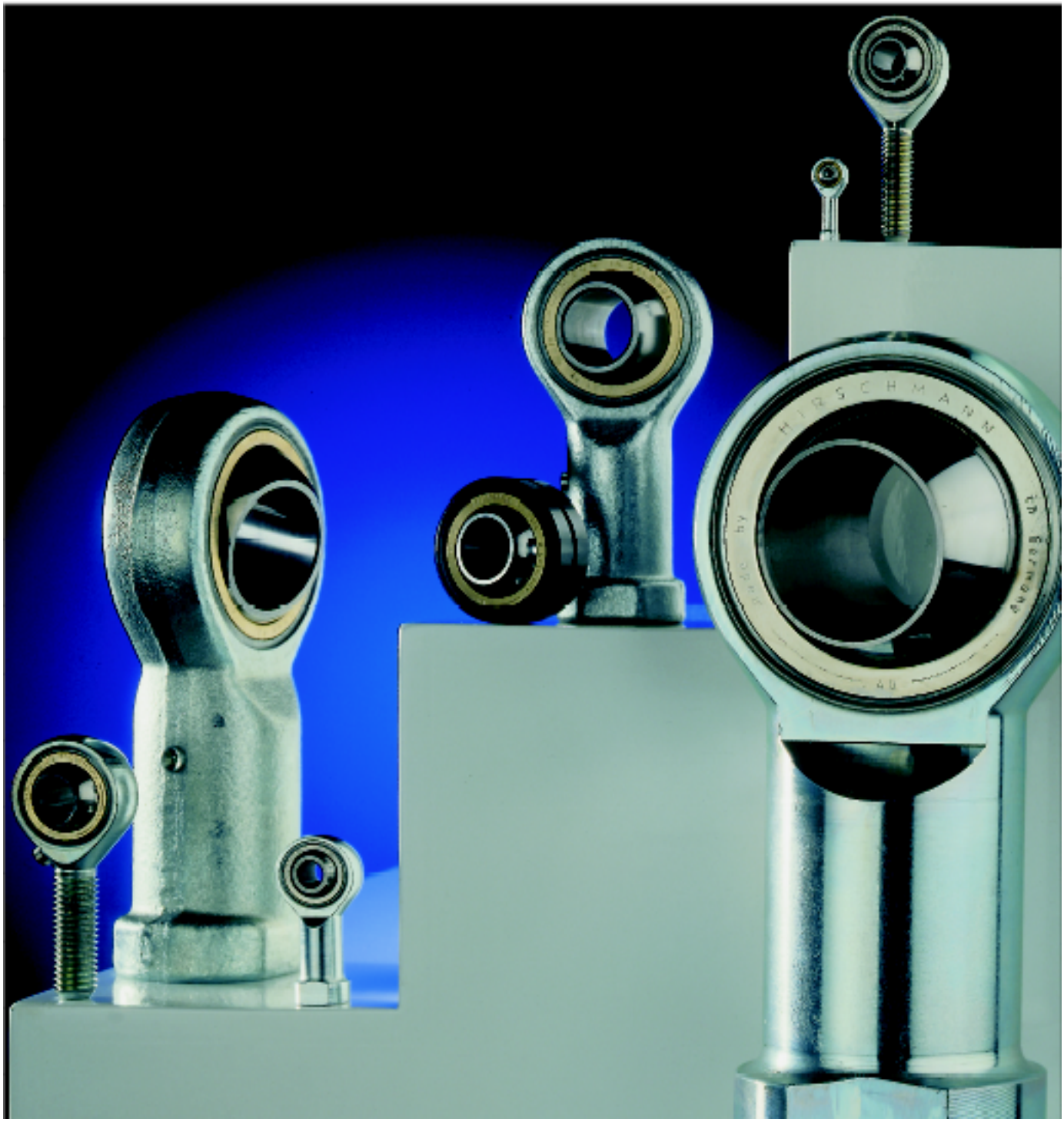
# Heavy duty
# Rod ends and
# Spherical bearings

## DIN ISO 12240-4 (DIN 684 K) · CETOP

DIN EN ISO 9001:2000

Catalogue GE 1204




HIRSCHMANN

# Introduction

**Production range:**
Besides rod ends and spherical bearings, which have been produced since 1957, the range also includes axial shaft seals as well as clamping and handling systems. The successful expansion of this product range depends on the use of the latest development and manufacturing methods. These are used at HIRSCHMANN and are carefully nurtured and expanded.

**General information:**
HIRSCHMANN's rod ends and spherical bearings are bearing elements which can be used for many applications, and are of the plain bearing type. They have proved their worth in millions of instances as a design element for transmitting power between members lying at various angles, both statically and
dynamically. The mounting dimensions of these bearing elements have been fixed in DIN ISO 12240-4 (648 K). This catalogue reflects the current state of development and manufacture, and the information contained in it supersedes earlier publications. We reserve the right to make modifications in the course of product development. Reprints and excerpts require our express permission.

**Standard products:**
For all the standard products shown in this catalogue, many variations are possible. Details are given in the text below the tables of dimensions, e.g. hard-chromed or rustproof inner ring or outer part, reduced bearing
slackness etc.

**Specials:**
In addition to our standard products, we make specials to customer requirements or to drawing. Examples of our specials are shown on the rear cover of the catalogue.

**Warranty:**
All the information contained in this catalogue is the result of years of experience in the manufacture and use of rod ends and spherical bearings. Nevertheless, unknown parameters and practical conditions of use can considerably reduce the validity of these general statements, so that the user must conduct practical tests. The multitude of applications for rod ends and spherical bearings mean that we cannot accept any
liability for the correctness of our recommendations in individual instances.

**Quality according to DIN EN ISO 9001:**
All HIRSCHMANN GMBH rod ends and spherical bearings are
produced using the latest and most reliable production methods, and are subject to quality assurance measures as per DIN EN ISO 9001 both during production and in the product stage.

**Advisory service and sales:**
Our staff and the sales engineers at our agencies and dealers in Germany and abroad (Page 23), all of whom have their own stocks, would be pleased to assist you at any time.

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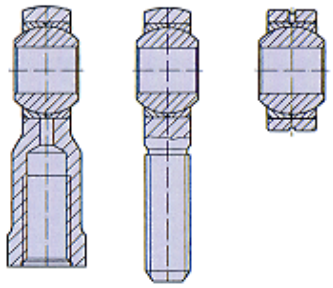
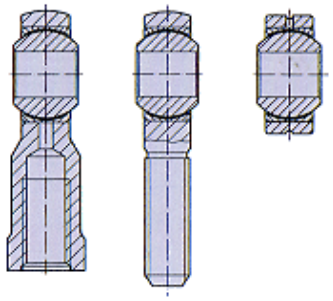
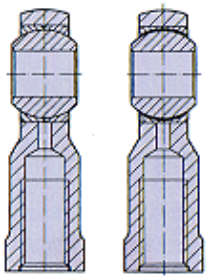
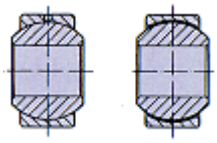
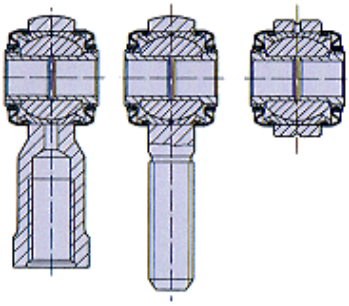
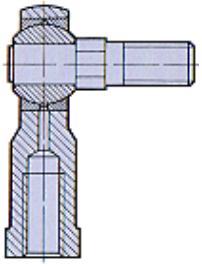
## Selection guidelines

| Construction | Series | Design features | Application features | Page |
|---|---|---|---|---|
|  | SFC..<br>SMC..<br>SSC.. | **Relubricatable heavy-duty design, rod ends and spherical bearings**<br>Friction pairing:<br>Steel/heavy-duty bronze, with precision-turned bushing having extremely high lining adjustment capability.<br>elenklager | Universal application at high alternating and shock loads in radial and axial directions. Suitable for large swings.<br>Vmax = 60 m/min. | 10–11<br>16 |
|  | SFCP..<br>SMCP..<br>SSCP.. | **Maintenance free heavy-duty. rod ends and and spherical bearings**<br>Friction pairing:<br>Steel/PTFE bronze fabric.<br>The sliding film is affixed inside the bushing. This ensures long service life. | Universal application at high constant loads and low alternating and shock loads in axial and radial directions.<br>For difficult lubrication conditions, high running speeds and large swings.<br>Vmax = 60 m/min. | 12–13<br>17 |
|  | SFC..CETOP<br>SFCP..CETOP | **CETOP-standard relubricatable or maintenance-free heavy-duty rod ends**<br>Friction pairing:<br>Steel/heavy-duty bronze<br>Steel/PTFE bronze fabric | As for relubricatable or maintenance-free heavy-duty rod ends and spherical bearings. | 14–15 |
|  | SC..<br>SCP.. | **Relubricatable or maintenance-free heavy-duty spherical bearings without steel outer ring**<br>Friction pairing:<br>Steel/heavy-duty bronze<br>Steel/PTFE bronze fabric | As for relubricatable or maintenance-free heavy-duty rod ends and spherical bearings. | 18 |
|  | ...2 RS | **Sealed rod ends, spherical bearings**<br>Heavy-duty and maintenancefree rod ends and spherical bearings of sizes 8-30 can be supplied with replaceable sealing sleeves. | For use in severe environmental conditions (dirt, dust, splashing water, etc.) | 19 |
|  | ..W | **Threaded bolts for rod ends and spherical bearings**<br>Heavy-duty and maintenance-free rod ends and spherical bearings of sizes 5–16 and 20 can be supplied ex stock with a down riveted threaded bolt. | Used as angle joints | 20 |

# Technical Notes

## Bearing slackness:

Bearing slackness or bearing clearance is the dimension by which the inner ring can be moved within the bushings in a radial or axial direction when not installed and unlubricated. Rod ends and spherical bearings are manufactured with differing bearing slackness, as shown in the following charts, depending on the friction pairing and the size of the bearing. **When mounting bearings, please note that the slackness can be reduced to null if necessary, due to possible differences in tolerance (bearing diameter to housing bore hole).**
The test load is 100 N.

Bearing slackness in lubricated design
(at room temperature)

| Size | Radial slackness in µm | | | | | |
|---|---|---|---|---|---|---|
| | C2 | | Normal | | C3 | |
| | min | max | min | max | min | max |
| 2 - 4 | - | - | 10 | 30 | - | - |
| 5 - 8 | 5 | 10 | 10 | 30 | 30 | 60 |
| 10 - 14 | 10 | 20 | 20 | 40 | 40 | 80 |
| 16 - 20 | 15 | 25 | 30 | 50 | 50 | 100 |
| 22 - 30 | 20 | 30 | 40 | 60 | 60 | 120 |
| 35 - 50 | 40 | 60 | 60 | 90 | 90 | 150 |

Fig. 1

Bearing slackness in maintenance-free design
(at room temperature)

| Size | Radial slackness in µm | | | | | |
|---|---|---|---|---|---|---|
| | C2 | | Normal | | C3 | |
| | min | max | min | max | min | max |
| 2 - 4 | - | - | 2 | 4 | - | - |
| 5 - 30 | - | - | 5 | 10 | 10 | 20 |
| 35 - 50 | - | - | 10 | 20 | 20 | 40 |

Fig. 2

The axial slackness is 2 to 3 times the radial slackness under the same test load (measured at room temperature).

## Selection of bearing slackness:

### Lubricated design

If there are no special reasons for a reduced bearing slackness according to C2, the “normal” radial slackness must be selected as it offers the best lubricating grease distribution with a high bearing contact area.
All rod ends and spherical bearings are supplied with “Normal” radial slackness unless otherwise ordered.

### Maintenance-free design

These bearings are remarkable for their low bearing slackness and a high contact area ratio. Unless otherwise ordered, the maintenance-free rod ends are supplied with “Normal” radial slackness.
If the overall friction movement should be kept low when several rod ends or spherical bearings are used, bearings with a radial slackness in accordance with C3 should be used also.

## Consideration of the environment:

It is recommendable to apply a stainless or sealed type when using it in a humid environment.
Accordingly to the individual customer’s requirements, the bearings are delivered in the following special designs:

- stainless and acid-proof
- high temperature-proof
- low temperature-proof
- etc.

## Lubrication:

All relubricatable rod ends and bearings are supplied ungreased. We recommend lubrication with an anticorrosive Lithiumbased pressure-resistant grease or a Lithium-complex metal soap (multipurpose antifriction bearing grease) for the temperature range of –20° C to +125° C. For temperatures above 125° C a high temperature grease must be used and for temperatures below –20° C a low temperature grease must be used.

## Initial lubrication and relubrication, lubrication intervals

Under severe conditions and at high load, a temperature check is recommended shortly after commissioning. If a temperature rise of 25° C occurs after a running-in time of approx. 1 hour of operation, immediate lubrication is necessary. A periodical relubrication is necessary in any event.
Rod ends and spherical bearings under alternate load from both sides require shorter intervals betweelubrication than rod ends and spherical bearings under load from one side only.
The lubrication intervals depend on the individual circumstances and on the surrounding conditions.

