CCVI
BEARING INDUSTRIES

spherical plain
bearings
rod ends

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contents

symbols and units in the catalogue
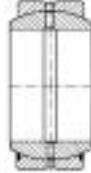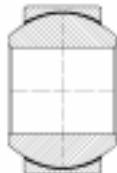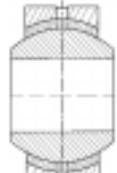
Symbol	Unit	Description
a_k		load feature life factor
a_T		temperature life factor
a_V		sliding speed life factor
a_z		bearing quality and lubrication life factor
B	mm	shaft washer nominal width
b_2		temperature factor
b_6		load type factor
C	mm	housing washer nominal width
C_O	N	basic static load rating
C_d	N	dynamic load rating
C_{dr}	N	dynamic radial load rating
C_{da}	N	dynamic axial load rating
C_{sr}	N	static radial load rating
C_{sa}	N	static axial load rating
dm	mm	sliding spherical surface nominal diameter
$\overline{dm}$	mm	equivalent diameter of sliding spherical surface
D	mm	bearing housing bore or outer ring outer diameter
E	mm	outer ring raceway diameter
F	mm	inner ring raceway diameter
f	min^{-1}	oscillation frequency
f_a		load rating factor of thrust spherical plain bearings
f_{rn}		load rating factor of angular contact spherical plain bearings
f_T		load rating factor of radial spherical plain bearings
f_s		static load rating factor
f_r		load rating factor of radial spherical plain bearings
F_a, F_r	N	axial or radial bearing load
H	mm	nominal width of thrust spherical plain bearings
k		pressure coefficient
K_m		factor related to friction couple material
L	10^6	basic rating life (oscillation times)
L_h	h	basic rating life (hours)
L_R		relubrication life
M	mm	bearing friction torque
n		load division number
p	N/mm^2	nominal contact pressure
P	N	bearing dynamic equivalent load
P_{perm}	N	max allowed load of rod end
s	μm	rotary clearance of unloaded bearing after mounting
s_r	μm	radial internal clearance
T	mm	nominal width of angular contact spherical plain bearing
T_{IR}	^0C	inner ring temperature
T_{oR}	^0C	outer ring temperature
U		theoretical interference amount of the part fitted with the shaft
V	m/s	sliding speed
y		load factor
α	K^{-1}	linear heat expansion coefficient
α_h		relubrication interval life factor
α_β		relubrication oscillation angle life factor
β	°	oscillation angle
μ		friction factor
$\triangle d$	μm	inner ring expansion amount
$\triangle s_p$	μm	internal radial clearance decreasing amount caused by fit
$\triangle s_T$	μm	internal radial clearance decreasing amount caused by temperature rise
$\triangle D$	μm	outer ring shrink amount

engineering data

basic designations and contents of spherical plain bearings

category	subcategory		description	figure
Radial spherical plain bearings	**GE series**	**GE..ES**	requiring maintenance, single-split outer rings, hardened inner rings, phosphate coated inner and outer ring surfaces	
		GE..LO	extended inner ring, single-split outer ring, hardened inner ring, phosphate coated inner and outer ring surfaces	
		GE..HO 2RS	extended inner ring, single-split outer ring, hardened inner ring, sealed, phosphate coated inner and outer ring surfaces	
		GE..FO	heavy load series, single-fractured outer ring, case-hardened inner ring, phosphate coated inner and outer ring surfaces	
		GE..FW	heavy load series, pressed round outer rings, chromium plated internal spherical surface, extended inner ring	
		GE..FW 2RS	heavy load series, chromium plated inner spherical surface, sealed, phosphate coated inner and outer rings, PTFE lined	
		GE..UK	pressed round outer rings, chromium plated internal spherical surface	
		GE..UK 2RS	phosphate coated single-split outer ring surface, chromium plated inner ring spherical surface, sealed,PTFE lined	

basic designations and contents of spherical plain bearings

division	subdivision	description	figure
Radial spherical plain bearings	GEZ series	requiring maintenance, single-split outer rings, hardened inner rings, phosphate coated inner and outer ring surfaces, inch series	
	COM series	inch series, requiring maintenance, pressed outer rings, chromium plated inner spherical surface	
	COM..T series	inch series, pressed outer rings, chromium plated inner spherical surface, PTFE lined	
	PB series	spherical plain bearing with inlaid liner (steel/ bronze) , oil hole & oil tank, chromium plated inner ring spherical surface, pressed round outer rings	
angular contact spherical plain bearings	GE..SX series	separable inner and outer ring, oil tank & oil hole, phosphate coated surface	
	GE..SW series	separable inner and outer ring, Chromium plated internal spherical surface, self-lubricating material (PTFE)	

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bearing load and life

◇ **Load definition**
Load direction

| radial load | axial load | composite load |
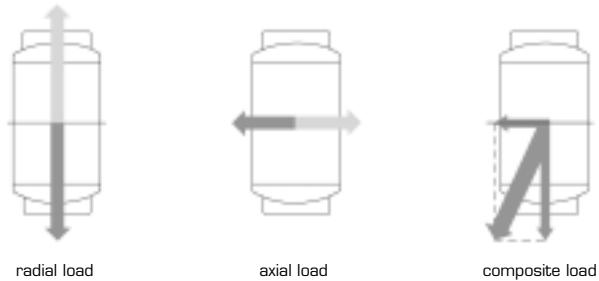
Fig. 1

- **Dynamic equivalent load**

Although there are single radial load and single axial load, most bearing loads are composite loads when radial loads and axial loads work simultaneously. It is not appropriate to compare actual load with basic dynamic rating load directly. At this time, the actual load has to be assumed as a fixed load, which passes through bearing center in one direction. Bearings have the same life under the assumed load as they are under actual load. This converted assumed load is called dynamic equivalent load and expressed as P.

- **Dynamic equivalent load calculation**

Dynamic equivalent load calculation for radial spherical plain bearings

$$P = yF_r$$

in which: P   dynamic equivalent load, N
$\quad\quad\quad$ F_r composite radial load
$\quad\quad\quad$ y   load factor, depends on F_a/F_r
for requiring maintenanceradial spherical plain bearings, choose y from Fig 2
for maintenance-free radial spherical plain bearings, choose y from Fig 3
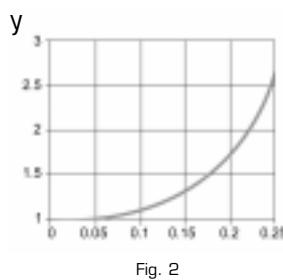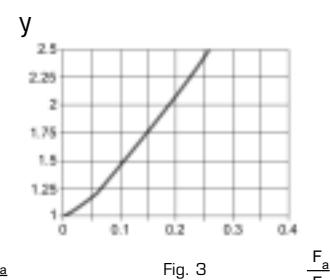
- **Dynamic equivalent load calculation for angular contact spherical plain bearings**

$$P = yF_r$$

in which: P   dynamic equivalent load, N
$\quad\quad\quad$ F_r composite radial load
$\quad\quad\quad$ y   load factor, depends on F_a/F_r, see Fig 4
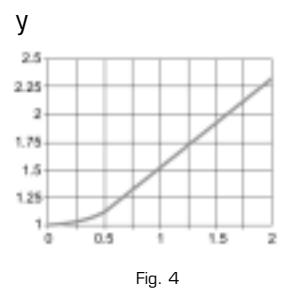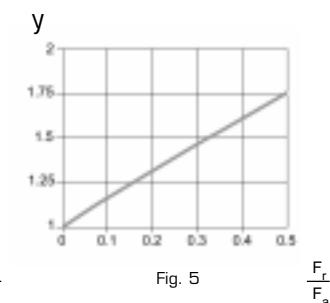
- **Dynamic equivalent load calculation for axial spherical plain bearings**

$$P = yF_a$$

in which: P   dynamic equivalent load, N
$\quad\quad\quad$ F_a composite radial load
$\quad\quad\quad$ y   load factor, depends on F_r/F_a, see Fig 5

Fig. 2 $\quad\dfrac{F_a}{F_r}$

Fig. 3 $\quad\dfrac{F_a}{F_r}$

Fig. 4 $\quad\dfrac{F_a}{F_r}$

Fig. 5 $\quad\dfrac{F_r}{F_a}$

◇ **Dynamic load rating calculation for spherical plain bearings**

· **radials spherical plain bearings**

Dynamic radial load rating of radial spherical plain bearing C_{dr}:

$$C_{dr}=f_r Cdm$$

in which: f_r load rating factor, see table 1

       C   outer ring (housing washer) nominal width, mm

       dm   sliding spherical surface nominal diameter, mm

       C_{dr} dynamic radial load rating, N

Table 1 load rating factors of radial spherical plain bearings

dm		material of friction couple			
over	to	steel/steel	steel/PTFE foil	steel/PTFE fabric liner	steel/ PTFE
5	400	85	50	120	90
400	500	87	-	125	-
500	700	90	-	136	-
700	1200	93	-	138	-

· **Angular contact spherical plain bearings**

Dynamic radial load rating of angular contact spherical plain bearing C_{dr}:

$$C_{dr}=f_{rn}(B+C-T)dm$$

in which: f_{rn} load rating factor of angular contact spherical plain bearing, see table 2

       B   shaft washer nominal width of spherical plain bearing, mm

       T   nominal width of angular contact spherical plain bearing, mm

Table 2 Load rating factor of angular contact spherical plain bearings

dm		material of friction couple	
over	to	steel/steel	steel/PTFE fabric liner
5	55	85.5	128
55	500	88	132

· **Axial spherical plain bearings**

dynamic radial load rating of axial spherical plain bearing, C_{da}:

$$C_{da}=f_a(B+C-H)\cdot dm$$

in which: C_{da} dynamic axial load rating of spherical plain bearing, N

       f_a load rating factor of axial spherical plain bearing, N/ mm^2 , see table 3

       H   nominal width of axial spherical plain bearing, mm

Table 3 load rating factor of thrust spherical plain bearings

dm		material of friction couple	
over	to	steel/steel	steel/PTFE fabric liner
5	60	170	255
60	110	185	280
110	150	190	288
150	220	180	275
220	300	155	230
300	500	143	222
500	700	-	256

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◇ **Life calculation of spherical plain bearings**

· **Sliding speed of bearing spherical surface**

Sliding speed of the working spherical surface of spherical plain bearing is:

$$V = 2.9089 \times 10^{-4} \beta f \overline{dm}$$

in which: V   sliding speed of spherical plain bearing，mm/s

           β   oscillation angle, °

           f   oscillation frequency of spherical plain bearing, min^{-1}

           $\overline{dm}$ equivalent diameter of the sliding spherical surface, mm($\underline{dm} = \xi$ dm), ξ is the conversed factor, see table 4

Table 4   Equivalent diameter of the sliding spherical surface

bearing type	radial bearing	angular contact bearing	thrust bearing
ξ	1	0.9	0.7

· **Nominal contact pressure**

Nominal contact pressure of spherical plain bearing is calculated as:

$$p = k \left(P/C_d \right)$$

in which: p   nominal contact pressure N/mm^2

           k   pressure coefficient, see table 5

           P   dynamic equivalent load of spherical plain bearing, N

           C_d dynamic rating load of spherical plain bearing, N

Table 5 pressure coefficient

material of friction couple	steel/steel	steel/PTFE foil	steel/PTFE fabric liner	steel/ PTFE
k	100	50	150	100

· **Bearing limit pV value**

pV value on the working surface of spherical plain bearing must be limited, otherwise bearing will become over heated and bearing life will be reduced. pV value is calculated as:

$$pV = 2.9089 \times 10^{-4} k \, \beta f \, \overline{dm} \, (P/C_d) \qquad (N/mm^2) \cdot (mm/s)$$

Limited pV values of different contact couple materials are listed in table 6

Table 6   limited pV values of different contact couple materials

material of friction couple	steel/steel	steel/PTFE foil	steel/PTFE fabric liner	steel/ PTFE
V	100	100	300	300
p	100	50	150	100
pV	400	400	300	300

- ## Life calculation of spherical plain bearings

The calculated life of spherical plain bearings is:

$$L= \alpha_k \cdot \alpha_T \cdot \alpha_p \cdot \alpha_V \cdot \alpha_Z \cdot \left(K_M C_d / VP \right)$$

in which :
L the first-time lubrication life of spherical plain bearing, r

α_k load feature life factor (see table 7)

α_T temperature life factor (see table 7)

α_p load life factor

α_V sliding speed life factor (see table 7)

α_Z bearing quality and lubrication life factor (see table 9)

K_M Factor related to friction couple material (see table 7)

Table 7

		steel/steel	steel/PTFE foil	steel/PTFE fabric liner	steel/ PTFE
K_M		830	207600	2.592×10^5	2.946×10^5
α_k		1	1	1	1
		1	1	$0.6062-6.0207 \times 10^{-3} f_p p^{1.11}$	$0.6062-3.1309 \times 10^{-3} f_p p^{1.25}$
		2	2	$0.433-4.3005 \times 10^{-3} f_p p^{1.11}$	$0.433-2.2364 \times 10^{-3} f_p p^{1.25}$
α_T		1	1	1	1
		0.9	$1.15-2.5 \times 10^{-3} t$	$1.225-3.75 \times 10^{-3}$	$2.2-0.02t$
		0.8	$2.1-0.012\ t$	$1.35-0.005t$	-
		0.6	-	-	-
α_V		$V^{0.86} \beta^{0.84} f^{0.64}$	$V^{0.4} f^{0.8}$	$f/(1.00475)^{av} \cdot 1.0093^{\beta}$	$f/(1.00344)^{av}$
α_P				G/P^b	
a		-	-	1.0139^p	1.0399^p

note: see table 8 for G and b values in the table

Table 8 G, b values

P		material of friction couple							
over	to	steel/steel		steel/PTFE foil		steel/PTFE fabric liner		steel/ PTFE	
		G	b	G	b	G	b	G	b
0	10	2	0	0.25	0	15.3460	0.0488	4.5102	0.2230
10	25	80.533	1.465	1	0.6	15.3460	0.0488	4.5102	0.2230
25	45	80.533	1.465	1	0.6	22.9060	0.1732	13.7170	0.5686
45	65	80.533	1.465	-	-	47.7259	0.3660	13.7170	0.5686
65	100	80.533	1.465	-	-	157.9193	0.6527	13.7170	0.5686
100	150	-	-	-	-	402.0115	0.8556	-	-

Table 9 Bearing quality and lubrication life factor

material of friction couple	grease lubrication		self-lubrication
	without oil tank	with oil tank	
α_Z	0.1-0.5	0.3-1	0.5-1

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- **Relubrication life calculation method**

For grease lubricated spherical plain bearing, the lubricant should be replaced periodically. The bearing life evaluation method is as:

$$L_R = \alpha_h\, \alpha_\beta\, L$$

in which: L_R relubricating life of spherical plain bearing, r

         α_h relubricating interval life factor, see table 10

         α_β relubricating oscillation angle life factor, see table 11

         L_W relubricating period, r

         L initial lubricating life of spherical plain bearing, r

Table 10   Relubricating interval life factor

$h = L/L_W$	1	5	10	20	30	40	50
α_h	1	2	2.85	4	4.9	5.45	5.45

Table 11   Relubricating oscillation angle life facto

$\beta\,(°)$	⩽ 7	10	15	20	25	30	35	40
α_β	0.8	1	2.4	3.7	4.6	5.2	5.2	5.2

- **When bearing under interval load, the life calculation formula is:**

$$L = T / \sum_{i=1}^{n} (T_i / L_i)$$

in which: T_i acting time of the ith time interval

         L_i calculated life of the ith time interval

$$L = T / \sum_{i=1}^{n} T_i$$

         n Interval number of the load

◇ **Calculation method of static load rating of spherical plain bearings**

- **Radial spherical plain bearings**

Under normal clearance condition, the static load rating of spherical plain bearing is:

$$C_{sr} = f_s \cdot C \cdot dm$$

in which: C_{sr} static load rating , N

         f_s static load rating factor, see table 12

         C outer ring (housing washer) nominal width of spherical plain bearing, mm

         dm sliding spherical surface nominal diameter of spherical plain bearing, mm

Table 12 f_s value of radial spherical plain bearings

dm(mm)		material of friction couple			
over	to	steel/steel	steel/PTFE foil	steel/PTFE fabric liner	steel/ PTFE
5	400	425	125	242	225
400	500	435	/	261	/
500	700	454	/	268	/
700	1000	468	/	278	/
1000	1200	475	/	284	/

· Angular contact spherical plain bearings

static load rating of angular contact spherical plain bearing is:

$$C_{sr}=f_s\ (\ B+C-T\ )\ dm$$

in which: B   inner ring (shaft washer) nominal width of spherical plain bearing, mm

T   nominal width of angular contact spherical plain bearing, mm

f_s static load rating factor, see table 13

Table 13 fs value of angular contact spherical plain bearings

dm(mm)		material of friction couple	
over	to	steel/steel	steel/PTFE fabric liner
5	55	426	254
55	500	440	263.5

· Axial spherical plain bearings

static axial load rating of thrust spherical plain bearing C_{sa} is calculated as:

$$C_{sa}=f_s\ (\ B+C-H\ )\ dm$$

in which: C_{sa} static axial load rating, N

H   nominal width of thrust spherical plain bearing, mm

f_s static load rating factor, see table 14

Table 14 fs value of thrust spherical plain bearings

dm(mm)		material of friction couple	
over	to	steel/steel	steel/PTFE fabric liner
5	60	855	512
60	100	924	560
100	150	966	575
150	200	920	550
200	300	768	462
300	500	710	425
500	700	/	529

engineering data

◇ **Friction**

The calculation formula of friction torque of spherical plain bearing is as:

$$M = 0.5 \times 10^{-3} \, \mu P \, dm$$

in which: M   friction torque Nm

          μ friction factor, see table 15

          P   equivalent dynamic load, N

          dm   dm=dk for radial spherical plain bearings; dm=0.9dk for angular contact spherical plain bearings; dm=0.7dk for thrust ball beearings

Table 15

sliding contact surface	friction factor μ	
	min	max
steel/steel	0.08	0.20
steel/copper	0.10	0.25
steel/PTFE+copper mesh	0.05	0.25
steel/PTFE paint cloth	0.03	0.15
steel/PTFE fiber cloth	0.05	0.20

◇ **Fit of spherical plain bearings**

· **Purpose of fit**

The purpose of fit is to fix bearing inner ring or outer ring with the shaft and housing to avoid any harmful circumferential movement on the matched surfaces. This kind of circumferential sliding will result in abnormal heat, matching surface wear (abrasive debris entering bearing), vibration and other questions.

