the best part is this part

VICO PARTS
INDUSTRIAL COMPONENTS

SPHERICAL PLAIN BEARINGS • ROD ENDS • CLEVISES

GENERAL TECHNICAL CATALOGUE

General catalogue index

1. Introduction

Our brand includes a wide range of excellent quality products. Our production is centered on a pool of constructors who accumulated decades of experience in this specific sector.

Production takes place in factories equipped with modern machineries, able to manage and control every phase of construction, guaranteeing precision and quality of finished product. The factories have Technical Offices dedicating their time to continuous research, with the precise goal of obtaining constant improvement in production standards. They also have the task of overseeing upgrading and technological renewal of the equipment used for production. Specialized Laboratories support the Technical Offices to control the quality of finished products. The main task of these Laboratories is to prevent, by every possible means, the circulation of out-of-standard products. These Laboratories are furnished with modern gauges for quality control. ***All products are manufactured according to RoHS regulation.***

2. 2. Dimensions, tolerances and accuracies

Spherical plain bearings are self-aligning mechanical components ready to be applied, whose dimensions are unified, and allowing the transmission of both static and dynamic loads in conjunction with oscillating, rotary and tilting alignment movements in several directions. The inner ring is provided with an external convex spherical surface, while the outer ring is equally spherical with a concave internal surface. They are available with sliding surfaces realized in a combination of steel on steel and in many other executions which do not require maintenance. The rod ends consist of a body, also defined as housing, in which is permanently inserted, in a proper seat, a spherical plain bearing, with dimensional and shape ***precision*** *of the inner and outer diameters, which comply with the same specifications for rolling bearings.*

*Even the main **dimensions** of the spherical plain bearings and the rod ends follow their particular specifications, internationally recognized by standard regulations.*
*Spherical plain bearings are manufactured respecting the main **tolerances** and mounting dimensions indicated by the above mentioned regulations. Consequently, they are interchangeable with products from the main Leaders on the market.*
As for the steel/steel spherical plain bearings, a particular treatment is performed on the surface, which allows a better sliding in the housing, as well as better protection against corrosion. This however does not compromise in any way either the assembly or the functioning. For spherical plain bearings with splitted external rings, a slight error in the circularity is possible, due specifically to the split and/or cut. When the product is inserted in the housing, the circularity of the bore is restored.

3. Symbols and tolerances

Symbols	Description
d	*nominal bore diameter*
d_{mp}	*mean bore diameter*
V_{dp}	*bore diameter variation*
V_{dmp}	*mean bore diameter variation*
$^{\Delta}d_{mp}$	*deviation of bore diameter from nominal value* ($^{\Delta}d_{mp} = d_{mp} - d$)
D	*nominal outer diameter*
D_{mp}	*mean outer diameter*
V_{Dp}	*outer diameter variation*
V_{Dmp}	*mean outer diameter variation*
$^{\Delta}D_{mp}$	*deviation of the mean outer diameter from nominal value* ($^{\Delta}D_{mp} = D_{mp} - D$)
B	*nominal width of the inner ring*
C	*nominal width of the outer ring*
$B_s - C_s$	*single width of the inner and outer ring*
$^{\Delta}B_s - {}^{\Delta}C_s$	*inner* ($^{\Delta}B_s = B_s - B$) *and outer* ($^{\Delta}C_s = C_s - C$) *ring single width deviation as regards to nominal dimension*
$^{\Delta}T_s$	*deviation of width dimension (angular contact spherical plain bearings)*
$h - h_1$	*centre height deviation (rod ends)*

Tolerances for radial spherical plain bearings

GE..E/ES - GE..ES 2RS - GEG..E/ES - GEG..ES 2RS - GE..CP - GEEM..ES 2RS GE..C - GE..ET 2RS - GEG..C - GEG..ET 2RS - GEZ..ES - GEZ..ES 2RS

Inner ring

d (mm.)		Δd_{mp} µm.		V_{dp} µm.	V_{dmp} µm.	ΔBs µm.	
Over	*Up to*	max	min	max	max	max	min
-	18	0	- 8	8	6	0	- 120
18	30	0	- 10	10	8	0	- 120
30	50	0	- 12	12	9	0	- 120
50	80	0	- 15	15	11	0	- 150
80	120	0	- 20	20	15	0	- 200
120	180	0	- 25	25	19	0	- 250
180	250	0	- 30	30	23	0	- 300
250	315	0	- 35	35	26	0	- 350
315	400	0	- 40	40	30	0	- 400
400	500	0	- 45	45	34	0	- 450
500	630	0	- 50	50	38	0	- 500
630	800	0	- 75	75	56	0	- 750
800	1.000	0	- 100	135	75	0	- 1.000

Outer ring

D (mm.)		ΔD_{mp} µm.		V_{Dp} µm.	V_{Dmp} µm.	ΔCs µm.	
Over	*Up to*	max	min	max	max	max	min
-	18	0	- 8	10	6	0	- 240
18	30	0	- 9	12	7	0	- 240
30	50	0	- 11	15	8	0	- 240
50	80	0	- 13	17	10	0	- 300
80	120	0	- 15	20	11	0	- 400
120	150	0	- 18	24	14	0	- 500
150	180	0	- 25	33	19	0	- 500
180	250	0	- 30	40	23	0	- 600
250	315	0	- 35	47	26	0	- 700
315	400	0	- 40	53	30	0	- 800
400	500	0	- 45	60	34	0	- 900
500	630	0	- 50	67	38	0	- 1.000
630	800	0	- 75	100	56	0	- 1.100
800	1.000	0	- 100	135	75	0	- 1.200
1.000	1.250	0	- 125	190	125	0	- 1.300
1.250	1.320	0	- 160	240	160	0	- 1.600

Tolerances for radial spherical plain bearings

GEEW..ES - SSR

Inner ring

d (mm.)		Δd_{mp} µm.		V_{dp} µm.	V_{dmp} µm.	ΔBs µm.		ΔBs [1] µm.		h - h_1 [2] µm.
Over	*Up to*	max	min	max	max	max	min	max	min	
-	3	+ 10	0	10	6	0	- 120	0	- 180	± 1.200
3	6	+ 12	0	12	9	0	- 120	0	- 180	± 1.200
6	10	+ 15	0	15	11	0	- 120	0	- 180	± 1.200
10	18	+ 18	0	18	14	0	- 120	0	- 180	± 1.200
18	30	+ 21	0	21	16	0	- 120	0	- 210	± 1.700
30	50	+ 25	0	25	19	0	- 120	0	- 250	± 2.100
50	80	+ 30	0	30	22	0	- 180	0	- 300	-
80	110	+ 35	0	35	26	0	- 200	0	- 350	-
125	160	+ 40	0	40	30	0	- 250	0	- 400	-
160	200	+ 46	0	46	35	0	- 300	0	- 460	-
250	315	+ 52	0	52	39	0	- 350	0	- 520	-
315	400	+ 57	0	57	43	0	- 400	0	- 570	-

1) *apply to spherical plain bearings* **GEEW..ES** and *rod ends for hydraulic components* ***TAPR.CE***

2) *apply to rod ends*

Outer ring

D (mm.)		ΔD_{mp} µm.		V_{Dp} µm.	V_{Dmp} µm.	ΔD_{mp} [3] µm.		ΔCs µm.	
Over	Up to	max	min	max	max	max	min	max	min
10	18	0	- 11	18	18	0	- 8	0	- 240
18	30	0	- 13	21	21	0	- 9	0	- 240
30	50	0	- 16	25	25	0	- 11	0	- 240
50	80	0	- 19	30	30	0	- 13	0	- 300
80	120	0	- 22	35	35	0	- 15	0	- 400

3) *apply to spherical plain bearings:* ***GE..SB - GE..SP***

Tolerances for thrust spherical plain bearings (GX..S - GX..CP)

Inner ring

d (mm.)		Δd_{mp} µm		V_{dp} µm.	V_{dmp} µm.	ΔBs µm.		ΔHs [1] µm.	ΔHs [2] µm.
Over	*Up to*	max	min	max	max	max	min	min	min
-	18	0	- 8	8	6	0	- 240	- 400	- 300
18	30	0	- 10	10	8	0	- 240	- 400	- 300
30	50	0	- 12	12	9	0	- 240	- 400	- 300
50	80	0	- 15	15	11	0	- 300	- 400	- 300
80	120	0	- 20	20	15	0	- 400	- 400	- 400
120	180	0	- 25	25	19	0	- 500	- 500	-500
180	200	0	- 30	30	23	0	- 600	- 600	- 500
200	240	0	- 30	-	-	0	- 600	-	- 600
260	300	0	- 35	-	-	0	- 700	-	- 700
320	360	0	- 40	-	-	0	- 800	-	- 800

1) *apply to spherical plain bearings of series:* ***GX..S***
2) *apply to spherical plain bearings of series:* ***GX..CP***

Outer ring

D (mm.)		ΔD_{mp} µm.		V_{Dp} µm.	V_{Dmp} µm.	ΔCs µm.	
Over	*Up to*	max	min	max	max	max	min
-	30	0	- 9	12	7	0	- 240
30	50	0	- 11	15	8	0	- 240
50	80	0	- 13	17	10	0	- 300
80	120	0	- 15	20	11	0	- 400
120	150	0	- 18	24	14	0	- 500
150	180	0	- 25	33	19	0	- 500
180	250	0	- 30	40	23	0	- 600
250	315	0	- 35	47	26	0	- 700
320	400	0	- 40	53	30	0	- 800
430	480	0	- 45	-	-	0	- 800
520	560	0	- 50	-	-	0	- 800

Tolerances for angular contact spherical plain bearings (GAC..S - GAC..CP - GAC..SP)

Inner ring

d (mm.)		$^{\Delta}d_{mp}$ µm		V_{dp} µm	V_{dmp} µm	$^{\Delta}Bs$ µm		$^{\Delta}Bs$ [1] µm		ΔTs µm		ΔTs [1] µm	
Over	*Up to*	max	min	max	max	max	min	max	min	max	min	max	min
-	30	0	- 10	11	8	0	- 200	0	- 200	+ 250	- 250	+ 200	- 200
30	50	0	- 12	12	9	0	- 240	0	- 240	+ 250	- 250	+ 200	- 200
50	80	0	- 15	15	11	0	- 300	0	- 300	+ 250	- 250	+ 200	- 200
80	120	0	- 20	20	15	0	- 400	0	- 400	+ 250	- 250	+ 200	- 200
120	180	0	- 25	25	19	0	- 500	0	- 500	+ 350	- 350	+ 350	- 250
180	200	0	- 30	30	23	0	- 600	0	- 600	+ 350	- 350	+ 350	- 250

[1] *apply to angular contact spherical plain bearings series:* ***GAC..CP - GAC..SP***

Outer ring

D (mm.)		$^{\Delta}D_{mp}$ µm		V_{Dp} µm	V_{Dmp} µm	$^{\Delta}Cs$ µm	$^{\Delta}Cs$ [1] µm
Over	*Up to*	max	min	max	max	min	min
-	50	0	- 14	14	11	- 200	- 200
50	80	0	- 16	16	12	- 240	- 240
80	120	0	- 18	18	14	- 300	- 300
120	150	0	- 20	20	15	- 400	- 400
150	180	0	- 25	25	19	- 400	- 400
180	250	0	- 30	30	23	- 500	- 500
250	315	0	- 35	35	26	- 600	- 600

[1] *apply to angular contact spherical plain bearings series:* ***GAC..CP - GAC..SP***

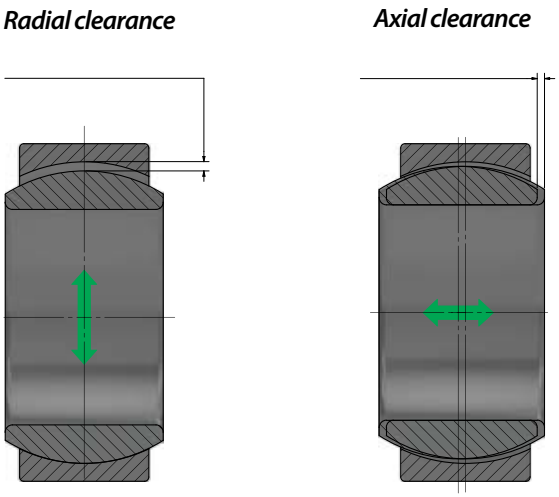
Tolerances for rod ends

For the following series: **SI..E/ES - SI..ES 2RS - SI..C - SI..C 2RS - SA..E/ES - SA..ES 2RS - SA..C - SA..C 2RS T.A.C. - TAPR.N - TAPR.U - T.P.N. - TAPR.DO**, the $^{\Delta}d_{mp}$ *and* $^{\Delta}Bs$ value, are the same as radial spherical plain bearings.

For the following series: **TSF.. - TSF..C - TSF.R.. - TSM.. - TSM..C - TSM.R.. - TAPR.CE**, the $^{\Delta}d_{mp}$ *and* $^{\Delta}Bs$ value, are the same as radial spherical plain bearings GEEW..ES - SSR - GE..SB - GE..SP.

4. Clearance of the spherical plain bearing

*"**Clearance of the spherical plain bearing**" is defined as the possibility of both radial and axial movement of the inner ring towards the outer ring (fig. 1). In the dimensional tables the radial clearance values are indicated. The axial clearance has a close relation with the radial clearance; it depends upon the shape of the rings and the type of execution though having no standard regulation defining its value.*



(fig. 1)

In standard condition, the normal radial clearance of the spherical plain bearings allows the optimal result of the functioning, always respecting the indicated tolerances (table 1). There are executions with different clearances available for most spherical plain bearings, whose choice is driven by the application. For some applications, in presence of high thermal differences or for highly forced coupling with both rings, the use of a spherical plain bearing with a higher clearance is more indicated (example: C3), in other cases, the use of spherical plain bearings with lower clearance is preferable (example: C2). During the offering and ordering phases, it's important to specify and request the clearance C2 and C3 as they have special executions, otherwise, if not expressly requested, the spherical plain bearing is supplied with a C0 (normal) radial clearance.

Table 1 **(*Radial clearance*)** **µm**

Inner bore diameter		*Spherical plain bearing radial clearance*											
		Sliding coupling: steel/steel						*Sliding coupling: steel/PTFE*					
		C2 *Lower than normal*		C0 *Normal*		C3 *Higher than normal*		C2 *Lower than normal*		C0 *Normal*		C3 *Higher than normal*	
over	*up to*	*from*	*to*	*from*	*to*	*from*	*to*	*from*	*to*	*from*	*to*	*from*	*to*
6	12	8	32	32	68	68	104	0	25	0	32	15	45
12	20	10	40	40	82	82	124	0	30	0	40	20	60
20	35	12	50	50	100	100	150	0	35	0	50	25	65
35	60	15	60	60	120	120	180	0	40	0	60	30	80
60	90	18	72	72	142	142	212	0	50	0	72	35	90
90	140	18	85	85	165	165	245	0	60	0	85	40	100
140	200	18	100	100	192	192	284	0	70	0	100	50	120
200	240	18	110	110	214	214	318	-	-	-	-	-	-
240	300	18	125	125	239	239	353	0	80	0	110	60	140
320	340	-	-	125	239	-	-	0	90	0	125	70	150
360	420	-	-	135	261	-	-	-	-	0	135	-	-
440	530	-	-	145	285	-	-	-	-	0	145	-	-
560	670	-	-	160	320	-	-	-	-	0	160	-	-
710	850	-	-	170	350	-	-	-	-	-	-	-	-
900	1000	-	-	195	405	-	-	-	-	-	-	-	-

(*Inch spherical plain bearing*)

Inner bore diameter		*Spherical plain bearing radial clearance*					
		C2		*Normal*		C3	
over	*up to*	*from*	*to*	*from*	*to*	*from*	*to*
in		µm					
-	0.625	15	75	50	150	150	200
0.625	2	25	105	80	180	180	260
2	3	30	130	100	200	200	300
3	6	40	160	130	230	230	350

(*Radial clearance tables*)

SI..E/ES - SI..ES 2RS - SA..E/ES - SA..ES 2RS - T.A.C. - TAPR.N - TAPR.U - T.P.N. - TAPR.CE

d (mm.)		*Radial clearance* µm	
Over	*Up to*	Min	Max
-	12	23	68
12	20	30	82
20	35	37	100
35	60	43	120
60	90	55	142
100	125	65	165
160	200	65	192

SI..C - SI..C 2RS - SA..C - SA..C 2RS

d (mm.)		*Radial clearance* µm	
Over	*Up to*	Min	Max
-	12	0	32
12	20	0	40
20	35	0	50
35	60	0	60
60	80	0	72

TSF.. - TSF..C - TSF.R.. - TSM.. - TSM..C - TSM.R..

d (mm.)		*Radial clearance* µm	
Over	*Up to*	Min	Max
-	30	0	35

5. Radial fixing of the spherical plain bearings (coupling)

Between the spherical surface of the inner ring and the one of the outer ring a movement takes place which is defined as "sliding", and based on this the quality of the product and of the surface treatment are defined. Inaccurate sliding movements on the shaft or in the housing can cause damages and failures to parts of the machinery. It is therefore important that the elements of the mounting structure are proportional to the ones of the spherical plain bearing rings.

In order to obtain a higher friction coefficient than that of the spherical plain bearing, ***fixed coupling*** *can be used, which provide maximum friction of the rings taking advantage of their total load capacity.*

If needed, in order to protect the rings from eventual undesirable sliding movements, it is possible to use axial locking devices.

The choice of fixed coupling should be done with particular care, as a contraction of the outer ring caused by the interference with the housing, or an expansion of the inner ring due to interference with the shaft could occur. The elastic deformations mentioned above can lead to a reduction of the clearance in the spherical bearing.

The spherical plain bearing clearance and the osculation of the sliding surfaces must always maintain a reciprocal balance.

The following tables (table 2 and 3) show the recommended coupling values, more suitable to obtain the above mentioned balance.

Table 2 ***(Spherical plain bearings requiring maintenance)***

Type	*Radial clearance of spherical plain bearing*	*Iron housing Iron shaft*	*Light alloy housing Iron shaft*
Radial spherical plain bearings	C2 [1)]	K7 - j6	M7 - j6
	C0 [2)]	M7 - m6 [1)]	N7 - m6[1)]
	C3 [1)]	M7 - m6	N7 - m6
Angular contact spherical plain bearings	-	M7 - n6	-
Thrust spherical plain bearings	-	M7 - n6	-

1) *Excluding coupling steel/steel. The indicated tolerance for the shaft is r6.*
2) *For coupling steel/bronze: K7 - m6*

Table 3 ***(Maintenance-free spherical plain bearings)***

Type	*Iron housing Iron shaft*	*Light alloy housing Iron shaft*
Radial spherical plain bearings (bore up to 300 mm.)	K7 / j6 [3)]	M7 / j6 [3)]
Radial spherical plain bearings (bore over 300 mm.)	K7 / j6	-
Angular contact spherical plain bearings	M7 / m6	-
Thrust spherical plain bearings	M7 / m6	-

3) *Excluding coupling steel/PTFE. The indicated tolerance of the shaft is m6.*

6. Machining and execution of the housing and the shaft

The following tables (table 4 and 5) show the values concerning the possible deviations for ***housing*** *and* **shaft**.

Table 4 (***Bore deviation***) **µm**

Inner bore diameter mm.		G7		H7		H8		H9		H11		H13		H14		J6		J7		K7		K8		M7		N7	
over	*up to*	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
6	10	+20	+5	+15	0	+22	0	+36	0	+90	0	+220	0	+360	0	+5	-4	+8	-7	+5	-10	+6	-16	0	-15	-4	-19
10	18	+24	+6	+18	0	+27	0	+43	0	+110	0	+270	0	+430	0	+6	-5	+10	-8	+6	-12	+8	-19	0	-18	-5	-23
18	30	+28	+7	+21	0	+33	0	+52	0	+130	0	+330	0	+520	0	+8	-5	+12	-9	+6	-15	+10	-23	0	-21	-7	-28
30	50	+34	+9	+25	0	+39	0	+62	0	+160	0	+390	0	+620	0	+10	-6	+14	-11	+7	-18	+12	-27	0	-25	-8	-33
50	80	+40	+10	+30	0	+46	0	+74	0	+190	0	+460	0	+740	0	+13	-6	+18	-12	+9	-21	+14	-32	0	-30	-9	-39
80	120	+47	+12	+35	0	+54	0	+87	0	+220	0	+540	0	+870	0	+16	-6	+22	-13	+10	-25	+16	-38	0	-35	-10	-45
120	180	+54	+14	+40	0	+63	0	+100	0	+250	0	+630	0	+1000	0	+18	-7	+26	-14	+12	-28	+20	-43	0	-40	-12	-52
180	250	+61	+15	+46	0	+72	0	+115	0	+290	0	+720	0	+1150	0	+22	-7	+30	-16	+13	-33	+22	-50	0	-46	-14	-60
250	315	+69	+17	+52	0	+81	0	+130	0	+320	0	+810	0	+1300	0	+25	-7	+36	-16	+16	-36	+25	-56	0	-52	-14	-66
315	400	+75	+18	+57	0	+89	0	+140	0	+360	0	+890	0	+1400	0	+29	-7	+39	-18	+17	-40	+28	-61	0	-57	-16	-73
400	500	+83	+20	+63	0	+97	0	+155	0	+400	0	+970	0	+1550	0	+33	-7	+43	-20	+18	-45	+29	-68	0	-63	-17	-80
500	630	+92	+22	+70	0	+110	0	+175	0	-	-		-		-	+35	-8	+46	-22	0	-70	0	-110	-26	-96	-44	-114
630	800	+104	+24	+80	0	+125	0	+200	0	-	-		-		-	+38	-9	+52	-24	0	-80	0	-125	-30	-110	-50	-130
800	1000	+116	+26	+90	0	+140	0	+230	0	-	-		-		-	+42	-10	+58	-26	0	-90	0	-140	-34	-124	-56	-146
1000	1250	+133	+28	+105	0	+165	0	+260	0	-	-		-		-	+48	-10	+64	-29	0	-105	0	-165	-40	-145	-66	-171
1250	1600	+155	+30	+125	0	+195	0	+310	0	-	-		-		-	+54	-11	+72	-33	0	-125	0	-195	-48	-173	-78	-203

Table 5 (***Shaft deviation***) **µm**

Inner bore diameter mm.		e7		f7		g6		h6		h7		h8		h11		h12		j6		j7		js14		k6		m6		n6	
over	*up to*	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
3	6	-20	-32	-10	-22	-4	-12	0	-8	0	-12	0	-18	0	-75	0	-120	+6	-2	+8	-4	+150	-150	+9	+1	+12	+4	+16	+8
6	10	-25	-40	-13	-28	-5	-14	0	-9	0	-15	0	-22	0	-90	0	-150	+7	-2	+10	-5	+180	-180	+10	+1	+15	+6	+19	+10
10	18	-32	-50	-16	-34	-6	-17	0	-11	0	-18	0	-27	0	-110	0	-180	+8	-3	+12	-6	+215	-215	+12	+1	+18	+7	+23	+12
18	30	-40	-61	-20	-41	-7	-20	0	-13	0	-21	0	-33	0	-130	0	-210	+9	-4	+13	-8	+260	-260	+15	+2	+21	+8	+28	+15
30	50	-50	-75	-25	-50	-9	-25	0	-16	0	-25	0	-39	0	-160	0	-250	+11	-5	+15	-10	+310	-310	+18	+2	+25	+9	+33	+17
50	80	-60	-90	-30	-60	-10	-29	0	-19	0	-30	0	-46	0	-190	0	-300	+12	-7	+18	-12	+370	-370	+21	+2	+30	+11	+39	+20
80	120	-72	-107	-36	-71	-12	-34	0	-22	0	-35	0	-54	0	-220	0	-350	+13	-9	+20	-15	+435	-435	+25	+3	+35	+13	+45	+23
120	180	-85	-125	-43	-83	-14	-39	0	-25	0	-40	0	-63	0	-250	0	-400	+14	-11	+22	-18	+500	-500	+28	+3	+40	+15	+52	+27
180	250	-100	-146	-50	-96	-15	-44	0	-29	0	-46	0	-72	0	-290	0	-460	+16	-13	+25	-21	+575	-575	+33	+4	+46	+17	+60	+31
250	315	-110	-162	-56	-108	-17	-49	0	-32	0	-52	0	-81	0	-320	0	-520	+16	-16	+26	-26	+650	-650	+36	+4	+52	+20	+66	+34
315	400	-125	-182	-62	-119	-18	-54	0	-36	0	-89	0	-89	0	-360	0	-570	+18	-18	+29	-28	+700	-700	+40	+4	+57	+21	+73	+37
400	500	-135	-198	-68	-131	-20	-60	0	-40	0	-63	0	-97	0	-400	0	-630	+20	-20	+31	-32	+775	-775	+45	+5	+63	+23	+80	+40
500	630	-	-	-	-	-22	-66	0	-44	0	-70	0	-110	-	-	-	-	+22	-21	-	-	-	-	+44	0	+70	+26	+88	+44
630	800	-	-	-	-	-24	-74	0	-50	0	-80	0	-125	-	-	-	-	+24	-23	-	-	-	-	+50	0	+80	+30	+100	+50
800	1000	-	-	-	-	-26	-82	0	-56	0	-90	0	-140	-	-	-	-	-	-	-	-	-	-	+56	0	+90	+34	+112	+56

7. Quality of the shaft and of the housing bore

The spherical plain bearings are normally subjected to very high loads; for this reason the housings, the shafts and the spherical plain bearings themselves must be configured so that the transmitted forces do not cause permanent deformation, thus compromising their use (C/P ≤1,2). The accuracies of the seats form are included in the tolerance of the different couplings indicated. As for the surface quality, the values (expressed in µm) for roughness shown below are valid.

***Housing bore**: from R_z 10 to R_z 16 from R_a 2,5 to R_a 8*

***Shaft:** ≤ R_z 10 R_a ≤ 2,5*

8. Coupling conditions

The following tables (6 and 7) provide the tolerances and clearances resulting from the corresponding ISO fits, applied to bearing Normal tolerances ISO 12240-1 to ISO 12240-3, always considering their actual dimension as "average tolerance".

Note: - indicates interference

+ indicates clearance

Table 6

(*Shaft couplings*) **µm**

Shaft diameter mm.		*Coupling interference/clearance*				
		Shaft				
over	*up to*	h6	j6	k6	m6	n6
3	6	0	-6	-9	-12	-16
6	10	0	-7	-9	-15	-19
10	18	+1	-7	-9	-17	-22
18	30	+1	-8	-14	-20	-27
30	50	+2	-9	-16	-23	-31
50	80	+2	-10	-20	-28	-37
80	120	+1	-13	-24	-34	-44
120	180	0	-14	-28	-40	-52
180	250	0	-17	-30	-47	-61
250	315	-2	-17	-33	-53	-67
315	400	-2	-20	-38	-59	-75
400	500	-2	-22	-42	-65	-82

- *Example: shaft diameter 60 m6 → probable interference: 0,028 mm*
  Not applicable to series GE..SB, GE..SP, GEEW..ES, GAC..S, GAC..CP

Table 7

(*Housing couplings*) **µm**

Housing bore mm.		*Coupling interference/clearance*			
		Outer ring			
over	*up to*	J7	K7	M7	N7
6	10	+4	+1	-4	-8
10	18	+5	+1	-5	-10
18	30	+6	-1	-7	-14
30	50	+7	0	-8	-16
50	80	+10	0	-9	-18
80	120	+12	-1	-11	-21
120	150	+15	+1	-11	-23
150	180	+18	+4	-8	-20
180	250	+22	+5	-8	-22
250	315	+27	+7	-9	-23
315	400	+31	+8	-9	-25
400	500	+34	+8	-10	-27

- *Example: housing diameter 105 m7 → probable interference: 0,011 mm*
  Not applicable to series GAC..S, GAC..CP

9. Axial fixing of the spherical plain bearings

During the functioning and because of the loads, the spherical plain bearings are subjected to constant elastic deformations that cause micro-movements between the coupled parts. Independently from the fixed couplings, what above can cause a gradual axial movement of the spherical plain bearing rings; this can be solved by axially blocking the rings.

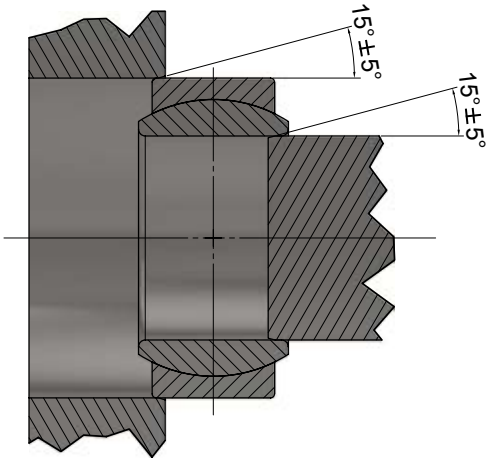
The housings of the spherical plain bearings must be designed to provide the axial movement between the shaft and the bore of the spherical plain bearing in which it is mounted.
By using the security rings, the plain bearings can be ***axially fixed****.*

It is not possible to machine proper grooves on the shaft, it is better to provide the blockage of the spherical plain bearing using rings or distance holders; once placed aligned with spherical plain bearing rings, they allow to act with axial pre-loading on the front surface of the latter.

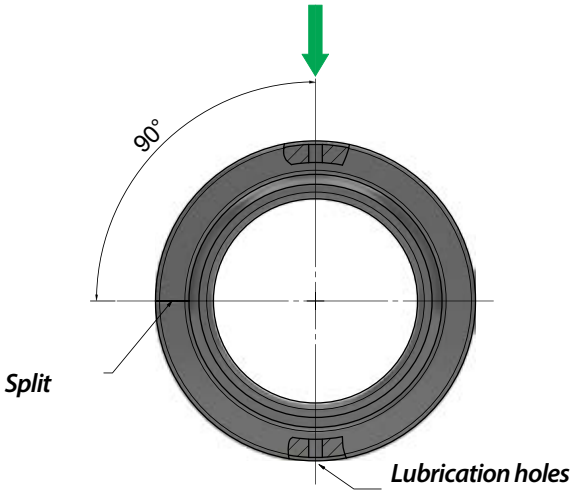
10. Use (mounting and dismounting)

The spherical plain bearings can be rightly considered components of elevated precision, so they absolutely must not be manipulated or even simply touched with naked hands, or cleaned with unsuitable liquids. In fact, it must be remembered that the sweat from hands can be corrosive and can create rusty spots on the surface of the rings, thus compromising their integrity and use. The proper application of the spherical plain bearing is the primary condition for good functioning. The edges of the mounting side of the shaft and the housing should have a chamfer between 10° and 20°; this should allow appreciable results in terms of product life (fig. 2).

In presence of fixed coupling and particularly heavy conditions, it is allowed to lightly oil the surface of the shaft and of the housing. When using spherical plain bearings with a splitted outer ring, it is suggested that the split is placed at 90° (fig.3) with respect to the main



(fig. 2)



(fig. 3)

load direction, making sure that the lubrication holes are placed in the load area; this should uniformly distribute the lubricating liquid in the area of greatest load. While ***mounting*** *the spherical plain bearing, the use of appropriate tools is indicated, for example: a mounting sleeve, hydraulic press and pipe. It is always better to avoid direct hits on the front sides, as this could possibly cause micro-damages and malfunctioning.*

If it is not possible to use the ordinary tools, mounting can be performed by means of heating and cooling techniques.

The ***dismounting*** *phase of the spherical plain bearing can be extremely delicate; because of the product structure, when acting on the ring to dismount, the resistance due to the coupling of the other ring creates a blocking effect. To avoid this problem, it would be better – in the project stage already - to foresee on the housing some threaded bores for dismounting screws, or some millings on the shaft for the use of dismounting instruments.*

11. Protection of the housing

In order to obtain a good functioning and a correct wear of the spherical plain bearings, it is fundamental to use some ***protection*** *from eventual external contaminating agents (dust, humidity etc…), by applying a proper seal. Different criteria exist for the seal choice: space, radial movement, tilting angle, environ-mental conditions etc.*
A possible solution, very simple and efficient, could be the layer of grease used for lubrication. With constant maintenance, it gives ex-cellent results in particular functioning conditions.
In case of indoor applications, the common seal 2RS, bilaterally mounted, is sufficient. There are also "special seals", which are suit-able for applications in extreme environmental conditions (up to +200°C). For outdoor applica-tions, it is possible to use a simple seal in polyurethane elastomer, particularly indicated for the spherical radial bearings. It is also possible to use V rings, particularly indicated in pres-ence of significant tilting movements, plastic rings with steel bone and rings with supple-mentary anti-dust lips.

12. Lubrication

Generally, the ***lubrication*** *of the spherical plain bearings is particularly important, because it leads to a reduction of friction, protects from cor-rosive external agents, and acts as a separator from the sliding surface.*
The choice of the lubricant is determined by dif-ferent factors, for example: load, load direction, oscillation angle, speed and environmental con-dition.
For standard applications, common lubricants that can be found on the commercial market are indicated; they are anticorrosion, pressure resis-tant, based on lithium soap with addition of solid and EP lubricants.
These solid additives, mixed with the lubricant, allow the perfect separation of the sliding surfaces, even in cases of elevated surface pressure, thus avoiding the breakage of the spherical

plain bearing. Lubricants with about 3% of MoS_2, or solid additives containing calcium and zinc-phosphate in combination are suitable.

For spherical plain bearings with iron/bronze coupling, lubricants with a base of lithium soap, anticorrosion, water repellent and of normal consistency, not containing MoS_2 or other solid lubricants are particularly indicated.

The initial phase of lubrication is very important; it is necessary to pay attention to the technical operating conditions, in order to obtain a uniform wear and an optimal yield from a spherical plain bearing during the working phase.

For spherical plain bearings with steel/steel couplings, a regular lubrication is necessary; with this activity, residuals of lubricant are eliminated and replaced with new lubricant, and abrasive residual impurities are ejected. The frequency as well as the intervals of lubrication must be carefully calculated, evaluating different factors, such as: load, speed, use conditions etc..., because a too frequent lubricant interval can lead to malfunctioning for the spherical plain bearing, reducing its lifetime. Maintenance-free spherical plain bearings must not be lubricated, so they are not supplied with relubrication devices.

The sliding process is facilitated during the running-in period, because the PTFE particles are transferred from the outer ring to the surface of the inner ring, reducing the roughness peaks that could be present on the surface of the inner ring. If maintenance-free spherical plain bearings were lubricated, this transfer and smoothing effect would be eliminated, considering the reduced adhesive capacity of PTFE particles on lubricated surfaces.
All of the above mentioned concepts are valid for rod ends as well.

13. Friction

*The **friction** phenomenon, occurring when two surfaces slide against each other, can depend on several factors, for example: coupling, load, speed, lubrication conditions and quality of the material of the sliding surfaces. During the life of the spherical plain bearing, the friction values are not always stable. In fact, in the initial and final phases the friction values are higher, while friction values on a well-run spherical plain bearing are remarkably lower. For safety reasons, it is always suggested to use the highest values as a reference.*

As reported below (table 8), it is possible to verify the reference friction coefficients for spherical plain bearings.

Should the friction coefficients exceed the indicated values, higher wear would be generated, increasing the temperature and causing eventual misfunctioning.

Table 8 (***Spherical plain bearings friction coefficients***)

Sliding coupling	*Friction coefficients*	
Steel/Steel	min. 0,08	max. 0,20
Steel/Bronze	min. 0,10	max. 0,25
Chromium/Composed material	min. 0,05	max. 0,20
Steel/PTFE sheet	min. 0,05	max. 0,15
Chromium/PTFE fabric	min. 0,03	max. 0,12

14. Temperature

*The sliding coupling is an element which directly affects the admitted operating **temperature**. In the following table (table 9), temperature values admitted by spherical plain bearings in different executions are shown.*

Table 9 (***Temperature***)

Type	*Dimension mm.*	*Sliding coupling*	*Temperature*	*Reduced efficiency*
GE..E/ES	4 - 1.000	*Steel/Steel*	Min -60 °C Max +200 °C	+150 °C
GE..ES 2RS	15 - 300	*Steel/Steel*	Min -60 °C Max +130 °C	-
GEG..E/ES	4 - 280	*Steel/Steel*	Min -60 °C Max +200 °C	+150 °C
GEG..ES 2RS	15 - 280	*Steel/Steel*	Min -60 °C Max +130 °C	-
GE..SB	5 - 30	*Steel/Bronze*	Min -60 °C Max +250 °C	+150 °C
GE..SP	5 - 30	*Steel/PTFE*	Min -50 °C Max +200 °C	+100 °C
GE..CP	100 - 630	*Hard Chromium/PTFE*	Min -50 °C Max +130 °C	+70 °C
GEEW..ES	12 - 320	*Steel/Steel*	Min -60 °C Max +200 °C	+150 °C
GEEM..ES 2RS	17 - 80	*Steel/Steel*	Min -60 °C Max +130 °C	-
GE..C	4 - 30	*Hard Chromium/PTFE*	Min -50 °C Max +200 °C	+95 °C
GE..ET 2RS	17 - 300	*Hard Chromium/PTFE*	Min -50 °C Max +130 °C	+70 °C
GEG..C	4 - 30	*Hard Chromium/PTFE*	Min -50 °C Max +200 °C	+95 °C
GEG..ET 2RS	30 - 280	*Hard Chromium/PTFE*	Min -50 °C Max +130 °C	+70 °C
GAC..S	25 - 200	*Steel/Steel*	Min -60 °C Max +200 °C	+150 °C
GAC..CP	25 - 200	*Hard Chromium/PTFE*	Min -50 °C Max +150 °C	-
GAC..SP	25 - 200	*Steel/PTFE*	Min -40 °C Max +150 °C	-
GX..S	10 - 200	*Steel/Steel*	Min -60 °C Max +200 °C	+150 °C
GX..CP	10 - 360	*Hard Chromium/PTFE*	Min -50 °C Max +150 °C	-
GEZ..ES	12,7 - 152,4	*Steel/Steel*	Min -60 °C Max +200 °C	+150 °C
GEZ..ES 2RS	25,4 - 152,4	*Steel/Steel*	Min -60 °C Max +130 °C	-
GE..XS K	12 - 150	*Steel/Steel*	Min -60 °C Max +200 °C	-
GEK..XS 2RS	25 - 60	*Steel/Steel*	Min -60 °C Max +130 °C	-
SSR	5 - 30	*Steel/Bronze*	Min -60 °C Max +250 °C	-

On request, all spherical plain bearings are available in stainless steel (inner ring AISI 440C or 420C - outer ring AISI 316)
The maximum allowed temperature for 2RS spherical plain bearings depends on seal material

If high operating temperatures are reached, the life of the spherical plain bearing decreases, as well as - proportionally - the efficiency of the seals. In cases where the use of sealed spherical plain bearings is not possible, spherical plain bearings protected by external seals, or the use of lubricants as shielding offering good thermal resistance would be indicated. If the heat should extend through the inner ring, this could lead to an expansion of the same, therefore necessitating the use of spherical plain bearings with wider clearances, for example C3. The materials with which the seals are made (table 10) guarantee different results in terms of thermal resistance, for example:

Table 10 (***Thermal resistance***)

Material	*Dimension* mm.	*Temperature*°C
NBR		Min -40 • Max +80
Polyurethane	17 • 30	Min -50 • Max +130

15. Dynamic load C

*The "**C dynamic load**" is defined as the load charging the spherical plain bearings or rod ends subjected to dynamic solicitations, therefore in presence of oscillating, overturning or rotation movements. The action of the load will be in a radial direction for radial spherical and angular contact plain bearings and for the rod ends, while purely axial and centered for thrust spherical plain bearings. Every movement on the sliding surface generates wear and tear, and this should be kept in consideration.*

16. Static load C_0

*The "**C_0 static load**" is defined as the maximum load charging on the spherical plain bearings or rod ends in the presence of:*

- *small settling movements*
- *added loads due to shocks*
- *static conditions*

At room temperature, the static load must not cause failures or damages on the sliding surface that could affect the functioning of the product.

Specific bearings load

The dynamic load determines the surface pressure on the spherical plain bearing; in order to determine this pressure, the following formula can be adopted:

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

where;

- *p: pressure, N/mm²*
- *K: specific load value, N/mm²*
- *P: dynamic equivalent load on the bearing, kN*
- *C: dynamic load, kN*

Coupling	*Load coefficient* K N/mm²
Steel/steel	100
Steel/bronze	50
Steel/brass	

Sliding material	*Load coefficient* K N/mm²
PTFE material	150
PTFE composed	100
PTFE sheet	100

17. Load

*The applied **load** is surely one of the main elements which affects the duration and the choice of the spherical plain bearing. Together with the load, other elements must be considered, such as the movement, the duration and the maintenance, if any. The choice of the dimension of the spherical plain bearing varies when the load varies, as well as the direction and the sliding coupling. Based on all of the above mentioned elements, the best choice of the right spherical plain bearing can be carried out. Once the load value is determined, it is possible to define the theoretical duration, considering that the load acts in radial direction for radial spherical plain bearings and in axial direction for thrust spherical plain bearings, and that the direction and the entity are constant during the functioning.*

As the spherical plain bearings can be charged contemporaneously in both radial and axial direction, it is necessary to indicate a P value in the duration formula which will be calculated as follows:

$P = "X" \cdot F_r$

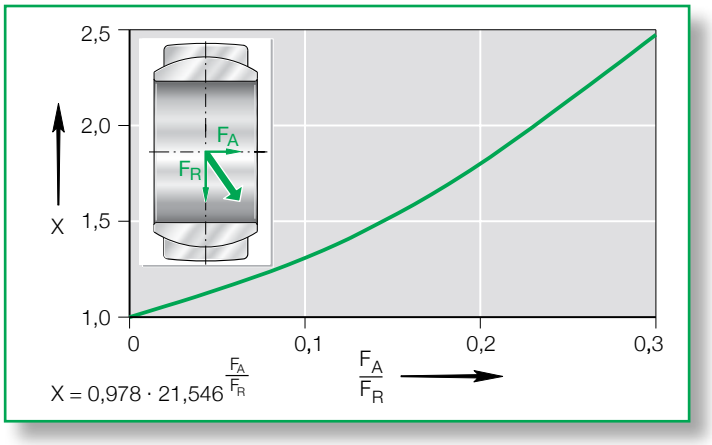
for radial and angular contact spherical plain bearings;

$P = "Y" \cdot F_a$

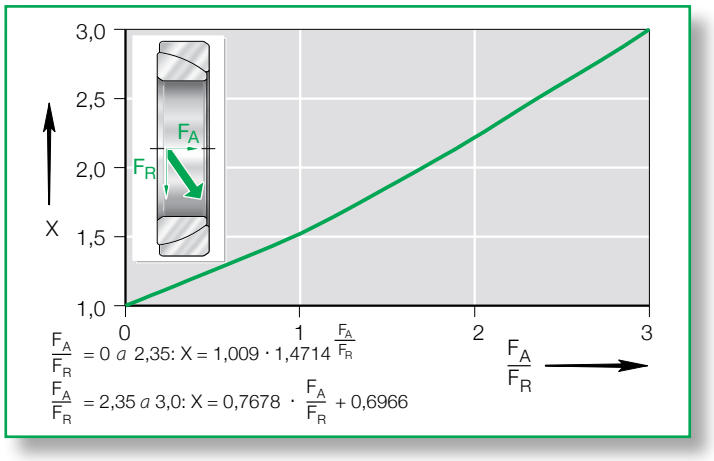
for thrust spherical plain bearings,

where:

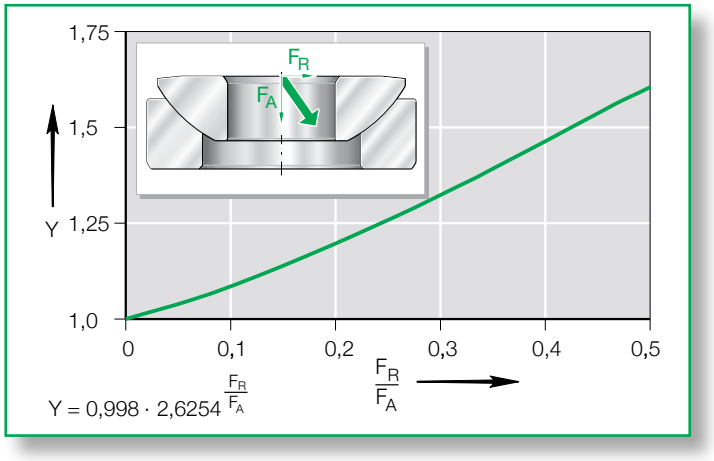
- *P: equivalent dynamic load, kN*
- *F_r: radial load, kN*
- *F_a: axial load, kN*
- *"X": axial load factor, referred to radial spherical plain bearings*
- *"Y": radial load factor, referred to axial spherical plain bearings*



Radial spherical plain bearings – combined load



Angular contact spherical plain bearings – combined load



Thrust spherical plain bearings – combined load

18 Mean sliding speed

The mean sliding speed for a constant movement can be calculated using the formula:

$$v = 5{,}82 \times 10^{-7}\, d_m \beta f$$

where:

v = mean sliding speed [m/s].

