65742

Material
Housing - stainless steel (AISI 304), forged, hardened bearing race, superfinished, rolled thread.
Inner ring - stainless steel (AISI 304), hardened, superfine finish.
Lubrication - aluminium-complex-soap-grease, temp range -45°C to +120°C.

Lubrication nipple - DIN 3405 D1/A (until size 10) DIN 71412 H1 (from size 12).

Technical Notes
Low maintenance, sizes according to DIN ISO 12240-4 series K, for tolerances see technical pages.

Tips
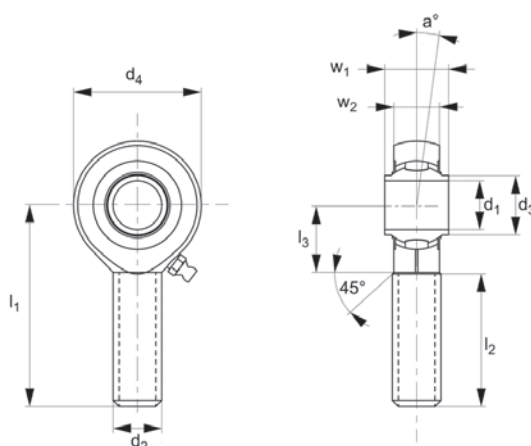Standard thread is right hand thread.

Important Notes
*Denotes fine pitch thread.

Order No.	Thread hand	d_1	l_1	d_2	d_3	l_2	d_4	$a°$	l_3	w_1	Weight g
65742.W0008	Right	8	42	M8	10.5	25	24	8.5	15	12	36
65742.W0010	Right	10	48	M10	12.0	29	28	8.0	15	14	60
65742.W0012	Right	12	54	M12	14.5	33	32	7.5	19	16	87
65742.W0016	Right	16	66	M16	19.0	40	42	8.0	22	21	190
65742.W0020	Right	20	78	M20x1,5*	24.5	47	50	7.0	28	25	338
65742.W0508	Left	8	42	M8	10.5	25	24	8.5	15	12	36
65742.W0510	Left	10	48	M10	12.0	29	28	8.0	15	14	60
65742.W0512	Left	12	54	M12	14.5	33	32	7.5	19	16	87
65742.W0516	Left	16	66	M16	19.0	40	42	8.0	22	21	190
65742.W0520	Left	20	78	M20x1,5*	24.5	47	50	7.0	28	25	338

Order No.	w_2	Calc. factor Y	Calc. factor Y_0	Dyn. load C kN max.	Speed rpm max.	Static load C_0 kN max.
65742.W0008	9.00	1.89	1.80	0.7	1300	2.8
65742.W0010	10.50	1.81	1.90	1.0	1225	3.1
65742.W0012	12.00	1.82	1.74	1.3	1125	3.5
65742.W0016	15.00	2.35	2.24	1.6	975	4.3
65742.W0020	18.00	2.58	2.46	2.3	825	5.4
65742.W0508	9.00	1.89	1.80	0.7	1300	2.8
65742.W0510	10.50	1.81	1.90	1.0	1225	3.1
65742.W0512	12.00	1.82	1.74	1.3	1125	3.5
65742.W0516	15.00	2.35	2.24	1.6	975	4.3
65742.W0520	18.00	2.58	2.46	2.3	825	5.4

65780

Material
Rod end housing - forged steel, tempered, case hardened bearing race, ground and lapped, surface galvanized.
Inner ring - ball bearing steel, hardened, superfine ground.
Lubrication - calcium-complex-soap-grease, temp. range -20°C to +120°C, lubrication nipple - DIN 71412 HZ.

Technical Notes
Low maintenance. Sizes according to DIN ISO 12240-4, series K, for tolerances see technical pages.

Tips
Standard thread is right hand thread.

Important Notes
*Denotes fine pitch thread.

Order No.	Thread hand	d_1	l_1	d_2	d_3	l_2	d_4	a°	Weight g
65780.W0112	Right	12	54	M12	14.5	33	32	7.5	88
65780.W0116	Right	16	66	M16	19.0	40	42	7.0	185
65780.W0120	Right	20	78	M20x1,5*	24.5	47	50	7.0	340
65780.W0125	Right	25	94	M24x2*	29.5	57	64	5.0	596
65780.W0130	Right	30	110	M30x2*	34.5	66	70	7.5	912
65780.W0512	Left	12	54	M12	14.5	33	32	7.5	88
65780.W0516	Left	16	66	M16	19.0	40	42	7.0	185
65780.W0520	Left	20	78	M20x1,5*	24.5	47	50	7.0	340
65780.W0525	Left	25	94	M24x2*	29.5	57	64	5.0	596
65780.W0530	Left	30	110	M30x2*	34.5	66	70	7.5	912

