

Assembly Instructions

Ball screws

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1. Information about the document

These assembly instructions are intended for planners, developers and operators of systems who plan for and install linear ballscrews as machine elements. They are also intended for persons who perform the following tasks:

- Transportation
- Assembly
- Retrofitting or upgrading
- Setup
- Commissioning
- Operation
- Cleaning
- Maintenance
- Troubleshooting and error elimination

1.1 Applicability of these assembly instructions

These assembly instructions apply to all rolled, peeled and ground ballscrews from HIWIN.

1.2 Depictions used in these assembly instructions

1.2.1 Instructions

Instructions are indicated by triangular bullet points in the order in which they are to be carried out. Results of the actions carried out are indicated by ticks.

Example:

- ▶ Attach the fixed bearing firmly with bolts.
 - ▶ Tighten the bolts for the nut.
 - ▶ Move the application as close as possible to the supported bearing.
 - ▶ Attach the supported bearing firmly with bolts.
- ✓ The ballscrew with the bearing units has been mounted.

1.2.2 Lists

Lists are indicated by bullet points.

Example:

- ...
- Double nuts and preloaded single nuts must not be removed.
- Never remove recirculations.
- ...

1.2.3 Depiction of safety notices

Safety notices are always indicated using a signal word and sometimes also a symbol for the specific risk. In these instructions, the following signal words and risk levels are used:

 DANGER!
Imminent danger! Non-compliance with the safety notices will result in serious injury or death!
 WARNING!
Potentially dangerous situation! Non-compliance with the safety notices runs the risk of serious injury or death!
 CAUTION!
Potentially dangerous situation! Non-compliance with the safety notices runs the risk of slight to moderate injury!
ATTENTION!
Potentially dangerous situation! Non-compliance with the safety notices runs the risk of damage to property or environmental pollution!

1.2.4 Symbols used

The following symbols are used in these assembly instructions:

Table 1.1 **Warning signs**

	Warning of dangerous electrical voltage!		Warning! Danger of crushing!
	Warning of danger from suspended loads!		Substance hazardous to the environment!

1.2.5 Information

NOTE

Describes general information and recommendations.

2. Safety

WARNING!

This chapter serves to ensure the safety of everyone working with ballscrews and those who assemble, install, operate, maintain or disassemble them. Non-compliance with the following information results in dangerous working conditions.

2.1 Intended use

The ballscrew is a linear drive element, which converts a rotary movement into a lengthwise movement or vice versa and is used for the precise positioning in terms of time and location of fixed mounted loads, e.g. system components, within an automated system.

WARNING!

Danger of death and significant danger of injury from falling loads should the driveline components fail in vertical or sloping mounting positions!

- In the case of vertical assembly, provide a suitable clamping or braking device!

The ballscrews are designed for installation and operation in horizontal and vertical positions. **In the case of vertical or sloping assembly, a suitable clamping or braking device must be provided in order to prevent unintended lowering of the load.** Ballscrews can only be loaded in an axial direction. Radial loads result in uneven loading and may cause the ballscrew to fail prematurely.

Ballscrews may only be used for the intended purpose as described.

2.2 Exclusion of liability in the event of alterations and improper use

No alterations may be made to the ballscrews that are not described in these assembly instructions. If it is necessary to alter the design, please contact the manufacturer.

In the event of alterations or improper assembly, installation, commissioning, operation, maintenance or repair, the manufacturer shall assume no liability.

Only original parts from HIWIN may be used as spare parts and accessories. Spare parts and accessories not supplied by HIWIN are not checked for operation with HIWIN ballscrews and may restrict operational safety. The manufacturer shall accept no liability for damage caused as a result of using non-approved spare parts and accessories.

2.3 Qualified trained staff

The ballscrew may only be assembled, integrated into higher-level systems, commissioned, operated and maintained by qualified personnel. Qualified personnel are those who:

- have received appropriate technical training
and
- have received training from the machine operator concerning machine operation and the applicable safety guidelines,
and can assess the risks to be expected
and
- have read and understood these assembly instructions in their entirety and have access to them at all times.

2.4 General safety information

WARNING!

The following safety notices must be observed. Non-compliance with safety notices may endanger life and limb.

- Before and during all assembly, disassembly or repair work, the higher-level system must be disconnected from the power supply, and you must ensure that the power supply cannot be restored by anyone else. Otherwise, there is a danger of death and injury.
- During assembly and disassembly, the ballscrew must be transported horizontally. If this is not possible, a suitable holding device must be installed to prevent the ballscrew nut from coming off the ballscrew shaft.
- For long ballscrews, a hoist may be used for assembly.

2.5 Safety notices regarding storing the ballscrews

CAUTION!



Risk of crushing!

Lifting heavy loads may damage your health.

- ▶ Only remove transportation safety device upon assembly!

If the ballscrews are to be put into storage, they must be kept in their transport packaging. They must be stored in a dry location with protection from impact.

2.6 Safety notices regarding transporting the ballscrews

ATTENTION!

Damage caused by tilting or falling!

If no transportation safety device is used, the ballscrew may tilt or fall over.

- ▶ Before transport, secure the ballscrew to prevent tilting!

Use suitable hoists to lift the ballscrews. Observe the applicable occupational health and safety regulations when handling suspended loads.

When transporting long ballscrews, use support at various points so that they do not bend. Bending during transport permanently compromises the function and precision of the ballscrews.

2.7 Additional information

If you have any questions, please contact our sales organisation:

Tel.: +49 (0) 781 / 9 32 78-0

Fax: +49 (0) 781 / 9 32 78-90

If you have questions, suggestions or corrections concerning the documentation, please send a fax to the following number:

+49 (0) 781 / 9 32 78-90

3. Product descriptions

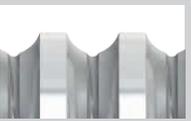
3.1 Design and function of the ballscrew

The ballscrew essentially consists of the ballscrew shaft, ballscrew nut and the balls located between the shaft and nut. The balls in the ballscrew nut run around the shaft in a closed circuit and thereby convert the rotary motion of the ballscrew shaft into a linear movement of the ballscrew nut or vice versa.

3.2 Ballscrew shafts

HIWIN offers rolled, peeled and ground ballscrews – depending on the application requirements. For the selection of the appropriate shaft the individual characteristics are listed in [Table 3.1](#).

Table 3.1 Procedure for the selection of a ballscrew

	Rolled	Peeled	Ground
Profile			
Manufacturing process	Forming process	Cutting process	Grinding process
Typical applications	Transportation	Transport and positioning	Positioning
Tolerance classes	T5 – T10	T5 + T7	T0 – T5
Nominal diameter [mm]	8 – 63	16 – 80	6 – 100
Max. shaft length¹⁾ [mm]	500 – 5,600	3,300 – 6,500	110 – 10,000
Nut shapes	Flange nut Cylindrical nut	Flange nut Cylindrical nut Double nut	Flange nut Cylindrical nut Double nut
Availability	From stock	From stock	Upon request

¹⁾ Depends on the diameter and the tolerance class

3.3 Ball recirculation systems

HIWIN ballscrews are available with three different recirculation systems.

The external recirculation system consists of the ball return tube and the clamping plate. The balls are placed in the ball track between the ballscrew shaft and nut. At the end of the nut, they are guided out of the ball track and back to the start via a return tube; ball circulation is therefore a closed circuit. Because the return line is outside the nut body, this type of return is known as an external recirculation system (see [Fig. 3.1](#)).

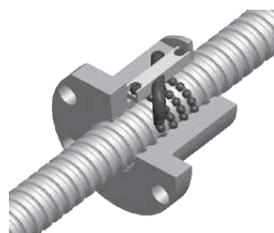


Fig. 3.1 External recirculation type nut with return tubes

An internal separate return is fitted with deflecting parts that return the balls to the start of their thread turn. The balls undertake just one circuit around the shaft. The circuit is closed by a deflecting part in the ballscrew nut and allows the balls to return to the start via the rear of the thread. The position of the ball deflection in the nut gives the internal single recirculation system its name (see Fig. 3.2).

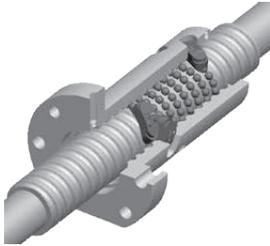


Fig. 3.2 **Internal single recirculation type nut with return caps**

The third type of return is the endcap recirculation system shown in Fig. 3.3. It has the same basic principle as the external return, however, the balls are returned via a channel in the ballscrew nut. The balls perform one complete cycle in the ballscrew nut. The endcap recirculation system is also called „internal total recirculation“.

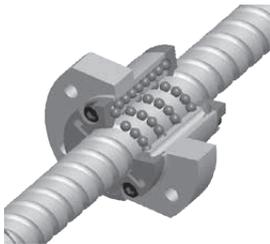


Fig. 3.3 **Endcap recirculation type nut with recirculation system**

4. Assembly

⚠ DANGER!



Danger of electrical voltage!

Before and during assembly, disassembly and repair work, dangerous currents may flow.

- ▶ Before carrying out work on the system, disconnect the power supply and protect it from being switched back on!

⚠ WARNING!



Danger from heavy loads!

Lifting heavy loads may damage your health.

- ▶ Use a hoist of an appropriate size when positioning heavy loads!
- ▶ Observe applicable occupational health and safety regulations when handling suspended loads!

4.1 Assembling the ballscrew

⚠ WARNING!

Danger of death and significant danger of injury from falling loads should the driveline components fail in vertical or sloping mounting positions!

- ▶ In the case of vertical assembly, provide a suitable clamping or braking device!

Ballscrews are delivered either fully assembled or with ballscrew nuts and shafts supplied separately. In order to avoid damaging the ballscrew, the following procedures must be adhered to.

- ▶ Only remove transport packaging directly before assembly.
- ▶ Only remove the transportation safety device from the nut after the ballscrew is assembled. If this isn't possible, ensure that the ballscrew nut does not run under from the ballscrew shaft. Even if the ballscrew nut only runs off the ballscrew shaft's thread at some points, there is a risk of balls coming out of the ballscrew nut and the function no longer being guaranteed.
- ▶ Ballscrews must be installed such that there are no radial or eccentric forces acting on the nut or shaft (e.g. by a lack of alignment between bearing and nut). Ballscrews are only suited to the transfer of axial forces.

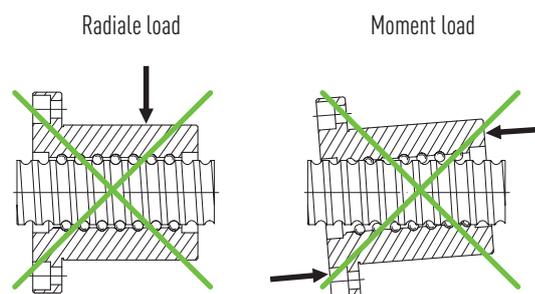


Fig. 4.1 **When installing the ballscrew, there must not be any radial or eccentric forces acting on the nuts or shafts**

- ▶ Limit switches and stops should be provided on the machine to prevent the stroke distance from being exceeded and therefore damage to the unit. During assembly the nut must not be screwed out beyond the end of the shaft without an auxiliary device (assembly tube).
- ▶ Heavy ballscrews in particular must not be placed on the nut.
- ▶ The recirculation units visible from the outside must not be damaged. The recirculation units may only be disassembled in the factory.
- ▶ During installation, ensure that dirt does not accumulate on the ballscrew. Chippings and other contaminants can be removed using petroleum, thin oil or white spirit. Paint solvents and cold cleaning solvents damage the ballscrews and must therefore not be used.
- ▶ Ballscrews must be aligned perfectly flush with the guide.

4.2 Assembling and disassembling ballscrew nut on ballscrew shaft

4.2.1 Disassembling nut from ballscrew shaft

ATTENTION!

Damage will result from balls being lost if the nut is disassembled without an assembly tube!

- ▶ Always use an assembly tube to hold the nut!

HIWIN ballscrews are generally supplied with the nut fitted. Should this have to be disassembled, please proceed as follows:

NOTE

- ▶ Double nuts and preloaded single nuts must not be removed.
- ▶ Never remove recirculations.
- ▶ Do not replace missing balls with new ones. All the balls in a ballscrew nut must always be replaced at the same time.
- ▶ An assembly tube is needed to hold the nut. The outer diameter of the assembly tube is 0.1 to 0.2 mm less than the core diameter of the thread. It is slightly longer than the nut.
- ▶ Place assembly tube on start of thread and unscrew nut according to thread direction towards assembly tube. The assembly tube prevents the balls from falling out of the nut. **The nut can now be pulled off the shaft with the assembly tube.**

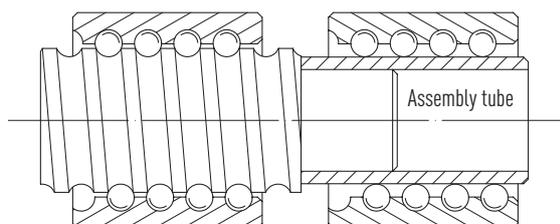


Fig. 4.2 Removing nut from shaft using assembly tube

4.2.2 Assembling nut on ballscrew shaft

The nut is assembled in reverse order. Force must not be applied, otherwise the nut will be damaged. The nut must be fully on the thread before the assembly tube is removed. Then move the nut onto the shaft by a distance of at least three times the nut length.

Only assemble the ballscrew nut with a suitable assembly tube. Inappropriate auxiliary devices may result in the entire ballscrew being damaged or destroyed. Unassembled ballscrew nuts are usually supplied on an assembly tube, which can be used for correct assembly. If a special assembly tube is needed, the outer diameter of this tube should be 0.1 – 0.2 mm smaller than the core diameter of the ballscrew. The assembly tube should be around 20 mm longer than the nut.

Assembling nuts with NBR or TPU wiper

Nuts with a NBR/TPU wiper have a sealing lip which has a sliding sealing effect. The wiper therefore very reliably prevents foreign objects from entering the nut and extends its life as a result. The sealing lip also greatly reduces the amount of lubricant which can escape via the thread groove.

The nut must be assembled correctly for the sealing lip to function properly. The following points should be observed otherwise the function of the sealing lip may be impaired.

Incorrect assembly may result in the ballscrew failing prematurely.

NOTE

Assembly

- ▶ The ballscrew shaft's thread should be bevelled, free of burrs and clean. Placing a small quantity of grease at the start of the thread or on the wiper makes assembly easier, protects the sealing lip and prevents damage.



Fig. 4.3 End of shaft before the NBR wiper is assembled

- ▶ Before assembly check that the two wipers are seated correctly in the nut. The wipers are aligned using a nose in the nut and must not protrude beyond the nut housing.



Fig. 4.4 Before assembly ensure that wipers are seated correctly

- ▶ Place assembly tube on face end of ballscrew shaft. This makes it easier for the nut to be aligned with the shaft. During assembly, the nut must be aligned concentrically and flush with the shaft.



Fig. 4.5 Nut – shaft alignment

- ▶ Slide nut to start of thread and screw onto ballscrew shaft with a little pressure and a rotating movement. The wiper is then in the correct position in the thread groove. It must be possible for the nut to be screwed onto the shaft with little effort. Screw nut up to end of shaft.
If the torque needed is considerably greater or if the nut jams, unscrew it and repeat the process.



Fig. 4.6 Screw nut with wiper onto shaft

- ▶ Slowly screw nut further onto shaft and use your finger or a suitable blunt tool to fix the wiper near the sealing lip (e.g. piping of a suitable diameter). This ensures that the sealing lip runs into the thread groove correctly.

Do not use tools with points or sharp edges otherwise there is a risk of damaging the sealing lip.

NOTE



Fig. 4.7 Fixing the wiper while slowly screwing nut onto shaft

- ▶ Screw nut all the way onto the shaft and move it back and forth at least 3 nut lengths. The nut must turn easily on the shaft. Check that both wipers are seated correctly.
- ▶ Before starting up, lubricate the ballscrew as described in the lubrication instructions.

4.2.3 Tolerance details and measuring methods for HIWIN ballscrews

Table 4.1 Radial runout t_5 of ballscrew shaft outer diameter related to AA' per length l_5 (measurement in accordance with DIN ISO 3408)

Nominal $\varnothing d_0$ [mm]		Reference length [mm]	Tolerance class l_{5p} [μm] for l_5							
above	up to		l_5	T0	T1	T2	T3	T4	T5	T7
6	12	80	16	20	23	25	25	32	40	80
12	25	160	16	20	23	25	25	32	40	80
25	50	315	16	20	23	25	25	32	40	80
50	100	630	16	20	23	25	25	32	40	80
100	200	1,250	16	20	23	25	25	32	40	80

l_1 / d_0		Tolerance class l_{5maxp} [μm] for $l_1 > 4l_5$							
above	up to	T0	T1	T2	T3	T4	T5	T7	T10
—	40	32	40	45	50	50	64	80	160
40	60	48	60	70	75	75	96	120	240
60	80	80	100	115	125	125	160	200	400
80	100	128	160	180	200	200	256	320	640

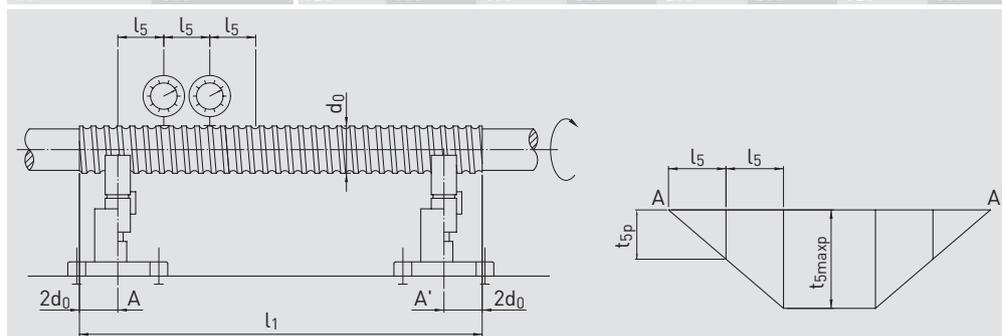


Table 4.2 Radial runout $t_{6,1}$ of bearing seat related to AA' per unit length l
(measurement in accordance with DIN ISO 3408)

Nominal $\varnothing d_0$ [mm]		Reference length [mm]	Tolerance class $t_{6,1p}$ [μm] for l							
above	up to	l	T0	T1	T2	T3	T4	T5	T7	T10
6	20	80	6	10	11	12	12	20	40	63
20	50	125	8	12	14	16	16	25	50	80
50	125	200	10	16	18	20	20	32	63	100
125	200	315	—	—	20	25	25	40	80	125

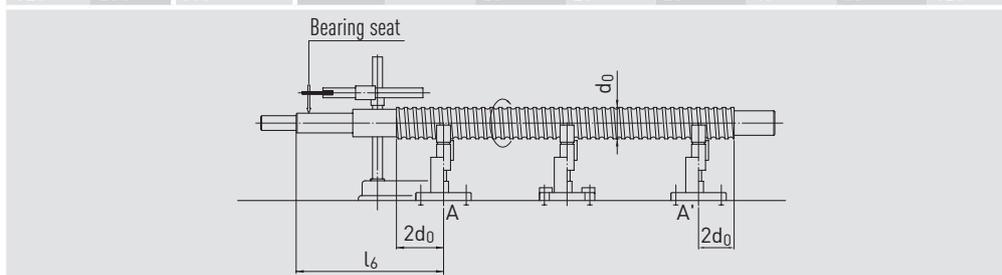


Table 4.3 Radial runout $t_{6,2}$ of bearing seat related to the centre line of the screw part
(measurement in accordance with DIN ISO 3408)

Nominal $\varnothing d_0$ [mm]		Tolerance class $t_{6,2p}$ [μm]			
above	up to	T0	T1	T3	T5
—	8	3	5	8	10
8	12	4	5	8	11
12	20	4	6	9	12
20	32	5	7	10	13
32	50	6	8	12	15
50	80	7	9	13	17
80	125	—	10	15	20

Table 4.4 Radial runout $t_{7,1}$ of journal diameter related to the bearing seat
(measurement in accordance with DIN ISO 3408)

Nominal $\varnothing d_0$ [mm]		Reference length [mm]	Tolerance class $t_{7,1p}$ [μm] for l							
above	up to	l	T0	T1	T2	T3	T4	T5	T7	T10
6	20	80	4	5	6	6	6	8	12	16
20	50	125	5	6	7	8	8	10	16	20
50	125	200	6	8	8	10	10	12	20	25
125	200	315	—	—	10	12	12	16	25	32

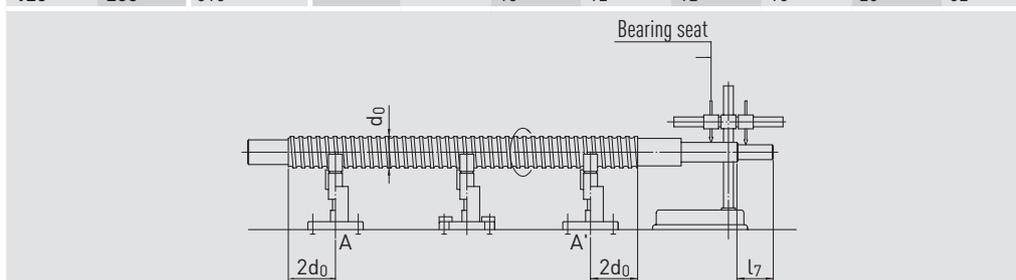


Table 4.5 Radial runout $t_{7,2}$ of the journal diameter related to the centre line of the bearing seat
(measurement in accordance with DIN ISO 3408)

Nominal $\varnothing d_0$ [mm]		Tolerance class $t_{7,2p}$ [μm]			
above	up to	T0	T1	T3	T5
—	8	3	5	8	10
8	12	4	5	8	11
12	20	4	6	9	12
20	32	5	7	10	13
32	50	6	8	12	15
50	80	7	9	13	17
80	125	—	10	15	20

Table 4.6 Radial runout $t_{8,1}$ of journal diameter related to the bearing seat
(measurement in accordance with DIN ISO 3408)

Nominal $\varnothing d_0$ [mm]		Tolerance class $t_{8,1p}$ [μm]							
above	up to	T0	T1	T2	T3	T4	T5	T7	T10
6	63	3	3	3	4	4	5	6	10
63	125	3	4	4	5	5	6	8	12
125	200	—	—	6	6	6	8	10	16

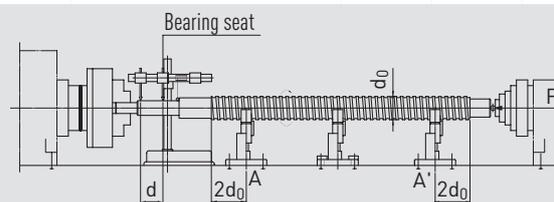


Table 4.7 Axial runout $t_{8,2}$ of the shaft faces related to the centre line of the screw shaft
(measurement in accordance with DIN ISO 3408)

Nominal $\varnothing d_0$ [mm]		Tolerance class $t_{8,2p}$ [μm]			
above	up to	T0	T1	T3	T5
—	8	2	3	4	5
8	12	2	3	4	5
12	20	2	3	4	5
20	32	2	3	4	5
32	50	2	3	4	5
50	80	3	4	5	7
80	125	—	4	6	8

Table 4.8 Axial runout t_{9p} of ballscrew nut location face related to AA' (for preloaded ballscrew nuts only) (measurement in accordance with DIN ISO 3408)

Flange diameter D_2 [mm]		Tolerance class t_{9p} [μm]							
above	up to	T0	T1	T2	T3	T4	T5	T7	T10
16	32	8	10	10	12	12	16	20	—
32	63	10	12	12	16	16	20	25	—
63	125	12	16	16	20	20	25	32	—
125	250	16	20	20	25	25	32	40	—
250	500	—	—	15	32	32	40	50	—

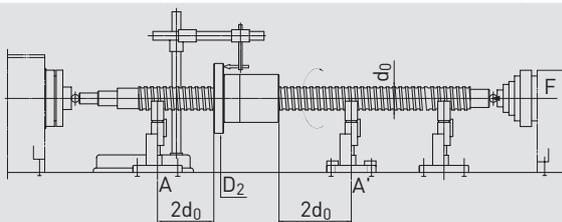


Table 4.9 Radial runout t_{10} of ballscrew nut location diameter related to AA' (for preloaded and rotating ballscrew nuts only) (measurement in accordance with DIN ISO 3408)

Outer diameter D_1 of ballscrew nut [mm]		Tolerance class t_{10p} [μm]							
above	up to	T0	T1	T2	T3	T4	T5	T7	T10
16	32	8	10	10	12	12	16	20	—
32	63	10	12	12	16	16	20	25	—
63	125	12	16	16	20	20	25	32	—
125	250	16	20	20	25	25	32	40	—
250	500	—	—	—	32	32	40	50	—

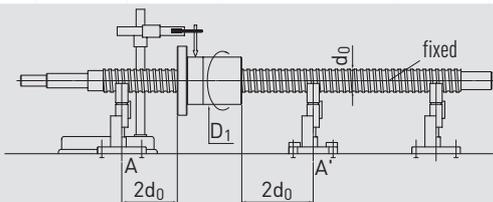
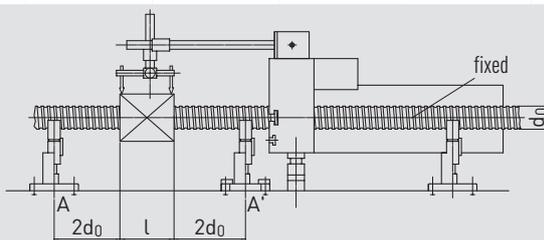


Table 4.10 Parallelism deviation t_{11} of rectangular ballscrew nut related to AA' (for preloaded ballscrew nuts only) (measurement in accordance with ISO 3408)

Tolerance class t_{11p} [μm] / 100 mm, cumulative							
T0	T1	T2	T3	T4	T5	T7	T10
14	16	16	20	20	25	32	—



4.3 Assembly of the bearing units

4.3.1 Requirements on the mounting surface

- Adequately stable and rigid
- Evenness $\leq 0,06$ mm
- Parallelism to the guiding system ≤ 0.06 mm
- Clean

4.3.2 Cleanliness requirements

Contamination may cause damage to the rolling bearing. Cleaning residue may contribute to contamination!

Measures for safeguarding cleanliness:

- ▶ Make sure the assembly workspace is clean.
- ▶ Clean the underlying surface.

Use only volatile solvents and lint free cloths for cleaning!

NOTE

Do not remove the bearing unit from the packaging until immediately prior to installation. The corrosion inhibitor on these components need not be removed.

NOTE

4.3.3 Requirements on the mounting surface

The separate components of the bearing units have been matched to each other and may not be removed: the bearings may otherwise suffer damage.

NOTE

When mounting the bearing units, make sure that sharp edges cannot damage the seals.

NOTE

The nominal tightening torques can be taken from the bearings' data sheets.

