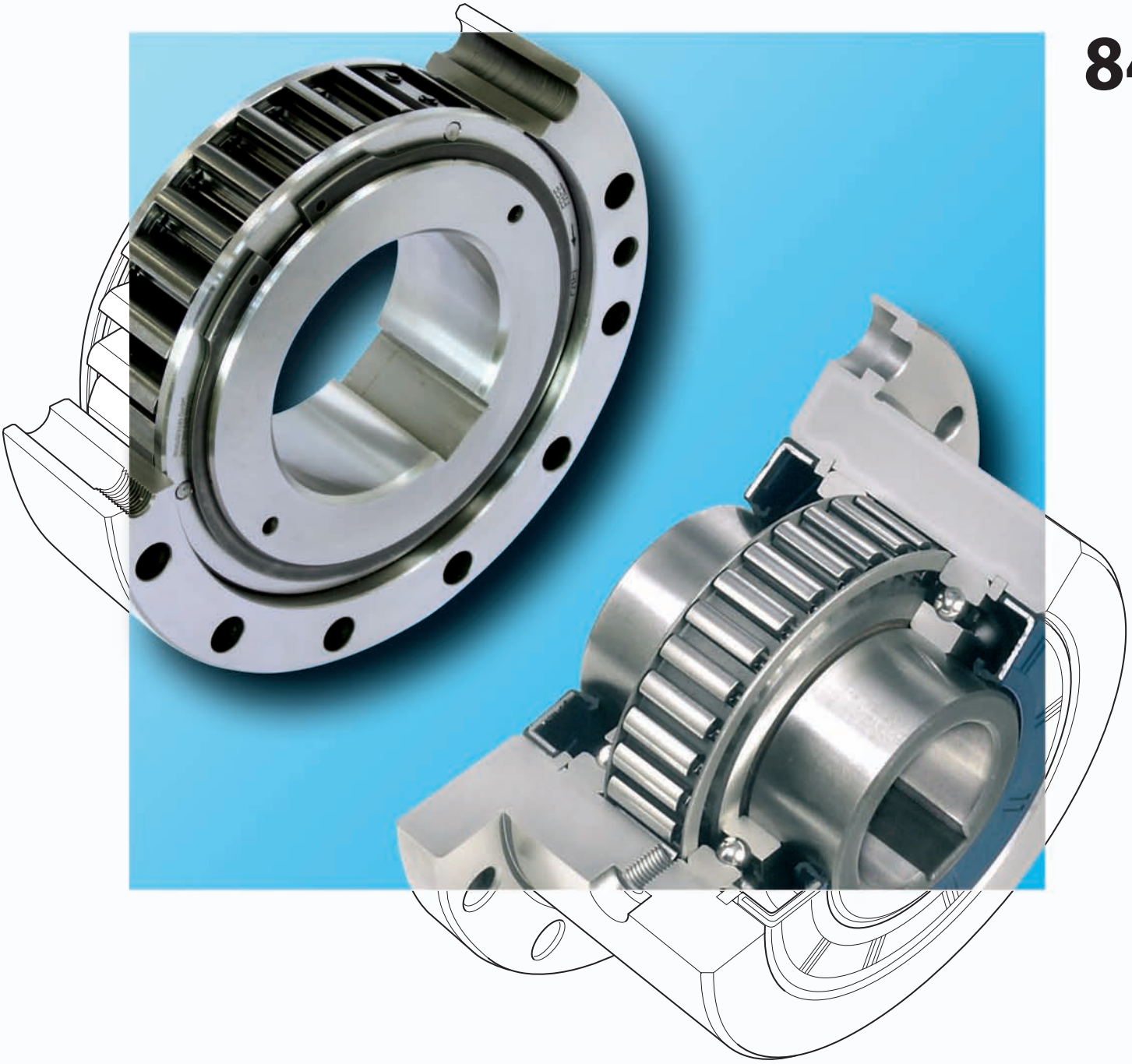
RINGSPANN®
Power Transmission

Freewheels

Backstops • Overrunning Clutches • Indexing Freewheels

84



Edition 2013/2014

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Integrated Freewheels	Used as: Backstops	Used as: Overrunning Clutch	Used as: Indexing Freewheel	With bearing support	Nominal torques up to Nm	Bore up to mm	Page
for bolting to the face							
FXM with sprag lift-off X	●	●			888000	460	64
FON with sprags, available in three types	●	●	●		25000	155	70
for bolting to the face, with torque limiting							
FXRV with sprag lift-off X	●				100000	320	72
FXRT with sprag lift-off X and with release function	●				53000	240	72

Internal Freewheels	Used as: Backstops	Used as: Overrunning Clutch	Used as: Indexing Freewheel	With bearing support	Nominal torques up to Nm	Bore up to mm	Page
for press fit on the outer ring							
FXN with sprag lift-off X	●	●			20500	130	76
FEN with sprags	●	●	●		4000	100	80
FGK with sprags and bearing support	●	●	●	●	460	50	82
FCN … R with rollers	●	●	●		840	80	84
FDN with sprags, available in three types	●	●	●	◐	2400	80	86
FDE with sprags, available in three types	●	●	●	◐	2400	95	88
FD with sprags, available in three types	●	●	●	◐	2400	105	90
ZZ with sprags and bearing support	●	●	●	●	325	40	92
ZZ … 2RS with sprags, bearing support and seals	●	●	●	●	325	40	94
ZZ … P2RS with sprags, bearing support and seals	●	●	●	●	325	40	95
ZZ ... P with sprags and bearing support	●	●	●	●	325	40	96
for keyway connection on the outer ring							
ZZ ... PP with sprags and bearing support	●	●	●	●	325	40	97
FSN with rollers	●	●	●		3000	80	98
FN with rollers	●	●	●		3000	60	100
FNR with rollers and bearing support	●	●	●	●	3000	60	102

Cage Freewheels	Used as: Backstops	Used as: Overrunning Clutch	Used as: Indexing Freewheel	With bearing support	Nominal torques up to Nm		Page
for assembly with inner and outer ring							
SF with sprags, available in three types	●	●	●		93000		104
SF … P for high run out (T.I.R.), with sprags	●	●	●		5800		106
BWX in inch dimension, with sprags	●	●	●		4900		108
K with sprags	●	●	●		470		110

Irreversible Locks	Used as: Backstops	Used as: Overrunning Clutch	Used as: Indexing Freewheel	With bearing support	Nominal torques up to Nm	Bore up to mm	Page
bidirectional acting backstop for assembly with connecting parts							
Irreversible lock IR with rollers	●			◐	100	35	112

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The maximum transmissible torques are 2 times the specified nominal torques.
Issue 03/2013 • Technical details subject to change without notice.

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.

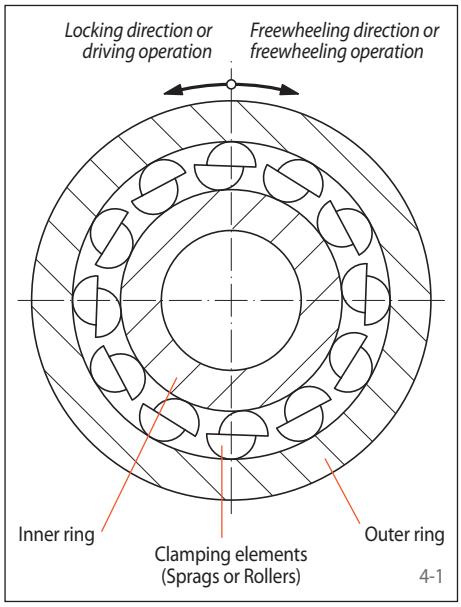
Freewheels consist of an inner and an outer ring between which clamping elements are arranged. Clamping elements can be sprags or rollers. We differentiate as follows:

- 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.

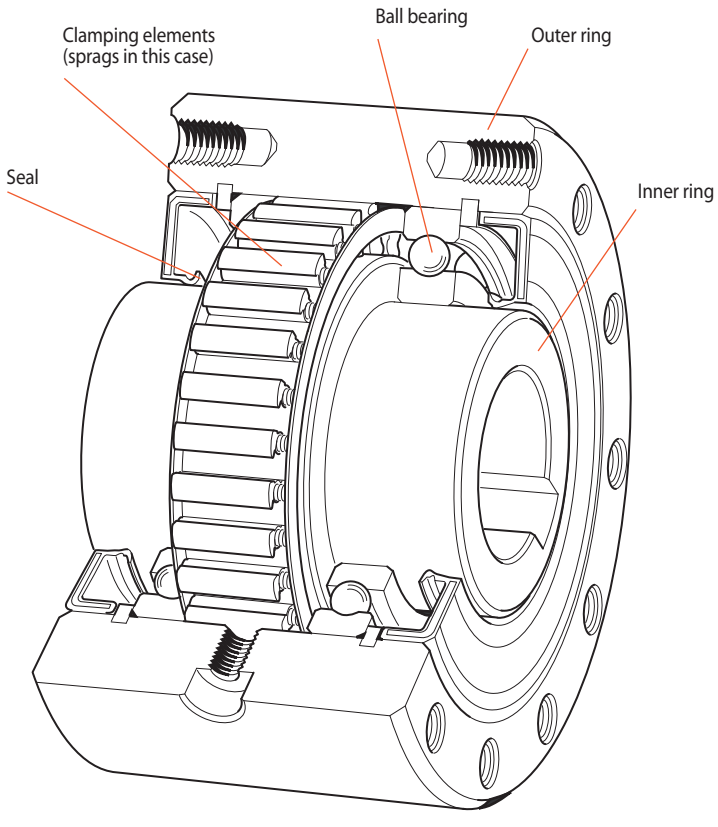
RINGSPANN freewheels are an indispensable design element in the machine building industry as well as in the aerospace industry. Many designs are only economical if freewheels are used. The freewheel as an automatic driving element is preferred to conventional solutions because it offers the following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

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

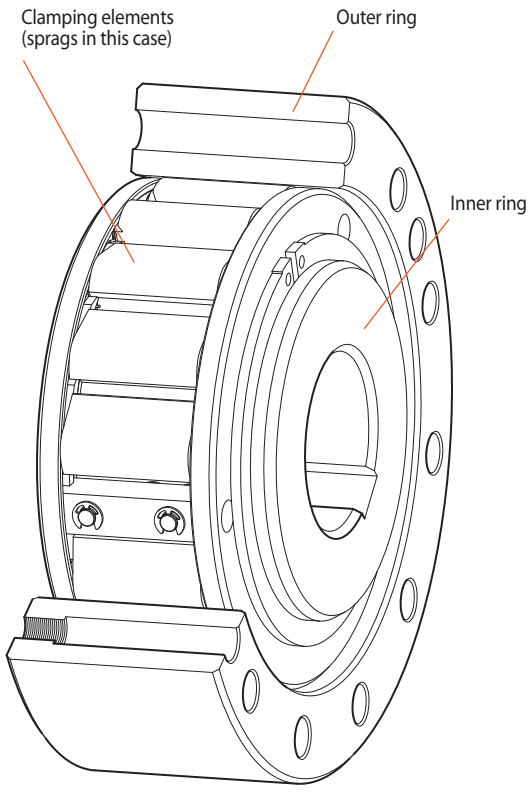


4-1

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.



Freewheel with bearing support



Freewheel without bearing support

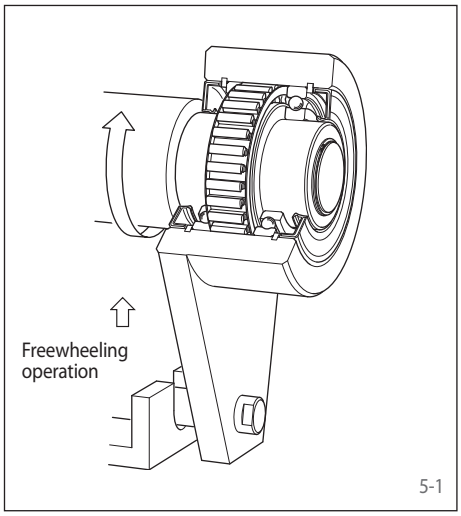
4-2

Applications of Freewheels

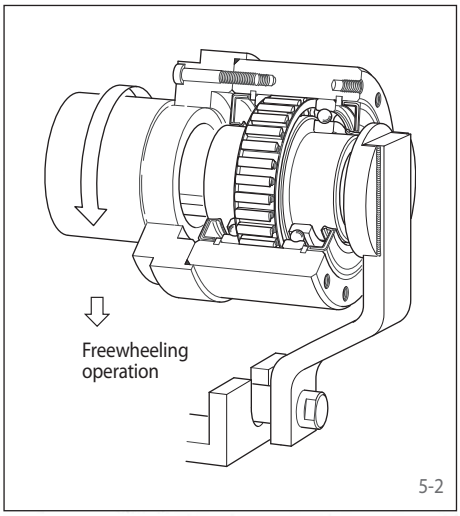
Backstop

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.

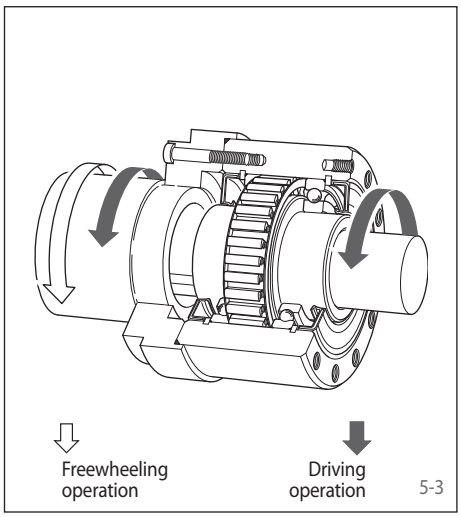


Figure 5-3 shows an overrunning clutch where in driving operation the power flow is transferred from the inner ring to the outer ring and in freewheeling operation the outer ring overruns the inner ring at a higher speed.

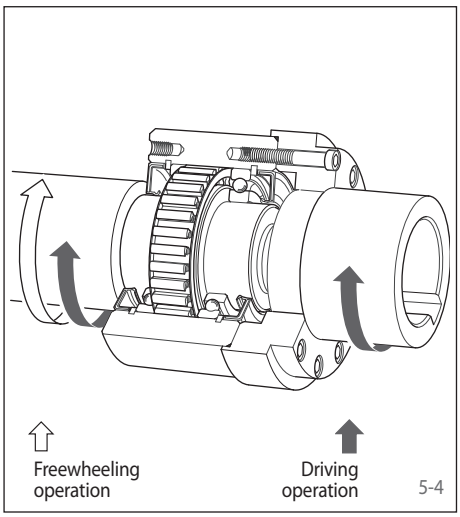


Figure 5-4 shows an overrunning clutch where in driving operation the power flow is transferred from the outer ring to the inner ring and in freewheeling operation the inner ring overruns the outer ring at a higher speed.

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 infinitly adjustable setting of the feed.

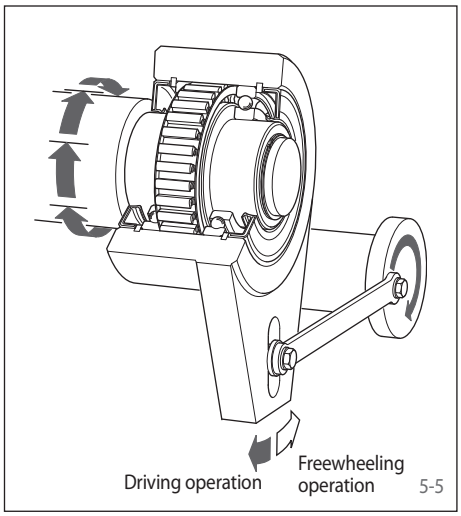


Figure 5-5 shows an indexing freewheel where the outer ring makes the back and forth motion and the inner ring carries out the indexed feed.

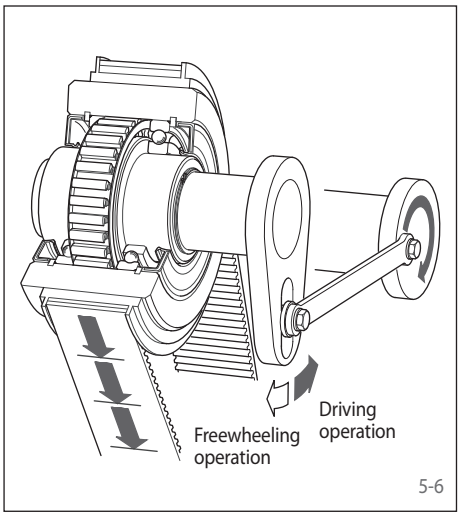
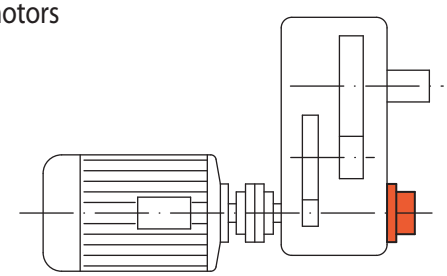


Figure 5-6 shows an indexing freewheel where the inner ring makes the back and forth motion and the outer ring carries out the indexed feed.

Areas of Application for Freewheels

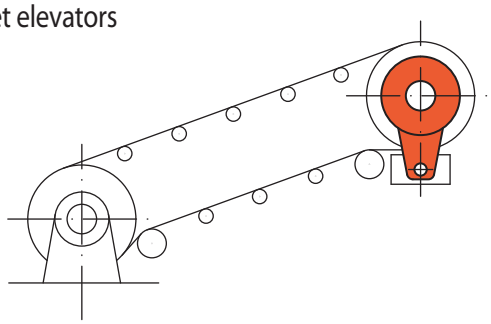
Areas of application for Backstops

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.

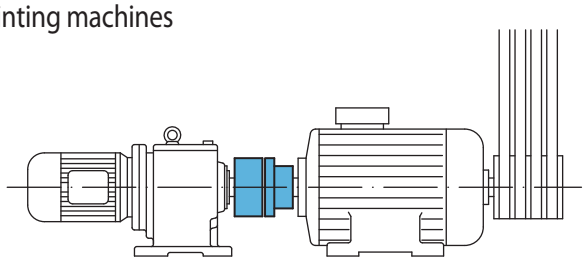
Inclined conveyors
Elevators
Bucket elevators



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

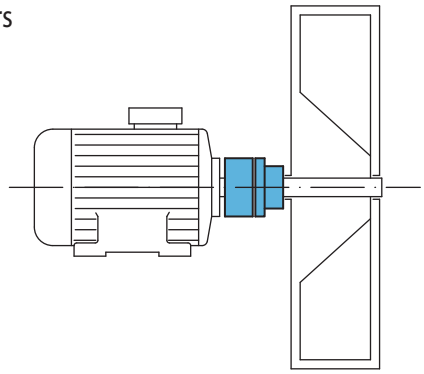
Areas of application for Overrunning Clutches

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.

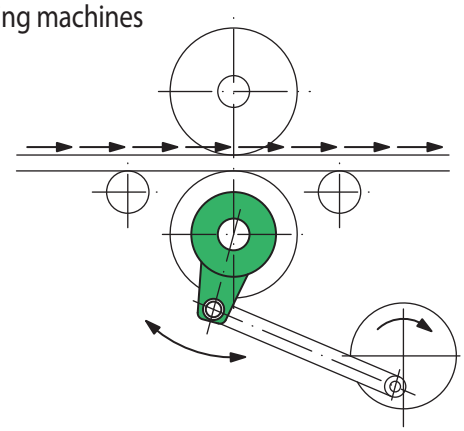
Fans
Ventilators



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

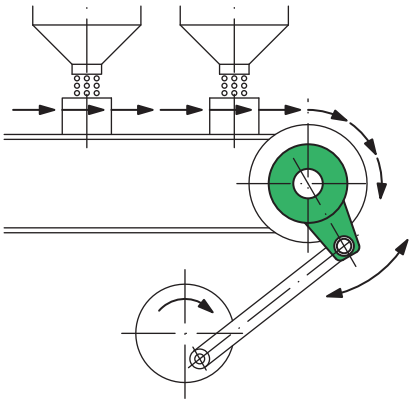
Areas of application for Indexing Freewheels

Textile machines
Printing machines



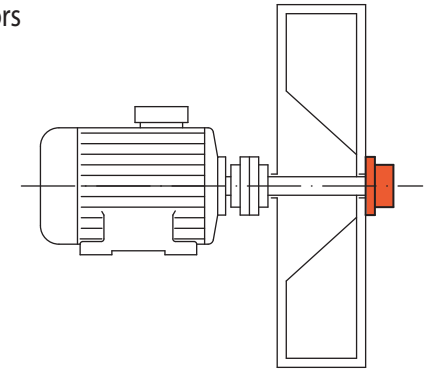
The indexing freewheel generates an indexed feed in textile and printing machines.

Packaging machines
Filling plants



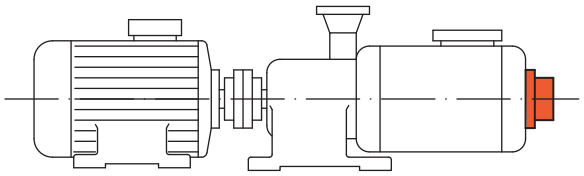
The indexing freewheel is used in packaging machines and filling plants for an indexed feed.

Fans
Ventilators



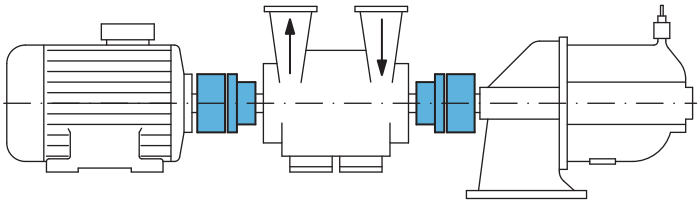
The backstop prevents reverse rotation under the back pressure of the conveyed medium if the motor is turned off.

Pumps
Compressors



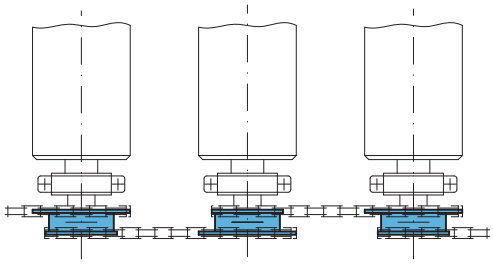
The backstop prevents reverse rotation under the back pressure of the conveyed medium if the motor is turned off.

Pumps
Generators



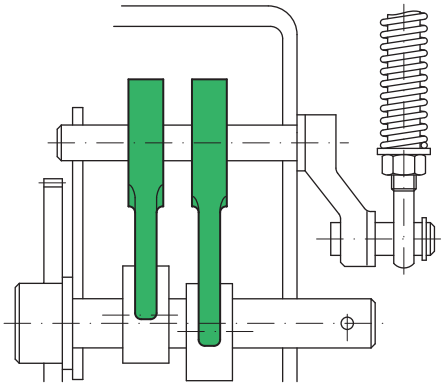
In multimotor drives the overrunning clutch disengages the inactive or lower speed drive.

Roller conveyor



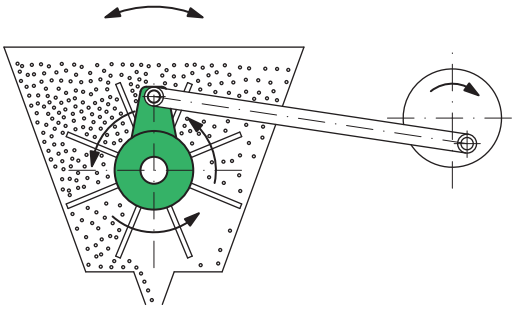
The overrunning clutch ensures that the conveyed material can be pushed or pulled faster over the rollers than the speed of the drive.

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

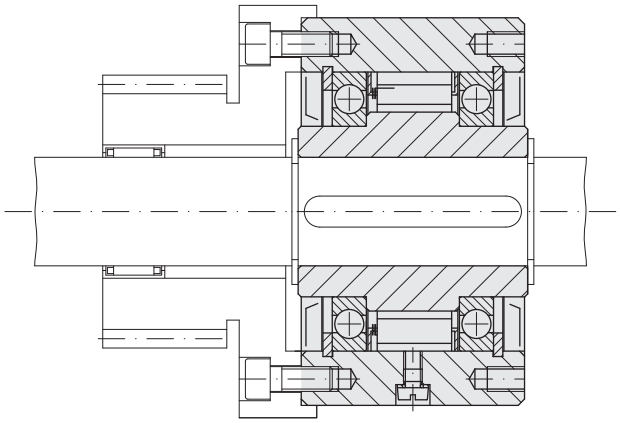


The indexing freewheel replaces a reduction gear in seed spreader.

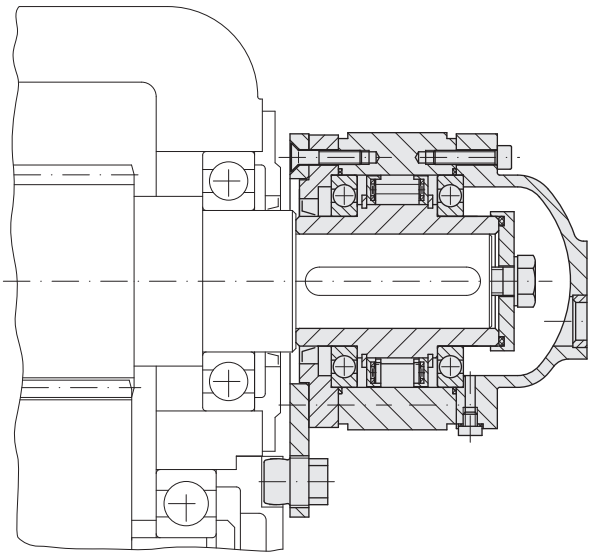
Categories of Freewheels

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.



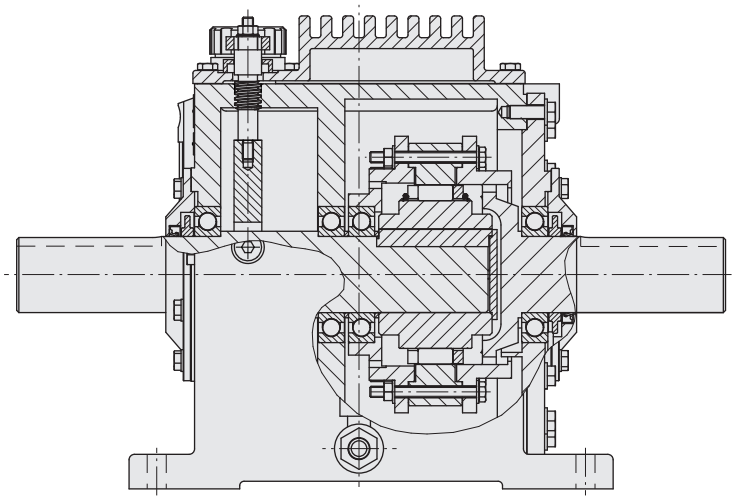
8-1



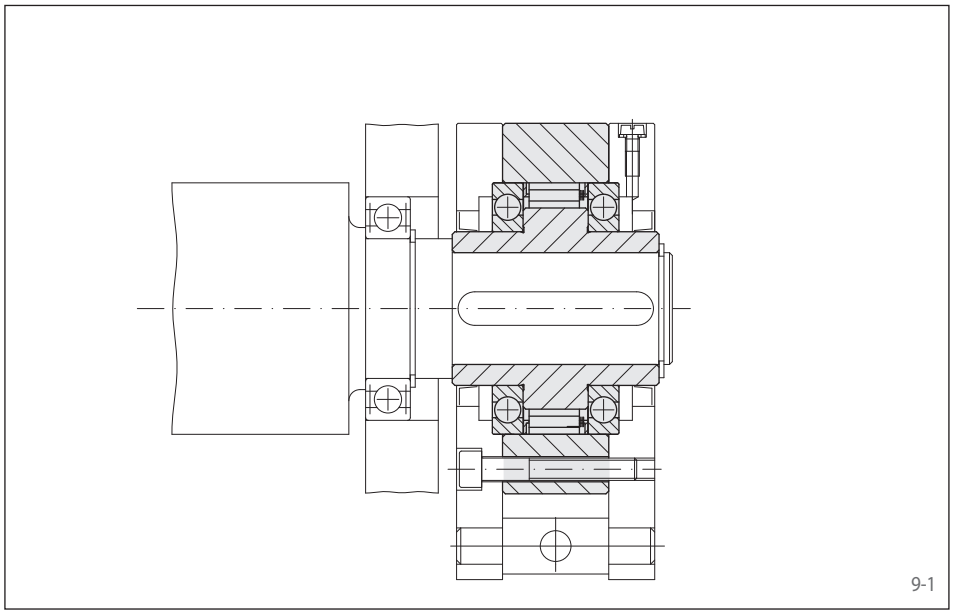
8-2

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

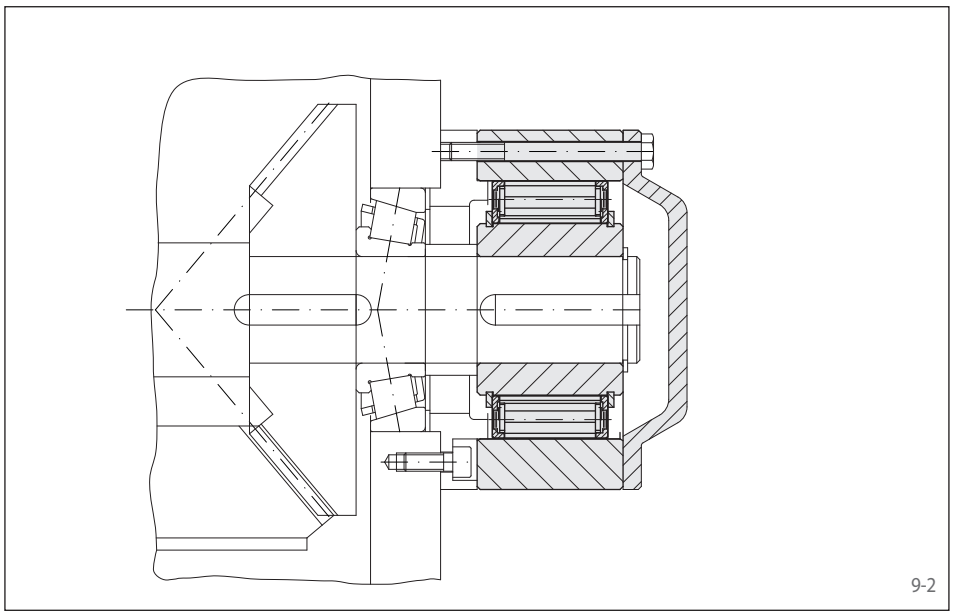


8-3



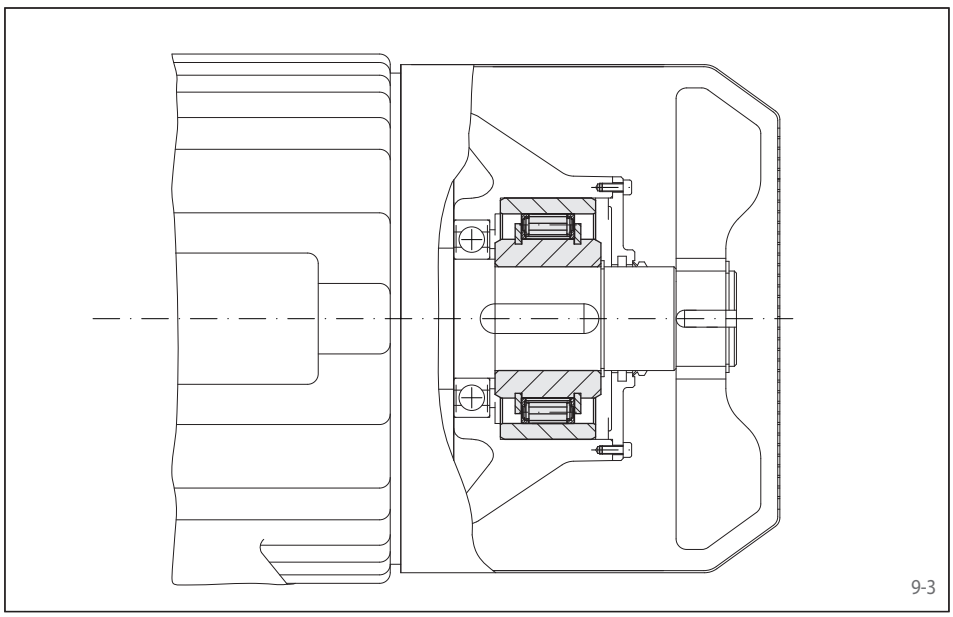
Basic Freewheels

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



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



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

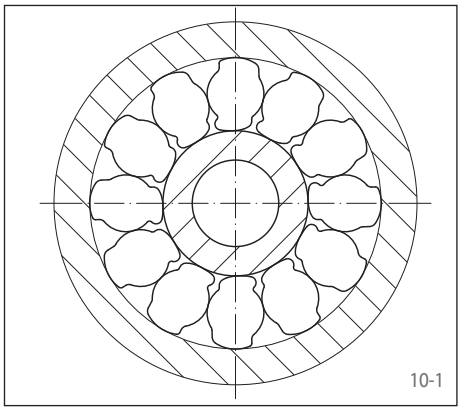
Freewheels with Sprags or Rollers

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



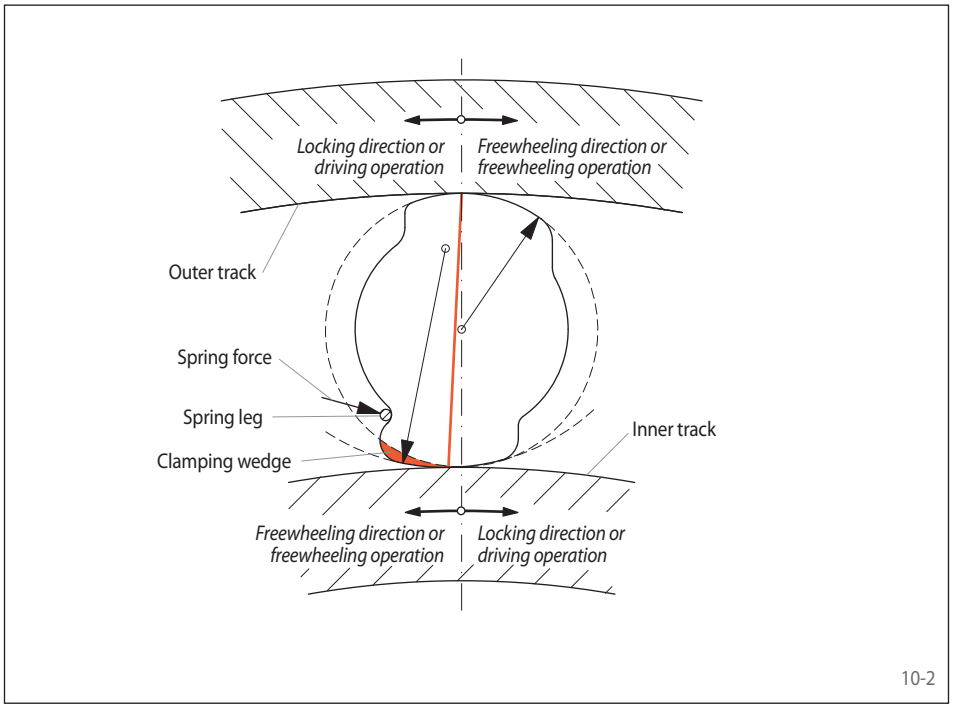
Function of Sprag Freewheels

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 counterclockwise 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 counterclockwise 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 ε_I or ε_A, whereby $\varepsilon_I > \varepsilon_A$. To achieve self-locking, the tangent of the clamping angle ε_I must be less than the friction value μ.

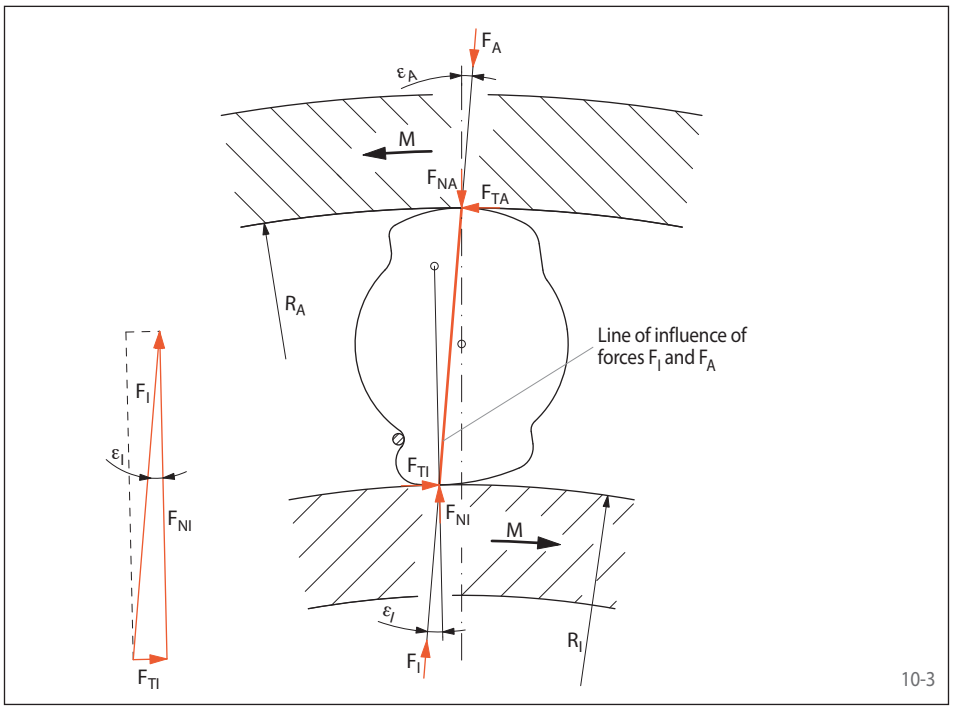
$$\tan \varepsilon_I = \frac{F_{TI}}{F_{NI}} \leqq \mu$$

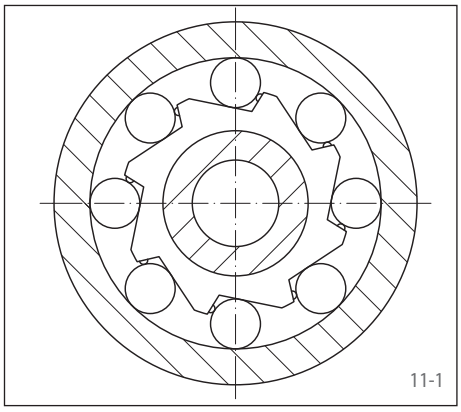
Because of the relationship

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

with z = number of sprags

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

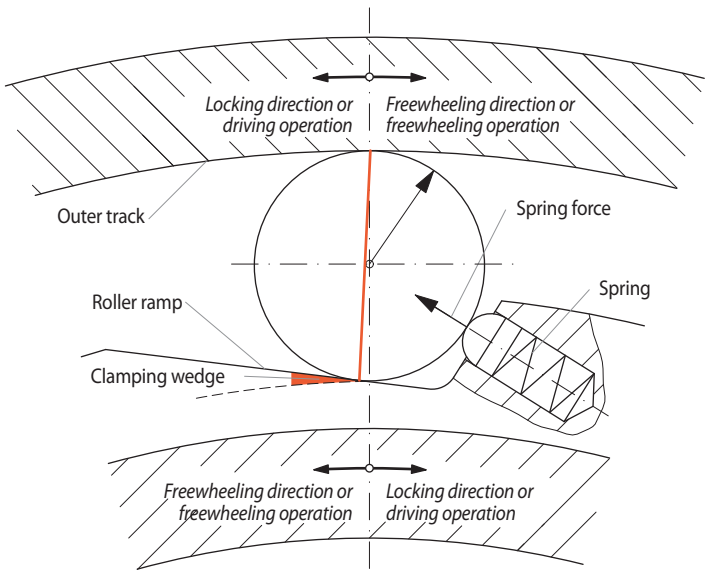




11-1

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.



11-2

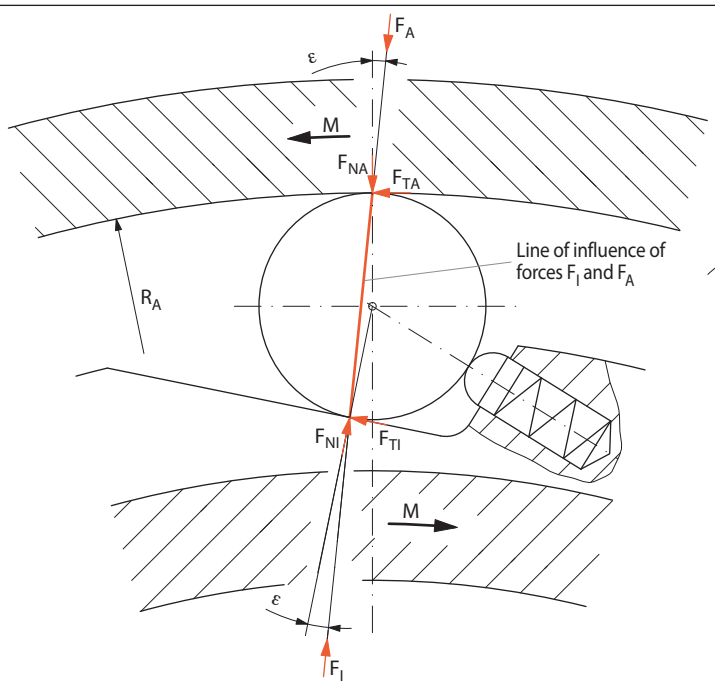
Function of Roller Freewheels

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 counterclockwise 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 counterclockwise and driving operation when turning clockwise.



11-3

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 ε. To achieve self-locking, the tangent of the clamping angle must be less than the friction value μ. E.g. for the contact point of the roller to the outer track this means:

$$\tan \varepsilon = \frac{F_{TA}}{F_{NA}} \leqq \mu$$

Because of the relationship

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

with z = number of rollers

the normal force and the clamping angle adapt automatically to the acting torque M.

Types for Extended Service Life

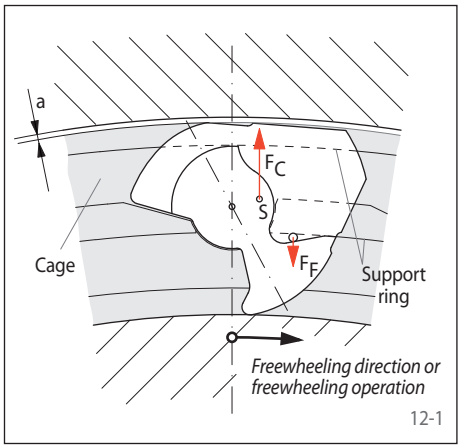
Use as	Standard type	Type with sprag lift-off X	Type with sprag lift-off Z	Type with RIDUVIT®	Type with P-grinding	Type with hydrodynamic sprag lift-off
	For universal use	For extended service life using sprag lift-off at high speed rotating inner ring	For extended service life using sprag lift-off at 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
Backstop	Up to medium speeds during freewheeling 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 freewheeling 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	

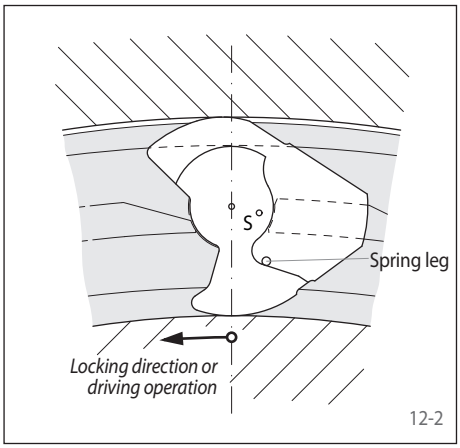
In addition the standard type, RINGSPANN has developed five other types for extended service life for freewheels with sprags. The table above lists the recommended application conditions for these types.

Type with sprag lift-off X

The sprag lift-off X is used for backstops and overrunning clutches, provided that in 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 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 counterclockwise and rests against the support ring of the cage. This results in the gap a between the sprag and the outer track; the freewheel works without contact. If the inner ring speed decreases to such an extent that the effect of the centrifugal force on the sprag is less than that of the spring force F_F, the sprag again rests on the outer ring and the freewheel is ready to lock (figure 12-2). If used as an overrunning clutch, the driving speed must not exceed 40% of the lift-off speed.

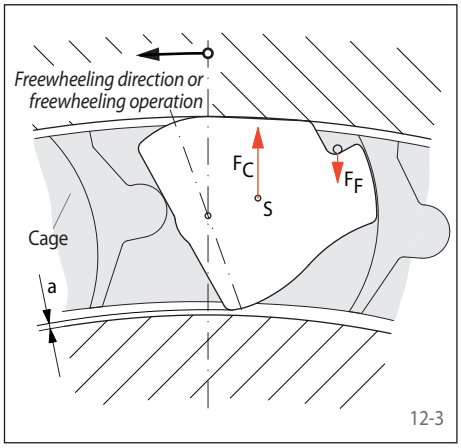


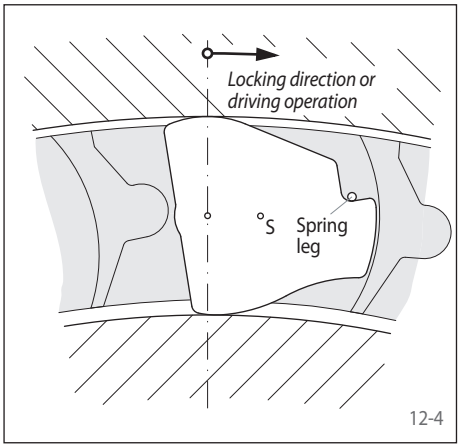


Type with sprag lift-off Z

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.

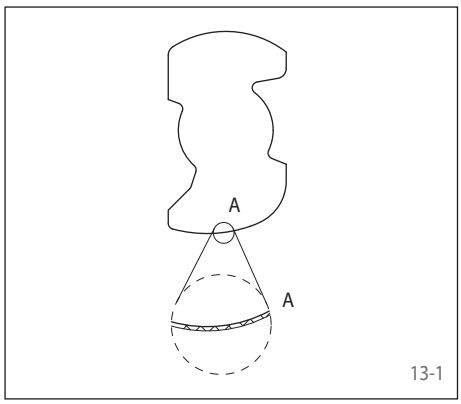
Figure 12-3 shows a freewheel with sprag lift-off Z in freewheeling operation. The sprags rotate with the outer ring. The centrifugal force F_C that is applied in the centre of gravity S of the sprag turns the sprag counterclockwise and rests against the outer ring. This results in the gap a between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

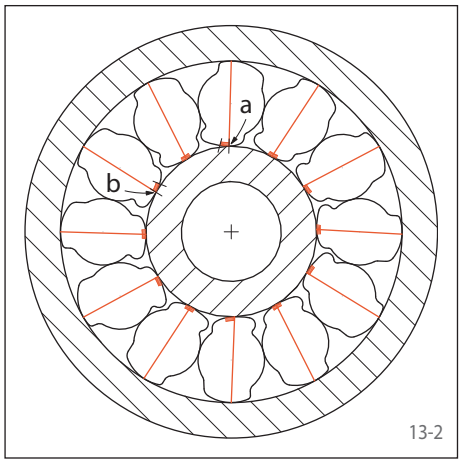
RINGSPANN sprags are made from chrome steel, the same material as used for the balls in ball bearings. The high compressive strength, elasticity and tensile strength of this material is required for the sprags in a locked state. In freewheeling operation, however, it is able to cope with utmost wear 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.



13-1

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 freewheeling 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.

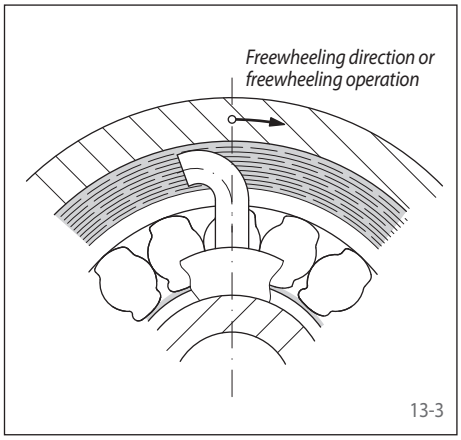


13-2

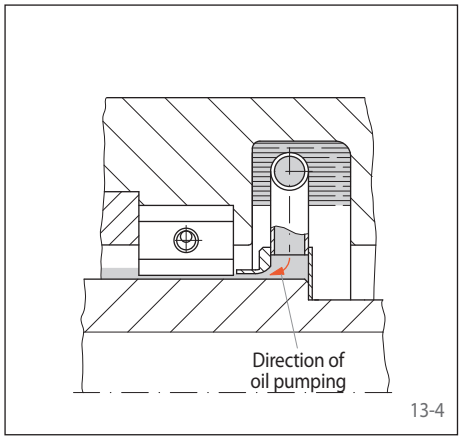
Type with hydrodynamic sprag lift-off

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 FKh) 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



13-3



13-4

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:

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

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

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

In these equations:

M_A = Selection torque of the backstop [Nm]

M_L = $9550 \cdot \eta \cdot P_L/n_{SP}$ [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^{-1}]

η = 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 η:

Type of installation	η	η^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 com- bustion 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^{-1}]

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.

Freewheel Selection

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 122 to 125 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

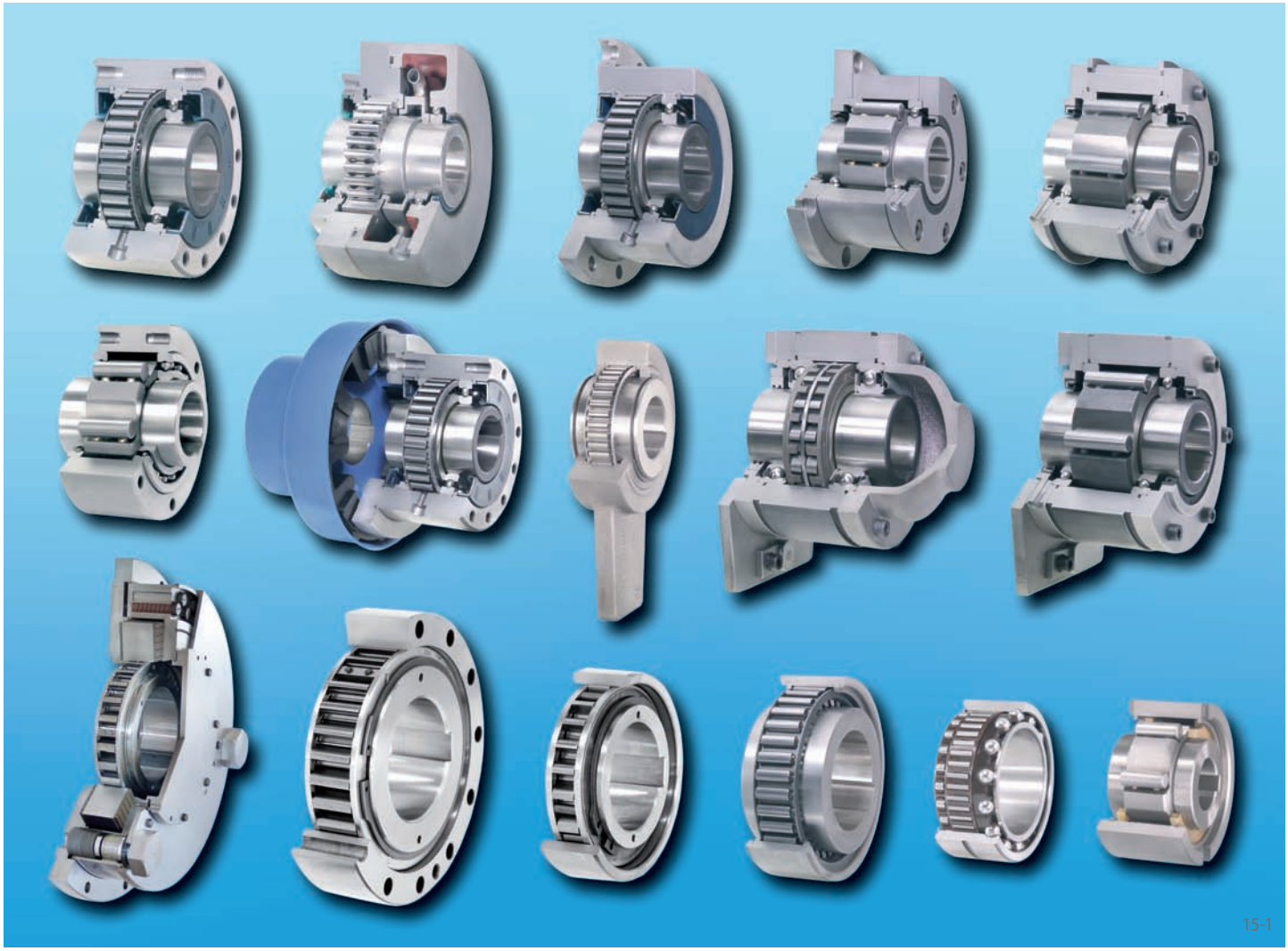
   Refer to page 5.
2. **Determine the suitable category of the Freewheel as**
   - Complete Freewheel,
   - Housing Freewheel,
   - Basic Freewheel,
   - Integrated Freewheel or
   - Internal Freewheel.

   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 113 as well as the technical points on pages 118 to 121.



