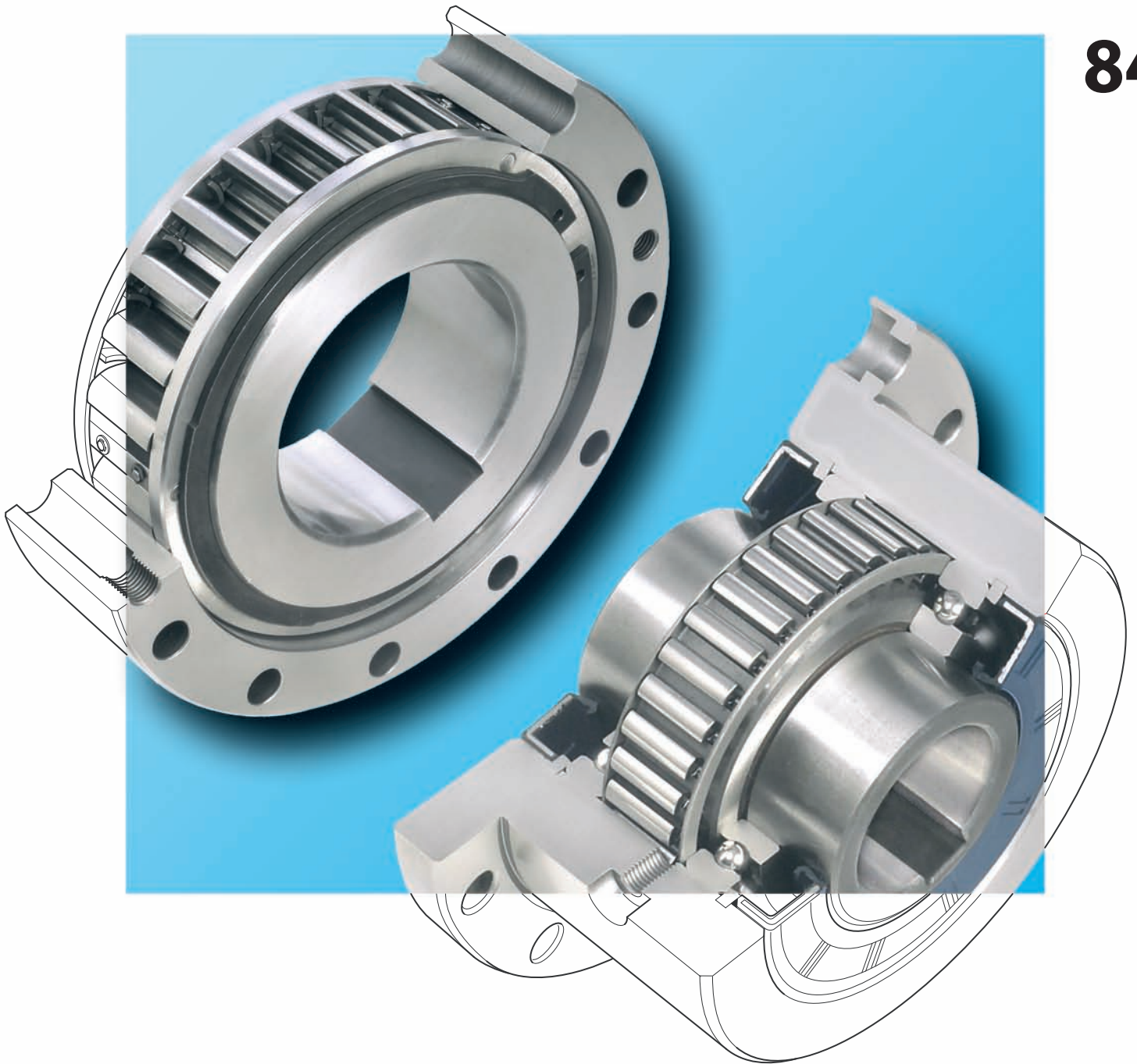


# Freewheels





































































Backstops • Overrunning Clutches • Indexing Freewheels










































































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Edition 2010

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Complete Freewheels	Used as			With bearing support	Nominal torques up to Nm	Bore up to mm	Page
	Backstops	Overrunning Clutch	Indexing Freewheel				
for bolting to the face							
FB with sprags, available in five types					160 000	300	16
FR in inch dimension with sprags, available in four types					34 500	180	18
FKh with hydrodynamic sprag lift-off					22 000	120	20
BD ... X with sprag lift-off X					42 500	150	22
BD ... R with rollers					57 500	150	24
with mounting flange							
FBF with sprags, available in five types					160 000	300	26
FGR ... R A1A2 with rollers					68 000	150	28
FGR ... R A2A7 with rollers					68 000	150	28
for keyway connection on the outer ring							
BM ... X with sprag lift-off X					42 500	150	30
BM ... R with rollers					57 500	150	32
FGRN ... R A5A6 with rollers					6 800	80	34
with lever arm							
BA ... XG with sprag lift-off X and grease lubrication					42 500	150	36
BC ... XG with sprag lift-off X and grease lubrication					42 500	150	36
BA ... X with sprag lift-off X					42 500	150	38
BC ... X with sprag lift-off X					42 500	150	38
BA ... R with rollers					57 500	150	40
BC ... R with rollers					57 500	150	40
FGR ... R A3A4 with rollers					68 000	150	42
FGR ... R A2A3 with rollers					68 000	150	42
FA with sprags and grease lubrication					2 500	85	44
FAV with rollers and grease lubrication					5 000	80	46
with shaft coupling							
FBL for large shaft misalignments, with sprags					8 000	140	48
FBE for small shaft misalignments, with sprags					160 000	300	50
Housing Freewheels	Used as			With bearing support	Nominal torque up to Nm	Shaft up to mm	Page
	Backstop	Overrunning Clutch	Indexing Freewheel				
for stationary arrangement							
FKhG with hydrodynamic sprag lift-off					14 000	110	52

Basic Freewheels	Used as			With bearing support	Nominal torque up to Nm	Bore up to mm	Page
	Backstop	Overrunning Clutch	Indexing Freewheel				
for assembly with connecting parts							
FBO with sprags, available in five types					160 000	300	56
FGR ... R with rollers					68 000	150	58
Integrated Freewheels	Used as			With bearing support	Nominal torque up to Nm	Bore up to mm	Page
	Backstop	Overrunning Clutch	Indexing Freewheel				
for bolting to the face							
FXM with sprag lift-off X					364 000	320	60
FON with sprags, available in three types					25 000	155	66
for bolting to the face, with torque limiting							
FXRV with sprag lift-off X					53 000	320	68
FXRT with sprag lift-off X and with release function					53 000	320	68
Internal Freewheels	Used as			With bearing support	Nominal torque up to Nm	Bore up to mm	Page
	Backstop	Overrunning Clutch	Indexing Freewheel				
for press fit on the outer ring							
FXN with sprag lift-off X					20 000	130	72
FEN with sprags					4 000	100	76
FGK with sprags and bearing support					460	50	78
FCN ... K/CF with sprags					500	60	80
FCN ... R with rollers					840	80	82
FDN with sprags, available in three types					2 400	80	84
FDE with sprags, available in three types					2 400	95	86
FD with sprags, available in three types					2 400	95	88
ZZ with sprags and bearing support					325	40	90
ZZ ... 2RS with sprags, bearing support and seals					325	40	92
ZZ ... P2RS with sprags, bearing support and seals					138	30	93
ZZ ...P with sprags and bearing support					325	40	94
for keyway connection on the outer ring							
ZZ ...PP with sprags and bearing support					325	40	95
FSN with rollers					3 000	80	96
FN with rollers					3 000	60	98
FNR with rollers and bearing support					3 000	60	100
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# Design and Function of Freewheels



Freewheels are machine elements with particular characteristics:

- In one direction of rotation there is no contact between the inner and outer ring; the freewheel is in freewheeling operation.
- In the other direction of rotation there is contact between the inner and outer ring; in this direction it is possible to transmit high torque.

For example the outer ring of the freewheel shown in figure 4-1 can freewheel clockwise while the inner ring is stationary. If, however, the outer ring is turned in the opposite direction, there is contact between the inner and outer ring and the inner ring is driven (driving operation).

Freewheels are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

Freewheels can fulfill these functions completely automatically in the most diverse machines. No mechanical or hydraulic operating equipment is required, as for example with external actuated clutches or brakes.

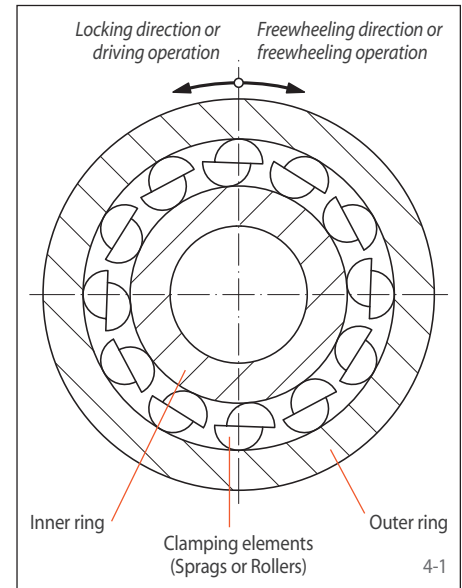
Freewheels consist of an inner and an outer ring between which clamping elements are arranged. Clamping elements can be sprags or rollers. We differentiate as follows:

- Freewheels with bearing support and
- Freewheels without bearing support.

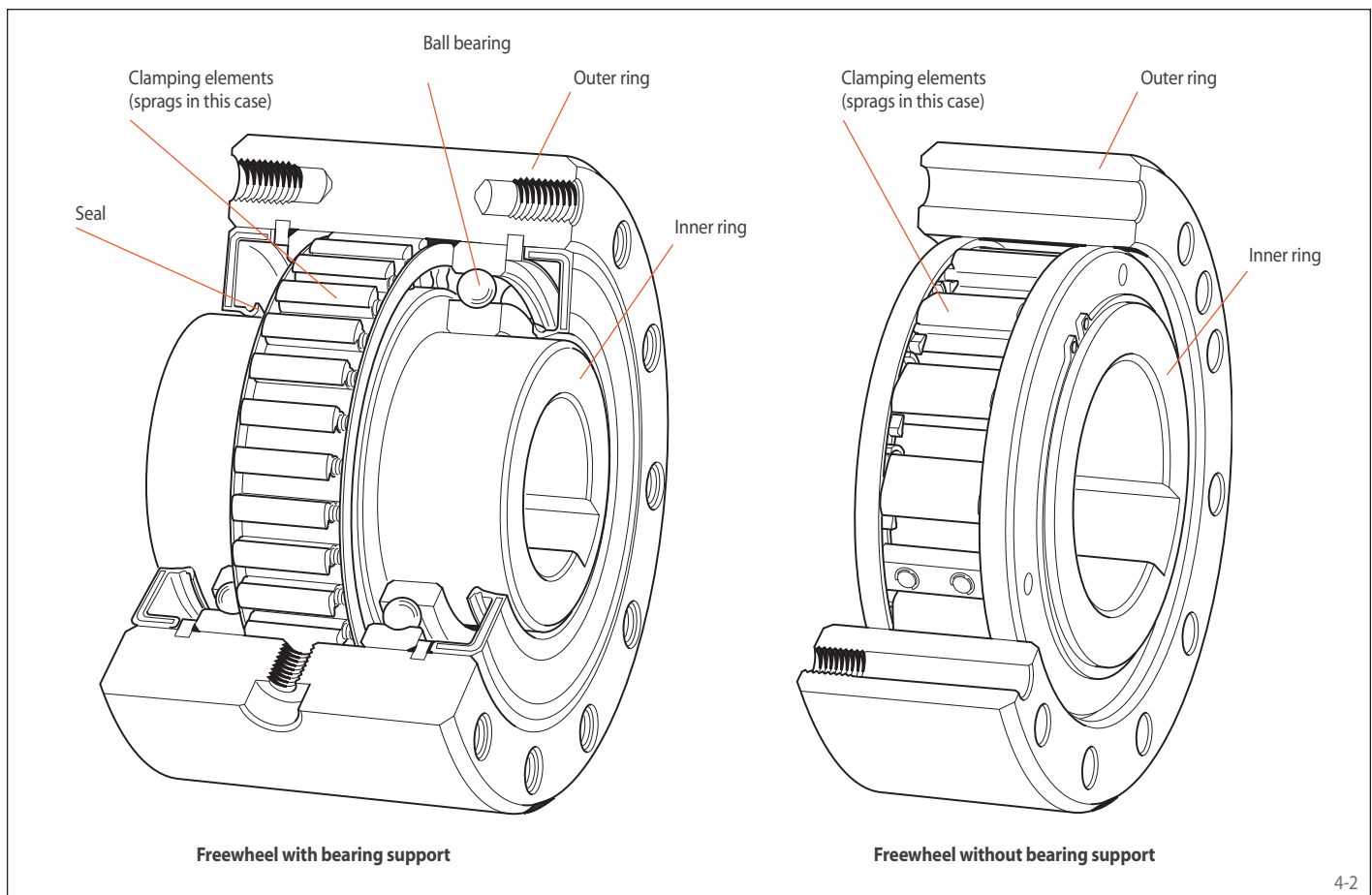
For a freewheel to function, the concentric alignment of the inner and outer ring is required. In the case of freewheels without bearing support, concentric alignment like this must be provided by the customer.

RINGSPANN freewheels are an indispensable design element in the machine building industry as well as in the aerospace industry. Many designs are only economical if freewheels are used. The freewheel as an automatic driving element is preferred to conventional solutions because it offers the following significant advantages:

- operating safety,
- efficiency and
- a higher degree of automation.



With more than 50 years experience in the development, production and sales of freewheels, RINGSPANN offers the most comprehensive range of freewheels. A global network of subsidiaries and sales agencies ensures the best possible personal on-site service. Assembly and production facilities in various countries provide fast, reliable delivery.

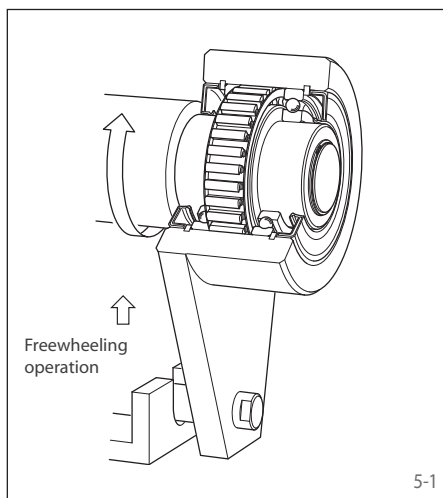




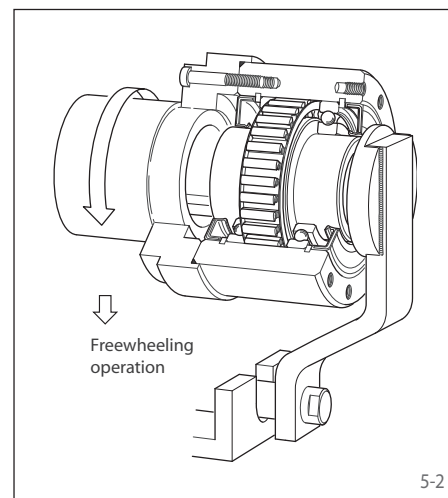
## Backstop

Freewheels are used as backstops if reverse rotation of the operating direction is to be prevented. In many machines and installations, for technical safety or functional reasons, it is necessary to ensure that you are working in just one specified direction of rotation. This is why there are legal stipulations requiring a mechanical safety device for the operation of, e.g. conveyor systems.

The normal operating mode of a backstop is freewheeling operation; the locking (torque transmission) is performed at zero speed. The immediate engagement of the clamping elements ensures the required high operating safety.



In general, backstops are used where the inner ring freewheels and the stationary held outer ring prevents reverse rotation (figure 5-1).



The more complicated designed backstops where the outer ring freewheels and the stationary held inner ring prevents reverse rotation are rarely used today (figure 5-2).

## Overrunning Clutch

The overrunning clutch engages machines or machine parts and automatically interrupts their contact as soon as the driven part of the overrunning clutch is turned faster than the driving part. In many cases, this can replace a more expensive externally actuated clutch.

With overrunning clutches the engagement takes place in the driving operation (torque transmission), while in freewheeling operation the torque transmission between the inner and outer ring is interrupted. In driving operation the speeds of the inner and outer ring are equal, while in freewheeling operation they are different.

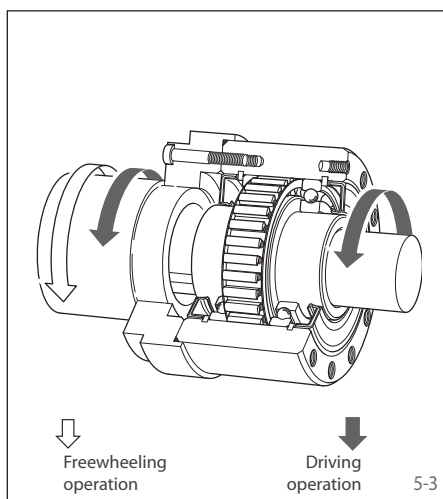


Figure 5-3 shows an overrunning clutch where in driving operation the power flow is transferred from the inner ring to the outer ring and in freewheeling operation the outer ring overruns the inner ring at a higher speed.

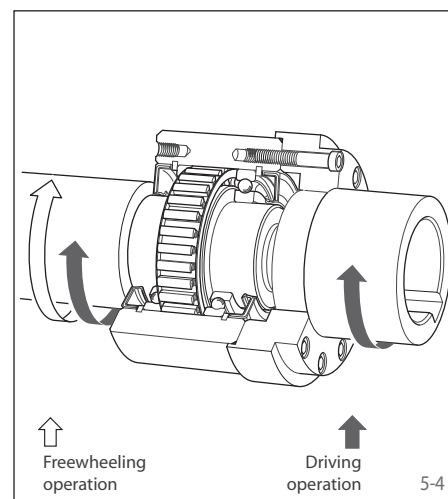


Figure 5-4 shows an overrunning clutch where in driving operation the power flow is transferred from the outer ring to the inner ring and in freewheeling operation the inner ring overruns the outer ring at a higher speed.

## Indexing Freewheel

The indexing freewheel transmits a back and forth motion into a stepped rotation (indexed feed). The RINGSPANN indexing freewheel works precisely and quietly and enables an infinitely adjustable setting of the feed.

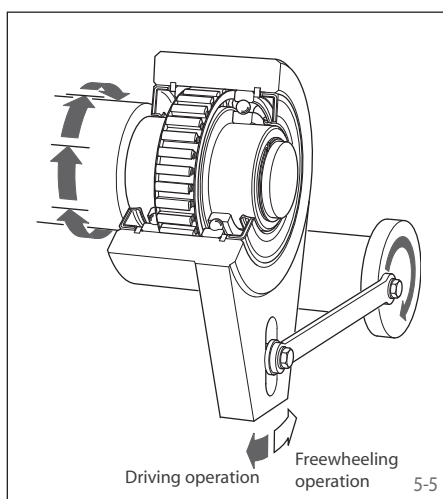


Figure 5-5 shows an indexing freewheel where the outer ring makes the back and forth motion and the inner ring carries out the indexed feed.

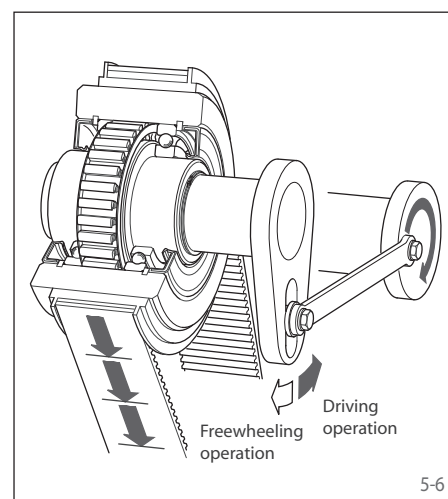
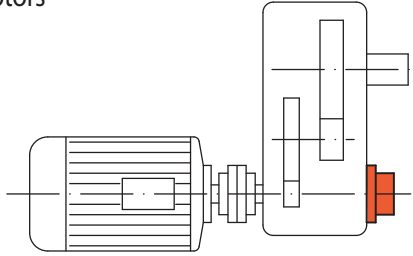


Figure 5-6 shows an indexing freewheel where the inner ring makes the back and forth motion and the outer ring carries out the indexed feed.

# Areas of Application for Freewheels

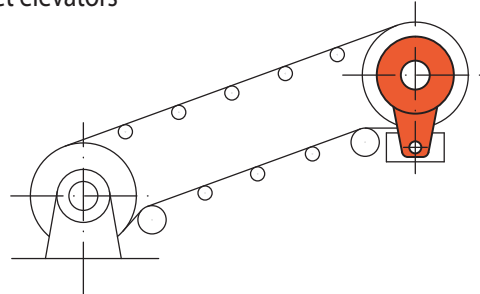
## Areas of application for Backstops

Gear units  
Electric motors  
Gear motors



The backstop prevents reverse rotation in a drive of a conveyor installation if the power fails or the motor is turned off.

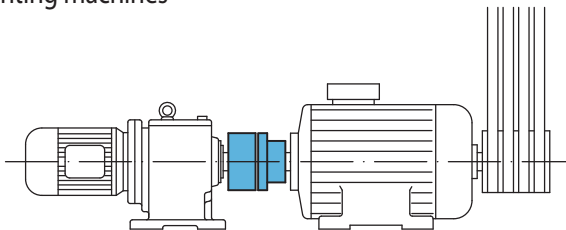
Inclined conveyors  
Elevators  
Bucket elevators



The backstop prevents reverse rotation of the conveyor load if the power fails or the motor is turned off.

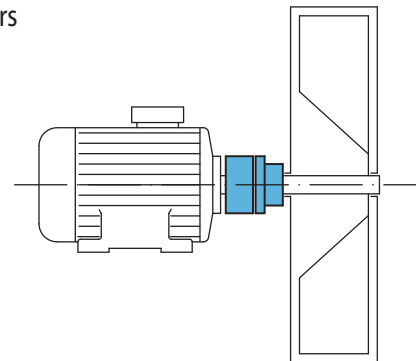
## Areas of application for Overrunning Clutches

Textile machines  
Printing machines



During normal operation of textile or printing machines, the overrunning clutch separates the barring drive which is used for set up from the main drive.

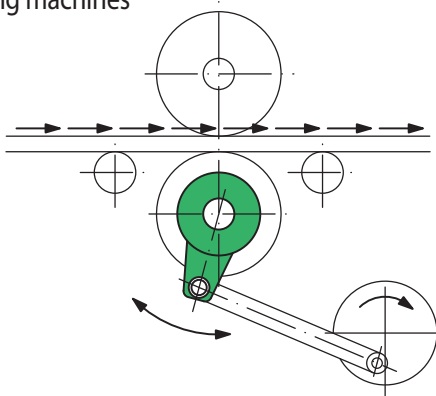
Fans  
Ventilators



If fans or ventilators are turned off, the overrunning clutch prevents the flywheel mass from rotating the drive.

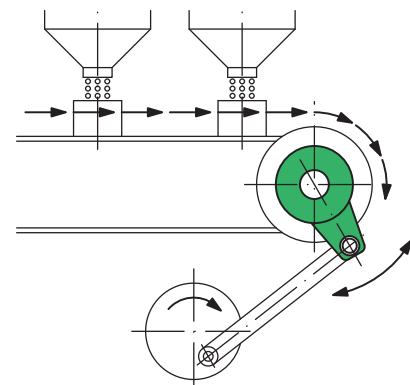
## Areas of application for Indexing Freewheels

Textile machines  
Printing machines



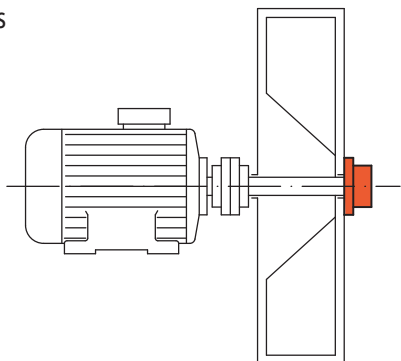
The indexing freewheel generates an indexed feed in textile and printing machines.

Packaging machines  
Filling plants



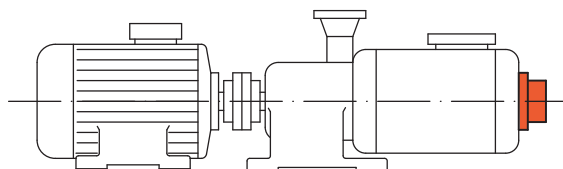
The indexing freewheel is used in packaging machines and filling plants for an indexed feed.

Fans  
Ventilators



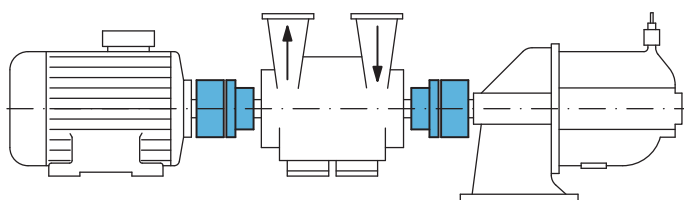
The backstop prevents reverse rotation under the back pressure of the conveyed medium if the motor is turned off.

Pumps  
Compressors



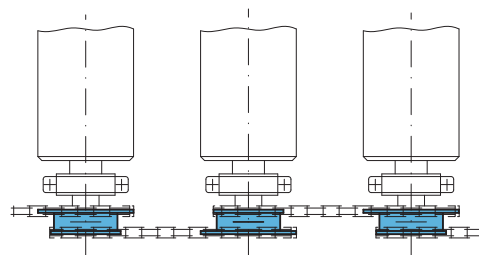
The backstop prevents reverse rotation under the back pressure of the conveyed medium if the motor is turned off.

Pumps  
Generators



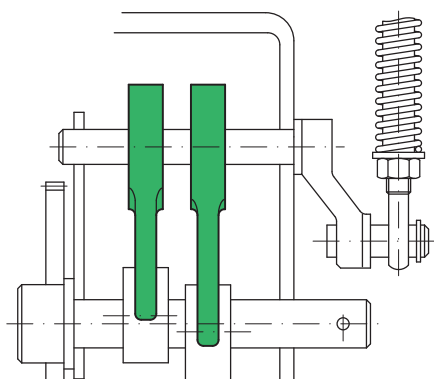
In multimotor drives the overrunning clutch disengages the inactive or lower speed drive.

Roller conveyor



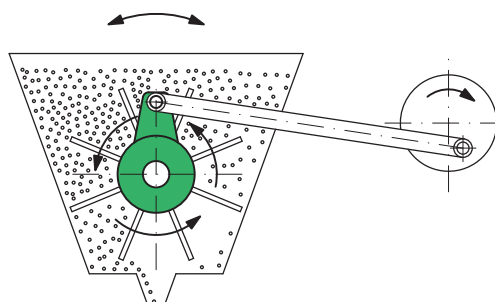
The overrunning clutch ensures that the conveyed material can be pushed or pulled faster over the rollers than the speed of the drive.

High voltage switches



In high voltage switches for tensioning a spring, the indexing freewheel is used in the place of a reduction gear.

Seed spreader

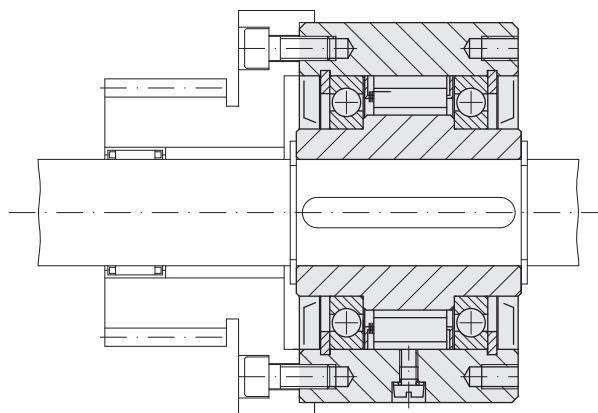


The indexing freewheel replaces a reduction gear in seed spreader.

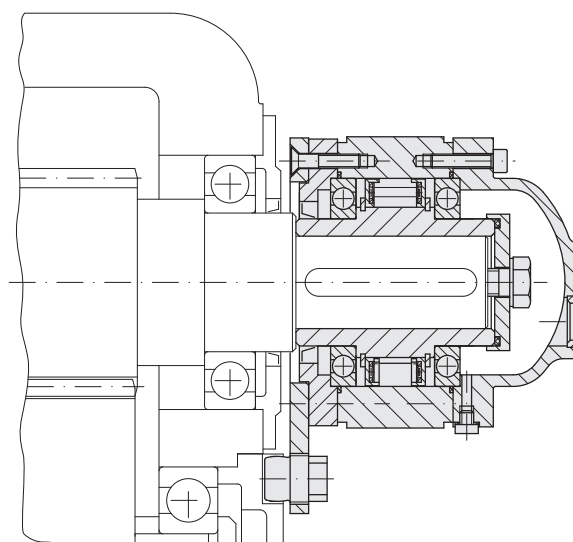
# Categories of Freewheels

## Complete Freewheels

- With bearing support between inner and outer ring
- Completely enclosed
- With own lubrication
- Connection to the outer ring and the customer part by:
  - bolting to the face (figure 8-1),
  - mounting flange,
  - keyway connection on the outer ring,
  - lever arm (figure 8-2) or
  - shaft coupling.



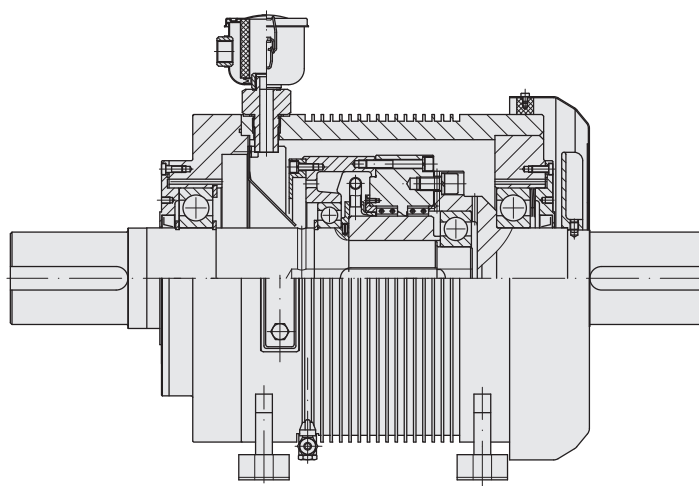
8-1



8-2

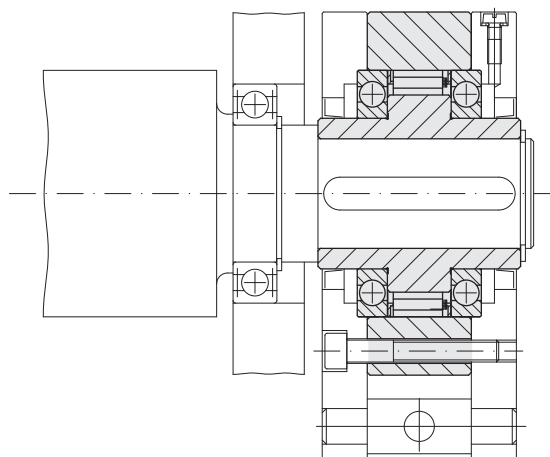
## Housing Freewheels

- With bearing support between inner and outer ring
- Completely enclosed by its own housing
- With own lubrication
- With bearing supported input and output shafts
- Stationary arrangement
- Exclusively used as an overrunning clutch



8-3

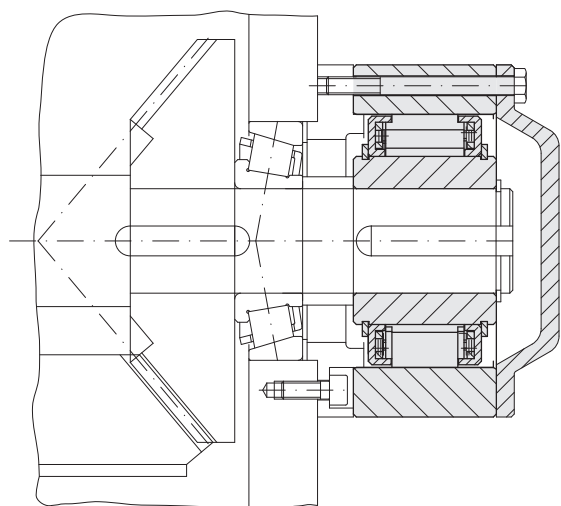




9-1

### Basic Freewheels

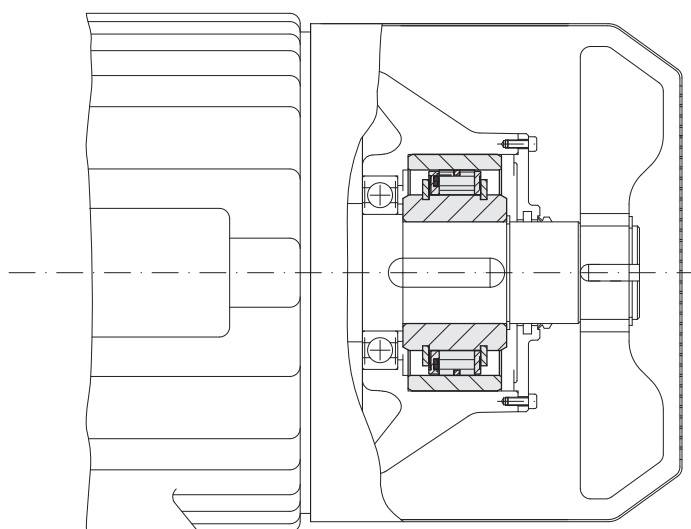
- With bearing support between inner and outer ring
- For assembly with connecting parts
- Lubrication – if necessary – to be provided by the customer



9-2

### Integrated Freewheels

- Without bearing support. Concentric alignment of inner and outer ring must be provided by the customer
- Integrating the outer ring on the customer part by bolting to the face
- Lubrication – if necessary – to be provided by the customer



9-3

### Internal Freewheels

- Series both with and without bearing support. In the case of series without bearing support, concentric alignment of the inner and outer ring must be provided by the customer
- Installing the outer ring in the customer's housing with press fit or keyway connection. This makes compact, space-saving solutions possible
- Lubrication – if necessary – to be provided by the customer

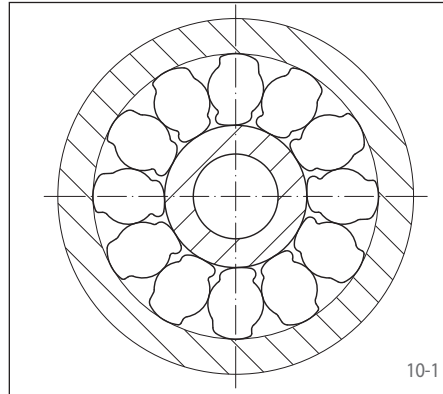
# Freewheels with Sprags or Rollers

## two different designs of freewheels

### Design as Sprag Freewheel

The sprag freewheel has outer and inner rings with cylindrical tracks. The individually spring loaded sprags are arranged in between the rings. The freewheel locks without slipping. Different sprag profiles enable a multitude of types. Types are available for:

- High torques
- Contactless freewheeling operation
- High indexing accuracy



### Function of Sprag Freewheels

With the sprag arrangement illustrated in figure 10-2 the outer ring can be turned freely clockwise (freewheeling operation), if the inner ring

- is at a standstill,
- is turned anticlockwise or
- is turned clockwise slower than the outer ring.

If the outer ring - e.g. with a stationary inner ring - is turned in the opposite direction, the clamping becomes effective. The sprags clamp without slipping between the tracks. In this direction of rotation high torque can be transmitted (driving operation).

The sprag arrangement in figure 10-2 also enables freewheeling operation while the inner ring is turned anticlockwise and driving operation when turning clockwise.

On the line of influence which links the points of contact of the sprag to the inner track and the sprag to the outer track, in driving operation the clamping generates the forces  $F_I$  and  $F_A$  (refer to figure 10-3). Because of the equilibrium of forces, these are equal. The forces  $F_I$  and  $F_A$  can be divided into the normal forces  $F_{NI}$  and  $F_{NA}$  as well as into the circumferential forces  $F_{TI}$  and  $F_{TA}$ . The line of influence forms against the force  $F_{NI}$  or  $F_{NA}$  the clamping angle  $\varepsilon_I$  or  $\varepsilon_A$ , whereby  $\varepsilon_I > \varepsilon_A$ . To achieve self-locking, the tangent of the clamping angle  $\varepsilon_I$  must be less than the friction value  $\mu$ .

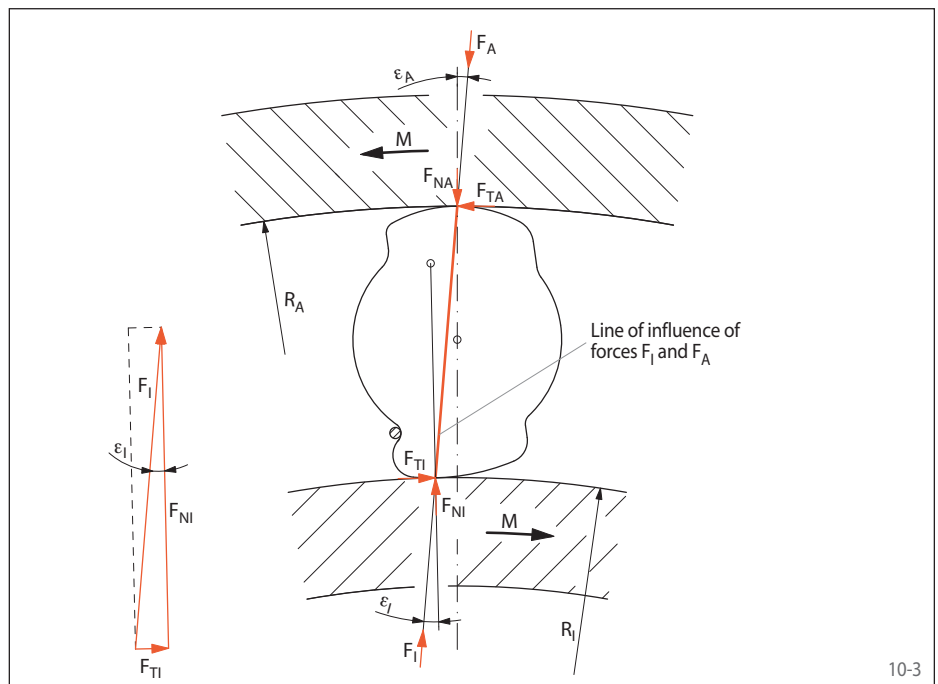
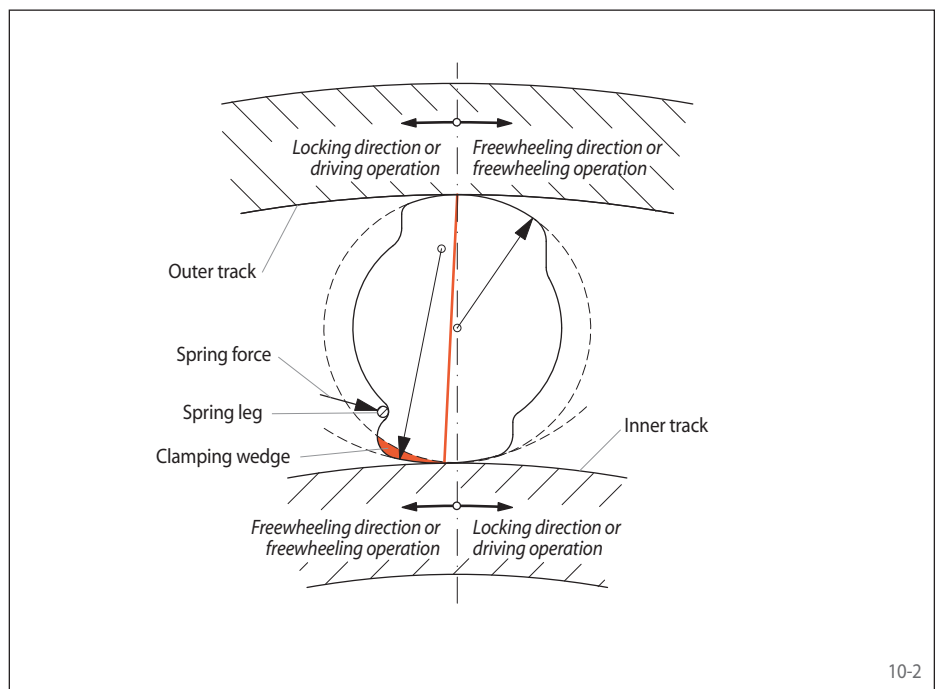
$$\tan \varepsilon_I = \frac{F_{TI}}{F_{NI}} \leq \mu$$

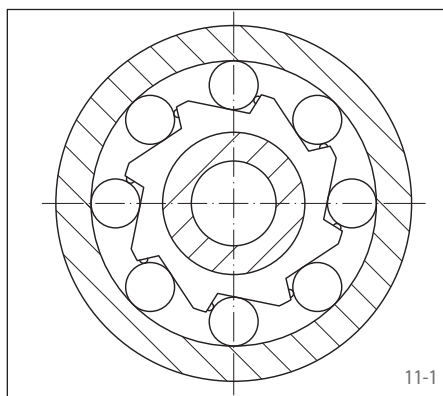
Because of the relationship

$$\begin{aligned} M &= z \cdot R_I \cdot F_{TI} = z \cdot R_I \cdot F_{NI} \cdot \tan \varepsilon_I \\ &= z \cdot R_A \cdot F_{TA} = z \cdot R_A \cdot F_{NA} \cdot \tan \varepsilon_A \end{aligned}$$

with  $z$  = number of sprags

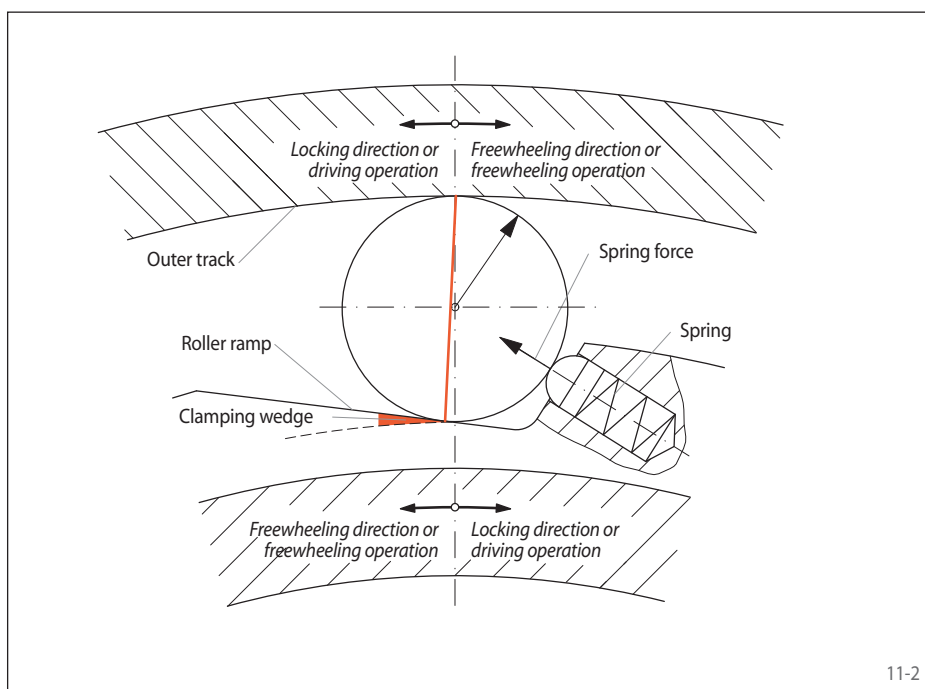
the normal forces and the clamping angles adapt automatically to the acting torque  $M$ .





## Design as a Roller Freewheel

With roller freewheels either the inner or the outer ring has roller ramps. The other ring has a cylindrical track. The individually spring loaded rollers are arranged in between the rings. The freewheel locks without slipping.



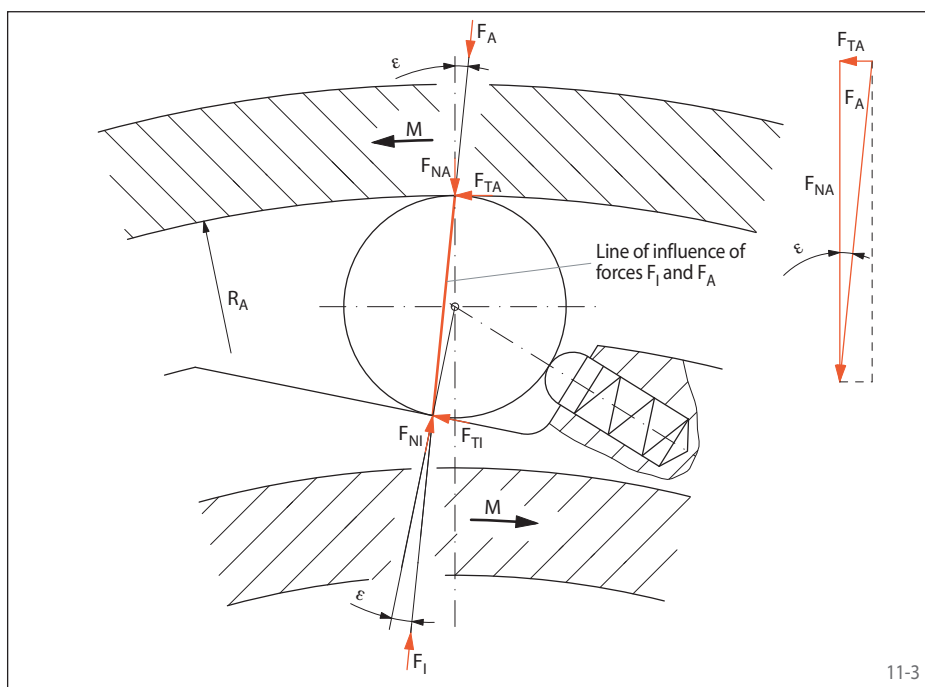
## Function of Roller Freewheels

With the version illustrated in figure 11-2, the outer ring can be turned freely clockwise (freewheeling operation), if the inner ring

- is at a standstill,
- is turned anticlockwise or
- is turned clockwise slower than the outer ring.

If the outer ring - e.g. with a stationary inner ring - is turned in the opposite direction, the clamping becomes effective. The rollers clamp without slipping between the tracks. In this direction of rotation high torque can be transmitted (driving operation).

The version illustrated in figure 11-2 also enables a freewheeling operation while the inner ring is turned anticlockwise and driving operation when turning clockwise.



On the line of influence which links the points of contact of the roller to the roller ramp and the roller to the outer track, in driving operation the clamping generates the forces  $F_I$  and  $F_A$  (refer to figure 11-3). Because of the equilibrium of forces, these are equal. The forces  $F_I$  and  $F_A$  can be divided into the normal forces  $F_{NI}$  and  $F_{NA}$  as well as into the circumferential forces  $F_{TI}$  and  $F_{TA}$ . The line of influence forms against the force  $F_{NI}$  or  $F_{NA}$  the clamping angle  $\epsilon$ . To achieve self-locking, the tangent of the clamping angle must be less than the friction value  $\mu$ . E.g. for the contact point of the roller to the outer track this means:

$$\tan \epsilon = \frac{F_{TA}}{F_{NA}} \leq \mu$$

Because of the relationship

$$M = z \cdot R_A \cdot F_{TA} = z \cdot R_A \cdot F_{NA} \cdot \tan \epsilon$$

with  $z$  = number of rollers

the normal forces and the clamping angles adapt automatically to the acting torque  $M$ .

# Types for Extended Service Life

		Standard type	Type with sprag lift-off X	Type with sprag lift-off Z	Type with RIDUVIT®	Type with P-grinding	Type with hydrodynamic sprag lift-off
		For universal use	For extended service life using sprag lift-off at high speed rotating inner ring	For extended service life using sprag lift-off at high speed rotating outer ring	For extended service life using coated sprags	For extended service life and indexing accuracy	For extended service life using sprag lift-off at high speed rotating outer ring
Use as	Backstop	Up to medium speeds during free-wheeling operation (inner or outer ring freewheels)	Up to very high speeds during freewheeling operation (inner ring freewheels)	Up to very high speeds during freewheeling operation (outer ring freewheels)	Up to high speeds during freewheeling operation (inner or outer ring freewheels)		
	Overrunning Clutch	Up to medium speeds during free-wheeling operation (inner or outer ring overruns)	Up to very high speeds during freewheeling operation (inner ring overruns)	Up to very high speeds during freewheeling operation (outer ring overruns)	Up to high speeds during freewheeling operation (inner or outer ring overruns)		Up to very high speeds during freewheeling operation (outer ring overruns)
		Up to very high speeds in driving operation (outer or inner ring drives)	Low speeds in driving operation (outer ring drives)	Low speeds in driving operation (inner ring drives)	Up to very high speeds in driving operation (outer or inner ring drives)		Up to very high speeds in driving operation (inner ring drives)
	Indexing Freewheel	Up to a medium total number of actuations				Up to a high total number of actuations	

In addition the standard type, RINGSPANN has developed five other types for extended service

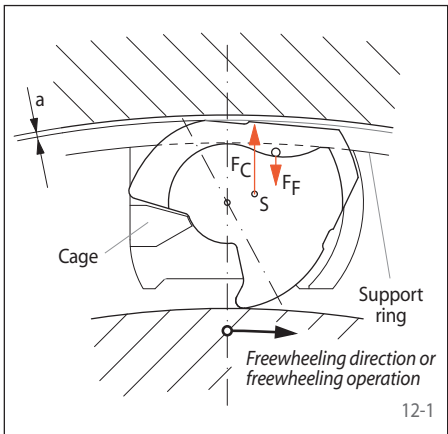
life for freewheels with sprags. The table above lists the recommended application conditions

for these types.

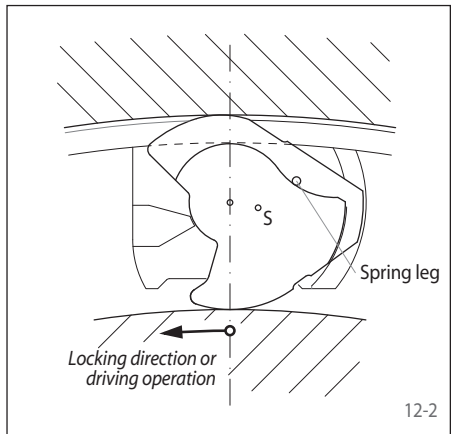
## Type with sprag lift-off X

The sprag lift-off X is used for backstops and overrunning clutches, provided that in free-wheeling 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 12-1 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 anticlockwise 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

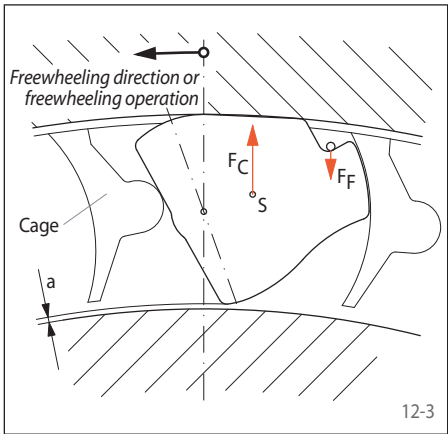


outer ring and the freewheel is ready to lock (figure 12-2). If used as an overrunning clutch, the driving speed must not exceed 40% of the lift-off speed.

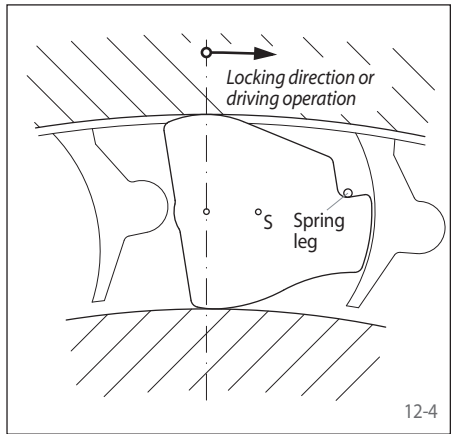
## Type with sprag lift-off Z

The sprag lift-off Z is applied for backstops and overrunning clutches, provided in freewheeling operation the outer ring is rotating at high speed, and providing with overrunning clutches the driving operation is conducted at low speed. In freewheeling operation, the centrifugal force  $F_C$  causes the sprag to lift off from the inner track. In this operating state, the freewheel works wear-free, i.e. with unrestricted service life.

Figure 12-3 shows a freewheel with sprag lift-off Z in freewheeling operation. The sprags rotate with the outer ring. The centrifugal force  $F_C$  that is applied in the centre of gravity  $S$  of the sprag turns the sprag anticlockwise and rests against the outer ring. This results in the gap  $a$  between the sprag and the inner track; the



freewheel works without contact. If the outer 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

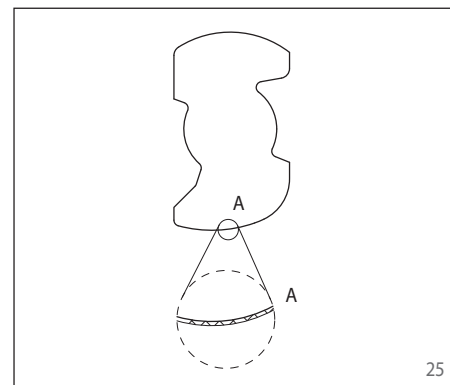


rests on the inner ring and the freewheel is ready to lock (figure 12-4). If used as an overrunning clutch, the driving speed must not exceed 40% of the lift-off speed.

## Type RIDUVIT®

RINGSPANN sprags are made from chrome steel, the same material as used for the balls in ball bearings. The high compressive strength, elasticity and tensile strength of this material is required for the sprags in a locked state. In freewheeling operation, however, it is able to cope with utmost wear resistance on the points of contact of the sprag with the inner track. All of these requirements are perfectly fulfilled by using a chrome steel sprag with RIDUVIT coating. The RIDUVIT coating lends the sprag a resistance to wear akin to that of hard metal. The technology used here is based on state-of-

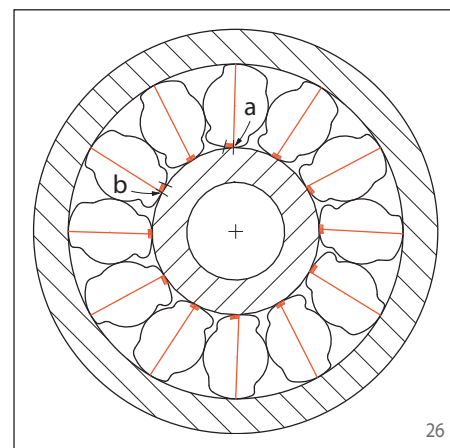
the-art tribology research. RIDUVIT sprags are used in backstops and overrunning clutches and considerably increase the service life.



## Type with P-grinding

The P-grinding gives the RINGSPANN sprag freewheel its outstanding suitability as an indexing freewheel. P-grinding means that the outer track is not round, it is ground in a polygon shape. This means that the distance between the outer race and the inner race differs varies at different points on the circumference. Because the sprags slowly wander in the circumferential direction during free-wheeling operation, their angle positions change constantly. The contact line on the sprag hence moves back and forth between the points a and b. This means the wear is distributed across the sprag over a greater area, which means the sprag profile that is so critical for its

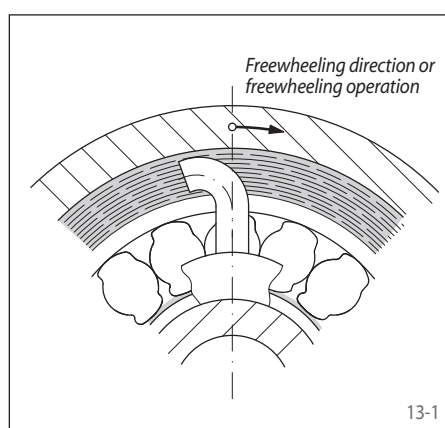
function is maintained. The sprags remain capable of functioning despite a considerable degree of use. P-grinding is used on indexing freewheels as this does not just give the freewheels an increased service life, but also an increase in indexing accuracy.



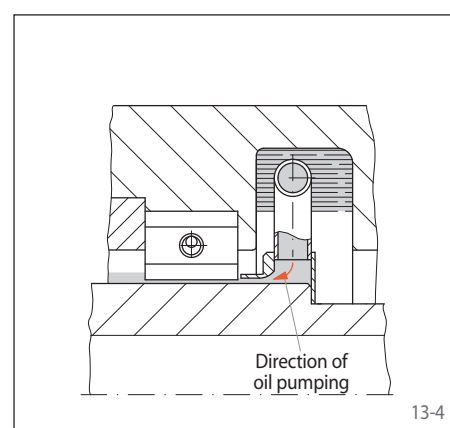
## Type with hydrodynamic sprag lift-off

The hydrodynamic sprag lift-off is the ideal solution for overrunning clutches at high speeds, not only in freewheeling operation, but also in the driving operation, as can occur, for example, in multimotor drives. In the case of the hydrodynamic sprag lift-off, the lifting force is generated by an oil flow. The relative speed between the inner and outer rings is decisive for the lifting-off function. Compared to the freewheels with sprag lift-off X or Z, here the driving speed can be just as high as the freewheeling speed.

The freewheels with hydrodynamic sprag lift-off (series FKX and FKXG) include an oil pump that is based on the pitot tube principle. The pitot tubes are connected with the inner ring. When the outer ring is rotating, an oil ring forms in the oil chamber, into which the pitot tubes are immersed. As soon as the outer ring overruns the inner ring, the pitot tubes pump the oil under pressure into the ring chamber and the oil then seeps out through the ring gap at high speed axially into the intermediate areas of the sprags. Depending on the relative speed between the outer and inner ring, the oil flow does



not flow axially into the intermediate areas of the sprags, but at an angle. This creates a reaction force on the sprags. This reaction force overcomes the contact force of the sprag springs, and the sprags lift off from the inner ring. This process is supported by a hydrodynamic wedge formation. If the relative speed between the outer and inner rings reduces, the lifting force also reduces. Before achieving synchronous running, the sprags are brought safely to rest on the inner ring and are ready to lock.



This guarantees immediate torque transfer once the synchronous speed has been reached. The hydrodynamic sprag lift-off enables a virtually wear-free freewheeling operation.

