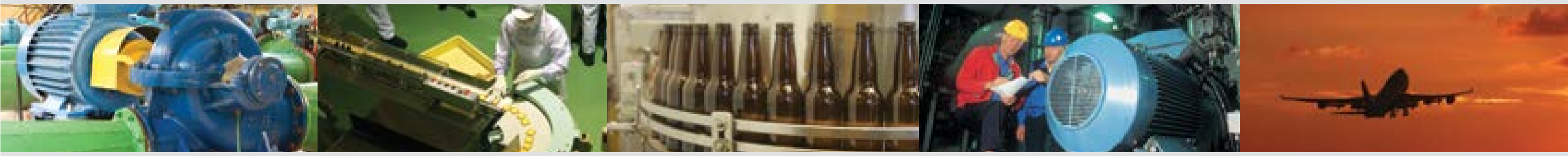
MRC



# MRC Engineering Handbook

# MRC Engineering Handbook

## Table of contents

### Section 1 – Introduction page



### Section 2 – Bearing specification tables page

# MRC Engineering Handbook

## Table of contents

# Introduction

# Section 1-Introduction



## Table of contents

# MRC® history

## The historical perspective of MRC

MRC is the outgrowth of three of America's oldest bearing companies—Standard Roller Bearing Company, Gurney Ball Bearing Company, and Strom Bearing Company.

The Standard Roller Bearing Company was formed when a Philadelphia industrialist, S. S. Eveland, merged the Ball Bearing Company of Boston with seven other major ball bearing and ball-making equipment manufacturers. The company used the SRB Diamond trademark. SRB made many contributions to the advancement of anti-friction bearings; most notably, the development of 52100 steel, a high carbon, high chrome alloy steel that greatly improved bearing life.

In 1902, Frederick W. Gurney started the manufacture of ball bearing machinery in Jamestown, New York. He originated the Gurney "radial-thrust angular-contact" bearing (today's 7000 Series) in 1905, and the Gurney "radial-Type R" bearing (same designation today) in 1909. Gurney also developed duplex bearings—a matched pair of counterbored bearings—which were a major contribution to the accuracy of high speed machine tool spindles.

Stephen Snyder began manufacturing filling slot radial ball bearings in a small Chicago shop in 1908. His business was incorporated in 1909 as the U.S. Ball Bearing Manufacturing Company. Axel Strom became sole owner and changed the name to Strom Ball Bearing Manufacturing Company. The company established itself as a major supplier of precision ball bearings to the automotive and machinery industries. A major innovation by Strom was engineering service, provided to customers, "to aid in proper choice of ball bearings, their use, and guidance for mounting and maintenance."

Prior to World War I, Albert F. Rockwell, one of two brothers who founded New Departure Company, formed the Rockwell-Drake Corporation to manufacture ball bearings in Plainville, Connecticut. During the war, Rockwell combined Rockwell-Drake Corporation with several other corporations including the Standard Roller Bearing Company of Philadelphia.

After World War I, some of the manufacturing units were liquidated and the company was reorganized as Standard Steel and Bearing, Inc., Division of Marlin Rockwell Corporation. In 1923, the bearing manufacturing plants were consolidated at Plainville, Connecticut. The following year, Gurney Ball Bearing Company merged with Marlin Rockwell Corporation. MRC® purchased Strom Ball Bearing Manufacturing Corporation in 1925 and its assets were moved to Jamestown, New York, in 1931.

The manufacturing experience, technical background, and managerial skills of these antecedent companies provided Marlin Rockwell with a firm base out of which to develop and grow. In 1953, a new state-of-the-art plant was built at Falconer, New York, and an addition to the plant was completed in 1966. The plant was devoted to the manufacture of high-precision ball and roller bearings.

In 1964, Marlin Rockwell Corporation was merged with TRW, Incorporated, and renamed TRW Bearings Division in 1979. With the technological background and facilities of the parent company at its disposal, TRW Bearings Division entered a new period of growth. A ball manufacturing plant was acquired in 1964 at Winstead, Connecticut. In 1976, the Division built a new facility at Gainesville, Georgia, to specialize in high-volume bearing production.

In 1986, the Bearing Division was acquired by the SKF Group, which is an international manufacturing and marketing organization composing approximately 200 companies with 85 factories, together operating in more than 130 countries. SKF sales units are backed up by nearly 200 sales offices and over 10,000 distributors and retailers.

# Catalog and speed rating disclaimer and warranty

## Disclaimer

The contents of this catalog are the copyright of the publishers and may not be reproduced (even extracts) unless permission is granted. Every care has been taken to insure the accuracy of the information contained in this catalog but no liability can be accepted for any errors or omissions.

Listing in this catalog does not necessarily imply product availability. Cage type speed adjustment factor footnotes does not mean that particular cage variants are available.

The designs and load ratings shown in this catalog are those being used at the time of publication. The possibility exists that the designs and ratings may be changed to reflect product improvement or may be procured from a different company facility. To determine current conditions, contact MRC Engineering.

## Interchange information

Interchanges provided in this catalog can provide a fast conversion of manufacturer numbers to MRC equivalents. Please note that interchanges are made on an application basis and may not be completely identical to MRC products. Basic interchanges indicate overall compatible design. The interchange information was compiled using data available at the time of publication; however, SKF USA Inc. and MRC assume no responsibility or liability for errors or omissions. Also, bearing illustrations depict closure grooves; however, actual bearings may or may not have closure grooves.

## Warranty

MRC warrants that products sold by it shall be free from defects in material and workmanship. MRC's obligation under this warranty is expressly limited to furnishing without additional charge a replacement, or at its option, repairing or issuing credit for any product which shall within one year from the date of sale be returned freight prepaid to the plant designated by an MRC representative and which upon inspection is determined by MRC to be defective in materials or workmanship. Complete information as to service, mounting and relubrication should accompany any product returned for inspection. The provisions of this warranty shall not apply to any MRC product which has been subjected to misuse, improper mounting, assembly or lubrication; or which has been repaired or altered if such repair or alteration in the judgement of MRC would adversely affect performance of the product.

This warranty is in lieu of all other warranties, expressed or implied, including any limited warranty of merchantability or fitness for a particular purpose and is also in lieu of all other obligations or liabilities on the part of MRC, including any obligation or liability arising from contract, tort or otherwise for damages and in no event shall seller be liable hereunder or otherwise for loss of profits; special, incidental, or consequential damages of any kind. There are no warranties, expressed or implied, made by MRC, except the warranty against defects in material and workmanship set forth above. MRC and SKF USA Inc. neither assume nor authorize any other person or firm to assume for it any other obligation or liability in connection with its products.

# Identification system for MRC bearings

## Metric radial bearings

**Example of marking on bearing box**

**R07**

**203SZZ-0001**
**Steel/C3/ABEC-1**

**0001 = MRC internal suffix code**
**R07 = Date code**
**H### = MRC external suffix code**

**Bearing identification code**

Type prefix

| | |
|---|---|
| F | One shield, non-standard location |
| G | Snap-ring, non-standard location |
| Z | One seal, non-standard location |

Bore diameter

04 and up, multiply last two numbers by 5 to obtain bore diameter in mm

| Code | Diameter |
|---|---|
| 00 | 10 |
| 01 | 12 |
| 02 | 15 |
| 03 | 17 |
| 04 | 20 |

Accessories

| | |
|---|---|
| F | One shield |
| FF | Two shields |
| FP | One rubber coated shield |
| FFP | Two rubber coated shields |
| G | Snap-ring |
| RSI | Seal for self-aligning bearing |
| Z | One seal |
| ZZ | Two seals |

| | | | | | |
|---|---|---|---|---|---|
| | 2 | 03 | S | ZZ | |

Series

| | | | |
|---|---|---|---|
| 1800 | Thin section | 1200 | Self-aligning |
| 1900 | Extremely light | 1300 | Self-aligning |
| 100K | Extra light | 1400 | Self-aligning |
| 200 | Light | 2200 | Self-aligning |
| 300 | Medium | 2300 | Self-aligning |
| 400 | Heavy | 11000 | Self-aligning, extended inner |

Type suffix

| | |
|---|---|
| M | Maximum capacity, filling notch |
| S | Conrad deep groove |
| SWI | Conrad deep groove, wide inner ring |
| WI | Maximum capacity, wide inner ring |

Additional features

| | |
|---|---|
| C | Cartridge width bearing |
| K | Tapered bore self-aligning bearing |
| X | Tapered bore |
| HYB#1 | Ceramic rolling elements ABEC-1 tolerances |

## Metric angular contact bearings

**Example of marking on bearing box**

**R07**

**7308 PJDU - H501**
**Pressed brass/ABEC-3**

**H501 = MRC internal suffix code**
**R07 = Date code**

**Bearing identification code**

Type

| | |
|---|---|
| BB | Pumpac Diamond |
| C | Double-row, Conrad |
| M | Double-row, maximum capacity |
| P | 40° contact angle, counterbored outer |
| PJ | 40° contact angle, counterbored inner and outer |
| R | 15° contact angle, counterbored outer |
| SB | Double-row, Conrad |
| SBK | Double-row, Conrad with closures |
| U | 29° contact angle, split ring |
| UP | 40° contact angle, split ring |
| U2 | Matched set of 7000DT /9000UDT 29° contact angle |
| UP2 | Matched set of 7000PDT /9000UPDT, 40° contact angle |

Series

| | | | |
|---|---|---|---|
| 1900 | Extremely light | 7200 | Angular contact, light |
| 100K | Extra light | 7300 | Angular contact, medium |
| 200 | Light | 7400 | Angular contact, heavy |
| 300 | Medium | 8000 | Pumpac® |
| 400 | Heavy | 9200 | Angular contact, split ring, light |
| 5200 | Double-row, light | 9300 | Angular contact, split ring, medium |
| 5300 | Double-row, medium | 97200 | 7200/9200 matched set, light |
| 5400 | Double-row, heavy | 97300 | 7300/9300 matched set, medium |
| 7100K | Angular contact, extra light | | |

Accessories

| | |
|---|---|
| F | One shield |
| FF | Two shields |
| Z | One seal |
| ZZ | Two seals |

| | | | | |
|---|---|---|---|---|
| 73 | 08 | PJ | DU | |

Bore diameter

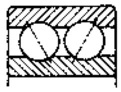
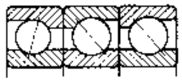
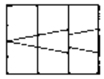
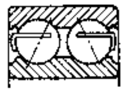
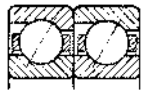
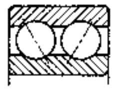
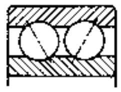
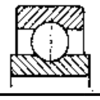
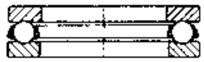
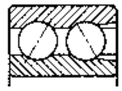
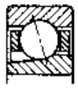
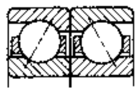
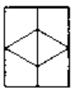
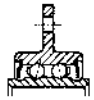
04 and up, multiply last two numbers by 5 to obtain bore diameter in mm

| Code | Diameter |
|---|---|
| 00 | 10 |
| 01 | 12 |
| 02 | 15 |
| 03 | 17 |
| 04 | 20 |

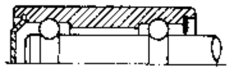
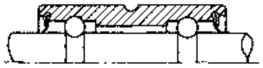
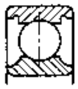
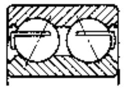
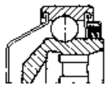
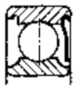
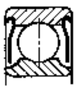
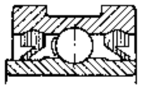
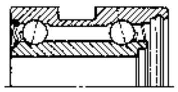
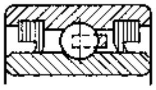
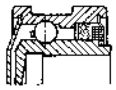
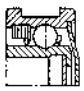
Duplex execution

| | |
|---|---|
| DB | Pair, back-to-back mounting |
| DE | Half pair with endplay |
| DF | Pair, face-to-face mounting |
| DS | Half pair with preload |
| DT | Pair, tandem mounting |
| DU | Half pair, flush ground |

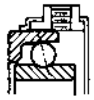
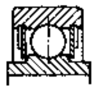
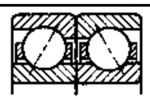
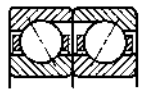
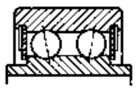
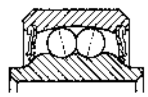
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| | A | Double-row, angular contact, non-filling notch ball bearing with cast bronze finger type cage, inwardly convergent contact angles, non-rigid design. | 5210A |  |
| | AAB | A triplex set of PumPac bearings. Two 40° contact angle bearings in tandem mounting matched back-to-back with one 15° contact angle bearing. “V” etched on O.D. | 8309AAB |   |
| | AC | Double-row angular contact, non-filling notch ball bearing, with outwardly convergent contact angles, rigid design and heavy duty cage. | 5308AC |  |
| | ADT | Two PumPac “A” bearings in tandem. | |  |
| | AH | Double-row angular contact, non-filling notch ball bearing, with cast iron bronze finger type cage, narrow width, inwardly convergent contact angles, non-rigid design. | 5210AH |  |
| AN | | Lock nut. | AN15 |  |
| | AS | Double-row, angular contact, non-filling notch ball bearing, with cast bronze finger type cage, and inwardly convergent contact angles, non-rigid design. | 5210AS |  |
| B | | Torque tube type airframe bearing. | B540 |  |
| | B | Thrust ball bearing with grooved races. | 4B |  |
| | B | Outwardly convergent contact angle when used with 5000 series filling notch bearings. Rigid design. | 5309B |  |
| | B | Single-row, metric, high speed rotor ball bearing. | 34B |  |
| | BB | PumPac Diamond. Matched set of 15° contact angle bearings in back-to-back mounting. “V” etched on O.D. to form a diamond. | 8309BB |   |
| BC | W | Bell crank type airframe bearing. | BC4W10 |  |
| BIC | | ABMA designation, non-filling notch, inch size, various configurations. | 18BIC4800 |  |

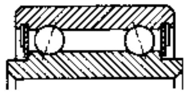
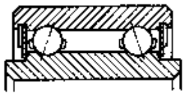
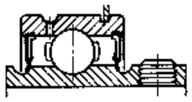
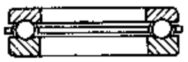
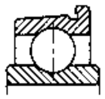
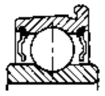
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| BTK | | Double-row, integral shaft ball bearing, with seal and shield. | BTK4800 |  |
| BWF | | Double-row, integral shaft ball bearing, with two seals. | BWF4800 |  |
| | C | Single-row deep groove type ball bearing, similar to S type. | 208C |  |
| | C | Thrust ball bearing, single acting, with flat races. | 6C |  |
| | C | Double-row angular contact, non-filling notch ball bearing, with outwardly convergent contact angles, rigid design. | 5310C |  |
| CB | | Conveyor type ball bearing. | CB5043 |  |
| | CF | Single-row deep groove type ball bearing, with one shield, similar to SF type. | 208CF |  |
| | CFF | Single-row deep groove type ball bearing, with two shields, similar to SFF type. | 208CFF |  |
| CONV | A | Conveyor bearing, two seals, slotted for bracket mounting. | CONV4A |  |
| CONV | E | Double-row conveyor bearing, seal and shield, slotted for bracket mounting, rigid design. | CONV4E2 |  |
| CONV | J | Conveyor bearing, two seals, direct roller mounting. | CONV4J |  |
| CONV | SF | Conveyor bearing, seal and shield, slotted for bracket mounting. | CONV4SF |  |
| CONV | SZ | Conveyor bearing, one seal, direct roller mounting. | CONV4SZ |  |
| CONV | Y | Conveyor bearing, seal and shield, slotted for bracket mounting. | CONV3Y2 |  |

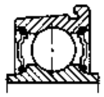
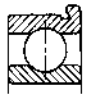
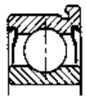
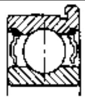
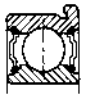
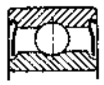
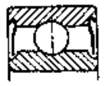
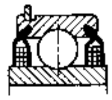
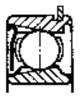
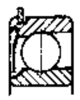
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| | CT | Clutch release bearing, plain. | 211CT |  |
| | CTC | Clutch release bearing, with housing. | 210CTC |  |
| | CTQ | Clutch release bearing, with housing. | 211CTQ |  |
| | CTR | Clutch release bearing, with housing and grease fitting. | 209CTR |  |
| | CZ | Single-row deep groove type ball bearing with one seal, similar to SZ type. | 208CZ |  |
| | CZZ | Single-row deep groove type ball bearing with two seals, similar to SZZ type. | 208CZZ |  |
| | D | A duplex ground half pair matched with a similar half pair in a DE, DS, DT or DU arrangement. | 7207D |  |
| | DB | Matched set of duplex bearings, back-to-back mounting. | 7207DB |  |
| | DD | Two glass fabric reinforced PTFE (Teflon®) seals. | B540DD |  |
| | DE | Matched set of duplex bearings, universal mounting, with endplay requirement. | 7207DE |  |
| | DF | Matched set of duplex bearings, face-to-face mounting. | 7207DF |  |
| DPP | | Double-row airframe bearing with two glass reinforced PTFE (Teflon) seals, non- rigid design. | DPP4 |  |
| | DS | Matched set of duplex bearings, universal mounting, with preload requirement. | 7207 DS DL |  |
| DSP | | Double-row, internally self-aligning, airframe bearing, with two glass reinforced PTFE (Teflon) seals. | DSP4 |  |

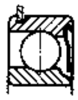
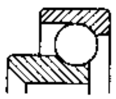
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| | DT | Matched set of duplex bearings, tandem mounting. | 7207 DT |  |
| | DU | Half pair duplex bearings, universal mounting with no preload or endplay. | 7207 DU |  |
| DW | | Double-row airframe bearing with two glass reinforced PTFE (Teflon) seals, rigid design. | DW4 |  |
| DW | K | Double-row airframe bearing with cage and two glass reinforced PTFE (Teflon) seals, rigid design. | DW4K |  |
| E | | Single-row magneto type ball bearing with separable outer ring. | E16 |  |
| | E | Self-aligning ball bearing with higher load rating than original design. | 2205E |  |
| ER | | Power transmission type bearing, extended inner ring with set screws, with snap-ring and relube holes in outer ring. | ER16 |  |
| E | R | Single-row, counterbored outer ring, radial type ball bearing. | E16R1 |  |
| | ES | Single-row elevator type bearing with groove in outer ring and two shields. | 203ES |  |
| | F | Thrust bearing, single acting. | 1115F |  |
| | F | One shield. | 207SF |  |
| FB | | Single-row flanged ball bearing with tapered O.D. | FB3 |  |
| FB | FFM | Single-row flanged ball bearing with tapered O.D. and two removable shields. | FB3FFM |  |
| FB | FFP | Single-row flanged ball bearing with tapered O.D. and two rubber beaded shields. | FB3FFP |  |

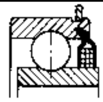
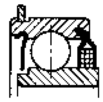
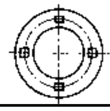
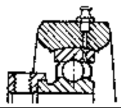
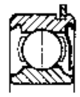
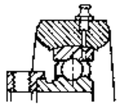
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| FB | ZZ | Single-row flanged ball bearing with tapered O.D. and two seals. | FB3ZZ |  |
| FC | | Single-row flanged ball bearing with cylindrical O.D. | FC3 |  |
| FC | FFM | Single-row flanged ball bearing with cylindrical O.D. and two removable shields. | FC3FFM |  |
| FC | FFP | Single-row flanged ball bearing with cylindrical O.D. and two rubber beaded shields. | FC3FFP |  |
| FC | ZZ | Single-row flanged ball bearing with cylindrical O.D. and two seals. | FC3ZZ |  |
| | FF | Two shields. | 207SFF |  |
| | FFC | Single-row, inch size, cartridge width bearing with two shields. | R4FFC |  |
| | FFM | Two removable shields. | R4FFM |  |
| | FFMC | Single-row, inch size, cartridge width bearing with two removable shields. | R4FFMC |  |
| | FFP | Two rubber coated shields. | R4FFP |  |
| | FFS | Two felt seals, replaced by 88XXX. | 203FFS |  |
| | FFSG | Two felt seals and snap-ring, replaced by 488XXX. | 203FFSG |  |
| FG | M | Single-row maximum capacity ball bearing with shield on same side as filling notch and snap-ring on opposite side. | FG309M |  |
| FG | R | Single-row counterbored outer ring ball bearing with shield and snap-ring on side opposite counterbore. | FG209R |  |

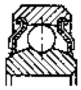
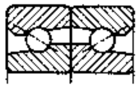
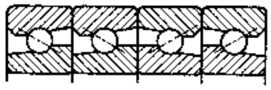
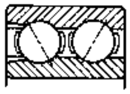
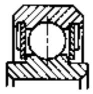
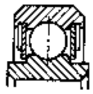
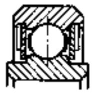
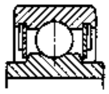
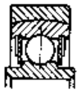
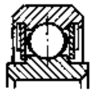
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| | FM | One removable shield. | R4FM |  |
| F | M | Single-row maximum capacity ball bearing with shield on same side as filling notch. | F309M |  |
| F | MG | Single-row maximum capacity ball bearing with shield and snap-ring on same side as filling notch. | F309MG |  |
| | FP | One rubber coated shield. | R4FP |  |
| F | R | Single-row counterbored outer ring ball bearing with shield on side opposite counterbore. | F209R |  |
| F | RG | Single-row counterbored outer ring ball bearing with snap-ring on counterbore side and shield on opposite side. | F209RG |  |
| | FS | One felt seal, replaced by 8XXX. | 203FS |  |
| | FSF | One felt seal and one shield, replaced by 87XXX. | 203FSF |  |
| | FSFG | One felt seal and one shield with snap-ring on seal side. | 203FSFG |  |
| | FSG | One felt seal with snap-ring on open side of bearing. | 209FSG |  |
| | FW | Front wheel bearing. | 41FW |  |
| | FZ | One seal and one shield. | 207SFZ |  |
| FZG | M | Single-row maximum capacity ball bearing with seal on filling notch side and shield and snap-ring on opposite side. | FZG209M |  |
| FZ | M | Single-row maximum capacity ball bearing with seal on filling notch side and shield on opposite side. | FZ209M |  |

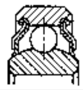
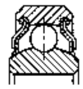
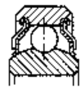
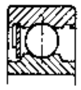
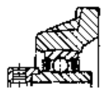
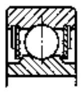
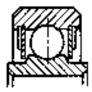
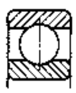
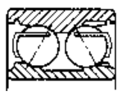
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| FZ | MG | Single-row maximum capacity ball bearing with seal and snap-ring on filling notch side and shield on opposite side. | FZ209MG |  |
| | G | Snap-ring. | 208SG |  |
| G | FS | One felt seal with snap-ring on same side as seal. | G209FS |  |
| G | FSF | One felt seal and one shield with snap-ring on shield side, replaced by 487XXX. | G209FSF |  |
| G | MF | Single-row maximum capacity ball bearing with shield and snap-ring on side opposite filling notch. | G207MF |  |
| G | MFZ | Single-row maximum capacity ball bearing with shield on filling notch side and seal and snap-ring on opposite side. | G207MFZ |  |
| G | MS | Pressed flange housing, regreaseable, eccentric locking collar. | G62MS3 |  |
| GR | | Pillow block, regreaseable, with two Flexigard seals, eccentric locking collar. | GR2 |  |
| G | R | Single-row counterbored outer ring ball bearing with snap-ring on side opposite counterbore. 15° contract angle. | G209R |  |
| G | RF | Single-row counterbored outer ring ball bearing with shield on counterbore side and snap-ring on opposite side. 15° contact angle. | G209RF |  |
| G | SF | Single-row deep groove ball bearing with shield and snap-ring on same side. | G208SF |  |
| GT | | Pillow block, regreaseable, with two seals, eccentric locking collar. | GT1½ |  |
| H | | Adapter sleeve, nut and lock washer assembly used with self-aligning ball bearing with tapered bore. | H322 |  |
| | H | 9000 series angular contact ball bearing with split outer ring. | 9310H |  |

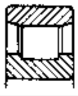
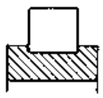
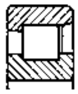
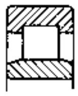
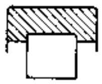
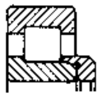
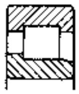
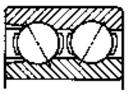
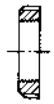
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| HH | | Combined glass reinforced PTFE (Teflon) seal and stainless steel shield. | HH-KSP8 |  |
| J | DF | Ball screw support, duplex pair, face-to-face mounting. | J150DF |  |
| J | DFDT | Ball screw support, quadruplex set, tandem pair matched face-to-face with a tandem pair. | J150DFDT |  |
| | JR | Single-row, counterbored outer ring, radial type bearing, reduced O.D. and narrow width. 15° contact angle. | 114JR |  |
| | K | Double-row angular contact, filling notch type bearing, standard width and inwardly converging contact angles, non-rigid design. | 5210K |  |
| | K | Self-aligning ball bearing with 1:12 tapered bore. | 1215K |  |
| K | L | Single-row airframe type bearing with two stainless steel shields. | K3L |  |
| KP | | Single-row airframe type bearing with two glass reinforced PTFE (Teflon) seals. | KP3 |  |
| KP | A | Single-row airframe type bearing with two glass reinforced PTFE (Teflon) seals, similar to KP type except reduced O.D. and width. | KP3A |  |
| KP | AK | Single-row airframe type bearing with two glass reinforced PTFE (Teflon) seals, and cage, same as KP-A except includes cage. | KP3AK |  |
| KP | B | Single-row airframe type bearing with two glass reinforced PTFE (Teflon) seals. | KP16B |  |
| KP | BS | Single-row airframe type bearing with two glass reinforced PTFE (Teflon) seals, and self-aligning ring in O.D. | KP16BS |  |
| KP | K | Single-row airframe type bearing with two glass reinforced PTFE (Teflon) seals, and cage. | KP4K |  |
| | KR | Single-row, counterbored outer ring, radial type, ball bearing. 15° contact angle. | 104KR |  |

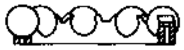
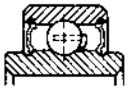
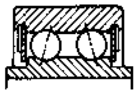
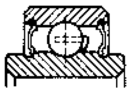
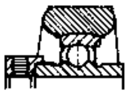
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| | KS | Single-row deep groove type ball bearing. | 104KS |  |
| | KSB | Single-row, extra precision, separable inner ring, radial type bearing. | 106KSB |  |
| | KSJ | Single-row, extra precision, low shoulder one side of inner, non-separable, radial type bearing. | 106KSJ |  |
| KSP | | Single-row, airframe type bearing, internally self-aligning, with two glass reinforced PTFE (Teflon) seals. | KSP4 |  |
| KSP | A | Single-row, airframe type bearing, internally self-aligning, with two glass reinforced PTFE (Teflon) seals. Similar to KSP except reduced O.D. and width. | KSP4A |  |
| KSP | L | Single-row airframe type bearing, internally self-aligning, with two glass reinforced PTFE (Teflon) seals. Similar to KSP except reduced O.D. and width. | KSP3L |  |
| L | KS | One glass reinforced PTFE (Teflon) seal. | L105KS |  |
| LB | | Flange unit, non-regreaseable, with two labyrinth seals, and eccentric locking collar. | LB1 |  |
| LL | KS | Two glass reinforced PTFE (Teflon) seals. | LL105KS |  |
| LZ | | Flange unit, non-regreaseable, with two seals and eccentric locking collars. | LZ2 |  |
| M | | Airframe bearing with special close tolerances. | MKP16B |  |
| M | | Single-row, miniature, inch size bearing, ABEC-5 precision. | M0620 |  |
| | M | Single-row, maximum capacity, filling notch type ball bearing. | 208M |  |
| | M | Double-row angular contact, filling notch ball bearing with outwardly convergent contact angles. | 5210M |  |

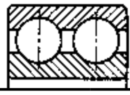
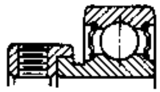
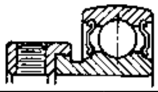
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| | M | Machined bronze cage for self-aligning ball bearings. | 2314M |  |
| | MC2 | Machined bronze cage and ABMA C2 internal clearance for self-aligning ball bearing. | 2315MC2 |  |
| | MFZG | Single-row maximum capacity, filling notch ball bearing with shield and snap-ring on filling notch side and seal on opposite side. | 209MFZG |  |
| MR | C | Cylindrical roller bearing, with two flanges on inner ring, none on outer ring. | MR208C |  |
| MR | CQ | Cylindrical roller bearing, outer ring only, no flanges. | MR208CQ |  |
| MR | CY | Cylindrical roller bearing, inner ring, roller and cage assembly only, two flanges on inner ring. | MR208CY |  |
| MR | D | Cylindrical roller bearing, with two flanges on inner ring, one on outer ring. | MR208D |  |
| MR | E | Cylindrical roller bearing, two flanges on outer ring, none on inner ring. | MR208E |  |
| MR | EJ | Cylindrical roller bearing, inner ring only, no flanges. | MR208EJ |  |
| MR | EX | Cylindrical roller bearing, outer ring, roller and cage assembly only, two flanges on outer ring. | MR208EX |  |
| MR | F | Cylindrical roller bearing, two flanges on outer ring, one flange on inner ring, with side plate. | MR208F |  |
| MR | G | Cylindrical roller bearing, two flanges on outer ring, one flange on inner ring. | MR208G |  |
| | MW | Double-row angular contact, filling notch ball bearing with inwardly convergent contact angles. | 5210MW |  |
| N | | Lock nut. | N06 |  |

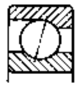
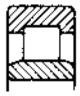
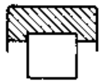
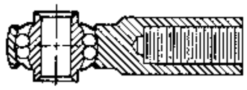
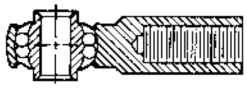
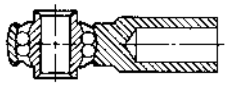
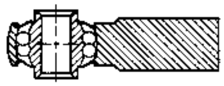
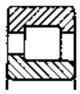
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| | N | Single-row, maximum capacity, filling notch type ball bearing, narrow width. | 112N |  |
| | NYL | Fiberglass reinforced 6/6 polyamide cage. | 206S-NYL |  |
| 0 | B | Single-row, metric, high speed rotor bearing, less inner ring. | 034B |  |
| OR | B | Single-row, inch size, high speed rotor bearing, less inner ring. | OR4B |  |
| P | | Single-row airframe type bearing, two seals, aircraft pulley type. | P8 |  |
| | P | Single-row angular contact, counterbored outer ring, heavy duty bearing, with 40° contact angle. | 7308P |  |
| PB | | Pillow block, non-regreaseable, with two labyrinth seals and eccentric locking collar. | PB$1\frac{7}{16}$ |  |
| | PD | A duplex ground half pair, 40° angular contact bearing, counterbored outer ring, matched with a similar half pair in a DE, DS, DT, or DU arrangement. | 7308PD |  |
| PD | K | Double-row airframe type bearing, two seals, aircraft pulley type, rigid design. | PD5K |  |
| | PJ | Single-row angular contact, counterbored inner and outer ring, heavy duty bearing, with a 40° contact angle. | 7308PJ |  |
| | PJD | A duplex ground half pair, 40° angular contact bearing, counterbored inner and outer rings, matched with a similar half pair in a DE, DS, DT, or DU arrangement. | 7308PJD |  |
| P | K | Single-row airframe type bearing, with two seals, aircraft pulley type. | P5K |  |
| PZ | | Pillow block, non-regreaseable, with two seals and eccentric locking collar. | PZ$2\frac{7}{16}$ |  |
| R | | Single-row, small inch size bearing. | R6 |  |

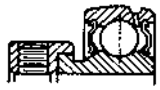
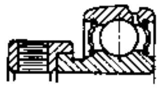
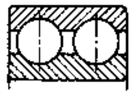
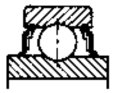
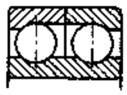
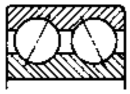
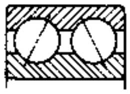
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| | R | Single-row, counterbored outer ring, radial type bearing, 15° contact angle. | 207R |  |
| | R | Double-row, radial type, non-filling notch ball bearing with cast bronze finger type cage. 0° contact angles. | 5306R |  |
| R | A | Single-row, small inch size bearing, with increased O.D. and width. | R4A |  |
| RA | ATT | Power transmission type, inner extended one side only, cylindrical O.D., two Flexigard seals, non-regreaseable, eccentric locking collar. | RA008ATT |  |
| RA | AZZ | Power transmission type, inner extended one side only, cylindrical O.D., two seals, non-regreaseable, eccentric locking collar. | RA008AZZ |  |
| RA | BTT | Power transmission type, inner ring extended one side only, spherical O.D., two Flexigard seals, non-regreaseable, eccentric locking collar. | RA008BTT |  |
| RA | BZZ | Power transmission type, inner ring extended one side only, spherical O.D., two seals, non-regreaseable, eccentric locking collar. | RA008BZZ |  |
| RAP | M | Airframe bearing, rod end type, with male threaded shank. | RAP3M |  |
| R | B | Single-row, small inch size, high speed rotor bearing, with separable inner ring. | R3B |  |
| R | C | Cylindrical roller bearing, with two flanges on inner ring, none on outer ring. | R208C |  |
| R | CQ | Cylindrical roller bearing, outer ring only, no flanges. | R208CQ |  |
| R | CY | Cylindrical roller bearing, inner ring, roller and cage assembly only, two flanges on inner ring. | R208CY |  |
| R | D | Cylindrical roller bearing, with two flanges on inner ring, one on outer ring. | R208D |  |
| | RD | Single-row, counterbored outer ring, radial type bearing, with controlled relationship of ring faces, used in duplex sets. | 306RD |  |

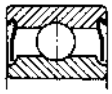
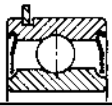
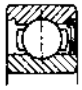
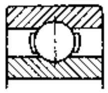
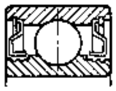
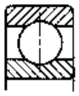
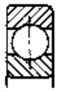
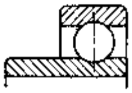
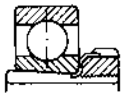
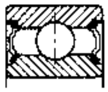
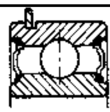
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| | RDM | Dynamometer bearing, ABEC-5 inner ring, ABEC-1 outer ring, phenolic cage, 15° contact angle. | 316RDM |  |
| | RDT | Single-row, split inner ring bearing, 20° contact angle. | 309RDT1½ |  |
| R | E | Cylindrical roller bearing, two flanges on outer ring, none on inner ring. | R208E |  |
| R | EJ | Cylindrical roller bearing, inner ring only, no flanges. | R208EJ |  |
| R | EX | Cylindrical roller bearing, outer ring, roller and cage assembly only, two flanges on outer ring. | R208EX |  |
| REPB | N | Airframe bearing, rod end type, with female threaded shank. | REPB3N |  |
| REP | F | Airframe bearing, rod end type, with female threaded shank. | REP4F7 |  |
| REP | H | Airframe bearing, rod end type, with hollow shank. | REP3H5 |  |
| REP | M | Airframe bearing, rod end type, with male threaded shank. | REP4M6 |  |
| REP | S | Airframe bearing, rod end type, with solid shank. | REP4S10 |  |
| R | F | Cylindrical roller bearing, two flanges on outer ring, one flange on inner ring, with side plate. | R208F |  |
| | RF | Single-row, counterbored outer ring, radial type bearing, with shield on counterbored side, 15° contact angle. | 208RF |  |
| | RFG | Single-row, counterbored outer ring, radial type bearing, with shield and snap-ring on counterbored side, 15° contact angle. | 208RFG |  |
| R | G | Cylindrical roller bearing, two flanges on outer ring, one flange on inner ring. | R208G |  |

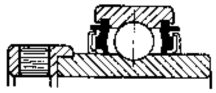
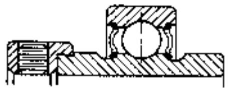
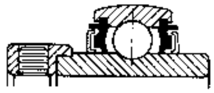
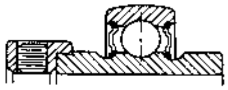
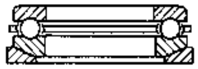
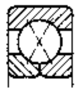
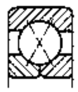
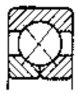
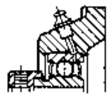
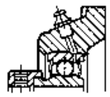
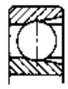
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| | RG | Single-row, counterbored outer ring, radial type bearing, with snap-ring on counterbored side, 15° contact angle. | 208RG |  |
| | RJ | Single-row, counterbored inner and outer rings, extra precision, radial type bearing, 15° contact angle. | 106RJ |  |
| RRA | BTT | Power transmission bearing, inner ring extended one side only, spherical O.D., two Flexigard seals, regreaseable, eccentric locking collar. | RRA008BTT |  |
| RRA | BZZ | Power transmission bearing, inner ring extended one side only, spherical O.D., two seals, regreaseable, eccentric locking collar. | RRA008BZZ |  |
| | RS | Double-row, radial type, non-filling notch ball bearing, with cast bronze finger type cage. | 5312RS |  |
| | 2RS1 | Self-aligning ball bearing with two synthetic rubber seals. | 22102RS1 |  |
| RT | BZZ | Power transmission bearing, inner ring extended both sides, two seals, regreaseable, eccentric locking collar. | RT107BZZ |  |
| RW | | Single-row deep groove, rear wheel type bearing with two seals. | RW716 |  |
| | RZ | Single-row, counterbored outer ring, radial type bearing, with seal on counterbored side, 15° contact angle. | 306RZ |  |
| | R2 | Double-row, split outer ring, radial type bearing. | 5206R2 |  |
| | S | Single-row deep groove ball bearing. | 207S |  |
| | S | 9000 series angular contact angle bearing with one-piece inner and outer rings, 20° contact angle. | 9212S1 |  |
| | SB | Double-row, angular contact, non-filling notch bearing, with outwardly convergent contact angles, rigid design. | 5203SB |  |
| | SBK | Double-row, angular contact, non-filling notch, standard width bearing, with outwardly convergent contact angles, rigid design. | 5203SBK |  |

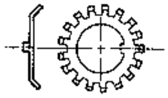
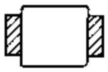
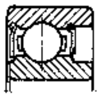
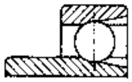
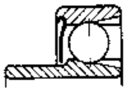
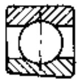
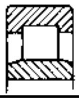
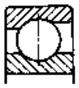
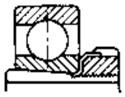
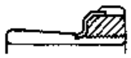
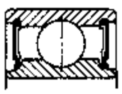
# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| | SFFC | Single-row deep groove, cartridge width bearing, with two shields. | 210SFFC |  |
| | SFFCG | Single-row deep groove, cartridge width bearing, with two shields and snap-ring. | 210SFFCG |  |
| | SFFP | Single-row deep groove ball bearing with two rubber beaded shields. | 1910SFFP |  |
| | SFP | Single-row deep groove ball bearing with rubber beaded shield. | 1806SFP |  |
| | SH | Single-row deep groove bearing, wider than standard. | 105SH |  |
| | SLLC | Single-row deep groove, cartridge width bearing, with two removable shields. | 210SLLC |  |
| | SRRC | Single-row deep groove, cartridge width bearing, with two labyrinth seals. | 210SRRC |  |
| S | S | Single-row, small inch size bearing. | S3S |  |
| | ST | Stainless steel (440C) rings and rolling elements. | 207SST |  |
| | SV | Single-row deep groove bearing, narrower than standard. | 209SV |  |
| | SWI | Single-row deep groove bearing, with inner ring extended one side. | 311SWI |  |
| | SXY | Single-row deep groove bearing, tapered bore, with adapter sleeve and nut. | 210SXY |  |
| | SZZC | Single-row deep groove bearing, cartridge width, with two seals. | 210SZZC |  |
| | SZZCG | Single-row deep groove bearing, cartridge width, with two seals and snap-ring. | 210SZZCG |  |

# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| T | ARR | Power transmission bearing, inner ring extended both sides, cylindrical O.D., two labyrinth seals, non-regreaseable, eccentric locking collar. | T1100ARR |  |
| T | AZZ | Power transmission bearing, inner ring extended both sides, cylindrical O.D., two seals, non-regreaseable, eccentric locking collar. | T1100AZZ |  |
| T | BRR | Power transmission bearing, inner ring extended both sides, spherical O.D., two labyrinth seals, non-regreaseable, eccentric locking collar. | T1100BRR |  |
| T | BZZ | Power transmission bearing, inner ring extended both sides, spherical O.D., two seals, non-regreaseable, eccentric locking collar. | T1100BZZ |  |
| | TT | Two metal shrouded synthetic rubber seals. | 205STT |  |
| | U | Thrust bearing, single acting, with self-aligning washer. | 1109U |  |
| | U | 9000 series angular contact ball bearing with split inner ring, 29° contact angle. | 9309U |  |
| | UH | 9000 series angular contact ball bearing with split inner and outer rings, 29° contact angle. | 9213UH |  |
| | UK | 9000 series, extra light, angular contact ball bearing with split inner ring, 29° contact angle. | 9107UK |  |
| | UP | 9000 series, 40° angular contact ball bearing with split inner ring. | 9308UP |  |
| UR | | Flange unit, two seals, regreaseable, with eccentric locking collar. | UR2 |  |
| UT | | Flange unit, two Flexigard seals, regreaseable, with eccentric locking collar. | UT1½ |  |
| | V | Single-row, maximum capacity, filling notch type ball bearing, with narrow width. | 209V |  |
| | V | Felt seal replacement bearing with one seal and one shield with snap-ring on seal side. | 487508V |  |

# Bearing symbols

| Prefix | Suffix | Description | Example | Illustration |
|---|---|---|---|---|
| W | | Lock washer. | W06 |  |
| | W | Cylindrical roller bearing, roller and cage assembly only. | R207W |  |
| WC | | Single-row felt seal replacement bearing with inner and outer ring faces flush on one side. | WC87504 |  |
| | WI | Single-row, maximum capacity, filling notch type ball bearing, with inner ring extended one side only. | 318WI |  |
| | WIF | Single-row maximum capacity ball bearing with inner ring extended one side, and shield on extended inner side. | 318WIF |  |
| | X | Tapered bore bearing. | 206SX |  |
| XLR | | Cylindrical roller bearing, inch size. | XLR3½E |  |
| XLS | | Single-row, counterbored outer ring, 15° angular contact ball bearing, inch size. | XLS2 |  |
| XO | RBDS | Excello replacement bearing. | XO90RBDS |  |
| | XY | Tapered bore bearing with adapter sleeve. | 208SXY |  |
| | Y | Adapter sleeve and nut. | 6Y |  |
| Y | PWI-DB | Duplex pair of airframe bearings, seals on outboard side, aircraft pulley type. | Y96PWID2B |  |
| | Z | One synthetic rubber seal. | 206SZ |  |
| | ZZ | Two synthetic rubber seals. | 206SZZ |  |
| | ZZC | Single-row, cartridge width bearing, extra small size, with two synthetic rubber seals. | 38ZZC |  |

# Prefix/suffix symbols for single-row bearing non-standard variants

## Nomenclature

**S**-Single-row deep groove type
**M**-Single-row filling notch type
**R**-15° angular contact type
**WI**-Wide inner ring filling notch type
**SWI**-Wide inner ring non-filling notch type

**F**-Shield
**Z**-Seal
**G**-Snap-ring
**FS**-Felt seal
**X**-Tapered bore

When single seal is used, seal symbol (Z) replaces (F) in designations shown except for filling notch (M) type.

| Prefix-Suffix | Illustration | Prefix-Suffix | Illustration | Prefix-Suffix | Illustration |
|---|---|---|---|---|---|
| -MF |  | X-M |  | G-MFZ |  |
| -MG |  | F-MX |  | FZG-M |  |
| -MFG |  | X-MF |  | -MXFZ |  |
| G-M |  | -MFX |  | XFZ-M |  |
| F-M |  | XF-M |  | X-MFZ |  |
| F-MG |  | -MFZ |  | FZ-MX |  |
| G-MF |  | FZ-M |  | -SFG |  |
| FG-M |  | -MFZG |  | G-SF |  |
| -MX |  | FZ-MG |  | -SFX |  |

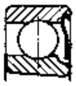
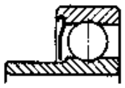
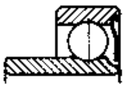
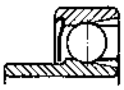
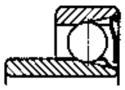
# Prefix/suffix symbols for single-row bearing non-standard variants

## Nomenclature

**S**-Single-row deep groove type
**M**-Single-row filling notch type
**R**-15° angular contact type
**WI**-Wide inner ring filling notch type
**SWI**-Wide inner ring non-filling notch type

**F**-Shield
**Z**-Seal
**G**-Snap-ring
**FS**-Felt seal
**X**-Tapered bore

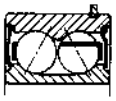
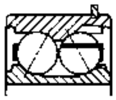
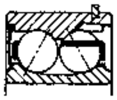
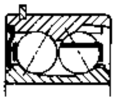
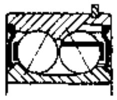
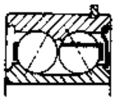
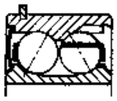
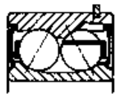
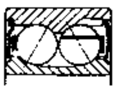
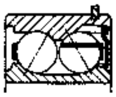
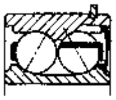
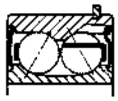
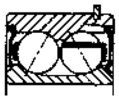
When single seal is used, seal symbol (Z) replaces (F) in designations shown except for filling notch (M) type.

| Prefix-Suffix | Illustration | Prefix-Suffix | Illustration | Prefix-Suffix | Illustration |
|---|---|---|---|---|---|
| -SXF |  | G-FSF |  | F-RG |  |
| -SWIF |  | -RF |  | -RX |  |
| F-SWI |  | -RG |  | X-R |  |
| -WIF |  | -RFG |  | -RFX |  |
| F-WI |  | F-R |  | X-RF |  |
| -FSG |  | G-R |  | F-RX |  |
| G-FS |  | FG-R |  | FX-R |  |
| -FSFG |  | G-RF |  | | |

# Prefix/suffix symbols for double-row bearing non-standard variants

## Nomenclature

**M**-Filling notch type
**C**-Non-filling notch type
**F**-Shield
**Z**-Seal
**G**-Snap-ring

| Prefix–Suffix | Illustration | Prefix–Suffix | Illustration | Prefix–Suffix | Illustration |
|---|---|---|---|---|---|
| G-CFZ |  | G-M |  | ZG-M |  |
| G-CZ |  | F-MG |  | G-MFF |  |
| G-CF |  | Z-MG |  | G-MZZ |  |
| F-MZ |  | G-MF |  | F-MZG |  |
| F-M |  | G-MZ |  | G-MFZ |  |
| Z-M |  | FG-M |  | FG-MZ |  |

# MRC manufacturing suffixes

The manufacturing suffix is specified on packing lists, invoices and all unit cartons. Whenever possible the manufacturing suffix is also shown on the bearing steel. It is separated from the standard MRC part number by several spaces. Example:

| 204SZZ | H501 |
| --- | --- |
| **Standard MRC part no.** | **Manufacturing suffix** |

A four digit manufacturing suffix is used by MRC internally to define bearing specifications as well as to track such information as plant-of-manufacture as product is distributed throughout the MRC warehousing network. This suffix is assigned sequentially within the MRC computer system and can only be cross-referenced internally by the MRC Customer Service Representative.

The standard MRC part number is sufficient for specifying customer requirements for all “stock” sizes. The use of a non-descriptive manufacturing suffix permits minor changes to the design and manufacture of standard product without a confusing nomenclature change. The revised product may still be tracked through distribution by the four digit manufacturing suffix.

# MRC descriptive part suffixes

A descriptive part suffix is frequently combined with the standard MRC part number to provide a more complete description of bearing design specifications. Descriptive suffixes are found on MRC price sheets, packing lists and invoices. Preload and endplay descriptive suffixes are only displayed on the bearing steel away from the basic part number.

Descriptive part suffixes are physically separated from the standard MRC part number by a dash “-”.

$\underbrace{\text{213RDS}}_{\text{Basic part no.}}$ - $\underbrace{\text{BKE\#7}}_{\text{Descriptive suffix}}$

| | Descriptive part suffix definitions |
|---|---|
| **BKE** | Machined phenolic composition (Bakelite) |
| **BRS** | Pressed brass cage |
| **BRZ** | Machined bronze cage |
| **CA** | Less than normal endplay designation for duplexed bearings |
| **CB** | Normal endplay designation for duplexed bearings |
| **CC** | Greater than normal endplay designation for duplexed bearings |
| **CX** | Special endplay designation for duplexed bearings |
| **C0** | ABMA #0 radial clearance (MRC-ST Fit) |
| **C2** | ABMA #2 radial clearance (MRC-TI Fit) |
| **C3** | ABMA #3 radial clearance (MRC-LO Fit) |
| **C4** | ABMA #4 radial clearance (MRC-XL Fit) |
| **DE** | Endplay designation for duplexed bearings |
| **DL** | Light preload designation for duplexed bearings |
| **DM** | Medium preload designation for duplexed bearings |
| **DH** | Heavy preload designation for duplexed bearings |
| **DX** | Special preload designation for duplexed bearings |
| **EA** | Each, sold as half pair (example: 9218UDT-BRZEA) |
| **HT** | High temperature heat treat |
| **HYB#1** | Ceramic rolling elements and ABEC-1 tolerances |
| **M** | Machined brass cage for self-aligning ball bearing |
| **RB** | Texaco premium RB grease |
| **#3** | ABEC-3 tolerances |
| **#5** | ABEC-5 tolerances |
| **#7** | ABEC-7 tolerances |
| **EMQ** | Electric motor quality |
| **NYL** | Glass fiber reinforced polyamide |
| **PO** | Poly-oil treatment |
| **STL** | Steel cage |
| **TDC** | Thin dense chrome plated |
| **TN9** | Glass fiber reinforced polyamide cage |
| **T44** | MRC code #44 radial clearance |

# MRC customer service features

- MRC is always one 1-888-753-3477 phone call away—saving time in response to your customer.
- MRC fax number: 267-436-6022.
- Immediate attention is given to technical questions by our in-house engineering department, call 1-888-753-2000.
- MRC technical services experts are able to address bearing problems in the field and offer solutions.
- MRC provides bearing failure analysis in problem applications.
- Friendly, knowledgeable customer service people are able to take important action on your requests.
- Many servicing warehouses assure inventory accessibility in all parts of the country.

# Bearing specification tables

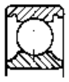
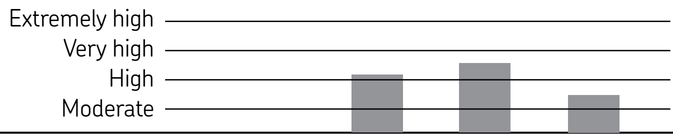
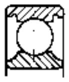
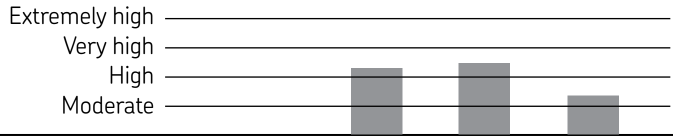
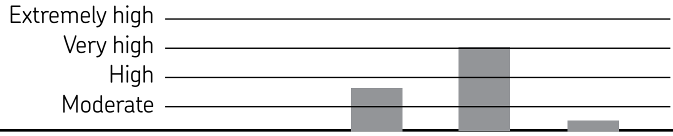
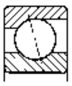
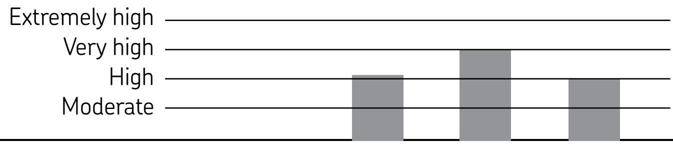
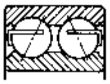
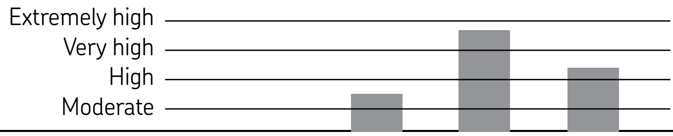
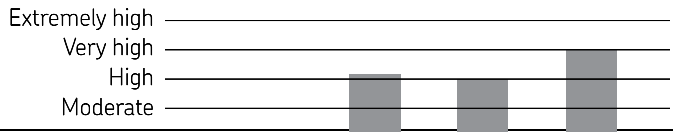
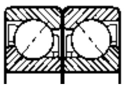
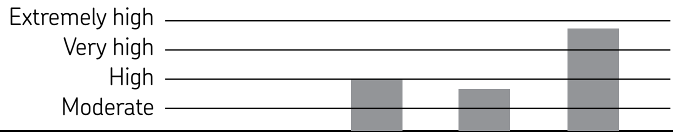
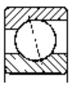
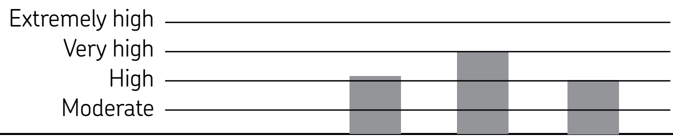
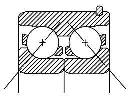
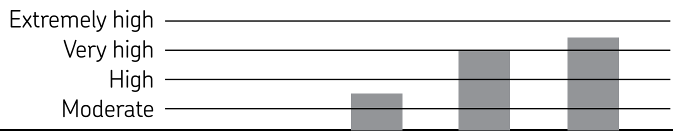
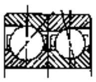
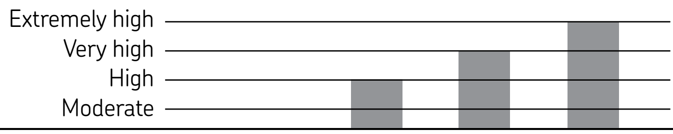
# Section 2-Bearing specification tables



## Table of contents

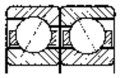
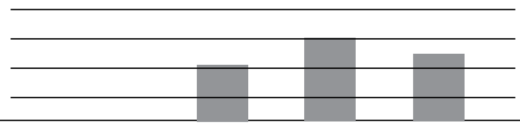
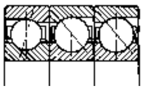
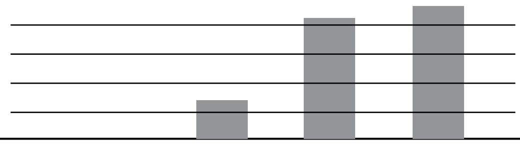
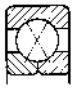
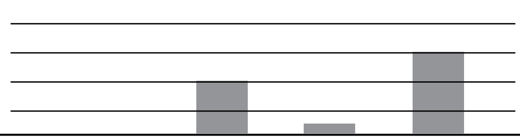
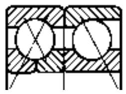
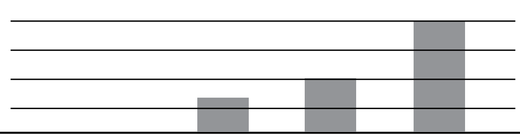
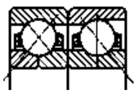
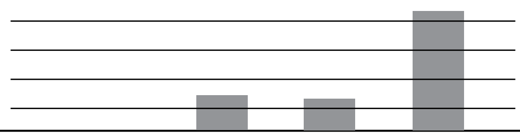
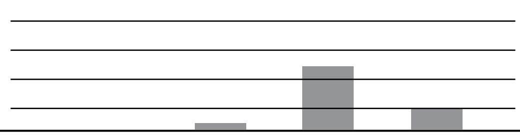
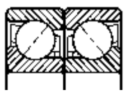
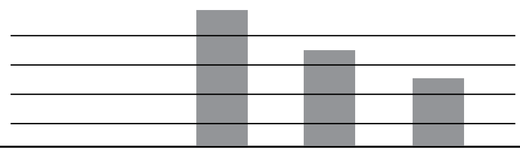
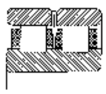
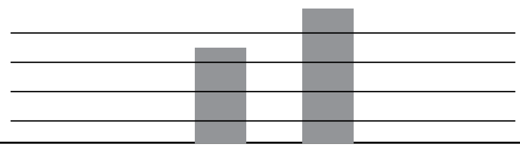
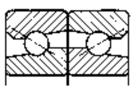
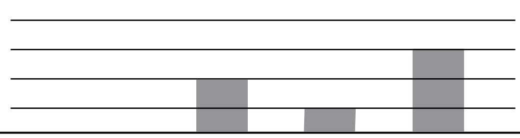
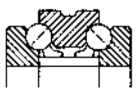
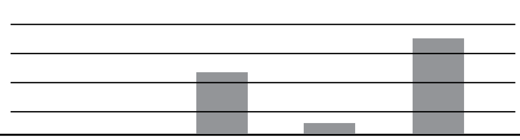
page

# Bearing types summary chart

| Bearing type | | Cage | Contact angle | Performance level / Characteristics (Speed, Radial capacity, Axial capacity) |
|---|---|---|---|---|
| Type "S" Conrad deep groove |  | Pressed steel | 0° |   |
| "R" inch series Conrad deep groove |  | Pressed steel | 0° |   |
| Type "M" maximum capacity filling notch |  | Pressed steel | 0° |   |
| Type "R" 15° angular contact |  | Pressed steel | 15° |   |
| 5000 series double-row "C" type Conrad, "M" type maximum capacity |  | Pressed steel | 30° |   |
| 7000 series 29° angular contact |  | Pressed steel | 29° |   |
| 7000P series 40° angular contact |  | Machined and pressed brass | 40° |   |
| "XLS" inch series angular contact |  | Bakelite | 15° |   |
| 5300UPG series split inner ring double-row |  | Machined brass | 40° |   |
| 8000 PumPac series angular contact assembly |  | Machined brass | 40° and 15° |   |

| Description |
|---|
| Ordinarily supplied with loose internal clearance. Outer and inner races have full shoulders. Has equal load-carrying capacity in either direction. Recommended for moderately heavy radial loads, thrust loads in either direction, or combination loads. |
| Ordinarily supplied with standard internal clearance. Has inch boundary dimensions. Outer and inner races have full shoulders. Has equal load-carrying capacity in either direction. Recommended for moderately heavy radial loads, thrust loads in either direction, or combination loads. |
| Ordinarily supplied with standard internal clearance. This type has a filling notch on one side of the inner and outer rings to insert a maximum ball complement. Can carry heavy radial load or combined radial and thrust load where the radial load predominates. Not recommended for pure thrust loads or combined loads where thrust load predominates. |
| Supplied with loose internal clearance for normal applications. Counterbored outer ring to assemble maximum ball complement. Outer ring is heated in order to assemble. Can carry heavy radial load, moderate thrust load in one direction only, or combined loads where thrust load is against the heavy shoulder on the outer ring. |
| C type ordinarily supplied with loose internal clearance. Has full shoulders and no filling notches. Has outwardly converging contact angles. C type will support heavy radial loads, and equally heavy thrust load in either direction, or heavy combined radial and thrust loads. M type ordinarily supplied with loose internal clearance. Has filling notches on one side only for inserting maximum ball complement. Has outwardly converging contact angles. M type has heavy radial capacity. Also has moderate thrust capacity in one direction and can take light thrust load in reversing direction. |
| Counterbored outer ring, non-separable type. Ordinarily available in single and paired variants. Paired variants typically supplied with line-to-line internal clearance. Other degrees of internal clearance/preload may be necessary for special conditions. Two-piece pressed steel cage for normal use or one-piece non-metallic or solid brass cage for high speed, high operating temperature, or severe vibration application. High thrust load in one direction, combined radial and thrust load where thrust load predominates. Should not be used for radial loads only. |
| Similar in design to the 7000 series bearing. Thrust capacity is 1.18 to 1.4 times that of the 7000 series, varies with individual sizes. Restricted to primarily thrust loads. Should not be used for radial loads only or combined radial and thrust loads where radial load predominates. |
| Counterbored outer ring, non-separable type. Similar to the type R angular contact except that it has inch dimensions. It also has a relatively light cross section for space constraints. Can carry heavy radial load, moderate thrust load in one direction only, or combined loads where thrust load is against the heavy shoulder on the outer ring. |
| Designed with two-piece inner ring and one-piece outer ring and snap-ring. Differs from the 5000C and M types because of its 40° contact angle and split inner ring. Also has a machined brass cage and reduced axial clearance. Can carry very heavy thrust loads in either direction or combined loads where the thrust load predominates. |
| Bearing assembly consists of a 40° and 15° bearing, ABEC-3 precision tolerances, reduced axial clearance, and machined brass cages. Can carry high thrust load in one direction and light reversing thrust load in the opposite direction. The lower contact angle of the back bearing helps prevent ball skidding during periods of no load. |

# Bearing types summary chart

| Bearing type | | Cage | Contact angle | Performance level | Characteristics: Speed / Radial capacity / Axial capacity |
|---|---|---|---|---|---|
| 8000BB PumPac series angular contact assembly |  | Machined brass | 15° and 15° | Extremely high<br>Very high<br>High<br>Moderate |  |
| 8000AAB PumPac series angular contact assembly |  | Machined brass | 40° and 40° and 15° | Extremely high<br>Very high<br>High<br>Moderate |  |
| 9000U series split inner ring angular contact |  | Machined brass | 29° or 40° | Extremely high<br>Very high<br>High<br>Moderate |  |
| 97000U2 series angular contact assembly |  | Machined brass | 29° | Extremely high<br>Very high<br>High<br>Moderate |  |
| 97000UP2 series angular contact assembly |  | Machined brass | 40° | Extremely high<br>Very high<br>High<br>Moderate |  |
| Marathon® series |  | Polyamide | 0° | Extremely high<br>Very high<br>High<br>Moderate |  |
| Type DS high precision angular contact |  | Phenolic | 15° or 25° | Extremely high<br>Very high<br>High<br>Moderate |  |
| Type NN3100 double-row cylindrical |  | Polyamide | 0° | Extremely high<br>Very high<br>High<br>Moderate |  |
| Type J ball screw support |  | Phenolic | 60° | Extremely high<br>Very high<br>High<br>Moderate |  |
| Type DT double direction angular contact |  | Polyamide or machined brass | 60° | Extremely high<br>Very high<br>High<br>Moderate |  |

**Description**

Consists of two 15° bearings as opposed to one 40° and one 15°, ABEC-3 precision tolerances, reduced axial clearance, and machined brass cages. Can carry predominantly radial load with intermittent thrust load in either direction. Very similar performance to the 7000R series, except that it is a back-to-back paired arrangement.

Can carry very high thrust loads in one direction and light reversing thrust load in the opposite direction. The pair of 40° "A" bearings in tandem provides very high thrust capacity in the primary direction, while the 15° "B" bearing handles any reversing thrust load.

Designed with solid one-piece outer ring and two-piece inner ring, maximum ball complement and one-piece machined brass cage. Can carry greater thrust in either direction than the type S. May be used where there is substantial radial load providing there is always sufficient thrust load present. Often paired with another angular contact ball bearing in an assembly.

Paired assembly of a 9000U and a 7000 angular contact bearing. Assembly comes with axial clearance as standard and provides the capacity of a triplex set in the boundary dimensions of a pair. Very heavy thrust load capacity because of tandem assembly of 9000U and 7000 bearing in one direction. 9000U supports reversing thrust load in the opposite direction.

Very similar to the 97000U2 series except that it has a 40° contact angle. Because of the higher contact angle, this assembly has the highest thrust carrying capacity for its given boundary dimensions.

Series of corrosion resistant housings and bearings used in heavy wash down and contaminated environments such as food, car wash, gypsum, etc. The unique double sealing arrangement makes Marathon units very effective at keeping out solid and liquid contamination. These units incorporate an insert bearing based on the type S Conrad bearing so they can handle moderate radial loads and light thrust loads in either direction. However, since they are set screwed to the shaft, the axial load carrying capacity is determined by the holding power of the set screws.

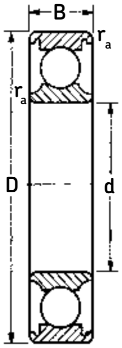
ABEC-7 tolerances for machine tool applications that require high speeds and precise running accuracies. Type DS are available in 15° and 25° contact angles. These bearings are normally used in paired arrangements. They function very similarly to the type R and 7000 series bearings except for the fact that they are much higher precision.

ABEC-7 tolerances for high speeds required by machine tool spindles. Very high radial stiffness because of its double-row roller design. Very high radial load carrying capacity. Zero axial load carrying capacity because of the shoulderless outer ring which allows the bearing to expand with shaft thermal growth.

ABEC-7 tolerances for high speed. Counterbored inner and outer ring construction. Very high axial stiffness because of the 60° contact angle and larger quantity of small balls. Usually used in paired, triplex, or quad sets in order to provide adequate stiffness and capacity for the given application conditions. Primarily designed for high thrust loads and very little radial load because of the 60° contact angle.

Type DT has a one-piece outer ring construction with a two-piece inner ring construction. Like the type J bearing, it has a 60° contact angle. It is also a paired assembly. Its large quantity of small balls also provides high axial stiffness as with the type J bearings. The type DT bearing can handle high thrust load in either direction and virtually zero radial load. It is usually paired with a radial type bearing in order to isolate it from any radial loading.

# Single-row deep groove ball bearings
# S-type

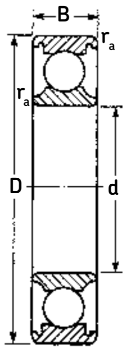



The MRC Conrad ball bearing is a single-row radial deep groove bearing with no filling notches. It can carry significant radial loads, and, because of the uninterrupted raceway grooves and the high degree of conformity between balls and raceways, it can carry substantial thrust loads in either direction, even at very high speeds. Single-row deep groove ball bearings are offered open or with single or double shields or seals, as well as with snap-rings in various combinations.

## Cage types and materials

This type of bearing is supplied with a pressed steel cage as standard; however, for special requirements, it can be supplied with a two-piece riveted machined cage of phenolic composition or bronze material.