· **How to choose fit**

When choosing fit, bearing operation conditions must be fully considered, for example:

load and load type

temperature distribution in operation

bearing internal clearance

manufacturing quality, material quality and thickness structure of the bearing and housing

mounting and dismounting method

· **Recommended fit**

    tolerance of the shaft

Table 16 shaft fit tolerance

working condition		friction factor μ	
		steel	self-lubrication
radial spherical plain bearings	all load types, interference fit	m6(n6)	k6
	all load types, clearance fit or transition fit	h6(hardened)	h6 or g6(hardened)
angular contact spherical plain bearings	all load types, interference fit	m6(n6)	k6
axial spherical plain bearings	all load types, interference fit	m6(n6)	k6

Note: If bearing under extremely heavy load, may choose tolerances in the brackets. But it will depend on whether the clearances after mounting guarantee a proper working situation or choose larger clearance bearings.

Table 17   shaft fit tolerance

working condition			friction factor μ	
			steel/steel	self-lubrication
radial spherical plain bearings	light load, axial movable		H7	H7
	heavy load		M7(N7)	K7
	-		N7	M7
angular contact spherical plain bearings	all load types, interference fit		M7(N7)	M7
	all loads, axial movable		J7	J7
thrust spherical plain bearings	pure axial load		H11	K11
	composite load		J7	J7

Note: If bearing under extremely heavy load, may choose tolerances in the brackets. But it will depend on whether the clearances after mounting guarantee a proper working situation or choose larger clearance bearings.
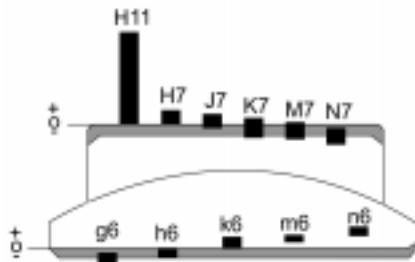
Fig. 6

ISO shaft and housing bore tolerance

Table 18 ISO shaft tolerance

shaft Dia. (mm)		△ Dmp (mm)		shaft tolerance μ m									
				HF		JF		KF		MF		NF	
over	to	min	max	higher	lower	higher	lower	higher	lower	higher	lower	higher	lower
3	6	-8	0	-4	-12	0	-8	9	1	12	4	16	8
6	10	-8	0	-5	-14	0	-9	10	1	15	6	19	10
10	18	-8	0	-6	-17	0	-11	12	1	18	7	23	12
18	30	-10	0	-7	-20	0	-13	15	2	21	8	28	15
30	50	-12	0	-9	-25	0	-16	18	2	25	9	33	17
50	80	-15	0	-10	-29	0	-19	21	2	30	11	39	20
80	120	-20	0	-12	-34	0	-22	25	3	35	13	45	23
120	180	-25	0	-14	-39	0	-25	28	3	40	15	52	27
180	250	-30	0	-15	-44	0	-29	33	4	46	17	60	31
250	315	-35	0	-17	-49	0	-32	36	4	52	20	66	34
315	400	-40	0	-18	-54	0	-36	40	4	57	21	73	37
400	500	-45	0	-20	-60	0	-40	45	5	63	23	80	40
500	630	-50	0	-22	-66	0	-44	44	0	70	26	88	44
630	800	-75	0	-24	-74	0	-50	50	0	80	30	100	50
800	1000	-100	0	-26	-82	0	-56	56	0	90	34	112	56

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Table 19 ISO shaft tolerance
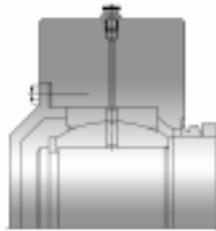
housing bore (mm)		△ Dmp (mm)		shaft tolerance μ m									
over	to	max	min	HF		JF		KF		MF		NF	
				lower	higher	lower	lower	lower	lower	lower	lower	lower	lower
10	18	0	-8	0	18	-8	10	-12	6	-18	0	-23	-5
18	30	0	-9	0	21	-9	12	-15	6	-21	0	-28	-7
30	50	0	-11	0	25	-11	14	-18	7	-25	0	-33	-8
50	80	0	-13	0	30	-12	18	-21	9	-30	0	-39	-9
80	120	0	-15	0	35	-13	22	-25	10	-35	0	-45	-10
120	150	0	-18	0	40	-14	26	-28	12	-40	0	-52	-12
150	180	0	-25	0	40	-14	26	-28	13	-40	0	-52	-12
180	250	0	-30	0	46	-16	30	-33	16	-46	0	-60	-14
250	315	0	-35	0	52	-16	36	-36	17	-52	0	-66	-14
315	400	0	-40	0	57	-18	39	-40	18	-57	0	73	-16
400	500	0	-45	0	63	-20	43	-45	0	-63	0	-80	-17
500	630	0	-50	0	70	-	-	-70	0	-96	-26	-114	-44
630	800	0	-75	0	80	-	-	-80	0	-110	-30	-130	-50
800	1000	0	-100	0	90	-	-	-90	0	-124	-34	-146	-56

◇ **Lubrication and seal**
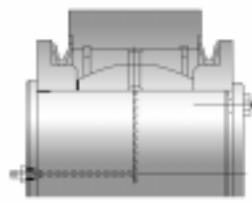
· **Self-lubricating bearing**

The combined types of sliding contact surfaces of CCVI self-lubricating
spherical plain bearings have six kinds:

- · steel/copper
- · steel/PTFE fiber cloth
- · steel/PTFE paint cloth
- · steel/PTFE composite material + copper mesh
- · steel/PTFE sintered bronze composite material(BK-1)
- · steel/nylon

relubricating through bearing outer ring   **relubricating through bearing inner ring**

Fig. 7

· **Oil lubrication / Grease lubrication**

Radial spherical plain bearings with steel/steel sliding contact surfaces
must be lubricated. The purpose of lubrication is that:

· **Reduce friction and wear**

Prevent metal contacts on bearing rings and reduce friction

· **Extend fatigue life**

Good lubrication on the contact surfaces will extend bearing fatigue
life; otherwise, lower viscosity and uneven-distributed lubricating oil film
will shorten bearing life.

· **Rust resistance**

· **Prevent outside external substance entering bearing and take wear debris out of bearing.**

◇ **Angular contact spherical plain bearings**

· **Type of oil groove**

A

B

C

D

Fig.8

◇ **Sealing**

seal of spherical plain bearings
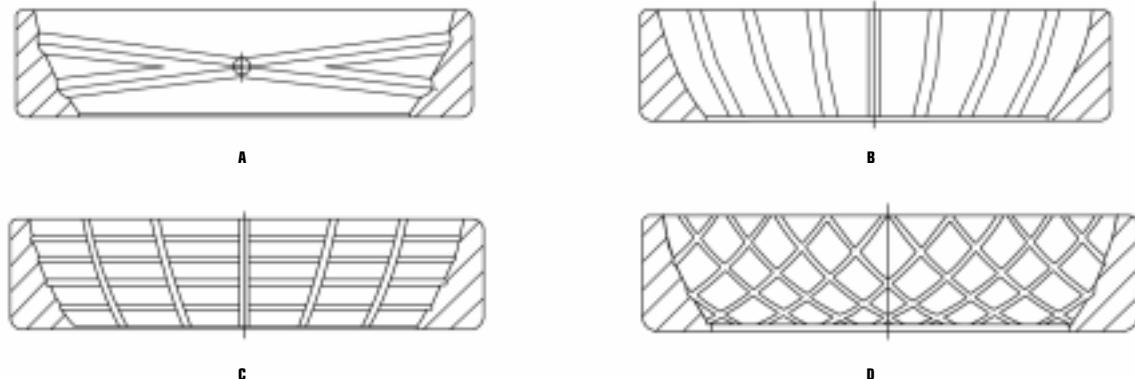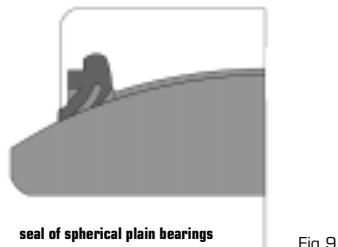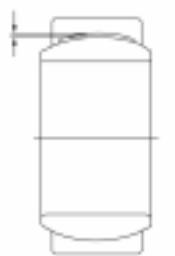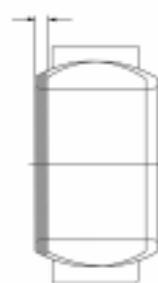
Fig.9

◇ **Clearance of spherical plain bearings**

Clearance of spherical plain bearings is the gap amount between inner and outer rings, i.e. the amount of movement of the inner (outer) ring when the other inner ring is fixed. Radial movement amount is called radial internal clearance, while axial movement amount is called axial internal clearance.

radial internal clearance

axial internal clearance

Fig.10

engineering data

- **Internal radial clearances of radial spherical plain bearings (table 20-22)**

Table 20 steel/steel metric system

ID d (mm)		radial internal clearance μ m					
		C2		CN		C3	
over	to	min	max	min	max	min	max
	12	8	32	32	68	68	104
12	20	10	40	40	82	82	124
20	35	12	50	50	100	100	150
35	60	15	60	60	120	120	180
60	90	18	72	72	142	142	212
90	140	18	85	85	165	165	245
140	200	18	100	100	192	192	284
200	240	18	110	110	214	214	318
240	300	18	125	125	239	239	353

Table 21 steel/steel metric system

ID d (mm)		radial internal clearance μ m					
		C2		CN		C3	
over	to	min	max	min	max	min	max
	15.875	15	75	50	150	150	200
15.875	50.8	25	105	80	180	180	260
50.8	76.2	30	130	100	200	200	300
76.2	152.4	40	160	130	230	230	350

Table 22 steel/PTFE

ID d (mm)		radial internal clearance μ m	breakaway torque Nm
over	to	max	max
	12	28	0.15
12	20	35	0.25
20	30	44	0.40
30	35	53	0.75
35	60	60	0.75
60	90	72	-
90	140	85	-
140	240	100	-

· **Working clearance**

The working clearance is defined as the displacement of the shaft moving from one extreme position to the other after bearing is mounted onto the shaft or in the housing. Working clearance can be obtained from two aspects:

· Radial internal clearance (table 20 - table 22)
· Radial internal clearance variation caused by interference fit and temperature,

Working clearance depends on bearing running conditions and the mounting.

Working clearance calculation:

$$S = S_r - \triangle_{sp} - \triangle_{sT}$$

in which: s radial working clearance of unloaded bearings after mounting

         s_r radial internal clearance (table20 - table 22)

         $\triangle_{sp}$ radial internal clearance decreasing amount caused by fit

         $\triangle_{sT}$ radial internal clearance decreasing amount caused by temperature

The reasons of radial internal clearance decreasing amount caused by fit:

· inner ring expansion, mm
· inner ring shrink, μm

$$\triangle_{sp} = \triangle_d + \triangle_D$$
         $\triangle_d$ inner ring expansion amount, μm

         $\triangle_D$ outer ring shrink amount, μm

$$\triangle_d = 0.9Ud\ (d/F)$$
         U theoretical interference amount of bearing parts fitted on the shaft, μm

         d inner ring bore diameter, mm

         F internal raceway diameter, mm

$$\triangle_d = 0.8U\ (E/D)$$
         E external raceway diameter, mm

         D outer ring outer diameter, mm

Radial internal clearance decreasing amount caused by temperature

If inner ring and outer ring temperature has great difference, bearing radial internal clearance will change a great deal.

$$\triangle_{sT} = 0.011 d_M\ (T_{IR} - T_{AR})$$
         d_M bearing mean diameter $d_M = (d+D)/2$, mm

         T_{IR} inner ring temperature °C

         T_{AR} outer ring temperature °C
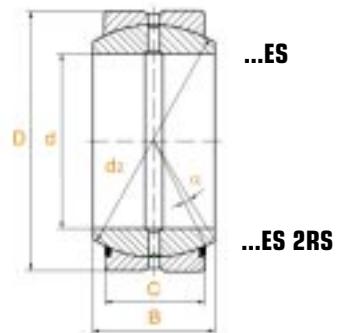
spherical plain bearings
requiring maintenance

GE...E
GE...ES
**GE...ES 2RS Series**

sliding contact surface: steel/steel
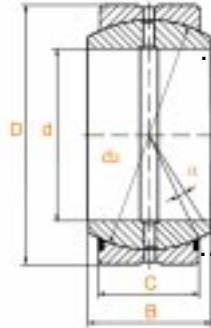
...ES

...ES 2RS

Type	with seals	Dimension (mm)					Basic load ratings (kN)		Misalign Angle	Mass
		d	D	B	C	d_2	dyn. C_r	stat. C_{or}	α^o ≈	kg ≈
GE 6 E[1]		6	14	6	4	11.112	3.40	17.0	13	0.004
GE 8 E[1]		8	16	8	5	12.7	5.50	27.5	15	0.007
GE 10 E[1]		10	19	9	6	15.875	8.15	40.5	12	0.011
GE 12 E[1]		12	22	10	7	18	10.80	54.0	10	0.016
GE 15 ES		15	26	12	9	22	17.00	85.0	8	0.025
GE 17 ES		17	30	14	10	25	21.20	106.0	10	0.041
GE 20 ES	GE 20 ES 2RS	20	35	16	12	29	30.00	146.0	9	0.061
GE 25 ES	GE 25 ES 2RS	25	42	20	16	35	48.00	240.0	7	0.110
GE 30 ES	GE 30 ES 2RS	30	47	22	18	40	62.00	310.0	6	0.140
GE 35 ES	GE 35 ES 2RS	35	55	25	20	47	80.00	400.0	6	0.220
GE 40 ES	GE 40 ES 2RS	40	62	28	22	53	100.00	500.0	7	0.300
GE 45 ES	GE 45 ES 2RS	45	68	32	25	60	127.00	640.0	7	0.400
GE 50 ES	GE 50 ES 2RS	50	75	35	28	66	156.00	780.0	6	0.540
GE 60 ES	GE 60 ES 2RS	60	90	44	36	80	245.00	1220.0	6	1.000
GE 70 ES	GE 70 ES 2RS	70	105	49	40	92	315.00	1560.0	6	1.500
GE 80 ES	GE 80 ES 2RS	80	120	55	45	105	400.00	2000.0	6	2.200
GE 90 ES	GE 90 ES 2RS	90	130	60	50	115	490.00	2450.0	5	2.700
GE 100 ES	GE 100 ES 2RS	100	150	70	55	130	610.00	3050.0	7	4.300
GE 110 ES	GE 110 ES 2RS	110	160	70	55	140	655.00	3250.0	6	4.700
GE 120 ES	GE 120 ES 2RS	120	180	85	70	160	950.00	4750.0	6	8.000
GE 140 ES	GE 140 ES 2RS	140	210	90	70	180	1080.00	5400.0	7	11.000
GE 160 ES	GE 160 ES 2RS	160	230	105	80	200	1370.00	6800.0	8	13.500
GE 180 ES	GE 180 ES 2RS	180	260	105	80	225	1530.00	7650.0	6	18.500
GE 200 ES	GE 200 ES 2RS	200	290	130	100	250	2120.00	10600.0	7	28.000
GE 220 ES	GE 220 ES 2RS	220	320	135	100	275	2320.00	11600.0	8	35.500
GE 240 ES	GE 240 ES 2RS	240	340	140	100	300	2550.00	12700.0	8	40.000
GE 260 ES	GE 260 ES 2RS	260	370	150	110	325	3050.00	15300.0	7	50.000