# Determination of Selection Torque



## Selection torque for Backstops

Bringing a loaded inclined conveyor, an elevator or a pump to a standstill is a highly dynamic process that incurs high peak torques. These peak torques are decisive for the selection of the backstop. The prior determination of the occurring torque in the case of locking is carried out most safely by using a rotational vibration analysis of the entire system. This, however, requires a knowledge of the rotating masses, the rotational rigidity and all of the excitation moments that occur on the system. In many cases, a vibrational calculation is too time consuming or you may not have all the necessary data in the configuration phase available. In this case, the selection torque  $M_A$  of the backstop should be determined as follows:

$$M_A = 1,75 \cdot M_L \text{ [Nm]}$$

Often you only have the figures for the motor nominal output  $P_0$  [kW] available. Then:

$$M_A = 1,75 \cdot \eta^2 \cdot 9550 \cdot P_0 / n_{SP} \text{ [Nm]}$$

In these equations:

$M_A$  = Selection torque of the backstop [Nm]

$$M_L = 9550 \cdot \eta \cdot P_L / n_{SP} \text{ [Nm]}$$

= Static backdriving torque of the load referring to the backstop shaft [Nm]

$P_L$  = Lifting capacity of the conveyor system at full load [kW]

= Lifting height [m] multiplied by the load that is being conveyed per second [kN/s]

$P_0$  = Nominal power of motor [kW]

$n_{SP}$  = Speed of backstop shaft [min<sup>-1</sup>]

$\eta$  = Efficiency of installation (refer to table)

After calculating  $M_A$  the backstop size must be selected in accordance with the catalogue tables in such a way that in all cases this applies:

$$M_N \geq M_A$$

$M_N$  = Nominal torque of the backstop in accordance with the table values [Nm]

It must be noted that, with a direct motor start in the locking direction of a backstop, very high peak torques can occur which in turn can destroy the backstop.

Approximate values for  $\eta$ :

Type of installation	$\eta$	$\eta^2$
Conveyor belts, angle up to 6°	0,71	0,50
Conveyor belts, angle up to 8°	0,78	0,61
Conveyor belts, angle up to 10°	0,83	0,69
Conveyor belts, angle up to 12°	0,86	0,74
Conveyor belts, angle up to 15°	0,89	0,79
Screw pumps	0,93	0,87
Ball mills, drying drums	0,85	0,72
Bucket conveyors, elevators	0,92	0,85
Hammer mills	0,93	0,87

## Selection torque for Overrunning Clutches

In many cases where overrunning clutches are being used, dynamic processes occur that cause high peak torques. In the case of overrunning clutches, the torques that occur during start up must be observed. The peak torques when starting up can, in the case of asynchronous motors - especially when accelerating large masses and when using elastic couplings - significantly exceed the torque calculated from the motor pull-over torque. The conditions for internal combustion engines are similar. Even in normal operation, on account of their degree of irregularity, peak torques can occur that are way in excess of the nominal torque.

The prior determination of the maximum occurring torque is carried out most safely by using a rotational vibration analysis of the entire system. This, however, requires a knowledge of the rotating masses, the rotational rigidity and all of the excitation moments that occur on the system. In many cases, a vibrational calculation is too time consuming or you may not have all the necessary data in the configuration phase available. In this case, the selection torque  $M_A$  of the overrunning clutch should be determined as follows:

$$M_A = K \cdot M_L$$

In this equation:

$M_A$  = Selection torque of the freewheel

$K$  = Operating factor (refer to table)

$M_L$  = Load torque for constant rotating freewheel:

$$= 9550 \cdot P_0 / n_{FR}$$

$P_0$  = Nominal power of motor [kW]

$n_{FR}$  = Speed of the freewheel in driving operation [min<sup>-1</sup>]

After calculating  $M_A$  the freewheel size must be selected in accordance with the catalogue tables in such a way that in all cases this applies:

$$M_N \geq M_A$$

$M_N$  = Nominal torque of the freewheel in accordance with the table values [Nm]

Approximate values for operating factor  $K$ :

Type of driver	$K$
Electric motors with low start up impact (e.g. DC motors, asynchronous motors with slip rings or soft start couplings), steam turbines, gas turbines	0.8 to 2.5
Electric motors with considerable start up impact (e.g. synchronous or asynchronous motors with direct start)	1.25 to 2.5
Piston engines with more than two cylinders, water turbines, hydraulic motors	1.25 to 3.15
Piston engines with one or two cylinders	1.6 to 3.15

The operating factor  $K$  depends on the properties of the driver and the machine. The general rules of mechanical engineering apply here. We know from practice that applications are known where the operating factor  $K$  can also assume values of up to 20, e.g. with a direct start-up of asynchronous electric motors in connection with elastic couplings.

## Selection torque for Indexing Freewheels

The selection torque for indexing freewheels is, among other things, dependent upon how the back and forth motion is generated (crank

operation, hydraulic cylinders, pneumatic cylinders etc.). It cannot be specified in a simple equation. When stating the maximum torque to

be transmitted, we are happy to advise you regarding the selection torque.



The selection of the correct freewheel depends on several criteria. In order to make an optimum freewheel selection for you, we ask that you complete the respective questionnaire on pages 110 to 113 and send it to us.

If you wish to select the freewheel yourself, then we recommend - without liability for possible errors that could occur during selection - that you proceed as follows:

## 1. Determine the application of the Freewheel as a

- ▶ Backstop
- ▶ Overrunning Clutch
- ▶ Indexing Freewheel

Refer to page 5.

## 2. Determine the suitable category of the Freewheel as

- Complete Freewheel,
- Housing Freewheel,
- Basic Freewheel,
- Integrated Freewheel or
- Internal Freewheel.

Refer to pages 8 and 9.

## 3. Determine the selection torque of the Freewheel.

Refer to page 14.

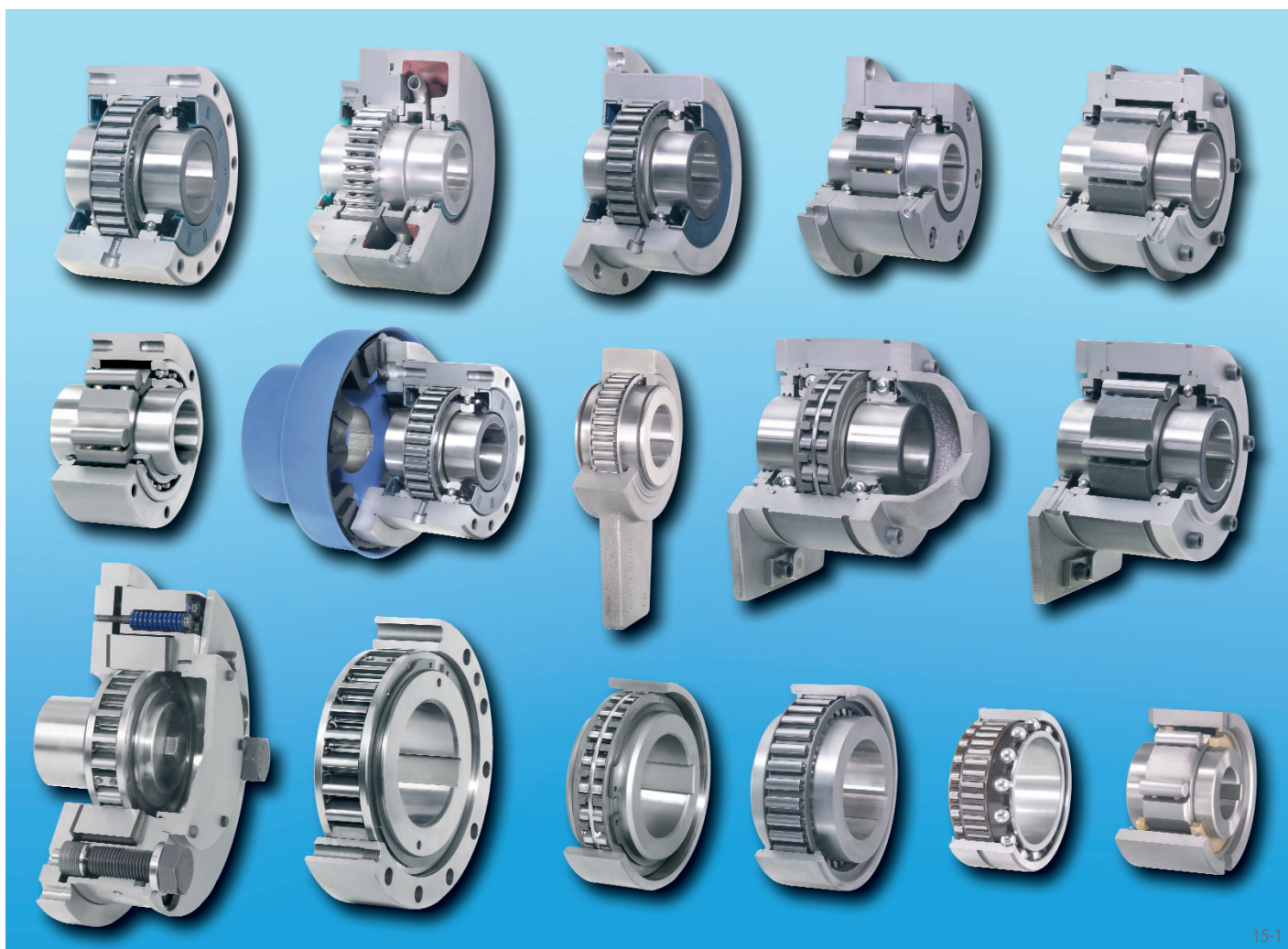
## 4. Determine the suitable type of the Freewheel as

- Standard type,
- Type with sprag lift-off X,
- Type with sprag lift-off Z,
- Type with RIDUVIT,
- Type with P-grinding or
- Type with hydrodynamic sprag lift-off.

Refer to pages 12 and 13.

## 5. Choose the suitable Freewheel

Refer to the table of contents on pages 2 and 3, the representations of the different series on pages 16 to 101 as well as the technical points on pages 106 to 109.

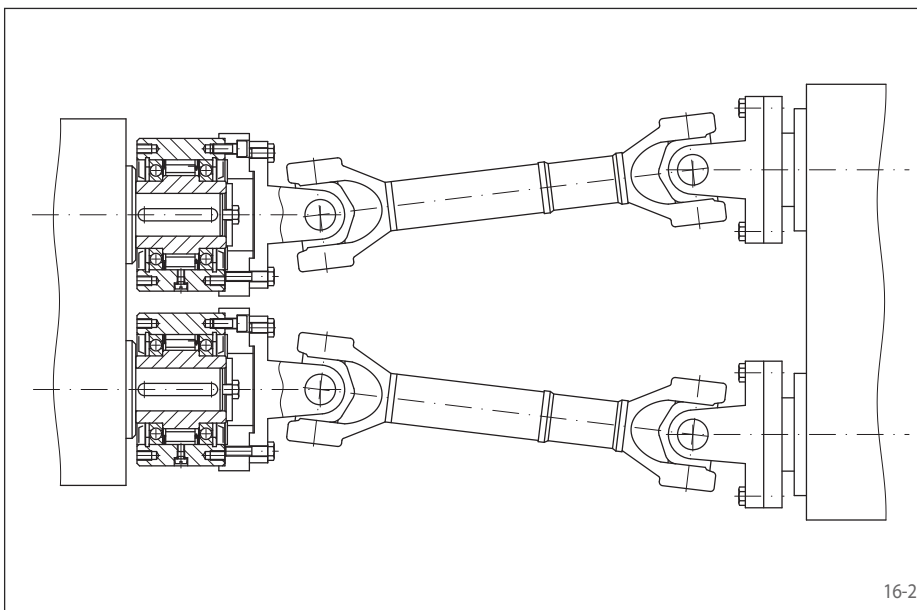


# Complete Freewheels FB

for bolting to the face  
with sprags, available in five types



16-1



16-2

## Features

Complete Freewheels FB are sealed sprag freewheels with ball bearings. They are supplied oil-filled and ready for installation.

The freewheels FB are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

In addition to the standard type, four other types are available for extended service life and indexing accuracy.

Nominal torques up to 160 000 Nm.

Bores up to 300 mm. Many standard bores are available.

## Application example

Two Complete Freewheels FB 82 SFT as overrunning clutches in the drive of an edge trimming shear in a wide strip roll train. When trimming the edges of the strip, the trimming rollers are driven by the drive of the edge trimming shear. By doing so, the two freewheels work in driving operation. As soon as the sheet metal strip is gripped by the next pair of rollers, they pull the strip at an increased speed and the inner rings overrun the slower turning drive of the edge trimming shear. By doing so, the freewheels work in freewheeling operation. The RIDUVIT sprags lend the freewheels an extended service life.

## Mounting

The customer attachment part is on the external diameter D and then bolted on to the face.

The tolerance of the shaft must be ISO h6 or j6 and the tolerance of the pilot diameter D of the attachment part must be ISO H7 or J7.

## Example for ordering

Freewheel size FB 72, type with sprag lift-off Z and 38 mm bore:

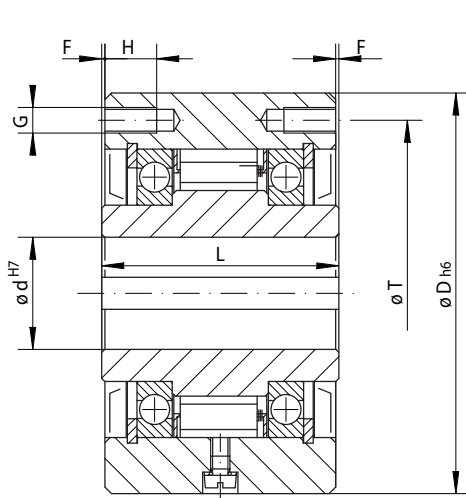
- FB 72 LZ, d = 38 mm

When ordering freewheel size FB 340 and FB 440, please also specify the freewheeling direction of the inner ring when viewed in direction X:

- anticlockwise free or
- clockwise free

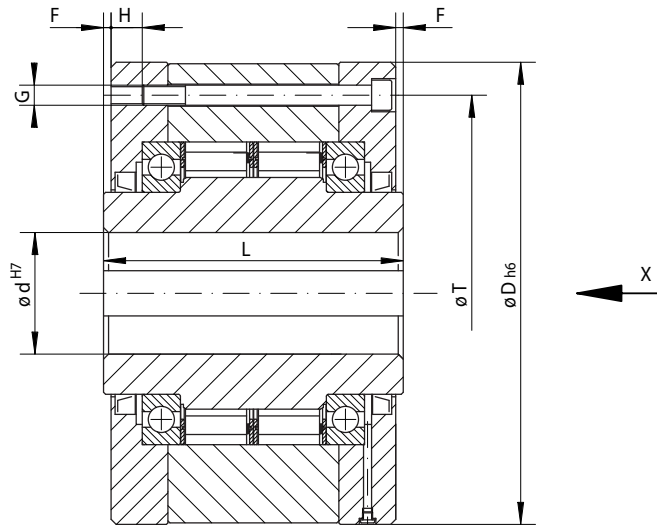
# Complete Freewheels FB

for bolting to the face  
with sprags, available in five types



Size FB 24 to FB 270

17-1



Size FB 340 to FB 440

17-2

Indexing Freewheel	Standard type For universal use	Type with RIDUVIT® For extended service life using coated sprags	Type with sprag lift-off X For extended service life using sprag lift-off at high speed rotating inner ring	Type with sprag lift-off Z For extended service life using sprag lift-off at high speed rotating outer ring	Type with P-grinding For extended service life and indexing accuracy
Overrunning Clutch					
Backstop					

Freewheel Size	Type	Nominal torque Nm	Max. speed		Type	Nominal torque Nm	Max. speed		Type	Nominal torque Nm	Sprag lift-off at inner ring speed min <sup>-1</sup>	Max. speed		Type	Nominal torque Nm	Sprag lift-off at outer ring speed min <sup>-1</sup>	Max. speed		Type	Nominal torque Nm
			Inner ring freewheels/overruns min <sup>-1</sup>	Outer ring freewheels/overruns min <sup>-1</sup>			Inner ring freewheels/overruns min <sup>-1</sup>	Outer ring freewheels/overruns min <sup>-1</sup>				Inner ring freewheels/overruns min <sup>-1</sup>	Outer ring drives min <sup>-1</sup>				Outer ring freewheels/overruns min <sup>-1</sup>	Inner ring drives min <sup>-1</sup>		
FB 24	CF	45	4 800	5 500	CFT	45	4 800	5 500											CFP	19
FB 29	CF	80	3 500	4 000	CFT	80	3 500	4 000											CFP	31
FB 37	SF	200	2 500	2 600	SFT	200	2 500	2 600						CZ	110	850	3 000	340	SFP	120
FB 44	SF	320	1 900	2 200	SFT	320	1 900	2 200	DX	130	860	1 900	344	CZ	180	800	2 600	320	SFP	180
FB 57	SF	630	1 400	1 750	SFT	630	1 400	1 750	DX	460	750	1 400	300	LZ	430	1 400	2 100	560	SFP	310
FB 72	SF	1 250	1 120	1 600	SFT	1 250	1 120	1 600	DX	720	700	1 150	280	LZ	760	1 220	1 800	488	SFP	630
FB 82	SF	1 800	1 025	1 450	SFT	1 800	1 025	1 450	DX	1 000	670	1 050	268	SFZ	1 700	1 450	1 600	580	SFP	750
FB 107	SF	2 500	880	1 250	SFT	2 500	880	1 250	DX	1 500	610	900	244	SFZ	2 500	1 300	1 350	520	SFP	1 250
FB 127	SF	5 000	800	1 150	SFT	5 000	800	1 150	SX	3 400	380	800	152	SFZ	5 000	1 200	1 200	480	SFP	3 100
FB 140	SF	10 000	750	1 100	SFT	10 000	750	1 100	SX	7 500	320	750	128	SFZ	10 000	950	1 150	380	SFP	6 300
FB 200	SF	20 000	630	900	SFT	20 000	630	900	SX	23 000	240	630	96	SFZ	20 000	680	900	272	SFP	12 500
FB 270	SF	40 000	510	750	SFT	40 000	510	750	UX	40 000	210	510	84	SFZ	37 500	600	750	240	SFP	25 000
FB 340	SF	80 000	460	630	SFT	80 000	460	630												
FB 440	SF	160 000	400	550	SFT	160 000	400	550												

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Freewheel Size	Bore d						D	F	G**	H	L	T	Z**	Weight
	mm	mm	Standard mm	mm	mm	max. mm	mm	mm		mm	mm	mm		kg
FB 24	12	14*				14*	62	1,0	M5	8	50	51	3	0,9
FB 29	15	17*				17*	68	1,0	M5	8	52	56	3	1,1
FB 37	14	16	18	20	22*	22*	75	0,5	M6	10	48	65	4	1,3
FB 44	20	22	25*			25*	90	0,5	M6	10	50	75	6	1,9
FB 57	25	28	30	32*		32*	100	0,5	M8	12	65	88	6	2,8
FB 72	35	38	40	42*		42*	125	1,0	M8	12	74	108	12	5,0
FB 82	35	40	45	50*		50*	135	2,0	M10	16	75	115	12	5,8
FB 107	50	55	60	65*		65*	170	2,5	M10	16	90	150	10	11,0
FB 127	50	60	70	75*		75*	200	3,0	M12	18	112	180	12	19,0
FB 140	65	75	80	90		95*	250	5,0	M16	25	150	225	12	42,0
FB 200	110	120				120	300	5,0	M16	25	160	270	16	62,0
FB 270	140					150	400	6,0	M20	30	212	360	18	150,0
FB 340	180					240	500	7,5	M20	35	265	450	24	275,0
FB 440	220					300	630	7,5	M30	40	315	560	24	510,0

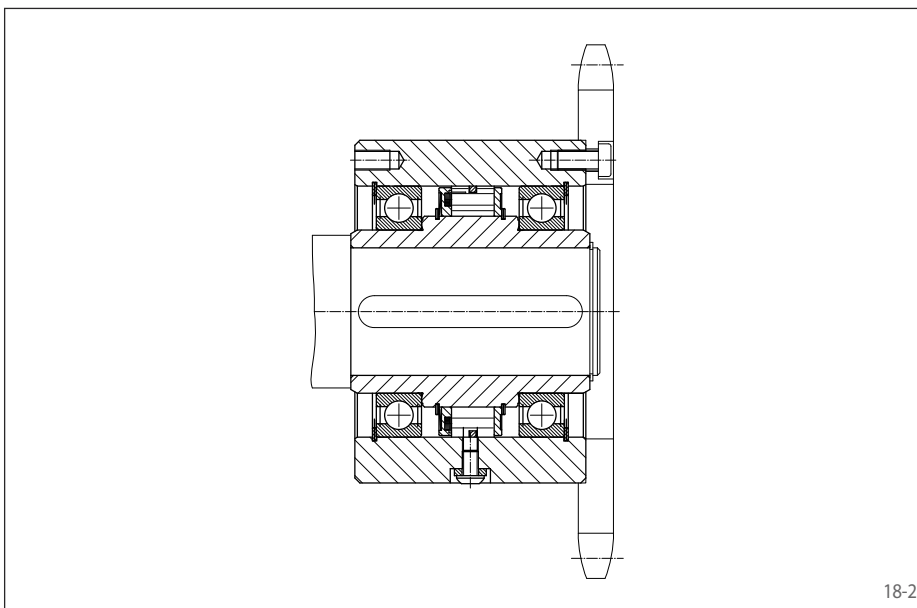
Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.  
\* Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.  
\*\* Z = Number of tapped holes G on pitch circle T.

# Complete Freewheels FR ...

for bolting to the face  
in inch dimension with sprags, available in four types



18-1



18-2

## Features

Complete Freewheels FR ... are sealed sprag freewheels in inch dimension with ball bearings. They are supplied oil-filled and ready for installation.

The freewheels FR ... are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

In addition to the standard type, three other types are available for extended service life.

Nominal torques up to 25 500 ft-lbs.

Bores up to 7 inch. Many standard bores are available.

## Application example

Complete Freewheel FRX 600 as an overrunning clutch on the shaft end of the high speed rotating main drive of a textile machine. The sprocket is linked to an auxiliary drive. In normal operation (freewheeling operation) the inner ring overruns and the outer ring is at a standstill with the bolted on sprocket. During set-up, the machine is driven by the slowly running auxiliary drive via the chain drive and the freewheel that is working in the driving operation. With the high speed of the inner ring in freewheeling operation, the type sprag lift-off X is used; the sprags work in freewheeling operation without contact and hence are wear-free.

Standard bores and keyway sizes [inch]

FR ...	0,500	0,625	0,750						
FR ... 300	1/8 x 1/16	3/16 x 3/32	3/16 x 3/32						
FR ... 400	0,500	0,625	0,750						
	1/8 x 1/16	3/16 x 3/32	3/16 x 3/32	3/16 x 3/32					
FR ... 450	0,750	0,875	1,000						
	3/16 x 3/32	3/16 x 3/32	1/4 x 1/8	1/4 x 1/8					
FR ... 500	0,875	1,000	1,125	1,250					
	3/16 x 3/32	1/4 x 1/8	1/4 x 1/8	1/4 x 1/8	1/4 x 3/32				
FR ... 550	1,250	1,312	1,500	1,625					
	1/4 x 1/8	3/8 x 3/16	3/8 x 3/16	3/8 x 1/8					
FR ... 600	1,250	1,375	1,438	1,500	1,625	1,688	1,750	1,938	2,000
	1/4 x 1/8	3/8 x 3/16	3/8 x 3/16	3/8 x 3/16	3/8 x 3/16	3/8 x 3/16	3/8 x 3/16	3/8 x 1/8	3/8 x 1/8
FR ... 650	1,938	2,000	2,250	2,438	2,500				
	1/2 x 1/4	1/2 x 1/4	1/2 x 1/4	5/8 x 1/8	5/8 x 1/8				
FR ... 700	1,938	2,000	2,250	2,438	2,500	2,750	2,938		
	1/2 x 1/4	1/2 x 1/4	1/2 x 1/4	5/8 x 5/16	5/8 x 5/16	5/8 x 7/32	5/8 x 1/8		
FR ... 750	2,438	2,500	2,938	3,000	3,250	3,438			
	5/8 x 5/16	5/8 x 5/16	3/4 x 3/8	3/4 x 3/8	3/4 x 3/16	3/4 x 1/8			
FR ... 775	2,750	2,938	3,000	3,250	3,438	3,500	3,750		
	5/8 x 5/16	3/4 x 3/8	3/4 x 3/8	3/4 x 3/8	7/8 x 5/16	7/8 x 5/16	7/8 x 1/4		
FR ... 800	3,000	3,250	3,438	3,500	3,750	3,937	4,000	4,250	4,500
	3/4 x 3/8	3/4 x 3/8	7/8 x 7/16	7/8 x 7/16	7/8 x 7/16	1 x 1/2	1 x 1/2	1 x 3/8	1 x 1/4
FR ... 900	4,000	4,438	4,500	4,938	5,000	5,438			
	1 x 1/2	1 x 1/2	1 x 1/2	1 1/4 x 5/16	1 1/4 x 5/16	1 1/4 x 5/16			
FR ... 1000	5,750	5,938	6,000	6,750	6,875	7,000			
	1 1/2 x 3/4	1 1/2 x 3/4	1 1/2 x 3/4	1 3/4 x 7/16	1 3/4 x 7/16	1 3/4 x 7/16			

## Mounting

The customer attachment part is centered on the external diameter D and then bolted on to the face.

The tolerance of the shaft must be + 0 / - ,001 inch and the tolerance of the pilot diameter D of the attachment part must be - 0 / + ,002 inch.

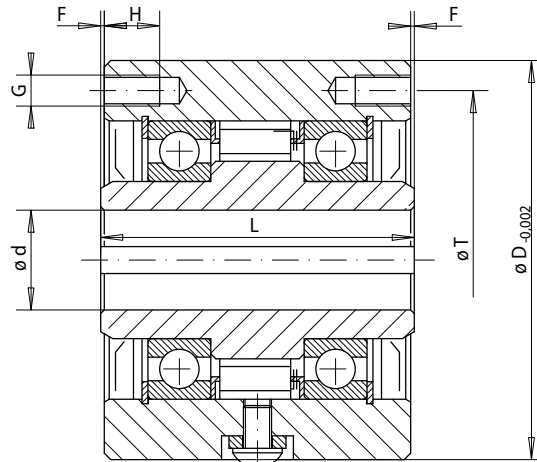
## Example for ordering

Freewheel size FR ... 700, type with sprag lift-off Z and 2 inch bore:

- FRZ 700, d = 2 inch

# Complete Freewheels FR ...

for bolting to the face  
in inch dimension with sprags, available in four types



19-1

Indexing Freewheel Overrunning Clutch Backstop	Standard type For universal use	Standard type - grease lubricated For universal use	Type with sprag lift-off X For extended service life using sprag lift-off at high speed rotating inner ring	Type with sprag lift-off Z For extended service life using sprag lift-off at high speed rotating outer ring

Freewheel Type	Nominal torque ft-lbs	Max. speed		Freewheel Type	Nominal torque ft-lbs	Max. speed		Freewheel Type	Nominal torque ft-lbs	Sprag lift-off at inner ring speed min <sup>-1</sup>	Max. speed		Freewheel Type	Nominal torque ft-lbs	Sprag lift-off at outer ring speed min <sup>-1</sup>	Max. speed	
		Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>			Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>				Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring drives min <sup>-1</sup>				Outer ring freewheels/ overruns min <sup>-1</sup>	Inner ring drives min <sup>-1</sup>
FRS 300	180	2500	2600	FRSG 300	180	3600	3600	FRX 400	97	860	4000	340	FRZ 400	320	800	2600	320
FRS 400	320	1900	2200	FRSG 400	320	3600	3600	FRX 500	310	750	4000	300	FRZ 500	570	1400	2050	560
FRS 450	320	1900	2100	FRSG 450	320	3600	3600	FRX 550	540	700	4000	280	FRZ 550	1050	1550	1800	620
FRS 500	570	1400	1900	FRSG 500	570	3600	3600	FRX 600	720	670	4000	265	FRZ 600	1300	1450	1650	580
FRS 550	1050	1175	1600	FRSG 550	1050	3600	3600	FRX 650	1100	610	4000	240	FRZ 650	1850	1300	1400	520
FRS 600	1300	1100	1500	FRSG 600	1300	3600	3600	FRX 700	2900	350	3600	140	FRZ 700	3500	1160	1200	465
FRS 650	1850	900	1250	FRSG 650	1850	3600	3600	FRX 750	5600	320	2400	125	FRZ 750	5900	1160	1200	465
FRS 700	3500	790	1150	FRSG 700	3500	1800	1800	FRX 775	5600	320	2100	125	FRZ 775	8000	950	1050	380
FRS 750	5900	790	1150	FRSG 750	5900	1800	1800	FRX 800	12300	250	1800	100	FRZ 800	7700	880	975	350
FRS 775	8000	750	1050	FRSG 775	8000	1800	1800	FRX 900	12300	250	650	100					
FRS 800	7700	700	950	FRSG 800	7700	1800	1800										
FRS 900	15000	700	950	FRSG 900	15000	1200	1200										
FRS 1000	25500	630	800	FRSG 1000	25500	1200	1200										

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Freewheel Size	Bore d Standard bores inch										max. inch	D	F	G Thread	L	H	T	Z*	Weight
	inch	inch	inch	inch	inch	inch	inch	inch	inch	inch		inch	inch	inch	inch	inch	inch	inch	lbs
FR ... 300	0,500	0,650	0,750							0,750	3,000	0,063	0,250-28	2,500	0,500	2,625	4	3,5	
FR ... 400	0,500	0,625	0,750	0,875						0,875	3,500	0,032	0,312-24	2,750	0,630	2,875	4	6,0	
FR ... 450	0,750	0,875	1,000	1,125						1,125	3,500	0,032	0,312-24	2,750	0,630	2,875	4	6,0	
FR ... 500	0,875	1,000	1,125	1,250	1,312					1,312	4,250	0,063	0,312-24	3,500	0,625	3,625	4	10,0	
FR ... 550	1,250	1,312	1,500	1,625						1,625	4,750	0,063	0,312-24	3,250	0,540	4,250	6	12,0	
FR ... 600	1,250	1,375	1,438	1,500	1,625	1,688	1,750	1,938	2,000	2,000	5,375	0,063	0,312-24	3,750	0,625	4,750	6	19,0	
FR ... 650	1,938	2,000	2,250	2,438	2,500					2,500	6,500	0,063	0,375-24	3,500	0,790	5,750	8	24,0	
FR ... 700	1,938	2,000	2,250	2,438	2,500	2,75	2,938			2,938	7,125	0,063	0,375-24	5,000	0,750	6,250	8**	42,0	
FR ... 750	2,438	2,500	2,938	3,000	3,250	3,438				3,438	8,750	0,063	0,500-20	6,000	1,000	7,000	8**	83,0	
FR ... 775	2,750	2,938	3,000	3,250	3,438	3,500	3,750			3,750	9,750	0,063	0,500-20	6,000	1,000	8,500	8	96,0	
FR ... 800	3,000	3,250	3,438	3,500	3,750	3,937	4,000	4,250	4,500	4,500	10,000	0,063	0,500-20	6,000	1,000	8,937	8	102,0	
FR ... 900	4,000	4,438	4,500	4,938	5,000	5,438				5,438	12,000	0,063	0,625-18	6,375	1,250	9,750	10	156,0	
FR ... 1000	5,750	5,938	6,000	6,750	6,875	7,000				7,000	15,000	0,063	0,625-18	6,625	1,000	11,750	12	250,0	

\* Z = Number of tapped holes G on pitch circle T.

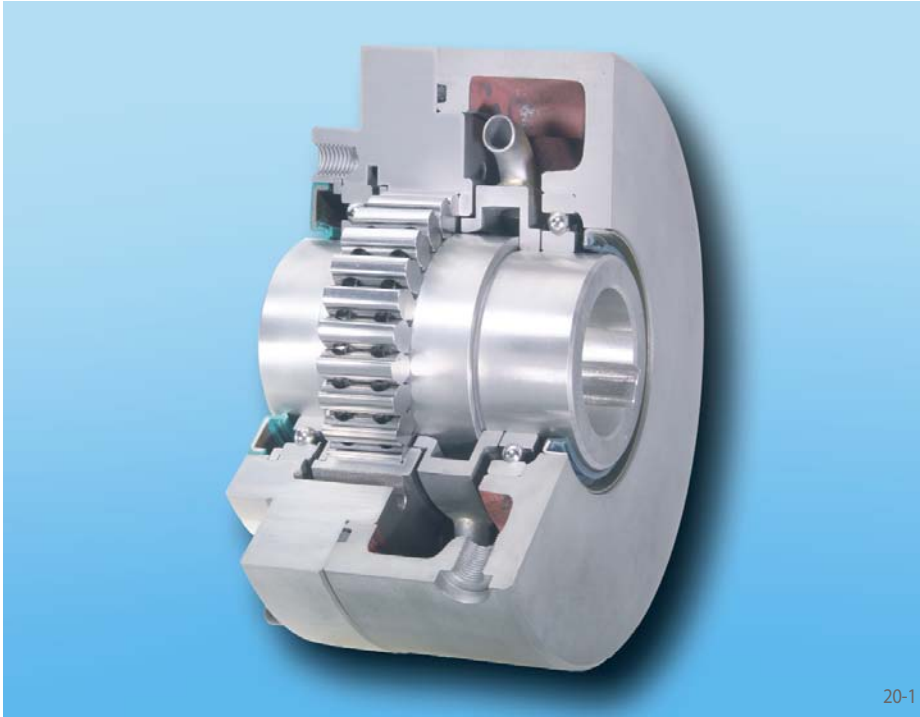
\*\* Six holes are equally spaced 60° apart with two additional holes located 30° from the six equally spaced holes and 180° apart.

Conversion factors: 1 ft-lbs = 1,35 Nm, 1 inch = 25,4 mm, 1 lbs = 0,453 kg.



# Complete Freewheels FKh

for bolting to the face  
with hydrodynamic sprag lift-off for multimotor drives



20-1

## Features

Complete Freewheels FKh with hydrodynamic sprag lift-off are typically used in cases where an assembly can be driven from two or more motors or turbines at the same or similar high speed.

Complete Freewheels FKh are sealed sprag freewheels with ball bearings. They are supplied oil-filled and ready for installation.

The freewheels FKh are used as:

### ► Overrunning Clutches

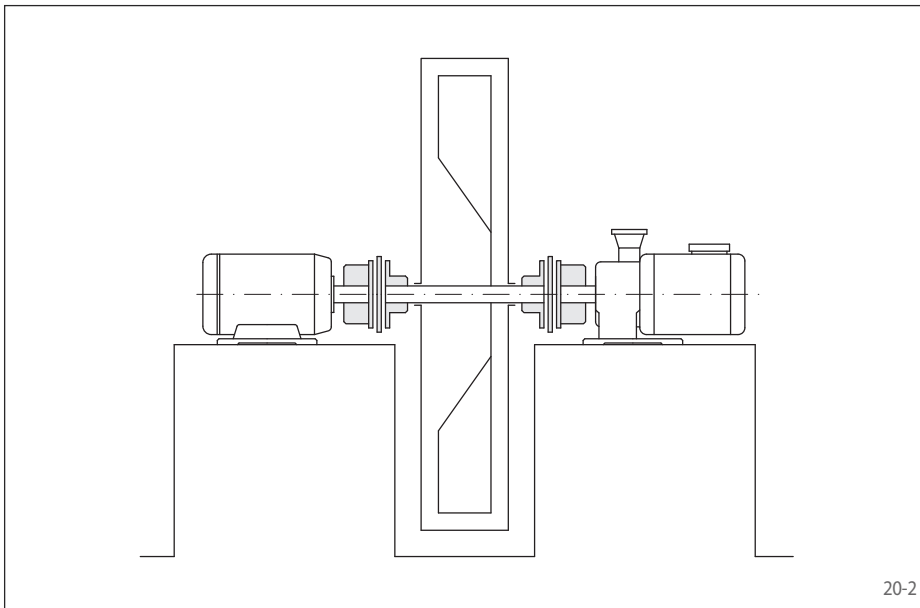
if the speeds in freewheeling operation and in driving operation are the same or similarly high.

Nominal torques up to 14 000 Nm.

Bores up to 95 mm.

## Application example

Two Complete Freewheels FKh 28 ATR as overrunning clutches in the drive system of a fan. The fan can be driven either by an electric motor or by a turbine. The freewheels between the fan and the two drive assemblies automatically engage the working drive with the fan and in each case disengage the drive that is no longer giving power. The freewheels replace actuated clutches, which require an additional activation when changing over from one drive to another. The hydrodynamic sprag lift-off is the most suitable type for a wear-free freewheeling operation if the speeds in driving operation are the same or similarly high to those speeds in freewheeling operation.

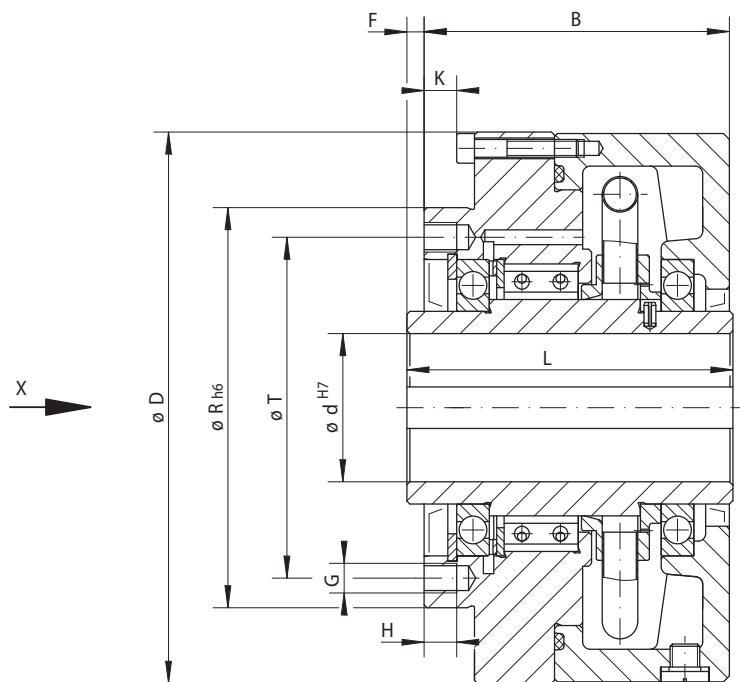


20-2



# Complete Freewheels FKh

for bolting to the face  
with hydrodynamic sprag lift-off for multimotor drives



21-1

		Dimensions															
		Nominal torque Nm	Max. speed Outer ring overruns min <sup>-1</sup>	Max. speed Inner ring drives min <sup>-1</sup>	Bore d		B	D	F	G**	H	K	L	R	T	Z**	Weight kg
Freewheel Size	Type				Standard mm	max. mm	mm	mm	mm		mm	mm	mm	mm	mm		
FKh 24	ATR	1 100	3 000	3 000	35	40*	90	170	1,0	M10	11	9	95	135	115	6	9,6
FKh 28	ATR	1 800	2 000	2 000	45	50*	103	186	1,0	M10	11	11	105	135	115	12	14,0
FKh 94	ATR	2 500	1 800	1 800	60	60	112	210	7,0	M10	16	9	120	170	150	10	19,0
FKh 106	ATR	4 200	1 600	1 600	70	75*	116	250	7,5	M12	18	8	125	200	180	12	25,0
FKh 148	ATR	7 000	1 600	1 600	90	95*	156	291	7,5	M16	25	9	165	250	225	12	52,0
FKh 2.53	ATR	14 000	1 600	1 600	90	95*	241	345	2,0	M16	25	6	245	250	220	16	98,0

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

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 tapped holes G on pitch circle T.

## Mounting

The customer attachment part is centered on the diameter R and then bolted on to the face.

The installation must invariably take place in such a way that the drive (driving operation) is carried out via the inner ring and the outer ring overruns in freewheeling operation.

The tolerance of the shaft must be ISO h6 or j6 and the tolerance of the pilot diameter R of the attachment part must be ISO H7 or J7.

## Example for ordering

Freewheel size FKh 28, type with hydrodynamic sprag lift-off and 50 mm bore:

- FKh 28 ATR, d = 50 mm

When ordering, please also specify the freewheel direction of the outer ring when viewed in direction X:

- anticlockwise free or
- clockwise free

# Complete Freewheels BD ... X

for bolting to the face  
with sprag lift-off X



22-1

## Features

Complete Freewheels BD ... X are sealed sprag freewheels with ball bearings and sprag lift-off X. They are supplied oil-filled.

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

The freewheels BD ... X are used as:

- ▶ Backstops
- ▶ Overrunning Clutches

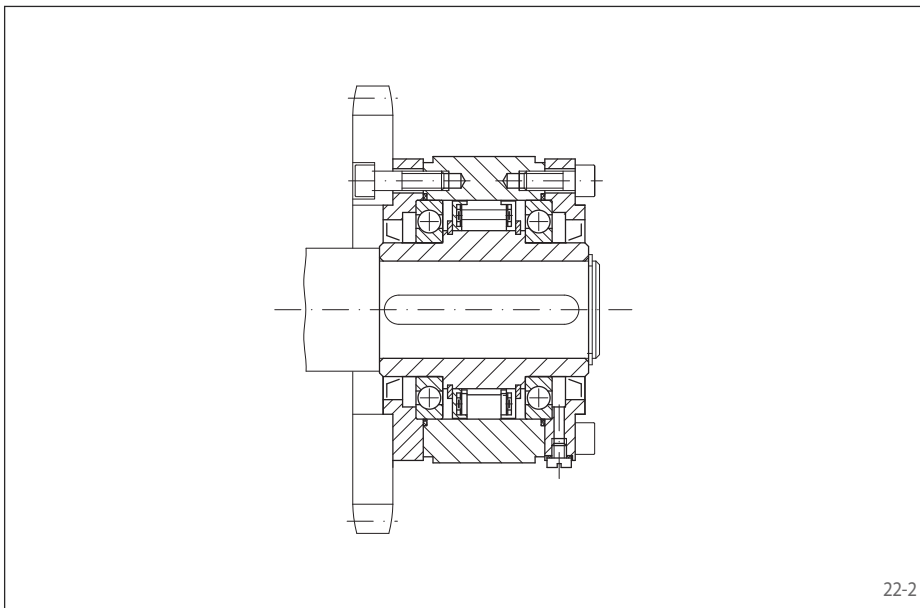
for applications with high speed freewheeling operation and when used as an overrunning clutch with low speed driving operation.

Nominal torques up to 42 500 Nm.

Bores up to 150 mm.

## Application example

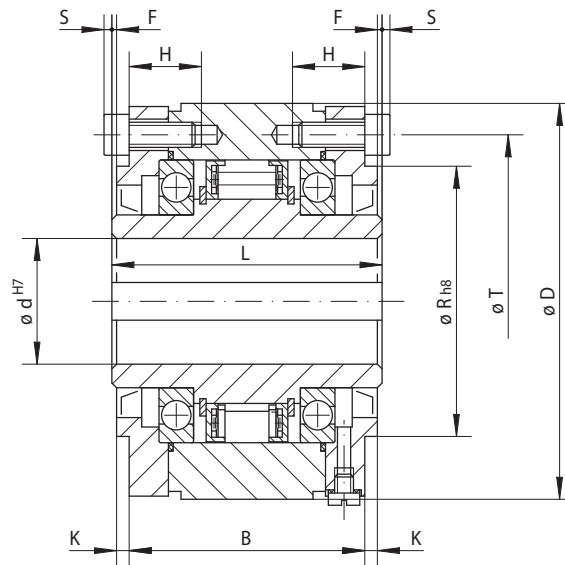
Complete Freewheel BD 45 SX as an overrunning clutch on the shaft end of the high speed rotating main drive of a textile machine. The sprocket is linked to an auxiliary drive. In normal operation (freewheeling operation) the inner ring overruns and the outer ring is at a standstill with the bolted on sprocket. During set-up, the machine is driven by the slowly running auxiliary drive via the chain drive and the freewheel that is working in the driving operation. With the high speed of the inner ring in freewheeling operation, the type sprag lift-off X is used; the sprags work in freewheeling operation without contact and hence are wear-free.



22-2

# Complete Freewheels BD ... X

for bolting to the face  
with sprag lift-off X



23-1

Type with sprag lift-off X For extended service life using sprag lift-off at high speed rotating inner ring						Dimensions														
Freewheel Size	Type	Nominal torque Nm	Sprag lift-off at inner ring speed min <sup>-1</sup>	Inner ring freewheels/ overruns min <sup>-1</sup>	Max. speed Outer ring drives min <sup>-1</sup>	Bore d			B	D	F	G**	H	K	L	R	S	T	Z**	Weight kg
						mm	Standard mm	max. mm												
BD 20	DX	420	750	1700	300	30		30	65,5	106	0,75	M6	26	5	77	70	2,5	90	6	3,8
BD 25	DX	700	700	1600	280	35	40	40	81,5	126	0,75	M6	30	5	93	80	2,5	105	6	6,6
BD 30	DX	1250	630	1600	252	45	50	50	88,5	151	0,75	M8	36	6	102	100	4,0	130	6	10,3
BD 40	DX	1700	610	1500	244	45	55	60	102,5	181	0,75	M10	37	6	116	120	6,5	160	6	17,4
BD 45	SX	2300	400	1500	160	55	65	70	115,5	196	1,25	M12	38	6	130	130	8,5	170	8	22,4
BD 52	SX	5600	320	1500	128	65	75	80	130,5	216	1,75	M14	44	8	150	150	8,5	190	8	31,1
BD 55	SX	7700	320	1250	128	75	85	90	146,5	246	1,75	M14	48	10	170	160	6,5	215	8	45,6
BD 60	SX	14500	250	1100	100	85	95	100	182,5	291	1,75	M14	55	10	206	190	6,5	250	8	78,2
BD 70	SX	21000	240	1000	96	120		120	192,5	321	1,25	M16	58	10	215	210	9,0	280	8	93,4
BD 100	UX	42500	210	750	84	150		150	248,5	411	3,75	M20	79	10	276	270	11,5	365	10	198,4

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

\*\* Z = Number of tapped holes G on pitch circle T.

## Mounting

The customer attachment part is centered on the diameter R and bolted on to the face. The pilot on the covers is particularly suitable for attaching smaller and narrower parts (sprockets, gear wheels etc.).

The customer must provide fastening screws of the necessary length in order to mount the attachment part.

The tolerance of the shaft must be ISO h6 or j6 and the tolerance of the pilot diameter R of the attachment part must be ISO H7 or J7.

## Example for ordering

Freewheel size BD 30, type with sprag lift-off X and 45 mm bore:

- BD 30 DX, d = 45 mm

# Complete Freewheels BD ... R

for bolting to the face  
with rollers



24-1

## Features

Complete Freewheels BD ... R are sealed freewheels with rollers and ball bearings. They are supplied oil-filled.

The freewheels BD ... R are used as:

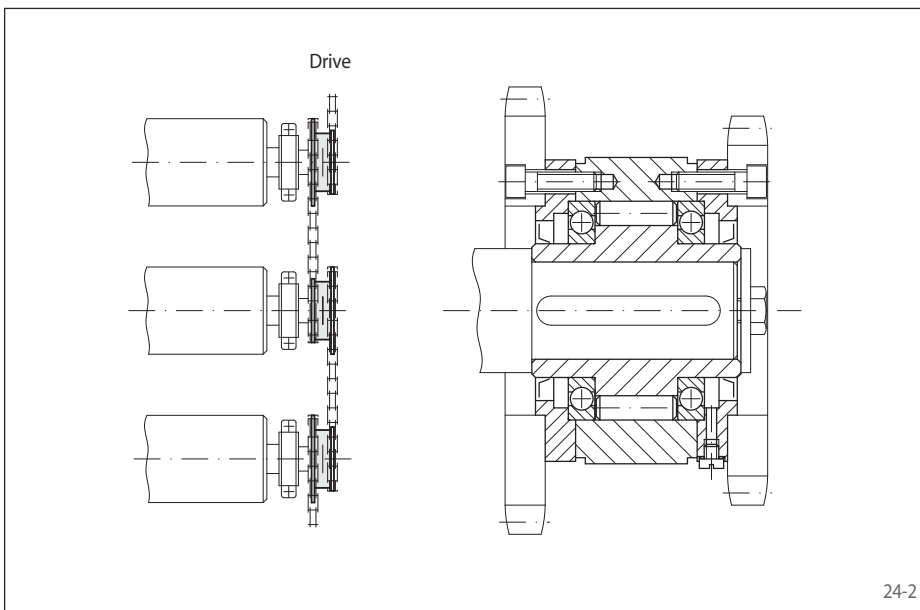
- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

Nominal torques up to 57 500 Nm.

Bores up to 150 mm.

## Application example

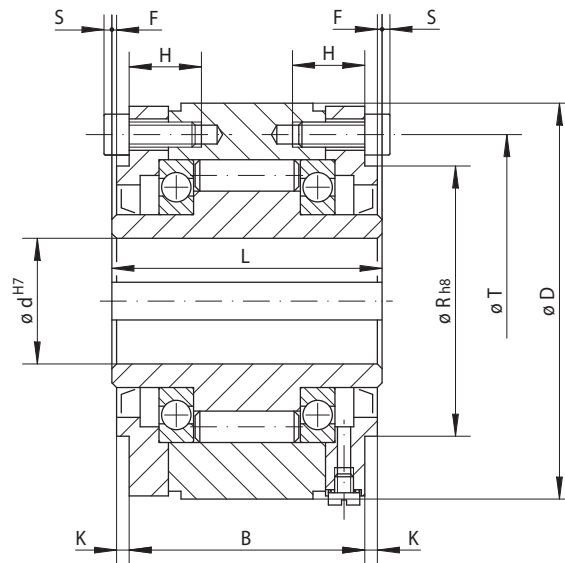
Complete Freewheels BD 28 R as overrunning clutches in the roller conveyor of a continuous heating furnace system. The steel billets must run through the furnace at increasing speed. In order to achieve this, overrunning clutches with sprockets on both sides are arranged on the drive side of the transport rollers. The driven sprocket has in each case two teeth less than the driving sprocket. Therefore the speed increases from roller to roller. The length of the steel billet covers several rollers, all running at different speeds. The freewheels allow the slower rollers to adjust to the speed of the billet by overrunning their drive.



24-2

# Complete Freewheels BD ... R

for bolting to the face  
with rollers



25-1

Indexing Freewheel Overrunning Clutch Backstop	Standard type For universal use	Dimensions

Freewheel Size	Type	Nominal torque Nm	Max.Speed		Bore d				B	D	F	G**	H	K	L	R	S	T	Z**	Weight
			Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>	Standard			max. mm												
					mm	mm	mm													
BD 12	R	150	1 750	3 500	15			15	60,5	71	0,75	M5	25	3	68	45	3,0	56	4	1,5
BD 15	R	230	1 650	3 300	20			20	62,5	81	0,75	M5	25	3	70	50	3,0	65	4	2,0
BD 18	R	340	1 550	3 100	25			25	62,5	96	0,75	M5	25	3	70	60	3,0	80	6	2,9
BD 20	R	420	1 450	2 900	30			30	65,5	106	0,75	M6	26	5	77	70	2,5	90	6	3,8
BD 25	R	800	1 250	2 500	35	40		40	81,5	126	0,75	M6	30	5	93	80	2,5	105	6	6,6
BD 28	R	1 200	1 100	2 200	35	40	45	45	81,5	136	0,75	M8	30	6	95	90	4,0	115	6	7,8
BD 30	R	1 600	1 000	2 000	45	50		50	88,5	151	0,75	M8	36	6	102	100	4,0	130	6	10,3
BD 35	R	1 800	900	1 800	50	55		55	96,5	161	0,75	M8	35	6	110	110	4,0	140	6	12,5
BD 40	R	3 500	800	1 600	45	55	60	60	102,5	181	0,75	M10	37	6	116	120	6,5	160	6	17,4
BD 45	R	7 100	750	1 500	55	65	70	70	115,5	196	1,25	M12	38	6	130	130	8,5	170	8	22,4
BD 50	R	7 500	700	1 400	70	75		75	117,5	206	1,25	M12	39	6	132	140	8,5	180	8	24,2
BD 52	R	9 300	650	1 300	65	75	80	80	130,5	216	1,75	M14	44	8	150	150	8,5	190	8	31,1
BD 55	R	12 500	550	1 100	75	85	90	90	146,5	246	1,75	M14	48	10	170	160	6,5	215	8	45,6
BD 60	R	14 500	500	1 000	85	95	100	105	182,5	291	1,75	M14	55	10	206	190	6,5	250	8	78,2
BD 70	R	22 500	425	850	120			120	192,5	321	1,25	M16	58	10	215	210	9,0	280	8	93,4
BD 80	R	25 000	375	750	130			130	200,5	351	1,75	M16	60	10	224	220	8,5	310	8	116,8
BD 90	R	33 500	350	700	140			140	210,5	371	2,75	M16	68	10	236	240	7,5	330	10	136,7
BD 95	R	35 000	300	600	150			150	223,5	391	2,75	M16	79	10	249	250	6,5	345	10	159,3
BD 100	R	57 500	250	500	150			150	248,5	411	3,75	M20	79	10	276	270	11,5	365	10	198,4

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

\*\* Z = Number of tapped holes G on pitch circle T.

## Mounting

The customer attachment part is centered on the diameter R and then bolted on to the face. The pilot on the covers is particularly suitable for attaching smaller and narrower parts (sprockets, gear wheels etc.).

The customer must provide fastening screws of the necessary length in order to mount the attachment part.

The tolerance of the shaft must be ISO h6 or j6 and the tolerance of the pilot diameter R of the attachment part must be ISO H7 or J7.

## Example for ordering

Freewheel size BD 40, standard type with bore 60 mm:

- BD 40 R, d = 60 mm

# Complete Freewheels FBF

with mounting flange  
with sprags, available in five types



26-1

## Features

Complete Freewheels FBF with mounting flange are sealed sprag freewheels with ball bearings. They are supplied oil-filled and ready for installation.

The freewheels FBF are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

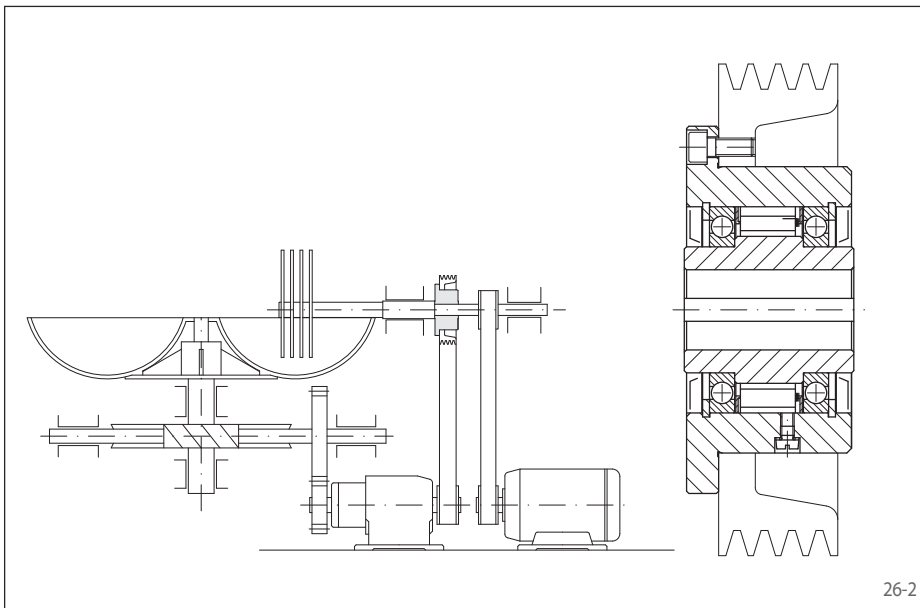
In addition to the standard type, four other types are available for extended service life and indexing accuracy.

Nominal torques up to 160 000 Nm.

Bores up to 300 mm. Many standard bores are available.

## Application example

Complete Freewheel FBF 72 DX as an overrunning clutch in the drive of a meat processing machine (chopper). During the mixing process, the gear motor drives the bowl via the gear wheel drive and simultaneously the knife shaft via the belt drive and the locked freewheel. In the cutting process, the knife shaft is driven by a second motor at high speed. By doing so, the inner ring overruns the outer ring that is driven by the gear motor and the gear motor is automatically disengaged. With the high speed of the inner ring in freewheeling operation, the type sprag lift-off X is used; the sprags work in freewheeling operation without contact and hence are wear-free.



26-2

## Mounting

The customer attachment part is centered on the external diameter D and then bolted on to the face via the flange.

The tolerance of the shaft must be ISO h6 or j6 and the tolerance of the pilot diameter D of the attachment part must be ISO H7 or J7.