# 30 series
# extra small size




F
One shield

Z
One seal

FF
Two shields

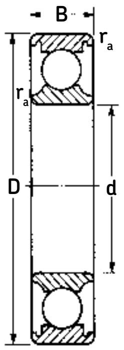
ZZ
Two seals

These single-row radial conrad-type bearings have 4 mm to 9 mm bores (approximately 5/32 in. to 3/8 in.), and are designed for very small shafts. They are suitable for high speed fractional horsepower motors and small turbines. MRC offers open, shielded, and sealed types. Some sizes are available in stainless steel. The 30 series is supplied with ABMA CO radial clearance unless otherwise specified.

| | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | Basic radial load rating | | | | Speed rating[2] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Dynamic | | Static | | Open and shielded | | Single and double sealed |
| MRC bearing number | d | | D | | B | | $r_a$ | | $ZD^2$ | | C[3] | | $C_0$ | | Grease | Oil | Grease |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm | rpm |
| **34** | 4 | **.1575** | 16 | **.6299** | 5 | **.1969** | .30 | **.012** | 45 | **.07** | 1 470 | **330** | 600 | **135** | 43 000 | 50 000 | 30 000 |
| **35** | 5 | **.1969** | 19 | **.7480** | 6 | **.2362** | .30 | **.012** | 96 | **.15** | 2 210 | **497** | 950 | **214** | 36 000 | 43 000 | 26 000 |
| **36** | 6 | **.2362** | 19 | **.7480** | 6 | **.2362** | .30 | **.012** | 96 | **.15** | 2 210 | **497** | 950 | **214** | 36 000 | 43 000 | 26 000 |
| **37** | 7 | **.2756** | 22 | **.8661** | 7 | **.2756** | .30 | **.012** | 110 | **.17** | 3 250 | **731** | 1 360 | **306** | 36 000 | 43 000 | 23 000 |
| **38** | 8 | **.3150** | 22 | **.8661** | 7 | **.2756** | .30 | **.012** | 110 | **.17** | 3 250 | **731** | 1 360 | **306** | 36 000 | 43 000 | 23 000 |
| **39** | 9 | **.3543** | 26 | **1.0236** | 8 | **.3150** | .64 | **.025** | 161 | **.25** | 4 620 | **1 040** | 1 960 | **441** | 28 000 | 34 000 | 20 000 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil. For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice.
For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at 33 1/3 rpm.

# R series
# small inch size




F
One shield

Z
One seal

FF
Two shields

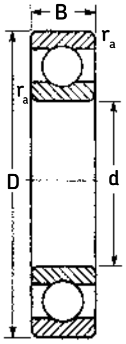
ZZ
Two seals

R series bearings are single-row radial conrad-type bearings that are available in inch sizes for shafts from 1/8 in. to 1 1/2 in. diameter. Open, shielded, and sealed types are available, and many sizes are available in stainless steel. The R series is supplied with ABMA C0 radial clearance unless otherwise specified.

| MRC bearing number | Bore | | Outside diameter | | Width | | | | Fillet radius[1] | | | | Basic radial load rating | | | | Speed rating[2] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Shielded or sealed | | | | | | Dynamic | | Static | | Open and shielded | | Single and double sealed |
| | d | | D | | B | | | | $r_a$ | | ZD² | | C[3] | | $C_0$ | | Grease | Oil | Grease |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm | rpm |
| **R2** | 3.2 | **.1250** | 9.5 | **.3750** | 4.0 | **.1562** | 4.0 | **.1562** | .30 | **.012** | 19 | **.03** | 312 | **70** | 120 | **27** | 75 000 | 91 000 | 52 000 |
| **R2A** | 3.2 | **.1250** | 12.7 | **.5000** | 4.4 | **.1719** | 4.4 | **.1719** | .30 | **.012** | 19 | **.03** | 312 | **70** | 120 | **27** | 75 000 | 91 000 | 52 000 |
| **R3** | 4.8 | **.1875** | 12.7 | **.5000** | 4.0 | **.1562** | 5.0 | **.1960** | .30 | **.012** | 39 | **.06** | 956 | **215** | 490 | **110** | 57 000 | 69 000 | 40 000 |
| **R4** | 6.4 | **.2500** | 15.9 | **.6250** | 5.0 | **.1960** | 5.0 | **.1960** | .30 | **.012** | 45 | **.07** | 1 480 | **332** | 620 | **139** | 44 000 | 54 000 | 31 000 |
| **R4A** | 6.4 | **.2500** | 19.1 | **.7500** | 5.6 | **.2188** | 7.1 | **.2812** | .41 | **.016** | 71 | **.11** | 2 810 | **632** | 1 160 | **261** | 39 000 | 48 000 | 27 000 |
| **R6** | 9.5 | **.3750** | 22.2 | **.8750** | 5.6 | **.2188** | 7.1 | **.2812** | .41 | **.016** | 110 | **.17** | 3 320 | **746** | 1 340 | **301** | 31 000 | 38 000 | 21 000 |
| **R8** | 12.7 | **.5000** | 28.6 | **1.1250** | 6.4 | **.2500** | 7.9 | **.3125** | .41 | **.016** | 181 | **.28** | 5 070 | **1 140** | 2 400 | **540** | 24 000 | 29 000 | 16 000 |
| **R10** | 15.9 | **.6250** | 34.9 | **1.3750** | 7.1 | **.2812** | 8.7 | **.3438** | .79 | **.031** | 226 | **.35** | 6 050 | **1 360** | 3 250 | **731** | 18 000 | 22 000 | 13 000 |
| **R12** | 19.1 | **.7500** | 41.3 | **1.6250** | 7.9 | **.3125** | 11.1 | **.4375** | .79 | **.031** | 361 | **.56** | 9 360 | **2 100** | 5 100 | **1 150** | 16 000 | 19 000 | 11 000 |
| **R14** | 22.2 | **.8750** | 47.6 | **1.8750** | 9.5 | **.3750** | 12.7 | **.5000** | .79 | **.031** | 406 | **.63** | 10 100 | **2 270** | 5 850 | **1 320** | 14 000 | 17 000 | 9 600 |
| **R16** | 25.4 | **1.0000** | 50.8 | **2.0000** | 9.5 | **.3750** | 12.7 | **.5000** | .79 | **.031** | 406 | **.63** | 10 100 | **2 270** | 6 000 | **1 350** | 13 000 | 16 000 | 9 000 |
| **R18** | 28.6 | **1.1250** | 54.0 | **2.1250** | 9.5 | **.3750** | 12.7 | **.5000** | .79 | **.031** | 510 | **.79** | 12 500 | **2 810** | 7 500 | **1 690** | 11 000 | 14 000 | 7 900 |
| **R20** | 31.8 | **1.2500** | 57.2 | **2.2500** | 9.5 | **.3750** | 12.7 | **.5000** | .79 | **.031** | 613 | **.95** | 14 000 | **3 150** | 9 300 | **2 090** | 11 000 | 13 000 | 7 500 |
| **R24** | 38.1 | **1.5000** | 66.7 | **2.6250** | 11.1 | **.4375** | 14.3 | **.5625** | .79 | **.031** | 755 | **1.17** | 16 800 | **3 780** | 11 800 | **2 650** | 9 000 | 11 000 | 6 200 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil.
For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice.
For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at 33 1/3 rpm.

# 1800S
## thin section series





SZ
One seal


SZZ
Two seals


SFP
One shield

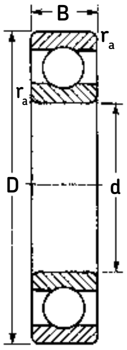

SFFP
Two shields

1800S series bearings are single-row radial conrad-type bearings that can accommodate light radial loads, two-directional thrust loads, or a combination of both. They are designed for applications where space or weight is very limited. The 1800S series is supplied with an ABMA C0 radial internal clearance unless otherwise specified.

| MRC bearing number | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | Basic radial load rating | | | | Speed rating[2] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Dynamic | | Static | | Open and shielded | | Single and double sealed |
| | d | | D | | B | | $r_a$ | | $ZD^2$ | | $C^{3)}$ | | $C_0$ | | Grease | Oil | Grease |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm | rpm |
| **1800S** | 10 | **.3937** | 19 | **.7480** | 5 | **.1969** | .30 | **.012** | 62 | **.10** | 1 820 | **410** | 930 | **209** | 36 000 | 43 000 | 20 000 |
| **1801S** | 12 | **.4724** | 21 | **.8268** | 5 | **.1969** | .30 | **.012** | 68 | **.11** | 1 900 | **427** | 1 040 | **234** | 32 000 | 38 000 | 19 000 |
| **1802S** | 15 | **.5906** | 24 | **.9449** | 5 | **.1969** | .30 | **.012** | 80 | **.12** | 2 080 | **468** | 1 250 | **281** | 28 000 | 34 000 | 17 000 |
| **1803S** | 17 | **.6693** | 26 | **1.0236** | 5 | **.1969** | .30 | **.012** | 91 | **.14** | 2 250 | **505** | 1 460 | **328** | 24 000 | 30 000 | 16 000 |
| **1804S** | 20 | **.7874** | 32 | **1.2598** | 7 | **.2756** | .30 | **.012** | 141 | **.22** | 3 510 | **790** | 2 240 | **504** | 19 000 | 24 000 | 13 000 |
| **1805S** | 25 | **.9843** | 37 | **1.4567** | 7 | **.2756** | .30 | **.012** | 184 | **.28** | 4 360 | **980** | 2 900 | **652** | 17 000 | 20 000 | 11 000 |
| **1806S** | 30 | **1.1811** | 42 | **1.6535** | 7 | **.2756** | .30 | **.012** | 208 | **.32** | 4 490 | **1 010** | 3 400 | **764** | 15 000 | 18 000 | 9 500 |
| **1807S** | 35 | **1.3780** | 47 | **1.8504** | 7 | **.2756** | .30 | **.012** | 233 | **.36** | 4 750 | **1 070** | 3 800 | **854** | 13 000 | 16 000 | 8 000 |
| **1808S** | 40 | **1.5748** | 52 | **2.0472** | 7 | **.2756** | .30 | **.012** | 257 | **.40** | 4 940 | **1 110** | 4 150 | **933** | 11 000 | 14 000 | 7 500 |
| **1809S** | 45 | **1.7717** | 58 | **2.2835** | 7 | **.2756** | .30 | **.012** | 315 | **.49** | 6 050 | **1 360** | 5 100 | **1 150** | 9 500 | 12 000 | 6 700 |
| **1810S** | 50 | **1.9685** | 65 | **2.5591** | 7 | **.2756** | .30 | **.012** | 347 | **.54** | 6 240 | **1 400** | 5 500 | **1 240** | 9 000 | 11 000 | 6 000 |
| **1811S** | 55 | **2.1654** | 72 | **2.8346** | 9 | **.3543** | .30 | **.012** | 454 | **.70** | 8 320 | **1 870** | 7 350 | **1 650** | 8 500 | 10 000 | 5 180 |
| **1812S** | 60 | **2.3622** | 78 | **3.0709** | 10 | **.3937** | .30 | **.012** | 499 | **.77** | 8 710 | **1 960** | 8 000 | **1 800** | 7 500 | 9 000 | 4 800 |
| **1813S** | 65 | **2.5591** | 85 | **3.3465** | 10 | **.3937** | .60 | **.025** | 679 | **1.05** | 11 700 | **2 630** | 11 000 | **2 470** | 7 000 | 8 500 | 4 500 |
| **1814S** | 70 | **2.7559** | 90 | **3.5433** | 10 | **.3937** | .60 | **.025** | 741 | **1.15** | 12 100 | **2 720** | 11 800 | **2 650** | 6 700 | 8 000 | 4 300 |
| **1815S** | 75 | **2.9528** | 95 | **3.7402** | 10 | **.3937** | .60 | **.025** | 803 | **1.24** | 12 500 | **2 810** | 12 900 | **2 900** | 6 300 | 7 500 | 4 000 |
| **1816S** | 80 | **3.1496** | 100 | **3.9370** | 10 | **.3937** | .60 | **.025** | 864 | **1.32** | 13 000 | **2 920** | 13 700 | **3 080** | 6 000 | 7 000 | 3 600 |
| **1817S** | 85 | **3.3465** | 110 | **4.3307** | 13 | **.5118** | 1.0 | **.040** | 1 230 | **1.90** | 19 500 | **4 380** | 19 600 | **4 410** | 5 300 | 6 300 | 3 400 |
| **1818S** | 90 | **3.5433** | 115 | **4.5276** | 13 | **.5118** | 1.0 | **.040** | 1 280 | **1.98** | 19 500 | **4 380** | 20 400 | **4 590** | 5 300 | 6 300 | 3 200 |
| **1819S** | 95 | **3.7402** | 120 | **4.7244** | 13 | **.5118** | 1.0 | **.040** | 1 330 | **2.06** | 19 900 | **4 470** | 21 200 | **4 770** | 5 000 | 6 000 | 3 000 |
| **1820S** | 100 | **3.9370** | 125 | **4.9213** | 13 | **.5118** | 1.0 | **.040** | 1 380 | **2.14** | 20 300 | **4 560** | 22 000 | **4 950** | 4 800 | 5 600 | 3 000 |
| **1821S** | 105 | **4.1339** | 130 | **5.1181** | 13 | **.5118** | 1.0 | **.040** | 1 480 | **2.29** | 20 800 | **4 680** | 23 600 | **5 310** | 4 500 | 5 300 | 2 800 |
| **1822S** | 110 | **4.3307** | 140 | **5.5118** | 16 | **.6299** | 1.0 | **.040** | 1 910 | **2.95** | 28 100 | **6 320** | 30 500 | **6 860** | 4 300 | 5 000 | 2 600 |
| **1824S**[4] | 120 | **4.7244** | 150 | **5.9055** | 16 | **.6299** | 1.0 | **.040** | 2 060 | **3.19** | 29 100 | **6 540** | 32 500 | **7 310** | 3 800 | 4 500 | 2 400 |
| **1826S**[4] | 130 | **5.1181** | 165 | **6.4961** | 18 | **.7087** | 1.0 | **.040** | 2 660 | **4.13** | 37 700 | **8 480** | 43 000 | **9 670** | 3 600 | 4 300 | 2 200 |
| **1828S**[4] | 140 | **5.5118** | 175 | **6.8898** | 18 | **.7087** | 1.0 | **.040** | 2 870 | **4.46** | 39 000 | **8 770** | 46 500 | **10 500** | 3 400 | 4 000 | 2 000 |
| **1830S**[4] | 150 | **5.9055** | 190 | **7.4803** | 20 | **.7874** | 1.0 | **.040** | 3 540 | **5.49** | 48 800 | **11 000** | 57 000 | **12 800** | 3 000 | 3 600 | — |

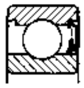
1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel cage for 1800S through 1830S. All others for outer land guided machined bronze.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.
4) Typically non-stocked sizes, please check availability before designing into equipment.

# 1900S
## extremely light series




**SZ**
**One seal**

**SZZ**
**Two seals**



**SFP**
**One shield**

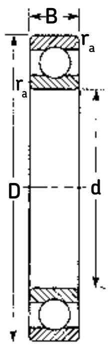
**SFFP**
**Two shields**

1900S series bearings are single-row radial conrad-type bearings that can accommodate light radial loads, two-directional thrust loads, or a combination of both. They are designed for applications where a lack of space or limitations on weight require a bearing with a thinner section than 100KS series bearings. Some sizes are available with shields or seals.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | Fillet radius[1] $r_a$ in. | $ZD^2$ mm | $ZD^2$ in. | Basic radial load rating Dynamic C[3] N | Dynamic C[3] lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[2] Open and shielded Grease rpm | Open and shielded Oil rpm | Single and double sealed Grease rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1900S** | 10 | **.3937** | 22 | **.8661** | 6 | **.2362** | .30 | **.012** | 840 | **.13** | 2 510 | **565** | 1 120 | **252** | 34 000 | 40 000 | 19 000 |
| **1901S** | 12 | **.4724** | 24 | **.9449** | 6 | **.2362** | .30 | **.012** | 103 | **.16** | 2 910 | **655** | 1 500 | **337** | 30 000 | 36 000 | 18 000 |
| **1902S** | 15 | **.5906** | 28 | **1.1024** | 7 | **.2756** | .30 | **.012** | 142 | **.22** | 4 030 | **906** | 2 040 | **459** | 24 000 | 30 000 | 16 000 |
| **1903S** | 17 | **.6693** | 30 | **1.1811** | 7 | **.2756** | .30 | **.012** | 155 | **.24** | 4 360 | **980** | 2 320 | **522** | 22 000 | 28 000 | 14 000 |
| **1904S** | 20 | **.7874** | 37 | **1.4567** | 9 | **.3543** | .30 | **.012** | 252 | **.39** | 6 370 | **1 430** | 3 650 | **821** | 18 000 | 22 000 | 12 000 |
| **1905S** | 25 | **.9843** | 42 | **1.6535** | 9 | **.3543** | .30 | **.012** | 271 | **.42** | 6 630 | **1 490** | 4 150 | **933** | 16 000 | 19 000 | 10 000 |
| **1906S** | 30 | **1.1811** | 47 | **1.8504** | 9 | **.3543** | .30 | **.012** | 317 | **.49** | 7 280 | **1 640** | 5 000 | **1 120** | 14 000 | 17 000 | 8 500 |
| **1907S** | 35 | **1.3780** | 55 | **2.1654** | 10 | **.3937** | .64 | **.025** | 432 | **.67** | 9 560 | **2 150** | 6 800 | **1 530** | 11 000 | 14 000 | 7 500 |
| **1908S** | 40 | **1.5748** | 62 | **2.4409** | 12 | **.4724** | .64 | **.025** | 637 | **.99** | 13 800 | **3 100** | 10 000 | **2 250** | 10 000 | 13 000 | 6 700 |
| **1909S** | 45 | **1.7717** | 68 | **2.6772** | 12 | **.4724** | .64 | **.025** | 683 | **1.06** | 14 000 | **3 150** | 10 800 | **2 430** | 9 000 | 11 000 | 6 000 |
| **1910S** | 50 | **1.9685** | 72 | **2.8346** | 12 | **.4724** | .64 | **.025** | 728 | **1.13** | 14 600 | **3 280** | 11 800 | **2 650** | 8 500 | 10 000 | 5 600 |
| **1911S** | 55 | **2.1654** | 80 | **3.1496** | 13 | **.5118** | 1.00 | **.040** | 864 | **1.34** | 16 500 | **3 710** | 14 000 | **3 150** | 8 000 | 9 500 | 5 000 |
| **1912S** | 60 | **2.3622** | 85 | **3.3465** | 13 | **.5118** | 1.00 | **.040** | 864 | **1.34** | 16 500 | **3 710** | 14 300 | **3 210** | 7 500 | 9 000 | 4 500 |
| **1913S** | 65 | **2.5591** | 90 | **3.5433** | 13 | **.5118** | 1.00 | **.040** | 968 | **1.50** | 17 400 | **3 910** | 16 000 | **3 600** | 6 700 | 8 000 | 4 300 |
| **1914S** | 70 | **2.7559** | 100 | **3.9370** | 16 | **.6299** | 1.00 | **.040** | 1 300 | **2.01** | 23 800 | **5 350** | 21 200 | **4 770** | 6 300 | 7 500 | 4 000 |
| **1915S** | 75 | **2.9528** | 105 | **4.1339** | 16 | **.6299** | 1.00 | **.040** | 1 370 | **2.13** | 24 200 | **5 440** | 22 400 | **5 040** | 6 000 | 7 000 | 3 600 |
| **1916S** | 80 | **3.1496** | 110 | **4.3307** | 16 | **.6299** | 1.00 | **.040** | 1 450 | **2.25** | 25 100 | **5 640** | 24 000 | **5 400** | 5 600 | 6 700 | 3 400 |
| **1917S** | 85 | **3.3465** | 120 | **4.7244** | 18 | **.7087** | 1.00 | **.040** | 1 810 | **2.81** | 31 900 | **7 170** | 30 000 | **6 740** | 5 300 | 6 300 | 3 200 |
| **1918S** | 90 | **3.5433** | 125 | **4.9213** | 18 | **.7087** | 1.00 | **.040** | 1 920 | **2.97** | 32 500 | **7 310** | 31 500 | **7 080** | 5 000 | 6 000 | 3 100 |
| **1919S** | 95 | **3.7402** | 130 | **5.1181** | 18 | **.7087** | 1.00 | **.040** | 2 025 | **3.14** | 33 800 | **7 600** | 33 500 | **7 530** | 4 800 | 5 600 | 2 900 |
| **1920S** | 100 | **3.9370** | 140 | **5.5118** | 20 | **.7874** | 1.00 | **.040** | 2 550 | **3.96** | 42 300 | **9 510** | 41 500 | **9 330** | 4 500 | 5 300 | 2 700 |
| **1921S** | 105 | **4.1339** | 145 | **5.7087** | 20 | **.7874** | 1.00 | **.040** | 2 770 | **4.18** | 44 200 | **9 940** | 44 000 | **9 890** | 4 300 | 5 000 | 2 600 |
| **1922S** | 110 | **4.3307** | 150 | **5.9055** | 20 | **.7874** | 1.00 | **.040** | 2 770 | **4.18** | 43 600 | **9 800** | 44 000 | **9 890** | 4 000 | 4 800 | 2 500 |
| **1924S** | 120 | **4.7244** | 165 | **6.4961** | 22 | **.8661** | 1.00 | **.040** | 3 460 | **5.36** | 55 300 | **12 400** | 57 000 | **12 800** | 3 600 | 4 300 | 2 300 |
| **1926S**[4] | 130 | **5.1181** | 180 | **7.0866** | 24 | **.9449** | 1.50 | **.060** | 4 100 | **6.35** | 65 000 | **14 600** | 67 000 | **15 100** | 3 400 | 4 000 | 2 100 |
| **1928S**[4] | 140 | **5.5118** | 190 | **7.4803** | 24 | **.9449** | 1.50 | **.060** | 4 320 | **6.70** | 66 300 | **14 900** | 71 000 | **16 000** | 3 200 | 3 800 | 2 000 |
| **1930S**[4] | 150 | **5.9055** | 210 | **8.2677** | 28 | **1.1024** | 2.00 | **.080** | 5 670 | **8.78** | 88 400 | **19 900** | 93 000 | **20 900** | 2 800 | 3 400 | 1 800 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil. For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.
4) Typically non-stocked sizes, please check availability before designing into equipment.

# 100S
## narrow-type light series




The 100S narrow-type light series is made up of single-row radial conrad-type bearings with bores ranging from 10 mm to 95 mm.

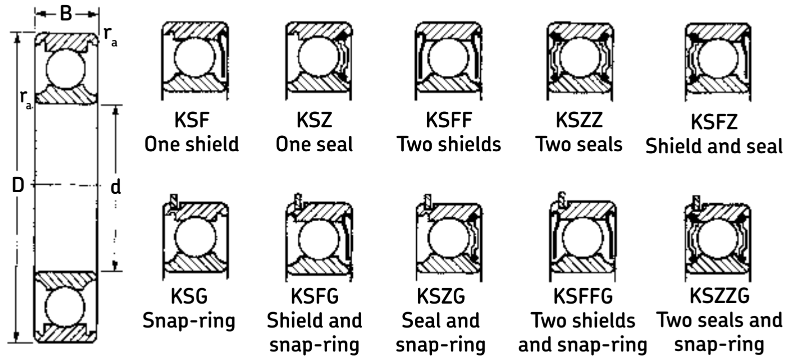
Note: This series is obsoleted but is still manufactured in a few sizes for replacement parts. Please check availability before designing into equipment.

| | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | Basic radial load rating | | | | Speed rating[2] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Dynamic | | Static | | Open and shielded | |
| MRC bearing number | d | | D | | B | | $r_a$ | | $ZD^2$ | | $C$[3] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **102S** | 10 | **.3937** | 32 | **1.2598** | 9 | **.3543** | .51 | **.02** | 181 | **.28** | 5 200 | **1 170** | 2 450 | **551** | 24 000 | 29 000 |
| **103S** | 15 | **.5906** | 37 | **1.4567** | 9 | **.3543** | .51 | **.02** | 284 | **.44** | 7 800 | **1 750** | 3 550 | **798** | 21 000 | 26 000 |
| **104S** | 20 | **.7874** | 42 | **1.6535** | 9 | **.3543** | .51 | **.02** | 361 | **.56** | 9 360 | **2 100** | 5 100 | **1 150** | 17 000 | 21 000 |
| **105S** | 25 | **.9843** | 52 | **2.0472** | 9 | **.3543** | 1.00 | **.04** | 458 | **.71** | 12 100 | **2 710** | 6 700 | **1 510** | 14 000 | 17 000 |
| **106S** | 30 | **1.1811** | 62 | **2.4409** | 10 | **.3937** | 1.00 | **.04** | 632 | **.98** | 15 600 | **3 500** | 9 300 | **2 090** | 11 000 | 14 000 |
| **107S** | 35 | **1.3780** | 70 | **2.7559** | 10 | **.3937** | 1.00 | **.04** | 755 | **1.17** | 16 800 | **3 780** | 11 600 | **2 610** | 10 000 | 12 000 |
| **108S** | 40 | **1.5748** | 80 | **3.1496** | 11 | **.4331** | 1.00 | **.04** | 819 | **1.27** | 18 200 | **4 100** | 12 900 | **2 900** | 9 000 | 11 000 |
| **109S** | 45 | **1.7717** | 85 | **3.3465** | 11 | **.4331** | 1.00 | **.04** | 1 010 | **1.56** | 19 800 | **4 450** | 16 300 | **3 670** | 8 000 | 9 700 |
| **110S** | 50 | **1.9685** | 90 | **3.5433** | 11 | **.4331** | 1.00 | **.04** | 1 010 | **1.56** | 19 900 | **4 470** | 16 600 | **3 730** | 7 400 | 9 000 |
| **111S** | 55 | **2.1654** | 100 | **3.9370** | 12 | **.4724** | 1.00 | **.04** | 1 220 | **1.89** | 23 400 | **5 260** | 20 000 | **4 500** | 6 800 | 8 300 |
| **112S** | 60 | **2.3622** | 105 | **4.1339** | 12 | **.4724** | 1.00 | **.04** | 1 450 | **2.25** | 27 000 | **6 080** | 23 600 | **5 300** | 6 100 | 7 400 |
| **113S** | 65 | **2.5591** | 115 | **4.5276** | 14 | **.5512** | 1.00 | **.04** | 1 450 | **2.25** | 27 000 | **6 080** | 23 600 | **5 300** | 6 100 | 7 400 |
| **114S** | 70 | **2.7559** | 120 | **4.7244** | 14 | **.5512** | 1.00 | **.04** | 1 700 | **2.64** | 31 200 | **7 010** | 28 000 | **6 300** | 5 400 | 6 600 |
| **115S** | 75 | **2.9528** | 130 | **5.1181** | 16 | **.6299** | 1.50 | **.06** | 2 260 | **3.50** | 42 300 | **9 520** | 36 000 | **8 090** | 5 100 | 6 200 |
| **116S** | 80 | **3.1496** | 135 | **5.3150** | 16 | **.6299** | 1.50 | **.06** | 2 420 | **3.75** | 44 200 | **9 940** | 39 000 | **8 770** | 4 800 | 5 900 |
| **117S** | 85 | **3.3465** | 145 | **5.7087** | 18 | **.7087** | 1.50 | **.06** | 2 850 | **4.42** | 52 700 | **11 800** | 45 500 | **10 200** | 4 500 | 5 500 |
| **118S** | 90 | **3.5433** | 150 | **5.9055** | 18 | **.7087** | 1.50 | **.06** | 2 850 | **4.42** | 52 700 | **11 800** | 46 500 | **10 500** | 4 300 | 5 200 |
| **119S** | 95 | **3.7402** | 160 | **6.2992** | 20 | **.7874** | 1.50 | **.06** | 3 530 | **5.47** | 63 700 | **14 300** | 57 000 | **12 800** | 4 000 | 4 900 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil.
For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice.
For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 100KS extra light series

(see pg. 52 for hybrid series)



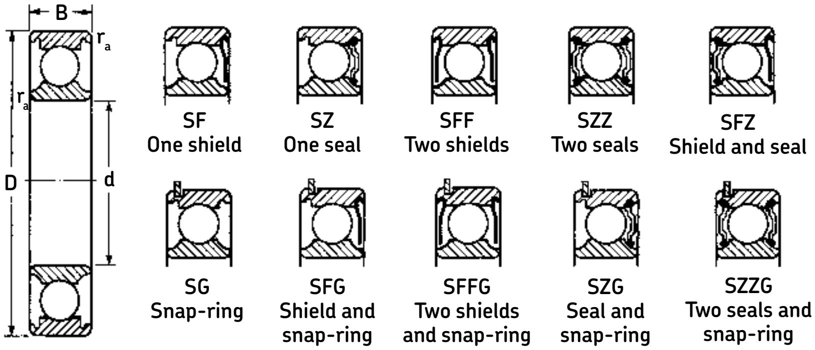

The 100KS extra light series consists of single-row radial conrad-type bearings made with bores from 10 mm to 320 mm for light to moderate radial loads, two-directional thrust loads, or a combination of both, where space is somewhat limited. This series is available in plain, shielded, or sealed types, as well as with snap-rings.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | Fillet radius[1] $r_a$ in. | $ZD^2$ mm | $ZD^2$ in. | Basic radial load rating: Dynamic C[3] N | Dynamic C[3] lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[2]: Open and shielded Grease rpm | Open and shielded Oil rpm | Single and double sealed Grease rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100KS | 10 | **.3937** | 26 | **1.0236** | 8 | **.3150** | .30 | **.012** | 181 | **.28** | 4 620 | **1 040** | 1 960 | **440** | 30 000 | 36 000 | 19 000 |
| 101KS | 12 | **.4724** | 28 | **1.1024** | 8 | **.3150** | .30 | **.012** | 181 | **.28** | 5 070 | **1 140** | 2 360 | **530** | 26 000 | 32 000 | 17 000 |
| 102KS | 15 | **.5906** | 32 | **1.2598** | 9 | **.3543** | .30 | **.012** | 206 | **.32** | 5 590 | **1 260** | 2 850 | **640** | 22 000 | 28 000 | 14 000 |
| 103KS | 17 | **.6693** | 35 | **1.3780** | 10 | **.3937** | .30 | **.012** | 226 | **.35** | 6 050 | **1 360** | 3 250 | **730** | 19 000 | 24 000 | 13 000 |
| 104KS | 20 | **.7874** | 42 | **1.6535** | 12 | **.4724** | .64 | **.025** | 361 | **.56** | 9 360 | **2 100** | 5 000 | **1 120** | 17 000 | 20 000 | 11 000 |
| 105KS | 25 | **.9843** | 47 | **1.8504** | 12 | **.4724** | .64 | **.025** | 458 | **.71** | 11 200 | **2 520** | 6 550 | **1 470** | 15 000 | 18 000 | 9 500 |
| 106KS | 30 | **1.1811** | 55 | **2.1654** | 13 | **.5118** | 1.00 | **.040** | 561 | **.87** | 13 300 | **2 990** | 8 300 | **1 870** | 12 000 | 15 000 | 8 000 |
| 107KS | 35 | **1.3780** | 62 | **2.4409** | 14 | **.5512** | 1.00 | **.040** | 691 | **1.07** | 15 800 | **3 570** | 10 200 | **2 290** | 10 000 | 13 000 | 7 000 |
| 108KS | 40 | **1.5748** | 68 | **2.6772** | 15 | **.5906** | 1.00 | **.040** | 909 | **1.41** | 20 800 | **4 680** | 11 600 | **2 610** | 9 500 | 12 000 | 6 300 |
| 109KS | 45 | **1.7717** | 75 | **2.9528** | 16 | **.6299** | 1.00 | **.040** | 1 090 | **1.69** | 23 400 | **5 270** | 16 600 | **3 730** | 9 000 | 11 000 | 5 600 |
| 110KS | 50 | **1.9685** | 80 | **3.1496** | 16 | **.6299** | 1.00 | **.040** | 1 180 | **1.83** | 24 700 | **5 560** | 18 000 | **4 050** | 8 500 | 10 000 | 5 000 |
| 111KS | 55 | **2.1654** | 90 | **3.5433** | 18 | **.7087** | 1.00 | **.040** | 1 390 | **2.16** | 28 100 | **6 320** | 21 600 | **4 880** | 7 500 | 9 000 | 4 500 |
| 112KS | 60 | **2.3622** | 95 | **3.7402** | 18 | **.7087** | 1.00 | **.040** | 1 610 | **2.49** | 32 500 | **7 310** | 25 000 | **5 620** | 6 700 | 8 000 | 4 300 |
| 113KS | 65 | **2.5591** | 100 | **3.9370** | 18 | **.7087** | 1.00 | **.040** | 1 730 | **2.68** | 33 800 | **7 600** | 27 000 | **6 070** | 6 300 | 7 500 | 4 000 |
| 114KS | 70 | **2.7559** | 110 | **4.3307** | 20 | **.7874** | 1.00 | **.040** | 2 100 | **3.25** | 41 000 | **9 220** | 32 500 | **7 310** | 6 000 | 7 000 | 3 600 |
| 115KS | 75 | **2.9528** | 115 | **4.5276** | 20 | **.7874** | 1.00 | **.040** | 2 260 | **3.50** | 42 300 | **9 510** | 35 500 | **7 970** | 5 600 | 6 700 | 3 400 |
| 116KS | 80 | **3.1496** | 125 | **4.9213** | 22 | **.8661** | 1.00 | **.040** | 2 650 | **4.11** | 50 700 | **11 400** | 41 500 | **9 330** | 5 300 | 6 300 | 3 200 |
| 117KS | 85 | **3.3465** | 130 | **5.1181** | 22 | **.8661** | 1.00 | **.040** | 2 860 | **4.43** | 52 700 | **11 800** | 45 000 | **10 100** | 5 000 | 6 000 | 3 000 |
| 118KS | 90 | **3.5433** | 140 | **5.5118** | 24 | **.9449** | 1.50 | **.060** | 3 280 | **5.08** | 61 800 | **13 900** | 51 000 | **11 500** | 4 800 | 5 600 | 2 800 |
| 119KS | 95 | **3.7402** | 145 | **5.7087** | 24 | **.9449** | 1.50 | **.060** | 3 530 | **5.47** | 63 700 | **14 300** | 54 000 | **12 100** | 4 500 | 5 300 | 2 800 |
| 120KS | 100 | **3.9370** | 150 | **5.9055** | 24 | **.9449** | 1.50 | **.060** | 3 530 | **5.47** | 63 700 | **14 300** | 54 000 | **12 100** | 4 300 | 5 000 | 2 600 |
| 121KS | 105 | **4.1339** | 160 | **6.2992** | 26 | **1.0236** | 2.00 | **.080** | 4 330 | **6.72** | 79 300 | **17 800** | 65 500 | **14 700** | 4 000 | 4 800 | 2 400 |
| 122KS | 110 | **4.3307** | 170 | **6.6929** | 28 | **1.1024** | 2.00 | **.080** | 4 660 | **7.23** | 81 800 | **18 400** | 73 500 | **16 500** | 3 800 | 4 500 | 2 400 |
| 124KS | 120 | **4.7244** | 180 | **7.0866** | 28 | **1.1024** | 2.00 | **.080** | 5 000 | **7.75** | 85 200 | **19 100** | 80 000 | **18 000** | 3 400 | 4 000 | 2 200 |
| 126KS | 130 | **5.1181** | 200 | **7.8740** | 33 | **1.2992** | 2.00 | **.080** | 5 960 | **9.24** | 106 000 | **23 800** | 100 000 | **22 500** | 3 200 | 3 800 | 2 000 |
| 128KS[4] | 140 | **5.5118** | 210 | **8.2677** | 33 | **1.2992** | 2.00 | **.080** | 6 900 | **10.70** | 111 000 | **25 000** | 108 000 | **24 300** | 3 000 | 3 600 | 1 800 |
| 130KS[4] | 150 | **5.9055** | 225 | **8.8583** | 35 | **1.3780** | 2.00 | **.080** | 8 385 | **13.00** | 125 000 | **28 100** | 125 000 | **28 100** | 2 600 | 3 200 | 1 700 |
| 132KS[4] | 160 | **6.2992** | 240 | **9.4488** | 38 | **1.4961** | 2.00 | **.080** | 9 030 | **14.00** | 143 000 | **32 100** | 143 000 | **32 100** | 2 400 | 3 000 | 1 600 |
| 134KS[4] | 170 | **6.6929** | 260 | **10.2362** | 42 | **1.6535** | 2.00 | **.080** | 11 800 | **18.30** | 168 000 | **37 800** | 173 000 | **38 900** | 2 200 | 2 800 | 1 500 |
| 136KS[4] | 180 | **7.0866** | 280 | **11.0236** | 46 | **1.8110** | 2.00 | **.080** | 11 400 | **17.70** | 190 000 | **42 700** | 200 000 | **45 000** | 2 000 | 2 600 | 1 400 |
| 138KS[4] | 190 | **7.4803** | 290 | **11.4173** | 46 | **1.8110** | 2.00 | **.080** | 13 400 | **20.80** | 195 000 | **43 800** | 216 000 | **48 600** | 2 000 | 2 600 | 1 400 |
| 140KS[4] | 200 | **7.8740** | 310 | **12.2047** | 51 | **2.0079** | 2.00 | **.080** | 15 900 | **24.60** | 216 000 | **48 600** | 245 000 | **55 100** | 1 900 | 2 400 | 1 300 |
| 144KS[4] | 220 | **8.6614** | 340 | **13.3868** | 56 | **2.2047** | 2.50 | **.100** | 18 600 | **28.90** | 247 000 | **55 500** | 290 000 | **65 200** | 1 800 | 2 200 | 1 100 |
| 148KS[4] | 240 | **9.4488** | 360 | **14.1732** | 56 | **2.2047** | 2.50 | **.100** | 19 500 | **30.20** | 255 000 | **57 300** | 315 000 | **70 800** | 1 700 | 2 000 | 1 000 |
| 152KS[4] | 260 | **10.2362** | 400 | **15.7480** | 65 | **2.5591** | 3.00 | **.120** | 23 900 | **37.00** | 291 000 | **65 400** | 375 000 | **84 300** | 1 500 | 1 800 | 940 |
| 156KS[4] | 280 | **11.0236** | 420 | **16.5354** | 65 | **2.5591** | 3.00 | **.120** | 25 700 | **39.90** | 302 000 | **67 900** | 405 000 | **91 000** | 1 400 | 1 700 | 890 |
| 160KS[4] | 300 | **11.8110** | 460 | **18.1102** | 74 | **2.9134** | 3.00 | **.120** | 31 700 | **49.20** | 358 000 | **80 500** | 500 000 | **112 000** | 1 200 | 1 500 | 780 |
| 164KS[4] | 320 | **12.5984** | 480 | **18.8976** | 74 | **2.9134** | 3.00 | **.120** | 34 000 | **52.70** | 371 000 | **83 400** | 540 000 | **121 000** | 1 100 | 1 400 | 730 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil.
For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice.
For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33\frac{1}{3}$ rpm.
4) Typically non-stocked sizes, please check availability before designing into equipment.

# 200S light series

(see pg. 54 for hybrid series)



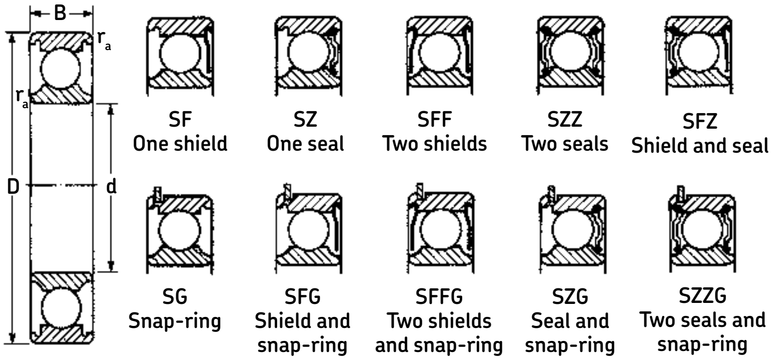

200S light series bearings are single-row radial conrad-type bearings made with bores from 10 mm to 120 mm. They are used in applications with moderate to heavy radial loads, two-directional thrust loads, or a combination of both.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1) ] $r_a$ mm | Fillet radius $r_a$ in. | $ZD^2$ mm | $ZD^2$ in. | Basic radial load rating: Dynamic C[3)] N | Dynamic C lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[2)]: Open and shielded, Grease rpm | Open and shielded, Oil rpm | Single and double sealed, Grease rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200S | 10 | .3937 | 30 | **1.1811** | 9 | **.3543** | .64 | **.025** | 181 | **.28** | 5 070 | **1 140** | 2 360 | **531** | 24 000 | 30 000 | 17 000 |
| 201S | 12 | .4724 | 32 | **1.2598** | 10 | **.3937** | .64 | **.025** | 252 | **.39** | 6 890 | **1 550** | 3 100 | **697** | 22 000 | 28 000 | 15 000 |
| 202S | 15 | .5906 | 35 | **1.3780** | 11 | **.4331** | .64 | **.025** | 290 | **.45** | 7 800 | **1 750** | 3 250 | **843** | 19 000 | 24 000 | 13 000 |
| 203S | 17 | .6693 | 40 | **1.5748** | 12 | **.4724** | .64 | **.025** | 361 | **.56** | 9 560 | **2 150** | 4 750 | **1 070** | 17 000 | 20 000 | 12 000 |
| 204S | 20 | .7874 | 47 | **1.8504** | 14 | **.5512** | 1.00 | **.040** | 503 | **.78** | 12 700 | **2 860** | 6 550 | **1 470** | 15 000 | 18 000 | 10 000 |
| 205S | 25 | .9843 | 52 | **2.0472** | 15 | **.5906** | 1.00 | **.040** | 568 | **.88** | 14 000 | **3 150** | 7 800 | **1 750** | 12 000 | 15 000 | 8 500 |
| 206S | 30 | **1.1811** | 62 | **2.4409** | 16 | **.6299** | 1.00 | **.040** | 819 | **1.27** | 19 500 | **4 380** | 11 200 | **2 520** | 10 000 | 13 000 | 7 500 |
| 207S | 35 | **1.3780** | 72 | **2.8346** | 17 | **.6693** | 1.00 | **.040** | 1 110 | **1.72** | 25 500 | **5 730** | 15 300 | **3 440** | 9 000 | 11 000 | 6 300 |
| 208S | 40 | **1.5748** | 80 | **3.1496** | 18 | **.7087** | 1.00 | **.040** | 1 360 | **2.11** | 30 700 | **6 900** | 19 000 | **4 270** | 8 500 | 10 000 | 5 600 |
| 209S | 45 | **1.7717** | 85 | **3.3465** | 19 | **.7480** | 1.00 | **.040** | 1 510 | **2.35** | 33 200 | **7 460** | 21 600 | **4 860** | 7 500 | 9 000 | 5 000 |
| 210S | 50 | **1.9685** | 90 | **3.5433** | 20 | **.7874** | 1.00 | **.040** | 1 610 | **2.50** | 35 100 | **7 890** | 23 200 | **5 220** | 7 000 | 8 500 | 4 800 |
| 211S | 55 | **2.1654** | 100 | **3.9370** | 21 | **.8268** | 1.50 | **.060** | 2 040 | **3.16** | 43 600 | **9 800** | 29 000 | **6 520** | 6 300 | 7 500 | 4 300 |
| 212S | 60 | **2.3622** | 110 | **4.3307** | 22 | **.8661** | 1.50 | **.060** | 2 280 | **3.53** | 47 500 | **10 700** | 32 500 | **7 310** | 6 000 | 7 000 | 4 000 |
| 213S | 65 | **2.5591** | 120 | **4.7244** | 23 | **.9055** | 1.50 | **.060** | 2 770 | **4.30** | 55 900 | **12 600** | 40 500 | **9 110** | 5 300 | 6 300 | 3 600 |
| 214S | 70 | **2.7559** | 125 | **4.9213** | 24 | **.9449** | 1.50 | **.060** | 3 060 | **5.18** | 60 500 | **13 600** | 45 000 | **10 100** | 5 000 | 6 000 | 3 400 |
| 215S | 75 | **2.9528** | 130 | **5.1181** | 25 | **.9843** | 1.50 | **.060** | 3 350 | **5.20** | 66 300 | **14 900** | 49 000 | **11 000** | 4 800 | 5 600 | 3 200 |
| 216S | 80 | **3.1496** | 140 | **5.5118** | 26 | **1.0236** | 2.00 | **.080** | 3 630 | **5.63** | 72 800 | **16 400** | 53 000 | **11 900** | 4 500 | 5 300 | 3 000 |
| 217S | 85 | **3.3465** | 150 | **5.9055** | 28 | **1.1024** | 2.00 | **.080** | 4 260 | **6.60** | 83 200 | **18 700** | 64 000 | **14 400** | 4 300 | 5 000 | 2 800 |
| 218S | 90 | **3.5433** | 160 | **6.2992** | 30 | **1.1811** | 2.00 | **.080** | 5 050 | **7.83** | 95 600 | **21 500** | 73 500 | **16 500** | 3 800 | 4 500 | 2 600 |
| 219S | 95 | **3.7402** | 170 | **6.6929** | 32 | **1.2598** | 2.00 | **.080** | 5 670 | **8.79** | 108 000 | **24 300** | 81 500 | **18 300** | 3 600 | 4 300 | 2 400 |
| 220S | 100 | **3.9370** | 180 | **7.0866** | 34 | **1.3386** | 2.00 | **.080** | 6 450 | **10.00** | 124 000 | **27 900** | 93 000 | **20 900** | 3 400 | 4 000 | 2 400 |
| 221S | 105 | **4.1339** | 190 | **7.4803** | 36 | **1.4173** | 2.00 | **.080** | 7 280 | **11.30** | 133 000 | **29 900** | 104 000 | **23 400** | 3 200 | 3 800 | 2 200 |
| 222S | 110 | **4.3307** | 200 | **7.8740** | 38 | **1.4961** | 2.00 | **.080** | 8 190 | **12.70** | 143 000 | **32 100** | 118 000 | **26 500** | 3 000 | 3 600 | 2 000 |
| 224S | 120 | **4.7244** | 215 | **8.4646** | 40 | **1.5748** | 2.00 | **.080** | 8 970 | **13.90** | 146 000 | **32 800** | 118 000 | **26 500** | 2 800 | 3 400 | 1 900 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil.
For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice.
For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.

# 300S medium series

(see pg. 56 for hybrid series)

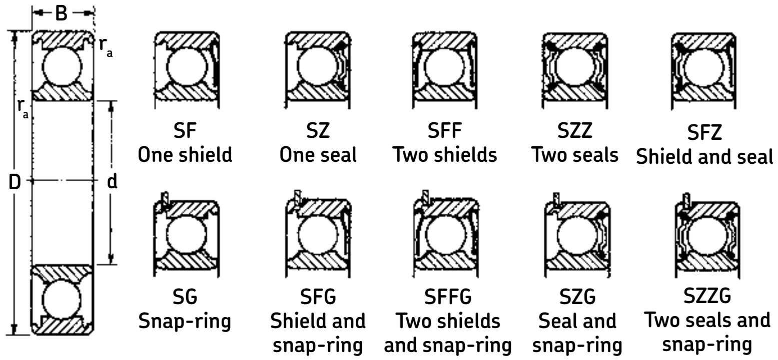



300S medium series bearings are used with heavy radial loads, two-directional thrust loads, or a combination of both.

| MRC bearing number | Bore d | | Outside diameter D | | Width B | | Fillet radius[1] $r_a$ | | $ZD^2$ | | Basic radial load rating Dynamic $C$[3] | | Static $C_0$ | | Speed rating[2] Open and shielded Grease | Oil | Single and double sealed Grease |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm | rpm |
| 300S | 10 | **.3937** | 35 | **1.3780** | 11 | **.4331** | .64 | **.025** | 303 | **.47** | 8 060 | **1 810** | 3 400 | **764** | 20 000 | 26 000 | 15 000 |
| 301S | 12 | **.4724** | 37 | **1.4567** | 12 | **.4724** | 1.00 | **.040** | 381 | **.59** | 9 750 | **2 190** | 4 150 | **933** | 19 000 | 24 000 | 14 000 |
| 302S | 15 | **.5906** | 42 | **1.6535** | 13 | **.5118** | 1.00 | **.040** | 439 | **.68** | 11 400 | **2 560** | 5 400 | **1 210** | 17 000 | 20 000 | 12 000 |
| 303S | 17 | **.6693** | 47 | **1.8504** | 14 | **.5512** | 1.00 | **.040** | 535 | **.83** | 13 500 | **3 030** | 6 550 | **1 470** | 16 000 | 19 000 | 11 000 |
| 304S | 20 | **.7874** | 52 | **2.0472** | 15 | **.5906** | 1.00 | **.040** | 632 | **.98** | 15 900 | **3 570** | 7 800 | **1 750** | 13 000 | 16 000 | 9 500 |
| 305S | 25 | **.9843** | 62 | **2.4409** | 17 | **.6693** | 1.00 | **.040** | 864 | **1.34** | 21 200 | **4 760** | 10 800 | **2 430** | 11 000 | 14 000 | 7 500 |
| 306S | 30 | **1.1811** | 72 | **2.8346** | 19 | **.7480** | 1.00 | **.040** | 1 210 | **1.88** | 28 100 | **6 320** | 16 000 | **3 600** | 9 000 | 11 000 | 6 300 |
| 307S | 35 | **1.3780** | 80 | **3.1496** | 21 | **.8268** | 1.50 | **.060** | 1 460 | **2.26** | 33 200 | **7 460** | 19 000 | **4 270** | 8 500 | 10 000 | 6 000 |
| 308S | 40 | **1.5748** | 90 | **3.5433** | 23 | **.9055** | 1.50 | **.060** | 1 820 | **2.82** | 41 000 | **9 220** | 24 000 | **5 400** | 7 500 | 9 000 | 5 000 |
| 309S | 45 | **1.7717** | 100 | **3.9370** | 25 | **.9843** | 1.50 | **.060** | 2 440 | **3.62** | 52 700 | **11 900** | 31 500 | **7 080** | 6 700 | 8 000 | 4 500 |
| 310S | 50 | **1.9685** | 110 | **4.3307** | 27 | **1.0630** | 2.00 | **.080** | 2 900 | **4.50** | 61 800 | **13 900** | 38 000 | **8 540** | 6 300 | 7 500 | 4 300 |
| 311S | 55 | **2.1654** | 120 | **4.7244** | 29 | **1.1417** | 2.00 | **.080** | 3 410 | **5.28** | 71 500 | **16 100** | 45 000 | **10 100** | 5 600 | 6 700 | 3 800 |
| 312S | 60 | **2.3622** | 130 | **5.1181** | 31 | **1.2205** | 2.00 | **.08** | 3 950 | **6.13** | 81 900 | **18 400** | 52 000 | **11 700** | 5 000 | 6 000 | 3 400 |
| 313S | 65 | **2.5591** | 140 | **5.5118** | 33 | **1.2992** | 2.0 | **.080** | 4 540 | **7.03** | 92 300 | **20 800** | 60 000 | **13 500** | 4 800 | 5 600 | 3 200 |
| 314S | 70 | **2.7559** | 150 | **5.9055** | 35 | **1.3780** | 2.00 | **.080** | 5 160 | **8.00** | 104 000 | **23 400** | 68 000 | **15 300** | 4 500 | 5 300 | 3 000 |
| 315S | 75 | **2.9528** | 160 | **6.2992** | 37 | **1.4567** | 2.00 | **.080** | 5 820 | **9.03** | 114 000 | **25 600** | 76 500 | **17 200** | 4 300 | 5 000 | 2 800 |
| 316S | 80 | **3.1496** | 170 | **6.6929** | 39 | **1.5354** | 2.00 | **.080** | 6 515 | **10.1** | 124 000 | **27 900** | 86 500 | **19 400** | 3 800 | 4 500 | 2 600 |
| 317S | 85 | **3.3465** | 180 | **7.0866** | 41 | **1.6142** | 2.5 | **.100** | 7 290 | **11.3** | 133 000 | **29 900** | 96 500 | **21 700** | 3 600 | 4 300 | 2 400 |
| 318S | 90 | **3.5433** | 190 | **7.4803** | 43 | **1.6929** | 2.50 | **.100** | 8 060 | **12.5** | 143 000 | **32 100** | 108 000 | **24 300** | 3 400 | 4 000 | 2 400 |
| 319S | 95 | **3.7402** | 200 | **7.8740** | 45 | **1.7717** | 2.50 | **.100** | 8 900 | **13.8** | 153 000 | **34 400** | 118 000 | **26 500** | 3 200 | 3 800 | 2 200 |
| 320S | 100 | **3.9370** | 215 | **8.4646** | 47 | **1.8504** | 2.50 | **.100** | 10 600 | **16.5** | 174 000 | **39 100** | 140 000 | **31 500** | 3 000 | 3 600 | 2 100 |
| 321S | 105 | **4.1339** | 225 | **8.8583** | 49 | **1.9291** | 2.50 | **.100** | 11 600 | **18.0** | 182 000 | **40 800** | 153 000 | **34 400** | 2 800 | 3 400 | 2 000 |
| 322S | 110 | **4.3307** | 240 | **9.4488** | 50 | **1.9685** | 2.50 | **.100** | 13 600 | **21.1** | 203 000 | **45 600** | 180 000 | **40 500** | 2 600 | 3 200 | 1 800 |
| 324S | 120 | **4.7244** | 260 | **10.2362** | 55 | **2.1654** | 2.50 | **.100** | 13 600 | **21.1** | 208 000 | **46 700** | 186 000 | **41 800** | 2 400 | 3 000 | — |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil.
For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice.
For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 400S heavy series

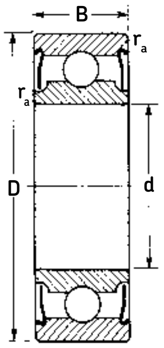



This series is made up of single-row radial conrad-type bearings made with bores ranging from 17 mm to 110 mm. They are used in applications with very heavy radial loads, two-directional thrust loads, or a combination of both.

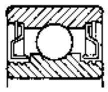
| MRC bearing number | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | Basic radial load rating | | | | Speed rating[2] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Dynamic | | Static | | Open and shielded | | Single and double sealed |
| | d | | D | | B | | $r_a$ | | $ZD^2$ | | C[3] | | $C_0$ | | Grease | Oil | Grease |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm | rpm |
| 403S | 17 | .6693 | 62 | **2.4409** | 17 | .6693 | 1.0 | **.04** | 968 | **1.50** | 22 900 | **5 150** | 10 800 | **2 430** | 12 000 | 15 000 | 8 500 |
| 404S | 20 | .7874 | 72 | **2.8346** | 19 | .7480 | 1.0 | **.04** | 1 370 | **2.12** | 30 700 | **6 900** | 15 000 | **3 370** | 10 000 | 13 000 | 7 300 |
| 405S | 25 | .9843 | 80 | **3.1496** | 21 | .8268 | 1.5 | **.06** | 1 590 | **2.47** | 35 800 | **8 050** | 19 300 | **4 340** | 9 000 | 11 000 | 6 400 |
| 406S | 30 | **1.1811** | 90 | **3.5433** | 23 | .9055 | 1.5 | **.06** | 1 950 | **3.02** | 43 600 | **9 800** | 23 600 | **5 310** | 8 500 | 10 000 | 5 600 |
| 407S | 35 | **1.3780** | 100 | **3.9370** | 25 | .9843 | 1.5 | **.06** | 2 540 | **3.94** | 55 300 | **12 400** | 31 000 | **6 970** | 7 000 | 8 500 | 4 900 |
| 408S | 40 | **1.5748** | 110 | **4.3307** | 27 | **1.0630** | 2.0 | **.08** | 2 980 | **4.62** | 63 700 | **14 300** | 36 500 | **8 210** | 6 700 | 8 000 | 4 400 |
| 409S | 45 | **1.7717** | 120 | **4.7244** | 29 | **1.1417** | 2.0 | **.08** | 3 710 | **5.75** | 76 100 | **17 100** | 45 000 | **10 100** | 6 000 | 7 000 | 4 000 |
| 410S | 50 | **1.9685** | 130 | **5.1181** | 31 | **1.2205** | 2.0 | **.08** | 4 520 | **7.00** | 87 100 | **19 600** | 52 000 | **11 700** | 5 200 | 6 300 | 3 700 |
| 411S | 55 | **2.1654** | 140 | **5.5118** | 33 | **1.2992** | 2.0 | **.08** | 5 100 | **7.90** | 99 500 | **22 400** | 62 000 | **13 900** | 5 000 | 6 000 | 3 400 |
| 412S | 60 | **2.3622** | 150 | **5.9055** | 35 | **1.3780** | 2.0 | **.08** | 5 710 | **8.86** | 108 000 | **24 300** | 69 500 | **15 600** | 4 800 | 5 600 | 3 100 |
| 413S | 65 | **2.5591** | 160 | **6.2992** | 37 | **1.4567** | 2.0 | **.08** | 6 370 | **9.87** | 119 000 | **26 800** | 78 000 | **17 500** | 4 500 | 5 300 | 2 900 |
| 414S | 70 | **2.7559** | 180 | **7.0866** | 42 | **1.6535** | 2.5 | **.10** | 8 510 | **13.2** | 143 000 | **32 100** | 104 000 | **23 400** | 3 800 | 4 500 | 2 600 |
| 415S | 75 | **2.9528** | 190 | **7.4803** | 45 | **1.7717** | 2.5 | **.10** | 9 350 | **14.50** | 153 000 | **34 400** | 114 000 | **25 600** | 3 600 | 4 300 | 2 500 |
| 416S | 80 | **3.1496** | 200 | **7.8740** | 48 | **1.8898** | 2.5 | **.10** | 10 200 | **15.80** | 163 000 | **36 600** | 125 000 | **28 100** | 3 400 | 4 000 | 2 300 |
| 417S | 85 | **3.3465** | 210 | **8.2677** | 52 | **2.0472** | 3.0 | **.12** | 11 000 | **17.10** | 174 000 | **39 100** | 137 000 | **30 800** | 3 200 | 3 800 | 2 200 |
| 418S | 90 | **3.5433** | 225 | **8.8583** | 54 | **2.1260** | 3.0 | **.12** | 12 800 | **19.90** | 186 000 | **41 800** | 150 000 | **33 700** | 3 000 | 3 600 | 2 100 |
| 419S[4] | 95 | **3.7402** | 250 | **9.8425** | 55 | **2.1654** | 3.0 | **.12** | 13 800 | **21.40** | 203 000 | **45 600** | 173 000 | **38 900** | 2 700 | 3 300 | 1 900 |
| 420S[4] | 100 | **3.9370** | 265 | **10.4331** | 60 | **2.3622** | 3.0 | **.12** | 15 900 | **24.60** | 225 000 | **50 600** | 200 000 | **45 000** | 2 500 | 3 100 | 1 800 |
| 421S[4] | 105 | **4.1339** | 290 | **11.4173** | 65 | **2.5591** | 3.0 | **.12** | 18 100 | **28.00** | 247 000 | **55 500** | 228 000 | **51 300** | 2 400 | 2 900 | 1 600 |
| 422S[4] | 110 | **4.3307** | 320 | **12.5984** | 70 | **2.7559** | 3.0 | **.12** | 20 300 | **31.60** | 270 000 | **60 700** | 260 000 | **58 500** | 2 100 | 2 600 | 1 500 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil.
For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice.
For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.
4) Typically non-stocked sizes, please check availability before designing into equipment.

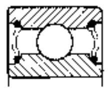
# Cartridge-type bearings
# SFFC, SZZC, SLLC




SFFC
metal shields



SLLC removable
metal shields



SZZC synthetic
rubber shields

Cartridge-type bearings have an extra large grease chamber packed with high quality lubricant. For applications where space for a lubrication system is limited or conditions demand a larger grease supply inside bearing.

Note: Bearings designated SFFC have non-removable metal shields.

| MRC bearing number | Bore d | | Outside diameter D | | Width B | | Fillet radius[1] $r_a$ | | $ZD^2$ | | Basic radial load rating Dynamic $C$[3] | | Static $C_0$ | | Speed rating[2] Open and shielded Grease | Oil | Single and double sealed Grease |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm | rpm |
| 200SFFC | 10 | .3937 | 30 | **1.1811** | 14.29 | **9/16** | .64 | **.025** | 181 | **.28** | 5 070 | **1 140** | 2 400 | **540** | 24 000 | 30 000 | 17 000 |
| 201SFFC | 12 | .4724 | 32 | **1.2598** | 15.88 | **5/8** | .64 | **.025** | 252 | **.39** | 6 760 | **1 520** | 3 000 | **674** | 22 000 | 28 000 | 15 000 |
| 202SFFC | 15 | .5906 | 35 | **1.3780** | 15.88 | **5/8** | .64 | **.025** | 290 | **.45** | 7 610 | **1 710** | 3 750 | **843** | 19 000 | 24 000 | 13 000 |
| 203SFFC | 17 | .6693 | 40 | **1.5748** | 17.46 | **11/16** | .64 | **.025** | 361 | **.56** | 9 560 | **2 150** | 4 500 | **1 010** | 17 000 | 20 000 | 12 000 |
| 204SFFC | 20 | .7874 | 47 | **1.8504** | 20.64 | **13/16** | 1.0 | **.04** | 503 | **.78** | 13 000 | **2 920** | 6 700 | **1 510** | 15 000 | 18 000 | 10 000 |
| 205SFFC | 25 | .9843 | 52 | **2.0472** | 20.64 | **13/16** | 1.0 | **.04** | 568 | **.88** | 15 100 | **3 390** | 8 150 | **1 830** | 12 000 | 15 000 | 8 500 |
| 206SFFC | 30 | **1.1811** | 62 | **2.4409** | 23.81 | **15/16** | 1.0 | **.04** | 819 | **1.27** | 20 800 | **4 680** | 11 400 | **2 560** | 10 000 | 13 000 | 7 500 |
| 207SFFC | 35 | **1.3780** | 72 | **2.8346** | 26.99 | **1 1/16** | 1.0 | **.04** | 1 140 | **1.76** | 26 500 | **5 960** | 15 300 | **3 440** | 9 000 | 11 000 | 6 300 |
| 208SFFC | 40 | **1.5748** | 80 | **3.1496** | 30.16 | **1 3/16** | 1.0 | **.04** | 1 450 | **2.25** | 32 500 | **7 310** | 20 000 | **4 550** | 8 500 | 10 000 | 5 600 |
| 209SFFC | 45 | **1.7717** | 85 | **3.3465** | 30.16 | **1 3/16** | 1.0 | **.04** | 1 640 | **2.54** | 36 400 | **8 180** | 22 800 | **5 130** | 7 500 | 9 000 | 5 000 |
| 210SFFC | 50 | **1.9685** | 90 | **3.5433** | 30.16 | **1 3/16** | 1.0 | **.04** | 1 610 | **2.50** | 35 100 | **7 890** | 23 200 | **5 220** | 7 000 | 8 500 | 4 800 |
| 211SFFC | 55 | **2.1654** | 100 | **3.9370** | 33.34 | **1 5/16** | 1.5 | **.06** | 2 040 | **3.16** | 39 700 | **8 920** | 29 000 | **6 520** | 6 300 | 7 500 | 4 300 |
| 213SFFC | 65 | **2.5591** | 120 | **4.7244** | 38.10 | **1 1/2** | 1.5 | **.06** | 3 050 | **4.73** | 62 400 | **14 000** | 44 000 | **9 890** | 5 300 | 6 300 | 3 600 |
| 214SFFC | 70 | **2.7559** | 125 | **4.9213** | 39.69 | **1 9/16** | 1.5 | **.06** | 3 050 | **4.73** | 62 400 | **14 000** | 44 000 | **9 890** | 5 000 | 6 000 | 3 400 |
| 216SFFC | 80 | **3.1496** | 140 | **5.5118** | 44.45 | **1 3/4** | 2.0 | **.08** | 3 630 | **5.63** | 78 000 | **17 500** | 53 000 | **11 900** | 4 500 | 5 300 | 3 000 |
| 304SFFC | 20 | .7874 | 52 | **2.0472** | 22.23 | **7/8** | 1.0 | **.04** | 632 | **.98** | 15 900 | **3 570** | 7 800 | **1 750** | 13 000 | 16 000 | 9 500 |
| 305SFFC | 25 | .9843 | 62 | **2.4409** | 25.40 | **1** | 1.0 | **.04** | 864 | **1.34** | 21 000 | **4 770** | 11 000 | **2 470** | 11 000 | 14 000 | 7 500 |
| 306SFFC | 30 | **1.1811** | 72 | **2.8346** | 30.16 | **1 3/16** | 1.0 | **.04** | 1 290 | **2.00** | 29 600 | **6 650** | 16 600 | **3 730** | 9 000 | 11 000 | 6 300 |
| 307SFFC | 35 | **1.3780** | 80 | **3.1496** | 34.93 | **1 3/8** | 1.5 | **.06** | 1 590 | **2.47** | 36 400 | **8 180** | 20 000 | **4 500** | 8 500 | 10 000 | 6 000 |
| 308SFFC | 40 | **1.5748** | 90 | **3.5433** | 36.51 | **1 7/16** | 1.5 | **.06** | 2 020 | **3.13** | 44 200 | **9 940** | 26 000 | **5 850** | 7 500 | 9 000 | 5 000 |
| 309SFFC | 45 | **1.7717** | 100 | **3.9370** | 39.69 | **1 9/16** | 1.5 | **.06** | 2 330 | **3.62** | 52 000 | **11 700** | 30 000 | **6 740** | 6 700 | 8 000 | 4 500 |
| 310SFFC | 50 | **1.9685** | 110 | **4.3307** | 44.45 | **1 3/4** | 2.0 | **.08** | 2 900 | **4.50** | 61 800 | **13 900** | 38 000 | **8 540** | 6 300 | 7 500 | 4 300 |
| 311SFFC | 55 | **2.1654** | 120 | **4.7244** | 49.21 | **1 15/16** | 2.0 | **.08** | 3 410 | **5.28** | 71 500 | **16 100** | 45 000 | **10 100** | 5 600 | 6 700 | 3 800 |
| 312SFFC | 60 | **2.3622** | 130 | **5.1181** | 53.98 | **2 1/8** | 2.0 | **.08** | 3 950 | **6.13** | 81 900 | **18 400** | 52 000 | **11 700** | 5 000 | 6 000 | 3 400 |
| 313SFFC | 65 | **2.5591** | 140 | **5.5118** | 58.74 | **2 5/16** | 2.0 | **.08** | 4 530 | **7.03** | 92 300 | **20 700** | 60 000 | **13 500** | 4 800 | 5 600 | 3 200 |
| 314SFFC | 70 | **2.7559** | 150 | **5.9055** | 63.50 | **2 1/2** | 2.0 | **.08** | 5 160 | **8.00** | 104 000 | **23 400** | 68 000 | **15 300** | 4 500 | 5 300 | 3 000 |
| 315SFFC | 75 | **2.9528** | 160 | **6.2992** | 68.26 | **2 11/16** | 2.0 | **.08** | 6 530 | **10.1** | 124 000 | **27 900** | 85 000 | **19 100** | 4 300 | 5 000 | 2 800 |
| 316SFFC | 80 | **3.1496** | 170 | **6.6929** | 68.26 | **2 11/16** | 2.0 | **.08** | 7 280 | **11.3** | 133 000 | **29 900** | 95 000 | **21 400** | 3 800 | 4 500 | 2 600 |
| 317SFFC | 85 | **3.3465** | 180 | **7.0866** | 73.03 | **2 7/8** | 2.5 | **.10** | 7 280 | **11.3** | 133 000 | **29 900** | 96 500 | **21 700** | 3 600 | 4 300 | 2 400 |
| 318SFFC | 90 | **3.5433** | 190 | **7.4803** | 73.03 | **2 7/8** | 2.5 | **.10** | 8 060 | **12.5** | 143 000 | **32 100** | 108 000 | **24 300** | 3 400 | 4 000 | 2 400 |
| 320SFFC | 100 | **3.9370** | 215 | **8.4646** | 82.55 | **3 1/4** | 2.5 | **.10** | 11 600 | **18.0** | 182 000 | **40 900** | 150 000 | **33 700** | 3 000 | 3 600 | 2 100 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1. The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at 33 1/3 rpm.



