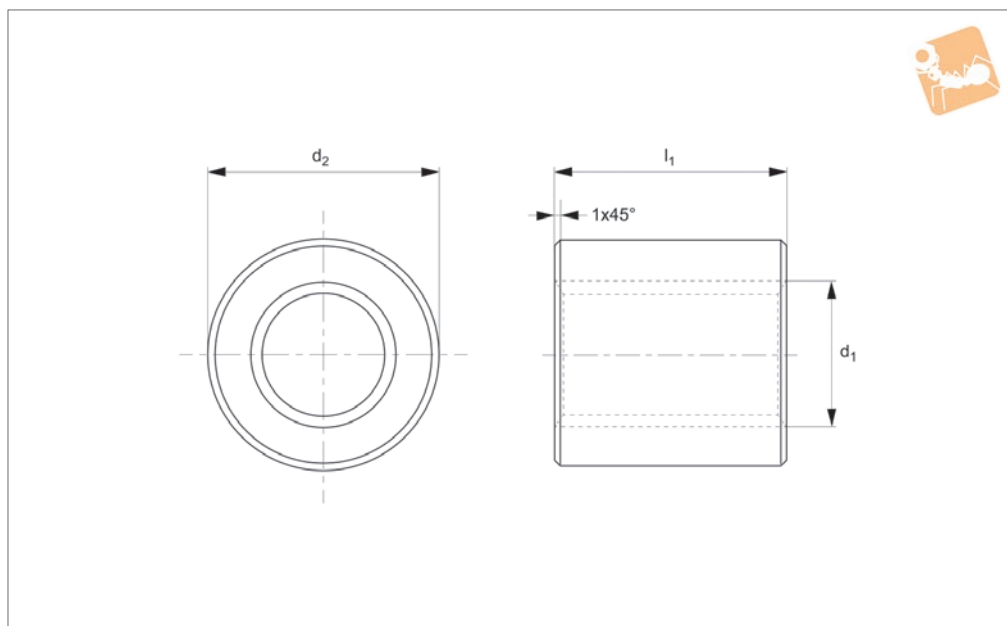




# Cylindrical Stainless Steel Nuts for lead screws

## Lead Screws & Nuts



### L1341

LEAD SCREWS & NUTS

#### Material

Stainless steel (AISI 303).

chemicals.

nos. L1322 and L1323.

#### Technical Notes

Especially suitable to withstand corrosive

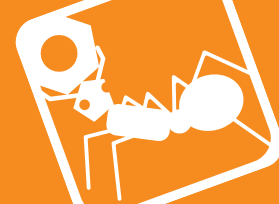
#### Tips

Standard nuts are right hand thread.

For use with stainless steel lead screws

Order No.	Size	No. of starts	d <sub>1</sub> tol. 7H	Lead	Thread direction	Contact surface mm <sup>2</sup>	d <sub>2</sub> tol. h11	l <sub>1</sub> +0.0 -0.2	Weight kg
L1341.R12-03	TR12x3	1	12	3	Right	297	26	18	0.060
L1341.R16-04	TR16x4	1	16	4	Right	528	36	24	0.157
L1341.R20-04	TR20x4	1	20	4	Right	847	45	30	0.305
L1341.R24-05	TR24x5	1	24	5	Right	1215	50	36	0.436
L1341.R30-06	TR30x6	1	30	6	Right	1908	60	45	0.766
L1341.R36-06	TR36x6	1	36	6	Right	2799	75	54	1.462
L1341.R40-07	TR40x7	1	40	7	Right	3440	80	60	1.808
L1341.R50-08	TR50x8	1	50	8	Right	5418	90	75	2.653
L1341.L12-03	TR12x3	1	12	3	Left	297	26	18	0.060
L1341.L16-04	TR16x4	1	16	4	Left	528	36	24	0.157
L1341.L20-04	TR20x4	1	20	4	Left	847	45	30	0.305
L1341.L24-05	TR24x5	1	24	5	Left	1215	50	36	0.436
L1341.L30-06	TR30x6	1	30	6	Left	1908	60	45	0.766
L1341.L36-06	TR36x6	1	36	6	Left	2799	75	54	1.462
L1341.L40-07	TR40x7	1	40	7	Left	3440	80	60	1.808
L1341.L50-08	TR50x8	1	50	8	Left	5418	90	75	2.653





The choice between different types of lead screws and lead screw nuts available is generally made after taking into account the following factors.