## Example for ordering

Freewheel size FBF 72, type with sprag lift-off Z and 38 mm bore:

- FBF 72 LZ, d = 38 mm

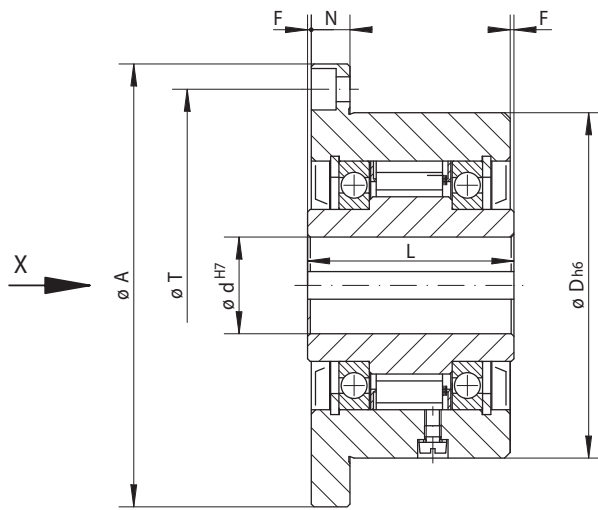
When ordering, please also specify the freewheeling direction of the inner ring when viewed in direction X:

- anticlockwise free or
- clockwise free



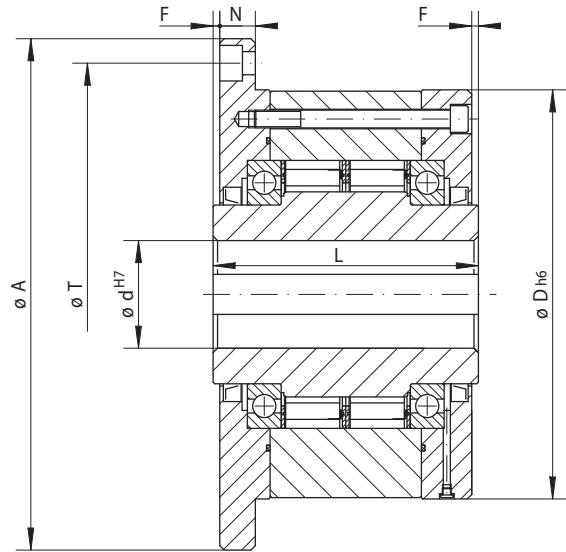
# Complete Freewheels FBF

with mounting flange  
with sprags, available in five types



Size FBF 24 to FBF 270

27-1



Size FBF 340 to FBF 440

27-2

Indexing Freewheel Overrunning Clutch Backstop	Standard type For universal use	Type with RIDUVIT® For extended service life with coated sprags	Type with sprag lift-off X For extended service life using sprag lift-off at high speed rotating inner ring	Type with sprag lift-off Z For extended service life using sprag lift-off at high speed rotating outer ring	Type with P-grinding For extended service life and indexing accuracy

Freewheel Size	Type	Nominal torque Nm	Max.Speed		Type	Nominal torque Nm	Max.Speed		Type	Nominal torque Nm	Sprag lift-off at inner ring speed min <sup>-1</sup>	Max.Speed		Type	Nominal torque Nm	Sprag lift-off at outer ring speed min <sup>-1</sup>	Max.Speed		Type	Nominal torque Nm
			Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>			Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>				Inner ring freewheels/ overruns min <sup>-1</sup>	Inner ring drives							
FBF 24	CF	45	4800	5500	CFT	45	4800	5500											CFP	19
FBF 29	CF	80	3500	4000	CFT	80	3500	4000											CFP	31
FBF 37	SF	200	2500	2600	SFT	200	2500	2600						CZ	110	850	3000	340	SFP	120
FBF 44	SF	320	1900	2200	SFT	320	1900	2200	DX	130	860	1900	344	CZ	180	800	2600	320	SFP	180
FBF 57	SF	630	1400	1750	SFT	630	1400	1750	DX	460	750	1400	300	LZ	430	1400	2100	560	SFP	310
FBF 72	SF	1250	1120	1600	SFT	1250	1120	1600	DX	720	700	1150	280	LZ	760	1220	1800	488	SFP	630
FBF 82	SF	1800	1025	1450	SFT	1800	1025	1450	DX	1000	670	1050	268	SFZ	1700	1450	1600	580	SFP	750
FBF 107	SF	2500	880	1250	SFT	2500	880	1250	DX	1500	610	900	244	SFZ	2500	1300	1350	520	SFP	1250
FBF 127	SF	5000	800	1150	SFT	5000	800	1150	SX	3400	380	800	152	SFZ	5000	1200	1200	480	SFP	3100
FBF 140	SF	10000	750	1100	SFT	10000	750	1100	SX	7500	320	750	128	SFZ	10000	950	1150	380	SFP	6300
FBF 200	SF	20000	630	900	SFT	20000	630	900	SX	23000	240	630	96	SFZ	20000	680	900	272	SFP	12500
FBF 270	SF	40000	510	750	SFT	40000	510	750	UX	40000	210	510	84	SFZ	37500	600	750	240	SFP	25000
FBF 340	SF	80000	460	630	SFT	80000	460	630												
FBF 440	SF	160000	400	550	SFT	160000	400	550												

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Freewheel Size	Bore d						A	D	F	G**	L	N	T	Z**	Weight
	mm	mm	Standard	mm	mm	max. mm	mm	mm	mm		mm	mm	mm		kg
FBF 24	12	14*				14*	85	62	1,0	M5	50	10	72	3	1,1
FBF 29	15	17*				17*	92	68	1,0	M5	52	11	78	3	1,3
FBF 37	14	16	18	20	22*	22*	98	75	0,5	M5	48	11	85	8	1,5
FBF 44	20	22	25*			25*	118	90	0,5	M6	50	12	104	8	2,3
FBF 57	25	28	30	32*		32*	128	100	0,5	M6	65	12	114	12	3,2
FBF 72	35	38	40	42*		42*	160	125	1,0	M8	74	14	142	12	5,8
FBF 82	35	40	45	50*		50*	180	135	2,0	M10	75	16	155	8	7,0
FBF 107	50	55	60	65*		65*	214	170	2,5	M10	90	18	192	10	12,6
FBF 127	50	60	70	75*		75*	250	200	3,0	M12	112	20	225	12	21,4
FBF 140	65	75	80	90		95*	315	250	5,0	M16	150	22	280	12	46,0
FBF 200	110	120				120	370	300	5,0	M16	160	25	335	16	68,0
FBF 270	140					150	490	400	6,0	M20	212	32	450	16	163,0
FBF 340	180					240	615	500	7,5	M24	265	40	560	18	300,0
FBF 440	220					300	775	630	7,5	M30	315	50	710	18	564,0

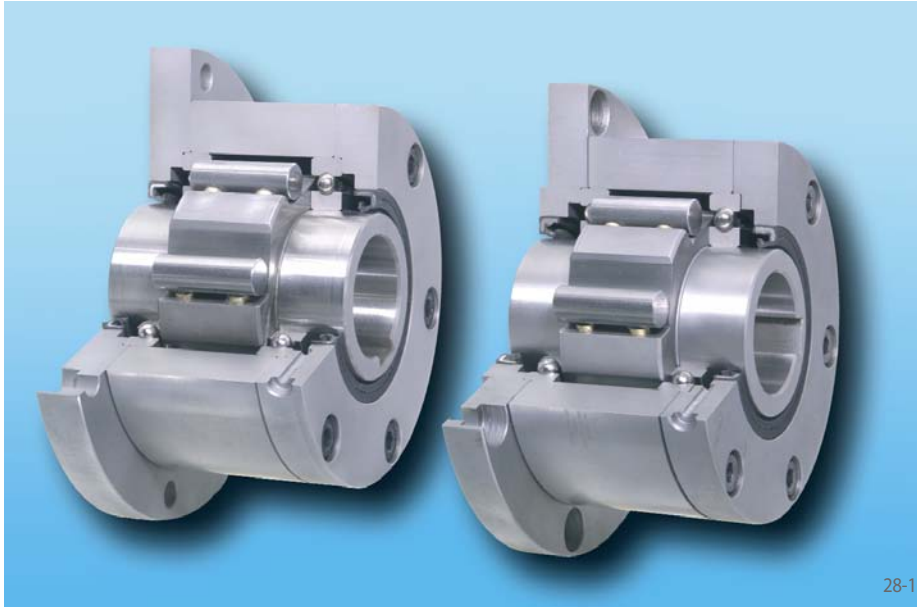
Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

\* Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.

\*\* Z = Number of fastening holes for screws G (DIN 912) on pitch circle T.

# Complete Freewheels FGR ... R A1A2 and FGR ... R A2A7

with mounting flange  
with rollers



28-1

## Features

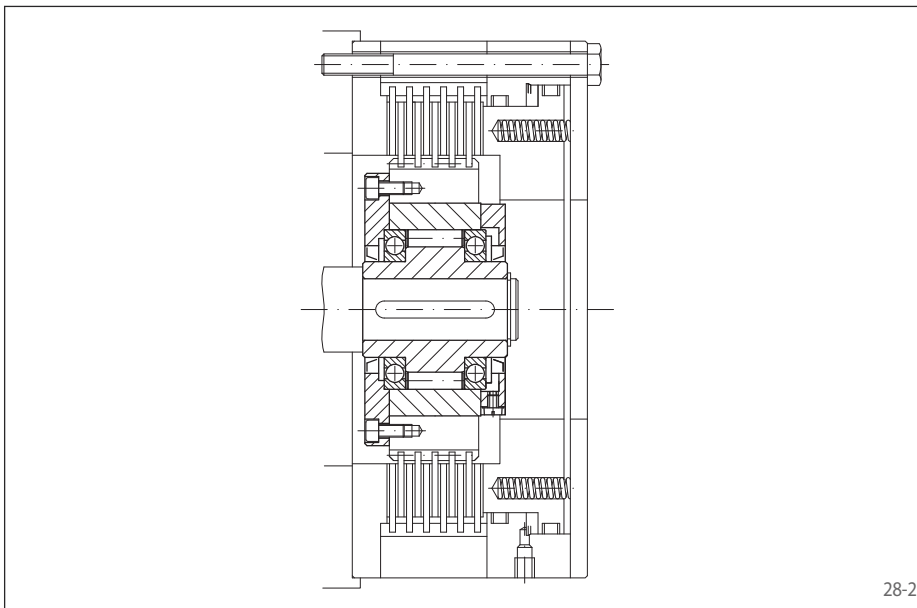
Complete Freewheel FGR ... R A1A2 and FGR ... R A2A7 with mounting flange are sealed roller freewheels with ball bearings. They are oil lubricated.

The freewheels FGR ... R A1A2 and FGR ... R A2A7 are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

Nominal torques up to 68 000 Nm.

Bores up to 150 mm.



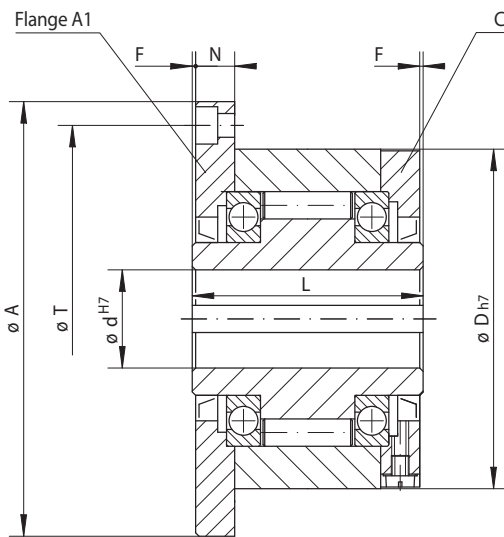
28-2

## Application example

Complete Freewheel FGR 50 R A1A2, used in a hydraulically released, spring actuated multi-disk brake for winch drives. When the load is lifted, the multiple-disk brake is closed and the inner ring is freewheeling. At a standstill, the freewheel functions as a backstop. The load is held by the brake and the locked freewheel. When lowering, the brake is released with control and the load is lowered via the locked freewheel. By using the freewheel, the hydraulic control could be designed in a simpler and more cost-effective manner.

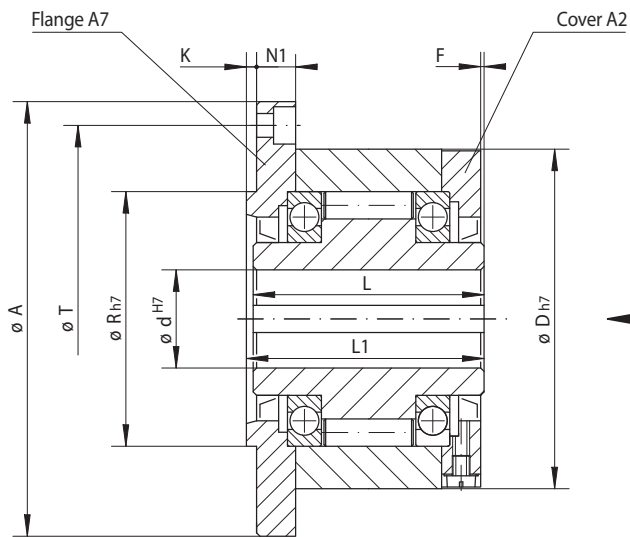
# Complete Freewheels FGR ... R A1A2 and FGR ... R A2A7

with mounting flange  
with rollers



Series FGR ... R A1A2

29-1



Series FGR ... R A2A7

29-2

Indexing Freewheel Overrunning Clutch Backstop	Standard type For universal use		Dimensions															

Freewheel Size	Type	Flange and cover combination		Nominal torque Nm	Max. speed Inner ring freewheels/ overruns min <sup>-1</sup>	Max. speed Outer ring freewheels/ overruns min <sup>-1</sup>	Bore d mm	A mm	D mm	F mm	G**	K mm	L mm	L1 mm	N mm	N1 mm	R mm	T mm	Z**	Weight mm
FGR 12	R	A1A2	A2A7	55	2 500	5 400	12	85	62	1	M5	3,0	42	44	10,0	10,0	42	72	3	1,2
FGR 15	R	A1A2	A2A7	130	2 200	4 800	15	92	68	1	M5	3,0	52	54	11,0	11,0	47	78	3	1,6
FGR 20	R	A1A2	A2A7	180	1 900	4 100	20	98	75	1	M5	3,0	57	59	10,5	10,5	55	85	4	1,9
FGR 25	R	A1A2	A2A7	290	1 550	3 350	25	118	90	1	M6	3,0	60	62	11,5	11,5	68	104	4	2,9
FGR 30	R	A1A2	A2A7	500	1 400	3 050	30	128	100	1	M6	3,0	68	70	11,5	11,5	75	114	6	3,9
FGR 35	R	A1A2	A2A7	730	1 300	2 850	35	140	110	1	M6	3,5	74	76	13,5	13,0	80	124	6	4,9
FGR 40	R	A1A2	A2A7	1 000	1 150	2 500	40	160	125	1	M8	3,5	86	88	15,5	15,0	90	142	6	7,5
FGR 45	R	A1A2	A2A7	1 150	1 100	2 400	45	165	130	1	M8	3,5	86	88	15,5	15,0	95	146	8	7,8
FGR 50	R	A1A2	A2A7	2 100	950	2 050	50	185	150	1	M8	4,0	94	96	14,0	13,0	110	166	8	10,8
FGR 55	R	A1A2	A2A7	2 600	900	1 900	55	204	160	1	M10	4,0	104	106	18,0	17,0	115	182	8	14,0
FGR 60	R	A1A2	A2A7	3 500	800	1 800	60	214	170	1	M10	4,0	114	116	17,0	16,0	125	192	10	16,8
FGR 70	R	A1A2	A2A7	6 000	700	1 600	70	234	190	1	M10	4,0	134	136	18,5	17,5	140	212	10	20,8
FGR 80	R	A1A2	A2A7	6 800	600	1 400	80	254	210	1	M10	4,0	144	146	21,0	20,0	160	232	10	27,0
FGR 90	R	A1A2	A2A7	11 000	500	1 300	90	278	230	1	M12	4,5	158	160	20,5	19,0	180	254	10	40,0
FGR 100	R	A1A2	A2A7	20 000	350	1 100	100	335	270	1	M16	5,0	182	184	30,0	28,0	210	305	10	67,0
FGR 130	R	A1A2	A2A7	31 000	250	900	130	380	310	1	M16	5,0	212	214	29,0	27,0	240	345	12	94,0
FGR 150	R	A1A2	A2A7	68 000	200	700	150	485	400	1	M20	5,0	246	248	32,0	30,0	310	445	12	187,0

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

\*\* Z = Number of fastening holes for screws G (DIN 912) on pitch circle T.

## Mounting

Basic Freewheel, flange, cover, seals and screws are supplied loose. These must be assembled by the customer with regard to the required freewheeling direction into the Complete Freewheel. Prior to commissioning, the freewheel must be filled with oil of the specified quality. Upon request, assembled Complete Freewheels already oil-filled can be supplied.

With Complete Freewheels FGR ... R A1A2, the customer attachment part is centered on the external diameter D and bolted on to the face via flange A1.

With Complete Freewheels FGR ... R A2A7, the customer attachment part is centered on the pilot diameter R and bolted on to the face via flange A7. Hence, Complete Freewheels FGR ... SF A2A7 are particularly suitable for attaching smaller and narrower parts (sprockets, gear wheels etc.).

The tolerance of the shaft must be ISO h6 or j6 and the tolerance of the pilot diameter D or R of the attachment part must be ISO H7 or J7.

## Example for ordering

Freewheel size FGR 25, standard type with flange A1 and cover A2:

- FGR 25 R A1A2

Basic Freewheel, flange, cover, seals and screws are supplied loose provided nothing else is stated in the order.

If assembled, oil-filled, Complete Freewheels are to be supplied, this must be specified in the order. When ordering, please also specify the freewheeling direction of the inner ring when viewed in direction X:

- anticlockwise free or
- clockwise free

# Complete Freewheels BM ... X

for keyway connection on the outer ring  
with sprag lift-off X



30-1

## Features

Complete Freewheels BM... X are sealed sprag freewheels with ball bearings and sprag lift-off X. They are supplied oil-filled and ready for installation.

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

The freewheels BM ... X are used as:

- ▶ Backstops
- ▶ Overrunning Clutches

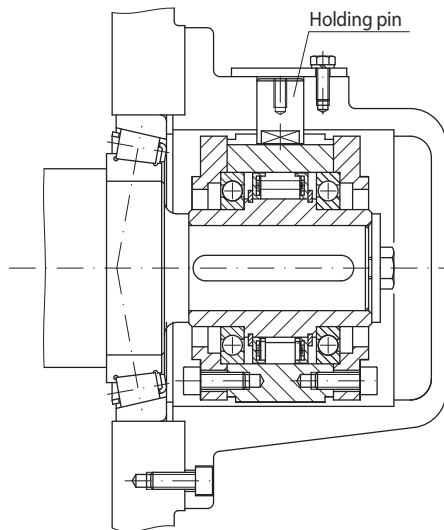
for applications with high speed freewheeling operation and when used as overrunning clutch with low speed driving operation.

Nominal torques up to 42 500 Nm.

Bores up to 150 mm.

## Application example

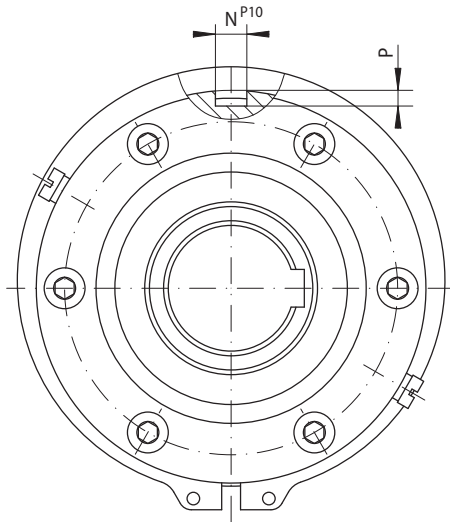
Complete Freewheel BM 60 SX as a backstop, arranged at the end of the intermediate shaft of a spur gearbox. The freewheel is used without the radial seal rings on each side, and is lubricated by the gearbox oil. A radial holding pin engages in the keyway of the outer ring. The backdriving torque is supported by the holding pin in the stationary housing. By removing the radial holding pin, the installation can be turned in both directions in order to carry out maintenance work. With the high shaft speed in normal operation (freewheeling operation), the type with sprag lift-off X is used; the sprags work in freewheeling operation without contact and hence are wear-free.



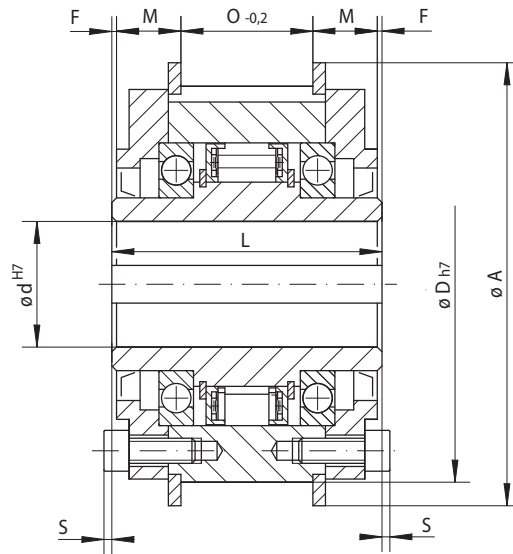
30-2

# Complete Freewheels BM ... X

for keyway connection on the outer ring  
with sprag lift-off X



31-1



31-2

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

Freewheel Size	Type	Nominal torque Nm	Sprag lift-off at inner ring speed min <sup>-1</sup>	Max. speed		Bore d			A	D	F	L	M	N	O	P	S	Weight
				Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring drives min <sup>-1</sup>	Standard mm	max. mm	mm										
BM 20	DX	420	750	1700	300	30		30	121	105	0,75	77	20,25	8	35	4,0	2,5	3,8
BM 25	DX	700	700	1600	280	35	40	40	144	125	0,75	93	22,25	10	47	5,0	2,5	6,6
BM 30	DX	1250	630	1600	252	45	50	50	171	150	0,75	102	24,25	12	52	5,0	4,0	10,3
BM 40	DX	1700	610	1500	244	45	55	60	202	180	0,75	116	25,25	16	64	6,0	6,5	17,4
BM 45	SX	2300	400	1500	160	55	65	70	218	195	1,25	130	24,75	20	78	7,5	8,5	22,4
BM 52	SX	5600	320	1500	128	65	75	80	237	215	1,75	150	33,75	25	79	9,0	8,5	31,1
BM 55	SX	7700	320	1250	128	75	85	90	267	245	1,75	170	35,25	25	96	9,0	6,5	45,6
BM 60	SX	14500	250	1100	100	85	95	100	314	290	1,75	206	40,25	28	122	10,0	6,5	78,2
BM 70	SX	21000	240	1000	96	120		120	350	320	1,25	215	44,75	28	123	10,0	9,0	93,4
BM 100	UX	42500	210	750	84	150		150	450	410	3,75	276	56,25	36	156	12,0	11,5	198,4

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.  
Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

## Mounting

The customer attachment part is connected via a keyway connection with the outer ring. The customer must provide the key required for assembling the attachment part.

The tolerance of the shaft must be ISO h6 or j6 and the tolerance of the pilot diameter D of the attachment part must be ISO H7 or J7.

## Example for ordering

Freewheel size BM 55, type with sprag lift-off X and 90 mm bore:

- BM 55 SX, d = 90 mm

# Complete Freewheels BM ... R

for keyway connection on the outer ring  
with rollers



32-1

## Features

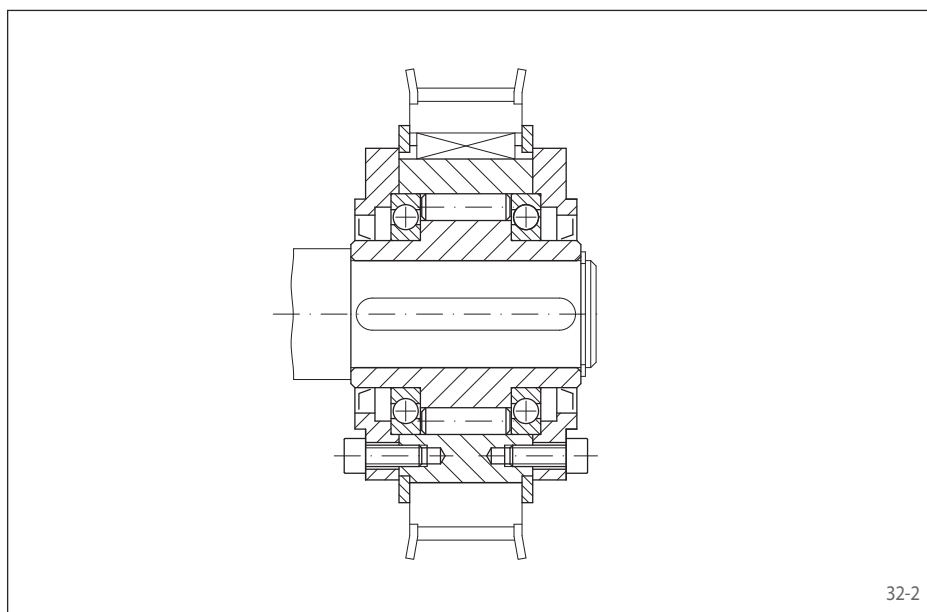
Complete Freewheels BM ... R are sealed roller freewheels with ball bearings. They are supplied oil-filled and ready for installation.

The freewheels BM ... R are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

Nominal torques up to 57 500 Nm.

Bores up to 150 mm.



32-2

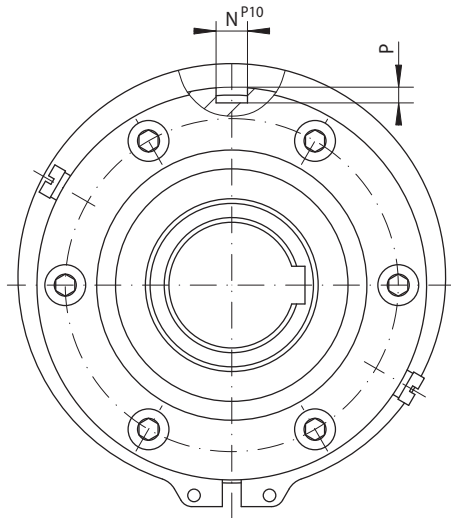
## Application example

Complete Freewheel BM 40 R as an overrunning clutch on the shaft end of the main drive of a paper processing machine. The pulley is connected to an auxiliary drive. In normal operation (freewheeling operation) the inner ring overruns and the outer ring is at a standstill with the attached pulley. During set-up (driving operation) the machine is driven by an auxiliary drive via the pulley at a low speed.

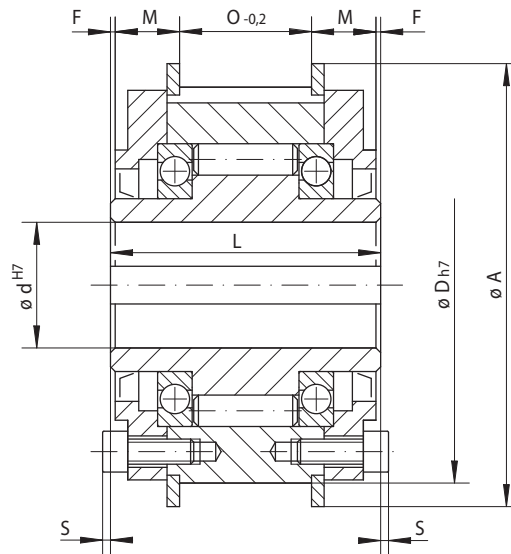


# Complete Freewheels BM ... R

for keyway connection on the outer ring  
with rollers



33-1



33-2

Indexing Freewheel Overrunning Clutch Backstop	Standard type For universal use		Dimensions															

Freewheel Size	Type	Nominal torque Nm	Max. speed		Bore d				A	D	F	L	M	N	O	P	S	Weight
			Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>	Standard			max. mm										
					mm	mm	mm											
BM 12	R	150	1 750	3 500	15			15	84	70	0,75	68	15,75	5	35	3,0	3,0	1,5
BM 15	R	230	1 650	3 300	20			20	94	80	0,75	70	15,75	5	37	3,0	3,0	2,0
BM 18	R	340	1 550	3 100	25			25	111	95	0,75	70	16,25	8	36	4,0	3,0	2,9
BM 20	R	420	1 450	2 900	30			30	121	105	0,75	77	20,25	8	35	4,0	2,5	3,8
BM 25	R	800	1 250	2 500	35	40		40	144	125	0,75	93	22,25	10	47	5,0	2,5	6,6
BM 28	R	1 200	1 100	2 200	35	40	45	45	155	135	0,75	95	23,25	12	47	5,0	4,0	7,8
BM 30	R	1 600	1 000	2 000	45	50		50	171	150	0,75	102	24,25	12	52	5,0	4,0	10,3
BM 35	R	1 800	900	1 800	50	55		55	182	160	0,75	110	24,25	14	60	5,5	4,0	12,5
BM 40	R	3 500	800	1 600	45	55	60	60	202	180	0,75	116	25,25	16	64	6,0	6,5	17,4
BM 45	R	7 100	750	1 500	55	65	70	70	218	195	1,25	130	24,75	20	78	7,5	8,5	22,4
BM 50	R	7 500	700	1 400	70	75		75	227	205	1,25	132	26,75	20	76	7,5	8,5	24,2
BM 52	R	9 300	650	1 300	65	75	80	80	237	215	1,75	150	33,75	25	79	9,0	8,5	31,1
BM 55	R	12 500	550	1 100	75	85	90	90	267	245	1,75	170	35,25	25	96	9,0	6,5	45,6
BM 60	R	14 500	500	1 000	85	95	100	105	314	290	1,75	206	40,25	28	122	10,0	6,5	78,2
BM 70	R	22 500	425	850	120			120	350	320	1,25	215	44,75	28	123	10,0	9,0	93,4
BM 80	R	25 000	375	750	130			130	380	350	1,75	224	46,25	32	128	11,0	8,5	116,8
BM 90	R	33 500	350	700	140			140	400	370	2,75	236	49,25	32	132	11,0	7,5	136,7
BM 95	R	35 000	300	600	150			150	420	390	2,75	249	53,25	36	137	12,0	6,5	159,3
BM 100	R	57 500	250	500	150			150	450	410	3,75	276	56,25	36	156	12,0	11,5	198,4

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.  
Keyway according to DIN 6885, page 1 • Keyway width tolerance • JS10

## Mounting

The customer attachment part is connected via a keyway connection with the outer ring. The customer must provide the key required for assembling the attachment part.

The tolerance of the shaft must be ISO h6 or j6 and the tolerance of the pilot diameter D of the attachment part must be ISO H7 or J7.

## Example for ordering

Freewheel size BM 20, standard type and 30 mm bore:

- BM 20 R, d = 30 mm

# Complete Freewheels FGRN ... R A5A6

for keyway connection on the outer ring  
with rollers



34-1

## Features

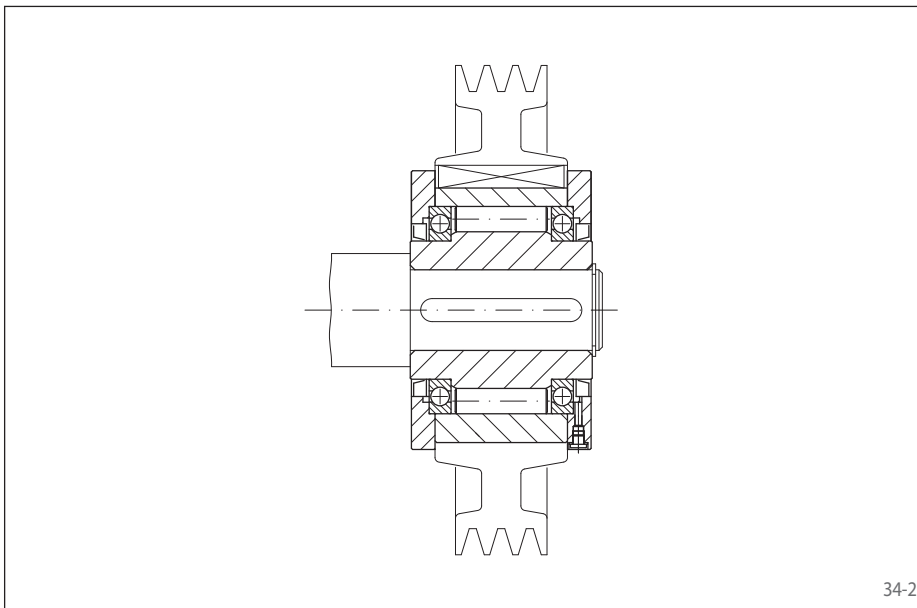
Complete Freewheels FGRN... R A5A6 are sealed roller freewheels with ball bearings. They are oil lubricated.

The freewheels FGRN... R A5A6 are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

Nominal torques up to 6 800 Nm.

Bores up to 80 mm.



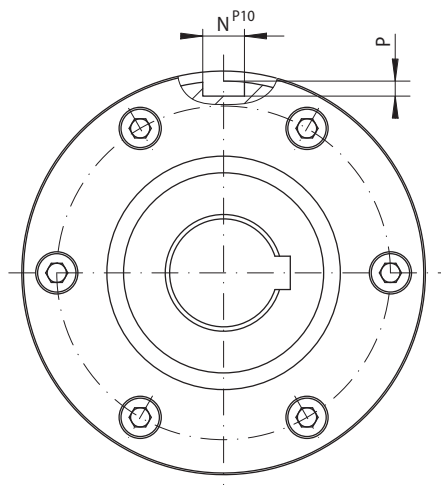
34-2

## Application example

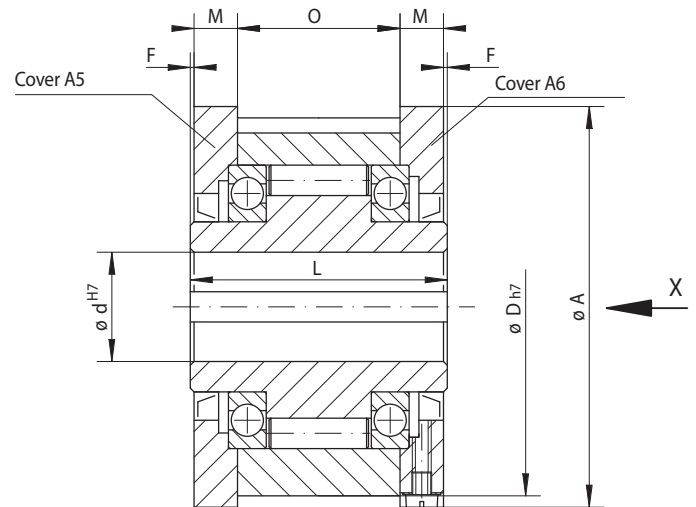
Complete Freewheel FGRN 45 R as an overrunning clutch on the shaft end of a mobile fan. In normal operation, the fan is driven by a diesel motor via the V-belt drive. By doing so, the freewheel works in driving operation. When the motor is turned off, the freewheel automatically disengages the rotating flywheel mass of the fan from the drive. In this operating state, the inner ring overruns the stationary outer ring; the freewheel works in freewheeling operation.

# Complete Freewheels FGRN ... R A5A6

for keyway connection on the outer ring  
with rollers



35-1



35-2

	Standard type For universal use		Dimensions											

Freewheel Size	Type	Cover combination	Nominal Torque Nm	Max. speed		Bore d mm	A mm	D mm	F mm	L mm	M mm	N mm	P mm	O mm	Weight kg
				Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>										
FGRN 12	R	A5A6	55	2 500	5 400	12	70	62	1	42	10,0	4	2,5	20	1,2
FGRN 15	R	A5A6	130	2 200	4 800	15	76	68	1	52	11,0	5	3,0	28	1,6
FGRN 20	R	A5A6	180	1 900	4 100	20	84	75	1	57	10,5	6	3,5	34	1,9
FGRN 25	R	A5A6	290	1 550	3 350	25	99	90	1	60	11,5	8	4,0	35	2,9
FGRN 30	R	A5A6	500	1 400	3 050	30	109	100	1	68	11,5	8	4,0	43	3,9
FGRN 35	R	A5A6	730	1 300	2 850	35	119	110	1	74	13,5	10	5,0	45	4,9
FGRN 40	R	A5A6	1 000	1 150	2 500	40	135	125	1	86	15,5	12	5,0	53	7,5
FGRN 45	R	A5A6	1 150	1 100	2 400	45	140	130	1	86	15,5	14	5,5	53	7,8
FGRN 50	R	A5A6	2 100	950	2 050	50	160	150	1	94	14,0	14	5,5	64	10,8
FGRN 55	R	A5A6	2 600	900	1 900	55	170	160	1	104	18,0	16	6,0	66	14,0
FGRN 60	R	A5A6	3 500	800	1 800	60	182	170	1	114	17,0	18	7,0	78	16,8
FGRN 70	R	A5A6	6 000	700	1 600	70	202	190	1	134	18,5	20	7,5	95	20,8
FGRN 80	R	A5A6	6 800	600	1 400	80	222	210	1	144	21,0	22	9,0	100	27,0

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.  
Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

## Mounting

Basic Freewheel, covers, seals and screws are supplied loose. These must be assembled by the customer with regard to the required freewheeling direction into the Complete Freewheel. Prior to commissioning, the freewheel must be filled with oil of the specified quality. Upon request, assembled Complete Freewheels already oil-filled can be supplied.

The customer attachment part is connected via a keyway connection with the outer ring. The customer must provide the key required for assembling the attachment part.

The tolerance of the shaft must be ISO h6 or j6 and the tolerance of the pilot diameter D of the attachment part must be ISO H7 or J7.

## Example for ordering

Freewheel size FGRN 60, standard type with flange A5 and cover A6:

- FGRN 60 R A5A6

Basic Freewheel, covers, seals and screws are supplied loose provided nothing else is stated in the order.

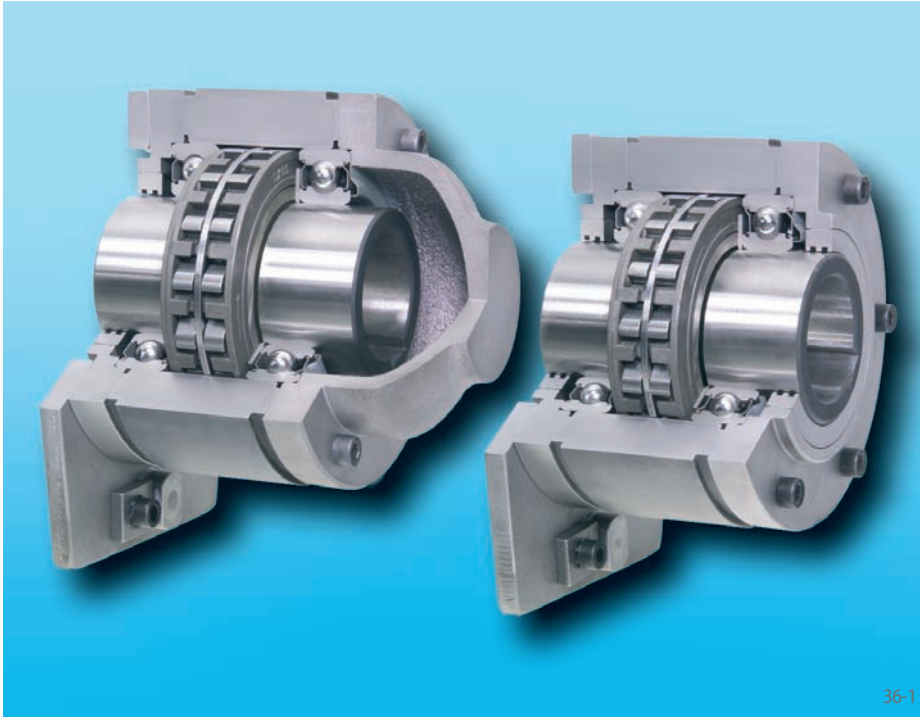
If assembled, oil-filled, Complete Freewheels are to be supplied, this must be specified in the order. When ordering, please also specify the freewheeling direction of the inner ring when viewed in direction X:

- anticlockwise free or
- clockwise free

# Complete Freewheels BA ... XG and BC ... XG

with lever arm

with sprag lift-off X and grease lubrication



## Features

Complete Freewheels BA ... XG and BC ... XG with lever arm are sprag freewheels with sprag lift-off X and grease-lubricated ball bearings.

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

The freewheels BA ... XG have an end cover and are fitted to shaft ends.

The freewheels BC ... XG are arranged on through shafts or shaft ends.

The freewheels BA ... XG and BC ... XG are used as:

### ► Backstops

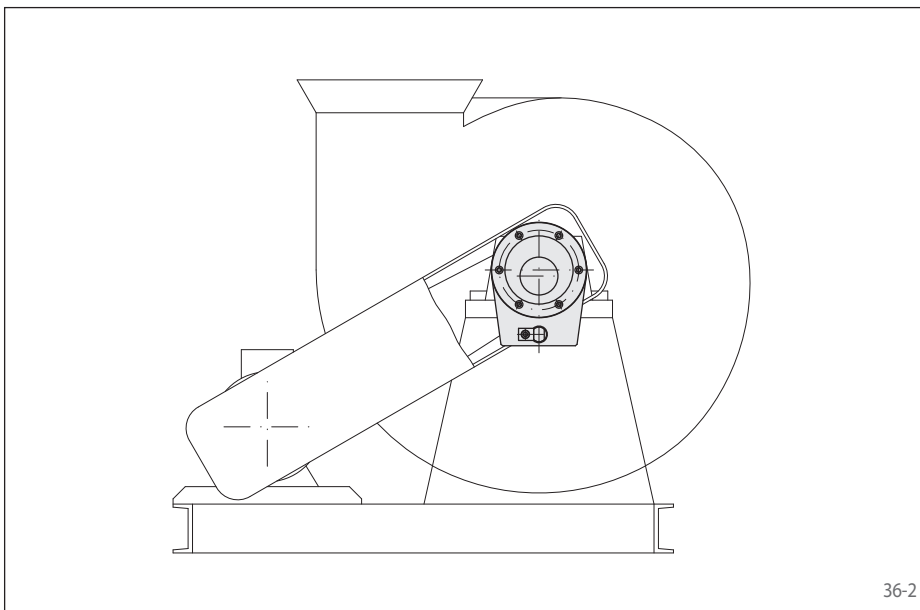
for applications with high speed freewheeling operation.

Nominal torques up to 42 500 Nm.

Bores up to 150 mm.

## Application example

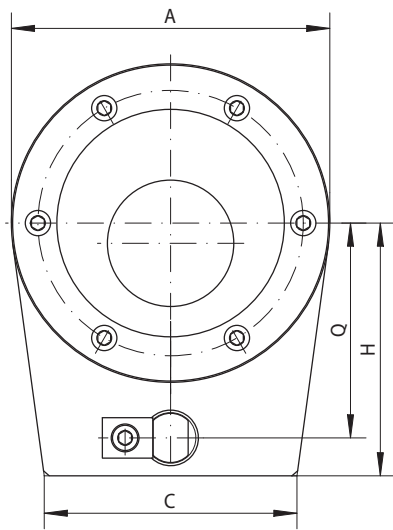
Complete Freewheel BA 52 SXG as a backstop on a radial fan. The backstop prevents a reverse rotation of the fan shaft from air flow or from an incorrectly polarized drive motor. By pulling out the holding pin in the lever arm, the shaft can be turned in both directions in order to carry out maintenance work. With the high shaft speed, the type with sprag lift-off X is used; the sprags work in freewheeling operation without contact and hence are wear-free.



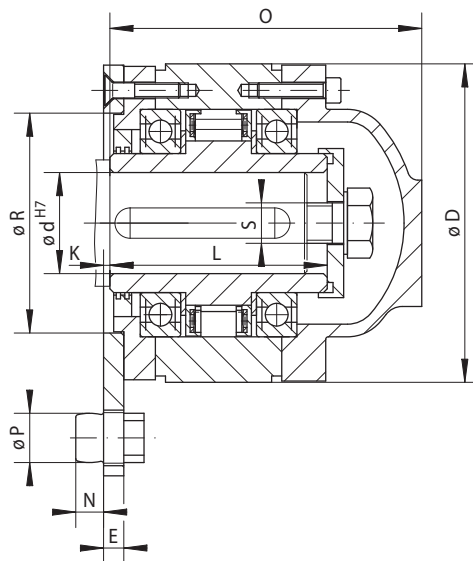
# Complete Freewheels BA ... XG and BC ... XG

with lever arm

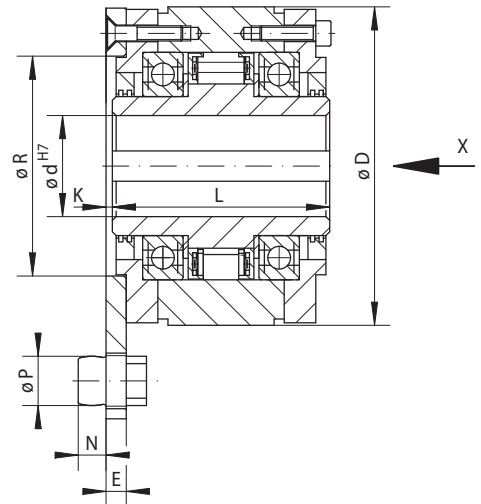
with sprag lift-off X and grease lubrication



37-1



Series BA ... XG



37-2

Series BC ... XG

37-3

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

Freewheel Size			Type	Nominal Torque Nm	Sprag lift-off at inner ring speed min <sup>-1</sup>	Max. speed Inner ring freewheels min <sup>-1</sup>	Bore d				A	C	D	E	H	K	L	N	O	P	Q	R	S for Screw	Weight kg
							Standard			max. mm														
BA 20	BC 20	DXG	400	750	2500	30	mm	mm	mm	30	110	90	106	8	80	2,5	77	11	104	19,5	65	70	M10	5
BA 25	BC 25	DXG	650	700	2350	35	40			40	126	100	126	8	90	2,5	93	11	125	19,5	75	80	M12	8
BA 30	BC 30	DXG	1 100	630	2350	45	50			50	155	120	151	10	120	3,5	102	16	140	27,5	95	100	M16	12
BA 40	BC 40	SXG	1 400	430	2200	45	55	60		60	190	150	181	12	160	5,5	116	22	160	37,5	130	120	M16	20
BA 45	BC 45	SXG	2 300	400	2200	55	65	70		70	210	160	196	14	175	7,5	130	26	176	41,5	140	130	M16	25
BA 52	BC 52	SXG	4 900	320	2200	65	75	80		80	230	190	216	14	200	4,5	150	26	208	41,5	160	150	M20	35
BA 55	BC 55	SXG	6 500	320	2000	75	85	90		90	255	200	246	15	210	3,5	170	29	228	49,5	170	160	M20	50
BA 60	BC 60	SXG	14 500	250	1800	85	95	100		105	295	220	291	20	250	8,5	206	35	273	60,5	200	190	M24	91
BA 70	BC 70	SXG	21 000	240	1650	120				120	335	260	321	25	280	14,5	215	39	291	65,5	225	210	M24	115
BA 100	BC 100	UXG	42 500	210	1450	150				150	420	380	411	45	345	31,5	276	60	372	80,5	280	270	M30	260

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.  
Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

## Mounting

The backdriving torque is supported by the lever arm with holding pin. The holding pin engages in a slot or bore in the frame of the machine. It must have 0,5 to 2 mm play in the axial and radial directions.

If the holding pin is removed, the shaft can be turned in both directions.

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

The freewheels BC ... XG are supplied ready for installation.

In the case of freewheels BA ... XG, the inner ring must be secured axially with a retainer plate. Retainer plate with fastening screw can be supplied upon request.

## Example for ordering

Freewheel size BC 45 type with sprag lift-off X, grease lubrication and 65 mm bore:

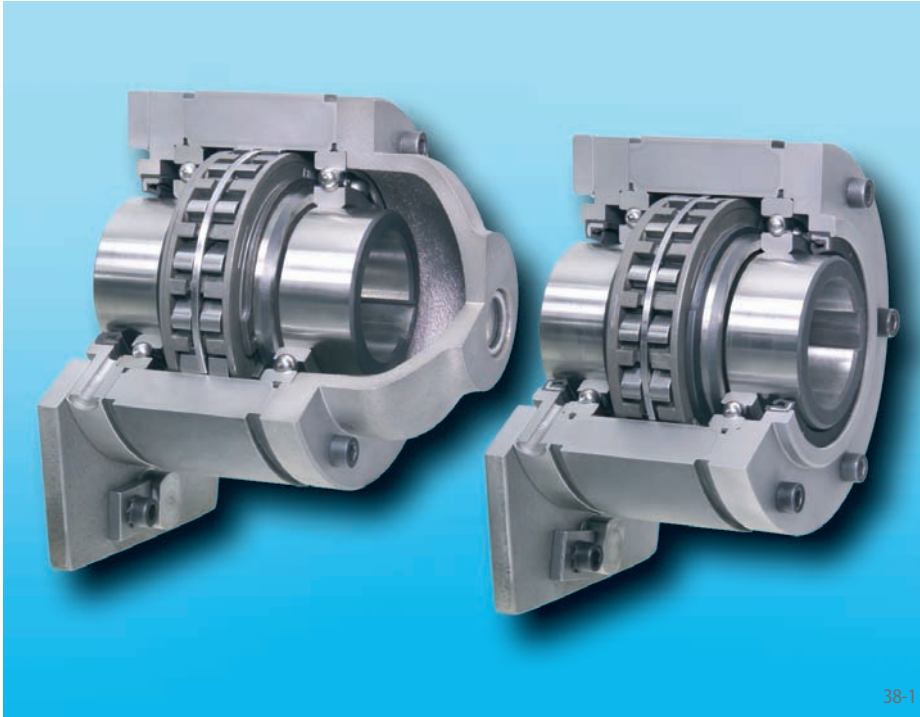
- BC 45 SXG, d = 65 mm

When ordering, please also specify the freewheeling direction of the inner ring when viewed in direction X:

- anticlockwise free or
- clockwise free

# Complete Freewheels BA ... X and BC ... X

with lever arm  
with sprag lift-off X



38-1

## Features

Complete Freewheels BA ... X and BC ... X with lever arm are sealed sprag freewheels with ball bearings and with sprag lift-off X. The sprag lift-off X ensures wear-free freewheeling operation when the inner ring rotates at high speed.

The freewheels BA ... X have an end cover and are fitted to shaft ends. The oil filling is carried out after the freewheel has been fitted to the end of the shaft.

The freewheels BC ... X are supplied oil-filled and are arranged on through shafts or shaft ends.

The freewheels BA ... X and BC ... X are used as:

### ► Backstops

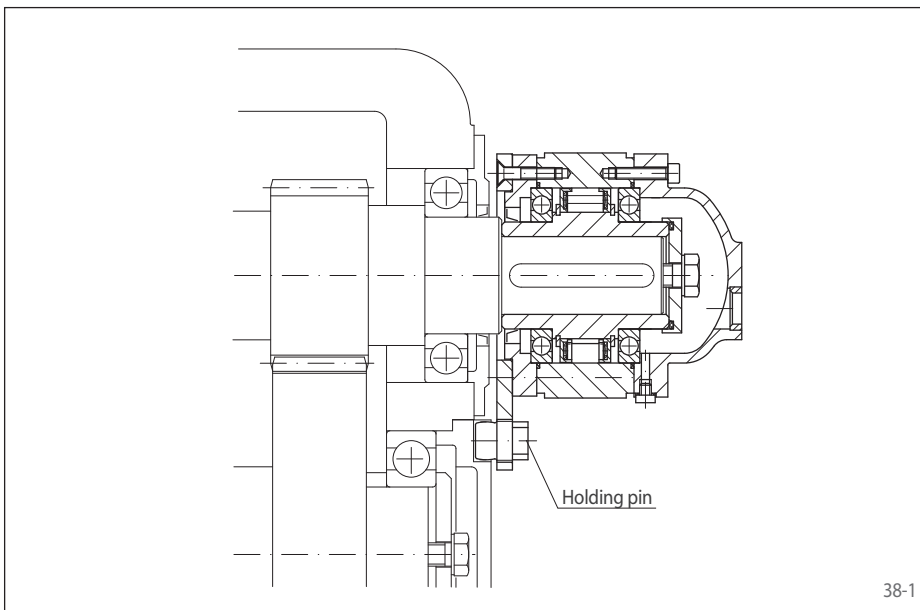
for applications with high speed freewheeling operation.

Nominal torques up to 42 500 Nm.

Bores up to 150 mm.

## Application example

Complete Freewheel BA 45 SX as a backstop, arranged at the end of the intermediate shaft of a spur gearbox. The backdriving torque is supported by the lever arm with holding pin on the gearbox housing. If the holding pin is removed, the shaft can be turned in both directions. With the high shaft speed in normal operation (freewheeling operation), the type with sprag lift-off X is used; the sprags work in freewheeling operation without contact and hence are wear-free.

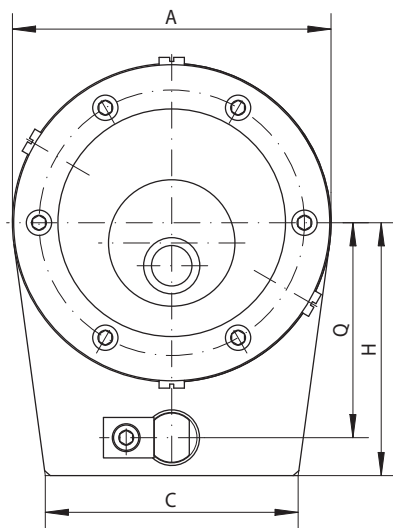


38-1

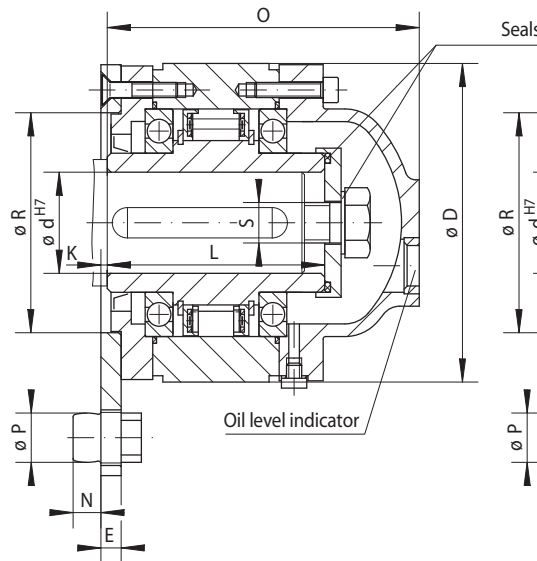


# Complete Freewheels BA ... X and BC ... X

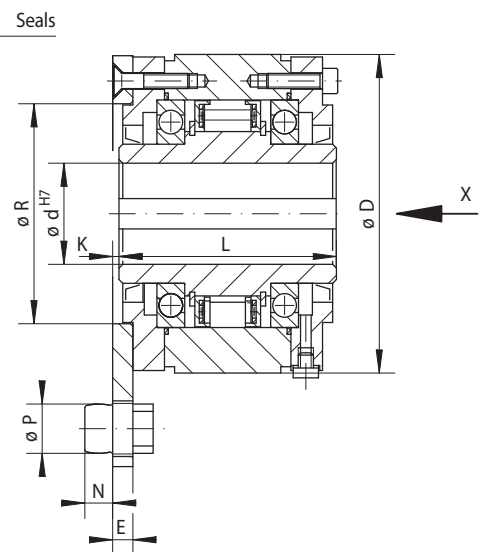
with lever arm  
with sprag lift-off X



39-1



Series BA ... X



39-2

Series BC ... X

39-3

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

Freewheel Size			Type	Nominal Torque Nm	Sprag lift-off at inner ring speed min <sup>-1</sup>	Max. speed Inner ring freewheels min <sup>-1</sup>	Bore d				A	C	D	E	H	K	L	N	O	P	Q	R	S for Screw	Weight kg
							Standard			max. mm														
BA 20	BC 20	DX	400	750	1 700	30	mm	mm	mm	30	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	M10	5
BA 25	BC 25	DX	650	700	1 600	35	40			40	126	100	126	8	90	2,5	93	11	125	19,5	75	80	M12	8
BA 30	BC 30	DX	1 100	630	1 600	45	50			50	155	120	151	10	120	3,5	102	16	140	27,5	95	100	M16	12
BA 40	BC 40	SX	1 400	430	1 500	45	55	60		60	190	150	181	12	160	5,5	116	22	160	37,5	130	120	M16	20
BA 45	BC 45	SX	2 300	400	1 500	55	65	70		70	210	160	196	14	175	7,5	130	26	176	41,5	140	130	M16	25
BA 52	BC 52	SX	4 900	320	1 500	65	75	80		80	230	190	216	14	200	4,5	150	26	208	41,5	160	150	M20	35
BA 55	BC 55	SX	6 500	320	1 250	75	85	90		90	255	200	246	15	210	3,5	170	29	228	49,5	170	160	M20	50
BA 60	BC 60	SX	14 500	250	1 100	85	95	100		105	295	220	291	20	250	8,5	206	35	273	60,5	200	190	M24	91
BA 70	BC 70	SX	21 000	240	1 000	120				120	335	260	321	25	280	14,5	215	39	291	65,5	225	210	M24	115
BA 100	BC 100	UX	42 500	210	750	150				150	420	380	411	45	345	31,5	276	60	372	80,5	280	270	M30	260

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.  
Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

## Mounting

The backdriving torque is supported by the lever arm with holding pin. The holding pin engages in a slot or bore in the frame of the machine. It must have 0,5 to 2 mm play in the axial and radial directions.

If the holding pin is removed, the shaft can be turned in both directions.

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

The freewheels BC ... X are supplied oil-filled and ready for installation.

In the case of freewheels BA ... X, the inner ring must be secured axially with a retainer plate. Retainer plate with fastening screw and two seals can be supplied upon request. Prior to commissioning, the freewheel must be filled with oil of the specified quality.

## Example for ordering

Freewheel size BA 30, type with sprag lift-off X and 50 mm bore:

- BA 30 DX, d = 50 mm

When ordering, please also specify the freewheeling direction of the inner ring when viewed in direction X:

- anticlockwise free or
- clockwise free

# Complete Freewheels BA ... R and BC ... R

with lever arm  
with rollers



40-1

## Features

Complete Freewheels BA ... R and BC ... R with lever arm are sealed roller freewheels with ball bearings.

The freewheels BA ... R have an end cover and are fitted to shaft ends. The oil filling is carried out after the freewheel has been installed to the end of the shaft.

The freewheels BC ... R are supplied oil-filled and are arranged on through shafts or shaft ends.

The freewheels BA ... R and BC ... R are used as:

### ► Backstops

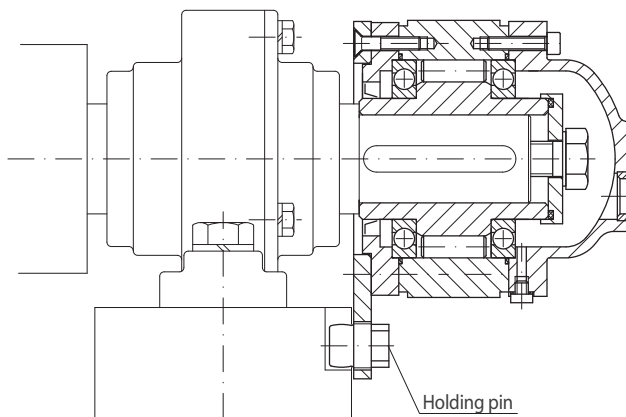
for applications with low to medium speed freewheeling operation.

Nominal torques up to 57 500 Nm.

Bores up to 150 mm.

## Application example

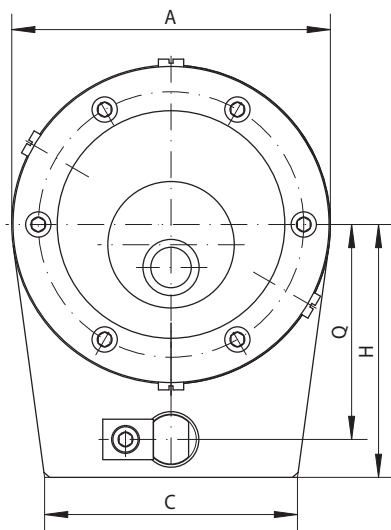
Complete Freewheel BA 90 R as a backstop on the end of a transport roller. The backdriving torque is supported by the lever arm with holding pin on the base. If the holding pin is removed, the shaft can be turned in both directions.



