Self-locking

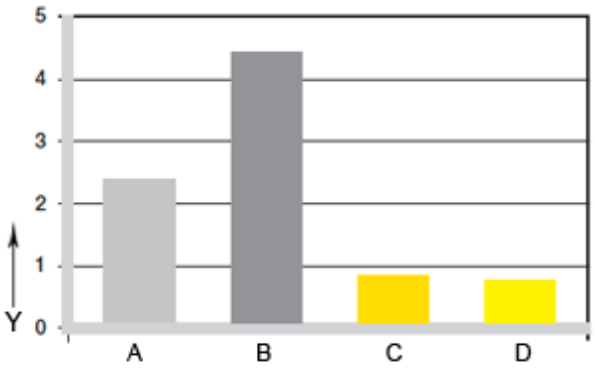
Single start trapezoidal lead screw units are self-locking. This means that the flank angle and the sliding friction prevent movement of the nut or the lead screw without the application of outside forces. As soon as the static friction is exceeded, the components are no longer self-locking. Multi-start trapezoidal lead screw units have a "residual self-locking" feature; high helix lead screw units are not self-locking.

Anti-Backlash leadscrew nuts

Backlash refers to the clearance at direction reversal, which is caused in a lead screw unit by the axial clearance. Oscillations and self-induced vibrations (frequently the causes of noise, especially with long lead screws and high RPMs) are significantly reduced by means of radial pre-tensioning using a spring-elastomer.

Zero-Backlash leadscrew nuts

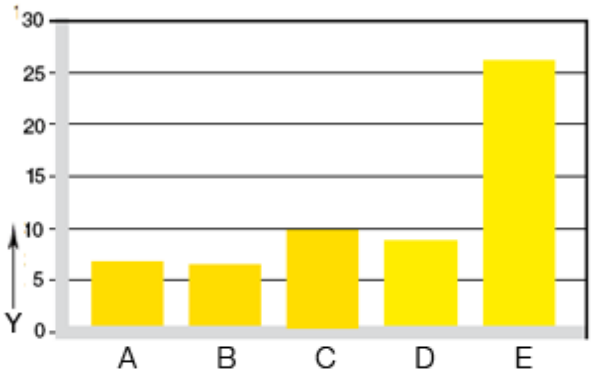
Screw drives with steep thread for quick adjustments of small loads. The zero-backlash system ensures minimal backlash for life. Ideal for precise positioning and feed movements in medical, laboratory and printing engineering and other life-science fields. High-helix nuts without zero-backlash feature or trapezoidal thread should be used for high loads, dirt exposure or extreme external influences.



Y = Wear [Wt.-%]

A = POM
B = PA
C = J
D = W300

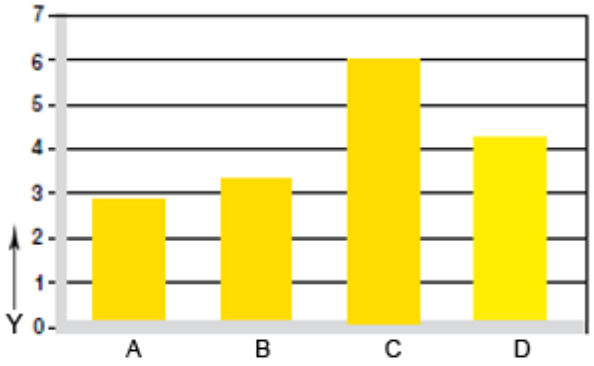
Fig. 01: Wear test on a rolled trapezoidal lead screw



Y = Wear [mg/km]

A = J
B = W300
C = J350
D = A180
E = POM

Fig. 02: Wear test on a C15 lead screw [mg/km] stroke 140 mm, 50 N, lead screw C15 rolled, 450 RPM

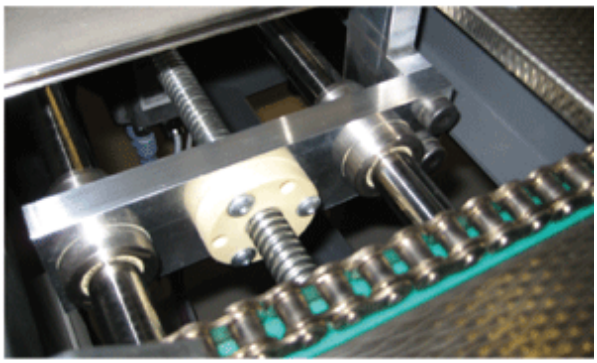


Y = Wear [mg/km]

A = J
B = W300
C = J350
D = A180

Fig. 03: Wear test on a stainless steel lead screw [mg/km] stroke 140 mm, 50 N, stainless steel lead screw, rolled, 450 RPM

Anti-backlash lead screw nuts in a glue application system of a seam gluing machine (wood industry). These ensure the utmost in precision for the clearance-free adjustment mechanism.



Format adjustment in the paper industry with anti-backlash lead screw nut

Lead screw nut assembly

drylin® lead screw nuts must be secured against twisting and axial sway.

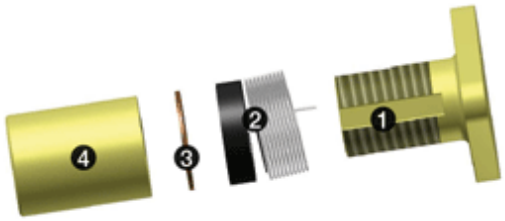
Leadscrew nuts with flange

A maximum tightening torque of 2.5 Nm applies to M6 mounting screws on flanged nuts. We recommend the securing of the mounting screws via a third medium (e.g. liquid screw locking). The use of metallic press-fit sleeves is recommended for higher tightening torques.

