# Rod End Bearings, Spherical Bearings

# SPHERCO

SPHERCO - An industry
standard for over 50 years

RBC BEARINGS

Heim Bearings

www.rbcbearings.com
800.390.3300

# SPHERCO®

Since 1978, Heim has produced the Spherco® line of Rod End and Spherical Bearings. Heim uses the same time-tested manufacturing and quality techniques used since 1942 when the first integral rod end bearing was produced. The same technical innovations in design and production that have made Heim the most recognized name in the rod end spherical bearing industry have been applied to the Spherco® products. The same Heim practice of high quality, numerous design advantages and unparalleled engineering are extended to the Spherco® line as well.

## RBC Products

RBC and its divisions are manufacturers of bearings for applications in construction, mining and material handling equipment; mobile hydraulics systems; farm machinery; transportation equipment; automation and robotics; and a wide range of other industrial machinery. RBC is also a major manufacturer of bearings for critical and demanding aircraft and aerospace applications. RBC's high quality bearings include:

- **Spherco® Rod ends and Spherical bearings**—commercial and industrial, precision aircraft, and self-lubricating.
- **Spherical Plain Bearings** - Radial, angular contact, high misalignment, extended inner ring, QuadLube™ long life bearings, self-lubricating bearings, inch and metric.
- **Cam Followers and Yoke Rollers** - Standard stud, heavy stud, yoke type, type SRF caged roller followers, RBC Roller™ long life cam followers, airframe track rollers.
- **Heavy Duty Needle Roller Bearings** - Pitchlign® caged heavy duty needle roller bearings, inner rings, type TJ Tandem Roller bearings for long life.
- **Self-Lubricating Bearings** - Radial, thrust, rod ends, spherical plain bearings, high temperature, high loads, inch and metric.
- **Cylindrical Roller Bearings** - 200/300 series separable assemblies. Wide range of series, sizes and styles. Specials to customer specifications.
- **Thin Section Ball Bearings** - Standard cross sections to one inch. Sizes to 40 inches. Stainless steel and other materials available. Seals are available on all sizes and standard cross sections.
- **Airframe Control Bearings** - Ball bearing types, self-lubricating types, needle roller track rollers.
- **Mast Guide and Sheave Bearings** - Roller bearing construction for durability and long life. Mast guide rollers and carriage rollers. Chain sheaves for leaf type chain. Toothless sprockets for roller type chain.
- **Unibal® Rod Ends** - Commercial and industrial, precision, Mil-Spec series, aircraft, self-lubricating, inch and metric.
- **Unibal® Unground Ball Bearings** - Full complement design for high loads and longer life. Unique design utilizes non-split rings to simplify mounting and assure integrity of the assembly. Burnished races give smooth operation exceeding other unground designs.
- **Custom Designed Bearings** - RBC produces a wide range of custom bearings for specific customer applications.

## Spherco® Rod Ends

Spherco® offers a wide range of rod end types and sizes. Spherco® product range includes rod ends with brass race inserts in standard, precision and high capacity designs; high strength two piece designs and self-lubricating rod ends with engineered thermoplastic races or Teflon® liners with a wide range of optional features such as lubrication fittings, left hand threads, and keyway slots.

## Spherco® Spherical Bearings

Spherco® uses a wide variety of designs and materials to offer a comprehensive line of spherical bearings. Standard Spherco® Spherical Bearing designs include steel on steel precision spherical bearings with brass race inserts, high capacity and self-lubricating spherical bearings with Teflon® liners. Among the special bearing offered is the BTS LS Series, a bellows-type sealed bearing design

## How We Can Serve You

To continued the tradition of quality Spherco® bearings which began in 1978 and to allow our customers to meet the ever increasing challenges from industry, RBC uses a total quality control system that employs statistical quality control. This enables RBC to provide traceability, certification, and product manufactured to consistantly high standards.

RBC is efficiently compact enough to provide innovative custom designs, yet large enough to manufacture in high volume to a just-in-time program.

RBC has district sales representatives throughout the USA and authorized agents worldwide. Spherco® bearings are stocked and sold by authorized Spherco®distributors in the USA. For assistance with your application, contact Heim at:

**Heim Bearings Company**
60 Round Hill Road • P.O. Box 430
Fairfield, CT 06430-5172
Phone: (203) 255-1511 • Fax: (203) 259-8120

A Heim engineer and/or a RBC sales representative will be available for consultation. Heim's commitment, innovation, and quality will provide the most cost effective solutions to your bearing requirements.

## Warranty

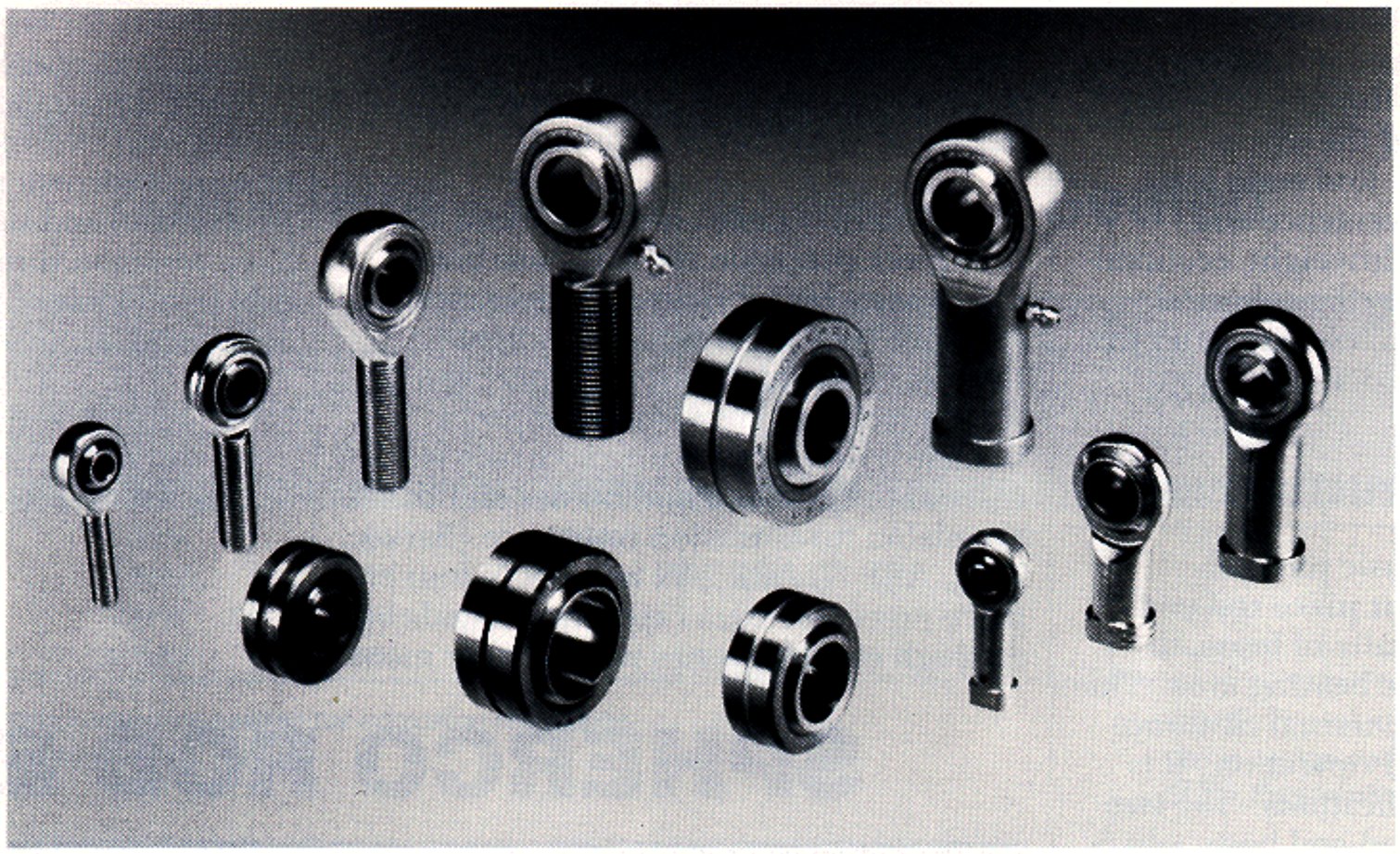
Spherco® bearings are warranted for material and workmanship for a period not to exceed 90 days from shipment and for a value not to exceed purchase price. No other warranty is in effect.



RBC BEARINGS®

00017.5M

# SPHERCO®



## TABLE OF CONTENTS







RBC BEARINGS

# SPHERCO®

Spherco rod ends and spherical plain bearings are intended for linkage applications where a bearing must accommodate significant misalignment. While spherical plain bearings offer flexibility in housing and mounting design, the user bears the responsibility for housing design and the cost of housing manufacture. Rod ends offer greater mounting convenience and provide a compact, lightweight, economical design alternative to the spherical plain bearing. Spherco bearings offer the industry's widest selection of rod end types and sizes.

## Rod End Construction

Spherco offers three basic rod end constructions. The **four piece rod** end uses race inserts, typically of brass, to provide lubricity in the bearing area. This design offers reduced internal clearance and provides smoother operation. It is ideal for dynamic applications. The **two piece** rod end uses a rod end body which is formed around a spherical ball. The comparatively heavy cross section of the rod end body in the two piece design provides high strength. This makes the two piece rod end ideal for highly loaded, static applications where high strength is required. The **cartridge type** rod end consists of a spherical plain bearing mounted in a rod end body. This design allows the optimum selection of materials for ball, race and rod end body. The cartridge type rod end can also accommodate a PTFE liner for self-lubrication. This design is best suited for applications where lubrication is not practical.

## Self-lubricating Rod Ends

Spherco offers metal-to-metal rod ends and self-lubricating rod ends. All metal-to-metal rod ends, including brass insert four piece types, require regular lubrication. This can be accomplished by splash or immersion oil lubrication, or by greasing through optional lubricators (grease fittings). Self-lubricating types are used where relubrication is not practical or in applications where relubrication is not desirable such as on food processing machinery or in clean environments. Spherco self-lubricating rods ends are available with bonded PTFE fabric liners or with molded, engineered thermoplastic race inserts.

## Rod End Grades

Spherco rod ends are offered in three grades: precision, commercial and aircraft. **Precision** rod ends are manufactured to tight tolerances for applications requiring improved linkage accuracy and reduced looseness. **Commercial** rod ends are produced using standard materials and manufacturing methods, and are an economical choice for industrial applications. **Aircraft** rod ends use premium materials and have magnafluxed rod end bodies. Originally intended for aircraft applications, aircraft rod ends are used in many industrial applications where a high degree of reliability is required.

***Precision Rod Ends*** Grade TRE and TR four piece precision rod ends use brass race inserts for lubricity and clearance control. They are produced to tight tolerances for applications requiring a more precise rod end; for example, a linkage where positioning accuracy is essential. These rod end bodies and balls are plated for corrosion resistance. Series ARE, ARE N, ARE 20N and AR N four piece precision extra capacity rod ends are the high strength series intended for more heavily loaded, static and dynamic industrial applications. These rod ends have alloy steel heat treated bodies for increased strength and aluminum bronze race inserts for high bearing capacity. The rod end bodies are protective coated for corrosion resistance and the balls are heat treated and chrome plated for superior wear and corrosion resistance. Series ARE (male) and series AR N (female) have common thread sizes. Series ARE 20N (male) have oversized shanks for additional shank strength.


- Series TRE and TR: pages 4-5
- Series ARE, ARE 20N and AR N: pages 6-7


# SPHERCO ROD ENDS

**ROD END QUICK SELECTION GUIDE**

| Series *Size Range* | Product Features | Customer Benefits | Common Applications |
|---|---|---|---|
| TRE, TR 3/16" to 1" | Precision Grade, Brass Inserts, Four Piece Construction | Low Friction, Long Dynamic Life, Smooth Feel, Good Conformity | Control Linkages, For Reduced Play, Accelerator Linkages |
| ARE, ARE 20N, AR N, 1/4" to 3/4" | Precision Grade Aluminum Bronze Inserts, High Strength Body, Four Piece Construction | High Capacity Version | Heavy Duty Applications |
| TM, TF 3/16" to 3/4" | Commercial Grade Brass Inserts, Four Piece Construction | Low Friction, Long Dynamic Life, Smooth Feel, Good Conformity Cost Effective | Packaging Machine Linkages |
| CFM, CFF 3/16" to 3/4" | Commercial Grade Two Piece Construction | High Loads, Reversing Loads, Shock Loads, Cost Effective | Brake and Clutch Pedals For Heavy Machinery, Satellite Dish Controls |
| CTMD, CTFD 3/16" to 3/4" | Commercial Grade Self-Lubricating Thermoplastic Race | Maintenance Free Virtually No Radial Clearance, Dimensional Stability | Food Processing, Paper Machinery, Bus Door Closures, Marine Applications |
| CFM T, CFF T 1/4" to 5/8" | Commercial Grade Self-Lubricating Fiberglide® | Maintenance Free, High Loads, Reversing Loads, Shock Loads, Cost Effective | Packaging Machines, Robotics, Textile Equipment, Hydraulic Cylinders |

SPHERCO®

# SPHERICAL BEARINGS COMSUMER GUIDE

● Best
⊖ Better
○ Good
✔ Yes

| | SPHERCO SERIES | PAGE | LOADING: STATIC | LOADING: OSCILLATING | LOADING: REVERSING | LOADING: SHOCK | PRECISION | CORROSION RESISTANCE | SELF-LUBRICATING | MAXIMUM TEMPERATURE | SIZE RANGE | RACE MATERIAL | DESIGN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COMMERCIAL AND PRECISION | TRE<br>TR | 4-5 | ⊖ | ⊖ | ○ | ○ | | ⊖ | | 250°F | 3/16" to 1" | BRASS | FOUR PIECE |
| | ARE<br>AR N<br>ARE 20N | 6-7 | ● | ● | ● | ⊖ | | ⊖ | | 250°F | 1/4" to 3/4" | ALUMINUM BRONZE | |
| | TM<br>TF | 8-9 | ⊖ | ⊖ | ○ | ○ | | ⊖ | | 250°F | 3/16" to 3/4" | BRASS | |
| | CFM<br>CFF | 10-11 | ⊖ | ○ | ⊖ | ● | | ⊖ | | 250°F | 3/16" to 3/4" | STEEL | TWO PIECE |
| | CTMD<br>CTFD | 12-13 | ○ | ⊖ | ○ | ○ | | ⊖ | ✔ | 125°F | 3/16" to 3/4" | THERMO-PLASTIC | MOLDED RACE |
| | CFM T<br>CFF T | 18-19 | ⊖ | ● | ● | ⊖ | | ⊖ | ✔ | 250°F | 1/4" to 3/4" | FIBERGLIDE® | THREE PIECE |

***Commercial Rod Ends*** Series TM and TF four piece commercial rod ends use Spherco's classic brass race insert design for lubricity and clearance control. These rod ends are preferred for dynamic applications. Spherco commercial rod ends have zinc plated bodies and nickel plated balls for corrosion resistance.

• Series TM and TF: pages 8-9

Series CFM and CFF two piece commercial rod ends offer high strength for heavy static loads. Heim's unique manufacturing process for two piece rod ends yields the industry's best conformity between ball and body for maximum bearing capacity.

• Series CFM and CFF: pages 10-11

Series CTMD and CTFD self-lubricating commercial rod ends use an engineered thermoplastic race for applications where relubrication is not practical or desirable. The rod end body and ball are plated for corrosion resistance. This series is also available in stainless steel for superior corrosion resistance.

• Series CTMD and CTFD: pages 12-13

## Optional Rod End Features

Spherco rod ends are available with male and female threaded shanks. Standard rod ends have right hand threads. Left hand threads are available as an option. Lubricators are standard on selected series and are available as an option on all other series. Shank keyways are optional on most series to engage lock washer tangs. A wide range of other optional features includes plain shanks, special plating, longer or shorter shanks, and tighter radial clearance.

### FEATURED PRODUCT

The CFM T and CFF T Series utilize the two piece rod end manufacturing process and a durable Fiberglide® liner system. This series offers a high strength rod end with a long lasting, self-lubricating liner. Radial clearance is minimal while rotating torque is low.

• Series CFM T and CFF T: pages 16-17

SPHERCO®

# Precision Series

## Four Piece - Metal to Metal

***Series TRE***

| ROD END NUMBER | DIMENSIONS IN INCHES | | | | | | | | | MAXIMUM STATIC RADIAL LOAD | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | BORE | BALL WIDTH | HOUSING WIDTH ❹ | HEAD DIAMETER | LENGTH TO CENTER OF BALL | THREAD LENGTH | THREAD SIZE | BALL DIAMETER | BALL FLAT DIAMETER | | |
| | B | W | H | D | F | A | M | E | O | | |
| | +.0015 -.0005 | +.000 -.005 | +.005 -.005 | +.010 -.010 | +.031 -.031 | +.062 -.031 | UNF-3A | REF | REF | LBF | LBS |
| **TRE3** | .1900 | .312 | .250 | .625 | 1.250 | .750 | .1900-32 | .437 | .306 | 900 | .03 |
| **TRE4** | .2500 | .375 | .281 | .750 | 1.562 | 1.000 | .2500-28 | .515 | .353 | 1,700 | .05 |
| **TRE5** | .3125 | .437 | .344 | .875 | 1.875 | 1.250 | .3125-24 | .625 | .447 | 2,500 | .08 |
| **TRE6** | .3750 | .500 | .406 | 1.000 | 1.938 | 1.250 | .3750-24 | .718 | .516 | 4,000 | .12 |
| **TRE7** | .4375 | .562 | .437 | 1.125 | 2.125 | 1.375 | .4375-20 | .812 | .586 | 5,000 | .17 |
| **TRE8** | .5000 | .625 | .500 | 1.312 | 2.438 | 1.500 | .5000-20 | .937 | .698 | 7,000 | .26 |
| **TRE10** | .6250 | .750 | .562 | 1.500 | 2.625 | 1.625 | .6250-18 | 1.125 | .839 | 8,050 | .41 |
| **TRE12** | .7500 | .875 | .687 | 1.750 | 2.875 | 1.750 | .7500-16 | 1.312 | .978 | 11,300 | .64 |
| **TRE16** | 1.0000 | 1.375 | 1.000 ❺ | 2.750 ❺ | 4.125 | 2.125 | 1.2500-12 | 1.875 | 1.269 | 28,400 | 2.25 |

***Outer Member:*** *Carbon steel, with protective coating for corrosion resistance*

***Ball:*** *52100 Alloy steel, heat treated, chrome plated*

***Inserts:*** *Brass*
*16 size has a one piece carbon steel race*

**NOTES**

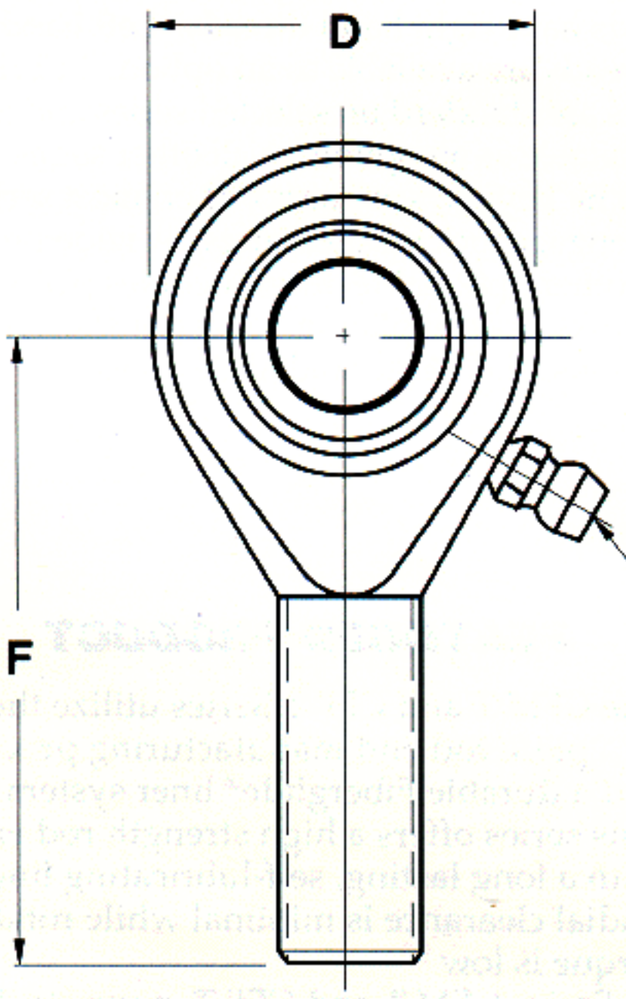
❶ Add letter "L" to prefix to indicate Left Hand thread
Example: TREL4

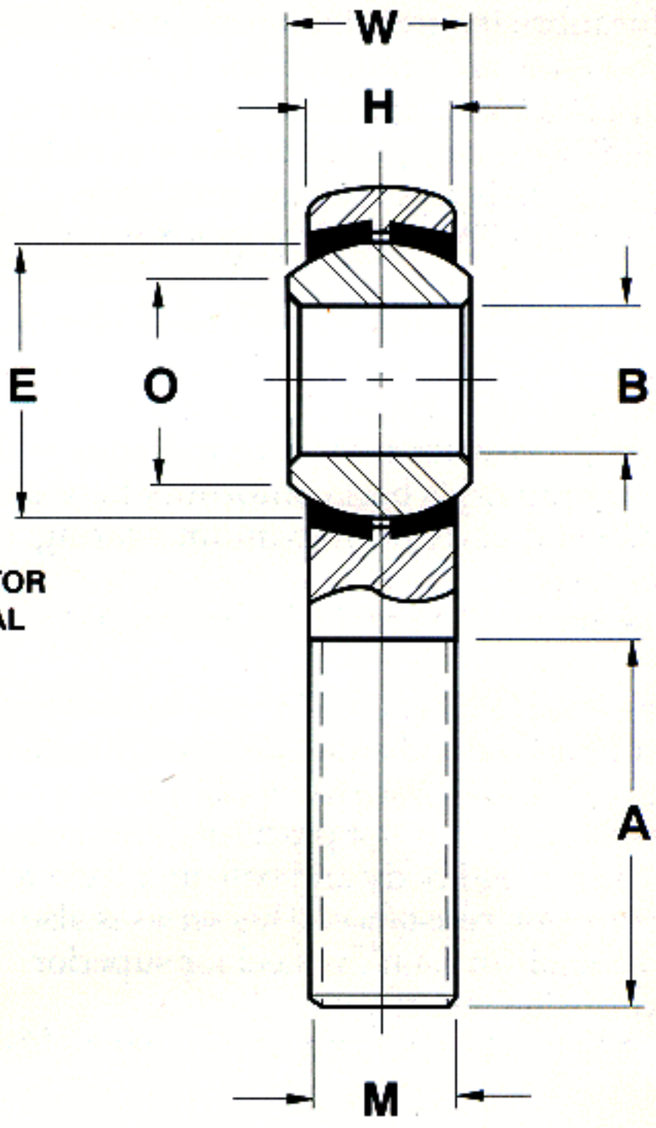
❷ For design options, see page 21

❸ For Engineering data, see pages 18 thru 20

❹ "H" tolerance across inserts is +/-.015

❺ Tolerances for 16 size: "D" +.030 -.010
"H" +.030 -.010



# SPHERCO®

# Precision Series

## Four Piece - Metal to Metal

***Series TR***

| ROD END NUMBER | DIMENSIONS IN INCHES | | | | | | | | | | | | MAXIMUM STATIC RADIAL LOAD | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BORE | BALL WIDTH | HOUSING WIDTH ❹ | HEAD DIAMETER | LENGTH TO CENTER OF BALL | THREAD LENGTH | THREAD SIZE | BALL DIAMETER | BALL FLAT DIAMETER | ACROSS WRENCH FLATS | OTHER DIMENSIONS | | | |
| | B | W | H ❹ | D | F | A | M | E | O | J | K | L | | |
| | +.0015 -.0005 | +.000 -.005 | +.005 -.005 | +.010 -.010 | +.031 -.031 | +.062 -.031 | UNF-3B | REF | REF | +.010 -.010 | +.010 -.010 | +.010 -.010 | LBF | LBS |
| **TR3** | .1900 | .312 | .250 | .625 | 1.062 | .562 | .1900-32 | .437 | .306 | .312 | .406 | .187 | 1,850 | .03 |
| **TR4** | .2500 | .375 | .281 | .750 | 1.312 | .750 | .2500-28 | .515 | .353 | .375 | .468 | .187 | 2,700 | .05 |
| **TR5** | .3125 | .437 | .344 | .875 | 1.375 | .750 | .3125-24 | .625 | .447 | .437 | .500 | .187 | 3,350 | .08 |
| **TR6** | .3750 | .500 | .406 | 1.000 | 1.625 | .937 | .3750-24 | .718 | .516 | .562 | .687 | .250 | 4,450 | .12 |
| **TR7** | .4375 | .562 | .437 | 1.125 | 1.812 | 1.062 | .4375-20 | .812 | .586 | .625 | .750 | .250 | 5,350 | .17 |
| **TR8** | .5000 | .625 | .500 | 1.312 | 2.125 | 1.187 | .5000-20 | .937 | .698 | .750 | .875 | .250 | 7,400 | .26 |
| **TR10** | .6250 | .750 | .562 | 1.500 | 2.500 | 1.500 | .6250-18 | 1.125 | .839 | .875 | 1.000 | .312 | 8,050 | .41 |
| **TR12** | .7500 | .875 | .687 | 1.750 | 2.875 | 1.750 | .7500-16 | 1.312 | .978 | 1.000 | 1.125 | .312 | 11,300 | .64 |
| **TR16** | 1.0000 | 1.375 | 1.000 ❺ | 2.750 ❺ | 4.125 | 2.125 | 1.2500-12 | 1.875 | 1.275 | 1.500 ❺ | 1.625 ❺ | .437 ❺ | 28,400 | 2.25 |

