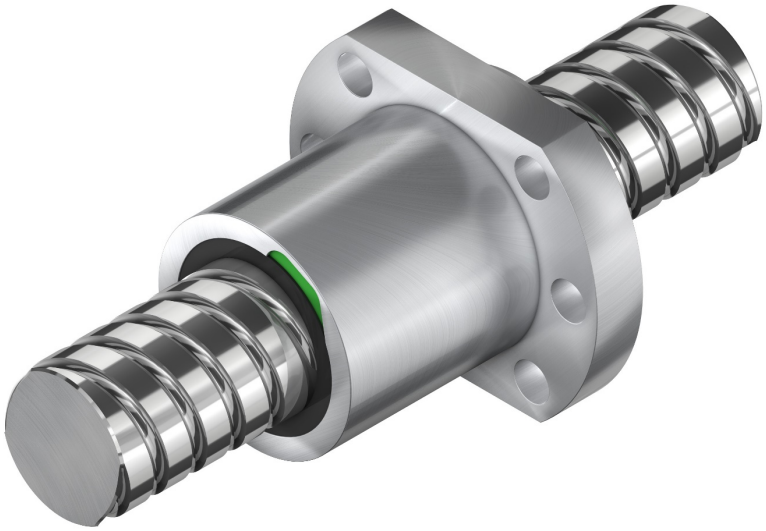
HIWIN®



Assembly instructions

Ballscrews

BS-04-4-EN-2409-MA

hiwin.de

Legal information

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Contents

1 General

1.1 About these assembly instructions

These assembly instructions are intended for planners, developers and operators of systems who plan and install the named product as a machine element. It is also addressed to persons who carry out the following work:

- Transport
- Assembly
- Retrofitting or upgrading
- Setup
- Commissioning
- Operation
- Cleaning
- Maintenance
- Troubleshooting
- Decommissioning, disassembly and disposal

1.1.1 Requirements

We assume that

- The operating personnel have been instructed in the safe operation of the named product and have read and understood these assembly instructions in full,
- Maintenance personnel maintain and repair the product in such a way that it presents no danger to persons, the environment or property.

1.1.2 Availability

These assembly instructions must always be available to all persons working with or on the named products. The assembly instructions are also available at hiwin.de.

1.2 Presentation and layout conventions used in these assembly instructions

1.2.1 Instructions for actions

Instructions for actions are provided in sequential order and identified with a triangle symbol.
The results of the actions are accompanied by a tick symbol.

Example:

- ▶ Instruction 1
- ▶ Instruction 2
- ✓ Result

1.2.2 Lists

Lists are identified through the use of bullet points.

Example:

The products must not be operated:

- Outdoors
- In areas where there is a risk of explosion
- …

1.2.3 Presentation of safety notices

Safety notices are always indicated by a signal word and sometimes with a hazard-specific symbol (see section 1.2.4 Symbols used).

The following signal words/hazard levels are used:

⚠ **Danger!** Immediate danger!

Non-compliance with the safety notices will result in severe or fatal injury!

⚠ **Warning**! Potentially dangerous situation!

Non-compliance with the safety notices could result in severe or fatal injury!

⚠ **Attention!** Potentially dangerous situation!

Non-compliance with the safety notices could result in moderately severe or minor injury!

Caution! Potentially dangerous situation!

Non-compliance with the safety notices could result in damage to property or the environment!

1.2.4 Symbols used

The following symbols are used in these assembly instructions and on the products:

Warning and prohibition signs			
	Warning of dangerous electrical voltage!		Warning of crushing risk!
	Warning of danger from suspended loads!		Environmentally hazardous substance!

1.2.5 Information

Note:

Notes describe general advice and recommendations.

1.3 Warranty and liability

The manufacturer's "General Terms and Conditions of Sale and Delivery" apply.

1.4 Manufacturer information

Address	HIWIN GmbH Brücklesbünd 1 77654 Offenburg, Germany
Telephone	+49 781 93278-0
Technical customer service team	+49 781 93278-77
Fax	+49 781 93278-90
Technical customer service team fax	+49 781 93278-97
E-Mail	support@hiwin.de
Internet	hiwin.de

1.5 Product monitoring

Please inform HIWIN GmbH, as manufacturer of the named products, about:

- Accidents
- Possible sources of danger on the products
- Any unclear information in these assembly instructions

2 Basic safety notices

⚠ **Warning**!

This chapter is for the safety of everyone who works with, assembles, installs, operates, maintains or disassembles the named product. Failure to comply with the following information could be dangerous!

2.1 Proper use

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

⚠ **Warning**! Danger of serious or fatal injuries!

In vertical or sloping installation positions, components may break, causing loads to fall!

- ▶ For vertical assembly, provide a suitable clamping or braking device!

The ballscrews are designed for installation and operation in horizontal and vertical positions. **In the event of vertical or sloping assembly, a suitable clamping or braking device must be provided to be able to prevent unintentional lowering of the load.** Ballscrews can only be loaded in axial direction. Radial loads result in an uneven load and can lead to premature failure of the ballscrew.
Ballscrews may only be used as described for the intended purpose.

2.2 Exclusion of liability in the event of alteration and improper handling

No changes whatsoever may be made to the ballscrews that are not described in these assembly instructions. If a modified design is necessary, please contact the manufacturer.
The manufacturer accepts no liability in the event of modifications or improper assembly, installation, commissioning, operation, maintenance or repair.
Only original HIWIN parts are permitted as spare parts and accessories. Spare parts and accessories not supplied by HIWIN have not been tested for operation with HIWIN ballscrews and may impair operational safety. The manufacturer accepts no liability for damage caused by the use of non-approved spare parts and accessories.

2.3 Qualified personnel

The ballscrew may only be installed, integrated into higher-level systems, commissioned, operated and maintained by qualified personnel. A qualified person is one who

- Has suitable technical training
  and
- Has been instructed by the machine operator in operation and the valid safety guidelines and can assess the dangers to be expected
  and
- Has read through these assembly instructions in full and understood them and has access to the assembly instructions at all times

2.4 General safety notices

⚠ **Danger!** Danger due to electrical voltage!

Dangerous currents may flow before and during assembly, disassembly and repair work.

- ▶ Work may only be carried out by qualified electricians when the device is de-energised!
- ▶ Before working, disconnect the higher-level system from the power supply and secure it against being switched on again!

⚠ **Warning**! Risk of injury!

- The ballscrew must be transported horizontally during assembly and disassembly. If this is not possible, prevent the ballscrew nut from running off the ballscrew shaft by attaching a suitable holding device.
- For large or long ballscrews, use lifting gear for assembly if necessary!

2.5 Safety notices for storing the ballscrews

Always store ballscrews in the transport packaging so they are protected from impacts. The storage room must be dry, frost-free and free of corrosive atmosphere.
Clean and protect used ballscrews before storage.

Ambient conditions	
Ambient temperature:	+5 °C to +40 °C
Installation site:	Level, dry, vibration-free
Atmosphere:	Non-corrosive, non-explosive

2.6 Safety notices for transporting the ballscrews

⚠ **Warning**! Danger from suspended loads or falling parts!

Lifting heavy loads can cause damage to health!

- Maintenance and assembly of the ballscrews only by qualified personnel!
- Take the mass of the parts into account during transport. Use suitable lifting gear!
- Comply with the applicable industrial safety regulations for handling suspended loads.

⚠ **Attention!** Risk of impact and crushing!

If the transport securing device is missing, the nut can move uncontrollably on the shaft and cause injuries.

- Do not remove the transport securing device until assembly!

Caution! Damage due to tipping or falling!

If the transport securing device is missing, the ballscrew may tip or fall.

- Secure the ballscrew against tipping before transport!

Caution! Danger of property damage!

Deflection during transport impairs the function and accuracy of the ballscrews.

- Support long ballscrews at several points during transport!

2.7 Further information

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

Tel.: +49 781 93278-0

Fax: +49 781 93278-90

For questions regarding the documentation, suggestions and corrections, please send a fax to the following fax address: +49 781 93278-90

3 Product descriptions

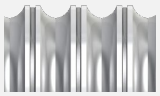
3.1 Design and function of the ballscrew

The ballscrew consists mainly of the ballscrew shaft, the ballscrew nut and the balls, which are located between the ballscrew shaft and the ballscrew nut. The balls run in the ballscrew nut in a closed circuit around the shaft and thus convert the rotary movement 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 requirements of the respective application. To make the right shaft selection, the characteristics are compared in Table 3.1.

Table 3.1: Procedure for the selection of a ballscrew

	Rolled	Peeled	Ground
Profile			
Manufacturing processes	Forming process	Cutting process	Grinding process
Typical application	Transport	Transport and positioning	Positioning
Tolerance classes	T5 – T10	T5 + T7	T0 – T5
Nominal diameter [mm]	8 – 63	16 – 80	6 – 100
Max. shaft length [1] **[mm]**	500 – 5,600	3,300 – 6,500	110 – 10,000
Nut types	Flange nut Cylindrical nuts	Flange nut Cylindrical nuts Double nuts	Flange nut Cylindrical nuts Double nuts
Cylindrical nuts	From stock	From stock	On request

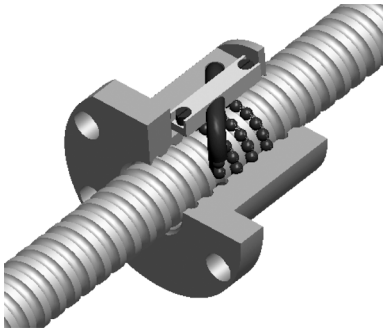
[1] Max. shaft length depending on diameter and tolerance class

3.3 Ball recirculation systems

HIWIN ballscrews are available with three different types of recirculation systems.

The external return system consists of the ball return tube and the clamping plate. The balls are inserted into the ball track between the ballscrew shaft and the ballscrew nut. At the end of the nut, they are led out of the ball track and brought back to the beginning via a return; the ball course thus forms a closed circuit. Since the return line is located outside the nut body, this type of recirculation is called an external recirculation system (see Fig. 3.1).

Fig. 3.1: Ballscrew nut with external ball recirculation



With internal single return, the balls with the recirculation pieces are each returned to the beginning of a thread. The balls make only one circuit around the shaft. The circuit is closed by a recirculation piece in the ballscrew nut and allows the balls to return to the beginning via the back of the thread. The positioning of the ball recirculation in the nut gives the internal single recirculation system its name (see Fig. 3.2).

Fig. 3.2: Ballscrew nut with internal single recirculation system

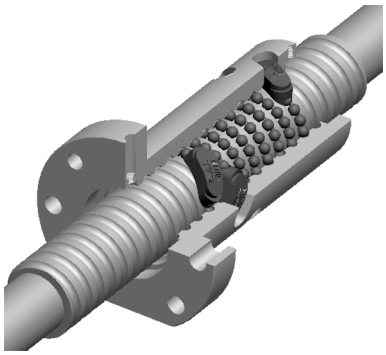
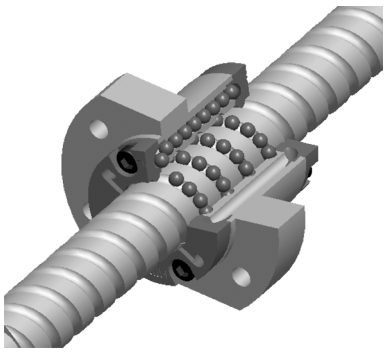


Fig. 3.3: Ballscrew nut with cassette recirculation system



3.4 Wiper variants

NBR wiper (N): The all-rounder
The nitrile rubber wiper offers excellent sealing and wiping properties for most ambient conditions and is therefore used in almost all applications.

NBR-finger wiper (K): For coarse material
It really cleans up wherever there is stubborn dirt. The finger wiper with its hard plastic fingers is indispensable in environments with coarse dirt particles.

Felt wiper (F): The most absorbent of the wipers
Felt can also absorb liquids, store them and then release them again. The felt wiper thus has an ideal wiping effect and provides additional lubrication.

Felt-finger wiper (VI): The duo
With our duo consisting of a felt and a finger wiper, dirt – be it coarse or fine – is sure not to stand a chance.

Table 3.2: Wiper properties

	NBR (N)	Felt (F)	NBR finger (K)	Felt finger (F)
Temperature resistance		+ +		+
Soiling	+		+ +	+
Friction reduction	+ +		+	
Tightness	+ +		+ +	
Emergency running		+ +		+ +
Chemical resistance	+ +	+	+	+

4 Assembly

⚠ **Danger!** Danger due to electrical voltage!

Dangerous currents may flow before and during assembly, disassembly and repair work.

- Work may only be carried out by qualified electricians when the device is de-energised!
- Before working, disconnect the higher-level system from the power supply and secure it against being switched on again!

⚠ **Warning**! Danger from suspended loads or falling parts!

Lifting heavy loads can cause damage to health!

- Maintenance and assembly of the ballscrews only by qualified personnel!
- Take the mass of the parts into account during transport. Use suitable lifting gear!
- Comply with the applicable industrial safety regulations for handling suspended loads.

4.1 Assembly of the ballscrew

⚠ **Warning**! Danger of serious or fatal injuries!

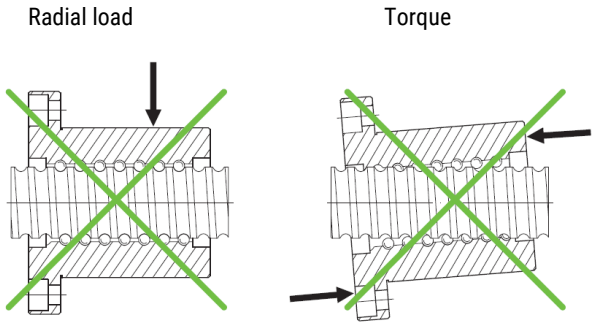
In vertical or sloping installation positions, components may break, causing loads to fall!

- For vertical assembly, provide a suitable clamping or braking device!

Ballscrews are supplied either fully assembled or with the ballscrew nut and shaft supplied separately. To prevent damage to the ballscrew, adhere to the following work steps.

- Do not remove the transport packaging until immediately before assembly.
- Do not remove the transport securing device from the nut until the ballscrew has been assembled. If this is not possible, make sure that the ballscrew nut does not run off the ballscrew shaft. If the ballscrew nut runs even partially off the thread of the ballscrew shaft, there is a risk of balls escaping from the ballscrew nut and the function is no longer guaranteed.
- Install the ballscrew in such a way that no radial or eccentric forces act on the nut or the shaft (e.g. due to misalignment between the bearing and the nut). Ballscrews are only suitable for transferring axial forces.

Fig. 4.1: When installing the ballscrew, no radial or eccentric forces may act on the nut or the shaft



- Limit switches and stops must be provided to prevent the stroke distance from being exceeded and thus damage to the unit. The nut must not be unscrewed beyond the shaft end without an auxiliary device (assembly sleeve) during assembly.
- 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.
- Avoid contamination of the ballscrew during installation. Chippings and other contaminants can be removed using petroleum, thin oil or white spirit. Paint solvents or cold cleaning solvents will damage the ballscrews and must therefore not be used.
- Ballscrews must be aligned perfectly flush with the guide.

4.2 Assembly and disassembly of the ballscrew nut on the ballscrew shaft

4.2.1 Disassembly of the nut from the ballscrew shaft

Caution! Danger of property damage!

If the nut is disassembled without an assembly sleeve, damage may occur due to the loss of balls.

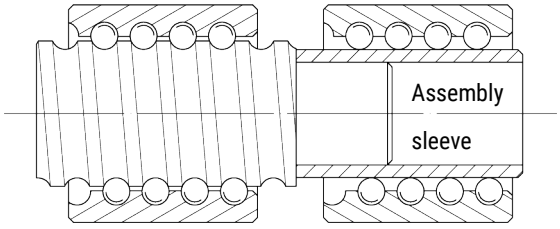
- Always use an assembly sleeve to hold the nut!

Note:

HIWIN ballscrews are generally supplied with the nut assembled. Should disassembly nevertheless be necessary, please proceed as follows:

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

Fig. 4.2: Removal of the nut from the shaft using the assembly sleeve



4.2.2 Assembly of the nut on the ballscrew shaft

Assembly takes place in reverse order. This must be done without applying any force; otherwise, the nut will be damaged. The nut must be fully on the thread before removing the assembly sleeve. Then move the nut onto the shaft by a distance of at least three times the nut length.
Only assemble the ballscrew nut using a suitable assembly sleeve. Unsuitable auxiliary devices can lead to damage or destruction of the complete ballscrew. Unassembled ballscrew nuts are usually supplied on an assembly sleeve that can be used for proper assembly. If a special assembly sleeve is required, the outer diameter of this assembly sleeve should be 0.1 – 0.2 mm smaller than the core diameter of the ballscrew. The assembly sleeve should be approx. 20 mm longer than the nut.

Assembly of the nuts with NBR or TPU wiper

Nuts with an NBR/TPU wiper have a sealing lip that acts as a contact seal. As a result, the wiper reliably prevents foreign bodies from entering the nut, thereby extending its service life. The sealing lip also significantly reduces the leakage of lubricant via the thread groove.
Correct nut assembly is a prerequisite for the sealing lip to function properly. Therefore, observe the following points carefully, as otherwise the sealing lip may be impaired.

Note:

Incorrect assembly can result in premature failure of the ballscrew.

- The thread of the ballscrew shaft 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.

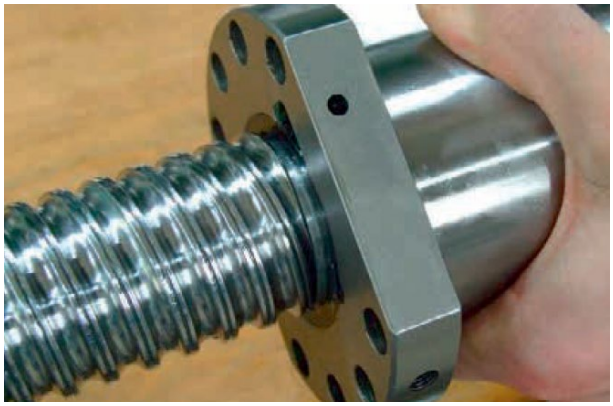
Fig. 4.3: Shaft end before assembling the NBR wiper

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

Fig. 4.4: Before assembly, check that the wiper is seated correctly

- Place the assembly sleeve on the face end of the ballscrew shaft. This facilitates alignment of the nut with the shaft. During assembly, the nut must be aligned concentrically and flush with the shaft.

Fig. 4.5: Nut – shaft alignment



- Slide the nut to the start of the thread and screw it onto the 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 to screw the nut onto the shaft with only a small amount of effort. Screw the nut all the way up to the end of the shaft.
  If the torque needed is considerably greater or should the nut become jammed, unscrew it and repeat the process.

Fig. 4.6: Screwing the nut with wiper onto the shaft

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

Note:

Do not use pointed or sharp-edged tools, otherwise there is a risk of damaging the sealing lip.

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

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

4.2.3 Replacement of the wiper

Caution! Danger of property damage!

Incorrect assembly can result in damage to the wipers.

- Shaft ends must always be bevelled, free of burrs and clean!
- Do not use sharp tools to fit the wiper!

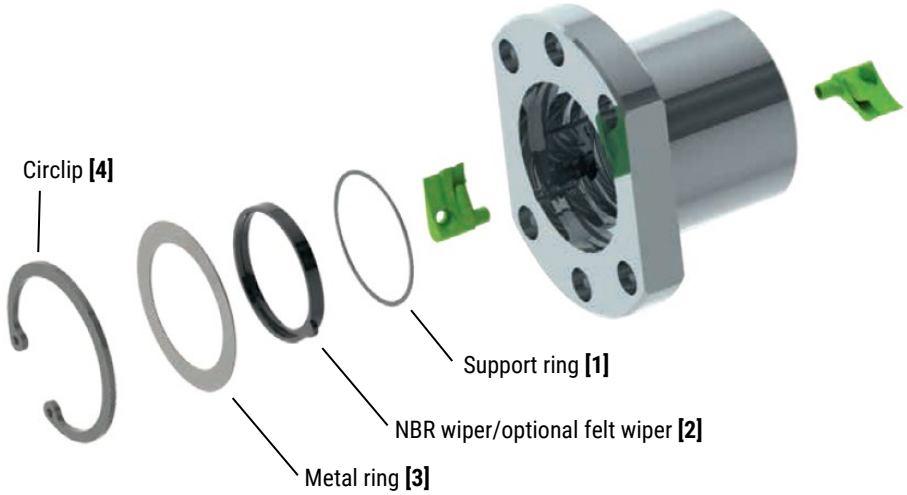
Note:

Replacement of the wiper is only intended for nuts that have a letter in the order code after the description of the nut type, e.g. R20-05K4-DEB- **N** -1000-1200-0,023.

Note:

HIWIN ballscrews are supplied as standard with the wipers assembled. Should disassembly nevertheless be necessary, please proceed as described below.

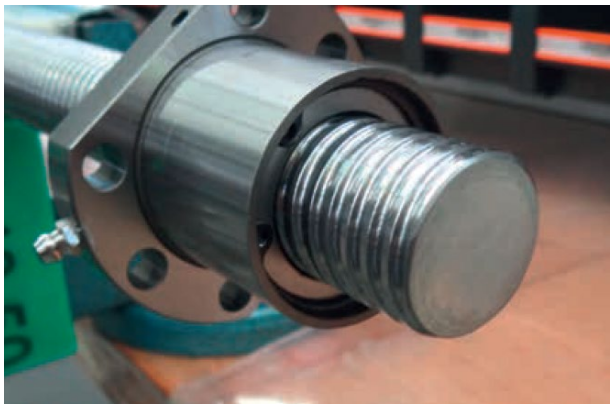
4.2.3.1 Disassembly/Assembly of the NBR/felt wiper



When carrying out maintenance or replacing the NBR wiper with a felt wiper, the existing wiper must be removed. To do so, follow the steps described below.

- Move the nut to the end of the shaft to facilitate disassembly of the circlip **[4]**.

Fig. 4.8: Nut at the end of the shaft



- Use circlip pliers to remove the circlip **[4]**.

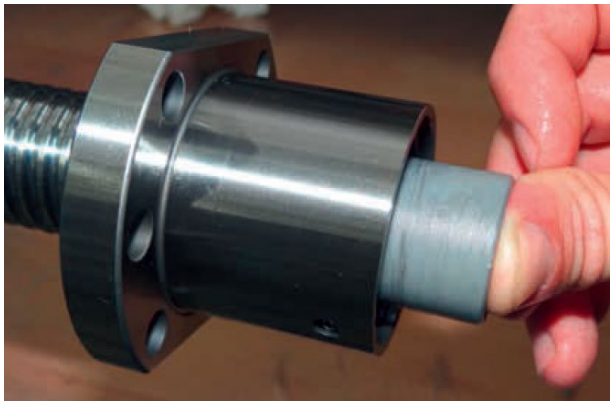
Fig. 4.9: Removing the circlip

- Remove the metal ring **[3]** to expose the wiper **[2]**.

Fig. 4.10: Removing the metal ring

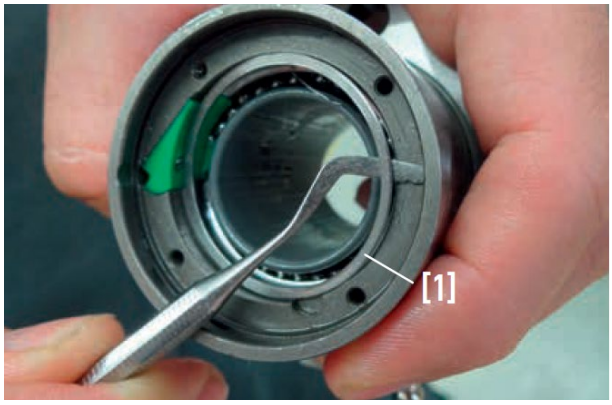
- Disassemble the nut as described in section 4.2.1 to facilitate wiper replacement. Always use an appropriate assembly sleeve for this task.