MRC

# Single-row deep groove ball bearings S-type

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

$P = XF_R + YF_A$

P = Dynamic equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

Z = Number of balls

D = Ball diameter

X = Radial load factor

Y = Thrust load factor

e = Limiting factor for $F_A/F_R$

| Internal radial clearance | $\frac{F_A}{ZD^2}$ Units N, mm | $\frac{F_A}{ZD^2}$ Units lb, in. | $\frac{F_A}{F_R} > e$ X | $\frac{F_A}{F_R} > e$ Y | e |
|---|---|---|---|---|---|
| | 0.172 | 25 | | 2.30 | 0.19 |
| | 0.345 | 50 | | 1.99 | 0.22 |
| Standard | 0.689 | 100 | | 1.71 | 0.26 |
| (ABMA C0) | 1.03 | 150 | | 1.56 | 0.28 |
| | 1.38 | 200 | 0.56 | 1.45 | 0.30 |
| | 2.07 | 300 | | 1.31 | 0.34 |
| | 3.45 | 500 | | 1.15 | 0.38 |
| | 5.17 | 750 | | 1.04 | 0.42 |
| | 6.89 | 1000 | | 1.00 | 0.44 |
| | 0.172 | 25 | | 1.47 | 0.38 |
| | 0.345 | 50 | | 1.40 | 0.40 |
| | 0.689 | 100 | | 1.30 | 0.43 |
| Loose | 1.03 | 150 | | 1.23 | 0.46 |
| (ABMA C3) | 1.38 | 200 | 0.44 | 1.19 | 0.47 |
| | 2.07 | 300 | | 1.12 | 0.50 |
| | 3.45 | 500 | | 1.02 | 0.55 |
| | 5.17 | 750 | | 1.00 | 0.56 |
| | 6.89 | 1000 | | 1.00 | 0.56 |

When $F_A/F_R \le e$, use X = 1.0, Y = 0.

Values of Y and e for loads not shown are obtained from chart below.

### Life rating

$$L10 = \left(\frac{C}{P}\right)^3 \text{ (millions of revolutions)}$$

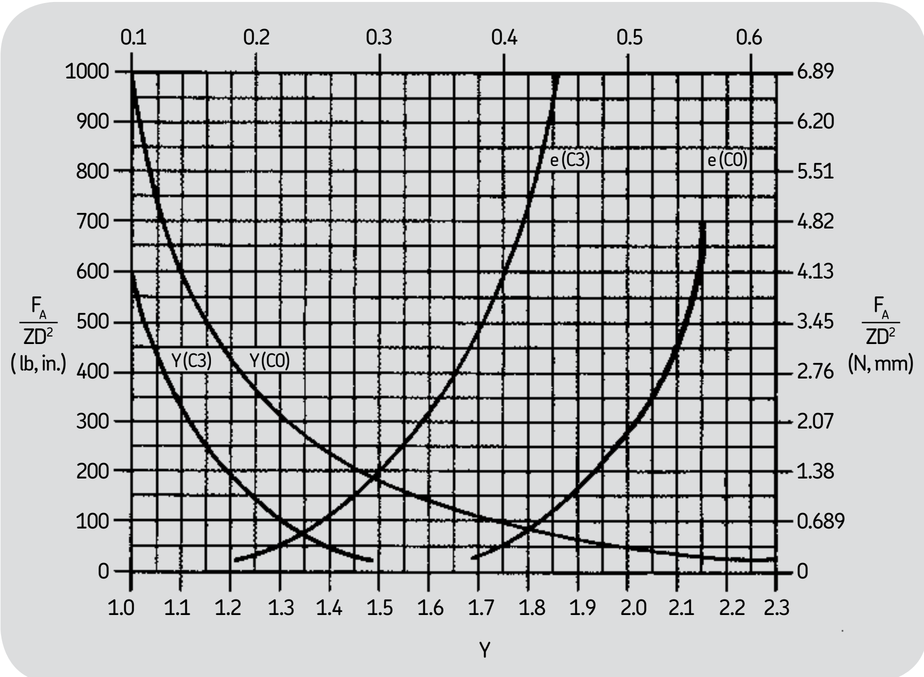
or

$$L10_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 \text{ (hours)}$$

C = Basic dynamic load rating

P = Dynamic equivalent radial load

n = Speed in rpm




### Static equivalent radial load

$P_0 = 0.6\ F_R + 0.5\ F_A$

$P_0$ is always $\ge F_R$

$P_0$ = Static equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

# Single-row deep groove ball bearings, S-type

## Dynamic equivalent radial load and life calculation examples

Bearing size: 309S
Speed = 2000 rpm
Basic dynamic load rating (C) = 11900 lbf
$ZD^2$ = 3.62

### ABMA C0 internal clearance

#### Case 1

Radial load ($F_R$) = 1890

Equivalent load (P) = $X F_R + Y F_A$

$P = F_R = 1890$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11900}{1890}\right)^3 = 249.6 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{11900}{1890}\right)$$

= 2080 Hrs

#### Case 2

Radial load ($F_R$) = 1890
Thrust load ($F_A$) = 1250
Equivalent load (P) = $X F_R + Y F_A$
$F_A/ZD^2 = 1250/3.62 = 345$
X = 0.56
Y = 1.27
$P = 0.56 \times 1890 + 1.27 \times 1250 = 2646$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11900}{2646}\right)^3 = 91.0 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{11900}{2646}\right)^3$$

= 758 Hrs

#### Case 3

Thrust load ($F_A$) = 1250
Equivalent load (P) = $X F_R + Y F_A$
$F_A/ZD^2 = 1250/3.62 = 345$
Y = 1.27
$P = 1.27 \times 1250 = 1588$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11900}{1588}\right)^3 = 420.8 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L\,10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{11900}{1588}\right)^3$$

= 3507 Hrs

### ABMA C3 internal clearance

#### Case 1

Radial load ($F_R$) = 1890

Equivalent load (P) = $X F_R + Y F_A$

$P = F_R = 1890$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11900}{1890}\right)^3 = 249.6 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{11900}{1890}\right)^3$$

= 2080 Hrs

#### Case 2

Radial load ($F_R$) = 1890
Thrust load ($F_A$) = 1250
Equivalent load (P) = $X F_R + Y F_A$
$F_A/ZD^2 = 1250/3.62 = 345$
X = 0.44
Y = 1.08
$P = 0.44 \times 1890 + 1.08 \times 1250 = 2182$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11900}{2182}\right)^3 = 162.2 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L\,10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{11900}{2182}\right)^3$$

= 1352 Hrs

#### Case 3

Thrust load ($F_A$) = 1250
Equivalent load (P) = $X F_R + Y F_A$
$F_A/ZD^2 = 1250/3.62 = 345$
Y = 1.08
$P = 1.08 \times 1250 = 1350$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11900}{1350}\right)^3 = 684.9 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L\,10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{11900}{1350}\right)^3$$

= 5708 Hrs

# Hybrid ceramic ball bearings

Because turnaround time is critical in the electric motor and generator repair business, a complete range of MRC hybrid bearings (including XL-bore sizes and sealed or shielded configurations) are in stock and readily available when you need them. That's the MRC brand advantage.

In addition to those listed, other sizes of the 200S and 300S series can be supplied through the MTO program. Most series of angular contact ball bearings can also be supplied through MTO.

## Prevents electrical arcing

When electrical current passes across bearings, a washboard or fluting pattern appears on the raceways, in addition to a darkened grey appearance. This damage usually results in excessive noise which requires that the bearing be removed. Besides the surface damage, premature aging of the lubricant also occurs. The natural insulating properties of ceramic material eliminates this type of damage.

## Lower maintenance costs

Maintenance costs can quickly add up if a bearing must be changed frequently. Anything that extends the service life of a bearing without increasing maintenance costs will reduce the operating cost of the equipment. Though the initial cost of a hybrid bearing is higher than a standard steel bearing, the difference is quickly recovered in maintenance savings. Less friction also results in lower energy costs.

## Extended service life

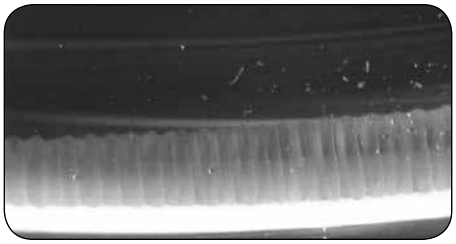
Most bearings are designed into applications based on loading conditions and do not take into account factors such as lubrication, contamination and maintenance. Without proper attention to these external factors, a steel bearing rarely reaches its design L10 life and therefore has a shortened service life. Because of the properties of ceramics, the service life of a hybrid bearing is up to 10 times that of a standard steel bearing. And longer service life reduces the need for maintenance on your machine as well as the costly interruptions in production.

## Extended grease life

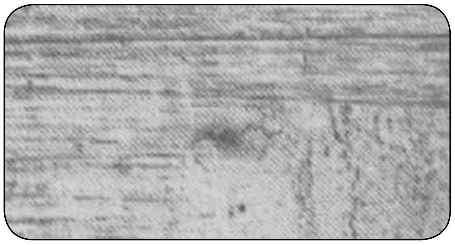
In environments that place high demands on the bearing lubricant, standard bearings experience surface wear because of insufficient lubricant film. Bearings can fail if the initial grease charge is not replenished within an acceptable period of time. Hybrid bearings run cooler and can operate with thinner lubricant films, so there is less aging of the grease and the required relubrication interval will be longer. The result is increased service life compared to standard bearings in the same operating conditions.

## Lower operating temperatures

The heat generated in bearings is attributable to viscous friction from lubrication and load dependent friction between the balls and raceways. The source of the loading is external as well as internal. There is little that can be done to reduce the external loads. However, since ceramic balls have only 40% of the density of steel balls, the centrifugal load generated by the balls is less and the internal friction is lower. This provides cooler running for the same operating conditions or, if applicable, a higher rotational speed while maintaining the same temperature.



**Fluting created by electrical arcing**



**Wear caused by static vibration**

## Reduced wear from contamination

In contaminated environments, solid particles create dents in the rolling surfaces and raised edges around those dents. This condition causes noise and premature wear as the steel balls roll over those surfaces. The harder ceramic ball material smooths the surface roughness with no material removal. Also, there is little evidence of adhesive wear as seen in steel bearings. This reduces the noise and wear, which extends the bearing service life.

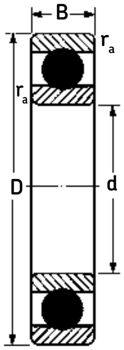
## Reduced wear from vibration

In equipment exposed to static vibration, there is an inherent risk of false brinelling, (the wearing away of the surfaces within the ball and raceway contacts) which can eventually lead to spalling and premature failure. Because of the lighter weight ceramic balls and dissimilar materials, the risk of false brinelling damage is much less.

# Hybrid ceramic ball bearings

| Material properties | Bearing steel | Bearing silicon nitride | Benefit |
|---|---|---|---|
| Mechanical properties | | | |
| Density [g/cm3] | 7.9 | 3.2 | Lower density reduces the centrifugal force and thereby reduces bearing friction. |
| Hardness, HV10 [kg/mm2] | 700 | 1600 | Higher hardness promotes wear resistance against hard particles and lower plastic deformation. |
| Modulus of elasticity, E [GPa] | 210 | 310 | Higher modulus of elasticity increases the bearing stiffness. Hybrid bearings deflect less under load, providing more predictable performance. |
| Coefficient of thermal expansion [/C] | $12 \times 10^{-6}$ | $63 \times 10^{-6}$ | Lower coefficient of expansion reduces the effects of ring temperature difference resulting in more stable clearance or preload. |
| Electrical properties | | | |
| Electrical resistivity [Wm] | $0.4 \times 10^{-6}$ (conductor) | $10^{12}$ (insulator) | The ceramic balls break the electrical current (DC) path and act as an insulator. |
| Relative dielectric constant | N/A | 4.2 to 6.1 | The ceramic balls break the electrical current (AC) path and act as a large impedance. |
| Magnetic field influence | Yes | No | Ceramic balls do not respond to magnetic forces. |
| Chemical resistance | Reactive | Inert | Ceramic to steel contacts show no micro-welding and do not seize during poor lubrication. |

# 100KS
## extra light hybrid series



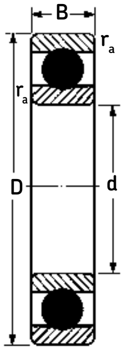

The 100KS extra light hybrid series consists of single-row radial conrad-type bearings made with bores from 25 mm to 100 mm for use in applications that would use the characteristics of traditional 100KS series, but also utilize the benefits of the hybrid solution.

| | Bore | | Outside diameter | | Width | | Fillet radius[1] | | Basic radial load rating | | | | Speed rating | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d | | D | | B | | $r_a$ | | $C^{2)}$ | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **105KS-HYB#1** | 25 | **0.9843** | 47 | **1.8504** | 12 | **0.4724** | 0.64 | **0.025** | 11 900 | **2 680** | 6 550 | **1 470** | 18 000 | 21 600 |
| **105KSFF-HYB#1** | 25 | **0.9843** | 47 | **1.8504** | 12 | **0.4724** | 0.64 | **0.025** | 11 900 | **2 680** | 6 550 | **1 470** | 18 000 | - |
| **105KSZZ-HYB#1** | 25 | **0.9843** | 47 | **1.8504** | 12 | **0.4724** | 0.64 | **0.025** | 11 900 | **2 680** | 6 550 | **1 470** | 9 500 | - |
| **106KS-HYB#1** | 30 | **1.1811** | 55 | **2.1654** | 13 | **0.5118** | 1.00 | **0.039** | 13 800 | **3 100** | 8 300 | **1 870** | 14 400 | 18 000 |
| **106KSFF-HYB#1** | 30 | **1.1811** | 55 | **2.1654** | 13 | **0.5118** | 1.00 | **0.039** | 13 800 | **3 100** | 8 300 | **1 870** | 14 400 | - |
| **106KSZZ-HYB#1** | 30 | **1.1811** | 55 | **2.1654** | 13 | **0.5118** | 1.00 | **0.039** | 13 800 | **3 100** | 8 300 | **1 870** | 8 000 | - |
| **107KS-HYB#1** | 35 | **1.3780** | 62 | **2.4409** | 14 | **0.5512** | 1.00 | **0.039** | 16 800 | **3 780** | 10 200 | **2 290** | 12 000 | 15 600 |
| **107KSFF-HYB#1** | 35 | **1.3780** | 62 | **2.4409** | 14 | **0.5512** | 1.00 | **0.039** | 16 800 | **3 780** | 10 200 | **2 290** | 12 000 | 15 600 |
| **107KSZZ-HYB#1** | 35 | **1.3780** | 62 | **2.4409** | 14 | **0.5512** | 1.00 | **0.039** | 16 800 | **3 780** | 10 200 | **2 290** | 7 000 | - |
| **108KS-HYB#1** | 40 | **1.5748** | 68 | **2.6772** | 15 | **0.5906** | 1.00 | **0.039** | 17 800 | **4 000** | 11 000 | **2 470** | 11 400 | 14 400 |
| **108KSFF-HYB#1** | 40 | **1.5748** | 68 | **2.6772** | 15 | **0.5906** | 1.00 | **0.039** | 17 800 | **4 000** | 11 000 | **2 470** | 11 400 | 14 400 |
| **108KSZZ-HYB#1** | 40 | **1.5748** | 68 | **2.6772** | 15 | **0.5906** | 1.00 | **0.039** | 17 800 | **4 000** | 11 000 | **2 470** | 6 300 | - |
| **109KS-HYB#1** | 45 | **1.7717** | 75 | **2.9528** | 16 | **0.6299** | 1.00 | **0.039** | 22 100 | **4 970** | 14 600 | **3 280** | 10 800 | 13 200 |
| **109KSFF-HYB#1** | 45 | **1.7717** | 75 | **2.9528** | 16 | **0.6299** | 1.00 | **0.039** | 22 100 | **4 970** | 14 600 | **3 280** | 10 800 | 13 200 |
| **109KSZZ-HYB#1** | 45 | **1.7717** | 75 | **2.9528** | 16 | **0.6299** | 1.00 | **0.039** | 22 100 | **4 970** | 14 600 | **3 280** | 5 600 | - |
| **110KS-HYB#1** | 50 | **1.9685** | 80 | **3.1496** | 16 | **0.6299** | 1.00 | **0.039** | 22 900 | **5 150** | 16 000 | **3 600** | 10 200 | 12 000 |
| **110KSFF-HYB#1** | 50 | **1.9685** | 80 | **3.1496** | 16 | **0.6299** | 1.00 | **0.039** | 22 900 | **5 150** | 16 000 | **3 600** | 10 200 | 12 000 |
| **110KSZZ-HYB#1** | 50 | **1.9685** | 80 | **3.1496** | 16 | **0.6299** | 1.00 | **0.039** | 22 900 | **5 150** | 16 000 | **3 600** | 5 000 | - |
| **111KS-HYB#1** | 55 | **2.1654** | 90 | **3.5433** | 18 | **0.7087** | 1.00 | **0.039** | 29 600 | **6 650** | 21 200 | **4 770** | 9 000 | 10 800 |
| **111KSFF-HYB#1** | 55 | **2.1654** | 90 | **3.5433** | 18 | **0.7087** | 1.00 | **0.039** | 29 600 | **6 650** | 21 200 | **4 770** | 9 000 | 10 800 |
| **111KSZZ-HYB#1** | 55 | **2.1654** | 90 | **3.5433** | 18 | **0.7087** | 1.00 | **0.039** | 29 600 | **6 650** | 21 200 | **4 770** | 4 500 | - |
| **112KS-HYB#1** | 60 | **2.3622** | 95 | **3.7402** | 18 | **0.7087** | 1.00 | **0.039** | 30 700 | **6 900** | 23 200 | **5 220** | 8 040 | 9 600 |
| **112KSFF-HYB#1** | 60 | **2.3622** | 95 | **3.7402** | 18 | **0.7087** | 1.00 | **0.039** | 30 700 | **6 900** | 23 200 | **5 220** | 8 040 | 9 600 |
| **112KSZZ-HYB#1** | 60 | **2.3622** | 95 | **3.7402** | 18 | **0.7087** | 1.00 | **0.039** | 30 700 | **6 900** | 23 200 | **5 220** | 4 300 | - |
| **113KS-HYB#1** | 65 | **2.5591** | 100 | **3.9370** | 18 | **0.7087** | 1.00 | **0.039** | 31 900 | **7 170** | 25 000 | **5 620** | 7 560 | 9 000 |
| **113KSFF-HYB#1** | 65 | **2.5591** | 100 | **3.9370** | 18 | **0.7087** | 1.00 | **0.039** | 31 900 | **7 170** | 25 000 | **5 620** | 7 560 | 9 000 |
| **113KSZZ-HYB#1** | 65 | **2.5591** | 100 | **3.9370** | 18 | **0.7087** | 1.00 | **0.039** | 31 900 | **7 170** | 25 000 | **5 620** | 4 000 | - |
| **114KS-HYB#1** | 70 | **2.7559** | 110 | **4.3307** | 20 | **0.7874** | 1.00 | **0.039** | 39 700 | **8 920** | 31 000 | **6 970** | 7 200 | 8 400 |
| **114KSFF-HYB#1** | 70 | **2.7559** | 110 | **4.3307** | 20 | **0.7874** | 1.00 | **0.039** | 39 700 | **8 920** | 31 000 | **6 970** | 7 200 | 8 400 |
| **114KSZZ-HYB#1** | 70 | **2.7559** | 110 | **4.3307** | 20 | **0.7874** | 1.00 | **0.039** | 39 700 | **8 920** | 31 000 | **6 970** | 3 600 | - |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil.
For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice.
For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33\frac{1}{3}$ rpm.

| | Bore | | Outside diameter | | Width | | Fillet radius[1)] | | Basic radial load rating | | | | Speed rating | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d | | D | | B | | $r_a$ | | $C$[2)] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **115KS-HYB#1** | 75 | **2.9528** | 115 | **4.5276** | 20 | **0.7874** | 1.00 | **0.039** | 41600 | **9350** | 33500 | **7530** | 6720 | 8040 |
| **115KSFF-HYB#1** | 75 | **2.9528** | 115 | **4.5276** | 20 | **0.7874** | 1.00 | **0.039** | 41600 | **9350** | 33500 | **7530** | 6720 | 8040 |
| **115KSZZ-HYB#1** | 75 | **2.9528** | 115 | **4.5276** | 20 | **0.7874** | 1.00 | **0.039** | 41600 | **9350** | 33500 | **7530** | 3400 | - |
| **116KS-HYB#1** | 80 | **3.1496** | 125 | **4.9213** | 22 | **0.8661** | 1.00 | **0.039** | 49400 | **11110** | 40000 | **8990** | 6360 | 7560 |
| **116KSFF-HYB#1** | 80 | **3.1496** | 125 | **4.9213** | 22 | **0.8661** | 1.00 | **0.039** | 49400 | **11110** | 40000 | **8990** | 6360 | 7560 |
| **116KSZZ-HYB#1** | 80 | **3.1496** | 125 | **4.9213** | 22 | **0.8661** | 1.00 | **0.039** | 49400 | **11110** | 40000 | **8990** | 3200 | - |
| **117KS-HYB#1** | 85 | **3.3465** | 130 | **5.1181** | 22 | **0.8661** | 1.00 | **0.039** | 52000 | **11690** | 43000 | **9670** | 6000 | 7200 |
| **117KSFF-HYB#1** | 85 | **3.3465** | 130 | **5.1181** | 22 | **0.8661** | 1.00 | **0.039** | 52000 | **11690** | 43000 | **9670** | 6000 | 7200 |
| **117KSZZ-HYB#1** | 85 | **3.3465** | 130 | **5.1181** | 22 | **0.8661** | 1.00 | **0.039** | 52000 | **11690** | 43000 | **9670** | 3000 | - |
| **118KS-HYB#1** | 90 | **3.5433** | 140 | **5.5118** | 24 | **0.9449** | 1.50 | **0.059** | 60500 | **13600** | 50000 | **11240** | 5760 | 6720 |
| **118KSFF-HYB#1** | 90 | **3.5433** | 140 | **5.5118** | 24 | **0.9449** | 1.50 | **0.059** | 60500 | **13600** | 50000 | **11240** | 5760 | 6720 |
| **118KSZZ-HYB#1** | 90 | **3.5433** | 140 | **5.5118** | 24 | **0.9449** | 1.50 | **0.059** | 60500 | **13600** | 50000 | **11240** | 2800 | - |
| **119KS-HYB#1** | 95 | **3.7402** | 145 | **5.7087** | 24 | **0.9449** | 1.50 | **0.059** | 63700 | **14320** | 54000 | **12140** | 5400 | 6360 |
| **119KSFF-HYB#1** | 95 | **3.7402** | 145 | **5.7087** | 24 | **0.9449** | 1.50 | **0.059** | 63700 | **14320** | 54000 | **12140** | 5400 | 6360 |
| **119KSZZ-HYB#1** | 95 | **3.7402** | 145 | **5.7087** | 24 | **0.9449** | 1.50 | **0.059** | 63700 | **14320** | 54000 | **12140** | 2800 | - |
| **120KS-HYB#1** | 100 | **3.9370** | 150 | **5.9055** | 24 | **0.9449** | 1.50 | **0.059** | 63700 | **14320** | 54000 | **12140** | 5160 | 6000 |
| **120KSFF-HYB#1** | 100 | **3.9370** | 150 | **5.9055** | 24 | **0.9449** | 1.50 | **0.059** | 63700 | **14320** | 54000 | **12140** | 5160 | 6000 |
| **120KSZZ-HYB#1** | 100 | **3.9370** | 150 | **5.9055** | 24 | **0.9449** | 1.50 | **0.059** | 63700 | **14320** | 54000 | **12140** | 2600 | - |

# 200S
# light hybrid series



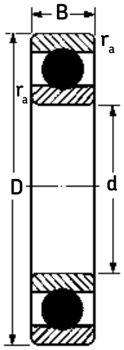

The 200S light hybrid series consists of single-row radial conrad-type bearings made with bores from 25 mm to 180 mm for use in applications that would use the characteristics of traditional 200S series, but also utilize the benefits of the hybrid solution.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | Fillet radius[1] $r_a$ in. | Basic radial load rating Dynamic $C^{2)}$ N | Basic radial load rating Dynamic $C^{2)}$ lbf | Basic radial load rating Static $C_0$ N | Basic radial load rating Static $C_0$ lbf | Speed rating Grease rpm | Speed rating Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 205S-HYB#1 | 25 | 0.9843 | 52 | 2.0472 | 15 | 0.5906 | 1.0 | 0.039 | 14800 | 3330 | 7800 | 1750 | 14400 | 18000 |
| 205SFF-HYB#1 | 25 | 0.9843 | 52 | 2.0472 | 15 | 0.5906 | 1.0 | 0.039 | 14800 | 3330 | 7800 | 1750 | 14400 | 18000 |
| 205SZZ-HYB#1 | 25 | 0.9843 | 52 | 2.0472 | 15 | 0.5906 | 1.0 | 0.039 | 14800 | 3330 | 7800 | 1750 | 8500 | - |
| 206S-HYB#1 | 30 | 1.1811 | 62 | 2.4409 | 16 | 0.6299 | 1.0 | 0.039 | 20300 | 4560 | 11200 | 2520 | 12000 | 15600 |
| 206SFF-HYB#1 | 30 | 1.1811 | 62 | 2.4409 | 16 | 0.6299 | 1.0 | 0.039 | 20300 | 4560 | 11200 | 2520 | 12000 | 15600 |
| 206SZZ-HYB#1 | 30 | 1.1811 | 62 | 2.4409 | 16 | 0.6299 | 1.0 | 0.039 | 20300 | 4560 | 11200 | 2520 | 7500 | - |
| 207S-HYB#1 | 35 | 1.3780 | 72 | 2.8346 | 17 | 0.6693 | 1.0 | 0.039 | 27000 | 6070 | 15300 | 3440 | 10800 | 13200 |
| 207SFF-HYB#1 | 35 | 1.3780 | 72 | 2.8346 | 17 | 0.6693 | 1.0 | 0.039 | 27000 | 6070 | 15300 | 3440 | 10800 | 13200 |
| 207SZZ-HYB#1 | 35 | 1.3780 | 72 | 2.8346 | 17 | 0.6693 | 1.0 | 0.039 | 27000 | 6070 | 15300 | 3440 | 6300 | - |
| 208S-HYB#1 | 40 | 1.5748 | 80 | 3.1496 | 18 | 0.7087 | 1.0 | 0.039 | 32500 | 7310 | 19000 | 4270 | 10200 | 12000 |
| 208SFF-HYB#1 | 40 | 1.5748 | 80 | 3.1496 | 18 | 0.7087 | 1.0 | 0.039 | 32500 | 7310 | 19000 | 4270 | 10200 | 12000 |
| 208SZZ-HYB#1 | 40 | 1.5748 | 80 | 3.1496 | 18 | 0.7087 | 1.0 | 0.039 | 32500 | 7310 | 19000 | 4270 | 5600 | - |
| 209S-HYB#1 | 45 | 1.7717 | 85 | 3.3465 | 19 | 0.7480 | 1.0 | 0.039 | 35100 | 7890 | 21600 | 4860 | 9000 | 10800 |
| 209SFF-HYB#1 | 45 | 1.7717 | 85 | 3.3465 | 19 | 0.7480 | 1.0 | 0.039 | 35100 | 7890 | 21600 | 4860 | 9000 | 10800 |
| 209SZZ-HYB#1 | 45 | 1.7717 | 85 | 3.3465 | 19 | 0.7480 | 1.0 | 0.039 | 35100 | 7890 | 21600 | 4860 | 5000 | - |
| 210S-HYB#1 | 50 | 1.9685 | 90 | 3.5433 | 20 | 0.7874 | 1.0 | 0.039 | 37100 | 8340 | 23200 | 5220 | 8400 | 10200 |
| 210SFF-HYB#1 | 50 | 1.9685 | 90 | 3.5433 | 20 | 0.7874 | 1.0 | 0.039 | 37100 | 8340 | 23200 | 5220 | 8400 | 10200 |
| 210SZZ-HYB#1 | 50 | 1.9685 | 90 | 3.5433 | 20 | 0.7874 | 1.0 | 0.039 | 37100 | 8340 | 23200 | 5220 | 4800 | - |
| 211S-HYB#1 | 55 | 2.1654 | 100 | 3.9370 | 21 | 0.8268 | 1.5 | 0.059 | 46200 | 10390 | 29000 | 6520 | 7500 | 9000 |
| 211SFF-HYB#1 | 55 | 2.1654 | 100 | 3.9370 | 21 | 0.8268 | 1.5 | 0.059 | 46200 | 10390 | 29000 | 6520 | 7500 | 9000 |
| 211SZZ-HYB#1 | 55 | 2.1654 | 100 | 3.9370 | 21 | 0.8268 | 1.5 | 0.059 | 46200 | 10390 | 29000 | 6520 | 4300 | - |
| 212S-HYB#1 | 60 | 2.3622 | 110 | 4.3307 | 22 | 0.8661 | 1.5 | 0.059 | 55300 | 12430 | 36000 | 8090 | 7200 | 8400 |
| 212SFF-HYB#1 | 60 | 2.3622 | 110 | 4.3307 | 22 | 0.8661 | 1.5 | 0.059 | 55300 | 12430 | 36000 | 8090 | 7200 | 8400 |
| 212SZZ-HYB#1 | 60 | 2.3622 | 110 | 4.3307 | 22 | 0.8661 | 1.5 | 0.059 | 55300 | 12430 | 36000 | 8090 | 4000 | - |
| 213S-HYB#1 | 65 | 2.5591 | 120 | 4.7244 | 23 | 0.9055 | 1.5 | 0.059 | 58500 | 13150 | 40500 | 9100 | 6300 | 7500 |
| 213SFF-HYB#1 | 65 | 2.5591 | 120 | 4.7244 | 23 | 0.9055 | 1.5 | 0.059 | 58500 | 13150 | 40500 | 9100 | 6300 | 7500 |
| 213SZZ-HYB#1 | 65 | 2.5591 | 120 | 4.7244 | 23 | 0.9055 | 1.5 | 0.059 | 58500 | 13150 | 40500 | 9100 | 3600 | - |
| 214S-HYB#1 | 70 | 2.7559 | 125 | 4.9213 | 24 | 0.9449 | 1.5 | 0.059 | 63700 | 14320 | 45000 | 10120 | 6000 | 7200 |
| 214SFF-HYB#1 | 70 | 2.7559 | 125 | 4.9213 | 24 | 0.9449 | 1.5 | 0.059 | 63700 | 14320 | 45000 | 10120 | 6000 | 7200 |
| 214SZZ-HYB#1 | 70 | 2.7559 | 125 | 4.9213 | 24 | 0.9449 | 1.5 | 0.059 | 63700 | 14320 | 45000 | 10120 | 3400 | - |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil.
For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice.
For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at 33$\frac{1}{3}$ rpm.

| | Bore | | Outside diameter | | Width | | Fillet radius[1] | | Basic radial load rating | | | | Speed rating | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d | | D | | B | | $r_a$ | | C[2] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **215S-HYB#1** | 75 | **2.9528** | 130 | **5.1181** | 25 | **0.9843** | 1.5 | **0.059** | 68900 | **15490** | 49000 | **11020** | 5700 | 6700 |
| **215SFF-HYB#1** | 75 | **2.9528** | 130 | **5.1181** | 25 | **0.9843** | 1.5 | **0.059** | 68900 | **15490** | 49000 | **11020** | 5700 | 6700 |
| **215SZZ-HYB#1** | 75 | **2.9528** | 130 | **5.1181** | 25 | **0.9843** | 1.5 | **0.059** | 68900 | **15490** | 49000 | **11020** | 3200 | - |
| **216S-HYB#1** | 80 | **3.1496** | 140 | **5.5118** | 26 | **1.0236** | 2.0 | **0.079** | 72800 | **16370** | 55000 | **12360** | 5400 | 6300 |
| **217S-HYB#1** | 85 | **3.3465** | 150 | **5.9055** | 28 | **1.1024** | 2.0 | **0.079** | 87100 | **19580** | 64000 | **14390** | 5100 | 6000 |
| **218S-HYB#1** | 90 | **3.5433** | 160 | **6.2992** | 30 | **1.1811** | 2.0 | **0.079** | 101000 | **22710** | 73500 | **16520** | 4500 | 5400 |
| **219S-HYB#1** | 95 | **3.7402** | 170 | **6.6929** | 32 | **1.2598** | 2.0 | **0.079** | 114000 | **25630** | 81500 | **18320** | 4300 | 5100 |
| **220S-HYB#1** | 100 | **3.9370** | 180 | **7.0866** | 34 | **1.3386** | 2.0 | **0.079** | 127000 | **28550** | 93000 | **20910** | 4000 | 4900 |
| **222S-HYB#1** | 110 | **4.3307** | 200 | **7.8740** | 38 | **1.4961** | 2.0 | **0.079** | 151000 | **33950** | 118000 | **26530** | 3600 | 4300 |
| **224S-HYB#1** | 120 | **4.7244** | 215 | **8.4646** | 40 | **1.5748** | 2.0 | **0.079** | 146000 | **32820** | 118000 | **26530** | 3300 | 4000 |
| **226S-HYB#1** | 130 | **5.1181** | 230 | **9.0551** | 40 | **1.5748** | 3.0 | **0.118** | 156000 | **35070** | 132000 | **29670** | 2900 | 3600 |
| **228S-HYB#1** | 140 | **5.5118** | 250 | **9.8425** | 42 | **1.6535** | 3.0 | **0.118** | 165000 | **37090** | 150000 | **33720** | 2700 | 3400 |
| **230S-HYB#1** | 150 | **5.9055** | 270 | **10.6299** | 45 | **1.7717** | 3.0 | **0.118** | 174000 | **39120** | 166000 | **37320** | 2500 | 3200 |
| **232S-HYB#1** | 160 | **6.2992** | 290 | **11.4173** | 48 | **1.8898** | 3.0 | **0.118** | 186000 | **41810** | 186000 | **41810** | 2300 | 3000 |
| **236S-HYB#1** | 180 | **7.0866** | 320 | **12.5984** | 52 | **2.0472** | 4.0 | **0.157** | 229000 | **51480** | 240000 | **53950** | 2000 | 2600 |

# 300S
# medium hybrid series



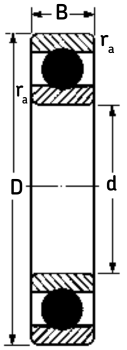

The 300S medium hybrid series consists of single-row radial conrad-type bearings made with bores from 30 mm to 180 mm for use in applications that would use the characteristics of traditional 300S series, but also utilize the benefits of the hybrid solution.

| MRC bearing number | Bore | | Outside diameter | | Width | | Fillet radius[1] | | Basic radial load rating | | | | Speed rating | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dynamic | | Static | | | |
| | d | | D | | B | | $r_a$ | | C[2] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **306S-HYB#1** | 30 | **1.1811** | 72 | **2.8346** | 19 | **0.7480** | 1 | **0.039** | 29600 | **6650** | 16000 | **3600** | 10800 | 13200 |
| **306SFF-HYB#1** | 30 | **1.1811** | 72 | **2.8346** | 19 | **0.7480** | 1 | **0.039** | 29600 | **6650** | 16000 | **3600** | 10800 | 13200 |
| **306SZZ-HYB#1** | 30 | **1.1811** | 72 | **2.8346** | 19 | **0.7480** | 1 | **0.039** | 29600 | **6650** | 16000 | **3600** | 6300 | - |
| **307S-HYB#1** | 35 | **1.3780** | 80 | **3.1496** | 21 | **0.8268** | 1.5 | **0.059** | 35100 | **7890** | 19000 | **4270** | 10200 | 12000 |
| **307SFF-HYB#1** | 35 | **1.3780** | 80 | **3.1496** | 21 | **0.8268** | 1.5 | **0.059** | 35100 | **7890** | 19000 | **4270** | 10200 | 12000 |
| **307SZZ-HYB#1** | 35 | **1.3780** | 80 | **3.1496** | 21 | **0.8268** | 1.5 | **0.059** | 35100 | **7890** | 19000 | **4270** | 6000 | - |
| **308S-HYB#1** | 40 | **1.5748** | 90 | **3.5433** | 23 | **0.9055** | 1.5 | **0.059** | 42300 | **9510** | 24000 | **5400** | 9000 | 10800 |
| **308SFF-HYB#1** | 40 | **1.5748** | 90 | **3.5433** | 23 | **0.9055** | 1.5 | **0.059** | 42300 | **9510** | 24000 | **5400** | 9000 | 10800 |
| **308SZZ-HYB#1** | 40 | **1.5748** | 90 | **3.5433** | 23 | **0.9055** | 1.5 | **0.059** | 42300 | **9510** | 24000 | **5400** | 5000 | - |
| **309S-HYB#1** | 45 | **1.7717** | 100 | **3.9370** | 25 | **0.9843** | 1.5 | **0.059** | 55300 | **12430** | 31500 | **7080** | 8000 | 9600 |
| **309SFF-HYB#1** | 45 | **1.7717** | 100 | **3.9370** | 25 | **0.9843** | 1.5 | **0.059** | 55300 | **12430** | 31500 | **7080** | 8000 | 9600 |
| **309SZZ-HYB#1** | 45 | **1.7717** | 100 | **3.9370** | 25 | **0.9843** | 1.5 | **0.059** | 55300 | **12430** | 31500 | **7080** | 4500 | - |
| **310S-HYB#1** | 50 | **1.9685** | 110 | **4.3307** | 27 | **1.0630** | 2 | **0.079** | 65000 | **14610** | 38000 | **8540** | 7500 | 9000 |
| **310SFF-HYB#1** | 50 | **1.9685** | 110 | **4.3307** | 27 | **1.0630** | 2 | **0.079** | 65000 | **14610** | 38000 | **8540** | 7500 | 9000 |
| **310SZZ-HYB#1** | 50 | **1.9685** | 110 | **4.3307** | 27 | **1.0630** | 2 | **0.079** | 65000 | **14610** | 38000 | **8540** | 4300 | - |
| **311S-HYB#1** | 55 | **2.1654** | 120 | **4.7244** | 29 | **1.1417** | 2 | **0.079** | 74100 | **16660** | 45000 | **10120** | 6700 | 8000 |
| **311SFF-HYB#1** | 55 | **2.1654** | 120 | **4.7244** | 29 | **1.1417** | 2 | **0.079** | 74100 | **16660** | 45000 | **10120** | 6700 | 8000 |
| **311SZZ-HYB#1** | 55 | **2.1654** | 120 | **4.7244** | 29 | **1.1417** | 2 | **0.079** | 74100 | **16660** | 45000 | **10120** | 3800 | - |
| **312S-HYB#1** | 60 | **2.3622** | 130 | **5.1181** | 31 | **1.2205** | 2 | **0.079** | 85200 | **19150** | 52000 | **11690** | 6000 | 7200 |
| **312SFF-HYB#1** | 60 | **2.3622** | 130 | **5.1181** | 31 | **1.2205** | 2 | **0.079** | 85200 | **19150** | 52000 | **11690** | 6000 | 7200 |
| **312SZZ-HYB#1** | 60 | **2.3622** | 130 | **5.1181** | 31 | **1.2205** | 2 | **0.079** | 85200 | **19150** | 52000 | **11690** | 3400 | - |
| **313S-HYB#1** | 65 | **2.5591** | 140 | **5.5118** | 33 | **1.2992** | 2 | **0.079** | 97500 | **21920** | 60000 | **13490** | 5700 | 6800 |
| **313SFF-HYB#1** | 65 | **2.5591** | 140 | **5.5118** | 33 | **1.2992** | 2 | **0.079** | 97500 | **21920** | 60000 | **13490** | 5700 | 6800 |
| **313SZZ-HYB#1** | 65 | **2.5591** | 140 | **5.5118** | 33 | **1.2992** | 2 | **0.079** | 97500 | **21920** | 60000 | **13490** | 3200 | - |
| **314S-HYB#1** | 70 | **2.7559** | 150 | **5.9055** | 35 | **1.3780** | 2 | **0.079** | 111000 | **24950** | 68000 | **15290** | 5400 | 6400 |
| **314SFF-HYB#1** | 70 | **2.7559** | 150 | **5.9055** | 35 | **1.3780** | 2 | **0.079** | 111000 | **24950** | 68000 | **15290** | 5400 | 6400 |
| **314SZZ-HYB#1** | 70 | **2.7559** | 150 | **5.9055** | 35 | **1.3780** | 2 | **0.079** | 111000 | **24950** | 68000 | **15290** | 3000 | - |
| **315S-HYB#1** | 75 | **2.9528** | 160 | **6.2992** | 37 | **1.4567** | 2 | **0.079** | 119000 | **26750** | 76500 | **17200** | 5100 | 6100 |
| **315SFF-HYB#1** | 75 | **2.9528** | 160 | **6.2992** | 37 | **1.4567** | 2 | **0.079** | 119000 | **26750** | 76500 | **17200** | 5100 | 6100 |
| **315SZZ-HYB#1** | 75 | **2.9528** | 160 | **6.2992** | 37 | **1.4567** | 2 | **0.079** | 119000 | **26750** | 76500 | **17200** | 2800 | - |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil.
For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice.
For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width in. | Fillet radius[1)] $r_a$ mm | Fillet radius[1)] in. | Basic radial load rating Dynamic $C^{2)}$ N | Dynamic lbf | Static $C_0$ N | Static lbf | Speed rating Grease rpm | Speed rating Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **316S-HYB#1** | 80 | **3.1496** | 170 | **6.6929** | 39 | **1.5354** | 2 | **0.079** | 130000 | **29230** | 86500 | **19450** | 4500 | 5400 |
| **316SF-HYB#1** | 80 | **3.1496** | 170 | **6.6929** | 39 | **1.5354** | 2 | **0.079** | 130000 | **29230** | 86500 | **19450** | 4500 | 5400 |
| **316SFF-HYB#1** | 80 | **3.1496** | 170 | **6.6929** | 39 | **1.5354** | 2 | **0.079** | 130000 | **29230** | 86500 | **19450** | 4500 | 5400 |
| **317S-HYB#1** | 85 | **3.3465** | 180 | **7.0866** | 41 | **1.6142** | 2.5 | **0.098** | 140000 | **31470** | 96500 | **21690** | 4300 | 5100 |
| **318S-HYB#1** | 90 | **3.5433** | 180 | **7.0866** | 41 | **1.6142** | 2.5 | **0.098** | 151000 | **33950** | 108000 | **24280** | 4000 | 4800 |
| **319S-HYB#1** | 95 | **3.7402** | 200 | **7.8740** | 41 | **1.6142** | 2.5 | **0.098** | 159000 | **35740** | 118000 | **26530** | 3800 | 4500 |
| **320S-HYB#3** | 100 | **3.9370** | 215 | **8.4646** | 47 | **1.8504** | 2.5 | **0.098** | 174000 | **39120** | 140000 | **31470** | 3600 | 4300 |
| **322S-HYB#3** | 110 | **4.3307** | 240 | **9.4488** | 50 | **1.9685** | 2.5 | **0.098** | 187500 | **42150** | 174800 | **39300** | 3100 | 3700 |
| **322SF-HYB#3** | 110 | **4.3307** | 240 | **9.4488** | 50 | **1.9685** | 2.5 | **0.098** | 187500 | **42150** | 174800 | **39300** | 3100 | 3700 |
| **324S-HYB#3** | 120 | **4.7244** | 260 | **10.2362** | 55 | **2.1654** | 2.5 | **0.098** | 200300 | **45030** | 198700 | **44670** | 2800 | 3600 |
| **326S-HYB#3** | 130 | **5.1181** | 280 | **11.0236** | 58 | **2.2835** | 4 | **0.157** | 212200 | **47700** | 222800 | **50090** | 2600 | 3400 |
| **328S-HYB#3** | 140 | **5.5118** | 300 | **11.8110** | 62 | **2.4409** | 4 | **0.157** | 265900 | **59780** | 265900 | **59780** | 2400 | 3200 |
| **330S-HYB#3** | 150 | **5.9055** | 320 | **12.5984** | 65 | **2.5591** | 4 | **0.157** | 288700 | **64900** | 306500 | **68900** | 2200 | 3000 |
| **332S-HYB#3** | 160 | **6.2992** | 340 | **13.3858** | 68 | **2.6772** | 4 | **0.157** | 330900 | **74390** | 391100 | **87920** | 2000 | 2800 |
| **334S-HYB#3** | 170 | **6.6929** | 360 | **14.1732** | 72 | **2.8346** | 4 | **0.157** | 330900 | **74390** | 391100 | **87920** | 1800 | 2600 |
| **336S-HYB#3** | 180 | **7.0866** | 380 | **14.9606** | 75 | **2.9528** | 4 | **0.157** | 330900 | **74390** | 391100 | **87920** | 1600 | 2400 |

# HNCR
# hybrid series single-row deep groove (SRDG) ball bearings




**Next-generation bearing steel**

Featuring extreme corrosion resistance, superior fatigue life and increase material hardness, HNCR represents the next-generation bearing material of choice – one that's enabled MRC to produce the industry's first corrosion-resistant steel ball bearing.

All MRC HNCR hybrid SRDG ball bearings can also be specified with a lubricant option that meets the needs of the application's specifications and requirements. Other sizes not listed in the chart, can be supplied through a MTO program.

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1] $r_a$ mm | in. | Basic radial load rating Dynamic $C$[2] N | lbf | Static $C_0$ N | lbf | Speed rating Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200S-HNCR-HYB | 10 | 0.3937 | 30 | 1.1811 | 9 | 0.3543 | 0.64 | 0.025 | 5100 | 1150 | 2370 | 530 | 28800 | 36000 |
| 200SZZ-HNCR-HYB | 10 | 0.3937 | 30 | 1.1811 | 9 | 0.3543 | 0.64 | 0.025 | 5100 | 1150 | 2370 | 530 | 17000 | - |
| 201S-HNCR-HYB | 12 | 0.4724 | 32 | 1.2598 | 10 | 0.3937 | 0.64 | 0.025 | 6800 | 1530 | 3050 | 685 | 26400 | 33600 |
| 201SZZ-HNCR-HYB | 12 | 0.4724 | 32 | 1.2598 | 10 | 0.3937 | 0.64 | 0.025 | 6800 | 1530 | 3050 | 685 | 15000 | - |
| 202S-HNCR-HYB | 15 | 0.5906 | 35 | 1.3780 | 11 | 0.4331 | 0.64 | 0.025 | 7600 | 1710 | 3700 | 830 | 22800 | 28800 |
| 202SZZ-HNCR-HYB | 15 | 0.5906 | 35 | 1.3780 | 11 | 0.4331 | 0.64 | 0.025 | 7600 | 1710 | 3700 | 830 | 13000 | - |
| 203S-HNCR-HYB | 17 | 0.6693 | 40 | 1.5748 | 12 | 0.4724 | 0.64 | 0.025 | 9550 | 2150 | 4760 | 1070 | 20400 | 24000 |
| 203SZZ-HNCR-HYB | 17 | 0.6693 | 40 | 1.5748 | 12 | 0.4724 | 0.64 | 0.025 | 9550 | 2150 | 4760 | 1070 | 12000 | - |
| 204S-HNCR-HYB | 20 | 0.7874 | 47 | 1.8504 | 14 | 0.5512 | 1.00 | 0.039 | 12800 | 2870 | 6580 | 1480 | 18000 | 21600 |
| 204SZZ-HNCR-HYB | 20 | 0.7874 | 47 | 1.8504 | 14 | 0.5512 | 1.00 | 0.039 | 12800 | 2870 | 6580 | 1480 | 10000 | - |
| 205S-HNCR-HYB | 25 | 0.9843 | 52 | 2.0472 | 15 | 0.5906 | 1.00 | 0.039 | 14000 | 3150 | 7830 | 1760 | 14400 | 18000 |
| 205SZZ-HNCR-HYB | 25 | 0.9843 | 52 | 2.0472 | 15 | 0.5906 | 1.00 | 0.039 | 14000 | 3150 | 7830 | 1760 | 8500 | - |
| 206S-HNCR-HYB | 30 | 1.1811 | 62 | 2.4409 | 16 | 0.6299 | 1.00 | 0.039 | 19500 | 4370 | 11300 | 2530 | 12000 | 15600 |
| 206SZZ-HNCR-HYB | 30 | 1.1811 | 62 | 2.4409 | 16 | 0.6299 | 1.00 | 0.039 | 19500 | 4370 | 11300 | 2530 | 7500 | - |
| 207S-HNCR-HYB | 35 | 1.3780 | 72 | 2.8346 | 17 | 0.6693 | 1.00 | 0.039 | 25500 | 5730 | 15300 | 3440 | 10800 | 13200 |
| 207SZZ-HNCR-HYB | 35 | 1.3780 | 72 | 2.8346 | 17 | 0.6693 | 1.00 | 0.039 | 25500 | 5730 | 15300 | 3440 | 6300 | - |
| 208S-HNCR-HYB | 40 | 1.5748 | 80 | 3.1496 | 18 | 0.7087 | 1.00 | 0.039 | 30700 | 6900 | 19000 | 4270 | 10200 | 12000 |
| 208SZZ-HNCR-HYB | 40 | 1.5748 | 80 | 3.1496 | 18 | 0.7087 | 1.00 | 0.039 | 30700 | 6900 | 19000 | 4270 | 5600 | - |
| 209S-HNCR-HYB | 45 | 1.7717 | 85 | 3.3465 | 19 | 0.7480 | 1.00 | 0.039 | 33200 | 7460 | 21600 | 4860 | 9000 | 10800 |
| 209SZZ-HNCR-HYB | 45 | 1.7717 | 85 | 3.3465 | 19 | 0.7480 | 1.00 | 0.039 | 33200 | 7460 | 21600 | 4860 | 5000 | - |
| 210S-HNCR-HYB | 50 | 1.9685 | 90 | 3.5433 | 20 | 0.7874 | 1.00 | 0.039 | 35100 | 7890 | 23200 | 5220 | 8400 | 10200 |
| 210SZZ-HNCR-HYB | 50 | 1.9685 | 90 | 3.5433 | 20 | 0.7874 | 1.00 | 0.039 | 35100 | 7890 | 23200 | 5220 | 4800 | - |
| 100KS-HNCR-HYB | 10 | 0.3937 | 26 | 1.0236 | 8 | 0.3150 | 0.30 | 0.012 | 4620 | 1040 | 1960 | 440 | 36000 | 43200 |
| 100KSZZ-HNCR-HYB | 10 | 0.3937 | 26 | 1.0236 | 8 | 0.3150 | 0.30 | 0.012 | 4620 | 1040 | 1960 | 440 | 19000 | - |
| 101KS-HNCR-HYB | 12 | 0.4724 | 28 | 1.1024 | 8 | 0.3150 | 0.30 | 0.012 | 5070 | 1140 | 2360 | 530 | 31200 | 38400 |
| 101KSZZ-HNCR-HYB | 12 | 0.4724 | 28 | 1.1024 | 8 | 0.3150 | 0.30 | 0.012 | 5070 | 1140 | 2360 | 530 | 17000 | - |
| 102KS-HNCR-HYB | 15 | 0.5906 | 32 | 1.2598 | 89 | 3.5039 | 0.30 | 0.012 | 5590 | 1260 | 2850 | 640 | 26400 | 33600 |
| 102KSZZ-HNCR-HYB | 15 | 0.5906 | 32 | 1.2598 | 89 | 3.5039 | 0.30 | 0.012 | 5590 | 1260 | 2850 | 640 | 14000 | - |
| 103KS-HNCR-HYB | 17 | 0.6693 | 35 | 1.3780 | 10 | 0.3937 | 0.30 | 0.012 | 6050 | 1360 | 3250 | 730 | 22800 | 28800 |
| 103KSZZ-HNCR-HYB | 17 | 0.6693 | 35 | 1.3780 | 10 | 0.3937 | 0.30 | 0.012 | 6050 | 1360 | 3250 | 730 | 13000 | - |

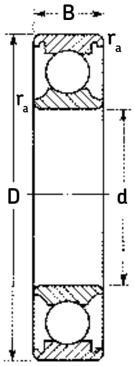
1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil.
For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice.
For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^{1}/_{3}$ rpm.



MRC

| MRC bearing number | Bore | | Outside diameter | | Width | | Fillet radius[1] | | Basic radial load rating | | | | Speed rating | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dynamic | | Static | | | |
| | d | | D | | B | | $r_a$ | | C[2] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **104KS-HNCR-HYB** | 20 | **0.7874** | 42 | **1.6535** | 12 | **0.4724** | 0.64 | **0.025** | 9360 | **2100** | 5000 | **1120** | 20400 | 24000 |
| **104KSZZ-HNCR-HYB** | 20 | **0.7874** | 42 | **1.6535** | 12 | **0.4724** | 0.64 | **0.025** | 9360 | **2100** | 5000 | **1120** | 11000 | - |
| **105KS-HNCR-HYB** | 25 | **0.9843** | 47 | **1.8504** | 12 | **0.4724** | 0.64 | **0.025** | 11200 | **2520** | 6550 | **1470** | 18000 | 21600 |
| **105KSZZ-HNCR-HYB** | 25 | **0.9843** | 47 | **1.8504** | 12 | **0.4724** | 0.64 | **0.025** | 11200 | **2520** | 6550 | **1470** | 9500 | - |
| **106KS-HNCR-HYB** | 30 | **1.1811** | 55 | **2.1654** | 13 | **0.5118** | 1.00 | **0.039** | 13200 | **2970** | 8270 | **1860** | 14400 | 18000 |
| **106KSZZ-HNCR-HYB** | 30 | **1.1811** | 55 | **2.1654** | 13 | **0.5118** | 1.00 | **0.039** | 13200 | **2970** | 8270 | **1860** | 8000 | - |
| **38-HNCR-HYB** | 8 | **0.3150** | 22 | **0.8661** | 7 | **0.2756** | 0.30 | **0.012** | 3250 | **730** | 1360 | **306** | 43200 | 51600 |
| **38ZZ-HNCR-HYB** | 8 | **0.3150** | 22 | **0.8661** | 7 | **0.2756** | 0.30 | **0.012** | 3250 | **730** | 1360 | **306** | 23000 | - |
| **1900S-HNCR-HYB** | 10 | **0.3937** | 22 | **0.8661** | 6 | **0.2362** | 0.30 | **0.012** | 2510 | **565** | 1120 | **252** | 40800 | 48000 |
| **1900SZZ-HNCR-HYB** | 10 | **0.3937** | 22 | **0.8661** | 6 | **0.2362** | 0.30 | **0.012** | 2510 | **565** | 1120 | **252** | 19000 | - |
| **1901S-HNCR-HYB** | 12 | **0.4724** | 24 | **0.9449** | 6 | **0.2362** | 0.30 | **0.012** | 2890 | **649** | 1460 | **329** | 36000 | 43200 |
| **1901SZZ-HNCR-HYB** | 12 | **0.4724** | 24 | **0.9449** | 6 | **0.2362** | 0.30 | **0.012** | 2890 | **649** | 1460 | **329** | 18000 | - |
| **1902S-HNCR-HYB** | 15 | **0.5906** | 28 | **1.1024** | 7 | **0.2756** | 0.30 | **0.012** | 4030 | **906** | 2040 | **459** | 28800 | 36000 |
| **1902SZZ-HNCR-HYB** | 15 | **0.5906** | 28 | **1.1024** | 7 | **0.2756** | 0.30 | **0.012** | 4030 | **906** | 2040 | **459** | 16000 | - |
| **1903S-HNCR-HYB** | 17 | **0.6693** | 30 | **1.1811** | 7 | **0.2756** | 0.30 | **0.012** | 4360 | **980** | 2320 | **522** | 26400 | 33600 |
| **1903SZZ-HNCR-HYB** | 17 | **0.6693** | 30 | **1.1811** | 7 | **0.2756** | 0.30 | **0.012** | 4360 | **980** | 2320 | **522** | 14000 | - |
| **1904S-HNCR-HYB** | 20 | **0.7874** | 37 | **1.4567** | 9 | **0.3543** | 0.30 | **0.012** | 6380 | **1430** | 3680 | **827** | 21600 | 26400 |
| **1904SZZ-HNCR-HYB** | 20 | **0.7874** | 37 | **1.4567** | 9 | **0.3543** | 0.30 | **0.012** | 6380 | **1430** | 3680 | **827** | 12000 | - |
| **1905S-HNCR-HYB** | 25 | **0.9843** | 42 | **1.6535** | 9 | **0.3543** | 0.30 | **0.012** | 7030 | **1580** | 4530 | **1020** | 19200 | 22800 |
| **1905SZZ-HNCR-HYB** | 25 | **0.9843** | 42 | **1.6535** | 9 | **0.3543** | 0.30 | **0.012** | 7030 | **1580** | 4530 | **1020** | 10000 | - |

# Stainless steel
# single-row deep groove (SRDG) ball bearings




FFST, KSFFST, SFFST
Two shields

ZZST, KSZZST, SZZST
Two seals

MRC stainless steel (SRDG) ball bearings are used in fish, poultry and other food processing applications. Examples of popular applications include automatic filleting and sizing equipment aboard fishing trawlers, and evisceration equipment in poultry plants.

MRC stainless steel SRDG ball bearings exhibit significantly longer life than standard bearings in a wide range of demanding applications.

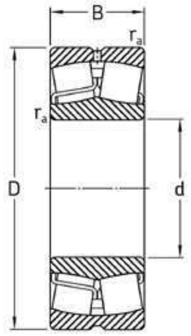
All MRC stainless steel SRDG ball bearings can also be specified with a solid lubricant pack that prevents grease washout during washdowns and helps protect against contamination in harsh environments.

Note: For equivalent load and life calculations see page 47 and 48.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1)] $r_a$ mm | Fillet radius[1)] $r_a$ in. | $ZD^2$ mm | $ZD^2$ in. | Basic radial load rating Dynamic $C$[2)] N | Dynamic $C$[2)] lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[3)] Open and shielded Grease rpm | Open and shielded Oil rpm | Single and double sealed Grease rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 38ZZST | 8.0 | .3150 | 22.0 | .8661 | 7.0 | .2756 | .30 | .012 | 110 | .17 | 2 600 | 585 | 1 360 | 306 | 36 000 | 43 000 | 23 000 |
| R2ST | 3.2 | .1250 | 9.5 | .3750 | 4.0 | .1562 | .30 | .012 | 19 | .03 | 250 | 56 | 120 | 27 | 75 000 | 91 000 | 52 000 |
| R2FFST | 3.2 | .1250 | 9.5 | .3750 | 4.0 | .1562 | .30 | .012 | 19 | .03 | 250 | 56 | 120 | 27 | 75 000 | 91 000 | 52 000 |
| R3FFST | 4.8 | .1875 | 12.7 | .5000 | 5.0 | .1960 | .30 | .012 | 39 | .06 | 765 | 172 | 490 | 110 | 57 000 | 69 000 | 40 000 |
| R3ZZST | 4.8 | .1875 | 12.7 | .5000 | 5.0 | .1960 | .30 | .012 | 39 | .06 | 765 | 172 | 490 | 110 | 57 000 | 69 000 | 40 000 |
| R4FFST | 6.4 | .2500 | 15.9 | .6250 | 5.0 | .1960 | .30 | .012 | 45 | .07 | 1 180 | 266 | 620 | 139 | 44 000 | 54 000 | 31 000 |
| R6FFST | 9.5 | .3750 | 22.2 | .8750 | 7.1 | .2812 | .41 | .016 | 110 | .17 | 2 660 | 597 | 1 340 | 301 | 31 000 | 38 000 | 21 000 |
| R6ZZST | 9.5 | .3750 | 22.2 | .8750 | 7.1 | .2812 | .41 | .016 | 110 | .17 | 2 660 | 597 | 1 340 | 301 | 31 000 | 38 000 | 21 000 |
| R8ST | 12.7 | .5000 | 28.6 | 1.1250 | 6.4 | .2500 | .41 | .016 | 181 | .28 | 4 060 | 912 | 2 400 | 540 | 24 000 | 29 000 | 16 000 |
| R8FFST | 12.7 | .5000 | 28.6 | 1.1250 | 7.9 | .3125 | .41 | .016 | 181 | .28 | 4 060 | 912 | 2 400 | 540 | 24 000 | 29 000 | 16 000 |
| R8ZZST | 12.7 | .5000 | 28.6 | 1.1250 | 7.9 | .3125 | .41 | .016 | 181 | .28 | 4 060 | 912 | 2 400 | 540 | 24 000 | 29 000 | 16 000 |
| R10ZZST | 15.9 | .6250 | 34.9 | 1.3750 | 8.7 | .3438 | .79 | .031 | 226 | .35 | 4 840 | 1 090 | 3 250 | 731 | 18 000 | 22 000 | 13 000 |
| R12FFST | 19.1 | .7500 | 41.3 | 1.6250 | 11.1 | .4375 | .79 | .031 | 361 | .56 | 7 490 | 1 680 | 5 100 | 1 150 | 16 000 | 19 000 | 11 000 |
| R12ZZST | 19.1 | .7500 | 41.3 | 1.6250 | 11.1 | .4375 | .79 | .031 | 361 | .56 | 7 490 | 1 680 | 5 100 | 1 150 | 16 000 | 19 000 | 11 000 |
| 101KSZZST | 12.0 | .4724 | 28.0 | 1.1024 | 8.0 | .3125 | .30 | .012 | 181 | .28 | 4 060 | 912 | 2 360 | 530 | 26 000 | 32 000 | 17 000 |
| 102KSZZST | 15.0 | .5906 | 32.0 | 1.2598 | 9.0 | .3543 | .30 | .012 | 206 | .32 | 4 470 | 1 010 | 2 850 | 640 | 22 000 | 28 000 | 14 000 |
| 103KSZZST | 17.0 | .6693 | 35.0 | 1.3780 | 10.0 | .3937 | .30 | .012 | 226 | .35 | 4 840 | 1 090 | 3 250 | 730 | 19 000 | 24 000 | 13 000 |
| 104KSZZST | 20.0 | .7874 | 42.0 | 1.6535 | 12.0 | .4724 | .64 | .025 | 361 | .56 | 7 490 | 1 680 | 5 000 | 1 120 | 17 000 | 20 000 | 11 000 |
| 105KSZZST | 25.0 | .9843 | 47.0 | 1.8504 | 12.0 | .4724 | .64 | .025 | 458 | .71 | 8 960 | 2 010 | 6 550 | 1 470 | 15 000 | 18 000 | 9 500 |
| 106KSZZST | 30.0 | 1.1811 | 55.0 | 2.1654 | 13.0 | .5118 | 1.00 | .040 | 561 | .87 | 9 470 | 2 130 | 7 390 | 1 660 | 12 000 | 15 000 | 8 000 |
| 200SZZST | 10.0 | .3937 | 30.0 | 1.1811 | 9.0 | .3543 | .64 | .025 | 181 | .28 | 4 060 | 912 | 2 360 | 531 | 24 000 | 30 000 | 17 000 |
| 201SST | 12.0 | .4724 | 32.0 | 1.2598 | 10.0 | .3937 | .64 | .025 | 252 | .39 | 5 510 | 1 240 | 3 100 | 697 | 22 000 | 28 000 | 15 000 |
| 201SZZST | 12.0 | .4724 | 32.0 | 1.2598 | 10.0 | .3937 | .64 | .025 | 252 | .39 | 5 510 | 1 240 | 3 100 | 697 | 22 000 | 28 000 | 15 000 |
| 202SST | 15.0 | .5906 | 35.0 | 1.3780 | 11.0 | .4331 | .64 | .025 | 290 | .45 | 6 240 | 1 400 | 3 250 | 843 | 19 000 | 24 000 | 13 000 |
| 202SFFST | 15.0 | .5906 | 35.0 | 1.3780 | 11.0 | .4331 | .64 | .025 | 290 | .45 | 6 240 | 1 400 | 3 250 | 843 | 19 000 | 24 000 | 13 000 |
| 202SZZST | 15.0 | .5906 | 35.0 | 1.3780 | 11.0 | .4331 | .64 | .025 | 290 | .45 | 6 240 | 1 400 | 3 250 | 843 | 19 000 | 24 000 | 13 000 |
| 203SFFST | 17.0 | .6693 | 40.0 | 1.5748 | 12.0 | .4724 | .64 | .025 | 361 | .56 | 7 650 | 1 720 | 4 750 | 1 070 | 17 000 | 20 000 | 12 000 |
| 203SZZST | 17.0 | .6693 | 40.0 | 1.5748 | 12.0 | .4724 | .64 | .025 | 361 | .56 | 7 650 | 1 720 | 4 750 | 1 070 | 17 000 | 20 000 | 12 000 |
| 204SST | 20.0 | .7874 | 47.0 | 1.8504 | 14.0 | .5512 | 1.00 | .040 | 503 | .78 | 10 200 | 2 280 | 6 550 | 1 470 | 15 000 | 18 000 | 10 000 |
| 204SZZST | 20.0 | .7874 | 47.0 | 1.8504 | 14.0 | .5512 | 1.00 | .040 | 503 | .78 | 10 200 | 2 280 | 6 550 | 1 470 | 15 000 | 18 000 | 10 000 |
| 205SFFST | 25.0 | .9843 | 52.0 | 2.0472 | 15.0 | .5906 | 1.00 | .040 | 568 | .88 | 11 200 | 2 520 | 7 800 | 1 750 | 12 000 | 15 000 | 8 500 |
| 205SZZST | 25.0 | .9843 | 52.0 | 2.0472 | 15.0 | .5906 | 1.00 | .040 | 568 | .88 | 11 200 | 2 520 | 7 800 | 1 750 | 12 000 | 15 000 | 8 500 |
| 206SST | 30.0 | 1.1811 | 62.0 | 2.4409 | 16.0 | .6299 | 1.00 | .040 | 819 | 1.27 | 15 600 | 3 510 | 11 200 | 2 520 | 10 000 | 13 000 | 7 500 |
| 206SFFST | 30.0 | 1.1811 | 62.0 | 2.4409 | 16.0 | .6299 | 1.00 | .040 | 819 | 1.27 | 15 600 | 3 510 | 11 200 | 2 520 | 10 000 | 13 000 | 7 500 |
| 206SZZST | 30.0 | 1.1811 | 62.0 | 2.4409 | 16.0 | .6299 | 1.00 | .040 | 819 | 1.27 | 15 600 | 3 510 | 11 200 | 2 520 | 10 000 | 13 000 | 7 500 |
| 207SZZST | 35.0 | 1.3780 | 72.0 | 2.8346 | 17.0 | .6693 | 1.00 | .040 | 1 111 | 1.72 | 20 500 | 4 610 | 15 300 | 3 440 | 9 000 | 11 000 | 6 300 |
| 304SZZST | 20.0 | .7874 | 52.0 | 2.0472 | 15.0 | .5906 | 1.00 | .040 | 632 | .98 | 12 700 | 2 860 | 7 800 | 1 750 | 13 000 | 16 000 | 9 500 |
| 305SZZST | 25.0 | .9843 | 62.0 | 2.4409 | 17.0 | .6693 | 1.00 | .040 | 864 | 1.34 | 17 000 | 3 810 | 10 800 | 2 430 | 11 000 | 14 000 | 7 500 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.
3) Listed values are for a pressed stainless steel cage; ABEC-1. The speed ratings have been determined through historical application and practice.