When the rotation is intermittent (not continuous), the average sliding speed should be calculated for a complete cycle.

dm = mean diameter of the inner ring [mm]

- *dm = dk for radial spherical plain bearings and rod ends*
- *dm = 0,9 dk for angular contact spherical plain bearings*
- *dm = 0,7 dk for thrust spherical plain bearings*
- *dk = inner ring spherical diameter [mm]*

β = half of the oscillation angle (fig. pag. 24), expressed in degrees [°]

f = oscillation frequency [min - 1] or rotation speed [min – 1]

In case of intermittent movement, the oscillation angle is usually provided in time unit. In this case the mean sliding speed can be calculated using the formula:

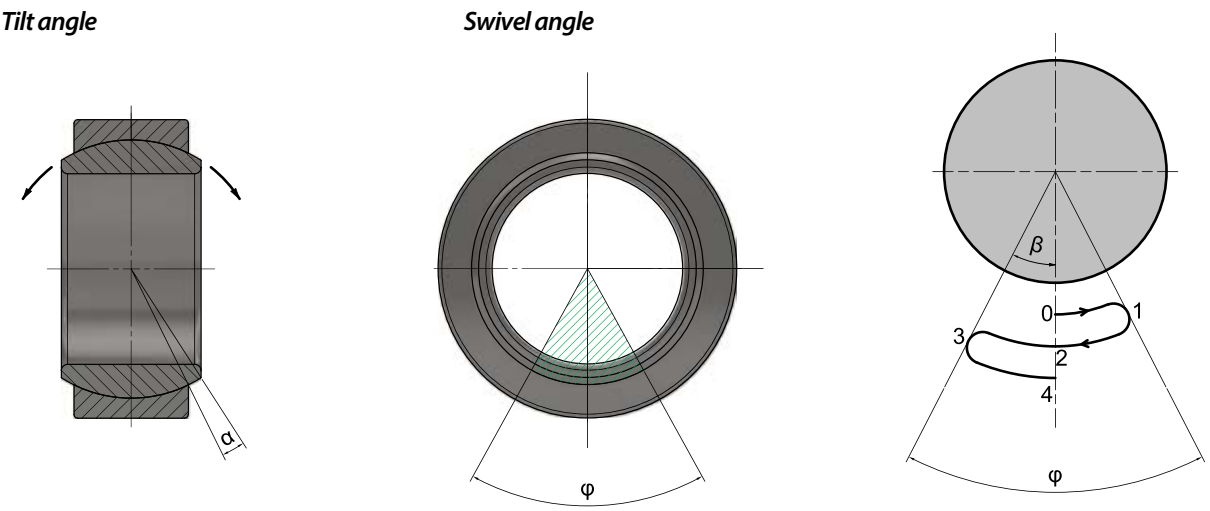
$$v = 8{,}73 \times 10^{-6} \, d_m \frac{4\beta}{t}$$

β = half of the oscillation angle [°] (fig. pag. 24), expressed in degrees [°]

t = time taken to complete the oscillation [s]

19. Movements of the spherical plain bearings

*The spherical plain bearings have been designed to react to heavy loads with oscillating, tilting and rotating **movements**. The oscillating movement is the movement of the two rings of the bearing, one towards the other around the axis of the bearing itself. The amplitude of this movement is expressed by the angle of oscillation β. The tilting movement is the internal ring movement in a not coaxial rotating direction towards the external ring. The value α, that is the tilting angle, expresses the separation of the axes relative to the rings. The main movements are visible on fig. at page 24, and according to the type and the number they directly influence the duration of the spherical plain bearing.*



φ = Swivel angle = 2β - A complete swivel angle is from point 0 to point 4 and corresponde to 4 β

(fig. 4)

20. Spherical plain bearings requiring maintenance

With the introduction of spherical plain bearings, both those that ***require maintenance*** *as well as those that do not require maintenance, since more than a half a century ago, it has been possible, thanks to their application, to obtain the remarkable advantage of movement and load transmission, in absence of torque and therefore in absence of radial loads and bending stresses in the structural elements. The use of spherical plain bearings is extremely diversified because it covers every sector of the construction of machines, plants and vehicles.*

Normally, when speaking about spherical plain bearings they are intended steel/steel coupling, products particularly used in presence of alternate loads, dynamic and hit type solicitation. The spherical plain bearings with steel/steel coupling are made with precious steel of rolling bearings; both rings are machined, tempered and grounded on all sides, then successively treated on the sliding surface by means of a manganese phosphating treatment, adopted long ago, then successively protected with layers of bisulphide of molybdenum. This procedure ensures excellent resistance to wear, when bearings are lubricated at the calculated intervals. The steel/steel spherical plain bearings can be divided into 3 categories based on the direction of the load: ***radial***, ***axial*** *and* ***angular contact***.

21. Radial spherical plain bearings (requiring maintenance)

*The **radial spherical plain bearings (requiring maintenance)** are composed by an inner ring with a cylindrical bore and sliding external spherical surface and with an outer ring with a cylindrical external surface and an internal sliding spherical surface.*
For dimensions up to 300 mm the external rings are axially splitted during the tempering phase; it is this expansion of the external split ring that allows the mounting of the inner ring.
The radial spherical plain bearings are particularly suitable to support elevated radial forces, like for example, those present in hydraulic cylinders.

22. Thrust spherical plain bearings (requiring maintenance)

***Thrust spherical plain bearings (requiring maintenance)**, if the applications allows, are particularly indicated in the presence of axial loads; they can even sustain, up to a certain force, combined loads.*

Axial spherical plain bearings have a convex sliding surface in the shaft washer, while the concave housing washer is placed at angle towards the axis of the bearing itself. When loads are present, the washer is subjected to an expansion which forces it to enlarge its diameter. To obviate this situation, it is opportune to use a closed housing properly sized to counter the force, thus taking advantage of all the potentiality of the axial type spherical plain bearing.

23. Angular contact spherical plain bearings (requiring maintenance)

Angular contact spherical plain bearings (requiring maintenance) *are composed by a washer for the shaft with a sliding external spherical surface positioned obliquely, and a washer for the housing with a sliding concave spherical surface. The spherical plain bearings with angular contact have the characteristic of absorbing combined loads (in axial and radial direction), they can therefore be mounted in pairs (coupled). They have the same dimensions of the 320.. series of tapered roller bearings; they can therefore be used as sliding bearings, should the application of rolling bearings create functional complications. As for their maintenance, the standard models require a lubrication with grease; other models require an oil bath lubrication by means of lubrication grooves.*

24. Life of the spherical plain bearings (requiring maintenance)

The ***life*** *of* ***spherical plain bearings requiring maintenance*** *can be intended as the number of complete oscillations or the number of working hours. Generally, it is very difficult to carry out a precise calculation of the duration, due to the condition of different elements, among which the movement, the maintenance, the lubrication and duration itself, as well as other use conditions, such as loads, hits, impurities in the environment that are often difficult to calculate and evaluate. As much as possible, each of the above mentioned elements must be considered, because they directly affect the duration of the spherical bearing. It is always good practice to follow the previous applicative experiences.*

The formulas indicated below apply to spherical plain bearings requiring maintenance with a sliding contact surface steel / steel and steel / bronze.
Specifically, the calculation of the life of the spherical plain bearings under initial lubrication only can be carried out using the following formula:

$$G_h = b_1\, b_2\, b_3\, b_4\, b_5\, \frac{330}{p^{2,5} v}$$

Instead, when the spherical plain bearing is relubricated at regular intervals after initial lubrication, one of the following formulas can be used:

$$G_{hN} = G_h \, f_\beta \, f_H \qquad or \qquad G_N = 60 \, f \, G_{hN}$$

It is also possible to calculate the relubrication frequency using the formula below:

$$H = \frac{G_h}{N}$$

where

G_h = *duration with only initial lubrication, expressed in working hours [h]*

G_{hN} = *duration with regular relubrication, expressed in hours of operation [h]*

G_N = *duration with regular relubrication, expressed in number of oscillations*

H = *relubrication frequency*

b_1 = *load factor:*

- b_1 = *1 for load in constant direction*
- b_1 = *2 for load in alternate direction*

b_2 = *temperature factor*

b_3 = *sliding factor*

b_4 = *speed factor*

b_5 = *factor for the tilt angle*

p = *specific load on the bearing [N/mm2] (if p <10 N/mm2, use p = 10 N/mm2)*

v = *mean sliding speed [m/s]*

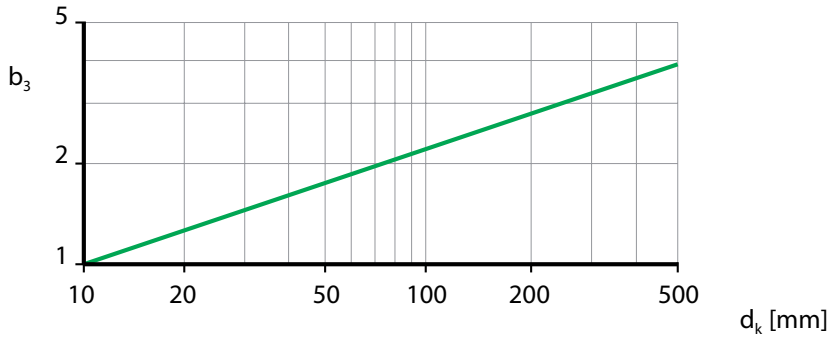
f_β = *factor depending on the tilt angle*

f_H = *factor depending on relubrication frequency f = oscillation frequency [min – 1]*

N = *relubrication interval [h]*

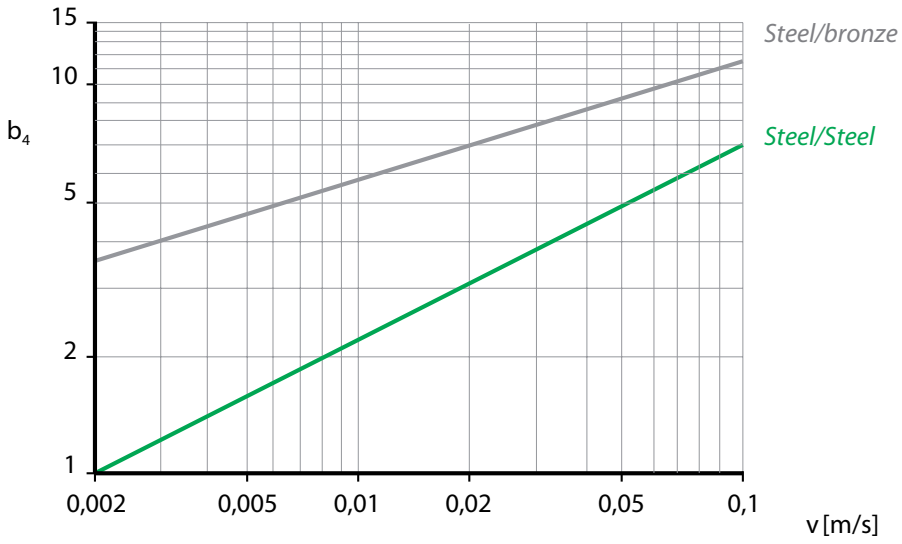
If the theoretical duration has to be implemented, the relubrication interval N can be reduced, or it may be proceeded with homologous analysis but evaluating a bigger sized product.

Sliding factor b_3 for steel/steel and steel/bronze sliding contact surface combinations



d_K = *inner ring spherical diameter*

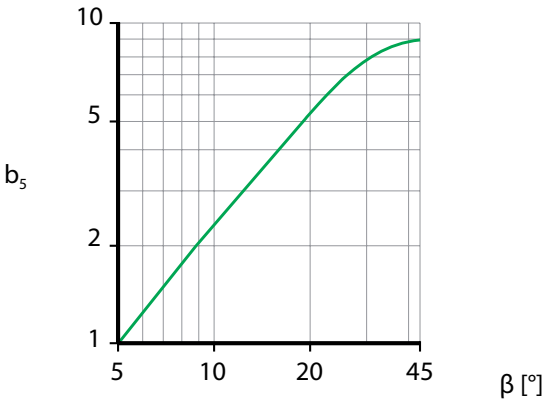
Speed factor b_4 for steel/steel and steel/bronze sliding contact surface combinations



Temperature factor b_2 for steel/steel and steel/bronze sliding contact surface combinations

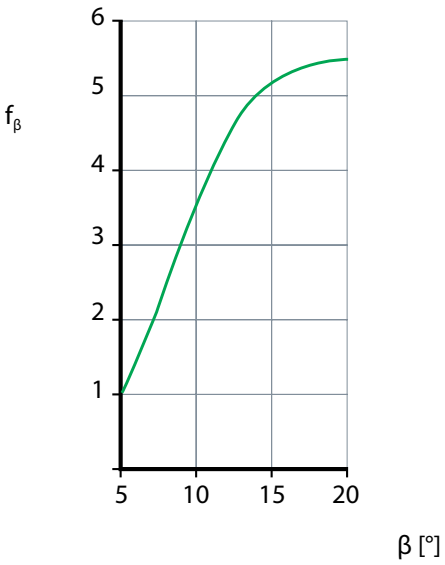
Operating temperature		Temperature factor b_2
over °C	incl. -	
-	120	1,0
120	160	0,9
160	180	0,8

Oscillation angle factor b_5 for steel/steel and steel/bronze sliding contact surface combinations



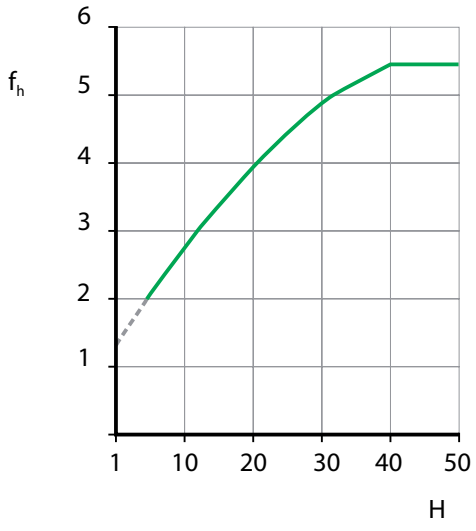
If β < 5°, the value of b_5 for β = 5° should be used.

Multiplication factor f_β for steel/steel and steel/bronze sliding contact surface combinations



If β < 5°, the value of f_β for β = 5° should be used.

Relubrication factor f_H for steel/steel and steel/bronze sliding contact surface combinations



If H < 5, the values indicated by the broken line can be used.

25. Maintenance-free spherical plain bearings

Maintenance-free spherical plain bearings *do not require lubricating because they have sliding layers made with PTFE (polytetrafluoroethylene). This material constitutes the sliding surface of the external ring and has a double function: it bears the loads and acts as a lubricant. Thanks to the low coefficient of friction, they are particularly used in case of long durations exigencies and where the use of bearings with sliding metal coupling steel/steel is not possible .*

Even these spherical plain bearings are classified in 3 categories according to the direction of the acting load, that are: ***radial***,***axial*** *and* ***angular contact****.*

26. Radial spherical plain bearings (maintenance-free)

Radial spherical plain bearings (maintenance-free) *are composed by an internal ring made in hardened bearing steel, eventually with chromed surfaces, and with external rings eventually composed of 2 bushes, inserted one inside the other using the "riveting" method.*

In a subsequent phase, the steel covering the outer ring is worked with precision, and between the internal and the external rings the PTFE layer is placed.

For some kind of spherical plain bearings, available also in 2RS execution, the external rings have a split, while for bigger sizes the external rings are divided in half-rings, fixed by special locking screws.

The main characteristic of this type of spherical plain bearings is the radial load absorption, always coming from the same direction.

27. Thrust spherical plain bearings (maintenance-free)

Thrust spherical plain bearings (maintenance- free) *have a convex sliding surface in the shaft washer, while the concave housing washer creates a contact angle towards the axis of the bearing itself; the chromed surface is cap-shaped and is positioned in the sliding zone, in form of a spherical cavity covered with PTFE. For bore dimensions within 140 mm, they are produced with steel for rolling bearings, hardened and finished with extremely precise equipments. Considering their structure, the axial spherical plain bearings are indicated to react to unidirectional load, especially in axial direction. Under strain, there is a diameter expansion of the housing washer; to obviate to this situation, it is possible to use a closed housing with appropriate dimensions, facing the load and allowing to take full advantage of the potential of the thrust spherical plain bearing. All spherical plain bearings are machined as a single item, so it is not possible to replace or couple rings belonging to different bearings.*

28. Angular contact spherical plain bearings (maintenance-free)

Angular contact spherical plain bearings (maintenance-free)*, are composed by washers for housing and shaft, made in steel for rolling bearings, hardened and worked with accuracy; the internal sliding spherical surface, positioned obliquely in the washer for housing, is covered with a PTFE layer, while the sliding surface of the shaft washer is chromed. Each single component is made and adapted to its corresponding counterpart, therefore it is not possible to interchange them. The spherical plain bearings with angular contact have the same dimensions of tapered roller bearings of the 320.. series. Suitable to react to combined loads, if mounted in couples they can support high loads in all directions.*

29. High-speed GE..BBH and GE..BBL centripetal ball joint with integrated double-row ball bearing

GE..BBH ball joints series *have an integrated double-row ball bearing, self-lubricated by a special high-speed bearing grease.*
GE..BBL ball joints series *are suitable to bear lighter loads compared to GE..BBH series.*
The two rows of balls are centered on the inner ring.
They are produced according to DIN ISO 12240-4, K series.

30. High-speed GE..RB centripetal ball joint with integrated single-row roller bearing

GE..RB ball joints series *have an integrated single-row roller bearing, self-lubricated by a special high-speed bearing grease.*
As for previous series, rollers are centered on the inner ring.
They are produced according to DIN ISO 12240-4, K series.

31. Life of the spherical plain bearings (maintenance-free)

*The **life** of **maintenance-free spherical plain bearings**, as for the spherical plain bearings requiring maintenance, can be considered as the number of complete oscillations or the number of operating hours. Even in this case, it is good practice to consider previous application experiences and compare the sizing of the bearing with the formulas below, which consider the influence of the load and the sliding speed. For applications characterized by light loads and / or low sliding speeds, therefore by long durations, environmental factors, pollution (considered as dirt and contaminants), humidity, and the presence of corrosive agents have a greater influence on the expected duration. The basic service life of spherical plain bearings with contact surfaces in sintered bronze and steel/PTFE (maintenance-free) can be calculated using:*

$$G_h = b_1 \, b_2 \, \frac{1400}{p^{1,3} \, v}$$

Or

$$G = 60 \, f \, G_h$$

where:

G_h = *basic life, operating hours*

G = *nominal life, number of oscillations*

b_1 = *load condition factor (see table below)*

b_2 = *temperature factor (see diagram below)*

p = *specific load on the bearing [N/mm2]*

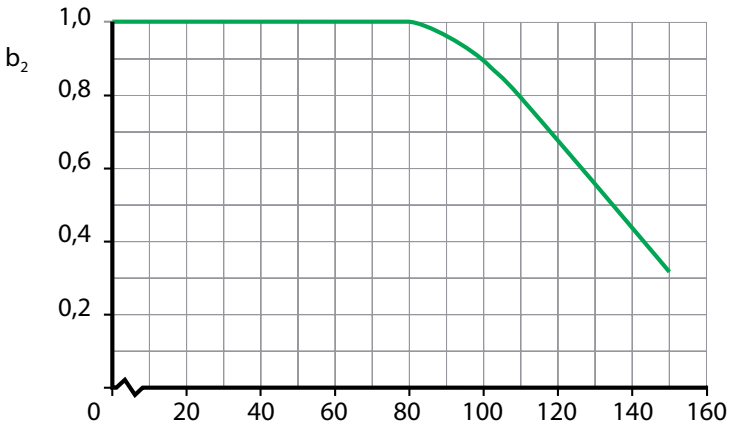
v = *average sliding speed [m/s]*

f = *oscillation frequency [min−1]*

Load condition factor b_1 for the steel/PTFE sintered bronze sliding contact surface combination		
Type of load	***Factor b_1***	***Admitted specific bearing load*** (1)
-	-	N/mm^2
Constant load (2) *Single direction*	1	up to 100
Variable load *(2)* *Alternate direction or pulsating magnitude at a* *frequency up to 0,5 Hz* *over 0,5 up to 5 Hz*	 0,4 0,2	 up to 60 up to 40

(1) Inertia forces should also be taken into consideration;
(2) For constant load, oscillating frequencies above 300 min^{-1} and very short sliding distances, $b_1 = 1$ factor cannot be used because of possible material fatigue.

Temperature factor b_2 for the steel/PTFE-sintered bronze sliding contact surface combination



The basic service life of the maintenance-free bearings with steel / PTFE fabric-sintered bronze contact surface can be calculated using the formula:

$$G_h = b_1 \, b_2 \, b_4 \, \frac{K_p}{p^n \, v}$$

Or:

$$G = 60 \, f \, G_h$$

where:

G_h = basic life, expressed in working hours

G = nominal life, number of oscillations

b_1 = load condition factor (see table below)

b_2 = temperature factor (see diagram below)

b_4 = speed factor (see diagram below)

K_p = constant for the specific load on the bearing (see table below)

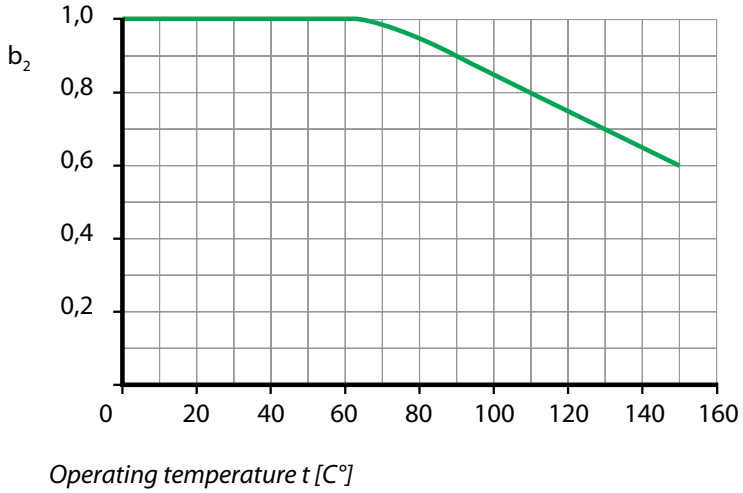
p = specific load on the bearing [N/mm²]

n = exponent for the specific load on the bearing (see table below)

v = mean sliding speed [m/s]

f = oscillation frequency [min-1]

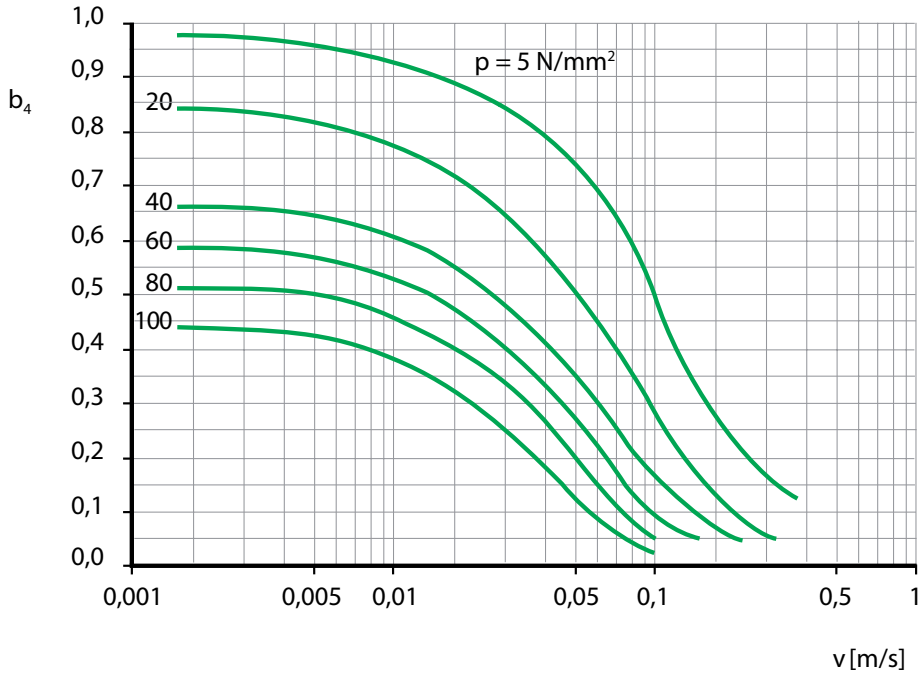
Temperature factor b_2 for steel/PTFE fabric sliding contact surface combination



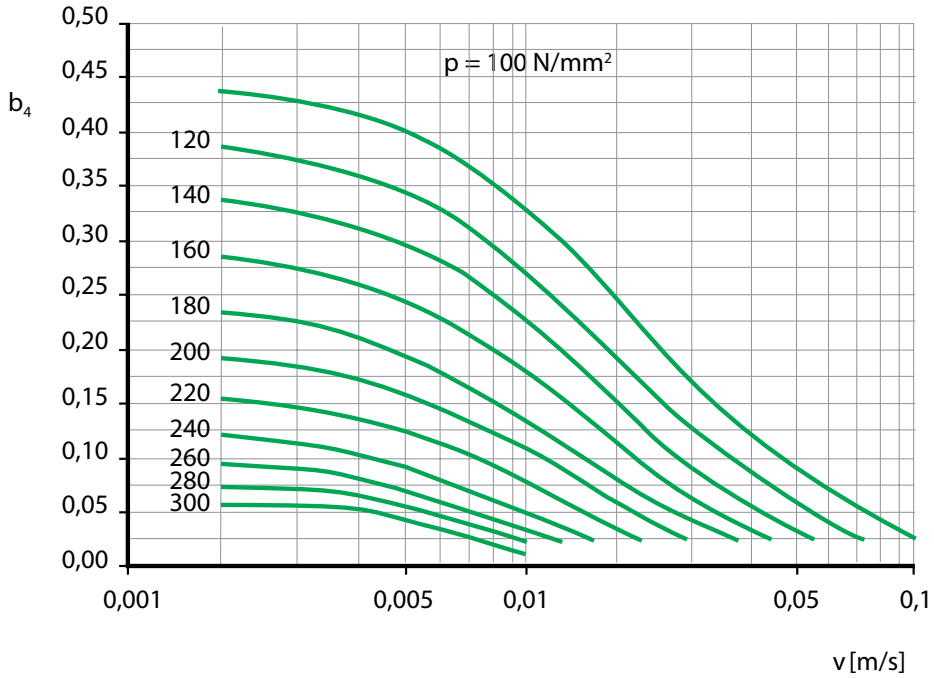
Load condition factor b_1 for the steel/PTFE fabric sliding contact surface combination		
Type of load	***Factor b_1 (1)***	***Bearing specific load***
-	-	N/mm²
Constant *Single direction*	1	up to 300
Variable load *Alternating direction or pulsating magnitude*		
up to 0,5 Hz	0,55 0,4	up to 50 50 to 100
over 0,5 to 1 Hz	0,35 0,15	up to 50 50 to 100
over 1 to 5 Hz	0,1	up to 50

(1) The factor b_1 covers several parameters that affect the bearing life. Depending on the operating conditions, higher b_1 values can applied.

Speed factor b_4 for steel/PTFE fabric sliding contact surface combination



Speed factor b_4 for steel/PTFE fabric sliding contact surface combination



Constant K_p and exponent n for steel/PTFE fabric sliding contact surface combination			
Specific bearing load (1)		**Constant K_p**	**Exponent n**
Over	Incl.		
N/mm²		-	-
-	25	770	0,2
25	90	4000	0,7
90	300	40000	1,2

(1) For inch bearings, specific bearing load can not exceed 150 N/mm²

32. Rod ends

***Rod ends** are composed by a "body", also defined as housing, in which a spherical plain bearing is permanently inserted in a housing specifically designed to locate it. Thanks to the threading and to the welded surface, the rod ends can be considered excellent elements of support and connection, integrating perfectly with various types of applications.*
From the type of rod end, it is possible to find which spherical plain bearing has been inserted, for example: SI 30 C (rod end type)
GE 30 C (spherical plain bearings)
Should no reference to the type of spherical plain bearing appear in the code, it can be assumed that the rod end and the spherical plain bearing are part of an integrated structure.

33. SI - SA rod ends

*The **rod ends SI - SA** series are produced with C 45 forged and tempered steel; the surfaces are protected from external corrosive agents, thanks to a galvanized zinc covering.*
They are available with internal and external, right-hand and left-hand thread, and they are provided with greaser or lubrication holes.

34. TSF - TSM rod ends

*The **rod ends TSF - TSM** series are available with right-hand and left-hand thread, with sliding coupling in steel/bronze and steel/PTFE; they are mainly used for: pneumatic cylinders, connecting rod gears, printing and labelling machines, packaging machines, filling plants and mechanical drives. They can be supplied in stainless steel as well (housing in AISI 304 steel and internal rings AISI 440C or 420C steel), particularly indicated in the food, chemical/ pharmaceutical sector, in presence of oxidizing or corrosive liquid (water, acids etc…).*

35. Heavy-duty TSM..BB and TSF..BB rod ends with integrated double-row self-aligning ball bearing

***TSM..BB** and **TSF..BB rod- ends** series have an integrated double-row self-aligning ball bearing, self-lubricated by a special high-speed bearing grease.*
*In **TSM..BB-O** and **TSF..BB-O** series, balls are centered on outer housing instead of inner ring.*
***TSM..BB-E** e **TSF..BB-E** series differ because of an edge at the beginning of the thread.*
TSM..BB, TSF..BB, TSM..BB- O, TSF..BB- O, TSM..BB-E and TSF..BB-E series are available with left/right hand, inner/outer, metric and inches size thread.

36. Heavy-duty TSM..RB and TSF..RB rod ends with integrated single-row self-aligning roller bearing

***TSM..RB** and **TSF..RB** rod- ends series have an integrated single row roller bearing, self-lubricated by a special high-speed bearing grease.*
TSM..RB and TSF..RB series are available with left/right hand, inner/outer, metric and inches thread.
They are produced according to DIN ISO 12240-4, K series.

37. Rod ends for hydraulics TAPR.N - TAPR.U - TAPR.DO - TAPR.CE

Rod ends for hydraulics *are composed by a threaded base with a lengthwise cut and two incased hexagon screws which allow threads blockage.*
Using two security rings, the spherical plain bearings, in steel/steel coupling, are fixed in the housing bore axially.
The rod ends for hydraulics are made in forged C45 steel, up to a nominal diameter of 50 mm.; for bigger sizes, spheroid cast iron may be used.
The surfaces are treated against corrosion.

38. Rod ends for hydraulics with weldable housing T.A.C. - T.P.N.

There are two types of ***rod ends for hydraulics with weldable housing****; both are available in steel/steel coupling. The first type (T.A.C.), made in forged steel, has a 45° chamfered base that allows easy welding to the stem of the piston; they can be positioned using a reference pin placed in the center of the base surface.*
The spherical plain bearing is fixed in the housing bore axially by means of an edging. The second type (T.P.N.) is made in forged steel up to a 50 mm. bore diameter, and in laminated steel for bigger sizes; its welding base has rectangular form, this particular remarkably facilitates the assembly on the bottoms of cylinders; using two security rings, the bearings are fixed in the mounting bore axially.

39. Maintenance and lubrication

When rod ends with integrated spherical plain bearings requiring maintenance are used, their castings will be equipped with devices for lubrication. It is always recommended to carry out proper maintenance and lubrication, where required, because they are fundamental factors for the duration of the product. In the following diagram (table 13), some characteristics concerning spherical plain bearings and rod ends are noted.

Table 13

Type		*Maintenance*
SI - SA..ES		*from diameter 6 to diameter 12 (not present)* *from diameter 15 to diameter 20 (with oiler)* *from diameter 15 (with greaser)*
SI - SA..C		*self-lubricating*
TSF - TSM		*greaser and oiler in the seating*
TSF - TSM..C - TSF.R - TSM.R		*maintenance-free*
Hydraulics		*greaser*

40. Rod ends dynamic load C

*The **Dynamic load C** values indicated in the dimension tables refer to the spherical plain bearings integrated in their rod ends, and can be used to calculate the working life of the housing itself.*
Besides the radial load, acting in both directions of traction and pressure, other forces can be present, both in axial and radial direction, therefore the bearing equivalent load should be considered in life calculation.

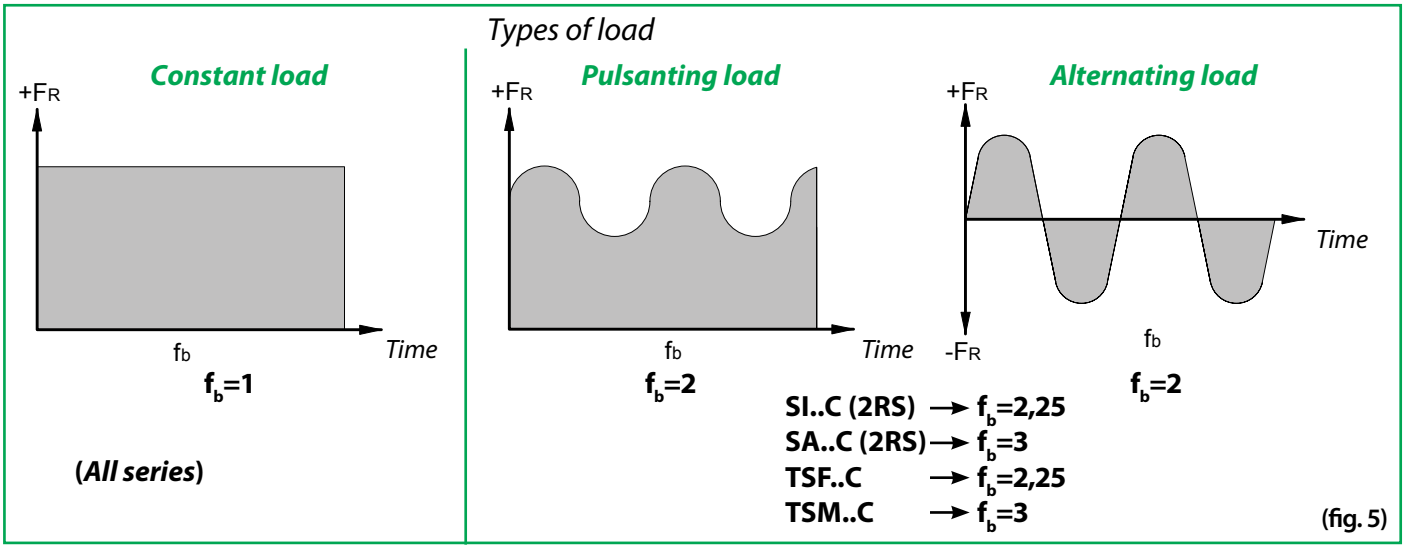
41. Rod ends static load C_0

*The **Static load C_0** values, shown in the dimension tables, indicate the load capacity of the housing in itself.*

42. Allowed load on rod ends

*There are different **types of load** (fig. 5) that may act on the rod end, among which:*

- *constant loads (the load acts always in the same direction, so that the bearing is stressed always in the same area)*
- *swinging and alternate loads (they stress more than static loads with the same rated load; the opposite stressed areas are loaded and unloaded alternatively).*



(fig. 5)

f_b : *load coefficient*

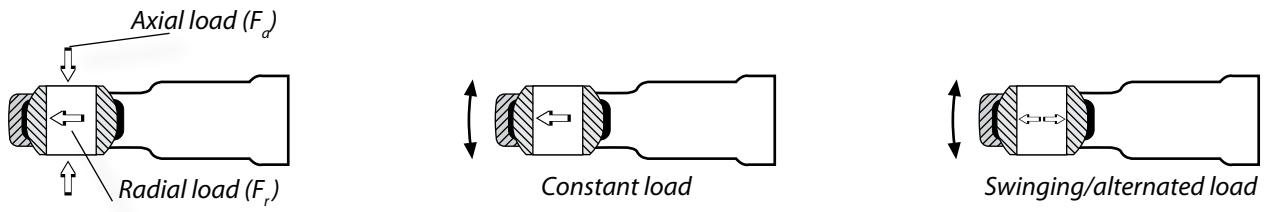
Considering what above, it is necessary to check the working conditions and to apply the following reduction factor when calculating the allowed load.

$$P = \frac{C_O}{f_b}$$

Where;

- *P: equivalent dynamic load allowed on the rod end, kN*
- *C_o: rod end static load, kN*
- *f_b : load coefficient*

Rod ends are designed to absorb mainly high radial loads, even if they can be used with combined loads (fig. 6). It should however be considered that the total axial load value should not be more than 20% of the radial load.



(fig. 6)

43. Failure causes

The main reason for the failure of a rod end is the "blocking" of the sliding surface of the spherical plain bearings.

This can be caused by:

- *friction increase*
- *great clearance increase*

The above situations may happen with rod ends coupled with spherical plain bearings requiring maintenance.

On the contrary, if spherical plain bearings are maintenance-free, the surface sliding is regular; however, some conditions can compromise the normal parts rubbing, thus causing a reduction in the duration of the spherical plain bearings.

44. Clevises with threaded hole and pins, with complementary accessories

Clevises *are mechanical junction components, suitable for the transmission of static loads, produced according to DIN 71752 detailed in the dimension table. They can be identified by the thread and its pitch. Every type of clevis has its pin, with eventual split pin or, as alternative, the spring clip. These accessories have the function to connect the clevis to the mechanical part for the transmission of the force. The above items are usually manufactured in steel, and under request can be supplied also in aluminum or stainless steel (AISI 304). The products can be supplied with or without a protective galvanic treatment; furthermore, clevises are available also with fine thread (CETOP) or ex CNomo, which are particular both for the threaded bores and the bigger dimensions, able to guarantee greater resistance. For tolerances and dimensions see produts tables.*

General products index

Page	Designation	Type	Dimensions (inner diameter) mm.	Sliding coupling
67-68	GE..E/ES 	Spherical plain radial bearings, without seals	4 - 1.000	steel/steel
67-68	GE..ES 2RS 	Spherical plain radial bearings, with seals	15 - 300	steel/steel
69	GEG..E/ES 	Spherical plain radial bearings, without seals	4 - 280	steel/steel
69	GEG..ES 2RS 	Spherical plain radial bearings, with seals	15 - 280	steel/steel
70	GE..SB 	Spherical plain radial bearings, without seals	5 - 30	steel/bronze
71	GE..CP 	Spherical plain radial bearings, (heavy duty)	100 - 630	Hard chromium/PTFE
72	GE..SP 	Spherical plain radial bearings, without seals	5 - 30	steel/PTFE
73	GEEW..E/ES 	Spherical plain radial bearings with wide inner ring, without seals	12 - 320	steel/steel
74	GEEM..ES 2RS 	Spherical plain radial bearings with wide inner ring and seals	17 - 80	steel/steel
75	GE..C 	Maintenance-free spherical plain radial bearings, without seals	4 - 30	Hard chromium/PTFE

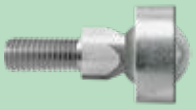
Lubrication	Temperature °C	Technical details and main application fields
Yes	-60 ~ +200	Hardened outer and inner ring, with groove on outer ring and lubrication hole, with or without seals. Particularly suitable for working with high alternate loads and impact loads; suitable for building machinery, hydraulic cylinders, vehicles for road and naval transport.
Yes	-60 ~ +130	
Yes	-60 ~ +200	The oversize inner ring allows a wider turnover angle α. Technical characteristics and main applications are the same as for GE type.
Yes	-60 ~ +130	
Yes	-60 ~ +250	Outer ring shaped on inner ring. Particularly suitable for packing machinery, printing machinery, conveyor and sorting machinery.
No	-50 ~ +130	Hardened inner ring, outer ring not hardened, radial cut and tightened with blocking screws. Particularly suitable for building heavy vehicles, lifting equipments, cranes, bridge cranes.
No	-50 ~ +200	Outer ring shaped on inner ring. Particularly suitable for packing machinery, printing machinery, lifting devices.
Yes	-60 ~ +200	Hardened inner and outer ring. The outer ring has an axial rift for inner ring mounting. Manufactured according to DIN 24338, and particularly suitable for coupling pistons and standardized cylinders.
Yes	-60 ~ +130	Main technical characteristics and application fields are equivalent to the GE type. However, they are different for the presence of special cylindrical extensions on the inner ring, which allow the assembling without using spacer rings between shoulders.
No	-50 ~ +200	Hardened inner ring, outer ring formed by an external steel part and an internal PTFE part. In normal working conditions they are particularly suitable for hydraulic cylinders pistons of and lifting equipment.

General products index

Page	Designation	Type	Dimensions (inner diameter) mm.	Sliding coupling
75	**GE..ET 2RS** 	*Maintenance-free spherical plain radial bearings, with seals*	17 - 300	*Hard chromium/PTFE*
76	**GEG..C** 	*Maintenance-free spherical plain radial bearings, without seals*	4 - 30	*Hard chromium/PTFE*
76	**GEG..ET 2RS** 	*Maintenance-free spherical plain radial bearings, with seals*	30 - 280	*Hard chromium/PTFE*
77	**GEZ..ES** 	*Spherical plain radial bearings, without seals (inches sizes)*	12,7 - 152,4	*steel/steel*
77	**GEZ..ES 2RS** 	*Spherical plain radial bearings, with seals (inches sizes)*	25,4 - 152,4	*steel/steel*
78	**GE..XS K** 	*Spherical plain radial bearings with two-pieces*	12 - 150	*steel/steel*
79	**GEK..XS 2RS** 	*Spherical plain radial bearings with two-pieces, and seals*	25 - 60	*steel/steel*
80	**GX..S** 	*Spherical plain thrust bearings requiring maintenance*	10 - 200	*steel/steel*
81	**GX..CP** 	*Spherical plain thrust bearings maintenance free*	10 - 360	*Hard chromium/PTFE*

Lubrication	Temperature °C	Technical details and main application fields
No	-50 ~ +130	*Hardened inner and outer ring. An axial rift for assemblying is present on the outer ring (up to diameter 120 mm.); for bigger diameters the external ring is splitted and blocked by rings. The technical characteristics and application fields are equivalent to the GE..C type, but with better performances.*
No	-50 ~ +200	*The main technical characteristics and application fields are equivalent to the GE C. type. However, they are different for the bigger inner ring, which allows a wider turnover angle* α.
No	-50 ~ +130	*The main technical characteristics and application fields are equivalent to the GE..ET 2RS type. However, they are different for the bigger inner ring, which allows a wider turnover angle* α.
Yes	-60 ~ +200	*The technical characteristics and the main application fields are equivalent to the GE type. They are however different for the use in application where inches measures are required.*
Yes	-60 ~ +130	
Yes	-60 ~ +200	*Outer ring with two-pieces in axial direction. Lubrication groove and hole in the outer and inner ring. Joint is bonderized and phosphated.*
Yes	-60 ~ +130	*Outer ring with two axial pieces and two seals. Inner sphere is chrome steel plated with lubrication groove and hole.*
Yes	-60 ~ +200	*Shaft and housing rings both hardened and separable, they can be joined directly with spherical radial bearings. They have groove and lubrication hole on the housing ring. They represent an alternative for taper roller bearing of the series 320..; they can bear axial and radial loads, in the adjustment movement they are subject only to unidirectional load.*
No	-50 ~ +150	*The technical characteristics and applications fields are equivalent to the GAC..S type. They are particularly suitable in case of minimum movements and heavy loads. The housing ring starting from diameter 160 mm is not hardened.*

General products index

Page	Designation	Type	Dimensions (inner diameter) mm.	Sliding coupling
82	GAC..S 	Angular contact spherical plain bearings requiring maintenance	25 - 200	steel/steel
83	GAC..CP 	Angular contact spherical plain bearings maintenance free	25 - 200	Hard chromium/PTFE
84	SSR 	Spherical plain bearings	5 - 30	steel/bronze
85	GE..BBL 	Ball joint with integral double-row ball bearing	8 - 50	steel/steel
86	GE..BBH 	Ball joint with integral double-row ball bearing	6 - 30	steel/steel
87	GE..RB 	Ball joint with integral roller bearing	12 - 30	steel/steel
91	SQD..C 	Ball joint rod ends with one shank	5 - 16	steel with sintered bronze and PTFE
92	SQ..C RS 	Winding shape ball joint rod ends	5 - 22	steel with sintered bronze and PTFE

Lubrication	Temperature °C	Technical details and main application fields
Yes	-60 ~ +200	Inner and outer ring are both hardened and completely separable; they can be considered as an alternative to taper roller bearing. They have grooves and lubrication hole on the outer ring. Due to their shape they are suitable in case of dynamic loads or when impact loads, together with little oscillation angles, should cause damages. They are particularly suitable for elastic inge support, trailers' axle and generally in the transport field.
No	-50 ~ +150	The technical characteristics and applications fields are equivalent to GAC..S. type. Particularly suitable in case of minimum movements and heavy loads.
Yes	-60 ~ +250	Outer ring with circumference groove and lubrication hole. The technical characteristics and the main application fields are equivalent to the GE...SB type.
Yes	-45 ~ +120	Outer ring: 100 Cr 6 steel; hardened, superfinished, with seals. Inner ring: 100 Cr 6 steel; hardened, superfinished. Lubrication: high speed bearing grease (temp. range -45° to +120°). Radial clearance: 10 ÷ 30 µm.
Yes	-45 ~ +120	Outer ring: 100 Cr 6 steel; hardened, superfinished, with shields. Inner ring: 100 Cr 6 steel; hardened, superfinished. Lubrication: high speed bearing grease (temp. range -45° to +120°). Radial clearance: 10 ÷ 30 µm.
Yes	-45 ~ +120	Outer ring: 100 Cr 6 steel; hardened, superfinished, with shields. Inner ring: 100 Cr 6 steel; hardened, superfinished. Lubrication: high speed bearing grease (temp. range -45° to +120°). Radial clearance: 10 ÷ 30 µm.
No	-50 ~ +130	S Radial spherical plain bearing with internal ball and threaded rod. It is suitable in application which require self-aligning between the outer ring and the housing.
No	-50 ~ +130	Ball joint bearing "L" shaped with dust cover. Particularly suitable to be used on moving parts, steering, axles whereas self-aligning is necessary.