NOTE

- ▶ Install the ballscrew nut on the application, at the same time tightening the bolts only slightly.
- ▶ Using the circlip, secure the supported bearing to the ballscrew spindle (see Fig. 4.8).
- ▶ Using the locknut, secure the fixed bearing to the spindle's fixed bearing side, first tightening the locknut with double the nominal torque and then loosening the locknut after 10 min. Now tighten the locknut with the nominal torque.

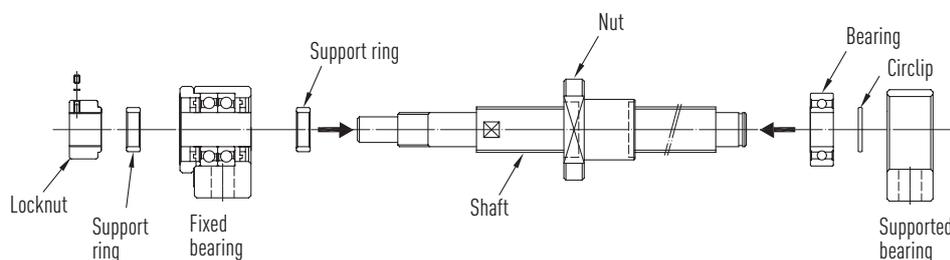


Fig. 4.8 Exploded view of the ballscrew with bearing units

The application moving over the linear guideway is used to align the bearing units.

NOTE

Assembly

- ▶ Move the application as close as possible to the fixed bearing (see Fig. 4.9).

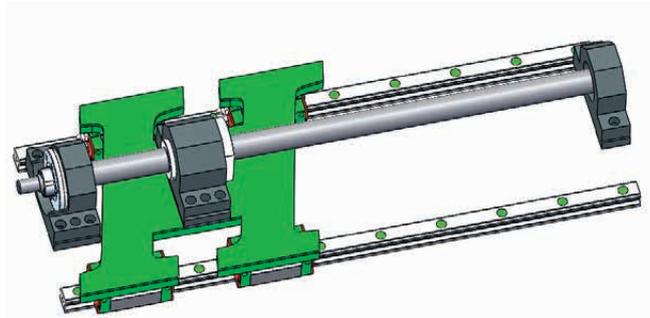


Fig. 4.9 Ballscrew at the left stop for aligning the fixed bearing

NOTE

The bearing unit is brought to the optimal radial position under the constraining forces exerted by the linear guideways (see Fig. 4.10).

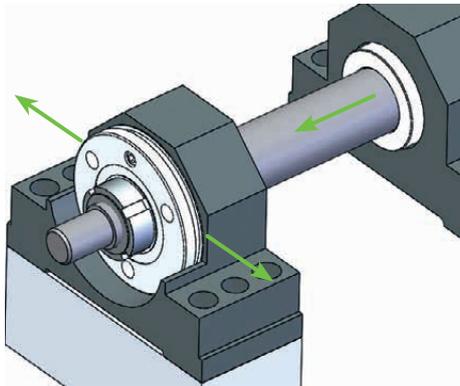


Fig. 4.10 Fixed bearing with applied constraining forces

- ▶ Attach the fixed bearing firmly with bolts.
- ▶ Tighten the bolts for the nut.
- ▶ Move the application as close as possible to the supported bearing.
- ▶ Attach the supported bearing firmly with bolts.

NOTE

It is recommended to lock all bolts.

NOTE

The locknut must be secured with the grub screw to prevent it coming loose.

The application should now allow movement over the full stroke under a constant force.

- ✓ The ballscrew with the bearing units has been mounted.

4.4 Mounting the separate bearings

4.4.1 Requirements on the mounting surface

- Adequately stable and rigid
- Observe the specified circularity of the bearing seat (IT 5)
- Unpainted
- Clean

4.4.2 Cleanliness requirements

Contamination may cause damage to the rolling bearing. Cleaning residue may contribute to contamination!

Measures for safeguarding cleanliness:

- Make sure the assembly workspace is clean
- Clean the bearing seat

Use only volatile solvents and lint free cloths for cleaning!

NOTE

Do not remove the bearing unit from the packaging until immediately prior to installation. The corrosion inhibitor on these components need not be removed.

NOTE

4.4.3 Mounting the bearing

Bear in mind when mounting the bearing that the pressing force acts only on the ring that is to be pressed in. No mounting forces may be transferred through the balls.

NOTE

In the case of tighter fits, the bearing should preferably be heated for easier pressing.

NOTE

The nominal tightening torque can be taken from the bearings' data sheet.

NOTE

- ▶ Using the locknut, secure the fixed bearing to the shaft's fixed bearing side, first tightening the locknut with double the nominal torque and then loosening the locknut after 10 min. Now tighten the locknut with the nominal torque.
- ▶ The bearing must lie over its whole surface on the plane face.
- ▶ Use support rings or clamps to lock the fixed bearing against loosening.
- ▶ Use circlips to lock the supported bearing against loosening.

✓ The bearing has been mounted.

4.4.4 Mounting the flange bearing

- ▶ Using the locknut, secure the flange bearing to the shaft's fixed bearing side, first tightening the locknut with double the nominal torque and then loosening the locknut after 10 min. Now tighten the locknut with the nominal torque.
- ▶ Press the fixed bearing into the bearing seat. Bolt the flange ring to the bearing seat, tightening the bolts only slightly. Adjustments can then still be made to the radial position.
- ▶ After aligning the shaft, tighten the screws proceeding in a crosswise fashion.

✓ The bearing has been mounted.

5. Maintenance

DANGER!



Danger of electrical voltage!

Before and during assembly, disassembly and repair work, dangerous currents may flow.

- ▶ Before carrying out work on the system, disconnect the power supply and protect it from being switched back on!

5.1 Cleaning

ATTENTION!

The legal regulations and the manufacturer's regulations concerning the use of cleaning agents must be observed.

- ▶ Damage to the profile rail by pointed objects must be avoided in all circumstances.
- ▶ When cleaning, please make sure that no metal particles end up or remain in the ballscrew.

- Ballscrews can be cleaned using white spirit and oil.
- Trichlorethylene or an equivalent cleaning agent can be used as a degreasing agent.
- In each case, the legal regulations and the manufacturer's regulations concerning the use of cleaning agents must be observed.
- In order to avoid corrosion, all parts must be dried and preserved/lubricated after cleaning.
- Damage to the ball track by pointed objects must be avoided in all circumstances.
- When cleaning, please make sure that no metal particles end up or remain in the ball track or ballscrew nut.

6. Lubrication

6.1 General information about lubrication

Ballscrews need a sufficient supply of lubricant to ensure their function and service life.

The specifications and information provided below are intended to help the user select an appropriate lubricant, the corresponding amount of lubricant and establish the lubrication intervals.

These lubrication instructions do not mean that the user does not have to check the defined lubrication intervals in reality and correct them if necessary. After every lubrication process check whether there is sufficient lubricant on the machine element (check for a film of lubricant).

Lubricants

- reduce wear
- protect against dirt
- prevent corrosion

The lubricant is a design element and should be taken into account when designing a machine. The operating temperature range and operating and ambient conditions should be considered when selecting the lubricant.

6.1.1 Safety

ATTENTION!

This chapter explains how to use lubricants safely. Improper handling of lubricants may endanger life and limb. It is essential that the following information is observed. Before handling lubricants, always note the associated safety data sheet.

6.1.2 Proper use of lubricants

Recurring contact with the skin over long periods should be avoided wherever possible. Clean wetted areas of skin with soap and water. Use skin protection during work and a moisturising cream afterwards. Wear oil-resistant protective clothing if necessary (e.g. gloves, apron). Do not clean your hands with petroleum, solvents or coolants that can be or are mixed with water. Oil mists must be extracted from their point of origin.

Wear safety goggles to avoid contact with the eyes. Should lubricants come into contact with the eyes, the areas affected should be rinsed with plenty of water. Seek the advice of an ophthalmologist if eyes feel irritated for long periods.

If swallowed by mistake, do not induce vomiting. Call the doctor immediately.

Safety data sheets in accordance with 91/155/EEC are generally available for lubricants. These contain detailed information about protecting your health and the environment and preventing accidents.

Lubricants are generally a risk to waterways. They must not therefore enter the ground, water or sewerage system.

6.1.3 Safety notices regarding storing lubricants

Store the lubricants in a cool and dry location in well-sealed containers. They should be protected from direct sunlight and frost. Lubricants must not be stored in the same place as foodstuffs. Lubricants must not be stored in the same place as oxidants.

The information in the safety data sheet provided by the lubricant manufacturer must be observed.

Lubrication

6.2 Lubrication provided upon delivery

HIWIN ballscrews are supplied preserved as standard. A mineral oil-based grease for rolling and slide bearings containing thickening agents in accordance with DIN 51825 (K2K), NLGI class 2 is used to preserve the ballscrews. Viscosity of base oil: 60 mm²/s. Initial lubrication should be undertaken before starting up for the first time (see section 6.7.1.1)

6.3 Selecting the lubricant

Oils, greases or even semi-fluid grease can be used. The lubricants that you would use for a rolling bearing can be used. The choice of lubricant and type of supply can usually be adjusted to the lubrication used for the rest of the machine components.

NOTE

Lubricants containing MoS₂ or graphite must not be used.

6.4 Miscibility

Check the miscibility of different lubricants. Mineral oil-based lubricant oils with the same classification (e.g. CL) and a similar viscosity (maximum of one class difference) can be mixed. Greases are miscible when their base oil and thickening types are the same. The viscosity of the base oil must be similar. The NLGI class may differ by no more than one stage. If lubricants other than those specified are used, shorter lubrication intervals and diminished performance should be expected. Potential chemical interactions between plastics, lubricants and preservatives must be expected.

Table 6.1 Miscibility of HIWIN greases

	G01	G02	G03	G04	G05
G01	●	●	●	○	○
G02	●	●	●	●	●
G03	●	●	●	●	●
G04	○	●	●	●	●
G05	○	●	●	●	●

Table 6.2 Compatibility of preserved products with HIWIN greases

	G01	G02	G03	G04	G05
Standard ballscrews	○	●	●	●	●
Heavy-duty ballscrews	●	●	●	○	○

- miscible
- partly miscible

Recommendation:

Using lubricants, which are only partially miscible, the old grease should be used up as much as possible before the new grease is introduced. The relubrication quantity of the new grease should be temporarily increased. Using lubricants, which are immiscible, the old grease should be removed completely before the new grease is introduced.

6.5 Operating conditions

The choice of lubricant basically depends on operating temperature and various operating factors, such as level of loading, oscillations, vibrations or short-stroke applications. Special requirements, such as use in conjunction with strong or aggressive media applications, in clean rooms, in a vacuum or in the food industry are also taken into consideration.

Applications and suitable lubricants are listed in chapter 6.8. If in any doubt, contact the lubricant manufacturer to ensure optimum lubrication.

6.6 Use of greases and oils in central lubrication systems

When using a central lubrication system, it is recommended that the initial lubrication (see section 6.7.1.1) is carried out separately using a manual grease gun before connection to the system. Furthermore, make sure that all pipes and elements up to the user are filled with lubricant and that no air pockets are present.

Long pipelines and narrow pipe diameters are to be avoided. The pipes are to be installed on an incline.

The pulse count results from the partial quantities and the piston distributor sizes.

In addition, the lubrication system manufacturer's regulations must be observed.

6.7 Lubricating ballscrews

HIWIN ballscrews can be lubricated with grease, semi-fluid grease or oil depending on the application. The lubricant pressure required depends on the nominal diameter, lubricant, length of the feed pipe and the type of lubrication connection.

Too high a lubrication pressure or too great a lubricant quantity may destroy the ballscrews.

NOTE

In particular, for ballscrew nuts with felt or lip sealing, lubrication must be carried out very carefully, otherwise the seals may be damaged.

6.7.1 General information about lubricant quantities

6.7.1.1 Initial lubrication upon commissioning

HIWIN ballscrews are supplied preserved as standard. The initial lubrication takes place in three steps:

Supply the amount of grease stated for the range in the table. Move the nut three times by approx. three nut lengths. Repeat the aforementioned process twice more.

Initial lubrication for short-stroke applications:

Stroke $< 2 \times$ nut length: Provide lubricant connections on both sides of the nut and lubricate.

Stroke $< 0.5 \times$ nut length: Provide lubricant connections on both sides of the nut and lubricate. In doing so, move the ballscrew nut by two nut lengths several times. If this is not possible, please contact us.

The quantities stated in the corresponding tables should be doubled for short-stroke applications.

If nuts do not have a lubricant connection, supply via the shaft.

6.7.1.2 Relubrication

The lubrication intervals depend heavily on the operating conditions (nominal size, lead, speed, acceleration, loads, etc.) and environmental conditions (temperature, fluids etc.). Environmental influences such as high loads, vibrations and dirt shorten the lubrication intervals. For clean environmental conditions and light loads, the lubrication intervals can be extended.

If the ballscrews are fitted vertically, the relubrication quantities must be increased by roughly 50 %.

For normal operating conditions, the lubrication intervals provided shall apply.

Twice the amount of lubricant should be used for relubrication with short-stroke applications.

Lubrication

6.8 Lubricant recommendations

The choice of lubricant basically depends on operating temperature and various operating factors, such as level of loading, oscillations, vibrations or short-stroke applications. Special requirements, such as use in conjunction with strong or aggressive media applications, in clean rooms, in a vacuum or in the food industry are also taken into consideration.

Applications and suitable lubricants are listed below. If in any doubt, contact the lubricant manufacturer to ensure optimum lubrication.

6.8.1 Grease lubrication

For grease lubrication, we recommend mineral oil-based grease for rolling and slide bearings with thickening agents in accordance with DIN51825 (K1K, K2K). EP additives are needed for heavy-duty applications (KP1K, KP2K). NLGI class 1 or 2 and other consistency classes can be used following consultation with the lubricant manufacturer.

NOTE

Greases containing solid lubricants such as graphite or MOS_2 must not be used.

The following lubricant details are examples and should only be used to assist with selection. Other lubricants can be used once the application has been discussed with the lubricant supplier.

6.8.1.1 Standard applications

Load: max. 15 % of the dynamic load rating

Temperature range: $-10\text{ }^\circ\text{C}$ to $+80\text{ }^\circ\text{C}$

Specific speed value: $< 120,000$

Table 6.3 Greases recommended for standard applications

HIWIN	G05
Klüber	MICROLUBE GL-261
Mobil	Mobilux EP1
Fuchs Lubritech	Lagermeister BF2
Lubcon	TURMOGREASE CAK 2502

6.8.1.2 Heavy-duty applications

Load: max. 50 % of the dynamic load rating

Temperature range: $0\text{ }^\circ\text{C}$ to $+80\text{ }^\circ\text{C}$

Specific speed value: $< 120,000$

Table 6.4 Greases recommended for heavy-duty applications

HIWIN	G01
Klüber	Klüberlub BE 71-501
Fuchs Lubritech	Lagermeister EP2
Lubcon	TURMOGREASE Li 802EP

6.8.1.3 Clean room applications

Load: max. 50 % of the dynamic load rating

Temperature range: -10 °C to + 80 °C

Specific speed value: < 120,000

Table 6.5 Greases recommended for clean room applications

HIWIN	G02
Klüber	Klüberalfa HX 83-302
Fuchs Lubritech	gleitmo 591

6.8.1.4 Clean room applications at high speeds

Load: max. 50 % of the dynamic load rating

Temperature range: -10 °C to + 80 °C

Specific speed value: > 120,000

Table 6.6 Greases recommended for clean room applications at high speeds

HIWIN	G03
Klüber	Isoflex Topas NCA52

6.8.1.5 Applications at high speeds

Load: max. 50 % of the dynamic load rating

Temperature range: -10 °C to + 80 °C

Specific speed value: > 120,000

Table 6.7 Greases recommended for applications at high speeds

HIWIN	G04
Klüber	Isoflex NCA15
Lubcon	TURMOGREASE Highspeed L252

6.8.1.6 Foodstuff applications in accordance with USDA H1

Load: max. 15 % of the dynamic load rating

Temperature range: -10 °C to + 80 °C

Specific speed value: < 120,000

Table 6.8 Greases recommended for foodstuff applications in accordance with USDA H1

Klüber	Klübersynth UH1 14-151
Mobil	Mobilgrease FM102
Fuchs Lubritech	GERALYN 1

6.8.2 Semi-fluid grease lubrication

Semi-fluid greases are often used in central lubrication systems because their soft structure allows them to be better distributed.

Observe the information provided by the lubrication system manufacturer.

The following lubricant details are examples and should only be used to assist with selection. Other lubricants can be used once the application and central lubrication system used have been discussed with the lubricant supplier.

In addition, the lubrication system manufacturer's regulations must be observed.

6.8.2.1 Standard applications

Load: max. 15 % of the dynamic load rating

Temperature range: -10 °C to + 80 °C

Specific speed value: < 120,000

Table 6.9 Semi-fluid greases recommended for standard applications

Klüber	MICROLUBE GB 00
Mobil	Mobilux EP004
Fuchs Lubritech	GEARMASTER LI 400

6.8.2.2 Heavy-duty applications

NOTE

We recommend contacting a lubricant manufacturer for advice on using semi-fluid greases for heavy-duty applications.

6.8.2.3 Clean room applications/vacuum

NOTE

We recommend contacting a lubricant manufacturer for advice on using semi-fluid greases for clean room applications/vacuum.

6.8.2.4 Applications at high speeds

Load: max. 50 % of the dynamic load rating

Temperature range: -10 °C to + 80 °C

Specific speed value: > 120,000

Table 6.10 Semi-fluid greases recommended for applications at high speeds

Klüber	Isoflex Topas NCA5051
Mobil	Mobilux EP004
Fuchs Lubritech	GEARMASTER LI 400

6.8.2.5 Foodstuff applications in accordance with USDA H1

Load: max. 15 % of the dynamic load rating

Temperature range: -10 °C to + 80 °C

Specific speed value: < 120,000

Table 6.11 Semi-fluid greases recommended for foodstuff applications in accordance with USDA H1

Klüber	Klübersynth UH1 14-1600
Mobil	Mobilgrease FM 003
Fuchs Lubritech	GERLYNN 00

6.8.3 Oil lubrication

The benefits of lubricating oils include more even distribution and better access to contact points. This does however mean that lubricating oils collect in the lower part of the product due to the force of gravity and get dirty more quickly. Larger amounts of oil are therefore needed than grease. Oil lubrication is usually only suited to use with central lubrication units or products fitted with a lubrication unit.

Observe the information provided by the lubrication system manufacturer.

The following lubricant details are examples and should only be used to assist with selection. Other lubricants can be selected once the application and central lubrication system used have been discussed with the lubricant supplier.

6.8.3.1 Standard applications

Load: max. 15 % of the dynamic load rating

Temperature range: -10 °C to + 80 °C

Specific speed value: < 120,000

Table 6.12 Oils recommended for standard applications

Klüber	Klüberoil GEM 1-150 N
Mobil	Mobilgear 630
Fuchs Lubritech	GEARMASTER CLP 320

6.8.3.2 Heavy-duty applications

We recommend contacting a lubricant manufacturer for advice on using oils for heavy-duty applications.

NOTE

6.8.3.3 Clean room applications

Load: max. 50 % of the dynamic load rating

Temperature range: -10 °C to + 80 °C

Specific speed value: < 120,000

Table 6.13 Oils recommended for clean room applications

Klüber	Tyreno Fluid E-95 V
Mobil	Mobilgear 626

6.8.3.4 Applications at high speeds

Load: max. 50 % of the dynamic load rating

Temperature range: -10 °C to + 80 °C

Specific speed value: > 120,000

Table 6.14 Oil recommended for applications at high speeds

Klüber	Klüberoil GEM 1-46 N
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Lubrication

6.8.3.5 Foodstuff applications in accordance with USDA H1

Load: max. 15 % of the dynamic load rating

Temperature range: -10 °C to +80 °C

Specific speed value: < 120,000

Table 6.15 **Oil recommended for foodstuff applications in accordance with USDA H1**

Klüber	Klüberoil 4 UH1-68 N
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6.8.4 HIWIN lubricants

6.8.4.1 HIWIN greases

Table 6.16 Overview of HIWIN greases

Grease type	Application	Article number		
		Cartridge 70 g	Cartridge 400 g	Can 1 kg
				
G01	Heavy-duty applications	20-000335	20-000336	20-000337
G02	Clean room applications	20-000338	20-000339	20-000340
G03	Clean room applications at high speeds	20-000341	20-000342	20-000343
G04	Applications with high speeds	20-000344	20-000345	20-000346
G05	Standard grease	20-000347	20-000348	20-000349

Table 6.17 HIWIN grease guns

Article no.	Description	Scope of delivery	Comment
5-12-0009	Grease gun GN-80M incl. set of lubrication adapter and nozzles (see Fig. 6.1)	Grease gun GN-80M consisting of: <ul style="list-style-type: none"> ○ Grease gun ○ Hydraulic coupling A1 suitable for conical grease nipples acc. to DIN 71412, outer diameter 15 mm ○ Hollow mouthpiece A2 suitable for conical or ball grease nipples acc. to DIN 71412/DIN 3402, outer diameter 10 mm ○ Set of lubrication adapter and nozzles 	Suitable for 70 g cartridge or direct filling
5-12-0010	Grease gun GN-400C incl. set of lubrication adapter and nozzles (see Fig. 6.2)	Grease gun GN-400-C consisting of: <ul style="list-style-type: none"> ○ Grease gun ○ Hydraulic coupling A1 suitable for conical grease nipples acc. to DIN 71412, outer diameter 15 mm ○ Hollow mouthpiece A2 suitable for conical or ball grease nipples acc. to DIN 71412/DIN 3402, outer diameter 10 mm ○ Set of lubrication adapter and nozzles 	Suitable for 400 g cartridge or direct filling
5-12-0035	Set of lubrication adapter and nozzles(see Fig. 6.3)	Set of lubrication adapter and nozzles consisting of: <ul style="list-style-type: none"> ○ Hollow mouthpiece A3 suitable for ball grease nipples acc. to DIN 3402, outer diameter 6 mm ○ Ball type mouthpiece A4 for funnel type grease nipples acc. to DIN 3405 outer diameter 6 mm ○ Tip mouthpiece A5 ○ Tip mouthpiece angled A6 	

Lubrication



Fig. 6.1 Grease gun GN-80M



Fig. 6.2 Grease gun GN-400C



Fig. 6.3 Set of lubrication adapter and nozzles

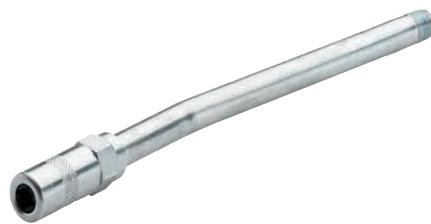


Fig. 6.4 A1 - Hydraulic coupling



Fig. 6.5 A2 - Hollow mouthpiece 10 mm



Fig. 6.6 A3 - Hollow mouthpiece 6 mm



Fig. 6.7 A4 - Ball type mouthpiece 6 mm

Table 6.18 Overview of grease nipples and recommended adapters for grease gun

	Grease nipple	Article number	Recommended adapter for grease gun
	Ball-type grease nipple		
	M3	20-000275	A2, A3 ¹⁾
	Conical grease nipple		
	M6 × 0.75 P	20-000278	A1, A2 ¹⁾
	M6 × 1	20-000279	A1, A2 ¹⁾
	1/8 PT	20-000280	A1, A2 ¹⁾
	Funnel-type grease nipple		
	M3	20-000370	A4
	M6	20-000328	A4

¹⁾ optional for limited installation space

6.9 Lubricant quantities and lubrication intervals

ATTENTION!

Never commission ballscrews without initial lubrication.

In general, if lubricant quantities or lubrication pressure are too high, this can damage or destroy the product. The specified procedure must be observed in order to avoid damaging the product.

The lubricant quantities specified below are reference values that may fluctuate according to the environmental conditions.

6.9.1 Lubricant quantities and lubrication intervals for grease lubrication

Table 6.19 Lubricant quantities for grease lubrication

Nominal diameter × lead with type of recirculation	Single nut		Double nut	
	Lubricant quantity for initial lubrication [cm ³]	Lubricant quantity for relubrication [cm ³]	Lubricant quantity for initial lubrication [cm ³]	Lubricant quantity for relubrication [cm ³]
8 × 2.5	0.05 (3 ×)	0.1	—	—
10 × 2.5	0.1 (3 ×)	0.1	—	—
10 × 4	0.1 (3 ×)	0.2	—	—
12 × 4	0.1 (3 ×)	0.2	—	—
16 × 5	0.2 (3 ×)	0.4	0.8 (3 ×)	1.6
16 × 10K3	0.4 (3 ×)	0.8	—	—
16 × 16K2	0.3 (3 ×)	0.6	—	—
20 × 5T4	0.4 (3 ×)	0.8	0.9 (3 ×)	1.8
20 × 10K3	0.3 (3 ×)	0.6	—	—
20 × 20K2	0.5 (3 ×)	1.0	—	—
25 × 5T4	0.6 (3 ×)	1.2	1.3 (3 ×)	2.2
25 × 10K4	0.6 (3 ×)	1.2	—	—
25 × 10T3	0.7 (3 ×)	1.4	1.0 (3 ×)	2.0
25 × 25K2	0.8 (3 ×)	1.6	—	—
32 × 5T5	0.9 (3 ×)	1.8	1.7 (3 ×)	2.7
32 × 10K5	1.5 (3 ×)	2.0	—	—
32 × 10T4	3.5 (3 ×)	4.0	6.5 (3 ×)	9.0
32 × 20K3	1.5 (3 ×)	2.0	—	—
32 × 20T2	3.5 (3 ×)	4.0	7.5 (3 ×)	11.0
32 × 32K2	2.0 (3 ×)	3.0	—	—
40 × 5	1.5 (3 ×)	2.0	2.5 (3 ×)	4.0
40 × 10K4	3.0 (3 ×)	4.0	—	—
40 × 10T4	5.0 (3 ×)	7.5	9.5 (3 ×)	15.0
40 × 20K3	4.5 (3 ×)	5.5	—	—

Table 6.19 Lubricant quantities for grease lubrication (continued)

Nominal diameter × lead with type of recirculation	Single nut		Double nut	
	Lubricant quantity for initial lubrication [cm ³]	Lubricant quantity for relubrication [cm ³]	Lubricant quantity for initial lubrication [cm ³]	Lubricant quantity for relubrication [cm ³]
40 × 20T2	5.0 (3 ×)	7.5	10.0 (3 ×)	16.0
40 × 40K2	5.0 (3 ×)	7.5	—	—
50 × 5	1.5 (3 ×)	2.0	3.5 (3 ×)	5.0
50 × 10K6	5.5 (3 ×)	7.5	—	—
50 × 10T4	5.5 (3 ×)	7.5	11.5 (3 ×)	18.0
50 × 20K5	8.5 (3 ×)	12.0	—	—
50 × 20T3	8.5 (3 ×)	12.0	15.0 (3 ×)	22.0
50 × 40K3	8.5 (3 ×)	12.0	—	—
63 × 10	9.0 (3 ×)	15.0	17.0 (3 ×)	25.0
63 × 20T4	17.0 (3 ×)	25.0	30.0 (3 ×)	45.0
63 × 20T5	21.0 (3 ×)	30.0	—	—
63 × 20K6	35.0 (3 ×)	52.0	—	—
80 × 10	12.0 (3 ×)	18.0	20.0 (3 ×)	30.0
80 × 20T4	22.0 (3 ×)	33.0	37.0 (3 ×)	55.0
80 × 20T5	25.0 (3 ×)	37.0	—	—
80 × 10K5	40.0 (3 ×)	60.0	—	—
80 × 20K7	45.0 (3 ×)	68.0	—	—

Relubrication interval for grease lubrication

The relubrication intervals for grease lubrication under standard conditions are between 200 and 600 hours of operation or 100 km in a clean environment (reference values).