Fig. 4.11: Disassembling the nut using an assembly sleeve



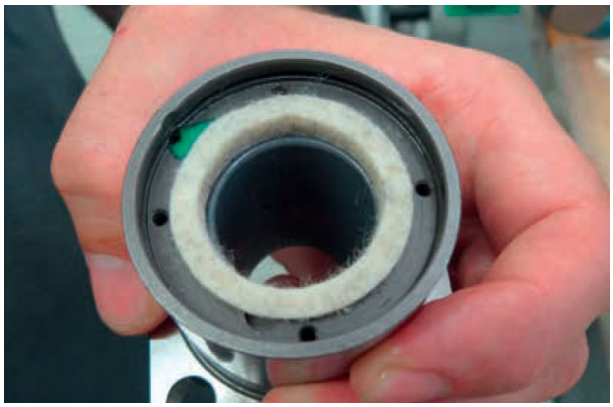
- Remove the wiper **[2]** from the nut. Make sure that the inner support ring **[1]** remains in the nut.

Fig. 4.12: NBR wiper **[2]** and inner support ring **[1]**



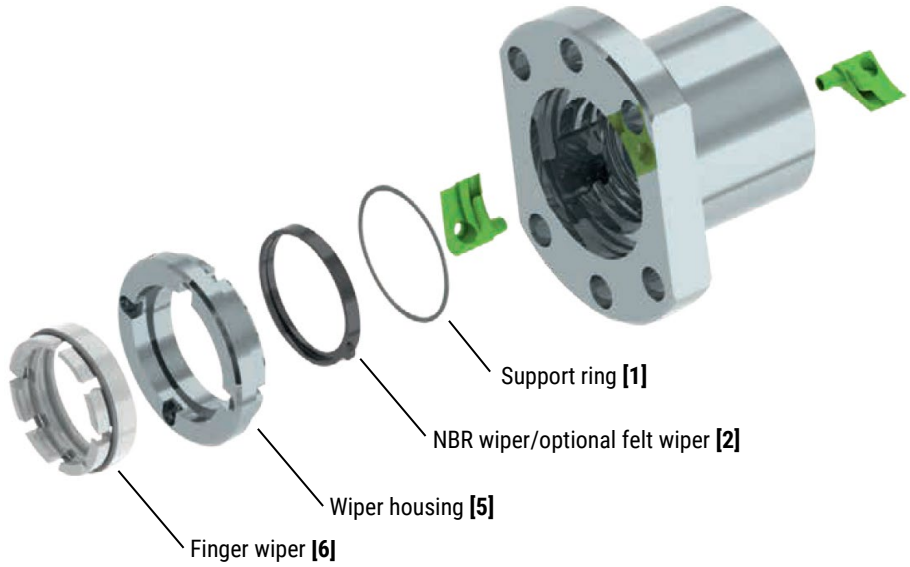
- Place the new wiper in the nut housing and assemble the nut in reverse order.

Fig. 4.13: Nut with inserted felt wiper



- Finally, assemble the nut on the shaft as described in section 4.2.2.
- ✓ The felt wiper has been assembled.

4.2.3.2 Disassembly/Assembly of the finger wiper



For nuts with optional finger wiper **[6]**, it must first be disassembled in order to replace the NBR or felt wiper **[2]**. To do so, perform the steps described below.

- Undo the grub screws that fix the finger wiper **[6]** in the wiper housing **[5]**.

Fig. 4.14: Undoing the grub screws

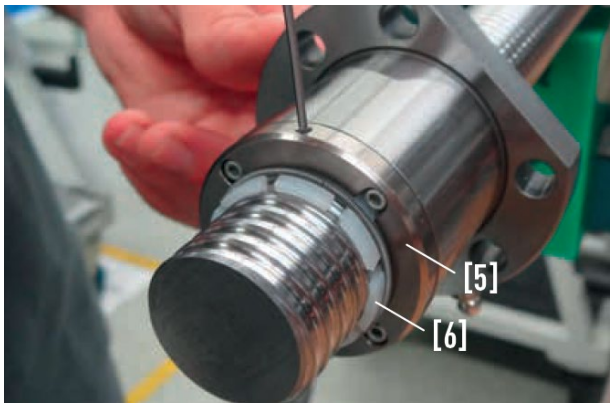


Fig. 4.15: Removing the finger wiper

- Remove the screws that secure the wiper housing **[5]** to the nut and then remove the wiper housing from the nut.

Fig. 4.16: Unscrewing the wiper housing

- ✓ The finger wiper has been disassembled.

- Disassemble the NBR/felt wiper **[2]** as described in section 4.2.3.1.
- Subsequently assemble the finger wiper **[6]** in reverse order. Note that the finger wiper can only be assembled once the nut with the assembled wiper housing has been re-assembled on the shaft.
- ✓ The finger wiper has been assembled.

4.2.4 Tolerance details and measuring methods for HIWIN ballscrews

Table 4.1: Radial runout t_5 of the outer diameter related to AA' per length l_5 (measurement according to DIN ISO 3408)

Nominal Ø 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**	**T10**
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**	1250	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

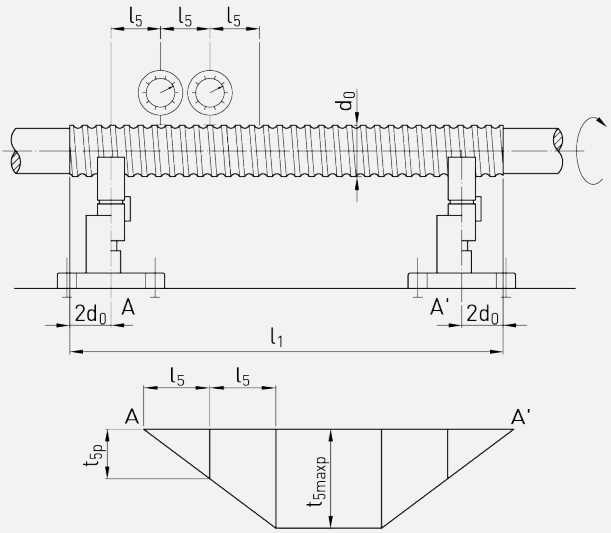
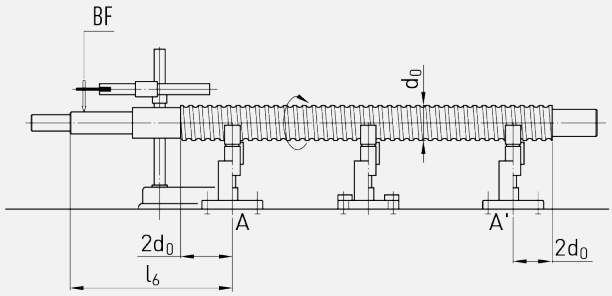


Table 4.2: Radial runout $t_{6.1}$ of the bearing seat related to AA' per length l (measurement according to DIN ISO 3408)

Nominal Ø 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



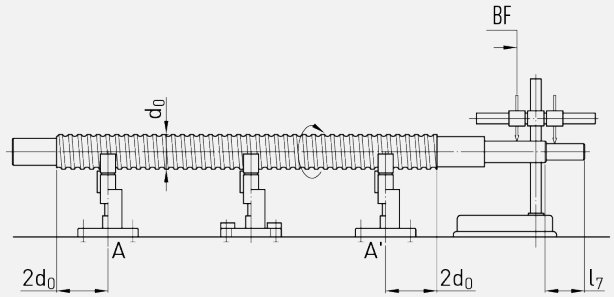
BF bearing seat

Table 4.3: Radial runout $t_{6.2}$ of the bearing seat related to the centre line of the threaded section (measurement according to DIN ISO 3408)

Nominal Ø 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 the end journal diameter related to the bearing seat (measurement according to DIN ISO 3408)

Nominal Ø 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



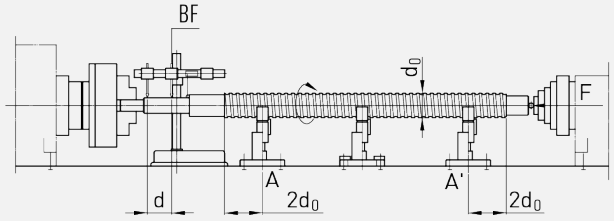
BF bearing seat

Table 4.5: Radial runout $t_{7.2}$ of the end journal diameter related to the centre line of the bearing seat (measurement according to DIN ISO 3408)

Nominal Ø 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: Axial runout $t_{8.1}$ of the installation surface for the bearing related to AA' (measurement according to DIN ISO 3408)

Nominal Ø d_0 [mm]		Tolerance class $t_{7.1p}$ [µm] for l							
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



BF bearing seat

Table 4.7: Axial runout $t_{8.2}$ of the installation surface for the bearing related to the axis of the ballscrew shaft (measurement according to DIN ISO 3408)

Nominal Ø d_0 [mm]		Tolerance class $t_{7.2p}$ [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_9 of the installation surface of the ballscrew nut related to AA' (for preloaded ballscrew nuts only) (measurement according to 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	–

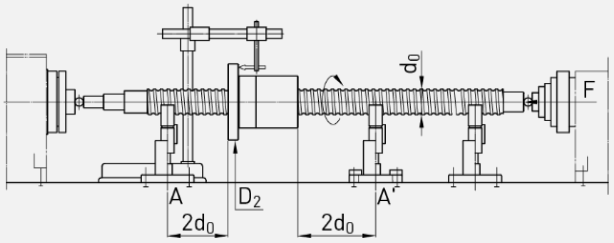
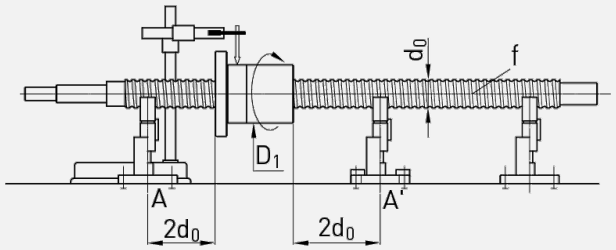


Table 4.9: Radial runout t_{10} of the outer diameter of the ballscrew nut in related to AA' (for preloaded and rotating ballscrew nuts only) (measurement according to DIN ISO 3408)

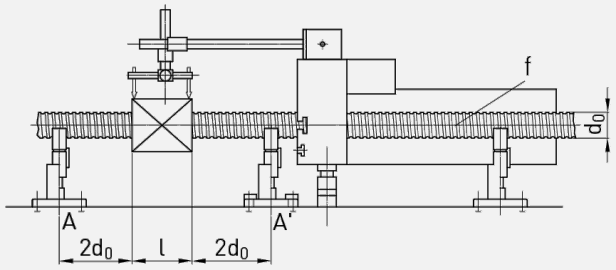
Flange diameter D_2 [mm]		Tolerance class t_{10p} [µm]							
Above	**Up to**	**T0**	**T1**	**T2**	**T3**	**T4**	**T5**	**T7**	**T10**
16	**32**	8	10	10	12	12	16	20	–
32	**63**	10	12	12	16	16	20	25	–
63	**125**	12	16	16	20	20	25	32	–
125	**250**	16	20	20	25	25	32	40	–
250	**500**	–	–	–	32	32	40	50	–



f fixed

Table 4.10: Parallelism deviation t_{11} of a rectangular ballscrew nut related to AA' (for preloaded ballscrew nuts only) (measurement according to DIN 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	–



f fixed

4.3 Assembly of the bearing units

4.3.1 Requirements for the mounting surface

- Sufficiently stable and rigid
- Evenness ≤ 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 agent residues can contribute to contamination!

Measures to ensure cleanliness:

- Make sure that the assembly workspace is clean
- Clean the underlying surface

Note:
Only use volatile solvents and lint-free cloths for cleaning!

Note:
Do not remove the bearing unit from the packaging until immediately before installation. Do not remove the corrosion inhibitor from these components.

4.3.3 Assembly of the bearing unit

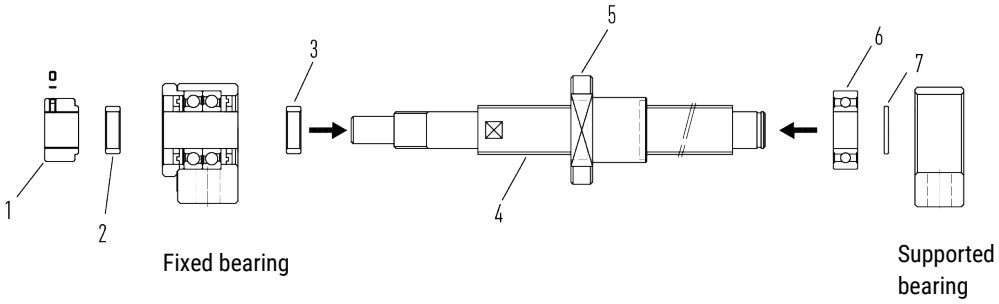
Note:
The individual components of the bearing units are matched to each other and must not be disassembled, as this could damage the bearings.

Note:
When assembling the bearing units, make sure that the seals are not damaged by sharp edges.

Note:
The nominal tightening torques are specified on the respective bearing data sheets.

- Assemble the ballscrew nut on the application while tightening the screws only slightly.
- Using the circlip, secure the supported bearing to the ballscrew shaft (see Fig. 4.17).
- Using the lock nut, secure the fixed bearing to the fixed bearing side of the shaft; initially tighten the lock nut to twice the nominal tightening torque before loosening the lock nut again after 10 minutes. Then tighten the lock nut to the nominal tightening torque.

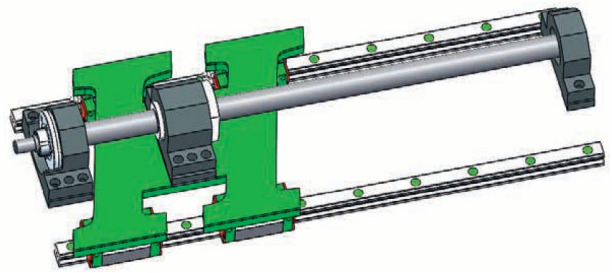
Fig. 4.17: Exploded view of the ballscrew with bearing units



Note:
The application, which is guided via the linear guide, is used to align the bearing units.

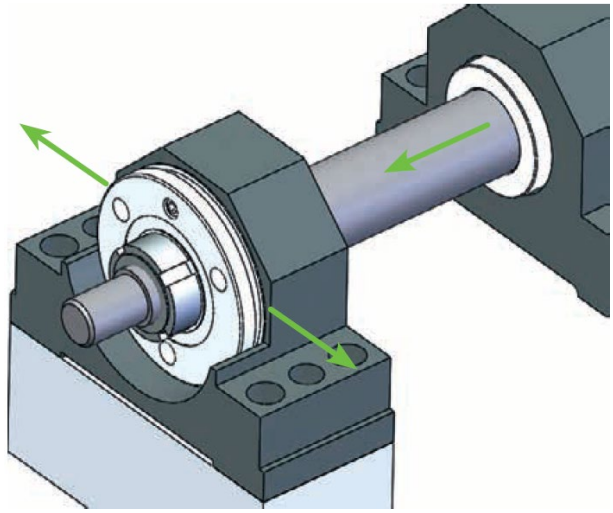
Move the application as close as possible to the fixed bearing (see Fig. 4.18).

Fig. 4.18: Ballscrew at the left stop for aligning the fixed bearing



Note:
The bearing unit is moved to the optimum radial position by the constraining forces exerted by the linear guides (see Fig. 4.19).

Fig. 4.19: Fixed bearing with acting constraining forces



- Screw the fixed bearing firmly in place.
- Tighten the screws of the nuts.
- Move the application as close as possible to the supported bearing.
- Screw the supported bearing firmly in place.

Note:
It is recommended to secure all the screws against loosening with threadlockers.

Note:
The lock nut must be secured against loosening using the Allen set screw.

It should now be possible to move the application with a constant force applied along the full stroke.

✓ The ballscrew with the bearing units has been assembled.

4.4 Assembly of the individual bearings

4.4.1 Requirements for the mounting surface

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

4.4.2 Cleanliness requirements

Contamination may cause damage to the rolling bearing. Cleaning agent residues can contribute to contamination!

Measures to ensure cleanliness:

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

Note:
Only use volatile solvents and lint-free cloths for cleaning!

Note:
Do not remove the bearing from the packaging until immediately before installation. Do not remove the corrosion inhibitor from these components.

4.4.3 Assembling the bearing

Note:
To assemble the bearing, make sure that the pressing force only acts on the ring being pressed. Assembly forces must not be transferred through the balls.

Note:
For tighter fits, the bearing should preferably be heated to facilitate pressing it on.

Note:
The nominal tightening torque is specified on the respective bearing data sheet.

- ▶ Using the lock nut, secure the fixed bearing to the fixed bearing side of the shaft; initially tighten the lock nut to twice the nominal tightening torque before loosening the lock nut again after 10 minutes. Then tighten the lock nut to the nominal tightening torque.
- ▶ The bearing must be in contact with 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 assembled.

4.4.4 Assembling the flange bearing

- ▶ Using the lock nut, secure the flange bearing to the fixed bearing side of the shaft; initially tighten the lock nut to twice the nominal tightening torque before loosening the lock nut again after 10 minutes. Then tighten the lock nut to the nominal tightening torque.
- ▶ Press the fixed bearing into the bearing seat. Screw the flange ring to the bearing seat, tightening the screws only slightly to compensate for the radial position.
- ▶ After aligning the shaft, tighten the screws in crisscross fashion.

✓ The bearing has been assembled.

5 Maintenance

⚠ **Danger!** Danger due to electrical voltage!

Dangerous currents may flow before and during assembly, disassembly and repair work.

- Work may only be carried out by qualified electricians when the device is de-energised!
- Before working, disconnect the higher-level system from the power supply and secure it against being switched on again!

5.1 Cleaning

Caution! Damage to the ballscrew due to improper cleaning!

- The legal regulations and the manufacturer's regulations concerning the use of cleaning agents must be observed!
- Damage to the ballscrew as a result of sharp objects must be avoided!
- When cleaning, make sure that no metal particles get into or remain in the ball track or the ballscrew nut!

- Ballscrews can be cleaned using petroleum ether and oil.
- Trichloroethylene or a comparable cleaning agent can be used as a degreasing agent.
- To prevent corrosion, all parts must be dried, preserved or lubricated after cleaning.

6 Lubrication

6.1 Basic information on lubrication

Ballscrews require a sufficient supply of lubricants to ensure their function and service life.
The following specifications and notes are intended to assist the user in selecting a suitable lubricant, the appropriate lubricant quantity and determining the lubrication intervals. These lubrication instructions do not release the user from checking the specified lubrication intervals in practice and correcting them if necessary. After each lubrication process, check whether there is sufficient lubricant on the machine element (check whether there is a lubricant film).

Lubricants

- Reduce wear and tear
- Protect from dirt
- Prevent corrosion

The lubricant is a constructional element and should be taken into consideration when designing a machine. When selecting the lubricant, the operating temperature range and the operating and ambient conditions must be taken into account.

6.1.1 Safety

Caution! Danger to health and the environment!

Contact with lubricants can cause irritation, poisoning and allergic reactions as well as damage to the environment.

- Only use suitable media that are not dangerous for humans. Observe the manufacturer's safety data sheets.
- Dispose of substances appropriately.

Intended use of the lubricants

This chapter is intended to ensure safety when using lubricants. The improper use of lubricants may endanger life and health. The instructions below must be observed. Before using lubricants, always refer to the corresponding safety data sheet.

- Prolonged and repeated contact with the skin should be avoided if possible. Clean wetted skin areas with soap and water. Use skin protection products during work and moisturising cream after work. If necessary, wear oil-resistant protective clothing (e.g. gloves, apron). Do not clean hands with petroleum, solvents, water-miscible or water-mixed cooling lubricants. Oil mist must be extracted at the point of origin.
- Protective goggles must be worn to avoid eye contact. If eye contact nevertheless occurs, rinse the affected areas with plenty of water. If eye irritation persists, consult an eye doctor.
- In case of accidental ingestion, do not induce vomiting under any circumstances. Immediate medical attention is required.
- Safety data sheets according to 91/155/EEC are usually available for lubricants. Here you will find detailed information on health, accident and environmental protection.
- Lubricants are usually products that are hazardous to water. That is why they must not get into the soil, water or sewage system.

Safety notices for storing the lubricants

Lubricants must be stored in well-sealed packaging in a cool, dry location. They must be protected against direct sunlight and frost. Lubricants must not be stored together with food products. Lubricants must not be stored together with oxidants.

6.2 Lubrication condition upon delivery

HIWIN ballscrews are supplied preserved as standard. For preservation of the ballscrews, a mineral oil-based grease for rolling and slide bearings containing thickening agents according to DIN 51825 (K2K), NLGI class 2 is used. Base oil viscosity: 60 mm2/s. Carry out initial lubrication prior to commissioning (see section 6.7.1.1).

6.3 Selecting a lubricant

Oils, greases or also semi-fluid greases can be used as lubricants.
The same lubricants are used as for rolling bearings. As a rule, the selection of a lubricant and the infeed method can be adapted to fit in with the lubrication of the other machine components.

Note:
Lubricants containing MoS2 or graphite must not be used.

6.4 Miscibility

Check the miscibility of various lubricants. Lubricating oils based on mineral oil with the same classification (e.g. CL) and similar viscosity (maximum one class difference) are miscible.
Greases are miscible if their base oil and thickening type are the same. The viscosity of the base oil must be similar. The NLGI class may differ by a maximum of one level.
If lubricants other than those specified are used, shorter relubrication intervals and reduced performance must be expected. Possible 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 load ballscrews	●	●	●	○	○

● Miscible

○ Partially miscible

Recommendation:
In the case of lubricants that are only partially miscible, the old grease should be used up as far as possible before the new grease is introduced. The relubrication quantity with the new grease should be increased for a short time.
In the case of lubricants that are not miscible, the old grease should be completely used up before the new grease is introduced.

6.5 Operating conditions

Essentially, the selection of a lubricant depends on the operating temperature and various operation-related factors, e.g. load, vibrations, oscillation or short-stroke applications. Special requirements – such as use in combination with strong or aggressive media, in clean rooms, in a vacuum or in the food industry – also need to be considered.
Applications and suitable lubricants are listed in chapter 6.8. In case of doubt, consult the lubricant supplier to ensure optimum lubrication.

6.6 Use of greases and oils in central lubrication systems

If a central lubrication system is used, carrying out the initial lubrication (see section 6.7.1.1) separately with a manual grease gun before connecting it to the system is recommended. Also make sure that all lines and elements up to the consumer are filled with lubricant and do not contain any air pockets.
Long cable runs and small cable diameters should be avoided. The cables are to be laid uphill. The pulse number results from the partial quantities and the piston distributor size. In addition, the lubrication system manufacturers' instructions must be observed.

6.7 Lubrication of ballscrews

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

Note:
Excessive lubricating pressure levels or lubricant quantities can damage the ballscrew nut.

Lubrication must be carried out very carefully, especially for ballscrew nuts with felt or lip seals, as otherwise the seals may be damaged.

6.7.1 General information on lubricant quantities

6.7.1.1 Initial lubrication during commissioning

HIWIN ballscrews are supplied preserved as standard. Initial lubrication takes place in three steps: Supply the quantity of grease according to the table for the corresponding series. Move the nut three times by approx. three nut lengths. Repeat the described procedure twice.

Initial lubrication for short-stroke applications:

Stroke < 2 × nut length: Provide and lubricate lubrication connectors on both sides of the nut.

Stroke < 0.5 × nut length: Provide and lubricate lubrication connectors on both sides of the nut. In doing so, move the ballscrew nut by two nut lengths several times. If this is not possible, please consult us.

For short-stroke applications, the lubricant quantities must be doubled in accordance with the relevant tables.

For nuts without a lubrication connector, the lubricant must be supplied via the shaft.