General products index

Page	Designation	Type	Dimensions (inner diameter) mm.	Sliding coupling
93	SQZ..C RS 	Straight ball joint rod ends	5 - 22	steel with sintered bronze and PTFE
94	SI..E/ES 	Rod ends, without seals	5 - 80	steel/steel
94	SI..ES 2RS 	Rod ends, with seals	15 - 80	steel/steel
95	SI..C 	Rod ends, without seals	5 - 30	steel with sintered bronze and PTFE
95	SI..C 2RS 	Rod ends, with seals (maintenance-free)	35 - 80	steel with sintered bronze and PTFE
96	SA..E/ES 	Rod ends, without seals (maintenance-free)	5 - 80	steel/steel
96	SA..ES 2RS 	Rod ends, with seals	20 - 80	steel/steel
97	SA..C 	Rod ends, without seals (maintenance-free)	5 - 30	hard chromium/ PTFE
97	SA..C 2RS 	Rod ends, with seals (maintenance-free)	35 - 80	hard chromium/ PTFE

Lubrication	Temperature °C	Technical details and main application fields
No	-50 ~ +130	*The technical characteristics and the main application field are equivalent to the SQ..C RS type, the only difference is the shape which is straight.*
Yes	-	*Rod ends manufactured in steel C45 (zinc plated) according to regulation DIN 648 series E. The registration thread is located in the internal part of the shank and it is very long. The spherical rod end needs to be lubricated with a grease nipple on the housing or a lubrication hole. They are particularly suitable in presence of high alternate and impact loads. They can be supplied with seals 2RS.*
Yes	-	
No	-	*Rod ends manufactured in steel C45 (zinc plated) according to regulation DIN 648 series E. The registration thread is located in the internal part of the shank and it is very long. The rod end is maintenance-free. They are particularly suitable in presence of steady unilateral loads and slow movements. They can be supplied with seals 2RS.*
No	-	
Yes	-	*Rod ends manufactured in steel C45 (zinc plated) according to regulation DIN 648 series E. The registration thread is located in the internal part of the shank and it is very long. The rod end needs to be lubricated with a grease nipple on the housing or a lubrication hole. They are particularly suitable in presence of high alternate and impact loads. They can be supplied with seals 2RS.*
Yes	-	
No	-	*Rod ends manufactured in steel C45 (zinc plated) according to regulation DIN 648 series E. The registration thread is located in the internal part of the shank and it is very long. The rod end is maintenance-free. They are particularly suitable in presence of steady and unilateral loads. They can be supplied with seals 2RS.*
No	-	

General products index

Page	Designation	Type	Dimensions (inner diameter) mm.	Sliding coupling
98	TSF 	Rod ends	5 - 30	steel/bronze
99	TSF..C 	Rod ends (maintenance-free)	5 - 50	steel/PTFE
100	TSF..R 	Rod ends (maintenance-free reduced series)	3 - 30	steel/PTFE
101	TSM 	Rod ends	5 - 30	steel/bronze
102	TSM..C 	Rod ends (maintenance-free)	5 - 50	steel/PTFE
103	TSM..R 	Rod ends (maintenance-free reduced series)	3 - 30	steel/PTFE
104	TSF..BB 	Heavy-duty rod ends with integral double-row ball bearing	6 - 50	steel/steel
105	TSF..BB-O 	Heavy-duty rod ends with integral double-row ball bearing	6 - 30	steel/steel
106	TSF..BB-E 	Heavy-duty rod ends with integral double-row ball bearing with edge	10 - 20	steel/steel

Lubrication	Temperature °C	Technical details and main application fields
Yes	-	Rod end manufactured in steel C45 (zinc plated) according to the regulation DIN 648 series K. The registration thread is located in the internal part of the shank and it is very long. The spherical rod end needs to be lubricated with a funnel on the housings or a lubrication hole (for series TSF). They are particularly suitable for universal applications (alternate and unilateral loads - slow rotation movements, medium to wide oscillation angles). They are also suitable for joining movement devices and transmission chains. Available also with CETOP [1] thread.
No	-	
No	-	
Yes	-	Rod end manufactured in steel C45 (zinc plated) according to the regulation DIN 648 series K. The registration thread is located in the internal part of the shank and it is very long. The spherical rod end needs to be lubricated with a funnel on the housings or a lubrication hole (for series TSM). They are particularly suitable for universal applications (alternate and unilateral loads - slow rotation movements, medium to wide oscillation angles). They are suitable also for joining movement devices and transmission chains. Available also with CETOP [1] thread.
No	-	
No	-	
Yes	-45 ~ +120	Housing forged steel case-hardened bearing race superfinished galvanized surface chromium VI free. Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished. Lubrication: high speed bearing grease (temp. range -45° to +120°). Temperature range: -45°C to +120°C. Radial clearance (radial): 10 ÷ 30 µm
Yes	-45 ~ +120	Housing forged steel case-hardened bearing race superfinished galvanized surface chromium VI free. Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished. Lubrication: high speed bearing grease (temp. range -45° to +120°). Temperature range: -45°C to +120°C. Radial clearance (radial): 10 ÷ 30 µm
Yes	-45 ~ +120	Housing forged steel case-hardened bearing race superfinished galvanized surface chromium VI free. Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished. Lubrication: high speed bearing grease (temp. range -45° to +120°). Temperature range: -45°C to +120°C. Radial clearance (radial): 10 ÷ 30 µm

[1] Hydraulics and pneumatics European Committee

General products index

Page	Designation	Type	Dimensions (inner diameter) mm.	Sliding coupling
107	**TSF..RB** 	*Heavy-duty rod ends with integral roller bearing*	12 - 50	*steel/steel*
108	**TSM..BB** 	*Heavy-duty rod ends with integral double-row ball bearing*	6 - 50	*steel/steel*
109	**TSM..BB-O** 	*Heavy-duty rod ends with integral double-row ball bearing*	6 - 30	*steel/steel*
110	**TSM..BB-E** 	*Heavy-duty rod ends with integral double-row ball bearing with edge*	5 - 20	*steel/steel*
111	**TSM..RB** 	*Heavy-duty rod ends with integral roller bearing*	12 - 50	*steel/steel*
112	**TAPR.N** 	*Rod ends for hydraulic components*	20 - 120	*steel/steel*
113	**TAPR.U** 	*Rod ends for hydraulic components*	20 - 120	*steel/steel*
114	**TAPR.DO** 	*Rod ends for hydraulic components*	12 - 100	*steel/steel*
115	**TAPR.CE** 	*Rod ends for hydraulic components*	12 - 200	*steel/steel*

Lubrication	Temperature °C	Technical details and main application fields
Yes	-45 ~ +120	Housing forged steel case-hardened bearing race superfinished galvanized surface chromium VI free. Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished. Lubrication: high speed bearing grease (temp. range -45° to +120°). Temperature range: -45°C to +120°C. Radial clearance (radial): 10 ÷ 30 µm
Yes	-45 ~ +120	Housing forged steel case-hardened bearing race superfinished rolled thread galvanized surface chromium VI free. Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished. Lubrication: high speed bearing grease (temp. range -45° to +120°). Temperature range: -45°C to +120°C. Radial clearance (radial): 10 ÷ 30 µm.
Yes	-45 ~ +120	Housing forged steel case-hardened bearing race superfinished rolled thread galvanized surface chromium VI free. Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished. Lubrication: high speed bearing grease (temp. range -45° to +120°). Temperature range: -45°C to +120°C.Radial clearance (radial): 10 ÷ 30 µm.
Yes	-45 ~ +120	Housing forged steel case-hardened bearing race superfinished rolled thread galvanized surface chromium VI free. Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished. Lubrication: high speed bearing grease (temp. range -45° to +120°). Temperature range: -45°C to +120°C. Radial clearance (radial): 10 ÷ 30 µm.
Yes	-45 ~ +120	Housing forged steel case-hardened bearing race superfinished rolled thread galvanized surface chromium VI free. Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished. Lubrication: high speed bearing grease (temp. range -45° to +120°). Temperature range: -45°C to +120°C. Radial clearance (radial): 10 ÷ 30 µm
Yes	-	Rod ends for hydraulic and oleodinamic components, with short internal thread according to DIN 648 series E. Up to size 50 mm. the external housing is made of forged steel, starting from size 60 mm. is made of cast iron; it has a grease nipple for lubrication. They are particularly suitable in the field of oleodynamics and hydraulic cylinders, the special structure allows the stroke maximum exploitation due to shortest axel base connection. Type TAPR.U allows to fix the thread to the pin with a blocking system.
Yes	-	
Yes	-	Rod ends for hydraulic components, with internal thread according to DIN 24555. The external housing is made of forged steel C 45 N and has a grease nipple for lubrication. The thread is blocked by devices on the shank. Spherical plain bearing according to DIN 648 series E (ISO 6124/1 series E). They are particularly suitable in the hydraulic field for cylinders with 160 bar pressure according to ISO 6020/II.
Yes	-	Rod ends for hydraulic components with internal thread according to DIN 24338, longer in comparison to the series TAPR.N and TAPR.U. The external housing, with grease nipple for lubrication, is made of forged steel up to size 50 mm.; starting from diameter 63 mm. it is made of cast iron. The thread is blocked through devices on the shank. Spherical plain bearing connected to the rod end through elastic rings. They are particularly suitable in the hydraulic field for cylinders with 160 bar pressure, according to ISO 6020/II and manufactured as per CETOP [1], DIN 2433-24336 and ISO 6020/I e 6022 regulations.

[1] Hydraulics and pneumatics European Committee

General products index

Page	Designation	Type	Dimensions (inner diameter) mm.	Sliding coupling
116	SN-GAS 	Rod ends for hydraulic components	25 - 160	steel/steel
117	T.P.N. 	Rod ends for hydraulic components	20 - 120	steel/steel
118	T.P.N.CE 	Rod ends for hydraulic components	20 - 125	steel/steel
119	T.A.C. 	Rod ends for hydraulic components	10 - 80	steel/steel
120	SN-PF 	Rod ends for hydraulic components	20 - 50	steel/steel
121	SN-AF 	Rod ends for hydraulic components	20 - 50	steel/steel
122	SGG-ES 	Rod ends for hydraulic components	6 - 80	steel/steel
123	EPB 	Ball joint ends	40 - 160	-
124	B-BS 	Ball joints rod ends with shank, with spring clamping	8 - 19	steel/steel
124	A-AS 	Ball joints rod ends with shank, with safety ring	8 - 19	steel/steel
125	SQS 	Self-aligning spherical plain bearings	16 - 80/100	steel/steel

Lubrication	Temperature °C	Technical details and main application fields
-	-	Rod end with greaser with internal threading for hydraulic applications. Plain bearing compliant to ISO 12240 standard. For the items SN95GAS, SN96GAS, SN97GAS, SN98GAS, SN99GAS the housing is provided in spheroidal cast iron material.
Yes	-	Rod end for hydraulic components with rectangular basis, without dowel pin, it can be connected with steel welding ST 52-3. Detachable spherical rod ends according to DIN 648 series E, joined to the rod end through elastic rings. They are particularly suitable for oleodinamic cylinders, manufactured according CETOP [1)] regulations, with grease nipple for lubrication.
Yes	-	
Yes	-	T Rod end with circular welding surface, according to DIN 648 series E, shape C. The external housing is made of forged steel, with pin at the bottom of the shank, welding bevel at 45° and with grease nipple for lubrication. Particularly suitable in the hydraulic field, it can be applied on the rod and cylinder ends.
-	-	Rod end for welding with greaser. Plain bearing compliant to ISO 12240 standard.
-	-	Rod end for welding with greaser.
-	-	Rod end with greaser without internal threading. Plain bearing compliant to ISO 12240 standard. Recommended for application with alternate high loads and shock loads.
-	-	Ball Joint ends.
Yes	-	Ball joint rod ends, as well as self-aligning rod ends, are mechanical devices suitable to connect perpendicular parts. Their constructive features allow the transmission of alternate forces and angular low speed oscillations, thus compensating angular flexions and radial movements. Type A is different from type B as the first has a safety ring, the second a spring seal.
Yes	-	
Yes	-	

General products index

Page	Designation	Type	Dimensions (inner diameter) mm.	Sliding coupling
129-130	FK 	Standard clevises with threaded hole (DIN 71752 - ISO 8140 CETOP)	4 - 50	-
131	FK..CN 	Clevises with threaded hole ex CNomo	8 - 25	-
132	FT 	Clevises with male thread (DIN 71752 - ISO 8140 CETOP)	6 - 20	-
133	FPT 	Clevises with threaded hole	16,2 - 35,25	-
133	FPW 	Weldable clevises	16,2 - 35,25	-
134	FY 	Hinge clevis with threaded hole	10 - 70	
135	CL 	Spring pins for clevises	4 - 20	-
136	CL..CN 	Spring pins for ex CNomo clevises	8 - 20	-
137	PC 	Pins with cylindrical head for split pins	4 - 25	-
137	PCB 	Pins with barrel head (spherical) for split pins	16 - 50	-
138	PM 	Pins with cylindrical head for spring	4 - 25	-

Lubrication	Temperature °C	Technical details and main application fields
-	-	*Clevises are mechanical devices particularly suitable in the pneumatic, hydraulic and mechanical field in general. The application usually works together with other products such as pins, clips, springs, split pins, washers an so on. Clevises can be made in different materials: steel, stainless steel and aluminium and have a thread in the internal part of the shank (FK - FK..CN), whereas in the FT type the thread is positioned in the external part of the shank, in the FPT type the thread is positioned on the base, in the FPS type is missing cause it's used for weldable application.*
-	-	
-	-	
-	-	
-	-	
		Hinge clevis combinable with "PFY" pin and snap rings.
-	-	*All items (clips, pins, washers, split pins, springs, seeger) are to be used mainly together with clevises. The main characteristics are suitable in the relevant dimension tables, together with dimensions and tolerances of the different products.*
-	-	
-	-	
-	-	
-	-	

Page	Designation	Type	Dimensions (inner diameter) mm.	Sliding coupling
138	PMB 	Pins with barrel head (spherical) for spring	14 - 25	-
139	PH 	Pins with head	7 - 24	-
140	PS 	Pins for clevises	5 - 35	-
140	PS..CN 	Pins for ex CNomo clevises	8 - 25	-
141	PFY 	Pins for hinge clevises	10 - 70	-
142	PC-R 	Washers for pins	4,3 - 25	-
145	TGG 	Rod end	19-32	-
146	TGF 	Rod end with threaded stem	19-32	steel/steel
147	ROT 	Balls	22,1-25,4	-
147	ROT 	Balls without guidance cones for lower hitch	28,4-37	-
148	SUP 	Rod ends with round end (to be welded or with inner thread)	14-30	steel/steel

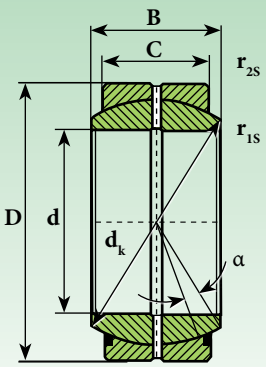
Lubrication	Temperature °C	Technical details and main application fields
-	-	*All items (clips, pins, washers, split pins, springs, seeger) are to be used mainly together with clevises. The main characteristics are suitable in the relevant dimension tables, together with dimensions and tolerances of the different products.*
-	-	
-	-	
-	-	
-	-	*Pin combinable with hinge clevis "FY" and snap rings.*
-	-	
-	-	
-	-	
-	-	
-	-	
-	-	

Page	Designation	Type	Dimensions (inner diameter) mm.	Sliding coupling
149	SUP 	Rod ends with round end (to be welded or with inner thread)	25,4-60	steel/steel
150	SUP 	Rod ends with round end	19-35	steel/steel
151	SUP 	Rod ends with disassembled spherical plain bearing	16-40	steel/steel
152	FSUP 	Rod ends	25,4	steel/steel

Lubrication	Temperature °C	Technical details and main application fields
-	-	
-	-	
-	-	
-	-	

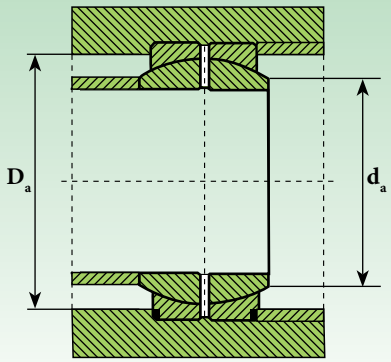
Spherical plain bearings

Spherical plain radial bearings with/without seals



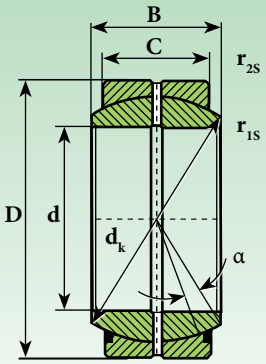
GE..ES

GE..ES 2RS



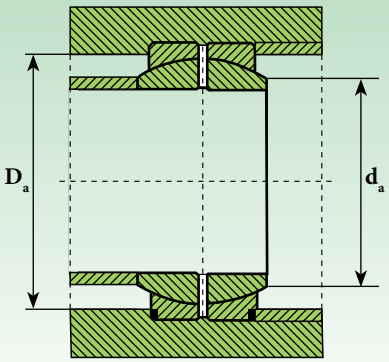
Designation		Dimensions (mm.)					Degrees	Mounting dimensions (mm.)		Distance from edges (mm.)		Load ratings		Weight
without seals	with seals	d	d_k	B	C	D	≈ α	$d_{a\,max}$	$D_{a\,min}$	$r_{1s\,min}$	r_{2smin}	Dynamic C kN	Static C_o kN	≈ Kg
GE 4 E	-	**4**	-	5	3	12	16	6	-	-	-	2	10	0,0033
GE 5 E	-	**5**	10	6	4	14	13	7	-	-	-	3	17	0,0038
GE 6 E[1)]	-	**6**	10	6	4	14	13	8	9,60	0,30	0,30	3	17	0,0040
GE 8 E[1)]	-	**8**	13	8	5	16	15	10,20	12,50	0,30	0,30	6	28	0,0070
GE 10 E[1)]	-	**10**	16	9	6	19	12	13,20	15,50	0,30	0,30	8	41	0,0110
GE 12 E[1)]	-	**12**	18	10	7	22	11	14,90	17,50	0,30	0,30	11	54	0,0160
GE 15 ES	**GE 15 ES 2RS**	**15**	22	12	9	26	8	18,40	21	0,30	0,30	17	85	0,0250
GE 16 ES	**GE 16 ES 2RS**	**16**	25	14	10	30	10	20,70	24	0,30	0,30	21	106	0,0380
GE 17 ES	**GE 17 ES 2RS**	**17**	25	14	10	30	10	20,70	24	0,30	0,30	21	106	0,0410
GE 20 ES	**GE 20 ES 2RS**	**20**	29	16	12	35	9	24,10	27,50	0,60	0,30	30	146	0,0610
GE 25 ES	**GE 25 ES 2RS**	**25**	36	20	16	42	7	29,30	33	0,60	0,60	48	240	0,110
GE 30 ES	**GE 30 ES 2RS**	**30**	41	22	18	47	6	34,20	38	0,60	0,60	62	310	0,140
GE 35 ES	**GE 35 ES 2RS**	**35**	47	25	20	55	6	39,70	44,50	0,60	1	80	400	0,220
GE 40 ES	**GE 40 ES 2RS**	**40**	53	28	22	62	7	45	51	0,60	1	100	500	0,300
GE 45 ES	**GE 45 ES 2RS**	**45**	60	32	25	68	7	50,70	57	0,60	1	127	640	0,400
GE 50 ES	**GE 50 ES 2RS**	**50**	66	35	28	75	6	55,90	63	0,60	1	156	780	0,540
GE 60 ES	**GE 60 ES 2RS**	**60**	80	44	36	90	6	66,80	75	1	1	245	1.220	1
GE 70 ES	**GE 70 ES 2RS**	**70**	92	49	40	105	6	77,80	87	1	1	315	1.560	1,50
GE 80 ES	**GE 80 ES 2RS**	**80**	105	55	45	120	6	89,40	99	1	1	400	2.000	2,20
GE 90 ES	**GE 90 ES 2RS**	**90**	115	60	50	130	5	98,10	108	1	1	490	2.450	2,70
GE 100 ES	**GE 100 ES 2RS**	**100**	130	70	55	150	7	109,50	123	1	1	610	3.050	4,30
GE 110 ES	**GE 110 ES 2RS**	**110**	140	70	55	160	6	121,20	134	1	1	655	3.250	4,70
GE 120 ES	**GE 120 ES 2RS**	**120**	160	85	70	180	6	135,50	150	1	1	950	4.750	8
GE 140 ES	**GE 140 ES 2RS**	**140**	180	90	70	210	7	155,80	173	1	1	1.080	5.400	11
GE 160 ES	**GE 160 ES 2RS**	**160**	200	105	80	230	8	170,20	191	1	1	1.370	6.800	13,50
GE 180 ES	**GE 180 ES 2RS**	**180**	225	105	80	260	6	198,90	219	1,10	1,10	1.530	7.650	18,50
GE 200 ES	**GE 200 ES 2RS**	**200**	250	130	100	290	7	213,50	239	1,10	1,10	2.120	10.600	28
GE 220 ES	**GE 220 ES 2RS**	**220**	275	135	100	320	8	239,50	267	1,10	1,10	2.320	11.600	35,50
GE 240 ES	**GE 240 ES 2RS**	**240**	300	140	100	340	8	265,30	295	1,10	1,10	2.550	12.700	40
GE 260 ES	**GE 260 ES 2RS**	**260**	325	150	110	370	7	288,30	319	1,10	1,10	3.050	15.300	50
GE 280 ES	**GE 280 ES 2RS**	**280**	350	155	120	400	6	313,80	342	1,10	1,10	3.550	18.000	64
GE 300 ES	**GE 300 ES 2RS**	**300**	375	165	120	430	7	336,70	370	1,10	1,10	3.800	19.000	75
GE 320 ES*	-	**320**	380	160	135	440	4	344,60	361	1,10	3	4.400	22.000	77
GE 340 ES*	-	**340**	400	160	135	460	3,80	366,60	382	1,10	3	4.650	23.200	82
GE 360 ES*	-	**360**	420	160	135	480	3,60	388,30	403	1,10	3	4.800	24.000	88
GE 380 ES*	-	**380**	450	190	160	520	4,10	407,90	426	1,50	4	6.300	31.500	127
GE 400 ES*	-	**400**	470	190	160	540	3,90	429,80	447	1,50	4	6.550	32.500	132
GE 420 ES*	-	**420**	490	190	160	560	3,70	451,60	469	1,50	4	6.800	34.500	145
GE 440 ES*	-	**440**	520	218	185	600	3,90	472	491	1,50	4	8.650	42.300	190
GE 460 ES*	-	**460**	540	218	185	620	3,70	494	513	1,50	4	9.000	45.000	200
GE 480 ES*	-	**480**	565	230	195	650	3,80	516	536	2	5	9.800	49.000	237
GE 500 ES*	-	**500**	585	230	195	670	3,60	537,80	557	2	5	10.200	51.000	244

Spherical plain radial bearings with/without seals



GE..ES

GE..ES 2RS



Designation		Dimensions (mm.)					Degrees	Mounting dimensions (mm.)		Distance from edges (mm.)		Load ratings		Weight
without seals	with seals	d	d_k	B	C	D	≈ α	$d_{a\,max}$	$D_{a\,min}$	$r_{1s\,min}$	r_{2smin}	Dynamic C kN	Static C_o kN	≈ Kg
GE 530 ES*	-	**530**	620	243	205	710	3,70	570,30	591	2	5	11.400	57.000	290
GE 560 ES*	-	**560**	655	258	215	750	4	602	624	2	5	12.700	64.000	340
GE 600 ES*	-	**600**	700	272	230	800	3,60	644,90	667	2	5	14.600	73.500	409
GE 630 ES*	-	**630**	740	300	260	850	3,30	676,40	698	3	6	17.600	88.000	526
GE 670 ES*	-	**670**	785	308	260	900	3,70	722	746	3	6	19.000	95.000	596
GE 710 ES*	-	**710**	830	325	275	950	3,70	763,70	789	3	6	21.200	106.000	693
GE 750 ES*	-	**750**	875	335	280	1.000	3,80	808,30	834	3	6	22.800	114.000	784
GE 800 ES*	-	**800**	930	355	300	1.060	3,60	859,50	886	3	6	26.000	129.000	925
GE 850 ES*	-	**850**	985	365	310	1.120	3,40	914,80	940	3	6	28.500	143.000	1.055
GE 900 ES*	-	**900**	1.040	375	320	1.180	3,20	970	995	3	6	31.000	156.000	1.190
GE 950 ES*	-	**950**	1.100	400	340	1.250	3,30	1.024,60	1.052	4	7,50	35.500	176.000	1.424
GE 1000 ES*	-	**1.000**	1.160	438	370	1.320	3,50	1.074,10	1.105	4	7,50	40.500	204.000	1.755

Under request, stainless steel available

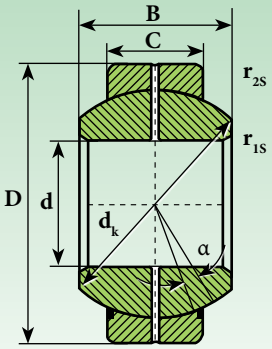
[1] *Maintenance-free*

* *Available under request*

C2 and C3 clearance also available

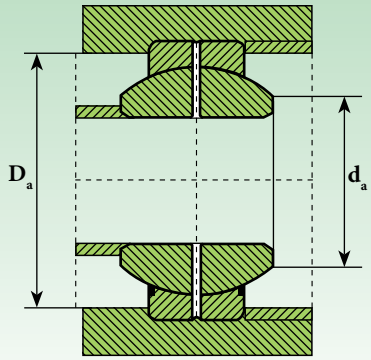
Sliding coupling: steel/steel

Spherical plain radial bearings with/without seals



GEG..E/ES

GEG..ES 2RS



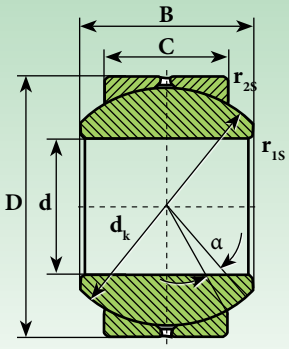
Designation		Dimensions (mm.)					Degrees	Mounting dimensions (mm.)		Distance from edges (mm.)		Load ratings		Weight
without seals	with seals	d	d_k	B	C	D	≈ α	$d_{a\,max}$	$D_{a\,min}$	$r_{1s\,min}$	r_{2smin}	Dynamic C kN	Static C_o kN	≈ Kg
GEG 4 E	-	**4**	-	7	4	14	20	7	-	-	-	3,4	17	0,0045
GEG 5 E	-	**5**	-	9	5	16	21	8	-	-	-	5,5	27	0,0066
GEG 6 E[1]	-	**6**	13[3]	9	5	16	21	9,3	12,5	0,30	0,30	5,5	27,5	0,0080
GEG 8 E[1]	-	**8**	16[3]	11	6	19	21	11,6	15,5	0,30	0,30	8,15	40,5	0,0140
GEG 10 E[1]	-	**10**	18[3]	12	7	22	18	13,4	17,5	0,30	0,30	10,8	54	0,020
GEG 12 E[2]	-	**12**	22[3]	15	9	26	18	16	21	0,30	0,30	17	85	0,034
GEG 15 ES	**GEG 15 ES 2RS**	**15**	25[3]	16	10	30	16	19,2	24	0,30	0,30	21,2	106	0,046
GEG 17 ES	**GEG 17 ES 2RS**	**17**	29[3]	20	12	35	19	21	27,5	0,30	0,30	30	146	0,078
GEG 20 ES	**GEG 20 ES 2RS**	**20**	35,5	25	16	42	17	25,2	33	0,60	0,60	48	240	0,15
GEG 25 ES	**GEG 25 ES 2RS**	**25**	40,7	28	18	47	17	29,5	38	0,60	0,60	62	310	0,19
GEG 30 ES	**GEG 30 ES 2RS**	**30**	47	32	20	55	17	34,4	44,5	0,60	1	80	400	0,29
GEG 35 ES	**GEG 35 ES 2RS**	**35**	53	35	22	62	16	39,7	51	0,60	1	100	500	0,39
GEG 40 ES	**GEG 40 ES 2RS**	**40**	60	40	25	68	17	44,7	57	0,60	1	127	640	0,52
GEG 45 ES	**GEG 45 ES 2RS**	**45**	66	43	28	75	15	50	63	0,60	1	156	780	0,68
GEG 50 ES	**GEG 50 ES 2RS**	**50**	80	56	36	90	17	57,1	75	0,60	1	245	1.220	1,4
GEG 60 ES	**GEG 60 ES 2RS**	**60**	92	63	40	105	17	67	87	1	1	315	1.560	2
GEG 70 ES	**GEG 70 ES 2RS**	**70**	105	70	45	120	16	78,2	99	1	1	400	2.000	2,9
GEG 80 ES	**GEG 80 ES 2RS**	**80**	115	75	50	130	14	87,1	108	1	1	490	2.450	3,5
GEG 90 ES	**GEG 90 ES 2RS**	**90**	130	85	55	150	15	98,3	123	1	1	610	3.050	5,4
GEG 100 ES	**GEG 100 ES 2RS**	**100**	140	85	55	160	14	111,2	134	1	1	655	3.250	5,9
GEG 110 ES	**GEG 110 ES 2RS**	**110**	160	100	70	180	12	124,8	150	1	1	950	4.750	9,7
GEG 120 ES	**GEG 120 ES 2RS**	**120**	180	115	70	210	16	138,4	173	1	1	1.080	5.400	15
GEG 140 ES	**GEG 140 ES 2RS**	**140**	200	130	80	230	16	151,9	191	1	1	1.370	6.800	18,5
GEG 160 ES	**GEG 160 ES 2RS**	**160**	225	135	80	260	16	180	219	1	1,10	1.530	7.650	25
GEG 180 ES	**GEG 180 ES 2RS**	**180**	250	155	100	290	14	196,1	239	1,10	1,10	2.120	10.600	35,5
GEG 200 ES	**GEG 200 ES 2RS**	**200**	275	165	100	320	15	220	267	1,10	1,10	2.320	11.600	45
GEG 220 ES	**GEG 220 ES 2RS**	**220**	300	175	100	340	16	243,6	295	1,10	1,10	2.550	12.700	51
GEG 240 ES	**GEG 240 ES 2RS**	**240**	325	190	110	370	15	263,6	319	1,10	1,10	3.050	15.300	64
GEG 260 ES	**GEG 260 ES 2RS**	**260**	350	205	120	400	15	283,6	342	1,10	1,10	3.550	18.000	81
GEG 280 ES	**GEG 280 ES 2RS**	**280**	375	210	120	430	15	310,6	370	1,10	1,10	3.800	19.000	94

Under request, stainless steel available

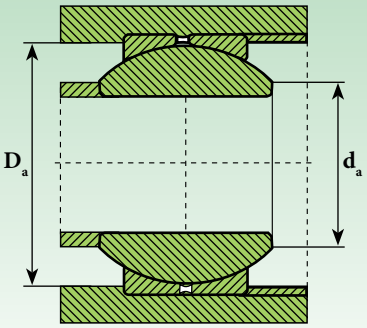
1) *Maintenance-free*
2) *Lubrification only through outer ring*
3) *No lubrication groove on spherical inner ring surface*

C2 and C3 clearance also available
Sliding coupling: steel/steel

Spherical plain radial bearings without seals



GE..SB



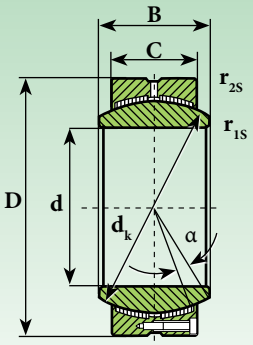
Designation	Dimensions (mm.)					Degrees	Mounting dimensions (mm.)		Distance from edges (mm.)		Radial clearance (mm.)		Load ratings		Weight
without seals	d H7	d_k	B	C	D	≈ α	$d_{a\,max}$	$D_{a\,min}$	$r_{1s\,min}$	r_{2smin}			Dynamic C kN	Static C_o kN	≈ Kg
GE 5 SB[1]	**5**	11,11	8	6	13	13	7,7	9,8	0,30	0,30	0,006	0,035	3,3	8,5	0,006
GE 6 SB	**6**	12,70	9	6,75	16	13	8,9	11,5	0,30	0,30	0,006	0,035	4,3	10,8	0,010
GE 8 SB	**8**	15,88	12	9	19	14	10,3	14	0,30	0,30	0,006	0,035	7,2	18	0,018
GE 10 SB	**10**	19,05	14	10,5	22	13	12,9	17	0,30	0,30	0,006	0,035	10	25	0,027
GE 12 SB	**12**	22,23	16	12	26	13	15,4	19,5	0,30	0,30	0,006	0,035	13	33,5	0,043
GE 14 SB	**14**	25,40	19	13,5	28	16	16,8	22,5	0,30	0,30	0,006	0,035	17	43	0,055
GE 16 SB	**16**	28,58	21	15	32	15	19,3	25,5	0,30	0,30	0,006	0,035	21,6	54	0,08
GE 18 SB	**18**	31,75	23	16,5	35	15	21,8	28,5	0,30	0,30	0,006	0,035	26	65,5	0,10
GE 20 SB	**20**	34,93	25	18	40	14	24,3	31,5	0,30	0,60	0,006	0,035	32	80	0,15
GE 22 SB	**22**	38,10	28	20	42	15	25,8	34	0,30	0,60	0,006	0,035	38	96,5	0,18
GE 25 SB	**25**	42,85	31	22	47	15	29,5	38,5	0,30	0,60	0,006	0,035	47,5	118	0,24
GE 30 SB	**30**	50,80	37	25	55	17	34,8	46	0,30	0,60	0,006	0,035	64	160	0,38

Under request, stainless steel available

[1] *Maintenance-free*

Sliding coupling: steel/bronze

Spherical plain radial bearings (heavy duty)



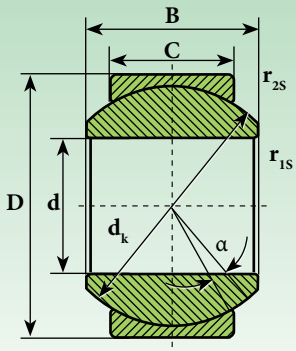
GE..CP

Designation	Dimensions (mm.)					Degrees	Distance from edges (mm.)		Load ratings		Weight
	d H7	d_k	B	C	D	≈ α	$r_{1s\,min}$	r_{2smin}	Dynamic C kN	Static C_o kN	≈ Kg
GE 100 CP	**100**	135	71	67	150	2	1	1	810	1.350	4,51
GE 110 CP	**110**	145	78	74	160	2	1	1	960	1.650	5,35
GE 120 CP	**120**	160	85	80	180	2	1	1	1.150	1.950	7,96
GE 140 CP	**140**	185	100	95	210	2	1	1	1.580	2.700	13
GE 160 CP	**160**	210	115	109	230	2	1	1	2.060	3.600	16,60
GE 180 CP	**180**	240	128	122	260	2	1,1	1,1	2.630	4.600	24,40
GE 200 CP	**200**	260	140	134	290	2	1,1	1,1	3.130	5.500	33,50
GE 220 CP	**220**	290	155	148	320	2	1,1	1,1	3.860	6.800	45,80
GE 240 CP	**240**	310	170	162	340	2	1,1	1,1	4.510	8.000	53,70
GE 260 CP	**260**	340	185	175	370	2	1,1	1,1	5.350	9.500	69,50
GE 280 CP	**280**	370	200	190	400	2	1,1	1,1	6.320	11.200	89,50
GE 300 CP	**300**	390	212	200	430	2	1,1	1,1	7.020	12.500	110
GE 320 CP	**320**	414	230	218	460	2	1,1	3	8.120	14.500	135
GE 340 CP	**340**	434	243	230	480	2	1,1	3	8.980	16.000	150
GE 360 CP	**360**	474	258	243	520	2	1,1	4	10.300	18.400	200
GE 380 CP	**380**	494	272	258	540	2	1,5	4	11.400	20.400	220
GE 400 CP	**400**	514	280	265	580	2	1,5	4	12.200	21.800	275
GE 420 CP	**420**	534	300	280	600	2	1,5	4	13.400	24.000	300
GE 440 CP	**440**	574	315	300	630	2	1,5	4	15.400	27.600	360
GE 460 CP	**460**	593	325	308	650	2	1,5	4	16.400	29.300	380
GE 480 CP	**480**	623	340	320	680	2	2	5	17.900	32.000	435
GE 500 CP	**500**	643	355	335	710	2	2	5	19.300	34.600	500
GE 530 CP	**530**	673	375	355	750	2	2	5	21.500	38.500	585
GE 560 CP	**560**	723	400	380	800	2	2	5	24.700	44.300	730
GE 600 CP	**600**	773	425	400	850	2	2	6	27.800	49.800	860
GE 630 CP	**630**	813	450	425	900	2	3	6	31.000	55.700	1.040

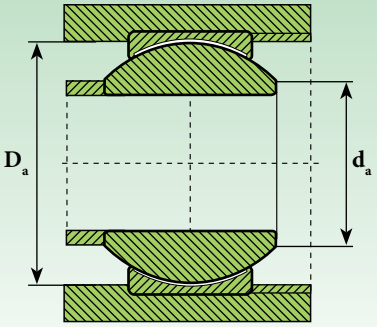
Under request, stainless steel available

Sliding coupling: hard chromium/PTFE — *Available under request*

Spherical plain radial bearings without seals



GE..SP

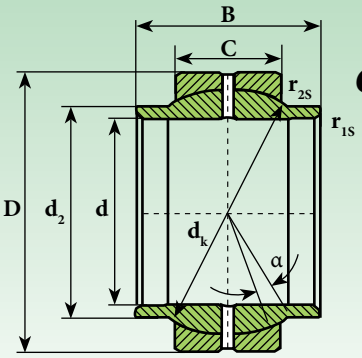


Designation	Dimensions (mm.)					Degrees	Mounting dimensions (mm.)		Distance from edges (mm.)		Radial clearance (mm.)		Load ratings		Weight
without seals	d H7	d_k	B	C	D	≈ α	$d_{a\,max}$	$D_{a\,min}$	$r_{1s\,min}$	r_{2smin}			Dynamic C kN	Static C_o kN	≈ Kg
GE 5 SP	**5**	11,11	8	6	13	13	7,7	9,8	0,30	0,30	0,006	0,035	6	15	0,006
GE 6 SP	**6**	12,70	9	6,75	16	13	8,9	11,5	0,30	0,30	0,006	0,035	7,65	19,3	0,010
GE 8 SP	**8**	15,88	12	9	19	14	10,3	14	0,30	0,30	0,006	0,035	12,9	32	0,018
GE 10 SP	**10**	19,05	14	10,5	22	13	12,9	17	0,30	0,30	0,006	0,035	18	45	0,027
GE 12 SP	**12**	22,23	16	12	26	13	15,4	19,5	0,30	0,30	0,006	0,035	24	60	0,043
GE 14 SP	**14**	25,40	19	13,5	28	16	16,8	22,5	0,30	0,30	0,006	0,035	31	76,5	0,055
GE 16 SP	**16**	28,58	21	15	32	15	19,3	25,5	0,30	0,30	0,006	0,035	39	96,5	0,08
GE 18 SP	**18**	31,75	23	16,5	35	15	21,8	28,5	0,30	0,30	0,006	0,035	47,5	118	0,10
GE 20 SP	**20**	34,93	25	18	40	14	24,3	31,5	0,30	0,60	0,006	0,035	57	140	0,15
GE 22 SP	**22**	38,10	28	20	42	15	25,8	34	0,30	0,60	0,006	0,035	68	170	0,18
GE 25 SP	**25**	42,85	31	22	47	15	29,5	38,5	0,30	0,60	0,006	0,035	85	212	0,24
GE 30 SP	**30**	50,80	37	25	55	17	34,8	46	0,30	0,60	0,006	0,035	114	285	0,38

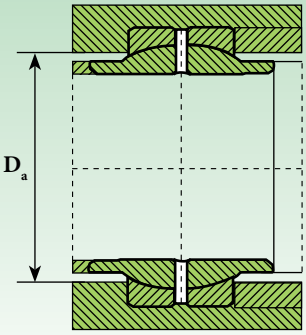
Under request, stainless steel available

Sliding coupling: steel/PTFE

Spherical plain radial bearings with wide inner ring without seals



GEEW..E/ES



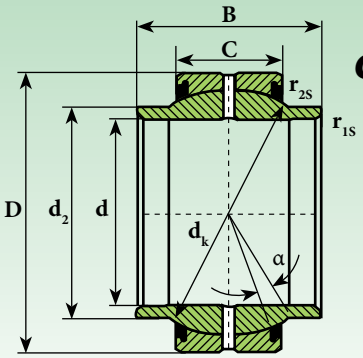
Designation	Dimensions (mm.)						Degrees	Mounting dimensions (mm.)	Distance from edges (mm.)		Load ratings		Weight
without seals	d H7	d_2	d_K	B	C	D	≈ α	$D_{a\,min}$	$r_{1s\,min}$	r_{2smin}	Dynamic C kN	Static C_o kN	≈ Kg
GEEW 12 ES[1]	**12**	15,5	18	12	7	22	4	18	0,30	0,30	10,8	54	0,020
GEEW 15 ES	**15**	18,5	-	15	9	26	5	-	-	-	17	85	0,031
GEEW 16 ES[2]	**16**	20	23	16	9	28	4	23	0,30	0,30	17,6	88	0,030
GEEW 17 ES	**17**	21	-	17	10	30	7	-	-	-	21	106	0,044
GEEW 20 ES[2]	**20**	25	29	20	12	35	4	28	0,30	0,30	30	146	0,070
GEEW 25 ES	**25**	30	35,5	25	16	42	4	33	0,60	0,60	48	240	0,120
GEEW 30 ES	**30**	34	-	30	18	47	4	-	-	-	62	310	0,168
GEEW 32 ES	**32**	38	44	32	18	52	4	42	0,60	1	67	335	0,200
GEEW 35 ES	**35**	40	-	35	20	55	4	-	-	-	80	400	0,253
GEEW 40 ES	**40**	46	53	40	22	62	4	51	0,60	1	100	500	0,340
GEEW 45 ES	**45**	52	-	45	25	68	4	-	-	-	127	640	0,481
GEEW 50 ES	**50**	57	66	50	28	75	4	63	1	1	156	780	0,560
GEEW 60 ES	**60**	68	-	60	36	90	3	-	-	-	245	1.220	1,15
GEEW 63 ES	**63**	71,5	83	63	36	95	4	78	-	-	255	1.270	1,2
GEEW 70 ES	**70**	79	92	70	40	105	4	87	1	1	315	1.560	1,7
GEEW 80 ES	**80**	91	105	80	45	120	4	99	1	1	400	2.000	2,4
GEEW 90 ES	**90**	99	115	90	50	130	4	108	1	1	490	2.450	3,2
GEEW 100 ES	**100**	113	130	100	55	150	4	123	1	1	610	3.050	4,8
GEEW 110 ES	**110**	124	140	110	55	160	4	134	1	1	655	3.250	5,8
GEEW 125 ES	**125**	138	160	125	70	180	4	150	1	1	950	4.750	8,5
GEEW 160 ES	**160**	177	200	160	80	230	4	191	1	1	1.370	6.800	16,5
GEEW 200 ES	**200**	221	250	200	100	290	4	239	1,10	1,10	2.120	10.600	32
GEEW 250 ES	**250**	317	350	250	120	400	4	342	1,10	1,10	3.550	18.000	99
GEEW 320 ES	**320**	405	450	320	160	520	4	438	1,10	1,10	6.100	30.500	240

Under request, stainless steel available

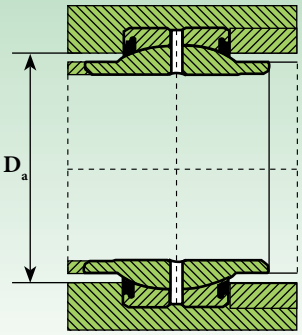
1) *Lubrification groove and hole only on the outer ring*
2) *Cylindrical inner ring bore*

Sliding coupling: steel/steel

Spherical plain radial bearings with wide inner ring and seals



GEEM..ES 2RS



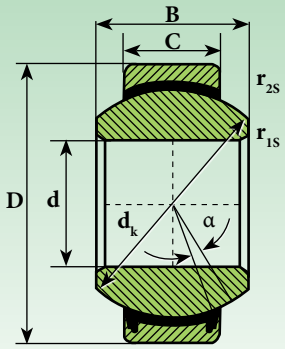
Designation	*Dimensions mm*						*Degrees*	*Mounting dimensions (mm.)*	*Distance from edges (mm.)*		*Load ratings*		*Weight*
with seals	d	d_2	d_k	B	C	D	≈ α	$D_{a\,min}$	$r_{1s\,min}$	r_{2smin}	*Dynamic C* kN	*Static* C_o kN	≈ Kg
GEEM 17 ES 2RS[1)]	**17**	21	25	$21^{\pm0,2}$	10	30	3	24	0,20	0,30	21,20	106	0,040
GEEM 20 ES 2RS[1)]	**20**	24	29	$24^{\pm0,2}$	12	35	3	27,5	0,20	0,30	30	146	0,057
GEEM 25 ES 2RS	**25**	29	35,5	$29^{\pm0,3}$	16	42	3	33	0,20	0,60	48	240	0,10
GEEM 30 ES 2RS	**30**	34,2	40,7	$30^{\pm0,3}$	18	47	3	38	0,20	0,60	62	310	0,14
GEEM 35 ES 2RS	**35**	40	47	$35^{\pm0,3}$	20	55	3	44,5	0,30	1	80	400	0,24
GEEM 40 ES 2RS	**40**	45	53	$38^{\pm0,3}$	22	62	3	51	0,30	1	100	500	0,29
GEEM 45 ES 2RS	**45**	51,5	60	$40^{\pm0,3}$	25	68	3	57	0,30	1	127	640	0,43
GEEM 50 ES 2RS	**50**	56,5	66	$43^{\pm0,3}$	28	75	3	63	0,30	1	156	780	0,54
GEEM 60 ES 2RS	**60**	67,7	80	$54^{\pm0,3}$	36	90	3	75	0,30	1	245	1.220	1,10
GEEM 70 ES 2RS	**70**	78	92	$65^{\pm0,3}$	40	105	3	87	0,30	1	315	1.560	1,60
GEEM 80 ES 2RS	**80**	90	105	$74^{\pm0,3}$	45	120	3	99	0,30	1	400	2.000	2,40

Under request, stainless steel available

1) *Without lubrication groove on the inner ring*

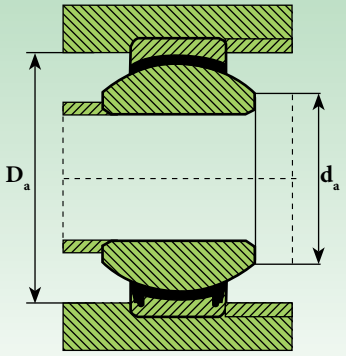
Sliding coupling: steel/steel

Maintenance-free spherical plain radial bearings with/without seals



GE..C

GE..ET 2RS

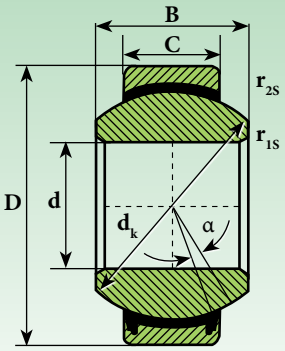


Designation		Dimensions mm					Degrees	Mounting dimensions (mm.)		Distance from edges (mm.)		Load ratings		Weight
without seals	with seals	d	d_k	B	C	D	≈ α	$d_{a\,max}$	$D_{a\,min}$	$r_{1s\,min}$	r_{2smin}	Dynamic C kN	Static C_o kN	≈ Kg
GE 4 C	-	**4**	-	5	3	12	16	-	-	-	-	2,1	5,4	0,0033
GE 5 C	-	**5**	-	6	4	14	13	-	-	-	-	3,6	9,1	0,0038
GE 6 C	-	**6**	10	6	4	14	13	8	9,6	0,30	0,30	3,6	9	0,0042
GE 8 C	-	**8**	13	8	5	16	15	10,2	12,5	0,30	0,30	5,85	14,6	0,0075
GE 10 C	-	**10**	16	9	6	19	11	13,2	15,5	0,30	0,30	8,65	21,6	0,011
GE 12 C	-	**12**	18	10	7	22	10	14,9	17,5	0,30	0,30	11,4	28,5	0,015
GE 15 C	-	**15**	22	12	9	26	8	18,4	21	0,30	0,30	17,6	44	0,027
GE 17 C	-	**17**	25	14	10	30	10	20,7	24	0,30	0,30	22,4	56	0,041
-	**GE 17 ET 2RS**	**17**	25	14	10	30	10	20,7	24	0,30	0,30	30	60	0,038
GE 20 C	-	**20**	29	16	12	35	9	24,1	27,5	0,60	0,30	31,5	78	0,066
-	**GE 20 ET 2RS**	**20**	29	16	12	35	9	24,1	27,5	0,60	0,30	41,5	83	0,066
GE 25 C	-	**25**	35,5	20	16	42	7	29,3	33	0,60	0,60	51	127	0,119
-	**GE 25 ET 2RS**	**25**	35,5	20	16	42	7	29,3	33	0,60	0,60	68	137	0,119
GE 30 C	-	**30**	40,7	22	18	47	6	34,2	38	0,60	0,60	65,5	166	0,163
-	**GE 30 ET 2RS**	**30**	40,7	22	18	47	6	34,2	38	0,60	0,60	88	176	0,163
-	**GE 35 ET 2RS**	**35**	47	25	20	55	6	39,7	44,5	0,60	1	112	224	0,25
-	**GE 40 ET 2RS**	**40**	53	28	22	62	6	45	51	0,60	1	140	280	0,30
-	**GE 45 ET 2RS**	**45**	60	32	25	68	6	50,7	57	0,60	1	180	360	0,35
-	**GE 50 ET 2RS**	**50**	66	35	28	75	6	55,9	63	0,60	1	220	440	0,50
-	**GE 60 ET 2RS**	**60**	80	44	36	90	6	66,8	75	1	1	345	695	1
-	**GE 70 ET 2RS**	**70**	92	49	40	105	6	77,8	87	1	1	440	880	1,40
-	**GE 80 ET 2RS**	**80**	105	55	45	120	6	89,4	99	1	1	570	1.140	2
-	**GE 90 ET 2RS**	**90**	115	60	50	130	5	98,1	108	1	1	695	1.370	2,50
-	**GE 100 ET 2RS**	**100**	130	70	55	150	7	109,5	123	1	1	865	1.730	4
-	**GE 110 ET 2RS**	**110**	140	70	55	160	6	121,2	134	1	1	930	1.860	4,50
-	**GE 120 ET 2RS**	**120**	160	85	70	180	6	135,5	150	1	1	1.340	2.700	7,20
-	**GE 140 ET 2RS**	**140**	180	90	70	210	6	155,8	173	1	1	1.500	3.000	11
-	**GE 160 ET 2RS**	**160**	200	105	80	230	8	170,2	191	1	1	1.930	3.800	13,50
-	**GE 180 ET 2RS**	**180**	225	105	80	260	6	198,9	219	1,10	1,10	2.160	4.300	18,50
-	**GE 200 ET 2RS**	**200**	250	130	100	290	7	213,5	239	1,10	1,10	3.000	6.000	28
-	**GE 220 ET 2RS**	**220**	275	135	100	320	8	239,5	267	1,10	1,10	3.350	6.550	35,50
-	**GE 240 ET 2RS**	**240**	300	140	100	340	8	265,3	295	1,10	1,10	3.600	7.200	40
-	**GE 260 ET 2RS**	**260**	325	150	110	370	7	288,3	319	1,10	1,10	4.300	8.650	50
-	**GE 280 ET 2RS**	**280**	350	155	120	400	6	313,8	342	1,10	1,10	5.000	10.000	64
-	**GE 300 ET 2RS**	**300**	375	165	120	430	7	336,7	370	1,10	1,10	5.400	10.800	75