***Outer Member:*** *Carbon steel, with protective coating for corrosion resistance*

***Ball:*** *52100 Alloy steel, heat treated, chrome plated*

***Inserts:*** *Brass*
*16 size has a one piece carbon steel race*

**NOTES**

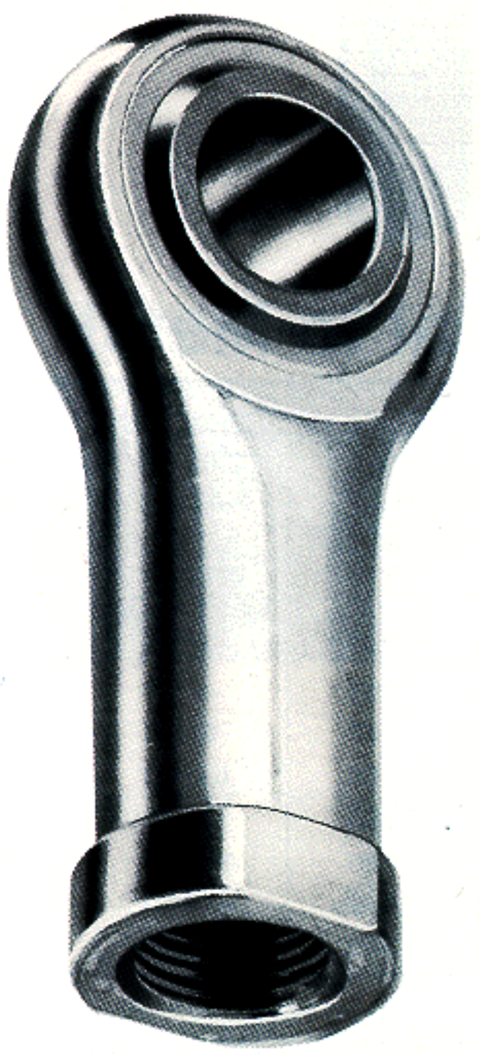
❶Add letter "L" to prefix to indicate Left Hand thread
Example: TRL 4

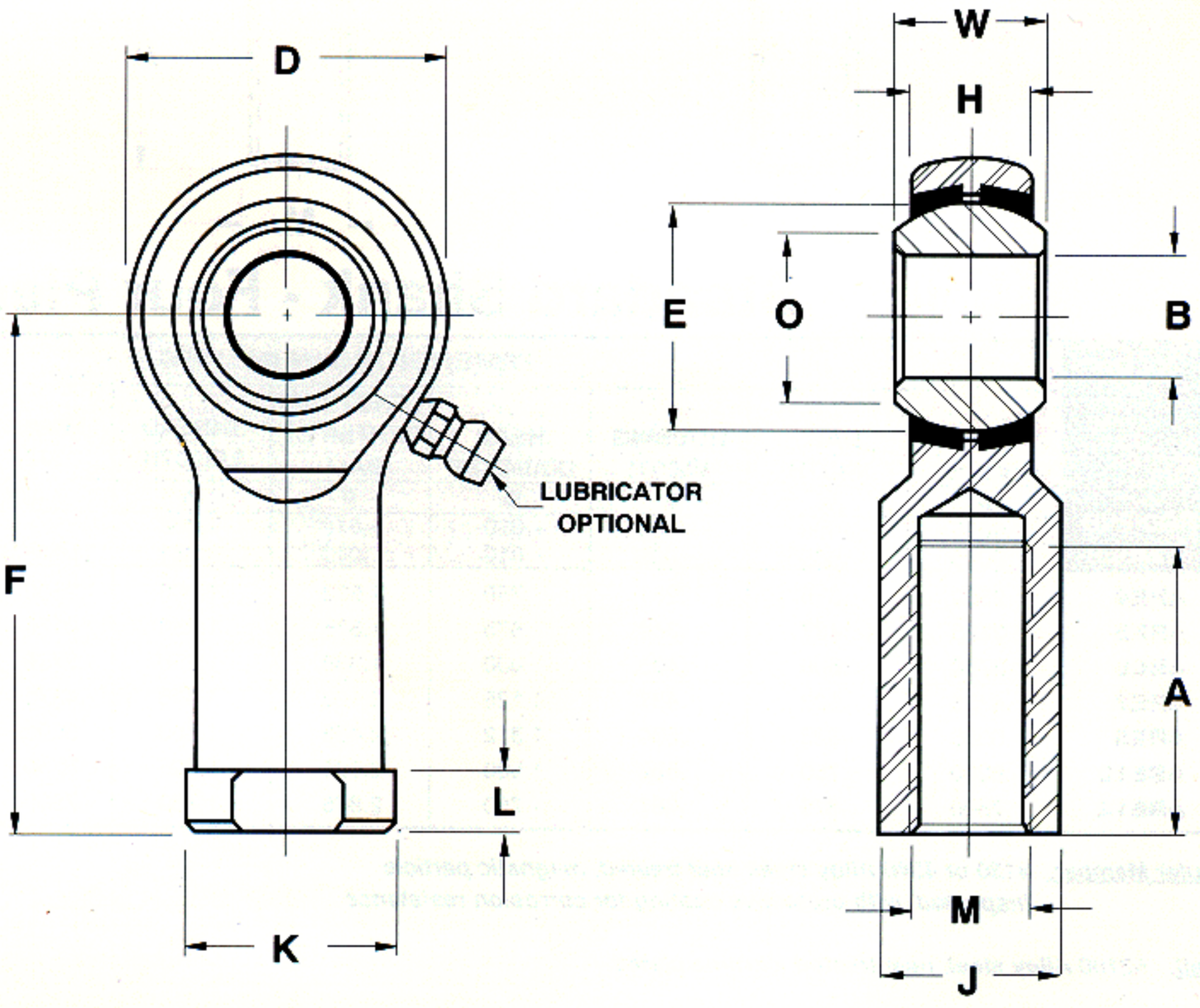
❷For design options, see page 21

❸For Engineering data, see pages 18 thru 20

❹"H" tolerance across inserts is +/-.015

❺Tolerances for 16 size: "D" +.030 -.010
"H" +.030 -.010
"K", "J", "L" +/-.015





# SPHERCO®

# Precision Extra Capacity Series

## Oversize Shank - Four Piece - Metal to Metal

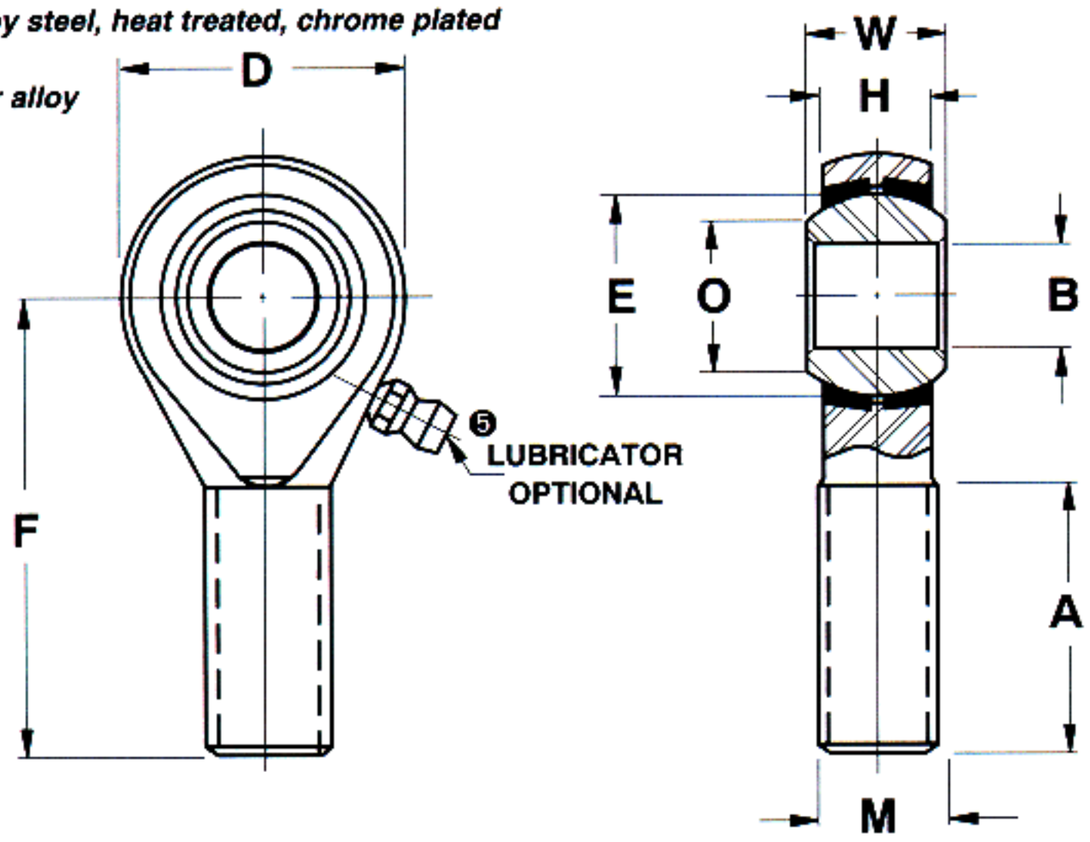
### *Series ARE 20N*

| ROD END NUMBER | DIMENSIONS IN INCHES | | | | | | | | | MAXIMUM STATIC RADIAL LOAD | | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BORE | BALL WIDTH | HOUSING WIDTH | HEAD DIAMETER | LENGTH TO CENTER OF BALL | THREAD LENGTH | THREAD SIZE | BALL DIAMETER | BALL FLAT DIAMETER | WITH LUBRICATOR | WITHOUT LUBRICATOR | |
| | B | W | H ❹ | D | F | A | M | E | O | LBF | | LBS |
| | +.0015 -.0005 | +.000 -.005 | +.005 -.005 | +.010 -.010 | +.010 -.010 | +.062 -.031 | UNF -3A | REF | REF | | | |
| **ARE420N** | .2500 | .375 | .281 | .750 | 1.562 | 1.000 | .3125-24 | .515 | .353 | 3,260 | 6,680 | .06 |
| **ARE520N** | .3125 | .437 | .344 | .875 | 1.875 | 1.250 | .3750-24 | .625 | .447 | 4,920 | 8,410 | .09 |
| **ARE620N** | .3750 | .500 | .406 | 1.000 | 1.938 | 1.250 | .4375-20 | .718 | .516 | 7,240 | 11,160 | .13 |
| **ARE720N** | .4375 | .562 | .437 | 1.125 | 2.125 | 1.375 | .5000-20 | .812 | .586 | 7,620 | 13,660 | .18 |
| **ARE820N** | .5000 | .625 | .500 | 1.312 | 2.438 | 1.500 | .6250-18 | .937 | .698 | 11,920 | 19,340 | .30 |
| **ARE1020N** | .6250 | .750 | .562 | 1.500 | 2.625 | 1.625 | .7500-16 | 1.125 | .839 | 13,940 | 21,080 | .46 |
| **ARE1220N** | .7500 | .875 | .687 | 1.750 | 2.875 | 1.750 | .8750-14 | 1.312 | .978 | 21,570 | 29,800 | .72 |

***Outer Member:*** *4130 or 4340 Alloy steel, heat treated, magnetic particle inspected, with protective coating for corrosion resistance*

***Ball:*** *52100 Alloy steel, heat treated, chrome plated*

***Inserts:*** *Copper alloy*




**NOTES**

❶ Add letter "L" to prefix to indicate Left Hand thread
Example: AREL420N

❷ For design options, see page 21

❸ For Engineering data, see pages 18 thru 20

❹ "H" tolerance across inserts is +/-.015

❺ Delete letter "N" from suffix to indicate no lubricator
Example: ARE420

## Standard Shank - Four Piece - Metal to Metal

| ROD END NUMBER | DIMENSIONS IN INCHES | | | | | | | | | MAXIMUM STATIC RADIAL LOAD | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | BORE | BALL WIDTH | HOUSING WIDTH | HEAD DIAMETER | LENGTH TO CENTER OF BALL | THREAD LENGTH | THREAD SIZE | BALL DIAMETER | BALL FLAT DIAMETER | WITHOUT LUBRICATOR | |
| | B | W | H ❹ | D | F | A | M ❻ | E | O | LBF | LBS |
| | +.0015 -.0005 | +.000 -.005 | +.005 -.005 | +.010 -.010 | +.010 -.010 | +.062 -.031 | UNF-3A | REF | REF | | |
| **ARE4** | .2500 | .375 | .281 | .750 | 1.562 | 1.000 | .2500 - 28 | .515 | .353 | 4,290 | .05 |
| **ARE5** | .3125 | .437 | .344 | .875 | 1.875 | 1.250 | .3125 - 24 | .625 | .447 | 6,880 | .08 |
| **ARE6** | .3750 | .500 | .406 | 1.000 | 1.938 | 1.250 | .3750 - 24 | .718 | .516 | 10,500 | .12 |
| **ARE7** | .4375 | .562 | .437 | 1.125 | 2.125 | 1.375 | .4375 - 20 | .812 | .586 | 13,660 | .17 |
| **ARE8** | .5000 | .625 | .500 | 1.312 | 2.438 | 1.500 | .5000 - 20 | .937 | .698 | 19,340 | .26 |
| **ARE10** | .6250 | .750 | .562 | 1.500 | 2.625 | 1.625 | .6250 - 18 | 1.125 | .839 | 21,080 | .41 |
| **ARE12** | .7500 | .875 | .687 | 1.750 | 2.875 | 1.750 | .7500 - 16 | 1.312 | .978 | 29,800 | .64 |

***Outer Member:*** *4130 or 4340 Alloy steel, heat treated, magnetic particle inspected, with protective coating for corrosion resistance*

***Ball:*** *52100 Alloy steel, heat treated, chrome plated*

***Inserts:*** *Copper alloy*

**NOTES**

❶ Add letter "L" to prefix to indicate Left Hand thread
Example: AREL4

❷ For design options, see page 21

❸ For Engineering data, see pages 18 thru 20

❹ "H" tolerance across inserts is +/-.015

❺ Lubricator optional on ARE series
Example: ARE4N

❻ ARE has same thread size as AR N series

# SPHERCO®

# Precision Extra Capacity Series

## Standard Thread -Four Piece - Metal to Metal

### *Series AR N*

| ROD END NUMBER | DIMENSIONS IN INCHES | | | | | | | | | | | | | MAXIMUM STATIC RADIAL LOAD | | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BORE | BALL WIDTH | HOUSING WIDTH ④ | HEAD DIAMETER | LENGTH TO CENTER OF BALL | THREAD LENGTH | THREAD SIZE | BALL DIAMETER | BALL FLAT DIAMETER | ACROSS WRENCH FLATS | OTHER DIMENSIONS | | | WITH LUBRICATOR | WITHOUT LUBRICATOR | |
| | B | W | H ④ | D | F | A | M ⑥ | E | O | J | K | N | L | LBF | | LBS |
| | +.0015 -.0005 | +.000 -.005 | +.005 -.005 | +.010 -.010 | +.010 -.010 | +.062 -.031 | UNF -3B | REF | REF | +.010 -.010 | +.010 -.010 | +.020 -.020 | +.010 -.010 | | | |
| **AR4N** | .2500 | .375 | .281 | .750 | 1.312 | .750 | .2500 - 28 | .515 | .355 | .375 | .468 | .312 | .187 | 3,260 | 6,680 | .06 |
| **AR5N** | .3125 | .437 | .344 | .875 | 1.375 | .750 | .3125 - 24 | .625 | .447 | .437 | .500 | .406 | .187 | 4,920 | 8,410 | .08 |
| **AR6N** | .3750 | .500 | .406 | 1.000 | 1.625 | .937 | .3750 - 24 | .718 | .517 | .562 | .687 | .469 | .250 | 7,240 | 11,160 | .14 |
| **AR7N** | .4375 | .562 | .437 | 1.125 | 1.812 | 1.062 | .4375 - 20 | .812 | .586 | .625 | .750 | .531 | .250 | 7,620 | 13,660 | .18 |
| **AR8N** | .5000 | .625 | .500 | 1.312 | 2.125 | 1.187 | .5000 - 20 | .937 | .698 | .750 | .875 | .594 | .250 | 11,920 | 19,340 | .29 |
| **AR10N** | .6250 | .750 | .562 | 1.500 | 2.500 | 1.500 | .6250 - 18 | 1.125 | .839 | .875 | 1.000 | .750 | .312 | 13,940 | 21,080 | .43 |
| **AR12N** | .7500 | .875 | .687 | 1.750 | 2.875 | 1.750 | .7500 - 16 | 1.312 | .978 | 1.000 | 1.125 | .875 | .312 | 21,570 | 29,800 | .64 |

***Outer Member:*** *4130 or 4340 Alloy steel, heat treated, magnetic particle inspected, with protective coating for corrosion resistance*

***Ball:*** *52100 Alloy steel, heat treated, chrome plated*

***Inserts:*** *Copper alloy*

**NOTES**

❶ Add letter "L" to prefix to indicate Left Hand thread.
Example: ARL4N

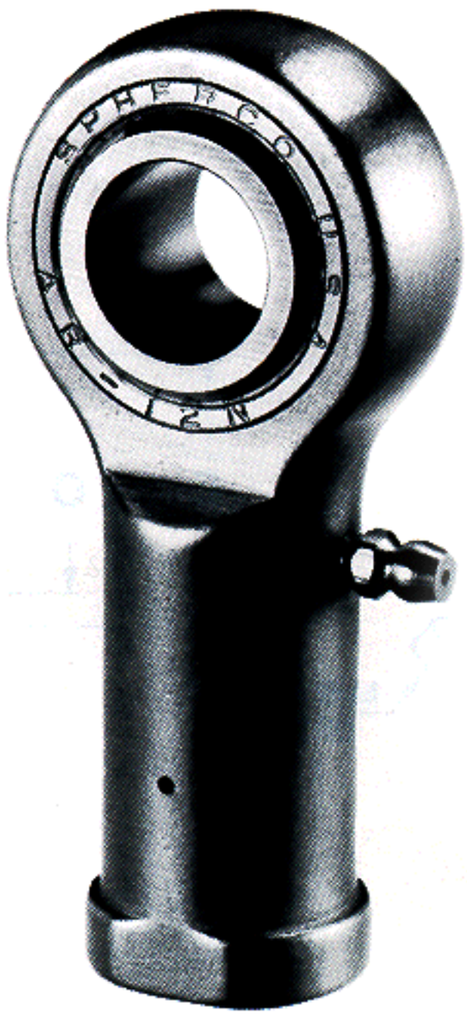
❷ For design options, see page 21

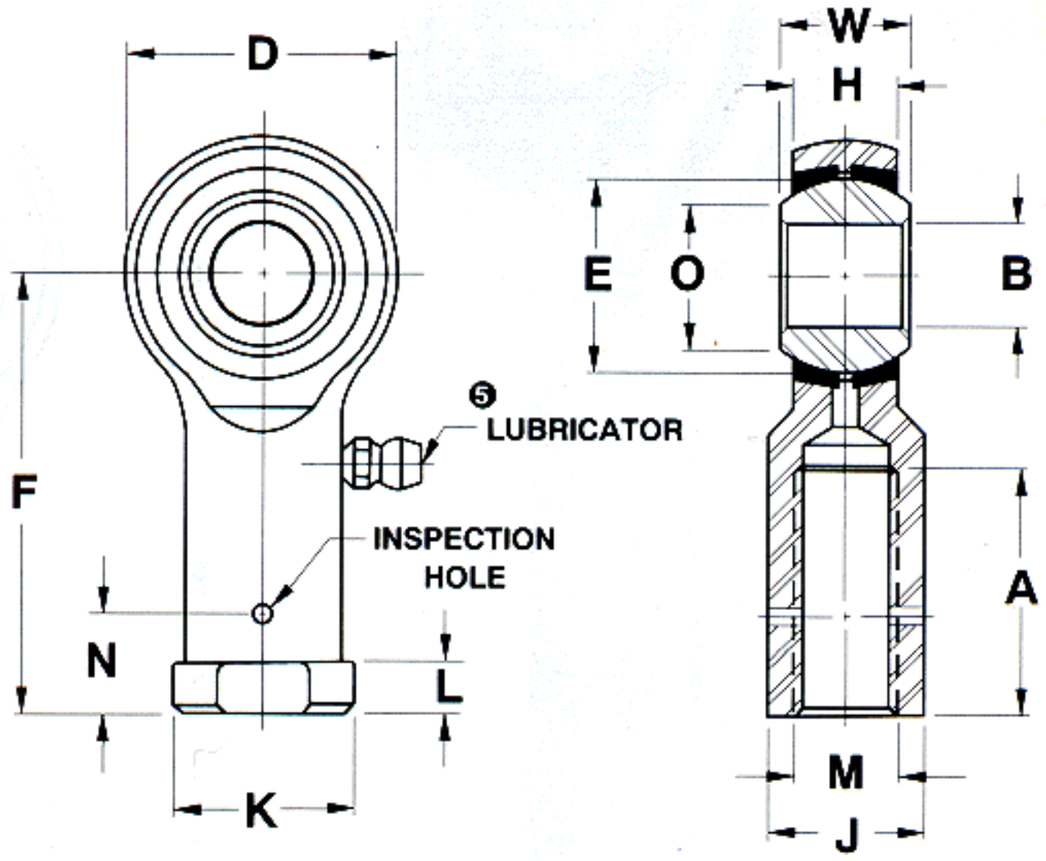
❸ For Engineering data, see pages 18 thru 20

❹ "H" tolerance across inserts is +/-.015

❺ Delete letter "N" from suffix on AR N Series to indicate no lubricator
Example: AR 4

❻ AR N series has same thread size as ARE series.





# SPHERCO®

## Commercial Series

### Four Piece - Metal to Metal

***Series TM***

| ROD END NUMBER | BORE B +.0025 -.0005 | BALL WIDTH W +.005 -.005 | HOUSING WIDTH H ❹ +.010 -.010 | HEAD DIAMETER D +.031 -.031 | LENGTH TO CENTER OF BALL F +.031 -.031 | THREAD LENGTH A +.062 -.062 | THREAD SIZE M UNF-3A | BALL DIAMETER E REF | BALL FLAT DIAMETER O REF | MAXIMUM STATIC RADIAL LOAD LBF | APPROX WEIGHT LBS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **TM3** | .1900 | .312 | .250 | .625 | 1.250 | .750 | .1900 - 32 | .437 | .306 | 900 | .03 |
| **TM4** | .2500 | .375 | .281 | .750 | 1.562 | 1.000 | .2500 - 28 | .515 | .353 | 1,700 | .05 |
| **TM5** | .3125 | .437 | .344 | .875 | 1.875 | 1.250 | .3125 - 24 | .625 | .447 | 2,500 | .08 |
| **TM6** | .3750 | .500 | .406 | 1.000 | 1.938 | 1.250 | .3750 - 24 | .718 | .516 | 4,000 | .12 |
| **TM7** | .4375 | .562 | .437 | 1.125 | 2.125 | 1.375 | .4375 - 20 | .812 | .586 | 5,000 | .17 |
| **TM8** | .5000 | .625 | .500 | 1.312 | 2.438 | 1.500 | .5000 - 20 | .937 | .698 | 7,000 | .25 |
| **TM10** | .6250 | .750 | .562 | 1.500 | 2.625 | 1.625 | .6250 - 18 | 1.125 | .839 | 8,050 | .41 |
| **TM12** | .7500 | .875 | .687 | 1.750 | 2.875 | 1.750 | .7500 - 16 | 1.312 | .978 | 11,300 | .64 |

***Outer Member:*** *Carbon steel, with protective coating for corrosion resistance*

***Ball:*** *Carbon steel, case hardened, with protective coating for additional hardness and corrosion resistance*

***Inserts:*** *Brass*

**NOTES**

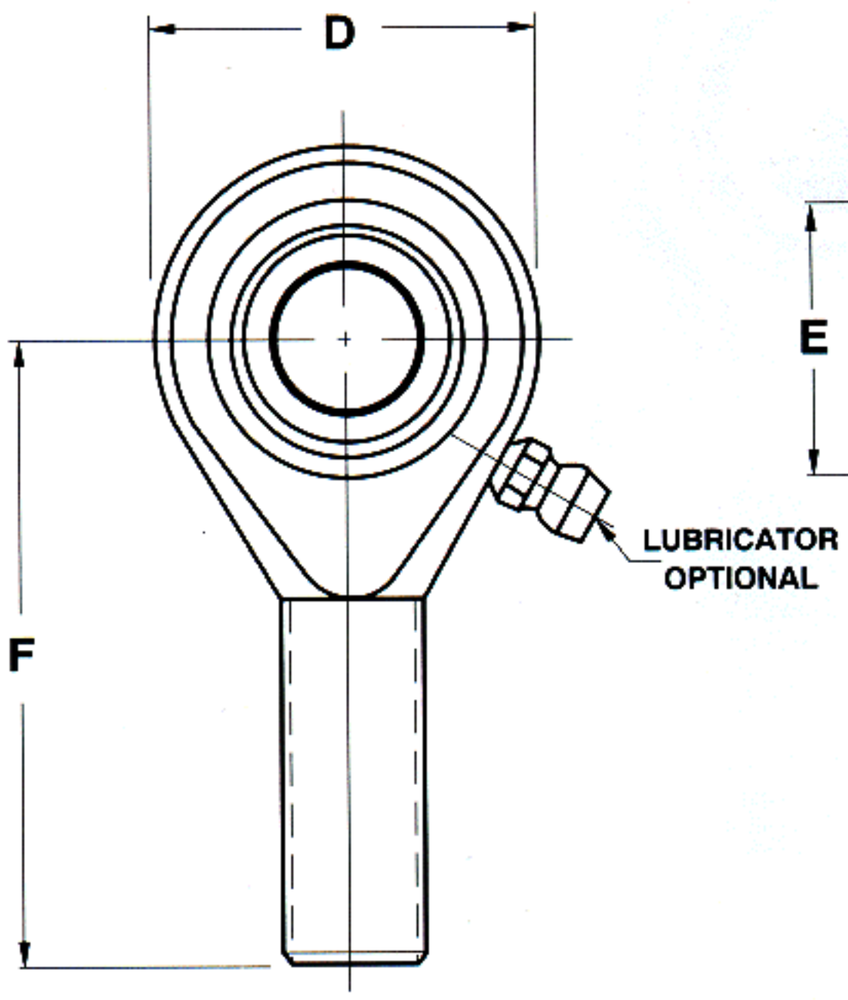
❶ Add letter "L" to prefix to indicate Left Hand thread
Example: TML4

