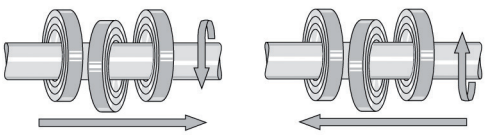
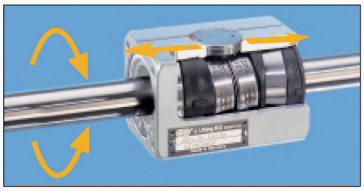
RS Series

Rolling Ring Linear Drive Nuts

RS Rolling Ring Linear Drive Nuts convert the rotation of a plain round shaft into a linear traversing movement. Fixed pitch provides a constant speed with direction of travel according to direction of shaft rotation.

This effect is achieved by using rolling rings that are mounted on roller bearings and have a specially shaped running surface. These rings are pressed against the shaft so that they roll on the surface of the shaft at a specific angle.





Seven models cover shaft diameters from 10mm to 60mm, with up to 2000 Newtons side thrust being available.

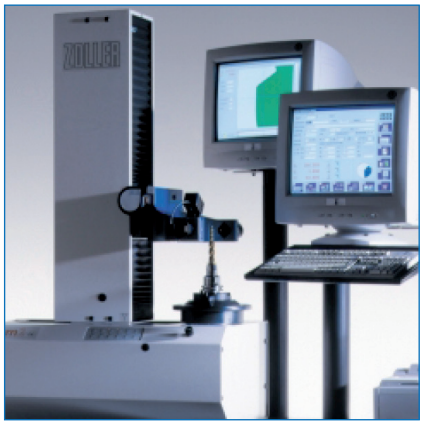
With over 45 years experience, Techna can provide considerable expertise backed by the latest, internally developed, computer modelling software, together with extensive spares facilities.

Features

- Backlash-free
- Resistant to vibration
- Compact design
- Overload protection
- High-efficiency
- Quiet in operation
- Low maintenance
- Free-movement lever
- Good sealing possibilities
- Linked nuts for higher side thrust
- Left and right hand pitch on the same shaft (2 nuts moving in opposite directions)

Applications - Complete Versatility!

Metrology Measuring Machines



Speed Control of Ship Motors

The objective was to adjust the injection pump-regulator to a rotary speed value set from the drive control console of a ship.

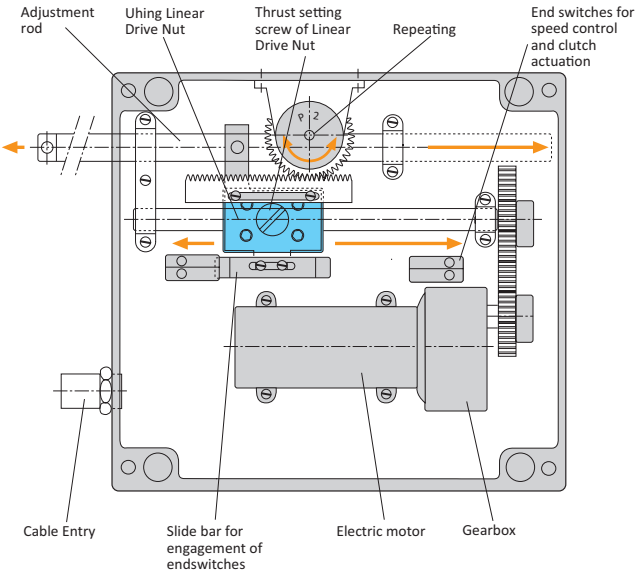
Advantages of the RS Drive Nut compared with previously used lead screws:

1. Absolutely play-free, even after long periods of use, providing very accurate control

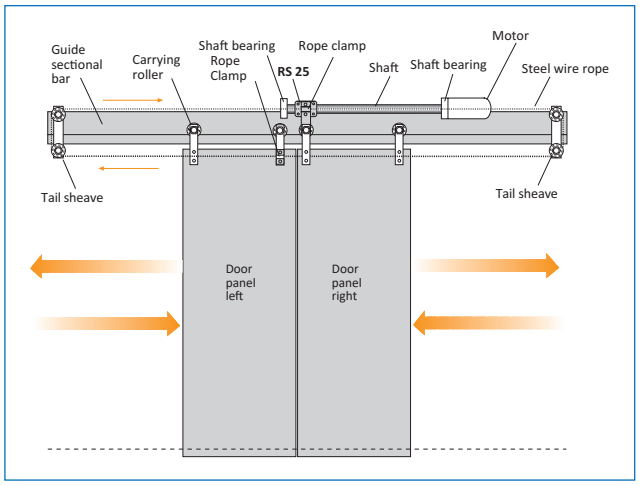
2. Resistant to severe diesel engine vibrations (German Lloyd Certificate)

3. With side thrust limited to 200N, safeguards against damage or any electronic failure.

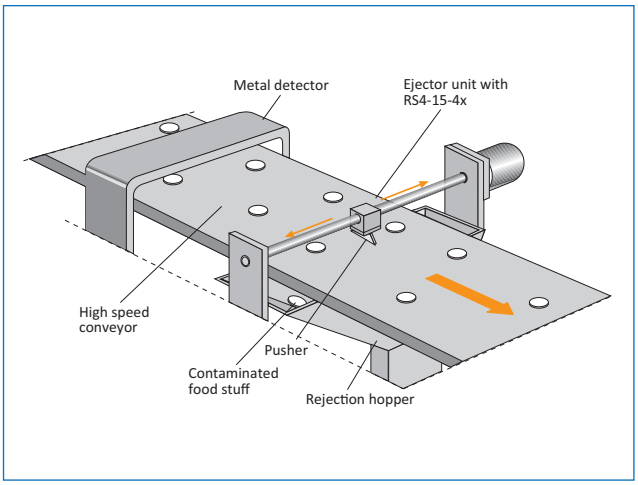
In addition to ship's motors, this application also relates to other diesel motor uses (locomotives) or severely vibrating equipment (compressors, crushing machinery, earth compacting equipment).



