

# Technical information for ball screw linear actuators

## Efficiency and self-locking:

The low rolling friction of ball screw linear actuators give them a mechanical efficiency of up to 95%. Operating duration can be 100%. Due to low rolling friction ball screw linear actuators are not self-locking. A brake mechanism must be installed where self-locking is required (reduction gear or motor brake). This is a must by vertical installations.

## Operating temperature:

Ball screw linear actuators can be used with normal loads within a temperature range of -20 to +80 °C. Temporarily up to +110 °C. A prerequisite is constant lubrication.

## Lubrication:

Correct lubrication is important for ball screw linear actuators to achieve the calculated lifespan, avoid overheating and guarantee smooth and quiet operation. The same lubricants are used for ball screw linear actuators as those used for roller bearings. They should always be protected from dirt. This is normally carried out by the wiper in the ball screw nut. This wiper also prevents the lubricant seeping out of the ball screw nut.

## Installation information:

When ordering ball screw nuts individually, they come mounted on a sleeve. This sleeve must not be removed prior to installation, as the balls could fall out of the ball screw nut. To install (Figure 1), hold the sleeve on the end of the spindle, then slide the nut over the sleeve while simultaneously and without force twisting onto the spindle thread. Now the lubrication should be applied through the hole in the ball screw nut. To avoid damaging the ball screw linear actuator, limit switches and end position dampers should be installed on the machine.

## Note:

Ball screw linear actuators consist of a ball screw spindle, a ball screw nut in which the balls are integrated and a ball re-circulator. They are used to convert a rotary motion into a linear motion and vice-versa. They are very accurate and highly efficient.

## Manufacturing process:

The rolled threads of ball screw linear actuators are produced by a precision rolling process. The thread on the spindle and nut has a Gothic arch profile. The load angle is 45°. As by precision screw drives, the flank of the spindle nut is ground to give smooth running properties and a long life.

## Gradient deviations:

Thread length		Precision class			
over	under	C 3 (µm)	C 5 (µm)	C 7 (µm)	C 10 (µm)
0	315	8	18	±50 / 300 mm	±210 / 300 mm
315	500	10	20		
500	630	12	23		
630	800	13	25		
800	1000	15	27		
1000	1250	16	30		
1250	1600	18	35		
1600	2000	21	40		
2000	2500	24	46		
2500	3150	29	54		
3150	4000	35	65		
4000	5000	41	77		

## Axial backlash and preload:

Differentiation is made between a play-afflicted (axial play > 0) and a play-free or preloaded (axial play < 0) ball screw linear actuator. Preloaded nuts have considerably less elastic deformation occurrence than in nuts without preloading. Preloaded nuts are recommended when positioning accuracy under load is required.

Spindle Ø	Axial backlash P0 (mm)	Zero backlash P1 (mm)	Light preload P2 single nut loosening torque N
16x5	0,08	0	1 - 3
20x5			1 - 3
25x5			2 - 5
32x5			2 - 5
32x10			3 - 6

## Assessment of the lifespan:

The lifespan can be calculated from the ratio of dynamic load rating and average load.

$$L = \left( \frac{C_{dyn}}{F_m} \right)^3 \cdot 10^6$$

L = lifespan in rotations  
 $C_{dyn}$  = dynamic load rating (N)  
 $F_m$  = average load (N)