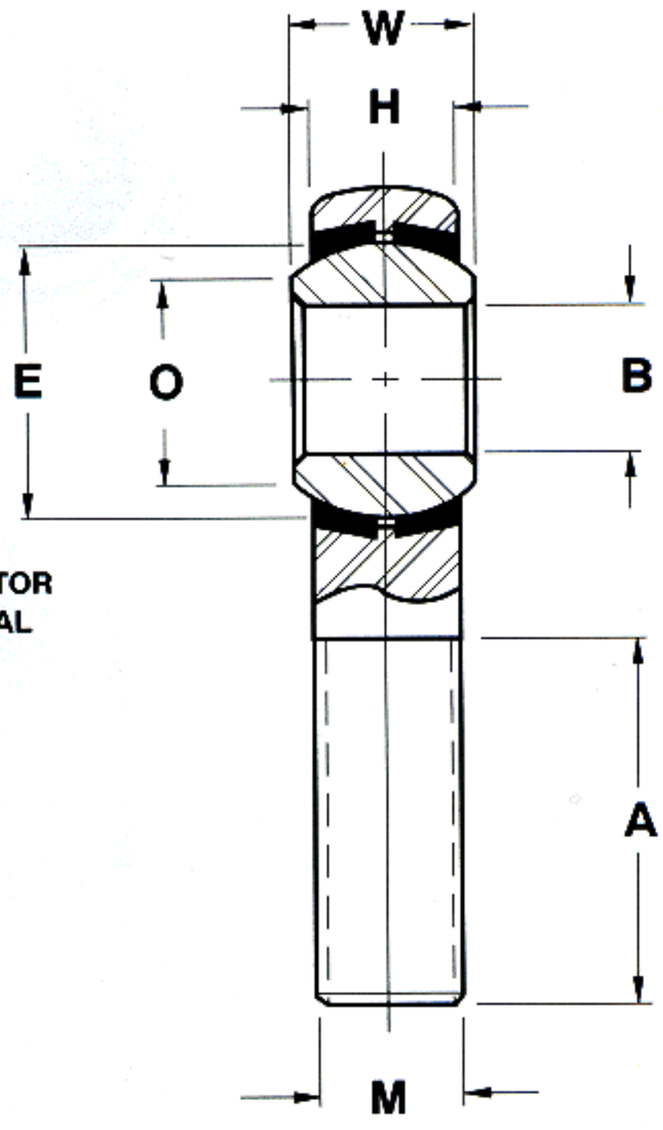
❷ For design options, see page 21

❸ For Engineering data, see pages 18 thru 20

❹ "H" tolerance across inserts is +/-.015





# SPHERCO®

# Commercial Series

## Four Piece - Metal to Metal

### *Series TF*

| ROD END NUMBER | DIMENSIONS IN INCHES | | | | | | | | | | | | MAXIMUM STATIC RADIAL LOAD | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BORE | BALL WIDTH | HOUSING WIDTH | HEAD DIAMETER | LENGTH TO CENTER OF BALL | THREAD LENGTH | THREAD SIZE | BALL DIAMETER | BALL FLAT DIAMETER | ACROSS WRENCH FLATS | OTHER DIMENSIONS | | | |
| | B | W | H ④ | D | F | A | M | E | O | J | K | L | | |
| | +.0025 -.0005 | +.005 -.005 | +.010 -.010 | +.031 -.031 | +.031 -.031 | +.062 -.062 | UNF-3B | REF | REF | +.010 -.010 | +.010 -.010 | +.010 -.010 | LBF | LBS |
| **TF3** | .1900 | .312 | .250 | .625 | 1.062 | .562 | .1900-32 | .437 | .306 | .312 | .406 | .187 | 1,850 | .03 |
| **TF4** | .2500 | .375 | .281 | .750 | 1.312 | .750 | .2500-28 | .515 | .353 | .375 | .468 | .187 | 2,700 | .05 |
| **TF5** | .3125 | .437 | .344 | .875 | 1.375 | .750 | .3125-24 | .625 | .447 | .437 | .500 | .187 | 3,350 | .08 |
| **TF6** | .3750 | .500 | .406 | 1.000 | 1.625 | .937 | .3750-24 | .718 | .516 | .562 | .687 | .250 | 4,450 | .12 |
| **TF7** | .4375 | .562 | .437 | 1.125 | 1.812 | 1.062 | .4375-20 | .812 | .586 | .625 | .750 | .250 | 5,350 | .17 |
| **TF8** | .5000 | .625 | .500 | 1.312 | 2.125 | 1.187 | .5000-20 | .937 | .698 | .750 | .875 | .250 | 7,400 | .26 |
| **TF10** | .6250 | .750 | .562 | 1.500 | 2.500 | 1.500 | .6250-18 | 1.125 | .839 | .875 | 1.000 | .312 | 8,050 | .41 |
| **TF12** | .7500 | .875 | .687 | 1.750 | 2.875 | 1.750 | .7500-16 | 1.312 | .978 | 1.000 | 1.125 | .312 | 11,300 | .64 |

***Outer Member:*** *Carbon steel, with protective coating for corrosion resistance*

***Ball:*** *Carbon steel, case hardened, with protective coating for additional hardness and corrosion resistance*

***Inserts:*** *Brass*

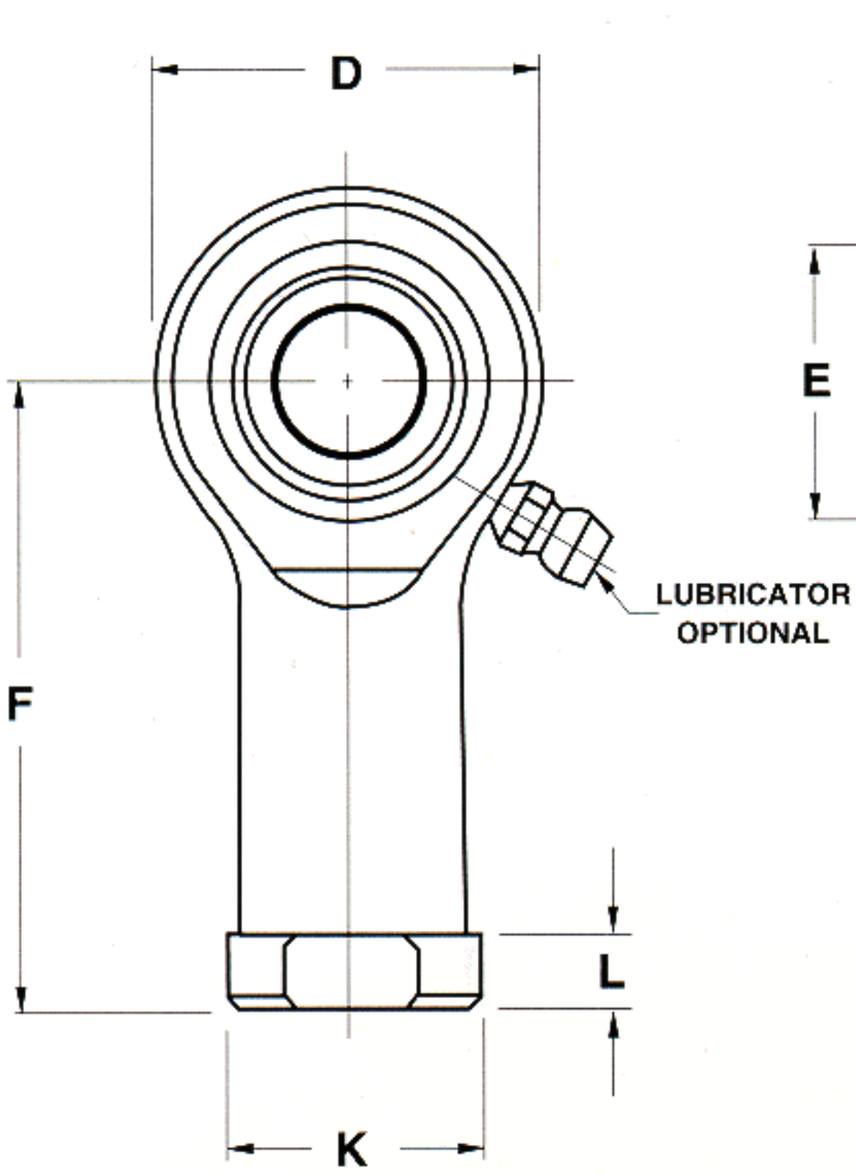
**NOTES**

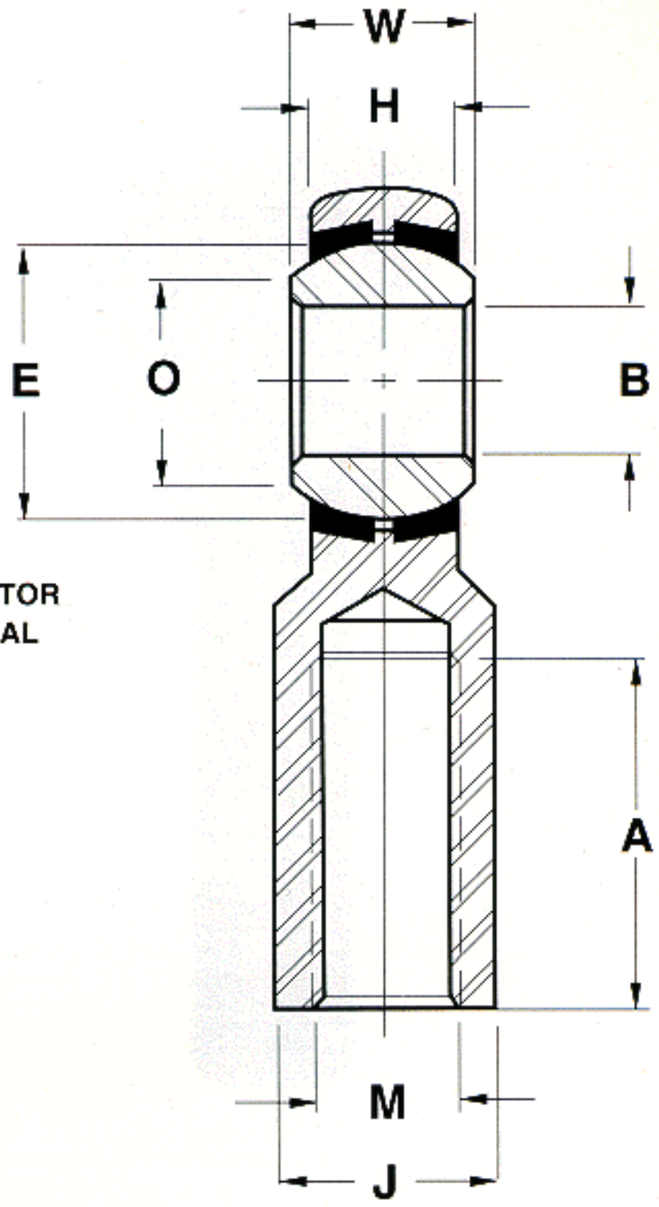
❶ **Add letter "L" to prefix to indicate Left Hand thread**
**Example: TFL4**

❷ **For design options, see page 21**

❸ **For Engineering data, see pages 18 thru 20**

❹ **"H" tolerance across inserts is +/-.015**




ROD ENDS

SPHERCO®

# Commercial Extra Capacity Series

## Two Piece - Metal to Metal

### *Series CFM*

| ROD END NUMBER | DIMENSIONS IN INCHES | | | | | | | | | MAXIMUM STATIC RADIAL LOAD | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | BORE | BALL WIDTH | HOUSING WIDTH | HEAD DIAMETER | LENGTH TO CENTER OF BALL | THREAD LENGTH | THREAD SIZE | BALL DIAMETER | BALL FLAT DIAMETER | | |
| | B | W | H | D | F | A | M | E | O | | |
| | +.0025 -.0005 | +.005 -.005 | +.010 -.010 | +.031 -.031 | +.031 -.031 | +.062 -.062 | UNF -3A | REF | REF | LBF | LBS |
| CFM3 | .1900 | .312 | .250 | .625 | 1.250 | .750 | .1900 - 32 | .437 | .306 | 950 | .03 |
| CFM4 | .2500 | .375 | .281 | .750 | 1.562 | 1.000 | .2500 - 28 | .515 | .353 | 2,000 | .05 |
| CFM5 | .3125 | .437 | .344 | .875 | 1.875 | 1.250 | .3125 - 24 | .625 | .447 | 3,000 | .08 |
| CFM6 | .3750 | .500 | .406 | 1.000 | 1.938 | 1.250 | .3750 - 24 | .718 | .516 | 5,000 | .11 |
| CFM7 | .4375 | .562 | .437 | 1.125 | 2.125 | 1.375 | .4375 - 20 | .812 | .586 | 6,500 | .16 |
| CFM8 | .5000 | .625 | .500 | 1.312 | 2.438 | 1.500 | .5000 - 20 | .937 | .698 | 9,000 | .24 |
| CFM10 | .6250 | .750 | .562 | 1.500 | 2.625 | 1.625 | .6250 - 18 | 1.125 | .839 | 10,000 | .40 |
| CFM12 | .7500 | .875 | .687 | 1.750 | 2.875 | 1.750 | .7500 - 16 | 1.312 | .978 | 14,000 | .63 |

*Outer Member:* *Carbon steel, with protective coating for corrosion resistance*

*Ball:* *Carbon steel, case hardened, with protective coating for additional hardness and corrosion resistance*

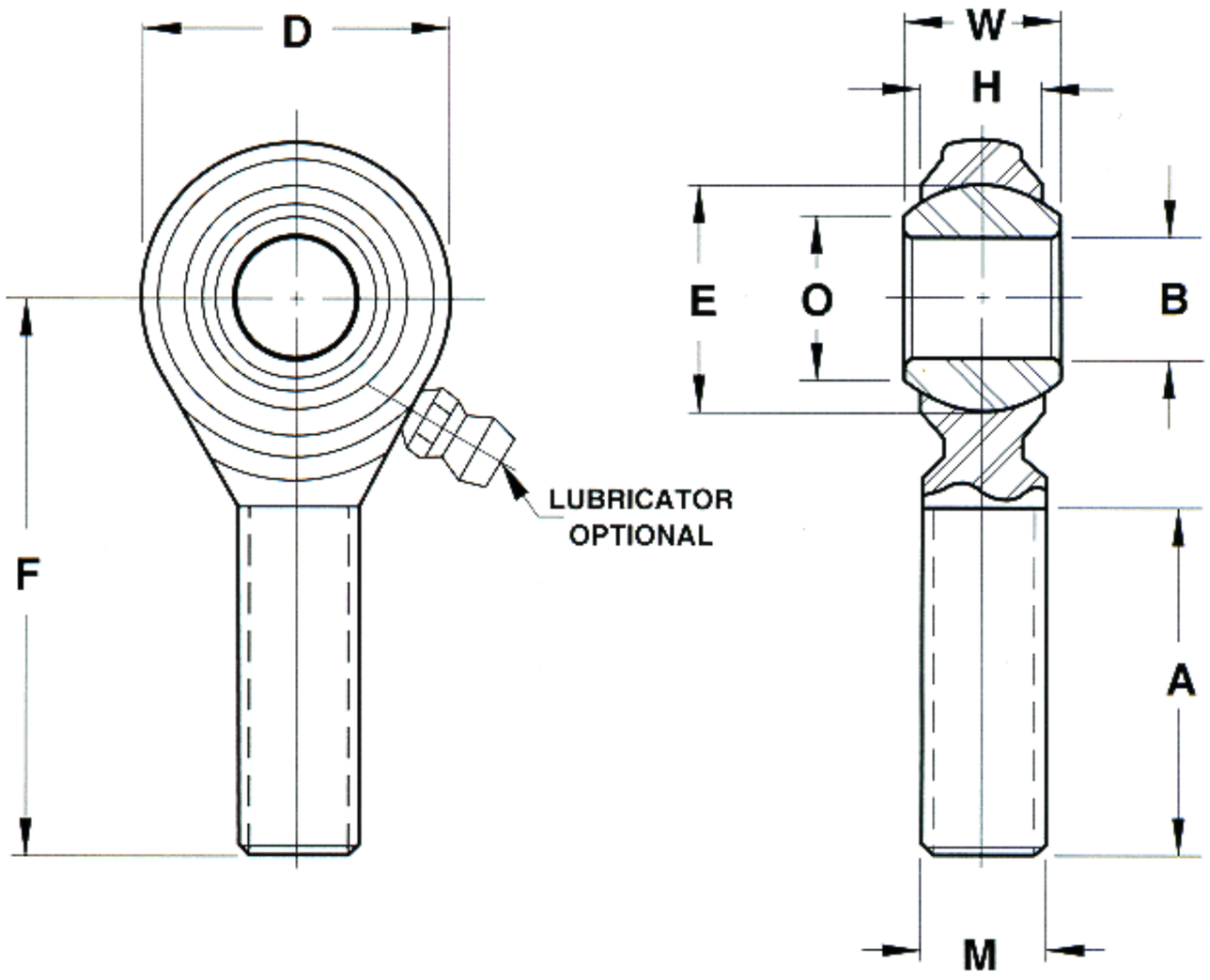
NOTES

❶ Add letter "L" to prefix to indicate Left Hand thread
Example: CFML4

❷ For design options, see page 21

❸ For Engineering data, see pages 18 thru 20





# SPHERCO®

# Commercial Extra Capacity Series

## Two Piece - Metal to Metal

***Series CFF***

| ROD END NUMBER | DIMENSIONS IN INCHES | | | | | | | | | | | | MAXIMUM STATIC RADIAL LOAD | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BORE | BALL WIDTH | HOUSING WIDTH | HEAD DIAMETER | LENGTH TO CENTER OF BALL | THREAD LENGTH | THREAD SIZE | BALL DIAMETER | BALL FLAT DIAMETER | ACROSS WRENCH FLATS | OTHER DIMENSIONS | | | |
| | B | W | H | D | F | A | M | E | O | J | K | L | | |
| | +.0025 -.0005 | +.005 -.005 | +.010 -.010 | REF | REF | +.062 -.031 | UNF-3B | REF | REF | REF | REF | REF | LBF | LBS |
| **CFF3** | .1900 | .312 | .250 | .625 | 1.062 | .500 | .1900-32 | .437 | .306 | .312 | .406 | .187 | 2,000 | .03 |
| **CFF4** | .2500 | .375 | .281 | .750 | 1.312 | .625 | .2500-28 | .515 | .355 | .375 | .468 | .187 | 3,200 | .05 |
| **CFF5** | .3125 | .437 | .344 | .875 | 1.375 | .625 | .3125-24 | .625 | .447 | .437 | .500 | .187 | 3,800 | .08 |
| **CFF6** | .3750 | .500 | .406 | 1.000 | 1.625 | .687 | .3750-24 | .718 | .517 | .562 | .687 | .250 | 5,000 | .12 |
| **CFF7** | .4375 | .562 | .437 | 1.125 | 1.812 | .812 | .4375-20 | .812 | .586 | .625 | .750 | .250 | 6,500 | .17 |
| **CFF8** | .5000 | .625 | .500 | 1.312 | 2.125 | .937 | .5000-20 | .937 | .698 | .750 | .875 | .250 | 9,000 | .26 |
| **CFF10** | .6250 | .750 | .562 | 1.500 | 2.500 | 1.187 | .6250-18 | 1.125 | .839 | .875 | 1.000 | .312 | 10,000 | .41 |
| **CFF12** | .7500 | .875 | .687 | 1.750 | 2.875 | 1.375 | .7500-16 | 1.312 | .978 | 1.000 | 1.125 | .312 | 14,000 | .64 |

*Outer Member:* ***Carbon steel, with protective coating for corrosion resistance.***

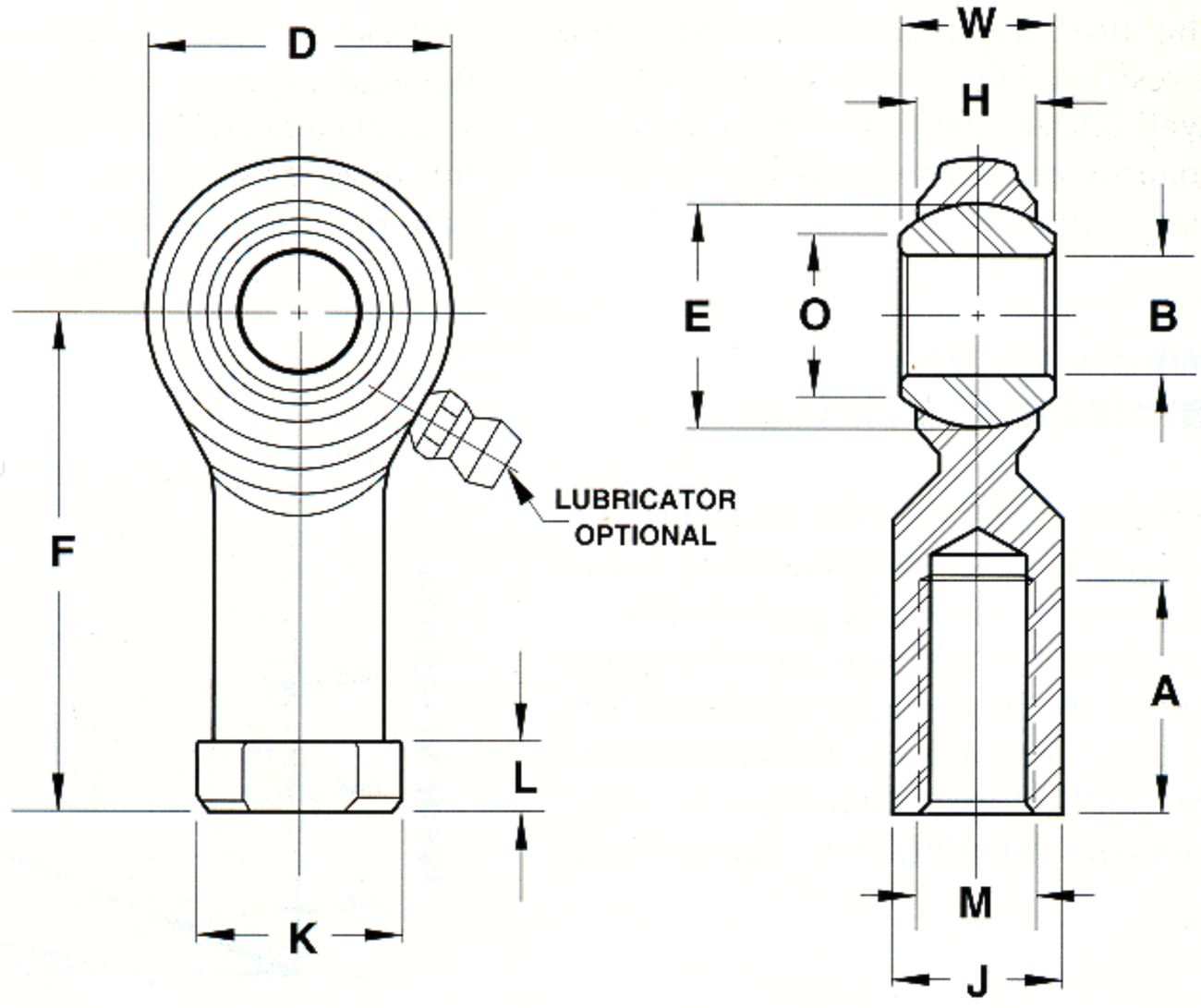
*Ball:* ***Carbon steel, case hardened, with protective coating for additional hardness and corrosion resistance.***

**NOTES**

❶ **Add letter "L" to prefix to indicate Left Hand thread**
**Example: CFFL4**

❷ **For design options, see page 21**

❸ **For Engineering data, see pages 18 thru 20**



# SPHERCO®

CTMD

CTFD

## SPHERCO® Self-Lubricating Series

For commercial applications where a self-lubricating bearing is either desirable or necessary, Spherco developed Spherco CTMD/CTFD Series bearings. Spherco CTMD/CTFD bearings are designed with an engineered thermoplastic race material and offer a lower coefficient of friction than metal-to-metal types that use conventional lubricants. It is a resilient material that performs well under vibratory and dynamic loading and withstands dynamic loads up to 3500 PSI.

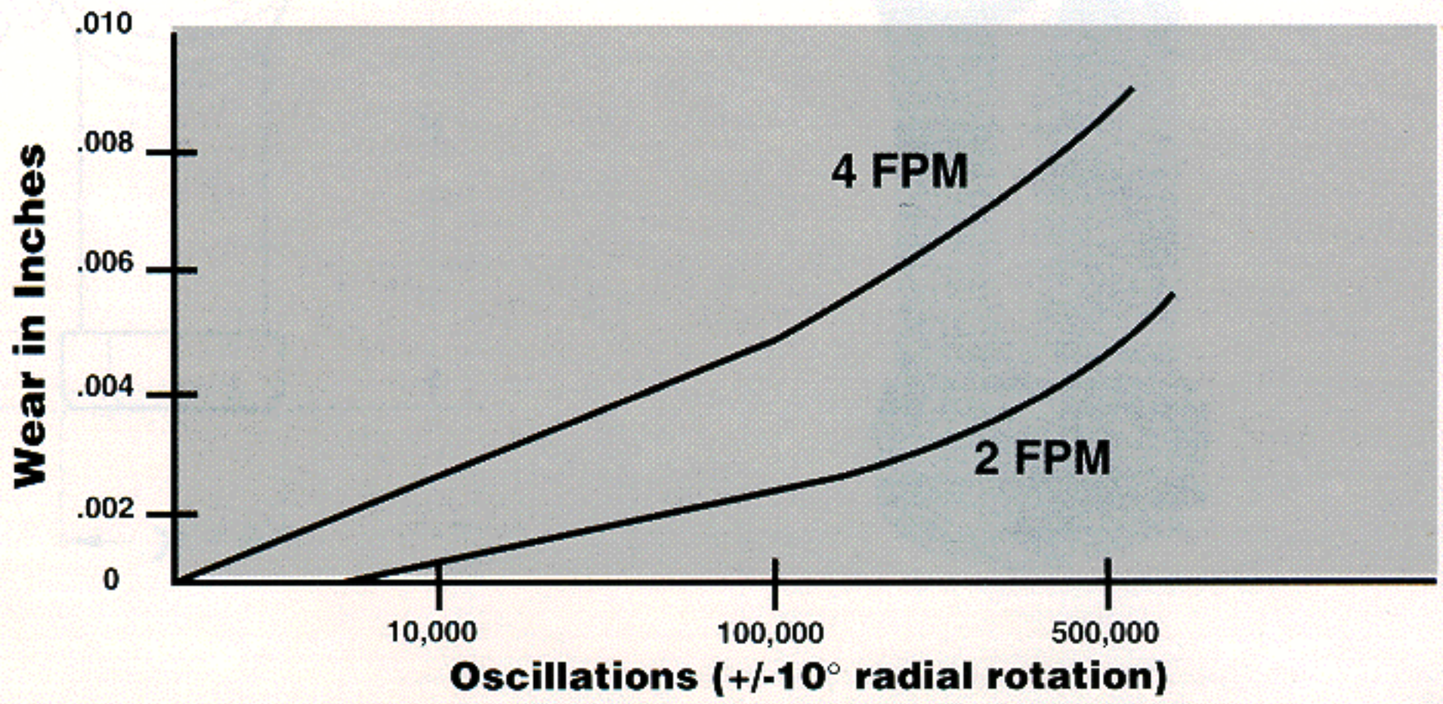
## Where to Use SPHERCO® Bearings

Spherco CTMD/CTFD bearings should be used in applications where the bearing cannot be periodically lubricated or where it is desirable to eliminate the need for regular maintenance. They are also recommended for applications where there is considerable vibration. The resilience of the engineered thermoplastic race absorbs vibration without causing fretting or galling of the surface. The torque level of the bearing will be low because of the low coefficient of friction of the hardened steel ball on the engineered thermoplastic race . The coefficient of friction for these bearings is approximately 0.1, but will vary somewhat depending on the loads, speeds, temperatures, and solvents that are present. The chart on this page shows a typical bearing wear pattern of these bearings and how they vary with number of oscillations.

