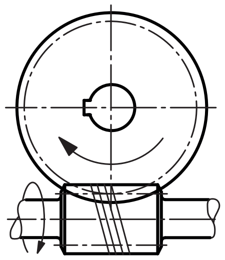
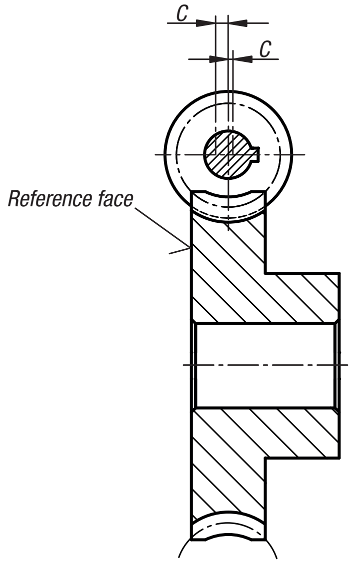
Technical information for worm gears

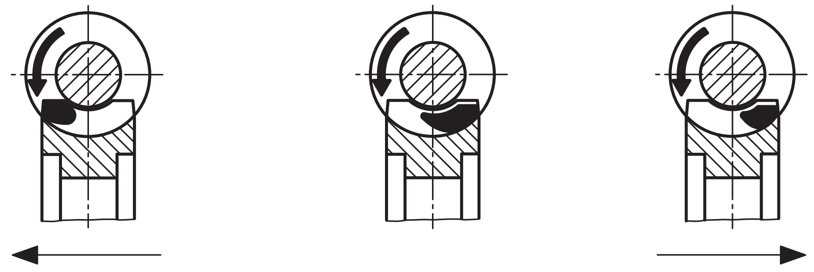
Worm gears right hand



The parts available from the catalogue are right hand. Custom made left hand gears for opposite direction of rotation are only available on request.

Installing the worm wheel





Slide the wheel in the direction of the arrow | **Correct marking** | **Slide the wheel in the direction of the arrow**

Check the contact pattern to ensure that the worm wheel is correctly installed with regard to axial positioning. The contact pattern should tend towards the runout edge of the wheel. When the worm gear is put into reverse, the contact pattern should tend towards the centre.

For lateral mounting of the worm wheel, the toleranced reference face is decisive. The lateral tolerance "c" must not exceed 0.15 mm for all centre distances.

Important: Some of the slots are not DIN standard. Please observe the specified slot widths.

Efficiency

The efficiency is generally dependent on the following conditions:

- Worm screw gradient angle
- Glide velocity
- Lubricant
- Surface finish
- Installation dimensions

The efficiency improves with increasing axial distance. For reasons of space and economy, plain bearings are often used by smaller centre distances. These have a higher co-efficient of friction compared to ball bearings and can strongly effect the overall efficiency. The specified efficiency values are only valid under optimum conditions.
Start-up efficiency: The lubricating film between the tooth flanks only forms once the transmission is in motion causing the start-up efficiency to be ca. 30% lower than the operating efficiency specified in the catalogue.

Self-locking

Self-locking is influenced by the gradient angle, the surface finish on the flanks, the glide velocity, the lubricant and the resulting heating. There is a difference between dynamic and static self-locking.
Dynamic self-locking: up to 3° gradient angle with grease lubrication; up to 2.5° gradient angle with synthetic oil lubrication.
Static self-locking: from 3° to 5° gradient angle with grease lubrication; from 2.5° to 4.5° gradient angle with synthetic oil lubrication. There is no self-locking by gradient angles over 4.5° or 5°. Shocks and vibrations can hinder the self-locking function. A number of factors relating to lubrication, glide velocity and load can create glide characteristics such that the self-locking function is negatively influenced and for this reason, no guarantees can be made with regard to the self-locking function.

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Torque data and service life

The torque data is based on a screw speed of 2800 rpm. By reduced screw, the torque increases by the following factors:

n1	2800 rpm	1400 rpm	950 rpm	700 rpm	500 rpm	250 rpm	125 rpm
Factor n1	1	1,12	1,2	1,26	1,33	1,49	1,67

A service life of ca. 3000 hours is basic. The following factors are used for a shortened or increased service life:

Service life	approx. 3000 hours	approx. 1500 hours	approx. 6000 hours
Factor Sl	1	1,4	0,71

Calculation example (operating conditions not taken into account)

Gear size centre distance 40 mm; transmission ratio 1:35; mineral oil lubrication; screw speed 700 rpm; service life 1500 hours

What output torque does this produce on the worm wheel?

Output torque = T2 (mineral oil) x n (factor) x L (factor) <= breaking point

= 37.2 Nm x 1.26 x 1.4

= 65.6 Nm

Warning! The output torque is limited by attainment of the yield point of the gear wheel. The yield point is attained at factor ca. 3 (or 300%) of the catalogue data.

T2 for mineral oil = 37.2 Nm x 3 = 111.6 Nm.

Calculation example (operating conditions taken into account)

Operating factors

Due to the wide spectrum of possible applications, the operating factors are guideline values that should be used at ones own discretion. When commissioning it must be taken into account that, independent of the type of operation, the housing temperature does not exceed 80 °C.

Shocks at the drive	None	Medium	Strong
Operating factor f1	1	1,2	1,5

Start-up frequency	10/h	60/h	360/h
Start-up factor f2	1	1,1	1,2

Duty cycle DC	<40%	<70%	<100%
Duty cycle factor f3	1	1,15	1,3

Gear set size 40 mm centre distance, transmission ration 1:35, T2=65.6 Nm (see above calculation) however with severe jolts / 360 starts per hour / 100% duty cycle operating conditions.

$$\textbf{Output torque} = \frac{T2}{f1 \times f2 \times f3} = \frac{65{,}6\ \text{Nm}}{1{,}5 \times 1{,}2 \times 1{,}3} = 28\ \text{Nm}$$

The relationship between service life, speed and torque can be calculated using the following simplified formula

Calculation of the service life (Lh new) with the required torque (T2 new)	$L_{h\ new} = \left(\frac{T2_{Nom.} \text{ x Factor n1}}{T2_{new}}\right)^2 \bullet L_{h\ Nom.}$	T2 Nom. = Output torque acc. to catalogue specifications Lh Nom. = Service life estimate acc. to catalogue ca. 3000 h
Calculation of the torque (T2 new) with the required service life (Lh new)	$T2_{new} = \frac{T2_{Nom.} \text{ x Factor } n_1}{\sqrt{\frac{L_{h\ new}}{L_{h\ Nom.}}}}$	