# HNCR
## spherical roller bearing series (SRB)



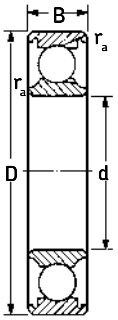

All MRC HNCR spherical roller bearings consist of double row spherical bearings for use in applications that would use the traditional spherical roller bearing, but also utilize the benefits of the HNCR material.

| MRC bearing number | Bore | | Outside diameter | | Width | | Fillet radius[1] | | Basic radial load rating | | | | Speed rating | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dynamic | | Static | | | |
| | d | | D | | B | | $r_a$ | | C[2] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **DR22313-HNCR** | 65 | **2.5591** | 140 | **5.5118** | 48 | **1.8898** | 2.00 | **0.079** | 340000 | **76440** | 360000 | **80940** | 3800 | - |
| **DR22314-HNCR** | 70 | **2.7559** | 150 | **5.9055** | 51 | **2.0079** | 2.00 | **0.079** | 400000 | **89930** | 430000 | **96670** | 3400 | - |
| **DR22315-HNCR** | 75 | **2.9528** | 160 | **6.2992** | 55 | **2.1654** | 2.00 | **0.079** | 440000 | **98920** | 475000 | **106790** | 3200 | - |
| **DR22316-HNCR** | 80 | **3.1496** | 170 | **6.6929** | 58 | **2.2835** | 2.00 | **0.079** | 490000 | **110160** | 540000 | **121400** | 3000 | - |
| **DR22317-HNCR** | 85 | **3.3465** | 180 | **7.0866** | 60 | **2.3622** | 2.50 | **0.098** | 550000 | **123650** | 620000 | **139390** | 2800 | - |
| **DR22318-HNCR** | 90 | **3.5433** | 190 | **7.4803** | 64 | **2.5197** | 2.50 | **0.098** | 495000 | **111290** | 635500 | **142870** | 2600 | - |
| **DR22320-HNCR** | 100 | **3.9370** | 215 | **8.4646** | 73 | **2.8740** | 2.50 | **0.098** | 815000 | **183220** | 950000 | **213570** | 2400 | - |
| **DR22322-HNCR** | 110 | **4.3307** | 240 | **9.4488** | 80 | **3.1496** | 2.50 | **0.098** | 950000 | **213570** | 1120000 | **251790** | 2000 | - |
| **DR23226-HNCR** | 130 | **5.1181** | 230 | **9.0551** | 80 | **3.1496** | 2.50 | **0.098** | 780000 | **175360** | 1060000 | **238300** | 1900 | - |



MRC

# “Max-type” (M-type) single-row filling-notch ball bearings




MRC’s single-row maximum M-type bearings have a single filling slot in both the inner and outer ring, enabling more balls to be added. Because of the increased ball complement, filling slot bearings have a higher radial load carrying capacity than bearings without filling slots, but their axial load carrying capacity is reduced. They can be used in applications with heavy radial loads, or a combination of radial and thrust loads, where the radial load is pre-dominant. They are not recommended for use where only thrust loads are present.

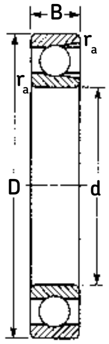
The M-type bearing is also designated as the “notched” type because it has a filling notch on one side of the inner and outer rings.

Normally furnished with ABMA C0 radial clearance.

## Cage types and materials

Type and material available is a two-piece, pressed steel, ball riding, stayrod cage.

# 100M narrow-type light series




MF
One shield

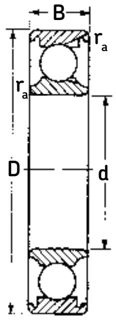
The 100M narrow-type light series consists of single-row radial filling-notch bearings having bores ranging from 50 mm to 160 mm. They can be used in applications with high radial loads, or a combination of radial and thrust loads, where the radial load is predominant. They are not recommended for use where only thrust loads are present.

Note: This series is obsoleted but is still manufactured in a few sizes for replacement parts. Please check availability before designing into equipment.

| MRC bearing number | Bore d | | Outside diameter D | | Width B | | Fillet radius[1)] $r_a$ | | Basic radial load rating Dynamic $C$[3)] | | Static $C_0$ | | Speed rating[2)] Open and shielded Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **110M**[4)] | 50 | **1.9685** | 90 | **3.5433** | 11 | **.4331** | 1.0 | **.04** | 18 700 | **4 200** | 19 600 | **4 400** | 5 600 | 6 800 |
| **113M**[4)] | 65 | **2.5591** | 115 | **4.5276** | 14 | **.5512** | 1.0 | **.04** | 31 900 | **7 170** | 36 500 | **8 210** | 4 400 | 5 400 |
| **117M**[4)] | 85 | **3.3465** | 145 | **5.7087** | 18 | **.7087** | 1.5 | **.06** | 58 300 | **13 100** | 68 000 | **15 300** | 3 400 | 4 200 |
| **120M** | 100 | **3.9370** | 160 | **6.2992** | 28 | **1.1024** | 2.0 | **.08** | 96 800 | **21 800** | 108 000 | **24 300** | 3 000 | 3 700 |
| **124M** | 120 | **4.7244** | 190 | **7.4803** | 32 | **1.2598** | 2.0 | **.08** | 123 000 | **27 700** | 146 000 | **32 800** | 2 500 | 3 100 |
| **126M** | 130 | **5.1181** | 205 | **8.0709** | 34 | **1.3386** | 2.0 | **.08** | 138 000 | **31 000** | 166 000 | **37 300** | 2 300 | 2 800 |
| **128M** | 140 | **5.5118** | 220 | **8.6614** | 36 | **1.4173** | 2.0 | **.08** | 157 000 | **35 300** | 190 000 | **42 800** | 2 100 | 2 600 |
| **132M** | 160 | **6.2992** | 250 | **9.8425** | 40 | **1.5748** | 2.0 | **.08** | 190 000 | **42 700** | 255 000 | **57 300** | 1 900 | 2 300 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.
4) Typically non-stocked sizes, please check availability before designing into equipment.

# 200M light series





MF
One shield


MFF
Two shields


MG
Snap-ring


MFG
Shield and snap-ring

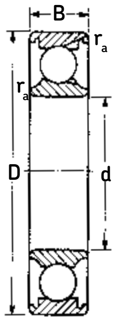

MFFG
Two shields and snap-ring

200M light series bearings are single-row maximum capacity filling-notch bearings. They are used in applications with heavy radial loads, or a combination of radial and thrust loads where the radial load is predominant. They are not to be used where only thrust loads are present.

| MRC bearing number | Bore | | Outside diameter | | Width | | Fillet radius[1] | | Basic radial load rating | | | | Speed rating[2] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dynamic | | Static | | Open and shielded | |
| | d | | D | | B | | $r_a$ | | $C$[3] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **202M**[4] | 15 | **.5906** | 35 | **1.3780** | 11 | **.4331** | .64 | **.025** | 8 250 | **1 850** | 5 100 | **1 150** | 16 000 | 20 000 |
| **203M**[4] | 17 | **.6693** | 40 | **1.5748** | 12 | **.4724** | .64 | **.025** | 8 970 | **2 020** | 6 000 | **1 350** | 14 000 | 17 000 |
| **204M**[4] | 20 | **.7874** | 47 | **1.8504** | 14 | **.5512** | 1.00 | **.040** | 12 500 | **2 810** | 8 300 | **1 870** | 12 000 | 15 000 |
| **205M**[4] | 25 | **.9843** | 52 | **2.0472** | 15 | **.5906** | 1.00 | **.040** | 16 100 | **3 620** | 11 200 | **2 510** | 11 000 | 13 000 |
| **206M** | 30 | **1.1811** | 62 | **2.4409** | 16 | **.6299** | 1.00 | **.040** | 22 900 | **5 150** | 17 000 | **3 820** | 9 000 | 11 000 |
| **207M** | 35 | **1.3780** | 72 | **2.8346** | 17 | **.6693** | 1.00 | **.040** | 29 700 | **6 680** | 22 800 | **5 130** | 7 800 | 9 500 |
| **208M** | 40 | **1.5748** | 80 | **3.1496** | 18 | **.7087** | 1.00 | **.040** | 33 600 | **7 550** | 26 500 | **5 960** | 7 000 | 8 500 |
| **209M** | 45 | **1.7717** | 85 | **3.3465** | 19 | **.7480** | 1.00 | **.040** | 39 300 | **8 840** | 32 500 | **7 310** | 6 200 | 7 500 |
| **210M** | 50 | **1.9685** | 90 | **3.5433** | 20 | **.7874** | 1.00 | **.040** | 39 100 | **8 790** | 34 500 | **7 760** | 5 700 | 7 000 |
| **211M** | 55 | **2.1654** | 100 | **3.9370** | 21 | **.8268** | 1.50 | **.060** | 48 400 | **10 900** | 44 000 | **9 890** | 5 200 | 6 300 |
| **212M** | 60 | **2.3622** | 110 | **4.3307** | 22 | **.8661** | 1.50 | **.060** | 56 100 | **12 600** | 51 000 | **11 500** | 4 900 | 6 000 |
| **213M** | 65 | **2.5591** | 120 | **4.7244** | 23 | **.9055** | 1.50 | **.060** | 69 300 | **15 600** | 65 500 | **14 700** | 4 300 | 5 300 |
| **214M** | 70 | **2.7559** | 125 | **4.9213** | 24 | **.9449** | 1.50 | **.060** | 69 300 | **15 600** | 65 500 | **14 700** | 4 100 | 5 000 |
| **215M** | 75 | **2.9528** | 130 | **5.1181** | 25 | **.9843** | 1.50 | **.060** | 74 800 | **16 800** | 72 000 | **16 200** | 3 900 | 4 800 |
| **216M** | 80 | **3.1496** | 140 | **5.5118** | 26 | **1.0236** | 2.00 | **.080** | 85 800 | **19 300** | 86 500 | **19 400** | 3 700 | 4 500 |
| **217M** | 85 | **3.3465** | 150 | **5.9055** | 28 | **1.1024** | 2.00 | **.080** | 88 000 | **19 800** | 93 000 | **20 900** | 3 500 | 4 300 |
| **218M** | 90 | **3.5433** | 160 | **6.2992** | 30 | **1.1811** | 2.00 | **.080** | 101 000 | **22 700** | 108 000 | **24 300** | 3 300 | 4 000 |
| **219M** | 95 | **3.7482** | 170 | **6.6929** | 32 | **1.2598** | 2.00 | **.080** | 111 000 | **25 000** | 118 000 | **26 500** | 3 100 | 3 800 |
| **220M** | 100 | **3.9370** | 180 | **7.0866** | 34 | **1.3386** | 2.00 | **.080** | 127 000 | **28 600** | 134 000 | **30 100** | 2 800 | 3 400 |
| **221M** | 105 | **4.1339** | 190 | **7.4803** | 36 | **1.4173** | 2.00 | **.080** | 142 000 | **31 900** | 153 000 | **34 400** | 2 600 | 3 200 |
| **222M** | 110 | **4.3307** | 215 | **7.8740** | 38 | **1.4961** | 2.00 | **.080** | 154 000 | **34 600** | 170 000 | **38 200** | 2 500 | 3 100 |
| **224M** | 120 | **4.7244** | 200 | **8.4646** | 40 | **1.5748** | 2.00 | **.080** | 172 000 | **38 700** | 200 000 | **45 000** | 2 300 | 2 800 |
| **226M** | 130 | **5.1181** | 230 | **9.0551** | 40 | **1.5748** | 2.50 | **.100** | 179 000 | **40 300** | 216 000 | **48 500** | 2 100 | 2 600 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.
4) Typically non-stocked sizes, please check availability before designing into equipment.

# 300M medium series




MF
One shield

MFF
Two shields

MG
Snap-ring

MFG
Shield and snap-ring

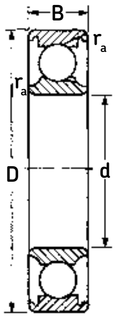
MFFG
Two shields and snap-ring

The 300M medium series consists of single-row maximum capacity filling-notch bearings with bores ranging from 17 mm to 110 mm. They are used with very heavy radial loads, or a combination of radial and thrust loads where the radial load is predominant. They are not to be used where only a thrust load is present.

| | Bore | | Outside diameter | | Width | | Fillet radius[1] | | Basic radial load rating | | | | Speed rating[2] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dynamic | | Static | | Open and shielded | |
| MRC bearing number | d | | D | | B | | $r_a$ | | $C$[3] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| 303M | 17 | .6693 | 47 | 1.8504 | 14 | .5512 | 1.0 | .04 | 14 200 | 3 200 | 8 500 | 1 910 | 12 000 | 15 000 |
| 304M | 20 | .7874 | 52 | 2.0472 | 15 | .5906 | 1.0 | .04 | 15 900 | 3 570 | 10 200 | 2 280 | 11 000 | 14 000 |
| 305M | 25 | .9843 | 62 | 2.4409 | 17 | .6693 | 1.0 | .04 | 22 900 | 5 150 | 15 600 | 3 510 | 9 800 | 12 000 |
| 306M | 30 | 1.1811 | 72 | 2.8346 | 19 | .7480 | 1.0 | .04 | 29 200 | 6 560 | 20 800 | 4 680 | 7 800 | 9 500 |
| 307M | 35 | 1.3780 | 80 | 3.1496 | 21 | .8268 | 1.5 | .06 | 39 300 | 8 830 | 28 500 | 6 410 | 7 000 | 8 500 |
| 308M | 40 | 1.5748 | 90 | 3.5433 | 23 | .9055 | 1.5 | .06 | 46 800 | 10 500 | 36 000 | 8 090 | 6 200 | 7 500 |
| 309M | 45 | 1.7717 | 100 | 3.9370 | 25 | .9843 | 1.5 | .06 | 59 400 | 13 400 | 46 500 | 10 500 | 5 700 | 7 000 |
| 310M | 50 | 1.9685 | 110 | 4.3307 | 27 | 1.0630 | 2.0 | .08 | 64 400 | 14 500 | 52 000 | 11 700 | 5 200 | 6 300 |
| 311M | 55 | 2.1654 | 120 | 4.7244 | 29 | 1.1417 | 2.0 | .08 | 79 200 | 17 800 | 65 500 | 14 700 | 4 600 | 5 600 |
| 312M | 60 | 2.3622 | 130 | 5.1181 | 31 | 1.2205 | 2.0 | .08 | 91 300 | 20 500 | 78 000 | 17 500 | 4 300 | 5 300 |
| 313M | 65 | 2.5591 | 140 | 5.5118 | 33 | 1.2992 | 2.0 | .08 | 102 000 | 22 900 | 90 000 | 20 200 | 3 900 | 4 800 |
| 314M | 70 | 2.7559 | 150 | 5.9055 | 35 | 1.3780 | 2.0 | .08 | 114 000 | 25 600 | 102 000 | 22 900 | 3 700 | 4 500 |
| 315M | 75 | 2.9528 | 160 | 6.2992 | 37 | 1.4567 | 2.0 | .08 | 125 000 | 28 000 | 116 000 | 26 000 | 3 500 | 4 300 |
| 316M | 80 | 3.1496 | 170 | 6.6929 | 39 | 1.5354 | 2.0 | .08 | 138 000 | 31 000 | 129 000 | 29 000 | 3 300 | 4 000 |
| 317M | 85 | 3.3465 | 180 | 7.0866 | 41 | 1.6142 | 2.5 | .10 | 147 000 | 33 000 | 146 000 | 32 800 | 3 100 | 3 800 |
| 318M | 90 | 3.5433 | 190 | 7.4803 | 43 | 1.6929 | 2.5 | .10 | 157 000 | 35 300 | 160 000 | 36 000 | 2 800 | 3 400 |
| 319M | 95 | 3.7402 | 200 | 7.8740 | 45 | 1.7717 | 2.5 | .10 | 168 000 | 37 800 | 180 000 | 40 500 | 2 600 | 3 200 |
| 320M | 100 | 3.9370 | 215 | 8.4646 | 47 | 1.8504 | 2.5 | .10 | 194 000 | 43 600 | 212 000 | 47 700 | 2 500 | 3 000 |
| 321M | 105 | 4.1339 | 225 | 8.8583 | 49 | 1.9291 | 2.5 | .10 | 205 000 | 46 100 | 232 000 | 52 200 | 2 400 | 2 900 |
| 322M | 110 | 4.3307 | 240 | 9.4488 | 50 | 1.9685 | 2.5 | .10 | 216 000 | 48 600 | 250 000 | 56 200 | 2 200 | 2 700 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^{1}/_{3}$ rpm.

# 400M heavy series




MF
One shield

MFF
Two shields

MG
Snap-ring

MFG
Shield and
snap-ring

MFFG
Two shields
and snap-ring

400M heavy series bearings are single-row maximum capacity filling-notch bearings with bores ranging from 17 mm to 100 mm. They are used with extremely heavy radial loads, or a combination of radial and thrust loads where the radial load is predominant. They are not used where only thrust loads are present.

| | Bore | | Outside diameter | | Width | | Fillet radius[1)] | | Basic radial load rating | | | | Speed rating[2)] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dynamic | | Static | | Open and shielded | |
| MRC bearing number | d | | D | | B | | $r_a$ | | C[3)] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **403M** | 17 | **.6693** | 62 | **2.4409** | 17 | **.6693** | 1.0 | **.04** | 23 300 | **5 240** | 14 600 | **3 280** | 11 000 | 13 000 |
| **404M** | 20 | **.7874** | 72 | **2.8346** | 19 | **.7480** | 1.0 | **.04** | 29 200 | **6 560** | 18 600 | **4 210** | 9 000 | 11 000 |
| **405M** | 25 | **.9843** | 80 | **3.1496** | 21 | **.8268** | 1.5 | **.06** | 35 800 | **8 050** | 23 600 | **5 270** | 7 700 | 9 400 |
| **406M** | 30 | **1.1811** | 90 | **3.5433** | 23 | **.9055** | 1.5 | **.06** | 45 700 | **10 300** | 32 500 | **7 310** | 6 200 | 7 500 |
| **407M** | 35 | **1.3780** | 100 | **3.9370** | 25 | **.9843** | 1.5 | **.06** | 53 900 | **12 100** | 39 000 | **8 770** | 5 600 | 6 800 |
| **408M** | 40 | **1.5748** | 110 | **4.3307** | 27 | **1.0630** | 2.0 | **.08** | 68 200 | **15 300** | 52 000 | **11 700** | 5 300 | 6 500 |
| **409M** | 45 | **1.7717** | 120 | **4.7244** | 29 | **1.1417** | 2.0 | **.08** | 78 100 | **17 600** | 61 000 | **13 700** | 4 800 | 5 900 |
| **410M** | 50 | **1.9685** | 130 | **5.1181** | 31 | **1.2205** | 2.0 | **.08** | 88 000 | **19 800** | 71 000 | **16 000** | 4 400 | 5 400 |
| **411M** | 55 | **2.1654** | 140 | **5.5118** | 33 | **1.2992** | 2.0 | **.08** | 108 000 | **24 200** | 90 000 | **20 200** | 4 100 | 5 000 |
| **412M** | 60 | **2.3622** | 150 | **5.9055** | 35 | **1.3780** | 2.0 | **.08** | 117 000 | **26 200** | 102 000 | **22 900** | 3 800 | 4 600 |
| **413M** | 65 | **2.5591** | 160 | **6.2992** | 37 | **1.4567** | 2.0 | **.08** | 128 000 | **28 800** | 112 000 | **25 200** | 3 400 | 4 100 |
| **414M** | 70 | **2.7559** | 180 | **7.0866** | 42 | **1.6535** | 2.5 | **.10** | 147 000 | **33 100** | 140 000 | **31 500** | 3 200 | 3 900 |
| **415M** | 75 | **2.9528** | 190 | **7.4803** | 45 | **1.7717** | 2.5 | **.10** | 157 000 | **55 300** | 153 000 | **34 400** | 3 000 | 3 600 |
| **416M** | 80 | **3.1496** | 200 | **7.8740** | 48 | **1.8898** | 2.5 | **.10** | 176 000 | **89 600** | 176 000 | **39 600** | 2 800 | 3 400 |
| **417M** | 85 | **3.3465** | 210 | **8.2677** | 52 | **2.0472** | 3.0 | **.12** | 190 000 | **42 700** | 200 000 | **45 000** | 2 600 | 3 200 |
| **418M** | 90 | **3.5433** | 225 | **8.8583** | 54 | **2.1260** | 3.0 | **.12** | 198 000 | **44 500** | 212 000 | **47 700** | 2 500 | 3 000 |
| **419M** | 95 | **3.7402** | 250 | **9.8425** | 55 | **2.1654** | 3.0 | **.12** | 229 000 | **51 500** | 260 000 | **58 500** | 2 300 | 2 800 |
| **420M** | 100 | **3.9370** | 265 | **10.4331** | 60 | **2.3622** | 3.0 | **.12** | 251 000 | **56 500** | 300 000 | **67 400** | 2 100 | 2 600 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# Single-row filling-notch ball bearings, M-type

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

$P = F_R + F_A$

$P$ = Dynamic equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

When $F_A/F_R > 0.6$ or $P > 0.5\ C_0$,
a non-filling notch bearing is suggested.

$C_0$ = Basic static radial load rating

### Life rating

$$L10 = \left(\frac{C}{P}\right)^3 \text{ (millions of revolutions)}$$

or

$$L10_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 \text{ (hours)}$$

$C$ = Basic dynamic load rating

$P$ = Dynamic equivalent radial load

$n$ = Speed in rpm

### Static equivalent radial load

$P_0 = F_R + 0.5\ F_A$

Provided $F_A/F_R$ is always $\leq 0.6$

$P_0$ = Static equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

# Single-row filling-notch ball bearings, M-type

## Dynamic equivalent radial load and life calculation examples

Bearing size: 309M
Speed = 2000 rpm
Basic dynamic load rating (C) = 13400 lbf

**ABMA C0 internal clearance**

### Case 1

Radial load ($F_R$) = 1890
Equivalent load (P) = $F_R + F_A$
P = $F_R$ = 1890

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13400}{1890}\right)^3 = 356 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L10}_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{13400}{1890}\right)$$

= 2967 Hrs

### Case 2

Radial load ($F_R$) = 1890
Thrust load ($F_A$) = 950
$F_A / F_R$ = 950/1890 = 0.50
Since $F_A / F_R < 0.60$
P = $F_R + F_A$ = 1890 + 950 = 2840

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13400}{2840}\right)^3 = 105 \times 10^6 \text{ Rev.}$$

or

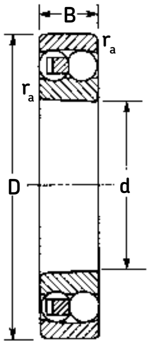
$$\text{Life (L10}_h) = \frac{10^6}{60n} = \left(\frac{13400}{2840}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{13400}{2840}\right)^3$$

= 875 Hrs

### Case 3

Radial load ($F_R$) = 1890
Thrust load ($F_A$) = 1250
$F_A/F_R$ = 1250/1890 = 0.66
Since $F_A / F_R > 0.60$, use a non-filling notch bearing.

# Self-aligning ball bearings




Self-aligning bearings have two rows of balls with a common sphered raceway in the outer ring. This gives the bearings their self-aligning property, permitting angular misalignment of the shaft relative to the housing. They are therefore particularly suitable for applications where misalignment can arise from errors in mounting or from shaft deflection. In addition, non-sealed self-aligning ball bearings have the lowest friction of any bearing type.

Bearing sizes having the E suffix have higher load ratings than the original standard design because of improvements in internal construction. They are supplied with a glass fiber reinforced, 6.6 polyamide cage as standard. Machined brass or pressed steel cages are supplied on other sizes.

# Self-aligning ball bearings

## Basic design

Self-aligning bearings of the basic design are available with both a cylindrical bore and a tapered bore with a 1:12 taper. Tapered bore bearings are furnished with adapter sleeves, including nut and lock washer, with which the bearings can be secured to smooth or stepped shafts. They are identified by suffix letter K.

## Sealed bearings

Self-aligning bearings with cylindrical and tapered bores are available with contact seals on both sides, identified by the suffix 2RS1. The seals are made of oil and wear resistant synthetic rubber reinforced by a steel insert. The operating temperature range for the seals, with a suitable grease, is -40° C to 120° C (-40° F to 248° F). Sealed bearings are supplied with a lithium base grease suitable for an operating temperature range of -30° C to 110° C (-22° F to 230° F).

Sealed bearings with a tapered bore require a special adapter sleeve and lock washer identified by the suffix letter C. The lock washers have a circular beading on the side facing the bearing to prevent interference with the seal.

## Extended inner ring bearings

Self-aligning bearings with an extended inner ring are used in applications employing commercial ground shafting. A special bore tolerance allows easy mounting and dismounting.

These bearings are located axially by pins or shouldered screws which engage in a slot at one side of the inner ring. The pins or screws also prevent the inner ring from turning on the shaft. When used in pairs, the slots on the inner ring must either be adjacent or at the outboard positions to provide shaft location in both directions.

## Tolerances

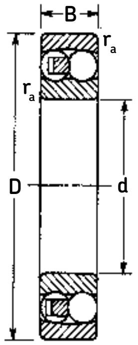
Self-aligning bearings are manufactured to ABEC-1 tolerances as shown on page 245. The exceptions are the bore and inner ring width on extended inner ring bearings, which are manufactured to the tolerances shown in the table below.

Notes:

All tolerances in ten thousandths inches (.0001) and micrometers (um).
Top figure is inch, bottom is micrometer.

| Bore diameter (mm) over | Incl | Bore diameter tolerance | | Bore out-of round (max) | Inner ring width |
|---|---|---|---|---|---|
| 2.5 | 10 | +3 | –3 | 6 | –130 |
| | | +8 | –8 | 14 | –330 |
| 10.0 | 18 | +3 | –3 | 6 | –130 |
| | | +8 | –8 | 14 | –330 |
| 18.0 | 30 | +4 | –4 | 7 | –130 |
| | | +10 | –10 | 17 | –330 |
| 30.0 | 50 | +5 | –5 | 8 | –153 |
| | | +12 | –12 | 21 | –390 |
| 50.0 | 80 | +6 | –6 | 10 | –181 |
| | | +15 | –15 | 26 | –460 |

# 100, 1200, 1200E series
# Self-aligning ball bearings

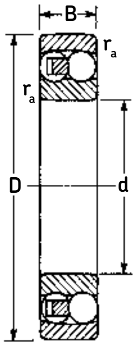



Cylindrical bore

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | Fillet radius[1] $r_a$ in. | Calculation factors e | $Y_1$ | $Y_2$ | $Y_0$ | Basic radial load rating Dynamic $C$[2] N | Dynamic lbf | Static $C_0$ N | Static lbf | Speed rating Grease rpm | Speed rating Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **135** | 5 | **.1969** | 19 | **.7480** | 6 | **.2362** | .30 | **.012** | .33 | 1.9 | 3.0 | 2.0 | 2 510 | **564** | 480 | **108** | 32 000 | 38 000 |
| **126** | 6 | **.2362** | 19 | **.7480** | 6 | **.2362** | .30 | **.012** | .33 | 1.9 | 3.0 | 2.0 | 2 510 | **564** | 480 | **108** | 32 000 | 38 000 |
| **127** | 7 | **.2756** | 22 | **.8661** | 7 | **.2756** | .30 | **.012** | .33 | 1.9 | 3.0 | 2.0 | 2 650 | **596** | 560 | **126** | 30 000 | 36 000 |
| **108** | 8 | **.3150** | 22 | **.8661** | 7 | **.2756** | .30 | **.012** | .33 | 1.9 | 3.0 | 2.0 | 2 650 | **596** | 560 | **126** | 30 000 | 36 000 |
| **129** | 9 | **.3543** | 26 | **1.0236** | 8 | **.3150** | .60 | **.024** | .33 | 1.9 | 3.0 | 2.0 | 3 900 | **877** | 815 | **183** | 26 000 | 32 000 |
| **1200E** | 10 | **.3937** | 30 | **1.1811** | 9 | **.3543** | .60 | **.024** | .33 | 1.9 | 3.0 | 2.0 | 5 530 | **1 240** | 1 180 | **265** | 24 000 | 30 000 |
| **1201E** | 12 | **.4724** | 32 | **1.2598** | 10 | **.3937** | .60 | **.024** | .33 | 1.9 | 3.0 | 2.0 | 6 240 | **1 400** | 1 430 | **321** | 22 000 | 28 000 |
| **1202E** | 15 | **.5906** | 35 | **1.3780** | 11 | **.4331** | .60 | **.024** | .33 | 1.9 | 3.0 | 2.0 | 7 410 | **1 670** | 1 760 | **396** | 19 000 | 24 000 |
| **1203E** | 17 | **.6693** | 40 | **1.5748** | 12 | **.4724** | .60 | **.024** | .31 | 2.0 | 3.1 | 2.2 | 8 840 | **1 990** | 2 200 | **495** | 18 000 | 22 000 |
| **1204E** | 20 | **.7874** | 47 | **1.8504** | 14 | **.5512** | 1.0 | **.039** | .30 | 2.1 | 3.3 | 2.2 | 12 700 | **2 860** | 3 400 | **764** | 15 000 | 18 000 |
| **1205E** | 25 | **.9843** | 52 | **2.0472** | 15 | **.5906** | 1.0 | **.039** | .28 | 2.2 | 3.5 | 2.5 | 14 300 | **3 220** | 4 000 | **899** | 13 000 | 16 000 |
| **1206E** | 30 | **1.1811** | 62 | **2.4409** | 16 | **.6299** | 1.0 | **.039** | .25 | 2.5 | 3.9 | 2.5 | 15 600 | **3 510** | 4 650 | **1 050** | 10 000 | 13 000 |
| **1207E** | 35 | **1.3780** | 72 | **2.8346** | 17 | **.6693** | 1.0 | **.039** | .23 | 2.7 | 4.2 | 2.8 | 19 000 | **4 270** | 6 000 | **1 350** | 9 000 | 11 000 |
| **1208E** | 40 | **1.5748** | 80 | **3.1496** | 18 | **.7087** | 1.0 | **.039** | .22 | 2.9 | 4.5 | 2.8 | 19 900 | **4 470** | 6 950 | **1 560** | 8 500 | 10 000 |
| **1209E** | 45 | **1.7717** | 85 | **3.3465** | 19 | **.7480** | 1.0 | **.039** | .21 | 3.0 | 4.6 | 3.2 | 22 900 | **5 150** | 7 800 | **1 750** | 7 500 | 9 000 |
| **1210E** | 50 | **1.9685** | 90 | **3.5433** | 20 | **.7874** | 1.0 | **.039** | .21 | 3.0 | 4.6 | 3.2 | 26 500 | **5 960** | 9 150 | **2 060** | 7 000 | 8 500 |
| **1211E** | 55 | **2.1654** | 100 | **3.9370** | 21 | **.8268** | 1.5 | **.059** | .19 | 3.3 | 5.1 | 3.6 | 27 600 | **6 210** | 10 600 | **2 380** | 6 300 | 7 500 |
| **1212E** | 60 | **2.3622** | 110 | **4.3307** | 22 | **.8661** | 1.5 | **.059** | .19 | 3.3 | 5.1 | 3.6 | 31 200 | **7 010** | 12 200 | **2 740** | 5 600 | 6 700 |
| **1213E** | 65 | **2.5591** | 120 | **4.7244** | 23 | **.9055** | 1.5 | **.059** | .18 | 3.5 | 5.4 | 3.6 | 35 100 | **7 890** | 14 000 | **3 150** | 5 300 | 6 300 |
| **1214** | 70 | **2.7559** | 125 | **4.9213** | 24 | **.9449** | 1.5 | **.059** | .18 | 3.5 | 5.4 | 3.6 | 34 500 | **7 760** | 13 700 | **3 080** | 5 000 | 6 000 |
| **1215** | 75 | **2.9528** | 130 | **5.1181** | 25 | **.9843** | 1.5 | **.059** | .17 | 3.7 | 5.7 | 4.0 | 39 000 | **8 770** | 15 600 | **3 510** | 4 800 | 5 600 |
| **1216** | 80 | **3.1496** | 140 | **5.5118** | 26 | **1.0236** | 2.0 | **.079** | .16 | 3.9 | 6.1 | 4.0 | 39 700 | **8 930** | 17 000 | **3 820** | 4 500 | 5 300 |
| **1217** | 85 | **3.3465** | 150 | **5.9055** | 28 | **1.1024** | 2.0 | **.079** | .17 | 3.7 | 5.7 | 4.0 | 48 800 | **11 000** | 20 800 | **4 680** | 4 000 | 4 800 |
| **1218** | 90 | **3.5433** | 160 | **6.2992** | 30 | **1.1811** | 2.0 | **.079** | .17 | 3.7 | 5.7 | 4.0 | 57 200 | **12 900** | 23 600 | **5 310** | 3 800 | 4 500 |
| **1219** | 95 | **3.7402** | 170 | **6.6929** | 32 | **1.2598** | 2.0 | **.079** | .17 | 3.7 | 5.7 | 4.0 | 63 700 | **14 300** | 27 000 | **6 070** | 3 600 | 4 300 |
| **1220** | 100 | **3.9370** | 180 | **7.0866** | 34 | **1.3386** | 2.0 | **.079** | .17 | 3.7 | 5.7 | 4.0 | 68 900 | **15 500** | 30 000 | **6 740** | 3 400 | 4 000 |
| **1221** | 105 | **4.1339** | 190 | **7.4803** | 36 | **1.4173** | 2.0 | **.079** | .17 | 3.7 | 5.7 | 4.0 | 74 100 | **16 700** | 32 500 | **7 310** | 3 200 | 3 800 |
| **1222** | 110 | **4.3307** | 200 | **7.8740** | 38 | **1.4961** | 2.0 | **.079** | .17 | 3.7 | 5.7 | 4.0 | 88 400 | **19 900** | 39 000 | **8 770** | 3 000 | 3 600 |
| **1224** | 120 | **4.7244** | 215 | **8.4646** | 42 | **1.6535** | 2.0 | **.079** | .19 | 3.3 | 5.1 | 3.6 | 119 000 | **26 800** | 53 000 | **11 900** | 2 800 | 3 400 |
| **1226** | 130 | **5.1181** | 230 | **9.0551** | 46 | **1.8110** | 2.5 | **.098** | .19 | 3.3 | 5.1 | 3.6 | 127 000 | **28 600** | 58 500 | **13 200** | 2 600 | 3 200 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.

# 1300, 1300E, 1400 series self-aligning ball bearings

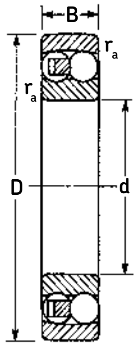



Cylindrical bore

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1] $r_a$ mm | in. | Calculation factors e | $Y_1$ | $Y_2$ | $Y_0$ | Basic radial load rating Dynamic $C$[2] N | lbf | Static $C_0$ N | lbf | Speed rating Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1301E** | 12 | **.4724** | 37 | **1.4567** | 12 | **.4724** | 1.0 | **.039** | .35 | 1.8 | 2.8 | 1.8 | 9 360 | **2 100** | 2 160 | **486** | 18 000 | 22 000 |
| **1302E** | 15 | **.5906** | 42 | **1.6535** | 13 | **.5118** | 1.0 | **.039** | .31 | 2.0 | 3.1 | 2.2 | 10 800 | **2 430** | 2 600 | **585** | 17 000 | 20 000 |
| **1303E** | 17 | **.6693** | 47 | **1.8504** | 14 | **.5512** | 1.0 | **.039** | .30 | 2.1 | 3.3 | 2.2 | 12 700 | **2 860** | 3 400 | **764** | 14 000 | 17 000 |
| **1304E** | 20 | **.7874** | 52 | **2.0472** | 15 | **.5906** | 1.0 | **.039** | .28 | 2.2 | 3.5 | 2.5 | 14 300 | **3 220** | 4 000 | **899** | 12 000 | 15 000 |
| **1305E** | 25 | **.9843** | 62 | **2.4409** | 17 | **.6693** | 1.0 | **.039** | .28 | 2.2 | 3.5 | 2.5 | 19 000 | **4 270** | 5 400 | **1 210** | 9 500 | 12 000 |
| **1306E** | 30 | **1.1811** | 72 | **2.8346** | 19 | **.7480** | 1.0 | **.039** | .25 | 2.5 | 3.9 | 2.5 | 22 500 | **5 060** | 6 800 | **1 530** | 9 000 | 11 000 |
| **1307E** | 35 | **1.3780** | 80 | **3.1496** | 21 | **.8268** | 1.5 | **.059** | .25 | 2.5 | 3.9 | 2.5 | 26 500 | **5 960** | 8 500 | **1 910** | 7 500 | 9 000 |
| **1308E** | 40 | **1.5748** | 90 | **3.5433** | 23 | **.9055** | 1.5 | **.059** | .23 | 2.7 | 4.2 | 2.8 | 33 800 | **7 600** | 11 200 | **2 520** | 6 700 | 8 000 |
| **1309E** | 45 | **1.7717** | 100 | **3.9370** | 25 | **.9843** | 1.5 | **.059** | .23 | 2.7 | 4.2 | 2.8 | 39 000 | **8 770** | 13 400 | **3 010** | 6 300 | 7 500 |
| **1310E** | 50 | **1.9685** | 110 | **4.3307** | 27 | **1.0630** | 2.0 | **.079** | .24 | 2.6 | 4.1 | 2.8 | 43 600 | **9 800** | 14 000 | **3 150** | 5 600 | 6 700 |
| **1311E** | 55 | **2.1654** | 120 | **4.7244** | 29 | **1.1417** | 2.0 | **.079** | .23 | 2.7 | 4.2 | 2.8 | 50 700 | **11 400** | 18 000 | **4 050** | 5 000 | 6 000 |
| **1312E** | 60 | **2.3622** | 130 | **5.1181** | 31 | **1.2205** | 2.0 | **.079** | .23 | 2.7 | 4.2 | 2.8 | 58 500 | **13 200** | 22 000 | **4 950** | 4 500 | 5 300 |
| **1313E** | 65 | **2.5591** | 140 | **5.5118** | 33 | **1.2992** | 2.0 | **.079** | .22 | 2.9 | 4.5 | 2.8 | 65 000 | **14 600** | 25 500 | **5 730** | 4 300 | 5 000 |
| **1314** | 70 | **2.7559** | 150 | **5.9055** | 35 | **1.3780** | 2.0 | **.079** | .22 | 2.9 | 4.5 | 2.8 | 74 100 | **16 700** | 27 500 | **6 180** | 4 000 | 4 800 |
| **1315** | 75 | **2.9528** | 160 | **6.2992** | 37 | **1.4567** | 2.0 | **.079** | .22 | 2.9 | 4.5 | 2.8 | 79 300 | **17 800** | 30 000 | **6 740** | 3 800 | 4 500 |
| **1316** | 80 | **3.1496** | 170 | **6.6929** | 39 | **1.5354** | 2.0 | **.079** | .22 | 2.9 | 4.5 | 2.8 | 88 400 | **19 900** | 33 500 | **7 530** | 3 600 | 4 300 |
| **1317** | 85 | **3.3465** | 180 | **7.0866** | 41 | **1.6142** | 2.5 | **.098** | .22 | 2.9 | 4.5 | 2.8 | 97 500 | **21 900** | 38 000 | **8 540** | 3 400 | 4 000 |
| **1318** | 90 | **3.5433** | 190 | **7.4803** | 43 | **1.6929** | 2.5 | **.098** | .22 | 2.9 | 4.5 | 2.8 | 117 000 | **26 300** | 44 000 | **9 890** | 3 200 | 3 800 |
| **1319** | 95 | **3.7402** | 200 | **7.8740** | 45 | **1.7717** | 2.5 | **.098** | .23 | 2.7 | 4.2 | 2.8 | 133 000 | **29 900** | 51 000 | **11 500** | 3 000 | 3 600 |
| **1320** | 100 | **3.9370** | 215 | **8.4646** | 47 | **1.8504** | 2.5 | **.098** | .23 | 2.7 | 4.2 | 2.8 | 143 000 | **32 200** | 57 000 | **12 800** | 2 800 | 3 400 |
| **1322** | 110 | **4.3307** | 240 | **9.4488** | 50 | **1.9685** | 2.5 | **.098** | .22 | 2.9 | 4.5 | 2.8 | 163 000 | **36 600** | 72 000 | **16 200** | 2 400 | 3 000 |
| **1406** | 30 | **1.1811** | 90 | **3.5433** | 28 | **1.1024** | 1.5 | **.059** | .40 | 1.6 | 2.4 | 1.6 | 59 200 | **13 300** | 17 000 | **3 820** | 6 700 | 8 000 |
| **1407** | 35 | **1.3780** | 100 | **3.9370** | 30 | **1.1811** | 1.5 | **.059** | .37 | 1.7 | 2.6 | 1.8 | 62 400 | **14 000** | 18 000 | **4 050** | 6 300 | 7 500 |
| **1408** | 40 | **1.5748** | 110 | **4.3307** | 33 | **1.2992** | 2.0 | **.079** | .35 | 1.8 | 2.8 | 1.8 | 76 100 | **17 100** | 23 600 | **5 310** | 5 300 | 6 300 |
| **1409** | 45 | **1.7717** | 120 | **4.7244** | 35 | **1.3780** | 2.0 | **.079** | .35 | 1.8 | 2.8 | 1.8 | 88 400 | **19 900** | 27 500 | **6 180** | 5 000 | 6 000 |
| **1410** | 50 | **1.9685** | 130 | **5.1181** | 37 | **1.4567** | 2.0 | **.079** | .35 | 1.8 | 2.8 | 1.8 | 101 000 | **22 700** | 32 000 | **7 190** | 4 800 | 5 600 |
| **1411** | 55 | **2.1654** | 140 | **5.5118** | 40 | **1.5748** | 2.0 | **.079** | .33 | 1.9 | 3.0 | 2.0 | 111 000 | **25 000** | 36 500 | **8 210** | 4 300 | 5 000 |
| **1412** | 60 | **2.3622** | 150 | **5.9055** | 42 | **1.6535** | 2.0 | **.079** | .33 | 1.9 | 3.0 | 2.0 | 125 000 | **28 100** | 41 500 | **9 330** | 3 800 | 4 500 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 2200, 2200E, 2300, 2300E series self-aligning ball bearings

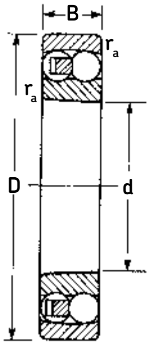



Cylindrical bore

| | | | | | | | | | Calculation factors | | | | Basic radial load rating | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bore | | Outside diameter | | Width | | Fillet radius[1] | | e | $Y_1$ | $Y_2$ | $Y_0$ | Dynamic | | Static | | Speed rating | |
| MRC bearing number | d | | D | | B | | $r_a$ | | | | | | $C^{2)}$ | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | | | | | N | lbf | N | lbf | rpm | rpm |
| **2200E** | 10 | .3937 | 30 | **1.1811** | 14 | **.5512** | .60 | **.024** | .54 | 1.15 | 1.8 | 1.3 | 8 060 | **1 810** | 1 730 | **389** | 22 000 | 28 000 |
| **2201E** | 12 | .4724 | 32 | **1.2598** | 14 | **.5512** | .60 | **.024** | .50 | 1.25 | 2 | 1.3 | 8 520 | **1 920** | 1 900 | **427** | 20 000 | 26 000 |
| **2202E** | 15 | .5906 | 35 | **1.3780** | 14 | **.5512** | .60 | **.024** | .43 | 1.50 | 2.3 | 1.6 | 8 710 | **1 960** | 2 040 | **459** | 18 000 | 22 000 |
| **2203E** | 17 | .6693 | 40 | **1.5748** | 16 | **.6299** | .60 | **.024** | .43 | 1.50 | 2.3 | 1.6 | 10 600 | **2 380** | 2 550 | **573** | 17 000 | 20 000 |
| **2204E** | 20 | .7874 | 47 | **1.8504** | 18 | **.7087** | 1.0 | **.039** | .40 | 1.60 | 2.4 | 1.6 | 16 800 | **3 780** | 4 150 | **933** | 14 000 | 17 000 |
| **2205E** | 25 | .9843 | 52 | **2.0472** | 18 | **.7087** | 1.0 | **.039** | .35 | 1.80 | 2.8 | 1.8 | 16 800 | **3 780** | 4 400 | **989** | 11 000 | 14 000 |
| **2206E** | 30 | **1.1811** | 62 | **2.4409** | 20 | **.7874** | 1.0 | **.039** | .33 | 1.90 | 3 | 2.0 | 23 800 | **5 350** | 6 700 | **1 510** | 9 500 | 12 000 |
| **2207E** | 35 | **1.3780** | 72 | **2.8346** | 23 | **.9055** | 1.0 | **.039** | .31 | 2.00 | 3.1 | 2.2 | 30 700 | **6 900** | 8 800 | **1 980** | 8 500 | 10 000 |
| **2208E** | 40 | **1.5748** | 80 | **3.1496** | 23 | **.9055** | 1.0 | **.039** | .28 | 2.20 | 3.5 | 2.5 | 31 900 | **7 170** | 10 000 | **2 250** | 7 500 | 9 000 |
| **2209E** | 45 | **1.7717** | 85 | **3.3465** | 23 | **.9055** | 1.0 | **.039** | .26 | 2.40 | 3.7 | 2.5 | 32 500 | **7 310** | 10 600 | **2 380** | 7 000 | 8 500 |
| **2210E** | 50 | **1.9685** | 90 | **3.5433** | 23 | **.9055** | 1.0 | **.039** | .23 | 2.70 | 4.2 | 2.8 | 33 800 | **7 600** | 11 200 | **2 520** | 6 300 | 7 500 |
| **2211E** | 55 | **2.1654** | 100 | **3.9370** | 25 | **.9843** | 1.5 | **.059** | .23 | 2.70 | 4.2 | 2.8 | 39 000 | **8 770** | 13 400 | **3 010** | 6 000 | 7 000 |
| **2212E** | 60 | **2.3622** | 110 | **4.3307** | 28 | **1.1024** | 1.5 | **.059** | .24 | 2.60 | 4.1 | 2.8 | 48 800 | **11 000** | 17 000 | **3 820** | 5 300 | 6 300 |
| **2213E** | 65 | **2.5591** | 120 | **4.7244** | 31 | **1.2205** | 1.5 | **.059** | .24 | 2.60 | 4.1 | 2.8 | 57 200 | **12 900** | 20 000 | **4 500** | 5 000 | 6 000 |
| **2214** | 70 | **2.7559** | 125 | **4.9213** | 31 | **1.2205** | 1.5 | **.059** | .27 | 2.30 | 3.6 | 2.5 | 44 200 | **9 940** | 17 000 | **3 820** | 4 800 | 5 600 |
| **2215** | 75 | **2.9528** | 130 | **5.1181** | 31 | **1.2205** | 1.5 | **.059** | .25 | 2.50 | 3.9 | 2.5 | 44 200 | **9 940** | 18 000 | **4 050** | 4 500 | 5 300 |
| **2216E** | 80 | **3.1496** | 140 | **5.5118** | 33 | **1.2992** | 2.0 | **.079** | .22 | 2.90 | 4.5 | 2.8 | 65 000 | **14 600** | 25 500 | **5 730** | 4 000 | 4 800 |
| **2217** | 85 | **3.3465** | 150 | **5.9055** | 36 | **1.4173** | 2.0 | **.079** | .25 | 2.50 | 3.9 | 2.5 | 58 500 | **13 200** | 23 600 | **5 310** | 3 800 | 4 500 |
| **2218** | 90 | **3.5433** | 160 | **6.2992** | 40 | **1.5748** | 2.0 | **.079** | .27 | 2.30 | 3.6 | 2.5 | 70 200 | **15 800** | 28 500 | **6 410** | 3 600 | 4 300 |
| **2219** | 95 | **3.7402** | 170 | **6.6929** | 43 | **1.6929** | 2.0 | **.079** | .27 | 2.30 | 3.6 | 2.5 | 83 200 | **18 700** | 34 500 | **7 760** | 3 400 | 4 000 |
| **2220** | 100 | **3.9370** | 180 | **7.0866** | 46 | **1.8110** | 2.0 | **.079** | .27 | 2.30 | 3.6 | 2.5 | 97 500 | **21 900** | 40 500 | **9 110** | 3 200 | 3 800 |
| **2221** | 105 | **4.1339** | 190 | **7.4803** | 50 | **1.9685** | 2.0 | **.079** | .28 | 2.20 | 3.5 | 2.5 | 108 000 | **24 300** | 45 000 | **10 100** | 3 000 | 3 600 |
| **2222** | 110 | **4.3307** | 200 | **7.8740** | 53 | **2.0866** | 2.0 | **.079** | .28 | 2.20 | 3.5 | 2.5 | 124 000 | **27 900** | 52 000 | **11 700** | 2 800 | 3 400 |
| **2301** | 12 | .4724 | 37 | **1.4567** | 17 | **.6693** | 1.0 | **.039** | .60 | 1.05 | 1.6 | 1.1 | 11 700 | **2 630** | 2 700 | **607** | 17 000 | 20 000 |
| **2302** | 15 | .5906 | 42 | **1.6535** | 17 | **.6693** | 1.0 | **.039** | .52 | 1.20 | 1.9 | 1.3 | 11 900 | **2 680** | 2 900 | **652** | 15 000 | 18 000 |
| **2303** | 17 | .6693 | 47 | **1.8504** | 19 | **.7480** | 1.0 | **.039** | .52 | 1.20 | 1.9 | 1.3 | 14 600 | **3 280** | 3 550 | **798** | 13 000 | 16 000 |
| **2304** | 20 | .7874 | 52 | **2.0472** | 21 | **.8268** | 1.0 | **.039** | .52 | 1.20 | 1.9 | 1.3 | 18 200 | **4 090** | 4 750 | **1 070** | 11 000 | 14 000 |
| **2305** | 25 | .9843 | 62 | **2.4409** | 24 | **.9449** | 1.0 | **.039** | .48 | 1.30 | 2 | 1.4 | 24 200 | **5 440** | 6 550 | **1 470** | 9 500 | 12 000 |
| **2306** | 30 | **1.1811** | 72 | **2.8346** | 27 | **1.0630** | 1.0 | **.039** | .44 | 1.40 | 2.2 | 1.4 | 31 200 | **7 010** | 8 800 | **1 980** | 8 500 | 10 000 |
| **2307E** | 35 | **1.3780** | 80 | **3.1496** | 31 | **1.2205** | 1.5 | **.059** | .46 | 1.35 | 2.1 | 1.4 | 39 700 | **8 930** | 11 200 | **2 520** | 7 000 | 8 500 |
| **2308E** | 40 | **1.5748** | 90 | **3.5433** | 33 | **1.2992** | 1.5 | **.059** | .40 | 1.60 | 2.4 | 1.6 | 54 000 | **12 100** | 16 000 | **3 600** | 6 300 | 7 500 |
| **2309E** | 45 | **1.7717** | 100 | **3.9370** | 36 | **1.4173** | 1.5 | **.059** | .33 | 1.90 | 3 | 2.0 | 63 700 | **14 300** | 19 300 | **4 340** | 5 600 | 6 700 |
| **2310** | 50 | **1.9685** | 110 | **4.3307** | 40 | **1.5748** | 2.0 | **.079** | .43 | 1.50 | 2.3 | 1.6 | 63 700 | **14 300** | 20 000 | **4 500** | 5 300 | 6 300 |
| **2311** | 55 | **2.1654** | 120 | **4.7244** | 43 | **1.6929** | 2.0 | **.079** | .40 | 1.60 | 2.4 | 1.6 | 76 100 | **17 100** | 24 000 | **5 400** | 4 800 | 5 600 |
| **2312** | 60 | **2.3622** | 130 | **5.1181** | 46 | **1.8110** | 2.0 | **.079** | .33 | 1.90 | 3 | 2.0 | 87 100 | **19 600** | 28 500 | **6 410** | 4 500 | 5 300 |
| **2313** | 65 | **2.5591** | 140 | **5.5118** | 48 | **1.8898** | 2.0 | **.079** | .37 | 1.70 | 2.6 | 1.8 | 95 600 | **21 500** | 32 500 | **7 310** | 4 000 | 4 800 |
| **2314** | 70 | **2.7559** | 150 | **5.9055** | 51 | **2.0079** | 2.0 | **.079** | .37 | 1.70 | 2.6 | 1.8 | 111 000 | **25 000** | 37 500 | **8 430** | 3 800 | 4 500 |
| **2315** | 75 | **2.9528** | 160 | **6.2992** | 55 | **2.1654** | 2.0 | **.079** | .37 | 1.70 | 2.6 | 1.8 | 124 000 | **27 900** | 43 000 | **9 670** | 3 400 | 4 000 |
| **2316** | 80 | **3.1496** | 170 | **6.6929** | 58 | **2.2835** | 2.0 | **.079** | .37 | 1.70 | 2.6 | 1.8 | 135 000 | **30 400** | 49 000 | **11 000** | 3 200 | 3 800 |
| **2317** | 85 | **3.3465** | 180 | **7.0866** | 60 | **2.3622** | 2.5 | **.098** | .37 | 1.70 | 2.6 | 1.8 | 140 000 | **31 500** | 51 000 | **11 500** | 3 000 | 3 600 |
| **2318** | 90 | **3.5433** | 190 | **7.4803** | 64 | **2.5197** | 2.5 | **.098** | .37 | 1.70 | 2.6 | 1.8 | 153 000 | **34 400** | 57 000 | **12 800** | 2 800 | 3 400 |
| **2319** | 95 | **3.7402** | 200 | **7.8740** | 67 | **2.6378** | 2.5 | **.098** | .37 | 1.70 | 2.6 | 1.8 | 165 000 | **37 100** | 64 000 | **14 400** | 2 600 | 3 200 |
| **2320** | 100 | **3.9370** | 215 | **8.4646** | 73 | **2.8740** | 2.5 | **.098** | .37 | 1.70 | 2.6 | 1.8 | 190 000 | **42 700** | 80 000 | **18 000** | 2 400 | 3 000 |
| **2322** | 110 | **4.3307** | 240 | **9.4488** | 80 | **3.1496** | 2.5 | **.098** | .37 | 1.70 | 2.6 | 1.8 | 216 000 | **48 600** | 95 000 | **21 400** | 2 200 | 2 800 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 1200K, 1200EK, 1300K, 1300EK series
## self-aligning ball bearings with tapered bore

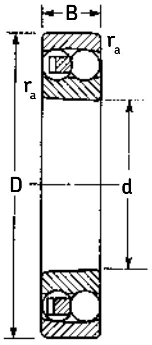



**Tapered bore**
**taper 1:12 on diameter**

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1] $r_a$ mm | in. | Calculation factors e | $Y_1$ | $Y_2$ | $Y_0$ | Basic radial load rating Dynamic C[2] N | lbf | Static $C_0$ N | lbf | Speed rating Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1204EK | 20 | .7874 | 47 | 1.8504 | 14 | .5512 | 1.0 | .039 | .30 | 2.1 | 3.3 | 2.2 | 12 700 | 2 860 | 3 400 | 764 | 15 000 | 18 000 |
| 1205EK | 25 | .9843 | 52 | 2.0472 | 15 | .5906 | 1.0 | .039 | .28 | 2.2 | 3.5 | 2.5 | 14 300 | 3 220 | 4 000 | 899 | 13 000 | 16 000 |
| 1206EK | 30 | 1.1811 | 62 | 2.4409 | 16 | .6299 | 1.0 | .039 | .25 | 2.5 | 3.9 | 2.5 | 15 600 | 3 510 | 4 650 | 1 050 | 10 000 | 13 000 |
| 1207EK | 35 | 1.3780 | 72 | 2.8346 | 17 | .6693 | 1.0 | .039 | .23 | 2.7 | 4.2 | 2.8 | 19 000 | 4 270 | 6 000 | 1 350 | 9 000 | 11 000 |
| 1208EK | 40 | 1.5748 | 80 | 3.1496 | 18 | .7087 | 1.0 | .039 | .22 | 2.9 | 4.5 | 2.8 | 19 900 | 4 470 | 6 950 | 1 560 | 8 500 | 10 000 |
| 1209EK | 45 | 1.7717 | 85 | 3.3465 | 19 | .7480 | 1.0 | .039 | .21 | 3.0 | 4.6 | 3.2 | 22 900 | 5 150 | 7 800 | 1 750 | 7 500 | 9 000 |
| 1210EK | 50 | 1.9685 | 90 | 3.5433 | 20 | .7874 | 1.0 | .039 | .21 | 3.0 | 4.6 | 3.2 | 26 500 | 5 960 | 9 150 | 2 060 | 7 000 | 8 500 |
| 1211EK | 55 | 2.1654 | 100 | 3.9370 | 21 | .8268 | 1.5 | .059 | .19 | 3.3 | 5.1 | 3.6 | 27 600 | 6 210 | 10 600 | 2 380 | 6 300 | 7 500 |
| 1212EK | 60 | 2.3622 | 110 | 4.3307 | 22 | .8661 | 1.5 | .059 | .19 | 3.3 | 5.1 | 3.6 | 31 200 | 7 010 | 12 200 | 2 740 | 5 600 | 6 700 |
| 1213EK | 65 | 2.5591 | 120 | 4.7244 | 23 | .9055 | 1.5 | .059 | .18 | 3.5 | 5.4 | 3.6 | 35 100 | 7 890 | 14 000 | 3 150 | 5 300 | 6 300 |
| 1215K | 75 | 2.9528 | 130 | 5.1181 | 25 | .9843 | 1.5 | .059 | .17 | 3.7 | 5.7 | 4.0 | 39 000 | 8 770 | 15 600 | 3 510 | 4 800 | 5 600 |
| 1216K | 80 | 3.1496 | 140 | 5.5118 | 26 | 1.0236 | 2.0 | .079 | .16 | 3.9 | 6.1 | 4.0 | 39 700 | 8 930 | 17 000 | 3 820 | 4 500 | 5 300 |
| 1217K | 85 | 3.3465 | 150 | 5.9055 | 28 | 1.1024 | 2.0 | .079 | .17 | 3.7 | 5.7 | 4.0 | 48 800 | 11 000 | 20 800 | 4 680 | 4 000 | 4 800 |
| 1218K | 90 | 3.5433 | 160 | 6.2992 | 30 | 1.1811 | 2.0 | .079 | .17 | 3.7 | 5.7 | 4.0 | 57 200 | 12 900 | 23 600 | 5 310 | 3 800 | 4 500 |
| 1219K | 95 | 3.7402 | 170 | 6.6929 | 32 | 1.2598 | 2.0 | .079 | .17 | 3.7 | 5.7 | 4.0 | 63 700 | 14 300 | 27 000 | 6 070 | 3 600 | 4 300 |
| 1220K | 100 | 3.9370 | 180 | 7.0866 | 34 | 1.3386 | 2.0 | .079 | .17 | 3.7 | 5.7 | 4.0 | 68 900 | 15 500 | 30 000 | 6 740 | 3 400 | 4 000 |
| 1221K | 105 | 4.1339 | 190 | 7.4803 | 36 | 1.4173 | 2.0 | .079 | .17 | 3.7 | 5.7 | 4.0 | 74 100 | 16 700 | 32 500 | 7 310 | 3 200 | 3 800 |
| 1222K | 110 | 4.3307 | 200 | 7.8740 | 38 | 1.4961 | 2.0 | .079 | .17 | 3.7 | 5.7 | 4.0 | 88 400 | 19 900 | 39 000 | 8 770 | 3 000 | 3 600 |
| 1224K | 120 | 4.7244 | 215 | 8.4646 | 42 | 1.6535 | 2.0 | .079 | .19 | 3.3 | 5.1 | 3.6 | 11 900 | 26 800 | 53 000 | 11 900 | 2 800 | 3 400 |
| 1304EK | 20 | .7874 | 52 | 2.0472 | 15 | .5906 | 1.0 | .039 | .28 | 2.2 | 3.5 | 2.5 | 14 300 | 3 220 | 4 000 | 899 | 12 000 | 15 000 |
| 1305EK | 25 | .9843 | 62 | 2.4409 | 17 | .6693 | 1.0 | .039 | .28 | 2.2 | 3.5 | 2.5 | 19 000 | 4 270 | 5 400 | 1 210 | 9 500 | 12 000 |
| 1306EK | 30 | 1.1811 | 72 | 2.8346 | 19 | .7480 | 1.0 | .039 | .25 | 2.5 | 3.9 | 2.5 | 22 500 | 5 060 | 6 800 | 1 530 | 9 000 | 11 000 |
| 1307EK | 35 | 1.3780 | 80 | 3.1496 | 21 | .8268 | 1.5 | .059 | .25 | 2.5 | 3.9 | 2.5 | 26 500 | 5 960 | 8 500 | 1 910 | 7 500 | 9 000 |
| 1308EK | 40 | 1.5748 | 90 | 3.5433 | 23 | .9055 | 1.5 | .059 | .23 | 2.7 | 4.2 | 2.8 | 33 800 | 7 600 | 11 200 | 2 520 | 6 700 | 8 000 |
| 1309EK | 45 | 1.7717 | 100 | 3.9370 | 25 | .9843 | 1.5 | .059 | .23 | 2.7 | 4.2 | 2.8 | 39 000 | 8 770 | 13 400 | 3 010 | 6 300 | 7 500 |
| 1310EK | 50 | 1.9685 | 110 | 4.3307 | 27 | 1.0630 | 2.0 | .079 | .24 | 2.6 | 4.1 | 2.8 | 43 600 | 9 800 | 14 000 | 3 150 | 5 600 | 6 700 |
| 1311EK | 55 | 2.1654 | 120 | 4.7244 | 29 | 1.1417 | 2.0 | .079 | .23 | 2.7 | 4.2 | 2.8 | 50 700 | 11 400 | 18 000 | 4 050 | 5 000 | 6 000 |
| 1312EK | 60 | 2.3622 | 130 | 5.1181 | 31 | 1.2205 | 2.0 | .079 | .23 | 2.7 | 4.2 | 2.8 | 58 500 | 13 200 | 22 000 | 4 950 | 4 500 | 5 300 |
| 1313EK | 65 | 2.5591 | 140 | 5.5118 | 33 | 1.2992 | 2.0 | .079 | .22 | 2.9 | 4.5 | 2.8 | 65 000 | 14 600 | 25 500 | 5 730 | 4 300 | 5 000 |
| 1315K | 75 | 2.9528 | 160 | 6.2992 | 37 | 1.4567 | 2.0 | .079 | .22 | 2.9 | 4.5 | 2.8 | 79 300 | 17 800 | 30 000 | 6 740 | 3 800 | 4 500 |
| 1316K | 80 | 3.1496 | 170 | 6.6929 | 39 | 1.5354 | 2.0 | .079 | .22 | 2.9 | 4.5 | 2.8 | 88 400 | 19 900 | 33 500 | 7 530 | 3 600 | 4 300 |
| 1317K | 85 | 3.3465 | 180 | 7.0866 | 41 | 1.6142 | 2.5 | .098 | .22 | 2.9 | 4.5 | 2.8 | 97 500 | 21 900 | 38 000 | 8 540 | 3 400 | 4 000 |
| 1318K | 90 | 3.5433 | 190 | 7.4803 | 43 | 1.6929 | 2.5 | .098 | .22 | 2.9 | 4.5 | 2.8 | 117 000 | 26 300 | 44 000 | 9 890 | 3 200 | 3 800 |
| 1319K | 95 | 3.7402 | 200 | 7.8740 | 45 | 1.7717 | 2.5 | .098 | .23 | 2.7 | 4.2 | 2.8 | 133 000 | 29 900 | 51 000 | 11 500 | 3 000 | 3 600 |
| 1320K | 100 | 3.9370 | 215 | 8.4646 | 47 | 1.8504 | 2.5 | .098 | .23 | 2.7 | 4.2 | 2.8 | 143 000 | 32 200 | 57 000 | 12 800 | 2 800 | 3 400 |
| 1322K | 110 | 4.3307 | 240 | 9.4488 | 50 | 1.9685 | 2.5 | .098 | .22 | 2.9 | 4.5 | 2.8 | 163 000 | 36 600 | 72 000 | 16 200 | 2 400 | 3 000 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at 33 1/3 rpm.