Complete Freewheels FB

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

Features

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

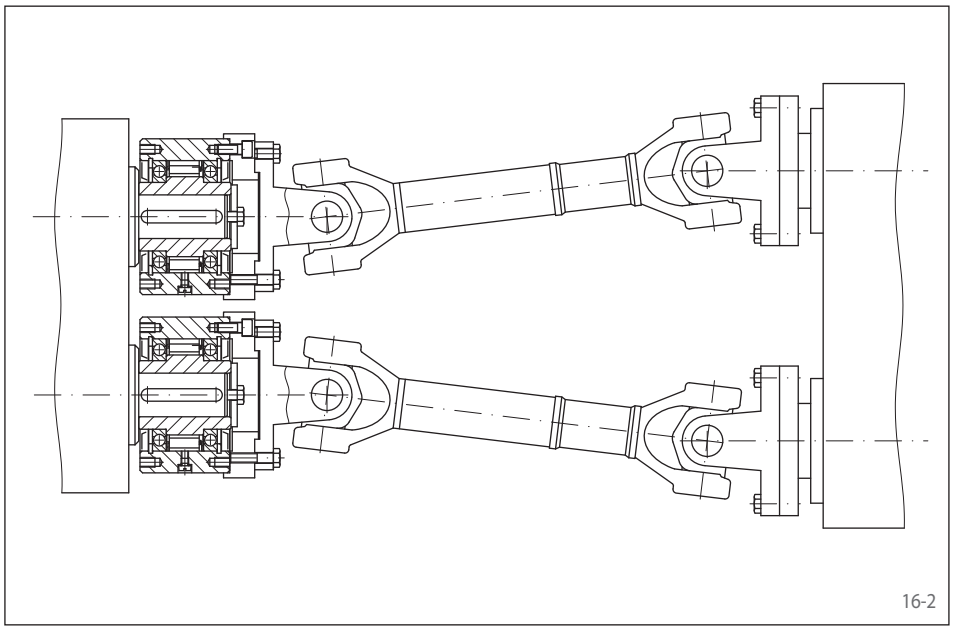
The freewheels FB are used as:

- 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:

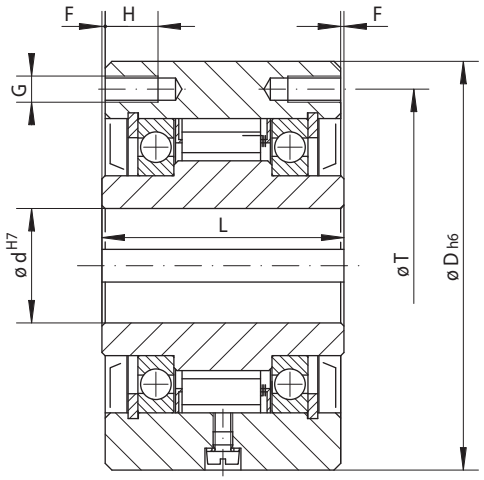
- FB 72 LZ, d = 38 mm

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

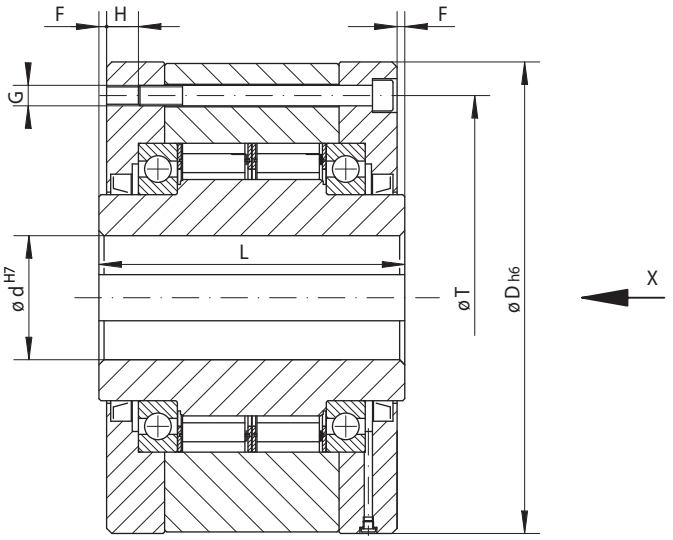
- counterclockwise free or
- clockwise free

Complete Freewheels FB

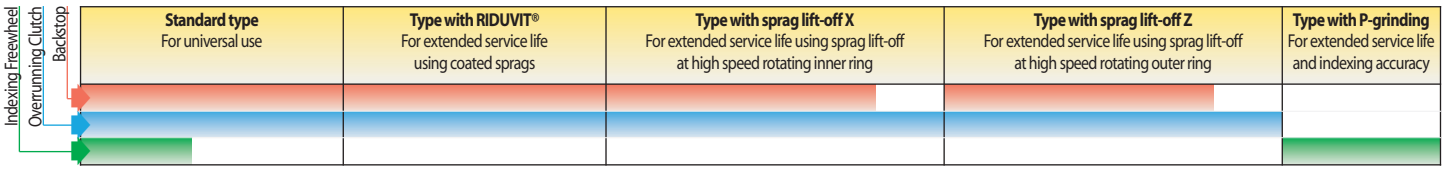
for bolting to the face with sprags, available in five types



Size FB 24 to FB 270 17-1



Size FB 340 to FB 440 17-2



Freewheel Size	Type	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Type	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Type	Nominal torque M_N Nm	Sprag lift-off at inner ring speed min^{-1}	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring drives min^{-1}	Type	Nominal torque M_N Nm	Sprag lift-off at outer ring speed min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Max. speed Inner ring drives min^{-1}	Type	Nominal torque M_N Nm
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 Standard mm	Standard mm	Standard mm	Standard mm	Standard mm	max. mm	D mm	F mm	G**	H mm	L mm	T mm	Z**	Weight kg
FB 24	12	14*				14*	62	1,0	M 5	8	50	51	3	0,9
FB 29	15	17*				17*	68	1,0	M 5	8	52	56	3	1,1
FB 37	14	16	18	20	22*	22*	75	0,5	M 6	10	48	65	4	1,3
FB 44	20	22	25*			25*	90	0,5	M 6	10	50	75	6	1,9
FB 57	25	28	30	32*		32*	100	0,5	M 8	12	65	88	6	2,8
FB 72	35	38	40	42*		42*	125	1,0	M 8	12	74	108	12	5,0
FB 82	35	40	45	50*		50*	135	2,0	M 10	16	75	115	12	5,8
FB 107	50	55	60	65*		65*	170	2,5	M 10	16	90	150	10	11,0
FB 127	50	60	70	75*		75*	200	3,0	M 12	18	112	180	12	19,0
FB 140	65	75	80	90		95*	250	5,0	M 16	25	150	225	12	42,0
FB 200	110	120				120	300	5,0	M 16	25	160	270	16	62,0
FB 270	140					150	400	6,0	M 20	30	212	360	18	150,0
FB 340	180					240	500	7,5	M 20	35	265	450	24	275,0
FB 440	220					300	630	7,5	M 30	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

Features

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

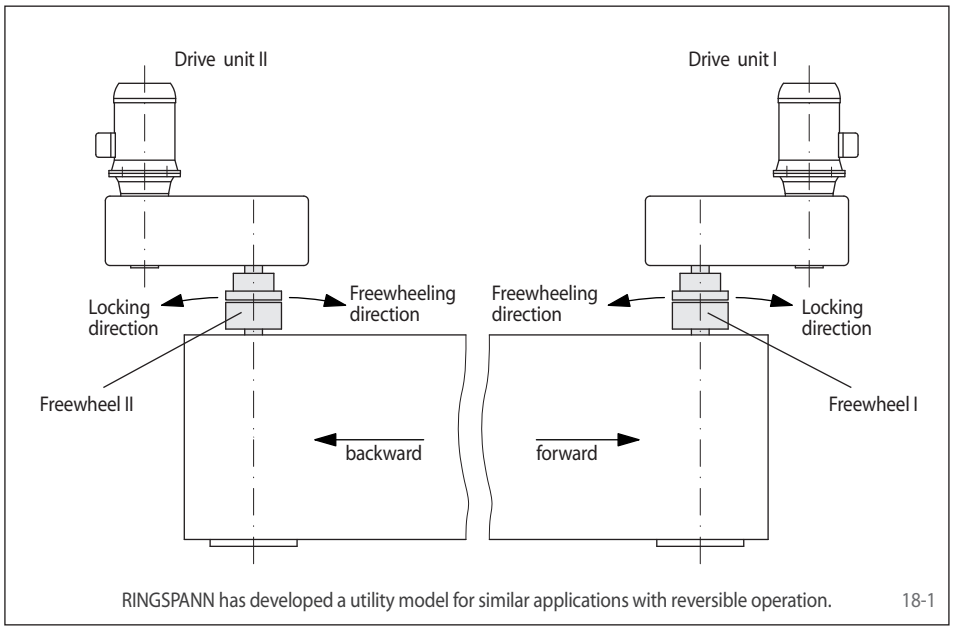
The freewheels FR … are used as:

- Backstops
- Overrunning Clutches
- Indexing Freewheels

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

Nominal torques up to 27 500 ft-lbs.

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



RINGSPANN has developed a utility model for similar applications with reversible operation. 18-1

Application example

Complete Freewheels FRS 600 in both drive units of a transport system with a conveyor belt that moves both forward and backward (reversible operation). In order to ensure that the conveyor belt is moved under tension, forward movement is driven by drive unit I, reverse movement by drive unit II. The freewheels automatically disengage the respective non working drive, eliminating the need for expensive external clutches or brakes.

For forward movement, drive unit II is started in freewheeling direction of freewheel II; freewheel II is in freewheeling operation and disengages drive unit II from the conveyor belt. Afterwords drive unit I is started in the locking direction of the freewheel I; freewheel I is in driving operation and the conveyor belt is moved forward by drive unit I. The speed of drive unit I is lower than that of drive unit II. Thus freewheel II remains in freewheeling operation and drive unit II is not improperly engaged.

For reverse movement, the drive units are started in reverse order and direction of rotation at the corresponding speeds.

Mounting

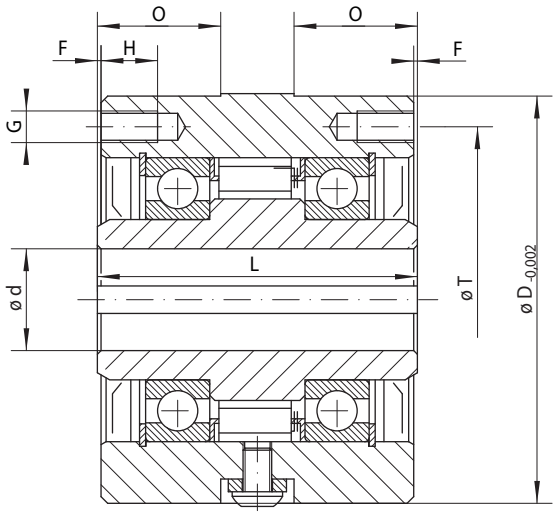
The customer attachment part is centered on the external diameter D and then bolted on to the face.

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

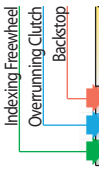
Standard bores and keyway sizes [inch]									
FR … 300	0,500 1/8 x 1/16	0,625 3/16 x 3/32	0,750 3/16 x 3/32						
FR … 400	0,500 1/8 x 1/16	0,625 3/16 x 3/32	0,750 3/16 x 3/32	0,875 3/16 x 3/32	1,000 1/4 x 1/8	1,125 1/4 x 1/8			
FR … 500	0,875 3/16 x 3/32	1,000 1/4 x 1/8	1,125 1/4 x 1/8	1,250 1/4 x 1/8	1,312 1/4 x 3/32				
FR … 550	1,250 1/4 x 1/8	1,312 3/8 x 3/16	1,500 3/8 x 3/16	1,625 3/8 x 1/8					
FR … 600	1,250 1/4 x 1/8	1,375 3/8 x 3/16	1,438 3/8 x 3/16	1,500 3/8 x 3/16	1,625 3/8 x 3/16	1,688 3/8 x 3/16	1,750 3/8 x 3/16	1,938 3/8 x 1/8	2,000 3/8 x 1/8
FR … 650	1,938 1/2 x 1/4	2,000 1/2 x 1/4	2,250 1/2 x 1/4	2,438 5/8 x 1/8	2,500 5/8 x 1/8				
FR … 700	1,938 1/2 x 1/4	2,000 1/2 x 1/4	2,250 1/2 x 1/4	2,438 5/8 x 5/16	2,500 5/8 x 5/16	2,750 5/8 x 7/32	2,938 5/8 x 1/8		
FR … 750	2,438 5/8 x 5/16	2,500 5/8 x 5/16	2,938 3/4 x 3/8	3,000 3/4 x 3/8	3,250 3/4 x 3/16	3,438 3/4 x 1/8			
FR … 775	2,750 5/8 x 5/16	2,938 3/4 x 3/8	3,000 3/4 x 3/8	3,250 3/4 x 3/8	3,438 7/8 x 5/16	3,500 7/8 x 5/16	3,750 7/8 x 1/4		
FR … 800	3,000 3/4 x 3/8	3,250 3/4 x 3/8	3,438 7/8 x 7/16	3,500 7/8 x 7/16	3,750 7/8 x 7/16	3,937 1 x 1/2	4,000 1 x 1/2	4,250 1 x 3/8	4,500 1 x 1/4
FR … 900	4,000 1 x 1/2	4,438 1 x 1/2	4,500 1 x 1/2	4,938 1 1/4 x 5/16	5,000 1 1/4 x 5/16	5,438 1 1/4 x 5/16			
FR …1000	5,750 1 1/2 x 3/4	5,938 1 1/2 x 3/4	6,000 1 1/2 x 3/4	6,750 1 3/4 x 7/16	6,875 1 3/4 x 7/16	7,000 1 3/4 x 7/16			

Complete Freewheels FR …

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



19-1



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 Size	Nominal torque M_N ft-lbs	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Freewheel Size	Nominal torque M_N ft-lbs	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Freewheel Size	Nominal torque M_N ft-lbs	Sprag lift-off at inner ring speed min^{-1}	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring drives min^{-1}	Freewheel Size	Nominal torque M_N ft-lbs	Sprag lift-off at outer ring speed min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Max. speed Inner ring drives min^{-1}
FRS 300	210	2500	2600	FRSG 300	210	3600	3600										
FRS 400	335	1900	2100	FRSG 400	335	3600	3600	FRX 400	125	860	4000	340	FRZ 400	280	800	2600	320
FRS 500	800	1400	1900	FRSG 500	800	3600	3600	FRX 500	425	750	4000	300	FRZ 500	535	1400	2050	560
FRS 550	1525	1175	1600	FRSG 550	1525	3600	3600	FRX 550	750	700	4000	280	FRZ 550	1380	1550	1800	620
FRS 600	1950	1100	1500	FRSG 600	1950	3600	3600	FRX 600	1000	670	4000	265	FRZ 600	1765	1450	1650	580
FRS 650	2700	900	1250	FRSG 650	2700	3600	3600	FRX 650	1750	610	4000	240	FRZ 650	2500	1300	1400	520
FRS 700	5525	790	1150	FRSG 700	5525	1800	1800	FRX 700	4050	350	3600	140	FRZ 700	5250	1160	1200	465
FRS 750	9350	790	1150	FRSG 750	9350	1800	1800	FRX 750	7500	320	2400	125	FRZ 750	8750	1160	1200	465
FRS 775	8500	750	1050	FRSG 775	8500	1800	1800	FRX 775	7400	320	2100	125	FRZ 775	6500	950	1050	380
FRS 800	8200	700	950	FRSG 800	8200	1800	1800	FRX 800	14500	250	1800	100	FRZ 800	6500	880	975	350
FRS 900	16800	700	950	FRSG 900	16800	1200	1200	FRX 900	15000	250	650	100					
FRS 1000	27500	630	800	FRSG 1000	27500	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 inch	F inch	G Thread	L inch	H inch	O inch	T inch	Z*	Weight lbs
FR … 300	0,500	0,650	0,750							0,750	3,000	0,063	0,250-28	2,500	0,375	0,750	2,625	4	3,5
FR … 400	0,500	0,625	0,750	0,875	1,000	1,125				1,125	3,500	0,032	0,312-24	2,750	0,500	0,750	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	1,000	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	0,750	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	1,000	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	0,750	1,000	5,750	8	24,0
FR … 700	1,938	2,000	2,250	2,438	2,500	2,750	2,938			2,938	7,125	0,063	0,375-24	5,000	0,750	1,000	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	0,875	1,250	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	0,875	1,250	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	0,875	1,250	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	1,000	1,375	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	1,375	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.

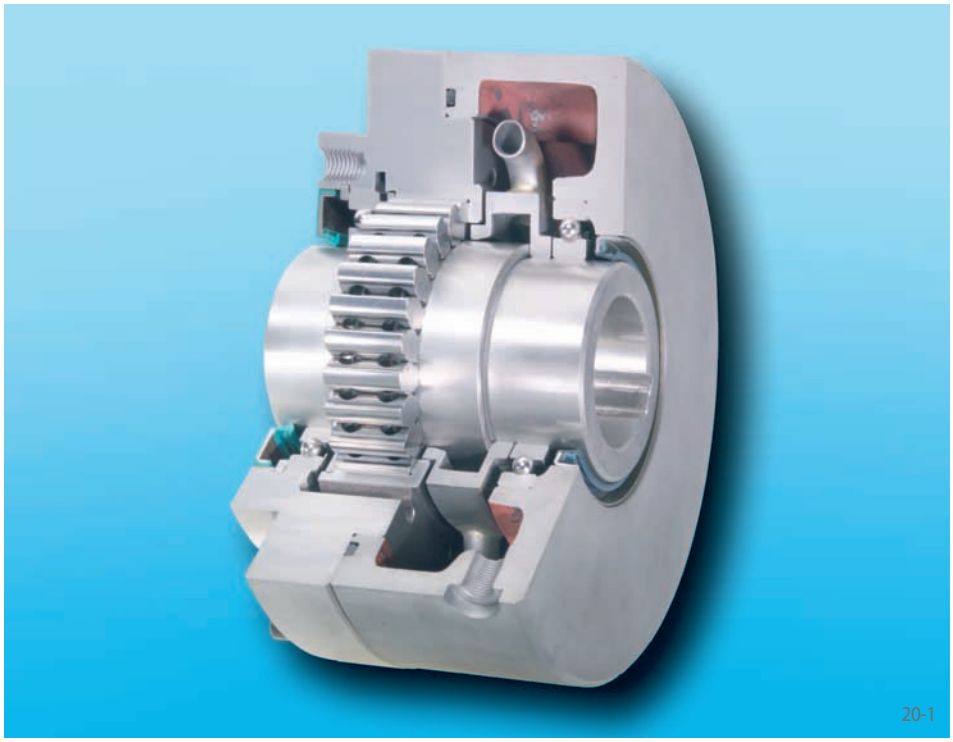
Example for ordering

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

- FRZ 700, d = 2 inch

Complete Freewheels FKh

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



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.

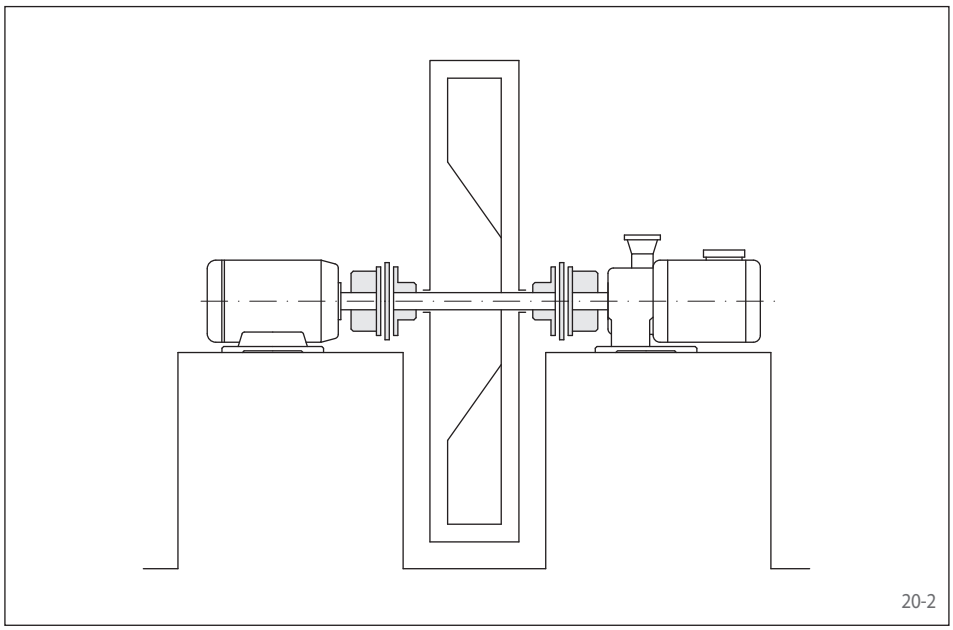
The freewheels FKh are used as:

- 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.

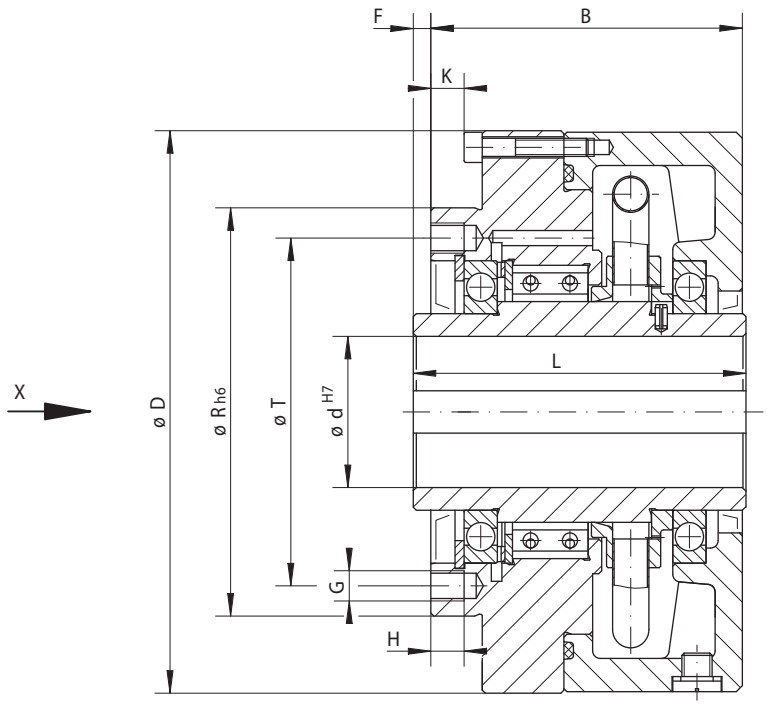


Application example

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.

Complete Freewheels FKh

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



21-1

Overrunning Clutch

Dimensions

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

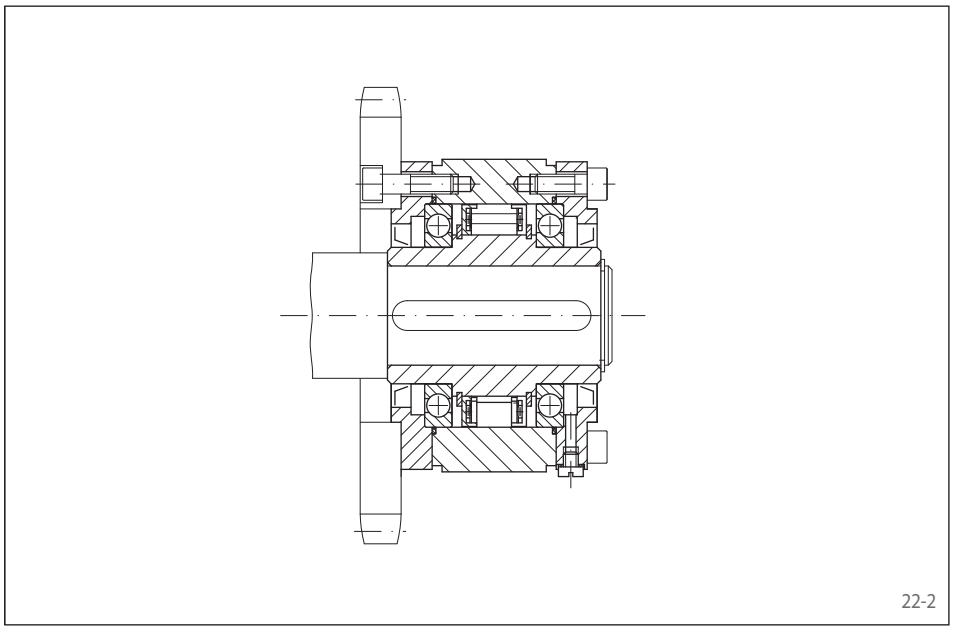
- FKh 28 ATR, d = 50 mm

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

- counterclockwise free or
- clockwise free

Complete Freewheels BD … X

for bolting to the face with sprag lift-off X



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.

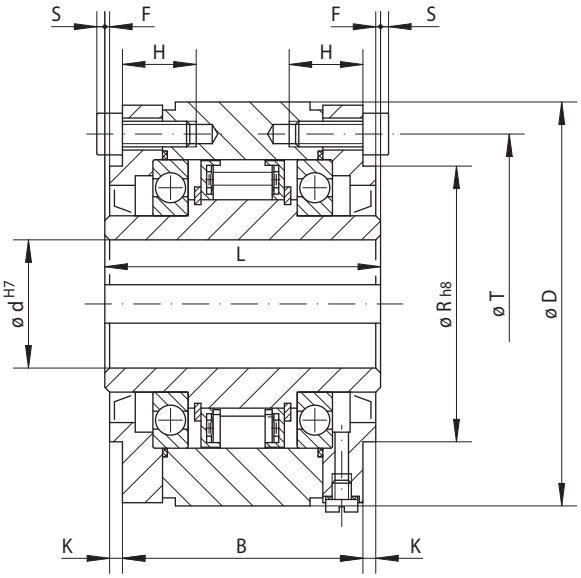
Bores up to 150 mm.

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.

Complete Freewheels BD … X

for bolting to the face with sprag lift-off X



23-1

Overrunning Clutch / 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 M_N Nm	Sprag lift-off at inner ring speed min^{-1}	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring drives min^{-1}	Bore d Standard mm	Bore d Standard mm	Bore d Standard mm	Bore d max. mm	B mm	D mm	F mm	G**	H mm	K mm	L mm	R mm	S mm	T mm	Z**	Weight kg
BD 20	DX	420	750	1700	300	30			30	65,5	106	0,75	M 6	26	5	77	70	0,5	90	6	3,8
BD 25	DX	700	700	1600	280	35	40		40	81,5	126	0,75	M 6	30	5	93	80	0,5	105	6	6,6
BD 30	DX	1250	630	1600	252	45	50		50	88,5	151	0,75	M 8	36	6	102	100	1,5	130	6	10,3
BD 40	SX	1900	430	1500	172	45	55	60	60	102,5	181	0,75	M 10	37	6	116	120	3,5	160	6	17,4
BD 45	SX	2300	400	1500	160	55	65	70	70	115,5	196	1,25	M 12	38	6	130	130	5,0	170	8	22,4
BD 52	SX	5600	320	1500	128	65	75	80	80	130,5	216	1,75	M 14	44	8	150	150	4,5	190	8	31,1
BD 55	SX	7700	320	1250	128	75	85	90	90	146,5	246	1,75	M 14	48	10	170	160	2,5	215	8	45,6
BD 60	SX	14500	250	1100	100	85	95	100	105	182,5	291	1,75	M 14	55	10	206	190	2,5	250	8	78,2
BD 70	SX	21000	240	1000	96	120			120	192,5	321	1,25	M 16	58	10	215	210	5,0	280	8	93,4
BD 100	UX	42500	210	750	84	150			150	248,5	411	3,75	M 20	79	10	276	270	6,5	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

Features

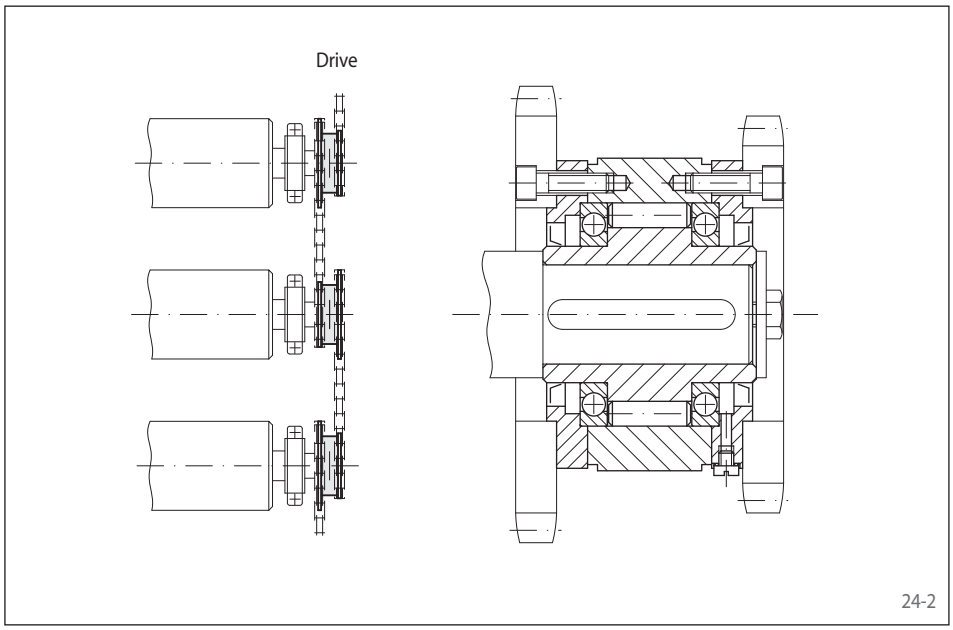
Complete Freewheels BD … R are sealed freewheels with rollers and ball bearings. They are supplied oil-filled.

The freewheels BD … R are used as:

- Backstops
- Overrunning Clutches
- Indexing Freewheels

Nominal torques up to 57 500 Nm.

Bores up to 150 mm.

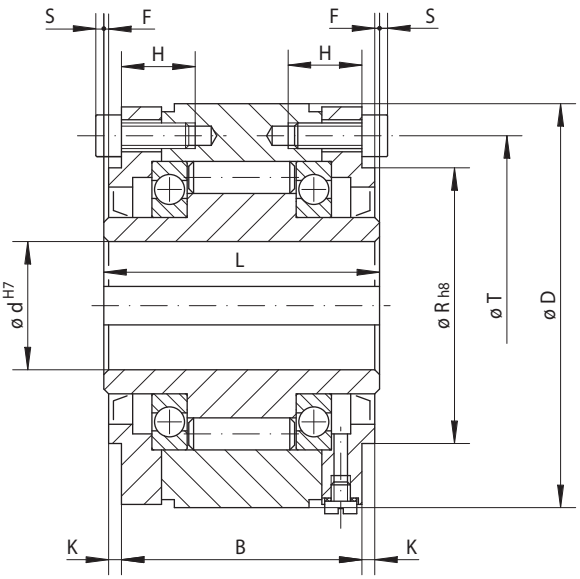


Application example

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. Therefor 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.

Complete Freewheels BD … R

for bolting to the face with rollers



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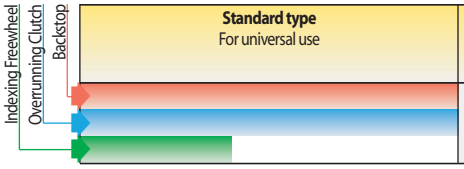


Standard type
For universal use

Dimensions

Freewheel Size	Type	Nominal torque M_N Nm	Max. Speed Inner ring freewheels/ overruns min^{-1}	Max. Speed Outer ring freewheels/ overruns min^{-1}	Bore d Standard mm	Bore d max. mm	B mm	D mm	F mm	G**	H mm	K mm	L mm	R mm	S mm	T mm	Z**	Weight kg
BD 12	R	150	1750	3500	15	15	60,5	71	0,75	M 5	25	3	68	45	1,5	56	4	1,5
BD 15	R	230	1650	3300	20	20	62,5	81	0,75	M 5	25	3	70	50	1,5	65	4	2,0
BD 18	R	340	1550	3100	25	25	62,5	96	0,75	M 5	25	3	70	60	1,5	80	6	2,9
BD 20	R	420	1450	2900	30	30	65,5	106	0,75	M 6	26	5	77	70	0,5	90	6	3,8
BD 25	R	800	1250	2500	40	40	81,5	126	0,75	M 6	30	5	93	80	0,5	105	6	6,6
BD 28	R	1200	1100	2200	45	45	81,5	136	0,75	M 8	30	6	95	90	1,5	115	6	7,8
BD 30	R	1600	1000	2000	50	50	88,5	151	0,75	M 8	36	6	102	100	1,5	130	6	10,3
BD 35	R	1800	900	1800	55	55	96,5	161	0,75	M 8	35	6	110	110	1,5	140	6	12,5
BD 40	R	3500	800	1600	60	60	102,5	181	0,75	M 10	37	6	116	120	3,5	160	6	17,4
BD 45	R	7100	750	1500	70	70	115,5	196	1,25	M 12	38	6	130	130	5,0	170	8	22,4
BD 50	R	7500	700	1400	75	75	117,5	206	1,25	M 12	39	6	132	140	5,0	180	8	24,2
BD 52	R	9300	650	1300	80	80	130,5	216	1,75	M 14	44	8	150	150	4,5	190	8	31,1
BD 55	R	12500	550	1100	90	90	146,5	246	1,75	M 14	48	10	170	160	2,5	215	8	45,6
BD 60	R	14500	500	1000		105	182,5	291	1,75	M 14	55	10	206	190	2,5	250	8	78,2
BD 70	R	22500	425	850		120	192,5	321	1,25	M 16	58	10	215	210	5,0	280	8	93,4
BD 80	R	25000	375	750		130	200,5	351	1,75	M 16	60	10	224	220	4,5	310	8	116,8
BD 90	R	33500	350	700		140	210,5	371	2,75	M 16	68	10	236	240	3,5	330	10	136,7
BD 95	R	35000	300	600		150	223,5	391	2,75	M 16	79	10	249	250	3,5	345	10	159,3
BD 100	R	57500	250	500		150	248,5	411	3,75	M 20	79	10	276	270	6,5	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.

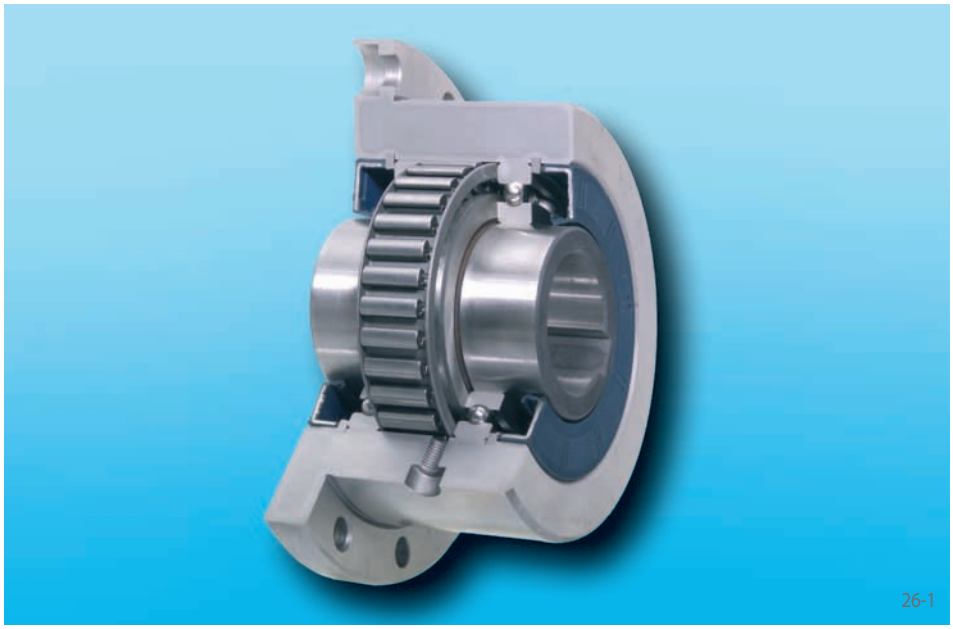
Example for ordering

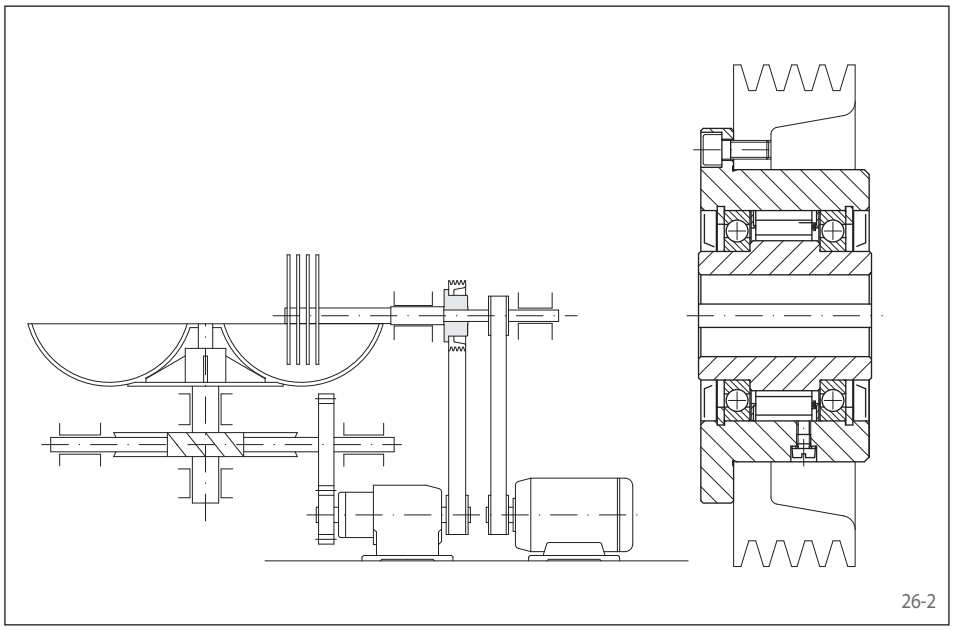
Freewheel size BD 40, standard type with bore 60 mm:

- BD 40 R, d = 60 mm

Complete Freewheels FBF

with mounting flange
with sprags, available in five types





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.

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:

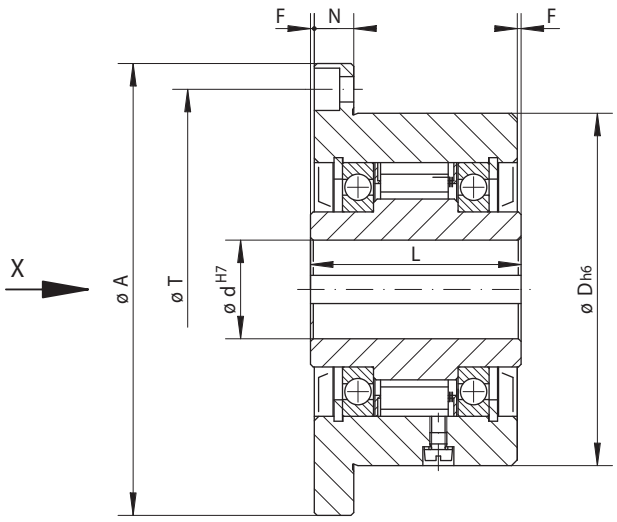
- FBF 72 LZ, d = 38 mm

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

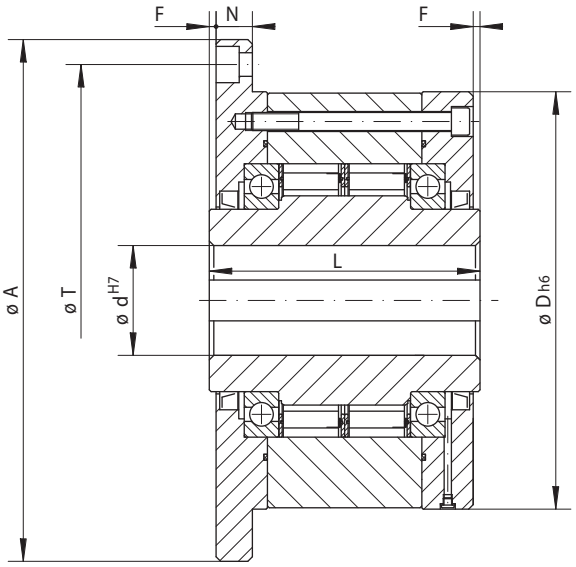
- counterclockwise free or
- clockwise free

Complete Freewheels FBF

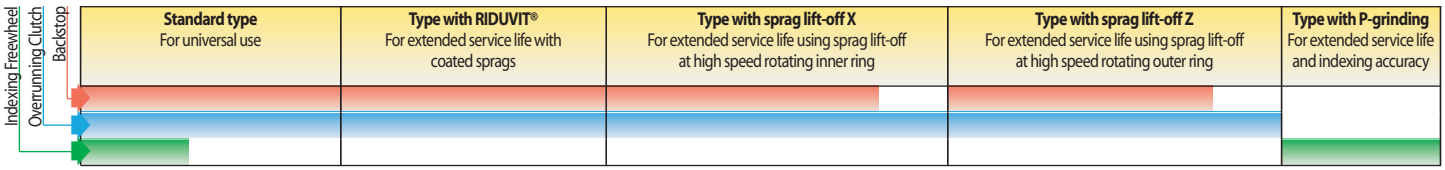
with mounting flange
with sprags, available in five types



Size FBF 24 to FBF 270 27-1



Size FBF 340 to FBF 440 27-2



Freewheel Size	Type	Nominal torque M_N Nm	Max. Speed Inner ring freewheels/ overruns min^{-1}	Max. Speed Outer ring freewheels/ overruns min^{-1}	Type	Nominal torque M_N Nm	Max. Speed Inner ring freewheels/ overruns min^{-1}	Max. Speed Outer ring freewheels/ overruns min^{-1}	Type	Nominal torque M_N Nm	Sprag lift-off at inner ring speed min^{-1}	Max. Speed Inner ring freewheels/ overruns min^{-1}	Max. Speed Outer ring drives min^{-1}	Type	Nominal torque M_N Nm	Sprag lift-off at outer ring speed min^{-1}	Max. Speed Outer ring freewheels/ overruns min^{-1}	Max. Speed Inner ring drives min^{-1}	Type	Nominal torque M_N Nm
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												

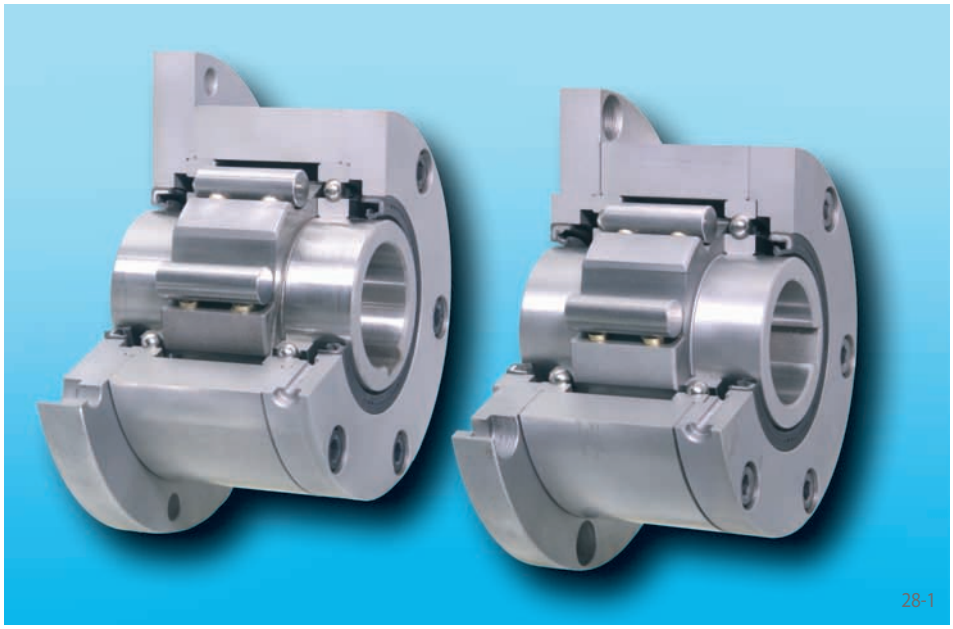
The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Freewheel Size	Bore d Standard mm	Standard mm	Standard mm	Standard mm	Standard mm	max. mm	A mm	D mm	F mm	G**	L mm	N mm	T mm	Z**	Weight kg
FBF 24	12	14*				14*	85	62	1,0	M 5	50	10	72	3	1,1
FBF 29	15	17*				17*	92	68	1,0	M 5	52	11	78	3	1,3
FBF 37	14	16	18	20	22*	22*	98	75	0,5	M 5	48	11	85	8	1,5
FBF 44	20	22	25*			25*	118	90	0,5	M 6	50	12	104	8	2,3
FBF 57	25	28	30	32*		32*	128	100	0,5	M 6	65	12	114	12	3,2
FBF 72	35	38	40	42*		42*	160	125	1,0	M 8	74	14	142	12	5,8
FBF 82	35	40	45	50*		50*	180	135	2,0	M 10	75	16	155	8	7,0
FBF 107	50	55	60	65*		65*	214	170	2,5	M 10	90	18	192	10	12,6
FBF 127	50	60	70	75*		75*	250	200	3,0	M 12	112	20	225	12	21,4
FBF 140	65	75	80	90		95*	315	250	5,0	M 16	150	22	280	12	46,0
FBF 200	110	120				120	370	300	5,0	M 16	160	25	335	16	68,0
FBF 270	140					150	490	400	6,0	M 20	212	32	450	16	163,0
FBF 340	180					240	615	500	7,5	M 24	265	40	560	18	300,0
FBF 440	220					300	775	630	7,5	M 30	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 EN ISO 4762) on pitch circle T.

Complete Freewheels FGR … R A1A2 and FGR … R A2A7

with mounting flange
with rollers



Features

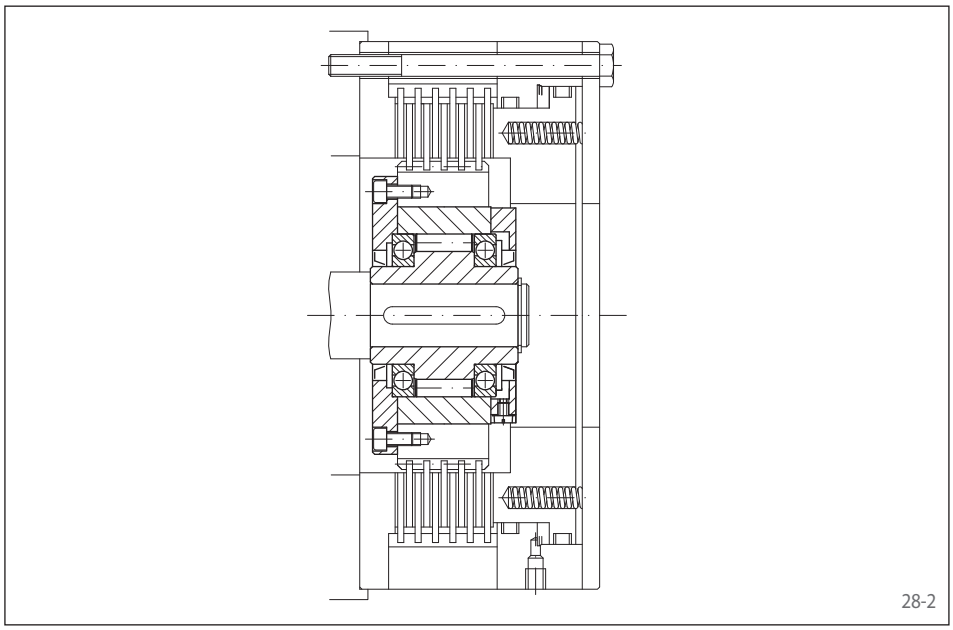
Complete Freewheels FGR … R A1A2 and FGR … R A2A7 with mounting flange are sealed roller freewheels with ball bearings. They are oil lubricated.

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.

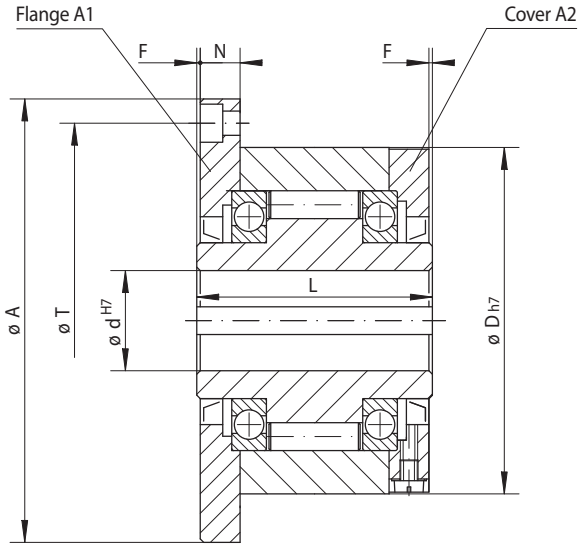


Application example

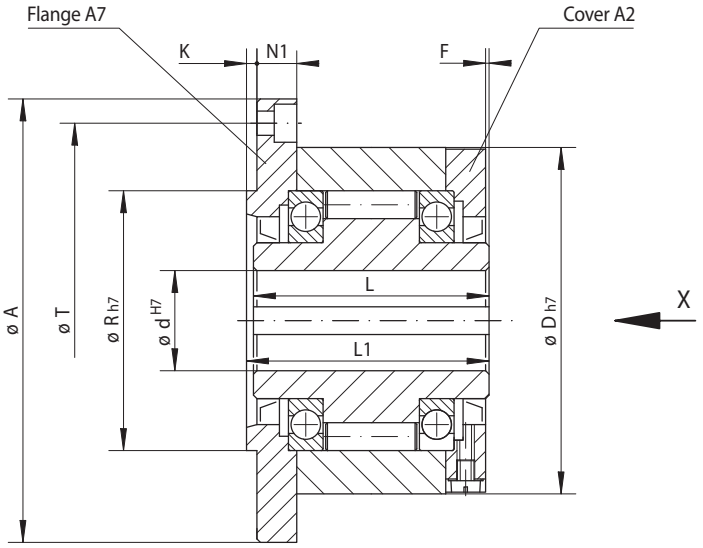
Complete Freewheel FGR 50 R A1A2, used in a hydraulically released, spring actuated multi-disk brake for winch drives. When the load is lifted, the multiple-disk brake is closed and the inner ring is freewheeling. At a standstill, the freewheel functions as a backstop. The load is held by the brake and 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 an simpler and more cost-effective manner.

Complete Freewheels FGR … R A1A2 and FGR … R A2A7

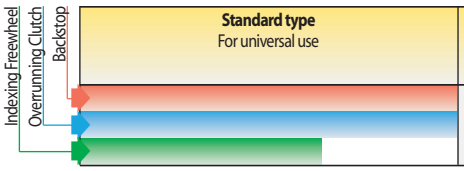
with mounting flange
with rollers



Series FGR … R A1A2 29-1



Series FGR … R A2A7 29-2



Standard type
For universal use

Dimensions

Freewheel Size	Type	Flange and cover combination		Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	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 kg
FGR 12	R	A1A2	A2A7	55	2 500	5 400	12	85	62	1	M 5	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	M 5	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	M 5	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	M 6	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	M 6	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	M 6	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	M 8	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	M 8	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	M 8	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	M 10	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	M 10	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	M 10	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	M 10	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	M 12	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	M 16	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	M 16	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	M 20	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 EN ISO 4762) 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

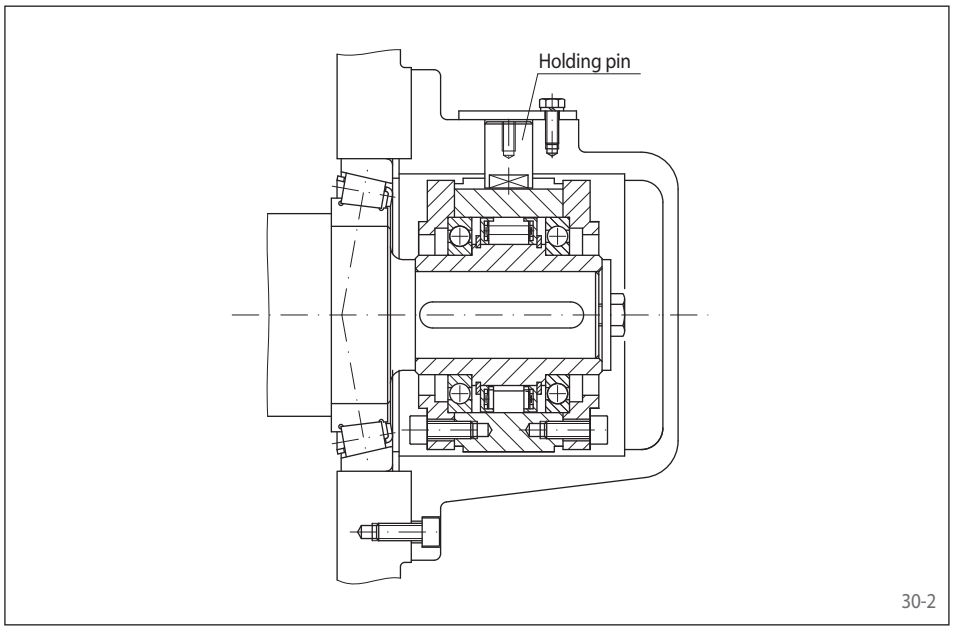
Basic Freewheel, flange, cover, seals and screws are supplied loose provided nothing else is stated in the order.

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:

- counterclockwise free or
- clockwise free

Complete Freewheels BM … X

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



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.

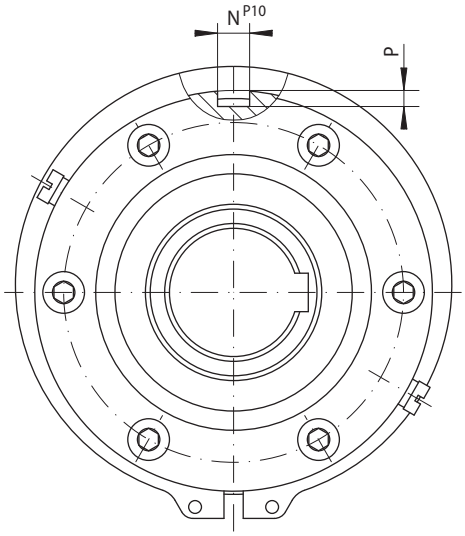
Bores up to 150 mm.