Order No.	l_3	w_1	w_2	Dyn. load C kN max.	Speed rpm max.	Static load C_0 kN max.
65780.W0112	19	16	12	10.25	1125	6.6
65780.W0116	22	21	15	13.3	975	8.9
65780.W0120	28	25	18	17.0	825	11.7
65780.W0125	30	31	22	24.90	600	18.5
65780.W0130	35	37	25	32.5	450	24.8
65780.W0512	19	16	12	10.25	1125	6.6
65780.W0516	22	21	15	13.3	975	8.9
65780.W0520	28	25	18	17.0	825	11.7
65780.W0525	30	31	22	24.9	600	18.5
65780.W0530	35	37	25	32.5	450	24.8

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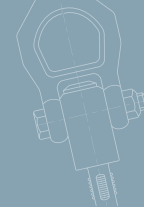
Parts overview

Heavy Duty Rod Ends: integral spherical plain bearings - series K and series E

Male and female rod ends, maintenance free. These are our most popular range of heavy duty rod ends. Bore diameters 5mm up to 30mm.

Spherical Plain Bearings: steel and stainless steel

65974 is our lowest cost, most popular option spherical bearing. Stainless steel version **65976** requires maintenance. **65974** is maintenance free. Bore diameters 5mm up to 30mm.

Heavy Duty Rod Ends: integral ball bearings - series K and series E

Male and female rod ends. Different bore sizes in relation to the thread size. All require maintenance. Bore diameters 6mm up to 30mm.

Stainless Steel Heavy Duty Rod Ends: integral spherical plain bearings

Male and female rod ends maintenance free.

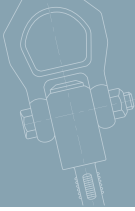### Low Cost Rod Ends: with spherical plain bearing

These are our most popular male and female rod ends. Maintenance free. Female-bore diameters 5mm up to 12mm. Male-bore diameters 5mm up to 16mm.

Rod Ends with Studs

Steel and Stainless steel, male and female, maintenance free. Sizes M6 up to M16.

see our website for our full range: **wixroyd.com**

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All of our rod ends incorporate either a plain spherical bearing, ball bearing, or roller bearing. Below is an overview of each type.

Plain spherical bearings

1. Thin coating made from Polyamid-PTFE-fibreglass - compound, maintenance free, absorbs any foreign particles.
2. Ball made of bearing steel, hardened, ground, polished and hard chromium plated, ensures reliable corrosion protection.
3. No clearance - radial clearance 0-10µm.
4. All rod end housings made of forged steel, tempered, extremely high load resistances.
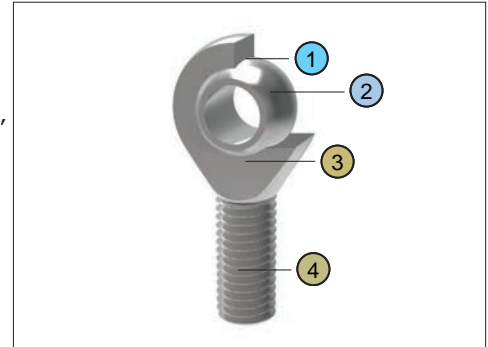
Ball and roller bearings

1. Radial clearance: 10-30µm, low friction.
2. Inner ring made of bearing steel, hardened ball grooves polished.
3. Shields on both sides protect against rough dirt penetration.
4. All rod ends housings are made of forged steel, case hardened bearing race.
5. Low maintenance due to long-term greasing, especially suitable for high speed large swiveling angles or rotating movements.
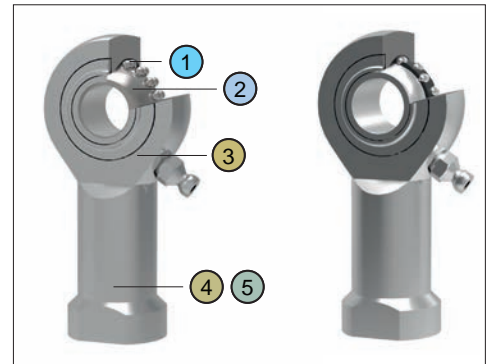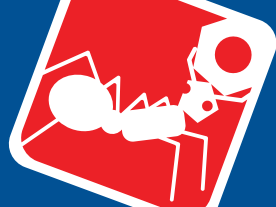

Rod ends and water

Stainless steel versions

Most of our rod ends are available in stainless steel as standard.