6.7.1.2 Relubrication

The lubrication intervals are very much dependent on the operating conditions (nominal size, lead, speed, acceleration, loads, etc.) and the ambient conditions (temperature, fluids, etc.). Ambient influences such as high loads, vibrations and dirt can shorten the lubrication intervals. The lubrication intervals can be extended under clean ambient conditions and low loads.
If the ballscrews are installed vertically, the relubrication quantities must be increased by approx. 50%.
The specified lubrication intervals apply for normal operating conditions.
The lubrication quantity must be doubled for the relubrication of short-stroke applications.

6.8 Lubricant recommendations

Essentially, the selection of a lubricant depends on the operating temperature and various operation-related factors, e.g. load, vibrations, oscillation or short-stroke applications. Special requirements – such as use in combination with strong or aggressive media, in clean rooms, in a vacuum or in the food industry – also need to be considered.
Examples of applications and suitable lubricants are listed below. In case of doubt, consult the lubricant supplier to ensure optimum lubrication.

6.8.1 Grease lubrication

For grease lubrication, we recommend mineral oil-based lubricating grease for rolling and slide bearings with thickening agents according to DIN 51825 (K1K, K2K). In heavy load applications, we recommend using EP additives (KP1K, KP2K) NLGI class 1 or 2 and other consistency classes can be used following consultation with the lubricant supplier.

Note:
Greases containing solid lubricants such as graphite or MOS2 must not be used.

The following lubricant details are examples and should only be used to assist with selection. Other lubricants may be selected after clarification of the specific application with the lubricant supplier.

6.8.1.1 Standard applications

Load: max. 15% dynamic load rating

Temperature range: –10 °C to + 80 °C

Specific speed value: < 120,000

Table 6.3: Recommended greases for standard applications

HIWIN	G05
Klüber	MICROLUBE GL-261
Mobil	Mobilux EP1
Fuchs Lubritech	Lagermeister BF2
Lubcon	TURMOGREASE CAK 2502
BECHEM	Ceritol CF 2

6.8.1.2 Heavy load applications

Load: max. 50% dynamic load rating

Temperature range: 0 °C to + 80 °C

Specific speed value: < 120,000

Table 6.4: Recommended greases for heavy load 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% dynamic load rating

Temperature range: –10 °C to + 80 °C

Specific speed value: < 120,000

Table 6.5: Recommended greases for clean room applications

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

6.8.1.4 Clean room applications with high speeds

Load: max. 50% dynamic load rating

Temperature range: –10 °C to + 80 °C

Specific speed value: > 120,000

Table 6.6: Recommended greases for clean room applications at high speeds

HIWIN	G03
Klüber	Isoflex Topas NCA52

6.8.1.5 Applications with high speeds

Load: max. 50% dynamic load rating

Temperature range: –10 °C to + 80 °C

Specific speed value: > 120,000

Table 6.7: Recommended greases for applications at high speeds

HIWIN	G04
Klüber	Isoflex NCA15
Lubcon	TURMOGREASE Highspeed L252

6.8.1.6 Applications for the food sector according to USDA H1

Load: max. 15% dynamic load rating

Temperature range: –10 °C to + 80 °C

Specific speed value: < 120,000

Table 6.8: Recommended greases for applications for the food sector according to USDA H1

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

6.8.2 Lubrication with semi-fluid grease

In centralised lubrication systems, semi-fluid greases are frequently used, as they are distributed more effectively over the whole system due to their soft structure.
The instructions of the manufacturer of the lubrication system must be observed.
The following lubricant details are examples and should only be used to assist with selection. Other lubricants may be selected after clarification of the specific application and the central lubrication system with the lubricant supplier.
In addition, the lubrication system manufacturers' instructions must be observed.

6.8.2.1 Standard applications

Load: max. 15% dynamic load rating

Temperature range: –10 °C to + 80 °C

Specific speed value: < 120,000

Table 6.9: Recommended semi-fluid greases for standard applications

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

6.8.2.2 Heavy load applications

Information:

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

6.8.2.3 Clean room applications/vacuum

Information:

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

6.8.2.4 Applications with high speeds

Load: max. 50% dynamic load rating

Temperature range: –10 °C to + 80 °C

Specific speed value: > 120,000

Table 6.10: Recommended semi-fluid greases for applications at high speeds

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

6.8.2.5 Applications for the food sector according to USDA H1

Load: max. 15% dynamic load rating

Temperature range: –10 °C to + 80 °C

Specific speed value: < 120,000

Table 6.11: Recommended semi-fluid greases for applications for the food sector according to USDA H1

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

6.8.3 Oil lubrication

Lubricating oils offer the advantage of more even distribution and reach the contact surfaces more effectively. However, this also means that lubricating oils collect in the lower area of the product as a result of the force of gravity and thus cause soiling more quickly. For this reason, higher quantities of lubricant are required than with grease lubrication. As a rule, oil lubrication is only suitable when centralised lubrication units are being used or for products equipped with a lubrication unit.
The instructions of the manufacturer of the lubrication system must be observed.

The following lubricant details are examples and should only be used to assist with selection. Other lubricants can be selected after clarification of the specific application and the central lubrication system with the lubricant supplier.

6.8.3.1 Standard applications

Load: max. 15% dynamic load rating

Temperature range: –10 °C to + 80 °C

Specific speed value: < 120,000

Table 6.12: Recommended oils for standard applications

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

6.8.3.2 Heavy load applications

Note:
We recommend contacting a lubricant manufacturer for advice on using oils for heavy load applications.

6.8.3.3 Clean room applications

Load: max. 50% dynamic load rating

Temperature range: –10 °C to + 80 °C

Specific speed value: < 120,000

Table 6.13: Recommended oils for clean room applications

Klüber	Tyreno Fluid E-95 V
Mobil	Mobilgear 626

6.8.3.4 Applications with high speeds

Load: max. 50% dynamic load rating

Temperature range: –10 °C to + 80 °C

Specific speed value: > 120,000

Table 6.14: Recommended oil for applications at high speeds

Klüber	Klüberoil GEM 1-46 N

6.8.3.5 Applications for the food sector according to 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: Recommended oil for applications for the food sector according to USDA H1

Klüber	Klüberoil 4 UH1-68 N

6.8.4 HIWIN lubricants and accessories

6.8.4.1 HIWIN greases

Table 6.16: Overview of HIWIN greases

Grease type	Area of application	Article number		
		Cartridge 70 g	**Cartridge 400 g**	**Can 1 kg**
				
G01	Heavy load applications	20-000335	20-000336	20-000337
G02	Clean room applications	20-000338	20-000339	20-000340
G03	Clean room applications + high speed	20-000341	20-000342	20-000343
G04	High velocity	20-000344	20-000345	20-000346
G05	Standard grease	20-000347	20-000348	20-000349

6.8.4.2 Grease guns and lubrication adapters

A1: Hydraulic gripping coupling
For conical grease nipples according to DIN 71412, outer diameter 15 mm

Fig. 6.1: A1

A2: Hollow mouthpiece
For conical and ball grease nipples according to DIN 71412/DIN 3402, outer diameter 10 mm

Fig. 6.2: A2

A3: Hollow mouthpiece with lubrication adapter
For ball grease nipples according to DIN 3402, outer diameter 6 mm

Fig. 6.3: A3

A4: Round mouthpiece with lubrication adapter
For hopper lubrication nipples according to DIN 3405, outer diameter 6 mm

Fig. 6.4: A4

A5: Pointed mouthpiece with lubrication adapter

Fig. 6.5: A5

A6: Angled pointed mouthpiece with lubrication adapter

Fig. 6.6: A6

Set of lubrication adapters and nozzles

Fig. 6.7: Lubrication adapters and nozzles A3, A4, A5, A6

Set GN-400C: Grease gun large and adapter A1, A2

Fig. 6.8: GN-400C

Set GN-80M: Grease gun small and adapter A1, A2

Fig. 6.9: GN-80M

Table 6.17: Overview of HIWIN grease guns and accessories

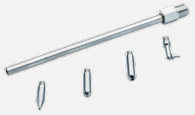
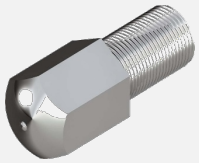
Article number	Contents			Direct filling	Cartridge
	GN-80M (Fig. 7.22) 	GN-400C (Fig. 7.21) 	Set of lubrication adapter and nozzles (Fig. 7.20) 		
20-000352	●	–	–	●	70 g
20-000332	●	–	●	●	70 g
20-000353	–	●	–	●	400 g
20-000333	–	●	●	●	400 g
20-000358	–	–	●	–	–

Table 6.18: Overview of grease nipples and recommended grease gun adapter

	Grease nipple	Article number	Recommended grease gun adapters
	Ball grease nipple		
	M3	20-000275	A2, A3 [1)]
	Conical grease nipple		
	M6	20-000278	A1, A2 [1)]
	M8 × 1	20-000279	A1, A2 [1)]
	1/8 PT	20-000280	A1, A2 [1)]
	Hopper lubrication nipple		
	M3	20-000370	A4
	M6	20-000328	A4

[1)] optional for limited installation space

6.9 Lubricant quantities and lubrication intervals

Caution! Risk of damage to the ballscrews due to missing or incorrect lubrication!

Lack of initial lubrication or excessive lubricant quantities/pressure can damage or destroy the product.

- Never put the ballscrews into operation without initial lubrication!
- The specified work steps must be followed without fail in order to avoid damage to the product!

The lubricant quantities given below are reference values which may fluctuate depending on the ambient conditions.

6.9.1 Lubricant quantities and lubrication intervals for grease lubrication

Table 6.19: Lubricant quantities for grease lubrication of DEB-x, DDB-x, ZE, SE, SEM, AME

Nominal diameter × lead	Single nut		Double nut		Relubrication interval
	Lubricant quantity for initial lubrication [g]	Lubricant quantity for relubrication [g]	Lubricant quantity for initial lubrication [g]	Lubricant quantity for relubrication [g]	Travel distance [km]
R16-05_3	0.2 (3×)	0.3	0.3 (3×)	0.6	100
R16-05_4	0.2 (3×)	0.4	0.4 (3×)	0.8	100
R16-10_3	0.3 (3×)	0.6	–	–	200
R16-16_2	0.3 (3×)	0.7	–	–	320
R20-5_4	0.3 (3×)	0.6	0.6 (3×)	1.2	100
R20-10_3	0.5 (3×)	0.9	–	–	200
R20-20_2	0.6 (3×)	1.3	–	–	400
R25-5_4	0.4 (3×)	0.8	0.8 (3×)	1.5	100
R25-10_3	0.6 (3×)	1.1	1.2 (3×)	2.3	200
R25-10_4	0.8 (3×)	1.5	1.5 (3×)	3.1	200
R25-25_2	1.0 (3×)	2.0	–	–	500
R32-5_5	0.6 (3×)	1.2	1.2 (3×)	2.5	100

Nominal diameter × lead	Single nut		Double nut		Relubrication interval
	Lubricant quantity for initial lubrication [g]	Lubricant quantity for relubrication [g]	Lubricant quantity for initial lubrication [g]	Lubricant quantity for relubrication [g]	Travel distance [km]
R32-10_3	0.9 (3×)	1.7	1.8 (3×)	3.5	200
R32-10_4	1.2 (3×)	2.3	2.3 (3×)	4.6	200
R32-10_5	1.5 (3×)	2.9	2.9 (3×)	5.8	200
R32-10_5-H	3.6 (3×)	7.2	5.7 (3×)	11.5	200
R32-20_2	2.9 (3×)	5.7	5.7 (3×)	11.5	400
R40-5_5	0.8 (3×)	1.6	1.5 (3×)	3.0	100
R40-10_3	2.3 (3×)	4.5	–	–	200
R40-10_4	3.0 (3×)	6.0	6.0 (3×)	11.9	200
R40-20_2	3.3 (3×)	6.6	6.6 (3×)	13.3	400
R40-40_2	6.0 (3×)	12.1	–	–	800
R50-5_5	1.0 (3×)	2.0	2.0 (3×)	3.9	100
R50-10_4	3.7 (3×)	7.4	5.9 (3×)	11.8	200
R50-10_5	4.6 (3×)	9.2	7.3 (3×)	14.7	200
R50-20_3	6.0 (3×)	11.9	11.9 (3×)	23.8	400
R63-10_6	5.7 (3×)	11.5	11.5 (3×)	22.9	200
R63-20_3	9.2 (3×)	18.4	–	–	400
R63-20_4	12.3 (3×)	24.5	24.5 (3×)	49.0	400
R63-20_5	15.3 (3×)	30.6	–	–	400
R63-20_6-H	22.9 (3×)	45.9	–	–	400
R80-10_6	7.5 (3×)	14.9	14.9 (3×)	29.8	200
R80-20_4	16.8 (3×)	33.5	26.9 (3×)	53.7	400
R80-20_5	21.0 (3×)	41.9	33.5 (3×)	67.1	400
R80-20_6-H	29.0 (3×)	58.1	–	–	400
R80-20_7-H	33.9 (3×)	67.8	–	–	400

Table 6.20: Lubricant quantities for grease lubrication of DEB-x, DDB-x, ZE, SE, SEM, AME

Nominal diameter × lead	Single nut		Relubrication interval
	Lubrication quantity for initial lubrication [g]	Lubrication quantity for relubrication [g]	Travel distance [km]
R08-02.5_2	0.03 (3×)	0.05	50
R10-02.5_2	0.03 (3×)	0.06	50
R10-04_2	0.08 (3×)	0.16	80
R12-04_1	0.03 (3×)	0.05	80
R12-05_4	0.07 (3×)	0.14	100
R12-10_3	0.15 (3×)	0.30	200
R15-05_4	0.19 (3×)	0.38	100
R16-05_3	0.18 (3×)	0.36	100
R16-10_3-FSCDIN	0.3 (3×)	0.6	200
R16-10_3-RSI	0.4 (3×)	0.7	200
R16-16_3	0.5 (3×)	1.0	320

Nominal diameter × lead	Single nut		Relubrication interval
	Lubrication quantity for initial lubrication [g]	Lubrication quantity for relubrication [g]	Travel distance [km]
R16-20_2	0.4 (3×)	0.9	400
R20-05_4	0.3 (3×)	0.6	100
R20-10_3-FSCDIN	0.4 (3×)	0.9	200
R20-10_3-RSI	1.0 (3×)	1.9	200
R20-20_2	0.6 (3×)	1.3	400
R20-20_4	1.3 (3×)	2.5	400
R25-05_4	0.4 (3×)	0.8	100
R25-10_4	0.8 (3×)	1.5	200
R25-25_2	2.0 (3×)	4.0	500
R25-25_4	1.0 (3×)	2.0	500
R32-05_6	0.7 (3×)	1.5	100
R32-10_5	1.4 (3×)	2.8	200
R32-20_3	1.7 (3×)	3.5	400
R32-32_2	2.4 (3×)	4.9	640
R32-32_4	1.2 (3×)	2.4	640
R40-05_6	0.9 (3×)	1.8	100
R40-10_4	3.0 (3×)	6.0	200
R40-20_3	5.0 (3×)	10.0	400
R40-40_2	12.1 (3×)	24.2	800
R40-40_4	6.0 (3×)	12.1	800
R50-05_6	1.1 (3×)	2.3	100
R50-10_6	5.3 (3×)	10.5	200
R50-20_5	9.5 (3×)	19.0	400
R50-40_3	14.3 (3×)	28.7	800
R50-40_6	7.2 (3×)	14.3	800
R63-10_6	5.7 (3×)	11.5	200

Relubrication intervals for grease lubrication

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

Standard conditions:

Load ratio: max. 20% dynamic load rating

Temperature range: –10 °C to + 80 °C

Specific speed value: < 120,000

No impacts or vibration

Deviating conditions and contamination shorten the relubrication intervals.

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

If a central lubrication system is used, carrying out the initial lubrication separately with a manual grease gun before connecting it to the system is recommended.
Also make sure that all lines and elements up to the consumer are filled with lubricant and do not contain any air pockets. Long cable runs and small cable diameters should be avoided. The cables are to be laid uphill.

The pulse number results from the partial quantities and the piston distributor size.
In addition, the lubrication system manufacturers' instructions must be observed.

Lubricant quantities for semi-fluid grease lubrication:
The quantities for lubrication with fluid grease are identical to the lubricant quantities for grease lubrication.

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

Piston distributor size for metering units (single-line systems) for fluid grease lubrication

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

$$\text{Lubrication interval [km]} = \frac{\text{Piston distributor size [cm}^3\text{]}}{\text{Relubrication quantity [cm}^3\text{]}} \times \text{Eelubrication interval [km]}$$

6.9.3 Lubricant quantities and lubrication intervals for oil lubrication

When using a central lubrication system, make sure that all lines and elements up to the consumer are filled with lubricant and do not contain any air pockets. Long cable runs and small cable diameters should be avoided. The cables are to be laid uphill.
The pulse number results from the partial quantities and the piston distributor size.
In addition, the lubrication system manufacturers' instructions must be observed.

Table 6.21: Lubricant quantities for oil lubrication

Nominal diameter [mm]	Initial lubrication	Relubrication
	Partial oil quantity [cm³]	Oil quantity [cm³]
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:
With 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 specified above.

Piston distributor size for metering units (single-line systems) for oil lubrication
The time interval between the individual lubrication pulses results from the relubrication quantity, the relubrication interval and the piston distributor size:

$$\text{Lubrication interval [km]} = \frac{\text{Piston distributor size [cm}^3\text{]}}{\text{Relubrication quantity [cm}^3\text{]}} \times \text{Eelubrication interval [km]}$$

7 Measures in the event of a fault

7.1 Troubleshooting

This chapter explains potential ballscrew malfunctions and how to avoid them. Moreover, various measuring devices are presented that enable the user to localise the causes of excessive backlash.

7.2 Causes and prevention of errors

The basic sources of errors can be divided into four categories:

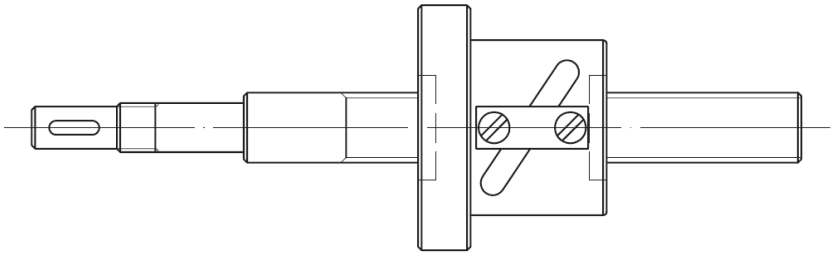
7.2.1 Excessive backlash

No 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 backlash or is slightly preloaded. Ballscrews without preload may have significant axial play, which is why they are used in applications that do not primarily require high accuracy levels.

HIWIN determines the necessary preload for the respective application and supplies the correspondingly preloaded ballscrew. For this reason, a detailed and precise description of the operating conditions is particularly important when ordering the HIWIN ballscrew.

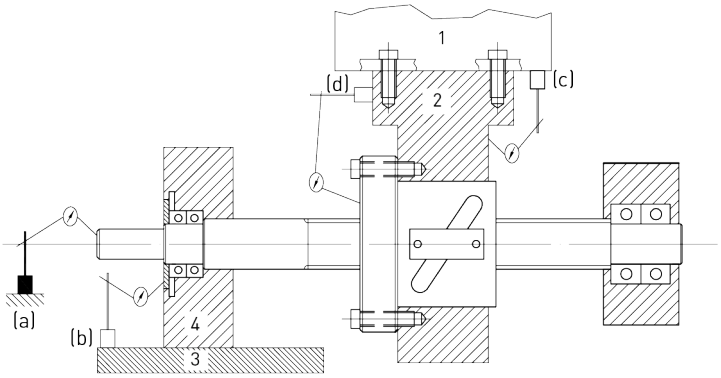
Fig. 7.1: Design of a ballscrew



The following measurements can be carried out to determine the reason for abnormal backlash in the ballscrew:

1. Glue the ball gauge into the central hole at one end of the ballscrew shaft. Use a dial gauge to measure the axial play of the ball gauge as you rotate the ballscrew shaft. (Fig. 7.2 (a)). It should not move more than 0.003 mm if the bearing, the ballscrew nut and the nut housing are assembled correctly.
2. Use a dial gauge to measure the relative movement between the bearing housing and the bearing seat as you rotate the ballscrew shaft (Fig. 7.2 (b)). Any measured value other than zero indicates that the bearing is either not rigid enough or assembled incorrectly.
3. Check the relative movement between the machine bed and the housing of the ballscrew nut (Fig. 7.2 (c)).
4. Check the relative movement between the housing of the ballscrew nut and the flange (Fig. 7.2 (d)). Contact HIWIN if the aforesaid checks have not produced any results and there is still backlash. It may be necessary to increase the preload or the rigidity of the ballscrew.

Fig. 7.2: Determining the reason for abnormal backlash



1	Machine bed	3	Bearing seat
2	Nut housing	4	Bearing housing

7.2.2 Excessive torsional deformation

1 Incorrect material selection:
Table 7.1 shows 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 the heat-treated layer insufficient, uneven heat treatment of the surface, material too soft: The standard hardness levels for balls, nuts and shafts for ballscrews are listed in Table 7.2.

Table 7.2: Standard hardness levels

	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 length to diameter of the shaft (L/D figure), the greater the rigidity. The recommended L/D figure is less than 60. Excessive L/D figures can lead to significant torsional deformation. Assembly with bearings on one side should – whenever possible – be avoided.

4 **Incorrect bearing selection:**
Ballscrews should be mounted with angular contact ball bearings; angular contact ball bearings designed specifically for ballscrews are recommended in particular. When axial loads occur, normal ball bearings exhibit considerable axial play; these bearings should, therefore, not be used in 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 the machine load if it is not rigid enough. The test setup shown in Fig. 7.2 (d) can be used to test the rigidity of the nut housing. Similar test setups can be used to test the rigidity of bearing housings.

6 **Nut housing or bearing housing is not assembled correctly**

- Components may work loose due to vibration or a lack of dowel pins. Fixed dowel pins and not clamping pins should be used for the lock.
- The screw connection on the ballscrew nut is not secure, as the screws are too long or the threaded holes on the housing are too short.
- The screws on the ballscrew nut work loose due to vibration and a lack of circlips.

7 **Housing surface is not parallel or flat enough**
During machine assembly, spacers are often fitted between the housing and the machine frame for adjustment. The dimensions of the mounting surface may differ at various points if the parallelism of the surfaces or the evenness of one of the components is outside the tolerances.

8 **Motor and ballscrew are not assembled correctly**

- If the coupling is not assembled securely or is not rigid enough, relative rotation will occur between the motor shaft and the ballscrew shaft.
- Gear teeth do not mesh correctly or the drive train is not rigid enough. If the ballscrew is driven by a belt, a toothed belt should be used to avoid slippage.
- Feather key is loose in the groove. Any incorrect combination of shaft, groove and feather key can cause backlash.

7.2.3 Uneven running

1 **Production-related defects on the ballscrew**

- The race profile on the ballscrew shaft or ballscrew nut is too rough.
- The bearing balls, the ballscrew nut or the ballscrew shaft are out of round.
- The lead or the lead circle diameter of the ballscrew nut or shaft is outside the tolerances.
- The ball recirculation is not assembled correctly in the ballscrew nut.
- Uneven ball size or hardness.
- The said problems should not arise with high-quality manufacturers.

2 **Foreign objects in the ball race profile**

- Packaging material jammed in the ball race profile. Before being shipped, ballscrews are packaged with various packaging materials and oil paper. These materials and other objects may become jammed in the ball race profile if care is not taken 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 race profiles of the ballscrew. This causes uneven running, reduced accuracy and a shorter service 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 might 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 useful path, a ballscrew must be checked and repaired by the manufacturer before being used again.

4 **Ball recirculation damaged**
The ball recirculation may be damaged and cause the aforesaid problems if it experiences severe impact during assembly.