# 2200K, 2200EK, 2300K, 2300EK series
## self-aligning ball bearings with tapered bore

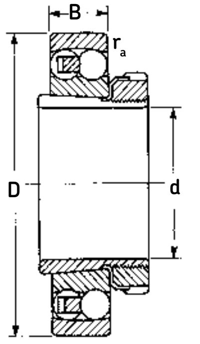



Tapered bore
taper 1:12 on diameter

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1] $r_a$ mm | in. | Calculation factors e | $Y_1$ | $Y_2$ | $Y_0$ | Basic radial load rating Dynamic C[2] N | lbf | Static $C_0$ N | lbf | Speed rating Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2205EK | 25 | .9843 | 52 | 2.0472 | 18 | .7087 | 1.0 | .039 | .35 | 1.8 | 2.8 | 1.8 | 16 800 | 3 780 | 4 400 | 989 | 11 000 | 14 000 |
| 2206EK | 30 | 1.1811 | 62 | 2.4409 | 20 | .7874 | 1.0 | .039 | .33 | 1.9 | 3.0 | 2.0 | 23 800 | 5 350 | 6 700 | 1 510 | 9 500 | 12 000 |
| 2207EK | 35 | 1.3780 | 72 | 2.8346 | 23 | .9055 | 1.0 | .039 | .31 | 2.0 | 3.1 | 2.2 | 30 700 | 6 900 | 8 800 | 1 980 | 8 500 | 10 000 |
| 2208EK | 40 | 1.5748 | 80 | 3.1496 | 23 | .9055 | 1.0 | .039 | .28 | 2.2 | 3.5 | 2.5 | 31 900 | 7 170 | 10 000 | 2 250 | 7 500 | 9 000 |
| 2209EK | 45 | 1.7717 | 85 | 3.3465 | 23 | .9055 | 1.0 | .039 | .26 | 2.4 | 3.7 | 2.5 | 32 500 | 7 310 | 10 600 | 2 380 | 7 000 | 8 500 |
| 2210EK | 50 | 1.9685 | 90 | 3.5433 | 23 | .9055 | 1.0 | .039 | .23 | 2.7 | 4.2 | 2.8 | 33 800 | 7 600 | 11 200 | 2 520 | 6 300 | 7 500 |
| 2211EK | 55 | 2.1654 | 100 | 3.9370 | 25 | .9843 | 1.5 | .059 | .23 | 2.7 | 4.2 | 2.8 | 39 000 | 8 770 | 13 400 | 3 010 | 6 000 | 7 000 |
| 2212EK | 60 | 2.3622 | 110 | 4.3307 | 28 | 1.1024 | 1.5 | .059 | .24 | 2.6 | 4.1 | 2.8 | 48 800 | 11 000 | 17 000 | 3 820 | 5 300 | 6 300 |
| 2213EK | 65 | 2.5591 | 120 | 4.7244 | 31 | 1.2205 | 1.5 | .059 | .24 | 2.6 | 4.1 | 2.8 | 57 200 | 12 900 | 20 000 | 4 500 | 5 000 | 6 000 |
| 2215K | 75 | 2.9528 | 130 | 5.1181 | 31 | 1.2205 | 1.5 | .059 | .25 | 2.5 | 3.9 | 2.5 | 44 200 | 9 940 | 18 000 | 4 050 | 4 500 | 5 300 |
| 2216EK | 80 | 3.1496 | 140 | 5.5118 | 33 | 1.2992 | 2.0 | .079 | .22 | 2.9 | 4.5 | 2.8 | 65 000 | 14 600 | 25 500 | 5 730 | 4 000 | 4 800 |
| 2217K | 85 | 3.3465 | 150 | 5.9055 | 36 | 1.4173 | 2.0 | .079 | .25 | 2.5 | 3.9 | 2.5 | 58 500 | 13 200 | 23 600 | 5 310 | 3 800 | 4 500 |
| 2218K | 90 | 3.5433 | 160 | 6.2992 | 40 | 1.5748 | 2.0 | .079 | .27 | 2.3 | 3.6 | 2.5 | 70 200 | 15 800 | 28 500 | 6 410 | 3 600 | 4 300 |
| 2219K | 95 | 3.7402 | 170 | 6.6929 | 43 | 1.6929 | 2.0 | .079 | .27 | 2.3 | 3.6 | 2.5 | 83 200 | 18 700 | 34 500 | 7 760 | 3 400 | 4 000 |
| 2220K | 100 | 3.9370 | 180 | 7.0866 | 46 | 1.8110 | 2.0 | .079 | .27 | 2.3 | 3.6 | 2.5 | 97 500 | 21 900 | 40 500 | 9 110 | 3 200 | 3 800 |
| 2221K | 105 | 4.1339 | 190 | 7.4803 | 50 | 1.9685 | 2.0 | .079 | .28 | 2.2 | 3.5 | 2.5 | 108 000 | 24 300 | 45 000 | 10 100 | 3 000 | 3 600 |
| 2222K | 110 | 4.3307 | 200 | 7.8740 | 53 | 2.0866 | 2.0 | .079 | .28 | 2.2 | 3.5 | 2.5 | 124 000 | 27 900 | 52 000 | 11 700 | 2 800 | 3 400 |
| 2305K | 25 | .9843 | 62 | 2.4409 | 24 | .9449 | 1.0 | .039 | .48 | 1.3 | 2.0 | 1.4 | 24 200 | 5 440 | 6 550 | 1 470 | 9 500 | 12 000 |
| 2306K | 30 | 1.1811 | 72 | 2.8346 | 27 | 1.0630 | 1.0 | .039 | .44 | 1.4 | 2.2 | 1.4 | 31 200 | 7 010 | 8 800 | 1 980 | 8 500 | 10 000 |
| 2307EK | 35 | 1.3780 | 80 | 3.1496 | 31 | 1.2205 | 1.5 | .059 | .46 | 1.3 | 2.1 | 1.4 | 39 700 | 8 930 | 11 200 | 2 520 | 7 000 | 8 500 |
| 2308EK | 40 | 1.5748 | 90 | 3.5433 | 33 | 1.2992 | 1.5 | .059 | .40 | 1.6 | 2.4 | 1.6 | 54 000 | 12 100 | 16 000 | 3 600 | 6 300 | 7 500 |
| 2309EK | 45 | 1.7717 | 100 | 3.9370 | 36 | 1.4173 | 1.5 | .059 | .33 | 1.9 | 3.0 | 2.0 | 63 700 | 14 300 | 19 300 | 4 340 | 5 600 | 6 700 |
| 2310K | 50 | 1.9685 | 110 | 4.3307 | 40 | 1.5748 | 2.0 | .079 | .43 | 1.5 | 2.3 | 1.6 | 63 700 | 14 300 | 20 000 | 4 500 | 5 300 | 6 300 |
| 2311K | 55 | 2.1654 | 120 | 4.7244 | 43 | 1.6929 | 2.0 | .079 | .40 | 1.6 | 2.4 | 1.6 | 76 100 | 17 100 | 24 000 | 5 400 | 4 800 | 5 600 |
| 2312K | 60 | 2.3622 | 130 | 5.1181 | 46 | 1.8110 | 2.0 | .079 | .33 | 1.9 | 3.0 | 2.0 | 87 100 | 19 600 | 28 500 | 6 410 | 4 500 | 5 300 |
| 2313K | 65 | 2.5591 | 140 | 5.5118 | 48 | 1.8898 | 2.0 | .079 | .37 | 1.7 | 2.6 | 1.8 | 95 600 | 21 500 | 32 500 | 7 310 | 4 000 | 4 800 |
| 2315K | 75 | 2.9528 | 160 | 6.2992 | 55 | 2.1654 | 2.0 | .079 | .37 | 1.7 | 2.6 | 1.8 | 124 000 | 27 900 | 43 000 | 9 670 | 3 400 | 4 000 |
| 2316K | 80 | 3.1496 | 170 | 6.6929 | 58 | 2.2835 | 2.0 | .079 | .37 | 1.7 | 2.6 | 1.8 | 135 000 | 30 400 | 49 000 | 11 000 | 3 200 | 3 800 |
| 2317K | 85 | 3.3465 | 180 | 7.0866 | 60 | 2.3622 | 2.5 | .098 | .37 | 1.7 | 2.6 | 1.8 | 140 000 | 31 500 | 51 000 | 11 500 | 3 000 | 3 600 |
| 2318K | 90 | 3.5433 | 190 | 7.4803 | 64 | 2.5197 | 2.5 | .098 | .37 | 1.7 | 2.6 | 1.8 | 153 000 | 34 400 | 57 000 | 12 800 | 2 800 | 3 400 |
| 2319K | 95 | 3.7402 | 200 | 7.8740 | 67 | 2.6378 | 2.5 | .098 | .37 | 1.7 | 2.6 | 1.8 | 165 000 | 37 100 | 64 000 | 14 400 | 2 600 | 3 200 |
| 2320K | 100 | 3.9370 | 215 | 8.4646 | 73 | 2.8740 | 2.5 | .098 | .37 | 1.7 | 2.6 | 1.8 | 190 000 | 42 700 | 80 000 | 18 000 | 2 400 | 3 000 |
| 2322K | 110 | 4.3307 | 240 | 9.4488 | 80 | 3.1496 | 2.5 | .098 | .37 | 1.7 | 2.6 | 1.8 | 216 000 | 48 600 | 95 000 | 21 400 | 2 200 | 2 800 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 1200K, 1200EK, 1300K, 1300EK series
## self-aligning ball bearings with adapter sleeve

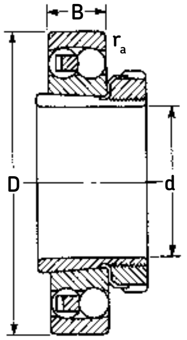



**Tapered bore**
**taper 1:12 on diameter**

| MRC bearing number | Adapter sleeve | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1)] $r_a$ mm | in. | Calculation factors e | $Y_1$ | $Y_2$ | $Y_0$ | Basic radial load rating Dynamic $C$[2)] N | lbf | Static $C_0$ N | lbf | Speed rating Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1204EK** | H204 | 17 | **.6693** | 47 | **1.8504** | 14 | **.5512** | 1.0 | **.039** | .30 | 2.1 | 3.3 | 2.2 | 12 700 | **2 860** | 3 400 | **764** | 15 000 | 18 000 |
| **1205EK** | H205 | 20 | **.7874** | 52 | **2.0472** | 15 | **.5906** | 1.0 | **.039** | .28 | 2.2 | 3.5 | 2.5 | 14 300 | **3 220** | 4 000 | **899** | 13 000 | 16 000 |
| **1206EK** | H206 | 25 | **.9843** | 62 | **2.4409** | 16 | **.6299** | 1.0 | **.039** | .25 | 2.5 | 3.9 | 2.5 | 15 600 | **3 510** | 4 650 | **1 050** | 10 000 | 13 000 |
| **1207EK** | H207 | 30 | **1.1811** | 72 | **2.8346** | 17 | **.6693** | 1.0 | **.039** | .23 | 2.7 | 4.2 | 2.8 | 19 000 | **4 270** | 6 000 | **1 350** | 9 000 | 11 000 |
| **1208EK** | H208 | 35 | **1.3780** | 80 | **3.1496** | 18 | **.7087** | 1.0 | **.039** | .22 | 2.9 | 4.5 | 2.8 | 19 900 | **4 470** | 6 950 | **1 560** | 8 500 | 10 000 |
| **1209EK** | H209 | 40 | **1.5748** | 85 | **3.3465** | 19 | **.7480** | 1.0 | **.039** | .21 | 3.0 | 4.6 | 3.2 | 22 900 | **5 150** | 7 800 | **1 750** | 7 500 | 9 000 |
| **1210EK** | H210 | 45 | **1.7717** | 90 | **3.5433** | 20 | **.7874** | 1.0 | **.039** | .21 | 3.0 | 4.6 | 3.2 | 26 500 | **5 960** | 9 150 | **2 060** | 7 000 | 8 500 |
| **1211EK** | H211 | 50 | **1.9685** | 100 | **3.9370** | 21 | **.8268** | 1.5 | **.059** | .19 | 3.3 | 5.1 | 3.6 | 27 600 | **6 210** | 10 600 | **2 380** | 6 300 | 7 500 |
| **1212EK** | H212 | 55 | **2.1654** | 110 | **4.3307** | 22 | **.8661** | 1.5 | **.059** | .19 | 3.3 | 5.1 | 3.6 | 31 200 | **7 010** | 12 200 | **2 740** | 5 600 | 6 700 |
| **1213EK** | H213 | 60 | **2.3622** | 120 | **4.7244** | 23 | **.9055** | 1.5 | **.059** | .18 | 3.5 | 5.4 | 3.6 | 35 100 | **7 890** | 14 000 | **3 150** | 5 300 | 6 300 |
| **1215K** | H215 | 65 | **2.5591** | 130 | **5.1181** | 25 | **.9843** | 1.5 | **.059** | .17 | 3.7 | 5.7 | 4.0 | 39 000 | **8 770** | 15 600 | **3 510** | 4 800 | 5 600 |
| **1216K** | H216 | 70 | **2.7559** | 140 | **5.5118** | 26 | **1.0236** | 2.0 | **.079** | .16 | 3.9 | 6.1 | 4.0 | 39 700 | **8 930** | 17 000 | **3 820** | 4 500 | 5 300 |
| **1217K** | H217 | 75 | **2.9528** | 150 | **5.9055** | 28 | **1.1024** | 2.0 | **.079** | .17 | 3.7 | 5.7 | 4.0 | 48 800 | **11 000** | 20 800 | **4 680** | 4 000 | 4 800 |
| **1218K** | H218 | 80 | **3.1496** | 160 | **6.2992** | 30 | **1.1811** | 2.0 | **.079** | .17 | 3.7 | 5.7 | 4.0 | 57 200 | **12 900** | 23 600 | **5 310** | 3 800 | 4 500 |
| **1219K** | H219 | 85 | **3.3465** | 170 | **6.6929** | 32 | **1.2598** | 2.0 | **.079** | .17 | 3.7 | 5.7 | 4.0 | 63 700 | **14 300** | 27 000 | **6 070** | 3 600 | 4 300 |
| **1220K** | H220 | 90 | **3.5433** | 180 | **7.0866** | 34 | **1.3386** | 2.0 | **.079** | .17 | 3.7 | 5.7 | 4.0 | 68 900 | **15 500** | 30 000 | **6 740** | 3 400 | 4 000 |
| **1221K** | H221 | 95 | **3.7402** | 190 | **7.4803** | 36 | **1.4173** | 2.0 | **.079** | .17 | 3.7 | 5.7 | 4.0 | 74 100 | **16 700** | 32 500 | **7 310** | 3 200 | 3 800 |
| **1222K** | H222 | 100 | **3.9370** | 200 | **7.8740** | 38 | **1.4961** | 2.0 | **.079** | .17 | 3.7 | 5.7 | 4.0 | 88 400 | **19 900** | 39 000 | **8 770** | 3 000 | 3 600 |
| **1224K** | H3024 | 110 | **4.3307** | 215 | **8.4646** | 42 | **1.6535** | 2.0 | **.079** | .19 | 3.3 | 5.1 | 3.6 | 119 000 | **26 800** | 53 000 | **11 900** | 2 800 | 3 400 |
| **1304EK** | H304 | 17 | **.6693** | 52 | **2.0472** | 15 | **.5906** | 1.0 | **.039** | .28 | 2.2 | 3.5 | 2.5 | 14 300 | **3 220** | 4 000 | **899** | 12 000 | 14 000 |
| **1305EK** | H305 | 20 | **.7874** | 62 | **2.4409** | 17 | **.6693** | 1.0 | **.039** | .28 | 2.2 | 3.5 | 2.5 | 19 000 | **4 270** | 5 400 | **1 210** | 9 500 | 12 000 |
| **1306EK** | H306 | 25 | **.9843** | 72 | **2.8346** | 19 | **.7480** | 1.0 | **.039** | .25 | 2.5 | 3.9 | 2.5 | 22 500 | **5 060** | 6 800 | **1 530** | 9 000 | 11 000 |
| **1307EK** | H307 | 30 | **1.1811** | 80 | **3.1496** | 21 | **.8268** | 1.5 | **.059** | .25 | 2.5 | 3.9 | 2.5 | 26 500 | **5 960** | 8 500 | **1 910** | 7 500 | 9 000 |
| **1308EK** | H308 | 35 | **1.3780** | 90 | **3.5433** | 23 | **.9055** | 1.5 | **.059** | .23 | 2.7 | 4.2 | 2.8 | 33 800 | **7 600** | 11 200 | **2 520** | 6 700 | 8 000 |
| **1309EK** | H309 | 40 | **1.5748** | 100 | **3.9370** | 25 | **.9843** | 1.5 | **.059** | .23 | 2.7 | 4.2 | 2.8 | 39 000 | **8 770** | 13 400 | **3 010** | 6 300 | 7 500 |
| **1310EK** | H310 | 45 | **1.7717** | 110 | **4.3307** | 27 | **1.0630** | 2.0 | **.079** | .24 | 2.6 | 4.1 | 2.8 | 43 600 | **9 800** | 14 000 | **3 150** | 5 600 | 6 700 |
| **1311EK** | H311 | 50 | **1.9685** | 120 | **4.7244** | 29 | **1.1417** | 2.0 | **.079** | .23 | 2.7 | 4.2 | 2.8 | 50 700 | **11 400** | 18 000 | **4 050** | 5 000 | 6 000 |
| **1312EK** | H312 | 55 | **2.1654** | 130 | **5.1181** | 31 | **1.2205** | 2.0 | **.079** | .23 | 2.7 | 4.2 | 2.8 | 58 500 | **13 200** | 22 000 | **4 950** | 4 500 | 5 300 |
| **1313EK** | H313 | 60 | **2.3622** | 140 | **5.5118** | 33 | **1.2992** | 2.0 | **.079** | .22 | 2.9 | 4.5 | 2.8 | 65 000 | **14 600** | 25 500 | **5 730** | 4 300 | 5 000 |
| **1315K** | H315 | 65 | **2.5591** | 160 | **6.2992** | 37 | **1.4567** | 2.0 | **.079** | .22 | 2.9 | 4.5 | 2.8 | 79 300 | **17 800** | 30 000 | **6 740** | 3 800 | 4 500 |
| **1316K** | H316 | 70 | **2.7559** | 170 | **6.6929** | 39 | **1.5354** | 2.0 | **.079** | .22 | 2.9 | 4.5 | 2.8 | 88 400 | **19 900** | 33 500 | **7 530** | 3 600 | 4 300 |
| **1317K** | H317 | 75 | **2.9528** | 180 | **7.0866** | 41 | **1.6142** | 2.5 | **.098** | .22 | 2.9 | 4.5 | 2.8 | 97 500 | **21 900** | 38 000 | **8 540** | 3 400 | 4 000 |
| **1318K** | H318 | 80 | **3.1496** | 190 | **7.4803** | 43 | **1.6929** | 2.5 | **.098** | .22 | 2.9 | 4.5 | 2.8 | 117 000 | **26 300** | 44 000 | **9 890** | 3 200 | 3 800 |
| **1319K** | H319 | 85 | **3.3465** | 200 | **7.8740** | 45 | **1.7717** | 2.5 | **.098** | .23 | 2.7 | 4.2 | 2.8 | 133 000 | **29 900** | 51 000 | **11 500** | 3 000 | 3 600 |
| **1320K** | H320 | 90 | **3.5433** | 215 | **8.4646** | 47 | **1.8504** | 2.5 | **.098** | .23 | 2.7 | 4.2 | 2.8 | 143 000 | **32 200** | 57 000 | **12 800** | 2 800 | 3 400 |
| **1322K** | H322 | 100 | **3.9370** | 240 | **9.4488** | 50 | **1.9685** | 2.5 | **.098** | .22 | 2.9 | 4.5 | 2.8 | 163 000 | **36 600** | 72 000 | **16 200** | 2 400 | 3 000 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 2200K, 2200EK, 2300K, 2300EK series
## self-aligning ball bearings with adapter sleeve

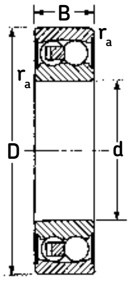



**Tapered bore**
**taper 1:12 on diameter**

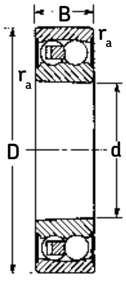
| MRC bearing number | Adapter sleeve | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1] $r_a$ mm | in. | Calculation factors e | $Y_1$ | $Y_2$ | $Y_0$ | Basic radial load rating Dynamic C[2] N | lbf | Static $C_0$ N | lbf | Speed rating Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2205EK** | H305 | 20 | **.7874** | 52 | **2.0472** | 18 | **.7087** | 1.0 | **.039** | .35 | 1.80 | 2.8 | 1.8 | 16 800 | **3 780** | 4 400 | **989** | 11 000 | 14 000 |
| **2206EK** | H306 | 25 | **.9843** | 62 | **2.4409** | 20 | **.7874** | 1.0 | **.039** | .33 | 1.90 | 3.0 | 2.0 | 23 800 | **5 350** | 6 700 | **1 510** | 9 500 | 12 000 |
| **2207EK** | H307 | 30 | **1.1811** | 72 | **2.8346** | 23 | **.9055** | 1.0 | **.039** | .31 | 2.00 | 3.1 | 2.2 | 30 700 | **6 900** | 8 800 | **1 980** | 8 500 | 10 000 |
| **2208EK** | H308 | 35 | **1.3780** | 80 | **3.1496** | 23 | **.9055** | 1.0 | **.039** | .28 | 2.20 | 3.5 | 2.5 | 31 900 | **7 170** | 10 000 | **2 250** | 7 500 | 9 000 |
| **2209EK** | H309 | 40 | **1.5748** | 85 | **3.3465** | 23 | **.9055** | 1.0 | **.039** | .26 | 2.40 | 3.7 | 2.5 | 32 500 | **7 310** | 10 600 | **2 380** | 7 000 | 8 500 |
| **2210EK** | H310 | 45 | **1.7717** | 90 | **3.5433** | 23 | **.9055** | 1.0 | **.039** | .23 | 2.70 | 4.2 | 2.8 | 33 800 | **7 600** | 11 200 | **2 520** | 6 300 | 7 500 |
| **2211EK** | H311 | 50 | **1.9685** | 100 | **3.9370** | 25 | **.9843** | 1.5 | **.059** | .23 | 2.70 | 4.2 | 2.8 | 39 000 | **8 770** | 13 400 | **3 010** | 6 000 | 7 000 |
| **2212EK** | H312 | 55 | **2.1654** | 110 | **4.3307** | 28 | **1.1024** | 1.5 | **.059** | .24 | 2.60 | 4.1 | 2.8 | 48 800 | **11 000** | 17 000 | **3 820** | 5 300 | 6 300 |
| **2213EK** | H313 | 60 | **2.3622** | 120 | **4.7244** | 31 | **1.2205** | 1.5 | **.059** | .24 | 2.60 | 4.1 | 2.8 | 57 200 | **12 900** | 20 000 | **4 500** | 5 000 | 6 000 |
| **2215K** | H315 | 65 | **2.5591** | 130 | **5.1181** | 31 | **1.2205** | 1.5 | **.059** | .25 | 2.50 | 3.9 | 2.5 | 44 200 | **9 940** | 18 000 | **4 050** | 4 500 | 5 300 |
| **2216EK** | H316 | 70 | **2.7559** | 140 | **5.5118** | 33 | **1.2992** | 2.0 | **.079** | .22 | 2.90 | 4.5 | 2.8 | 65 000 | **14 600** | 25 500 | **5 730** | 4 000 | 4 800 |
| **2217K** | H317 | 75 | **2.9528** | 150 | **5.9055** | 36 | **1.4173** | 2.0 | **.079** | .25 | 2.50 | 3.9 | 2.5 | 58 500 | **13 200** | 23 600 | **5 310** | 3 800 | 4 500 |
| **2218K** | H318 | 80 | **3.1496** | 160 | **6.2992** | 40 | **1.5748** | 2.0 | **.079** | .27 | 2.30 | 3.6 | 2.5 | 70 200 | **15 800** | 28 500 | **6 410** | 3 600 | 4 300 |
| **2219K** | H319 | 85 | **3.3465** | 170 | **6.6929** | 43 | **1.6929** | 2.0 | **.079** | .27 | 2.30 | 3.6 | 2.5 | 83 200 | **18 700** | 34 500 | **7 760** | 3 400 | 4 000 |
| **2220K** | H320 | 90 | **3.5433** | 180 | **7.0866** | 46 | **1.8110** | 2.0 | **.079** | .27 | 2.30 | 3.6 | 2.5 | 97 500 | **21 900** | 40 500 | **9 110** | 3 200 | 3 800 |
| **2221K** | H321 | 95 | **3.7402** | 190 | **7.4803** | 50 | **1.9685** | 2.0 | **.079** | .28 | 2.20 | 3.5 | 2.5 | 108 000 | **24 300** | 45 000 | **10 100** | 3 000 | 3 600 |
| **2222K** | H322 | 100 | **3.9370** | 200 | **7.8740** | 53 | **2.0866** | 2.0 | **.079** | .28 | 2.20 | 3.5 | 2.5 | 124 000 | **27 900** | 52 000 | **11 700** | 2 800 | 3 400 |
| **2305K** | H2305 | 20 | **.7874** | 62 | **2.4409** | 24 | **.9449** | 1.0 | **.039** | .48 | 1.30 | 2.0 | 1.4 | 24 200 | **5 440** | 6 550 | **1 470** | 9 500 | 12 000 |
| **2306K** | H2306 | 25 | **.9843** | 72 | **2.8346** | 27 | **1.0630** | 1.0 | **.039** | .44 | 1.40 | 2.2 | 1.4 | 31 200 | **7 010** | 8 800 | **1 980** | 8 500 | 10 000 |
| **2307EK** | H2307 | 30 | **1.1811** | 80 | **3.1496** | 31 | **1.2205** | 1.5 | **.059** | .46 | 1.35 | 2.1 | 1.4 | 39 700 | **8 930** | 11 200 | **2 520** | 7 000 | 8 500 |
| **2308EK** | H2308 | 35 | **1.3780** | 90 | **3.5433** | 33 | **1.2992** | 1.5 | **.059** | .40 | 1.60 | 2.4 | 1.6 | 54 000 | **12 100** | 16 000 | **3 600** | 6 300 | 7 500 |
| **2309EK** | H2309 | 40 | **1.5748** | 100 | **3.9370** | 36 | **1.4173** | 1.5 | **.059** | .33 | 1.90 | 3.0 | 2.0 | 63 700 | **14 300** | 19 300 | **4 340** | 5 600 | 6 700 |
| **2310K** | H2310 | 45 | **1.7717** | 110 | **4.3307** | 40 | **1.5748** | 2.0 | **.079** | .43 | 1.50 | 2.3 | 1.6 | 63 700 | **14 300** | 20 000 | **4 500** | 5 300 | 6 300 |
| **2311K** | H2311 | 50 | **1.9685** | 120 | **4.7244** | 43 | **1.6929** | 2.0 | **.079** | .40 | 1.60 | 2.4 | 1.6 | 76 100 | **17 100** | 24 000 | **5 400** | 4 800 | 5 600 |
| **2312K** | H2312 | 55 | **2.1654** | 130 | **5.1181** | 46 | **1.8110** | 2.0 | **.079** | .33 | 1.90 | 3.0 | 2.0 | 87 100 | **19 600** | 28 500 | **6 410** | 4 500 | 5 300 |
| **2313K** | H2313 | 60 | **2.3622** | 140 | **5.5118** | 48 | **1.8898** | 2.0 | **.079** | .37 | 1.70 | 2.6 | 1.8 | 95 600 | **21 500** | 32 500 | **7 310** | 4 000 | 4 800 |
| **2315K** | H2315 | 65 | **2.5591** | 160 | **6.2992** | 55 | **2.1654** | 2.0 | **.079** | .37 | 1.70 | 2.6 | 1.8 | 124 000 | **27 900** | 43 000 | **9 670** | 3 400 | 4 000 |
| **2316K** | H2316 | 70 | **2.7559** | 170 | **6.6929** | 58 | **2.2835** | 2.0 | **.079** | .37 | 1.70 | 2.6 | 1.8 | 135 000 | **30 400** | 49 000 | **11 000** | 3 200 | 3 800 |
| **2317K** | H2317 | 75 | **2.9528** | 180 | **7.0866** | 60 | **2.3622** | 2.5 | **.098** | .37 | 1.70 | 2.6 | 1.8 | 140 000 | **31 500** | 51 000 | **11 500** | 3 000 | 3 600 |
| **2318K** | H2318 | 80 | **3.1496** | 190 | **7.4803** | 64 | **2.5197** | 2.5 | **.098** | .37 | 1.70 | 2.6 | 1.8 | 153 000 | **34 400** | 57 000 | **12 800** | 2 800 | 3 400 |
| **2319K** | H2319 | 85 | **3.3465** | 200 | **7.8740** | 67 | **2.6378** | 2.5 | **.098** | .37 | 1.70 | 2.6 | 1.8 | 165 000 | **37 100** | 64 000 | **14 400** | 2 600 | 3 200 |
| **2320K** | H2320 | 90 | **3.5433** | 215 | **8.4646** | 73 | **2.8740** | 2.5 | **.098** | .37 | 1.70 | 2.6 | 1.8 | 190 000 | **42 700** | 80 000 | **18 000** | 2 400 | 3 000 |
| **2322K** | H2322 | 100 | **3.9370** | 240 | **9.4488** | 80 | **3.1496** | 2.5 | **.098** | .37 | 1.70 | 2.6 | 1.8 | 216 000 | **48 600** | 95 000 | **21 400** | 2 200 | 2 800 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.

# 2200 and 2300 series
## self-aligning ball bearings with seals, and with seals and tapered bore




Cylindrical bore

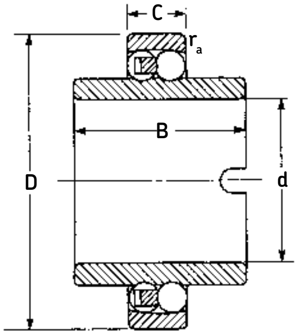



Tapered bore
taper 1:12 on diameter

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1) ] $r_a$ mm | in. | Calculation factors e | $Y_1$ | $Y_2$ | $Y_0$ | Basic radial load rating Dynamic C[2)] N | lbf | Static $C_0$ N | lbf | Speed rating Grease rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cylindrical bore** | | | | | | | | | | | | | | | | | |
| **2200E2RS1** | 10 | **.3937** | 30 | **1.1811** | 14 | **.5512** | .60 | **.024** | .33 | 1.9 | 3.0 | 2.0 | 5 530 | **1 240** | 1 180 | **265** | 17 000 |
| **2201E2RS1** | 12 | **.4724** | 32 | **1.2598** | 14 | **.5512** | .60 | **.024** | .33 | 1.9 | 3.0 | 2.0 | 6 240 | **1 400** | 1 430 | **321** | 16 000 |
| **2202E2RS1** | 15 | **.5906** | 35 | **1.3780** | 14 | **.5512** | .60 | **.024** | .33 | 1.9 | 3.0 | 2.0 | 7 410 | **1 670** | 1 760 | **396** | 14 000 |
| **2203E2RS1** | 17 | **.6693** | 40 | **1.5748** | 16 | **.6299** | .60 | **.024** | .31 | 2.0 | 3.1 | 2.2 | 8 840 | **1 990** | 2 200 | **495** | 12 000 |
| **2204E2RS1** | 20 | **.7874** | 47 | **1.8504** | 18 | **.7087** | 1.0 | **.039** | .30 | 2.1 | 3.3 | 2.2 | 12 700 | **2 860** | 3 400 | **764** | 10 000 |
| **2205E2RS1** | 25 | **.9843** | 52 | **2.0472** | 18 | **.7087** | 1.0 | **.039** | .28 | 2.2 | 3.5 | 2.5 | 14 300 | **3 220** | 4 000 | **899** | 9 000 |
| **2206E2RS1** | 30 | **1.1811** | 62 | **2.4409** | 20 | **.7874** | 1.0 | **.039** | .25 | 2.5 | 3.9 | 2.5 | 15 600 | **3 510** | 4 650 | **1 050** | 7 500 |
| **2207E2RS1** | 35 | **1.3780** | 72 | **2.8346** | 23 | **.9055** | 1.0 | **.039** | .23 | 2.7 | 4.2 | 2.8 | 19 000 | **4 270** | 6 000 | **1 350** | 6 300 |
| **2208E2RS1** | 40 | **1.5748** | 80 | **3.1496** | 23 | **.9055** | 1.0 | **.039** | .22 | 2.9 | 4.5 | 2.8 | 19 900 | **4 470** | 6 950 | **1 560** | 5 600 |
| **2209E2RS1** | 45 | **1.7717** | 85 | **3.3465** | 23 | **.9055** | 1.0 | **.039** | .21 | 3.0 | 4.6 | 3.2 | 22 900 | **5 150** | 7 800 | **1 750** | 5 300 |
| **22102RS1** | 50 | **1.9685** | 90 | **3.5433** | 23 | **.9055** | 1.0 | **.039** | .20 | 3.2 | 4.9 | 3.2 | 22 900 | **5 150** | 8 150 | **1 830** | 4 800 |
| **2211E2RS1** | 55 | **2.1654** | 100 | **3.9370** | 25 | **.9843** | 1.5 | **.059** | .19 | 3.3 | 5.1 | 3.6 | 27 600 | **6 210** | 10 600 | **2 380** | 4 300 |
| **2212E2RS1** | 60 | **2.3622** | 110 | **4.3307** | 28 | **1.1024** | 1.5 | **.059** | .19 | 3.3 | 5.1 | 3.6 | 31 200 | **7 010** | 12 200 | **2 740** | 3 800 |
| **2213E2RS1** | 65 | **2.5591** | 120 | **4.7244** | 31 | **1.2205** | 1.5 | **.059** | .18 | 3.5 | 5.4 | 3.6 | 35 100 | **7 890** | 14 000 | **3 150** | 3 600 |
| **22142RS1** | 70 | **2.7559** | 125 | **4.9213** | 31 | **1.2205** | 1.5 | **.059** | .18 | 3.5 | 5.4 | 3.6 | 34 500 | **7 760** | 13 700 | **3 080** | 3 400 |
| **2302E2RS1** | 15 | **.5906** | 42 | **1.6535** | 17 | **.6693** | 1.0 | **.039** | .31 | 2.0 | 3.1 | 2.2 | 10 800 | **2 430** | 2 600 | **585** | 12 000 |
| **2303E2RS1** | 17 | **.6693** | 47 | **1.8504** | 19 | **.7480** | 1.0 | **.039** | .30 | 2.1 | 3.3 | 2.2 | 12 700 | **2 860** | 3 400 | **764** | 11 000 |
| **2304E2RS1** | 20 | **.7874** | 52 | **2.0472** | 21 | **.8268** | 1.0 | **.039** | .28 | 2.2 | 3.5 | 2.5 | 14 300 | **3 220** | 4 000 | **899** | 9 500 |
| **2305E2RS1** | 25 | **.9843** | 62 | **2.4409** | 24 | **.9449** | 1.0 | **.039** | .28 | 2.2 | 3.5 | 2.5 | 19 000 | **4 270** | 5 400 | **1 210** | 7 500 |
| **2306E2RS1** | 30 | **1.1811** | 72 | **2.8346** | 27 | **1.0630** | 1.0 | **.039** | .25 | 2.5 | 3.9 | 2.5 | 22 500 | **5 060** | 6 800 | **1 530** | 6 700 |
| **2307E2RS1** | 35 | **1.3780** | 80 | **3.1496** | 31 | **1.2205** | 1.5 | **.059** | .25 | 2.5 | 3.9 | 2.5 | 26 500 | **5 960** | 8 500 | **1 910** | 5 600 |
| **2308E2RS1** | 40 | **1.5748** | 90 | **3.5433** | 33 | **1.2992** | 1.5 | **.059** | .23 | 2.7 | 4.2 | 2.8 | 33 800 | **7 600** | 11 200 | **2 520** | 5 000 |
| **2309E2RS1** | 45 | **1.7717** | 100 | **3.9370** | 36 | **1.4173** | 1.5 | **.059** | .23 | 2.7 | 4.2 | 2.8 | 39 000 | **8 770** | 13 400 | **3 010** | 4 500 |
| **2310E2RS1** | 50 | **1.9685** | 110 | **4.3307** | 40 | **1.5748** | 2.0 | **.079** | .24 | 2.6 | 4.1 | 2.8 | 43 600 | **9 800** | 14 000 | **3 150** | 4 000 |
| **Tapered bore** | | | | | | | | | | | | | | | | | |
| **2205E2RS1K** | 25 | **.9843** | 52 | **2.0472** | 18 | **.7087** | 1.0 | **.039** | .28 | 2.2 | 3.5 | 2.5 | 14 300 | **3 220** | 4 000 | **899** | 9 000 |
| **2206E2RS1K** | 30 | **1.1811** | 62 | **2.4409** | 20 | **.7874** | 1.0 | **.039** | .25 | 2.5 | 3.9 | 2.5 | 15 600 | **3 510** | 4 650 | **1 050** | 7 500 |
| **2207E2RS1K** | 35 | **1.3780** | 72 | **2.8346** | 23 | **.9055** | 1.0 | **.039** | .23 | 2.7 | 4.2 | 2.8 | 19 000 | **4 270** | 6 000 | **1 350** | 6 300 |
| **2208E2RS1K** | 40 | **1.5748** | 80 | **3.1496** | 23 | **.9055** | 1.0 | **.039** | .22 | 2.9 | 4.5 | 2.8 | 19 900 | **4 470** | 6 950 | **1 560** | 5 600 |
| **2209E2RS1K** | 45 | **1.7717** | 85 | **3.3465** | 23 | **.9055** | 1.0 | **.039** | .21 | 3.0 | 4.6 | 3.2 | 22 900 | **5 150** | 7 800 | **1 750** | 5 300 |
| **22102RS1K** | 50 | **1.9685** | 90 | **3.5433** | 23 | **.9055** | 1.0 | **.039** | .20 | 3.2 | 4.9 | 3.2 | 22 900 | **5 150** | 8 150 | **1 830** | 4 800 |
| **2211E2RS1K** | 55 | **2.1654** | 100 | **3.9370** | 25 | **.9843** | 1.5 | **.059** | .19 | 3.3 | 5.1 | 3.6 | 27 600 | **6 210** | 10 600 | **2 380** | 4 300 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 11200E, 11300E series
## self-aligning ball bearings with extended inner ring




| MRC bearing number | Bore d | | Outside diameter D | | Width C | | B | | Fillet radius[1) $r_a$ | | Calculation factors e | $Y_1$ | $Y_2$ | $Y_0$ | Basic radial load rating Dynamic $C$[2) | | Static $C_0$ | | Speed rating Grease or oil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | | | | | N | lbf | N | lbf | rpm |
| 11204E | 20 | .7874 | 47 | 1.8504 | 14 | .5512 | 40 | 1.575 | 1.0 | .039 | .30 | 2.1 | 3.3 | 2.2 | 12 700 | 2 860 | 3 400 | 764 | 9 000 |
| 11205E | 25 | .9843 | 52 | 2.0472 | 15 | .5906 | 44 | 1.732 | 1.0 | .039 | .28 | 2.2 | 3.5 | 2.5 | 14 300 | 3 220 | 4 000 | 899 | 8 000 |
| 11206E | 30 | 1.1811 | 62 | 2.4409 | 16 | .6299 | 48 | 1.890 | 1.0 | .039 | .25 | 2.5 | 3.9 | 2.5 | 15 600 | 3 510 | 4 650 | 1 050 | 6 700 |
| 11207E | 35 | 1.3780 | 72 | 2.8346 | 17 | .6693 | 52 | 2.047 | 1.0 | .039 | .23 | 2.7 | 4.2 | 2.8 | 19 000 | 4 270 | 6 000 | 1 350 | 5 600 |
| 11208E | 40 | 1.5748 | 80 | 3.1496 | 18 | .7087 | 56 | 2.205 | 1.0 | .039 | .22 | 2.9 | 4.5 | 2.8 | 19 900 | 4 470 | 6 950 | 1 560 | 5 000 |
| 11209E | 45 | 1.7717 | 85 | 3.3465 | 19 | .7480 | 58 | 2.283 | 1.0 | .039 | .21 | 3.0 | 4.6 | 3.2 | 22 900 | 5 150 | 7 800 | 1 750 | 4 500 |
| 11210E | 50 | 1.9685 | 90 | 3.5433 | 20 | .7874 | 58 | 2.283 | 1.0 | .039 | .21 | 3.0 | 4.6 | 3.2 | 26 500 | 5 960 | 9 150 | 2 060 | 4 300 |
| 11212E | 60 | 2.3622 | 110 | 4.3307 | 22 | .8661 | 62 | 2.441 | 1.5 | .059 | .19 | 3.3 | 5.1 | 3.6 | 31 200 | 7 010 | 12 200 | 2 740 | 3 400 |
| 11305E | 25 | .9843 | 62 | 2.4409 | 17 | .6693 | 48 | 1.890 | 1.0 | .039 | .28 | 2.2 | 3.5 | 2.5 | 19 000 | 4 270 | 5 400 | 1 210 | 6 700 |
| 11306E | 30 | 1.1811 | 72 | 2.8346 | 19 | .7480 | 52 | 2.047 | 1.0 | .039 | .25 | 2.5 | 3.9 | 2.5 | 22 500 | 5 060 | 6 800 | 1 530 | 5 600 |
| 11307E | 35 | 1.3780 | 80 | 3.1496 | 21 | .8268 | 56 | 2.205 | 1.5 | .059 | .25 | 2.5 | 3.9 | 2.5 | 26 500 | 5 960 | 8 500 | 1 910 | 5 000 |
| 11308E | 40 | 1.5748 | 90 | 3.5433 | 23 | .9055 | 58 | 2.283 | 1.5 | .059 | .23 | 2.7 | 4.2 | 2.8 | 33 800 | 7 600 | 11 200 | 2 520 | 4 500 |
| 11310E | 50 | 1.9685 | 110 | 4.3307 | 27 | 1.0630 | 62 | 2.441 | 2.0 | .079 | .24 | 2.6 | 4.1 | 2.8 | 43 600 | 9 800 | 14 000 | 3 150 | 3 600 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.

# Radial internal clearance of self-aligning ball bearings

| Bore diameter d | | | | C2 | | | | Normal | | | | C3 | | | | C4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Over | | Including | | .001 mm | | .0001 in. | | .001 mm | | .0001 in. | | .001 mm | | .0001 in. | | .001 mm | | .0001 in. | |
| mm | in. | mm | in. | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| **Bearings with cylindrical bore** | | | | | | | | | | | | | | | | | | | |
| 2.5 | **.0984** | 6 | **.2362** | 1 | 8 | **0** | **3** | 5 | 15 | **2** | **6** | 10 | 20 | **4** | **8** | 15 | 25 | **6** | **10** |
| 6.0 | **.2362** | 10 | **.3937** | 2 | 9 | **1** | **4** | 6 | 17 | **2** | **7** | 12 | 25 | **5** | **10** | 19 | 33 | **7** | **13** |
| 10.0 | **.3937** | 14 | **.5512** | 2 | 10 | **1** | **4** | 6 | 19 | **2** | **7** | 13 | 26 | **5** | **10** | 21 | 35 | **8** | **14** |
| 14.0 | **.5512** | 18 | **.7087** | 3 | 12 | **1** | **5** | 8 | 21 | **3** | **8** | 15 | 28 | **6** | **11** | 23 | 37 | **9** | **15** |
| 18.0 | **.7087** | 24 | **.9449** | 4 | 14 | **2** | **6** | 10 | 23 | **4** | **9** | 17 | 30 | **7** | **12** | 25 | 39 | **10** | **15** |
| 24.0 | **.9449** | 30 | **1.1811** | 5 | 16 | **2** | **6** | 11 | 24 | **4** | **9** | 19 | 35 | **7** | **14** | 29 | 46 | **11** | **18** |
| 30.0 | **1.1811** | 40 | **1.5748** | 6 | 18 | **2** | **7** | 13 | 29 | **5** | **11** | 23 | 40 | **9** | **16** | 34 | 53 | **13** | **21** |
| 40.0 | **1.5748** | 50 | **1.9685** | 6 | 19 | **2** | **7** | 14 | 31 | **6** | **12** | 25 | 44 | **10** | **17** | 37 | 57 | **15** | **22** |
| 50.0 | **1.9685** | 65 | **2.5591** | 7 | 21 | **3** | **8** | 16 | 36 | **6** | **14** | 30 | 50 | **12** | **20** | 45 | 69 | **18** | **27** |
| 65.0 | **2.5591** | 80 | **3.1496** | 8 | 24 | **3** | **9** | 18 | 40 | **7** | **16** | 35 | 60 | **14** | **24** | 54 | 83 | **21** | **33** |
| 80.0 | **3.1496** | 100 | **3.9370** | 9 | 27 | **4** | **11** | 22 | 48 | **9** | **19** | 42 | 70 | **17** | **28** | 64 | 96 | **25** | **38** |
| 100.0 | **3.9370** | 120 | **4.7244** | 10 | 31 | **4** | **12** | 25 | 56 | **10** | **22** | 50 | 83 | **20** | **33** | 75 | 114 | **30** | **45** |
| 120.0 | **4.7244** | 140 | **5.5118** | 10 | 38 | **4** | **15** | 30 | 68 | **12** | **27** | 60 | 100 | **24** | **39** | 90 | 135 | **35** | **53** |
| **Bearings with tapered bore** | | | | | | | | | | | | | | | | | | | |
| 18.0 | **.7087** | 24 | **.9449** | 7 | 17 | **3** | **7** | 13 | 26 | **5** | **10** | 20 | 33 | **8** | **13** | 28 | 42 | **11** | **17** |
| 24.0 | **.9449** | 30 | **1.1811** | 9 | 20 | **4** | **8** | 15 | 28 | **6** | **11** | 23 | 39 | **9** | **15** | 33 | 50 | **13** | **20** |
| 30.0 | **1.1811** | 40 | **1.5748** | 12 | 24 | **5** | **9** | 19 | 35 | **7** | **14** | 26 | 46 | **10** | **18** | 40 | 59 | **16** | **23** |
| 40.0 | **1.5748** | 50 | **1.9685** | 14 | 27 | **6** | **11** | 22 | 39 | **9** | **15** | 33 | 52 | **13** | **20** | 45 | 65 | **18** | **26** |
| 50.0 | **1.9685** | 65 | **2.5591** | 18 | 32 | **7** | **13** | 27 | 47 | **11** | **19** | 41 | 61 | **16** | **24** | 56 | 80 | **22** | **31** |
| 65.0 | **2.5591** | 80 | **3.1496** | 23 | 39 | **9** | **15** | 35 | 57 | **14** | **22** | 50 | 75 | **20** | **30** | 69 | 98 | **27** | **39** |
| 80.0 | **3.1496** | 100 | **3.9370** | 29 | 47 | **11** | **19** | 42 | 68 | **17** | **27** | 62 | 90 | **24** | **35** | 84 | 116 | **33** | **46** |
| 100.0 | **3.9370** | 120 | **4.7244** | 35 | 56 | **14** | **22** | 50 | 81 | **20** | **32** | 75 | 108 | **30** | **43** | 100 | 139 | **39** | **75** |

## Allowable angular misalignment of self-aligning ball bearings

| Bearing series | Allowable angular misalignment degrees |
|---|---|
| 108, 126, 127, 129, 1350 | 3.0 |
| 1200, 1200E | 2.5 |
| 1300, 1300E | 3.0 |
| 1400 | 3.0 |
| 2200, 2200E | 2.5 |
| 2200ERS1 | 1.5 |
| 2300, 2300E | 3.0 |
| 2300ERS1 | 1.5 |
| 11200E | 2.5 |
| 11300E | 3.0 |

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

$P = F_R + Y_1 F_A$, where $F_A/F_R \le e$

or

$P = 0.65 F_R + Y_2 F_A$, where $F_A/F_R > e$

$P$ = Dynamic equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

$Y_1$ = Thrust load factor

$Y_2$ = Thrust load factor

$e$ = Limiting factor for $F_A/F_R$

$Y_1$, $Y_2$ and e are given in bearing tables

### Life rating

$$L10 = \left(\frac{C}{P}\right)^3 \text{ (millions of revolutions)}$$

or

$$L10_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 \text{ (hours)}$$

C = Basic dynamic load rating

P = Dynamic equivalent radial load

n = Speed in rpm

### Static equivalent radial load

$P_0 = F_R + Y_0 F_A$

$P_0$ = Static equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

$Y_0$ = Thrust load factor

$Y_0$ given in bearing tables

## Dynamic equivalent radial load and life calculation examples

Bearing size: 1209E

Speed: 2000 rpm

Basic dynamic radial load rating (C) = 5150

e = 0.21

$Y_1 = 3.0$

$Y_2 = 4.6$

### Case 1

Radial load ($F_R$) = 500

Thrust load ($F_A$) = 100

$F_A/F_R = 100/500 = 0.20$

Equivalent load (P) = $F_R + Y_1 F_A$

$P = 500 + 3.0 \times 100 = 800$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{5150}{800}\right)^3 = 266.8 \times 10^6 \text{ Rev.}$$

or

$$\text{Life }(L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{5150}{800}\right)^3$$

= 2223 Hrs

### Case 2

Radial load ($F_R$) = 500

Thrust load ($F_A$) = 170

$F_A/F_R = 170/500 = 0.34$

Equivalent load (P) = $0.65 F_R + Y_2 F_A$

$P = 0.65 \times 500 + 4.6 \times 170 = 1107$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{5150}{1107}\right)^3 = 100.7 \times 10^6 \text{ Rev.}$$

or

$$\text{Life }(L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{5150}{1107}\right)^3$$

= 839 Hrs

### Minimum load

In order to provide satisfactory operation, self-aligning ball bearings, like all ball and roller bearings, must always be subjected to a given minimum load, particularly if they are to operate at high speeds or are subjected to high accelerations or rapid changes in the direction of load. Under such conditions the inertia forces of the balls and cage, and the friction in the lubricant, can have a detrimental influence on the rolling conditions in the bearing arrangement and may cause damaging sliding movements to occur between the balls and raceways.

The requisite minimum load to be applied to self-aligning ball bearings can be estimated using:

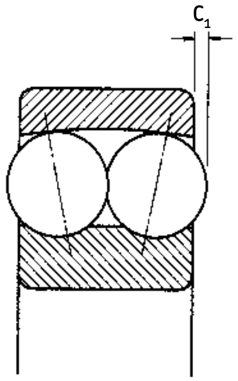
$P_m = 0.01\, C_0$

where, $P_m$ = minimum equivalent static bearing load, lbs

$C_0$ = basic static load rating, lbs

When starting up at low temperatures or when the lubricant is highly viscous, even greater minimum loads may be required. The weight of the components supported by the bearing, together with external forces, generally exceeds the requisite minimum load. If this is not the case, the self-aligning ball bearing must be subjected to an additional radial load, for example, by increasing belt tension or by similar means.

# Self-aligning ball bearings




## Ball protrusion

Self-aligning bearings in series 1400 and in some sizes in series 1200, 1200K and 1300K, have ball protrusion beyond the bearing ring faces as shown in the table below. This must be considered when designing adjacent components.

| Size | Protrusion ($C_1$) | |
|---|---|---|
| | mm | inches |
| 1224K | 1.3 | .051 |
| 1226 | 0.7 | .028 |
| 1318K | 1.0 | .039 |
| 1319K | 1.5 | .059 |
| 1320K | 2.5 | .098 |
| 1321K | 2.6 | .102 |
| 1322K | 2.6 | .102 |
| 1406 | 2.2 | .087 |
| 1407 | 2.0 | .079 |
| 1408 | 2.0 | .079 |
| 1409 | 2.5 | .098 |
| 1410 | 3.0 | .118 |
| 1411 | 2.4 | .094 |
| 1412 | 2.8 | .110 |

## Axial load carrying capacity of bearings mounted on adapter sleeves

The ability of self-aligning ball bearings mounted on adapter sleeves on smooth shafts to carry axial loads, depends on the friction between sleeve and shaft. The approximate permissible axial load can be determined from:

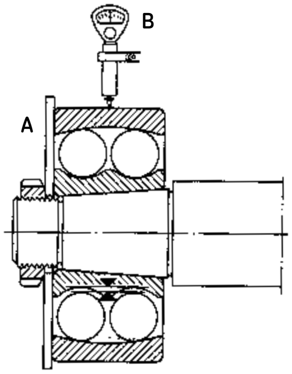
$F_{AP} = 3\ B\ d$

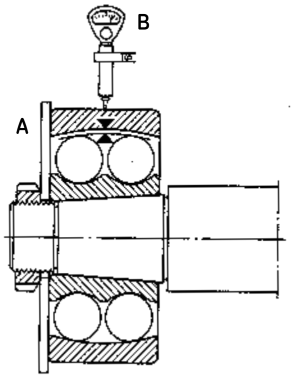
where, $F_{AP}$ = maximum permissible axial load (N)

B = bearing width (mm)

d = bearing bore (mm)

To convert newtons (N) to pounds, multiply by 0.2248




## Mounting bearings with tapered bore

Bearings with a tapered bore are always mounted with an interference fit on the shaft, adapter sleeve or withdrawal sleeve. As a measure of the degree of interference of the fit, either the reduction in radial internal clearance of the bearing or the axial displacement of the inner ring on the tapered bearing seating can be used. The mounting of self-aligning ball bearings with tapered bore calls for experience and skill as they have a relatively small internal clearance, and a reliable measurement of the clearance reduction is not always possible.

When mounting bearings with normal radial internal clearance it is generally sufficient to check clearance reduction during the drive-up by turning and swivelling out the outer ring. When the bearing is properly mounted the outer ring can be easily turned but there should be a slight resistance when the ring is swivelled out. The bearing will then have the requisite interference fit. In some cases, however, the residual internal clearance may be too small for the application, and a bearing with C3 radial internal clearance should be used instead.

When mounting bearings with C3 clearance, the tightening angle $\alpha$ or the axial displacement S can be used to measure the degree of interference. The procedures and values given in the following also apply to bearings with normal clearance.

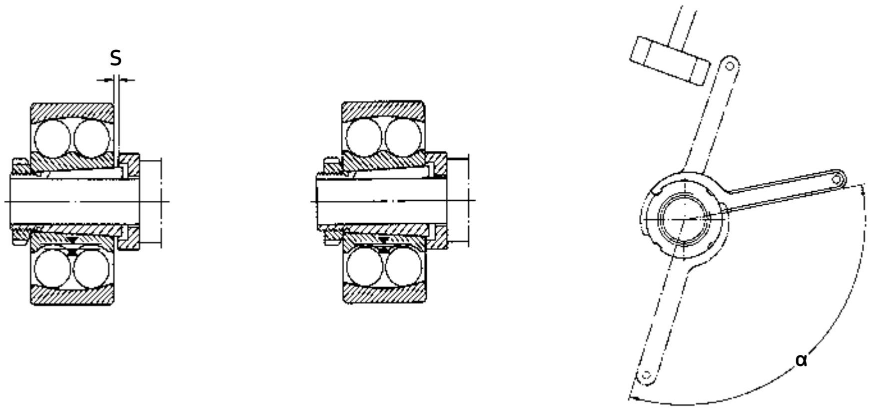
An easy method of mounting bearings on adapter sleeves is based on the tightening angle $\alpha$ through which the nut is turned and the procedure is described in the following. Guideline values for the tightening angle $\alpha$ are given in the table overleaf. Before mounting, the thread of the nut and the side face of the nut which is to abut the bearing should be smeared with a molybdenum disulphide paste or similar lubricant, and the outside diameter of the sleeve should be lightly oiled. The bearing is then pushed on to the sleeve and the nut screwed on. By turning the nut through the given angle $\alpha$ the bearing will be pressed up on the tapered seating of the sleeve. As the bearing has a tendency to skew when being pressed up it is advisable to reposition the hook spanner in a slot at 180° to that used for tightening and then apply a light hammer blow to the spanner. The bearing will straighten up on its seating. The nut is then removed, the locking washer inserted and the nut replaced, tightened and locked by bending down one of the tabs of the locking washer. The residual clearance of the bearing should be checked.

Another method which is often used to mount bearings with a tapered bore correctly and reliably is to measure the axial displacement S of the inner ring on the tapered seating. Guideline values for the requisite displacement S are given in the table overleaf.

When using either of the above methods, the self-aligning ball bearings should always be pushed up on to the tapered seating until the bore of the bearing is in contact with the seating on the shaft or sleeve around its whole circumference, before the final tightening procedure is begun. A sufficiently tight fit will then be obtained and the residual clearance will correspond to the mean values given in the table.

One method of measuring the internal clearance of self-aligning ball bearings is shown in the illustrations above. A washer A is inserted between the bearing and the shaft or sleeve nut to ensure correct alignment of the outer ring with respect to the inner ring. A dial gauge B placed on the bearing outer ring can be used to measure the bearing clearance. The outer ring should be pushed upwards in the direction of the shaft.

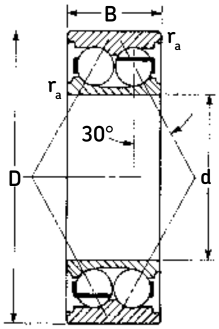
# Self-aligning ball bearings



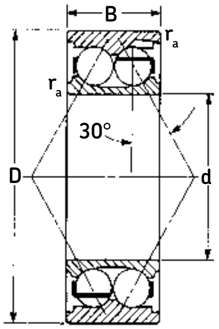

**Mounting self-aligning ball bearings with tapered bore**

| | | | Axial displacement S | | | | | | | | Mean residual clearance after mounting | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bearing bore | | Tightening angle | Bearing series | | | | | | | | Normal | | C3 | |
| d | | a | 1200K | | 1300K | | 2200K | | 2300K | | .001 | .0001 | .001 | .0001 |
| mm | in. | Degrees | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. |
| 20 | **.7874** | 70 | .22 | **.009** | .23 | **.009** | — | **—** | — | **—** | 10 | **4** | 20 | **8** |
| 25 | **.9843** | 70 | .22 | **.009** | .23 | **.009** | .22 | **.009** | .23 | **.009** | 10 | **4** | 20 | **8** |
| 30 | **1.1811** | 70 | .22 | **.009** | .23 | **.009** | .22 | **.009** | .23 | **.009** | 10 | **4** | 20 | **8** |
| 35 | **1.3780** | 70 | .30 | **.012** | .30 | **.012** | .30 | **.012** | .30 | **.012** | 10 | **4** | 20 | **8** |
| 40 | **1.5748** | 70 | .30 | **.012** | .30 | **.012** | .30 | **.012** | .30 | **.012** | 10 | **4** | 20 | **8** |
| 45 | **1.7717** | 70 | .31 | **.012** | .34 | **.013** | .31 | **.012** | .33 | **.013** | 15 | **6** | 25 | **10** |
| 50 | **1.9685** | 70 | .31 | **.012** | .34 | **.013** | .31 | **.012** | .33 | **.013** | 15 | **6** | 25 | **10** |
| 55 | **2.1654** | 90 | .40 | **.016** | .41 | **.016** | .39 | **.015** | .40 | **.016** | 15 | **6** | 30 | **12** |
| 60 | **2.3622** | 90 | .40 | **.016** | .41 | **.016** | .39 | **.015** | .40 | **.016** | 15 | **6** | 30 | **12** |
| 65 | **2.5591** | 90 | .40 | **.016** | .41 | **.016** | .39 | **.015** | .40 | **.016** | 15 | **6** | 30 | **12** |
| 75 | **2.9528** | 120 | .45 | **.018** | .47 | **.019** | .43 | **.017** | .46 | **.018** | 20 | **8** | 40 | **16** |
| 80 | **3.1496** | 120 | .45 | **.018** | .47 | **.019** | .43 | **.017** | .46 | **.018** | 20 | **8** | 40 | **16** |
| 85 | **3.3465** | 120 | .58 | **.023** | .60 | **.024** | .54 | **.021** | .59 | **.023** | 20 | **8** | 40 | **16** |
| 90 | **3.5433** | 120 | .58 | **.023** | .60 | **.024** | .54 | **.021** | .59 | **.023** | 20 | **8** | 40 | **16** |
| 95 | **3.7402** | 120 | .58 | **.023** | .60 | **.024** | .54 | **.021** | .59 | **.023** | 20 | **8** | 40 | **16** |
| 100 | **3.9370** | 120 | .58 | **.023** | .60 | **.024** | .54 | **.021** | .59 | **.023** | 20 | **8** | 40 | **16** |
| 105 | **4.1339** | 120 | .67 | **.026** | — | **—** | .66 | **.026** | — | **—** | 25 | **10** | 55 | **22** |
| 110 | **4.3307** | 120 | .67 | **.026** | .70 | **.028** | .66 | **.026** | .69 | **.027** | 25 | **10** | 55 | **22** |
| 120 | **4.7244** | 120 | .67 | **.026** | — | **—** | — | **—** | — | **—** | 25 | **10** | 55 | **22** |

# 5000 series double-row angular contact ball bearings




C Plain




M Plain

MRC double-row angular contact ball bearings are manufactured in two main types: C-type (Conrad construction) and M-type (maximum capacity with filling notches). Each of the two rows has a 30° contact angle.

## C-type

Conrad construction, or C-type, double-row ball bearings have contact angles that converge outside the bearing, thereby increasing resistance to misalignment. This type does not have filling notches. These bearings are recommended for applications where single-row ball bearings are inadequate, but radial loads are not so great as to suggest a filling-notch bearing. They will take heavy radial loads and axial loads equally in either direction. The C-type design fully meets the requirements of American Petroleum Institute (API) Specification 610.

Both the inner and the outer rings have closure grooves. These bearings are available with seals, shields, and snap-rings.

## M-type

Maximum capacity double-row ball bearings have filling notches on one side to permit assembling the maximum number of balls into the bearing. Contact angles converge outside the bearing. All inner and outer rings have closure grooves. These bearings may be equipped with seals, shields, and snap-rings. The M-type bearing has very heavy radial capacity. It also has thrust capacity in one direction, with the ability to accommodate light thrust load in the reversing direction.

Part numbers on M-type double-row bearings are normally located on either the side face or the O.D. surface of the bearing. The side face marking is always on the side opposite the filling notch and the O.D. marking is offset from the center away from the filling notch. Therefore, double sealed or shielded bearings with the filling notch covered from view can be oriented correctly.

## Ball cages and types

The cage supplied with C-type and M-type bearings is a one-piece crown-type of heat-treated pressed steel. It is snapped into place after the full quota of balls has been introduced between the inner and outer ring.

# 5000 series ball bearings suffix and width summary

The older MRC 5000 series double-row ball bearings were made in three series — 5200 light, 5300 medium, and 5400 heavy — each with progressively larger cross sections. These old-style 5000 type double-rows were available in the SB Conrad and maximum capacity configurations. The SB Conrad version had contact angles which diverged inwardly, thereby increasing resistance to misalignment. The maximum capacity version had contact angles which converged inwardly, giving it the capability of handling small amounts of misalignment. It also had filling notches on both sides, for the introduction of a maximum complement of balls.

Our double-row ball bearings are available in the C-type (Conrad construction) and M-type (with filling notches on one side only). Both types feature inwardly diverging contact angles, which provide greater rigidity than found in the previous double-row filling-notch type bearings. A unique manufacturing system utilizing "common parts" is employed in the manufacture of these bearings. Using a minimum number of components, the system provides greater flexibility for producing either Conrad or maximum capacity types as open bearings or with a variety of closures. Twenty-four variations of a single bearing size can be manufactured to solve your application problems.

The charts on pages 91–92 outline the suffixes and widths of MRC 5000 series bearings. The data on the charts do not represent actual availability of double-row products. These data are intended to be used as references for interchanging. Current style double-rows appear next to their old-style counterparts that are the same width.