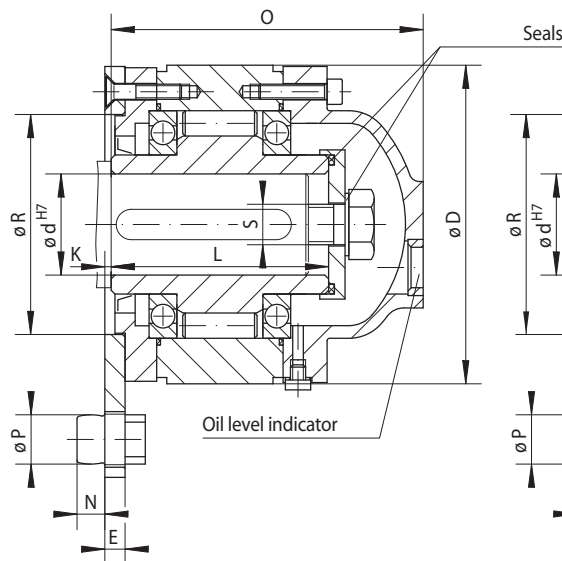
40-2

# Complete Freewheels BA ... R and BC ... R

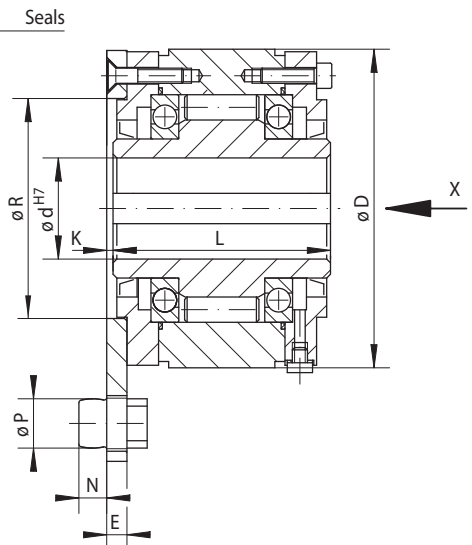
with lever arm  
with rollers



41-1



Series BA ... R



Series BC ... R

41-3

Backstop	Standard type For universal use	Dimensions																		

Freewheel Size				Type	Nominal Torque Nm	Max.speed Inner ring freewheels  min <sup>-1</sup>	Bore d				A	C	D	E	H	K	L	N	O	P	Q	R	S for Screw	Weight  kg
							Standard			max. mm														
BA 12	BC 12	R	150	1750	15			15	71	50	71	8	53	4,5	68	9	91	11,5	42	45	M6	2		
BA 15	BC 15	R	230	1650	20			20	81	60	81	8	62	4,5	70	9	93	13,5	50	50	M6	3		
BA 18	BC 18	R	340	1550	25			25	96	70	96	8	73	4,5	70	9	96	15,5	60	60	M10	4		
BA 20	BC 20	R	420	1450	30			30	110	90	106	8	80	2,5	77	11	104	19,5	65	70	M10	5		
BA 25	BC 25	R	800	1250	35	40		40	126	100	126	8	90	2,5	93	11	125	19,5	75	80	M12	8		
BA 28	BC 28	R	1200	1100	35	40	45	45	140	110	136	10	105	3,5	95	14	129	24,5	85	90	M12	9		
BA 30	BC 30	R	1600	1000	45	50		50	155	120	151	10	120	3,5	102	16	140	27,5	95	100	M16	12		
BA 35	BC 35	R	1800	900	50	55		55	170	130	161	10	140	3,5	110	19	151	33,5	112	110	M16	15		
BA 40	BC 40	R	3500	800	45	55	60	60	190	150	181	12	160	5,5	116	22	160	37,5	130	120	M16	20		
BA 45	BC 45	R	7100	750	55	65	70	70	210	160	196	14	175	7,0	130	26	176	41,5	140	130	M16	25		
BA 50	BC 50	R	7500	700	70	75		75	220	180	206	14	185	7,0	132	26	178	41,5	150	140	M16	30		
BA 52	BC 52	R	9300	650	65	75	80	80	230	190	216	14	200	4,5	150	26	208	41,5	160	150	M20	35		
BA 55	BC 55	R	12500	550	75	85	90	90	255	200	246	15	210	3,5	170	29	228	49,5	170	160	M20	50		
BA 60	BC 60	R	14500	500	85	95	100	105	295	220	291	20	250	8,5	206	35	273	60,0	200	190	M24	91		
BA 70	BC 70	R	22500	425	120			120	335	260	321	25	280	14,0	215	39	291	65,0	225	210	M24	115		
BA 80	BC 80	R	25000	375	130			130	360	280	351	30	280	18,5	224	39	302	65,0	225	220	M24	150		
BA 90	BC 90	R	33500	350	140			140	385	300	371	35	310	22,5	236	55	314	70,0	250	240	M30	180		
BA 95	BC 95	R	35000	300	150			150	400	350	391	40	310	27,5	249	55	337	70,0	250	250	M30	225		
BA 100	BC 100	R	57500	250	150			150	420	380	411	45	345	31,5	276	60	372	80,0	280	270	M30	260		

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.  
Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

## Mounting

The backdriving torque is supported by the lever arm with holding pin. The holding pin engages in a slot or bore in the frame of the machine. It must have 0,5 to 2 mm play in the axial and radial directions.

If the holding pin is removed, the shaft can be turned in both directions.

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

The freewheels BC ... R are supplied oil-filled and ready for installation.

In the case of freewheels BA ... R, the inner ring must be secured axially with a retainer plate. Retainer plate with fastening screw and two seals can be supplied upon request. Prior to commissioning, the freewheel must be filled with oil of the specified quality.

## Example for ordering

Freewheel size BA 30, standard type and 50 mm bore:

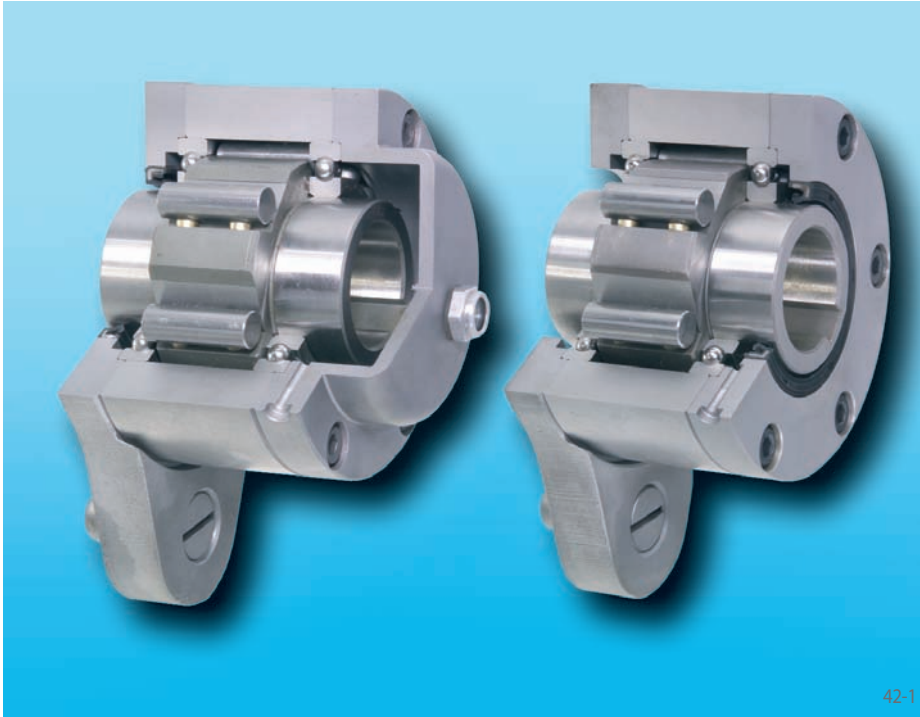
- BA 30 R, d = 50 mm

When ordering, please also specify the freewheeling direction of the inner ring when viewed in direction X:

- anticlockwise free or
- clockwise free

# Complete Freewheels FGR ... R A3A4 and FGR ... R A2A3

with lever arm  
with rollers



## Features

Complete Freewheel FGR ... R A2A3 and FGR ... R A3A4 with lever arm are sealed roller freewheels with ball bearings. They are oil lubricated.

The freewheels FGR ... R A3A4 have an end cover and are fitted to the shaft ends.

The freewheels FGR ... R A2A3 are arranged on through shafts or shaft ends.

The oil filling is carried out after the freewheel has been installed.

The freewheels FGR ... R A2A3 and FGR...R A3A4 are used as:

### ▶ Backstops

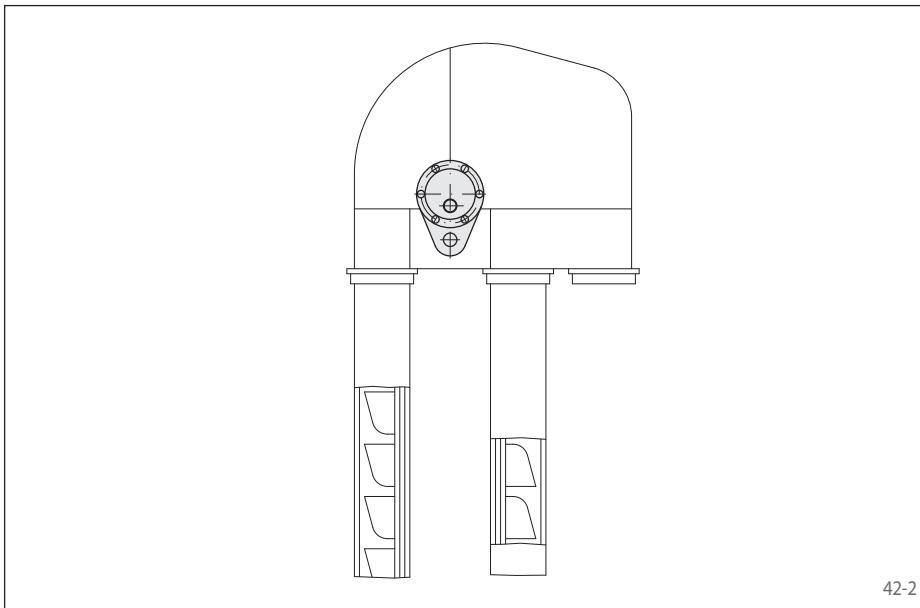
for applications with low to medium speed freewheeling operation.

Nominal torques up to 68 000 Nm.

Bores up to 150 mm.

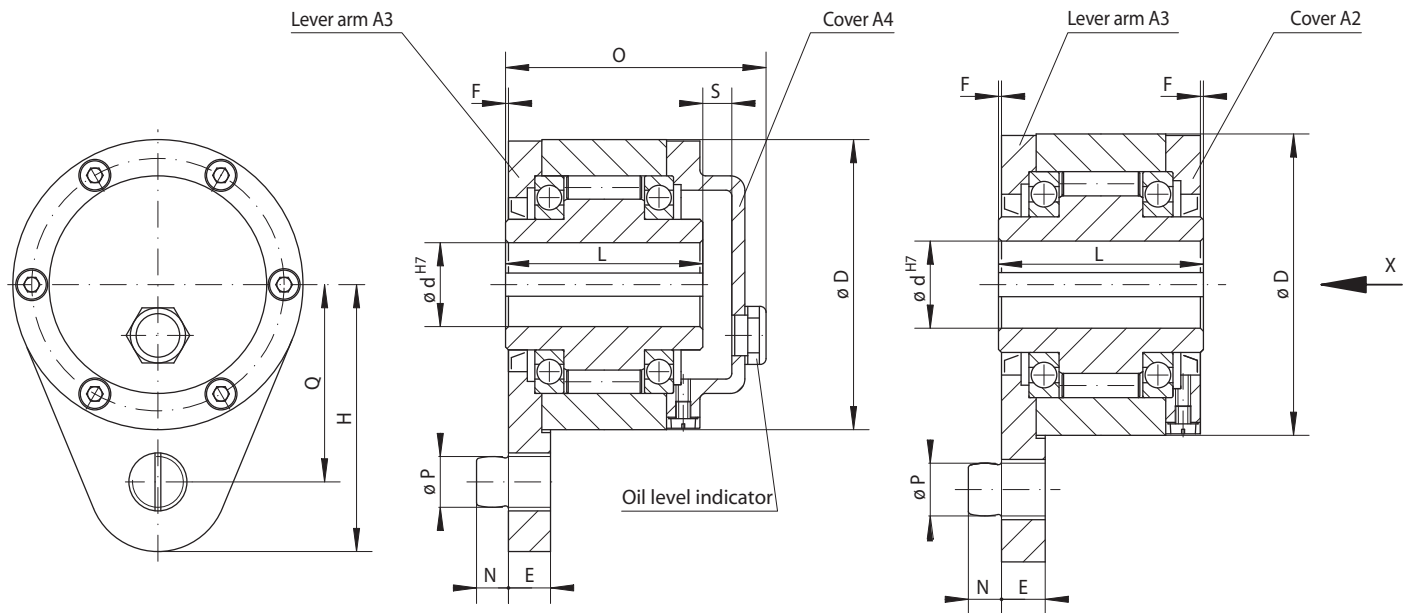
## Application example

Complete Freewheel FGR 45 R A3A4 as a back-stop on the opposite ends of the drive shaft of a bucket conveyor. In the case of a motor stop, the bucket conveyor must be held securely so that the conveyor goods do not pull the belt backwards and, in doing so, drive the motor quickly. The backdriving torque is supported by the lever arm with holding pin on the housing. If the holding pin is removed, the belt shaft can be turned in both directions.



# Complete Freewheels FGR ... R A3A4 and FGR ... R A2A3

with lever arm  
with rollers



43-1

Series FGR ... R A3A4

43-2

Series FGR ... R A2A3

43-3

Backstop	Standard type For universal use		Dimensions													

Freewheel Size	Type	Lever arm and cover combination	Nominal Torque Nm	Max. speed Inner ring freewheels min <sup>-1</sup>	Bore d mm	D mm	E mm	F mm	H mm	L mm	N mm	O mm	P mm	Q mm	S mm	Weight kg
FGR 12	R	A2A3 A3A4	55	2 500	12	62	13	1	51	42	10	64	10	44	12	1,4
FGR 15	R	A2A3 A3A4	130	2 200	15	68	13	1	62	52	10	78	10	47	12	1,8
FGR 20	R	A2A3 A3A4	180	1 900	20	75	15	1	72	57	11	82	12	54	12	2,3
FGR 25	R	A2A3 A3A4	290	1 550	25	90	17	1	84	60	14	85	16	62	12	3,4
FGR 30	R	A2A3 A3A4	500	1 400	30	100	17	1	92	68	14	95	16	68	12	4,5
FGR 35	R	A2A3 A3A4	730	1 300	35	110	22	1	102	74	18	102	20	76	12	5,6
FGR 40	R	A2A3 A3A4	1 000	1 150	40	125	22	1	112	86	18	115	20	85	13	8,5
FGR 45	R	A2A3 A3A4	1 150	1 100	45	130	26	1	120	86	22	115	25	90	14	8,9
FGR 50	R	A2A3 A3A4	2 100	950	50	150	26	1	135	94	22	123	25	102	15	12,8
FGR 55	R	A2A3 A3A4	2 600	900	55	160	30	1	142	104	25	138	32	108	18	16,2
FGR 60	R	A2A3 A3A4	3 500	800	60	170	30	1	145	114	25	147	32	112	18	19,3
FGR 70	R	A2A3 A3A4	6 000	700	70	190	35	1	175	143	30	168	38	135	17	23,5
FGR 80	R	A2A3 A3A4	6 800	600	80	210	35	1	185	144	30	178	38	145	17	32,0
FGR 90	R	A2A3 A3A4	11 000	500	90	230	45	1	205	158	40	192	50	155	17	47,2
FGR 100	R	A2A3 A3A4	20 000	350	100	270	45	1	230	182	40	217	50	180	17	76,0
FGR 130	R	A2A3 A3A4	31 000	250	130	310	60	1	268	212	55	250	68	205	18	110,0
FGR 150	R	A2A3 A3A4	68 000	200	150	400	60	1	325	246	55	286	68	255	20	214,0

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.  
Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

## Mounting

Basic Freewheel, lever arm, cover, seals and screws are supplied loose. These must be assembled by the customer with regard to the required freewheeling direction into the Complete Freewheel. Prior to commissioning, the freewheel must be filled with oil of the specified quality. Upon request, assembled Complete Freewheels FGR ... R A2A3 already oil-filled can be supplied.

The backdriving torque is supported by the lever arm with holding pin. The holding pin engages in a slot or bore in the frame of the machine. It must have 0,5 to 2 mm play in the axial and radial directions.

If the holding pin is removed, the shaft can be turned in both directions.

In the case of freewheels FGR... R A3A4, the inner ring must be secured axially with a retainer plate. The tolerance of the shaft must be ISO h6 or j6.

## Example for ordering

Freewheel size FGR 25, standard type with lever arm A3 and cover A4:

- FGR 25 R A3A4

Basic Freewheel, lever arm, cover, seals and screws are supplied loose provided nothing else is stated in the order.

If assembled, oil-filled, Complete Freewheels FGR ... R A2A3 are to be supplied, this must be specified in the order. When ordering, please also specify the freewheeling direction of the inner ring when viewed in direction X:

- anticlockwise free or
- clockwise free

# Complete Freewheels FA

with lever arm

with sprags and grease lubrication



44-1

## Features

Complete Freewheels FA with lever arm are sprag freewheels with sleeve bearings. They are grease-lubricated and therefore maintenance-free.

The freewheels FA are used as:

- ▶ Backstops
- ▶ Indexing Freewheels

for applications with low speed freewheeling operation when used as a backstop or with a low to medium total number of actuations when used as an indexing freewheel.

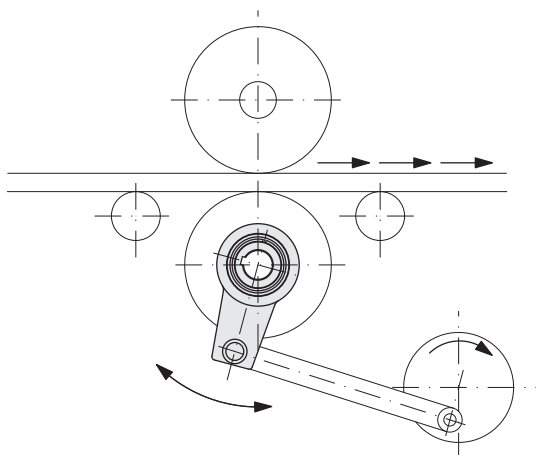
In addition the standard type, two other types are available for extended service life and indexing accuracy.

Nominal torques up to 2 500 Nm.

Bores up to 85 mm.

## Application example

Complete Freewheel FA 82 SFP as an indexing freewheel for the material feed of a punch. The freewheel is driven by a bell crank. The type with P-grinding does not just give the freewheel an increased service life, but also an increased indexing accuracy.



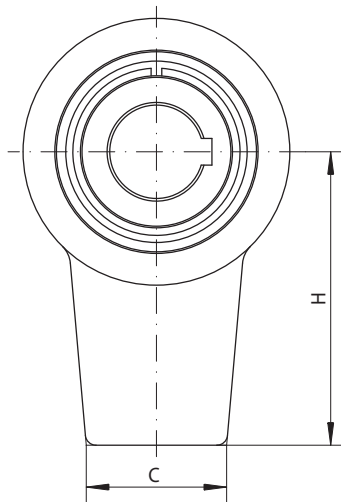
44-2



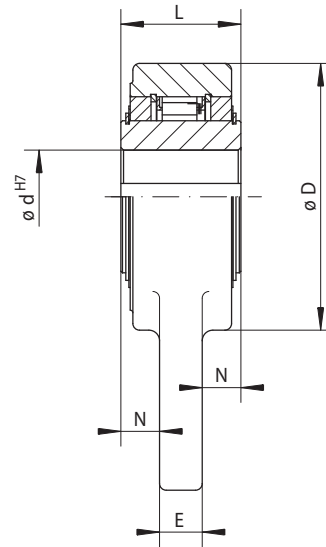
# Complete Freewheels FA

with lever arm

with sprags and grease lubrication



45-1



45-2

Indexing Freewheel	Backstop	Standard type For universal use	Type with RIDUVIT® For extended service life with coated sprags	Type with P-grinding For extended service life with indexing accuracy	Dimensions												

Freewheel Size	Type	Nominal Torque Nm	Max. speed Inner ring freewheels min <sup>-1</sup>	Type	Nominal Torque Nm	Max. speed Inner ring freewheels min <sup>-1</sup>	Type	Nominal Torque Nm	Bore d				C mm	D mm	E mm	H mm	L mm	N mm	Weight kg
									Standard mm			max. mm							
FA 37	SF	230	250	SFT	230	500	SFP	120	20	22	25	25*	35	76	12	90	35	11,5	1,0
FA 57	SF	630	170	SFT	630	340	SFP	320	30	35	40	42*	50	100	16	125	45	14,5	2,5
FA 82	SF	1600	130	SFT	1600	260	SFP	900	50	55		65*	60	140	18	160	60	21,0	5,5
FA 107	SF	2500	90	SFT	2500	180	SFP	1350	70	80		85*	80	170	20	180	65	22,5	8,5

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

\* Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.

## Mounting

When used as a backstop, the backdriving torque is supported by the lever arm. The lever arm must not be clamped into position. It must have 0,5 to 2 mm play in the axial and radial directions.

When used as an indexing freewheel, the lever arm serves as the indexing lever.

The lever arm is not heat treated enabling the customer to provide their own holes.

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

## Example for ordering

Freewheel size FA 57, type with RIDUVIT® and 40 mm bore:

- FA 57 SFT, d = 40 mm

# Complete Freewheels FAV

with lever arm

with rollers and grease lubrication



46-1

## Features

Complete Freewheels FAV with lever arm are roller freewheels with sleeve bearings. They are grease-lubricated and therefore maintenance-free.

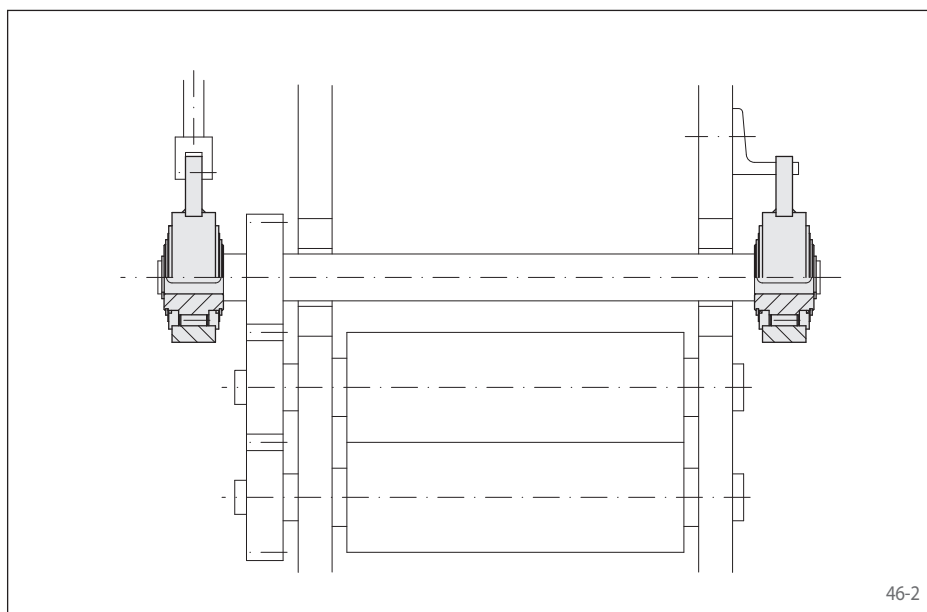
The freewheels FAV are used as:

- ▶ Backstops
- ▶ Indexing Freewheels

for applications with low speed freewheeling operation when used as a backstop or with a low to medium total number of actuations when used as an indexing freewheel.

Nominal torques up to 2 500 Nm.

Bores up to 80 mm.



46-2

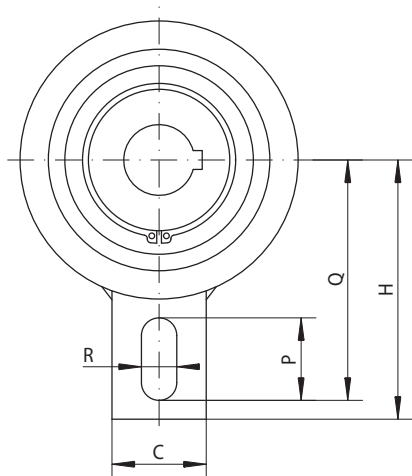
## Application example

Two Complete Freewheels FAV 50 in the roller feed of a sheet metal processing machine. The indexing freewheel arranged on the left is driven via a bell crank with an adjustable lift. This enables an infinite setting of the feed. The backstop arranged on the right prevents the indexing rollers from running backwards while the indexing freewheel carries out its back stroke. Often, an additional small brake is provided in order to prevent the accelerated sheet metal strip from advancing.

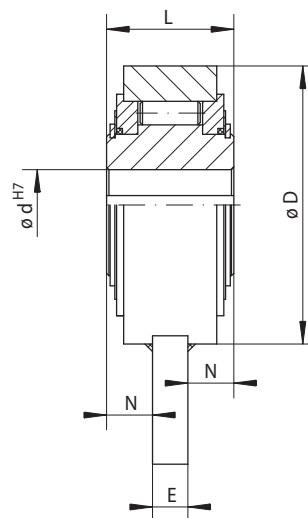
# Complete Freewheels FAV

with lever arm

with rollers and grease lubrication



47-1



47-2

Indexing Freewheel	Backstop	Standard type For universal use	Dimensions										

Freewheel Size	Nominal Torque Nm	Max. speed Inner ring freewheels min <sup>-1</sup>	Bore d mm	C mm	D mm	E mm	H mm	L mm	N mm	P mm	Q mm	R mm	Weight kg
FAV 20	220	500	20	40	83	12	90	35	11,5	35	85	15	1,3
FAV 25	220	500	25	40	83	12	90	35	11,5	35	85	15	1,3
FAV 30	1 025	350	30	40	118	15	110	54	19,5	35	102	15	3,5
FAV 35	1 025	350	35	40	118	15	110	54	19,5	35	102	15	3,4
FAV 40	1 025	350	40	40	118	15	110	54	19,5	35	102	15	3,3
FAV 45	1 600	250	45	80	155	20	140	54	17,0	35	130	18	5,5
FAV 50	1 600	250	50	80	155	20	140	54	17,0	35	130	18	5,4
FAV 55	1 600	250	55	80	155	20	140	54	17,0	35	130	18	5,3
FAV 60	1 600	250	60	80	155	20	140	54	17,0	35	130	18	5,2
FAV 70	1 600	250	70	80	155	20	140	54	17,0	35	130	18	5,0
FAV 80	2 500	220	80	80	190	20	155	64	22,0	40	145	20	9,0

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.  
Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

## Mounting

When used as a backstop, the backdriving torque is supported by the lever arm. The lever arm must not be clamped into position. It must have 0,5 to 2 mm play in the axial and radial directions.

When used as an indexing freewheel, the lever arm serves as the indexing lever.

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

## Example for ordering

Freewheel size FAV 60, standard type:

- FAV 60

# Complete Freewheels FBL

with shaft coupling for large shaft misalignments  
with sprags, available in three types



48-1

## Features

Complete Freewheels FBL with RINGSPANN shaft coupling are sealed sprag freewheels with ball bearings for coupling two shafts. They are supplied oil-filled and ready for installation

The freewheels FBL are used as:

### ◆ Overrunning Clutches

In addition to the standard type, two other types are available for extended service life.

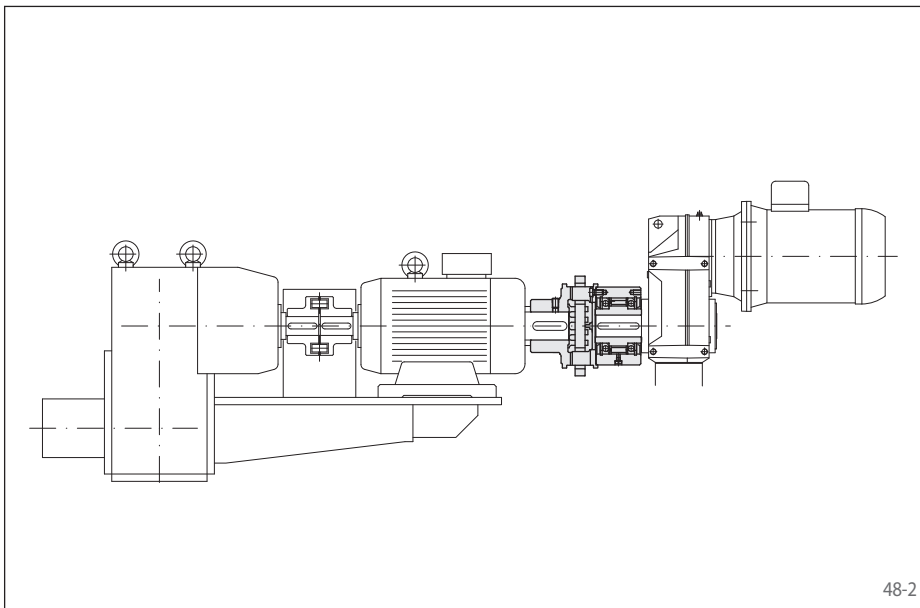
Nominal torques up to 8 000 Nm.

Bores up to 140 mm. Many standard bores are available.

The torsionally stiff shaft coupling can accept large radial and angular misalignments, without reactive forces affecting neighbouring bearings. We can provide you with performance data upon request.

## Application example

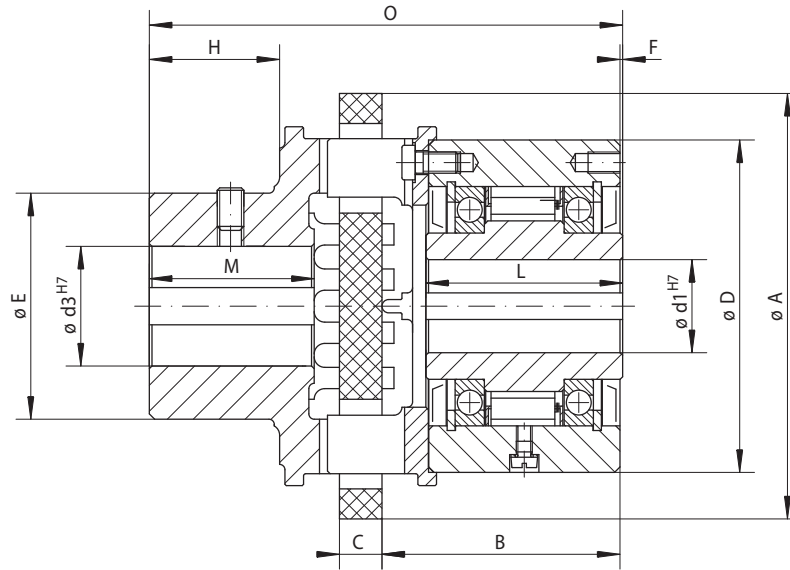
Complete Freewheel FBL 82 SFZ as an overrunning clutch in the drive unit of a conveyor belt system with additional creep drive. The freewheel with shaft coupling is arranged in between the main motor and the creep drive. When the creep drive operates, the freewheel is in driving operation and drives the belt at low speed. In normal operation (freewheeling operation), the main motor drives and the outer ring overruns, whereupon the creep drive is automatically disengaged. With the high speed here, the type sprag lift-off Z is used; the sprags work in freewheeling operation without contact and hence are wear-free.



48-2

# Complete Freewheels FBL

with shaft coupling for large shaft misalignments  
with sprags, available in three types



49-1

Overrunning Clutch	Standard type For universal use				Type with RIDUVIT® For extended service life with coated sprags				Type with Sprag lift-off Z For extended service life using sprag lift-off at high speed rotating outer ring				
Freewheel Size	Type	Nominal Torque Nm	Max. speed		Type	Nominal Torque Nm	Max. speed		Type	Nominal Torque Nm	Sprag lift-off at outer ring speed min <sup>-1</sup>	Max. speed	
			Inner ring overruns min <sup>-1</sup>	Outer ring overruns min <sup>-1</sup>				Inner ring overruns min <sup>-1</sup>				Outer ring overruns min <sup>-1</sup>	
FBL 37	SF	85	2500	2600	SFT	85	2500	2600	CZ	85	850	3000	340
FBL 44	SF	190	1900	2200	SFT	190	1900	2200	CZ	180	800	2600	320
FBL 57	SF	500	1400	1750	SFT	500	1400	1750	LZ	430	1400	2100	560
FBL 72	SF	500	1120	1600	SFT	500	1120	1600	LZ	500	1220	1800	488
FBL 82	SF	1000	1025	1450	SFT	1000	1025	1450	SFZ	1000	1450	1600	580
FBL 107	SF	2000	880	1250	SFT	2000	880	1250	SFZ	2000	1300	1350	520
FBL 127	SF	4000	800	1150	SFT	4000	800	1150	SFZ	4000	1200	1200	480
FBL 140	SF	8000	750	1050	SFT	8000	750	1050	SFZ	8000	950	1050	380

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Freewheel Size	Bore d1						Bore d3		A	B	C	D	E	F	H	L	M	O	Weight kg
	mm	mm	mm	mm	mm	max. mm	min. mm	max. mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	
FBL 37	14	16	18	20	22*	22*	16	35	110	62,0	12	75	53	0,5	33	48	42	124	3,0
FBL 44	20	22	25*			25*	20	42	135	65,0	14	90	66	0,5	41	50	53	140	4,6
FBL 57	25	28	30	32*		32*	30	50	160	82,5	16	100	85	0,5	51	65	62	170	6,9
FBL 72	35	38	40	42*		42*	30	50	160	89,5	16	125	85	1,0	51	74	62	178	10,0
FBL 82	35	40	45	50*		50*	40	70	200	92,0	20	135	104	2,0	65	75	79	204	14,2
FBL 107	50	55	60	65*		65*	50	90	250	111,5	25	170	150	2,5	81	90	100	250	28,0
FBL 127	50	60	70	75*		75*	60	110	315	138,0	32	200	175	3,0	101	112	124	313	48,8
FBL 140	65	75	80	90		95*	75	140	400	183,5	40	250	216	5,0	130	150	160	410	102,2

For bore d1: Keyway according to DIN 6885, page 1 • Keyway width tolerance JS10. \* Keyway according to DIN 6885, page 3 • Keyway width tolerance JS10.

For bore d3: Keyway according to DIN 6885, page 1 • Keyway width tolerance P9

## Mounting

The flexible disk of the shaft coupling must be axially free when fitted so that the ball bearings in the freewheel are not distorted due to heat expansion.

The shaft coupling including the fastening screws are supplied loose. Depending on the desired freewheeling direction, the shaft coupling can be fitted on the right or the left of the freewheel.

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

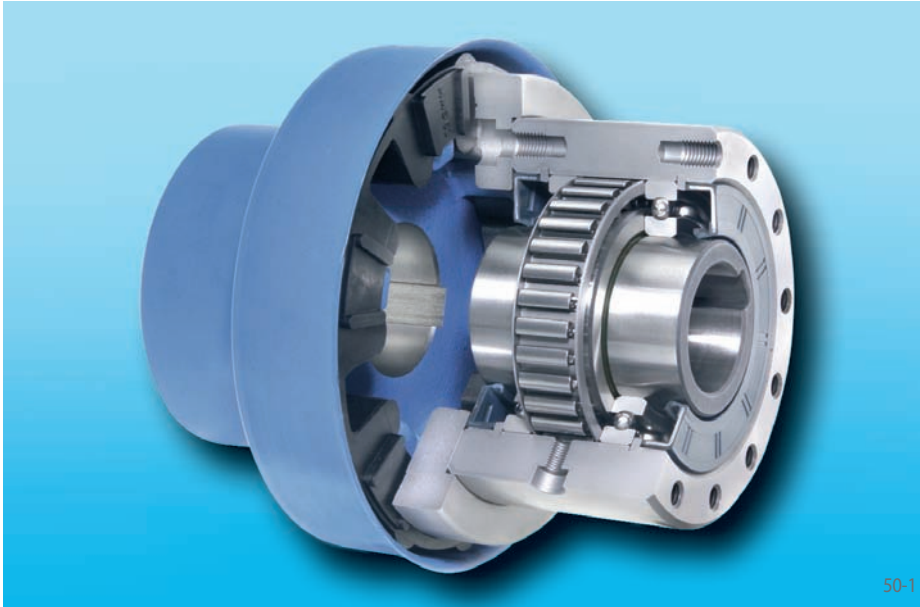
## Example for ordering

Freewheel size FBL 72, type with sprag lift-off Z and 38 mm bore in the freewheel and 40 mm bore in the shaft coupling:

- FBL 72 LZ, d1 = 38 mm, d3 = 40 mm

# Complete Freewheels FBE

with shaft coupling for small shaft misalignments  
with sprags, available in three types



50-1

## Features

Complete Freewheels FBE with flexible shaft coupling are sealed sprag freewheels with ball bearings for coupling two aligned shafts. They are supplied oil-filled and ready for installation. The freewheels FBE are used as:

### Overrunning Clutches

In addition to the standard type, two other types are available for extended service life.

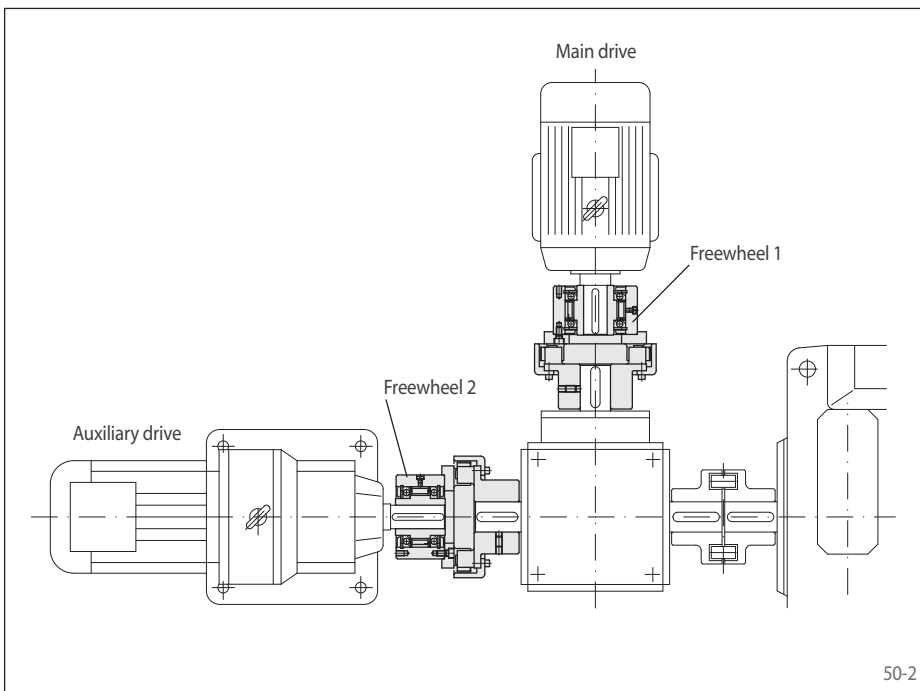
Nominal torques up to 160 000 Nm.

Bores up to 300 mm. Many standard bores are available.

The material of the flexible coupling element is oil-resistant. We can provide you with performance data for the flexible shaft coupling upon request.

## Application example

Two Complete Freewheels FBE 72 with shaft coupling as an overrunning clutch in the drive unit of a tube mill with additional auxiliary drive. A freewheel FBE 72 SF, standard type (freewheel 1) is arranged between the main drive and the angular gear. However, a freewheel FBE 72 LZ, type with sprag lift-off Z (freewheel 2) is arranged between the auxiliary drive and the angular gear. If the gear motor is driving in the auxiliary power mode, freewheel 2 works in driving operation and freewheel 1 overruns at a low speed (freewheeling operation). When driving via the main motor, the unit is driven via freewheel 1 (driving operation). Freewheel 2 overruns and automatically disengages the auxiliary drive (freewheeling operation). With the high speed, the type with sprag lift-off Z is used; the sprags work in freewheeling operation without contact and hence are wear-free.



50-2

## Mounting

The shaft coupling including the fastening screws are supplied loose. Depending on the desired freewheeling direction, the shaft coupling can be fitted on the right or the left of the freewheel.

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

## Example for ordering

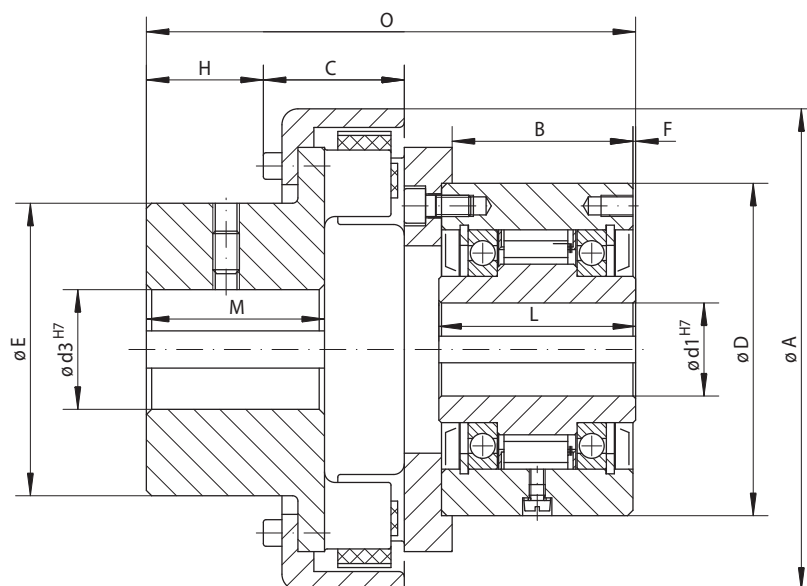
Freewheel size FBE 107, standard type with 60 mm bore in the freewheel and 55 mm bore in the shaft coupling:

- FBE 107 SF, d1 = 60 mm, d3 = 55 mm



# Complete Freewheels FBE

with shaft coupling for small shaft misalignments  
with sprags, available in three types



51-1

Overrunning Clutch	Standard type For universal use				Type with RIDUVIT® For extended service life with coated sprags				Type with Sprag lift-off Z For extended service life using sprag lift-off at high speed rotating outer ring				
Freewheel Size	Type	Nominal Torque Nm	Max.speed Inner ring overruns min <sup>-1</sup>	Outer ring overruns min <sup>-1</sup>	Type	Nominal Torque Nm	Max.speed Inner ring overruns min <sup>-1</sup>	Outer ring overruns min <sup>-1</sup>	Type	Nominal Torque Nm	Sprag lift-off at outer ring speed min <sup>-1</sup>	Max.speed Outer ring overruns min <sup>-1</sup>	Inner ring drives min <sup>-1</sup>
FBE 24	CF	45	4800	5 000	CFT	45	4800	5 000					
FBE 29	CF	80	3 500	4 000	CFT	80	3 500	4 000					
FBE 37	SF	200	2 500	2 600	SFT	200	2 500	2 600	CZ	110	850	3 000	340
FBE 44	SF	320	1 900	2 200	SFT	320	1 900	2 200	CZ	180	800	2 600	320
FBE 57	SF	630	1 400	1 750	SFT	630	1 400	1 750	LZ	430	1 400	2 100	560
FBE 72	SF	1 250	1 120	1 600	SFT	1 250	1 120	1 600	LZ	760	1 220	1 800	488
FBE 82	SF	1 800	1 025	1 450	SFT	1 800	1 025	1 450	SFZ	1 700	1 450	1 600	580
FBE 107	SF	2 500	880	1 250	SFT	2 500	880	1 250	SFZ	2 500	1 300	1 350	520
FBE 127	SF	5 000	800	1 150	SFT	5 000	800	1 150	SFZ	5 000	1 200	1 200	480
FBE 140	SF	10 000	750	1 100	SFT	10 000	750	1 100	SFZ	10 000	950	1 150	380
FBE 200	SF	20 000	630	900	SFT	20 000	630	900	SFZ	20 000	680	900	272
FBE 270	SF	40 000	510	750	SFT	40 000	510	750	SFZ	37 500	600	750	240
FBE 340	SF	80 000	460	630	SFT	80 000	460	630					
FBE 440	SF	160 000	400	550	SFT	160 000	400	550					

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Freewheel Size	Bore d1 Standard						Bore d3		A	B	C	D	E	F	H	L	M	O	Weight
	mm	mm	mm	mm	mm	max. mm	min. mm	max. mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
FBE 24	12	14*				14*	10	35	77	45	30	62	55	1,0	28	50	40	114,0	1,7
FBE 27	15	17*				17*	10	40	90	47	33	68	65	1,0	32	52	45	123,0	2,4
FBE 37	14	16	18	20	22*	22*	10	45	114	44	37	75	72	0,5	28	48	48	122,5	3,1
FBE 44	20	22	25*			25*	10	50	127	45	36	90	78	0,5	31	50	52	129,5	4,3
FBE 57	25	28	30	32*		32*	20	60	158	60	48	100	96	0,5	39	65	61	162,5	7,3
FBE 72	35	38	40	42*		42	20	70	181	68	53	125	110	1,0	44	74	67	184,0	11,6
FBE 82	35	40	45	50*		50*	25	75	202	67	64	135	120	2,0	46	75	75	200,0	15,4
FBE 107	50	55	60	65*		65*	30	80	230	81	75	170	130	2,5	48	90	82	230,0	24,9
FBE 127	50	60	70	75*		75*	45	100	294	102	97	200	160	3,0	56	112	97	288,0	47,3
FBE 140	65	75	80	90		95*	60	120	330	135	100	250	200	5,0	80	150	116	350,0	93,3
FBE 200	110	120				120	85	160	432	143	141	300	255	5,0	104	160	160	408,0	169,0
FBE 270	140					150		180	553	190	197	400	300	6,0	145	212	230	512,0	320,0
FBE 340	180					240		235	725	240	235	500	390	7,5	173	265	285	637,5	580,0
FBE 440	220					300		265	832	290	247	630	435	7,5	183	315	310	737,5	1206,0

For bore d1: Keyway according to DIN 6885, page 1 • Keyway width tolerance JS10. \* Keyway according to DIN 6885, page 3 • Keyway width tolerance JS10.

For bore d3: Keyway according to DIN 6885, page 1 • Keyway width tolerance P9

# Housing Freewheels FKhG

for stationary arrangement  
with hydrodynamic sprag lift-off for multimotor drives



## Features

Housing Freewheels FKhG with hydrodynamic sprag lift-off are typically used in cases where an assembly can be driven from two or more motors or turbines at the same or similar high speed.

The Housing Freewheels FKhG are completely enclosed freewheels for stationary arrangement with input and output shaft.

The freewheels FKhG are used as:

### ► Overrunning Clutch

if the speeds in freewheeling operation and in driving operation are the same or similarly high.

Nominal torques up to 14 000 Nm.

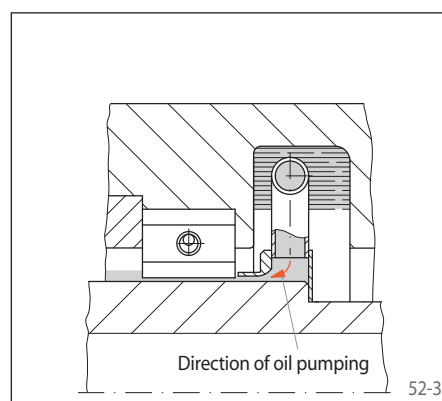
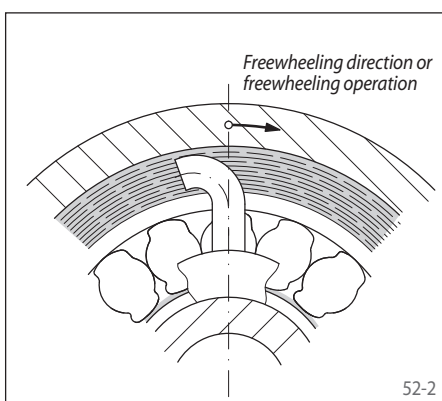
Shaft diameter up to 110 mm.

## Hydrodynamic sprag lift-off

Housing Freewheels FKhG are equipped with hydrodynamic sprag lift-off. The hydrodynamic sprag lift-off is the ideal solution for overrunning clutches at high speeds, not only in freewheeling operation, but also in the driving operation, as can occur, for example, in multimotor drives. In the case of the hydrodynamic sprag lift-off, the lifting force is generated by an oil flow. The relative speed between the inner and outer rings is decisive for the lifting-off function. Compared to the freewheels with sprag lift-off X or Z, here the driving speed can be just as high as the freewheeling speed.

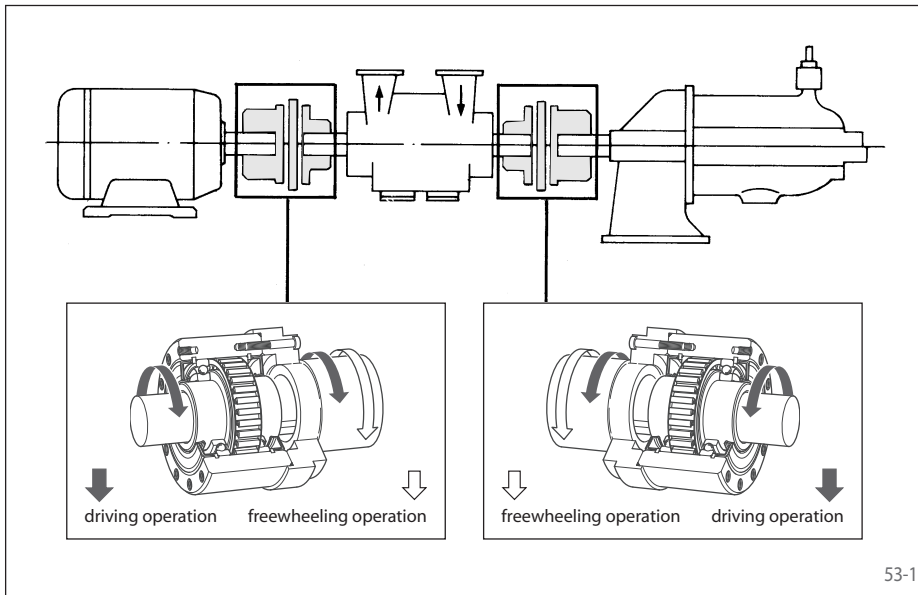
The freewheels with hydrodynamic sprag lift-off (series FKh and FKhG) include an oil pump that is based on the pitot tube principle. The pitot tubes are connected with the inner ring. When the outer ring is rotating, an oil ring forms in the oil chamber, into which the pitot tubes are immersed. As soon as the outer ring overruns the inner ring, the pitot tubes pump the oil under pressure into the ring chamber and the oil then seeps out through the ring gap at high speed axially into the intermediate areas of the sprags. Depending on the relative speed between the outer and inner ring, the oil flow does not flow

but at an angle. This creates a reaction force on the sprags. This reaction force overcomes the contact force of the sprag springs, and the sprags lift off from the inner ring. This process is supported by a hydrodynamic wedge formation. If the relative speed between the outer and inner rings reduces, the lifting force also reduces. Before achieving synchronous running, the sprags are brought safely to rest on the inner ring and are ready to lock. This guarantees immediate torque transfer once the synchronous speed has been reached. The hydrodynamic sprag lift-off enables a virtually wear-free freewheeling operation.



# Housing Freewheels FKhG

for stationary arrangement  
with hydrodynamic sprag lift-off for multimotor drives

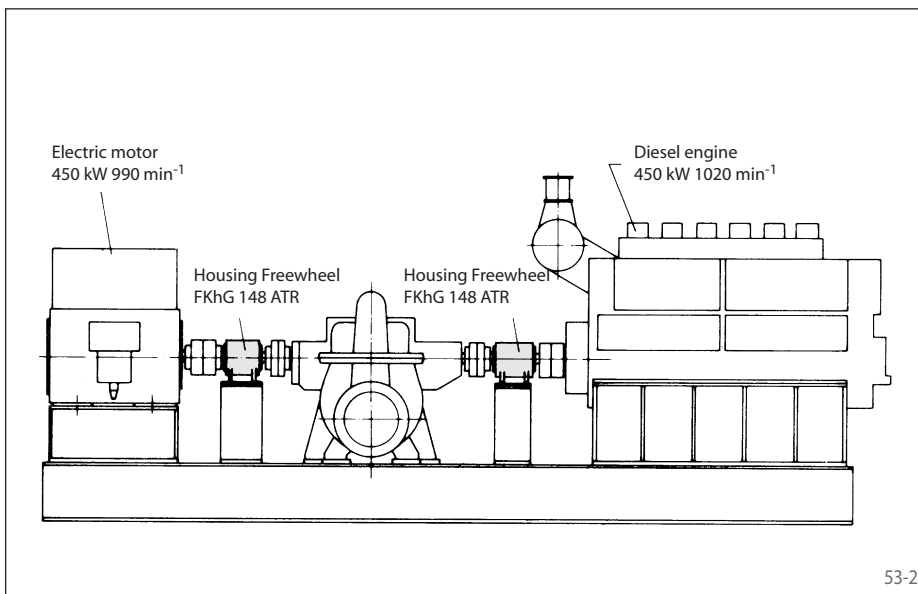


## Areas of application

Multimotor drives will be provided for two main reasons:

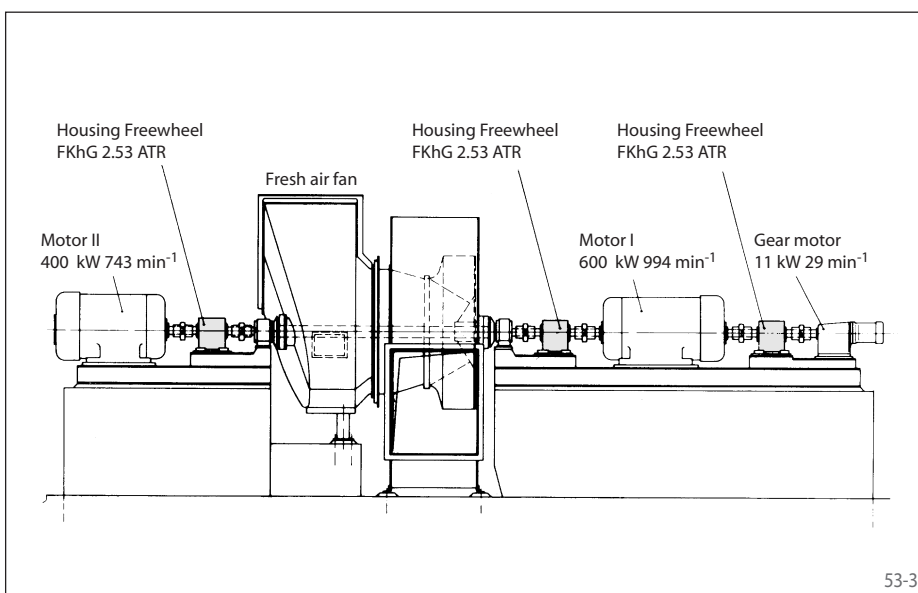
- Utmost security for a continuous plant operation in the event that one of the energy sources or a drive line fails.
- Energy saving in the case of partial load operation

Overrunning clutches as automatic clutches fulfil here an important function. They disengage the drive independently as soon as it no longer provides power to the working machine. The overrunning clutches do not require any external switching facilities.



## Application example

Two Housing Freewheels FKhG 148 ATR in the multimotor drive of a coolant pump in a nuclear power plant. Under normal circumstances the pump is driven by the electric motor. In the event of a fault, the diesel engine is put into operation by a safety device, and continues to drive the pump without interrupting the coolant circulation. The Housing Freewheels automatically engage the respective working drive to the pump.

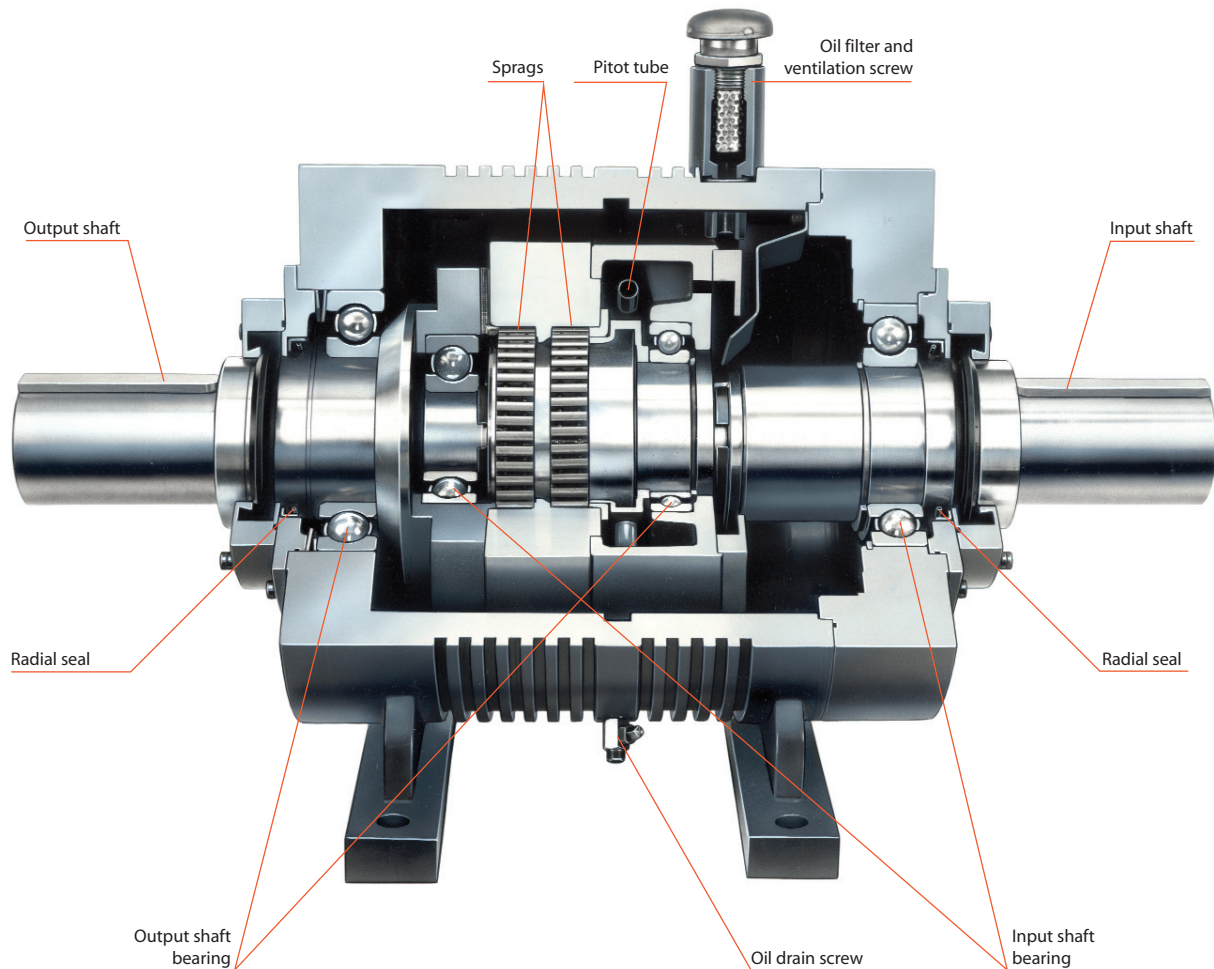


## Application example

Three Housing Freewheels FKhG 2.53 ATR in the multimotor drive of a fresh air fan. The fan is driven by one or two electric motors. An additional auxiliary drive serves to slowly turn the fan for the purposes of inspection work or for an even cooling down after shut down. The Housing Freewheels automatically engage the respective working electric motor to the fan.