[1] No oil groove and oil holes

GEZ...ES
GEZ...ES 2RS Series

sliding contact surface: steel/steel
inch sizes

...ES

...ES 2RS
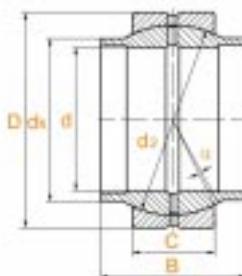
| Type | with seals | Dimension (mm) | | | | | Basic load ratings (kN) | | Misalign Angle | Mass |
		d	D	B	C	d2	dyn. Cr	stat. Cor	α° ≈	kg ≈
GEZ 12 ES		12.700	22.225	11.10	9.52	18.3	13.0	41.0	6	0.022
GEZ 15 ES		15.875	26.988	13.89	11.91	22.8	21.6	65.5	6	0.036
GEZ 19 ES		19.050	31.750	16.66	14.27	27.4	31.5	95.0	6	0.053
GEZ 22 ES		22.225	36.513	19.43	16.66	32.0	42.5	127.0	6	0.085
GEZ 25 ES	GEZ 25 ES 2RS	25.400	41.275	22.22	19.05	36.5	56.0	166.0	6	0.121
GEZ 31 ES	GEZ 31 ES 2RS	31.750	50.800	27.76	23.80	45.6	86.5	260.0	6	0.232
GEZ 34 ES	GEZ 34 ES 2RS	34.925	55.563	30.15	26.19	49.2	102.0	310.0	6	0.351
GEZ 38 ES	GEZ 38 ES 2RS	38.100	61.913	33.32	28.58	54.7	125.0	375.0	6	0.422
GEZ 44 ES	GEZ 44 ES 2RS	44.450	71.438	38.89	33.32	63.9	170.0	510.0	6	0.641
GEZ 47 ES	GEZ 47 ES 2RS	47.638	90.488	50.01	42.85	82.0	280.0	850.0	6	0.932
GEZ 50 ES	GEZ 50 ES 2RS	50.800	80.963	44.45	38.10	73.0	224.0	670.0	6	1.330
GEZ 57 ES	GEZ 57 ES 2RS	57.150	90.488	50.01	42.85	82.0	280.0	850.0	6	1.850
GEZ 63 ES	GEZ 63 ES 2RS	63.500	100.013	55.55	47.62	91.2	355.0	1060.0	6	2.420
GEZ 69 ES	GEZ 69 ES 2RS	69.850	111.125	61.11	52.37	100.3	500.0	1500.0	6	3.100
GEZ 76 ES	GEZ 76 ES 2RS	76.200	120.650	66.67	57.15	109.5	585.0	1760.0	6	3.820
GEZ 82 ES	GEZ 82 ES 2RS	82.550	130.175	72.24	61.90	118.7	680.0	2040.0	6	4.790
GEZ 88 ES	GEZ 88 ES 2RS	88.900	139.700	77.77	66.68	128.0	780.0	2360.0	6	5.780
GEZ 95 ES	GEZ 95 ES 2RS	95.250	149.225	83.34	71.42	137.0	900.0	2650.0	6	6.990
GEZ 101 ES	GEZ 101 ES 2RS	101.600	158.750	88.90	76.20	146.0	1066.03	5330.2	6	8.410
GEZ 114 ES	GEZ 114 ES 2RS	114.300	177.800	100	85.73	164.5	1120.0	3400.0	6	9.790
GEZ 120 ES	GEZ 120 ES 2RS	120.650	187.325	105.56	90.47	173.4	1250.0	3750.0	6	11.500
GEZ 127 ES	GEZ 127 ES 2RS	127.000	196.850	111.13	95.25	182.6	1400.0	4150.0	6	13.500
GEZ 152 ES	GEZ 152 ES 2RS	152.400	222.250	120.65	104.77	207.2	1730.0	5200.0	5	17.500
GEZ 165 ES	GEZ 165 ES 2RS	165.100	247.650	123.82	103.17	222.8	1953.77	9768.8	7	22.900
GEZ 177 ES	GEZ 177 ES 2RS	177.800	266.700	133.35	111.12	239.9	2266.61	11333.0	7	28.600
GEZ 190 ES	GEZ 190 ES 2RS	190.500	285.750	142.87	119.05	257.0	2601.28	13006.4	7	35.100
GEZ 203 ES	GEZ 203 ES 2RS	203.200	304.800	152.40	127.00	274.2	2960.46	14802.3	7	42.600
GEZ 215 ES	GEZ 215 ES 2RS	215.900	323.850	161.92	134.92	291.3	3341.30	16706.5	7	51.100

spherical plain bearings
requiring maintenance

GE...LO Series

sliding contact surface: steel/steel
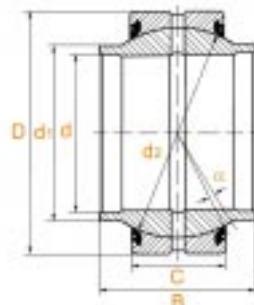
GE...LO

Type	Dimension (mm)						Basic load ratings (kN)		Misalign Angle	Mass
	d	D	B	C	d_2	d_k	dyn. C_r	stat. C_{or}	α^o ≈	kg ≈
GE 12 LO[1]	12	22	12	7	18	15.5	10.8	54	4	0.020
GE 16 LO	16	28	16	9	23	20.0	17.6	88	4	0.030
GE 20 LO	20	35	20	12	29	25.0	30.0	146	4	0.070
GE 25 LO	25	42	25	16	35	30.0	48.0	240	4	0.120
GE 30 LO	30	47	30	18	40	34.0	62.0	310	4	0.168
GE 32 LO	32	52	32	18	44	37.0	67.0	335	4	0.200
GE 35 LO	35	55	35	20	47	40.0	79.0	399	4	0.253
GE 40 LO	40	62	40	22	53	46.0	100.0	500	4	0.340
GE 50 LO	50	75	50	28	66	57.0	156.0	780	4	0.560
GE 63 LO	63	95	63	36	83	71.5	255.0	1270	4	1.200
GE 70 LO	70	105	70	40	92	78.0	315.0	1560	4	1.700
GE 80 LO	80	120	80	45	105	91.0	400.0	2000	4	2.400
GE 90 LO	90	130	90	50	115	99.0	490.0	2450	4	3.200
GE 100 LO	100	150	100	55	130	113.0	610.0	3050	4	4.800
GE 110 LO	110	160	110	55	140	124.0	655.0	3250	4	5.800
GE 125 LO	125	180	125	70	160	138.0	950.0	4750	4	8.500
GE 160 LO	160	230	160	80	200	177.0	1370	6800	4	16.500
GE 200 LO	200	290	200	100	250	221.0	2120	10600	4	32.000

[1] No oil groove and oil holes

GE...HO 2RS Series

sliding contact surface: steel/steel

GE...HO 2RS

Type	Dimension (mm)						Basic load ratings (kN)		Misalign Angle	Mass
	d	D	B	C	d_2	d_k	dyn. C_r	stat. C_{or}	α^o ≈	kg ≈
GE 17 HO 2RS	17	30	21	10	25	21.0	21.2	106	3	0.400
GE 20 HO 2RS	20	35	24	12	29	24.0	30.0	146	6	0.057
GE 25 HO 2RS	25	42	29	16	35	29.0	48.0	240	4	0.100
GE 30 HO 2RS	30	47	30	18	40	33.5	62.0	310	4	0.140
GE 35 HO 2RS	35	55	35	20	47	39.5	80.0	400	4	0.240
GE 40 HO 2RS	40	62	38	22	53	45.0	100.0	500	4	0.290
GE 45 HO 2RS	45	68	40	25	60	51.0	127.0	640	4	0.430
GE 50 HO 2RS	50	75	43	28	66	57.0	156.0	780	4	0.540
GE 60 HO 2RS	60	90	54	36	80	68.0	245.0	1220	3	1.100
GE 70 HO 2RS	70	105	65	40	92	78.0	315.0	1560	4	1.600
GE 80 HO 2RS	80	120	74	45	105	89.0	400.0	2000	4	2.400
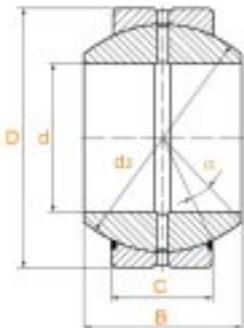
spherical plain bearings
requiring maintenance

GE...FO
GE...FO 2RS Series

sliding contact surface: steel/steel

...FO

...FO 2RS

Type	with seals	Dimension (mm)					Basic load ratings (kN)		Misalign Angle	Mass
		d	D	B	C	d_2	dyn. C_r	stat. C_{or}	α ≈	kg ≈
GE 6 FO[1]		6	16	9	5	13	5.50	27.5	21	0.008
GE 8 FO[1]		8	19	11	6	16	8.15	40.5	21	0.014
GE 10 FO[1]		10	22	12	7	18	10.80	54.0	18	0.020
GE 12 FO[1]		12	26	15	9	22	17.00	85.0	18	0.034
GE 15 FO	GE 15 FO 2RS	15	30	16	10	25	21.20	106.0	16	0.046
GE 17 FO	GE 17 FO 2RS	17	35	20	12	29	30.00	146.0	19	0.078
GE 20 FO	GE 20 FO 2RS	20	42	25	16	35	48.00	240.0	17	0.150
GE 25 FO	GE 25 FO 2RS	25	47	28	18	40	62.00	310.0	17	0.190
GE 30 FO	GE 30 FO 2RS	30	55	32	20	47	80.00	400.0	17	0.290
GE 35 FO	GE 35 FO 2RS	35	62	35	22	53	100.00	500.0	16	0.390
GE 40 FO	GE 40 FO 2RS	40	68	40	25	60	127.00	640.0	17	0.520
GE 45 FO	GE 45 FO 2RS	45	75	43	28	66	156.00	780.0	15	0.680
GE 50 FO	GE 50 FO 2RS	50	90	56	36	80	245.00	1220.0	17	1.400
GE 60 FO	GE 60 FO 2RS	60	105	63	40	92	315.00	1560.0	17	2.000
GE 70 FO	GE 70 FO 2RS	70	120	70	45	105	400.00	2000.0	16	2.900
GE 80 FO	GE 80 FO 2RS	80	130	75	50	115	490.00	2450.0	14	3.500
GE 90 FO	GE 90 FO 2RS	90	150	85	55	130	610.00	3050.0	15	5.400
GE 100 FO	GE 100 FO 2RS	100	160	85	55	140	655.00	3250.0	14	5.900
GE 110 FO	GE 110 FO 2RS	110	180	100	70	160	950.00	4750.0	12	9.700
GE 120 FO	GE 120 FO 2RS	120	210	115	70	180	1080.0	5400.0	16	15.00
GE 140 FO	GE 140 FO 2RS	140	230	130	80	200	1370.0	6800.0	16	18.500
GE 160 FO	GE 160 FO 2RS	160	260	135	80	225	1530.00	7650.0	16	25.000
GE 180 FO	GE 180 FO 2RS	180	290	155	100	250	2120.00	10600.0	14	35.500
GE 200 FO	GE 200 FO 2RS	200	320	165	100	275	2320.00	11600.0	15	45.000

[1] No oil groove and oil holes

spherical plain bearings
maintenance free

CCVI BEARING INDUSTRIES
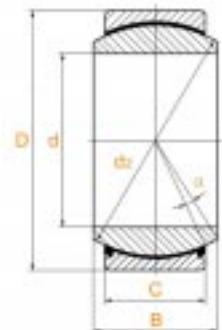
GE…UK
GE…UK 2RS Series

GE…UK: steel/PTFE foil
GE…UK 2RS: steel/PTFE fabric

...UK

...UK.2RS

Type	with seals	Dimension (mm)					Basic load ratings (kN)				Misalign Angle	Mass
		d	D	B	C	d₂	dyn. C_r		stat. C_{or}		α^o ≈	kg ≈
GE 6 UK		6	14	6	4	10	3.6		9		13	0.004
GE 8 UK		8	16	8	5	13	5.85		14.6		15	0.007
GE 10 UK		10	19	9	6	16	8.65		21.6		12	0.011
GE 12 UK		12	22	10	7	18	11.4		28.5		10	0.016
GE 15 UK		15	26	12	9	22	17.6		44		8	0.025
GE 17 UK	GE 17 UK 2RS[1]	17	30	14	10	25	22.40	30.0[1]	56	60[1]	10	0.038
GE 20 UK	GE 20 UK 2RS[1]	20	35	16	12	29	34.5	41.5[1]	78	83[1]	9	0.061
GE 25 UK	GE 25 UK 2RS[1]	25	42	20	16	35	51.00	68.0[1]	127	137[1]	7	0.110
GE 30 UK	GE 30 UK 2RS[1]	30	47	22	18	40	65.50	68.0[1]	166	176[1]	6	0.140
	GE 35 UK 2RS	35	55	25	20	47		112		224	6	0.220
	GE 40 UK 2RS	40	62	28	22	53		140		280	7	0.300
	GE 45 UK 2RS	45	68	32	25	60		180		360	7	0.400
	GE 50 UK 2RS	50	75	35	28	66		220		440	6	0.540
	GE 60 UK 2RS	60	90	44	36	80		345		695	6	1.000
	GE 70 UK 2RS	70	105	49	40	92		440		880	6	1.500
	GE 80 UK 2RS	80	120	55	45	105		570		1140	6	2.200
	GE 90 UK 2RS	90	130	60	50	115		695		1370	5	2.700
	GE 100 UK 2RS	100	150	70	55	130		865		1730	7	4.300
	GE 110 UK 2RS	110	160	70	55	140		930		1860	6	4.700
	GE 120 UK 2RS	120	180	85	70	160		1340		2700	6	8.000
	GE 140 UK 2RS	140	210	90	70	180		1500		3000	7	11.000
	GE 160 UK 2RS	160	230	105	80	200		1930		3800	8	13.500
	GE 180 UK 2RS	180	260	105	80	225		2160		4300	6	18.500
	GE 200 UK 2RS	200	290	130	100	250		3000		6000	7	28.000
	GE 220 UK 2RS[2]	220	320	135	100	275		3350		6550	8	35.500
	GE 240 UK 2RS[2]	240	340	140	100	300		3600		7200	8	40.000
	GE 260 UK 2RS[2]	260	370	150	110	325		4300		8650	7	50.000

(1) Basic load rating of GE…UK 2RS
(2) Double fracture outer ring
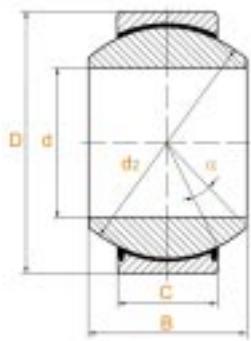
spherical plain bearings
maintenance free

GE...FW
GE...FW 2RS Series

GE...FW: steel/PTFE foil
GE...FW 2RS: steel/PTFE fabric

...FW

...FW 2RS

| Type | with seals | Dimension (mm) | | | | | Basic load ratings (kN) | | Misalign Angle | Mass |
		d	D	B	C	d_2	dyn. C_r	stat. C_{or}	α ≈	kg ≈
GE 6 FW		6	16	9	5	13	5.85	14.6	21	0.008
GE 8 FW		8	19	11	6	16	8.65	21.6	21	0.014
GE 10 FW		10	22	12	7	18	11.40	28.5	18	0.020
GE 12 FW		12	26	15	9	22	17.60	44.0	18	0.034
GE 15 FW		15	30	16	10	25	22.40	56.0	16	0.046
GE 17 FW		17	35	20	12	29	31.50	78.0	19	0.078
GE 20 FW	GE 20 FW 2RS[1]	20	42	25	16	35	51 67[1]	127 135[1]	17	0.150
GE 25 FW	GE 25 FW 2RS[1]	25	47	28	18	40	65.5 86.4[1]	166 174[1]	17	0.190
	GE 30 FW 2RS[1]	30	55	32	20	47	112.00	224.0	17	0.290
	GE 35 FW 2RS	35	62	35	22	53	140.00	280.0	16	0.390
	GE 40 FW 2RS	40	68	40	25	60	180.00	360.0	17	0.520
	GE 45 FW 2RS	45	75	43	28	66	220.00	440.0	15	0.680
	GE 50 FW 2RS	50	90	56	36	80	345.00	695.0	17	1.400
	GE 60 FW 2RS	60	105	63	40	92	440.00	880.0	17	2.000
	GE 70 FW 2RS	70	120	70	45	105	570.00	1140.0	16	2.900
	GE 80 FW 2RS	80	130	75	50	115	695.00	1370.0	14	3.500
	GE 90 FW 2RS	90	150	85	55	130	865.00	1730.0	15	5.400
	GE 100 FW 2RS	100	160	85	55	140	930.00	1860.0	14	5.900
	GE 110 FW 2RS	110	180	100	70	160	1340.00	2700.0	12	9.700
	GE 120 FW 2RS	120	210	115	70	180	1500.00	3000.0	16	15.000
	GE 140 FW 2RS	140	230	130	80	200	1930.00	3800.0	16	18.500
	GE 160 FW 2RS	160	260	135	80	225	2160.00	4300.0	16	25.000
	GE 180 FW 2RS	180	290	155	100	250	3000.00	6000.0	14	35.500
	GE 200 FW 2RS[2]	200	320	165	100	275	3350.00	6550.0	15	45.000

(1) Basic load rating of GE...FW 2RS
(2) Double fracture outer ring
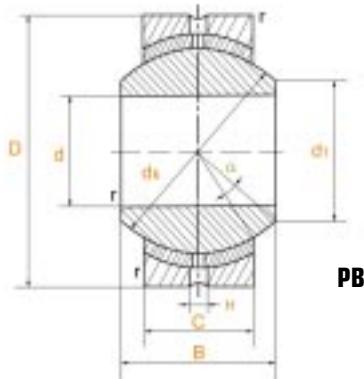
spherical plain bearings
requiring maintenance