Application example

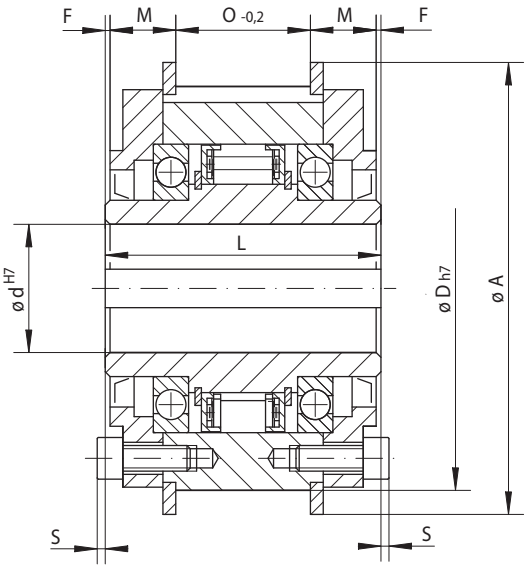
Complete Freewheel BM 60 SX as a backstop, arranged at the end of the intermediate shaft of a spur gearbox. The freewheel is used without the radial seal rings on each side, and is lubricated by the gearbox oil. A radial holding pin engages in the keyway of the outer ring. The backdriving torque is supported 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.

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 M_N Nm	Sprag lift-off at inner ring speed min^{-1}	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring drives min^{-1}	Bore d Standard mm	Bore d Standard mm	Bore d Standard mm	Bore d max. mm	A mm	D mm	F mm	L mm	M mm	N mm	O mm	P mm	S mm	Weight kg
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	SX	1900	430	1500	172	45	55	60	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	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	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	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	105	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.

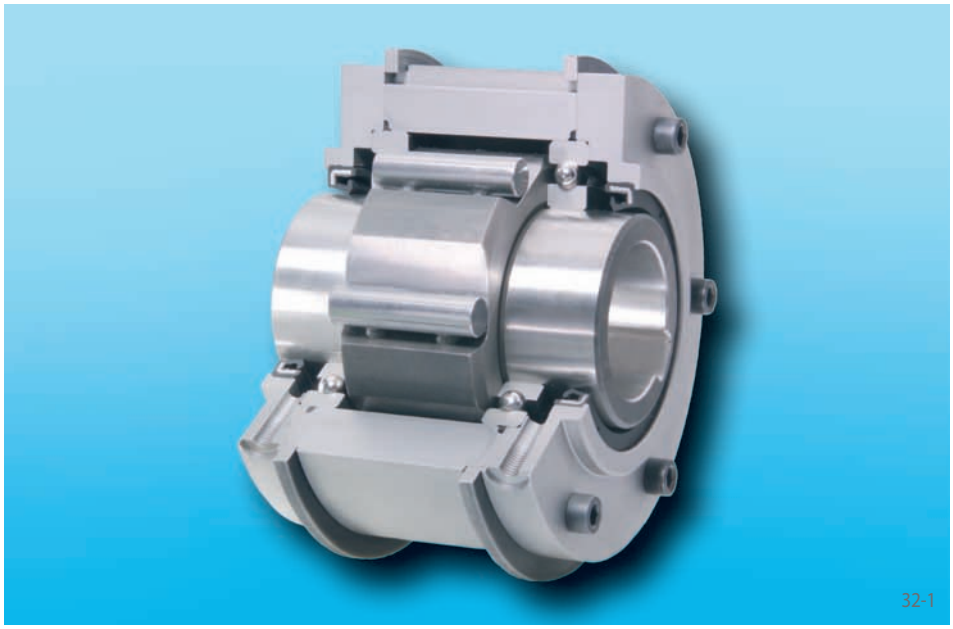
Example for ordering

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



Features

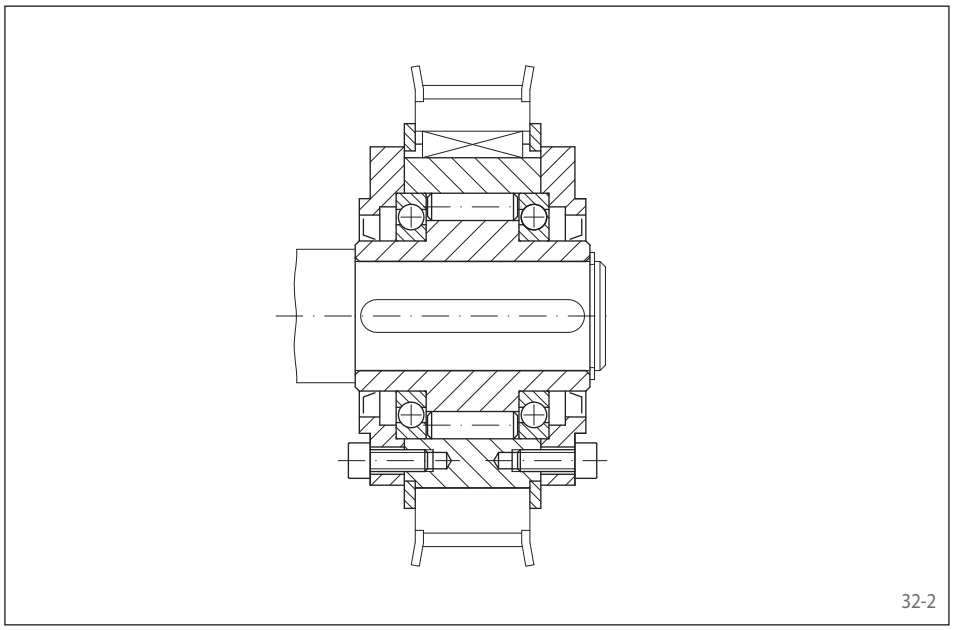
Complete Freewheels BM … R are sealed roller freewheels with ball bearings. They are supplied oil-filled and ready for installation.

The freewheels BM … R are used as:

- Backstops
- Overrunning Clutches
- Indexing Freewheels

Nominal torques up to 57 500 Nm.

Bores up to 150 mm.

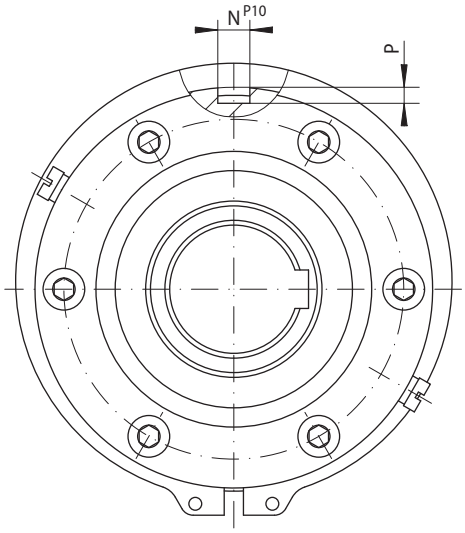


Application example

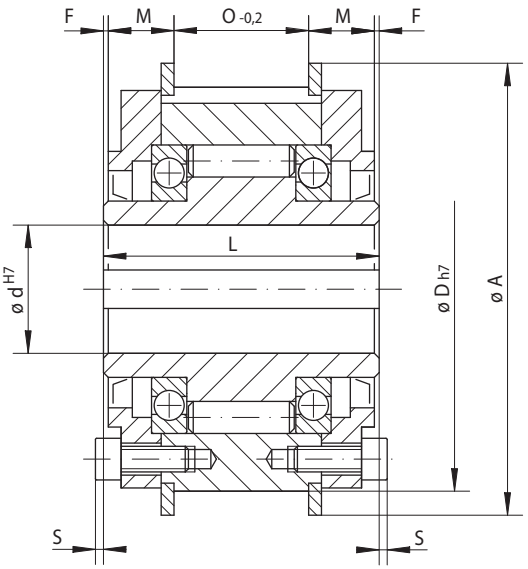
Complete Freewheel BM 40 R as an overrunning clutch on the shaft end of the main drive of a paper processing machine. The pulley is connected to an auxiliary drive. In normal operation (freewheeling operation) the inner ring overruns and the outer ring is at a standstill with the attached pulley. During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

Complete Freewheels BM … R

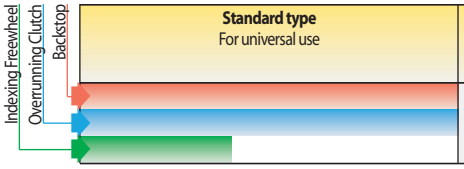
for keyway connection on the outer ring with rollers



33-1



33-2



Standard type
For universal use

Dimensions

Freewheel Size	Type	Nominal torque M_N Nm	Max. speed: Inner ring freewheels/ overruns min^{-1}	Max. speed: Outer ring freewheels/ overruns min^{-1}	Bore d: Standard mm	Bore d: max. mm	A mm	D mm	F mm	L mm	M mm	N mm	O mm	P mm	S mm	Weight kg
BM 12	R	150	1750	3500	15	15	84	70	0,75	68	15,75	5	35	3,0	3,0	1,5
BM 15	R	230	1650	3300	20	20	94	80	0,75	70	15,75	5	37	3,0	3,0	2,0
BM 18	R	340	1550	3100	25	25	111	95	0,75	70	16,25	8	36	4,0	3,0	2,9
BM 20	R	420	1450	2900	30	30	121	105	0,75	77	20,25	8	35	4,0	2,5	3,8
BM 25	R	800	1250	2500	40	40	144	125	0,75	93	22,25	10	47	5,0	2,5	6,6
BM 28	R	1200	1100	2200	45	45	155	135	0,75	95	23,25	12	47	5,0	4,0	7,8
BM 30	R	1600	1000	2000	50	50	171	150	0,75	102	24,25	12	52	5,0	4,0	10,3
BM 35	R	1800	900	1800	55	55	182	160	0,75	110	24,25	14	60	5,5	4,0	12,5
BM 40	R	3500	800	1600	60	60	202	180	0,75	116	25,25	16	64	6,0	6,5	17,4
BM 45	R	7100	750	1500	70	70	218	195	1,25	130	24,75	20	78	7,5	8,5	22,4
BM 50	R	7500	700	1400	75	75	227	205	1,25	132	26,75	20	76	7,5	8,5	24,2
BM 52	R	9300	650	1300	80	80	237	215	1,75	150	33,75	25	79	9,0	8,5	31,1
BM 55	R	12500	550	1100	90	90	267	245	1,75	170	35,25	25	96	9,0	6,5	45,6
BM 60	R	14500	500	1000		105	314	290	1,75	206	40,25	28	122	10,0	6,5	78,2
BM 70	R	22500	425	850		120	350	320	1,25	215	44,75	28	123	10,0	9,0	93,4
BM 80	R	25000	375	750		130	380	350	1,75	224	46,25	32	128	11,0	8,5	116,8
BM 90	R	33500	350	700		140	400	370	2,75	236	49,25	32	132	11,0	7,5	136,7
BM 95	R	35000	300	600		150	420	390	2,75	249	53,25	36	137	12,0	6,5	159,3
BM 100	R	57500	250	500		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

Features

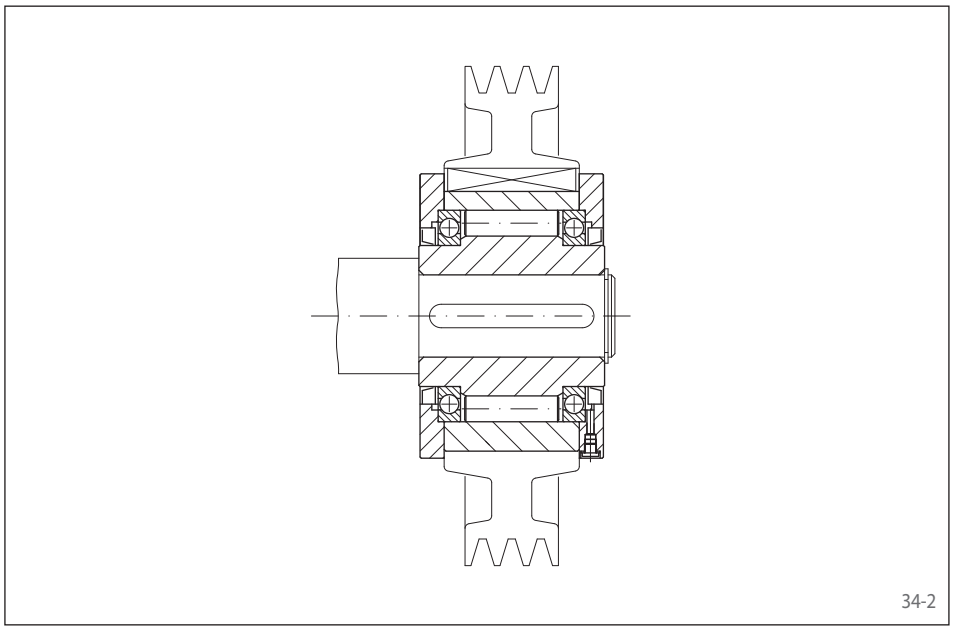
Complete Freewheels FGRN… R A5A6 are sealed roller freewheels with ball bearings. They are oil lubricated.

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.

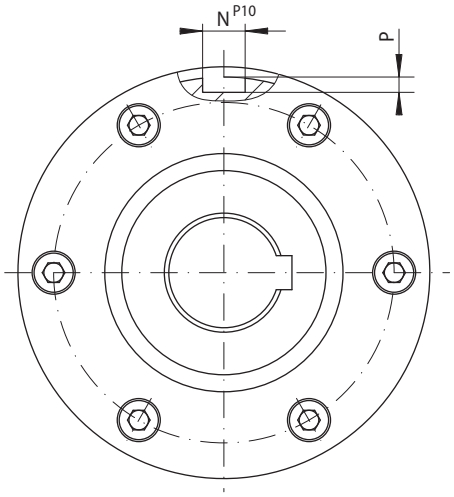


Application example

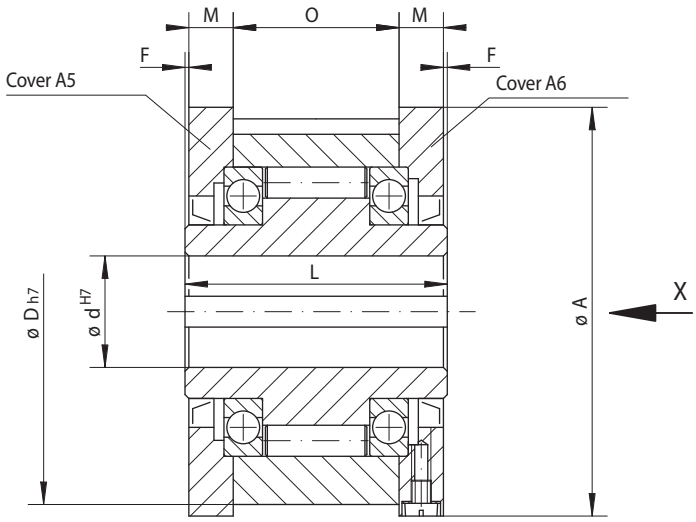
Complete Freewheel FGRN 45 R as an overrunning clutch on the shaft end of a mobile fan. In normal operation, the fan is driven by a diesel motor via the V-belt drive. By doing so, the freewheel works in driving operation. When the motor is turned off, the freewheel automatically disengages the rotating 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

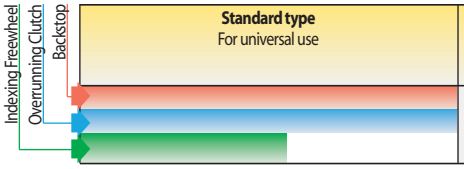
for keyway connection on the outer ring with rollers



35-1



35-2



Standard type
For universal use

Dimensions

Freewheel Size	Type	Cover combination	Nominal Torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Bore d mm	A mm	D mm	F mm	L mm	M mm	N mm	P mm	O mm	Weight kg
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

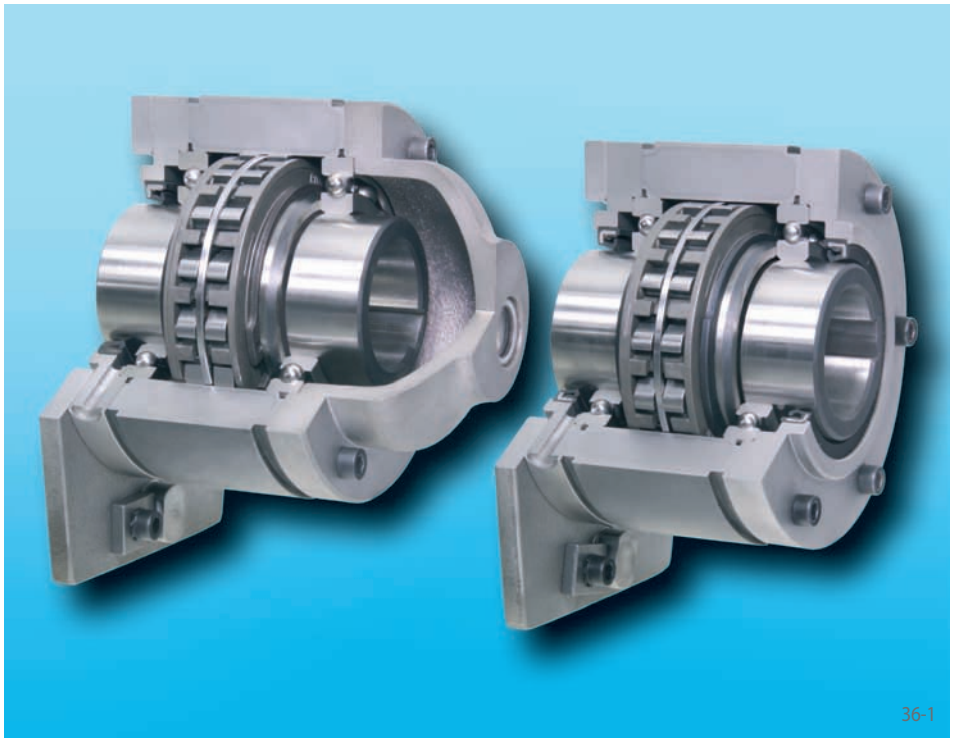
Basic Freewheel, covers, seals and screws are supplied loose provided nothing else is stated in the order.

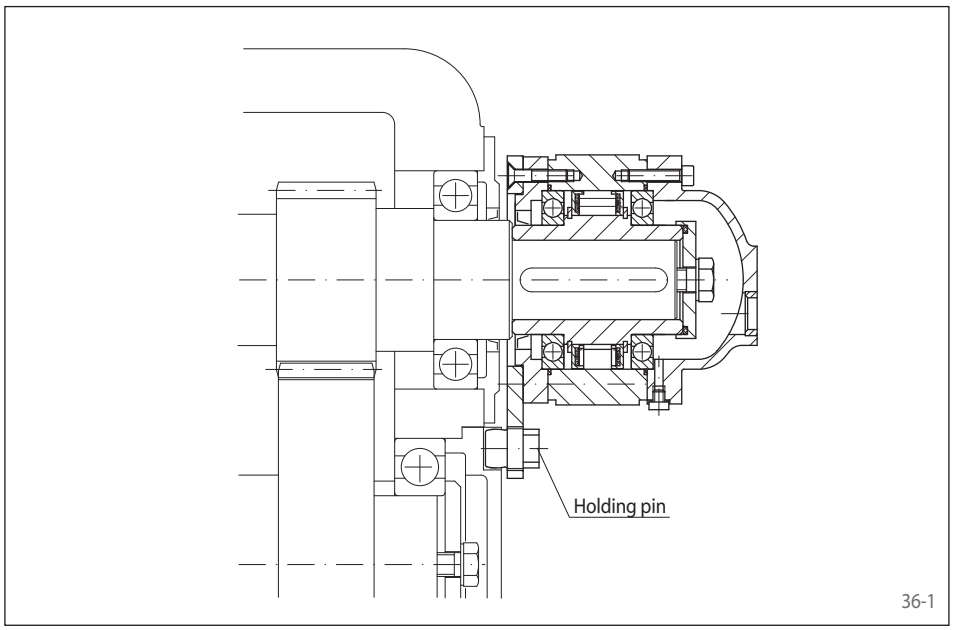
If assembled, oil-filled, Complete Freewheels are to be supplied, this must be specified in the order. When ordering, please also specify the freewheeling direction of the inner ring when viewed in direction X:

- counterclockwise free or
- clockwise free

Complete Freewheels BA … X and BC … X

with lever arm
with sprag lift-off X





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.

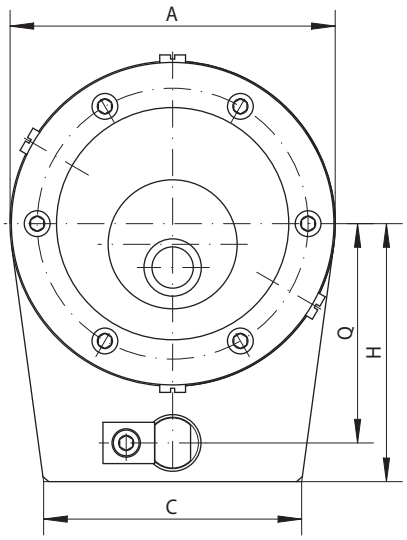
Bores up to 150 mm.

Application example

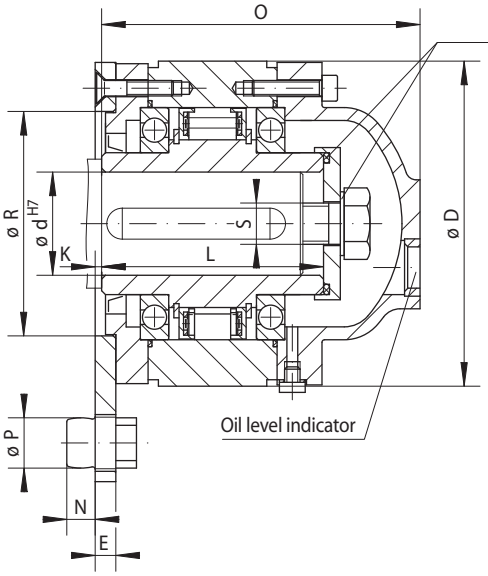
Complete Freewheel BA 45 SX as a backstop, arranged at the end of the intermediate shaft of a spur gearbox. The backdriving torque is supported by the lever arm with holding pin on the gearbox housing. If the holding pin is removed, the shaft can be turned in both directions. With the high shaft speed 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.

Complete Freewheels BA … X and BC … X

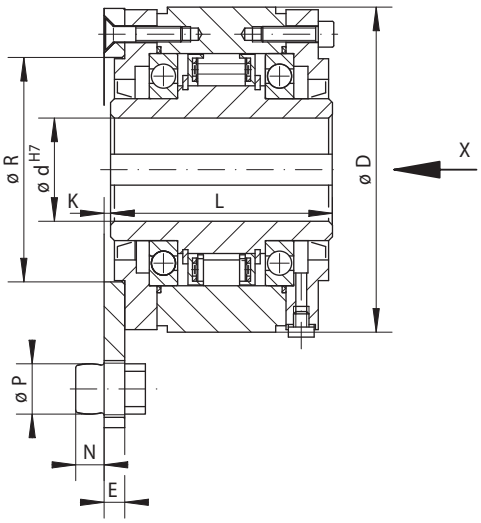
with lever arm
with sprag lift-off X



37-1



Series BA … X 37-2



Series BC … X 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 M_N Nm	Sprag lift-off at inner ring speed min^{-1}	Max. speed Inner ring freewheels min^{-1}	Bore d Standard mm	Standard mm	Standard mm	max. mm	A mm	C mm	D mm	E mm	H mm	K mm	L mm	N mm	O mm	P mm	Q mm	R mm	S for Screw	Weight kg
BA 20	BC 20	DX	400	750	1 700	30			30	110	90	106	8	80	2,5	77	11	104	19,5	65	70	M 10	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	M 12	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	M 16	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	M 16	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	M 16	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	M 20	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	M 20	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	M 24	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	M 24	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	M 30	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. 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:

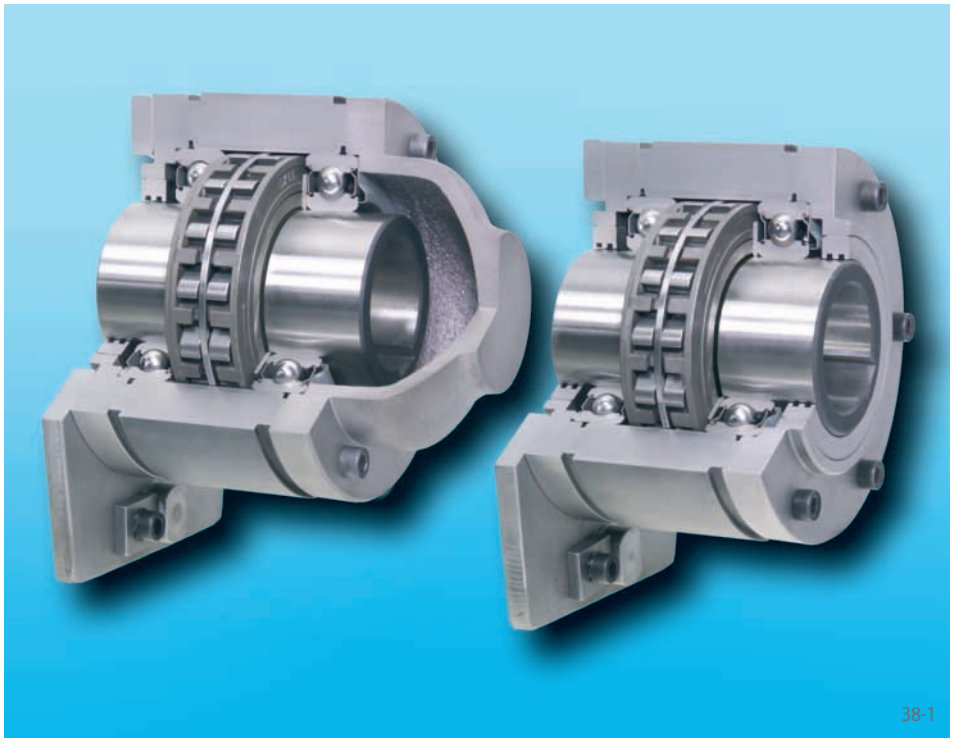
- BA 30 DX, d = 50 mm

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

- counterclockwise 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.

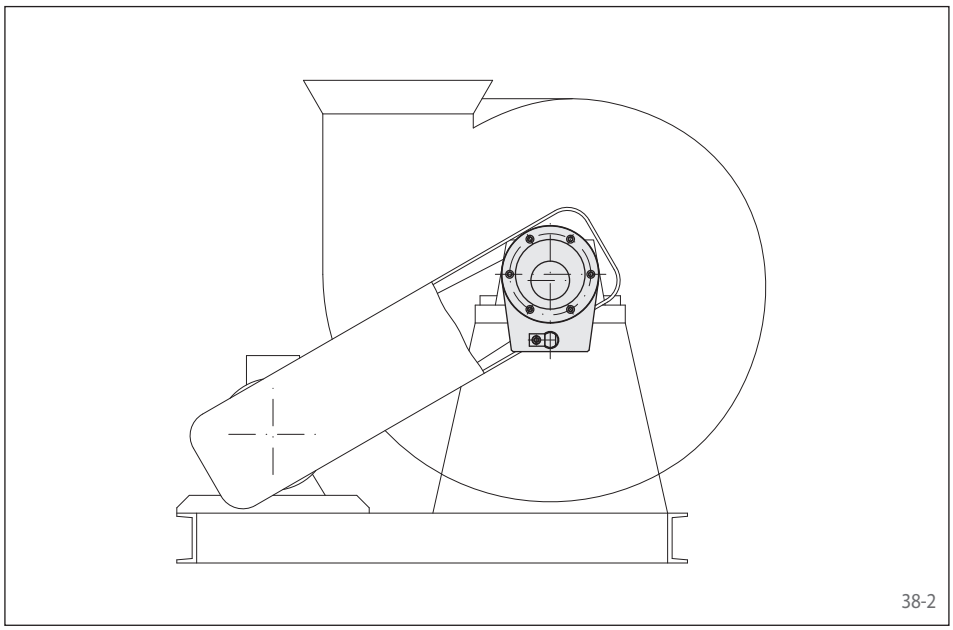
The freewheels BA … XG and BC … XG are used as:

- Backstops

for applications with high speed freewheeling operation.

Nominal torques up to 42 500 Nm.

Bores up to 150 mm.

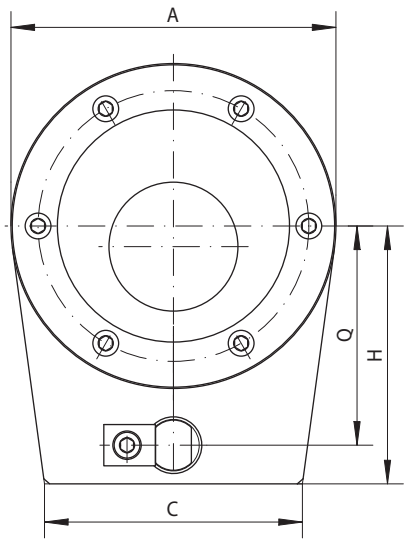


Application example

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



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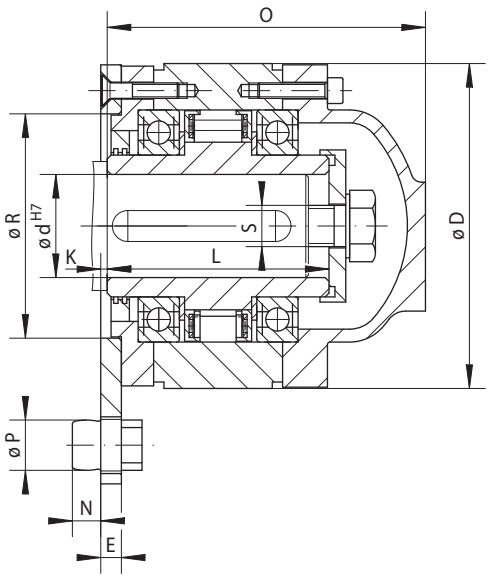
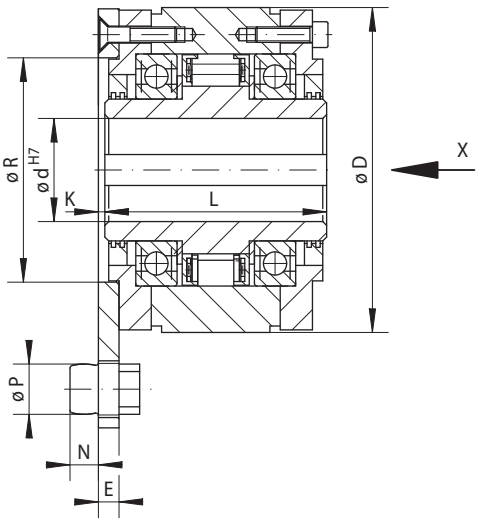


Series BA … XG 39-2



Series BC … XG 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 M_N Nm	Sprag lift-off at inner ring speed min^{-1}	Max. speed Inner ring freewheels min^{-1}	Bore d Standard mm	Standard mm	Standard mm	max. mm	A mm	C mm	D mm	E mm	H mm	K mm	L mm	N mm	O mm	P mm	Q mm	R mm	S for Screw	Weight kg
BA 20	BC 20	DXG	400	750	2 500	30			30	110	90	106	8	80	2,5	77	11	104	19,5	65	70	M 10	5
BA 25	BC 25	DXG	650	700	2 350	35	40		40	126	100	126	8	90	2,5	93	11	125	19,5	75	80	M 12	8
BA 30	BC 30	DXG	1 100	630	2 350	45	50		50	155	120	151	10	120	3,5	102	16	140	27,5	95	100	M 16	12
BA 40	BC 40	SXG	1 400	430	2 200	45	55	60	60	190	150	181	12	160	5,5	116	22	160	37,5	130	120	M 16	20
BA 45	BC 45	SXG	2 300	400	2 200	55	65	70	70	210	160	196	14	175	7,5	130	26	176	41,5	140	130	M 16	25
BA 52	BC 52	SXG	4 900	320	2 200	65	75	80	80	230	190	216	14	200	4,5	150	26	208	41,5	160	150	M 20	35
BA 55	BC 55	SXG	6 500	320	2 000	75	85	90	90	255	200	246	15	210	3,5	170	29	228	49,5	170	160	M 20	50
BA 60	BC 60	SXG	14 500	250	1 800	85	95	100	105	295	220	291	20	250	8,5	206	35	273	60,5	200	190	M 24	91
BA 70	BC 70	SXG	21 000	240	1 650	120			120	335	260	321	25	280	14,5	215	39	291	65,5	225	210	M 24	115
BA 100	BC 100	UXG	42 500	210	1 450	150			150	420	380	411	45	345	31,5	276	60	372	80,5	280	270	M 30	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.

Lubrication

Please note the technical points on page 118 regarding grease-lubricated ball bearings.

Example for ordering

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

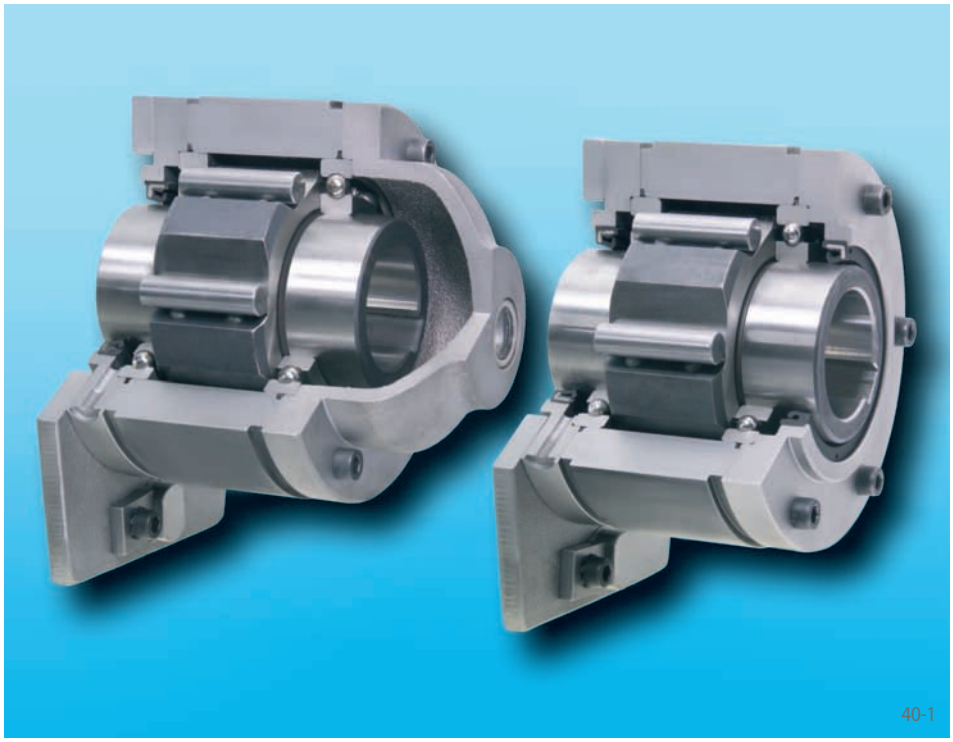
- BC 45 SXG, d = 65 mm

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

- counterclockwise free or
- clockwise free

Complete Freewheels BA … R and BC … R

with lever arm
with rollers



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.

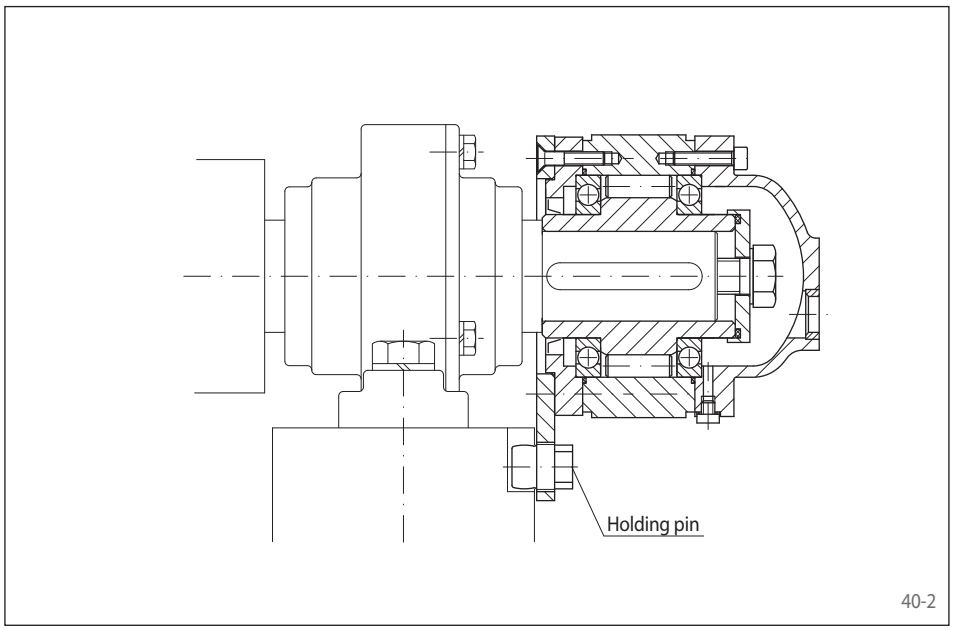
The freewheels BA … R and BC … R are used as:

- Backstops

for applications with low to medium speed freewheeling operation.

Nominal torques up to 57 500 Nm.

Bores up to 150 mm.

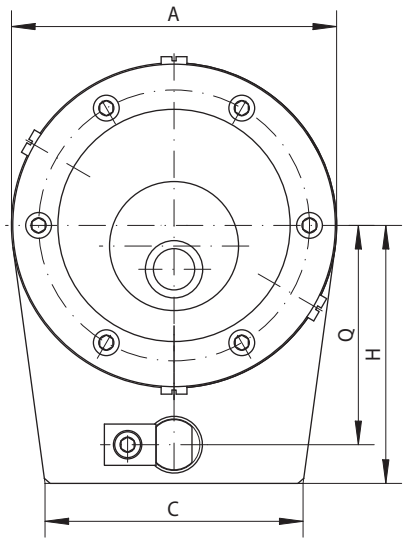


Application example

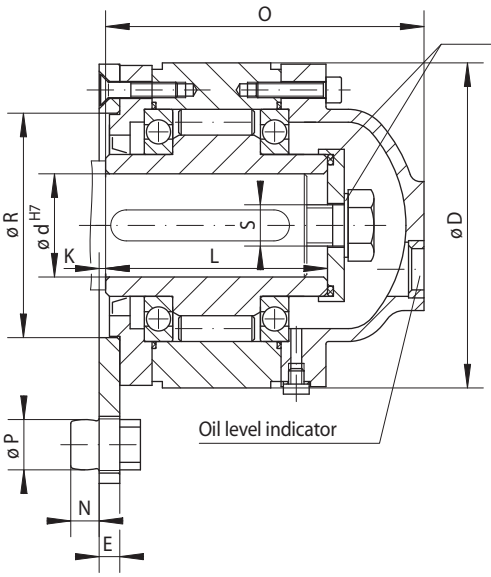
Complete Freewheel BA 90 R as a backstop on the end of a transport roller. The backdriving torque is supported by the lever arm with holding pin on the base. If the holding pin is removed, the shaft can be turned in both directions.

Complete Freewheels BA … R and BC … R

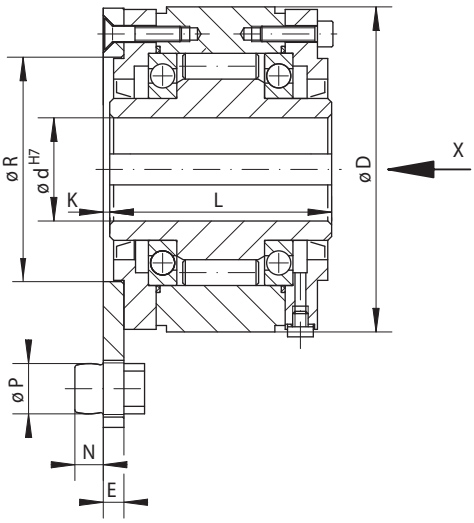
with lever arm
with rollers



41-1



Series BA … R 41-2



Series BC … R 41-3

Backstop

Standard type For universal use	Dimensions

Freewheel Size		Type	Nominal Torque M_N Nm	Max. speed Inner ring freewheels min^{-1}	Bore d Standard mm	Bore d max. mm	A mm	C mm	D mm	E mm	H mm	K mm	L mm	N mm	O mm	P mm	Q mm	R mm	S for Screw	Weight kg
BA 12	BC 12	R	150	1 750	15	15	71	50	71	8	53	4,5	68	9	91	11,5	42	45	M 6	2
BA 15	BC 15	R	230	1 650	20	20	81	60	81	8	62	4,5	70	9	93	13,5	50	50	M 6	3
BA 18	BC 18	R	340	1 550	25	25	96	70	96	8	73	4,5	70	9	96	15,5	60	60	M 10	4
BA 20	BC 20	R	420	1 450	30	30	110	90	106	8	80	2,5	77	11	104	19,5	65	70	M 10	5
BA 25	BC 25	R	800	1 250	40	40	126	100	126	8	90	2,5	93	11	125	19,5	75	80	M 12	8
BA 28	BC 28	R	1 200	1 100	45	45	140	110	136	10	105	3,5	95	14	129	24,5	85	90	M 12	9
BA 30	BC 30	R	1 600	1 000	50	50	155	120	151	10	120	3,5	102	16	140	27,5	95	100	M 16	12
BA 35	BC 35	R	1 800	900	55	55	170	130	161	10	140	3,5	110	19	151	33,5	112	110	M 16	15
BA 40	BC 40	R	3 500	800	60	60	190	150	181	12	160	5,5	116	22	160	37,5	130	120	M 16	20
BA 45	BC 45	R	7 100	750	70	70	210	160	196	14	175	7,0	130	26	176	41,5	140	130	M 16	25
BA 50	BC 50	R	7 500	700	75	75	220	180	206	14	185	7,0	132	26	178	41,5	150	140	M 16	30
BA 52	BC 52	R	9 300	650	80	80	230	190	216	14	200	4,5	150	26	208	41,5	160	150	M 20	35
BA 55	BC 55	R	12 500	550	90	90	255	200	246	15	210	3,5	170	29	228	49,5	170	160	M 20	50
BA 60	BC 60	R	14 500	500		105	295	220	291	20	250	8,5	206	35	273	60,0	200	190	M 24	91
BA 70	BC 70	R	22 500	425		120	335	260	321	25	280	14,0	215	39	291	65,0	225	210	M 24	115
BA 80	BC 80	R	25 000	375		130	360	280	351	30	280	18,5	224	39	302	65,0	225	220	M 24	150
BA 90	BC 90	R	33 500	350		140	385	300	371	35	310	22,5	236	55	314	70,0	250	240	M 30	180
BA 95	BC 95	R	35 000	300		150	400	350	391	40	310	27,5	249	55	337	70,0	250	250	M 30	225
BA 100	BC 100	R	57 500	250		150	420	380	411	45	345	31,5	276	60	372	80,0	280	270	M 30	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. 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:

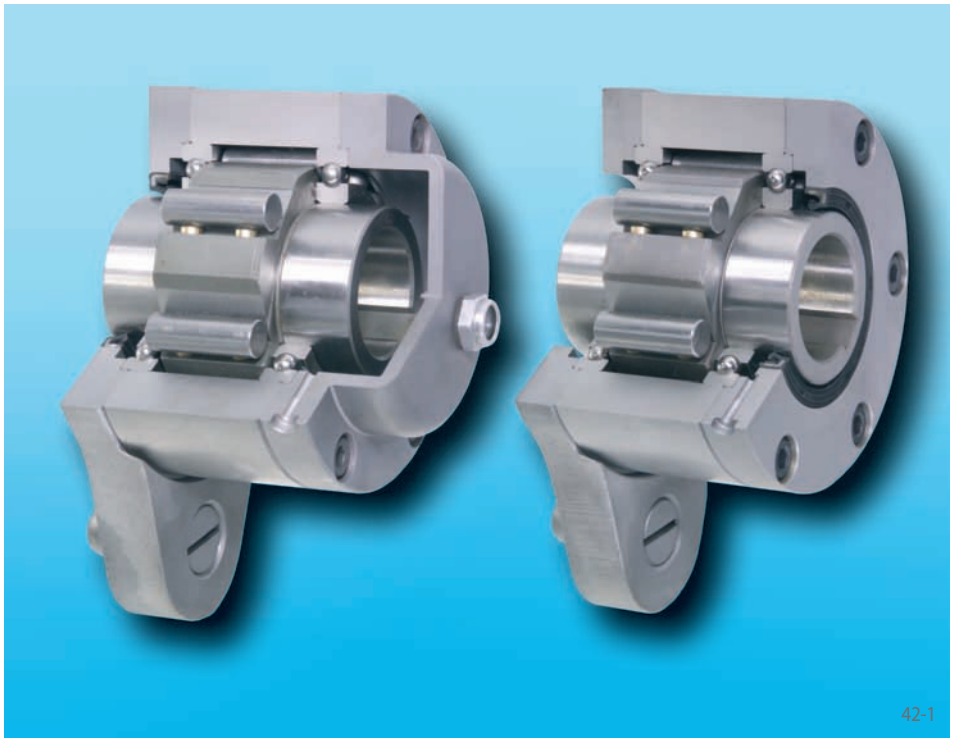
- BA 30 R, d = 50 mm

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

- counterclockwise 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.

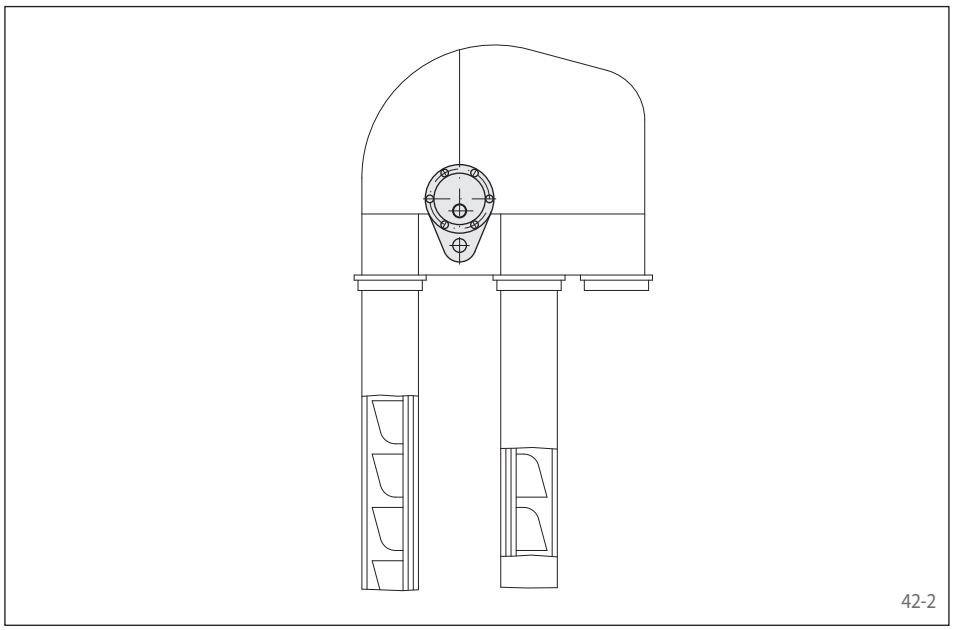
The freewheels FGR … R A2A3 and FGR…R A3A4 are used as:

- Backstops

for applications with low to medium speed freewheeling operation.

Nominal torques up to 68 000 Nm.

Bores up to 150 mm.

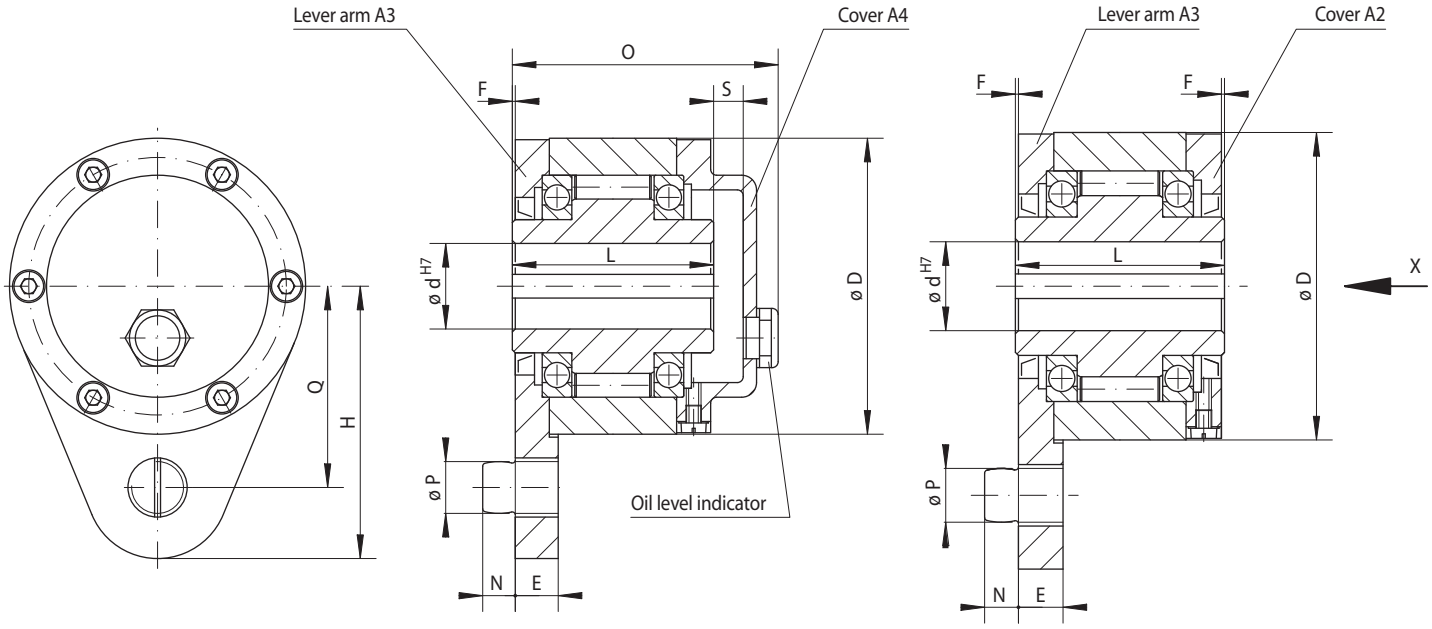


Application example

Complete Freewheel FGR 45 R A3A4 as a backstop 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 M_N Nm	Max. speed Inner ring freewheels min^{-1}	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	134	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

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

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

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

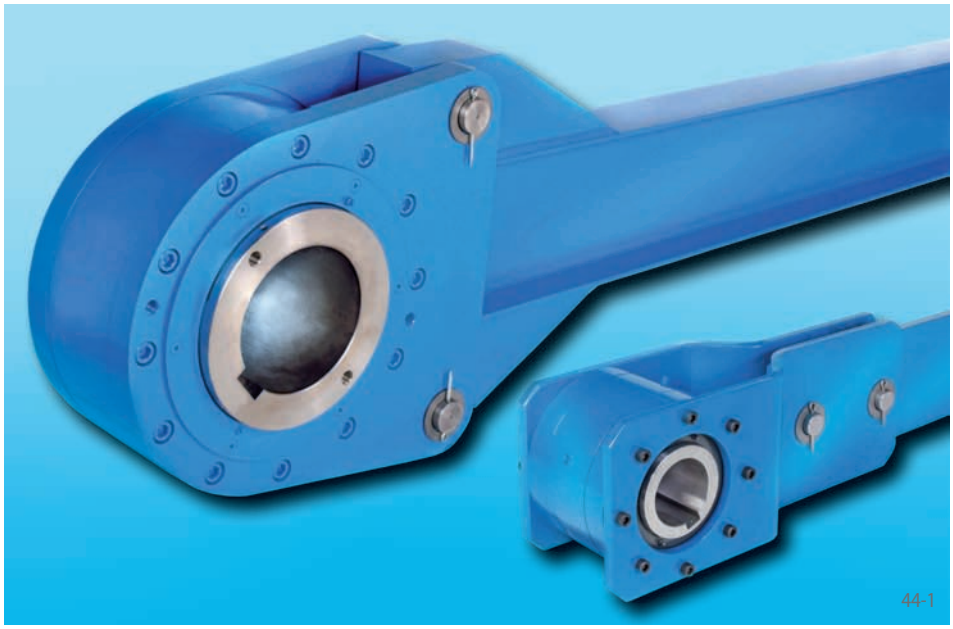
- FGR 25 R A3A4

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:

- counterclockwise free or
- clockwise free

Complete Freewheel FRHD

with lever arm
in inch dimension, with sprags



Features

Complete Freewheels FRHD with lever arm are sealed sprag freewheels with ball bearings. They are supplied oil-filled and ready for installation. The freewheels are arranged on through shafts or shaft ends.

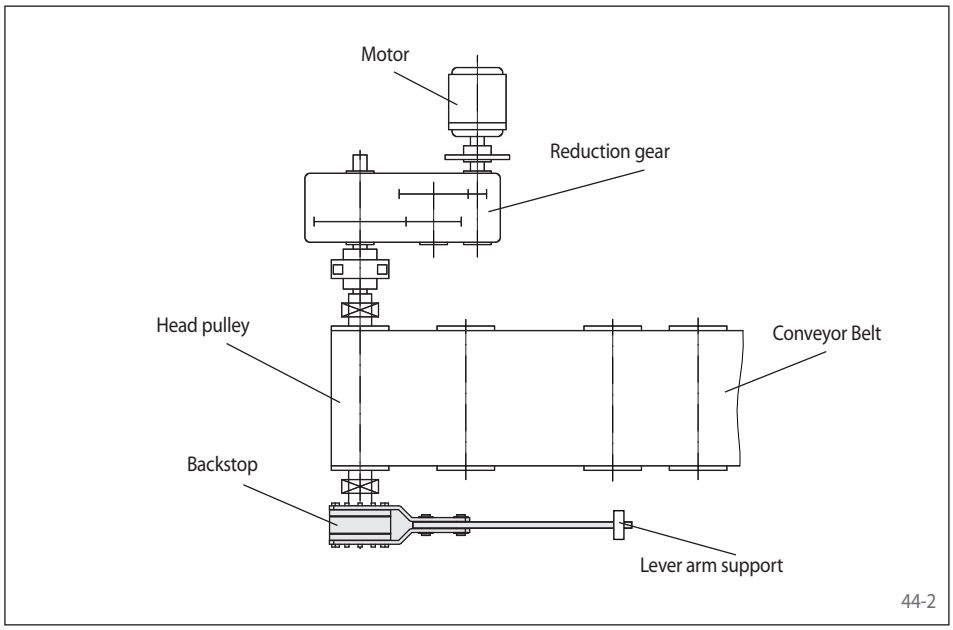
The freewheels FRHD are used as:

- Backstops

for low-speed applications. They are designed for use in inclined conveyor-belt systems, elevators and pumps. Taconite seals protect the backstops when conditions are dirty and dusty.

