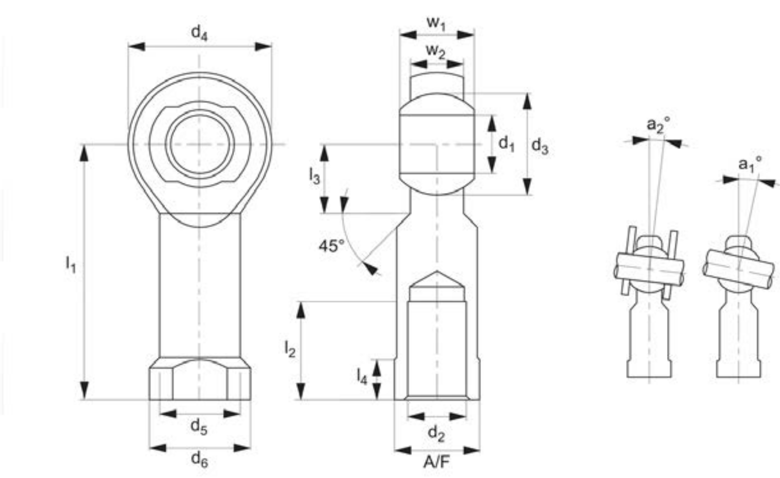
Stainless Heavy-Duty Rod Ends -
with integral spherical plain bearing



65722

Material
Rod end housing: Stainless steel DIN 12240-4 (AISI 304).
Joint Ball: Stainless steel 1.4412, hardened and ground, surface polished.
Race: nylon/teflon/glass compound.

Technical Notes
Maintenance free, for tolerances see technical page 123, standard thread is right hand thread.

Tips
A2 stainless steel provides good corrosion resistance to a wide range of atmospheric conditions and corrosive media.
It is considered resistant to potable water.

Important Notes
*Denotes fine pitch thread.

Order No.	Thread hand	d_1	l_1	d_2	d_3	d_4	d_5	d_6	l_2	Weight g
65722.W0104	Right	5	36	M4	11.11	18	9.0	11	10	18
65722.W0105	Right	5	36	M5	11.11	18	9.0	11	10	18
65722.W0106	Right	6	40	M6	12.70	20	10.0	13	12	24
65722.W0108	Right	8	48	M8	15.87	24	12.5	16	16	45
65722.W0110	Right	10	57	M10	19.05	28	15.0	19	20	74
65722.W0111	Right	10	57	M10x1,25*	19.05	28	15.0	19	20	74
65722.W0112	Right	12	66	M12	22.22	32	17.5	22	22	109
65722.W0113	Right	12	66	M12x1,25*	22.22	32	17.5	22	22	109
65722.W0114	Right	14	75	M14	25.40	36	20.0	25	25	155
65722.W0116	Right	16	85	M16	28.57	42	22.0	27	28	233
65722.W0117	Right	16	85	M16x1,5*	28.57	42	22.0	27	28	233
65722.W0118	Right	18	94	M18x1,5*	31.75	46	25.0	31	32	310
65722.W0120	Right	20	102	M20x1,5*	34.92	50	27.5	34	33	386
65722.W0122	Right	22	111	M22x1,5*	38.10	54	30.0	38	37	520
65722.W0125	Right	25	124	M24x2*	42.85	60	33.5	42	42	705
65722.W0130	Right	30	145	M30x2*	50.80	70	40.0	50	51	1084
65722.W0131	Right	30	145	M27x2*	50.80	70	40.0	50	51	1084
65722.W0504	Left	5	36	M4	11.11	18	9.0	11	10	18
65722.W0505	Left	5	36	M5	11.11	18	9.0	11	10	18
65722.W0506	Left	6	40	M6	12.70	20	10.0	13	12	24
65722.W0508	Left	8	48	M8	15.87	24	12.5	16	16	45
65722.W0510	Left	10	57	M10	19.05	28	15.0	19	20	74
65722.W0511	Left	10	57	M10x1,25*	19.05	28	15.0	19	20	74
65722.W0512	Left	12	66	M12	22.22	32	17.5	22	22	109
65722.W0513	Left	12	66	M12x1,25*	22.22	32	17.5	22	22	109
65722.W0514	Left	14	75	M14	25.40	36	20.0	25	25	155
65722.W0516	Left	16	85	M16	28.57	42	22.0	27	28	233
65722.W0517	Left	16	85	M16x1,5*	28.57	42	22.0	27	28	233
65722.W0518	Left	18	94	M18x1,5*	31.75	46	25.0	31	32	310