**MRC double-row suffix identification summary**

| Suffix | Description |
|---|---|
| **B** | Rigid construction, maximum capacity |
| **BK** | Rigid construction, maximum capacity, standard width |
| **C** | Conrad, rigid construction, standard width |
| **C1** | 1/8 in. additional width from standard. 5205C1 and 5212C1 are 1/16 in. wider than standard |
| **F** | One shield |
| **FF** | Two shields |
| **G** | Snap-ring |
| **HYB#1** | Ceramic rolling elements |
| **K** | Standard width |
| **M** | Maximum capacity, rigid construction, standard width |
| **M1** | 1/8 in. additional width from standard. 5205M1 and 5212M1 are 1/16 in. wider than standard |
| **Plain** | Maximum capacity, nonrigid construction. Narrow width in 5200 series, extra width is required with closures |
| **S** | Conrad construction (Note: always combined with additional suffix letters) |
| **SB** | Conrad, rigid construction, narrow width. Extra width is required with closures |
| **SBK** | Conrad, rigid construction, standard width |
| **Z** | One seal |
| **ZZ** | Two seals |

# 5000 series ball bearings suffix and width summary

| Basic bearing number | Old style suffix | New style suffix | Width (inches) |
|---|---|---|---|
| **5200 Series** | | | |
| **5106** | SBZZ | — | $\frac{29}{32}$ |
| **5200** | SB | — | $\frac{9}{16}$ |
| | SBKF | — | $\frac{9}{16}$ |
| | SBKFF | — | $\frac{9}{16}$ |
| | SBKZ | — | $\frac{9}{16}$ |
| | SBKZZ | — | $\frac{9}{16}$ |
| **5201** | SB | — | $\frac{5}{8}$ |
| | SBFG | — | $\frac{5}{8}$ |
| | SBKF | — | $\frac{5}{8}$ |
| | SBKFF | — | $\frac{5}{8}$ |
| | SBKFFG | — | $\frac{5}{8}$ |
| | SBKFG | — | $\frac{5}{8}$ |
| | SBKZ | — | $\frac{5}{8}$ |
| | SBKZZ | — | $\frac{5}{8}$ |
| **5202** | Plain | — | $\frac{5}{8}$ |
| | SB | — | $\frac{5}{8}$ |
| | SBFG | — | $\frac{11}{16}$ |
| | SBKF | — | $\frac{5}{8}$ |
| | SBKFF | — | $\frac{5}{8}$ |
| | SBKFG | — | $\frac{5}{8}$ |
| | SBKZZ | — | $\frac{5}{8}$ |
| **5203** | SB | — | $\frac{11}{16}$ |
| | SBKF | — | $\frac{11}{16}$ |
| | SBKFF | — | $\frac{11}{16}$ |
| | SBKFFG | — | $\frac{11}{16}$ |
| | SBKFG | — | $\frac{11}{16}$ |
| | SBKZ | — | $\frac{11}{16}$ |
| | SBKZZ | — | $\frac{11}{16}$ |
| **5204** | Plain | — | $\frac{3}{4}$ |
| | K | M | $\frac{13}{16}$ |
| | KF | MF | $\frac{13}{16}$ |
| | SB | — | $\frac{3}{4}$ |
| | SBK | C | $\frac{13}{16}$ |
| | SBKF | CF | $\frac{13}{16}$ |
| | SBKFF | CFF | $\frac{13}{16}$ |
| | SBKFFG | CFFG | $\frac{13}{16}$ |
| | SBKFG | CFG | $\frac{13}{16}$ |
| | SBKG | CG | $\frac{13}{16}$ |
| | SBKZ | CZ | $\frac{13}{16}$ |
| **5205** | F | MF1 | $\frac{7}{8}$ |
| | K | M | $\frac{13}{16}$ |
| | KG | MG | $\frac{13}{16}$ |
| | Plain | — | $\frac{3}{4}$ |
| | SB | — | $\frac{3}{4}$ |
| | SBF | CF1 | $\frac{7}{8}$ |
| | SBK | C | $\frac{13}{16}$ |
| | SBKF | CF | $\frac{13}{16}$ |
| | SBKFF | CFF | $\frac{13}{16}$ |
| | SBKFG | CFG | $\frac{13}{16}$ |
| | SBKG | CG | $\frac{13}{16}$ |
| | — | C1, M1 | $\frac{7}{8}$ |
| **5206** | F | MF1 | $1\frac{1}{16}$ |
| | K | M | $\frac{15}{16}$ |
| | KF | MF | $\frac{15}{16}$ |
| | KFF | MFF | $\frac{15}{16}$ |
| | KG | MG | $\frac{15}{16}$ |
| | Plain | — | $\frac{3}{4}$ |
| | SBF | CF1 | $1\frac{1}{16}$ |
| | SBK | C | $\frac{15}{16}$ |
| | SBKF | CF | $\frac{15}{16}$ |
| | SBKFF | CFF | $\frac{15}{16}$ |
| | SBKFFG | CFFG | $\frac{15}{16}$ |
| | SBKFG | CFG | $\frac{15}{16}$ |
| | SBKG | CG | $\frac{15}{16}$ |
| | SBZZ | CZZ1 | $1\frac{1}{16}$ |
| | SBKZZG | CZZG1 | $1\frac{1}{16}$ |
| | — | C1, M1 | $1\frac{1}{16}$ |
| **5207** | F | MF1 | $1\frac{3}{16}$ |
| | K | M | $1\frac{1}{16}$ |
| | KF | MF | $1\frac{1}{16}$ |
| | KFF | MFF | $1\frac{1}{16}$ |
| | KFG | MFG | $1\frac{1}{16}$ |
| | KG | MG | $1\frac{1}{16}$ |
| | Plain | — | $\frac{7}{8}$ |
| | SBK | C | $1\frac{1}{16}$ |
| | SBKF | CF | $1\frac{1}{16}$ |
| | SBKFF | CFF | $1\frac{1}{16}$ |
| | SBKFG | CFG | $1\frac{1}{16}$ |
| | SBKFFG | CFFG | $1\frac{1}{16}$ |
| | SBKG | CG | $1\frac{1}{16}$ |
| | — | C1, M1 | $1\frac{3}{16}$ |
| **5208** | BKF | MF | $1\frac{3}{16}$ |
| | BKFF | MFF | $1\frac{3}{16}$ |
| | K | M | $1\frac{3}{16}$ |
| | KF | MF | $1\frac{3}{16}$ |
| | KFF | MFF | $1\frac{3}{16}$ |
| | KFG | MFG | $1\frac{3}{16}$ |
| | KG | MG | $1\frac{3}{16}$ |
| | Plain | — | 1 |
| | SBK | C | $1\frac{3}{16}$ |
| | SBKF | CF | $1\frac{3}{16}$ |
| | SBKFF | CFF | $1\frac{3}{16}$ |
| | SBKFG | CFG | $1\frac{3}{16}$ |
| | SBKG | CG | $1\frac{3}{16}$ |
| **5209** | K | M | $1\frac{3}{16}$ |
| | KF | MF | $1\frac{3}{16}$ |
| | KG | MG | $1\frac{3}{16}$ |
| | Plain | — | 1 |
| | SBK | C | $1\frac{3}{16}$ |
| | SBKF | CF | $1\frac{3}{16}$ |
| | SBKFF | CFF | $1\frac{3}{16}$ |
| **5210** | K | M | $1\frac{3}{16}$ |
| | KF | MF | $1\frac{3}{16}$ |
| | KFF | MFF | $1\frac{3}{16}$ |
| | KG | MG | $1\frac{3}{16}$ |
| | Plain | — | 1 |
| | — | C | $1\frac{3}{16}$ |
| **5211** | BK | M | $1\frac{5}{16}$ |
| | BKG | MG | $1\frac{5}{16}$ |
| | K | M | $1\frac{5}{16}$ |
| | KF | MF | $1\frac{5}{16}$ |
| | KFG | MFG | $1\frac{5}{16}$ |
| | KG | MG | $1\frac{5}{16}$ |
| | Plain | — | $1\frac{3}{16}$ |
| | — | C | $1\frac{5}{16}$ |
| **5212** | F | MF1 | $1\frac{1}{2}$ |
| | FG | MFG1 | $1\frac{1}{2}$ |
| | K | M | $1\frac{7}{16}$ |
| | KF | MF | $1\frac{7}{16}$ |
| | KFG | MFG | $1\frac{7}{16}$ |
| | KG | MG | $1\frac{7}{16}$ |
| | Plain | — | $1\frac{3}{8}$ |
| | — | C1, M1 | $1\frac{1}{2}$ |
| | — | C | $1\frac{7}{16}$ |
| **5213** | K | M | $1\frac{1}{2}$ |
| | KF | MF | $1\frac{1}{2}$ |
| | KFG | MFG | $1\frac{1}{2}$ |
| | KG | MG | $1\frac{1}{2}$ |
| | Plain | — | $1\frac{3}{8}$ |
| | — | C | $1\frac{1}{2}$ |
| **5214** | K | M | $1\frac{9}{16}$ |
| | KF | MF | $1\frac{9}{16}$ |
| | KFG | MFG | $1\frac{9}{16}$ |
| | KG | MG | $1\frac{9}{16}$ |
| | Plain | — | $1\frac{7}{16}$ |
| | — | C | $1\frac{9}{16}$ |
| **5215** | K | M | $1\frac{5}{8}$ |
| | KF | MF | $1\frac{5}{8}$ |
| | KFF | MFF | $1\frac{5}{8}$ |
| | KFG | MFG | $1\frac{5}{8}$ |
| | KG | MG | $1\frac{5}{8}$ |
| | Plain | — | $1\frac{7}{16}$ |
| | — | C | $1\frac{5}{8}$ |
| **5216** | BFF | — | $1\frac{7}{8}$ |
| | K | M | $1\frac{3}{4}$ |
| | KF | MF | $1\frac{3}{4}$ |
| | KFG | MFG | $1\frac{3}{4}$ |
| | KG | MG | $1\frac{3}{4}$ |
| | Plain | — | $1\frac{5}{8}$ |
| | — | C | $1\frac{3}{4}$ |
| **5217** | K | M | $1\frac{15}{16}$ |
| | KF | MF | $1\frac{15}{16}$ |
| | KG | MG | $1\frac{15}{16}$ |
| | Plain | — | $1\frac{3}{4}$ |
| | — | C | $1\frac{15}{16}$ |
| **5218** | K | M | $2\frac{1}{16}$ |
| | KF | MF | $2\frac{1}{16}$ |
| | KG | MG | $2\frac{1}{16}$ |
| | Plain | — | 2 |
| | — | C | $2\frac{1}{16}$ |
| **5219** | G | — | $2\frac{3}{16}$ |
| | Plain | — | $2\frac{3}{16}$ |
| **5220** | G | — | $2\frac{3}{8}$ |
| | Plain | — | $2\frac{3}{8}$ |
| **5221** | Plain | — | $2\frac{9}{16}$ |
| **5222** | KF | — | $2\frac{3}{4}$ |
| | Plain | — | $2\frac{3}{4}$ |

# 5000 series ball bearings suffix and width summary

| Basic bearing number | Old style suffix | New style suffix | Width (inches) |
|---|---|---|---|
| **5300 Series** | | | |
| **5300** | SB | — | $\frac{3}{4}$ |
| **5301** | SB | — | $\frac{3}{4}$ |
| **5302** | Plain | — | $\frac{3}{4}$ |
| | SB | — | $\frac{3}{4}$ |
| **5303** | G | — | $\frac{7}{8}$ |
| | KF | — | $\frac{7}{8}$ |
| | KFG | — | $\frac{7}{8}$ |
| | SB | — | $\frac{7}{8}$ |
| | SBG | — | $\frac{7}{8}$ |
| | SBKF | — | $\frac{7}{8}$ |
| | SBKFF | — | $\frac{7}{8}$ |
| | SBKFG | — | $\frac{7}{8}$ |
| **5304** | F | MF1 | 1 |
| | Plain | M | $\frac{7}{8}$ |
| | SB | C | $\frac{7}{8}$ |
| | SBF | CF1 | 1 |
| | SBG | CG | $\frac{7}{8}$ |
| | SBKF | CF | $\frac{7}{8}$ |
| | SBKFF | CFF | $\frac{7}{8}$ |
| | SBKFFG | CFFG | $\frac{7}{8}$ |
| | SBKFG | CFG | $\frac{7}{8}$ |
| | — | C1, M1 | 1 |
| **5305** | F | — | $1\frac{1}{8}$ |
| | FG | — | $1\frac{1}{8}$ |
| | G | MG | 1 |
| | KFF | MFF | 1 |
| | Plain | M | 1 |
| | SB | C | 1 |
| | SBF | — | $1\frac{1}{8}$ |
| | SBFG | — | $1\frac{1}{8}$ |
| | SBG | CG | 1 |
| | SBKF | CF | 1 |
| | SBKFF | CFF | 1 |
| | SBKFG | CFG | 1 |
| **5306** | B | M | $1\frac{3}{16}$ |
| | BKFF | MFF | $1\frac{3}{16}$ |
| | F | MF1 | $1\frac{5}{16}$ |
| | FG | MFG1 | $1\frac{5}{16}$ |
| | G | MG | $1\frac{3}{16}$ |
| | KF | MF | $1\frac{3}{16}$ |
| | KFF | MFF | $1\frac{3}{16}$ |
| | KFG | MFG | $1\frac{3}{16}$ |
| | Plain | M | $1\frac{3}{16}$ |
| | — | C1, M1 | $1\frac{5}{16}$ |
| | — | C | $1\frac{3}{16}$ |
| **5307** | BKFF | MFF | $1\frac{3}{8}$ |
| | F | MF1 | $1\frac{1}{2}$ |
| | FG | MFG1 | $1\frac{1}{2}$ |
| | G | MG | $1\frac{3}{8}$ |
| | KF | MF | $1\frac{3}{8}$ |
| | KFG | MFG | $1\frac{3}{8}$ |
| | Plain | M | $1\frac{3}{8}$ |
| | — | C1, M1 | $1\frac{1}{2}$ |
| | — | C | $1\frac{3}{8}$ |
| **5308** | BG | MG | $1\frac{7}{16}$ |
| | F | MF1 | $1\frac{9}{16}$ |
| | FG | MFG1 | $1\frac{9}{16}$ |
| | G | MG | $1\frac{7}{16}$ |
| | Plain | M | $1\frac{7}{16}$ |
| | — | C | $1\frac{7}{16}$ |
| | — | C1, M1 | $1\frac{9}{16}$ |
| **5309** | B | M | $1\frac{9}{16}$ |
| | F | MF1 | $1\frac{11}{16}$ |
| | FG | MFG1 | $1\frac{11}{16}$ |
| | G | MG | $1\frac{9}{16}$ |
| | Plain | M | $1\frac{9}{16}$ |
| | — | C | $1\frac{9}{16}$ |
| | — | C1, M1 | $1\frac{11}{16}$ |
| **5310** | F | MF1 | $1\frac{7}{8}$ |
| | FG | MFG1 | $1\frac{7}{8}$ |
| | G | MG | $1\frac{3}{4}$ |
| | KF | MF | $1\frac{3}{4}$ |
| | KFG | MFG | $1\frac{3}{4}$ |
| | Plain | M | $1\frac{3}{4}$ |
| | — | C | $1\frac{3}{4}$ |
| | — | C1, M1 | $1\frac{7}{8}$ |
| **5311** | F | MF1 | $2\frac{1}{16}$ |
| | FG | MFG1 | $2\frac{1}{16}$ |
| | G | MG | $1\frac{15}{16}$ |
| | Plain | M | $1\frac{15}{16}$ |
| | — | C | $1\frac{15}{16}$ |
| | — | C1, M1 | $2\frac{1}{16}$ |
| **5312** | F | MF1 | $2\frac{1}{4}$ |
| | FG | MFG1 | $2\frac{1}{4}$ |
| | G | MG | $2\frac{1}{8}$ |
| | Plain | M | $2\frac{1}{8}$ |
| | — | C | $2\frac{1}{8}$ |
| | — | C1, M1 | $2\frac{1}{4}$ |
| **5313** | F | MF1 | $2\frac{7}{16}$ |
| | FG | MFG1 | $2\frac{7}{16}$ |
| | G | MG | $2\frac{5}{16}$ |
| | Plain | M | $2\frac{5}{16}$ |
| | — | C | $2\frac{5}{16}$ |
| | — | C1, M1 | $2\frac{7}{16}$ |
| **5314** | F | MF1 | $2\frac{5}{8}$ |
| | G | MG | $2\frac{1}{2}$ |
| | KF | MF | $2\frac{1}{2}$ |
| | KFG | MFG | $2\frac{1}{2}$ |
| | Plain | M | $2\frac{1}{2}$ |
| | — | C | $2\frac{1}{2}$ |
| | — | C1, M1 | $2\frac{5}{8}$ |
| **5315** | F | MF1 | $2\frac{13}{16}$ |
| | G | MG | $2\frac{11}{16}$ |
| | Plain | M | $2\frac{11}{16}$ |
| | — | C | $2\frac{11}{16}$ |
| | — | C1, M1 | $2\frac{13}{16}$ |
| **5316** | G | MG | $2\frac{11}{16}$ |
| | Plain | M | $2\frac{11}{16}$ |
| | — | C | $2\frac{11}{16}$ |
| **5317** | Plain | | $2\frac{7}{8}$ |
| | — | C | $2\frac{7}{8}$ |
| **5318** | Plain | — | $2\frac{7}{8}$ |
| | — | C | $2\frac{7}{8}$ |
| **5319** | Plain | — | $3\frac{1}{16}$ |
| | — | C | $3\frac{1}{16}$ |
| **5320** | Plain | — | $3\frac{1}{4}$ |
| **5321** | Plain | — | $3\frac{7}{16}$ |
| **5322** | Plain | — | $3\frac{5}{8}$ |
| **5400 Series** | | | |
| **5403** | Plain | — | $1\frac{3}{16}$ |
| **5404** | Plain | — | $1\frac{3}{8}$ |
| **5405** | Plain | — | $1\frac{3}{8}$ |
| **5406** | Plain | — | $1\frac{9}{16}$ |
| | — | C | $1\frac{9}{16}$ |
| **5407** | G | — | $1\frac{3}{4}$ |
| | Plain | — | $1\frac{3}{4}$ |
| | — | C | $1\frac{3}{4}$ |
| **5408** | Plain | — | $1\frac{15}{16}$ |
| | — | C | $1\frac{15}{16}$ |
| **5409** | G | — | $2\frac{1}{8}$ |
| | Plain | — | $2\frac{1}{8}$ |
| | — | C | $2\frac{1}{8}$ |
| **5410** | F | — | $2\frac{7}{16}$ |
| | Plain | — | $2\frac{5}{16}$ |
| | — | C | $2\frac{5}{16}$ |
| **5411** | F | — | $2\frac{5}{8}$ |
| | G | — | $2\frac{1}{2}$ |
| | Plain | — | $2\frac{1}{2}$ |
| | — | C | $2\frac{1}{2}$ |
| **5412** | Plain | — | $2\frac{5}{8}$ |
| | — | C | $2\frac{5}{8}$ |
| **5413** | Plain | — | $2\frac{13}{16}$ |
| | — | C | $2\frac{13}{16}$ |
| **5414** | Plain | — | $3\frac{1}{8}$ |
| | — | C | $3\frac{1}{8}$ |
| **5415** | Plain | — | $3\frac{1}{4}$ |
| | — | C | $3\frac{1}{4}$ |
| **5416** | Plain | — | $3\frac{7}{16}$ |
| | — | C | $3\frac{7}{16}$ |
| **5417** | Plain | — | $3\frac{5}{8}$ |
| | — | C | $3\frac{5}{8}$ |
| **5418** | Plain | — | $3\frac{7}{8}$ |
| | — | C | $3\frac{7}{8}$ |
| **5419** | Plain | — | $4\frac{3}{16}$ |

# Interchange to C- and M-types double-row angular contact ball bearings

Bearing numbers of MRC double-row ball bearings produced before 1983 differ from the C- and M-types listed in this catalog. Shown below is the interchange of pre-1983 bearing numbers with the C- and M-types.

5000 series double-row bearings not listed here maintain the original bearing number and must be specified by that number when ordering.

| MRC Bearing numbers | |
|---|---|
| **Prior to 1983** | **Superseded by** |
| 5200SB | **5200C*** |
| 5200SBKF | **5200CF*** |
| 5200SBKFF | **5200CFF*** |
| 5200SBKZ | **5200CZ*** |
| 5200SBKZZ | **5200CZZ*** |
| 5201SB | **5201C*** |
| 5201SBKF | **5201CF*** |
| 5201SBKFF | **5201CFF*** |
| 5201SBKZ | **5201CZ*** |
| 5201SBKZZ | **5201CZZ*** |
| 5202SB | **5202C*** |
| 5202SBKFF | **5202CFF*** |
| 5202SBFG | **5202CFG1*** |
| 5202SBKFG | **5202CFG*** |
| 5202SBKZ | **5202CZ*** |
| 5202SBKZZ | **5202CZZ*** |
| 5203SB | **5203C*** |
| 5203SBKF | **5203CF*** |
| 5203SBKFF | **5203CFF*** |
| 5203SBKFG | **5203CFG*** |
| 5203SBKZ | **5203CZ*** |
| 5203SBKZZ | **5203CZZ*** |
| 5204SBK | **5204C** |
| 5204SBKF | **5204CF** |
| 5204SBKFF | **5204CFF** |
| 5204SBKFG | **5204CFG** |
| 5204SBKFFG | **5204CFFG** |
| 5204SBKG | **5204CG** |
| 5204SBKZ | **5204CZ** |
| 5205SBK | **5205C** |
| 5205SBF | **5205CF1** |
| 5205SBKF | **5205CF** |
| 5205SBKFF | **5205CFF** |
| 5205SBKG | **5205CG** |
| 5206SBK | **5206C** |
| 5206SBF | **5206CF1** |
| 5206SBKF | **5206CF** |
| 5206SBKFF | **5206CFF** |
| 5206SBKFG | **5206CFG** |
| 5206SBKG | **5206CG** |
| 5206SBZZ | **5206CZZ1** |
| 5207F | **5207MF1** |
| 5207SBK | **5207C** |
| 5207SBKF | **5207CF** |
| 5207SBKFF | **5207CFF** |
| 5207SBKFG | **5207CFG** |
| 5207SBKG | **5207CG** |
| 5208SBK | **5208C** |
| 5208SBKF | **5208CF** |
| 5208SBKFF | **5208CFF** |

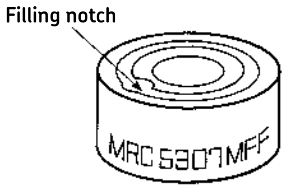
| MRC Bearing numbers | |
|---|---|
| **Prior to 1983** | **Superseded by** |
| 5208SBKFG | **5208CFG** |
| 5208SBKG | **5208CG** |
| 5209K | **5209M** |
| 5209KF | **5209MF** |
| 5209SBFF | **5209CFF** |
| 5209KG | **5209MG** |
| 5210K | **5210M** |
| 5210KF | **5210MF** |
| 5210KFF | **5210MFF** |
| 5210KG | **5210MG** |
| 5211K | **5211M** |
| 5211KF | **5211MF** |
| 5211KFG | **5211MFG** |
| 5211KG | **5211MG** |
| 5212F | **5212MF1** |
| 5212FG | **5212MFG1** |
| 5212K | **5212M** |
| 5212KF | **5212MF** |
| 5212KFG | **5212MFG** |
| 5212KG | **5212MG** |
| 5213K | **5213M** |
| 5213KF | **5213MF** |
| 5213KFG | **5213MFG** |
| 5213KG | **5213MG** |
| 5214K | **5214M** |
| 5214KF | **5214MF** |
| 5214KG | **5214MG** |
| 5215K | **5215M** |
| 5215KF | **5215MF** |
| 5215KFF | **5215MFF** |
| 5215KFG | **5215MFG** |
| 5215KG | **5215MG** |
| 5216K | **5216M** |
| 5216KF | **5216MF** |
| 5216KFG | **5216MFG** |
| 5216KG | **5216MG** |
| 5217K | **5217M** |
| 5217KF | **5217MF** |
| 5217KG | **5217MG** |
| 5218K | **5218M** |
| 5218KF | **5218MF** |
| 5218KG | **5218MG** |
| 5219 | **5219** |
| 5219G | **5219G** |
| 5220 | **5220** |
| 5220G | **5220G** |
| 5221 | **5221** |
| 5222 | **5222** |
| 5222KF | **5222KF** |
| 5300SB | **5300C*** |

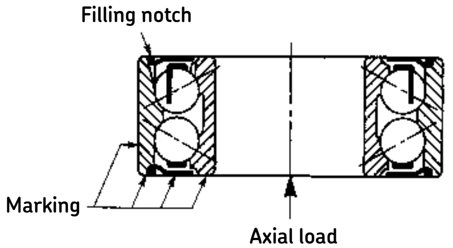
| MRC Bearing numbers | |
|---|---|
| **Prior to 1983** | **Superseded by** |
| 5301SB | **5301C*** |
| 5302SB | **5302C*** |
| 5303SB | **5303C*** |
| 5303SBG | **5303CG*** |
| 5303SBKF | **5303CF*** |
| 5303SBKFF | **5303CFF*** |
| 5303SBKFG | **5303CFG*** |
| 5304SB | **5304C** |
| 5304SBF | **5304CF1** |
| 5304SBKF | **5304CF** |
| 5304SBKFF | **5304CFF** |
| 5305SB | **5305C** |
| 5305SBG | **5305CG** |
| 5305SBKF | **5305CF** |
| 5305SBKFF | **5305CFF** |
| 5305SBKFG | **5305CFG** |
| 5306 | **5306M** |
| 5306F | **5306MF1** |
| 5306FG | **5306MFG1** |
| 5306G | **5306MG** |
| 5306KF | **5306MF** |
| 5306KFF | **5306MFF** |
| 5306KFG | **5306MFG** |
| 5307 | **5307M** |
| 5307F | **5307MF1** |
| 5307FG | **5307MFG1** |
| 5307G | **5307MG** |
| 5307KF | **5307MF** |
| 5307KFG | **5307MFG** |
| 5308 | **5308M** |
| 5308F | **5308MF1** |
| 5308FG | **5308MFG1** |
| 5308G | **5308MG** |
| 5309 | **5309M** |
| 5309B | **5309M** |
| 5309F | **5309MF1** |
| 5309FG | **5309MFG1** |
| 5309G | **5309MG** |
| 5310 | **5310** |
| 5310F | **5310MF1** |
| 5310FG | **5310MFG1** |
| 5310G | **5310MG** |
| 5310KF | **5310MF** |
| 5310KFG | **5310MFG** |
| 5311 | **5311M** |
| 5311F | **5311MF1** |
| 5311FG | **5311MFG1** |
| 5311G | **5311MG** |
| 5312 | **5312M** |

| MRC Bearing numbers | |
|---|---|
| **Prior to 1983** | **Superseded by** |
| 5312F | **5312MF1** |
| 5312FG | **5312MFG1** |
| 5312G | **5312MG** |
| 5313 | **5313M** |
| 5313F | **5313MF1** |
| 5313FG | **5313MFG1** |
| 5313G | **5313MG** |
| 5314 | **5314M** |
| 5314F | **5314MF1** |
| 5314G | **5314MG** |
| 5314KF | **5314MF** |
| 5315 | **5315M** |
| 5315F | **5315MF1** |
| 5315G | **5315MG** |
| 5316 | **5316M** |
| 5316G | **5316MG** |
| 5317 | **5317** |
| 5318 | **5318** |
| 5319 | **5319** |
| 5320 | **5320** |
| 5321 | **5321** |
| 5322 | **5322** |

*Listed for information only. Not currently in production. Use SB types.

# Filling notch location on 5000MFF and 5000MZZ series




Since the filling notch row is not visible on 5000MFF and 5000MZZ bearings, it is necessary to identify which row of balls has the notch in those cases where the bearing will be subjected to axial load. Axial load should be carried on the non-filling notch row. A moderate reversing axial load is permissible on the filling notch row.

The filling notch is oriented in relation to the identification marking on the bearing, which will be found in one of the following locations:

- Side face of the outer ring
- Side face of the inner ring
- O.D. surface of the outer ring
- Face of the closure

In each case the marking will occur on the side of the bearing opposite the filling notch as illustrated above.

A typical application of a 5000MFF or 5000MZZ bearing is shown above in which it is subjected to an axial load in an upward direction. The bearing should be mounted with the filling notch up so that the axial load is taken by the bottom, non-filling notch row.

# 5000 series axial and radial internal clearance

## 5200 and 5300 series

| Bore diameter d | | | | Axial internal clearance | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | C2 | | | | Normal C0 | | | | C3 | | | | C4 | | | |
| Over | | Including | | .001 mm | | .0001 in. | | .001 mm | | .0001 in. | | .001 mm | | .0001 in. | | .001 mm | | .0001 in. | |
| mm | in. | mm | in. | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| | | 10 | .3937 | 1 | 11 | 0 | 4 | 5 | 21 | 2 | 8 | 12 | 28 | 5 | 11 | 25 | 45 | 10 | 18 |
| 10 | .3937 | 18 | .7087 | 1 | 12 | 0 | 5 | 6 | 23 | 2 | 9 | 13 | 31 | 5 | 12 | 27 | 47 | 11 | 19 |
| 18 | .7087 | 24 | .9449 | 2 | 14 | 1 | 6 | 7 | 25 | 3 | 10 | 16 | 34 | 6 | 13 | 28 | 48 | 11 | 19 |
| 24 | .9449 | 30 | 1.1811 | 2 | 15 | 1 | 6 | 8 | 27 | 3 | 11 | 18 | 37 | 7 | 15 | 30 | 50 | 12 | 20 |
| 30 | 1.1811 | 40 | 1.5748 | 2 | 16 | 1 | 6 | 9 | 29 | 4 | 11 | 21 | 40 | 8 | 16 | 33 | 54 | 13 | 21 |
| 40 | 1.5748 | 50 | 1.9685 | 2 | 18 | 1 | 7 | 11 | 33 | 4 | 13 | 23 | 44 | 9 | 17 | 36 | 58 | 14 | 23 |
| 50 | 1.9685 | 65 | 2.5591 | 3 | 22 | 1 | 9 | 13 | 36 | 5 | 14 | 26 | 48 | 10 | 19 | 40 | 63 | 16 | 25 |
| 65 | 2.5591 | 80 | 3.1496 | 3 | 24 | 1 | 9 | 15 | 40 | 6 | 16 | 30 | 54 | 12 | 21 | 46 | 71 | 18 | 28 |
| 80 | 3.1496 | 100 | 3.9370 | 3 | 26 | 1 | 10 | 18 | 46 | 7 | 18 | 35 | 63 | 14 | 25 | 55 | 83 | 22 | 33 |
| 100 | 3.9370 | 110 | 4.3307 | 4 | 30 | 2 | 12 | 22 | 53 | 9 | 21 | 42 | 73 | 17 | 29 | 65 | 96 | 26 | 38 |

| Bore diameter d | | | | Radial internal clearance | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | C2 | | | | Normal C0 | | | | C3 | | | | C4 | | | |
| Over | | Including | | .001 mm | | .0001 in. | | .001 mm | | .0001 in. | | .001 mm | | .0001 in. | | .001 mm | | .0001 in. | |
| mm | in. | mm | in. | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| | | 10 | .3937 | 0.6 | 7 | 0.0 | 2.4 | 3.0 | 13 | 1.2 | 5 | 8 | 18 | 3 | 7 | 15 | 27 | 6 | 11 |
| 10 | .3937 | 18 | .7087 | 0.6 | 7 | 0.0 | 3.0 | 3.6 | 14 | 1.2 | 5 | 8 | 18 | 3 | 7 | 18 | 27 | 7 | 11 |
| 18 | .7087 | 24 | .9449 | 1.2 | 8 | 0.6 | 3.6 | 4.0 | 15 | 1.8 | 6 | 11 | 21 | 4 | 8 | 18 | 27 | 7 | 11 |
| 24 | .9449 | 30 | 1.1811 | 1.2 | 9 | 0.6 | 3.6 | 5.0 | 16 | 1.8 | 7 | 11 | 23 | 4 | 9 | 18 | 31 | 7 | 12 |
| 30 | 1.1811 | 40 | 1.5748 | 1.2 | 10 | 0.6 | 3.6 | 5.0 | 17 | 2.4 | 7 | 12 | 25 | 5 | 10 | 21 | 33 | 8 | 13 |
| 40 | 1.5748 | 50 | 1.9685 | 1.2 | 11 | 0.6 | 4.0 | 7.0 | 20 | 2.4 | 8 | 12 | 25 | 5 | 10 | 21 | 36 | 8 | 14 |
| 50 | 1.9685 | 65 | 2.5591 | 1.8 | 13 | 0.6 | 5.0 | 8.0 | 22 | 3.0 | 8 | 15 | 27 | 6 | 11 | 25 | 38 | 10 | 15 |
| 65 | 2.5591 | 80 | 3.1496 | 1.8 | 14 | 0.6 | 5.0 | 9.0 | 24 | 3.6 | 10 | 18 | 33 | 7 | 13 | 27 | 44 | 11 | 17 |
| 80 | 3.1496 | 100 | 3.9370 | 1.8 | 16 | 0.6 | 6.0 | 11.0 | 28 | 4.0 | 11 | 21 | 38 | 8 | 15 | 33 | 50 | 13 | 20 |
| 100 | 3.9370 | 110 | 4.3307 | 2.4 | 18 | 1.2 | 7.0 | 13.0 | 32 | 5.0 | 13 | 25 | 44 | 10 | 17 | 40 | 58 | 16 | 23 |

## 5400 series

| Bore diameter d | | | | Radial internal clearance | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | C2 | | | | Normal C0 | | | | C3 | | | | C4 | | | |
| Over | | Including | | .001 mm | | .0001 in. | | .001 mm | | .0001 in. | | .001 mm | | .0001 in. | | .001 mm | | .0001 in. | |
| mm | in. | mm | in. | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| | | 30 | 1.1811 | 1 | 8 | 0.4 | 3 | 2 | 13 | 1 | 5 | 13 | 23 | 5 | 9 | 20 | 38 | 8 | 15 |
| 30 | 1.1811 | 40 | 1.5748 | 1 | 8 | 0.5 | 3 | 6 | 13 | 2 | 5 | 15 | 23 | 6 | 9 | 23 | 41 | 9 | 16 |
| 40 | 1.5748 | 50 | 1.9685 | 1 | 8 | 0.5 | 3 | 6 | 15 | 2 | 6 | 15 | 25 | 6 | 10 | 23 | 44 | 9 | 17 |
| 50 | 1.9685 | 65 | 2.5591 | 1 | 11 | 0.5 | 4 | 6 | 15 | 2 | 6 | 15 | 28 | 6 | 11 | 25 | 45 | 10 | 18 |
| 65 | 2.5591 | 70 | 2.7559 | 1 | 11 | 0.5 | 4 | 6 | 18 | 2 | 7 | 18 | 31 | 7 | 12 | 28 | 48 | 11 | 19 |
| 70 | 2.7559 | 80 | 3.1496 | 0 | 6 | 0.0 | 2 | 6 | 18 | 2 | 7 | 18 | 33 | 7 | 13 | 33 | 48 | 13 | 19 |
| 80 | 3.1496 | 90 | 3.5433 | 0 | 7 | 0.0 | 3 | 7 | 23 | 3 | 9 | 23 | 44 | 9 | 17 | 44 | 65 | 17 | 26 |

# Thrust rating of 5000 series double-row angular contact ball bearings

## Dynamic rating

To obtain dynamic thrust rating multiply dynamic radial rating C by the factor shown below.

| Size | Factor |
|---|---|
| 5200SB-5203SB<br>5300SB-5303SB<br>5403C-5414C | 0.71 |
| 5204C and M-5218C and M<br>5304C and M-5319C and M | 0.81 |

**Example:**

Bearing size: 5307C

Basic dynamic radial load rating (C) = 11100 lbf

Thrust rating factor = 0.81

Thrust rating = 0.81 × 11100 = 8991 lbf

Sizes 5415C–5419C have 0° contact angles and are not included in the above tables. When thrust load is present, the equivalent radial load should be used to determine life.

## Static rating

To obtain static thrust rating multiply static radial rating $C_0$ by the factor shown below.

| Size | Factor |
|---|---|
| 5200SB-5203SB<br>5300SB-5303SB<br>5204C and M-5206C and M<br>5403C-5414C | 0.57 |
| 5207C and M-5218C and M<br>5304C and M-5319C and M | 0.66 |

**Example:**

Bearing size: 5214M

Basic static radial load rating ($C_0$) = 28100 lbf

Thrust rating factor = 0.66

Thrust rating = 0.66 × 28100 = 18546 lbf

# 5000 series extra wide double-row angular contact ball bearings

Double-row angular contact ball bearings with non-standard extra wide width are currently available as a retrofit kit. These replacement units consist of a standard width double-row angular contact ball bearing and two specially designed spacers packaged together in a single carton.

## Spacers

The extra width double-row angular contact ball bearing retrofit kit is simple to use. When used with bearings without snap-rings, place both spacers on the same side, as shown in Figure 1.

With snap-ring bearings, the inner ring spacer must be installed on the side opposite the snap-ring, as shown in Figure 2. The outer spacer is not needed in applications where the bearing's snap-ring controls the axial location of the outer ring in the housing.

The spacers accommodate slight variations in the shaft and housing seat width. The inner ring and spacer can be secured to the shaft with a retaining ring or threaded lock nut. If a lock nut is used, the amount of clamping force can be regulated to make slight adjustments in the shaft's axial location. The spacer rings yield slightly when an axial clamping force is applied. The spacer rings also exert a reaction force, which helps maintain the initial clamping force and helps prevent the inner ring from becoming loose on the shaft. The same circumstances apply to the outer ring spacers when an end cap is used to clamp the bearing's outer ring against a housing shoulder.

Because the spacer rings are designed to yield slightly when axial clamping forces are applied, the spacer rings should always be replaced with new spacer rings anytime the bearing is removed, replaced or reinstalled.

## Materials for rings, balls and spacers

High-carbon chromium vacuum-processed steel (SAE 52100) is used for all balls and rings. Machined and roll formed spacer rings are fabricated from 1018 carbon steel and 304 stainless steel.

## Mounting instructions without snap-ring

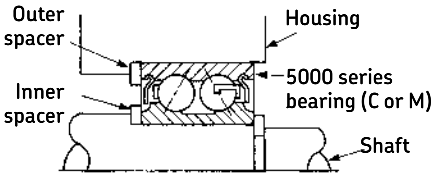



Figure 1

1. Install inner and outer ring spacers onto the shaft and into the housing bore respectively.
2. Install bearing in accordance with normal mounting instructions.
3. If any locking devices such as snap-rings or lock nuts are normally used to secure the bearing on the shaft or in the housing, be sure they are properly installed.
4. These inner and outer ring spacers are adjusted to proper width prior to installation. During bearing installation their width may be slightly altered to accommodate variations in shaft and housing shoulder distances. As a consequence, when a new extra width retrofit bearing kit is installed, the new spacer rings supplied with the kit should always be used and the old spacers discarded.

## Mounting instructions with snap-ring

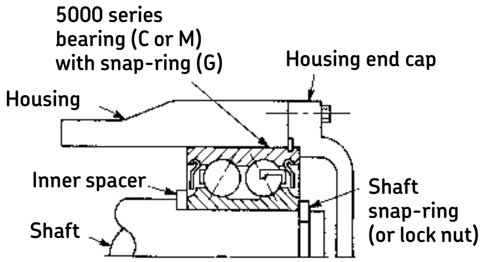



Figure 2

1. Install the inner ring spacer onto the shaft. The outer ring spacer is not used with a snap-ring bearing and may be discarded.
2. Install bearing in accordance with normal mounting instructions.
3. If any locking devices such as snap-rings, lock nuts or end caps are normally used to secure the bearing on the shaft or in the housing, be sure they are properly installed.
4. These inner and outer ring spacers are adjusted to proper width prior to installation. During bearing installation their width may be slightly altered to accommodate variations in shaft and housing shoulder distances. As a consequence, when a new extra width retrofit bearing kit is installed, the new spacer rings supplied with the kit should always be used and the old spacers discarded.

# Extra wide 5000 series part numbers

A listing of available part numbers appears below. This listing may change with sizes being added or deleted based on demand.

| MRC part number | Width including spacers | | |
|---|---|---|---|
| | in. | | mm |
| 5205CF1 | 7/8 | .8750 | 22.23 |
| 5205MF1 | 7/8 | .8750 | 22.23 |
| 5206CF1 | 1 1/16 | 1.0625 | 26.99 |
| 5206MF1 | 1 1/16 | 1.0625 | 26.99 |
| 5206SBZZ* | 1 1/16 | 1.0625 | 26.99 |
| 5212MF1 | 1 1/2 | 1.5000 | 38.10 |
| 5304CF1 | 1 | 1.0000 | 25.40 |
| 5304MF1 | 1 | 1.0000 | 25.40 |
| 5305CF1 | 1 1/8 | 1.1250 | 28.58 |
| 5305MFG1 | 1 1/8 | 1.1250 | 28.58 |
| 5306MFG1 | 1 5/16 | 1.3125 | 33.34 |
| 5306MF1 | 1 5/16 | 1.3125 | 33.34 |
| 5307MF1 | 1 1/2 | 1.5000 | 38.10 |
| 5307MFG1 | 1 1/2 | 1.5000 | 38.10 |
| 5308MFG1 | 1 9/16 | 1.5625 | 39.69 |
| 5308MF1 | 1 9/16 | 1.5625 | 39.69 |
| 5309MFG1 | 1 11/16 | 1.6875 | 42.86 |
| 5309MF1 | 1 11/16 | 1.6875 | 42.86 |
| 5310MFG1 | 1 7/8 | 1.8750 | 47.63 |
| 5310MF1 | 1 7/8 | 1.8750 | 47.63 |
| 5311MFG1 | 2 1/16 | 2.0625 | 52.39 |
| 5311MF1 | 2 1/16 | 2.0625 | 52.39 |
| 5312MFG1 | 2 1/4 | 2.2500 | 57.15 |
| 5312MF1 | 2 1/4 | 2.2500 | 57.15 |
| 5313MFG1 | 2 7/16 | 2.4375 | 61.91 |
| 5313MF1 | 2 7/16 | 2.4375 | 61.91 |
| 5315MF1 | 2 13/16 | 2.8125 | 71.44 |

*Currently stocked. No spacer needed.

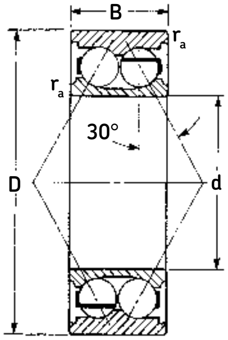
## Nomenclature

5 3 09 M F G 1

- Double-row angular contact type ball bearing — 5
- Series (200, 300, 400) — 3
- Bore diameter code — 09
- C or M (Conrad or max type) — M
- F or Z (shield or seal) — F
- Snap-ring — G
- Extra width (spacer ring kit supplied) — 1

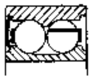
# 5200C, 5200SB light series

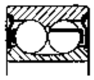
5200C bearings are used with moderate to heavy radial loads, two-directional thrust loads, or a combination of both.

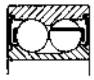




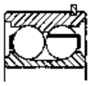
CF/SBKF
One shield

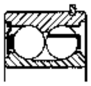

CZ/SBKZ
One seal

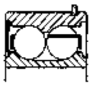

CFF/SBKFF
Two shields

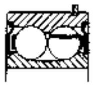

CZZ/SBKZZ
Two seals

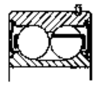

CFZ/SBKFZ
Shield and seal

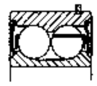

CG/SBKG
Snap-ring


CFG/SBKFG
One shield
and snap-ring


CZG
One seal
and snap-ring


CFFG/SBKFFG
Two shields
and snap-ring

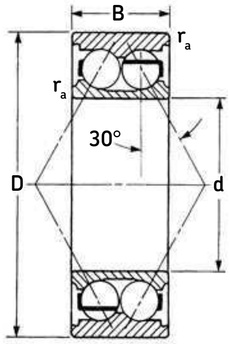

CZZG
Two seals
and snap-ring


CFZG
Shield, seal
and snap-ring

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | Fillet radius[1] $r_a$ in. | Basic radial load rating Dynamic C[3] N | Dynamic C[3] lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[2] Open and shielded Grease rpm | Open and shielded Oil rpm | Single and double sealed grease rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5200SB** | 10 | **.3937** | 30 | **1.1811** | 14.00 | **.5625** | .64 | **.025** | 7 610 | **1 710** | 4 300 | **967** | 16 000 | 22 000 | 16 000 |
| **5201SB** | 12 | **.4724** | 32 | **1.2598** | 15.88 | **.6250** | .64 | **.025** | 10 400 | **2 340** | 5 600 | **1 260** | 15 000 | 20 000 | 15 000 |
| **5202SB** | 15 | **.5906** | 35 | **1.3780** | 15.88 | **.6250** | .64 | **.025** | 11 400 | **2 560** | 6 800 | **1 530** | 12 000 | 17 000 | 12 000 |
| **5203SB** | 17 | **.6693** | 40 | **1.5748** | 17.47 | **.6876** | .64 | **.025** | 14 300 | **3 210** | 8 800 | **1 980** | 10 000 | 15 000 | 10 000 |
| **5204C** | 20 | **.7874** | 47 | **1.8504** | 20.64 | **.8125** | 1.00 | **.040** | 19 000 | **4 270** | 12 000 | **2 700** | 9 000 | 13 000 | 9 000 |
| **5205C** | 25 | **.9843** | 52 | **2.0472** | 20.64 | **.8125** | 1.00 | **.040** | 20 800 | **4 680** | 14 000 | **3 150** | 8 000 | 11 000 | 8 000 |
| **5205C1** | 25 | **.9843** | 52 | **2.0472** | 22.23 | **.8750** | 1.00 | **.040** | 20 800 | **4 680** | 14 000 | **3 150** | 8 000 | 11 000 | 8 000 |
| **5206C** | 30 | **1.1811** | 62 | **2.4409** | 23.81 | **.9375** | 1.00 | **.040** | 28 600 | **6 430** | 20 400 | **4 590** | 7 000 | 9 500 | 7 000 |
| **5206C1** | 30 | **1.1811** | 62 | **2.4409** | 26.99 | **1.0625** | 1.00 | **.040** | 28 600 | **6 430** | 20 400 | **4 590** | 7 000 | 9 500 | 7 000 |
| **5207C** | 35 | **1.3780** | 72 | **2.8346** | 26.99 | **1.0625** | 1.00 | **.040** | 37 700 | **8 480** | 27 500 | **6 180** | 6 000 | 8 000 | 6 000 |
| **5207C1** | 35 | **1.3780** | 72 | **2.8346** | 30.16 | **1.1875** | 1.00 | **.040** | 37 700 | **8 480** | 27 500 | **6 180** | 6 000 | 8 000 | 6 000 |
| **5208C** | 40 | **1.5748** | 80 | **3.1496** | 30.16 | **1.1875** | 1.00 | **.040** | 44 900 | **10 100** | 34 000 | **7 640** | 5 600 | 7 500 | 5 600 |
| **5209C** | 45 | **1.7717** | 85 | **3.3465** | 30.16 | **1.1875** | 1.00 | **.040** | 48 800 | **11 000** | 39 000 | **8 770** | 5 000 | 6 700 | 5 000 |
| **5210C** | 50 | **1.9685** | 90 | **3.5433** | 30.16 | **1.1875** | 1.00 | **.040** | 48 800 | **11 000** | 39 000 | **8 770** | 4 800 | 6 300 | 4 800 |
| **5211C** | 55 | **2.1654** | 100 | **3.9370** | 33.34 | **1.3125** | 1.50 | **.060** | 57 200 | **12 900** | 47 500 | **10 700** | 4 300 | 5 600 | 4 300 |
| **5212C** | 60 | **2.3622** | 110 | **4.3307** | 36.51 | **1.4375** | 1.50 | **.060** | 70 200 | **15 800** | 58 500 | **13 200** | 3 800 | 5 000 | 3 800 |
| **5212C1** | 60 | **2.3622** | 110 | **4.3307** | 38.10 | **1.5000** | 1.50 | **.060** | 70 200 | **15 800** | 58 500 | **13 200** | 3 800 | 5 000 | 3 800 |
| **5213C** | 65 | **2.5591** | 120 | **4.7244** | 38.10 | **1.5000** | 1.50 | **.060** | 80 600 | **18 100** | 73 500 | **16 500** | 3 600 | 4 800 | 3 600 |
| **5214C** | 70 | **2.7559** | 125 | **4.9213** | 39.69 | **1.5625** | 1.50 | **.060** | 88 400 | **19 900** | 80 000 | **18 000** | 3 200 | 4 300 | 3 200 |
| **5215C** | 75 | **2.9528** | 130 | **5.1181** | 41.28 | **1.6250** | 1.50 | **.060** | 95 600 | **21 500** | 88 000 | **19 800** | 3 200 | 4 300 | 3 200 |
| **5216C** | 80 | **3.1496** | 140 | **5.5118** | 44.45 | **1.7500** | 2.00 | **.080** | 106 000 | **23 900** | 95 000 | **21 400** | 2 800 | 3 800 | 2 800 |
| **5217C** | 85 | **3.3465** | 150 | **5.9055** | 49.21 | **1.9375** | 2.00 | **.080** | 124 000 | **27 900** | 110 000 | **24 700** | 2 600 | 3 600 | 2 600 |
| **5218C** | 90 | **3.5433** | 160 | **6.2992** | 52.39 | **2.0625** | 2.00 | **.080** | 130 000 | **29 300** | 120 000 | **27 000** | 2 400 | 3 400 | 2 400 |
| **5219C** | 95 | **3.7402** | 170 | **6.6929** | 55.56 | **2.1875** | 2.00 | **.080** | 159 000 | **35 700** | 146 000 | **32 800** | 2 200 | 3 200 | 2 200 |
| **5220C** | 100 | **3.9370** | 180 | **7.0866** | 60.33 | **2.3750** | 2.00 | **.080** | 178 000 | **40 000** | 166 000 | **37 300** | 2 000 | 3 000 | 2 000 |
| **5221C** | 105 | **4.1339** | 190 | **7.4803** | 65.09 | **2.5625** | 2.00 | **.080** | 186 000 | **41 800** | 180 000 | **40 500** | 1 800 | 2 800 | 1 800 |
| **5222C** | 110 | **4.3307** | 200 | **7.8740** | 69.85 | **2.7500** | 2.00 | **.080** | 203 000 | **45 600** | 200 000 | **45 000** | 1 600 | 2 600 | 1 600 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel cage, ABEC-1.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.
Note: Extra width bearings identified by the suffix C1 are supplied with a retrofit kit described on pages 97, 98.

# 5300C, 5300SB medium series

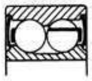


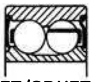


CF/SBKF
One shield


CZ/SBKZ
One seal


CFF/SBKFF
Two shields


CZZ/SBKZZ
Two seals


CFZ/SBKFZ
Shield and seal


CG/SBKG
Snap-ring


CFG/SBKFG
One shield
and snap-ring


CZG
One seal
and snap-ring


CFFG/SBKFFG
Two shields
and snap-ring


CZZG
Two seals
and snap-ring


CFZG
Shield, seal
and snap-ring

5300C bearings are used with moderate to heavy radial loads, two-directional thrust loads, or a combination of both.

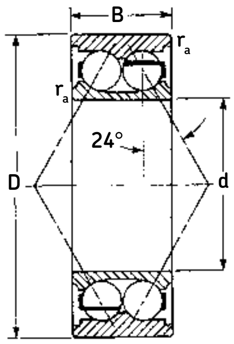
| | Bore | | Outside diameter | | Width | | Fillet radius1) | | Basic radial load rating | | | | Speed rating2) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dynamic | | Static | | Open and shielded | | Single and double sealed |
| MRC bearing number | d | | D | | B | | $r_a$ | | $C^{3)}$ | | $C_0$ | | Grease | Oil | Grease |
| | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm | rpm |
| 5300SB | 10 | .3937 | 35 | 1.3780 | 19.05 | .7500 | .64 | .025 | 10 600 | 2 380 | 6 100 | 1 370 | 15 000 | 20 000 | 15 000 |
| 5301SB | 12 | .4724 | 37 | 1.4567 | 19.05 | .7500 | 1.00 | .040 | 11 700 | 2 630 | 6 800 | 1 530 | 14 000 | 18 000 | 14 000 |
| 5302SB | 15 | .5906 | 42 | 1.6535 | 19.05 | .7500 | 1.00 | .040 | 15 100 | 3 390 | 9 300 | 2 090 | 11 000 | 15 000 | 11 000 |
| 5303SB | 17 | .6693 | 47 | 1.8504 | 22.23 | .8750 | 1.00 | .040 | 21 600 | 4 860 | 12 700 | 2 860 | 11 000 | 14 000 | 11 000 |
| 5304C | 20 | .7874 | 52 | 2.0472 | 22.23 | .8750 | 1.00 | .040 | 22 500 | 5 060 | 14 600 | 3 280 | 8 500 | 12 000 | 8 500 |
| 5304C1 | 20 | .7874 | 52 | 2.0472 | 25.40 | 1.0000 | 1.00 | .040 | 22 500 | 5 060 | 14 600 | 3 280 | 8 500 | 12 000 | 8 500 |
| 5305C | 25 | .9843 | 62 | 2.4409 | 25.40 | 1.0000 | 1.00 | .040 | 30 700 | 6 910 | 20 400 | 4 590 | 7 500 | 10 000 | 7 500 |
| 5306C | 30 | 1.1811 | 72 | 2.8346 | 30.16 | 1.1875 | 1.00 | .040 | 41 600 | 9 360 | 29 000 | 6 520 | 6 300 | 8 500 | 6 300 |
| 5306C1 | 30 | 1.1811 | 72 | 2.8346 | 33.34 | 1.3125 | 1.00 | .040 | 41 600 | 9 360 | 29 000 | 6 520 | 6 300 | 8 500 | 6 300 |
| 5307C | 35 | 1.3780 | 80 | 3.1496 | 34.93 | 1.3750 | 1.50 | .060 | 49 400 | 11 100 | 34 500 | 7 760 | 5 600 | 7 500 | 5 600 |
| 5307C1 | 35 | 1.3780 | 80 | 3.1496 | 38.10 | 1.5000 | 1.50 | .060 | 49 400 | 11 100 | 34 500 | 7 760 | 5 600 | 7 500 | 5 600 |
| 5308C | 40 | 1.5748 | 90 | 3.5433 | 36.51 | 1.4375 | 1.50 | .060 | 60 500 | 13 600 | 43 000 | 9 760 | 5 000 | 6 700 | 5 000 |
| 5308C1 | 40 | 1.5748 | 90 | 3.5433 | 39.69 | 1.5625 | 1.50 | .060 | 60 500 | 13 600 | 43 000 | 9 760 | 5 000 | 6 700 | 5 000 |
| 5309C | 45 | 1.7717 | 100 | 3.9370 | 39.69 | 1.5625 | 1.50 | .060 | 72 800 | 16 400 | 53 000 | 11 900 | 4 500 | 6 000 | 4 500 |
| 5309C1 | 45 | 1.7717 | 100 | 3.9370 | 42.86 | 1.6875 | 1.50 | .060 | 72 800 | 16 400 | 53 000 | 11 900 | 4 500 | 6 000 | 4 500 |
| 5310C | 50 | 1.9685 | 110 | 4.3307 | 44.45 | 1.7500 | 2.00 | .080 | 85 200 | 19 200 | 64 000 | 14 400 | 4 000 | 5 300 | 4 000 |
| 5310C1 | 50 | 1.9685 | 110 | 4.3307 | 47.63 | 1.8750 | 2.00 | .080 | 85 200 | 19 200 | 64 000 | 14 400 | 4 000 | 5 300 | 4 000 |
| 5311C | 55 | 2.1654 | 120 | 4.7244 | 49.21 | 1.9375 | 2.00 | .080 | 106 000 | 23 900 | 81 500 | 18 300 | 3 800 | 5 000 | 3 800 |
| 5311C1 | 55 | 2.1654 | 120 | 4.7244 | 52.39 | 2.0625 | 2.00 | .080 | 106 000 | 23 900 | 81 500 | 18 300 | 3 800 | 5 000 | 3 800 |
| 5312C | 60 | 2.3622 | 130 | 5.1181 | 53.98 | 2.1250 | 2.00 | .080 | 121 000 | 27 200 | 95 000 | 21 400 | 3 400 | 4 500 | 3 400 |
| 5312C1 | 60 | 2.3622 | 130 | 5.1181 | 57.15 | 2.2500 | 2.00 | .080 | 121 000 | 27 200 | 95 000 | 21 400 | 3 400 | 4 500 | 3 400 |
| 5313C | 65 | 2.5591 | 140 | 5.5118 | 58.74 | 2.3125 | 2.00 | .080 | 138 000 | 31 100 | 108 000 | 24 300 | 3 200 | 4 300 | 3 200 |
| 5313C1 | 65 | 2.5591 | 140 | 5.5118 | 61.91 | 2.4375 | 2.00 | .080 | 138 000 | 31 100 | 108 000 | 24 300 | 3 200 | 4 300 | 3 200 |
| 5314C | 70 | 2.7559 | 150 | 5.9055 | 63.50 | 2.5000 | 2.00 | .080 | 153 000 | 34 400 | 125 000 | 28 100 | 2 800 | 3 800 | 2 800 |
| 5314C1 | 70 | 2.7559 | 150 | 5.9055 | 66.68 | 2.6250 | 2.00 | .080 | 153 000 | 34 400 | 125 000 | 28 100 | 2 800 | 3 800 | 2 800 |
| 5315C | 75 | 2.9528 | 160 | 6.2992 | 68.26 | 2.6875 | 2.00 | .080 | 168 000 | 37 800 | 140 000 | 31 500 | 2 600 | 3 600 | 2 600 |
| 5315C1 | 75 | 2.9528 | 160 | 6.2992 | 71.44 | 2.8125 | 2.00 | .080 | 168 000 | 37 800 | 140 000 | 31 500 | 2 600 | 3 600 | 2 600 |
| 5316C | 80 | 3.1496 | 170 | 6.6929 | 68.26 | 2.6875 | 2.00 | .080 | 182 000 | 41 000 | 156 000 | 35 100 | 2 400 | 3 400 | 2 400 |
| 5317C | 85 | 3.3465 | 180 | 7.0866 | 73.03 | 2.8750 | 2.50 | .100 | 195 000 | 43 900 | 176 000 | 39 600 | 2 200 | 3 200 | 2 200 |
| 5318C | 90 | 3.5433 | 190 | 7.4803 | 73.03 | 2.8750 | 2.50 | .100 | 212 000 | 47 700 | 196 000 | 44 100 | 2 000 | 3 000 | 2 000 |
| 5319C | 95 | 3.7402 | 200 | 7.8740 | 77.79 | 3.0625 | 2.50 | .100 | 234 000 | 52 700 | 224 000 | 50 400 | 1 900 | 2 800 | 1 900 |
| 5320C | 100 | 3.9370 | 215 | 8.4646 | 82.55 | 3.2500 | 2.50 | .100 | 255 000 | 57 300 | 255 000 | 57 300 | 1 800 | 2 600 | 1 800 |
| 5322C | 110 | 4.3307 | 240 | 9.4488 | 92.08 | 3.6250 | 2.50 | .100 | 291 000 | 65 400 | 305 000 | 68 600 | 1 700 | 2 400 | 1 700 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel cage, ABEC-1.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.
Note: Extra width bearings identified by the suffix C1 are supplied with a retrofit kit described on pages 97, 98.



MRC

# 5400C heavy series




5400 series bearings are used with extremely heavy radial loads, two-directional thrust loads, or a combination of both.

Notes:

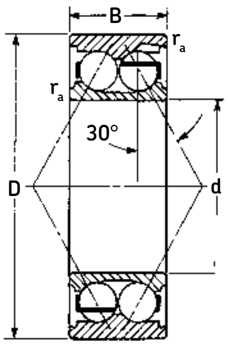
5406-5414 have a 24° contact angle per row.

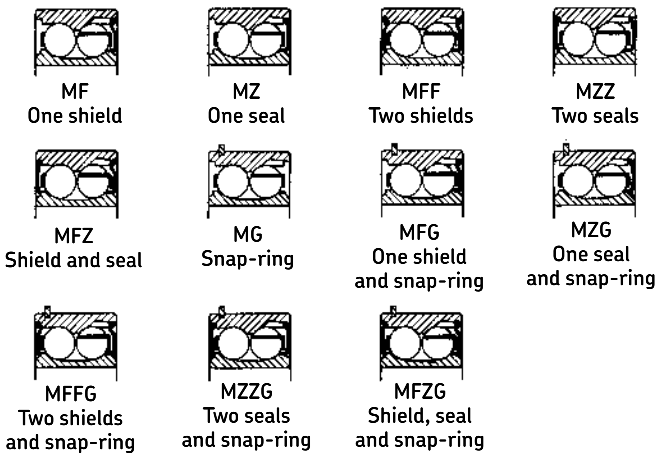
5415-5418 have a 0° contact angle.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | Fillet radius[1] $r_a$ in. | Basic radial load rating Dynamic C[3] N | Dynamic C[3] lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[2] Grease rpm | Speed rating[2] Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5406C** | 30 | **1.1811** | 90 | **3.5433** | 39.69 | **1.5625** | 1.5 | **.06** | 67 600 | **15 200** | 45 000 | **10 100** | 5 300 | 7 000 |
| **5407C** | 35 | **1.3780** | 100 | **3.9370** | 44.45 | **1.7500** | 1.5 | **.06** | 76 100 | **17 000** | 49 000 | **11 000** | 4 800 | 6 300 |
| **5408C** | 40 | **1.5748** | 110 | **4.3307** | 49.21 | **1.9375** | 2.0 | **.08** | 88 400 | **19 900** | 57 000 | **12 800** | 4 300 | 5 600 |
| **5409C** | 45 | **1.7717** | 120 | **4.7244** | 53.98 | **2.1250** | 2.0 | **.08** | 112 000 | **25 200** | 78 000 | **17 600** | 4 000 | 5 300 |
| **5410C** | 50 | **1.9685** | 130 | **5.1181** | 58.74 | **2.3125** | 2.0 | **.08** | 143 000 | **32 200** | 102 000 | **23 000** | 3 600 | 4 800 |
| **5411C** | 55 | **2.1654** | 140 | **5.5118** | 63.50 | **2.5000** | 2.0 | **.08** | 146 000 | **32 900** | 102 000 | **23 000** | 3 200 | 4 300 |
| **5412C** | 60 | **2.3622** | 150 | **5.9055** | 66.68 | **2.6250** | 2.0 | **.08** | 159 000 | **35 800** | 114 000 | **25 700** | 3 000 | 4 000 |
| **5413C** | 65 | **2.5591** | 160 | **6.2992** | 71.44 | **2.8125** | 2.0 | **.08** | 195 000 | **43 900** | 156 000 | **35 100** | 2 800 | 3 800 |
| **5414C** | 70 | **2.7559** | 180 | **7.0866** | 79.38 | **3.1250** | 2.5 | **.10** | 199 000 | **44 800** | 156 000 | **35 100** | 2 400 | 3 400 |
| **5415C** | 75 | **2.9528** | 190 | **7.4803** | 82.55 | **3.2500** | 2.5 | **.10** | 212 000 | **47 700** | 200 000 | **45 000** | 2 200 | 3 200 |
| **5416C** | 80 | **3.1496** | 200 | **7.8740** | 87.31 | **3.4375** | 2.5 | **.10** | 229 000 | **51 500** | 216 000 | **48 600** | 2 000 | 3 000 |
| **5417C** | 85 | **3.3465** | 210 | **8.2677** | 92.08 | **3.6250** | 3.0 | **.12** | 255 000 | **57 300** | 255 000 | **57 300** | 1 900 | 2 800 |
| **5418C** | 90 | **3.5433** | 225 | **8.8583** | 98.43 | **3.8750** | 3.0 | **.12** | 281 000 | **63 200** | 300 000 | **67 400** | 1 800 | 2 600 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel cage, ABEC-1.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 5200M light series



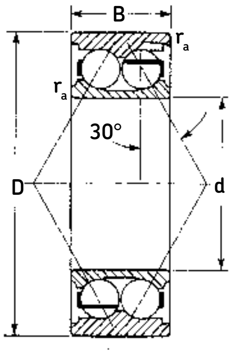




5200M bearings are used with heavy radial loads, two-directional thrust loads, or a combination of both. Thrust load should be carried on the non-filling notch row. Moderate thrust load is permissible on the filling notch row.

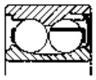
| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | Fillet radius[1] $r_a$ in. | Basic radial load rating Dynamic $C^{3)}$ N | Dynamic $C^{3)}$ lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[2] Open and shielded Grease rpm | Open and shielded Oil rpm | Single and double sealed Grease rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5204M** | 20 | **.7874** | 47 | **1.8504** | 20.64 | **.8125** | 1.0 | **.04** | 20 500 | **4 610** | 17 000 | **3 820** | 9 000 | 13 000 | 9 000 |
| **5205M** | 25 | **.9843** | 52 | **2.0472** | 20.64 | **.8125** | 1.0 | **.04** | 22 900 | **5 150** | 21 200 | **4 770** | 8 000 | 11 000 | 8 000 |
| **5205M1** | 25 | **.9843** | 52 | **2.0472** | 22.23 | **.8750** | 1.0 | **.04** | 22 900 | **5 150** | 21 200 | **4 770** | 8 000 | 11 000 | 8 000 |
| **5206M** | 30 | **1.1811** | 62 | **2.4409** | 23.81 | **.9375** | 1.0 | **.04** | 30 300 | **6 820** | 28 000 | **6 290** | 7 000 | 9 500 | 7 000 |
| **5206M1** | 30 | **1.1811** | 62 | **2.4409** | 26.99 | **1.0625** | 1.0 | **.04** | 30 300 | **6 820** | 28 000 | **6 290** | 7 000 | 9 500 | 7 000 |
| **5207M** | 35 | **1.3780** | 72 | **2.8346** | 26.99 | **1.0625** | 1.0 | **.04** | 39 100 | **8 800** | 36 500 | **8 210** | 6 000 | 8 000 | 6 000 |
| **5207M1** | 35 | **1.3780** | 72 | **2.8346** | 30.16 | **1.1875** | 1.0 | **.04** | 39 100 | **8 800** | 36 500 | **8 210** | 6 000 | 8 000 | 6 000 |
| **5208M** | 40 | **1.5748** | 80 | **3.1496** | 30.16 | **1.1875** | 1.0 | **.04** | 49 500 | **11 100** | 49 000 | **11 000** | 5 600 | 7 500 | 5 600 |
| **5209M** | 45 | **1.7717** | 85 | **3.3465** | 30.16 | **1.1875** | 1.0 | **.04** | 51 200 | **11 500** | 54 000 | **12 100** | 5 000 | 6 700 | 5 000 |
| **5210M** | 50 | **1.9685** | 90 | **3.5433** | 30.16 | **1.1875** | 1.0 | **.04** | 53 900 | **12 100** | 58 500 | **13 200** | 4 800 | 6 300 | 4 800 |
| **5211M** | 55 | **2.1654** | 100 | **3.9370** | 33.34 | **1.3125** | 1.5 | **.06** | 66 000 | **14 900** | 76 500 | **17 200** | 4 300 | 5 600 | 4 300 |
| **5212M** | 60 | **2.3622** | 110 | **4.3307** | 36.51 | **1.4375** | 1.5 | **.06** | 78 100 | **17 600** | 88 000 | **19 800** | 3 800 | 5 000 | 3 800 |
| **5212M1** | 60 | **2.3622** | 110 | **4.3307** | 38.10 | **1.5000** | 1.5 | **.06** | 78 100 | **17 600** | 88 000 | **19 800** | 3 800 | 5 000 | 3 800 |
| **5213M** | 65 | **2.5591** | 120 | **4.7244** | 38.10 | **1.5000** | 1.5 | **.06** | 88 000 | **19 800** | 106 000 | **23 800** | 3 600 | 4 800 | 3 600 |
| **5214M** | 70 | **2.7559** | 125 | **4.9213** | 39.69 | **1.5625** | 1.5 | **.06** | 101 000 | **22 700** | 125 000 | **28 100** | 3 200 | 4 300 | 3 200 |
| **5215M** | 75 | **2.9528** | 130 | **5.1181** | 41.28 | **1.6250** | 1.5 | **.06** | 108 000 | **24 300** | 137 000 | **30 800** | 3 200 | 4 300 | 3 200 |
| **5216M** | 80 | **3.1496** | 140 | **5.5118** | 44.45 | **1.7500** | 2.0 | **.08** | 128 000 | **28 800** | 160 000 | **36 000** | 2 800 | 3 800 | 2 800 |
| **5217M** | 85 | **3.3465** | 150 | **5.9055** | 49.21 | **1.9375** | 2.0 | **.08** | 142 000 | **32 000** | 176 000 | **39 600** | 2 600 | 3 600 | 2 600 |
| **5218M** | 90 | **3.5433** | 160 | **6.2992** | 52.39 | **2.0625** | 2.0 | **.08** | 151 000 | **34 000** | 193 000 | **43 400** | 2 400 | 3 400 | 2 400 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel cage, ABEC-1.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.
Note: Extra width bearings identified by the suffix M1 are supplied with a retrofit kit described on pages 97, 98.

