CCTYGroup.com

CCTY

Plain Bearings

China
CCTY Company
458 Jinrun Boulevard, Zhenjiang, China, 212141
Tel:+86-511-8883388
E-mail: info.cn@cctygroup.com

North America
CCTY Company
1111 Rose Road, Lake Zurich, IL60047, USA
Tel:+1-847-540-8196
E-mail: info.usa@cctygroup-us.com

Europe
CCTY GmbH
Gewerbepark West 5, 97525 Schwebheim, Germany
Tel: +49-(0)-9723-9339-000
E-mail: info.de@cctygroup.com

India
CCTY India Private Limited
904-A, at OZONE, Vikram Sarabhai Marg,
Wadivadi, Vadodara-390023, Gujarat, India
Tel: +91 96876 33753/+91 98230 17144
E-mail: info.in@cctygroup.com

Japan
CCTY Japan Corporation
11-5 Shiba 4-chome Minato-ku
Tokyo 108-0014 Japan
Tel: +81-3-5444-4451
E-mail: info.jp@cctygroup.com

CCTY

Plain Bearings

Spherical Plain Bearings
Rod Ends
Bushings

About CCTY

Bold engineering produces bold design. At CCTY our engineers reimagine what is possible in motion control. These innovative ideas lead to patented products like the Square Ball Universal Joint® and bearing assemblies.

As a full-service manufacturing partner, we lend our engineering support to OEMs to quickly turn new product ideas into reality. More than 50% of the bearings we manufacture are bearing assemblies and unique designs specific to OEM customer applications.

Our 70,000 m^2 plant featuring precision robotics and CNC-controlled production is located in Zhenjiang, China. The plant's size allows for all critical processes, such as heat treatment, sintering, welding and phosphating, to be conducted onsite.

Engineering, logistics and customer service is offered at our offices in India, China, Germany, Japan and the United States. For more information about CCTY or to speak with a bearing expert, visit CCTYGroup.com.

CCTY reserves the right to make modifications to the information contained in this product catalog. Any reproduction is prohibited unless authorized by CCTY Company.

All rights reserved © 2024 CCTY Company

Issued: Jul. 2024

Contents

	Page
Product index	4
Spherical plain bearings	20
Rod ends	60
Bushings	90
PTFE composite / Metallic plain bushings	95
Polymer composite / Metallic plain bushings	169
Metallic and bimetallic plain bushings	193
Special designs	216

Product Index

GE .. ES

Radial spherical plain bearing, metric, requires maintenance, ISO 12240-1, dimension series E, sliding contact surface steel/steel

• page 42

GE .. ES 2RS

Radial spherical plain bearing, metric, requires maintenance, ISO 12240-1, dimension series E, sliding contact surface steel/steel, lip seals on both sides

• page 42

GE .. LO

Radial spherical plain bearing, metric, requires maintenance, ISO 12240-1, dimension series W, sliding contact surface steel/steel, cylindrical extensions on inner ring

• page 44

GE .. HO 2RS

Radial spherical plain bearing, metric, requires maintenance, sliding contact surface steel/steel, cylindrical extensions on inner ring, lip seals on both sides

• page 45

GE .. FO

Radial spherical plain bearing, metric, requires maintenance, ISO 12240-1, dimension series G, sliding contact surface steel/steel, heavy duty

• page 46

GE .. FO 2RS

Radial spherical plain bearing, metric, requires maintenance, ISO 12240-1, dimension series G, sliding contact surface steel/steel, heavy duty, lip seals on both sides

• page 46

PB

Radial spherical plain bearing, metric, requires maintenance, ISO 12240-1, dimension series K, sliding contact surface steel/bronze

• page 47

Product Index

GE .. C

Radial spherical plain bearing,
metric, maintenance-free,
ISO 12240-1, dimension series E,
formed steel outer ring, sliding contact
surface steel/PTFE composite

• page 48

GEH .. C

Radial spherical plain bearing,
metric, maintenance-free,
ISO 12240-1, dimension series G,
formed steel outer ring, sliding contact
surface steel/PTFE composite, heavy duty

• page 49

GE .. UK 2RS

Radial spherical plain bearing,
metric, maintenance-free,
ISO 12240-1, dimension series E,
sliding contact surface steel/PTFE fabric,
lip seals on both sides

• page 50

GE .. FW 2RS

Radial spherical plain bearing,
metric,maintenance-free,
ISO 12240-1,dimension series G,
sliding contact surface steel/PTFE fabric,
lip seals on both sides, heavy duty

• page 51

GEZ .. ES

Radial spherical plain bearing,
inch, requires maintenance,
sliding contact surface steel/steel

• page 52

GEZ .. ES 2RS

Radial spherical plain bearing,
inch, requires maintenance,
sliding contact surface steel/steel,
lip seals on both sides

• page 52

COM

Radial spherical plain bearing,
inch, requires maintenance,
formed steel outer ring,
sliding contact surface steel/steel

• page 53

COM .. T

Radial spherical plain bearing,
inch, maintenance-free,
formed steel outer ring, sliding contact
surface steel/PTFE fabric

• page 54

Product Index

GE .. SX

Angular contact spherical plain bearing,
metric, requires maintenance,
ISO 12240-2,
sliding contact surface steel/steel

• page 55

GE .. SW

Angular contact spherical plain bearing,
metric, maintenance-free,
ISO 12240-2,
sliding contact surface steel/PTFE fabric

• page 56

GE .. AX

Axial spherical plain bearing,
metric, requires maintenance,
ISO 12240-3,
sliding contact surface steel/steel

• page 57

GE .. AW

Axial spherical plain bearing,
metric, maintenance-free,
ISO 12240-3,
sliding contact surface steel/PTFE fabric

• page 58

POS .. DF

Rod end,
metric, requires maintenance,
ISO 12240-4, dimension series K
sliding contact surface steel/bronze
male thread, right hand thread

• page 68

PHS .. DF

Rod end,
metric, requires maintenance,
ISO 12240-4, dimension series K,
sliding contact surface steel/bronze
female thread, right hand thread

• page 69

GAR .. DO

Rod end,
metric, requires maintenance,
ISO 12240-4, dimension series E,
sliding contact surface steel/steel,
male thread, right hand thread

• page 70

GAR .. DO 2RS

Rod end,
metric, requires maintenance,
ISO 12240-4, dimension series E,
sliding contact surface steel/steel,
male thread, right hand thread,
lip seals on both sides

• page 70

Product Index

GIR .. DO

Rod end,
metric, requires maintenance,
ISO 12240-4, dimension series E,
sliding contact surface steel/steel,
female thread, right hand thread

• page 71

GIR .. DO 2RS

Rod end,
metric, requires maintenance,
ISO 12240-4, dimension series E,
sliding contact surface steel/steel,
female thread, right hand thread,
lip seals on both sides

• page 71

MC

Precision rod end,
inch, requires maintenance,
sliding contact surface steel/steel,
male thread, right hand thread

• page 72

FC

Precision rod end,
inch, requires maintenance,
sliding contact surface steel/steel,
female thread, right hand thread

• page 73

MA

Precision rod end,
inch, requires maintenance,
sliding contact surface steel/steel,
male thread, right hand thread,
heavy duty

• page 74

FA

Precision rod end,
inch, requires maintenance,
sliding contact surface steel/steel,
female thread, right hand thread,
heavy duty

• page 75

EM

Economical rod end,
inch, requires maintenance,
sliding contact surface steel/steel,
male thread, right hand thread

• page 76

EF

Economical rod end,
inch, requires maintenance,
sliding contact surface steel/steel,
female thread, right hand thread

• page 77

Product Index

COS .. BK

Rod end,
metric, maintenance-free,
ISO 12240-4, dimension series K,
sliding contact surface steel/PTFE
composite, male thread,
right hand thread

• page 78

CHS .. BK

Rod end,
metric, maintenance-free,
ISO 12240-4, dimension series K,
sliding contact surface steel/PTFE
composite, female thread,
right hand thread

• page 79

COS .. N

Rod end,
metric, maintenance-free,
ISO 12240-4, dimension series K,
sliding contact surface steel/polymer,
male thread, right hand thread

• page 80

CHS .. N

Rod end,
metric, maintenance-free,
ISO 12240-4, dimension series K,
sliding contact surface steel/polymer,
female thread, right hand thread

• page 81

GAR .. C

Rod end,
metric, maintenance-free,
ISO 12240-4, dimension series E,
sliding contact surface steel/PTFE
composite, male thread,
right hand thread

• page 82

GIR .. C

Rod end,
metric, maintenance-free,
ISO 12240-4, dimension series E,
sliding contact surface steel/PTFE
composite, female thread,
right hand thread

• page 83

GAR .. UK 2RS

Rod end,
metric, maintenance-free,
ISO 12240-4, dimension series E,
sliding contact surface steel/PTFE fabric,
male thread, right hand thread,
lip seals on both sides

• page 84

GIR .. UK 2RS

Rod end,
metric, maintenance-free,
ISO 12240-4, dimension series E,
sliding contact surface steel/PTFE fabric,
female thread, right hand thread,
lip seals on both sides

• page 85

Product Index

MCN ..

Rod end,
inch, maintenance-free,
sliding contact surface steel/polymer,
male thread, right hand thread

• page 86

FCN ..

Rod end,
inch, maintenance-free,
sliding contact surface steel/polymer,
female thread, right hand thread

• page 87

SQF .. N RS

Ball joint,
metric, maintenance-free,
sliding contact surface steel/polymer,
with boot seal, right hand thread

• page 88

TSA

PTFE composite/Metallic plain bushing
metric, maintenance-free,
ISO 3547,
bushing with steel backing,
sliding layer TSA

• page 116

TSAE

PTFE composite/Metallic plain bushing
inch, maintenance-free,
bushing with steel backing,
sliding layer TSA

• page 124

TSA .. F

PTFE composite/Metallic plain bushing
metric, maintenance-free,
ISO 3547,
flanged bushing with steel backing,
sliding layer TSA

• page 128

TSAE .. F

PTFE composite/Metallic plain bushing
inch, maintenance-free,
flanged bushing with steel backing,
sliding layer TSA

• page 130

TSA .. SF

PTFE composite/Metallic plain bushing
metric, maintenance-free,
ISO 3547-4,
thrust washer with steel backing,
sliding layer TSA

• page 132

Product Index

B-TSA

PTFE composite/Metallic plain bushing
metric, maintenance-free,
ISO 3547,
bushing with bronze backing,
sliding layer TSA

• page 133

TFA

PTFE composite/Metallic plain bushing
metric, maintenance-free,
ISO 3547,
bushing with steel backing,
sliding layer TFA

• page 140

TOA

PTFE composite/Metallic plain bushing
metric, maintenance-free,
ISO 3547,
bushing with steel backing,
sliding layer TOA

• page 147

TGA

PTFE composite/Metallic plain bushing
metric, maintenance-free,
ISO 3547,
bushing with steel backing,
sliding layer TGA

• page 154

TLA

PTFE composite/Metallic plain bushing
metric, maintenance-free,
ISO 3547,
bushing with steel backing,
sliding layer TLA

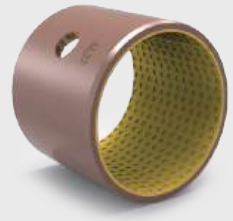
• page 161

PSA

Polymer composite/Metallic plain bushing
metric, low-maintenance,
ISO 3547,
bushing with steel backing,
sliding layer PSA

• page 179

PSAE



Polymer composite/Metallic plain bushing
inch, low-maintenance,
ISO 3547,
bushing with steel backing,
sliding layer PSA

• page 188

PSA .. SF

Polymer composite/Metallic plain bushing
metric, low-maintenance,
ISO 3547-4,
thrust washer with steel backing,
sliding layer PSA

• page 190

Product Index

MBA

Metallic and bimetallic plain bushing
metric, requires maintenance,
bushing with steel backing and leaded
bronze overlay

• page 199

MBB

Metallic and bimetallic plain bushing
metric, requires maintenance,
bushing with steel backing and bronze
overlay

• page 203

MCA

Metallic and bimetallic plain bushing
metric, requires maintenance,
bushing with bronze strip

• page 207

INNOVATION STARTS HERE

SPHERICAL PLAIN BEARINGS

Spherical Plain Bearings

Radial Spherical Plain Bearings
Angular Contact Spherical Plain Bearings
Axial/Thrust Spherical Plain Bearings

Spherical Plain Bearings

Page

Load carrying capacity 24

Friction 28

Spherical plain bearing fit 29

Lubrication and sealing 32

Clearance 34

Installation and disassembly 38

Dimension tables 42

Load Carrying Capacity

Load direction F_r or F_a and movement

Figure 01

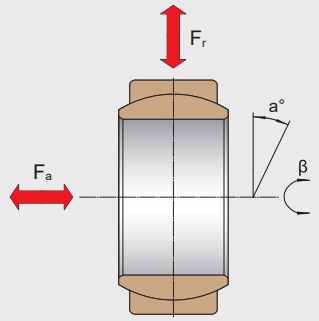
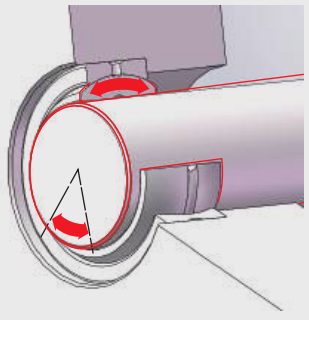


Figure 02



Equivalent dynamic load P

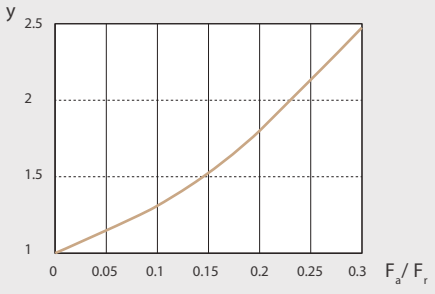
In most cases, axial load and radial load are acting on the bearing at the same time to form combined load. Therefore, the actual load of a bearing cannot be directly compared with the basic rated load. Thus the actual load is converted to the assumed load that passes through the center of the bearing, and in certain size and direction, the bearing under assumed load has the service life under actual load and revolution. Such converted assumed load is called the equivalent load, represented by P.

Calculation for equivalent dynamic load of radial spherical plain bearing

$$P = yF_r$$

P	N	Equivalent dynamic load
F_r	N	Radial load of bearing
F_a	N	Axial load of bearing
y	—	Load factor, depending on F_a / F_r (Figure 03)

Figure 03

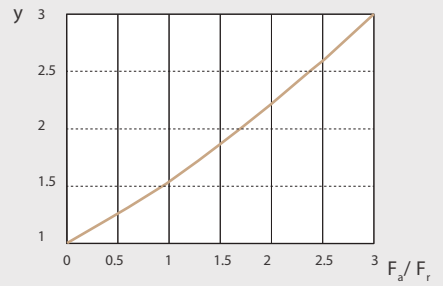


Calculation for equivalent dynamic load of angular contact spherical plain bearing

$$P = yF_r$$

P	N	Equivalent dynamic load
F_r	N	Radial load of bearing
F_a	N	Axial load of bearing
y	—	Load factor, depending on F_a /F_r (Figure 04)

Figure 04

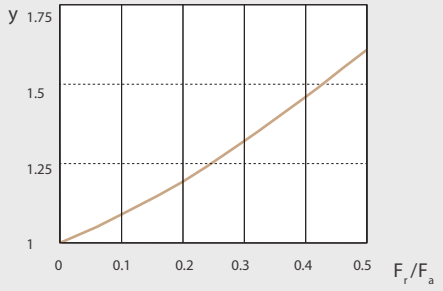


Calculation for equivalent dynamic load of axial spherical plain bearing

$$P = yF_a$$

P	N	Equivalent dynamic load
F_r	N	Radial load of bearing
F_a	N	Axial load of bearing
y	—	Load factor, depending on F_r /F_a (Figure05)

Figure 05



Load Carrying Capacity

Basic dynamic load rating

The basic dynamic load rating $C_r(C_a)$ is a parameter for calculating the life of spherical plain bearings.

It is dependent on the sliding contact surface and has a significant influence on the life of spherical plain bearings.

Basic load ratings are always defined by the bearing manufacturer.

They cannot therefore be compared in a simplistic manner with data from other manufacturers.

Basic dynamic load rating calculation

The contact pressures actually occurring in a spherical plain bearing are dependent on:

- load
- sliding contact surface
- osculation conditions
- installation situation

Due to the influence of these factors, it is not possible to precisely determine the pressures. The basic dynamic load ratings are dependent on :

- a load parameter K specific to the material (Table 01)
- the projected load bearing area.

C_r=projected load bearing area · specific dynamic load parameter

Basic static load rating

The basic static load rating $C_{0r}(C_{0a})$ is used if spherical plain bearing is subjected to load while stationary.

It indicates the load that a spherical plain bearing can support at room temperature without damage to the sliding surfaces. This is subject to the precondition that the components adjacent to the bearing must prevent deformation of the bearing.

If the basic static load rating $C_{0r}(C_{0a})$ is used to the full, the shaft and housing must be made from high-strength materials.

Due to the influence of these factors, it is not possible to precisely determine the pressures. The basic dynamic load ratings are dependent on :

- a load parameter K_0 specific to the material (Table 01)
- the projected load bearing area.

C_{0r} =projected load bearing area · specific static load parameter

Unit: N/mm²

Table 01

Sliding contact surface	Specific dynamic load parameter K	Specific static load parameter K_0
Steel / Steel	100	500
Steel / Bronze	50	125
Hard chromium / PTFE composite	100	250
Hard chromium / PTFE fabric	300	500

Sliding speed of spherical plain bearing calculation

$$v = 2.9089 \times 10^{-4} \beta f \overline{d_m}$$

v	mm/s	Sliding speed of spherical plain bearing
β	°	Swing angle
f	min^{-1}	Swing frequency of spherical plain bearing
$\overline{d_m}$	mm	Equivalent diameter of sliding spherical surface, ($\overline{d_m}=\xi d_m$), ξ for conversion factor (Table 02)

Table 02

Conversion factor	Radial bearing	Angular contact bearing	Axial bearing
ξ	1	0.9	0.7

Nominal contact pressure

$$p = k(P/C_r)$$

p	N/mm²	Nominal contact pressure
k	N/mm²	Compressive resistance factor (Table 03)
P	N	Equivalent dynamic load of bearing
C_r	N	Radial basic dynamic load rating

Unit: N/mm²

Table 03

Compressive resistance factor	Steel / Steel	Steel / Bronze	Steel / PTFE composite	Steel / PTFE fabric
k	100	50	100	300

pv limits

$$pv = p \cdot v$$

p	N/mm²	Nominal contact pressure
v	mm/s	Sliding speed of spherical plain bearing

Table 04

Sliding surface	Steel / Steel	Steel / Bronze	Steel / PTFE composite	Steel / PTFE fabric
v [mm/s]	≤ 100	≤ 100	≤ 300	≤ 300
p [N/mm²]	≤ 100	≤ 50	≤ 100	≤ 150
pv [N/mm²·mm/s]	≤ 400	≤ 400	≤ 300	≤ 300

Contact CCTY for life calculations.

Friction

Friction

$$M=0.5\times10^{-3}\mu P\overline{d_m}$$

M	N·m	Friction torque of bearing
μ	—	Friction factor (Table 05)
P	N	Equivalent dynamic load
$\overline{d_m}$	mm	$\overline{d_m}=d_m$ for radial spherical plain bearing
		$\overline{d_m}=0.9d_m$ for angular contact spherical plain bearing
		$\overline{d_m}=0.7d_m$ for axial spherical plain bearing

Table 05

Sliding contact surface	Friction factor μ	
	min	max
Steel / Steel	0.08	0.22
Steel / Bronze	0.10	0.25
Hard chromium / PTFE composite	0.05	0.20
Hard chromium / PTFE fabric	0.02	0.20

Spherical Plain Bearing Fit

Spherical plain bearing fit

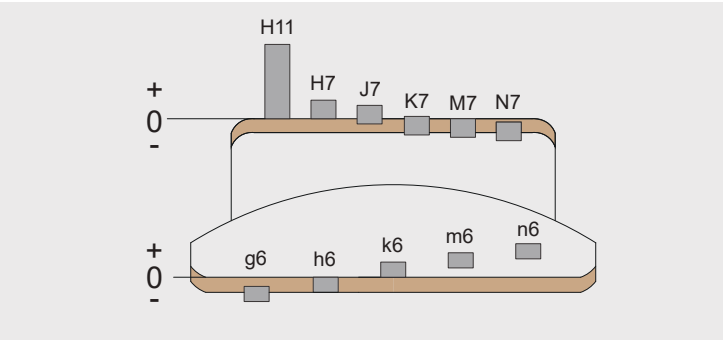
The purpose of fit is to fix the inner ring to the shaft or outer ring to the housing to prevent unfavorable axial movement. Such axial movement will cause issues, e.g. abnormal heat, fitting surface abrasion and ingress of particles into bearing and vibration. All of which will make the bearing dysfunction.

The application conditions of the bearing should be fully considered when selecting fit.

- Load character
- Size
- Temperature distribution during operation
- Internal bearing clearance
- Machining quality
- Material and wall structure of bearing and housing
- Installation and disassembly method

Recommended fit: see Figure 06, Table 06 and 07

Figure 06



Shaft tolerance

Table 06

Working conditions		Friction	
		Steel / Steel	Self-lubricating
Radial spherical plain bearing	All loads, interference fit	m6 (n6)	k6
	All loads, clearance or transition fit	h6 (hardened)	g6 (hardened)
Angular contact spherical plain bearing	All loads, interference fit	m6 (n6)	k6
Axial spherical plain bearing	All loads, interference fit	m6 (n6)	k6

Housing tolerance

Table 07

Working conditions		Friction	
		Steel / Steel	Self-lubricating
Radial spherical plain bearing	Light loads, axial displacement required	H7	H7
	Heavy loads	M7 (N7)	K7
	Light alloy housings	N7	M7
Angular contact spherical plain bearing	All loads, interference fit	M7 (N7)	M7
	All loads, axial displacement required	J7	J7
Axial spherical plain bearing	Purely axial loads	H11	H11
	Combined loads	J7	J7

Shaft tolerance

Table 08

Shaft diameter (mm)		△ dmp (um)		Shaft tolerance (um)									
				g6		h6		k6		m6		n6	
>	≤	min	max	high	low	high	low	high	low	high	low	high	low
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

Housing tolerance

Table 09

Housing diameter (mm)		△ Dmp (um)		Housing tolerance (um)									
				H7		J7		K7		M7		N7	
>	≤	min	max	high	low	high	low	high	low	high	low	high	low
10	18	-8	0	18	0	10	-8	6	-12	0	-18	-5	-23
18	30	-9	0	21	0	12	-9	6	-15	0	-21	-7	-28
30	50	-11	0	25	0	14	-11	7	-18	0	-25	-8	-33
50	80	-13	0	30	0	18	-12	9	-21	0	-30	-9	-39
80	120	-15	0	35	0	22	-13	10	-25	0	-35	-10	-45
120	150	-18	0	40	0	26	-14	12	-28	0	-40	-12	-52
150	180	-25	0	40	0	26	-14	12	-28	0	-40	-12	-52
180	250	-30	0	46	0	30	-16	13	-33	0	-46	-14	-60
250	315	-35	0	52	0	36	-16	16	-36	0	-52	-14	-66
315	400	-40	0	57	0	39	-18	17	-40	0	-57	-16	-73
400	500	-45	0	63	0	43	-20	18	-45	0	-63	-17	-80
500	630	-50	0	70	0	46	-22	0	-70	-26	-96	-44	-114
630	800	-75	0	80	0	52	-24	0	-80	-30	-110	-50	-130
800	1000	-100	0	90	0	58	-26	0	-90	-34	-124	-56	-146

Lubrication and Sealing

Self-lubricating

CCTY's self-lubricating series has the following combination options on the sliding contact surface:

- Steel / PTFE fabric
- Steel / PTFE composite
- Steel / Polymer

Oil / Grease lubricated

Steel / steel sliding contact surfaces on radial bearings have surface phosphating treatment and MoS_2 solid lubricant after assembly. Periodic lubrication after run-in is required. Extreme pressure grease is preferable.

Purpose of lubricating for bearing:

Proper lubrication:

- Reduce friction and wear

Lubrication prevents metal contact wh reduces friction and wear at the contact point between rings.

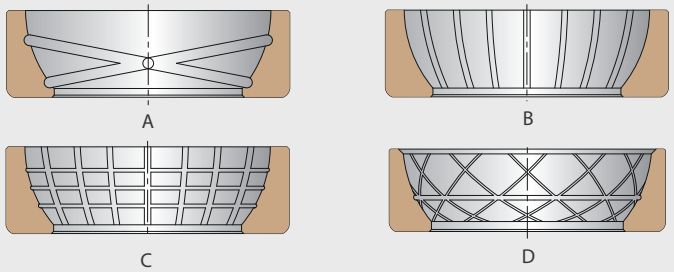
- Extend life

The contact surface should be well lubricated during operation. A low viscosity grease or poor fitting lubricating membrane will shorten the life.

- Prevent rust
- Prevent ingress of foreign matters

The oil groove in angular contact oil-libricated bearings can be designed according to the lubricating method, requirements and working conditions. Figure 07 displays recommended oil groove designs.

Figure 07



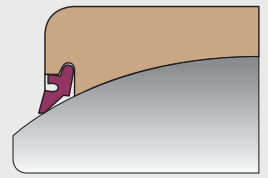
Sealing

Bearings needs to be sealed to a specific angle to prevent ingress of pollutants and moisture. A good seal has direct impact on the service life of the bearing.
The following factors should be considered when choosing a seal:

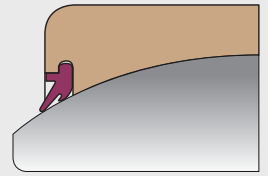
- Working and environmental conditions
- Radial movement
- Swing angle
- Available space for installation

A seal structure can be designed on the block hole for working conditions with higher requirements. The self-sealed structure can be used for bearings under common working conditions or small space conditions.

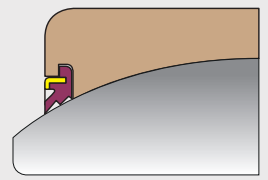
Figure 08



Single-lip seal



Double-lip seal



Triple-lip seal
with steel backing

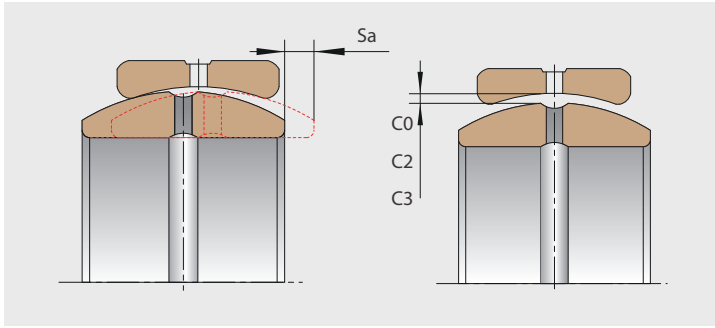
Clearance

Spherical plain bearing clearance

Clearance is the space between the inner and outer ring in a spherical plain bearing. When either the inner or outer ring is fixed, the clearance is the amount of movement in the other ring up/down or left/right. The radial amount of movement is called the radial clearance. The axial amount of movement is called the axial clearance.

C0	µm	Normal internal radial clearance
C2	µm	Internal radial clearance smaller than normal
C3	µm	Internal radial clearance larger than normal
Sa	µm	Normal internal axial clearance

Figure 09



Steel / Steel

Table 10

Series		Radial internal clearance (um)					
GE..ES GE..ES-2RS GE..HO-2RS GE..LO	GE..FO GE..FO-2RS						
Bore d	Bore d	C2		C0		C3	
mm	mm	min.	max.	min.	max.	min.	max.
6	6	8	32	32	68	68	104
8	8	8	32	32	68	68	104
10	10	8	32	32	68	68	104
12	-	8	32	32	68	68	104
-	12	10	40	40	82	82	124
15	15	10	40	40	82	82	124
16	-	10	40	40	82	82	124
17	17	10	40	40	82	82	124
20	-	10	40	40	82	82	124
-	20	12	50	50	100	100	150
25	25	12	50	50	100	100	150
30	30	12	50	50	100	100	150
32	-	12	50	50	100	100	150
35	-	12	50	50	100	100	150
-	35	15	60	60	120	120	180
40	40	15	60	60	120	120	180
45	45	15	60	60	120	120	180
50	50	15	60	60	120	120	180
60	-	15	60	60	120	120	180
-	60	18	72	72	142	142	212

Clearance

Steel / Steel

Table 11

Series		Radial internal clearance (um)					
GE..ES GE..ES-2RS GE..HO-2RS GE..LO	GE..FO GE..FO-2RS						
Bore d	Bore d	C2		C0		C3	
mm	mm	min.	max.	min.	max.	min.	max.
63	-	18	72	72	142	142	212
70	70	18	72	72	142	142	212
80	80	18	72	72	142	142	212
90	-	18	72	72	142	142	212
-	90	18	85	85	165	165	245
100	100	18	85	85	165	165	245
110	110	18	85	85	165	165	245
120	120	18	85	85	165	165	245
140	-	18	85	85	165	165	245
160	140	18	100	100	192	192	284
180	160	18	100	100	192	192	284
200	180	18	100	100	192	192	284
-	200	18	110	110	214	214	318
220	220	18	110	110	214	214	318
240	-	18	110	110	214	214	318
250	240	18	125	125	239	239	353
260	260	18	125	125	239	239	353
280	280	18	125	125	239	239	353
300	-	18	125	125	239	239	353

Steel / PTFE fabric

Table 12

d (mm)		Radial internal clearance (um)	
>	≤	min	max
	12	0	32
12	20	0	40
20	35	0	50
35	60	0	60
60	90	0	72
90	140	0	85
140	240	0	100
240	300	0	125

Steel / PTFE composite

Table 13

d (mm)		Radial internal clearance (um)	
>	≤	min	max
	12	0	28
12	20	0	35
20	30	0	44
30	35	0	50
35	40	0	60
40	45	0	60
50	60	0	60
60	70	0	72

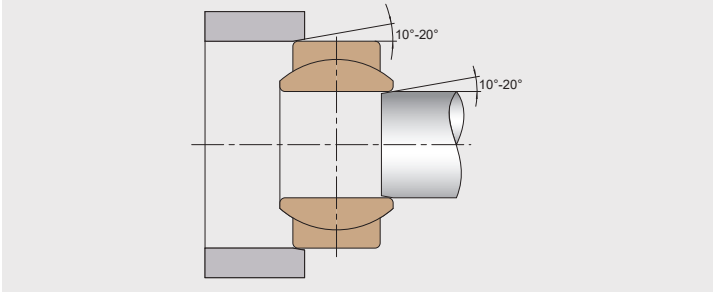
Installation and Disassembly

Installation and disassembly

Proper bearing installation is important to prevent bearing failure or housing damage. Before installing, check the shaft and housing bore for:

- Surface quality roughness below Ra1.6
- Accurate measurement of dimensional and geometrical tolerance
- Guiding chamfer for assembly, preferably 10-20° as shown in Figure 10
- Removal of sharp edges and burrs
- Dry and clean surface that is free of water, steam or other contaminated media
- Shaft is concentric with the housing bore to prevent inclination
- Direction of force is perpendicular to the joint

Figure 10



Heat assisted installation or direct mechanical installation can be determined based on the assembly interference.

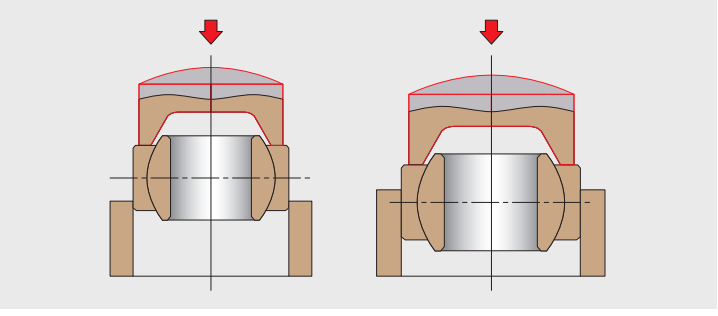
When the installation interference is large, the inner ring can be partially heated during assembly with the following method:

- Heat the surface of the inner ring with an induction heating device. Control the temperature to no more than 110℃. Higher temperatures will damage the seal ring.
- Do not heat directly with flames. Flames will damage the surface quality, reduce the hardness, and damage the seal ring and the self-lubricating material.
- Self-lubricating material on a PTFE fabric lined bearing will be damaged if it is immersed in an oil bath.

Proper means of mechanical installation

- Place the bearing flat on the guiding angle of the shaft to make sure that the bearing and block hole are concentric without inclination
- Make an auxiliary cover to contact the end face of outer ring while the bearing is pressed into the housing. See Figure 11.
- Press the bearing axially into the housing with a hydraulic press to compress the cover.

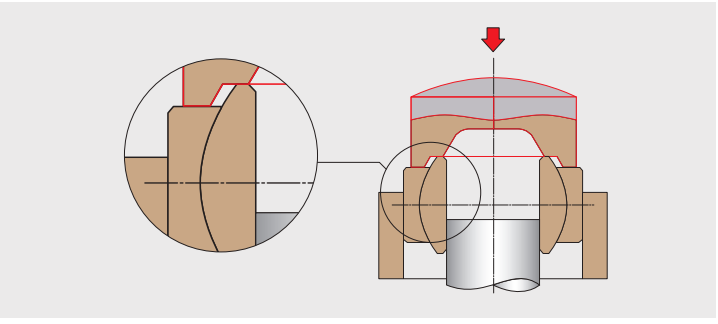
Figure 11



When the housing and shaft are installed at the same time

- Place the inner ring on the guiding angle of the shaft to make sure that the bearing and shaft are concentric without inclination
- Make an auxiliary cover with stepped end face to keep contact with the inner ring and outer ring of the bearing at the same time, see Figure 12
- Press the bearing axially into the housing with a hydraulic press to compress the cover.

Figure 12



Precautions:

It is not advised to:

- Use a hammer or other tool that induces shock to directly knock the bearing.
- Press the bearing when alignment is off-center.
- Directly press the outer ring while the shaft is also pressed.

Installation and Disassembly

Disassembly of bearing

Use auxiliary tools to disassemble the bearing. Do not directly knock the bearing from the assembly.

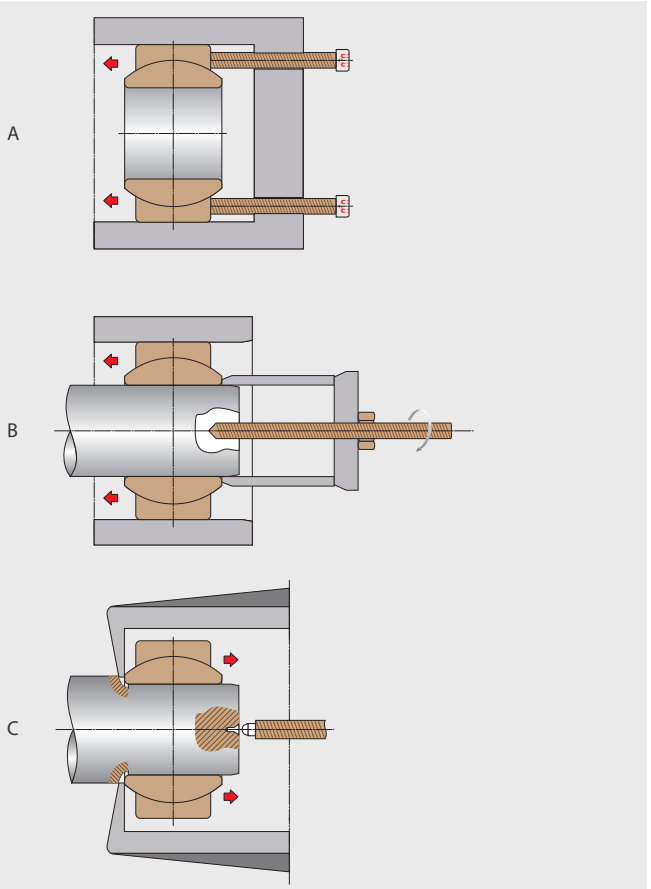
Disassembly of the block hole:

- Sunken hole: The end face of the block hole should be bored to place a screw against the outer ring. It can then be pressed out of the assembly. Figure 13 A
- Through hole: Align a hold down block with the end face of the outer ring and press it out of the assembly.

Disassembly of the shaft:

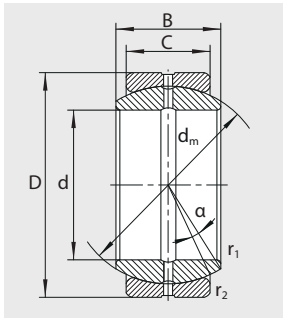
- Align a threaded screw against the end face of the inner ring via the sleeve. Rotate the screw to eject the shaft from the inner ring. Figure 13 B
- When the bearing is already removed from the block hole, a hook can be used to press the end face of the inner ring. Align a screw against the center of the shaft and then rotate the screw to pull the bearing from the shaft. Figure 13 C

Figure 13

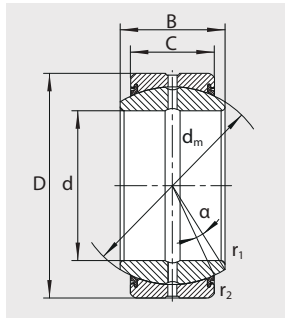


GE .. ES/GE .. ES 2RS

Sliding contact surface:
Steel / Steel



GE .. ES



GE .. ES 2RS

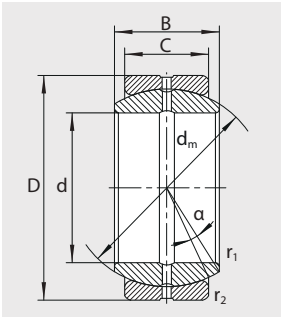
Dimension table · Unit: mm

Product Number		Dimensions							Basic load ratings		Angle	Mass
		d	D	B	C	d_m	r_1 min.	r_2 min.	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GE 6 E [1]		6	14	6	4	10	0.3	0.3	3.4	17	13	0.005
GE 8 E [1]		8	16	8	5	13	0.3	0.3	5.5	27.5	15	0.007
GE 10 E [1]		10	19	9	6	16	0.3	0.3	8.2	40.5	12	0.012
GE 12 E [1]		12	22	10	7	18	0.3	0.3	10.8	54	11	0.017
GE 15 ES	GE 15 ES 2RS	15	26	12	9	22	0.3	0.3	17	85	8	0.027
GE 17 E S	GE 17 ES 2RS	17	30	14	10	25	0.3	0.3	21.2	106	10	0.041
GE 20 ES	GE 20 ES 2RS	20	35	16	12	29	0.3	0.3	30	146	9	0.065
GE 25 ES	GE 25 ES 2RS	25	42	20	16	35	0.6	0.6	48	240	7	0.12
GE 30 ES	GE 30 ES 2RS	30	47	22	18	40	0.6	0.6	62	310	6	0.15
GE 35 ES	GE 35 ES 2RS	35	55	25	20	47	0.6	1	80	400	6	0.23
GE 40 ES	GE 40 ES 2RS	40	62	28	22	53	0.6	1	100	500	7	0.32
GE 45 ES	GE 45 ES 2RS	45	68	32	25	60	0.6	1	127	640	7	0.42
GE 50 ES	GE 50 ES 2RS	50	75	35	28	66	0.6	1	156	780	6	0.56
GE 60 ES	GE 60 ES 2RS	60	90	44	36	80	1	1	245	1220	6	1.03
GE 70 ES	GE 70 ES 2RS	70	105	49	40	92	1	1	315	1560	6	1.56
GE 80 ES	GE 80 ES 2RS	80	120	55	45	105	1	1	400	2000	6	2.29
GE 90 ES	GE 90 ES 2RS	90	130	60	50	115	1	1	490	2450	5	2.76
GE 100 ES	GE 100 ES 2RS	100	150	70	55	130	1	1	610	3050	7	4.42

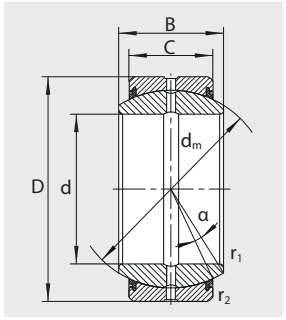
[1] Grease fittings not available on these sizes.

GE .. ES/GE .. ES 2RS

Sliding contact surface:
Steel / Steel



GE .. ES



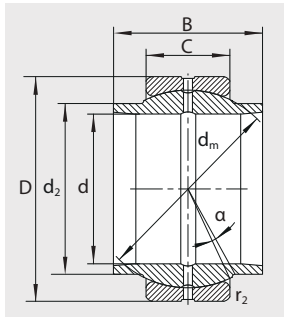
GE .. ES 2RS

Dimension table · Unit: mm

Product Number		Dimensions							Basic load ratings		Angle	Mass
		d	D	B	C	d_m	r_1 min.	r_2 min.	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GE 110 ES	GE 110 ES 2RS	110	160	70	55	140	1	1	655	3250	6	4.8
GE 120 ES	GE 120 ES 2RS	120	180	85	70	160	1	1	950	4750	6	8.06
GE 140 ES	GE 140 ES 2RS	140	210	90	70	180	1	1	1080	5400	7	11.2
GE 160 ES	GE 160 ES 2RS	160	230	105	80	200	1	1	1370	6800	8	14.2
GE 180 ES	GE 180 ES 2RS	180	260	105	80	225	1.1	1.1	1530	7650	6	18.6
GE 200 ES	GE 200 ES 2RS	200	290	130	100	250	1.1	1.1	2120	10600	7	28.5
GE 220 ES	GE 220 ES 2RS	220	320	135	100	275	1.1	1.1	2320	11600	8	35.5

GE .. LO

Sliding contact surface:
Steel / Steel



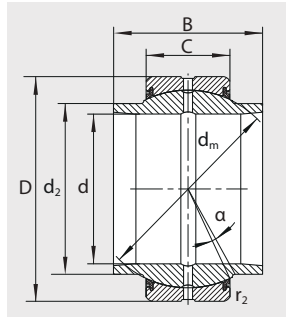
GE .. LO

Dimension table · Unit: mm

Product Number	Dimensions							Basic load ratings		Angle	Mass
	d	D	B	C	d_m	d_k	r_2 min.	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GE 12 LO	12	22	12	7	18	15.5	0.3	10.8	54	4	0.018
GE 16 LO	16	28	16	9	23	20	0.3	17.6	88	4	0.035
GE 20 LO	20	35	20	12	29	25	0.3	30	146	4	0.07
GE 25 LO	25	42	25	16	35	30	0.6	48	240	4	0.13
GE 30 LO	30	47	30	18	40	34	0.6	62	310	4	0.168
GE 32 LO	32	52	32	18	44	37	1	67	335	4	0.22
GE 35 LO	35	55	35	20	47	40	1	79	399	4	0.253
GE 40 LO	40	62	40	22	53	46	1	100	500	4	0.35
GE 50 LO	50	75	50	28	66	57	1	156	780	4	0.62
GE 63 LO	63	95	63	36	83	71.5	1	255	1270	4	1.28
GE 70 LO	70	105	70	40	92	78	1	315	1560	4	1.71
GE 80 LO	80	120	80	45	105	91	1	400	2000	4	2.56
GE 90 LO	90	130	90	50	115	99	1	490	2450	4	3.05
GE 100 LO	100	150	100	55	130	113	1	610	3050	4	4.9
GE 110 LO	110	160	110	55	140	124	1	655	3250	4	5.57
GE 125 LO	125	180	125	70	160	138	1	950	4750	4	8.2
GE 160 LO	160	230	160	80	200	177	1	1370	6800	4	16.1
GE 200 LO	200	290	200	100	250	221	1.1	2120	10600	4	32.2

GE .. HO 2RS

Sliding contact surface:
Steel / Steel



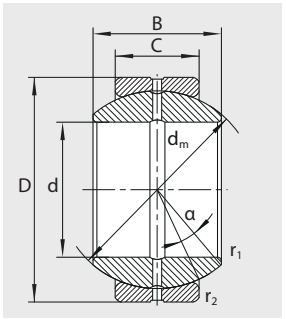
GE .. HO 2RS

Dimension table · Unit: mm

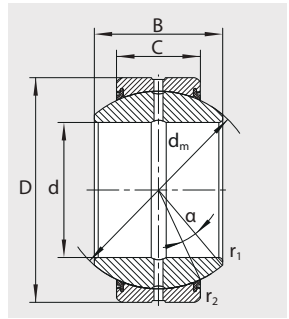
Product Number	Dimensions							Basic load ratings		Angle	Mass
	d	D	B	C	d_m	d_k	r_2 min.	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GE 17 HO 2RS	17	30	21	10	25	21	0.3	21.2	106	3	0.04
GE 20 HO 2RS	20	35	24	12	29	24	0.3	30	146	3	0.07
GE 25 HO 2RS	25	42	29	16	35	29	0.6	48	240	3	0.13
GE 30 HO 2RS	30	47	30	18	40	33.5	0.6	62	310	3	0.16
GE 35 HO 2RS	35	55	35	20	47	39.5	1	80	400	3	0.25
GE 40 HO 2RS	40	62	38	22	53	45	1	100	500	3	0.33
GE 45 HO 2RS	45	68	40	25	60	51	1	127	640	3	0.44
GE 50 HO 2RS	50	75	43	28	66	57	1	156	780	3	0.58
GE 60 HO 2RS	60	90	54	36	80	68	1	245	1220	3	1.06
GE 70 HO 2RS	70	105	65	40	92	78	1	315	1560	3	1.64
GE 80 HO 2RS	80	120	74	45	105	89	1	400	2000	3	2.44

GE .. FO/GE .. FO 2RS

Sliding contact surface:
Steel / Steel



GE .. FO



GE .. FO 2RS

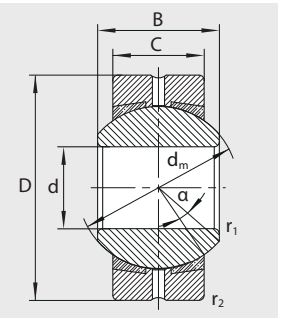
Dimension table · Unit: mm

Product Number		Dimensions							Basic load ratings		Angle	Mass
		d	D	B	C	d_m	r_1	r_2	dyn. C_r	stat. C_{0r}		
								min.	kN	kN	α[°]	≈kg
GE 6 FO [1]		6	16	9	5	13	0.3	0.3	5.5	27.5	21	0.009
GE 8 FO [1]		8	19	11	6	16	0.3	0.3	8.15	40.5	21	0.015
GE 10 FO [1]		10	22	12	7	18	0.3	0.3	10.8	54	18	0.021
GE 12 FO [1]		12	26	15	9	22	0.3	0.3	17	85	18	0.037
GE 15 FO	GE 15 FO 2RS	15	30	16	10	25	0.3	0.3	21.2	106	16	0.047
GE 17 FO	GE 17 FO 2RS	17	35	20	12	29	0.3	0.3	30	146	19	0.079
GE 20 FO	GE 20 FO 2RS	20	42	25	16	35	0.3	0.6	48	240	17	0.15
GE 25 FO	GE 25 FO 2RS	25	47	28	18	40	0.6	0.6	62	310	17	0.2
GE 30 FO	GE 30 FO 2RS	30	55	32	20	47	0.6	1	80	400	17	0.3
GE 35 FO	GE 35 FO 2RS	35	62	35	22	53	0.6	1	100	500	16	0.4
GE 40 FO	GE 40 FO 2RS	40	68	40	25	60	0.6	1	127	640	17	0.53
GE 45 FO	GE 45 FO 2RS	45	75	43	28	66	0.6	1	156	780	15	0.69
GE 50 FO	GE 50 FO 2RS	50	90	56	36	80	0.6	1	245	1220	17	1.41
GE 60 FO	GE 60 FO 2RS	60	105	63	40	92	1	1	315	1560	17	2.1
GE 70 FO	GE 70 FO 2RS	70	120	70	45	105	1	1	400	2000	16	3
GE 80 FO	GE 80 FO 2RS	80	130	75	50	115	1	1	490	2450	14	3.6
GE 90 FO	GE 90 FO 2RS	90	150	85	55	130	1	1	610	3050	15	5.5
GE 100 FO	GE 100 FO 2RS	100	160	85	55	140	1	1	655	3250	14	6
GE 110 FO	GE 110 FO 2RS	110	180	100	70	160	1	1	950	4750	12	9.7
GE 120 FO	GE 120 FO 2RS	120	210	115	70	180	1	1	1080	5400	16	15.1
GE 140 FO	GE 140 FO 2RS	140	230	130	80	200	1	1	1370	6800	16	18.9
GE 160 FO	GE 160 FO 2RS	160	260	135	80	225	1	1.1	1530	7650	16	24.8
GE 180 FO	GE 180 FO 2RS	180	290	155	100	250	1.1	1.1	2120	10600	14	35.9
GE 200 FO	GE 200 FO 2RS	200	320	165	100	275	1.1	1.1	2320	11600	15	44.9

[1] Grease fittings not available on these sizes.