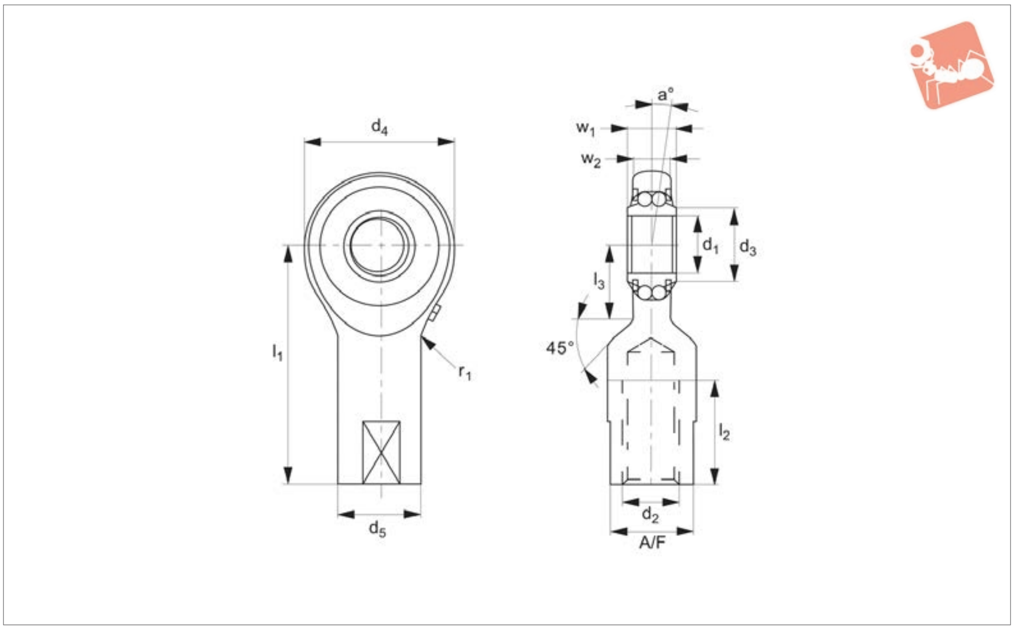
Stainless Heavy-Duty Rod Ends -
with integral spherical plain bearing

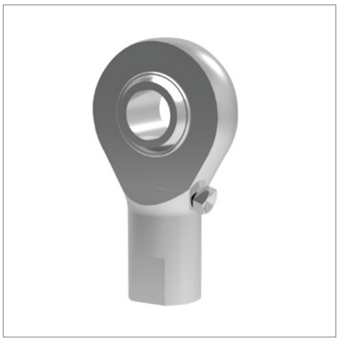
Order No.	Thread hand	d_1	l_1	d_2	d_3	d_4	d_5	d_6	l_2	Weight g
65722.W0520	Left	20	102	M20x1,5*	34.92	50	27.5	34	33	386
65722.W0522	Left	22	111	M22x1,5*	38.10	54	30.0	38	37	520
65722.W0525	Left	25	124	M24x2*	42.85	60	33.5	42	42	705
65722.W0530	Left	30	145	M30x2*	50.80	70	40.0	50	51	1084
65722.W0531	Left	30	145	M27x2*	50.80	70	40.0	50	51	1084