Standard conditions:

Load ratio: max. 20 % of the dynamic load rating

Temperature range: -10 °C to + 80 °C

Specific speed value: < 120,000

No impacts or vibrations

Deviating conditions and dirt reduce the relubrication intervals.

6.9.2 Lubricant quantities and lubrication intervals for semi-fluid grease lubrication

When using a central lubrication system, it is recommended that the initial lubrication is carried out separately using a manual grease gun before connection to the system.

Furthermore, make sure that all pipes and elements up to the user are filled with lubricant and that no air pockets are present. Long pipelines and narrow pipe diameters are to be avoided. The pipes are to be installed on an incline. The pulse count results from the partial quantities and the piston distributor sizes.

In addition, the lubrication system manufacturer's regulations must be observed.

Lubricant quantities for semi-fluid grease lubrication:

The quantities for lubrication with semi-fluid grease are identical to those for grease lubrication.

Relubrication interval for semi-fluid grease lubrication:

The relubrication intervals for semi-fluid grease lubrication are reduced to 50 % of the relubrication intervals for grease lubrication (period between two lubrications).

Piston distributor sizes for feed units (single-line systems) for semi-fluid grease lubrication

The interval between the individual lubrication pulses results from the relubrication quantity, the relubrication interval and the piston distributor size:

$$\text{Interval between lubrication pulses [km]} = \frac{\text{Piston distributor size [cm}^3\text{]}}{\text{Relubrication quantity [cm}^3\text{]}} \times \text{Relubrication interval [km]}$$

6.9.3 Lubricant quantities and lubrication intervals for oil lubrication

When using a central lubrication system, make sure that all pipes and elements up to the user are filled with lubricant and that no air pockets are present. Long pipelines and narrow pipe diameters are to be avoided. The pipes are to be installed on an incline.

The pulse count results from the partial quantities and the piston distributor sizes. In addition, the lubrication system manufacturer's regulations must be observed.

Table 6.20 Lubricant quantities for oil lubrication

Nominal diameter [mm]	Initial lubrication	Relubrication
	Partial oil quantity [cm ³]	Oil quantity [cm ³]
8	0.2 (3 ×)	0.1
10	0.2 (3 ×)	0.1
12	0.2 (3 ×)	0.1
16	0.3 (3 ×)	0.2
20	0.3 (3 ×)	0.3
25	0.5 (3 ×)	0.5
32	0.5 (3 ×)	0.5
40	0.9 (3 ×)	0.7
50	1.1 (3 ×)	1.0
63	2.0 (3 ×)	1.5
80	3.0 (3 ×)	2.0

Oil bath lubrication:

If using oil bath lubrication, the shaft should be 0.5 to 1 mm above the oil level.

Relubrication interval for oil lubrication:

The relubrication intervals for oil lubrication should not exceed 8 hours with the oil quantity stated above.

Piston distributor sizes for feed units (single-line systems) for semi-fluid oil lubrication

The interval between the individual lubrication pulses results from the relubrication quantity, the relubrication interval and the piston distributor size:

$$\text{Interval between lubrication pulses [km]} = \frac{\text{Piston distributor size [cm}^3\text{]}}{\text{Relubrication quantity [cm}^3\text{]}} \times \text{Relubrication interval [km]}$$

7. Incident procedures

7.1 Troubleshooting and error elimination

This chapter explains potential ballscrew malfunctions and how to avoid them. It also introduces several measuring devices which allow the user to localise the causes of excess clearance.

7.2 Causes of errors and error prevention

The main sources of error can be split into four categories:

7.2.1 Excess play

No preload or insufficient preload:

If the ballscrew is held vertically and the nut can be pulled down under its own weight and rotated around the shaft, the ballscrew has play or is slightly preloaded. Ballscrews without preload may have significant axial backlash; they are therefore used in applications which do not primarily require high accuracy levels.

HIWIN establishes the preload needed for the application and supplies the ballscrew with the necessary preload. A detailed and accurate description of the usage conditions is therefore very important for HIWIN ballscrew orders.

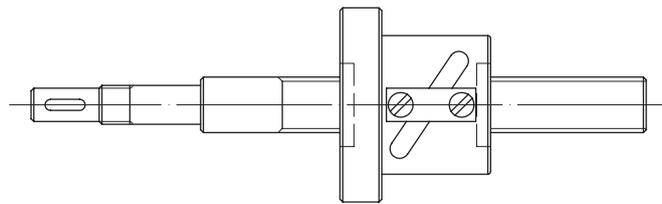


Fig. 7.1 Structure of a ballscrew

The following measurements can be taken to establish the reason behind abnormal play in the ballscrew:

1. Glue ball gauge in central hole at one end of ballscrew shaft. Use a dial gauge to measure the axial backlash of the ball gauge as you rotate the ballscrew shaft. (Fig. 7.2 (a)). It should not move any more than 0.003 mm if the bearing, ballscrew nut and nut housing are fitted correctly.
2. Use a dial gauge to measure the relative movement between the bearing housing and bearing seat as you rotate the ballscrew shaft (Fig. 7.2 (b)). Any measurement other than zero shows that the bearing is either not rigid enough or incorrectly mounted.
3. Check relative movement between machine bed and housing of ballscrew nut (Fig. 7.2 (c)).
4. Check relative movement between housing of ballscrew nut and flange (Fig. 7.2 (d)).

Contact HIWIN if the tests described do not yield anything but play is still present. The preload or rigidity of the ballscrew may have to be increased.

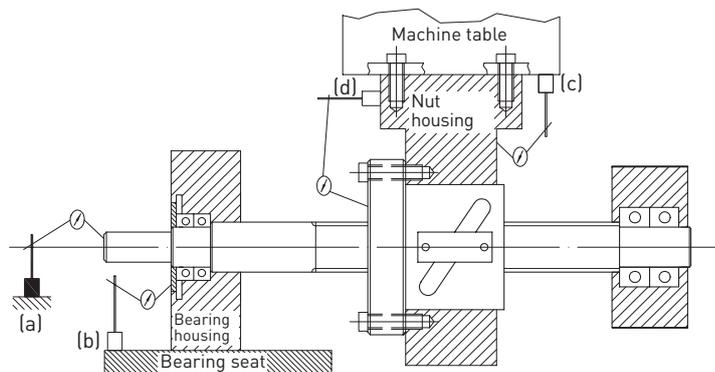


Fig. 7.2 Establishing reason for abnormal play

7.2.2 Excess torsional deformation

1. Incorrect choice of material:

Table 7.1 is an overview of the materials to be used in ballscrews for shafts and nuts.

Table 7.1 **Material**

	Material numbers according to DIN EN 10027		
Component	Rolled ballscrews	Peeled ballscrews	Ground ballscrews
Shaft	1.1213	1.1213 1.7225	1.7228
Nut ¹⁾		1.6523 ¹⁾	
Ball		1.3505	

¹⁾ Special nuts 16MnCr5B

2. Incorrect heat treatment:

Depth of heat-treated layer too shallow, uneven surface heat treatment, material too soft: The standard hardnesses for balls, nuts and shafts are listed in Table 7.2.

Table 7.2 **Standard hardnesses**

	Hardness
Shaft	58 – 62 HRC
Nut	58 – 62 HRC
Ball	62 – 66 HRC

3. Design errors, ratio of length to diameter too large etc.:

The smaller the ratio of shaft length to diameter (L/D figure), the greater the rigidity. The recommended L/D figure is less than 60. Too high an L/D figure may result in significant torsional deformation. Wherever possible, assembly with bearings on one side should be avoided.

4. Incorrect choice of bearings:

Ballscrews should be mounted with angular ball bearings; angular ball bearings designed especially for ballscrews are recommended in particular. When axial loads occur, normal ball bearings display considerable axial backlash; such bearings should not therefore be used for applications with axial loads.

5. Nut housing or bearing housing is not rigid enough

The housing mounted on the ballscrew nut or on a bearing may twist under the weight of the components or machine load if not rigid enough. The test structure shown in Fig. 7.2 (d) can be used to test the rigidity of the nut housing. Similar test structures can be used to test the rigidity of bearing housings.

6. Nut housing or bearing housing is not mounted correctly

- Vibration or a lack of dowel pins may cause the components to come loose. Fixed dowel pins and not clamping pins should be used to lock.
- The screw connection on the ballscrew nut is not secure because the screws are too long and/or the threaded holes on the housing are too short.
- Vibration and a lack of circlips causes the screws on the ballscrew nut to come loose.

7. Housing surface is not parallel or flat enough

When the machine is assembled, spacers are often fitted between the housing and machine frame for adjustment. The dimensions of the mounting surface may vary at different points if the surface parallelism or evenness of the components is not within tolerance.

Incident procedures

8. Motor and ballscrew are not fitted correctly

- If the coupling is not fitted securely or is not rigid enough, relative rotation results between the motor shaft and ballscrew shaft.
- Gear teeth do not mesh correctly or the driveline is not rigid enough. If the ballscrew is driven by a belt, a toothed belt should be used to avoid slipping.
- Feather key is loose in groove. Any incorrect combination of shaft, groove and feather key may cause play.

7.2.3 Uneven running

1. Production-related defects on ballscrew

- The race profile on the ballscrew shaft or nut is too rough.
- The bearing balls, ballscrew nut or shaft are out of round.
- The lead or lead circle diameter of ballscrew nut or shaft are outside tolerance.
- The ball return is not correctly fitted in the ballscrew nut.
- Uneven ball size or hardness.

These problems should not arise with high-quality manufacturers.

2. Foreign objects in ball race profile

- Packaging material jammed in ball race profile. Before being shipped, ballscrews are packaged with various packaging materials and oil paper. These materials and other objects may jam in the ball race profile if care is not exercised when assembling and aligning the ballscrew. This may cause the balls to slide rather than roll or even jam completely.
- Machine chips enter the ball track. Chips or dust from machine operations may enter the ball track if wipers are not used to keep items away from the ballscrew's race profiles. This causes uneven running, reduced accuracy and a shortened life.

3. Operation beyond the maximum useful path

Travel beyond the maximum useful path may damage or even destroy the recirculation system. If this happens, the balls are no longer able to circulate evenly. In the worst cases, they may break and the race profile on the ballscrew shaft or nut be damaged. Operation beyond the maximum useful path may occur when setting up, as a result of limit switch failure or due to collisions in the machine. To avoid further damage, after exceeding the path, a ballscrew must be checked and repaired by the manufacturer before being used again.

4. Ball return damaged

The ball return may be damaged and cause the problems described above if it experiences severe impact during assembly.

5. Incorrect alignment

If the axles of the ballscrew nut housing and the shaft bearing don't fully match, radial load occurs. The ballscrew may bend if the load is excessive. Even if the axle error is so minor as to cause no discernible bending, it will still cause increased wear. If incorrectly aligned, the ballscrew accuracy will quickly deteriorate. The greater the ballscrew nut preload, the greater the need for the ballscrew to be accurately aligned.

6. Ballscrew nut not correctly mounted on housing

If the ballscrew nut is mounted at an angle or poorly aligned, eccentric loads occur. If this happens, the motor input current may fluctuate during operation.

7. Transport damage to ballscrew

7.2.4 Breakage

1. Broken ball

Cr-Mo steel is the material most commonly used for bearing balls. A load of 1,400 – 1,600 kg is needed to break a ball with a diameter of 3.175 mm. The temperature of a ball with insufficient or no lubrication rises continuously during operation. This increase in temperature can make the balls brittle and cause them to break, which then results in damage to the race profile in the ballscrew nut and on the shaft. The process of topping up lubricant should therefore be taken into account at the design stage. If an automatic lubrication system cannot be used, regular lubricant top-ups should be included in the maintenance schedule.

2. Pressed-in or broken ball return

If the ballscrew nuts travel beyond the permissible path or impact against the ball return, the return may be pressed in or broken. This blocks the path for the balls, so they simply slide and ultimately break.

3. Bearing journal breakage on shaft

○ Incorrect design:

Sharp edges should be avoided on the shaft's bearing journal to avoid local peaks in stress. Fig. 7.3 shows useful design features for the bearing journal.

○ Bending strain on the bearing journal:

The bearing's mounting surface and the bearing lug's axle are not perpendicular to one another or the opposite sides of the bearing lug are not parallel to one another. The bearing journal is thereby bent and may ultimately break. The deviation in the bearing journal position before and after the bearing lug is tightened should not exceed 0.01 mm.

○ Radial load or load fluctuations:

Incorrect alignment during ballscrew assembly causes abnormal fluctuating shearing loads and therefore premature ballscrew failure.

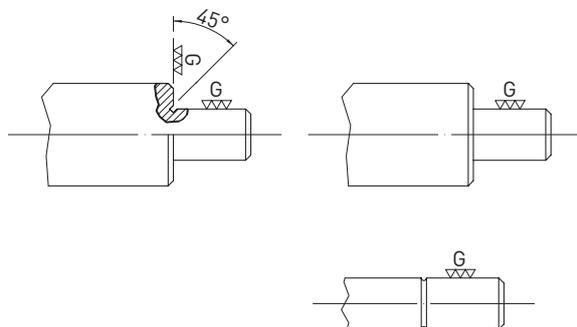


Fig. 7.3 Recesses for avoiding peaks in stress

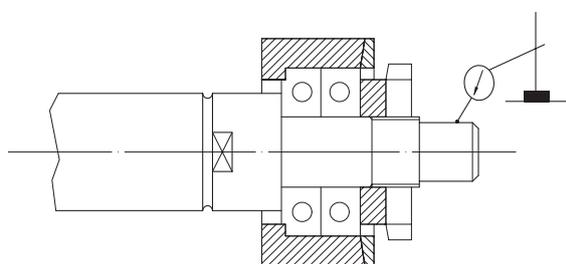


Fig. 7.4 Concentricity check on drive journal

Incident procedures

Table 7.3 **Fault table**

Fault	Possible cause	Remedy
High level of operating noise while the ballscrew is running	Ballscrew speed too high	Check the permissible specific speed value
	Insufficient lubrication	Lubricate the ballscrew as specified in the lubrication instructions
	Ballscrew is not mounted axially parallel with the guides	Align the ballscrew
	Nut, shaft or balls displaying traces of wear	Replace the ballscrew
Ballscrew nut is sluggish near the mounting	Ballscrew is not mounted axially parallel with the guides	Align the ballscrew
Ballscrew nut is sluggish over its entire travel distance	Ballscrew nut has radial load or is not axially parallel with the shaft	Check alignment of nut housing to ballscrew mounting
	Dirt has entered the nut and is making it sluggish	Check the wipers Replace and check the ballscrew
	One or more of the ballscrew components are damaged	Replace the ballscrew
Ballscrew nut is heating up a lot	Ballscrew nut has radial load or is not axially parallel with the shaft	Check alignment of nut housing to ballscrew mounting
	Insufficient lubrication	Lubricate the ballscrew as specified in the lubrication instructions

8. Disposal

ATTENTION!



Danger caused by environmentally hazardous substances!

The danger to the environment depends on the type of substance used.

- ▶ Clean contaminated parts thoroughly before disposal!
- ▶ Clarify the requirements for safe disposal with disposal companies and, where appropriate, with the competent authorities!

Fluids

Lubricants	Dispose of as hazardous waste in an environmentally friendly way
Soiled cleaning cloths	Dispose of as hazardous waste in an environmentally friendly w

Nut

Steel components	Dispose of separately
Plastic components	Dispose of as residual waste

Shaft

Steel components	Dispose of separately
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Balls

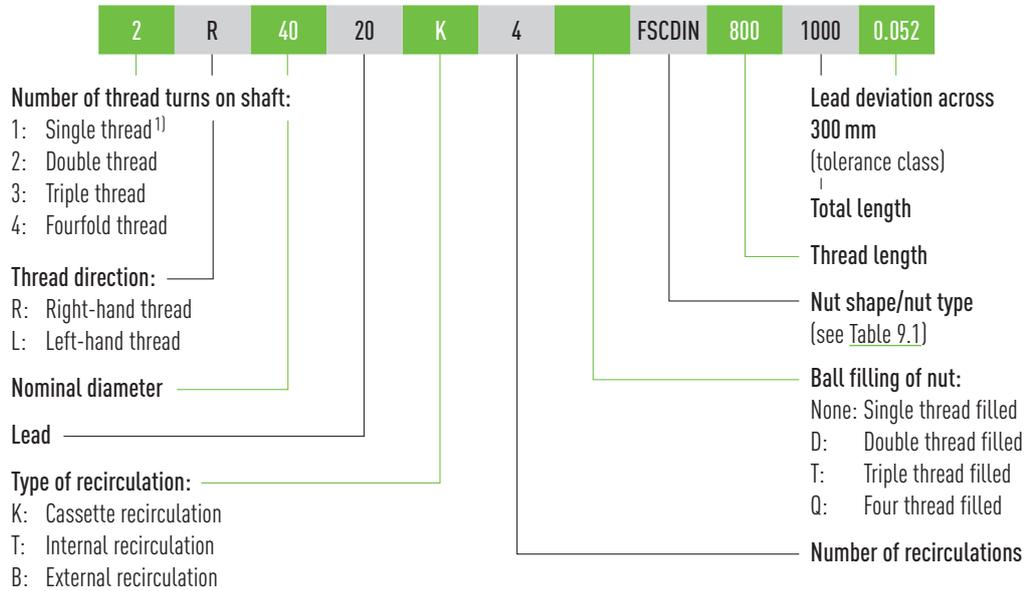
Steel components	Dispose of separately
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Appendix 1: Order codes

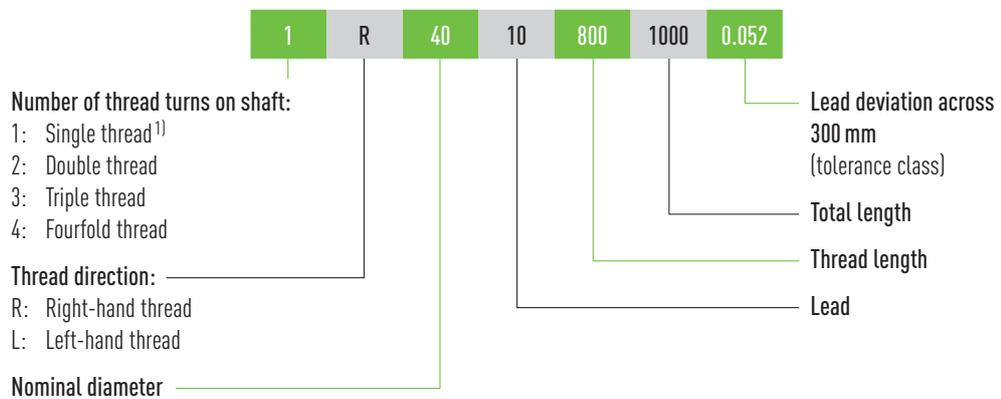
9. Appendix 1: Order codes

In order to clearly identify the ballscrew, information about the ballscrew shaft and nut is needed.

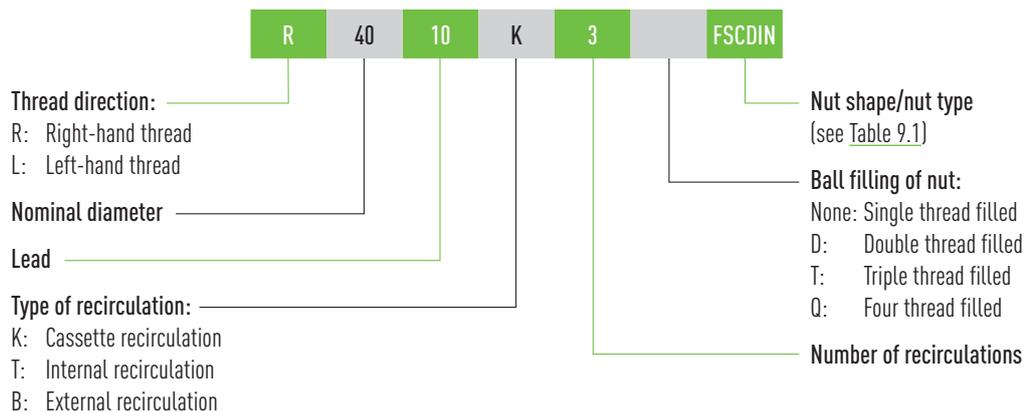
9.1 Order codes for rolled ballscrews



Order code for ballscrew shaft without the nut



Order code for ballscrew nut without the shaft

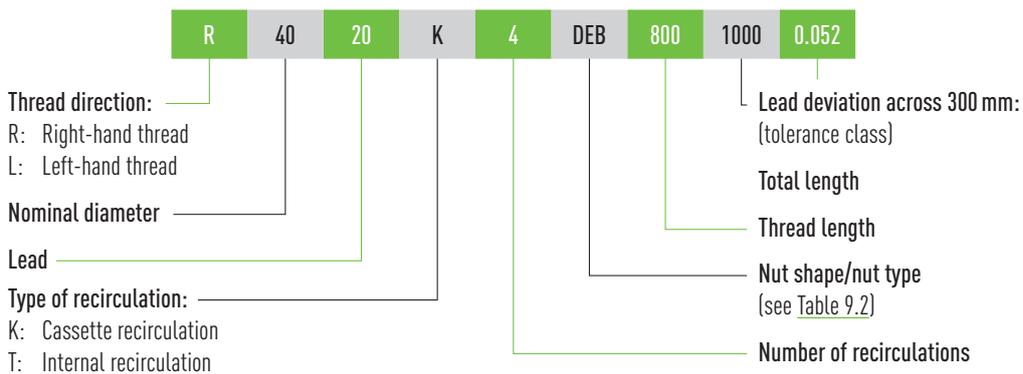


¹⁾ Standard; can be omitted with single-thread shafts

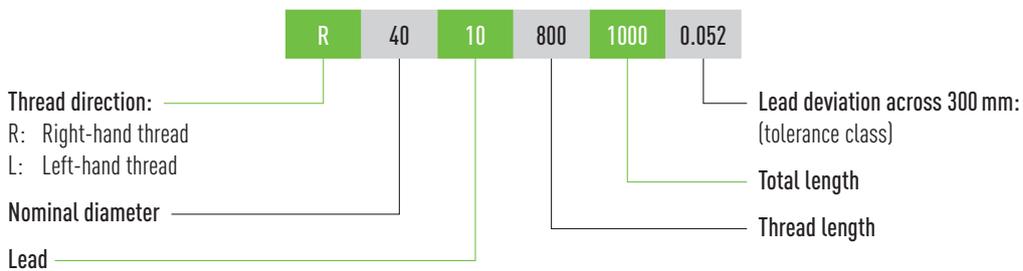
Table 9.1 Overview of nut shapes

Nut designation	Description
FSIDIN	Flange single nut with internal single recirculation
FSCDIN	Flange single nut with cassette recirculation
RSI	Cylindrical single nut with internal single return
RSIT	Cylindrical single nut with screw-in thread and internal single return

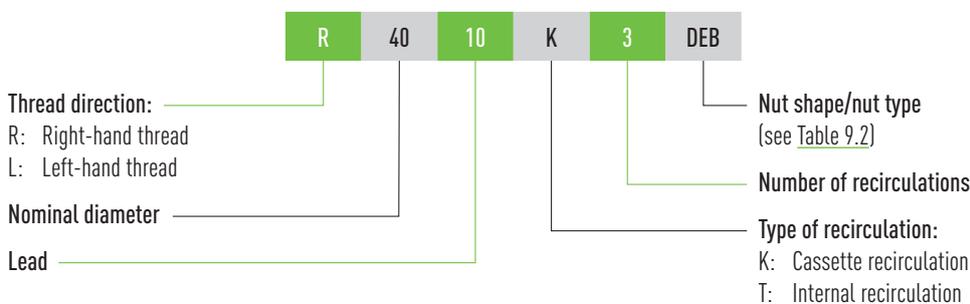
9.2 Order codes for peeled ballscrews



Order code for ballscrew shaft without the nut



Order code for ballscrew nut without the shaft



Appendix 1: Order codes

Table 9.2 **Overview of nut shapes**

Nut designation	Description
DEB	Flange single nut
DDB	Flange double nut
ZE	Cylindrical single nut
ZD	Cylindrical double nut
SE	Cylindrical single nut with screw-in thread
SEM	Flange single nut with integrated locking nut ¹⁾

¹⁾ Simply using a safety nut does not provide sufficient protection against a load being lowered unintentionally. The safety guidelines valid for the application must be observed. The safety nut it is not a safety component according to the Machinery Directive.