PB

Sliding contact surface:
Steel / Bronze



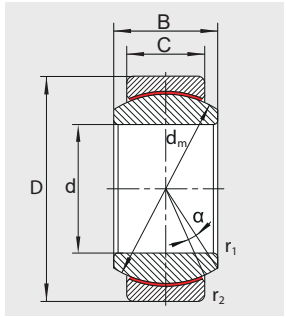
PB

Dimension table · Unit: mm

Product Number	Dimensions							Basic load ratings		Angle	Mass
	d	D	C	B	d_m	r_1	r_2	dyn. C_r	stat. C_{0r}		
						min.	min.	kN	kN	α[°]	≈kg
PB 5	5	16	6	8	11.11	0.3	0.3	3.25	8.5	13	0.008
PB 6	6	18	6.75	9	12.7	0.3	0.3	4.3	10.8	13	0.013
PB 8	8	22	9	12	15.88	0.3	0.3	7.2	18	14	0.024
PB 10	10	26	10.5	14	19.05	0.3	0.3	10	25	13	0.039
PB 12	12	30	12	16	22.23	0.3	0.3	13.4	33.5	13	0.058
PB 14	14	34	13.5	19	25.4	0.3	0.3	17	43	16	0.084
PB 16	16	38	15	21	28.58	0.3	0.3	21.6	54	15	0.111
PB 18	18	42	16.5	23	31.75	0.3	0.3	26	66.5	15	0.16
PB 20	20	46	18	25	34.93	0.3	0.3	31.5	80	14	0.21
PB 22	22	50	20	28	38.1	0.3	0.6	38	91.5	15	0.26
PB 25	25	56	22	31	42.85	0.3	0.6	47.5	118	15	0.39
PB 30	30	66	25	37	50.08	0.3	0.6	64	160	17	0.61

GE .. C

Sliding contact surface:
Steel / PTFE composite



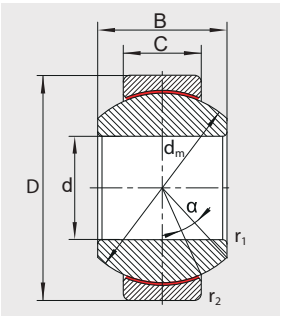
GE .. C

Dimension table · Unit: mm

Product Number	Dimensions							Basic load ratings		Angle	Mass
	d	D	B	C	d_m	r_1 min.	r_2 min.	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GE 6 C	6	14	6	4	10	0.3	0.3	3.6	9	13	0.004
GE 8 C	8	16	8	5	13	0.3	0.3	5.85	14.6	15	0.007
GE 10 C	10	19	9	6	16	0.3	0.3	8.65	21.6	12	0.011
GE 12 C	12	22	10	7	18	0.3	0.3	11.4	28.5	11	0.016
GE 15 C	15	26	12	9	22	0.3	0.3	17.6	44	8	0.027
GE 17 C	17	30	14	10	25	0.3	0.3	22.4	56	10	0.042
GE 20 C	20	35	16	12	29	0.3	0.3	31.5	78	9	0.067
GE 25 C	25	42	20	16	35	0.6	0.6	51	127	7	0.12
GE 30 C	30	47	22	18	40	0.6	0.6	65.5	166	6	0.15

GEH .. C

Sliding contact surface:
Steel / PTFE composite



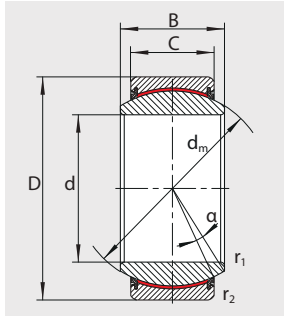
GEH .. C

Dimension table · Unit: mm

Product Number	Dimensions							Basic load ratings		Angle	Mass
	d	D	B	C	d_m	r_1	r_2 min.	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GEH 6 C	6	16	9	5	13	0.3	0.3	5.85	14.6	21	0.009
GEH 8 C	8	19	11	6	16	0.3	0.3	8.65	21.6	21	0.015
GEH 10 C	10	22	12	7	18	0.3	0.3	11.4	28.5	18	0.021
GEH 12 C	12	26	15	9	22	0.3	0.3	17.6	44	18	0.037
GEH 15 C	15	30	16	10	25	0.3	0.3	22.4	56	16	0.05
GEH 17 C	17	35	20	12	29	0.3	0.3	31.5	78	19	0.083
GEH 20 C	20	42	25	16	35	0.3	0.6	51	127	17	0.16
GEH 25 C	25	47	28	18	40	0.6	0.6	65.5	166	17	0.21

GE .. UK 2RS

Sliding contact surface:
Steel / PTFE fabric



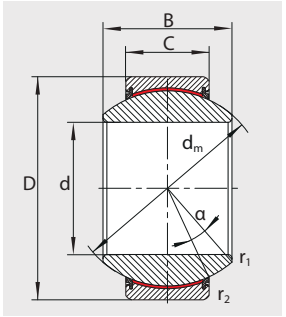
GE .. UK 2RS

Dimension table · Unit: mm

Product Number	Dimensions							Basic load ratings		Angle	Mass
	d	D	B	C	d_m	r_1 min.	r_2 min.	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GE 17 UK 2RS	17	30	14	10	25	0.3	0.3	48.7	81.2	10	0.038
GE 20 UK 2RS	20	35	16	12	29	0.3	0.3	67.5	112	9	0.061
GE 25 UK 2RS	25	42	20	16	35	0.6	0.6	127	212	7	0.11
GE 30 UK 2RS	30	47	22	18	40	0.6	0.6	165	275	6	0.14
GE 35 UK 2RS	35	55	25	20	47	0.6	1	210	350	6	0.22
GE 40 UK 2RS	40	62	28	22	53	0.6	1	277	462	7	0.31
GE 45 UK 2RS	45	68	32	25	60	0.6	1	360	600	7	0.41
GE 50 UK 2RS	50	75	35	28	66	0.6	1	442	737	6	0.55
GE 60 UK 2RS	60	90	44	36	80	1	1	690	1150	6	1
GE 70 UK 2RS	70	105	49	40	92	1	1	885	1475	6	1.53
GE 80 UK 2RS	80	120	55	45	105	1	1	1125	1875	6	2.25
GE 90 UK 2RS	90	130	60	50	115	1	1	1380	2300	5	2.73
GE 100 UK 2RS	100	150	70	55	130	1	1	1717	2862	7	4.34
GE 110 UK 2RS	110	160	70	55	140	1	1	1845	3075	6	4.71
GE 120 UK 2RS	120	180	85	70	160	1	1	2685	4475	6	7.98
GE 140 UK 2RS	140	210	90	70	180	1	1	3015	5025	7	11.1
GE 160 UK 2RS	160	230	105	80	200	1	1	3840	6400	8	14
GE 180 UK 2RS	180	260	105	80	225	1.1	1.1	4320	7200	6	18.4
GE 200 UK 2RS	200	290	130	100	250	1.1	1.1	6000	10000	7	28.2
GE 220 UK 2RS	220	320	135	100	275	1.1	1.1	6600	11000	8	35.4

GE .. FW 2RS

Sliding contact surface:
Steel / PTFE fabric



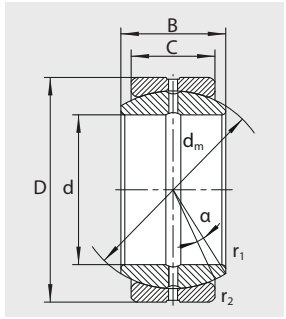
GE .. FW 2RS

Dimension table · Unit: mm

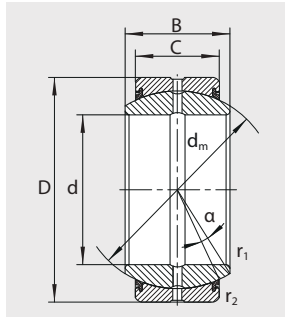
Product Number	Dimensions							Basic load ratings		Angle	Mass
	d	D	B	C	d_m	r_1 min.	r_2 min.	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GE 20 FW 2RS	20	42	25	16	35	0.3	0.6	51	127	17	0.15
GE 25 FW 2RS	25	47	28	18	40	0.6	0.6	65.5	166	17	0.2
GE 30 FW 2RS	30	55	32	20	47	0.6	1	210	350	17	0.29
GE 35 FW 2RS	35	62	35	22	53	0.6	1	277	462	16	0.4
GE 40 FW 2RS	40	68	40	25	60	0.6	1	360	600	17	0.53
GE 45 FW 2RS	45	75	43	28	66	0.6	1	442	737	15	0.69
GE 50 FW 2RS	50	90	56	36	80	0.6	1	690	1150	17	1.4
GE 60 FW 2RS	60	105	63	40	92	1	1	885	1475	17	2.1
GE 70 FW 2RS	70	120	70	45	105	1	1	1125	1875	16	3
GE 80 FW 2RS	80	130	75	50	115	1	1	1380	2300	14	3.6
GE 90 FW 2RS	90	150	85	55	130	1	1	1717	2862	15	5.34
GE 100 FW 2RS	100	160	85	55	140	1	1	1845	3075	14	6
GE 110 FW 2RS	110	180	100	70	160	1	1	2685	4475	12	9.7
GE 120 FW 2RS	120	210	115	70	180	1	1	3015	5025	16	15.1
GE 140 FW 2RS	140	230	130	80	200	1	1	3840	6400	16	18.9
GE 160 FW 2RS	160	260	135	80	225	1	1.1	4320	7200	16	24.7
GE 180 FW 2RS	180	290	155	100	250	1.1	1.1	6000	10000	14	35.8
GE 200 FW 2RS	200	320	165	100	275	1.1	1.1	6600	11000	15	44.9

GEZ .. ES/GEZ .. ES 2RS

Sliding contact surface:
Steel / Steel



GEZ .. ES



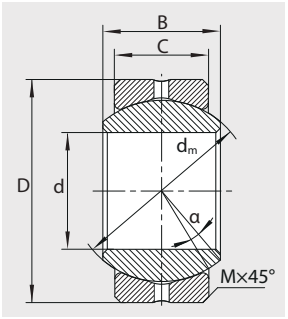
GEZ .. ES 2RS

Dimension table · Unit: mm

Product Number		Dimensions							Basic load ratings		Angle	Mass
		d	D	B	C	d_m	r_1 min.	r_2 min.	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GEZ 12 ES		12.7	22.225	11.1	9.525	18.3	0.15	0.6	14	41.5	6	0.022
GEZ 15 ES		15.875	26.988	13.89	11.913	22.8	0.15	1	21.6	65.5	6	0.036
GEZ 19 ES		19.05	31.75	16.662	14.275	27.4	0.3	1	31.5	93	6	0.052
GEZ 22 ES		22.225	36.513	19.431	16.662	32	0.3	1	42.5	127	6	0.085
GEZ 25 ES	GEZ 25 ES 2RS	25.4	41.275	22.225	19.05	36.5	0.6	1	56	166	6	0.13
GEZ 31 ES	GEZ 31 ES 2RS	31.75	50.8	27.762	23.8	45.6	0.6	1	86.5	260	6	0.23
GEZ 34 ES	GEZ 34 ES 2RS	34.925	55.563	30.15	26.187	49.2	0.6	1	104	310	6	0.3
GEZ 38 ES	GEZ 38 ES 2RS	38.1	61.913	33.325	28.575	54.7	0.6	1	125	375	6	0.41
GEZ 44 ES	GEZ 44 ES 2RS	44.45	71.438	38.887	33.325	63.9	0.6	1	170	510	6	0.64
GEZ 47 ES	GEZ 47 ES 2RS	47.638	90.488	50.013	42.85	82	0.6	1	280	850	6	1.63
GEZ 50 ES	GEZ 50 ES 2RS	50.8	80.963	44.45	38.1	73	0.6	1	224	670	6	0.94
GEZ 57 ES	GEZ 57 ES 2RS	57.15	90.488	50.013	42.85	82	0.6	1	280	850	6	1.6
GEZ 63 ES	GEZ 63 ES 2RS	63.5	100.013	55.55	47.625	91.2	0.6	1	345	1040	6	1.78
GEZ 69 ES	GEZ 69 ES 2RS	69.85	111.125	61.112	52.375	100.3	0.6	1	425	1270	6	2.41
GEZ 76 ES	GEZ 76 ES 2RS	76.2	120.65	66.675	57.15	109.5	0.6	1	500	1500	6	3.1
GEZ 82 ES	GEZ 82 ES 2RS	82.55	130.175	72.238	61.9	118.7	0.6	1	585	1760	6	3.8
GEZ 88 ES	GEZ 88 ES 2RS	88.9	139.7	77.775	66.675	128	0.6	1	680	2040	6	4.83
GEZ 95 ES	GEZ 95 ES 2RS	95.25	149.225	83.337	71.425	137	0.6	1	780	2360	6	5.87
GEZ 101 ES	GEZ 101 ES 2RS	101.6	158.75	88.9	76.2	146	0.6	1	900	2650	6	7.06
GEZ 114 ES	GEZ 114 ES 2RS	114.3	177.8	100	85.725	164.5	1	1.1	1120	3400	6	9.95
GEZ 120 ES	GEZ 120 ES 2RS	120.65	187.325	105.56	90.47	173.4	1	1.1	1250	3750	6	11.5
GEZ 127 ES	GEZ 127 ES 2RS	127	196.85	111.125	95.25	182.6	1	1.1	1400	4150	6	13.5
GEZ 152 ES	GEZ 152 ES 2RS	152.4	222.25	120.65	104.77	207.2	1	1.1	1730	5200	5	17.5

COM

Sliding contact surface:
Steel / Steel



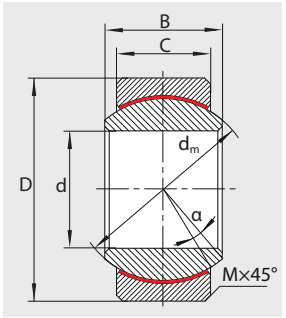
COM

Dimension table · Unit: inch

Product Number	Dimensions						Radial Static Load Capacity	Angle	Mass
	d	D	B	C	d_m	M	Lbs	α[°]	≈Lbs
COM 3	.1900	.5625	.281	.218	.406	.015	3,250	11	.014
COM 4	.2500	.6562	.343	.250	.500	.022	4,950	13.5	.022
COM 5	.3125	.7500	.375	.281	.562	.032	6,475	12	.030
COM 6	.3750	.8125	.406	.312	.656	.032	8,400	10	.038
COM 7	.4375	.9062	.437	.343	.687	.032	9,453	8	.047
COM 8	.5000	1.0000	.500	.390	.781	.032	13,250	9.5	.065
COM 9	.5625	1.0937	.562	.437	.875	.032	16,630	9.5	.086
COM 10	.6250	1.1875	.625	.500	.968	.032	21,280	8.5	.110
COM 12	.7500	1.4375	.750	.593	1.187	.044	31,920	9	.204
COM 14	.8750	1.5625	.875	.703	1.312	.044	41,960	9.5	.263
COM 16	1.0000	1.7500	1.000	.797	1.500	.044	55,200	10	.386

COM .. T

Sliding contact surface:
Steel / PTFE fabric



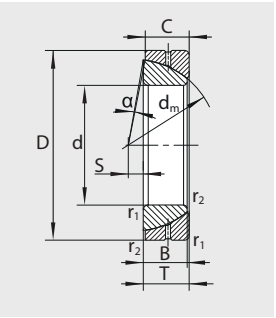
COM .. T

Dimension table · Unit: inch

Product Number	Dimensions						Radial Static Load Capacity	Angle	Mass
	d	D	B	C	d_m	M	Lbs	α[°]	≈ Lbs
COM 3 T	.1900	.5625	.281	.218	.406	.015	3,250	11	.014
COM 4 T	.2500	.6562	.343	.250	.500	.022	4,950	13.5	.022
COM 5 T	.3125	.7500	.375	.281	.562	.032	6,475	12	.030
COM 6 T	.3750	.8125	.406	.312	.656	.032	8,400	10	.038
COM 7 T	.4375	.9062	.437	.343	.687	.032	9,453	8	.047
COM 8 T	.5000	1.0000	.500	.390	.781	.032	13,250	9.5	.065
COM 9 T	.5625	1.0937	.562	.437	.875	.032	16,630	9.5	.086
COM 10 T	.6250	1.1875	.625	.500	.968	.032	21,280	8.5	.110
COM 12 T	.7500	1.4375	.750	.593	1.187	.044	31,920	9	.204
COM 14 T	.8750	1.5625	.875	.703	1.312	.044	41,960	9.5	.263
COM 16 T	1.0000	1.7500	1.000	.797	1.500	.044	55,200	10	.386

GE .. SX

Sliding contact surface:
Steel / Steel



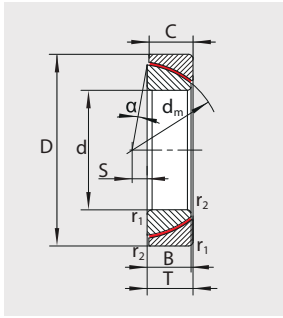
GE .. SX

Dimension table · Unit: mm

Product Number	Dimensions									Basic load ratings		Angle	Mass
	d	D	T	d_m	B	C	S	r_1 min.	r_2 min.	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈ kg
GE 25 SX	25	47	15	42.5	14	14	1	0.6	0.3	47.8	239	2.7	0.14
GE 28 SX	28	52	16	47	15	15	1	1	0.3	57.5	287	2.4	0.18
GE 30 SX	30	55	17	50	16	16	2	1	0.3	64.6	323	2.3	0.22
GE 35 SX	35	62	18	56	17	17	2	1	0.3	78.5	392	2.1	0.28
GE 40 SX	40	68	19	60	18	18	1.5	1	0.3	90.6	453	1.9	0.35
GE 45 SX	45	75	20	66	19	19	1.5	1	0.3	106	532	1.7	0.43
GE 50 SX	50	80	20	74	19	19	4	1	0.3	118	590	1.6	0.47
GE 55 SX	55	90	23	80	22	22	4	1.5	0.6	149	745	1.4	0.68
GE 60 SX	60	95	23	86	22	22	5	1.5	0.6	160	802	1.3	0.74
GE 65 SX	65	100	23	92	22	22	5	1.5	0.6	173	867	1.3	0.79
GE 70 SX	70	110	25	102	24	24	7	1.5	0.6	208	1040	1.1	1.08
GE 80 SX	80	125	29	115	27	27	10	1.5	0.6	244	1220	2	1.55
GE 90 SX	90	140	32	130	30	30	11	2	0.6	313	1560	1.8	2.1
GE 100 SX	100	150	32	140	30	30	12	2	0.6	339	1690	1.7	2.36
GE 110 SX	110	170	38	160	36	36	15	2.5	0.6	469	2340	1.5	3.78
GE 120 SX	120	180	38	170	36	36	17	2.5	0.6	498	2490	1.4	4.05
GE 130 SX	130	200	45	190	42	42	20	2.5	0.6	622	3110	1.9	6.1
GE 140 SX	140	210	45	200	42	42	20	2.5	1	663	3310	1.8	6.5
GE 150 SX	150	225	48	213	45	45	21	3	1	764	3820	1.7	7.9
GE 160 SX	160	240	51	225	48	48	21	3	1	872	4360	1.6	9.4
GE 170 SX	170	260	57	250	54	54	27	3	1	1080	5440	1.4	13.2
GE 180 SX	180	280	64	260	61	61	21	3	1	1310	6590	1.3	17.6
GE 190 SX	190	290	64	275	61	61	29	3	1	1370	6850	1.3	18.3
GE 200 SX	200	310	70	290	66	66	26	3	1	1540	7740	1.6	23.3

GE .. SW

Sliding contact surface:
Steel / PTFE fabric



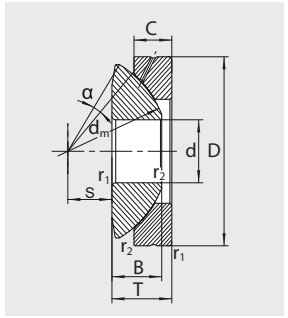
GE .. SW

Dimension table · Unit: mm

Product Number	Dimensions									Basic load ratings		Angle	Mass
	d	D	T	d_m	B	C	S	r_1 min.	r_2 min.	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GE 25 SW	25	47	15	42.5	14	14	1	0.6	0.3	143	239	2.7	0.14
GE 28 SW	28	52	16	47	15	15	1	1	0.3	172	287	2.4	0.18
GE 30 SW	30	55	17	50	16	16	2	1	0.3	193	323	2.3	0.21
GE 35 SW	35	62	18	56	17	17	2	1	0.3	235	392	2.1	0.28
GE 40 SW	40	68	19	60	18	18	1.5	1	0.3	272	453	1.9	0.34
GE 45 SW	45	75	20	66	19	19	1.5	1	0.3	319	532	1.7	0.42
GE 50 SW	50	80	20	74	19	19	4	1	0.3	354	590	1.6	0.46
GE 55 SW	55	90	23	80	22	22	4	1.5	0.6	447	745	1.4	0.68
GE 60 SW	60	95	23	86	22	22	5	1.5	0.6	481	802	1.3	0.73
GE 65 SW	65	100	23	92	22	22	5	1.5	0.6	520	867	1.3	0.78
GE 70 SW	70	110	25	102	24	24	7	1.5	0.6	626	1040	1.1	1.1
GE 80 SW	80	125	29	115	27	27	10	1.5	0.6	733	1220	2.0	1.56
GE 90 SW	90	140	32	130	30	30	11	2	0.6	939	1560	1.7	2.15
GE 100 SW	100	150	32	140	30	30	12	2	0.6	1010	1690	1.7	2.33
GE 110 SW	110	170	38	160	36	36	15	2.5	0.6	1400	2340	1.5	3.76
GE 120 SW	120	180	38	170	36	36	17	2.5	0.6	1490	2490	1.4	4.1
GE 130 SW	130	200	45	190	42	42	20	2.5	0.6	1860	3110	1.9	6.1
GE 140 SW	140	210	45	200	42	42	20	2.5	1	1990	3310	1.8	6.46
GE 150 SW	150	225	48	213	45	45	21	3	1	2290	3820	1.7	7.92
GE 160 SW	160	240	51	225	48	48	21	3	1	2610	4360	1.6	9.6
GE 170 SW	170	260	57	250	54	54	27	3	1	3260	5440	1.4	13.1
GE 180 SW	180	280	64	260	61	61	21	3	1	3950	6590	1.3	17.5
GE 190 SW	190	290	64	275	61	61	29	3	1	4110	6850	1.3	18.4
GE 200 SW	200	310	70	290	66	66	26	3	1	4640	7740	1.6	23.3

GE .. AX

Sliding contact surface:
Steel / Steel



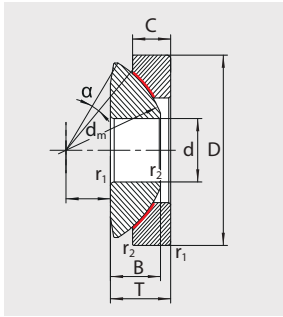
GE .. AX

Dimension table · Unit: mm

Product Number	Dimensions									Basic load ratings		Angle	Mass
	d	D	T	d_m	B	C	S	r_1 min.	r_2 min.	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GE 10 AX	10	30	9.5	32	7.9	6	7	0.6	0.2	24.4	122	10	0.039
GE 12 AX	12	35	13	37	9.3	9	8	0.6	0.2	32.4	162	9	0.072
GE 15 AX	15	42	15	45	10.7	11	10	0.6	0.2	52.2	261	7	0.12
GE 17 AX	17	47	16	50	11.5	11.5	11	0.6	0.2	59.2	296	6	0.16
GE 20 AX	20	55	20	60	14.3	13	12.5	1	0.3	75.1	375	6	0.27
GE 25 AX	25	62	22.5	66	16	17	14	1	0.3	129	645	7	0.4
GE 30 AX	30	75	26	80	18	19.5	17.5	1	0.3	169	848	6	0.65
GE 35 AX	35	90	28	98	22	20	22	1	0.3	259	1290	6	1.05
GE 40 AX	40	105	32	114	27	22	24.5	1	0.3	373	1860	6	1.65
GE 45 AX	45	120	36.5	130	31	25	27.5	1	0.3	486	2430	6	2.49
GE 50 AX	50	130	42.5	140	33.5	32	30	1	0.3	650	3250	5	3.44
GE 60 AX	60	150	45	160	37	33	35	1	0.3	735	3670	7	4.66
GE 70 AX	70	160	50	170	40	36	35	1	0.3	806	4030	6	5.68
GE 80 AX	80	180	50	194	42	36	42.5	1	0.3	1030	5180	6	7.2
GE 100 AX	100	210	59	220	50	42	45	1	0.3	1200	6020	7	10.7

GE .. AW

Sliding contact surface:
Steel / PTFE fabric



GE .. AW

Dimension table · Unit: mm

Product Number	Dimensions									Basic load ratings		Angle	Mass
	d	D	T	d_m	B	C	S	r_1 min.	r_2 min.	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GE 10 AW	10	30	9.5	32	7.9	6	7	0.6	0.2	73.2	122	10	0.039
GE 12 AW	12	35	13	37	9.3	9	8	0.6	0.2	97.2	162	9	0.071
GE 15 AW	15	42	15	45	10.7	11	10	0.6	0.2	156	261	7	0.12
GE 17 AW	17	47	16	50	11.5	11.5	11	0.6	0.2	177	296	6	0.16
GE 20 AW	20	55	20	60	14.3	13	12.5	1	0.3	225	375	6	0.27
GE 25 AW	25	62	22.5	66	16	17	14	1	0.3	387	645	7	0.39
GE 30 AW	30	75	26	80	18	19.5	17.5	1	0.3	508	848	6	0.65
GE 35 AW	35	90	28	98	22	20	22	1	0.3	777	1290	6	1.04
GE 40 AW	40	105	32	114	27	22	24.5	1	0.3	1120	1860	6	1.65
GE 45 AW	45	120	36.5	130	31	25	27.5	1	0.3	1450	2430	6	2.48
GE 50 AW	50	130	42.5	140	33.5	32	30	1	0.3	1950	3250	5	3.43
GE 60 AW	60	150	45	160	37	33	35	1	0.3	2200	3670	7	4.65
GE 70 AW	70	160	50	170	40	36	35	1	0.3	2420	4030	6	5.65
GE 80 AW	80	180	50	194	42	36	42.5	1	0.3	3110	5180	6	7.16
GE 100 AW	100	210	59	220	50	42	45	1	0.3	3610	6020	7	10.7

CCTY

ROD ENDS

Rod Ends

Rod Ends

Page

Load carrying capacity 64

Installation and disassembly 65

Dimension tables 68

Load Carrying Capacity

Rod ends

The static load rating or ultimate load rating calculation of rod ends is based on the structure type. When rod ends have a spherical plain bearing insert, the static load rating can be calculated the same as the spherical plain bearings. The yield strength of the steel material also has to taken into consideration.

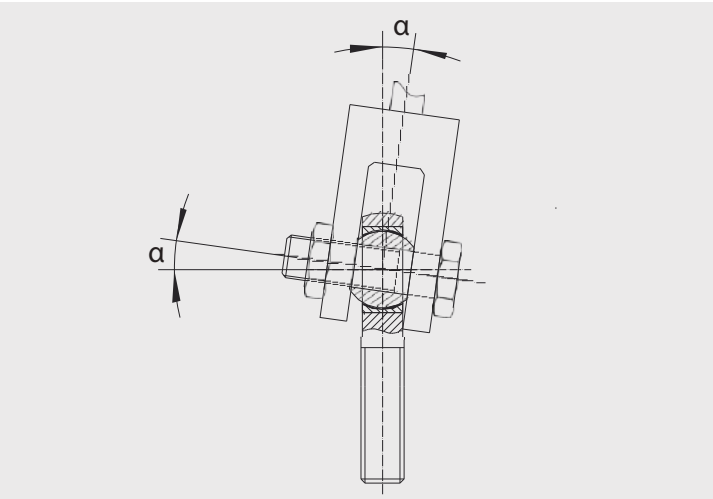
When comparing static load and yield, the smaller value represents the ultimate load rating.

Installation and Disassembly

Oscillation angle

The self-aligning angle depends on the geometrical cone formed between the center line of the ball and the boundary line of the ball as it moves from the center to the farthest position. It is presumed that a u-clamp is installed on the two spherical surfaces (Figure 14). The ball can swing symmetrically from the center in two directions, so the calculated angle needs to be multiplied by two. This provides a complete angle according to the definition of dislocated cone.

Figure 14

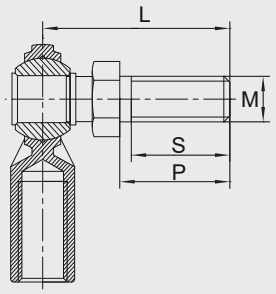


Installation and Disassembly

Stud and grease fitting

Standard material for the stud, unless otherwise specified by the customer, is carbon steel. Zinc plating is used for surface treatment to promote anti-corrosive performance. Female and male threads should be matched with the same accuracy. However, the higher accuracy male thread may be a better fit than a female thread. For example, 3A male thread matches 2B female thread.

Figure 15



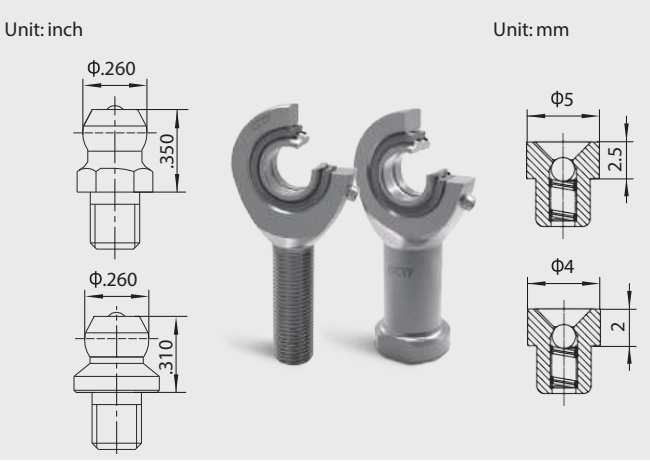
Unit: inch

Table 14

Rod End Bore Size	L REF.	P ±.010	S REF.	M 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

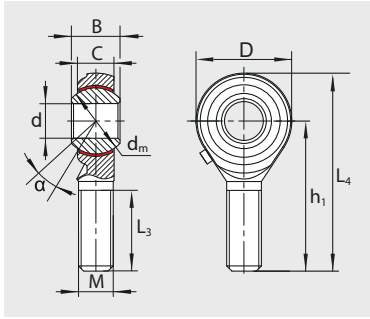
Grease fitting

Figure 16



POS .. DF

Male thread
Sliding contact surface:
Steel / Bronze



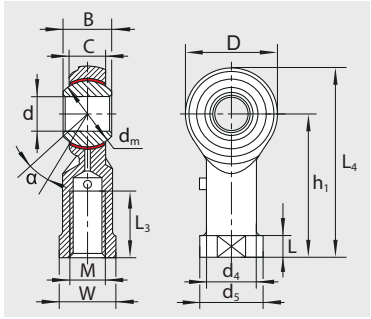
POS .. DF

Dimension table · Unit: mm

Product Number	Dimensions								Thread	Basic load ratings		Angle	Mass
	d	B	C	D	h_1	L_4	L_3	d_m	M -6g	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
POS 5 DF	5	8	6	18	33	42	19	11.11	M5	3.25	4.89	13	0.014
POS 6 DF	6	9	6.75	20	36	46	21	12.7	M6	4.3	6.92	13	0.018
POS 8 DF	8	12	9	24	42	54	25	15.875	M8	7.2	12.9	14	0.033
POS 10 DF	10	14	10.5	28	48	62	28	19.05	M10	10	18.5	13	0.055
POS 12 DF	12	16	12	32	54	70	32	22.225	M12	13.4	20.8	13	0.060
POS 14 DF	14	19	13.5	36	60	78	36	25.4	M14	17	32	16	0.124
POS 16 DF	16	21	15	42	66	87	37	28.575	M16	21.6	45.2	15	0.189
POS 18 DF	18	23	16.5	46	72	95	41	31.75	M18x1.5	26	46.9	15	0.255
POS 20 DF	20	25	18	50	78	103	45	34.925	M20x1.5	31.5	45.6	14	0.325
POS 22 DF	22	28	20	54	84	111	48	38.1	M22x1.5	38	61.1	15	0.433
POS 25 DF	25	31	22	60	94	124	55	42.85	M24x2	47.5	72.8	15	0.580
POS 28 DF	28	35	24	66	103	136	62	47.6	M27x2	57.2	78.6	15	0.714
POS 30 DF	30	37	25	70	110	145	66	50.8	M30x2	64	95.9	17	0.963

PHS .. DF

Female thread
Sliding contact surface:
Steel / Bronze



PHS .. DF

Dimension table · Unit: mm

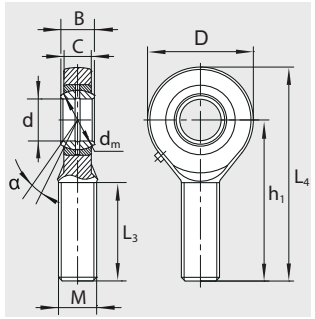
Product Number	Dimensions												Thread	Basic load ratings		Angle	Mass
	d	B	C	D	h_1	L_4	L_3	d_5	d_4	L	W	d_m	M -6H	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
PHS 5 DF	5	8	6	18	27	36	10	11	9	4	9	11.11	M5	3.25	9.2	13	0.016
PHS 6 DF	6	9	6.75	20	30	40	12	13	10	5	11	12.7	M6	4.3	8	13	0.024
PHS 8 DF	8	12	9	24	36	48	16	16	12.5	5	14	15.875	M8	7.2	13.1	14	0.043
PHS 10 DF	10	14	10.5	28	43	57	20	19	15	6.5	17	19.05	M10	10	18.5	13	0.071
PHS 12 DF	12	16	12	32	50	66	22	22	17.5	6.5	19	22.225	M12	13.4	20.8	13	0.100
PHS 14 DF	14	19	13.5	36	57	75	25	26	20	8	22	25.4	M14	17	32	16	0.160
PHS 16 DF	16	21	15	42	64	85	28	28	22	8	22	28.575	M16	21.6	45.2	15	0.220
PHS 18 DF	18	23	16.5	46	71	94	32	31	25	10	27	31.75	M18×1.5	26	46.9	15	0.326
PHS 20 DF	20	25	18	50	77	102	33	35	27.5	10	30	34.925	M20×1.5	31.5	45.6	14	0.399
PHS 22 DF	22	28	20	54	84	111	37	38	30	12	32	38.1	M22×1.5	38	61.1	15	0.515
PHS 25 DF	25	31	22	60	94	124	42	42	33.5	12	36	42.85	M24×2	47.5	72.8	15	0.700
PHS 28 DF	28	35	24	66	103	136	51	46	37	14	41	47.6	M27×2	57.2	78.6	15	0.907
PHS 30 DF	30	37	25	70	110	145	51	50	40	15	41	50.8	M30×2	64	95.9	17	1.135

GAR .. DO / GAR .. DO 2RS

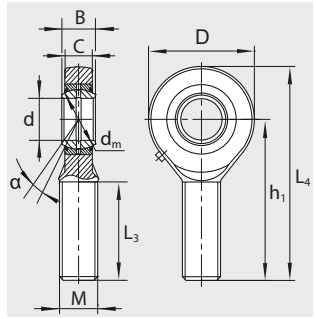
Male thread

Sliding contact surface:

Steel / Steel



GAR .. DO



GAR .. DO 2RS

Dimension table · Unit: mm

Product Number		Dimensions								Thread	Basic load ratings		Angle	Mass
Open	Sealed	d	B	C	d_m	D	h_1	L_4	L_3	M-6g	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GAR 6 DO [1]		6	6	4.4	10	21	36	46.5	18	M6	3.4	6.92	13	0.017
GAR 8 DO [1]		8	8	6	13	24	42	54	22	M8	5.5	12.9	15	0.029
GAR 10 DO [1]		10	9	7	16	29	48	62.5	26	M10	8.15	20.6	12	0.051
GAR 12 DO [1]		12	10	8	18	34	54	71	28	M12	10.8	30.1	11	0.086
GAR 15 DO		15	12	10	22	40	63	83	34	M14	17	41.5	8	0.14
GAR 17 DO		17	14	11	25	46	69	92	36	M16	21.2	56.5	10	0.19
GAR 20 DO	GAR 20 DO 2RS	20	16	13	29	53	78	104.5	43	M20x1.5	30	75.6	9	0.31
GAR 25 DO	GAR 25 DO 2RS	25	20	17	35	64	94	126	53	M24 x2	48	88.2	7	0.56
GAR 30 DO	GAR 30 DO 2RS	30	22	19	40	73	110	146.5	65	M30x2	62	119	6	0.89
GAR 35 DO	GAR 35 DO 2RS	35	25	21	47	82	140	181	82	M36x3	80	159	6	1.4
GAR 40 DO	GAR 40 DO 2RS	40	28	23	53	92	150	196	86	M39x3	100	194	7	1.8
GAR 45 DO	GAR 45 DO 2RS	45	32	27	60	102	163	214	94	M42x3	127	259	7	2.6

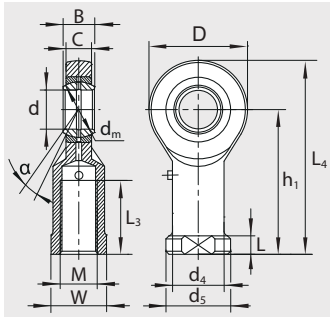
[1] Grease fittings not available on these sizes.

GIR .. DO / GIR .. DO 2RS

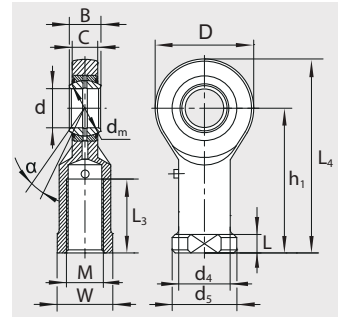
Female thread

Sliding contact surface:

Steel / Steel



GIR .. DO



GIR .. DO 2RS

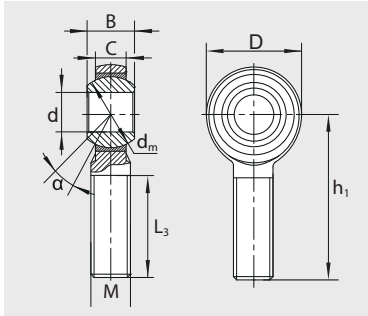
Dimension table · Unit: mm

Product Number		Dimensions												Thread	Basic load ratings		Angle	Mass
Open	Sealed	d	B	C	d_m	D	h_1	L_4	L_3	d_5	d_4	L	W	M-6H	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GIR 6 DO [1]		6	6	4.4	10	21	30	40.5	11	13	10	5	11	M6	3.4	10.2	13	0.021
GIR 8 DO [1]		8	8	6	13	24	36	48	15	16	12.5	5	14	M8	5.5	16	15	0.039
GIR 10 DO [1]		10	9	7	16	29	43	57.5	20	19	15	6.5	17	M10	8.15	22	12	0.061
GIR 12 DO [1]		12	10	8	18	34	50	67	23	22	17.5	6.5	19	M12	10.8	30.4	11	0.096
GIR 15 DO		15	12	10	22	40	61	81	30	26	21	8	22	M14	17	44.8	8	0.18
GIR 17 DO		17	14	11	25	46	67	90	34	30	24	10	27	M16	21.2	56.5	10	0.22
GIR 20 DO	GIR 20 DO 2RS	20	16	13	29	53	77	103.5	40	35	27.5	10	32	M20x1.5	30	75.6	9	0.35
GIR 25 DO	GIR 25 DO 2RS	25	20	17	35	64	94	126	48	42	33.5	12	36	M24 x2	48	88.2	7	0.64
GIR 30 DO	GIR 30 DO 2RS	30	22	19	40	73	110	146.5	56	50	40	15	41	M30x2	62	119	6	0.93
GIR 35 DO	GIR 35 DO 2RS	35	25	21	47	82	125	166	60	58	47	15	50	M36x3	80	159	6	1.3
GIR 40 DO	GIR 40 DO 2RS	40	28	23	53	92	142	188	65	65	52	18	55	M39x3	100	194	7	2.0
GIR 45 DO	GIR 45 DO 2RS	45	32	27	60	102	145	196	65	70	58	20	60	M42x3	127	259	7	2.5

[1] Grease fittings not available on these sizes.

MC

Male thread
Sliding contact surface:
Steel / Steel



MC

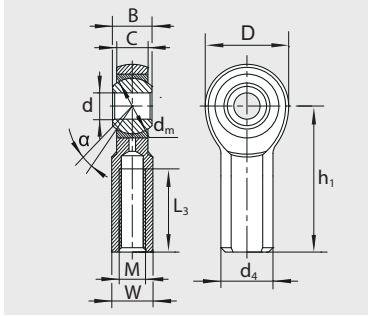
Dimension table · Unit: inch

Product Number	Dimension							Thread	Ultimate Radial Static Load Capacity	Angle	Mass
	d	D	B	C	d_m	h_1	L_3	M			
								UNF-3A	Lbs	α[°]	≈Lbs
MC 3	.1900	.625	.312	.250	.437	1.250	.750	10-32	1,169	7	.028
MC 4	.2500	.750	.375	.281	.500	1.562	1.000	1/4-28	2,158	8	.043
MC 5	.3125	.875	.437	.344	.625	1.875	1.250	5/16-24	2,784	7	.072
MC 6	.3750	1.000	.500	.406	.719	1.938	1.250	3/8-24	3,915	6	.112
MC 7	.4375	1.125	.562	.437	.812	2.125	1.375	7/16-20	4,218	7	.160
MC 8	.5000	1.312	.625	.500	.937	2.438	1.500	1/2-20	6,660	6	.249
MC 10	.6250	1.500	.750	.562	1.125	2.625	1.625	5/8-18	7,364	8	.382
MC 12	.7500	1.750	.875	.687	1.312	2.875	1.750	3/4-16	11,518	7	.602
MC 14	.8750	2.000	.875	.765	1.375	3.375	2.000	7/8-14	18,476	4	.906
MC 16	1.0000	2.750	1.375	1.000	1.875	4.125	2.125	1 1/4-12	43,541	8	2.406
MC 16-1	1.0000	2.750	1.375	1.000	1.875	4.125	2.125	1-14 [1)]	43,541	8	2.127
MC 16-2	1.0000	2.750	1.375	1.000	1.875	4.125	2.125	1-12	43,541	8	2.127

[1)] Threads 1-14 UNS-3A.

FC

Female thread
Sliding contact surface:
Steel / Steel



FC

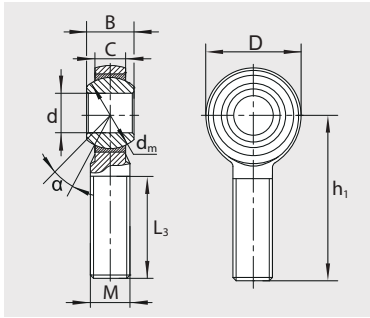
Dimension table · Unit: inch

Product Number	Dimensions									Thread	Ultimate Radial Static Load Capacity	Angle	Mass
	d	D	B	C	d_m	W	d_4	h_1	L_3	M			
										UNF-2B	Lbs	α[°]	≈Lbs
FC 3	.1900	.625	.312	.250	.437	.312	.406	1.062	.562	10-32	1,531	7	.038
FC 4	.2500	.750	.375	.281	.500	.375	.469	1.312	.750	1/4-28	2,539	8	.059
FC 5	.3125	.875	.437	.344	.625	.437	.500	1.375	.750	5/16-24	3,133	7	.092
FC 6	.3750	1.000	.500	.406	.719	.562	.687	1.625	.937	3/8-24	3,915	6	.152
FC 7	.4375	1.125	.562	.437	.812	.625	.750	1.812	1.062	7/16-20	4,218	7	.198
FC 8	.5000	1.312	.625	.500	.937	.750	.875	2.125	1.187	1/2-20	6,660	6	.329
FC 10	.6250	1.500	.750	.562	1.125	.875	1.000	2.500	1.500	5/8-18	7,364	8	.477
FC 12	.7500	1.750	.875	.687	1.312	1.000	1.125	2.875	1.750	3/4-16	11,518	7	.723
FC 14	.8750	2.000	.875	.765	1.375	1.125	1.300	3.375	1.875	7/8-14	18,476	4	1.030
FC 16	1.0000	2.750	1.375	1.000	1.875	1.500	1.625	4.125	2.125	1 1/4-12	40,881	8	2.125
FC 16-1	1.0000	2.750	1.375	1.000	1.875	1.500	1.625	4.125	2.125	1-14 [1)]	43,541	8	2.410
FC 16-2	1.0000	2.750	1.375	1.000	1.875	1.500	1.625	4.125	2.125	1-12	43,541	8	2.410

[1)] Threads 1-14 UNS-2B.