## Environmental Characteristics

Spherco CTMD/CTFD bearings have good environmental tolerances. They offer advantages over bearings that use a nylon race because the Spherco engineered thermoplastic race absorbs very little moisture. It is generally resistant to alcohols, aldehydes, esters, ethers, hydrocarbons, weak acids and bases, water and agricultural chemicals. Dimensional stability is quite good when exposed to these substances, however the Heim engineering department should be contacted for recommendations on specific performance characteristics.

### Wear vs. Oscillations




This chart shows typical wear of engineered thermoplastic race bearings (load at one-half static rating - ball surface velocity as noted),

ROD ENDS



RBC BEARINGS

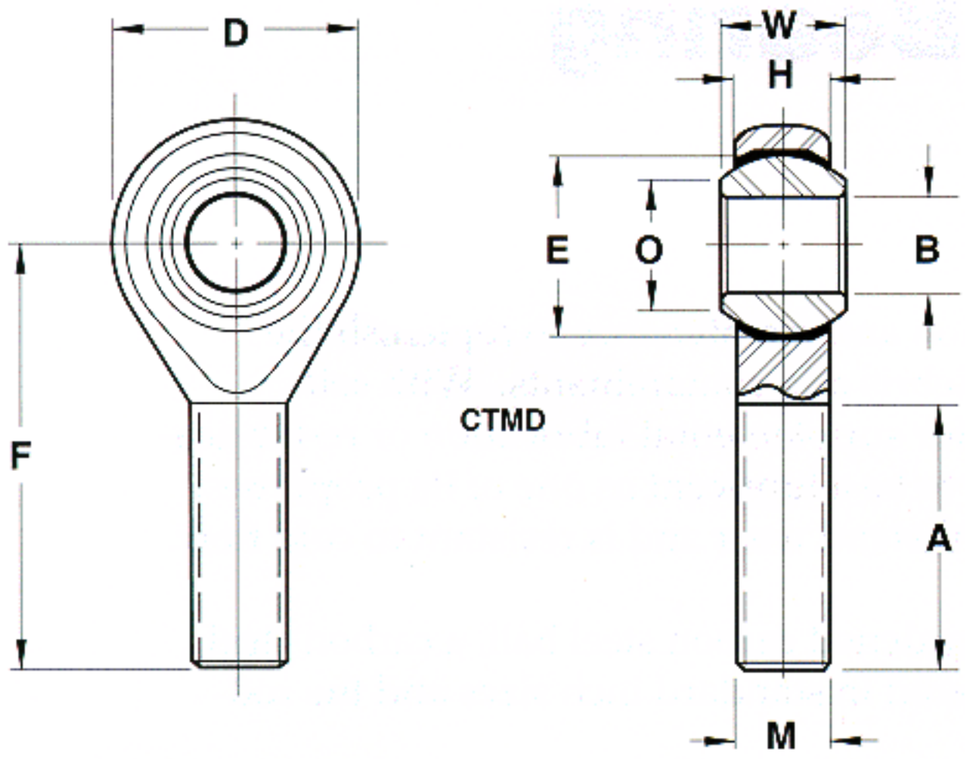
# SPHERCO®

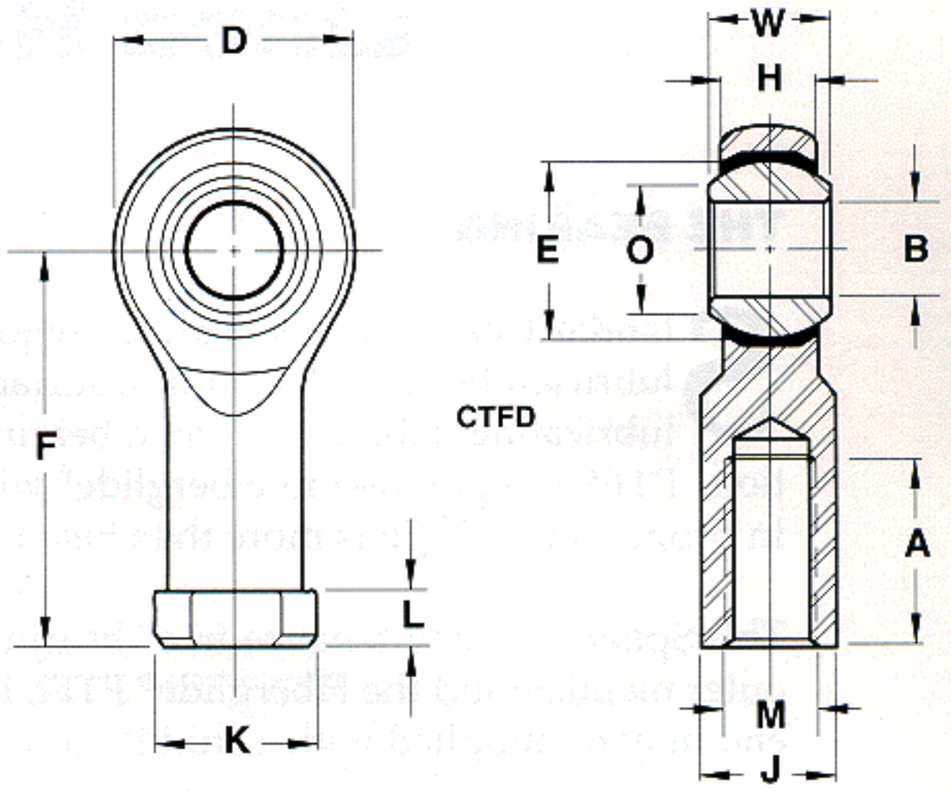
# Commercial Series

## Light Duty - Self-Lubricating - Thermoplastic

### *Series CTMD*

| ROD END NUMBER | DIMENSIONS IN INCHES | | | | | | | | | MAXIMUM STATIC RADIAL LOAD | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | BORE | BALL WIDTH | HOUSING WIDTH | HEAD DIAMETER | LENGTH TO CENTER OF BALL | THREAD LENGTH | THREAD SIZE | BALL DIAMETER | BALL FLAT DIAMETER | | |
| | B | W | H | D | F | A | M | E | O | | |
| | +.0025 -.0005 | +.005 -.005 | +.010 -.010 | REF | REF | +.062 -.062 | UNF-3A | REF | REF | LBF | LBS |
| **CTMD3** | .1900 | .313 | .250 | .625 | 1.250 | .750 | .1900-32 | .437 | .306 | 800 | .03 |
| **CTMD4** | .2500 | .375 | .281 | .750 | 1.562 | 1.000 | .2500-28 | .515 | .353 | 1,060 | .05 |
| **CTMD5** | .3125 | .437 | .344 | .875 | 1.875 | 1.250 | .3125-24 | .625 | .447 | 1,575 | .08 |
| **CTMD6** | .3750 | .500 | .406 | 1.000 | 1.938 | 1.250 | .3750-24 | .718 | .516 | 2,150 | .12 |
| **CTMD7** | .4375 | .562 | .437 | 1.125 | 2.125 | 1.375 | .4375-20 | .812 | .586 | 2,600 | .17 |
| **CTMD8** | .5000 | .625 | .500 | 1.312 | 2.438 | 1.500 | .5000-20 | .937 | .698 | 3,425 | .26 |
| **CTMD10** | .6250 | .750 | .562 | 1.500 | 2.625 | 1.625 | .6250-18 | 1.125 | .839 | 4,625 | .41 |
| **CTMD12** | .7500 | .875 | .687 | 1.750 | 2.875 | 1.750 | .7500-16 | 1.312 | .978 | 6,600 | .64 |




*Outer Member:* *Carbon steel, with protective coating for corrosion resistance*
*Ball:* *Carbon steel, case hardened, with protective coating for additional hardness and corrosion resistance*
*Race:* *Engineered thermoplastic*

NOTES
❶ Add letter "L" to prefix to indicate Left Hand thread
Example: CTMDL4 or CTFDL4
❷ For design options, see page 21
❸ For Engineering data, see pages 12, 18 thru 20

### *Series CTFD*

| ROD END NUMBER | DIMENSIONS IN INCHES | | | | | | | | | | | | MAXIMUM STATIC RADIAL LOAD | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BORE | BALL WIDTH | HOUSING WIDTH | HEAD DIAMETER | LENGTH TO CENTER OF BALL | THREAD LENGTH | THREAD SIZE | BALL DIAMETER | BALL FLAT DIAMETER | ACROSS WRENCH FLATS | OTHER DIMENSIONS | | | |
| | B | W | H | D | F | A | M | E | O | J | K | L | | |
| | +.0025 -.0005 | +.005 -.005 | +.010 -.010 | REF | REF | +.062 -.062 | UNF -3B | REF | REF | REF | REF | REF | LBF | LBS |
| **CTFD3** | .1900 | .313 | .250 | .625 | 1.062 | .562 | .1900 - 32 | .437 | .306 | .312 | .406 | .187 | 800 | .03 |
| **CTFD4** | .2500 | .375 | .281 | .750 | 1.312 | .750 | .2500 - 28 | .515 | .355 | .375 | .468 | .187 | 1,060 | .05 |
| **CTFD5** | .3125 | .437 | .344 | .875 | 1.375 | .750 | .3125 - 24 | .625 | .447 | .437 | .500 | .187 | 1,575 | .08 |
| **CTFD6** | .3750 | .500 | .406 | 1.000 | 1.625 | .937 | .3750 - 24 | .718 | .517 | .562 | .687 | .250 | 2,150 | .12 |
| **CTFD7** | .4375 | .562 | .437 | 1.125 | 1.812 | 1.062 | .4375 - 20 | .812 | .586 | .625 | .750 | .250 | 2,600 | .17 |
| **CTFD8** | .5000 | .625 | .500 | 1.312 | 2.125 | 1.187 | .5000 - 20 | .937 | .698 | .750 | .875 | .250 | 3,425 | .26 |
| **CTFD10** | .6250 | .750 | .562 | 1.500 | 2.500 | 1.500 | .6250 - 18 | 1.125 | .839 | .875 | 1.000 | .312 | 4,625 | .41 |
| **CTFD12** | .7500 | .875 | .687 | 1.750 | 2.875 | 1.750 | .7500 - 16 | 1.312 | .978 | 1.000 | 1.125 | .312 | 6,600 | .64 |





RBC BEARINGS

# FEATURED PRODUCT


## The Spherco® Self-Lubricated, Fiberglide® Lined Rod End Bearing



### THE BEARING

Standard steel on steel bearings require periodic lubrication and maintenance to replenish the lubricant between the sliding surfaces and to flush out debris and contaminants. With self-lubricating, Fiberglide® lined bearings, there is no need for supplemental lubrication or re-lubrication. PTFE is a polymer in Fiberglide® which has the capacity to be a lubricant as one of its properties. In proper form, PTFE is more than just a lubricant as it can withstand wear and is resistant to cold flow.

This Spherco® "maintenance-free" bearing consists of a case hardened carbon steel ball, a carbon steel outer member and the Fiberglide® PTFE liner system. It is offered in standard inch sizes and the rod end may be supplied with a stud if required.

### WHAT IS FIBERGLIDE®?

Fiberglide® is the trademark used for a proprietary bearing material manufactured by RBC's Transport Dynamics Division. This material utilizes Teflon (Polytetrafluoroethylene) fibers in a woven or cloth-like form. Fiberglide® is used in many variations and may be adapted for use in broad and varied fields of applications.

Fiberglide® bearings are self-lubricating and can be run either dry or with fluids over a wide range of loads and speeds. Unlike most conventional bearings, the coefficient of friction decreases in Fiberglide® bearings as the load increases, while galling of the ball is eliminated.

Fiberglide's PTFE fibers have a tensile strength near 50,000 psi, as compared to the 4,000 to 5,000 psi for standard Teflon resin. This strength is a direct result of Fiberglide's high molecular orientation and accounts, in part, for its very high load-carrying capacity and the elimination of the usual Teflon resin cold flow problems. An equally important aspect of Fiberglide® is the superior manner in which its PTFE fibers are mechanically locked in place.

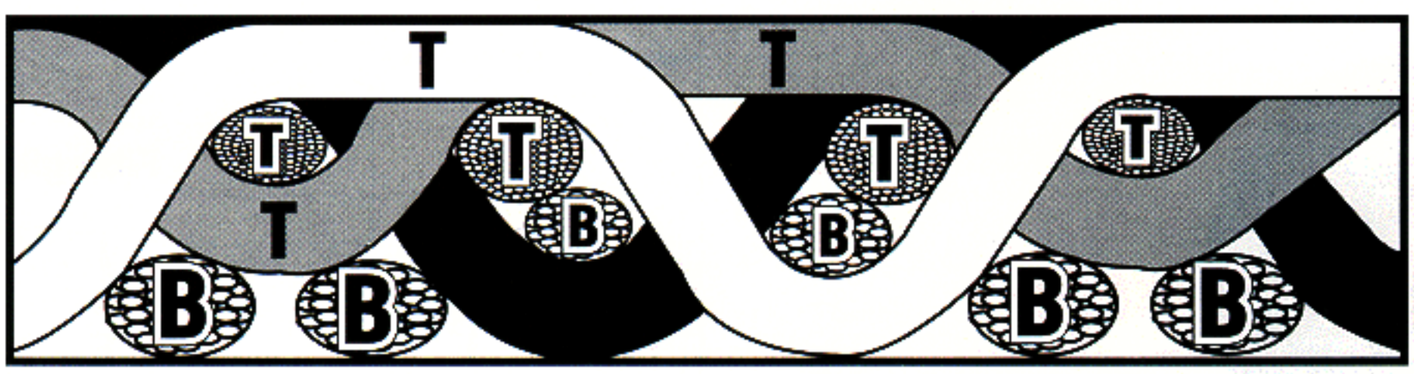
# FEATURED PRODUCT

## The Spherco® Self-Lubricated, Fiberglide® Lined Rod End Bearing

The Fiberglide® liner system is a unique PTFE fabric consisting of a special weave of PTFE Teflon® and Dacron fibers bonded to a rigid metallic backing. The weave of the fabric incorporates Dacron (**B**) thread bundles in one direction and a Teflon® thread (**T**) in the same and crossing directions. Advantages of this system versus earlier generation liner systems include:

**Low Wear** rates at **High Loads**
**High Temperature (250°F)** performance capability
**High** static **Strength**
Good **Resistance to** a variety of **Fluids** encountered in various applications

The Dacron fibers in the liner backing result in a matrix that is particularly resistant to breakdown caused by high vibration.




### THE SPHERCO® ADVANTAGE

Spherco Fiberglide® lined bearings have many distinct and valuable advantages over conventional metal-to-metal plain bearings. They provide the answer for many difficult applications.

Spherco Fiberglide® lined bearings:

1. Operate without lubrication while tolerating all common and many special lubricating fluids in the bearing area, as well as most non-lubricant fluids.
2. Have a low and consistent coefficient of friction.
3. Have little or no radial play.
4. Are free from stick-slip.
5. Have a high load-carrying capacity.
6. Show a high resistance to fatigue under shock.
7. Have a high resistance to wear (over 1,000,000 cycles tested).
8. Have inherent damping properties.

Dacron and Teflon® are registered trademarks of El Du Pont de Nemours & Co.

SPHERCO®

# Commercial Series
## Extra Duty - Self-Lubricating - Fiberglide®

### *Series CFM T*

| ROD END NUMBER | DIMENSIONS IN INCHES | | | | | | | | | MAXIMUM STATIC RADIAL LOAD | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | BORE | BALL WIDTH | HOUSING WIDTH | HEAD DIAMETER | LENGTH TO CENTER OF BALL | THREAD LENGTH | THREAD SIZE | BALL DIAMETER | BALL FLAT DIAMETER | | |
| | B | W | H | D | F | A | M | E | O | | |
| | +.0025 -.0005 | +.005 -.005 | +.010 -.010 | +.031 -.031 | +.031 -.031 | +.062 -.062 | UNF -2A ❹ | REF | REF | LBF | LBS |
| **CFM4T** | .2500 | .375 | .281 | .750 | 1.562 | 1.000 | .2500 - 28 | .515 | .353 | 2,000 | .05 |
| **CFM5T** | .3125 | .437 | .344 | .875 | 1.875 | 1.250 | .3125 - 24 | .625 | .447 | 3,000 | .08 |
| **CFM6T** | .3750 | .500 | .406 | 1.000 | 1.938 | 1.250 | .3750 - 24 | .718 | .516 | 5,000 | .11 |
| **CFM8T** | .5000 | .625 | .500 | 1.312 | 2.438 | 1.500 | .5000 - 20 | .937 | .698 | 9,000 | .24 |
| **CFM10T** | .6250 | .750 | .562 | 1.500 | 2.625 | 1.625 | .6250 - 18 | 1.125 | .839 | 10,000 | .40 |
| **CFM12T** | .7500 | .875 | .687 | 1.750 | 2.875 | 1.750 | .7500 - 16 | 1.312 | .978 | 14,000 | .63 |

*Outer Member:* ***Carbon steel, with protective coating for corrosion resistance***

*Ball:* ***Carbon steel, case hardened, with protective coating for additional hardness and corrosion resistance***

*Liner:* ***Fiberglide®***

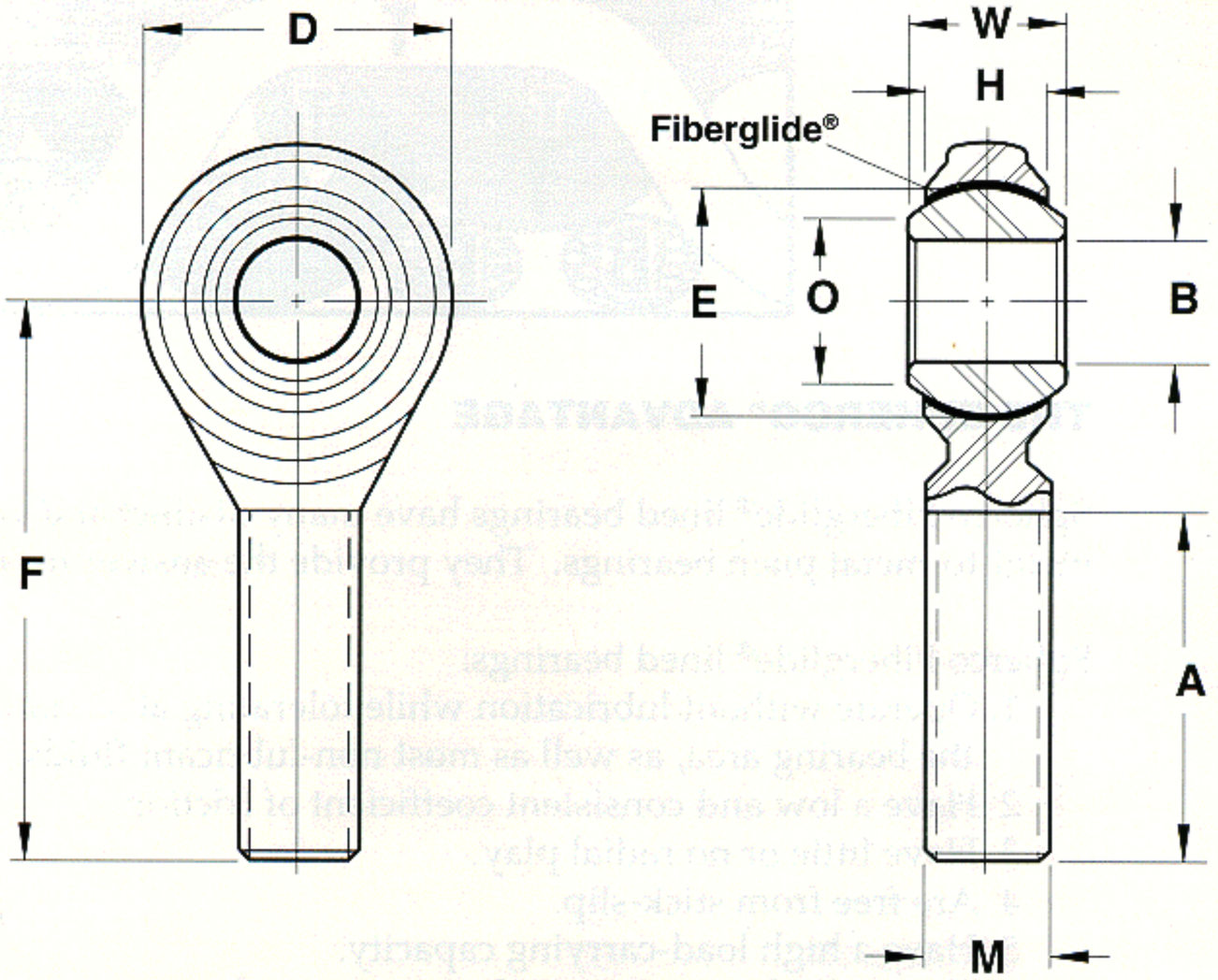
**NOTES**

❶ **Add letter "L" to prefix to indicate Left Hand thread**
**Example: CFML4T**

❷ **For design options, see page 21**

❸ **For Engineering data, see pages 18 thru 20**

❹ **UNF-3A threads may be supplied at manufacturers option**




ROD ENDS



RBC BEARINGS

# SPHERCO®

# Commercial Series
## Extra Duty - Self-Lubricating - Fiberglide®

### *Series CFF T*

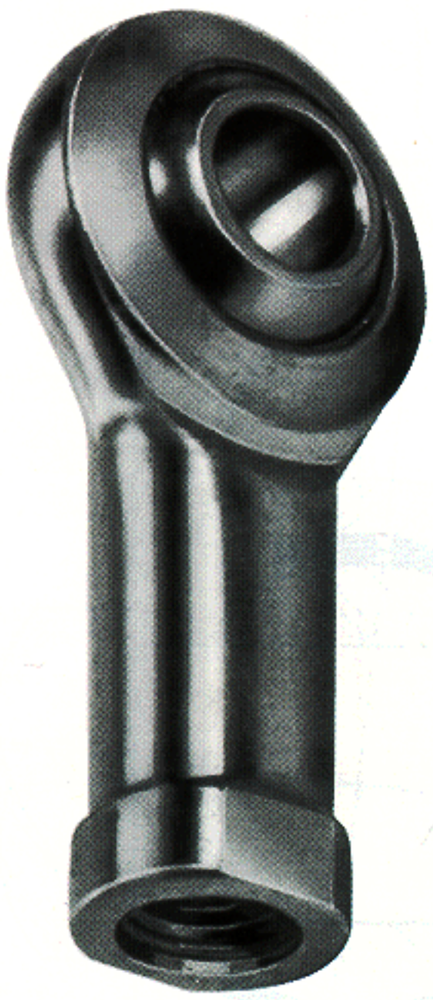
| ROD END NUMBER | DIMENSIONS IN INCHES | | | | | | | | | | | | MAXIMUM STATIC RADIAL LOAD | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BORE | BALL WIDTH | HOUSING WIDTH | HEAD DIAMETER | LENGTH TO CENTER OF BALL | THREAD LENGTH | THREAD SIZE | BALL DIAMETER | BALL FLAT DIAMETER | ACROSS WRENCH FLATS | OTHER DIMENSIONS | | | |
| | B | W | H | D | F | A | M | E | O | J | K | L | | |
| | +.0025 -.0005 | +.005 -.005 | +.010 -.010 | REF | REF | +.062 -.031 | UNF-2B ❹ | REF | REF | REF | REF | REF | LBF | LBS |
| **CFF4T** | .2500 | .375 | .281 | .750 | 1.312 | .625 | .2500-28 | .515 | .355 | .375 | .468 | .187 | 3,200 | .05 |
| **CFF5T** | .3125 | .437 | .344 | .875 | 1.375 | .625 | .3125-24 | .625 | .447 | .437 | .500 | .187 | 3,800 | .08 |
| **CFF6T** | .3750 | .500 | .406 | 1.000 | 1.625 | .687 | .3750-24 | .718 | .517 | .562 | .687 | .250 | 5,000 | .12 |
| **CFF8T** | .5000 | .625 | .500 | 1.312 | 2.125 | .937 | .5000-20 | .937 | .698 | .750 | .875 | .250 | 9,000 | .26 |
| **CFF10T** | .6250 | .750 | .562 | 1.500 | 2.500 | 1.187 | .6250-18 | 1.125 | .839 | .875 | 1.000 | .312 | 10,000 | .41 |
| **CFF12T** | .7500 | .875 | .687 | 1.750 | 2.875 | 1.375 | .7500 - 16 | 1.312 | .978 | 1.000 | 1.125 | .312 | 14,000 | .64 |

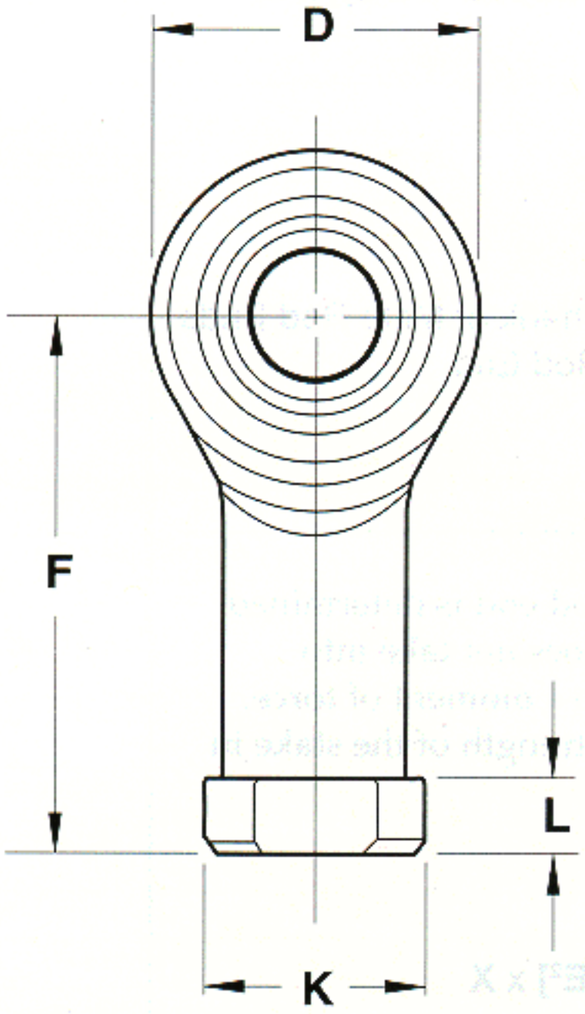
*Outer Member:* ***Carbon steel, with protective coating for corrosion resistance***

