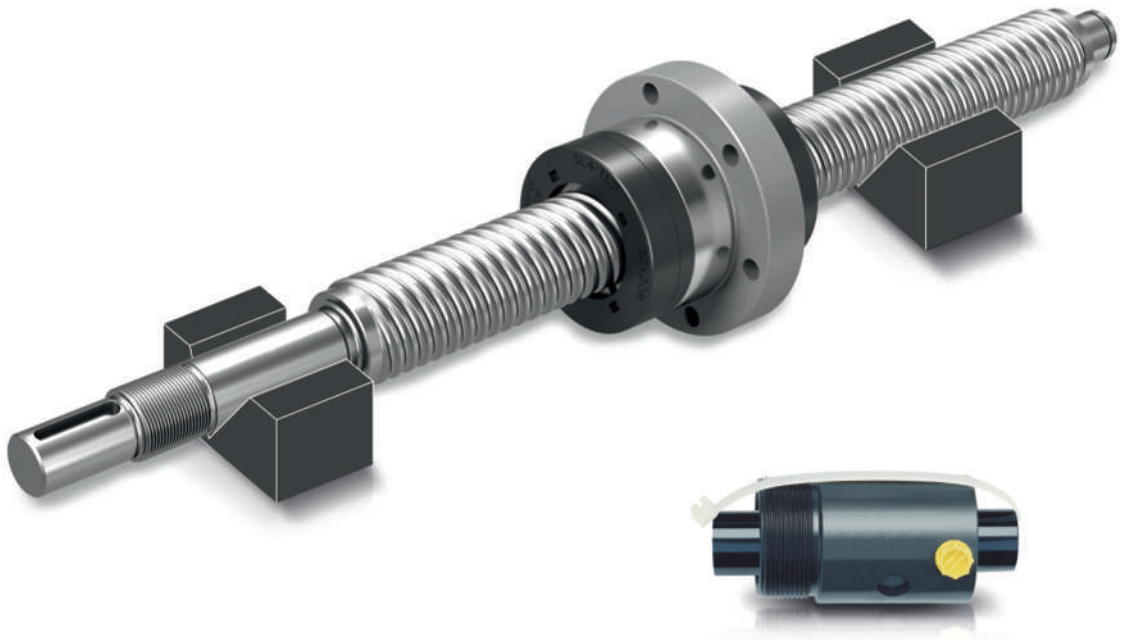


Ball Screws

Mounting Manual

We pioneer motion

SCHAEFFLER

Contents

1 About the manual

The purpose of this mounting instruction is to assist the fitter in mounting precision ball screws safely and correctly. It contains important information on mounting with the following objectives:

- prevent personal injury or damage to property that may result from mounting errors
- ensure a long service life through correct and professional mounting

1.1 Symbols

The warning and hazard symbols are defined in accordance with ANSI Z535.6-2011.

1 Warning and hazard symbols

Signs and descriptions	
⚠DANGER	In case of non-compliance, death or serious injury will occur.
⚠WARNING	In case of non-compliance, death or serious injury may occur.
⚠CAUTION	In case of non-compliance, minor or moderate injury may occur.
NOTICE	In case of non-compliance, damage or malfunctions in the product or the adjacent construction may occur.

1.2 Legal notices

The information in this manual reflects the status at the time of publication.

Unauthorized modifications to or improper use of the product are not permitted. Schaeffler accepts no liability in these cases.

1.3 Images

The images in this manual may be schematic representations and may differ from the delivered device.

2 General safety regulations

2.1 Intended use

Ball screws transform rotating motion into linear motion. Ball screws are designed for installation in industrial machines. The selection of the type and design of the ball screw is key to the application.

2.2 Selection and qualification of personnel

Only qualified personnel are permitted to mount precision screw drives.

Qualified personnel:

- are authorized to fit precision screw drives
- possess all the required knowledge for mounting precision screw drives
- are familiar with the safety regulations

2.3 Protective equipment

For certain work on the product, suitable protective equipment must be worn. Personal protective equipment consists of:

2 Required personal protective equipment

Personal protective equipment	Mandatory signs in accordance with DIN EN ISO 7010
Protective gloves	
Safety shoes	

2.4 Safety regulations

Observe the following safety instructions to prevent personal injury and property damage during mounting.

General instructions

Secure heavy components to prevent tipping or falling. When setting down or joining heavy components, pay attention to limbs in order to prevent crushing.

Perform all mounting and maintenance work only when the machine or system is stationary.