The following guideline values apply for the minimum lubricating periods:
With load from one direction

$$t = \frac{G_h}{30}$$

With load from alternating directions

$$t = \frac{G_h}{130}$$

t = lubricating period in hours of operation.
Gh = duration of use in hours of operation
(see page 7).

Lubricating more often does not have any advantages, furthermore it can damage the hydrodynamic balance on the sliding surface. If the lubricating periods are not observed, the service life can decrease.

The rod ends with female thread are equipped from size 5 upwards with funnel-type lubricating nipples to DIN 3405, those with thread from size 6 upwards. We can supply other lubricating nipples on request.

During the running-in time of the maintenance-free types only a small part of the PTFE is transferred from the sliding foil to the inner ring. Hereby a smoothing effect arises. This reduces the friction and leads to the longer durability. A greasy or oily film prevents this smoothing effect. Thus, we recommend using these elements without lubrication.

## Operating temperature:

All designs can be used without restriction in a temperature range from –30° C to +120° C. Increasing the operating temperature reduces the bearing power and, thus, the service life. Operation at high temperature of relubricatable rod ends and spherical bearings depends to a very great extent on whether the high-temperature lubricating grease used offers sufficient lubricity at high operating temperatures. These designs could be used in the short term under low load and with suitable lubrication at temperatures up to +250° C. The maintenance-free bearings can be used in a temperature range from –50° C to +150° C (mind the decrease or the increase of bearing slackness).
Sealed rod ends and spherical bearings can be used at temperatures from –20° C to +120° C (sealing sleeves of Perbunan). For higher temperatures up to +250° C sealing sleeves can be specially made from fluorelastomer rubber (Viton B).

## Moment of friction M:

The moment of friction for rod ends and spherical bearings can be calculated using the following equation:

$$M = 5 \cdot 10^{-4} \cdot \mu \cdot P \cdot K$$

M = moment of friction [Nm]
μ = friction coefficient of sliding surface
P = dynamically equivalent bearing load [N]
K = inner ring diameter [mm]

Guideline values for the friction coefficient μ

| Bearing type | Friction coefficient | |
|---|---|---|
| | min | max |
| lubricated | 0.08 | 0.15 |
| maintenance-free | 0.03 | 0.10 |

Fig. 3

The low friction coefficients apply for high loads (p = 80–100 N/mm²) at low running speeds (v = 5–10 m/min). The high friction coefficients are for low loads (p = 5–10 N/mm²) at high running speeds (v = 30–60 m/min).

p = specific surface pressure [N/mm²]
v = running speed in the lining [m/min]

## Bearing capacities:

## The dynamic bearing capacity C:

The dynamic bearing capacity C is a characteristic value for the calculation of the service life of rod ends and spherical bearings under dynamic load, i.e. having to perform tilting, swinging or pivoting movements under load.
The dynamic bearing capacity C is based on the values given in the table for the specific surface pressure kc:

| Type of bearing | Specific surface pressure kc [N/mm²] |
|---|---|
| lubricated | 50 |
| maintenance-free | 150 |

Fig. 4

## The static bearing capacity Co:

The static bearing capacity Co represents the maximum permissible load at which no permanent deformation of the lining or the outer part occurs. In the case of the spherical bearing, the surrounding components must be so designed that they prevent any deformation of the bearing.
In the case of rod ends, Co corresponds to the permissible load based on the weakest cross-section which results form the yield point of the outer material, **with a safety factor of 1.2.**
**The ultimate load is at least 1.5 the permissible Co load**.

## The axial load-bearing capacity:

The axial load-bearing capacity of the rod ends and the spherical bearings is limited by the axial fixing of the bushing (flanged) in the outer part.
In the case of spherical bearings without steel outer ring (types SC.. and SCP..), it must be ensured that the axial bushing support can absorb the forces given in the table (Fig. 5) both statically and dynamically.
The maximum permissible axial load is calculated on the basis of the values given in the table.

| Heavy-duty and maintenance-free series | Permissible axial load dynamic $Fa_{perm.}$ [N] | static $Fa_{perm.}$ [N] |
|---|---|---|
| SFC/SMC/SSC.. SFRC/SMRC/SSRC.. | $0.06 \cdot Co$ | $0.03 \cdot Co$ |
| SFXC/SMXC/SC.. | $0.04 \cdot Co$ | $0.02 \cdot Co$ |

Fig. 5

## Checking bearing size:

To check a bearing size with regard to its static and dynamic load-bearing capacity, the bearing must be investigated to the following criteria:

- Constant dynamic load
- Variable dynamic load
- Static load

The equivalent bearing loads are calculated from Fr and Fa.

### Dynamic load:

The inner ring carries out a swinging or pivoting movement in relation to the bushing.

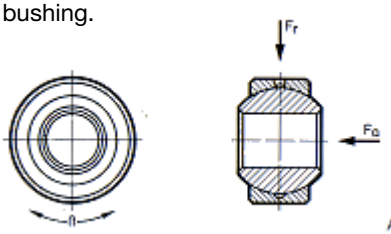



Abb. 6

### Constant dynamic load:

The dynamically equivalent bearing load P for rod ends and spherical bearings with constant dynamic loads is calculated as follows:

$$P = F_r + Y \cdot F_a \quad [N]$$

It is necessary that: $F_a <= F_{a.\ perm.}$

$F_{a.\ perm.}$ as per table (Fig. 5)

The axial factor Y is taken from the following table (Fig. 7). Intermediate values can be interpolated linearly.

| Load relation $\frac{F_a}{F_r}$ | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | > 0.5 |
|---|---|---|---|---|---|---|
| Axial factor Y | 0.8 | 1 | 1.5 | 2.5 | 3 | not suitable |

Fig. 7

Using the calculated value for P, the load ratio fc = C/P is formed and compared with the values in the table (Fig. 8). The bearing is overloaded if a value below the limit value is obtained.
P is also required for calculation of the service life.

| Bearing type | $f_o = \frac{C}{P}$ (lower limit) |
|---|---|
| lubricated | 0.5 |
| maintenance-free | 1.0 |

Fig. 8

### Variable dynamic load:

For rod ends and spherical bearings with variable radial dynamic load, the mean dymanic bearing load Fm from the individual load steps F1, F2 ... Fn and the corresponding time components q1, q2 ... qn, for instance for three load steps, are calculated as follows: (Fig. 9)

$$F_m = \sqrt{\frac{F_1^2 \cdot q_1 + F_2^2 \cdot q_2 + F_3^2 \cdot q_3}{Q}} \quad [N]$$

The dynamic bearing load is:

$$P = F_m \quad [N]$$

If there is also a constant axial load acting, P is calculated as follows:

$$P = F_m + Y \cdot F_a \quad [N]$$

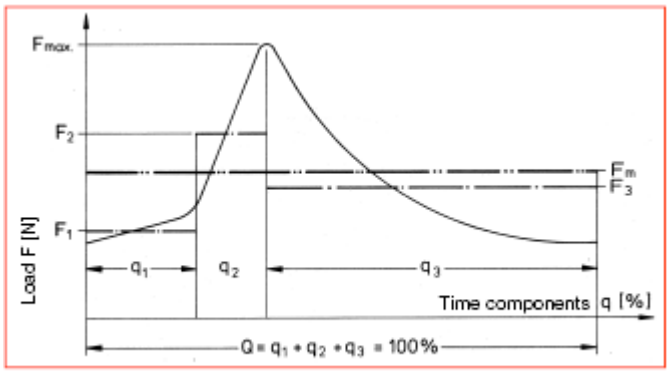



Fig. 9

In addition Fmax must be checked for static safety.

$$F_{max} \leq P_{perm.} \quad [N]$$

For Pperm. see "Permissible load".

### Static load:

The inner ring is stationary in relation to the bushing.

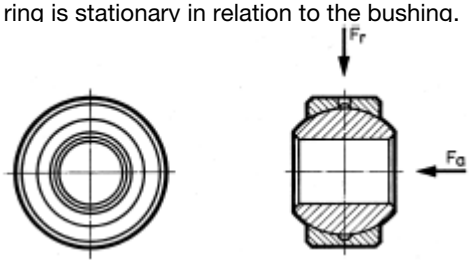



Fig. 10

For rod ends and spherical bearings with static load, the statically equivalent bearing load Po is calculated as follows:

$$P_o = F_r + Y \cdot F_a \quad [N]$$

It is necessary that: $F_a \leq F_{a\ perm.}$ [N]

$F_{a,\ perm.}$ as per table (Fig. 5)
The axial factor Y is taken from the table (Fig. 7).
$P_o$ must be $\leq P_{perm.}$. See "Permissible load" for $P_{perm.}$.

### Permissible load $P_{perm.}$:

Rod ends: $P_{perm.} = C_o \cdot b_2 \cdot b_4$ Spherical bearings: $P_{perm.} = C_o \cdot b_2$

$P_{perm.}$ = permissible load [N]
$C_o$ = static bearing capacity [N]
$b_2$ = temperature factor from table (Fig. 12)
$b_4$ = load factor from table (Fig. 11)

| Type of load | $b_4$ |
|---|---|
| +Fr invariable time | 1 |
| +Fr pulsating time | 0,5 (0,35) |
| +Fr / -Fr variable time | 0,5 (0,35) |

Fig. 11

The values written in brackets are valid for rod ends with male threads and lubricating nipples or lubrication holes.

It is necessary that: $P \leq P_{perm.}$ or $P_o \leq P_{perm.}$

## Service life:

The service life of a rod end or spherical bearing is a function of several factors, some of which are difficult to determine. A precise calculation is therefore not possible. The calculation method following, which has been proved correct in many test stand trials, gives a relatively accurate result for the service life. Influences as shocks, vibrations, soiling etc. are not taken into consideration. This calculation is based on a total abrasion of the linings of 0.3% of the diameter of the inner ring. The coefficient of the sliding friction of the linings increases of about 0.25.

$$G_h = \frac{b_1 \cdot b_2 \cdot b_3}{K \cdot \beta \cdot f} \cdot 10^7 \cdot \frac{C}{P}$$

$G_h$ = service life [h]
C = dynamic bearing capacity [N]
P = dynamic equivalent bearing load [N]
K = inner ring diameter [mm]
$\beta$ = swing angle $\geq 1$ [degrees]
(by pivoting movements $\beta = 180°$)

f = swing frequency [rpm]
$b_1$ = load direction factor (Fig.12)
$b_2$ = temperature factor (Fig.12)
$b_3$ = material factor (Fig.13)

| Operating-factors | Load direction factor $b_1$ | | Temperature factor $b_2$ | | | | |
|---|---|---|---|---|---|---|---|
| Bearing type | Load direction | | Temperature [° C] | | | | |
| | single direction | alternat. direction | 80 | 100 | 150 | 200 | 250 |
| lubricated | 1 | 2.5 | 1 | 1 | 1 | 0.8 | 0.5 |
| maintenance-free | 1 | 0.3 | 1 | 1 | 0.8 | – | – |

Fig. 12

Very low loads or running speeds result in a relatively high arithmetic service life. In practice, with a longer service life, environmental influences can acquire importance and lead to an error in the results.

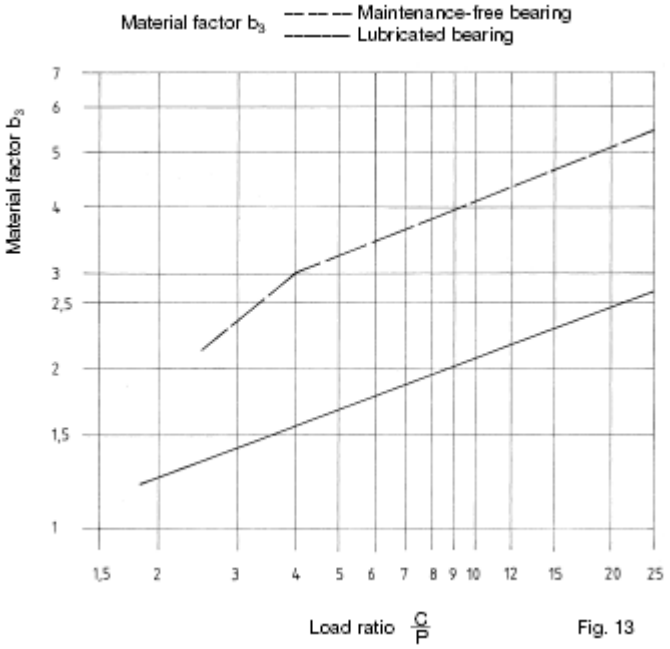



Fig. 13

If the required service life is not obtained, repeat this calculation with next bearing size up.

## Checking of linings for overheating:
## Permissible running speed:

The permissible running speed is largely a function of the surface exerted, the friction pairing, the lubrication and cooling if applicable. The heat building up in the bearing is proportional to the product of surface pressure and running speed. When checking the bearing size, therefore the p · v value must be determined and compared with the permissible value (Fig. 14). The bearing running speed must also be checked.