# Housing Freewheels FKhG

for stationary arrangement  
with hydrodynamic sprag lift-off for multimotor drives



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## Advantages

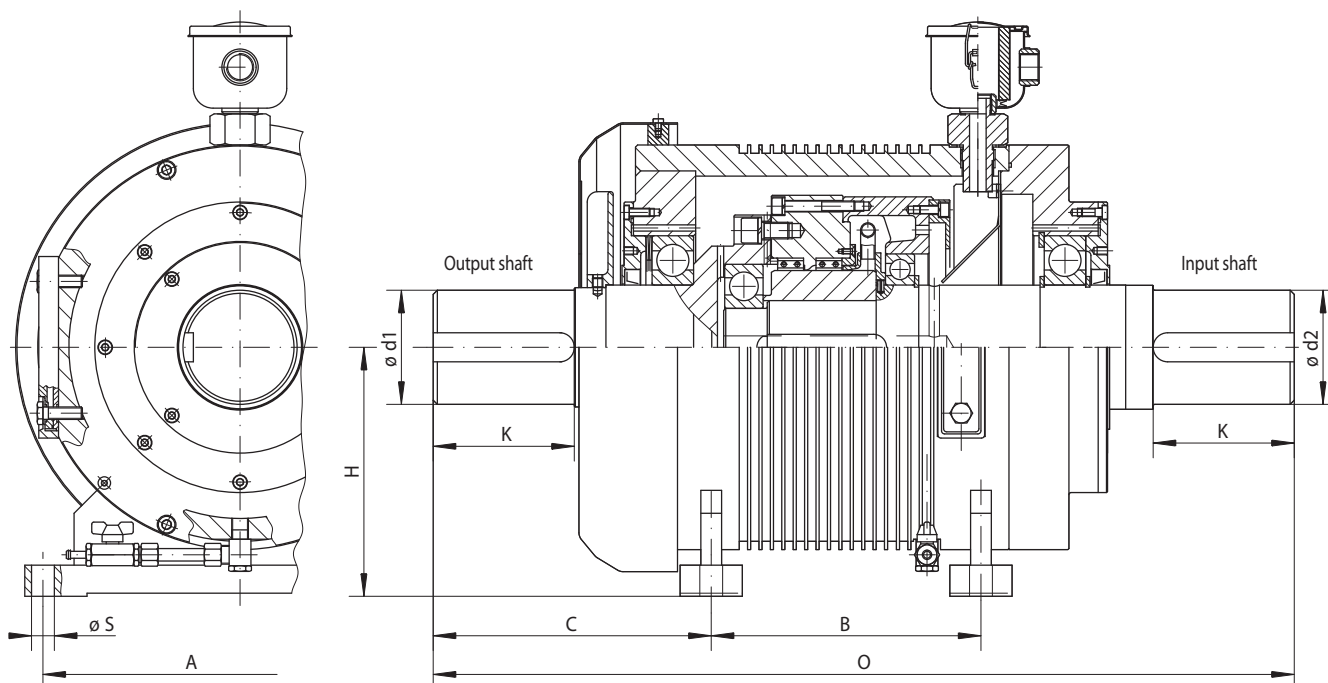
- For the automatic engagement and disengagement of multimotor drives
- Designed for continuous operation
- Extremely long service life due to wear-free freewheeling operation by means of hydrodynamic sprag lift-off
- Technically sophisticated design
- Oil pumping by means of the integrated pitot tube
- Long oil-change intervals due to large oil volume
- Oil level can be checked or changed without shut down
- Low bearing forces due to use of large bearings results in long bearing life
- The spring characteristic curve is available for vibrational calculations

## Selection of Housing Freewheel

We shall be pleased to advise you on the selection of a suitable Housing Freewheel. We can provide you with complete dimensions and technical data to aid in your design. If required, you will receive with the delivery quality certificates from our factory's own quality assurance department or from a recognised classification office.

# Housing Freewheels FKhG

for stationary arrangement  
with hydrodynamic sprag lift-off for multimotor drives



55-1

55-2

		Type with hydrodynamic sprag lift-off For extended service life using sprags lift-off at high speed rotating outer ring		Dimensions									
Freewheel Size	Type	Nominal torque Nm	Max. speed Output shaft overruns min <sup>-1</sup>	Input shaft drives min <sup>-1</sup>	Shaft d1 und d2 mm	A mm	B mm	C mm	H mm	K mm	O mm	S mm	Weight kg
FKhG 24	ATR	1 100	2 400	2 400	45	300	180	114	150	75	408	18	60
FKhG 28	ATR	2 250	2 400	2 400	60	300	180	133	150	98	446	18	75
FKhG 94	ATR	3 400	1 800	1 800	75	380	175	243	210	120	690	22	190
FKhG 106	ATR	4 200	1 800	1 800	90	380	175	268	210	140	740	22	220
FKhG 148	ATR	7 000	1 500	1 500	100	380	260	268	240	140	830	22	310
FKhG 2.53	ATR	14 000	1 500	1 500	110	380	260	268	240	140	830	22	320

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

The freewheel sizes FK hG 24 and FK hG 28 are not equipped with a cooling fan.

## Accessories

During freewheeling operation, the stationary input shaft of the Housing Freewheel is effected by a drag torque from the freewheeling output shaft. The amount of drag torque depends on the size of the unit and the freewheeling speed; it could reach up to 20 Nm. If during freewheeling operation the torsional resistance of the adjacent drive is lower than the drag torque of the Housing Freewheel, it can be fitted with a brake to prevent the drive from being carried along during freewheeling operation. Therefore we offer:

- Built-in electromagnetic brake with indicator showing the operating conditions
- External brake

## Mounting

The Housing Freewheel must be mounted in such a way that shaft d2 is the input shaft and shaft d1 the output shaft.

We recommend the use of torsionally stiff shaft couplings generating only low reactive forces. On indication of the reactive forces that occur we are well prepared to check the usable life of the bearings installed.

## Example for ordering

Prior to ordering, please complete the questionnaire on page 113 so that we can check the selection.



# Basic Freewheels FBO

for assembly with connecting parts  
with sprags, available in five types



## Features

Basic Freewheels FBO are sprag freewheels with ball bearings to be assembled with customer connecting parts. The freewheels are particularly suitable for installation in housings with oil lubrication and seals.

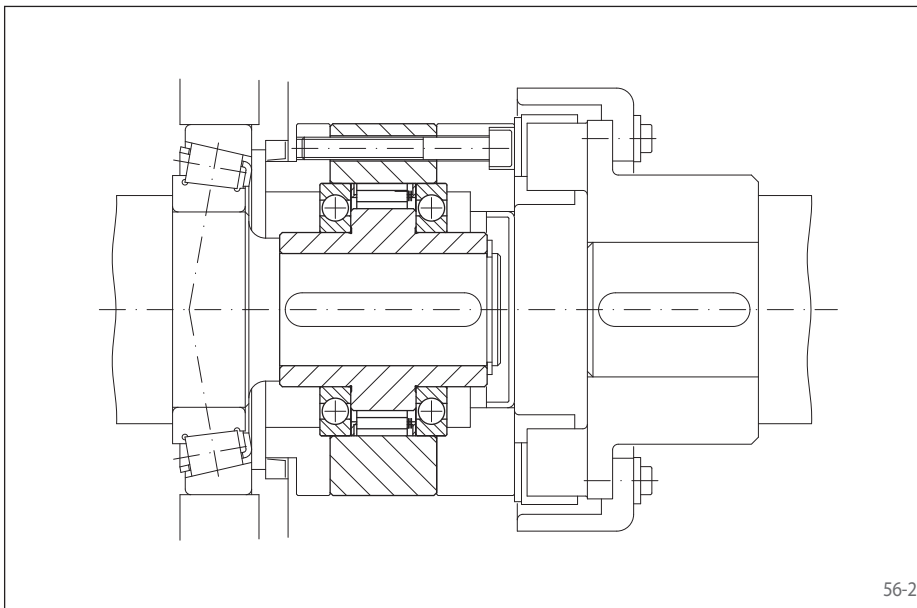
The freewheels FBO are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

In addition to the standard type, four other types are available for extended service life and indexing accuracy.

Nominal torques up to 160 000 Nm.

Bores up to 300 mm. Many standard bores are available.



## Application example

Basic Freewheel FBO 127 SF as an overrunning clutch between the creep drive and the main drive of a cement mixer. In the case of creep operation, 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 and the creep drive is automatically disengaged. The freewheel is connected to the oil lubrication of the main gearbox and does not require any special maintenance. The arrangement of the seals between the freewheel and the main gearbox is advantageous. In normal operation (freewheeling operation), this is at a standstill and hence generates no additional friction-related temperature rise.

## Mounting

The customer connecting parts are centered on the ball bearing external diameter F and assembled via the outer ring.

The tolerance of the shaft must be ISO h6 or j6 and the tolerance of the pilot diameter F of the connecting part must be ISO H7 or J7. The centering depth C must be observed.

## Lubrication

An oil lubrication of the specified quality must be provided.

## Example for ordering

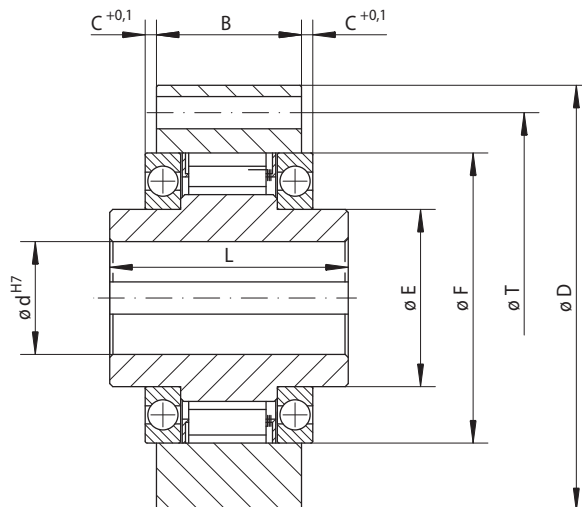
Freewheel size FBO 72, type with P-grinding and 38 mm bore:

- FBO 72 SFP, d = 38 mm



# Basic Freewheels FBO

for assembly with connecting parts  
with sprags, available in five types



57-1

Indexing Freewheel Overrunning Clutch Backstop	Standard type For universal use	Type with RIDUVIT® For extended service life with coated sprags	Type with sprag lift-off X For extended service life using sprag lift-off at high speed rotating inner ring	Type with sprag lift-off Z For extended service life using sprag lift-off at high speed rotating outer ring	Type with P-grinding For extended service life and indexing accuracy

Freewheel Size	Type	Nominal torque Nm	Max. speed		Type	Nominal torque Nm	Max. speed		Type	Nominal torque Nm	Sprag lift-off at inner ring speed min <sup>-1</sup>	Max. speed		Type	Nominal torque Nm	Sprag lift-off at outer ring speed min <sup>-1</sup>	Max. speed		Type	Nominal torque Nm
			Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>			Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>				Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>							
FBO 37	SF	200	2 500	2 600	SFT	200	2 500	2 600	DX	130	860	1 900	344	CZ	110	850	3 000	340	SFP	120
FBO 44	SF	320	1 900	2 200	SFT	320	1 900	2 200	DX	130	860	1 900	344	CZ	180	800	2 600	320	SFP	180
FBO 57	SF	630	1 400	1 750	SFT	630	1 400	1 750	DX	460	750	1 400	300	LZ	430	1 400	2 100	560	SFP	310
FBO 72	SF	1 250	1 120	1 600	SFT	1 250	1 120	1 600	DX	720	700	1 150	280	LZ	760	1 220	1 800	488	SFP	630
FBO 82	SF	1 800	1 025	1 450	SFT	1 800	1 025	1 450	DX	1 000	670	1 050	268	SFZ	1 700	1 450	1 600	580	SFP	750
FBO 107	SF	2 500	880	1 250	SFT	2 500	880	1 250	DX	1 500	610	900	244	SFZ	2 500	1 300	1 350	520	SFP	1 250
FBO 127	SF	5 000	800	1 150	SFT	5 000	800	1 150	SX	3 400	380	800	152	SFZ	5 000	1 200	1 200	480	SFP	3 100
FBO 140	SF	10 000	750	1 100	SFT	10 000	750	1 100	SX	7 500	320	750	128	SFZ	10 000	950	1 150	380	SFP	6 300
FBO 200	SF	20 000	630	900	SFT	20 000	630	900	SX	23 000	240	630	96	SFZ	20 000	680	900	272	SFP	12 500
FBO 270	SF	40 000	510	750	SFT	40 000	510	750	SX	40 000	210	510	84	SFZ	37 500	600	750	240	SFP	25 000
FBO 340	SF	80 000	460	630	SFT	80 000	460	630												
FBO 440	SF	160 000	400	550	SFT	160 000	400	550												

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

The specified maximum speeds apply for installation conditions as given with Complete Freewheels. Knowing the actual installation conditions higher speeds can be permitted under some circumstances.

Freewheel Size	Bore d						B	C1***	C2***	C3***	D	E	F	G**	L	T	Z**	Weight
	mm	mm	mm	mm	mm	max. mm												
FBO 37	14	16	18	20	22*	22*	25	3,7		4,3	85	30	55	M 6	48	70	6	0,9
FBO 44	20	22	25*			25*	25	3,7	4,7	4,4	95	35	62	M 6	50	80	8	1,3
FBO 57	25	28	30	32*		32*	30	4,2	7,7	7,4	110	45	75	M 8	65	95	8	1,9
FBO 72	35	38	40	42*		42*	38	3,7	4,9	4,4	132	55	90	M 8	74	115	12	3,5
FBO 82	35	40	45	50*		50*	40	6,6	6,6	6,6	145	65	100	M 10	75	125	12	4,0
FBO 107	50	55	60	65*		65*	45	8,1	8,1	8,1	170	80	125	M 10	90	150	12	7,7
FBO 127	50	60	70	75*		75*	68	6,9	7,9	6,9	200	95	145	M 12	112	180	12	13,3
FBO 140	65	75	80	90		95*	68	19,1	20,1	19,1	250	120	180	M 16	150	225	12	31,5
FBO 200	110	120				120	85	14,1	15,1	14,1	320	160	240	M 16	160	288	16	46,5
FBO 270	140					150	100	22,5	22,5	22,5	420	200	310	M 20	212	370	18	105,0
FBO 340	180					240	125	25,6			497	300	380	M 20	265	450	24	190,0
FBO 440	220					300	150	34,1			627	380	480	M 30	315	560	24	360,0

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 (DIN 912) on pitch circle T.

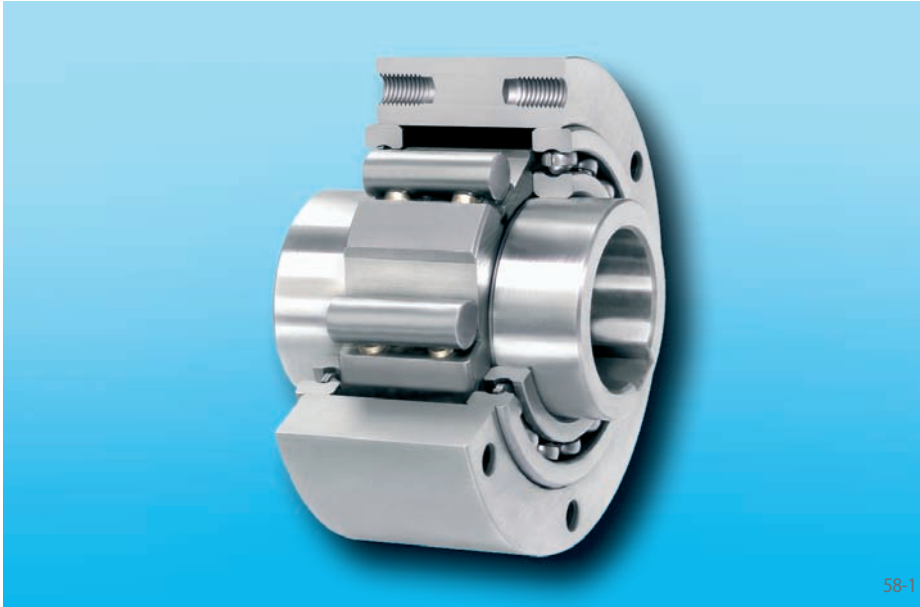
\*\*\* C1 = Centering depth of connecting parts for standard type, type with RIDUVIT® and type with P-grinding.

C2 = Centering depth of connecting parts for type with sprag lift-off X.

C3 = Centering depth of connecting parts for type with sprag lift-off Z.

# Basic Freewheels FGR ... R

for assembly with connecting parts  
with rollers



58-1

## Features

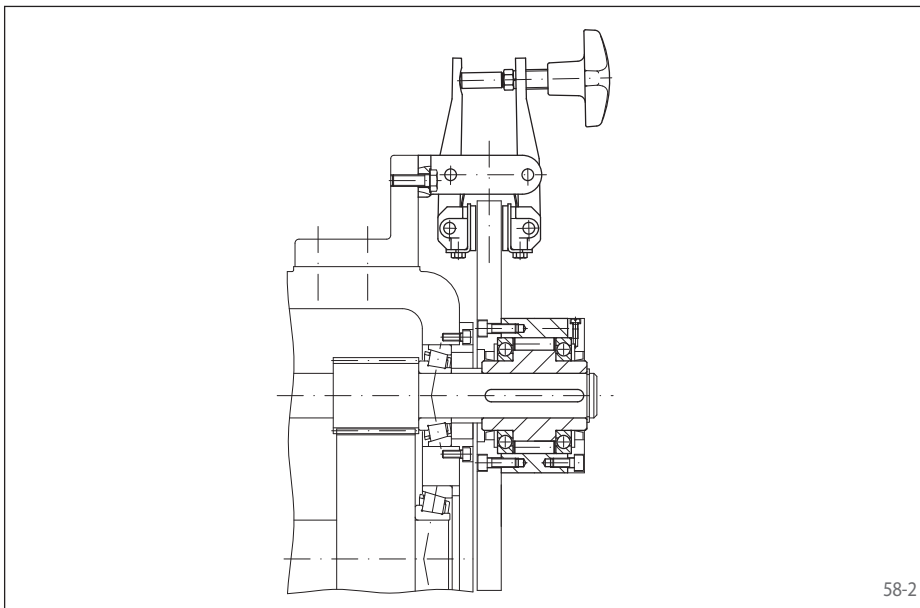
Basic Freewheels FGR ... R are roller freewheels with ball bearings to be assembled with customer connecting parts. The freewheels are particularly suitable for installation in housings with oil lubrication and seals.

Freewheels of series FGR ... R are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

Nominal torques up to 68 000 Nm.

Bores up to 150 mm.



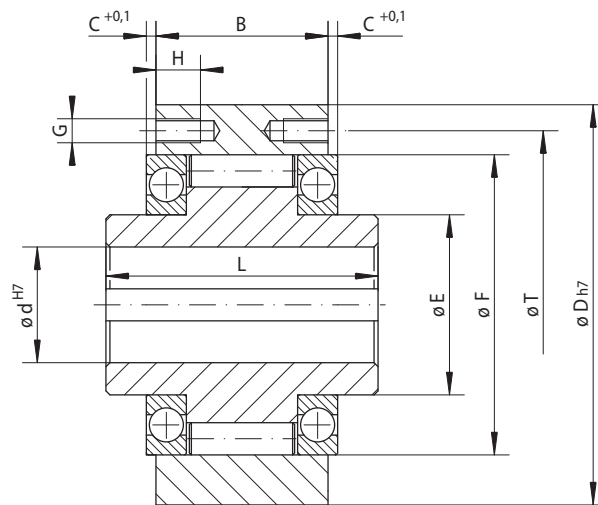
58-2

## Application example

Basic Freewheel FGR 25 R as a backstop on a reduction gear in the drive of an inclined conveyor of an assembly train. When the unit stops, the conveyor belt must be held securely so that it does not run backwards by the weight of the assembly parts. A brake disk is fitted to the outer ring of the freewheel alongside a manually operated RINGSPANN brake calliper. The back-driving torque is maintained by the freewheel and the closed brake. During set-up it must be possible to move the installation in both directions of rotation. To do this, the brake calliper is opened manually.

# Basic Freewheels FGR ... R

for assembly with connecting parts  
with rollers



59-1

	Standard type For universal use		Dimensions													

Freewheel Size	Type	Nominal torque Nm	Max. speed		Bore d mm	B mm	C mm	D mm	E mm	F mm	G**	H mm	L mm	T mm	Z**	Weight kg
			Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>												
FGR 12	R	55	2 500	5 400	12	20	3,5	62	20	42	M5	—	42	51	3	0,5
FGR 15	R	130	2 200	4 800	15	28	2,0	68	25	47	M5	8	52	56	3	0,8
FGR 20	R	180	1 900	4 100	20	34	2,4	75	30	55	M5	8	57	64	4	1,0
FGR 25	R	290	1 550	3 350	25	35	2,4	90	40	68	M6	10	60	78	4	1,5
FGR 30	R	500	1 400	3 050	30	43	2,4	100	45	75	M6	10	68	87	6	2,2
FGR 35	R	730	1 300	2 850	35	45	2,9	110	50	80	M6	12	74	96	6	3,0
FGR 40	R	1 000	1 150	2 500	40	53	2,9	125	55	90	M8	14	86	108	6	4,6
FGR 45	R	1 150	1 100	2 400	45	53	2,9	130	60	95	M8	14	86	112	8	4,7
FGR 50	R	2 100	950	2 050	50	64	3,9	150	70	110	M8	14	94	132	8	7,2
FGR 55	R	2 600	900	1 900	55	66	2,9	160	75	115	M10	16	104	138	8	8,6
FGR 60	R	3 500	800	1 800	60	78	5,4	170	80	125	M10	16	114	150	10	10,5
FGR 70	R	6 000	700	1 600	70	95	6,4	190	90	140	M10	16	134	165	10	13,4
FGR 80	R	6 800	600	1 400	80	100	3,9	210	105	160	M10	16	144	185	10	18,2
FGR 90	R	11 000	500	1 300	90	115	4,9	230	120	180	M12	20	158	206	10	28,0
FGR 100	R	20 000	350	1 000	100	120	5,4	270	140	210	M16	24	182	240	10	43,0
FGR 130	R	31 000	250	900	130	152	7,9	310	160	240	M16	24	212	278	12	66,0
FGR 150	R	68 000	200	700	150	180	6,9	400	200	310	M20	32	246	360	12	136,0

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

\*\* Z = Number of tapped holes G on pitch circle T.

## Mounting

The customer connecting parts are centered on the ball bearing external diameter F and assembled via the outer ring.

The tolerance of the shaft must be ISO h6 or j6 and the tolerance of the pilot diameter F of the connecting part must be ISO H7 or J7. The centering depth C must be observed.

## Lubrication

An oil lubrication of the specified quality must be provided. Two flat seals are supplied for sealing between the faces of the outer ring and the connecting parts.

## Example for ordering

Freewheel size FGR 35, standard type:

- FGR 35 R

# Integrated Freewheels FXM

for bolting to the face  
with sprag lift-off X



## Features

Integrated Freewheels FXM are sprag free-wheels 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.

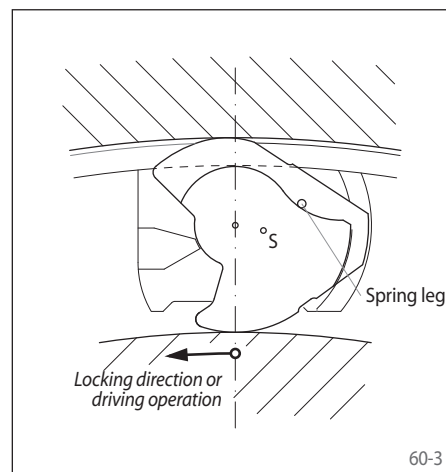
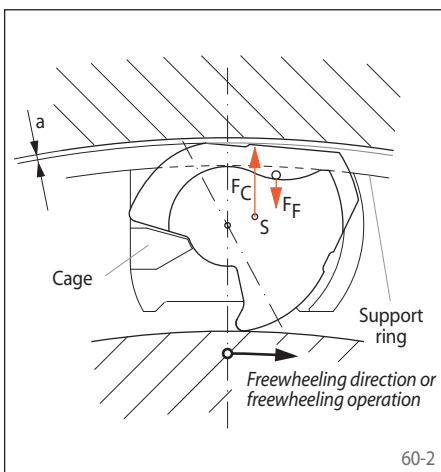
Bores up to 320 mm. Many standard bores are available.

## 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.

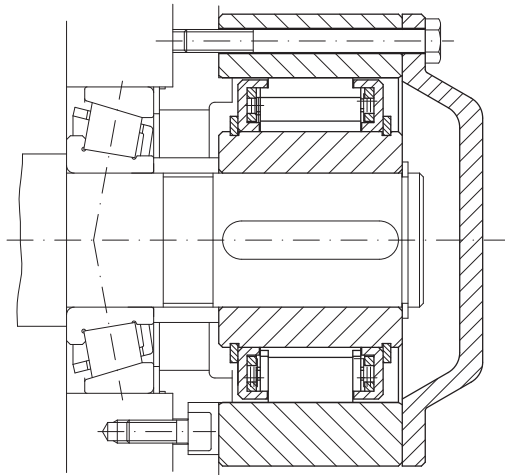
Figure 60-2 shows a freewheel with sprag lift-off X in freewheeling operation. The sprags, which are supported in a cage connected with the inner ring, rotate with the inner ring. The centrifugal force  $F_C$  that is applied in the center of gravity  $S$  of the sprag turns the sprag anti-clockwise 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 cen-

trifugal 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 60-3). If used as an overrunning clutch, the driving speed must not exceed 40% of the lift-off speed.



# Integrated Freewheels FXM

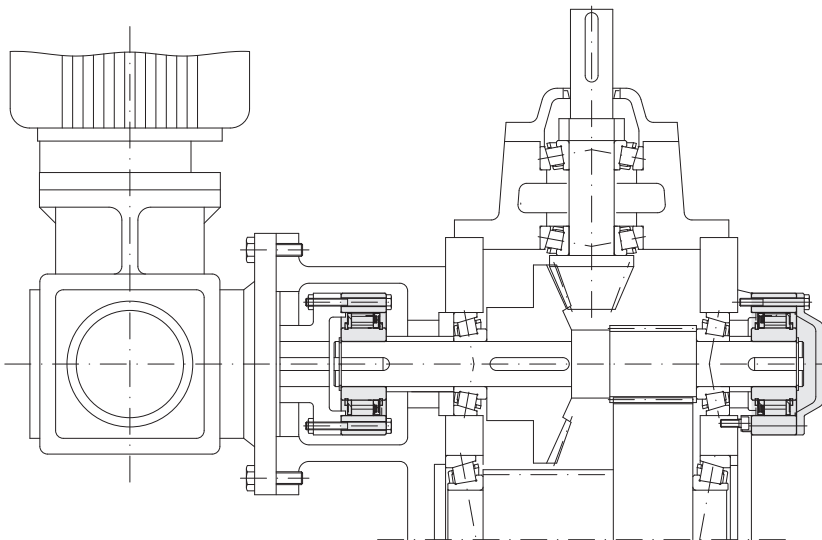
for bolting to the face  
with sprag lift-off X



61-1

## Application example

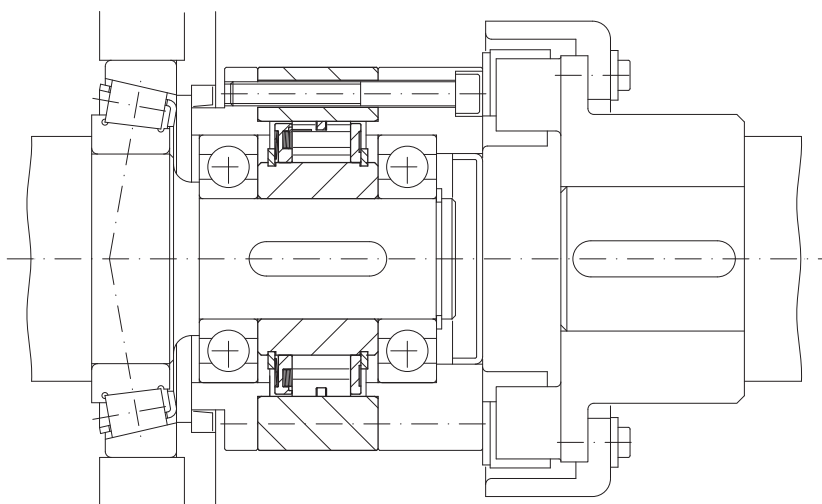
Integrated Freewheel FXM 170 - 63 SX with end cover as backstop fitted to the end of the first intermediate shaft of a spur gearbox in the drive of an inclined conveyor belt. In the case of a motor stop, the conveyor belt must be held securely so that the conveyor goods do not pull the belt backwards 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.



61-2

## Application example

Two Integrated Freewheels FXM 120 - 50 SX 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.



61-3

## Application example







Integrated Freewheel FXM 76-25 DX 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 FXM ... DX and FXM ... SX

for bolting to the face  
with sprag lift-off X



		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	Nominal torque at existing run out (T.I.R.)						Sprag lift-off at inner ring speed min <sup>-1</sup>	Max. speed	
		 0 A	 0,1 A	 0,2 A	 0,3 A	 0,4 A	 0,5 A	Inner ring freewheels/ overruns min <sup>-1</sup>		Outer ring drives min <sup>-1</sup>	
		Nm	Nm	Nm	Nm	Nm	Nm				
FXM 31 - 17	DX	100	100	95				890	5 000	356	
FXM 38 - 17	DX	150	140	130				860	5 000	344	
FXM 46 - 25	DX	390	380	350				820	5 000	328	
FXM 51 - 25	DX	480	470	420				750	5 000	300	
FXM 56 - 25	DX	580	570	490				730	5 000	292	
FXM 61 - 19	DX	420	410	370				750	5 000	300	
FXM 66 - 25	DX	800	780	700				700	5 000	280	
FXM 76 - 25	DX	1 050	1 040	890				670	5 000	268	
FXM 86 - 25	DX	1 350	1 300	1 030				630	5 000	252	
FXM 101 - 25	DX	1 700	1 600	1 400				610	5 000	244	
FXM 85 - 40	SX	1 900	1 900	1 800	1 800	1 700	1 600	430	6 000	172	
FXM 100 - 40	SX	2 700	2 600	2 500	2 400	2 200	2 000	400	4 500	160	
FXM 120 - 50	SX	6 500	6 300	5 800	4 800	4 400	3 600	320	4 000	128	
FXM 140 - 50	SX	8 700	8 500	7 900	6 700	5 500	5 400	320	3 000	128	
FXM 170 - 63	SX	20 000	19 000	16 000	14 000	13 000	12 000	250	2 700	100	
FXM 200 - 63	SX	26 000	23 000	20 500	17 500	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 63-1). The tolerance of the pilot diameter of the attachment part must be ISO h6 or h7.

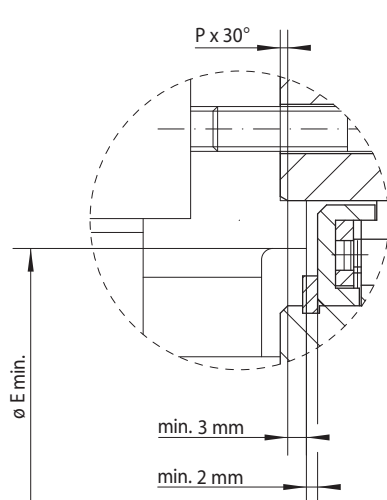
The tolerance of the shaft must be ISO h6 or j6.

For fitting to shaft ends, end covers can be supplied upon request (refer to figure 63-3).

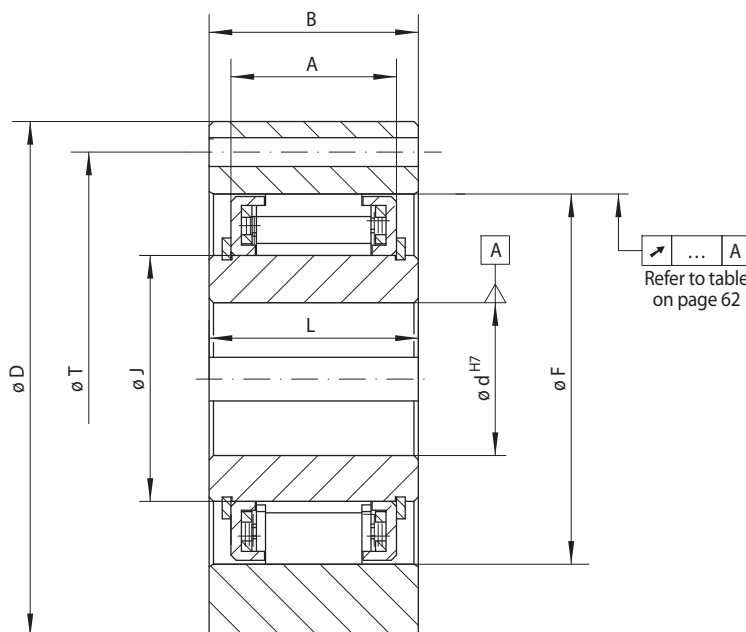


# Integrated Freewheels FXM ... DX and FXM ... SX

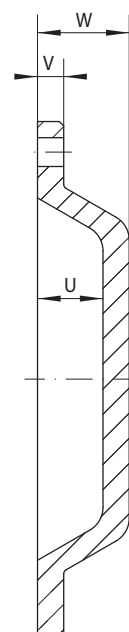
for bolting to the face  
with sprag lift-off X



63-1



63-2



63-3

Freewheel Size	Bore d							A	B	D	E min. mm	F	G	J	L	P	T	U	V	W	Z**	Weight kg
	mm	mm	mm	mm	mm	mm	max. mm															
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.

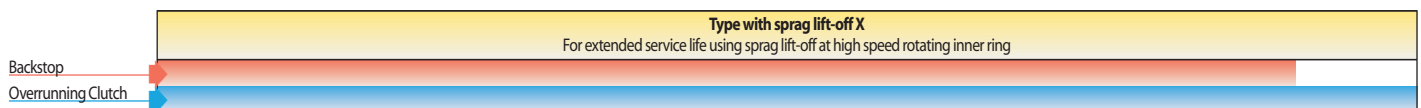
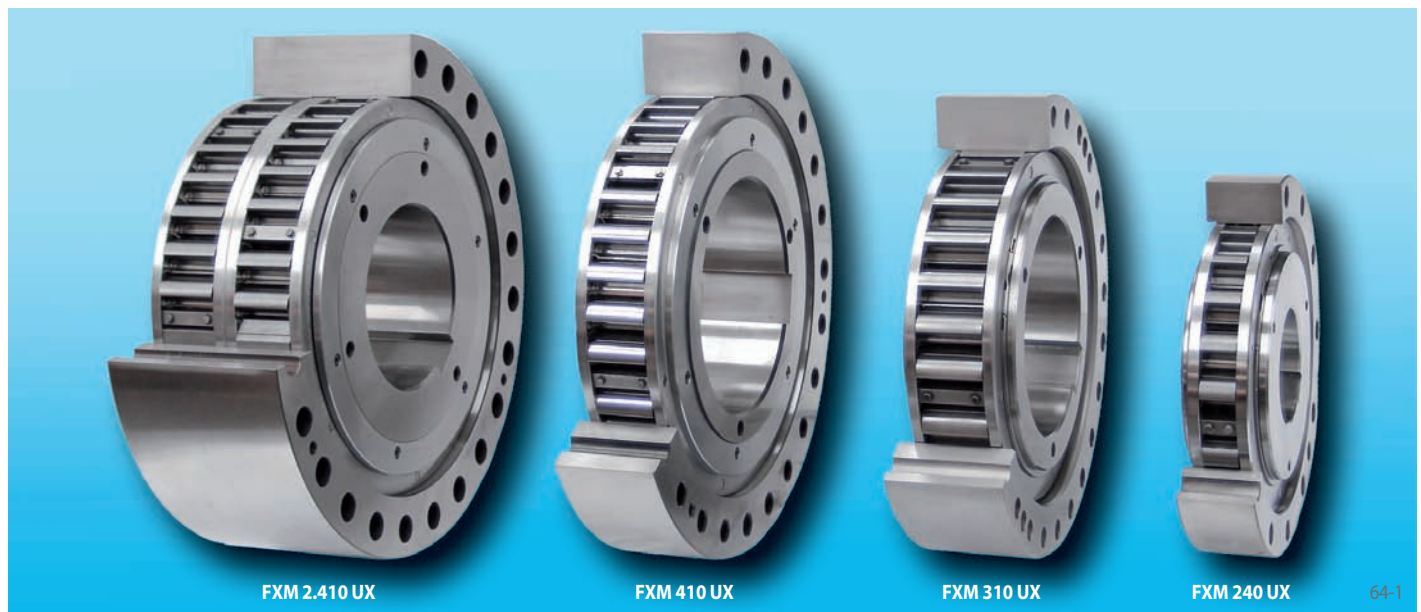
## Example for ordering








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

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

# Integrated Freewheels FXM ... UX

for bolting to the face  
with sprag lift-off X



Freewheel Size	Type	Theoretical nominal torque	Nominal torque at existing run out (T.I.R.)						Sprag lift-off at inner ring speed min <sup>-1</sup>	Max. speed	
		 0 A	 0,1 A	 0,2 A	 0,3 A	 0,4 A	 0,5 A	 0,8 A		Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring drives min <sup>-1</sup>
		Nm	Nm	Nm	Nm	Nm	Nm	Nm			
FXM 240 -63	UX	31 000	30 500	30 000	29 000	26 000	24 000	19 500	220	3 000	88
FXM 240 -96	UX	52 050	51 000	49 000	47 500	46 000	44 000	35 000	220	2 500	88
FXM 2.240 -70	UX	68 500	67 500	67 500	65 500	62 500	57 000	49 500	220	2 500	88
FXM 2.240 -96	UX	102 500	100 500	100 000	99 500	92 500	88 500	75 000	220	2 500	88
FXM 260 -63	UX	38 500	38 000	37 000	36 500	33 000	29 000	25 000	210	2 250	84
FXM 290 -70	UX	59 500	59 000	56 000	50 000	47 000	45 000	37 000	200	2 250	80
FXM 290 -96	UX	91 000	90 000	82 500	77 500	70 000	62 500	55 000	200	2 250	80
FXM 2.290 -70	UX	110 000	109 000	107 000	106 500	96 500	85 000	73 500	200	2 250	80
FXM 2.290 -96	UX	166 500	165 000	162 500	160 000	143 500	126 500	111 500	200	2 250	80
FXM 310 -70	UX	69 000	68 000	64 500	60 000	55 000	49 000	43 000	195	2 250	78
FXM 310 -96	UX	107 000	105 000	99 000	85 500	81 000	74 000	68 000	195	2 100	78
FXM 320 -70	UX	76 500	73 000	67 000	62 000	56 500	49 500	43 000	195	2 000	78
FXM 320 -96	UX	110 500	105 500	104 500	92 500	83 500	73 500	67 000	195	2 000	78
FXM 2.320 -70	UX	143 500	142 000	138 000	122 500	112 000	97 500	87 000	195	2 000	78
FXM 2.320 -96	UX	208 500	206 000	205 000	190 500	171 500	151 000	133 000	195	2 000	78
FXM 360 -100	UX	149 000	139 500	128 000	119 500	103 500	90 000	80 500	180	1 800	72
FXM 2.360 -73	UX	194 500	188 000	165 500	154 000	141 000	125 500	108 500	180	1 800	72
FXM 2.360 -100	UX	278 500	275 500	265 500	242 000	219 000	188 000	171 500	180	1 800	72
FXM 410 -100	UX	193 000	179 500	167 000	154 500	137 000	121 500	111 500	170	1 500	68
FXM 2.410 -73	UX	245 000	243 000	221 500	201 500	184 500	159 500	142 000	170	1 500	68
FXM 2.410 -100	UX	386 000	359 000	334 000	309 000	274 000	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

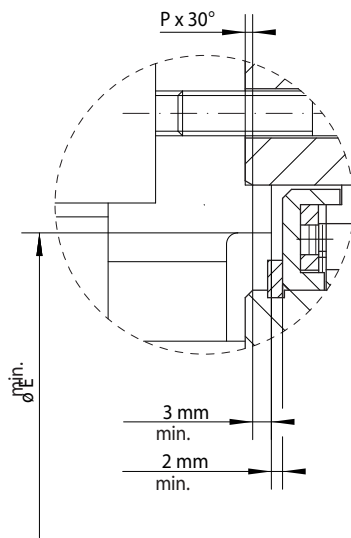
Integrated Freewheels FXM are without bearing support. Concentric alignment of inner and outer ring must be provided by the customer. The permissible run out (T.I.R.) must be observed.

The Integrated Freewheel FXM is centered via the outer track F on the customer attachment part and bolted to this (refer to figure 65-1). The tolerance of the pilot diameter of the attachment part must be ISO h6 or h7.

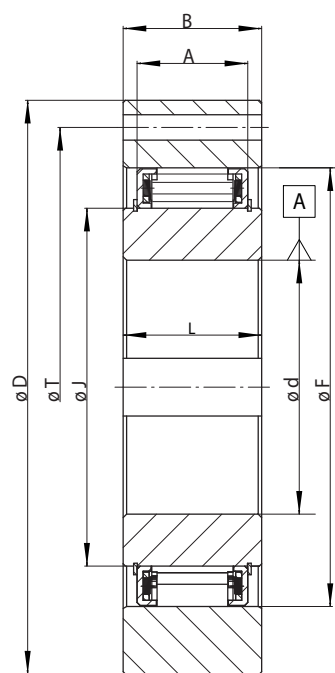
The tolerance of the shaft must be ISO h6 or j6.

# Integrated Freewheels FXM ... UX

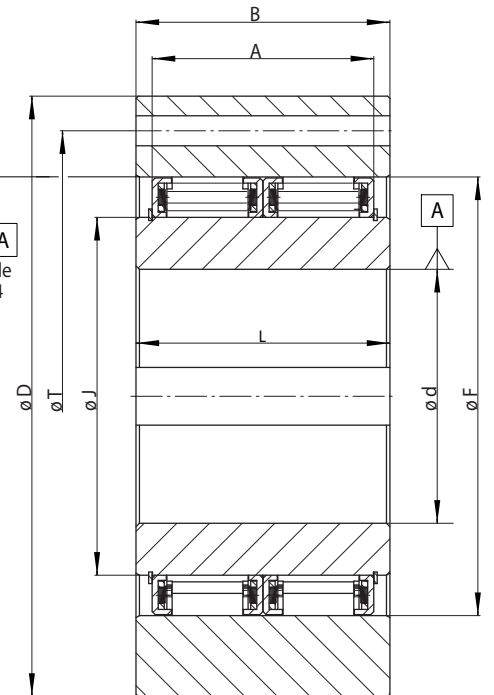
for bolting to the face  
with sprag lift-off X



65-1



65-2



65-3

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	460	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:

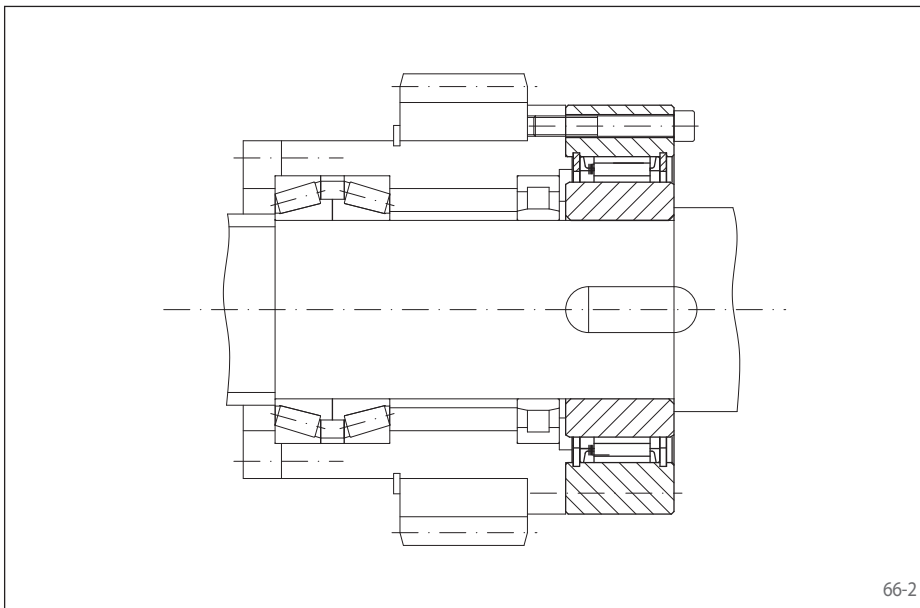
- FXM 240 - 63 UX, d = 140 mm

# Integrated Freewheels FON

for bolting to the face  
with sprags, available in three types



66-1



66-2

## Mounting

Integrated Freewheels FON 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 FON is centered via the outer track F on the customer attachment part and bolted to this. The tolerance of the pilot diameter of the attachment part must be ISO h6.

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

## Lubrication

In the case of standard type and type with RIDUVIT®, an oil lubrication of the specified oil quality must be provided.

In the case of the type with sprag lift-off Z, 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.

## Features

Integrated Freewheels FON are sprag freewheels without bearing support.

The freewheels FON are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

In addition to the standard type, two other types are available for extended service life and indexing accuracy.

Nominal torques up to 25 000 Nm.

Bores up to 155 mm. Many standard bores are available.

## Application example

Integrated Freewheel FON 57 SFT as an overrunning clutch, arranged on the main drive shaft of a packaging machine. The outer ring is connected to a creep drive by means of a gear wheel. This drive is used during set-up. In this operating state, the freewheel works in driving operation and drives the machine at a very low speed via the main shaft. In normal operation (freewheeling operation), the inner ring overruns and the creep drive is automatically disengaged. The RIDUVIT® sprags give the freewheel an extended service life.

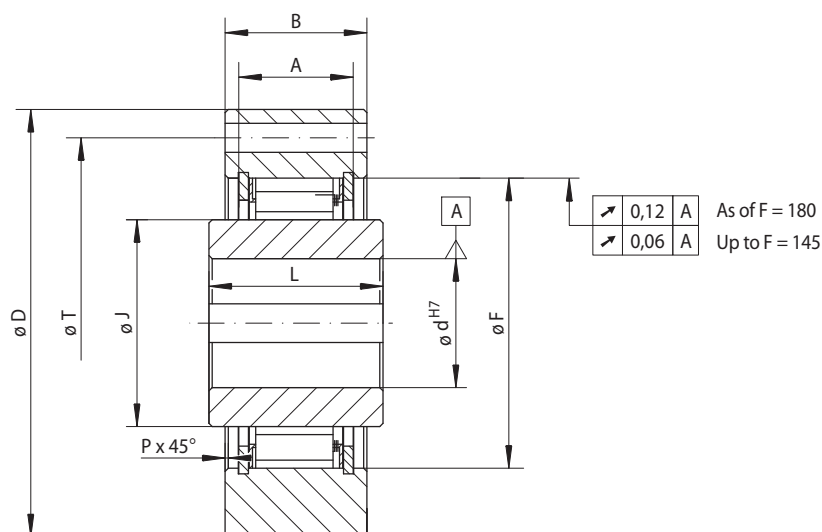
## Example for ordering

Freewheel size FON 72, type with RIDUVIT® and 45 mm bore:

- FON 72 SFT, d = 45 mm

# Integrated Freewheels FON

for bolting to the face  
with sprags, available in three types



67-1

Indexing Freewheel Overrunning Clutch Backstop	Standard type For universal use	Type with RIDUVIT® For extended service life with coated sprags	Type with sprag lift-off Z For extended service life using sprag lift-off at high speed rotating outer ring

Freewheel Size	Type	Nominal torque Nm	Max. speed		Type	Nominal torque Nm	Max. speed		Type	Nominal torque Nm	Sprag lift-off at outer ring speed min <sup>-1</sup>	Max. speed	
			Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>			Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>				Outer ring freewheels/ overruns min <sup>-1</sup>	Inner ring drives min <sup>-1</sup>
FON 37	SF	220	2 500	2 600	SFT	220	2 500	2 600	SFZ	180	2 900	3 700	340
FON 44	SF	315	1 900	2 200	SFT	315	1 900	2 200	SFZ	250	2 250	3 000	320
FON 57	SF	630	1 400	1 750	SFT	630	1 400	1 750	SFZ	630	2 000	2 200	560
FON 72	SF	1 250	1 120	1 600	SFT	1 250	1 120	1 600	SFZ	1 250	1 550	1 850	488
FON 82	SF	1 900	1 025	1 450	SFT	1 900	1 025	1 450	SFZ	1 700	1 450	1 600	580
FON 107	SF	2 800	880	1 250	SFT	2 800	880	1 250	SFZ	2 500	1 300	1 350	520
FON 127	SF	6 300	800	1 150	SFT	6 300	800	1 150	SFZ	5 000	1 200	1 200	480
FON 140	SF	10 000	750	1 100	SFT	10 000	750	1 100	SFZ	10 000	950	1 150	380
FON 170	SF	16 000	700	1 000	SFT	16 000	700	1 000	SFZ	14 000	880	1 000	352
FON 200	SF	25 000	630	900	SFT	25 000	630	900	SFZ	20 000	680	900	272

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

The specified maximum speeds apply for installation conditions as given with Complete Freewheels. Knowing the actual installation conditions higher speeds can be permitted under some circumstances.

Freewheel Size	Bore d				A	B	D	F	G**	J	L	P	T	Z**	Weight kg
	mm	mm	mm	max. mm											
FON 37	20			25*	18,5	25	85	55	M6	37	35	0,5	70	6	0,8
FON 44	25			32*	18,5	25	95	62	M6	44	35	0,5	80	8	1,0
FON 57	30	35	40	42*	23,5	30	110	75	M8	57	45	0,5	95	8	1,7
FON 72	45			55*	29,5	38	132	90	M8	72	60	1,0	115	12	3,0
FON 82	50	55		65*	31,0	40	145	100	M10	82	60	1,0	125	12	4,0
FON 107	70			85*	33,0	45	170	125	M10	107	65	1,0	150	12	6,0
FON 127	90			100*	58,0	68	200	145	M12	127	75	1,0	180	12	11,5
FON 140	100			115*	58,0	68	250	180	M16	140	75	1,0	225	12	17,0
FON 170	120			140*	60,0	70	290	210	M16	170	75	1,0	258	16	24,0
FON 200	140			155	73,0	85	320	240	M16	200	85	1,5	288	16	34,0

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.

# Integrated Freewheels FXRV and FXRT

for bolting to the face  
with sprag lift-off X and torque limiting



68-1

## Features

Integrated Freewheels FXRV and FXRT are sprag freewheels without bearing support and with sprag lift-off X. They consist of the Integrated Freewheels FXM (refer to pages 60 to 65) with additional torque limiter.

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

The freewheels FXRV and FXRT are used as:

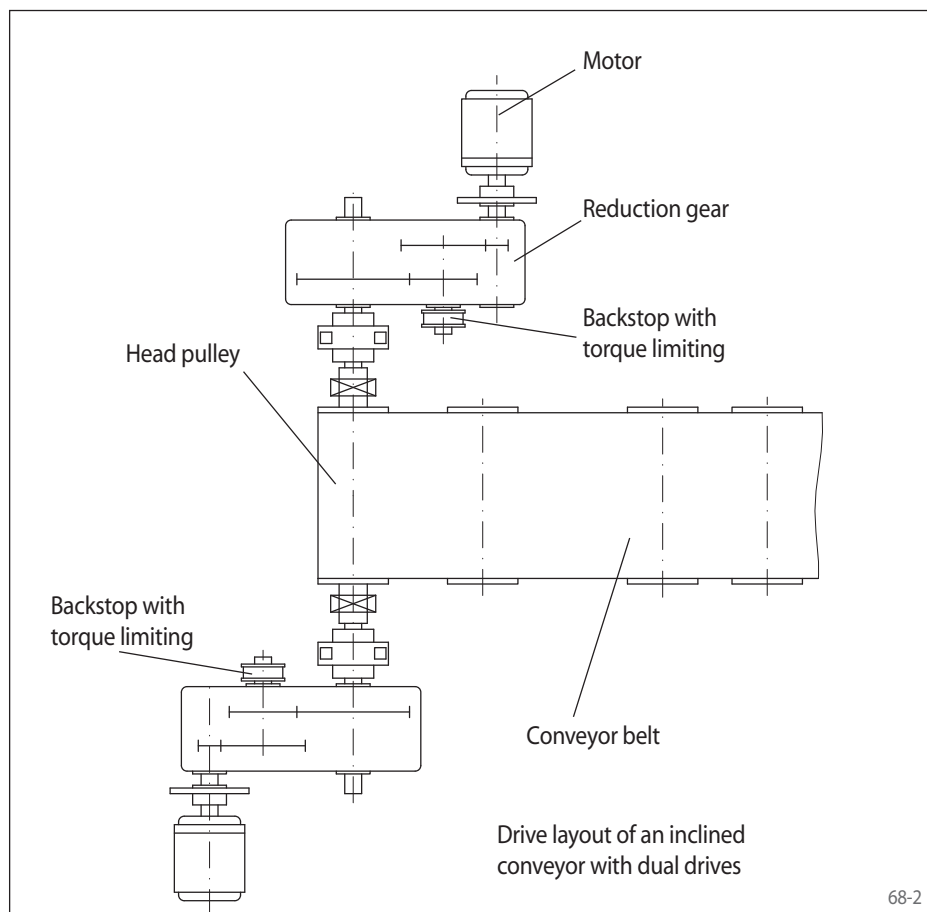
### ► Backstops

for continuous conveyor installations with multiple drives in which each drive is equipped with its own backstop. In such continuous conveyor installations with multiple drives it is important to consider the problem of the unequal distribution of backdriving torque to the individual drives and backstops. As soon as the installation comes to a standstill, the entire backdriving torque is applied primarily to a single backstop, due to differences in the play and elasticity of the drives involved. In installations equipped with backstops without torque limiters, the individual gearboxes and the corresponding backstops must be designed to accommodate the entire backdriving torque of the conveyor installation in order to ensure safety.

The problem of the unequal distribution of backdriving torque is solved by using backstops FXRV and FXRT with torque limiting. The torque limiter which is built into the backstop slips temporarily when the specified torque is exceeded until the other backstops engage in succession. In this way, the entire backdriving torque of the conveyor installation is distributed to the individual gearboxes and backstops. Furthermore, dynamic peak torques which occur during the locking process are reduced, thereby protecting the gearboxes against damaging peak torques. For this reason the use of backstops FXRV and FXRT with torque limiting in continuous conveyor installations with multiple drives enables the application of gearboxes with smaller dimensions.

## Advantages

- Protection of gearboxes from overload by unequal load distribution in multiple drives
- Protection of gearboxes from dynamic peak torques during the locking process
- Smaller gearboxes can be used without negatively affecting the safety
- Protection of the backstops, as dynamic peak torques are reduced by temporarily slipping



68-2



# Integrated Freewheels FXRV and FXRT

for bolting to the face  
with sprag lift-off X and torque limiting



## Integrated Freewheels FXRV with torque limiting and without release function

This series of backstops with torque limiting is the basic version. The design and the available standard sizes are shown on page 70.

## Integrated Freewheels FXRT with torque limiting and with release function

This series is designed in the same way as series FXRV; as an addition, a finely controllable release function is built in. The design, the description of the release function and the available standard sizes are shown on page 71.

The backstops with controllable release function are used if a controlled relaxing of the belt or the unit – perhaps in the case of a jam on the pulley drum – or a limited reverse movement of the conveyor system is required.

## Selection torque

The following determination of the selection torque applies to multiple-drives installations in which each drive has the same motor power. Please contact us in case of different motor powers.

If the backdriving torque  $M_L$  per drive is known, then the selection torque  $M_A$  for the particular backstop should be determined as follows:

$$M_A = 1,2 \cdot M_L \text{ [Nm]}$$

If, however, only the nominal power per drive  $P_0$  [kW] is known, then this applies:

$$M_A = 1,2 \cdot 9550 \cdot \eta^2 \cdot P_0 / n_{SP} \text{ [Nm]}$$

In these equations:

$M_A$  = Selection torque of the particular backstop [Nm]

$$M_L = 9550 \cdot \eta \cdot P_L / n_{SP} \text{ [Nm]}$$

= Static backdriving torque of the load for each drive referring to the particular backstop shaft [Nm]

$P_L$  = Lifting capacity per drive at full load [kW]

= Lifting height [m] multiplied by the load that is being conveyed per second divided by the number of drives [kN/s]

$P_0$  = Nominal power of motor [kW]

$n_{SP}$  = Speed of backstop shaft [min<sup>-1</sup>]

$\eta$  = Efficiency of installation

$$= \frac{\text{Lifting capacity}}{\text{Lifting capacity} + \text{Power loss}}$$

After calculating  $M_A$ , the size of the particular backstop must be selected in accordance with the catalogue tables in such a way that in all cases this applies:

$$M_R \geq M_A$$

$M_R$  = Maximum slipping torque of the particular backstop in accordance with the table values on pages 70 and 71 [Nm]

Approximate values for  $\eta$ :

Type of installation	$\eta$	$\eta^2$
Conveyor belts, angle up to 6°	0,71	0,50
Conveyor belts, angle up to 8°	0,78	0,61
Conveyor belts, angle up to 10°	0,83	0,69
Conveyor belts, angle up to 12°	0,86	0,74
Conveyor belts, angle up to 15°	0,89	0,79
Screw pumps	0,93	0,87
Ball mills, drying drums	0,85	0,72
Bucket conveyors, elevators	0,92	0,85
Hammer mills	0,93	0,87

In each case, the sum of the slipping torques of the particular backstops must be 1,2 times higher than the static backdriving torque of the installation (also at overload). The torques specified in the tables are maximum values. Lower values can be set upon request. If in doubt, please contact us stating the precise description of the installation and the operating conditions. It is preferable to use the questionnaire on page 110.