10. Appendix 2: Product specifications and technical data

10.1 Buckling load and critical speed

10.1.1 Buckling load

F 10.1

$$F_k = 4.072 \times 10^5 \left(\frac{f_k \times d_k^4}{l_s^2} \right)$$

- F_k Permissible load [N]
- F_{kmax} Max. permissible load [N]
- d_k Core diameter of threaded shaft [mm]
- l_s Unsupported shaft length [mm]
- f_k Factor for different types of assembly (buckling load)

F 10.2

$$F_{kmax} = 0.5 \times F_k$$

- Fixed bearing – fixed bearing $f_k = 1.0$
- Fixed bearing – supported bearing $f_k = 0.5$
- Supported bearing – supported bearing $f_k = 0.25$
- Fixed bearing – no bearing $f_k = 0.0625$

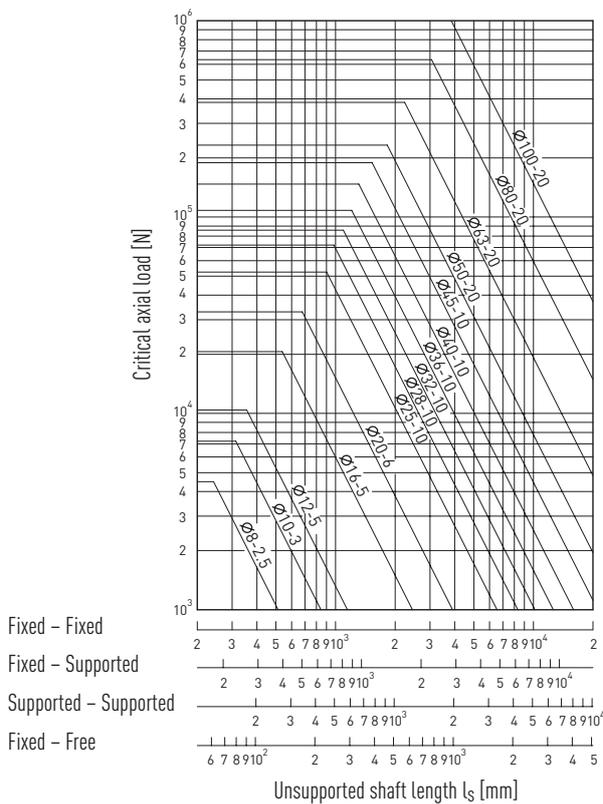


Fig. 10.1 Buckling load for different diameters and lengths of threaded shafts

Appendix 2: Product specifications and technical data

10.1.2 Critical speed

F 10.3
$$n_k = 2.71 \times 10^8 \left(\frac{f_n \times d_k}{l_s^2} \right)$$

F 10.4
$$n_{kmax} = 0.8 \times n_k$$

- n_k Critical speed [rpm]
- n_{kmax} Max. permissible speed [rpm]
- d_k Core diameter of threaded shaft [mm]
- l_s Unsupported shaft length [mm]
- f_n Factor for different types of assembly (critical speed)

- Fixed bearing – fixed bearing $f_n = 1.0$
- Fixed bearing – supported bearing $f_n = 0.692$
- Supported bearing – supported bearing $f_n = 0.446$
- Fixed bearing – no bearing $f_n = 0.147$

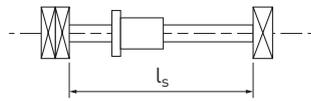


Fig. 10.2 Definition of „Unsupported shaft length“

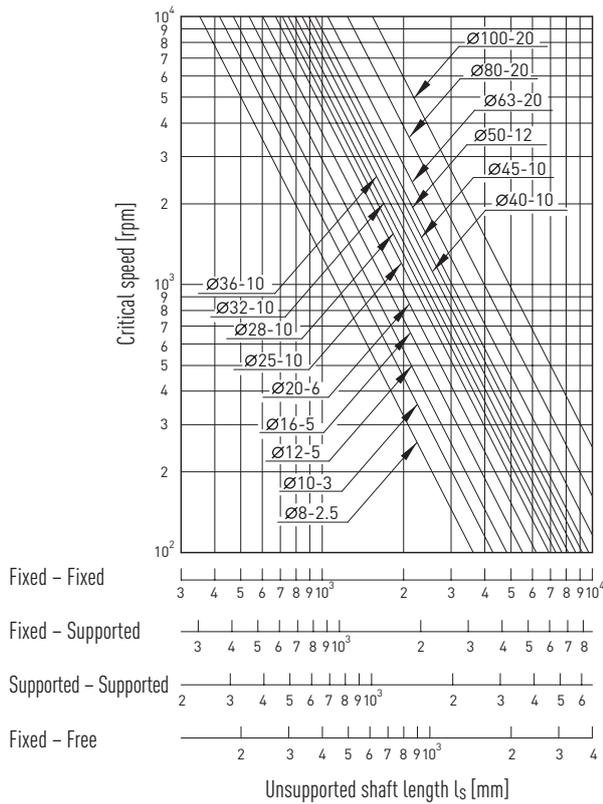


Fig. 10.3 Critical speed for different diameters and lengths of threaded shafts

10.2 Technical data

10.2.1 Nuts for rolled ballscrews

10.2.1.1 Flange single nut FSCDIN/FSIDIN

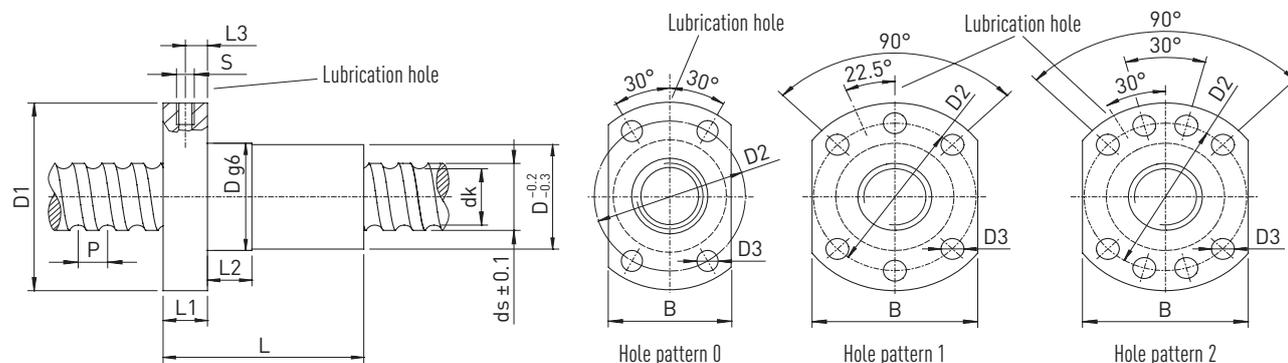


Table 10.1 Nut dimensions

Article number	ds	P	D	D1	D2	D3	Hole pattern	L	L1	L2	L3	S	B	dk	C _{dyn} [N]	C ₀ [N]	Max. axial play [mm]	Mass [kg/St.]
R12-05K4-FSCDIN	11.7	5	24	40	32	4.5	0	33	8	8	4	M3	26	9.9	5,500	12,000	0.02	0.11
R12-10K3-FSCDIN	11.8	10	24	40	32	4.5	0	43	8	8	4	M3	26	9.6	5,100	10,100	0.02	0.13
R15-05K4-FSCDIN	13.9	5	28	48	38	5.5	1	38	10	10	5	M6	40	11.8	12,600	21,000	0.04	0.18
R16-05T3-FSIDIN	15.5	5	28	48	38	5.5	1	40	10	10	5	M6	40	12.9	6,500	11,700	0.04	0.18
R16-10K3-FSCDIN	14.7	10	28	48	38	5.5	1	45	10	10	5	M6	40	12.5	9,100	19,300	0.04	0.20
R16-16K3-FSCDIN	15.0	16	28	48	38	5.5	1	61	12	20	6	M6	40	13.0	7,900	17,000	0.04	0.26
R16-20K2-FSCDIN	14.0	20	28	48	38	5.5	1	56	10	10	5	M6	40	11.8	5,200	10,400	0.04	0.25
R20-05K4-FSCDIN	19.6	5	36	58	47	6.6	1	40	10	10	5	M6	44	16.9	13,400	32,740	0.04	0.28
R20-10K3-FSCDIN	19.3	10	36	58	47	6.6	1	48	10	10	5	M6	44	16.6	10,000	23,500	0.04	0.32
R20-20K2-FSCDIN	19.7	20	36	58	47	6.6	1	57	10	10	5	M6	44	17.1	6,800	15,300	0.04	0.37
R20-20K4-DFSCDIN	19.7	20	36	58	47	6.6	1	57	10	10	5	M6	44	17.1	12,300	30,500	0.04	0.36
R25-05K4-FSCDIN	24.9	5	40	62	51	6.6	1	43	10	12	5	M6	48	22.3	14,900	41,500	0.04	0.22
R25-10K4-FSCDIN	24.5	10	40	62	51	6.6	1	61	10	16	5	M6	48	21.8	16,100	44,900	0.04	0.43
R25-25K2-FSCDIN	24.7	25	40	62	51	6.6	1	70	10	16	5	M6	48	22.1	7,400	19,100	0.04	0.48
R25-25K4-DFSCDIN	24.7	25	40	62	51	6.6	1	70	10	16	5	M6	48	22.1	13,500	38,200	0.04	0.46
R32-05K6-FSCDIN	31.7	5	50	80	65	9	1	48	12	10	6	M6	62	29.1	23,900	81,900	0.04	0.59
R32-10K5-FSCDIN	31.8	10	50	80	65	9	1	77	12	16	6	M6	62	28.6	31,500	80,100	0.04	0.82
R32-20K3-FSCDIN	31.8	20	50	80	65	9	1	88	12	16	6	M6	62	28.6	17,000	48,500	0.04	0.91
R32-32K2-FSCDIN	31.9	32	50	80	65	9	1	88	12	20	6	M6	62	28.7	11,600	31,800	0.04	0.90
R32-32K4-DFSCDIN	31.9	32	50	80	65	9	1	88	12	20	6	M6	62	28.7	20,600	62,200	0.04	0.87
R40-05K6-FSCDIN	39.4	5	63	93	78	9	2	50	14	10	7	M8 × 1	70	36.8	25,900	100,600	0.04	0.93
R40-10K4-FSCDIN	37.8	10	63	93	78	9	2	70	14	16	7	M8 × 1	70	32.8	45,000	123,000	0.04	1.19
R40-20K3-FSCDIN	37.8	20	63	93	78	9	2	88	14	16	7	M8 × 1	70	32.8	34,850	90,000	0.07	1.43
R40-40K2-FSCDIN	37.9	40	63	93	78	9	2	102	14	16	7	M8 × 1	70	32.9	23,000	58,400	0.07	1.61
R40-40K4-DFSCDIN	37.9	40	63	93	78	9	2	102	14	16	7	M8 × 1	70	32.9	41,500	115,800	0.07	1.59
R50-05K6-FSCDIN	49.4	5	75	110	93	11	2	50	16	10	8	M8 × 1	85	46.8	28,300	127,200	0.07	1.32
R50-10K6-FSCDIN	48.0	10	75	110	93	11	2	90	16	20	8	M8 × 1	85	42.9	74,500	250,000	0.07	2.05
R50-20K5-FSCDIN	47.9	20	75	110	93	11	2	132	18	25	9	M8 × 1	85	42.9	67,200	217,500	0.07	2.89
R50-40K3-FSCDIN	50.0	40	75	110	93	11	2	149	18	45	9	M8 × 1	85	45.0	39,000	123,000	0.07	2.96
R50-40K6-DFSCDIN	50.0	40	75	110	93	11	2	149	18	45	9	M8 × 1	85	45.0	70,300	242,600	0.07	2.93
R63-10T6-FSIDIN	63.1	10	90	125	108	11	2	120	18	16	9	M8 × 1	95	58.0	61,920	214,090	0.07	3.30

All dimensions stated without a unit are in mm

Appendix 2: Product specifications and technical data

10.2.1.2 Cylindrical single nut with screw-in thread RSIT

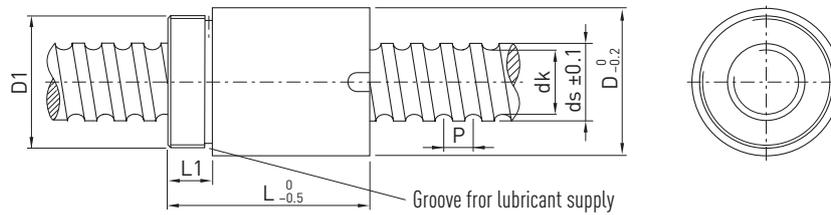


Table 10.2 Nut dimensions

Article number	ds	P	D	D1	L	L1	dk	Dynamic load rating C_{dyn} [N]	Static load rating C_0 [N]	Max. axial play [mm]	Mass [kg/St.]
R08-02,5T2-RSIT ¹⁾	7.7	2.5	17.5	M15 × 1	27.5	7.5	6.1	1,300	1,750	0.04	0.03
R10-02,5T2-RSIT ²⁾	9.9	2.5	19.5	M17 × 1	25.0	7.5	8.1	1,780	2,630	0.04	0.04
R10-04T2-RSIT ²⁾	9.9	4.0	24.0	M22 × 1	32.0	10.0	7.7	1,980	2,820	0.04	0.08
R12-04B1-RSIT ¹⁾	12.0	4.0	25.5	M20 × 1	34.0	10.0	9.5	3,000	5,700	0.04	0.08

All dimensions stated without a unit are in mm

¹⁾ Polyamide wiper on one side

²⁾ Without dirt wiper

10.2.1.3 Cylindrical single nut RSI

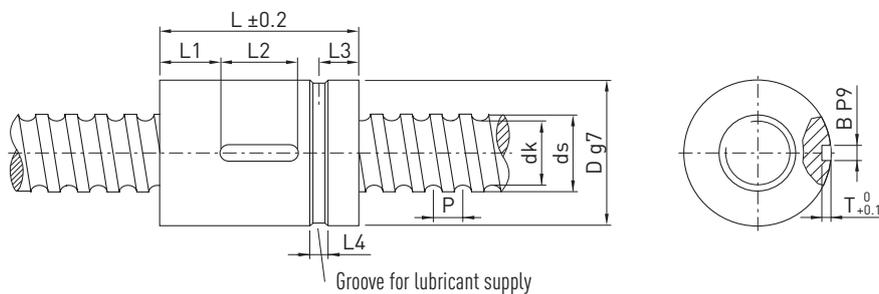


Table 10.3 Nut dimensions

Article number	ds	P	D	L	L1	L2	L3	L4	T	B	dk	Dynamic load rating C_{dyn} [N]	Static load rating C_0 [N]	Max. axial play [mm]	Mass [kg/St.]
R16-10T3-RSI	15.4	10	28	60	8	20	9.5	5	2.5	4	12.9	6,100	10,800	0.04	0.17
R20-10T3-RSI	19.9	10	34	60	20	20	12.0	4	2.0	5	17.5	8,100	12,600	0.04	0.35

All dimensions stated without a unit are in mm

Appendix 2: Product specifications and technical data

10.2.2 Nuts for peeled ballscrews

10.2.2.1 Flange single nut DEB

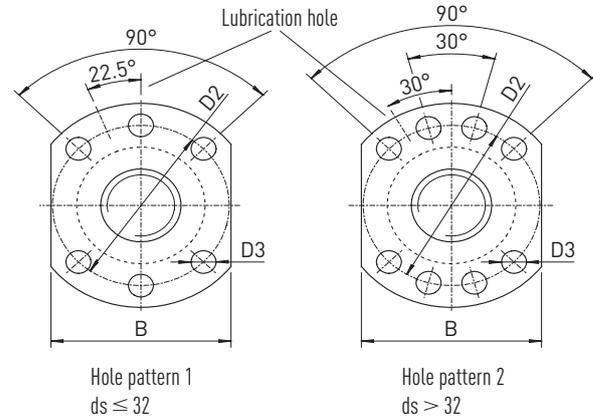
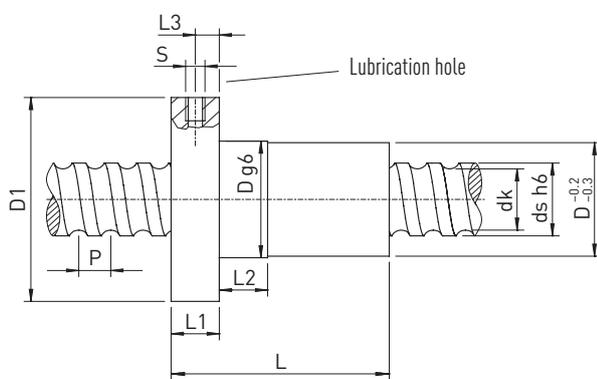


Table 10.4 Nut dimensions

Article number	ds	P	D	D1	D2	D3	L	L1	L2	L3	S	B	dk	Dynamic load rating C_{dyn} [N]	Static load rating C_0 [N]	Max. axial play [mm]	Mass [kg/St.]
R16-05T3-DEB	16	5	28	48	38	5.5	40	10	10	5.0	M6	40	13.5	9,600	12,700	0.02	0.15
R20-05T4-DEB	20	5	36	58	47	6.6	52	10	10	5.0	M6	44	17.5	13,900	21,800	0.02	0.29
R25-05T4-DEB	25	5	40	62	51	6.6	52	10	10	5.0	M6	48	22.5	15,600	27,900	0.02	0.31
R25-10T3-DEB	25	10	40	62	51	6.6	65	10	16	5.0	M6	48	21.0	24,100	36,200	0.02	0.36
R32-05T5-DEB	32	5	50	80	65	9.0	60	12	10	6.0	M6	62	29.5	20,700	43,900	0.02	0.62
R32-10T4-DEB	32	10	50	80	65	9.0	85	14	16	7.0	M6	62	27.8	40,900	63,200	0.02	0.69
R32-20T2-DEB	32	20	50	80	65	9.0	80	14	16	7.0	M6	62	27.8	20,300	26,800	0.02	0.66
R40-05T5-DEB	40	5	63	93	78	9.0	69	14	10	7.0	M8 × 1	70	37.5	22,500	54,600	0.02	1.04
R40-10T4-DEB	40	10	63	93	78	9.0	88	14	16	7.0	M8 × 1	70	35.8	46,800	82,600	0.02	1.13
R40-20T2-DEB	40	20	63	93	78	9.0	88	14	16	7.0	M8 × 1	70	35.8	23,800	36,400	0.03	1.14
R50-05T5-DEB	50	5	75	110	93	11.0	69	16	10	8.0	M8 × 1	85	47.5	24,900	69,800	0.02	1.44
R50-10T4-DEB	50	10	75	110	93	11.0	98	16	16	8.0	M8 × 1	85	45.8	52,800	106,800	0.02	1.62
R50-20T3-DEB	50	20	75	110	93	11.0	114	16	16	8.0	M8 × 1	85	45.8	40,000	76,200	0.03	1.92
R63-10T6-DEB	63	10	90	125	108	11.0	120	18	16	9.0	M8 × 1	95	58.8	84,700	210,800	0.04	2.73
R63-20T4-DEB	63	20	95	135	115	13.5	150	20	25	10.0	M8 × 1	100	55.4	105,000	250,000	0.04	4.00
R63-20T5-DEB	63	20	95	135	115	13.5	175	20	25	10.0	M8 × 1	100	55.4	125,000	300,000	0.04	4.50
R63-20K6-DEBH	63	20	125	165	145	13.5	170	25	25	12.0	M8 × 1	130	50.2	245,700	768,200	0.04	12.50
R80-10T6-DEB	80	10	105	145	125	13.5	120	20	16	10.0	M8 × 1	110	75.8	93,400	269,200	0.04	3.00
R80-20T4-DEB	80	20	125	165	145	13.5	160	25	25	12.0	M8 × 1	130	72.4	135,000	322,000	0.05	8.20
R80-20T5-DEB	80	20	125	165	145	13.5	175	25	25	12.0	M8 × 1	130	72.4	161,500	398,000	0.05	9.10
R80-20K6-DEBH	78	20	135	175	155	13.5	170	25	25	12.5	M8 × 1	140	68.2	280,000	783,300	0.05	11.50
R80-20K7-DEBH	78	20	135	175	155	13.5	190	25	25	12.5	M8 × 1	140	68.2	320,000	1,143,000	0.05	13.00

All dimensions stated without a unit are in mm

10.2.2.2 Flange double nut DDB

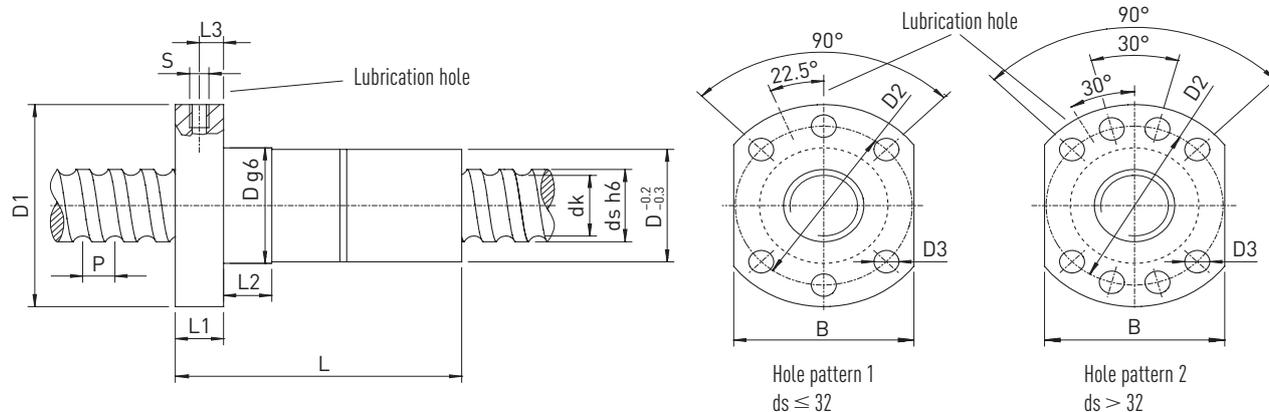


Table 10.5 Nut dimensions

Article number	ds	P	D	D1	D2	D3	L	L1	L2	L3	S	B	dk	Dynamic load rating C_{dyn} [N]	Static load rating C_0 [N]	Mass [kg/St.]
R16-05T3-DDB	16	5	28	48	38	5.5	80	10	10	5	M6	40	13.5	9,600	12,700	0.25
R20-05T4-DDB	20	5	36	58	47	6.6	82	10	10	5	M6	44	17.5	13,900	21,800	0.42
R25-05T4-DDB	25	5	40	62	51	6.6	95	10	10	5	M6	48	22.5	15,600	27,900	0.52
R25-10T3-DDB	25	10	40	62	51	6.6	115	10	16	5	M6	48	21.0	24,100	36,200	0.57
R32-05T5-DDB	32	5	50	80	65	9.0	95	12	10	6	M6	62	29.5	20,700	43,900	0.88
R32-10T4-DDB	32	10	50	80	65	9.0	138	14	16	7	M6	62	27.8	40,900	63,200	1.01
R32-20T2-DDB	32	20	50	80	65	9.0	138	14	16	7	M6	62	27.8	20,300	26,800	1.02
R40-05T5-DDB	40	5	63	93	78	9.0	109	14	10	7	M8 × 1	70	37.5	22,500	54,600	1.54
R40-10T4-DDB	40	10	63	93	78	9.0	150	14	16	7	M8 × 1	70	35.8	46,800	82,600	1.80
R40-20T2-DDB	40	20	63	93	78	9.0	150	14	16	7	M8 × 1	70	35.8	23,800	36,400	1.82
R50-05T5-DDB	50	5	75	110	93	11.0	112	16	10	8	M8 × 1	85	47.5	24,900	69,800	2.15
R50-10T4-DDB	50	10	75	110	93	11.0	164	16	16	8	M8 × 1	85	45.8	52,800	106,800	2.52
R50-20T3-DDB	50	20	75	110	93	11.0	196	16	16	8	M8 × 1	85	45.8	40,000	76,200	3.14
R63-10T6-DDB	63	10	90	125	108	11.0	205	18	16	9	M8 × 1	95	58.8	84,700	210,800	4.19
R63-20T4-DDB	63	20	95	135	115	13.5	270	20	25	10	M8 × 1	100	55.4	105,000	250,000	6.70
R80-10T6-DDB	80	10	105	145	125	13.5	205	20	16	10	M8 × 1	110	75.8	93,400	269,200	4.74
R80-20T4-DDB	80	20	125	165	145	13.5	280	25	25	12	M8 × 1	130	72.4	135,000	322,000	13.80

All dimensions stated without a unit are in mm

Appendix 2: Product specifications and technical data

Cylindrical single nut ZE

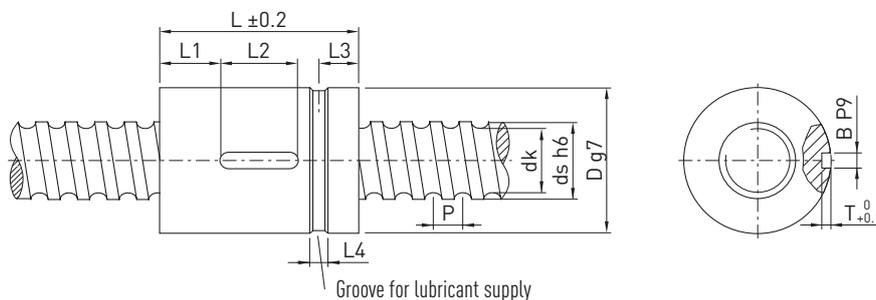


Table 10.6 Nut dimensions

Article number	ds	P	D	L	L1	L2	L3	L4	T	B	dk	Dynamic load rating C_{dyn} [N]	Static load rating C_0 [N]	Max. axial play [mm]	Mass [kg/St.]
R16-05T3-ZE	16	5	28	40	12.0	16	9	4	2.4	4	13.5	9,600	12,700	0.02	0.10
R20-05T4-ZE	20	5	36	51	15.0	20	10	4	2.4	4	17.5	13,900	21,800	0.02	0.23
R25-05T4-ZE	25	5	40	60	20.0	20	12	5	2.4	4	22.5	15,600	27,900	0.02	0.29
R25-10T3-ZE	25	10	48	65	22.0	20	15	5	2.4	4	21.0	24,100	36,200	0.02	0.50
R32-05T5-ZE	32	5	48	60	20.0	20	12	5	2.4	4	29.5	20,700	43,900	0.02	0.38
R32-10T4-ZE	32	10	56	80	27.0	25	15	5	2.4	4	27.8	40,900	63,200	0.02	0.74
R32-20T2-ZE	32	20	56	80	27.0	25	15	5	2.4	4	27.8	20,300	26,800	0.02	0.70
R40-05T5-ZE	40	5	56	68	24.0	20	15	6	2.4	4	37.5	22,500	54,600	0.02	0.44
R40-10T4-ZE	40	10	62	88	31.0	25	15	6	2.4	4	35.8	46,800	82,600	0.02	0.85
R40-20T2-ZE	40	20	62	88	31.0	25	15	6	2.4	4	35.8	23,800	36,400	0.03	0.88
R50-05T5-ZE	50	5	68	69	24.0	20	15	6	2.4	4	47.5	24,900	69,800	0.02	0.72
R50-10T4-ZE	50	10	72	100	37.0	25	17	6	2.4	4	45.8	52,800	106,800	0.02	1.04
R50-20T3-ZE	50	20	72	114	44.0	25	17	6	2.4	4	45.8	40,000	76,200	0.03	1.10
R63-10T6-ZE	63	10	85	120	44.0	32	17	6	3.5	6	58.8	84,700	210,800	0.04	1.73
R63-20T4-ZE	63	20	95	135	52.0	32	17	6	3.5	6	55.4	105,000	300,000	0.04	3.80
R80-10T6-ZE	80	10	105	120	44.0	32	17	8	3.5	6	75.8	93,400	269,200	0.04	2.80
R80-20T4-ZE	80	20	125	150	52.0	45	17	8	3.5	6	72.4	135,000	322,000	0.05	7.80
R80-20T6-ZEH	78	20	130	182	68.5	45	19	8	4.0	8	68.2	200,000	510,000	0.05	11.05

