192	240	530	360	390	M30	320	240	3,0	460	24	310
FXM 360 - 100	280	100	120	540	400	430	M24	360	125	3,0	500	24	170
FXM 2.360 - 73	280	146	210	550	400	430	M24	360	210	3,0	500	24	270
FXM 2.360 - 100	280	200	250	580	400	430	M30	360	250	3,0	500	24	380
FXM 410 - 100	320	100	120	630	460	480	M24	410	125	3,0	560	24	245
FXM 2.410 - 73	320	146	210	630	460	480	M24	410	210	3,0	560	24	400
FXM 2.410 - 100	320	200	220	630	460	480	M30	410	220	3,0	560	24	440

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.
* Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.
** Z = Number of fastening holes for screws G on pitch circle T.

Lubrication

At speeds in excess of the sprag lift-off speed, no special lubrication is required; the freewheel functions maintenance-free.

When operating below the sprag lift-off speed, an oil lubrication of the specified oil quality must be provided.

Example for ordering

Freewheel size FXM 240 – 63, type with sprag lift-off X and 140 mm bore:

- FXM 240 - 63 LX, d = 140 mm

Integrated Freewheels