PB Series

sliding contact surface: steel/bronze

PB
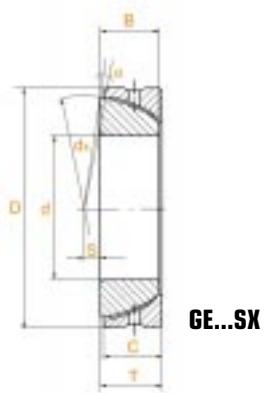
Type	Dimension (mm)								Basic load ratings (kN)		Misalign Angle	Mass
	d	D	C	B	d₁	H	r min	dk	dyn. Cr	stat. Cor	α° ≈	kg ≈
PB 5	5	16	6	8	7.7	1.2	0.5	11.11	3.3	8.0	13	0.008
PB 6	6	18	6.75	9	8.96	1.2	0.3	12.70	4.3	10.3	13	0.013
PB 8	8	22	9	12	10.39	1.2	0.3	15.88	7.1	17.1	14	0.024
PB 10	10	26	10.5	14	12.91	1.5	0.6	19.05	10.0	24.0	13	0.039
PB 12	12	30	12	16	15.42	1.5	0.6	22.23	13.3	32.0	13	0.058
PB 14	14	34	13.5	19	16.85	1.5	0.6	25.40	17.1	41.1	16	0.084
PB 16	16	38	15	21	19.37	1.5	0.6	28.58	21.4	51.4	15	0.111
PB 18	18	42	16.5	23	21.89	2.0	0.6	31.75	26.2	62.9	15	0.160
PB 20	20	46	18	25	24.39	2.0	0.6	34.93	31.4	75.4	14	0.210
PB 22	22	50	20	28	25.84	2.0	0.6	38.10	38.1	91.4	15	0.260
PB 25	25	56	22	31	29.60	2.0	0.6	42.85	47.1	110.0	15	0.390
PB 28	28	62	25	35	32.30	2.0	0.6	33.32	59.5	143.0	15	0.410
PB 30	30	66	25	37	34.80	3.0	0.6	50.08	63.5	148.0	17	0.610

angular contact
spherical plain bearings
requiring maintenance

GE...SX Series

sliding contact surface: steel/steel

GE...SX
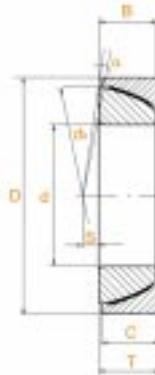
Type	Dimension (mm)							Basic load ratings (kN)		Misalign Angle	Mass
	d	D	T	d_k	B	C	S	dyn. C_r	stat. C_{or}	$\alpha°$ ≈	kg ≈
GE 25 SX	25	47	15	42.5	14	14	1	47.5	236	3.5	0.148
GE 28 SX	28	52	16	47	15	15	1	60.0	300	3.0	0.180
GE 30 SX	30	55	17	50	16	16	2	63.0	315	3.0	0.208
GE 35 SX	35	62	18	56	17	17	2	76.5	390	3.0	0.268
GE 40 SX	40	68	19	60	18	18	1.5	90.0	450	3.0	0.327
GE 45 SX	45	75	20	66	19	19	1.5	106	530	3.0	0.416
GE 50 SX	50	80	20	74	19	19	4	118	585	3.0	0.455
GE 55 SX	55	90	23	80	22	22	4	146	735	3.0	0.645
GE 60 SX	60	95	23	86	22	22	5	160	800	3.0	0.714
GE 65 SX	65	100	23	92	22	22	5	173	865	2.5	0.759
GE 70 SX	70	110	25	102	24	24	7	208	1,040	2.5	1.040
GE 80 SX	80	125	29	115	27	27	10	250	1,250	2.5	1.540
GE 90 SX	90	140	32	130	30	30	11	320	1,600	2.5	2.090
GE 100 SX	100	150	32	140	30	30	12	345	1,760	2.0	2.340
GE 110 SX	110	170	38	160	36	36	15	475	2,360	2.0	3.680
GE 120 SX	120	180	38	170	36	36	17	510	2,550	2.0	3.970
GE 130 SX	130	200	45	190	42	42	20	640	3,200	1.0	5.920
GE 140 SX	140	210	45	200	42	42	20	680	3,450	1.0	6.330
GE 150 SX	150	225	48	213	45	45	21	780	3,900	1.0	8.010
GE 160 SX	160	240	51	225	48	48	21	900	4,500	1.0	9.420
GE 170 SX	170	260	57	250	54	54	27	1,100	5,500	1.0	12.300
GE 180 SX	180	280	64	260	61	61	21	1,320	6,700	1.0	17.400
GE 190 SX	190	290	64	275	61	61	29	1,370	6,950	1.5	18.200
GE 200 SX	200	310	70	290	66	66	26	1,560	7,800	1.0	22.500

angular contact spherical plain bearings maintenance free

GE...SW Series

sliding contact surface: steel/PTFE

GE...SW
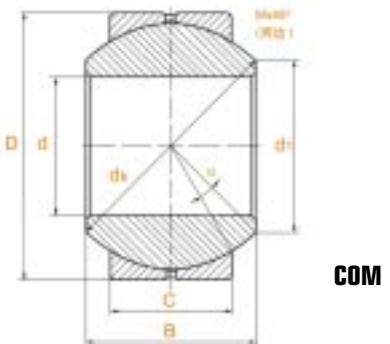
Type	Dimension (mm)							Basic load ratings (kN)		Misalign Angle	Mass
	d	D	T	dk	B	C	S	dyn. Cr	stat. Cor	α° ≈	kg ≈
GE 25 SW	25	47	15	42.5	14	14	1	71.0	140	3.5	0.148
GE 28 SW	28	52	16	47	15	15	1	95.0	190	3.0	0.180
GE 30 SW	30	55	17	50	16	16	2	102	204	3.0	0.208
GE 35 SW	35	62	18	56	17	17	2	116	232	3.0	0.268
GE 40 SW	40	68	19	60	18	18	1.5	134	270	3.0	0.327
GE 45 SW	45	75	20	66	19	19	1.5	160	320	3.0	0.416
GE 50 SW	50	80	20	74	19	19	4	176	355	3.0	0.455
GE 55 SW	55	90	23	80	22	22	4	220	440	3.0	0.645
GE 60 SW	60	95	23	86	22	22	5	240	480	3.0	0.714
GE 65 SW	65	100	23	92	22	22	5	260	520	2.5	0.759
GE 70 SW	70	110	25	102	24	24	7	315	630	2.5	1.040
GE 80 SW	80	125	29	115	27	27	10	375	750	2.5	1.540
GE 90 SW	90	140	32	130	30	30	11	480	965	2.5	2.090
GE 100 SW	100	150	32	140	30	30	12	520	1,040	2.0	2.340
GE 110 SW	110	170	38	160	36	36	15	710	1,430	2.0	3.680
GE 120 SW	120	180	38	170	36	36	17	765	1,530	2.0	3.970
GE 130 SW	130	200	45	190	42	42	20	965	1,930	1.0	5.920
GE 140 SW	140	210	45	200	42	42	20	1,020	2,040	1.0	6.330
GE 150 SW	150	225	48	213	45	45	21	1,180	2,360	1.0	8.010
GE 160 SW	160	240	51	225	48	48	21	1,340	2,700	1.0	9.420
GE 170 SW	170	260	57	250	54	54	27	1,660	3,350	1.0	12.300
GE 180 SW	180	280	64	260	61	61	21	2,000	4,000	1.0	17.400
GE 190 SW	190	290	64	275	61	61	29	2,080	4,150	1.5	18.200
GE 200 SW	200	310	70	290	66	66	26	2,360	4,750	1.0	22.500

spherical plain bearings
requiring maintenance

COM Series

sliding contact surface: steel/steel

COM

Type	Dimension (mm)							Basic load ratings (kN)	Misalign Angle	Mass
	d	D	C	B	d1	M	dk	stat.	$\alpha°$	kg
							REF	C_{or}	≈	≈
COM 3	4.826	14.288	5.54	7.14	7.44	0.38	10.31	14.5	11	0.006
COM 4	6.350	16.667	6.35	8.71	9.24	0.56	12.70	22.0	13.5	0.010
COM 5	7.938	19.050	7.14	9.53	10.62	0.80	14.27	28.8	12	0.014
COM 6	9.525	20.637	7.92	10.31	13.09	0.80	16.66	37.4	10	0.017
COM 7	11.113	23.017	8.71	11.10	13.46	0.80	17.45	42.05	8	0.021
COM 8	12.700	25.400	9.91	12.70	15.24	0.80	19.84	58.9	9.5	0.029
COM 9	14.288	27.780	11.10	14.27	17.05	0.80	22.23	74.0	9.5	0.039
COM 10	15.875	30.163	12.70	15.88	18.77	0.80	24.59	94.7	8.5	0.050
COM 12	19.050	36.513	15.06	19.05	23.36	1.10	30.15	142.0	9	0.093
COM 14	22.225	39.688	17.86	22.22	24.83	1.10	33.32	186.7	9.5	0.119
COM 16	25.400	44.450	20.24	25.40	28.40	1.10	38.10	245.6	10	0.175
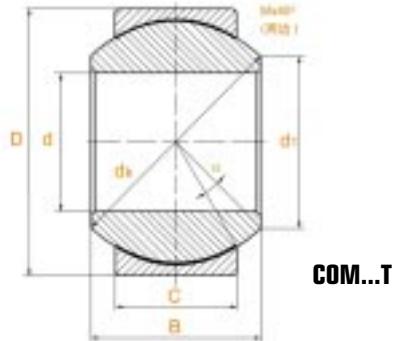
# spherical plain bearings
## maintenance free

COM...T Series
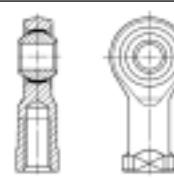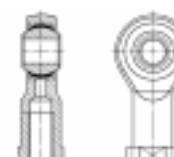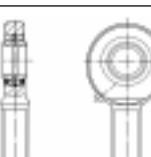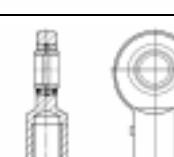
sliding contact surface: steel/PTFE

COM...T

Type	Dimension (mm)							Basic load ratings (kN)	Misalign Angle	Mass
	d	D	C	B	d1	M	dk	stat.	$\alpha °$	kg
							REF	Cor	≈	≈
COM 3 T	4.826	14.288	5.54	7.14	7.44	0.38	10.31	14.5	11	0.006
COM 4 T	6.350	16.667	6.35	8.71	9.24	0.56	12.70	22.0	13.5	0.010
COM 5 T	7.938	19.050	7.14	9.53	10.62	0.80	14.27	28.8	12	0.014
COM 6 T	9.525	20.637	7.92	10.31	13.09	0.80	16.66	37.4	10	0.017
COM 7 T	11.113	23.017	8.71	11.10	13.46	0.80	17.45	42.05	8	0.021
COM 8 T	12.700	25.400	9.91	12.70	15.24	0.80	19.84	58.9	9.5	0.029
COM 9 T	14.288	27.780	11.10	14.27	17.05	0.80	22.23	74.0	9.5	0.039
COM 10 T	15.875	30.163	12.70	15.88	18.77	0.80	24.59	94.7	8.5	0.050
COM 12 T	19.050	36.513	15.06	19.05	23.36	1.10	30.15	142.0	9	0.093
COM 14 T	22.225	39.688	17.86	22.23	24.83	1.10	33.32	186.7	9.5	0.119
COM 16 T	25.400	44.450	20.24	25.40	28.40	1.10	38.10	245.6	10	0.175

engineering data

basic designations and contents of rod ends
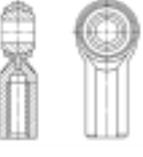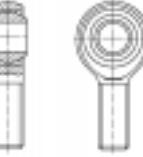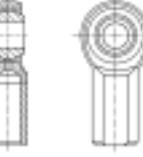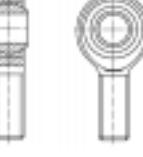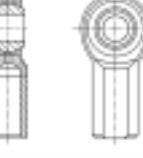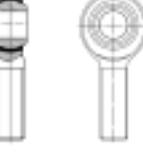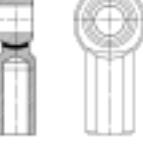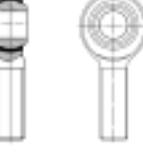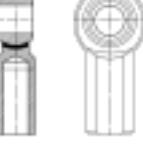
category	subcategory		description	figure
Metric Rod Ends	**2-pieces**	**KMDV**	steel/PTFE, male thread	
		KFDV	steel/PTFE, female thread	
	3-pieces	**COS**	steel/PTFE, male thread	
		CHS	steel/PTFE, female thread	
		GAR..DO	steel/steel, male thread	
		GIR..DO	steel/steel, female thread	
		GAR..UK	steel/PTFE, male thread	

basic designations and contents of rod ends

category	subcategory		description	figure
Metric Rod Ends	**3-pieces**	**GIR..UK**	steel/PTFE，female thread	
		POS...HD	steel/bronze，male thread	
		PHS...HD	steel/bronze，female thread	
	4-pieces	**POS**	steel/bronze，male thread	
		PHS	steel/bronze，female thread	
	Injection Rod Ends	**COS..N**	steel/nylon，male thread	
		CHS..N	steel/nylon，female thread	

engineering data

basic designations and contents of rod ends

category	subcategory		description	figure
Inch Rod Ends	**2-pieces**	**EM/EMA**	steel/steel，male thread	
		EF/EFA	steel/steel，female thread	
	3-pieces	**MA**	steel/steel，male thread	
		FA	steel/steel，female thread	
		MC **MCB**	steel/steel，male thread steel/bronze，male thread	
		FC **FCB**	steel/steel，female thread steel/bronze，female thread	
	Injection Rod Ends	**MCN**	steel/nylon，male thread	
		FCN	steel/nylon，female thread	

◇ **Radial Load Rating**

Typically, rod end strength is measured in two dimensions: radially, or strength vertically when the rod end is in a "standup" position, and axially, or along the axis of an imagined pin through the bore of the rod end's spherical ball.

radial load   axial load
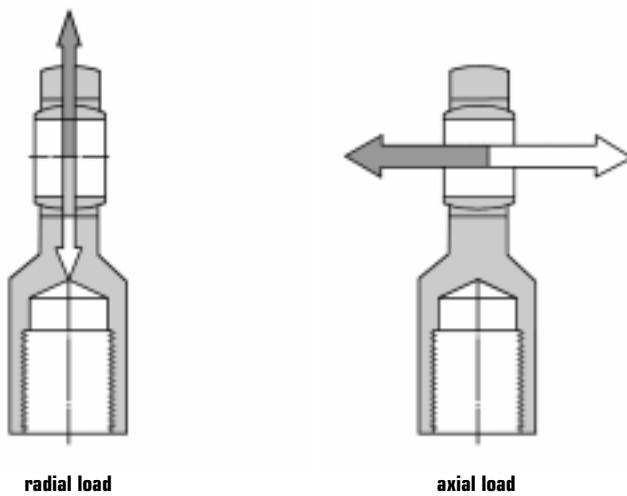
Fig. 11

• **Ultimate Static Radial Load**

Ultimate Static Radial Load is calculated in pounds (or Newton) of force, is that force which when gradually applied in radial direction to the stationery rod ends, results in fracture or catastrophic failure.

• **Static Radial load**

Static Radial Load is that force which, when applied in a manner similar to that above, results in distension of one or more of the rod end components, which effectively renders the rod end as non-functional.

CCVI references the Static Load in this catalog, which generally includes a safety factor of at least 10%.

Note that the load ratings listed assume standard metal-to-metal sliding surface configurations, except where PTFE liners are noted as "standard". Optional grease fittings, PTFE liners, and even customer mounted components can affect the integrity and strength of the rod end components.

◇ **Axial Load Rating**

The axial load is measured by applying a force along the axis of a real or imagined pin through the center of the spherical ball's bore. In general terms, and depending on material and other variables, the axial rating is generally 10-20% of the ultimate static load rating. Because a complete 100% axial load contradicts the purpose of a rod end's misalignment design, axial load is generally considered for reference only. Given the breadth of applications in which a rod end can be placed. CCVI recommends that the load ratings supplied herein be used for reference only, and that the user assure that the load limits not be exceeded.

engineering data

calculation

◇ **Allowed load for rod end**

$$P_{perm} = C_0 b_2 b_6$$

in which: P_{perm} max allowed load for spherical plain bearings rod end, N

        C_0 static equivalent load, N

        b_2 temperature factor

                for lubricated spherical plain bearings rod end, choose from table 23

                for maintenance-free spherical plain bearings rod end:

                steel/copper sliding contact surface, see Fig 12

                steel/PTFE paint cloth sliding contact surface, see Fig 13

                steel/PTFE fiber cloth sliding contact surface, see Fig 14

        b_6 load type factor, see Fig 15

Table.23

working condition		temperature factor
over	to	b_2
-	120	1,0
120	160	0,9
160	180	0,8

Fig. 12

Fig. 13

Fig. 14

+F_r constant load
$b_6 = 1$

+F_r one direction pulse load
$b_6 = 0.5(0.35)$

+F_r
- F_r changing load
$b_6 = 0.5(0.35)$
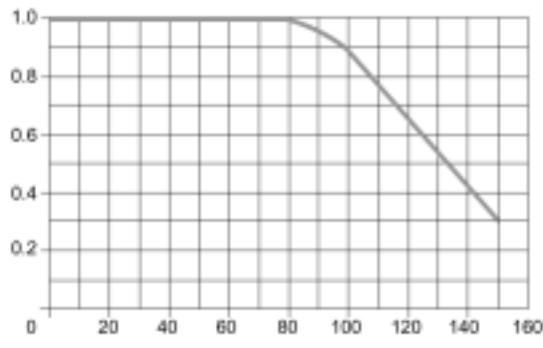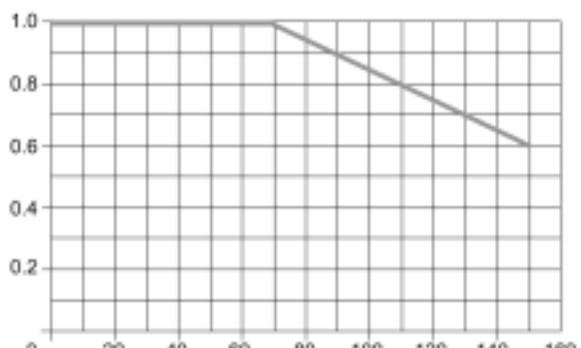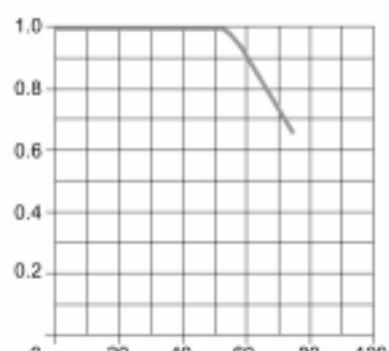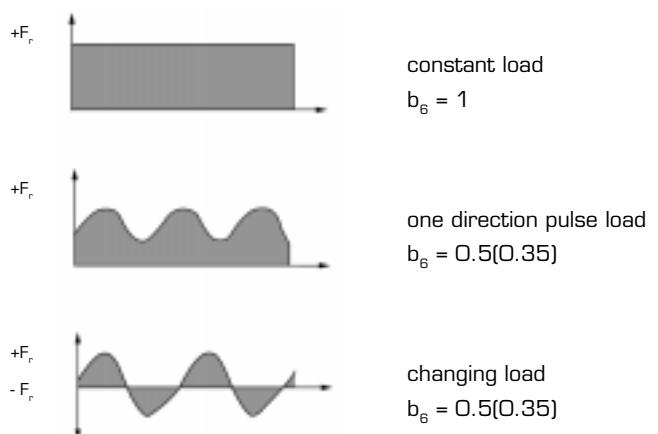
Fig. 15

note: values in the brackets apply to spherical plain bearings rod end with lubricating hole or nozzle.