To avoid overheating, the following is necessary:

$$p \cdot v \leq (p \cdot v)_{perm.} \qquad \left[\frac{N}{mm^2} \cdot \frac{m}{min}\right]$$

$$v \leq v_{perm.} \qquad [m/min]$$

p = surface pressure = $k_c \cdot \frac{P}{C}$ [N/mm²]
$k_c$ = specific surface pressure (Fig. 4) [N/mm²]
v = mean running speed =
$1{,}745 \cdot 10^{-5} \cdot K \cdot \beta \cdot f$ [m/min]

Guideline values for the permissible p · v value

| Bearing type | $(p \cdot v)_{perm.}$ $\frac{N}{mm^2} \cdot \frac{m}{min}$ | Perm. running speed $v_{perm.}$ [m/min] swing | pivot |
|---|---|---|---|
| lubricated | 30 | 15 | 60 |
| maintenance-free | 80 | 60 | |

Fig. 14

## Lubricated design
### Determining of the bearing size

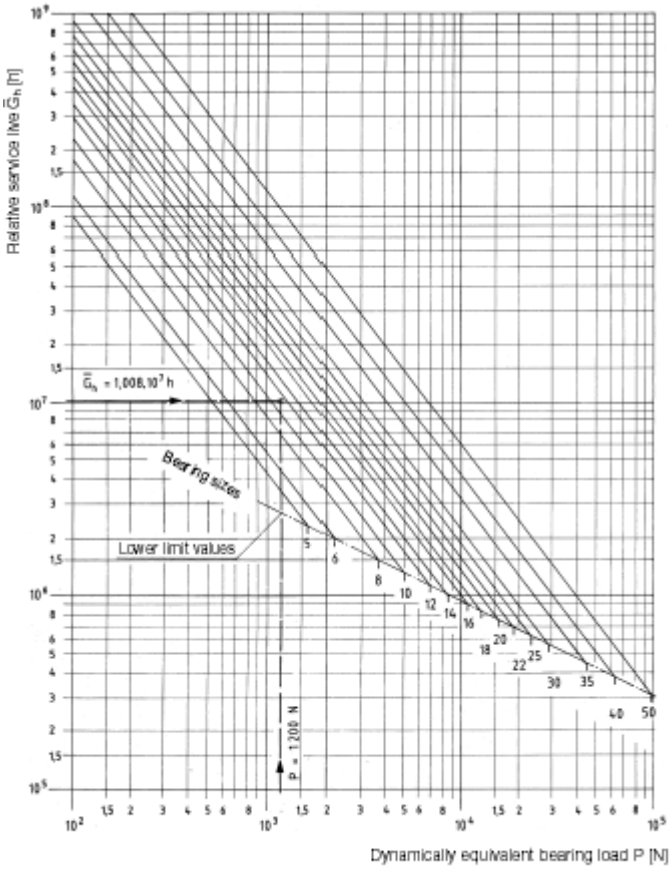



Fig. 15

### Maintenance-free design

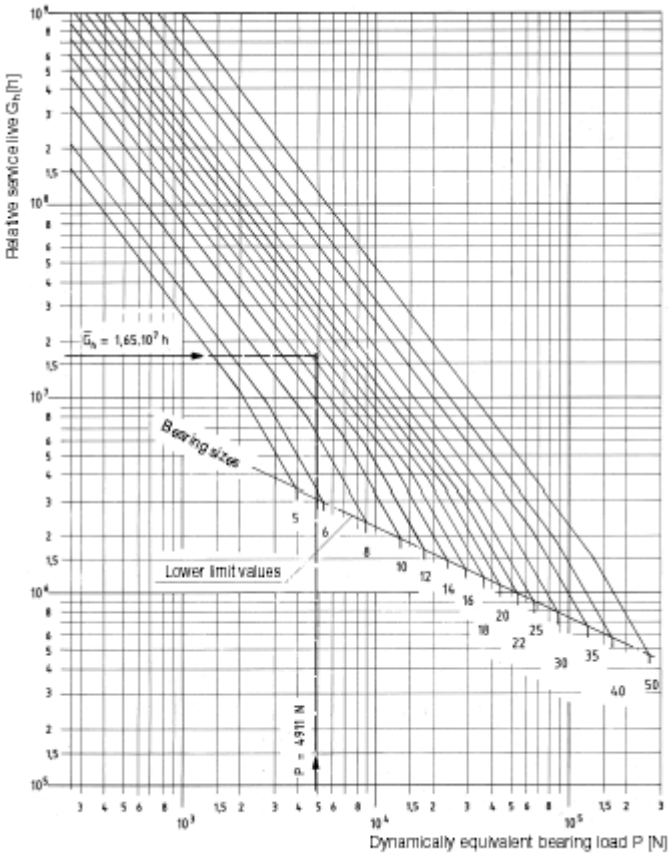



Fig. 16

The insertion of the relative service life $\bar{G}h$ as auxiliary quantity enables a correlation between the relative service life and the dynamically equivalent bearing load to be represented graphically.

The following equation applies for the relative service life:

$$\bar{G}_h = G_h \cdot \frac{\beta \cdot f}{b_1 \cdot b_2}$$

| | | |
|---|---|---|
| $\bar{G}_h$ | = relative service life | [h] |
| $G_h$ | = required service life | [h] |
| $\beta$ | = swing angle | [degrees] |
| f | = swing frequency | [rpm] |
| $b_1$ | = load direction factor (Fig. 12) | |
| $b_2$ | = temperature factor (Fig. 12) | |

Example:

A rod end with male thread is required for the following operating conditions:

| | |
|---|---|
| Alternating dynamic load $F_r$ | 1200 N |
| Swing angle $\beta$ | 30° |
| Swing frequency f | 120 rpm |
| Operating temperature | 50° C |
| Required service life $G_h$ | 7000 h |

Since the load is alternating, a lubricated design is recommended, as set forth in the "Selection" section (page 3). Thus, Fig. 12 gives $b_1 = 2.5$ and $b_2 = 1$.

Dynamically equivalent bearing load:

$$P = F_r = 1200 \text{ N}$$

Relative service life:

$$\bar{G}_h = G_h \cdot \frac{\beta \cdot f}{b_1 \cdot b_2} = 7000 \cdot \frac{30 \cdot 120}{2{,}5 \cdot 1} = 10{,}08 \cdot 10^6 \text{ h}$$

The intersection in Fig. 15 with P = 1200 N and $\bar{G}h = 10{,}08 \cdot 10^6$ h results in the bearing size 12. Thus, SMC 12 is chosen. Checking the rod end SMC 12 with regard to the permissible load Pperm. and the service life Gh, and checking the lining for overheating and determination of the lubricating intervals is conducted as shown in Example 1, page 9.

The example given in Fig. 16 is the result of the 2nd calculation example on page 9.

## Calculation examples

### Example 1:

The conveying lever on a packaging machine is to be moved via a rod end. The designs calls for a size 12 rod end.
Values dictated by design:

| | |
|---|---|
| Alternating constant dynamic radial load $F_r$ | 1200 N |
| Swing angle β | 30° |
| Swing frequency f | 120 rpm |
| Operating temperature | 50° C |

Since the load is alternating and constant, a lubricated design is recommended according to the section "Selection" (page 3), e.g. SMC 12.
Catalogue values:

| | |
|---|---|
| Dynamic bearing capacity C | 13400 N |
| Static bearing capacity $C_o$ | 17000 N |
| Inner ring ∅ K | 22.225 mm |

Requirements on rod end SMC 12:

1. Radial load $F_r$ must be smaller than the permissible load $P_{perm.}$ to avoid permanent deformation.
2. The service life $G_{h,\,req.}$ should be at least 6000 operating hours.

Calculation:

Dynamically equivalent bearing load P:

$$P = F_r + Y \cdot F_a \quad \left| \frac{F_a}{F_r} = \frac{0}{1200} = 0 \right| Y = 0$$

$$P = F_r = 1200\ N$$

Permissible rod end load $P_{perm.}$:

$$P_{perm.} = C_o \cdot b_2 \cdot b_4 \quad \left| \begin{array}{l} b_2 = 1 \text{ (acc. to Fig. 12)} \\ b_4 = 0.35 \text{ (acc. to Fig. 11)} \end{array} \right.$$

$$P_{perm.} = 17000 \cdot 1 \cdot 0.35 = 5950\ N$$

$P = 1200\ N < P_{perm.} = 5950\ N$ **(1st requirement met)**

Determination of service life $G_h$:

$$G_h = \frac{b_1 \cdot b_2 \cdot b_3}{K \cdot \beta \cdot f} \cdot 10^7 \cdot \frac{C}{P} \quad [h]$$

$b_1 = 2.5$ (Fig. 12)
$b_2 = 1$ (Fig. 12)
$b_3 = 2.1$ (Fig. 13) $\quad \left| \frac{C}{P} = \frac{13400}{1200} = 11.1 \right.$

$G_h = 7200\ h > G_{h,\,req.} = 7000\ h$ **(2nd requirement met)**

Checking of lining for overheating:

$$p = k_c \cdot \frac{P}{C} \quad [N/mm^2]$$

$k_c = 50\ N/mm^2$ (acc. to Fig. 4)

$$\frac{P}{C} = \frac{1200}{13400} = \frac{1}{11.1} = 0.089$$

$p = 50 \cdot 0{,}089\ N/mm^2 = 4.45\ N/mm^2$
$v = 1.745 \cdot 10^{-5} \cdot K \cdot \beta \cdot f = 1.745 \cdot 10^{-5} \cdot 22.225 \cdot 30 \cdot 120\ m/min$
$v = 1.4\ m/min < v_{perm.} = 15\ m/min$ (acc. to Fig. 14)
$p \cdot v = 4.45 \cdot 1.4 = 6.23 < (p \cdot v)_{perm.} = 30$ (Fig. 14)
**No overheat**

Lubrication interval:

$$t = \frac{G_h}{130} = \frac{7200}{130} = 55\ h$$

### Example 2:

A lever of a filling machine is moved via a double-action pneumatic cylinder. A maintenance-free rod end with mounting dimensions to CETOP is required.

Values dictated by design:
Variable, pulsating, radial, dynamic load
$F_1 = 2000\ N$, $F_2 = 6000\ N$, $F_3 = 3000\ N$. $F_{max} = 8000\ N$
$q_1 = 20\%$, $q_2 = 15\%$, $q_3 = 65\%$

| | |
|---|---|
| Constant axial load $F_a$ | 1000 N |
| Swing angle β | 25° |
| Swing frequency f | 60 rpm |
| Operating temperature | max. 80° C |

Requirements on rod end:
1. The dynamically equivalent bearing load P and the statically equivalent bearing load $P_o$ must be lower than the permissible load $P_{perm.}$
2. The service life $G_{h,\,req.}$ must be at least 11000 operating hours.

Calculation:

Mean dynamic bearing load $F_m$:

$$F_m = \sqrt{\frac{F_1^2 \cdot q_1 + F_2^2 \cdot q_2 + F_3^2 \cdot q_3}{Q}}$$

$$F_m = \sqrt{\frac{2000^2 \cdot 20 + 6000^2 \cdot 15 + 3000^2 \cdot 65}{100}} = 3471\ N$$

Dynamically equivalent bearing load P:

$$P = F_m + Y \cdot F_a \quad \left| \begin{array}{l} \frac{F_a}{F_m} = \frac{1000}{3471} = 0.28 \\ Y = 1.44 \text{ (interpolated acc. to Fig. 7)} \end{array} \right.$$

$P = 3471 + 1.44 \cdot 1000 = 4911\ N$

Determination of relative service life $\bar{G}_h$:

$$\bar{G}_h = G_h = \frac{\beta \cdot f}{b_1 \cdot b_2} \quad \left| \begin{array}{l} \beta = 25 \\ f = 60 \end{array} \right. \quad \left| \begin{array}{l} b_1 = 1 \text{ (Fig. 12)} \\ b_2 = 1 \text{ (Fig. 12)} \end{array} \right.$$

$$\bar{G}_h = 11000 \cdot \frac{25 \cdot 60}{1 \cdot 1} = 16.5 \cdot 10^6\ h$$

On the basis of the chart (Fig. 16) the rod end size calculated is 16
SFCP 16 CETOP is selected (page 15).

| | |
|---|---|
| Dynamic bearing capacity C | 60000 N |
| Static bearing capacity $C_o$ | 28500 N |
| Inner ring ∅ K | 28.575 mm |

Limit value $f_c = \frac{C}{P} = \frac{60000}{4911} = 12.2$ (correct acc. to Fig. 8)

Permissible road end load $P_{perm.}$:

$P_{perm.} = C_o \cdot b_2 \cdot b_4 \quad | b_2 = 1$ (Fig. 12) $\quad | b_4 = 0.5$ (Fig. 11)
$P_{perm.} = 28500 \cdot 1 \cdot 0.5 = 14250\ N$
$P_o = F_{max} = 8000\ N < P_{perm.}$
$P = 4911\ N < P_{perm.}$ } **1st requirement met**

Determination of service line $G_h$:

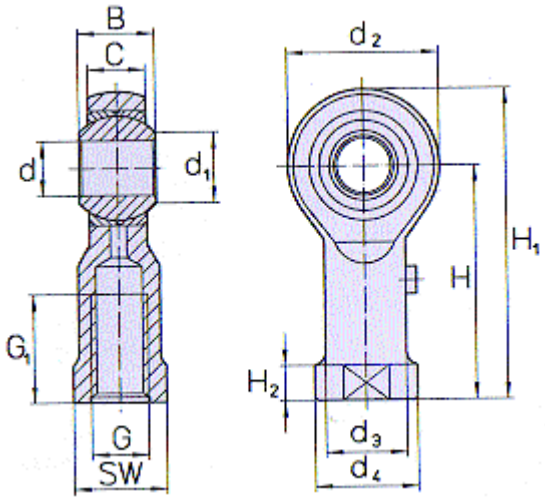
$$G_h = \frac{b_1 \cdot b_2 \cdot b_3}{K \cdot \beta \cdot f} \cdot 10^7 \cdot \frac{C}{P} \quad \left| b_3 = 4.2, \text{ for } \frac{C}{P} = 12.2 \text{ (Fig. 13)} \right.$$

$$G_h = \frac{1 \cdot 1 \cdot 4}{28.575 \cdot 25 \cdot 60} \cdot 10_7 \cdot 12.2 = 11900\ h$$

$G_{h,\,req.} = 11000\ h < G_h = 11900\ h$ **(2nd requirement met)**

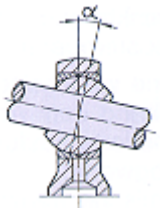
# Relubricatable heavy-duty rod ends with female thread

Friction pairing steel on heavy-duty bronze




Series **SFC..**
**SFXC..**
**SFRC..** (rustproof)

**Angle of misalignment**




| Series SFC.. | d | B | C | $d_1$ | $d_2$ | $d_3$ | $d_4$ | H | $H_1$ | $H_2$ | $G_1$ | K Ball dia ∅ | G Thread | SW | Bearing capacities dynamic C N | Bearing capacities static $C_o$* SFC/SFRC N | Bearing capacities static $C_o$* SFXC N | Angle of misalign. α° | Weight each ≈ g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 4.8 | 3.6 | 3.6 | 9 | 3.8 | 4.5 | 16 | 20.5 | 2.5 | 7 | 6.000 | M2 | 4.5 | 900 | 1900 | — | 16 | 3 |
| 3 | 3 | 6 | 4.5 | 5.1 | 12 | 5 | 6.5 | 21 | 27 | 3 | 10 | 7.937 | M3 | 5.5 | 1 500 | 3600/2200 | — | 15 | 7 |
| 4 | 4 | 7 | 5.25 | 6.5 | 14 | 6.5 | 8.5 | 24 | 31 | 3.5 | 12 | 9.520 | M4 | 7 | 2 260 | 4500/2700 | — | 14 | 11 |
| 5 | 5 | 8 | 6 | 7.7 | 18 | 9 | 11 | 27 | 36 | 4 | 10 | 11.112 | M5 | 9 | 3 250 | 6 000 | 10 000 | 13 | 18 |
| 6 | 6 | 9 | 6.75 | 8.9 | 20 | 10 | 13 | 30 | 40 | 5 | 12 | 12.700 | M6 | 11 | 4 300 | 7 000 | 12 000 | 13 | 27 |
| 8 | 8 | 12 | 9 | 10.4 | 24 | 12.5 | 16 | 36 | 48 | 5 | 16 | 15.875 | M8 | 14 | 7 200 | 12 000 | 21 000 | 13 | 46 |
| 10 | 10 | 14 | 10.5 | 12.9 | 28 | 15. | 19. | 43 | 57. | 6.5 | 20 | 19.050 | M10 | 17 | 10 000 | 14 500 | 28 000 | 13 | 78 |
| 12 | 12 | 16 | 12 | 15.4 | 32 | 17.5 | 22 | 50 | 66. | 6.5 | 22 | 22.225 | M12 | 19 | 13 400 | 17 000 | 34 000 | 13 | 115 |
| 14 | 14 | 19 | 13.5 | 16.8 | 36 | 20. | 25. | 57 | 75. | 8. | 25 | 25.400 | M14 | 22 | 17 000 | 24 000 | 46 000 | 15 | 170 |
| 16 | 16 | 21 | 15 | 19.3 | 42 | 22. | 27. | 64 | 85. | 9. | 28 | 28.575 | M16 | 22 | 21 600 | 28 500 | 55 000 | 15 | 230 |
| 18 | 18 | 23 | 16.5 | 21.8 | 46 | 25 | 31 | 71 | 94 | 10 | 32 | 31.750 | M18x1.5 | 27 | 26 000 | 40 000 | 66 000 | 15 | 320 |
| 20 | 20 | 25. | 18. | 24.3 | 50 | 27.5 | 34 | 77 | 102 | 10 | 33 | 34.925 | M20x1.5 | 32 | 31 500 | 45 000 | 76 000 | 15 | 420 |
| 22 | 22 | 28. | 20 | 25.8 | 54 | 30 | 37 | 84 | 111 | 12 | 37 | 38.100 | M22x1.5 | 32 | 38 000 | 52 000 | 93 000 | 15 | 540 |
| 25 | 25 | 31 | 22 | 29.6 | 60 | 33.5 | 42 | 94 | 124 | 12 | 42 | 42.850 | M24x2. | 36 | 47 500 | 60 000 | 110 000 | 15 | 750 |
| 30 | 30 | 37 | 25 | 34.8 | 70 | 40 | 50 | 110 | 145 | 15 | 51 | 50.800 | M30x2 | 41 | 64 000 | 81 000 | 150 000 | 15 | 1130 |
| 35 | 35 | 43 | 30 | 40.3 | 80 | 49 | 60 | 125 | 165 | 20 | 56 | 59.000 | M36x2 | 50 | 90 000 | 95 000 | 170 000 | 16 | 1600 |
| 40 | 40 | 49 | 35 | 44.2 | 90 | 57 | 69 | 142 | 187 | 25 | 60 | 66.000 | M42x2 | 60 | 120 000 | 130 000 | 235 000 | 15 | 2400 |
| 50 | 50 | 60 | 45 | 55.8 | 116 | 65 | 78 | 160 | 218 | 25 | 65 | 82.000 | M48x2 | 65 | 190 000 | 235 000 | 440 000 | 14 | 5000 |
| Tolerance ± | H7 | 0 0.12 | — | — | — | — | — | — | — | — | 1.0 0 | — | DIN 13 6 H | 0 0.3 | — | — | — | — | — |

The sizes 2, 3 and 4 are not included in DIN ISO 12240-4.

*Safety factor $C_o$ see page 5

## Material

**Series SFC..**
**Outer part:** Up to size 14 free-cutting steel 1.0718, from size 16 material 1.0501, galvanized and chromalized to DIN 50961.
**Bushings:** Cu Sn 8/Cu Zn 40 Al 2 F59, 2.0550.31.
**Inner ring:** Roller bearing steel 1.3505, hardened, ground and polished.

**Series SFXC..** (available from size 5)
**Outer part:** Material 1.7225 tempered or similar, galvanized and chromalized to DIN 50961.
**Bushings:** As for SFC..
**Inner ring:** As for SFC..

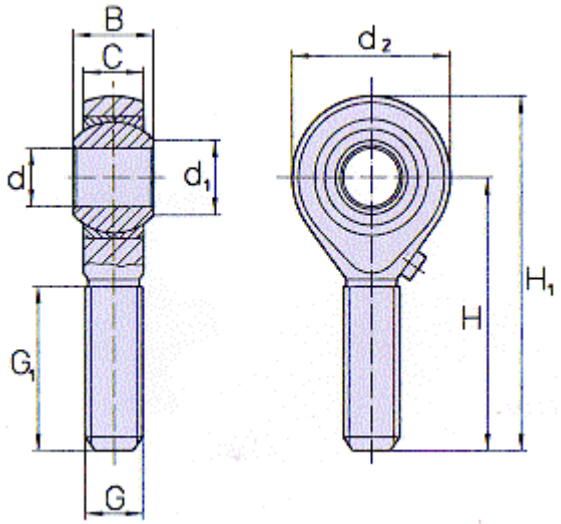
**Series SFRC..** (available from size 3)
**Outer part:** Stainless steel 1.4305, from size 16, forged.
**Bushings:** As for SFC..
**Inner ring:** As for SFC.. but hard-chromed; if required stainless steel.

## Design

**Bearing slackness:** Depending on size, between 0.01 and 0.09 mm radially. With reduced or increased slackness see page 4. Designation example SFC 10 **C 2**.
**Thread:** DIN 13 - 6 H, r.h. or l.h. L.h. thread designation example SF**L** C 10. Special threads on request, see pages 14 and 15 for CETOP standard.
**Lubricating nipple:** Size 5-50 funnel-type DIN 3405, form D.
**Stainless inner ring:** From size 5 with stainless inner ring of material 1.4034 possible.
Designation example SFRC 10 **IR**.
**Hard-chromed inner ring:** From size 5 with hard-chromed inner ring (on bearing surface only).
Designation example SFC 10 **IH**.
**Hard-chromed outer part and inner ring:**
Designation example SFC 10 **H**.
**Sealed design:** Sizes 8-30 can be supplied with replaceable sealing sleeves (see page 19).

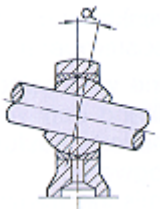
# Relubricatable heavy-duty rod ends with male thread

Friction pairing steel on heavy-duty bronze




Series **SMC..**
**SMXC..**
**SMRC..** (rustproof)

**Angle of misalignment**




| Series SMC.. | d | B | C | $d_1$ | $d_2$ | H | $H_1$ | $G_1$ | K Ball dia. ∅ | G Thread | Bearing capacities dynamic C N | static $C_o$* SMC/SMRC N | static $C_o$* SMXC N | Angle of misalig. α° | Weight each ≈ g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 4.8 | 3.6 | 3.6 | 9 | 18 | 22.5 | 9 | 6.000 | M2 | 900 | 400 | — | 16 | 2 |
| 3 | 3 | 6 | 4.5 | 5.1 | 12 | 27 | 33. | 15 | 7.937 | M3 | 1 500 | 1200/700 | — | 15 | 5 |
| 4 | 4 | 7 | 5.25 | 6.5 | 14 | 30 | 37. | 18 | 9.520 | M4 | 2 260 | 2000/1200 | — | 14 | 9 |
| 5 | 5 | 8. | 6. | 7.7 | 18 | 33 | 42. | 20 | 11.112 | M5 | 3 250 | 3 000 | 6 000 | 13 | 15 |
| 6 | 6 | 9. | 6.75 | 8.9 | 20 | 36 | 46. | 22 | 12.700 | M6 | 4 300 | 4 000 | 8 800 | 13 | 20 |
| 8 | 8 | 12. | 9. | 10.4 | 24 | 42 | 54. | 25 | 15.875 | M8 | 7 200 | 8 000 | 16 000 | 13 | 38 |
| 10 | 10 | 14. | 10.5 | 12.9 | 28 | 48 | 62. | 29 | 19.050 | M10 | 10 000 | 13 000 | 26 000 | 13 | 62 |
| 12 | 12 | 16. | 12. | 15.4 | 32 | 54 | 70. | 33 | 22.225 | M12 | 13 400 | 17 000 | 34 000 | 13 | 92 |
| 14 | 14 | 19. | 13.5 | 16.8 | 36 | 60 | 78. | 36 | 25.400 | M14 | 17 000 | 24 000 | 46 000 | 15 | 135 |
| 16 | 16 | 21. | 15. | 19.3 | 42 | 66 | 87. | 40 | 28.575 | M16 | 21 600 | 28 500 | 55 000 | 15 | 205 |
| 18 | 18 | 23. | 16.5 | 21.8 | 46 | 72 | 95. | 44 | 31.750 | M18x1.5 | 26 000 | 38 000 | 66 000 | 15 | 285 |
| 20 | 20 | 25 | 18 | 24.3 | 50 | 78 | 103. | 47 | 34.925 | M20x1.5 | 31 500 | 42 000 | 76 000 | 15 | 360 |
| 22 | 22 | 28 | 20 | 25.8 | 54 | 84 | 111. | 51 | 38.100 | M22x1.5 | 38 000 | 52 000 | 93 000 | 15 | 475 |
| 25 | 25 | 31 | 22 | 29.6 | 60 | 94 | 124 | 57 | 42.850 | M24x2. | 47 500 | 60 000 | 110 000 | 15 | 650 |
| 30 | 30 | 37 | 25 | 34.8 | 70 | 110 | 145 | 66 | 50.800 | M30x2. | 64 000 | 81 000 | 150 000 | 15 | 1050 |
| 35 | 35 | 43 | 30 | 40.3 | 80 | 140 | 180 | 85 | 59.000 | M36x2. | 90 000 | 95 000 | 170 000 | 16 | 1780 |
| 40 | 40 | 49 | 35 | 44.2 | 90 | 150 | 195 | 90 | 66.000 | M42x2. | 120 000 | 130 000 | 235 000 | 15 | 2600 |
| 50 | 50 | 60 | 45 | 55.8 | 116 | 185 | 243 | 105 | 82.000 | M48x2. | 190 000 | 235 000 | 440 000 | 14 | 4900 |
| Tolerance ± | H7 | 0 0.12 | — | — | — | — | — | 1.0 0 | — | DIN 13 6 g | — | — | — | — | — |

The sizes 3 and 4 are not included in DIN ISO 12240-4.