Order No.	l_3	l_4	w_1	w_2	A/F	a_1 °	a_2 °	Dyn. load C kN max.	Static load C_0 kN max.
65722.W0104	10	4.0	8	6.00	9	13.0	7.5	3.9	7.9
65722.W0105	10	4.0	8	6.00	9	13.0	7.5	3.9	7.9
65722.W0106	12	5.0	9	6.75	11	13.0	6.5	4.6	9.4
65722.W0108	12	5.0	12	9.00	14	14.5	7.5	7.0	14.1
65722.W0110	15	6.5	14	10.50	17	13.5	8.0	10.4	20.1
65722.W0111	15	6.5	14	10.50	17	13.5	8.0	10.4	20.1
65722.W0112	16	6.5	16	12.00	19	13.0	8.0	12.4	24.5
65722.W0113	16	6.5	16	12.00	19	13.0	8.0	12.4	24.5
65722.W0114	20	8.0	19	13.50	22	16.0	9.5	15.4	30.4
65722.W0116	22	8.0	21	15.00	22	15.5	8.5	22.4	43.7
65722.W0117	22	8.0	21	15.00	22	15.5	8.5	22.4	43.7
65722.W0118	24	10.0	23	16.50	27	15.0	9.5	26.3	51.2
65722.W0120	26	10.0	25	18.00	30	14.5	9.0	30.8	60.3
65722.W0122	26	12.0	28	20.00	32	15.5	10.0	38.2	70.0
65722.W0125	30	12.0	31	22.00	36	15.0	10.0	45.4	87.0
65722.W0130	35	15.0	37	25.00	41	17.0	10.5	55.0	106.8
65722.W0131	35	15.0	37	25.0	41	17.0	10.5	55.0	106.8
65722.W0504	10	4.0	8	6.00	9	13.0	7.5	3.9	7.9
65722.W0505	10	4.0	8	6.00	9	13.0	7.5	3.9	7.9
65722.W0506	12	5.0	9	6.75	11	13.0	6.5	4.6	9.4
65722.W0508	12	5.0	12	9.00	14	14.5	7.5	7.0	14.1
65722.W0510	15	6.5	14	10.50	17	13.5	8.0	10.4	20.1
65722.W0511	15	6.5	14	10.50	17	13.5	8.0	10.4	20.1
65722.W0512	16	6.5	16	12.00	19	13.0	8.0	12.4	24.5
65722.W0513	16	6.5	16	12.00	19	13.0	8.0	12.4	24.5
65722.W0514	20	8.0	19	13.50	22	16.0	9.5	15.4	30.4
65722.W0516	22	8.0	21	15.00	22	15.5	8.5	22.4	43.7
65722.W0517	22	8.0	21	15.00	22	15.5	8.5	22.4	43.7
65722.W0518	24	10.0	23	16.50	27	15.0	9.5	26.3	51.2
65722.W0520	26	10.0	25	18.00	30	14.5	9.0	30.8	60.3
65722.W0522	26	12.0	28	20.00	32	15.5	10.0	38.2	70.0
65722.W0525	30	12.0	31	22.00	36	15.0	10.0	45.4	87.0
65722.W0530	35	15.0	37	25.00	41	17.0	10.5	55.0	106.8
65722.W0531	35	15.0	37	25.00	41	17.0	10.5	55.0	106.8

Heavy-Duty Rod Ends - Female

with integral ball bearing





65840

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 3405 D1/A.

Technical Notes
Low maintenance, for tolerances see technical pages.

Tips
Standard thread is right hand thread.

Order No.	Thread hand	d_1	l_1	d_2	d_3	d_4	d_5	l_2	l_3	w_1	w_2	R	Weight g
65840.W0010	Right	10	38	M8	13.0	30	15	17	14.5	13.0	9	10	63
65840.W0015	Right	15	51	M12	17.5	40	19	24	20.0	16.5	12	15	140
65840.W0020	Right	20	65	M16	24.0	48	22	32	22.0	20.5	15	20	223
65840.W0510	Left	10	38	M8	13.0	30	15	917	14.5	13.0	9	10	63
65840.W0515	Left	15	51	M12	17.5	40	19	24	20.0	16.5	12	15	140
65840.W0520	Left	20	65	M16	24.0	48	22	32	22.0	20.5	15	20	223

Order No.	A/F	a °	Calc. factor Y	Dyn. load C kN max.	Calc. factor Y_0	Speed rpm max.	Static load C_0 kN max.
65840.W0010	13	7.0	1.90	2.6	1.81	1225	1.0
65840.W0015	17	7.0	2.30	5.0	2.41	1025	1.9
65840.W0020	19	6.5	2.34	6.1	2.45	850	3.0
65840.W0510	13	7.0	1.90	2.6	1.81	1225	1.0
65840.W0515	17	7.0	2.30	5.0	2.41	1025	1.9
65840.W0520	19	6.5	2.34	6.1	2.45	850	3.0

ROD ENDS

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.