All dimensions stated without a unit are in mm

Cylindrical double nut ZD

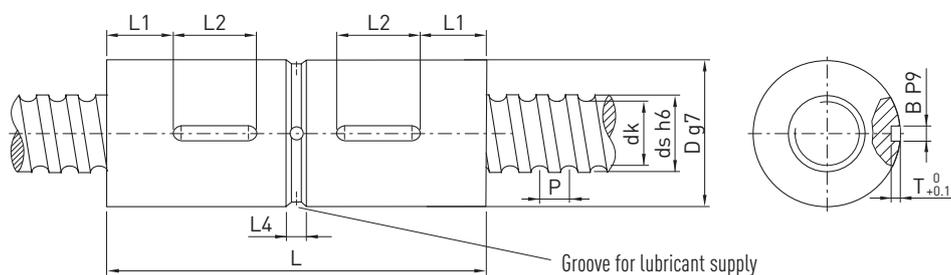


Table 10.7 Nut dimensions

Article number	ds	P	D	L	L1	L2	L4	T	B	dk	Dynamic load rating C_{dyn} [N]	Static load rating C_0 [N]	Mass [kg/St.]
R16-05T3-ZD	16	5	28	72	14	16	4	2.4	4	13.5	9,600	12,700	0.20
R20-05T4-ZD	20	5	36	86	15	20	4	2.4	4	17.5	13,900	21,800	0.39
R25-05T4-ZD	25	5	40	100	20	20	5	2.4	4	22.5	15,600	27,900	0.48
R25-10T3-ZD	25	10	48	115	20	20	5	2.4	4	21.0	24,100	36,200	0.80
R32-05T5-ZD	32	5	48	100	20	20	5	2.4	4	29.5	20,700	43,900	0.63
R32-10T3-ZD	32	10	56	136	25	25	6	2.4	4	27.8	32,000	47,500	1.30
R32-20T2-ZD	32	20	56	142	28	25	6	2.4	4	27.8	20,300	26,800	1.30
R40-05T5-ZD	40	5	56	108	20	20	6	2.4	4	37.5	22,500	54,600	0.78
R40-10T4-ZD	40	10	62	142	28	25	6	2.4	4	35.8	46,500	82,600	1.34
R40-20T2-ZD	40	20	62	146	30	25	6	2.4	4	35.8	23,800	36,400	1.51
R50-05T5-ZD	50	5	68	108	20	20	6	2.4	4	47.5	24,900	69,800	1.40
R50-10T4-ZD	50	10	72	168	35	25	8	2.4	4	45.8	38,200	108,900	1.72
R50-20T3-ZD	50	20	72	190	47	25	6	2.4	4	45.8	40,000	76,200	1.95
R63-10T6-ZD	63	10	85	208	44	32	6	3.5	6	58.8	84,700	210,800	2.81
R63-20T4-ZD	63	20	95	260	65	32	6	3.5	6	55.4	105,000	250,000	7.30
R80-10T6-ZD	80	10	105	208	44	32	6	3.5	6	75.8	93,400	269,200	5.50
R80-20T4-ZD	80	20	125	285	55	32	8	4.1	8	72.4	135,000	322,000	14.90

All dimensions stated without a unit are in mm

Appendix 2: Product specifications and technical data

Cylindrical single nut with screw-in thread SE

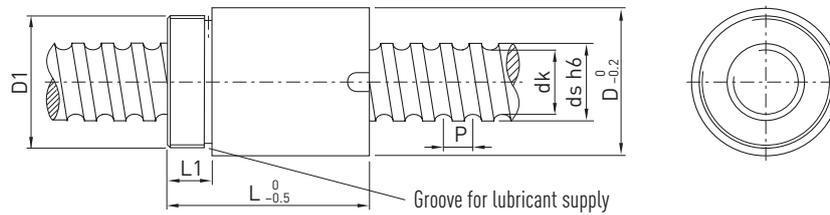


Table 10.8 Nut dimensions

Article number	ds	P	D	D1	L	L1	dk	Dynamic load rating C_{dyn} [N]	Static load rating C_0 [N]	Max. axial play [mm]	Mass [kg/St.]
R16-05T3-SE	16	5	36	M30 × 1.5	42	12	13.5	6,500	11,700	0.02	0.45
R20-05T4-SE	20	5	40	M35 × 1.5	52	12	17.5	9,200	19,500	0.02	0.53
R25-05T4-SE	25	5	45	M40 × 1.5	60	15	22.5	12,200	30,200	0.02	0.82
R25-10T3-SE	25	10	48	M45 × 1.5	70	15	21.0	15,600	31,700	0.02	1.00
R32-05T5-SE	32	5	52	M48 × 1.5	60	15	29.5	16,900	50,300	0.02	1.13
R32-10T3-SE	32	10	56	M52 × 1.5	80	15	27.8	24,800	52,200	0.02	1.62
R32-20T2-SE	32	20	56	M52 × 1.5	80	15	27.8	17,500	34,800	0.02	1.44
R40-05T5-SE	40	5	65	M60 × 1.5	68	18	37.5	22,500	54,600	0.02	1.63
R40-10T4-SE	40	10	65	M60 × 1.5	88	18	35.8	37,100	92,400	0.02	1.75
R40-20T2-SE	40	20	65	M60 × 1.5	88	18	35.8	20,400	26,200	0.03	1.75
R50-10T4-SE	50	10	80	M75 × 1.5	100	20	45.8	38,200	108,900	0.02	2.96
R50-20T3-SE	50	20	80	M75 × 1.5	114	20	45.8	33,200	90,700	0.03	3.15
R63-10T6-SE	63	10	95	M85 × 2.0	120	20	58.8	84,700	210,800	0.04	4.37
R63-20T3-SE	63	20	95	M85 × 2.0	138	20	55.4	96,000	189,000	0.04	4.40

All dimensions stated without a unit are in mm

Safety nut SEM

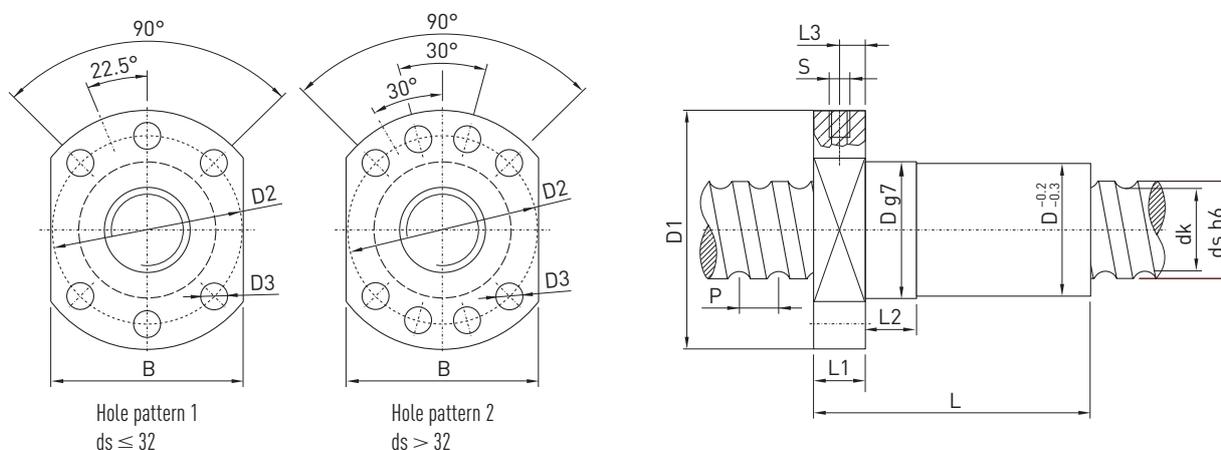


Table 10.9 Safety nut dimensions

Article number	ds	P	D	D1	D2	D3	Hole pattern	L	L1	L2	L3	S	B	dk	Dynamic load rating C_{dyn} [N]	Static load rating C_0 [N]
R32-10T4-SEM	32	10	56	86	70	9.0	1	130	15	16	7.5	M6	66	27.8	40,900	63,200
R40-10T4-SEM	40	10	63	93	78	9.0	2	130	15	16	7.5	M8 × 1	70	35.8	46,800	82,500
R40-20T2-SEM	40	20	63	93	78	9.0	2	140	15	16	7.5	M8 × 1	70	35.8	23,800	36,400
R50-10T5-SEM	50	10	75	110	93	11.0	2	145	16	16	8.0	M8 × 1	85	45.8	63,900	133,300
R63-20T4-SEM	63	20	95	135	115	13.5	2	205	20	25	10.0	M8 × 1	100	55.4	105,000	250,000
R80-20T5-SEM	80	20	125	165	145	13.5	2	230	25	25	12.5	M8 × 1	130	72.4	161,500	398,000

All dimensions stated without a unit are in mm

Note:

Simply using a safety nut does not provide sufficient protection against a load being lowered unintentionally. The safety guidelines valid for the application must be observed. The safety nut it is not a safety component according to the Machinery Directive.

Appendix 2: Product specifications and technical data

10.2.3 Driven nut unit AME

Sample application

The tool carriage of a machining centre can be moved up to 3,000 mm. The maximum rapid motion speed is 25 m/min. The rotary speed of the long feed shaft required for this cannot be reached due to its considerably lower critical bending speed. The ballscrew nut is therefore driven rather than the ballscrew shaft. High axial and radial loading capacity and a good resistance to tilting are required of the bearing.

Design solution

The threaded nut is mounted in an axial angular ball bearing ZKLF...2Z. The less stringent PE version is preferred. The bearing has defined preload using a precision groove nut from the HIR series. The bearing achieves a good resistance to tilting thanks to the O arrangement of the two rows of balls. Any axial and radial forces which arise are absorbed with ease. The thick-walled, dimensionally-stable outer bearing race is screwed directly onto the bearing block.

There is no need for an extra bearing bush or bearing cover. Circulating oil lubrication supplies the bearing with lubricant. The ballscrew nut is lubricated via a radial bore in the shaft. The less stringent axial angular ball bearing can only be lubricated axially.

We are happy to develop the right unit for any application, taking due account of different installation circumstances. A wide range of realised applications provides the ideal basis for finding a solution to your problem.

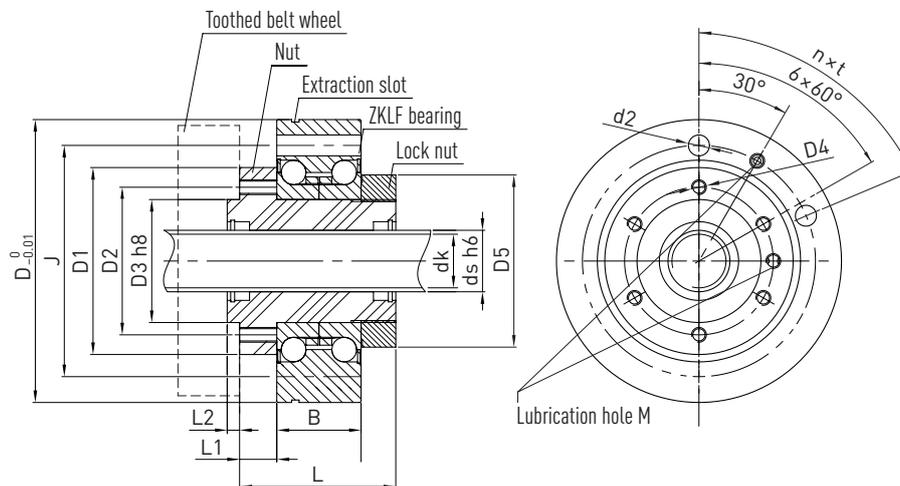


Table 10.10 Nut dimensions

Article number	Shaft dimensions			Nut dimensions									Bearing dimensions					Dynamic load rating C_{dyn} [N]	Static load rating C_0 [N]	n max. [rpm]
	ds	P	dk	D1	D2	D3	D4	D5	L	L1	L2	M	D	J	n x t	d2	B			
R16-05T3-AME	16	5	13.5	50	40	30	M6	47	50	10	3	M6	80	63	6 x (60°)	6.5	28	9,600	12,700	4,000
R20-05T4-AME	20	5	17.5	63	52	40	M6	60	60	12	5	M6	100	80	4 x (90°)	8.5	34	13,900	21,800	3,300
R25-05T4-AME	25	5	22.5	76	60	50	M6	72	63	15	5	M6	115	94	6 x (60°)	8.5	34	15,600	27,900	3,000
R25-10T3-AME	25	10	21.0	76	60	50	M6	72	74	15	5	M6	115	94	6 x (60°)	8.5	34	24,100	36,200	3,000
R32-05T5-AME	32	5	29.5	76	62	50	M8	72	70	15	5	M8	115	94	6 x (60°)	8.5	34	20,700	43,900	3,000
R32-10T4-AME	32	10	27.8	76	62	50	M8	72	105	15	5	M8	115	94	6 x (60°)	8.5	34	40,900	63,200	3,000
R32-20T2-AME	32	20	27.8	76	62	50	M8	72	100	15	5	M8	115	94	6 x (60°)	8.5	34	20,300	26,800	3,000
R40-05T5-AME	40	5	37.5	90	70	60	M8	82	76	15	5	M8	145	120	8 x (45°)	8.5	45	22,500	54,600	2,400
R40-10T3-AME	40	10	35.8	90	70	60	M8	82	85	15	5	M8	145	120	8 x (45°)	8.5	45	37,100	61,900	2,400
R40-20T2-AME	40	20	35.8	90	70	60	M8	82	105	15	5	M8	145	120	8 x (45°)	8.5	45	23,800	36,400	2,400
R50-05T5-AME	50	5	47.5	100	84	70	M10	94	78	15	5	M10	155	130	8 x (45°)	8.5	45	24,900	69,800	2,200
R50-10T4-AME	50	10	45.8	100	84	70	M10	94	95	15	5	M10	155	130	8 x (45°)	8.5	45	52,800	106,800	2,200
R50-20T3-AME	50	20	45.8	100	84	70	M10	94	120	15	5	M10	155	130	8 x (45°)	8.5	45	40,000	76,200	2,200
R63-10T6-AME	63	10	58.8	130	110	90	M10	122	120	20	7	M10	190	165	8 x (45°)	10.5	55	84,700	210,800	1,800

All dimensions stated without a unit are in mm

10.2.4 Ballscrew for heavy-duty operation

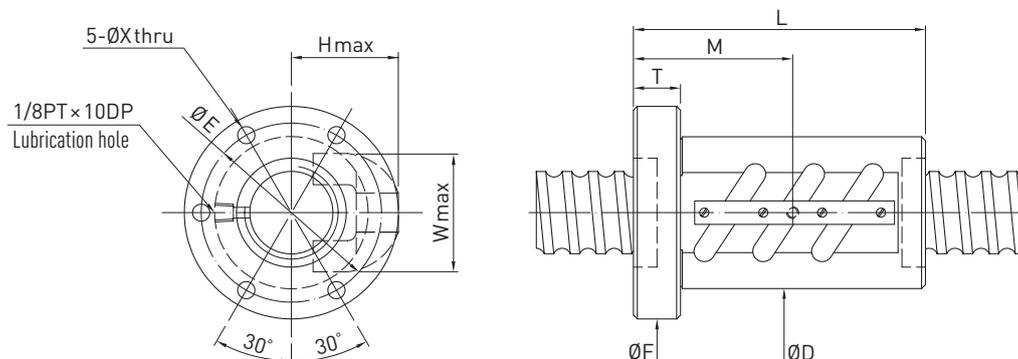


Table 10.11 Nut dimensions

Model	Nominal diameter	Lead	Circuits	Dynamic load rating C_{dyn} [kN]	Static load rating C_0 [kN]	D	L	F	T	E	X	H	W
R45-10B3-FSV	45	10	2.5 × 3	145	488	70	143	104	18	87	9	47.0	52
R50-12B3-FSV	50	12	2.5 × 3	175	602	77	171	111	22	94	9	52.0	59
R50-16B3-FSV	50	16	2.5 × 3	330	971	95	223	129	28	112	9	68.0	66
R55-16B3-FSV	55	16	2.5 × 3	343	1,054	99	223	133	28	116	9	70.0	70
R63-16B3-FSV	63	16	2.5 × 3	368	1,217	105	223	139	28	122	9	72.5	76
R80-16B3-FSV	80	16	2.5 × 3	409	1,543	120	227	154	32	137	9	80.0	92
R80-25B3-FSV	80	25	2.5 × 3	714	2,366	145	338	185	40	165	11	102.0	100
R100-16B3-FSV	100	16	2.5 × 3	453	1,949	145	227	185	32	165	11	91.0	109
R100-25B3-FSV	100	25	2.5 × 3	788	2,920	159	338	199	40	179	11	108.5	118
R120-25B3-FSV	120	25	2.5 × 3	850	3,473	173	338	213	40	193	11	116.0	135

All dimensions stated without a unit are in mm

Appendix 2: Product specifications and technical data

10.2.5 Shaft ends and accessories

10.2.5.1 Shaft ends and bearing configuration

Table 10.12 Overview of standard shaft ends for SFA, SLA bearing series

<p>Supported bearing type S1 Bearing: deep groove ball bearing 60.. or 62.. For SLA bearing unit</p>	<p>Fixed bearing type S2 Bearing: ZKLF.. or ZKLN.. For SFA bearing unit</p>	<p>Fixed bearing type S3 Bearing: ZKLF.. or ZKLN.. For SFA bearing unit</p>
<p>Supported bearing type S11 Bearing: deep groove ball bearing 60.. or 62.. For SLA bearing unit</p>	<p>Fixed bearing type S21 Bearing: ZKLF.. or ZKLN.. For SFA bearing unit</p>	<p>Supported bearing type S5 Bearing: deep groove ball bearing 62.. For SLA bearing unit</p>

Example: Designation of shaft end, type S2, with the fit diameter $d = 20$: S2-20

Table 10.13 Dimensions of standard shaft ends for SFA, SLA bearing series

Shaft end type	Ballscrew nominal \emptyset	d	D2	D3	L1	L2	L3	L5	L12	L15	DE	LE	LA	LP	LZ	Width \times depth	Recess R
S_-06	12	6	M6 \times 0.5	5 j6	31	37	—	8	—	6	5.7 h10	0.80	26	—	16	—	10002475
S_-10	15, 16	10	M10 \times 0.75	8 j6	39	50	30	12	12	9	9.6 h10	1.10	32	14	20	2 \times 1.2	10002475
S_-12	20	12	M12 \times 1	10 j6	43	58	35	13	12	10	11.5 h11	1.10	35	16	23	3 \times 1.8	10002475
S_-17	25	17	M17 \times 1	14 j6	60	73	43	15	20	12	16.2 h11	1.10	50	20	30	5 \times 3	10002475
S_-20	25, 32	20	M20 \times 1	14 j6	62	76	46	17	20	14	19 h12	1.30	50	20	30	5 \times 3	DIN509-E0.6 \times 0.3
S_-25	32, 40	25	M25 \times 1.5	20 j6	83	96	46	19	20	15	23.9 h12	1.30	71	36	50	6 \times 3.5	DIN509-E0.6 \times 0.3
S_-30	40	30	M30 \times 1.5	25 j6	95	108	48	20	22	16	28.6 h12	1.60	82	45	60	8 \times 4	10002476
S_-40	50	40	M40 \times 1.5	32 k6	119	135	55	22	24	18	37.5 h12	1.85	104	56	80	10 \times 5	DIN509-E0.6 \times 0.3
S_-50	63	50	M50 \times 1.5	40 k6	142	155	55	25	24	20	47 h12	2.15	124	70	100	12 \times 5	10002476
S_-60	80	60	M60 \times 2	50 k6	155	177	67	28	25	22	57 h12	2.15	135	70	110	14 \times 5.5	10002476

Unit: mm

Table 10.14 Overview of standard shaft ends for EK, BK, FK, EF, BF, FF bearing series

<p>Fixed bearing type E8 Bearing: 70.. For EK, FK bearing units</p>	<p>Fixed bearing type E9 Bearing: 72.. For BK bearing unit</p>	<p>Supported bearing type E10 Bearing: deep groove ball bearing 60.. or 62.. For EF, BF, FF bearing unit</p>
<p>Fixed bearing type E81 Bearing: 70.. For EK, FK bearing units</p>	<p>Fixed bearing type E91 Bearing: 72.. For BK bearing unit</p>	

Example: Designation of shaft end, type S3, with the fit diameter $d = 10$: S3-10

Table 10.15 Dimensions of standard shaft ends for EK, BK, FK, EF, BF, FF bearing series

Shaft end type	Ballscrew nominal \varnothing	d	D4	D5	D10	L8	L9	L10	L16	L17	DE	LB	LC	LP	Width \times depth	C	Recess R
E_-08	12	8	6	M8 \times 1	6	41	—	9	6	0.80	5.8	9	19	—	—	5.5	DIN509-E0.6 \times 0.2
E_-10	15, 16	10	8	M10 \times 1	8	56	—	10	7	0.90	7.7	20	31	14	2 \times 1.2	5.5	DIN509-E0.6 \times 0.2
E10-12	16 ¹⁾	12	10	M12 \times 1	10	59	—	11	8	1.15	9.6	23	34	16	3 \times 1.8	5.5	10002475
E8-12	16 ¹⁾	12	10	M12 \times 1	10	59	—	11	8	1.15	9.6	23	34	16	3 \times 1.8	5.5	DIN509-E0.6 \times 0.2
E81-12	16 ¹⁾	12	10	M12 \times 1	10	59	—	11	8	1.15	9.6	23	34	16	3 \times 1.8	5.5	DIN509-E0.6 \times 0.2
E_-15	20	15	12	M15 \times 1	15	70	—	13	9	1.15	14.3	23	36	16	4 \times 2.5	10.0	DIN509-E0.6 \times 0.2
E_-20	25	20	17	M20 \times 1	20	92	—	19	14	1.35	19.0	30	47	20	5 \times 3.0	11.0	DIN509-E0.6 \times 0.3
E_-25	32	25	20	M25 \times 1.5	25	126	115	20	15	1.35	23.9	50	70	36	6 \times 3.5	15 (9) ³⁾	DIN509-E0.8 \times 0.3
E_-30	40	30	25	M30 \times 1.5	30	132	132	21	16	1.75	28.6	60	85	45	8 \times 4.0	9.0	10002476
E_-40	50	40	35 ²⁾	M40 \times 1.5	40	—	173	23	18	1.95	38.0	80	115	56	10 \times 5	15.0	DIN509-E0.8 \times 0.3

Unit: mm

¹⁾ Depending on actual shaft outer diameter $d_{s \min} = 15.5$

²⁾ Tolerance k6

³⁾ for BK 25

It goes without saying that we also machine the shaft ends to your drawings and individual requirements.

Appendix 2: Product specifications and technical data

Table 10.16 Overview of standard shaft ends for WBK bearing series

<p>Fixed bearing type W1 Bearing: BSB.. For WBK_DF bearing unit</p>	<p>Fixed bearing type W2 Bearing: BSB.. For WBK_DFD bearing unit</p>	<p>Fixed bearing type W3 Bearing: BSB.. For WBK_DFF bearing unit</p>
<p>Fixed bearing type W11 Bearing: BSB.. For WBK_DF bearing unit</p>	<p>Fixed bearing type W21 Bearing: BSB.. For WBK_DFD bearing unit</p>	<p>Fixed bearing type W31 Bearing: BSB.. For WBK_DFF bearing unit</p>

Example: Designation of shaft end, type W2, with the fit diameter $d = 20$: W2-20

Table 10.17 Dimensions of standard shaft ends for WBK bearing series

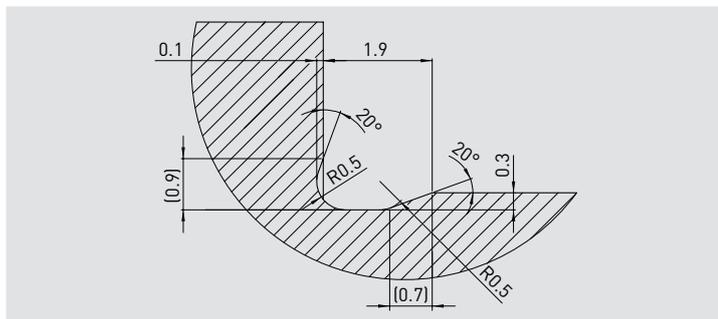
Shaft end type	Ballscrew nominal \emptyset	d	D4	D5	L11	L12	L13	LB	LC	LP	Width \times depth	Recess R
W_-15	20	15	12	M15 \times 1	104	—	—	23	46	16	4 \times 2.5	DIN509-E0.6 \times 0.2
W_-17	25	17	14	M17 \times 1	111	—	—	30	53	20	5 \times 3.0	10002475
W_-20	25	20	17	M20 \times 1	111	—	—	30	53	20	5 \times 3.0	DIN509-E0.6 \times 0.3
W_-25	32	25	20	M25 \times 1.5	139	154	—	50	76	36	6 \times 3.5	DIN509-E0.8 \times 0.3
W_-30	40	30	25	M30 \times 1.5	149	164	—	60	86	45	8 \times 4.0	10002476
W_-35	45	35	30	M35 \times 1.5	152	167	182	60	90	45	8 \times 4.0	DIN509-E0.8 \times 0.3
W_-40	50	40	35 ¹⁾	M40 \times 1.5	172	187	202	80	110	56	10 \times 5.0	DIN509-E0.8 \times 0.3

Unit: mm

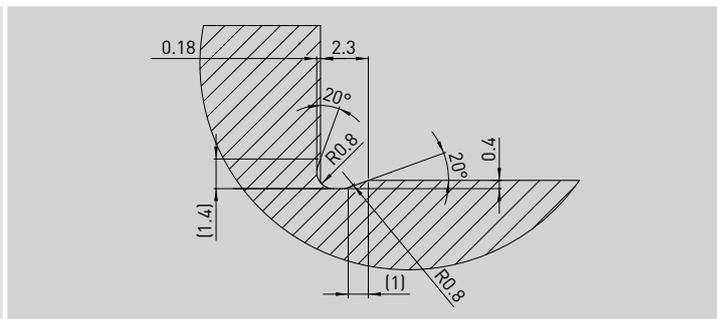
¹⁾ Tolerance k6

It goes without saying that we also machine the shaft ends to your drawings and individual requirements.