High grade AISI 316 stainless steel available on request.

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In many cases heavy-duty rod ends with integral spherical plain bearings are most often used. They are above all used for small swivelling or tilting movements at low speeds. They stand out for their high load capacity and can also be used for shock-like loads. The rod end ball slides on a plastic bearing shell consisting of a glass fibre-filled nylon/teflon compound. This design assures a maintenance-free rod end. Heavy-duty plain bearing rod ends have slight initial movement friction and virtually no clearance. The plastic material used has another advantage in that it can absorb many foreign particles so that no damage can occur. The balls of heavy-duty rod ends with integral spherical plain bearings are hard chrome plated. This reliable corrosion protection ensures that the function of the rod end will not be affected by a corroded ball surface under humid operating conditions.

Rod ends with integral maintenance-free spherical plain bearings

This design is especially suitable for high speeds, large swivelling angles or rotating movements with relatively low or medium loads. Prominent technical features are the low bearing friction, long-time greasing as well as the sealing against some dirt pentration (by means of shields on both sides). Under normal operating conditions the rod ends are maintenance-free. Greasing nipples are provided for lubrication in case of rough operations and maximum loads. To avoid incompatibility with the production lubrication, we recommend lubrication with a calcium-complex-soap-grease. A special heat treatment procedure gives the rod end housing a raceway hardness adapted to the antifriction bearing, ensuring at the same time high stability with changing loads.

Rod ends with integral ball bearings

This design, based on the structure of a self-aligning roller bearing is preferably used for high speed, large tilting angles or rotating movements under high loads. Compared to rod ends with ball bearings, rod ends with self-aligning roller bearings essentially have higher basic load ratings. This design is equipped with a cage to minimise the rolling friction and heat build-up. These rod ends, with long-time lubrication are under normal operating conditions maintenance-free. Greasing nipples are provided for lubrication in case of rough operations and maximum loads. To avoid incompatibility with the production lubrication, we recommend lubricating with a calcium-complex-soap-grease. Shields on both sides limit dirt particles from penetrating into the bearing. The rod ends with roller bearings are subjected to a special heat treatment to obtain a raceway hardness adapted to the antifriction bearings, ensuring at the same time a high stability with changing loads.

Rod ends with integral roller bearings

Rod end bearings load capacity explained

The static load capacity C_0 is the radially acting static load which does not cause any permanent deformation of the components when the spherical bearing or rod end is stationary, (i.e. the load condition without pivoting, swivelling or tilting movements). It is also a precondition here that the operating temperature must be at normal room temperature and the surrounding components must possess sufficient stability.

The values specified in the tables are determined by static tension tests on a representative number of series components at 20°C normal room temperature. The static load capacity may vary with lower or higher temperature depending on the material. In the case of all rod ends with plain bearings, the static load rating refers to the maximum permissible static load of the rod end housing in a tensile direction up to which no permanent deformation occurs at the weakest housing cross-section. The value in the product tables has a safety factor of 1.2 times the tensile strength of the rod ends housing material.

Static load capacity C_0 (plain bearings)

For our rod ends with roller and ball bearings, the static load rating is the load at which the bearing can operate at room temperature without its performance being impaired as a result of deformations, fracture, or damage to the sliding contact surfaces (max 1/10,000[th] of the ball diameter).

Static load capacity C_0 (roller and ball bearings)

Dynamic load ratings serve as values for calculation of the service life of dynamically-loaded spherical bearings and rod ends. The values themselves do not provide any information about the effective dynamic load capacity of the spherical bearing or rod end. To obtain this information, it is necessary to take into account the additional influencing factors such as load type, swivel or tilt angle, speed characteristic, max. permitted bearing clearance, max. permitted bearing friction, lubrication conditions and temperature, etc.

Dynamic load capacities depend on the definition used to calculate them. Comparison of values is not always possible owing to the different definitions used by various manufacturers, and because the load capacities are often determined under completely different test conditions.

Dynamic load capacity C (plain bearings)

For our rod ends with roller and ball bearings, the dynamic load capacity is the load at which 90% of a large quantity of identical rod ends reach 1 million revolutions before they fail (due to fatigue of the rolling surfaces.)

Dynamic load capacity C (roller and ball bearings)

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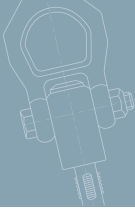
ROD ENDS

Operating temperatures

Heavy-duty ball and roller bearing rod ends can be used for operating temperatures between -20°C and +120°C. The temperature range of heavy-duty rod ends with integral spherical plain bearing is between -30°C and +60°C, without affecting the load capacity. Higher temperatures will reduce the load capacity taken into account for the calculation of the 'working life' under the temperature factor C_2 on page 451.