◇ **Angle of Misalignment**

The primary function of a rod end is to allow for two "fixtures" to misalign against each other, where a completely rigid connection would cause damage or otherwise prevent the connection to function at all. The calculated misalignment is the geometrical cone limited by the centerline axis of the ball's bore, and by the line of limitation of the ball oscillated to its furthest position from center (assuming that a clevis is mounted flush to the ball's face, on both sides). Since the ball can obviously oscillate at maximum two symmetric directions from center, the angle is multiplied by two, in order to give the total angle defined by the misalignment cone.

a(1,2,3) = angle of misalignment
W= width of ball
D= rod end dead diameter
H= housing width
R= ball diameter
B= bore of ball
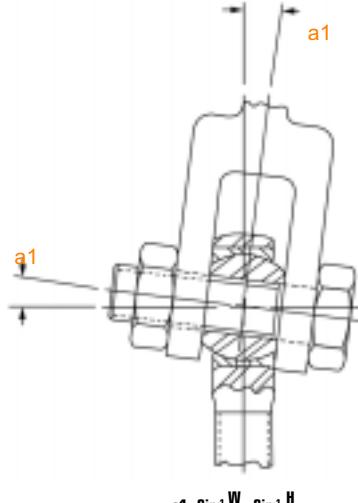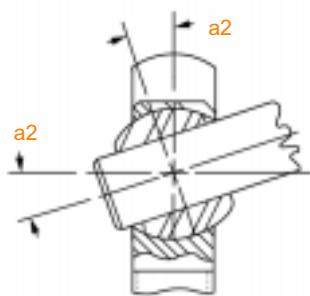
$$a1 = Sin^{-1}\frac{W}{D} - Sin^{-1}\frac{H}{D}$$

$$a2 = Cos^{-1}\frac{B}{R} - Sin^{-1}\frac{H}{R}$$

Fig. 16

$$a3 = Sin^{-1}\frac{W}{R} - Sin^{-1}\frac{H}{R}$$

37
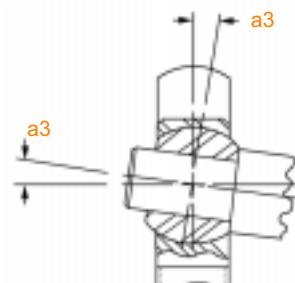
engineering data

Table 24 steel/steel (GAR...DO/GIR...DO, EM, EF, MC, FC, MA, FA)

ID d mm		radial internal clearance μ m	
over	to	min	max
	12	16	68
12	20	20	82
20	35	25	100
35	60	30	120
60	80	36	142

Table 25 steel/bronze (POS/PHS, POS...HD/PHS...HD, MCB, FCB)

ID d mm		radial internal clearance μ m	
over	to	min	max
	6	5	50
6	10	7	61
10	18	8	75
18	30	10	92

Table 26 steel/PTFE (GIR...UK, GAR...UK, EM...T, EF...T, MC...T, FC...T, MA...T, FA...T, COM...T)
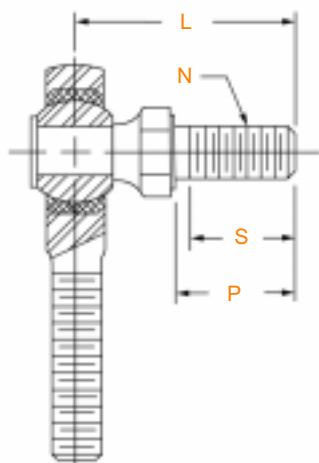
ID d mm		radial internal clearance μ m	breakaway torque Nm
over	to	max	max
	12	28	0.15
12	20	35	0.25
20	30	44	0.40
30	35	50	2.50
35	40	60	2.50
40	45	60	3.50
50	60	60	4.00
60	70	75	5.00

Generally, CCVI recommend to match the male and female thread with same accuracy if application required, it is better to match the female thread with higher accuracy male thread.

For example, match 3A male thread with 2B female thread.

◇ **Accessories**

· **Stud**
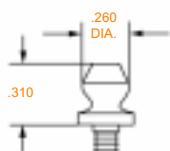
Standard studs are carbon steel, zinc plated with yellow dichromate for corrosion resistance unless specified otherwise
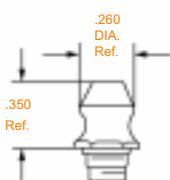
Table 27

Rod End Bore Size	L REF	P 030	S Min Thread Length	N Thread Size UNF-2A
3/16"	1.000	.500	.437	10-32
1/4"	1.031	.562	.500	1/4-28
5/16"	1.219	.687	.593	5/16-24
3/8"	1.562	.906	.812	3/8-24
7/16"	1.750	1.062	.937	7/16-20
1/2"	2.000	1.125	1.000	1/2-20
5/8"	2.500	1.500	1.375	5/8-18
3/4"	3.000	1.812	1.625	3/4-16
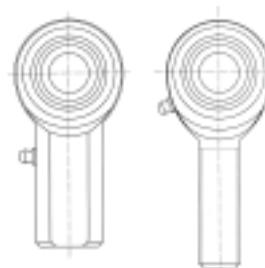
· **Grease fitting**

Standard Drive Fit Zerk

Standard Thread Zerk

Standard grease fitting place ments
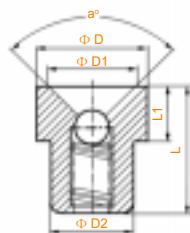
Table 28   Metric Zerk
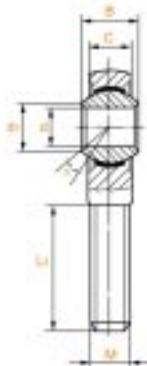
Type	Φ Dmm	Φ D1mm	Φ D2mm	L1 mm	Lmm	a°
BN3.00	4	3.2	3	2	4.6	90
BN4.00	5	4.2	4	2.5	5.5	90

rod ends
metric sizes, maintenance free

KMDV Series

sliding contact surface: steel/PTFE fiber Glass
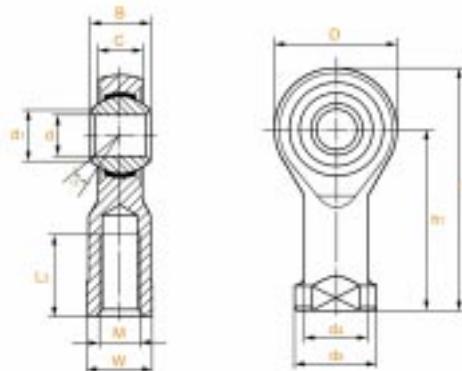
Type	Dimension (mm)									Basic load ratings (kN)		Mass
	d	B	C	D	h1	L4	d1	M 6g	L3	dyn. Cr	stat. Cor	kg ≈
KMDV 4	4	7	5.25	14	30	37	6.5	M4	19	3.25	5.70	0.009
KMDV 5	5	8	6.00	18	33	42	7.7	M5	19	4.25	7.20	0.013
KMDV 6	6	9	6.75	20	36	46	8.9	M6	21	7.10	11.6	0.020
KMDV 8	8	12	9.00	24	42	54	10.3	M8	25	9.80	14.5	0.033
KMDV 10	10	14	10.50	28	48	62	12.9	M10	28	13.20	17.0	0.056
KMDV 12	12	16	12.00	32	54	70	15.4	M12	32	17.0	24.0	0.087
KMDV 14	14	19	13.50	36	60	78	16.8	M14	36	21.4	28.5	0.129
KMDV 16	16	21	15.00	42	66	87	19.3	M16	37	26.0	42.5	0.189
KMDV 20	20	25	18.00	50	78	103	24.3	M20x1.5	45	31.0	42.5	0.348

For left hand thread, add suffix "L" (Ex: KMDVL 8)

KFDV

KFDV...·1 Series

sliding contact surface: steel/PTFE fiber Glass

Type	Dimension (mm)												Basic load ratings (kN)		Mass	Cetop	
	d	B	C	D	h1	L4	d5	d4	d1	W	M 6H	L3	dyn. Cr	stat. Cor	kg ≈	Type	M 6H
KFDV 4	4	7	5.25	14	24	31	9.5	7.8	6.5	8	M4	12	3.25	5.70	0.011	KFDV 4-1	M4
KFDV 5	5	8	6.00	18	27	36	11.0	9.0	7.7	9	M5	10	4.25	7.20	0.018	KFDV 5-1	M4
KFDV 6	6	9	6.75	20	30	40	13.0	10.0	8.9	11	M6	12	7.10	11.6	0.027	KFDV 6-1	M6
KFDV 8	8	12	9.00	24	36	48	16.0	12.5	10.3	13	M8	16	9.80	14.5	0.046	KFDV 8-1	M8
KFDV 10	10	14	10.50	28	43	57	19.0	15.0	12.9	17	M10	20	13.20	17.0	0.076	KFDV 10-1	M10x1.25
KFDV 12	12	16	12.00	32	50	66	22.0	17.5	15.4	19	M12	22	17.0	24.0	0.115	KFDV 12-1	M12x1.25
KFDV 14	14	19	13.50	36	57	75	27.0	20.0	16.8	22	M14	25	21.4	28.5	0.170	KFDV 14-1	M14
KFDV 16	16	21	15.00	42	64	85	29.0	22.0	19.3	22	M16	28	26.0	42.5	0.230	KFDV 16-1	M16x1.5
KFDV 20	20	25	18.00	50	77	102	37.0	27.5	24.3	32	M20x1.5	33	31.0	42.5	0.415	KFDV 20-1	M20x1.5

For left hand thread, add suffix "L" (Ex: KFDVL 8 / KFDVL 8-1)
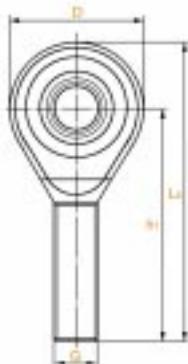
rod ends
metric sizes, maintenance free

COS
SCOS stainless Series
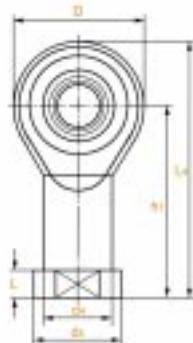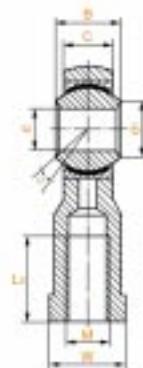
sliding contact surface: steel/PTFE Foil

Type	Dimension (mm)									Basic load ratings (kN)		Angle	Mass
	d	B	C	d₁	D	h₁	L₄	L₃	M	dyn.	stat.	α°	kg
			max		max			min	6g	Cr	Cor	≈	≈
COS 5	5	8	6	7.7	18	33	42	19	M5	6	5.02	13	0.013
COS 6	6	9	6.75	8.9	20	36	46	21	M6	7.65	7.18	13	0.020
COS 8	8	12	9	10.3	24	42	54	25	M8	12.9	13.04	14	0.038
COS 10	10	14	10.5	12.9	28	48	62	28	M10	18	18.5	13	0.055
COS 12	12	16	12	15.4	32	54	70	32	M12	24	20.8	13	0.085
COS 14	14	19	13.5	16.8	36	60	78	36	M14	31	32	16	0.140
COS 16	16	21	15	19.3	42	66	87	37	M16	39	45.2	15	0.210
COS 18	18	23	16.5	21.8	46	72	95	41	M18x1.5	47.5	46.9	15	0.280
COS 20	20	25	18	24.3	50	78	103	45	M20x1.5	57	45.6	14	0.380
COS 22	22	28	20	25.8	54	84	111	48	M22x1.5	68	61.1	15	0.480
COS 25	25	31	22	29.5	60	94	124	55	M24x2	85	72.8	15	0.640
COS 28	28	35	24	32.29	66	103	136	62	M27x2	102.88	78.6	15	0.949
COS 30	30	37	25	34.8	70	110	145	66	M30x2	114	95.9	17	1.100

For left hand thread, add suffix "L" (Ex: COSL 8 /SCOSL 8)

CCVi
BEARING INDUSTRIES

CHS
CHS...-1
SCHS Stainless series

sliding contact surface: steel/PTFE Foil

Type	Dimension (mm)												Basic load ratings (kN)		Angle	Mass	Cetop	
	d	B	C	d1	D	h1	L4	L3	d5	d4	L	W	M	dyn.	stat.	α°	kg		M
			max		max			min	max	max	max		6H	Cr	Cor	≈	≈	Type	6H
CHS 5	5	8	6	7.7	18	27	36	10	11	9	4	9	M5	6	9.18	13	0.016	CHS 5-1	M4
CHS 6	6	9	6.75	8.9	20	30	40	12	13	10	5	11	M6	7.65	8	13	0.022	CHS 6-1	M6
CHS 8	8	12	9	10.3	24	36	48	16	16	12.5	5	14	M8	12.9	13.1	14	0.047	CHS 8-1	M8
CHS 10	10	14	10.5	12.9	28	43	57	20	19	15	6.5	17	M10	18	18.5	13	0.077	CHS 10-1	M10x1.25
CHS 12	12	16	12	15.4	32	50	66	22	22	17.5	6.5	19	M12	24	20.8	13	0.100	CHS 12-1	M12x1.25
CHS 14	14	19	13.5	16.8	36	57	75	25	26	20	8	22	M14	31	32	16	0.160	CHS 14-1	M14x1.5
CHS 16	16	21	15	19.3	42	64	85	28	28	22	8	22	M16	39	45.2	15	0.220	CHS 16-1	M16x1.5
CHS 18	18	23	16.5	21.8	46	71	94	32	31	25	10	27	M18x1.5	47.5	46.9	15	0.320	CHS 18-1	M18x1.5
CHS 20	20	25	18	24.3	50	77	102	33	35	27.5	10	30	M20x1.5	57	45.6	14	0.420	CHS 20-1	M20x1.5
CHS 22	22	28	20	25.8	54	84	111	37	38	30	12	32	M22x1.5	68	61.1	15	0.540	CHS 22-1	M22x1.5
CHS 25	25	31	22	29.5	60	94	124	42	42	33.5	12	36	M24x2	85	72.8	15	0.730	CHS 25-1	M24x2
CHS 28	28	35	24	32.29	66	103	136	51	46	37	14	41	M27x2	102.88	78.6	15	0.949	CHS 28-1	M27x2
CHS 30	30	37	25	34.8	70	110	145	51	50	40	15	41	M30x2	114	95.9	17	1.100	CHS 30-1	M27x2
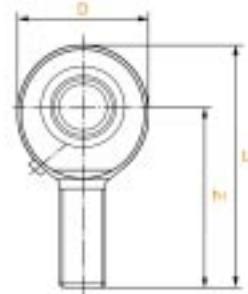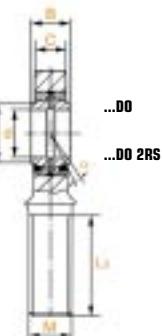
For left hand thread, add suffix "L" (Ex: CHSL 8 / CHSL 8-1 / SCHSL 8)

rod ends
metric sizes, requiring maintenance

GAR...DO
GAR...DO 2RS Series

sliding contact surface: steel/steel
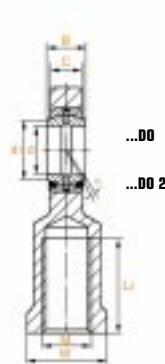
Type		Dimension (mm)									Basic load ratings (kN)		Angle	Mass
		d	B	C	d1	D	h1	L4	L3	M	dyn.	stat.	α °	kg
	with seals				REF				min	6g	Cr	Cor	≈	≈
GAR 6 DO*		6	6	4.4	8.00	21	30	40.5	18	M6	3.40	6.92	13	0.017
GAR 8 DO*		8	8	6.0	10.2	24	36	48.0	22	M8	12.9	12.9	15	0.029
GAR 10 DO*		10	9	7.0	13.2	29	43	57.5	26	M10	8.15	20.6	12	0.051
GAR 12 DO*		12	10	8.0	14.9	34	50	67.0	28	M12	10.8	30.1	11	0.086
GAR 15 DO		15	12	10.0	18.4	40	61	81.0	34	M14	17.0	41.5	8	0.140
GAR 17 DO		17	14	11.0	20.7	46	67	90.0	36	M16	21.2	56.5	10	0.190
GAR 20 DO	GAR 20 DO 2RS	20	16	13.0	24.1	53	77	103.5	43	M20x1.5	30.0	75.6	9	0.310
GAR 25 DO	GAR 25 DO 2RS	25	20	17.0	28.7	64	94	126.0	53	M24x2	48.0	88.2	7	0.560
GAR 30 DO	GAR 30 DO 2RS	30	22	19.0	33.4	73	110	146.0	65	M30x2	62.0	119	6	0.890
GAR 35 DO	GAR 35 DO 2RS	35	25	21.0	39.8	82	140	181.0	82	M36x3	80.0	159	6	1.400
GAR 40 DO	GAR 40 DO 2RS	40	28	23.0	45.0	92	150	196.0	86	M39x3	100.0	194	7	1.800
GAR 45 DO	GAR 45 DO 2RS	45	32	27.0	50.7	102	163	214.0	92	M42x3	127.0	259	7	2.600

1) For left hand thread, use" L" instead of "R" (Ex: GAL 8 DO)

*   No relubrication

GIR...DO
GIR...DO 2RS Series

sliding contact surface: steel/steel

...DO

...DO 2RS

Type	with seals	Dimension (mm)													Basic load ratings (kN)		Angle	Mass
		d	B	C	d1 REF	d2 max	h1	L4	L3 min	d5	d4	L	W	M 6H	dyn. Cr	stat. Cor	α° ≈	kg ≈
GIR 6 DO *		6	6	4.4	8.00	21	30	40.5	11	13	10.0	5.0	11	M6	3.40	10.2	13	0.021
GIR 8 DO*		8	8	6.0	10.2	24	36	48.0	15	16	12.5	5.0	14	M8	12.9	11.6	15	0.039
GIR 10 DO*		10	9	7.0	13.2	29	43	57.5	20	19	15.0	6.5	17	M10	8.15	22.0	12	0.061
GIR 12 DO*		12	10	8.0	14.9	34	50	67.0	23	22	17.5	6.5	19	M12	10.8	30.4	11	0.096
GIR 15 DO		15	12	10.0	18.4	40	61	81.0	30	26	21.0	8.0	22	M14	17.0	44.8	8	0.180
GIR 17 DO		17	14	11.0	20.7	46	67	90.0	34	30	24.0	10.0	27	M16	21.2	56.5	10	0.220
GIR 20 DO	GIR 20 DO 2RS	20	16	13.0	24.1	53	77	103.5	40	35	27.5	10.0	32	M20x1.5	30.0	75.6	9	0.350
GIR 25 DO	GIR 25 DO 2RS	25	20	17.0	28.7	64	94	126.0	48	42	33.5	12.0	36	M24x2	48.0	88.2	7	0.640
GIR 30 DO	GIR 30 DO 2RS	30	22	19.0	33.4	73	110	146.5	56	50	40.0	15.0	41	M30x2	62.0	11.9	6	0.930
GIR 35 DO	GIR 35 DO 2RS	35	25	21.0	39.8	82	125	166.0	60	58	47.0	15.0	50	M36x3	80.0	159	6	1.300
GIR 40 DO	GIR 40 DO 2RS	40	28	23.0	45.0	92	142	188.0	65	65	52.0	18.0	55	M39x3	100.0	194	7	2.000
GIR 45 DO	GIR 45 DO 2RS	45	32	27.0	50.7	102	145	196.0	65	70	58.0	20.0	60	M42x3	127.0	259	7	2.500