10.2.5.2 HIWIN recesses



HIWIN recess 10002475



HIWIN recess 10002476

Appendix 2: Product specifications and technical data

10.2.5.3 Bearing types and associated end machining

Table 10.18 Overview of bearing type and associated end machining for SLA, SFA bearing units

Ballscrew nominal Ø	Fixed bearing		Supported bearing	
	Pillow block	End machining	Pillow block	End machining
12	SFA06	S21-06	SLA06	S5-06 / S11-06
15, 16	SFA10	S2-10 / S3-10 / S21-10	SLA10	S1-10 / S5-10 / S11-10
20	SFA12	S2-12 / S3-12 / S21-12	SLA12	S1-12 / S5-12 / S11-12
25	SFA17	S2-17 / S3-17 / S21-17	SLA17	S1-17 / S5-17 / S11-17
32	SFA20	S2-20 / S3-20 / S21-20	SLA20	S1-20 / S5-20 / S11-20
40	SFA30	S2-30 / S3-30 / S21-30	SLA30	S1-30 / S5-30 / S11-30
50	SFA40	S2-40 / S3-40 / S21-40	SLA40	S1-40 / S5-40 / S11-40

Table 10.19 Overview of bearing type and associated end machining for EK, BK, FK, EF, BF, FF bearing units

Ballscrew nominal Ø	Fixed bearing				Supported bearing			
	Pillow block	End machining	Flange bearing	End machining	Pillow block	End machining	Flange bearing	End machining
12	EK08	E81-08	FK08	E81-08	EF08	E10-08	—	—
15, 16	EK10	E8-10 / E81-10	FK10	E8-10 / E81-10	EF10	E10-10	FF10	E10-10
16 ¹⁾	EK12	E8-12 / E81-12	FK12	E8-12 / E81-12	EF12	E10-12	FF12	E10-12
20	EK15	E8-15 / E81-15	FK15	E8-15 / E81-15	EF15	E10-15	FF15	E10-15
25	EK20	E8-20 / E81-20	FK20	E8-20 / E81-20	EF20	E10-20	FF20	E10-20
32	BK25	E9-25 / E91-25	FK25	E8-25 / E81-25	BF25	E10-25	FF25	E10-25
40	BK30	E9-30 / E91-30	FK30	E8-30 / E81-30	BF30	E10-30	FF30	E10-30
50	BK40	E9-40 / E91-40	—	—	BF40	E10-40	—	—

¹⁾ Depending on actual shaft outer diameter $d_{s \min} = 15.5$

Table 10.20 Overview of bearing type and associated end machining for WBK bearing unit

Ballscrew nominal Ø	Flange bearing	End machining
20	WBK15DF	W1-15 / W11-15
25	WBK17DF	W1-17 / W11-17
25	WBK20DF	W1-20 / W11-20
32	WBK25DF	W1-25 / W11-25
32	WBK25DFD	W2-25 / W21-25
40	WBK30DF	W1-30 / W11-30
40	WBK30DFD	W2-30 / W21-30
45	WBK35DF	W1-35 / W11-35
45	WBK35DFD	W2-35 / W21-35
45	WBK35DFF	W3-35 / W31-35
50	WBK40DF	W1-40 / W11-40
50	WBK40DFD	W2-40 / W21-40
50	WBK40DFF	W3-40 / W31-40

10.2.5.4 WBK bearing series

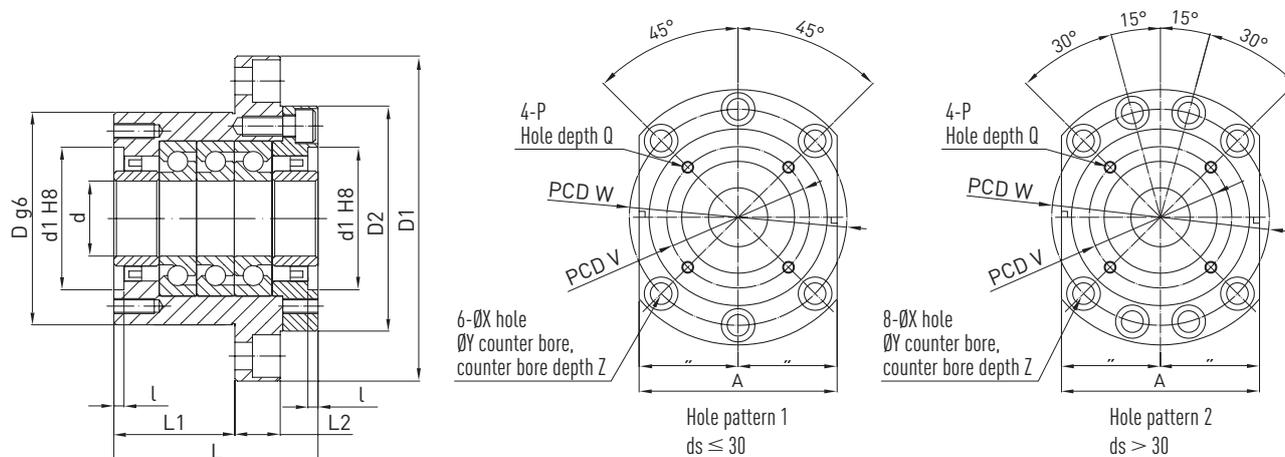


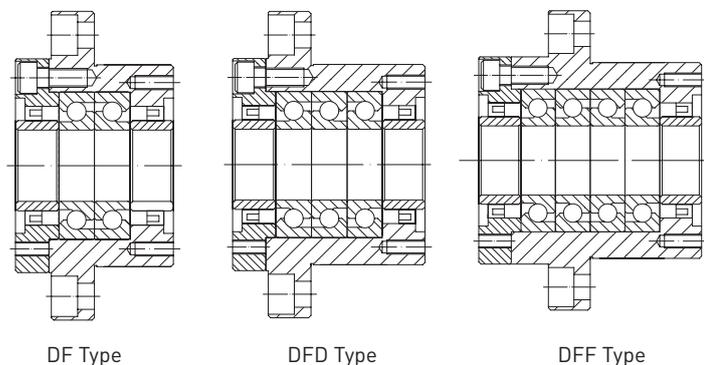
Table 10.21 Bearing unit dimensions

Article number	Shaft nominal \emptyset	d	D	$D1$	$D2$	L	$L1$	$L2$	A	W	X	Y	Z	$d1$	l	V	P	Q
WBK15DF	20	15	70	106	72	60	32	15	80	88	9	14.0	8.5	45	3	58	M5	10
WBK17DF	25	17	70	106	72	60	32	15	80	88	9	14.0	8.5	45	3	58	M5	10
WBK20DF	25	20	70	106	72	60	32	15	80	88	9	14.0	8.5	45	3	58	M5	10
WBK25DF	32	25	85	130	90	66	33	18	100	110	11	17.5	11.0	57	4	70	M6	12
WBK25DFD	32	25	85	130	90	81	48	18	100	110	11	17.5	11.0	57	4	70	M6	12
WBK30DF	40	30	85	130	90	66	33	18	100	110	11	17.5	11.0	57	4	70	M6	12
WBK30DFD	40	30	85	130	90	81	48	18	100	110	11	17.5	11.0	57	4	70	M6	12
WBK35DF	45	35	95	142	102	66	33	18	106	121	11	17.5	11.0	69	4	80	M6	12
WBK35DFD	45	35	95	142	102	81	48	18	106	121	11	17.5	11.0	69	4	80	M6	12
WBK35DFF	45	35	95	142	102	96	48	18	106	121	11	17.5	11.0	69	4	80	M6	12
WBK40DF	50	40	95	142	102	66	33	18	106	121	11	17.5	11.0	69	4	80	M6	12
WBK40DFD	50	40	95	142	102	81	48	18	106	121	11	17.5	11.0	69	4	80	M6	12
WBK40DFF	50	40	95	142	102	96	48	18	106	121	11	17.5	11.0	69	4	80	M6	12

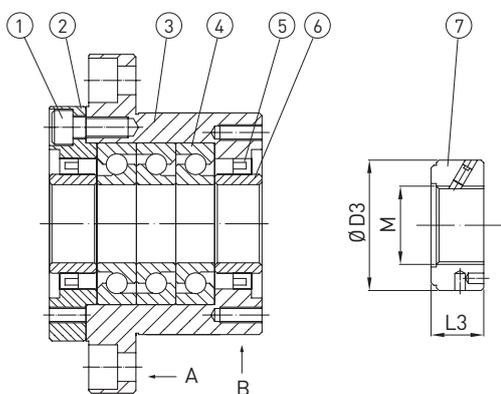
Unit: mm

Appendix 2: Product specifications and technical data

Bearing arrangements



Bearing structure



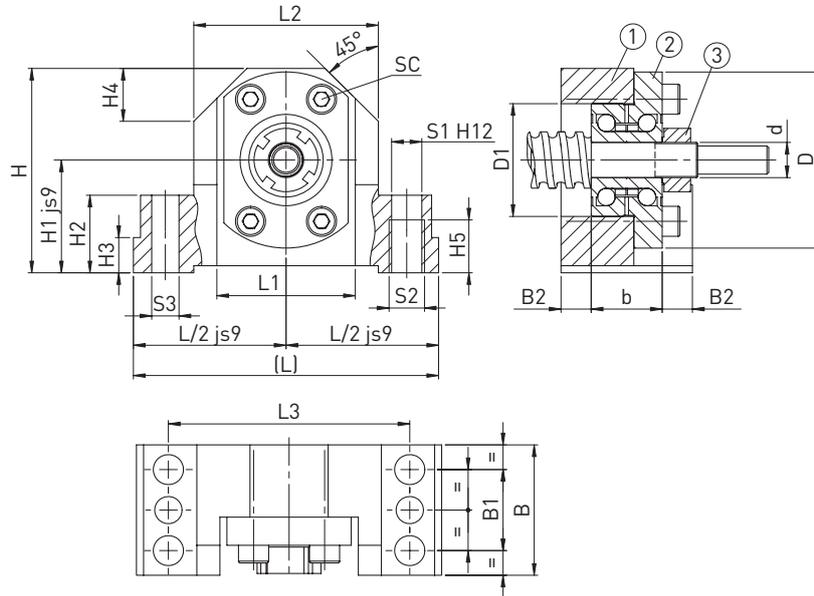
(1) Mounting bolt, (2) Bearing cover, (3) Bearing housing, (4) Bearing, (5) Seal, (6) Spacer, (7) Lock nut

Table 10.22 **Technical data of the bearing**

Article number	Dynamic load rating [kN]	Permissible axial load [kN]	Preload [kN]	Axial rigidity [N/μm]	Starting torque [Nm]	Lock nut			Weight [kg]	
						M	D3	L3		Nut tightening torque [Nm]
WBK15DF	21.9	26.6	2.15	750	0,19	M15 × 1	30	14	52	1.9
WBK17DF	21.9	26.6	2.15	750	0,19	M17 × 1	32	16	74	1.9
WBK20DF	21.9	26.6	2.15	750	0,19	M20 × 1	38	16	118	1.9
WBK25DF	28.5	40.5	3.15	1,000	0,29	M25 × 1.5	38	18	188	3.1
WBK25DFD	46.5	81.5	4.30	1,470	0,39	M25 × 1.5	38	18	188	3.4
WBK30DF	29.2	43.0	3.35	1,030	0,30	M30 × 1.5	45	18	260	3.0
WBK30DFD	47.5	86.0	4.50	1,520	0,40	M30 × 1.5	45	18	260	3.3
WBK35DF	31.0	50.0	3.80	1,180	0,34	M35 × 1.5	52	18	340	3.4
WBK35DFD	50.5	100.0	5.20	1,710	0,45	M35 × 1.5	52	18	340	4.3
WBK35DFF	50.5	100.0	7.65	2,350	0,59	M35 × 1.5	52	18	340	5.0
WBK40DF	31.5	52.0	3.90	1,230	0,36	M40 × 1.5	58	20	500	3.6
WBK40DFD	51.5	104.0	5.30	1,810	0,47	M40 × 1.5	58	20	500	4.2
WBK40DFF	51.5	104.0	7.85	2,400	0,61	M40 × 1.5	58	20	500	4.7

10.2.5.5 Fixed bearing SFA

SFA06, SFA10



(1) Steel pillow block housing, (2) Bearing, (3) Lock nut

Table 10.23 Bearing unit dimensions

Article number	Shaft nominal \varnothing	L	L/2	L1	L2	L3	H	H1	H2	H3	H4	H5	d	D	D1	b
SFA06	12	62	31	34	38	50	41	22	13	5	11	9	6	30	19	12
SFA10	16	86	43	52	52	68	58	32	22	7	15	15	10	50	32	20

Unit: mm

Table 10.24 Bearing unit dimensions

Article number	Shaft nominal \varnothing	B	B1	B2	S1	S2	S3	SC ISO 4762-10.9
SFA06	12	32	16	10.0	5.3	M6	3.7	4 × M3 × 12
SFA10	16	37	23	8.5	8.4	M10	7.7	4 × M5 × 20

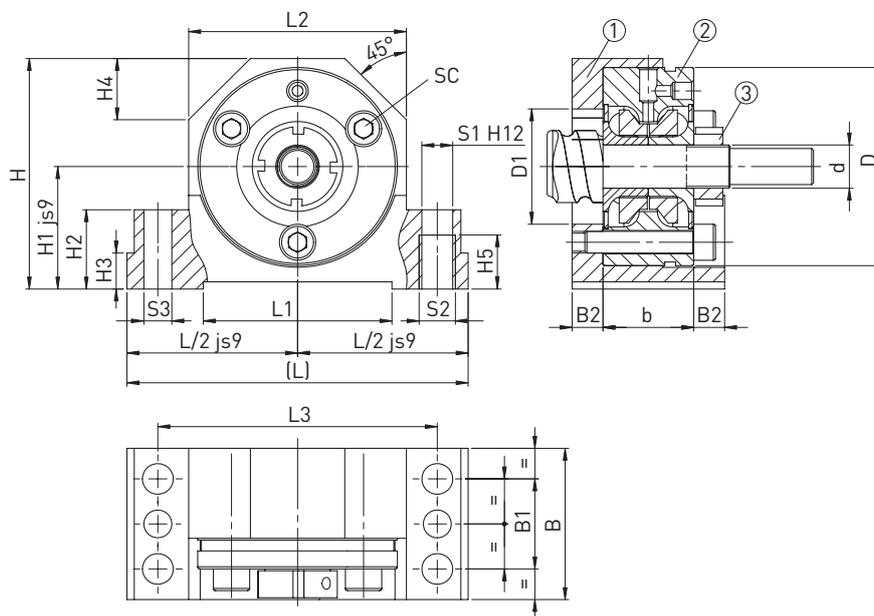
Unit: mm

Table 10.25 Technical data of the bearing

Article number	Bearing type	C_0 axial [N]	C_{dyn} axial [N]	Max. speed [n/min]	Lock nut			
					Type	Nut tightening torque [Nm]	Screw size	Screw tightening torque [Nm]
SFA06	ZKLFA0630.2Z	6,100	4,900	14,000	HIR 06	2	M4	1
SFA10	ZKLFA1050.2RS	8,500	6,900	6,800	HIR 10	6	M4	1

Appendix 2: Product specifications and technical data

SFA12 – SFA40



(1) Steel pillow block housing, (2) Bearing, (3) Lock nut

Table 10.26 Bearing unit dimensions

Article number	Shaft nominal \varnothing	L	L/2	L1	L2	L3	H	H1	H2	H3	H4	H5	d	D	D1	b
SFA12	20	94	47	52	60	77	64	34	22	7	17	15	12	55	32	25
SFA17	25	108	54	65	66	88	72	39	27	10	19	18	17	62	36	25
SFA20	32	112	56	65	73	92	78	42	27	10	20	18	20	68	42	28
SFA30	40	126	63	82	84	105	92	50	32	13	23	21	30	80	52	28
SFA40	50	146	73	82	104	125	112	60	32	13	30	21	40	100	66	34

Unit: mm

Table 10.27 Bearing unit dimensions

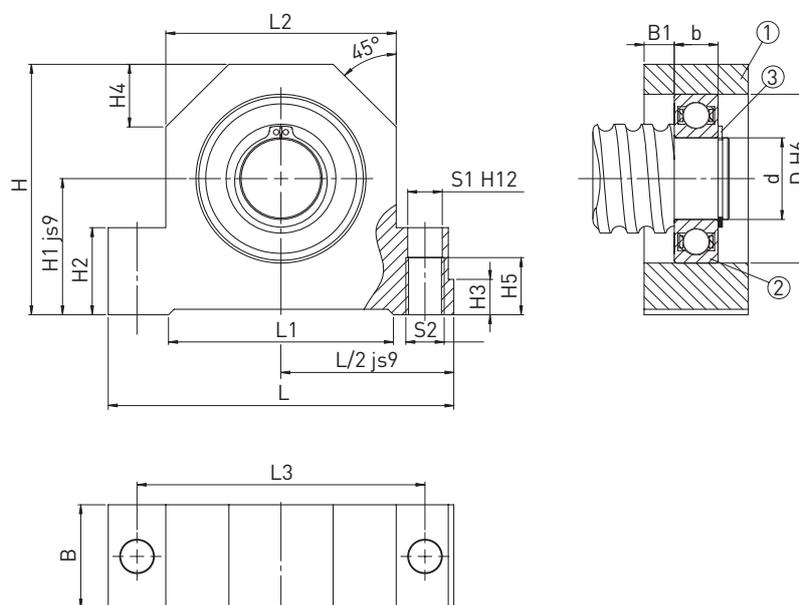
Article number	Shaft nominal \varnothing	B	B1	B2	S1	S2	S3	Lock nut	SC ISO 4762-10.9
SFA12	20	42	25	8.5	8.4	M10	7.7	HIR 12	3 × M6 × 35
SFA17	25	46	29	10.5	10.5	M12	9.7	HIR 17	3 × M6 × 35
SFA20	32	49	29	10.5	10.5	M12	9.7	HIR 20 × 1	4 × M6 × 40
SFA30	40	53	32	12.5	12.6	M14	9.7	HIR 30	6 × M6 × 40
SFA40	50	59	34	12.5	12.6	M14	9.7	HIR 40	4 × M8 × 50

Unit: mm

Table 10.28 Technical data of the bearing

Article number	Bearing type	C_0 axial [N]	C_{dyn} axial [N]	Max. speed [n/min]	Lock nut			
					Type	Nut tightening torque [Nm]	Screw size	Screw tightening torque [Nm]
SFA12	ZKLF1255.2RS-XL	24,700	18,600	3,800	HIR 12	8	M4	1
SFA17	ZKLF1762.2RS-XL	31,000	20,700	3,300	HIR 17	15	M5	3
SFA20	ZKLF2068.2RS-XL	47,000	28,500	3,000	HIR 20 × 1	18	M5	3
SFA30	ZKLF3080.2RS-XL	64,000	32,000	2,200	HIR 30	32	M6	5
SFA40	ZKLF40100.2RS-XL	101,000	47,500	1,800	HIR 40	55	M6	5

10.2.5.6 Bearing series SLA



(1) Steel pillow block housing, (2) Bearing, (3) Circlip

Table 10.29 Bearing unit dimensions

Article number	Shaft nominal \varnothing	L	L/2	L1	L2	L3	H	H1	H2	H3	H4	H5	b
SLA06	12	62	31	34	38	50	41	22	13	5	11	9	6
SLA10	16	86	86	52	52	68	58	32	22	7	15	15	9
SLA12	20	94	47	52	60	77	64	34	22	7	17	15	10
SLA17	25	108	54	65	66	88	72	39	27	10	19	18	12
SLA20	32	112	56	65	73	92	78	42	27	10	20	18	14
SLA30	40	126	63	82	84	105	92	50	32	13	23	21	16
SLA40	50	146	73	82	104	125	112	60	32	13	30	21	18

Unit: mm

Table 10.30 Bearing unit dimensions

Article number	Shaft nominal \varnothing	B	B1	S1	S2	d	D	Circlip DIN 471	Deep groove ball bearing DIN 625
SLA06	12	15	4.5	5.3	M6	6	19	6 × 0.7	626.2RS
SLA10	16	24	7.5	8.4	M10	10	30	10 × 1	6200.2RS
SLA12	20	26	8.0	8.4	M10	12	32	12 × 1	6201.2RS
SLA17	25	28	8.0	10.5	M12	17	40	17 × 1	6203.2RS
SLA20	32	34	10.0	10.5	M12	20	47	20 × 1.2	6204.2RS
SLA30	40	38	11.0	12.6	M14	30	62	30 × 1.5	6206.2RS
SLA40	50	44	13.0	12.6	M14	40	80	40 × 1.75	6208.2RS

Unit: mm

Appendix 2: Product specifications and technical data

10.2.5.7 Housing for flange nuts (DIN 69051 Part 5)

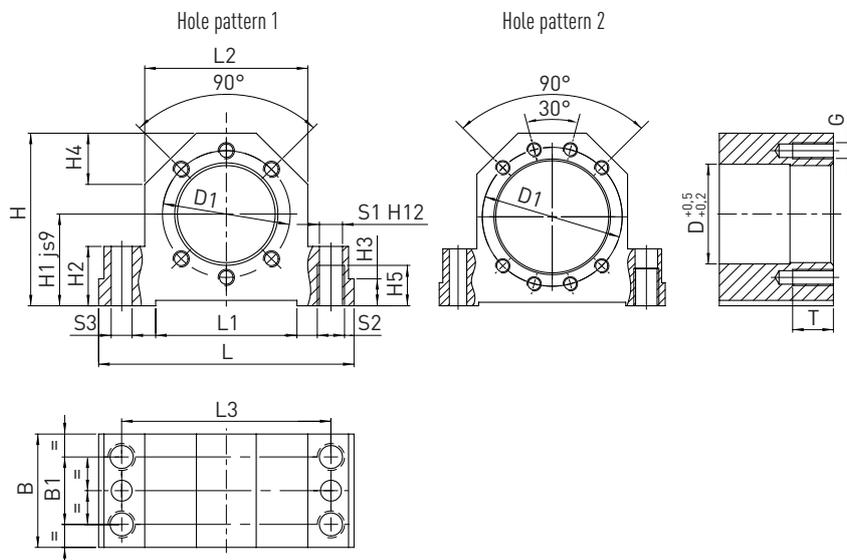


Table 10.31 Bearing unit dimensions

Article number	Shaft nominal Ø	L	L1	L2	L3	H	H1	H2	H3	H4	H5
GFD16	16	86	52	52	68	58	32	22	7	15	15
GFD20	20	94	52	60	77	64	34	22	7	17	15
GFD25	25	108	65	66	88	72	39	27	10	19	18
GFD32	32	112	65	72	92	82	42	27	10	19	18
GFD40	40	126	82	84	105	97	50	32	13	23	21
GFD50	50	146	82	104	125	115	60	32	13	30	21

Unit: mm

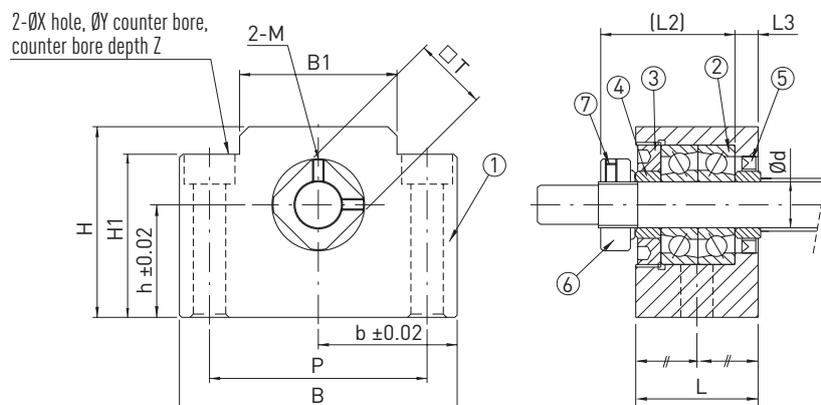
Table 10.32 Housing dimensions

Article number	Shaft nominal Ø	D	D1	B	B1	S1	S2	S3	Hole pattern	G	T
GFD16	16	28	38	37	23	8.4	M10	7.7	1	M5	12
GFD20	20	36	47	42	25	8.4	M10	7.7	1	M6	15
GFD25	25	40	51	46	29	10.5	M12	9.7	1	M6	15
GFD32	32	50	65	49	29	10.5	M12	9.7	1	M8	20
GFD40	40	63	78	53	32	12.6	M14	9.7	2	M8	20
GFD50	50	75	93	59	34	12.6	M14	9.7	2	M10	25

Unit: mm

10.2.5.8 Fixed bearing EK

EK08



1) Housing, (2) Bearing, (3) Retaining cover, (4) Support ring, (5) Seal, (6) Clamping nut, (7) Allen set screw

Table 10.33 Bearing unit dimensions

Article number	Shaft nominal \varnothing	d	L	L2	L3	B	H	b	h	B1	H1	P	X	Y	Z	M	T
EK08	12	8	23	26	4	52	32	26	17	25	26	38	6,6	11	12	M3	14

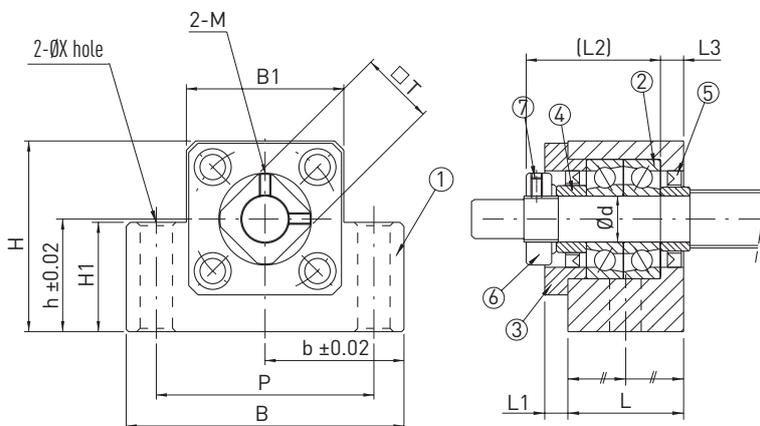
Unit: mm

Table 10.34 Technical data of the bearing

Article number	Bearing type	C_0 axial [N]	C_{dyn} axial [N]	Max. permissible axial load [N]	Max. speed [n/min]	Lock nut			
						Type	Nut tightening torque [Nm]	Screw size	Screw tightening torque [Nm]
EK08	708	4,800	2,800	1,100	40,000	RN8	2.5	M3	0.6

Appendix 2: Product specifications and technical data

EK10 – EK20



1) Housing, (2) Bearing, (3) Retaining cover, (4) Support ring, (5) Seal, (6) Clamping nut, (7) Allen set screw

Table 10.35 **Bearing unit dimensions**

Article number	Shaft nominal Ø	d	L	L1	L2	L3	B	H	b	h	B1	H1	P	X	M	T
EK10	16	10	24	6	29.5	6	70	43	35.0	25	36	24	52	9	M3	16
EK12	16 ¹⁾	12	24	6	29.5	6	70	43	35.0	25	36	24	52	9	M4	19
EK15	20	15	25	6	36.0	5	80	49	40.0	30	41	25	60	11	M4	22
EK20	25	20	42	10	50.0	10	95	58	47.5	30	56	25	75	11	M4	30