5 **Incorrect alignment**
If the axes of the housing of the ballscrew nut and the shaft bearing do not match fully, a radial load occurs. The ballscrew may bend if the load is excessive. Even if the axis error is so minor as to cause no discernible bending, it will still cause increased wear. If aligned incorrectly, ballscrew precision will deteriorate quickly. The greater the preload of the ballscrew nut, the greater the need for precise alignment of the ballscrew.

6 **Ballscrew nut not assembled correctly on the housing**
If the ballscrew nut is assembled at an angle or poorly aligned, eccentric loads occur. If this happens, the motor input current may fluctuate during operation.

7 **Transport damage to the 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 measuring 3,175 mm in diameter. 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 too break, resulting 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 during the design phase. 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 recirculation**
If the ballscrew nuts travel beyond the permissible path or in case of an impact against the ball recirculation, the return may be pressed in or break. This blocks the path for the balls, meaning that they only slide and ultimately break.

3 **Bearing journal breakage on the shaft**

- Incorrect design:
  Sharp edges should be avoided on the bearing journal of the shaft to avoid local peaks in stress. Fig. 7.3 shows useful design features for the bearing journal.
- Bending strain on the bearing journal:
  The mounting surface of the bearing and the axis of the bearing lug are not perpendicular to one another or the opposite sides of the bearing lug are not parallel to one another. The bearing journal is therefore 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

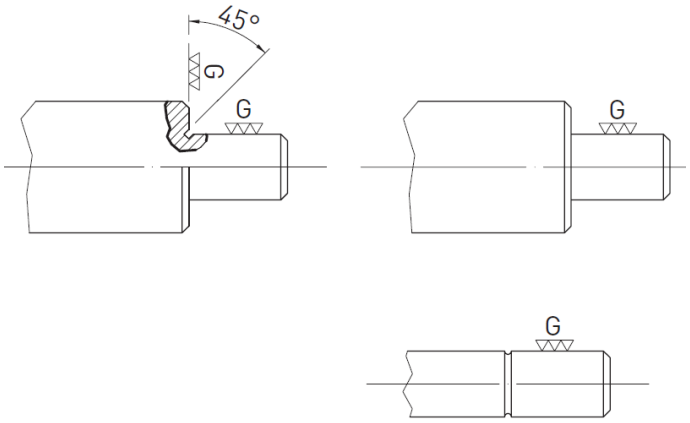


Fig. 7.4: Concentricity check on the drive journal

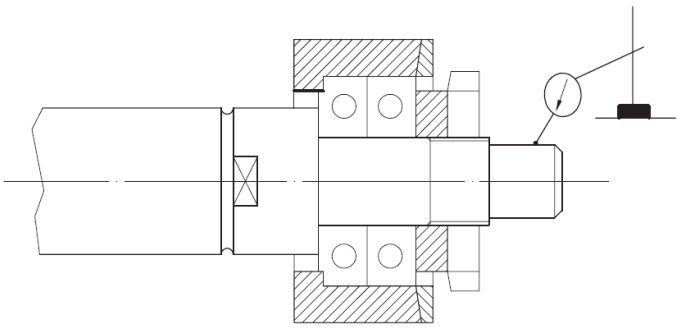


Table 7.3: Fault table

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 assembled axially parallel to the guides	Align the ballscrew
	Nut, shaft or balls display traces of wear	Replace the ballscrew
Ballscrew nut is sluggish near the mounting	Ballscrew is not assembled axially parallel to the guides	Align the ballscrew
Ballscrew nut is sluggish over its entire travel distance	Ballscrew nut has a radial load or is not axially parallel to the shaft	Check alignment of the nut housing to the 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 heats up a lot	Ballscrew nut has a radial load or is not axially parallel to the shaft	Check alignment of the nut housing to the ballscrew mounting
	Insufficient lubrication	Lubricate the ballscrew as specified in the lubrication instructions

8 Disposal

Caution! Environmentally hazardous substances!

The risk posed to the environment depends on the type of materials used.

- Always clean contaminated components before disposal!
- Clarify proper disposal with disposal companies and, if necessary, with the responsible authorities!

Liquids	
Lubricants	Dispose of as hazardous waste in an environmentally-safe manner
Soiled cleaning cloths	Dispose of as hazardous waste in an environmentally-safe manner
Nut	
Steel components	Sort by type before disposal
Plastic components	Dispose of as residual waste
Shaft	
Steel components	Sort by type before disposal
Balls	
Steel components	Sort by type before disposal

9 Appendix 1: Order codes

To clearly identify the ballscrew, information about the ballscrew shaft and the ballscrew nut is needed.

9.1 Order codes for rolled ballscrews

Number		1	2	3	4	5	6	7	8	9	10	11
Order code		2	R	40	20	K	4		FSCDIN	800	1000	0.052
1	2	Number of thread turns on shaft: 1: Single thread [1)] 2: Double thread 3: Triple thread 4: Four thread										
2	R	Thread direction: R: Right-hand thread L: Left-hand thread										
3	40	Nominal diameter										
4	20	Lead										
5	K	Type of ball recirculation: K: Cassette recirculation T: Internal recirculation B: External recirculation										
6	4	Number of recirculations										
7		Ball filling of nut: None: Single thread filled D: Double thread filled T: Triple thread filled Q: Four thread filled										
8	FSCDIN	Nut type (See Table 9.1)										
9	800	Thread length in mm										
10	1000	Total length										
11	0.052	Pitch variation across 300 mm: (tolerance class)										

Order code for ballscrew shaft without ballscrew nut

Number		1	2	3	4	5	6	7
Order code		1	R	40	10	800	1000	0.052
1	1	Number of thread turns on shaft: 1: Single thread [1)] 2: Double thread 3: Triple thread 4: Four thread						
2	R	Thread direction: R: Right-hand thread L: Left-hand thread						
3	40	Nominal diameter						
4	10	Lead						
5	800	Thread length in mm						
6	1000	Total length						
7	0.052	Pitch variation across 300 mm: (tolerance class)						

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

Order code for ballscrew nut without ballscrew shaft

Number		1	2	3	4	5	6	7
Order code		R	40	10	K	3		FSCDIN
1	R	Thread direction: R: Right-hand thread L: Left-hand thread						
2	40	Nominal diameter						
3	10	Lead						
4	K	Type of ball recirculation: K: Cassette recirculation T: Internal recirculation B: External recirculation						
5	3	Number of recirculations						
6		Ball filling of nut: None: Single thread filled D: Double thread filled T: Triple thread filled Q: Four thread filled						
7	FSCDIN	Nut type (See Table 9.1)						

Table 9.1: Overview of the nut types

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

Number		1	2	3	4	5	6	7	8	9	10
Order code		R	40	20	K	4	DEB	N	800	1000	0.052
1	R	Thread direction: R: Right-hand thread L: Left-hand thread									
2	40	Nominal diameter									
3	20	Lead									
4	K	Type of ball recirculation: K: Cassette recirculation T: Internal recirculation									
5	4	Number of recirculations									
6	DEB	Nut type (See Table 9.2)									
7	N	Wiper [1]: N: NBR wiper F: Felt wiper K: NBR-finger wiper V: Felt-finger wiper B: Brush S: Gap									
8	800	Thread length in mm									
9	1000	Total length									
10	0.052	Pitch variation across 300 mm: (tolerance class)									

[1] The installed wiper is shown in the following tables for the individual nut types. For nut types DEB-x and DDB-x, you can choose between N, K, F or V wipers, depending on the thread pitch.

Order code for ballscrew shaft without ballscrew nut

Number		1	2	3	4	5	6
Order code		R	40	10	800	1000	0.052
1	R	Thread direction: R: Right-hand thread L: Left-hand thread					
2	40	Nominal diameter					
3	10	Lead					
4	800	Thread length in mm					
5	1000	Total length					
6	0.052	Pitch variation across 300 mm: (tolerance class)					

Order code for ballscrew nut without ballscrew shaft

Number		1	2	3	4	5	6	7
Order code		R	40	10	K	3	DEB	N
1	R	Thread direction: R: Right-hand thread L: Left-hand thread						
2	40	Nominal diameter						
3	10	Lead						
4	K	Type of ball recirculation: K: Cassette recirculation T: Internal recirculation						
5	3	Number of recirculations						
6	DEB	Nut type (See Table 9.2)						
7	N	Wiper [1]: N: NBR wiper F: Felt wiper K: NBR-finger wiper V: Felt-finger wiper B: Brush S: Gap						

[1] The installed wiper is shown in the following tables for the individual nut types. For nut types DEB-x and DDB-x, you can choose between N, K, F or V wipers, depending on the thread pitch.

Table 9.2: Overview of the nut types

Nut designation	Description
DEB-x	Flange single nut with variable wiper type
DDB-x	Flange double nut with variable wiper type
ZE	Cylindrical single nut
SE	Cylindrical single nut with screw-in thread
SEM	Flange single nut with integrated safety 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

$$F_k = 4{,}072 \times 10^5 \left(\frac{f_k \times d_k^4}{l_s^2} \right)$$

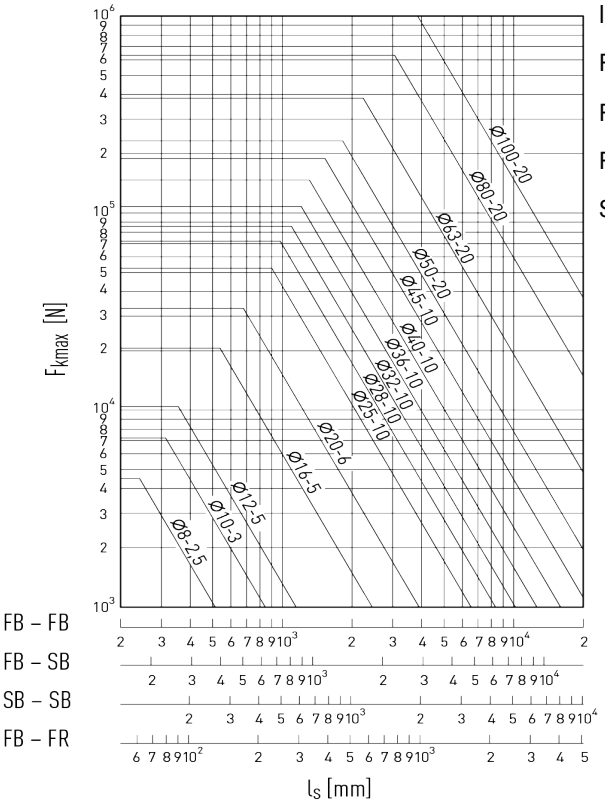
F 10.2

$$F_k = 0{,}5 \times F_k$$

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)

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



l_s	Unsupported shaft length [mm]
F_{kmax}	Critical axial load [N]
FB	Fixed bearing
FR	No bearing
SB	Supported bearing

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_k	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" l_s

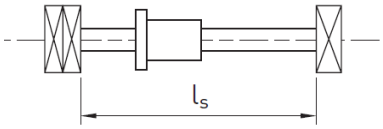
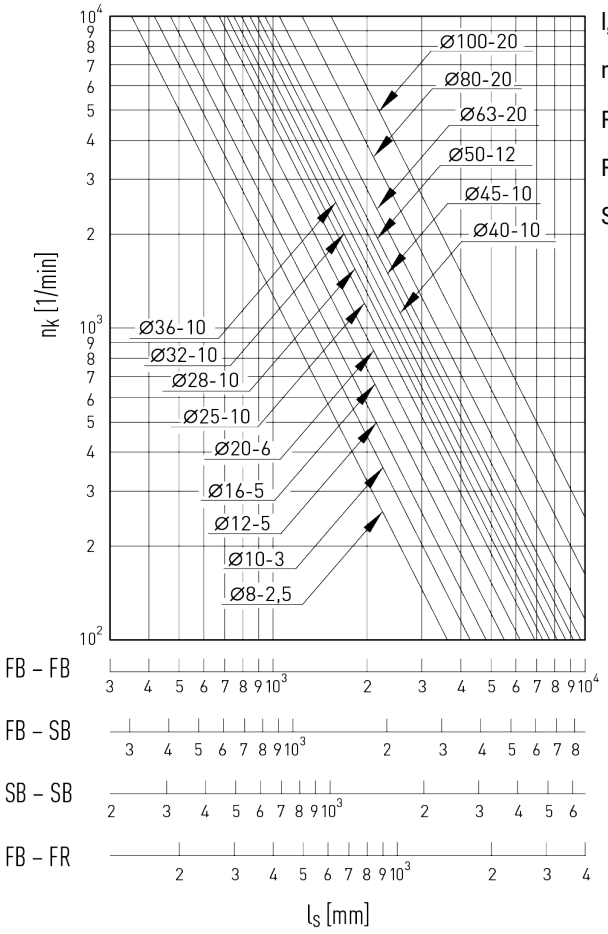


Fig. 10.3: Critical speed for different diameters and lengths of threaded shafts



l_s	Unsupported shaft length [mm]
n_k	Critical speed [rpm]
FB	Fixed bearing
FR	No bearing
SB	Supported bearing

10.2 Technical data

10.2.1 Nuts for rolled ballscrews

10.2.1.1 Flange single nut FSCDIN/FSIDIN

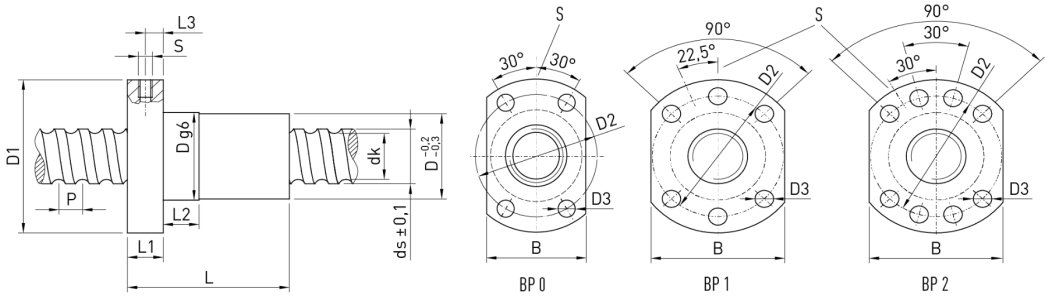


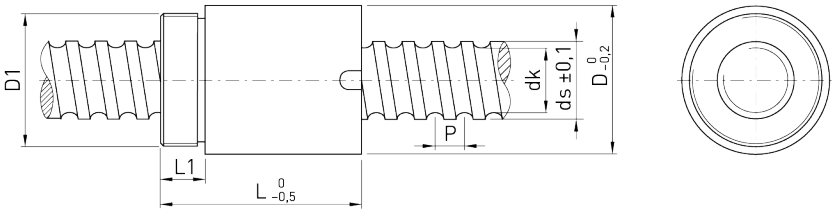
Table 10.1: Nut dimensions

Article number	ds	P	D	D1	D2	D3	Hole pattern BP	L	L1	L2	L3	Lubrication hole S	B	dk	Cdyn [N]	C0 [N]	Max. axial play [mm]	Mass [kg/pc.]
R12-05K4-FSCDIN	11.7	5	24	40	32	4.5	0	33	8	8	4	M3	26	9.9	5500	12000	0.02	0.11
R12-10K3-FSCDIN	11.8	10	24	40	32	4.5	0	43	8	8	4	M3	26	9.6	5100	10100	0.02	0.13
R15-05K4-FSCDIN	13.9	5	28	48	38	5.5	1	38	10	10	5	M6	40	11.8	12600	21000	0.04	0.18
R16-05T3-FSIDIN	15.5	5	28	48	38	5.5	1	40	10	10	5	M6	40	12.9	6500	11700	0.04	0.18
R16-10K3-FSCDIN	14.7	10	28	48	38	5.5	1	45	10	10	5	M6	40	12.5	9100	19300	0.04	0.20
R16-16K3-FSCDIN	15.0	16	28	48	38	5.5	1	61	12	20	6	M6	40	13.0	7900	17000	0.04	0.26
R16-20K2-FSCDIN	14.0	20	28	48	38	5.5	1	56	10	10	5	M6	40	11.8	5200	10400	0.04	0.25
R20-05K4-FSCDIN	19.6	5	36	58	47	6.6	1	40	10	10	5	M6	44	16.9	13400	32740	0.04	0.28
R20-10K3-FSCDIN	19.3	10	36	58	47	6.6	1	48	10	10	5	M6	44	16.6	10000	23500	0.04	0.32
R20-20K2-FSCDIN	19.7	20	36	58	47	6.6	1	57	10	10	5	M6	44	17.1	6800	15300	0.04	0.37
R20-20K4-DFSCDIN	19.7	20	36	58	47	6.6	1	57	10	10	5	M6	44	17.1	12300	30500	0.04	0.36
R25-05K4-FSCDIN	24.9	5	40	62	51	6.6	1	43	10	12	5	M6	48	22.3	14900	41500	0.04	0.22
R25-10K4-FSCDIN	24.5	10	40	62	51	6.6	1	61	10	16	5	M6	48	21.8	16100	44900	0.04	0.43
R25-25K2-FSCDIN	24.7	25	40	62	51	6.6	1	70	10	16	5	M6	48	22.1	7400	19100	0.04	0.48
R25-25K4-DFSCDIN	24.7	25	40	62	51	6.6	1	70	10	16	5	M6	48	22.1	13500	38200	0.04	0.46
R32-05K6-FSCDIN	31.7	5	50	80	65	9.0	1	48	12	10	6	M6	62	29.1	23900	81900	0.04	0.59
R32-10K5-FSCDIN	31.8	10	50	80	65	9.0	1	77	12	16	6	M6	62	28.6	31500	80100	0.04	0.82
R32-20K3-FSCDIN	31.8	20	50	80	65	9.0	1	88	12	16	6	M6	62	28.6	17000	48500	0.04	0.91
R32-32K2-FSCDIN	31.9	32	50	80	65	9.0	1	88	12	20	6	M6	62	28.7	11600	31800	0.04	0.90
R32-32K4-DFSCDIN	31.9	32	50	80	65	9.0	1	88	12	20	6	M6	62	28.7	20600	62200	0.04	0.87
R40-05K6-FSCDIN	39.4	5	63	93	78	9.0	2	50	14	10	7	M8 × 1	70	36.8	25900	100600	0.04	0.93
R40-10K4-FSCDIN	37.8	10	63	93	78	9.0	2	70	14	16	7	M8 × 1	70	32.8	45000	123000	0.04	1.19
R40-20K3-FSCDIN	37.8	20	63	93	78	9.0	2	88	14	16	7	M8 × 1	70	32.8	34850	90000	0.07	1.43
R40-40K2-FSCDIN	37.9	40	63	93	78	9.0	2	102	14	16	7	M8 × 1	70	32.9	23000	58400	0.07	1.61
R40-40K4-DFSCDIN	37.9	40	63	93	78	9.0	2	102	14	16	7	M8 × 1	70	32.9	41500	115800	0.07	1.59
R50-05K6-FSCDIN	49.4	5	75	110	93	11.0	2	50	16	10	8	M8 × 1	85	46.8	28300	127200	0.07	1.32
R50-10K6-FSCDIN	48.0	10	75	110	93	11.0	2	90	16	20	8	M8 × 1	85	42.9	74500	250000	0.07	2.05
R50-20K5-FSCDIN	47.9	20	75	110	93	11.0	2	132	18	25	9	M8 × 1	85	42.9	67200	217500	0.07	2.89

Article number	ds	P	D	D1	D2	D3	Hole pattern BP	L	L1	L2	L3	Lubrication hole S	B	dk	Cdyn [N]	C0 [N]	Max. axial play [mm]	Mass [kg/pc.]
R50-40K3-FSCDIN	50.0	40	75	110	93	11.0	2	149	18	45	9	M8 × 1	85	45.0	39000	123000	0.07	2.96
R50-40K6-DFSCDIN	50.0	40	75	110	93	11.0	2	149	18	45	9	M8 × 1	85	45.0	70300	242600	0.07	2.93
R63-10T6-FSIDIN	63.1	10	90	125	108	11.0	2	120	18	16	9	M8 × 1	95	58.0	61920	214090	0.07	3.30

All dimensions stated without a unit are in mm

10.2.1.2 Cylindrical single nut RSIT with screw-in thread



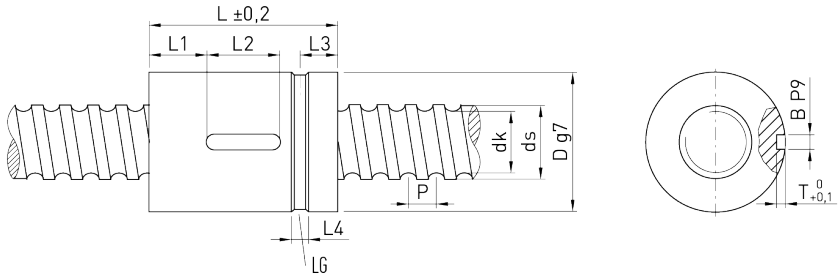
Sufficient lubricant supply to the shaft must be ensured via a lubricant channel in the adjacent construction.