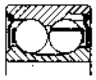
# 5300M medium series



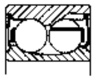

MF
One shield



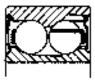
MZ
One seal



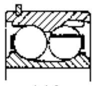
MFF
Two shields



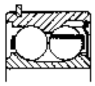
MZZ
Two seals



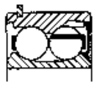
MFZ
Shield and seal



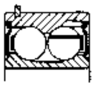
MG
Snap-ring



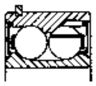
MFG
One shield
and snap-ring



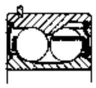
MZG
One seal
and snap-ring



MFFG
Two shields
and snap-ring



MZZG
Two seals
and snap-ring



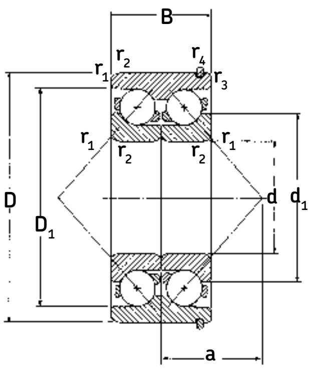
MFZG
Shield, seal
and snap-ring

5300M bearings are used with heavy radial loads, two-directional thrust loads, or a combination of both. Thrust load should be carried on the non-filling notch row. Moderate thrust load is permissible on the filling notch row.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | Fillet radius[1] $r_a$ in. | Basic radial load rating Dynamic $C$[3] N | Dynamic $C$[3] lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[2] Open and shielded Grease rpm | Open and shielded Oil rpm | Single and double sealed Grease rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5304M | 20 | .7874 | 52 | 2.0472 | 22.23 | .8750 | 1.0 | .04 | 23 800 | 5 360 | 20 000 | 4 500 | 8 500 | 12 000 | 8 500 |
| 5304M1 | 20 | .7874 | 52 | 2.0472 | 25.40 | 1.0000 | 1.0 | .04 | 23 800 | 5 360 | 20 000 | 4 500 | 8 500 | 12 000 | 8 500 |
| 5305M | 25 | .9843 | 62 | 2.4409 | 25.40 | 1.0000 | 1.0 | .04 | 34 100 | 7 670 | 30 500 | 6 860 | 7 500 | 10 000 | 7 500 |
| 5306M | 30 | 1.1811 | 72 | 2.8346 | 30.16 | 1.1875 | 1.0 | .04 | 46 800 | 10 500 | 43 000 | 9 670 | 6 300 | 8 500 | 6 300 |
| 5306M1 | 30 | 1.1811 | 72 | 2.8346 | 33.34 | 1.3125 | 1.0 | .04 | 46 800 | 10 500 | 43 000 | 9 670 | 6 300 | 8 500 | 6 300 |
| 5307M | 35 | 1.3780 | 80 | 3.1496 | 34.93 | 1.3750 | 1.5 | .06 | 52 300 | 11 800 | 48 000 | 10 800 | 5 600 | 7 500 | 5 600 |
| 5307M1 | 35 | 1.3780 | 80 | 3.1496 | 38.10 | 1.5000 | 1.5 | .06 | 52 300 | 11 800 | 48 000 | 10 800 | 5 600 | 7 500 | 5 600 |
| 5308M | 40 | 1.5748 | 90 | 3.5433 | 36.51 | 1.4375 | 1.5 | .06 | 67 100 | 15 100 | 65 500 | 14 700 | 5 000 | 6 700 | 5 000 |
| 5308M1 | 40 | 1.5748 | 90 | 3.5433 | 39.69 | 1.5625 | 1.5 | .06 | 67 100 | 15 100 | 65 500 | 14 700 | 5 000 | 6 700 | 5 000 |
| 5309M | 45 | 1.7717 | 100 | 3.9370 | 39.69 | 1.5625 | 1.5 | .06 | 80 900 | 18 200 | 80 000 | 18 000 | 4 500 | 6 000 | 4 500 |
| 5309M1 | 45 | 1.7717 | 100 | 3.9370 | 42.86 | 1.6875 | 1.5 | .06 | 80 900 | 18 200 | 80 000 | 18 000 | 4 500 | 6 000 | 4 500 |
| 5310M | 50 | 1.9685 | 110 | 4.3307 | 44.45 | 1.7500 | 2.0 | .08 | 95 200 | 21 400 | 95 000 | 21 400 | 4 000 | 5 300 | 4 000 |
| 5310M1 | 50 | 1.9685 | 110 | 4.3307 | 47.63 | 1.8750 | 2.0 | .08 | 95 200 | 21 400 | 95 000 | 21 400 | 4 000 | 5 300 | 4 000 |
| 5311M | 55 | 2.1654 | 120 | 4.7244 | 49.21 | 1.9375 | 2.0 | .08 | 119 000 | 26 800 | 122 000 | 27 400 | 3 800 | 5 000 | 3 800 |
| 5311M1 | 55 | 2.1654 | 120 | 4.7244 | 52.39 | 2.0625 | 2.0 | .08 | 119 000 | 26 800 | 122 000 | 27 400 | 3 800 | 5 000 | 3 800 |
| 5312M | 60 | 2.3622 | 130 | 5.1181 | 53.98 | 2.1250 | 2.0 | .08 | 134 000 | 30 200 | 143 000 | 32 100 | 3 400 | 4 500 | 3 400 |
| 5312M1 | 60 | 2.3622 | 130 | 5.1181 | 57.15 | 2.2500 | 2.0 | .08 | 134 000 | 30 200 | 143 000 | 32 100 | 3 400 | 4 500 | 3 400 |
| 5313M | 65 | 2.5591 | 140 | 5.5118 | 58.74 | 2.3125 | 2.0 | .08 | 154 000 | 34 700 | 163 000 | 36 600 | 3 200 | 4 300 | 3 200 |
| 5313M1 | 65 | 2.5591 | 140 | 5.5118 | 61.91 | 2.4375 | 2.0 | .08 | 154 000 | 34 700 | 163 000 | 36 600 | 3 200 | 4 300 | 3 200 |
| 5314M | 70 | 2.7559 | 150 | 5.9055 | 63.50 | 2.5000 | 2.0 | .08 | 172 000 | 38 700 | 186 000 | 41 800 | 2 800 | 3 800 | 2 800 |
| 5314M1 | 70 | 2.7559 | 150 | 5.9055 | 66.68 | 2.6250 | 2.0 | .08 | 172 000 | 38 700 | 186 000 | 41 800 | 2 800 | 3 800 | 2 800 |
| 5315M | 75 | 2.9528 | 160 | 6.2992 | 68.26 | 2.6875 | 2.0 | .08 | 187 000 | 42 000 | 208 000 | 46 800 | 2 600 | 3 600 | 2 600 |
| 5315M1 | 75 | 2.9528 | 160 | 6.2992 | 71.44 | 2.8125 | 2.0 | .08 | 187 000 | 42 000 | 208 000 | 46 800 | 2 600 | 3 600 | 2 600 |
| 5316M | 80 | 3.1496 | 170 | 6.6929 | 68.26 | 2.6875 | 2.0 | .08 | 201 000 | 45 200 | 236 000 | 53 100 | 2 400 | 3 400 | 2 400 |
| 5317 | 85 | 3.3465 | 180 | 7.0866 | 73.03 | 2.8750 | 2.5 | .10 | 198 000 | 44 500 | 245 000 | 55 100 | 2 200 | 3 200 | 2 200 |
| 5318 | 90 | 3.5433 | 190 | 7.4803 | 73.03 | 2.8750 | 2.5 | .10 | 224 000 | 50 400 | 290 000 | 65 200 | 2 000 | 3 000 | 2 000 |
| 5319 | 95 | 3.7402 | 200 | 7.8740 | 77.79 | 3.0625 | 2.5 | .10 | 242 000 | 54 400 | 315 000 | 70 800 | 1 900 | 2 800 | 1 900 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel cage, ABEC-1.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.
Note: Extra width bearings identified by the suffix M1 are supplied with a retrofit kit described on pages 97, 98.

# 5300UPG series double-row angular contact ball bearings




5300UPG series bearings are a specialized double-row angular contact design developed specifically for pump applications. The bearings are capable of carrying axial loads in either direction, radial loads, or a combination of both. Machined brass cages, ABEC-3 tolerances, 40° contact angle and reduced ("CB") endplay are standard features selected to improve performance for these bearings.

The 5300UPG series is "The Pump Bearing".

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | Fillet radius[1] $r_a$ in. | Basic radial load rating Dynamic C[2] N | Dynamic C[2] lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating Grease rpm | Speed rating Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5308UPG** | 40 | **1.5748** | 90 | **3.5433** | 36.51 | **1.4375** | 1.5 | **0.06** | 49 400 | **11 110** | 41 500 | **9 330** | 5 000 | 6 700 |
| **5309UPG** | 45 | **1.7717** | 100 | **3.9370** | 39.69 | **1.5625** | 1.5 | **0.06** | 61 800 | **13 890** | 52 000 | **11 690** | 4 500 | 6 000 |
| **5310UPG** | 50 | **1.9685** | 110 | **4.3307** | 44.45 | **1.7500** | 2.0 | **0.08** | 81 900 | **18 410** | 69 500 | **15 620** | 4 000 | 5 300 |
| **5311UPG** | 55 | **2.1654** | 120 | **4.7244** | 49.21 | **1.9375** | 2.0 | **0.08** | 95 600 | **21 490** | 83 000 | **18 660** | 3 800 | 5 000 |
| **5313UPG** | 65 | **2.5591** | 140 | **5.5118** | 58.74 | **2.3125** | 2.1 | **0.08** | 138 000 | **31 000** | 122 000 | **27 400** | 3 200 | 4 300 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at 33 1/3 rpm.

# 5000 series double-row angular contact ball bearings

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

$P = XF_R + YF_A$

P = Dynamic equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

X = Radial load factor

Y = Thrust load factor

$C_0$ = Basic static radial load rating

e = Limiting factor for $F_A/F_R$

| Size | e | $F_A/F_R \le e$ | | $F_A/F_R > e$ | |
|---|---|---|---|---|---|
| | | X | Y | X | Y |
| 5200SB–5206C and M<br>5300SB–5303SB<br>5403C–5414C | 0.66 | 1.0 | 0.92 | 0.67 | 1.41 |
| 5207C and M–5218C and M<br>5304C and M–5319C and M | 0.80 | 1.0 | 0.78 | 0.63 | 1.24 |
| 5308UPG–5313UPG | 1.14 | 1.0 | 0 | 0.35 | 0.57 |

| Size | $F_A/C_0$ | Normal clearance (ST Fit) | | | C3 clearance (LO Fit) | | |
|---|---|---|---|---|---|---|---|
| | | e | X | Y | e | X | Y |
| 5415C–5419C | 0.025 | 0.22 | 0.56 | 2.0 | 0.25 | 0.52 | 1.80 |
| | 0.040 | 0.24 | 0.56 | 1.8 | 0.28 | 0.52 | 1.65 |
| | 0.070 | 0.27 | 0.56 | 1.6 | 0.30 | 0.52 | 1.50 |
| | 0.130 | 0.31 | 0.56 | 1.4 | 0.34 | 0.52 | 1.33 |
| | 0.250 | 0.37 | 0.56 | 1.2 | 0.40 | 0.52 | 1.17 |
| | 0.500 | 0.44 | 0.56 | 1.0 | 0.48 | 0.52 | 1.00 |

Values of Y and e for loads not shown are obtained by linear interpolation.

### Life rating

$$L10 = \left(\frac{C}{P}\right)^3 \text{ (millions of revolutions)}$$

or

$$L10_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 \text{ (hours)}$$

C = Basic dynamic load rating

P = Dynamic equivalent radial load

n = Speed in rpm

### Static equivalent radial load

$P_0 = X_0F_R + Y_0F_A$

$P_0$ = Static equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

$X_0$ = Radial load factor

$Y_0$ = Thrust load factor

| Size | $X_0$ | $Y_0$ | |
|---|---|---|---|
| 5200SB–5206C and M<br>5300SB–5303SB<br>5403C–5414C | 1.00 | 0.76 | |
| 5207C and M–5218C and M<br>5304C and M–5319C and M | 1.00 | 0.66 | |
| 5308–5313UPG | 0.50 | 0.26 | |
| 5415C–5419C | 0.60 | 0.50 | $P_0$ is always $\ge F_R$ |

### Minimum radial load

To insure satisfactory operation of double-row, angular contact ball bearings, they must be subjected to a minimum radial load. This is especially true at high speeds where inertia forces of the balls and cage, and the friction in the lubricant, can cause skidding to occur between the balls and raceway.

The required minimum radial load can be estimated from:

$$F_{rm} = K_r \left(\frac{vn}{1000}\right)^{2/3} \left(\frac{d_m}{100}\right)^2$$

$F_{rm}$ = Minimum radial load (N)

$K_r$ = Minimum load factor

| Series | $K_r$ |
|---|---|
| 5200SB and C | 60 |
| 5200M | 90 |
| 5300SB and C | 70 |
| 5300M | 110 |
| 5400C | 70 |

v = Oil viscosity at operating temperature (cSt)

n = Speed in rpm

$d_m$ = Mean bearing diameter = $\left(\frac{D+d}{2}\right)$, (mm)

D = Bearing outside diameter (mm)

d = Bearing inside diameter (mm)

# 5000 series double-row angular contact ball bearings

## Dynamic equivalent radial load and life calculation examples

Bearing size: 5210M
Speed: 2000 rpm
Basic dynamic radial load rating (C) = 12100

### Case 1

Radial load ($F_R$) = 1750

$F_A/F_R$ = 0/1750 = 0

Equivalent load (P) = $X F_R + Y F_A$

Since $F_A/F_R < e$, equivalent load

(P) = $1.0 F_R + 0.78 F_A = 1.0 \times 1750 = 1750$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{12100}{1750}\right)^3 = 331 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{12100}{1750}\right)^3$$

= 2755 Hrs

### Case 2

Radial load ($F_R$) = 1750

Thrust load ($F_A$) = 1300

$F_A/F_R$ = 1300/1750 = 0.74

Equivalent load (P) = $X F_R + Y F_A$

Since $F_A/F_R < e$, equivalent load

(P) = $1.0 F_R + 0.78 F_A = 1.0 \times 1750 + 0.78 \times 1300 = 2764$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{12100}{2764}\right)^3 = 83.9 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{12100}{2764}\right)^3$$

= 699 Hrs

### Case 3

Radial load ($F_R$) = 1750

Thrust load ($F_A$) = 1500

$F_A/F_R$ = 1500/1750 = 0.86

Equivalent load (P) = $X F_R + Y F_A$

Since $F_A/F_R > e$, equivalent load

(P) = $0.63 F_R + 1.24 F_A$

= $0.63 \times 1750 + 1.24 \times 1500 = 2963$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{12100}{2963}\right)^3 = 68.1 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{12100}{2963}\right)^3$$

= 568 Hrs

### Case 4

Thrust load ($F_A$) = 1500

$F_A/F_R$ = 1500/0 = ∞

Equivalent load (P) = $X F_R + Y F_A$

Since $F_A/F_R > e$, equivalent load

(P) = $0.63 F_R + 1.24 F_A = 1.24 \times 1500 = 1860$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{12100}{1860}\right)^3 = 275 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{12100}{1860}\right)^3$$

= 2294 Hrs

# 5000 series double-row angular contact ball bearings

## Dynamic equivalent radial load and life calculation examples

Bearing size: 5203SB
Speed: 2000 rpm
Basic dynamic radial load rating (C) = 3210

### Case 1

Radial load ($F_R$) = 500

$F_A/F_R$ = 0/500 = 0

Equivalent load (P) = $X F_R + Y F_A$

Since $F_A/F_R < e$, equivalent load

(P) = $1.0 F_R + 0.92 F_A = 1.0 \times 500 = 500$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{3210}{500}\right)^3 = 265 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{3210}{500}\right)^3$$

= 2205 Hrs

### Case 2

Radial load ($F_R$) = 500

Thrust load ($F_A$) = 325

$F_A/F_R$ = 325/500 = 0.65

Equivalent load (P) = $X F_R + Y F_A$

Since $F_A/F_R < e$, equivalent load

(P) = $1.0 F_R + 0.92 F_A = 1.0 \times 500 + 0.92 \times 325 = 799$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{3210}{799}\right)^3 = 64.8 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{3210}{799}\right)^3$$

= 540 Hrs

### Case 3

Radial load ($F_R$) = 500

Thrust load ($F_A$) = 375

$F_A/F_R$ = 375/500 = 0.75

Equivalent load (P) = $X F_R + Y F_A$

Since $F_A/F_R > e$, equivalent load

(P) = $0.67 F_R + 1.41 F_A$

= $0.67 \times 500 + 1.41 \times 375 = 864$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{3210}{864}\right)^3 = 51.3 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{3210}{864}\right)^3$$

= 427 Hrs

### Case 4

Thrust load ($F_A$) = 375

$F_A/F_R = 375/0 = \infty$

Equivalent load (P) = $X F_R + Y F_A$

Since $F_A/F_R > e$, equivalent load

(P) = $0.67 F_R + 1.41 F_A = 1.41 \times 375 = 529$

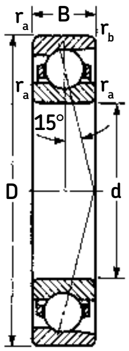
$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{3210}{529}\right)^3 = 223 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{3210}{529}\right)^3$$

= 1862 Hrs

# R-type single-row 15° angular contact ball bearings



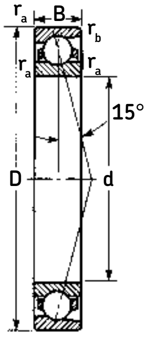

R-type bearings are single-row 15° angular contact ball bearings with one heavy race shoulder and one counterbored race shoulder on the outer ring. Because of this construction, it is possible to incorporate a greater number of balls than in the deep-groove nonfilling notch bearing. R-type bearings have ample radial capacity and moderate thrust capacity in order to accommodate those applications involving heavy radial loads; some thrust load; or a combination of both.

Note: Normally furnished with ABMA C3 radial clearance.

## Cage types and materials

Cage types and materials available are: two-piece pressed steel, ball-riding, bent prong cages; one-piece machined brass, inner ring-riding cages; and one-piece phenolic (Bakelite), inner ring-riding cages.

# 1900R extremely light series single ball bearings




1900R extremely light series bearings are made with bores ranging from 10 mm to 200 mm. The extremely light section on the 1900R bearing permits the use of these bearings in applications where there are space and weight limitations. These bearings can accommodate light radial loads and one directional thrust loads, or a combination of both. Use duplex bearings for two-directional thrust loads. 1900R bearings can be furnished duplex ground for installation in pairs.

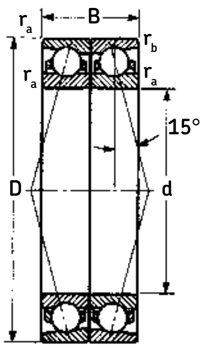
| | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | | | Basic radial load rating | | | | Speed rating[2] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d mm | d in. | D mm | D in. | B mm | B in. | $r_a$ mm | $r_a$ in. | $r_b$ mm | $r_b$ in. | $ZD^2$ mm | $ZD^2$ in. | C[3] N | C[3] lbf | $C_0$ N | $C_0$ lbf | Grease rpm | Oil rpm |
| **1900R** | 10 | **.3937** | 22 | **.8661** | 6 | **.2362** | .30 | **.012** | .10 | **.004** | 110 | **.17** | 3 120 | **701** | 1 560 | **351** | 33 000 | 40 000 |
| **1901R** | 12 | **.4724** | 24 | **.9449** | 6 | **.2362** | .30 | **.012** | .10 | **.004** | 123 | **.19** | 3 250 | **731** | 1 800 | **405** | 30 000 | 36 000 |
| **1902R** | 15 | **.5906** | 28 | **1.1024** | 7 | **.2756** | .30 | **.012** | .10 | **.004** | 187 | **.29** | 4 880 | **1 100** | 2 700 | **607** | 24 000 | 30 000 |
| **1903R** | 17 | **.6693** | 30 | **1.1811** | 7 | **.2756** | .30 | **.012** | .10 | **.004** | 206 | **.32** | 5 400 | **1 210** | 3 000 | **674** | 22 000 | 28 000 |
| **1904R** | 20 | **.7874** | 37 | **1.4567** | 9 | **.3543** | .30 | **.012** | .15 | **.006** | 400 | **.62** | 9 360 | **2 100** | 5 850 | **1 320** | 18 000 | 22 000 |
| **1905R** | 25 | **.9843** | 42 | **1.6535** | 9 | **.3543** | .30 | **.012** | .15 | **.006** | 342 | **.53** | 7 610 | **1 710** | 5 300 | **1 190** | 16 000 | 19 000 |
| **1906R** | 30 | **1.1811** | 47 | **1.8504** | 9 | **.3543** | .30 | **.012** | .15 | **.006** | 452 | **.70** | 9 750 | **2 190** | 7 100 | **1 600** | 14 000 | 17 000 |
| **1907R** | 35 | **1.3780** | 55 | **2.1654** | 10 | **.3937** | .64 | **.025** | .15 | **.006** | 555 | **.86** | 11 200 | **2 520** | 9 000 | **2 020** | 11 000 | 14 000 |
| **1908R** | 40 | **1.5748** | 62 | **2.4409** | 12 | **.4724** | .64 | **.025** | .15 | **.006** | 722 | **1.12** | 14 300 | **3 210** | 11 600 | **2 600** | 10 000 | 15 000 |
| **1909R** | 45 | **1.7717** | 68 | **2.6772** | 12 | **.4724** | .64 | **.025** | .15 | **.006** | 806 | **1.25** | 15 100 | **3 400** | 13 400 | **3 010** | 9 000 | 11 000 |
| **1910R** | 50 | **1.9685** | 72 | **2.8346** | 12 | **.4724** | .64 | **.025** | .15 | **.006** | 1 070 | **1.66** | 19 500 | **4 380** | 17 300 | **3 900** | 8 500 | 10 000 |
| **1911R** | 55 | **2.1654** | 80 | **3.1496** | 13 | **.5118** | 1.00 | **.040** | .30 | **.012** | 1 260 | **1.95** | 22 900 | **5 150** | 20 400 | **4 590** | 8 000 | 9 500 |
| **1912R** | 60 | **2.3622** | 85 | **3.3465** | 13 | **.5118** | 1.00 | **.040** | .30 | **.012** | 1 390 | **2.15** | 24 200 | **5 440** | 22 800 | **5 130** | 7 500 | 9 000 |
| **1913R** | 65 | **2.5591** | 90 | **3.5433** | 13 | **.5118** | 1.00 | **.040** | .30 | **.012** | 1 450 | **2.25** | 24 700 | **5 550** | 24 000 | **5 400** | 6 700 | 8 000 |
| **1914R** | 70 | **2.7559** | 100 | **3.9370** | 16 | **.6299** | 1.00 | **.040** | .30 | **.012** | 1 990 | **3.09** | 33 200 | **7 460** | 32 500 | **7 300** | 6 300 | 7 500 |
| **1915R** | 75 | **2.9528** | 105 | **4.1339** | 16 | **.6299** | 1.00 | **.040** | .30 | **.012** | 2 080 | **3.23** | 34 500 | **7 760** | 34 500 | **7 760** | 6 000 | 7 000 |
| **1916R** | 80 | **3.1496** | 110 | **4.3307** | 16 | **.6299** | 1.00 | **.040** | .30 | **.012** | 2 180 | **3.38** | 34 500 | **7 760** | 36 000 | **8 100** | 5 600 | 6 700 |
| **1917R** | 85 | **3.3465** | 120 | **4.7244** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 2 840 | **4.40** | 44 900 | **10 100** | 46 500 | **10 500** | 5 300 | 6 300 |
| **1918R** | 90 | **3.5433** | 125 | **4.9213** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 3 400 | **5.27** | 52 700 | **11 800** | 56 000 | **12 600** | 5 000 | 6 000 |
| **1919R** | 95 | **3.7402** | 130 | **5.1181** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 3 090 | **4.79** | 47 500 | **10 700** | 52 000 | **11 700** | 4 800 | 5 600 |
| **1920R** | 100 | **3.9370** | 140 | **5.5118** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 3 870 | **6.00** | 58 500 | **13 200** | 64 000 | **14 400** | 4 500 | 5 300 |
| **1921R** | 105 | **4.1339** | 145 | **5.7087** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 4 030 | **6.25** | 60 500 | **13 600** | 67 000 | **15 100** | 4 300 | 5 000 |
| **1922R** | 110 | **4.3307** | 150 | **5.9055** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 3 820 | **5.93** | 55 300 | **12 400** | 64 000 | **14 400** | 4 000 | 4 800 |
| **1924R** | 120 | **4.7244** | 165 | **6.4961** | 22 | **.8661** | 1.00 | **.040** | .60 | **.024** | 5 100 | **7.91** | 74 100 | **16 700** | 85 000 | **19 100** | 3 600 | 4 300 |
| **1926R** | 130 | **5.1181** | 180 | **7.0866** | 24 | **.9449** | 1.50 | **.060** | .60 | **.024** | 6 300 | **9.77** | 90 400 | **20 500** | 106 000 | **23 800** | 3 400 | 4 000 |
| **1928R** | 140 | **5.5118** | 190 | **7.4803** | 24 | **.9449** | 1.50 | **.060** | .60 | **.024** | 6 580 | **10.20** | 95 600 | **21 400** | 110 000 | **24 700** | 3 200 | 3 800 |
| **1930R** | 150 | **5.9055** | 210 | **8.2677** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 9 090 | **14.10** | 125 000 | **28 200** | 150 000 | **33 700** | 2 800 | 3 400 |
| **1932R** | 160 | **6.2992** | 220 | **8.6614** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 9 420 | **14.60** | 127 000 | **28 600** | 156 000 | **35 100** | 2 600 | 3 200 |
| **1934R** | 170 | **6.6929** | 230 | **9.0551** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 10 200 | **15.80** | 133 000 | **29 800** | 170 000 | **38 300** | 2 400 | 3 000 |
| **1936R** | 180 | **7.0866** | 250 | **9.8425** | 33 | **1.2992** | 2.00 | **.080** | 1.00 | **.040** | 12 800 | **19.90** | 168 000 | **36 000** | 212 000 | **47 800** | 2 200 | 2 800 |
| **1938R** | 190 | **7.4803** | 260 | **10.2362** | 33 | **1.2992** | 2.00 | **.080** | 1.00 | **.040** | 13 400 | **20.70** | 174 000 | **39 100** | 224 000 | **50 400** | 2 200 | 2 800 |
| **1940R** | 200 | **7.8740** | 280 | **11.0236** | 38 | **1.4961** | 2.00 | **.080** | 1.00 | **.040** | 16 800 | **26.00** | 216 100 | **48 600** | 275 000 | **61 800** | 2 000 | 2 600 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil. For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^{1}/_{3}$ rpm.



MRC

# 1900RD extremely light series duplex ball bearings




Notes:

"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

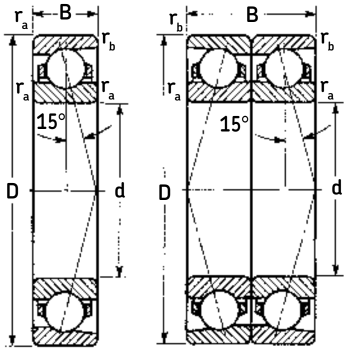
Use these values for back-to-back (DB) or face-to-face (DF) mounting arrangements.

ABEC-1 and -3 are stocked as half-pairs where available.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1)] $r_a$ mm | $r_a$ in. | $r_b$ mm | $r_b$ in. | $ZD^2$ mm | $ZD^2$ in. | Basic radial load rating Dynamic C[3)] N | Dynamic C lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[2)] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1900RD | 10 | .3937 | 22 | .8661 | 12 | .4724 | .30 | .012 | .10 | .004 | 110 | .17 | 5 070 | 1 140 | 3 100 | 697 | 26 000 | 32 000 |
| 1901RD | 12 | .4724 | 24 | .9449 | 12 | .4724 | .30 | .012 | .10 | .004 | 123 | .19 | 5 270 | 1 180 | 3 550 | 798 | 24 000 | 29 000 |
| 1902RD | 15 | .5906 | 28 | 1.1024 | 14 | .5512 | .30 | .012 | .10 | .004 | 187 | .29 | 7 930 | 1 780 | 5 400 | 1 210 | 19 000 | 24 000 |
| 1903RD | 17 | .6693 | 30 | 1.1811 | 14 | .5512 | .30 | .012 | .10 | .004 | 206 | .32 | 8 710 | 1 960 | 6 100 | 1 370 | 18 000 | 22 000 |
| 1904RD | 20 | .7874 | 37 | 1.4567 | 18 | .7087 | .30 | .012 | .15 | .006 | 400 | .62 | 15 300 | 3 440 | 11 600 | 2 600 | 14 000 | 18 000 |
| 1905RD | 25 | .9843 | 42 | 1.6535 | 18 | .7087 | .30 | .012 | .15 | .006 | 342 | .53 | 12 400 | 2 790 | 10 800 | 2 430 | 13 000 | 15 000 |
| 1906RD | 30 | 1.1811 | 47 | 1.8504 | 18 | .7087 | .30 | .012 | .15 | .006 | 452 | .70 | 15 900 | 3 580 | 14 300 | 3 210 | 11 000 | 14 000 |
| 1907RD | 35 | 1.3780 | 55 | 2.1654 | 20 | .7874 | .64 | .025 | .15 | .006 | 555 | .86 | 18 200 | 4 090 | 18 000 | 4 050 | 8 800 | 11 000 |
| 1908RD | 40 | 1.5748 | 62 | 2.4409 | 24 | .9449 | .64 | .025 | .15 | .006 | 722 | 1.12 | 22 900 | 5 150 | 23 200 | 5 220 | 8 000 | 10 000 |
| 1909RD | 45 | 1.7717 | 68 | 2.6772 | 24 | .9449 | .64 | .025 | .15 | .006 | 806 | 1.25 | 24 700 | 5 550 | 26 500 | 5 960 | 7 200 | 8 800 |
| 1910RD | 50 | 1.9685 | 72 | 2.8346 | 24 | .9449 | .64 | .025 | .15 | .006 | 1 070 | 1.66 | 31 900 | 7 170 | 34 500 | 7 760 | 6 800 | 8 000 |
| 1911RD | 55 | 2.1654 | 80 | 3.1496 | 26 | 1.0236 | 1.00 | .040 | .30 | .012 | 1 260 | 1.95 | 37 100 | 8 340 | 40 500 | 9 100 | 6 400 | 7 600 |
| 1912RD | 60 | 2.3622 | 85 | 3.3465 | 26 | 1.0236 | 1.00 | .040 | .30 | .012 | 1 390 | 2.15 | 39 000 | 8 770 | 45 500 | 10 200 | 6 000 | 7 200 |
| 1913RD | 65 | 2.5591 | 90 | 3.5433 | 26 | 1.0236 | 1.00 | .040 | .30 | .012 | 1 450 | 2.25 | 39 700 | 8 920 | 48 000 | 10 800 | 5 400 | 6 400 |
| 1914RD | 70 | 2.7559 | 100 | 3.9370 | 32 | 1.2598 | 1.00 | .040 | .30 | .012 | 1 990 | 3.09 | 54 000 | 12 100 | 65 500 | 14 700 | 5 000 | 6 000 |
| 1915RD | 75 | 2.9528 | 105 | 4.1339 | 32 | 1.2598 | 1.00 | .040 | .30 | .012 | 2 080 | 3.23 | 55 900 | 12 600 | 68 000 | 15 300 | 4 800 | 5 600 |
| 1916RD | 80 | 3.1496 | 110 | 4.3307 | 32 | 1.2598 | 1.00 | .040 | .30 | .012 | 2 180 | 3.38 | 57 200 | 12 900 | 72 000 | 16 200 | 4 500 | 5 400 |
| 1917RD | 85 | 3.3465 | 120 | 4.7244 | 36 | 1.4173 | 1.00 | .040 | .60 | .024 | 2 840 | 4.40 | 74 100 | 16 700 | 93 000 | 20 900 | 4 200 | 5 000 |
| 1918RD | 90 | 3.5433 | 125 | 4.9213 | 36 | 1.4173 | 1.00 | .040 | .60 | .024 | 3 400 | 5.27 | 85 200 | 19 200 | 112 000 | 25 200 | 4 000 | 4 800 |
| 1919RD | 95 | 3.7402 | 130 | 5.1181 | 36 | 1.4173 | 1.00 | .040 | .60 | .024 | 3 090 | 4.79 | 76 100 | 17 100 | 104 000 | 23 400 | 3 800 | 4 500 |
| 1920RD | 100 | 3.9370 | 140 | 5.5118 | 40 | 1.5748 | 1.00 | .040 | .60 | .024 | 3 870 | 6.00 | 95 600 | 21 500 | 127 000 | 28 600 | 3 600 | 4 200 |
| 1921RD | 105 | 4.1339 | 145 | 5.7087 | 40 | 1.5748 | 1.00 | .040 | .60 | .024 | 4 030 | 6.25 | 97 500 | 21 900 | 134 000 | 30 100 | 3 400 | 4 000 |
| 1922RD | 110 | 4.3307 | 150 | 5.9055 | 40 | 1.5748 | 1.00 | .040 | .60 | .024 | 3 820 | 5.93 | 90 400 | 20 300 | 129 000 | 29 000 | 3 200 | 3 800 |
| 1924RD | 120 | 4.7244 | 165 | 6.4961 | 44 | 1.7323 | 1.00 | .040 | .60 | .024 | 5 100 | 7.91 | 121 000 | 27 200 | 170 000 | 38 200 | 2 900 | 3 400 |
| 1926RD | 130 | 5.1181 | 180 | 7.0866 | 48 | 1.8898 | 1.50 | .060 | .60 | .024 | 6 300 | 9.77 | 146 000 | 32 800 | 208 000 | 46 800 | 2 700 | 3 200 |
| 1928RD | 140 | 5.5118 | 190 | 7.4803 | 48 | 1.8898 | 1.50 | .060 | .60 | .024 | 6 580 | 10.20 | 156 000 | 35 100 | 220 000 | 49 500 | 2 600 | 3 000 |
| 1930RD | 150 | 5.9055 | 210 | 8.2677 | 56 | 2.2047 | 2.00 | .080 | 1.00 | .040 | 9 090 | 14.10 | 203 000 | 45 600 | 300 000 | 67 400 | 2 200 | 2 700 |
| 1932RD | 160 | 6.2992 | 220 | 8.6614 | 56 | 2.2047 | 2.00 | .080 | 1.00 | .040 | 9 420 | 14.60 | 208 000 | 46 800 | 315 000 | 70 800 | 2 100 | 2 600 |
| 1934RD | 170 | 6.6929 | 230 | 9.0551 | 56 | 2.2047 | 2.00 | .080 | 1.00 | .040 | 10 200 | 15.80 | 216 000 | 48 600 | 340 000 | 76 400 | 1 900 | 2 400 |
| 1936RD | 180 | 7.0866 | 250 | 9.8425 | 66 | 2.5984 | 2.00 | .080 | 1.00 | .040 | 12 800 | 19.90 | 276 000 | 62 000 | 425 000 | 95 600 | 1 800 | 2 200 |
| 1938RD | 190 | 7.4803 | 260 | 10.2362 | 66 | 2.5984 | 2.00 | .080 | 1.00 | .040 | 13 400 | 20.70 | 281 000 | 63 200 | 440 000 | 98 900 | 1 800 | 2 200 |
| 1940RD | 200 | 7.8740 | 280 | 11.0236 | 76 | 2.9921 | 2.00 | .080 | 1.00 | .040 | 16 800 | 26.00 | 351 000 | 78 900 | 550 000 | 124 000 | 1 600 | 2 100 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil. For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33\frac{1}{3}$ rpm.

# 100R and 100RD extra large series




100R extra large series bearings are available in bore diameters ranging from 100 mm to 320 mm. They are used with light to moderate radial loads, one-directional thrust loads, or a combination of both. Duplex bearings should be used for two-directional thrust loads.

Notes:

"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex.

See pages 240 and 241 for suffix description.

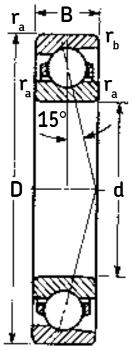
Values for RD bearings are for back-to-back (DB) or face-to-face (DF) mounting arrangements

ABEC-1 and -3 are stocked as half-pairs where available.

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1] $r_a$ mm | in. | $r_b$ mm | in. | $ZD^2$ mm | in. | Basic radial load rating Dynamic C[3] N | lbf | Static $C_0$ N | lbf | Speed rating[2] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **100R** | | | | | | | | | | | | | | | | | | |
| **120R** | 100 | **3.9370** | 160 | **6.2992** | 28 | **1.1024** | 2.0 | **.08** | 1.0 | **.040** | 6 100 | **9.45** | 95 600 | **21 500** | 95 000 | **21 400** | 3 900 | 4 800 |
| **122R** | 110 | **4.3307** | 175 | **6.8898** | 30 | **1.1811** | 2.0 | **.08** | 1.0 | **.040** | 7 290 | **11.30** | 114 000 | **25 600** | 114 000 | **25 600** | 3 600 | 4 400 |
| **124R** | 120 | **4.7244** | 190 | **7.4803** | 32 | **1.2598** | 2.0 | **.08** | 1.0 | **.040** | 8 970 | **13.90** | 134 000 | **30 100** | 140 000 | **31 500** | 3 300 | 4 000 |
| **126R** | 130 | **5.1181** | 205 | **8.0709** | 34 | **1.3386** | 2.0 | **.08** | 1.0 | **.040** | 9 350 | **14.50** | 138 000 | **31 000** | 150 000 | **33 700** | 3 000 | 3 700 |
| **128R** | 140 | **5.5118** | 220 | **8.6614** | 36 | **1.4173** | 2.0 | **.08** | 1.0 | **.040** | 10 800 | **16.80** | 157 000 | **35 300** | 173 000 | **38 900** | 2 800 | 3 400 |
| **130R** | 150 | **5.9055** | 235 | **9.2520** | 38 | **1.4961** | 2.0 | **.08** | 1.0 | **.040** | 12 400 | **19.30** | 176 000 | **39 600** | 200 000 | **45 000** | 2 600 | 3 200 |
| **132R** | 160 | **6.2992** | 250 | **9.8425** | 40 | **1.5748** | 2.0 | **.08** | 1.0 | **.040** | 14 200 | **22.00** | 183 000 | **41 100** | 228 000 | **51 300** | 2 500 | 3 000 |
| **134R** | 170 | **6.6929** | 265 | **10.4331** | 42 | **1.6535** | 2.5 | **.10** | 1.0 | **.040** | 16 000 | **24.80** | 216 000 | **48 600** | 255 000 | **57 300** | 2 300 | 2 800 |
| **136R** | 180 | **7.0866** | 280 | **11.0236** | 44 | **1.7323** | 2.5 | **.10** | 1.0 | **.040** | 17 900 | **27.80** | 233 000 | **52 400** | 285 000 | **64 100** | 2 100 | 2 600 |
| **138R** | 190 | **7.4803** | 300 | **11.8110** | 46 | **1.8110** | 2.5 | **.10** | 1.0 | **.040** | 22 200 | **34.40** | 275 000 | **61 800** | 355 000 | **79 800** | 2 100 | 2 500 |
| **140R** | 200 | **7.8740** | 320 | **12.5984** | 48 | **1.8898** | 2.5 | **.10** | 1.0 | **.040** | 24 400 | **37.90** | 292 000 | **65 600** | 390 000 | **87 700** | 1 900 | 2 300 |
| **142R** | 210 | **8.2677** | 340 | **13.3858** | 50 | **1.9685** | 2.5 | **.10** | 1.0 | **.040** | 28 000 | **43.40** | 319 000 | **71 700** | 440 000 | **98 900** | 1 800 | 2 200 |
| **144R** | 220 | **8.6614** | 350 | **13.7795** | 51 | **2.0079** | 2.5 | **.10** | 1.0 | **.040** | 29 300 | **45.50** | 336 000 | **75 500** | 465 000 | **105 000** | 1 700 | 2 100 |
| **146R** | 230 | **9.0551** | 370 | **14.5669** | 53 | **2.0866** | 3.0 | **.12** | 1.0 | **.040** | 31 900 | **49.50** | 352 000 | **79 100** | 510 000 | **115 000** | 1 600 | 2 000 |
| **148R** | 240 | **9.4488** | 390 | **15.3543** | 55 | **2.1654** | 3.0 | **.12** | 1.0 | **.040** | 34 600 | **53.70** | 374 000 | **84 100** | 550 000 | **124 000** | 1 600 | 1 900 |
| **150R** | 250 | **9.8425** | 410 | **16.1417** | 57 | **2.2441** | 3.0 | **.12** | 1.0 | **.040** | 37 500 | **58.10** | 393 000 | **88 400** | 600 000 | **135 000** | 1 500 | 1 800 |
| **152R** | 260 | **10.2362** | 430 | **16.9291** | 59 | **2.3228** | 3.0 | **.12** | 1.0 | **.040** | 40 400 | **62.70** | 413 000 | **92 800** | 655 000 | **147 000** | 1 400 | 1 700 |
| **156R** | 280 | **11.0236** | 460 | **18.1102** | 63 | **2.4803** | 3.0 | **.12** | 1.0 | **.040** | 46 600 | **72.30** | 457 000 | **103 000** | 750 000 | **169 000** | 1 300 | 1 600 |
| **164R** | 320 | **12.5984** | 500 | **19.6850** | 71 | **2.7953** | 3.0 | **.12** | 1.0 | **.040** | 56 800 | **88.00** | 523 000 | **118 000** | 900 000 | **202 000** | 1 100 | 1 400 |
| **100RD** | | | | | | | | | | | | | | | | | | |
| **120RD** | 100 | **3.9370** | 160 | **6.2992** | 56 | **2.2047** | 2.0 | **.08** | 1.0 | **.040** | 6 100 | **9.450** | 156 000 | **35 100** | 190 000 | **42 700** | 3 100 | 3 800 |
| **122RD** | 110 | **4.3307** | 175 | **6.8898** | 60 | **2.3622** | 2.0 | **.08** | 1.0 | **.040** | 7 290 | **11.30** | 185 000 | **41 800** | 228 000 | **51 300** | 2 900 | 3 500 |
| **124RD** | 120 | **4.7244** | 190 | **7.4803** | 64 | **2.5197** | 2.0 | **.08** | 1.0 | **.040** | 8 970 | **13.90** | 221 000 | **49 700** | 280 000 | **62 900** | 2 600 | 3 200 |
| **126RD** | 130 | **5.1181** | 205 | **8.0709** | 68 | **2.6772** | 2.0 | **.08** | 1.0 | **.040** | 9 350 | **14.50** | 221 000 | **49 700** | 300 000 | **67 400** | 2 400 | 3 000 |
| **128RD** | 140 | **5.5118** | 220 | **8.6614** | 72 | **2.8346** | 2.0 | **.08** | 1.0 | **.040** | 10 800 | **16.80** | 255 000 | **57 300** | 345 000 | **77 600** | 2 200 | 2 700 |
| **130RD** | 150 | **5.9055** | 235 | **9.2520** | 76 | **2.9921** | 2.0 | **.08** | 1.0 | **.040** | 12 400 | **19.30** | 286 000 | **64 300** | 400 000 | **89 900** | 2 100 | 2 600 |
| **132RD** | 160 | **6.2992** | 250 | **9.8425** | 80 | **3.1496** | 2.0 | **.08** | 1.0 | **.040** | 14 200 | **22.00** | 296 000 | **66 500** | 455 000 | **102 000** | 2 000 | 2 400 |
| **134RD** | 170 | **6.6929** | 265 | **10.4331** | 84 | **3.3071** | 2.5 | **.10** | 1.0 | **.040** | 16 000 | **24.80** | 351 000 | **78 900** | 510 000 | **115 000** | 1 800 | 2 200 |
| **136RD** | 180 | **7.0866** | 280 | **11.0236** | 88 | **3.4646** | 2.5 | **.10** | 1.0 | **.040** | 17 900 | **27.80** | 377 000 | **84 800** | 570 000 | **128 000** | 1 700 | 2 100 |
| **138RD** | 190 | **7.4803** | 300 | **11.8110** | 92 | **3.6220** | 2.5 | **.10** | 1.0 | **.040** | 22 200 | **34.40** | 442 000 | **99 400** | 710 000 | **160 000** | 1 700 | 2 000 |
| **140RD** | 200 | **7.8740** | 320 | **12.5984** | 96 | **3.7795** | 2.5 | **.10** | 1.0 | **.040** | 24 400 | **37.90** | 475 000 | **107 000** | 780 000 | **175 000** | 1 500 | 1 800 |
| **142RD** | 210 | **8.2677** | 340 | **13.3858** | 100 | **3.9370** | 2.5 | **.10** | 1.0 | **.040** | 28 000 | **43.40** | 527 000 | **118 000** | 880 000 | **198 000** | 1 400 | 1 800 |
| **144RD** | 220 | **8.6614** | 350 | **13.7795** | 102 | **4.0157** | 2.5 | **.10** | 1.0 | **.040** | 29 300 | **45.50** | 540 000 | **121 000** | 930 000 | **209 000** | 1 400 | 1 700 |
| **146RD** | 230 | **9.0551** | 370 | **14.5669** | 106 | **4.1732** | 3.0 | **.12** | 1.0 | **.040** | 31 900 | **49.50** | 572 000 | **129 000** | 1 020 000 | **229 000** | 1 300 | 1 600 |
| **148RD** | 240 | **9.4488** | 390 | **15.3543** | 110 | **4.3307** | 3.0 | **.12** | 1.0 | **.040** | 34 600 | **53.70** | 605 000 | **136 000** | 1 100 000 | **247 000** | 1 300 | 1 500 |
| **150RD** | 250 | **9.8425** | 410 | **16.1417** | 114 | **4.4882** | 3.0 | **.12** | 1.0 | **.040** | 37 500 | **58.10** | 637 000 | **143 000** | 1 200 000 | **270 000** | 1 200 | 1 400 |
| **152RD** | 260 | **10.2362** | 430 | **16.9291** | 118 | **4.6457** | 3.0 | **.12** | 1.0 | **.040** | 40 400 | **62.70** | 676 000 | **152 000** | 1 290 000 | **290 000** | 1 100 | 1 400 |
| **156RD** | 280 | **11.0236** | 460 | **18.1102** | 126 | **4.9606** | 3.0 | **.12** | 1.0 | **.040** | 46 600 | **72.30** | 741 000 | **167 000** | 1 500 000 | **337 000** | 1 000 | 1 300 |
| **164RD** | 320 | **12.5984** | 500 | **19.6850** | 142 | **5.5906** | 3.0 | **.12** | 1.0 | **.040** | 56 800 | **88.00** | 852 000 | **192 000** | 1 800 000 | **405 000** | 880 | 1 100 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil. For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^{1}/_{3}$ rpm.

# 100KR extra light series single ball bearings

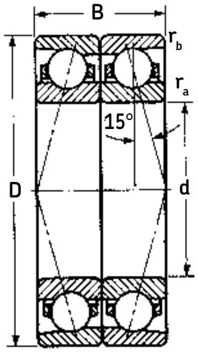



100KR extra light series bearings are made with bores ranging from 10 mm to 320 mm. 100KR bearings can accommodate light to moderate radial loads or one-directional thrust loads, or a combination of both where space is somewhat limited. They can be furnished duplex-ground for mounting in pairs. Duplex bearings should be used for two-directional thrust loads.

| | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | | | Basic radial load rating | | | | Speed rating[2] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d | | D | | B | | $r_a$ | | $r_b$ | | $ZD^2$ | | $C$[3] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **100KR** | 10 | **.3937** | 26 | **1.0236** | 8 | **.3150** | .30 | **.012** | .10 | **.004** | 181 | **.28** | 4 940 | **1 110** | 2 280 | **513** | 30 000 | 36 000 |
| **101KR** | 12 | **.4724** | 28 | **1.1024** | 8 | **.3150** | .30 | **.012** | .10 | **.004** | 206 | **.32** | 5 530 | **1 240** | 2 650 | **596** | 26 000 | 32 000 |
| **102KR** | 15 | **.5906** | 32 | **1.2598** | 9 | **.3543** | .30 | **.012** | .10 | **.004** | 226 | **.35** | 6 050 | **1 350** | 3 150 | **708** | 22 000 | 28 000 |
| **103KR** | 17 | **.6693** | 35 | **1.3780** | 10 | **.3937** | .30 | **.012** | .10 | **.004** | 342 | **.53** | 8 520 | **1 920** | 4 650 | **1 050** | 19 000 | 24 000 |
| **104KR** | 20 | **.7874** | 42 | **1.6535** | 12 | **.4724** | .64 | **.025** | .30 | **.012** | 445 | **.69** | 10 800 | **2 420** | 6 200 | **1 390** | 17 000 | 20 000 |
| **105KR** | 25 | **.9843** | 47 | **1.8504** | 12 | **.4724** | .64 | **.025** | .30 | **.012** | 522 | **.81** | 12 100 | **2 720** | 7 650 | **1 720** | 15 000 | 18 000 |
| **106KR** | 30 | **1.1811** | 55 | **2.1654** | 13 | **.5118** | 1.00 | **.040** | .30 | **.012** | 716 | **1.11** | 15 600 | **3 500** | 10 600 | **2 380** | 12 000 | 15 000 |
| **107KR** | 35 | **1.3780** | 62 | **2.4409** | 14 | **.5512** | 1.00 | **.040** | .30 | **.012** | 884 | **1.37** | 18 600 | **4 180** | 13 200 | **2 970** | 10 000 | 13 000 |
| **108KR** | 40 | **1.5748** | 68 | **2.6772** | 15 | **.5906** | 1.00 | **.040** | .30 | **.012** | 942 | **1.46** | 19 500 | **4 380** | 14 600 | **3 280** | 9 500 | 12 000 |
| **109KR** | 45 | **1.7717** | 75 | **2.9528** | 16 | **.6299** | 1.00 | **.040** | .30 | **.012** | 1 220 | **1.89** | 24 200 | **5 440** | 19 000 | **4 270** | 9 000 | 11 000 |
| **110KR** | 50 | **1.9685** | 80 | **3.1496** | 16 | **.6299** | 1.00 | **.040** | .30 | **.012** | 1 300 | **2.01** | 25 100 | **5 640** | 20 400 | **4 590** | 8 500 | 10 000 |
| **111KR** | 55 | **2.1654** | 90 | **3.5433** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 1 810 | **2.81** | 33 800 | **7 600** | 28 000 | **6 290** | 7 500 | 9 000 |
| **112KR** | 60 | **2.3622** | 95 | **3.7402** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 1 920 | **2.97** | 35 100 | **7 890** | 30 000 | **6 740** | 6 700 | 8 000 |
| **113KR** | 65 | **2.5591** | 100 | **3.9370** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 2 030 | **3.14** | 35 800 | **8 050** | 32 500 | **7 310** | 6 300 | 7 500 |
| **114KR** | 70 | **2.7559** | 110 | **4.3307** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 2 470 | **3.83** | 42 300 | **9 510** | 40 000 | **8 990** | 6 000 | 7 000 |
| **115KR** | 75 | **2.9528** | 115 | **4.5276** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 2 590 | **4.02** | 43 600 | **9 800** | 42 500 | **9 550** | 5 600 | 6 770 |
| **116KR** | 80 | **3.1496** | 125 | **4.9213** | 22 | **.8661** | 1.00 | **.040** | .60 | **.024** | 3 390 | **5.25** | 55 900 | **12 600** | 54 000 | **12 100** | 5 300 | 6 300 |
| **117KR** | 85 | **3.3465** | 130 | **5.1181** | 22 | **.8661** | 1.00 | **.040** | .60 | **.024** | 3 550 | **5.50** | 57 200 | **12 900** | 57 000 | **12 800** | 5 000 | 6 000 |
| **118KR** | 90 | **3.5433** | 140 | **5.5118** | 24 | **.9449** | 1.50 | **.060** | .60 | **.024** | 4 280 | **6.64** | 68 900 | **15 500** | 68 000 | **15 300** | 4 800 | 5 600 |
| **119KR** | 95 | **3.7402** | 145 | **5.7087** | 24 | **.9449** | 1.50 | **.060** | .60 | **.024** | 5 040 | **7.81** | 83 200 | **18 700** | 80 000 | **18 000** | 4 500 | 5 300 |
| **120KR** | 100 | **3.9370** | 150 | **5.9055** | 24 | **.9449** | 1.50 | **.060** | .60 | **.024** | 4 700 | **7.28** | 71 500 | **16 100** | 76 500 | **17 200** | 4 300 | 5 000 |
| **121KR** | 105 | **4.1339** | 160 | **6.2992** | 26 | **1.0236** | 2.00 | **.080** | 1.00 | **.040** | 5 540 | **8.59** | 85 200 | **19 200** | 90 000 | **20 200** | 4 000 | 4 800 |
| **122KR** | 110 | **4.3307** | 170 | **6.6929** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 6 400 | **9.93** | 99 500 | **22 400** | 102 000 | **23 000** | 3 800 | 4 500 |
| **124KR** | 120 | **4.7244** | 180 | **7.0866** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 6 710 | **10.40** | 101 000 | **22 600** | 110 000 | **24 700** | 3 400 | 4 000 |
| **126KR** | 130 | **5.1181** | 200 | **7.8740** | 33 | **1.2992** | 2.00 | **.080** | 1.00 | **.040** | 9 350 | **14.50** | 138 000 | **31 000** | 150 000 | **33 700** | 3 200 | 3 800 |
| **128KR** | 140 | **5.5118** | 210 | **8.2677** | 33 | **1.2992** | 2.00 | **.080** | 1.00 | **.040** | 9 350 | **14.50** | 135 000 | **30 300** | 153 000 | **34 400** | 3 000 | 3 600 |
| **130KR** | 150 | **5.9055** | 225 | **8.8583** | 35 | **1.3780** | 2.00 | **.080** | 1.00 | **.040** | 10 800 | **16.80** | 156 000 | **35 000** | 176 000 | **39 600** | 2 600 | 3 200 |
| **132KR** | 160 | **6.2992** | 240 | **9.4488** | 38 | **1.4961** | 2.00 | **.080** | 1.00 | **.040** | 12 400 | **19.30** | 178 000 | **40 000** | 204 000 | **45 900** | 2 400 | 3 000 |
| **134KR** | 170 | **6.6929** | 260 | **10.2362** | 42 | **1.6535** | 2.00 | **.080** | 1.00 | **.040** | 15 300 | **23.70** | 212 000 | **47 700** | 245 000 | **55 100** | 2 200 | 2 800 |
| **136KR** | 180 | **7.0866** | 280 | **11.0236** | 46 | **1.8110** | 2.00 | **.080** | 1.00 | **.040** | 17 900 | **27.80** | 234 000 | **52 600** | 290 000 | **65 200** | 2 000 | 2 600 |
| **138KR** | 190 | **7.4803** | 290 | **11.4173** | 46 | **1.8110** | 2.00 | **.080** | 1.00 | **.040** | 18 800 | **29.10** | 242 000 | **54 400** | 305 000 | **68 600** | 2 000 | 2 600 |
| **140KR** | 200 | **7.8740** | 310 | **12.2047** | 51 | **2.0079** | 2.00 | **.080** | 1.00 | **.040** | 22 200 | **34.40** | 276 000 | **62 000** | 355 000 | **79 800** | 1 900 | 2 400 |
| **144KR** | 220 | **8.6614** | 340 | **13.3858** | 56 | **2.2047** | 2.50 | **.100** | 1.00 | **.040** | 30 400 | **47.20** | 345 000 | **77 600** | 480 000 | **108 000** | 1 800 | 2 200 |
| **148KR** | 240 | **9.4488** | 360 | **14.1732** | 56 | **2.2047** | 2.50 | **.100** | 1.00 | **.040** | 31 900 | **49.50** | 351 000 | **78 900** | 510 000 | **115 000** | 1 700 | 2 000 |
| **152KR** | 260 | **10.2362** | 400 | **15.7480** | 65 | **2.5591** | 3.00 | **.120** | 1.50 | **.060** | 41 500 | **64.30** | 423 000 | **95 100** | 655 000 | **147 000** | 1 500 | 1 800 |
| **156KR** | 280 | **11.0236** | 420 | **16.5354** | 65 | **2.5591** | 3.00 | **.120** | 1.50 | **.060** | 43 500 | **67.40** | 436 000 | **98 000** | 695 000 | **156 000** | 1 400 | 1 700 |
| **160KR** | 300 | **11.8110** | 460 | **18.1102** | 74 | **2.9134** | 3.00 | **.120** | 1.50 | **.060** | 54 200 | **84.00** | 520 000 | **117 000** | 850 000 | **191 000** | 1 200 | 1 500 |
| **164KR** | 320 | **12.5984** | 480 | **18.8976** | 74 | **2.9134** | 3.00 | **.120** | 1.50 | **.060** | 56 800 | **88.00** | 527 000 | **118 000** | 900 000 | **202 000** | 1 100 | 1 400 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil. For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 100KRD extra light series duplex ball bearings




Notes:

"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

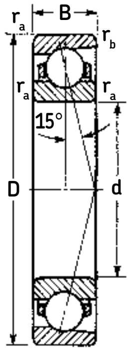
Use these values for back-to-back (DB) or face-to-face (DF) mounting arrangements.