### Choice of the screw

#### Working environment

For work environments where there are no particular corrosive or oxidising agents our steel (L1320 and L1321) lead screws can be used.

Where these conditions are not met, we recommend using our stainless steel screws (L1322 and L1323) which are particularly suitable in the following cases:

- With a relative humidity of 70-80% and above.
- Immersed in water (including sea water).
- In the presence of particular corrosive agents such as chlorides. In case of highly corrosive agents please contact our Technical Department.
- In the food industry or pharmaceutical industry, where they are used with stainless steel or bronze nuts.
- Where the lead screws cannot be reached for lubrication. In particular, for lubricating “maintenance free” fittings they are coupled with plastic nuts.
- Where working temperatures are relatively high (above 200°C) - because stainless steel has a structure that is more suited to higher temperatures.

#### Backdrive

Irreversibility defines how much the nut can “backdrive” down the lead screw. If a nut cannot backdrive down the screw then it is irreversible. This is especially important if the lead screw and nut are being used in a vertical application i.e. in this situation no backdrive is normally acceptable.

Lead screws with a lead angle of  $<2^{\circ} 30'$  are completely irreversible i.e., they cannot backdrive.

Lead screws with a lead angle  $>5^{\circ}$  but  $<6^{\circ}$  still have a good degree of irreversibility and may in some instances exhibit some backdrive.

Lead screws with a lead angle  $>6^{\circ}$  have zero irreversibility, therefore the nut may backdrive down the lead screw with little or no load applied.

This is important to know in vertical applications.

### Choice of the nut

#### Working environment

Our bronze and stainless steel 303 lead screw nuts, are resistant to standard oxidizing agents that occur in various applications.

Where corrosive agents are present, please contact our Technical Department for advice.

**In applications where the presence of added lubricant (grease or oil) is not allowed we recommend the use of self-lubricating plastic nuts.**

**The use of plastics can however be limited by the specific working conditions, therefore please consult our Technical Department should you wish. This is because plastics have excellent self-lubrication features, but at the same time have restrictions on the working temperature or moisture absorption problems, (as well as some mechanical properties that may not be suitable for the intended use).**

### Single start and double start

#### Pitch

The axial distance between threads. Pitch is equal to the lead in a single start screw.

#### Lead

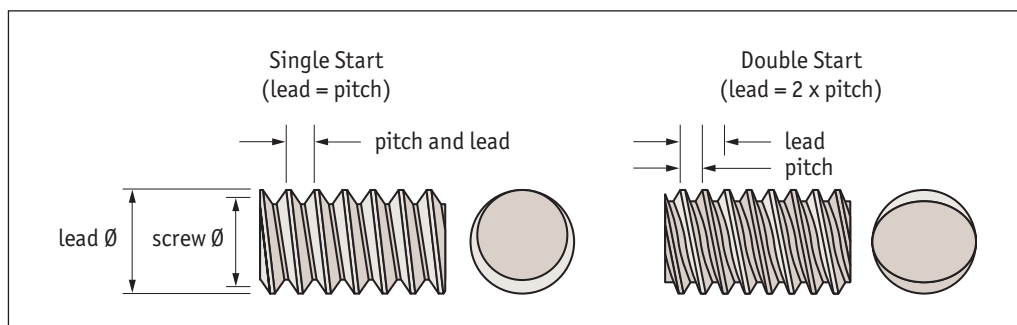
The axial distance the nut advances in one revolution of the screw. The lead is equal to the pitch times the number of starts.

$$\text{Lead} = \text{Pitch} \times \text{No. of starts}$$

For example: A 10mm diameter lead screw has a pitch of 2mm. On a single start lead screw the lead is also 2mm. On a twin start lead screw the lead is 4mm.

#### Screw starts

The number of independent threads on the screw shaft, example one or two.