## Example

Dual-drive system

Motor power per drive:  $P_0 = 630$  kW

Type of installation:

Conveyor belt with 8° incline  $\Rightarrow \eta^2 = 0,61$

Speed per backstop shaft:

$$n_{SP} = 360 \text{ min}^{-1}$$

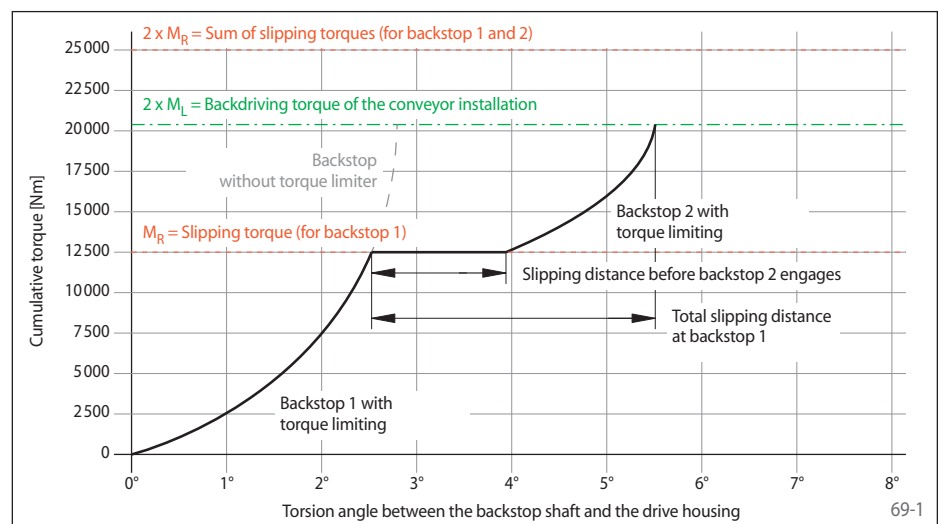
Selection torque of the particular backstop:

$$M_A = 1,2 \cdot 9550 \cdot 0,61 \cdot 630 / 360 \text{ [Nm]} \\ = 12234 \text{ Nm}$$

The following rule applies in all cases:

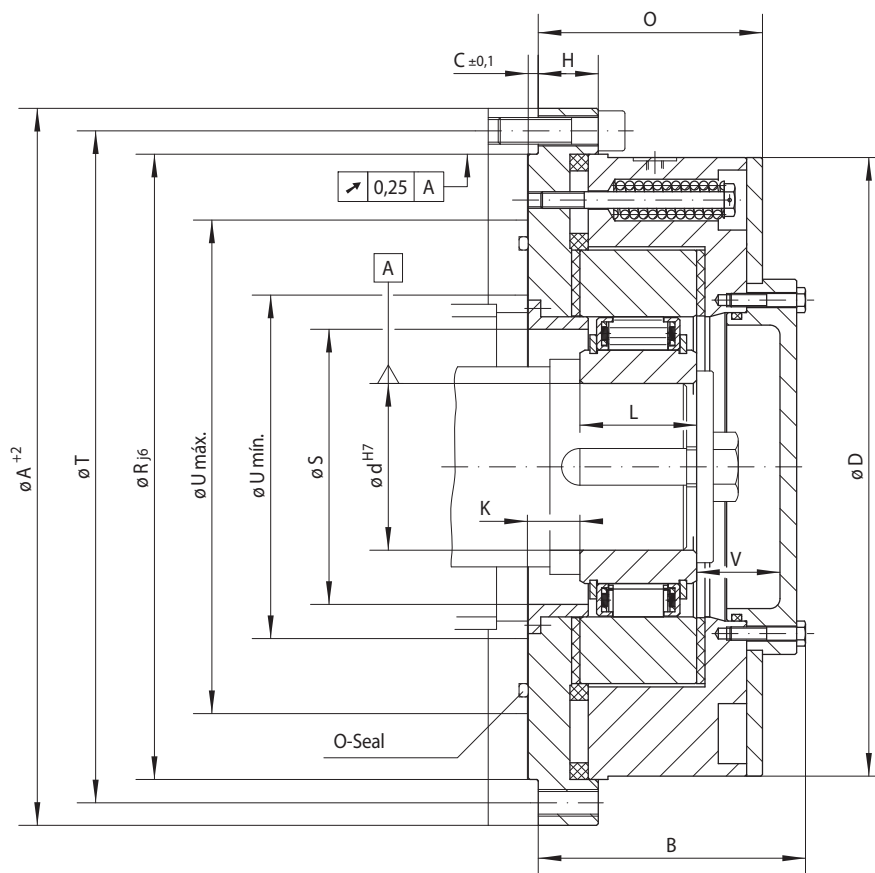
$$M_R \geq M_A$$

$\Rightarrow$  FXRT or FXRV 200 - 63 SX are the suitable, economical backstop sizes.



# Integrated Freewheels FXRV

for bolting to the face  
with sprag lift-off X and torque limiting



70-1

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

Freewheel Size	Type	Slipping torque M <sub>R</sub> Nm	Sprag lift-off at inner ring speed min <sup>-1</sup>	Max. speed Inner ring freewheels  min <sup>-1</sup>	Bore d								A	B	C	D	G**	H	K	L	O	R	S	T	U***		V	Z**	Weight
					Standard																				min. mm	max. mm			
					mm	mm	mm	mm	mm	mm	mm	max. mm																	
FXRV 85 - 40	SX	1 400	430	6 000	45	50	60	65				65	330	143	6	280	M12	34	29	60	127	280	110	308	165	215	38	6	48
FXRV 100 - 50	SX	2 300	400	4 500	45	50	55	60	70	75	80*	350	150	6	311	M12	34	31	70	134	340	125	328	180	240	38	6	58	
FXRV 120 - 50	SX	3 400	320	4 000	60	65	70	75	80	95	95	400	151	6	345	M16	36	31	70	134	340	145	373	200	260	38	6	80	
FXRV 140 - 50	SX	4 500	320	3 000	65	90	100	110			95	110	430	160	6	386	M16	36	31	70	135	375	165	403	220	280	50	6	90
FXRV 170 - 63	SX	9 000	250	2 700	70	85	90	100	120			130	500	175	6	462	M16	43	40	80	157	425	196	473	250	340	38	6	140
FXRV 200 - 63	SX	12 500	240	2 100	130							155	555	175	6	516	M16	43	40	80	157	495	226	528	275	390	38	6	195
FXRV 240 - 63	UX	21 200	220	3 000								185	710	195	8	630	M20	50	50	90	173	630	290	670	355	455	38	12	340
FXRV 260 - 63	UX	30 000	210	2 500								205	750	205	8	670	M20	50	50	105	183	670	307	710	375	500	38	12	410
FXRV 290 - 70	UX	42 500	200	2 500								230	850	218	8	755	M24	50	50	105	193	730	335	800	405	560	38	12	490
FXRV 310 - 96	UX	53 000	195	2 100								240	900	260	10	775	M24	63	63	120	246	775	355	850	435	600	50	12	740

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 (DIN 912) on pitch circle T. \*\*\* Area for O-ring sealing.

See page 69 for determination of selection torque. Other freewheel sizes upon request.

## Torques

The Integrated Freewheels FXRV are supplied with a set slipping torque  $M_R$  of the torque limiter. The static backdriving torque  $M_L$  of the installation (also in the case of an overload) must under no circumstances achieve the sum of the slipping torques  $M_R$  of the provided Integrated Freewheels. The slipping torques  $M_R$  specified in the table are maximum values; lower values can be set.

## Mounting

The Integrated Freewheels FXRV are without bearing support, therefore it must be ensured that the run out (T.I.R.) between the pilot diameter R and the shaft diameter d does not exceed the value 0,25 mm.

Dimension C applies for the Integrated Freewheel. The centering depth of the customer attachment part must be at least  $C + 0,2$  mm. The tolerance of the pilot diameter R of the attachment part must be ISO H7.

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

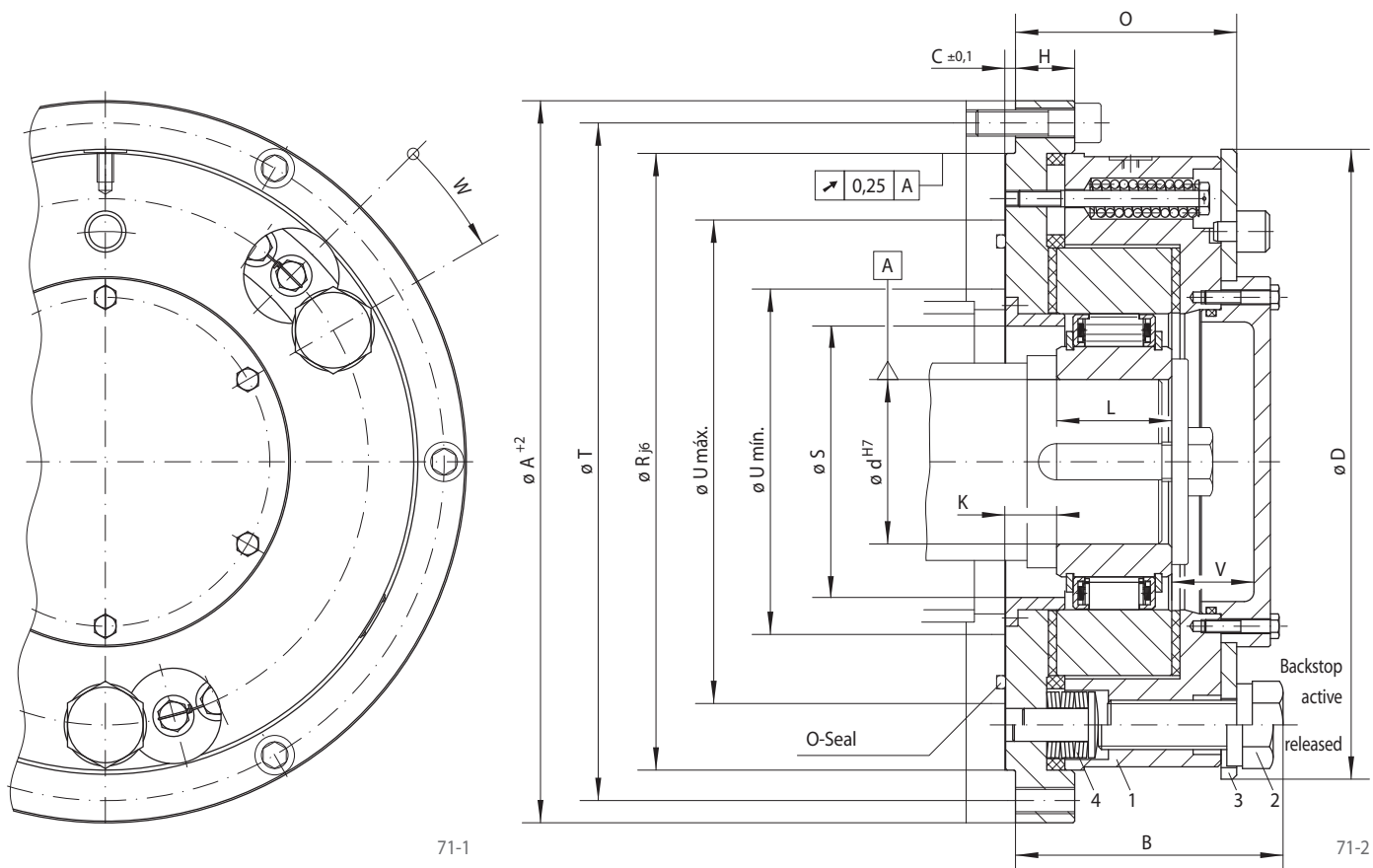
## Example for ordering

Freewheel size FXRV 170 - 63 SX, type with sprag lift-off X, 90 mm bore and slipping torque 8 000 Nm:

- FXRV 170 - 63 SX, d = 90 mm,  $M_R$  = 8 000 Nm

# Integrated Freewheels FXRT

for bolting to the face  
with sprag lift-off X, torque limiting and release function



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

Freewheel Size	Type	Slipping torque M <sub>R</sub> Nm	Sprag lift-off at inner ring speed min <sup>-1</sup>	Max. speed Inner ring freewheels  min <sup>-1</sup>	Bore d								A	B	C	D	G**	H	K	L	O	R	S	T	U***		V	Z**	Weight
					Standard																				min. mm	max. mm			
					mm	mm	mm	mm	mm	mm	mm	max. mm																	
FXRT 85 - 40	SX	1 400	430	6000	45	50	60	65				65	330	151	6	280	M12	34	29	60	127	280	110	308	165	215	38	6	48
FXRT 100 - 50	SX	2 300	400	4500	45	50	55	60	70	75	80*	350	163	6	311	M12	34	31	70	134	300	125	328	180	240	38	6	58	
FXRT 120 - 50	SX	3 400	320	4000	60	65	70	75	80	95	95	400	163	6	345	M16	36	31	70	134	340	145	373	200	260	38	6	80	
FXRT 140 - 50	SX	4 500	320	3000	65	90	100	110				110	430	167	6	386	M16	36	31	70	135	375	165	403	220	280	50	6	90
FXRT 170 - 63	SX	9 000	250	2700	70	85	90	100	120			130	500	193	6	462	M16	43	40	80	157	425	196	473	250	340	38	6	140
FXRT 200 - 63	SX	12 500	240	2100	130							155	555	193	6	516	M16	43	40	80	157	495	226	528	275	390	38	6	195
FXRT 240 - 63	UX	21 200	220	3000								185	710	200	8	630	M20	50	50	90	173	630	290	670	355	455	38	12	340
FXRT 260 - 63	UX	30 000	210	2500								205	750	212	8	670	M20	50	50	105	183	670	307	710	375	500	38	12	410
FXRT 290 - 70	UX	42 500	200	2500								230	850	212	8	755	M24	50	50	105	193	730	335	800	405	560	38	12	490
FXRT 310 - 96	UX	53 000	195	2100								240	900	280	10	775	M24	63	63	120	246	775	355	850	435	600	50	12	740

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 (DIN 912) on pitch circle T. \*\*\* Area for O-ring sealing.

See page 69 for determination of selection torque. Other freewheel sizes upon request.

## Torques

The Integrated Freewheels FXRT are supplied with a set slipping torque  $M_R$  of the torque limiter. The static backdriving torque  $M_L$  of the installation (also in the case of an overload) must under no circumstances achieve the sum of the slipping torques  $M_R$  of the provided Integrated Freewheels. The slipping torques  $M_R$  specified in the table are maximum values; lower values can be set.

## Mounting

The Integrated Freewheels FXRT are without bearing support, therefore it must be ensured that the run out (T.I.R.) between the pilot diameter R and the shaft diameter d does not exceed the value 0,25 mm.

Dimension C applies for the Integrated Freewheel. The centering depth of the customer attachment part must be at least  $C + 0,2$  mm. The tolerance of the pilot diameter R of the attachment part must be ISO H7.

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

## Release function

The finely controllable release function consists basically of three special screws (2) that are located in the spring pocket (1) and the locking plate (3). To release the backstop, first of all the special screws have to be unscrewed slightly, then the locking plate has to be turned clockwise by the angle W. The special screws can then be tightened, whereupon, with the aid of the belleville spring set (4) the release procedure is finely initiated. When the release facility is actuated a small amount of oil may seep out for a brief period of time.

# Internal Freewheels FXN

for press fit on the outer ring  
with sprag lift-off X



## Features

Internal Freewheels FXN are sprag freewheels without bearing support and with sprag lift-off X.

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

The outer ring is pressed into the customer housing. This makes compact, space-saving fitting solutions possible.

The freewheels FXN are used as:

- ▶ Backstops
- ▶ Overrunning Clutches

for applications with high speed free-wheeling operation and when used as an overrunning clutch with low speed driving operation.

Nominal torques up to 20 000 Nm. The torque is transmitted on the outer ring by press fit.

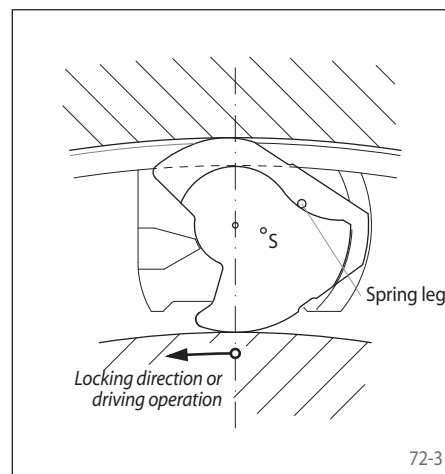
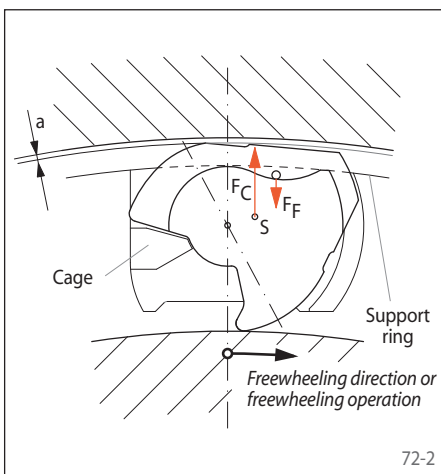
Bores up to 130 mm. Many standard bores are available.

## Sprag lift-off X

Internal Freewheels FXN are equipped with sprag lift-off X. The sprag lift-off X is used for backstops and overrunning clutches, provided that in free-wheeling operation the inner ring is rotating at high speed and providing with overrunning clutches that the driving operation is conducted at low speed. In free-wheeling 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.

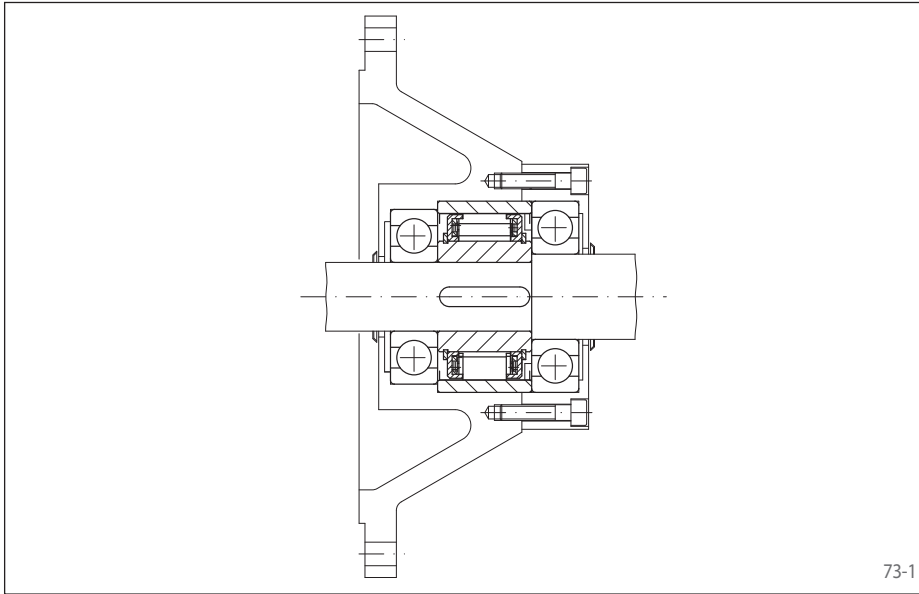
Figure 72-2 shows a freewheel with sprag lift-off X in free-wheeling operation. The sprags, which are supported in a cage connected with the inner ring, rotate with the inner ring. The centrifugal force  $F_C$  that is applied in the center of gravity  $S$  of the sprag turns the sprag anti-clockwise 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 cen-

trifugal 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 72-3). If used as an overrunning clutch, the driving speed must not exceed 40% of the lift-off speed.



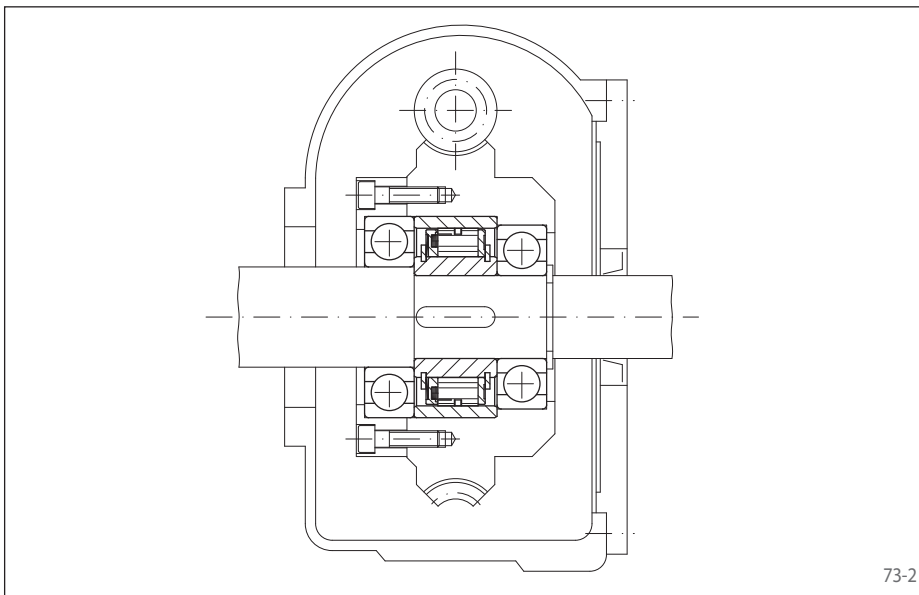
# Internal Freewheels FXN

for press fit on the outer ring  
with sprag lift-off X



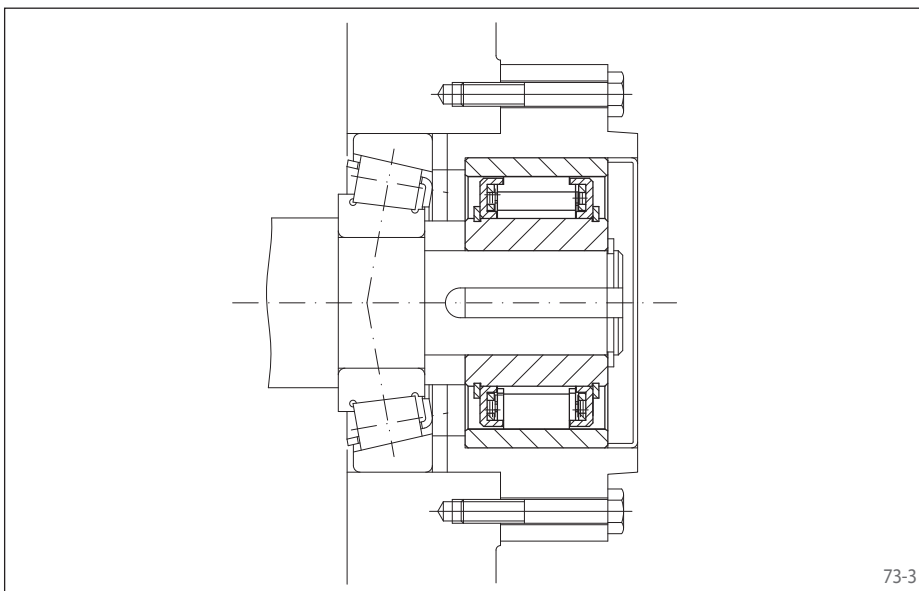
## Application example

Internal Freewheel FXN 38 - 17/70 DX as a back-stop, arranged in a housing adapter to attach to an electric motor. The thin outer ring that is pressed into the housing enables a space-efficient fitting solution. 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.



## Application example

Internal Freewheel FXN 66-25/100 DX as an overrunning clutch in the creep drive of a textile machine. The freewheel installation is compactly solved by means of the thin outer ring that is pressed into the worm wheel. During set-up, the machine is driven by the worm gear and the freewheel that is working in driving operation. In normal operation (freewheeling operation), the inner ring that is located on the high speed main drive shaft overruns and automatically disengages the creep drive. With the high overrunning speed of the inner ring, the type with sprag lift-off X is used; the sprags work in freewheeling operation without contact and hence are wear-free.



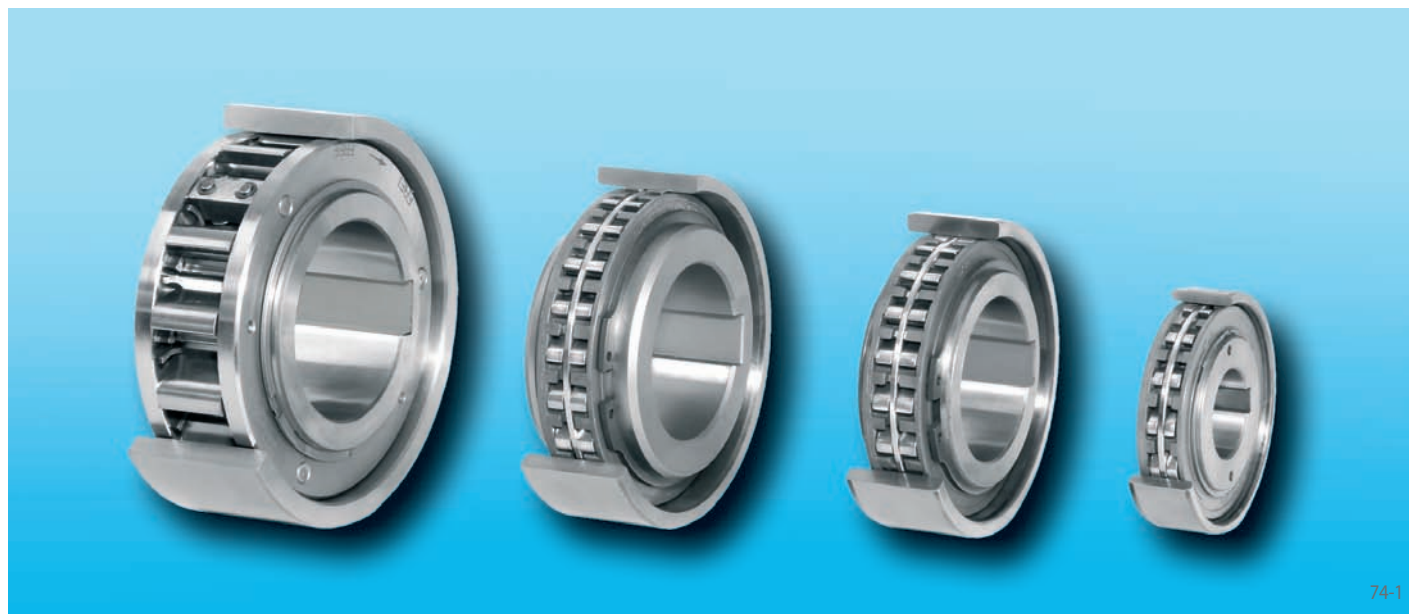
## Application example

Internal Freewheel FXN 85 - 40/140 SX as a back-stop 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.









# Internal Freewheels FXN

for press fit on the outer ring  
with sprag lift-off X



74-1

		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	Nominal torque at existing run out T.I.R.						Sprag lift-off at inner ring speed min <sup>-1</sup>	Max.speed	
		 0 A	 0,1 A	 0,2 A	 0,3 A	 0,4 A	 0,5 A	Inner ring freewheels/ overruns min <sup>-1</sup>		Outer ring drives  min <sup>-1</sup>	
		Nm	Nm	Nm	Nm	Nm	Nm				
FXN 31 - 17/60	DX	100	100	95				890	5000	356	
FXN 31 - 17/62	DX	100	100	95				890	5000	356	
FXN 38 - 17/70	DX	150	140	130				860	5000	224	
FXN 46 - 25/80	DX	390	380	350				820	5000	328	
FXN 51 - 25/85	DX	480	470	420				750	5000	300	
FXN 56 - 25/90	DX	580	570	490				730	5000	292	
FXN 61 - 19/95	DX	420	410	370				750	5000	300	
FXN 61 - 19/106	DX	420	410	370				750	5000	300	
FXN 66 - 25/100	DX	800	780	700				700	5000	280	
FXN 66 - 25/110	DX	800	780	700				700	5000	280	
FXN 76 - 25/115	DX	1 050	1 040	890				670	5000	268	
FXN 76 - 25/120	DX	1 050	1 040	890				670	5000	268	
FXN 86 - 25/125	DX	1 350	1 300	1 030				630	5000	252	
FXN 86 - 25/130	DX	1 350	1 300	1 030				630	5000	252	
FXN 101 - 25/140	DX	1 700	1 600	1 400				610	5000	244	
FXN 101 - 25/149	DX	1 700	1 600	1 400				610	5000	244	
FXN 101 - 25/150	DX	1 700	1 600	1 400				610	5000	244	
FXN 85 - 40/140	SX	1 900	1 900	1 800	1 800	1 700	1 600	430	6000	172	
FXN 85 - 40/150	SX	1 900	1 900	1 800	1 800	1 700	1 600	430	6000	172	
FXN 100 - 40/160	SX	2 700	2 600	2 500	2 400	2 200	2 000	400	4 500	160	
FXN 105 - 50/165	SX	4 000	3 800	3 500	3 300	2 900	2 800	380	4 500	152	
FXN 120 - 50/198	SX	6 500	6 300	5 800	4 800	4 400	3 600	320	4 000	128	
FXN 140 - 50/215	SX	8 700	8 500	7 900	6 700	5 500	5 400	320	3 000	128	
FXN 170 - 63/258	SX	20 000	19 000	16 000	14 000	13 000	12 000	250	2 700	100	

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

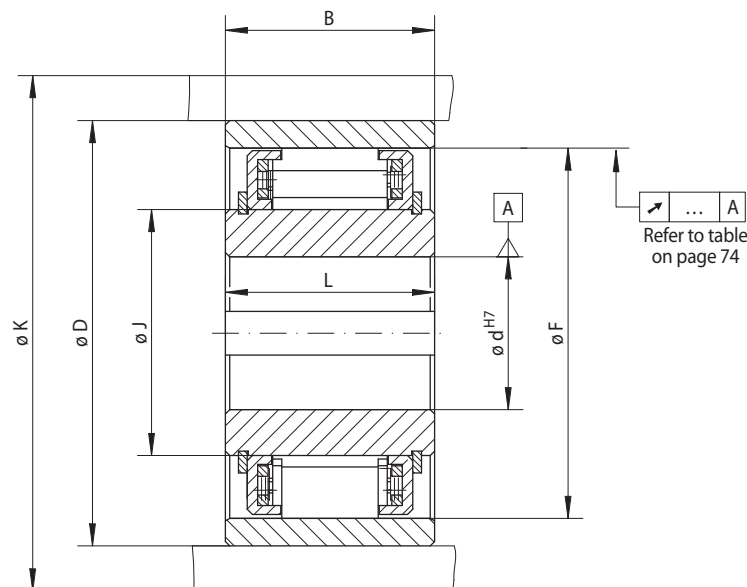
The theoretical nominal torque applies only for ideal concentricity between the inner and outer ring. In practice, the concentricity is affected by the bearing play and centering errors of the neighbouring parts. Then the nominal torques specified in the table apply, whilst taking into consideration the existing run out (T.I.R.).

Higher speeds upon request.



# Internal Freewheels FXN

for press fit on the outer ring  
with sprag lift-off X



75-1

Freewheel size	Bore d							B	D	F	J	K min.	L	Weight
	mm	mm	mm	mm	mm	mm	max. mm							
FXN 31 - 17/60	20*						20*	25	60 P6	55	31	85	24	0,3
FXN 31 - 17/62	20*						20*	25	62 P6	55	31	85	24	1,2
FXN 38 - 17/70	25*						25*	25	70 P6	62	38	90	24	0,4
FXN 46 - 25/80	25						30	35	80 P6	70	46	95	35	0,8
FXN 51 - 25/85	25	30	35				36	35	85 P6	75	51	105	35	0,8
FXN 56 - 25/90	35						40	35	90 P6	80	56	110	35	0,9
FXN 61 - 19/95	30	35	40				45*	26	95 P6	85	61	120	25	0,8
FXN 61 - 19/106	30	35	40				45*	25	106 H7	85	61	120	25	1,2
FXN 66 - 25/100	35	40	45				48*	30	100 P6	90	66	132	35	1,1
FXN 66 - 25/110	35	40	45				48*	40	110 P6	90	66	132	35	1,8
FXN 76 - 25/115	45	55					60*	40	115 P6	100	76	140	35	1,7
FXN 76 - 25/120	45	55					60*	32	120 J6	100	76	140	35	1,8
FXN 86 - 25/125	40	45	50	60	65		70*	40	125 P6	110	86	150	40	2,3
FXN 86 - 25/130	40	45	50	60	65		70*	40	130 P6	110	86	150	40	2,6
FXN 101 - 25/140	55	70					75	45	140 P6	125	101	175	50	3,1
FXN 101 - 25/149	70						75	62	149 H6	125	101	175	62	4,2
FXN 101 - 25/150	55	70					75	45	150 P6	125	101	175	50	3,6
FXN 85 - 40/140	45	50	60	65			65	45	140 P6	125	85	175	60	3,2
FXN 85 - 40/150	45	50	60	65			65	45	150 P6	125	85	175	60	4,2
FXN 100 - 40/160	45	50	55	60	70	75	75	50	160 P6	140	100	190	60	5,1
FXN 105 - 50/165	80						80	62	165 P6	145	105	195	62	5,8
FXN 120 - 50/198	60	65	70	75	80	95	95	70	198 H6	160	120	210	70	8,6
FXN 140 - 50/215	65	90	100	110			110	70	215 J6	180	140	245	70	14,0
FXN 170 - 63/258	70	85	100	120			130	80	258 H6	210	170	290	80	21,0

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.  
\* Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.

## Mounting

Internal Freewheels FXN 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 torque is transmitted on the outer ring by press fit. In order to transmit the torques specified in the table, the outer ring must be accommodated in a housing with an external diameter K. The housing is made of steel or grey cast iron in minimum quality GG-20. When

using other housing materials or smaller external diameters, we urge you to contact us regarding the transmissible torque.

The tolerance of the housing bore is specified in the table under dimension D.

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

## 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 quality must be provided.

## Example for ordering

Freewheel size FXN 61 - 19/95, type with sprag lift-off X and 35 mm bore:

- FXN 61-19/95 DX, d = 35 mm

# Internal Freewheels FEN

for press fit on the outer ring  
with sprags



76-1

## Features

Internal Freewheels FEN are sprag freewheels without bearing support.

The outer ring is pressed into the customer housing. This makes compact, space-saving fitting solutions possible.

The freewheels FEN are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

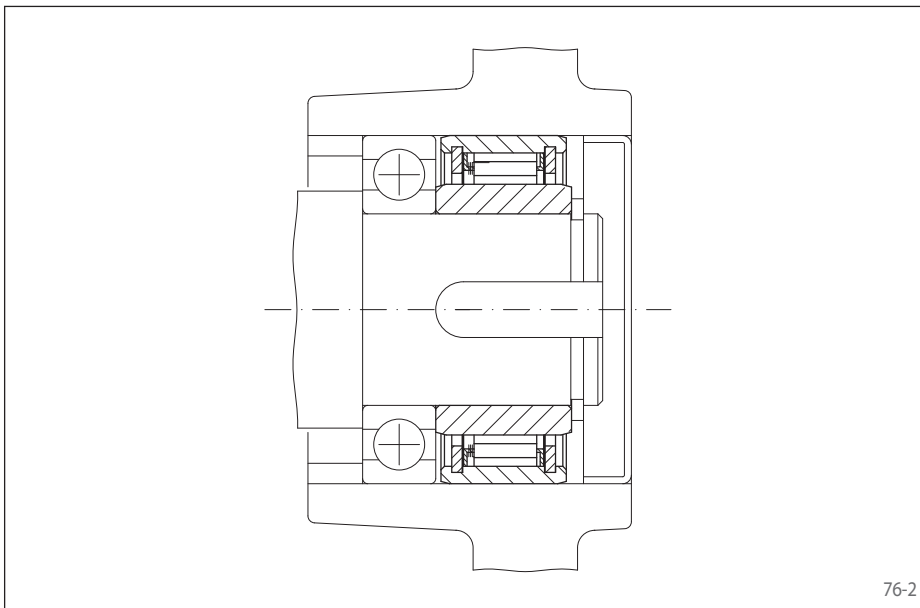
In addition to the standard type, the type with RIDUVIT® can be supplied for extended service life.

Nominal torques up to 4 000 Nm. The torque is transmitted on the outer ring by press fit.

Bores up to 100 mm. Many standard bores are available.

## Application example

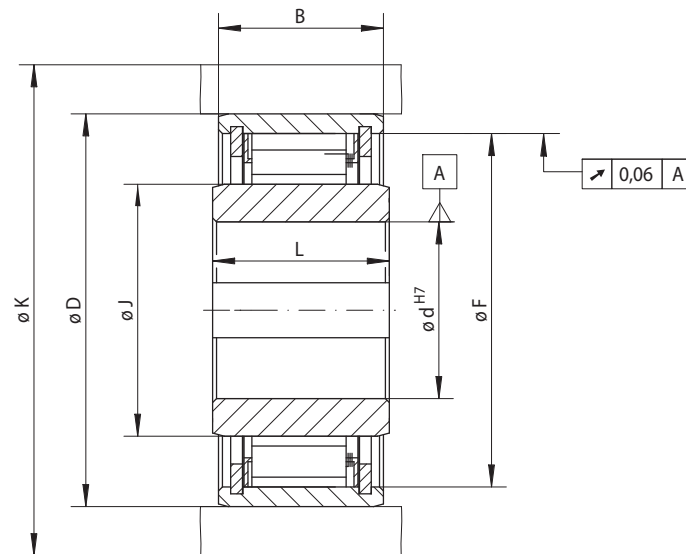
Internal Freewheel FEN 82 SF as backstop fitted to the end of the intermediate shaft of a spur gearbox in the drive of a bucket conveyor. In the case of a motor stop, the bucket conveyor must be held securely so that the conveyor goods do not pull backwards. The thin outer ring that is pressed into the housing enables a space-efficient fitting solution.



76-2

# Internal Freewheels FEN

for press fit on the outer ring  
with sprags



77-1

Indexing Freewheel Overrunning Clutch Backstop	Standard type For universal use	Type with RIDUVIT® For extended service life using coated sprags	Dimensions

Freewheel Size	Type	Nominal torque Nm	Max. speed		Type	Nominal torque Nm	Max. speed		Bore d				B	D	F	J	K min.	L	Weight	
			Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>			Standard			max. mm										
							mm	mm	mm											
FEN 37	SF	220	2 500	2 600	SFT	220	2 500	2 600	20	25*			25*	25	62	55	37	85	35	0,4
FEN 44	SF	315	1 900	2 200	SFT	315	1 900	2 200	25				32*	25	70	62	44	90	35	0,6
FEN 44	SF	315	1 900	2 200	SFT	315	1 900	2 200	30				32*	25	70	62	44	90	19	0,5
FEN 57	SF	630	1 400	1 750	SFT	630	1 400	1 750	30	35	40		42*	35	85	75	57	105	45	1,2
FEN 72	SF	1 250	1 120	1 600	SFT	1 250	1 120	1 600	45	50			55*	36	100	90	72	132	60	1,8
FEN 82	SF	1 900	1 025	1 450	SFT	1 900	1 025	1 450	50	55			65*	40	115	100	82	140	60	2,9
FEN 82	SF	1 900	1 025	1 450	SFT	1 900	1 025	1 450	50	55			65*	32	120	100	82	140	60	3,2
FEN 107	SF	2 800	880	1 250	SFT	2 800	880	1 250	70				85*	45	140	125	107	175	65	4,2
FEN 107	SF	2 800	880	1 250	SFT	2 800	880	1 250	70				85*	45	150	125	107	175	65	5,0
FEN 127	SF	4 000	800	1 150	SFT	4 000	800	1 150	90				100*	62	165	145	127	195	75	7,0

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

The maximum speed values listed above apply to installation conditions as they are given for Complete Freewheels. If the actual installation conditions are known, higher speeds may be permitted under certain circumstances.

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

\* Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.

## Mounting

Internal Freewheels FEN 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 torque is transmitted on the outer ring by press fit. In order to transmit the torques specified in the table, the outer ring must be accommodated in a housing with an external diameter K. The housing is made of steel or grey cast iron in minimum quality GG-20. When using other housing materials or smaller external diameters, we urge you to contact us regarding the transmissible torque.

The tolerance of the housing bore D must be ISO P6 and the tolerance of the shaft must be ISO h6 or j6.

## Lubrication

An oil lubrication of the specified quality must be provided.

## Example for ordering

Freewheel size FEN 72, type with RIDUVIT® and 50 mm bore:

- FEN 72 SFT, d = 50 mm

# Internal Freewheels FGK

for press fit on the outer ring  
with sprags and bearing



78-1

## Features

Internal Freewheels FGK are sprag freewheels with bearing support in the dimensions of the needle bearing series 59. The freewheels are supplied grease-filled for normal operating conditions and are maintenance-free.

The outer ring is pressed into the customer housing. This makes compact, space-saving fitting solutions possible.

The freewheels FGK are used as

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

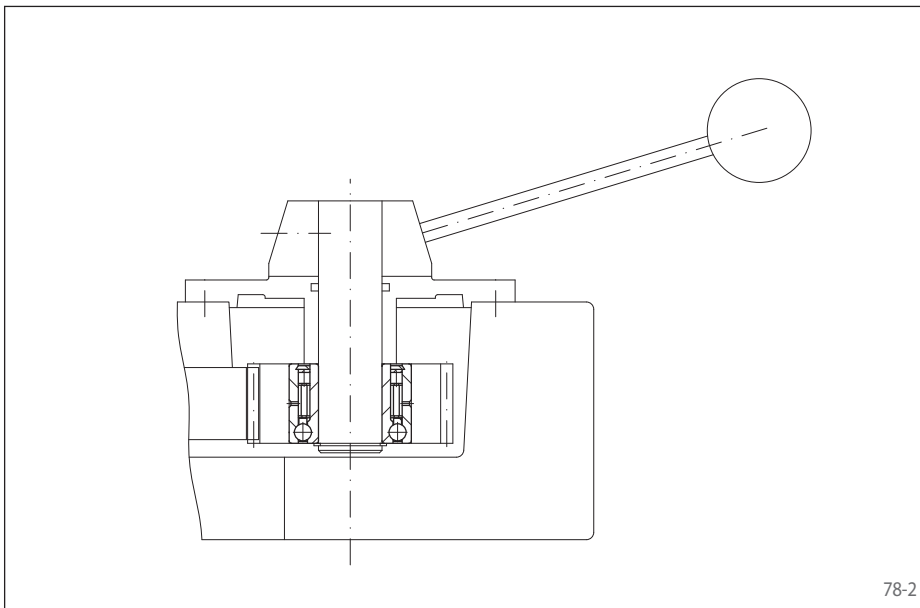
Nominal torques up to 460 Nm.

The torque is transmitted on the outer ring by press fit.

Bores up to 50 mm.

## Application example

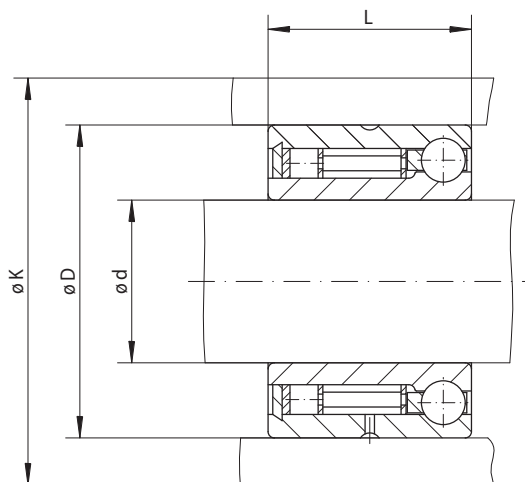
Internal Freewheel FGK 35 as an indexing freewheel in a circular knitting machine. Set-up in order to change material or after breakdown requires a sensitive, manual adjustment of the rotary table. Therefore the rotary table is moved per hand lever via the freewheel which is working in driving operation. After set-up, the drive is carried out via the main motor and the freewheel outer ring overruns.



78-2

# Internal Freewheels FGK

for press fit on the outer ring  
with sprags and bearing



79-1

Indexing Freewheel Overrunning Clutch Backstop	Standard type For universal use	Dimensions

Freewheel Size	Nominal torque Nm	Max. speed		Load rating of bearing support				Bore d  mm	D  mm	K  mm	L  mm	Weight  kg
		Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>	dynamic C		static C						
				Roller N	Ball N	Roller N	Ball N					
FGK 20	50	5 500	4 000	5 600	4 400	2 900	2 750	20	37	42	23	0,09
FGK 25	70	5 300	3 800	6 300	5 300	3 450	3 350	25	42	48	23	0,11
FGK 30	95	5 000	3 500	7 700	5 500	4 600	3 650	30	47	54	23	0,13
FGK 35	200	4 600	3 200	8 200	8 500	5 200	5 700	35	55	63	27	0,20
FGK 40	310	4 200	3 000	8 650	8 300	5 750	5 700	40	62	70	30	0,30
FGK 45	370	3 800	2 500	9 200	9 650	6 350	7 200	45	68	76	30	0,34
FGK 50	460	3 400	2 200	9 650	10 000	6 950	7 800	50	72	80	30	0,36

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

## Mounting

The torque is transmitted on the inner and outer ring by press fit. In order to transmit the torques specified in the table, the outer ring must be accommodated in a housing with an external diameter K. The housing is made of steel or grey cast iron in minimum quality GG-20. When using other housing materials or smaller external diameters, we urge you to contact us regarding the transmissible torque.

The tolerance of the housing bore D must be ISO R6 and the tolerance of the shaft must be ISO p5. With these fits, normal bearing clearance is achieved in a built-in state.

The permissible operating temperature of the freewheel is -40°C to 80°C.

## Lubrication

The freewheels are supplied grease-filled for normal operating conditions. However, the freewheels can also be connected to the customer's oil lubrication system; this is particularly recommended in the case of higher speeds.

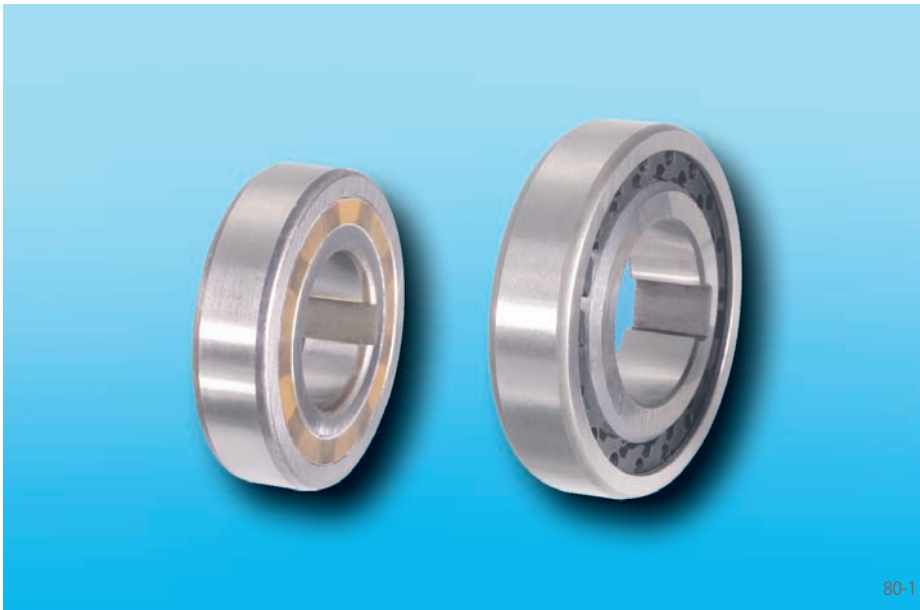
## Example for ordering

Freewheel size FGK 40, standard type:

- FGK 40

# Internal Freewheels FCN ... K/CF

for press fit on the outer ring  
with sprags



80-1

## Features

Internal Freewheels FCN ... K/CF are sprag freewheels with series 62 ball bearing dimensions. The freewheels FCN ... K (sizes 20 to 30) are also ball bearings and can accept radial and axial forces. They are supplied grease-filled for normal operating conditions and are maintenance-free. The freewheels FCN ... CF (sizes 35 to 60) have no bearing support.

The freewheels FCN ... K/CF are used as:

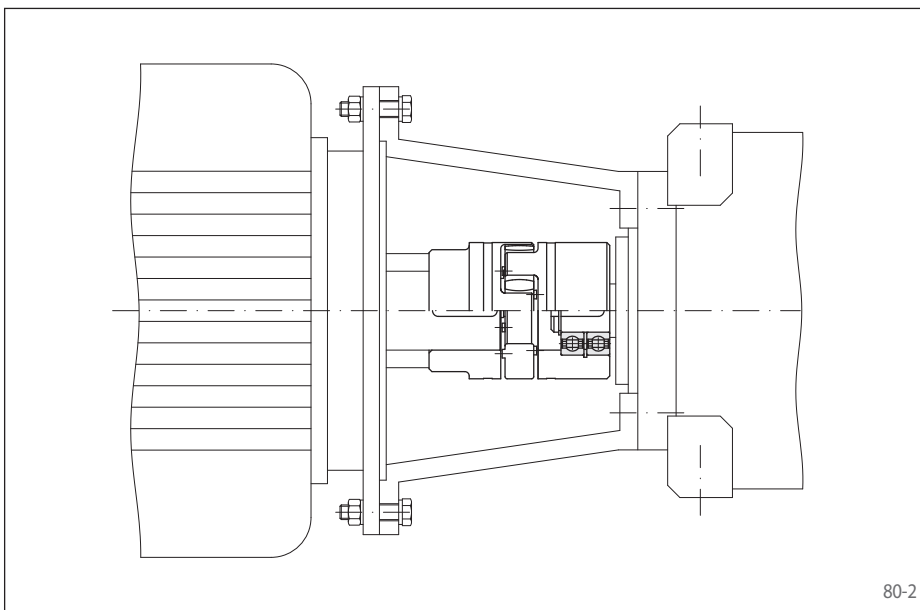
- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

Nominal torques up to 500 Nm. The torque is transmitted on the outer ring by press fit.

Bores up to 60 mm.

## Application example

Two Internal Freewheels FCN 30 K in parallel arrangement as overrunning freewheels in the drive of the roof brush of an automatic car washing facility. The freewheels are arranged in the hub of a shaft coupling that connects the motor and the reduction gear. The freewheels prevent the drive from pushing the roof brush uncontrolled down onto the car roof in the event of a fault. The roof brush is raised by the freewheels that are working in driving operation. The direction of motor rotation changes in order to lower the brush. The downwards movement of the roof brush is performed by its own weight at the speed specified by the motor. In the case of an uncontrolled lowering of the roof brush on the car roof, the drive is automatically disengaged via the freewheel. The brush rests on the roof under its own weight, while the freewheel which is working in driving operation enables the drive to continue to turn in the lowering direction without causing any damage.

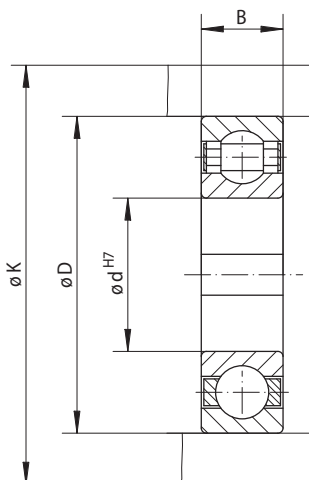


80-2



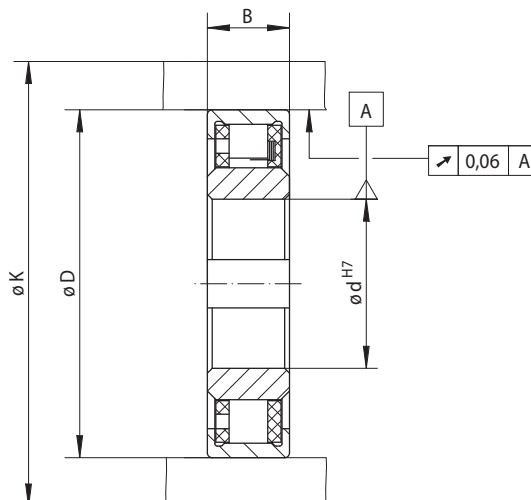
# Internal Freewheels FCN ... K/CF

for press fit on the outer ring  
with sprags



Size FCN 20 to FCN 30

81-1



Size FCN 35 to FCN 60

81-2

<div>Indexing Freewheel</div> <div>Overrunning Clutch</div> <div>Backstop</div>	Standard type					Dimensions					
	For universal use										
Freewheel Size	Type	Nominal torque Nm	Max. speed Inner ring freewheels/ overruns min <sup>-1</sup>	Max. speed Outer ring freewheels/ overruns min <sup>-1</sup>	Load rating of bearing support		Bore d  mm	B  mm	D  mm	K  mm	Weight  kg
FCN 20	K	65	3 375	3 450	dynamic C N	static C <sub>0</sub> N	20	14	47	54	0,12
FCN 25	K	80	2 900	3 050	11 000	7 000	25	15	52	60	0,14
FCN 30	K	110	2 525	2 675	15 000	10 000	30	16	62	70	0,22
FCN 35	CF	200	1 475	1 775	without bearing support		35	17	72	80	0,31
FCN 40	CF	260	1 250	1 600	without bearing support		40	18	80	90	0,39
FCN 45	CF	300	1 150	1 525	without bearing support		45	19	85	96	0,44
FCN 50	CF	330	1 100	1 475	without bearing support		50	20	90	100	0,49
FCN 55	CF	420	1 000	1 400	without bearing support		55	21	100	112	0,62
FCN 60	CF	500	950	1 350	without bearing support		60	22	110	122	0,81

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

The maximum speed values listed above apply to installation conditions as they are given for Complete Freewheels. If the actual installation conditions are known, higher speeds may be permitted under certain circumstances.

Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.

## Mounting

The freewheels FCN ... CF (sizes 35 to 60) 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 torque is transmitted on the outer ring by press fit. In order to transmit the torques specified in the table, the outer ring must be accommodated in a housing with an external diameter K. The housing is made of steel or grey cast iron in minimum quality GG-20. When using other housing materials or smaller external diameters, we urge you to contact us regarding the transmissible torque.

The tolerance of the housing bore D must be ISO H7 or J6 and the tolerance of the shaft must be ISO h6 or j6.

The permissible operating temperature of the freewheel is -40°C to 80°C.

## Lubrication

The freewheels FCN ... K (sizes 20 to 30) are supplied grease-filled for normal operating conditions. However, the freewheels can also be connected to the customer's oil lubrication system; this is particularly recommended in the case of higher speeds.

In the case of the freewheels FCN ... CF (sizes 35 to 60), an oil lubrication of the specified quality must be provided.

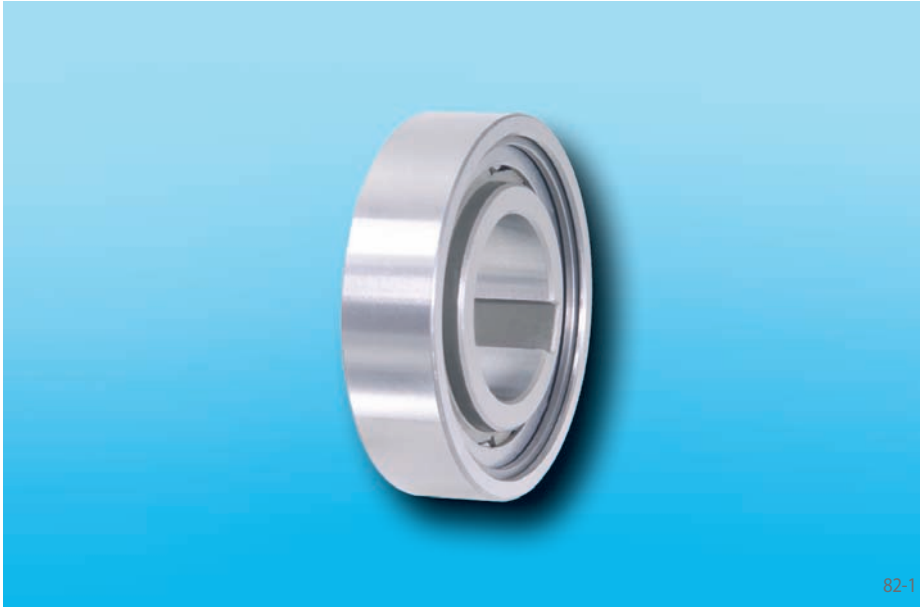
## Example for ordering

Freewheel size FCN 40, standard type:

- FCN 40 CF

# Internal Freewheels FCN ... R

for press fit on the outer ring  
with rollers



82-1

## Features

Internal Freewheels FCN ... R are roller free-wheels without bearing support and with series 62 ball bearing dimensions.

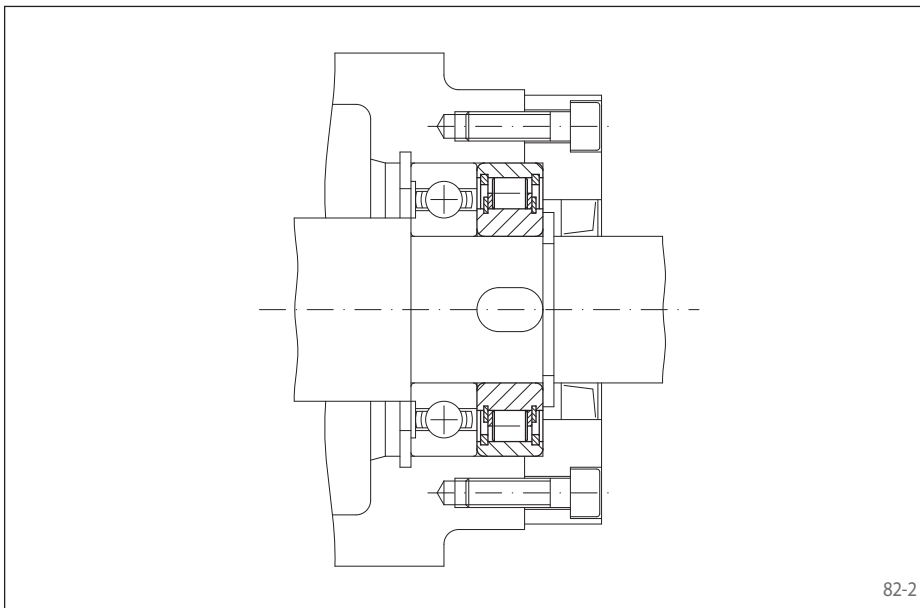
The outer ring is pressed into the customer housing. This makes compact, space-saving fitting solutions possible.

The freewheels FCN ... R are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

Nominal torques up to 840 Nm. The torque is transmitted on the outer ring by press fit.

Bores up to 80 mm.



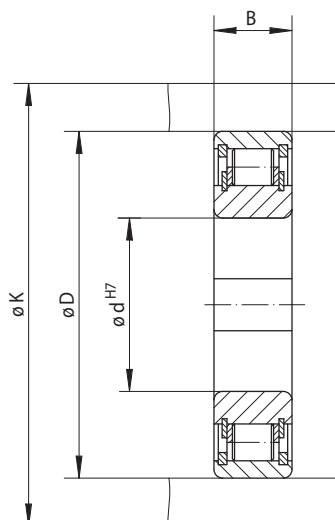
82-2

## Application example

Internal Freewheel FCN 45 R as a backstop fitted to the end of the intermediate shaft of a spur gearbox in the drive of a chain conveyor. In the case of a motor stop, the conveyor must be held securely so that the conveyor goods do not pull backwards. The thin outer ring that is pressed into the housing enables a space-efficient fitting solution.