MA

Male thread
Sliding contact surface:
Steel / Steel



MA

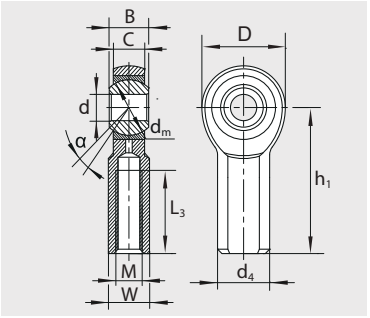
Dimension table · Unit: inch

Product Number	Dimensions							Thread	Ultimate Radial Static Load Capacity	Angle	Mass
	d	D	B	C	d_m	h_1	L_3	M			
								UNF-3A	Lbs	α[°]	≈Lbs
MA 3	.1900	.625	.312	.250	.437	1.250	.750	10-32	2,851	7	.028
MA 4	.2500	.750	.375	.281	.500	1.562	1.000	1/4-28	5,260	8	.043
MA 5	.3125	.875	.437	.344	.625	1.875	1.250	5/16-24	7,639	7	.072
MA 6	.3750	1.000	.500	.406	.719	1.938	1.250	3/8-24	9,544	6	.112
MA 7	.4375	1.125	.562	.437	.812	2.125	1.375	7/16-20	10,285	7	.160
MA 8	.5000	1.312	.625	.500	.937	2.438	1.500	1/2-20	16,238	6	.249
MA 10	.6250	1.500	.750	.562	1.125	2.625	1.625	5/8-18	17,955	8	.382
MA 12	.7500	1.750	.875	.687	1.312	2.875	1.750	3/4-16	28,081	7	.602
MA 14	.8750	2.000	.875	.765	1.375	3.375	2.000	7/8-14	45,051	4	.906
MA 16	1.0000	2.750	1.375	1.000	1.875	4.125	2.125	1 1/4-12	76,200	8	2.406
MA 16-1	1.0000	2.750	1.375	1.000	1.875	4.125	2.125	1-14 [1)]	76,200	8	2.127
MA 16-2	1.0000	2.750	1.375	1.000	1.875	4.125	2.125	1-12	76,200	8	2.127

[1)] Threads 1-14 UNS-3A.

FA

Female thread
Sliding contact surface:
Steel / Steel



FA

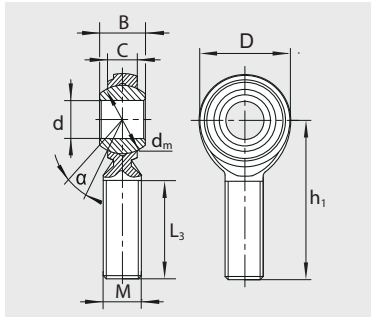
Dimension table · Unit: inch

Product Number	Dimensions									Thread	Ultimate Radial Static Load Capacity	Angle	Mass
	d	D	B	C	d_m	W	d_4	h_1	L_3	M			
										UNF-2B	Lbs	α[°]	≈Lbs
FA 3	.1900	.625	.312	.250	.437	.312	.4060	1.062	.562	10-32	3,733	7	.038
FA 4	.2500	.750	.375	.281	.500	.375	.4690	1.312	.750	1/4-28	6,190	8	.059
FA 5	.3125	.875	.437	.344	.625	.437	.5000	1.375	.750	5/16-24	7,639	7	.092
FA 6	.3750	1.000	.500	.406	.719	.562	.6870	1.625	.937	3/8-24	9,544	6	.152
FA 7	.4375	1.125	.562	.437	.812	.625	.7500	1.812	1.062	7/16-20	10,285	7	.198
FA 8	.5000	1.312	.625	.500	.937	.750	.8750	2.125	1.187	1/2-20	16,238	6	.329
FA 10	.6250	1.500	.750	.562	1.125	.875	1.0000	2.500	1.500	5/8-18	17,955	8	.477
FA 12	.7500	1.750	.875	.687	1.312	1.000	1.1250	2.875	1.750	3/4-16	28,081	7	.723
FA 14	.8750	2.000	.875	.765	1.375	1.125	1.3000	3.375	1.875	7/8-14	45,051	4	1.030
FA 16	1.0000	2.750	1.375	1.000	1.875	1.500	1.6250	4.125	2.125	1 1/4-12	76,200	8	2.125
FA 16-1	1.0000	2.750	1.375	1.000	1.875	1.500	1.6250	4.125	2.125	1-14 [1)]	76,200	8	2.410
FA 16-2	1.0000	2.750	1.375	1.000	1.875	1.500	1.6250	4.125	2.125	1-12	76,200	8	2.410

[1)] Threads 1-14 UNS-2B.

EM

Male thread
Sliding contact surface:
Steel / Steel



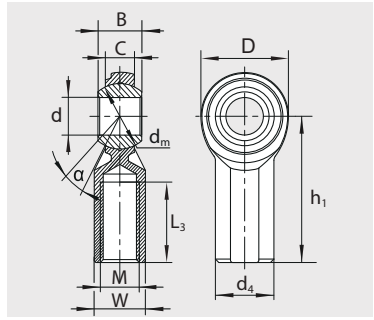
EM

Dimension table · Unit: inch

Product Number	Dimensions							Thread	Ultimate Radial Static Load Capacity	Angle	Mass
	d	B	C	h_1	D	d_m	L_3	M			
								UNF-3A	Lbs	α[°]	≈Lbs
EM 3	.1900	.312	.234	1.250	.625	.437	.750	10-32	1,204	10	.03
EM 4	.2500	.375	.250	1.562	.750	.500	1.000	1/4-28	2,212	13	.04
EM 4-5	.2500	.375	.250	1.875	.875	.500	1.250	5/16-24	4,574	13	.07
EM 5	.3125	.437	.312	1.875	.875	.625	1.250	5/16-24	3,577	11	.07
EM 5-6	.3125	.437	.312	1.938	1.000	.625	1.250	3/8-24	5,544	11	.11
EM 6	.3750	.500	.359	1.938	1.000	.719	1.250	3/8-24	5,068	11	.11
EM 7	.4375	.562	.406	2.125	1.125	.812	1.375	7/16-20	6,345	10	.15
EM 8	.5000	.625	.453	2.438	1.312	.937	1.500	1/2-20	8,388	10	.24
EM 10	.6250	.750	.484	2.625	1.500	1.125	1.625	5/8-18	9,713	13	.36
EM 10-12	.6250	.750	.484	2.875	1.750	1.125	1.750	3/4-16	16,067	13	.57
EM 12	.7500	.875	.593	2.875	1.750	1.312	1.750	3/4-16	14,207	12	.57

EF

Female thread
Sliding contact surface:
Steel / Steel



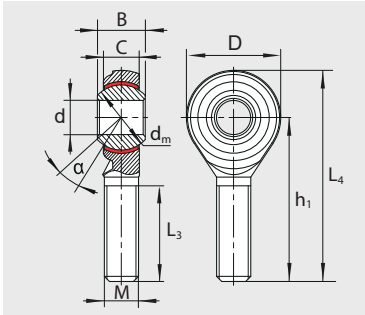
EF

Dimension table · Unit: inch

Product Number	Dimensions									Thread	Ultimate Radial Static Load Capacity	Angle	Mass
	d	D	B	C	W	d_4	d_m	L_3	h_1	M			
										UNF-2B	Lbs	α[°]	≈Lbs
EF 3	.1900	.625	.312	.234	.312	.406	.437	.500	1.062	10-32	2,079	10	.04
EF 4	.2500	.750	.375	.250	.375	.469	.500	.687	1.312	1/4-28	3,208	13	.05
EF 5	.3125	.875	.437	.312	.437	.500	.625	.687	1.375	5/16-24	3,824	11	.08
EF 5-6	.3125	1.000	.437	.312	.562	.687	.625	.812	1.625	3/8-24	5,544	11	.13
EF 6	.3750	1.000	.500	.359	.562	.687	.719	.812	1.625	3/8-24	5,087	11	.13
EF 7	.4375	1.125	.562	.406	.625	.750	.812	.937	1.812	7/16-20	6,385	10	.18
EF 8	.5000	1.312	.625	.453	.750	.875	.937	1.062	2.125	1/2-20	9,096	10	.29
EF 10	.6250	1.500	.750	.484	.875	1.000	1.125	1.375	2.500	5/8-18	9,713	13	.43
EF 10-12	.6250	1.750	.750	.484	1.000	1.125	1.125	1.562	2.875	3/4-16	16,338	13	.65
EF 12	.7500	1.750	.875	.593	1.000	1.125	1.312	1.562	2.875	3/4-16	14,207	12	.65

COS .. BK

Male thread
Sliding contact surface:
Steel / PTFE composite



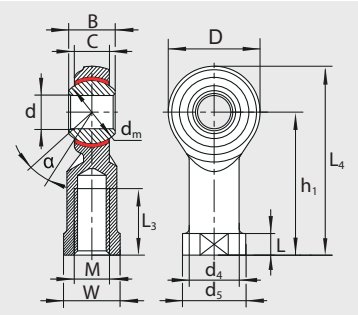
COS .. BK

Dimension table · Unit: mm

Product Number	Dimensions								Thread	Basic load ratings		Angle	Mass
	d	B	C	D	h_1	L_4	L_3	d_m	M -6g	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
COS 5 BK	5	8	6	18	33	42	19	11.11	M5	6	4.89	13	0.014
COS 6 BK	6	9	6.75	20	36	46	21	12.7	M6	7.65	6.92	13	0.018
COS 8 BK	8	12	9	24	42	54	25	15.875	M8	12.9	12.9	14	0.033
COS 10 BK	10	14	10.5	28	48	62	28	19.05	M10	18	18.5	13	0.055
COS 12 BK	12	16	12	32	54	70	32	22.225	M12	24	20.8	13	0.060
COS 14 BK	14	19	13.5	36	60	78	36	25.4	M14	31	32	16	0.124
COS 16 BK	16	21	15	42	66	87	37	28.575	M16	39	45.2	15	0.189
COS 18 BK	18	23	16.5	46	72	95	41	31.75	M18x1.5	47.5	46.9	15	0.255
COS 20 BK	20	25	18	50	78	103	45	34.925	M20x1.5	57	45.6	14	0.325
COS 22 BK	22	28	20	54	84	111	48	38.1	M22x1.5	68	61.1	15	0.433
COS 25 BK	25	31	22	60	94	124	55	42.85	M24x2	85	72.8	15	0.580
COS 28 BK	28	35	24	66	103	136	62	47.6	M27x2	102.9	78.6	15	0.714
COS 30 BK	30	37	25	70	110	145	66	50.8	M30x2	114	95.9	17	0.963

CHS .. BK

Female thread
Sliding contact surface:
Steel / PTFE composite



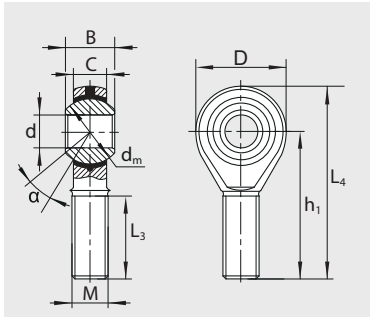
CHS .. BK

Dimension table · Unit: mm

Product Number	Dimensions												Thread	Basic load ratings		Angle	Mass
	d	B	C	D	h_1	L_4	L_3	d_5	d_4	L	W	d_m	M -6H	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
CHS 5 BK	5	8	6	18	27	36	10	11	9	4	9	11.11	M5	6	9.2	13	0.016
CHS 6 BK	6	9	6.75	20	30	40	12	13	10	5	11	12.7	M6	7.65	8	13	0.024
CHS 8 BK	8	12	9	24	36	48	16	16	12.5	5	14	15.875	M8	12.9	13.1	14	0.043
CHS 10 BK	10	14	10.5	28	43	57	20	19	15	6.5	17	19.05	M10	18	18.5	13	0.071
CHS 12 BK	12	16	12	32	50	66	22	22	17.5	6.5	19	22.225	M12	24	20.8	13	0.100
CHS 14 BK	14	19	13.5	36	57	75	25	26	20	8	22	25.4	M14	31	32	16	0.160
CHS 16 BK	16	21	15	42	64	85	28	28	22	8	22	28.575	M16	39	45.2	15	0.220
CHS 18 BK	18	23	16.5	46	71	94	32	31	25	10	27	31.75	M18×1.5	47.5	46.9	15	0.326
CHS 20 BK	20	25	18	50	77	102	33	35	27.5	10	30	34.925	M20×1.5	57	45.6	14	0.399
CHS 22 BK	22	28	20	54	84	111	37	38	30	12	32	38.1	M22×1.5	68	61.1	15	0.515
CHS 25 BK	25	31	22	60	94	124	42	42	33.5	12	36	42.85	M24×2	85	72.8	15	0.700
CHS 28 BK	28	35	24	66	103	136	51	46	37	14	41	47.6	M27×2	102.9	78.6	15	0.907
CHS 30 BK	30	37	25	70	110	145	51	50	40	15	41	50.8	M30×2	114	95.9	17	1.135

COS .. N

Male thread
Sliding contact surface:
Steel / Polymer



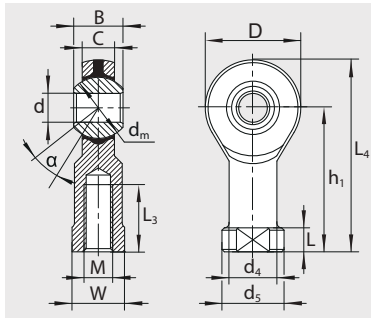
COS .. N

Dimension table · Unit: mm

Product Number	Dimensions								Thread	Ultimate Radial Static Load Capacity	Angle	Mass
	d	B	C	D	h_1	L_4	L_3	d_m	M -6g	kN	α[°]	≈kg
COS 5 N	5	8	6	18	33	42	19	11.11	M5	5	13	0.012
COS 6 N	6	9	6.75	20	36	46	21	12.7	M6	7	13	0.018
COS 8 N	8	12	9	24	42	54	25	15.875	M8	9.5	14	0.033
COS 10 N	10	14	10.5	28	48	62	28	19.05	M10	14.5	13	0.055
COS 12 N	12	16	12	32	54	70	32	22.225	M12	19	13	0.060
COS 14 N	14	19	13.5	36	60	78	36	25.4	M14	20.5	16	0.124
COS 16 N	16	21	15	42	66	87	37	28.575	M16	21.5	15	0.185
COS 18 N	18	23	16.5	46	72	95	41	31.75	M18x1.5	26.2	15	0.250
COS 20 N	20	25	18	50	78	103	45	34.925	M20x1.5	36	14	0.310
COS 22 N	22	28	20	54	84	111	48	38.1	M22x1.5	38.1	15	0.400
COS 25 N	25	31	22	60	94	124	55	42.85	M24x2	47.1	15	0.503
COS 28 N	28	35	24	66	103	136	62	47.6	M27x2	57.2	15	0.683
COS 30 N	30	37	25	70	110	145	66	50.8	M30x2	63.5	17	0.770

CHS .. N

Female thread
Sliding contact surface:
Steel / Polymer



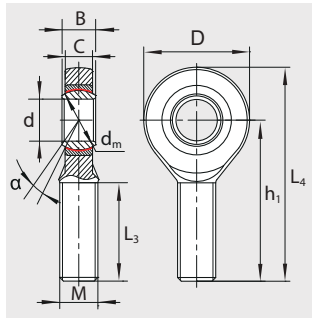
CHS .. N

Dimension table · Unit: mm

Product Number	Dimensions												Thread	Ultimate Radial Static Load Capacity	Angle	Mass
	d	B	C	D	h_1	L_4	L_3	d_5	d_4	L	W	d_m	M -6H	kN	α[°]	≈kg
CHS 5 N	5	8	6	18	27	36	10	11	9	4	9	11.11	M5	5	13	0.014
CHS 6 N	6	9	6.75	20	30	40	12	13	10	5	11	12.7	M6	7	13	0.200
CHS 8 N	8	12	9	24	36	48	16	16	12.5	5	14	15.875	M8	9.5	14	0.033
CHS 10 N	10	14	10.5	28	43	57	20	19	15	6.5	17	19.05	M10	14.5	13	0.055
CHS 12 N	12	16	12	32	50	66	22	22	17.5	6.5	19	22.225	M12	19	13	0.060
CHS 14 N	14	19	13.5	36	57	75	25	26	20	8	22	25.4	M14	20.5	16	0.124
CHS 16 N	16	21	15	42	64	85	28	28	22	8	22	28.575	M16	21.5	15	0.189
CHS 18 N	18	23	16.5	46	71	94	32	31	25	10	27	31.75	M18×1.5	26.2	15	0.255
CHS 20 N	20	25	18	50	77	102	33	35	27.5	10	30	34.925	M20×1.5	36	14	0.325
CHS 22 N	22	28	20	54	84	111	37	38	30	12	32	38.1	M22×1.5	38.1	15	0.433
CHS 25 N	25	31	22	60	94	124	42	42	33.5	12	36	42.85	M24×2	47.1	15	0.580
CHS 28 N	28	35	24	66	103	136	51	46	37	14	41	47.6	M27×2	57.2	15	0.714
CHS 30 N	30	37	25	70	110	145	51	50	40	15	41	50.8	M30×2	63.5	17	0.963

GAR .. C

Male thread
Sliding contact surface:
Steel / PTFE composite



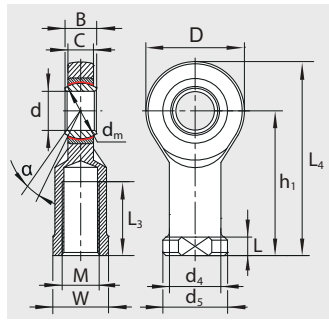
GAR .. C

Dimension table · Unit: mm

Product Number	Dimensions								Thread	Basic load ratings		Angle	Mass
	d	B	C	d_m	D	h_1	L_4	L_3	M-6g	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GAR 6 C	6	6	4.4	10	21	36	46.5	18	M6	3.6	6.92	13	0.017
GAR 8 C	8	8	6	13	24	42	54	22	M8	5.85	12.9	15	0.029
GAR 10 C	10	9	7	16	29	48	62.5	26	M10	8.65	20.6	12	0.051
GAR 12 C	12	10	8	18	34	54	71	28	M12	11.4	30.1	11	0.086
GAR 15 C	15	12	10	22	40	63	83	34	M14	17.6	41.5	8	0.14
GAR 17 C	17	14	11	25	46	69	92	36	M16	22.4	56.5	10	0.19
GAR 20 C	20	16	13	29	53	78	104.5	43	M20x1.5	31.5	75.6	9	0.31
GAR 25 C	25	20	17	35	64	94	126	53	M24 x2	51	104	7	0.56
GAR 30 C	30	22	19	40	73	110	146.5	65	M30x2	65.5	138	6	0.89

GIR .. C

Female thread
Sliding contact surface:
Steel / PTFE composite



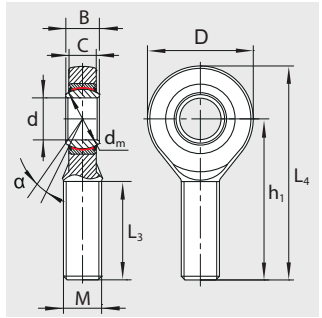
GIR .. C

Dimension table · Unit: mm

Product Number	Dimensions													Thread	Basic load ratings		Angle	Mass
	d	B	C	d_m	D	h_1	L_4	L_3	d_5	d_4	L	W		M-6H	dyn. C_r kN	stat. C_{0r} kN	α[°]	≈kg
GIR 6 C	6	6	4.4	10	21	30	40.5	11	13	10	5	11		M6	3.6	10.2	13	0.021
GIR 8 C	8	8	6	13	24	36	48	15	16	12.5	5	14		M8	5.85	16	15	0.039
GIR 10 C	10	9	7	16	29	43	57.5	20	19	15	6.5	17		M10	8.65	22	12	0.061
GIR 12 C	12	10	8	18	34	50	67	23	22	17.5	6.5	19		M12	11.4	30.4	11	0.096
GIR 15 C	15	12	10	22	40	61	81	30	26	21	8	22		M14	17.6	44.8	8	0.18
GIR 17 C	17	14	11	25	46	67	90	34	30	24	10	27		M16	22.4	56.5	10	0.22
GIR 20 C	20	16	13	29	53	77	103.5	40	35	27.5	10	32		M20x1.5	31.5	75.6	9	0.35
GIR 25 C	25	20	17	35	64	94	126	48	42	33.5	12	36		M24 x2	51	104	7	0.64
GIR 30 C	30	22	19	40	73	110	146.5	56	50	40	15	41		M30x2	65.5	138	6	0.93

GAR .. UK 2RS

Male thread
Sliding contact surface:
Steel / PTFE fabric



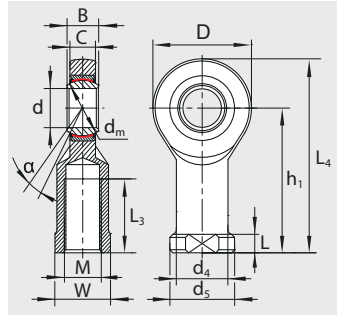
GAR .. UK 2RS

Dimension table · Unit: mm

Product Number	Dimensions								Thread	Basic load ratings		Angle	Mass
	d	B	C	d_m	D	h_1	L_4	L_3	M-6g	dyn. C_r	stat. C_{0r}		
										kN	kN	α[°]	≈kg
GAR 20 UK 2RS	20	16	13	29	53	78	104.5	43	M20x1.5	31.5	75.6	9	0.31
GAR 25 UK 2RS	25	20	17	35	64	94	126	53	M24 x2	51	104	7	0.56
GAR 30 UK 2RS	30	22	19	40	73	110	146.5	65	M30x2	65.5	138	6	0.89
GAR 35 UK 2RS	35	25	21	47	82	140	181	82	M36x3	210	159	6	1.4
GAR 40 UK 2RS	40	28	23	53	92	150	196	86	M39x3	277	194	7	1.8
GAR 45 UK 2RS	45	32	27	60	102	163	214	94	M42x3	360	259	7	2.6

GIR .. UK 2RS

Female thread
Sliding contact surface:
Steel / PTFE fabric



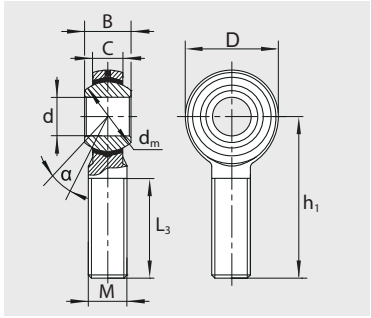
GIR .. UK 2RS

Dimension table · Unit: mm

Product Number	Dimensions												Thread	Basic load ratings		Angle	Mass
	d	B	C	d_m	D	h_1	L_4	L_3	d_5	d_4	L	W	M-6H	dyn. C_r	stat. C_{0r}		
														kN	kN	α[°]	≈kg
GIR 20 UK 2RS	20	16	13	29	53	77	103.5	40	35	27.5	10	32	M20x1.5	31.5	75.6	9	0.35
GIR 25 UK 2RS	25	20	17	35	64	94	126	48	42	33.5	12	36	M24x2	51	104	7	0.64
GIR 30 UK 2RS	30	22	19	40	73	110	146.5	56	50	40	15	41	M30x2	65.5	138	6	0.93
GIR 35 UK 2RS	35	25	21	47	82	125	166	60	58	47	15	50	M36x3	210	159	6	1.3
GIR 40 UK 2RS	40	28	23	53	92	142	188	65	65	52	18	55	M39x3	277	194	7	2.0
GIR 45 UK 2RS	45	32	27	60	102	145	196	65	70	58	20	60	M42x3	360	259	7	2.5

MCN ..

Male thread
Sliding contact surface:
Steel / Polymer



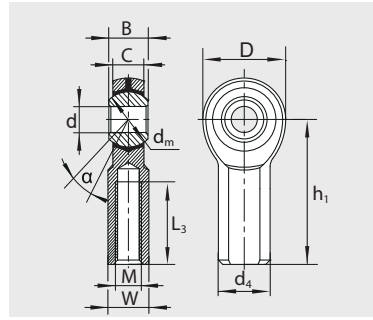
MCN ..

Dimension table · Unit: inch

Product Number	Dimensions							Thread	Ultimate Radial Static Load Capacity	Angle	Mass
	d	B	C	h_1	D	d_m	L_3	M			
								UNF-2A	Lbs	α[°]	≈Lbs
MCN 3	.1900	.312	.250	1.250	.625	.437	.750	10-32	1,210	7	.023
MCN 4	.2500	.375	.281	1.562	.750	.500	1.000	1/4-28	2,470	8	.040
MCN 5	.3125	.437	.344	1.875	.875	.625	1.250	5/16-24	2,740	7	.071
MCN 6	.3750	.500	.406	1.938	1.000	.719	1.250	3/8-24	4,210	6	.107
MCN 7	.4375	.562	.437	2.125	1.125	.812	1.312	7/16-20	5,350	7	.148
MCN 8	.5000	.625	.500	2.438	1.312	.937	1.500	1/2-20	6,430	6	.232
MCN 10	.6250	.750	.562	2.625	1.500	1.125	1.625	5/8-18	8,300	8	.364
MCN 12	.7500	.875	.687	2.875	1.750	1.312	1.750	3/4-16	10,900	7	.568

FCN ..

Female thread
Sliding contact surface:
Steel / Polymer



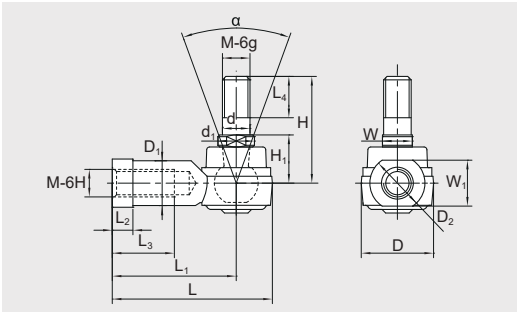
FCN ..

Dimension table · Unit: inch

Product Number	Dimensions									Thread	Ultimate Radial Static Load Capacity	Angle	Mass
	d	B	C	h_1	D	d_4	W	d_m	L_3	M			
										UNF-2B	Lbs	α[°]	≈Lbs
FCN 3	.1900	.312	.250	1.062	.625	.406	.312	.437	.562	10-32	1,210	7	.036
FCN 4	.2500	.375	.281	1.312	.750	.469	.375	.500	.750	1/4-28	2,470	8	.059
FCN 5	.3125	.437	.344	1.375	.875	.500	.437	.625	.750	5/16-24	2,740	7	.077
FCN 6	.3750	.500	.406	1.625	1.000	.687	.562	.719	.937	3/8-24	4,100	6	.146
FCN 7	.4375	.562	.437	1.812	1.125	.750	.625	.812	1.031	7/16-20	5,350	7	.192
FCN 8	.5000	.625	.500	2.125	1.312	.875	.750	.937	1.187	1/2-20	6,430	6	.313
FCN 10	.6250	.750	.562	2.500	1.500	1.000	.875	1.125	1.500	5/8-18	8,300	8	.464
FCN 12	.7500	.875	.687	2.875	1.750	1.125	1.000	1.312	1.562	3/4-16	10,900	7	.672

SQF .. N RS

Male and female thread
Sliding contact surface:
Steel / Polymer



SQF .. N RS

Dimension table · Unit: mm

Product Number	Dimensions														Thread	Ultimate stat.		Angle	Mass
	d	d_1	L	L_1	L_2	L_3	L_4	H	H_1	D	D_1	D_2	W_1	W	M	Pull Out kN	Shear kN	α[°]	≈kg
SQF 8 N RS	8	10.6	46.5	36	6	18	12	31	14	21	13	16	14	9	M8	3.5	6	40	0.064
SQF 10 N RS	10	13	56.5	43	7	22	21	43	17	27	15	19	17	11	M10	18.3	11.3	40	0.108
SQF 12 N RS	12	16	65.5	50	5.5	26	17	41.7	18.7	31	20	26	22	14	M12x1.25	25	16	40	0.21
SQF 14 N RS	14	18	74	57	10	30	22	56	21.5	34	20	25	22	17	M14x1.5	36.4	19.8	40	0.27
SQF 16 N RS	16	18.7	83	64	11	34	29	66	23.5	38	22	27	24	17	M16	36.4	26.9	30	0.366

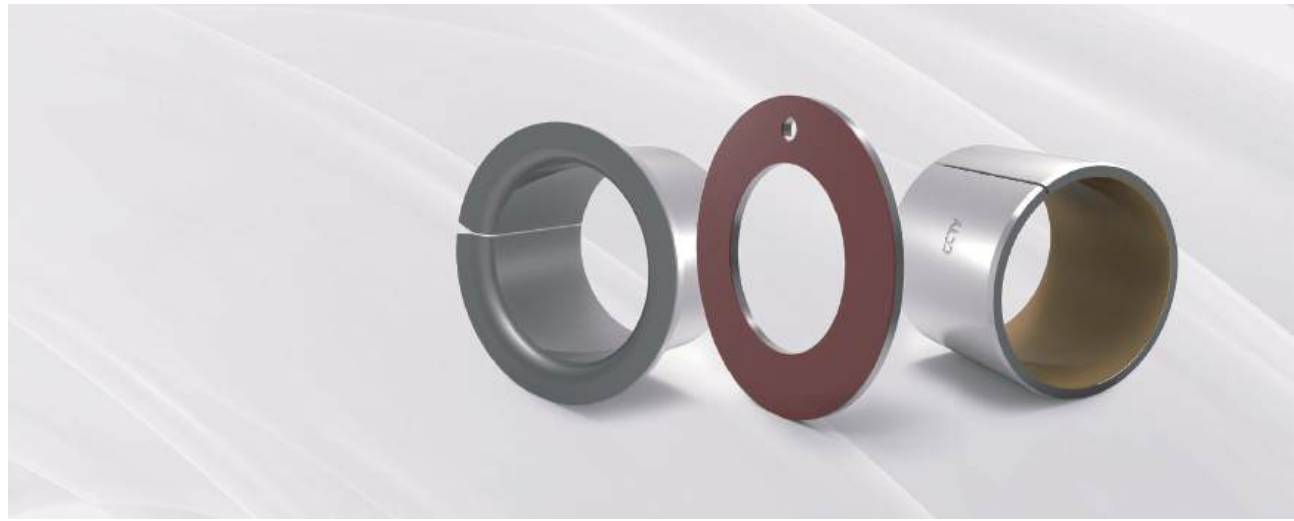
BUSHINGS

Bushings

PTFE Composite / Metal Bushings
Polymer Composite / Metal Bushings
Bimetal / Metal Bushings

Bushings

	Page
PTFE composite/ Metallic plain bushings	95
Material	96
Performance	105
Methods of checking	112
Mounting	113
Dimension tables	116
Polymer composite/ Metallic plain bushings	169
Material	170
Lubrication	172
Performance	173
Dimension tables	179
Metallic and bimetallic plain bushings	193
Material	194
Dimension tables	199



PTFE composite/Metallic plain bushings Maintenance-free

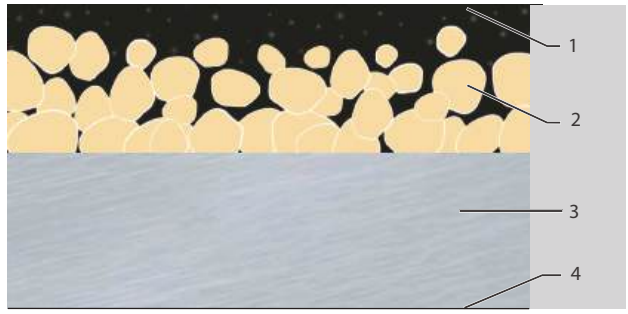
Cylindrical Bushings
Flanged Bushings
Thrust Washers

Material

TSA bushing material

Structure

Figure 17



1. PTFE composite: 0.01-0.05 mm
2. Porous bronze: 0.2-0.3 mm
3. Steel backing: 0.3-2.3 mm
4. Coating: phosphating (tin-plating/copper plating)

Features

- Low carbon steel backing with sintered porous bronze impregnated with a PTFE composite polymer.
- Self-lubricating material resulting in low friction and excellent wear resistance providing a long operation life.
- Excels in dry applications by managing bearing load, speed and temperatures under environmental conditions.
- Lead-free material compliant with RoHS and REACH.
- Available as cylindrical, flanged and thrust.

B-TSA bushing material

Structure

Figure 18

1. PTFE composite: 0.01-0.05 mm
2. Porous bronze: 0.2-0.3 mm
3. Bronze backing: 0.5-2.3 mm

Features

- Bronze backing with sintered porous bronze impregnated with a PTFE composite polymer.
- Excellent wear and low friction performance over a range of loads, speeds and temperatures in dry running conditions.
- Suitable for linear, oscillating and rotating movements.
- Bronze backing offers improved corrosion resistance compared to TSA material.
- Lead-free material compliant with RoHS and REACH.
- Available as cylindrical, flanged and thrust.

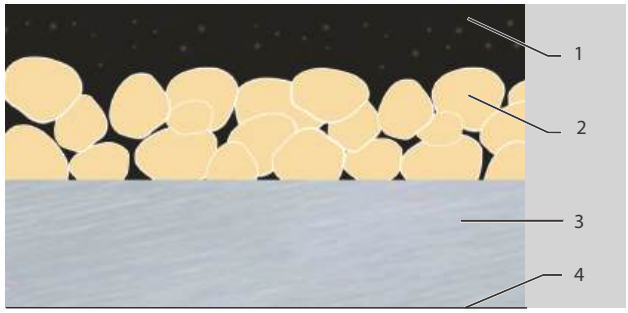
Material

TFA bushing material

For dry applications

Structure

Figure 19



1. PTFE composite: 0.03-0.15 mm
2. Porous bronze: 0.15-0.30 mm
3. Steel backing: 0.3-2.3 mm
4. Coating: phosphating (tin-plating/copper plating)

Features

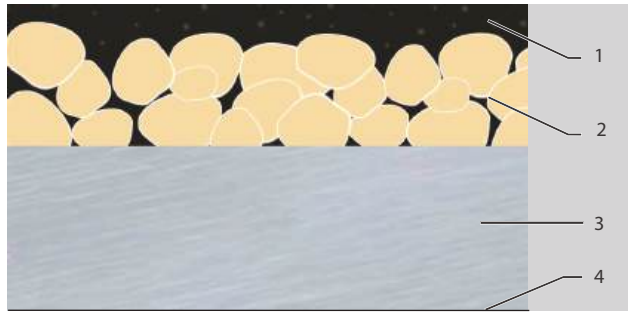
- Low carbon steel backing with sintered porous bronze impregnated with a thick PTFE composite polymer.
- Self-lubricating material resulting in low friction and excellent wear resistance providing a long operation life in dry applications.
- Excels in high frequency oscillation applications such as belt tensioners and dual-mass flywheels.
- Lead-free material compliant with RoHS and REACH.
- Available as cylindrical, welded flanged and thrust.

TOA bushing material

For oil, rotation applications

Structure

Figure 20



1. PTFE composite: 0.01-0.05 mm
2. Porous bronze: 0.20-0.30 mm
3. Steel backing 0.3-2.3 mm
4. Coating: phosphating (tin-plating/copper plating)

Features

- Low carbon steel backing with sintered porous bronze impregnated with a PTFE composite polymer.
- Self-lubricating material resulting in low friction and excellent wear resistance providing a long operation life in oil applications.
- Very good flow erosion and cavitation resistance.
- Excels in oil applications such as hydraulic cylinders, hydraulic motors, torque converters and pumps.
- Lead-free material compliant with RoHS and REACH.
- Available as cylindrical, flanged and thrust.

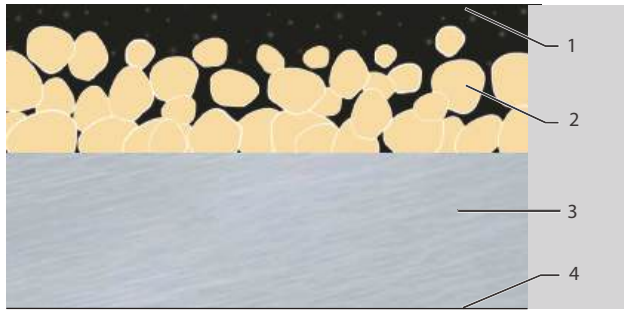
Material

TGA bushing material

For grease applications

Structure

Figure 21



1. PTFE composite: 0.01-0.05 mm
2. Porous bronze: 0.20-0.30 mm
3. Steel backing 0.3-2.3 mm
4. Coating: phosphating (tin-plating/copper plating)

Features

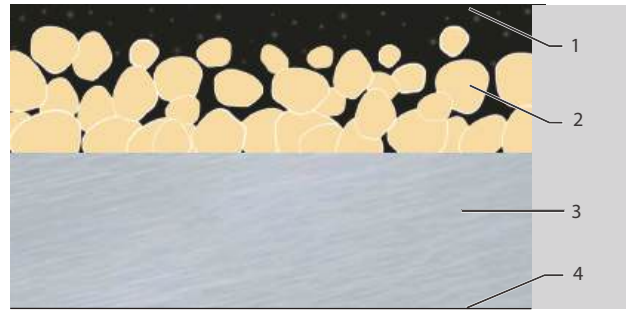
- Low carbon steel backing with sintered porous bronze impregnated with a PTFE composite polymer.
- Self-lubricating material resulting in low friction and excellent wear resistance providing a long operation life in grease applications.
- Excels in grease applications such as cross coupling, clutch.
- Lead-free material compliant with RoHS and REACH.
- Available as cylindrical and thrust.

TLA bushing material

For oil, liner motion applications

Structure

Figure 22



1. PTFE composite: 0.01-0.05 mm
2. Porous bronze: 0.20-0.30 mm
3. Steel backing 0.3-2.3 mm
4. Coating: phosphating (tin-plating/copper plating)

Features

- Low carbon steel backing with sintered porous bronze impregnated with a PTFE composite polymer.
- Self-lubricating material resulting in low friction and excellent wear resistance providing a long operation life in oil applications.
- Eliminates “stick and slip” thanks to a low coefficient of friction.
- Very good flow erosion and cavitation resistance.
- Excels in oil applications such as shock absorbers and liner movement applications.
- Lead-free material compliant with RoHS and REACH.
- Available as cylindrical, flanged and thrust.

Material

Physical and mechanical performance

Table 15

Characteristics		Symbol	Parameter	Unit
Physical performance	Thermal conductivity	λ	40	W/mK
	Linear expansion factor:			
	Parallel to surface	α_1	11	$1/10^6K$
	Normal to surface	α_2	30	$1/10^6K$
	Max working temperature	T_{max}	280	°C
	Min working temperature	T_{min}	-200	°C
Mechanical properties	Compressive strength	σ_C	350	N/mm^2
	Maximum load			
	Static load	$p_{sta.max}$	250	N/mm^2
	Dynamic load	$p_{dyn.max}$	140	N/mm^2

pV limits

Table 16

Bushing series	Ultimate pV (N/mm^2 x m/s)		
	Dry	Oil lubricated	Grease lubricated
TSA	3.6	—	—
TOA	—	10	—
TFA	3.6	—	—
TGA	—	—	3.6
TLA	2.0	10	—

Speed V

Table 17

Bushing series	Ultimate V (m/s)		
	Dry	Oil lubricated	Grease lubricated
TSA	2.5	—	—
TOA	—	10	—
TFA	2.5	—	—
TGA	—	—	2.5
TLA	2.5	10	—

Chemical performance

Table 18

Bushing series	Air	Vacuum	Water	Steam	Weak acid	Strong acid	Alkaline
TSA	●●●	●●●	●●●	●●●	●●	●	●●●
TOA	●●●	●●●	●●●	●●●	●●	●	●●●
TFA	●●●	●●●	●●●	●●●	●●	●	●●●
TGA	●●●	●●●	●●●	●●●	●●	●	●●●
TLA	●●●	●●●	●●●	●●●	●●	●	●●●

● Not Recommended ●● Acceptable ●●● Satisfactory

Performance under different lubricating conditions

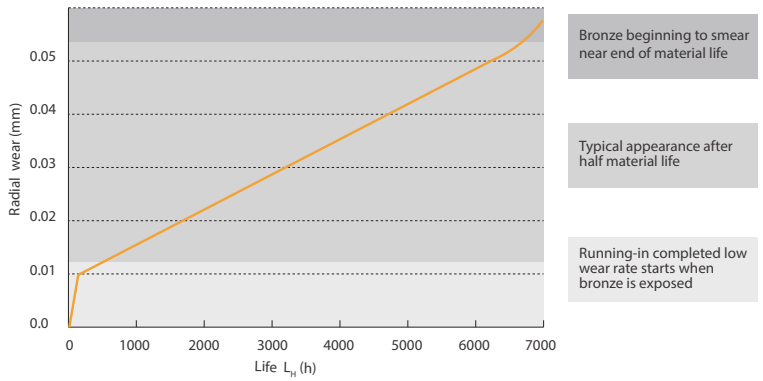
Table 19

Bushing series	Dry	Oil lubricated	Grease lubricated
TSA	Excellent	Good	Good
TOA	Fair	Excellent	Very good
TFA	Excellent	Fair	Good
TGA	Fair	Good	Excellent
TLA	Good	Excellent	Very good

Material

Dry wear mechanism

Figure 23

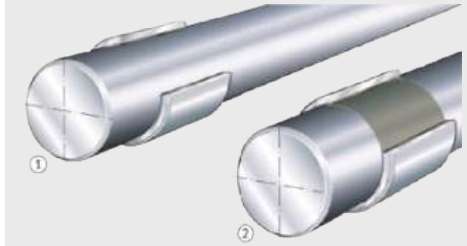


Running-in process

During the running-in phase, some of the PTFE layer is transferred to the mating shaft forming a low coefficient of friction by compensating for uneven areas, Figure 24

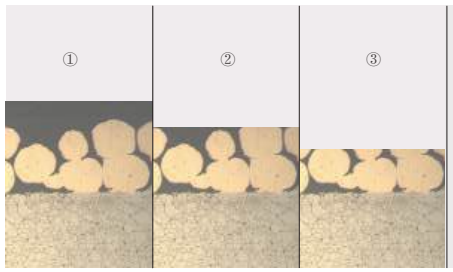
After the running-in phase is complete, some of the porous bronze layer is visible on the sliding layers, Figure 25.

Figure 24



Material transfer during running-in
① Before running-in
② After running-in

Figure 25



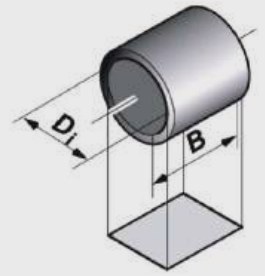
Typical wear pattern of sliding layer
① Before running-in
② After running-in
③ After long operating life

Performance

Specific load P

The specific load P is the working load divided by the projected area (A) of the bushing.

Figure 26



Projected Area

$A = D_i \cdot B$

A	mm^2	Projected area of bushing
D_i	mm	Inner diameter of bushing, flanged bushing or thrust washer
B	mm	Width of bushing

Bushing

$$p = \frac{F}{D_i \cdot B}$$

Flanged bushing (axial load)

$$p = \frac{F}{0.04 \cdot (D_{f1}^2 - D_i^2)}$$

Thrust washer

$$p = \frac{4F}{\pi \cdot (D_o^2 - D_i^2)}$$

p	N/mm^2	Specific load
F	N	Bushing load
D_o	mm	Outer diameter of bushing or thrust washer
D_{f1}	mm	Nominal flange outer diameter

Performance

Specific load limit p_{lim}

The maximum load that can be borne by the bushing is the ultimate load. When the limit load is high under constant steady load, the specific load limit will be decreased due to fatigue pressure on bushing under dynamic load or vibrating load.

Table 20

Type of load	p_{lim}[N/mm²]									
Rotating under constant load	140									
Oscillation under constant load										
p_{lim}	140	140	115	95	85	80	60	44	30	20
Number of movement cycles Q	1000	2000	4000	6000	8000	10^4	10^5	10^6	10^7	10^8
Dynamic load, rotating or oscillating movement										
p_{lim}	60	60	50	46	42	40	30	22	15	10
Number of movement cycles Q	1000	2000	4000	6000	8000	10^4	10^5	10^6	10^7	10^8

Sliding speed V

Continuous rotating

Bushing

$$v = \frac{D_i \cdot \pi \cdot n}{60 \cdot 10^3}$$

Thrust washer

$$v = \frac{\frac{D_o + D_i}{2} \cdot \pi \cdot n}{60 \cdot 10^3}$$

Oscillating movement

Bushing

$$v = \frac{D_i \cdot \pi}{60 \cdot 10^3} \cdot \frac{4\varphi \cdot N_{OSZ}}{360}$$

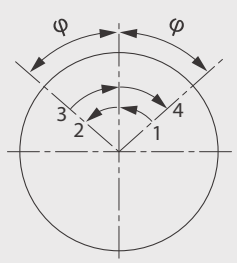
Thrust washer

$$v = \frac{\frac{D_o + D_i}{2} \cdot \pi \cdot n}{60 \cdot 10^3} \cdot \frac{4\varphi \cdot N_{OSZ}}{360}$$

v	m/s	Sliding speed
D_i	mm	Inner diameter of bushing, flanged bushing or thrust washer
n	min^{-1}	Revolution
φ	°	Angular displacement
N_{osz}	min^{-1}	Oscillating frequency

Oscillating angle φ

Figure 27



pV value

The service life of bushing depends on pV value, i.e. the actual load p[N/mm²] times the sliding speed V[m/s].

$$pv = p \cdot v$$

p	N/mm²	Specific load
v	m/s	Sliding speed

Application factors

Temperature f_T

The service life of the bushing depends on the operating temperature. Under dry running conditions, frictional heat is generated at the surface of the bushing dependent on the pV condition. While pV is given, the operating temperature of the bushing depends on the environment temperature and thermal dissipation properties of the housing. Intermittent operation affects the thermal dissipation and the operating temperature. The influence of operating temperature on bushing is indicated by f_T

Table 21

Working mode	Property of bushing housing	Ambient temperature of bushing T_{amb} [°C] and temperature application factor f_T					
		25	60	100	150	200	280
Dry friction, continuous running	Average heat dissipation	1	0.8	0.6	0.4	0.2	0.1
Dry friction, continuous running	Light housing fit or isolated housing with poor heat dissipation	0.5	0.4	0.3	0.2	0.1	-
Dry friction, continuous running	Non-metal bearing housing with extremely poor heat dissipation	0.3	0.3	0.2	0.1	-	-
Dry friction, intermittent operation (cycle less than 2 min before long-term standby)	Average heat dissipation	2	1.6	1.2	0.8	0.4	0.2
Continuous operation in water		2	1.5	0.6	-	-	-
Alternative operation of water immersion and dry friction		0.2	0.1	-	-	-	-
Continuous operation in unlubricated fluid other than water		1.5	1.2	0.9	0.6	0.3	0.1
Continuous operation in lubricated fluid		3	2.5	2	1.5	-	-

Performance

Mating surface f_M and modification factor for service life f_L

The influence of material of fitting surface on the service life is represented by factor for mating surface f_M , modification factor for service life f_L.

Note:

The surface mated with the bushing is fine machined to roughness Ra 0.4 or better. After surface fine ground, the mating surface is cleaned to remove grinding particles. The cast iron surface should be <Ra 0.3.