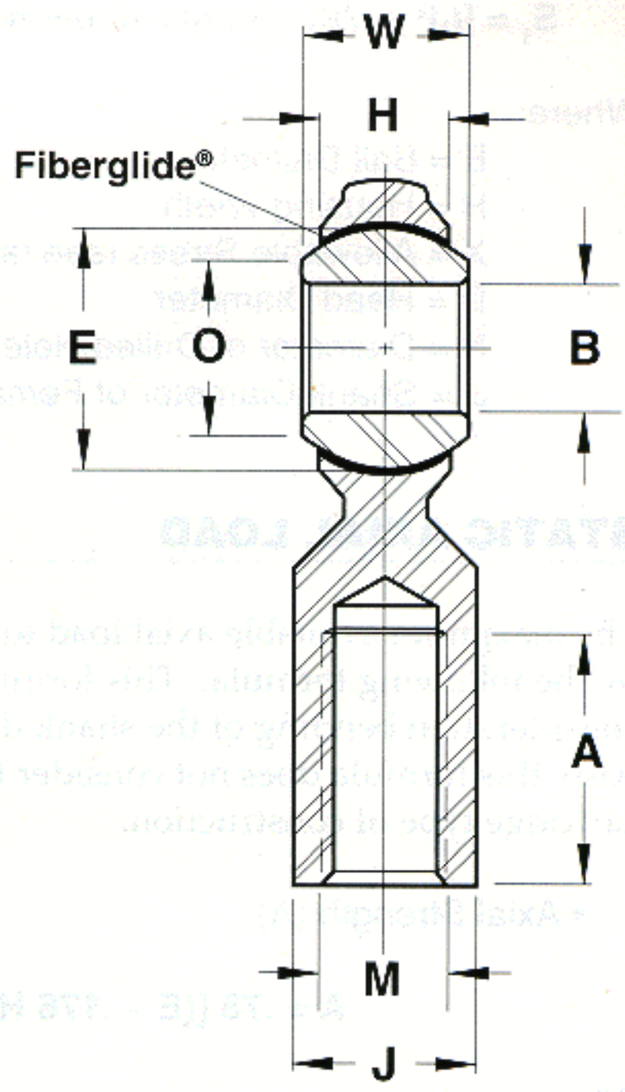
*Ball:* ***Carbon steel, case hardened, with protective coating for additional hardness and corrosion resistance***

*Liner:* ***Fiberglide®***

NOTES
- ❶ Add letter "L" to prefix to indicate Left Hand thread Example: CFFL4T
- ❷ For design options, see page 21
- ❸ For Engineering data, see pages 18 thru 20
- ❹ UNF-3B threads may be supplied at manufacturers option






ROD ENDS



RBC BEARINGS®

## STATIC RADIAL LOAD

The maximum static radial load permissible for a rod end depends on three factors: race material compressive strength, rod end head strength, and shank strength. The maximum static radial load is determined by taking the *lowest* of the three following values:

- Race material compressive strengths (R)

$$R = E \times H \times X$$

- Rod end head strength (T)

*insert construction*

$$T = [D - (E + .176\ H)] \times H \times X$$

*cartridge type construction*

$$T = \left[ \left(\frac{H}{2}\sqrt{D^2 - H^2}\right) + \left(\frac{D^2}{2} \times \text{SIN}^{-1}\frac{H}{D}\right) - (\text{O.D. of bearing} \times H)\right] \times X$$

angle of $\frac{H}{D}$ expressed in radians

- Shank Strength (S)

*male threaded rod end*

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

*female threaded rod end*

$$S_1 = [(J^2 \times .78) - (\text{major diameter of thread}^2 \times .78)] \times X$$

Where:

E = Ball Diameter
H = Housing Width
X = Allowable Stress (see table)
D = Head Diameter
N = Diameter of Drilled Hole in Shank of Male Rod Ends
J = Shank Diameter of Female Rod End

## STATIC AXIAL LOAD

The maximum available axial load for a rod end is determined by the following formula. This formula does not take into consideration bending of the shank due to a moment of force. Also, this formula does not consider the strength of the stake in cartridge type of construction.

- Axial Strength (A)

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

Where:

X = Allowable Stress (See Table)
E = Ball Diameter
H = Housing Width

**MATERIAL STRESS TABLE**

| Material | Allowable Stress (PSI) |
|---|---|
| Brass | 30,000 |
| Aluminum Bronze | 35,000 |
| 300 Series Stainless Steel | 35,000 |
| Low Carbon Steel | 52,000 |
| Alloy Steel | 140,000 |

## MISALIGNMENT

The angle of misalignment in a rod end is controlled by the outside diameter of the head. The maximum degree of misalignment is obtained when the head contacts the side of the fork or clevis in which it is mounted.

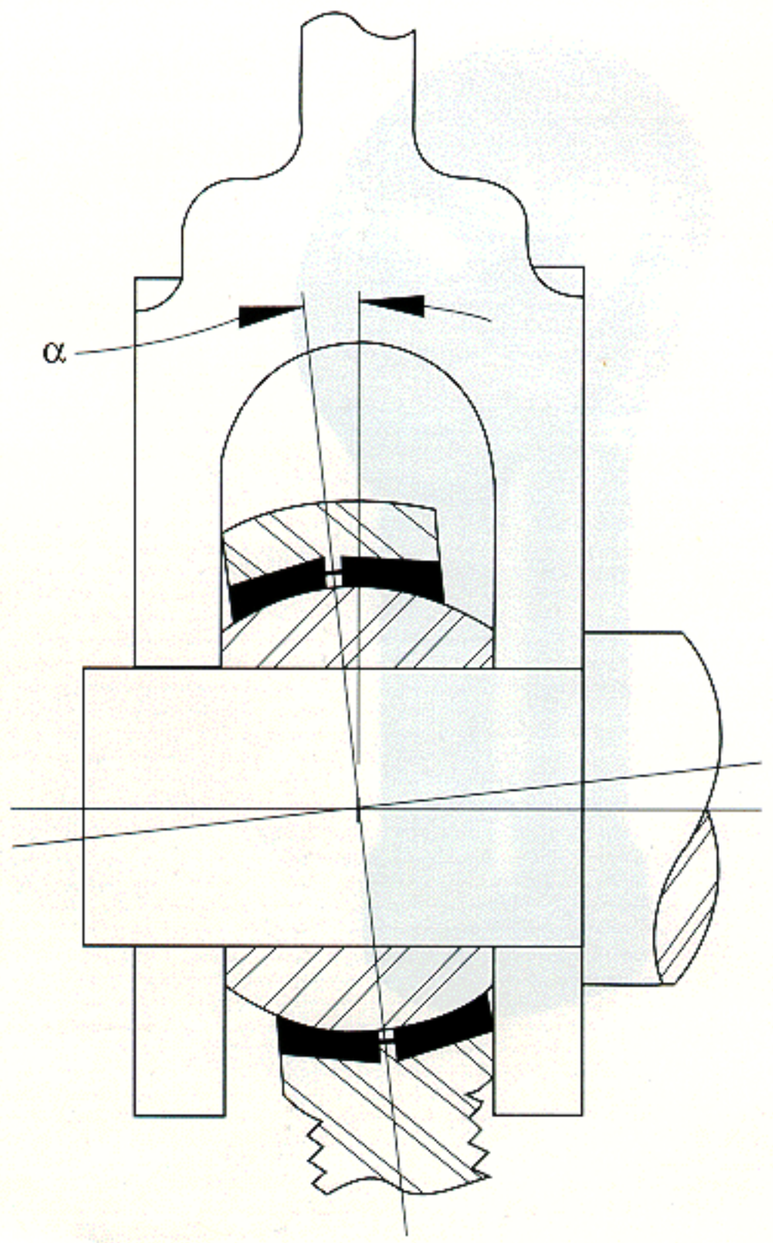
*Maximum misalignment is calculated by the following formula.*

- Rod End Angle ($\alpha$):

$$\alpha = \text{SIN}^{-1}\frac{W}{D} - \text{SIN}^{-1}\frac{H}{D}$$

Where:

D = Head diameter or diameter of outer race
H = Housing width
W= Ball width



- Angles of misalignment for series:

| | | | |
|---|---|---|---|
| TRE | TR | CTMD | CTFD |
| TM | TF | CFM | CFF |
| ARE 20N | AR N | ARE | CFM T |
| CFF T | | | |

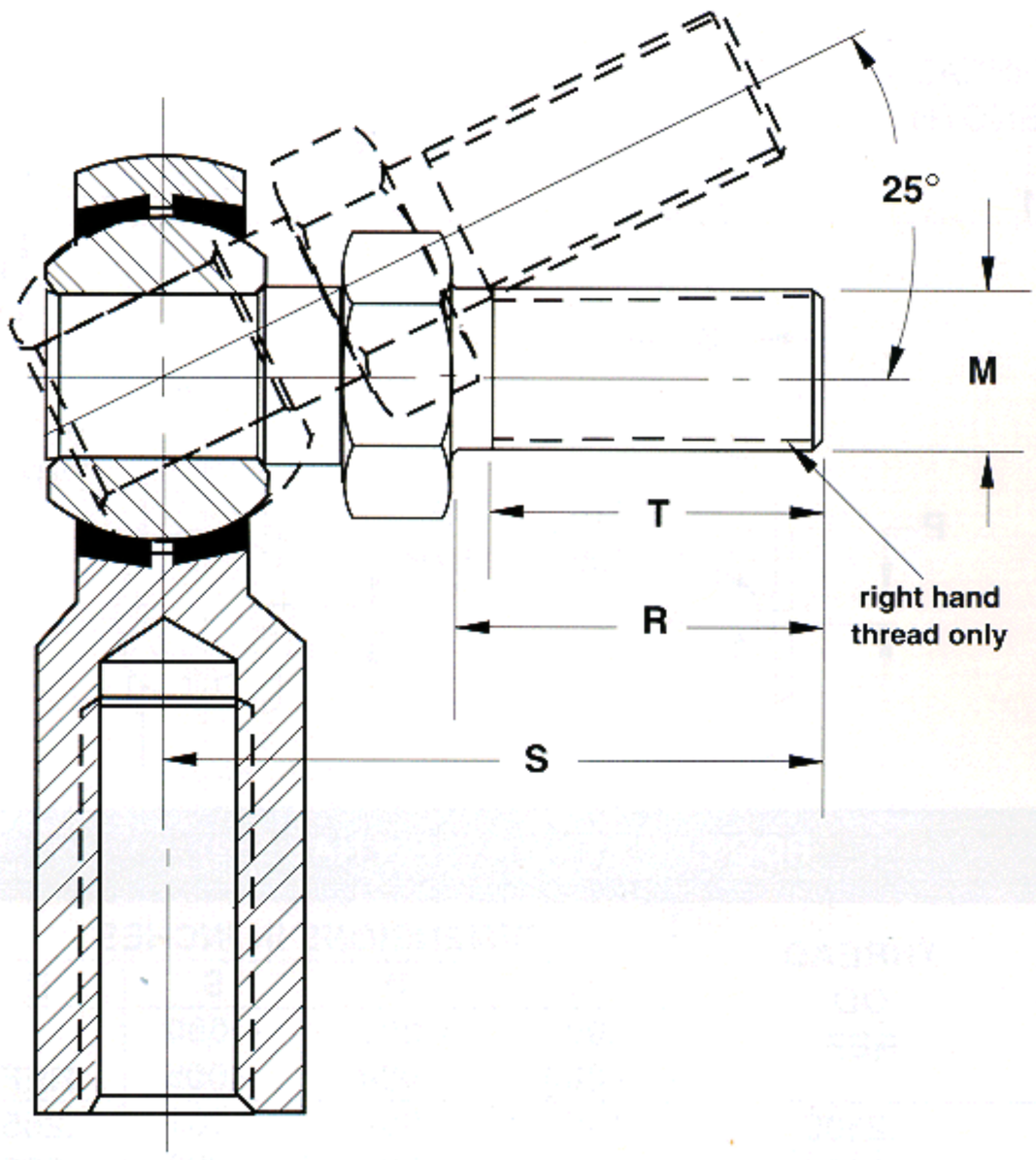
| ROD END SIZE | MISALIGNMENT +/- DEGREES |
|---|---|
| 2 | 8.5 |
| 2A | 7.0 |
| 3 | 6.5 |
| 4 | 8.0 |
| 5 | 7.0 |
| 6 | 6.0 |
| 7 | 7.0 |
| 8 | 6.0 |
| 10 | 8.0 |
| 12 | 7.0 |
| 16 | 8.5 |

## STUDS

Studs are used in combination with Spherco rod ends to simplify mounting. Studs are compatible with the following Spherco rod end series:

| | |
|---|---|
| CFM | CFF |
| TM | TF |
| TRE | TR |
| CTMD | CTFD |
| CFM T | CFF T |

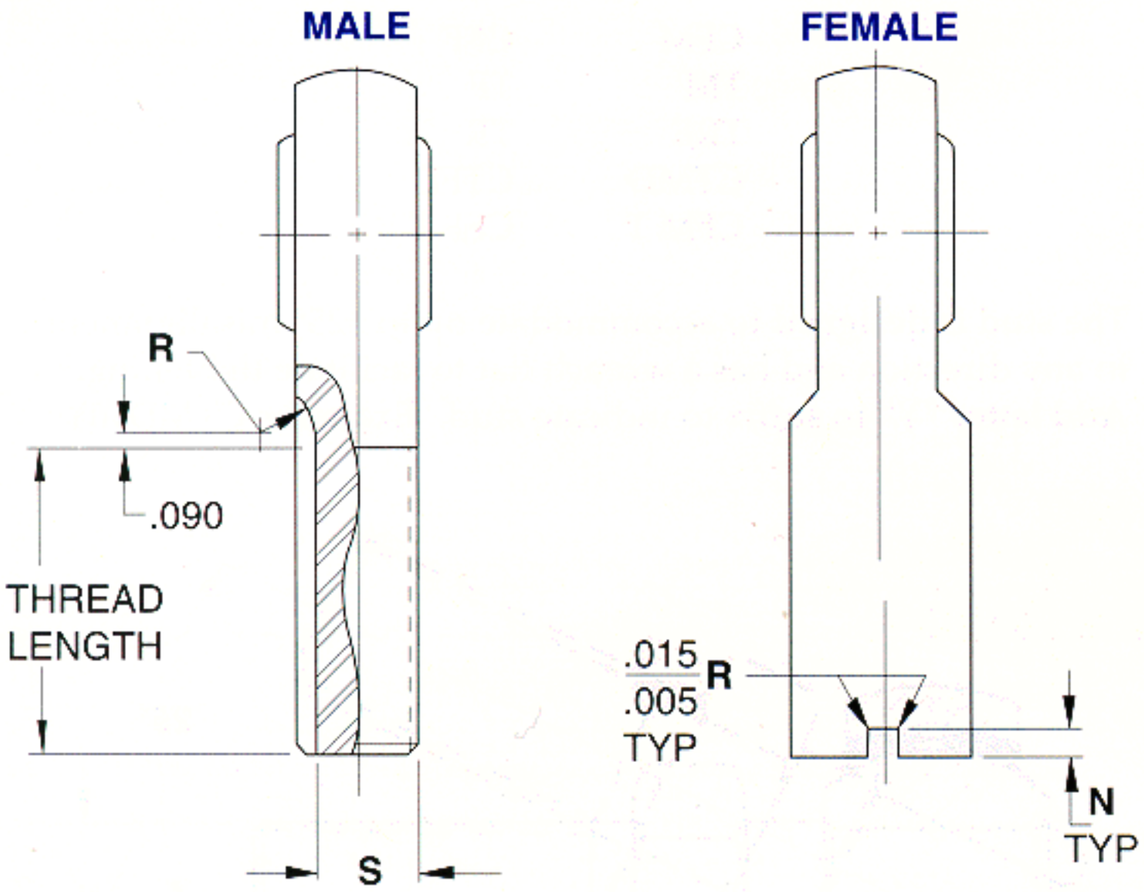
The stud is designed to accommodate up to ±25° misalignment in any direction and has a wrench flat to facilitate tightening. Add letter "Y" to suffix to indicate stud. Example: CTMD10Y




| TO FIT ROD END SIZE | DIMENSIONS IN INCHES | | | |
|---|---|---|---|---|
| | R | S | T | M |
| | +.010 -.010 | +.030 -.030 | REF | UNF-2A |
| 3 | .500 | .969 | .437 | .1900-32 |
| 4 | .562 | 1.047 | .500 | .2500-28 |
| 5 | .687 | 1.234 | .594 | .3125-24 |
| 6 | .906 | 1.540 | .812 | .3750-24 |
| 7 | 1.125 | 1.930 | 1.000 | .4375-20 |
| 8 | 1.125 | 2.000 | 1.000 | .5000-20 |
| 10 | 1.500 | 2.500 | 1.375 | .6250-18 |
| 12 | 1.812 | 3.000 | 1.625 | .7500-16 |

## KEYWAYS

Keyway slots, where available, are dimensioned as follows. Contact the Heim Engineering Department to determine keyway slot availability on a particular size.




### ROD END KEYWAY (Ref NAS 559)

| THREAD OD REF | DIMENSIONS IN INCHES | | | |
|---|---|---|---|---|
| | N | P | S | R |
| | +.005 -.000 | +.005 -.000 | +.000 -.005 | REF |
| .2500 | .056 | .062 | .201 | .255 |
| .3125 | .056 | .062 | .260 | .255 |
| .3750 | .056 | .093 | .311 | .255 |
| .4375 | .069 | .093 | .370 | .255 |
| .5000 | .069 | .093 | .436 | .255 |
| .5625 | .077 | .125 | .478 | .255 |
| .6250 | .077 | .125 | .541 | .255 |
| .7500 | .077 | .125 | .633 | .255 |
| .8750 | .086 | .156 | .777 | .318 |
| 1.0000 | .094 | .156 | .900 | .318 |
| 1.1250 | .094 | .187 | 1.010 | .382 |
| 1.2500 | .116 | .187 | 1.136 | .382 |
| 1.3750 | .116 | .250 | 1.236 | .445 |
| 1.5000 | .116 | .250 | 1.361 | .445 |
| 1.6250 | .129 | .250 | 1.477 | .445 |
| 1.7500 | .129 | .312 | 1.589 | .508 |
| 1.8750 | .129 | .312 | 1.714 | .508 |
| 2.0000 | .129 | .312 | 1.839 | .508 |
| 2.1250 | .129 | .312 | 1.955 | .508 |
| 2.2500 | .129 | .312 | 2.080 | .508 |

## MILITARY SPECIFICATIONS

Many of the processes used by Heim in the manufacture of rod ends are performed to U.S. Military Specifications. A partial list of these specifications follows:

| PROCESS | |
|---|---|
| **Anodize** | MIL-A-8625 Type 1 or 2 |
| **Cadmium Plate** | QQ-P-416 Type 1 Class 2 |
| **Chrome Plate** | QQ-C-320 Class 2 (.0002 min) |
| **Heat Treat** | MIL-H-6875<br>MIL-H-7199 |
| **Magnetic Particle Inspection** | ASTM-E-1444 |
| **Penetrant Inspection** | ASTM-E-1417 |
| **Zinc Plate** | ASTM B633<br>Type III, SC 1 or 2,<br>with chromate coating |

# Design Options

Spherco rod end and spherical bearings can be ordered with the following design options at extra cost.

| DESIGN OPTIONS | OPTION OFFERED ON THESE SERIES | ORDERING INSTRUCTIONS & PART NUMBER EXAMPLE FOR SPECIFYING DESIGN OPTIONS |
|---|---|---|
| **Keyway/Keyslot (per NAS 559)** | **TRE, TR, TM, TF, ARE 20N, AR N, ARE** | add "V" to part number suffix<br>Example: TRE8 with a keyway would be a TRE8V. (See page 20 for Keyway/Keyslot specifications) |
| **Lubricators** -Zerk Type | **TRE, TR, TM, TF, CFM, CFF, ARE, AR** | add "N" to part number suffix<br>Example: TM6 with a zerk type lubricator would be a TM6N<br>(available on sizes 4 through 16, male)<br>(available on sizes 3 through 16, female) |
| **Cross Drilled Oil Hole** | **SBG, SBG S, SBG SS** | add "A" to part number suffix<br>Example: SBG8S would be an SBG8SA |
| **Lubricators** -Flush type | **TRE, TR, TM, TF, ARE 20N, AR, CFM, CFF, ARE** | add "FN" to part number suffix<br>Example: TM6 with a flush type lubricator would be a TM6FN<br>(available on sizes 4 through 16 only) |
| **Stainless Steel Inserts (300 Series)** | **TRE, TR, TM, TF, ARE 20N, AR N, ARE, FSBG, FLBG** | add "SS" to part number suffix<br>Example: TR6 with 300 series stainless steel inserts would be a TR6SS |
| **Stud** | **TM, TF, CTMD, CTFD, TRE, TR, CFM, CFF, CFM T, CFF T** | add "Y" to part number suffix<br>Example: TM8 with a stud would be a TM8Y<br>(See page 19 for stud specifications.) |

# SPHERCO®

Spherco spherical plain bearings are intended for linkage applications where a bearing must accommodate significant misalignment. Spherical plain bearings offer flexibility in housing and mounting design. Spherco offers the industry's widest selection of spherical bearings types and sizes.

## Spherical Bearing Construction

Spherco offers two basic spherical bearing constructions. The four piece spherical bearing uses race inserts ( typically of brass) to provide lubricity in the bearing area. This design offers reduced internal clearance, and provides smoother operation. It is ideal for dynamic applications. The two piece spherical bearing uses an outer race which is formed around a spherical ball. This type uses a large variety of race materials to accommodate high loads, corrosive environments, etc. and can also accommodate a PTFE liner for self-lubrication.

## Lubricating Spherical Bearings

Spherco produces both metal-to-metal and self-lubricating bearings. All metal-to-metal spherical bearings, including brass insert four piece types, require regular lubrication. This can be accomplished by splash or immersion oil lubrication, or by greasing through the housing where the spherical bearing is installed. Self-lubricating types are used where relubrication is not practical, or in applications where relubrication is not desirable (such as food processing machinery).

## Spherical Bearing Grades

These spherical bearings are offered in two grades: precision and commercial. Precision spherical bearings are manufactured to tight tolerances for applications requiring improved linkage accuracy and reduced looseness. Commercial spherical bearings are produced using standard materials and manufacturing methods and are an economical choice for industrial applications.

Precision spherical bearings series FSBG and FLBG are four piece construction which use bronze race inserts for lubricity and clearance control. They are produced to tight tolerances for applications requiring a more precise spherical bearing. Series SBG S, SBG, SBG SS and COR are two piece bearings which offer a variety of materials for the one piece race and the ball. In general, these are high strength series intended for more heavily loaded, static and dynamic applications.

Commercial spherical bearings series COM, BH LS and BTS LS are two piece spherical bearings which use steel races and balls. They are used in applications which are less demanding than those which require the precision series of spherical bearings. The BTS LS series incorporates rubber seals to protect the bearing from contamination. If you have any questions regarding the application of these spherical bearings, please contact the Heim Engineering Department.