Table 10.2: Nut dimensions

Article number	ds	P	D	D1	L	L1	dk	Dyn. load rating C_{dyn} [N]	Stat. load rating C_0 [N]	Max. axial play [mm]	Mass [kg/pc.]
R08-02,5T2-RSIT 1)	7.7	2.5	17.5	M15 × 1	27.5	7.5	6.1	1300	1750	0.04	0.03
R10-02,5T2-RSIT 2)	9.9	2.5	19.5	M17 × 1	25.0	7.5	8.1	1780	2630	0.04	0.04
R10-04T2-RSIT 2)	9.9	4.0	24.0	M22 × 1	32.0	10.0	7.7	1980	2820	0.04	0.08
R12-04B1-RSIT 1)	12.0	4.0	25.5	M20 × 1	34.0	10.0	9.5	3000	5700	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



LG Groove for lubricant supply

Table 10.3: Nut dimensions

Article number	ds	P	D	L	L1	L2	L3	L4	T	B	dk	Dyn. load rating C_{dyn} [N]	Stat. load rating C_0 [N]	Max. axial play [mm]	Mass [kg/pc.]
R16-10T3-RSI	15.4	10	28	60	8	20	9.5	5	2.5	4	12.9	6100	10800	0.04	0.17
R20-10T3-RSI	19.9	10	34	60	20	20	12.0	4	2.0	5	17.5	8100	12600	0.04	0.35

All dimensions stated without a unit are in mm

10.2.2 Nuts for peeled ballscrews

10.2.2.1 Flange single nut DEB-x

Fig. 10.4: Flange single nut DEB-x with wiper variants N and F

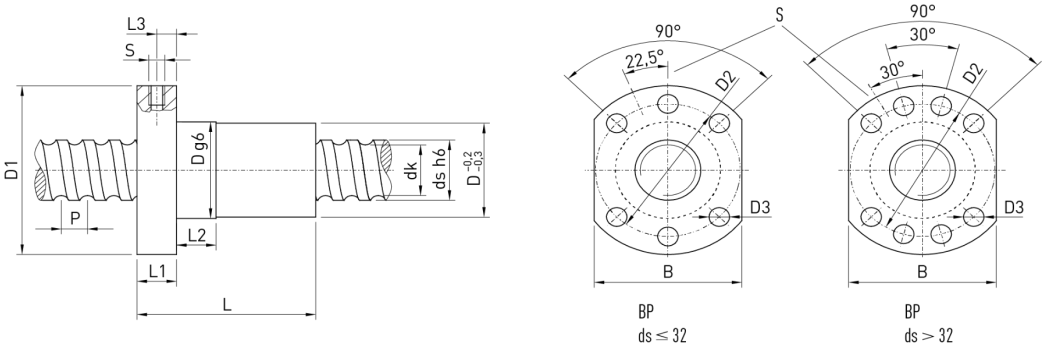
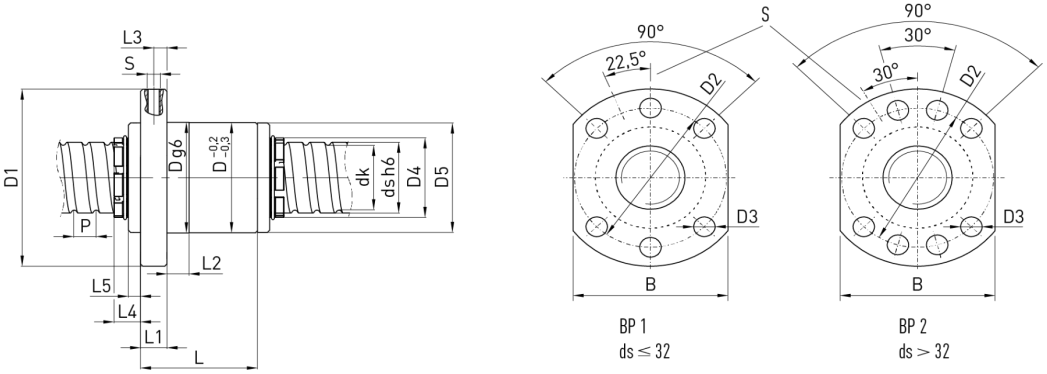


Fig. 10.5: Flange single nut DEB-x with wiper variants K and V



BP Hole pattern
S Lubrication hole

Table 10.4: Nut dimensions (wiper variants N and K or F and V)

Type	ds	P	D	D1	D2	D3	D4	D5	L	L1	L2	L3	L4 [1)]	L5 [1)]	Lubrication hole S	B	dk	Dyn. load rating C_{dyn} [N]	Stat. load rating C_0 [N]	Max. axial play [mm]	Mass [kg/pc.]	N/K	F/V
R16-05K4-DEB-x	15	5	28	48	38	5.5	22	28	47	10	10	5.0	14.0	8	M6	40	12.5	10400	16400	0.02	0.15	x	x
R16-10K3-DEB-x	15	10	28	48	38	5.5	22	28	53	10	10	5.0	14.0	8	M6	40	12.9	8200	12800	0.02	0.17	x	x
R16-16K2-DEB-x	15	16	28	48	38	5.5	22	28	55	10	10	5.0	14.0	8	M6	40	12.9	5600	8300	0.02	0.18	x	
R20-05K4-DEB-x	20	5	36	58	47	6.6	25	36	48	10	10	5.0	10.5	5	M6	44	17.3	13900	23300	0.02	0.29	x	x
R20-10K3-DEB-x	20	10	36	58	47	6.6	25	36	55	10	10	5.0	10.5	5	M6	44	17.3	9900	17400	0.02	0.30	x	x
R20-20K2-DEB-x	20	20	36	58	47	6.6	25	36	65	10	10	5.0	12.0	6	M6	44	17.3	7000	11800	0.02	0.32	x	
R25-05K4-DEB-x	25	5	40	62	51	6.6	30	40	53	10	10	5.0	11.5	6	M6	48	22.3	15600	29800	0.02	0.32	x	x
R25-10K4-DEB-x	25	10	40	62	51	6.6	30	40	70	10	10	5.0	12.0	6	M6	48	22.3	14300	29700	0.02	0.38	x	x
R25-25K2-DEB-x	25	25	40	62	51	6.6	30	40	79	10	10	5.0	12.0	6	M6	48	22.3	7700	14900	0.02	0.41	x	
R32-05K5-DEB-x	32	5	50	80	65	9.0	36	50	53	12	10	6.0	12.5	6	M6	62	29.3	20700	48700	0.02	0.60	x	x
R32-10K5-DEB-x	32	10	50	80	65	9.0	40	50	83	14	20	7.0	11.0	6	M6	62	28.7	30900	72800	0.02	0.68	x	x
R32-10K5-DEBH-x	32	10	56	86	71	9.0	41	56	87	14	20	7.0	12.0	6	M6	65	26.9	55500	108800	0.02	0.75	x	x
R32-20K2-DEB-x	32	20	56	86	71	9.0	41	56	72	14	20	7.0	11.0	6	M6	65	26.9	24800	43000	0.02	0.75	x	
R40-05K5-DEB-x	40	5	63	93	78	9.0	50	59	56	14	10	7.0	11.0	5	M8 × 1	70	37.3	22500	61700	0.02	0.90	x	x
R40-10K4-DEB-x	38	10	63	93	78	9.0	50	62	81	14	20	7.0	11.0	5	M8 × 1	70	32.9	50500	105800	0.02	1.13	x	x

Type	ds	P	D	D1	D2	D3	D4	D5	L	L1	L2	L3	L4 [1]	L5 [1]	Lubrication hole S	B	dk	Dyn. load rating C_{dyn} [N]	Stat. load rating C_0 [N]	Max. axial play [mm]	Mass [kg/pc.]	N/K	F/V
R40-20K2-DEB-x	38	20	63	93	78	9.0	50	62	79	14	20	7.0	12.0	5	M8 × 1	70	32.9	27500	52400	0.03	1.10	x	
R40-40K2-DEB-x	38	40	63	93	78	9.0	50	62	113	14	20	7.0	11.0	5	M8 × 1	70	32.9	27200	53300	0.04	1.60	x	
R50-05K5-DEB-x	50	5	75	110	93	11.0	58	74	58	16	10	8.0	12.0	6	M8 × 1	85	47.3	24900	77900	0.02	1.20	x	x
R50-10K5-DEB-x	50	10	75	110	93	11.0	58	74	93	16	20	8.0	12.0	6	M8 × 1	85	44.9	70500	179100	0.02	1.80	x	x
R50-20K3-DEB-x	50	20	75	110	93	11.0	58	74	101	16	20	8.0	12.0	6	M8 × 1	85	44.9	45100	106900	0.03	1.95	x	
R63-10K6-DEB-x	63	10	90	125	108	11.0	72	90	103	18	10	9.0	13.0	7	M8 × 1	95	57.9	90800	271500	0.04	2.90	x	x
R63-20T5-DEB-x	63	20	95	135	115	13.5	78	95	169	20	25	10.0	15.0	9	M8 × 1	100	55.5	129000	315400	0.04	4.10	x	
R63-20K6-DEBH-x	63	20	125	165	145	13.5	83	125	185	25	25	12.5	18.0	10	M8 × 1	130	53.2	295900	723500	0.04	9.50	x	x
R80-10K6-DEB-x	80	10	105	145	125	13.5	88	104	105	20	12	10.0	14.0	6	M8 × 1	110	74.9	101800	355800	0.04	3.00	x	x
R80-20K5-DEB-x	80	20	125	165	145	13.5	92	124	157	25	25	12.5	17.0	9	M8 × 1	130	72.5	151700	437400	0.05	7.80	x	
R80-20K6-DEBH-x	78	20	135	175	155	13.5	100	134	175	25	25	12.5	19.0	11	M8 × 1	140	68.2	336500	931200	0.05	13.50	x	
R80-20K7-DEBH-x	78	20	135	175	155	13.5	100	134	195	25	25	12.5	19.0	11	M8 × 1	140	68.2	384100	1086400	0.05	15.00	x	

[1] only for wiper variants K and V

All dimensions stated without a unit are in mm

10.2.2.2 Flange double nut DDB-x

Fig. 10.6: Flange double nut DDB-x with wiper variants N and F

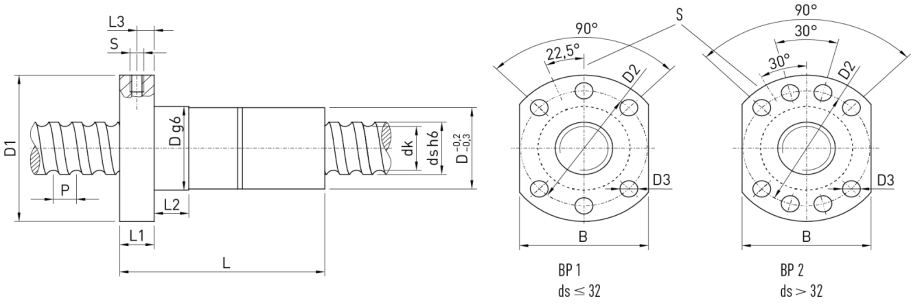


Fig. 10.7: Flange double nut DDB-x with wiper variants K and V

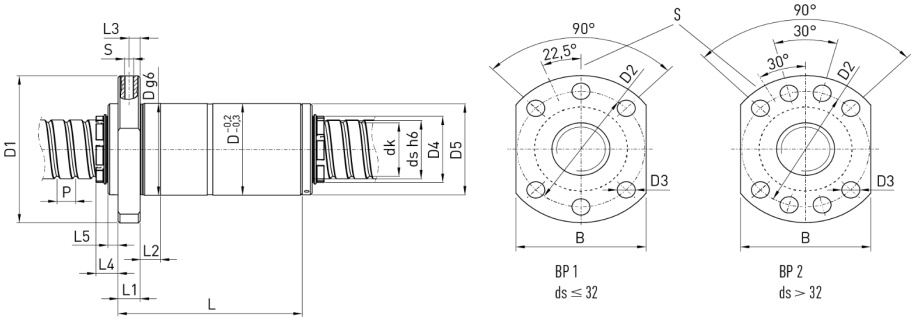
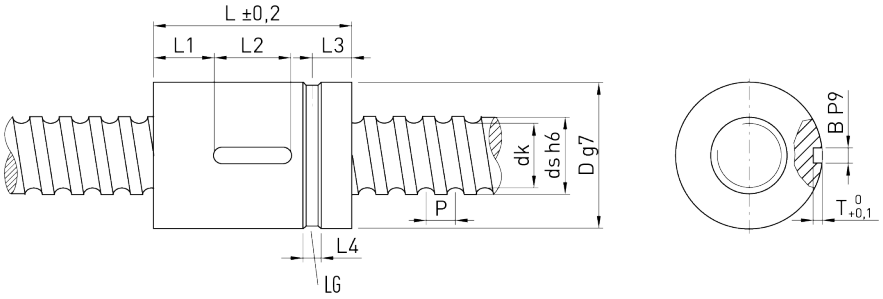


Table 10.5: Nut dimensions (wiper variants N and K or F and V)

Type	ds	P	D	D1	D2	D3	L	L1	L2	L3	L4 [1]	L5 [1]	Lubrication hole S	B	dk	Dyn. load rating C_{dyn} [N]	Stat. load rating C_0 [N]	Mass [kg/pc.]	N/K	F/V
R16-05K4-DDB-x	15	5	28	48	38	5.5	75	10	10	5	14	8	M6	40	12.5	10400	16400	0.3	x	x
R20-05K4-DDB-x	20	5	36	58	47	6.6	87	10	10	5	10.5	5	M6	44	17.3	13900	23300	0.5	x	x
R25-05K4-DDB-x	25	5	40	62	51	6.6	96	10	10	5	11.5	6	M6	48	22.3	15600	29800	0.68	x	x
R25-10K4-DDB-x	25	10	40	62	51	6.6	130	10	10	5	12	6	M6	48	22.3	14300	29700	0.7	x	x
R32-05K5-DDB-x	32	5	50	80	65	9.0	96	12	10	6	12.5	6	M6	62	29.3	20700	48700	1.2	x	x
R32-10K5-DDB-x	32	10	50	80	65	9.0	156	14	20	7	11	6	M6	62	28.7	30900	72800	1.3	x	x
R32-10K4-DDBH-x	32	10	56	86	71	9.0	144	14	20	7	12	6	M6	62	26.9	45800	87000	1.4	x	x
R32-20K2-DDB-x	32	20	56	86	71	9.0	134	14	20	7	11	6	M6	65	26.9	24800	43000	1.4	x	
R40-05K5-DDB-x	40	5	63	93	78	9.0	101	14	10	7	11	5	M8 x 1	70	37.3	22500	61700	1.7	x	x
R40-10K4-DDB-x	38	10	63	93	78	9.0	150	14	20	7	11	5	M8 x 1	70	32.9	50500	105800	1.9	x	x
R40-20K2-DDB-x	38	20	63	93	78	9.0	146	14	20	7	12	5	M8 x 1	70	32.9	27500	52400	2.0	x	
R50-05K5-DDB-x	50	5	75	110	93	11.0	103	16	10	8	12	6	M8 x 1	85	47.3	24900	77900	2.1	x	x
R50-10K4-DDB-x	50	10	75	110	93	11.0	153	16	20	8	12	6	M8 x 1	85	44.9	58200	143300	3.2	x	x
R50-20K3-DDB-x	50	20	75	110	93	11.0	189	16	20	8	12	6	M8 x 1	85	44.9	45100	106900	4.8	x	
R63-10K6-DDB-x	63	10	90	125	108	11.0	193	18	16	9	13	7	M8 x 1	95	57.9	90800	271500	6.8	x	x
R63-20T4-DDB-x	63	20	95	135	115	13.5	289	20	25	10	15	9	M8 x 1	100	55.5	105000	250000	8.0	x	
R80-10K6-DDB-x	80	10	105	145	125	13.5	195	20	25	10	14	6	M8 x 1	110	74.9	101800	355800	6.0	x	x
R80-20K4-DDB-x	80	20	125	165	145	13.5	259	25	25	12.5	17	9	M8 x 1	130	72.5	135000	349900	14.0	x	

[1] only for wiper variants K and V
All dimensions stated without a unit are in mm

Cylindrical single nut ZE



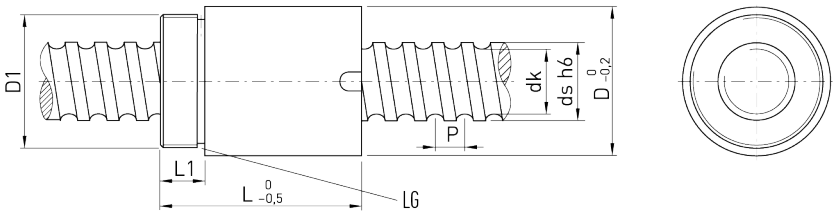
LG Groove for lubricant supply

Table 10.6: Nut dimensions

Article number	ds	P	D	L	L1	L2	L3	L4	T	B	dk	Dyn. load rating C_{dyn} [N]	Stat. load rating C_0 [N]	Max. axial play [mm]	Mass [kg/pc.]
R16-05T3-ZE-F	16	5	28	40	12.0	16	9	4	2.4	4	13.5	9600	12700	0.02	0.10
R20-05T4-ZE-F	20	5	36	51	15.0	20	10	4	2.4	4	17.5	13900	21800	0.02	0.23
R25-05T4-ZE-F	25	5	40	60	20.0	20	12	5	2.4	4	22.5	15600	27900	0.02	0.29
R25-10T3-ZE-F	25	10	48	65	22.0	20	15	5	2.4	4	21.0	24100	36200	0.02	0.50
R32-05T5-ZE-F	32	5	48	60	20.0	20	12	5	2.4	4	29.5	20700	43900	0.02	0.38
R32-10T4-ZE-F	32	10	56	80	27.0	25	15	5	2.4	4	27.8	40900	63200	0.02	0.74
R32-20T2-ZE-B	32	20	56	80	27.0	25	15	5	2.4	4	27.8	20300	26800	0.02	0.70
R40-05T5-ZE-F	40	5	56	68	24.0	20	15	6	2.4	4	37.5	22500	54600	0.02	0.44
R40-10T4-ZE-F	40	10	62	88	31.0	25	15	6	2.4	4	35.8	46800	82600	0.02	0.85
R40-20T2-ZE-B	40	20	62	88	31.0	25	15	6	2.4	4	35.8	23800	36400	0.03	0.88
R50-05T5-ZE-F	50	5	68	69	24.0	20	15	6	2.4	4	47.5	24900	69800	0.02	0.72
R50-10T4-ZE-F	50	10	72	100	37.0	25	17	6	2.4	4	45.8	52800	106800	0.02	1.04
R50-20T3-ZE-B	50	20	72	114	44.0	25	17	6	2.4	4	45.8	40000	76200	0.03	1.10
R63-10T6-ZE-F	63	10	85	120	44.0	32	17	6	3.5	6	58.8	84700	210800	0.04	1.73
R63-20T4-ZE-S	63	20	95	135	52.0	32	17	6	3.5	6	55.4	105000	250000	0.04	3.80
R80-10T6-ZE-F	80	10	105	120	44.0	32	17	8	3.5	6	75.8	93400	269200	0.04	2.80
R80-20T4-ZE-S	80	20	125	150	52.0	45	17	8	3.5	6	72.4	135000	322000	0.05	7.80
R80-20T6-ZEH-S	78	20	130	182	68.5	45	19	8	4.0	8	68.2	200000	510000	0.05	11.05

All dimensions stated without a unit are in mm

Cylindrical single nut with screw-in thread SE



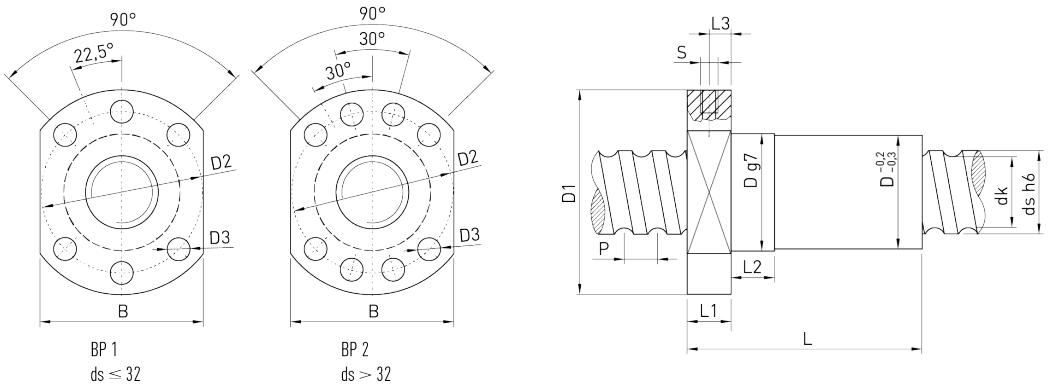
LG Groove for lubricant supply

Table 10.7: Nut dimensions

Article number	ds	P	D	D1	L	L1	dk	Dyn. load rating C_{dyn} [N]	Stat. load rating C_0 [N]	Max. axial play [mm]	Mass [kg/pc.]
R16-05T3-SE-F	16	5	36	M30 × 1.5	42	12	13.5	9600	12700	0.02	0.45
R20-05T4-SE-F	20	5	40	M35 × 1.5	52	12	17.5	13900	21800	0.02	0.53
R25-05T4-SE-F	25	5	45	M40 × 1.5	60	15	22.5	15600	27900	0.02	0.82
R25-10T3-SE-F	25	10	48	M45 × 1.5	70	15	21.0	24100	36200	0.02	1.00
R32-05T5-SE-F	32	5	52	M48 × 1.5	60	15	29.5	20700	43900	0.02	1.13
R32-10T3-SE-F	32	10	56	M52 × 1.5	80	15	27.8	34100	56100	0.02	1.62
R32-20T2-SE-B	32	20	56	M52 × 1.5	80	15	27.8	20300	26800	0.02	1.44
R40-05T5-SE-B	40	5	65	M60 × 1.5	68	18	37.5	22500	54600	0.02	1.63
R40-10T4-SE-F	40	10	65	M60 × 1.5	88	18	35.8	46800	82600	0.02	1.75
R40-20T2-SE-B	40	20	65	M60 × 1.5	88	18	35.8	23800	36400	0.03	1.75
R50-10T4-SE-F	50	10	80	M75 × 1.5	100	20	45.8	52800	106800	0.02	2.96
R50-20T3-SE-B	50	20	80	M75 × 1.5	114	20	45.8	40000	76200	0.03	3.15
R63-10T6-SE-F	63	10	95	M85 × 2.0	120	20	58.8	84700	210800	0.04	4.37
R63-20T3-SE-S	63	20	95	M85 × 2.0	138	20	55.4	96000	189000	0.04	4.40

All dimensions stated without a unit are in mm

Safety nut SEM



BP Hole pattern

Table 10.8: Safety nut dimensions

Article number	ds	P	D	D1	D2	D3	L	L1	L2	L3	S	B	dk	Dyn. load rating C_{dyn} [N]	Stat. load rating .. C_0 [N]	Max. axial play [mm]	Mass [kg/pc.]
R32-10T4-SEM-F	32	10	56	86	70	9.0	130	15	16	7.5	M6	66	27.8	40900	63200	0.02	1.55
R40-10T4-SEM-F	40	10	63	93	78	9.0	130	15	16	7.5	M8 × 1	70	35.8	46800	82500	0.02	1.69
R40-20T2-SEM-B	40	20	63	93	78	9.0	140	15	16	7.5	M8 × 1	70	35.8	23800	36400	0.03	1.82
R50-10T5-SEM-F	50	10	75	110	93	11.0	145	16	16	8.0	M8 × 1	85	45.8	63900	133300	0.02	2.40
R63-20T4-SEM-S	63	20	95	135	115	13.5	205	20	25	10.0	M8 × 1	100	55.4	105000	250000	0.04	5.90
R80-20T5-SEM-S	80	20	125	165	145	13.5	230	25	25	12.5	M8 × 1	130	72.4	161500	398000	0.05	12.10

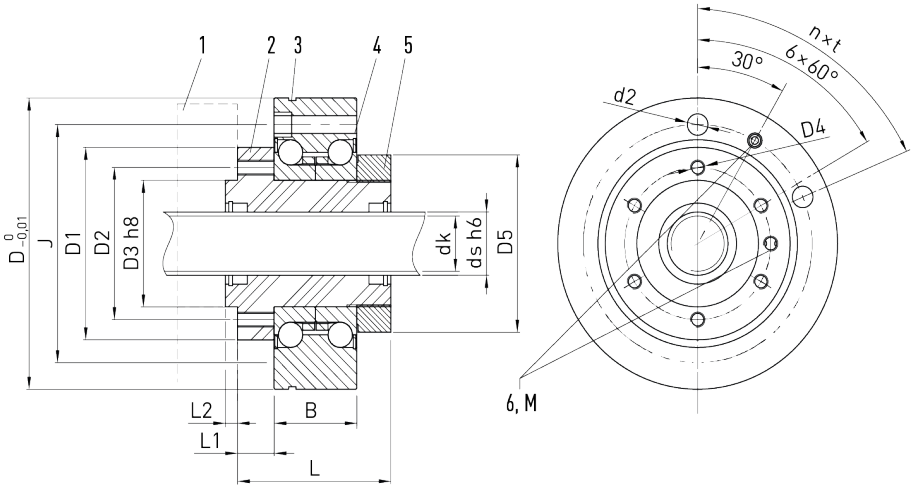
All dimensions stated without a unit are in mm

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.

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 speed of the long feed shaft required for this speed cannot be reached due to its considerably lower critical bending speed. The ballscrew nut is, therefore, driven instead of the ballscrew shaft. High axial and radial loading capacity as well as high resistance to tilting are required of the bearing.

Design solution
The threaded nut is mounted in an axial angular contact ball bearing ZKLF...2Z. The less stringent PE version is preferred. The bearing has a defined preload using a precision lock nut from the HIR series. The bearing achieves a high resistance to tilting thanks to the O arrangement of the two rows of balls. Any axial and radial loads are absorbed without any problems. The thick-walled, dimensionally stable bearing outer race is screwed directly onto the bearing block.
An additional bearing bushing and bearing cover are not required. A circulating oil lubrication system supplies the bearing with lubricant. The ballscrew nut is lubricated via a radial hole in the shaft. The less stringent axial angular contact ball bearing can only be lubricated axially.
We are happy to develop the right unit for any application, taking due account of the various installation conditions. A wide range of implemented applications provides the ideal basis for finding a solution to your problem.