Nominal torques up to 415 000 ft-lbs.

Bores up to 18 inch.



Application example

Backstop FRHD 900 on the head drum shaft of an inclined conveyor belt system. The lever arm is bolted to the freewheel. The backdriving torque is supported by the lever arm on the base plate. When the conveyor belt is without any load, the drum shaft can be turned in both directions during maintenance by removing the bolts.

Mounting

The backdriving torque is supported by the lever arm. The lever arm must not be clamped into position. It must have 0,5 inch play in the axial and in the radial direction.

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

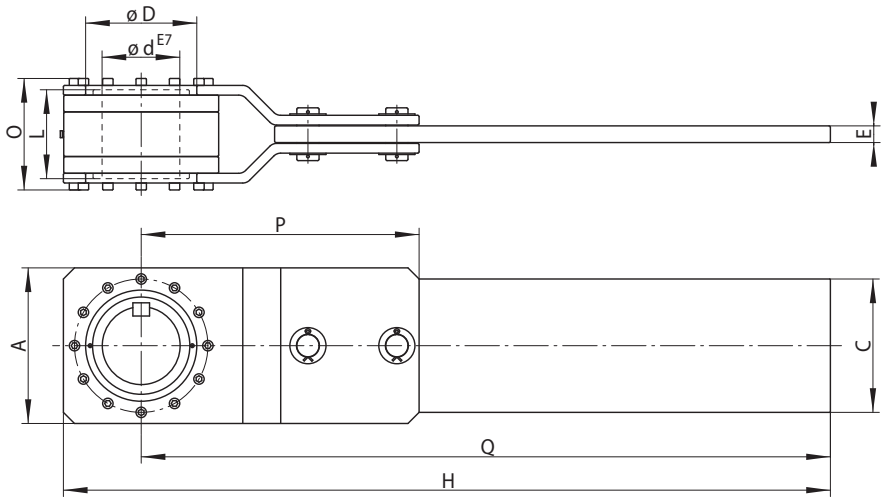
Example for ordering

Freewheel size FRHD 800 with a 3,500 inch bore

- FRHD 800, d = 3,5 inch

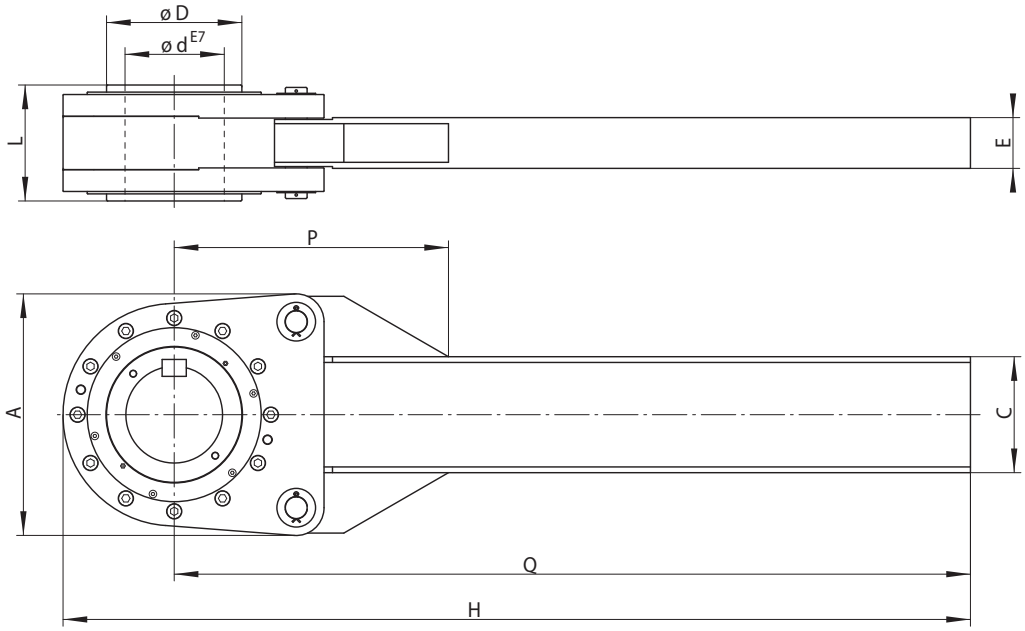
Complete Freewheel FRHD

with lever arm
in inch dimension, with sprags



Size FRHD 775 to FRHD 1 100

45-1



Size FRHD 1 200 to FRHD 1 700

45-2

Backstop

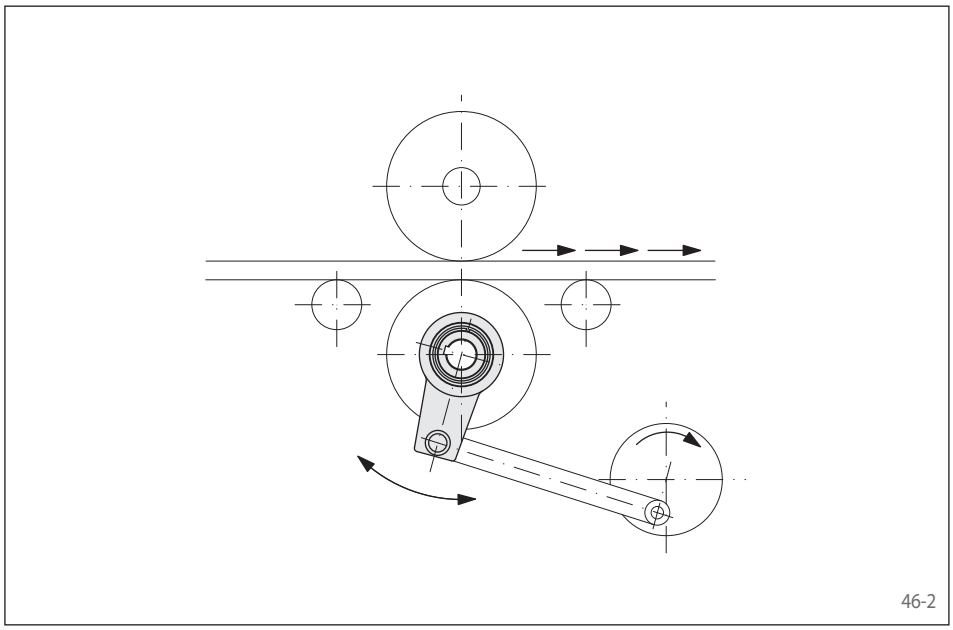
Standard type	Dimensions

Freewheel Size	Nominal torque M_N ft-lbs	Max. Speed Inner ring freewheels min^{-1}	Bore d max. inch	A inch	C inch	D inch	E inch	H inch	L inch	O inch	P inch	Q inch	Weight lbs
FRHD 775	7 500	500	3,75	9,75	8,00	6,00	1,00	42,88	7,50	9,00	20,38	38,00	310
FRHD 800	12 000	400	4,50	10,50	10,00	7,00	1,00	43,25	8,00	9,50	22,13	38,00	360
FRHD 900	18 500	350	5,44	12,00	10,00	8,00	1,50	54,00	7,63	9,38	22,75	48,00	480
FRHD 1 000	23 500	300	7,00	14,00	12,00	10,00	1,50	69,00	8,00	10,00	25,00	62,00	695
FRHD 1 100	47 000	200	7,00	14,00	12,00	10,00	1,50	79,00	10,50	12,50	29,00	72,00	795
FRHD 1 200	84 000	200	9,00	23,00	10,00	12,00	4,94	88,00	11,00	-	27,75	78,00	1 300
FRHD 1 300	107 000	200	10,00	25,00	12,00	14,00	5,25	93,88	12,00	-	28,38	82,38	1 674
FRHD 1 400	190 000	200	11,00	27,25	15,00	16,00	5,50	101,88	13,00	-	29,38	89,38	2 170
FRHD 1 500	290 000	110	12,00	30,00	18,00	15,00	6,25	106,00	17,63	-	29,50	94,00	2 440
FRHD 1 600	373 000	110	14,00	32,25	20,00	17,63	6,38	122,25	19,25	-	30,44	108,00	3 400
FRHD 1 700	415 000	110	18,00	40,25	24,25	23,00	8,063	140,00	18,00	-	41,50	120,00	6 325

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.
Keyway according to USA Standard USAS B17.1-1967, class 1 fit.
Conversion factors: 1 ft-lbs = 1,35 Nm, 1 inch = 25,4 mm, 1 lbs = 0,453 kg.

Complete Freewheels FA

with lever arm
with sprags and grease lubrication



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.

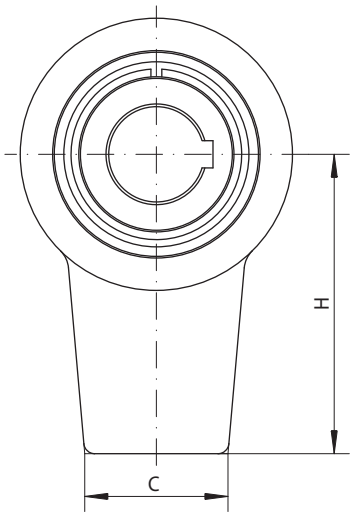
Bores up to 85 mm.

Application example

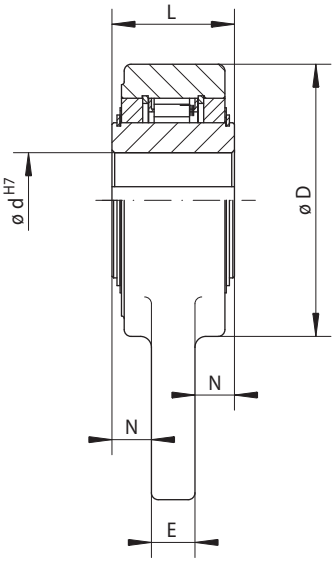
Complete Freewheel FA 82 SFP as an indexing freewheel for the material feed of a punch. The freewheel is driven by a bell crank. The type with P-grinding does not just give the freewheel an increased service life, but also an increased indexing accuracy.

Complete Freewheels FA

with lever arm
with sprags and grease lubrication



47-1



47-2

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 and indexing accuracy	Dimensions

Freewheel Size	Type	Nominal Torque M_N Nm	Max. speed Inner ring freewheels min^{-1}	Type	Nominal Torque M_N Nm	Max. speed Inner ring freewheels min^{-1}	Type	Nominal Torque M_N Nm	Bore d Standard mm			Bore d max. mm	C mm	D mm	E mm	H mm	L mm	N mm	Weight kg
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.

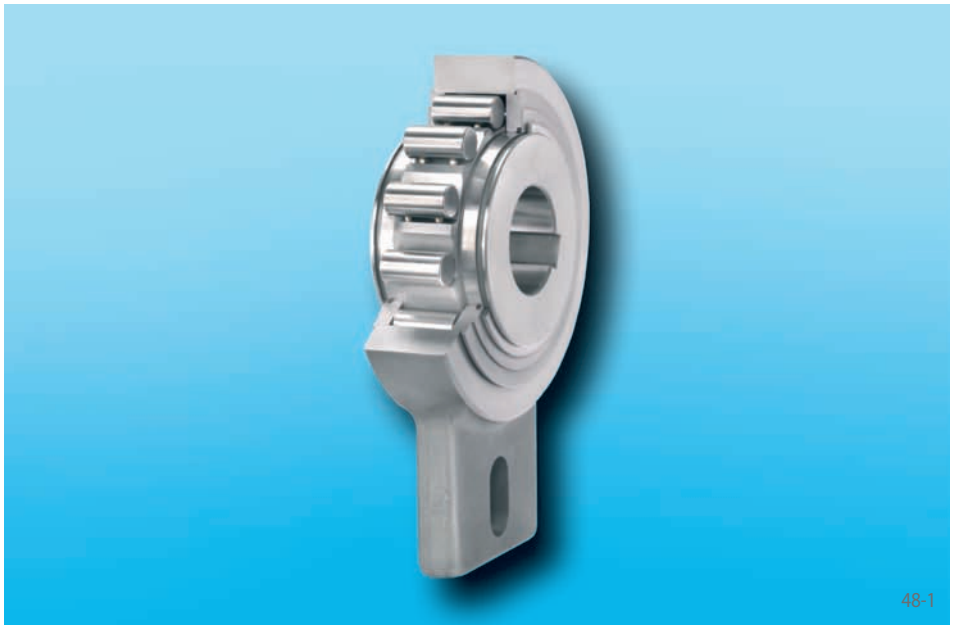
Example for ordering

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



Features

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

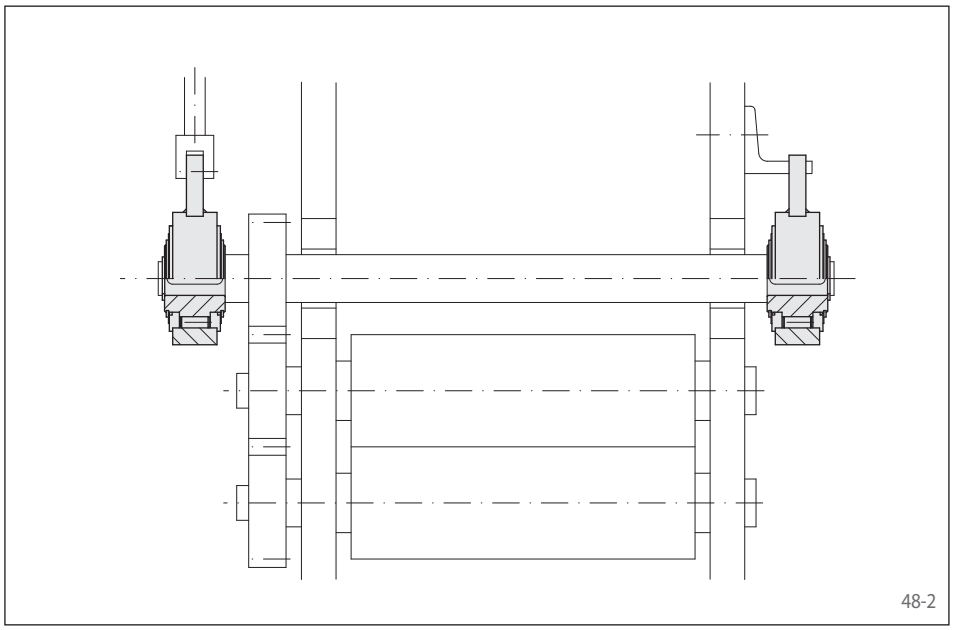
The freewheels FAV are used as:

- 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.

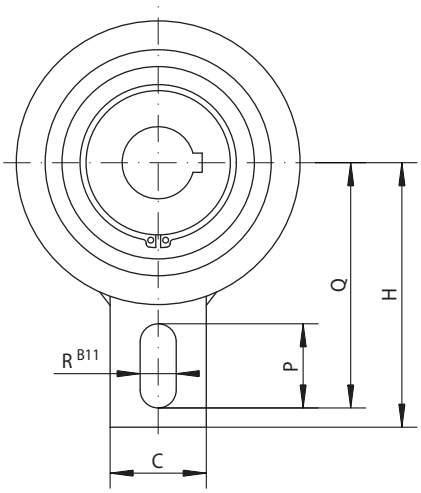


Application example

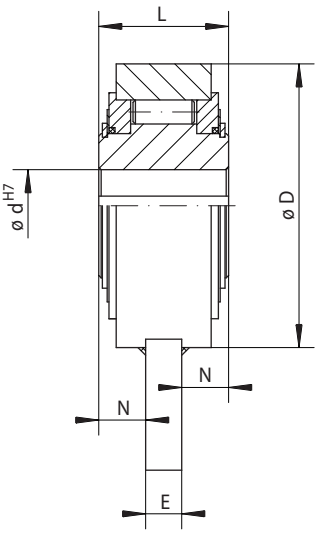
Two Complete Freewheels FAV 50 in the roller feed of a sheet metal processing machine. The indexing freewheel arranged on the left is driven via a bell crank with an adjustable lift. This enables an infinite setting of the feed. The backstop arranged on the right prevents the indexing rollers from running 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



49-1



49-2

Indexing Freewheel
Backstop

Standard type For universal use	Dimensions

Freewheel Size	Nominal Torque M_N Nm	Max.speed Inner ring freewheels min^{-1}	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.

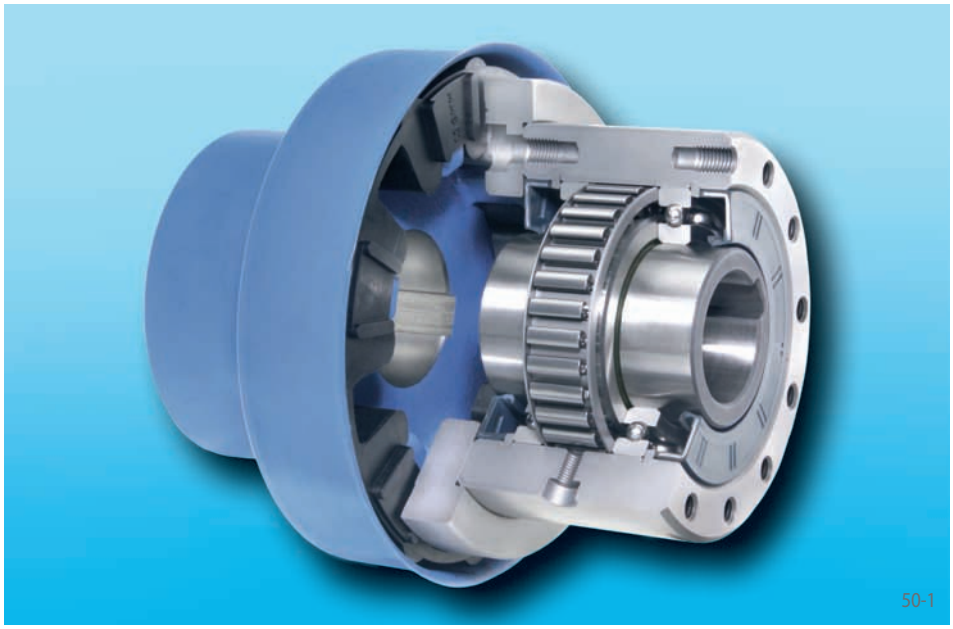
Example for ordering

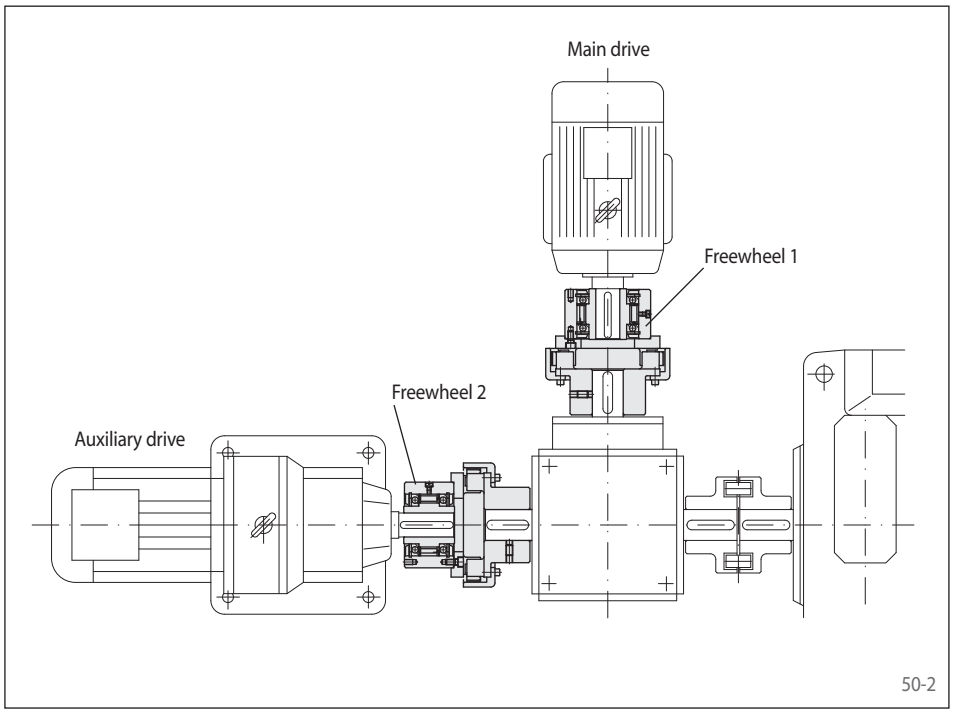
Freewheel size FAV 60, standard type:

- FAV 60

Complete Freewheels FBE

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





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 aux-iliary 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.

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.

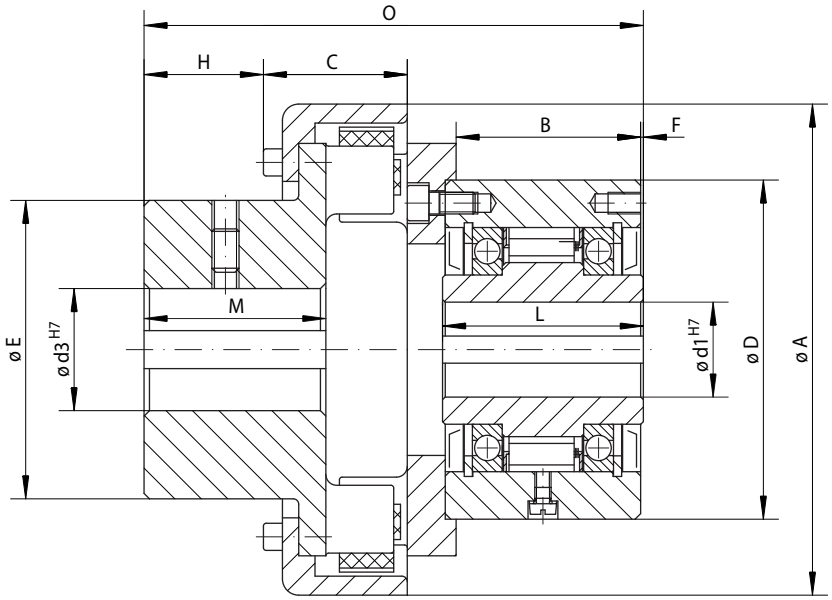
Example for ordering

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 M_N Nm	Max. speed: Inner ring overruns min^{-1}	Max. speed: Outer ring overruns min^{-1}	Type	Nominal Torque M_N Nm	Max. speed: Inner ring overruns min^{-1}	Max. speed: Outer ring overruns min^{-1}	Type	Nominal Torque M_N Nm	Sprag lift-off at outer ring speed min^{-1}	Max. speed: Outer ring overruns min^{-1}	Max. speed: Inner ring drives min^{-1}
FBE 24	CF	45	4800	5000	CFT	45	4800	5000					
FBE 29	CF	80	3500	4000	CFT	80	3500	4000					
FBE 37	SF	200	2500	2600	SFT	200	2500	2600	CZ	110	850	3000	340
FBE 44	SF	320	1900	2200	SFT	320	1900	2200	CZ	180	800	2600	320
FBE 57	SF	630	1400	1750	SFT	630	1400	1750	LZ	430	1400	2100	560
FBE 72	SF	1250	1120	1600	SFT	1250	1120	1600	LZ	760	1220	1800	488
FBE 82	SF	1800	1025	1450	SFT	1800	1025	1450	SFZ	1700	1450	1600	580
FBE 107	SF	2500	880	1250	SFT	2500	880	1250	SFZ	2500	1300	1350	520
FBE 127	SF	5000	800	1150	SFT	5000	800	1150	SFZ	5000	1200	1200	480
FBE 140	SF	10000	750	1100	SFT	10000	750	1100	SFZ	10000	950	1150	380
FBE 200	SF	20000	630	900	SFT	20000	630	900	SFZ	20000	680	900	272
FBE 270	SF	40000	510	750	SFT	40000	510	750	SFZ	37500	600	750	240
FBE 340	SF	80000	460	630	SFT	80000	460	630					
FBE 440	SF	160000	400	550	SFT	160000	400	550					

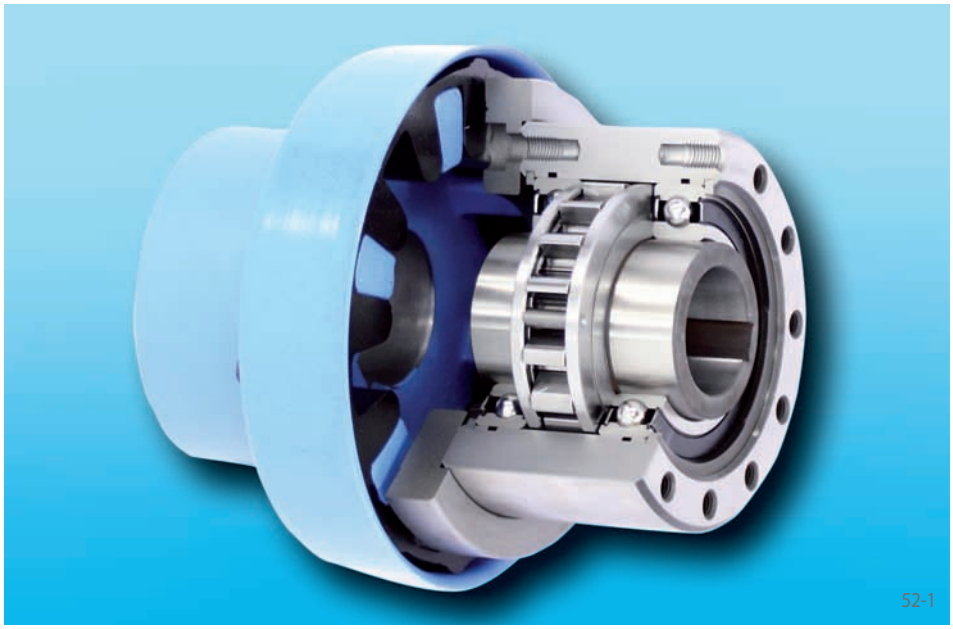
The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

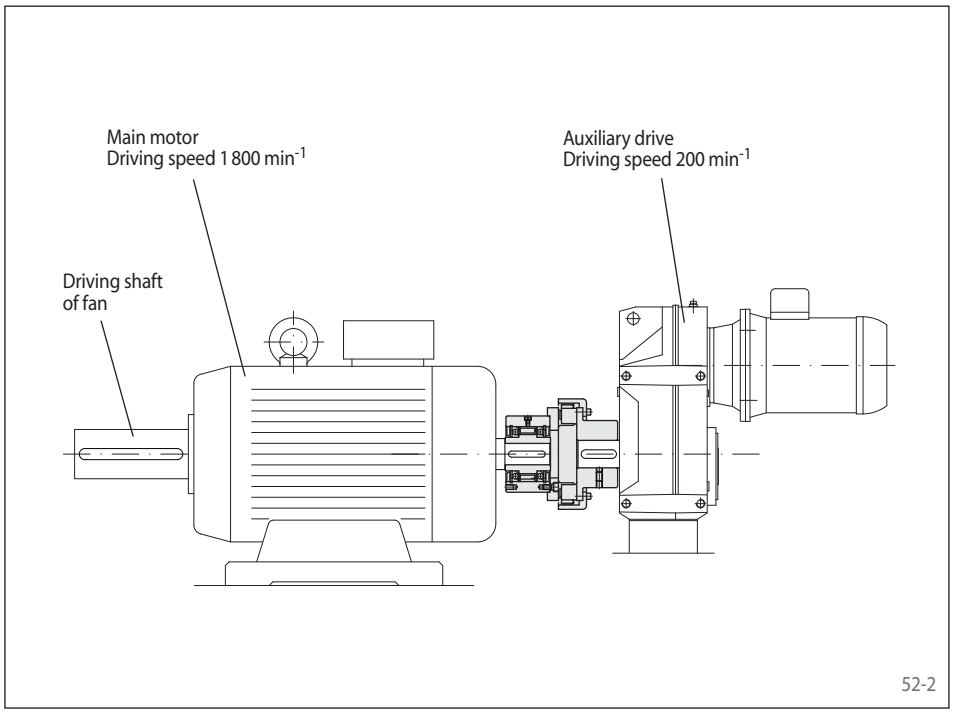
Freewheel Size	Bore d1: Standard mm	Standard mm	Standard mm	Standard mm	Standard mm	max. mm	Bore d3: min. mm	max. mm	A mm	B mm	C mm	D mm	E mm	F mm	H mm	L mm	M mm	O mm	Weight kg
FBE 24	12	14*				14*	10	35	77	45	30	62	55	1,0	28	50	40	114,0	1,7
FBE 29	15	17*				17*	10	40	90	47	33	68	65	1,0	32	52	45	123,0	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

Complete Freewheels FBE … XG

with shaft coupling for small shaft misalignments with sprag lift-off X and grease lubrication





Features

Complete Freewheels FBE … XG with flexible shaft coupling are sprag freewheels with sprag lift-off X and grease-lubricated ball bearings for coupling two aligned shafts.

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

The freewheels FBE … XG are used as:

- Overrunning Clutches

for applications with high speed freewheeling operation.

Nominal torques up to 7 500 Nm.

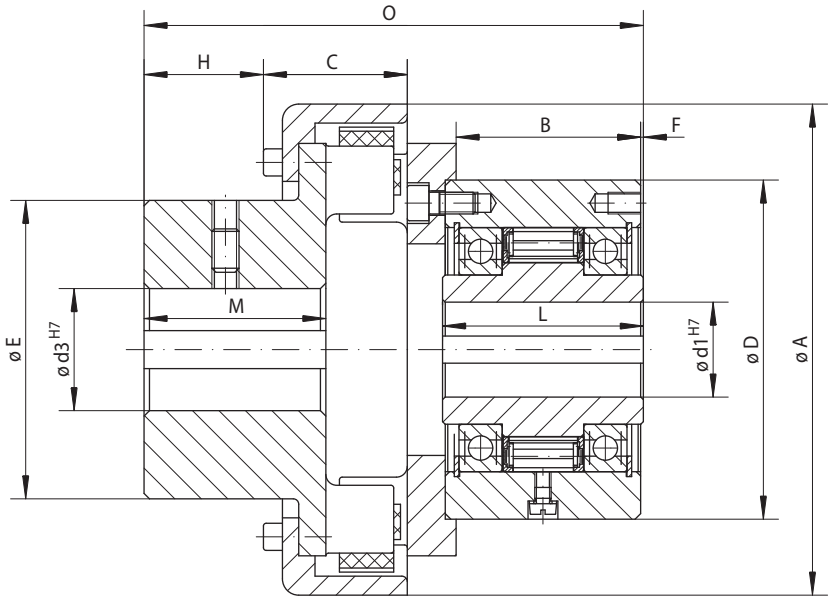
Bores up to 95 mm. Many standard bores are available.

Application example

Complete Freewheel FBE 72 DXG with shaft coupling as overrunning clutch in the drive system of a fan. The freewheel is positioned between the main motor and the auxiliary drive. When the system is driven by the main motor, the auxiliary drive is automatically disengaged by the freewheel. Due to the high speed of the main motor, the type with sprag lift-off X is used; the sprags work in freewheeling operation without contact and hence are wear-free.

Complete Freewheels FBE … XG

with shaft coupling for small shaft misalignments with sprag lift-off X and grease lubrication



53-1

Overrunning Clutch

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 M_N Nm	Sprag lift-off at inner ring speed min^{-1}	Max.speed Inner ring freewheels/ overruns min^{-1}	Max.speed Outer ring drives min^{-1}	Bore d1 Standard mm	Bore d1 Standard mm	Bore d1 Standard mm	Bore d1 Standard mm	Bore d1 max. mm	Bore d3 min. mm	Bore d3 max. mm	A mm	B mm	C mm	D mm	E mm	F mm	H mm	L mm	M mm	O mm	Weight kg
FBE 57	DXG	460	750	2500	300	25	28	30	32*	32*	20	60	158	60	48	100	96	0,5	39	65	61	162,5	7,3
FBE 72	DXG	720	700	2350	280	35	38	40	42*	42	20	70	181	68	53	125	110	1,0	44	74	67	184,0	11,6
FBE 82	DXG	1000	670	2350	268	35	40	45	50*	50*	25	75	202	67	64	135	120	2,0	46	75	75	200,0	15,4
FBE 107	SXG	1500	610	2200	244	50	55	60	65*	65*	30	80	230	81	75	170	130	2,5	48	90	82	230,0	24,9
FBE 127	SXG	3400	380	2200	152	50	60	70	75*	75*	45	100	294	102	97	200	160	3,0	56	112	97	288,0	47,3
FBE 140	SXG	7500	320	2000	128	65	75	80	90	95*	60	120	330	135	100	250	200	5,0	80	150	116	350,0	93,3

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

Shaft coupling

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

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.

Lubrication

Please note the technical points on page 118 regarding grease-lubricated ball bearings.

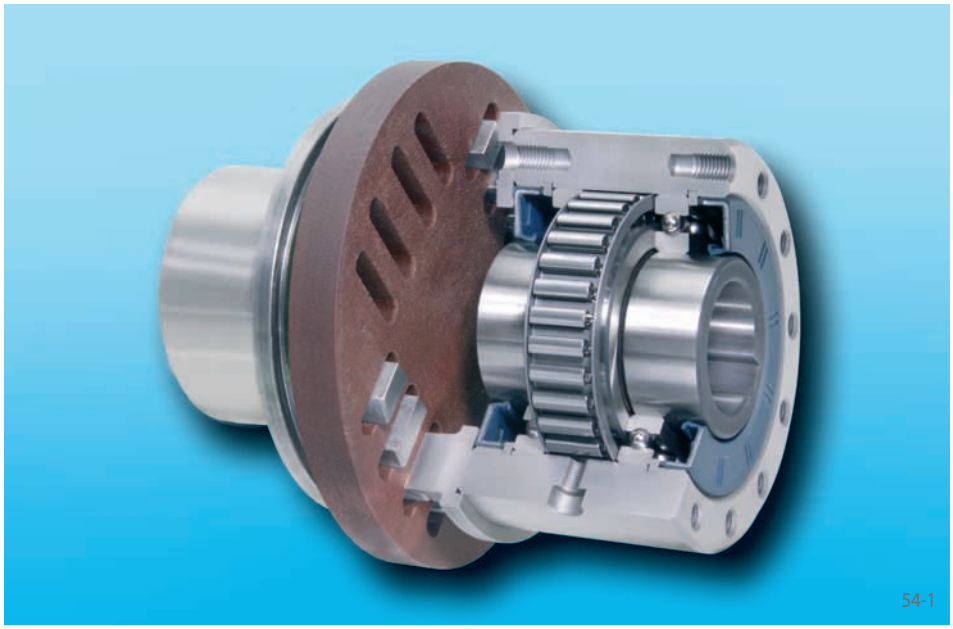
Example for ordering

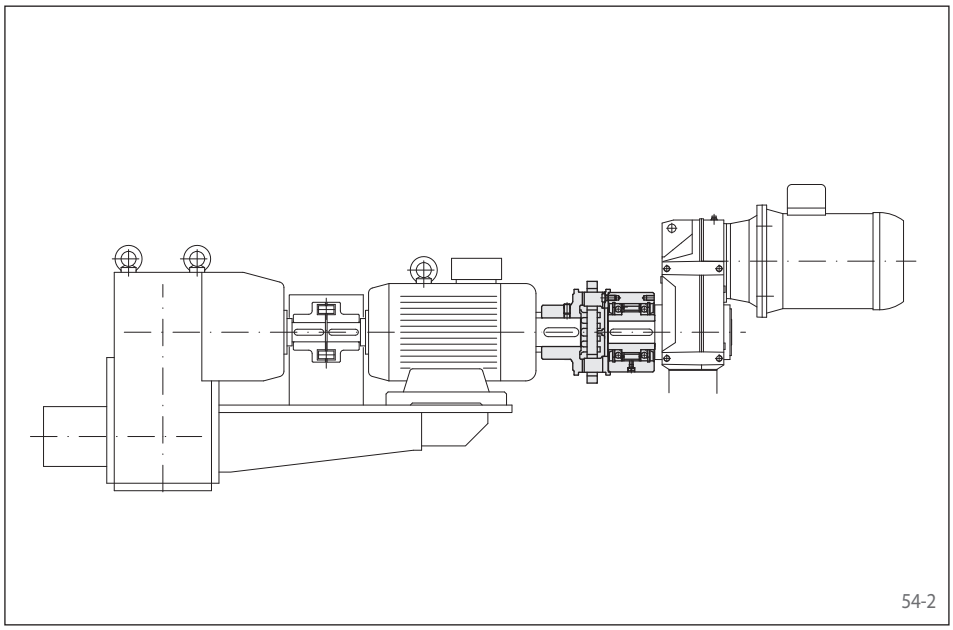
Freewheel size FBE 107 type with sprag lift-off X and grease lubrication with 60 mm bore in the freewheel and 55 mm bore in the shaft coupling:

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

Complete Freewheels FBL

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





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.

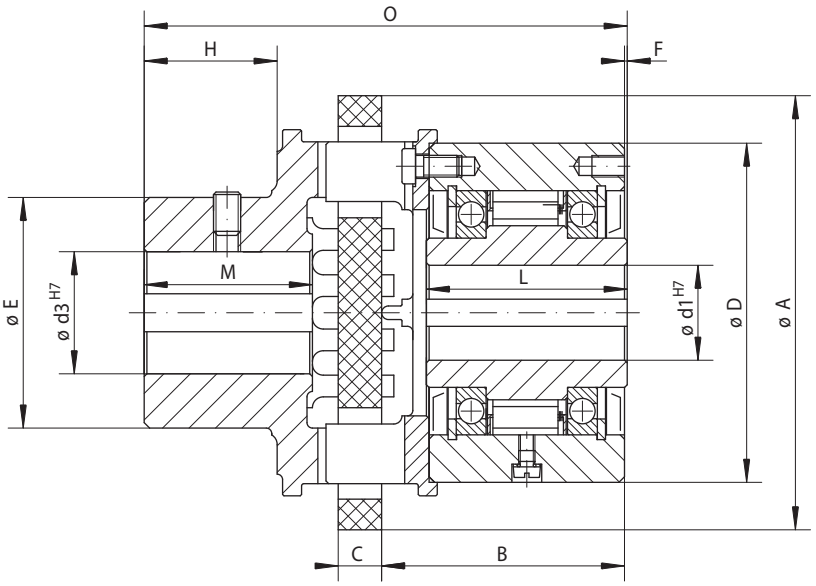
The torsionally stiff shaft coupling can accept large radial and angular misalignments, without reactive forces affecting neighbouring bearings. We can provide you with performance data upon request.

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.

Complete Freewheels FBL

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



55-1

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 M_N Nm	Max. speed: Inner ring overruns min^{-1}	Max. speed: Outer ring overruns min^{-1}	Type	Nominal Torque M_N Nm	Max. speed: Inner ring overruns min^{-1}	Max. speed: Outer ring overruns min^{-1}	Type	Nominal Torque M_N Nm	Sprag lift-off at outer ring speed min^{-1}	Max. speed: Outer ring overruns min^{-1}	Max. speed: Inner ring drives min^{-1}
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 Standard mm	mm	mm	mm	mm	max. mm	Bore d3 min. mm	max. mm	A mm	B mm	C mm	D mm	E mm	F mm	H mm	L mm	M mm	O mm	Weight kg
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.

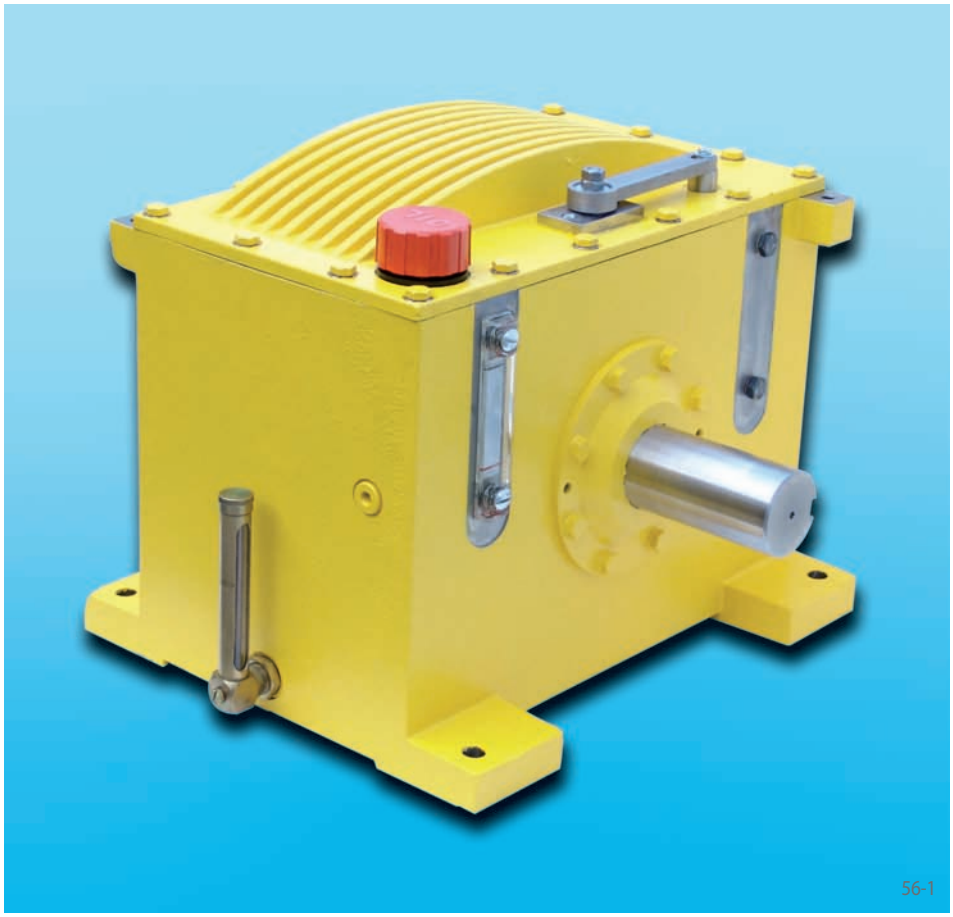
Example for ordering

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

Housing Freewheels FH

for stationary arrangement in multimotor drives with hydrodynamic roller lift-off for extended service life



Features

Housing Freewheels FH with hydrodynamic roller 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. They allow a continuous plant operation in the event that one of the energy sources or a drive line fails as well as energy saving in the case of partial load operation.

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

The freewheels FH are used as:

- Overrunning Clutch

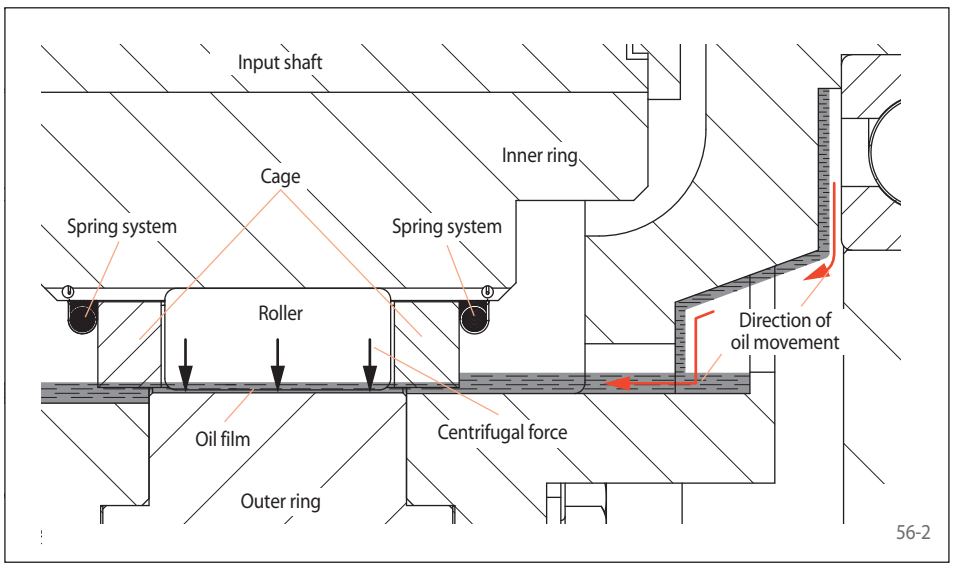
if the speeds in freewheeling operation and in driving operation are the same or similarly high.

Advantages

- Nominal torques up to 24 405 Nm
- Shaft diameter up to 110 mm
- Wear-free operation
- Low noise
- Low power dissipation
- Integrated oil filtration system
- Integrated locking brake
- Oil change without down time

Hydrodynamic roller lift-off

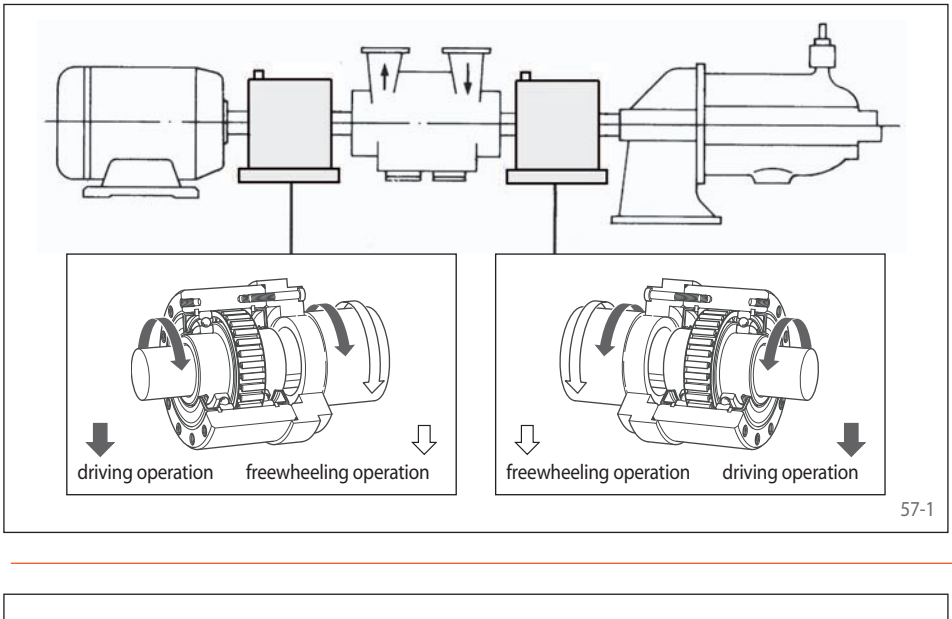
Housing Freewheels FH are equipped with hydrodynamic roller lift-off. The hydrodynamic roller lift-off is the ideal solution for overrunning clutches at high speeds, not only in freewheeling operation, but also in the driving operation, as can occur, for example, in multimotor drives.



In the case of hydrodynamic roller lift-off, the lifting force is generated by an oil film applied during freewheeling operation by centrifugal force exerted on the outer ring race. This provides for practically wear-free freewheeling operation. The speed differential between the inner and outer rings is the decisive factor affecting the lift-off function. If the speed differential decreases, the lift-off force also decreases. Before achieving synchronous running, the clamping rollers guided in a cage are positioned with the aid of the central spring system against the outer ring race and are then ready to lock. This guarantees immediate torque transfer once the synchronous speed has been reached. The hydrodynamic roller lift-off enables a virtually wear-free freewheeling operation.

Housing Freewheels FH

for stationary arrangement in multimotor drives with hydrodynamic roller lift-off for extended service life



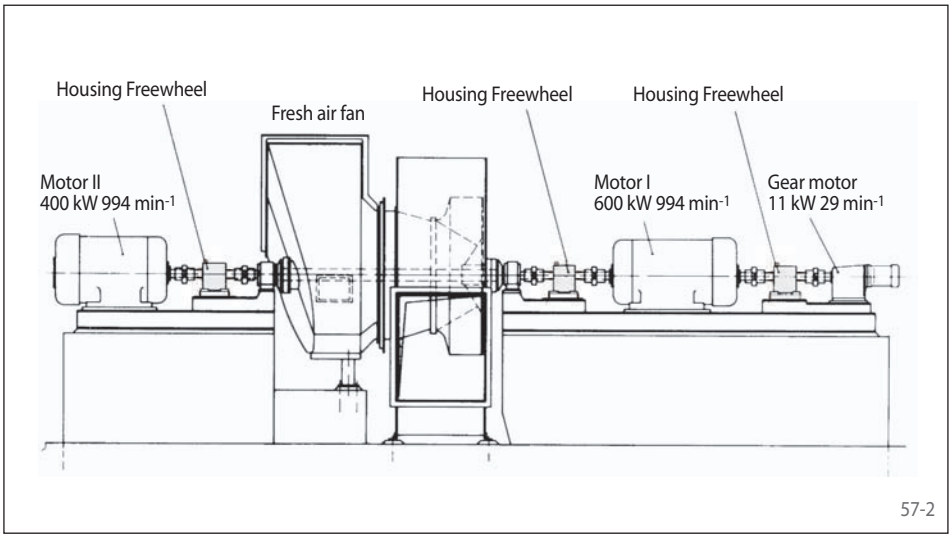
57-1

Areas of application

Housing Freewheels as automatic clutches in multimotor drives fulfil here an important function. They disengage a drive automatically as soon as it no longer provides power to the working machine. The Housing Freewheels do not require any external operating equipment.

Typical applications for multimotor drives are:

- Generators
- Pumps
- Ventilators
- Fans
- Uninterrupted power supply



57-2

Application example

Three Housing Freewheels 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.

Selection torque for Housing Freewheels FH

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 pullover 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

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^{-1}]

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:

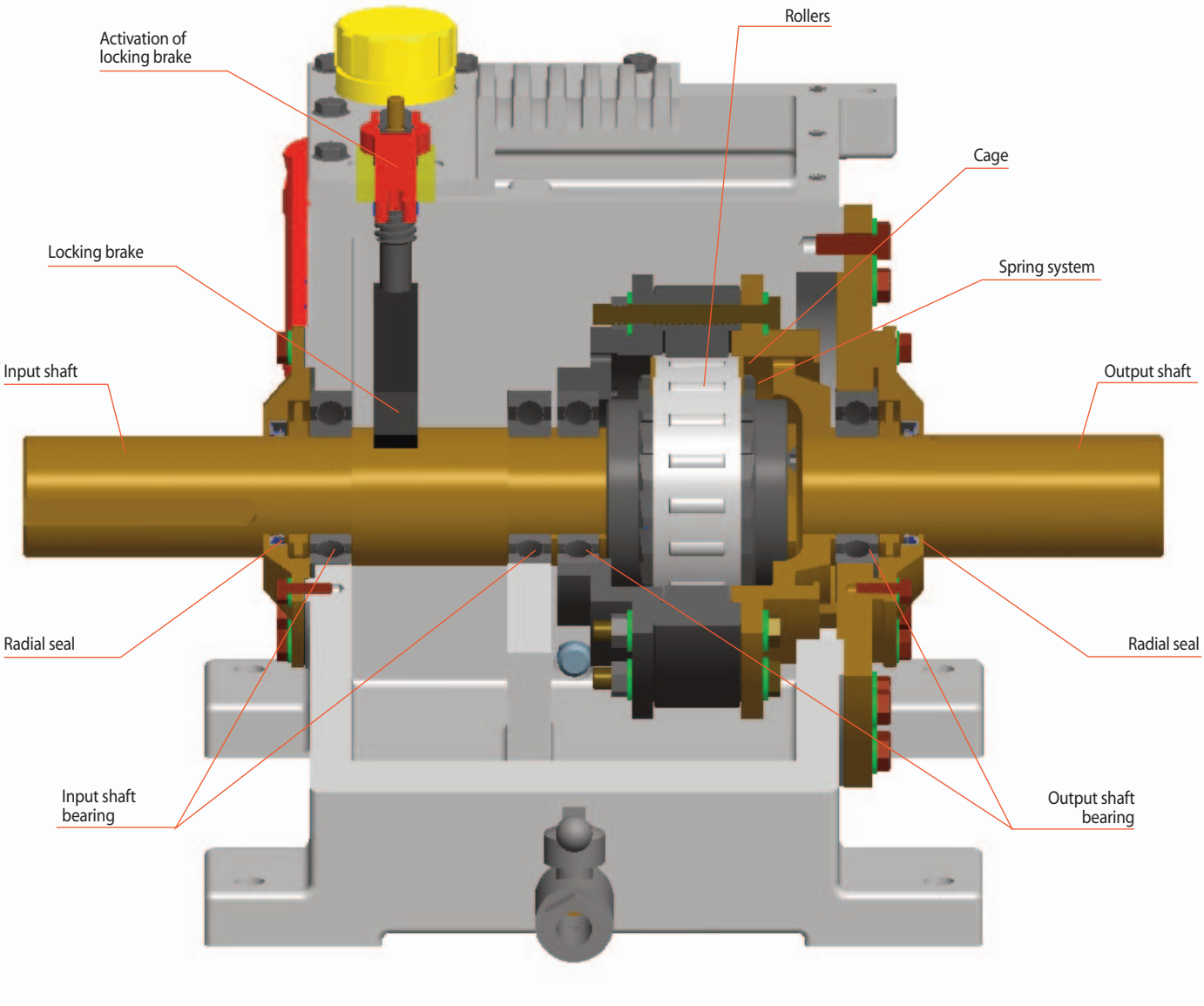
$$M_N \geq M_A$$

M_N = Nominal torque of the Housing Freewheel FH in accordance with the table values [Nm]

The operating factor K depends on the properties of the driver and the machine. The general rules of mechanical engineering apply here. We recommend using an operating factor K of at least 1,5. We will be pleased to check your selection.

