Uhing Lineartriebe®
Uhing Linear Drives®

Rollringgetriebe
Rolling Ring Drives
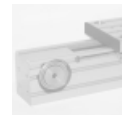
Zubehör
Accessories

Model RS & ARS
Technical Information

Zahnriemenantriebe
Timing Belt Drive
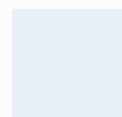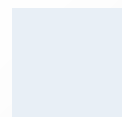
Klemm- und Spannelemente
Clamping Systems

Verlegesysteme
Winding Systems

Uhing *Motion* Drive®

Uhing *Modular* Winder

Selection

If you wish Joachim Uhing GmbH & Co. KG to make a selection for you in respect of your application, please ask for: Applications Questionnaire 03e.

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 (FN ·μ) only relevant when the 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 e.g. component of the cutting force of a separator
f(mm) = shaft sag from Fig.1
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 centres of bearing brackets
m(kg) = total mass to be moved, including Drive Nut, connections etc.
Md (Ncm) = drive torque
Mo (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 Drive Nut should be selected which has a greater side thrust than the value calculated.

$$F < F_{RS}$$

Several smaller 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 min⁻¹
RS 4-08-4 =	10000 min⁻¹
RS 3-10-4 =	10000 min⁻¹
RS 4-10-4 =	10000 min⁻¹
RS 4-15-4 =	8000 min⁻¹
RS 4-20-4 =	7000 min⁻¹
RS 4-25-4 =	6000 min⁻¹
RS 4-35-4 =	4000 min⁻¹
RS 4-50-3 =	3400 min⁻¹
RS 4-60-3 =	2500 min⁻¹

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 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

$$Md = \frac{F_{RS} \cdot h}{20 \cdot \pi} + Mo$$

Values for Mo to be taken from the technical detail tables.

4. Shaft Sag
see Diagram Fig.1

5. Calculation of the operational life of Uhing Rolling Rings

Fig. 1

1. Select C

Typ	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 RS3-types: $P_R = 5 \cdot F_{RS}$*
All RS4-types: $P_R = 2{,}5 \cdot F_{RS}$*
*F = calculated value of the side thrust according to 2.1 and 2.2 only if increasing of operational life time of the Rolling Rings is really necessary. In case of order it is an absolute must to mention.
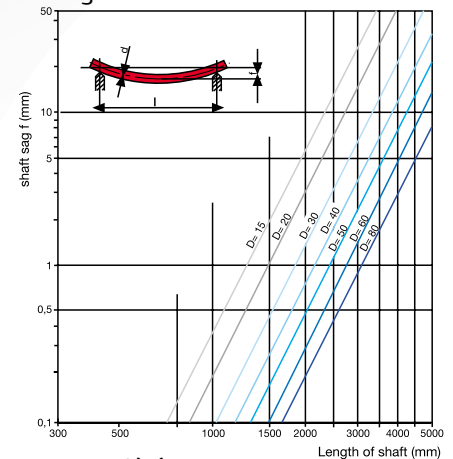
3. Divide C by P_R
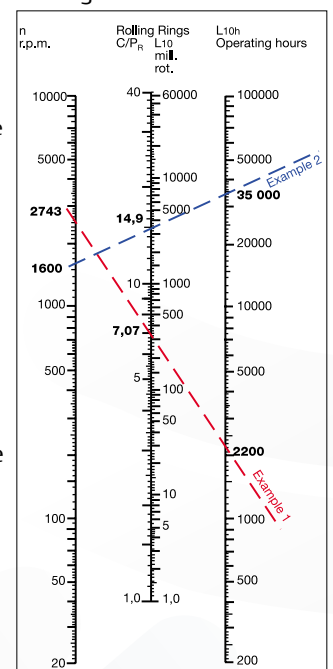
4. Calculate the required shaft speed

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

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

Nomogram

	Example 1	Example 2
	RS4-35-4R17,5 Speed 0,8 m/sec.	RS4-15-4R7,5 Speed 0,2 m/sec. **reduced side thrust 150 N**
1.	C = 15.900	C = 5590
2.	P_R = 2,5 · 900 N = 2.250 N	P_R = 2,5 · 150 N = 375 N
3.	$\dfrac{C}{P_R} = \dfrac{15.900}{2.250} = 7{,}07$	$\dfrac{C}{P_R} = \dfrac{5.590}{375} = 14{,}9$
4.	$n = \dfrac{0{,}8 \cdot 6 \cdot 10^4}{17{,}5} = 2.743$ rpm	$n = \dfrac{0{,}2 \cdot 6 \cdot 10^4}{7{,}5} = 1.600$ rpm
5.	L_{10h} = 2.200 Hours of operation	L_{10h} = 35.000 Hours of operation

Operational Guide

1. Shaft material

1.1. Basic 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. Uhing Precision Shaft

Standard:Material Cf 53, Mat.-Nr. 1.1213, induction surface hardened, 60-64 HRC
Rust resistant:
Material X 40 Cr 13, Mat.-Nr. 1.4034, induction surface hardened, 51-55 HRC
Rust and acid resistant:
Material X 90 CrMoV 18, Mat.-Nr. 1.4112, induction surface hardened, 52-56 HRC

- all ground and superfinished
- surface roughness: mean value (DIN 4768 T.1) R_a:≤ 0.35 µm
- tolerance on diameter: h6
- out of roundness: maximum one half of the dia meter variation permitted by ISO tolerance h6
- true running tolerance(DIN ISO 1101): ≤ 0.1 mm/m

1.3. Uhing Precision Shafts with Enhanced True Running Tolerance

Available in the above styles, but true running tolerance (DIN ISO 1101): ≤0.03 mm/m

1.4. Leading end chamfer

30°

X
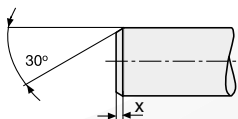
X = depends upon type

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

2. Pitch

The standard pitch is 0,5 x d. 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 the 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 twist-free coupling system.

self-alingning coupling
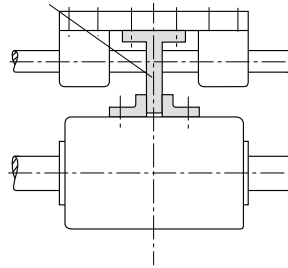
Torque-free coupling system
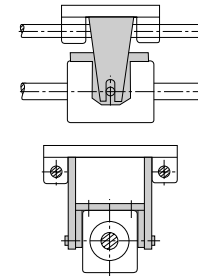
4. Vertical applications

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 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 Drive Nut).

With units having a free-movement lever, care must be taken before its 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 +70°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.

We reserve the right to make technical alterations.

For further information please refer to our Operating Instructions 05e, available on request or in the internet as download:

www.uhing.com

Worldwide

**The addresses of our agencies are available in the internet:
www.uhing.com**