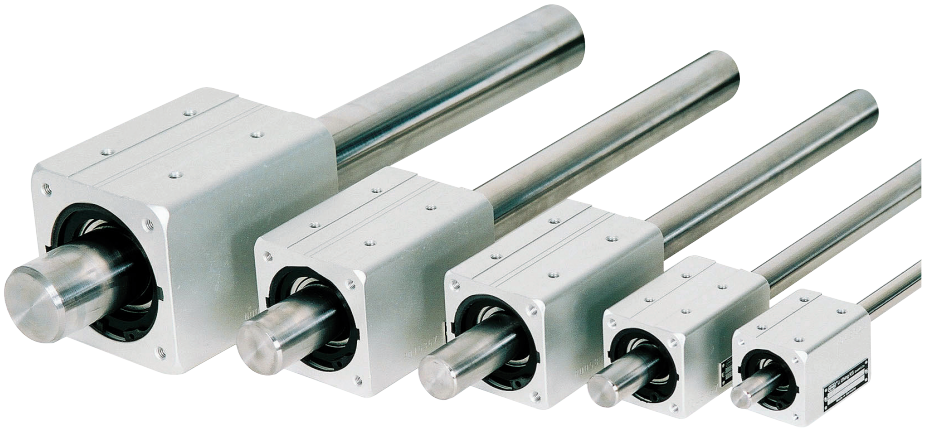
Drive for Double Sliding Doors



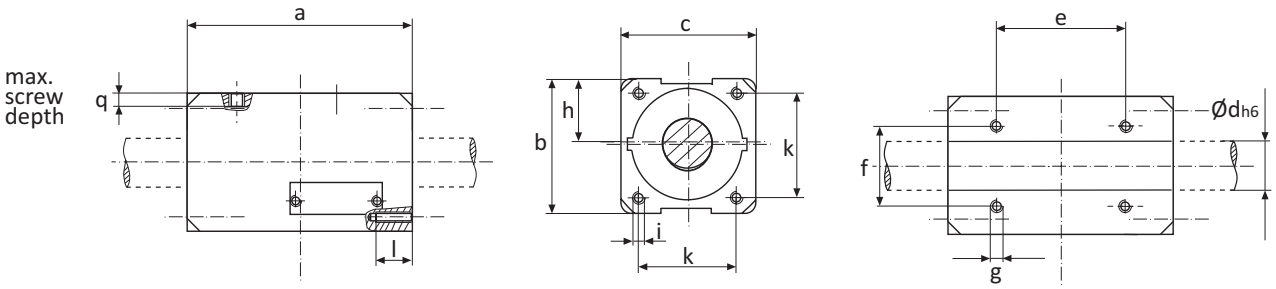
Ejector Unit for contaminated foodstuffs



RS - Linear Drive Nuts



Special design for open Linear Drive Nuts upon request



Dimensions and Technical Data

RS	Dimensions (mm)							
Order Ref.	a*	a_1*	b	c	Ød$_{h6}$	e	f	g
RS3-08-4	40	54	30	30	8	26	16	M4
RS4-08-4	48	62	30	30	8	26	16	M4
RS3-10-4	47	65	35	35	10	30	18	M4
RS4-10-4	55	73	35	35	10	30	18	M4
RS4-15-4	62	82	40	40	15	26	18	M4
RS4-20-4	83	108	52	52	20	40	30	M5
RS4-25-4	85	110	60	60	25	40	30	M5
RS4-35-4	105	126	80	80	35	50	40	M6
RS4-50-3	120	140	100	100	50	50	50	M8
RS4-60-3	130	156	120	120	60	69	62	M10

Order Ref.	h$^{\pm 0.3}$	i	k	l	q	F_{RS} (N)	M_0 (Ncm)	h (mm)	Mass (kg)
RS3-08-4	15	M3	24	6	5	50	0.7	4.0	0.09
RS4-08-4	15	M3	24	6	5	100	1.4	4.0	0.11
RS3-10-4	16.8	M3	26	6	5	100	1.8	5.0	0.14
RS4-10-4	16.8	M3	26	6	5	200	5.0	5.0	0.18
RS4-15-4	19.6	M4	30	8	5	260	5.0	7.5	0.23
RS4-20-4	26	M5	40	11	8	420	10.0	10.0	0.55
RS4-25-4	29.4	M5	45	10	9	600	20.0	12.5	0.70
RS4-35-4	40	M6	60	12	13	900	45.0	17.5	1.55
RS4-50-3	48.8	-	-	-	16	1300	140.0	25.0	2.70
RS4-60-3	58.4	-	-	-	15	2000	200.0	30.0	4.20

* **Note:** If wipers are used, dimension **a** becomes **a_1**

F_{RS} (N) = Maximum available side thrust / M_0 (Ncm) = Idling torque / h (mm) = Maximum pitch

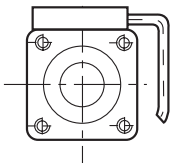
How to Order

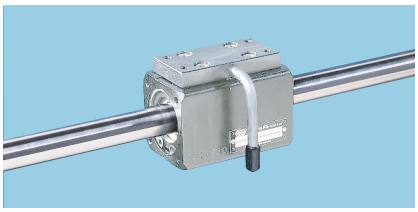
Product Group Type Reference	Uhing Linear Drive Nut							
	RS							
Style (Number of Rolling Rings)	**3** or 4		3 or **4**					
Size (Shaft Diameter)	**8**	**10**	**15**	**20**	**25**	**35**	50	60
Design Category	4	4	4	4	4	4	3	3
Pitch Direction	**L** (Left), **R** (Right)							
Pitch	0.1 x shaft Ø 0.4 x shaft Ø		0.2 x shaft Ø **0.5 x shaft Ø**		0.3 x shaft Ø			
Available Features*	F, P, R							
Customer Specific Features**	X							

In bold: standard versions

*Available Features

F - Mechanical Free-Movement Lever

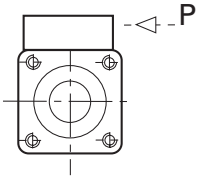




Free-movement lever for disengagement & manual repositioning of unit on shaft.