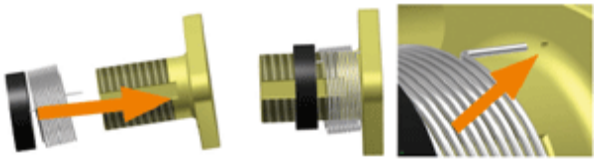
Zero-backlash lead screw nut assembly

1. Support nut
2. Locking ring with torsion spring

3. Friction disc
4. Axial element



Thread the locking ring approx. half-way onto the support nut 1. using torsion spring 2., and secure the spring tab in the bore.

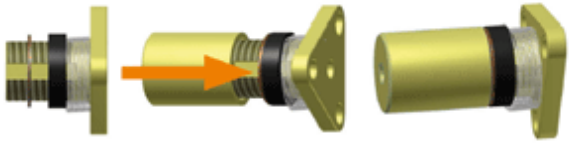


Position the friction disc 3. and the axial element 4. flush against the locking ring. Ensure that the locking ring does not rotate.

You can now let go of the locking ring, therefore pre-tensioning the nut on the lead screw.

Cylindrical lead screw nuts

The outside diameter of the cylindrical lead screw nuts has h9 tolerance. We therefore recommend a positive fit, e.g. by employing keyways for a secure lock. When low forces are involved, field experience has also demonstrated that screw connections will work. Gluing lead screw nuts is principally not recommended. However, if lead screw nuts are nevertheless intended for gluing, suitable tests need to be performed under all circumstances.



Thread the locking ring to the end of the support nut to tension the torsion spring.

Press together the support nut 1. and the axial element 4. and thread the lead screw through the nut. Pre-tension the locking ring while doing so.

Spindle selection

The ultilzability and the operating behavior of the system also depend decisively on the spindles as counter-direction partners. Basically we recommend the purchase of nut and spindle as one system from a single supplier. Spindles are tested with ring gages compatible with DIN 103. Basically the drylin® trapezoidal leadscrew nuts can be used in combination with spindles made of steel, stainless steel or hard-anodized aluminum. "Split" lead screws (right and left-handed threads on one lead screw) are available in

addition to right-handed and left-handed versions.

Custom lead screws

Take advantage of our machining service - we manufacture ready to install lead screws based on your needs. Please send us your drawing. We will promptly submit a quote.

Custom nuts

Take advantage of our machining service - we manufacture lead screws nuts based on your needs. Please send us your drawing. We will promptly submit a quote.

Custom nut examples

Selecting materials

Standard drylin® lead screw nuts are available in 4 materials:

iglidur® J
This material is characterized by the best friction values with the most counter partners and low moisture absorption.

iglidur® W300
This material features high static strength.

iglidur® A180
This material meets the requirements of the FOOD AND DRUG ADMINISTRATION (FDA) and can therefore be used in direct contact with foods and pharmaceuticals.

iglidur® J350
This material features very high resistance to temperatures. Lead screw nuts made from iglidur J350 can be used up to 150 °C.

Service Live

drylin® lead screw nuts are made from tribologically optimized materials. Already during the development phase, the focus is on optimizing the friction properties of the drylin® lead screw units, with the objective of attaining the lowest possible wear rates and good friction values. The igus® test lab in Cologne conducts several hundred tests every year on lead screw test fixtures in order to make the best possible service life and wear-resistance projections. Our experts will also gladly test your application.

Test fixture at the igus® lab to determine service life

iglidur® material	surface pressure
iglidur® J	4 MPa
iglidur® W300	5 MPa
iglidur® A180	3,5 MPa
iglidur® J350	2 MPa

Table 01: Allowable continuous surface pressure in the threads

Evaluation: Trapezoidal leadscrew

The load capacity of the trapezoidal leadscrew nuts made of high-performance polymers is dependent on the surface pressure, the surface speed and the resultant temperature. The temperature behavior is additionally influenced by the duty cycle as well as the selected spindle material and its specific heat conductivity.

iglidur® material	rotating long-term
iglidur® J	1,5
iglidur® W300	1,0
iglidur® A180	0,8
iglidur® J350	1,3

Table 02: Surface speeds of the iglidur® bearing in m/s

Max. allowable pv value
The permitted surface speed and the resultant feed rate for every thread size can be determined with the p x v value and the percentages of the surface contact area stated in the dimensions table.

Duty cycle ED	$pv\text{-value}_{max.}$ [MPaxm/s]
100 %	0,08
50 %	0,2
10 %	0,4

Table 03: Reference values when using drylin® plastic nuts without lubrication (with stroke 500 mm). A correction factor may need to be used with very short or long strokes.

Required percentage of surface contact area:
$A_e = F_{axial} / p_{tol}$ [mm^2]

Selection of the required thread size and determination of the actual surface pressure:
$p_{real} = F_{axial} / A_{e\ real}$ [MPa]

pv-value:
$pv = p_{real} \times v$

Sliding speed:
$v = n \times d1 \times \pi / 60.000$[m/s]

Number of revolutions:
$n = v \times 1.000 \times 60 / \pi \times d1$ [1/min]

Feed rate:
$s = n \times P / 60.000$ [m/s]

Drive torque:
$M_{ta} = F_{axial} \times p / 2000 \times \pi \times \eta$
$M_{te} = F_{axial} \times p \times \eta / 2000 \times \pi$

Fig. 05: Formula chart - lead screw units

F_{axial}	Axial force
P_{per}	Max. permitted surface pressure 5 N/mm^2
p_{real}	Actually occurring surface pressure for selected installation size
$A_{e\ real}$	Percentage of surface contact area of the selected trapezoidal leadscrew nut
P	Lead
d1	Pitch diameter
M_{ta}	Drive torque [Nm] when converting a rotating motion into a linear motion
M_{te}	Drive torque [Nm] when converting a linear motion into a rotating motion