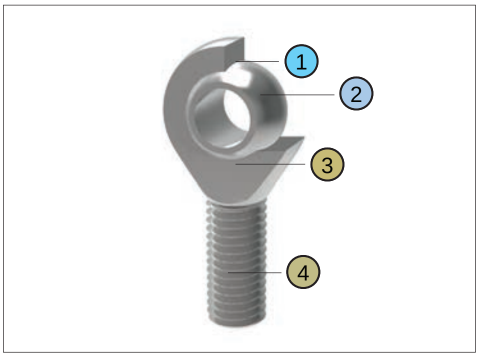
see our website for our full range: **wixroyd.com**

ov-W65700-AR3550-T-W65970-AR3630-T-a-lnh- Updated -31-10-2022

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

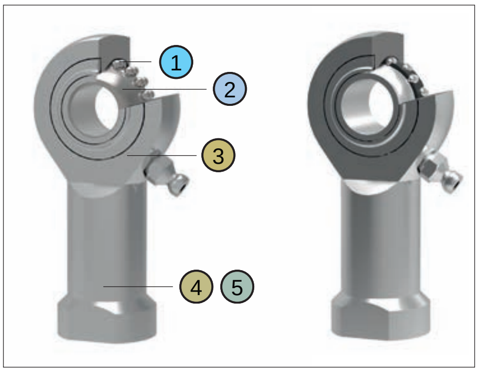
Plain spherical bearings

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.

Rod ends with integral maintenance-free spherical plain bearings

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 ball 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 roller 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 end bearings load capacity explained

Static load capacity C_0 (plain bearings)

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 (roller and ball 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 1/10,000th of the ball diameter).

Dynamic load capacity C (plain 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 (roller and ball 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.)

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

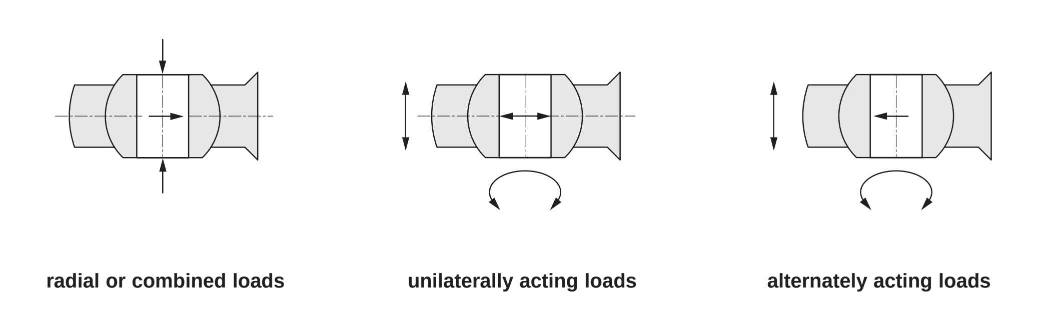
The heavy-duty rod ends have been especially designed to cope with high radial loads. They can be used for combined loads, the axial load share of which does not exceed 20% of the corresponding radial load.

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.