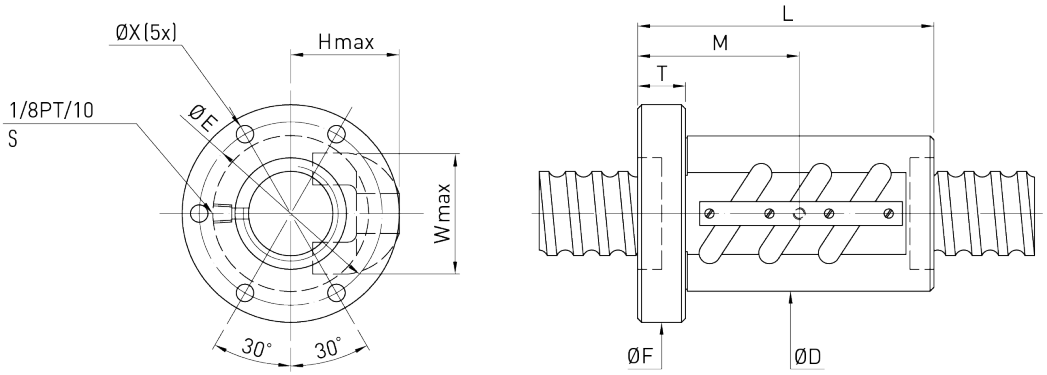
1	Toothed belt pulley	4	ZKLF Bearing
2	Nut	5	Lock nut
3	Extraction slot	6	Lubrication hole M

Table 10.9: Nut dimensions

Article number	Shaft dimensions			Nut dimesions									Bearing dimensions					Dyn. load rating C_{dyn} [N]	Stat. load rating C_0 [N]	$n_{max.}$ [rpm]
	ds	P	dk	D1	D2	D3	D4	D5	L	L1	L2	M	D	J	n × t	d2	B			
R16-05T3-AME	16	5	13.5	50	40	30	M6	47	50	10	3	M6	80	63	6 × (60°)	6.5	28	9600	12700	4000
R20-05T4-AME	20	5	17.5	63	52	40	M6	60	60	12	5	M6	100	80	4 × (90°)	8.5	34	13900	21800	3300
R25-05T4-AME	25	5	22.5	76	60	50	M6	72	63	15	5	M6	115	94	6 × (60°)	8.5	34	15600	27900	3000
R25-10T3-AME	25	10	21.0	76	60	50	M6	72	74	15	5	M6	115	94	6 × (60°)	8.5	34	24100	36200	3000
R32-05T5-AME	32	5	29.5	76	62	50	M8	72	70	15	5	M6	115	94	6 × (60°)	8.5	34	20700	43900	3000
R32-10T4-AME	32	10	27.8	76	62	50	M8	72	105	15	5	M6	115	94	6 × (60°)	8.5	34	40900	63200	3000
R32-20T2-AME	32	20	27.8	76	62	50	M8	72	100	15	5	M6	115	94	6 × (60°)	8.5	34	20300	26800	3000
R40-05T5-AME	40	5	37.5	90	70	60	M8	82	76	15	5	M6	145	120	8 × (45°)	8.5	45	22500	54600	2400
R40-10T3-AME	40	10	35.8	90	70	60	M8	82	85	15	5	M6	145	120	8 × (45°)	8.5	45	37100	61900	2400
R40-20T2-AME	40	20	35.8	90	70	60	M8	82	105	15	5	M6	145	120	8 × (45°)	8.5	45	23800	36400	2400
R50-05T5-AME	50	5	47.5	100	84	70	M10	94	78	15	5	M6	155	130	8 × (45°)	8.5	45	24900	69800	2200
R50-10T4-AME	50	10	45.8	100	84	70	M10	94	95	15	5	M6	155	130	8 × (45°)	8.5	45	52800	106800	2200
R50-20T3-AME	50	20	45.8	100	84	70	M10	94	120	15	5	M6	155	130	8 × (45°)	8.5	45	40000	76200	2200
R63-10T6-AME	63	10	58.8	130	110	90	M10	122	120	20	7	M8	190	165	8 × (45°)	10.5	55	84700	210800	1800

All dimensions stated without a unit are in mm

10.2.4 Ballscrew for heavy load operation



S Lubrication hole

Table 10.10: Safety nut dimensions

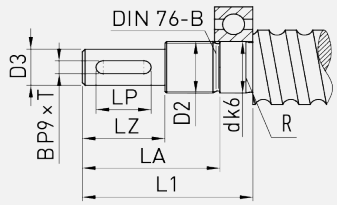
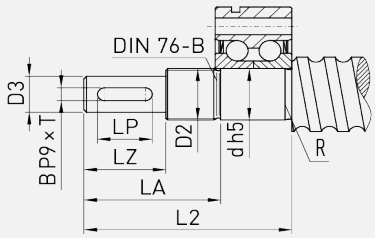
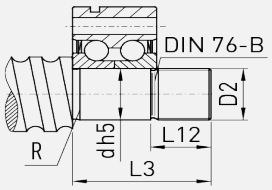
Type	Nominal Ø	Lead	Recirculations	Dynamic load rating C_{dyn} [kN]	Static load rating C_0 [kN]	D	L	F	T	E	X	H	W
R45-10B3-FSV	45	10	2.5 × 3	145	488	70	143	104	18	87	9	47.0	57
R50-12B3-FSV	50	12	2.5 × 3	175	602	77	171	111	22	94	9	52.0	62
R50-16B3-FSV	50	16	2.5 × 3	330	971	95	223	129	28	112	9	68.0	66
R55-16B3-FSV	55	16	2.5 × 3	343	1054	99	223	133	28	116	9	70.0	70
R63-16B3-FSV	63	16	2.5 × 3	368	1217	105	223	139	28	122	9	72.5	82
R80-16B3-FSV	80	16	2.5 × 3	409	1543	120	227	154	32	137	9	80.0	98
R80-25B3-FSV	80	25	2.5 × 3	714	2366	145	338	185	40	165	11	102.0	100
R100-16B3-FSV	100	16	2.5 × 3	453	1949	145	227	185	32	165	11	91.0	117
R100-25B3-FSV	100	25	2.5 × 3	788	2920	159	338	199	40	179	11	108.5	118
R120-25B3-FSV	120	25	2.5 × 3	850	3473	173	338	213	40	193	11	116.0	135

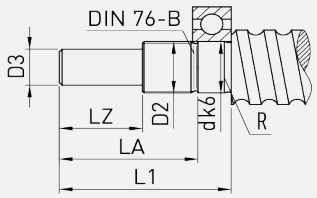
All dimensions stated without a unit are in mm

10.2.5 Shaft ends and accessories

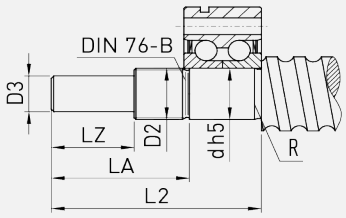
10.2.5.1 Shaft ends and bearing configuration

Table 10.11: Overview of standard shaft ends for SFA, SLA bearing series

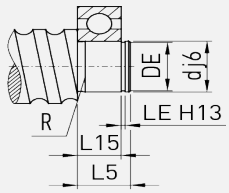
		
Supported bearing type S1 Bearing: Deep groove ball bearing 60.. or 62.. For SLA bearing unit	**Fixed bearing type S2** Bearing: ZKLF.. or ZKLN.. For SFA bearing unit	**Fixed bearing type S3** Bearing: ZKLF.. or ZKLN.. For SFA bearing unit



Supported bearing type S11
Bearing: Deep groove ball bearing 60.. or 62..
For SLA bearing unit



Fixed bearing type S21
Bearing: ZKLF.. or ZKLN..
For SFA bearing unit



Supported bearing type S5
Bearing: Deep groove ball bearing 62..
For SLA bearing unit

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

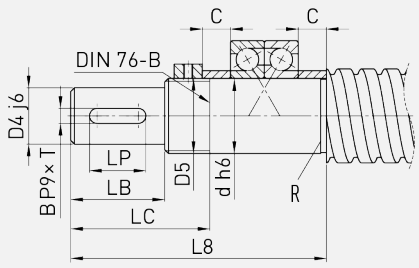
If using bearings other than the specified bearing units, it must be checked whether the size of the bearing installation surface is sufficient.

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

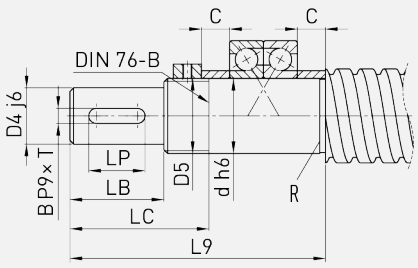
Shaft end type	Ballscrew nominal Ø	d	D2	D3	L1	L2	L3	L5	L12	L15	DE	LE	LA	LP	LZ	B × T	Recess R
S_-06	12	6	M6 × 0.5	5 j6	31	37	–	8	–	6	5.7 h10	0.80	26	–	16	–	10002475
S_-10	15, 16	10	M10 × 0.75	8 j6	39	50	30	12	12	9	9.6 h10	1.10	32	14	20	2 × 1.2	10002475
S_-12	20	12	M12 × 1	10 j6	43	58	35	13	12	10	11.5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

Unit: mm

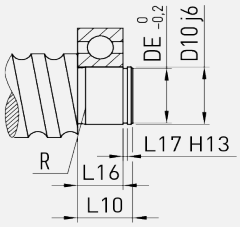
Table 10.13: Overview of standard shaft ends for EK, BK, FK, EF, BF, FF bearing series



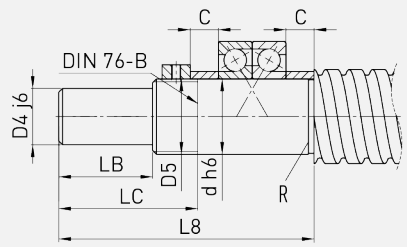
Fixed bearing type E8
Bearing: 70..
For EK, FK bearing units



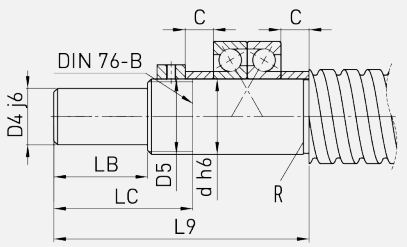
Fixed bearing type E9
Bearing: 72..
For BK bearing unit



Supported bearing type E10
Bearing: Deep groove ball bearing 60.. or 62..
For EF, BF, FF bearing units



Fixed bearing type E81
Bearing: 70..
For EK, FK bearing units



Fixed bearing type E91
Bearing: 72..
For BK bearing unit

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

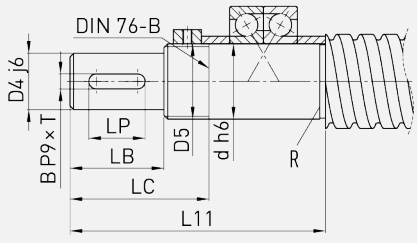
If using bearings other than the specified bearing units, it must be checked whether the size of the bearing installation surface is sufficient.

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

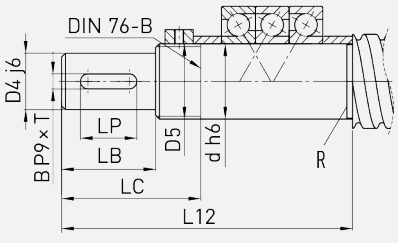
Shaft end type	Ballscrew nominal Ø	d	D4	D5	D10	L8	L9	L10	L16	L17	DE	LB	LC	LP	B × T	C	Recess R
E_-08	12	8	6	M8 × 1	6	41	–	9	6	0.80	5.8	9	19	–	–	5.5	10002475
E_-10	15, 16	10	8	M10 × 1	8	56	–	10	7	0.90	7.7	20	31	14	2 × 1.2	5.5	10002475
E_-12	16 [1]	12	10	M12 × 1	10	59	–	11	8	1.15	9.6	23	34	16	3 × 1.8	5.5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

Unit: mm
[1] Depending on actual shaft outer diameter $d_{s\,min}$ = 15.5
[2] Tolerance k6
[3] for BK 25

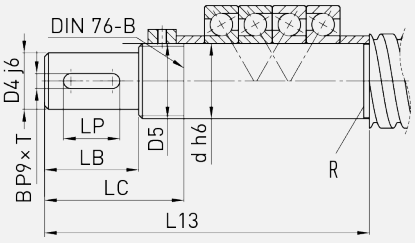
Table 10.15: Overview of shaft ends for WBK bearing series



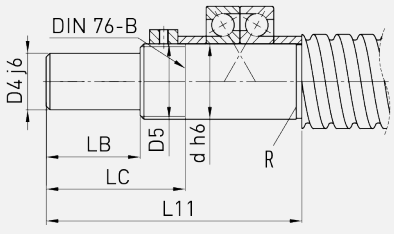
Fixed bearing type W1
Bearing: BSB..
For WBK_DF bearing unit



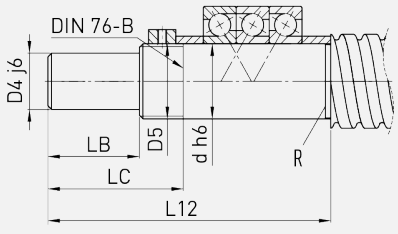
Fixed bearing type W2
Bearing: BSB..
For WBK_DFD bearing unit



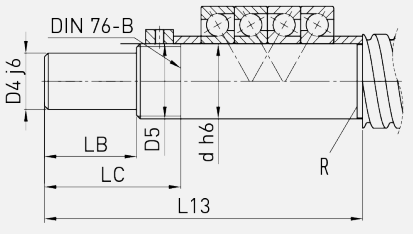
Fixed bearing type W3
Bearing: BSB..
For WBK_DFF bearing unit



Fixed bearing type W11
Bearing: BSB..
For WBK_DF bearing unit



Fixed bearing type W21
Bearing: BSB..
For WBK_DFD bearing unit



Fixed bearing type W31
Bearing: BSB..
For WBK_DFF bearing unit

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

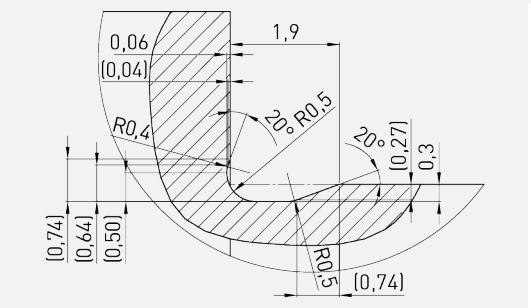
If using bearings other than the specified bearing units, it must be checked whether the size of the bearing installation surface is sufficient.

Table 10.16: Dimensions of standard shaft ends for WBK bearing series

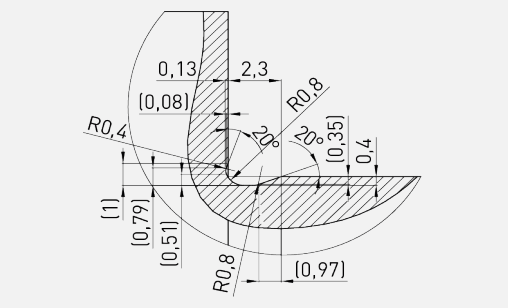
Shaft end type	Ballscrew nominal Ø	d	D4	D5	L11	L12	L13	LB	LC	LP	B × T	Recess R
W_-15	20	15	12	M15 × 1	104	–	–	23	46	16	4 × 2.5	10002475
W_-17	25	17	14	M17 × 1	111	–	–	30	53	20	5 × 3.0	10002475
W_-20	25	20	17	M20 × 1	111	–	–	30	53	20	5 × 3.0	10002476
W_-25	32	25	20	M25 × 1.5	139	154	–	50	76	36	6 × 3.5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

Unit: mm
[1)] Tolerance k6

10.2.5.2 HIWIN recesses



HIWIN recess 10002475



HIWIN recess 10002476

10.2.5.3 Bearing types and associated end machining

Table 10.17: 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 10.18: 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	Flanged housing	End machining	Pillow block	End machining	Flanged housing	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 10.19: Overview of bearing type and associated end machining for WBK bearing unit

Ballscrew nominal Ø	Flanged housing	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 unit

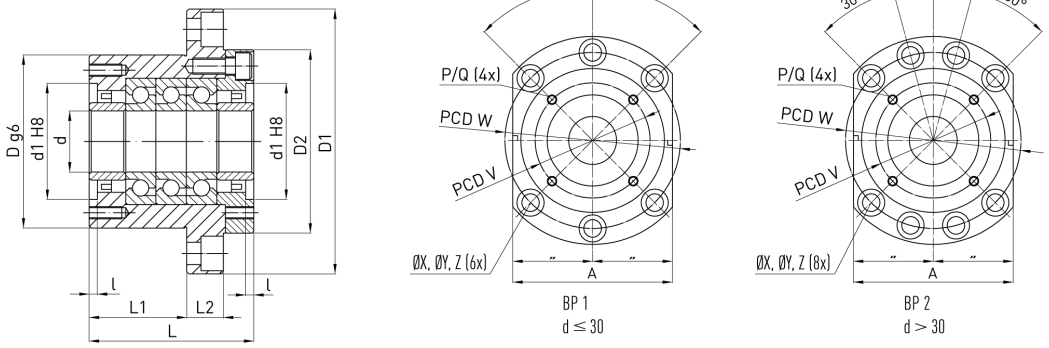
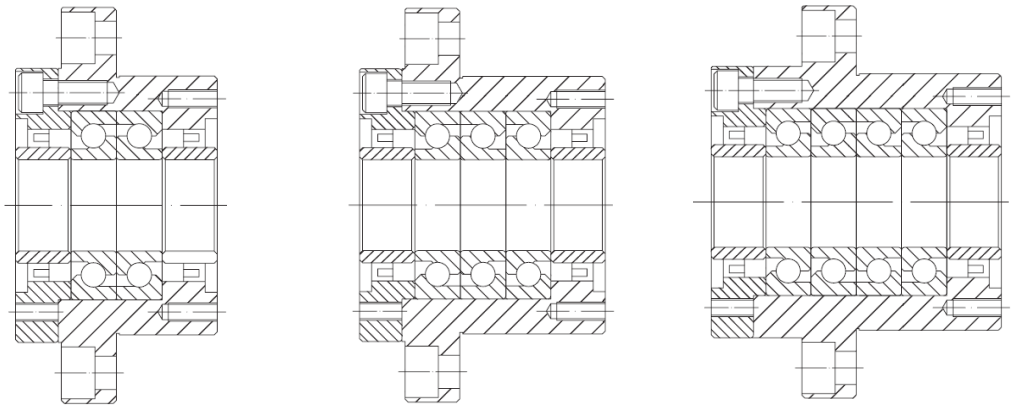


Table 10.20: Bearing unit dimensions

Article no.	Shaft nominal Ø	d	D	D1	D2	L	L1	L2	A	W	Hole X	Counter bore Y	Counter bore depth Z	d1	l	V	P	Hole depth 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

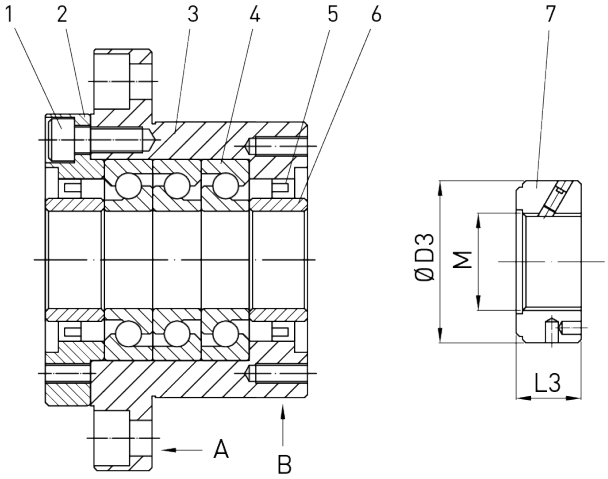
Unit: mm

Bearing arrangements



DF type DFD type DFF type

Bearing design



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

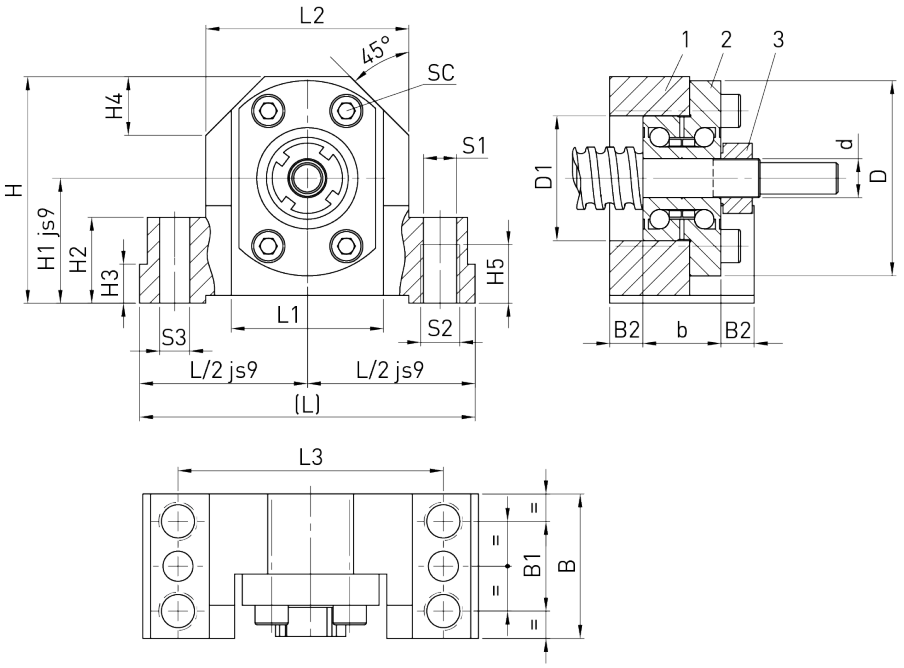
Table 10.21: Technical data of the bearing

Article no.	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	1000	0.29	M25 × 1.5	38	18	188	3.1
WBK25DFD	46.5	81.5	4.30	1470	0.39	M25 × 1.5	38	18	188	3.4
WBK30DF	29.2	43.0	3.35	1030	0.30	M30 × 1.5	45	18	260	3.0
WBK30DFD	47.5	86.0	4.50	1520	0.40	M30 × 1.5	45	18	260	3.3
WBK35DF	31.0	50.0	3.80	1180	0.34	M35 × 1.5	52	18	340	3.4
WBK35DFD	50.5	100.0	5.20	1710	0.45	M35 × 1.5	52	18	340	4.3
WBK35DFF	50.5	100.0	7.65	2350	0.59	M35 × 1.5	52	18	340	5.0
WBK40DF	31.5	52.0	3.90	1230	0.36	M40 × 1.5	58	20	500	3.6
WBK40DFD	51.5	104.0	5.30	1810	0.47	M40 × 1.5	58	20	500	4.2
WBK40DFF	51.5	104.0	7.85	2400	0.61	M40 × 1.5	58	20	500	4.7

Unit: mm

10.2.5.5 Fixed bearing SFA

SFA06, SFA10



1	Steel pillow block
2	Bearings
3	Lock nut

Table 10.22: Bearing unit dimensions

Article no.	Shaft nominal Ø	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 10.23: Bearing unit dimensions

Article no.	Shaft nominal Ø	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