Loads

The decisive parameters for the selection and calculation of heavy-duty rod ends are size, direction and type of load.

Radial or combined loads

The heavy-duty rod ends have been especially designed to cope with high radial loads. They can be used for combined loads, the axial load share of which does not exceed 20% of the corresponding radial load.

Unilaterally acting load

In this case the load acts only in the same direction, which means that the load area is always in the same bearing section.

Alternately acting load

In case of alternating loads, the load areas facing each other are alternately loaded and/or relieved, which means that the load changes its direction constantly by approximately 180°.

| radial or combined loads | unilaterally acting loads | alternately acting loads |
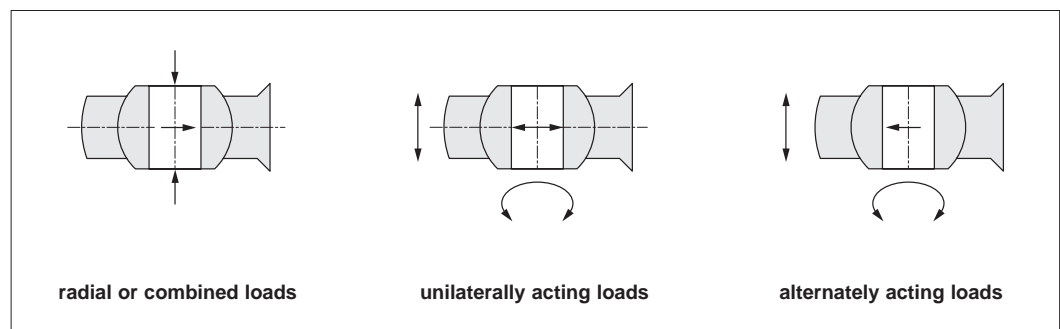
Swivelling angle

The swivelling angle is the movement of the rod end from one final position to the other. Half the swivelling angle a° is used to calculate the service or 'working life'.

swivel angle

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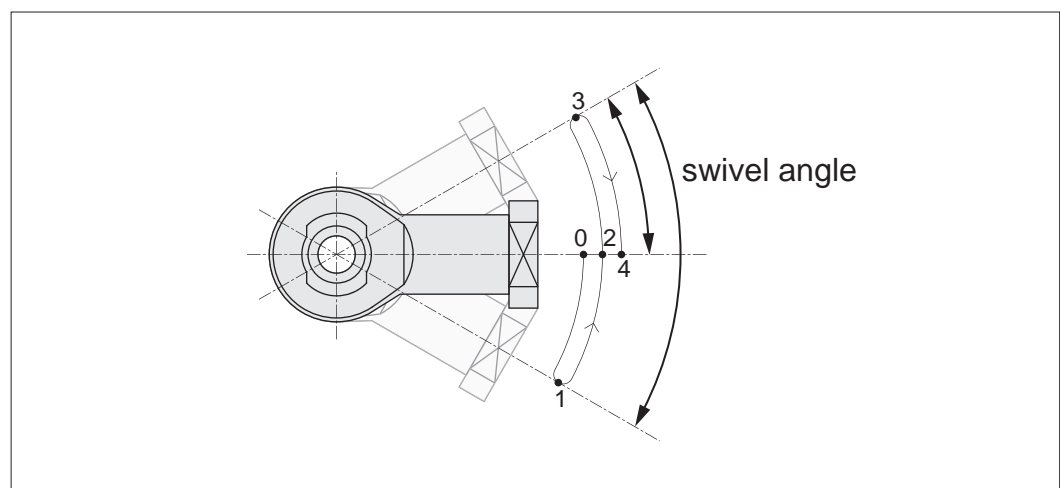
Angle of tilt

The angle of tilt, also called setting angle, refers to the movement of the joint ball and/ or the inner ring to the rod end axis (in degrees). The tilting angle (a) indicated in the table for the heavy-duty ball and roller bearing rod ends corresponds to the maximum possible movement being limited by the shields on both sides.

It is important that this tilting angle is not exceeded either during installation or operation, as otherwise the shields may be damaged. For heavy-duty plain bearing rod ends a distinction is made between the tilting angles (a_1 and a_2).

If the movement is not limited by adjacent components, then angle a_1 can fully be used without affecting the rod end capacity. Tilting angle a_2 is the movement limit when connecting a forked component.