## SPHERCO SPHERICAL BEARINGS COMSUMER GUIDE

● Best
⊖ Better
○ Good
✔ Yes

| | SPHERCO SERIES | LOADING: STATIC | LOADING: OSCILLATING | LOADING: REVERSING | LOADING: SHOCK | PRECISION | CORROSION RESISTANCE | SELF-LUBRICATING | MAXIMUM TEMPERATURE | SIZE RANGE | RACE MATERIAL | DESIGN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRECISION | FSBG | ● | ● | ● | ⊖ | ✔ | ⊖ | | 250°F | 1/8" to 1" | ALUMINUM BRONZE | FOUR PIECE |
| | FLBG | ⊖ | ⊖ | ○ | ○ | ✔ | ⊖ | | 250°F | 3/16" to 1 7/8" | BRASS | |
| | SBG S | ● | ○ | ⊖ | ● | ✔ | ⊖ | | 250°F | 1/8" to 1" | 4130 H.T. | TWO PIECE |
| | SBG | ● | ● | ● | ⊖ | ✔ | ⊖ | | 250°F | 1/8" to 1" | ALUMINUM BRONZE | |
| | SBG SS | ⊖ | ○ | ○ | ○ | ✔ | ● | | 750°F | 1/8" to 1" | 300 SERIES | |
| | COR | ● | ○ | ● | ● | ✔ | ● | | 750°F | 3/16" to 1" | 17-4 PH, H.T. | |
| COMMERCIAL | COM T | ● | ⊖ | ● | ● | | ⊖ | ✔ | 250°F | 3/16" to 1" | CARBON STEEL PTFE LINED | THREE PIECE |
| | COM | ● | ○ | ● | ● | | ○ | | 250°F | 3/16" to 1" | CARBON STEEL | TWO PIECE |
| | BH LS | ● | ○ | ● | ● | | ⊖ | | 250°F | 1" to 2" | CARBON STEEL | |
| | BTS LS | ● | ○ | ● | ● | | ⊖ | | 250°F | 3/4" to 1 1/2" | CARBON STEEL | |

SPHERICAL



RBC BEARINGS

# SPHERCO®

# SPHERICAL BEARINGS

| SPHERICAL BEARING QUICK SELECTION GUIDE | | | |
|---|---|---|---|
| **Series** *Size Range* | **Product Features** | **Customer Benefits** | **Common Applications** |
| FSBG 1/8" to 1" FLBG 3/16" to 1 7/8" | Precision Grade, FSBG Bronze Inserts, FLBG Brass Inserts, Four Piece Construction | Low Friction Long Dynamic Life Smooth Feel Good Conformity | Packaging Equipment Textile Equipment |
| SBG S 1/8" to 1" | Alloy steel, heat treated, race and ball | High Loads, Shock Loads | Packaging Equipment Textile Equipment Industrial Trucks Off-the-road Equipment Hydraulic Cylinder |
| SBG 1/8" to 1" | Aluminum bronze race, alloy steel heat treated ball | Low Friction, Long Dynamic Life | |
| | Stainless steel race and ball | Corrosion Resistant | |
| | Stainless steel, heat treated, race and ball | Corrosion Resistant, High Loads | |
| COM T 3/16" to 1" | Commercial Grade Three Piece Construction, Fiberglide® Liner | High Loads, Reversing Loads, Shock Loads, Cost Effective, Self-Lubricating | Packaging Equipment Textile Equipment Robotics Hydraulic Cylinder |
| COM 3/16" to 1" BH LS 1" to 2" BTS LS 3/4" to 1 1/2" | Commercial Grade Two Piece Contruction | High Loads, Reversing Loads, Shock Loads | Packaging Equipment Textile Equipment Industrial Trucks Off-the-road Equipment Hydraulic Cylinder |

# SPHERCO®

# Precision Series

## Four Piece - Metal to Metal

### *Series FSBG*

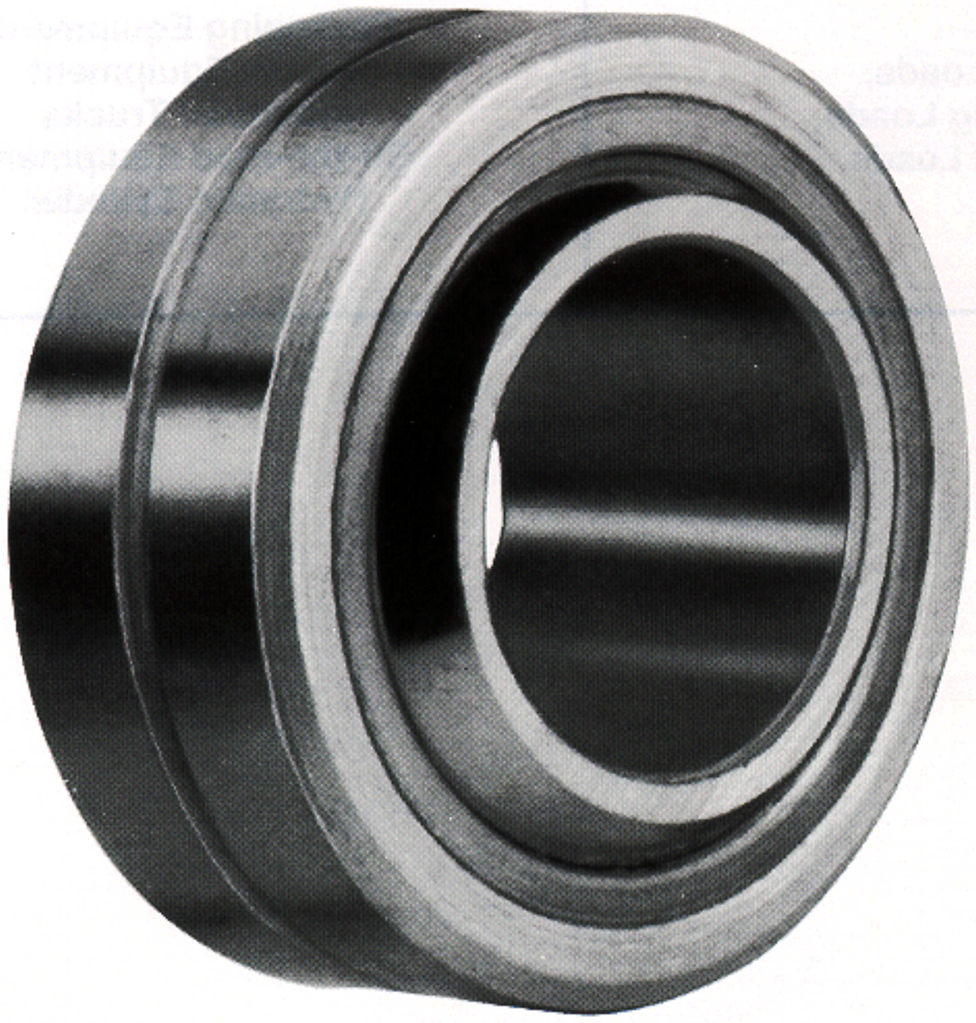
| SPHERICAL BEARING NUMBER | DIMENSIONS IN INCHES | | | | | | | MAXIMUM STATIC RADIAL LOAD | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|
| | BORE | OUTSIDE DIAMETER | BALL WIDTH | HOUSING WIDTH ❸ | CHAMFER | BALL DIAMETER | BALL FLAT DIAMETER | | |
| | B | D | W | H | C | E | O | | |
| | +.0000 -.0005 | +.0000 -.0005 | +.000 -.005 | +.000 -.005 | +.015 -.000 | REF | REF | LBF | LBS |
| **FSBG2** | .1650 | .4687 | .250 | .187 | .020 | .343 | .235 | 2,000 | .01 |
| **FSBG3** | .1900 | .5625 | .281 | .218 | .020 | .406 | .293 | 2,750 | .02 |
| **FSBG4** | .2500 | .6562 | .343 | .250 | .022 | .500 | .364 | 4,200 | .02 |
| **FSBG5** | .3125 | .7500 | .375 | .281 | .022 | .562 | .419 | 5,800 | .03 |
| **FSBG6** | .3750 | .8125 | .406 | .312 | .032 | .625 | .475 | 7,150 | .04 |
| **FSBG7** | .4375 | .9062 | .437 | .343 | .032 | .687 | .530 | 8,625 | .05 |
| **FSBG8** | .5000 | 1.0000 | .500 | .390 | .032 | .781 | .600 | 11,200 | .07 |
| **FSBG9** | .5625 | 1.0937 | .562 | .437 | .032 | .875 | .670 | 14,000 | .09 |
| **FSBG10** | .6250 | 1.1875 | .625 | .500 | .032 | .968 | .739 | 17,700 | .12 |
| **FSBG12** | .7500 | 1.4375 | .750 | .593 | .044 | 1.187 | .920 | 25,750 | .21 |
| **FSBG14** | .8750 | 1.5625 | .875 | .703 | .044 | 1.312 | .980 | 33,600 | .27 |
| **FSBG16** | 1.0000 | 1.7500 | 1.000 | .797 | .044 | 1.500 | 1.118 | 37,520 | .38 |

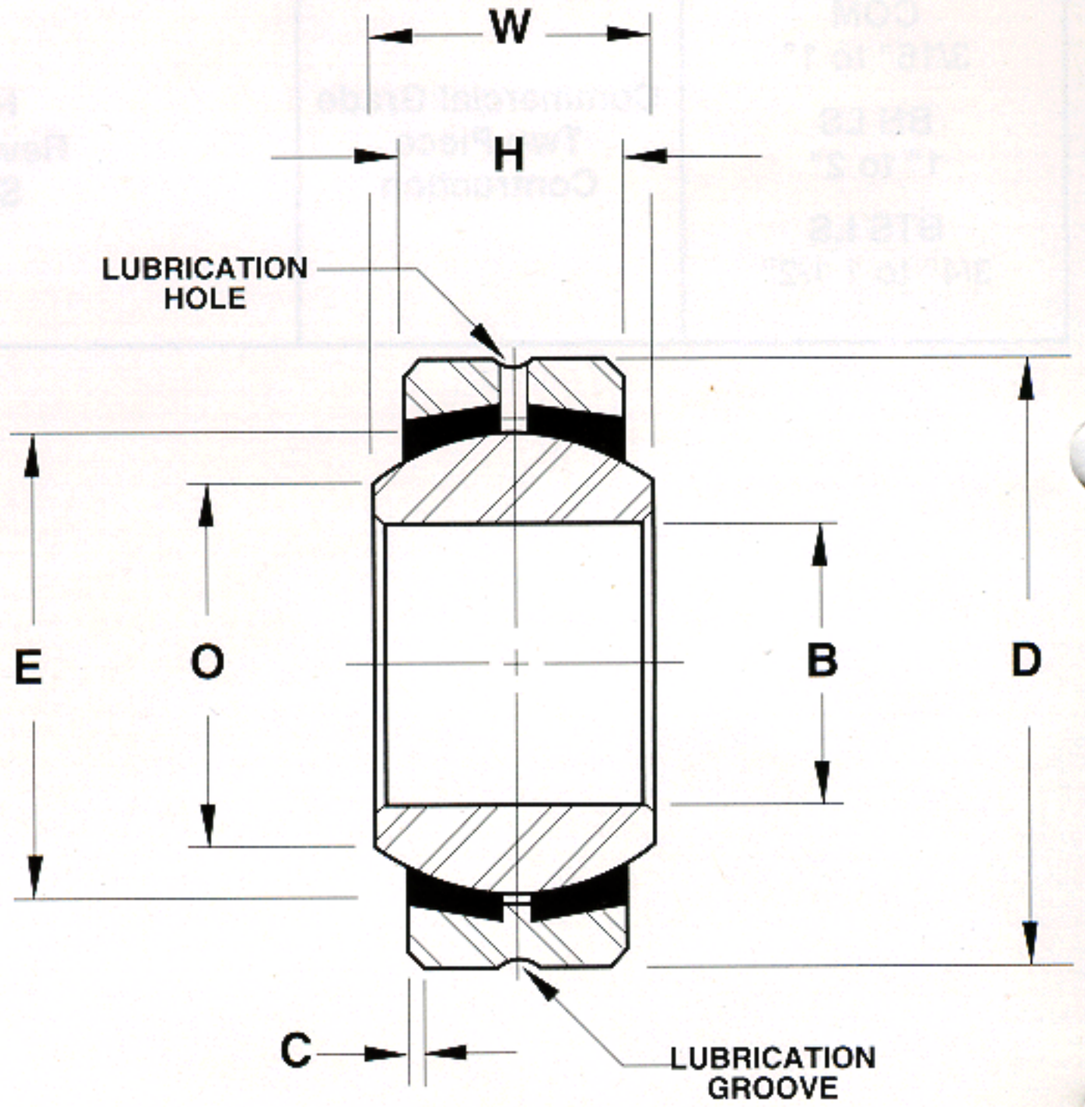
*Outer Member:* *4130 or 4340 Alloy steel, heat treated, with protective coating for corrosion resistance on all surfaces exposed after installation*

*Ball:* *52100 Alloy steel, heat treated, chrome plated*

*Inserts:* *Copper alloy*

NOTES
❶ For design options, see page 21
❷ For Engineering data, see pages 32 and 33
❸ "H" tolerance across inserts is +/-.015






SPHERICAL



RBC BEARINGS

# SPHERCO®

# Precision Extra Capacity Series

## Four Piece - Metal to Metal

### *Series FLBG*

| SPHERICAL BEARING NUMBER | DIMENSIONS IN INCHES | | | | | | | MAXIMUM STATIC RADIAL LOAD | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|
| | BORE | OUTSIDE DIAMETER | BALL WIDTH | HOUSING WIDTH ❸ | CHAMFER | BALL DIAMETER | BALL FLAT DIAMETER | | |
| | B | D | W | H | C | E | O | | |
| | +.0000 -.0005 | +.0000 -.0005 | +.000 -.005 | +.000 -.005 | +.015 -.000 | REF | REF | LBF | LBS |
| **FLBG3** | .1900 | .6250 | .281 | .187 | .016 | .406 | .293 | 2,960 | .02 |
| **FLBG4** | .2500 | .7500 | .375 | .281 | .016 | .515 | .354 | 5,245 | .04 |
| **FLBG5** | .3125 | .8750 | .437 | .313 | .016 | .625 | .447 | 6,550 | .05 |
| **FLBG6** | .3750 | 1.0000 | .500 | .375 | .016 | .718 | .517 | 8,605 | .08 |
| **FLBG7** | .4375 | 1.1875 | .562 | .437 | .032 | .812 | .586 | 11,100 | .12 |
| **FLBG8** | .5000 | 1.3125 | .687 | .531 | .044 | .937 | .637 | 15,600 | .18 |
| **FLBG10** | .6250 | 1.5625 | .875 | .687 | .044 | 1.187 | .802 | 25,700 | .33 |
| **FLBG12** | .7500 | 2.2500 | 1.250 | .937 | .044 | 1.625 | 1.038 | 47,600 | .97 |
| **FLBG16** | 1.0000 | 2.3750 | 1.125 | .875 | .062 | 1.750 | 1.345 | 48,200 | .94 |
| **FLBG19** | 1.1875 | 2.6250 | 1.250 | 1.000 | .085 | 2.000 | 1.562 | 63,000 | 1.27 |
| **FLBG24** | 1.5000 | 3.2500 | 1.500 | 1.250 | .085 | 2.500 | 2.000 | 98,000 | 2.38 |
| **FLBG30** | 1.8750 | 4.0000 | 1.625 | 1.313 | .125 | 3.000 | 2.521 | 123,500 | 3.75 |

***Outer Member:*** *Carbon steel, with protective coating for corrosion resistance on all surfaces exposed after installation*

***Ball:*** *52100 Alloy steel, heat treated, chrome plated*

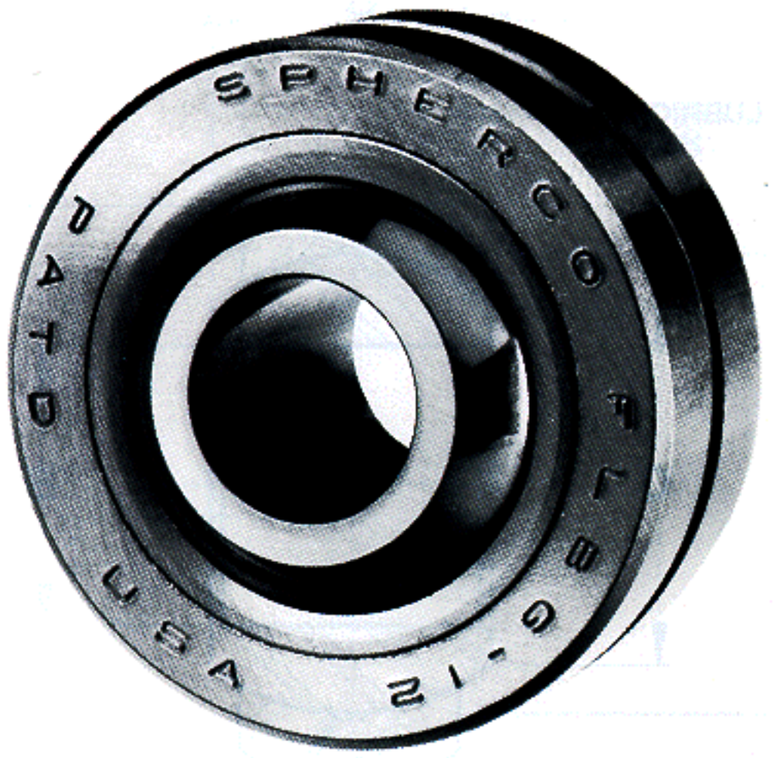
***Inserts:*** *Brass*

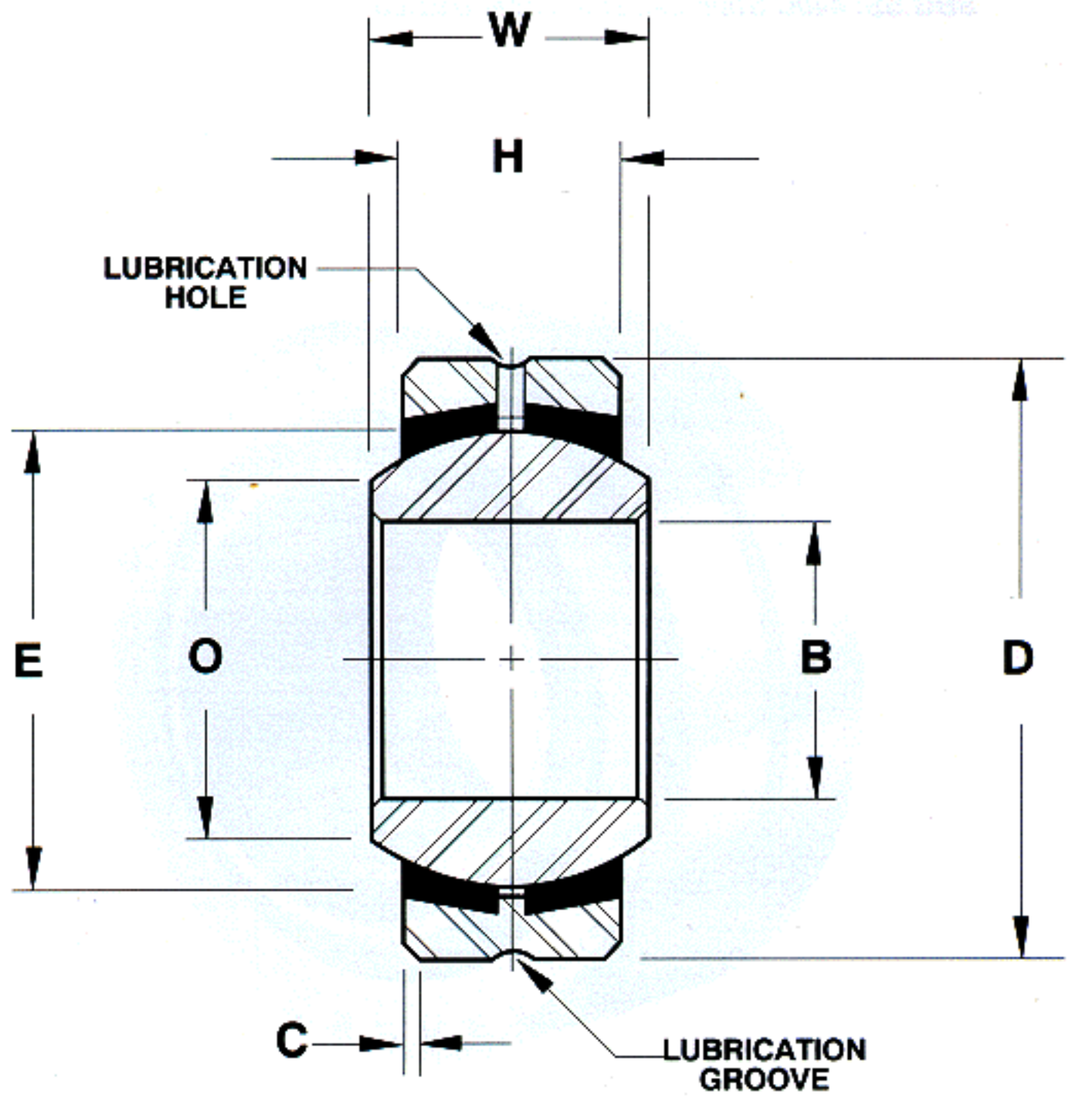
**NOTES**

❶ For design options, see page 21

❷ For Engineering data, see pages 32 and 33

❸ "H" tolerance across inserts is +/-.015



# SPHERCO®

## Precision Series

### Two Piece - Metal to Metal

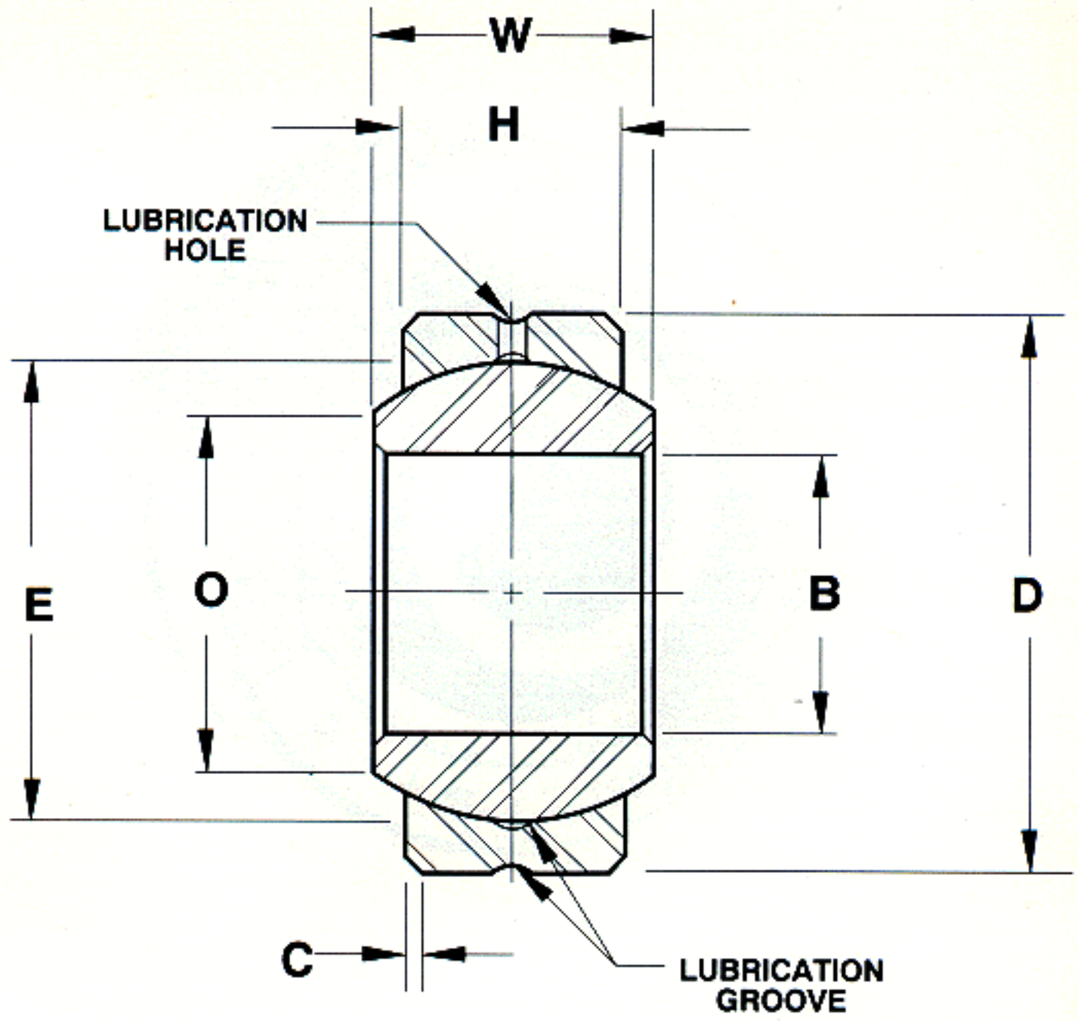
***Series SBG S, SBG, SBG SS***

| SPHERICAL BEARING NUMBER | | | DIMENSIONS IN INCHES | | | | | | | MAXIMUM STATIC RADIAL LOAD LBF | | | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BORE | OUTSIDE DIAMETER | BALL WIDTH | HOUSING WIDTH | CHAMFER | BALL DIAMETER | BALL FLAT DIAMETER | | | | |
| | | | B | D | W | H | C | E | O | | | | |
| | | | +.0000 -.0005 | +.0000 -.0005 | +.000 -.005 | +.005 -.005 | +.015 -.000 | REF | REF | SBG S SERIES | SBG SERIES | SBG SS SERIES | LBS |
| SBG2S | SBG2 | SBG2SS | .1650 | .4687 | .250 | .187 | .020 | .343 | .235 | 4,400 | 2,000 | 3,200 | .01 |
| SBG3S | SBG3 | SBG3SS | .1900 | .5625 | .281 | .218 | .020 | .406 | .293 | 6,480 | 2,750 | 4,400 | .02 |
| SBG4S | SBG4 | SBG4SS | .2500 | .6562 | .343 | .250 | .022 | .500 | .364 | 10,000 | 4,200 | 6,700 | .02 |
| SBG5S | SBG5 | SBG5SS | .3125 | .7500 | .375 | .281 | .022 | .562 | .419 | 13,900 | 5,800 | 9,200 | .03 |
| SBG6S | SBG6 | SBG6SS | .3750 | .8125 | .406 | .312 | .032 | .625 | .475 | 18,750 | 7,750 | 12,400 | .04 |
| SBG7S | SBG7 | SBG7SS | .4375 | .9062 | .437 | .343 | .032 | .687 | .530 | 22,300 | 9,300 | 14,900 | .05 |
| SBG8S | SBG8 | SBG8SS | .5000 | 1.0000 | .500 | .390 | .032 | .781 | .600 | 26,900 | 11,200 | 17,900 | .07 |
| SBG9S | SBG9 | SBG9SS | .5625 | 1.0937 | .562 | .437 | .032 | .875 | .670 | 36,000 | 14,800 | 23,700 | .09 |
| SBG10S | SBG10 | SBG10SS | .6250 | 1.1875 | .625 | .500 | .032 | .968 | .739 | 48,000 | 20,000 | 32,000 | .12 |
| SBG12S | SBG12 | SBG12SS | .7500 | 1.4375 | .750 | .593 | .044 | 1.187 | .920 | 78,000 | 30,000 | 48,000 | .21 |
| SBG14S | SBG14 | SBG14SS | .8750 | 1.5625 | .875 | .703 | .044 | 1.312 | .980 | 103,000 | 43,000 | 69,000 | .27 |
| SBG16S | SBG16 | SBG16SS | 1.0000 | 1.7500 | 1.000 | .797 | .044 | 1.500 | 1.118 | 125,000 | 52,000 | 83,000 | .38 |

*Outer Member:* ***SBG S: 4130 or 4340 Alloy steel, heat treated, with protective coating for corrosion resistance on all surfaces exposed after installation***
***SBG: Aluminum bronze***
***SBG SS: 300 Series stainless steel***

**NOTES**
❶ **For design options, see page 21**
❷ **For Engineering data, see pages 32 and 33**

*Ball:* ***SBG S: 52100 Alloy steel, heat treated, chrome plated***
***SBG: 52100 Alloy steel, heat treated, chrome plated***
***SBG SS: 440C Stainless steel, heat treated***


SPHERICAL



RBC BEARINGS

SPHERCO®

# Precision Series

## Two Piece - Corrosion Resistant - Metal to Metal

***Series COR***

| SPHERICAL BEARING NUMBER | DIMENSIONS IN INCHES | | | | | | | MAXIMUM STATIC RADIAL LOAD |
|---|---|---|---|---|---|---|---|---|
| | BORE | OUTSIDE DIAMETER | BALL WIDTH | HOUSING WIDTH | CHAMFER | BALL DIAMETER | BALL FLAT DIAMETER | |
| | B | D | W | H | C | E | O | |
| | +.0000 -.0005 | +.0000 -.0005 | +.000 -.005 | +.005 -.005 | +.015 -.000 | REF | REF | LBF |
| **COR3** | .1900 | .5625 | .281 | .218 | .020 | .406 | .293 | 4,800 |
| **COR4** | .2500 | .6562 | .343 | .250 | .022 | .500 | .364 | 7,500 |
| **COR5** | .3125 | .7500 | .375 | .281 | .022 | .562 | .419 | 10,400 |
| **COR6** | .3750 | .8125 | .406 | .312 | .032 | .625 | .475 | 14,000 |
| **COR7** | .4375 | .9062 | .437 | .343 | .032 | .687 | .530 | 16,750 |
| **COR8** | .5000 | 1.0000 | .500 | .390 | .032 | .781 | .600 | 20,000 |
| **COR9** | .5625 | 1.0937 | .562 | .437 | .032 | .875 | .670 | 27,000 |
| **COR10** | .6250 | 1.1875 | .625 | .500 | .032 | .968 | .739 | 36,000 |
| **COR12** | .7500 | 1.4375 | .750 | .593 | .044 | 1.187 | .920 | 54,000 |
| **COR14** | .8750 | 1.5625 | .875 | .703 | .044 | 1.312 | .980 | 77,000 |
| **COR16** | 1.0000 | 1.7500 | 1.000 | .797 | .044 | 1.500 | 1.118 | 93,500 |