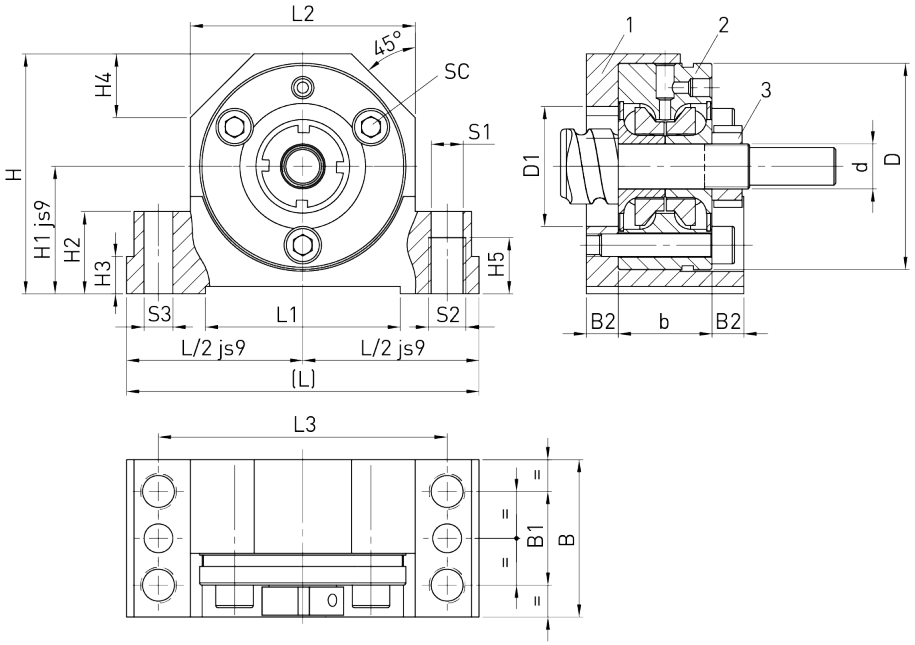
Unit: mm

Table 10.24: Technical data of the bearing

Article no.	Bearing type	C_0 axial [N]	C_{dyn} axial [N]	Permissible speed [rpm]	Lock nut			
					Type	Nut tightening torque [Nm]	Screw size	Screw tightening torque [Nm]
SFA06	ZKLFA0630.2Z	6,100	4900	14000	HIR 06	2	M4	1
SFA10	ZKLFA1050.2RS	8,500	6900	6800	HIR 10	6	M4	1

Unit: mm

SFA12 – SFA40



1	Steel pillow block
2	Bearings
3	Lock nut

Table 10.25: Bearing unit dimensions

Article no.	Shaft nominal Ø	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 10.26: Bearing unit dimensions

Article no.	Shaft nominal Ø	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

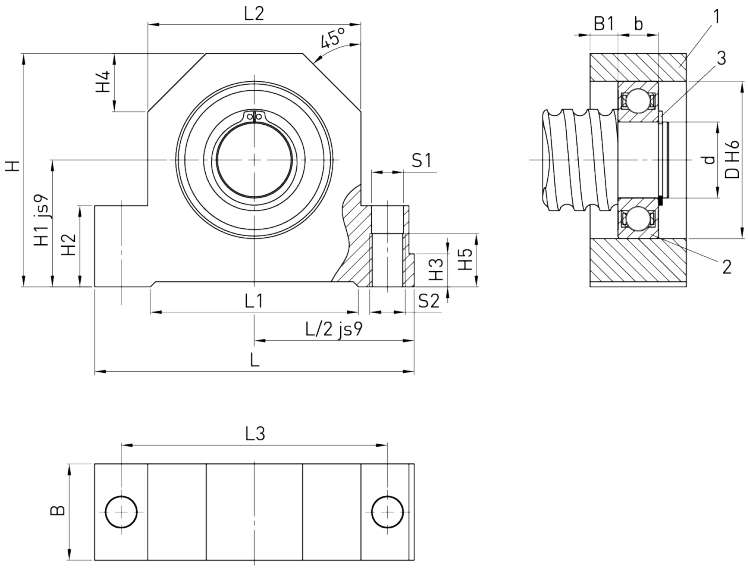
Unit: mm

Table 10.27: Technical data of the bearing

Article no.	Bearing type	C_0 axial [N]	C_{dyn} axial [N]	Permissible speed [rpm]	Lock nut			
					Type	Nut tightening torque [Nm]	Screw size	Screw tightening torque [Nm]
SFA12	ZKLF1255.2RS-PE	24700	18600	3800	HIR 12	8	M4	1
SFA17	ZKLF1762.2RS-PE	31000	20700	3300	HIR 17	15	M5	3
SFA20	ZKLF2068.2RS-PE	47000	28500	3000	HIR 20 × 1	18	M5	3
SFA30	ZKLF3080.2RS-PE	64000	32000	2200	HIR 30	32	M6	5
SFA40	ZKLF40100.2RS-PE	101000	47500	1800	HIR 40	55	M6	5

Unit: mm

10.2.5.6 SLA bearing series



1	Steel pillow block
2	Bearings
3	Circlip

Table 10.28: Bearing unit dimensions

Article no.	Shaft nominal Ø	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

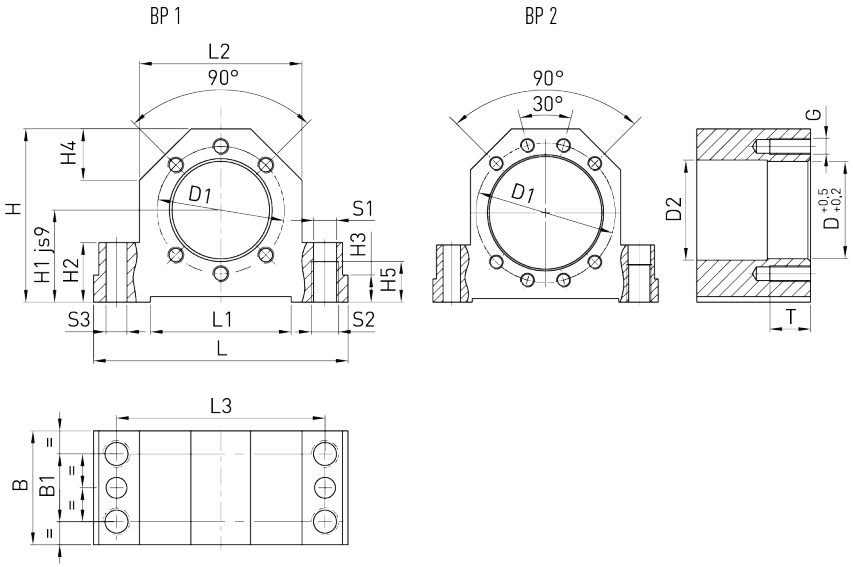
Unit: mm

Table 10.29: Bearing unit dimensions

Article no.	Shaft nominal Ø	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

10.2.5.7 Housing for flange nuts (DIN 69051 Part 5)



BP Hole pattern

Table 10.30: Bearing unit dimensions

Article no.	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

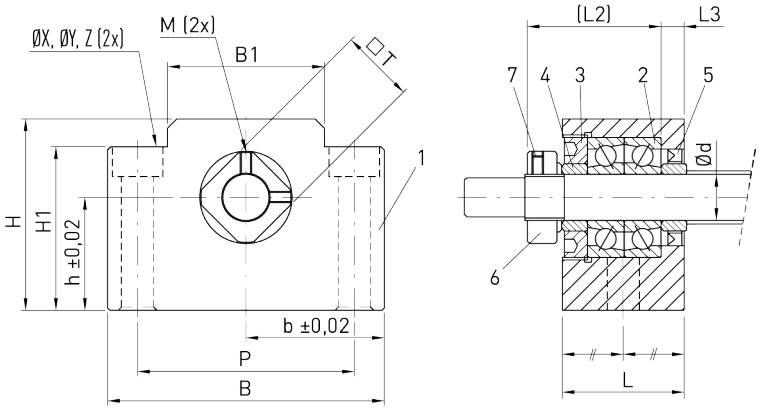
Table 10.31: Bearing unit dimensions

Article no.	Shaft nominal Ø	D	D1	B	B1	S1	S2	S3	Hole pattern BP	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	5	Seal
2	Bearings	6	Clamping nut
3	Retaining cover	7	Allen set screw
4	Support ring		

Table 10.32: Bearing unit dimensions

Article no.	Shaft nominal Ø	d	L	L2	L3	B	H	b	H	B1	H1	P	Hole X	Counter bore Y	Counter bore depth Z	M	T
EK08	12	8	23	26	4	52	32	26	17	25	26	38	6.6	11	12	M3	14

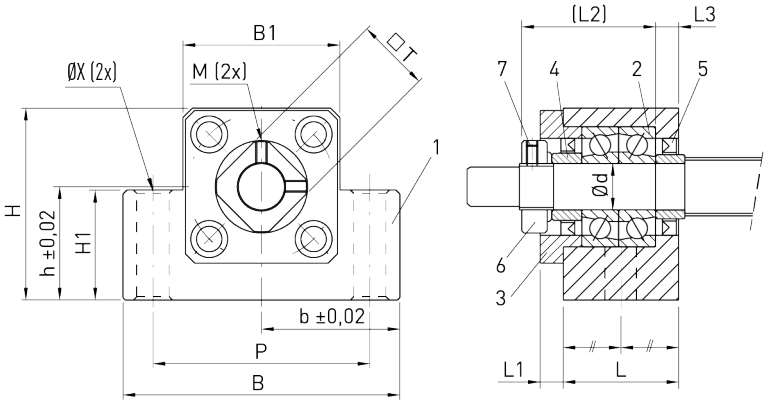
Unit: mm

Table 10.33: Technical data of the bearing

Article no.	Bearing type	C_0 axial [N]	C_{dyn} axial [N]	Max. permissible axial load [N]	Lock nut			
					Type	Nut tightening torque [Nm]	Screw size	Screw tightening torque [Nm]
EK08	708	4800	2800	1100	RN8	2.5	M3	0.6

Unit: mm

EK10 – EK20



1	Housing	5	Seal
2	Bearings	6	Clamping nut
3	Retaining cover	7	Allen set screw
4	Support ring		

Table 10.34: Bearing unit dimensions

Article no.	Shaft nominal Ø	d	L	L1	L2	L3	B	H	b	H	B1	H1	P	Hole 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

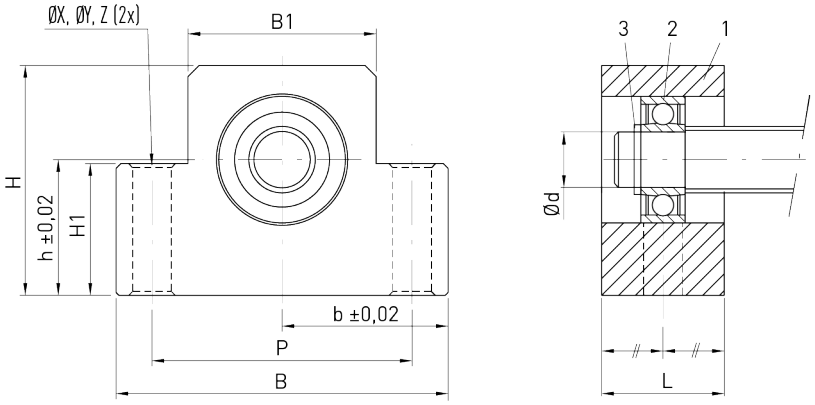
[1)] Depending on actual shaft outer diameter $d_{s\,min}$ = 15.5

Table 10.35: Technical data of the bearing

Article no.	Bearing type	C_0 axial [N]	C_{dyn} axial [N]	Max. permissible axial load [N]	Lock nut			
					Type	Nut tightening torque [Nm]	Screw size	Screw tightening torque [Nm]
EK10	7000A P0	8800	5200	2000	RN10	2.9	M3	0.6
EK12	7001A P0	9400	6000	2200	RN12	6.4	M4	1.5
EK15	7002A P0	10000	6900	2400	RN15	7.9	M4	1.5
EK20	7204B P0	21600	15200	6800	RN20	16.7	M4	1.5

Unit: mm

10.2.5.9 Supported bearing EF



1	Housing
2	Bearings
3	Circlip

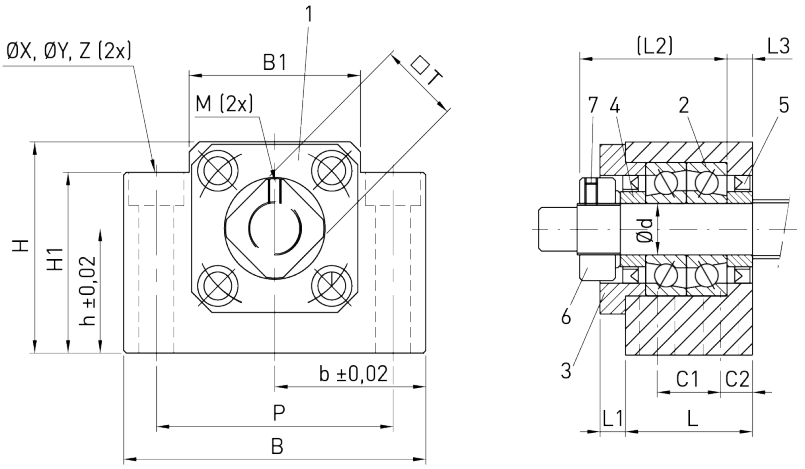
Table 10.36: Bearing unit dimensions

Article no.	Shaft nominal Ø	d	L	B	H	b	H	B1	H1	P	Hole X	Counter bore Y	Counter bore depth Z	Bearings	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

10.2.5.10 Fixed bearing BK



1	Housing	5	Seal
2	Bearings	6	Clamping nut
3	Retaining cover	7	Allen set screw
4	Support ring		

Table 10.37: Bearing unit dimensions

Article no.	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 10.38: Bearing unit dimensions

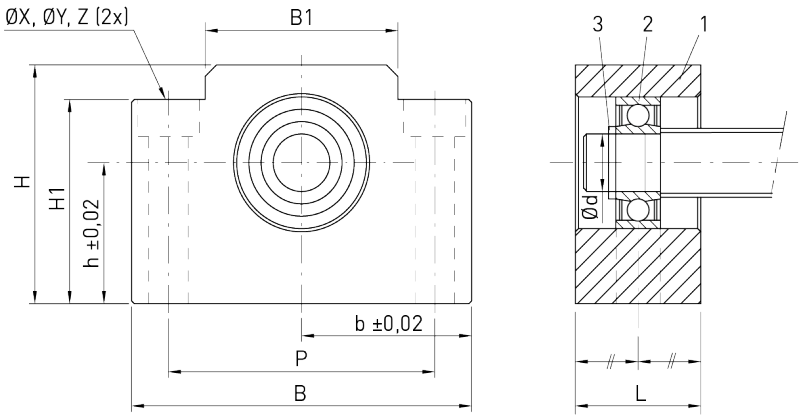
Article no.	Shaft nominal Ø	B1	H1	P	C1	C2	Hole X	Counter bore Y	Counter bore depth Z	M	T
BK25	32	64	70	85	22	10	11	17	11.0	M6	35
BK30	40	76	78	102	23	11	14	20	13.0	M6	40
BK40	50	100	90	130	33	14	18	26	17.5	M6	50

Unit: mm

Table 10.39: Technical data of the bearing

Article no.	Bearing type	C_0 axial [N]	C_{dyn} axial [N]	Max. permissible axial load [N]	Lock nut			
					Type	Nut tightening torque [Nm]	Screw size	Screw tightening torque [Nm]
BK25	7205A P0	26300	20500	7000	RN25	21	M6	5
BK30	7206B P0	33500	27000	10600	RN30	31	M6	5
BK40	7208B P0	52000	46100	18000	RN40	71	M6	5

10.2.5.11 Supported bearing BF



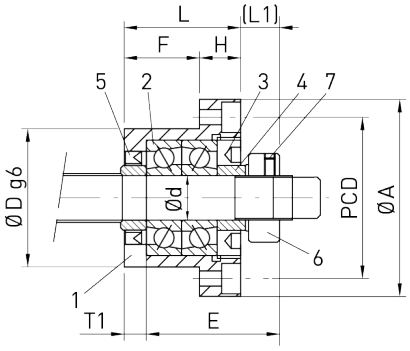
1	Housing
2	Bearings
3	Circlip

Table 10.40: Bearing unit dimensions

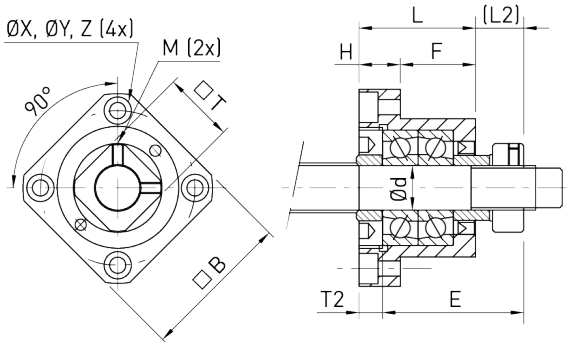
Article no.	Shaft nominal Ø	d	L	B	H	b	H	B1	H1	P	Hole X	Counter bore Y	Counter bore depth Z	Bearings	Circlip
BF25	32	25	30	106	80	53	48	64	70	85	11	17	11.0	6205ZZ	S 25
BF30	40	30	32	128	89	64	51	76	78	102	14	20	13.0	6206ZZ	S 30
BF40	50	40	37	160	110	80	60	100	90	130	18	26	17.5	6208ZZ	S 40

Unit: mm

10.2.5.12 Fixed bearing FK



Assembly variant A



Assembly variant B

1	Housing	5	Seal
2	Bearings	6	Clamping nut
3	Retaining cover	7	Allen set screw
4	Support ring		

Table 10.41: Bearing unit dimensions

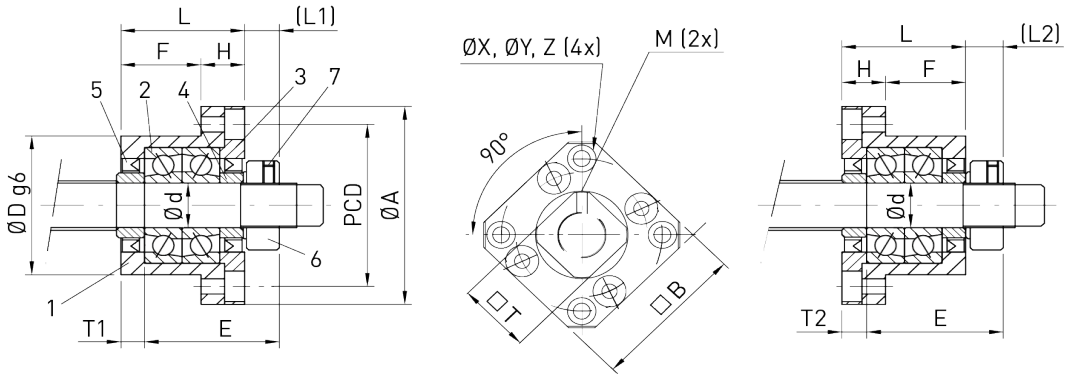
Article no.	Shaft nominal Ø	d	L	H	F	E	D	A	PCD in mm	B	Assembly variant A		Assembly variant B		Hole X	Counter bore Y	Counter bore depth Z	M	T
											L1	T1	L2	T2					
FK08	12	8	23	9	14	26	28	43	35	35	7	4	8	5	3.4	6.5	4	M3	14

Unit: mm

Table 10.42: Technical data of the bearing

Article no.	Bearing type	C_0 axial [N]	C_{dyn} axial [N]	Max. permissible axial load [N]	Lock nut			
					Type	Nut tightening torque [Nm]	Screw size	Screw tightening torque [Nm]
FK08	708	4800	2800	1000	RN8	2.5	M3	0.6

FK10 – FK3



Assembly variant A

Assembly variant B

1	Housing	5	Seal
2	Bearings	6	Clamping nut
3	Retaining cover	7	Allen set screw
4	Support ring		

Table 10.43: Bearing unit dimensions

Article no.	Shaft nominal Ø	d	L	H	F	E	D	A	PCD in mm	B	Assembly variant A		Assembly variant B		Hole X	Counter bore Y	Counter bore depth 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

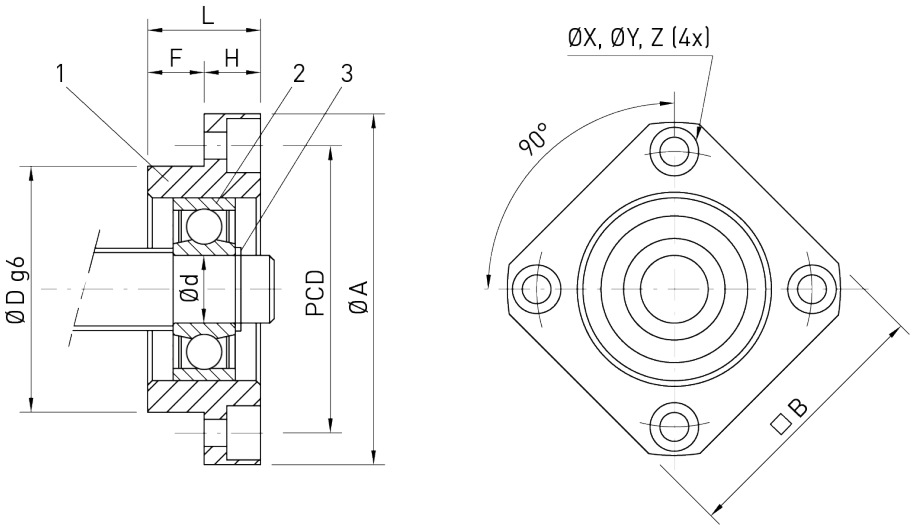
Unit: mm

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

Table 10.44: Technical data of the bearing

Article no.	Bearing type	C_0 axial [N]	C_{dyn} axial [N]	Max. permissible axial load [N]	Lock nut			
					Type	Nut tightening torque [Nm]	Screw size	Screw tightening torque [Nm]
FK10	7000A P0	8800	5200	1900	RN10	2.9	M3	0.6
FK12	7001A P0	9400	6000	2200	RN12	6.4	M4	1.5
FK15	7002A P0	10000	6900	2400	RN15	7.9	M4	1.5
FK20	7204B P0	21600	15300	6800	RN20	16.7	M4	1.5
FK25	7205B P0	24000	19000	8100	RN25	20.6	M6	4.9
FK30	7206B P0	33500	27000	10600	RN30	31.4	M6	4.9

10.2.5.13 Supported bearing FF



1	Housing
2	Bearings
3	Circlip

Table 10.45: Bearing unit dimensions

Article no.	Shaft nominal Ø	d	L	H	F	D	A	PCD in mm	B	Hole X	Counter bore Y	Counter bore depth Z	Bearings	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 assemblies and the 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 required in the surrounding construction.

ZKLF series

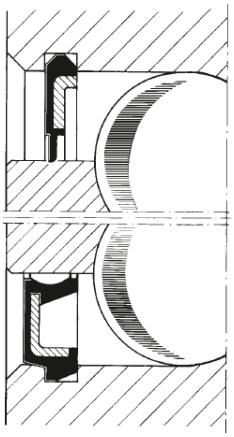
The difference between bearings of the ZKLF series and those of the ZKLN series are an outer race which can be unscrewed and a different lubrication hole arrangement. Directly screwing the outer race onto the adjacent construction means that the bearing cover usually needed to lock it in place is not required; adaptation work required in advance is also not required. 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 relubrication in special applications.

Less stringent PE version

In their standard version, the axial angular contact ball bearings ZKLN and ZKLF are designed for high-precision ballscrews. In many applications, such as handling, woodworking machines and mounting several ballscrews, this precision is not absolutely essential. A cheaper type 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 high loading capacity and rigidity at high speed limits, as well as easy assembly and low maintenance effort. Advantages of the less stringent type:

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

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



Contact sealing disc
Additional characters .2RS

Gap seal
Additional characters .2Z

Installation/Removal
When installing axial angular contact ball bearings, ensure that the assembly forces are not transmitted via the rolling elements.
The mounting bolts of the ZKLF bearings must 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 the bearings from the ZKLF series.

Tightening the lock nuts preloads the axial angular contact ball bearings. The lock nut tightening torques specified in the dimension tables must be observed.

After tightening the lock nut, tighten the two locking threaded pins with a hexagon socket. In doing so, tighten the locking threaded pins alternately.