Under request, stainless steel available

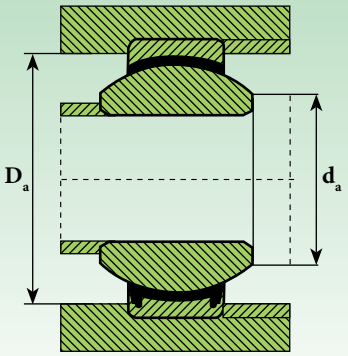
Sliding coupling: hard chromium/PTFE

Maintenance-free spherical plain radial bearings with/without seals



GEG..C

GEG..ET 2RS

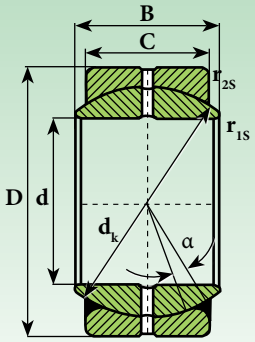


Designation		Dimensions mm					Degrees	Mounting dimensions (mm.)		Distance from edges (mm.)		Load ratings		Weight
without seals	with seals	d	d_k	B	C	D	≈ α	$d_{a\,max}$	$D_{a\,min}$	$r_{1s\,min}$	r_{2smin}	Dynamic C kN	Static C_o kN	≈ Kg
GEG 4 C	-	**4**		7	4	14	20	-	-	-	-	3,6	9,1	0,0045
GEG 5 C	-	**5**		9	5	16	21	-	-	-	-	5,8	14	0,0066
GEG 6 C	-	**6**	13	9	5	16	21	9,3	12,5	0,30	0,30	5,85	14,6	0,0080
GEG 8 C	-	**8**	16	11	6	19	21	11,6	15,5	0,30	0,30	8,65	21,6	0,0140
GEG 10 C	-	**10**	18	12	7	22	18	13,4	17,5	0,30	0,30	11,4	28,5	0,0200
GEG 12 C	-	**12**	22	15	9	26	18	16	21	0,30	0,30	17,6	44	0,0340
GEG 15 C	-	**15**	25	16	10	30	16	19,2	24	0,30	0,30	22,4	56	0,0460
GEG 17 C	-	**17**	29	20	12	35	19	21	27,5	0,30	0,30	31,5	78	0,0780
GEG 20 C	-	**20**	35,5	25	16	42	17	25,2	33	0,60	0,60	51	127	0,15
GEG 25 C	-	**25**	40,7	28	18	47	17	29,5	38	0,60	0,60	65,5	166	0,19
GEG 30 C	**GEG 30 ET 2RS**	**30**	47	32	20	55	17	34,4	44,5	0,60	1	112	224	0,29
-	**GEG 35 ET 2RS**	**35**	53	35	22	62	16	39,7	51	0,60	1	140	280	0,39
-	**GEG 40 ET 2RS**	**40**	60	40	25	68	17	44,7	57	0,60	1	180	360	0,52
-	**GEG 45 ET 2RS**	**45**	66	43	28	75	15	50	63	0,60	1	220	440	0,68
-	**GEG 50 ET 2RS**	**50**	80	56	36	90	17	57,1	75	0,60	1	345	695	1,4
-	**GEG 60 ET 2RS**	**60**	92	63	40	105	17	67	87	1	1	440	880	2
-	**GEG 70 ET 2RS**	**70**	105	70	45	120	16	78,2	99	1	1	570	1.140	2,9
-	**GEG 80 ET 2RS**	**80**	115	75	50	130	14	87,1	108	1	1	695	1.370	3,5
-	**GEG 90 ET 2RS**	**90**	130	85	55	150	15	98,3	123	1	1	865	1.730	5,4
-	**GEG 100 ET 2RS**	**100**	140	85	55	160	14	111,2	134	1	1	930	1.860	5,9
-	**GEG 110 ET 2RS**	**110**	160	100	70	180	12	124,8	150	1	1	1.340	2.700	9,7
-	**GEG 120 ET 2RS**	**120**	180	115	70	210	12	138,4	173	1	1	1.500	3.000	15
-	**GEG 140 ET 2RS**	**140**	200	130	80	230	16	151,9	191	1	1	1.930	3.800	18,5
-	**GEG 160 ET 2RS**	**160**	225	135	80	260	16	180	219	1	1,10	2.160	4.300	25
-	**GEG 180 ET 2RS**	**180**	250	155	100	290	14	196,1	239	1,10	1,10	3.000	6.000	35,5
-	**GEG 200 ET 2RS**	**200**	275	165	100	320	15	220	267	1,10	1,10	3.350	6.550	45
-	**GEG 220 ET 2RS**	**220**	300	175	100	340	16	243,6	295	1,10	1,10	3.600	7.200	51
-	**GEG 240 ET 2RS**	**240**	325	190	110	370	15	263,6	319	1,10	1,10	4.300	8.650	64
-	**GEG 260 ET 2RS**	**260**	350	205	120	400	15	283,6	342	1,10	1,10	5.000	10.000	81
-	**GEG 280 ET 2RS**	**280**	375	210	120	430	15	310,6	370	1,10	1,10	5.400	10.800	94

Under request, stainless steel available

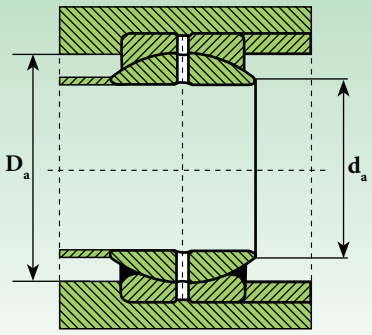
Sliding coupling: hard chromium/PTFE

Spherical plain radial bearings with/without seals (inches sizes)



GEZ..ES

GEZ..ES 2RS



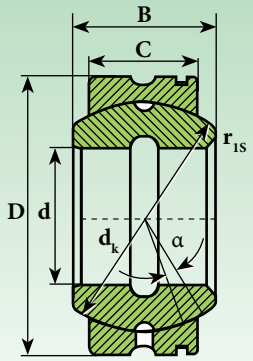
1" = 25,4 mm.

Designation		Dimensions									Degrees	Mounting dimensions (mm.)		Distance from edges (mm.)		Radial clearance (mm.)		Load ratings		Weight
		d		B		C		D		d_K	≈ α	$D_{a\,max}$	$d_{a\,min}$	$r_{1s\,min}$	r_{2smin}			Dynamic C kN	Static C_0 kN	≈ Kg
without seals	with seals	mm	inc.	mm	inc.	mm	inc.	mm	inc.	mm										
GEZ 12 ES	-	**12,7**	**0,5**	11,1	0,437	9,53	0,375	22,23	0,875	18	6	14,1	16	0,15	0,6	0,05	0,15	13,7	41,5	0,022
GEZ 15 ES	-	**15,87**	**0,625**	13,89	0,547	11,91	0,469	26,99	1,062	23	6	18,3	20,5	0,15	0,6	0,05	0,15	22	65,5	0,036
GEZ 19 ES	**GEZ 19 ES 2RS**	**19,05**	**0,75**	16,66	0,659	14,27	0,562	31,75	1,250	27,5	6	21,8	24,5	0,30	0,6	0,08	0,18	31,5	95	0,05
GEZ 22 ES	**GEZ 22 ES 2RS**	**22,22**	**0,875**	19,43	0,765	16,66	0,656	36,51	1,437	32	6	25,4	28,5	0,30	0,6	0,08	0,18	42,5	127	0,08
GEZ 25 ES	**GEZ 25 ES 2RS**	**25,4**	**1**	22,23	0,875	19,05	0,75	41,28	1,625	35,5	6	27,6	31,5	0,30	0,6	0,08	0,18	54	163	0,11
GEZ 31 ES	**GEZ 31 ES 2RS**	**31,75**	**1,25**	27,76	1,093	23,8	0,937	50,8	2	45,5	6	36	40,5	0,60	0,6	0,08	0,18	86,5	260	0,22
GEZ 34 ES	**GEZ 34 ES 2RS**	**34,92**	**1,375**	30,15	1,187	26,18	1,031	55,56	2,187	49	6	38,6	43,5	0,60	1	0,08	0,18	102	310	0,32
GEZ 38 ES	**GEZ 38 ES 2RS**	**38,1**	**1,5**	33,33	1,321	28,57	1,125	61,91	2,437	53	6	41,2	46,5	0,60	1	0,08	0,18	122	365	0,40
GEZ 44 ES	**GEZ 44 ES 2RS**	**44,45**	**1,75**	38,89	1,531	33,32	1,312	71,44	2,812	63,9	6	50,7	57	0,60	1	0,08	0,18	170	510	0,62
GEZ 47 ES	**GEZ 47 ES 2RS**	**47,63**	**1,875**	50,01	1,969	42,85	1,687	90,49	3,562	82	6	64,9	73	0,60	1	0,08	0,18	280	850	1,1
GEZ 50 ES	**GEZ 50 ES 2RS**	**50,8**	**2**	44,45	1,75	38,1	1,5	80,96	3,187	73	6	57,9	65	0,60	1	0,08	0,18	224	670	0,9
GEZ 57 ES	**GEZ 57 ES 2RS**	**57,15**	**2,25**	50,01	1,969	42,85	1,687	90,49	3,562	82	6	64,9	73	0,60	1	0,10	0,20	280	850	1,3
GEZ 63 ES	**GEZ 63 ES 2RS**	**63,5**	**2,5**	55,55	2,187	47,62	1,875	100,01	3,937	92	6	73,3	82	1	1	0,10	0,20	355	1.060	1,8
GEZ 69 ES	**GEZ 69 ES 2RS**	**69,85**	**2,75**	61,11	2,406	52,37	2,062	111,13	4,375	100	6	79,1	89	1	1	0,10	0,20	375	1.250	2,4
GEZ 76 ES	**GEZ 76 ES 2RS**	**76,2**	**3**	66,68	2,625	57,15	2,250	120,65	4,750	109,5	6	86,8	98	1	1	0,10	0,20	500	1.500	3
GEZ 82 ES	**GEZ 82 ES 2RS**	**82,55**	**3,25**	72,24	2,844	61,9	2,437	130,18	5,125	119	6	94,5	106	1	1	0,13	0,23	600	1.760	3,8
GEZ 88 ES	**GEZ 88 ES 2RS**	**88,9**	**3,5**	77,78	3,062	66,67	2,625	139,7	5,5	128	6	101,6	114	1	1	0,13	0,23	680	2.040	4,8
GEZ 95 ES	**GEZ 95 ES 2RS**	**95,25**	**3,75**	83,34	3,281	71,43	2,812	149,23	5,875	137	6	108,7	122	1	1	0,13	0,23	780	2.360	5,8
GEZ 101 ES	**GEZ 101 ES 2RS**	**101,6**	**4**	88,9	3,5	76,2	3	158,75	6,25	146	6	115,8	130	1	1	0,13	0,23	900	2.650	7
GEZ 107 ES	**GEZ 107 ES 2RS**	**107,95**	**4,25**	94,46	3,719	80,95	3,187	168,28	6,625	155	6	122,8	138	1	1	0,13	0,23	1.000	3.000	8,4
GEZ 114 ES	**GEZ 114 ES 2RS**	**114,3**	**4,5**	100,01	3,937	85,73	3,375	177,8	7	164,5	6	130,6	147	1	1	0,13	0,23	1.120	3.400	9,8
GEZ 120 ES	**GEZ 120 ES 2RS**	**120,65**	**4,75**	105,56	4,156	90,48	3,562	187,33	7,375	173,5	6	137,6	154	1	1	0,13	0,23	1.250	3.750	11,5
GEZ 127 ES	**GEZ 127 ES 2RS**	**127**	**5**	111,13	4,375	95,25	3,750	196,85	7,75	183	6	145,3	163	1	1	0,13	0,23	1.400	4.150	13,5
GEZ 152 ES	**GEZ 152 ES 2RS**	**152,4**	**6**	120,65	4,75	104,77	4,125	222,25	8,75	207	6	168,2	186	1	1	0,13	0,23	1.730	5.200	17,5

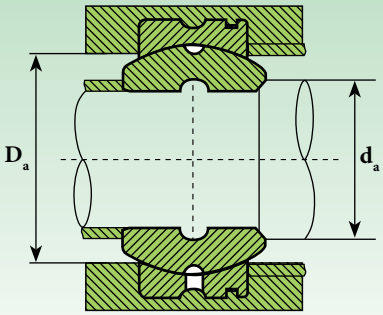
Under request, stainless steel available

Sliding coupling: steel/steel

Spherical plain radial bearings with two-pieces



GE..XS K



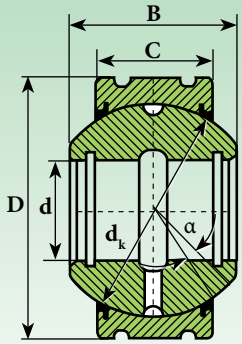
Designation	Dimensions mm					Degrees	Mounting dimensions (mm.)				Distance from edges (mm.)	Load ratings		Weight
	d	d_k	B	C	D	≈ α	d_a		D_a		$r_{1s\,min}$	Dynamic C kN	Static C_o kN	≈ Kg
							min	max	min	max				
GE 12 XS K	**12**	18	11	9	22	7	14	14	19,5	17	0,3	13	68	0,02
GE 15 XS K	**15**	22	13	11	26	6	17,5	17,5	23,5	21	0,3	20	102	0,03
GE 20 XS K	**20**	28	16	14	32	4	22,5	23	29,5	26	0,3	33	166	0,05
GE 22 XS K	**22**	32	19	16	37	6	24,5	25,5	34,5	30	0,3	43	217	0,09
GE 25 XS K	**25**	36	21	18	42	5	27,5	29	39,5	34	0,3	55	275	0,12
GE 30 XS K	**30**	45	27	23	50	6	34,5	36	45,5	42	0,6	87	439	0,23
GE 35 XS K	**35**	50	30	26	55	5	39,5	40	50,5	46,5	0,6	110	552	0,30
GE 40 XS K	**40**	55	33	28	62	6	44	44	57,5	51,5	0,6	130	654	0,38
GE 45 XS K	**45**	62	36	31	72	5	49,5	50,5	67,5	58	0,6	163	816	0,60
GE 50 XS K	**50**	72	42	36	80	5	54,5	58,5	75,5	67	0,6	220	1.100	0,87
GE 55 XS K	**55**	80	47	40	90	5	59,5	64,5	85,5	74,5	0,6	272	1.360	1,26
GE 60 XS K	**60**	90	53	45	100	6	64,5	72,5	95,5	83,5	0,6	344	1.720	1,72
GE 65 XS K	**65**	94	55	47	105	5	69,5	76	100,5	87	0,6	375	1.870	2,05
GE 70 XS K	**70**	100	58	50	110	5	74,5	81,5	105,5	93	0,6	425	2.125	2,23
GE 75 XS K	**75**	110	64	55	120	5	79,5	89,5	115,5	102	0,6	510	2.570	3,01
GE 80 XS K	**80**	120	70	60	130	5	84,5	97,5	125,5	112	0,6	610	3.060	3,98
GE 85 XS K	**85**	125	74	63	135	6	89,5	100,5	130,5	116	0,6	669	3.340	4,31
GE 90 XS K	**90**	130	76	65	140	5	94,5	105,5	135,5	121	0,6	718	3.590	4,72
GE 95 XS K	**95**	140	82	70	150	5	99,5	113,5	145,5	130	0,6	833	4.165	6,05
GE 100 XS K	**100**	150	88	75	160	5	105,5	121,5	154,5	139	1	956	4.780	7,43
GE 110 XS K	**110**	160	93	80	170	5	115,5	130	164,5	149	1	1.080	5.440	8,54
GE 115 XS K	**115**	165	98	85	180	5	120,5	132,5	174,5	152	1	1.190	5.960	10,3
GE 120 XS K	**120**	175	105	90	190	5	125,5	140	184,5	162	1	1.330	6.690	12,4
GE 130 XS K	**130**	185	110	95	200	5	135,5	148,5	194,5	171	1	1.490	7.460	13,8
GE 150 XS K	**150**	205	120	105	220	5	155,5	166	214,5	189	1	1.820	9.140	17,1

Under request, stainless steel available

Sliding coupling: steel/steel

Spherical plain radial bearings with two-pieces, and seals

GEK..XS 2RS

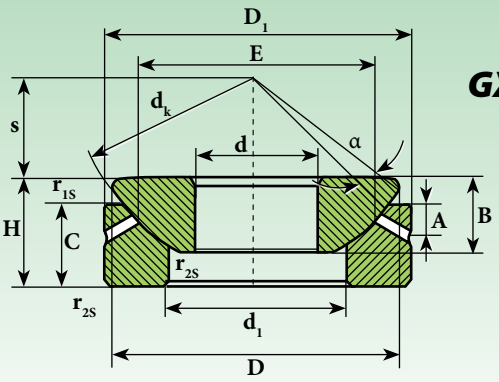


Designation	Dimensions mm					Degrees	Load ratings		Weight
	d	d_k	B	C	D	≈ α	Dynamic C kN	Static C_o kN	≈ Kg
GEK 25 XS 2RS	**25**	30	40	28	68	19	117	590	0,52
GEK 30 XS 2RS	**30**	37,3	47	32	70	19	163	813	0,79
GEK 35 XS 2RS	**35**	44,5	54	38	80	17	226	1.130	1,23
GEK 40 XS 2RS	**40**	48	64	44	90	19	298	1.490	1,83
GEK 45 XS 2RS	**45**	54	72	52	100	17	398	1.990	2,56
GEK 50 XS 2RS	**50**	60	80	58	110	17	493	2.450	3,43
GEK 55 XS 2RS	**55**	63,2	90	64	125	19	598	2.990	5,02
GEK 60 XS 2RS	**60**	69,3	98	72	135	17	732	3.660	6,43

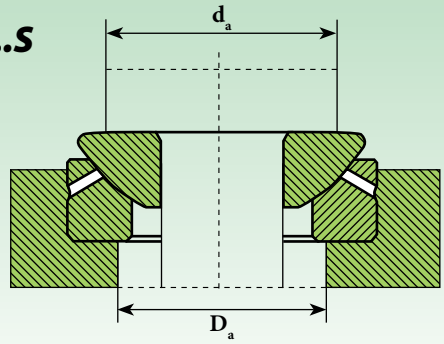
Under request, stainless steel available

Sliding coupling: steel/steel

Spherical plain thrust bearings requiring maintenance



GX..S

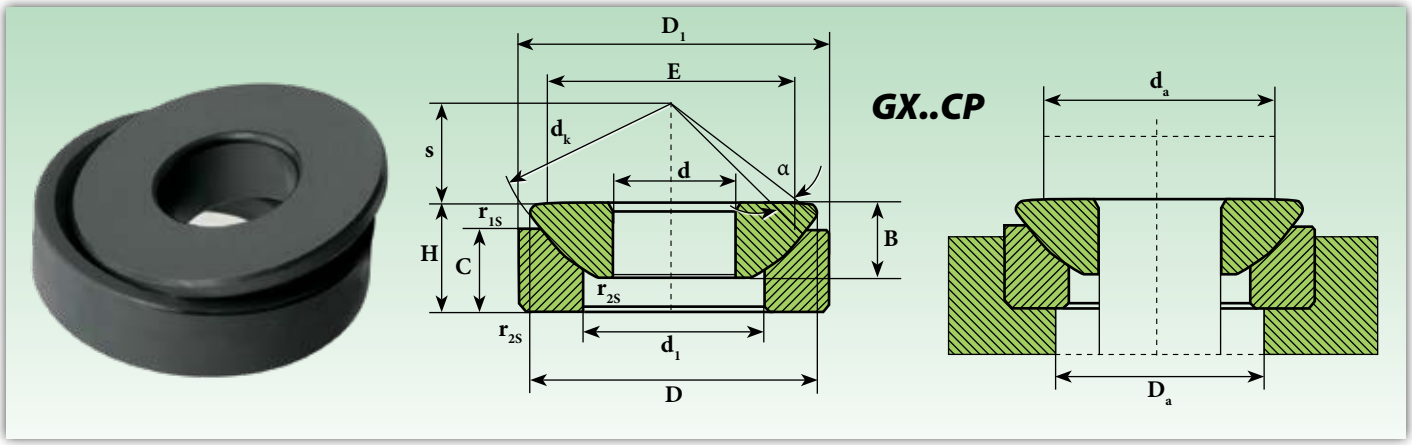


Designation	Dimensions mm											Degrees	Mounting dimensions (mm.)		Dist. from edges (mm.)		Load ratings		Weight
	d	d_1	d_K	A	B	C	D	D_1	E	H	s	≈ α	$d_{a\,min}$	$D_{a\,min}$	$r_{1s\,min}$	$r_{2s\,min}$	*Dynamic C* kN	*Static* C_o kN	≈ Kg
GX 10 S	**10**	16.5	32	3	7.9	6	27.5	30	21	95	7	10	21	19	0.6	0.2	24	120	0.040
GX 12 S	**12**	19.5	37	4	9.3	9	32	35	24	13	8	9	24	22	0.6	0.2	32.50	163	0.070
GX 15 S	**15**	24	45	5	10.7	11	38 9	42	29	15	10	7	29	26	0.6	0.2	52	260	0.120
GX 17 S	**17**	28	50	5	11.5	11.5	434	47	34	16	11	6	34	31	0.6	0.15	58.50	300	0.160
GX 20S	**20**	33.5	60	6	14.3	13	50	55	40	20	12.5	6	40	38	1	0.3	75	375	0.250
GX 25S	**25**	34.5	66	6	16	17	57.5	62	45	22.5	14	7	45	39	1	0.3	129	640	0.380
GX 30S	**30**	44	80	8	18	19.5	69	75	56	26	17.5	6	56	49	1	0.3	170	850	0.650
GX 35S	**35**	52	98	8	22	20	84	90	66	28	22	6	66	57	1	0.3	260	1290	1000
GX 40S	**40**	59	114	9	27	22	98	105	78	32	24.5	6	78	64	1	0.3	375	1860	1.600
GX 45S	**45**	68	130	11	31	25	112	120	89	36.5	27.5	6	89	74	1	0.3	490	2450	2.400
GX 50S	**50**	69	140	10	33.5	32	122.5	130	98	42.5	30	5	98	75	1	0.3	655	3250	3.300
GX 60S	**60**	86	160	12.5	37	33	140	150	108	45	35	7	108	92	1	0.3	735	3650	4.500
GX 70S	**70**	95	170	13.5	40	36	149.5	160	121	50	35	6	121	102	1	0.3	800	4050	5.500
GX 80S	**80**	108	194	14.5	42	36	168	180	130	50	42.5	6	130	115	1	0.3	1040	5200	7.000
GX 100 S	**100**	133	220	15	50	42	195.5	210	155	59	45	7	155	141	1	0.3	1200	6000	10.500
GX 120 S	**120**	154	245	16.5	52	45	214	230	170	64	52.5	8	170	162	1	0.3	1250	6200	13
GX 140 S	**140**	176	272	23	61	50	244	260	198	72	52.5	6	198	187	1.5	0.6	1630	8150	18
GX 160 S	**160**	199	310	23	65	52	272	290	213	77	65	7	213	211	1.5	0.6	1900	9500	23
GX 180 S	**180**	224	335	26	70	60	300	320	240	86	67.5	8	240	236	1.5	0.6	2120	10600	31
GX 200S	**200**	246	358	27	74	60	321	340	265	87	70	8	265	259	1.5	0.6	2360	11800	34

Under request, stainless steel available

Sliding coupling: steel/steel

Spherical plain thrust bearings maintenance free

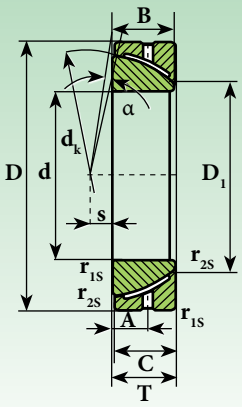


Designation	Dimensions mm										Degrees	Mounting dimensions mm		Distance from edges mm		Load ratings		Weight
	d	d_1	d_k	B	C	D	D_1	E	H	s	≈ α	$d_{a\,min}$	$D_{a\,min}$	$r_{1s\,min}$	$r_{2s\,min}$	Dynamic C kN	Static C_o kN	≈ Kg
GX10 CP	10	16.5	32	7.9	6	27.5	30	21	9.5	7	10	21	18,5	0.6	0.2	69	116	0.040
GX12 CP	12	19.5	37	9.3	9	32	35	24	13	8	9	24	21,5	0.6	0.2	92	154	0.070
GX 15 CP	15	24	45	10.7	11	38.9	42	29	15	10	7	29	26	0.6	02	148	248	0.120
GX17CP	17	28	50	11.5	11.5	43.4	47	34	16	11	6	34	30,5	0.6	0.2	168	281	0.160
GX 20CP	20	33.5	60	14.3	13	50	55	40	20	12.5	6	40	38	1	0.3	213	356	0.250
GX25CP	25	34.5	66	16	17	57.5	62	45	22.5	14	7	45	39	1	0.3	367	612	0.380
GX30CP	30	44	80	18	19.5	69	75	56	26	17.5	6	56	49	1	0.3	482	805	0.650
GX35CP	35	52	98	22	20	84	90	66	28	22	6	66	57	1	03	738	1225	1.000
GX40CP	40	59	114	27	22	98	105	78	32	24.5	6	78	64	1	0.3	1064	1767	1.600
GX 45CP	45	68	130	31	25	112	120	89	36.5	27.5	6	89	74	1	0.3	1377	2308	2.400
GX50CP	50	69	140	33.5	32	122.5	130	98	42.5	30	5	98	75	1	0.3	1852	3087	3.300
GX60CP	60	86	160	37	33	140	150	108	45	35	7	108	92	1	0.3	2090	3486	4.500
GX 70 CP	70	95	170	40	36	149.5	160	121	50	35	6	121	102	1	0.3	2300	3828	5.500
GX 80CP	80	108	194	42	36	168	180	130	50	42.5	6	130	115	1	0.3	2955	4920	7.000
GX100 CP	100	133	220	50	42	195.5	210	155	59	45	7	155	141	1	0.3	3430	5719	10.500
GX120 CP	120	154	245	52	45	214	230	170	64	52.5	8	170	162	1	0.3	3543	5910	13.000
GX 140 CP	140	176	272	61	50	244	260	198	72	52.5	6	198	187	1.5	0.6	4655	7760	18.000
GX 160CP	160	199	310	65	52	272	290	213	77	65	7	213	211	1.5	0.6	5385	8990	23.000
GX 180 CP	180	224	335	70	60	300	320	240	86	67.5	8	240	236	1.5	0.6	6060	10100	31.000
GX 200CP	200	246	358	74	60	321	340	265	87	70	8	265	259	1.5	0.6	6720	11200	34.000
GX220 CP	220	265	388	82	67	350	370	289	97	75	7	289	279	1.5	0.6	8100	13500	44.500
GX240CP	240	294	420	87	73	382	400	314	103	77.5	6	314	309	1.5	0.6	9785	16300	55.000
GX260 CP	260	317	449	95	80	409	430	336	115	82.5	7	336	332	1.5	0.6	10270	17100	69.000
GX280CP	280	337	480	100	85	445	460	366	110	80	4	366	355	3.0	1	16200	27100	82.000
GX300 CP	300	356	490	100	90	460	480	388	110	80	3.5	388	375	3.0	1	16400	27300	87.000
GX 320CP	320	380	540	105	91	500	520	405	116	95	4	405	402	4.0	1.1	20000	33400	109.000
GX 340CP	340	380	550	105	91	510	540	432	116	95	4	432	402	4.0	1.1	22000	34400	114.000
GX360CP	360	400	575	115	95	535	560	452	125	95	4	452	422	4.0	1.1	22400	40300	129.000

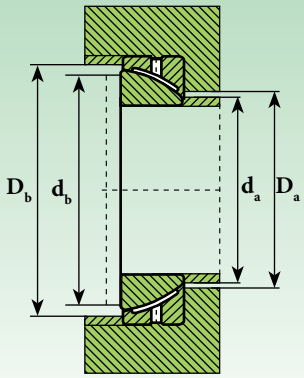
Under request, stainless steel available

Sliding coupling: hard chromium/PTFE

Angular contact spherical plain bearings requiring maintenance



GAC..S

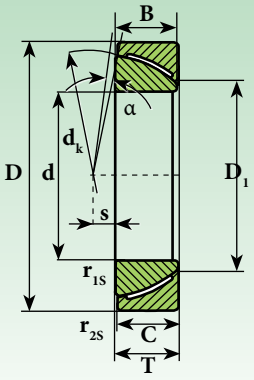


Designation	Dimensions mm									Degrees	Mounting dimensions (mm.)				Dist. from edges (mm.)		Load ratings		Weight
	d	d_K	C	D	D_1	B	s	T	A	≈ α	$d_{a\,min}$	$d_{b\,max}$	$D_{a\,min}$	$D_{b\,min}$	$r_{1s\,min}$	$r_{2s\,min}$	Dynamic C kN	Static C_o kN	≈ Kg
GAC 25 S	**25**	42.5	14	47	31.4	14	1	15	7.5	2.7	30,01	39,5	34	43	0.6	0.2	47.5	236	0.13
GAC 28 S	**28**	47	15	52	35.7	15	1	16	8	2.4	34,4	42	40	47,5	1	0.3	60	300	0.17
GAC 30 S	**30**	50	16	55	36.1	16	2	17	8.5	2.3	34,6	45	40,5	50,5	1	0.3	63	315	0.21
GAC 32 S	**32**	52	16	58	37.5	17	2	17	8.5	2.3	37,9	47,5	44	54	1	0.3	71	354	0.24
GAC 35 S	**35**	56	17	62	42.4	17	2	18	9	2	41,1	50	47	57	1	0.3	76.5	390	0.27
GAC 40 S	**40**	60	18	68	46.8	18	1.5	19	9.5	1.9	45,5	54	52	61	1	0.3	90	450	0.32
GAC 45 S	**45**	66	19	75	52 9	19	1.5	20	10	u	51,7	60	58	67	1	0.3	106	530	0.41
GAC 50 S	**50**	74	19	80	59.1	19	4	20	10	1.6	57,9	67	65	75	1	0.3	118	585	0.45
GAC 55 S	**55**	80	22	90	62	22	4	23	11.5	1.4	61	71	70	81	1.5	0.6	146	735	0.67
GAC 60 S	**60**	86	22	95	68.1	22	5	23	11.5	1.3	66,9	77	76	87	1.5	0.6	160	800	0.72
GAC 65 S	**65**	92	22	100	75.6	22	5	23	11.5	1.3	74,4	83	84	93	1.5	0.6	173	865	0.76
GAC 70 S	**70**	102	24	110	82.2	24	7	25	12.5	1.1	80,9	92	90	104	1.5	0.6	208	1040	1.0
GAC 75 S	**75**	107	24	115	84.4	25	7.9	25	12.5	1	84,7	95	94	107	1.5	0.6	220	1129	1.1
GAC 80 S	**80**	115	27	125	90.5	27	10	29	14.5	2	88	104	99	117	1.5	0.6	250	1250	1.5
GAC 85 S	**85**	122	26.5	130	94.8	29	9.4	29	14.5	2	94,4	109	105	122	1.5	0.6	284	1422	1.6
GAC 90 S	**90**	130	30	140	103.3	30	11	32	16	1.8	100,8	118	112	132	2	0.6	320	1600	2.1
GAC 95 S	**95**	135	29.5	145	104.4	32	10.8	32	16	2	105,4	119	117	132	2	0.6	335	1750	2.2
GAC 100 S	**100**	140	30	150	114.3	30	12	32	16	u	112	128	123	142	2	0.6	345	1760	2.3
GAC 105 S	**105**	148	32.5	160	113.8	35	12.3	35	17.5	2	116,8	137	129	152	2	0.6	423	2116	2.9
GAC110S	**110**	160	36	170	125.8	36	15	38	19	1.5	123,2	146	135	162	2.5	0.6	475	2360	3.6
GAC 120 S	**120**	170	36	180	135.4	36	17	38	19	1.4	132,9	155	145	172	2.5	0.6	51o	2550	3.9
GAC 130 S	**130**	190	42	200	148	42	20	45	22.5	1 9	144	174	158	192	2.5	0.6	640	3200	5.9
GAC 140 S	**140**	200	42	210	160.6	42	20	45	22.5	1.8	156,9	184	171	202	2.5	0.6	680	3450	6.3
GAC 150 S	**150**	213	45	225	170.9	45	21	48	24	u	167,1	194	184	216	3	1	780	3900	7.7
GAC 160 S	**160**	225	48	240	181.4	48	21	51	25.5	1.6	177,7	206	195	228	3	1	900	4500	9.4
GAC 170 S	**170**	250	54	260	194.3	54	27	57	28.5	1.4	190,4	228	208	253	3	1	1100	5500	12.0
GAC 180 S	**180**	260	61	280	205.5	61	21	64	32	1.3	201,7	240	220	263	3	1	1320	6700	17.0
GAC 190 S	**190**	275	61	290	211.8	61	29	64	32	1.3	207,9	252	226	278	3	1	1370	6950	18.0
GAC 200 S	**200**	290	66	310	229.5	66	26	70	35	1.6	224,1	268	244	293	3	1	1560	7800	22.5

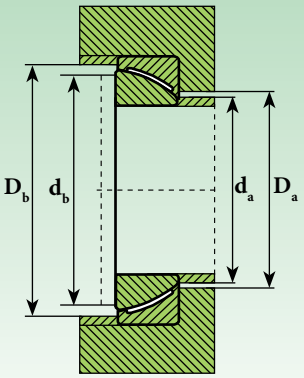
Under request, stainless steel available

Sliding coupling: steel/steel

Angular contact spherical plain bearings maintenance free



GAC..CP



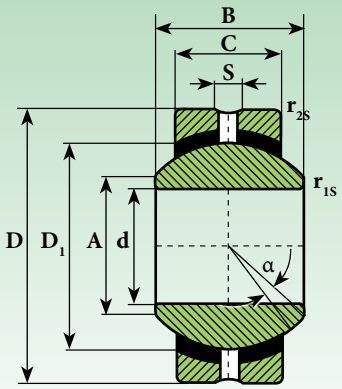
Designation	Dimensions mm								Degrees	Mounting dimensions (mm.)				Dist. from edges (mm.)		Load ratings		Weight
	d	d_K	B	C	D	D_1	s	T	≈ α	$d_{a\,max}$	$d_{b\,max}$	$D_{a\,min}$	$D_{b\,min}$	$r_{1s\,min}$	$r_{2s\,min}$	Dynamic C kN	Static C_o kN	≈ Kg
GAC 25 CP	**25**	42.5	14	14	47	31,4	1	15	2.7	30	40	34	43	0.6	0.2	71	140	0.14
GAC 28 CP	**28**	47	15	15	52	35,7	1	16	2.4	34	42	40	48	1	0.3	90	180	0.18
GAC 30 CP	**30**	50	16	15	55	36,1	2	17	2.3	35	45	41	51	1	0.3	95	190	0.22
GAC 32 CP	**32**	52	17	16	58	39,3	2	17	2.3	38	48	44	54	1	0.3	102	204	0.24
GAC 35 CP	**35**	56	17	16	62	42,4	2	18	2	41	50	47	57	1	0.3	116	232	0.28
GAC 40 CP	**40**	60	18	17	68	46,8	1.5	19	1 9	46	54	52	61	1	0.3	134	270	0.34
GAC 45 CP	**45**	66	19	18	75	52,9	1.5	20	1,7	52	60	58	67	1	0.3	160	320	0.43
GAC 50 CP	**50**	74	19	19	80	59,1	4	20	1.6	58	67	65	75	1	0.3	176	355	0.47
GAC 55 CP	**55**	80	22	20	90	62	4	23	1.4	61	71	70	81	1.5	0.6	220	440	0.70
GAC 60 CP	**60**	86	22	21	95	68,1	5	23	1.3	67	77	76	87	1.5	0.6	240	480	0.75
GAC 65 CP	**65**	92	22	22	100	75,6	5	23	1.3	74	83	84	93	1.5	0.6	260	520	0.80
GAC 70 CP	**70**	102	24	23	110	82,2	7	25	1.1	81	92	90	104	1.5	0.6	315	630	1.0
GAC 75 CP	**75**	107	25	24	115	85,9	7.9	25	1	85	95	94	107	1.5	0.6	345	670	1.1
GAC 80 CP	**80**	115	27	25,5	125	90,5	10	29	2	88	104	99	117	1.5	0.6	375	750	1.6
GAC 85 CP	**85**	122	29	26,5	130	96,9	9.4	29	2	94,4	109	105	122	1.5	0.6	425	810	1.7
GAC 90 CP	**90**	130	30	28	140	103,3	11	32	1.8	101	118	112	132	2	0.6	480	965	2.2
GAC 95 CP	**95**	135	32	29,5	145	107,7	10.8	32	2	105,4	119	117	132	2	0.6	500	1000	2.3
GAC 100 CP	**100**	140	30	31	150	114,3	12	32	1,7	112	128	123	142	2	0.6	520	1040	2.4
GAC 105 CP	**105**	148	35	32,5	160	119,4	12.3	35	2	116,8	137	129	152	2	0.6	565	1250	2.9
GAC 110 CP	**110**	160	36	34	170	125,8	15	38	1.5	123	146	135	162	2.5	0.6	710	1430	3.7
GAC 120 CP	**120**	170	36	37	180	135,4	17	38	1.4	133	155	145	172	2.5	0.6	765	1530	4.0
GAC 130 CP	**130**	190	42	43	200	148	20	45	1 9	144	174	158	192	2.5	0.6	965	1930	6.0
GAC 140 CP	**140**	200	42	43	210	160,6	20	45	1.8	157	184	171	202	2.5	0.6	1020	2040	6.4
GAC 150 CP	**150**	213	45	46	225	170,9	21	48	1,7	167	194	184	216	3	1	1180	2360	7.9
GAC 160 CP	**160**	225	48	49	240	181,4	21	51	1.6	178	206	195	228	3	1	1340	2700	9.6
GAC 170 CP	**170**	250	54	55	260	194,3	27	57	1.4	190	228	208	253	3	1	1660	3350	13.0
GAC 180 CP	**180**	260	61	61	280	205,5	21	65	1.3	202	240	220	263	3	1	2000	4000	17.5
GAC 190 CP	**190**	275	61	62	290	211,8	29	64	1.3	208	252	226	278	3	1	2080	4150	18.0
GAC 200 CP	**200**	290	66	66	310	229,2	26	70	1.6	224	268	244	293	3	1	2360	4750	23.0

Under request, stainless steel available

Sliding coupling: hard chromium/PTFE

Spherical plain bearings

SSR



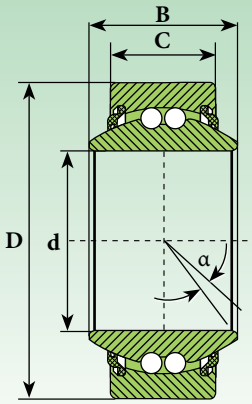
Designation	Dimensions mm							Degrees	Distance from edges (mm.)		Load ratings		Weight
	d	A	B	C	D	D_1	S	≈ α	$r_{1s\,min}$	r_{2smin}	*Dynamic C* kN	*Static* C_o kN	≈ Kg
SSR 5	**5**	7,1	8	6	16	11,11	1,5	13	0,3	0,3	3,3	7,8	0,009
SSR 6	**6**	8,96	9	6,75	18	12,70	1,5	13	0,3	0,3	4,3	9,8	0,013
SSR 8	**8**	10,04	12	9	22	15,88	1,5	14	0,3	0,3	6,8	16	0,024
SSR 10	**10**	12,92	14	10,5	26	19,05	1,5	14	0,3	0,6	10	23	0,039
SSR 12	**12**	15,43	16	12	30	22,23	2	13	0,3	0,6	13	31	0,058
SSR 14	**14**	16,86	19	13,5	34	25,40	2	16	0,3	0,6	17	40	0,084
SSR 15*	**15**	18,12	20	14	36	26,99	2	15	0,3	0,6	19	45	0,108
SSR 16	**16**	19,39	21	15	38	28,58	2	15	0,3	0,6	21	50	0,111
SSR 17*	**17**	20,63	22	16	40	30,16	2,5	15	0,3	0,6	24	56	0,124
SSR 18	**18**	21,89	23	16,5	42	31,75	2,5	15	0,3	0,6	26	61	0,160
SSR 20	**20**	24,38	25	18	46	34,93	2,5	15	0,3	0,6	31	73	0,210
SSR 22	**22**	25,84	28	20	50	38,10	2,5	15	0,3	0,6	38	88	0,260
SSR 25	**25**	29,6	31	22	56	42,86	3	15	0,6	0,6	47	110	0,390
SSR 28*	**28**	32,29	35	25	62	47,63	3	16	0,6	0,6	59	138	0,530
SSR 30	**30**	34,81	37	25	66	50,80	3	17	0,6	0,6	63	148	0,610

Under request, stainless steel available

Sliding coupling: steel/bronze

** Available only after request and with relative technical drawing*

Ball joint with integral double-row ball bearing



GE..BBL

DIN ISO 12240-4

series E

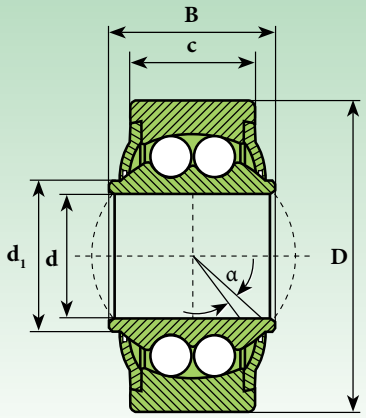
Designation	*Dimensions mm*				*Degrees*	*Calculation factors*		*Limit speed*	*Load ratings*		*Weight*
	d	D	B	C	≈ α	Y	Y0	N_{max} (Min $^{-1}$)	*Dynamic C* kN	*Static C_o* kN	≈ Kg
GE 08 BBL	**8**	16	8	5	15	2.09	2.19	1400	0,25	0,10	0.006
GE 10 BBL	**10**	19	9	6	12	1.80	1.89	1350	0,75	0,25	0.010
GE 12 BBL	**12**	22	10	7	11	1.90	1.81	1200	0,80	0,30	0.015
GE 15 BBL	**15**	26	12	9	8	1.74	1.82	1100	1,10	0,40	0.024
GE 17 BBL	**17**	30	14	10	10	2.24	2.35	950	1,70	0,60	0.034
GE 20 BBL	**20**	35	16	12	9	2.21	2.31	900	1,70	0,75	0.057
GE 25 BBL	**25**	42	20	16	7	2.46	2.58	850	2,40	1,10	0.106
GE 30 BBL	**30**	47	22	18	6	2.35	2.24	750	3,50	1,50	0.121
GE 35 BBL	**35**	55	25	20	6	2.02	2.12	600	5,50	2,50	0.195
GE 40 BBL	**40**	62	28	22	7	2.24	2.35	480	7,50	3,00	0.266
GE 45 BBL	**45**	68	32	25	7	2.46	2.58	450	10,00	4,50	0.348
GE 50 BBL	**50**	75	35	28	6	2.35	2.24	450	11,50	5,00	0.464

GE..BBL = ***LIGHT-DUTY***

Outer ring: 100 Cr 6 steel; hardened, superfinished, with seals
Inner ring: 100 Cr 6 steel; hardened, superfinished

Lubrication: high speed bearing grease (temp. range -45° to +120°)
Radial clearance: 10 ÷ 30 µm

Ball joint with integral double-row ball bearing



GE..BBH

DIN ISO 12240-4

series K

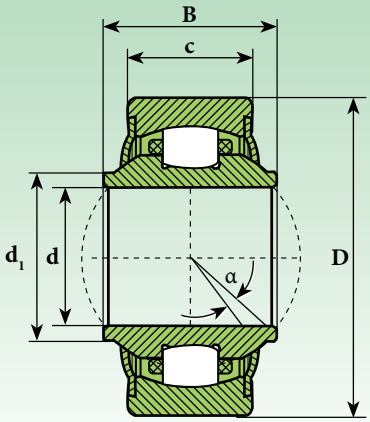
Designation	Dimensions mm					Degrees	Calculation factors		Limit speed	Load ratings		Weight
	d	d_1	D	B	C	≈ α	Y	Y0	N_{max} (Min $^{-1}$)	*Dynamic C* kN	*Static* C_o kN	≈ Kg
GE 06 BBH	**6**	9	18	9	6.75	8.0	2.09	2.19	1400	2,80	0,67	0.019
GE 08 BBH	**8**	10.5	22	12	9	8.5	1.80	1.89	1350	4,05	1,05	0.036
GE 10 BBH	**10**	12	26	14	10.5	8.0	1.90	1.81	1250	4,40	1,45	0.060
GE 12 BBH	**12**	14.5	30	16	12	7.5	1.74	1.82	1150	5,00	1,65	0.087
GE 14 BBH	**14**	17	34	19	13.5	6.0	2.36	2.48	1050	5,55	1,95	0.135
GE 16 BBH	**16**	19	38	21	15	8.0	2.24	2.35	950	6,30	2,40	0.190
GE 18 BBH	**18**	21.5	42	23	16.5	8.5	2.21	2.31	900	7,15	2,95	0.270
GE 20 BBH	**20**	24.5	46	25	18	7.0	2.46	2.58	850	7,98	3,50	0.338
GE 22 BBH	**22**	26	50	28	20	8.0	2.35	2.24	750	9,35	3,95	0.450
GE 25 BBH	**25**	29.5	56	31	22	5.0	2.02	2.12	620	11,00	5,70	0.602
GE 30 BBH	**30**	34.5	66	37	25	7.5	2.24	2.35	500	14,20	7,40	0.922