Environmental hazards

Depending on the ambient conditions, safety risks may exist at the mounting location that are not associated directly with the housing but must be considered when mounting the housing. Consult a local safety engineer before starting mounting work. Observe all safety regulations that are applicable to the mounting location and to the machine or system involved in the mounting work.

Cleaning

For cleaning precision ball screws, we recommend using volatile solvents, as these allow residue-free cleaning. Ensure that the solvent used is compatible with the housing paint finish. Insufficient compatibility may result in damage to the paint finish, which would compromise the corrosion protection of the housing.

⚠ WARNING

Risk of injury due to volatile solvents

Hazard due to ignition of vapors, as well as through skin or eye contact, inhalation, or swallowing.

- Avoid direct contact with the body and wear protective gloves.
- Observe the safety instructions provided by the manufacturer.

Disposal

Dispose of any cloths soaked with lubricating grease or solvents, excess lubricating grease, packaging material, and any other waste generated during mounting using environmentally acceptable methods. Observe the applicable statutory regulations.

3 Guidelines for mounting

Ball screws are precision components. They should be handled with care. Shock loads, contamination, and corrosion must be avoided.

Transport and storage

The storage location must protect the ball screws from harmful influences such as:

- contaminants
- shock loads
- moisture

If stored outside the delivery box, ball screws must be placed on V-shaped wooden or plastic blocks and protected against jolts, impacts, and other such conditions. The threaded nut must not be used as a support.

During transport, ball screws must be protected using thick plastic bags that effectively shield against foreign substances and contamination. The screw drives should only be removed from the bags immediately prior to fitting.

Misalignment

Once fitted, any radial load or moment load on the nut will lead to overloading of the contact surfaces, thus significantly reducing the service life.

To ensure correct alignment and avoid non-axial loads, the use of linear guidance components is recommended. Alignment between the screw shaft and the guide must be carefully checked. If the use of an external linear guide proves impractical, we recommend mounting the nut on trunnions or in gimbal mounts, and guiding the screw shaft using self-aligning bearings.

Fitting the nut under tension facilitates proper alignment and helps prevents the shaft from buckling.

Lubrication

Proper lubrication is essential for the correct functioning and long-term reliability of the ball screw. Further information is available on request from Schaeffler.

Before shipping, the screw shaft is treated with a protective agent that forms a protective film once dry. This film is not a lubricant. To avoid the risk of incompatibility, it may be necessary to remove the protective film before applying certain lubricants. In such cases, we recommend the following procedure:

1. Fully immerse the ball screw in a suitable solvent.
2. Shake and rotate the screw drive to allow the solvent to penetrate all areas.
3. Remove the screw drive from the solvent and allow any remaining solvent to dry.

4 Preparing the ball screw for mounting

Depending on the configuration of the ball screw at delivery, different assembly steps must be observed during preparation.

4.1 Nut mounted on the shaft

4

- Do not remove the nut if possible, especially in the case of preloaded nuts. If the nut must be removed, for example for end machining, check the orientation of the nut before removal and use a sleeve.

4.2 Nut on a sleeve, machined shaft ends

1. Clean the nut and the shaft end using a solvent.
2. Fit the wipers on the nut ➤9|5.2 ➤10|5.3.
3. Mount the nut on the screw shaft, paying attention to the orientation of the nut ➤11|5.4. For SL ball screws with a large lead, check the mounting ➤13|5.5.

4.3 Nut on a sleeve, unmachined shaft ends

1. Machining of the shaft ends: Standard screw shafts are manufactured from surface-hardened steel (56 HRC to 60 HRC). For this purpose, it may be advisable to anneal the shaft.
2. Clean the nut and the shaft end using a solvent.
3. Fit the wipers on the nut ➤9|5.2 ➤10|5.3.
4. Mount the nut on the screw shaft, paying attention to the orientation of the nut ➤11|5.4. For SL ball screws with a large lead, check the mounting ➤13|5.5.

5 Mounting the ball screw

1. Check that the end bearings and guidance devices are aligned with the shaft.
2. Checking the stroke and limit switches: Operate the ball screw several times at low speed (< 50 min^{-1}) and under low load (< 5 % of the dynamic rating).

5.1 Cleaning the nut

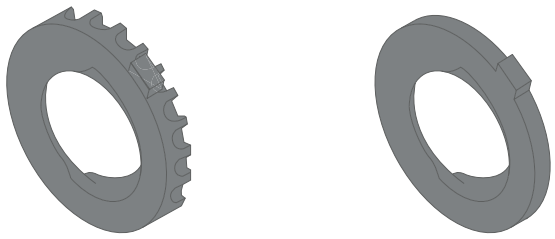
✓ The nuts are coated with a protective oil. We recommend removing the protective oil before mounting the nut on the screw shaft.