# Internal Freewheels FCN ... R

for press fit on the outer ring  
with rollers



83-1

	Standard type For universal use	Dimensions
Indexing Freewheel		
Overrunning Clutch		
Backstop		

Freewheel Size	Type	Nominal torque Nm	Max. speed		Bore d mm	B mm	D mm	K mm	Weight kg
			Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>					
FCN 8	R	3,2	4300	6700	8	8	24	28	0,02
FCN 10	R	7,3	3500	5300	10	9	30	35	0,03
FCN 12	R	11,0	3200	5000	12	10	32	37	0,05
FCN 15	R	12,0	2800	4400	15*	11	35	40	0,08
FCN 20	R	40,0	2200	3300	20*	14	47	54	0,12
FCN 25	R	50,0	1900	2900	25*	15	52	60	0,15
FCN 30	R	90,0	1600	2400	30*	16	62	70	0,24
FCN 35	R	135,0	1350	2100	35*	17	72	80	0,32
FCN 40	R	170,0	1200	1900	40*	18	80	90	0,40
FCN 45	R	200,0	1150	1750	45*	19	85	96	0,45
FCN 50	R	220,0	1050	1650	50*	20	90	100	0,50
FCN 60	R	420,0	850	1350	60*	22	110	122	0,80
FCN 80	R	840,0	690	1070	80*	26	140	155	1,40

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

\* Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.

## Mounting

Internal freewheels FCN ... R are without bearing support. Concentric alignment of inner and outer ring must be provided by the customer.

The torque is transmitted on the outer ring by press fit. In order to transmit the torques specified in the table, the outer ring must be accommodated in a housing with an external diameter K. The housing is made of steel or grey cast iron in minimum quality GG-20. When using other housing materials or smaller external diameters, we urge you to contact us regarding the transmissible torque.

The tolerance of the housing bore D must be ISO H7 or J6 and the tolerance of the shaft must be ISO h6 or j6.

## Lubrication

An oil lubrication of the specified quality must be provided.

## Example for ordering

Freewheel size FCN 30, standard type:

- FCN 30 R

# Internal Freewheels FDN

for press fit on the outer ring  
with sprags, available in three types



84-1

## Features

Internal Freewheels FDN are sprag freewheels with anti-friction bearing dimensions.

The freewheels FDN are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

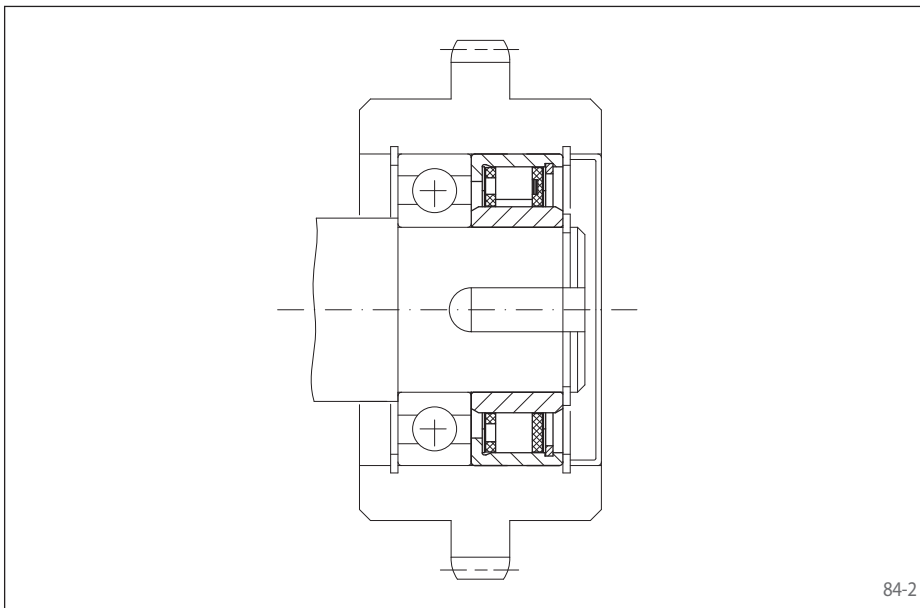
The standard type and the type with P-grinding for increased service life and indexing accuracy do not have bearing support. In the case of the standard type, every second sprag has been replaced by a cylindrical roller; this freewheel can accept radial forces.

Nominal torques up to 2 400 Nm. The torque is transmitted on the outer ring by press fit.

Bores up to 80 mm. Many standard bores are available.

## Application example

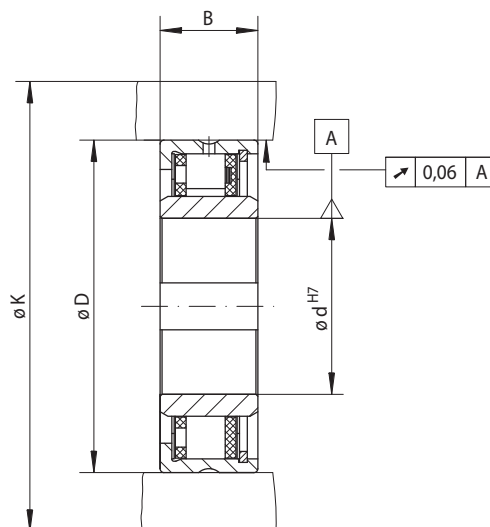
Internal Freewheel FDN 40 CFR in standard type with bearing support as an overrunning clutch on the shaft end of the main drive of a textile machine. The gear wheel is linked to an auxiliary drive. In normal operation (freewheeling operation) the inner ring overruns and the gear wheel with the pressed-in outer ring is at a standstill. During set-up, the machine is driven by the slowly running auxiliary drive via the gear wheel and the freewheel that is working in driving operation.



84-2

# Internal Freewheels FDN

for press fit on the outer ring  
with sprags, available in three types



85-1

Indexing Freewheel Overrunning Clutch Backstop	Standard type For universal use	Standard type with bearing support For universal use	Type with P-grinding For extended service life and indexing accuracy	Dimensions

Freewheel Size	Type	Nominal torque Nm	Max. speed		Type	Nominal torque Nm	Max. speed		Load rating of bearing support		Type	Nominal torque Nm	Bore d			B mm	D mm	K mm	Weight kg
			Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>			Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>	dynamic C N	static C <sub>0</sub> N			Standard mm	max. mm	mm				
FDN 15	CFH	16	3875	3925	CFR	8	3875	3925	7800	4200	CFP	7	8	8	8	20	37	50	0,1
FDN 20	CFH	28	3375	3450	CFR	14	3375	3450	8300	4200	CFP	12	12	12	12	20	42	55	0,1
FDN 25	CFH	48	2900	3050	CFR	24	2900	3050	10700	5600	CFP	21	15	15	15	20	47	60	0,1
FDN 30	CFH	75	2525	2675	CFR	36	2525	2675	12900	7000	CFP	32	20*	20*	20*	20	52	65	0,2
FDN 40	CFH	160	1900	2150	CFR	71	1900	2150	15000	8400	CFP	71	25	28*	28*	22	62	80	0,2
FDN 50	CFH	260	1475	1775	CFR	120	1475	1775	18400	11300	CFP	120	30	35	35	22	72	95	0,4
FDN 65	CFH	430	1200	1550	CFR	200	1200	1550	21400	14100	CFP	210	40	50*	50*	25	90	120	0,7
FDN 80	CFH	650	950	1350	CFR	300	950	1350	23800	17800	CFP	320	50	60	60	25	110	140	1,2
FDN 105	CFH	2400	800	1175	CFR	1100	800	1175	48600	45000	CFP	1200	60	80	80	35	130	165	3,2

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

The maximum speed values listed above apply to installation conditions as they are given for Complete Freewheels. If the actual installation conditions are known, higher speeds may be permitted under certain circumstances.

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

\* Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.

## Mounting

Internal freewheels FDN in standard type and type with P-grinding 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 torque is transmitted on the outer ring by press fit. In order to transmit the torques specified in the table, the outer ring must be accommodated in a housing with an external diameter K. The housing is made of steel or grey cast iron in minimum quality GG-20. When using other housing materials or smaller external diameters, we urge you to contact us regarding the transmissible torque.

The tolerance of the housing bore D must be ISO P6 and the tolerance of the shaft must be ISO h6 or j6.

The permissible operating temperature of the freewheel is -40°C to 80°C.

## Lubrication

An oil lubrication of the specified quality must be provided.

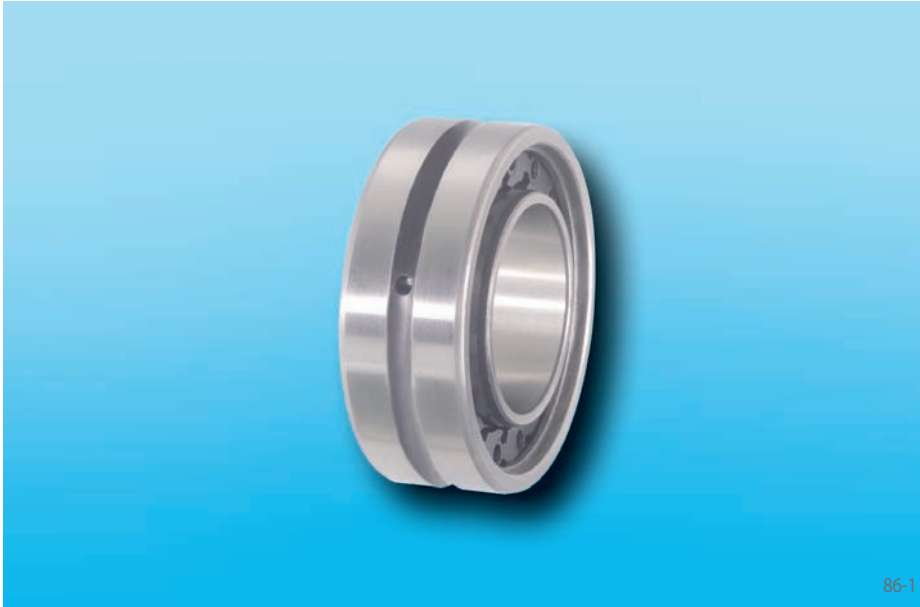
## Example for ordering

Freewheel size FDN 30, type with P-grinding with 20 mm bore:

- FDN 30 CFP, d = 20 mm

# Internal Freewheels FDE

for press fit on the outer ring  
with sprags, available in three types



## Features

Internal Freewheels FDE are sprag freewheels with anti-friction bearing dimensions.

The freewheels FDE are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

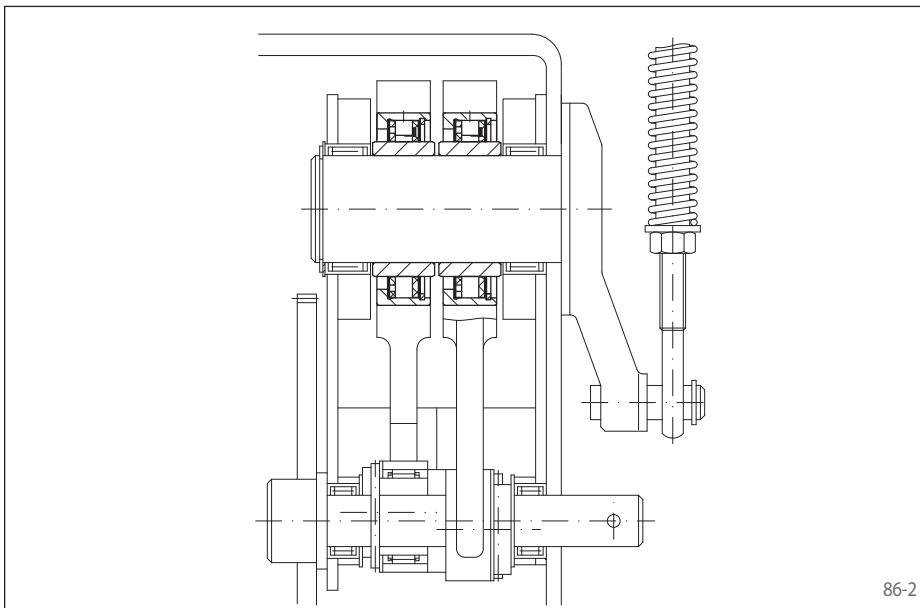
The standard type and the type with P-grinding for increased service life and indexing accuracy do not have bearing support. In the case of the standard type, every second sprag has been replaced by a cylindrical roller; this freewheel can accept radial forces.

Nominal torques up to 2 400 Nm. The torque is transmitted on the inner and outer ring by press fit.

Bores up to 95 mm.

## Application example

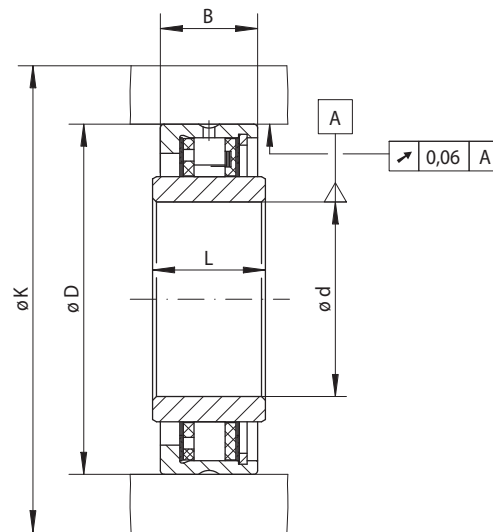
Two Internal Freewheels FDE 65 CFP, type with P-grinding, as indexing freewheels in the spring drive of a high-voltage switch. The contacts of high-voltage switches must be separated from each other within a few milliseconds upon shut down. The abrupt opening is achieved by a pre-tensioned spring. When this is triggered the contacts are pulled apart from each other. After the switch is switched back on, the release spring is retensioned. This is executed by a camshaft that drives two indexing freewheels. This turns the shaft of the release spring at a specified angle in small steps. The solution with indexing freewheels replaces a more expensive reduction gear. The P-grinding type ensures an increased service life and considerable indexing precision.





# Internal Freewheels FDE

for press fit on the outer ring  
with sprags, available in three types



87-1

Indexing Freewheel Overrunning Clutch Backstop	Standard type For universal use	Standard type with bearing support For universal use	Type with P-grinding For extended service life and indexing accuracy	Dimensions

Freewheel Size	Type	Nominal torque Nm	Max. speed Inner ring freewheels/ overruns min <sup>-1</sup>	Max. speed Outer ring freewheels/ overruns min <sup>-1</sup>	Type	Nominal torque Nm	Max. speed Inner ring freewheels/ overruns min <sup>-1</sup>	Max. speed Outer ring freewheels/ overruns min <sup>-1</sup>	Load rating of bearing support dynamic C N	Load rating of bearing support static C <sub>0</sub> N	Type	Nominal torque Nm	Bore d mm	B mm	D mm	K mm	L mm	Weight kg
FDE 12	CFH	11	4 225	4 250	CFR	6	4 225	4 250	7 600	4 200	CFP	5	8	16	34	45	12,5	0,1
FDE 15	CFH	16	3 875	3 925	CFR	8	3 875	3 925	7 800	4 200	CFP	7	10	20	37	50	16	0,1
FDE 20	CFH	28	3 375	3 450	CFR	14	3 375	3 450	8 300	4 200	CFP	12	15	20	42	55	16	0,1
FDE 25	CFH	48	2 900	3 050	CFR	24	2 900	3 050	10 700	5 600	CFP	21	20	20	47	60	20	0,1
FDE 30	CFH	75	2 525	2 675	CFR	36	2 525	2 675	12 900	7 000	CFP	32	25	20	52	65	20	0,1
FDE 40	CFH	160	1 900	2 150	CFR	71	1 900	2 150	15 000	8 400	CFP	71	35	22	62	80	22	0,2
FDE 50	CFH	260	1 475	1 775	CFR	120	1 475	1 775	18 400	11 300	CFP	120	45	22	72	95	20	0,3
FDE 65	CFH	430	1 200	1 550	CFR	200	1 200	1 550	21 400	14 100	CFP	210	55	25	90	120	28	0,6
FDE 80	CFH	650	950	1 350	CFR	300	950	1 350	23 800	17 800	CFP	320	70	25	110	140	25	0,8
FDE 105	CFH	2 400	800	1 175	CFR	1 100	800	1 175	48 600	45 000	CFP	1 200	95	35	130	165	36	1,1

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

The maximum speed values listed above apply to installation conditions as they are given for Complete Freewheels. If the actual installation conditions are known, higher speeds may be permitted under certain circumstances.

## Mounting

Internal freewheels FDE in standard type and type with P-grinding 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 torque is transmitted on the inner and outer ring by press fit. In order to transmit the torques specified in the table, the outer ring must be accommodated in a housing with an external diameter K. The housing is made of steel or grey cast iron in minimum quality GG-20. When using other housing materials or smaller external diameters, we urge you to contact us regarding the transmissible torque.

The tolerance of the housing bore D must be ISO P6 and the tolerance of the shaft must be ISO p6.

The permissible operating temperature of the freewheel is -40°C to 80°C.

## Lubrication

An oil lubrication of the specified quality must be provided.

## Example for ordering

Freewheel size FDE 50, standard type with bearing support:

- FDE 50 CFR

# Internal Freewheels FD

for press fit on the outer ring  
with sprags, available in three types



88-1

## Features

Internal Freewheels FD are sprag freewheels without an inner ring. The customer's hardened and ground shaft is used as the inner track.

The freewheels FD are used as:

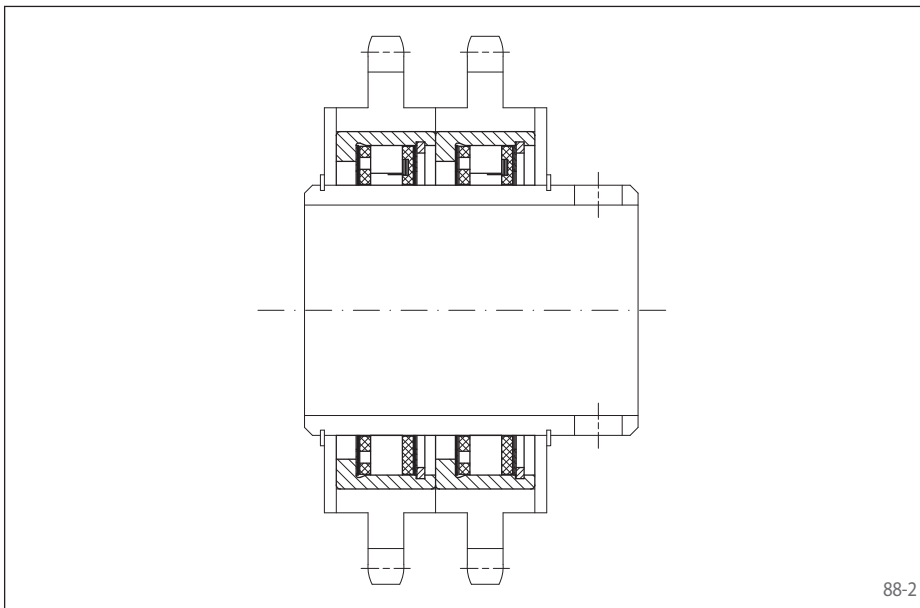
- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

The standard type and type with P-grinding for increased service life and indexing accuracy do not have bearing support. In the case of the standard type, every second sprag has been replaced by a cylindrical roller; this freewheel can accept radial forces.

Nominal torques up to 2 400 Nm. The torque is transmitted on the outer ring by press fit.

## Application example

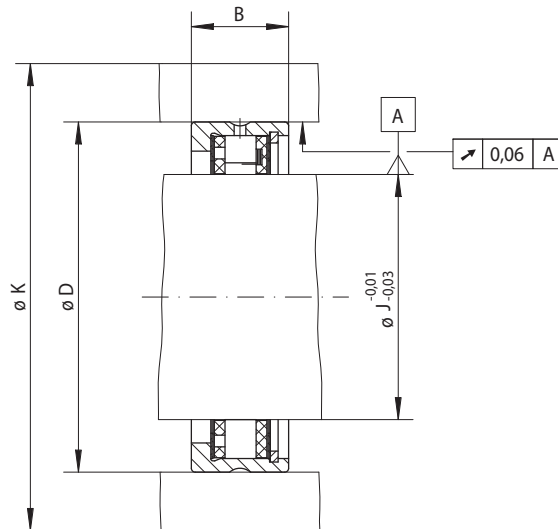
Two Internal Freewheels FD 40 CFR of standard type with bearing support as overrunning clutches in the drive of the transport rollers in a packaging distribution unit. In normal operation, the transport rollers are driven by means of the freewheels that are working in driving operation. At the withdrawal station, the arriving packages can easily slip off as the drive is overrun by the freewheel (freewheeling operation).



88-2

# Internal Freewheels FD

for press fit on the outer ring  
with sprags, available in three types



89-1

	Standard type For universal use	Standard type with bearing support For universal use	Type with P-grinding For extended service life and indexing accuracy	Dimensions
Indexing Freewheel				
Overrunning Clutch				
Backstop				

Freewheel Size	Type	Nominal torque Nm	Max. speed Inner ring freewheels/ overruns min <sup>-1</sup>	Max. speed Outer ring freewheels/ overruns min <sup>-1</sup>	Type	Nominal torque Nm	Max. speed Inner ring freewheels/ overruns min <sup>-1</sup>	Max. speed Outer ring freewheels/ overruns min <sup>-1</sup>	Load rating of bearing support dynamic C N	Load rating of bearing support static C <sub>0</sub> N	Type	Nominal torque Nm	J mm	B mm	D mm	K mm	Weight kg
FD 12	CFH	11	4225	4250	CFR	6	4225	4250	7600	4200	CFP	5	12	16	34	45	0,1
FD 15	CFH	16	3875	3925	CFR	8	3875	3925	7800	4200	CFP	7	15	20	37	50	0,1
FD 20	CFH	28	3375	3450	CFR	14	3375	3450	8320	4200	CFP	12	20	20	42	55	0,1
FD 25	CFH	48	2900	3050	CFR	24	2900	3050	10700	5600	CFP	21	25	20	47	60	0,1
FD 30	CFH	75	2525	2675	CFR	36	2525	2675	12900	7000	CFP	32	30	20	52	65	0,1
FD 40	CFH	160	1900	2150	CFR	71	1900	2150	15000	8400	CFP	71	40	22	62	80	0,1
FD 50	CFH	260	1475	1775	CFR	120	1475	1775	18400	11300	CFP	120	50	22	72	95	0,2
FD 65	CFH	430	1200	1550	CFR	200	1200	1550	21400	14100	CFP	210	65	25	90	120	0,3
FD 80	CFH	650	950	1350	CFR	300	950	1350	23800	17800	CFP	320	80	25	110	140	0,6
FD 105	CFH	2400	800	1175	CFR	1100	800	1175	48600	45000	CFP	1200	105	35	130	165	0,7

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

The maximum speed values listed above apply to installation conditions as they are given for Complete Freewheels. If the actual installation conditions are known, higher speeds may be permitted under certain circumstances.

## Mounting

Internal freewheels FD in type standard and type with P-grinding 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 torque is transmitted on the outer ring by press fit. In order to transmit the torques specified in the table, the outer ring must be accommodated in a housing with an external diameter K. The housing is made of steel or grey cast iron in minimum quality GG-20. When using other housing materials or smaller external diameters, we urge you to contact us regarding the transmissible torque.

The tolerance of the housing bore D must be ISO P6.

Please note the instructions on page 106 regarding the sprag track (shaft).

The permissible operating temperature of the freewheel is -40°C to 80°C.

## Lubrication

An oil lubrication of the specified quality must be provided.

## Example for ordering

Freewheel size FD 12, standard type:

- FD 12 CFH

# Internal Freewheels ZZ ...

with ball bearing properties



90-1

## Features

Internal Freewheels ZZ ... are sprag freewheels with bearing support and ball bearing properties. The freewheels are supplied grease-filled for normal operating conditions.

The freewheel is built into the customer housing. This makes compact, space-saving fitting solutions possible.

The freewheels ZZ ... are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

Nominal torques up to 325 Nm. The torque is transmitted on the inner ring and/or on the outer ring by press fit or keyway connection.

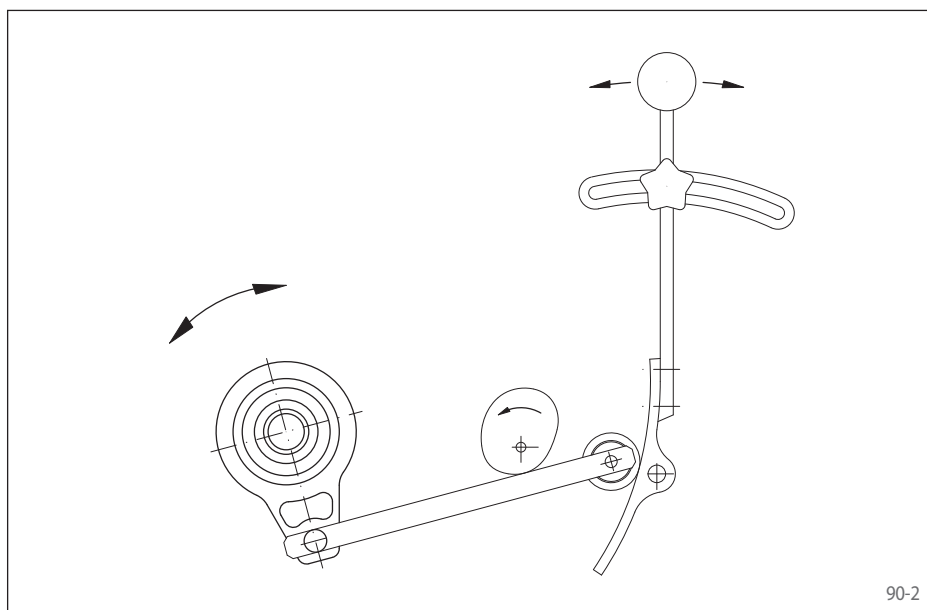
Bores up to 40 mm.

The following series are available:

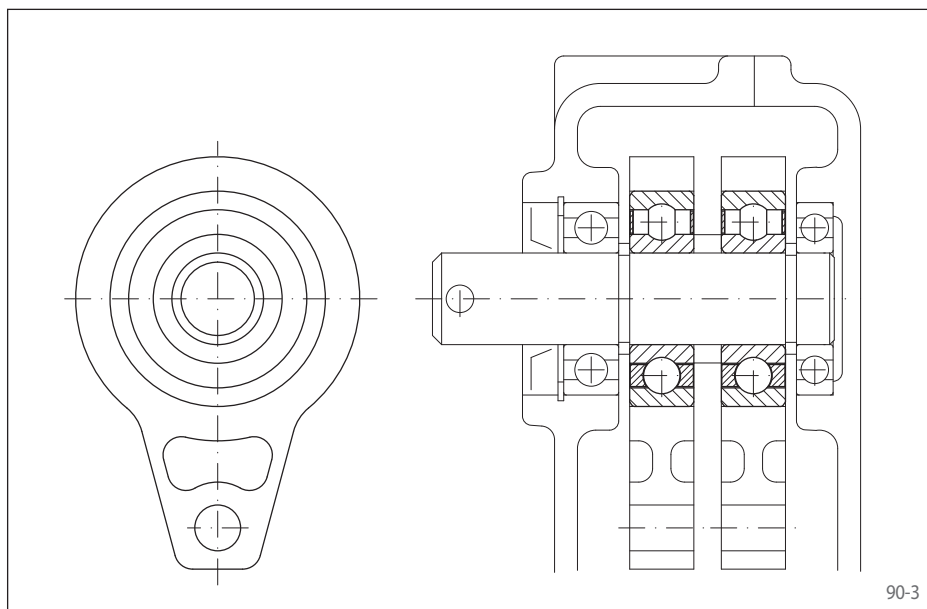
Series	Torque transmission on				2RS-seals	Page
	Outer ring by		Inner ring by			
	keyway	press fit	keyway	press fit		
ZZ		●		●		91
ZZ ... 2RS		●		●	●	92
ZZ ... P2RS		●	●	●	●	93
ZZ ... P		●	●	●		94
ZZ ... PP	●		●			95

The Internal Freewheels ZZ of the sizes ZZ 6201 to ZZ 6207 have the same dimensions as the respective ball bearings of series 62.

The series ZZ .... 2RS and ZZ ... P2RS have 2RS seals.



90-2



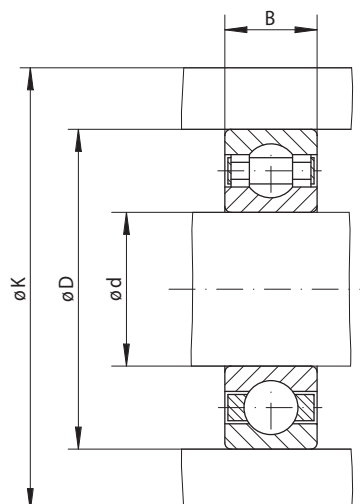
90-3

## Application example

Two Internal Freewheels ZZ 6206 as indexing freewheels in the drive of the metering roller of a seed spreader. The freewheels are built in an infinitely variable oil bath gearbox. Two cam disks that are set off by 180° are arranged on the gearbox shaft. By means of lever arms, these drive the outer rings of the two adjacent Internal Freewheels, which then gradually turn the metering shaft. The infinite speed settings of the gearbox's drive shaft are executed by means of the respective pivoting of the roller support plate, so that the lever arms can execute lifts of differing amounts.

# Internal Freewheels ZZ

for press fit on the outer ring  
with sprags and bearing support



91-1

Standard type For universal use					Dimensions				
Freewheel Size					Bore d	B	D	K	Weight
Nominal torque Nm					mm	mm	mm	mm	kg
Maximum speed min <sup>-1</sup>									
Load rating of bearing support									
dynamic C N									
static C <sub>0</sub> N									
ZZ 8	2,5	15 000	3 200	860	8	9	22	27	0,02
ZZ 6201	9,3	10 000	6 100	2 700	12	10	32	39	0,04
ZZ 6202	26,0	9 400	6 000	3 700	15	11	35	42	0,06
ZZ 6203	34,0	8 200	7 350	4 550	17	12	40	51	0,08
ZZ 6204	65,0	6 800	10 000	6 300	20	14	47	58	0,12
ZZ 6205	80,0	5 600	11 000	7 000	25	15	52	63	0,15
ZZ 6206	170,0	4 000	15 000	10 000	30	16	62	73	0,25
ZZ 6207	175,0	3 600	12 500	7 200	35	17	72	85	0,30
ZZ 40	325,0	3 000	15 500	12 250	40	22	80	94	0,50

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

## Mounting

The torque is transmitted on the inner and outer ring by press fit. In order to transmit the torques specified in the table, the outer ring must be accommodated in a housing with an external diameter K. The housing is made of steel or grey cast iron in minimum quality GG-20. When using other housing materials or smaller external diameters, we urge you to contact us regarding the transmissible torque.

The tolerance of the housing bore D must be ISO N6 and the tolerance of the shaft must be ISO n6.

The permissible operating temperature of the freewheel is -40°C to 80°C.

## Lubrication

The freewheels are supplied grease-filled for normal operating conditions.

However, the freewheels can also be connected to the customer's oil lubrication system; this is particularly recommended in the case of higher speeds.

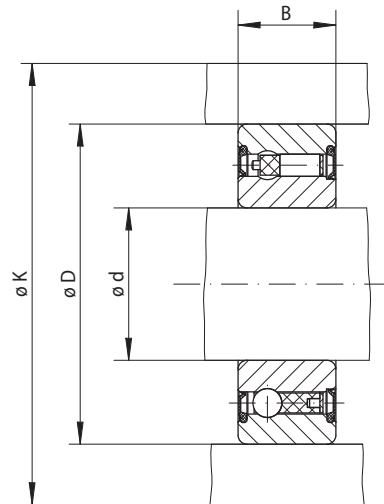
## Example for ordering

Freewheel size ZZ 6202, standard type:

- ZZ 6202

# Internal Freewheels ZZ ... 2RS

for press fit on the outer ring  
with sprags, bearing support and sealing



92-1

Indexing Freewheel Overrunning Clutch Backstop	Standard type For universal use	Dimensions

Freewheel Size	Nominal torque Nm	Maximum speed min <sup>-1</sup>	Load rating of bearing support		Bore d mm	B mm	D mm	K mm	Weight kg
			dynamic C N	static C <sub>0</sub> N					
ZZ 12 2RS	9,3	10 000	6 100	2 800	12	14	32	39	0,05
ZZ 15 2RS	17,0	8 400	7 400	3 400	15	16	35	42	0,07
ZZ 17 2RS	31,0	7 350	7 900	3 800	17	17	40	51	0,09
ZZ 20 2RS	50,0	6 000	9 400	4 500	20	19	47	58	0,15
ZZ 25 2RS	85,0	5 200	10 700	5 500	25	20	52	63	0,18
ZZ 30 2RS	138,0	4 200	11 700	6 500	30	21	62	73	0,27
ZZ 35 2RS	175,0	3 600	12 600	7 300	35	22	72	85	0,40
ZZ 40 2RS	325,0	3 000	15 500	12 300	40	27	80	94	0,60

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

## Mounting

The torque is transmitted on the inner and outer ring by press fit. In order to transmit the torques specified in the table, the outer ring must be accommodated in a housing with an external diameter K. The housing is made of steel or grey cast iron in minimum quality GG-20. When using other housing materials or smaller external diameters, we urge you to contact us regarding the transmissible torque.

The tolerance of the housing bore D must be ISO N6 and the tolerance of the shaft must be ISO n6.

The permissible operating temperature of the freewheel is -40°C to 100 °C, briefly up to 120°C.

## Lubrication

The freewheels are supplied grease-filled and with 2 RS seals.

## Example for ordering

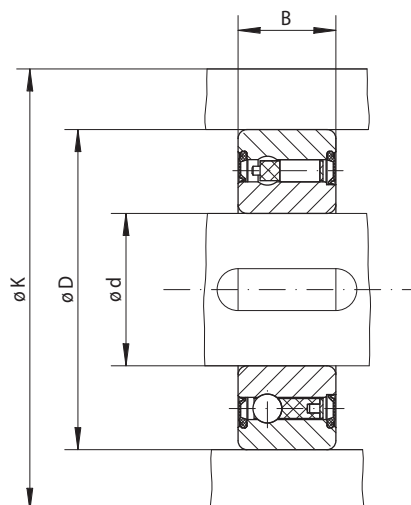
Freewheel size ZZ 17 2RS, standard type:

- ZZ 17 2RS



# Internal Freewheels ZZ ... P2RS

for press fit on the outer ring  
with sprags, bearing support and sealing



93-1

Standard type For universal use					Dimensions				
Indexing Freewheel Overrunning Clutch Backstop									
Freewheel Size	Nominal torque Nm	Maximum speed min <sup>-1</sup>	Load rating of bearing support		Bore d mm	B mm	D mm	K mm	Weight kg
ZZ 20 P2RS	50	6 000	dynamic C N	static C <sub>0</sub> N	20	19	47	58	0,15
ZZ 25 P2RS	85	5 200	10 700	5 500	25	20	52	63	0,18
ZZ 30 P2RS	138	4 200	11 700	6 500	30	21	62	73	0,30

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.  
Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.

## Mounting

The torque is transmitted on the inner ring by keyway connection and on the outer ring by press fit. In order to transmit the torques specified in the table, the outer ring must be accommodated in a housing with an external diameter K. The housing is made of steel or grey cast iron in minimum quality GG-20. When using other housing materials or smaller external diameters, we urge you to contact us regarding the transmissible torque.

The tolerance of the housing bore D must be ISO N6 and the tolerance of the shaft must be ISO k6.

The permissible operating temperature of the freewheel is -40°C to 100 °C, briefly up to 120°C.

## Lubrication

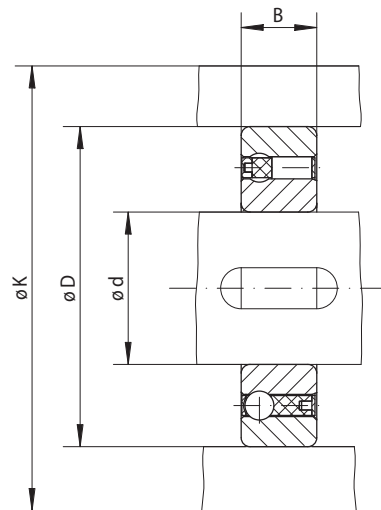
The freewheels are supplied grease-filled and with 2 RS seals.

## Example for ordering

Freewheel size ZZ 25 P2RS, standard type:  
• ZZ 25 P2RS

# Internal Freewheels ZZ ... P

for press fit on the outer ring  
with sprags and bearing support



94-1

Indexing Freewheel Overrunning Clutch Backstop	Standard type For universal use	Dimensions

Freewheel Size	Nominal torque Nm	Maximum speed min <sup>-1</sup>	Load rating of bearing support		Bore d mm	B mm	D mm	K mm	Weight kg
			dynamic C N	static C <sub>0</sub> N					
ZZ 6202 P	17	8400	7400	3400	15*	11	35	42	0,06
ZZ 6203 P	31	7350	7900	3800	17*	12	40	51	0,07
ZZ 6204 P	50	6000	9400	4500	20*	14	47	58	0,11
ZZ 6205 P	85	5200	10700	5500	25*	15	52	63	0,14
ZZ 6206 P	138	4200	11700	6500	30*	16	62	73	0,21
ZZ 6207 P	175	3600	12600	7300	35*	17	72	85	0,30
ZZ 40 P	325	3000	15500	12300	40	22	80	94	0,50

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

\* Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.

## Mounting

The torque is transmitted on the inner ring by keyway connection and on the outer ring by press fit. In order to transmit the torques specified in the table, the outer ring must be accommodated in a housing with an external diameter K. The housing is made of steel or grey cast iron in minimum quality GG-20. When using other housing materials or smaller external diameters, we urge you to contact us regarding the transmissible torque.

The tolerance of the housing bore D must be ISO N6 and the tolerance of the shaft must be ISO k6.

The permissible operating temperature of the freewheel is -40°C to 100 °C, briefly up to 120°C.

## Lubrication

The freewheels are supplied grease-filled.

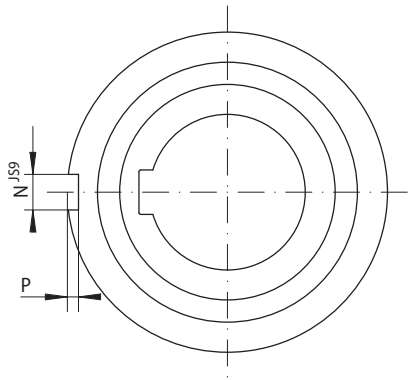
## Example for ordering

Freewheel size ZZ 6203 P, standard type:

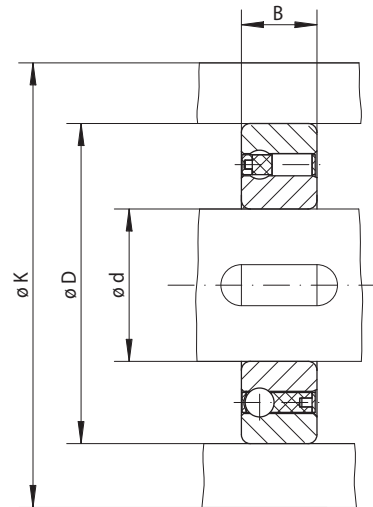
- ZZ 6203 P

# Internal Freewheels ZZ ... PP

for keyway connection on the outer ring  
with sprags and bearing support



95-1



95-2

	Standard type For universal use		Dimensions	
	Indexing Freewheel	Overrunning Clutch	Backstop	

Freewheel Size	Nominal torque Nm	Maximum speed min <sup>-1</sup>	Load rating of bearing support		Bore d mm	B mm	D mm	K mm	N mm	P mm	Weight kg
			dynamic C N	static C <sub>0</sub> N							
ZZ 6202 PP	17	8 400	7 400	3 400	15*	11	35	42	2	0,6	0,06
ZZ 6203 PP	31	7 350	7 900	3 800	17*	12	40	51	2	1,0	0,07
ZZ 6204 PP	50	6 000	9 400	4 500	20*	14	47	58	3	1,5	0,11
ZZ 6205 PP	85	5 200	10 700	5 500	25*	15	52	63	6	2,0	0,14
ZZ 6206 PP	138	4 200	11 700	6 500	30*	16	62	73	6	2,0	0,21
ZZ 6207 PP	175	3 600	12 600	7 300	35*	17	72	85	8	2,5	0,30
ZZ 40 PP	325	3 000	15 500	12 300	40	22	80	94	10	3,0	0,50

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

\* Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.

## Mounting

The torque is transmitted on the inner and on the outer ring by keyway connection. In order to transmit the torques specified in the table, the outer ring must be accommodated in a housing with an external diameter K. The housing is made of steel or grey cast iron in minimum quality GG-20. When using other housing materials or smaller external diameters, we urge you to contact us regarding the transmissible torque.

The tolerance of the housing bore D must be ISO H6 and the tolerance of the shaft must be ISO h6.

The permissible operating temperature of the freewheel is -40°C to 100°C, briefly up to 120°C.

## Lubrication

The freewheels are supplied grease-filled.

## Example for ordering

Freewheel size ZZ 6205 PP, standard type:

- ZZ 6205 PP

# Internal Freewheels FSN

for keyway connection on the outer ring  
with rollers



96-1

## Features

Internal Freewheels FSN are roller freewheels without bearing support.

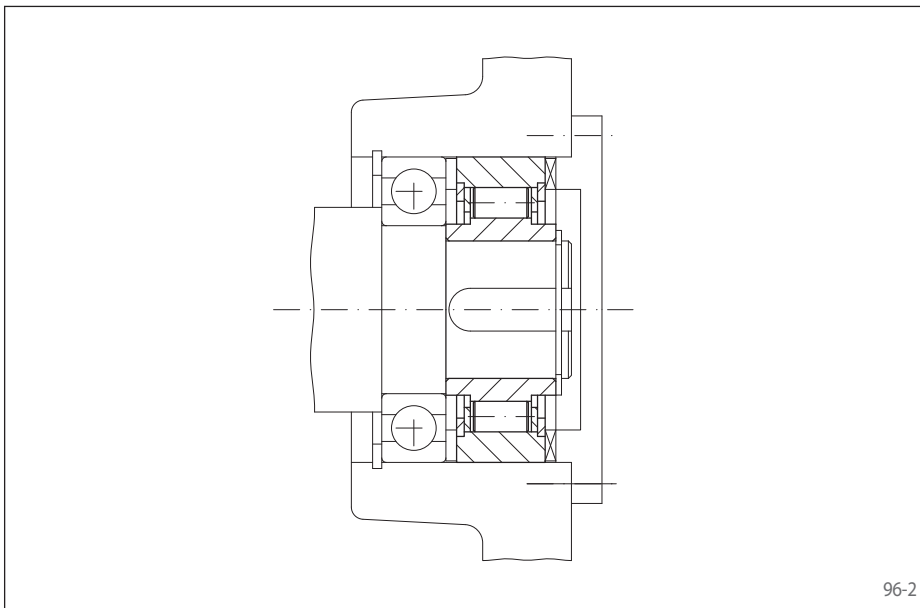
The freewheel is built into the customer housing. This makes compact, space-saving fitting solutions possible.

The freewheels FSN are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

Nominal torques up to 3 000 Nm. The faces of both sides of the outer ring are provided with grooves for torque transmission.

Bores up to 80 mm.



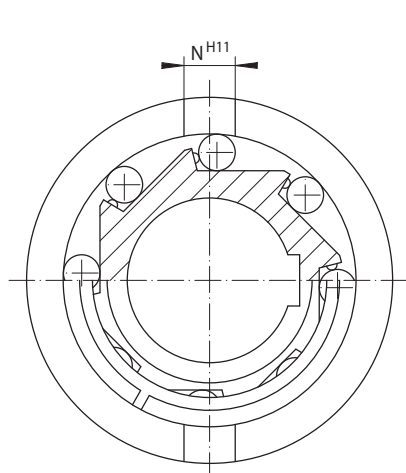
96-2

## Application example

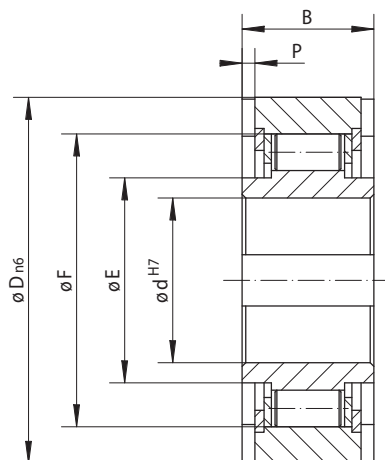
Internal freewheel FSN 50 as backstop fitted to the end of the intermediate shaft of a spur gearbox in the drive of an elevator. In the case of a motor stop, the elevator must be held securely so that the conveyor goods do not pull backwards.

# Internal Freewheels FSN

for keyway connection on the outer ring  
with rollers



97-1



97-2

Indexing Freewheel Overrunning Clutch Backstop	Standard type For universal use	Dimensions

Freewheel Size	Nominal torque Nm	Max. speed Inner ring freewheels/ overruns min <sup>-1</sup>	Max. speed Outer ring freewheels/ overruns min <sup>-1</sup>	Bore d mm	B mm	D mm	E mm	F mm	N mm	P mm	Weight kg
FSN 8	11	3050	4700	8	13	35	18,5	28	4	1,3	0,1
FSN 12	11	3050	4700	12	13	35	18,5	28	4	1,3	0,1
FSN 15	36	2350	3700	15*	18	42	21,0	36	5	1,7	0,1
FSN 17	56	2100	3300	17*	19	47	24,0	40	5	2,0	0,2
FSN 20	90	1750	3200	20*	21	52	29,0	45	6	1,5	0,2
FSN 25	125	1650	3100	25*	24	62	35,0	52	8	2,0	0,4
FSN 30	210	1400	2200	30*	27	72	40,0	60	10	2,5	0,6
FSN 35	306	1250	2150	35*	31	80	47,0	68	12	3,5	0,8
FSN 40	430	1100	2050	40*	33	90	55,0	78	12	3,5	0,9
FSN 45	680	1000	1900	45*	36	100	56,0	85	14	3,5	1,3
FSN 50	910	900	1750	50*	40	110	60,0	92	14	4,5	1,7
FSN 60	1200	750	1450	60*	46	130	75,0	110	18	5,5	2,8
FSN 70	2000	600	1000	70*	51	150	85,0	125	20	6,5	4,2
FSN 80	3000	500	900	80*	58	170	95,0	140	20	7,5	6,0

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

\* Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.

## Mounting

Internal Freewheels FSN are without bearing support. Concentric alignment of inner and outer ring must be provided by the customer.

The tolerance of the housing bore D must be ISO H7 or G7 and the tolerance of the shaft must be ISO h6 or j6.

## Lubrication

An oil lubrication of the specified quality must be provided.

## Example for ordering

Freewheel size FSN 12, standard type:

- FSN 12

# Internal Freewheels FN

for keyway connection on the outer ring  
with rollers



98-1

## Features

Internal Freewheels FN are roller freewheels without bearing support.

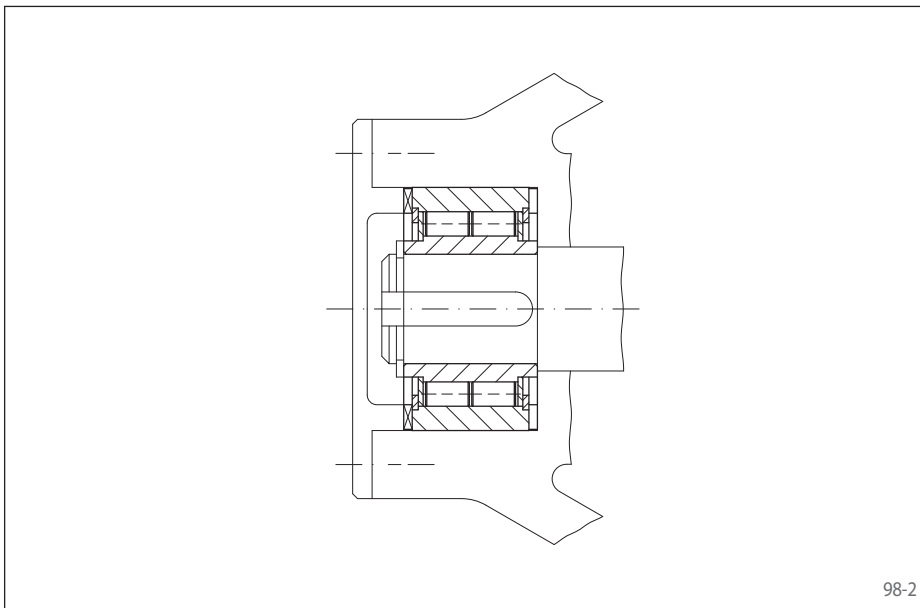
The freewheel is built into the customer housing. This makes compact, space-saving fitting solutions possible.

The freewheels FN are used as:

- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

Nominal torques up to 3 000 Nm. The faces of both sides of the outer ring are provided with grooves for torque transmission.

Bores up to 60 mm.



98-2

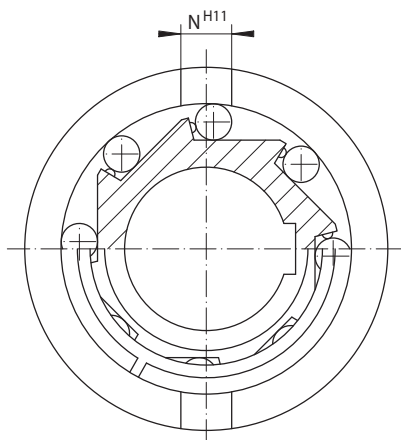
## Application example

Internal freewheel FN 20 as a backstop, on the drive shaft of running gears on a chain conveyor. In normal operation, the drive shaft drives and the freewheel works in freewheeling operation. The freewheel as a backstop prevents the running gears from being able to run backwards uncontrolled in the event of a fault.

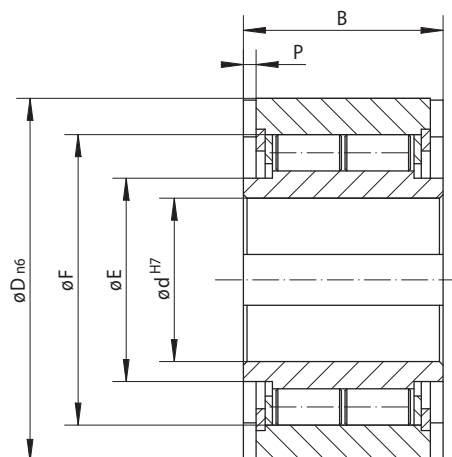


# Internal Freewheels FN

for keyway connection on the outer ring  
with rollers



99-1



99-2

	Standard type For universal use		Dimensions	
	Indexing Freewheel	Overrunning Clutch	Backstop	
	Indexing Freewheel	Overrunning Clutch	Backstop	

Freewheel Size	Nominal torque Nm	Max. speed		Bore d mm	B mm	D mm	E mm	F mm	N mm	P mm	Weight kg
		Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>								
FN 8	18	2800	5400	8	20	37	19	30	6	3,0	0,1
FN 12	18	2800	5400	12	20	37	19	30	6	3,0	0,1
FN 15	50	2500	5100	15	30	47	23	37	7	3,5	0,3
FN 20	112	1900	4350	20	36	62	35	50	8	6,5	0,6
FN 25	220	1550	3350	25	40	80	40	68	9	4,0	1,1
FN 30	410	1400	3050	30	48	90	45	75	12	5,0	1,6
FN 35	500	1300	2850	35	53	100	50	80	13	6,0	2,3
FN 40	750	1150	2500	40	63	110	55	90	15	7,0	3,1
FN 45	1020	1100	2400	45	63	120	60	95	16	7,0	3,7
FN 50	1900	950	2050	50	80	130	70	110	17	8,5	5,3
FN 55	2000	900	1900	55	80	140	75	115	18	9,0	6,0
FN 60	3000	800	1800	60	95	150	80	125	18	9,0	8,4

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.  
Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

## Mounting

Internal Freewheels FN are without bearing support. Concentric alignment of inner and outer ring must be provided by the customer.

The tolerance of the housing bore D must be ISO H7 or G7 and the tolerance of the shaft must be ISO h6 or j6.

## Lubrication

An oil lubrication of the specified quality must be provided.

## Example for ordering

Freewheel size FN 45, standard type:  
• FN 45

# Internal Freewheels FNR

for keyway connection on the outer ring  
with rollers and bearing



100-1

## Features

Internal Freewheels FNR are roller freewheels with bearing support. The freewheels of sizes 8 to 20 have a sleeve bearing. The sizes 25 to 60 have ball bearings, these enable higher speeds in freewheeling operation.

The freewheel is built into the customer housing. This makes compact, space-saving fitting solutions possible.

The freewheels FNR are used as:

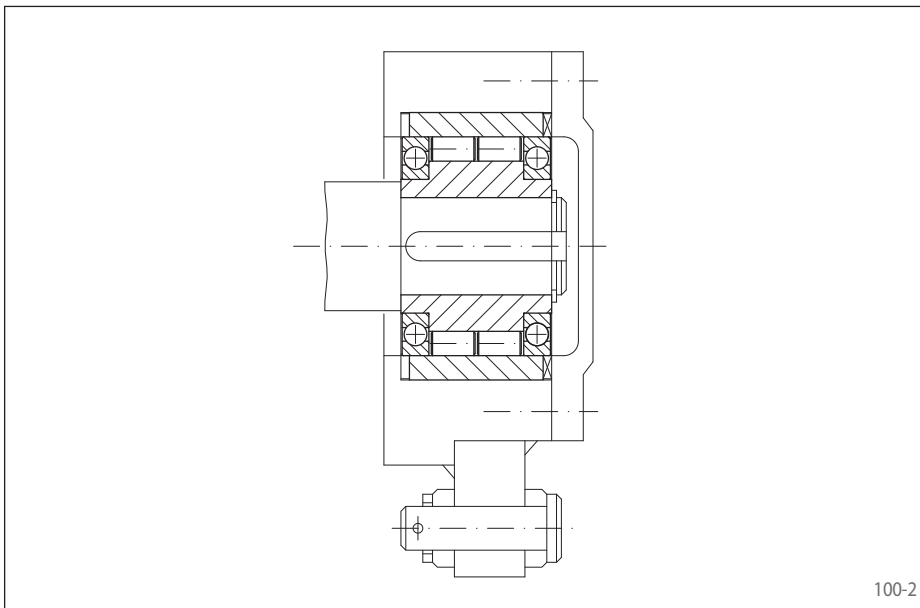
- ▶ Backstops
- ▶ Overrunning Clutches
- ▶ Indexing Freewheels

Nominal torques up to 3 000 Nm. The faces of both sides of the outer ring are provided with grooves for torque transmission.

Bores up to 60 mm.

## Application example

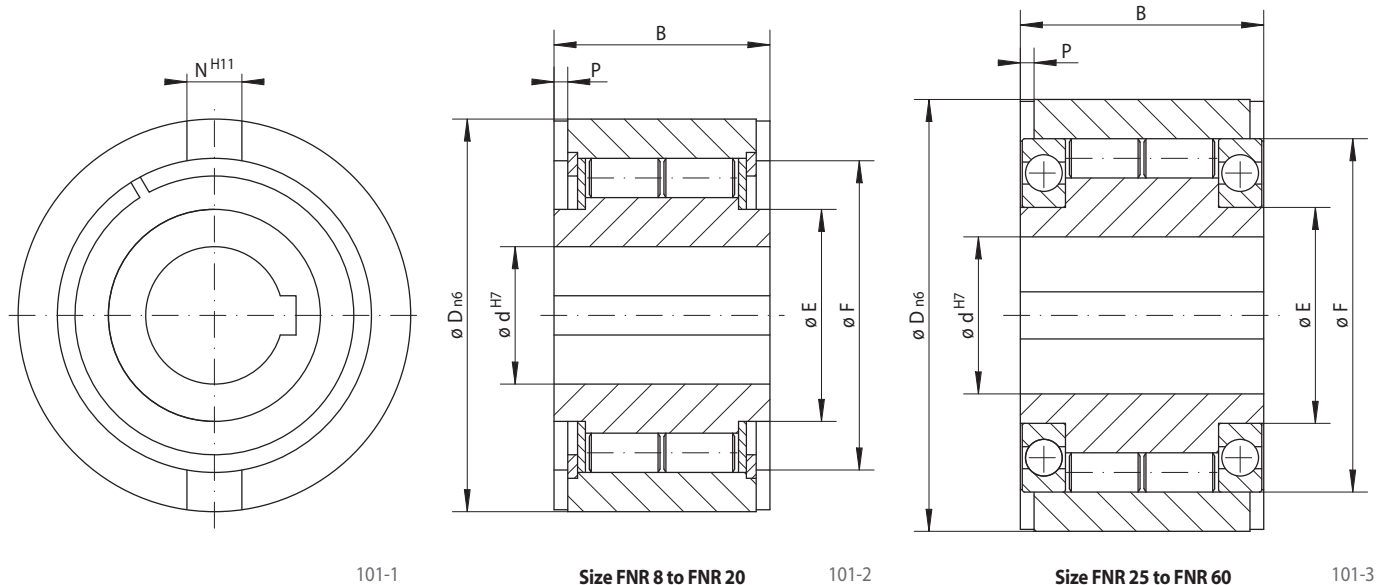
Internal Freewheel FNR 40 as an indexing freewheel for an incremental drive in the feeding device of a wire processing machine. The indexing lever is driven by a crank operation. The back and forth movement is transferred by the indexing freewheel in a gradual rotating movement of the wire feeding device.



100-2

# Internal Freewheels FNR

for keyway connection on the outer ring  
with rollers and bearing



	Standard type For universal use	Dimensions	
Indexing Freewheel			
Overrunning Clutch			
Backstop			

Freewheel Size	Nominal torque Nm	Max. speed		Bore d mm	B mm	D mm	E mm	F mm	N mm	P mm	Weight kg
		Inner ring freewheels/ overruns min <sup>-1</sup>	Outer ring freewheels/ overruns min <sup>-1</sup>								
FNR 8	18	1 200	1 200	8	20	37	19	30	6	3,0	0,1
FNR 12	18	1 200	1 200	12	20	37	19	30	6	3,0	0,1
FNR 15	50	950	950	15	30	47	23	37	7	3,5	0,3
FNR 20	112	650	650	20	36	62	35	50	8	6,5	0,6
FNR 25	220	1 550	3 350	25	40	80	40	68	9	4,0	1,3
FNR 30	410	1 400	3 050	30	48	90	45	75	12	5,0	1,9
FNR 35	500	1 300	2 850	35	53	100	50	80	13	6,0	2,6
FNR 40	750	1 150	2 500	40	63	110	55	90	15	7,0	3,6
FNR 45	1 020	1 100	2 400	45	63	120	60	95	16	7,0	4,2
FNR 50	1 900	950	2 050	50	80	130	70	110	17	8,5	6,0
FNR 55	2 000	900	1 900	55	80	140	75	115	18	9,0	6,8
FNR 60	3 000	800	1 800	60	95	150	80	125	18	9,0	9,5

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.  
Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.