*Safety factor $C_o$ see page 5

## Material

**Series SMC..**
**Outer part:** Up to size 14 free-cutting steel 1.0718, from size 16 material 1.0501 galvanized and chromalized to DIN 50961.
**Bushings:** Cu Sn 8/Cu Zn 40 Al 2 F59, 2.0550.31.
**Inner ring:** Roller bearing steel 1.3505, hardened, ground and polished.

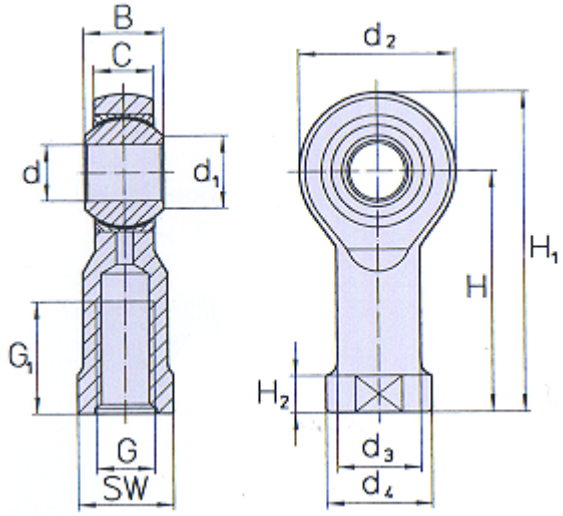
**Series SMXC..** (available from size 5)
**Outer part:** Material 1.7225 tempered or similar, galvanized and chromalized to DIN 50961.
**Bushings:** As for SMC..
**Inner ring:** As for SMC..
**Series SMRC..** (available form size 3) Outer part: Stainless steel 1.4305, from size 16 forged. Bushings: as for SMC..
**Inner ring:** as for SMC.. but hard-chromed, if required stainless steel.

## Design

Bearing slackness: Depending on size between 0.01 and 0.09 mm radially. With reduced or increased slackness see page 4.
Designation example SMC 10 **C 2**.
**Thread:** DIN 13 - 6 g, r.h. or l.h. Lh. thread designation example SM**L** C 10. Special threads on request.
**Lubricating nipple:** Size 6-50 funnel-type DIN 3405, form D.
**Stainless inner ring:** From size 5 stainless steel inner ring of material 1.4034 possible.
Designation example SMRC 10 **IR**.
**Hard-chromed inner ring:** From size 5 available with hard-chromed inner ring (on bearing surface only).
Designation example SMC 10 **IH**.
**Hard-chromed outer part and inner ring:**
Designation example SMC 10 **H**.
**Sealed design:** Sizes 8-30 can be supplied with replaceable sealing sleeves (see page 19).

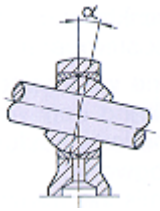
# Maintenance-free heavy-duty rod ends with female thread

Friction pairing steel on PTFE bronze fabric




Series **SFCP..**
**SFXCP..**
**SFRCP..** (rustproof)

**Angle of misalignment**




| Series SFCP.. | d | B | C | $d_1$ | $d_2$ | $d_3$ | $d_4$ | H | $H_1$ | $H_2$ | $G_1$ | K Ball dia. ∅ | G Thread | SW | Bearing capacities dynamic C N | static $C_o$* SFCP/SFRCP N | static $C_o$* SFXCP N | Angle of misalign. α° | Weight each ≈ g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 3 | 6 | 4.5 | 5.2 | 12 | 5 | 6.5 | 21 | 27 | 3 | 10 | 7.937 | M3 | 5.5 | 4 700 | 2700/1600 | — | 15 | 7 |
| 4 | 4 | 7 | 5.25 | 6.5 | 14 | 6.5 | 8.5 | 24 | 31 | 3.5 | 10 | 9.520 | M4 | 7 | 6 700 | 3500/2000 | — | 14 | 11 |
| 5 | 5 | 8 | 6 | 7.7 | 18 | 9 | 11 | 27 | 36 | 4 | 10 | 11.112 | M5 | 9 | 7 800 | 6 000 | 10 000 | 13 | 17 |
| 6 | 6 | 9 | 6.75 | 8.9 | 20 | 10 | 13 | 30 | 40 | 5 | 12 | 12.700 | M6 | 11 | 10 900 | 7 000 | 12 000 | 13 | 25 |
| 8 | 8 | 12 | 9 | 10.4 | 24 | 12.5 | 16 | 36 | 48 | 5 | 16 | 15.875 | M8 | 14 | 18 000 | 12 000 | 21 000 | 13 | 43 |
| 10 | 10 | 14 | 10.5 | 12.9 | 28 | 15 | 19 | 43 | 57 | 6.5 | 20 | 19.050 | M10 | 17 | 27 000 | 14 500 | 28 000 | 13 | 75 |
| 12 | 12 | 16 | 12 | 15.4 | 32 | 17.5 | 22. | 50 | 66 | 6.5 | 22 | 22.225 | M12 | 19 | 36 000 | 17 000 | 34 000 | 13 | 110 |
| 14 | 14 | 19 | 13.5 | 16.8 | 36 | 20 | 25 | 57 | 75 | 8 | 25 | 25.400 | M14 | 22 | 48 000 | 24 000 | 46 000 | 15 | 160 |
| 16 | 16 | 21 | 15 | 19.3 | 42 | 22 | 27 | 64 | 85 | 8 | 28 | 28.575 | M16 | 22 | 60 000 | 28 500 | 55 000 | 15 | 220 |
| 18 | 18 | 23 | 16.5 | 21.8 | 46 | 25 | 31 | 71 | 94 | 10 | 32 | 31.750 | M18x1,5 | 27 | 74 000 | 40 000 | 66 000 | 15 | 315 |
| 20 | 20 | 25 | 18 | 24.3 | 50 | 27.5 | 34 | 77 | 102 | 10 | 33 | 34.925 | M20x1,5 | 32 | 90 000 | 45 000 | 76 000 | 15 | 400 |
| 22 | 22 | 28 | 20 | 25.8 | 54 | 30 | 37 | 84 | 111 | 12 | 37 | 38.100 | M22x1,5 | 32 | 110 000 | 52 000 | 93 000 | 15 | 515 |
| 25 | 25 | 31 | 22 | 29.6 | 60 | 33.5 | 42 | 94 | 124 | 12 | 42 | 42.850 | M24x2 | 36 | 136 000 | 60 000 | 110 000 | 15 | 710 |
| 30 | 30 | 37 | 25 | 34.8 | 70 | 40 | 50 | 110 | 145 | 15 | 51 | 50.800 | M30x2 | 41 | 186 000 | 81 000 | 150 000 | 15 | 1130 |
| 35 | 35 | 43 | 30 | 40.3 | 80 | 49 | 60 | 125 | 165 | 20 | 56 | 59.000 | M36x2 | 50 | 264 000 | 95 000 | 170 000 | 16 | 1850 |
| 40 | 40 | 49 | 35 | 44.2 | 90 | 57 | 69 | 142 | 187 | 25 | 60 | 66.000 | M42x2 | 60 | 348 000 | 130 000 | 235 000 | 15 | 2750 |
| 50 | 50 | 60 | 45 | 58.8 | 116 | 65 | 78 | 160 | 218 | 25 | 65 | 82.000 | M48x2 | 65 | 550 000 | 235 000 | 440 000 | 14 | 4800 |
| Tolerance ± | H7 | 0 0.12 | — | — | — | — | — | — | — | — | 1.0 0 | — | DIN 13 6 H | 0 0.3 | — | — | — | — | — |

The sizes 3 and 4 are not included in DIN ISO 12240-4.

*Safety factor $C_o$ see page 5

## Material

**Series SFCP..**
Outer part: Up to size 14 free-cutting steel 1.0718. from size 16 material 1.0501. galvanized and chromalized to DIN50961.
**Bushings:** Cu Sn 8/Cu Zn 40 Al 2 F59. galvanized, lined with permanently affixed sliding foil, consisting of PTFE with a bronze supporting fabric.
**Inner ring:** Roller bearing steel 1,3505, hardened, ground and polished.

**Series SFXCP.** (available from size 5)
Outer part: Material 1.7225 tempered or similar, galvanized and chromalized to DIN 50961.
**Bushings:** As for SFCP..
**Inner ring:** As for SFCP..

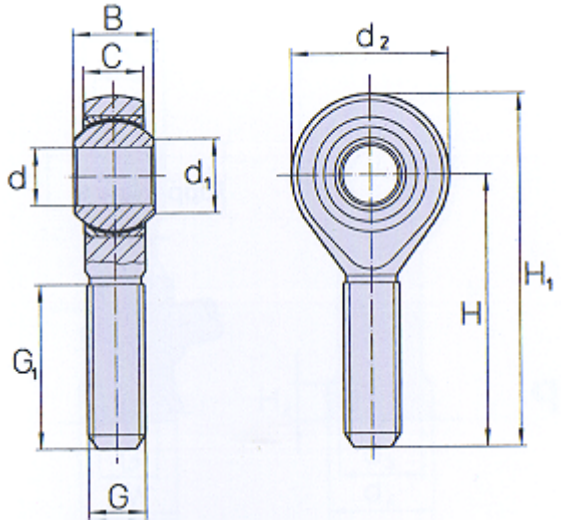
**Series SFRCP..** (available from size 3) Outer part: Stainless steel 1.4305. from size 16 forged.
**Bushings:** As for SFCP.., if required stain-less steel.
**Inner ring:** As for SFCP.. but hard-chromed; if required stain-less steel.

## Design

**Bearing slackness:** Depending on size, between 0.002 and 0.020 mm radially. See page 4 for precise details. Designation example SFCP 10 **C 2**.
**Thread:** DIN 13 - 6 H, r.h. or l.h. L.h. thread designation example SF**L** CP 10. Special thread on request, see pages 14 and 15 for CETOP standard.
**Stainless inner ring:** From size 5 with stainless inner ring of material 1.4034 possible.
Designation example SFRCP 10 **IR.**
**Hard-chromed inner ring:** From size 5 available with hard-chromed inner ring (on bearing surface only). Designation example SFCP 10 **IH.**
**Hard-chromed outer part and inner ring:**
Designation example SFCP 10 **H**.
**Sealed design:** Sizes 8-30 can be supplied with replaceable sealing sleeves (see page 19).

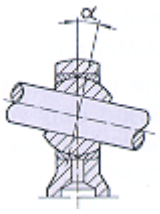
# Maintenance-free heavy-duty rod ends with male thread

Friction pairing steel on PTFE bronze fabric




Series **SMCP..**
**SMXCP..**
**SMRCP..** (rustproof)

**Angle of misalignment**




| Series SMCP.. | d | B | C | $d_1$ | $d_2$ | H | $H_1$ | $G_1$ | K Ball dia. ∅ | G Thread | Bearing capacities dynamic C N | static $C_o$* SMCP/SMRCP N | static $C_o$* SMXCP N | Angle of misalign. α° | Weight each ≈ g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 3 | 6 | 4.5 | 5.1 | 12 | 27 | 33 | 15 | 7.937 | M3 | 4 700 | 900/500 | — | 15 | 5 |
| 4 | 4 | 7 | 5.25 | 6.5 | 14 | 30 | 37 | 18 | 9.520 | M4 | 6 700 | 1500/900 | — | 14 | 9 |
| 5 | 5 | 8 | 6 | 7.7 | 18 | 33 | 42 | 20 | 11.112 | M5 | 7 800 | 3 000 | 6 000 | 13 | 15 |
| 6 | 6 | 9 | 6.75 | 8.9 | 20 | 36 | 46 | 22 | 12.700 | M6 | 10 900 | 4 000 | 8 800 | 13 | 20 |
| 8 | 8 | 12 | 9 | 10.4 | 24 | 42 | 54 | 25 | 15.875 | M8 | 18 000 | 8 000 | 16 000 | 13 | 38 |
| 10 | 10 | 14 | 10.5 | 12.9 | 28 | 48 | 62 | 29 | 19.050 | M10 | 27 000 | 13 000 | 26 000 | 13 | 60 |
| 12 | 12 | 16 | 12 | 15.4 | 32 | 54 | 70 | 33 | 22.225 | M12 | 36 000 | 17 000 | 34 000 | 13 | 90 |
| 14 | 14 | 19 | 13.5 | 16.8 | 36 | 60 | 78 | 36 | 25.400 | M14 | 48 000 | 24 000 | 46 000 | 15 | 135 |
| 16 | 16 | 21 | 15 | 19.3 | 42 | 66 | 87 | 40 | 28.575 | M16 | 60 000 | 28 500 | 55 000 | 15 | 200 |
| 18 | 18 | 23 | 16.5 | 21.8 | 46 | 72 | 95 | 44 | 31.750 | M18x1.5 | 74 000 | 40 000 | 66 000 | 15 | 280 |
| 20 | 20 | 25 | 18 | 24.3 | 50 | 78 | 103 | 47 | 34.925 | M20x1.5 | 90 000 | 45 000 | 76 000 | 15 | 350 |
| 22 | 22 | 28 | 20 | 25.8 | 54 | 84 | 111 | 51 | 38.100 | M22x1.5 | 110 000 | 52 000 | 93 000 | 15 | 470 |
| 25 | 25 | 31 | 22 | 29.6 | 60 | 94 | 124 | 57 | 42.850 | M24x2 | 136 000 | 60 000 | 110 000 | 15 | 650 |
| 30 | 30 | 37 | 25 | 34.8 | 70 | 110 | 145 | 66 | 50.800 | M30x2 | 186 000 | 81 000 | 150 000 | 15 | 1090 |
| 35 | 35 | 43 | 30 | 40.3 | 80 | 140 | 180 | 85 | 59.000 | M36x2 | 264 000 | 95 000 | 170 000 | 16 | 1800 |
| 40 | 40 | 49 | 35 | 44.2 | 90 | 150 | 195 | 90 | 66.000 | M42x2 | 348 000 | 130 000 | 235 000 | 15 | 2500 |
| 50 | 50 | 60 | 45 | 55.8 | 116 | 185 | 243 | 105 | 82000 | M48x2 | 550 000 | 235 000 | 440 000 | 14 | 4900 |
| Tolerance ± | H7 | 0 0.12 | — | — | — | — | — | 1.0 0 | — | DIN 13 6g | — | — | — | — | — |

The sizes 3 and 4 are not included in DIN ISO 12240-4.