1. Therefore, immerse the nut and the sleeve in the solvent. Shake and rotate them so that the solvent penetrates the nut and dissolves the protective film.
2. Remove the nut from the solvent and allow it to drain.

5.2 Fitting the molded wipers (optional)

1. These instructions apply only to molded wipers. Ensure that the wiper used is the one you received.

1 Molded wipers



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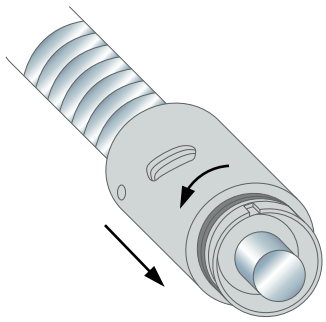
2. Screw the nut to the end of the thread so that it protrudes only a few millimeters beyond the thread. Ensure that no balls are lost.

2 Wiper mounted on the shaft



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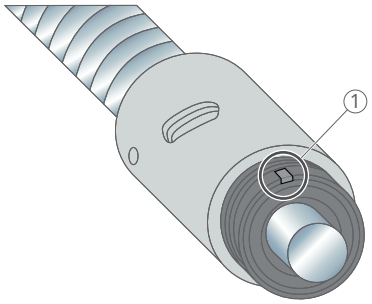
3. Insert the wiper into the recess of the nut with the spigot flush in the groove (1). The labeled side of the wiper should be attached facing outward.

3 Inserting the wiper



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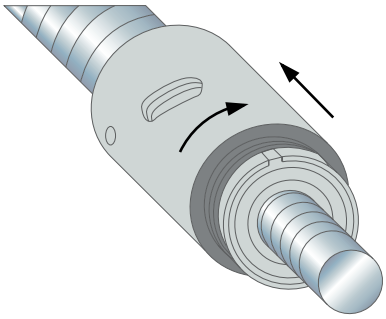
1	Internal hole of the nut

4. Screw the wiper and the nut back onto the shaft.

4 Mounting the nut



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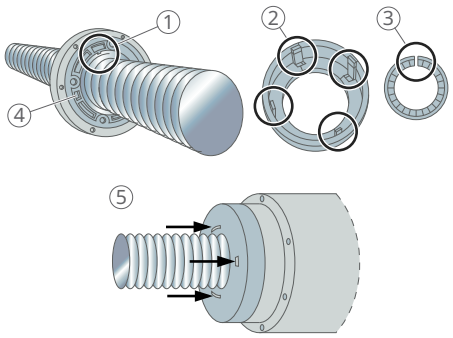
5.3 Fitting the brush wiper (optional)

Once fitted, the end cap cannot be removed.

The brush wipers and end caps are identical on both sides.

1. Identify the lug (1) in the wiper recess of the nut.
2. Align the cut out of the brush wiper (2) with the lug.
3. Identify the 4 rectangular cut outs on the end flange (3) and align the 4 mounting clips (4) on the end cap with them.
4. Press the end cap firmly into place until it snaps into position (5). Repeat the procedure described above for the second wiper and cap at the other end of the nut.

5 Brush wiper



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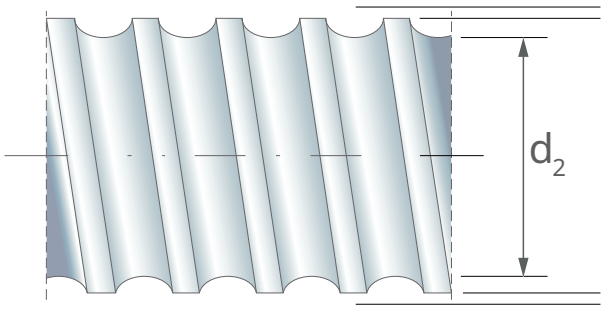
1	Lug	2	Mounting clips
3	Brush wiper cut out	4	Rectangular cut outs
5	End cap		

The nut must be secured on the screw shaft using cable ties or similar means to prevent inadvertent loosening. Do not use adhesive tape or other retaining devices.

5.4 Mounting the nut on the screw shaft

1. Inspect the screw, cut to length or with machined ends, for any damage or corrosion. Only use screws that are free from damage and corrosion.
2. It is recommended that the nut be mounted at the root diameter, where present.