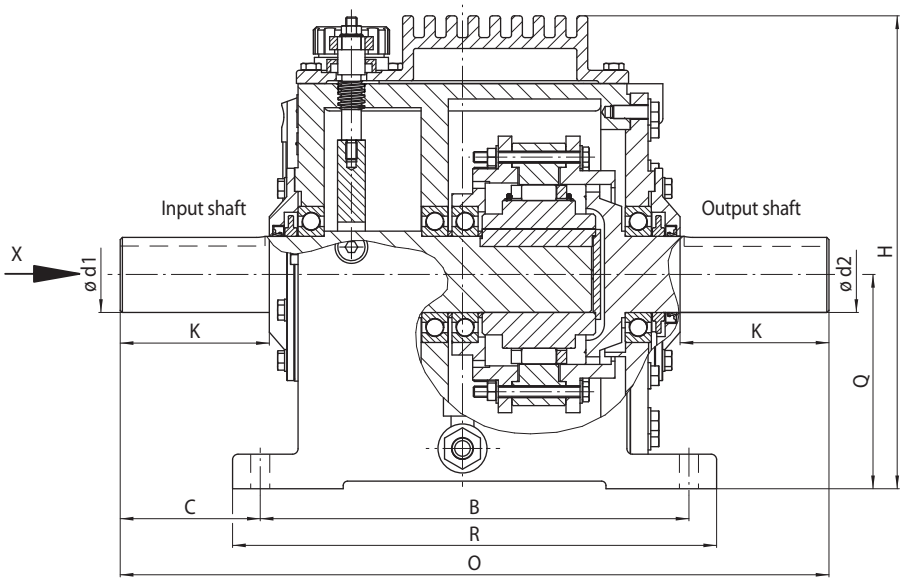
Housing Freewheels FH

for stationary arrangement in multimotor drives with hydrodynamic roller lift-off for extended service life

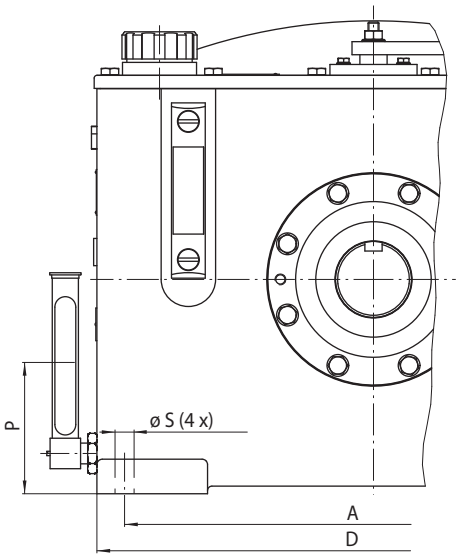


Housing Freewheels FH

for stationary arrangement in multimotor drives with hydrodynamic roller lift-off for extended service life



59-1



59-2

Overrunning Clutch

Type hydrodynamic roller lift-off	Dimensions

	Freewheel Size	Type	Nominal torque M_N	Max. speed Output shaft overruns	Max. speed Input shaft drives	Shaft d1 and d2	A	B	C	D	H	K	O	P	Q	R	S	Weight
			ft-lbs	min^{-1}	min^{-1}	inch	inch	inch	inch	inch	inch	inch	inch	inch	inch	inch	inch	lbs
inch	FH 1000	R	1000	5600	5600	1 3/4	12 3/4	12 3/4	3 7/16	16 1/4	12 7/8	3 7/8	19 5/8	4 5/8	5 3/4	14 1/2	11/16	231
inch	FH 2000	R	2000	4200	4200	2 5/16	16 3/4	14 3/4	4 1/4	18 3/4	15	4 5/8	23 1/4	5 1/2	6 7/8	16 1/2	11/16	355
inch	FH 4000	R	4000	3600	3600	2 3/4	18	15 1/2	5 1/16	20	17 1/8	5 3/8	25 5/8	6 1/8	7 3/4	17 1/2	11/16	496
inch	FH 8000	R	8000	3000	3000	3 5/16	17 1/2	18 1/4	5 5/8	21 1/2	18 15/16	6 1/8	29 1/2	6 3/4	8 5/8	20 1/2	13/16	716
inch	FH 12000	R	12000	2500	2500	3 7/8	18 1/4	21 1/2	6 5/16	22 3/4	20 15/16	6 15/16	34 1/8	7 1/2	9 5/8	23 3/4	1 1/16	926
inch	FH 18000	R	18000	2300	2300	4 5/16	20 1/2	23 1/4	7 5/16	26	20 5/8	7 11/16	37 7/8	8 7/8	11 1/4	25 3/4	1 5/16	1402
			Nm	min^{-1}	min^{-1}	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
metric	FH 1000	R	1356	5600	5600	44,45	323,85	323,85	87,31	412,75	327,00	98,43	498,48	117,48	146,05	368,30	17,50	105
metric	FH 2000	R	2712	4200	4200	58,74	425,45	374,65	107,95	480,00	381,00	117,48	590,55	139,70	174,63	419,10	17,50	161
metric	FH 4000	R	5423	3600	3600	69,85	457,20	393,70	128,59	508,00	435,00	136,53	650,88	155,58	196,85	444,50	17,50	225
metric	FH 8000	R	10847	3000	3000	84,14	444,50	463,55	142,87	546,00	481,00	155,58	749,30	171,45	219,08	520,00	21,00	325
metric	FH 12000	R	16270	2500	2500	98,43	463,55	546,10	160,35	578,00	532,00	177,00	866,80	190,50	244,48	603,00	27,00	425
metric	FH 18000	R	24405	2300	2300	109,54	520,70	590,55	185,74	660,00	600,00	195,26	962,00	225,43	285,75	654,00	33,00	636

The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.
Keyway according to USAS B17.1-1967

Locking brake

During freewheeling operation, the stationary input shaft of the Housing Freewheel is effected by a drag torque from the freewheeling output shaft. By manually activation of the in the housing freewheel integrated locking brake the driving parts are prevented from being carried along.

Mounting

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

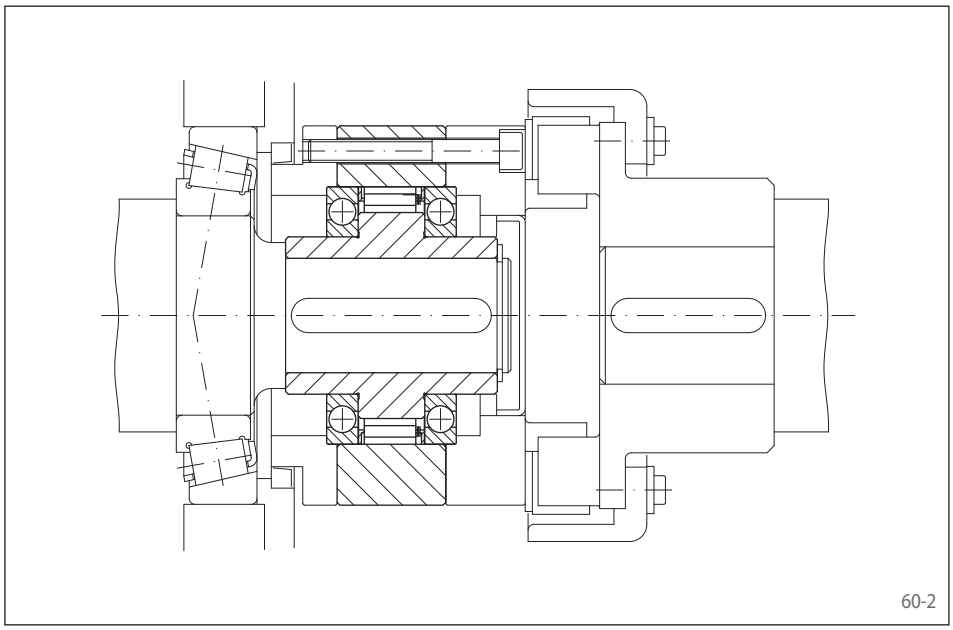
We recommend the use of torsionally stiff shaft couplings generating only low reactive forces. On indication of the reactive forces that occur we are well prepared to check the usable life of the bearings installed.

Example for ordering

Prior to ordering, please complete the questionnaire on page 125 by specifying the direction of rotation in driving operation when viewed in direction X 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
- Overrrunning 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.

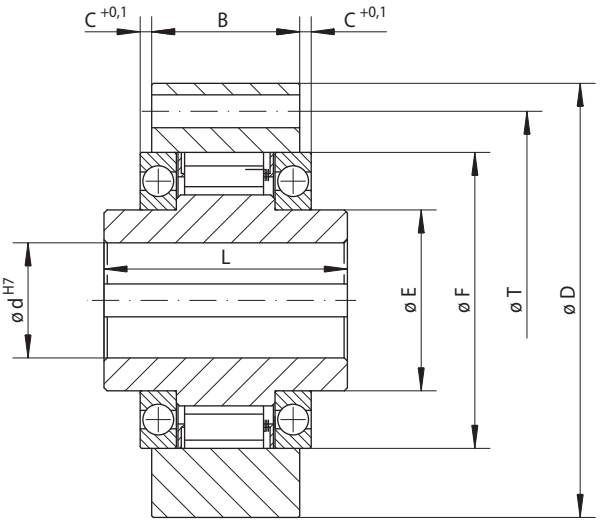
Example for ordering

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

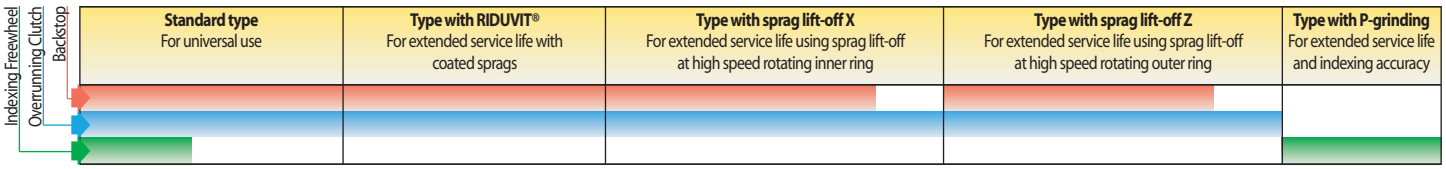
- FBO 72 SFP, d = 38 mm

Basic Freewheels FBO

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



61-1



Freewheel Size	Type	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Type	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Type	Nominal torque M_N Nm	Sprag lift-off at inner ring speed min^{-1}	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring drives min^{-1}	Type	Nominal torque M_N Nm	Sprag lift-off at outer ring speed min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Max. speed Inner ring drives min^{-1}	Type	Nominal torque M_N Nm
FBO 37	SF	200	2 500	2 600	SFT	200	2 500	2 600						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												

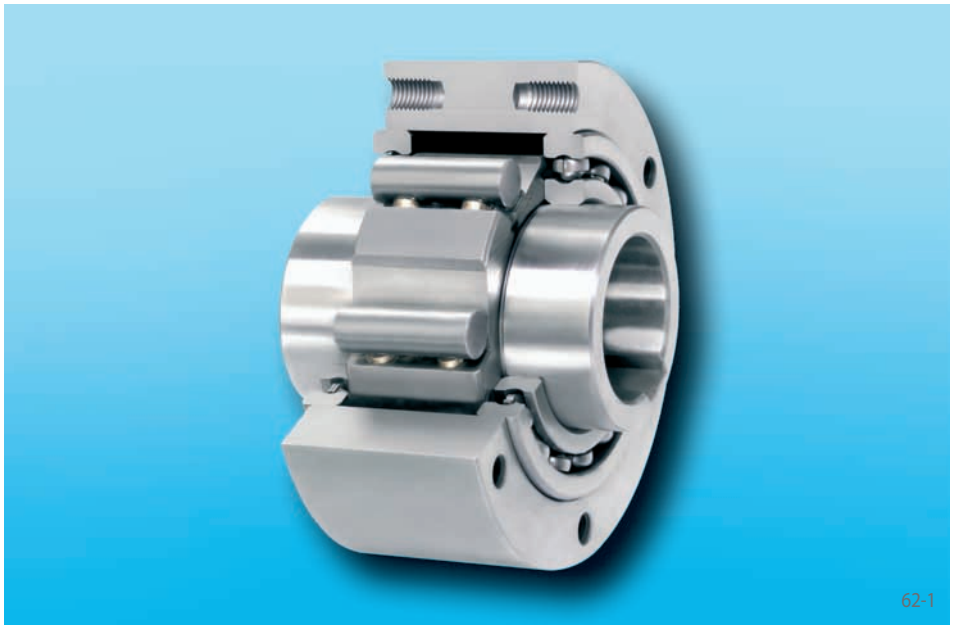
The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.
The specified maximum speeds apply for installation conditions as given with Complete Freewheels. Knowing the actual installation conditions higher speeds can be permitted under some circumstances.

Freewheel Size	Bore d Standard mm	mm	mm	mm	mm	Bore d max. mm	B mm	C1*** mm	C2*** mm	C3*** mm	D mm	E mm	F mm	G**	L mm	T mm	Z**	Weight kg
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 EN ISO 4762) 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



Features

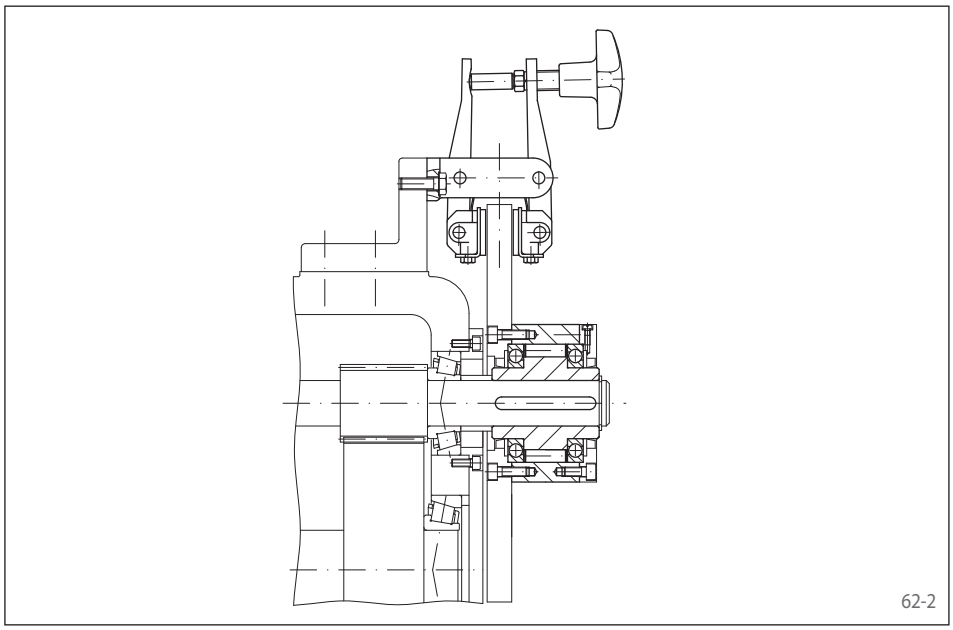
Basic Freewheels FGR … R are roller freewheels with ball bearings to be assembled with customer connecting parts. The freewheels are particularly suitable for installation in housings with oil lubrication and seals.

The freewheels FGR … R are used as:

- Backstops
- Overrrunning Clutches
- Indexing Freewheels

Nominal torques up to 68 000 Nm.

Bores up to 150 mm.

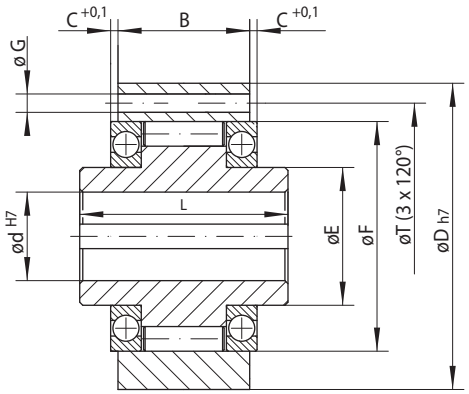


Application example

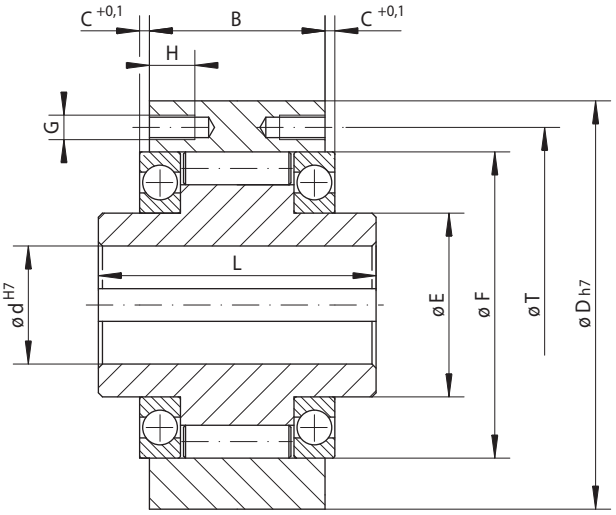
Basic Freewheel FGR 25 R as a backstop on a reduction gear in the drive of an inclined conveyor of an assembly train. When the unit stops, the conveyor belt must be held securely so that it does not run backwards by the weight of the assembly parts. A brake disk is fitted to the outer ring of the freewheel 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

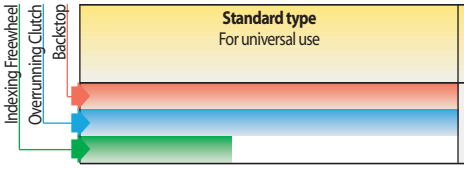
for assembly with connecting parts with rollers



Size FGR 12 63-1



Size FGR 15 to FGR 150 63-2



Standard type
For universal use

Dimensions

Freewheel Size	Type	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Bore d mm	B mm	C mm	D mm	E mm	F mm	G**	H mm	L mm	T mm	Z**	Weight kg
FGR 12	R	55	2500	5400	12	20	3,5	62	20	42	5,5 mm	–	42	51	3	0,5
FGR 15	R	130	2200	4800	15	28	2,0	68	25	47	M 5	8	52	56	3	0,8
FGR 20	R	180	1900	4100	20	34	2,4	75	30	55	M 5	8	57	64	4	1,0
FGR 25	R	290	1550	3350	25	35	2,4	90	40	68	M 6	10	60	78	4	1,5
FGR 30	R	500	1400	3050	30	43	2,4	100	45	75	M 6	10	68	87	6	2,2
FGR 35	R	730	1300	2850	35	45	2,9	110	50	80	M 6	12	74	96	6	3,0
FGR 40	R	1 000	1150	2500	40	53	2,9	125	55	90	M 8	14	86	108	6	4,6
FGR 45	R	1 150	1100	2400	45	53	2,9	130	60	95	M 8	14	86	112	8	4,7
FGR 50	R	2 100	950	2050	50	64	3,9	150	70	110	M 8	14	94	132	8	7,2
FGR 55	R	2 600	900	1900	55	66	2,9	160	75	115	M 10	16	104	138	8	8,6
FGR 60	R	3 500	800	1800	60	78	5,4	170	80	125	M 10	16	114	150	10	10,5
FGR 70	R	6 000	700	1600	70	95	6,4	190	90	140	M 10	16	134	165	10	13,4
FGR 80	R	6 800	600	1400	80	100	3,9	210	105	160	M 10	16	144	185	10	18,2
FGR 90	R	11 000	500	1300	90	115	4,9	230	120	180	M 12	20	158	206	10	28,0
FGR 100	R	20 000	350	1000	100	120	5,4	270	140	210	M 16	24	182	240	10	43,0
FGR 130	R	31 000	250	900	130	152	7,9	310	160	240	M 16	24	212	278	12	66,0
FGR 150	R	68 000	200	700	150	180	6,9	400	200	310	M 20	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 bzw. Befestigungslöcher 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 freewheels without bearing support and with sprag lift-off X.

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

The freewheels FXM are used as:

- Backstops
- Overunning Clutches

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

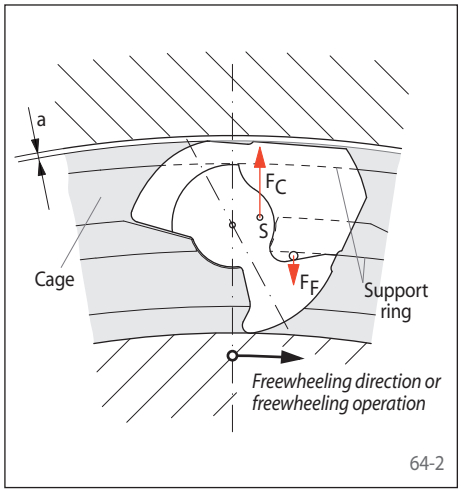
Nominal torques up to 888 000 Nm.

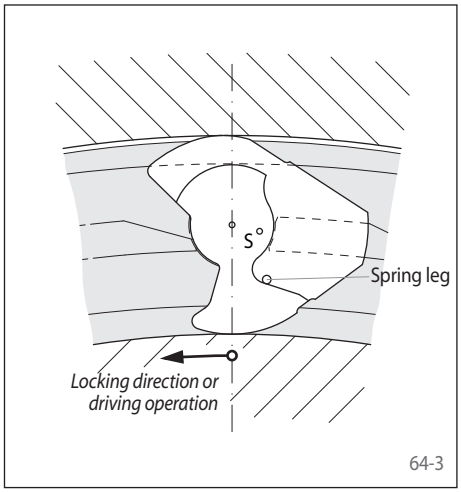
Bores up to 460 mm. Many standard bores are available.

Sprag lift-off X

Integrated Freewheels FXM are equipped with sprag lift-off X. The sprag lift-off X is used for backstops and overrunning clutches, provided that in freewheeling operation the inner ring is rotating at high speed and providing with overrunning clutches that the driving operation is conducted at low speed. In freewheeling operation, the centrifugal force F_C causes the sprag to lift off from the outer track. In this operating state, the freewheel works wear-free, i.e. with unlimited service life.

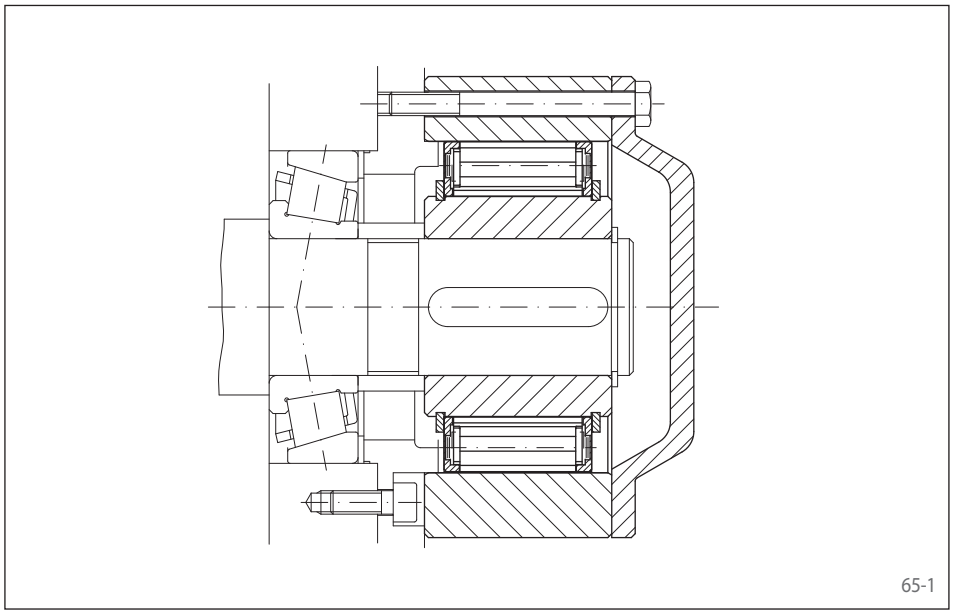
Figure 64-2 shows a freewheel with sprag lift-off X in freewheeling operation. The sprags, which are supported in a cage connected with the inner ring, rotate with the inner ring. The centrifugal force F_C that is applied in the center of gravity S of the sprag turns the sprag counterclockwise and rests against the support ring of the cage. This results in the gap a between the sprag and the outer track; the freewheel works without contact. If the inner ring speed decreases to such an extent that the effect of the centrifugal force on the sprag is less than that of the spring force F_F, the sprag again rests on the outer ring and the freewheel is ready to lock (figure 64-3). If used as an overrunning clutch, the driving speed must not exceed 40% of the lift-off speed.





Integrated Freewheels FXM

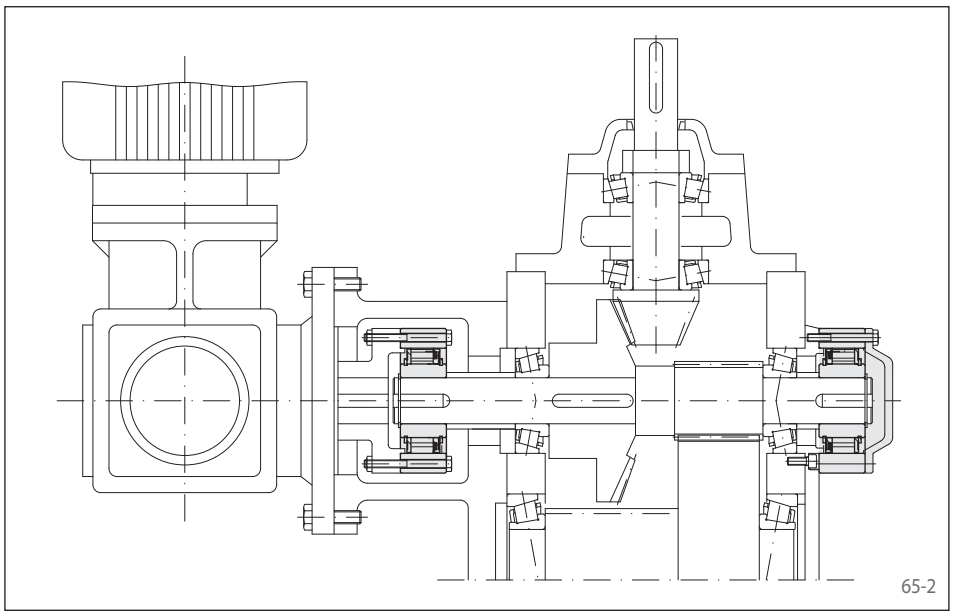
for bolting to the face with sprag lift-off X



65-1

Application example

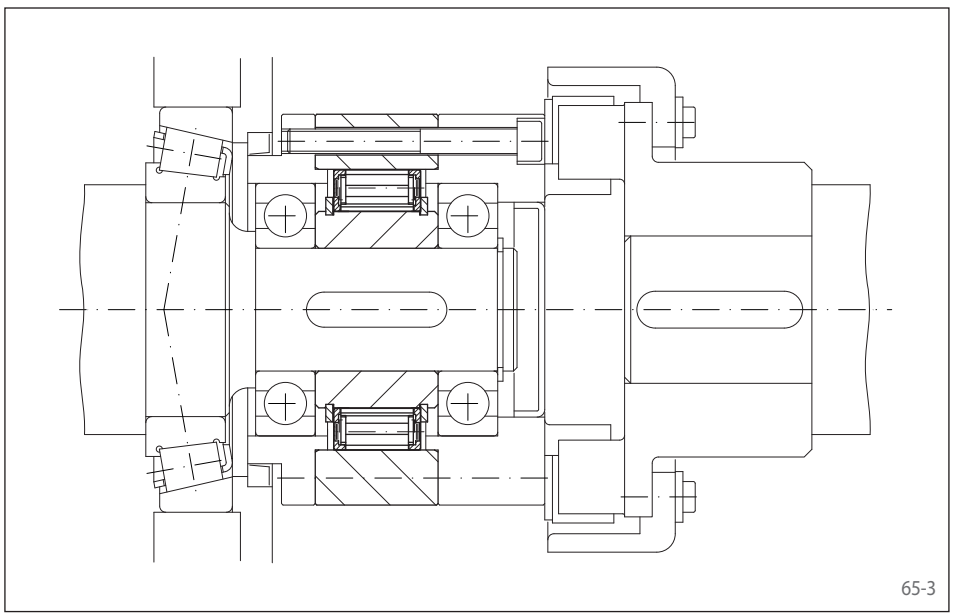
Integrated Freewheel FXM 170 - 63 MX with end cover as backstop fitted to the end of the first intermediate shaft of a spur gearbox in the drive of an inclined conveyor belt. In the case of a motor stop, the conveyor belt must be held securely so that the conveyor goods do not pull the belt backwards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



65-2

Application example

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



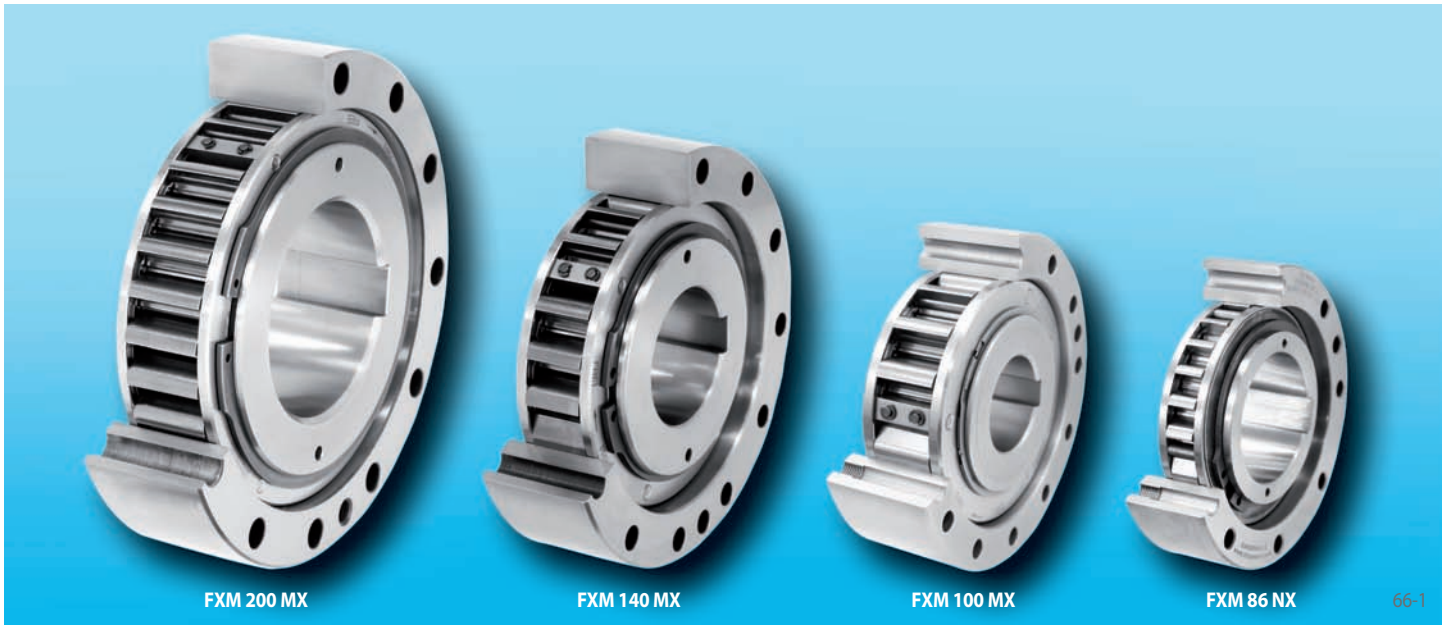
65-3

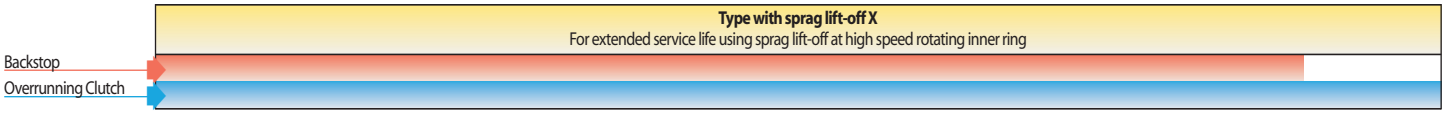
Application example

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

Integrated Freewheels FXM … NX and FXM … MX

for bolting to the face with sprag lift-off X





Freewheel Size	Type	Theoretical nominal torque ⌖ 0 A Nm	Nominal torque at existing run out (T.I.R.) ⌖ 0,1 A Nm	⌖ 0,2 A Nm	⌖ 0,3 A Nm	⌖ 0,4 A Nm	⌖ 0,5 A Nm	Sprag lift-off at inner ring speed min^{-1}	Max. speed Inner ring freewheels/ overruns min^{-1}	Outer ring drives min^{-1}
FXM 31 - 17	NX	110	110	105	100			890	5000	356
FXM 38 - 17	NX	180	170	160	150			860	5000	344
FXM 46 - 25	NX	460	450	440	430			820	5000	328
FXM 51 - 25	NX	560	550	540	530			750	5000	300
FXM 56 - 25	NX	660	650	640	630			730	5000	292
FXM 61 - 19	NX	520	500	480	460			750	5000	300
FXM 66 - 25	NX	950	930	910	890			700	5000	280
FXM 76 - 25	NX	1 200	1 170	1 140	1 110			670	5000	268
FXM 86 - 25	NX	1 600	1 550	1 500	1 450			630	5000	252
FXM 101 - 25	NX	2 100	2 050	2 000	1 950			610	5000	244
FXM 85 - 40	MX	2 500	2 500	2 450	2 450	2 450	2 450	430	6000	172
FXM 100 - 40	MX	3 700	3 600	3 600	3 500	3 500	3 500	400	4500	160
FXM 120 - 50	MX	7 700	7 600	7 500	7 300	7 300	7 300	320	4000	128
FXM 140 - 50	MX	10 100	10 000	9 800	9 600	9 500	9 500	320	3000	128
FXM 170 - 63	MX	20 500	20 500	20 000	19 500	19 000	19 000	250	2700	100
FXM 200 - 63	MX	31 000	30 500	30 000	26 500	23 000	20 500	240	2100	96

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

Mounting

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

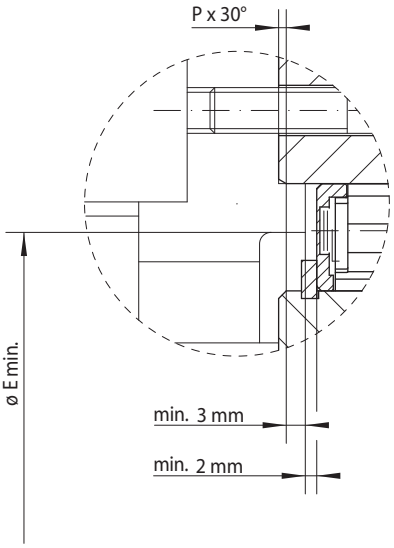
The Integrated Freewheel FXM is centered via the outer track F on the customer attachment part and bolted to this (refer to figure 67-1). The tolerance of the pilot diameter of the attachment part must be ISO h6 or h7.

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

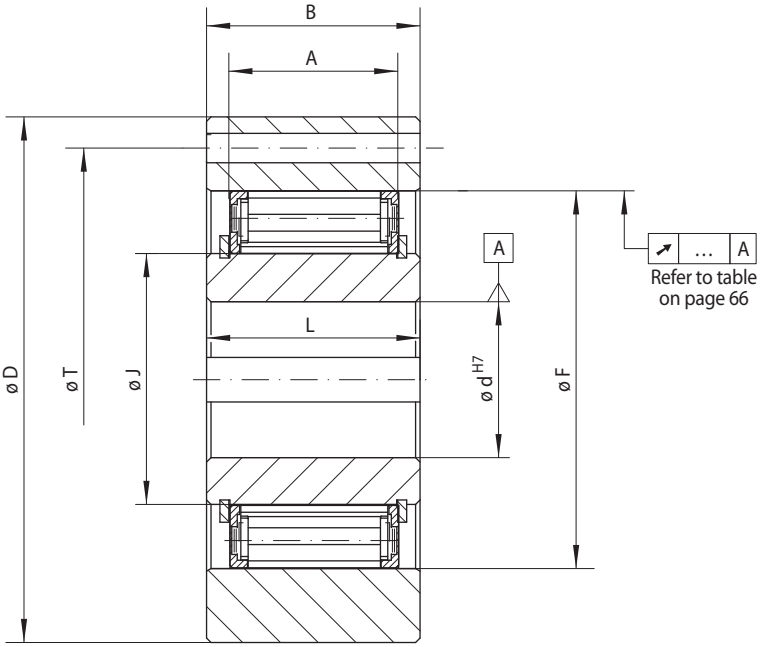
For fitting to shaft ends, end covers can be supplied upon request (refer to figure 67-3).

Integrated Freewheels FXM … NX and FXM … MX

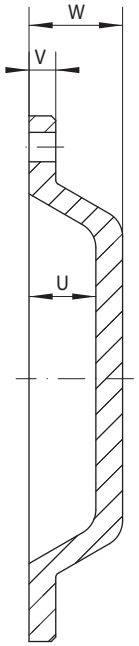
for bolting to the face with sprag lift-off X



67-1



67-2



67-3

Freewheel Size	Bore d Standard						max.	A	B	D	E min.	F	G**	J	L	P	T	U	V	W	Z**	Weight
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm		mm	mm	mm	mm	mm	mm	mm		kg
FXM 31 -17	20*						20*	17	25	85	41	55	M 6	31	24	1,0	70	15	6	21	6	0,8
FXM 38 -17	25*						25*	17	25	90	48	62	M 6	38	24	1,0	75	15	6	21	6	0,9
FXM 46 -25	25						30	25	35	95	56	70	M 6	46	35	1,0	82	15	6	21	6	1,3
FXM 51 -25	25	30	35				36	25	35	105	62	75	M 6	51	35	1,0	90	15	6	21	6	1,7
FXM 56 -25	35						40	25	35	110	66	80	M 6	56	35	1,0	96	15	6	21	8	1,8
FXM 61 -19	30	35	40				45*	19	27	120	74	85	M 8	61	25	1,0	105	15	6	21	6	1,8
FXM 66 -25	35	40	45				48*	25	35	132	82	90	M 8	66	35	1,0	115	15	8	23	8	2,8
FXM 76 -25	45	55					60*	25	35	140	92	100	M 8	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	M 8	86	40	1,0	132	15	8	23	8	4,2
FXM 101 -25	55	70					80*	25	50	175	117	125	M 10	101	50	1,0	155	20	8	28	8	6,9
FXM 85 -40	45	50	60	65			65	40	50	175	102	125	M 10	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	M 10	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	M 10	120	70	1,5	185	25	10	35	12	12,7
FXM 140 -50	65	90	100	110			110	50	70	245	170	180	M 12	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	M 16	170	80	2,0	258	28	12	38	12	33,0
FXM 200 -63	130						155	63	80	310	230	240	M 16	200	80	2,0	278	32	12	42	12	32,0

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

Lubrication

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

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

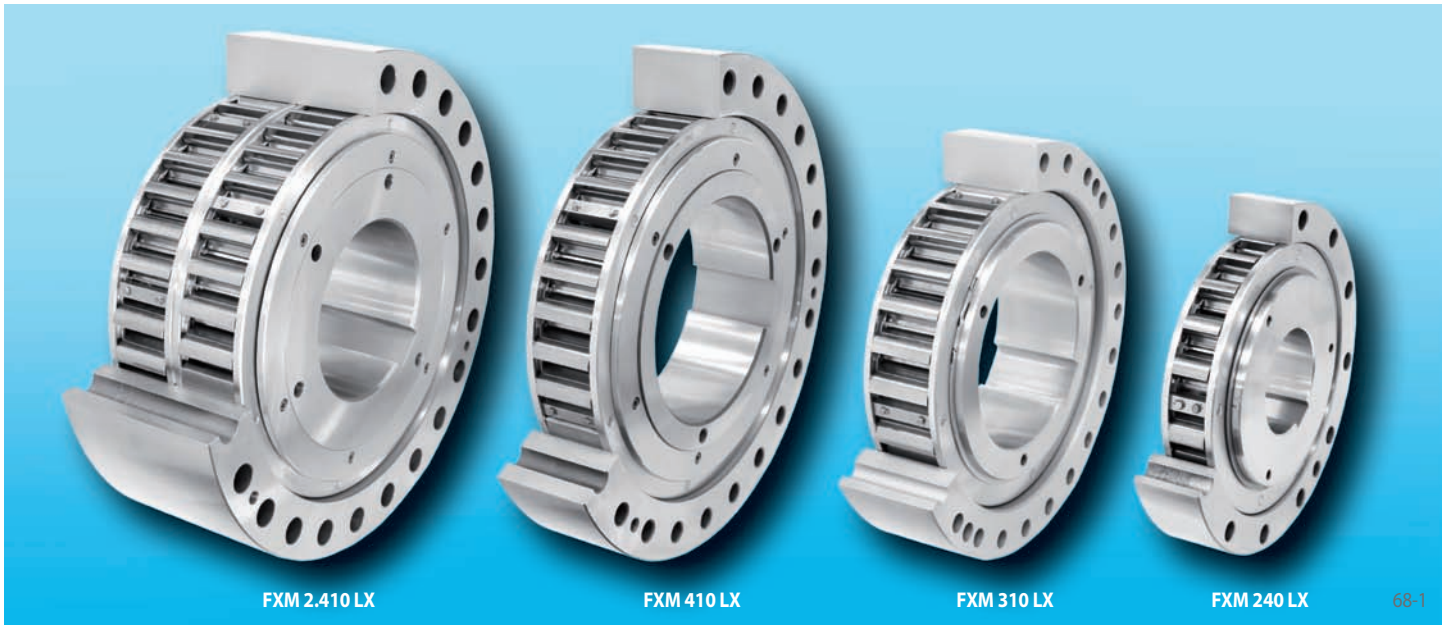
Example for ordering

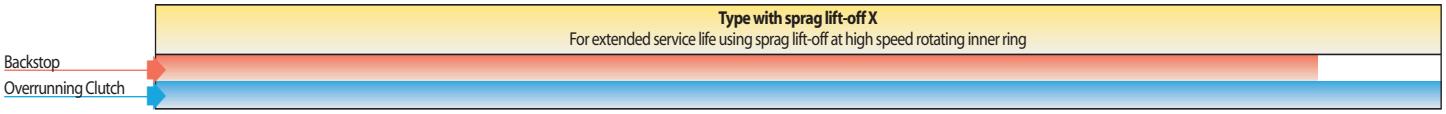
Freewheel size FXM 140 - 50, type with sprag lift-off X and 100 mm bore and end cover:

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

Integrated Freewheels FXM … LX

for bolting to the face with sprag lift-off X





Freewheel Size	Type	Theoretical nominal torque ⌖ 0 A Nm	Nominal torque at existing run out (T.I.R.) ⌖ 0,1 A Nm	⌖ 0,2 A Nm	⌖ 0,3 A Nm	⌖ 0,4 A Nm	⌖ 0,5 A Nm	⌖ 0,8 A Nm	Sprag lift-off at inner ring speed min^{-1}	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring drives min^{-1}
FXM 240 - 63	LX	36 500	36 000	35 500	35 500	35 000	34 500	34 000	220	3 000	88
FXM 240 - 96	LX	59 000	58 500	58 500	57 500	57 000	56 500	56 000	220	2 500	88
FXM 2.240 - 70	LX	81 000	80 500	80 000	79 500	78 500	77 500	77 000	220	2 500	88
FXM 2.240 - 96	LX	117 500	116 500	116 000	114 500	113 500	112 500	111 500	220	2 500	88
FXM 260 - 63	LX	44 500	44 000	44 000	43 500	43 000	42 500	41 500	210	2 250	84
FXM 290 - 70	LX	65 000	64 500	64 000	63 500	62 500	62 000	60 000	200	2 250	80
FXM 290 - 96	LX	95 500	95 000	94 500	93 500	92 500	91 500	84 500	200	2 250	80
FXM 2.290 - 70	LX	125 500	124 500	123 500	122 500	121 000	119 500	117 000	200	2 250	80
FXM 2.290 - 96	LX	183 000	181 500	180 000	178 500	176 500	174 500	171 000	200	2 250	80
FXM 310 - 70	LX	76 000	75 000	74 500	74 000	73 000	72 500	70 000	195	2 250	78
FXM 310 - 96	LX	112 000	111 000	110 500	109 500	108 000	107 000	99 000	195	2 100	78
FXM 320 - 70	LX	81 000	80 500	80 000	79 500	78 500	78 000	65 500	195	2 000	78
FXM 320 - 96	LX	114 000	113 500	112 500	111 500	110 000	109 000	105 500	195	2 000	78
FXM 2.320 - 70	LX	158 000	156 500	155 500	154 000	152 500	151 000	143 000	195	2 000	78
FXM 2.320 - 96	LX	225 000	223 500	221 500	220 000	217 500	215 000	209 000	195	2 000	78
FXM 360 - 100	LX	156 000	155 000	154 000	152 500	144 000	134 500	108 000	180	1 800	72
FXM 2.360 - 73	LX	208 000	206 500	204 500	203 000	201 000	199 000	163 000	180	1 800	72
FXM 2.360 - 100	LX	294 500	292 500	290 000	287 500	284 500	281 500	258 500	180	1 800	72
FXM 410 - 100	LX	194 500	193 500	192 000	190 000	188 500	179 500	145 000	170	1 500	68
FXM 2.410 - 73	LX	263 000	261 000	259 000	257 000	254 500	252 000	209 500	170	1 500	68
FXM 2.410 - 100	LX	389 500	387 000	384 000	380 500	377 000	359 500	289 500	170	1 500	68
FXM 500 - 100	LX	290 000	287 500	285 500	283 000	272 000	255 000	202 000	150	1 000	60
FXM 2.500 - 100	LX	578 000	574 000	570 000	566 000	547 000	508 000	407 000	150	1 000	60
FXM 620 - 105	LX	444 500	441 500	438 500	427 000	400 000	374 000	300 000	135	1 000	54
FXM 2.620 - 105	LX	888 000	882 000	876 000	860 000	807 000	754 000	603 000	135	1 000	54

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

Mounting

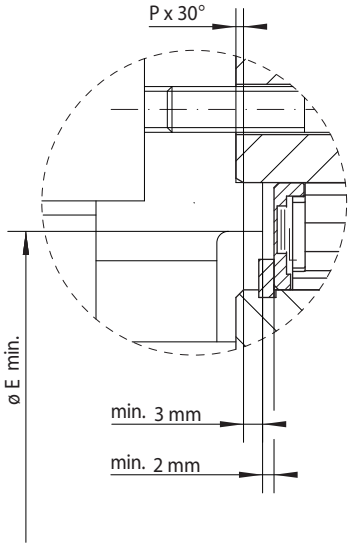
Integrated Freewheels FXM are without bearing support. Concentric alignment of inner and outer ring must be provided by the customer. The permissible run out (T.I.R.) must be observed.

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

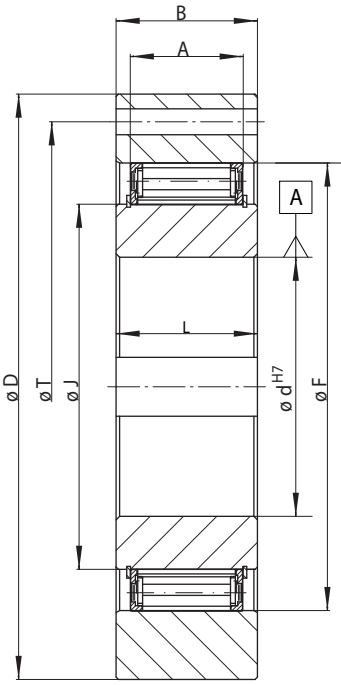
The tolerance of the shaft must be ISO h6 or j6.

Integrated Freewheels FXM … LX

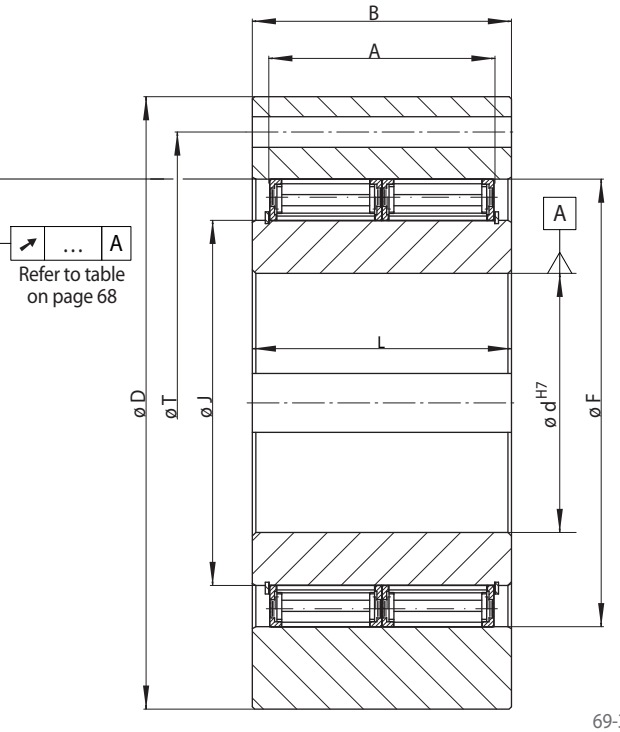
for bolting to the face with sprag lift-off X



69-1



69-2



69-3

Freewheel Size	Bore d max. mm	A mm	B mm	D mm	E min. mm	F mm	G*	J mm	L mm	P mm	T mm	Z*	Weight kg
FXM 240 - 63	185	63	80	400	280	310	M 20	240	90	2,0	360	12	60
FXM 240 - 96	185	96	125	420	280	310	M 24	240	120	2,0	370	16	95
FXM 2.240 - 70	185	140	160	412	280	310	M 20	240	160	2,0	360	24	120
FXM 2.240 - 96	185	192	240	425	280	310	M 24	240	240	2,0	370	24	200
FXM 260 - 63	205	63	80	430	300	330	M 20	260	105	2,0	380	16	75
FXM 290 - 70	230	70	80	460	330	360	M 20	290	105	2,0	410	16	90
FXM 290 - 96	230	96	110	460	330	360	M 20	290	120	2,0	410	16	91
FXM 2.290 - 70	230	140	160	480	330	360	M 24	290	160	2,0	410	18	170
FXM 2.290 - 96	230	192	240	490	330	360	M 30	290	240	2,0	425	20	260
FXM 310 - 70	240	70	125	497	360	380	M 20	310	110	3,0	450	24	135
FXM 310 - 96	240	96	125	497	360	380	M 20	310	120	3,0	450	24	145
FXM 320 - 70	250	70	80	490	360	390	M 24	320	105	3,0	440	16	105
FXM 320 - 96	250	96	120	520	360	390	M 24	320	120	3,0	440	16	150
FXM 2.320 - 70	250	140	180	505	360	390	M 24	320	180	3,0	440	24	200
FXM 2.320 - 96	250	192	240	530	360	390	M 30	320	240	3,0	460	24	310
FXM 360 - 100	280	100	120	540	400	430	M 24	360	125	3,0	500	24	170
FXM 2.360 - 73	280	146	210	550	400	430	M 24	360	210	3,0	500	24	270
FXM 2.360 - 100	280	200	250	580	400	430	M 30	360	250	3,0	500	24	380
FXM 410 - 100	300	100	120	630	460	480	M 24	410	125	3,0	560	24	245
FXM 2.410 - 73	300	146	210	630	460	480	M 24	410	210	3,0	560	24	400
FXM 2.410 - 100	300	200	220	630	460	480	M 30	410	220	3,0	560	24	440
FXM 500 - 100	360	100	130	780	550	570	M 30	500	130	3,0	680	24	310
FXM 2.500 - 100	360	200	230	780	550	570	M 30	500	230	3,0	680	24	560
FXM 620 - 105	460	105	140	980	670	690	M 30	620	140	3,0	840	24	570
FXM 2.620 - 105	460	210	240	980	670	690	M 30	620	240	3,0	840	24	990

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

Lubrication

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

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

Example for ordering

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

- FXM 240 - 63 LX, d = 140 mm

Integrated Freewheels FON

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

Features

Integrated Freewheels FON are sprag freewheels without bearing support.

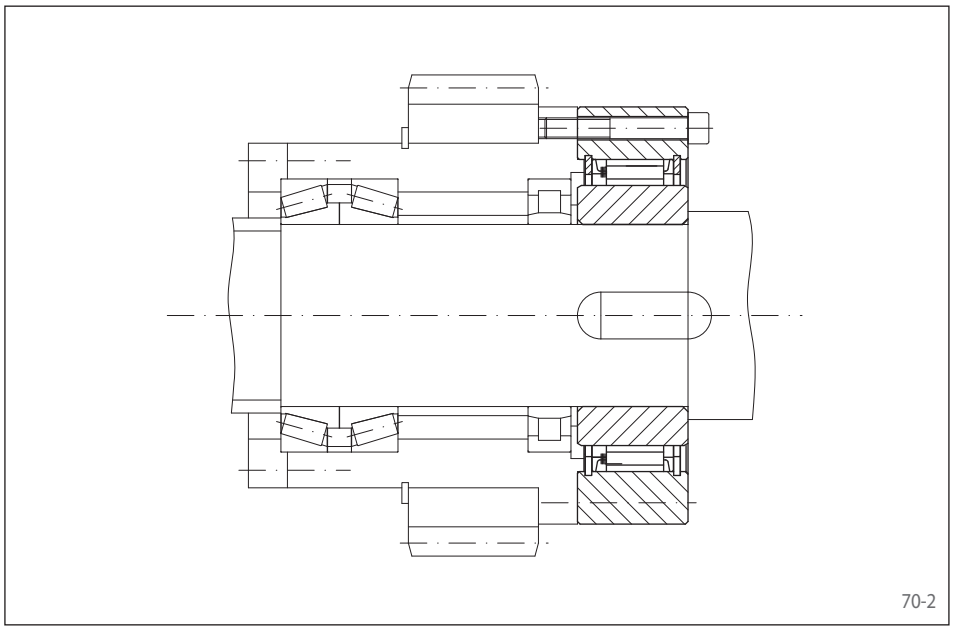
The freewheels FON are used as:

- 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.

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.