Nominal service life
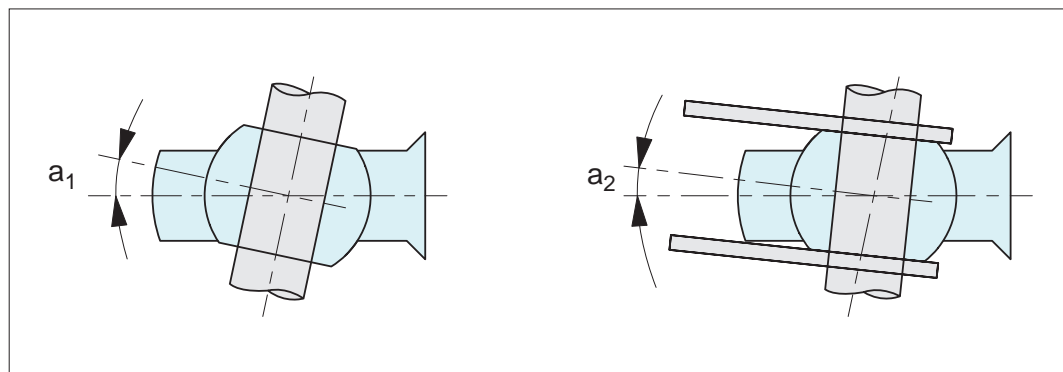
The term 'nominal service life' is used for heavy-duty ball and roller bearing rod ends and represents the number of swivelling motions or rotations and/or the number of service hours the rod end performs before showing the first signs of material fatigue on the raceway or roller bodies. In view of many factors that are difficult or impossible to assess, the service life of several apparently identical bearings differ under the same operating conditions.

For this reason, the following method for the service life determination of heavy-duty ball and roller rod ends results in a nominal service life being achieved or exceeded by at least 90% of a large quantity of identical rod ends.

Working life

The term 'working life' is used with heavy-duty plain bearing rod ends. It represents the number of swivelling motions or rotations and/ or the number of service hours the heavy duty plain bearing rod end performs before becoming unserviceable due to material fatigue, wear, increased bearing clearance or increase of the bearing friction moment.

The 'working life' is not only influenced by the size and the type of load, it is also affected by a number of factors, which are difficult to assess. A calculation of the exact service life is therefore impossible. Field-experienced standard values for the approximate 'working life' can nevertheless be determined by using the following calculation procedure which is based on numerous results from endurance test runs and values from decades of experience. The values determined by this formula are achieved, if not exceeded, by the majority of the heavy-duty rod ends.
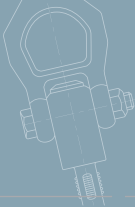
Heavy-duty rod ends

65700, 65720, 65740, 65742, 65760, 65780, 65800

d_1		d_{1mp} Tolerance limit		V_{d1p}	V_{d1mp}	b_{1s} Tolerance limit		h_s, h_{1s}, h_{2s} Tolerance limit	
Over	Icl.	Upper	Lower	Max.	Max.	Upper	Lower	Upper	Lower
	6	+0,012	0	0,012	0,009	0	-0,12	+0,8	-1,2
6	10	+0,015	0	0,015	0,011	0	-0,12	+0,8	-1,2
10	18	+0,018	0	0,018	0,014	0	-0,12	+1,0	-1,7
18	30	+0,021	0	0,021	0,016	0	-0,12	+1,4	-2,1
30	50	+0,025	0	0,025	0,019	0	-0,12	+1,8	-2,7

Dimensions and tolerance symbols

d_1 = nominal bore diameter of the inner ring or joint ball.

d_{1mp} = mean bore diameter deviation in one plane, arithmetical mean of the largest and smallest bore diameter.

V_{d1p} = bore diameter variation in one plane, difference between the largest and smallest bore diameter.

V_{d1mp} = mean bore diameter variation, difference between the largest and smallest bore diameter of one inner ring or joint ball.

b_{1s} = single inner ring or joint ball width deviation.

h, h_1, h_2 = single length from inner ring or ball bore centre to shank end.

h_s, h_{1s}, h_{s2} = single length variation of a single rod end.