6 Mounting the nut at the root diameter



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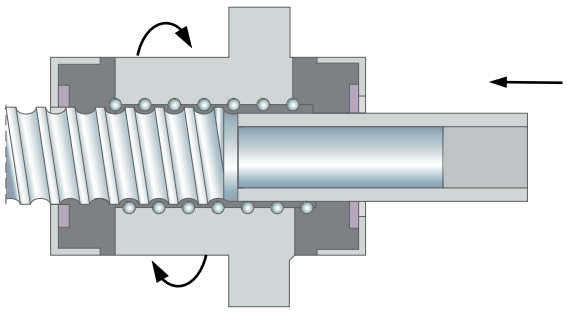
d_2	mm	root diameter

3. Check the orientation of the nut and compare it with the information shown in the dimension drawing.
4. Remove the cable tie from the nut and the sleeve.
5. Move the sleeve to the end of the screw shaft and insert the nut into the screw. Advance the nut by approximately 300 mm.

7 Screwing the nut to the end of the thread



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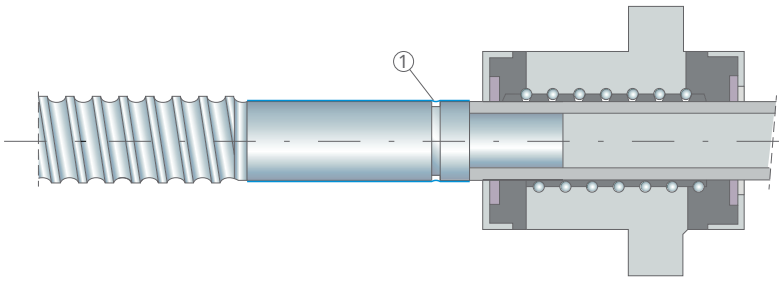
6. If the sleeve does not cover the machined end up to the ball track, adhesive tape may be used, or the sleeve can be positioned against the unmachined end.

8 Using adhesive tape



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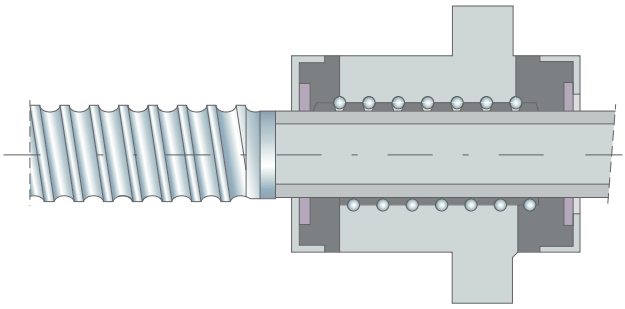
1	Adhesive tape

9 Sleeve at the end of the screw shaft



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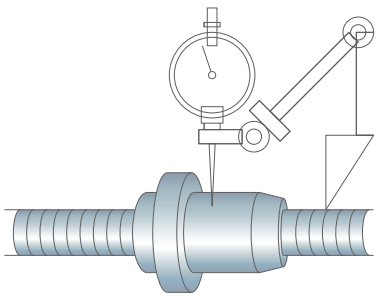
If the nut has been inadvertently mounted in the wrong orientation, place it back onto the sleeve and remount it. Using a sleeve, the nut can be easily removed from a screw shaft for realignment or cleaning.

5.5 Procedure for verifying correct mounting for SL, TL, BL

Play measurement

The play can be checked using a dial gauge (0.01 mm).

10 Play measurement



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1. Adjust the magnetic base of the dial gauge to the screw shaft.
2. Bring the plunger into contact with the ground diameter of the nut body.
3. Lift the nut evenly at both ends to move the plunger.
4. To verify correct mounting, the play should be checked at a minimum of 3 positions along the screw shaft (end, middle, end).

Inspection for SL ball screws

For SL ball screws play should be measurable. If no play is measured, the nut has been engaged onto the wrong thread on the shaft.

1. Move the nut from the screw back onto the sleeve.
2. Rotate the nut by 90°.
3. Screw the nut back onto the shaft without applying force.
4. Check the play: the target value is between 0.01 mm and 0.08 mm.

Inspection for TL ball screws

For TL ball screws no play should be measurable. If play is measured, the nut has been engaged onto the wrong thread on the shaft.

1. Move the nut from the screw back onto the sleeve.
2. Rotate the nut by 90°.
3. Screw the nut back onto the shaft to ensure that no play is present.

Inspection for BL ball screws

For BL ball screws where the nut has been removed for end machining or cleaning, the assembly is free of play regardless of the nut position on the screw drive.

In this case, carrying out a play measurement will not provide any meaningful result.

1. Place the nut on the screw and feel for the preload.
2. Move the nut from the screw back onto the sleeve.
3. Rotate the nut by 90°.
4. Place the nut back onto the screw and feel for the preload again.

The BL ball screw configuration has the least noticeable preload torque.

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