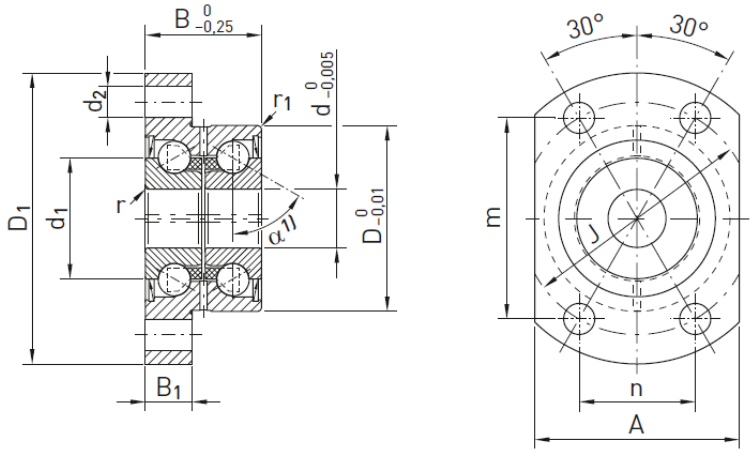
To counteract settling effects, it is recommended to initially tighten the lock nut to three times the specified tightening torque M_A. The lock nut should then be relieved again. Subsequently, they should be tightened again to the tightening torques M_A specified in the dimensions tables.

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

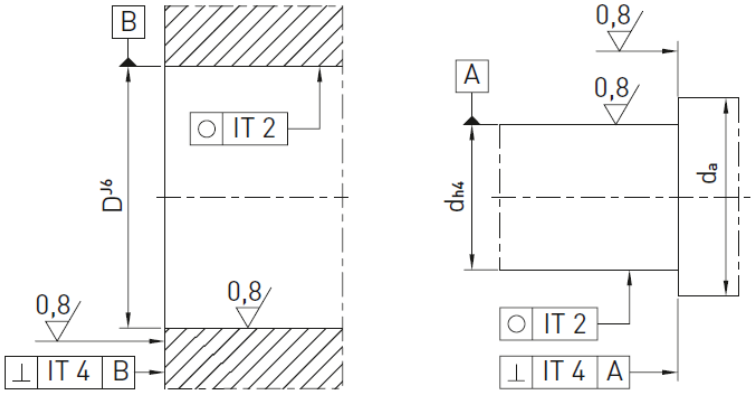
The dimensions of the inner races of the bearings are matched so that a defined preload, sufficient for most applications, is achieved when tightening the lock nut (tightening torque M_A according to the dimensions table).
Deviating tightening torques M_A can be selected for special applications. Please contact us in such cases.
If the bearing frictional torque M_{RL} can be checked, compare the values measured with those in the dimensions tables.

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

10.2.6.1 Axial angular contact ball bearing ZKLFA



Housing and shaft tolerances ZKLFA



Housing Shaft

Table 10.46: Dimensions and mating dimensions for angular contact ball bearing unit ZKLFA

Article no.	Shaft Ø [mm]	Weight [kg]	Dimensions [mm]													Mating dimensions [mm]	
			d	D	B	D_1	B_1	J	d_2	m	n	A	d_1	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	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	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	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	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	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	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	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	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	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	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	0.3	0.6	34	20

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

[1)] Contact angle α = 60°

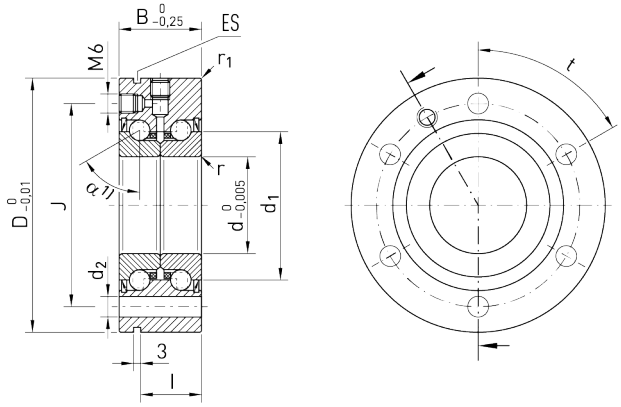
Table 10.47: Technical data of angular contact ball bearing unit ZKLFA

Article no.	Shaft Ø [mm]	Mounting bolts DIN912 10.9 [1]		Axial load rating		Permissible speed	Bearing friction torque	Axial rigidity	Resistance to tilting	Recommended lock nut [1]	Tightening torque [1]
		Thread	Number n × t	C_{dyn} [N]	C_0 [N]	Grease [1/min]	M_{RL} [Nm]	c_{aL} [N/µm]	c_{kL} [Nm/mrad]	Article no.	M_A [Nm]
ZKLFA0630.2Z	6	M3	4	4900	6100	14000	0.01	150	4	HIR06	2
ZKLFA0640.2RS	6	M4	4	6900	8500	6800	0.04	200	8	HIR06	2
ZKLFA0640.2Z	6	M4	4	6900	8500	12000	0.02	200	8	HIR06	2
ZKLFA0850.2RS	8	M5	4	12500	16300	5100	0.08	250	20	HIR08	4
ZKLFA0850.2Z	8	M5	4	12500	16300	9500	0.04	250	20	HIR08	4
ZKLFA1050.2RS	10	M5	4	13400	18800	4600	0.12	325	25	HIR10	6
ZKLFA1050.2Z	10	M5	4	13400	18800	8600	0.06	325	25	HIR10	6
ZKLFA1263.2RS	12	M6	4	16900	24700	3800	0.16	375	50	HIR12	8
ZKLFA1263.2Z	12	M6	4	16900	24700	7600	0.08	375	50	HIR12	8
ZKLFA1563.2RS	15	M6	4	17900	28000	3500	0.20	400	65	HIR15	10
ZKLFA1563.2Z	15	M6	4	17900	28000	7000	0.10	400	65	HIR15	10

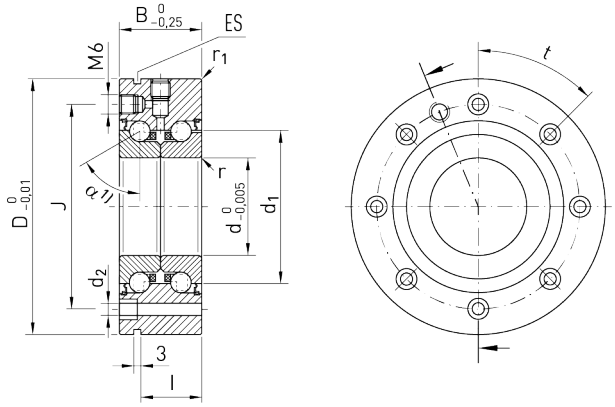
The ball cages are made from plastic, permissible operating temperature 120 °C (continuous operation)

[1] Tightening torque of the mounting bolts according to the manufacturer's specifications.
Screws to DIN 912 are not included in the scope of delivery.

10.2.6.2 Axial angular contact ball bearing ZKLF



ZKLF... (d ≤ 50)



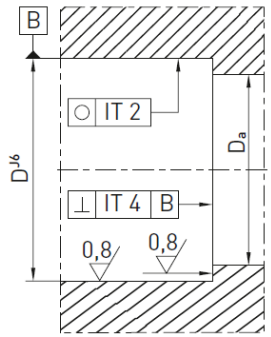
ZKLF...2Z (60 ≤ d ≤ 100)

ES Extraction slot

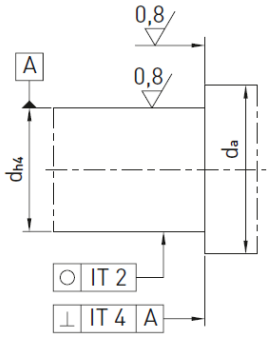
The ball cages are made from plastic, permissible operating temperature 120 °C (continuous operation)

[1] Contact angle ⊐ 60°

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



Housing



Shaft

Table 10.48: Dimensions and mating dimensions for angular contact ball bearing unit ZKLF

Article no.	Shaft Ø [mm]	Weight [kg]	Dimensions [mm]									Mating dimensions [mm]	
			d	D	B	J	d_2	l	d_1	r_{min}	$r_{1\ min}$	$D_{a\ max}$ [1)]	$d_{a\ min}$
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	0.6	0.6	80	56
ZKLF40115.2RS-XL	40	2.20	40	115	46	94	8.8	36	65.0	0.6	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

Article no.	Shaft Ø [mm]	Weight [kg]	Dimensions [mm]								Mating dimensions [mm]	
			d	D	B	J	d_2	l	d_1	r_{min}	$r_{1\ min}$	$D_{a\ max}$ [1]	$d_{a\ min}$
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 diameters of the installation surface

.2Z Gap seal

.2RS Contact seal

Table 10.49: Technical data of angular contact ball bearing unit ZKLF

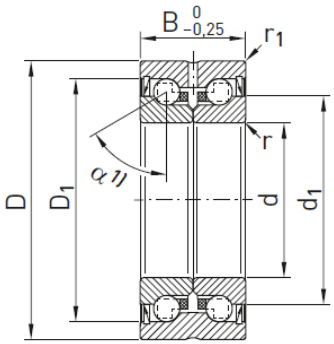
Article no.	Shaft Ø [mm]	Mounting bolts DIN912 10.9 [1]		Axial load rating		Permissible speed	Bearing friction torque	Axial rigidity	Resistance to tilting	Recommended lock nut [1]	Tightening torque [1]
		Thread	Number n × t	C_{dyn} [N]	C_0 [N]	Grease [1/min]	M_{RL} [Nm]	c_{aL} [N/µm]	c_{kL} [Nm/mrad]	Article no.	M_A [Nm]
ZKLF1255.2Z-XL	12	M6	3 × 120°	18600	24700	7600	0.08	375	50	HIR12	8
ZKLF1255.2RS-XL	12	M6	3 × 120°	18600	24700	3800	0.16	375	50	HIR12	8
ZKLF1560.2Z-XL	15	M6	3 × 120°	19600	28000	7000	0.10	400	65	HIR15	10
ZKLF1560.2RS-XL	15	M6	3 × 120°	19600	28000	3500	0.20	400	65	HIR15	10
ZKLF1762.2Z-XL	17	M6	3 × 120°	20700	31000	6600	0.12	450	80	HIR17/HIA17	15
ZKLF1762.2RS-XL	17	M6	3 × 120°	20700	31000	3300	0.24	450	80	HIR17/HIA17	15
ZKLF2068.2Z-XL	20	M6	4 × 90°	28500	47000	5400	0.15	650	140	HIR20/HIA20	18
ZKLF2068.2RS-XL	20	M6	4 × 90°	28500	47000	3000	0.30	650	140	HIR20/HIA20	18
ZKLF2575.2Z-XL	25	M6	4 × 90°	30500	55000	4700	0.20	750	200	HIR25/HIA25	25
ZKLF2575.2RS-XL	25	M6	4 × 90°	30500	55000	2600	0.40	750	200	HIR25/HIA25	25
ZKLF3080.2Z-XL	30	M6	6 × 60°	32000	64000	4300	0.25	850	300	HIR30/HIA30	32
ZKLF3080.2RS-XL	30	M6	6 × 60°	32000	64000	2200	0.50	850	300	HIR30/HIA30	32
ZKLF30100.2Z-XL	30	M8	8 × 45°	65000	108000	4000	0.40	950	400	HIA30	65
ZKLF30100.2RS-XL	30	M8	8 × 45°	65000	108000	2100	0.80	950	400	HIA30	65
ZKLF3590.2Z-XL	35	M8	4 × 90°	45000	89000	3800	0.30	900	400	HIR35/HIA35	40
ZKLF3590.2RS-XL	35	M8	4 × 90°	45000	89000	2000	0.60	900	400	HIR35/HIA35	40
ZKLF40100.2Z-XL	40	M8	4 × 90°	47500	101000	3300	0.35	1000	550	HIR40/HIA40	55
ZKLF40100.2RS-XL	40	M8	4 × 90°	47500	101000	1800	0.70	1000	550	HIR40/HIA40	55
ZKLF40115.2Z-XL	40	M8	12 × 30°	79000	149000	3100	0.65	1200	750	HIA40	110
ZKLF40115.2RS-XL	40	M8	12 × 30°	79000	149000	1600	1.30	1200	750	HIA40	110
ZKLF50115.2Z-XL	50	M8	6 × 60°	51000	126000	3000	0.45	1250	1000	HIR50/HIA50	85
ZKLF50115.2RS-XL	50	M8	6 × 60°	51000	126000	1500	0.90	1250	1000	HIR50/HIA50	85
ZKLF50140.2Z-XL	50	M10	12 × 30°	125000	250000	2500	1.30	1400	1500	HIA50	150
ZKLF50140.2RS-XL	50	M10	12 × 30°	125000	250000	1200	2.60	1400	1500	HIA50	150

Article no.	Shaft Ø [mm]	Mounting bolts DIN912 10.9 [1]		Axial load rating		Permissible speed	Bearing friction torque	Axial rigidity	Resistance to tilting	Recommended lock nut [1]	Tightening torque [1]
		Thread	Number n × t	C_{dyn} [N]	C_0 [N]	Grease [1/min]	M_{RL} [Nm]	c_{aL} [N/µm]	c_{kL} [Nm/mrad]	Article no.	M_A [Nm]
ZKLF60145.2Z-XL	60	M8	8 × 45°	93000	214000	3000	1.00	1300	1650	HIR60/HIA60	100
ZKLF70155.2Z-XL	70	M8	8 × 45°	97000	241000	2800	1.20	1450	2250	HIR70/HIA70	130
ZKLF80165.2Z-XL	80	M8	8 × 45°	100000	265000	2700	1.40	1600	3000	HIR80/HIA80	160
ZKLF90190.2Z-XL	90	M10	8 × 45°	149000	395000	2300	2.30	1700	4400	HIA90	200
ZKLF100200.2Z-XL	100	M10	8 × 45°	154000	435000	2150	2.60	1900	5800	HIA100	250

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

[1] Tightening torque of the mounting bolts according to the manufacturer's specifications.
Screws to DIN 912 are not included in the scope of delivery.

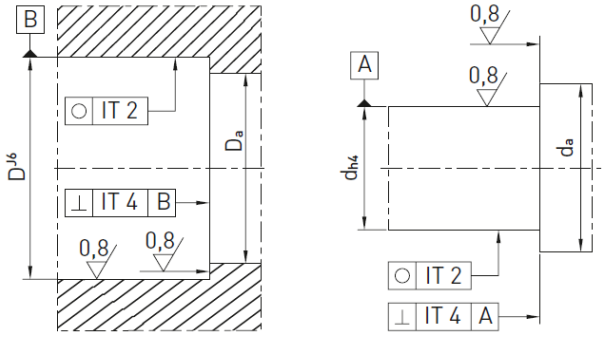
10.2.6.3 Axial angular contact ball bearing ZKLN



Acting on two sides

ZKLN...2RS, ZKLN...2Z series

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



Housing Shaft

Table 10.50: Dimensions and mating dimensions for angular contact ball bearing unit ZKLN

Article no.	Shaft Ø [mm]	Weight [kg]	Dimensions [mm]							Mating dimensions [mm]	
			d [2]	D [3]	B	r_{min}	$r_{1\,min}$	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 α = 60°
[2] Hole diameter tolerance 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 d = 6 – 50 mm: $d^{0}_{-0,01}$; d = 60 – 100 mm: $d^{0}_{-0,015}$
[4] Recommended diameters of the installation surface

.2Z = Gap seal
.2RS = Contact seal

Table 10.51: Technical data of angular contact ball bearing unit ZKLN

Article no.	Shaft Ø [mm]	Axial load rating		Permissible speed	Bearing friction torque	Axial rigidity	Resistance to tilting	Recommended lock nut [1]	Tightening torque [1]
		C_{dyn} [N]	C_0 [N]	Grease [1/min]	M_{RL} [Nm]	c_{aL} [N/µm]	c_{kL} [Nm/mrad]	Article no.	M_A [Nm]
ZKLN0619.2Z	6	5400	6100	14000	0.01	150	4	HIR6	1
ZKLN0624.2RS	6	7600	8500	6800	0.04	200	8	HIR6	2
ZKLN0624.2Z	6	7600	8500	12000	0.02	200	8	HIR6	2
ZKLN0832.2RS	8	13800	16300	5100	0.08	250	20	HIR8	4
ZKLN0832.2Z	8	13800	16300	9500	0.04	250	20	HIR8	4
ZKLN1034.2RS	10	14700	18800	4600	0.12	325	25	HIR10	6
ZKLN1034.2Z	10	14700	18800	8600	0.06	325	25	HIR10	6
ZKLN1242.2RS	12	18600	24700	3800	0.16	375	50	HIR12	8
ZKLN1242.2Z	12	18600	24700	7600	0.08	375	50	HIR12	8
ZKLN1545.2RS	15	19600	28000	3500	0.20	400	65	HIR15	10
ZKLN1545.2Z	15	19600	28000	7000	0.10	400	65	HIR15	10
ZKLN1747.2RS	17	20700	31000	3300	0.24	450	80	HIR17/HIA17	15
ZKLN1747.2Z	17	20700	31000	6600	0.12	450	80	HIR17/HIA17	15

Article no.	Shaft Ø [mm]	Axial load rating		Permissible speed	Bearing friction torque	Axial rigidity	Resistance to tilting	Recommended lock nut [1]	Tightening torque [1]
		C_{dyn} [N]	C_0 [N]	Grease [1/min]	M_{RL} [Nm]	c_{aL} [N/µm]	c_{kL} [Nm/mrad]	Article no.	M_A [Nm]
ZKLN2052.2RS	20	28500	47000	3000	0.30	650	140	HIR20/HIA20	18
ZKLN2052.2Z	20	28500	47000	5400	0.15	650	140	HIR20/HIA20	18
ZKLN2557.2RS	25	30500	55000	2600	0.40	750	200	HIR25/HIA25	25
ZKLN2557.2Z	25	30500	55000	4700	0.20	750	200	HIR25/HIA25	25
ZKLN3062.2RS	30	32000	64000	2200	0.50	850	300	HIR30/HIA30	32
ZKLN3062.2Z	30	32000	64000	4300	0.25	850	300	HIR30/HIA30	32
ZKLN3072.2RS	30	65000	108000	2100	0.80	950	400	HIA30	65
ZKLN3072.2Z	30	65000	108000	4000	0.40	950	400	HIA30	65
ZKLN3572.2RS	35	45000	89000	2000	0.60	900	400	HIR35/HIA35	40
ZKLN3572.2Z	35	45000	89000	3800	0.30	900	400	HIR35/HIA35	40
ZKLN4075.2RS	40	47500	101000	1800	0.70	1000	550	HIR40/HIA40	55
ZKLN4075.2Z	40	47500	101000	3300	0.35	1000	550	HIR40/HIA40	55
ZKLN4090.2RS	40	79000	149000	1600	1.30	1200	750	HIA40	110
ZKLN4090.2Z	40	79000	149000	3100	0.65	1200	750	HIA40	110
ZKLN5090.2RS	50	51000	126000	1500	0.90	1250	1000	HIR50/HIA50	85
ZKLN5090.2Z	50	51000	126000	3000	0.45	1250	1000	HIR50/HIA50	85
ZKLN50110.2RS	50	125000	250000	1200	2.60	1400	1500	HIA50	150
ZKLN50110.2Z	50	125000	250000	2500	1.30	1400	1500	HIA50	150
ZKLN60110.2Z	60	93000	214000	3000	1.00	1300	1650	HIR60/HIA60	100
ZKLN70120.2Z	70	97000	241000	2800	1.20	1450	2250	HIR70/HIA70	130
ZKLN80130.2Z	80	100000	265000	2700	1.40	1600	3000	HIR80/HIA80	160
ZKLN90150.2Z	90	149000	395000	2300	2.30	1700	4400	HIR90/HIA90	200
ZKLN100160.2Z	100	154000	435000	2150	2.60	1900	5800	HIR100/HIA100	250

[1] Lock nuts are not included in the scope of delivery – please order separately!

10.2.7 HIR lock nuts – radial clamping

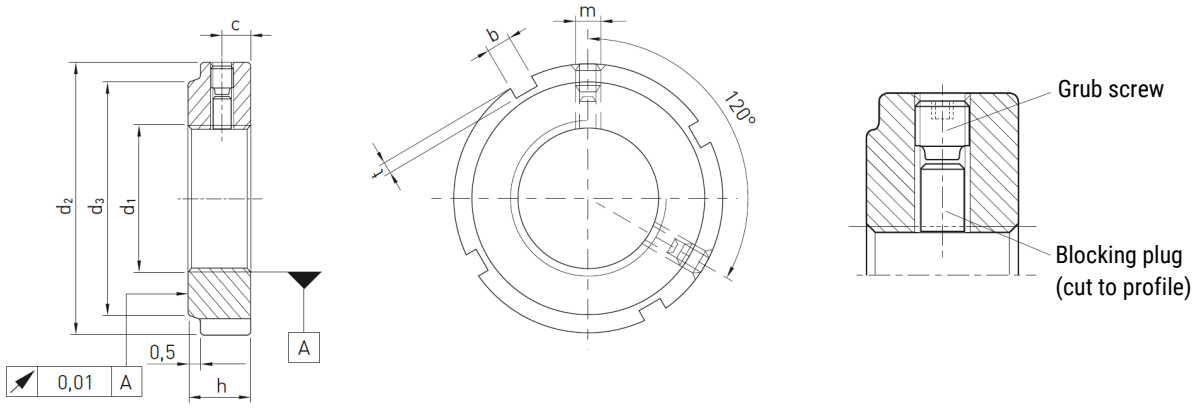


Table 10.52: Dimensions of lock nut HIR

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

10.2.8 HIA lock nuts – axial clamping

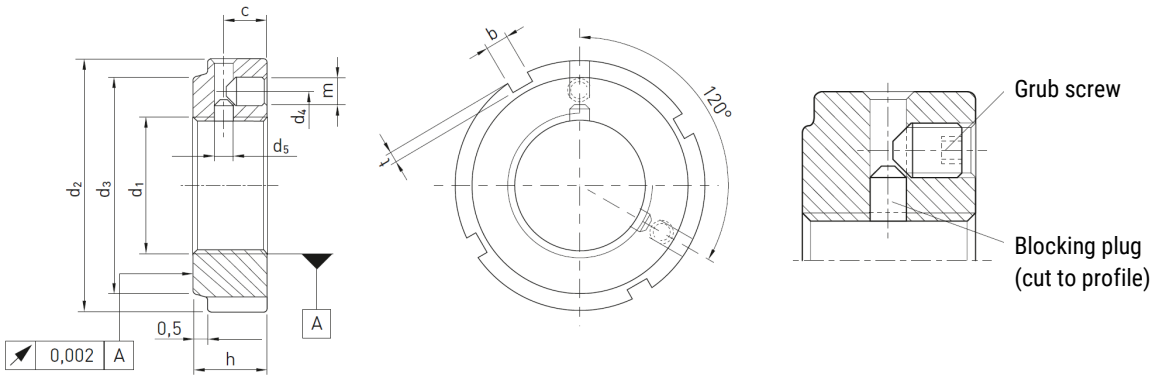
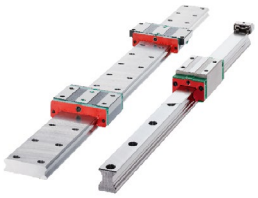


Table 10.53: Dimensions of lock nut HIA

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
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

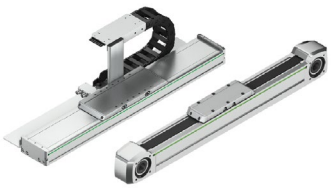
Unit: mm

We live motion.

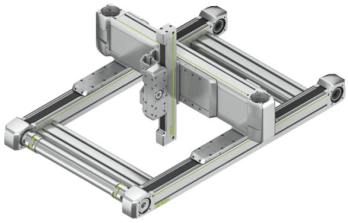


Linear guideways

Ballscrews



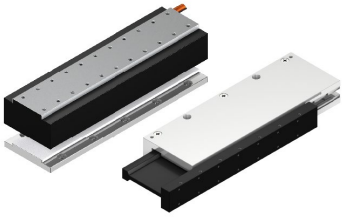
Linear axes



Linear axis systems

Torque motors

Robot



Linear motors

Rotary tables

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