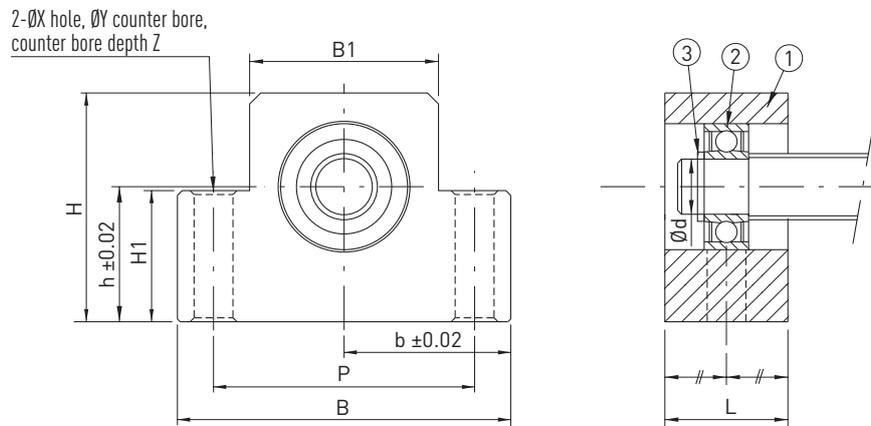
Unit: mm

¹⁾ Depending on actual shaft outer diameter $d_{s \min} = 15.5$

Table 10.36 **Technical data of the bearing**

Article number	Bearing type	C_0 axial [N]	C_{dyn} axial [N]	Max. permissible axial load [N]	Max. speed [n/min]	Lock nut			
						Type	Nut tightening torque [Nm]	Screw size	Screw tightening torque [Nm]
EK10	7000A P0	8,800	5,200	2,000	24,000	RN10	2.9	M3	0.6
EK12	7001A P0	9,400	6,000	2,200	22,000	RN12	6.4	M4	1.5
EK15	7002A P0	10,000	6,900	2,400	19,000	RN15	7.9	M4	1.5
EK20	7204B P0	21,600	15,200	6,800	9,500	RN20	16.7	M4	1.5

10.2.5.9 Supported bearing EF



(1) Housing, (2) Bearing, (3) Circlip

Table 10.37 Bearing unit dimensions

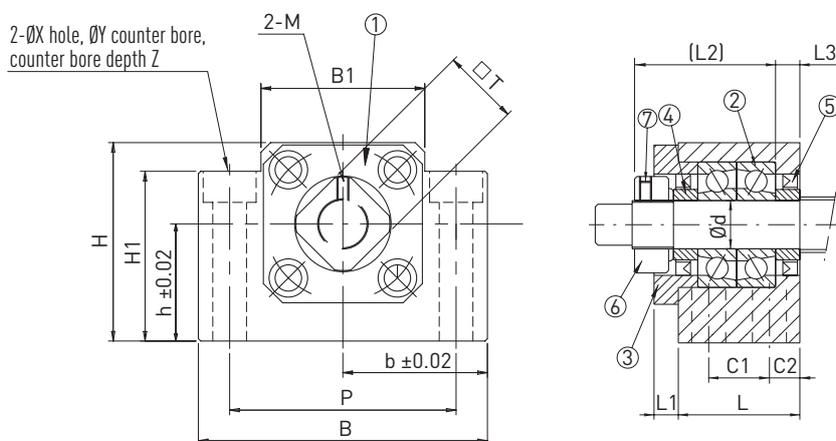
Article number	Shaft nominal \varnothing	d	L	B	H	b	h	B1	H1	P	X	Y	Z	Bearing	Circlip
EF08	12	6	14	52	32	26.0	17	25	26	38	6.6	11	12	606ZZ	S 06
EF10	16	8	20	70	43	35.0	25	36	24	52	9.0	—	—	608ZZ	S 08
EF12	16 ¹⁾	10	20	70	43	35.0	25	36	24	52	9.0	—	—	6000ZZ	S 10
EF15	20	15	20	80	49	40.0	30	41	25	60	9.0	—	—	6002ZZ	S 15
EF20	25	20	26	95	58	47.5	30	56	25	75	11.0	—	—	6204ZZ	S 20

Unit: mm

¹⁾ Depending on actual shaft outer diameter $d_{s \min} = 15.5$

Appendix 2: Product specifications and technical data

10.2.5.10 Fixed bearing BK



(1) Housing, (2) Bearing, (3) Retaining cover, (4) Support ring, (5) Seal, (6) Clamping nut, (7) Allen set screw

Table 10.38 Bearing unit dimensions

Article number	Shaft nominal Ø	d	L	L1	L2	L3	B	H	b	h
BK25	32	25	42	12	54	9	106	80	53	48
BK30	40	30	45	14	61	9	128	89	64	51
BK40	50	40	61	18	76	15	160	110	80	60

Unit: mm

Table 10.39 Bearing unit dimensions

Article number	Shaft nominal Ø	B1	H1	P	C1	C2	X	Y	Z	M	T
BK25	32	64	70	85	22	10	11	17	11.0	M6	35
BK30	40	76	78	102	23	11	14	20	13.0	M6	40
BK40	50	100	90	130	33	14	18	26	17.5	M6	50

Unit: mm

Table 10.40 Technical data of the bearing

Article number	Bearing type	C ₀ axial [N]	C _{dyn} axial [N]	Max. permissible axial load [N]	Max. speed [n/min]	Lock nut			
						Type	Nut tightening torque [Nm]	Screw size	Screw tightening torque [Nm]
BK25	7205A P0	26,300	20,500	7,000	12,000	RN25	21	M6	5
BK30	7206B P0	33,500	27,000	10,600	7,100	RN30	31	M6	5
BK40	7208B P0	52,000	46,100	18,000	5,300	RN40	71	M6	5

10.2.5.11 Supported bearing BF

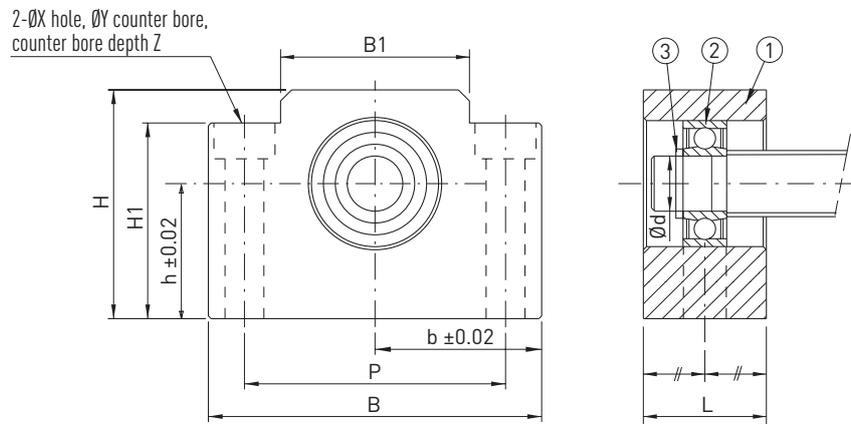


Table 10.41 Bearing unit dimensions

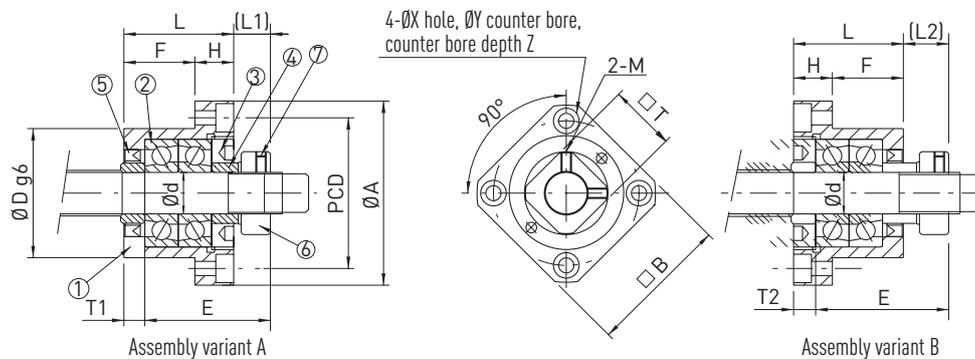
Article number	Shaft nominal \varnothing	d	L	B	H	b	h	B1	H1	P	X	Y	Z	Bearing	Circlip
BF25	32	25	30	106	80	53	48	64	70	85	11	17	11.0	6205ZZ	S 25
BF30	40	30	32	128	89	64	51	76	78	102	14	20	13.0	6206ZZ	S 30
BF40	50	40	37	160	110	80	60	100	90	130	18	26	17.5	6208ZZ	S 40

Unit: mm

Appendix 2: Product specifications and technical data

10.2.5.12 Fixed bearing FK

FK08



(1) Housing, (2) Bearing, (3) Retaining cover, (4) Support ring, (5) Seal, (6) Clamping nut, (7) Allen set screw

Table 10.42 Bearing unit dimensions

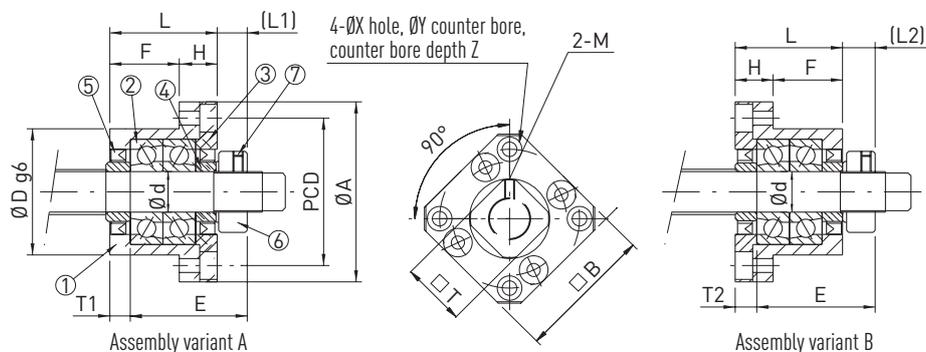
Article number	Shaft nominal \varnothing	d	L	H	F	E	D	A	PCD	B	Assembly variant A		Assembly variant B		X	Y	Z	M	T
											L1	T1	L2	T2					
FK08	12	8	23	9	14	26	28	43	35	35	7	4	8	5	3.4	6.5	4	M3	14

Unit: mm

Table 10.43 Technical data of the bearing

Article number	Bearing type	C_0 axial [N]	C_{dyn} axial [N]	Max. permissible axial load [N]	Max. speed [n/min]	Lock nut			
						Type	Nut tightening torque [Nm]	Screw size	Screw tightening torque [Nm]
FK08	708	4,800	2,800	1,000	40,000	RN8	2.5	M3	0.6

FK10 – FK30



(1) Housing, (2) Bearing, (3) Retaining cover, (4) Support ring, (5) Seal, (6) Clamping nut, (7) Allen set screw

Table 10.44 Bearing unit dimensions

Article number	Shaft nominal Ø	d	L	H	F	E	D	A	PCD	B	Assembly variant A		Assembly variant B		X	Y	Z	M	T
											L1	T1	L2	T2					
FK10	16	10	27	10	17	29.5	34	52	42	42	7.5	5	8.5	6	4.5	8.0	5	M3	16
FK12	16 ¹⁾	12	27	10	17	29.5	36	54	44	44	7.5	5	8.5	6	4.5	8.0	5	M4	19
FK15	20	15	32	15	17	36.0	40	63	50	52	10.0	6	12.0	8	5.5	9.5	6	M4	22
FK20	25	20	52	22	30	50.0	57	85	70	68	8.0	10	12.0	14	6.6	11.0	10	M4	30
FK25	32	25	57	27	30	60.0	63	98	80	79	13.0	10	20.0	17	9.0	15.0	13	M6	35
FK30	40	30	62	30	32	61.0	75	117	95	93	11.0	12	17.0	18	11.0	17.5	15	M6	40

Unit: mm

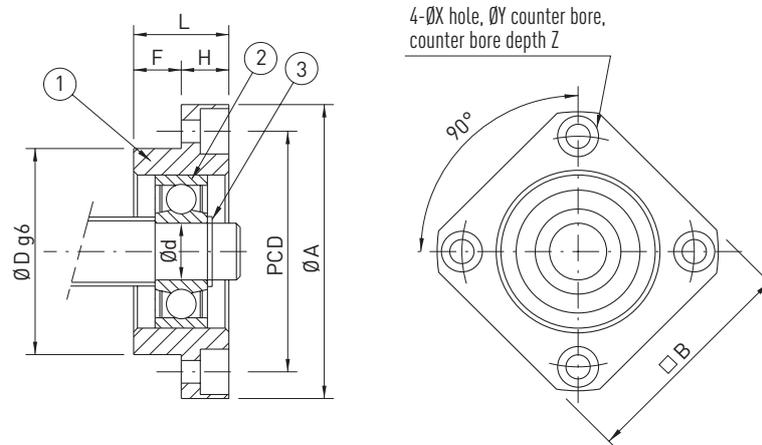
¹⁾ Depending on actual shaft outer diameter $d_{s \min} = 15.5$

Table 10.45 Technical data of the bearing

Article number	Bearing type	C_0 axial [N]	C_{dyn} axial [N]	Max. permissible axial load [N]	Max. speed [n/min]	Lock nut			
						Type	Nut tightening torque [Nm]	Screw size	Screw tightening torque [Nm]
FK10	7000A P0	8,800	5,200	1,900	24,000	RN10	2.9	M3	0.6
FK12	7001A P0	9,400	6,000	2,200	22,000	RN12	6.4	M4	1.5
FK15	7002A P0	10,000	6,900	2,400	19,000	RN15	7.9	M4	1.5
FK20	7204B P0	21,600	15,300	6,800	9,500	RN20	16.7	M4	1.5
FK25	7205B P0	24,000	19,000	8,100	8,500	RN25	20.6	M6	4.9
FK30	7206B P0	33,500	27,000	10,600	7,100	RN30	31.4	M6	4.9

Appendix 2: Product specifications and technical data

10.2.5.13 Supported bearing FF



(1) Housing, (2) Bearing, (3) Circlip

Table 10.46 Bearing unit dimensions

Article number	Shaft nominal Ø	d	L	H	F	D	A	PCD	B	X	Y	Z	Bearing	Circlip
FF10	16	8	12	7	5	28	43	35	35	3.4	6.5	4.0	608ZZ	S 08
FF12	16 ¹⁾	10	15	7	8	34	52	42	42	4.5	8.0	4.0	6000ZZ	S 10
FF15	20	15	17	9	8	40	63	50	52	5.5	9.5	5.5	6002ZZ	S 15
FF20	25	20	20	11	9	57	85	70	68	6.6	11.0	6.5	6204ZZ	S 20
FF25	32	25	24	14	10	63	98	80	79	9.0	14.0	8.5	6205ZZ	S 25
FF30	40	30	27	18	9	75	117	95	93	11.0	17.0	11.0	6206ZZ	S 30

Unit: mm

¹⁾ Depending on actual shaft outer diameter $d_{s \min} = 15.5$

10.2.6 Axial angular contact ball bearing

ZKLN series

Axial angular contact ball bearings of the ZKLN...2RS series are angular contact ball bearings in two rows with a 60° contact angle in an O arrangement. The outer race has a thick wall and is inherently stable. An accuracy of IT6 is therefore sufficient for the housing bore. The surround surface of the outer race has a lubrication groove and three lubrication holes. The two-part inner race is matched to the two ball and cage

ZKLF series

The differences between bearings of the ZKLF series and those of the ZKLN series are an outer race which can be unscrewed and a different lubrication hole arrangement. Directly screwing the outer race onto the connection construction means that the bearing cover usually needed to lock it in place is not required, neither is the adaptation

Less stringent PE version

In their normal version, the axial angular contact ball bearings ZKLN and ZKLF are designed for high-precision ballscrews. In many applications, such as handling, wood-working machines and mounting several ballscrews, this precision is not essential. A cheaper version with less stringent tolerances can often achieve the accuracy required for the function.

The ZKLN and ZKLF series with less stringent tolerances (indicated by the additional characters PE) provide the characteristics of the normal version, such as good loading capacity and rigidity with a high speed limit, as well as being easy to assemble and requiring little maintenance.

Benefits of the less stringent version:

- Cheaper
- Unit suited to function
- Less production work involved in connection construction

The less stringent PE version is available in hole diameters of 12 to 50.

Installation/removal

When installing the axial angular contact ball bearing, ensure that the assembly forces are not channelled via the rolling elements.

The mounting bolts of the ZKLF bearing should be tightened crosswise. The mounting bolts may be loaded up to 70 % of their yield strength.

The surround surface of the outer race has an extraction slot all the way round to speed up removal of bearings in the ZKLF series.

Tightening the lock nuts preloads the axial angular ball bearings. The lock nut tightening torques stated in the dimensions tables should be observed.

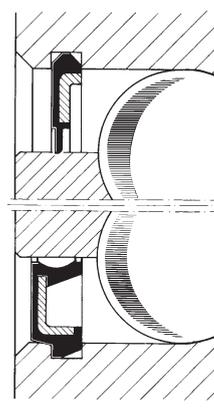
Once the lock nuts have been tightened, the two locking threaded pins should be tightened with a hexagon socket. Tighten the locking threaded pins alternately.

Lubrication

The bearings are greased using a lithium soap grease to GA28 and can be lubricated via the lubrication connectors in the outer ring. For the majority of applications, the initial greasing is sufficient for the whole bearing operating life.

assemblies and outer race such that the bearing is ideally preloaded when the lock nut is tightened to the specified tightening torque. Axial angular contact ball bearings are self-locking. They have sealing rings on both sides and are supplied ready to install and greased for life. No additional seals are needed in the surrounding construction.

work required in advance. There is an extraction slot all the way round the surround surface of the outer race to simplify disassembly. One radial and one axial M6 threaded hole permit re-lubrication in special applications.



Contact sealing disc
Additional characters .2RS

Gap seal
Additional characters .ZZ

To counteract settling effects, we would recommend initially tightening the lock nuts to three times the stated tightening torque M_A . Then relieve the lock nuts. They should then be tightened again to the tightening torques M_A stated in the dimensions tables.

When disassembling, proceed in reverse and first loosen the two locking threaded pins and then the lock nuts. If assembled and disassembled correctly, lock nuts can be used several times.

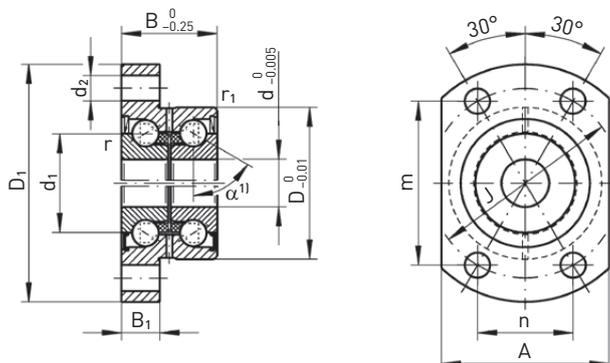
The dimensions of the bearing's inner races are such that a defined preload, sufficient for most applications, is achieved when the lock nut is tightened (tightening torque M_A according to dimensions table).

Deviating tightening torques M_A can be selected for special applications. Please contact us in such instances.

If the bearing friction torque M_{RL} can be checked, compare the values measured with those in the dimensions tables.

Appendix 2: Product specifications and technical data

10.2.6.1 Angular contact ball bearing ZKLFA



ZKLFA housing and shaft tolerances

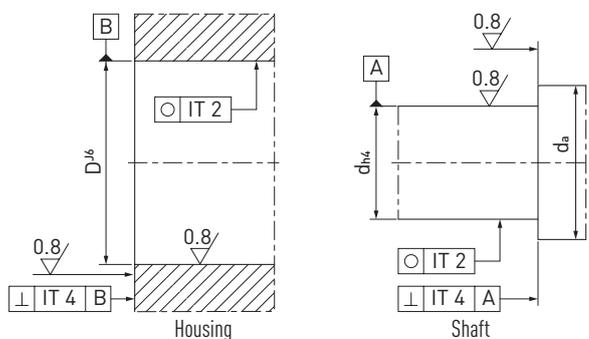


Table 10.47 Dimensions and connecting dimensions for angular ball bearing unit ZKLFA

Article number	Shaft Ø [mm]	Weight [kg]	Dimensions [mm]														Connecting dimensions [mm]	
			d	D	B	D ₁	B ₁	J	d ₂	m	n	A	d ₁	d	r _{min}	r _{1 min}	d _{a max}	d _{a min}
ZKLFA0630.2Z	6	0.05	6	19	12	30	5	24	3.5	21.0	12.0	22	12	30	0.3	0.3	15	9
ZKLFA0640.2RS	6	0.08	6	24	15	40	6	32	4.5	27.5	16.0	27	14	40	0.3	0.6	18	9
ZKLFA0640.2Z	6	0.08	6	24	15	40	6	32	4.5	27.5	16.0	27	14	40	0.3	0.6	18	9
ZKLFA0850.2RS	8	0.17	8	32	20	50	8	40	5.5	34.5	20.0	35	19	50	0.3	0.6	25	11
ZKLFA0850.2Z	8	0.17	8	32	20	50	8	40	5.5	34.5	20.0	35	19	50	0.3	0.6	25	11
ZKLFA1050.2RS	10	0.18	10	32	20	50	8	40	5.5	34.5	20.0	35	21	50	0.3	0.6	27	14
ZKLFA1050.2Z	10	0.18	10	32	20	50	8	40	5.5	34.5	20.0	35	21	50	0.3	0.6	27	14
ZKLFA1263.2RS	12	0.30	12	42	25	63	10	53	6.8	46.0	26.5	45	25	63	0.3	0.6	31	16
ZKLFA1263.2Z	12	0.30	12	42	25	63	10	53	6.8	46.0	26.5	45	25	63	0.3	0.6	31	16
ZKLFA1563.2RS	15	0.31	15	42	25	63	10	53	6.8	46.0	26.5	45	28	63	0.3	0.6	34	20
ZKLFA1563.2Z	15	0.31	15	42	25	63	10	53	6.8	46.0	26.5	45	28	63	0.3	0.6	34	20

The ball cages are made from plastic, permissible operating temperature 120 °C (continuous operation)

¹⁾ Contact angle $\alpha = 60^\circ$

Table 10.48 Technical data of angular ball bearing unit ZKLFA

Article number	Shaft Ø [mm]	Mounting bolts DIN912 10.9 ¹⁾		Axial load ratings		Limit speed Grease [rpm]	Bearing friction torque ²⁾ M _{RL} [Nm]	Axial rigidity c _{aL} [N/μm]	Resistance to tilting c _{KL} [Nm/mrad]	Recommended lock nut ¹⁾ Article number	Tightening torque ¹⁾ M _A [Nm]
		Number n × t	C _{dyn} [N]	C ₀ [N]							
ZKLFA0630.2Z	6	M3	4	4,900	6,100	14,000	0.01	150	4	HIR06	2
ZKLFA0640.2RS	6	M4	4	6,900	8,500	6,800	0.04	200	8	HIR06	2
ZKLFA0640.2Z	6	M4	4	6,900	8,500	12,000	0.02	200	8	HIR06	2
ZKLFA0850.2RS	8	M5	4	12,500	16,300	51,00	0.08	250	20	HIR08	4
ZKLFA0850.2Z	8	M5	4	12,500	16,300	9,500	0.04	250	20	HIR08	4
ZKLFA1050.2RS	10	M5	4	13,400	18,800	4,600	0.12	325	25	HIR10	6
ZKLFA1050.2Z	10	M5	4	13,400	18,800	8,600	0.06	325	25	HIR10	6
ZKLFA1263.2RS	12	M6	4	16,900	24,700	3,800	0.16	375	50	HIR12	8
ZKLFA1263.2Z	12	M6	4	16,900	24,700	7,600	0.08	375	50	HIR12	8
ZKLFA1563.2RS	15	M6	4	17,900	28,000	3,500	0.20	400	65	HIR15	10
ZKLFA1563.2Z	15	M6	4	17,900	28,000	7,000	0.10	400	65	HIR15	10

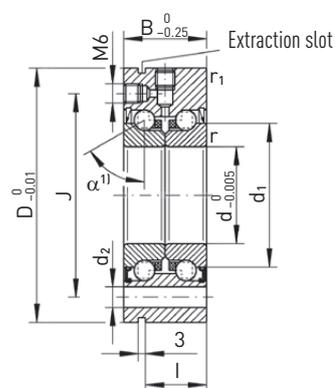
The ball cages are made from plastic, permissible operating temperature 120 °C (continuous operation)

¹⁾ Tightening torque of mounting bolts according to details from manufacturer

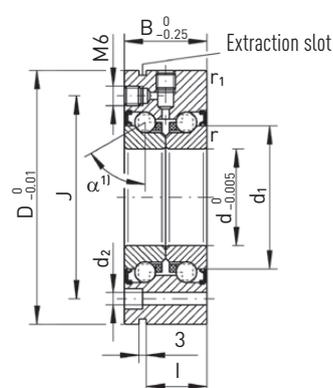
Screws according to DIN 912 are not supplied

²⁾ Bearing friction torque with gap seal (.2Z). With contact seal (.2RS) ≈ 2 × M_{RL}

10.2.6.2 Angular contact ball bearing ZKLF

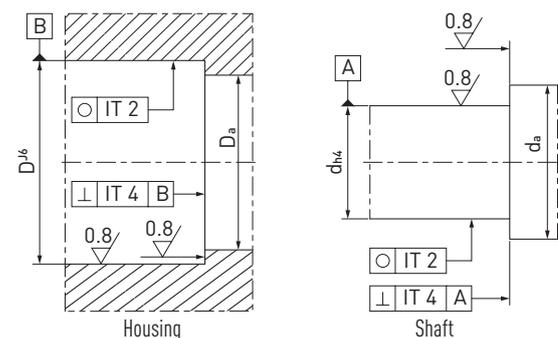


ZKLF... (d ≤ 50)



ZKLF...2Z (60 ≤ d ≤ 100)

Housing and shaft tolerances ZKLF...2RS/...2Z



Appendix 2: Product specifications and technical data

Table 10.49 Dimensions and connecting dimensions for angular ball bearing unit ZKLF