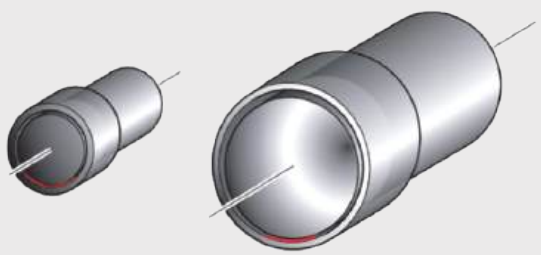
Table 22

Material	f_M	f_L	Material	f_M	f_L	Material	f_M	f_L
Steel and cast iron			Coating on steel no less than 0.013mm			Non-ferrous metal materials		
Carbon steel	1	200	Cadmium plating	0.2	600	A-alloy	0.4	200
Carbon manganese steel	1	200	Hard chrome	2	600	Bronze or bronze -based alloy	0.1-0.4	200
Alloy steel	1	200	Lead	1.5	600	Hard anodic aluminum oxide	3.0	600
Hardened tempered steel	1	200	Nickel plating	0.2	600			
Nitriding steel	1	200	Phosphating	0.2	300			
Salt-bath nitro cemented steel	1	200	Tin-nickel alloy	1.2	600			
Nitriding steel	1	200	Titanium nitride	1	600			
Cast iron	1	200	Hard alloy	3	600			
			Galvanizing	0.2	600			

Dimensional f_B

The running clearance of a bushing increases with bushing diameter resulting in a proportionally smaller contact area between the shaft and bushing (Figure 28). The reduced contact area will affect the actual load and the service life of bushing, hence, the dimensional factor for bushing f_B is used.

Figure 28

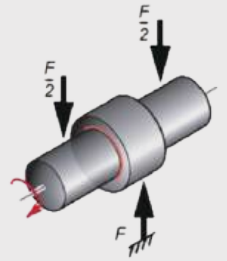


Contact area between the shaft and bushing

Figure 29

Type of load

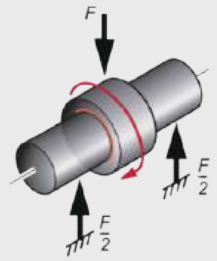
Figure 30



Steady load, bushing stationary, Shaft rotating

Type of load

Figure 31



Rotating load, shaft stationary, bushing rotating

Performance

Calculation of bushing service life

The bearing is overloaded when the calculated high load factor is negative, the diameter and width of bushing is increased.

High load f_E

$$f_E = \frac{p_{lim} - p}{p_{lim}}$$

f_E	-	Factor for high load
p_{lim}	N/mm²	Specific load limit
p	N/mm²	Specific load

Modified pV factor

Bushing

$$pv = \frac{5.25 \cdot 10^{-5} \cdot F \cdot n}{f_E \cdot B \cdot f_T \cdot f_M \cdot f_B}$$

Flanged bushing (axial load)

$$pv = \frac{6.5 \cdot 10^{-4} \cdot F \cdot n}{f_E \cdot (D_{f1} - D_i) \cdot f_T \cdot f_M \cdot f_B}$$

Thrust washer

$$pv = \frac{3.34 \cdot 10^{-5} \cdot F \cdot n}{f_E \cdot (D_o - D_i) \cdot f_T \cdot f_M \cdot f_B}$$

Estimated service life of bushing L_H

Bushing (Steady load)

$$L_H = \frac{615}{pv} - f_L$$

Thrust washer

$$L_H = \frac{410}{pv} - f_L$$

Bushing (Rotating load)

$$L_H = \frac{1230}{pv} - f_L$$

Flanged bushing (Axial load)

$$L_H = \frac{410}{pv} - f_L$$

L_H	h	Service life
p	N/mm²	Specific load
V	m/s	Sliding speed
f_L	-	Factor for service life

Estimating example for service life of bushing L_H

Table 23

Given data			
Detail load information	Steady load	Inner diameter D_i	40 mm
	Continuous rotating	Width B	30 mm
Shaft	Steel	Bushing load F	5000 N
	25℃ without lubricating	Rotary speed N	25 min^{-1}

Table 24

Calculation constants and application factors		
Specific load limit P_{lim}	140 N/mm²	Table 20, Page 106
Dimensional factor of bushing f_B	0.85	Figure 29, Page 109
Application factor of material f_M	1	Table 22, Page 108
Modification factor for service life f_L	200 h	Table 22, Page 108
Application factor f_T	1	Table 21, Page 107

Table 25

Calculation	Reference	Value
Specific load p [N/mm²]	Page 105	$p = \frac{F}{D_i \cdot B} = \frac{5000}{40 \cdot 30} = 4.17$
Sliding speed v [m/s]	Page 106	$v = \frac{D_i \cdot \pi \cdot n}{60 \cdot 10^3} = \frac{40 \cdot \pi \cdot 25}{60000} = 0.052$
High load factor f_E [-]	Page 110	$f_E = \frac{p_{lim} - p}{p_{lim}} = \frac{140 - 4.17}{140} = 0.970$
pv modification factor [N/mm² x m/s]	Page 110	$pv = \frac{5.25 \cdot 10^{-5} \cdot F \cdot n}{f_E \cdot B \cdot f_T \cdot f_M \cdot f_B} = \frac{6.5625}{24.265} = 0.27$
Service life L_H [h]	Page 110	$L_H = \frac{615}{pv} - f_L = \frac{615}{0.27} - 200 = 2077$

Note:

The service life of bushing products depends on many factors. The calculated theoretical service life varies under different test conditions.

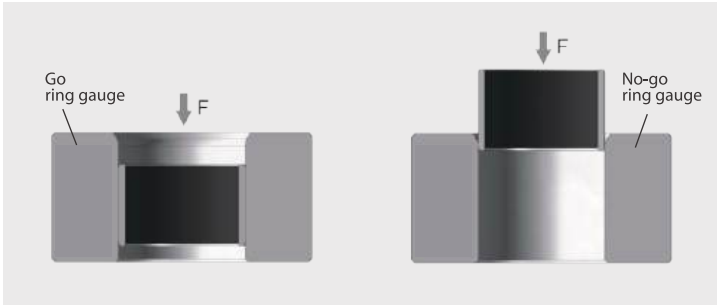
Please contact CCTY if theoretical service life calculations are required. We will complete a theoretical calculation for the service life based on the working conditions.

Methods of checking

Checking method for outer diameter (OD)

Check OD by go ring gauge and no go ring gauge： bushings can be pressed into go ring gauge under hand pressing of no more than 250 N, the length into no-go ring gauge should not exceed 1/3 height under same force.

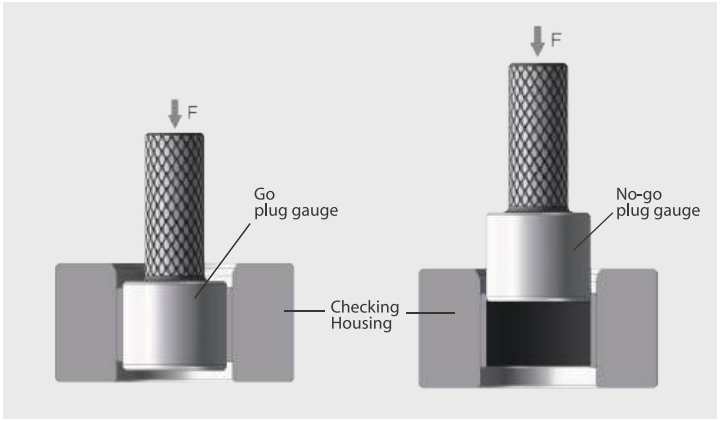
Figure 32



Checking method for inner diameter (ID)

When pressing a bushing into its checking housing, check the bushing bore with the go plug gauge and no-go plug gauge. The go plug gauge can be inserted into the internal diameter of the bushing with minimal hand force of 250N or less. Should stop at no more than 1/3 height of the bushing under the same force.

Figure 33

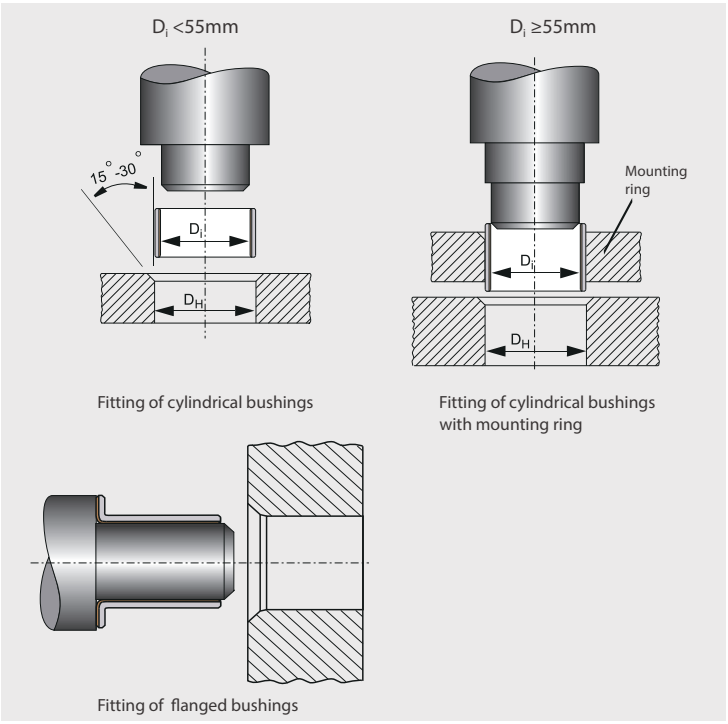


Mounting

Installation

The bushings can be easily pressed into the housing bore. The bushing can be easily pressed if the bushing backing or housing bore is lightly oiled.

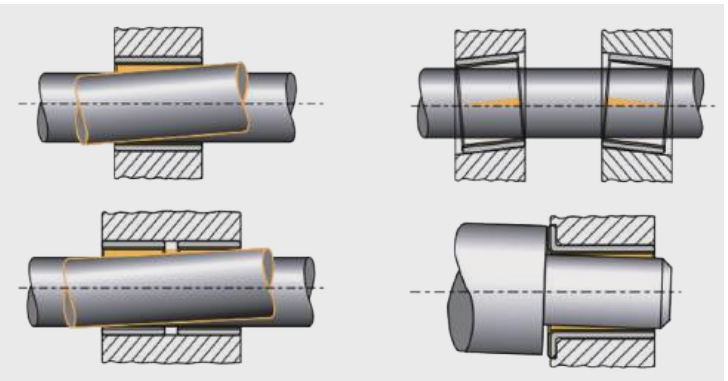
Figure 34



Design of bushing arrangements

In terms of bushing installation, accurate alignment is very important. Alignment is reflected in the length of the entire bushing. If the bushing is incorrectly aligned, edge load will occur and cause premature failure.

Figure 35



Wrong Alignment

Mounting

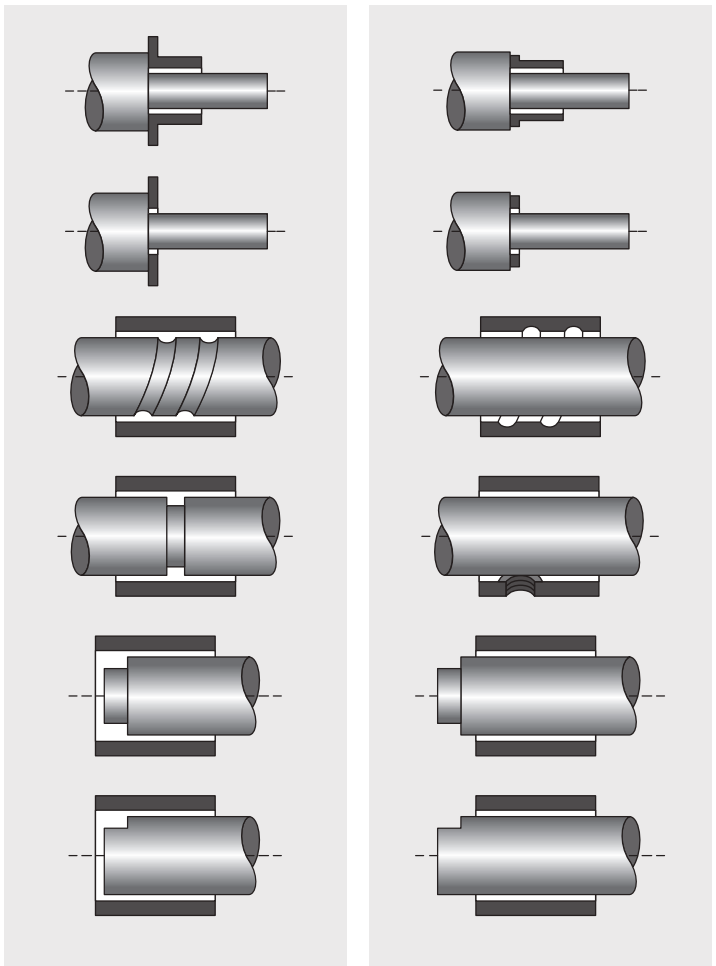
Pressing in force for bushings

The pressing force is related to the material, external diameter and interference of housing bore, and the height of bushing. If your application has special pressing force requirements, contact CCTY's technical service.

Design of mating shaft for bushings

The bushings rely on self-lubricating materials to reduce wear and protect the mating shaft. The preferred shaft surface finish is Ra 0.4 or better. The shaft, shoulder must extend beyond the bushing surface or thrust washer. The shaft surface must be free of holes and grooves. Here are some typical designs for mating shafts:

Figure 36

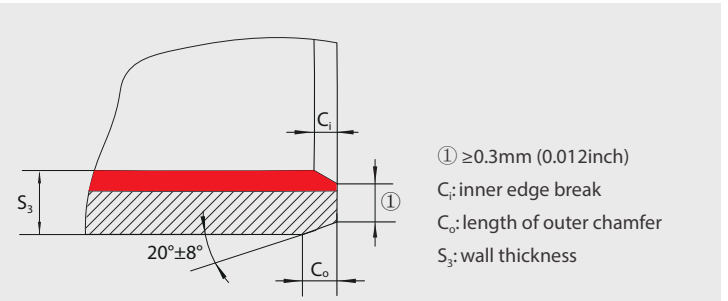


Improper Proper

Chamfers and chamfer tolerance

The tolerances and dimensions of the outer chamfer C_o and the inner edge break C_i for bushings of metric sizes conform to ISO 3547-1. Chamfer deformation due to round bending is permissible.

Figure 37



① ≥0.3mm (0.012inch)
C_i: inner edge break
C_o: length of outer chamfer
S_3: wall thickness

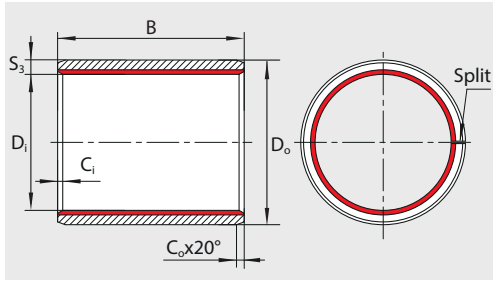
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
0.75	0.5 ± 0.3	0.1	0.4
1	0.6 ± 0.4	0.1	0.5



TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TSA 0203	2	3.5	3.25	2.75	0.75	2.000	1.994	3.508	3.500	2.048	2.000	0.054	0.000
TSA 0205	2	3.5	5.25	4.75	0.75	2.000	1.994	3.508	3.500	2.048	2.000	0.054	0.000
TSA 0303	3	4.5	3.25	2.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TSA 0305	3	4.5	5.25	4.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TSA 0306	3	4.5	6.25	5.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TSA 0403	4	5.5	3.25	2.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TSA 0404	4	5.5	4.25	3.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TSA 0406	4	5.5	6.25	5.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TSA 0410	4	5.5	10.25	9.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TSA 0505	5	7	5.25	4.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TSA 0508	5	7	8.25	7.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TSA 0510	5	7	10.25	9.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TSA 0604	6	8	4.25	3.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TSA 0606	6	8	6.25	5.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TSA 0608	6	8	8.25	7.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TSA 0610	6	8	10.25	9.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TSA 0710	7	9	10.25	9.75	1	6.987	6.972	9.015	9.000	7.055	6.990	0.083	0.003
TSA 0806	8	10	6.25	5.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TSA 0808	8	10	8.25	7.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TSA 0810	8	10	10.25	9.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TSA 0812	8	10	12.25	11.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003

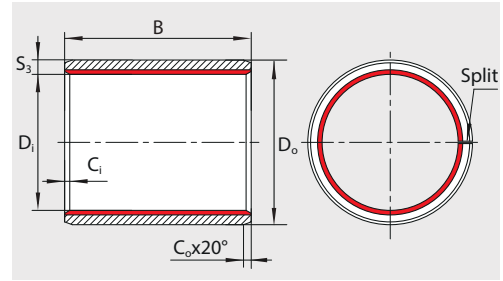
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
0.75	0.5 ± 0.3	0.1	0.4
1	0.6 ± 0.4	0.1	0.5



TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TSA 1008	10	12	8.25	7.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TSA 1010	10	12	10.25	9.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TSA 1012	10	12	12.25	11.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TSA 1015	10	12	15.5	14.5	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TSA 1020	10	12	20.5	19.5	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TSA 1208	12	14	8.25	7.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TSA 1210	12	14	10.25	9.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TSA 1212	12	14	12.25	11.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TSA 1215	12	14	15.5	14.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TSA 1220	12	14	20.5	19.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TSA 1225	12	14	25.5	24.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TSA 1310	13	15	10.25	9.75	1	12.984	12.966	15.018	15.000	13.058	12.990	0.092	0.006
TSA 1320	13	15	20.5	19.5	1	12.984	12.966	15.018	15.000	13.058	12.990	0.092	0.006
TSA 1405	14	16	5.25	4.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TSA 1410	14	16	10.25	9.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TSA 1412	14	16	12.25	11.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TSA 1415	14	16	15.5	14.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TSA 1420	14	16	20.5	19.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TSA 1425	14	16	25.5	24.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TSA 1510	15	17	10.25	9.75	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TSA 1512	15	17	12.25	11.75	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TSA 1515	15	17	15.5	14.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TSA 1520	15	17	20.5	19.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TSA 1525	15	17	25.5	24.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006

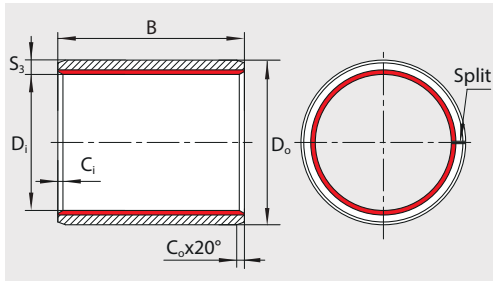
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1	0.6 ± 0.4	0.1	0.5
1.5	0.6 ± 0.4	0.1	0.7



TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TSA 1610	16	18	10.25	9.75	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TSA 1612	16	18	12.25	11.75	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TSA 1615	16	18	15.5	14.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TSA 1620	16	18	20.5	19.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TSA 1625	16	18	25.5	24.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TSA 1720	17	19	20.25	19.75	1	16.984	16.966	19.021	19.000	17.061	16.990	0.095	0.006
TSA 1810	18	20	10.25	9.75	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TSA 1815	18	20	15.5	14.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TSA 1820	18	20	20.5	19.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TSA 1825	18	20	25.5	24.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TSA 2010	20	23	10.25	9.75	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TSA 2015	20	23	15.25	14.75	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TSA 2020	20	23	20.5	19.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TSA 2025	20	23	25.5	24.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TSA 2030	20	23	30.5	29.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TSA 2215	22	25	15.25	14.75	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TSA 2220	22	25	20.5	19.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TSA 2225	22	25	25.5	24.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TSA 2230	22	25	30.5	29.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TSA 2415	24	27	15.25	14.75	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TSA 2420	24	27	20.5	19.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TSA 2425	24	27	25.5	24.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TSA 2430	24	27	30.5	29.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010

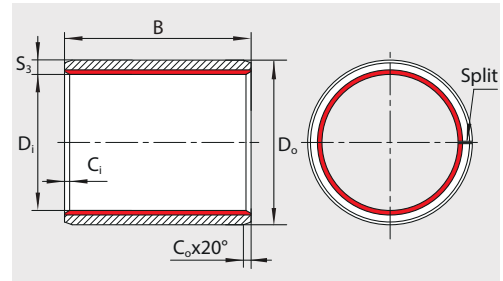
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1.5	0.6 ± 0.4	0.1	0.7
2	1.2 ± 0.4	0.1	0.7



TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TSA 2515	25	28	15.25	14.75	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TSA 2520	25	28	20.5	19.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TSA 2525	25	28	25.5	24.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TSA 2530	25	28	30.5	29.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TSA 2550	25	28	50.5	49.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TSA 2815	28	32	15.25	14.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TSA 2820	28	32	20.25	19.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TSA 2825	28	32	25.25	24.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TSA 2830	28	32	30.5	29.5	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TSA 3010	30	34	10.25	9.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TSA 3015	30	34	15.25	14.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TSA 3020	30	34	20.25	19.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TSA 3025	30	34	25.25	24.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TSA 3030	30	34	30.5	29.5	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TSA 3040	30	34	40.5	39.5	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TSA 3220	32	36	20.25	19.75	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TSA 3230	32	36	30.5	29.5	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TSA 3240	32	36	40.5	39.5	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TSA 3520	35	39	20.25	19.75	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TSA 3530	35	39	30.5	29.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TSA 3535	35	39	35.5	34.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TSA 3540	35	39	40.5	39.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TSA 3550	35	39	50.5	49.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015

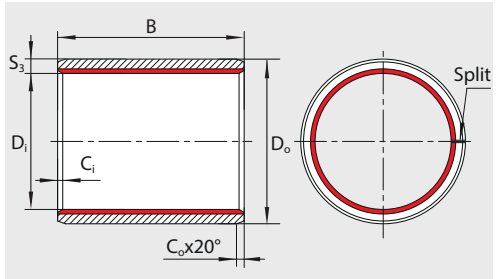
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2	1.2 ± 0.4	0.1	0.7
2.5	1.8 ± 0.6	0.2	1



TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TSA 3720	37	41	20.25	19.75	2	36.975	36.950	41.025	41.000	37.085	36.990	0.135	0.015
TSA 3815	38	42	15.25	14.75	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TSA 3820	38	42	20.25	19.75	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TSA 3830	38	42	30.5	29.5	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TSA 3840	38	42	40.5	39.5	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TSA 4020	40	44	20.25	19.75	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TSA 4030	40	44	30.5	29.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TSA 4040	40	44	40.5	39.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TSA 4050	40	44	50.5	49.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TSA 4520	45	50	20.25	19.75	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TSA 4530	45	50	30.25	29.75	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TSA 4540	45	50	40.5	39.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TSA 4545	45	50	45.5	44.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TSA 4550	45	50	50.5	49.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TSA 5020	50	55	20.25	19.75	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TSA 5030	50	55	30.25	29.75	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TSA 5040	50	55	40.5	39.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TSA 5050	50	55	50.5	49.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TSA 5060	50	55	60.5	59.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TSA 5520	55	60	20.25	19.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TSA 5525	55	60	25.25	24.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TSA 5530	55	60	30.25	29.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TSA 5540	55	60	40.5	39.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TSA 5550	55	60	50.5	49.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TSA 5555	55	60	55.5	54.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TSA 5560	55	60	60.5	59.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020

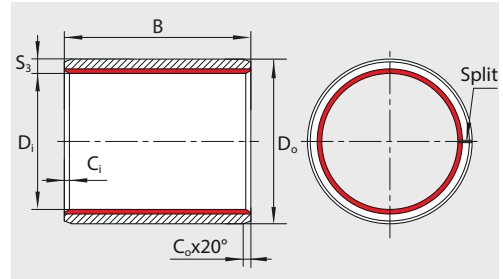
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TSA 6020	60	65	20.25	19.75	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TSA 6030	60	65	30.25	29.75	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TSA 6040	60	65	40.5	39.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TSA 6050	60	65	50.5	49.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TSA 6060	60	65	60.5	59.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TSA 6070	60	65	70.75	69.25	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TSA 6530	65	70	30.25	29.75	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
TSA 6550	65	70	50.5	49.5	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
TSA 6570	65	70	70.75	69.25	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
TSA 7030	70	75	30.25	29.75	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TSA 7040	70	75	40.5	39.5	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TSA 7050	70	75	50.5	49.5	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TSA 7070	70	75	70.75	69.25	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TSA 7540	75	80	40.5	39.5	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
TSA 7560	75	80	60.5	59.5	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
TSA 7580	75	80	80.75	79.25	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
TSA 8040	80	85	40.5	39.5	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TSA 8060	80	85	60.5	59.5	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TSA 8080	80	85	80.75	79.25	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TSA 80100	80	85	100.75	99.25	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TSA 8530	85	90	30.25	29.75	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TSA 8540	85	90	40.5	39.5	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TSA 8560	85	90	60.5	59.5	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TSA 8580	85	90	80.75	79.25	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TSA 85100	85	90	100.75	99.25	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020

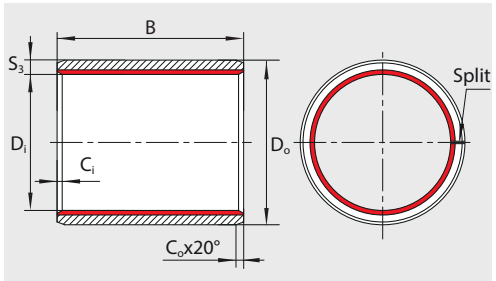
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TSA 9040	90	95	40.5	39.5	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
TSA 9060	90	95	60.5	59.5	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
TSA 90100	90	95	100.75	99.25	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
TSA 9560	95	100	60.5	59.5	2.5	95.000	94.946	100.035	100.000	95.155	95.020	0.209	0.020
TSA 95100	95	100	100.75	99.25	2.5	95.000	94.946	100.035	100.000	95.155	95.020	0.209	0.020
TSA 10050	100	105	50.5	49.5	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
TSA 10060	100	105	60.5	59.5	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
TSA 100100	100	105	100.75	99.25	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
TSA 100115	100	105	115.75	114.25	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
TSA 10560	105	110	60.5	59.5	2.5	105.000	104.946	110.035	110.000	105.155	105.020	0.209	0.020
TSA 105100	105	110	100.75	99.25	2.5	105.000	104.946	110.035	110.000	105.155	105.020	0.209	0.020
TSA 105115	105	110	115.75	114.25	2.5	105.000	104.946	110.035	110.000	105.155	105.020	0.209	0.020
TSA 11060	110	115	60.5	59.5	2.5	110.000	109.946	115.035	115.000	110.155	110.020	0.209	0.020
TSA 110100	110	115	100.75	99.25	2.5	110.000	109.946	115.035	115.000	110.155	110.020	0.209	0.020
TSA 110115	110	115	115.75	114.25	2.5	110.000	109.946	115.035	115.000	110.155	110.020	0.209	0.020
TSA 11550	115	120	50.5	49.5	2.5	115.000	114.946	120.035	120.000	115.155	115.020	0.209	0.020
TSA 11560	115	120	60.5	59.5	2.5	115.000	114.946	120.035	120.000	115.155	115.020	0.209	0.020
TSA 11570	115	120	70.5	69.5	2.5	115.000	114.946	120.035	120.000	115.155	115.020	0.209	0.020
TSA 115100	115	120	100.75	99.25	2.5	115.000	114.946	120.035	120.000	115.155	115.020	0.209	0.020
TSA 12050	120	125	50.5	49.5	2.5	120.000	119.946	125.040	125.000	120.210	120.070	0.264	0.070
TSA 12060	120	125	60.5	59.5	2.5	120.000	119.946	125.040	125.000	120.210	120.070	0.264	0.070
TSA 120100	120	125	100.75	99.25	2.5	120.000	119.946	125.040	125.000	120.210	120.070	0.264	0.070
TSA 12560	125	130	60.5	59.5	2.5	125.000	124.937	130.040	130.000	125.210	125.070	0.273	0.070
TSA 125100	125	130	100.75	99.25	2.5	125.000	124.937	130.040	130.000	125.210	125.070	0.273	0.070

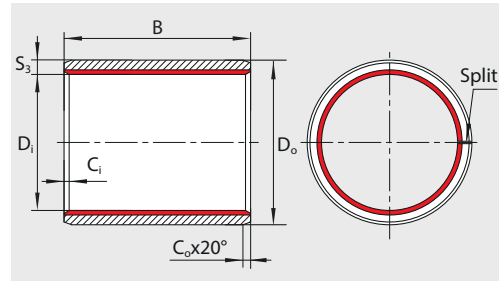
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TSA 13060	130	135	60.5	59.5	2.5	130.000	129.937	135.040	135.000	130.210	130.070	0.273	0.070
TSA 130100	130	135	100.75	99.25	2.5	130.000	129.937	135.040	135.000	130.210	130.070	0.273	0.070
TSA 13560	135	140	60.5	59.5	2.5	135.000	134.937	140.040	140.000	135.210	135.070	0.273	0.070
TSA 13580	135	140	80.75	79.25	2.5	135.000	134.937	140.040	140.000	135.210	135.070	0.273	0.070
TSA 135100	135	140	100.75	99.25	2.5	135.000	134.937	140.040	140.000	135.210	135.070	0.273	0.070
TSA 14060	140	145	60.5	59.5	2.5	140.000	139.937	145.040	145.000	140.210	140.070	0.273	0.070
TSA 140100	140	145	100.75	99.25	2.5	140.000	139.937	145.040	145.000	140.210	140.070	0.273	0.070
TSA 15060	150	155	60.5	59.5	2.5	150.000	149.937	155.040	155.000	150.210	150.070	0.273	0.070
TSA 15080	150	155	80.75	79.25	2.5	150.000	149.937	155.040	155.000	150.210	150.070	0.273	0.070
TSA 150100	150	155	100.75	99.25	2.5	150.000	149.937	155.040	155.000	150.210	150.070	0.273	0.070
TSA 16060	160	165	60.5	59.5	2.5	160.000	159.937	165.040	165.000	160.210	160.070	0.273	0.070
TSA 16080	160	165	80.75	79.25	2.5	160.000	159.937	165.040	165.000	160.210	160.070	0.273	0.070
TSA 160100	160	165	100.75	99.25	2.5	160.000	159.937	165.040	165.000	160.210	160.070	0.273	0.070
TSA 170100	170	175	100.75	99.25	2.5	170.000	169.937	175.040	175.000	170.210	170.070	0.273	0.070
TSA 180100	180	185	100.75	99.25	2.5	180.000	179.937	185.046	185.000	180.216	180.070	0.279	0.070
TSA 200100	200	205	100.75	99.25	2.5	200.000	199.928	205.046	205.000	200.216	200.070	0.288	0.070
TSA 210100	210	215	100.75	99.25	2.5	210.000	209.928	215.046	215.000	210.216	210.070	0.288	0.070
TSA 220100	220	225	100.75	99.25	2.5	220.000	219.928	225.046	225.000	220.216	220.070	0.288	0.070
TSA 250100	250	255	100.75	99.25	2.5	250.000	249.928	255.052	255.000	250.222	250.070	0.294	0.070
TSA 300100	300	305	100.75	99.25	2.5	300.000	299.919	305.052	305.000	300.222	300.070	0.303	0.070

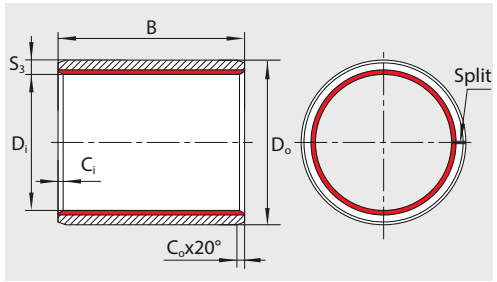
Cylindrical Bushings

Maintenance-free

Inch sizes

Chamfer specification

S_3 (inch/mm)	C_o (mm)	C_i (mm)	
		min.	max.
1/32 (0.79)	0.5 ± 0.3	0.1	0.4
3/64 (1.19)	0.6 ± 0.4	0.1	0.5



TSAE

Dimension table · Unit: inch

Product Number	D_i	D_o	B	S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			- 0.02		max.	min.	max.	min.	max.	min.	max.	min.
TSAE 0303	3/16	1/4	3/16	1/32	0.1865	0.1858	0.2503	0.2497	0.1893	0.1867	0.0035	0.0002
TSAE 0304	3/16	1/4	1/4	1/32	0.1865	0.1858	0.2503	0.2497	0.1893	0.1867	0.0035	0.0002
TSAE 0306	3/16	1/4	3/8	1/32	0.1865	0.1858	0.2503	0.2497	0.1893	0.1867	0.0035	0.0002
TSAE 0404	1/4	5/16	1/4	1/32	0.2490	0.2481	0.3128	0.3122	0.2518	0.2492	0.0037	0.0002
TSAE 0406	1/4	5/16	3/8	1/32	0.2490	0.2481	0.3128	0.3122	0.2518	0.2492	0.0037	0.0002
TSAE 0506	5/16	3/8	3/8	1/32	0.3115	0.3106	0.3753	0.3747	0.3143	0.3117	0.0037	0.0002
TSAE 0508	5/16	3/8	1/2	1/32	0.3115	0.3106	0.3753	0.3747	0.3143	0.3117	0.0037	0.0002
TSAE 0606	3/8	15/32	3/8	3/64	0.3740	0.3731	0.4691	0.4684	0.3769	0.3742	0.0038	0.0002
TSAE 0608	3/8	15/32	1/2	3/64	0.3740	0.3731	0.4691	0.4684	0.3769	0.3742	0.0038	0.0002
TSAE 0612	3/8	15/32	3/4	3/64	0.3740	0.3731	0.4691	0.4684	0.3769	0.3742	0.0038	0.0002
TSAE 0708	7/16	17/32	1/2	3/64	0.4365	0.4355	0.5316	0.5309	0.4394	0.4367	0.0039	0.0002
TSAE 0712	7/16	17/32	3/4	3/64	0.4365	0.4355	0.5316	0.5309	0.4394	0.4367	0.0039	0.0002
TSAE 0806	1/2	19/32	3/8	3/64	0.4990	0.4980	0.5941	0.5934	0.5019	0.4992	0.0039	0.0002
TSAE 0808	1/2	19/32	1/2	3/64	0.4990	0.4980	0.5941	0.5934	0.5019	0.4992	0.0039	0.0002
TSAE 0810	1/2	19/32	5/8	3/64	0.4990	0.4980	0.5941	0.5934	0.5019	0.4992	0.0039	0.0002
TSAE 0814	1/2	19/32	7/8	3/64	0.4990	0.4980	0.5941	0.5934	0.5019	0.4992	0.0039	0.0002
TSAE 0908	9/16	21/32	1/2	3/64	0.5615	0.5605	0.6566	0.6559	0.5644	0.5617	0.0039	0.0002
TSAE 0912	9/16	21/32	3/4	3/64	0.5615	0.5605	0.6566	0.6559	0.5644	0.5617	0.0039	0.0002
TSAE 1008	5/8	23/32	1/2	3/64	0.6240	0.6230	0.7192	0.7184	0.6270	0.6242	0.0040	0.0002
TSAE 1010	5/8	23/32	5/8	3/64	0.6240	0.6230	0.7192	0.7184	0.6270	0.6242	0.0040	0.0002
TSAE 1012	5/8	23/32	3/4	3/64	0.6240	0.6230	0.7192	0.7184	0.6270	0.6242	0.0040	0.0002
TSAE 1014	5/8	23/32	7/8	3/64	0.6240	0.6230	0.7192	0.7184	0.6270	0.6242	0.0040	0.0002
TSAE 1114	11/16	25/32	7/8	3/64	0.6865	0.6855	0.7817	0.7809	0.6895	0.6867	0.0040	0.0002

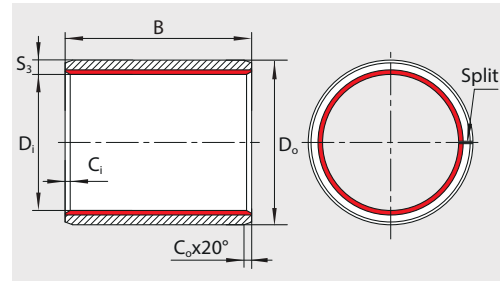
Cylindrical Bushings

Maintenance-free

Inch sizes

Chamfer specification

S_3 (inch/mm)	C_o (mm)	C_i (mm)	
		min.	max.
1/16 (1.59)	0.6 ± 0.4	0.1	0.7
5/64 (1.98)	1.2 ± 0.4	0.1	0.7



TSAE

Dimension table · Unit: inch

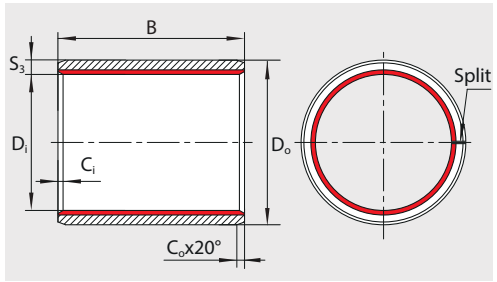
Product Number	D_i	D_o	B	S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			-0.02		max.	min.	max.	min.	max.	min.	max.	min.
TSAE 1208	3/4	7/8	1/2	1/16	0.7491	0.7479	0.8755	0.8747	0.7525	0.7493	0.0046	0.0002
TSAE 1212	3/4	7/8	3/4	1/16	0.7491	0.7479	0.8755	0.8747	0.7525	0.7493	0.0046	0.0002
TSAE 1216	3/4	7/8	1	1/16	0.7491	0.7479	0.8755	0.8747	0.7525	0.7493	0.0046	0.0002
TSAE 1312	13/16	15/16	3/4	1/16	0.8116	0.8104	0.9380	0.9372	0.8150	0.8118	0.0046	0.0002
TSAE 1316	13/16	15/16	1	1/16	0.8116	0.8104	0.9380	0.9372	0.8150	0.8118	0.0046	0.0002
TSAE 1412	7/8	1	3/4	1/16	0.8741	0.8729	1.0005	0.9997	0.8775	0.8743	0.0046	0.0002
TSAE 1414	7/8	1	7/8	1/16	0.8741	0.8729	1.0005	0.9997	0.8775	0.8743	0.0046	0.0002
TSAE 1416	7/8	1	1	1/16	0.8741	0.8729	1.0005	0.9997	0.8775	0.8743	0.0046	0.0002
TSAE 1612	1	1 1/8	3/4	1/16	0.9991	0.9979	1.1255	1.1247	1.0025	0.9993	0.0046	0.0002
TSAE 1616	1	1 1/8	1	1/16	0.9991	0.9979	1.1255	1.1247	1.0025	0.9993	0.0046	0.0002
TSAE 1624	1	1 1/8	1 1/2	1/16	0.9991	0.9979	1.1255	1.1247	1.0025	0.9993	0.0046	0.0002
TSAE 1812	9/8	1 9/32	3/4	5/64	1.1238	1.1226	1.2818	1.2808	1.1278	1.1240	0.0052	0.0002
TSAE 1816	9/8	1 9/32	1	5/64	1.1238	1.1226	1.2818	1.2808	1.1278	1.1240	0.0052	0.0002
TSAE 2012	5/4	1 13/32	3/4	5/64	1.2488	1.2472	1.4068	1.4058	1.2528	1.2490	0.0056	0.0002
TSAE 2016	5/4	1 13/32	1	5/64	1.2488	1.2472	1.4068	1.4058	1.2528	1.2490	0.0056	0.0002
TSAE 2020	5/4	1 13/32	1 1/4	5/64	1.2488	1.2472	1.4068	1.4058	1.2528	1.2490	0.0056	0.0002
TSAE 2028	5/4	1 13/32	1 3/4	5/64	1.2488	1.2472	1.4068	1.4058	1.2528	1.2490	0.0056	0.0002
TSAE 2216	1 3/8	1 17/32	1	5/64	1.3738	1.3722	1.5318	1.5308	1.3778	1.3740	0.0056	0.0002
TSAE 2222	1 3/8	1 17/32	1 3/8	5/64	1.3738	1.3722	1.5318	1.5308	1.3778	1.3740	0.0056	0.0002
TSAE 2228	1 3/8	1 17/32	1 3/4	5/64	1.3738	1.3722	1.5318	1.5308	1.3778	1.3740	0.0056	0.0002

Cylindrical Bushings

Maintenance-free
Inch sizes

Chamfer specification

S_3 (inch/mm)	C_o (mm)	C_i (mm)	
		min.	max.
$^{5}/_{64}$ (1.98)	1.2 ± 0.4	0.1	0.7
$^{3}/_{32}$ (2.38)	1.8 ± 0.6	0.2	1



TSAE

Dimension table · Unit: inch

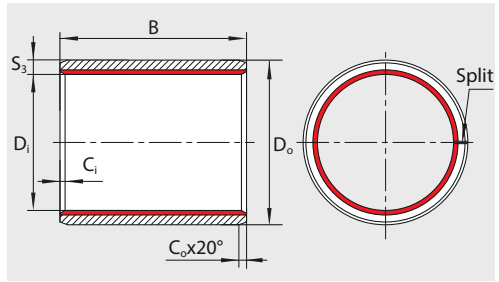
Product Number	D_i	D_o	B	S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			- 0.02		max.	min.	max.	min.	max.	min.	max.	min.
TSAE 2416	$1\ ^{1}/_{2}$	$1\ ^{21}/_{32}$	1	$^{5}/_{64}$	1.4988	1.4972	1.6568	1.6558	1.5028	1.4990	0.0056	0.0002
TSAE 2420	$1\ ^{1}/_{2}$	$1\ ^{21}/_{32}$	$1\ ^{1}/_{4}$	$^{5}/_{64}$	1.4988	1.4972	1.6568	1.6558	1.5028	1.4990	0.0056	0.0002
TSAE 2424	$1\ ^{1}/_{2}$	$1\ ^{21}/_{32}$	$1\ ^{1}/_{2}$	$^{5}/_{64}$	1.4988	1.4972	1.6568	1.6558	1.5028	1.4990	0.0056	0.0002
TSAE 2432	$1\ ^{1}/_{2}$	$1\ ^{21}/_{32}$	2	$^{5}/_{64}$	1.4988	1.4972	1.6568	1.6558	1.5028	1.4990	0.0056	0.0002
TSAE 2616	$1\ ^{5}/_{8}$	$1\ ^{25}/_{32}$	1	$^{5}/_{64}$	1.6238	1.6222	1.7818	1.7808	1.6278	1.6240	0.0056	0.0002
TSAE 2624	$1\ ^{5}/_{8}$	$1\ ^{25}/_{32}$	$1\ ^{1}/_{2}$	$^{5}/_{64}$	1.6238	1.6222	1.7818	1.7808	1.6278	1.6240	0.0056	0.0002
TSAE 2816	$1\ ^{3}/_{4}$	$1\ ^{15}/_{16}$	1	$^{3}/_{32}$	1.7487	1.7471	1.9381	1.9371	1.7535	1.7489	0.0064	0.0002
TSAE 2824	$1\ ^{3}/_{4}$	$1\ ^{15}/_{16}$	$1\ ^{1}/_{2}$	$^{3}/_{32}$	1.7487	1.7471	1.9381	1.9371	1.7535	1.7489	0.0064	0.0002
TSAE 2828	$1\ ^{3}/_{4}$	$1\ ^{15}/_{16}$	$1\ ^{3}/_{4}$	$^{3}/_{32}$	1.7487	1.7471	1.9381	1.9371	1.7535	1.7489	0.0064	0.0002
TSAE 2832	$1\ ^{3}/_{4}$	$1\ ^{15}/_{16}$	2	$^{3}/_{32}$	1.7487	1.7471	1.9381	1.9371	1.7535	1.7489	0.0064	0.0002
TSAE 3016	$1\ ^{7}/_{8}$	$2\ ^{1}/_{16}$	1	$^{3}/_{32}$	1.8737	1.8721	2.0633	2.0621	1.8787	1.8739	0.0066	0.0002
TSAE 3030	$1\ ^{7}/_{8}$	$2\ ^{1}/_{16}$	$1\ ^{7}/_{8}$	$^{3}/_{32}$	1.8737	1.8721	2.0633	2.0621	1.8787	1.8739	0.0066	0.0002
TSAE 3036	$1\ ^{7}/_{8}$	$2\ ^{1}/_{16}$	$2\ ^{1}/_{4}$	$^{3}/_{32}$	1.8737	1.8721	2.0633	2.0621	1.8787	1.8739	0.0066	0.0002
TSAE 3216	2	$2\ ^{3}/_{16}$	1	$^{3}/_{32}$	1.9987	1.9969	2.1883	2.1871	2.0037	1.9989	0.0068	0.0002
TSAE 3224	2	$2\ ^{3}/_{16}$	$1\ ^{1}/_{2}$	$^{3}/_{32}$	1.9987	1.9969	2.1883	2.1871	2.0037	1.9989	0.0068	0.0002
TSAE 3232	2	$2\ ^{3}/_{16}$	2	$^{3}/_{32}$	1.9987	1.9969	2.1883	2.1871	2.0037	1.9989	0.0068	0.0002
TSAE 3240	2	$2\ ^{3}/_{16}$	$2\ ^{1}/_{2}$	$^{3}/_{32}$	1.9987	1.9969	2.1883	2.1871	2.0037	1.9989	0.0068	0.0002
TSAE 3432	$2\ ^{1}/_{8}$	$2\ ^{5}/_{16}$	2	$^{3}/_{32}$	2.1257	2.1239	2.3130	2.3118	2.1326	2.1262	0.0087	0.0005
TSAE 3440	$2\ ^{1}/_{8}$	$2\ ^{5}/_{16}$	$2\ ^{1}/_{2}$	$^{3}/_{32}$	2.1257	2.1239	2.3130	2.3118	2.1326	2.1262	0.0087	0.0005
TSAE 3632	$2\ ^{1}/_{4}$	$2\ ^{7}/_{16}$	2	$^{3}/_{32}$	2.2507	2.2489	2.4377	2.4365	2.2573	2.2509	0.0084	0.0002
TSAE 3636	$2\ ^{1}/_{4}$	$2\ ^{7}/_{16}$	$2\ ^{1}/_{4}$	$^{3}/_{32}$	2.2507	2.2489	2.4377	2.4365	2.2573	2.2509	0.0084	0.0002
TSAE 3640	$2\ ^{1}/_{4}$	$2\ ^{7}/_{16}$	$2\ ^{1}/_{2}$	$^{3}/_{32}$	2.2507	2.2489	2.4377	2.4365	2.2573	2.2509	0.0084	0.0002
TSAE 3648	$2\ ^{1}/_{4}$	$2\ ^{7}/_{16}$	3	$^{3}/_{32}$	2.2507	2.2489	2.4377	2.4365	2.2573	2.2509	0.0084	0.0002

Cylindrical Bushings

Maintenance-free
Inch sizes

Chamfer specification

S_3 (inch/mm)	C_o (mm)	C_i (mm)	
		min.	max.
$^{5}/_{64}$ (1.98)	1.2 ± 0.4	0.1	0.7
$^{3}/_{32}$ (2.38)	1.8 ± 0.6	0.2	1