When disengaged, the nut can be slid freely along the shaft.

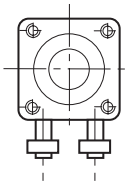
P - Pneumatic Free-Movement Lever



As above, operated with a pressure of p = 6 bar

Attention: Units supplied with P have a reduced thrust.
Refer to Techna for details

R - Steady Rollers

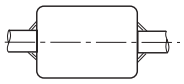


Rolls on Linear Drive Nut (in conjunction with a guide bar) prevent the rotation of the nut on the shaft.

Not available for RS-08

**Customer Specific Features

W - Wipers

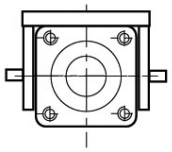


For sealing between nut and shaft (to +70°C)

Attention: For units with Wipers please note dimension a_1 on page 35.

Adapter

for twist-free coupling system



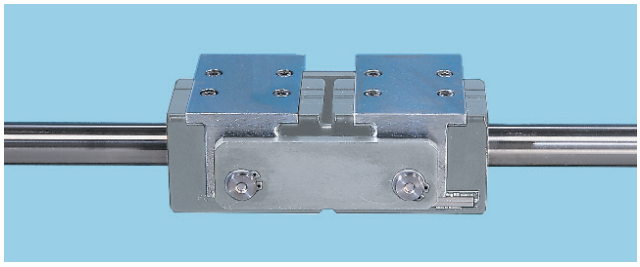
* See Operating Guide for separately carried loads (see page 39).

Other features on request

- Felt rings
- Increased protection against corrosion
- Specific pitch
- Grease nipples
- Reduced thrust

Example of Ordering Specifications

Type Reference	RS	4	-	25	-	4		R		12.5		P		X
Style		●												
Size (shaft dia.)				●										
Design Category						●								
Pitch Direction								●						
Pitch										●				
Available Features												●		
Customer Specific Features														●



Linked-nuts provide doubled side thrust

RS Drive Nut Selection

Formulae and Related Units

d(mm)	- Shaft diameter
F(N)	- Side thrust required
F_{RS}(N)	- Side thrust produced by Linear Drive Nut type RS
F_R(N)	- Friction ($F_N \cdot \mu$) only relevant when the associated mass is mounted on its own independent carriage
F_N(N)	- Normal force of total weight of associated mass and carriage
μ	- Coefficent of friction
F_Z(N)	- Additional force requirement e.g. where unit is utilised as a reciprocating cutting device, the force required to cut material
f(mm)	- Shaft sag from diagram
g(m/sec²)	- Acceleration due to gravity (9.81m/sec²) Note: for horizontal applications m·g = 0
h(mm)	- Pitch of unit (travel per shaft revolution)
l(mm)	- Length of shaft between centre of bearing brackets
m(kg)	- Total mass to be moved, including Drive Nut, connections etc.
M_d (Ncm)	- Drive torque
M_o (Ncm)	- Idling torque
n(r.p.m.)	- Shaft speed
n_{crit}(r.p.m.)	- Critical shaft speed
P(kW)	- Drive power required
t(s)	- Acceleration or braking time
v(m/sec)	- Maximum speed of travel
C(N)	- Dynamic loading of Rolling Rings
P_R(N)	- Radial loading of Rolling Rings

1 - Side Thrust

$$F = 2 \left(\frac{m \cdot v}{t} + m \cdot g \right) + F_R + F_Z$$

A Linear Drive Nut should be selected which has a greater side thrust than the value calculated.