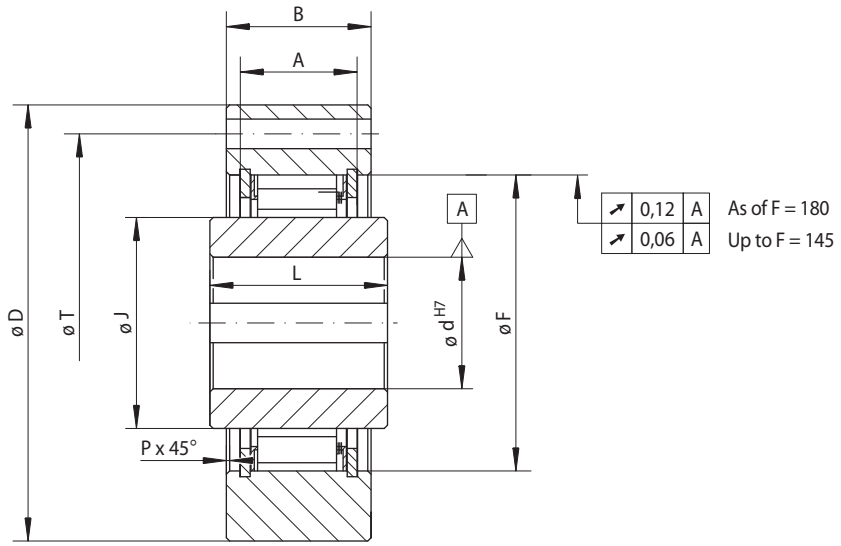
Example for ordering

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

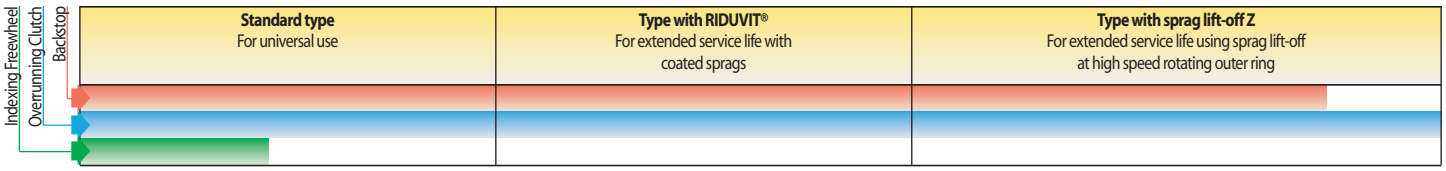
- FON 72 SFT, d = 45 mm

Integrated Freewheels FON

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



71-1



Freewheel Size	Type	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Type	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Type	Nominal torque M_N Nm	Sprag lift-off at outer ring speed min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Max. speed Inner ring drives min^{-1}
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

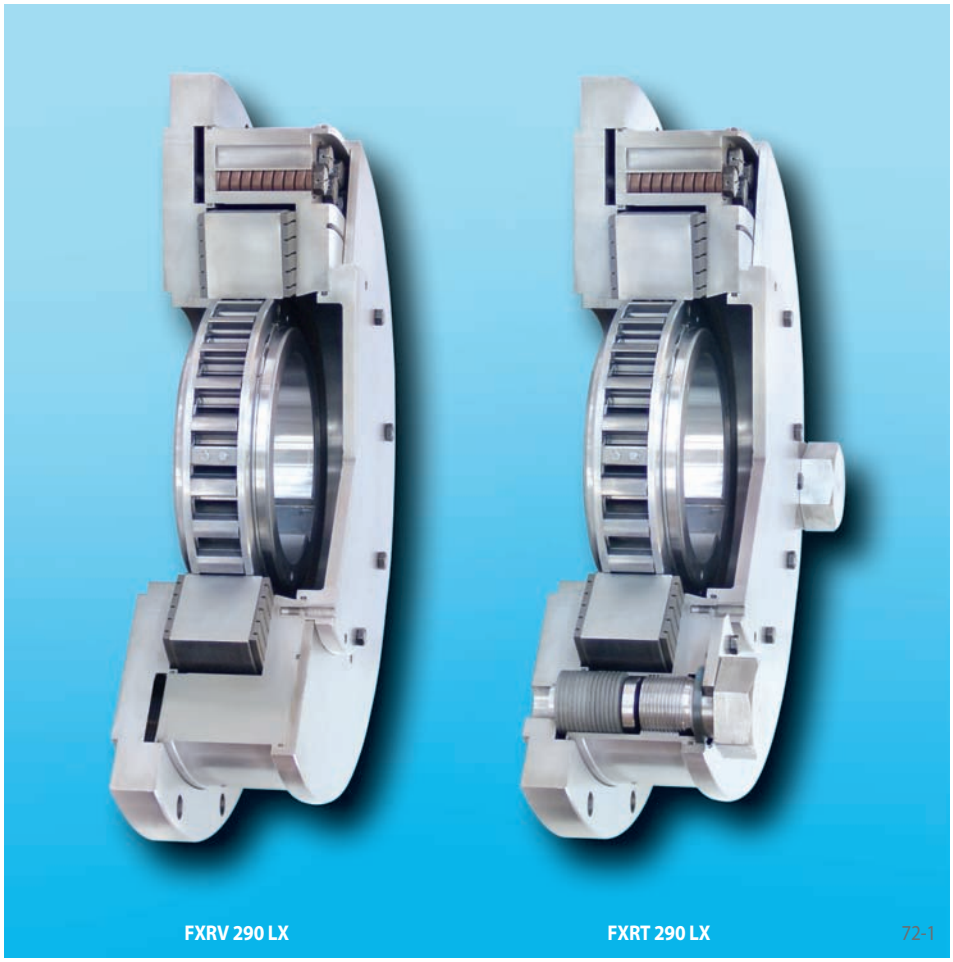
The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.
The specified maximum speeds apply for installation conditions as given with Complete Freewheels. Knowing the actual installation conditions higher speeds can be permitted under some circumstances.

Freewheel Size	Bore d Standard mm	Standard mm	Standard mm	max. mm	A mm	B mm	D mm	F mm	G**	J mm	L mm	P mm	T mm	Z**	Weight kg
FON 37	20			25*	18,5	25	85	55	M 6	37	35	0,5	70	6	0,8
FON 44	25			32*	18,5	25	95	62	M 6	44	35	0,5	80	8	1,0
FON 57	30	35	40	42*	23,5	30	110	75	M 8	57	45	0,5	95	8	1,7
FON 72	45			55*	29,5	38	132	90	M 8	72	60	1,0	115	12	3,0
FON 82	50	55		65*	31,0	40	145	100	M 10	82	60	1,0	125	12	4,0
FON 107	70			85*	33,0	45	170	125	M 10	107	65	1,0	150	12	6,0
FON 127	90			100*	58,0	68	200	145	M 12	127	75	1,0	180	12	11,5
FON 140	100			115*	58,0	68	250	180	M 16	140	75	1,0	225	12	17,0
FON 170	120			140*	60,0	70	290	210	M 16	170	75	1,0	258	16	24,0
FON 200	140			155	73,0	85	320	240	M 16	200	85	1,5	288	16	34,0

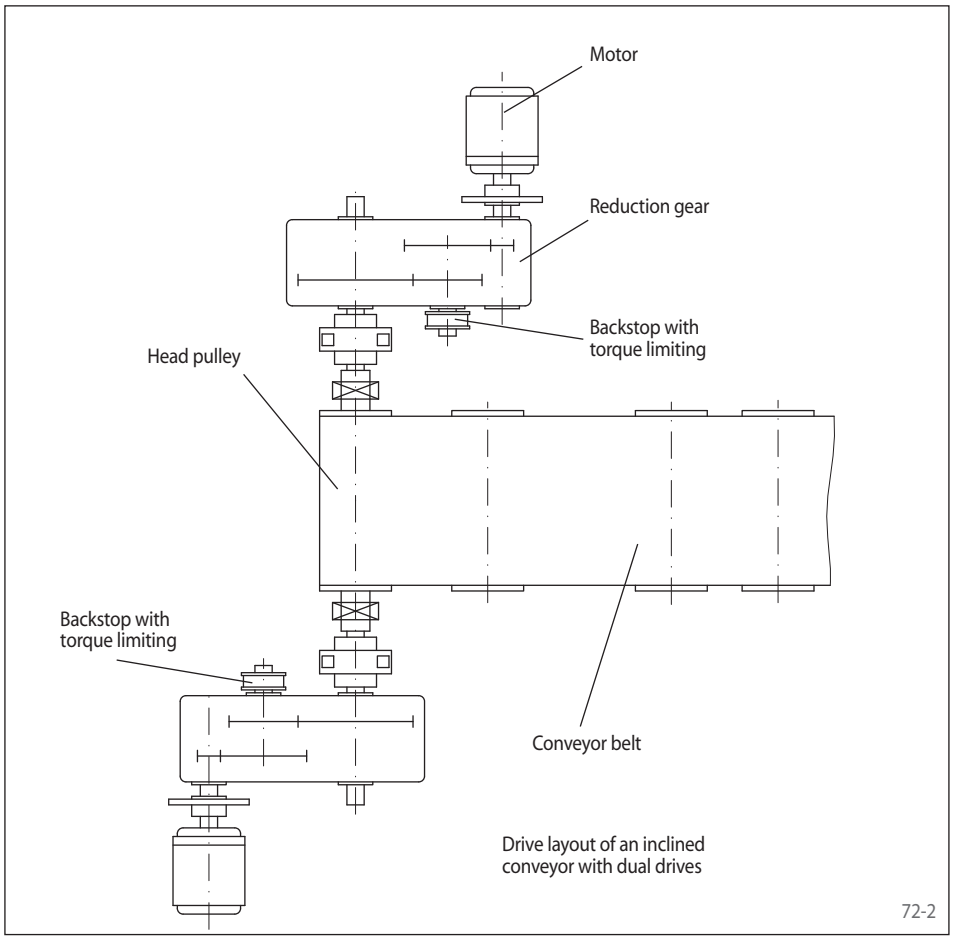
Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.
* Keyway according to DIN 6885, page 3 • Tolerance of keyway width JS10.
** Z = Number of fastening holes for screws G on pitch circle T.

Integrated Freewheels FXRV and FXRT

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



FXRV 290 LX FXRT 290 LX 72-1



Drive layout of an inclined conveyor with dual drives

72-2

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 64 to 69) with additional torque limiter.

The sprag lift-off X ensures a wear-free freewheeling 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 effecting the safety
- Protection of the backstops, as dynamic peak torques are reduced by temporarly slipping

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 74.

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 75.

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:

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

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

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

In these equiations:

M_A = Selection torque of the particular backstop [Nm]

M_L = $9550 \cdot \eta \cdot P_L / n_{SP}$ [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^{-1}]

η = Efficiency of installation

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

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:

$M_R \geqq M_A$

M_R = Maximum slipping torque of the particular backstop in accordance with the table values on pages 74 and 75 [Nm]

Approximate values for η:

Type of installation	η	η^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 124.

Example

Dual-drive system

Motor power per drive: $P_0 = 630$ kW

Type of installation:

Conveyor belt with 8° incline => $\eta^2 = 0{,}61$

Speed per backstop shaft:

n_{SP} = 360 min^{-1}

Selection torque of the particular backstop:

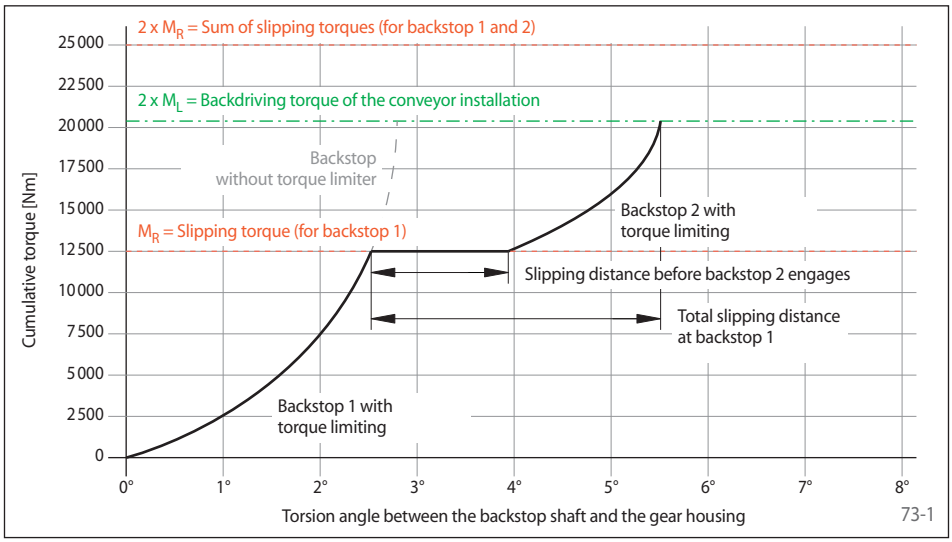
M_A = $1{,}2 \cdot 9550 \cdot 0{,}61 \cdot 630 / 360$ [Nm]

= 12234 Nm

The following rule applies in all cases:

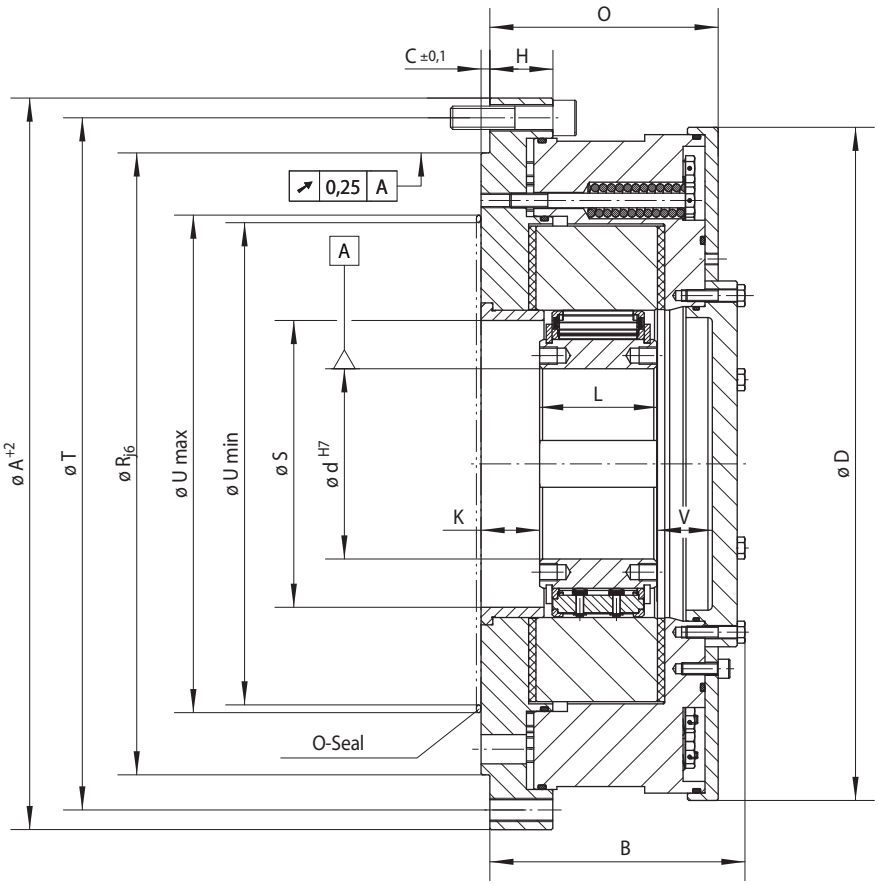
$M_R \geqq M_A$

=> FXRT or FXRV 200 - 63 MX are the suitable, economical backstop sizes.



Integrated Freewheels FXRV

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



74-1

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_R Nm	Sprag lift-off at inner ring speed min^{-1}	Max. speed Inner ring freewheels min^{-1}	Bore d Standard mm	mm	mm	mm	mm	mm	max. mm	A mm	B mm	C mm	D mm	G**	H mm	K mm	L mm	O mm	R mm	S mm	T mm	U*** min. mm	U*** max. mm	V mm	Z**	Weight kg
FXRV 85 - 40	MX	1 400	430	6 000	45	50	60	65			65	330	143	6	295	M 12	37	29	60	127	280	110	308	165	215	43	6	57
FXRV 100 - 50	MX	2 300	400	4 500	45	50	55	60	70	75	80*	350	150	6	311	M 12	39	31	70	134	300	125	328	180	240	38	6	65
FXRV 120 - 50	MX	3 400	320	4 000	60	65	70	75	80	95	95	400	150	6	360	M 16	36	31	70	134	340	145	373	200	260	38	6	86
FXRV 140 - 50	MX	4 500	320	3 000	65	90	100	110			110	430	160	6	386	M 16	36	31	70	134	375	165	403	220	280	50	6	102
FXRV 170 - 63	MX	9 000	250	2 700	70	85	90	100	120		130	500	175	6	460	M 16	43	40	80	156	425	196	473	250	340	38	6	163
FXRV 200 - 63	MX	12 500	240	2 100	130						155	555	175	6	516	M 16	49	40	80	156	495	226	528	275	390	38	6	205
FXRV 240 - 63	LX	21 200	220	3 000							185	710	195	8	630	M 20	50	50	90	170	630	290	670	355	455	45	12	347
FXRV 260 - 63	LX	30 000	210	2 500							205	750	205	8	670	M 20	50	50	105	183	670	310	710	375	500	40	12	411
FXRV 290 - 70	LX	42 500	200	2 500							230	850	218	8	755	M 24	52	50	105	190	730	335	800	405	560	48	12	562
FXRV 310 - 96	LX	53 000	195	2 100							240	900	260	10	800	M 24	63	63	120	240	775	355	850	435	600	69	12	792
FXRV 360 - 100	LX	75 000	180	1 800							280	975	267	10	870	M 30	63	63	125	243	850	400	925	485	670	71	12	942
FXRV 410 - 100	LX	100 000	170	1 500							300	1 060	267	10	950	M 30	63	63	125	243	950	450	1 000	535	750	71	12	1 053

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 EN ISO 4762) on pitch circle T. *** Area for O-ring sealing.
See page 73 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.

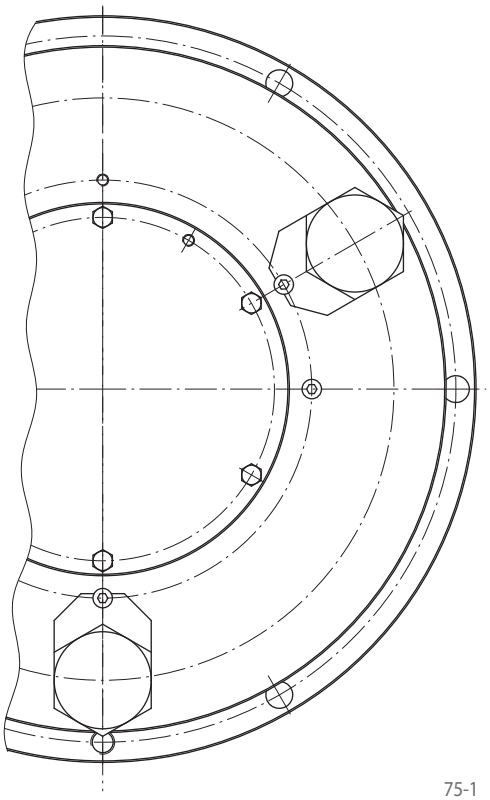
Example for ordering

Freewheel size FXRV 170 - 63 MX, type with sprag lift-off X, 90 mm bore and slipping torque 9 000 Nm:

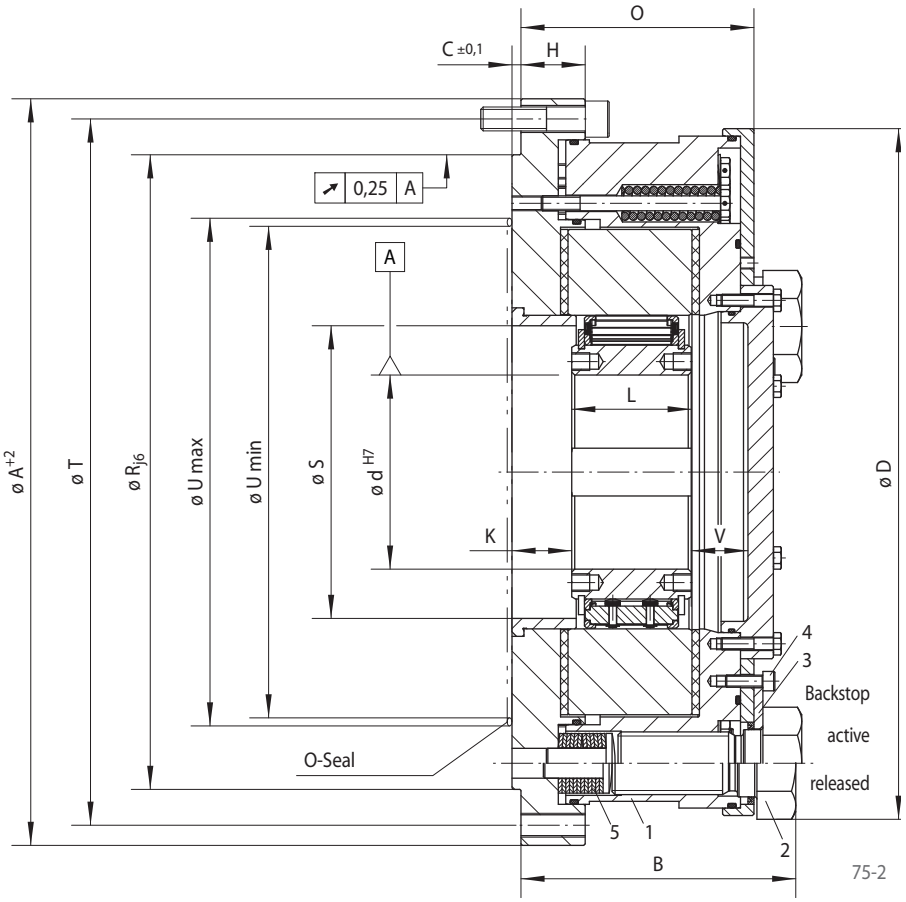
- FXRV 170 - 63 MX, d = 90 mm, M_R = 9 000 Nm

Integrated Freewheels FXRT

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



75-1



75-2

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_R Nm	Sprag lift-off at inner ring speed min^{-1}	Max. speed Inner ring freewheels min^{-1}	Bore d Standard mm	mm	mm	mm	mm	mm	max. mm	A mm	B mm	C mm	D mm	G**	H mm	K mm	L mm	O mm	R mm	S mm	T mm	U*** min. mm	U*** max. mm	V mm	Z**	Weight kg
FXRT 85 - 40	MX	1 400	430	6000	45	50	60	65			65	330	148	6	295	M 12	37	29	60	127	280	110	308	165	215	43	6	60
FXRT 100 - 50	MX	2 300	400	4500	45	50	55	60	70	75	80*	350	159	6	311	M 12	39	31	70	134	300	125	328	180	240	38	6	66
FXRT 120 - 50	MX	3 400	320	4000	60	65	70	75	80	95	95	400	159	6	360	M 16	36	31	70	134	340	145	373	200	260	38	6	87
FXRT 140 - 50	MX	4 500	320	3000	65	90	100	110			110	430	163	6	386	M 16	36	31	70	134	375	165	403	220	280	50	6	104
FXRT 170 - 63	MX	9 000	250	2700	70	85	90	100	120		130	500	188	6	460	M 16	43	40	80	156	425	196	473	250	340	38	6	166
FXRT 200 - 63	MX	12 500	240	2100	130						155	555	188	6	516	M 16	49	40	80	156	495	226	528	275	390	38	6	209
FXRT 240 - 63	LX	21 200	220	3000							185	710	210	8	630	M 20	50	50	90	170	630	290	670	355	455	45	12	355
FXRT 260 - 63	LX	30 000	210	2500							205	750	223	8	670	M 20	50	50	105	183	670	310	710	375	500	40	12	418
FXRT 290 - 70	LX	42 500	200	2500							230	850	243	8	755	M 24	52	50	105	190	730	335	800	405	560	48	12	574
FXRT 310 - 96	LX	53 000	195	2100							240	900	293	10	800	M 24	63	63	120	240	775	355	850	435	600	69	12	805

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 EN ISO 4762) on pitch circle T. *** Area for O-ring sealing.
See page 73 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.

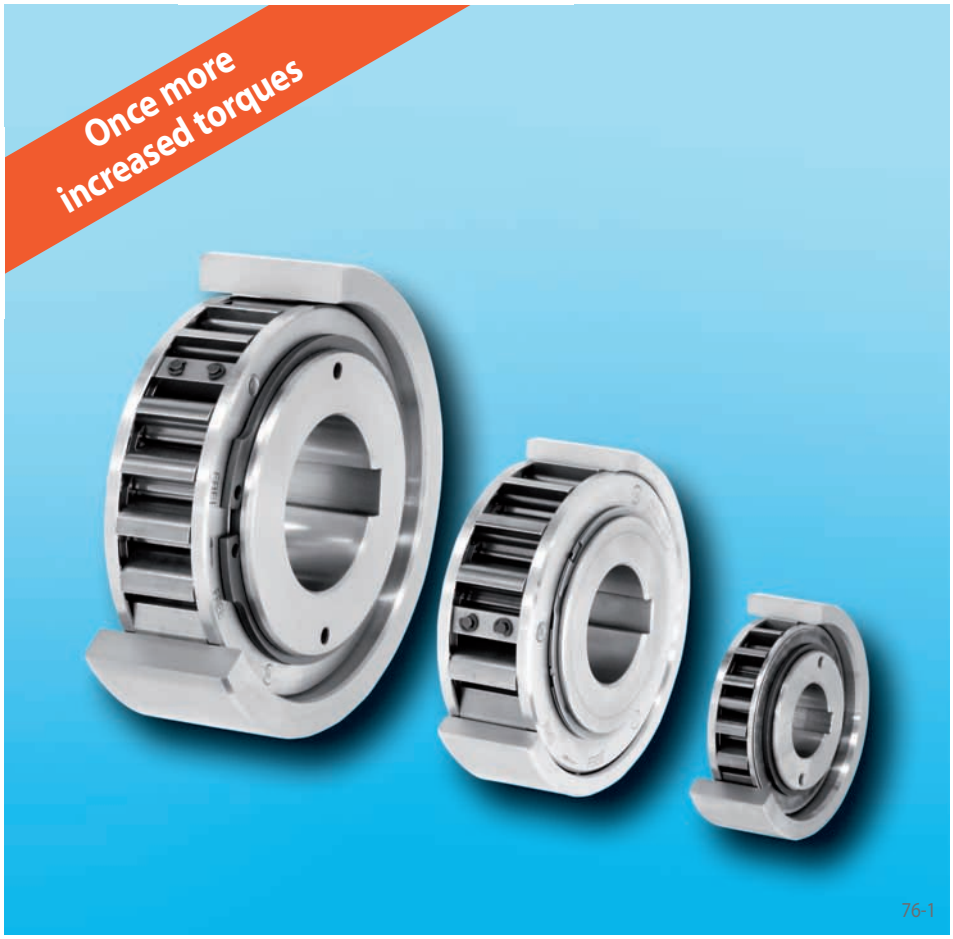
The tolerance of the shaft must be ISO h6 or j6.

Release function

The finely controllable release function consists basically of three special screws (2) that are located in the spring pocket (1) and the safety tabs (3). To release the backstop, first of all the special screws have to be unscrewed slightly. Then the cylinder screws (4) and the safety tabs have to be removed. The special screws can then be tightened, whereupon, with the aid of the belleville spring set (5) the release procedure is finely initiated.

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

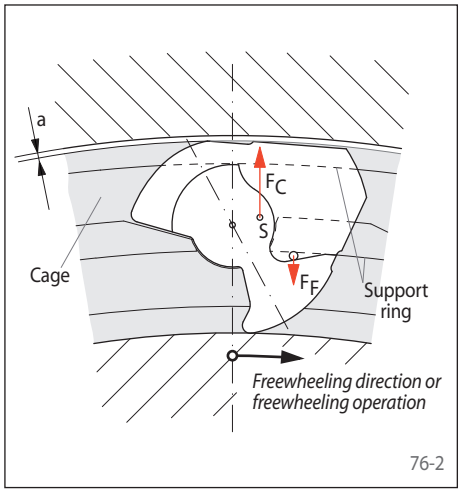
Nominal torques up to 20 500 Nm. The torque is transmitted on the outer ring by press fit.

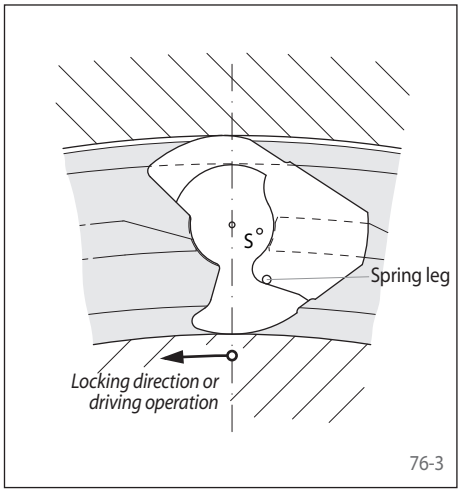
Bores up to 130 mm. Many standard bores are available.

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 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.

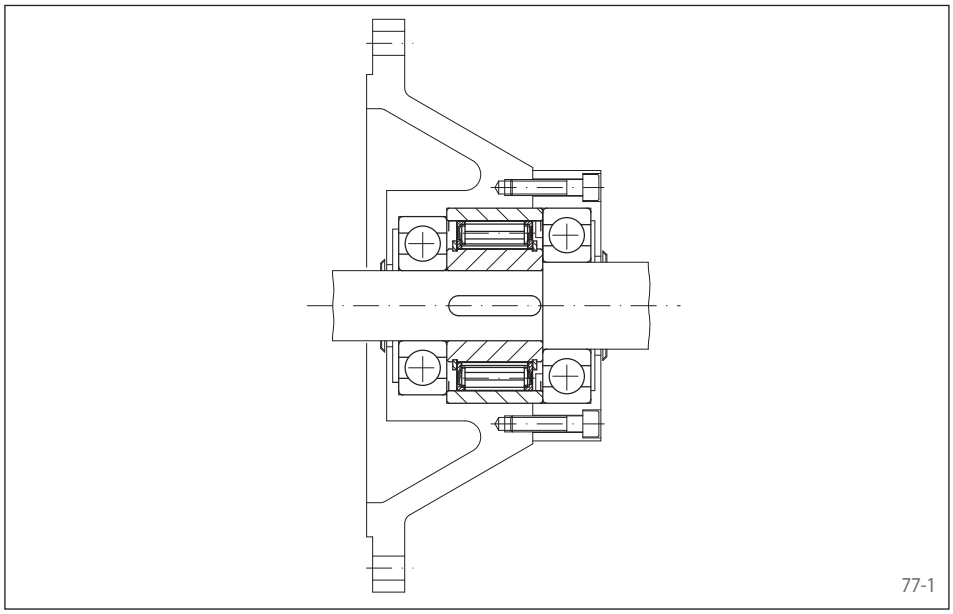
Figure 76-2 shows a freewheel with sprag lift-off X in freewheeling operation. The sprags, which are supported in a cage connected with the inner ring, rotate with the inner ring. The centrifugal force F_C that is applied in the center of gravity S of the sprag turns the sprag counterclockwise and rests against the support ring of the cage. This results in the gap a between the sprag and the outer track; the freewheel works without contact. If the inner ring speed decreases to such an extent that the effect of the centrifugal force on the sprag is less than that of the spring force F_F, the sprag again rests on the outer ring and the freewheel is ready to lock (figure 76-3). If used as an overrunning clutch, the driving speed must not exceed 40% of the lift-off speed.





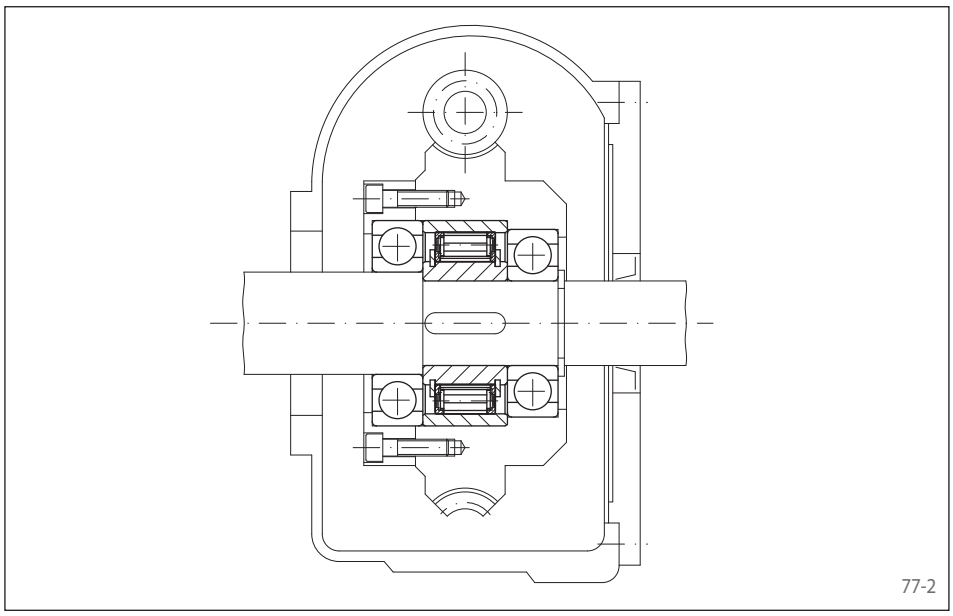
Internal Freewheels FXN

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



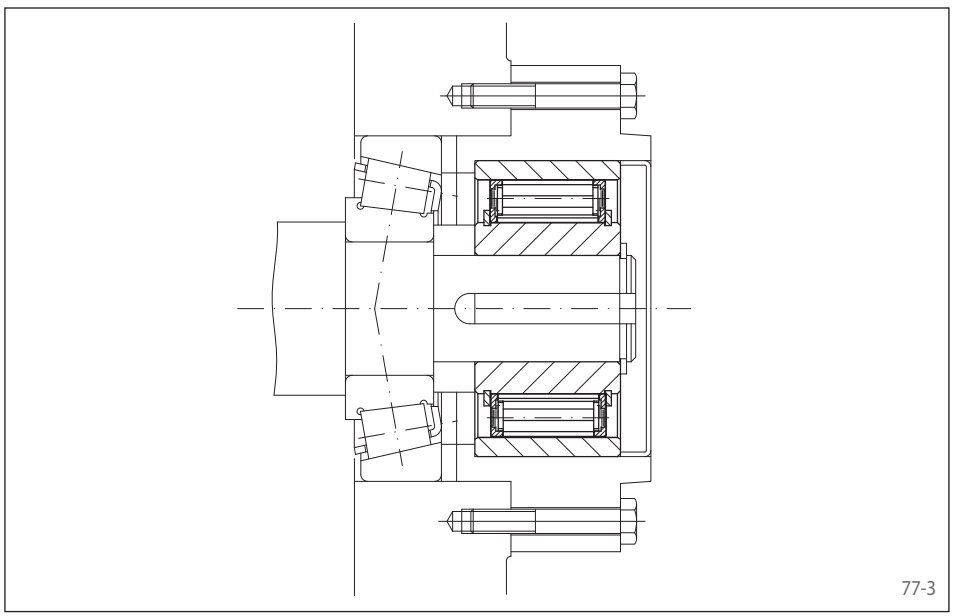
Application example

Internal Freewheel FXN 38 - 17/70 NX as a backstop, 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 NX 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.

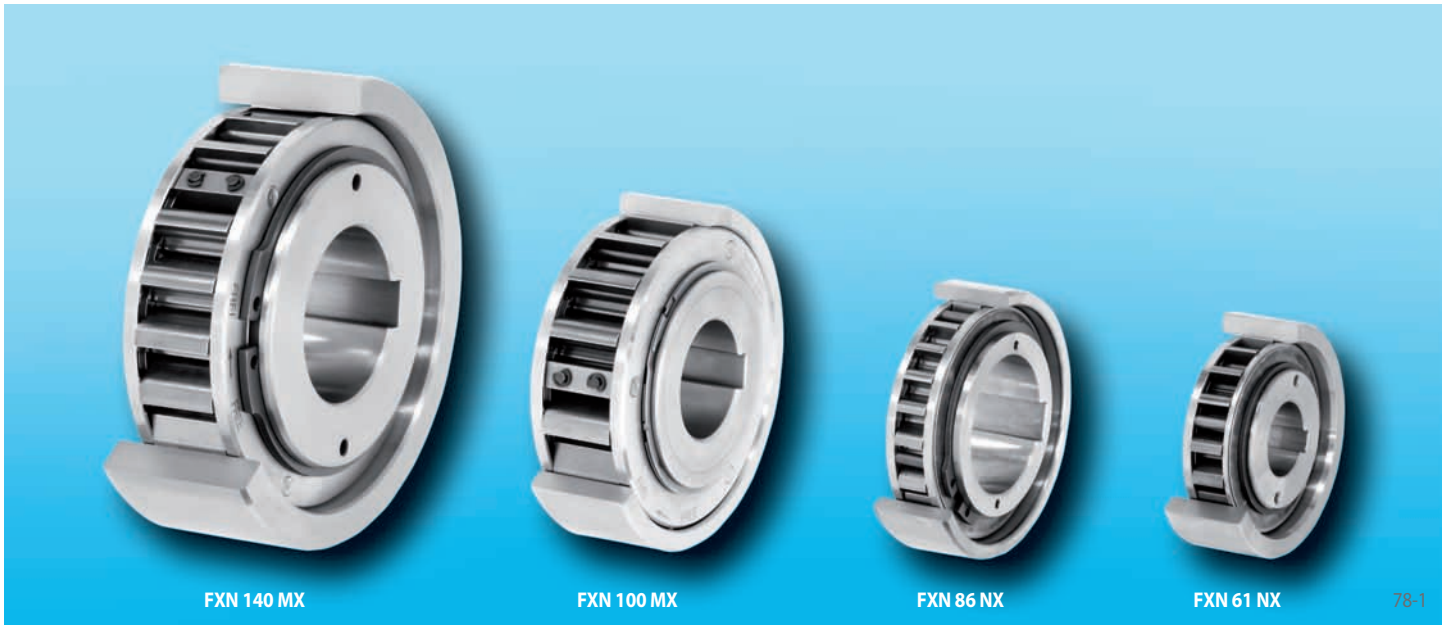


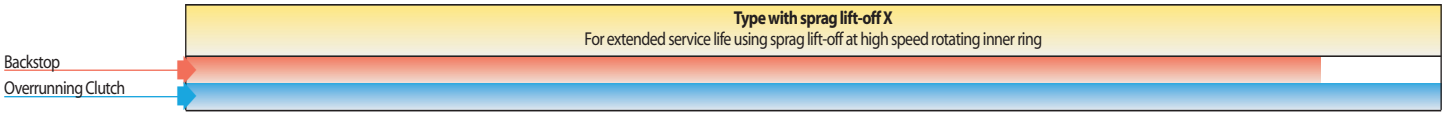
Application example

Internal Freewheel FXN 85-40/140 MX as a 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.

Internal Freewheels FXN

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



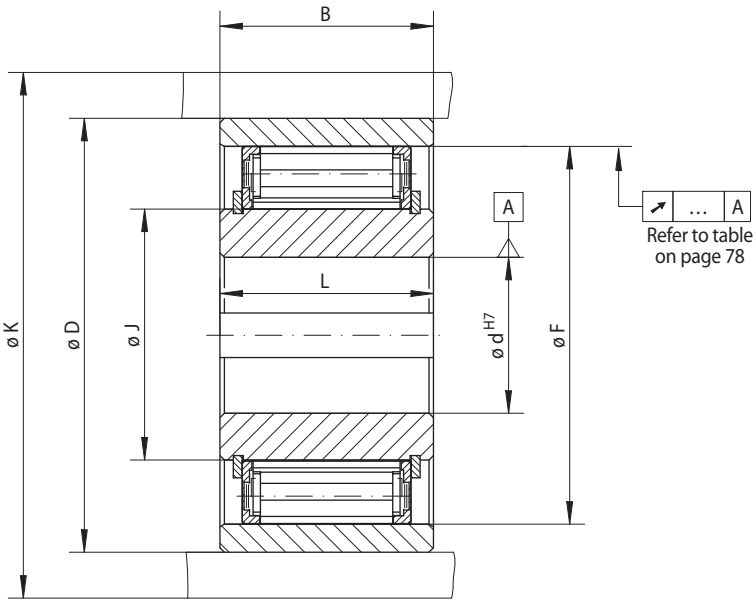


Freewheel Size	Type	Theoretical Nominal torque ⟋ 0 A Nm	Nominal torque at existing run out T.I.R. ⟋ 0,1 A Nm	⟋ 0,2 A Nm	⟋ 0,3 A Nm	⟋ 0,4 A Nm	⟋ 0,5 A Nm	Sprag lift-off at inner ring speed min^{-1}	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring drives min^{-1}
FXN 31 - 17/60	NX	110	110	105	100			890	5 000	356
FXN 31 - 17/62	NX	110	110	105	100			890	5 000	356
FXN 38 - 17/70	NX	180	170	160	150			860	5 000	224
FXN 46 - 25/80	NX	460	450	440	430			820	5 000	328
FXN 51 - 25/85	NX	560	550	540	530			750	5 000	300
FXN 56 - 25/90	NX	660	650	640	630			730	5 000	292
FXN 61 - 19/95	NX	520	500	480	460			750	5 000	300
FXN 61 - 19/106	NX	520	500	480	460			750	5 000	300
FXN 66 - 25/100	NX	950	930	910	890			700	5 000	280
FXN 66 - 25/110	NX	950	930	910	890			700	5 000	280
FXN 76 - 25/115	NX	1 200	1 170	1 140	1 110			670	5 000	268
FXN 76 - 25/120	NX	1 200	1 170	1 140	1 110			670	5 000	268
FXN 86 - 25/125	NX	1 600	1 550	1 500	1 450			630	5 000	252
FXN 86 - 25/130	NX	1 600	1 550	1 500	1 450			630	5 000	252
FXN 101 - 25/140	NX	2 100	2 050	2 000	1 950			610	5 000	244
FXN 101 - 25/149	NX	2 100	2 050	2 000	1 950			610	5 000	244
FXN 101 - 25/150	NX	2 100	2 050	2 000	1 950			610	5 000	244
FXN 85 - 40/140	MX	2 500	2 500	2 450	2 450	2 450	2 450	430	6 000	172
FXN 85 - 40/150	MX	2 500	2 500	2 450	2 450	2 450	2 450	430	6 000	172
FXN 100 - 40/160	MX	3 700	3 600	3 600	3 500	3 500	3 500	400	4 500	160
FXN 105 - 50/165	MX	5 200	5 200	5 100	5 000	5 000	5 000	380	4 500	152
FXN 120 - 50/198	MX	7 700	7 600	7 500	7 300	7 300	7 300	320	4 000	128
FXN 140 - 50/215	MX	10 100	10 000	9 800	9 600	9 500	9 500	320	3 000	128
FXN 170 - 63/258	MX	20 500	20 500	20 000	19 500	19 000	19 000	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



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Freewheel size	Bore d Standard						max.	B	D	F	J	K min.	L	Weight
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
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	0,4
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	69	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.

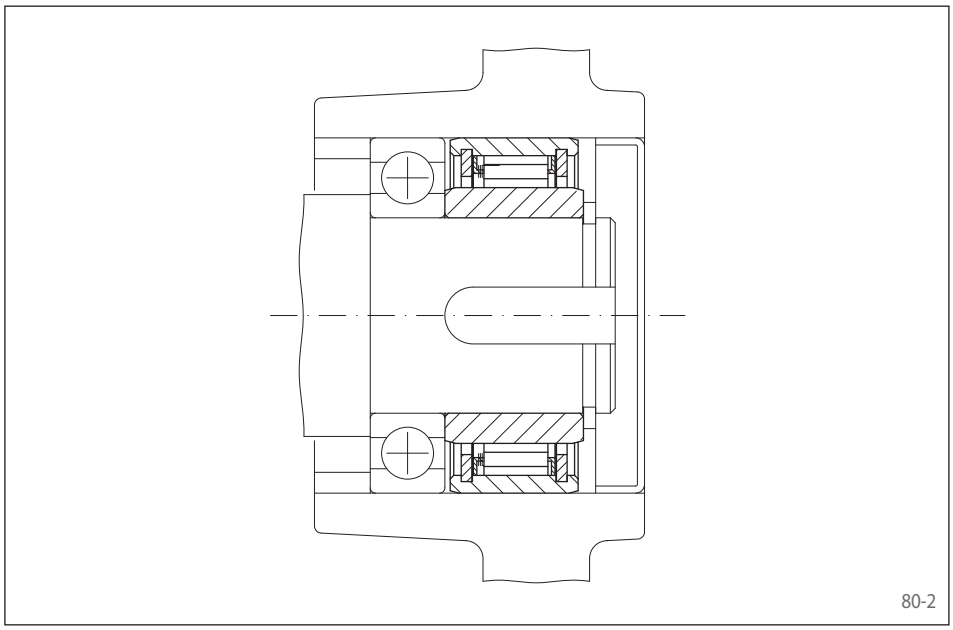
Example for ordering

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

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

Internal Freewheels FEN

for press fit on the outer ring with sprags



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.

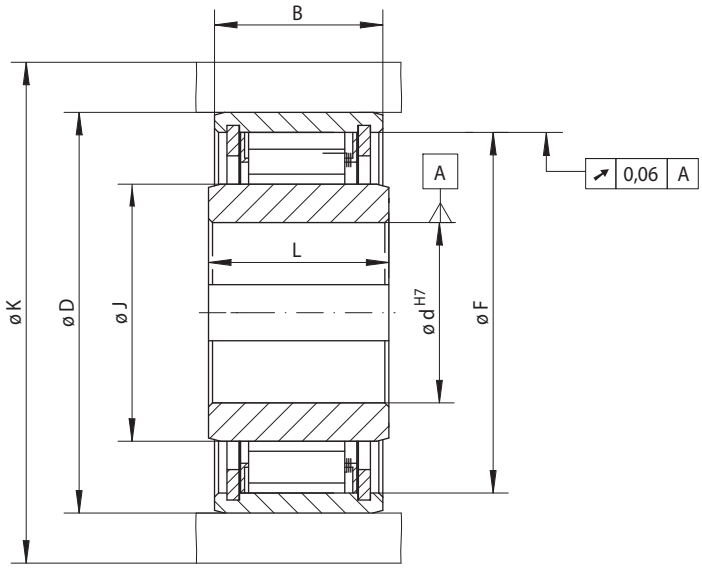
Bores up to 100 mm. Many standard bores are available.

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.

Internal Freewheels FEN

for press fit on the outer ring with sprags



81-1

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 M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Type	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Bore d mm	Bore d Standard mm	Bore d mm	Bore d max. mm	B mm	D mm	F mm	J mm	K min. mm	L mm	Weight kg
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.

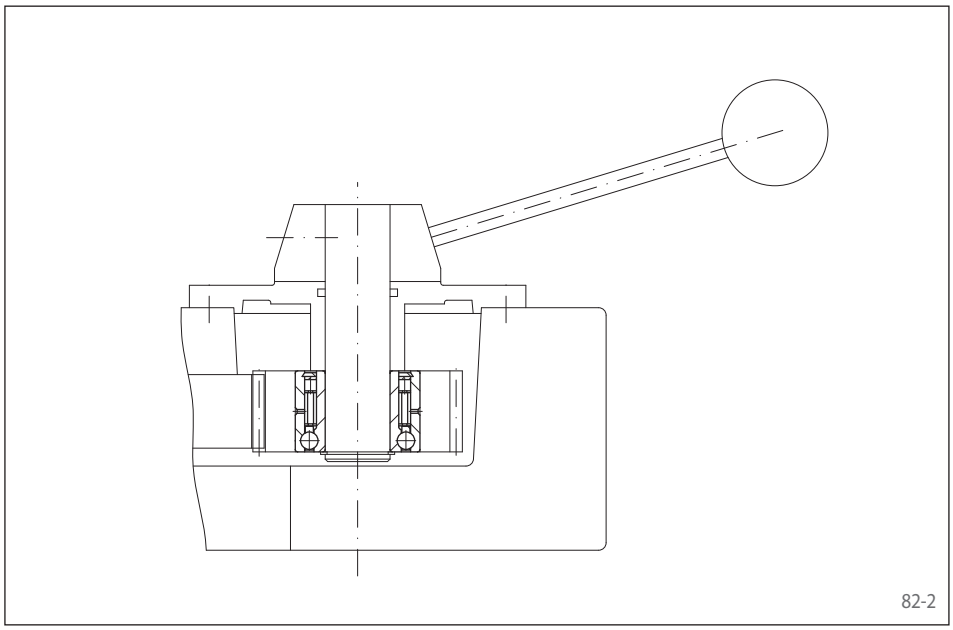
Example for ordering

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



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.

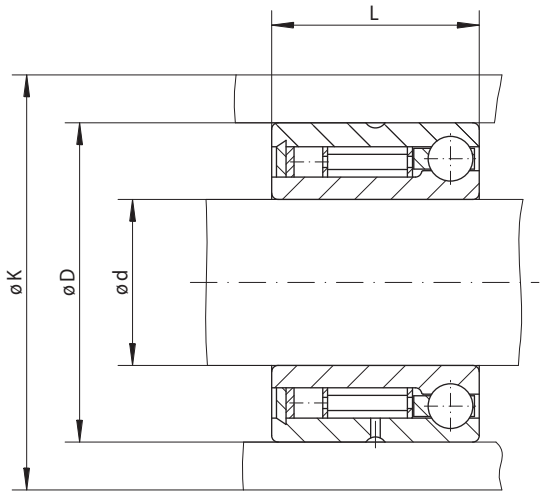
Bores up to 50 mm.

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.

Internal Freewheels FGK

for press fit on the outer ring with sprags and bearing



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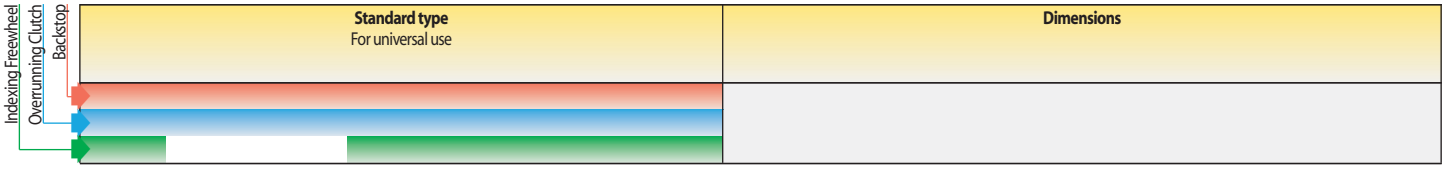


Freewheel Size	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Load rating of bearing support dynamic C Roller N	dynamic C Ball N	static C Roller N	static C Ball N	Bore d mm	D mm	K mm	L mm	Weight kg
FGK 20	50	5 500	4 000	5 600	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 systeem; this is particularly recommended in the case of higher speeds.

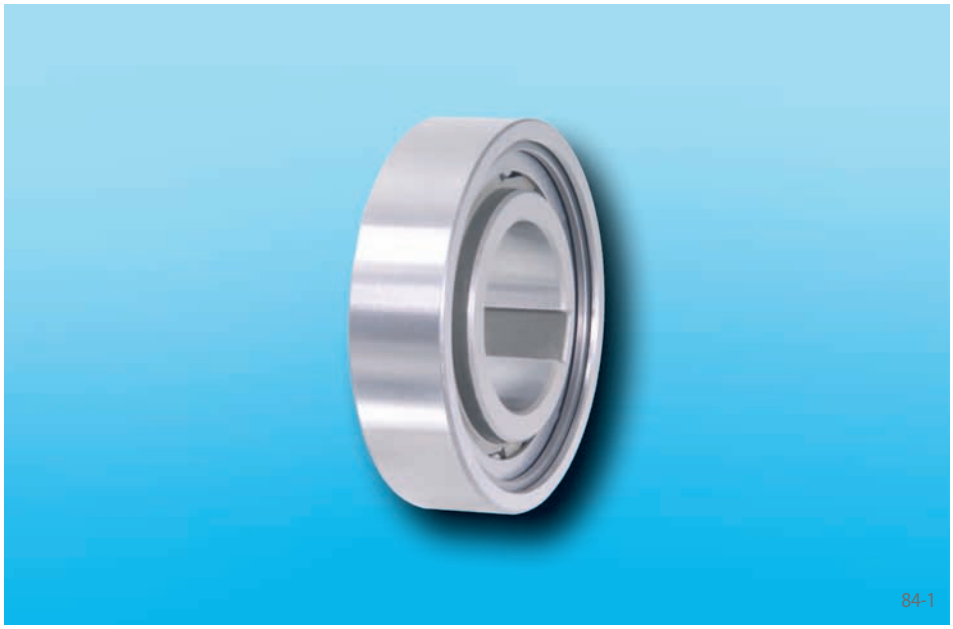
Example for ordering

Freewheel size FGK 40, standard type:

- FGK 40

Internal Freewheels FCN … R

for press fit on the outer ring with rollers



Features

Internal Freewheels FCN … R are roller freewheels without bearing support and with series 62 ball bearing dimensions.

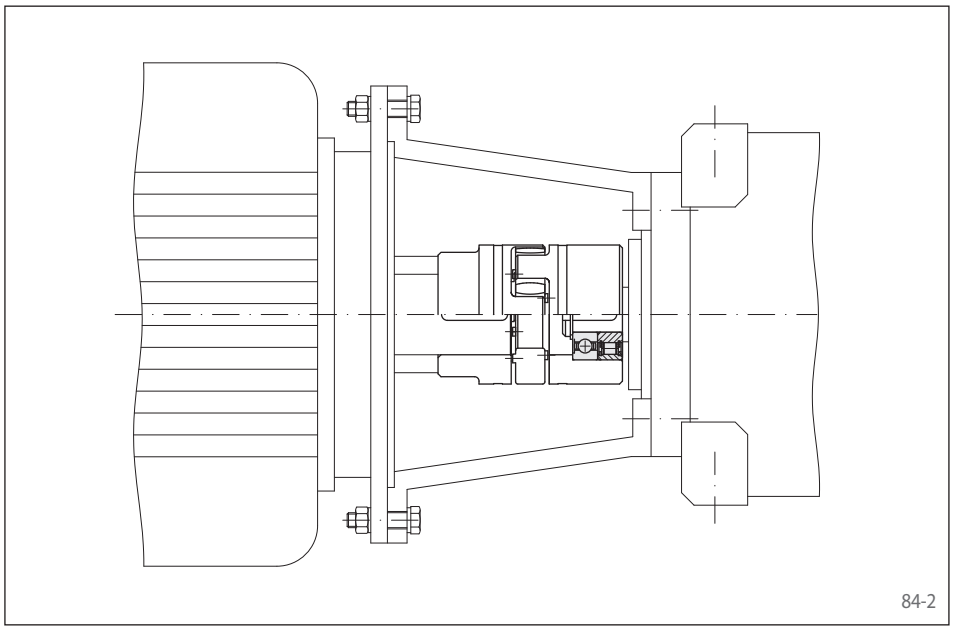
The outer ring is pressed into the customer housing. This makes compact, space-saving fitting solutions possible.