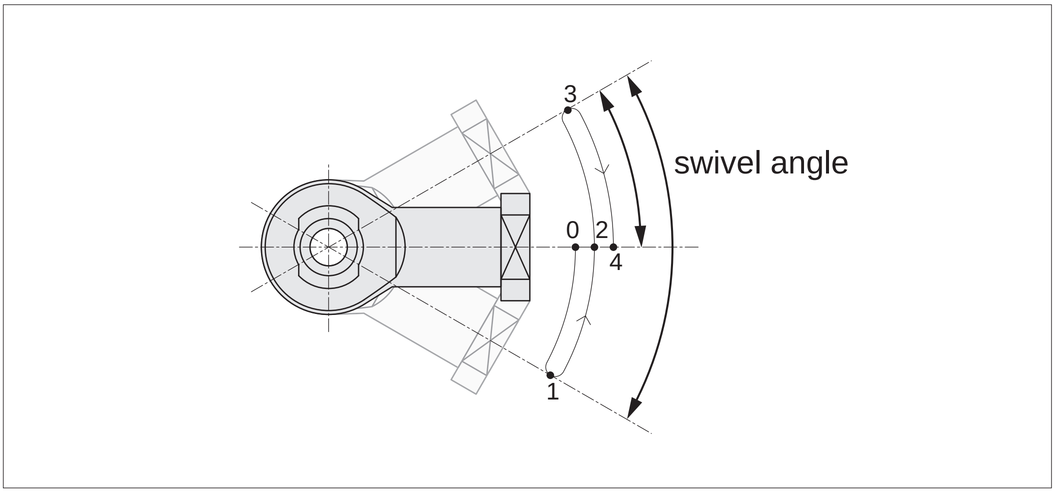
Alternately acting load

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°.



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'.

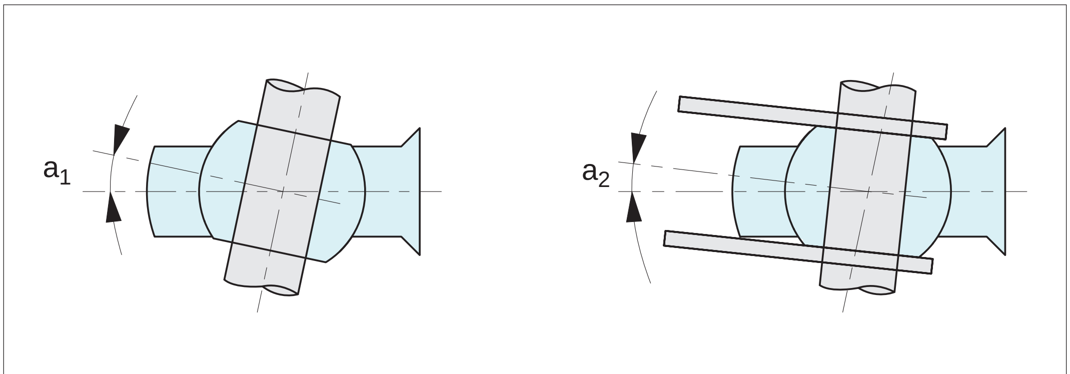


Angle of tilt

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 (a1 and a2).

If the movement is not limited by adjacent components, then angle a1 can fully be used without affecting the rod end capacity. Tilting angle a2 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.

ov-W65700-AR3550-T-W65970-AR3630-T-e-Inh- Updated -31-10-2022

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

Heavy-duty rod ends

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

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.

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.