$F < F_{RS}$

Several smaller Linear Drive Nuts can be coupled together if available space so dictates. The total thrust available is the sum of the individual values.

2 - Shaft Speed

$$n = \frac{v \cdot 6 \cdot 10^4}{h_{max}}$$

2.1 - Max. shaft speed

RS 3-08-4 =10000 rpm
RS 4-08-4 =10000 rpm
RS 3-10-4 =10000 rpm
RS 4-10-4 =10000 rpm
RS 4-15-4 = 8000 rpm
RS 4-20-4 = 7000 rpm
RS 4-25-4 = 6000 rpm
RS 4-35-4 = 4000 rpm
RS 4-50-3 = 3400 rpm
RS 4-60-3 = 2500 rpm

2.2 - Critical shaft speed

$$n_{crit} = 1.225 \cdot 10^8 \frac{d}{l^2}$$

Note: Depending upon its quality, the shaft can go out of balance at a speed of up to 25% lower than that specified above.

If it is necessary to go through a critical range in order to reach the operational speed, this can lead to short term shaft vibration. This has no effect on the operation of the Linear Drive Nut.

If the operational speed is in the critical speed range, this can be rectified as follows:

1. with a double bearing support at one end, increase factor approx. 1.5.
2. with double bearing supports at both ends, increase factor approx. 2.2.

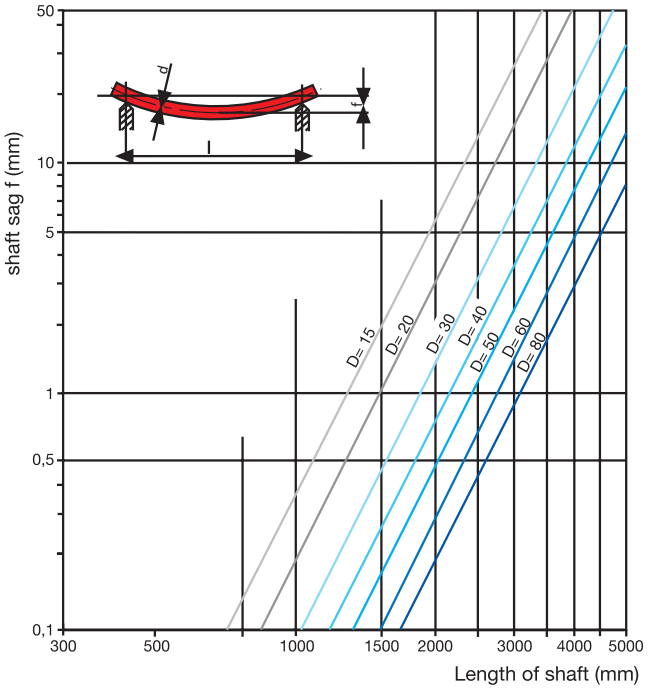
The distance between the bearing support brackets should be at least 2.5 x the diameter of the shaft.

3 - Drive Torque

$$M_d = \frac{F_{RS} \cdot h}{20 \cdot \pi} + M_0$$

Values for M_0 to be taken from the technical data table on page 35.

4 - Shaft Sag



5 - Calculation of the Operational Life of Rolling Rings

1. Select a "C" (constant) value for unit type:

Type	C(N)
RS 08	3200
RS 10	4620
RS 15	5590
RS 20	9560
RS 25	11200
RS 35	15900
RS 50	21600
RS 60	29600

2. Calculate P_R

All RS 3: $P_R = 5 \cdot F_{RS}$*

All RS 4 $P_R = 2.5 \cdot F_{RS}$*

Note: *F = standard maximum side thrust produced by unit, unless the side thrust has been derated to increase operational life of rolling-rings (see note below).