*Safety factor $C_o$ see page 5

## Material

**Series SMCP..**
**Outer part:** Up to size 14 free-cutting steel 1.0718, from size 16 material 1.0501, galvanized and chromalized to DIN50961.
**Bushings:** Cu Sn 8/Cu Zn 40 Al 2 F59 galvanized, lined with permanently affixed sliding foil, consisting of PTFE with a bronze supporting fabric.
**Inner ring:** Roller bearing steel 1.3505, hardened, ground and polished.

**Series SMXCP..** (available from size 5)
**Outer part:** Material 1.7225 tempered or similar, galvanized and chromalized to DIN 50961.
**Bushings:** As for SMCR.
**Inner ring:** As for SMCR.

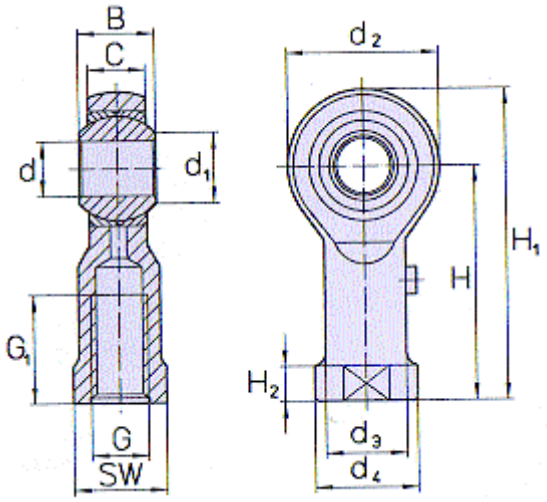
**Series SMRCP..** (available from size 3)
**Outer part:** Stainless steel 1.4305, from size 16 forged.
**Bushings:** As for SMCR., if required stainless steel.
**Inner ring:** As for SMCR. but hard-chromed; if required stainless steel.

## Design

**Bearing slackness:** Depending on size, between 0.002 and 0.020 mm radially. See page 4 for precise details. Designation example SMCP 10 **C 2**.
**Thread:** DIN 13 - 6 g, r.h. or l.h. L.h. designation example SMLCP 10. Special thread on request.
**Stainless inner ring:** From size 5 with stainless steel inner ring of material 1.4034 possible.
Designation example SMRCP 10 **IR**.
**Hard-chromed inner ring:** From size 5 available with hard-chromed inner ring (on bearing surface only). Designation example SMCP 10 **IH**.
**Hard-chromed outer part and inner ring:** Designation example SMCP 10 **H**.
**Sealed design:** Sizes 8-30 can be supplied with replaceable sealing sleeves (see page 19).

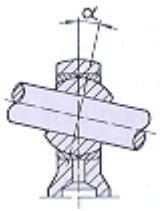
# Relubricatable heavy-duty rod ends for pneumatic cylinders

Friction pairing steel on heavy-duty bronze
Mounting dimensions: CETOP




Series **SFC..CETOP**

**Angle of misalignment**




| Series SFC.. | d | B | C | $d_1$ | $d_2$ | $d_3$ | $d_4$ | H | $H_1$ | $H_2$ | $G_1$ | K Ball dia. ∅ | G Thread | SW | Bearing capacities dynamic C N | Bearing capacities static $C_o$** SFC/SFRC N | Bearing capacities static $C_o$** SFXC N | Angle of misalign. α° | Weight each ≈ g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 5 | 8 | 6. | 7.7 | 18 | 9 | 11 | 27 | 36 | 4 | 10 | 11.112 | M4 | 9 | 3 250 | 6 000 | 10 000 | 13 | 17 |
| 6* | | | | | | | | | | | | | | | | | | | |
| 8* | | | | | | | | | | | | | | | | | | | |
| 10 | 10 | 14 | 10.5 | 12.9 | 28 | 15 | 19 | 43 | 57 | 6.5 | 20 | 19.050 | M10x1.25 | 17 | 10 000 | 14 500 | 28 000 | 13 | 75 |
| 12 | 12 | 16 | 12 | 15.4 | 32 | 17.5 | 22 | 50 | 66 | 6.5 | 22 | 22.225 | M12x1.25 | 19 | 13 400 | 17 000 | 34 000 | 13 | 110 |
| 16 | 16 | 21 | 15 | 19.3 | 42 | 22 | 27 | 64 | 85 | 8 | 28 | 28.575 | M16x1.5 | 22 | 21 600 | 28 500 | 55 000 | 15 | 220 |
| 20* | | | | | | | | | | | | | | | | | | | |
| 25* | | | | | | | | | | | | | | | | | | | |
| 30 | 30 | 37 | 25 | 34.8 | 70 | 40 | 50 | 110 | 145 | 15 | 51 | 50.800 | M27x2 | 41 | 64 000 | 81 000 | 150 000 | 15 | 1130 |
| 35* | | | | | | | | | | | | | | | | | | | |
| 40* | | | | | | | | | | | | | | | | | | | |
| 50* | | | | | | | | | | | | | | | | | | | |
| Tolerance ± | H7 | 0 0.12 | — | — | — | — | — | — | — | — | 1.0 0 | — | DIN 13 6 H | 0 0.3 | — | — | — | — | — |

*Sizes 6, 8, 20, 25 and 35 to 50 correspond to the rod ends on page 10.

**Safety factor $C_o$ see page 5

## Material

**Series SFC...CETOP**
**Outer part:** Up to size 14 free-cutting steel 1.0718, from size 16 material 1.0501, galvanized and chromalized to DIN 50961.
**Bushings:** Cu Sn 8/Cu Zn 40 Al 2 F59, 2.0550.31.
**Inner ring:** Roller bearing steel 1.3505, hardened, ground and polished.

**Series SFXC...CETOP** (available from size 5)
**Outer part:** Material 1.7225 tempered or similar, galvanized and chromalized to DIN 50961.
**Bushings:** As for SFC..
**Inner ring:** As for SFC..

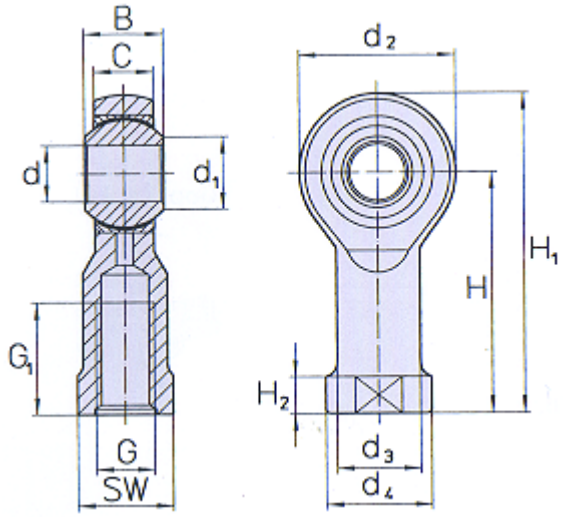
**Series SFRC...CETOP** (available from size 5)
**Outer part:** Stainless steel 1.4305, from size 16 forged.
**Bushings:** As for SFC..
**Inner ring:** As for SFC.. but hard-chromed; if required stainless steel.

## Design

**Bearing slackness:** Depending on size, between 0.002 and 0.090 mm radially. With reduced or increased slackness see page 4.
Designation example SFC 10 **C 2** CETOP.
**Thread:** DIN 13 - 6 H, r.h. or l.h. L.h. thread designation example SF**L** C 10 CETOP.
**Lubricating nipple:** Sizes 5-50 funnel-type DIN 3405, form D.
**Stainless inner ring:** From size 5 stainless steel inner ring of material 1.4034 possible.
Designation example SFRC 10 **IR** CETOP.
**Hard-chromed inner ring:** From size 5 available with hard-chromed inner ring (on bearing surface only).
Designation example SFC 10 **IH** CETOP.
**Hard-chromed outer part and inner ring:**
Designation example SFC 10 **H** CETOP.
**Sealed design:** Sizes 8-30 can be supplied with replaceable sealing sleeves (see page 19).

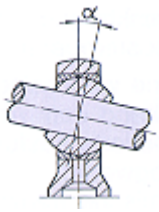
# Relubricatable heavy-duty rod ends for pneumatic cylinders

Friction pairing steel on PTFE bronze fabric
Mounting dimensions: CETOP




Series **SFCP ..CETOP**

**Angle of misalignment**




| Series SFCP.. | d | B | C | $d_1$ | $d_2$ | $d_3$ | $d_4$ | H | $H_1$ | $H_2$ | $G_1$ | K Ball dia. ∅ | G Thread | SW | Bearing capacities dynamic C N | Bearing capacities static $C_o$** SFCP/SFRCP N | Bearing capacities static $C_o$** SFXCP N | Angle of misalign. α° | Weight each ≈ g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 5 | 8 | 6 | 7.7 | 18 | 9 | 11 | 27 | 36 | 4 | 10 | 11.112 | M4 | 9 | 7 800 | 6 000 | 10 000 | 13 | 15 |
| 6* | | | | | | | | | | | | | | | | | | | |
| 8* | | | | | | | | | | | | | | | | | | | |
| 10 | 10 | 14 | 10.5 | 12.9 | 28 | 15 | 19 | 43 | 57 | 6.5 | 20 | 19.050 | M10x1.25 | 17 | 27 000 | 14 500 | 28 000 | 13 | 60 |
| 12 | 12 | 16 | 12 | 15.4 | 32 | 17.5 | 22 | 50 | 66 | 6.5 | 22 | 22.225 | M12x1.25 | 19 | 36 000 | 17 000 | 34 000 | 13 | 90 |
| 16 | 16 | 21 | 15 | 19.3 | 42 | 22 | 27 | 64 | 85 | 8 | 28 | 28.575 | M16x1.5 | 22 | 60 000 | 28 500 | 55 000 | 15 | 200 |
| 20* | | | | | | | | | | | | | | | | | | | |
| 25* | | | | | | | | | | | | | | | | | | | |
| 30 | 30 | 37 | 25 | 34.8 | 70 | 40 | 50 | 110 | 145 | 15 | 51 | 50.800 | M27x2 | 41 | 186 000 | 81 000 | 150 000 | 15 | 1090 |
| 35* | | | | | | | | | | | | | | | | | | | |
| 40* | | | | | | | | | | | | | | | | | | | |
| 50* | | | | | | | | | | | | | | | | | | | |
| Tolerance ± | H7 | 0 0.12 | — | — | — | — | — | — | — | — | 1.0 0 | — | DIN 13 6 H | 0 0.3 | — | — | — | — | — |

*Sizes 6, 8, 20, 25 and 35 to 50 correspond to the rod ends on page 12.

**Safety factor $C_o$ see page 5

## Material

**Series SFCP...CETOP**
**Outer part:** Up to size14 free-cutting steel 1.0718, from size 16 material 1.0501, galvanized and chromalized to DIN 50961.
**Bushings:** Cu Sn 8/Cu Zn 40 Al 2 F59, galvanized, lined with permanently affixed sliding foil, consisting of PTFE with a bronze supporting fabric.
**Inner ring:** Roller bearing steel 1.3505, hardened, ground and polished.

**Series SFXCP...CETOP** (available from size 5)
**Outer part:** Material 1.7225 tempered or similar, galvanized and chromalized to DIN 50961.
**Bushings:** As for SFCP..
**Inner ring:** As for SFCP..

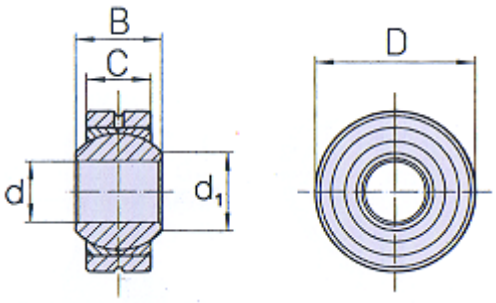
**Series SFRCP...CETOP** (available from size 5)
**Outer part:** Stainless steel 1.4305, from size 16 forged.
**Bushings:** As for SFCR., if required stainless steel.
**Inner ring:** As for SFCR. but hard-chromed; if required stainless steel.