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ROD ENDS

Permissible load

The maximum load is defined by the static basic load rating C_0. If static loads are a combination of radial and axial loads, the equivalent static load will have to be calculated.

$$P_0 \leq C_0 \ (N)$$

F_a = Axial load
F_r = Radial load
Y_0 = Axial factor, static, see individual product pages
Y_0 = Basic static load rating (kN), see individual product pages

P_0 = Static equivalent load
Self-aligning ball bearing $= P_0 = F_r + Y_0 \cdot F_a$
Self-aligning roller bearing $= P_0 = F_r + 5 \cdot F_a$

Nominal service life

For Rod Ends with integral self-aligning ball bearing **65740, 65742, 65760, 65820, 65840.**

Rotating

$$G_{h_{rot.}} = 10^6 \ \frac{\left(\frac{C}{P}\right)^3}{60 \cdot n} \ (h)$$

Oscillating

$$G_{h_{osc.}} = 10^6 \ \frac{\left(\frac{C}{P \sqrt[3]{\frac{ß}{90}}}\right)^3}{60 \cdot f} \ (h)$$

P = Dynamic equivalent load (kN)

Self-aligning ball bearing $= P = F_r + Y \cdot F_a$

Self-aligning roller bearing $= P = F_r + 9.5 \cdot F_a$

C = Basic dynamic load (kN), see individual product pages

Y = axial factor, dynamic, see individual product pages

$G_{h_{rot.}}$ = nominal service life for rotation (hours of operation)

$G_{h_{osc.}}$ = nominal service life for rotation (hours of operation)

$ß$ = half of swivelling angle (degree), $ß = 90$ should be used for rotation.
Condition: Swivelling angle $ß$ " 3°. For swivelling angles $ß < 3°$ we recommend the use of heavy-duty spherical plain bearing rod ends

n = rotation speed (rpm)

f = frequency of oscillation (rpm)

h = hours

For Rod ends with integral self-aligning roller bearing **65780, 65800.**

Rotating

$$G_{h_{rot.}} = 10^6 \ \frac{\left(\frac{C}{P}\right)^{3,333}}{60 \cdot n} \ (h)$$

Oscillating

$$G_{h_{osc.}} = 10^6 \ \frac{\left(\frac{C}{P \sqrt[3]{\frac{ß}{90}}}\right)^{3,333}}{60 \cdot f} \ (h)$$

Calculation example

At the rotating side of a crank mechanism a ball or roller bearing rod end should be installed. The expected service life amounts to at least 5000 hours.

Selected: **65760.W0108** = 4,0 kN

$$G_{h_{rot.}} = 10^6 \ \frac{\left(\frac{C}{P}\right)^3}{60 \cdot n} \ (h)$$

$$= 10^6 \ \frac{\left(\frac{4,0}{0,75}\right)^3}{60 \cdot 300} = 8428 \ h > 5000 \ h \quad ☑$$
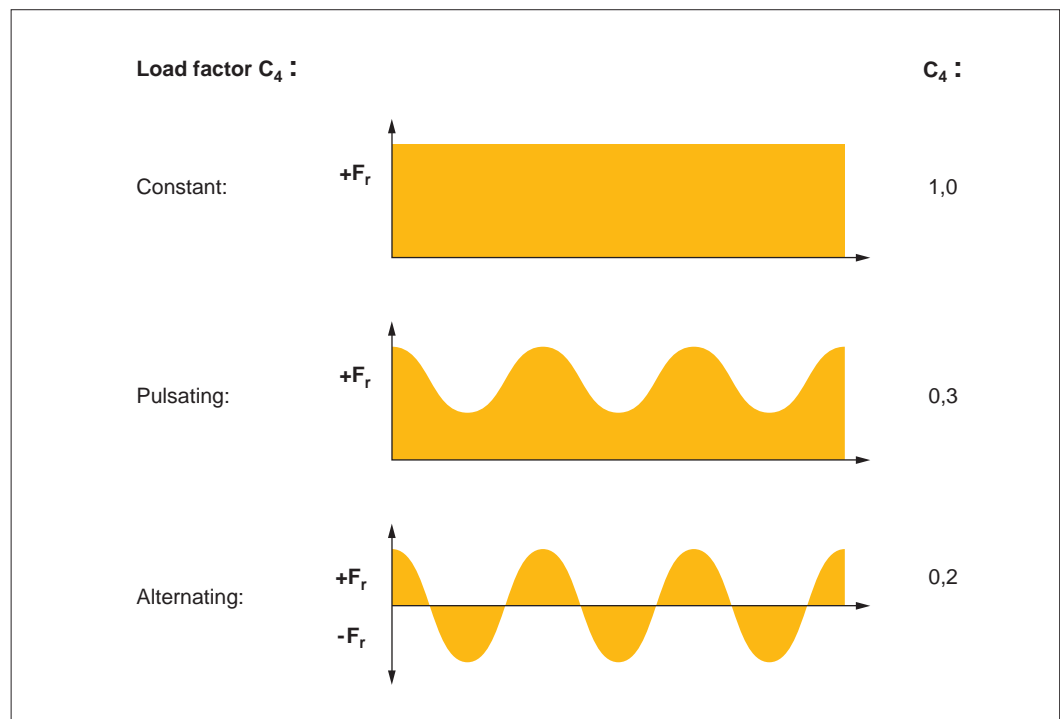

Permissible load

The maximum permissible load is calculated by using equation **1**. If static loads are a combination of radial and axial loads, the equivalent static load will have to be calculated using equation **2**.