$$P_0 \leq C_0 \text{ (N)}$$

P_0 = Static equivalent load

Self-aligning ball bearing $= P_0 = F_r + Y_0 \cdot F_a$

Self-aligning roller bearing $= P_0 = F_r + 5 \cdot F_a$

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

Nominal service life

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

Rotating

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

Oscillating

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

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

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

$Gh_{osc.}$ = 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

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

Oscillating

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

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

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

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

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Permissible load

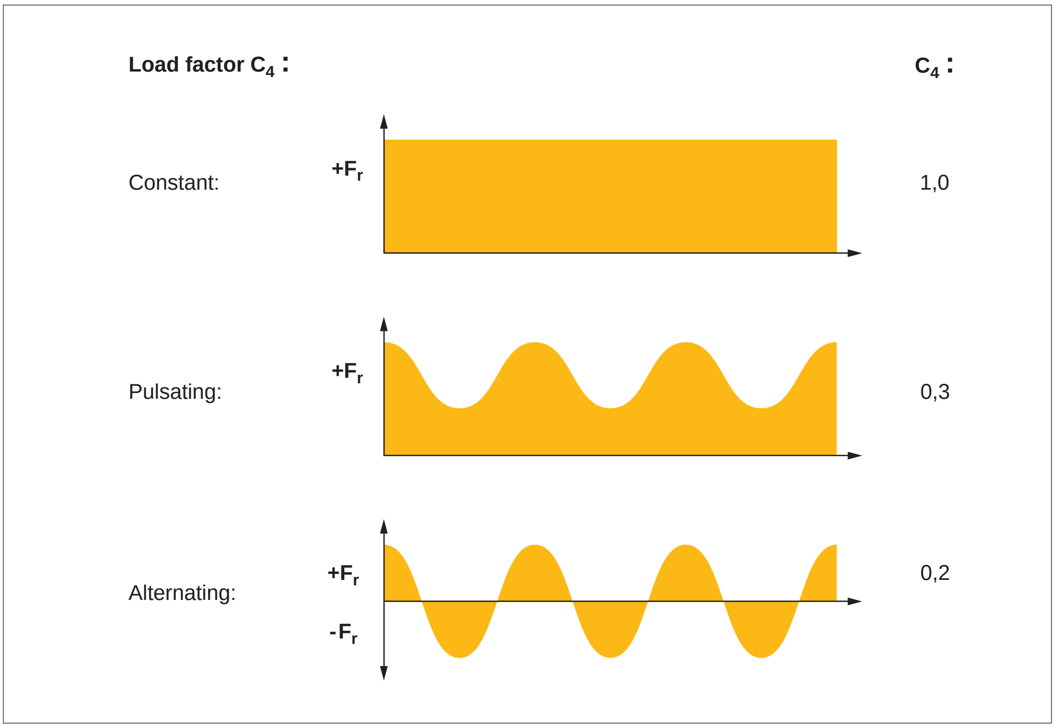
The maximum permissible load is calculated by using equation **1**. If static loads are a combination of radial and axial loads, the equivalent static load will have to be calculated using equation **2**.

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



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.

Specific bearing load

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

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

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

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

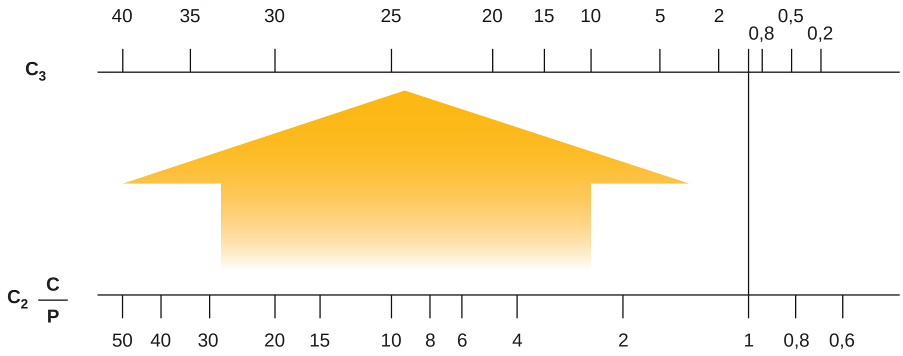
G = Nominal service life (number of oscillations or revolutions)
G_h = Nominal service life (hours)
C_2 = Temperature factor, see previous pages
C_3 = Material factor, see alignment chart on next page
C_1 = Load direction factor
C_1 = 1,0 = Single load direction

Alternating load direction at f < 30 rpm: C_1 = 0,250
Alternating load direction at f > 30 rpm: C_1 = 0,125

Alignment

To find C_3 calculate $C_2 \cdot \frac{C}{P}$ 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)



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

$$pV = p \cdot V_m$$

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

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

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

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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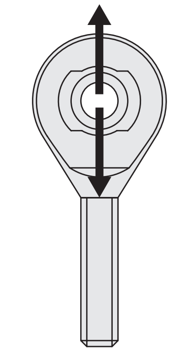
Radial static load



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 $\frac{T}{2}$ expressed in radians

3. Shank strength (S value)

Male Threaded Rod End

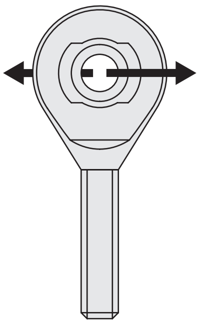
$$S = [(\text{root diameter of thread}^2 \times .78) - (N^2 \times .78)] \times X$$

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

Axial 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)

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

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

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