TSAE

Dimension table · Unit: inch

Product Number	D_i	D_o	B	S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			- 0.02		max.	min.	max.	min.	max.	min.	max.	min.
TSAE 4032	$2\ ^{1}/_{2}$	$2\ ^{11}/_{16}$	2	$^{3}/_{32}$	2.5011	2.4993	2.6881	2.6869	2.5077	2.5013	0.0084	0.0002
TSAE 4040	$2\ ^{1}/_{2}$	$2\ ^{11}/_{16}$	$2\ ^{1}/_{2}$	$^{3}/_{32}$	2.5011	2.4993	2.6881	2.6869	2.5077	2.5013	0.0084	0.0002
TSAE 4048	$2\ ^{1}/_{2}$	$2\ ^{11}/_{16}$	3	$^{3}/_{32}$	2.5011	2.4993	2.6881	2.6869	2.5077	2.5013	0.0084	0.0002
TSAE 4056	$2\ ^{1}/_{2}$	$2\ ^{11}/_{16}$	$3\ ^{1}/_{2}$	$^{3}/_{32}$	2.5011	2.4993	2.6881	2.6869	2.5077	2.5013	0.0084	0.0002
TSAE 4432	$2\ ^{3}/_{4}$	$2\ ^{15}/_{16}$	2	$^{3}/_{32}$	2.7500	2.7482	2.9370	2.9358	2.7566	2.7502	0.0084	0.0002
TSAE 4440	$2\ ^{3}/_{4}$	$2\ ^{15}/_{16}$	$2\ ^{1}/_{2}$	$^{3}/_{32}$	2.7500	2.7482	2.9370	2.9358	2.7566	2.7502	0.0084	0.0002
TSAE 4448	$2\ ^{3}/_{4}$	$2\ ^{15}/_{16}$	3	$^{3}/_{32}$	2.7500	2.7482	2.9370	2.9358	2.7566	2.7502	0.0084	0.0002
TSAE 4456	$2\ ^{3}/_{4}$	$2\ ^{15}/_{16}$	$3\ ^{1}/_{2}$	$^{3}/_{32}$	2.7500	2.7482	2.9370	2.9358	2.7566	2.7502	0.0084	0.0002
TSAE 4640	$2\ ^{7}/_{8}$	$3\ ^{1}/_{16}$	$2\ ^{1}/_{2}$	$^{3}/_{32}$	2.8752	2.8734	3.0623	3.0610	2.8819	2.8754	0.0085	0.0002
TSAE 4648	$2\ ^{7}/_{8}$	$3\ ^{1}/_{16}$	3	$^{3}/_{32}$	2.8752	2.8734	3.0623	3.0610	2.8819	2.8754	0.0085	0.0002
TSAE 4840	3	$3\ ^{3}/_{16}$	$2\ ^{1}/_{2}$	$^{3}/_{32}$	3.0000	2.9982	3.1872	3.1858	3.0068	3.0002	0.0086	0.0002
TSAE 4848	3	$3\ ^{3}/_{16}$	3	$^{3}/_{32}$	3.0000	2.9982	3.1872	3.1858	3.0068	3.0002	0.0086	0.0002
TSAE 4860	3	$3\ ^{3}/_{16}$	$3\ ^{3}/_{4}$	$^{3}/_{32}$	3.0000	2.9982	3.1872	3.1858	3.0068	3.0002	0.0086	0.0002
TSAE 5240	$3\ ^{1}/_{4}$	$3\ ^{7}/_{16}$	$2\ ^{1}/_{2}$	$^{3}/_{32}$	3.2500	3.2480	3.4372	3.4358	3.2568	3.2502	0.0088	0.0002
TSAE 5248	$3\ ^{1}/_{4}$	$3\ ^{7}/_{16}$	3	$^{3}/_{32}$	3.2500	3.2480	3.4372	3.4358	3.2568	3.2502	0.0088	0.0002
TSAE 5640	$3\ ^{1}/_{2}$	$3\ ^{11}/_{16}$	$2\ ^{1}/_{2}$	$^{3}/_{32}$	3.5000	3.4978	3.6872	3.6858	3.5068	3.5002	0.0090	0.0002
TSAE 5648	$3\ ^{1}/_{2}$	$3\ ^{11}/_{16}$	3	$^{3}/_{32}$	3.5000	3.4978	3.6872	3.6858	3.5068	3.5002	0.0090	0.0002
TSAE 5660	$3\ ^{1}/_{2}$	$3\ ^{11}/_{16}$	$3\ ^{3}/_{4}$	$^{3}/_{32}$	3.5000	3.4978	3.6872	3.6858	3.5068	3.5002	0.0090	0.0002
TSAE 5848	$3\ ^{5}/_{8}$	$3\ ^{13}/_{16}$	3	$^{3}/_{32}$	3.6250	3.6228	3.8122	3.8108	3.6318	3.6252	0.0090	0.0002
TSAE 5860	$3\ ^{5}/_{8}$	$3\ ^{13}/_{16}$	$3\ ^{3}/_{4}$	$^{3}/_{32}$	3.6250	3.6228	3.8122	3.8108	3.6318	3.6252	0.0090	0.0002
TSAE 6048	$3\ ^{3}/_{4}$	$3\ ^{15}/_{16}$	3	$^{3}/_{32}$	3.7500	3.7478	3.9372	3.9358	3.7568	3.7502	0.0090	0.0002
TSAE 6060	$3\ ^{3}/_{4}$	$3\ ^{15}/_{16}$	$3\ ^{3}/_{4}$	$^{3}/_{32}$	3.7500	3.7478	3.9372	3.9358	3.7568	3.7502	0.0090	0.0002
TSAE 6076	$3\ ^{3}/_{4}$	$3\ ^{15}/_{16}$	$4\ ^{3}/_{4}$	$^{3}/_{32}$	3.7500	3.7478	3.9372	3.9358	3.7568	3.7502	0.0090	0.0002
TSAE 6476	4	$4\ ^{3}/_{16}$	$4\ ^{3}/_{4}$	$^{3}/_{32}$	4.0000	3.9978	4.1872	4.1858	4.0068	4.0002	0.0090	0.0002

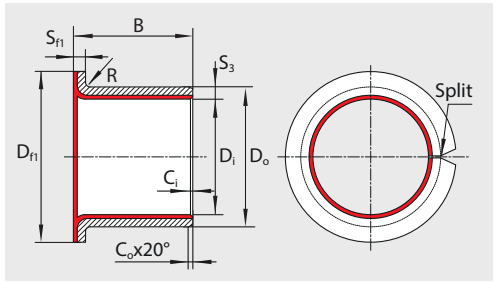
Flanged Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
0.75	0.5 ± 0.3	0.1	0.4
1	0.6 ± 0.4	0.1	0.5



TSA .. F

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	S_{fl}	D_{fl}	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.				max.	min.	max.	min.	max.	min.	max.	min.
TSA 0304 F	3	4.5	4.25	3.75	0.75	0.750	7.000	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TSA 0404 F	4	5.5	4.25	3.75	0.75	0.750	9.000	4.000	3.994	5.508	5.500	4.048	4.000	0.056	0.000
TSA 0505 F	5	7	5.25	4.75	1	1.000	10.000	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TSA 0604 F	6	8	4.25	3.75	1	1.000	12.000	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TSA 0607 F	6	8	7.25	6.75	1	1.000	12.000	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TSA 0608 F	6	8	8.25	7.75	1	1.000	12.000	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TSA 0805.5 F	8	10	5.75	5.25	1	1.000	15.000	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TSA 0807.5 F	8	10	7.75	7.25	1	1.000	15.000	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TSA 0809.5 F	8	10	9.75	9.25	1	1.000	15.000	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TSA 1007 F	10	12	7.25	6.75	1	1.000	18.000	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TSA 1009 F	10	12	9.25	8.75	1	1.000	18.000	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TSA 1012 F	10	12	12.25	11.75	1	1.000	18.000	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TSA 1207 F	12	14	7.25	6.75	1	1.000	20.000	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TSA 1209 F	12	14	9.25	8.75	1	1.000	20.000	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TSA 1212 F	12	14	12.25	11.75	1	1.000	20.000	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TSA 1217 F	12	14	17.50	16.50	1	1.000	20.000	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TSA 1412 F	14	16	12.25	11.75	1	1.000	22.000	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TSA 1417 F	14	16	17.50	16.50	1	1.000	22.000	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TSA 1509 F	15	17	9.25	8.75	1	1.000	23.000	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TSA 1512 F	15	17	12.25	11.75	1	1.000	23.000	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TSA 1612 F	16	18	12.25	11.75	1	1.000	24.000	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TSA 1617 F	16	18	17.50	16.50	1	1.000	24.000	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TSA 1812 F	18	20	12.25	11.75	1	1.000	26.000	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TSA 1817 F	18	20	17.50	16.50	1	1.000	26.000	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TSA 1820 F	18	20	20.50	19.50	1	1.000	26.000	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006

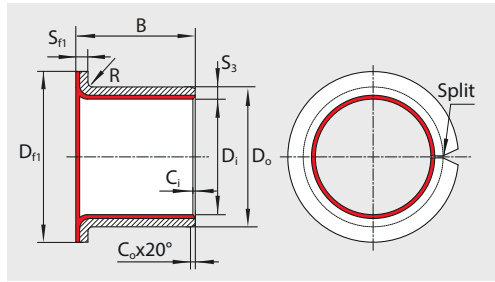
Flanged Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1.5	0.6 ± 0.4	0.1	0.7
2	1.2 ± 0.4	0.1	0.7
2.5	1.8 ± 0.6	0.2	1



TSA .. F

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	S_{fl}	D_{fl}	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.				max.	min.	max.	min.	max.	min.	max.	min.
TSA 2011.5 F	20	23	11.75	11.25	1.5	1.500	30.000	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TSA 2016.5 F	20	23	17	16	1.5	1.500	30.000	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TSA 2021.5 F	20	23	22	21	1.5	1.500	30.000	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TSA 2511.5 F	25	28	11.75	11.25	1.5	1.500	35.000	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TSA 2516.5 F	25	28	17	16	1.5	1.500	35.000	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TSA 2521.5 F	25	28	22	21	1.5	1.500	35.000	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TSA 3016 F	30	34	16.25	15.75	2	2.000	42.000	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TSA 3026 F	30	34	26.5	25.5	2	2.000	42.000	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TSA 3516 F	35	39	16.25	15.75	2	2.000	47.000	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TSA 3526 F	35	39	26.5	25.5	2	2.000	47.000	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TSA 4016 F	40	44	16.25	15.75	2	2.000	52.000	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TSA 4026 F	40	44	26.5	25.5	2	2.000	52.000	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TSA 4040 F	40	44	40.5	39.5	2	2.000	52.000	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TSA 4516 F	45	50	16.25	15.75	2.5	2.500	58.000	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TSA 4526 F	45	50	26.25	25.75	2.5	2.500	58.000	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015

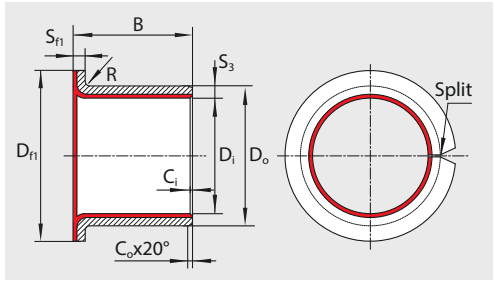
Flanged Bushings

Maintenance-free

Inch sizes

Chamfer specification

S_3 (inch/mm)	C_o (mm)	C_i (mm)	
		min.	max.
3/64 (1.19)	0.6 ± 0.4	0.1	0.5
1/16 (1.59)	0.6 ± 0.4	0.1	0.7



TSAE .. F

Dimension table · Unit: mm

Product Number	D_i	D_o	B - 0.02	S_3	S_{fl}	D_{fl}	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
							max.	min.	max.	min.	max.	min.	max.	min.
TSAE 0604 F	3/8	15/32	1/4	3/64	3/64	11/16	0.3750	0.3741	0.4691	0.4684	0.3779	0.3752	0.0038	0.0002
TSAE 0606 F	3/8	15/32	3/8	3/64	3/64	11/16	0.3750	0.3741	0.4691	0.4684	0.3779	0.3752	0.0038	0.0002
TSAE 0608 F	3/8	15/32	1/2	3/64	3/64	11/16	0.3750	0.3741	0.4691	0.4684	0.3779	0.3752	0.0038	0.0002
TSAE 0612 F	3/8	15/32	3/4	3/64	3/64	11/16	0.3750	0.3741	0.4691	0.4684	0.3779	0.3752	0.0038	0.0002
TSAE 0804 F	1/2	19/32	1/4	3/64	3/64	13/16	0.5000	0.4990	0.5941	0.5934	0.5029	0.5002	0.0039	0.0002
TSAE 0806 F	1/2	19/32	3/8	3/64	3/64	13/16	0.5000	0.4990	0.5941	0.5934	0.5029	0.5002	0.0039	0.0002
TSAE 0808 F	1/2	19/32	1/2	3/64	3/64	13/16	0.5000	0.4990	0.5941	0.5934	0.5029	0.5002	0.0039	0.0002
TSAE 0812 F	1/2	19/32	3/4	3/64	3/64	13/16	0.5000	0.4990	0.5941	0.5934	0.5029	0.5002	0.0039	0.0002
TSAE 1006 F	5/8	23/32	3/8	3/64	3/64	15/16	0.6250	0.6240	0.7192	0.7184	0.6280	0.6252	0.0040	0.0002
TSAE 1008 F	5/8	23/32	1/2	3/64	3/64	15/16	0.6250	0.6240	0.7192	0.7184	0.6280	0.6252	0.0040	0.0002
TSAE 1010 F	5/8	23/32	5/8	3/64	3/64	15/16	0.6250	0.6240	0.7192	0.7184	0.6280	0.6252	0.0040	0.0002
TSAE 1012 F	5/8	23/32	3/4	3/64	3/64	15/16	0.6250	0.6240	0.7192	0.7184	0.6280	0.6252	0.0040	0.0002
TSAE 1206 F	3/4	7/8	3/8	1/16	1/16	1 1/8	0.7500	0.7488	0.8755	0.8747	0.7534	0.7502	0.0046	0.0002
TSAE 1208 F	3/4	7/8	1/2	1/16	1/16	1 1/8	0.7500	0.7488	0.8755	0.8747	0.7534	0.7502	0.0046	0.0002
TSAE 1212 F	3/4	7/8	3/4	1/16	1/16	1 1/8	0.7500	0.7488	0.8755	0.8747	0.7534	0.7502	0.0046	0.0002
TSAE 1216 F	3/4	7/8	1	1/16	1/16	1 1/8	0.7500	0.7488	0.8755	0.8747	0.7534	0.7502	0.0046	0.0002
TSAE 1408 F	7/8	1	1/2	1/16	1/16	1 1/4	0.8750	0.8738	1.0005	0.9997	0.8784	0.8752	0.0046	0.0002
TSAE 1412 F	7/8	1	3/4	1/16	1/16	1 1/4	0.8750	0.8738	1.0005	0.9997	0.8784	0.8752	0.0046	0.0002
TSAE 1416 F	7/8	1	1	1/16	1/16	1 1/4	0.8750	0.8738	1.0005	0.9997	0.8784	0.8752	0.0046	0.0002
TSAE 1420 F	7/8	1	1 1/4	1/16	1/16	1 1/4	0.8750	0.8738	1.0005	0.9997	0.8784	0.8752	0.0046	0.0002
TSAE 1608 F	1	1 1/8	1/2	11/16	11/16	1 3/8	1.0000	0.9988	1.1255	1.1247	1.0034	1.0002	0.0046	0.0002
TSAE 1612 F	1	1 1/8	3/4	1/16	1/16	1 3/8	1.0000	0.9988	1.1255	1.1247	1.0034	1.0002	0.0046	0.0002
TSAE 1616 F	1	1 1/8	1	1/16	1/16	1 3/8	1.0000	0.9988	1.1255	1.1247	1.0034	1.0002	0.0046	0.0002
TSAE 1620 F	1	1 1/8	1 1/4	1/16	1/16	1 3/8	1.0000	0.9988	1.1255	1.1247	1.0034	1.0002	0.0046	0.0002

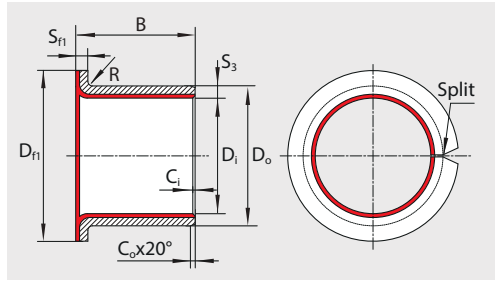
Flanged Bushings

Maintenance-free

Inch sizes

Chamfer specification

S_3 (inch/mm)	C_o (mm)	C_i (mm)	
		min.	max.
5/64 (1.98)	1.2 ± 0.4	0.1	0.7
3/32 (2.38)	1.8 ± 0.6	0.2	1.0



TSAE .. F

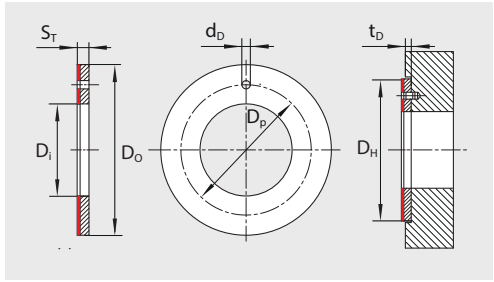
Dimension table · Unit: mm

Product Number	D_i	D_o	B - 0.02	S_3	S_{fl}	D_{fl}	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
							max.	min.	max.	min.	max.	min.	max.	min.
TSAE 2016 F	1 1/4	1 13/32	1	5/64	5/64	1 3/4	1.2500	1.2484	1.4068	1.4058	1.2540	1.2502	0.0056	0.0002
TSAE 2020 F	1 1/4	1 13/32	1 1/4	5/64	5/64	1 3/4	1.2500	1.2484	1.4068	1.4058	1.2540	1.2502	0.0056	0.0002
TSAE 2024 F	1 1/4	1 13/32	1 1/2	5/64	5/64	1 3/4	1.2500	1.2484	1.4068	1.4058	1.2540	1.2502	0.0056	0.0002
TSAE 2416 F	1 1/2	1 21/32	1	5/64	5/64	2	1.5000	1.4984	1.6568	1.6558	1.5040	1.5002	0.0056	0.0002
TSAE 2424 F	1 1/2	1 21/32	1 1/4	5/64	5/64	2	1.5000	1.4984	1.6568	1.6558	1.5040	1.5002	0.0056	0.0002
TSAE 2432 F	1 1/2	1 21/32	1 1/2	5/64	5/64	2	1.5000	1.4984	1.6568	1.6558	1.5040	1.5002	0.0056	0.0002
TSAE 2816 F	1 3/4	1 15/16	1	3/32	3/32	2 3/8	1.7500	1.7484	1.9381	1.9371	1.7548	1.7503	0.0064	0.0003
TSAE 2824 F	1 3/4	1 15/16	1 1/4	3/32	3/32	2 3/8	1.7500	1.7484	1.9381	1.9371	1.7548	1.7503	0.0064	0.0003
TSAE 2832 F	1 3/4	1 15/16	1 1/2	3/32	3/32	2 3/8	1.7500	1.7484	1.9381	1.9371	1.7548	1.7503	0.0064	0.0003

Thrust Washers

Maintenance-free

Metric sizes



TSA .. SF

Dimension table · Unit: mm

Product Number	D_i	D_o	S_T	Hole Diameter d_D		Hole PCD D_p		Housing Diameter D_H		Recess depth t_D	
	+0.25	-0.25	-0.05	max.	min.	max.	min.	max.	min.	max.	min.
TSA 10 SF	10	20	1.5	—	—	—	—	20.12	20	1.2	0.95
TSA 12 SF	12	24	1.5	1.875	1.625	18.12	17.88	24.12	24	1.2	0.95
TSA 14 SF	14	26	1.5	2.375	2.125	20.12	19.88	26.12	26	1.2	0.95
TSA 16 SF	16	30	1.5	2.375	2.125	22.12	21.88	30.12	30	1.2	0.95
TSA 18 SF	18	32	1.5	2.375	2.125	25.12	24.88	32.12	32	1.2	0.95
TSA 20 SF	20	36	1.5	3.375	3.125	28.12	27.88	36.12	36	1.2	0.95
TSA 22 SF	22	38	1.5	3.375	3.125	30.12	29.88	38.12	38	1.2	0.95
TSA 24 SF	24	42	1.5	3.375	3.125	33.12	32.88	42.12	42	1.2	0.95
TSA 26 SF	26	44	1.5	3.375	3.125	35.12	34.88	44.12	44	1.2	0.95
TSA 28 SF	28	48	1.5	4.375	4.125	38.12	37.88	48.12	48	1.2	0.95
TSA 32 SF	32	54	1.5	4.375	4.125	43.12	42.88	54.12	54	1.2	0.95
TSA 38 SF	38	62	1.5	4.375	4.125	50.12	49.88	62.12	62	1.2	0.95
TSA 42 SF	42	66	1.5	4.375	4.125	54.12	53.88	66.12	66	1.2	0.95
TSA 48 SF	48	74	2	4.375	4.125	61.12	60.88	74.12	74	1.7	1.45
TSA 52 SF	52	78	2	4.375	4.125	65.12	64.88	78.12	78	1.7	1.45
TSA 62 SF	62	90	2	4.375	4.125	76.12	75.88	90.12	90	1.7	1.45

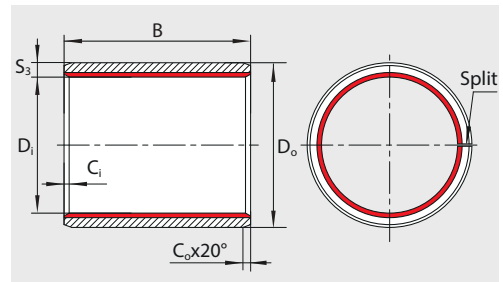
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1	0.6 ± 0.4	0.1	0.5



B-TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
B-TSA 0505	5	7	5.25	4.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
B-TSA 0508	5	7	8.25	7.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
B-TSA 0510	5	7	10.25	9.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
B-TSA 0604	6	8	4.25	3.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
B-TSA 0606	6	8	6.25	5.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
B-TSA 0608	6	8	8.25	7.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
B-TSA 0610	6	8	10.25	9.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
B-TSA 0710	7	9	10.25	9.75	1	6.987	6.972	9.015	9.000	7.055	6.990	0.083	0.003
B-TSA 0806	8	10	6.25	5.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
B-TSA 0808	8	10	8.25	7.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
B-TSA 0810	8	10	10.25	9.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
B-TSA 0812	8	10	12.25	11.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
B-TSA 1008	10	12	8.25	7.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
B-TSA 1010	10	12	10.25	9.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
B-TSA 1012	10	12	12.25	11.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
B-TSA 1015	10	12	15.5	14.5	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
B-TSA 1020	10	12	20.5	19.5	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
B-TSA 1208	12	14	8.25	7.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
B-TSA 1210	12	14	10.25	9.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
B-TSA 1212	12	14	12.25	11.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
B-TSA 1215	12	14	15.5	14.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
B-TSA 1220	12	14	20.5	19.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
B-TSA 1225	12	14	25.5	24.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006

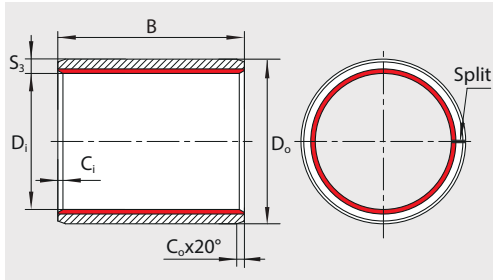
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1	0.6 ± 0.4	0.1	0.5
1.5	0.6 ± 0.4	0.1	0.7



B-TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
B-TSA 1610	16	18	10.25	9.75	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
B-TSA 1612	16	18	12.25	11.75	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
B-TSA 1615	16	18	15.5	14.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
B-TSA 1620	16	18	20.5	19.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
B-TSA 1625	16	18	25.5	24.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
B-TSA 1720	17	19	20.25	19.75	1	16.984	16.966	19.021	19.000	17.061	16.990	0.095	0.006
B-TSA 1810	18	20	10.25	9.75	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
B-TSA 1815	18	20	15.5	14.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
B-TSA 1820	18	20	20.5	19.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
B-TSA 1825	18	20	25.5	24.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
B-TSA 2010	20	23	10.25	9.75	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
B-TSA 2015	20	23	15.25	14.75	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
B-TSA 2020	20	23	20.5	19.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
B-TSA 2025	20	23	25.5	24.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
B-TSA 2030	20	23	30.5	29.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
B-TSA 2215	22	25	15.25	14.75	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
B-TSA 2220	22	25	20.5	19.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
B-TSA 2225	22	25	25.5	24.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
B-TSA 2230	22	25	30.5	29.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
B-TSA 2415	24	27	15.25	14.75	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
B-TSA 2420	24	27	20.5	19.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
B-TSA 2425	24	27	25.5	24.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
B-TSA 2430	24	27	30.5	29.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010

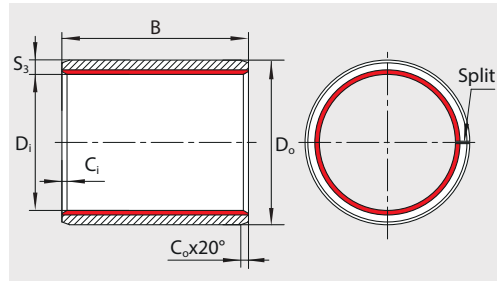
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1.5	0.6 ± 0.4	0.1	0.7
2	1.2 ± 0.4	0.1	0.7



B-TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
B-TSA 2515	25	28	15.25	14.75	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
B-TSA 2520	25	28	20.5	19.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
B-TSA 2525	25	28	25.5	24.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
B-TSA 2530	25	28	30.5	29.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
B-TSA 2550	25	28	50.5	49.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
B-TSA 2815	28	32	15.25	14.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
B-TSA 2820	28	32	20.25	19.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
B-TSA 2825	28	32	25.25	24.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
B-TSA 2830	28	32	30.5	29.5	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
B-TSA 3010	30	34	10.25	9.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
B-TSA 3015	30	34	15.25	14.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
B-TSA 3020	30	34	20.25	19.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
B-TSA 3025	30	34	25.25	24.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
B-TSA 3030	30	34	30.5	29.5	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
B-TSA 3040	30	34	40.5	39.5	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
B-TSA 3220	32	36	20.25	19.75	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
B-TSA 3230	32	36	30.5	29.5	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
B-TSA 3240	32	36	40.5	39.5	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
B-TSA 3520	35	39	20.25	19.75	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
B-TSA 3530	35	39	30.5	29.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
B-TSA 3535	35	39	35.5	34.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
B-TSA 3540	35	39	40.5	39.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
B-TSA 3550	35	39	50.5	49.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015

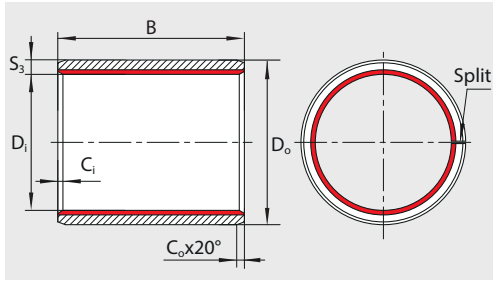
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2	1.2 ± 0.4	0.1	0.7
2.5	1.8 ± 0.6	0.2	1



B-TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
B-TSA 3720	37	41	20.25	19.75	2	36.975	36.950	41.025	41.000	37.085	36.990	0.135	0.015
B-TSA 3815	38	42	15.25	14.75	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
B-TSA 3820	38	42	20.25	19.75	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
B-TSA 3830	38	42	30.5	29.5	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
B-TSA 3840	38	42	40.5	39.5	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
B-TSA 4020	40	44	20.25	19.75	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
B-TSA 4030	40	44	30.5	29.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
B-TSA 4040	40	44	40.5	39.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
B-TSA 4050	40	44	50.5	49.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
B-TSA 4520	45	50	20.25	19.75	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
B-TSA 4530	45	50	30.25	29.75	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
B-TSA 4540	45	50	40.5	39.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
B-TSA 4545	45	50	45.5	44.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
B-TSA 4550	45	50	50.5	49.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
B-TSA 5020	50	55	20.25	19.75	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
B-TSA 5030	50	55	30.25	29.75	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
B-TSA 5040	50	55	40.5	39.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
B-TSA 5050	50	55	50.5	49.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
B-TSA 5060	50	55	60.5	59.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
B-TSA 5520	55	60	20.25	19.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
B-TSA 5525	55	60	25.25	24.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
B-TSA 5530	55	60	30.25	29.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
B-TSA 5540	55	60	40.5	39.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
B-TSA 5550	55	60	50.5	49.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
B-TSA 5555	55	60	55.5	54.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
B-TSA 5560	55	60	60.5	59.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020

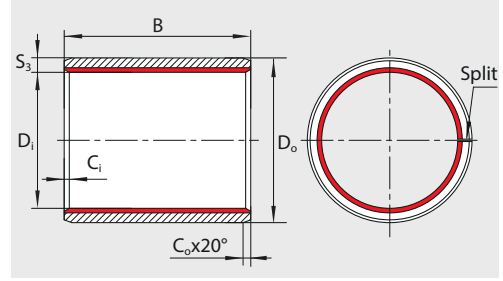
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



B-TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
B-TSA 6020	60	65	20.25	19.75	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
B-TSA 6030	60	65	30.25	29.75	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
B-TSA 6040	60	65	40.5	39.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
B-TSA 6050	60	65	50.5	49.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
B-TSA 6060	60	65	60.5	59.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
B-TSA 6070	60	65	70.75	69.25	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
B-TSA 6530	65	70	30.25	29.75	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
B-TSA 6550	65	70	50.5	49.5	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
B-TSA 6570	65	70	70.75	69.25	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
B-TSA 7030	70	75	30.25	29.75	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
B-TSA 7040	70	75	40.5	39.5	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
B-TSA 7050	70	75	50.5	49.5	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
B-TSA 7070	70	75	70.75	69.25	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
B-TSA 7540	75	80	40.5	39.5	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
B-TSA 7560	75	80	60.5	59.5	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
B-TSA 7580	75	80	80.75	79.25	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
B-TSA 8040	80	85	40.5	39.5	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
B-TSA 8060	80	85	60.5	59.5	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
B-TSA 8080	80	85	80.75	79.25	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
B-TSA 80100	80	85	100.75	99.25	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
B-TSA 8530	85	90	30.25	29.75	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
B-TSA 8540	85	90	40.5	39.5	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
B-TSA 8560	85	90	60.5	59.5	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
B-TSA 8580	85	90	80.75	79.25	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
B-TSA 85100	85	90	100.75	99.25	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020

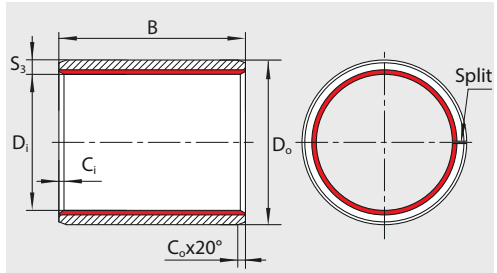
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



B-TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
B-TSA 9040	90	95	40.5	39.5	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
B-TSA 9060	90	95	60.5	59.5	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
B-TSA 90100	90	95	100.75	99.25	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
B-TSA 9560	95	100	60.5	59.5	2.5	95.000	94.946	100.035	100.000	95.155	95.020	0.209	0.020
B-TSA 95100	95	100	100.75	99.25	2.5	95.000	94.946	100.035	100.000	95.155	95.020	0.209	0.020
B-TSA 10050	100	105	50.5	49.5	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
B-TSA 10060	100	105	60.5	59.5	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
B-TSA 100100	100	105	100.75	99.25	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
B-TSA 100115	100	105	115.75	114.25	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
B-TSA 10560	105	110	60.5	59.5	2.5	105.000	104.946	110.035	110.000	105.155	105.020	0.209	0.020
B-TSA 105100	105	110	100.75	99.25	2.5	105.000	104.946	110.035	110.000	105.155	105.020	0.209	0.020
B-TSA 105115	105	110	115.75	114.25	2.5	105.000	104.946	110.035	110.000	105.155	105.020	0.209	0.020
B-TSA 11060	110	115	60.5	59.5	2.5	110.000	109.946	115.035	115.000	110.155	110.020	0.209	0.020
B-TSA 110100	110	115	100.75	99.25	2.5	110.000	109.946	115.035	115.000	110.155	110.020	0.209	0.020
B-TSA 110115	110	115	115.75	114.25	2.5	110.000	109.946	115.035	115.000	110.155	110.020	0.209	0.020
B-TSA 11550	115	120	50.5	49.5	2.5	115.000	114.946	120.035	120.000	115.155	115.020	0.209	0.020
B-TSA 11560	115	120	60.5	59.5	2.5	115.000	114.946	120.035	120.000	115.155	115.020	0.209	0.020
B-TSA 11570	115	120	70.5	69.5	2.5	115.000	114.946	120.035	120.000	115.155	115.020	0.209	0.020
B-TSA 115100	115	120	100.75	99.25	2.5	115.000	114.946	120.035	120.000	115.155	115.020	0.209	0.020
B-TSA 12050	120	125	50.5	49.5	2.5	120.000	119.946	125.040	125.000	120.210	120.070	0.264	0.070
B-TSA 12060	120	125	60.5	59.5	2.5	120.000	119.946	125.040	125.000	120.210	120.070	0.264	0.070
B-TSA 120100	120	125	100.75	99.25	2.5	120.000	119.946	125.040	125.000	120.210	120.070	0.264	0.070
B-TSA 12560	125	130	60.5	59.5	2.5	125.000	124.937	130.040	130.000	125.210	125.070	0.273	0.070
B-TSA 125100	125	130	100.75	99.25	2.5	125.000	124.937	130.040	130.000	125.210	125.070	0.273	0.070

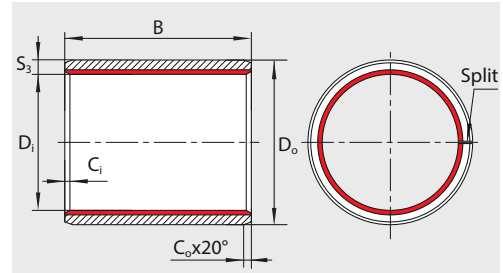
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



B-TSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
B-TSA 13060	130	135	60.5	59.5	2.5	130.000	129.937	135.040	135.000	130.210	130.070	0.273	0.070
B-TSA 130100	130	135	100.75	99.25	2.5	130.000	129.937	135.040	135.000	130.210	130.070	0.273	0.070
B-TSA 13560	135	140	60.5	59.5	2.5	135.000	134.937	140.040	140.000	135.210	135.070	0.273	0.070
B-TSA 13580	135	140	80.75	79.25	2.5	135.000	134.937	140.040	140.000	135.210	135.070	0.273	0.070
B-TSA 135100	135	140	100.75	99.25	2.5	135.000	134.937	140.040	140.000	135.210	135.070	0.273	0.070
B-TSA 14060	140	145	60.5	59.5	2.5	140.000	139.937	145.040	145.000	140.210	140.070	0.273	0.070
B-TSA 140100	140	145	100.75	99.25	2.5	140.000	139.937	145.040	145.000	140.210	140.070	0.273	0.070
B-TSA 15060	150	155	60.5	59.5	2.5	150.000	149.937	155.040	155.000	150.210	150.070	0.273	0.070
B-TSA 15080	150	155	80.75	79.25	2.5	150.000	149.937	155.040	155.000	150.210	150.070	0.273	0.070
B-TSA 150100	150	155	100.75	99.25	2.5	150.000	149.937	155.040	155.000	150.210	150.070	0.273	0.070
B-TSA 16060	160	165	60.5	59.5	2.5	160.000	159.937	165.040	165.000	160.210	160.070	0.273	0.070
B-TSA 16080	160	165	80.75	79.25	2.5	160.000	159.937	165.040	165.000	160.210	160.070	0.273	0.070
B-TSA 160100	160	165	100.75	99.25	2.5	160.000	159.937	165.040	165.000	160.210	160.070	0.273	0.070
B-TSA 170100	170	175	100.75	99.25	2.5	170.000	169.937	175.040	175.000	170.210	170.070	0.273	0.070
B-TSA 180100	180	185	100.75	99.25	2.5	180.000	179.937	185.046	185.000	180.216	180.070	0.279	0.070
B-TSA 200100	200	205	100.75	99.25	2.5	200.000	199.928	205.046	205.000	200.216	200.070	0.288	0.070
B-TSA 210100	210	215	100.75	99.25	2.5	210.000	209.928	215.046	215.000	210.216	210.070	0.288	0.070
B-TSA 220100	220	225	100.75	99.25	2.5	220.000	219.928	225.046	225.000	220.216	220.070	0.288	0.070
B-TSA 250100	250	255	100.75	99.25	2.5	250.000	249.928	255.052	255.000	250.222	250.070	0.294	0.070
B-TSA 300100	300	305	100.75	99.25	2.5	300.000	299.919	305.052	305.000	300.222	300.070	0.303	0.070

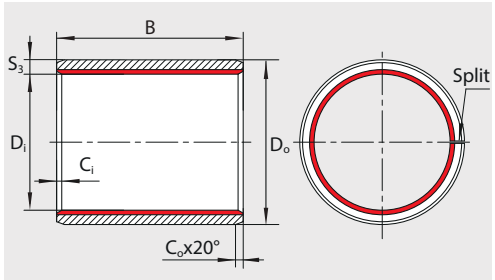
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
0.75	0.5 ± 0.3	0.1	0.4
1	0.6 ± 0.4	0.1	0.5



TFA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TFA 0203	2	3.5	3.25	2.75	0.75	2.000	1.994	3.508	3.500	2.048	2.000	0.054	0.000
TFA 0205	2	3.5	5.25	4.75	0.75	2.000	1.994	3.508	3.500	2.048	2.000	0.054	0.000
TFA 0303	3	4.5	3.25	2.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TFA 0305	3	4.5	5.25	4.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TFA 0306	3	4.5	6.25	5.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TFA 0403	4	5.5	3.25	2.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TFA 0404	4	5.5	4.25	3.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TFA 0406	4	5.5	6.25	5.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TFA 0410	4	5.5	10.25	9.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TFA 0505	5	7	5.25	4.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TFA 0508	5	7	8.25	7.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TFA 0510	5	7	10.25	9.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TFA 0604	6	8	4.25	3.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TFA 0606	6	8	6.25	5.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TFA 0608	6	8	8.25	7.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TFA 0610	6	8	10.25	9.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TFA 0710	7	9	10.25	9.75	1	6.987	6.972	9.015	9.000	7.055	6.990	0.083	0.003
TFA 0806	8	10	6.25	5.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TFA 0808	8	10	8.25	7.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TFA 0810	8	10	10.25	9.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TFA 0812	8	10	12.25	11.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003

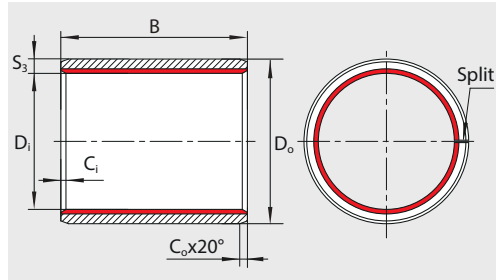
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1	0.6 ± 0.4	0.1	0.5



TFA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TFA 1008	10	12	8.25	7.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TFA 1010	10	12	10.25	9.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TFA 1012	10	12	12.25	11.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TFA 1015	10	12	15.5	14.5	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TFA 1020	10	12	20.5	19.5	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TFA 1208	12	14	8.25	7.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TFA 1210	12	14	10.25	9.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TFA 1212	12	14	12.25	11.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TFA 1215	12	14	15.5	14.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TFA 1220	12	14	20.5	19.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TFA 1225	12	14	25.5	24.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TFA 1310	13	15	10.25	9.75	1	12.984	12.966	15.018	15.000	13.058	12.990	0.092	0.006
TFA 1320	13	15	20.5	19.5	1	12.984	12.966	15.018	15.000	13.058	12.990	0.092	0.006
TFA 1405	14	16	5.25	4.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TFA 1410	14	16	10.25	9.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TFA 1412	14	16	12.25	11.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TFA 1415	14	16	15.5	14.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TFA 1420	14	16	20.5	19.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TFA 1425	14	16	25.5	24.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TFA 1510	15	17	10.25	9.75	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TFA 1512	15	17	12.25	11.75	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TFA 1515	15	17	15.5	14.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TFA 1520	15	17	20.5	19.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TFA 1525	15	17	25.5	24.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006

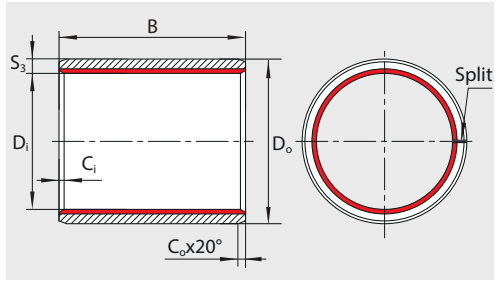
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1	0.6 ± 0.4	0.1	0.5
1.5	0.6 ± 0.4	0.1	0.7



TFA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TFA 1610	16	18	10.25	9.75	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TFA 1612	16	18	12.25	11.75	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TFA 1615	16	18	15.5	14.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TFA 1620	16	18	20.5	19.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TFA 1625	16	18	25.5	24.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TFA 1720	17	19	20.25	19.75	1	16.984	16.966	19.021	19.000	17.061	16.990	0.095	0.006
TFA 1810	18	20	10.25	9.75	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TFA 1815	18	20	15.5	14.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TFA 1820	18	20	20.5	19.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TFA 1825	18	20	25.5	24.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TFA 2010	20	23	10.25	9.75	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TFA 2015	20	23	15.25	14.75	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TFA 2020	20	23	20.5	19.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TFA 2025	20	23	25.5	24.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TFA 2030	20	23	30.5	29.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TFA 2215	22	25	15.25	14.75	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TFA 2220	22	25	20.5	19.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TFA 2225	22	25	25.5	24.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TFA 2230	22	25	30.5	29.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TFA 2415	24	27	15.25	14.75	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TFA 2420	24	27	20.5	19.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TFA 2425	24	27	25.5	24.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TFA 2430	24	27	30.5	29.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010

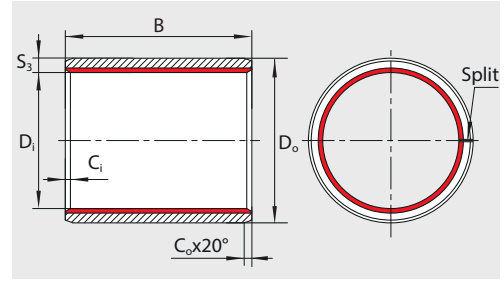
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1.5	0.6 ± 0.4	0.1	0.7
2	1.2 ± 0.4	0.1	0.7



TFA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TFA 2515	25	28	15.25	14.75	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TFA 2520	25	28	20.5	19.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TFA 2525	25	28	25.5	24.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TFA 2530	25	28	30.5	29.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TFA 2550	25	28	50.5	49.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TFA 2815	28	32	15.25	14.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TFA 2820	28	32	20.25	19.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TFA 2825	28	32	25.25	24.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TFA 2830	28	32	30.5	29.5	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TFA 3010	30	34	10.25	9.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TFA 3015	30	34	15.25	14.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TFA 3020	30	34	20.25	19.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TFA 3025	30	34	25.25	24.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TFA 3030	30	34	30.5	29.5	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TFA 3040	30	34	40.5	39.5	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TFA 3220	32	36	20.25	19.75	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TFA 3230	32	36	30.5	29.5	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TFA 3240	32	36	40.5	39.5	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TFA 3520	35	39	20.25	19.75	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TFA 3530	35	39	30.5	29.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TFA 3535	35	39	35.5	34.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TFA 3540	35	39	40.5	39.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TFA 3550	35	39	50.5	49.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015

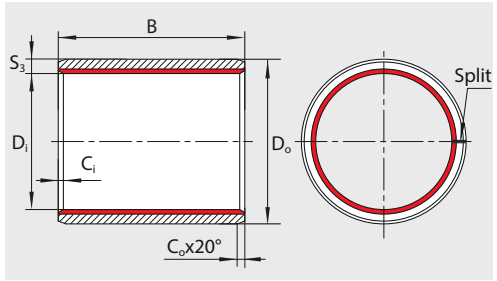
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2	1.2 ± 0.4	0.1	0.7
2.5	1.8 ± 0.6	0.2	1



TFA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TFA 3720	37	41	20.25	19.75	2	36.975	36.950	41.025	41.000	37.085	36.990	0.135	0.015
TFA 3815	38	42	15.25	14.75	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TFA 3820	38	42	20.25	19.75	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TFA 3830	38	42	30.5	29.5	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TFA 3840	38	42	40.5	39.5	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TFA 4020	40	44	20.25	19.75	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TFA 4030	40	44	30.5	29.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TFA 4040	40	44	40.5	39.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TFA 4050	40	44	50.5	49.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TFA 4520	45	50	20.25	19.75	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TFA 4530	45	50	30.25	29.75	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TFA 4540	45	50	40.5	39.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TFA 4545	45	50	45.5	44.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TFA 4550	45	50	50.5	49.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TFA 5020	50	55	20.25	19.75	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TFA 5030	50	55	30.25	29.75	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TFA 5040	50	55	40.5	39.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TFA 5050	50	55	50.5	49.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TFA 5060	50	55	60.5	59.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TFA 5520	55	60	20.25	19.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TFA 5525	55	60	25.25	24.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TFA 5530	55	60	30.25	29.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TFA 5540	55	60	40.5	39.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TFA 5550	55	60	50.5	49.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TFA 5555	55	60	55.5	54.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TFA 5560	55	60	60.5	59.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020

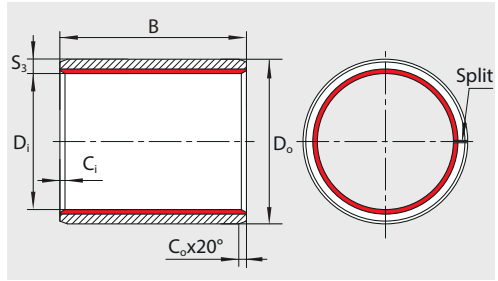
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



