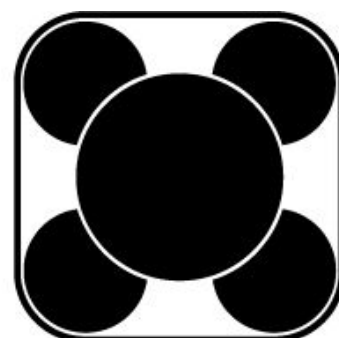


MOUNTING
MAINTENANCE



Franke

Antifriction wire race bearings

*Bearing elements
Bearing assemblies*

*Competence
for moving*





Mounting instructions for antifriction bearings


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1. General notes

1.1 Used symbols

- Marks an instruction.
-  Hints and recommendations (e.g. concerning tightening torques).

1.2 Due application

Franke antifriction bearings are provided for precise rotational motions as e.g. in the medical technology, measuring technology, textile industry in machine building.

1.3 Protection and maintenance measures

Until mounting please store Franke antifriction bearings in their original packing in order to protect them from humidity and damages. Do not use other parts than original Franke parts for mounting and repair. Franke bearing antifriction bearings must be lubricated. Information on lubrication of Franke bearings is found in chapter 4 "Lubrication and maintenance".

1.4 Preparation for mounting, tools and auxiliaries

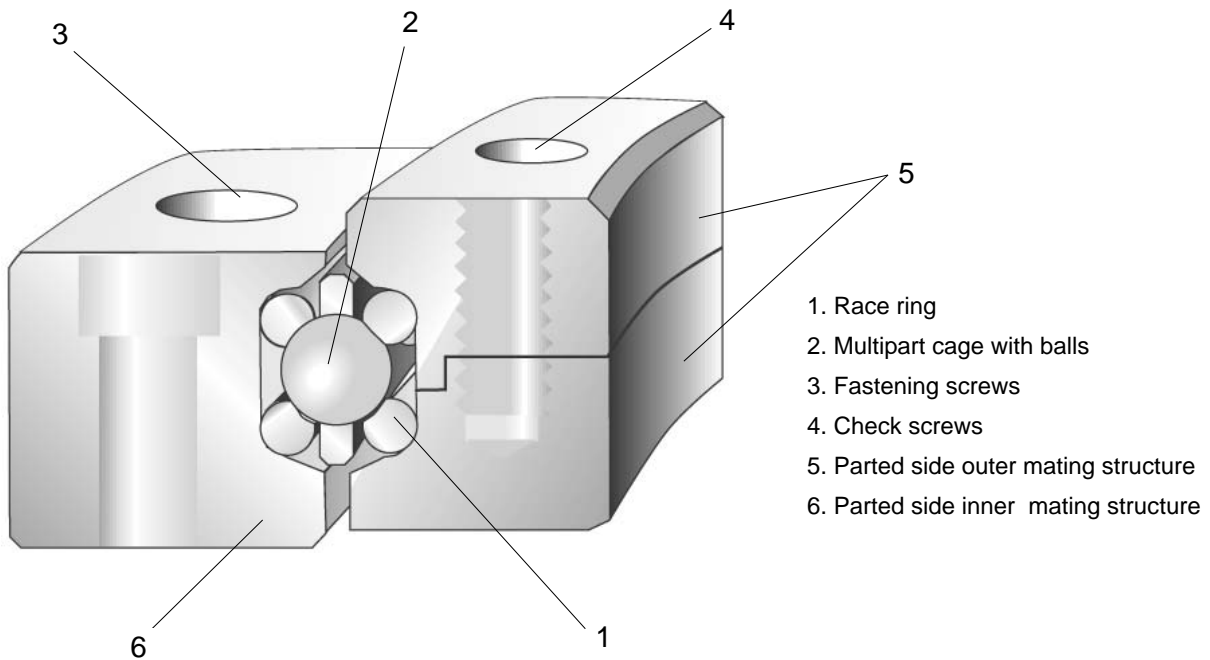
- Torque wrench
- Fastening screws
- Check-screws
- Dial gauge
- Hexagon socket screw key
- Screw driver
- Washers if necessary
- Grinding machine (with massive adjustment)

1.5 Survey on variants of antifriction bearings

Bearing elements (Mounting in chapter 2)

Bearing elements (LE) are composed of four race rings and a multipart cage with balls. In addition you need a mating structure which can optionally be made of steel, casting, aluminium, non-corrosive steel, bronze, composite material or plastics.