GE..BBH = ***HEAVY-DUTY***

Outer ring: 100 Cr 6 steel; hardened, superfinished, with shields
Inner ring: 100 Cr 6 steel; hardened, superfinished

Lubrication: high speed bearing grease (temp. range -45° to +120°)
Radial clearance: 10 ÷ 30 µm

Ball joint with integral roller bearing



GE..RB

DIN ISO 12240-4

series K

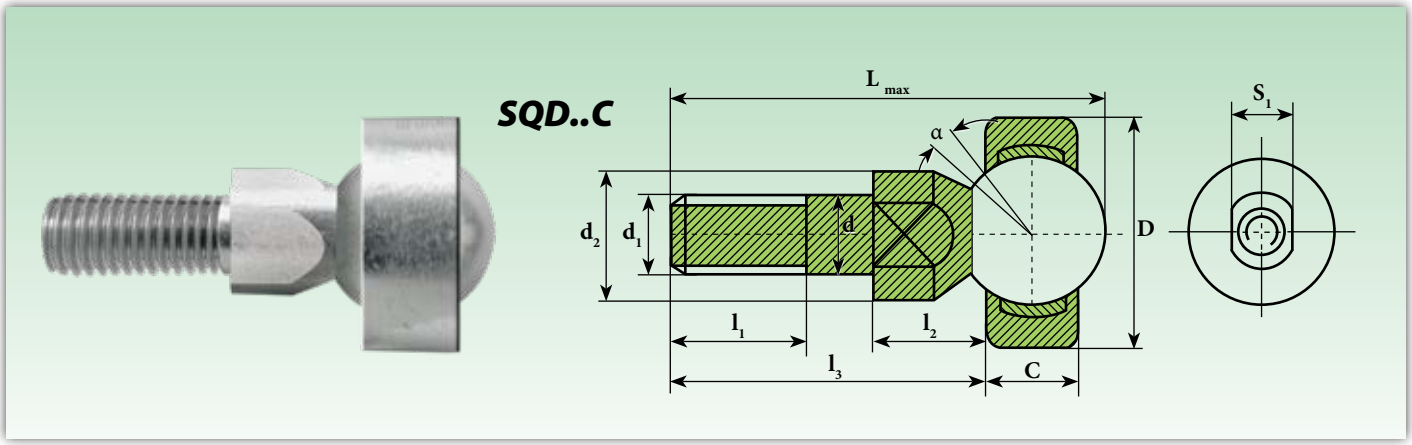
Designation	*Dimensions mm*					*Degrees*	*Limit speed*	*Load ratings*		*Weight*
	d	d_1	D	B	C	≈ α	N_{max} (Min^{-1})	*Dynamic C* kN	*Static* C_o kN	≈ Kg
GE 12 RB	**12**	14.5	30	16	12	7.5	1130	10,30	6,62	0.088
GE 16 RB	**16**	19	38	21	15	7.0	990	13,35	8,95	0.185
GE 20 RB	**20**	24.5	46	25	18	7.0	850	17,05	11,75	0.340
GE 25 RB	**25**	29.5	56	31	22	5.0	650	24,95	18,55	0.596
GE 30 RB	**30**	34.5	66	37	25	7.5	500	32,55	24,80	0.912

Outer ring: 100 Cr 6 steel; hardened, superfinished, with shields
Inner ring: 100 Cr 6 steel; hardened, superfinished

Lubrication: high speed bearing grease (temp. range -45° to +120°)
Radial clearance: 10 ÷ 30 µm

Ball joint rod ends - Rod ends

Ball joint rod ends with one shank

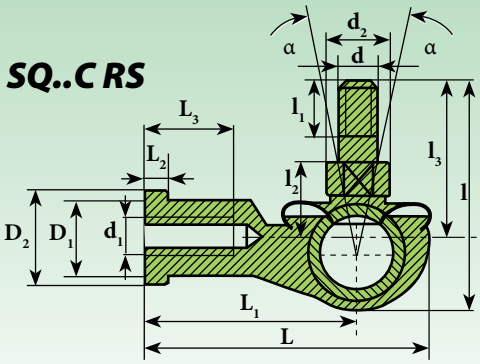


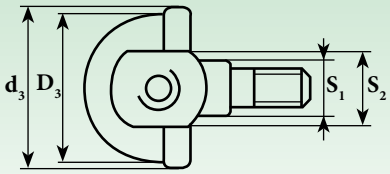
Designation	Dimensions mm										Degrees	Load ratings		Weight
	d	d_1	d_2	C	D	l_1	l_2	l_3	L_{max}	s_1	≈ α	*Dynamic C* kN	*Static* C_o kN	≈ Kg
SQD 5 C	**5**	M 5x0,8	9	6	16	8	8	19	27,5	7	25	2,4	6,2	0,014
SQD 6 C	**6**	M 6x1	10	6,75	18	11	8,8	23,5	33,5	8	25	3,2	8,1	0,021
SQD 8 C	**8**	M 8x1,25	12	9	22	12	11,6	28,6	41	10	25	5,5	14	0,042
SQD 10 C	**10**	M 10x1,25	14	10,5	26	15	14,2	34,2	49	11	25	7,8	20	0,067
SQD 10-1 C	**10**	M 10x1,5	14	10,5	26	21	14,2	40,2	55	11	25	7,8	20	0,067
SQD 12 C	**12**	M 12x1,25	17	12	30	17	15,1	38,1	55,1	15	25	10	27	0,108
SQD 12-1 C	**12**	M 12x1,75	17	12	30	24	15,1	45,1	62,1	15	25	10	27	0,108
SQD 14 C	**14**	M 14x1,5	19	13,5	34	22	16,8	51,3	70,7	17	20	13	35	0,167
SQD 14-1 C	**14**	M 14x2	19	13,5	34	28	16,8	57,3	76,7	17	20	13	35	0,167
SQD 16 C	**16**	M 16x1,5	22	15	38	23	18	54,5	76,3	19	20	17	45	0,238
SQD 16-1 C	**16**	M 16x2	22	15	38	29	18	60,5	82,3	19	20	17	45	0,238

Under request, stainless steel available

Sliding coupling: steel with sintered bronze and PTFE

Winding shape ball joint rod ends





Designation[1]	Dimensions mm																	Degrees	Load ratings		Weight
with seal	d	d_1	d_2	d_3 *	D_1	D_2	D_3	l	l_1	l_2	l_3	L	L_1	L_2	L_3	S_1	S_2	≈ α	Dynamic C kN	Static C_0 kN	≈ Kg
SQ 5 C RS	**5**	M 5x0,8	9	20	9	11	16	29	8	10	21	35	27	4	14	7	9	25	2,7	9,2	0,026
SQ 6 C RS	**6**	M 6x1	10	20	10	13	19	35,5	11	11	26	40	30	5	14	8	11	25	3,6	12	0,039
SQ 8 C RS	**8**	M 8x1,25	12	24	12,5	16	23	42,5	12	14	31	48	36	5	17	10	14	25	5,7	19	0,068
SQ 10 C RS	**10**	M 10x1,25	14	30	15	19	27	50,5	15	17	37	57	43	6,5	21	11	17	25	8,2	27	0,112
SQ 10 C RS-1	**10**	M 10x1,5	14	30	15	19	27	56,5	21	17	43	57	43	6,5	21	11	17	25	8,2	27	0,112
SQ 12 C RS	**12**	M 12x1,25	17	32	17,5	22	31	57,5	17	19	42	66	50	6,5	25	15	19	25	11	37	0,164
SQ 12 C RS-1	**12**	M 12x1,75	17	32	17,5	22	31	64,5	24	19	49	66	50	6,5	25	15	19	25	11	37	0,164
SQ 14 C RS	**14**	M 14x1,5	19	38	20	25	35	73,5	22	21,5	56	75	57	8	26	17	22	25	14	48	0,254
SQ 14 C RS-1	**14**	M 14x2	19	38	20	25	35	79,5	28	21,5	62	75	57	8	26	17	22	25	14	48	0,254
SQ 16 C RS	**16**	M 16x1,5	22	44	22	27	39	79,5	23	23,5	60	84	64	8	32	19	22	20	16	53	0,336
SQ 16 C RS-1	**16**	M 16x2	22	44	22	27	39	85,5	29	23,5	66	84	64	8	32	19	22	20	16	53	0,336
SQ 18 C RS	**18**	M 18x1,5	23	45	25	31	44	90	25	26,5	68	93	71	10	34	20	27	20	18	61	0,464
SQ 20 C RS	**20**	M 20x1,5	27	50	27,5	34	44	90	25	27	68	99	77	10	35	24	30	20	18	61	0,538
SQ 22 C RS	**22**	M 22x1,5	27	52	30	37	50	95	26	28	70	109	84	12	41	24	32	16	22	75	0,713

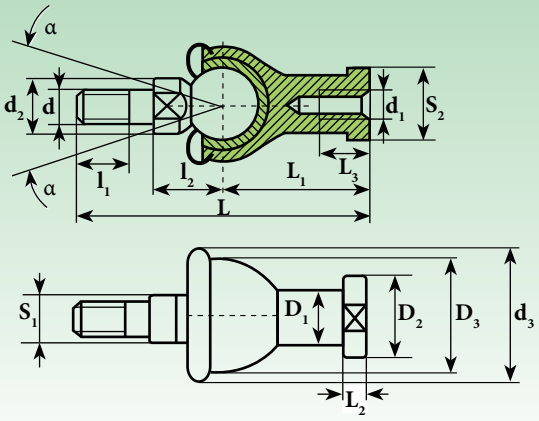
Under request, stainless steel available

[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: SQL..C RS)*

Sliding coupling: steel/steel grease pre-lubrication
** Rubber material, approximate dimension*

Straight ball joint rod ends

SQZ..C RS



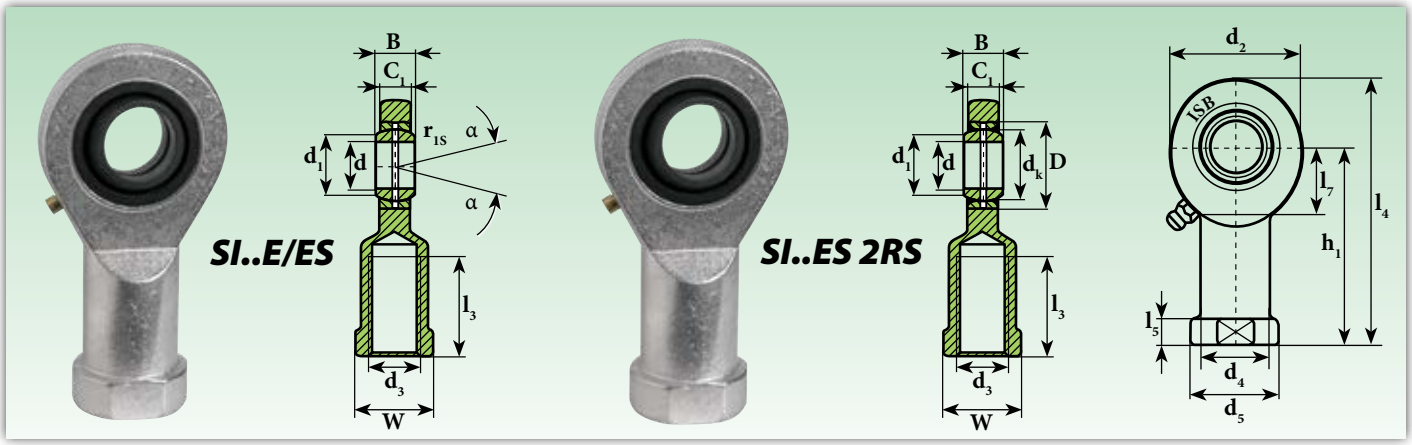
Designation[1]	Dimensions mm															Degrees	Load ratings		Weight
with seal	d	d_1	d_2	d_3 *	D_1	D_2	D_3	l_1	l_2	L	L_1	L_2	L_3	S_1	S_2	≈ α	Dynamic C kN	Static C_0 kN	≈ Kg
SQZ 5 C RS	**5**	M 5x0,8	9	20	9	11	17	8	11	46	24	4	12	7	9	15	1,7	5,7	0,025
SQZ 6 C RS	**6**	M 6x1	10	20	10	13	20	11	12,2	55,2	28	5	15	8	11	15	2,2	7,5	0,040
SQZ 8C RS	**8**	M 8x1,25	12	24	12,5	16	24	12	16	65	32	5	16	10	14	15	3,3	11	0,075
SQZ 10 C RS	**10**	M 10x1,25	14	30	15	19	28	15	19,5	74,5	35	6,5	18	11	17	15	4,8	16	0,121
SQZ 10 C RS-1	**10**	M 10x1,5	14	30	15	19	28	21	19,5	80,5	35	6,5	18	11	17	15	4,8	16	0,121
SQZ 12 C RS	**12**	M 12x1,25	17	32	17,5	22	32	17	21	84	40	6,5	20	15	19	15	6,6	22	0,187
SQZ 12 C RS-1	**12**	M 12x1,75	17	32	17,5	22	32	24	21	91	40	6,5	20	15	19	15	6,6	22	0,187
SQZ 14 C RS	**14**	M 14x1,5	19	38	20	25	36	22	23,5	103	45	8	25	17	22	11	8,7	29	0,277
SQZ 14 C RS-1	**14**	M 14x2	19	38	20	25	36	28	23,5	109	45	8	25	17	22	11	8,7	29	0,277
SQZ 16 C RS	**16**	M 16x1,5	22	44	22	27	40	23	25,5	112	50	8	27	19	22	11	10	33	0,361
SQZ 16 C RS-1	**16**	M 16x2	22	44	22	27	40	29	25,5	118	50	8	27	19	22	11	10	33	0,361
SQZ 18 C RS	**18**	M 18x1,5	23	45	25	31	45	25	31	130,50	58	10	32	20	27	11	11	37	0,539
SQZ 20 C RS	**20**	M 20x1,5	27	50	27,5	34	45	25	29	133	63	10	38	24	30	7,5	11	37	0,575
SQZ 22 C RS	**22**	M 22x1,5	27	52	30	37	50	26	33	145	70	12	43	24	32	7,5	14	46	0,757

Under request, stainless steel available

[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: SQZL..C RS)*

Sliding coupling: steel/steel grease pre-lubrication
** Rubber material, approximate dimension*

Rod ends



Designation[1]		Dimensions mm																Degrees	Distance from edges (mm.)	Load ratings		Weight
without seal	with seal	d	d_1	d_2	d_3	d_4	d_5	d_k	B	C_1	D	h_1	W	l_3	l_4	l_5	l_7	≈ α	r_{1smin}	Dynamic C kN	Static C_0 kN	≈ Kg
SI 5 E[2]	-	**5**	7	21	M 5x0,8	10	13	-	6	4,4	-	30	10	11	40,5	5	-	13	0,3	3,4	8,1	0,016
SI 6 E[2]	-	**6**	8	21	M 6x1	10,5	13	10	6	4,4	14	30	11	11	40,5	5	10,5	13	0,3	3,4	8,15	0,021
SI 8 E[2]	-	**8**	10,2	24	M 8x1,25	12	15	13	8	6	16	36	13	15	48	5	12	15	0,3	5,5	12,9	0,039
SI 10 E[2]	-	**10**	13,2	29	M 10x1,5	15	18	16	9	7	19	43	15	20	57,5	6,5	14	12	0,3	8,15	17,6	0,061
SI 12 E[2]	-	**12**	15	34	M 12x1,75	17	20	18	10	8	22	50	18	24	67	6,5	17,5	11	0,3	10,8	24,5	0,096
SI 15 ES[3]	**SI 15 ES 2RS**	**15**	18,4	40	M 14x2	20	24	22	12	10	26	61	21	30	81	8	20	8	0,3	17	36	0,18
SI 17 ES[3]	**SI 17 ES 2RS**	**17**	20,7	46	M 16x2	23	28	25	14	11	30	67	24	34	90	10	23	10	0,3	21,2	45	0,22
SI 20 ES[3]	**SI 20 ES 2RS**	**20**	24,1	53	M 20x1,5	27,5	35	29	16	13	35	77	32	40	103,5	10	27,5	9	0,6	30	60	0,35
SI 25 ES	**SI 25 ES 2RS**	**25**	29,3	64	M 24x2	33,5	42	35,5	20	17	42	94	36	48	126	12	32	7	0,6	48	83	0,64
SI 30 ES	**SI 30 ES 2RS**	**30**	34,2	73	M 30x2	40	50	40,7	22	19	47	110	41	56	146,5	15	37	6	0,6	62	110	0,93
SI 35 ES	**SI 35 ES 2RS**	**35**	39,7	82	M 36x3	47	58	47	25	21	55	125	50	60	166	15	42	6	0,6	80	146	1,3
SI 40 ES	**SI 40 ES 2RS**	**40**	45	92	M 39x3	52	65	53	28	23	62	142	55	67	188	18	48	7	0,6	100	180	2
SI 45 ES	**SI 45 ES 2RS**	**45**	50,7	102	M 42x3	58	70	60	32	27	68	145	60	65	196	20	52	7	0,6	127	240	2,5
SI 50 ES	**SI 50 ES 2RS**	**50**	56	112	M 45x3	62	75	66	35	30	75	160	65	69	216	20	59	6	0,6	156	290	3,5
SI 60 ES	**SI 60 ES 2RS**	**60**	66,8	135	M 52x3	70	88	80	44	38	90	175	75	73	242	20	75	6	1	245	450	5,9
SI 70 ES	**SI 70 ES 2RS**	**70**	77,8	160	M 56x4	80	98	92	49	42	105	200	85	80	280	20	87	6	1	315	610	8,6
SI 80 ES	**SI 80 ES 2RS**	**80**	89,4	180	M 64x4	95	110	105	55	47	120	230	100	85	320	25	100	6	1	400	695	12

Under request, stainless steel available

Spherical plain radial bearing inside GE..E, GE..ES, GE..ES 2RS

1) *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: SIL..ES)*
2) *Maintenance-free*
3) *Relubrication through a hole on the head*

Sliding coupling: steel/steel
Under request, available with increased thread

Rod ends (maintenance-free)

Designation[1]		Dimensions mm																Degrees	Distance from edges (mm.)	Load ratings		Weight
without seal	with seal	d	d_1	d_2	d_3	d_4	d_5	d_K	B	C_1	D	h_1	W	l_3	l_4	l_5	l_7	≈ α	r_{1smin}	Dynamic C kN	Static C_0 kN	≈ Kg
SI 5 C	-	**5**	7	21	M 5x0,8	10	13	10	6	4,4	-	30	10	11	40,5	5	-	13	0,3	3,4	8,1	0,016
SI 6 C	-	**6**	8	21	M 6x1	10,5	13	10	6	4,4	14	30	11	11	40,5	5	10,5	13	0,3	3,60	8,15	0,021
SI 8 C	-	**8**	10,2	24	M 8x1,25	12	15	13	8	6	16	36	13	15	48	5	12	15	0,3	5,85	12,90	0,039
SI 10 C	-	**10**	13,2	29	M 10x1,5	15	18	16	9	7	19	43	15	20	57,5	6,5	14	12	0,3	8,65	17,60	0,061
SI 12 C	-	**12**	15	34	M 12x1,75	17	20	18	10	8	22	50	18	24	67	6,5	17,5	11	0,3	11,40	24,50	0,096
SI 15 C	-	**15**	18,4	40	M 14x2	20	24	22	12	10	26	61	21	30	81	8	20	8	0,3	17,6	36	0,18
SI 17 C	-	**17**	20,7	46	M 16x2	23	28	25	14	11	30	67	24	34	90	10	23	10	0,3	22,40	45	0,22
SI 20 C	-	**20**	24,1	53	M 20x1,5	27,5	35	29	16	13	35	77	32	40	103,5	10	27,5	9	0,6	31,6	60	0,35
SI 25 C	-	**25**	29,3	64	M 24x2	33,5	42	35,5	20	17	42	94	36	48	126	12	32	7	0,6	51	83	0,64
SI 30 C	**SI 30 C 2RS**	**30**	34,2	73	M 30x2	40	50	40,7	22	19	47	110	41	56	146,5	15	37	6	0,6	66,5	110	0,93
	SI 17 C 2RS	**17**	20	46	M16x2	24	30	-	14	11	-	67	27	34	90	10	23	10	-	21.2	45.0	0.22
	SI 20 C 2RS	**20**	24	53	M20x1.5	27.5	35	-	16	13	-	77	32	40	103.5	10	27	9	-	30.0	60.0	0.35
	SI 25 C 2RS	**25**	29	64	M24x2	33.5	42	-	20	17	-	94	36	48	126	12	32	7	-	48.0	83.0	0.64
-	**SI 35 C 2RS**	**35**	39,7	82	M 36x3	47	58	47	25	21	55	125	50	60	166	15	42	6	0,6	200	150	1,30
-	**SI 40 C 2RS**	**40**	45	92	M 39x3	52	65	53	28	23	62	142	55	67	188	18	48	7	0,6	263	184	2
-	**SI 45 C 2RS**	**45**	50,7	102	M 42x3	58	70	60	32	27	68	145	60	65	196	20	52	7	0,6	342	246	2,50
-	**SI 50 C 2RS**	**50**	56	112	M 45x3	62	75	66	35	30	75	160	65	69	216	20	59	6	0,6	420	297	3,50
-	**SI 60 C 2RS**	**60**	66,8	135	M 52x3	70	88	80	44	38	90	175	75	73	242	20	75	6	1	655	460	5,50
-	**SI 70 C 2RS**	**70**	77,8	160	M 56x4	80	98	92	49	42	105	200	85	80	280	20	87	6	1	840	535	8,60
-	**SI 80 C 2RS**	**80**	89,4	180	M 64x4	95	110	105	55	47	120	230	100	85	320	25	100	6	1	1.068	654	12

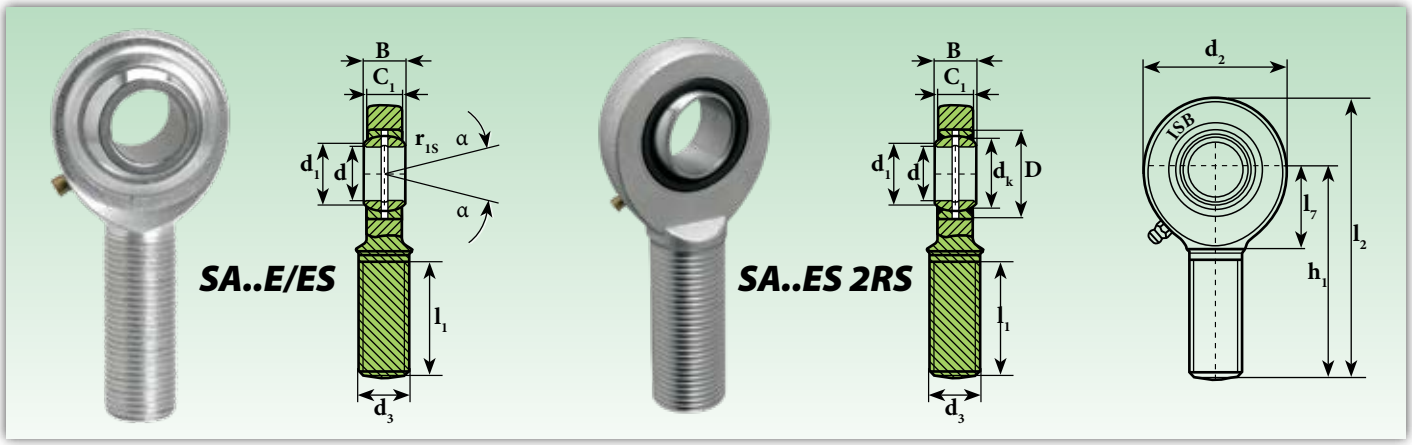
Under request, stainless steel available

Spherical plain radial bearing inside GE..C, GE..ET 2RS

[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: SIL..C)*

Sliding coupling: steel with sintered bronze and PTFE

Rod ends



Designation[1]		Dimensions mm												Degrees	Distance from edges (mm.)	Load ratings		Weight
without seal	with seal	d	d_1	d_2	d_3	d_k	B	C_1	D	h_1	l_1	l_2	l_7	≈ α	r_{1smin}	Dynamic C kN	Static C_o kN	≈ Kg
SA 5 E[2]	-	**5**	7	21	M 5x0,8	-	6	4,4	-	36	16	46,5	-	13	0,3	3,4	8,1	0,016
SA 6 E[2]	-	**6**	8	21	M 6x1	10	6	4,4	14	36	18	46,5	12	13	0,3	3,4	10,2	0,017
SA 8 E[2]	-	**8**	10,2	24	M 8x1,25	13	8	6	16	42	22	54	14	15	0,3	5,5	16	0,029
SA 10 E[2]	-	**10**	13,2	29	M 10x1,5	16	9	7	19	48	27	62,5	15	12	0,3	8,15	22	0,051
SA 12 E[2]	-	**12**	14,9	34	M 12x1,75	18	10	8	22	54	30	71	19	11	0,3	10,8	30,4	0,086
SA 15 ES[3]	**SA 15 ES 2RS**	**15**	18,4	40	M 14x2	22	12	10	26	63	34	83	20	8	0,3	17	44,8	0,14
SA 17 ES[3]	**SA 17 ES 2RS**	**17**	20,7	46	M 16x2	25	14	11	30	69	36	92	23	10	0,3	21,2	56,5	0,19
SA 20 ES	**SA 20 ES 2RS**	**20**	24,1	53	M 20x1,5	29	16	13	35	78	43	104,5	27,5	9	0,6	30	75,6	0,31
SA 25 ES	**SA 25 ES 2RS**	**25**	29,3	64	M 24x2	35,5	20	17	42	94	53	126	32	7	0,6	48	88,2	0,56
SA 30 ES	**SA 30 ES 2RS**	**30**	34,2	73	M 30x2	40,7	22	19	47	110	65	146,5	37	6	0,6	62	119	0,89
SA 35 ES	**SA 35 ES 2RS**	**35**	39,7	82	M 36x3	47	25	21	55	140	82	181	43	6	0,6	80	159	1,4
SA 40 ES	**SA 40 ES 2RS**	**40**	45	92	M 39x3	53	28	23	62	150	86	196	48	7	0,6	100	194	1,8
SA 45 ES	**SA 45 ES 2RS**	**45**	50,7	102	M 42x3	60	32	27	68	163	94	218	52	7	0,6	127	259	2,6
SA 50 ES	**SA 50 ES 2RS**	**50**	56	112	M 45x3	66	35	30	75	185	106	241	60	6	0,6	156	313	3,4
SA 60 ES	**SA 60 ES 2RS**	**60**	66,8	135	M 52x3	80	44	38	90	210	115	277,5	75	6	1	245	485	5,9
SA 70 ES	**SA 70 ES 2RS**	**70**	77,8	160	M 56x4	92	49	42	105	235	125	315	87	6	1	315	564	8,2
SA 80 ES	**SA 80 ES 2RS**	**80**	89,4	180	M 64x4	105	55	47	120	270	140	360	100	6	1	400	689	13,10

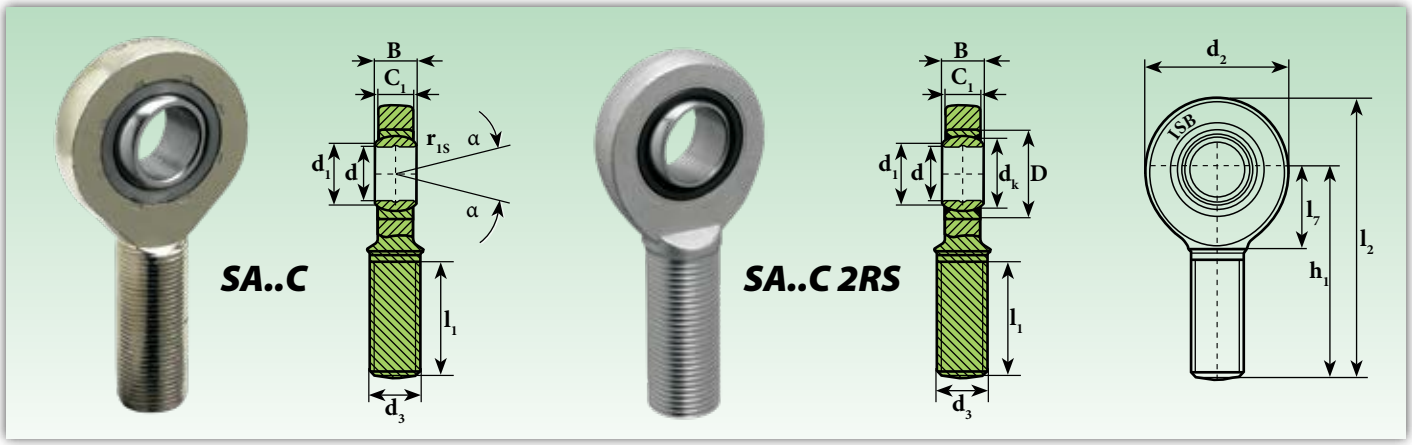
Under request, stainless steel available

Spherical plain radial bearing inside GE..E, GE..ES 2RS

1) *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: SAL..ES)*
2) *Maintenance-free*
3) *Relubrication through a hole on the head*

Sliding coupling: steel/steel
Under request, available with increased thread

Rod ends (maintenance-free)



Designation[1]		Dimensions mm												Degrees	Distance from edges (mm.)	Load ratings		Weight
without seal	with seal	d	d_1	d_2	d_3	d_k	B	C_1	D	h_1	l_1	l_2	l_7	≈ α	r_{1smin}	Dynamic C kN	Static C_o kN	≈ Kg
SA 5 C	-	**5**	7	21	M 5x0,8	-	6	4,3	-	36	16	46,5	-	13	0,3	3,4	8,1	0,016
SA 6 C	-	**6**	8	21	M 6x1	10	6	4,3	14	36	18	46,5	12	13	0,3	3,6	8,15	0,017
SA 8 C	-	**8**	10,2	24	M 8x1,25	13	8	6	16	42	22	54	14	15	0,3	5,85	12,9	0,029
SA 10 C	-	**10**	13,2	29	M 10x1,5	16	9	7	19	48	27	62,5	15	12	0,3	8,65	17,6	0,051
SA 12 C	-	**12**	15	34	M 12x1,75	18	10	8	22	54	30	71	19	11	0,3	11,4	24,5	0,086
SA 15 C	-	**15**	18,4	40	M 14x2	22	12	10	26	63	34	83	20	8	0,3	17,6	36	0,14
SA 17 C	-	**17**	20,7	46	M 16x2	25	14	11	30	69	36	92	23	10	0,3	22,4	45	0,19
-	**SA 17 C 2RS**	**17**	20	46	M16x2	-	14	11	-	69	36	92	-	10	-	21.2	45.0	0.19
SA 20 C	-	**20**	24,1	53	M 20x1,5	29	16	13	35	78	43	104,5	27,5	9	0,6	31,5	60	0,31
-	**SA 20 C 2RS**	**20**	24	53	M20x1.5	-	16	13	-	78	43	104.5	-	9	-	30.0	60.0	0.31
SA 25 C	-	**25**	29,3	64	M 24x2	35,5	20	17	42	94	53	126	33	7	0,6	51	83	0,56
-	**SA 25 C 2RS**	**25**	29	64	M24x2	-	20	17	-	94	53	126	-	7	-	48.0	83.0	0.56
SA 30 C	**SA 30 C 2RS**	**30**	34,2	73	M 30x2	40,7	22	19	47	110	65	146,5	37	6	0,6	65,5	110	0,89
-	**SA 35 C 2RS**	**35**	39,7	82	M 36x3	47	25	21	55	140	82	181	43	6	0,6	80,0	146	1,4
-	**SA 40 C 2RS**	**40**	45	92	M 39x3	53	28	23	62	150	86	196	48	7	0,6	100	180	1,8
-	**SA 45 C 2RS**	**45**	50,7	102	M 42x3	60	32	27	68	163	94	218	52	7	0,6	127	240	2,6
-	**SA 50 C 2RS**	**50**	56	112	M 45x3	66	35	30	75	185	106	241	60	6	0,6	156	290	3,4
-	**SA 60 C 2RS**	**60**	66,8	135	M 52x3	80	44	38	90	210	115	277,5	75	6	1	245	450	5,9
-	**SA 70 C 2RS**	**70**	77,8	160	M 56x4	92	49	42	105	235	125	315	87	6	1	315	610	8,2
-	**SA 80 C 2RS**	**80**	89,4	180	M 64x4	105	55	47	120	270	140	360	100	6	1	400	750	12

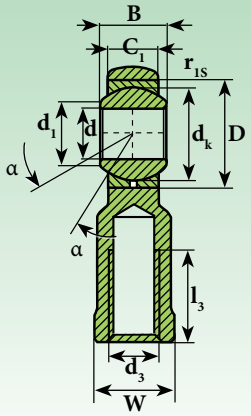
Under request, stainless steel available

Spherical plain radial bearing inside GE..C, GE..ET 2RS

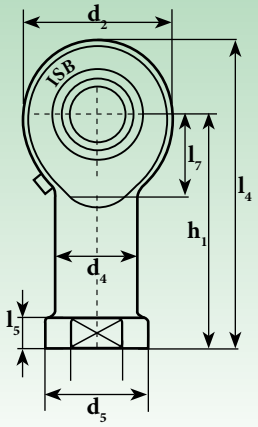
[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: SAL..C)*

Sliding coupling: hard chromium/PTFE

Rod ends



TSF



Designation[1]	Dimensions mm																Degrees	Distance from edges (mm.)	Load ratings		Weight
	d H7	d_1	d_2	d_3	d_4	d_5	d_K	B	C_1	D	h_1	l_3 *	l_4	l_5	l_7	W	≈ α	r_{1smin}	Dynamic C kN	Static C_o kN	≈ Kg
TSF 5	**5**	7,7	16	M 5x0,8	9	11	11,11	8	6	13	27	14	35	4	10	9	13	0,3	3,25	4,1	0,016
TSF 6	**6**	9	18	M 6x1	10	13	12,70	9	6,75	16	30	14	39	5	11	11	13	0,3	4,3	5,3	0,022
TSF 8	**8**	10,4	22	M 8x1,25	12,5	16	15,88	12	9	19	36	17	47	5	13	14	14	0,3	6,8	9,2	0,03
TSF 10	**10**	12,9	26	M 10x1,5	15	19	19,05	14	10,5	22	43	21	56	6,5	15	17	13	0,3	10	12	0,08
TSF 10.1[2]	**10**	12,9	26	M 10x1,25	15	19	19,05	14	10,5	22	43	21	56	6,5	15	17	13	0,3	10	12	0,08
TSF 12	**12**	15,4	30	M 12x1,75	17,5	22	22,23	16	12	26	50	24	65	6,5	17	19	13	0,3	13	17	0,12
TSF 12.1[2]	**12**	15,4	30	M 12x1,25	17,5	22	22,23	16	12	26	50	24	65	6,5	17	19	13	0,3	13	17	0,12
TSF 14	**14**	16,9	34	M 14x2	20	25	25,40	19	13,5	28	57	27	74	8	18	22	16	0,3	17	22	0,14
TSF 14.1[2]	**14**	16,9	34	M 14x1,5	20	25	25,40	19	13,5	28	57	27	74	8	18	22	16	0,3	17	22	0,14
TSF 15	**15**	18,12	36	M 14x2	22	26	26,99	20	14	-	61	30	79	8	-	22	-	0,3	19	26	0,18
TSF 16	**16**	19,4	40	M 16x2	22	27	28,58	21	15	32	64	33	83	8	23	22	15	0,3	21	28	0,22
TSF 16.1[2]	**16**	19,4	40	M 16x1,5	22	27	28,58	21	15	32	64	33	83	8	23	22	15	0,3	21	28	0,22
TSF 17	**17**	20,6	42	M 16x1,5	25	31	30,16	22	16	-	67	34	88	10	-	27	15	0,3	22	30	0,26
TSF 18	**18**	21,9	44	M 18x1,5	25	31	31,75	23	16,5	35	71	36	92	10	25	27	15	0,3	26	34	0,32
TSF 20	**20**	24,4	50	M 20x1,5	27,5	34	34,93	25	18	40	77	40	100	10	26	30	14	0,3	31	35	0,42
TSF 22	**22**	25,8	54	M 22x1,5	30	37	38,10	28	20	42	84	43	109	12	29	32	15	0,3	38	44	0,61
TSF 25	**25**	29,6	60	M 24x2	33,5	42	42,85	31	22	47	94	48	124	12	32	36	15	0,3	47	52	0,81
TSF 28	**28**	32,3	66	M 27x2	37	46	47,59	35	25	-	103	53	136	12	34	41	15	0,3	59	69	1,20
TSF 30	**30**	34,8	70	M 30x2	40	50	50,80	37	25	55	110	56	145	15	37	41	17	0,3	63	85	1,40
TSF 30.1[2]	**30**	34,8	70	M 27x2	40	50	50,80	37	25	55	110	60	145	15	37	41	17	0,3	63	85	1,40

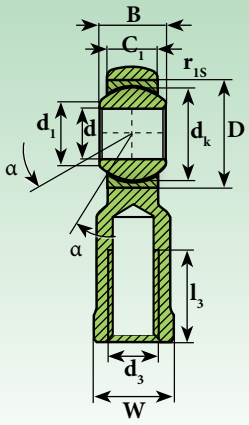
Under request, stainless steel available

Spherical plain radial bearing inside GE..SB

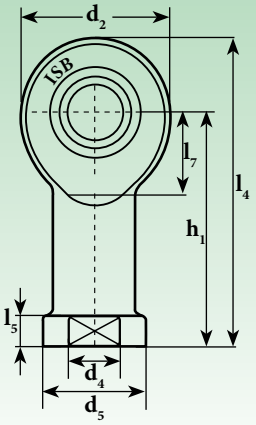
1) *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: TSFL..)*
2) CETOP *thread type*

Sliding coupling: steel/bronze
* *Minimum lenght*

Rod ends (maintenance-free)



TSF..C



Designation[1]	Dimensions mm																Degrees	Distance from edges (mm.)	Load ratings		Weight
	d H7	d_1	d_2	d_3	d_4	d_5	d_k	B	C_1	D	h_1	l_3 *	l_4	l_5	l_7	W	≈ α	r_{1smin}	Dynamic C kN	Static C_o kN	≈ Kg
TSF 5 C	**5**	7,7	18	M 5x0,8	9	12	11,11	8	7,5	13	27	8	36	4	10	10	13	0,3	3,2	5,2	0,01
TSF 5.1 C	**5**	7.7	18	M4x0.7	-	11	-	8	6	-	27	10	36	4	9	9	13	-	3.2	5.2	0.01
TSF 6 C	**6**	8,9	20	M 6x1	10	13	12,70	9	7,5	16	30	9	40	5	11	10	13	0,3	4,2	6,7	0,01
TSF 8 C	**8**	10,3	24	M 8x1,25	12,5	16	15,88	12	9,5	19	36	12	48	5	13	13	14	0,3	7	11,2	0,03
TSF 10 C	**10**	12,9	28	M 10x1,5	15	19	19,05	14	11,5	22	43	15	58	6,5	15	16	13	0,3	9,6	14,2	0,08
TSF 10.1 C[2]	**10**	12,9	28	M 10x1,25	15	19	19,05	14	11,5	22	43	15	58	6,5	15	16	13	0,3	9,6	14,2	0,08
TSF 12 C	**12**	15,4	32	M 12x1,75	17,5	22	22,23	16	12,5	26	50	18	67	6,5	17	18	13	0,3	13	16,8	0,12
TSF 12.1 C[2]	**12**	15,4	32	M 12x1,25	17,5	22	22,23	16	12,5	26	50	18	67	6,5	17	18	13	0,3	13	16,8	0,12
TSF 14 C	**14**	16,8	36	M 14x2	21	25	25,40	19	14,5	28	57	21	76	8	18	21	16	0,3	16,8	27,4	0,14
TSF 14.1 C[2]	**14**	16,8	36	M 14x1,5	21	25	25,40	19	14,5	28	57	21	76	8	18	21	16	0,3	16,8	27,4	0,14
TSF 15 C	**15**	18,12	36	M 14x2	22	26	26,99	20	15	-	61	22	79	8	-	22	-	0,3	19	28,1	0,19
TSF 16 C	**16**	19,3	42	M 16x2	22	27	28,57	21	15,5	32	64	24	85	8	23	24	15	0,3	21,2	34,3	0,22
TSF 16.1 C[2]	**16**	19,3	42	M 16x1,5	22	27	28,57	21	15,5	32	64	24	85	8	23	24	15	0,3	21,2	34,3	0,22
TSF 18 C	**18**	21,8	44	M 18x1,5	25	31	31,75	23	17,5	35	71	27	94	10	25	27	15	0,3	25,7	41,4	0,32
TSF 20 C	**20**	24,3	50	M 20x1,5	27,5	34	34,93	25	18,5	40	77	30	102	10	26	30	14	0,3	31	49,8	0,42
TSF 22 C	**22**	25,8	54	M 22x1,5	30	37	38,10	28	21	42	84	33	112	12	29	34	15	0,3	37,9	60,5	0,61
TSF 25 C	**25**	29,5	60	M 24x2	33,5	42	42,85	31	23	47	94	36	124	12	32	36	15	0,3	48,1	65,5	0,81
TSF 28 C	**28**	32,3	66	M 27x2	37	46	47,59	35	26	-	103	41	136	14	34	41	15	0,3	59,9	71,3	1,20
TSF 30 C	**30**	34,8	70	M 30x2	40	50	50,80	37	27	55	110	45	145	15	37	46	17	0,3	71,4	80,6	1,40
TSF 30.1 C	**30**	34.8	70	M27x2	-	50	-	37	25	-	110	51	145	15	38	41	17	-	71.4	80.6	1.20
TSF 35 C	**35**	39	81	M 36x2	46	58	57,15	43	28	-	125	56	165,5	17	-	50	16	0,3	89,2	97,2	1,70
TSF 40 C	**40**	-	91	M 42x2	53	65	66,67	49	33	-	142	60	187,5	19	-	55	16	0,3	-	-	2,40
TSF 50 C	**50**	-	117	M 48x2	65	75	82,5	60	45	-	160	65	218,5	23	-	65	12	0,3	-	-	5,00

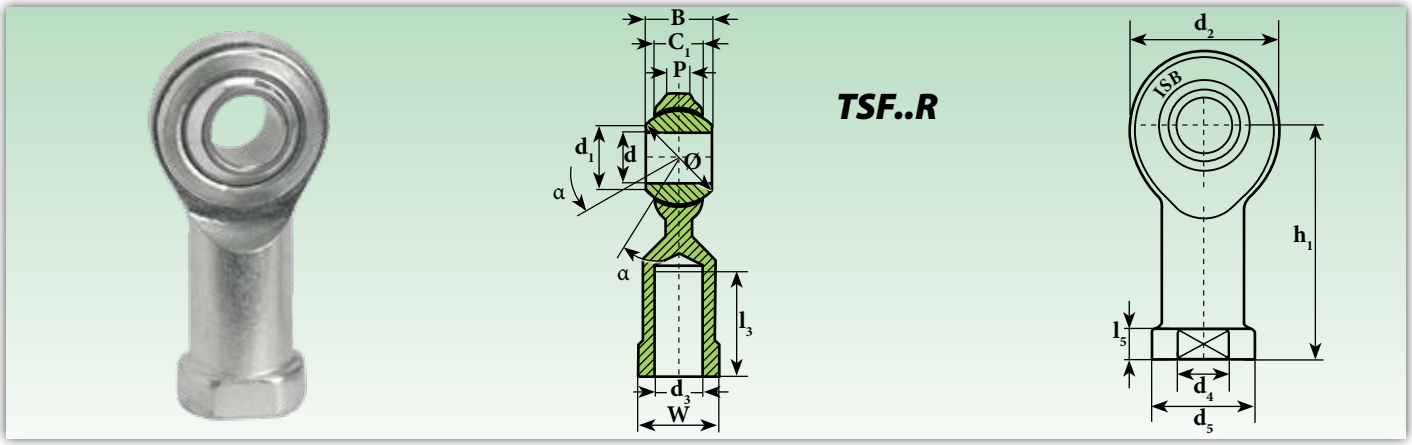
Under request, stainless steel available

Spherical plain radial bearing inside GE..SP

1) *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: TSFL..C)*
2) CETOP *thread type*

Sliding coupling: steel/PTFE
* *Minimum lenght*

Rod ends (maintenance-free - reduced series)



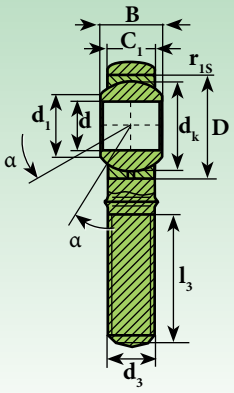
Designation[1]	Dimensions mm													Degrees	Load ratings	Weight
	d H7	d_{1*}	d_{2*}	d_3	d_{4*}	d_{5*}	B	C_1	h_{1*}	l_3 **	l_{5*}	P*	W	Ø ball	≈ α	Static C_o kN	≈ Kg
TSF.R 3	**3**	7,4	12	M 3x0,5	6,5	8	6	4,5	21	10	3	2,8	7	9,30	13	1,77	0,007
TSF.R 4	**4**	7,6	14	M 4x0,7	8	9,5	7	5,3	24	12	4	3	8	10,32	13	2,94	0,010
TSF.R 5	**5**	7,7	16	M 5x0,8	9	11	8	5,5	27	12	4	3	9	11,11	13	3,92	0,016
TSF.R 6	**6**	8,9	18	M 6x1	10	13	9	6	30	14	5	3,3	11	12,70	13	4,81	0,024
TSF.R 8	**8**	10,4	22	M 8x1,25	13	16	12	8	36	17	5	4,5	14	15,88	13	6,86	0,041
TSF.R 8.1 [2]	**8**	10,4	22	M 8x1	13	16	12	8	36	17	5	4,5	14	15,88	13	6,86	0,041
TSF.R 10	**10**	12,9	26	M 10x1,5	15	19	14	10	43	21	6,5	5,5	17	19,05	13	9,22	0,070
TSF.R 10.1 [2]	**10**	12,9	26	M 10x1,25	15	19	14	10	43	21	6,5	5,5	17	19,05	13	9,22	0,070
TSF.R 12	**12**	15,4	30	M 12x1,75	18	22	16	11	50	24	6,5	6	19	22,23	13	11,67	0,104
TSF.R 12.1 [2]	**12**	15,4	30	M 12x1,25	18	22	16	11	50	24	6,5	6	19	22,23	13	11,67	0,104
TSF.R 14	**14**	16,8	35	M 14x2	20	25	19	12	57	27	8	7	21	25,40	15	14,42	0,158
TSF.R 14.1 [2]	**14**	16,8	35	M 14x1,5	20	25	19	12	57	27	8	7	21	25,40	15	14,42	0,158
TSF.R 16	**16**	19,3	38	M 16x2	22	27	21	13	64	33	8	7,5	22	28,58	15	17,46	0,200
TSF.R 16.1 [2]	**16**	19,3	38	M 16x1,5	22	27	21	13	64	33	8	7,5	22	28,58	15	17,46	0,200
TSF.R 18	**18**	21,8	44	M 18x1,5	25	31	23	15	71	36	10	8,5	27	31,75	15	20,59	0,288
TSF.R 20	**20**	24,3	47	M 20x1,5	28	34	25	16	77	40	10	9	30	34,93	15	24,03	0,372
TSF.R 22	**22**	25,9	50	M 22x1,5	30	37	28	18	84	43	12	10	32	38,10	15	28,83	0,475
TSF.R 25	**25**	29,6	56	M 24x2	34	42	31	20	94	48	12	12	36	42,85	15	50,01	0,680
TSF.R 30	**30**	34,8	67	M 30x2	40	50	37	24	110	56	15	15	41	50,80	15	63,74	1,020