Permissible load

Equation 1 $P_{max} = C_0 \cdot C_2 \cdot C_4$

Equation 2 $P = F_r + F_a \leq P_{max}$

P_{max}	=	Maximum permissible load (kN)
C_0	=	Static basic load (kN), see individual product pages
C_2	=	Temperature factor, see below
C_4	=	Factor for type of load, see below
P	=	Equivalent dynamic load (kN)
F_r	=	Radial load
F_a	=	Axial load (kN)
		Condition: Fa 0.2 • F$_r$

Load factor C_4 : C_4 :

Constant: +F_r 1,0

Pulsating: +F_r 0,3

Alternating: +F_r 0,2
             -F_r

Temperature factor C_2

Up to 60°C   1,0.
60°C to 80°C   0,8.
80°C to 100°C   0,7.
100°C to 120°C   0,8.

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ROD ENDS

The permissible sliding velocity of heavy-duty rod ends mainly depends on the load and temperature conditions. Heat generated by friction in the rod end housing is the main limitation on sliding velocity. When selecting the rod end size, it is necessary to determine the sliding velocity and the pv-value, which is a product of the specific bearing load p (N/mm²) and the sliding velocity v (m/s).

Specific bearing load

$$p = k \cdot \frac{P}{C}$$

Known: Permissible pv-value = 0,5 N/mm² • m/s

P $=$ Specific bearing load (N/mm²)
C $=$ Basic dynamic load rating (N), see individual product pages
k $=$ Specific load factor (N/mm²) for tribological pairing
k = 50 N/mm²

Mean sliding velocity

$$V_m = 5{,}82 \cdot 10^{-7} \cdot d_3 \cdot ß \cdot f$$

Known: Permissible sliding velocity v_{max} = 0,15 m/s

V_m $=$ Mean sliding velocity (m/s)
d_3 $=$ Pivot ball diameter (mm), see individual product pages
ß $=$ Half swivelling angle (degree), for swivelling angle > 180°
ß = 90° to be used
f $=$ Frequency of oscillation (rpm)

Nominal service life

$$G = C_1 \cdot C_2 \cdot C_3 \cdot \frac{3}{d_3 \cdot ß} \cdot \frac{C}{P} \cdot 10^8$$

$$G_h = C_1 \cdot C_2 \cdot C_3 \cdot \frac{5}{d_3 \cdot ß \cdot f} \cdot \frac{C}{P} \cdot 10^6$$

G $=$ Nominal service life (number of oscillations or revolutions)
G_h $=$ Nominal service life (hours)
C_2 $=$ Temperature factor, see previous pages
C_3 $=$ Material factor, see alignment chart on next page
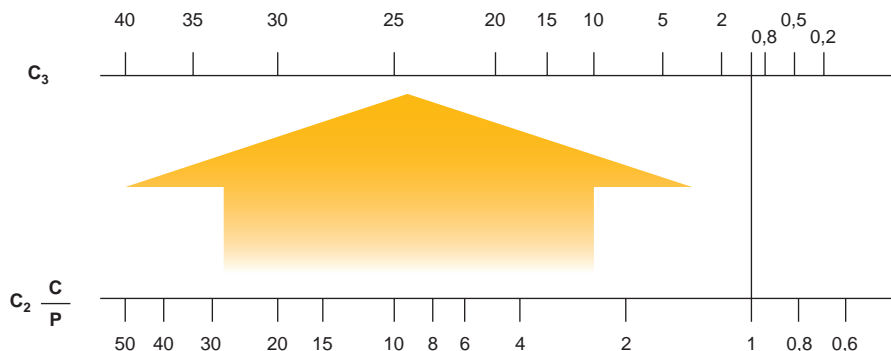C_1 $=$ Load direction factor
C_1 $=$ 1,0 $=$ Single load direction
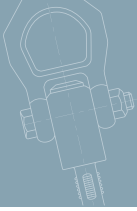
Alternating load direction at f < 30 rpm: C_1 = 0,250
Alternating load direction at f > 30 rpm: C_1 = 0,125

To find C_3 calculate $C_2 \cdot \dfrac{C}{P}$ and on the chart below, read across to C_3

C_2 $=$ Temperature factor
C $=$ Basic dynamic load rating (N) see individual product pages
P $=$ Specific bearing load (N/mm²)

C_3: 40 35 30 25 20 15 10 5 2 0,8 0,5 0,2

$C_2 \dfrac{C}{P}$: 50 40 30 20 15 10 8 6 4 2 1 0,8 0,6

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Calculation example

The rod end assembly of conveyor equipment calls for heavy-duty rod end with a service life of 7000 hours in conjunction with an alternating acting load of 5 kN. 25 swivelling moments with a swivelling angle of 20° take place per minute. The operating temperature amounts to approx. 60° C. The choice is a heavy-duty rod end **65880.W0115** with: C = 13,4 kN, d_3 = 22mm.