The rotational resistance is influenced by grinding or by adjusting of the parted mating structure.



Bearing assemblies (mounting in chapter 3)

Bearing assemblies (LD) are complete bearings ready for installation (bearing element with mating structure). Here the bearing clearance needs not be adjusted.

Slim bearing of series LDD are an exception. Here the bearing elements are embedded in an inner and outer enveloping steel sleeve. With this version the preload of the bearing has to be adjusted when mounting.


2. Mounting and adjustment of bearing elements

Inserting the rings:

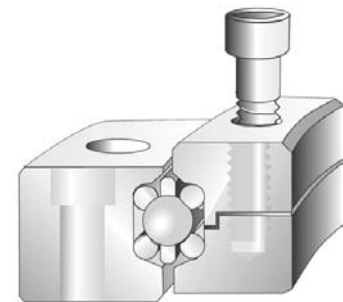
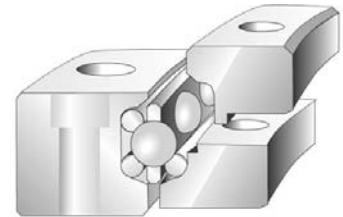
Apply some grease to the beds of the race rings; this helps to keep the race rings in their position during mounting. Two race rings are inserted in the inner and outer mating structure each.



- Insert the two race rings each in such a way that the open joints are offset by 175°.
- Grease the cage segments and insert them into the inner mating structure.

 When mounting the cage segments do not use other balls than those which are contained in the Franke consignment (quality class 3 DIN 5401). In case that some balls get lost all the balls have to be exchanged in order to avoid any negative influence on the running behaviour of the bearing.

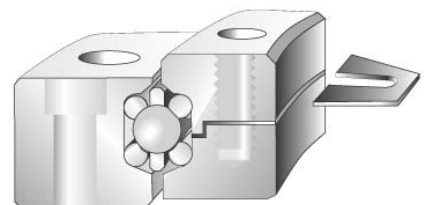
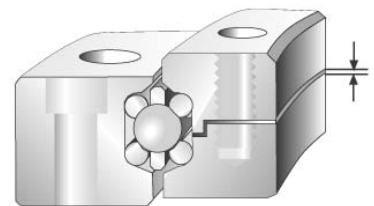
- Close the bearing with the parted side of the mating structure.
- Put the screws into the bores.



Afterwards the right rotational resistance of the bearing can either be adjusted by means of washers (chapter 2.1) or by massive adjustment (chapter 2.2).

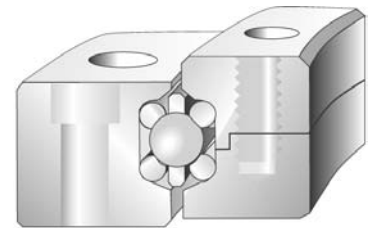
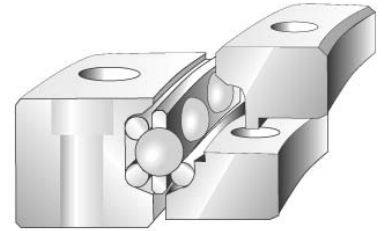
2.1 Mounting with washers

- Tighten the screws slightly.
- Measure the gap on several spots all around the parted mating structure. Add up the measured values and calculate the average.
- Select the block of washers. The thickness of the block should not be less than 0,01mm of the calculated mean value.
- Distribute the washers between all the check- and fastening screws of the parted mating structure.