Under request, stainless steel available

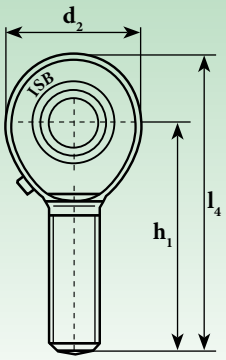
1) *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: TSF.RL..)*
2) CETOP *thread type*

Sliding coupling: steel/PTFE
** tolerance* ± 0,5 ≈ 1 mm.
*** Minimum lenght*

Rod ends



TSM



Designation[1]	Dimensions mm											Degrees	Distance from edges (mm.)	Load ratings		Weight
	d H7	d_1	d_2	d_3	d_k	B	C_1	D	h_1	l_3 *	l_4	≈ α	r_{1smin}	Dynamic C kN	Static C_o kN	≈ Kg
TSM 5	**5**	7,7	16	M 5x0,8	11,11	8	6	13	33	20	41	13	0,3	3,2	4,7	0,013
TSM 6	**6**	8,9	18	M 6x1	12,70	9	6,7	16	36	22	45	13	0,3	4,2	4,7	0,020
TSM 8	**8**	10,3	22	M 8x1,25	15,88	12	9	19	42	25	53	14	0,3	7	7,8	0,03
TSM 10	**10**	12,9	26	M 10x1,5	19,05	14	10,5	22	48	29	61	13	0,3	9,8	10,5	0,05
TSM 12	**12**	15,4	30	M 12x1,75	22,23	16	12	26	54	33	69	13	0,3	12,1	12,1	0,085
TSM 12.1	**12**	15,4	30	M 12x1,25	22,23	16	12	26	54	33	69	13	0,3	12,1	12,1	0,085
TSM 14	**14**	16,8	34	M 14x2	25,40	19	13,5	28	60	36	77	16	0,3	16,9	17,1	0,12
TSM 16	**16**	19,3	40	M 16x2	28,58	21	15	32	66	40	85	15	0,3	21,5	23	0,18
TSM 16.1	**16**	19,3	40	M 16x1,5	28,58	21	15	32	66	40	85	15	0,3	21,5	23	0,18
TSM 17	**17**	20,6	42	M 16x1,5	30,16	22	16	-	69	42	88	15	0,3	23,2	26,1	0,23
TSM 18	**18**	21,8	44	M 18x1,5	31,75	23	16,5	35	72	44	93	15	0,3	25,8	28,7	0,26
TSM 20	**20**	24,3	50	M 20x1,5	34,93	25	18	40	78	47	101	14	0,3	28,8	29	0,34
TSM 22	**22**	25,8	54	M 22x1,5	38,10	28	20	42	84	51	109	15	0,3	37,9	38,8	0,43
TSM 25	**25**	29,5	60	M 24x2	42,85	31	22	47	94	57	124	15	0,3	46,3	46,3	0,64
TSM 28	**28**	32,3	66	M 27x2	47,60	35	25	-	103	62	136	15	0,3	54,6	55,1	0,87
TSM 30	**30**	34,8	70	M 30x2	50,80	37	25	55	110	66	145	17	0,3	60,8	60,8	1,00

Under request, stainless steel available

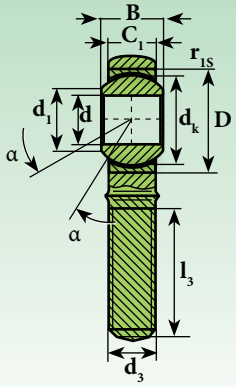
Spherical plain radial bearing inside GE..SB

[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: TSML..)*

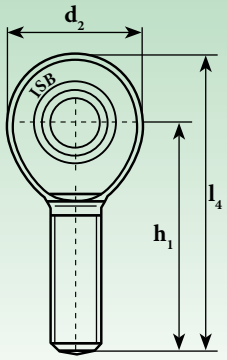
Sliding coupling: steel/bronze

* *Minimum lenght*

Rod ends (maintenance-free)



TSM..C



Designation[1]	Dimensions mm											Degrees	Distance from edges (mm.)	Load ratings		Weight
	d H7	d_1	d_2	d_3	d_K	B	C_1	D	h_1	l_3 *	l_4	≈ α	r_{1smin}	Dynamic C kN	Static C_0 kN	≈ Kg
TSM 5 C	**5**	7,7	18	M 5x0,8	11,11	8	7,5	13	33	19	42	13	0,3	3,2	5,2	0,01
TSM 6 C	**6**	8,9	20	M 6x1	12,70	9	7,5	16	36	21	46	13	0,3	4,2	6,7	0,020
TSM 8 C	**8**	10,3	24	M 8x1,25	15,88	12	9,5	19	42	25	54	14	0,3	7	9,9	0,03
TSM 10 C	**10**	12,9	28	M 10x1,5	19,05	14	11,5	22	48	28	63	13	0,3	9,6	12,4	0,05
TSM 12 C	**12**	15,4	32	M 12x1,75	22,23	16	12,5	26	54	32	71	13	0,3	13	14,8	0,085
TSM 12.1 C	**12**	15,4	32	M 12x1,25	22,23	16	12,5	26	54	32	71	13	0,3	13	14,8	0,085
TSM 14 C	**14**	16,8	36	M 14x2	25,40	19	14,5	29	60	36	79	16	0,3	16,8	25,4	0,12
TSM 16 C	**16**	19,3	42	M 16x2	28,58	21	15,5	32	66	37	87	15	0,3	21,3	34,3	0,18
TSM 16.1 C	**16**	19,3	42	M 16x1,5	28,58	21	15,5	32	66	37	87	15	0,3	21,3	34,3	0,18
TSM 18 C	**18**	21,8	44	M 18x1,5	31,75	23	17,5	35	72	41	95	15	0,3	25,8	41,4	0,26
TSM 20 C	**20**	24,3	50	M 20x1,5	34,93	25	18,5	40	78	45	103	14	0,3	30,9	49,8	0,34
TSM 22 C	**22**	25,8	54	M 22x1,5	38,10	28	21	42	84	48	112	15	0,3	37,8	58,3	0,43
TSM 25 C	**25**	29,5	60	M 24x2	42,85	31	23	47	94	55	124	15	0,3	48,1	69,8	0,64
TSM 28 C	**28**	32,3	66	M 27x2	47,60	35	26	-	103	62	136	15	0,3	60	78,4	0,87
TSM 30 C	**30**	34,8	70	M 30x2	50,80	37	27	55	110	66	145	17	0,3	71,9	96,7	1,07
TSM 35 C	**35**	-	81	M 36x2	57,15	43	28	-	140	85	180,5	16	0,3	-	-	1,64
TSM 40 C	**40**	-	91	M 42x2	66,67	49	33	-	150	90	195,5	17	0,3	-	-	2,3
TSM 50 C	**50**	-	117	M 48x2	82,5	60	45	-	185	105	243,5	17	0,3	-	-	4,8

Under request, stainless steel available

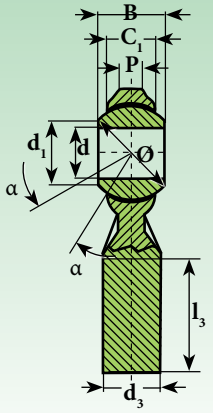
Spherical plain radial bearing inside GE..SP

[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: TSML..C)*

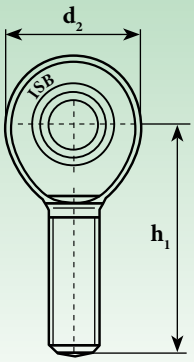
Sliding coupling: steel/PTFE

* *Minimum lenght*

Rod ends (maintenance-free - reduced series)



TSM..R



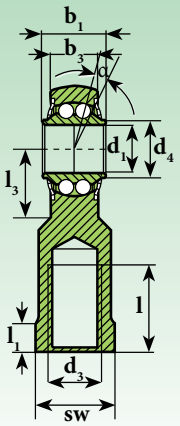
Designation[1]	Dimensions mm										Degrees	Load ratings	Weight
	d H7	d_{1*}	d_{2*}	d_3	B	C_1	h_{1*}	l_3 **	P*	Ø ball	≈ α	Static C_0 kN	≈ Kg
TSM.R 3	**3**	7,4	12	M 3x0,5	6	4,5	27	15	2,8	9,30	13	1,77	0,005
TSM.R 4	**4**	7,6	14	M 4x0,7	7	5,3	30	17	3	10,32	13	2,94	0,007
TSM.R 5	**5**	7,7	16	M 5x0,8	8	5,5	33	20	3	11,11	13	3,92	0,013
TSM.R 6	**6**	8,9	18	M 6x1	9	6	36	22	3,3	12,70	13	4,81	0,017
TSM.R 8	**8**	10,4	22	M 8x1,25	12	8	42	25	4,5	15,88	13	6,86	0,033
TSM.R 8.1	**8**	10,4	22	M 8x1	12	8	42	25	4,5	15,88	13	6,86	0,033
TSM.R 10	**10**	12,9	26	M 10x1,5	14	10	48	29	5,5	19,05	13	9,22	0,054
TSM.R 10.1[2]	**10**	12,9	26	M 10x1,25	14	10	48	29	5,5	19,05	13	9,22	0,054
TSM.R 12	**12**	15,4	30	M 12x1,75	16	11	54	33	6	22,23	13	11,67	0,085
TSM.R 12.1[2]	**12**	15,4	30	M 12x1,25	16	11	54	33	6	22,23	13	11,67	0,085
TSM.R 14	**14**	16,8	35	M 14x2	19	12	60	36	7	25,40	15	14,42	0,129
TSM.R 14.1[2]	**14**	16,8	35	M 14x1,5	19	12	60	36	7	25,40	15	14,42	0,129
TSM.R 16	**16**	19,3	38	M 16x2	21	13	66	40	7,5	28,58	15	17,46	0,181
TSM.R 16.1[2]	**16**	19,3	38	M 16x1,5	21	13	66	40	7,5	28,58	15	17,46	0,181
TSM.R 18	**18**	21,8	44	M 18x1,5	23	15	72	44	8,5	31,75	15	20,59	0,250
TSM.R 20	**20**	24,3	47	M 20x1,5	25	16	78	47	9	34,93	15	24,03	0,333
TSM.R 22	**22**	25,9	50	M 22x1,5	28	18	84	51	10	38,10	15	28,83	0,430
TSM.R 25	**25**	29,6	56	M 24x2	31	20	94	57	12	42,85	15	50,01	0,610
TSM.R 30	**30**	34,8	67	M 30x2	37	24	110	66	15	50,80	15	63,74	0,990

Under request, stainless steel available

1) *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: TSM.RL..)*
2) CETOP *thread type*

Sliding coupling: steel/PTFE
* *tolerance* ± 0,5 ≈ 1 mm.
** *Minimum lenght*

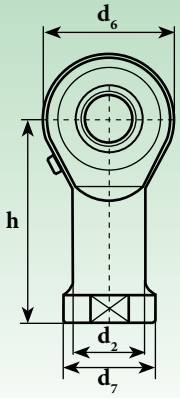
Heavy-duty rod ends with integral double-row ball bearing



TSF..BB

DIN ISO 12240-4

series K



Designation[1]	Dimensions mm													Degrees	Calculation factors		Limit speed	Load ratings		Weight
	d_1	d_2	d_3	d_4	d_6	d_7	b_1	b_3	h	l	l_1	l_3	sw	≈ α	Y	Y_0	(Min $^{-1}$)	Dynamic C kN	Static C_0 kN	≈ Kg
TSF 06 BB	6	10.0	M6	9.0	20	13	9	6.75	30	12	5.0	10	11	8.0	2.09	2.19	1400	2,8	0,67	0.024
TSF 08 BB	8	12.5	M8	10.5	24	16	12	9.0	36	16	5.0	12	14	8.5	1.80	1.89	1350	4,05	1,05	0.044
TSF 10 BB	10	15.0	M10	12.0	28	19	14	10.5	43	20	6,5	15	17	8.0	1.90	1.81	1250	4,4	1,45	0.072
TSF 12 BB	12	17.5	M12	14.5	32	22	16	12.0	50	22	6.5	16	19	7.5	1.74	1.82	1150	5	1,85	0.107
TSF 14 BB	14	20.0	M14	17.0	36	25	19	13.5	57	25	8.0	20	22	6.0	2.36	2.48	1050	5,55	1,95	0.160
TSF 16 BB	16	22.0	M16	19.0	42	27	21	15.0	64	28	8.0	22	22	8.0	2.24	2.35	950	6,3	2,4	0.224
TSF 18 BB	18	25.0	M18x1.5	21.5	46	31	23	16.5	71	32	10.0	24	27	8.5	2.21	2.31	900	7,15	2,95	0.293
TSF 20 BB	20	27.5	M20x1.5	24.5	50	34	25	18.0	77	33	10.0	26	30	7.0	2.46	2.58	850	7,98	3,5	0.367
TSF 22 BB	22	30.0	M22x1.5	26.0	54	38	28	20.0	84	37	12.0	26	32	8.0	2.35	2.24	750	9,35	3,95	0.480
TSF 25 BB	25	30.0	M24x2	29.5	64	35	31	22.0	94	42	10.0	32	30	5.0	2.02	2.12	620	11	5,7	0.572
TSF 30 BB	30	40.0	M30x2	34.5	70	50	37	25.0	110	51	15.0	35	41	7.5	2.24	2.35	500	14,2	7,5	0.978
TSF 35 BB	35	48	M36x2	40	81	58	43	28.0	125	56	17.0	45	50	8.0	2.7	2.83	450	25	8	1.600
TSF 40 BB	40	53	M48x2	45.1	91	65	49	33.0	142	60	19.0	50	55	8.0	2.7	2.83	400	30	10	2.400
TSF 50 BB	50	63	M48x2	56.7	117	75	60	45.0	160	65	23.0	65	65	8.5	2.7	2.83	350	51	17	5.000

[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added*

Female thread low maintenance with shields

Housing: forged steel; case-hardened bearing race; superfinished galvanized surface, chromium VI free

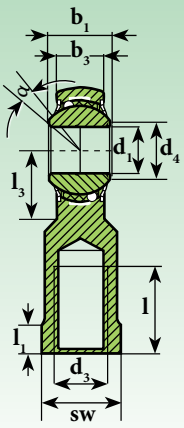
Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished

Lubrication: high speed bearing grease

Temperature range: -45°C to +120°C

Radial clearance (radial): 10 ÷ 30 µm

Heavy-duty rod ends with integral double-row ball bearing



TSF..BB-O

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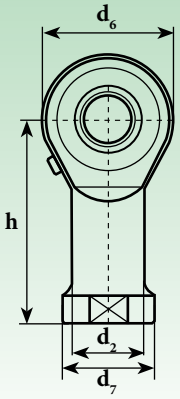
series K



Designation[1]	Dimensions mm													Degrees	Calculation factors		Limit speed	Load ratings		Weight
	d_1	d_2	d_3	d_4	d_6	d_7	b_1	b_3	h	l	l_1	l_3	sw	≈ α	Y	Y_0	(Min $^{-1}$)	Dynamic C kN	Static C_0 kN	≈ Kg
TSF 06 BB-O	6	10.0	M6	9.0	20	13	9	6.75	30	12	5.0	10	11	8.0	2.09	2.19	1350	2,75	0,65	0.019
TSF 08 BB-O	8	12.5	M8	10.5	24	16	12	9.0	36	16	5.0	12	14	8.5	1.80	1.89	1300	4	1	0.036
TSF 10 BB-O	10	15.0	M10	12.0	28	19	14	10.5	43	20	6.5	15	17	8.0	1.90	1.81	1225	4,45	1,45	0.060
TSF 12 BB-O	12	17.5	M12	14.5	32	22	16	12.0	50	22	6.5	16	19	7.5	1.74	1.82	1125	4,95	1,8	0.087
TSF 14 BB-O	14	20.0	M14	17.0	36	25	19	13.5	57	25	8.0	20	22	6.0	2.36	2.48	1025	5,6	2	0.135
TSF 16 BB-O	16	22.0	M16	19.0	42	27	21	15.0	64	28	8.0	22	22	8.0	2.24	2.35	975	6,25	2,35	0.190
TSF 18 BB-O	18	25.0	M18x1.5	21.5	46	31	23	16.5	71	32	10.0	24	27	8.5	2.21	2.31	900	7,1	2,9	0.270
TSF 20 BB-O	20	27.5	M20x1.5	24.5	50	34	25	18.0	77	33	10.0	26	30	7.0	2.46	2.58	825	7,9	3,45	0.338
TSF 22 BB-O	22	30.0	M22x1.5	26.0	54	38	28	20.0	84	37	12.0	26	32	8.0	2.35	2.24	725	9,3	3,98	0.450
TSF 25 BB-O	25	30.0	M24x2	29.5	64	35	31	22.0	94	42	10.0	32	30	5.0	2.02	2.12	600	11,03	5,68	0.602
TSF 30 BB-O	30	40.0	M30x2	34.5	70	50	37	25.0	110	51	15.0	35	41	7.5	2.24	2.35	450	14,15	7,45	0.922

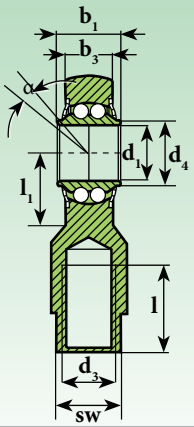
In TSF..BB-O balls are centered on outer body instead of inner ring as the TSF..BB

[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added*

Female thread low maintenance with shields
Housing: forged steel; case-hardened bearing race; superfinished galvanized surface, chromium VI free
Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished

Lubrication: high speed bearing grease
Temperature range: -45°C to +120°C
Radial clearance (radial): 10 ÷ 30 µm

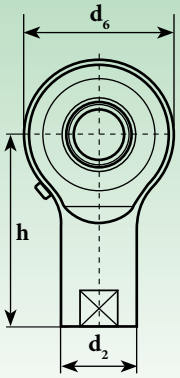
Heavy-duty rod ends with integral double-row ball bearing with edge



TSF..BB-E

DIN ISO 12240-4

series K



Designation[1]	*Dimensions mm*												*Degrees*	*Calculation factors*		*Limit speed*	*Load ratings*		*Weight*
	d_1	d_2	d_3	d_4	d_6	b_1	b_3	h	l	l_1	r	sw	≈ α	Y	Y_0	(Min $^{-1}$)	*Dynamic C* kN	*Static* C_0 kN	≈ Kg
TSF 10 BB-E	10	15	M8	13,0	30	13.0	9	38	17	14.5	10	13	7.0	1.90	1.81	1230	2,6	0,99	0.063
TSF 15 BB-E	15	19	M12	17.5	40	16.5	12	51	24	20.0	15	17	7.0	2.30	2.41	1050	5,05	1,9	0.140
TSF 20 BB-E	20	22	M16	24.0	48	20.0	15	65	32	22.0	20	19	6.5	2.34	2.45	900	6,1	2,98	0.223

[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added*

Female thread low maintenance with shields

Housing: forged steel; case-hardened bearing race; superfinished galvanized surface, chromium VI free

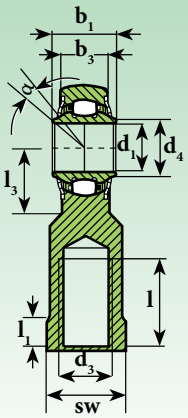
Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished

Lubrication: high speed bearing grease

Temperature range: -45°C to +120°C

Radial clearance (radial): 10 ÷ 30 µm

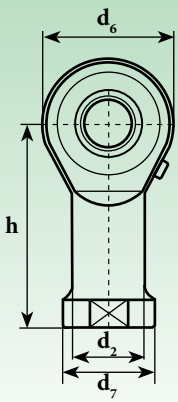
Heavy-duty rod ends with integral roller bearing



TSF..RB

DIN ISO 12240-4

series K

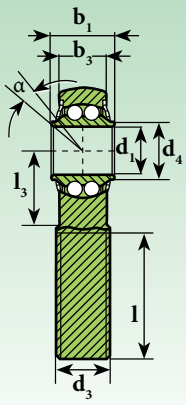


Designation[1]	*Dimensions mm*													*Degrees*	*Limit speed*	*Load ratings*		*Weight*
	d_1	d_2	d_3	d_4	d_6	d_7	b_1	b_3	h	l	l_1	l_3	sw	≈ α	(Min $^{-1}$)	*Dynamic C* kN	*Static* C_0 kN	≈ Kg
TSF 12 RB	12	17.5	M12	14.5	32	22	16	12	50	22	6.5	16	19	7.5	1130	10,3	6,62	0.109
TSF 16 RB	16	22.0	M16	19.0	42	27	21	15	64	25	8.0	22	22	7.0	990	13,35	8,95	0.220
TSF 20 RB	20	27.5	M20X1.5	24.5	50	34	25	18	77	33	10.0	26	30	7.0	850	17,05	11,75	0.361
TSF 25 RB	25	30.0	M24X2	29.5	64	35	31	22	94	42	10.0	32	30	5.0	650	24,95	18,55	0.565
TSF 30 RB	30	40.0	M30X2	34.5	70	50	37	25	110	51	15.0	35	41	7.5	500	32,55	24,8	1.000
TSF 35 RB	35	48	M36X2	40	81	58	43	28	125	56	17.0	45	50	8.0	450	64	60	1.570
TSF 40 RB	40	53	M42X2	45.1	91	65	49	33	142	60	19.0	50	55	8.0	400	75	65	2.407
TSF 50 RB	50	63	M48X2	56.7	117	75	60	45	160	65	23.0	65	65	8.5	350	120	105	4.875

[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added*
Female thread low maintenance with shields
Housing: forged steel; case-hardened bearing race; superfinished galvanized surface, chromium VI free
Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished

Lubrication: high speed bearing grease
Temperature range: -45°C to +120°C
Radial clearance (radial): 10 ÷ 30 µm

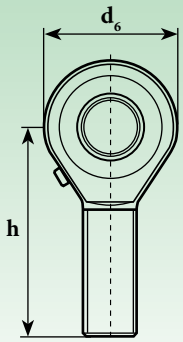
Heavy-duty rod ends with integral double-row ball bearing



TSM..BB

DIN ISO 12240-4

series K



Designation[1]	Dimensions mm													Degrees	Calculation factors		Limit speed	Load ratings		Weight
Fil. corto / Short thread: -01	d_1	d_2	d_3	d_4	d_6	d_7	b_1	b_3	h	l	l_1	l_3	sw	≈ α	Y	Y_0	N_{max} (Min $^{-1}$)	Dynamic C kN	Static C_o kN	≈ Kg
TSM 06 BB	6	10.0	M6	9.0	20	13	9	6.75	36	21	5.0	10	11	8.0	2.09	2.19	1400	2,8	0,67	0.024
TSM 08 BB	8	12.5	M8	10.5	24	16	12	9.0	42	25	5.0	12	14	8.5	1.80	1.89	1350	4,05	1,05	0.044
TSM 10 BB	10	15.0	M10	12.0	28	19	14	10.5	48	28	6.5	15	17	8.0	1.90	1.81	1250	4,4	1,45	0.072
TSM 12 BB	12	17.5	M12	14.5	32	22	16	12.0	54	32	6.5	16	19	7.5	1.74	1.82	1150	5	1,85	0.107
TSM 14 BB	14	20.0	M14	17.0	36	25	19	13.5	60	36	8.0	20	22	6.0	2.36	2.48	1050	5,55	1,95	0.160
TSM 16 BB	16	22.0	M16	19.0	42	27	21	15.0	66	37	8.0	22	22	8.0	2.24	2.35	950	6,3	2,4	0.224
TSM 18 BB	18	25.0	M18x1.5	21.5	46	31	23	16.5	72	41	10.0	24	27	8.5	2.21	2.31	900	7,15	2,95	0.293
TSM 20 BB	20	27.5	M20x1.5	24.5	50	34	25	18.0	78	45	10.0	26	30	7.0	2.46	2.58	850	7,98	3,5	0.367
TSM 22 BB	22	30.0	M22x1.5	26.0	54	38	28	20.0	84	48	12.0	26	32	8.0	2.35	2.24	750	9,35	3,95	0.480
TSM 25 BB	25	30.0	M24x2	29.5	64	35	31	22.0	94	55	10.0	32	30	5.0	2.02	2.12	620	11	5,7	0.572
TSM 30 BB	30	40.0	M30x2	34.5	70	50	37	25.0	110	66	15.0	35	41	7.5	2.24	2.35	500	14,2	7,5	0.978
TSM 35 BB	35	48.0	M36x2	40	81	58	43	28.0	140	85	17.0	45	50	8.0	2.7	2.83	450	25	8	1.600
TSM 40 BB	40	53.0	M48x2	45.1	91	65	49	33.0	150	90	19.0	50	55	8.0	2.7	2.83	400	30	10	2.400
TSM 50 BB	50	63.0	M48x2	56.7	117	75	60	45.0	185	105	23.0	65	65	8.5	2.7	2.83	350	51	17	5.000

[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added*

Male thread low maintenance with shields

Housing: forged steel; case-hardened bearing race; superfinished rolled thread; galvanized surface, chromium VI free

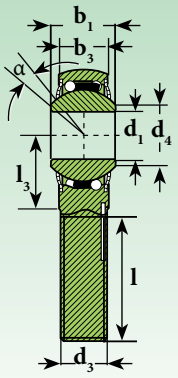
Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished

Lubrication: high speed bearing grease

Temperature range: -45°C to +120°C

Radial clearance (radial): 10 ÷ 30 µm

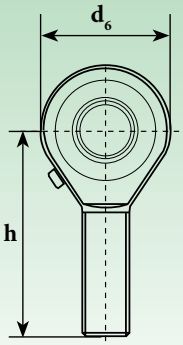
Heavy-duty rod ends with integral double-row ball bearing



TSM..BB-O

DIN ISO 12240-4

series K



Designation[1]	Dimensions mm									Degrees	Calculation factors		Limit speed	Load ratings		Weight
	d_1	d_3	d_4	d_6	b_1	b_3	h	l	l_3	≈ α	Y	Y_0	N_{max} (Min $^{-1}$)	Dynamic C kN	Static C_0 kN	≈ Kg
TSM 06 BB-O	6	M6	9.0	20	9	6.75	36	22	10	8.0	2.09	2.19	1350	2,75	0,65	0.019
TSM 08 BB-O	8	M8	10.5	24	12	9.0	42	25	12	8.5	1.80	1.89	1300	4	1	0.036
TSM 10 BB-O	10	M10	12.0	28	14	10.5	48	29	14	8.0	1.90	1.81	1225	4,45	1,45	0.060
TSM 12 BB-O	12	M12	14.5	32	16	12.0	54	33	16	7.5	1.74	1.82	1125	4,95	1,8	0.087
TSM 14 BB-O	14	M14	17.0	36	19	13.5	60	36	18	6.0	2.36	2.48	1025	5,6	2	0.135
TSM 16 BB-O	16	M16	19.0	42	21	15.0	66	40	21	8.0	2.24	2.35	975	6,25	2,35	0.190
TSM 18 BB-O	18	M18x1.5	21.5	46	23	16.5	72	44	23	8.5	2.21	2.31	900	7,1	2,9	0.270
TSM 20 BB-O	20	M20x1.5	24.5	50	25	18.0	78	47	25	7.0	2.46	2.58	825	7,9	3,45	0.338
TSM 22 BB-O	22	M22x1.5	26.0	54	28	20.0	84	51	27	8.0	2.35	2.24	725	9,3	3,98	0.450
TSM 25 BB-O	25	M24x2	29.5	64	31	22.0	94	57	30	5.0	2.02	2.12	600	11,03	5,68	0.602
TSM 30 BB-O	30	M30x2	34.5	70	37	25.0	110	66	35	7.5	2.24	2.35	450	14,15	7,45	0.922

In TSM..BB-O balls are centered on outer body instead of inner ring as the TSM..BB

[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added*

Male thread low maintenance with shields

Housing: forged steel; case-hardened bearing race; superfinished rolled thread; galvanized surface, chromium VI free

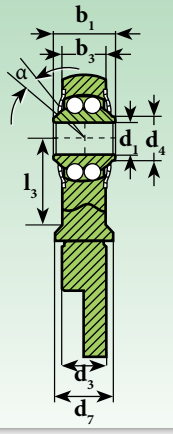
Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished

Lubrication: high speed bearing grease

Temperature range: -45°C to +120°C

Radial clearance (radial): 10 ÷ 30 µm

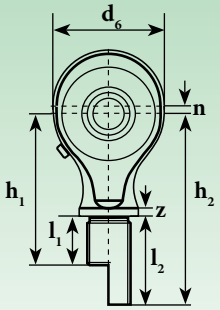
Heavy-duty rod ends with integral double-row ball bearing with edge



TSM..BB-E

DIN ISO 12240-4

series K



Designation[1] Fil. corto / Short thread: -01	Dimensions mm														Degrees	Calculation factors		Limit speed	Load ratings		Weight
	d_1	d_3	d_4	d_6	d_7	b_1	b_3	l_1	l_2	l_3	h_1	h_2	u	z	≈ α	Y	Y_0	N_{max} (Min $^{-1}$)	Dynamic C kN	Static C_0 kN	≈ Kg
TSM 05-00 BB-E	5	M8x1	7.5	19	12	12	8	-	39.5	13	-	57	1.5	2.5	7.0	1.51	1.58	1380	1,62	0,49	0.037
TSM 05-01 BB-E	5	M8x1	7.5	19	12	12	8	16	-	13	33.5	-	1.5	2.5	7.0	1.51	1.58	1380	1,62	0,49	0.033
TSM 06-00 BB-E	6	M10X1	8.5	24	14	14	10	-	42.5	17	-	64	1.5	2.5	10.5	1.28	1.34	1330	2,45	0,77	0.062
TSM 06-01 BB-E	6	M10X1	8.5	24	14	14	10	19	-	17	40.5	-	1.5	2.5	10.5	1.28	1.34	1330	2,45	0,77	0.057
TSM 08-00 BB-E	8	M12x1.5	11.0	30	17	15	10	-	46.5	20	-	72	2.0	2.5	8.5	1.9	1.81	1250	2,6	0,98	0.097
TSM 08-01 BB-E	8	M12x1.5	11.0	30	17	15	10	23	-	20	48.5	-	2.0	2.5	8.5	1.9	1.81	1250	2,6	0,98	0.088
TSM 10-00 BB-E	10	M14x1.5	13.5	36	19	20	14	-	49.5	28	-	82	2.5	2.5	9.5	1.69	1.77	1150	5,15	1,96	0.168
TSM 10-01 BB-E	10	M14x1.5	13.5	36	19	20	14	26	-	28	58.5	-	2.5	2.5	9.5	1.69	1.77	1150	5,15	1,96	0.154
TSM 12-00 BB-E	12	M16x1.5	15.0	40	21	20	14	-	53.5	31	-	90	3.0	2.5	7.5	1.81	1.90	1050	5,35	2,06	0.226
TSM 12-01 BB-E	12	M16x1.5	15.0	40	21	20	14	29	-	31	65.5	-	3.0	2.5	7.5	1.81	2.17	1050	5,35	2,06	0.204
TSM 15-00 BB-E	15	M20x1.5	18.5	42	26	20	14	-	62.5	30	-	100	3.0	2.5	6.5	2.07	2.17	980	5,49	3,28	0.310
TSM 15-01 BB-E	15	M20x1.5	18.5	42	26	20	14	36	-	30	73.5	-	3.0	2.5	6.5	2.07	2.46	980	5,49	3,28	0.273
TSM 17-00 BB-E	17	M20x1.5	21.0	48	26	22	16	-	62.5	36	-	105	3.5	2.5	7.0	2.35	2.46	870	5,58	2,685	0.401
TSM 17-01 BB-E	17	M20x1.5	21.0	48	26	22	16	36	-	36	78.5	-	3.5	2.5	7.0	2.35	2.46	870	5,58	2,685	0.354
TSM 20-00 BB-E	20	M24x1.5	24.0	56	30	24	18	-	68.5	41	-	117	3.5	3.0	5.5	2.76	2.90	780	6,17	3,15	0.587
TSM 20-01 BB-E	20	M24x1.5	24.0	56	30	24	18	41	-	41	89.5	-	3.5	3.0	5.5	2.76	2.90	780	6,17	3,15	0.519

[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added*

Male thread low maintenance with shields

Housing: forged steel; case-hardened bearing race; superfinished rolled thread; galvanized surface, chromium VI free

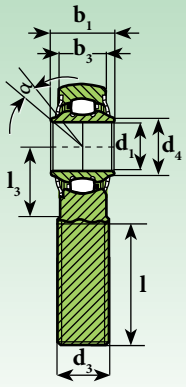
Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished

Lubrication: high speed bearing grease

Temperature range: -45°C to +120°C

Radial clearance (radial): 10 ÷ 30 µm

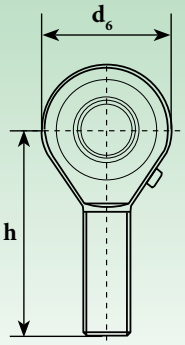
Heavy-duty rod ends with integral roller bearing



TSM..RB

DIN ISO 12240-4

series K



Designation[1]	*Dimensions mm*									*Degrees*	*Load ratings*		*Weight*
	d_1 H_7	d_4	d_6	d_3	b_1	b_3	h	l	l_3	≈ α	*Dynamic C* kN	*Static* C_0 kN	≈ Kg
TSM 12 RB	12	14,5	32	M 12x1,75	16	12	54	32	16	7,5	6,62	10,3	0,088
TSM 16 RB	16	19	42	M 16x2	21	15	66	37	21	7,0	8,95	13,35	0,185
TSM 20 RB	20	24,5	50	M 20x1,5	25	18	78	45	25	7,0	11,75	17,05	0,340
TSM 25 RB	25	29,5	64	M 24x2	31	22	94	55	30	5,0	18,55	24,95	0,596
TSM 30 RB	30	34,5	70	M 30x2	37	25	110	66	35	7,5	24,9	32,55	0,912
TSM 35 RB	35	40	81	M 36x2	43	28	140	85	40	8,0	60	64	1,637
TSM 40 RB	40	45,1	91	M 42x2	49	33	150	90	45	8,0	65	75	2,307
TSM 50 RB	50	56,7	117	M 48x2	60	45	185	105	58	8,5	105	120	4,720

[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added*

Male thread low maintenance with shields

Housing: forged steel; case-hardened bearing race; superfinished rolled thread; galvanized surface, chromium VI free

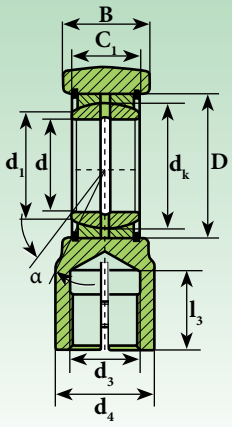
Inner ring ball bearing steel: 100 Cr 6; hardened, superfinished

Lubrication: high speed bearing grease

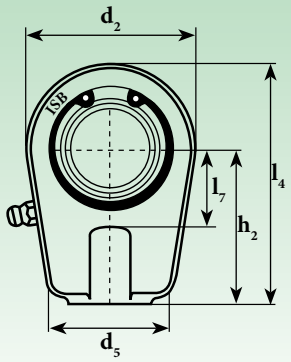
Temperature range: -45°C to +120°C

Radial clearance (radial): 10 ÷ 30 µm

Rod ends for hydraulic components



TAPR.N



Designation[1]	Dimensions mm															Degrees	Load ratings		Weight
	d	d_1	d_2	d_3	d_4	d_5	d_K	B	C_1	D	h_2	l_3	l_4	l_7	S_2	≈ α	Dynamic C kN	Static C_0 kN	≈ Kg
TAPR 420 N	**20**	24,1	56	M 16x1,5	25	46	29	19	16	35	50	17	80	25	17	9	30	81	0,45
TAPR 425 N	**25**	29,3	56	M 16x1,5	25	46	35,5	23	20	42	50	17	80	28	21	7	48	65	0,49
TAPR 430 N	**30**	34,2	64	M 22x1,5	32	50	40,7	28	22	47	60	23	94	30	26	6	62	96	0,76
TAPR 435 N	**35**	39,7	78	M 28x1,5	40	66	47	30	25	55	70	29	112	38	28	6	80	140	1,26
TAPR 440 N	**40**	45,0	94	M 35x1,5	49	76	53	35	28	62	85	36	135	45	33	7	100	227	2,15
TAPR 450 N	**50**	56,0	116	M 45x1,5	61	90	60	40	35	75	105	46	168	55	37	6	156	333	3,8
TAPR 460 N	**60**	66,8	130	M 58x1,5	75	120	66	50	44	90	130	59	200	65	46	6	245	326	6,20
TAPR 470 N	**70**	77,8	154	M 65x1,5	86	130	80	55	49	105	150	66	232	75	51	6	315	440	9,83
TAPR 480 N	**80**	89,4	176	M 80x2	105	160	92	60	55	120	170	81	265	80	55	6	400	550	13,97
TAPR 490 N	**90**	98,1	206	M 100x2	124	180	105	65	60	130	210	101	322	90	60	5	490	810	23,50
TAPR 495 N	**100**	109,5	231	M 110x2	138	200	115	70	70	150	235	111	360	105	65	7	610	920	32,00
TAPR 496 N	**110**	121,2	266	M 120x3	152	220	130	80	70	160	265	125	407	115	74	6	655	1.382	41,00
TAPR 497 N	**120**	135,5	340	M 130x3	172	257	160	90	85	180	310	135	490	140	84	6	950	2.373	72,00

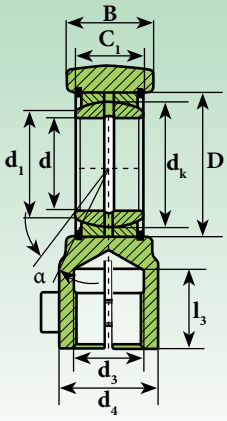
Under request, stainless steel available

Spherical plain radial bearing inside GE..ES

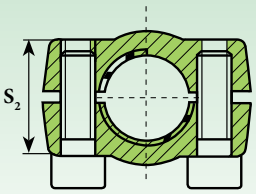
[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: TAPRL..N - TAPRL..U)*

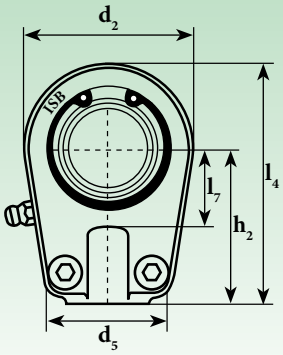
Sliding coupling: steel/steel

Rod ends for hydraulic components



TAPR.U





Designation[1]	Dimensions mm															Degrees	Screw UNI 5931	Load ratings		Weight
	d	d_1	d_2	d_3	d_4	d_5	d_K	B	C_1	D	h_2	l_3	l_4	l_7	S_2	≈ α		Dynamic C kN	Static C_0 kN	≈ Kg
TAPR 520 U	**20**	24,1	56	M 16x1,5	25	46	29	19	16	35	50	17	80	25	17	9	M8x20	30	81	0,45
TAPR 525 U	**25**	29,3	56	M 16x1,5	25	46	35,5	23	20	42	50	17	80	28	21	7	M8x20	48	65	0,49
TAPR 530 U	**30**	34,2	64	M 22x1,5	32	50	40,7	28	22	47	60	23	94	30	26	6	M8x25	62	96	0,76
TAPR 535 U	**35**	39,7	78	M 28x1,5	40	66	47	30	25	55	70	29	112	38	28	6	M10x30	80	140	1,26
TAPR 540 U	**40**	45,0	94	M 35x1,5	49	76	53	35	28	62	85	36	135	45	33	7	M10x35	100	227	2,15
TAPR 550 U	**50**	56,0	116	M 45x1,5	61	90	60	40	35	75	105	46	168	55	37	6	M12x40	156	333	3,8
TAPR 560 U	**60**	66,8	130	M 58x1,5	75	120	66	50	44	90	130	59	200	65	46	6	M16x45	245	326	6,20
TAPR 570 U	**70**	77,8	154	M 65x1,5	86	130	80	55	49	105	150	66	232	75	51	6	M16x50	315	440	9,83
TAPR 580 U	**80**	89,4	176	M 80x2	105	160	92	60	55	120	170	81	265	80	55	6	M20x55	400	550	13,97
TAPR 590 U	**90**	98,1	206	M 100x2	124	180	105	65	60	130	210	101	322	90	60	5	M20x60	490	810	23,50
TAPR 595 U	**100**	109,5	231	M 110x2	138	200	115	70	70	150	235	111	360	105	65	7	M24x65	610	920	32,00
TAPR 596 U	**110**	121,2	266	M 120x3	152	220	130	80	70	160	265	125	407	115	74	6	M24x75	655	1.382	41,00
TAPR 597 U	**120**	135,5	340	M 130x3	172	257	160	90	85	180	310	135	490	140	84	6	M24x85	950	2.373	72,00

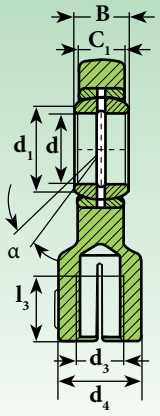
Under request, stainless steel available

Spherical plain radial bearing inside GE..ES

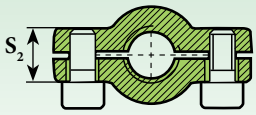
[1] *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: TAPRL..N - TAPRL..U)*

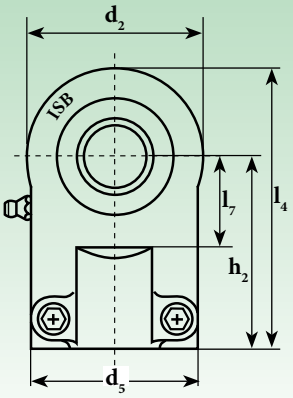
Sliding coupling: steel/steel

Rod ends for hydraulic components



TAPR.DO





Designation[1]	Dimensions mm													Degrees	Locking bolts	Locking torque	Load ratings		Weight
	d	d_1	d_2	d_3	d_4	d_5	B	C_1	h_2	l_3	l_4	l_7	S_2	≈ α		M_A - Nm	Dynamic C kN	Static C_0 kN	≈ Kg
TAPR 701 DO[2]	**12**	15	35	M 10x1,25	17	40	10	8	42	15	58	18	13	11	M 6x14	10	10,8	21	0,12
TAPR 702 DO	**16**	20.7	45	M 12x1,25	21	45	14	11	48	17	69	22	13	10	M 6x14	10	21,1	23	0,22
TAPR 703 DO	**20**	24.1	55	M 14x1,5	25	55	16	13	58	19	83	28	17	9	M 8x18	25	30	51	0,43
TAPR 704 DO	**25**	29.3	65	M 16x1,5	30	62	20	17	68	23	99	34	17	7	M 8x18	25	48	73	0,67
TAPR 705 DO	**30**	34.2	80	M 20x1,5	36	77	22	19	85	29	123	38	19	6	M 10x20	49	62	112	1,25
TAPR 706 DO	**40**	45	100	M 27x2	45	90	28	23	105	37	153	48	23	7	M 10x25	49	100	145	2,16
TAPR 707 DO	**50**	56	120	M 33x2	55	105	35	30	130	46	188	62	30	6	M 12x30	86	156	215	3,9
TAPR 708 DO	**60**	66.8	160	M 42x2	68	134	44	38	150	57	230	74	38	6	M 16x40	210	245	405	7,15
TAPR 709 DO	**80**	89.4	205	M 48x2	90	156	55	47	185	64	282,5	98	47	6	M 20x50	410	400	585	15
TAPR 710 DO	**100**	109.5	240	M 64x3	110	190	70	55	240	86	357,5	122	55	7	M 24x60	710	607	865	27,3

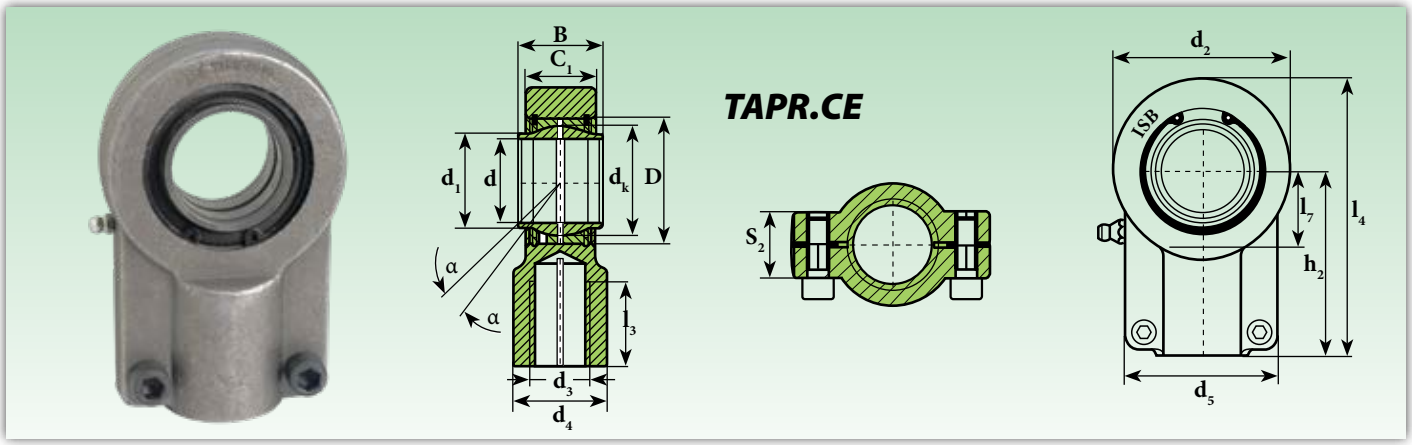
Under request, stainless steel available

Spherical plain radial bearing inside GE..ES

1) *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: TAPRL..DO)*
2) *No relubrication*

Sliding coupling: steel/steel

Rod ends for hydraulic components



Designation[1]	Dimensions mm															Degrees	Locking bolts	Locking torque Nm	Load ratings		Weight
	d	d_1	d_2	d_3	d_4	d_5	d_k	B	C_1	D	h_2	l_3	l_4	l_7	S_2	≈ α			Dynamic C kN	Static C_0 kN	≈ Kg
TAPR 612 CE [2]	**12**	15,5	32	M12x1,25	16	32	13	12	11	22	38	17	54	14	15	4	M 5x16	6	10,80	24	0,10
TAPR 616 CE	**16**	20	40	M14x1,5	21	40	23	16	13	28	44	19	64	20	15	4	M 6x14	10	17,60	35	0,20
TAPR 620 CE	**20**	25	47	M16x1,5	25	47	29	20	17	35	52	23	77	22	19	4	M 8x20	25	30	41	0,35
TAPR 625 CE	**25**	30,5	58	M20x1,5	30	54	35,5	25	22	42	65	29	96	27	19	4	M 8x20	25	48	69	0,62
TAPR 632 CE	**32**	38	71	M27x2	38	66	44	32	28	52	80	37	118	32	22	4	M 10x25	49	67	98	1,15
TAPR 640 CE	**40**	46	90	M33x2	47	80	53	40	33	62	97	46	146	41	26	4	M 10x30	49	100	175	2,18
TAPR 650 CE	**50**	57	109	M42x2	58	96	66	50	41	75	120	57	179	50	32	4	M 12x35	86	156	268	3,96
TAPR 663 CE	**63**	71,5	136	M48x2	70	114	83	63	53	95	140	64	213	62	38	4	M 16x40	210	255	320	6,8
TAPR 670 CE	**70**	79	155	M56x2	80	135	92	70	57	105	160	76	245	70	42	4	M 16x40	210	315	475	9,60
TAPR 680 CE	**80**	91	170	M64x3	90	148	105	80	67	120	180	86	270	78	48	4	M 20x50	410	400	527	13
TAPR 690 CE	**90**	99	185	M72x3	100	160	115	90	72	130	195	91	296	85	52	4	M 20x60	410	490	660	19,1
TAPR 695 CE	**100**	113	211	M80x3	110	178	130	100	85	150	210	96	322	98	62	4	M 24x60	710	610	840	25
TAPR 696 CE	**110**	124	235	M90x3	125	190	140	110	88	160	235	106	364	105	62	4	M 24x60	710	655	1.100	32
TAPR 697 CE	**125**	138	265	M100x3	135	200	160	125	103	180	260	113	406.5	120	72	4	M 24x70	710	950	1.390	46
TAPR 698 CE	**160**	177	326	M125x4	165	250	200	160	130	230	310	126	488	150	82	4	M 24x80	710	1.370	2.080	82,50
TAPR 699 CE	**200**	221	418	M160x4	215	320	250	200	162	290	390	161	620	195	102	4	M 30x100	1.500	2.120	3.450	168
TAPR 700 CE	**250**	317	580	M200X4	300	420	-	250	192	-	530	-	847	265	142	4	M36X140	2450	3550	6400	425

Under request, stainless steel available

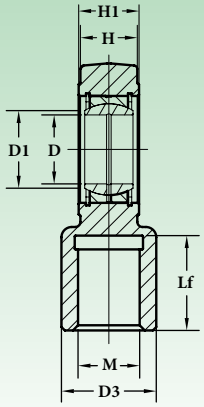
Spherical plain radial bearing inside GEEW..ES

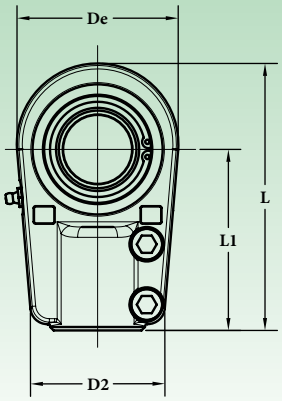
Sliding coupling: steel/steel

1) *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: TAPRL..CE)*
2) *No relubrication*

Rod ends for hydraulic components

SN-GAS





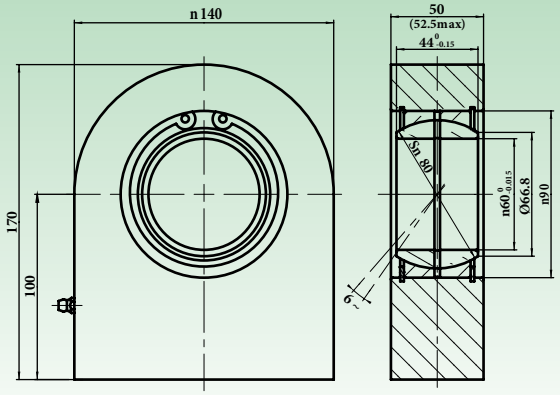
Designation	Dimensions mm													Load coefficient		Radial clearance	Grades	Locking bolts	Locking torque	Weight
without seal	D	D toll.	H	H toll.	D_1	L_1	De	H_1	L	L_2	D_3	M(6H)	Lf	Dyn.	Stat.	Min MAX	α	VTCEI UNI 5931	Nm	≈ Kg
SN25GAS	25	0 -0.010	20	0 -0.012	29.3	65	56	23	95	29	28	M18x2	30	48	72	0.050 - 0.100	7	M8x20	25	0.62
SN30GAS	30		22		34.2	75	64	28	109	30	34	M24x2	35	62	122	0.050 - 0.100	6	M8x25	25	0.88
SN35GAS	35	0 -0.012	25		39.7	90	78	30	132	40	44	M30x2	46	80	177	0.050 - 0.100	6	M10x30	49	1.52
SN40GAS	40		28		45	105	94	35	155	42	55	M39x2	55	100	287	0.060 - 0.120	7	M10x35	49	2.43
SN50GAS	50		35		56	135	116	40	198	55	70	M50x3	76	156	422	0.060 - 0.120	6	M12x35	86	4.75
SN60GAS	60	0 -0.015	44	0 -0.015	66.8	170	130	50	240	65	87	M64x3	95	245	522	0.060 - 0.120	6	M16x45	210	8.55
SN70GAS	70		49		77.8	195	154	55	278	75	105	M80x3	112	315	707	0.072 - 0.142	6	M16x50	210	12.24
SN80GAS	80		55		89.4	210	176	60	305	80	125	M90x3	122	400	870	0.072 - 0.142	6	M20x55	410	18.35
SN90GAS (1)	90	0 -0.020	60	0 -0.020	98.1	250	206	65	363	90	150	M100x3	142	490	1284	0.072 - 0.142	5	M20x60	410	31.56
SN95GAS (1)	100		70		109.5	275	230	70	400	105	170	M110x4	150	610	1460	0.085 - 0.165	7	M20x65	710	34.00
SN96GAS (1)	110		70		121.2	300	264	80	442	115	180	M120x4	160	655	2024	0.085 - 0.165	6	M24x75	710	44.00
SN97GAS (1)	120		85		135.5	360	340	90	540	140	210	M150x4	192	950	2970	0.085 - 0.165	6	M24x85	710	75.00
SN98GAS (1)	140	0 -0.025	90	0 -0.025	154	420	380	110	620	185	230	M160x4	210	1070	3350	0.085 - 0.165	7	M30x100	1100	160.00
SN99GAS (1)	160		105		170	460	480	110	710	200	260	M180x4	220	1360	4302	0.100 - 0.214	8	M30x100	1100	185.00

Under request, stainless steel and aluminium available

(1) *Material: spheroidal cast iron*
Available in seal version (··2RS) on request too.
Sliding coupling: steel/steel

Rod ends for hydraulic components

T.P.N.



