

Ball Screw Drives, Right Hand, Rolled Version



General Description

Because of the rolling friction, ball screw drives have a high efficiency up to 98% and require a relatively low drive power. Application: Conversion of a rotary movement into a linear one. Sometimes: Conversion of a linear movement into a rotary one (recommended only at high pitch, beginning from 1/3 of the nominal diameter).

No Self-Locking

Due to the low friction with high efficiency, ball screw drives require only a very low starting torque and are not no self-locking.

Designation according to DIN

According to DIN ISO 3408-1 and other standards, a ball screw drive consists of a spindle and, for minimum, one nut. The size has to be described by the nominal diameter and the pitch. Another essential dimension is the ball diameter. Further informations are required: The version (shape) of the nut, the pitch accuracy, the length and, if needed, the details of the spindle ends.

Conditions of Use and Lifespan

Ball screw drives are sensitive to dirt and high shock loads. Sufficiently protected, they reach a very long lifetime.

Catalog Spindles and Nuts

Catalog Version

Available from stock: Spindles right hand, rolled version in sizes from 8x2 to 63x10mm. Flanged nuts and cylindrical nuts. The production lengths are from 1,000mm up to 3,000mm, depending on the size. Partial lengths are also in the stock range. Other lengths and reworking of the spindle ends on request.

Rolled Spindles

Rolled from high quality bearing steel 100Cr6, hardened and straightened. Rolled spindles have a unsevered grain structure and high pitch accuracy. Rolling is the most economical method for serial production. The catalog spindles can get combined with the flanged nuts and cylindrical nuts on the following pages.

Axial Clearance

These ball screw drives are not backlash-free. Therefore the nuts run very easy with very low friction. The axial clearances are shown in the tables of the nuts. This play is only a disadvantage if a high positioning accuracy is required at alternating direction of force. To eliminate the axial play, two nuts can get braced against each other. Alternatively, the nuts could be equipped with better fitting ball sizes. This would be expensive.

Load Capacity

The static and dynamic load rates are shown in the tables of the nuts. These loads only apply to the use with axial play. At backlash-free preloaded nuts the load must be reduced, or the lifespan will get shorter. Additional to the axial load, the acceleration force and shock loads must be considered. Also the critical buckling force and critical spindle speed must be checked.

Maximum Speed

Ball screw drives allow very high speeds. But for sufficient lifespan, the speed should not exceed $3,000\text{min}^{-1}$ for longer time. And the length-depending, critical spindle speed must be considered.

Buckling Force and Critical Spindle Speed

At thin spindles under pressure load, there is a risk of buckling. At high speed, there is an additionally risk of resonant vibrations. For both, the calculation can be done like shown on page 512 for trapezoidal spindles.

Lubrication

Running without lubricant is not allowed. For grease lubrication, normal roller bearing grease is recommended. The lubricant consumption depends on the condition of use. Often a lubrication period of 200 hours is sufficient.

Operation manual at www.maedler.de in the section Downloads

Bearing Units for Spindles Page 474

These ready-to-install bearing units for trapezoidal and ball-screw spindle drives are available from stock. The unit for the fixed side has two angular contact ball bearings, lightly preloaded, to withstand high axial and radial forces. The unit for the support side has a standard ball bearing to hold the spindle end in its position.

Shaft End Reworking for Spindles Page 477

The matching spindle reworking can be done by the customer or, at short time, by **MÄDLER®**. The spindle reworking shown on page 477 is just a recommendation. For shaft processing, soft annealing (tempering) of the hardened spindle ends is necessary.