1) For left hand thread, use" L" instead of "R" (Ex: GIL 8 DO)

* No relubrication

rod ends
metric sizes, maintenance free
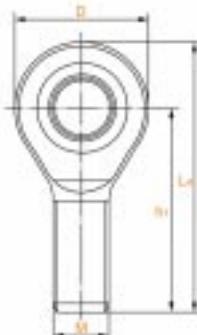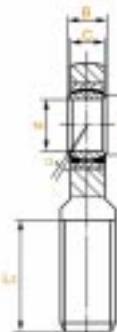
GAR...UK
GAR...UK 2RS Series

sliding contact surface:
GAR...UK: steel/PTFE Foil
GAR...UK 2RS: steel/PTFE Fabric

Type		Dimension (mm)									Basic load ratings (kN)		Angle	Mass
		d	B	C	d1	D	h1	L4	L3	M	dyn.	stat.	α^o	kg
	with seals					max		min		6g	Cr	Cor	≈	≈
GAR 6 UK		6	6	4.4	8.00	21	36	46.5	18	M6	3.60	6.92	13	0.017
GAR 8 UK		8	8	6.0	10.2	24	42	54.0	22	M8	5.85	12.9	15	0.029
GAR 10 UK		10	9	7.0	13.2	29	48	62.5	26	M10	8.65	20.6	12	0.051
GAR 12 UK		12	10	8.0	14.9	34	54	71.0	28	M12	11.4	30.1	10	0.086
GAR 15 UK		15	12	10.0	18.4	40	63	83.0	34	M14	17.6	41.5	8	0.140
GAR 17 UK		17	14	11.0	20.7	46	69	92.0	36	M16	22.4	56.5	10	0.190
GAR 20 UK	GAR 20 UK 2RS[1]	20	16	13.0	24.1	53	78	104.5	43	M20x1.5	31.5	75.6	9	0.310
GAR 25 UK	GAR 25 UK 2RS[1]	25	20	17.0	28.7	64	94	126.0	53	M24x2	51.0	104	7	0.560
GAR 30 UK	GAR 30 UK 2RS[1]	30	22	19.0	33.4	73	110	146.5	65	M30x2	66.5	138	6	0.890
	GAR 35 UK 2RS	35	25	22.0	39.8	82	140	181.0	82	M36x3	140	159	6	1.400
	GAR 40 UK 2RS	40	28	23.0	45.0	92	150	196.0	86	M39x3	185	194	7	1.800
	GAR 45 UK 2RS	45	32	27.0	50.8	102	163	214.0	94	M42x3	240	259	7	2.600

1) Basic load rating of GAR...UK 2RS
2) For left hand thread, use" L" instead of "R" (Ex: GAL 8 UK)
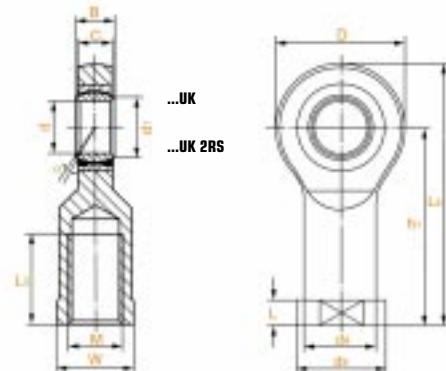
GIR...UK
GIR...UK 2RS Series

sliding contact surface:
GIR...UK: steel/PTFE Foil
GIR...UK 2RS: steel/PTFE Fabric

Type		Dimension (mm)													Basic load ratings (kN)		Angle	Mass
	with seals	d	B	C	d1	D	h1	L4	L3	d5	d4	L	W	M	dyn.	stat.	α °	kg
						max			min					6H	Cr	Cor	≈	≈
GIR 6 UK		6	6	4.4	8.00	21	30	40.5	11	13	10	5.0	11	M6	3.60	10.2	13	0.021
GIR 8 UK		8	8	6.0	10.2	24	36	48.0	15	16	12.5	5.0	14	M8	5.85	16.0	15	0.039
GIR 10 UK		10	9	7.0	13.2	29	43	57.5	20	19	15	6.5	17	M10	8.65	22.0	12	0.061
GIR 12 UK		12	10	8.0	14.9	34	50	67.0	23	22	17.5	6.5	19	M12	11.4	30.4	10	0.096
GIR 15 UK		15	12	10.0	18.4	40	61	81.0	30	26	21	8.0	22	M14	17.6	44.8	8	0.180
GIR 17 UK		17	14	11.0	20.7	46	67	90.0	34	30	24	10.0	27	M16	22.4	56.5	10	0.220
GIR 20 UK	GIR 20 UK 2RS[1]	20	16	13.0	24.1	53	77	103.5	40	35	27.5	10.0	32	M20x1.5	31.5	75.6	9	0.350
GIR 25 UK	GIR 25 UK 2RS[1]	25	20	17.0	28.7	64	94	126.0	48	42	33.5	12.0	36	M24x2	51.0	104	7	0.640
GIR 30 UK	GIR 30 UK 2RS[1]	30	22	19.0	33.4	73	110	146.5	56	50	40	15.0	41	M30x2	66.5	138	6	0.930
	GIR 35 UK 2RS	35	25	21.0	39.8	82	125	166.0	60	58	47	15.0	50	M36x3	140	159	6	1.500
	GIR 40 UK 2RS	40	28	23.0	45.0	92	142	188.0	65	65	52	18.0	55	M39x3	185	194	7	2.100
	GIR 45 UK 2RS	45	32	27.0	50.7	102	145	196.0	65	70	58	20.0	60	M42x3	240	259	7	2.700

1) Basic load rating of GIR...UK 2RS
2) For left hand thread, use" L" instead of "R" (Ex: GIL 8 UK)
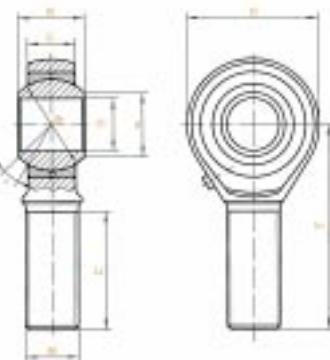
rod ends
metric sizes, requiring maintenance

POS...HD
SPOS...HD stainless Series
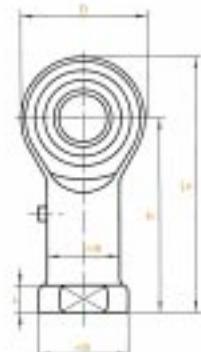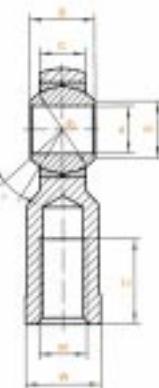
sliding contact surface: steel/bronze

Type	Dimension (mm)										Basic load ratings (kN)		Angle	Mass
	d	B	C	d1	D	h1	L4	L3	dk	M	dyn.	stat.	α°	kg
			max		max			min	REF	6g	Cr	C0r	≈	≈
POS 5 HD	5	8	6	7.7	18	33	42	19	11.11	M5	3.25	5.02	13	0.013
POS 6 HD	6	9	6.75	8.9	20	36	46	21	12.70	M6	4.3	7.18	13	0.020
POS 8 HD	8	12	9	10.3	24	42	54	25	15.88	M8	7.2	13.04	14	0.038
POS 10 HD	10	14	10.5	12.9	28	48	62	28	19.05	M10	10	18.5	13	0.055
POS 12 HD	12	16	12	15.4	32	54	70	32	22.23	M12	13.4	20.8	13	0.085
POS 14 HD	14	19	13.5	16.8	36	60	78	36	25.40	M14	17	32	16	0.140
POS 16 HD	16	21	15	19.3	42	66	87	37	28.55	M16	21.6	45.2	15	0.210
POS 18 HD	18	23	16.5	21.8	46	72	95	41	31.75	M18x1.5	26	46.9	15	0.280
POS 20 HD	20	25	18	24.3	50	78	103	45	34.93	M20x1.5	31.5	45.6	14	0.380
POS 22 HD	22	28	20	25.8	54	84	111	48	38.10	M22x1.5	38	64.1	15	0.480
POS 25 HD	25	31	22	29.5	60	94	124	55	42.86	M24x2	47.5	72.8	15	0.640
POS 28 HD	28	35	24	32.29	66	103	136	62	47.63	M27x2	57.16	78.6	15	0.949
POS 30 HD	30	37	25	34.8	70	110	145	66	50.80	M30x2	64	95.9	17	1.100

For left hand thread, add suffix "L" (Ex: POSL 8 HD / SPOSL 8 HD)

PHS...HD
PHS...-1HD
SPHS...HD stainless Series

sliding contact surface: steel/bronze

Type	Dimension (mm)													Basic load ratings (kN)		Angle	Mass	Cetop	
	d	B	C	d1	D	h1	L4	L3	d5	d4	L	W	dk	M	dyn.	stat.	α°	kg	Type	M
			max		max			min	max				REF	6H	Cr	Cor	≈	≈		6H
PHS 5 HD	5	8	6	7.7	18	27	36	10	11	9	4	9	11.11	M5	3.25	9.18	13	0.016	PHS 5-1 HD	M4
PHS 6 HD	6	9	6.75	8.9	20	30	40	12	13	10	5	11	12.70	M6	4.3	8	13	0.022	PHS 6-1 HD	M6
PHS 8 HD	8	12	9	10.3	24	36	48	16	16	12.5	5	14	15.88	M8	7.2	13.1	14	0.047	PHS 8-1 HD	M8
PHS 10 HD	10	14	10.5	12.9	28	43	57	20	19	15	6.5	17	19.05	M10	10.0	18.5	13	0.077	PHS 10-1 HD	M10x1.25
PHS 12 HD	12	16	12	15.4	32	50	66	22	22	17.5	6.5	19	22.23	M12	13.4	20.8	13	0.100	PHS 12-1 HD	M12x1.25
PHS 14 HD	14	19	13.5	16.8	36	57	75	25	26	20	8	22	25.40	M14	17.0	32	16	0.160	PHS 14-1 HD	M14
PHS 16 HD	16	21	15	19.3	42	64	85	28	28	22	8	22	28.55	M16	21.6	45.2	15	0.220	PHS 16-1 HD	M16x1.5
PHS 18 HD	18	23	16.5	21.8	46	71	94	32	31	25	10	27	31.75	M18x1.5	26.0	46.9	15	0.320	PHS 18-1 HD	M18x1.5
PHS 20 HD	20	25	18	24.3	50	77	102	33	35	27.5	10	30	34.93	M20x1.5	31.5	45.6	14	0.420	PHS 20-1 HD	M20x1.5
PHS 22 HD	22	28	20	25.8	54	84	111	37	38	30	12	32	38.10	M22x1.5	38.0	61.1	15	0.540	PHS 22-1 HD	M22x1.5
PHS 25 HD	25	31	22	29.5	60	94	124	42	42	33.5	12	36	42.86	M24x2	47.5	72.8	15	0.730	PHS 25-1 HD	M24x2
PHS 28 HD	28	35	24	32.29	66	103	136	51	46	37	14	41	47.63	M27x2	57.16	78.6	15	0.949	PHS 28-1 HD	M27x2
PHS 30 HD	30	37	25	34.8	70	110	145	51	50	40	15	41	50.80	M30x2	64.0	95.8	17	1.100	PHS 30-1 HD	M27x2
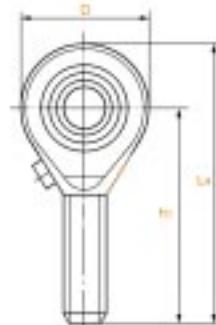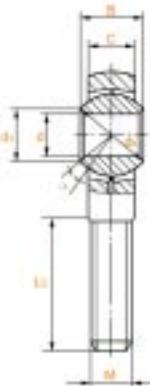
For left hand thread, add suffix "L" (Ex: PHSL 8 HD / PHSL 8-1 HD / SPHSL 8 HD)

rod ends
metric sizes, requiring maintenance

POS
SPOS stainless Series
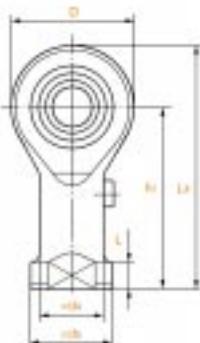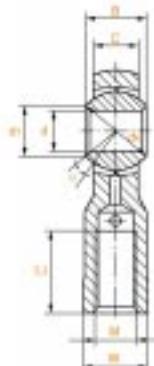
sliding contact surface: steel/bronze

| Type | Dimension (mm) | | | | | | | | | | Basic load ratings (kN) | | Angle | Mass |
	d	B	C	d1	D	h1	L4	L3	dk	M	dyn.	stat.	α°	kg
			max		max			min	REF	6g	Cr	Cor	≈	≈
POS 5	5	8	6	7.7	18	33	42	19	11.11	M5	3.3	5.02	13	0.013
POS 6	6	9	6.75	8.9	20	36	46	21	12.70	M6	4.3	7.18	13	0.020
POS 8	8	12	9	10.3	24	42	54	25	15.88	M8	7.1	13.04	14	0.038
POS 10	10	14	10.5	12.9	28	48	62	28	19.05	M10	10	20.61	13	0.055
POS 12	12	16	12	15.4	32	54	70	32	22.23	M12	13.3	29.89	13	0.085
POS 14	14	19	13.5	16.8	36	60	78	36	25.40	M14	17.1	37.62	16	0.140
POS 16	16	21	15	19.3	42	66	87	37	28.58	M16	21.4	54.69	15	0.210
POS 18	18	23	16.5	21.8	46	72	95	41	31.75	M18x1.5	26.2	50.06	15	0.280
POS 20	20	25	18	24.3	50	78	103	45	34.93	M20x1.5	31.4	58.59	14	0.380
POS 22	22	28	20	25.8	54	84	111	48	38.10	M22x1.5	38.1	68.01	15	0.480
POS 25	25	31	22	29.5	60	94	124	55	42.86	M24x2	47.1	79.42	15	0.640
POS 28	28	35	24	32.29	66	103	136	62	47.63	M27x2	57.16	93.91	15	0.949
POS 30	30	37	25	34.8	70	110	145	66	50.80	M30x2	63.5	102.12	17	1.100

For left hand thread, add suffix "L" (Ex: POSL 8 / SPOSL 8)

PHS
PHS...-1
SPHS stainless Series

sliding contact surface: steel/bronze

Type	Dimension (mm)														Basic load ratings (kN)		Angle	Mass	Cetop	
	d	B	C	d_1	D	h_1	L_4	L_3	d_5	d_4	L	W	d_k	M	dyn.	stat.	α°	kg		M
			max		max				max				REF	6H	C_r	C_{or}	≈	≈	Type	6H
PHS 5	5	8	6	7.7	18	27	36	10	11	9	4	9	11.11	M5	3.3	11.88	13	0.016	PHS 5-1	M4
PHS 6	6	9	6.75	8.9	20	30	40	12	13	10	5	11	12.70	M6	4.3	13.55	13	0.022	PHS 6-1	M6
PHS 8	8	12	9	10.3	24	36	48	16	16	12.5	5	14	15.88	M8	7.1	19.39	14	0.047	PHS 8-1	M8
PHS 10	10	14	10.5	12.9	28	43	57	20	19	15	6.5	17	19.05	M10	10	25.69	13	0.077	PHS 10-1	M10x1.25
PHS 12	12	16	12	15.4	32	50	66	22	22	17.5	6.5	19	22.23	M12	13.3	32.32	13	0.100	PHS 12-1	M12x1.25
PHS 14	14	19	13.5	16.8	36	57	75	25	26	20	8	22	25.40	M14	17.1	37.62	16	0.160	PHS 14-1	M14
PHS 16	16	21	15	19.3	42	64	85	28	28	22	8	22	28.58	M16	21.4	54.69	15	0.220	PHS 16-1	M16x1.5
PHS 18	18	23	16.5	21.8	46	71	94	32	31	25	10	27	31.75	M18x1.5	26.2	50.06	15	0.320	PHS 18-1	M18x1.5
PHS 20	20	25	18	24.3	50	77	102	33	35	27.5	10	30	34.93	M20x1.5	31.4	58.59	14	0.420	PHS 20-1	M20x1.5
PHS 22	22	28	20	25.8	54	84	111	37	38	30	12	32	38.10	M22x1.5	38.1	68.01	15	0.540	PHS 22-1	M22x1.5
PHS 25	25	31	22	29.5	60	94	124	42	42	33.5	12	36	42.86	M24x2	47.1	79.42	15	0.730	PHS 25-1	M24x2
PHS 28	28	35	24	32.29	66	103	136	51	46	37	14	41	47.63	M27x2	57.16	93.91	15	0.949	PHS 28-1	M27x2
PHS 30	30	37	25	34.8	70	110	145	51	50	40	15	41	50.80	M30x2	63.5	102.23	17	1.100	PHS 30-1	M27x2
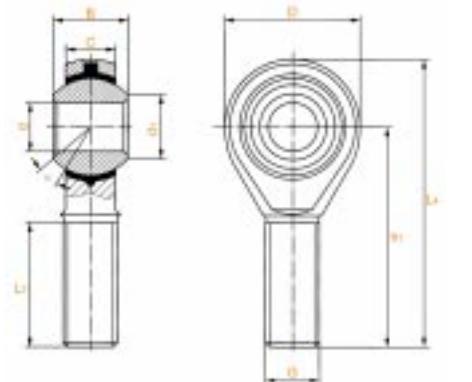
For left hand thread, add suffix "L" (Ex: PHSL 8 / PHSL 8-1 / SPHSL 8)