3. Divide C by P_R

4. Calculate the required shaft speed

$$n = \frac{v \cdot 6 \cdot 10^4}{h_{max}}$$

5. Determine the operational life in hours from the nomogram.

Note: Derating Side Thrust

If the width of the required traverse dictates that the unit selected is larger than otherwise necessary we generally end up with a Uhing traverse unit with more thrust than is required for the application. Using a unit with derated side thrust in this type of application will extend the life of the rolling rings in a Uhing traverse giving considerably extended service periods.

This MUST be included on your order.

Example:

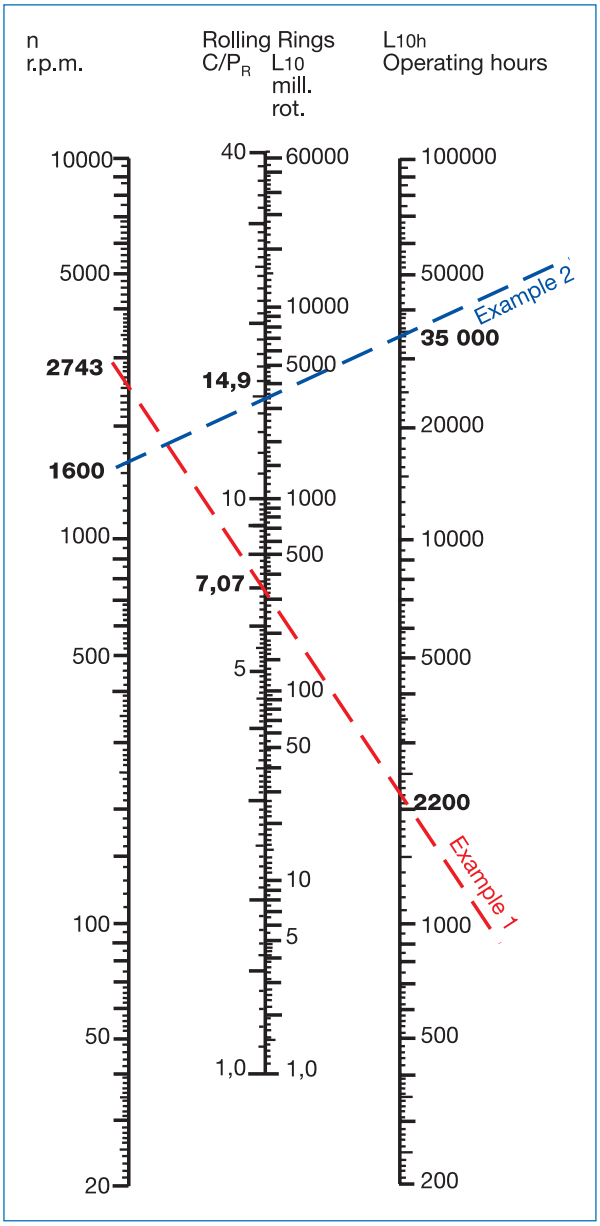
A 2500mm traverse width will dictate a selection of an RS4-60-3 unit to achieve the required shaft sag specification. However, if the application only requires 900N of side thrust we are using a unit that has more than two times this side thrust at 2000N.

At 2500mm the sag for an RS4-60-3 unit is approximately 4.55mm; however an RS4-35-4 has 29.58mm of shaft sag.

In this case we would use an RS4-60-3 and derate the side thrust to 900N, thus extending its service intervals.