Designation	Dimensions mm										Degrees	Distance from edges (mm.)	Load ratings		Weight
	d	d_1	d_2	d_K	B		C_1	D	h_2	l_4	≈ α	r_{1smin}	*Dynamic C* kN	*Static* C_o kN	≈ Kg
					min	max									
T.P.N. 315	**15**	18,4	45	-	16	-	12	-	31	53,5	8	-	17	53	0,23
T.P.N. 316	**16**	20,7	48	-	17	-	14	-	35	59	10	-	17,5	53	0,3
T.P.N. 317	**17**	20,7	48	-	17	-	14	-	35	59	10	-	17,5	59	0,3
T.P.N. 320	**20**	24,1	50	29	19	20	16	35	38	63	9	0,6	30	67	0,36
T.P.N. 325	**25**	29,3	55	35,5	23	24	20	42	45	72,5	7	0,6	48	69,5	0,53
T.P.N. 330	**30**	34,2	65	40,7	28	29	22	47	51	83,5	6	0,6	62	118	0,85
T.P.N. 335	**35**	39,7	83	47	30	31	25	55	61	102,5	6	0,6	80	196	1,5
T.P.N. 340	**40**	45	100	53	35	36,5	28	62	69	119	7	0,6	100	305	2,42
T.P.N. 345	**45**	50,7	110	60	40	41,5	32	68	77	132	7	0,6	127	386	3,39
T.P.N. 350	**50**	56	123	66	40	41,5	35	75	88	149,5	6	0,6	156	441	4,24
T.P.N. 360	**60**	66,8	140	80	50	52,56	44	90	100	170	6	1	245	570	7,1
T.P.N. 370	**70**	77,8	164	92	55	58	49	105	115	197	6	1	315	724	10,7
T.P.N. 380	**80**	89,4	180	105	60	63	55	120	141	231	6	1	400	804	15,10
T.P.N. 390	**90**	98,1	226	115	65	69	60	130	150	263	5	1	490	1.340	23,5
T.P.N. 395	**100**	109,5	250	130	70	74	70	150	170	295	7	1	610	1.516	33,10
T.P.N. 396	**110**	121,2	295	140	80	85	70	160	185	332,5	6	1	655	2.340	48,50
T.P.N. 397	**120**	135,5	360	160	90	95	85	180	210	390	6	1	950	3.210	79,50

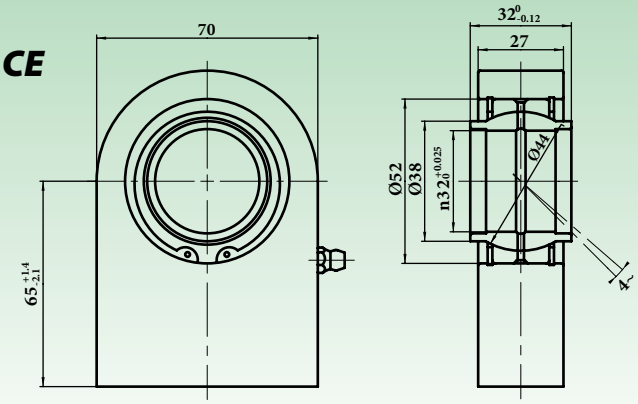
Under request, stainless steel available

Spherical plain radial bearing inside GE..ES

Sliding coupling: steel/steel

Rod ends for hydraulic components

T.P.N.CE



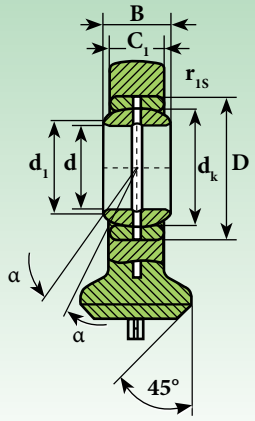
Designation	Dimensions mm									Degrees	Distance from edges (mm.)	Load ratings		Weight
	d	d_1	d_2	d_K	B	C_1	D	h_2	l_4	≈ α	r_{1smin}	Dynamic C kN	Static C_0 kN	≈ Kg
T.P.N. 720 CE	**20**	25	50	29	20	19	35	38	63	4	0,6	30	74	0,36
T.P.N. 725 CE	**25**	30,5	55	35	25	23	42	45	72,5	4	0,6	48	95	0,54
T.P.N. 732 CE	**32**	38	70	44	32	27	52	65	103	4	0,6	62,50	168	1,12
T.P.N. 740 CE	**40**	46	100	53	40	35	62	69	119	4	0,6	100	268	2,5
T.P.N. 750 CE	**50**	57	123	66	50	40	75	88	149,5	4	0,6	156	362	4,6
T.P.N. 763 CE	**63**	71,5	145	80	63	50	90	107	178	4	1	248	570	9,3
T.P.N. 770 CE	**70**	79	164	92	70	55	105	115	197	4	1	315	800	11,25
T.P.N. 780 CE	**80**	91	180	105	80	60	120	141	231	4	1	400	874	15,75
T.P.N. 790 CE	**90**	99	226	115	90	65	130	150	263	4	1	490	1.045	24
T.P.N. 7100 CE	**100**	113	250	130	100	70	150	170	295	4	1	610	1.330	33,95
T.P.N. 7110 CE	**110**	124	295	140	110	80	160	185	332,5	4	1	655	1.490	49
T.P.N. 7125 CE	**125**	138	360	160	125	90	180	210	390	4	1	950	2.200	81

Under request, stainless steel available

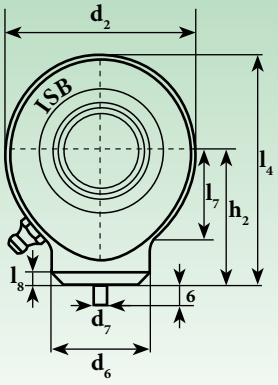
Spherical plain radial bearing inside GEEW..ES

Sliding coupling: steel/steel

Rod ends for hydraulic components



T.A.C.



Designation	Dimensions mm													Degrees	Distance from edges (mm.)	Load ratings		Weight
	d	d_1	d_2	d_6	d_7	d_k	B	C_1	D	h_2	l_4	l_7	l_8	≈ α	r_{1smin}	Dynamic C kN	Static C_0 kN	≈ Kg
T.A.C. 210[1]	**10**	13,2	29	15	3	16	9	7	19	24	38,5	15	1,5	12	0,3	8,15	15,6	0,041
T.A.C. 212[1]	**12**	15	34	17,5	3	18	10	8	22	27	44	18	1,5	11	0,3	10,8	21,6	0,066
T.A.C. 215[2]	**15**	18,4	40	21	4	22	12	10	26	31	51	20	2	8	0,3	17	32	0,12
TAC 216[2]	**16**	20	46	24	4	-	14	11	-	35	58	23	3	9	-	19	36	0,17
T.A.C. 217[2]	**17**	20,7	46	24	4	25	14	11	30	35	58	23	2	10	0,3	21,2	40	0,19
T.A.C. 220[2]	**20**	24,1	53	27,5	4	29	16	13	35	38	64,5	27,5	2	9	0,6	30	54	0,23
T.A.C. 225	**25**	29,3	64	33,5	4	35,5	20	17	42	45	77	33	3	7	0,6	48	72	0,43
T.A.C. 230	**30**	34,2	73	40	4	40,7	22	19	47	51	87,5	37,5	3	6	0,6	62	95	0,64
T.A.C. 235	**35**	39,7	82	47	4	47	25	21	55	61	102	43	3	6	0,6	80	125	0,96
T.A.C. 240	**40**	45	92	52	4	53	28	23	62	69	115	48	4	7	0,6	100	156	1,3
T.A.C. 245	**45**	50,7	102	58	6	60	32	27	68	77	128	52	4	7	0,6	127	208	1,8
T.A.C. 250	**50**	56	112	62	6	66	35	30	75	88	144	59	4	6	0,6	156	250	2,5
T.A.C. 260	**60**	66,8	135	70	6	80	44	38	90	100	167,5	72,5	4	6	1	245	390	3,9
T.A.C. 270	**70**	77,8	160	80	6	92	49	42	105	115	195	86	5	6	1	315	510	6,6
T.A.C. 280	**80**	89,4	180	95	6	105	55	47	120	141	231	98	5	6	1	400	620	8,7

Under request, stainless steel available

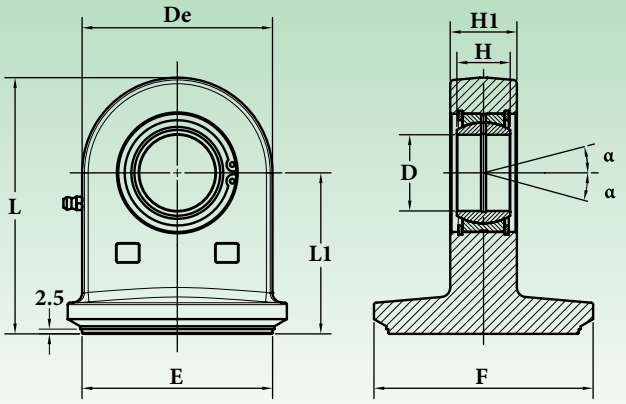
Spherical plain radial bearing inside GE..ES

1) *No relubrication*
2) *Relubrication via lubrication hole in housing*

Sliding coupling: steel/steel

Rod ends for hydraulic components

SN-PF



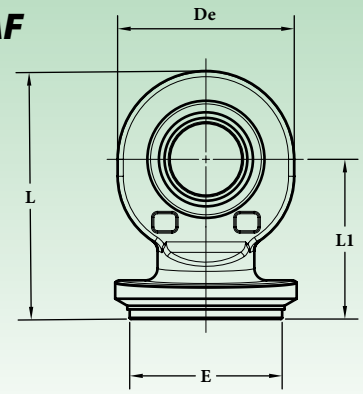
Designation		Dimensions mm												Load coefficient		Radial clearance	Grades	Weight
without seal	with seal	D	D toll.	H	H toll.	D_1	L_1	De	H_1	L	E	F	L_2	Dyn.	Stat.	Min MAX	α	≈ Kg
SN20PF 35	**SN20PF 35 2RS**	20		16		24.1	48.5	50	19	73.5	35	45	36	30	67	0.030 - 0.082	9	0.49
SN20PF 40	**SN20PF 40 2RS**	20		16		24.1	48.5	50	19	73.5	40	50	36	30	67	0.030 - 0.082	9	0.50
SN20PF 45	**SN20PF 45 2RS**	20		16		24.1	48.5	50	19	73.5	45	55	36	30	67	0.030 - 0.082	9	0.52
SN20PF 50	**SN20PF 50 2RS**	20		16		24.1	48.5	50	19	73.5	50	60	36	30	67	0.030 - 0.082	9	0.53
SN25PF 40	**SN25PF 40 2RS**	25		20		29.3	57.5	55	23	85	40	50	43	48	69.5	0.037 - 0.100	7	0.80
SN25PF 50	**SN25PF 50 2RS**	25	0 -0.010	20		29.3	57.5	55	23	85	50	60	43	48	69.5	0.037 - 0.100	7	0.82
SN25PF 55	**SN25PF 55 2RS**	25		20		29.3	57.5	55	23	85	55	65	43	48	69.5	0.037 - 0.100	7	0.85
SN30PF 50	**SN30PF 50 2RS**	30		22		34.2	63.5	65	28	96	50	60	49	62	118	0.037 - 0.100	6	1.20
SN30PF 60	**SN30PF 60 2RS**	30		22		34.2	63.5	65	28	96	60	70	49	62	118	0.037 - 0.100	6	1.24
SN30PF 63	**SN30PF 63 2RS**	30		22		34.2	63.5	65	28	96	63	73	49	62	118	0.037 - 0.100	6	1.26
SN30PF 65	**SN30PF 65 2RS**	30		22		34.2	63.5	65	28	96	65	75	49	62	118	0.037 - 0.100	6	1.27
SN35PF 63	**SN35PF 63 2RS**	35		25	0 -0.12	39.7	73.5	83	30	115	63	73	58	80	196	0.037 - 0.100	6	2.10
SN35PF 70	**SN35PF 70 2RS**	35		25		39.7	73.5	83	30	115	70	80	58	80	196	0.037 - 0.100	6	2.11
SN35PF 75	**SN35PF 75 2RS**	35		25		39.7	73.5	83	30	115	75	90	58	80	196	0.037 - 0.100	6	2.13
SN35PF 80	**SN35PF 80 2RS**	35		25		39.7	73.5	83	30	115	80	95	58	80	196	0.037 - 0.100	6	2.15
SN35PF 80-1	**SN35PF 80-1 2RS**	35		25		39.7	73.5	83	30	115	80	90	65	80	196	0.037 - 0.100	6	2.17
SN40PF 80	**SN40PF 80 2RS**	40	0 -0.012	28		45	84.5	100	35	134.5	80	95	65	100	305	0.043 - 0.120	7	3.20
SN40PF 85	**SN40PF 85 2RS**	40		28		45	84.5	100	35	134.5	85	100	65	100	305	0.043 - 0.120	7	3.30
SN40PF 90	**SN40PF 90 2RS**	40		28		45	84.5	100	35	134.5	90	105	65	100	305	0.043 - 0.120	7	3.40
SN40PF 100	**SN40PF 100 2RS**	40		28		45	84.5	100	35	134.5	100	115	84	100	305	0.043 - 0.120	7	3.55
SN50PF 110	**SN50PF 110 2RS**	50		35		56	106.5	123	40	168	110	130	84	156	441	0.043 - 0.120	6	6.55
SN50PF 120	**SN50PF 120 2RS**	50		35		56	106.5	123	40	168	120	140	84	156	441	0.043 - 0.120	6	6.80
SN50PF 125	**SN50PF 125 2RS**	50		35		56	106.5	123	40	168	125	145	84	156	441	0.043 - 0.120	6	7.00

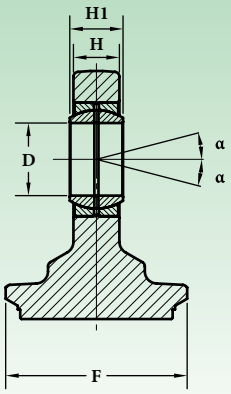
Under request, stainless steel and aluminium available

Sliding coupling: steel/steel

Rod ends for hydraulic components

SN-AF





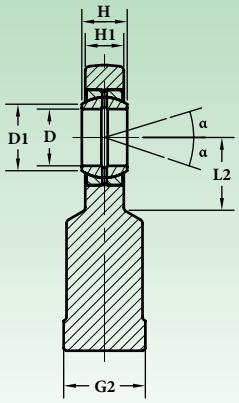
Designation		Dimensions mm												Load coefficient		Radial clearance	Tilt angle	Weight
without seal	with seal	D	D toll.	H	H toll.	D_1	L_1	De	H_1	L	E	F	L_2	Dyn.	Stat.	Min MAX	α	≈ Kg
SN20AF 35	**SN20AF 35 2RS**	20		16		24.1	48.5	53	13	76.5	35	45	38	30	54	0.030 - 0.082	9	-
SN20AF 40	**SN20AF 40 2RS**	20		16		24.1	48.5	53	13	76.5	40	50	38	30	54	0.030 - 0.082	9	0,42
SN20AF 45	**SN20AF 45 2RS**	20		16		24.1	48.5	53	13	76.5	45	55	38	30	54	0.030 - 0.082	9	-
SN20AF 50	**SN20AF 50 2RS**	20		16		24.1	48.5	53	13	76.5	50	60	38	30	54	0.030 - 0.082	9	0,5
SN25AF 40	**SN25AF 40 2RS**	25		20		29.3	57.5	64	17	90	40	50	45	48	72	0.037 - 0.100	7	-
SN25AF 50	**SN25AF 50 2RS**	25	0 -0.010	20		29.3	57.5	64	17	90	50	60	45	48	72	0.037 - 0.100	7	0,7
SN25AF 55	**SN25AF 55 2RS**	25		20		29.3	57.5	64	17	90	55	65	45	48	72	0.037 - 0.100	7	-
SN30AF 50	**SN30AF 50 2RS**	30		22		34.2	63.5	73	19	100.5	50	60	51	62	95	0.037 - 0.100	6	-
SN30AF 60	**SN30AF 60 2RS**	30		22		34.2	63.5	73	19	100.5	60	70	51	62	95	0.037 - 0.100	6	1
SN30AF 63	**SN30AF 63 2RS**	30		22		34.2	63.5	73	19	100.5	63	73	51	62	95	0.037 - 0.100	6	1,04
SN30AF 65	**SN30AF 65 2RS**	30		22	0 -0.12	34.2	63.5	73	19	100.5	65	75	51	62	95	0.037 - 0.100	6	-
SN35AF 63	**SN35AF 63 2RS**	35		25		39.7	73.5	82	21	116.5	63	73	61	80	125	0.037 - 0.100	6	-
SN35AF 70	**SN35AF 70 2RS**	35		25		39.7	73.5	82	21	116.5	70	80	61	80	125	0.037 - 0.100	6	-
SN35AF 75	**SN35AF 75 2RS**	35		25		39.7	73.5	82	21	116.5	75	90	61	80	125	0.037 - 0.100	6	-
SN35AF 80	**SN35AF 80 2RS**	35		25		39.7	73.5	82	21	116.5	80	95	61	80	125	0.037 - 0.100	6	2
SN40AF 80	**SN40AF 80 2RS**	40		28		45	84.5	92	23	130	80	95	61	100	156	0.043 - 0.120	7	-
SN40AF 85	**SN40AF 85 2RS**	40	0 -0.012	28		45	84.5	92	23	130	85	100	69	100	156	0.043 - 0.120	7	-
SN40AF 90	**SN40AF 90 2RS**	40		28		45	84.5	92	23	130	90	105	69	100	156	0.043 - 0.120	7	-
SN40AF 100	**SN40AF 100 2RS**	40		28		45	84.5	92	23	130	100	115	69	100	156	0.043 - 0.120	7	-
SN50AF 110	**SN50AF 110 2RS**	50		35		56	106.5	112	27	160	110	130	77	156	250	0.043 - 0.120	6	-
SN50AF 120	**SN50AF 120 2RS**	50		35		56	106.5	112	27	160	120	140	77	156	250	0.043 - 0.120	6	-
SN50AF 125	**SN50AF 125 2RS**	50		35		56	106.5	112	27	160	125	145	77	156	250	0.043 - 0.120	6	-

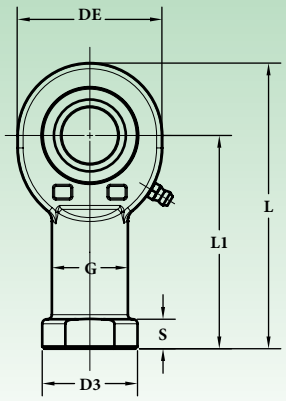
Under request, stainless steel and aluminium available

Sliding coupling: steel/steel

Rod ends for hydraulic components

SGG-ES





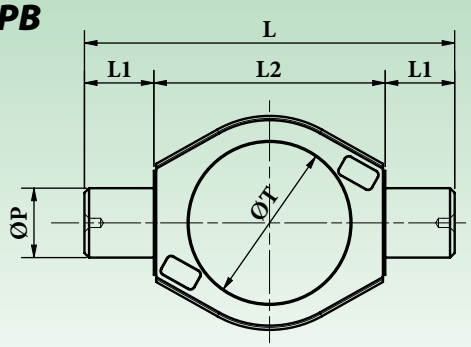
Designation	Dimensions mm														Load coefficient		Radial clearance	Tilt angle	Weight
without seal	D	D toll.	H	H toll.	D_1	L_1	D_3	De	G	G_2	S	H1	L	L_2	Dyn.	Stat.	Min MAX	α	≈ Kg
SGG06ES (1)	6	0 -0.008	6	0 -0.12	8	30	13	21	10	11	5	4.3	40.5	12	3.4	8.1	0.023 - 0.068	13	0.03
SGG08ES (1)	8		8		10	36	16	24	12.5	14	5	6	48	14	5.5	8.1	0.023 - 0.068	15	0.05
SGG10ES (1)	10		9		13	43	19	29	15	17	6.5	7	57.5	15	8.1	12.9	0.023 - 0.068	12	0.07
SGG12ES (1)	12		10		15	50	22	34	17.5	19	6.5	8	67	18	10.8	17.6	0.023 - 0.068	10	0.13
SGG15ES (2)	15		12		18	61	26	40	21	22	8	10	81	20	17	24.5	0.030 - 0.082	8	0.22
SGG17ES (2)	17		14		20	67	30	46	24	27	10	11	90	23	21.2	36	0.030 - 0.082	10	0.30
SGG20ES	20	0 -0.10	16		24	77	35	53	27.5	32	10	13	103.5	27	30	45	0.030 - 0.082	9	0.46
SGG25ES	25		20		29	94	42	64	33.5	36	12	17	126	32	48	60	0.037 - 0.100	7	0.81
SGG30ES	30		22		34	110	50	73	40	41	15	19	146.5	37	62	83	0.037 - 0.100	6	1.20
SGG35ES	35	0 -0.12	25		39	125	58	82	47	50	15	21	166	42	80	110	0.037 - 0.100	6	1.90
SGG40ES	40		28		45	142	65	92	52	55	18	23	188	48	100	150	0.043 - 0.120	7	2.70
SGG45ES	45		32		50.7	145	70	102	58	60	20	27	196	52	127	184	0.043 - 0.120	7	3.80
SGG50ES	50		35		55	160	75	112	62	65	20	30	216	59	156	246	0.043 - 0.120	6	5.00
SGG60ES	60	0 -0.15	44	0 -0.15	66	175	88	135	70	75	20	38	242.5	75	245	297	0.043 - 0.120	6	7.30
SGG70ES	70		49		77	200	98	160	80	85	20	42	280	87	315	460	0.055 - 0.142	6	11.40
SGG80ES	80		55		88	230	110	180	95	100	25	47	320	100	400	654	0.055 - 0.142	6	16.10

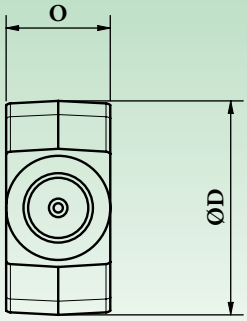
Under request, stainless steel and aluminium available

(1) *Not lubricable*
(2) *Lubricable by lubrication hole*
Available in seal version (··2RS) on request too. Availability and pricing on request.
Sliding coupling: steel/steel

Ball joint ends

EPB



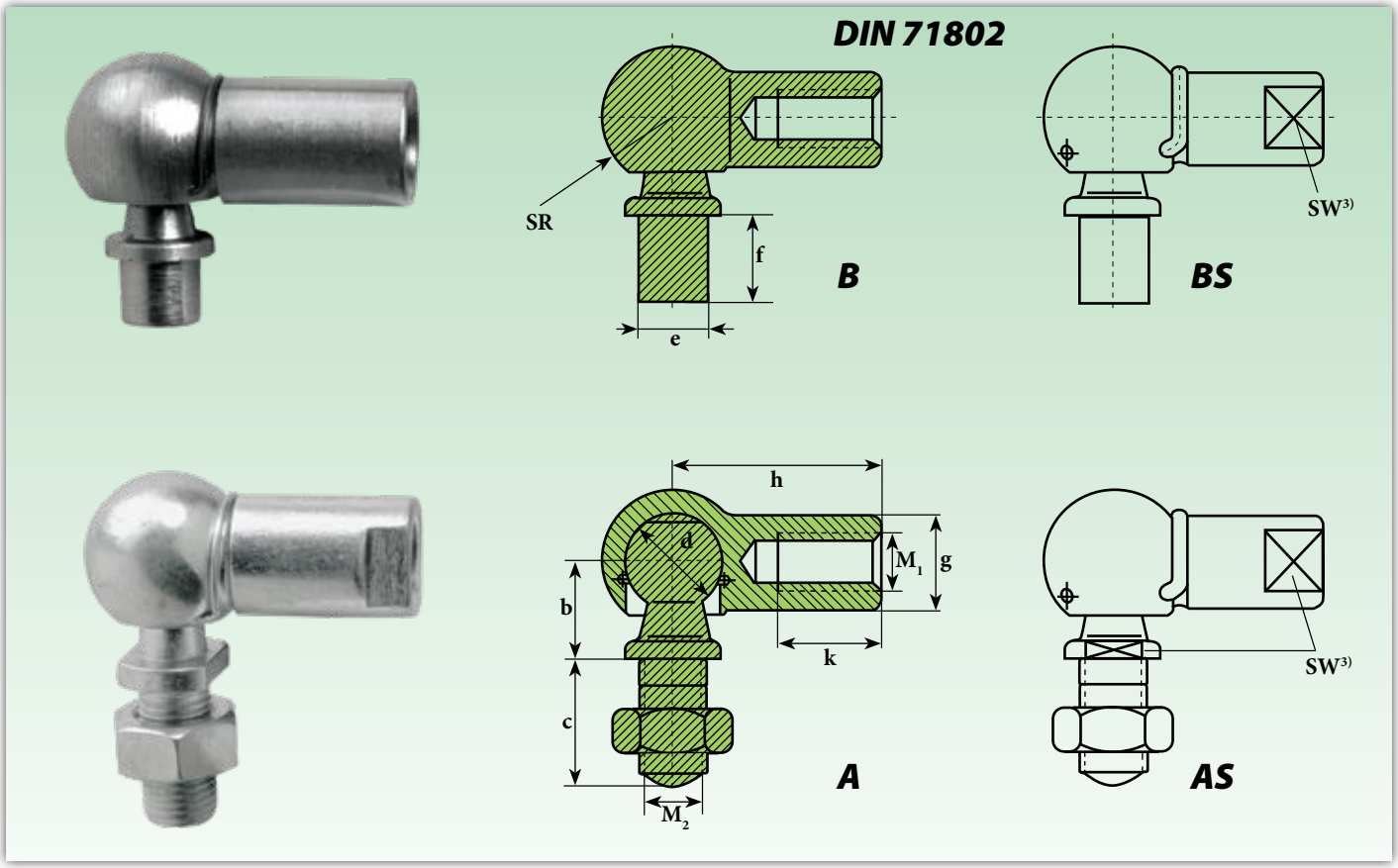


Designation	Dimensions mm									Weight
	ØT	ØT Toll.	S	ØD	L	L1	L2	ØP	ØP Toll	≈ Kg
EPB40A1	40		25	52	95	17.5	60	15	e8	0.25
EPB50A1	50		30	65	110	20	70	20		0.50
EPB60A1	60		35	75	130	25	80	25		0.75
EPB70A2	70	+0.3 +0.2	45	90	160	30	100	30		1.50
EPB80A3	80		50	100	180	35	110	35		2.15
EPB92A1	92		55	115	195	40	115	40	0	2.65
EPB95A1	95		55	115	195	40	115	40	-0.10	2.45
EPB105A3 (1)	105		60	125	215	45	125	45		3.00
EPB115A1	115	+0.4	70	145	245	50	145	50		5.40
EPB140A1 (1)	140	+0.3	80	170	290	60	170	60		7.80
EPB160A1 (1)	160		88	187	305	55	195	70		9.60

Under request, stainless steel and aluminium available

(1) *Manufactured by oxyfuel working*

Ball joints rod ends with shank



Designation[1]		Dimensions mm											Weight B-BS	Weight A-AS
with spring clamping[2]	with safety ring	d	b ±0,3	c ±0,3	e h11	f ±0,2	g	h ±0,3	k min	SR	$M_{1\,(6H)}$ - $M_{2\,(6g)}$	SW[3] h14	≈ Kg	≈ Kg
B - BS 8	**A - AS 8**	**8**	9	10,2	5	4 7,5	8	22	10,2	6,4	M 5x0,8	7	0,013	0,014
B - BS 10	**A - AS 10**	**10**	11	12,5	6	4,5 8	10	25	11,5	7,4	M 6x1	8	0,021	0,024
B - BS 13	**A - AS 13**	**13**	13	16,5	8	5 8 10	13	30	14	9,7	M 8x1,25	11	0,044	0,053
B - BS 16	**A - AS 16**	**16**	16	20	10	6 10 13	16	35	15,5	12	M 10x1,5	13	0,084	0,097
B - BS 16-1	**A - AS 16-1**	**16**	16	20	10	6 13	16	35	15,5	12	M 12x1,75	13	0,084	0,097
B - BS 19	**A - AS 19**	**19**	20	28	14	12 18	22	45	21,5	15	M 14x2	16	0,184	0,218
B - BS 19-1	**A - AS 19-1**	**19**	20	28	14	12 18	22	45	21,5	15	M 14x1,5	16	0,184	0,218

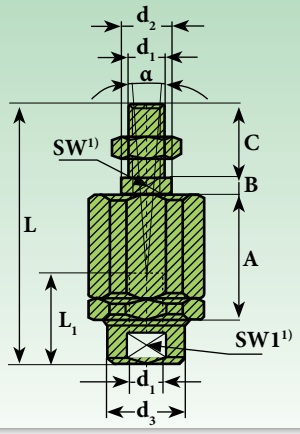
Under request, stainless steel available

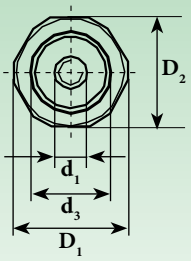
1) *The shank of ball joint housing may be left-hand thread, for left-hand thread suffix "L" is added (example: B-BSL.. - A-ASL..)*
2) *Available under request*

Surface : zinc-plating FeZn7 Uni 4721 - oiled raw surface available under request
3) *Clamping plains*

Self-aligning spherical plain bearings

SQS





Designation	Ø Cyl.	Dimensions mm													Degrees	Load ratings	Weight
		d_1	d_2	d_3	A	B	C	D_1	D_2	F	L	L_1	SW1)	SW11)	α°	Static C_0 kN	≈ Kg
SQS 6	**12/16**	M6x1	6	8,5	17,5	3,5	10	14,5	13	1	35	10	5	7	10	1,2	0,03
SQS 8	**25/30**	M8x1,25	8	12,5	28,5	4	20	19	17	2	57	20	7	11	10	2,5	0,06
SQS 10	**32**	M10x1,5	14	22	35	5	20	32	30	2	71	20	12	19	10	5	0,22
SQS 10.1	**32**	M10x1,25	14	22	35	5	20	32	30	2	71	20	12	19	10	5	0,22
SQS 12	**40**	M12x1.75	14	22	35	5	24	32	30	2	75	20	12	19	10	5	0,23
SQS 12.1	**40**	M12x1.25	14	22	35	5	24	32	30	2	75	20	12	19	10	5	0,23
SQS 16	**50/63**	M16x1.5	22	32	54	8	32	45	41	2	103	32	20	30	10	10	0,66
SQS 20	**80/100**	M20x1.5	22	32	54	8	40	45	41	2	119	40	20	30	10	10	0,70

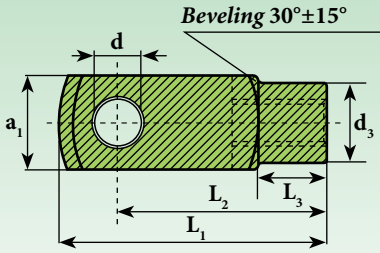
Under request, stainless steel available

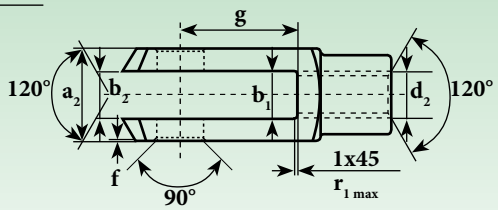
1) *Clamping plains*

devises and complementary accessories

Clevises with threaded hole (DIN 71752 - ISO 8140 CETOP)

FK





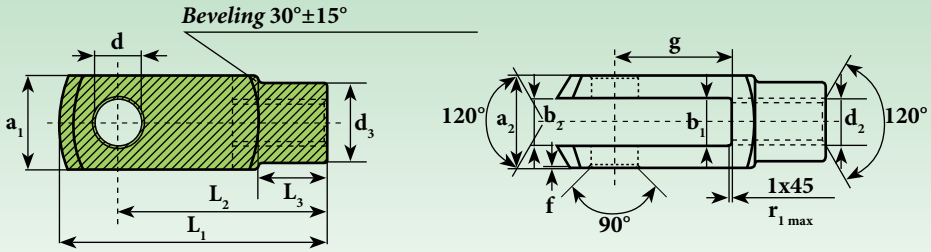
Designation [1]	Dimensions mm													Weight
	d H9	d_2 6H	d_3 ±0,3	a_1 h11	a_2 +0,30 -0,16	b_1 B13	b_2	f ±0,2	g ±0,5	L_1 ±0,5	L_2	L_3 ±0,3	$r_{1\,max}$ ±0,5	≈ Kg
FK 4X8	**4**	M4 X 0,7	8	8	8	4	4 [3]	0,5	8	21	16 [5]	6	0,5	0,005
FK 4X16	**4**	M4 X 0,7	8	8	8	4	4 [3]	0,5	16	29	24 [5]	6	0,5	0,007
FK 5X10	**5**	M5 X 0,8	9	10	10	5	5 [3]	0,5	10	26	20 [5]	7,5	0,5	0,009
FK 5X20	**5**	M5 X 0,8	9	10	10	5	5 [3]	0,5	20	36	30 [5]	7,5	0,5	0,013
FK 6X12	**6**	M6 X 1,0	10	12	12	6	6 [3]	0,5	12	31	24 [5]	9	0,5	0,015
FK 6X24	**6**	M6 X 1,0	10	12	12	6	6 [3]	0,5	24	43	36 [6]	9	0,5	0,021
FK 8X16	**8**	M8 X 1,25	14	16	16	8	8 [3]	0,5	16	42	32 [6]	12	0,5	0,037
FK 8X16FG	**8**	M8 X 1,0	14	16	16	8	8 [3]	0,5	16	42	32 [6]	12	0,5	0,037
FK 8X32	**8**	M8 X 1,25	14	16	16	8	8 [3]	0,5	32	58	48 [6]	12	0,5	0,054
FK 8X32FG	**8**	M8 X 1,0	14	16	16	8	8 [3]	0,5	32	58	48 [6]	12	0,5	0,054
FK 10X20	**10**	M10 X 1,5	18	20	20	10	10 [3]	0,5	20	52	40 [6]	15	0,5	0,074
FK 10X20 [2]	**10**	M10x1.25	18	20	20	10	10	-	20	52	40	15	-	0,074
FK 10X20FG	**10**	M10 X 1,25	18	20	20	10	10 [3]	0,5	20	52	40 [6]	15	0,5	0,074
FK 10X40	**10**	M10 X 1,5	18	20	20	10	10 [4]	0,5	40	72	60 [6]	15	0,5	0,116
FK 10X40FG	**10**	M10 X 1,25	18	20	20	10	10 [4]	0,5	40	72	60 [6]	15	0,5	0,116
FK 12X24	**12**	M12 X 1,75	20	24	24	12	12 [4]	0,5	24	62	48 [6]	18	0,5	0,121
FK 12X24 [2]	**12**	M12x1.25	20	24	24	12	12	-	24	62	48	18	-	0,121
FK 12X24FG	**12**	M12 X 1,25	20	24	24	12	12 [4]	0,5	24	62	48 [6]	18	0,5	0,121
FK 12X48	**12**	M12 X 1,75	20	24	24	12	12 [4]	0,5	48	86	72 [6]	18	0,5	0,175
FK 12X48FG	**12**	M12 X 1,25	20	24	24	12	12 [4]	0,5	48	86	72 [6]	18	0,5	0,175
FK 14X28	**14**	M14 X 2,0	24	27	27	14	14 [4]	1	28	72	56 [6]	22,5	1	0,178
FK 14X28FG	**14**	M14 X 1,5	24	27	27	14	14 [4]	1	28	72	56 [6]	22,5	1	0,178
FK 14X56	**14**	M14 X 2,0	24	27	27	14	14 [4]	1	56	101	85 [6]	22,5	1	0,258
FK 14X56FG	**14**	M14 X 1,5	24	27	27	14	14 [4]	1	56	101	85 [6]	22,5	1	0,258
FK 16X32	**16**	M16 X 2,0	26	32	32	16	16 [4]	1	32	83	64 [6]	24	1	0,282
FK 16X32 [2]	**16**	M16x1.5	26	32	32	16	16	-	32	83	64	24	-	0,282
FK 16X32FG	**16**	M16 X 1,5	26	32	32	16	16 [4]	1	32	83	64 [6]	24	1	0,282
FK 16X64	**16**	M16 X 2,0	26	32	32	16	16 [4]	1	64	115	96 [6]	24	1	0,411

1) *For left thread, suffix "L" is added (example: FKL..)*
2) CETOP *thread type*
3) *Tolerance* B13: +0,33 ≈ +0,15
4) *Tolerance*: +0,70 ≈ +0,15
5) *Tolerance*: ± 0,3
6) *Tolerance*: ± 0,4

FG= *Thin thread*

Clevises with threaded hole (DIN 71752 - ISO 8140 CETOP)

FK



Designation [1]	Dimensions mm													Weight
	d H9	d_2 6H	d_3 ±0,3	a_1 h11	a_2 +0,30 -0,16	b_1 B13	b_2	f ±0,2	g ±0,5	L_1 ±0,5	L_2	L_3 ±0,3	$r_{1\,max}$ ±0,5	≈ Kg
FK 16X64FG	**16**	M16 X 1,5	26	32	32	16	16 [4]	1	64	115	96 [6]	24	1	0,411
FK 18X36	**18**	M18 X 2,5	30	36	36	18	18 [4]	1	36	94	72 [6]	27	1,5	0,390
FK 18X36FG	**18**	M18 X 1,5	30	36	36	18	18 [4]	1	36	94	72 [6]	27	1,5	0,390
FK 20X40	**20**	M20 X 2,5	34	40	40	20	20 [4]	1	40	105	80 [6]	30	1,5	0,55
FK 20 X 40 [2]	**20**	M20x1.5	34	40	40	20	20	-	40	105	80	30	-	0,55
FK 20X40.1 [2] **FG**	**20**	M20 X 1,5	34	40	40	20	20 [4]	1	40	105	80 [6]	30	1,5	0,55
FK 20X80	**20**	M20 X 2,5	34	40	40	20	20 [4]	1	80	145	120 [6]	30	1,5	0,8
FK 20X80FG	**20**	M20 X 1,5	34	40	40	20	20 [4]	1	80	145	120 [6]	30	1,5	0,8
FK 25X50	**25**	M24 X 3,0	42	50	50	25	25 [4]	1,5	50	132	100 [6]	36	1,5	1,1
FK 25X50.1 [2] **FG**	**25**	M24 X 2,0	42	50	50	25	25 [4]	1,5	50	132	100 [6]	36	1,5	1,1
FK 28X56	**28**	M27 X 3,0	48	55	55	28	28 [4]	1,5	56	148	112 [6]	40	2	1,5
FK 28X56FG	**28**	M27 X 2,0	48	55	55	28	28 [4]	1,5	56	148	112 [6]	40	2	1,5
FK 30X54.1 [2] **FG**	**30**	M27 X 2,0	48	55	55	30	30 [4]	1,5	54	148	110 [6]	40	2	1,44
FK 30X55 [2]	**30**	M27x2	48	55	55	30	30	-	54	148	110	38	-	1,6
FK 30X60	**30**	M30 X 3,5	52	60	60	30	30 [4]	1,5	60	160	120 [6]	42	2	1,97
FK 30X60FG	**30**	M30 X 2,0	52	60	60	30	30 [4]	1,5	60	160	120 [6]	42	2	1,97
FK 35X54.1 [2] **FG**	**35**	M36 X 2,0	60	70	70	35	35 [4]	2	54	188	144 [6]	54	3	2,93
FK 35X70 [2]	**35**	M36x2	60	70	70	35	35	-	72	188	144	40	-	2,93
FK 35X72	**35**	M36 X 4,0	60	70	70	35	35 [4]	2	72	188	144 [6]	54	3	2,93
FK 35X72.1 [2] **FG**	**35**	M36 X 2,0	60	70	70	35	35 [4]	2	72	188	144 [6]	54	3	2,93
FK 36X72	**36**	M36 X 4,0	60	70	70	36	36 [4]	2	72	188	144 [6]	54	3	2,93
FK 36X72FG	**36**	M36 X 2,0	60	70	70	36	36 [4]	2	72	188	144 [6]	54	3	2,93
FK 40X84.1 [2] **FG**	**40**	M42 X 2,0	70	85	85	40	40 [4]	3	84	232	168 [6]	63,5	5	5,64
FK 42X84	**42**	M42 X 4,5	70	85	85	42	42 [4]	3	84	232	168 [6]	63,5	5	5,34
FK 42X84.1 [2] **FG**	**42**	M42 X 2,0	70	85	85	42	42 [4]	3	84	232	168 [6]	63,5	5	5,34
FK 50X96	**50**	M48 X 5,0	82	96	96	50	50 [4]	3	96	265	192 [6]	73	5	7,86
FK 50X96.1 [2] **FG**	**50**	M48 X 2,0	82	96	96	50	50 [4]	3	96	265	192 [6]	73	5	7,86