injection rod ends
metric sizes, maintenance free

COS...N Series

sliding contact surface: steel/nylon
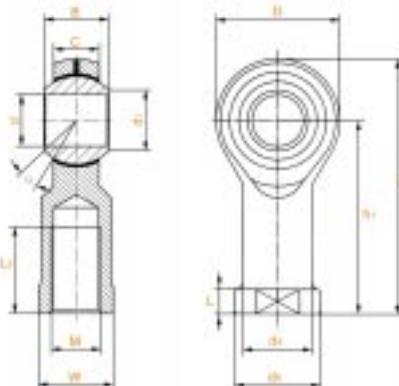
Type	Dimension (mm)									Basic load ratings (kN)		Angle	Mass
	d	B	C	d₁	D	h₁	L₄	L₃	M	dyn.	stat.	α°	kg
			max		max			min	6g	Cr	Cor	≈	≈
COS 5 N	5	8	6	7.7	18	33	42	19	M5	1.90	3.62	13	0.012
COS 6 N	6	9	6.75	8.9	20	36	46	21	M6	2.17	5.05	13	0.020
COS 8 N	8	12	9	10.3	24	42	54	25	M8	3.48	9.16	14	0.035
COS 10 N	10	14	10.5	12.9	28	48	62	28	M10	5.14	14.61	13	0.055
COS 12 N	12	16	12	15.4	32	54	70	32	M12	6.25	18.14	13	0.090
COS 14 N	14	19	13.5	16.8	36	60	78	36	M14	8.72	24.02	16	0.130
COS 16 N	16	21	15	19.3	42	66	87	37	M16	10.49	28.43	15	0.185
COS 18 N	18	23	16.5	21.8	46	72	95	41	M18x1.5	13.23	35.79	15	0.250
COS 20 N	20	25	18	24.3	50	78	103	45	M20x1.5	15.39	41.18	14	0.310
COS 22 N	22	28	20	25.8	54	84	111	48	M22x1.5	18.73	50.01	15	0.400
COS 25 N	25	31	22	29.5	60	94	124	55	M24x2	22.97	58.24	15	0.5032
COS 28 N	28	35	24	32.29	66	103	136	62	M27x2	27.57	62.88	15	0.6833
COS 30 N	30	37	25	34.8	70	110	145	66	M30x2	30.00	76.72	17	0.770

For left hand thread, add suffix "L" (Ex: COSL 8 N)

CHS...N Series

sliding contact surface: steel/nylon

| Type	Dimension (mm)													Basic load ratings (kN)		Angle	Mass
	d	B	C	d1	D	h1	L4	L3	d5	d4	L	W	M	dyn.	stat.	α°	kg
			max		max			min	max	max	max		6H	Cr	Cor	≈	≈
CHS 5 N	5	8	6	7.7	18	27	36	10	11	9	4	9	M5	1.90	5.98	13	0.015
CHS 6 N	6	9	6.75	8.9	20	30	40	12	13	10	5	11	M6	2.17	7.55	13	0.020
CHS 8 N	8	12	9	10.3	24	36	48	16	16	12.5	5	14	M8	3.48	10.29	14	0.045
CHS 10 N	10	14	10.5	12.9	28	43	57	20	19	15	6.5	17	M10	5.14	14.61	13	0.070
CHS 12 N	12	16	12	15.4	32	50	66	22	22	17.5	6.5	19	M12	6.25	18.14	13	0.090
CHS 14 N	14	19	13.5	16.8	36	57	75	25	26	20	8	22	M14	8.72	24.02	16	0.150
CHS 16 N	16	21	15	19.3	42	64	85	28	28	22	8	22	M16	10.49	28.43	15	0.200
CHS 18 N	18	23	16.5	21.8	46	71	94	32	31	25	10	27	M18x1.5	13.23	35.79	15	0.290
CHS 20 N	20	25	18	24.3	50	77	102	33	35	27.5	10	30	M20x1.5	15.39	41.18	14	0.380
CHS 22 N	22	28	20	25.8	54	84	111	37	38	30	12	32	M22x1.5	18.73	50.01	15	0.480
CHS 25 N	25	31	22	29.5	60	94	124	42	42	33.5	12	36	M24x2	22.97	58.24	15	0.570
CHS 28 N	28	35	24	32.29	66	103	136	51	46	37	14	41	M27x2	27.57	62.88	15	0.712
CHS 30 N	30	37	25	34.8	70	110	145	51	50	40	15	41	M30x2	30.00	76.72	17	0.825
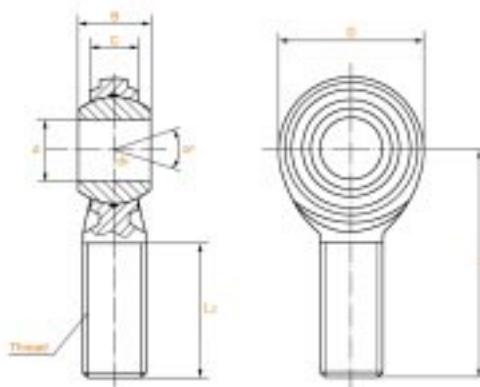
For left hand thread, add suffix "L" (Ex: CHSL 8 N)

commercial rod ends
inch sizes

EM Series

sliding contact surface: steel/steel

Type	Dimension (inch)					Ball Dia.	L3	thread	Ultimate Radial Static Load Capacity	Angle	Mass
	d	D	B	C	dk		+.062 -.031	UNF 3A	LBS	α° ≈	LBS
EM 3*	.1900	.312	.234	1.250	.625	.437	.750	10-32	1,384	20	.03
EM 4*	.2500	.375	.250	1.562	.750	.500	1.000	1/4-28	2,543	27	.04
EM 4-5*	.2500	.375	.250	1.875	.875	.500	1.250	5/16-24	4,574	27	.07
EM 5*	.3125	.437	.312	1.875	.875	.625	1.250	5/16-24	4,113	22	.07
EM 5-6	.3125	.437	.312	1.938	1.000	.625	1.250	3/8-24	5,544	22	.11
EM 6	.3750	.500	.359	1.938	1.000	.719	1.250	3/8-24	5,828	22	.11
EM 7	.4375	.562	.406	2.125	1.125	.812	1.375	7/16-20	7,296	21	.15
EM 8	.5000	.625	.453	2.438	1.312	.937	1.500	1/2-20	9,588	20	.24
EM 10	.6250	.750	.484	2.625	1.500	1.125	1.625	5/8-18	11,169	26	.36
EM 10-12	.6250	.750	.484	2.875	1.750	1.125	1.750	3/4-16	16,807	26	.57
EM 12	.7500	.875	.593	2.875	1.750	1.312	1.750	3/4-16	16,338	24	.57
EM 12-757	.7570	.875	.593	2.875	1.750	1.312	1.750	3/4-16	16,338	24	.57

For grease fitting, add "Z" to part number. Ex: EM 8 Z (See zerk option on page 39)
For left hand thread, add "L" to part number. Ex: EML 8
For stud, add "S" to part number. Ex: EM 8 S (See stud dimensions on page 39)
For PTFE liner, add "T" to part number. Ex: EM 8 T
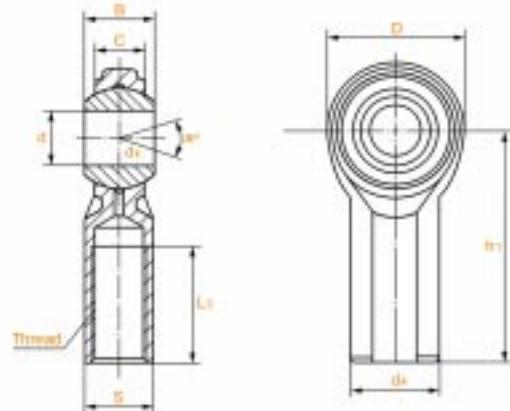
Note: * Grease fitting not available on these sizes.
          Units are supplied without grease fittings.

CCVi BEARING INDUSTRIES

EF Series

sliding contact surface: steel/steel

Type	Dimension (inch)									thread	Ultimate Radial Static Load Capacity	Angle	Mass
	d	D	B	C	dk	S	d4	Ball Dia.	L3 +.062 -.031	UNF 2B	LBS	α ° ≈	LBS
EF 3*	.1900	.312	.234	1.062	.625	.406	.312	.437	.500	10-32	1,384	20	0.04
EF 4*	.2500	.375	.250	1.312	.750	.469	.375	.500	.687	1/4-28	3,468	27	0.05
EF 4-5*	.2500	.375	.250	1.375	.875	.500	.437	.500	.687	5/16-24	4,574	27	0.08
EF 5*	.3125	.437	.312	1.375	.875	.500	.437	.625	.687	5/16-24	4,397	22	0.08
EF 5-6	.3125	.437	.312	1.625	1.000	.687	.562	.625	.812	3/8-24	5,544	22	0.13
EF 6	.3750	.500	.359	1.625	1.000	.687	.562	.719	.812	3/8-24	5,087	22	0.13
EF 6X	.3125	.512	.331	1.625	1.000	.687	.562	.719	.781	3/8-24	5,087	22	0.13
EF 7	.4375	.562	.406	1.812	1.125	.750	.625	.812	.937	7/16-20	7,342	21	0.18
EF 8	.5000	.625	.453	2.125	1.312	.875	.750	0973	1.062	1/2-20	10,460	20	0.29
EF 10	.6250	.750	.484	2.500	1.500	1.000	.875	1.125	1.375	5/8-16	16,807	26	0.43
EF 10-12	.6250	.750	.484	2.875	1.750	1.125	1.000	1.125	0.562	3/4-16	16,338	26	0.65
EF 12	.7500	.875	.593	2.875	1.750	1.125	1.000	1.312	1.562	3/4-16	16,338	24	0.65

For grease fitting, add "Z" to part number. Ex: EF 8 Z (See zerk option on page 39)
For left hand thread, add "L" to part number. Ex: EFL 8
For stud, add "S" to part number. Ex: EF 8 S (See stud dimensions on page 39)
For PTFE liner, add "T" to part number. Ex: EF 8 T
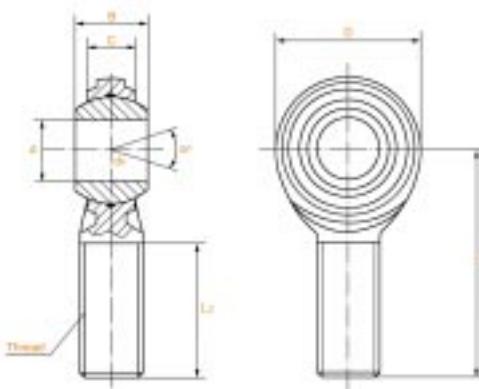
Note: * Grease fitting not available on these sizes.
Units are supplied without grease fittings.

commercial rod ends
inch sizes

EMA Series

sliding contact surface: steel/steel

Type	Dimension (inch)							thread	Ultimate Rodial Static Load Capacity	Angle α°	Mass
	d	D	B	C	dk	h1	L3 +.062 -.031	UNF 3A	LBS	≈	LBS
EMA 3*	.1900	.312	.234	1.250	.625	.437	.750	10-32	2,074	20	.03
EMA 4*	.2500	.375	.250	1.562	.750	.500	1.000	1/4-28	3,820	27	.04
EMA 4-5*	.2500	.375	.250	1.875	.875	.500	1.250	5/16-24	6,534	27	.07
EMA 5*	.3125	.437	.312	1.875	.875	.625	1.250	5/16-24	5,110	22	.07
EMA 5-6	.3125	.437	.312	1.938	1.000	.625	1.250	3/8-24	7,920	22	.11
EMA 6	.3750	.500	.359	1.938	1.000	.719	1.250	3/8-24	7,605	22	.11
EMA 7	.4375	.562	.406	2.125	1.125	.812	1.375	7/16-20	9,122	21	.15
EMA 8	.5000	.625	.453	2.438	1.312	.937	1.500	1/2-20	12,224	20	.24
EMA 10	.6250	.750	.484	2.625	1.500	1.125	1.625	5/8-18	13,540	26	.36
EMA 10-12	.6250	.750	.484	2.875	1.750	1.125	1.750	3/4-16	19,751	26	.57
EMA 12	.7500	.875	.593	2.875	1.750	1.312	1.750	3/4-16	18,810	24	.57

For grease fitting, add "Z" to part number. Ex: EMA 8 Z (See zerk option on page 39)
For left hand thread, add "L" to part number. Ex: EMAL 8
For stud, add "S" to part number. Ex: EMA 8 S (See stud dimensions on page 39)
For PTFE liner, add "T" to part number. Ex: EMA 8 T
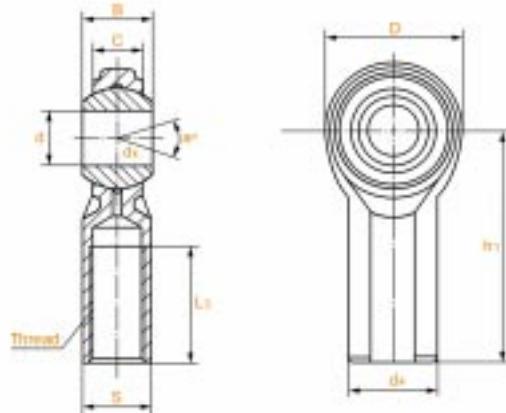
Note: * Grease fitting not available on these sizes.
        Units are supplied without grease fittings.

EFA Series

sliding contact surface: steel/steel

Type	Dimension (inch)									thread	Ultimate Radial Static Load Capacity	Angle α^o	Mass
	d	D	B	C	dk	S	d4	h1	L3 +.062 -.031	UNF 2B	LBS	≈	LBS
EFA 3*	.1900	.312	.234	1.062	.625	.406	.312	.437	.500	10-32	2,079	20	.04
EFA 4*	.2500	.375	.250	1.312	.750	.469	.375	.500	.687	1/4-28	3,820	27	.05
EFA 4-5*	.2500	.375	.250	1.375	.875	.500	.437	.500	.687	5/16-24	6,534	27	.08
EFA 5*	.3125	.437	.312	1.375	.875	.500	.437	.625	.687	5/16-24	5,110	22	.08
EFA 5-6	.3125	.437	.312	1.625	1.000	.687	.562	.625	.812	3/8-24	7,605	22	.13
EFA 6	.3750	.500	.359	1.625	1.000	.687	.562	.719	.812	3/8-24	7,605	22	.13
EFA 7	.4375	.562	.406	1.812	1.125	.750	.562	.812	.937	7/16-20	9,122	21	.18
EFA 8	.5000	.625	.453	2.215	1.312	.875	.625	.937	1.062	1/2-20	12,224	20	.29
EFA 10	.6250	.750	.484	2.500	1.500	1.000	.750	1.125	1.375	5/8-18	13,540	26	.43
EFA 10-12	.6250	.750	.484	2.875	1.750	1.125	.875	1.125	1.562	3/4-16	19,751	26	.65
EFA 12	.7500	.850	.593	2.875	1.750	1.125	1.000	1.312	.562	3/4-16	18,810	24	.65

For grease fitting, add "Z" to part number. Ex: EFA 8 Z (See zerk option on page 39)
For left hand thread, add "L" to part number. Ex: EFAL 8
For stud, add "S" to part number. Ex: EFA 8 S (See stud dimensions on page 39)
For PTFE liner, add "T" to part number. Ex: EFA 8 T
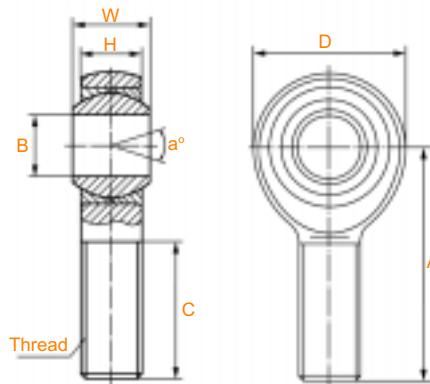
Note: * Grease fitting not available on these sizes.
Units are supplied without grease fittings.

precision rod ends
inch sizes

MA Series

sliding contact surface: steel/steel

Type	Dimension (inch)							thread	Ultimate Radial Static Load Capacity	Angle $\alpha°$	Mass
	d	D	B	C	dk	h1	L3	UNF 3A	LBS	≈	LBS
MA 3	.1900	.312	.250	1.250	.625	.437	.750	10-32	2,851	13	.028
MA 4	.2500	.375	.281	1.562	.750	.500	1.000	1/4-28	5,260	16	.043
MA 5	.3125	.437	.344	1.875	.875	.625	1.250	5/16-24	7,639	14	.072
MA 6	.3750	.500	.406	1.938	1.000	.719	1.250	3/8-24	9,544	12	.112
MA 7	.4375	.562	.437	2.215	1.125	.812	1.375	7/16-24	10,285	14	.160
MA 8	.5000	.625	.500	2.438	1.312	.937	1.500	1/2-20	16,238	12	.249
MA 10	.6250	.750	.562	2.625	1.500	1.125	1.625	5/8-18	17,955	16	.382
MA 12	.7500	.875	.687	2.875	1.750	1.312	1.750	3/4-16	28,081	14	.602
MA 12-20	.7500	.875	.687	2.875	1.750	1.312	1.750	7/8-14	28,081	14	.720
MA 14	.8750	.875	.765	3.375	2.000	1.375	2.000	7/8-14	45,051	7	.906
MA 14-1	.8750	.875	.687	3.375	2.000	1.312	1.875	7/8-14	55,692	12	.906
MA 16	1.0000	1.375	1.000	4.125	2.750	1.875	2.125	1 1/4-12	76,200	17	2.406
MA 16-1	1.0000	1.375	1.000	4.125	2.750	1.875	2.125	1-14*	76,200	17	2.127
MA 16-2	1.0000	1.375	1.000	4.125	2.750	1.875	2.125	1-12	76,200	17	2.127