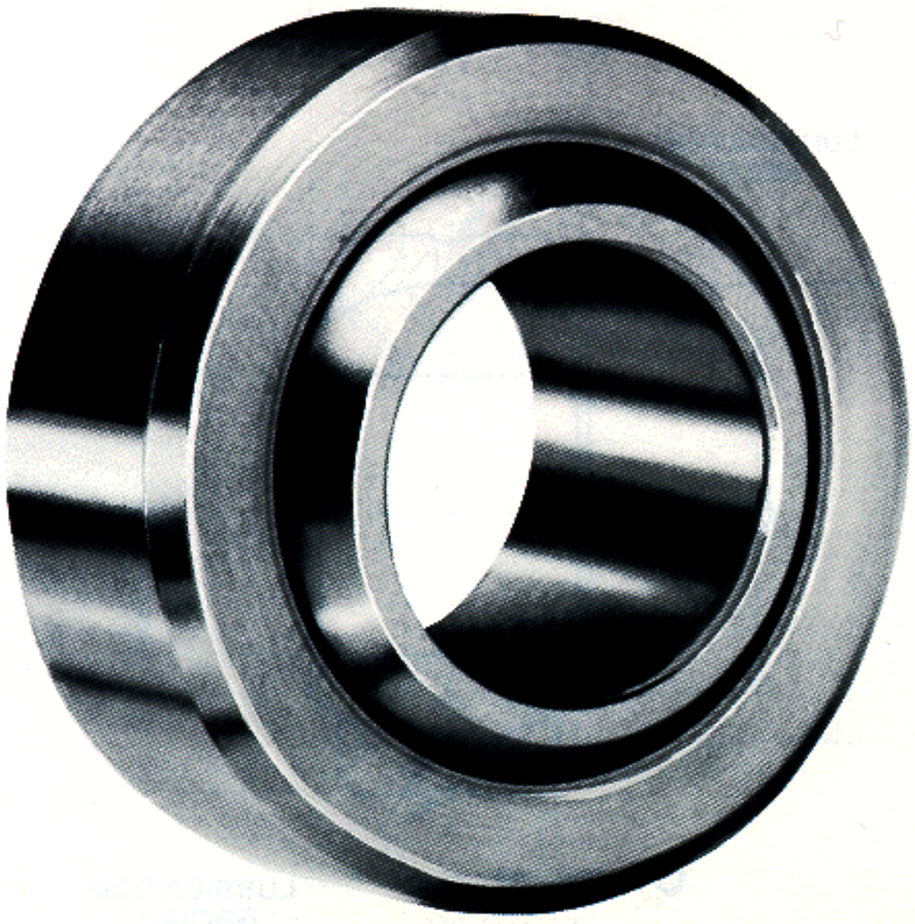
***Outer Member:*** *17-4 PH Stainless steel, heat treated*

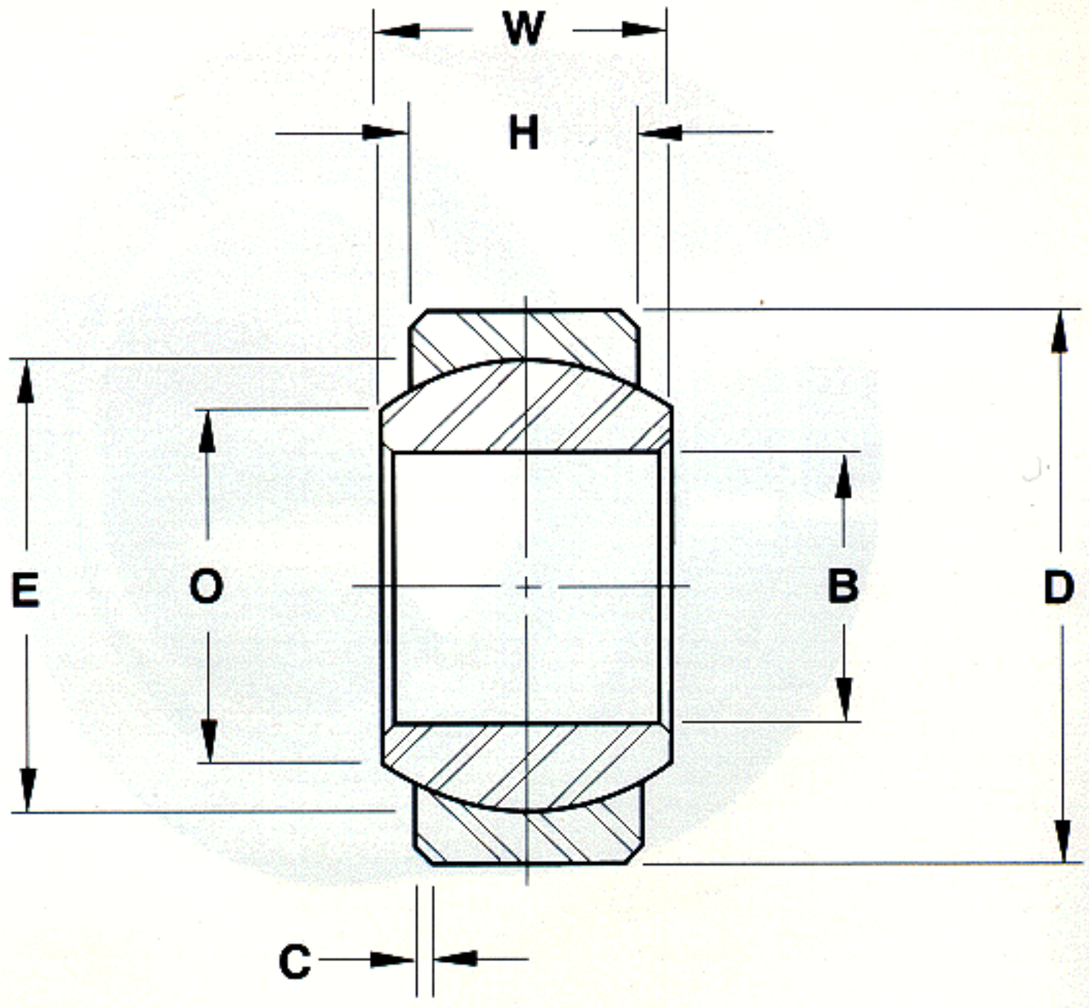
***Ball:*** *440C Stainless steel, heat treated, chrome plated*

**NOTES**

❶ For design options, see page 21

❷ For Engineering data, see pages 32 and 33





SPHERCO®

# Commercial Series

## Two Piece - Metal to Metal

### *Series COM*

| SPHERICAL BEARING NUMBER | DIMENSIONS IN INCHES | | | | | | | MAXIMUM STATIC RADIAL LOAD | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|
| | BORE | OUTSIDE DIAMETER | BALL WIDTH | HOUSING WIDTH | CHAMFER | BALL DIAMETER | BALL FLAT DIAMETER | | |
| | B | D | W | H | C | E | O | | |
| | +.0015 -.0005 | +.0000 -.0007 | +.005 -.005 | +.010 -.010 | +.015 -.000 | REF | REF | LBF | LBS |
| COM3 | .1900 | .5625 | .281 | .218 | .020 | .406 | .293 | 3,250 | .02 |
| COM4 | .2500 | .6562 | .343 | .250 | .022 | .500 | .364 | 4,900 | .02 |
| COM5 | .3125 | .7500 | .375 | .281 | .032 | .562 | .419 | 6,450 | .03 |
| COM6 | .3750 | .8125 | .406 | .312 | .032 | .625 | .475 | 8,250 | .04 |
| COM7 | .4375 | .9062 | .437 | .343 | .032 | .687 | .530 | 10,200 | .05 |
| COM8 | .5000 | 1.0000 | .500 | .390 | .032 | .781 | .600 | 13,600 | .07 |
| COM9 | .5625 | 1.0937 | .562 | .437 | .032 | .875 | .670 | 15,900 | .09 |
| COM10 | .6250 | 1.1875 | .625 | .500 | .032 | .968 | .739 | 21,000 | .12 |
| COM12 | .7500 | 1.4375 | .750 | .593 | .044 | 1.187 | .920 | 30,000 | .21 |
| COM14 | .8750 | 1.5625 | .875 | .703 | .044 | 1.312 | .980 | 41,100 | .27 |
| COM16 | 1.0000 | 1.7500 | 1.000 | .797 | .044 | 1.500 | 1.118 | 54,700 | .38 |

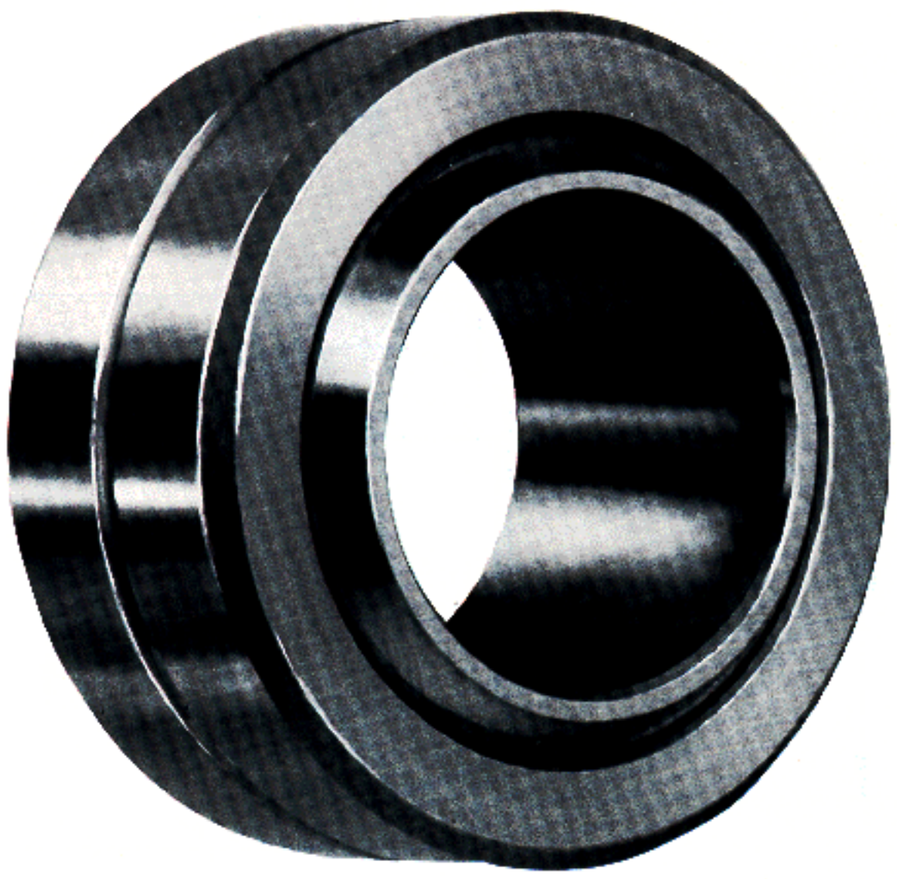
***Outer Member:*** *Carbon steel, with protective coating for corrosion resistance on all surfaces exposed after installation*

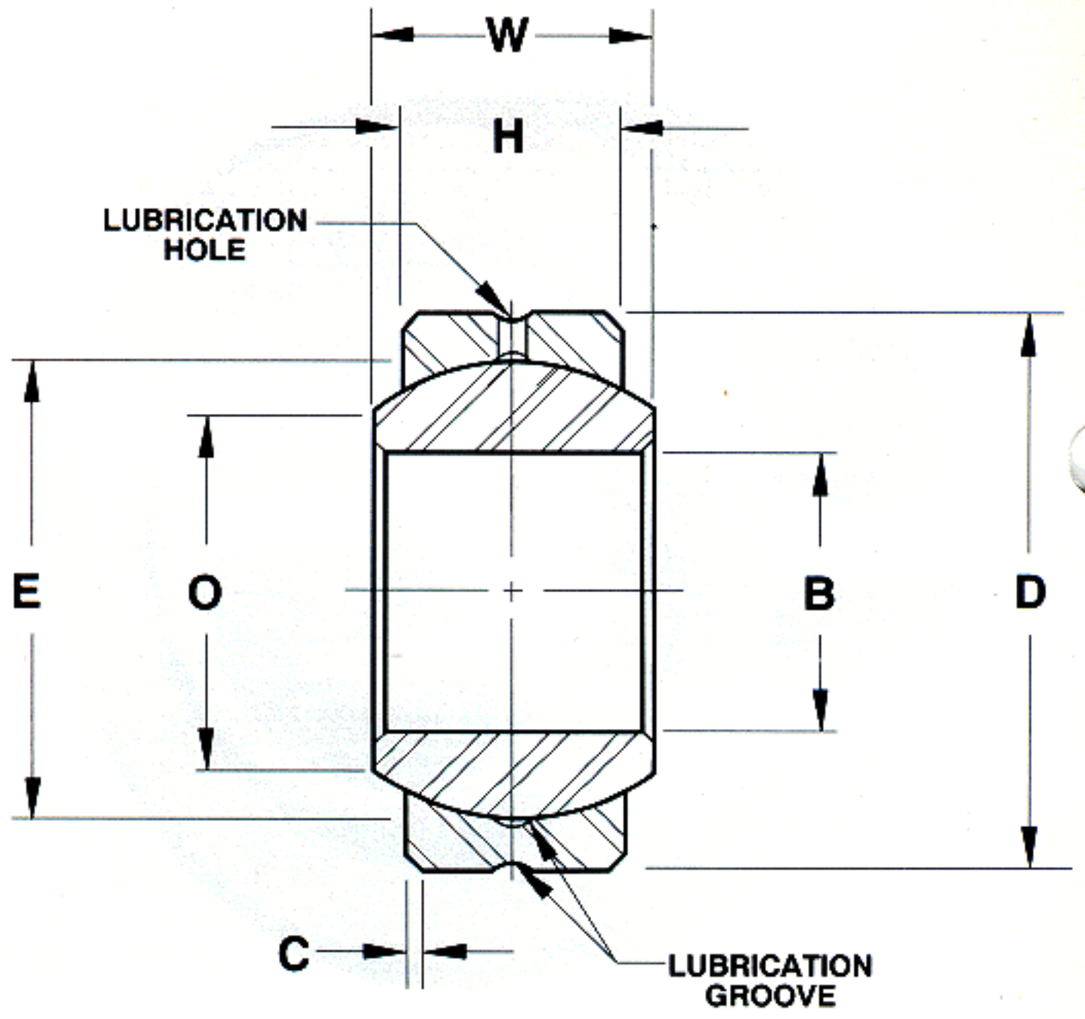
***Ball:*** *52100 Alloy steel, heat treated, chrome plated*

NOTES

❶ For design options, see page 21

❷ For Engineering data, see pages 32 and 33






SPHERICAL



RBC BEARINGS

# SPHERCO®

# Commercial Series

## Self-Lubricating - Fiberglide®

### *Series COM T*

| SPHERICAL BEARING NUMBER | DIMENSIONS IN INCHES | | | | | | | MAXIMUM STATIC RADIAL LOAD | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|---|
| | BORE | OUTSIDE DIAMETER | BALL WIDTH | HOUSING WIDTH | CHAMFER | BALL DIAMETER | BALL FLAT DIAMETER | | |
| | B | D | W | H | C | E | O | | |
| | +.0015 -.0005 | +.0000 -.0007 | +.005 -.005 | +.010 -.010 | +.015 -.000 | REF | REF | LBF | LBS |
| **COM3T** | .1900 | .5625 | .281 | .218 | .020 | .406 | .293 | 3,250 | .02 |
| **COM4T** | .2500 | .6562 | .343 | .250 | .022 | .500 | .364 | 4,900 | .02 |
| **COM5T** | .3125 | .7500 | .375 | .281 | .032 | .562 | .419 | 6,450 | .03 |
| **COM6T** | .3750 | .8125 | .406 | .312 | .032 | .625 | .475 | 8,250 | .04 |
| **COM7T** | .4375 | .9062 | .437 | .343 | .032 | .687 | .530 | 10,200 | .05 |
| **COM8T** | .5000 | 1.0000 | .500 | .390 | .032 | .781 | .600 | 13,600 | .07 |
| **COM9T** | .5625 | 1.0937 | .562 | .437 | .032 | .875 | .670 | 15,900 | .09 |
| **COM10T** | .6250 | 1.1875 | .625 | .500 | .032 | .968 | .739 | 21,000 | .12 |
| **COM12T** | .7500 | 1.4375 | .750 | .593 | .044 | 1.187 | .920 | 30,000 | .21 |
| **COM14T** | .8750 | 1.5625 | .875 | .703 | .044 | 1.312 | .980 | 41,100 | .27 |
| **COM16T** | 1.0000 | 1.7500 | 1.000 | .797 | .044 | 1.500 | 1.118 | 54,700 | .38 |

*Outer Member: Carbon steel, with protective coating for corrosion resistance on all surfaces exposed after installation*

*Ball: 52100 Alloy steel, heat treated, chrome plated*

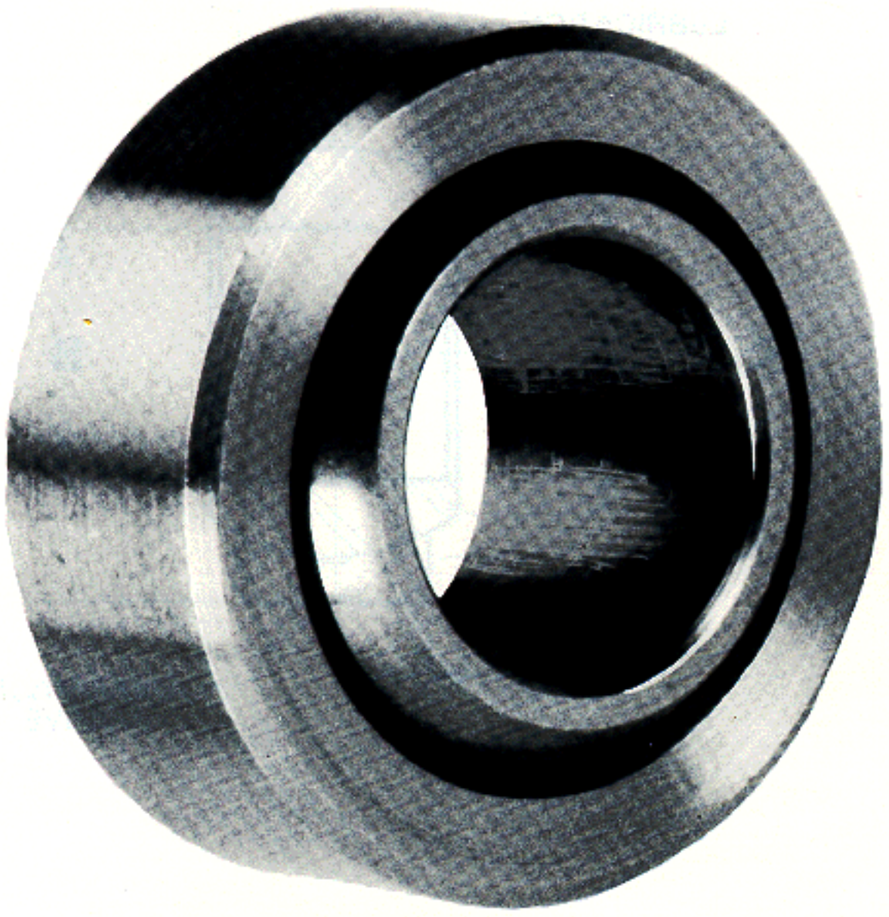
*Liner: Fiberglide®*

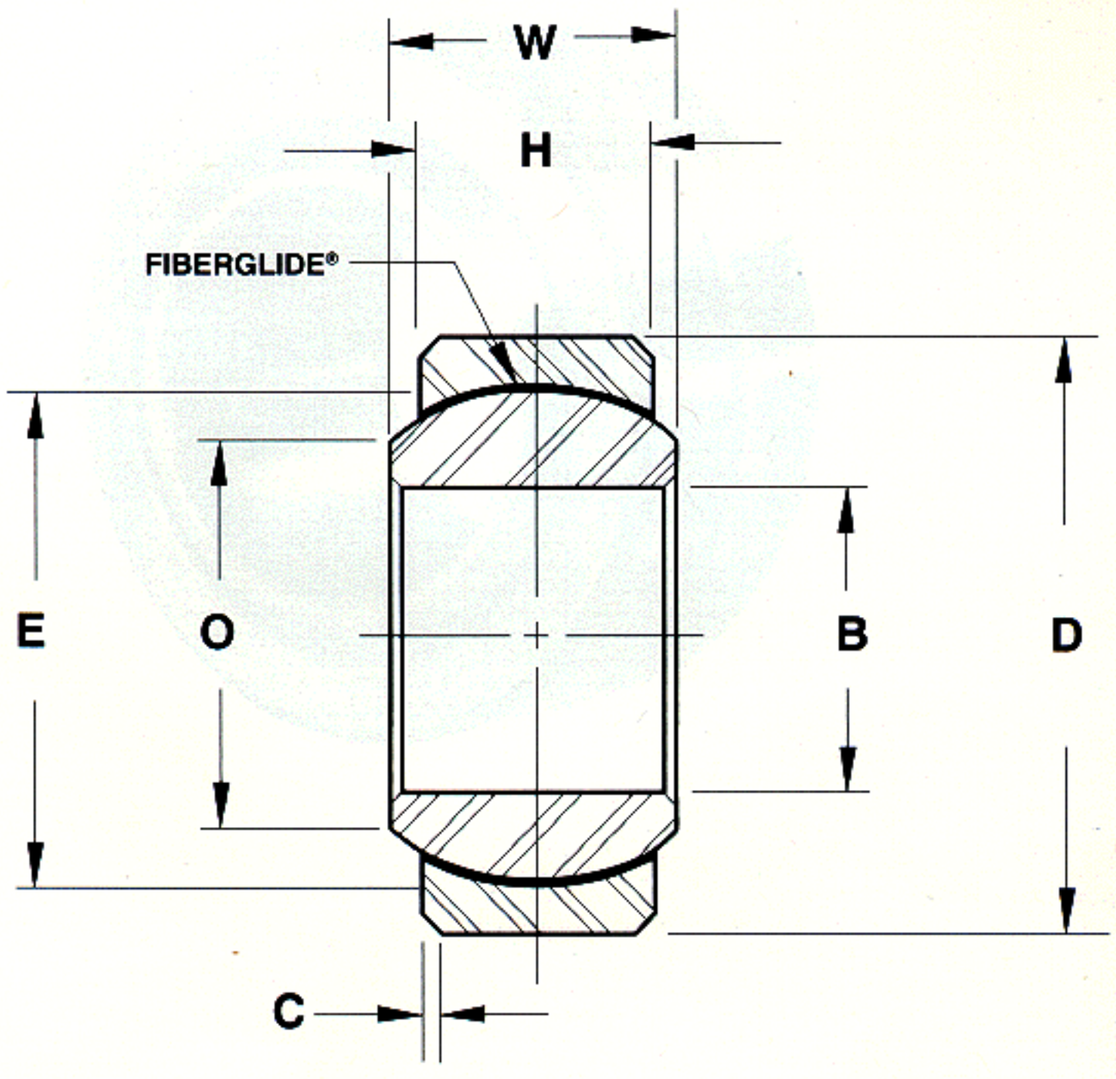
NOTES

❶ For design options, see page 21

❷ For Engineering data, see pages 32 and 33

►See Featured Product Notes, Pages 14 and 15





SPHERCO®

# Commercial Extra Duty Series

## Two Piece - Metal to Metal

***Series BH LS***

| SPHERICAL BEARING NUMBER | DIMENSIONS IN INCHES | | | | | | | MAXIMUM STATIC RADIAL LOAD |
|---|---|---|---|---|---|---|---|---|
| | BORE | OUTSIDE DIAMETER | BALL WIDTH | HOUSING WIDTH | CHAMFER | BALL DIAMETER | BALL FLAT DIAMETER | |
| | B | D | W | H | C | E | O | |
| | +.0015 -.0005 | +.0000 -.0007 | +.000 -.005 | +.007 -.007 | +.015 -.000 | REF | REF | LBF |
| **BH16LS** | 1.0000 | 2.0000 | 1.000 | .781 | .035 | 1.688 | 1.360 | 68,525 |
| **BH19LS** | 1.1875 | 2.3750 | 1.187 | .937 | .035 | 2.000 | 1.610 | 97,440 |
| **BH20LS** | 1.2500 | 2.3750 | 1.187 | .937 | .035 | 2.000 | 1.610 | 97,440 |
| **BH24LS** | 1.5000 | 2.7500 | 1.375 | 1.094 | .035 | 2.313 | 1.860 | 131,550 |
| **BH28LS** | 1.7500 | 3.1250 | 1.562 | 1.250 | .040 | 2.625 | 2.080 | 169,000 |
| **BH32LS** | 2.0000 | 3.5000 | 1.750 | 1.375 | .040 | 2.938 | 2.360 | 209,985 |