Article number	Shaft Ø [mm]	Weight [kg]	Dimensions [mm]									Connecting dimensions [mm]	
			d	D	B	J	d ₂	l	d ₁	r _{min}	r _{1 min}	D _a ¹⁾	d _a ¹⁾
ZKLF1255.2Z-XL	12	0.37	12	55	25	42	6.8	17	25.0	0.3	0.6	33	16
ZKLF1255.2RS-XL	12	0.37	12	55	25	42	6.8	17	25.0	0.3	0.6	33	16
ZKLF1560.2Z-XL	15	0.43	15	60	25	46	6.8	17	28.0	0.3	0.6	35	20
ZKLF1560.2RS-XL	15	0.43	15	60	25	46	6.8	17	28.0	0.3	0.6	35	20
ZKLF1762.2Z-XL	17	0.45	17	62	25	48	6.8	17	30.0	0.3	0.6	37	23
ZKLF1762.2RS-XL	17	0.45	17	62	25	48	6.8	17	30.0	0.3	0.6	37	23
ZKLF2068.2Z-XL	20	0.61	20	68	28	53	6.8	19	34.5	0.3	0.6	43	25
ZKLF2068.2RS-XL	20	0.61	20	68	28	53	6.8	19	34.5	0.3	0.6	43	25
ZKLF2575.2Z-XL	25	0.72	25	75	28	58	6.8	19	40.5	0.3	0.6	48	32
ZKLF2575.2RS-XL	25	0.72	25	75	28	58	6.8	19	40.5	0.3	0.6	48	32
ZKLF3080.2Z-XL	30	0.78	30	80	28	63	6.8	19	45.5	0.3	0.6	53	40
ZKLF3080.2RS-XL	30	0.78	30	80	28	63	6.8	19	45.5	0.3	0.6	53	40
ZKLF30100.2Z-XL	30	1.63	30	100	38	80	8.8	30	51.0	0.3	0.6	64	47
ZKLF30100.2RS-XL	30	1.63	30	100	38	80	8.8	30	51.0	0.3	0.6	64	47
ZKLF3590.2Z-XL	35	1.13	35	90	34	75	8.8	25	52.0	0.3	0.6	62	45
ZKLF3590.2RS-XL	35	1.13	35	90	34	75	8.8	25	52.0	0.3	0.6	62	45
ZKLF40100.2Z-XL	40	1.46	40	100	34	80	8.8	25	58.0	0.3	0.6	67	50
ZKLF40100.2RS-XL	40	1.46	40	100	34	80	8.8	25	58.0	0.3	0.6	67	50
ZKLF40115.2Z-XL	40	2.20	40	115	46	94	8.8	36	65.0	0.3	0.6	80	56
ZKLF40115.2RS-XL	40	2.20	40	115	46	94	8.8	36	65.0	0.3	0.6	80	56
ZKLF50115.2Z-XL	50	1.86	50	115	34	94	8.8	25	72.0	0.3	0.6	82	63
ZKLF50115.2RS-XL	50	1.86	50	115	34	94	8.8	25	72.0	0.3	0.6	82	63
ZKLF50140.2Z-XL	50	4.70	50	140	54	113	11.0	45	80.0	0.6	0.6	98	63
ZKLF50140.2RS-XL	50	4.70	50	140	54	113	11.0	45	80.0	0.6	0.6	98	63
ZKLF60145.2Z-XL	60	4.30	60	145	45	120	8.8	35	85.0	0.6	0.6	100	82
ZKLF70155.2Z-XL	70	4.90	70	155	45	130	8.8	35	95.0	0.6	0.6	110	92
ZKLF80165.2Z-XL	80	5.30	80	165	45	140	8.8	35	105.0	0.6	0.6	120	102
ZKLF90190.2Z-XL	90	8.70	90	190	55	165	11.0	45	120.0	0.6	0.6	138	116
ZKLF100200.2Z-XL	100	9.30	100	200	55	175	11.0	45	132.0	0.6	0.6	150	128

The ball cages are made from plastic, permissible operating temperature 120 °C (continuous operation)

¹⁾ Recommended diameter of installation surface

.2Z = Gap seal

.2RS = Contact seal

Table 10.50 Technical data of angular ball bearing unit ZKLF

Article number	Shaft Ø [mm]	Mounting bolt DIN912 10.9 ¹⁾		Axial load ratings		Limit speed	Bearing friction torque ²⁾	Axial rigidity	Resistance to tilting	Recommended lock nut ¹⁾	Tightening torque ¹⁾
		Number n × t	C _{dyn} [N]	C ₀ [N]	Grease [rpm]	M _{RL} [Nm]	C _{aL} [N/μm]	C _{kL} [Nm/mrad]	Article number	M _A [Nm]	
ZKLF1255.2Z-XL	12	M6	3 × 120°	18,600	24,700	7,600	0.08	375	50	HIR12	8
ZKLF1255.2RS-XL	12	M6	3 × 120°	18,600	24,700	3,800	0.16	375	50	HIR12	8
ZKLF1560.2Z-XL	15	M6	3 × 120°	19,600	28,000	7,000	0.10	400	65	HIR15	10
ZKLF1560.2RS-XL	15	M6	3 × 120°	19,600	28,000	3,500	0.20	400	65	HIR15	10
ZKLF1762.2Z-XL	17	M6	3 × 120°	20,700	31,000	6,600	0.12	450	80	HIR17/HIA17	15
ZKLF1762.2RS-XL	17	M6	3 × 120°	20,700	31,000	3,300	0.24	450	80	HIR17/HIA17	15
ZKLF2068.2Z-XL	20	M6	4 × 90°	28,500	47,000	5,400	0.15	650	140	HIR20/HIA20	18
ZKLF2068.2RS-XL	20	M6	4 × 90°	28,500	47,000	3,000	0.30	650	140	HIR20/HIA20	18
ZKLF2575.2Z-XL	25	M6	4 × 90°	30,500	55,000	4,700	0.20	750	200	HIR25/HIA25	25
ZKLF2575.2RS-XL	25	M6	4 × 90°	30,500	55,000	2,600	0.40	750	200	HIR25/HIA25	25
ZKLF3080.2Z-XL	30	M6	6 × 60°	32,000	64,000	4,300	0.25	850	300	HIR30/HIA30	32
ZKLF3080.2RS-XL	30	M6	6 × 60°	32,000	64,000	2,200	0.50	850	300	HIR30/HIA30	32
ZKLF30100.2Z-XL	30	M8	8 × 45°	65,000	108,000	4,000	0.40	950	400	HIA30	65
ZKLF30100.2RS-XL	30	M8	8 × 45°	65,000	108,000	2,100	0.80	950	400	HIA30	65
ZKLF3590.2Z-XL	35	M8	4 × 90°	45,000	89,000	3,800	0.30	900	400	HIR35/HIA35	40
ZKLF3590.2RS-XL	35	M8	4 × 90°	45,000	89,000	2,000	0.60	900	400	HIR35/HIA35	40
ZKLF40100.2Z-XL	40	M8	4 × 90°	47,500	101,000	3,300	0.35	1,000	550	HIR40/HIA40	55
ZKLF40100.2RS-XL	40	M8	4 × 90°	47,500	101,000	1,800	0.70	1,000	550	HIR40/HIA40	55
ZKLF40115.2Z-XL	40	M8	12 × 30°	79,000	149,000	3,100	0.65	1,200	750	HIA40	110
ZKLF40115.2RS-XL	40	M8	12 × 30°	79,000	149,000	1,600	1.30	1,200	750	HIA40	110
ZKLF50115.2Z-XL	50	M8	6 × 60°	51,000	126,000	3,000	0.45	1,250	1,000	HIR50/HIA50	85
ZKLF50115.2RS-XL	50	M8	6 × 60°	51,000	126,000	1,500	0.90	1,250	1,000	HIR50/HIA50	85
ZKLF50140.2Z-XL	50	M10	12 × 30°	125,000	250,000	2,500	1.30	1,400	1,500	HIA50	150
ZKLF50140.2RS-XL	50	M10	12 × 30°	125,000	250,000	1,200	2.60	1,400	1,500	HIA50	150
ZKLF60145.2Z-XL	60	M8	8 × 45°	93,000	214,000	3,000	1.00	1,300	1,650	HIR60/HIA60	100
ZKLF70155.2Z-XL	70	M8	8 × 45°	97,000	241,000	2,800	1.20	1,450	2,250	HIR70/HIA70	130
ZKLF80165.2Z-XL	80	M8	8 × 45°	100,000	265,000	2,700	1.40	1,600	3,000	HIR80/HIA80	160
ZKLF90190.2Z-XL	90	M10	8 × 45°	149,000	395,000	2,300	2.30	1,700	4,400	HIA90	200
ZKLF100200.2Z-XL	100	M10	8 × 45°	154,000	435,000	2,150	2.60	1,900	5,800	HIA100	250

The ball cages are made from plastic, permissible operating temperature 120 °C (continuous operation)

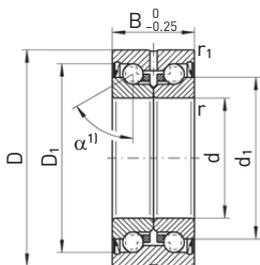
¹⁾ Tightening torque of mounting bolts according to details from manufacturer.

Screws according to DIN 912 are not supplied

²⁾ Bearing friction torque with gap seal (.2Z). With contact seal (.2RS) = 2 × M_{RL}

Appendix 2: Product specifications and technical data

10.2.6.3 Angular contact ball bearing ZKLN



Acting on two sides
Series ZKLN...2RS, ZKLN...ZZ

Housing and shaft tolerances ZKLN...2RS/...ZZ

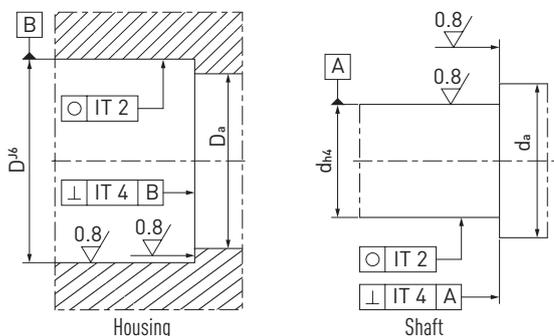


Table 10.51 Dimensions and connecting dimensions for angular ball bearing unit ZKLN

Article number	Shaft Ø [mm]	Weight [kg]	Dimensions [mm]							Connecting dimensions [mm]	
			d ²⁾	D ³⁾	B	r _{min}	r _{1min}	d ₁	D ₁	D _{a max} ⁴⁾	d _{a min} ⁴⁾
ZKLN0619.2Z-XL	6	0.02	6	19	12	0.3	0.3	12.0	16.5	16	9
ZKLN0624.2RS-XL	6	0.03	6	24	15	0.3	0.6	14.0	19.5	19	9
ZKLN0624.2Z-XL	6	0.03	6	24	15	0.3	0.6	14.0	19.5	19	9
ZKLN0832.2RS-XL	8	0.09	8	32	20	0.3	0.6	19.0	26.5	26	11
ZKLN0832.2Z-XL	8	0.09	8	32	20	0.3	0.6	19.0	26.5	26	11
ZKLN1034.2RS-XL	10	0.10	10	34	20	0.3	0.6	21.0	28.5	28	14
ZKLN1034.2Z-XL	10	0.10	10	34	20	0.3	0.6	21.0	28.5	28	14
ZKLN1242.2RS-XL	12	0.20	12	42	25	0.3	0.6	25.0	33.5	33	16
ZKLN1242.2Z-XL	12	0.20	12	42	25	0.3	0.6	25.0	33.5	33	16
ZKLN1545.2RS-XL	15	0.21	15	45	25	0.3	0.6	28.0	36.0	35	20
ZKLN1545.2Z-XL	15	0.21	15	45	25	0.3	0.6	28.0	36.0	35	20
ZKLN1747.2RS-XL	17	0.22	17	47	25	0.3	0.6	30.0	38.0	37	23
ZKLN1747.2Z-XL	17	0.22	17	47	25	0.3	0.6	30.0	38.0	37	23
ZKLN2052.2RS-XL	20	0.31	20	52	28	0.3	0.6	34.5	44.0	43	25
ZKLN2052.2Z-XL	20	0.31	20	52	28	0.3	0.6	34.5	44.0	43	25
ZKLN2557.2RS-XL	25	0.34	25	57	28	0.3	0.6	40.5	49.0	48	32

The ball cages are made from plastic, permissible operating temperature 120 °C (continuous operation)

¹⁾ Contact angle $\alpha = 60^\circ$

²⁾ Hole diameter tolerance as of $d = 6 \text{ mm}: D_{-0.003}^{+0.002}$; $d = 10 - 50 \text{ mm}: D_{-0.005}^0$; $d = 60 - 100 \text{ mm}: D_{-0.008}^0$

³⁾ Outer diameter tolerance as of $d = 6 - 50 \text{ mm}: d_{-0.01}^0$; $d = 60 - 100 \text{ mm}: d_{-0.015}^0$

⁴⁾ Recommended diameter of installation surface

.ZZ = Gap seal

.2RS = Contact seal

Table 10.51 Dimensions and connecting dimensions for angular ball bearing unit ZKLN – continuation

Article number	Shaft Ø [mm]	Weight [kg]	Dimensions [mm]							Connecting dimensions [mm]	
			d ²⁾	D ³⁾	B	r _{min}	r _{1min}	d ₁	D ₁	D _{a max} ⁴⁾	d _{a min} ⁴⁾
ZKLN2557.2Z-XL	25	0.34	25	57	28	0.3	0.6	40.5	49.0	48	32
ZKLN3062.2RS-XL	30	0.39	30	62	28	0.3	0.6	45.5	54.0	53	40
ZKLN3062.2Z-XL	30	0.39	30	62	28	0.3	0.6	45.5	54.0	53	40
ZKLN3072.2RS-XL	30	0.72	30	72	38	0.3	0.6	51.0	65.0	64	47
ZKLN3072.2Z-XL	30	0.72	30	72	38	0.3	0.6	51.0	65.0	64	47
ZKLN3572.2RS-XL	35	0.51	35	72	34	0.3	0.6	52.0	63.0	62	45
ZKLN3572.2Z-XL	35	0.51	35	72	34	0.3	0.6	52.0	63.0	62	45
ZKLN4075.2RS-XL	40	0.61	40	75	34	0.3	0.6	58.0	68.0	67	50
ZKLN4075.2Z-XL	40	0.61	40	75	34	0.3	0.6	58.0	68.0	67	50
ZKLN4090.2RS-XL	40	0.95	40	90	46	0.6	0.6	65.0	80.0	80	56
ZKLN4090.2Z-XL	40	0.95	40	90	46	0.6	0.6	65.0	80.0	80	56
ZKLN5090.2RS-XL	50	0.88	50	90	34	0.3	0.6	72.0	82.0	82	63
ZKLN5090.2Z-XL	50	0.88	50	90	34	0.3	0.6	72.0	82.0	82	63
ZKLN50110.2RS-XL	50	2.50	50	110	54	0.6	0.6	80.0	98.0	98	63
ZKLN50110.2Z-XL	50	2.50	50	110	54	0.6	0.6	80.0	98.0	98	63
ZKLN60110.2Z-XL	60	2.20	60	110	45	0.6	0.6	85.0	100.0	100	82
ZKLN70120.2Z-XL	70	2.40	70	120	45	0.6	0.6	95.0	110.0	110	92
ZKLN80130.2Z-XL	80	2.70	80	130	45	0.6	0.6	105.0	120.0	120	102
ZKLN90150.2Z-XL	90	4.50	90	150	55	0.6	0.6	120.0	138.0	138	116
ZKLN100160.2Z-XL	100	4.90	100	160	55	0.6	0.6	132.0	150.0	150	128

The ball cages are made from plastic, permissible operating temperature 120 °C (continuous operation)

¹⁾ Contact angle $\alpha = 60^\circ$

²⁾ Hole diameter tolerance as of d = 6 mm: D $^{+0.002}_{-0.003}$; d = 10 – 50 mm: D $^0_{-0.005}$; d = 60 – 100 mm: D $^0_{-0.008}$

³⁾ Outer diameter tolerance as of d = 6 – 50 mm: d $^0_{-0.01}$; d = 60 – 100 mm: d $^0_{-0.015}$

⁴⁾ Recommended diameter of installation surface

.2Z = Gap seal

.2RS = Contact seal

Appendix 2: Product specifications and technical data

Table 10.52 **Technical data of angular ball bearing unit ZKLN**

Article number	Shaft Ø [mm]	Axial load ratings		Limit speed	Bearing friction torque ¹⁾	Axial rigidity	Resistance to tilting	Recommended lock nut ²⁾	Tightening torque ²⁾
		C _{dyn} [N]	C ₀ [N]	Grease [rpm]	M _{RL} [Nm]	C _{aL} [N/μm]	C _{kL} [Nm/mrad]	Article number	M _A [Nm]
ZKLN0619.2Z	6	5,400	6,100	14,000	0.01	150	4	HIR6	1
ZKLN0624.2RS	6	7,600	8,500	6,800	0.04	200	8	HIR6	2
ZKLN0624.2Z	6	7,600	8,500	12,000	0.02	200	8	HIR6	2
ZKLN0832.2RS	8	13,800	16,300	5,100	0.08	250	20	HIR8	4
ZKLN0832.2Z	8	13,800	16,300	9,500	0.04	250	20	HIR8	4
ZKLN1034.2RS	10	14,700	18,800	4,600	0.12	325	25	HIR10	6
ZKLN1034.2Z	10	14,700	18,800	8,600	0.06	325	25	HIR10	6
ZKLN1242.2RS	12	18,600	24,700	3,800	0.16	375	50	HIR12	8
ZKLN1242.2Z	12	18,600	24,700	7,600	0.08	375	50	HIR12	8
ZKLN1545.2RS	15	19,600	28,000	3,500	0.20	400	65	HIR15	10
ZKLN1545.2Z	15	19,600	28,000	7,000	0.10	400	65	HIR15	10
ZKLN1747.2RS	17	20,700	31,000	3,300	0.24	450	80	HIR17/HIA17	15
ZKLN1747.2Z	17	20,700	31,000	6,600	0.12	450	80	HIR17/HIA17	15
ZKLN2052.2RS	20	28,500	47,000	3,000	0.30	650	140	HIR20/HIA20	18
ZKLN2052.2Z	20	28,500	47,000	5,400	0.15	650	140	HIR20/HIA20	18
ZKLN2557.2RS	25	30,500	55,000	2,600	0.40	750	200	HIR25/HIA25	25
ZKLN2557.2Z	25	30,500	55,000	4,700	0.20	750	200	HIR25/HIA25	25
ZKLN3062.2RS	30	32,000	64,000	2,200	0.50	850	300	HIR30/HIA30	32
ZKLN3062.2Z	30	32,000	64,000	4,300	0.25	850	300	HIR30/HIA30	32
ZKLN3072.2RS	30	65,000	108,000	2,100	0.80	950	400	HIA30	65
ZKLN3072.2Z	30	65,000	108,000	4,000	0.40	950	400	HIA30	65
ZKLN3572.2RS	35	45,000	89,000	2,000	0.60	900	400	HIR35/HIA35	40
ZKLN3572.2Z	35	45,000	89,000	3,800	0.30	900	400	HIR35/HIA35	40
ZKLN4075.2RS	40	47,500	101,000	1,800	0.70	1,000	550	HIR40/HIA40	55
ZKLN4075.2Z	40	47,500	101,000	3,300	0.35	1,000	550	HIR40/HIA40	55
ZKLN4090.2RS	40	79,000	149,000	1,600	1.30	1,200	750	HIA40	110
ZKLN4090.2Z	40	79,000	149,000	3,100	0.65	1,200	750	HIA40	110
ZKLN5090.2RS	50	51,000	126,000	1,500	0.90	1,250	1,000	HIR50/HIA50	85
ZKLN5090.2Z	50	51,000	126,000	3,000	0.45	1,250	1,000	HIR50/HIA50	85
ZKLN50110.2RS	50	125,000	250,000	1,200	2.60	1,400	1,500	HIA50	150
ZKLN50110.2Z	50	125,000	250,000	2,500	1.30	1,400	1,500	HIA50	150
ZKLN60110.2Z	60	93,000	214,000	3,000	1.00	1,300	1,650	HIR60/HIA60	100
ZKLN70120.2Z	70	97,000	241,000	2,800	1.20	1,450	2,250	HIR70/HIA70	130
ZKLN80130.2Z	80	100,000	265,000	2,700	1.40	1,600	3,000	HIR80/HIA80	160
ZKLN90150.2Z	90	149,000	395,000	2,300	2.30	1,700	4,400	HIR90/HIA90	200
ZKLN100160.2Z	100	154,000	435,000	2,150	2.60	1,900	5,800	HIR100/HIA100	250

¹⁾ Bearing friction torque with gap seal (.2Z). With seal disc (.2RS) $\approx 2 \times M_{RL}$

²⁾ Lock nuts are not supplied; please order separately!

10.2.7 HIR lock nuts – radial clamping

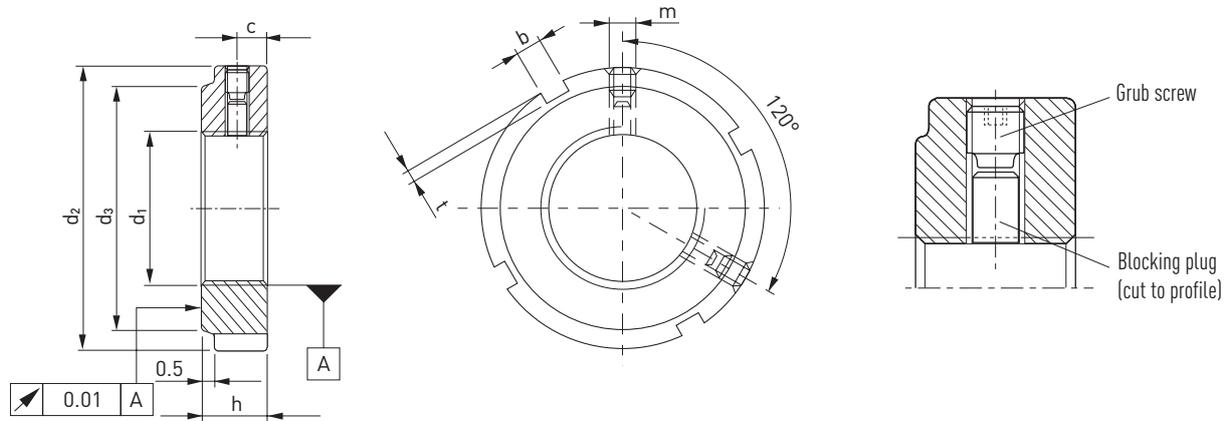


Table 10.53 Dimensions of lock nut HIR

Article number	Thread d_1	d_2	h	b	t	d_3	c	m
HIR06	M6 × 0.5	16	8	3	2.0	11	4	M4
HIR08	M8 × 0.75	16	8	3	2.0	11	4	M4
HIR10	M10 × 0.75	18	8	3	2.0	13	4	M4
HIR12	M12 × 1	22	8	3	2.0	18	4	M4
HIR15	M15 × 1	25	8	3	2.0	21	4	M4
HIR17	M17 × 1	28	10	4	2.0	23	5	M5
HIR20 × 1	M20 × 1	32	10	4	2.0	27	5	M5
HIR20 × 1.5	M20 × 1.5	32	10	4	2.0	27	5	M5
HIR25	M25 × 1.5	38	12	5	2.0	33	6	M6
HIR30	M30 × 1.5	45	12	5	2.0	40	6	M6
HIR35	M35 × 1.5	52	12	5	2.0	47	6	M6
HIR40	M40 × 1.5	58	14	6	2.5	52	7	M6
HIR45	M45 × 1.5	65	14	6	2.5	59	7	M6
HIR50	M50 × 1.5	70	14	6	2.5	64	7	M6
HIR55	M55 × 2	75	16	7	3.0	68	8	M6
HIR60	M60 × 2	80	16	7	3.0	73	8	M6
HIR65	M65 × 2	85	16	7	3.0	78	8	M6
HIR70	M70 × 2	92	18	8	3.5	85	9	M8
HIR75	M75 × 2	98	18	8	3.5	90	9	M8
HIR80	M80 × 2	105	18	8	3.5	95	9	M8
HIR85	M85 × 2	110	18	8	3.5	102	9	M8
HIR90	M90 × 2	120	20	10	4.0	108	10	M8
HIR95	M95 × 2	125	20	10	4.0	113	10	M8
HIR100	M100 × 2	130	20	10	4.0	120	10	M8

Unit: mm

Appendix 2: Product specifications and technical data

10.2.8 HIA lock nuts – axial clamping

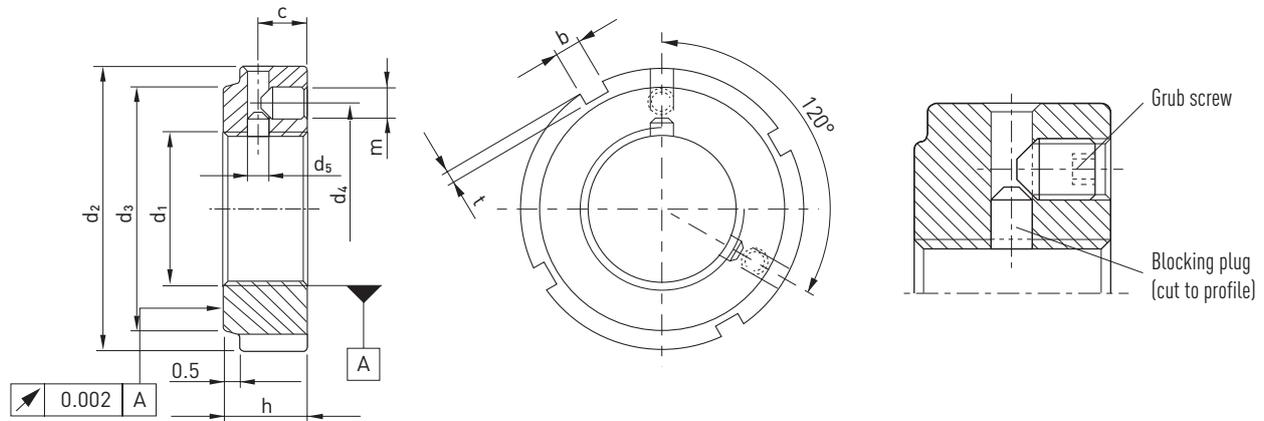


Table 10.54 Dimensions of lock nuts HIA

Article number	Thread d_1	d_2	h	b	t	d_3	d_4	m
HIA17	M17 × 1	28	16	4	2.0	23	22.5	M4
HIA20 × 1	M20 × 1	32	16	4	2.0	27	26.0	M4
HIA20 × 1,5	M20 × 1.5	32	16	4	2.0	27	26.0	M4
HIA25	M25 × 1.5	38	18	5	2.0	33	31.5	M5
HIA30	M30 × 1.5	45	18	5	2.0	40	37.5	M5
HIA35	M35 × 1.5	52	18	5	2.0	47	43.5	M5
HIA40	M40 × 1.5	58	20	6	2.5	52	49.0	M6
HIA45	M45 × 1.5	65	20	6	2.5	59	55.0	M6
HIA50	M50 × 1.5	70	20	6	2.5	64	60.0	M6
HIA55	M55 × 2	75	22	7	3.0	68	65.0	M6
HIA60	M60 × 2	80	22	7	3.0	73	70.0	M6
HIA65	M65 × 2	85	22	7	3.0	78	75.0	M6
HIA70	M70 × 2	92	24	8	3.5	85	81.0	M8
HIA75	M75 × 2	98	24	8	3.5	90	87.0	M8
HIA80	M80 × 2	105	24	8	3.5	95	93.0	M8
HIA85	M85 × 2	110	24	8	3.5	102	98.0	M8
HIA90	M90 × 2	120	26	10	4.0	108	105.0	M8
HIA95	M95 × 2	125	26	10	4.0	113	110.0	M8
HIA100	M100 × 2	130	26	10	4.0	120	115.0	M8

Unit: mm



Profilschienenführungen



Kugelgewindetriebe



Linearmotor-Systeme



Linearachsen



Elektrohubzylinder



Roboter



Linearmotor-Komponenten



Rundtische



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