## Mounting

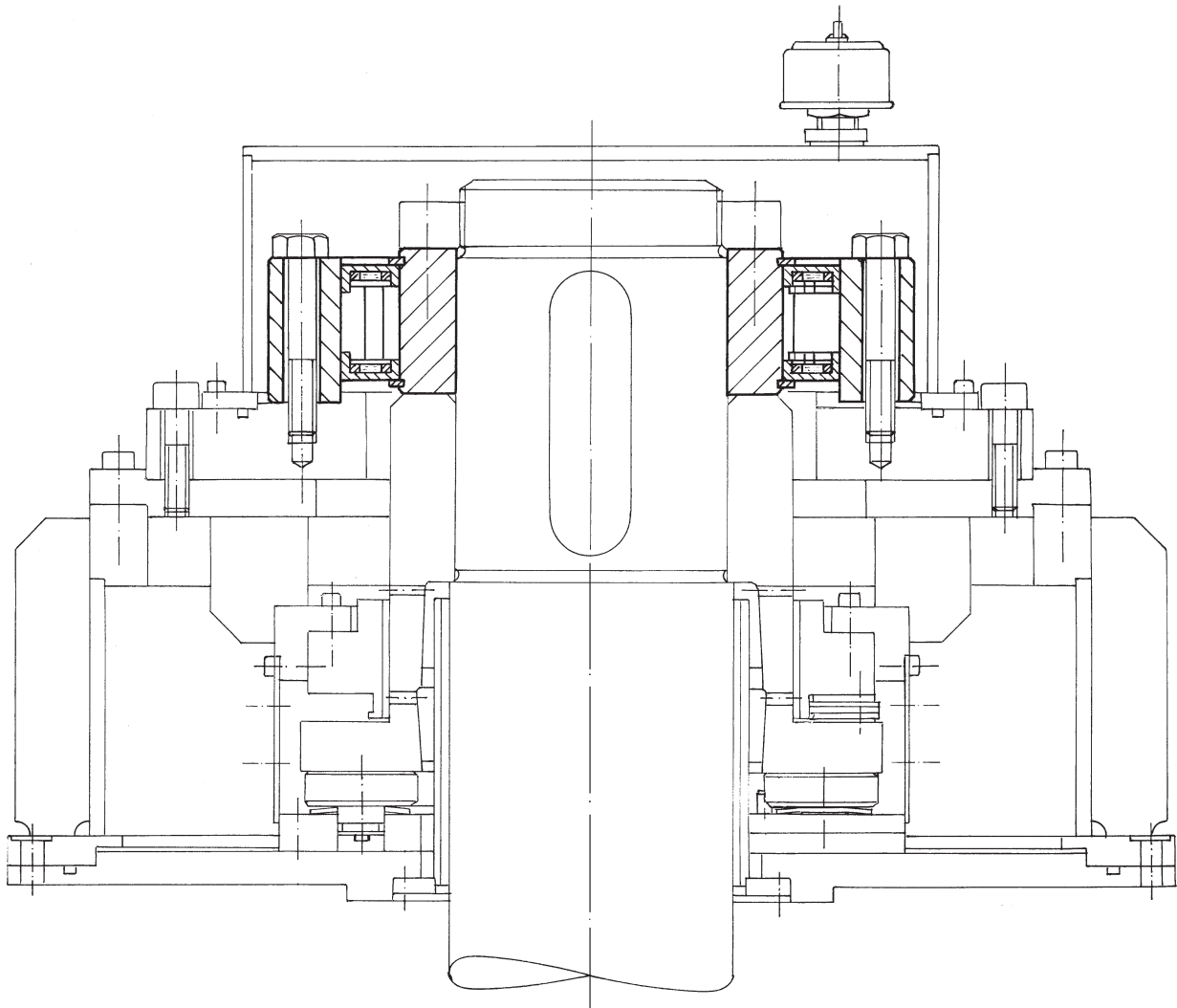
The tolerance of the housing bore D must be ISO H7 or G7 and the tolerance of the shaft must be ISO h6 or j6.

## Lubrication

An oil lubrication of the specified quality must be provided.

## Example for ordering

Freewheel size FNR 20, standard type:  
• FNR 20



Sleeve bearing: Renk Typ VB

102-1

Backstops FXM ... UX in the drive of large pumps for power stations: In order to guarantee the required operating safety, in accordance with the redundancy principle several parallel working pumps are arranged in one circuit. This also offers the possibility of adapting the feed rate to the respective requirements with the best possible use of the pump capacity.

In pumps that are shut down, the backstops have the task of preventing reverse running under the back pressure of the conveyed medium and thus of preventing the pumps to act

as turbines, while the other pumps of the pump group continue to operate. The reverse speeds and centrifugal forces that occur in such a case would destroy both the pump and the drive motor, incurring down time and considerable repair expense.

The backstop is located immediately above the sleeve bearing of the pump or, as shown in figure 102-1, above the sleeve bearing of the electric motor. Because of the function-related required sleeve bearing play and the unavoidable tolerances of neighbouring parts, the back-

stop needs a considerable misalignment capability. The backstop used with the sprag lift-off X at rotating inner ring permits T.I.R. of up to 0,8 mm.

In normal operation (freewheeling operation), because of the sprag lift-off the backstop works entirely without contact. Therefore, there is no wear on the sprags, and the service life is virtually unlimited. The existing oil mist protects the backstop from corrosion.



Backstop FXM 2.410 - 100 UX for the primary cooling water pump in a nuclear power station. Required torque 500 000 Nm. Speed 1 485 min<sup>-1</sup>. In service since 1996. Manufactured and tested with extensive documentation from RINGSPANN GmbH, Bad Homburg.

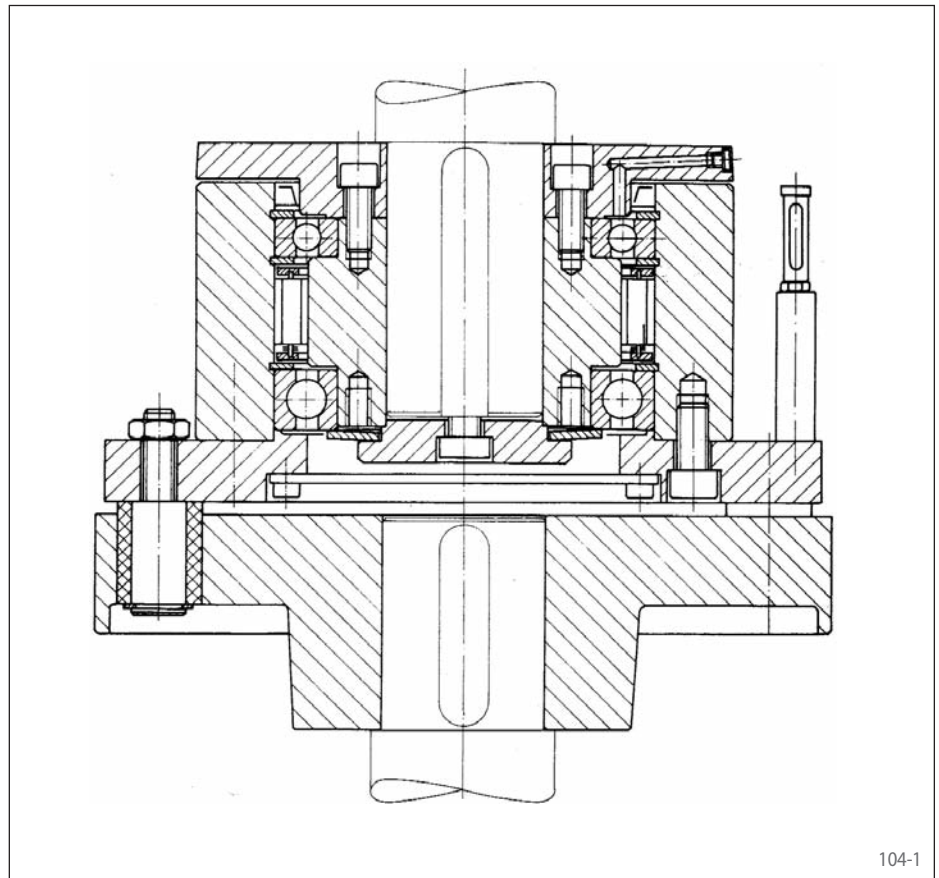


Iron ore conveyor plant in South Africa driven by three gear reducers with RINGSPANN backstops FXRT 170 SX.



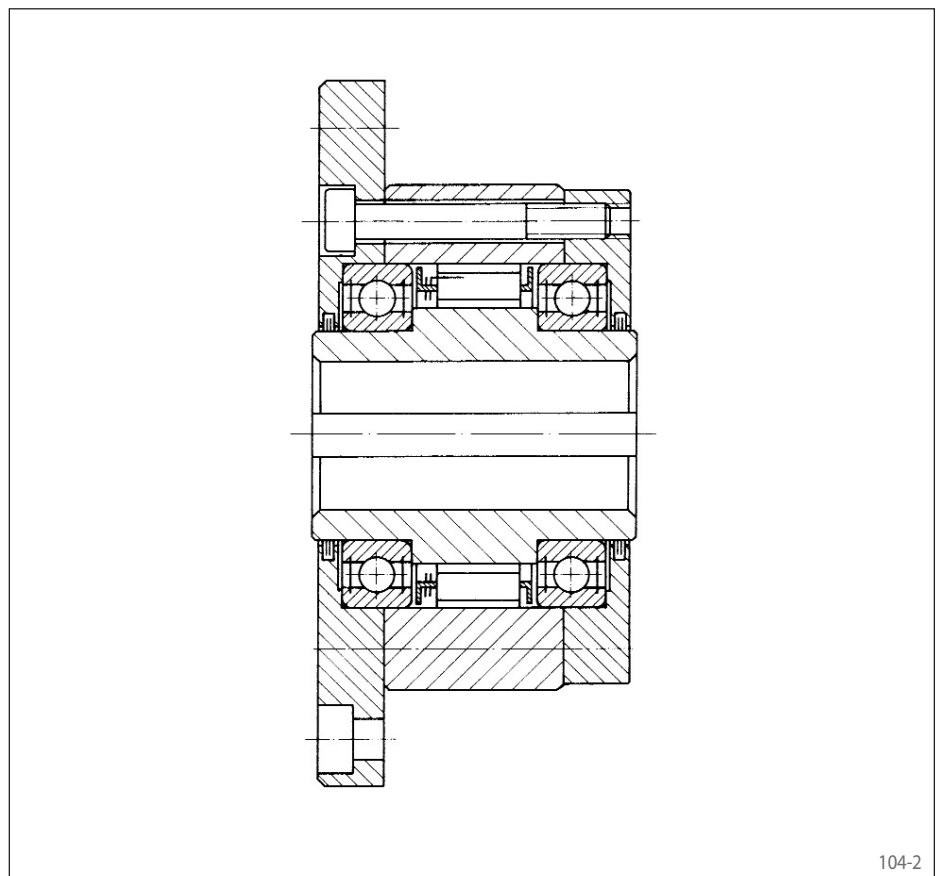
Special overrunning clutch for vertical installation, combined with a flexible pin-type coupling. The design is used in the dual drive of air pre-heaters in coal power plants.

The overrunning clutch is essential for both drives so that the respective stationary drive is not backdriven by the output side.



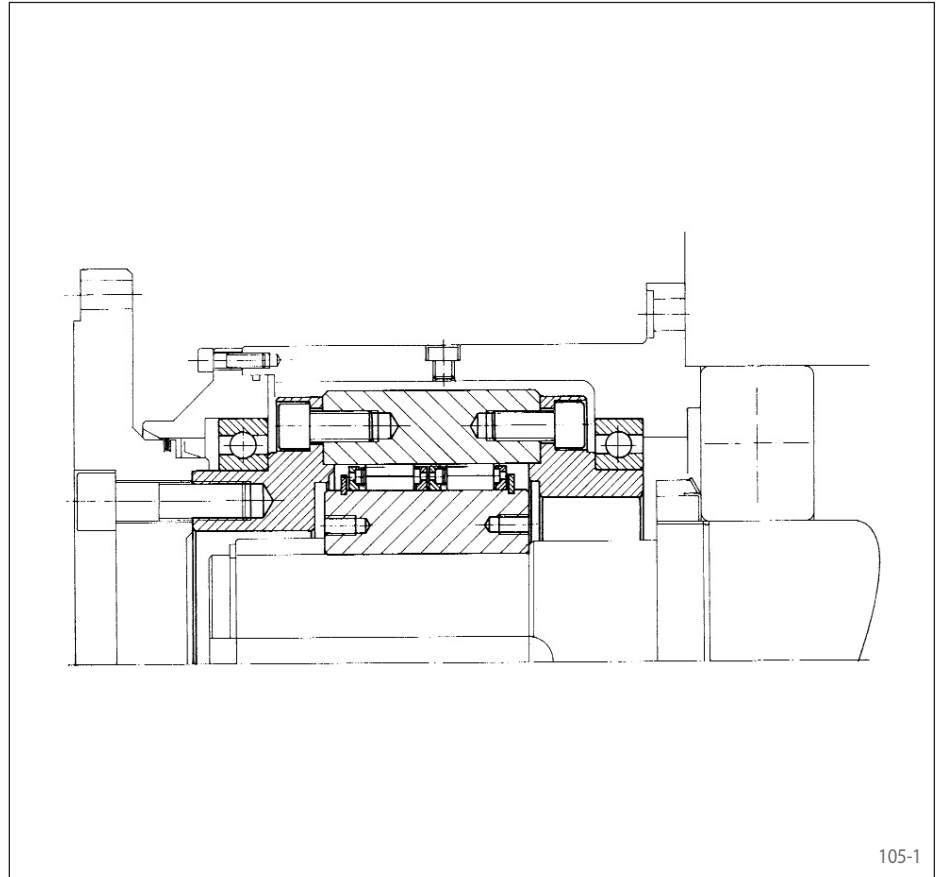
Overrunning clutch with sprag lift-off Z in special maintenance-free design. Lubrication of the sprags in the overrunning clutch is not required because of the high freewheeling speed of the outer ring. The sprags are lifted off of the stationary inner ring under the effect of the centrifugal force and thus operate without wear.

This overrunning clutch also uses life-time lubricated ball bearings and labyrinth seals; therefore, it is maintenance-free.





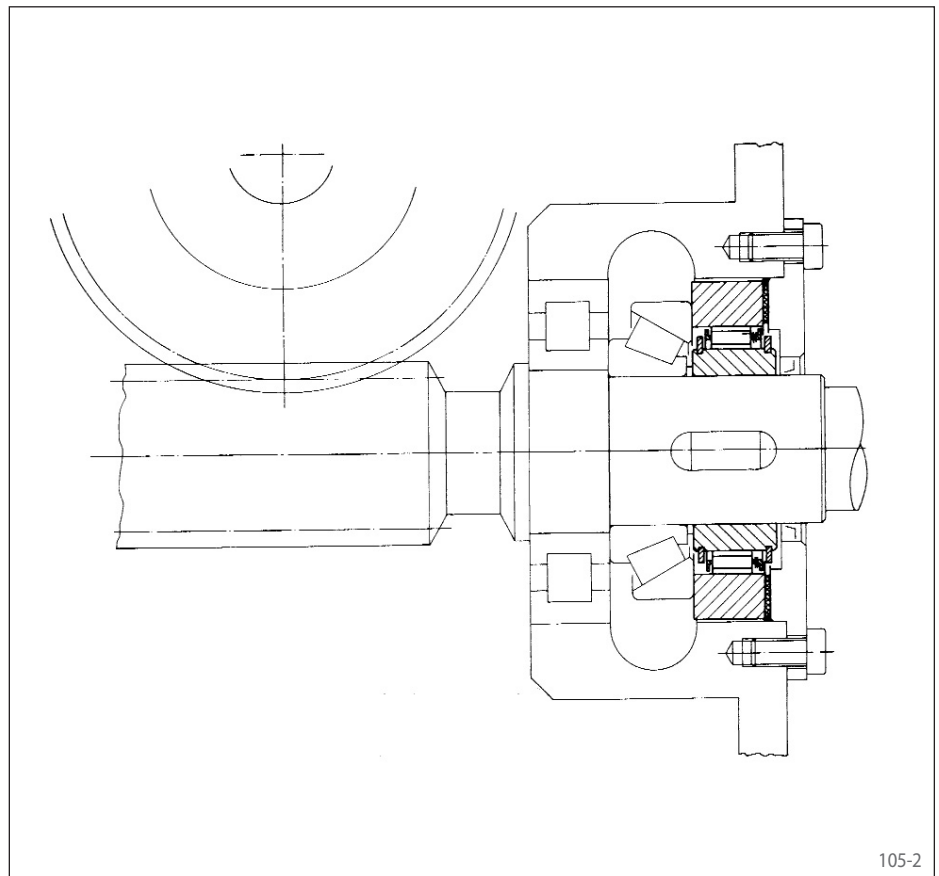
Overrunning clutch FXM 240 - 63 UX in custom-made design in the auxiliary drive of a mill. In this special bearing arrangement, the ball bearings of the overrunning clutch only rotate when the mill is driven slowly via the auxiliary drive and the locked overrunning clutch. The inner ring with the mounted freewheel cage runs at high speed, but rotates without contact because of the sprag lift-off X. Hence overheating of the bearings as well as wear on the sprags is avoided.



Integrated Freewheel FON 82 SFR in a special design as a load-operated brake in a non self-locking worm gear. A load is raised or lowered via the worm wheel. The load creates an axial force and this asserts back torque on the worm shaft. A freewheel is located on the worm shaft, the outer ring of the freewheel is connected via friction lining to the gearbox housing.

When the load is lifted, the inner ring freewheels and the freewheel runs in freewheeling operation. When the machine is brought to a standstill, the sprags of the freewheel lock and the back torque of the load is passed into the gearbox housing via the friction lining. If the motor lowers the load, the freewheel is also locked and the motor overcomes the friction torque of the brake.

In this case, the bearing support for the outer ring is secured by means of a special freewheel cage. Beside sprags, this design also includes cylindrical rollers. These rollers provide the centering of the outer ring to the inner ring.



## Bearing support

In the case of freewheels without bearing support, the design must ensure that the inner and outer ring are located concentric to one another with as little as possible play. The sprags do not have a centering effect of the outer ring to the inner ring. If the radial runout exceeds the prescribed limits, the transmissible torques will be reduced which could result in failures.

In the case of freewheels with built-in ball bearings, the customer must check these with

regard to the application related loads in accordance with the calculations from the bearing manufacturer. We will gladly supply you with documents regarding the built-in bearing types and bearing distances.

The series FDN, FDE and FD in type CFR have a bearing support to absorb radial forces. A second bearing support must be provided to absorb axial and tilting forces.

Axial forces between the inner and outer rings must not be directed via the sprags or the rollers, as this could interfere with the torque transmission. Therefore, the bearing support between the inner and outer ring must be free from axial play. The best design solution are axially pre-loaded roller bearings.

## Central application of force

The forces applied to the freewheel – push rod force, drive belt etc. – should act between the bearings of the freewheel. If the effective line of the lateral force acts outside of the bearing, a

rigid bearing or a pre-loaded bearing (as shown in figure 104-1) must be provided. Otherwise, the service life of the freewheel could be reduced. In the case of indexing freewheels, a central

application of force is required in order to achieve utmost indexing accuracy and highest service life.

## Fastening screws for connecting parts

In many freewheels in this catalogue, the customer's connecting parts are bolted to the outer ring of the freewheel. This screw connection is not comparable to a standard screw connection, e.g. like that of a VDI 2230. The torque in the freewheel is only pulsating, i.e. the circumferential force on the screw works in just one direction. The connection between the outer

ring and the connected part is not purely by friction, because the elastic expansion of the outer ring during torque transmission causes movement between the connected parts, until the screws locate circumferentially. Therefore, the screw connections in freewheels must be calculated for shearing. It has proven that for these fastening screws, the material quality 8.8

is sufficient. Because of the higher brittleness, screws of quality 12.9 should not be used. Tightening torques for the freewheel fastening screws should be selected as per the values listed in VDI 2230, in each case taking into account the existing friction values.

## Sprag track

In the case of freewheels without an inner ring (FD series), the inner sprag track is manufactured by the customer. It must be hardened and machined (grinding or hard-turned). The sprag track must then have the following characteristics:

- Conicity:  $\leq 3 \mu\text{m}$  per 10 mm track width
- Average peak-to-valley height  $R_z$  as per DIN 4768, page 1:  $1,6 \mu\text{m} \leq R_z \leq 6,3 \mu\text{m}$
- Hardness:  $62 \pm 2 \text{ HRC}$

With case hardening:

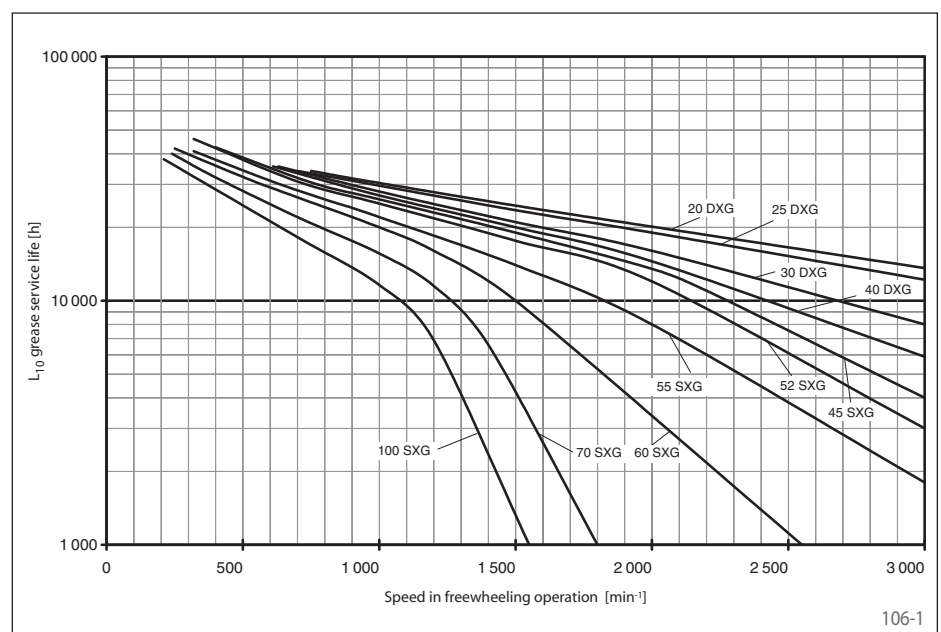
Case hardening depth  $E_{ht}$  as per DIN 50190, page 1: 1,5 ... 2 mm, hardness limit  $HG = 550 \text{ HV}_1$ , core strength  $\geq 1\,100 \text{ N/mm}^2$

If other hardness processes are to be applied or if you need to deviate from the specified directives, we will gladly offer assistance in working out a solution.

To facilitate mounting when sliding on the freewheel, a lead-in chamfer of, for example,  $2 \times 30^\circ$ , should be provided on the sprag track.

## Grease-lubricated ball bearings for Complete Freewheels BA ... XG and BC ... XG

Complete Freewheels BA ... XG and BC ... XG have grease-lubricated ball bearings. It should be noted that these ball bearings have a  $L_{10}$  grease service life. Diagram 106-1 shows the dependency of the grease service life  $L_{10}$  on the speed in the freewheeling operation. After reaching the grease service life  $L_{10}$  the bearing must be replaced or cleaned and regreased. The specifications in the diagram are valid for stationary installations, horizontal shafts and a maximum operating temperature of  $70^\circ\text{C}$ . A grease service life  $L_{10}$  of more than 30 000 hours is not recommended. The diagram shows an excerpt from the theoretically possible range of grease service life  $L_{10}$  (which would be practical for the majority of applications) as a function of the speed in freewheeling operation.



## Transmissible torque

The calculation of the transmissible torque of a freewheel assumes that you know the geometrical associations between the clamping elements and the freewheel rings.

In the case of a sprag freewheel with cylindrical inner and outer ring races, the formula for the inner clamping angle (refer to figure 107-1) is:

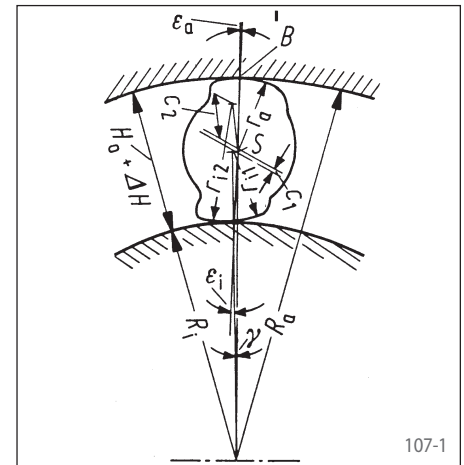
$$\tan \varepsilon_i = \frac{Ra}{Ra - Ri} \sqrt{\frac{c^2 - (Ri + ri - Ra + ra)^2}{(Ri + ri)(Ra - ra)}}$$

When calculating the transmissible torque you must also take into consideration the elastic deformations of the freewheel rings. These deformations are created by the large radial forces which the sprags exert on the rings during the locking process. For this purpose, differential equations must be solved that describe the in-

terplay between stresses and deformations in the rings. The Hertzian surface pressure distribution on the contact points between the sprags and the tracks is represented by Fourier's series and inserted as boundary conditions in differential equations. In an iterative process, with continuously increasing forces, geometrical values, deformations and stresses are calculated and compared with the permissible limit values. The following limits must be observed:

- Hertzian pressure on the contact points
- Limit of clamping angle
- Tangential stresses in the rings
- Limit of sprag positional angle

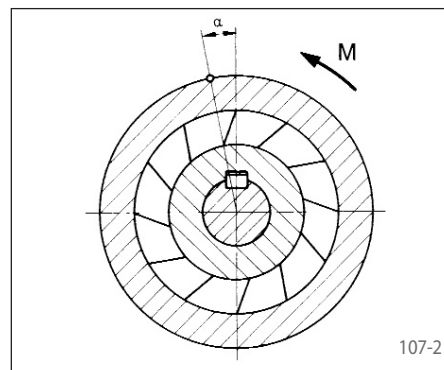
In this calculation the influence of eccentric tracks is also taken into consideration. In addition, the calculation provides the torsion spring



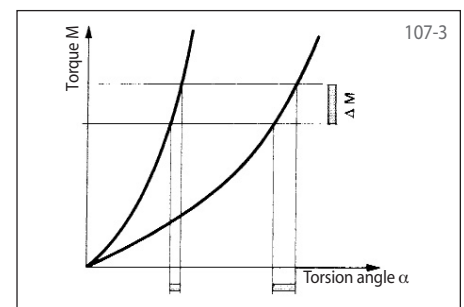
characteristic curve of the freewheel (refer to figure 107-3), which is particularly required for dynamic calculations of an entire installation.

## Torsion spring characteristic curve

For many applications, in addition to the torque transmission, the elastic behaviour of the freewheel in a locked state (driving operation) plays a decisive role. As figure 107-2 shows, the outer ring and the inner ring twist (wind-up) against each other during torque transmission. The higher the transmitted torque M the more they twist. The numerical relation between the torque M and the elastic torsional angle is represented in the torsion spring characteristic curve of the freewheel. The calculation of the torsion spring characteristic curve is also carried out using the geometrical values and the deformation equations. Figure 107-3 shows how important the torsion spring characteristic curve is, for example, in the application as indexing freewheel. Here, the torsion spring



characteristic curves are shown for a "soft" freewheel (flat characteristic curve) and a "stiff" freewheel (steep characteristic curve). If the driving torque M fluctuates, for example, around



the value ΔM, the effect on the torsion angle α of the freewheel with a flat characteristic curve is much greater than that of a freewheel with a steep characteristic curve. In indexed feed drives therefore, you always select freewheels with the steepest possible characteristic curve.

## Actuation frequencies and actuation service life of indexing freewheels

In the case of indexing freewheels, the maximum actuation frequency and the service life depending on the actuation frequency are important selection characteristic values.

### Maximum actuation frequency:

You cannot give a definite maximum permissible actuation frequency for any given freewheel, as many different influences of the entire machine construction can effect the freewheel. Of particular importance are: Type of machine, size and time course of the actuation torque and the index angle, required indexing accuracy, type of indexing freewheel, type of lubrication, drive of freewheel via inner or outer ring. This partial list shows that you cannot make a general statement regarding the maximum actuation frequency of a given catalogue freewheel. From successful applications with catalogue freewheels maximum actuation

frequencies of up to 800 actuations per minute have been realized.

### Actuation service life:

In the case of the actuation service life, it behaves similarly to that of the maximum actuation frequency as the influences on the freewheel are actually the same. It is not possible to calculate an exact number of actuations for any catalogue freewheel. Extensive research of the FVA (German Power Transmission Research Association) have come up with some associations. Of course, the test bench conditions are much idealised and cannot be freely transferred to the practical application conditions of indexing freewheels. In accordance with the research results, the total number of actuations of indexing freewheels is particularly dependent upon the torque and the resulting Hertzian pressure on the clamping points.

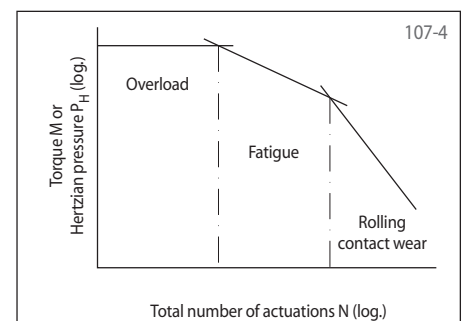


Figure 107-4 shows that we can differentiate between three areas: Overload, fatigue and rolling contact wear. Indexing freewheels must therefore be designed in such a way that they work in the area of rolling contact wear. This way, the total number of actuations can be in excess of  $1 \times 10^8$ . With an actuation frequency of 100 actuations/minute, this corresponds to a service life of approximately 16 666 hours.

## Maximum speeds and service life of backstops and overrunning clutches

The maximum permissible speed of freewheels that are used as backstops or overrunning clutches is primarily dependent upon the

- required service life in freewheeling operation,
- lubrication and heat dissipation as well as
- the category of the freewheel.

### Dependency of the maximum speed on the required freewheel duration of use

In the case of freewheels with sprags or rollers, wear will occur in the same way as it does with any other sliding machine parts. This wear increases as the relative speed of the sliding parts increases. RINGSPANN has developed different types which can reduce or even reverse these effects. The qualitative course of the service life in freewheeling operation of backstops and overrunning clutches in the various types is shown in figure 108-1. Refer to pages 12 and 13 for more detailed explanations on the types.

The maximum speeds given in the tables here (apart from the types with sprag lift-off X and Z as well as with hydrodynamic sprag lift-off) must always be considered in connection with the minimum required service life in freewheeling operation!

Information regarding the service life in freewheeling operation can be obtained upon request. Simply let us know the operating conditions.

The maximum speeds specified in the tables here apply for an ambient temperature of 20 °C. Other maximum speeds will apply for other ambient temperatures or special freewheel designs.

It is generally possible, by means of constructive measures that deviate from the standard design, to achieve even higher speeds. Please contact us if this is the case, preferably using the questionnaire on page 110 or 111.

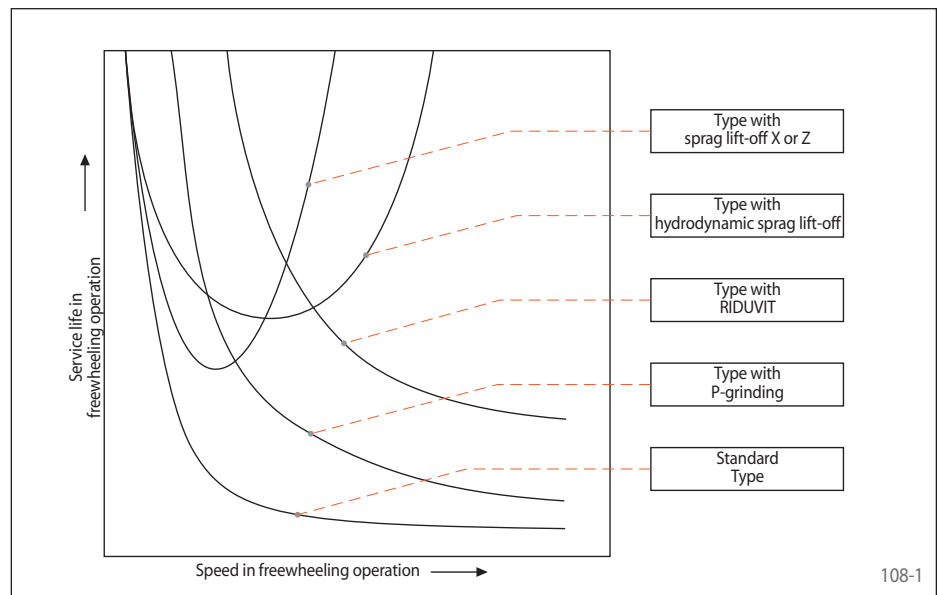
### Dependency of the maximum speed on the lubrication and heat dissipation

With regard to the lubrication and heat dissipation you must consider two key speed limits:

- Limit of maximum permissible operating temperature as well as the
- limit of lubricant life.

Maximum permissible operating temperature:

The maximum permissible speed of a freewheel in freewheeling operation is, among others, reached if the maximum permissible operating temperature of the freewheel has been reached. Freewheels are lubricated with either oil or grease, in order to minimise the friction between the sliding parts in freewheeling operation. The lubrication also has the function of removing any occurring frictional heat and



abrasive wear from the contact points. In principle, it is best to provide oil lubrication as this best facilitates the tasks described above.

In the case of Complete Freewheels and Internal Freewheels of series FCN ... K, FGK and ZZ ..., which form a unit made up of clamping elements, bearing support, seals and lubrication, there are predominantly four sources of heat that have a restrictive effect on the maximum permissible speed of the freewheel:

- Frictional heat of the seals
- Frictional heat of the lubricant
- Frictional heat of the clamping elements
- Frictional heat of the bearings

The major part of the frictional heat is dissipated into the environment. The ambient conditions (ambient temperature, air speed etc.) therefore also have an influence on the operating temperature. Hence, the ambient conditions also have a speed-restricting effect on Complete Freewheels and Internal Freewheels of series FCN ... K, FGK and ZZ ...

Lubricant life:

The lubricant ages because of the mechanical demands made upon it and after a certain period of use is no longer sufficiently capable of ensuring the function of reducing friction and protecting against wear. The speed of aging depends, among others, on the speed in freewheeling operation. In the event that the lubricant cannot be replaced, the lubricant life must be taken into consideration when establishing the maximum speed. Contact us for information in this regard.

### Dependency of the maximum speed on the category of the freewheel

All the components of a freewheel are stressed during rotation because of the centrifugal forces. The maximum permissible component stress must be taken into consideration when establishing the permissible speeds. Furthermore, the service life of the bearings must be considered. The bearing manufacturer's directives must be adhered to. For economic reasons, the standard freewheel is designed for a maximum speed that generally suits most applications. Higher speeds can be achieved by means of special construction measures.

The maximum speeds specified in this catalogue for Basic Freewheels FBO and FGR ... SF, for Integrated Freewheels FON as well as for Internal Freewheels FEN apply for installation conditions as given with Complete Freewheels. Knowing the actual installation conditions higher speeds can be permitted under some circumstances. Please contact us if this is the case, preferably using the questionnaire on page 110 or 111.



## Lubrication

For each series the standard lubrication (oil or grease lubrication) is specified on the respective catalogue pages. If a different design is required, please contact us.

The lubricants recommended in the table below for the various ambient temperature ranges have been predominantly chosen for the functioning capabilities of the sprags or the rollers when starting the machine or installation. If, after starting, the freewheel is in operation for a considerable period of time, then an operating temperature will arise in the freewheel that is generally higher than the ambient temperature. For this operating temperature you must check, if the lubrication capabilities of the oil or the basic oil contained in the grease is sufficient for any roller bearings that are built into the freewheel. In critical cases, it has proven useful to use the highly aging-resistant synthetic oil MOBIL SHC 626.

### Oil lubrication

The lubrication should be carried out with a non-resinous oil with a kinematic viscosity in accordance with the lubricant table below.

For Complete Freewheels and Housing Freewheels with standard oil lubrication, the oil quantity can be established from the installation and operating instruction manuals.

Integrated Freewheels FXM as well as Internal Freewheels FXN can run with immersion lubrication, circulating lubrication or – in the case of operation above the sprag lift-off speed – without oil lubrication. With these series it is also permissible to use oils and greases with friction-value-reducing additives (molybdenum disulphide). If operating without oil lubrication, the sprags and the outer track must be greased prior to installation with a suitable viscous grease in accordance with the installation and operating instruction manual.

In the case of designs with Basic Freewheels, Integrated Freewheels FON and Internal Freewheels with oil lubrication, ensure that the inner track is immersed in the oil.

If an immersion lubrication is not possible, an oil circulating lubrication must be provided, which will then ensures a constant oil film on the inner track.

### Grease lubrication

The freewheels BA ... XG, BC ... XG, FA, FAV, FCN ... K and ZZ ... have a grease lubrication that is designed to last for the service life. It is maintenance-free and generally requires no subsequent lubrication.

In order to increase the service life of freewheels with grease lubrication, after an operating time of about two years the freewheels should be disassembled, cleaned, checked and regreased. Refer to the lubrication table for recommended greases.

### Attention

Oils and greases that contain friction-reducing additives like molybdenum disulphide or the like, may only be used with our authorisation. Exception: Integrated Freewheels FXM as well as Internal Freewheels FXN.

## Lubrication table

Manufacturer	Oil			Grease
	For ambient temperatures from 0° C to +50° C Kinematic viscosity at 40° C, ISO-VG 46/68 [mm <sup>2</sup> /s]	For ambient temperatures from -15° C to +15° C Kinematic viscosity at 40° C, ISO-VG 32 [mm <sup>2</sup> /s]	For ambient temperatures from -40° C to 0° C Kinematic viscosity at 40° C, ISO-VG 10 [mm <sup>2</sup> /s]	For ambient temperatures from -15° C to +50° C
Agip	OSO 46/68	OSO 32	OSO 10	
ARAL	VITAM GF 46/68	VITAM GF 32	VITAM GF 10	ARALUB HL2
BP	ENERGOL HLP-HM 46/68	ENERGOL HLP-HM 32	ENERGOL HLP-HM 10	ENERGREASE LS2
CASTROL	VARIO HDX	VARIO HDX	ALPHASYN T 15	
CHEVRON	HYDRAULIC OIL AW 46/68	HYDRAULIC OIL AW 32	RANDO HD 10	
ELF	ELFOLNA 46	ELFOLNA 32	ELF AVIATION HYDRAULIC OIL 20	
ESSO	NUTO H 46/68	NUTO H 32	UNIVIS J 13	BEACON 2
KLÜBER	LAMORA HLP 46/68	LAMORA HLP 32	Klüberoil 4 UH1-15	ISOFLEX LDS 18 Spezial A POLYLUB WH 2
MOBIL	D.T.E. 25/26	D.T.E. 24	AERO HF A	MOBILUX 2
SHELL	TELLUS 46/68	TELLUS 32	TELLUST T 15	ALVANIA RL2
other manufacturers	Gearbox or hydraulic oils without solid lubricants ISO-VG 46/68	Gearbox or hydraulic oils without solid lubricants ISO-VG 32; Automatic transmission fluids [ATF]	Gearbox or hydraulic oils without solid lubricants ISO-VG 10; note setting point! Aviation hydraulic oils ISO-VG 10	

Please contact us in the case of temperatures in excess of 50° C and below -40° C.

# Questionnaire for selecting RINGSPANN Backstops

Please photocopy or use the PDF-File from our Homepage!

Company: _____ Address: _____ Name: _____ Department: _____	Date: _____ Enquiry Ref.: _____ Phone: _____ Fax: _____ E-mail: _____
--	---

**1. Where will the Backstop be used?**

1.1 Type of machine: \_\_\_\_\_

In the case of conveyor belts:  
 Angle of the steepest segment \_\_\_\_\_ °  
 Multiple-drive? ☐ Yes ☐ No  
 If yes, number of drives \_\_\_\_\_

1.2 Backstop location:

☐ on the gearbox  
☐ on the motor  
☐ elsewhere: \_\_\_\_\_

1.3 Arrangement:

☐ on the shaft end  
 Diameter: \_\_\_\_\_ mm  
 Length: \_\_\_\_\_ mm

☐ on a through shaft  
 Diameter: \_\_\_\_\_ mm

☐ on a pulley  
☐ on a sprocket  
☐ elsewhere: \_\_\_\_\_

1.4 If possible, please include specification, data sheet, sketch or drawing with connection dimensions.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2. Operating data**

2.1 Speed at the backstop location (backstop shaft)  $n_{sp} =$  \_\_\_\_\_  $\text{min}^{-1}$

Would it be possible to arrange the backstop on a high speed shaft? (higher speed = lower torque = smaller backstop)  
 If necessary please give further details on the drawing.

2.2 Nominal power of motor  
 $P_0 =$  \_\_\_\_\_ kW

2.3 Must the backstop also absorb the peak torque that occurs if the drive motor is started in the locking direction of the backstop (incorrectly poled drive motor)?  
 If yes, the backstop must be substantially oversized.  
☐ Yes ☐ No

2.4 Maximum backdriving torque  
 $M_{max} =$  \_\_\_\_\_ Nm

2.5 Lifting capacity of the conveyor system  
 $P_L =$  \_\_\_\_\_ kW

2.6 Efficiency of the machine between backstop and drive  
 $\eta =$  \_\_\_\_\_

2.7 Number of daily locking processes: \_\_\_\_\_

2.8 Daily operating time: \_\_\_\_\_ hours

**3. Installation conditions**

3.1 ☐ Open, outside  
☐ Open, in a closed room  
☐ In the machine housing

☐ Lubrication by means of oil bath or oil mist in the machine housing

☐ Connection to the central lubrication system is possible

Name of lubricant: \_\_\_\_\_

Kinematic viscosity: \_\_\_\_\_  $\text{mm}^2/\text{s}$  \_\_\_\_\_ °C

3.2 Should the backstop be releasable?  
☐ No ☐ Yes, in an emergency  
☐ Yes, frequently

3.3 Ambient temperature on the backstop:  
 from \_\_\_\_\_ °C to \_\_\_\_\_ °C

3.4 Other (e.g. accessibility, dust susceptibility and other environmental influences that could be of significance):  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

3.5 Are there any elastic elements/components located between the backstop and the installation that is to be backstopped (elastic couplings generate considerable peak torques at the moment of stopping)?  
☐ Yes ☐ No

**4. Estimated requirements**

\_\_\_\_\_ Pieces (one-off)      \_\_\_\_\_ Pieces/month      \_\_\_\_\_ Pieces/year

**5. Enclosures**

☐ Specifications      ☐ Data sheet      ☐ Sketch/drawing



## RINGSPANN GmbH

Schaberweg 30-34  
D-61348 Bad Homburg

Telefon +49 6172 275-0  
Telefax +49 6172 275-275

www.ringspann.com  
mailbox@ringspann.com



# Questionnaire for selecting RINGSPANN Overrunning Clutches

Please photocopy or use the PDF-File from our Homepage!

<p>Company: _____</p> <p>Address: _____</p> <p>Name: _____</p> <p>Department: _____</p>	<p>Date: _____</p> <p>Enquiry Ref.: _____</p> <p>Phone: _____</p> <p>Fax: _____</p> <p>E-mail: _____</p>
<b>1. Where will the Overrunning Clutch be used?</b>	
<p>1.1 Type of machine, machine group or installation, in which the overrunning clutch will be used:</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>1.2 Arrangement of the overrunning clutch (if possible, please include specification, data sheet, sketch or drawing with connection dimensions).</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<b>2. Operating data</b>	
<p>2.1 In driving operation the drive of the overrunning clutch will be carried out by:</p> <p><input type="checkbox"/> Asynchronous motor</p> <p style="margin-left: 20px;"><input type="checkbox"/> direct start-up</p> <p style="margin-left: 20px;"><input type="checkbox"/> <math>\lambda</math>-<math>\Delta</math>-start-up</p> <p><input type="checkbox"/> Other electric motor</p> <p style="margin-left: 20px;">Type: _____</p> <p><input type="checkbox"/> Combustion engine</p> <p style="margin-left: 20px;">Type: _____</p> <p style="margin-left: 20px;">Number of cylinders: ____</p> <p><input type="checkbox"/> Turbine</p> <p><input type="checkbox"/> Other (please explain in more detail):</p> <p>_____</p> <p>_____</p>	<p>2.3 Maximum torque _____ Nm (Important for drives that develop their maximum torque below their nominal speed.)</p> <p>2.4 Speed</p> <p style="margin-left: 20px;">1. in driving operation: from _____ min<sup>-1</sup> to _____ min<sup>-1</sup></p> <p style="margin-left: 20px;">2. in freewheeling operation: (when overrunning clutch is disengaged)</p> <p style="margin-left: 40px;">Primary part (driver) from _____ min<sup>-1</sup> to _____ min<sup>-1</sup></p> <p style="margin-left: 40px;">Secondary part (driven machine) from _____ min<sup>-1</sup> to _____ min<sup>-1</sup></p> <p>2.5 Should the overrunning clutch be combined with a shaft coupling?</p> <p style="margin-left: 20px;"><input type="checkbox"/> with an elastic coupling</p> <p style="margin-left: 20px;"><input type="checkbox"/> with a torsionally stiff coupling</p> <p style="margin-left: 20px;"><input type="checkbox"/> _____</p>
<p>2.2 To be transmitted in driving operation:</p> <p>Power: _____ kW or</p> <p>Torque: _____ Nm</p>	<p>2.6 If, upon start up, larger masses are to be accelerated:</p> <p style="margin-left: 20px;">Moment of inertia: <math>J =</math> _____ kgm<sup>2</sup></p> <p style="margin-left: 20px;">Speed of mass: <math>n =</math> _____ min<sup>-1</sup></p> <p>2.7 Torque fluctuations/torsional vibrations during driving operation generate the following torque limits</p> <p style="margin-left: 20px;"><input type="checkbox"/> Minimum torque <math>M_{\min} =</math> _____ Nm</p> <p style="margin-left: 20px;"><input type="checkbox"/> Maximum torque <math>M_{\max} =</math> _____ Nm</p> <p style="margin-left: 20px;"><input type="checkbox"/> Min-/Max.-torque is not known</p> <p>2.8 Daily operating time: _____ hours (h)</p> <p style="margin-left: 20px;">thereof _____ (h) driving operation</p> <p style="margin-left: 20px;">thereof _____ (h) freewheeling operation</p>
<b>3. Installation conditions</b>	
<p>3.1 <input type="checkbox"/> Open, outside</p> <p><input type="checkbox"/> Open, in a closed room</p> <p><input type="checkbox"/> in the machine housing</p> <p style="margin-left: 20px;"><input type="checkbox"/> Lubrication by means of oil bath or oil mist in the machine housing</p> <p style="margin-left: 20px;"><input type="checkbox"/> Connection to the central lubrication system is possible</p> <p>Name of lubricant: _____</p> <p>Kinematic viscosity _____ mm<sup>2</sup>/s _____ °C</p>	<p>3.2 Ambient temperature on the freewheel: from _____ °C to _____ °C</p> <p>3.3 Other (e.g. accessibility, dust susceptibility and other environmental influences that could be of significance):</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<b>4. Estimated requirements</b>	
<p>_____ Pieces (one-off)</p> <p>_____ Pieces/month</p> <p>_____ Pieces/year</p>	
<b>5. Enclosures</b>	
<p><input type="checkbox"/> Specifications</p> <p><input type="checkbox"/> Data sheet</p> <p><input type="checkbox"/> Sketch/drawing</p>	



## RINGSPANN GmbH

Schaberweg 30-34  
D-61348 Bad Homburg

Telefon +49 6172 275-0  
Telefax +49 6172 275-275

www.ringspann.com  
mailbox@ringspann.com

# Questionnaire for selecting RINGSPANN Indexing Freewheels

Please photocopy or use the PDF-File from our Homepage!

<p>Company: _____</p> <p>Address: _____</p> <p>Name: _____</p> <p>Department: _____</p>	<p>Date: _____</p> <p>Enquiry Ref.: _____</p> <p>Phone: _____</p> <p>Fax: _____</p> <p>E-mail: _____</p>	
<b>1. Where will the Indexing Freewheel be used?</b>		
<p>1.1 Type of machine, machine group or installation, in which the indexing freewheel will be used:</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>1.2 Arrangement of the indexing freewheel (if possible, please include specification, data sheet, sketch or drawing with connection dimensions).</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	
<b>2. Operating data</b>		
<p>2.1 Index angle of the indexing freewheel: from _____ ° to _____ °</p> <p>2.2 Number of actuations (indexes) per minute: from _____ /min to _____ /min</p> <p>2.3 The back and forth movement is made by</p> <p><input type="checkbox"/> freewheel outer ring</p> <p><input type="checkbox"/> freewheel inner ring</p> <p><input type="checkbox"/> _____</p>	<p>2.4 The back and forth movement is generated by</p> <p><input type="checkbox"/> bell crank</p> <p><input type="checkbox"/> hydraulic cylinder</p> <p><input type="checkbox"/> pneumatic cylinder</p> <p><input type="checkbox"/> cam disk or plate</p> <p><input type="checkbox"/> other (please explain in more detail):</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>2.5 Proposed shaft dimensions: Diameter _____ mm Length _____ mm</p> <p>2.6 Normal torque: M = _____ Nm Maximum torque: M<sub>max</sub> = _____ Nm (including peaks)</p> <p>2.7 Daily operating time: _____ hours</p>
<b>3. Installation conditions</b>		
<p>3.1 <input type="checkbox"/> Open, outside</p> <p><input type="checkbox"/> Open, in a closed room</p> <p><input type="checkbox"/> in the machine housing</p> <p><input type="checkbox"/> Lubrication by means of oil bath or oil mist in the machine housing</p> <p><input type="checkbox"/> Connection to the central lubrication system is possible</p> <p>Name of lubricant: _____</p> <p>Kinematic viscosity: _____ mm<sup>2</sup>/s _____ °C</p>	<p>3.2 Ambient temperature on freewheel: from _____ °C to _____ °C</p> <p>3.3 Other (e.g. accessibility, dust susceptibility and other environmental influences that could be of significance):</p> <p>_____</p> <p>_____</p> <p>_____</p>	
<b>4. Estimated requirement</b>		
<p>_____ Pieces (one-off)      _____ Pieces/month      _____ Pieces/year</p>		
<b>5. Enclosures</b>		
<p><input type="checkbox"/> Specifications      <input type="checkbox"/> Data sheet      <input type="checkbox"/> Sketch/drawing</p>		



## RINGSPANN GmbH

Schaberweg 30-34  
D-61348 Bad Homburg

Telefon +49 6172 275-0  
Telefax +49 6172 275-275

www.ringspann.com  
mailbox@ringspann.com

# Questionnaire for selecting RINGSPANN Housing Freewheels

Please photocopy or use the PDF-File from our Homepage!

Company: .....	Date: .....
Address: .....	Enquiry Ref.: .....
.....	Phone: .....
Name: .....	Fax: .....
Department: .....	E-mail: .....

## 1. Where will the Housing Freewheels be used?

1.1 Type of installation: .....

1.2 Type of working machine: .....



## 2. Operating data

2.1 In driving operation the drive will be carried out by

### Housing Freewheel A

- ☐ Asynchronous motor  
☐ Direct start up      ☐  $\lambda$ - $\Delta$ -start up  
☐ Other electric motor  
Type: .....  
☐ Combustion engine  
Type: ..... No. of cylinders: .....  
☐ Turbine  
☐ Other (please explain in more detail): .....

### Housing Freewheel B

- ☐ Asynchronous motor  
☐ Direct start up      ☐  $\lambda$ - $\Delta$ -start up  
☐ Other electric motor  
Type: .....  
☐ Combustion engine  
Type: ..... No. of cylinders: .....  
☐ Turbine  
☐ Other (please explain in more detail): .....

2.2 Speeds in driving operation  
Speeds in freewheeling operation

from ..... min<sup>-1</sup> to ..... min<sup>-1</sup>  
from ..... min<sup>-1</sup> to ..... min<sup>-1</sup>

from ..... min<sup>-1</sup> to ..... min<sup>-1</sup>  
from ..... min<sup>-1</sup> to ..... min<sup>-1</sup>

2.3 Direction of rotation in driving operation when viewed in direction X

- ☐ Anticlockwise  
☐ Clockwise

- ☐ Anticlockwise  
☐ Clockwise

2.4 To be transmitted in driving operation

Power: ..... kW  
Torque: ..... Nm

Power: ..... kW  
Torque: ..... Nm

2.5 Maximum torque determined by rotational vibration calculation

..... Nm

..... Nm

2.6 Should the Housing Freewheel be combined with shaft coupling?

- ☐ With elastic coupling  
Type: .....  
☐ With torsionally stiff coupling  
Type: .....

- ☐ With elastic coupling  
Type: .....  
☐ With torsionally stiff coupling  
Type: .....

2.7 Should the Housing Freewheel be equipped with a parking brake?

- ☐ With built-in electromagnetic brake  
☐ With externally fitted brake

- ☐ With built-in electromagnetic brake  
☐ With externally fitted brake

2.8 Selected Housing Freewheel

Size .....

Size .....

2.9 Daily operating time

..... hours (h)  
thereof ..... (h) driving operation  
thereof ..... (h) freewheeling operation

..... (h) driving operation  
thereof ..... (h) freewheeling operation

## 3. Installation conditions

3.1 Ambient temperature on the freewheel:  
from ..... °C to ..... °C

3.2 Other (e.g. accessibility, dust susceptibility and other environmental influences that could be of significance): .....

## 4. Estimated requirements

..... Pieces (one-off)      ..... Pieces/month      ..... Pieces/year

## 5. Enclosures

- ☐ Specifications      ☐ Data sheet      ☐ Sketch/drawing



# RINGSPANN GmbH

Schaberweg 30-34  
D-61348 Bad Homburg

Telefon +49 6172 275-0  
Telefax +49 6172 275-275

www.ringspann.com  
mailbox@ringspann.com





### Freewheels

#### Backstops

Automatic protection against reverse running of conveyor belts, elevators, pumps and fans.



Catalogue 84

#### Overrunning Clutches

Automatic engaging and disengaging of drives.



Catalogue 84

#### Indexing Freewheels

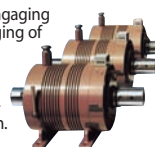
For gradual feed of materials.



Catalogue 84

#### Housing Freewheels

Automatic engaging and disengaging of multimotor drives for installations with continuous operation.



Catalogue 84

#### Freewheel Elements

Cage Freewheels, Sprag Sets and Freewheel Chains.

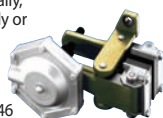


Catalogue 89

### Brakes

#### Industrial Disc Brakes

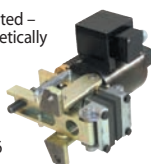
Spring activated – pneumatically, hydraulically or manually released.



Catalogue 46

#### Industrial Disc Brakes

Spring activated – electromagnetically released.



Catalogue 46

#### Industrial Disc Brakes

Pneumatically activated – spring released.



Catalogue 46

#### Industrial Disc Brakes

Manually activated – manually released.



Catalogue 46

#### Industrial Disc Brakes

Hydraulically activated – spring released.



Catalogue 46

### Torque and Force Limiters

#### Torque Limiters with Screw Face

Reliable overload protection for tough operating conditions.



Catalogue 45

#### Torque Limiters with Rollers

With double or single rollers. Through ratcheting or disengaging, also for 360° synchronous running.



Catalogue 45

#### Torque Limiters with Balls

Reliable overload protection with maximum response accuracy. Also backlash free.



Catalogue 45

#### Torque Limiters with Friction Linings

RIMOSTAT Torque Limiter for constant torque. Belleville Spring Torque Limiter for simple release.



Catalogue 45

#### Force Limiters

Reliable axial overload protection in piston rods.



Catalogue 49

### Couplings and Clamping Clutches

#### Flexible Couplings

Large, allowed radial and angular misalignments. Minimum resiliency.



Catalogue 44

#### Flange-Couplings

Rigid, easily removable shaft coupling with no clearance cone clamping elements.



E04.020

#### Clamping Clutches

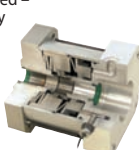
For the automatic coupling of rolls. Fast, safe and free from slipping connection.



Catalogue 45

#### Safety Clamping Units

Spring actuated – pneumatically released. For secure and precise positioning of piston rods.



E01.023

#### Safety Clamping Units

Spring actuated – hydraulically released. For secure and precise positioning of piston rods.



Catalogue 32

### Shaft-Hub-Connections

#### Two-part Shrink Discs

External clamping connection. Advantages: Simple, secure mounting even without torque wrench.



Catalogue 36

#### Three-part Shrink Discs

External clamping connection for the fastening of hollow shafts on solid shafts



Catalogue 36

#### Cone Clamping Elements

For shaft-hub connections. High torques with small dimensions.



Catalogue 36

#### Star and Clamping Discs

Ideal for shaft-hub-connection for frequent release.



Catalogue 36

#### Star Spring Washers

Axial spring element for preloading of ball bearings.



Catalogue 20

### Precision Clamping Fixtures

#### Standard Parts for Clamping Fixtures

The RINGSPANN-System for the manufacture of your own precision clamping fixtures.



Catalogue 14

#### Standard Clamping Fixtures

Standard program in high precision, ready manufactured chucks and mandrels.



Catalogue 14

#### Special Clamping Fixtures

Custom made solutions for specific clamping problems.



Catalogue 14

#### Collet Mandrels

Universal, cost effective standard series. Fast collet change to other clamping diameters.



Catalogue 15

#### Hydraulic Expanding Clamping Tools

Mandrels and chucks with high concentricity. Clamping several workpieces in one process possible.



Catalogue 16



# RINGSPANN GmbH

Schaberweg 30–34  
61348 Bad Homburg

Telefon +49 6172 275-0  
Telefax +49 6172 275-2 75

www.ringspann.com  
mailbox@ringspann.com