Units are supplied without grease fittings.
For grease fitting, add "Z" to part number. Ex: MA 8 Z (See zerk option on page 39)
For left hand thread, add "L" to part number. Ex: MAL 8
For stud, add "S" to part number. Ex: MA 8 S (See stud dimensions on page 39)
For PTFE liner, add "T" to part number. Ex: MA 8 T
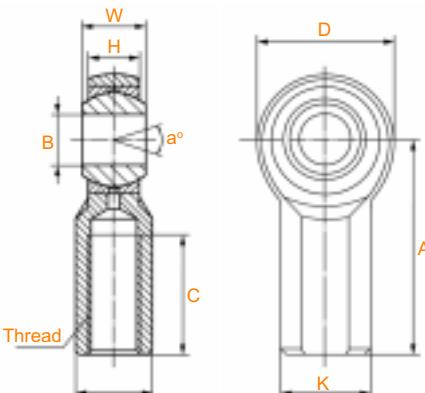
Note: * Thread 1-14 UNS

FA Series

sliding contact surface: steel/steel

Type	Dimension (inch)									thread	Ultimate Rodial Static Load Capacity	Angle	Mass
	d	D	B	C	d$_k$	S	d$_4$	h$_1$	L$_3$	UNF 2B	LBS	α ° ≈	LBS
FA 3	.1900	.312	.250	1.062	.625	.406	.312	.437	.562	10-32	2,079	20	.04
FA 4	.2500	.375	.281	1.312	.750	.469	.375	.500	.750	1/4-28	3,820	27	.05
FA 5	.3125	.437	.344	1.375	.875	.500	.437	.625	.750	5/16-24	6,534	27	.08
FA 6	.3750	.500	.406	1.625	1.000	.687	.562	.719	.937	3/8-24	5,110	22	.08
FA 7	.4375	.562	.437	1.812	1.125	.750	.625	.812	1.062	7/16-24	7,605	22	.13
FA 8	.5000	.625	.500	2.125	1.312	.875	.750	.937	1.187	1/2-20	7,605	22	.13
FA 10	.6250	.750	.562	2.500	1.500	1.000	.875	1.125	1.500	5/8-18	9,122	21	.18
FA 12	.7500	.875	.687	2.875	1.750	1.125	1.000	1.312	1.750	3/4-16	12,224	20	.29
FA 14	.8750	.875	.687	3.375	1.750	1.300	1.125	1.312	1.875	7/8-14	13,540	26	.43
FA 16	1.0000	1.375	1.000	4.125	2.750	1.625	1.500	1.875	2.125	1 1/4-12	19,751	26	.65
FA 16-1	1.0000	1.375	1.000	4.125	2.750	1.625	1.500	1.875	2.125	1-14*	18,810	24	.65
FA 16-2	1.0000	1.375	1.000	4.125	2.750	1.625	1.500	1.875	2.125	1-12			

Units are supplied without grease fittings.
For grease fitting, add "Z" to part number. Ex: FA 8 Z (See zerk option on page 39)
For left hand thread, add "L" to part number. Ex: FAL 8
For stud, add "S" to part number. Ex: FA 8 S (See stud dimensions on page 39)
For PTFE liner, add "T" to part number. Ex: FA 8 T
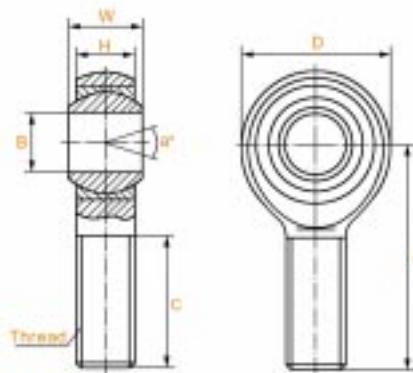
Note: * Thread 1-14 UNS

precision rod ends
inch sizes

MC Series

sliding contact surface: steel/steel

Type	Dimension (inch)					Ball Dia.	C	Thread	Angle	Ultimate Rodial Static Load Capacity	Mass
	B	W	H	A	D	REF	+.062 -.031	UNF 3A	α° ≈	LBS	LBS
MC 3	.1900	.312	.250	1.250	.625	.437	.750	10-32	13	1,169	.028
MC 4	.2500	.375	.281	1.562	.750	.500	1.000	1/4-28	16	2,158	.043
MC 5	.3125	.437	.344	1.875	.875	.625	1.250	5/16-24	14	2,784	.072
MC 6	.3750	.500	.406	1.938	1.000	.719	1.250	3/8-24	12	3,915	.112
MC 7	.4375	.562	.437	2.125	1.125	.812	1.375	7/16-20	14	4,218	.160
MC 8	.5000	.625	.500	2.438	1.312	.937	1.500	1/2-20	12	6,660	.249
MC 10	.6250	.750	.562	2.625	1.500	1.125	1.625	5/8-18	16	7,364	.382
MC 12	.7500	.875	.687	2.875	1.750	1.312	1.750	3/4-16	14	11,518	.602
MC 14	.8750	.875	.765	3.375	2.000	1.375	2.000	7/8-14	7	18,476	.906
MC 14-1	.8750	.875	.687	3.375	2.000	1.312	1.875	7/8-14	12	22,843	.906
MC 16	1.0000	1.375	1.000	4.125	2.750	1.875	2.125	11/4-12	17	43,541	2.406
MC 16-1	1.0000	1.375	1.000	4.125	2.750	1.875	2.125	1-14 ★	17	43,541	2.127
MC 16-2	1.0000	1.375	1.000	4.125	2.750	1.875	2.125	1-12	17	43,541	2.127

Units are supplied without grease fittings.
For grease fitting, add "Z" to part number. Ex: MC 8 Z (See zerk option on page 39)
For left hand thread, add "L" to part number. Ex: MCL 8
For stud, add "S" to part number. Ex: MC 8 S (See stud dimensions on page 39)
For PTFE liner, add "T" to part number. Ex: MC 8 T
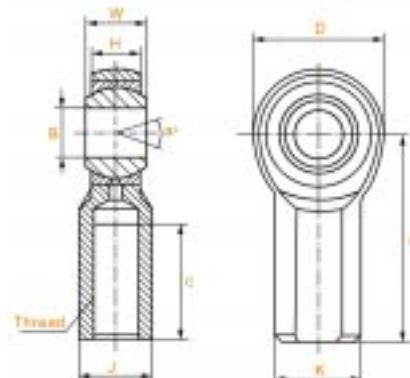
Note: * Thread 1-14 UNS

FC Series

sliding contact surface: steel/steel

| Type | Dimension (inch) | | | | | | | Ball Dia. | C | Thread | Angle | Ultimate Radial Static Load Capacity | Mass |
	B	W	H	A	D	K	J	REF	+.062 -.031	UNF 2B	α° ≈	LBS	LBS
FC 3	.1900	.312	.250	1.062	.625	.406	.312	.437	.562	10-32	13	1,531	0.038
FC 4	.2500	.375	.281	1.312	.750	.469	.375	.500	.750	1/4-28	16	2,539	0.059
FC 5	.3125	.437	.344	1.375	.875	.500	.437	.625	.750	5/16-24	14	3,133	0.092
FC 6	.3750	.500	.406	1.625	1.000	.687	.562	.719	.937	3/8-24	12	3,915	0.152
FC 7	.4375	.562	.437	1.812	1.125	.750	.625	.812	1.062	7/16-20	14	4,218	0.198
FC 8	.5000	.625	.500	2.125	1.312	.875	.750	.937	1.187	1/2-20	12	6,660	0.329
FC 10	.6250	.750	.562	2.500	1.500	1.000	.875	1.125	1.500	5/8-18	16	7,364	0.477
FC 12	.7500	.875	.687	2.875	1.750	1.125	1.000	1.312	1.750	3/4-16	14	11,518	0.723
FC 14	.8750	.875	.765	3.375	2.000	1.300	1.125	1.375	1.875	7/8-14	7	18,476	1.030
FC 14-1	.8750	.875	.687	3.500	2.000	1.312	1.187	1.312	1.812	7/8-14	12	22,843	1.030
FC 16	1.0000	1.375	1.000	4.125	2.750	1.625	1.500	1.875	2.125	11/4-12	17	40,889	2.125
FC 16-1	1.0000	1.375	1.000	4.125	2.750	1.625	1.500	1.875	2.125	1-14*	17	43,541	2.410
FC 16-2	1.0000	1.375	1.000	4.125	2.750	1.625	1.500	1.875	2.125	1-12	17	43,541	2.410

Units are supplied without grease fittings.
For grease fitting, add "Z" to part number. Ex: FC 8 Z (See zerk option on page 39)
For left hand thread, add "L" to part number. Ex: FCL 8
For stud, add "S" to part number. Ex: FC 8 S (See stud dimensions on page 39)
For PTFE liner, add "T" to part number. Ex: FC 8 T
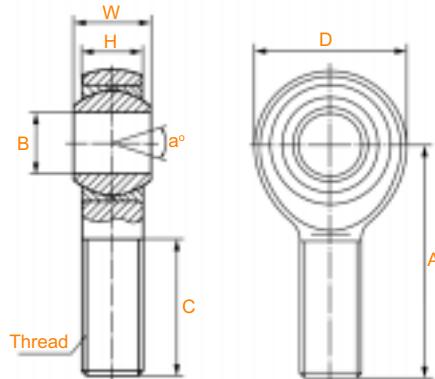
Note: * Thread 1-14 UNS

precision rod ends
inch sizes

MCB Series

sliding contact surface: steel/bronze

Type	Dimension (inch)					Ball Dia.	C	Thread	Angle	Ultimate Rodial Static Load Capacity	Mass
	B	W	H	A	D	REF	+.062 -.031	UNF 3A	α° ≈	LBS	LBS
MCB 3	.1900	.312	.250	1.250	.625	.437	.750	10-32	13	1,169	.028
MCB 4	.2500	.375	.281	1.562	.750	.500	1.000	1/4-28	16	2,158	.043
MCB 5	.3125	.437	.344	1.875	.875	.625	1.250	5/16-24	14	2,784	.072
MCB 6	.3750	.500	.406	1.938	1.000	.719	1.250	3/8-24	12	3,915	.112
MCB 7	.4375	.562	.437	2.125	1.125	.812	1.375	7/16-20	14	4,218	.160
MCB 8	.5000	.625	.500	2.438	1.312	.937	1.500	1/2-20	12	6,660	.249
MCB 10	.6250	.750	.562	2.625	1.500	1.125	1.625	5/8-18	16	7,364	.382
MCB 12	.7500	.875	.687	2.875	1.750	1.312	1.750	3/4-16	14	11,518	.602

Units are supplied without grease fittings.
For grease fitting, add "Z" to part number. Ex: MCB 8 Z (See zerk option on page 39)
For left hand thread, add "L" to part number. Ex: MCBL 8
For stud, add "S" to part number. Ex: MCB 8 S (See stud dimensions on page 39)
For PTFE liner, add "T" to part number. Ex: MCB 8 T
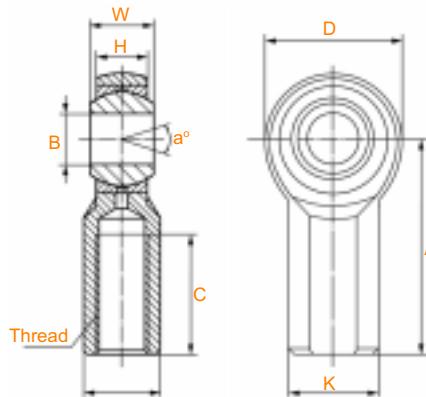
FCB Series

sliding contact surface: steel/bronze

| Type | Dimension (inch) | | | | | | | Ball Dia. | C | Thread | Angle | Ultimate Rodial Static | Mass |
	B	W	H	A	D	K	J	REF	+.062 -.031	UNF 2B	α° ≈	Load Capacity LBS	LBS
FCB 3	.1900	.312	.250	1.062	.625	.406	.312	.437	.562	10-32	13	1,531	.038
FCB 4	.2500	.375	.281	1.312	.750	.469	.375	.500	.750	1/4-28	16	2,539	.059
FCB 5	.3125	.437	.344	1.375	.875	.500	.437	.625	.750	5/16-24	14	3,133	.092
FCB 6	.3750	.500	.406	1.625	1.000	.687	.562	.719	.937	3/8-24	12	3,915	.152
FCB 7	.4375	.562	.437	1.812	1.125	.750	.625	.812	1.062	7/16-20	14	4,218	.198
FCB 8	.5000	.625	.500	2.125	1.312	.875	.750	.937	1.187	1/2-20	12	6,660	.329
FCB 10	.6250	.750	.562	2.500	1.500	1.000	.875	1.125	1.500	5/8-18	16	7,364	.477
FCB 12	.7500	.875	.687	2.875	1.750	1.125	1.000	1.312	1.750	3/4-16	14	11,518	.723

Units are supplied without grease fittings.
For grease fitting, add "Z" to part number. Ex: FCB 8 Z (See zerk option on page 39)
For left hand thread, add "L" to part number. Ex: FCBL 8
For stud, add "S" to part number. Ex: FCB 8 S (See stud dimensions on page 39)
For PTFE liner, add "T" to part number. Ex: FCB 8 T
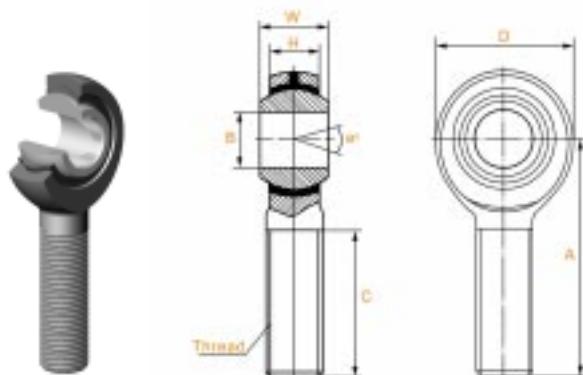
injection rod ends
inch sizes

MCN Series

sliding contact surface: steel/nylon

| Type | Dimension (inch) | | | | | | | Thread | Angle | Ultimate Rodial Static Load Capacity | Mass |
| | B | W | H | A | D | Ball Dia. | C | | $\alpha°$ | | |
						REF	± .06	UNF 2A	≈	LBS	LBS
MCN 3 Y	.1900	.312	.250	1.250	.625	.438	.750	10-32	13	1,210	.023
MCN 4 Y	.2500	.375	.281	1.562	.750	.516	1.000	1/4-28	16	2,470	.040
MCN 5 Y	.3125	.437	.344	1.875	.875	.625	1.250	5/16-24	14	2,740	.071
MCN 6 Y	.3750	.500	.406	1.937	1.000	.719	1.250	3/8-24	12	4,210	.107
MCN 7 Y	.4375	.562	.437	2.125	1.125	.812	1.372	7/16-20	14	5,350	.148
MCN 8 Y	.5000	.625	.500	2.437	1.312	.938	1.500	1/2-20	12	6,430	.232
MCN 10 Y	.6250	.750	.562	2.625	1.500	1.125	1.625	5/8-18	16	8,300	.364
MCN 12 Y	.7500	.875	.687	2.875	1.750	1.312	1.750	3/4-16	14	10,900	.568
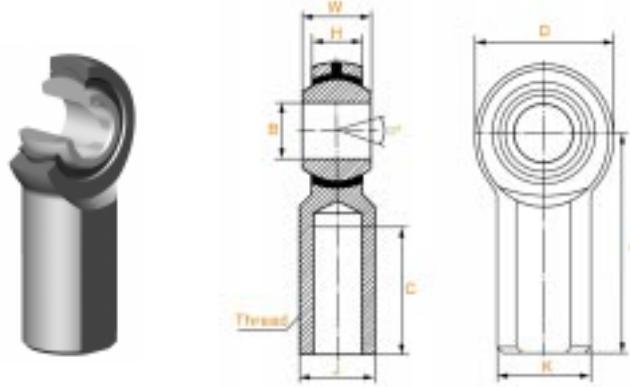
Units are supplied without grease fittings.
For left hand thread, add "L" to part number. Ex: MCNL 8 Y
For stud, add "S" to part number. Ex: MCN 8 Y S (See stud dimensions on page 39)

FCN Series

sliding contact surface: steel/nylon

Type	Dimension (inch)							Ball Dia.	C	Thread	Angle α°	Ultimate Radial Static Load Capacity	Mass
	B	W	H	A	D	K	J	REF	±.06	UNF 2B	≈	LBS	LBS
FCN 3 Y	.1900	.312	.250	1.062	.625	.406	.312	.438	.562	10-32	13	1,210	.036
FCN 4 Y	.2500	.375	.281	1.312	.750	.469	.375	.516	.750	1/4-28	16	2,470	.059
FCN 5 Y	.3125	.437	.344	1.375	.875	.500	.437	.625	.750	5/16-24	14	2,740	.077
FCN 6 Y	.3750	.500	.406	1.625	1.000	.687	.562	.719	.937	3/8-24	12	4,210	.146
FCN 7 Y	.4375	.562	.437	1.812	1.125	.750	.625	.812	1.031	7/16-20	14	5,350	.192
FCN 8 Y	.5000	.625	.500	2.125	1.312	.875	.750	.938	1.187	1/2-20	12	6,430	.313
FCN 10 Y	.6250	.750	.562	2.500	1.500	1.000	.875	1.125	1.500	5/8-18	16	8,300	.464
FCN 12 Y	.7500	.875	.687	2.875	1.750	1.125	1.000	1.312	1.562	3/4-16	14	10,900	.672

Units are supplied without grease fittings.
For left hand thread, add "L" to part number. Ex: FCNL 8 Y
For stud, add "S" to part number. Ex: FCN 8 Y S (See stud dimensions on page 39)

NOTE

spherical plain bearings

rod ends

CCVI
BEARING INDUSTRIES

cam followers

mast bearings

bushing

ball bearings

needle bearings

inner rings

product range