TFA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TFA 6020	60	65	20.25	19.75	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TFA 6030	60	65	30.25	29.75	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TFA 6040	60	65	40.5	39.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TFA 6050	60	65	50.5	49.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TFA 6060	60	65	60.5	59.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TFA 6070	60	65	70.75	69.25	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TFA 6530	65	70	30.25	29.75	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
TFA 6550	65	70	50.5	49.5	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
TFA 6570	65	70	70.75	69.25	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
TFA 7030	70	75	30.25	29.75	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TFA 7040	70	75	40.5	39.5	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TFA 7050	70	75	50.5	49.5	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TFA 7070	70	75	70.75	69.25	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TFA 7540	75	80	40.5	39.5	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
TFA 7560	75	80	60.5	59.5	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
TFA 7580	75	80	80.75	79.25	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
TFA 8040	80	85	40.5	39.5	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TFA 8060	80	85	60.5	59.5	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TFA 8080	80	85	80.75	79.25	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TFA 80100	80	85	100.75	99.25	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TFA 8530	85	90	30.25	29.75	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TFA 8540	85	90	40.5	39.5	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TFA 8560	85	90	60.5	59.5	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TFA 8580	85	90	80.75	79.25	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TFA 85100	85	90	100.75	99.25	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020

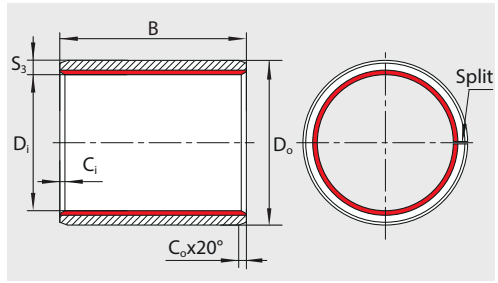
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



TFA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TFA 9040	90	95	40.5	39.5	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
TFA 9060	90	95	60.5	59.5	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
TFA 90100	90	95	100.75	99.25	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
TFA 9560	95	100	60.5	59.5	2.5	95.000	94.946	100.035	100.000	95.155	95.020	0.209	0.020
TFA 95100	95	100	100.75	99.25	2.5	95.000	94.946	100.035	100.000	95.155	95.020	0.209	0.020
TFA 10050	100	105	50.5	49.5	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
TFA 10060	100	105	60.5	59.5	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
TFA 100100	100	105	100.75	99.25	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
TFA 100115	100	105	115.75	114.25	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020

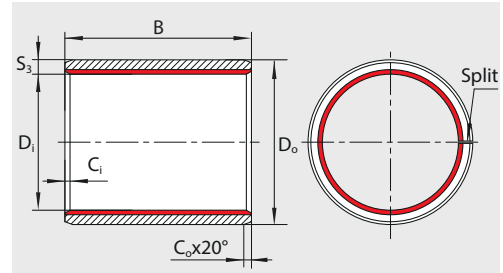
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
0.75	0.5 ± 0.3	0.1	0.4
1	0.6 ± 0.4	0.1	0.5



TOA

Dimension table · Unit: mm

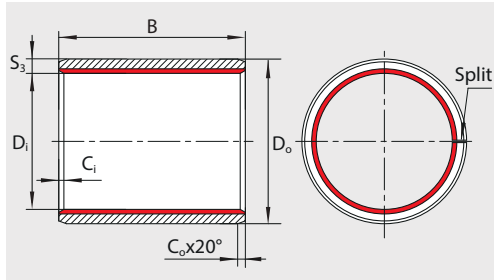
Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TOA 0203	2	3.5	3.25	2.75	0.75	2.000	1.994	3.508	3.500	2.048	2.000	0.054	0.000
TOA 0205	2	3.5	5.25	4.75	0.75	2.000	1.994	3.508	3.500	2.048	2.000	0.054	0.000
TOA 0303	3	4.5	3.25	2.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TOA 0305	3	4.5	5.25	4.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TOA 0306	3	4.5	6.25	5.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TOA 0403	4	5.5	3.25	2.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TOA 0404	4	5.5	4.25	3.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TOA 0406	4	5.5	6.25	5.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TOA 0410	4	5.5	10.25	9.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TOA 0505	5	7	5.25	4.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TOA 0508	5	7	8.25	7.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TOA 0510	5	7	10.25	9.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TOA 0604	6	8	4.25	3.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TOA 0606	6	8	6.25	5.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TOA 0608	6	8	8.25	7.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TOA 0610	6	8	10.25	9.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TOA 0710	7	9	10.25	9.75	1	6.987	6.972	9.015	9.000	7.055	6.990	0.083	0.003
TOA 0806	8	10	6.25	5.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TOA 0808	8	10	8.25	7.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TOA 0810	8	10	10.25	9.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TOA 0812	8	10	12.25	11.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003

Cylindrical Bushings

Maintenance-free
Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1	0.6 ± 0.4	0.1	0.5



TOA

Dimension table · Unit: mm

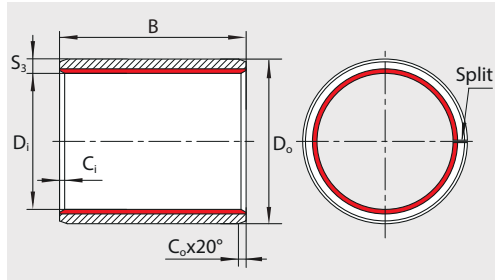
Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TOA 1008	10	12	8.25	7.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TOA 1010	10	12	10.25	9.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TOA 1012	10	12	12.25	11.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TOA 1015	10	12	15.5	14.5	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TOA 1020	10	12	20.5	19.5	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TOA 1208	12	14	8.25	7.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TOA 1210	12	14	10.25	9.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TOA 1212	12	14	12.25	11.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TOA 1215	12	14	15.5	14.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TOA 1220	12	14	20.5	19.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TOA 1225	12	14	25.5	24.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TOA 1310	13	15	10.25	9.75	1	12.984	12.966	15.018	15.000	13.058	12.990	0.092	0.006
TOA 1320	13	15	20.5	19.5	1	12.984	12.966	15.018	15.000	13.058	12.990	0.092	0.006
TOA 1405	14	16	5.25	4.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TOA 1410	14	16	10.25	9.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TOA 1412	14	16	12.25	11.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TOA 1415	14	16	15.5	14.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TOA 1420	14	16	20.5	19.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TOA 1425	14	16	25.5	24.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TOA 1510	15	17	10.25	9.75	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TOA 1512	15	17	12.25	11.75	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TOA 1515	15	17	15.5	14.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TOA 1520	15	17	20.5	19.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TOA 1525	15	17	25.5	24.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006

Cylindrical Bushings

Maintenance-free
Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1	0.6 ± 0.4	0.1	0.5
1.5	0.6 ± 0.4	0.1	0.7



TOA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TOA 1610	16	18	10.25	9.75	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TOA 1612	16	18	12.25	11.75	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TOA 1615	16	18	15.5	14.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TOA 1620	16	18	20.5	19.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TOA 1625	16	18	25.5	24.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TOA 1720	17	19	20.25	19.75	1	16.984	16.966	19.021	19.000	17.061	16.990	0.095	0.006
TOA 1810	18	20	10.25	9.75	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TOA 1815	18	20	15.5	14.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TOA 1820	18	20	20.5	19.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TOA 1825	18	20	25.5	24.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TOA 2010	20	23	10.25	9.75	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TOA 2015	20	23	15.25	14.75	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TOA 2020	20	23	20.5	19.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TOA 2025	20	23	25.5	24.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TOA 2030	20	23	30.5	29.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TOA 2215	22	25	15.25	14.75	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TOA 2220	22	25	20.5	19.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TOA 2225	22	25	25.5	24.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TOA 2230	22	25	30.5	29.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TOA 2415	24	27	15.25	14.75	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TOA 2420	24	27	20.5	19.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TOA 2425	24	27	25.5	24.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TOA 2430	24	27	30.5	29.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010

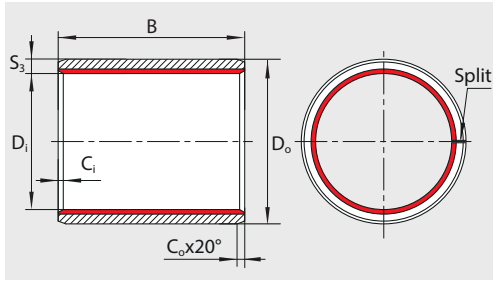
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1.5	0.6 ± 0.4	0.1	0.7
2	1.2 ± 0.4	0.1	0.7



TOA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TOA 2515	25	28	15.25	14.75	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TOA 2520	25	28	20.5	19.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TOA 2525	25	28	25.5	24.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TOA 2530	25	28	30.5	29.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TOA 2550	25	28	50.5	49.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TOA 2815	28	32	15.25	14.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TOA 2820	28	32	20.25	19.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TOA 2825	28	32	25.25	24.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TOA 2830	28	32	30.5	29.5	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TOA 3010	30	34	10.25	9.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TOA 3015	30	34	15.25	14.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TOA 3020	30	34	20.25	19.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TOA 3025	30	34	25.25	24.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TOA 3030	30	34	30.5	29.5	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TOA 3040	30	34	40.5	39.5	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TOA 3220	32	36	20.25	19.75	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TOA 3230	32	36	30.5	29.5	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TOA 3240	32	36	40.5	39.5	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TOA 3520	35	39	20.25	19.75	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TOA 3530	35	39	30.5	29.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TOA 3535	35	39	35.5	34.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TOA 3540	35	39	40.5	39.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TOA 3550	35	39	50.5	49.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015

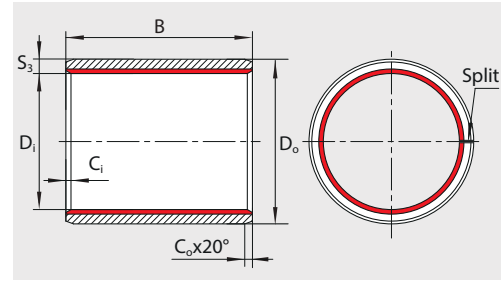
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2	1.2 ± 0.4	0.1	0.7
2.5	1.8 ± 0.6	0.2	1



TOA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TOA 3720	37	41	20.25	19.75	2	36.975	36.950	41.025	41.000	37.085	36.990	0.135	0.015
TOA 3815	38	42	15.25	14.75	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TOA 3820	38	42	20.25	19.75	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TOA 3830	38	42	30.5	29.5	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TOA 3840	38	42	40.5	39.5	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TOA 4020	40	44	20.25	19.75	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TOA 4030	40	44	30.5	29.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TOA 4040	40	44	40.5	39.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TOA 4050	40	44	50.5	49.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TOA 4520	45	50	20.25	19.75	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TOA 4530	45	50	30.25	29.75	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TOA 4540	45	50	40.5	39.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TOA 4545	45	50	45.5	44.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TOA 4550	45	50	50.5	49.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TOA 5020	50	55	20.25	19.75	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TOA 5030	50	55	30.25	29.75	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TOA 5040	50	55	40.5	39.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TOA 5050	50	55	50.5	49.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TOA 5060	50	55	60.5	59.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TOA 5520	55	60	20.25	19.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TOA 5525	55	60	25.25	24.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TOA 5530	55	60	30.25	29.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TOA 5540	55	60	40.5	39.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TOA 5550	55	60	50.5	49.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TOA 5555	55	60	55.5	54.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TOA 5560	55	60	60.5	59.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020

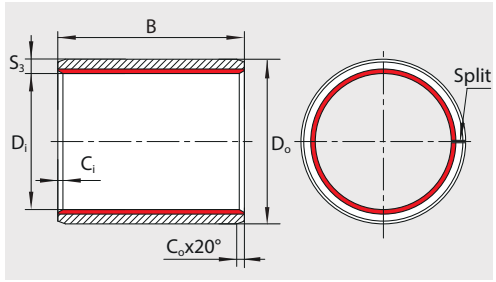
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



TOA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TOA 6020	60	65	20.25	19.75	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TOA 6030	60	65	30.25	29.75	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TOA 6040	60	65	40.5	39.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TOA 6050	60	65	50.5	49.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TOA 6060	60	65	60.5	59.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TOA 6070	60	65	70.75	69.25	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TOA 6530	65	70	30.25	29.75	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
TOA 6550	65	70	50.5	49.5	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
TOA 6570	65	70	70.75	69.25	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
TOA 7030	70	75	30.25	29.75	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TOA 7040	70	75	40.5	39.5	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TOA 7050	70	75	50.5	49.5	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TOA 7070	70	75	70.75	69.25	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TOA 7540	75	80	40.5	39.5	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
TOA 7560	75	80	60.5	59.5	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
TOA 7580	75	80	80.75	79.25	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
TOA 8040	80	85	40.5	39.5	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TOA 8060	80	85	60.5	59.5	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TOA 8080	80	85	80.75	79.25	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TOA 80100	80	85	100.75	99.25	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TOA 8530	85	90	30.25	29.75	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TOA 8540	85	90	40.5	39.5	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TOA 8560	85	90	60.5	59.5	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TOA 8580	85	90	80.75	79.25	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TOA 85100	85	90	100.75	99.25	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020

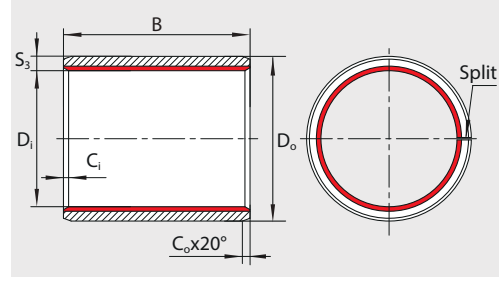
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



TOA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TOA 9040	90	95	40.5	39.5	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
TOA 9060	90	95	60.5	59.5	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
TOA 90100	90	95	100.75	99.25	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
TOA 9560	95	100	60.5	59.5	2.5	95.000	94.946	100.035	100.000	95.155	95.020	0.209	0.020
TOA 95100	95	100	100.75	99.25	2.5	95.000	94.946	100.035	100.000	95.155	95.020	0.209	0.020
TOA 10050	100	105	50.5	49.5	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
TOA 10060	100	105	60.5	59.5	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
TOA 100100	100	105	100.75	99.25	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
TOA 100115	100	105	115.75	114.25	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020

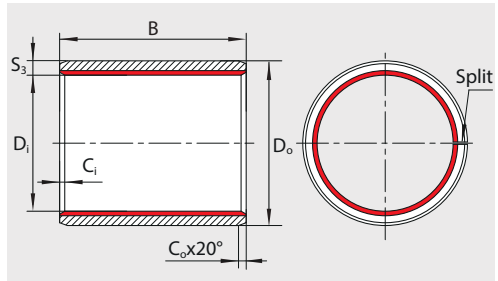
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
0.75	0.5 ± 0.3	0.1	0.4
1	0.6 ± 0.4	0.1	0.5



TGA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TGA 0203	2	3.5	3.25	2.75	0.75	2.000	1.994	3.508	3.500	2.048	2.000	0.054	0.000
TGA 0205	2	3.5	5.25	4.75	0.75	2.000	1.994	3.508	3.500	2.048	2.000	0.054	0.000
TGA 0303	3	4.5	3.25	2.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TGA 0305	3	4.5	5.25	4.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TGA 0306	3	4.5	6.25	5.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TGA 0403	4	5.5	3.25	2.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TGA 0404	4	5.5	4.25	3.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TGA 0406	4	5.5	6.25	5.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TGA 0410	4	5.5	10.25	9.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TGA 0505	5	7	5.25	4.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TGA 0508	5	7	8.25	7.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TGA 0510	5	7	10.25	9.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TGA 0604	6	8	4.25	3.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TGA 0606	6	8	6.25	5.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TGA 0608	6	8	8.25	7.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TGA 0610	6	8	10.25	9.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TGA 0710	7	9	10.25	9.75	1	6.987	6.972	9.015	9.000	7.055	6.990	0.083	0.003
TGA 0806	8	10	6.25	5.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TGA 0808	8	10	8.25	7.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TGA 0810	8	10	10.25	9.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TGA 0812	8	10	12.25	11.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003

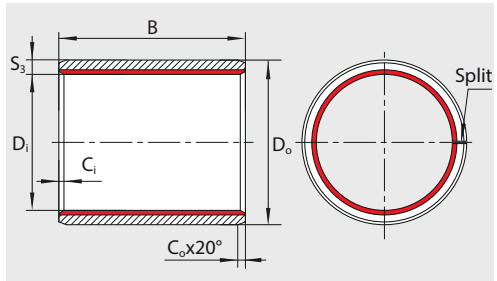
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1	0.6 ± 0.4	0.1	0.5



TGA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TGA 1008	10	12	8.25	7.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TGA 1010	10	12	10.25	9.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TGA 1012	10	12	12.25	11.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TGA 1015	10	12	15.5	14.5	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TGA 1020	10	12	20.5	19.5	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TGA 1208	12	14	8.25	7.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TGA 1210	12	14	10.25	9.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TGA 1212	12	14	12.25	11.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TGA 1215	12	14	15.5	14.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TGA 1220	12	14	20.5	19.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TGA 1225	12	14	25.5	24.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TGA 1310	13	15	10.25	9.75	1	12.984	12.966	15.018	15.000	13.058	12.990	0.092	0.006
TGA 1320	13	15	20.5	19.5	1	12.984	12.966	15.018	15.000	13.058	12.990	0.092	0.006
TGA 1405	14	16	5.25	4.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TGA 1410	14	16	10.25	9.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TGA 1412	14	16	12.25	11.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TGA 1415	14	16	15.5	14.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TGA 1420	14	16	20.5	19.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TGA 1425	14	16	25.5	24.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TGA 1510	15	17	10.25	9.75	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TGA 1512	15	17	12.25	11.75	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TGA 1515	15	17	15.5	14.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TGA 1520	15	17	20.5	19.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TGA 1525	15	17	25.5	24.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006

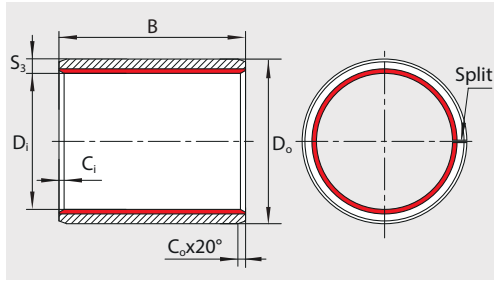
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1	0.6 ± 0.4	0.1	0.5
1.5	0.6 ± 0.4	0.1	0.7



TGA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TGA 1610	16	18	10.25	9.75	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TGA 1612	16	18	12.25	11.75	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TGA 1615	16	18	15.5	14.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TGA 1620	16	18	20.5	19.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TGA 1625	16	18	25.5	24.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TGA 1720	17	19	20.25	19.75	1	16.984	16.966	19.021	19.000	17.061	16.990	0.095	0.006
TGA 1810	18	20	10.25	9.75	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TGA 1815	18	20	15.5	14.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TGA 1820	18	20	20.5	19.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TGA 1825	18	20	25.5	24.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TGA 2010	20	23	10.25	9.75	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TGA 2015	20	23	15.25	14.75	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TGA 2020	20	23	20.5	19.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TGA 2025	20	23	25.5	24.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TGA 2030	20	23	30.5	29.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TGA 2215	22	25	15.25	14.75	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TGA 2220	22	25	20.5	19.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TGA 2225	22	25	25.5	24.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TGA 2230	22	25	30.5	29.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TGA 2415	24	27	15.25	14.75	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TGA 2420	24	27	20.5	19.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TGA 2425	24	27	25.5	24.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TGA 2430	24	27	30.5	29.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010

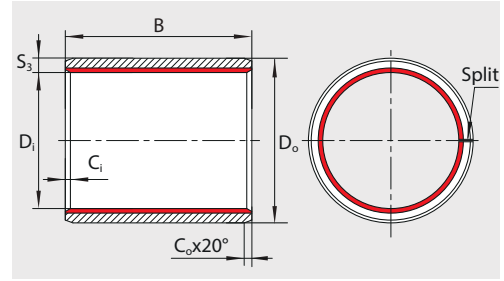
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1.5	0.6 ± 0.4	0.1	0.7
2	1.2 ± 0.4	0.1	0.7



TGA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TGA 2515	25	28	15.25	14.75	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TGA 2520	25	28	20.5	19.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TGA 2525	25	28	25.5	24.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TGA 2530	25	28	30.5	29.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TGA 2550	25	28	50.5	49.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TGA 2815	28	32	15.25	14.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TGA 2820	28	32	20.25	19.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TGA 2825	28	32	25.25	24.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TGA 2830	28	32	30.5	29.5	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TGA 3010	30	34	10.25	9.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TGA 3015	30	34	15.25	14.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TGA 3020	30	34	20.25	19.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TGA 3025	30	34	25.25	24.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TGA 3030	30	34	30.5	29.5	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TGA 3040	30	34	40.5	39.5	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TGA 3220	32	36	20.25	19.75	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TGA 3230	32	36	30.5	29.5	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TGA 3240	32	36	40.5	39.5	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TGA 3520	35	39	20.25	19.75	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TGA 3530	35	39	30.5	29.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TGA 3535	35	39	35.5	34.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TGA 3540	35	39	40.5	39.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TGA 3550	35	39	50.5	49.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015

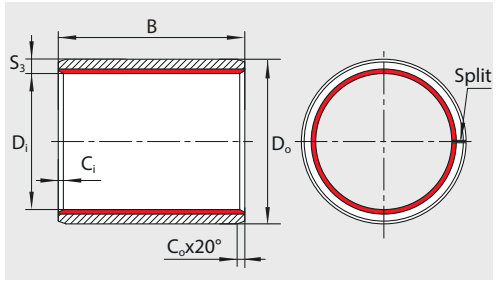
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2	1.2 ± 0.4	0.1	0.7
2.5	1.8 ± 0.6	0.2	1



TGA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TGA 3720	37	41	20.25	19.75	2	36.975	36.950	41.025	41.000	37.085	36.990	0.135	0.015
TGA 3815	38	42	15.25	14.75	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TGA 3820	38	42	20.25	19.75	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TGA 3830	38	42	30.5	29.5	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TGA 3840	38	42	40.5	39.5	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TGA 4020	40	44	20.25	19.75	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TGA 4030	40	44	30.5	29.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TGA 4040	40	44	40.5	39.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TGA 4050	40	44	50.5	49.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TGA 4520	45	50	20.25	19.75	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TGA 4530	45	50	30.25	29.75	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TGA 4540	45	50	40.5	39.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TGA 4545	45	50	45.5	44.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TGA 4550	45	50	50.5	49.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TGA 5020	50	55	20.25	19.75	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TGA 5030	50	55	30.25	29.75	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TGA 5040	50	55	40.5	39.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TGA 5050	50	55	50.5	49.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TGA 5060	50	55	60.5	59.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TGA 5520	55	60	20.25	19.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TGA 5525	55	60	25.25	24.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TGA 5530	55	60	30.25	29.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TGA 5540	55	60	40.5	39.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TGA 5550	55	60	50.5	49.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TGA 5555	55	60	55.5	54.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TGA 5560	55	60	60.5	59.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020

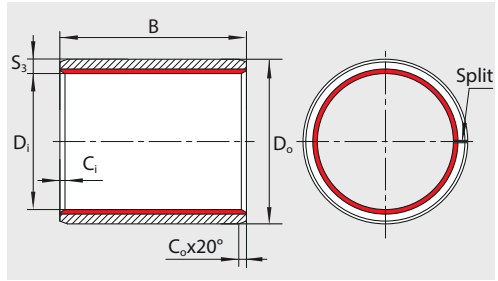
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



TGA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TGA 6020	60	65	20.25	19.75	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TGA 6030	60	65	30.25	29.75	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TGA 6040	60	65	40.5	39.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TGA 6050	60	65	50.5	49.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TGA 6060	60	65	60.5	59.5	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TGA 6070	60	65	70.75	69.25	2.5	59.970	59.940	65.030	65.000	60.110	59.990	0.170	0.020
TGA 6530	65	70	30.25	29.75	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
TGA 6550	65	70	50.5	49.5	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
TGA 6570	65	70	70.75	69.25	2.5	64.970	64.940	70.030	70.000	65.110	64.990	0.170	0.020
TGA 7030	70	75	30.25	29.75	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TGA 7040	70	75	40.5	39.5	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TGA 7050	70	75	50.5	49.5	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TGA 7070	70	75	70.75	69.25	2.5	69.970	69.940	75.030	75.000	70.110	69.990	0.170	0.020
TGA 7540	75	80	40.5	39.5	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
TGA 7560	75	80	60.5	59.5	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
TGA 7580	75	80	80.75	79.25	2.5	74.970	74.940	80.030	80.000	75.110	74.990	0.170	0.020
TGA 8040	80	85	40.5	39.5	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TGA 8060	80	85	60.5	59.5	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TGA 8080	80	85	80.75	79.25	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TGA 80100	80	85	100.75	99.25	2.5	80.000	79.954	85.035	85.000	80.155	80.020	0.201	0.020
TGA 8530	85	90	30.25	29.75	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TGA 8540	85	90	40.5	39.5	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TGA 8560	85	90	60.5	59.5	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TGA 8580	85	90	80.75	79.25	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020
TGA 85100	85	90	100.75	99.25	2.5	85.000	84.946	90.035	90.000	85.155	85.020	0.209	0.020

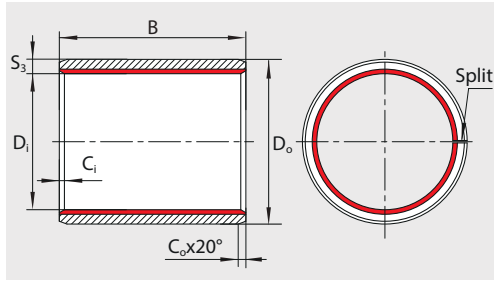
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



TGA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TGA 9040	90	95	40.5	39.5	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
TGA 9060	90	95	60.5	59.5	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
TGA 90100	90	95	100.75	99.25	2.5	90.000	89.946	95.035	95.000	90.155	90.020	0.209	0.020
TGA 9560	95	100	60.5	59.5	2.5	95.000	94.946	100.035	100.000	95.155	95.020	0.209	0.020
TGA 95100	95	100	100.75	99.25	2.5	95.000	94.946	100.035	100.000	95.155	95.020	0.209	0.020
TGA 10050	100	105	50.5	49.5	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
TGA 10060	100	105	60.5	59.5	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
TGA 100100	100	105	100.75	99.25	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020
TGA 100115	100	105	115.75	114.25	2.5	100.000	99.946	105.035	105.000	100.155	100.020	0.209	0.020

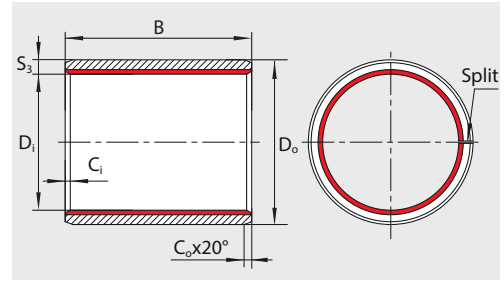
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
0.75	0.5 ± 0.3	0.1	0.4
1	0.6 ± 0.4	0.1	0.5



TLA

Dimension table · Unit: mm

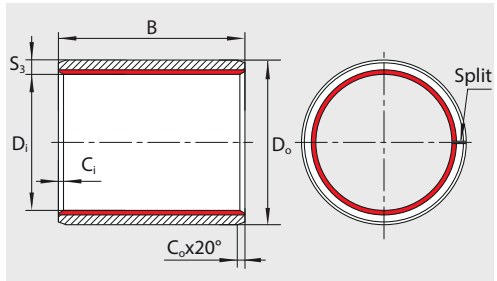
Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TLA 0203	2	3.5	3.25	2.75	0.75	2.000	1.994	3.508	3.500	2.048	2.000	0.054	0.000
TLA 0205	2	3.5	5.25	4.75	0.75	2.000	1.994	3.508	3.500	2.048	2.000	0.054	0.000
TLA 0303	3	4.5	3.25	2.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TLA 0305	3	4.5	5.25	4.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TLA 0306	3	4.5	6.25	5.75	0.75	3.000	2.994	4.508	4.500	3.048	3.000	0.054	0.000
TLA 0403	4	5.5	3.25	2.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TLA 0404	4	5.5	4.25	3.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TLA 0406	4	5.5	6.25	5.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TLA 0410	4	5.5	10.25	9.75	0.75	4.000	3.992	5.508	5.500	4.048	4.000	0.056	0.000
TLA 0505	5	7	5.25	4.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TLA 0508	5	7	8.25	7.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TLA 0510	5	7	10.25	9.75	1	4.990	4.978	7.015	7.000	5.055	4.990	0.077	0.000
TLA 0604	6	8	4.25	3.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TLA 0606	6	8	6.25	5.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TLA 0608	6	8	8.25	7.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TLA 0610	6	8	10.25	9.75	1	5.990	5.978	8.015	8.000	6.055	5.990	0.077	0.000
TLA 0710	7	9	10.25	9.75	1	6.987	6.972	9.015	9.000	7.055	6.990	0.083	0.003
TLA 0806	8	10	6.25	5.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TLA 0808	8	10	8.25	7.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TLA 0810	8	10	10.25	9.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003
TLA 0812	8	10	12.25	11.75	1	7.987	7.972	10.015	10.000	8.055	7.990	0.083	0.003

Cylindrical Bushings

Maintenance-free
Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1	0.6 ± 0.4	0.1	0.5



TLA

Dimension table · Unit: mm

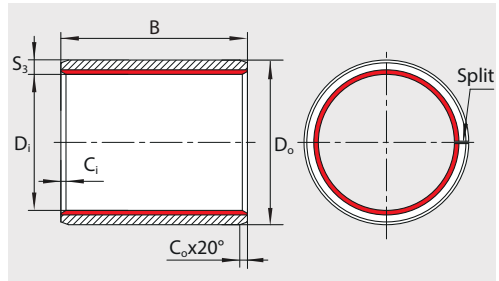
Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TLA 1008	10	12	8.25	7.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TLA 1010	10	12	10.25	9.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TLA 1012	10	12	12.25	11.75	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TLA 1015	10	12	15.5	14.5	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TLA 1020	10	12	20.5	19.5	1	9.987	9.972	12.018	12.000	10.058	9.990	0.086	0.003
TLA 1208	12	14	8.25	7.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TLA 1210	12	14	10.25	9.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TLA 1212	12	14	12.25	11.75	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TLA 1215	12	14	15.5	14.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TLA 1220	12	14	20.5	19.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TLA 1225	12	14	25.5	24.5	1	11.984	11.966	14.018	14.000	12.058	11.990	0.092	0.006
TLA 1310	13	15	10.25	9.75	1	12.984	12.966	15.018	15.000	13.058	12.990	0.092	0.006
TLA 1320	13	15	20.5	19.5	1	12.984	12.966	15.018	15.000	13.058	12.990	0.092	0.006
TLA 1405	14	16	5.25	4.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TLA 1410	14	16	10.25	9.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TLA 1412	14	16	12.25	11.75	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TLA 1415	14	16	15.5	14.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TLA 1420	14	16	20.5	19.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TLA 1425	14	16	25.5	24.5	1	13.984	13.966	16.018	16.000	14.058	13.990	0.092	0.006
TLA 1510	15	17	10.25	9.75	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TLA 1512	15	17	12.25	11.75	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TLA 1515	15	17	15.5	14.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TLA 1520	15	17	20.5	19.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006
TLA 1525	15	17	25.5	24.5	1	14.984	14.966	17.018	17.000	15.058	14.990	0.092	0.006

Cylindrical Bushings

Maintenance-free
Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1	0.6 ± 0.4	0.1	0.5
1.5	0.6 ± 0.4	0.1	0.7



TLA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TLA 1610	16	18	10.25	9.75	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TLA 1612	16	18	12.25	11.75	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TLA 1615	16	18	15.5	14.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TLA 1620	16	18	20.5	19.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TLA 1625	16	18	25.5	24.5	1	15.984	15.966	18.018	18.000	16.058	15.990	0.092	0.006
TLA 1720	17	19	20.25	19.75	1	16.984	16.966	19.021	19.000	17.061	16.990	0.095	0.006
TLA 1810	18	20	10.25	9.75	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TLA 1815	18	20	15.5	14.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TLA 1820	18	20	20.5	19.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TLA 1825	18	20	25.5	24.5	1	17.984	17.966	20.021	20.000	18.061	17.990	0.095	0.006
TLA 2010	20	23	10.25	9.75	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TLA 2015	20	23	15.25	14.75	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TLA 2020	20	23	20.5	19.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TLA 2025	20	23	25.5	24.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TLA 2030	20	23	30.5	29.5	1.5	19.980	19.959	23.021	23.000	20.071	19.990	0.112	0.010
TLA 2215	22	25	15.25	14.75	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TLA 2220	22	25	20.5	19.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TLA 2225	22	25	25.5	24.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TLA 2230	22	25	30.5	29.5	1.5	21.980	21.959	25.021	25.000	22.071	21.990	0.112	0.010
TLA 2415	24	27	15.25	14.75	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TLA 2420	24	27	20.5	19.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TLA 2425	24	27	25.5	24.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010
TLA 2430	24	27	30.5	29.5	1.5	23.980	23.959	27.021	27.000	24.071	23.990	0.112	0.010

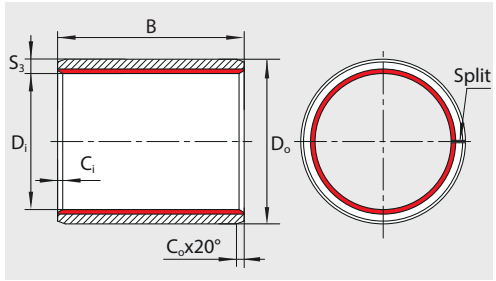
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1.5	0.6 ± 0.4	0.1	0.7
2	1.2 ± 0.4	0.1	0.7



TLA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TLA 2515	25	28	15.25	14.75	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TLA 2520	25	28	20.5	19.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TLA 2525	25	28	25.5	24.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TLA 2530	25	28	30.5	29.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TLA 2550	25	28	50.5	49.5	1.5	24.980	24.959	28.021	28.000	25.071	24.990	0.112	0.010
TLA 2815	28	32	15.25	14.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TLA 2820	28	32	20.25	19.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TLA 2825	28	32	25.25	24.75	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TLA 2830	28	32	30.5	29.5	2	27.980	27.959	32.025	32.000	28.085	27.990	0.126	0.010
TLA 3010	30	34	10.25	9.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TLA 3015	30	34	15.25	14.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TLA 3020	30	34	20.25	19.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TLA 3025	30	34	25.25	24.75	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TLA 3030	30	34	30.5	29.5	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TLA 3040	30	34	40.5	39.5	2	29.980	29.959	34.025	34.000	30.085	29.990	0.126	0.010
TLA 3220	32	36	20.25	19.75	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TLA 3230	32	36	30.5	29.5	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TLA 3240	32	36	40.5	39.5	2	31.975	31.950	36.025	36.000	32.085	31.990	0.135	0.015
TLA 3520	35	39	20.25	19.75	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TLA 3530	35	39	30.5	29.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TLA 3535	35	39	35.5	34.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TLA 3540	35	39	40.5	39.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015
TLA 3550	35	39	50.5	49.5	2	34.975	34.950	39.025	39.000	35.085	34.990	0.135	0.015

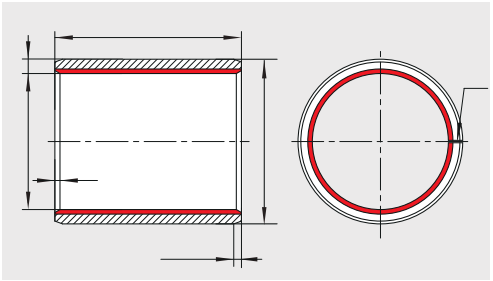
Cylindrical Bushings

Maintenance-free

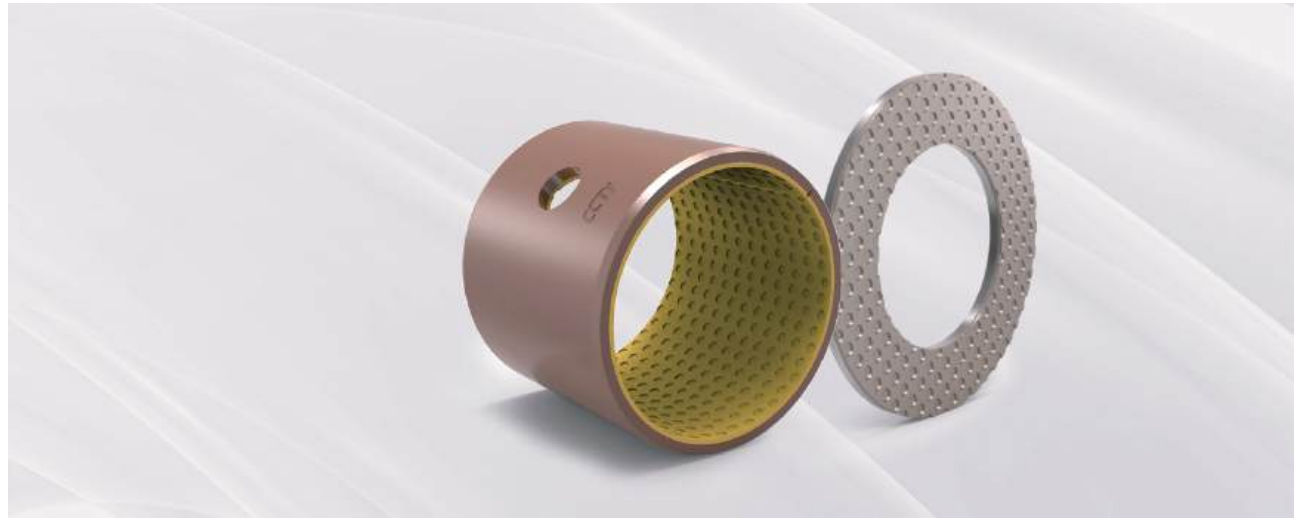
Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2	1.2 ± 0.4	0.1	0.7
2.5	1.8 ± 0.6	0.2	1



			B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance	
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.
TLA 3720	37	41	20.25	19.75	2	36.975	36.950	41.025	41.000	37.085	36.990	0.135	0.015
TLA 3815	38	42	15.25	14.75	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TLA 3820	38	42	20.25	19.75	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TLA 3830	38	42	30.5	29.5	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TLA 3840	38	42	40.5	39.5	2	37.975	37.950	42.025	42.000	38.085	37.990	0.135	0.015
TLA 4020	40	44	20.25	19.75	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TLA 4030	40	44	30.5	29.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TLA 4040	40	44	40.5	39.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TLA 4050	40	44	50.5	49.5	2	39.975	39.950	44.025	44.000	40.085	39.990	0.135	0.015
TLA 4520	45	50	20.25	19.75	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TLA 4530	45	50	30.25	29.75	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TLA 4540	45	50	40.5	39.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TLA 4545	45	50	45.5	44.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TLA 4550	45	50	50.5	49.5	2.5	44.975	44.950	50.025	50.000	45.105	44.990	0.155	0.015
TLA 5020	50	55	20.25	19.75	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TLA 5030	50	55	30.25	29.75	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TLA 5040	50	55	40.5	39.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TLA 5050	50	55	50.5	49.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TLA 5060	50	55	60.5	59.5	2.5	49.975	49.950	55.030	55.000	50.110	49.990	0.160	0.015
TLA 5520	55	60	20.25	19.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TLA 5525	55	60	25.25	24.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TLA 5530	55	60	30.25	29.75	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TLA 5540	55	60	40.5	39.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TLA 5550	55	60	50.5	49.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TLA 5555	55	60	55.5	54.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020
TLA 5560	55	60	60.5	59.5	2.5	54.970	54.940	60.030	60.000	55.110	54.990	0.170	0.020



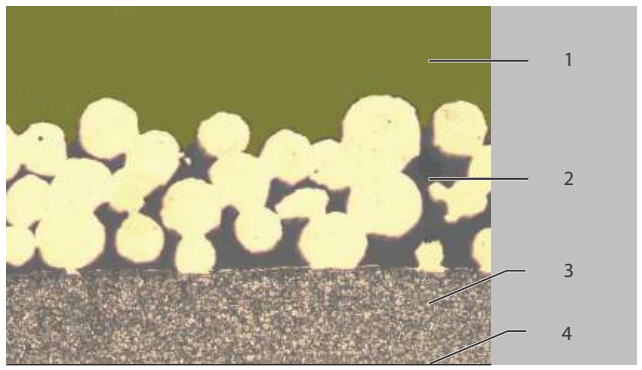
Polymer composite / Metallic plain bushings
Low-maintenance

Cylindrical Bushings
Thrust Washers

Material
PSA bushing material

Structure

Figure 38



1. POM composite: 0.3-0.5 mm

2. Porous bronze: 0.2-0.3 mm

3. Steel backing: 0.5-2.3 mm

4. Coating Thickness: 0.002-0.010 mm

Features

- Optimum performance under heavy loads at low speeds.
- Applicable for rotating, oscillating and linear movement.
- Working temperature from -40~+100°C continuous and up to 120°C for short term.
- Low coefficient of friction in grease applications.
- No stick slip.
- Low maintenance.
- Lead free and compliant with RoHS and REACH.
- Wide application range that includes agriculture, construction and off-highway equipment.
- Available as cylindrical and thrust.

Physical and mechanical performance

Table 26

Characteristics		Symbol	Parameter	Unit
Physical properties	Linear expansion factor:			
	Parallel to surface	α_1	11	$1/10^6K$
	Normal to surface	α_2	29	$1/10^6K$
	Max working temperature	T_{max}	130	℃
	Min working temperature	T_{min}	-40	℃
Mechanical properties	Compressive strength	σ_C	380	N/mm^2
	Ultimate load			
	Max static load	$P_{sta.max}$	250	N/mm^2
	Max dynamic load	$P_{dyn.max}$	140	N/mm^2

Chemical properties

Table 27

Bushing series	5 % HCl solution	5 % HNO_3 solution	5 % H_2SO_4 solution	5 % ethylic acid solution	10 % ammonia water	5 % NaCl solution	Acetone
PSA	●	●	●	●	●●	●●	●●●

Table 28

Bushing series	Paraffin	Gasoline	Kerosene	Diesel	Water	Seawater
PSA	●●●	●●●	●●●	●●●	●●	●

● Not Recommended ●● Acceptable ●●● Satisfactory

Lubrication

Choice of lubricantion

PSA must be lubricated. Lubricant considerations include pV, sliding speed and the stability of the lubricant under operating conditions.

Table 29

Manufacturer	Brand	Base oil	Grade
Esso	Andok C	Mineral	••
	Andok 260	Mineral	••
	Cazar K	Mineral	•
Mobil	Mobilplex 47	Mineral	••
	Mobiltemp 1	Mineral	•••
Shell	Albida R2	Mineral	•••
	Axinus S2	Mineral	••
	Darina R2	Mineral	•••
BP	Energrease LS2	Mineral	•••
	Energrease LT2	Mineral	•••

• Not recommended •• Satisfactory ••• Recommended

Grease

Grease lubrication is preferred. The performance of different greases is shown in Table 29. When the working temperature exceeds 50 °C, anti-oxidant should be added to the grease.

Grease containing EP additives, or significant additions of graphite or MoS_2, are not recommended.

Oil

PSA is not suitable for use with hydrocarbon oil operating above 115 °C. At this temperature, oil oxidation may produce a low concentration of labile residues, acid or free radicals. These will cause depolymerisation of the PSA's acetal copolymer.

The PSA is also not recommended for recirculating oil systems or bath systems where sump temperatures of 70 °C or greater are possible.

Water

PSA cannot be used in water unless the load and speed meet specified conditions.

Water-oil mixed emulsion

PSA is applicable to 95:5 water-oil emulsion. It is recommended that oil or grease lubrication is used before emulsion.

Performance

Specific load p

Bushing

$$p = \frac{F}{D_i \cdot B}$$

Thrust washer

$$p = \frac{4F}{\pi \cdot (D_o^2 - D_i^2)}$$

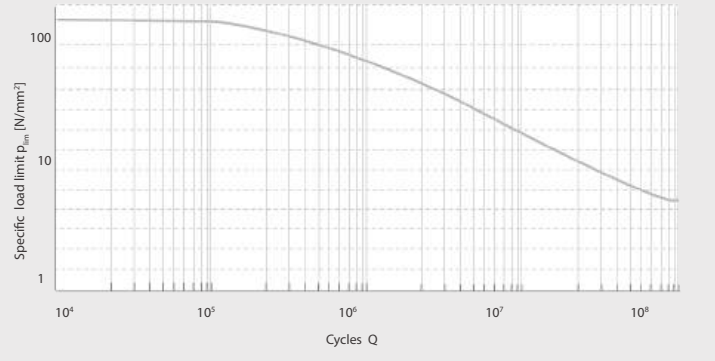
L_H	h	Service life
D_i	mm	Inner diameter of bushing or thrust washer
p	N/mm²	Specific load
B	mm	Width of bushing
F	N	Bushing load
D_O	mm	Outer diameter of bushing or thrust washer

Specific load limit p_{lim}

Table 30

Load	Working conditions	Lubricated	p_{lim} [N/mm²]
Constant stable load	Continuous rotating at low speed or swinging	Oil or grease	140
Constant stable load	Continuous rotating or swinging	Oil or grease	70
Steady load or dynamic load	Continuous rotating or swinging	Oil	45

Figure 39



Performance

Sliding speed v

Continuous rotating

Bushing

$$V = \frac{D_i \cdot \pi \cdot n}{60 \cdot 10^3}$$

Thrust washer

$$V = \frac{\frac{D_o + D_i}{2} \cdot \pi \cdot n}{60 \cdot 10^3}$$

Oscillating movement

Bushing

$$v = \frac{D_i \cdot \pi}{60 \cdot 10^3} \cdot \frac{4\varphi \cdot N_{OSZ}}{360}$$

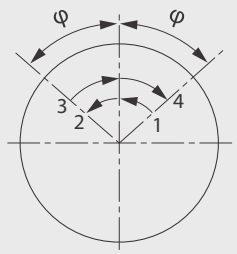
Thrust washer

$$v = \frac{\frac{D_o + D_i}{2} \cdot \pi \cdot n}{60 \cdot 10^3} \cdot \frac{4\varphi \cdot N_{OSZ}}{360}$$

v	m/s	Sliding speed
n	min^{-1}	Revolution
D_o	mm	Outer diameter of bushing or thrust washer
D_i	mm	Inner diameter of bushing or thrust washer
N_{osz}	min^{-1}	Oscillating frequency

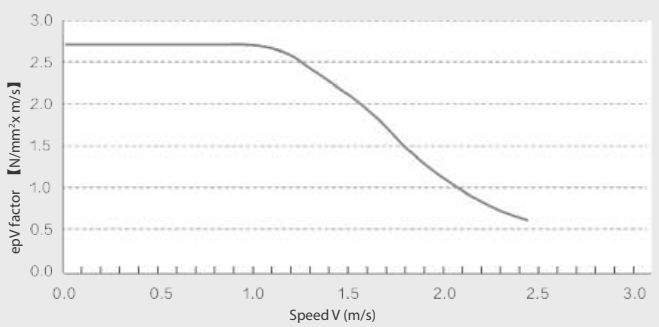
Oscillating angle φ

Figure 40



The allowable maximum pV factor epV for bushing with grease lubrication depends on the running speed, as shown in the Figure 41.