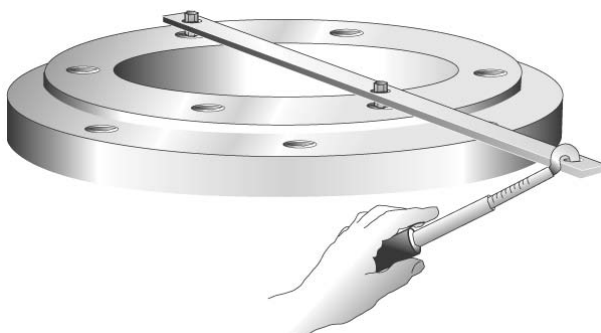
2.2 Massive adjustment

- Tighten the screws slightly.
 - ☞ Observe the prescribed tightening torques (see chapter 5 “screwed connections”, page 11).
- Turn the bearing two to three times by a full rotation of 360°. Check the clearance by means of a dial gauge.
- Dismantle the second parted side of the mating structure again (adjustment ring).
- With massive adjustment the separating surfaces (contact surface and adjustment surface) between the parted sides of the outer mating structures are form-fit. The outer mating structures has an over dimension of 0.1 mm. Grind off the measured value of the clearance and additional 0.02mm - 0.03 mm from the adjustment ring.
- Remove the grinding dust and attach the ring again as described above.



2.3 Measure the rotational resistance

- Tighten the screws.
 - ☞ Observe the prescribed tightening torques (chapter 5, page 11).
- Turn the bearing two to three times by a full rotation of 360° and measure the rotational resistance in order to check the adjustment of the bearing.
 - ☞ The rotational resistance shows the preload of the bearing. It depends on the series and the ball pitch diameter. The rotational resistance can be increased by using a seal page 10 (accessories) see table 1:



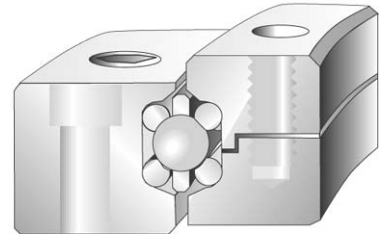
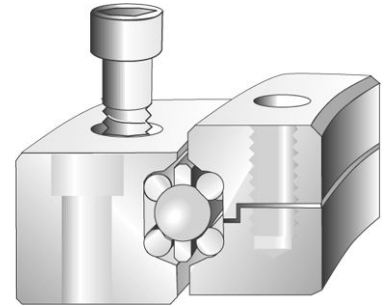
| KK Ø | 100 < 250 | 250 < 400 | 400 < 700 | 700 < 1000 | 1000 < 1600 |
|----------------------------|-----------|-----------|-----------|------------|-------------|
| Rotational resistance [Nm] | 1,0 | 1,5 | 3 | 4 | 5 |

Table 1: increase of rotational resistance per seal S10

- If the rotational resistance differs by more than 5 -10% from the measuring value given in the Franke catalogue the mounting procedure has to be made once again.
 - ☞ Mounting by means of washers: If the measured value differs please change the thickness of the washers and repeat the mounting procedure. We supply washers according to the screw diameter in diverse thicknesses.
- Grease the bearing via the provided lubrication holes (see chapter 4.2 “first lubrication, page 9).

3. Mounting of bearing assemblies

- First check the plane surfaces of the mating structure for evenness.
- Put the bearing assembly on the screw -on surface and put the fastening screws into the holes.
- Check the easy turning of the screws and the bore positions.
- Screw the bearing assembly on to the mating structure.
 - ☞ Observe the prescribed tightening torques (see chapter 5, page 11).



To be observed with slim bearings:

- ☞ Keep the axial preload dimensions. These dimensions must no differ by more than 0.02 mm referred to the total circumference of the bearing.

4. Lubrication and maintenance

4.1 Use of lubricants

- For long term lubrication you should use fully synthetic lubricants which have a higher aging resistance. We recommend the completely synthetical special grease “ISOFLEX TOPAS NCA 52” of make Klüber (DIN 51502:KHC 2 N-50).
- As an alternative you can use high-grade lithium soap greases based on polyalpha-olefin or on a mineral base respectively DIN 51825 K2K-40.
 - ☞ Take care that the lubricants are really suited for the case of application and the used materials (ball cage or seal).
- Where lubricants are mixed the compatibility of the different sorts has to be ensured. Pay attention to the type of basic oil, thickener, viscosity of the basic oil, and NLGI class. Please clear these questions directly with the producer of the lubricant, particularly in cases where the bearing has to work under extreme operating conditions.