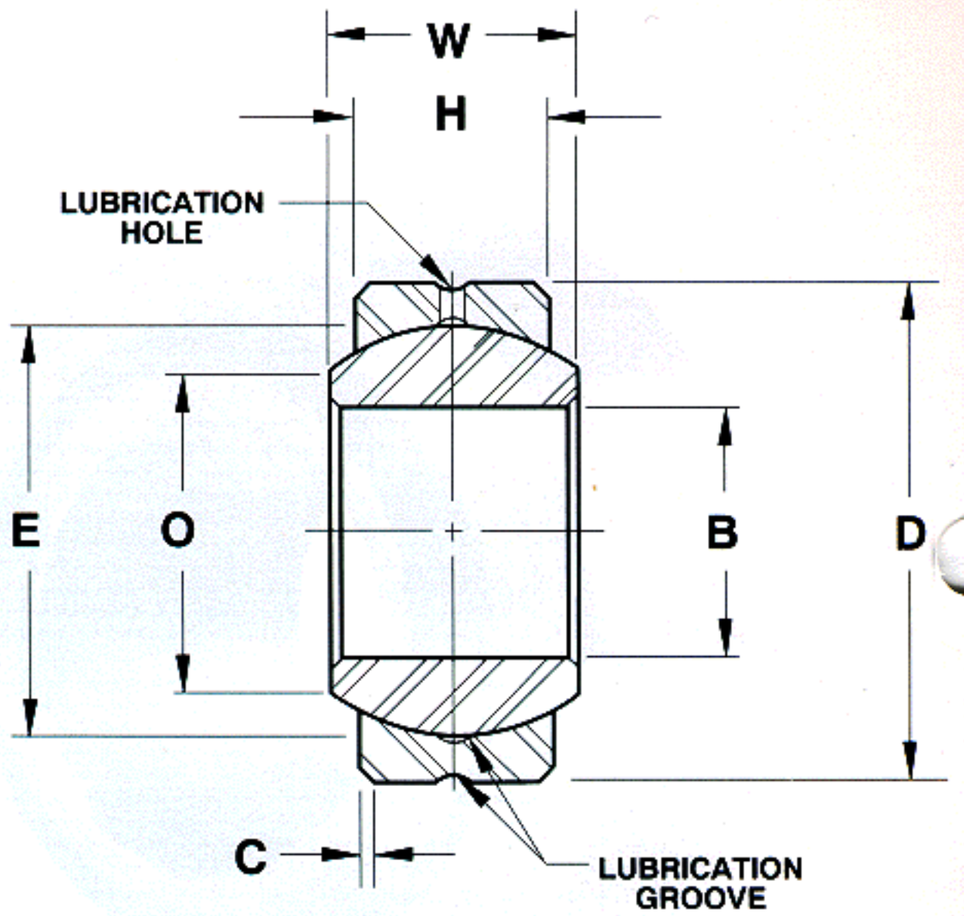
***Outer Member:*** *Carbon steel, with protective coating for corrosion resistance on all surfaces exposed after installation*

***Ball:*** *52100 Alloy steel, heat treated, chrome plated*

**NOTES**

❶ **For design options, see page 21**

❷ **For Engineering data, see pages 32 and 33**




SPHERICAL



RBC BEARINGS

SPHERCO®

# Commercial Extra Duty Series

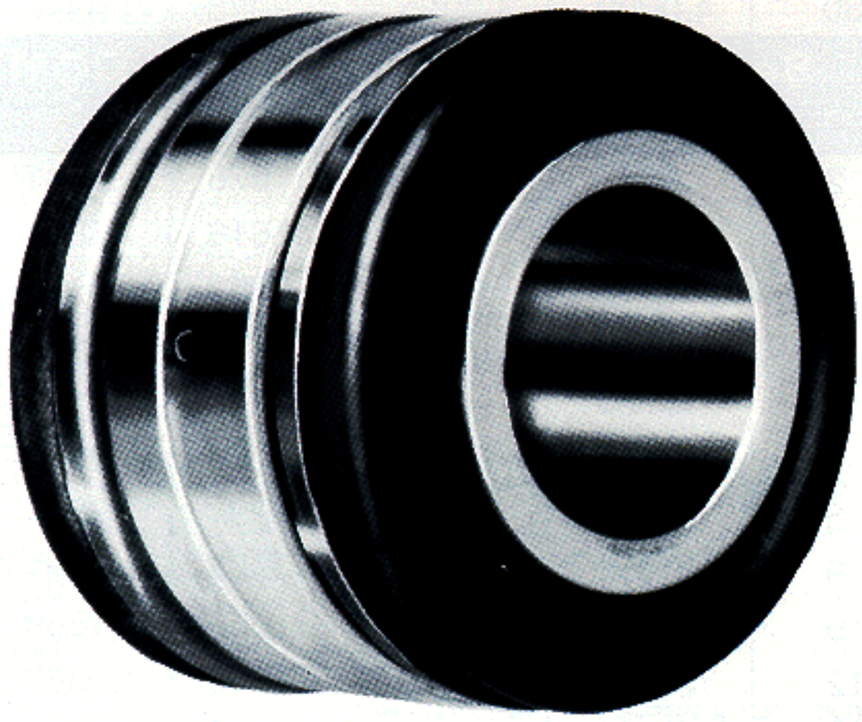
## Two Piece - Metal to Metal - Sealed

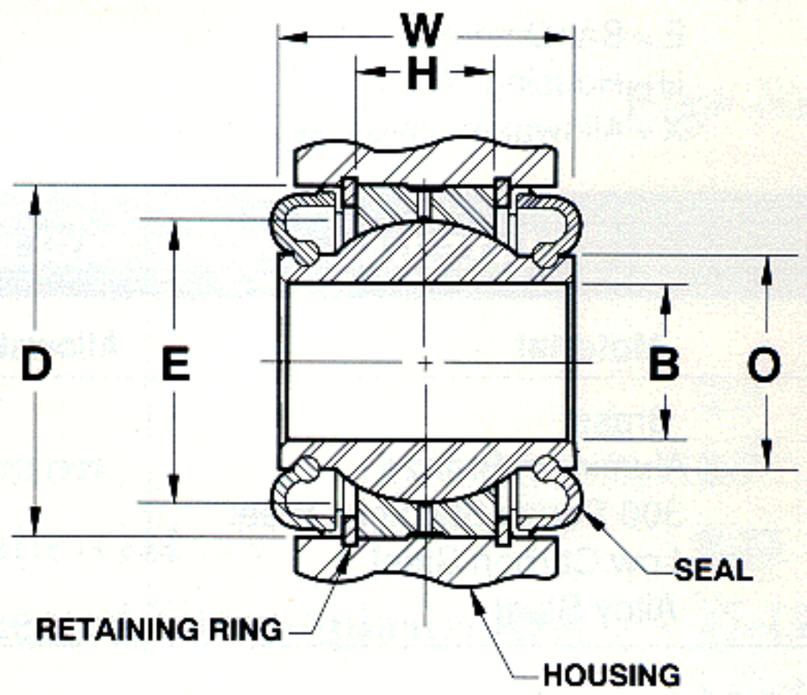
***Series BTS LS***

| SPHERICAL BEARING NUMBER | BORE B +.0000 -.0007 | OUTSIDE DIAMETER D +.0000 -.0007 | HOUSING WIDTH H +.000 -.005 | BALL WIDTH W +.000 -.005 | BALL DIAMETER E REF | BALL FLAT DIAMETER O REF | APPROX. ANGLE OF MISALIGNMENT W/SEALS DEGREES | MAXIMUM STATIC RADIAL LOAD LBF | APPROX WEIGHT LBS |
|---|---|---|---|---|---|---|---|---|---|
| **BTS12LS** | .7500 | 1.5000 | .500 | 1.250 | 1.250 | 1.000 | 12 1/2 | 31,500 | .25 |
| **BTS16LS** | 1.0000 | 2.2500 | .875 | 1.875 | 1.813 | 1.375 | 12 1/2 | 83,500 | .95 |
| **BTS20LS** | 1.2500 | 2.3750 | .875 | 1.875 | 2.000 | 1.625 | 12 1/2 | 94,000 | .99 |
| **BTS24LS** | 1.5000 | 2.7500 | 1.000 | 1.875 | 2.375 | 2.000 | 12 1/2 | 130,000 | 1.44 |

***Outer Member:*** *Carbon steel, with protective coating for corrosion resistance*
***Ball:*** *52100 Alloy steel, heat treated, chrome plated*
***Seals:*** *Synthetic rubber*

**NOTES**
❶ For design options, see page 21
❷ For Engineering data, see pages 32 and 33

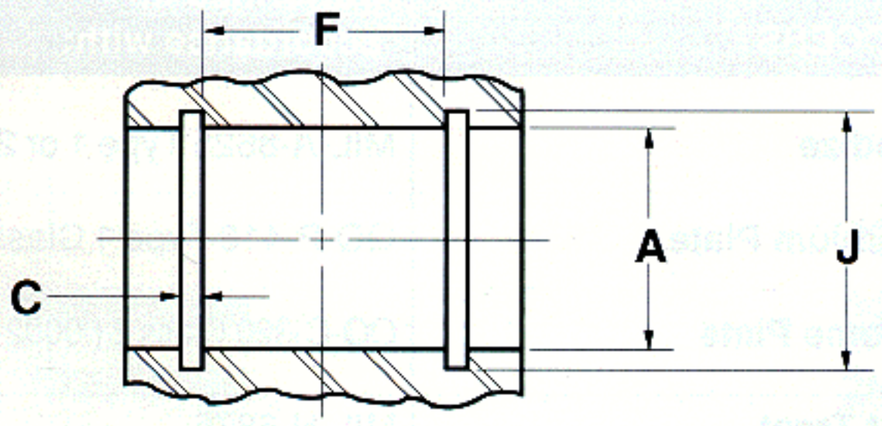





## *Housing Bore and Snap Ring Design Guide*

| HSG. WIDTH | BEARING NUMBER | F | RECOMMENDED HSG. BORE A | RECOMMENDED SNAP RING | J | C |
|---|---|---|---|---|---|---|
| 1.250 (Ref.) | **BTS12LS** | .505 .500 | 1.5002 1.4997 | TRUARC #5000-150 | 1.584 1.576 | .060 .056 |
| | | | | SPIROLOX #RR-150 | 1.556 1.551 | .048 .045 |
| 1.687 (Ref.) | **BTS16LS** | .879 .875 | 2.2502 2.2497 | TRUARC #5000-225 | 2.376 2.364 | .091 .086 |
| | | | | SPIROLOX #RR-225 | 2.330 2.324 | .058 .055 |
| 1.687 (Ref.) | **BTS20LS** | .879 | 2.3753 2.3747 | TRUARC #5000-237 | 2.511 2.499 | .091 .086 |
| | | | | SPIROLOX #RR-237 | 2.459 2.433 | .058 .055 |
| 1.875 (Ref.) | **BTS24LS** | 1.005 1.000 | 2.7502 2.7497 | TRUARC #5000-275 | 2.906 2.894 | .108 .103 |
| | | | | SPIROLOX #RR-275 | 2.847 2.841 | .058 .055 |

***NOTE: Snap rings not supplied with bearing***




SPHERICAL

# SPHERCO

# Spherical Bearing Technical Data

## RADIAL LOAD

The maximum static radial load is calculated using the following formula:

$$R = E \times H \times X$$

## STATIC AXIAL LOAD

The maximum static axial load is calculated using the following formulae:

- Axial Strength (A)

1. For four piece insert construction bearings

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

2. For two piece (cartridge type) bearings

$$A = .65(H^2) \times X$$

Where:

E = Ball Diameter
H = Housing Width
X = Allowable Stress (see table below)

**MATERIAL STRESS TABLE**

| Material | Allowable Stress (PSI) |
|---|---|
| Brass | 30,000 |
| Aluminum Bronze | 35,000 |
| 300 Series Stainless Steel | 35,000 |
| Low Carbon Steel | 52,000 |
| Alloy Steel | 140,000 |

## MILITARY SPECIFICATIONS

Many of the processes used by Heim in the manufacture of spherical bearings are performed to U.S. Military Specifications. A partial list of these specifications follows:

| PROCESS | Performed in accordance with: |
|---|---|
| **Anodize** | MIL-A-8625 Type 1 or 2 |
| **Cadmium Plate** | QQ-P-416 Type 1 Class 2 |
| **Chrome Plate** | QQ-C-320 Class 2 (.0002 min) |
| **Heat Treat** | MIL-H-6875<br>MIL-H-7199 |
| **Magnetic Particle Inspection** | ASTM-E-1444 |
| **Penetrant Inspection** | ASTM-E-1417 |
| **Zinc Plate** | ASTM B633, Type III, SC 1 or 2, with chromate coating |

## HOUSING BORES

| SPHERICAL BEARING SIZE | BEARING OD D +.0000 -.0005 | HOUSING BORE STEEL MAX | STEEL MIN | ALUMINUM MAX | ALUMINUM MIN |
|---|---|---|---|---|---|
| **Series FLBG** | | | | | |
| 3 | .6250 | .6245 | .6241 | .6244 | .6239 |
| 4 | .7500 | .7495 | .7491 | .7494 | .7489 |
| 5 | .8750 | .8745 | .8741 | .8744 | .8739 |
| 6 | 1.0000 | .9995 | .9991 | .9994 | .9989 |
| 7 | 1.1875 | 1.1870 | 1.1865 | 1.1869 | 1.1863 |
| 8 | 1.3125 | 1.3120 | 1.3115 | 1.3119 | 1.3113 |
| 10 | 1.5625 | 1.5620 | 1.5613 | 1.5619 | 1.5611 |
| 12 | 2.2500 | 2.2495 | 2.2488 | 2.2494 | 2.2486 |
| 16 | 2.3750 | 2.3745 | 2.3738 | 2.3744 | 2.3736 |
| 19 | 2.6250 | 2.6245 | 2.6238 | 2.6244 | 2.6236 |
| 24 | 3.2500 | 3.2495 | 3.2488 | 3.2494 | 3.2486 |
| 30 | 4.0000 | 3.9995 | 3.9988 | 3.9994 | 3:9986 |
| **Series FSBG, SBG S, SBG, COM T, COM, COR** | | | | | |
| 2 | .4687 | .4682 | .4678 | .4681 | .4676 |
| 3 | .5625 | .5620 | .5616 | .5619 | .5614 |
| 4 | .6562 | .6557 | .6553 | .6556 | .6551 |
| 5 | .7500 | .7495 | .7491 | .7494 | .7489 |
| 6 | .8125 | .8120 | .8116 | .8119 | .8114 |
| 7 | .9062 | .9057 | .9053 | .9056 | .9051 |
| 8 | 1.0000 | .9995 | .9991 | .9994 | .9989 |
| 9 | 1.0937 | 1.0932 | 1.0928 | 1.0931 | 1.0926 |
| 10 | 1.1875 | 1.1870 | 1.1866 | 1.1869 | 1.1864 |
| 12 | 1.4375 | 1.4370 | 1.4366 | 1.4369 | 1.4364 |
| 14 | 1.5625 | 1.5620 | 1.5616 | 1.5619 | 1.5614 |
| 16 | 1.7500 | 1.7495 | 1.7491 | 1.7494 | 1.7489 |

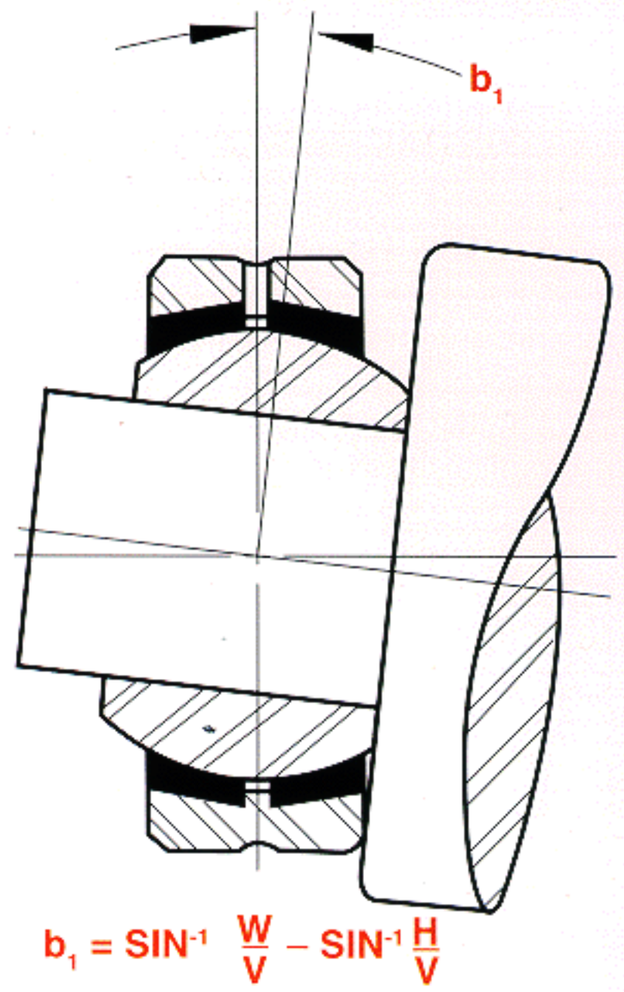
SPHERCO®

## MISALIGNMENT SPECIFICATIONS

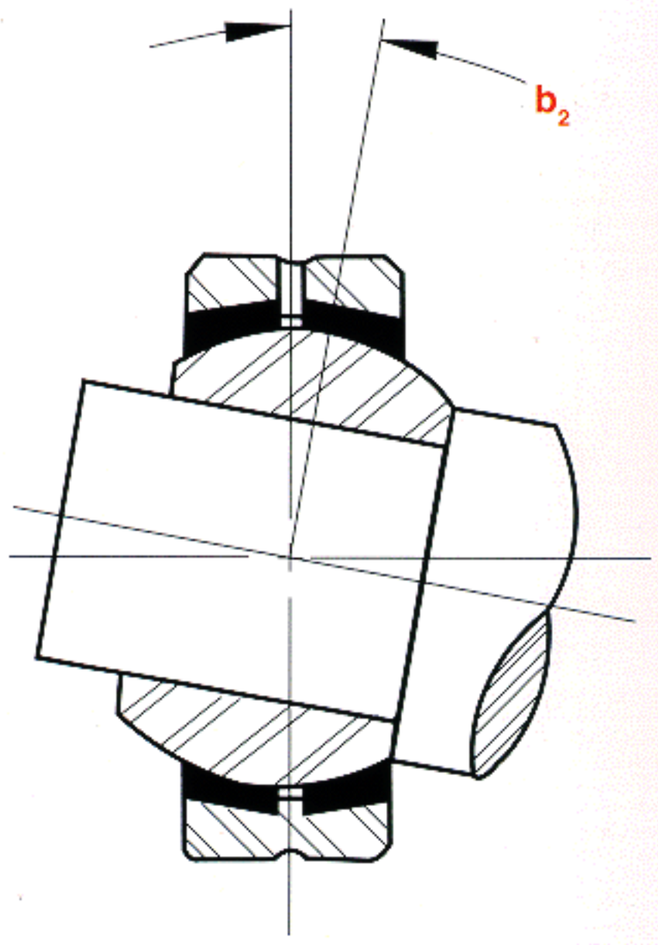
The angle of misalignment in a spherical bearing is calculated somewhat differently from that of the rod end because the housing is not spherical. There are three different types of mountings in which these bearings may be used as shown, and the angle of misalignment is governed by the type of mounting adopted.

Shown below are the common mountings for spherical bearings and the corresponding formula for calculating the angle of misalignment.

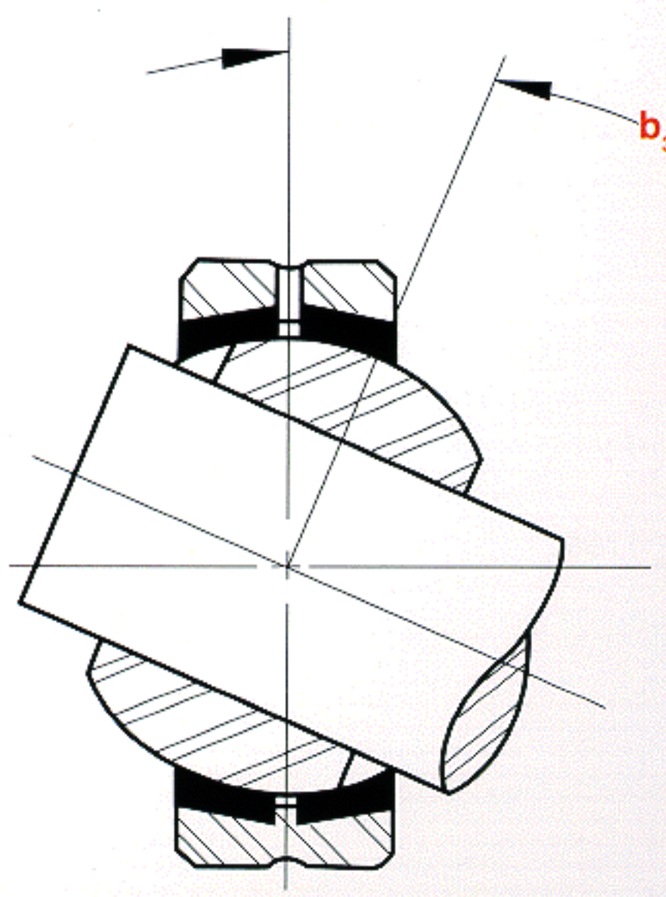
| SPHERICAL BEARING PART NUMBER | MAXIMUM MISALIGNMENT (+/- DEGREES) | | |
|---|---|---|---|
| | $b_1$ | $b_2$ | $b_3$ |
| **FLBG** | | | |
| 3 | 9.0 | 16.5 | 34.5 |
| 4 | 8.0 | 14.5 | 29.0 |
| 5 | 9.0 | 14.0 | 30.0 |
| 6 | 8.0 | 12.5 | 27.0 |
| 7 | 6.5 | 11.0 | 25.0 |
| 8 | 7.5 | 12.5 | 23.0 |
| 10 | 8.0 | 12.0 | 23.0 |
| 12 | 9.0 | 15.0 | 27.0 |
| 16 | 6.5 | 10.0 | 25.0 |
| 19 | 6.0 | 8.5 | 23.5 |
| 24 | 5.0 | 7.0 | 23.0 |
| 30 | 5.0 | 7.0 | 25.0 |
| **FSBG, SBG S, SBG, SBG SS, COM T, COM, COR** | | | |
| 2 | 8.5 | 13.5 | 28.0 |
| 3 | 7.0 | 11.0 | 29.5 |
| 4 | 9.0 | 13.0 | 30.0 |
| 5 | 8.0 | 12.0 | 26.0 |
| 6 | 7.5 | 10.5 | 23.5 |
| 7 | 6.5 | 9.5 | 20.5 |
| 8 | 7.0 | 10.0 | 20.0 |
| 9 | 7.5 | 10.0 | 20.0 |
| 10 | 7.0 | 9.0 | 19.0 |
| 12 | 7.0 | 9.0 | 21.0 |
| 14 | 7.0 | 9.0 | 16.0 |
| 16 | 7.5 | 9.5 | 16.0 |
| **BH LS** | | | |
| 16 | 6.5 | 8.5 | 26.0 |
| 19 | 6.0 | 8.0 | 25.5 |
| 20 | 6.0 | 8.0 | 23.0 |
| 24 | 6.0 | 8.0 | 21.0 |
| 28 | 6.0 | 8.0 | 19.0 |
| 32 | 6.0 | 8.5 | 19.0 |




$$b_1 = SIN^{-1}\frac{W}{V} - SIN^{-1}\frac{H}{V}$$




$$b_2 = SIN^{-1}\frac{W}{E} - SIN^{-1}\frac{H}{E}$$




$$b_3 = COS^{-1}\frac{B}{E} - SIN^{-1}\frac{H}{E}$$

**Reference Letters**

B = Bore of ball
C = Chamfer on outer race
D = Head diameter or diameter of outer race
E = Ball diameter
H = Housing width
$V = \sqrt{(D - 2C)^2 + H^2}$
W= Ball width

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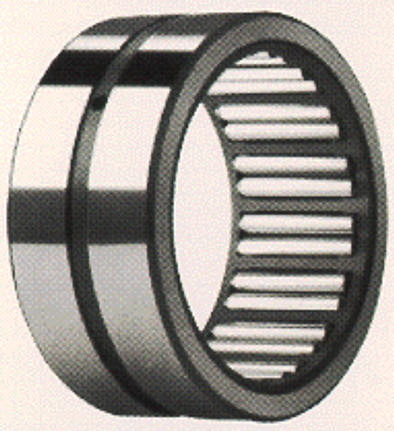

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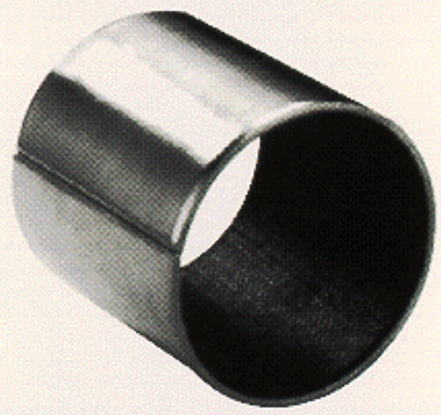

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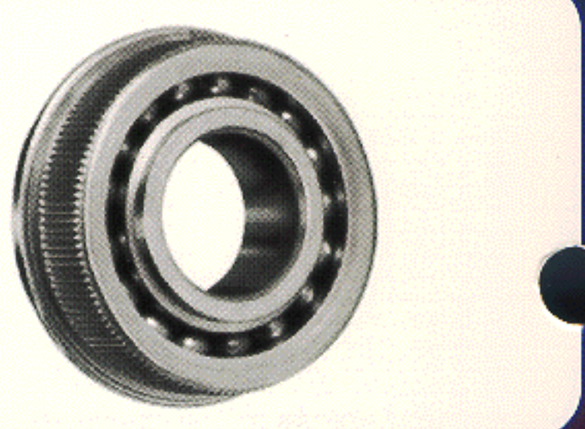

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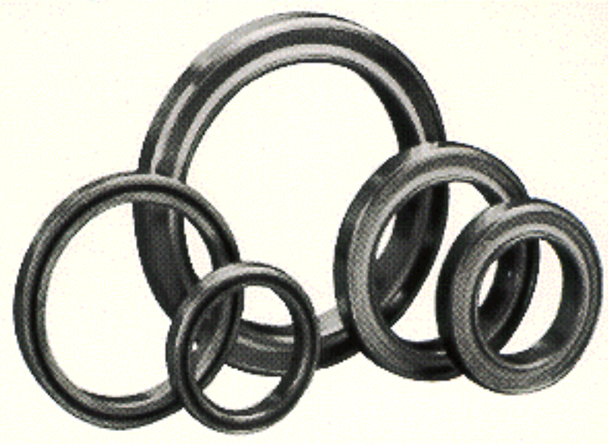

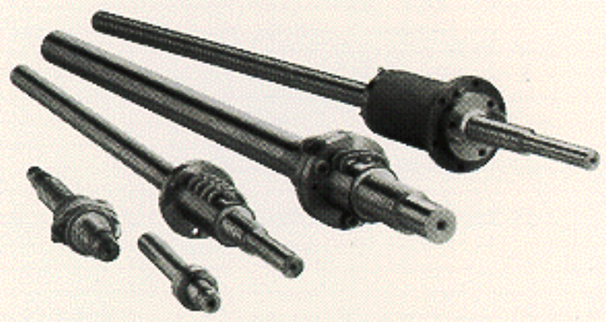

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