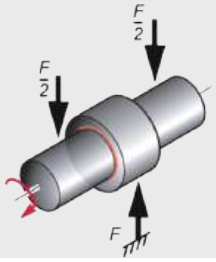
Figure 41



Application factor

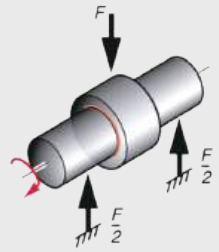
The load type and direction on the PSA bushing has influence on the performance and service life, bushing speed and load factor f_Q.
Type of load :

Figure 42



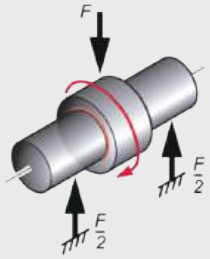
Steady load, vertically down-wards, bushing stationary, shaft rotating. Lubricant drains to loaded area.

Figure 43



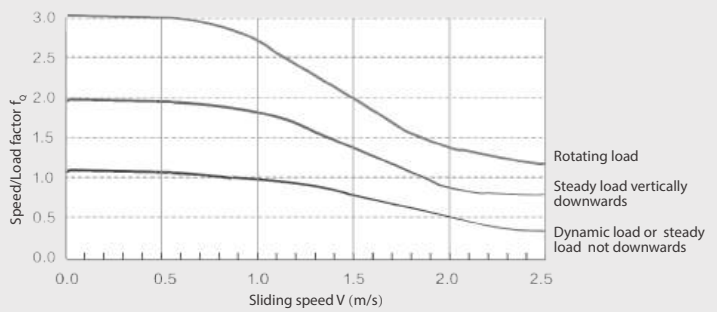
Steady load, vertically upwards, bushing stationary, shaft rotating. Lubricant drains away from loaded area.

Figure 44



Rotating load, shaft stationary, bushing rotating.

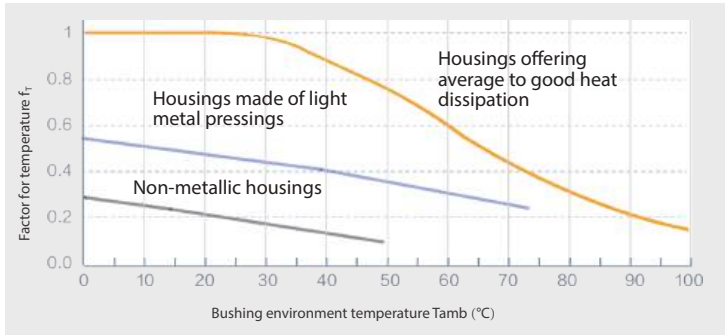
Figure 45



Performance

Temperature f_T

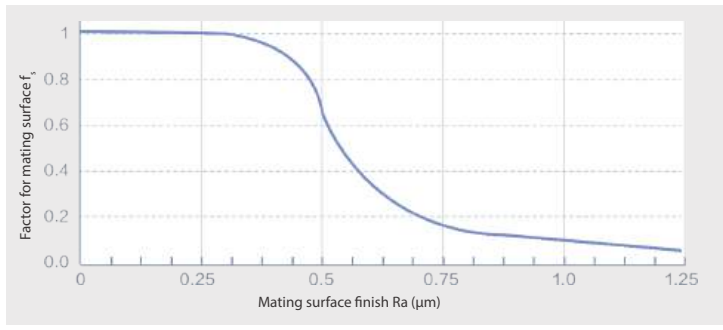
Figure 46



Mating surface f_S

The surface roughness influences the degree of wear during service. For optimal wear performance, the surface roughness is ground below RA 0.4. The surface roughness and grinding effect on the PSA service life f_s is illustrated in Fig 47.

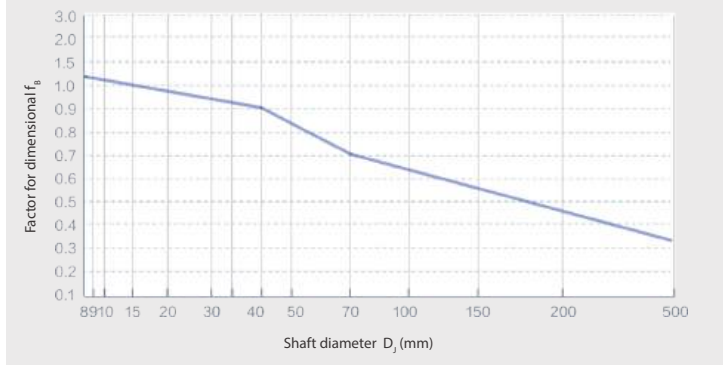
Figure 47



Bushing dimension f_B

The PSA bushing will produce heat during service due to friction. Heat will dissipate through the ground shaft and housing. The dissipation rate partially depends on the size of the sleeve. For example, under the same working conditions a larger bushing can realize faster heat dissipation than a smaller bushing. The dimensional factor is f_B:

Figure 48



Calculation of bushing service life

The bushing is overloaded when the calculated high load factor is negative, the diameter and length of bushing is enlarge.

high load f_E

$$f_E = \frac{p_{lim}}{p_{lim} - p}$$

f_E	-	Factor for high load
p_{lim}	N/mm²	Specific load limit
p	N/mm²	Specific load

Estimated specific pv factor epv

$$epv = \frac{f_E \cdot pv}{f_B}$$

epv	-	Estimated actual pV factor
v	m/s	Sliding speed
f_E	-	Factor for high load
f_B	-	Factor for bushing dimension

Estimated service life

When epv<1.0

$$L_H = \frac{3000}{epv} \cdot f_Q \cdot f_T \cdot f_S$$

When epv<1.0

$$L_H = \frac{3000}{(epv)^{2.4}} \cdot f_Q \cdot f_T \cdot f_S$$

L_H	h	service life
f_T	-	Factor for temperature
f_S	-	Factor for mating surface
f_Q	-	Factor for bushing speed/Load

Estimated re-lubricating time

$$L_{RG} = \frac{L_H}{2}$$

L_{RG}	h	Estimated re-lubricating time for bushing

Performance

Service life calculation

Table 31

Given data			
Detail load information	Constant stable load	Inner diameter D_i	40 mm
Force direction	Downward	Width B	30 mm
Shaft	Steel	Bushing load F	15000 N
	Ambient temperature	Rotary speed n	30 min^{-1}
	Good heat dissipation	Shaft roughness Ra	0.3μm

Table 32

Calculation constants and application factors		
Actual ultimate load P_{lim}	70 N/mm²	Table 30, Page 173
Bushing speed/load factor f_Q	1.8	Figure 45, Page 175
Mating surface factor f_s	0.98	Figure 47, Page 176
Dimensional factor of bushing f_B	0.98	Figure 48, Page 176
Temperature factor f_T	1	Figure 46, Page 176

Table 33

Calculation	Reference	Value
Specific load p [N/mm²]	Page 173	$p = \frac{F}{D_i \cdot B} = \frac{15000}{40 \cdot 30} = 12.5$
Sliding speed v [m/s]	Page 174	$v = \frac{D_i \cdot \pi \cdot n}{60 \cdot 10^3} = \frac{40 \cdot \pi \cdot 30}{60000} = 0.063$
High load factor f_E [-] (must be >0)	Page 177	$f_E = \frac{p_{lim}}{p_{lim} - p} = \frac{70}{70 - 12.5} = 1.22$
epv factor [-]	Page 177	$epv = \frac{f_E \cdot pv}{f_E} = \frac{1.22 \cdot 12.5 \cdot 0.063}{0.98} = 0.98$
Service life L_H [h] (if epV<1)	Page 177	$L_H = \frac{3000}{epv} \cdot f_Q \cdot f_T \cdot f_S = \frac{3000}{0.98} \cdot 1.8 \cdot 1.0 \cdot 0.98 = 5400$
Re-lubricating time L_{RG} [h]	Page 177	$L_{RG} = \frac{L_H}{2} = \frac{5400}{2} = 2700$

Note: The service life of bushing products depends on many factors. The calculated theoretical service life varies under different test conditions.

Please contact CCTY Bearing, if theoretical service life calculations are required. We will complete a theoretical calculation for the service life based on the working conditions.

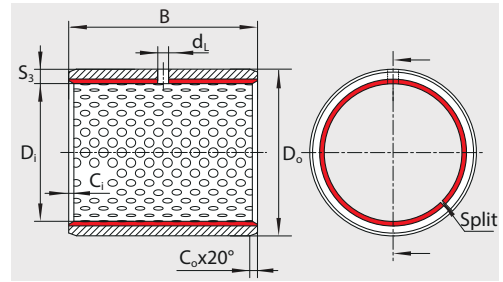
Cylindrical Bushings

Low-maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1	0.6 ± 0.4	0.1	0.5



PSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
PSA 0808	8	10	8.25	7.75	1	8.000	7.978	10.015	10.000	8.105	8.040	0.127	0.040	_
PSA 0810	8	10	10.25	9.75	1	8.000	7.978	10.015	10.000	8.105	8.040	0.127	0.040	3
PSA 0812	8	10	12.25	11.75	1	8.000	7.978	10.015	10.000	8.105	8.040	0.127	0.040	3
PSA 1010	10	12	10.25	9.75	1	10.000	9.978	12.018	12.000	10.108	10.040	0.130	0.040	4
PSA 1012	10	12	12.25	11.75	1	10.000	9.978	12.018	12.000	10.108	10.040	0.130	0.040	4
PSA 1015	10	12	15.5	14.5	1	10.000	9.978	12.018	12.000	10.108	10.040	0.130	0.040	4
PSA 1020	10	12	20.5	19.5	1	10.000	9.978	12.018	12.000	10.108	10.040	0.130	0.040	4
PSA 1210	12	14	10.25	9.75	1	12.000	11.973	14.018	14.000	12.108	12.040	0.135	0.040	4
PSA 1212	12	14	12.25	11.75	1	12.000	11.973	14.018	14.000	12.108	12.040	0.135	0.040	4
PSA 1215	12	14	15.5	14.5	1	12.000	11.973	14.018	14.000	12.108	12.040	0.135	0.040	4
PSA 1220	12	14	20.5	19.5	1	12.000	11.973	14.018	14.000	12.108	12.040	0.135	0.040	4
PSA 1225	12	14	25.5	24.5	1	12.000	11.973	14.018	14.000	12.108	12.040	0.135	0.040	4
PSA 1420	14	16	20.5	19.5	1	14.000	13.973	16.018	16.000	14.108	14.040	0.135	0.040	4
PSA 1425	14	16	25.5	24.5	1	14.000	13.973	16.018	16.000	14.108	14.040	0.135	0.040	4
PSA 1510	15	17	10.25	9.75	1	15.000	14.973	17.018	17.000	15.108	15.040	0.135	0.040	4
PSA 1512	15	17	12.25	11.75	1	15.000	14.973	17.018	17.000	15.108	15.040	0.135	0.040	4
PSA 1515	15	17	15.5	14.5	1	15.000	14.973	17.018	17.000	15.108	15.040	0.135	0.040	4
PSA 1525	15	17	25.5	24.5	1	15.000	14.973	17.018	17.000	15.108	15.040	0.135	0.040	4
PSA 1615	16	18	15.5	14.5	1	16.000	15.973	18.018	18.000	16.108	16.040	0.135	0.040	4
PSA 1620	16	18	20.5	19.5	1	16.000	15.973	18.018	18.000	16.108	16.040	0.135	0.040	4
PSA 1625	16	18	25.5	24.5	1	16.000	15.973	18.018	18.000	16.108	16.040	0.135	0.040	4

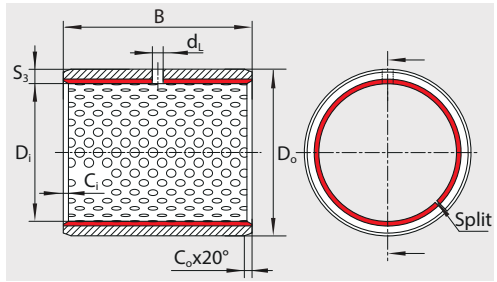
Cylindrical Bushings

Low-maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1	0.6 ± 0.4	0.1	0.5
1.5	0.6 ± 0.4	0.1	0.7
2	1.2 ± 0.4	0.1	0.7



PSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
PSA 1815	18	20	15.5	14.5	1	18.000	17.973	20.021	20.000	18.111	18.040	0.138	0.040	4
PSA 1820	18	20	20.5	19.5	1	18.000	17.973	20.021	20.000	18.111	18.040	0.138	0.040	4
PSA 1825	18	20	25.5	24.5	1	18.000	17.973	20.021	20.000	18.111	18.040	0.138	0.040	4
PSA 2010	20	23	10.25	9.75	1.5	20.000	19.967	23.021	23.000	20.131	20.050	0.164	0.050	4
PSA 2015	20	23	15.25	14.75	1.5	20.000	19.967	23.021	23.000	20.131	20.050	0.164	0.050	4
PSA 2020	20	23	20.5	19.5	1.5	20.000	19.967	23.021	23.000	20.131	20.050	0.164	0.050	4
PSA 2025	20	23	25.5	24.5	1.5	20.000	19.967	23.021	23.000	20.131	20.050	0.164	0.050	4
PSA 2030	20	23	30.5	29.5	1.5	20.000	19.967	23.021	23.000	20.131	20.050	0.164	0.050	4
PSA 2215	22	25	15.25	14.75	1.5	22.000	21.967	25.021	25.000	22.131	22.050	0.164	0.050	6
PSA 2220	22	25	20.5	19.5	1.5	22.000	21.967	25.021	25.000	22.131	22.050	0.164	0.050	6
PSA 2225	22	25	25.5	24.5	1.5	22.000	21.967	25.021	25.000	22.131	22.050	0.164	0.050	6
PSA 2230	22	25	30.5	29.5	1.5	22.000	21.967	25.021	25.000	22.131	22.050	0.164	0.050	6
PSA 2415	24	27	15.25	14.75	1.5	24.000	23.967	27.021	27.000	24.131	24.050	0.164	0.050	6
PSA 2420	24	27	20.5	19.5	1.5	24.000	23.967	27.021	27.000	24.131	24.050	0.164	0.050	6
PSA 2425	24	27	25.5	24.5	1.5	24.000	23.967	27.021	27.000	24.131	24.050	0.164	0.050	6
PSA 2430	24	27	30.5	29.5	1.5	24.000	23.967	27.021	27.000	24.131	24.050	0.164	0.050	6
PSA 2515	25	28	15.25	14.75	1.5	25.000	24.967	28.021	28.000	25.131	25.050	0.164	0.050	6
PSA 2520	25	28	20.5	19.5	1.5	25.000	24.967	28.021	28.000	25.131	25.050	0.164	0.050	6
PSA 2525	25	28	25.5	24.5	1.5	25.000	24.967	28.021	28.000	25.131	25.050	0.164	0.050	6
PSA 2530	25	28	30.5	29.5	1.5	25.000	24.967	28.021	28.000	25.131	25.050	0.164	0.050	6
PSA 2820	28	32	20.25	19.75	2	28.000	27.967	32.025	32.000	28.155	28.060	0.188	0.060	6
PSA 2825	28	32	25.25	24.75	2	28.000	27.967	32.025	32.000	28.155	28.060	0.188	0.060	6
PSA 2830	28	32	30.5	29.5	2	28.000	27.967	32..025	32.000	28.155	28.050	0.188	0.060	6

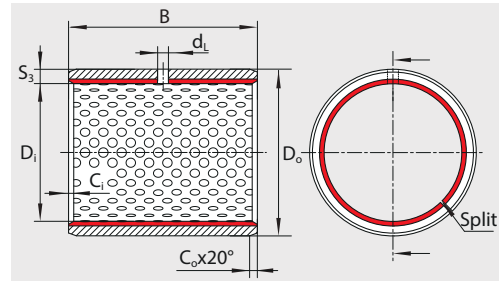
Cylindrical Bushings

Low-maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2	1.2 ± 0.4	0.1	0.7
2.5	1.8 ± 0.6	0.2	1



PSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
PSA 3020	30	34	20.25	19.75	2	30.000	29.967	34.025	34.000	30.155	30.060	0.188	0.060	6
PSA 3030	30	34	30.5	29.5	2	30.000	29.967	34.025	34.000	30.155	30.060	0.188	0.060	6
PSA 3040	30	34	40.5	39.5	2	30.000	29.967	34.025	34.000	30.155	30.060	0.188	0.060	6
PSA 3220	32	36	20.25	19.75	2	32.000	31.961	36.025	36.000	32.155	32.060	0.194	0.060	6
PSA 3230	32	36	30.5	29.5	2	32.000	31.961	36.025	36.000	32.155	32.060	0.194	0.060	6
PSA 3235	32	36	35.5	34.5	2	32.000	31.961	36.025	36.000	32.155	32.060	0.194	0.060	6
PSA 3240	32	36	40.5	39.5	2	32.000	31.961	36.025	36.000	32.155	32.060	0.194	0.060	6
PSA 3520	35	39	20.25	19.75	2	35.000	34.961	39.025	39.000	35.155	35.060	0.194	0.060	6
PSA 3530	35	39	30.5	29.5	2	35.000	34.961	39.025	39.000	35.155	35.060	0.194	0.060	6
PSA 3535	35	39	35.5	34.5	2	35.000	34.961	39.025	39.000	35.155	35.060	0.194	0.060	6
PSA 3540	35	39	40.5	39.5	2	35.000	34.961	39.025	39.000	35.155	35.060	0.194	0.060	6
PSA 3635	36	40	35.5	34.5	2	36.000	35.961	40.025	40.000	36.155	36.060	0.194	0.060	6
PSA 3720	37	41	20.25	19.75	2	37.000	36.961	41.025	41.000	37.155	37.060	0.194	0.060	6
PSA 4020	40	44	20.25	19.75	2	40.000	39.961	44.025	44.000	40.155	40.060	0.194	0.060	8
PSA 4030	40	44	30.5	29.5	2	40.000	39.961	44.025	44.000	40.155	40.060	0.194	0.060	8
PSA 4040	40	44	40.5	39.5	2	40.000	39.961	44.025	44.000	40.155	40.060	0.194	0.060	8
PSA 4050	40	44	50.5	49.5	2	40.000	39.961	44.025	44.000	40.155	40.060	0.194	0.060	8
PSA 4520	45	50	20.25	19.75	2.5	45.000	44.961	50.025	50.000	45.195	45.080	0.234	0.080	8
PSA 4530	45	50	30.25	29.75	2.5	45.000	44.961	50.025	50.000	45.195	45.080	0.234	0.080	8
PSA 4540	45	50	40.5	39.5	2.5	45.000	44.961	50.025	50.000	45.195	45.080	0.234	0.080	8
PSA 4545	45	50	45.5	44.5	2.5	45.000	44.961	50.025	50.000	45.195	45.080	0.234	0.080	8
PSA 4550	45	50	50.5	49.5	2.5	45.000	44.961	50.025	50.000	45.195	45.080	0.234	0.080	8

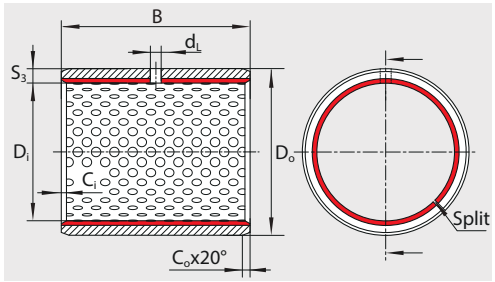
Cylindrical Bushings

Low-maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8± 0.6	0.2	1



PSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
PSA 5040	50	55	40.5	39.5	2.5	50.000	49.961	55.030	55.000	50.200	50.080	0.239	0.080	8
PSA 5050	50	55	50.5	49.5	2.5	50.000	49.961	55.030	55.000	50.200	50.080	0.239	0.080	8
PSA 5060	50	55	60.5	59.5	2.5	50.000	49.961	55.030	55.000	50.200	50.080	0.239	0.080	8
PSA 5520	55	60	20.25	19.75	2.5	55.000	54.954	60.030	60.000	55.200	55.080	0.246	0.080	8
PSA 5525	55	60	25.25	24.75	2.5	55.000	54.954	60.030	60.000	55.200	55.080	0.246	0.080	8
PSA 5530	55	60	30.25	29.75	2.5	55.000	54.954	60.030	60.000	55.200	55.080	0.246	0.080	8
PSA 5540	55	60	40.5	39.5	2.5	55.000	54.954	60.030	60.000	55.200	55.080	0.246	0.080	8
PSA 5550	55	60	50.5	49.5	2.5	55.000	54.954	60.030	60.000	55.200	55.080	0.246	0.080	8
PSA 5560	55	60	60.5	59.5	2.5	55.000	54.954	60.030	60.000	55.200	55.080	0.246	0.080	8
PSA 6030	60	65	30.25	29.75	2.5	60.000	59.954	65.030	65.000	60.200	60.080	0.246	0.080	8
PSA 6040	60	65	40.5	39.5	2.5	60.000	59.954	65.030	65.000	60.200	60.080	0.246	0.080	8
PSA 6060	60	65	60.5	59.5	2.5	60.000	59.954	65.030	65.000	60.200	60.080	0.246	0.080	8
PSA 6070	60	65	70.75	69.25	2.5	60.000	59.954	65.030	65.000	60.200	60.080	0.246	0.080	8
PSA 6540	65	70	40.5	39.5	2.5	65.000	64.954	70.030	70.000	65.200	65.080	0.246	0.080	8
PSA 6550	65	70	50.5	49.5	2.5	65.000	64.954	70.030	70.000	65.200	65.080	0.246	0.080	8
PSA 6560	65	70	60.5	59.5	2.5	65.000	64.954	70.030	70.000	65.200	65.080	0.246	0.080	8
PSA 6570	65	70	70.75	69.25	2.5	65.000	64.954	70.030	70.000	65.200	65.080	0.246	0.080	8
PSA 7040	70	75	40.5	39.5	2.5	70.000	69.954	75.030	75.000	70.200	70.080	0.246	0.080	8
PSA 7050	70	75	50.5	49.5	2.5	70.000	69.954	75.030	75.000	70.200	70.080	0.246	0.080	8
PSA 7065	70	75	65.5	64.5	2.5	70.000	69.954	75.030	75.000	70.200	70.080	0.246	0.080	8
PSA 7070	70	75	70.75	69.25	2.5	70.000	69.954	75.030	75.000	70.200	70.080	0.246	0.080	8
PSA 7080	70	75	80.75	79.25	2.5	70.000	69.954	75.030	75.000	70.200	70.080	0.246	0.080	8

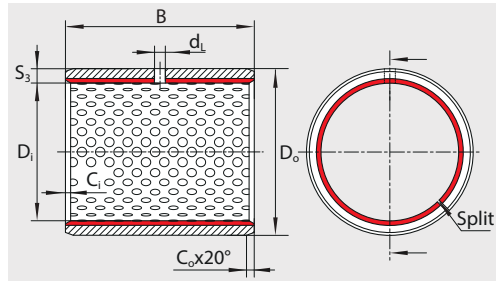
Cylindrical Bushings

Low-maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8± 0.6	0.2	1



PSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
PSA 7540	75	80	40.5	39.5	2.5	75.000	74.954	80.030	80.000	75.200	75.080	0.246	0.080	9.5
PSA 7560	75	80	60.5	59.5	2.5	75.000	74.954	80.030	80.000	75.200	75.080	0.246	0.080	9.5
PSA 7580	75	80	80.75	79.25	2.5	75.000	74.954	80.030	80.000	75.200	75.080	0.246	0.080	9.5
PSA 8060	80	85	60.5	59.5	2.5	80.000	79.954	85.035	85.000	80.205	80.080	0.251	0.080	9.5
PSA 8080	80	85	80.75	79.25	2.5	80.000	79.954	85.035	85.000	80.205	80.080	0.251	0.080	9.5
PSA 80100	80	85	100.75	99.25	2.5	80.000	79.954	85.035	85.000	80.205	80.080	0.251	0.080	9.5
PSA 8530	85	90	30.25	29.75	2.5	85.000	84.946	90.035	90.000	85.205	85.080	0.259	0.080	9.5
PSA 8540	85	90	40.5	39.5	2.5	85.000	84.946	90.035	90.000	85.205	85.080	0.259	0.080	9.5
PSA 8560	85	90	60.5	59.5	2.5	85.000	84.946	90.035	90.000	85.205	85.080	0.259	0.080	9.5
PSA 8580	85	90	80.75	79.25	2.5	85.000	84.946	90.035	90.000	85.205	85.080	0.259	0.080	9.5
PSA 85100	85	90	100.75	99.25	2.5	85.000	84.946	90.035	90.000	85.205	85.080	0.259	0.080	9.5
PSA 9040	90	95	40.5	39.5	2.5	90.000	89.946	95.035	95.000	90.205	90.080	0.259	0.080	9.5
PSA 9060	90	95	60.5	59.5	2.5	90.000	89.946	95.035	95.000	90.205	90.080	0.259	0.080	9.5
PSA 9080	90	95	80.75	79.25	2.5	90.000	89.946	95.035	95.000	90.205	90.080	0.259	0.080	9.5
PSA 9090	90	95	90.75	89.25	2.5	90.000	89.946	95.035	95.000	90.205	90.080	0.259	0.080	9.5
PSA 90100	90	95	100.75	99.25	2.5	90.000	89.946	95.035	95.000	90.205	90.080	0.259	0.080	9.5
PSA 9560	95	100	60.5	59.5	2.5	95.000	94.946	100.035	100.000	95.205	95.080	0.259	0.080	9.5
PSA 95100	95	100	100.75	99.25	2.5	95.000	94.946	100.035	100.000	95.205	95.080	0.259	0.080	9.5
PSA 10050	100	105	50.5	49.5	2.5	100.000	99.946	105.035	105.000	100.205	100.080	0.259	0.080	9.5
PSA 10060	100	105	60.5	59.5	2.5	100.000	99.946	105.035	105.000	100.205	100.080	0.259	0.080	9.5
PSA 10080	100	105	80.75	79.25	2.5	100.000	99.946	105.035	105.000	100.205	100.080	0.259	0.080	9.5
PSA 10095	100	105	95.75	94.25	2.5	100.000	99.946	105.035	105.000	100.205	100.080	0.259	0.080	9.5
PSA 100115	100	105	115.75	114.25	2.5	100.000	99.946	105.035	105.000	100.205	100.080	0.259	0.080	9.5

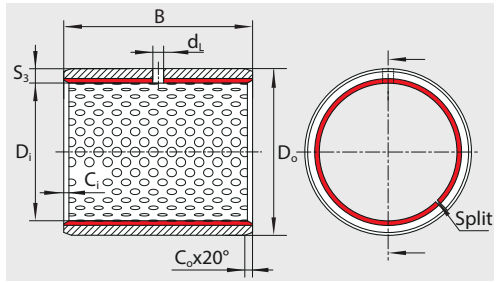
Cylindrical Bushings

Low-maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8± 0.6	0.2	1



PSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
PSA 10560	105	110	60.5	59.5	2.5	105.000	104.946	110.035	110.000	105.205	105.080	0.259	0.080	9.5
PSA 105110	105	110	110.75	109.25	2.5	105.000	104.946	110.035	110.000	105.205	105.080	0.259	0.080	9.5
PSA 105115	105	110	115.75	114.25	2.5	105.000	104.946	110.035	110.000	105.205	105.080	0.259	0.080	9.5
PSA 11060	110	115	60.5	59.5	2.5	110.000	109.946	115.035	115.000	110.205	105.080	0.259	0.080	9.5
PSA 110110	110	115	110.75	109.25	2.5	110.000	109.946	115.035	115.000	110.205	105.080	0.259	0.080	9.5
PSA 110115	110	115	115.75	114.25	2.5	110.000	109.946	115.035	115.000	110.205	105.080	0.259	0.080	9.5
PSA 11550	115	120	50.5	49.5	2.5	115.000	114.946	120.035	120.000	115.205	115.080	0.259	0.080	9.5
PSA 11570	115	120	70.5	69.5	2.5	115.000	114.946	120.035	120.000	115.205	115.080	0.259	0.080	9.5
PSA 12060	120	125	60.5	59.5	2.5	120.000	119.946	125.040	125.000	120.210	120.080	0.264	0.080	9.5
PSA 120100	120	125	100.75	99.25	2.5	120.000	119.946	125.040	125.000	120.210	120.080	0.264	0.080	9.5
PSA 120110	120	125	110.75	109.25	2.5	120.000	119.946	125.040	125.000	120.210	120.080	0.264	0.080	9.5
PSA 12560	125	130	60.5	59.5	2.5	125.000	124.937	130.040	130.000	125.210	125.080	0.273	0.080	9.5
PSA 125100	125	130	100.75	99.25	2.5	125.000	124.937	130.040	130.000	125.210	125.080	0.273	0.080	9.5
PSA 125110	125	130	110.75	109.25	2.5	125.000	124.937	130.040	130.000	125.210	125.080	0.273	0.080	9.5
PSA 13050	130	135	50.5	49.5	2.5	130.000	129.937	135.040	135.000	130.210	130.080	0.273	0.080	9.5
PSA 13060	130	135	60.5	59.5	2.5	130.000	129.937	135.040	135.000	130.210	130.080	0.273	0.080	9.5
PSA 13080	130	135	80.75	79.25	2.5	130.000	129.937	135.040	135.000	130.210	130.080	0.273	0.080	9.5
PSA 130100	130	135	100.75	99.25	2.5	130.000	129.937	135.040	135.000	130.210	130.080	0.273	0.080	9.5
PSA 13560	135	140	60.5	59.5	2.5	135.000	134.937	140.040	140.000	135.210	135.080	0.273	0.080	9.5
PSA 13580	135	140	80.5	79.5	2.5	135.000	134.937	140.040	140.000	135.210	135.080	0.273	0.080	9.5
PSA 14050	140	145	50.5	49.5	2.5	140.000	139.937	145.040	145.000	140.210	140.080	0.273	0.080	9.5
PSA 14060	140	145	60.5	59.5	2.5	140.000	139.937	145.040	145.000	140.210	140.080	0.273	0.080	9.5
PSA 14080	140	145	80.5	79.5	2.5	140.000	139.937	145.040	145.000	140.210	140.080	0.273	0.080	9.5
PSA 140100	140	145	100.75	99.25	2.5	140.000	139.937	145.040	145.000	140.210	140.080	0.273	0.080	9.5

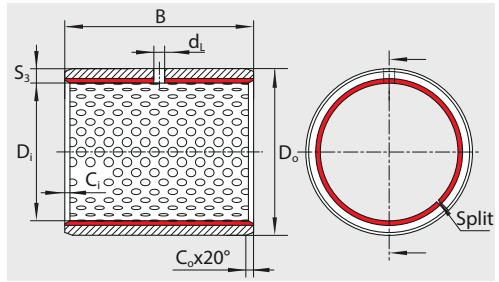
Cylindrical Bushings

Low-maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8± 0.6	0.2	1



PSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
PSA 15050	150	155	50.5	49.5	2.5	150.000	149.937	155.040	155.000	150.210	150.080	0.273	0.080	9.5
PSA 15060	150	155	60.5	59.5	2.5	150.000	149.937	155.040	155.000	150.210	150.080	0.273	0.080	9.5
PSA 15080	150	155	80.5	79.5	2.5	150.000	149.937	155.040	155.000	150.210	150.080	0.273	0.080	9.5
PSA 150100	150	155	100.75	99.25	2.5	150.000	149.937	155.040	155.000	150.210	150.080	0.273	0.080	9.5
PSA 16050	160	165	50.5	49.5	2.5	160.000	159.937	165.040	165.000	160.210	160.080	0.273	0.080	11
PSA 16060	160	165	60.5	59.5	2.5	160.000	159.937	165.040	165.000	160.210	160.080	0.273	0.080	11
PSA 16080	160	165	80.5	79.5	2.5	160.000	159.937	165.040	165.000	160.210	160.080	0.273	0.080	11
PSA 160100	160	165	100.75	99.25	2.5	160.000	159.937	165.040	165.000	160.210	160.080	0.273	0.080	11
PSA 17050	170	175	50.5	49.5	2.5	170.000	169.937	175.040	175.000	170.210	170.080	0.273	0.080	11
PSA 17060	170	175	60.5	59.5	2.5	170.000	169.937	175.040	175.000	170.210	170.080	0.273	0.080	11
PSA 17080	170	175	80.75	79.25	2.5	170.000	169.937	175.040	175.000	170.210	170.080	0.273	0.080	11
PSA 170100	170	175	100.75	99.25	2.5	170.000	169.937	175.040	175.000	170.210	170.080	0.273	0.080	11
PSA 18050	180	185	50.5	49.5	2.5	180.000	179.937	185.046	185.000	180.216	180.080	0.279	0.080	11
PSA 18060	180	185	60.5	59.5	2.5	180.000	179.937	185.046	185.000	180.216	180.080	0.279	0.080	11
PSA 18080	180	185	80.75	79.25	2.5	180.000	179.937	185.046	185.000	180.216	180.080	0.279	0.080	11
PSA 180100	180	185	100.75	99.25	2.5	180.000	179.937	185.046	185.000	180.216	180.080	0.279	0.080	11
PSA 19050	190	195	50.5	49.5	2.5	190.000	189.928	195.046	195.000	190.216	190.080	0.288	0.080	11
PSA 19060	190	195	60.5	59.5	2.5	190.000	189.928	195.046	195.000	190.216	190.080	0.288	0.080	11
PSA 19080	190	195	80.75	79.25	2.5	190.000	189.928	195.046	195.000	190.216	190.080	0.288	0.080	11
PSA 190100	190	195	100.75	99.25	2.5	190.000	189.928	195.046	195.000	190.216	190.080	0.288	0.080	11
PSA 190120	190	195	120.75	119.25	2.5	190.000	189.928	195.046	195.000	190.216	190.080	0.288	0.080	11

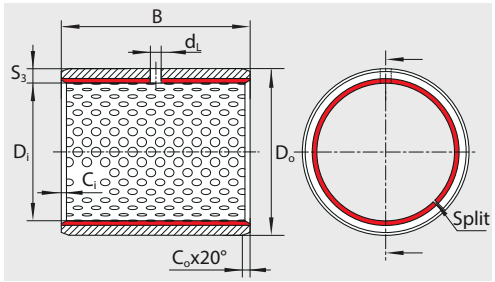
Cylindrical Bushings

Low-maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8± 0.6	0.2	1



PSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
PSA 20050	200	205	50.5	49.5	2.5	200.000	199.928	205.046	205.000	200.216	200.080	0.288	0.080	12
PSA 20060	200	205	60.5	59.5	2.5	200.000	199.928	205.046	205.000	200.216	200.080	0.288	0.080	12
PSA 20080	200	205	80.75	79.25	2.5	200.000	199.928	205.046	205.000	200.216	200.080	0.288	0.080	12
PSA 200100	200	205	100.75	99.25	2.5	200.000	199.928	205.046	205.000	200.216	200.080	0.288	0.080	12
PSA 200120	200	205	120.75	119.25	2.5	200.000	199.928	205.046	205.000	200.216	200.080	0.288	0.080	12
PSA 22060	220	225	60.5	59.5	2.5	220.000	219.928	225.046	225.000	220.216	220.080	0.288	0.080	12
PSA 22080	220	225	80.75	79.25	2.5	220.000	219.928	225.046	225.000	220.216	220.080	0.288	0.080	12
PSA 220100	220	225	100.75	99.25	2.5	220.000	219.928	225.046	225.000	220.216	220.080	0.288	0.080	12
PSA 220120	220	225	120.75	119.25	2.5	220.000	219.928	225.046	225.000	220.216	220.080	0.288	0.080	12
PSA 24050	240	245	50.5	49.5	2.5	240.000	239.928	245.046	245.000	240.216	240.080	0.288	0.080	12
PSA 24060	240	245	60.5	59.5	2.5	240.000	239.928	245.046	245.000	240.216	240.080	0.288	0.080	12
PSA 24080	240	245	80.75	79.25	2.5	240.000	239.928	245.046	245.000	240.216	240.080	0.288	0.080	12
PSA 240100	240	245	100.75	99.25	2.5	240.000	239.928	245.046	245.000	240.216	240.080	0.288	0.080	12
PSA 240120	240	245	120.75	119.25	2.5	240.000	239.928	245.046	245.000	240.216	240.080	0.288	0.080	12
PSA 25050	250	255	50.5	49.5	2.5	250.000	249.928	255.052	255.000	250.222	250.080	0.294	0.080	12
PSA 25060	250	255	60.5	59.5	2.5	250.000	249.928	255.052	255.000	250.222	250.080	0.294	0.080	12
PSA 25080	250	255	80.75	79.25	2.5	250.000	249.928	255.052	255.000	250.222	250.080	0.294	0.080	12
PSA 250100	250	255	100.75	99.25	2.5	250.000	249.928	255.052	255.000	250.222	250.080	0.294	0.080	12
PSA 250120	250	255	120.75	119.25	2.5	250.000	249.928	255.052	255.000	250.222	250.080	0.294	0.080	12
PSA 26050	260	265	50.5	49.5	2.5	260.000	259.919	265.052	265.000	260.222	260.080	0.303	0.080	12
PSA 26060	260	265	60.5	59.5	2.5	260.000	259.919	265.052	265.000	260.222	260.080	0.303	0.080	12
PSA 26080	260	265	80.75	79.25	2.5	260.000	259.919	265.052	265.000	260.222	260.080	0.303	0.080	12
PSA 260100	260	265	100.75	99.25	2.5	260.000	259.919	265.052	265.000	260.222	260.080	0.303	0.080	12
PSA 260120	260	265	120.75	119.25	2.5	260.000	259.919	265.052	265.000	260.222	260.080	0.303	0.080	12

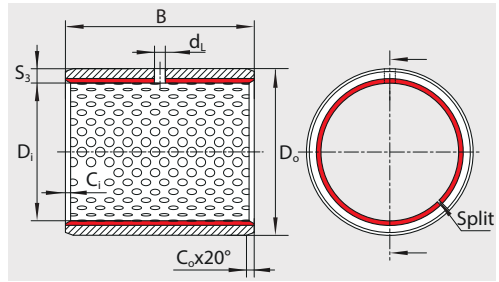
Cylindrical Bushings

Maintenance-free

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8± 0.6	0.2	1



PSA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
PSA 28050	280	285	50.5	49.5	2.5	280.000	279.919	285.052	285.000	280.222	280.080	0.303	0.080	12
PSA 28060	280	285	60.5	59.5	2.5	280.000	279.919	285.052	285.000	280.222	280.080	0.303	0.080	12
PSA 28080	280	285	80.5	79.5	2.5	280.000	279.919	285.052	285.000	280.222	280.080	0.303	0.080	12
PSA 280100	280	285	100.75	99.25	2.5	280.000	279.919	285.052	285.000	280.222	280.080	0.303	0.080	12
PSA 280120	280	285	50.5	49.5	2.5	280.000	279.919	285.052	285.000	280.222	280.080	0.303	0.080	12
PSA 30050	300	305	60.5	59.5	2.5	300.000	299.919	305.052	305.000	300.222	300.080	0.303	0.080	12
PSA 30060	300	305	80.5	79.5	2.5	300.000	299.919	305.052	305.000	300.222	300.080	0.303	0.080	12
PSA 30080	300	305	100.75	99.25	2.5	300.000	299.919	305.052	305.000	300.222	300.080	0.303	0.080	12
PSA 300100	300	305	50.5	49.5	2.5	300.000	299.919	305.052	305.000	300.222	300.080	0.303	0.080	12
PSA 300120	300	305	60.5	59.5	2.5	300.000	299.919	305.052	305.000	300.222	300.080	0.303	0.080	12

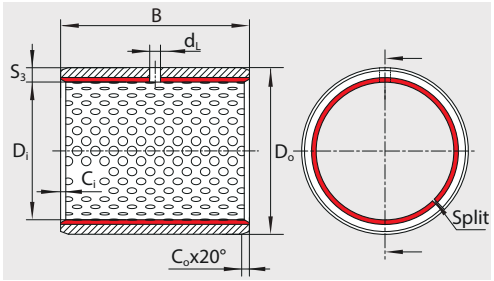
Cylindrical Bushings

Low-maintenance

Inch sizes

Chamfer specification

S_3	C_o	C_i (mm)	
(inch/mm)	(mm)	min.	max.
1/16 (1.59)	0.6 ± 0.4	0.1	0.7
3/32 (2.38)	1.8 ± 0.6	0.2	1



PSAE

Dimension table · Unit: inch

Product Number	D_i	D_o	B	S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			-0.02	max.	max.	min.	max.	min.	max.	min.	max.	min.	
PSAE 0806	1/2	5/8	3/8	1/16	0.5	0.499	0.6352	0.6345	0.5038	0.5007	0.0048	0.0007	5/32
PSAE 0808	1/2	5/8	1/2	1/16	0.5	0.499	0.6352	0.6345	0.5038	0.5007	0.0048	0.0007	5/32
PSAE 1010	5/8	3/4	5/8	1/16	0.625	0.624	0.7604	0.7596	0.629	0.6258	0.005	0.0008	5/32
PSAE 1012	5/8	3/4	3/4	1/16	0.625	0.624	0.7604	0.7596	0.629	0.6258	0.005	0.0008	5/32
PSAE 1212	3/4	7/8	3/4	1/16	0.75	0.7488	0.8854	0.8846	0.754	0.7508	0.0052	0.0008	5/32
PSAE 1216	3/4	7/8	1	1/16	0.75	0.7488	0.8854	0.8846	0.754	0.7508	0.0052	0.0008	5/32
PSAE 1412	7/8	1	3/4	1/16	0.875	0.8738	1.0105	1.0097	0.8791	0.8759	0.0053	0.0009	5/32
PSAE 1416	7/8	1	1	1/16	0.875	0.8738	1.0105	1.0097	0.8791	0.8759	0.0053	0.0009	5/32
PSAE 1612	1	1 1/8	3/4	1/16	1	0.9988	1.1356	1.1348	1.0042	1.001	0.0054	0.001	1/4
PSAE 1616	1	1 1/8	1	1/16	1	0.9988	1.1356	1.1348	1.0042	1.001	0.0054	0.001	1/4
PSAE 1812	1 1/8	1 1/4	3/4	1/16	1.125	1.1238	1.2606	1.2598	1.1292	1.126	0.0054	0.001	1/4
PSAE 1816	1 1/8	1 1/4	1	1/16	1.125	1.1238	1.2606	1.2598	1.1292	1.126	0.0054	0.001	1/4
PSAE 2012	1 1/4	1 7/16	3/4	3/32	1.25	1.2484	1.417	1.416	1.255	1.2512	0.0066	0.0012	1/4
PSAE 2016	1 1/4	1 7/16	1	3/32	1.25	1.2484	1.417	1.416	1.255	1.2512	0.0066	0.0012	1/4
PSAE 2216	1 3/8	1 9/16	1	3/32	1.375	1.3734	1.542	1.541	1.38	1.3762	0.0066	0.0012	1/4
PSAE 2224	1 3/8	1 9/16	1 1/2	3/32	1.375	1.3734	1.542	1.541	1.38	1.3762	0.0066	0.0012	1/4
PSAE 2416	1 1/2	1 11/16	1	3/32	1.5	1.4984	1.667	1.666	1.505	1.5012	0.0066	0.0012	5/16
PSAE 2424	1 1/2	1 11/16	1 1/2	3/32	1.5	1.4984	1.667	1.666	1.505	1.5012	0.0066	0.0012	5/16
PSAE 2432	1 1/2	1 11/16	2	3/32	1.5	1.4984	1.667	1.666	1.505	1.5012	0.0066	0.0012	5/16
PSAE 2616	1 5/8	1 13/16	1	3/32	1.625	1.6234	1.792	1.791	1.63	1.6262	0.0066	0.0012	5/16
PSAE 2624	1 5/8	1 13/16	1 1/2	3/32	1.625	1.6234	1.792	1.791	1.63	1.6262	0.0066	0.0012	5/16
PSAE 2632	1 5/8	1 13/16	2	3/32	1.625	1.6234	1.792	1.791	1.63	1.6262	0.0066	0.0012	5/16

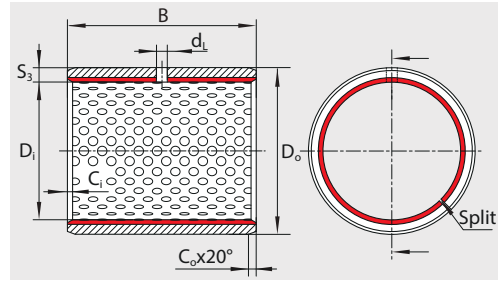
Cylindrical Bushings

Low-maintenance

Inch sizes

Chamfer specification

S_3	C_o	C_i (mm)	
(inch/mm)	(mm)	min.	max.
1/16 (1.59)	0.6 ± 0.4	0.1	0.7
3/32 (2.38)	1.8 ± 0.6	0.2	1



PSAE

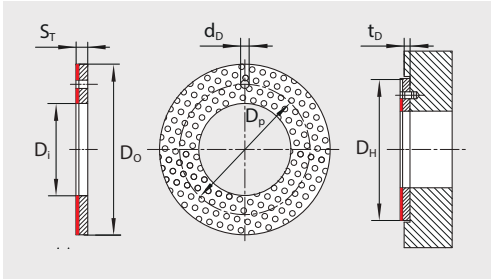
Dimension table · Unit: inch

Product Number	D_i	D_o	B	S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			-0.02	max.	max.	min.	max.	min.	max.	min.	max.	min.	
PSAE 2816	1 3/4	1 15/16	1	3/32	1.75	1.7484	1.9381	1.9371	1.7577	1.7515	0.0093	0.0015	5/16
PSAE 2824	1 3/4	1 15/16	1 1/2	3/32	1.75	1.7484	1.9381	1.9371	1.7577	1.7515	0.0093	0.0015	5/16
PSAE 2832	1 3/4	1 15/16	2	3/32	1.75	1.7484	1.9381	1.9371	1.7577	1.7515	0.0093	0.0015	5/16
PSAE 3016	1 7/8	2 1/16	1	3/32	1.875	1.8734	2.0633	2.0621	1.8829	1.8765	0.0095	0.0015	5/16
PSAE 3024	1 7/8	2 1/16	1 1/2	3/32	1.875	1.8734	2.0633	2.0621	1.8829	1.8765	0.0095	0.0015	5/16
PSAE 3032	1 7/8	2 1/16	2	3/32	1.875	1.8734	2.0633	2.0621	1.8829	1.8765	0.0095	0.0015	5/16
PSAE 3036	1 7/8	2 1/16	2 1/4	3/32	1.875	1.8734	2.0633	2.0621	1.8829	1.8765	0.0095	0.0015	5/16
PSAE 3216	2	2 3/16	1	3/32	2	1.9982	2.1883	2.1871	2.0079	2.0015	0.0097	0.0015	5/16
PSAE 3224	2	2 3/16	1 1/2	3/32	2	1.9982	2.1883	2.1871	2.0079	2.0015	0.0097	0.0015	5/16
PSAE 3232	2	2 3/16	2	3/32	2	1.9982	2.1883	2.1871	2.0079	2.0015	0.0097	0.0015	5/16
PSAE 4024	2 1/2	2 11/16	1 1/2	3/32	2.5	2.4982	2.6883	2.6871	2.5079	2.5015	0.0097	0.0015	5/16
PSAE 4032	2 1/2	2 11/16	2	3/32	2.5	2.4982	2.6883	2.6871	2.5079	2.5015	0.0097	0.0015	5/16
PSAE 4040	2 1/2	2 11/16	2 1/2	3/32	2.5	2.4982	2.6883	2.6871	2.5079	2.5015	0.0097	0.0015	5/16
PSAE 4824	3	3 3/16	1 1/2	3/32	3	2.9982	3.1889	3.1875	3.0085	3.0019	0.0103	0.0019	3/8
PSAE 4832	3	3 3/16	2	3/32	3	2.9982	3.1889	3.1875	3.0085	3.0019	0.0103	0.0019	3/8
PSAE 4840	3	3 3/16	2 1/2	3/32	3	2.9982	3.1889	3.1875	3.0085	3.0019	0.0103	0.0019	3/8

Thrust Washers

Low-maintenance

Metric sizes



PSA .. SF

Dimension table · Unit: mm

Product Number	D_i	D_o	S_T	Hole Diameter d_D		Hole PCD D_p		Housing Diameter D_H		Recess depth t_D	
	+0.25	-0.25	-0.05	max.	min.	max.	min.	max.	min.	max.	min.
PSA 10 SF	10	20	1.5	—	—	—	—	20.12	20	1.2	0.95
PSA 12 SF	12	24	1.5	1.875	1.625	18.12	17.88	24.12	24	1.2	0.95
PSA 14 SF	14	26	1.5	2.375	2.125	20.12	19.88	26.12	26	1.2	0.95
PSA 16 SF	16	30	1.5	2.375	2.125	22.12	21.88	30.12	30	1.2	0.95
PSA 18 SF	18	32	1.5	2.375	2.125	25.12	24.88	32.12	32	1.2	0.95
PSA 20 SF	20	36	1.5	3.375	3.125	28.12	27.88	36.12	36	1.2	0.95
PSA 22 SF	22	38	1.5	3.375	3.125	30.12	29.88	38.12	38	1.2	0.95
PSA 24 SF	24	42	1.5	3.375	3.125	33.12	32.88	42.12	42	1.2	0.95
PSA 26 SF	26	44	1.5	3.375	3.125	35.12	34.88	44.12	44	1.2	0.95
PSA 28 SF	28	48	1.5	4.375	4.125	38.12	37.88	48.12	48	1.2	0.95
PSA 32 SF	32	54	1.5	4.375	4.125	43.12	42.88	54.12	54	1.2	0.95
PSA 38 SF	38	62	1.5	4.375	4.125	50.12	49.88	62.12	62	1.2	0.95
PSA 42 SF	42	66	1.5	4.375	4.125	54.12	53.88	66.12	66	1.2	0.95
PSA 48 SF	48	74	2	4.375	4.125	61.12	60.88	74.12	74	1.7	1.45
PSA 52 SF	52	78	2	4.375	4.125	65.12	64.88	78.12	78	1.7	1.45
PSA 62 SF	62	90	2	4.375	4.125	76.12	75.88	90.12	90	1.7	1.45

Metallic and bimetallic plain bushings Requiring maintenance

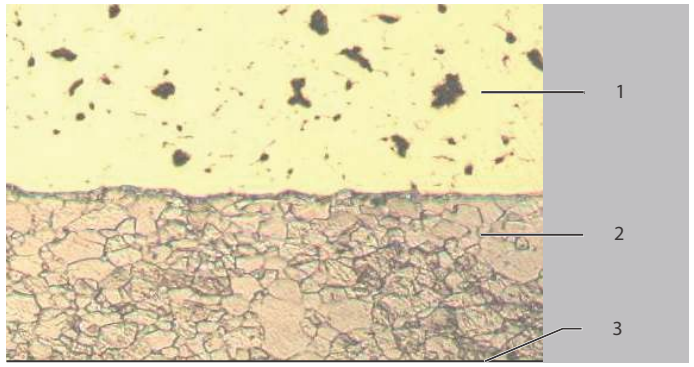
Bushings

Material

MBA bushing material

Structure

Figure 49



1. CuPb10Sn10 bronze layer, 0.2-0.8 mm thick, hardness 80-130 HB

2. Steel backing: 0.5-3.0 mm

3. Copper plating or phosphate coating 0.001-0.008 mm

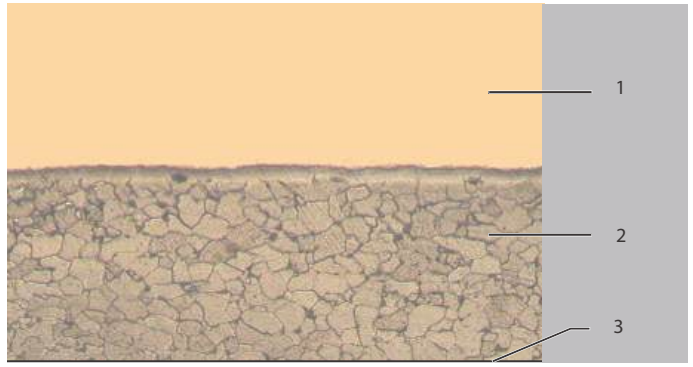
Features

- High load capacity, very good resistance to fatigue at higher temperatures.
- Suitable for high load, low frequency oscillating motion.
- Maintenance required.
- Applications include material handling and lifting equipment, hydraulic cylinders, agricultural equipment and off-highway equipment.
- Available as cylindrical, flanged and thrust.