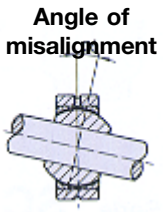
## Design

**Bearing slackness:** Depending on size, between 0.002 and 0.020 mm radially. See page 4 for precise details.
Designation example SFC 10 **C 2** CETOP.
**Thread:** DIN 13 - 6 H r.h. or l.h. L.h. thread designation example SFL CP 10 CETOP.
**Stainless inner ring:** From size 5 with stainless steel inner ring of material 1.4034 possible.
Designation example SFRCP 10 **IR** CETOP.
**Hard-chromed inner ring:** From size 5 available with hard-chromed inner ring (on bearing surface only).
Designation example SFCP 10 **IH** CETOP.
**Hard-chromed outer part and inner ring:**
Designation example SFCP 10 **H** CETOP.
**Sealed design:** Sizes 8-30 can be supplied with replaceable sealing sleeves (see page 19).

# Relubricatable heavy-duty spherical bearings

Friction pairing steel on heavy-duty bronze




Series **SSC ..**

**SSRC..** (rustproof)

| Series SSC.. | d | D | B | C | $d_1$ | K Ball dia. Ø | Bearing capacities dynamic C N | Bearing capacities static Co* N | Angle of align. α° | Weight each ≈ g |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 9 | 4.8 | 3.6 | 3.6 | 6.000 | 900 | 2 450 | 16 | 3 |
| 3 | 3 | 12 | 6 | 4.5 | 5.2 | 7.937 | 1 500 | 4 200 | 15 | 4 |
| 4 | 4 | 14 | 7 | 5.25 | 6.4 | 9.520 | 2 260 | 5 900 | 14 | 6 |
| 5 | 5 | 16 | 8 | 6 | 7.7 | 11.112 | 3 250 | 19 000 | 13 | 9 |
| 6 | 6 | 18 | 9 | 6.75 | 8.9 | 12.700 | 4 300 | 25 000 | 13 | 13 |
| 8 | 8 | 22 | 12 | 9 | 10.4 | 15.875 | 7 200 | 41 000 | 13 | 24 |
| 10 | 10 | 26 | 14 | 10.5 | 12.9 | 19.050 | 10 000 | 58 000 | 13 | 40 |
| 12 | 12 | 30 | 16 | 12 | 15.4 | 22.225 | 13 400 | 78 000 | 13 | 60 |
| 14 | 14 | 34 | 19 | 13.5 | 16.8 | 25.400 | 17 000 | 100 000 | 15 | 85 |
| 16 | 16 | 38 | 21 | 15 | 19.3 | 28.575 | 21 600 | 125 000 | 15 | 115 |
| 18 | 18 | 42 | 23 | 16.5 | 21.8 | 31.750 | 26 000 | 155 000 | 15 | 150 |
| 20 | 20 | 46 | 25 | 18 | 24.3 | 34.925 | 31 500 | 186 000 | 15 | 200 |
| 22 | 22 | 50 | 28 | 20 | 25.8 | 38.100 | 38 000 | 228 000 | 15 | 260 |
| 25 | 25 | 56 | 31 | 22. | 29.6 | 42.850 | 47 500 | 284 000 | 15 | 360 |
| 30 | 30 | 66 | 37 | 25 | 34.8 | 50.800 | 64 000 | 384 000 | 15 | 580 |
| 35 | 35 | 78 | 43 | 30 | 40.3 | 59.000 | 90 000 | 510 000 | 16 | 960 |
| 40 | 40 | 87 | 49 | 35 | 44.2 | 66.000 | 120 000 | 675 000 | 15 | 1350 |
| 50 | 50 | 108 | 60 | 45 | 55.8 | 82.000 | 190 000 | 1 100 000 | 14 | 2700 |
| Tolerance ± | H7 | h6** | 0 0.12 | 0 0.2 | — | — | — | — | — | — |

**recommended housing hole M 7

*Security factor $C_o$ see page 5

## Material

**Series SSC..**
**Outer part:** Free-cutting steel 1.0718, browned.
**Bushings:** Cu Sn 8/Cu Zn 40 Al 2 F59.
**Inner ring:** Roller bearing steel 100 Cr 6, material 1.3505, hardened, ground and polished.

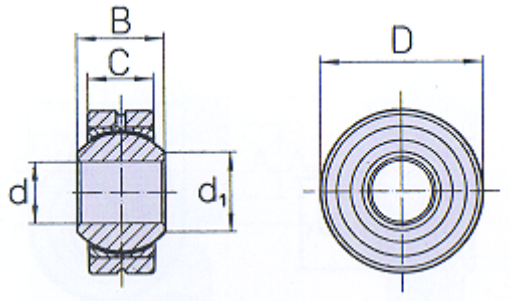
**Series SSRC..** (available from size 5)
**Outer part:** Stainless steel, material 1.4305.
**Bushings:** As for SSC..
**Inner ring:** As for SSC.. but hard-chromed, if requiered stainless steel.

## Design

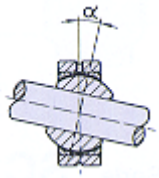
**Bearing slackness:** Depending on size, between 0.01 and 0.09 mm radially. With reduced or increased slackness see page 4. Designation example SSC 10 **C 2**.
**Lubrication:** Through an annular lubrication groove on the outer ring.
**Stainless inner ring:** From size 5 stainless steel inner ring of material 1.4034 possible.
Designation example SSRC 10 **IR**.
**Hard-chromed inner ring:** From size 5 available with hardchromed inner ring.
Designation example SSC 10 **IH**.
**Sealed design:** Sizes 8–30 can be supplied with replaceable sealing sleeves (see page 19).

# Relubricatable heavy-duty spherical bearings

Friction pairing steel on PTFE bronze fabric




**Angle of misalignment**




Series **SSCP ..**

**SSRCP..** (rustproof)

| Type SSCP.. | d | D | B | C | $d_1$ | K Ball dia. ∅ | Bearing cap. dynamic C N | Bearing cap. static Co* N | Angle of misalign. α° | Weight each ≈ g |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 9 | 4.8 | 3.6 | 3.6 | 6.000 | 2 700 | 5 100 | 16 | 3 |
| 3 | 3 | 12 | 6 | 4.5 | 5.2 | 7.937 | 4 700 | 7 300 | 15 | 4 |
| 4 | 4 | 14 | 7 | 5.25 | 6.4 | 9.520 | 6 700 | 11 000 | 14 | 6 |
| 5 | 5 | 16 | 8 | 6 | 7.7 | 11.112 | 7 800 | 15 000 | 13 | 9 |
| 6 | 6 | 18 | 9 | 6.75 | 8.9 | 12.700 | 10 900 | 21 000 | 13 | 12 |
| 8 | 8 | 22 | 12 | 9 | 10.4 | 15.875 | 18 000 | 36 000 | 13 | 20 |
| 10 | 10 | 26 | 14 | 10.5 | 12.9 | 19.050 | 27 000 | 53 000 | 13 | 35 |
| 12 | 12 | 30 | 16 | 12 | 15.4 | 22.225 | 36 000 | 71 000 | 13 | 55 |
| 14 | 14 | 34 | 19 | 13.5 | 18.8 | 25.400 | 48 000 | 93 000 | 15 | 80 |
| 16 | 16 | 38 | 21 | 15 | 19.3 | 28.575 | 60 000 | 116 000 | 15 | 115 |
| 18 | 18 | 42 | 23 | 16.5 | 21.8 | 31.750 | 74 000 | 143 000 | 15 | 150 |
| 20 | 20 | 46 | 25 | 18 | 24.3 | 34.925 | 90 000 | 173 000 | 15 | 200 |
| 22 | 22 | 50 | 28 | 20 | 25.8 | 38.100 | 110 000 | 212 000 | 15 | 260 |
| 25 | 25 | 56 | 31 | 22 | 29.6 | 42.850 | 136 000 | 263 000 | 15 | 370 |
| 30 | 30 | 66 | 37 | 25 | 34.8 | 50.800 | 186 000 | 358 000 | 15 | 580 |
| 35 | 35 | 78 | 43 | 30 | 40.3 | 59.000 | 264 000 | 500 000 | 16 | 950 |
| 40 | 40 | 87 | 49 | 35 | 44.2 | 66.000 | 348 000 | 660 000 | 15 | 1320 |
| 50 | 50 | 108 | 60 | 45 | 55.8 | 82.000 | 550 000 | 1 000 000 | 14 | 2630 |
| Tolerance ± | H7 | h6** | 0 0.12 | 0 0.2 | — | — | — | — | — | — |

**recommended housing hole M 7

*Security factor $C_o$ see page 5

## Material

**Series SSCP..**
**Outer part:** Free-cutting steel 1.0718, browned.
**Bushings:** Cu Sn 8/Cu Zn 40 Al 2 F59 galvanized, lined with permanently affixed sliding foil, consisting of PTFE with a bronze supporting fabric.
**Inner ring:** Roller bearing steel 100 Cr 6, material 1.3505, hardened, ground and polished.

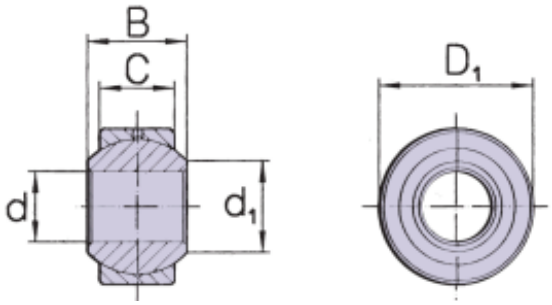
**Series SSRCP..** (available from size 5)
**Outer part:** Stainless steel, material 1.4305.
**Bushings:** As for SSCP.., if requiered stainless steel.
**Inner ring:** As for SSCP.. but hard-chromed, if requiered stainless steel.

## Design

**Bearing slackness:** Depending on size, between 0.002 and 0.020 mm radially. See page 4 for precise details.
Designation example SSCP 10 **C 2**.
**Stainless inner ring:** From size 5 stainless steel inner ring of material 1.4034 possible.
Designation example SSCP 10 **IR**.
**Hard-chromed inner ring:** From size 5 available with hardchromed innerring.
Designation example SSCP 10 **IH**.
**Sealed design:** Sizes 8–30 can be supplied with replaceable sealing sleeves (see page 19).

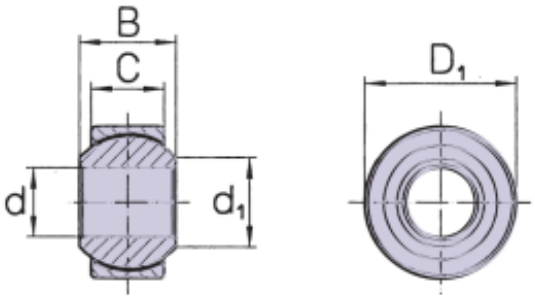
# Relubricatable heavy-duty spherical bearings

Friction pairing steel on heavy-duty bronze
relubricatable




Series **SC ..**

Steel on PTFE bronze fabric
maintenance-free




Series **SCP ..**

| Series | d | $D_1$ | B | C | $d_1$ | K Ball-dia. ∅ | Bearing cap. relubricatable dynamic C N | relubricatable static $C_o$* N | maintenance-free dynamic C N | maintenance-free static $C_o$* N | Angle of misalign. α° | Weight-each ≈ g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | 5 | 13 | 8 | 6 | 7.7 | 11.112 | 3 250 | 15 300 | 7 800 | 12 000 | 13 | 6 |
| 6 | 6 | 16 | 9 | 6.75 | 8.9 | 12.700 | 4 300 | 20 000 | 10 900 | 17 000 | 13 | 10 |
| 8 | 8 | 19 | 12 | 9 | 10.4 | 15.875 | 7 200 | 33 000 | 18 000 | 29 000 | 13 | 20 |
| 10 | 10 | 22 | 14 | 10.5 | 12.9 | 19.050 | 10 000 | 46 000 | 27 000 | 42 000 | 13 | 30 |
| 12 | 12 | 26 | 16 | 12 | 15.4 | 22.225 | 13 400 | 63 000 | 36 000 | 57 000 | 13 | 45 |
| 14 | 14 | 29 | 19 | 13.5 | 16.8 | 25.400 | 17 000 | 80 000 | 48 000 | 75 000 | 15 | 60 |
| 16 | 16 | 32 | 21 | 15 | 19.3 | 28.575 | 21600 | 100 000 | 60 000 | 93 000 | 15 | 80 |
| 18 | 18 | 35 | 23 | 16.5 | 21.8 | 31.750 | 26 000 | 124 000 | 74 000 | 115 000 | 15 | 105 |
| 20 | 20 | 40 | 25 | 18 | 24.3 | 34.925 | 31 500 | 150 000 | 90 000 | 138 000 | 15 | 150 |
| 22 | 22 | 42 | 28 | 20 | 25.8 | 38.100 | 38 000 | 182 000 | 110 000 | 170 000 | 15 | 180 |
| 25 | 25 | 47 | 31 | 22 | 29.6 | 42.850 | 47 500 | 227 000 | 136 000 | 210 000 | 15 | 240 |
| 30 | 30 | 55 | 37 | 25 | 34.8 | 50.800 | 64 000 | 307 000 | 186 000 | 286 000 | 15 | 390 |
| 35 | | | | | | | | | | | | |
| 40 | Sizes 2–4 and 35–50 are not available as spherical bearings. | | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| Tolerance ± | H7 | h6** | 0 0.12 | 0 0.2 | — | — | — | — | — | — | — | |

**recommended housing hole M 7

*Security factor $C_o$ see page 5

## Material

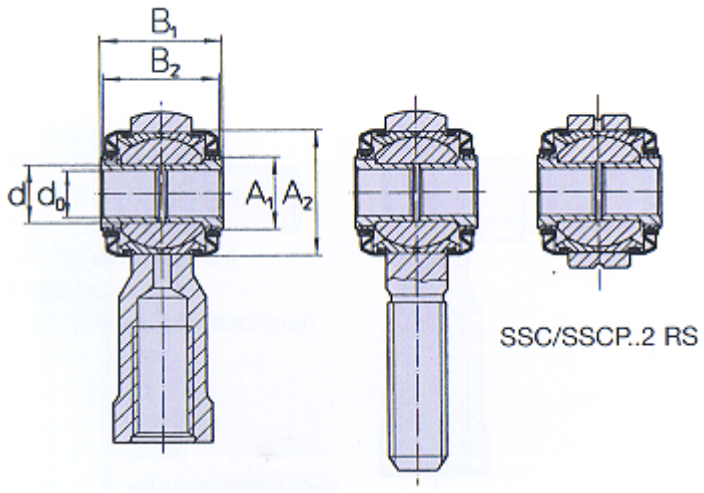
**Series SC..**
**Outer part/bushing:** Cu Sn 8.
**Inner ring:** Roller bearing steel 100 Cr 6, material 1.3505, hardened, ground and polished.