Example 1	Example 2
RS4-35-4R17.5 speed 0.8 m/s	RS4-15-4R7.5 reduced side thrust 150 N speed 0.2 m/s
C = 15900	C = 5590
$P_R = 2.5 \cdot 900\ N = 2250\ N$	$P_R = 2.5 \cdot 150\ N = 375\ N$
$\frac{C}{P_R} = \frac{15900}{2250} = 7.07$	$\frac{C}{P_R} = \frac{5590}{375} = 14.9$
$n = \frac{0.8 \cdot 6 \cdot 10^4}{17.5} = 2743$ rpm	$n = \frac{0.2 \cdot 6 \cdot 10^4}{7.5} = 1600$ rpm
$L_{10h} = 2200$ Hours of operation	$L_{10h} = 35000$ Hours of operation

Nomogram



RS Drive Nut Operating Guide

1 - Shaft Material

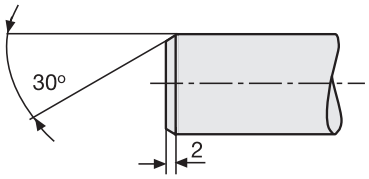
1.1 - Requirements

Uhing Linear Drives should only be used in conjunction with steel shafts manufactured from induction surface hardened, ground and finished bar of the following quality, minimum:

- surface hardness: 50 HRC
- tolerance on diameter: h6
- out of roundness: maximum one half of the diameter variation permitted by ISO tolerance h6
- true running tolerance (DIN ISO 1101): ≤ 0,1 mm/m

1.2 - Leading End Chamfer

The leading end of the shaft should be chamfered to avoid damage to the Rolling Rings when screwing the unit onto the shaft.



2 - Pitch

The standard pitch is 0.5 x shaft Ø. This can be ordered for RS as either a right or a left-handed pitch.

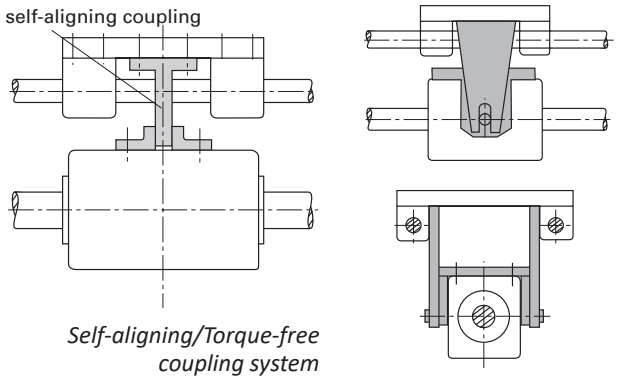
Unless otherwise specified, units having a right-handed pitch will be supplied. For RS subsequent alterations to the pitch are possible with units having a design category -4 reference by changing the associated pitch control wedges.

Non-standard pitches 0.1 - 0.2 - 0.3 and 0.4 x d are available. In this version reduction of the side thrust is recommended to improve smooth running.

3 - Separately Carried Loads

If Uhing Linear Drive Nuts are used to move separately carried loads, allowance should be made in the coupling to compensate for any misalignment between the drive shaft and the carriage. The available side thrust will otherwise be affected.

If the application so permits, we recommend the use of our self-aligning coupling system adapter (see page 36) to prevent unit from twisting on the shaft.



Self-aligning/Torque-free coupling system

4 - Vertical Applications

For vertical applications we advise the use of a directly braked motor so as to avoid the possibility of the shaft rotating backwards and the Linear Drive Nut falling due to the high efficiency of the drive.

Depending upon the application (safety considerations and value of the installation) a reserve of side thrust should be built in (using a second Linear Drive Nut).

With units having a free-movement lever, care must be taken before operation to ensure that they are unable to drop in an uncontrolled manner - danger of injury!

5 - Temperature Range

Uhing Linear Drive Nuts are suitable for operation at temperatures from -10°C to +50°C.

Please enquire for other temperatures.

6 - Maintenance

For the lubrication of the shaft, commercially available MoS2-free ballbearing greases can be used, e. g. SKF Alfalub LGMT2, Shell Alvania R2 or G2, Esso Beacon 2, BP Energrease LS2.

Procedure: Clean the shaft and spread the grease as thinly as possible with a rag.

Frequency: Once every ten weeks.

7 - Symmetry

The maximum difference in pitch for the two directions of travel is 2%. We therefore recommend the use of positional sensors for positioning applications.