4.2 First lubrication

The lubricant quantity is determined according to the free space inside the bearing assembly:

- Calculate the volume of the free space.
- Fill 20-30% of the calculated free space with lubricant via the provided lubrication bores.
- With slewing bearings 30 - 40% of the calculated free space is to be filled by the provided lubrication bores.

4.3 Re-lubrication, lubrication periods

- Re-lubricate the bearing at a normal operating temperature.
- During re-lubrication the bearing has to be turned.

Re-lubrication frequency:

The re-lubrication frequency depends on the application. The following table shows approximate values:

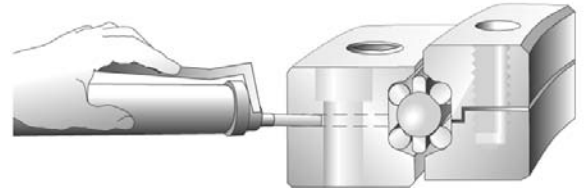
| Circumferential speed V_u [m/s] | Re-lubrication intervall [h] |
|-----------------------------------|------------------------------|
| 0 bis < 3 | 5000 |
| 3 bis < 5 | 1000 |
| 5 bis < 8 | 600 |
| 8 bis >10 | 200 |

Table 2: Re-lubrication period

Re-lubrication quantity:

After having defined the re-lubrication frequency, the re-lubrication quantity can be calculated according to the following formula:

$$m = KK\emptyset * h2 / 3 * x$$



- h2 = height of the bearing ring in mm
- KK∅ = Ball pitch diameter in mm
- m = re-lubrication quantity in g
- x = factor x in mm⁻¹ is found in table 3

| Relubrication | weekly | monthly | annually | every 2-3 years |
|-----------------------|--------|---------|----------|-----------------|
| x [mm ⁻¹] | 0,002 | 0,003 | 0,004 | 0,005 |

Table 3: factor re-lubrication quantity

Calculation example for re-lubrication period:

Bearing assemblies of series LDL, KK∅ 500 mm

Circumferential speed 3 m/s

Operation time approximately 16 hours per day.

Re-lubrication period for 3 m/s is 1000 h


1000 [h] / 16 [h/day] = 63 days ~ 3 months

Re-lubrication should be made every 3 months hence the factor x is rounded 0.003.

The dimension h2 is 42 mm (according to the catalogue).

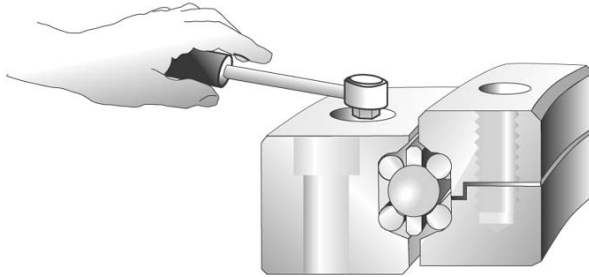
$m = 500 \text{ mm} * 42\text{mm} / 3 * 0.003 \text{ mm}^{-1} = 21 \text{ g}$

Hence the re-lubrication quantity amounts to 21 g after 3 months.

 Hint for the lubrication of toothed bearings: We recommend you an automatic lubrication device for the gear. With manual lubrication gear and pinion have to be lubricated manually before running in.

5. Screwed connections

- Tighten all the screws crosswise by means of a torque wrench according to the values found in table 4.
- Check the screws after about 100 operating hours for signs of settling. Re-tighten the screws if necessary.
- After that check the tightness of the screws every 600 operating hours. This period has to be reduced if there are particular operating conditions (e.g. vibrations).



| Screw size | Torque [Nm] | |
|------------|--------------------|---------------------|
| | strength class 8.8 | strength class 12.9 |
| M 6 | 10 | 17 |
| M 8 | 25 | 41 |
| M10 | 49 | 85 |
| M12 | 86 | 145 |
| M16 | 210 | 355 |

Table 4: Tightening torques



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