**Series SCP..**
**Outer part/bushing:** Stainless steel material 1.4305. Lined and covered with sliding foil of PTFE with bronze supporting fabric.
**Inner ring:** As for SC..

## Design

**Bearing slackness:** In the case of SC.. between 0.010 and 0.090 mm depending on the size. In the case of SCP.. between 0.005 and 0.010 mm depending on the size. See page 4 for precise details.
Designation example SC 10 **C 2**.
**Stainless inner ring:** Available with stainless steel inner ring of material 1.4034.
Designation example SC 10 **IR**.
**Hard-chromed inner ring:** Available with hard-chromed inner ring.
Designation example SC 10 **IH**.

# Sealed rod ends and spherical bearings




SFC/SFCP..2RS SMC/SMCP..2RS



SSC/SSCP..2 RS

Series **2 RS ..**

| Series ..RS | d | $d_o$ | $A_1$ | $A_2$ | $B_1$ | $B_2$ | Angle of misa. $\alpha°$ |
|---|---|---|---|---|---|---|---|
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 8 | 8 | 6 | 10.5 | 18.5 | 19 | 18.5 | 10 |
| 10 | 10 | 8 | 12.5 | 21.5 | 21 | 20 | 10 |
| 12 | 12 | 10 | 14.5 | 25.5 | 23 | 22.5 | 10 |
| 14 | 14 | 12 | 16.5 | 29.5 | 26 | 24.5 | 12 |
| 16 | 16 | 14 | 19 | 32.5 | 28 | 27. | 12 |
| 18 | 18 | 16 | 21 | 35.5 | 30 | 29 | 12 |
| 20 | 20 | 18 | 23 | 39 | 32 | 31 | 12 |
| 22 | 22 | 20 | 25.5 | 42.5 | 35 | 34 | 12 |
| 25 | 25 | 22 | 29 | 46.5 | 38 | 37 | 12 |
| 30 | 30 | 25 | 33.5 | 55 | 44 | 43 | 12 |
| 35 | | | | | | | |
| 40 | Sizes 2–6 and 35–50 are not available in sealed design. | | | | | | |
| 50 | | | | | | | |
| Tolerance ± | — | H7 | — | — | 0 0.2 | — | — |

## Material

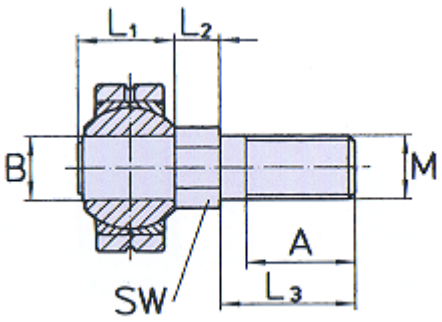
**Sealing sleeve:** Fluorelastomer rubber (Viton® fluoroelastomers).
Oil and ozone resistant, temperature resistant from –25° to +250° C.
**Slip ring:** Brass.
**Bore bushing:** Stainless steel, material 1.4305.

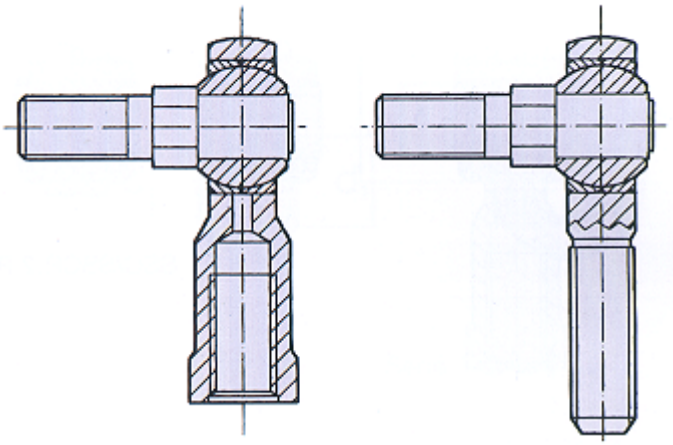
## Design

The relubricatable and maintenance-free rod ends and spherical
bearings of sizes 8 to 30 can be provided with replaceable sealing sleeves to protect the bearing from coarse dirt, dust and splashing water.
The elastic sealing sleeve is pulled on the outside over the specially extended and grooved bushing, and on the inside over a slip ring.
Designation example SFC 10.**2 RS**.

Viton® is a registered trademark of DuPont Performance Elastomers

# Threaded bolts for rod ends and spherical bearings



Series **.. W**

| Series ..W | B | $L_1$ | $L_2$ | $L_3$ | A | M | SW ⬡ | Weight each (only bolts) ≈ g |
|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | 5 | 9 | 5 | 11 | 8 | M 5 | 7 | 4 |
| 6 | 6 | 10 | 5.5 | 13 | 10 | M 6 | 7 | 7 |
| 8 | 8 | 13 | 6.5 | 17 | 13 | M 8 | 11 | 16 |
| 10 | 10 | 15 | 7 | 21 | 17 | M 10 | 11 | 26 |
| 12 | 12 | 17 | 7.5 | 25 | 20 | M 12 | 14 | 44 |
| 14 | 14 | 20 | 8.5 | 29 | 22 | M 14 | 14 | 67 |
| 16 | 16 | 22 | 9.5 | 33 | 24 | M 16 | 17 | 100 |
| 18 | | | | | | | | |
| 20 | 20 | 26 | 12 | 45 | 35 | M 20 | 22 | 200 |
| 22 | | | | | | | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | Sizes 2-4 and 18, 22–50 are not made in series. | | | | | | | |
| 40 | | | | | | | | |
| 50 | | | | | | | | |
| Tolerance ± | m6 | — | 0.1<br>0.1 | 0.3<br>0.3 | 0<br>1.0 | DIN13<br>6g | | — |

## Material

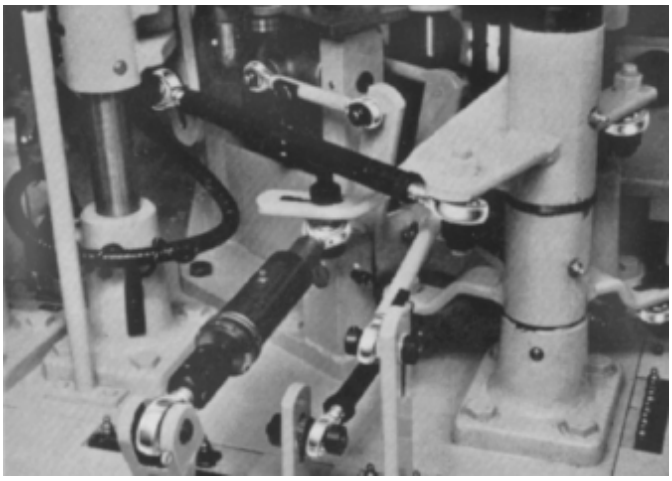
Stainless steel, material 1.4305, hexagon bare.
Other materials such as 1.7225 browned. Special dimensions on request.

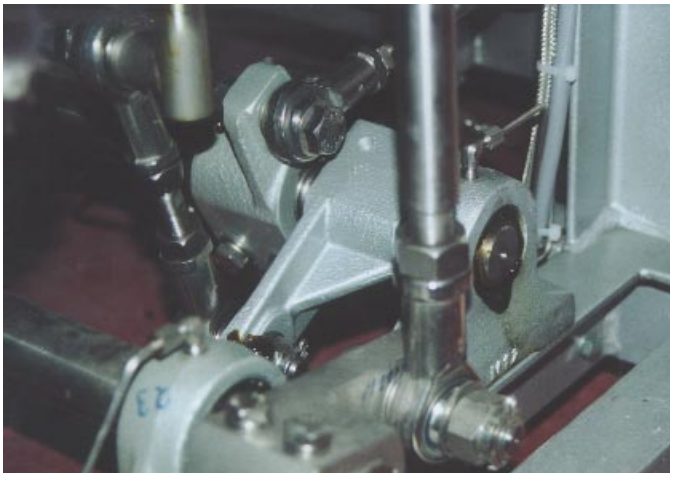
## Design

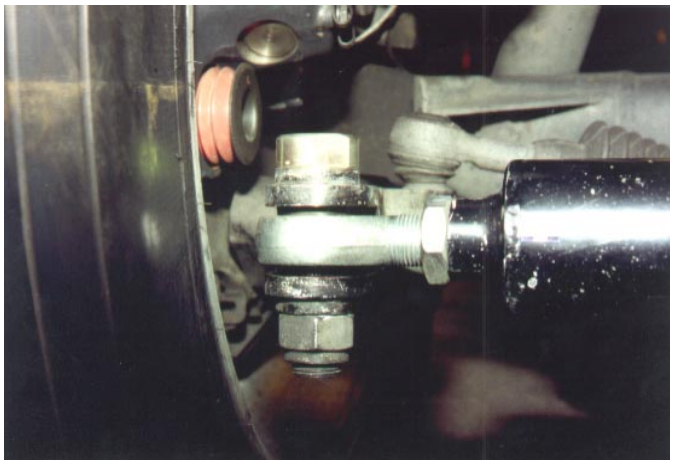
All series of rod ends and spherical bearings, except the sealed ..2 RS design, can be fitted with threaded bolts and used as angle joints. The bolt is pressed and riveted into the inner ring.
Designation example SF C 10 **W**.

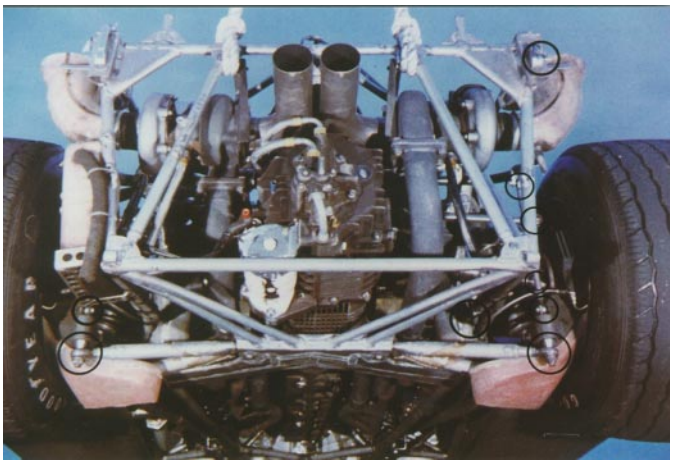
## Applications and typical installations

Agricultural machinery
Bakery machines
Bottle-washing machines
Brick-making machines
Cardboard-making machines
Cigarette making machines
Construction machines
Conveying systems
Driving machinery
Engine building
Engraving machines
Filling machines
Gas producers
Handling machines
Hydraulic cylinders
Knitting machines
Labeling machines
Leather-working machines
Lifts
Machine tools
Mining machines
Mixing machines
Motor vehicles
Packaging machines
Pneumatic cylinders
Power engineering
Preforming machines
Printing machines
Road-building machinery
Sail planes
Separating equipment
Sewing machines
Signaling equipment
Snow-clearing machines
Spinning machine
Textile machinery
Water turbines
Weighs
Welding machines
Wine-bottling machines
Woodworking machines and many more









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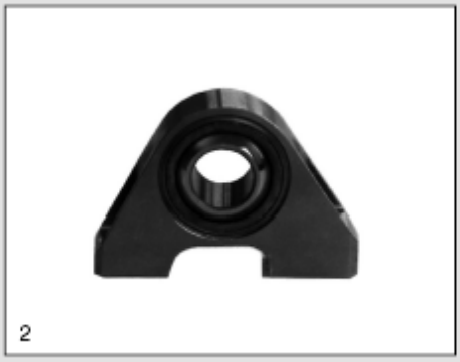
# Heavy duty
# Rod Ends and
# Spherical bearings

1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3

4

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