Checking the permissible load of the rod end

$$P_{max} = C_0 \cdot C_2 \cdot C_4$$

$$P_{max} = 41 \cdot 0,2 \cdot 1,0 = 8,2 \text{ kN} > 5,0 \text{ kN}$$

C_0 = 41 kN
C_2 = 1,0 (temperature 60°C)
C_4 = 0,2 (alternating load)

Checking the permissible sliding velocity

$$V_m = 5,82 \cdot 10^{-7} \cdot d_3 \cdot ß \cdot f = 5,82 \cdot 10^{-7} \cdot 22 \cdot 10 \cdot 25$$

$$= 0,0032 \text{ m/s} < 0,15 \text{ m/s} \quad ☑$$

Checking the p · V -value

$$pV = p \cdot V_m$$

$$pV = 18,66 \cdot 0,0032$$

$$= 0,06 \text{ N/mm}^2 \cdot \text{m/s} < 0,5 \text{ N/mm}^2 \cdot \text{m/s} \quad ☑$$

$$p = k \cdot \frac{P}{C} = 50 \cdot \frac{5000}{13400} \text{ x } 18,66 \text{ N/mm}^2$$

Nominal service life

$$G_h = C_1 \cdot C_2 \cdot C_3 \cdot \frac{5}{d_3 \cdot ß \cdot f} \cdot \frac{C}{P} \cdot 10^6$$

$$G_h = 0,25 \cdot 1,0 \cdot 12 \cdot \frac{5}{22 \cdot 10 \cdot 25} \cdot \frac{13,4}{5,0} \cdot 10^6$$

$$= 7308 \text{ h} > 7000 \text{ h} \quad ☑$$

Known: C_1 = 0,25 (alternating load direction, f = 25 rpm < 30 rpm)

$$C_3 = C_2 \cdot \frac{C}{P} = 1,0 \cdot \frac{13,4}{5,0} = 2,68$$

See alignment chart C_3 = 12

d_3 = 22
f = 25 rpm

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ROD ENDS

ROD ENDS

The ultimate radial static load rating is measured as the failure point when a load is increasingly applied to a pin through the rod end's bore and pulled straight up while the rod end is held in place. Note that the actual rating is determined by calculating the lowest of the following three values:

1. Raceway material comprehensive strength (R value)

$$R = E \times T \times X$$

2. Rod end head strength (H value, cartridge type construction)

$$H = \left[\left(\frac{T}{2}\sqrt{D^2 - T^2}\right) + \left(\frac{D}{2} \times SIN^{-1}\frac{T}{2}\right) - (\text{O.D. of Bearing} \times T)\right] \times X$$

Angle of $\dfrac{T}{2}$ expressed in radians

3. Shank strength (S value)

Male Threaded Rod End

$$S = [(\text{root diameter of thread}^2 \times .78) - (N^2 \times .78)] \times X$$

Female Threaded Rod End

$$S_2 = [(J^2 \times .78) + (\text{major diameter of thread} \times .78)] \times X$$

E = Ball diameter
T = Housing width
X = Allowable stress
D = Head diameter
N = Diameter of drilled hole in shank of male rod end
J = Shank diameter of female rod end

Radial static load

The axial static load capacity is measured as the force required to cause failure via a load parallel to the axis of the bore. Depending on the material types and construction methods, the ultimate axial load is generally 10-20% of the ultimate radial static load. The formula does not account for the bending of the shank due to a moment of force, nor the strength of the stake in cartridge-type construction.
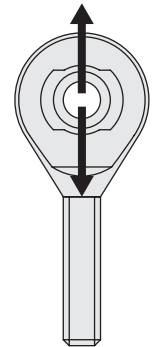
Axial strength (A value)

$$A = .78\left[(E + .176T)^2 - E2\right] \times X$$

X = Allowable Stress (see table)
E = Ball diameter
T = Housing width

Axial static load

Material	Allowable stress (PSI)
300 Series stainless steel	35,000
Low carbon steel	52,000

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