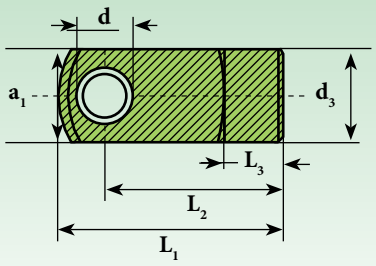
Under request, stainless steel and aluminium available

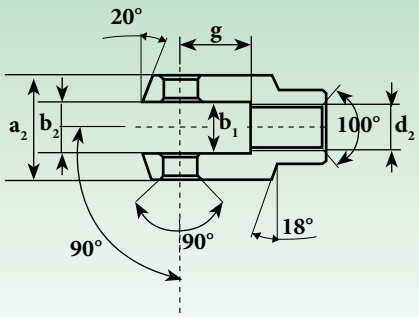
1) *For left thread, suffix "L" is added (example: FKL..)*
2) CETOP *thread type*
3) *Tolerance* B13: +0,33 ≈ +0,15
4) *Tolerance*: +0,70 ≈ +0,15
5) *Tolerance*: ± 0,3
6) *Tolerance*: ± 0,4

FG= *Thin thread*

Clevises with threaded hole ex CNomo

FK..CN





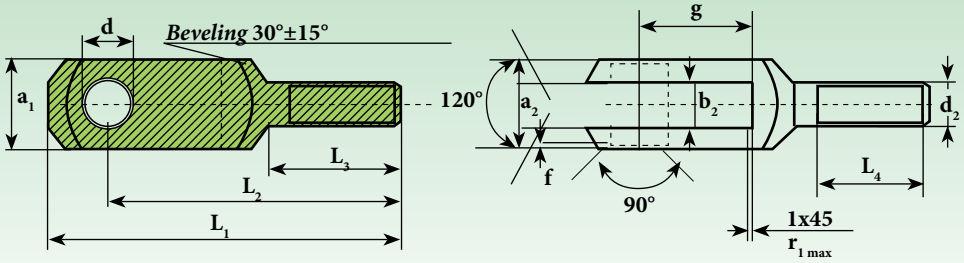
Designation[1]	Dimensions mm												Load ratings	Weight
	Bore	d	d_2	d_3	a_1	a_2	b_1	b_2	g	L_1	L_2	L_3	Static C_0	≈ Kg
		H8	6H	± 0,3	h11	h11	H11	H11	± 0,5	± 0,5	± 0,3	± 0,2	kN	
FK8X16CN	32	**8**	M10X1,5	18	22	22	11	11	16	45	36	14	30	0,08
FK12X25CN	40-50	**12**	M16X1,5	26	26	36	18	18	25	64	51	17	50	0,21
FK16X33CN	63-80	**16**	M20X1,5	34	34	45	22	22	33	80	63	18,50	82	0,44
FK20X40CN	100-125	**20**	M27X2,0	42	42	63	30	30	40	105	85	30	145	0,91
FK25X40CN	160-200	**25**	M36X2,0	50	50	80	40	40	40	140	115	45	200	1,80

Under request, stainless steel and aluminium available

[1] *For left thread, suffix "L" is added (example: FKL..CN)*

Clevises with male thread (DIN 71752 - ISO 8140 CETOP)

FT

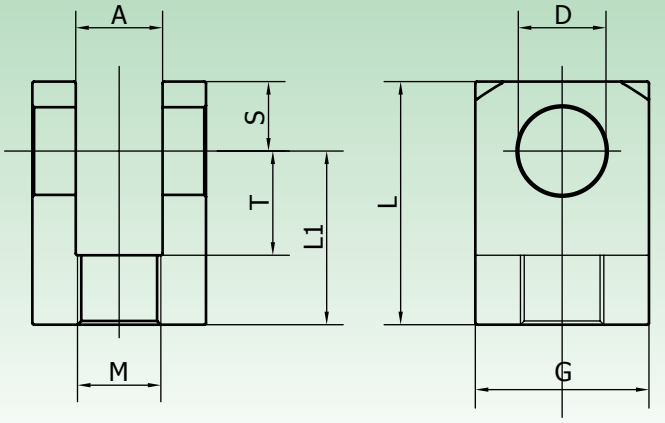


Designation	Dimensions mm												Weight
	d H9	d_2 6g	a_1 h11	a_2 +0,50 -0,20	b_2 +0,70 +0,15	f ±0,2	g ±0,5	L_1 ±0,2	L_2 ±0,4	L_3 ±0,2	L_4 min	$r_{1\,max}$ ±0,5	≈ Kg
FT 6X12	**6**	M6 X 1,0	12	12	6	0,5	12	44	37	20	15	0,8	0,015
FT 8X16	**8**	M8 X 1,25	16	16	8	0,5	16	57	47	25	20	0,8	0,036
FT 10X20	**10**	M10 X 1,5	20	20	10	0,5	20	69	57	30	25	0,8	0,068
FT 12X24	**12**	M12 X 1,75	24	24	12	0,5	24	82	68	35	30	0,8	0,122
FT 14X28	**14**	M14 X 2,0	27	27	14	1	28	94	78	40	35	1,2	0,171
FT 16X32	**16**	M16 X 2,0	32	32	16	1	32	108	89	45	40	1,2	0,282
FT 20X40	**20**	M20 X 2,5	40	40	20	1	40	134	109	55	50	1,5	0,550

Under request, stainless steel and aluminium available

Clevises with threaded hole

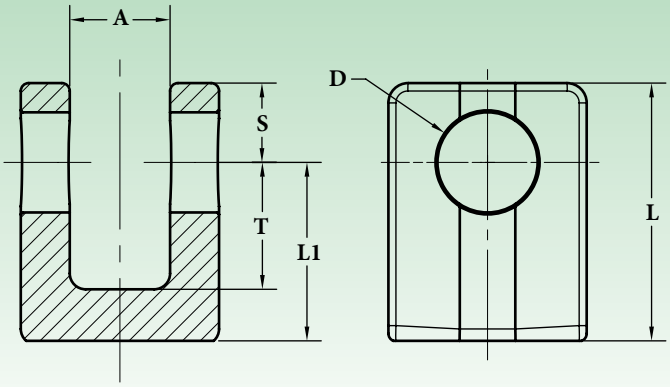
FPT



Designation	Dimensions mm								Weight
	M	A	G	D	L	L_1	T	S	≈ Kg
FF700	M16x1,5	16	35	16,2	55	39	24	16	0,3
FF702	M20x1,5	20	40	20,25	65	45	30	20	0,42
FF704	M24x2	25	50	25,25	70	50	30	20	0,72
FF706	M30x2	30	60	30,25	90	65	35	25	1,38
FF708	M33x2	35	70	35,25	105	75	40	30	2,2

Weldable clevises

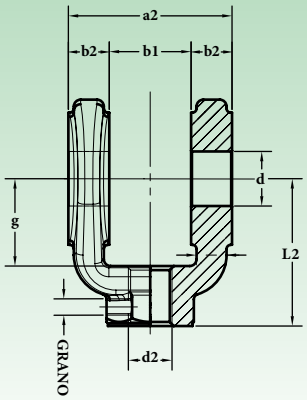
FPW

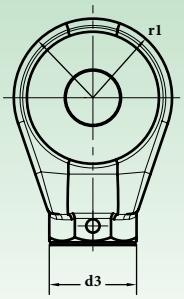


Designation	Dimensions mm							Weight
	A	G	D	L	L_1	T	S	≈ Kg
FS710	16	35	16,2	50	34	24	16	0,32
FS712	20	40	20,25	60	40	30	20	0,39
FS714	25	50	25,25	65	45	30	20	0,69
FS716	30	60	30,25	75	50	35	25	1,10
FS720	35	70	35,25	85	55	40	30	1,65

Hinge clevises with threaded hole

FY



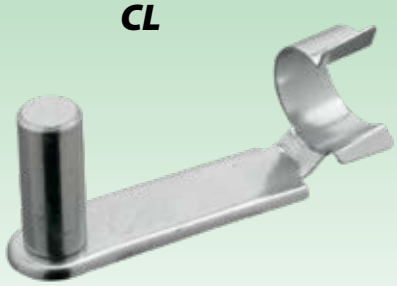


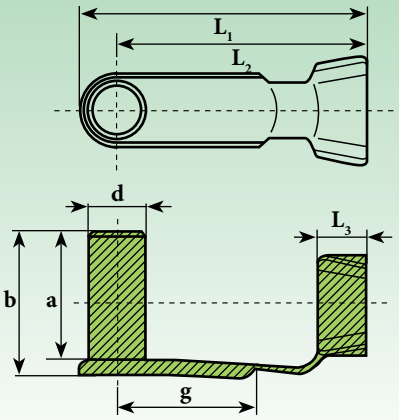
Designation	Dimensions mm											
	d	d2	d3	a2	b1	b2	g	L1	L2	L3	r1	Kg
FY 10X12	10	M10x1.25	19	24	12	6	13	42	32	19	12	0.10
FY 12X17	12	M12x1.25	21	32	16	8	19	50	36	17	17	0.18
FY 14X17	14	M14x1.5	21	40	20	10	19	52	38	19	17	0.20
FY 20X29	20	M16x1.5	32	60	30	15	32	78	54	22	29	0.90
FY 20X29	20	M20x1.5	32	60	30	15	32	84	60	28	29	0.90
FY 28X34	28	M27x2	40	80	40	20	39	104	75	36	34	1.90
FY 36X50	36	M33x2	55	100	50	25	54	143	99	45	50	4.90
FY 45X53	45	M42x2	55	120	60	30	57	160	113	56	53	6.50
FY 56X59	56	M48x2	75	140	70	35	63	164	126	63	59	10.10
FY 70X78	70	M64x3	95	160	80	40	83	213	168	85	78	19.20
FY 70X78 (1)	70	M80x3	95	160	80	40	83	213	168	85	78	18.40

(1) *Item out of standard ISO 8133*

Spring pins for clevises

CL





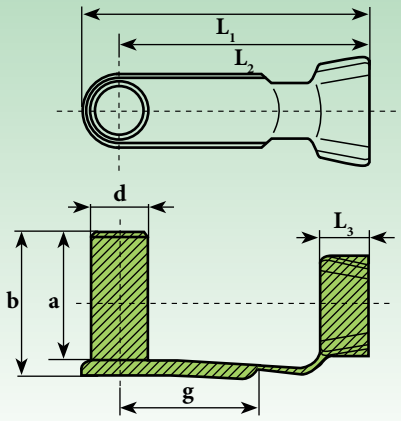
Designation	Dimensions mm							Weight
	d h11	a	b	g	L_1 ≈	L_2 ≈	L_3 ≈	≈ Kg
CL 4X8	**4**	9,5	11	8	19	15	4,5	0,0015
CL 4x8.1	**4**	9	11	-	19	15	5	0,0020
CL 4X16	**4**	9,5	11	16	26	23,5	4,5	0,0020
CL 5X10	**5**	12	13,5	10	23	19	5,5	0,0025
CL 5X20	**5**	12	13,5	20	33	29	5,5	0,0031
CL 6X12	**6**	14	16	12	28	23	6,5	0,0046
CL 6x12.1	**6**	14	16	-	28	23	6	0,0050
CL 6X24	**6**	14	16	24	40	35	6,5	0,0052
CL 8X16	**8**	19	21,5	16	37	30	8	0,0106
CL 8x16.1	**8**	19	22	-	37	31	8	0,0100
CL 8X32	**8**	19	21,5	32	52	46	8	0,0116
CL 10X20	**10**	23	26	20	46	38	10	0,0194
CL 10x20.1	**10**	23	26	-	46	39	10	0,0190
CL 10X40	**10**	23	26	40	66	58	10	0,0205
CL 12X24	**12**	28	31	24	53	45	12	0,0300
CL 12x24.1	**12**	28	30	-	55	47	12	0,0340
CL 12X48	**12**	28	31	48	78	69	12	0,0350
CL 14X28	**14**	31	34	28	62	52	14	0,0472
CL 14x56	**14**	31	34	56	92	82	14	0,0508
CL 16X32	**16**	36	39	32	73	62	16	0,0694
CL 16x32.1	**16**	36	40	-	72	62	18	0,0700
CL 16X64	**16**	36	39	64	103	92	16	0,0744
CL 20X40	**20**	45	50	40	87,5	71,5	16	0,1300
CL 20x40.1	**20**	44	48	-	88	72	16	0,1300

CL18x36 *Available under request*

Under request, stainless steel and aluminium available

Spring pins for ex CNomo clevises

CL.. CN

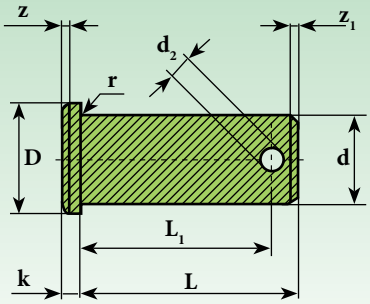


Designation	Dimensions mm							Weight
	d	a	b	g	L_1	L_2	L_3	≈ Kg
	h11				≈	≈	≈	
CL 8X16 CN	**8**	25	28	16	41	36	10	0,014
CL 12X25 CN	**12**	40	44	25	60	50	12	0,043
CL 16X33 CN	**16**	49	53	33	74	63	15	0,090
CL 20X40 CN	**20**	69	73	40	98	81	19	0,193

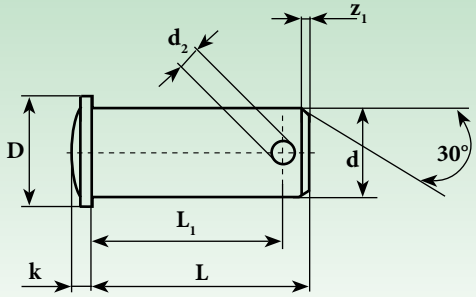
Under request, stainless steel and aluminium available

Pins with cylindrical head for split pins

PC



PCB



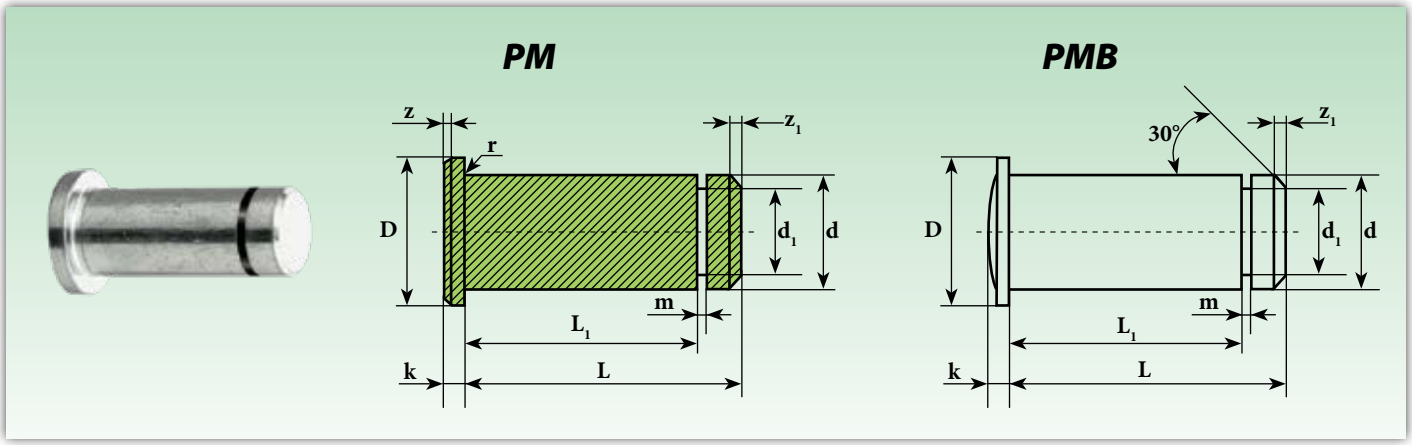
Designation	Dimensions mm									Weight
	d h11	d_2 H14	D h12	k js14	L +0,3 ≈ 0	L_1 +0,5 ≈ 0	r	z	z_1 ≈	≈ Kg
PC 4	**4**	1	6	1	12	10	0,3	0,5	0,8	0,001
PC 5	**5**	1,2	8	1,5	15	12,3	0,3	0,5	0,8	0,003
PC 6	**6**	1,6	9	1,5	18	15,3	0,5	0,5	1	0,005
PC 8	**8**	2	12	2	23	19,5	0,5	1	1	0,010
PC 10	**10**	3,20	14	2	29	24,5	0,5	1	1,5	0,019
PC 12	**12**	4	17	3	35	29,5	0,5	1,5	2	0,034
PC 14	**14**	4	20	3	40	32,5	1	1,5	2,5	0,053
PC 16	**16**	4	21	3	45	37,5	1	1,5	2,5	0,067
PC 18	**18**	5	25	3,5	50	43,5	1	1,5	3	0,140
PC 20	**20**	5	26	4	54	47	1	2	3	0,125
PC 25	**25**	6	32	5	67	59	1	2	3	0,260

Pins with barrel head (spherical) for split pins

Designation	Dimensions mm							Weight
	d h11	d_2 H14	D	k js14	L +0,3	L_1 +0,5	z_1 ≈	≈ Kg
PCB 16	**16**	4	20	3,5	45	38,2	1,5	0,072
PCB 18	**18**	5	25	3,5	50	43,5	1,5	0,104
PCB 20	**20**	5	28	4	53	47	1,5	0,139
PCB 25	**25**	6,3	34	5,5	67	59	1,5	0,266
PCB 28	**28**	6,3	34	5,5	72	63,2	2	0,361
PCB 30.6	**30**	6,3	36	5,5	67	59	2	0,383
PCB 30.7	**30**	6,3	36	5,5	77	68,2	2	0,428
PCB 35	**35**	8	45	7	87	76,5	2	0,677
PCB 40	**40**	8	48	6	100	90	5	1,035
PCB 42	**42**	8	48	7	100	90	5	1,151
PCB 50	**50**	10	58	7	115	103	6	1,846

Under request, stainless steel and aluminium available

Pins with cylindrical head for spring



Designation	Dimensions mm										Weight
	d h11	d_1 h11	D h12	k js14	L +0,3 ≈ 0	L_1 +0,3 ≈ 0	m +0,1 ≈ 0	r	z ≈	z_1 ≈	≈ Kg
PM 4	**4**	3,2	6	1	10,5	8,5	0,64	0,3	0,5	0,5	0,002
PM 5	**5**	4	8	1,5	13	10,5	0,74	0,5	0,5	0,5	0,003
PM 6	**6**	5	9	1,5	15,5	12,5	0,74	0,5	0,5	0,75	0,004
PM 8	**8**	6	12	2	20	16,5	0,94	0,5	1	1	0,009
PM 10	**10**	8	14	2	25	20,5	1,05	0,5	1	1	0,017
PM 12	**12**	9	17	3	30	24,5	1,15	0,5	1,5	1,25	0,030
PM 14	**14**	10	19	3	33	27,5	1,25	1	1,5	1,5	0,048
PM 16	**16**	12	20	3	38,5	32,5	1,35	1	1,5	1,5	0,067
PM 18	**18**	13	25	3,5	42	36,5	1,35	1	2	1,5	0,895
PM 20	**20**	17,5	26	4	46	40,5	1,8	1	2	1,5	0,125
PM 25	**25**	18	32	5	57	50,5	1,8	1	2	1,5	0,260

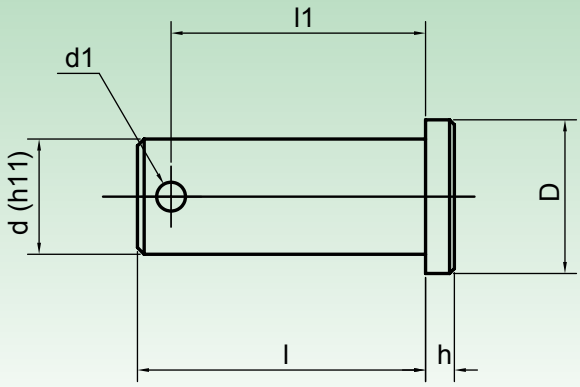
Pins with barrel head (spherical) for spring

Designation	Dimensions mm								Weight
	d h11	d_1 h11	D h12	k js14	L +0,3	L_1 +0,3	m +0,1	z_1 ≈	≈ Kg
PMB 14	**14**	10	20	2,5	33	27,5	1,25	1,25	0,041
PMB 16	**16**	12	20	3,5	38,5	32,5	1,35	1,5	0,062
PMB 18	**18**	13	25	3,5	42	36,5	1,35	1,5	0,090
PMB 20	**20**	17,5	28	4	46	40,5	1,80	1,5	0,121
PMB 25	**25**	18	34	5,5	57	50,5	1,80	1,5	0,231

Under request, stainless steel and aluminium available

Pins with head

PH

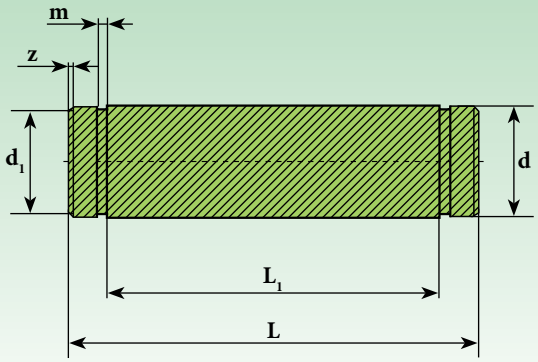


Designation	Dimensions mm					Weight
	d x L (Toll. d : h11)	h	D	d_1	L_1	≈ Kg
PH 4	4x12	1.5	7	1.5	9	0,002
PH 5	5x14	1.5	8	1.5	11	0,003
PH 6	6x16	1.5	9	2	13	0,004
PH 8	8x20	2	12	2	17	0,009
PH 10	10x25	2	14	3	21.5	0,017
PH 12	12x30	3	16	3	26.5	0,031
PH 14	14x35	3	19	4	31	0,048
PH 16	16x40	3	20	4	36	0,07
PH 18	18x45	4	22	4	40	0,1
PH 20	20x49	4	24	4	43.5	0,13

Under request, stainless steel and aluminium available

Pins for clevises

PS-PS..CN



Designation	Dimensions mm						Weight
	d h11	d_1 h11	L +0,4 ≈ 0	L_1 +0,3 ≈ 0	m H13	z ≈	≈ Kg
PS 4	**4**	-	13	8	-	1	0,001
PS 5	**5**	4,8	15	10,5	0,7	1	0,003
PS 6	**6**	5,7	17	12,2	0,8	1	0,005
PS 8	**8**	7,6	20	16,5	0,9	1	0,008
PS 10	**10**	9,6	25	20,5	1,1	1	0,015
PS 12	**12**	12	30	24,5	1,1	1	0,026
PS 14	**14**	13	35	27,5	1,1	1	0,042
PS 16	**16**	15	39	32,5	1,1	1	0,061
PS 20	**20**	19	48	40,5	1,3	1	0,118
PS 25	**25**	24	60	50,5	1,3	1	0,230
PS 30	**30**	29	65	55,5	1,6	1	0,350
PS 35	**35**	33	84	70,5	1,6	1	0,620

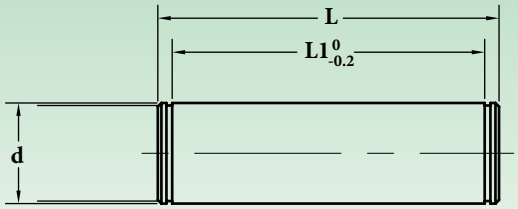
Pins for ex CNomo clevises

Designation	Dimensions mm						Weight
	d h11	d_1 h11	L +0,4 ≈ 0	L_1 +0,3 ≈ 0	m H13	z ≈	≈ Kg
PS 8 CN	**8**	7,6	30	22	0,9	1	0,012
PS 8X22,2 CN	**8**	-	27	22.2	-	-	0,011
PS 12 CN	**12**	11,5	45	36	1,1	1	0,039
PS 12X36,2 CN	**12**	-	43	36.2	-	-	0,038
PS 16 CN	**16**	15,2	55	45	1,1	1	0,085
PS 16X45,2 CN	**16**	-	53	45.2	-	-	0,083
PS 20 CN	**20**	19	75	63	1,3	1	0,185
PS 20 63,2 CN	**20**	-	72	63.2	-	-	0,180
PS 25 CN	**25**	23,9	95	80	1,3	1	0,360
PS 25X80,6 CN	**25**	-	89	80.6	-	-	0,340

Under request, stainless steel available

Pins for hinge clevises

PFY

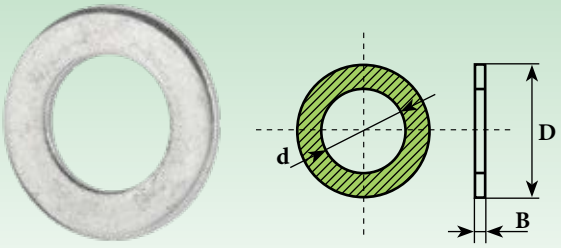


Designation	Dimensions mm				Weight
	d	L	L1	TO USE WITH HINGE CLEVISE	≈ Kg
PFY 10	10	34	29	**FY 10X12**	0,02
PFY 12	12	43	37	**FY 12X17**	0,04
PFY 14	14	51	45	**FY 14X17**	0,06
PFY 20	20	73	66	**FY 20X29**	0,18
PFY 20	20	73	66	**FY 20X29**	0,18
PFY 28	28	95	87	**FY 28X34**	0,46
PFY 36	36	117	107	**FY 36X50**	0,93
PFY 45	45	139	129	**FY 45X53**	1,73
PFY 56	56	161	149	**FY 56X59**	3,1
PFY 70	70	181	169	**FY 70X78**	5,45
PFY 70 (1)	70	181	169	**FY 70X78**	5,45

(1) *Item out of standard ISO 8133*

Washers for pins

PC-R



Designation	Dimensions mm			Weight[1]
	d	D	B	≈ Kg
PC-R 4	**4,3**	7,5	0,8	0,15
PC-R 5	**5,3**	9,5	1	0,39
PC-R 6	**6,4**	11	1,6	0,70
PC-R 8	**8,4**	15	1,6	1,52
PC-R 10	**10,5**	18	1,6	2,11
PC-R 12	**13**	20	2	2,85
PC-R 14	**15**	24	2	4,30
PC-R 16	**17**	27	2	5,42
PC-R 20	**21**	33	2,5	9,98
PC-R 25	**25**	39	4	14,50

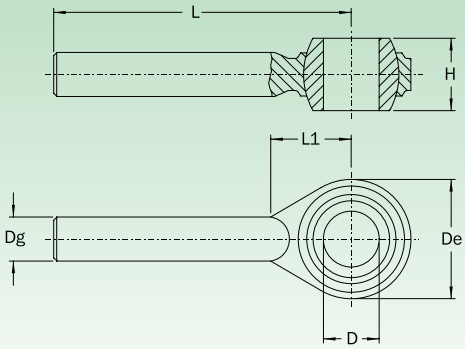
Under request, stainless steel and aluminium available

[1] *Weight ref. 1.000 pcs.*

Agricultural section

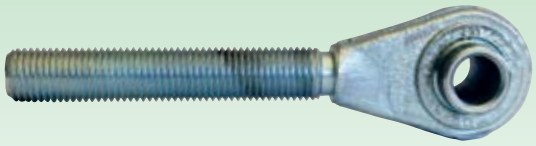
Rod end

TGG

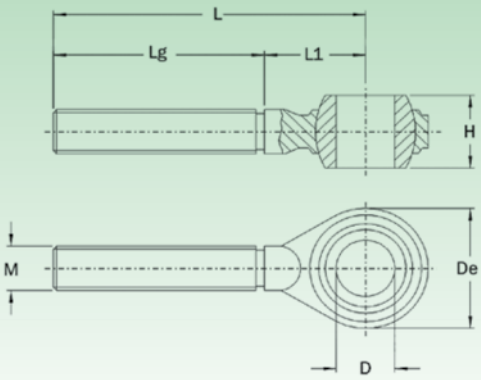


Designation	Dimensions mm							Weight
	Cat.	D (A12)	H (h11)	Dg (Ø)	L	L_1	De	≈ Kg
TGG 3342	1	19	44	25	205	50	58	1,14
TGG 3341	1	19	44	27	205	50	62	1,38
TGG 3394	2	25,4	51	28	220	55	75	1,64
TGG 3395	2	25,4	51	30	220	55	75	1,76
TGG 3425	2	25,4	51	36	220	60	80	2,32
TGG 3445	2	25,4	51	37	270	70	96	3,80
TGG 3455	3	32	51	37	270	70	96	3,70

Rod end with threaded stem



TGF

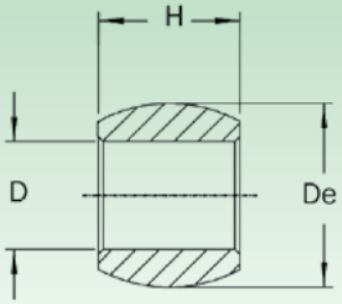


Designation	Dimensions mm								Weight
	Cat.	D (A12)	H (h11)	M	L	Lg	L_1	De	≈ Kg
TGF 3300 DX	1	19	44	M22x2,5	165	130	35	52	0,71
TGF 3310 SX	1	19	44	M22x2,5	165	130	35	52	0,71
TGF 3320 DX	1	19	44	M24x2,5	165	115	50	58	0,82
TGF 3330 SX	1	19	44	M24x2,5	165	115	50	58	0,82
TGF 3340 DX	1	19	44	M27x3	205	155	50	62	1,08
TGF 3350 SX	1	19	44	M27x3	205	155	50	62	1,08
TGF 3380 DX	2	25,4	51	M27x3	220	165	55	75	1,44
TGF 3390 SX	2	25,4	51	M27x3	220	165	55	75	1,44
TGF 4400 DX	2	25,4	51	M30x3	220	165	55	75	1,62
TGF 4410 SX	2	25,4	51	M30x3	220	165	55	75	1,62
TGF 4420 DX	2	25,4	51	M36x3	220	165	55	80	2,14
TGF 4430 SX	2	25,4	51	M36x3	220	165	55	80	2,14
TGF 4440 DX	2	25,4	51	M36x3	270	200	70	96	3,34
TGF 4450 SX	2	25,4	51	M36x3	270	200	70	96	3,34
TGF 4460 DX	3	32	51	M36x3	270	200	70	96	3,34
TGF 4470 SX	3	32	51	M36x3	270	200	70	96	3,34

Steel - to - steel coupling - body in C40 steel

Balls

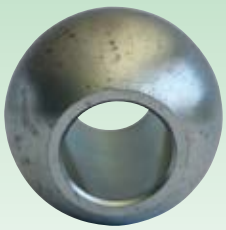
ROT

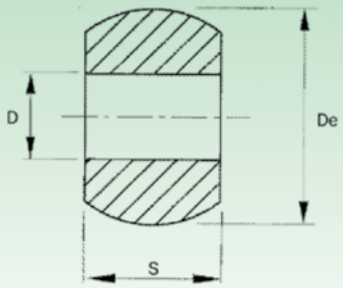


Designation	Dimensions mm				Use	Weight
	Cat.	D (A12)	De	H (-0,2)		≈ Kg
ROT 6681	1	22,1	56	35	SUP 4680	0,48
ROT 6682	-	25,4	56	45	SUP 4685	0,48
ROT 6691	2	28,4	56	35	SUP 4690	0,40
ROT 6692	-	25,4	56	35	SUP 4670	0,44

Balls without guidance cones for lower hitch

ROT

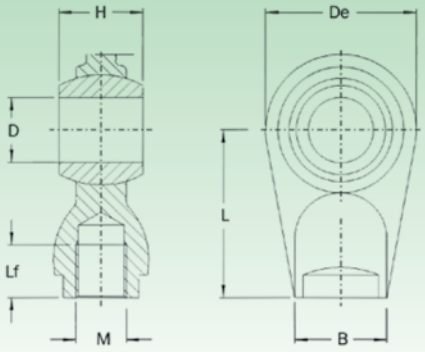




Designation	Dimensions mm				Weight
	Cat.	D (A12)	De	S (H11)	≈ Kg
ROT 993	2	28,4	56	45	0,44
ROT 994	3/2	28,4	64	45	0,72
ROT 995	3	38	64	45	0,56
ROT 996	3	37	64	45	0,56

Rod ends with round end (to be welded or with inner thread)

SUP

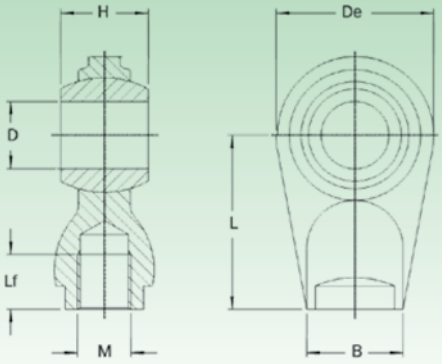


Designation	Dimensions mm								Notes	Weight
	Cat.	D (A12)	H (h11)	B (Ø)	De	L	M	Lf		≈ Kg
SUP 6693	-	14	44	25	55	50	-	-		0,46
SUP 6694	1	19	30	25	55	50	-	-		0,40
SUP 6695	1	19	44	25	55	50	-	-		0,42
SUP 6696	-	20	44	25	55	50	-	-		0,41
SUP 6700	1	19	44	30x14	62	34	-	-		0,44
SUP 6702	-	20	44	30x14	62	34	-	-		0,43
SUP 6704	-	22,1	44	30x14	62	34	-	-		0,42
SUP 6707	-	22,1	44	34	62	58	-	-		0,58
SUP 6708	1	19	44	34	62	58	-	-		0,60
SUP 6709	-	20	44	34	62	58	-	-		0,59
SUP 6710	1	19	44	34	62	60	-	-		0,62
SUP 6712	-	22,1	44	34	62	60	-	-		0,60
SUP 6720	-	20	44	34	62	60	-	-		0,61
SUP 6724	1	19	35	26	62	50	-	-		0,54
SUP 6725	-	22,1	35	26	62	50	-	-		0,52
SUP 6730	-	22,1	51	38	75	65	-	-		0,98
SUP 6735	2	25,4	40	38	75	65	-	-		0,90
SUP 6737	1	19	51	38	75	65	-	-	*FLATTENED BASE*	1,02
SUP 6739	-	30	51	38	75	65	-	-		0,88
SUP 6740	2	25,4	51	38	75	65	-	-		0,94
SUP 6741	2	25,4	51	30	75	70	-	-		0,90
SUP 6742	2	25,4	51	45	70	70	-	-		1,14
SUP 6744	1	19	51	45	70	70	-	-		1,22
SUP 6746	-	22,1	51	45	70	70	-	-		1,18
SUP 6748	-	30	51	45	70	70	-	-		1,08
SUP 6750	2	25,4	51	50	83	65	-	-		1,60
SUP 6756	-	22,1	51	50	85	70	-	-		1,64
SUP 6759	1	19	51	50	85	70	-	-		1,68
SUP 6760	2	25,4	51	50	85	70	-	-		1,62
SUP 6768	-	22,1	51	50	85	70	M27x2	27		1,50
SUP 6769	1	19	51	50	85	70	M27x2	27		1,54
SUP 6770	2	25,4	51	50	85	70	M27x2	27		1,46
SUP 6780	-	30	51	50	85	70	-	-		1,56
SUP 6790	-	30	51	50	85	70	M27x2	27		1,40

Steel - to - steel coupling - body in C40 steel - UNI EN 10083-1

Rod ends with round end (to be welded or with inner thread)

SUP



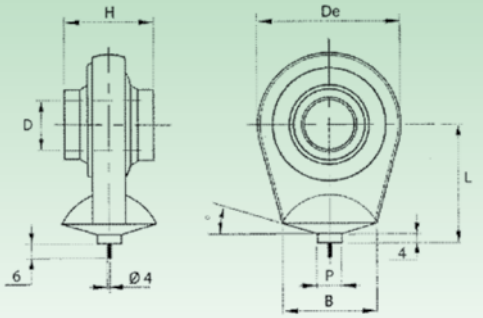
Designation	Dimensions mm								Notes	Weight
	Cat.	D (A12)	H (h11)	B (Ø)	De	L	M	Lf		≈ Kg
SUP 7791	2	25,4	51	40	90	85	-	-		1,68
SUP 7792	-	30	51	40	90	85	-	-		*BASE*
SUP 7793	3	32	51	40	90	85	-	-		1,58
SUP 7794	3	32	51	40	90	85	M27x2	27		1,44
SUP 7795	-	35	55	40	90	85	-	-		1,52
SUP 7796	1/2	19/25,4	45x45	40	90	85	-	-		1,56
SUP 7800	-	29	55	50	83	65	-	-		1,38
SUP 7805	-	30	42	50	83	65	-	-		1,30
SUP 7807	3	32	51	50	83	65	-	-		1,30
SUP 7810	-	30	55	50	83	65	-	-		1,36
SUP 7812	-	35	35	50	83	65	-	-		1,20
SUP 7815	-	35	55	50	83	65	-	-		1,24
SUP 7816	-	29	55	50	92	65	-	-		1,60
SUP 7817	-	30	55	50	92	65	-	-		1,58
SUP 7818	-	30	42	50	92	65	-	-		1,52
SUP 7825	3	32	51	50	92	65	-	-		1,54
SUP 7819	-	35	35	50	92	65	-	-		1,42
SUP 7821	-	40	75	58	108	60	-	-	*FLATTENED BASE*	2,76
SUP 7841	-	45	75	58	108	60	-	-		2,56
SUP 7861	-	50	75	58	108	60	-	-		2,36
SUP 7820	-	40	75	60	108	85	-	-		3,42
SUP 7830	-	40	75	60	108	85	M38x2	28		3,10
SUP 7840	-	45	75	60	108	85	-	-		3,22
SUP 7850	-	45	75	60	108	85	M38x2	28		2,90
SUP 7860	-	50	75	60	108	85	-	-		3,02
SUP 7870	-	50	75	60	108	85	M38x2	28		2,70
SUP 7871 (*) (■)	-	40	75	65	128	85	-	-		6,38
SUP 7872 (*) (■)	-	45	75	65	128	85	-	-		6,18
SUP 7873 (*) (■)	-	50	75	65	128	85	-	-		5,98
SUP 7874 (*) (■)	-	40	75	65	128	85	M38x2	28		6,16
SUP 7875 (*) (■)	-	45	75	65	128	85	M38x2	28		5,96
SUP 7876 (*) (■)	-	50	75	65	128	85	M38x2	28		5,76
SUP 7880 (■)	-	60 (H7)	100	75	140	87	-	-		5,66

Steel - to - steel coupling - body in C40 steel - UNI EN 10083-1

(*) *With two removable half outer rings*
(■) *With grease nipple*

Rod ends with round end

SUP

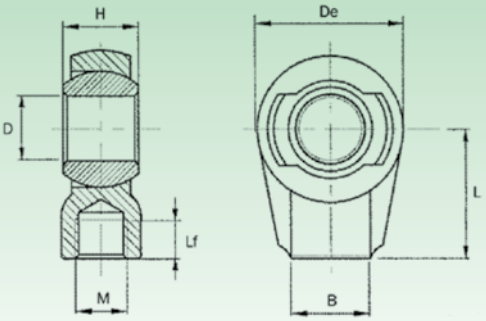


Designation	Dimensions mm							Degrees	Weight
	Cat.	D (A12)	H (h11)	B (Ø)	De	L	P	α°	≈ Kg
SUP 6731	1	19	51	35	75	55	12	15	0,88
SUP 6732	-	22,1	51	35	75	55	12	15	0,87
SUP 6733	-	28,4	51	35	75	55	12	15	0,82
SUP 6736	2	25,4	51	35	75	55	12	15	0,84
SUP 6738	-	30	51	35	75	55	12	15	0,78
SUP 7808	-	30	55	45	83	65	20	20	1,50
SUP 7811	3	32	51	45	83	65	20	20	1,40
SUP 7814	-	35	55	45	83	65	20	20	1,42

Steel - to - steel coupling - body in C40 steel - UNI EN 10083-1

Rod ends with disassembled spherical plain bearing

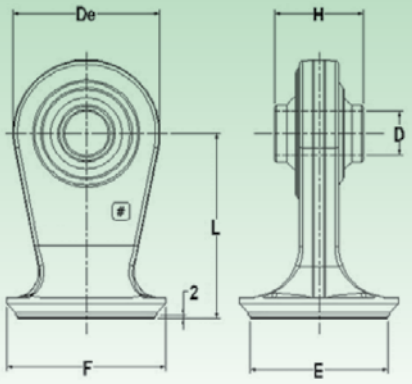
SUP



Designation	Dimensions mm							Notes	Weight
	D (H10)	H (H10)	B (Ø)	De	L	M	Lf		≈ Kg
SUP 7900	16	20	27	44	45	M16x1,5	20		0,28
SUP 7910	20	20	27	44	45	M18x1,5	20		0,25
SUP 7920	25	30	35	61	60	M20x1,5	25		0,80
SUP 7930	30	30	35	61	60	M22x1,5	25	*FLATTENED BASE*	0,72
SUP 7940	35	40	45	80	80	M27x2	35		1,70
SUP 7950	40	40	45	80	80	M30x2	35		1,60

Steel - to - steel coupling - body in C40 steel - UNI EN 10083-1

FSUP



Designation	Dimensions mm					
	De	L	D (A12)	H	E	F
FSUP6740D60	85	107	25,4	51	60	70
FSUP6740D63	85	107	25,5	51	63	73
FSUP6740D70	85	107	25,4	51	70	80
FSUP6740D80	85	107	25,4	51	80	92

Coupling: steel / steel material: C40

Interchangeability table

VICOPARTS	MAC POWER	SCHAEFFLER	SKF	Pag.
GE..E/ES	GE..ES	GE..DO	GE..E/ES	67-68
GE..ES 2RS	GE..ES 2RS	GE..DO 2RS	GE..ES 2RS	67-68
GEG..E/ES	GE..FO	GE..FO	GEH..E/ES	69
GEG..ES 2RS	GE..FO 2RS	GE..FO 2RS	GEH..ES 2RS	69
GE..SB	GE..SB	GE..PB	-	70
GE..CP	GE..CP	-	-	71
GE..SP	GE..SP	GE..PW	-	72
GEEW..E/ES	GE..LO	GE..LO	GEG..ES	73
GEEM..ES 2RS	GE..HO 2RS	GE..HO 2RS	GEM..ES 2RS	74
GE..C	GE..UK	GE..UK	GE..C	75
GE..ET 2RS	GE..UK 2RS	GE..UK 2RS	GE..TE 2RS/TA 2RS	75
GEG..C	GE..FW	GE..FW	GEH..C	76
GEG..ET 2RS	GE..FW 2RS	GE..FW 2RS	GEH..TE 2RS/TA 2RS	76
GEZ..ES	GE..ZO	-	-	77
GEZ..ES 2RS	GE..ZO 2RS	-	-	77
GE..XS K	GE..XS K	-	-	78
GEK..XS 2RS	GEK..XS 2RS	-	-	79
GX..S	GE..AX	GE..AX	-	80
GX..CP	GE..AW	GE..AW	GX..F	81
GAC..S	GE..SX	GE..SX	-	82
GAC..CP	GE..SW	GE..SW	GAC..F	83
SSR	SSR	-	-	84
GE..BBL	GE..BBL	-	-	85
GE..BBH	GE..BBH	-	-	86
GE..RB	GE..RB	-	-	87
SQD..C	SQD..C	-	-	91
SQ..C RS	SQ..C RS	-	-	92
SQZ..C RS	SQZ..C RS	-	-	93
SI..E/ES	SC..ES	GIR..DO	-	94
SI..ES 2RS	SC..ES 2RS	GIR..DO 2RS	-	94
SI..C	SC..UK	GIR..UK	-	95
SI..C 2RS	SC..UK 2RS	GIR..UK 2RS	-	95
SA..E/ES	SD..ES	GAR..DO	-	96
SA..ES 2RS	SD..ES 2RS	GAR..DO 2RS	-	96
SA..C	SD..UK	GAR..UK	-	97
SA..C 2RS	SD..UK 2RS	GAR..UK 2RS	-	97
TSF	SC..PB	GIKR..-PB	SIKAC..M	98
TSF..C	SC..PW	GIKR..-PW	SIKB..F	99

VICOPARTS	MAC POWER	SCHAEFFLER	SKF	Pag.
TSF..R	TSF.R	-	-	100
TSM	SD..PB	GAKR..-PB	SAKAC..M	101
TSM..C	SD..PW	GAKR..-PW	SAKB..F	102
TSM..R	TSM.R	-	-	103
TSF..BB	TSF..BB	-	-	104
TSF..BB-O	TSF..BB-O	-	-	105
TSF..BB-E	TSF..BB-E	-	-	106
TSF..RB	TSF..RB	-	-	107
TSM..BB	TSM..BB	-	-	108
TSM..BB-O	TSM..BB-O	-	-	109
TSM..BB-E	TSM..BB-E	-	-	110
TSM..RB	TSM..RB	-	-	111
TAPR.N	SN..N	GIHR..DO	SIRD..ES	112
TAPR.U	SN..U	GIHR-K..DO	SIR..ES	113
TAPR.DO	SN..S	GIHO-K..DO	SIJ..ES	114
TAPR.CE	SN..CE	GIHN-K..LO	SIQG..ES	115
SN-GAS	SN.. GAS	-	-	116
T.P.N.	SN..P	GF..DO	SCF..ES	117
T.P.N.CE	SN..L	GF..LO	-	118
T.A.C.	SN..A	GK..DO	SC..ES	119
SN-PF	SN.. PF	-	-	120
SN-AF	SN.. AF	-	-	121
SGG..ES	SGG.. ES	-	-	122
EPB		-	-	123
B-BS	B-BS	-	-	124
A-AS	A-AS	-	-	124
SQS	SQS	-	-	125
FK	FF-7, FF-23	-	-	129-130
FK..CN	FF-24	-	-	131
FT	FT	-	-	132
FPT	FF	-	-	133
FPW	FS	-	-	133
FY	CF	-	-	134
CL	SF-23	-	-	135
CL..CN	SF-24	-	-	136
PC	PC	-	-	137
PCB	PCB	-	-	137
PM	PM	-	-	138
PMB	PMB	-	-	138

VICOPARTS	MAC POWER	SCHAEFFLER	SKF	Pag.
PH	PF-23	-	-	139
PS	PF-7	-	-	140
PS..CN	PF-24	-	-	140
PFY	PCF	-	-	141
PC-R	PC-R	-	-	142
TGG	TGG	-	-	145
TGF	TGF	-	-	146
ROT	ROT	-	-	147
SUP	SUP	-	-	148-151
FSUP	FSUP	-	-	152

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