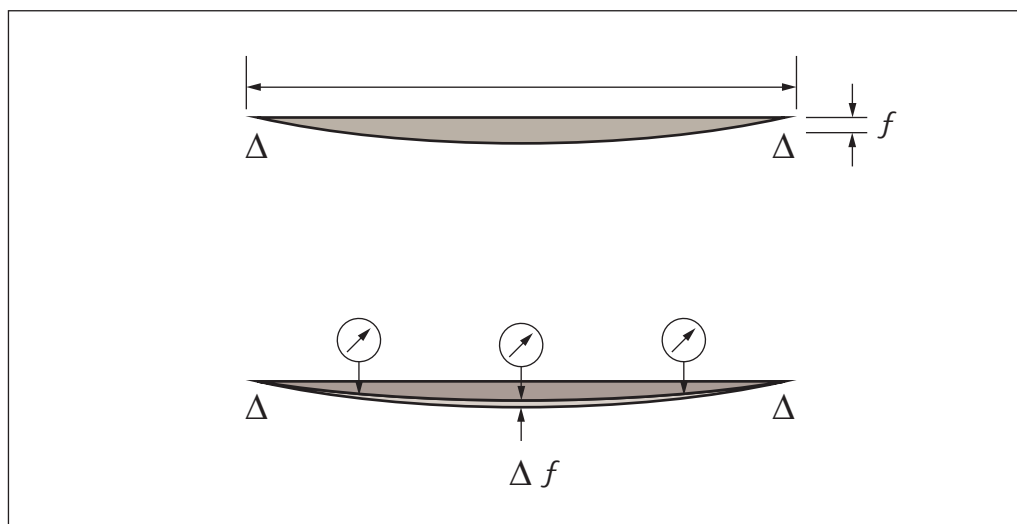
### Straightness

Automation Components lead screws are produced with controlled straightness.

Screw straightness is checked by measuring the variation of the deflection  $f$ , when the screw is supported at the ends on two fixed points and slightly rotated.

For example, the screw L1320.R30-06 has a straightness of 0.2 mm over 300 mm.

This means that a screw 30x6 300 mm long resting on two fixed points at the ends and rotated slightly displays a camber variation  $\Delta f$  less than 0.2 mm at all points on the screw.



#### Straightness

$\Delta f$  = lead screw weight camber.

Good screw straightness gives operation with load always centred on the axis, hence uniform distribution of surface contact pressure between screw and nut. This allows smooth running and a regular rotation.



To select the correct size of lead screw and nut to use, please take into consideration the following three points:

1. The size required to minimise the wear of the nut due to friction.
2. The maximum load the screw can take before it bends.
3. The maximum rpm the screw can run at before it begins to vibrate.

#### Finding a size to minimise the wear of a nut

Due to friction between the lead screw and nut, some of the power put into the lead screw is lost as heat. The solution is to limit the contact surface area between the lead screw and nut as this will help reduce the amount of friction and wear on the nut.

Lead screws are used to convert rotary motion into linear motion.

The efficiency of a lead screw and nut is defined as the amount of power you get from the nut in relation to the amount of power you put into the lead screw to begin with.

For example,  $P_t$  (the power you put into the screw) divided by  $P_u$  (the power you get from the nut) = the efficiency.

The efficiency depends on the friction between the contact surfaces of the lead screw and nut, and the lead angle of the thread.

The speed the nut moves along the lead screw must also be taken into consideration in order to limit the amount of friction in the system.

Please see the formulae on the next page which help in calculating the speeds in your application.

#### Calculation of the Contact Surface Pressure $p$

The contact surface pressure  $p$  is calculated using the following formula.

$$p = \frac{F}{A_t}$$

$F$  = Axial Force (N)

$A_t$  = Contact Surface Area ( $\text{mm}^2$ )

For standard nuts each  $A_t$  value has been listed in the product tables



## Calculating of the sliding speed $V_{st}$

The sliding speed is the result of the speed at which the nut moves and the friction.

Calculating the sliding speed helps you to calculate the required rpm of a screw if you know what speed the nut must move at, or help to calculate how fast the nut will move if you know the rpm of the screw.

You must first find the sliding speed of your lead screw and nut using one of the below formulae and then use this to calculate either rpm or output speed of the nut.

The sliding speed is calculated using one of the following formulae.

If the rpm of the screw has already been defined:

$$V_{st} = \frac{n \cdot P}{1000 \cdot \sin \alpha}$$

$V_{st}$  = sliding speed on mean diameter (m/min)

$n$  = rpm

$P$  = thread pitch (mm)

$\alpha$  = thread helix angle

If you have already established at which speed the nut must move:

$$V_{st} = \frac{V_{tr}}{\sin \alpha}$$

$V_{st}$  = sliding speed on mean diameter (m/min)

$V_{tr}$  = motion speed (m/min)

$\alpha$  = thread helix angle

Please note that the rpm and the speed at which the nut moves are bounded as follows:

$$n \text{ (rpm)} = \frac{1000 \cdot V_{tr}}{P}$$

$n$  = rpm

$V_{tr}$  = speed at which the nut moves (m/min)

$P$  = thread pitch (mm)