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.

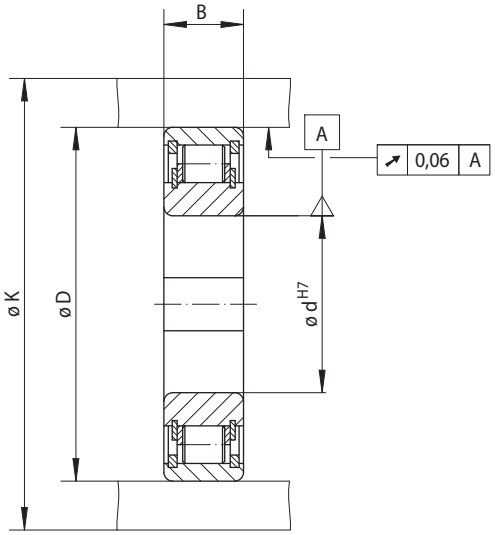


Application example

Internal Freewheel FCN 30 R as overrunning freewheel in the drive of the roof brush of an automatic car washing facility. The freewheel is arranged in the hub of a shaft coupling that connects the motor and the reduction gear. The freewheel 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.

Internal Freewheels FCN … R

for press fit on the outer ring with rollers



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Indexing Freewheel
Overrunning Clutch
Backstop

Standard type
For universal use

Dimensions

Freewheel Size	Type	Nominal torque M_N Nm	Max.speed Inner ring freewheels/ overruns min^{-1}	Max.speed Outer ring freewheels/ overruns min^{-1}	Bore d mm	B mm	D mm	K mm	Weight kg
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.

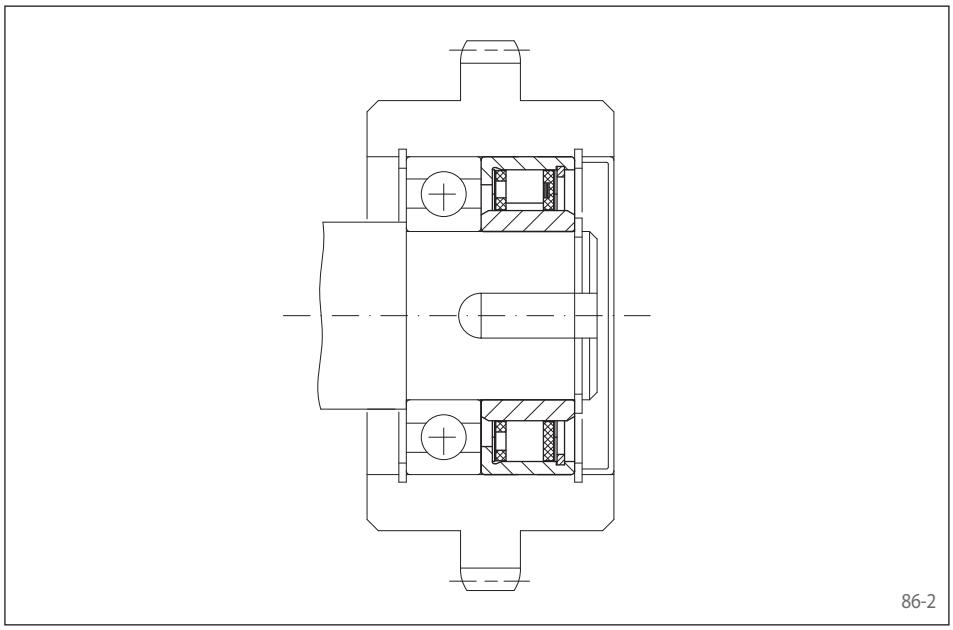
Example for ordering

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



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.

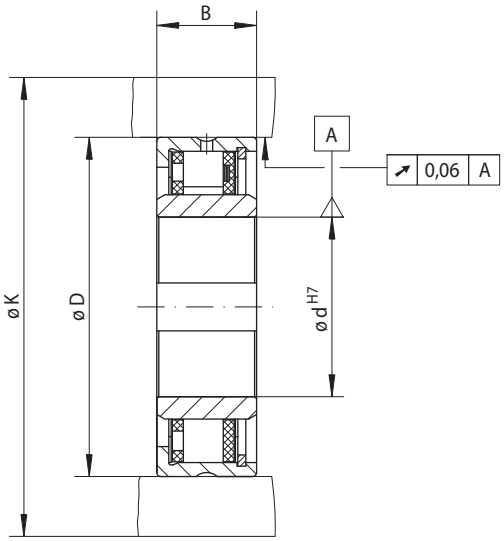
Bores up to 80 mm. Many standard bores are available.

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.

Internal Freewheels FDN

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 M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Type	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Load rating of bearing support dynamic C N	Load rating of bearing support static C_0 N	Type	Nominal torque M_N Nm	Bore d Standard mm	Bore d Standard mm	Bore d max. mm	B mm	D mm	K mm	Weight kg
FDN 15	CFH	16	3875	3925	CFR	8	3875	3925	7800	4200	CFP	7	8		8	20	37	50	0,1
FDN 20	CFH	28	3375	3450	CFR	14	3375	3450	8300	4200	CFP	12	12		12	20	42	55	0,1
FDN 25	CFH	48	2900	3050	CFR	24	2900	3050	10700	5600	CFP	21	15		15	20	47	60	0,1
FDN 30	CFH	75	2525	2675	CFR	36	2525	2675	12900	7000	CFP	32	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.

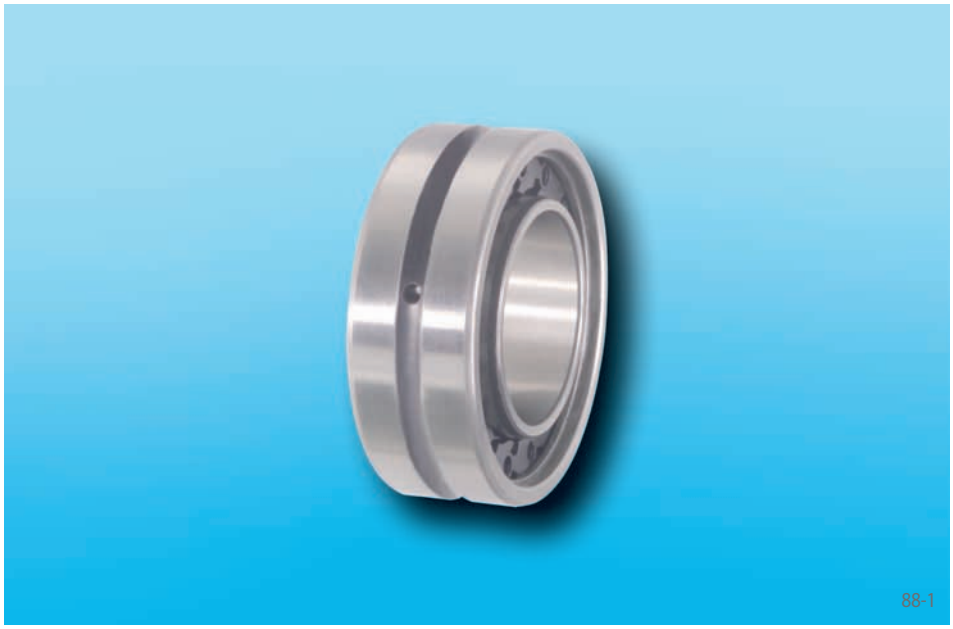
Example for ordering

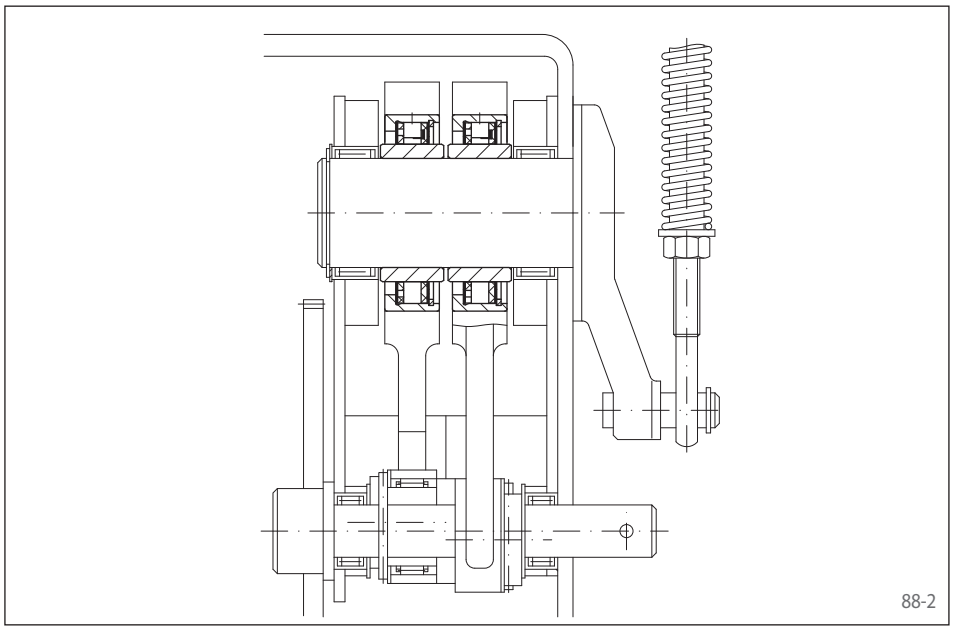
Freewheel size FDN 30, type with P-grinding with 20 mm bore:

- 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 be 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.

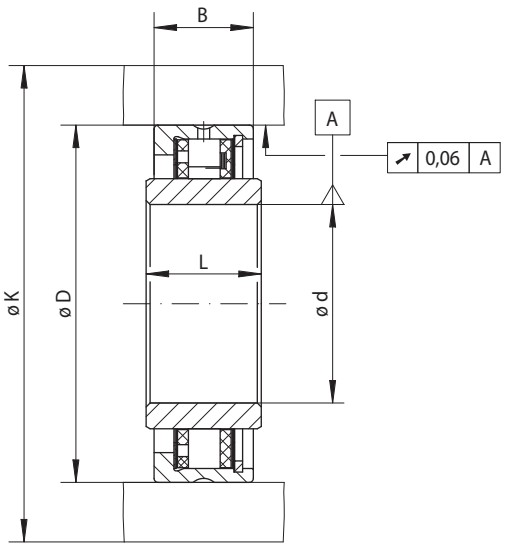
Bores up to 95 mm.

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



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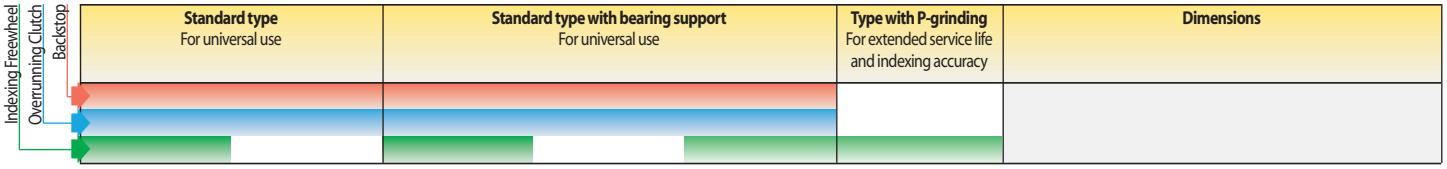


Freewheel Size	Type	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Type	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Load rating of bearing support dynamic C N	Load rating of bearing support static C_0 N	Type	Nominal torque M_N Nm	Bore d mm	B mm	D mm	K mm	L mm	Weight kg
FDE 12	CFH	11	4225	4250	CFR	6	4225	4250	7600	4200	CFP	5	8	16	34	45	12,5	0,1
FDE 15	CFH	16	3875	3925	CFR	8	3875	3925	7800	4200	CFP	7	10	20	37	50	16	0,1
FDE 20	CFH	28	3375	3450	CFR	14	3375	3450	8300	4200	CFP	12	15	20	42	55	16	0,1
FDE 25	CFH	48	2900	3050	CFR	24	2900	3050	10700	5600	CFP	21	20	20	47	60	20	0,1
FDE 30	CFH	75	2525	2675	CFR	36	2525	2675	12900	7000	CFP	32	25	20	52	65	20	0,1
FDE 40	CFH	160	1900	2150	CFR	71	1900	2150	15000	8400	CFP	71	35	22	62	80	22	0,2
FDE 50	CFH	260	1475	1775	CFR	120	1475	1775	18400	11300	CFP	120	45	22	72	95	20	0,3
FDE 65	CFH	430	1200	1550	CFR	200	1200	1550	21400	14100	CFP	210	55	25	90	120	28	0,6
FDE 80	CFH	650	950	1350	CFR	300	950	1350	23800	17800	CFP	320	70	25	110	140	25	0,8
FDE 105	CFH	2400	800	1175	CFR	1100	800	1175	48600	45000	CFP	1200	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.

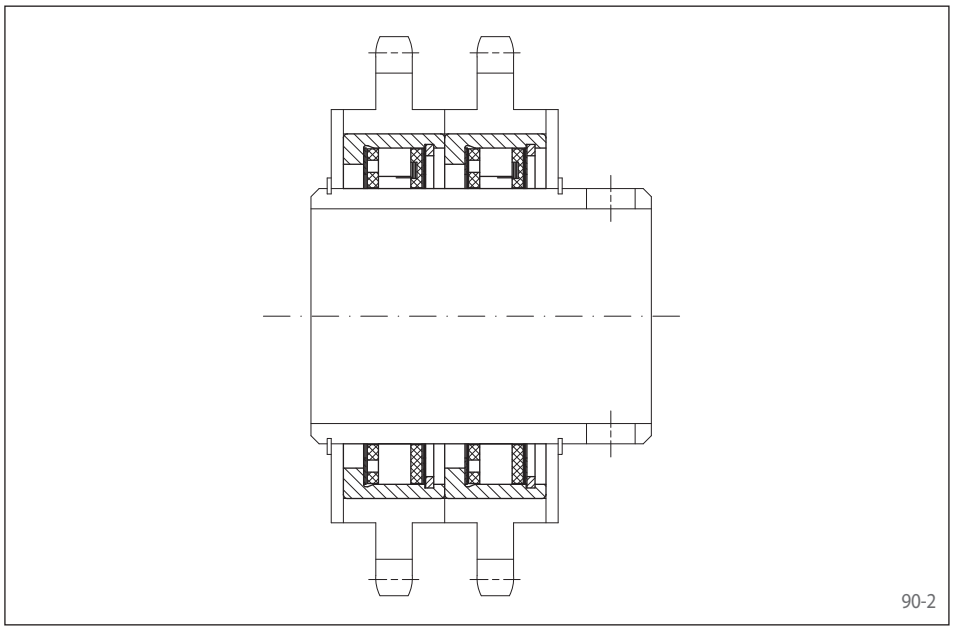
Example for ordering

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



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 be replaced by a cylindrical roller; this freewheel can accept radial forces.

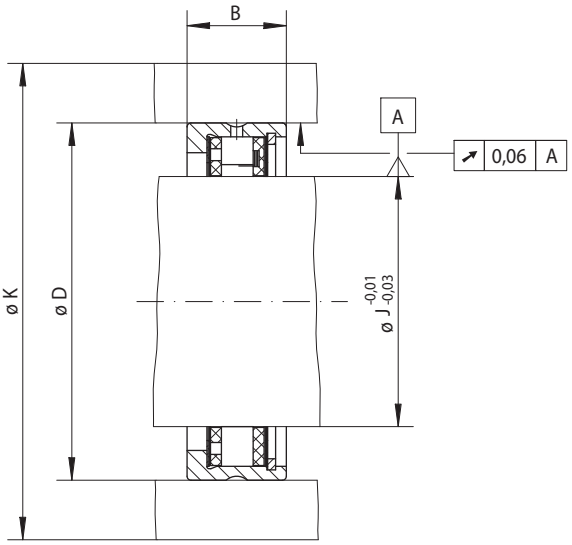
Nominal torques up to 2 400 Nm. The torque is transmitted on the outer ring by press fit.

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).

Internal Freewheels FD

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



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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 M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Type	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Load rating of bearing support dynamic C N	Load rating of bearing support static C_0 N	Type	Nominal torque M_N 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 technical points on page 118 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.

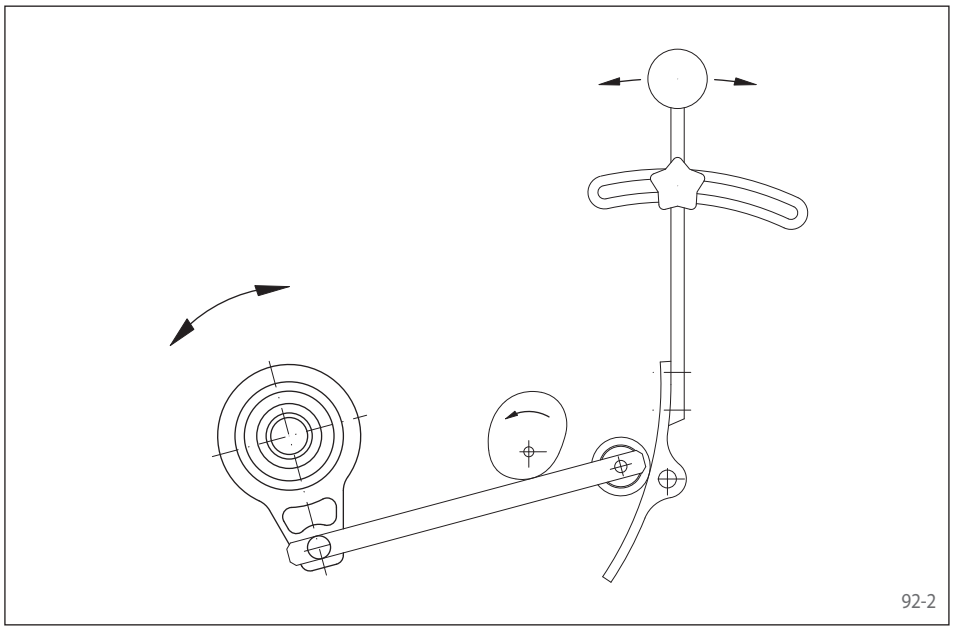
Example for ordering

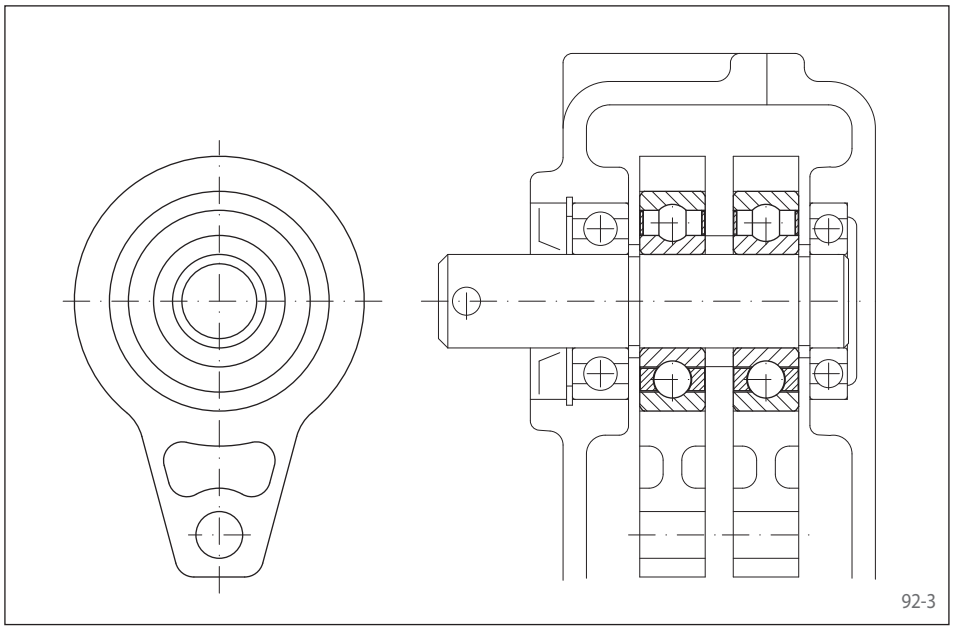
Freewheel size FD 12, standard type:

- FD 12 CFH

Internal Freewheels ZZ …

with ball bearing properties





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 Outer ring by keyway	Outer ring by press fit	Inner ring by keyway	Inner ring by press fit	2RS-seals	Page
ZZ		●		●		93
ZZ … 2RS		●		●	●	94
ZZ … P2RS		●	●		●	95
ZZ … P		●	●			96
ZZ … PP	●		●			97

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

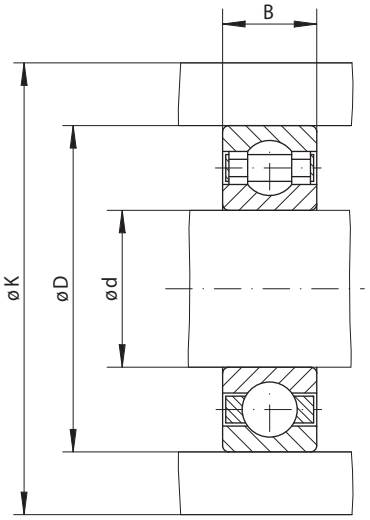
The series ZZ … 2RS and ZZ … P2RS have 2RS seals.

Application example

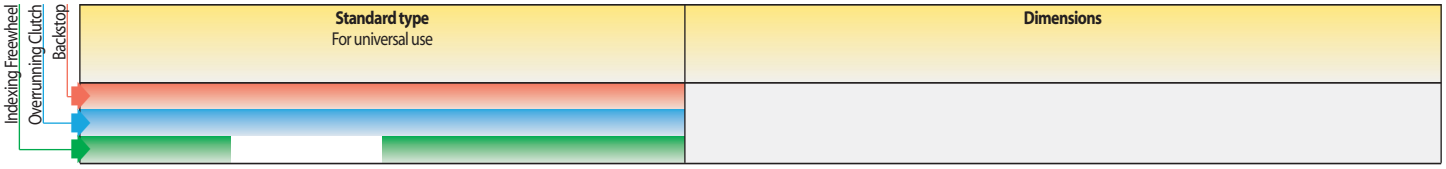
Two Internal Freewheels ZZ 6206 as indexing freewheels in the drive of the metering roller of a seed spreader. The freewheels are built in an infinitely variable oil bath gearbox. Two cam disks that are set off by 180° are arranged on the gearbox shaft. By means of lever arms, these drive the outer rings 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



93-1



Freewheel Size	Nominal torque M_N Nm	Maximum speed min^{-1}	Load rating of bearing support dynamic C N	static C_0 N	Bore d mm	B mm	D mm	K mm	Weight kg
ZZ 8	2,5	15000	3200	860	8	9	22	27	0,02
ZZ 6201	9,3	10000	6100	2700	12	10	32	39	0,04
ZZ 6202	26,0	9400	6000	3700	15	11	35	42	0,06
ZZ 6203	34,0	8200	7350	4550	17	12	40	51	0,08
ZZ 6204	65,0	6800	10000	6300	20	14	47	58	0,12
ZZ 6205	80,0	5600	11000	7000	25	15	52	63	0,15
ZZ 6206	170,0	4000	15000	10000	30	16	62	73	0,25
ZZ 6207	175,0	3600	12500	7200	35	17	72	85	0,30
ZZ 40	325,0	3000	15500	12250	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.

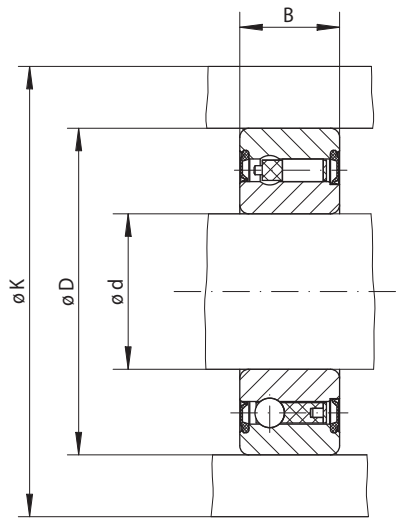
Example for ordering

Freewheel size ZZ 6202, standard type:

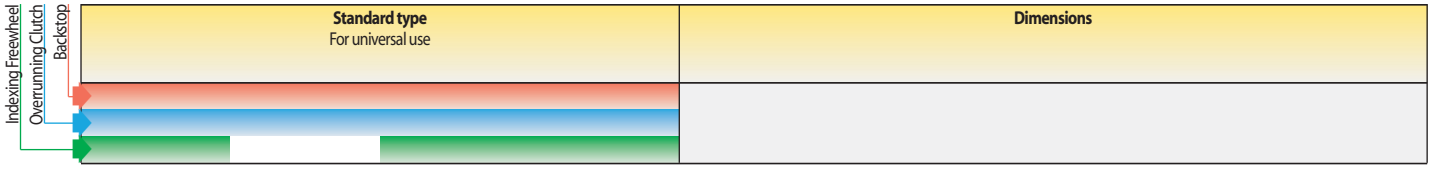
- ZZ 6202

Internal Freewheels ZZ … 2RS

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



94-1



Freewheel Size	Nominal torque M_N Nm	Maximum speed min^{-1}	Load rating of bearing support dynamic C N	Load rating of bearing support static C_0 N	Bore d mm	B mm	D mm	K mm	Weight kg
ZZ 8 2RS*	2,5	15000	3300	860	8	9	22	27	0,02
ZZ 12 2RS	9,3	10000	6100	2800	12	14	32	39	0,05
ZZ 15 2RS	17,0	8400	7400	3400	15	16	35	42	0,07
ZZ 17 2RS	30,0	7350	7900	3800	17	17	40	51	0,09
ZZ 20 2RS	50,0	6000	9400	4500	20	19	47	58	0,15
ZZ 25 2RS	85,0	5200	10700	5500	25	20	52	63	0,18
ZZ 30 2RS	138,0	4200	11700	6500	30	21	62	73	0,27
ZZ 35 2RS	175,0	3600	12600	7300	35	22	72	85	0,40
ZZ 40 2RS	325,0	3000	15500	12300	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.
* Only one RS seal on the ball bearing side. Locking from this side the freewheeling direction of the innerring is clockwise free.

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 +5°C to +60°C. Please contact us if the temperature is different to the given values.

Lubrication

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

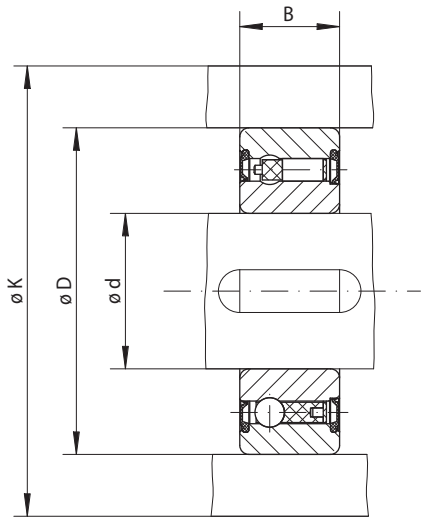
Example for ordering

Freewheel size ZZ 17 2RS, standard type:

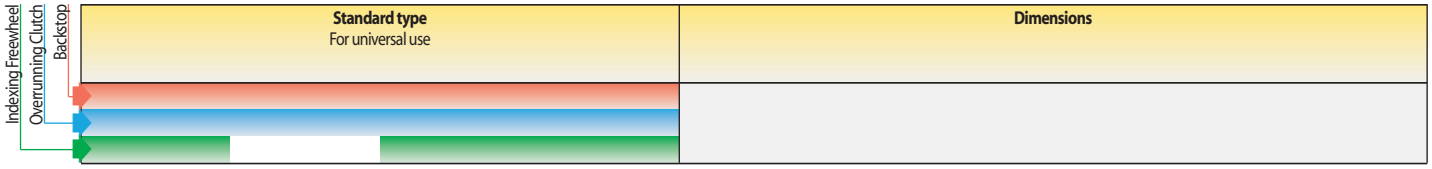
- ZZ 17 2RS

Internal Freewheels ZZ … P2RS

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



95-1



Freewheel Size	Nominal torque M_N Nm	Maximum speed min^{-1}	Load rating of bearing support dynamic C N	Load rating of bearing support static C_0 N	Bore d mm	B mm	D mm	K mm	Weight kg
ZZ 12 P2RS	9,3	10000	6100	2800	12	14	32	39	0,05
ZZ 15 P2RS	17,0	8400	7400	3400	15	16	35	42	0,07
ZZ 17 P2RS	30,0	7400	7900	3800	17	17	40	51	0,09
ZZ 20 P2RS	50,0	6000	9400	4500	20	19	47	58	0,15
ZZ 25 P2RS	85,0	5200	10700	5500	25	20	52	63	0,18
ZZ 30 P2RS	138,0	4200	11700	6500	30	21	62	73	0,30
ZZ 35 P2RS	175,0	3600	12600	7300	35	22	72	85	0,40
ZZ 40 P2RS	325,0	3000	15500	12300	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.
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 +5°C to +60°C. Please contact us if the temperature is different to the given values.

Lubrication

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

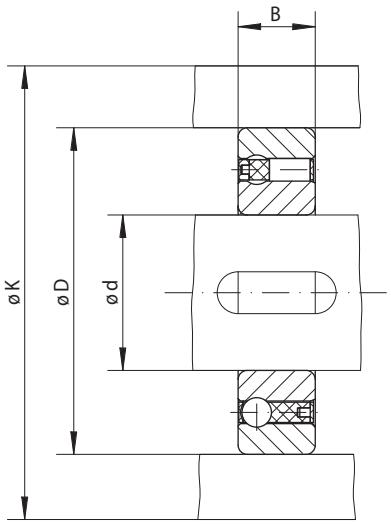
Example for ordering

Freewheel size ZZ 25 P2RS, standard type:

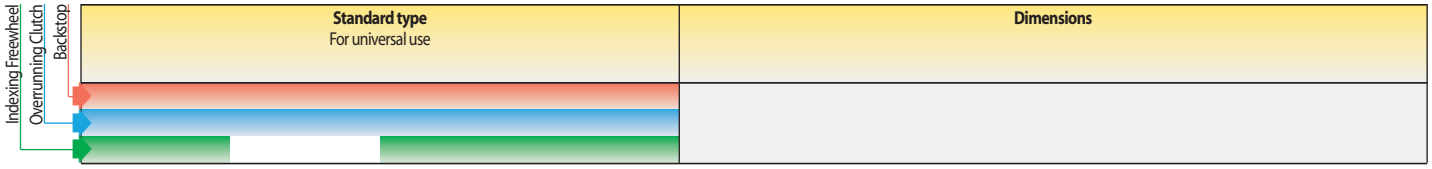
- ZZ 25 P2RS

Internal Freewheels ZZ … P

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



96-1



Freewheel Size	Nominal torque M_N Nm	Maximum speed min^{-1}	Load rating of bearing support dynamic C N	Load rating of bearing support static C_0 N	Bore d mm	B mm	D mm	K mm	Weight kg
ZZ 6201 P	9,3	10000	6100	2800	12*	10	32	39	0,04
ZZ 6202 P	17	8400	7400	3400	15*	11	35	42	0,06
ZZ 6203 P	30	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 +5°C to +60°C. Please contact us if the temperature is different to the given values.

Lubrication

The freewheels are supplied grease-filled.

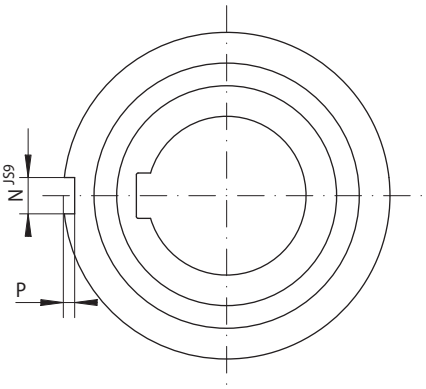
Example for ordering

Freewheel size ZZ 6203 P, standard type:

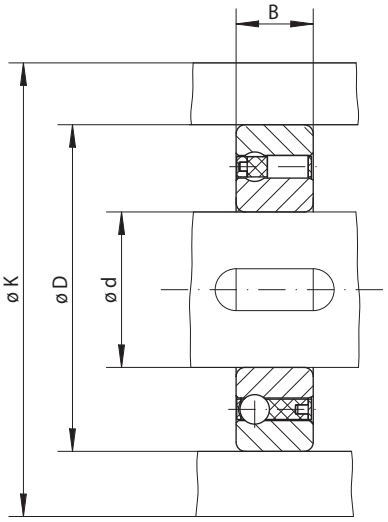
- ZZ 6203 P

Internal Freewheels ZZ … PP

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



97-1



97-2

Standard type
For universal use

Dimensions

Freewheel Size	Nominal torque M_N Nm	Maximum speed min^{-1}	Load rating of bearing support dynamic C N	Load rating of bearing support static C_0 N	Bore d mm	B mm	D mm	K mm	N mm	P mm	Weight kg
ZZ 6202 PP	17	8400	7400	3400	15*	11	35	42	2	0,6	0,06
ZZ 6203 PP	30	7350	7900	3800	17*	12	40	51	2	1,0	0,07
ZZ 6204 PP	50	6000	9400	4500	20*	14	47	58	3	1,5	0,11
ZZ 6205 PP	85	5200	10700	5500	25*	15	52	63	6	2,0	0,14
ZZ 6206 PP	138	4200	11700	6500	30*	16	62	73	6	2,0	0,21
ZZ 6207 PP	175	3600	12600	7300	35*	17	72	85	8	2,5	0,30
ZZ 40 PP	325	3000	15500	12300	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 +5°C to +60°C. Please contact us if the temperature is different to the given values.

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

Features

Internal Freewheels FSN are roller freewheels without bearing support.

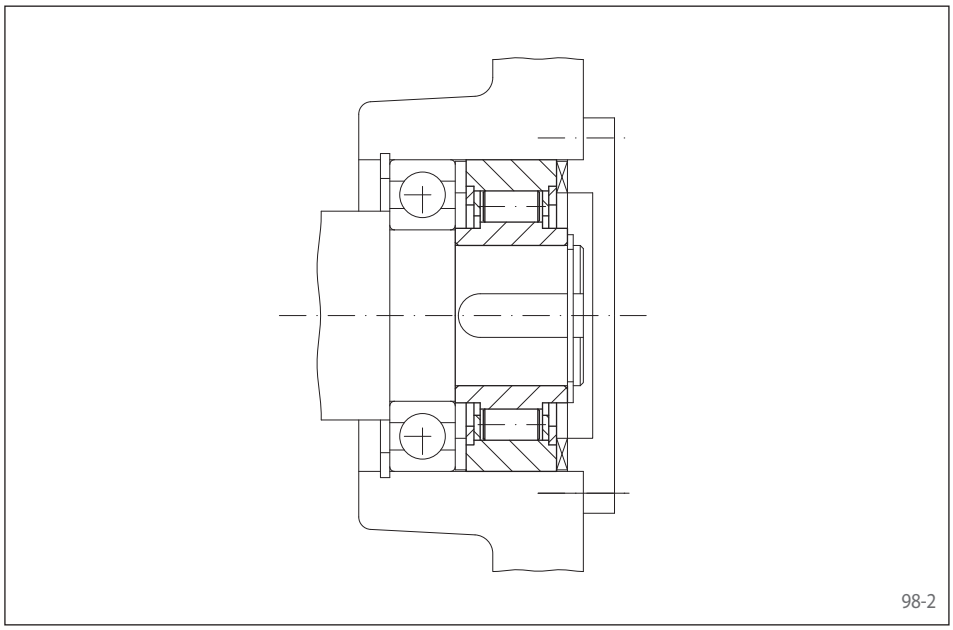
The freewheel is built into the customer housing. This makes compact, space-saving fitting solutions possible.

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.

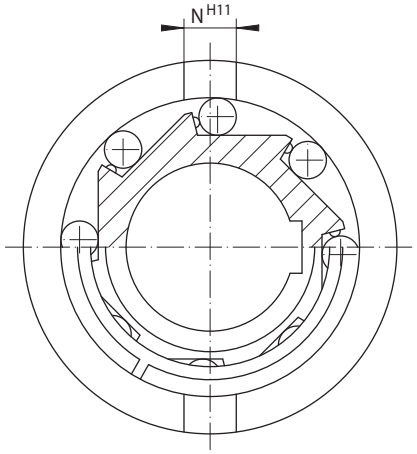


Application example

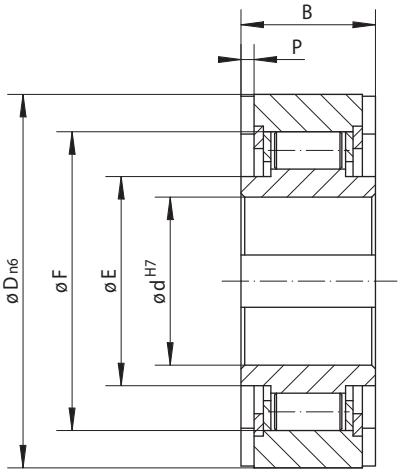
Internal freewheel FSN 50 as backstop fitted to the end of the intermediate shaft of a spur gear-box in the drive of an elevator. In the case of a motor stop, the elevator must be held securely so that the conveyor goods do not pull back-wards.

Internal Freewheels FSN

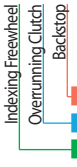
for keyway connection on the outer ring with rollers



99-1



99-2



Standard type
For universal use

Dimensions

Freewheel Size	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	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.

The outer ring has to be completely enclosed in a stable housing to transmit the listed torques.

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

Features

Internal Freewheels FN are roller freewheels without bearing support.

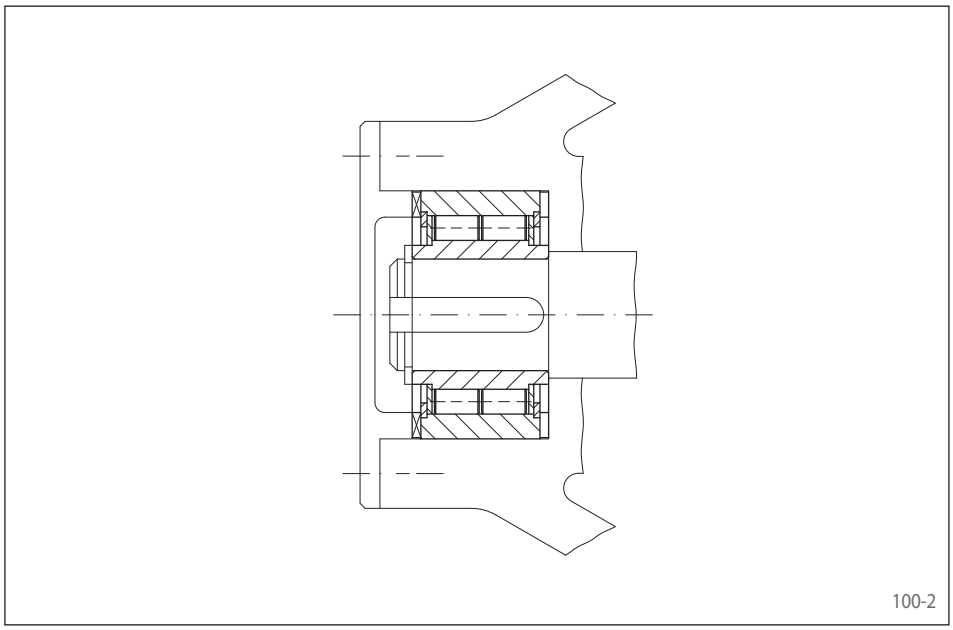
The freewheel is built into the customer housing. This makes compact, space-saving fitting solutions possible.

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.

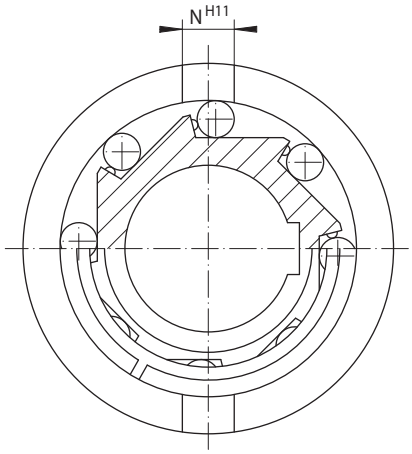


Application example

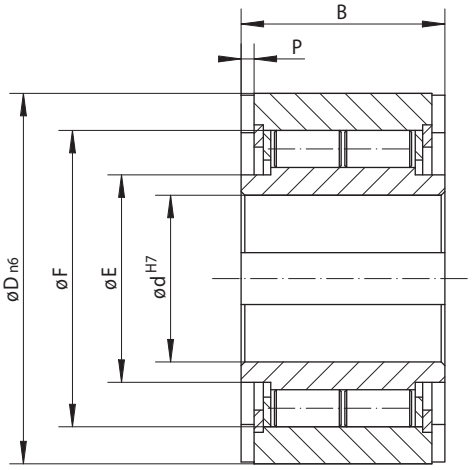
Internal freewheel FN 20 as a backstop, on the drive shaft of running gears on a chain conveyor. In normal operation, the drive shaft drives and the freewheel works in freewheeling operation. The freewheel as a backstop prevents the running gears from being able to run backwards uncontrolled in the event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

Internal Freewheels FN

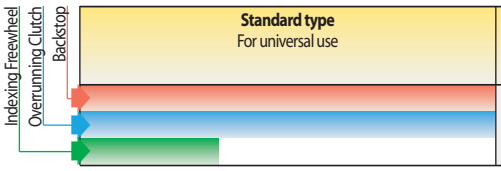
for keyway connection on the outer ring with rollers



101-1



101-2



Standard type
For universal use

Dimensions

Freewheel Size	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Bore d mm	B mm	D mm	E mm	F mm	N mm	P mm	Weight kg
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	3,5	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.

The outer ring has to be completely enclosed in a stable housing to transmit the listed torques.

Lubrication

An oil lubrication of the specified quality must be provided.

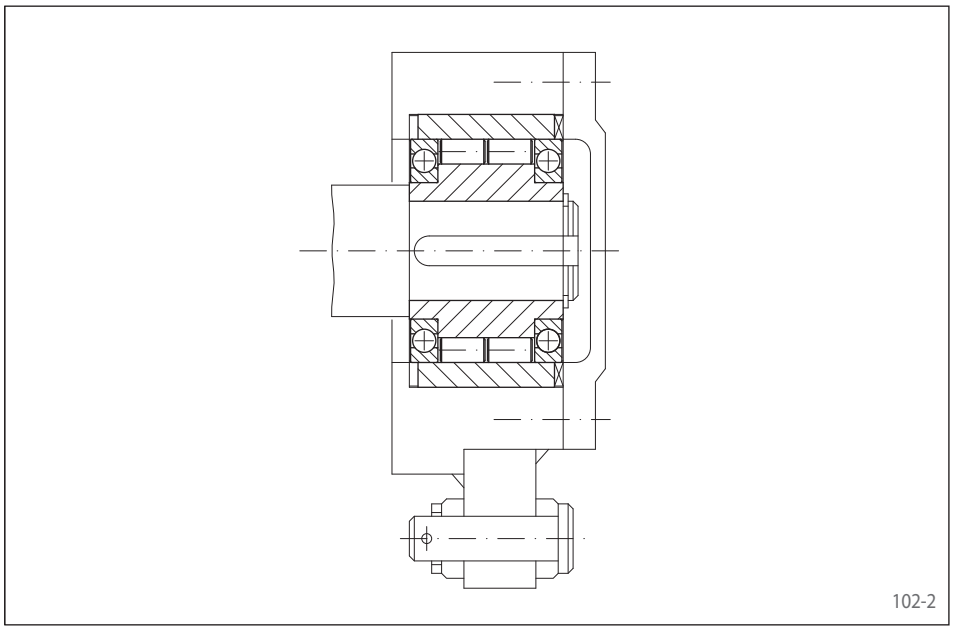
Example for ordering

Freewheel size FN 45, standard type:

- FN 45

Internal Freewheels FNR

for keyway connection on the outer ring with rollers and bearing



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.

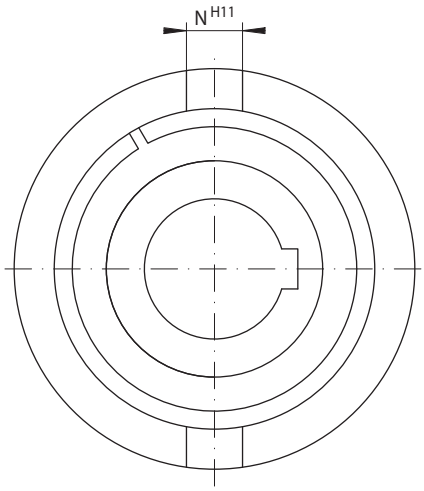
Bores up to 60 mm.

Application example

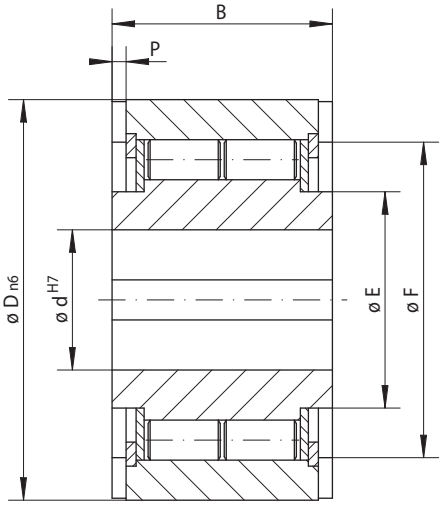
Internal Freewheel FNR 40 as an indexing freewheel for an incremental drive in the feeding device of a wire processing machine. The indexing lever is driven by a crank operation. The back and forth movement is transferred by the indexing freewheel in a gradual rotating movement of the wire feeding device.

Internal Freewheels FNR

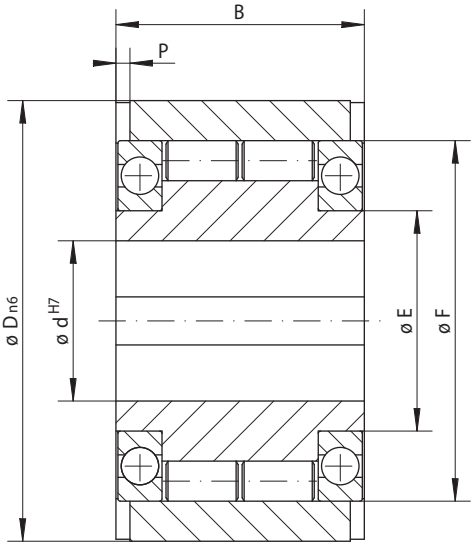
for keyway connection on the outer ring with rollers and bearing



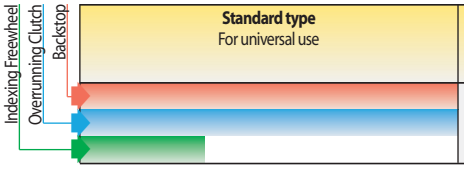
103-1



Size FNR 8 to FNR 20 103-2



Size FNR 25 to FNR 60 103-3



Standard type
For universal use

Dimensions

Freewheel Size	Nominal torque M_N Nm	Max. speed Inner ring freewheels/ overruns min^{-1}	Max. speed Outer ring freewheels/ overruns min^{-1}	Bore d mm	B mm	D mm	E mm	F mm	N mm	P mm	Weight kg
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	3,5	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.

The outer ring has to be completely enclosed in a stable housing to transmit the listed torques.

Lubrication

An oil lubrication of the specified quality must be provided.

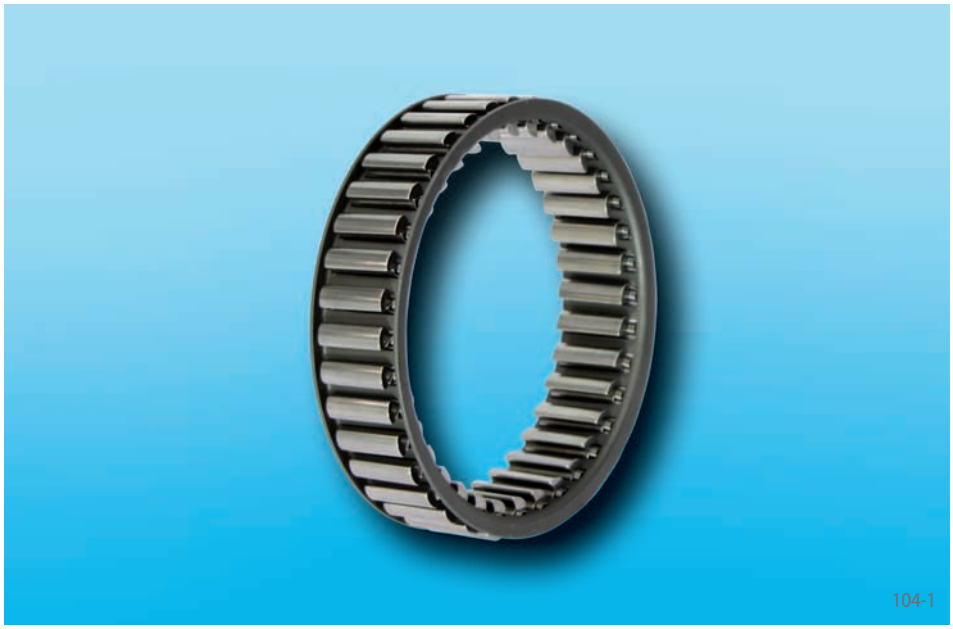
Example for ordering

Freewheel size FNR 20, standard type:

- FNR 20

Cage Freewheels SF

for assembly with inner and outer ring with sprags, available in three types



Features

Cage Freewheels SF are sprag freewheels to be installed between customer-supplied inner and outer rings.

The freewheels SF are used as:

- Backstops
- Overrunning Clutches
- Indexing Freewheels

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

Nominal torques up to 93 000 Nm.

Mounting

The lateral guidance of the Cage Freewheels can be effected either by a shoulder on the outer ring or by guard rings or guard discs which are fixed in the outer ring.

Torque transmission capacity can be increased if several cages are arranged side by side. In this case please consult with RINGSPANN on transmissible torques.

Please note the technical points on page 118 regarding the sprag tracks.

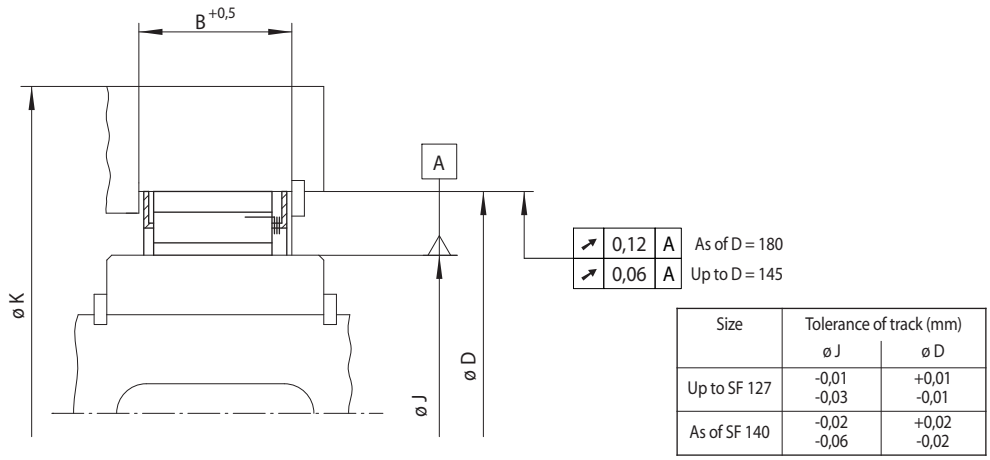
Example for ordering

Freewheel size SF 44-14,5, standard type:

- SF 44-14,5 K

Cage Freewheels SF

for assembly with inner and outer ring with sprags, available in three types



Size	Tolerance of track (mm)	
	ø J	ø D
Up to SF 127	-0,01 -0,03	+0,01 -0,01
As of SF 140	-0,02 -0,06	+0,02 -0,02

105-2

Indexing Freewheel
Overrunning Clutch
Backstop

Standard type
For universal use

Type with RIDUVIT®
For extended service life using coated sprags

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

Dimensions

Freewheel Size	Type	Nominal torque M_N Nm	Type	Nominal torque M_N Nm	Type	Nominal torque M_N Nm	Sprag lift-off at outer ring speed min^{-1}	J mm	D mm	B mm	K mm	Sprags Quantity	Weight kg
SF 18-13,5	J	66						18,80	35,47	13,5	50	10	0,04
SF 23-13,5	J	120						23,63	40,29	13,5	55	12	0,04
SF 27-13,5	J	160	JT	160	JZ	100	3600	27,78	44,42	13,5	65	14	0,05
SF 31-13,5	J	170	JT	170	JZ	110	3400	31,75	48,41	13,5	70	12	0,04
SF 32-21,5	J	400						32,77	49,44	21,5	65	14	0,07
SF 37-14,5	K	270	KT	270	KZ	210	2900	37	55	14,5	75	14	0,06
SF 42-21	J	720						42,10	58,76	21	85	18	0,09
SF 44-14,5	K	500	KT	500	KZ	400	2250	44	62	14,5	90	20	0,08
SF 46-21	J	840						46,77	63,43	21	90	20	0,10
SF 50-18,5	K	680	KT	680	KZ	580	2250	50	68	18,5	90	20	0,10
SF 56-21	J	1050						56,12	72,78	21	100	22	0,11
SF 57-18,5	K	950	KT	950	KZ	800	2000	57	75	18,5	105	24	0,13
SF 61-21	J	1300	JT	1300	JZ	1150	1550	61,91	78,57	21	110	26	0,14
SF 72-23,5	K	2100	KT	2100	KZ	1850	1550	72	90	23,5	135	32	0,23
SF 82-25	K	2300	KT	2300	KZ	2100	1450	82	100	25	140	36	0,26
SF 107-25	K	3300	KT	3300	KZ	3100	1300	107	125	25	170	48	0,35
SF 127-25	K	4900	KT	4900	KZ	4600	1200	127	145	25	210	56	0,40
SF 140-50	S	13600	ST	13600	SZ	10500	950	140	180	50	260	24	1,70
SF 140-63	S	18000	ST	18000	SZ	14000	800	140	180	63	260	24	2,00
SF 170-50	S	17000	ST	17000	SZ	13500	880	170	210	50	290	28	1,95
SF 170-63	S	23000	ST	23000	SZ	18500	720	170	210	63	290	28	2,40
SF 200-50	S	23000	ST	23000	SZ	18500	820	200	240	50	325	36	2,50
SF 200-63	S	29000	ST	29000	SZ	23500	680	200	240	63	325	36	3,10
SF 230-63	S	37000	ST	37000	SZ	29500	650	230	270	63	360	45	3,90
SF 270-50	S	35000	ST	35000	SZ	29500	720	270	310	50	410	48	3,40
SF 270-63	S	44000	ST	44000	SZ	37000	600	270	310	63	410	48	4,20
SF 340-50	S	45000	ST	45000	SZ	43000	640	340	380	50	510	60	4,20
SF 340-63	S	67500	ST	67500	SZ	57500	540	340	380	63	510	60	5,20
SF 380-50	S	57000	ST	57000	SZ	48500	610	380	420	50	550	63	4,40
SF 440-63	S	93000	ST	93000	SZ	80000	470	440	480	63	640	72	6,20

The theoretical nominal torque applies only for ideal concentricity between the inner and outer ring.
The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Cage Freewheels SF … P

for assembly with inner and outer ring for high run out (T.I.R.), with sprags

Features

Cage Freewheels SF … P are sprag freewheels to be installed between customer-supplied inner and outer rings.