MBB bushing material

Structure

Figure 50



1. CuSn6.5-0.1 bronze layer, 0.2-0.8 mm thick, hardness 80-130 HB

2. Steel backing: 0.5-3.0 mm

3. Copper plating or phosphate coating 0.001-0.008 mm

Features

- High load capacity, excellent resistance to fatigue under dynamic load or impact load.
- Excellent performance in swing conditions.
- Works well in narrow space applications.
- Maintenance required.
- Lead-free material compliant to RoHS and REACH.
- Applications include axles, steering systems, material handling, agricultural machines and construction equipment.
- Available as cylindrical, flanged and thrust.

Material
Physical and mechanical properties

Table 34

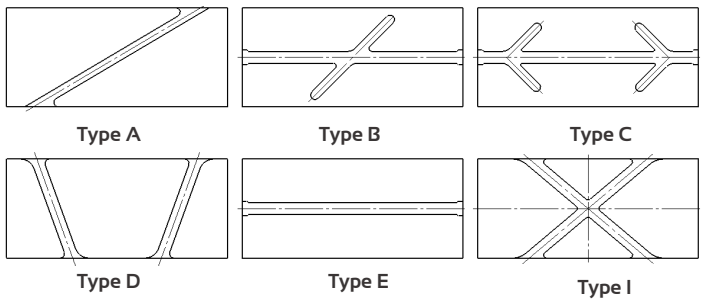
Characteristics		Symbols	Values	Units
Ultimate tensile strength		σ_T	180	N/mm^2
Shear strength		σ_S	160	N/mm^2
%-Elongation		-	8	-
Hardness of alloy layer		-	80-130	HB
Density		γ	8.95	g/cm^3
Liner expansion factor		α_1	18	$1/10^6 K$
Thermal conductivity		λ	47	-
Ultimate load		P	150	N/mm^2
Ultimate speed (lubricated)		V_{max}	5	m/s
Limits pV	Grease lubricated	pV	2.8	N/mm^2 x m/s
	Oil lubricated		10	
Ultimate temperature	Grease lubricated	T_{max}	150	°C
	Oil lubricated		250	
Coefficient of friction	Lubricated	f	0.05-0.12	-

Oil groove and indent

As for MBA and MBB products, the oil groove or oil indent on the alloy layer can store grease or lubricating oil to make the mating surface fully lubricated and improve service life. Please contact CCTY and for design solutions for special working conditions.

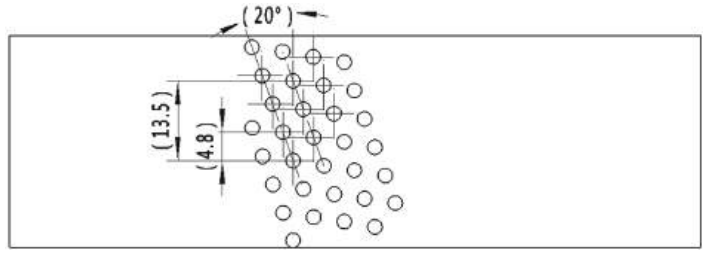
Type of oil groove

Figure 51



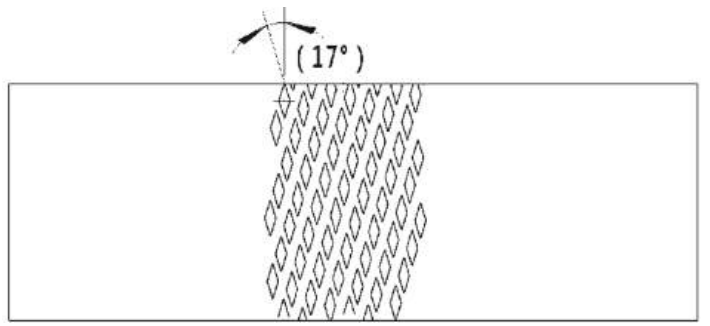
Oil indent distribution diagram

Figure 52



Oil indent distribution diagram

Figure 53



Material
MCA bushing material

Application features

- Excellent fatigue resistance, bearing capacity
- Good corrosive and wear resistance
- Excellent performance in heavy load, low speed applications
- Compliant with RoHS and REACH
- Applications include material handling and lifting equipment, agricultural machines and construction equipment
- Available as cylindrical, flanged and thrust

Chemical composition

Table 35

Code	Chemical composition(%)		
MCA	Cu	Sn	P
	91.3	8.3	0.2

Physical and mechanical performance

Table 36

Performance indicator		Units	Values
Ultimate bushing capacity		N/mm^2	100
Max linear speed		m/s	2
Ultimate pV		N/mm^2 x m/s	2.8
Tensile strength		N/mm^2	460
Yield strength		N/mm^2	260
Hardness		HB	90~150
Operating temperature		°C	-100~+300
Matched shaft	Hardness	HRC	≥50
	Roughness	Ra	0.4~1.0
Friction factor		μ	0.05~0.2
Thermal conductivity		W/(m.k)	58
Factor of thermal expansion		$10^{-6}/K$	18.58

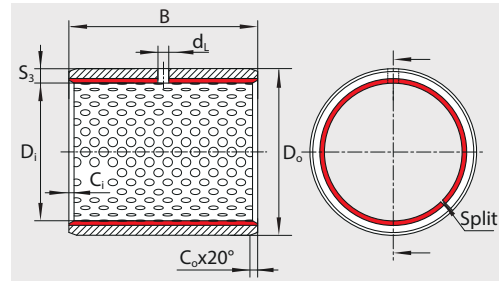
Cylindrical Bushings

Requires maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1.5	0.6 ± 0.4	0.1	0.7
2	1.2 ± 0.4	0.1	0.7



MBA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
MBA 2025	20	23	25.5	24.5	1.5	20.000	19.967	23.021	23.000	20.161	20.020	0.194	0.020	4
MBA 2030	20	23	30.5	29.5	1.5	20.000	19.967	23.021	23.000	20.161	20.020	0.194	0.020	4
MBA 2215	22	25	15.25	14.75	1.5	22.000	21.967	25.021	25.000	22.161	22.020	0.194	0.020	6
MBA 2220	22	25	20.5	19.5	1.5	22.000	21.967	25.021	25.000	22.161	22.020	0.194	0.020	6
MBA 2225	22	25	25.5	24.5	1.5	22.000	21.967	25.021	25.000	22.161	22.020	0.194	0.020	6
MBA 2230	22	25	30.5	29.5	1.5	22.000	21.967	25.021	25.000	22.161	22.020	0.194	0.020	6
MBA 2515	25	28	15.25	14.75	1.5	25.000	24.967	28.021	28.000	25.161	25.020	0.194	0.020	6
MBA 2520	25	28	20.5	19.5	1.5	25.000	24.967	28.021	28.000	25.161	25.020	0.194	0.020	6
MBA 2525	25	28	25.5	24.5	1.5	25.000	24.967	28.021	28.000	25.161	25.020	0.194	0.020	6
MBA 2530	25	28	30.5	29.5	1.5	25.000	24.967	28.021	28.000	25.161	25.020	0.194	0.020	6
MBA 2815	28	32	15.25	14.75	2	28.000	27.967	32.025	32.000	28.185	28.040	0.218	0.040	6
MBA 2820	28	32	20.25	19.75	2	28.000	27.967	32.025	32.000	28.185	28.040	0.218	0.040	6
MBA 2825	28	32	25.25	24.75	2	28.000	27.967	32.025	32.000	28.185	28.040	0.218	0.040	6
MBA 2830	28	32	30.5	29.5	2	28.000	27.967	32.025	32.000	28.185	28.040	0.218	0.040	6
MBA 3015	30	34	15.25	14.75	2	30.000	29.967	34.025	34.000	30.185	30.040	0.218	0.040	6
MBA 3020	30	34	20.25	19.75	2	30.000	29.967	34.025	34.000	30.185	30.040	0.218	0.040	6
MBA 3025	30	34	25.25	24.75	2	30.000	29.967	34.025	34.000	30.185	30.040	0.218	0.040	6
MBA 3030	30	34	30.5	29.5	2	30.000	29.967	34.025	34.000	30.185	30.040	0.218	0.040	6
MBA 3040	30	34	40.5	39.5	2	30.000	29.967	34.025	34.000	30.185	30.040	0.218	0.040	6
MBA 3230	32	36	30.5	29.5	2	32.000	31.961	36.025	36.000	32.185	32.040	0.224	0.040	6
MBA 3240	32	36	40.5	39.5	2	32.000	31.961	36.025	36.000	32.185	32.040	0.224	0.040	6

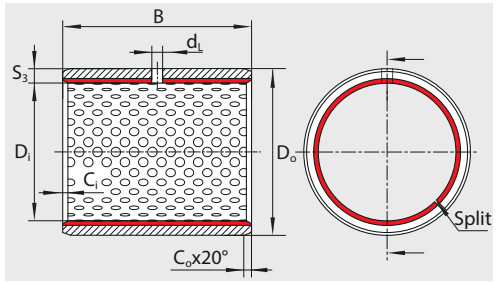
Cylindrical Bushings

Requires maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2	1.2 ± 0.4	0.1	0.7
2.5	1.8 ± 0.6	0.2	1



MBA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
MBA 3515	35	39	15.25	14.75	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBA 3520	35	39	20.25	19.75	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBA 3525	35	39	25.25	24.75	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBA 3530	35	39	30.5	29.5	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBA 3535	35	39	35.5	34.5	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBA 3540	35	39	40.5	39.5	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBA 3545	35	39	45.5	44.5	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBA 3550	35	39	50.5	49.5	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBA 4020	40	44	20.25	19.75	2	40.000	39.961	44.025	44.000	40.185	40.040	0.224	0.040	8
MBA 4030	40	44	30.5	29.5	2	40.000	39.961	44.025	44.000	40.185	40.040	0.224	0.040	8
MBA 4040	40	44	40.5	39.5	2	40.000	39.961	44.025	44.000	40.185	40.040	0.224	0.040	8
MBA 4050	40	44	50.5	49.5	2	40.000	39.961	44.025	44.000	40.185	40.040	0.224	0.040	8
MBA 4060	40	44	60.5	59.5	2	40.000	39.961	44.025	44.000	40.185	40.040	0.224	0.040	8
MBA 4530	45	50	30.25	29.75	2.5	45.000	44.961	50.025	50.000	45.225	45.080	0.264	0.080	8
MBA 4540	45	50	40.5	39.5	2.5	45.000	44.961	50.025	50.000	45.225	45.080	0.264	0.080	8
MBA 4550	45	50	50.5	49.5	2.5	45.000	44.961	50.025	50.000	45.225	45.080	0.264	0.080	8
MBA 4560	45	50	60.5	59.5	2.5	45.000	44.961	50.025	50.000	45.225	45.080	0.264	0.080	8
MBA 5030	50	55	30.25	29.75	2.5	50.000	49.961	55.030	55.000	50.230	50.080	0.269	0.080	8
MBA 5040	50	55	40.5	39.5	2.5	50.000	49.961	55.030	55.000	50.230	50.080	0.269	0.080	8
MBA 5050	50	55	50.5	49.5	2.5	50.000	49.961	55.030	55.000	50.230	50.080	0.269	0.080	8
MBA 5060	50	55	60.5	59.5	2.5	50.000	49.961	55.030	55.000	50.230	50.080	0.269	0.080	8

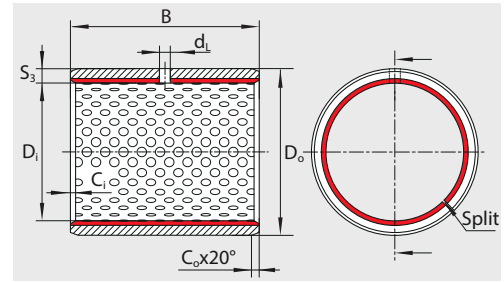
Cylindrical Bushings

Requires maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



MBA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
MBA 5535	55	60	35.5	34.5	2.5	55.000	54.954	60.030	60.000	55.230	55.080	0.276	0.080	8
MBA 5540	55	60	40.5	39.5	2.5	55.000	54.954	60.030	60.000	55.230	55.080	0.276	0.080	8
MBA 5555	55	60	55.5	54.5	2.5	55.000	54.954	60.030	60.000	55.230	55.080	0.276	0.080	8
MBA 5560	55	60	60.5	59.5	2.5	55.000	54.954	60.030	60.000	55.230	55.080	0.276	0.080	8
MBA 6030	60	65	30.25	29.75	2.5	60.000	59.954	65.030	65.000	60.230	60.080	0.276	0.080	8
MBA 6040	60	65	40.5	39.5	2.5	60.000	59.954	65.030	65.000	60.230	60.080	0.276	0.080	8
MBA 6060	60	65	60.5	59.5	2.5	60.000	59.954	65.030	65.000	60.230	60.080	0.276	0.080	8
MBA 6540	65	70	40.5	39.5	2.5	65.000	64.954	70.030	70.000	65.230	65.080	0.276	0.080	8
MBA 6550	65	70	50.5	49.5	2.5	65.000	64.954	70.030	70.000	65.230	65.080	0.276	0.080	8
MBA 6560	65	70	60.5	59.5	2.5	65.000	64.954	70.030	70.000	65.230	65.080	0.276	0.080	8
MBA 6570	65	70	70.75	69.25	2.5	65.000	64.954	70.030	70.000	65.230	65.080	0.276	0.080	8
MBA 7040	70	75	40.5	39.5	2.5	70.000	69.954	75.030	75.000	70.230	70.080	0.276	0.080	8
MBA 7045	70	75	45.5	44.5	2.5	70.000	69.954	75.030	75.000	70.230	70.080	0.276	0.080	8
MBA 7050	70	75	50.5	49.5	2.5	70.000	69.954	75.030	75.000	70.230	70.080	0.276	0.080	8
MBA 7065	70	75	65.75	64.25	2.5	70.000	69.954	75.030	75.000	70.230	70.080	0.276	0.080	8
MBA 7080	70	75	80.75	79.25	2.5	70.000	69.954	75.030	75.000	70.230	70.080	0.276	0.080	8
MBA 7540	75	80	40.5	39.5	2.5	75.000	74.954	80.030	80.000	75.230	75.080	0.276	0.080	9.5
MBA 7560	75	80	60.5	59.5	2.5	75.000	74.954	80.030	80.000	75.230	75.080	0.276	0.080	9.5
MBA 7580	75	80	80.75	79.25	2.5	75.000	74.954	80.030	80.000	75.230	75.080	0.276	0.080	9.5
MBA 8040	80	85	40.5	39.5	2.5	80.000	79.954	85.035	85.000	80.235	80.080	0.281	0.080	9.5
MBA 8060	80	85	60.5	59.5	2.5	80.000	79.954	85.035	85.000	80.235	80.080	0.281	0.080	9.5
MBA 8075	80	85	75.75	74.25	2.5	80.000	79.954	85.035	85.000	80.235	80.080	0.281	0.080	9.5
MBA 8080	80	85	80.75	79.25	2.5	80.000	79.954	85.035	85.000	80.235	80.080	0.281	0.080	9.5

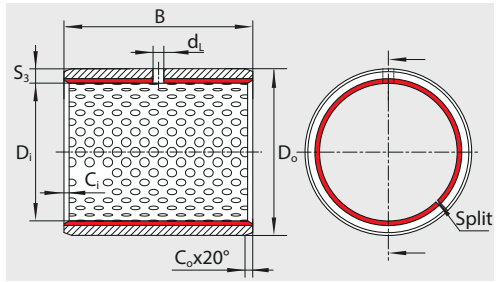
Cylindrical Bushings

Requires maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



MBA

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
MBA 8560	85	90	60.5	59.5	2.5	85.000	84.946	90.035	90.000	85.235	85.080	0.289	0.080	9.5
MBA 9040	90	95	40.5	39.5	2.5	90.000	89.946	95.035	95.000	90.235	90.080	0.289	0.080	9.5
MBA 9070	90	95	70.75	69.25	2.5	90.000	89.946	95.035	95.000	90.235	90.080	0.289	0.080	9.5
MBA 9090	90	95	90.75	89.25	2.5	90.000	89.946	95.035	95.000	90.235	90.080	0.289	0.080	9.5
MBA 10040	100	105	40.5	39.5	2.5	100.000	99.946	105.035	105.000	100.235	100.080	0.289	0.080	9.5
MBA 10050	100	105	50.5	49.5	2.5	100.000	99.946	105.035	105.000	100.235	100.080	0.289	0.080	9.5
MBA 10060	100	105	60.5	59.5	2.5	100.000	99.946	105.035	105.000	100.235	100.080	0.289	0.080	9.5
MBA 10080	100	105	80.75	79.25	2.5	100.000	99.946	105.035	105.000	100.235	100.080	0.289	0.080	9.5
MBA 10095	100	105	95.75	94.25	2.5	100.000	99.946	105.035	105.000	100.235	100.080	0.289	0.080	9.5
MBA 12050	120	125	50.5	49.5	2.5	120.000	119.946	125.040	125.000	120.240	120.080	0.294	0.080	9.5
MBA 13560	135	140	60.5	59.5	2.5	135.000	134.937	140.040	140.000	135.240	135.080	0.303	0.080	9.5

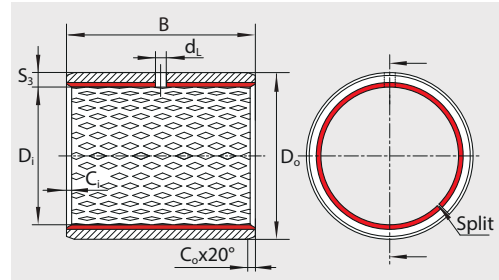
Cylindrical Bushings

Requires maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
1.5	0.6 ± 0.4	0.1	0.7
2	1.2 ± 0.4	0.1	0.7



MBB

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
MBB 2025	20	23	25.5	24.5	1.5	20.000	19.967	23.021	23.000	20.161	20.020	0.194	0.020	4
MBB 2030	20	23	30.5	29.5	1.5	20.000	19.967	23.021	23.000	20.161	20.020	0.194	0.020	4
MBB 2215	22	25	15.25	14.75	1.5	22.000	21.967	25.021	25.000	22.161	22.020	0.194	0.020	6
MBB 2220	22	25	20.5	19.5	1.5	22.000	21.967	25.021	25.000	22.161	22.020	0.194	0.020	6
MBB 2225	22	25	25.5	24.5	1.5	22.000	21.967	25.021	25.000	22.161	22.020	0.194	0.020	6
MBB 2230	22	25	30.5	29.5	1.5	22.000	21.967	25.021	25.000	22.161	22.020	0.194	0.020	6
MBB 2515	25	28	15.25	14.75	1.5	25.000	24.967	28.021	28.000	25.161	25.020	0.194	0.020	6
MBB 2520	25	28	20.5	19.5	1.5	25.000	24.967	28.021	28.000	25.161	25.020	0.194	0.020	6
MBB 2525	25	28	25.5	24.5	1.5	25.000	24.967	28.021	28.000	25.161	25.020	0.194	0.020	6
MBB 2530	25	28	30.5	29.5	1.5	25.000	24.967	28.021	28.000	25.161	25.020	0.194	0.020	6
MBB 2815	28	32	15.25	14.75	2	28.000	27.967	32.025	32.000	28.185	28.040	0.218	0.040	6
MBB 2820	28	32	20.25	19.75	2	28.000	27.967	32.025	32.000	28.185	28.040	0.218	0.040	6
MBB 2825	28	32	25.25	24.75	2	28.000	27.967	32.025	32.000	28.185	28.040	0.218	0.040	6
MBB 2830	28	32	30.5	29.5	2	28.000	27.967	32.025	32.000	28.185	28.040	0.218	0.040	6
MBB 3015	30	34	15.25	14.75	2	30.000	29.967	34.025	34.000	30.185	30.040	0.218	0.040	6
MBB 3020	30	34	20.25	19.75	2	30.000	29.967	34.025	34.000	30.185	30.040	0.218	0.040	6
MBB 3025	30	34	25.25	24.75	2	30.000	29.967	34.025	34.000	30.185	30.040	0.218	0.040	6
MBB 3030	30	34	30.5	29.5	2	30.000	29.967	34.025	34.000	30.185	30.040	0.218	0.040	6
MBB 3040	30	34	40.5	39.5	2	30.000	29.967	34.025	34.000	30.185	30.040	0.218	0.040	6
MBB 3230	32	36	30.5	29.5	2	32.000	31.961	36.025	36.000	32.185	32.040	0.224	0.040	6
MBB 3240	32	36	40.5	39.5	2	32.000	31.961	36.025	36.000	32.185	32.040	0.224	0.040	6

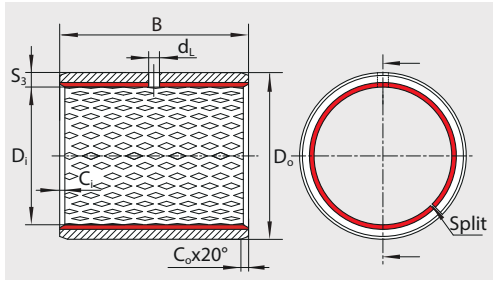
Cylindrical Bushings

Requires maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2	1.2 ± 0.4	0.1	0.7
2.5	1.8 ± 0.6	0.2	1



MBB

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
MBB 3515	35	39	15.25	14.75	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBB 3520	35	39	20.25	19.75	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBB 3525	35	39	25.25	24.75	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBB 3530	35	39	30.5	29.5	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBB 3535	35	39	35.5	34.5	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBB 3540	35	39	40.5	39.5	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBB 3545	35	39	45.5	44.5	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBB 3550	35	39	50.5	49.5	2	35.000	34.961	39.025	39.000	35.185	35.040	0.224	0.040	6
MBB 4020	40	44	20.25	19.75	2	40.000	39.961	44.025	44.000	40.185	40.040	0.224	0.040	8
MBB 4030	40	44	30.5	29.5	2	40.000	39.961	44.025	44.000	40.185	40.040	0.224	0.040	8
MBB 4040	40	44	40.5	39.5	2	40.000	39.961	44.025	44.000	40.185	40.040	0.224	0.040	8
MBB 4050	40	44	50.5	49.5	2	40.000	39.961	44.025	44.000	40.185	40.040	0.224	0.040	8
MBB 4060	40	44	60.5	59.5	2	40.000	39.961	44.025	44.000	40.185	40.040	0.224	0.040	8
MBB 4530	45	50	30.25	29.75	2.5	45.000	44.961	50.025	50.000	45.225	45.080	0.264	0.080	8
MBB 4540	45	50	40.5	39.5	2.5	45.000	44.961	50.025	50.000	45.225	45.080	0.264	0.080	8
MBB 4550	45	50	50.5	49.5	2.5	45.000	44.961	50.025	50.000	45.225	45.080	0.264	0.080	8
MBB 4560	45	50	60.5	59.5	2.5	45.000	44.961	50.025	50.000	45.225	45.080	0.264	0.080	8
MBB 5030	50	55	30.25	29.75	2.5	50.000	49.961	55.030	55.000	50.230	50.080	0.269	0.080	8
MBB 5040	50	55	40.5	39.5	2.5	50.000	49.961	55.030	55.000	50.230	50.080	0.269	0.080	8
MBB 5050	50	55	50.5	49.5	2.5	50.000	49.961	55.030	55.000	50.230	50.080	0.269	0.080	8
MBB 5060	50	55	60.5	59.5	2.5	50.000	49.961	55.030	55.000	50.230	50.080	0.269	0.080	8

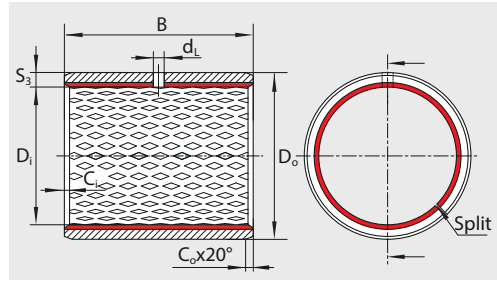
Cylindrical Bushings

Requires maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



MBB

Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
MBB 5535	55	60	35.5	34.5	2.5	55.000	54.954	60.030	60.000	55.230	55.080	0.276	0.080	8
MBB 5540	55	60	40.5	39.5	2.5	55.000	54.954	60.030	60.000	55.230	55.080	0.276	0.080	8
MBB 5555	55	60	55.5	54.5	2.5	55.000	54.954	60.030	60.000	55.230	55.080	0.276	0.080	8
MBB 5560	55	60	60.5	59.5	2.5	55.000	54.954	60.030	60.000	55.230	55.080	0.276	0.080	8
MBB 6030	60	65	30.25	29.75	2.5	60.000	59.954	65.030	65.000	60.230	60.080	0.276	0.080	8
MBB 6040	60	65	40.5	39.5	2.5	60.000	59.954	65.030	65.000	60.230	60.080	0.276	0.080	8
MBB 6060	60	65	60.5	59.5	2.5	60.000	59.954	65.030	65.000	60.230	60.080	0.276	0.080	8
MBB 6540	65	70	40.5	39.5	2.5	65.000	64.954	70.030	70.000	65.230	65.080	0.276	0.080	8
MBB 6550	65	70	50.5	49.5	2.5	65.000	64.954	70.030	70.000	65.230	65.080	0.276	0.080	8
MBB 6560	65	70	60.5	59.5	2.5	65.000	64.954	70.030	70.000	65.230	65.080	0.276	0.080	8
MBB 6570	65	70	70.75	69.25	2.5	65.000	64.954	70.030	70.000	65.230	65.080	0.276	0.080	8
MBB 7040	70	75	40.5	39.5	2.5	70.000	69.954	75.030	75.000	70.230	70.080	0.276	0.080	8
MBB 7045	70	75	45.5	44.5	2.5	70.000	69.954	75.030	75.000	70.230	70.080	0.276	0.080	8
MBB 7050	70	75	50.5	49.5	2.5	70.000	69.954	75.030	75.000	70.230	70.080	0.276	0.080	8
MBB 7065	70	75	65.75	64.25	2.5	70.000	69.954	75.030	75.000	70.230	70.080	0.276	0.080	8
MBB 7080	70	75	80.75	79.25	2.5	70.000	69.954	75.030	75.000	70.230	70.080	0.276	0.080	8
MBB 7540	75	80	40.5	39.5	2.5	75.000	74.954	80.030	80.000	75.230	75.080	0.276	0.080	9.5
MBB 7560	75	80	60.5	59.5	2.5	75.000	74.954	80.030	80.000	75.230	75.080	0.276	0.080	9.5
MBB 7580	75	80	80.75	79.25	2.5	75.000	74.954	80.030	80.000	75.230	75.080	0.276	0.080	9.5
MBB 8040	80	85	40.5	39.5	2.5	80.000	79.954	85.035	85.000	80.235	80.080	0.281	0.080	9.5
MBB 8060	80	85	60.5	59.5	2.5	80.000	79.954	85.035	85.000	80.235	80.080	0.281	0.080	9.5
MBB 8075	80	85	75.75	74.25	2.5	80.000	79.954	85.035	85.000	80.235	80.080	0.281	0.080	9.5
MBB 8080	80	85	80.75	79.25	2.5	80.000	79.954	85.035	85.000	80.235	80.080	0.281	0.080	9.5

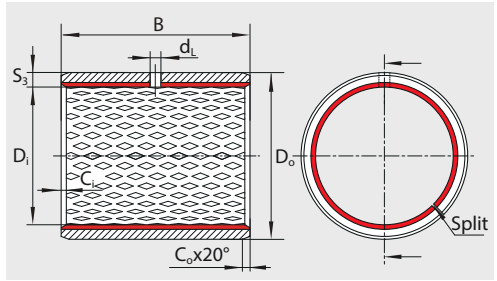
Cylindrical Bushings

Requires maintenance

Metric sizes

Chamfer specification

S_3	C_o	C_i	
		min.	max.
2.5	1.8 ± 0.6	0.2	1



MBB

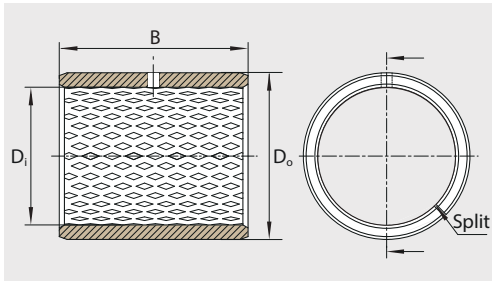
Dimension table · Unit: mm

Product Number	D_i	D_o	B		S_3	Shaft Diameter		Housing Diameter		I.D. after assembly		Clearance		Oil hole
			max.	min.		max.	min.	max.	min.	max.	min.	max.	min.	
MBB 8560	85	90	60.5	59.5	2.5	85.000	84.946	90.035	90.000	85.235	85.080	0.289	0.080	9.5
MBB 9040	90	95	40.5	39.5	2.5	90.000	89.946	95.035	95.000	90.235	90.080	0.289	0.080	9.5
MBB 9070	90	95	70.75	69.25	2.5	90.000	89.946	95.035	95.000	90.235	90.080	0.289	0.080	9.5
MBB 9090	90	95	90.75	89.25	2.5	90.000	89.946	95.035	95.000	90.235	90.080	0.289	0.080	9.5
MBB 10040	100	105	40.5	39.5	2.5	100.000	99.946	105.035	105.000	100.235	100.080	0.289	0.080	9.5
MBB 10050	100	105	50.5	49.5	2.5	100.000	99.946	105.035	105.000	100.235	100.080	0.289	0.080	9.5
MBB 10060	100	105	60.5	59.5	2.5	100.000	99.946	105.035	105.000	100.235	100.080	0.289	0.080	9.5
MBB 10080	100	105	80.75	79.25	2.5	100.000	99.946	105.035	105.000	100.235	100.080	0.289	0.080	9.5
MBB 10095	100	105	95.75	94.25	2.5	100.000	99.946	105.035	105.000	100.235	100.080	0.289	0.080	9.5
MBB 12050	120	125	50.5	49.5	2.5	120.000	119.946	125.040	125.000	120.240	120.080	0.294	0.080	9.5
MBB 13560	135	140	60.5	59.5	2.5	135.000	134.937	140.040	140.000	135.240	135.080	0.303	0.080	9.5

Cylindrical Bushings

Requires maintenance

Metric sizes



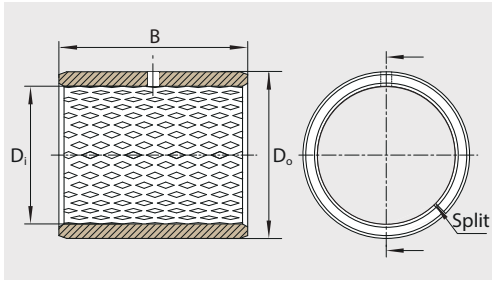
MCA

Dimension table · Unit: mm

Product Number	D_i	D_o	B
MCA 1010	10	12	10
MCA 1015	10	12	15
MCA 1210	12	14	10
MCA 1215	12	14	15
MCA 1220	12	14	20
MCA 1410	14	16	10
MCA 1415	14	16	15
MCA 1420	14	16	20
MCA 1425	14	16	25
MCA 1510	15	17	10
MCA 1515	15	17	15
MCA 1520	15	17	20
MCA 1525	15	17	25
MCA 1610	16	18	10
MCA 1615	16	18	15
MCA 1620	16	18	20
MCA 1625	16	18	25
MCA 1810	18	21	10
MCA 1815	18	21	15
MCA 1820	18	21	20
MCA 1825	18	21	25

Cylindrical Bushings

Requires maintenance
Metric sizes



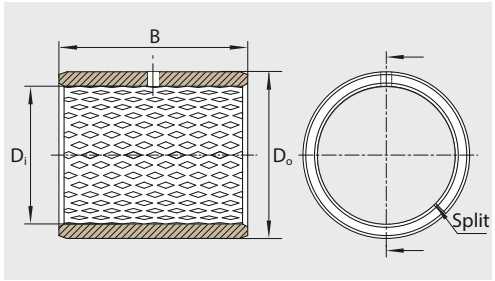
MCA

Dimension table · Unit: mm

Product Number	D_i	D_o	B
MCA 2010	20	23	10
MCA 2015	20	23	15
MCA 2020	20	23	20
MCA 2025	20	23	25
MCA 2030	20	23	30
MCA 2215	22	25	15
MCA 2220	22	25	20
MCA 2225	22	25	25
MCA 2230	22	25	30
MCA 2240	22	25	40
MCA 2430	24	27	30
MCA 2515	25	28	15
MCA 2520	25	28	20
MCA 2525	25	28	25
MCA 2530	25	28	30
MCA 2815	28	31	15
MCA 2820	28	31	20
MCA 2825	28	31	25
MCA 2830	28	31	30
MCA 3015	30	34	15
MCA 3020	30	34	20
MCA 3025	30	34	25
MCA 3030	30	34	30
MCA 3040	30	34	40

Cylindrical Bushings

Requires maintenance
Metric sizes



MCA

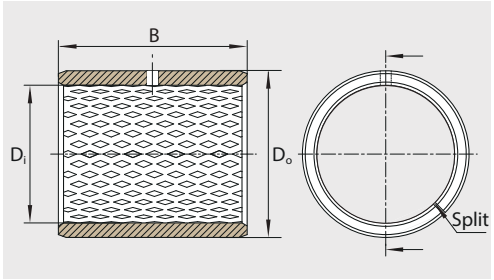
Dimension table · Unit: mm

Product Number	D_i	D_o	B
MCA 3215	32	36	15
MCA 3220	32	36	20
MCA 3225	32	36	25
MCA 3230	32	36	30
MCA 3240	32	36	40
MCA 3515	35	39	15
MCA 3520	35	39	20
MCA 3525	35	39	25
MCA 3530	35	39	30
MCA 3535	35	39	35
MCA 3540	35	39	40
MCA 3550	35	39	50
MCA 4020	40	44	20
MCA 4025	40	44	25
MCA 4030	40	44	30
MCA 4040	40	44	40
MCA 4050	40	44	50
MCA 4060	40	44	60
MCA 4520	45	50	20
MCA 4525	45	50	25
MCA 4530	45	50	30
MCA 4540	45	50	40
MCA 4550	45	50	50
MCA 4560	45	50	60

Cylindrical Bushings

Requires maintenance

Metric sizes



MCA

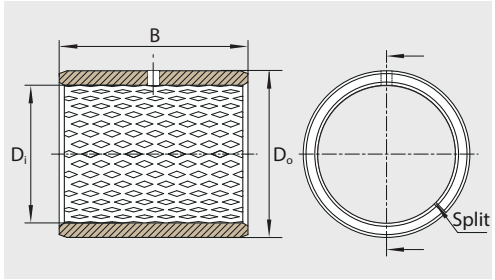
Dimension table · Unit: mm

Product Number	D_i	D_o	B
MCA 5025	50	55	25
MCA 5030	50	55	30
MCA 5040	50	55	40
MCA 5050	50	55	50
MCA 5060	50	55	60
MCA 5520	55	60	20
MCA 5525	55	60	25
MCA 5530	55	60	30
MCA 5540	55	60	40
MCA 5550	55	60	50
MCA 5560	55	60	60
MCA 6025	60	65	25
MCA 6030	60	65	30
MCA 6035	60	65	35
MCA 6040	60	65	40
MCA 6050	60	65	50
MCA 6060	60	65	60
MCA 6080	60	65	80
MCA 6090	60	65	90
MCA 6530	65	70	30
MCA 6540	65	70	40
MCA 6550	65	70	50
MCA 6560	65	70	60
MCA 6580	65	70	80

Cylindrical Bushings

Requires maintenance

Metric sizes



MCA

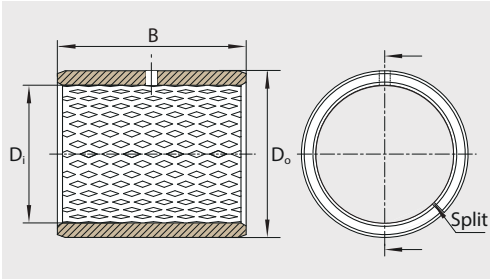
Dimension table · Unit: mm

Product Number	D_i	D_o	B
MCA 7040	70	75	40
MCA 7050	70	75	50
MCA 7060	70	75	60
MCA 7070	70	75	70
MCA 7080	70	75	80
MCA 7090	70	75	90
MCA 7530	75	80	30
MCA 7540	75	80	40
MCA 7560	75	80	60
MCA 7580	75	80	80
MCA 8030	80	85	30
MCA 8040	80	85	40
MCA 8060	80	85	60
MCA 8080	80	85	80
MCA 8530	85	90	30
MCA 8540	85	90	40
MCA 8560	85	90	60
MCA 8580	85	90	80
MCA 9040	90	95	40
MCA 9060	90	95	60
MCA 9080	90	95	80
MCA 9090	90	95	90

Cylindrical Bushings

Requires maintenance

Metric sizes



MCA

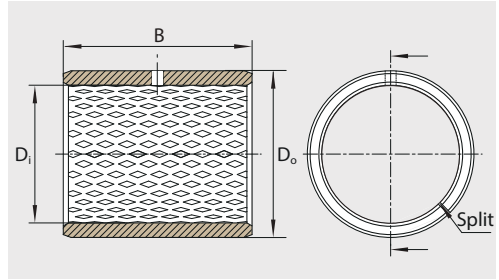
Dimension table · Unit: mm

Product Number	D_i	D_o	B
MCA 10050	100	105	50
MCA 10060	100	105	60
MCA 10095	100	105	95
MCA 10560	105	110	60
MCA 105100	105	110	100
MCA 11060	110	115	60
MCA 110100	110	115	100
MCA 11560	115	120	60
MCA 115100	115	120	100
MCA 12060	120	125	60
MCA 120100	120	125	100
MCA 12560	125	130	60
MCA 125100	125	130	100
MCA 13060	130	135	60
MCA 130100	130	135	100
MCA 13560	135	140	60
MCA 135100	135	140	100
MCA 14060	140	145	60
MCA 140100	140	145	100
MCA 14560	145	150	60
MCA 145100	145	150	100

Cylindrical Bushings

Requires maintenance

Metric sizes



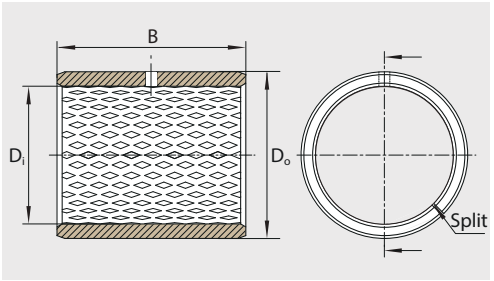
MCA

Dimension table · Unit: mm

Product Number	D_i	D_o	B
MCA 15060	150	155	60
MCA 150100	150	155	100
MCA 15560	155	160	60
MCA 155100	155	160	100
MCA 16060	160	165	60
MCA 160100	160	165	100
MCA 16560	165	170	60
MCA 165100	165	170	100
MCA 17060	170	175	60
MCA 170100	170	175	100
MCA 17560	175	180	60
MCA 175100	175	180	100
MCA 18060	180	185	60
MCA 180100	180	185	100
MCA 18560	185	190	60
MCA 185100	185	190	100
MCA 19060	190	195	60
MCA 190100	190	195	100
MCA 19560	195	200	60
MCA 195100	195	200	100
MCA 20060	200	205	60
MCA 200100	200	205	100

Cylindrical Bushings

Requires maintenance
Metric sizes



MCA

Dimension table · Unit: mm

Product Number	D_i	D_o	B
MCA 21560	215	220	60
MCA 215100	215	220	100
MCA 22560	225	230	60
MCA 225100	225	230	100
MCA 23560	235	240	60
MCA 235100	235	240	100
MCA 24560	245	250	60
MCA 245100	245	250	100
MCA 27560	275	280	60
MCA 275100	275	280	100
MCA 28560	285	290	60
MCA 285100	285	290	100
MCA 30060	300	305	60
MCA 300100	300	305	100

SPECIAL DESIGNS

Special Designs

Square Ball Universal Joint™

SBJ

The patented Square Ball Universal Joint is a smoother, more consistent universal joint for intermittent applications. The design reduces the number of components from nearly 100 to just eight. The improved design provides:

- More consistent & lower operating torque values.
- Minimized tolerance stackup due to fewer parts.
- Larger grease volume which is more resistant to contaminant saturation.
- Elimination of line fretting leading to premature part failure.
- External seal free of frictional wear.

Technical parameters	Units	Values
Sliding contact surface	—	Steel / Steel
Working temperature	ºC	-30 / +120 (sealed)
Type of lubrication	—	Grease or oil
Seal configuration	—	With boot(s)
Tilt angle	°	0 - 40 (single)

Backwards compatible to mating components.

Ball Joints

BJH

CCTY Bearing's ball joints are custom designed and hold tighter rotational torque ranges due to the precise nature of the overall product line.

- Maintenance-free design uses propriety materials with low friction and minimized clearance.
- Available in pinch bolt and taper designs with cone angles up to 60 degrees.
- Reliable boot keeps out contamination for the life of the ball joint.
- Quality steel provides high push out and pull out loads.
- High performance design reduces noise, vibration and harshness.

Technical parameters	Units	Values
Sliding contact surface	—	Steel / Steel (polymer)
Working temperature	ºC	-30 / +120 (sealed)
Type of lubrication	—	Grease
Seal configuration	—	With boot
Range(thread size)	mm	Customizable

Tie Rod Assemblies and Linkages

TR

Tie rods and linkages can be fitted with spherical plain bearings, ball joints and rod ends.

- Available in steel and aluminum with cone angles up to 60 degrees.
- Tie rods undergo induction hardening to provide reliable performance.
- Weather resistant boot is greased for life.
- Tie rods and linkages are available in adjustable lengths up to 1.5 m (5 ft).

Technical parameters	Units	Values
Sliding contact surface	—	Steel / Steel (polymer)
Working temperature	°C	-30 / +120 (sealed)
Type of lubrication	—	Grease
Seal configuration	—	With boot
Range (thread size)	mm	Customizable