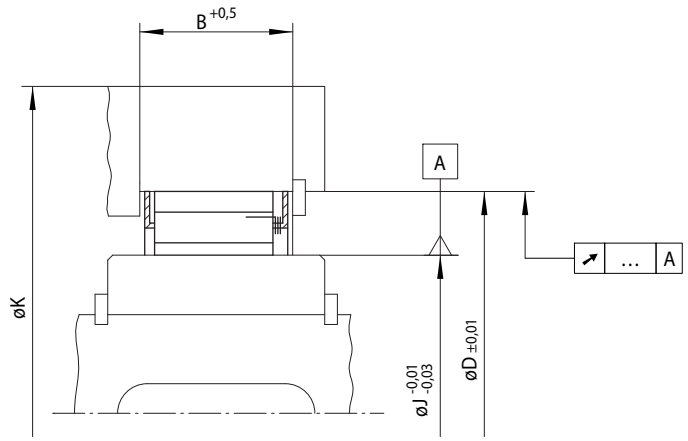
The freewheels SF … P are used as:

- Backstops
- Overrunning Clutches
- Indexing Freewheels

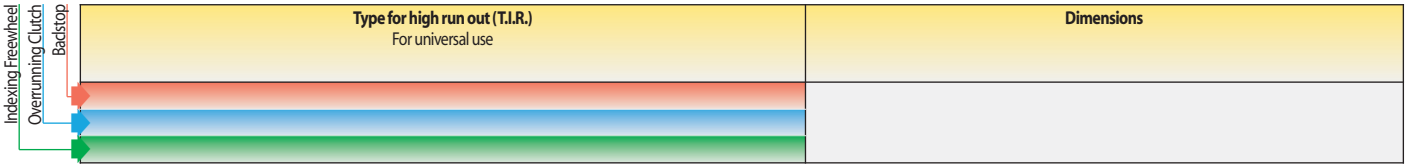
Nominal torques up to 5 800 Nm.

Cage Freewheels SF … P

for assembly with inner and outer ring for high run out (T.I.R.), with sprags



107-2



Freewheel Size	Type	Theoretical nominal torque ⟋ 0,0 A Nm	Nominal torque at existing run out (T.I.R.) ⟋ 0,05 A Nm	⟋ 0,1 A Nm	⟋ 0,15 A Nm	J mm	D mm	B mm	K mm	Sprags Quantity	Weight kg
SF 37-14,5	P	230	210	200	200	37,00	55,00	14,5	75	14	0,06
SF 44-14,5	P	420	390	360	350	44,00	62,00	14,5	90	20	0,08
SF 57-18,5	P	1 200	960	750	600	57,00	75,00	18,5	100	24	0,13
SF 72-23,5	P	2 700	2 200	1 700	1 400	72,00	90,00	23,5	130	32	0,23
SF 82-25	P	2 800	2 400	1 900	1 500	82,00	100,00	25,0	135	36	0,26
SF 107-25	P	4 100	3 300	2 700	2 100	107,00	125,00	25,0	165	48	0,35
SF 127-25	P	5 800	4 800	3 900	3 100	127,00	145,00	25,0	200	56	0,40

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.).

Mounting

The lateral guidance of the Cage Freewheels can be effected either by a shoulder on the outer ring or by guard rings or guard discs which are fixed in the outer ring.

Torque transmission capacity can be increased if several cages are arranged side by side. In this case please consult with RINGSPANN on transmissible torques.

Please note the technical points on page 118 regarding the sprag tracks.

Example for ordering

Freewheel size SF 44-14,5 type for high run out (T.I.R.):

- SF 44-14,5 P

Cage Freewheels BWX

for assembly with inner and outer ring with sprags

Mounting

The lateral guidance of the Cage Freewheels can be effected either by a shoulder on the outer ring or by guard rings or guard discs which are fixed in the outer ring. There must be no undercuts, recesses, shoulders or chamfers, or any eccentricity whatsoever, over dimension „B". For ease of assembly we recommend that the inner and outer races be chamfered at an angle of 15 degrees for a leghts of 3 mm.

Please note the technical points on page 118 regarding the sprag tracks.

Features

Cage Freewheels BWX are sprag freewheels to be installed between customer-supplied inner and outer rings.

The freewheels BWX are used as:

- Backstops
- Overrunning Clutches
- Indexing Freewheels

Nominal torques up to 4 900 Nm.

Disengaging

When the outer ring is rotating the centrifugal force causes the sprags to lift off from the inner race. This reduces wear during freewheeling operation.

Engaging

When the outer ring is rotating the centrifugal force presses the sprags against the inner ring. This enhances the ability of the sprags to engage immediately when torque is applied.

Drag strips

To reduce wear during freewheeling operation between sprags and the inner race, drag strips made from wear-resistant beryllium copper alloy are attached to the inner cage. This results in increased friction between inner cage and inner race. This counteracts individual sprag activation during freewheeling operation, thereby greatly reducing sprag pressure on the inner race.

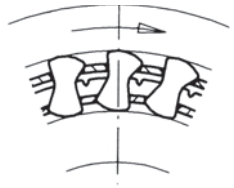
Brake clips

Some freewheel sizes are available with brake clips fitted on the outer cage to prevent further automatic rotation of the Cage Freewheel during rapid acceleration and deceleration of the outer ring (e.g. in indexing freewheels).

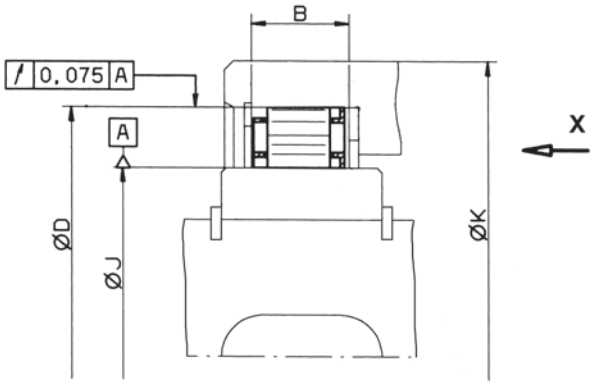
Cage Freewheels BWX

for assembly with inner and outer ring with sprags

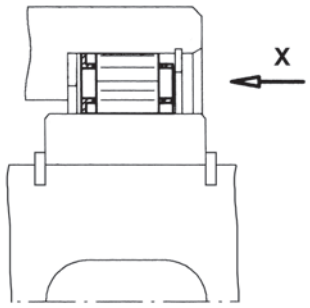
When viewing in directon X the outer ring freewheels clockwise



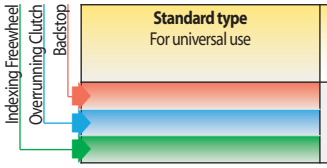
109-1



109-2



109-3



Standard type For universal use	Dimensions

Freewheel Size	Type	Nominal torque M_N Nm	J +0,008 -0,005 mm	D ±0,013 mm	B mm	K mm	Sprags Quantity	Drag strips Quantity	Brake clips Quantity	Design as ill.	Weight kg
BWX 133590A	Disengaging	63	22,225	38,887	10,0	44,0	12			109-2	0,03
BWX 13143A	Engaging	120	27,767	44,425	13,5	51,0	14			109-2	0,06
BWX 133392	Disengaging	280	38,092	54,750	16,0	71,0	18			109-3	0,09
BWX 1310145	Disengaging	180	41,275	57,937	13,5	74,2	14		3	109-2	0,07
BWX 132909A	Disengaging	360	44,450	61,112	16,0	78,5	20	2	3	109-2	0,10
BWX 133339	Disengaging	310	49,721	66,383	13,5	85,0	22	2	4	109-2	0,09
BWX 1310003	Disengaging	310	49,721	66,383	13,5	85,0	22		4	109-2	0,09
BWX 137222	Engaging	570	49,721	66,383	19,0	85,0	22			109-2	0,12
BWX 1310445	Disengaging	400	54,765	71,427	13,5	91,7	24			109-2	0,09
BWX 1310172	Engaging	540	54,765	71,427	16,0	91,7	24			109-2	0,12
BWX 1310226	Disengaging	520	54,765	71,427	16,0	91,7	24	2	4	109-2	0,12
BWX 136709	Engaging	770	54,765	71,427	21,0	91,7	24	3	10	109-2	0,16
BWX 1310147	Disengaging	1 000	54,765	71,427	25,4	91,7	24	3	8	109-2	0,20
BWX 136324	Engaging	600	57,760	74,427	19,0	95,0	26			109-3	0,14
BWX 1310080	Disengaging	670	72,217	88,882	13,5	115,0	30		4	109-2	0,12
BWX 13168	Engaging	1 300	72,217	88,882	21,0	115,0	30			109-3	0,20
BWX 134012	Engaging	1 300	72,217	88,882	21,0	115,0	30	4	10	109-3	0,20
BWX 137322	Disengaging	2 000	79,698[2]	96,363	25,4	124,0	34	5	12	109-2	0,28
BWX 138316	Disengaging	2 960	83,597[2]	102,596	25,4	131,6	34	5	12	109-2	0,30
BWX 13261A[1]	Disengaging	1 600	103,231[2]	119,893	16,0	154,0	40	6	10	109-3	0,19
BWX 13236	Disengaging	1 700	117,391[2]	136,391	16,0	175,3	30	5	6	109-3	0,25
BWX 133403B	Engaging	4 900	123,881[2]	142,880	25,4	188,0	44		11	109-2	0,46

[1] With this Freewheel Size the centering flange of the inner cage is on the right hand side!
[2] Tolerance of the inner ring race diameter may be increased by ±0,013 mm!
The theoretical nominal torque applies only for ideal concentricity between the inner and outer ring.
The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Example for ordering

Freewheel size BWX 13143A, standard type:

- BWX 13143A

Cage Freewheels K

for assembly with inner and outer ring with sprags

Features

Cage Freewheels K are sprag freewheels to be installed between customer-supplied inner and outer rings.

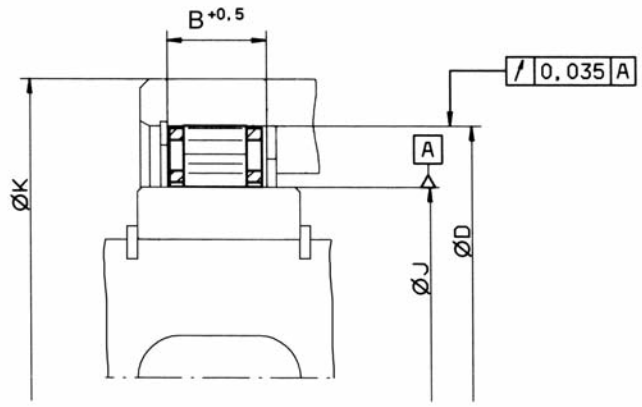
The freewheels K are used as:

- Backstops
- Overrunning Clutches
- Indexing Freewheels

Nominal torques up to 470 Nm.

Cage Freewheels K

for assembly with inner and outer ring with sprags



111-2

Indexing Freewheel
Overrunning Clutch
Backstop

Standard type
For universal use

Dimensions

Freewheel Size	Nominal torque M_N Nm	J -0,008 mm	D +0,01 mm	B mm	K mm	Sprags Quantity	Weight kg
K 2400 01	46	24	32	8,7	44	20	0,02
K 2900 02	67	29	37	8,7	53	24	0,02
K 3400 02	93	34	42	8,7	58	27	0,02
K 4100 03	220	41	49	11,7	66	32	0,03
K 4700 02	350	47	55	13,2	73	36	0,05
K 5100 02	400	51	59	13,2	79	39	0,05
K 5700 01	470	57	65	13,2	88	43	0,06

The theoretical nominal torque applies only for ideal concentricity between the inner and outer ring.
The maximum transmissible torque is 2 times the specified nominal torque. See page 14 for determination of selection torque.

Mounting

The lateral guidance of the Cage Freewheels can be effected either by a shoulder on the outer ring or by guard rings or guard discs which are fixed in the outer ring. There must be no undercuts, recesses, shoulders or chamfers, or any eccentricity whatsoever, over dimension „B". For ease of assembly we recommend that the inner and outer races be chamfered at an angle of 15 degrees for a leghts of 3 mm.

The double-cage is made of glass fibre reinforced polyamide 6.6. Permissible continuous operating temperature ranges from -20 °C to +130 °C.

Please note the technical points on page 118 regarding the sprag tracks.

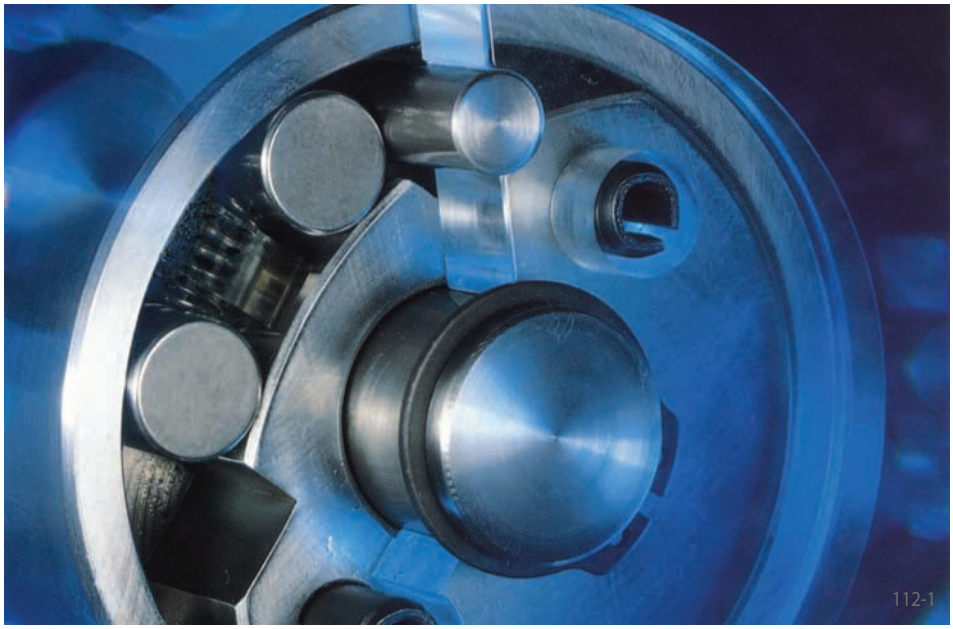
Example for ordering

Freewheel size K 5700 01, standard type:

- K 5700 01

Irreversible Locks IR

bidirectional acting backstop for assembly with connecting parts with rollers



Features

Irreversible Locks IR are bidirectional acting roller freewheels with bearing support. They are ready for installation.

The Irreversible Locks IR are used as:

- Bidirectional Acting Backstops

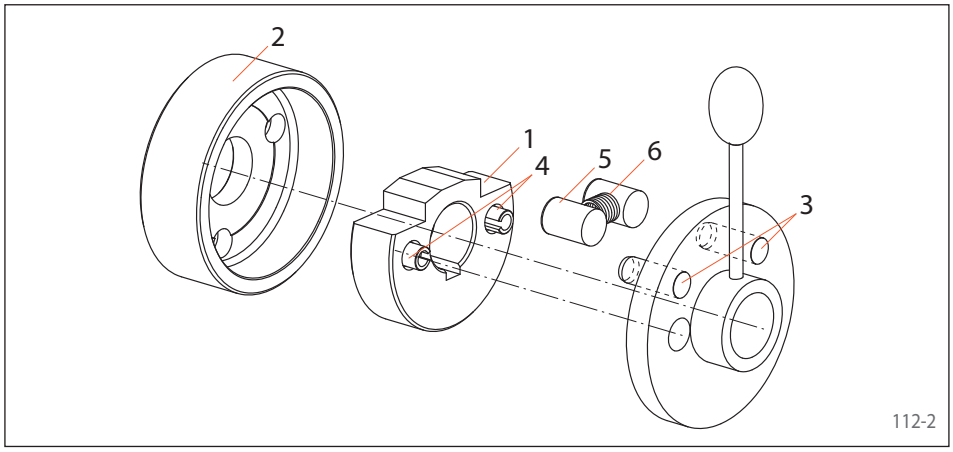
Nominal torques up to 100 Nm.

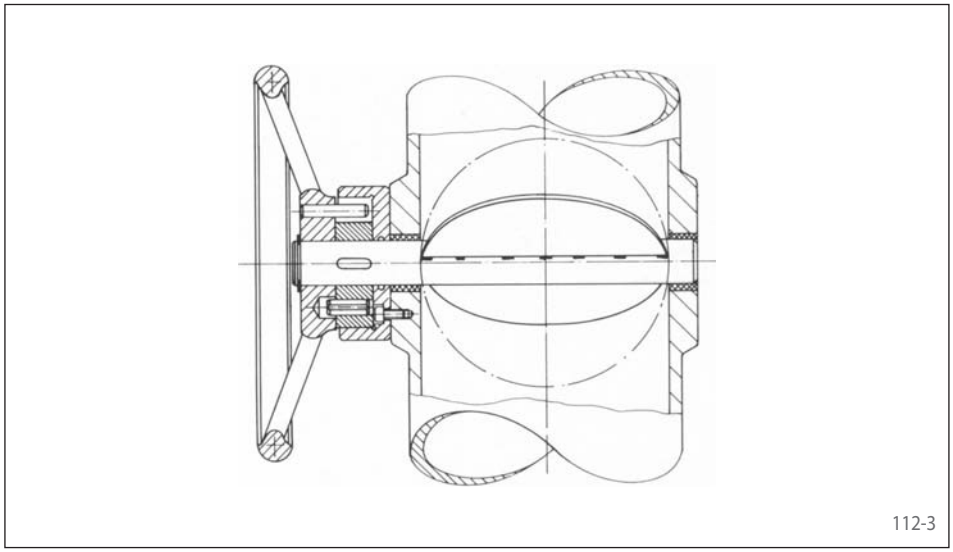
Bores up to 35 mm.

Whereas a normal Freewheel transmits torques from the driving or driven side in only one direction of rotation, with the Irreversible Lock IR it is possible for the driving part to drive the shaft in both directions of rotation. There is, however, a locking action against any reverse torque coming from the driven part, irrespective of the direction of rotation in which it is exerted.

Operation

The centre body (1) is positively locked to the shaft (driven part) by a key. The housing (2) is bolted in place, e. g. on the frame of a machine in a fixed position. The driving customer-supplied part (lever, handwheel, etc.), which carries actuating pegs (3), is mounted on the shaft and has two bores to hold the drive studs (4). Thus, if force is applied to the driving part, depending upon the direction in which it is applied one or other of the actuating pegs presses one of the two locking rollers (5) out of engagement in opposition to the force exerted by the engaging spring (6). In this way, the driven part connected to the centre body can be rotated without difficulty. When this is done the roller which is still engaged operates as in a freewheel mechanism turning in the freewheeling direction. Due to the symmetrical layout of the irreversible lock, the process which has just been described can also take place in the same way in the opposite direction of rotation. If, however, forces coming from the machine attempt to rotate the centre body via the shaft, the centre body is locked to the fixed housing by the locking rollers. Each roller performs this function for one direction of rotation. Thus, the irreversible lock prevents unintended shifts and displacements from taking place. The irreversible locks are not suitable for use where the driven side tends to run ahead of the driving side during operation (e.g. for the operation of brakes during descending movements in lifts and hoists).





Application example

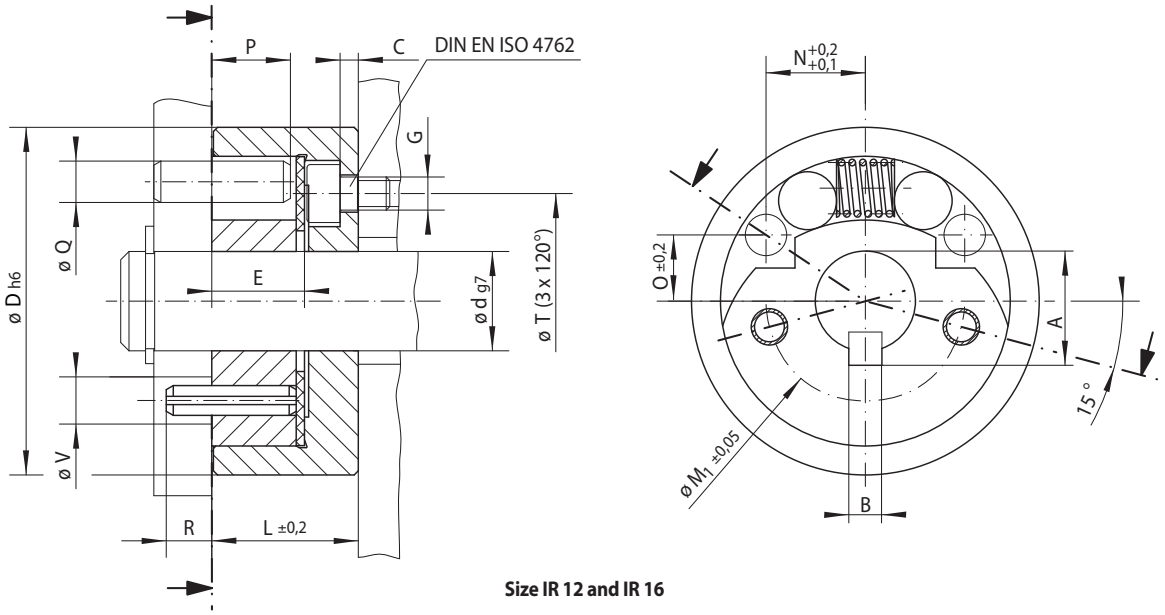
The valve, which in the example shown is a control or shut-off valve, is adjusted in the opening or closing direction by means of a handwheel.

The Irreversible Lock prevents any uncontrolled shifts in the position of the valve due to the pressure exerted by the medium flowing in the pipe.

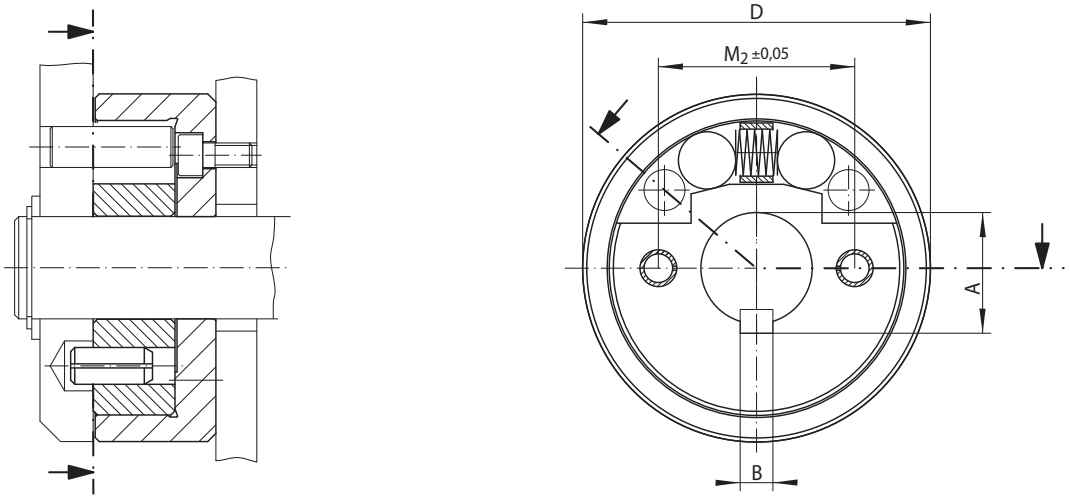
The use of Irreversible Locks is not restricted to manually operated valves and they can also be used with motorised adjusters. In this case there is the particular advantage that the torque motor need be designed to supply only the adjusting torque, which is generally low, since all standing and sudden reverse torques are absorbed by the Irreversible Lock.

Irreversible Locks IR

bidirectional acting backstop for assembly with connecting parts with rollers



Size IR 12 and IR 16 113-1



Size IR 25 and IR 35 113-2

Backstop

Standard type For univeral use	Dimensions

Freewheel Size	Type	Nominal torque M_N Nm	Bore d mm	A* mm	B* mm	C mm	D mm	E mm	G**	L mm	M_1 mm	M_2 mm	N mm	O mm	P mm	Q mm	R mm	T** mm	V mm	Z**	Weight kg
IR 12	R	8	12	13,8	4	2,2	42	11,2	M4	17,7	24		12,0	8,0	9,5	5	5,5	26	5,7	3	0,15
IR 16	R	15	16	18,3	5	3,0	48	12,2	M5	20,4	28		13,5	9,5	10,5	5	9,5	28	9,8	3	0,22
IR 25	R	48	25	28,5	8	3,2	85	20,0	M6	30,0		48	22,5	19,1	19,5	10	5,5	55	12,2	3	1,10
IR 35	R	100	35	38,5	10	4,5	120	32,0	M8	45,0		70	27,0	32,2	31,5	12	8,5	80	14,2	3	3,30

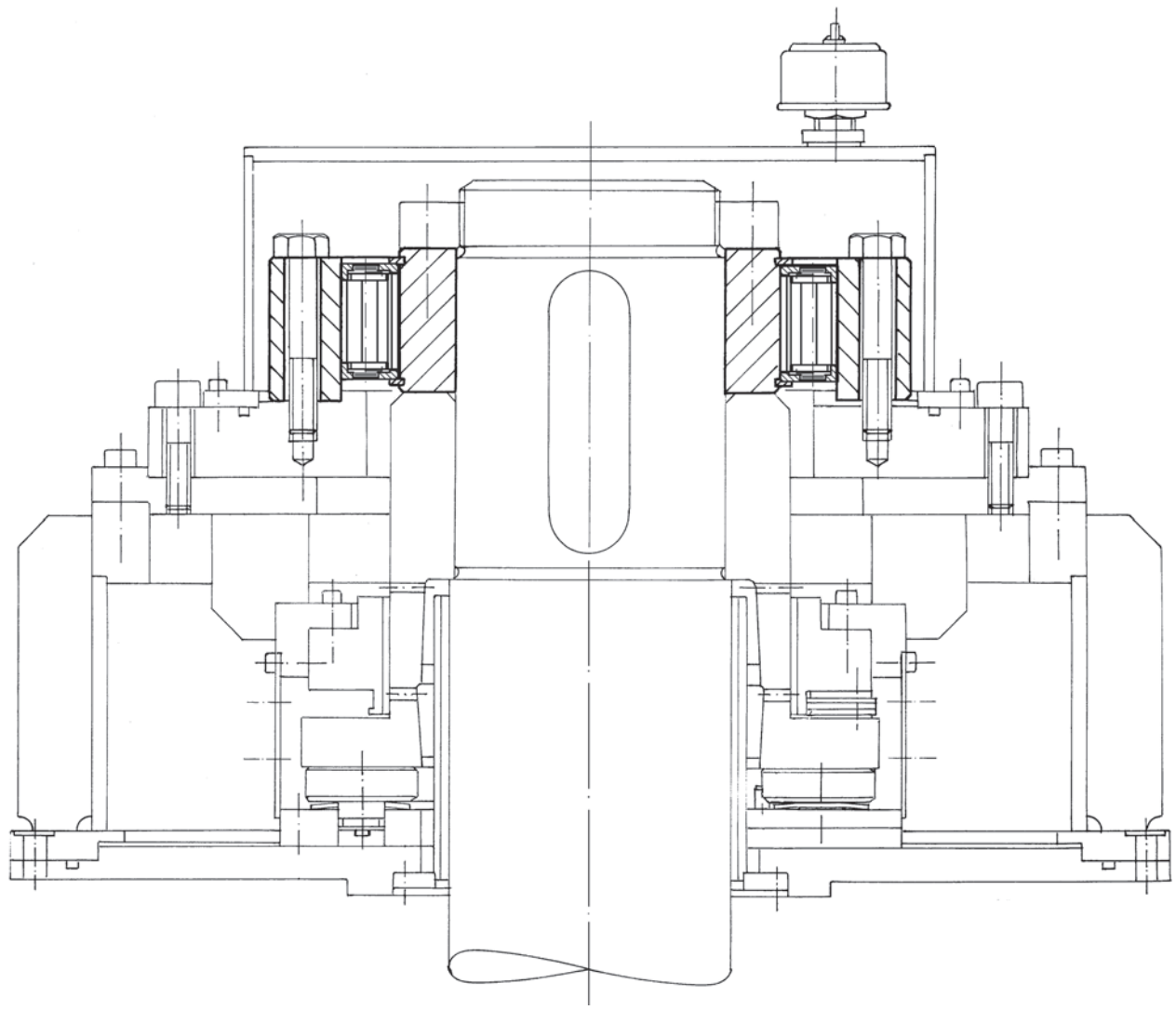
The maximum transmissible torque is 2 times the specified nominal torque.
* Keyway according to DIN 6885, page 1 • Tolerance of keyway width JS10.
** Z = Number of tapped holes G on pitch circle T.

Example for ordering

Irreversible Lock IR 16 R, standard type with bore 16 mm:

- IR 16 R, d = 16 mm

Application Examples



Sleeve bearing: Renk Typ VB 114-1

Backstops FXM … LX 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 114-1, 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 backstop 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.

Application Examples

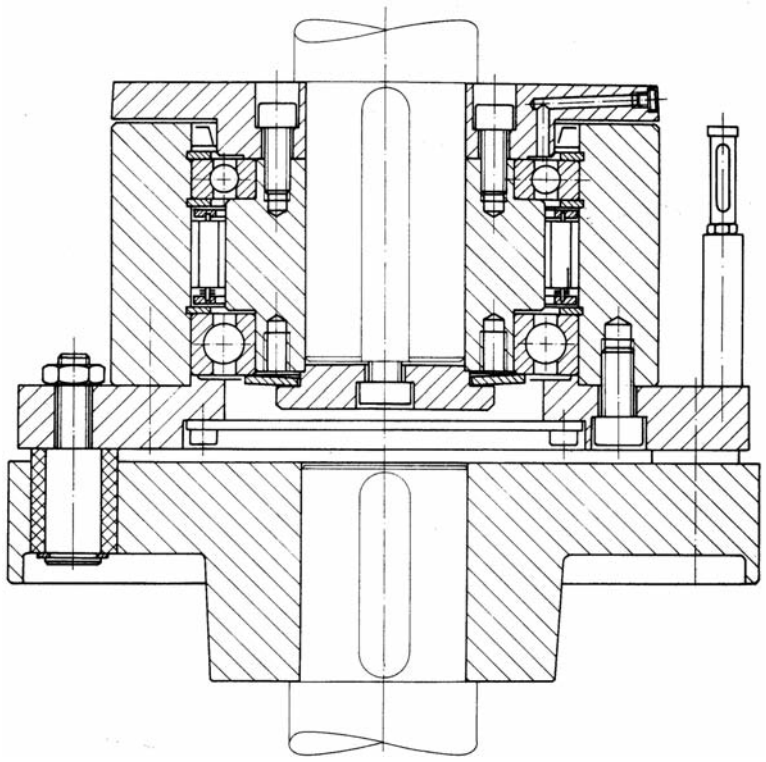
Backstop FXM 2.410 - 100 LX for the primary cooling water pump in a nuclear power station. Maximum torque 500 000 Nm. Speed 1 485 min^{-1}. In service since 1996. Manufactured and tested with extensive documentation from RINGSPANN GmbH, Bad Homburg.

Iron ore conveyor plant in South Africa driven by three gear reducers with RINGSPANN backstops FXRV 170-63 MX.

Special Freewheel Designs

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.

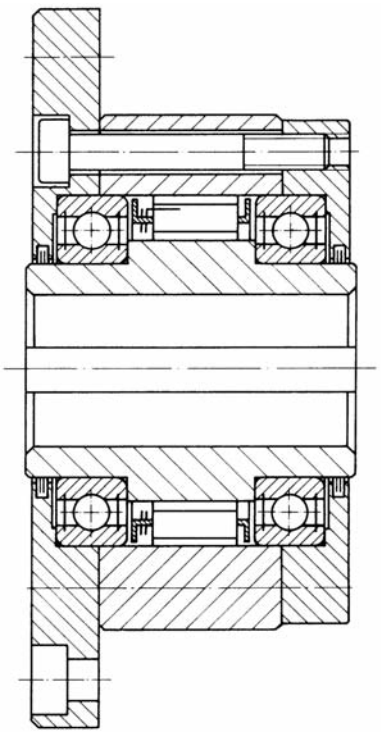
The overrunning clutch is essential for both drives so that the respective stationary drive is not backdriven by the output side.



116-1

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.

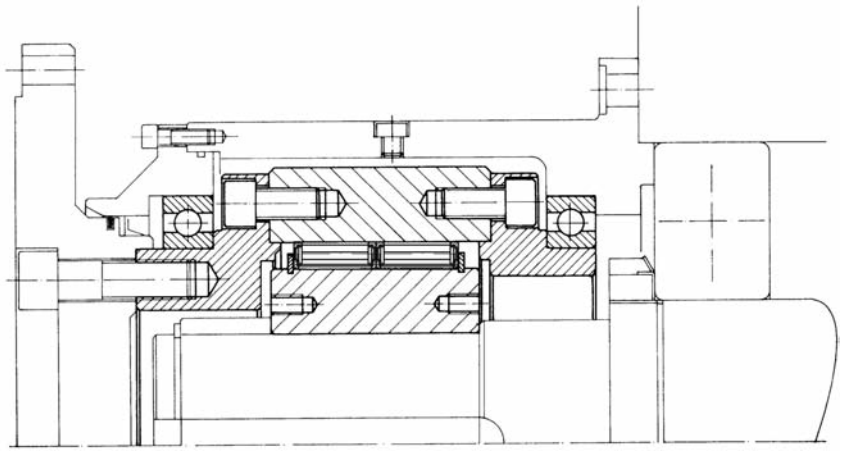
This overrunning clutch also uses life-time lubricated ball bearings and labyrinth seals; therefore, it is maintenance-free.



116-2

Special Freewheel Designs

Overrunning clutch FXM 2.240 - 96 LX 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.

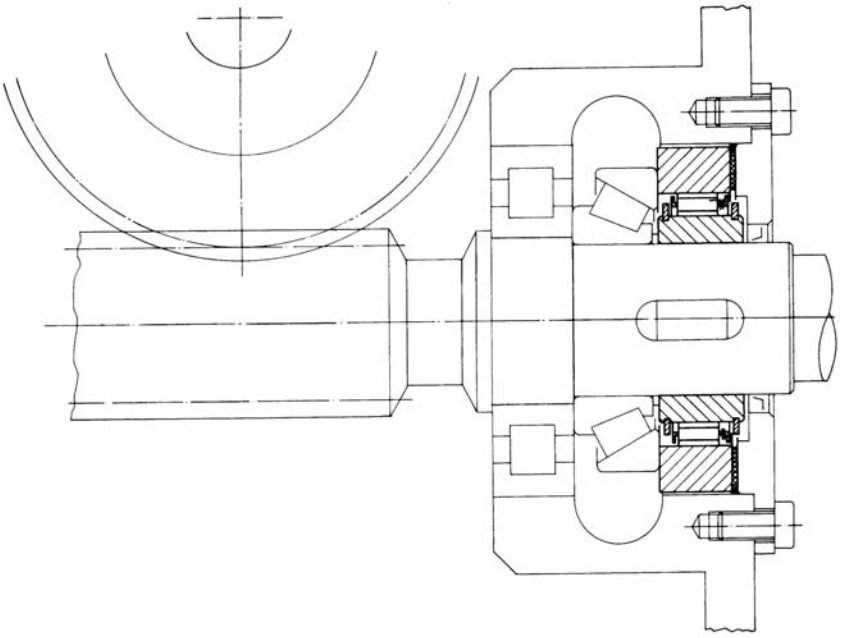


117-1

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.



117-2

Technical Points

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 exeeds the prescriped 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 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 selcted as per the values listed in VDI 2230, in each case taking into account the existing friction values.

Sprag track

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

- Conicity: ≤ 3 µm per 10 mm track width
- Average peak-to-valley height Rz as per DIN 4768, page 1: 1,6 µm ≤ Rz ≤ 6,3 µm
- Hardness: 62 ± 2 HRc

With case hardening:

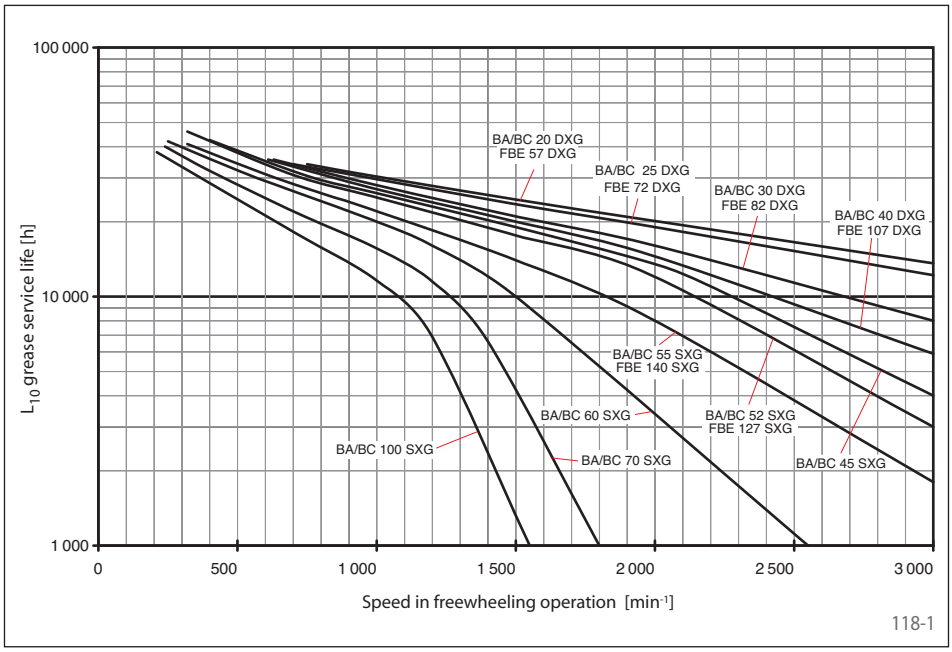
Case hardening depth Eht as per DIN 50190, page 1: 1,5 … 2 mm, hardness limit HG = 550 HV1, core strength ≥ 1 100 N/mm^2

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 x 30°, should be provided on the sprag track.

Grease-lubricated ball bearings for Complete Freewheels BA … XG, BC … XG and FBE … XG

Complete Freewheels BA … XG, BC … XG and FBE … XG have grease-lubricated ball bearings. It should be noted that these ball bearings have a L_{10} grease service life. Diagram 118-1 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° 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.



118-1

Technical Points

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.

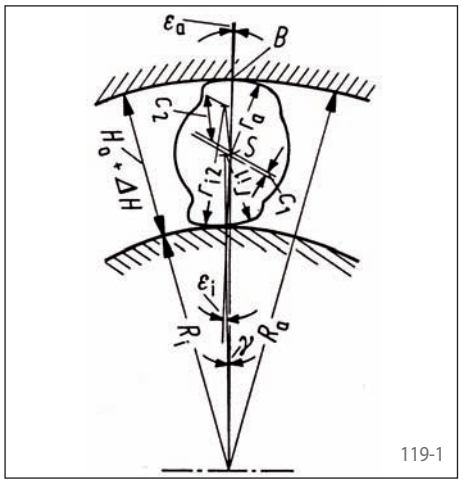
In the case of a sprag freewheel with cylindrical inner and outer ring races, the formula for the inner clamping angle (refer to figure 119-1) is:

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

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 interplay 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

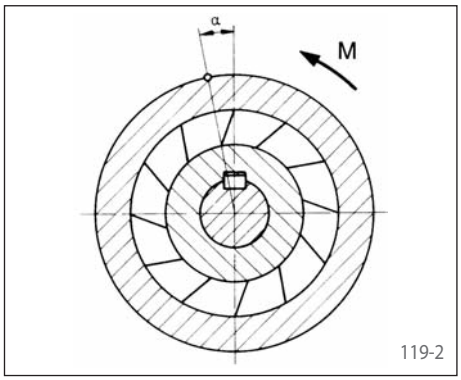
In this calculation the influence of eccentric tracks is also taken into consideration. In addition, the calculation provides the torsion spring



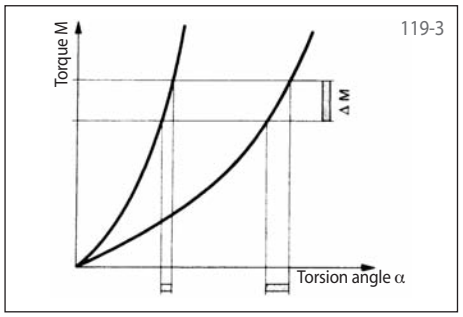
characteristic curve of the freewheel (refer to figure 119-3), which is particularly required for dynamic calculations of an entire installation.

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 119-2 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 119-3 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.

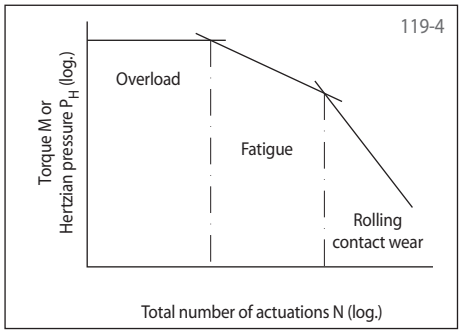


Figure 119-4 shows that we can differentiate between three areas: Overload, fatigue and rolling contact wear. Indexing freewheels must therefore be designed in such a way that they work in the area of rolling contact wear. This way, the total number of actuations can be in excess of 1×10^8. With an actuation frequency of 100 actuations/minute, this corresponds to a service life of approximately 16 666 hours.

Technical Points

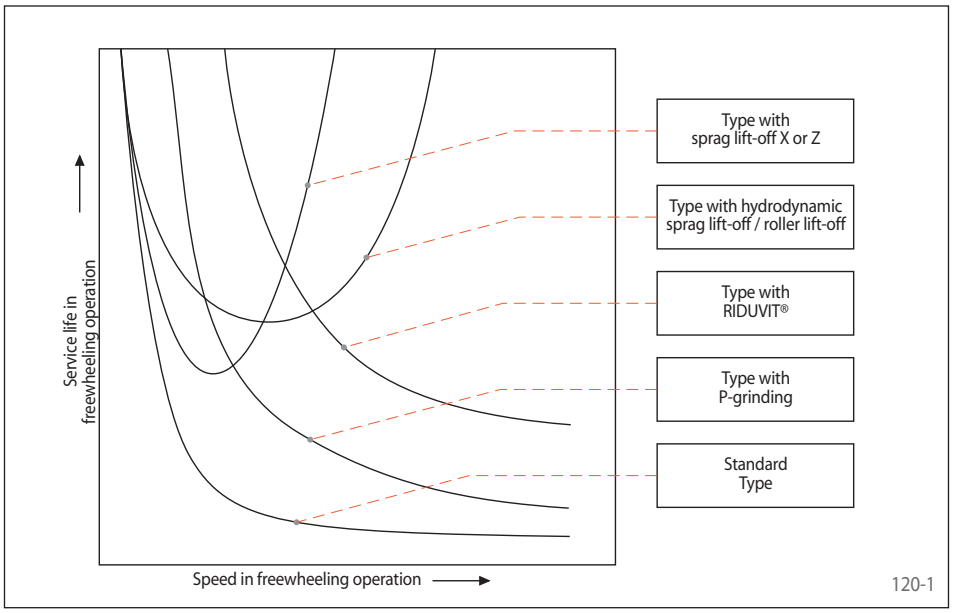
Maximum speeds and service life of backstops and overrunning clutches

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 disapation 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 effect. The qualitative course of the service life in freewheeling operation of backstops and overrunning clutches in the various types is shown in figure 120-1. 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 122 or 123.

Dependency of the maximum speed on the lubrication and heat disapation

With regard to the lubrication and heat disapation 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 ZZ … and FGK, 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 disapated 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 ZZ … and FGK.

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 122 and 123.

Technical Points

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, FBE … XG, FCN … K, FGK 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 authorisation of RINGSPANN. 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^2/s]	For ambient temperatures from -15° C to +15° C Kinematic viscosity at 40° C, ISO-VG 32 [mm^2/s]	For ambient temperatures from -40° C to 0° C Kinematic viscosity at 40° C, ISO-VG 10 [mm^2/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	TELLUS 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 website!

Company: ..... Date: .....
Address: ..... Enquiry Ref.: .....
..... Phone: .....
Name: ..... Fax: .....
Department: ..... 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} = _____ min^{-1}
Would it be possible to arrange the backstop on a high speed shaft? (higher speed = lower torque = smaller backstop)
If neccesary 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
η = _____

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:
_____ mm^2/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

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Questionnaire for selecting RINGSPANN Overrunning Clutches

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

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

1. Where will the Overrunning Clutch be used?

1.1 Type of machine, machine group or installation, in which the overrunning clutch will be used:

1.2 Arrangement of the overrunning clutch (if possible, please include specification, data sheet, sketch or drawing with connection dimensions).

2. Operating data

2.1 In driving operation the drive of the overrunning clutch will be carried out by:

- ❑ Asynchronous motor
  - ❑ direct start-up
  - ❑ λ-Δ-start-up
- ❑ Other electric motor
  Type: _____
- ❑ Combustion engine
  Type: _____
  Number of cylinders: ___
- ❑ Turbine
- ❑ Other (please explain in more detail):

2.2 To be transmitted in driving operation:
Power: _____ kW or
Torque: _____ Nm

2.3 Maximum torque _____ Nm
(Important for drives that develop their maximum torque below their nominal speed.)

2.4 Speed

1. in driving operation:
   from _____ min^{-1} to _____ min^{-1}
2. in freewheeling operation:
   (when overrunning clutch is disengaged)
   Primary part (driver)
   from _____ min^{-1} to _____ min^{-1}
   Secondary part (driven machine)
   from _____ min^{-1} to _____ min^{-1}

2.5 Should the overrunning clutch be combined with a shaft coupling?

- ❑ with an elastic coupling
- ❑ with a torsionally stiff coupling
- ❑ _____

2.6 If, upon start up, larger masses are to be accelerated:
Moment of inertia: J = _____ kgm^2
Speed of mass: n = _____ min^{-1}

2.7 Torque fluctuations/torsional vibrations during driving operation generate the following torque limits

- ❑ Minimum torque M_{min} = _____ Nm
- ❑ Maximum torque M_{max} = _____ Nm
- ❑ Minimum or Maximum torque is not known

2.8 Daily operating time: _____ hours (h)
thereof _____ (h) driving operation
thereof _____ (h) freewheeling operation

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
_____ mm^2/s _____ ° C

3.2 Ambient temperature on the freewheel:
from _____ ° C to _____ ° C

3.3 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

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Questionnaire for selecting RINGSPANN Indexing Freewheels

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

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

1. Where will the Indexing Freewheel be used?

1.1 Type of machine, machine group or installation, in which the indexing freewheel will be used:

1.2 Arrangement of the indexing freewheel (if possible, please include specification, data sheet, sketch or drawing with connection dimensions).

2. Operating data

2.1 Index angle of the indexing freewheel:
from _____° to _____°

2.2 Number of actuations (indexes) per minute:
from _____ /min to _____ /min

2.3 The back and forth movement is made by
- ❑ freewheel outer ring
- ❑ freewheel inner ring
- ❑ _____

2.4 The back and forth movement is generated by
- ❑ bell crank
- ❑ hydraulic cylinder
- ❑ pneumatic cylinder
- ❑ cam disk or plate
- ❑ other (please explain in more detail):

2.5 Proposed shaft dimensions:
Diameter _____ mm
Length _____ mm

2.6 Normal torque:
M = _____ Nm
Maximum torque:
M_{max} = _____ Nm
(including peaks)

2.7 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:
  _____ mm^2/s _____ ° C

3.2 Ambient temperature on freewheel:
from _____ ° C to _____ ° C

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

4. Estimated requirement

_____ Pieces (one-off) _____ Pieces/month _____ Pieces/year

5. Enclosures

❑ Specifications ❑ Data sheet ❑ Sketch/drawing

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Questionnaire for selecting RINGSPANN Housing Freewheels

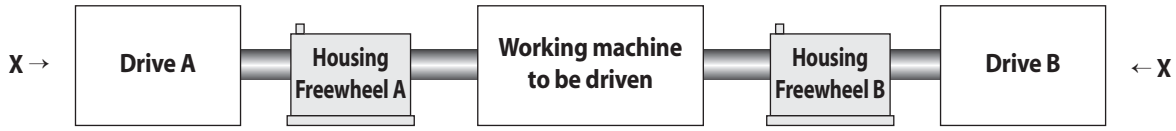
Please photocopy or use the PDF-File from our website!

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	**Housing Freewheel A**	**Housing Freewheel B**
2.1 In driving operation the drive will be carried out by	❑ Asynchronous motor ❑ Direct start up ❑ λ-Δ-start up ❑ Other electric motor Type: _____ ❑ Combustion engine Type: _____ No. of cylinders: _____ ❑ Turbine ❑ Other (please explain in more detail): _____	❑ Asynchronous motor ❑ Direct start up ❑ λ-Δ-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^{-1} to _____ min^{-1} from _____ min^{-1} to _____ min^{-1}	from _____ min^{-1} to _____ min^{-1} from _____ min^{-1} to _____ min^{-1}
2.3 Direction of rotation in driving operation when viewed in direction X	❑ Counterclockwise ❑ Clockwise	❑ Counterclockwise ❑ 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 Selected Housing Freewheel	Size _____	Size _____
2.8 Daily operating time	_____ hours (h) thereof _____ (h) driving operation thereof _____ (h) freewheeling operation	thereof _____ (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

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Notes

RINGSPANN®
Power Transmission

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

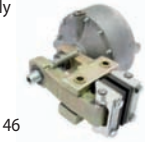
Housing Freewheels
Automatic engaging and disengaging of multimotor drives for installations with continuous operation.

Catalogue 84

Cage Freewheels
For installation between customer-supplied inner and outer rings.

Catalogue 84

Brakes

Industrial Disc Brakes
Spring activated - pneumatically, hydraulically, electromagnetically or manually released.

Catalogue 46

Industrial Disc Brakes
Pneumatically activated - spring released.

Catalogue 46

Industrial Disc Brakes
Hydraulically activated - non-releasing or spring released.

Catalogue 46

Industrial Disc Brakes
Spring activated - hydraulically released.

Catalogue 46

Clamping Units
Spring activated - hydraulically or pneumatically released. For secure and precise positioning of piston rods.

Catalogue 46

Shaft-Hub-Connections

Two-part Shrink Discs
External clamping connection for simple and secure mounting 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
Internal clamping connection in small dimensions for high torques.

Catalogue 36

Star and Clamping Discs
Shaft-Hub-Connection for frequent clamping and release.

Catalogue 36

Star Spring Washers
Axial spring element for preloading of ball bearings.

Catalogue 36

Overload Clutches

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 rods.

Catalogue 45

Couplings

Flange-Couplings
Rigid, easily removable shaft coupling with backlash free cone clamping connections.

Catalogue 44

Rigid Couplings
Rigid, easily removable shaft coupling with backlash free cone clamping connection.

Catalogue 44

Flexible Couplings
Large, allowed radial and angular misalignements. Minimum resiliency.

Catalogue 44

Flexible Couplings
Large, allowed radial and angular misalignements. Minimum resiliency.

Catalogue 44

RINGSPANN®
Workholding Technology

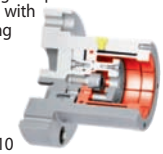
Precision Clamping Fixtures

Bonded Disc Packs
Precision Clamping Fixtures based on the unique method of the RINGSPANN Clamping Disc.

Catalogue 10

Taper Collets
Precision Clamping Fixtures for clamping thin or thick walled workpieces on long clamping length.

Catalogue 10

Taper Sleeves
Precision Clamping Fixtures for clamping compact workpieces with short or long clamping lengths.

Catalogue 10

Flat Elements
Very short Precision Clamping Fixtures for clamping thick walled workpieces with large clamping diameter and very short clamping depths.

Catalogue 10

Clamping Clutches
For rapid changes and precise clamping of profile rollers or printing rollers in printing presses in gravure and flexographic printing.

Catalogue 10

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