ABEC-1 and -3 are stocked as half-pairs where available.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | $r_a$ in. | $r_b$ mm | $r_b$ in. | $ZD^2$ mm | $ZD^2$ in. | Basic radial load rating Dynamic $C$[3] N | Dynamic $C$ lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[2] Grease rpm | Speed rating Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **100KRD** | 10 | **.3937** | 26 | **1.0236** | 16 | **.6299** | .30 | **.012** | .10 | **.004** | 181 | **.28** | 8 060 | **1 810** | 4 550 | **1 020** | 24 000 | 29 000 |
| **101KRD** | 12 | **.4724** | 28 | **1.1024** | 16 | **.6299** | .30 | **.012** | .10 | **.004** | 206 | **.32** | 8 840 | **1 990** | 5 300 | **1 190** | 21 000 | 26 000 |
| **102KRD** | 15 | **.5906** | 32 | **1.2598** | 18 | **.7087** | .30 | **.012** | .10 | **.004** | 226 | **.35** | 9 750 | **2 190** | 6 300 | **1 420** | 18 000 | 22 000 |
| **103KRD** | 17 | **.6693** | 35 | **1.3780** | 20 | **.7874** | .30 | **.012** | .10 | **.004** | 342 | **.53** | 13 800 | **3 100** | 9 300 | **2 090** | 15 000 | 19 000 |
| **104KRD** | 20 | **.7874** | 42 | **1.6535** | 24 | **.9449** | .64 | **.025** | .30 | **.012** | 445 | **.69** | 17 400 | **3 910** | 12 500 | **2 810** | 14 000 | 16 000 |
| **105KRD** | 25 | **.9843** | 47 | **1.8504** | 24 | **.9449** | .64 | **.025** | .30 | **.012** | 522 | **.81** | 19 500 | **4 380** | 15 300 | **3 440** | 12 000 | 14 000 |
| **106KRD** | 30 | **1.1811** | 55 | **2.1654** | 26 | **1.0236** | 1.00 | **.040** | .30 | **.012** | 716 | **1.11** | 25 500 | **5 730** | 21 200 | **4 760** | 9 600 | 12 000 |
| **107KRD** | 35 | **1.3780** | 62 | **2.4409** | 28 | **1.1024** | 1.00 | **.040** | .30 | **.012** | 884 | **1.37** | 30 200 | **6 790** | 26 500 | **5 960** | 8 000 | 10 000 |
| **108KRD** | 40 | **1.5748** | 68 | **2.6772** | 30 | **1.1811** | 1.00 | **.040** | .30 | **.012** | 942 | **1.46** | 31 900 | **7 170** | 29 000 | **6 520** | 7 600 | 9 600 |
| **109KRD** | 45 | **1.7717** | 75 | **2.9528** | 32 | **1.2598** | 1.00 | **.040** | .30 | **.012** | 1 220 | **1.89** | 39 000 | **8 770** | 37 500 | **8 430** | 7 200 | 8 800 |
| **110KRD** | 50 | **1.9685** | 80 | **3.1496** | 32 | **1.2598** | 1.00 | **.040** | .30 | **.012** | 1 300 | **2.01** | 40 300 | **9 060** | 40 500 | **9 100** | 6 800 | 8 000 |
| **111KRD** | 55 | **2.1654** | 90 | **3.5433** | 36 | **1.4173** | 1.00 | **.040** | .60 | **.024** | 1 810 | **2.81** | 55 300 | **12 400** | 56 000 | **12 600** | 6 000 | 7 200 |
| **112KRD** | 60 | **2.3622** | 95 | **3.7402** | 36 | **1.4173** | 1.00 | **.040** | .60 | **.024** | 1 920 | **2.97** | 55 900 | **12 600** | 61 000 | **13 700** | 5 400 | 6 400 |
| **113KRD** | 65 | **2.5591** | 100 | **3.9370** | 36 | **1.4173** | 1.00 | **.040** | .60 | **.024** | 2 030 | **3.14** | 58 500 | **13 200** | 64 000 | **14 400** | 5 000 | 6 000 |
| **114KRD** | 70 | **2.7559** | 110 | **4.3307** | 40 | **1.5748** | 1.00 | **.040** | .60 | **.024** | 2 470 | **3.83** | 68 900 | **15 500** | 80 000 | **18 000** | 4 800 | 5 600 |
| **115KRD** | 75 | **2.9528** | 115 | **4.5276** | 40 | **1.5748** | 1.00 | **.040** | .60 | **.024** | 2 590 | **4.02** | 70 200 | **15 800** | 85 000 | **19 100** | 4 500 | 5 400 |
| **116KRD** | 80 | **3.1496** | 125 | **4.9213** | 44 | **1.7323** | 1.00 | **.040** | .60 | **.024** | 3 390 | **5.25** | 90 400 | **20 300** | 110 000 | **24 700** | 4 200 | 5 000 |
| **117KRD** | 85 | **3.3465** | 130 | **5.1181** | 44 | **1.7323** | 1.00 | **.040** | .60 | **.024** | 3 550 | **5.50** | 92 300 | **20 700** | 116 000 | **26 100** | 4 000 | 4 800 |
| **118KRD** | 90 | **3.5433** | 140 | **5.5118** | 48 | **1.8898** | 1.50 | **.060** | .60 | **.024** | 4 280 | **6.64** | 111 000 | **25 000** | 137 000 | **30 800** | 3 800 | 4 500 |
| **119KRD** | 95 | **3.7402** | 145 | **5.7087** | 48 | **1.8898** | 1.50 | **.060** | .60 | **.024** | 5 040 | **7.81** | 135 000 | **30 300** | 160 000 | **36 000** | 3 600 | 4 200 |
| **120KRD** | 100 | **3.9370** | 150 | **5.9055** | 48 | **1.8898** | 1.50 | **.060** | .60 | **.024** | 4 700 | **7.28** | 117 000 | **26 300** | 153 000 | **34 400** | 3 400 | 4 000 |
| **121KRD** | 105 | **4.1339** | 160 | **6.2992** | 52 | **2.0472** | 2.00 | **.080** | 1.00 | **.040** | 5 540 | **8.59** | 138 000 | **31 000** | 180 000 | **40 500** | 3 200 | 3 800 |
| **122KRD** | 110 | **4.3307** | 170 | **6.6929** | 56 | **2.2047** | 2.00 | **.080** | 1.00 | **.040** | 6 400 | **9.93** | 163 000 | **36 600** | 204 000 | **45 900** | 3 000 | 3 600 |
| **124KRD** | 120 | **4.7244** | 180 | **7.0866** | 56 | **2.2047** | 2.00 | **.080** | 1.00 | **.040** | 6 710 | **10.40** | 163 000 | **36 600** | 220 000 | **49 500** | 2 700 | 3 200 |
| **126KRD** | 130 | **5.1181** | 200 | **7.8740** | 66 | **2.5984** | 2.00 | **.080** | 1.00 | **.040** | 9 350 | **14.50** | 225 000 | **50 000** | 300 000 | **67 400** | 2 600 | 3 000 |
| **128KRD** | 140 | **5.5118** | 210 | **8.2677** | 66 | **2.5984** | 2.00 | **.080** | 1.00 | **.040** | 9 350 | **14.50** | 221 000 | **49 700** | 305 000 | **68 600** | 2 400 | 2 900 |
| **130KRD** | 150 | **5.9055** | 225 | **8.8583** | 70 | **2.7559** | 2.00 | **.080** | 1.00 | **.040** | 10 800 | **16.80** | 255 000 | **57 300** | 355 000 | **79 800** | 2 100 | 2 600 |
| **132KRD** | 160 | **6.2992** | 240 | **9.4488** | 76 | **2.9921** | 2.00 | **.080** | 1.00 | **.040** | 12 400 | **19.30** | 286 000 | **64 300** | 405 000 | **91 000** | 1 900 | 2 400 |
| **134KRD** | 170 | **6.6929** | 260 | **10.2362** | 84 | **3.3071** | 2.00 | **.080** | 1.00 | **.040** | 15 300 | **23.70** | 345 000 | **77 600** | 490 000 | **110 000** | 1 800 | 2 200 |
| **136KRD** | 180 | **7.0866** | 280 | **11.0236** | 92 | **3.6220** | 2.00 | **.080** | 1.00 | **.040** | 17 900 | **27.80** | 377 000 | **84 800** | 570 000 | **128 000** | 1 600 | 2 100 |
| **138KRD** | 190 | **7.4803** | 290 | **11.4173** | 92 | **3.6220** | 2.00 | **.080** | 1.00 | **.040** | 18 800 | **29.10** | 390 000 | **87 700** | 610 000 | **137 000** | 1 600 | 2 100 |
| **140KRD** | 200 | **7.8740** | 310 | **12.2047** | 102 | **4.0157** | 2.00 | **.080** | 1.00 | **.040** | 22 200 | **34.40** | 442 000 | **99 400** | 710 000 | **160 000** | 1 500 | 1 900 |
| **144KRD** | 220 | **8.6614** | 340 | **13.3858** | 112 | **4.4094** | 2.50 | **.100** | 1.00 | **.040** | 30 400 | **47.20** | 559 000 | **126 000** | 965 000 | **217 000** | 1 400 | 1 800 |
| **148KRD** | 240 | **9.4488** | 360 | **14.1732** | 112 | **4.4094** | 2.50 | **.100** | 1.00 | **.040** | 31 900 | **49.50** | 572 000 | **129 000** | 1 020 000 | **228 000** | 1 400 | 1 600 |
| **152KRD** | 260 | **10.2362** | 400 | **15.7480** | 130 | **5.1181** | 3.00 | **.120** | 1.50 | **.060** | 41 500 | **64.30** | 702 000 | **158 000** | 1 320 000 | **297 000** | 1 200 | 1 400 |
| **156KRD** | 280 | **11.0236** | 420 | **16.5354** | 130 | **5.1181** | 3.00 | **.120** | 1.50 | **.060** | 43 500 | **67.40** | 715 000 | **161 000** | 1 400 000 | **315 000** | 1 100 | 1 400 |
| **160KRD** | 300 | **11.8110** | 460 | **18.1102** | 148 | **5.8268** | 3.00 | **.120** | 1.50 | **.060** | 54 200 | **84.00** | 832 000 | **187 000** | 1 700 000 | **382 000** | 960 | 1 200 |
| **164KRD** | 320 | **12.5984** | 480 | **18.8976** | 148 | **5.8268** | 3.00 | **.120** | 1.50 | **.060** | 56 800 | **88.00** | 852 000 | **192 000** | 1 810 000 | **406 000** | 880 | 1 100 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil. For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 200R light series single ball bearings

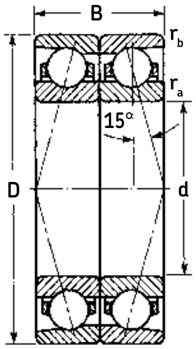



200R light series bearings are made with bore diameters ranging from 10 mm to 320 mm. These bearings are recommended for moderate to heavy radial loads, one-directional thrust loads, or for combinations of both. Duplex bearings should be used for two-directional thrust loads.

| | Bore | | Outside diameter | | Width | | Fillet radius1) | | | | | | Basic radial load rating | | | | Speed rating2) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d mm | in. | D mm | in. | B mm | in. | $r_a$ mm | in. | $r_b$ mm | in. | $ZD^2$ mm | in. | C3) N | lbf | $C_0$ N | lbf | Grease rpm | Oil rpm |
| **200R** | 10 | **.3937** | 30 | **1.1811** | 9 | **.3543** | .64 | **.025** | .30 | **.012** | 284 | **.44** | 7 280 | **1 640** | 3 200 | **719** | 24 000 | 30 000 |
| **201R** | 12 | **.4724** | 32 | **1.2598** | 10 | **.3937** | .64 | **.025** | .30 | **.012** | 323 | **.50** | 8 190 | **1 840** | 3 900 | **877** | 22 000 | 28 000 |
| **202R** | 15 | **.5906** | 35 | **1.3780** | 11 | **.4331** | .64 | **.025** | .30 | **.012** | 406 | **.63** | 9 750 | **2 190** | 5 100 | **1 150** | 19 000 | 24 000 |
| **203R** | 17 | **.6693** | 40 | **1.5748** | 12 | **.4724** | .64 | **.025** | .30 | **.012** | 510 | **.79** | 12 100 | **2 720** | 6 550 | **1 470** | 17 000 | 20 000 |
| **204R** | 20 | **.7874** | 47 | **1.8504** | 14 | **.5512** | 1.00 | **.040** | .60 | **.024** | 613 | **.95** | 14 000 | **3 150** | 8 500 | **1 910** | 15 000 | 18 000 |
| **205R** | 25 | **.9843** | 52 | **2.0472** | 15 | **.5906** | 1.00 | **.040** | .60 | **.024** | 755 | **1.17** | 16 800 | **3 780** | 10 600 | **2 380** | 12 000 | 15 000 |
| **206R** | 30 | **1.1811** | 62 | **2.4409** | 16 | **.6299** | 1.00 | **.040** | .60 | **.024** | 884 | **1.37** | 19 000 | **4 270** | 12 900 | **2 910** | 10 000 | 13 000 |
| **207R** | 35 | **1.3780** | 72 | **2.8346** | 17 | **.6693** | 1.00 | **.040** | .60 | **.024** | 1 270 | **1.97** | 26 000 | **5 850** | 18 600 | **4 180** | 9 000 | 11 000 |
| **208R** | 40 | **1.5748** | 80 | **3.1496** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 1 730 | **2.68** | 34 500 | **7 760** | 25 000 | **5 620** | 8 500 | 10 000 |
| **209R** | 45 | **1.7717** | 85 | **3.3465** | 19 | **.7480** | 1.00 | **.040** | .60 | **.024** | 1 730 | **2.68** | 34 500 | **7 760** | 25 500 | **5 730** | 7 500 | 9 000 |
| **210R** | 50 | **1.9685** | 90 | **3.5433** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 1 970 | **3.06** | 37 700 | **8 480** | 30 000 | **6 740** | 7 000 | 8 500 |
| **211R** | 55 | **2.1654** | 100 | **3.9370** | 21 | **.8268** | 1.50 | **.060** | 1.00 | **.040** | 2 860 | **4.43** | 54 000 | **12 100** | 41 500 | **9 330** | 6 300 | 7 500 |
| **212R** | 60 | **2.3622** | 110 | **4.3307** | 22 | **.8661** | 1.50 | **.060** | 1.00 | **.040** | 3 260 | **5.06** | 59 200 | **13 300** | 49 000 | **11 000** | 6 000 | 7 000 |
| **213R** | 65 | **2.5591** | 120 | **4.7244** | 23 | **.9055** | 1.50 | **.060** | 1.00 | **.040** | 4 030 | **6.25** | 60 500 | **13 600** | 58 500 | **13 200** | 5 300 | 6 300 |
| **214R** | 70 | **2.7559** | 125 | **4.9213** | 24 | **.9449** | 1.50 | **.060** | 1.00 | **.040** | 4 530 | **7.03** | 78 000 | **17 500** | 68 000 | **15 300** | 5 000 | 6 000 |
| **215R** | 75 | **2.9528** | 130 | **5.1181** | 25 | **.9843** | 1.50 | **.060** | 1.00 | **.040** | 5 190 | **8.04** | 88 400 | **19 900** | 76 500 | **17 200** | 4 800 | 5 600 |
| **216R** | 80 | **3.1496** | 140 | **5.5118** | 26 | **1.0236** | 2.00 | **.080** | 1.00 | **.040** | 4 880 | **7.56** | 85 200 | **19 200** | 73 500 | **16 500** | 4 500 | 5 300 |
| **217R** | 85 | **3.3465** | 150 | **5.9055** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 6 170 | **9.56** | 104 000 | **23 400** | 93 000 | **20 900** | 4 300 | 5 000 |
| **218R** | 90 | **3.5433** | 160 | **6.2992** | 30 | **1.1811** | 2.00 | **.080** | 1.00 | **.040** | 7 870 | **12.20** | 130 000 | **29 200** | 116 000 | **26 100** | 3 800 | 4 500 |
| **219R** | 95 | **3.7402** | 170 | **6.6929** | 32 | **1.2598** | 2.00 | **.080** | 1.00 | **.040** | 8 390 | **13.00** | 138 000 | **31 000** | 125 000 | **28 000** | 3 600 | 4 300 |
| **220R** | 100 | **3.9370** | 180 | **7.0866** | 34 | **1.3386** | 2.00 | **.080** | 1.00 | **.040** | 9 610 | **14.90** | 153 000 | **34 000** | 143 000 | **32 100** | 3 400 | 4 000 |
| **221R** | 105 | **4.1339** | 190 | **7.4803** | 36 | **1.4173** | 2.00 | **.080** | 1.00 | **.040** | 10 300 | **16.00** | 168 000 | **37 800** | 153 000 | **34 400** | 3 200 | 3 800 |
| **222R** | 110 | **4.3307** | 200 | **7.8740** | 38 | **1.4961** | 2.00 | **.080** | 1.00 | **.040** | 11 700 | **18.10** | 182 000 | **40 900** | 170 000 | **38 200** | 3 000 | 3 600 |
| **224R** | 120 | **4.7244** | 215 | **8.4646** | 40 | **1.5748** | 2.00 | **.080** | 1.00 | **.040** | 13 000 | **20.20** | 199 000 | **44 700** | 193 000 | **43 300** | 2 800 | 3 400 |
| **226R** | 130 | **5.1181** | 230 | **9.0551** | 40 | **1.5748** | 2.50 | **.100** | 1.00 | **.040** | 15 500 | **24.00** | 221 000 | **49 600** | 232 000 | **52 200** | 2 600 | 3 200 |
| **228R** | 140 | **5.5118** | 250 | **9.8425** | 42 | **1.6535** | 2.50 | **.100** | 1.00 | **.040** | 17 200 | **26.60** | 238 000 | **53 500** | 260 000 | **58 500** | 2 400 | 2 900 |
| **230R** | 150 | **5.9055** | 270 | **10.6299** | 45 | **1.7717** | 2.50 | **.100** | 1.00 | **.040** | 20 700 | **32.10** | 270 000 | **60 700** | 310 000 | **69 700** | 2 200 | 2 700 |
| **232R** | 160 | **6.2992** | 290 | **11.4173** | 48 | **1.8898** | 2.50 | **.100** | 1.00 | **.040** | 24 600 | **38.20** | 307 000 | **69 000** | 365 000 | **82 100** | 2 100 | 2 500 |
| **234R** | 170 | **6.6929** | 310 | **12.2047** | 52 | **2.0472** | 3.00 | **.120** | 1.00 | **.040** | 27 200 | **42.20** | 332 000 | **74 600** | 400 000 | **89 900** | 1 900 | 2 300 |
| **236R** | 180 | **7.0866** | 320 | **12.5984** | 52 | **2.0472** | 3.00 | **.120** | 1.00 | **.040** | 29 000 | **44.90** | 345 000 | **77 600** | 430 000 | **96 700** | 1 800 | 2 200 |
| **238R** | 190 | **7.4803** | 340 | **13.3858** | 55 | **2.1654** | 3.00 | **.120** | 1.00 | **.040** | 33 100 | **51.30** | 377 000 | **84 800** | 500 000 | **112 000** | 1 700 | 2 100 |
| **240R** | 200 | **7.8740** | 360 | **14.1732** | 58 | **2.2835** | 3.00 | **.120** | 1.00 | **.040** | 35 500 | **55.10** | 390 000 | **87 700** | 540 000 | **121 000** | 1 600 | 2 000 |
| **242R** | 210 | **8.2677** | 380 | **14.9606** | 61 | **2.4016** | 3.00 | **.120** | 1.00 | **.040** | 40 800 | **63.30** | 436 000 | **98 000** | 610 000 | **137 000** | 1 600 | 1 900 |
| **244R** | 220 | **8.6614** | 400 | **15.7480** | 65 | **2.5591** | 3.00 | **.120** | 1.00 | **.040** | 43 900 | **68.00** | 462 000 | **104 000** | 655 000 | **147 000** | 1 500 | 1 800 |
| **246R** | 230 | **9.0551** | 420 | **16.5354** | 68 | **2.6772** | 3.00 | **.120** | 1.00 | **.040** | 49 500 | **76.80** | 494 000 | **111 000** | 735 000 | **165 000** | 1 400 | 1 700 |
| **248R** | 240 | **9.4488** | 440 | **17.3228** | 72 | **2.8346** | 3.00 | **.120** | 1.00 | **.040** | 55 500 | **86.10** | 540 000 | **121 000** | 830 000 | **187 000** | 1 300 | 1 600 |
| **250R** | 250 | **9.8425** | 460 | **18.1102** | 76 | **2.9921** | 4.00 | **.160** | 1.50 | **.060** | 61 900 | **95.90** | 585 000 | **132 000** | 915 000 | **206 000** | 1 200 | 1 500 |
| **252R** | 260 | **10.2362** | 480 | **18.8976** | 80 | **3.1496** | 4.00 | **.160** | 1.50 | **.060** | 68 400 | **106.00** | 624 000 | **140 000** | 1 020 000 | **229 000** | 1 100 | 1 400 |
| **256R** | 280 | **11.0236** | 500 | **19.6850** | 80 | **3.1496** | 4.00 | **.160** | 1.50 | **.060** | 72 200 | **112.00** | 650 000 | **146 000** | 1 100 000 | **247 000** | 1 100 | 1 400 |
| **260R** | 300 | **11.8110** | 540 | **21.2598** | 85 | **3.3465** | 4.00 | **.160** | 1.50 | **.060** | 80 000 | **124.00** | 689 000 | **155 000** | 1 220 000 | **274 000** | 1 100 | 1 300 |
| **264R** | 320 | **12.5984** | 580 | **22.8346** | 92 | **3.6220** | 4.00 | **.160** | 1.50 | **.060** | 87 700 | **136.00** | 741 000 | **167 000** | 1 340 000 | **301 000** | 980 | 1 200 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil. For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^{1}/_{3}$ rpm.

# 200RD light series duplex bearings




Notes:

"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex See pages 240 and 241 for suffix description.

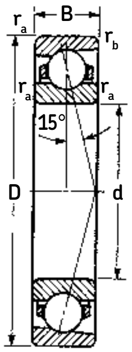
Use these values for back-to-back (DB) or face-to-face (DF) mounting arrangements.

ABEC-1 and -3 are stocked as half-pairs where available.

| | Bore | | Outside diameter | | Width | | Fillet radius1) | | | | | | Basic radial load rating | | | | Speed rating2) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d | | D | | B | | $r_a$ | | $r_b$ | | $ZD^2$ | | $C$ 3) | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| 200RD | 10 | **.3937** | 30 | **1.1811** | 18 | **.7087** | .64 | **.025** | .30 | **.012** | 284 | **.44** | 11 900 | **2 680** | 6 400 | **1 440** | 19 000 | 24 000 |
| 201RD | 12 | **.4724** | 32 | **1.2598** | 20 | **.7874** | .64 | **.025** | .30 | **.012** | 323 | **.50** | 13 300 | **2 990** | 7 800 | **1 750** | 18 000 | 22 000 |
| 202RD | 15 | **.5906** | 35 | **1.3780** | 22 | **.8661** | .64 | **.025** | .30 | **.012** | 406 | **.63** | 15 900 | **3 570** | 10 200 | **2 290** | 15 000 | 19 000 |
| 203RD | 17 | **.6693** | 40 | **1.5748** | 24 | **.9449** | .64 | **.025** | .30 | **.012** | 510 | **.79** | 19 900 | **4 470** | 13 200 | **2 970** | 14 000 | 16 000 |
| 204RD | 20 | **.7874** | 47 | **1.8504** | 28 | **1.1024** | 1.00 | **.040** | .60 | **.024** | 613 | **.95** | 22 900 | **5 140** | 17 000 | **3 820** | 12 000 | 14 000 |
| 205RD | 25 | **.9843** | 52 | **2.0472** | 30 | **1.1811** | 1.00 | **.040** | .60 | **.024** | 755 | **1.17** | 27 600 | **6 200** | 21 200 | **4 770** | 9 600 | 12 000 |
| 206RD | 30 | **1.1811** | 62 | **2.4409** | 32 | **1.2598** | 1.00 | **.040** | .60 | **.024** | 884 | **1.37** | 30 700 | **6 900** | 26 000 | **5 850** | 8 000 | 10 000 |
| 207RD | 35 | **1.3780** | 72 | **2.8346** | 34 | **1.3386** | 1.00 | **.040** | .60 | **.024** | 1 207 | **1.97** | 42 300 | **9 510** | 37 500 | **8 430** | 7 200 | 8 800 |
| 208RD | 40 | **1.5748** | 80 | **3.1496** | 36 | **1.4173** | 1.00 | **.040** | .60 | **.024** | 1 730 | **2.68** | 55 900 | **12 600** | 50 000 | **11 200** | 6 800 | 8 000 |
| 209RD | 45 | **1.7717** | 85 | **3.3465** | 38 | **1.4961** | 1.00 | **.040** | .60 | **.024** | 1 730 | **2.68** | 55 900 | **12 600** | 51 000 | **11 500** | 6 000 | 7 200 |
| 210RD | 50 | **1.9685** | 90 | **3.5433** | 40 | **1.5748** | 1.00 | **.040** | .60 | **.024** | 1 970 | **3.06** | 60 500 | **13 600** | 60 000 | **13 500** | 5 600 | 6 800 |
| 211RD | 55 | **2.1654** | 100 | **3.9370** | 42 | **1.6535** | 1.50 | **.060** | 1.00 | **.040** | 2 860 | **4.43** | 87 100 | **19 600** | 83 000 | **18 700** | 5 000 | 6 000 |
| 212RD | 60 | **2.3622** | 110 | **4.3307** | 44 | **1.7323** | 1.50 | **.060** | 1.00 | **.040** | 3 260 | **5.06** | 95 600 | **21 500** | 98 000 | **22 000** | 4 800 | 5 600 |
| 213RD | 65 | **2.5591** | 120 | **4.7244** | 46 | **1.8110** | 1.50 | **.060** | 1.00 | **.040** | 4 030 | **6.25** | 97 500 | **21 900** | 118 000 | **26 500** | 4 200 | 5 000 |
| 214RD | 70 | **2.7559** | 125 | **4.9213** | 48 | **1.8898** | 1.50 | **.060** | 1.00 | **.040** | 4 530 | **7.03** | 125 000 | **28 200** | 137 000 | **30 800** | 4 000 | 4 800 |
| 215RD | 75 | **2.9528** | 130 | **5.1181** | 50 | **1.9685** | 1.50 | **.060** | 1.00 | **.040** | 5 190 | **8.04** | 143 000 | **32 100** | 153 000 | **34 400** | 3 800 | 4 500 |
| 216RD | 80 | **3.1496** | 140 | **5.5118** | 52 | **2.0472** | 2.00 | **.080** | 1.00 | **.040** | 4 880 | **7.56** | 138 000 | **31 000** | 140 000 | **31 500** | 3 600 | 4 200 |
| 217RD | 85 | **3.3465** | 150 | **5.9055** | 56 | **2.2047** | 2.00 | **.080** | 1.00 | **.040** | 6 170 | **9.56** | 168 000 | **37 800** | 186 000 | **41 800** | 3 400 | 4 000 |
| 218RD | 90 | **3.5433** | 160 | **6.2992** | 60 | **2.3622** | 2.00 | **.080** | 1.00 | **.040** | 7 870 | **12.20** | 212 000 | **47 700** | 232 000 | **52 200** | 3 000 | 3 600 |
| 219RD | 95 | **3.7402** | 170 | **6.6929** | 64 | **2.5197** | 2.00 | **.080** | 1.00 | **.040** | 8 390 | **13.00** | 221 000 | **49 700** | 250 000 | **56 200** | 2 900 | 3 400 |
| 220RD | 100 | **3.9370** | 180 | **7.0866** | 68 | **2.6772** | 2.00 | **.080** | 1.00 | **.040** | 9610 | **14.90** | 251 000 | **56 400** | 285 000 | **64 100** | 2 700 | 3 200 |
| 221RD | 105 | **4.1339** | 190 | **7.4803** | 72 | **2.8346** | 2.00 | **.080** | 1.00 | **.040** | 10 300 | **16.00** | 270 000 | **60 700** | 305 000 | **68 600** | 2 600 | 3 000 |
| 222RD | 110 | **4.3307** | 200 | **7.8740** | 76 | **2.9921** | 2.00 | **.080** | 1.00 | **.040** | 11 700 | **18.10** | 296 000 | **66 500** | 340 000 | **76 400** | 2 400 | 2 900 |
| 224RD | 120 | **4.7244** | 215 | **8.4646** | 80 | **3.1496** | 2.00 | **.080** | 1.00 | **.040** | 13 000 | **20.20** | 325 000 | **73 100** | 390 000 | **87 700** | 2 200 | 2 700 |
| 226RD | 130 | **5.1181** | 230 | **9.0551** | 80 | **3.1496** | 2.50 | **.100** | 1.00 | **.040** | 15 500 | **24.00** | 358 000 | **80 500** | 465 000 | **105 000** | 2 100 | 2 600 |
| 228RD | 140 | **5.5118** | 250 | **9.8425** | 84 | **3.3071** | 2.50 | **.100** | 1.00 | **.040** | 17 200 | **26.60** | 390 000 | **87 700** | 510 000 | **115 000** | 1 900 | 2 300 |
| 230RD | 150 | **5.9055** | 270 | **10.6299** | 90 | **3.5433** | 2.50 | **.100** | 1.00 | **.040** | 20 700 | **32.10** | 442 000 | **99 400** | 620 000 | **139 000** | 1 800 | 2 200 |
| 232RD | 160 | **6.2992** | 290 | **11.4173** | 96 | **3.7795** | 2.50 | **.100** | 1.00 | **.040** | 24 600 | **38.20** | 494 000 | **111 000** | 735 000 | **165 000** | 1 700 | 2 000 |
| 234RD | 170 | **6.6929** | 310 | **12.2047** | 104 | **4.0945** | 3.00 | **.120** | 1.00 | **.040** | 27 200 | **42.20** | 527 000 | **118 000** | 800 000 | **180 000** | 1 500 | 1 800 |
| 236RD | 180 | **7.0866** | 320 | **12.5984** | 104 | **4.0945** | 3.00 | **.120** | 1.00 | **.040** | 29 000 | **44.90** | 559 000 | **126 000** | 865 000 | **194 000** | 1 400 | 1 800 |
| 238RD | 190 | **7.4803** | 340 | **13.3858** | 110 | **4.3307** | 3.00 | **.120** | 1.00 | **.040** | 33 100 | **51.30** | 605 000 | **136 000** | 1 000 000 | **225 000** | 1 400 | 1 700 |
| 240RD | 200 | **7.8740** | 360 | **14.1732** | 116 | **4.5669** | 3.00 | **.120** | 1.00 | **.040** | 35 500 | **55.10** | 637 000 | **143 000** | 1 080 000 | **243 000** | 1 300 | 1 600 |
| 242RD | 210 | **8.2677** | 380 | **14.9606** | 122 | **4.8031** | 3.00 | **.120** | 1.00 | **.040** | 40 800 | **63.30** | 702 000 | **158 000** | 1 220 000 | **274 000** | 1 300 | 1 500 |
| 244RD | 220 | **8.6614** | 400 | **15.7480** | 130 | **5.1181** | 3.00 | **.120** | 1.00 | **.040** | 43 900 | **68.00** | 741 000 | **167 000** | 1 320 000 | **297 000** | 1 200 | 1 400 |
| 246RD | 230 | **9.0551** | 420 | **16.5354** | 136 | **5.3543** | 3.00 | **.120** | 1.00 | **.040** | 49 500 | **76.80** | 806 000 | **181 000** | 1 500 000 | **337 000** | 1 100 | 1 400 |
| 248RD | 240 | **9.4488** | 440 | **17.3228** | 144 | **5.6693** | 3.00 | **.120** | 1.00 | **.040** | 55 500 | **86.10** | 871 000 | **196 000** | 1 660 000 | **373 000** | 1 000 | 1 300 |
| 250RD | 250 | **9.8425** | 460 | **18.1102** | 152 | **5.9843** | 4.00 | **.160** | 1.50 | **.060** | 61 900 | **95.90** | 956 000 | **215 000** | 1 830 000 | **411 000** | 960 | 1 200 |
| 252RD | 260 | **10.2362** | 480 | **18.8976** | 160 | **6.2992** | 4.00 | **.160** | 1.50 | **.060** | 68 400 | **106.00** | 1 010 000 | **227 000** | 2 040 000 | **459 000** | 880 | 1 100 |
| 256RD | 280 | **11.0236** | 500 | **19.6850** | 160 | **6.2992** | 4.00 | **.160** | 1.50 | **.060** | 72 200 | **112.00** | 1 060 000 | **238 000** | 2 200 000 | **495 000** | 880 | 1 100 |
| 260RD | 300 | **11.8110** | 540 | **21.2598** | 170 | **6.6929** | 4.00 | **.160** | 1.50 | **.060** | 80 000 | **124.00** | 1 140 000 | **256 000** | 2 400 000 | **540 000** | 880 | 1 000 |
| 264RD | 320 | **12.5984** | 580 | **22.8346** | 184 | **7.2441** | 4.00 | **.160** | 1.50 | **.060** | 87 700 | **136.00** | 1 210 000 | **272 000** | 2 700 000 | **607 000** | 780 | 960 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil. For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.

# 300R medium series single ball bearings

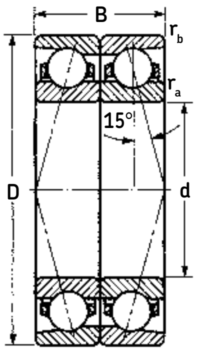



300R medium series bearing bores range in diameter from 12 mm to 280 mm. They are used with heavy radial loads, one-directional thrust loads, or a combination of both. They can be furnished duplex ground for mounting in pairs with two-directional thrust loads.

| MRC bearing number | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | | | Basic radial load rating | | | | Speed rating[2] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Dynamic | | Static | | | |
| | d | | D | | B | | $r_a$ | | $r_b$ | | $ZD^2$ | | $C$[3] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| 301R | 12 | .4724 | 37 | 1.4567 | 12 | .4724 | 1.0 | .04 | .60 | .024 | 439 | .68 | 10 600 | 2 380 | 4 900 | 1 100 | 19 000 | 24 000 |
| 302R | 15 | .5906 | 42 | 1.6535 | 13 | .5118 | 1.0 | .04 | .60 | .024 | 510 | .79 | 12 100 | 2 720 | 6 550 | 1 470 | 17 000 | 20 000 |
| 303R | 17 | .6693 | 47 | 1.8504 | 14 | .5512 | 1.0 | .04 | .60 | .024 | 632 | .98 | 14 800 | 3 330 | 8 150 | 1 830 | 16 000 | 19 000 |
| 304R | 20 | .7874 | 52 | 2.0472 | 15 | .5906 | 1.0 | .04 | .60 | .024 | 909 | 1.41 | 20 300 | 4 560 | 11 400 | 2 560 | 13 000 | 16 000 |
| 305R | 25 | .9843 | 62 | 2.4409 | 17 | .6693 | 1.0 | .04 | .60 | .024 | 1 090 | 1.69 | 23 400 | 5 260 | 15 300 | 3 440 | 11 000 | 14 000 |
| 306R | 30 | 1.1811 | 72 | 2.8346 | 19 | .7480 | 1.0 | .04 | .60 | .024 | 1 480 | 2.30 | 31 200 | 7 010 | 20 000 | 4 500 | 9 000 | 11 000 |
| 307R | 35 | 1.3780 | 80 | 3.1496 | 21 | .8268 | 1.5 | .06 | 1.00 | .040 | 1 940 | 3.00 | 39 700 | 8 920 | 26 000 | 5 850 | 8 500 | 10 000 |
| 308R | 40 | 1.5748 | 90 | 3.5433 | 23 | .9055 | 1.5 | .06 | 1.00 | .040 | 2 450 | 3.80 | 48 800 | 11 000 | 33 500 | 7 530 | 7 500 | 9 000 |
| 309R | 45 | 1.7717 | 100 | 3.9370 | 25 | .9843 | 1.5 | .06 | 1.00 | .040 | 3 030 | 4.69 | 58 500 | 13 200 | 40 500 | 9 100 | 6 700 | 8 000 |
| 310R | 50 | 1.9685 | 110 | 4.3307 | 27 | 1.0630 | 2.0 | .08 | 1.00 | .040 | 4 350 | 6.75 | 80 600 | 18 100 | 57 000 | 12 800 | 6 300 | 7 500 |
| 311R | 55 | 2.1654 | 120 | 4.7244 | 29 | 1.1417 | 2.0 | .08 | 1.00 | .040 | 5 110 | 7.92 | 93 600 | 21 000 | 67 000 | 15 100 | 5 600 | 6 700 |
| 312R | 60 | 2.3622 | 130 | 5.1181 | 31 | 1.2205 | 2.0 | .08 | 1.00 | .040 | 5 930 | 9.19 | 108 000 | 24 300 | 78 000 | 17 500 | 5 000 | 6 000 |
| 313R | 65 | 2.5591 | 140 | 5.5118 | 33 | 1.2992 | 2.0 | .08 | 1.00 | .040 | 6 900 | 10.70 | 121 000 | 27 200 | 93 000 | 20 900 | 4 800 | 5 600 |
| 314R | 70 | 2.7559 | 150 | 5.9055 | 35 | 1.3780 | 2.0 | .08 | 1.00 | .040 | 6 770 | 10.50 | 121 000 | 27 200 | 93 000 | 20 900 | 4 500 | 5 300 |
| 315R | 75 | 2.9528 | 160 | 6.2992 | 37 | 1.4567 | 2.0 | .08 | 1.00 | .040 | 9 030 | 14.00 | 153 000 | 34 400 | 122 000 | 27 400 | 4 300 | 5 000 |
| 316R | 80 | 3.1496 | 170 | 6.6929 | 39 | 1.5354 | 2.0 | .08 | 1.00 | .040 | 9 480 | 14.70 | 159 000 | 35 700 | 129 000 | 29 000 | 3 800 | 4 500 |
| 317R | 85 | 3.3465 | 180 | 7.0866 | 41 | 1.6142 | 2.5 | .10 | 1.00 | .040 | 11 400 | 17.70 | 182 000 | 40 900 | 156 000 | 35 100 | 3 600 | 4 300 |
| 318R | 90 | 3.5433 | 190 | 7.4803 | 43 | 1.6929 | 2.5 | .10 | 1.00 | .040 | 11 800 | 18.30 | 186 000 | 41 800 | 160 000 | 36 000 | 3 400 | 4 000 |
| 319R | 95 | 3.7402 | 200 | 7.8740 | 45 | 1.7717 | 2.5 | .10 | 1.00 | .040 | 13 100 | 20.30 | 199 000 | 44 700 | 180 000 | 40 500 | 3 200 | 3 800 |
| 320R | 100 | 3.9370 | 215 | 8.4646 | 47 | 1.8504 | 2.5 | .10 | 1.00 | .040 | 14 400 | 22.40 | 212 000 | 47 700 | 200 000 | 45 000 | 3 000 | 3 600 |
| 321R | 105 | 4.1339 | 225 | 8.8583 | 49 | 1.9291 | 2.5 | .10 | 1.00 | .040 | 15 900 | 24.60 | 229 000 | 51 500 | 204 000 | 45 900 | 2 800 | 3 400 |
| 322R | 110 | 4.3307 | 240 | 9.4488 | 50 | 1.9685 | 2.5 | .10 | 1.00 | .040 | 18 800 | 29.20 | 255 000 | 57 300 | 255 000 | 57 300 | 2 600 | 3 200 |
| 324R | 120 | 4.7244 | 260 | 10.2362 | 55 | 2.1654 | 2.5 | .10 | 1.00 | .040 | 22 100 | 34.30 | 265 000 | 59 600 | 300 000 | 67 400 | 2 500 | 3 000 |
| 326R | 130 | 5.1181 | 280 | 11.0236 | 58 | 2.2835 | 3.0 | .12 | 1.00 | .040 | 25 700 | 39.80 | 296 000 | 66 500 | 345 000 | 77 600 | 2 300 | 2 800 |
| 328R | 140 | 5.5118 | 300 | 11.8110 | 62 | 2.4409 | 3.0 | .12 | 1.00 | .040 | 29 500 | 45.70 | 351 000 | 78 900 | 400 000 | 89 900 | 2 100 | 2 600 |
| 330R | 150 | 5.9055 | 320 | 12.5984 | 65 | 2.5591 | 3.0 | .12 | 1.00 | .040 | 33 900 | 52.60 | 390 000 | 87 700 | 475 000 | 107 000 | 2 000 | 2 400 |
| 332R | 160 | 6.2992 | 340 | 13.3858 | 68 | 2.6772 | 3.0 | .12 | 1.00 | .040 | 38 400 | 59.60 | 423 000 | 95 100 | 530 000 | 119 000 | 1 800 | 2 200 |
| 334R | 170 | 6.6929 | 360 | 14.1732 | 72 | 2.8346 | 3.0 | .12 | 1.00 | .040 | 40 800 | 63.20 | 436 000 | 98 000 | 570 000 | 128 000 | 1 700 | 2 100 |
| 336R | 180 | 7.0866 | 380 | 14.9606 | 75 | 2.9528 | 3.0 | .12 | 1.00 | .040 | 45 700 | 70.90 | 475 000 | 107 000 | 640 000 | 144 000 | 1 600 | 2 000 |
| 338R | 190 | 7.4803 | 400 | 15.7480 | 78 | 3.0709 | 4.0 | .16 | 1.50 | .060 | 51 000 | 79.00 | 507 000 | 114 000 | 710 000 | 160 000 | 1 600 | 1 900 |
| 340R | 200 | 7.8740 | 420 | 16.5354 | 80 | 3.1496 | 4.0 | .16 | 1.50 | .060 | 56 400 | 87.50 | 553 000 | 124 000 | 780 000 | 175 000 | 1 500 | 1 800 |
| 342R | 210 | 8.2677 | 440 | 17.3228 | 84 | 3.3071 | 4.0 | .16 | 1.50 | .060 | 62 200 | 96.50 | 592 000 | 133 000 | 865 000 | 194 000 | 1 400 | 1 700 |
| 344R | 220 | 8.6614 | 460 | 18.1102 | 88 | 3.4646 | 4.0 | .16 | 1.50 | .060 | 68 400 | 106.00 | 637 000 | 143 000 | 950 000 | 214 000 | 1 300 | 1 600 |
| 348R | 240 | 9.4488 | 500 | 19.6850 | 95 | 3.7402 | 4.0 | .16 | 1.50 | .060 | 74 800 | 116.00 | 676 000 | 152 000 | 1 060 000 | 238 000 | 1 100 | 1 400 |
| 352R | 260 | 10.2362 | 540 | 21.2598 | 102 | 4.0157 | 5.0 | .20 | 2.00 | .080 | 87 100 | 135.00 | 741 000 | 167 000 | 1 250 000 | 281 000 | 1 100 | 1 300 |
| 356R | 280 | 11.0236 | 580 | 22.8346 | 108 | 4.2520 | 5.0 | .20 | 2.00 | .080 | 102 000 | 158.00 | 832 000 | 187 000 | 1 460 000 | 328 000 | 980 | 1 200 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil. For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^{1}/_{3}$ rpm.

# 300RD medium series duplex




Notes:

"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

Use these values for back-to-back (DB) or face-to-face (DF) mounting arrangements.

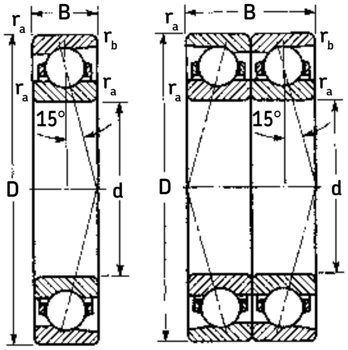
ABEC-1 and -3 are stocked as half-pairs where available.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | Fillet radius[1] $r_a$ in. | Fillet radius[1] $r_b$ mm | Fillet radius[1] $r_b$ in. | $ZD^2$ mm | $ZD^2$ in. | Basic radial load rating Dynamic C[3] N | Dynamic C[3] lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[2] Grease rpm | Speed rating[2] Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 301RD | 12 | .4724 | 37 | 1.4567 | 24 | .9449 | 1.0 | .04 | .60 | .024 | 439 | .68 | 17 200 | 3 870 | 9 800 | 2 200 | 15 000 | 19 000 |
| 302RD | 15 | .5906 | 42 | 1.6535 | 26 | 1.0236 | 1.0 | .04 | .60 | .024 | 510 | .79 | 19 900 | 4 470 | 13 200 | 2 970 | 14 000 | 16 000 |
| 303RD | 17 | .6693 | 47 | 1.8504 | 28 | 1.1024 | 1.0 | .04 | .60 | .024 | 632 | .98 | 24 200 | 5 440 | 16 300 | 3 660 | 13 000 | 15 000 |
| 304RD | 20 | .7874 | 52 | 2.0472 | 30 | 1.1811 | 1.0 | .04 | .60 | .024 | 909 | 1.41 | 33 200 | 7 460 | 22 800 | 5 130 | 10 000 | 13 000 |
| 305RD | 25 | .9843 | 62 | 2.4409 | 34 | 1.3386 | 1.0 | .04 | .60 | .024 | 1 090 | 1.69 | 37 700 | 8 480 | 30 500 | 6 860 | 8 800 | 11 000 |
| 306RD | 30 | 1.1811 | 72 | 2.8346 | 38 | 1.4961 | 1.0 | .04 | .60 | .024 | 1 480 | 2.30 | 50 700 | 11 400 | 40 000 | 8 990 | 7 200 | 8 800 |
| 307RD | 35 | 1.3780 | 80 | 3.1496 | 42 | 1.6535 | 1.5 | .06 | 1.00 | .040 | 1 940 | 3.00 | 65 000 | 14 600 | 52 000 | 11 700 | 6 800 | 8 000 |
| 308RD | 40 | 1.5748 | 90 | 3.5433 | 46 | 1.8110 | 1.5 | .06 | 1.00 | .040 | 2 450 | 3.80 | 79 300 | 17 800 | 67 000 | 15 100 | 6 000 | 7 200 |
| 309RD | 45 | 1.7717 | 100 | 3.9370 | 50 | 1.9685 | 1.5 | .06 | 1.00 | .040 | 3 030 | 4.69 | 95 600 | 21 500 | 81 500 | 18 300 | 5 400 | 6 400 |
| 310RD | 50 | 1.9685 | 110 | 4.3307 | 54 | 2.1260 | 2.0 | .08 | 1.00 | .040 | 4 350 | 6.75 | 133 000 | 29 900 | 114 000 | 25 600 | 5 000 | 6 000 |
| 311RD | 55 | 2.1654 | 120 | 4.7244 | 58 | 2.2835 | 2.0 | .08 | 1.00 | .040 | 5 110 | 7.92 | 153 000 | 34 400 | 134 000 | 30 100 | 4 500 | 5 400 |
| 312RD | 60 | 2.3622 | 130 | 5.1181 | 62 | 2.4409 | 2.0 | .08 | 1.00 | .040 | 5 930 | 9.19 | 174 000 | 39 100 | 156 000 | 35 100 | 4 000 | 4 800 |
| 313RD | 65 | 2.5591 | 140 | 5.5118 | 66 | 2.5984 | 2.0 | .08 | 1.00 | .040 | 6 900 | 10.70 | 195 000 | 43 800 | 190 000 | 42 700 | 3 800 | 4 500 |
| 314RD | 70 | 2.7559 | 150 | 5.9055 | 70 | 2.7559 | 2.0 | .08 | 1.00 | .040 | 6 770 | 10.50 | 195 000 | 43 800 | 186 000 | 41 800 | 3 600 | 4 200 |
| 315RD | 75 | 2.9528 | 160 | 6.2992 | 74 | 2.9134 | 2.0 | .08 | 1.00 | .040 | 9 030 | 14.00 | 247 000 | 55 500 | 245 000 | 55 100 | 3 400 | 4 000 |
| 316RD | 80 | 3.1496 | 170 | 6.6929 | 78 | 3.0709 | 2.0 | .08 | 1.00 | .040 | 9 480 | 14.70 | 260 000 | 58 500 | 260 000 | 58 500 | 3 000 | 3 600 |
| 317RD | 85 | 3.3465 | 180 | 7.0866 | 82 | 3.2283 | 2.5 | .10 | 1.00 | .040 | 11 400 | 17.70 | 291 000 | 65 400 | 310 000 | 67 400 | 2 900 | 3 400 |
| 318RD | 90 | 3.5433 | 190 | 7.4803 | 86 | 3.3858 | 2.5 | .10 | 1.00 | .040 | 11 800 | 18.30 | 302 000 | 67 900 | 320 000 | 71 900 | 2 700 | 3 200 |
| 319RD | 95 | 3.7402 | 200 | 7.8740 | 90 | 3.5433 | 2.5 | .10 | 1.00 | .040 | 13 100 | 20.30 | 325 000 | 73 100 | 360 000 | 80 900 | 2 600 | 3 000 |
| 320RD | 100 | 3.9370 | 215 | 8.4646 | 94 | 3.7008 | 2.5 | .10 | 1.00 | .040 | 14 400 | 22.40 | 345 000 | 77 600 | 400 000 | 89 900 | 2 400 | 2 900 |
| 321RD | 105 | 4.1339 | 225 | 8.8583 | 98 | 3.8583 | 2.5 | .10 | 1.00 | .040 | 15 900 | 24.60 | 371 000 | 83 400 | 405 000 | 91 000 | 2 200 | 2 700 |
| 322RD | 110 | 4.3307 | 240 | 9.4488 | 100 | 3.9370 | 2.5 | .10 | 1.00 | .040 | 18 800 | 29.20 | 416 000 | 93 500 | 510 000 | 115 000 | 2 100 | 2 600 |
| 324RD | 120 | 4.7244 | 260 | 10.2362 | 110 | 4.3307 | 2.5 | .10 | 1.00 | .040 | 22 100 | 34.30 | 436 000 | 98 000 | 600 000 | 135 000 | 2 000 | 2 400 |
| 326RD | 130 | 5.1181 | 280 | 11.0236 | 116 | 4.5669 | 3.0 | .12 | 1.00 | .040 | 25 700 | 39.80 | 475 000 | 107 000 | 695 000 | 156 000 | 1 800 | 2 200 |
| 328RD | 140 | 5.5118 | 300 | 11.8110 | 124 | 4.8819 | 3.0 | .12 | 1.00 | .040 | 29 500 | 45.70 | 572 000 | 129 000 | 800 000 | 180 000 | 1 700 | 2 100 |
| 330RD | 150 | 5.9055 | 320 | 12.5984 | 130 | 5.1181 | 3.0 | .12 | 1.00 | .040 | 33 900 | 52.60 | 624 000 | 140 000 | 950 000 | 214 000 | 1 600 | 1 900 |
| 332RD | 160 | 6.2992 | 340 | 13.3858 | 136 | 5.3543 | 3.0 | .12 | 1.00 | .040 | 38 400 | 59.60 | 689 000 | 155 000 | 1 080 000 | 243 000 | 1 400 | 1 800 |
| 334RD | 170 | 6.6929 | 360 | 14.1732 | 144 | 5.6693 | 3.0 | .12 | 1.00 | .040 | 40 800 | 63.20 | 715 000 | 161 000 | 1 140 000 | 256 000 | 1 400 | 1 700 |
| 336RD | 180 | 7.0866 | 380 | 14.9606 | 150 | 5.9055 | 3.0 | .12 | 1.00 | .040 | 45 700 | 70.90 | 780 000 | 175 000 | 1 270 000 | 286 000 | 1 300 | 1 600 |
| 338RD | 190 | 7.4803 | 400 | 15.7480 | 156 | 6.1417 | 4.0 | .16 | 1.50 | .060 | 51 000 | 79.00 | 832 000 | 187 000 | 1 430 000 | 321 000 | 1 300 | 1 500 |
| 340RD | 200 | 7.8740 | 420 | 16.5354 | 160 | 6.2992 | 4.0 | .16 | 1.50 | .060 | 56 400 | 87.50 | 904 000 | 203 000 | 1 560 000 | 351 000 | 1 200 | 1 400 |
| 342RD | 210 | 8.2677 | 440 | 17.3228 | 168 | 6.6142 | 4.0 | .16 | 1.50 | .060 | 62 200 | 96.50 | 956 000 | 215 000 | 1 730 000 | 389 000 | 1 100 | 1 400 |
| 344RD | 220 | 8.6614 | 460 | 18.1102 | 176 | 6.9291 | 4.0 | .16 | 1.50 | .060 | 68 400 | 106.00 | 1 040 000 | 234 000 | 1 900 000 | 427 000 | 1 000 | 1 300 |
| 348RD | 240 | 9.4488 | 500 | 19.6850 | 190 | 7.4803 | 4.0 | .16 | 1.50 | .060 | 74 800 | 116.00 | 1 080 000 | 243 000 | 2 120 000 | 477 000 | 880 | 1 100 |
| 352RD | 260 | 10.2362 | 540 | 21.2598 | 204 | 8.0315 | 5.0 | .20 | 2.00 | .080 | 87 100 | 135.00 | 1 210 000 | 272 000 | 2 500 000 | 562 000 | 880 | 1 000 |
| 356RD | 280 | 11.0236 | 580 | 22.8346 | 216 | 8.5039 | 5.0 | .20 | 2.00 | .080 | 102 000 | 158.00 | 1 350 000 | 303 000 | 2 900 000 | 652 000 | 780 | 960 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil. For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.


MRC

# 400R and 400RD heavy series




400R and RD heavy series bearings are available in bores from 17 mm to 110 mm. They can handle very heavy radial loads, one-directional thrust loads, or a combination of both. Use duplex bearings for two-directional thrust loads.

Notes:

"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

Values for RD bearings are for back-to-back (DB) or face-to-face (DF) mounting arrangements.

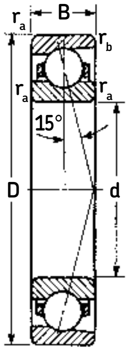
ABEC-1 and -3 are stocked as half-pairs where available.

This series is obsoleted and is for reference only. Minimum quantities required for future manufacturing.

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1] $r_a$ mm | in. | $r_b$ mm | in. | $ZD^2$ mm | in. | Basic radial load rating Dynamic $C$[3] N | lbf | Static $C_0$ N | lbf | Speed rating[2] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 403R | 17 | **.6693** | 62 | **2.4409** | 17 | **.6693** | 1.0 | **.04** | .60 | **.024** | 1 290 | **2.00** | 23 400 | **5 260** | 14 600 | **3 280** | 12 000 | 15 000 |
| 404R | 20 | **.7874** | 72 | **2.8346** | 19 | **.7480** | 1.0 | **.04** | .60 | **.024** | 1 840 | **2.85** | 37 100 | **8 340** | 21 200 | **4 770** | 10 000 | 13 000 |
| 405R | 25 | **.9843** | 80 | **3.1496** | 21 | **.8268** | 1.5 | **.06** | 1.00 | **.040** | 2 270 | **3.52** | 44 900 | **10 100** | 26 500 | **5 960** | 9 000 | 11 000 |
| 406R | 30 | **1.1811** | 90 | **3.5433** | 23 | **.9055** | 1.5 | **.06** | 1.00 | **.040** | 3 050 | **4.73** | 49 400 | **11 100** | 36 000 | **8 090** | 8 500 | 10 000 |
| 407R | 35 | **1.3780** | 100 | **3.9370** | 25 | **.9843** | 1.5 | **.06** | 1.00 | **.040** | 3 620 | **5.62** | 58 500 | **13 200** | 44 000 | **9 890** | 7 000 | 8 500 |
| 408R | 40 | **1.5748** | 110 | **4.3307** | 27 | **1.0630** | 2.0 | **.08** | 1.00 | **.040** | 4 260 | **6.60** | 67 600 | **15 200** | 52 000 | **11 700** | 6 700 | 8 000 |
| 409R | 45 | **1.7717** | 120 | **4.7244** | 29 | **1.1417** | 2.0 | **.08** | 1.00 | **.040** | 4 940 | **7.66** | 78 000 | **17 500** | 61 000 | **13 700** | 6 000 | 7 000 |
| 410R | 50 | **1.9685** | 130 | **5.1181** | 31 | **1.2205** | 2.0 | **.08** | 1.00 | **.040** | 6 240 | **9.67** | 95 600 | **21 500** | 78 000 | **17 500** | 5 300 | 6 300 |
| 411R | 55 | **2.1654** | 140 | **5.5118** | 33 | **1.2992** | 2.0 | **.08** | 1.00 | **.040** | 7 100 | **11.0** | 108 000 | **24 300** | 90 000 | **20 200** | 5 000 | 6 000 |
| 412R | 60 | **2.3622** | 150 | **5.9055** | 35 | **1.3780** | 2.0 | **.08** | 1.00 | **.040** | 8 000 | **12.4** | 117 000 | **26 300** | 102 000 | **22 900** | 4 800 | 5 600 |
| 413R | 65 | **2.5591** | 160 | **6.2992** | 37 | **1.4567** | 2.0 | **.08** | 1.00 | **.040** | 8 970 | **13.9** | 127 000 | **28 600** | 112 000 | **25 200** | 4 500 | 5 300 |
| 414R | 70 | **2.7559** | 180 | **7.0866** | 42 | **1.6535** | 2.5 | **.10** | 1.00 | **.040** | 12 200 | **18.9** | 156 000 | **35 100** | 150 000 | **33 700** | 3 800 | 4 500 |
| 415R | 75 | **2.9528** | 190 | **7.4803** | 45 | **1.7717** | 2.5 | **.10** | 1.00 | **.040** | 13 400 | **20.8** | 168 000 | **37 800** | 166 000 | **37 300** | 3 600 | 4 300 |
| 416R | 80 | **3.1496** | 200 | **7.8740** | 48 | **1.8898** | 2.5 | **.10** | 1.00 | **.040** | 14 600 | **22.7** | 178 000 | **40 000** | 183 000 | **41 100** | 3 400 | 4 000 |
| 417R | 85 | **3.3465** | 210 | **8.2677** | 52 | **2.0472** | 3.0 | **.12** | 1.00 | **.040** | 16 000 | **24.8** | 190 000 | **42 700** | 200 000 | **45 000** | 3 200 | 3 800 |
| 418R | 90 | **3.5433** | 225 | **8.8583** | 54 | **2.1260** | 3.0 | **.12** | 1.00 | **.040** | 18 700 | **29.0** | 212 000 | **47 700** | 236 000 | **53 100** | 3 000 | 3 600 |
| 419R | 95 | **3.7402** | 250 | **9.8425** | 55 | **2.1654** | 3.0 | **.12** | 1.00 | **.040** | 21 700 | **33.7** | 234 000 | **52 600** | 275 000 | **60 700** | 2 700 | 3 300 |
| 420R | 100 | **3.9370** | 265 | **10.4331** | 60 | **2.3622** | 3.0 | **.12** | 1.00 | **.040** | 25 000 | **38.7** | 260 000 | **58 500** | 305 000 | **68 600** | 2 500 | 3 100 |
| 421R | 105 | **4.1339** | 290 | **11.4173** | 65 | **2.5591** | 3.0 | **.12** | 1.00 | **.040** | 29 200 | **45.2** | 286 000 | **64 300** | 355 000 | **79 800** | 2 400 | 2 900 |
| 422R | 110 | **4.3307** | 320 | **12.5984** | 70 | **2.7559** | 3.0 | **.12** | 1.00 | **.040** | 34 500 | **53.5** | 319 000 | **71 700** | 425 000 | **95 500** | 2 100 | 2 600 |
| **400RD** | | | | | | | | | | | | | | | | | | |
| 403RD | 17 | **.6693** | 62 | **2.4409** | 34 | **1.3386** | 1.0 | **.04** | .60 | **.024** | 1 290 | **2.00** | 37 700 | **8 480** | 29 000 | **6 520** | 9 600 | 12 000 |
| 404RD | 20 | **.7874** | 72 | **2.8346** | 38 | **1.4961** | 1.0 | **.04** | .60 | **.024** | 1 840 | **2.85** | 60 500 | **13 600** | 42 500 | **9 550** | 8 000 | 10 000 |
| 405RD | 25 | **.9843** | 80 | **3.1496** | 42 | **1.6535** | 1.5 | **.06** | 1.00 | **.040** | 2 270 | **3.52** | 74 100 | **16 700** | 53 000 | **11 900** | 7 200 | 8 800 |
| 406RD | 30 | **1.1811** | 90 | **3.5433** | 46 | **1.8110** | 1.5 | **.06** | 1.00 | **.040** | 3 050 | **4.73** | 80 600 | **18 100** | 72 000 | **16 200** | 6 800 | 8 000 |
| 407RD | 35 | **1.3780** | 100 | **3.9370** | 50 | **1.9685** | 1.5 | **.06** | 1.00 | **.040** | 3 620 | **5.62** | 95 600 | **21 500** | 86 500 | **19 400** | 5 600 | 6 800 |
| 408RD | 40 | **1.5748** | 110 | **4.3307** | 54 | **2.1260** | 2.0 | **.08** | 1.00 | **.040** | 4 260 | **6.60** | 111 000 | **25 000** | 104 000 | **23 400** | 5 400 | 6 400 |
| 409RD | 45 | **1.7717** | 120 | **4.7244** | 58 | **2.2835** | 2.0 | **.08** | 1.00 | **.040** | 4 940 | **7.66** | 127 000 | **28 600** | 122 000 | **27 400** | 4 800 | 5 600 |
| 410RD | 50 | **1.9685** | 130 | **5.1181** | 62 | **2.4409** | 2.0 | **.08** | 1.00 | **.040** | 6 240 | **9.67** | 153 000 | **34 400** | 156 000 | **35 100** | 4 200 | 5 000 |
| 411RD | 55 | **2.1654** | 140 | **5.5118** | 66 | **2.5984** | 2.0 | **.08** | 1.00 | **.040** | 7 100 | **11.0** | 174 000 | **39 100** | 180 000 | **40 500** | 4 000 | 4 800 |
| 412RD | 60 | **2.3622** | 150 | **5.9055** | 70 | **2.7559** | 2.0 | **.08** | 1.00 | **.040** | 8 000 | **12.4** | 190 000 | **42 700** | 204 000 | **45 900** | 3 800 | 4 500 |
| 413RD | 65 | **2.5591** | 160 | **6.2992** | 74 | **2.9134** | 2.0 | **.08** | 1.00 | **.040** | 8 970 | **13.9** | 208 000 | **46 800** | 224 000 | **50 400** | 3 600 | 4 200 |
| 414RD | 70 | **2.7559** | 180 | **7.0866** | 84 | **3.3071** | 2.5 | **.10** | 1.00 | **.040** | 12 200 | **18.9** | 255 000 | **57 300** | 300 000 | **67 400** | 3 000 | 3 600 |
| 415RD | 75 | **2.9528** | 190 | **7.4803** | 90 | **3.5433** | 2.5 | **.10** | 1.00 | **.040** | 13 400 | **20.8** | 270 000 | **60 700** | 335 000 | **75 300** | 2 900 | 3 400 |
| 416RD | 80 | **3.1496** | 200 | **7.8740** | 96 | **3.7795** | 2.5 | **.10** | 1.00 | **.040** | 14 600 | **22.7** | 286 000 | **64 300** | 365 000 | **82 100** | 2 700 | 3 200 |
| 417RD | 85 | **3.3465** | 210 | **8.2677** | 104 | **4.0945** | 3.0 | **.12** | 1.00 | **.040** | 16 000 | **24.8** | 307 000 | **69 000** | 400 000 | **89 900** | 2 600 | 3 000 |
| 418RD | 90 | **3.5433** | 225 | **8.8583** | 108 | **4.2520** | 3.0 | **.12** | 1.00 | **.040** | 18 700 | **29.0** | 345 000 | **77 600** | 465 000 | **105 000** | 2 400 | 2 900 |
| 419RD | 95 | **3.7402** | 250 | **9.8425** | 110 | **4.3307** | 3.0 | **.12** | 1.00 | **.040** | 21 700 | **33.7** | 377 000 | **84 800** | 550 000 | **124 000** | 2 200 | 2 600 |
| 420RD | 100 | **3.9370** | 265 | **10.4331** | 120 | **4.7244** | 3.0 | **.12** | 1.00 | **.040** | 25 000 | **38.7** | 416 000 | **93 500** | 610 000 | **137 000** | 2 000 | 2 500 |
| 421RD | 105 | **4.1339** | 290 | **11.4173** | 130 | **5.1181** | 3.0 | **.12** | 1.00 | **.040** | 29 200 | **45.2** | 462 000 | **104 000** | 710 000 | **160 000** | 1 900 | 2 300 |
| 422RD | 110 | **4.3307** | 320 | **12.5984** | 140 | **5.5118** | 3.0 | **.12** | 1.00 | **.040** | 34 500 | **53.5** | 520 000 | **117 000** | 850 000 | **191 000** | 1 700 | 2 100 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil. For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# XLS type single-row inch size 15° angular contact ball bearings




XLS series bearings are single-row 15° angular contact ball bearings made to inch dimensions. They are similar to R-type bearings. The XLS series bearing is made with one heavy race shoulder and one counterbored race shoulder on the outer ring.

XLS series bearings have ample radial and thrust capacity for the majority of applications involving light radial loads, light thrust loads in one direction, or combinations of both. They are used in such applications where space limitations exist.

| | Bore | | Outside diameter | | Width | | Fillet radius[1)] | | | | | | Basic radial load rating | | | | Speed rating[2)] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d mm | in. | D mm | in. | B mm | in. | $r_a$ mm | in. | $r_b$ mm | in. | $ZD^2$ mm | in. | $C^{3)}$ N | lbf | $C_0$ N | lbf | Grease rpm | Oil rpm |
| XLS-1 3/8 | 34.9 | 1.3750 | 65.1 | 2.5625 | 14.3 | .5625 | 1.0 | .04 | .60 | .024 | 1 060 | 1.65 | 22 500 | 5 060 | 15 600 | 3 510 | 11 000 | 13 000 |
| XLS-1 1/2 | 38.1 | 1.5000 | 68.3 | 2.6875 | 14.3 | .5625 | 1.0 | .04 | .60 | .024 | 1 140 | 1.77 | 23 800 | 5 350 | 17 000 | 3 820 | 9 800 | 12 000 |
| XLS-1 5/8 | 41.3 | 1.6250 | 73.0 | 2.8750 | 14.3 | .5625 | 1.0 | .04 | .60 | .024 | 1 220 | 1.89 | 24 200 | 5 400 | 18 600 | 4 180 | 9 000 | 11 000 |
| XLS-1 5/8 | 44.5 | 1.7500 | 76.2 | 3.0000 | 14.3 | .5625 | 1.0 | .04 | .60 | .024 | 1 300 | 2.01 | 25 100 | 5 640 | 20 000 | 4 500 | 8 200 | 10 000 |
| XLS-1 7/8 | 47.6 | 1.8750 | 81.0 | 3.1875 | 15.9 | .6250 | 1.0 | .04 | .60 | .024 | 1 540 | 2.39 | 29 600 | 6 650 | 23 600 | 5 310 | 8 200 | 10 000 |
| XLS-2 | 50.8 | 2.0000 | 84.1 | 3.3125 | 15.9 | .6250 | 1.0 | .04 | .60 | .024 | 1 630 | 2.53 | 30 200 | 6 790 | 25 500 | 5 730 | 7 800 | 9 500 |
| XLS-2 1/8 | 54.0 | 2.1250 | 87.3 | 3.4375 | 15.9 | .6250 | 1.5 | .06 | .60 | .024 | 1 630 | 2.53 | 30 200 | 6 790 | 25 500 | 5 730 | 7 400 | 9 000 |
| XLS-2 1/4 | 57.2 | 2.2500 | 90.5 | 3.5625 | 15.9 | .6250 | 1.5 | .06 | .60 | .024 | 1 720 | 2.67 | 31 200 | 7 010 | 27 000 | 6 070 | 7 100 | 8 700 |
| XLS-2 1/2-S | 63.5 | 2.5000 | 98.4 | 3.8750 | 17.5 | .6875 | 1.5 | .06 | .60 | .024 | 1 360 | 2.11 | 26 000 | 5 850 | 22 000 | 4 950 | 6 500 | 7 900 |
| XLS-2 1/2 | 63.5 | 2.5000 | 98.4 | 3.8750 | 17.5 | .6875 | 1.5 | .06 | .60 | .024 | 1 900 | 2.95 | 32 500 | 7 310 | 31 000 | 6 740 | 6 400 | 7 800 |
| XLS-2 5/8 | 66.7 | 2.6250 | 105.0 | 4.1250 | 17.5 | .6875 | 1.5 | .06 | .60 | .024 | 2 470 | 3.83 | 42 300 | 9 510 | 39 000 | 8 770 | 6 100 | 7 400 |
| XLS-2 3/4 | 69.9 | 2.7500 | 105.0 | 4.1250 | 17.5 | .6875 | 1.5 | .06 | .60 | .024 | 2 470 | 3.83 | 42 300 | 9 510 | 39 000 | 8 770 | 6 000 | 7 300 |
| XLS-3 | 76.2 | 3.0000 | 114.0 | 4.5000 | 19.1 | .7500 | 2.0 | .08 | 1.00 | .040 | 2 720 | 4.21 | 44 200 | 9 940 | 44 000 | 9 890 | 5 500 | 6 700 |
| XLS-3 1/4 | 82.6 | 3.2500 | 121.0 | 4.7500 | 19.1 | .7500 | 2.0 | .08 | 1.00 | .040 | 2 840 | 4.40 | 44 900 | 10 100 | 46 500 | 10 500 | 5 100 | 6 200 |
| XLS-3 1/2 | 88.9 | 3.5000 | 127.0 | 5.0000 | 19.1 | .7500 | 2.0 | .08 | 1.00 | .040 | 3 090 | 4.79 | 47 500 | 10 700 | 51 000 | 11 500 | 4 800 | 5 900 |
| XLS-3 3/4 | 95.3 | 3.7500 | 133.0 | 5.2500 | 19.1 | .7500 | 2.0 | .08 | 1.00 | .040 | 3 210 | 4.98 | 47 500 | 10 700 | 53 000 | 11 900 | 4 500 | 5 500 |
| XLS-4 1/4 | 108.0 | 4.2500 | 152.0 | 6.0000 | 22.2 | .8750 | 2.0 | .08 | 1.00 | .040 | 4 190 | 6.50 | 61 800 | 13 900 | 69 500 | 15 600 | 3 900 | 4 800 |
| XLS-4 1/2 | 114.0 | 4.5000 | 159.0 | 6.2500 | 22.2 | .8750 | 2.0 | .08 | 1.00 | .040 | 4 350 | 6.75 | 61 800 | 13 900 | 73 500 | 16 500 | 3 800 | 4 600 |
| XLS-4 3/4 | 121.0 | 4.7500 | 165.0 | 6.5000 | 22.2 | .8750 | 2.0 | .08 | 1.00 | .040 | 4 520 | 7.00 | 63 700 | 14 300 | 76 500 | 17 200 | 3 600 | 4 400 |
| XLS-5 | 127.0 | 5.0000 | 178.0 | 7.0000 | 25.4 | 1.0000 | 2.0 | .08 | 1.00 | .040 | 5 510 | 8.54 | 78 000 | 17 500 | 91 500 | 20 600 | 3 400 | 4 100 |
| XLS-5 1/2 | 140.0 | 5.5000 | 191.0 | 7.5000 | 25.4 | 1.0000 | 2.5 | .10 | 1.00 | .040 | 5 920 | 9.18 | 79 300 | 17 800 | 100 000 | 22 500 | 3 100 | 3 800 |
| XLS-6 | 152.0 | 6.0000 | 203.0 | 8.0000 | 25.4 | 1.0000 | 2.5 | .10 | 1.00 | .040 | 6 330 | 9.81 | 81 900 | 18 400 | 108 000 | 24 300 | 2 900 | 3 500 |
| XLS-6 1/4 | 159.0 | 6.2500 | 216.0 | 8.5000 | 28.6 | 1.1250 | 2.5 | .10 | 1.00 | .040 | 7 550 | 11.70 | 97 500 | 21 900 | 129 000 | 29 000 | 2 700 | 3 300 |
| XLS-6 1/2 | 165.0 | 6.5000 | 222.0 | 8.7500 | 28.6 | 1.1250 | 2.5 | .10 | 1.00 | .040 | 7 800 | 12.00 | 99 500 | 22 400 | 134 000 | 30 100 | 2 600 | 3 200 |
| XLS-7 | 178.0 | 7.0000 | 241.0 | 9.5000 | 31.8 | 1.2500 | 3.0 | .12 | 1.50 | .060 | 9 480 | 14.70 | 119 000 | 26 800 | 160 000 | 36 000 | 2 400 | 2 900 |
| XLS-7 1/4 | 184.0 | 7.2500 | 248.0 | 9.7500 | 31.8 | 1.2500 | 3.0 | .12 | 1.50 | .060 | 9 740 | 15.10 | 121 000 | 27 200 | 166 000 | 37 300 | 2 300 | 2 800 |
| XLS-7 3/4 | 197.0 | 7.7500 | 267.0 | 10.5000 | 34.9 | 1.3750 | 3.0 | .12 | 1.50 | .060 | 11 200 | 17.40 | 138 000 | 31 000 | 193 000 | 43 400 | 2 100 | 2 600 |
| XLS-8 | 203.0 | 8.0000 | 273.0 | 10.7500 | 34.9 | 1.3750 | 3.0 | .12 | 1.50 | .060 | 11 600 | 18.00 | 140 000 | 31 500 | 200 000 | 45 000 | 2 100 | 2 500 |
| XLS-8 1/4 | 210.0 | 8.2500 | 279.0 | 11.0000 | 34.9 | 1.3750 | 3.0 | .12 | 1.50 | .060 | 12 000 | 18.60 | 140 000 | 31 500 | 204 000 | 45 900 | 2 100 | 2 500 |
| XLS-8 1/2 | 216.0 | 8.5000 | 292.0 | 11.5000 | 38.1 | 1.5000 | 3.0 | .12 | 1.50 | .060 | 13 600 | 21.00 | 163 000 | 36 600 | 232 000 | 52 200 | 2 000 | 2 400 |
| XLS-9 | 229.0 | 9.0000 | 305.0 | 12.0000 | 38.1 | 1.5000 | 3.0 | .12 | 1.50 | .060 | 15 300 | 23.70 | 182 000 | 40 900 | 260 000 | 58 500 | 1 900 | 2 300 |
| XLS-10 | 254.0 | 10.0000 | 337.0 | 13.2500 | 41.3 | 1.6250 | 4.0 | .16 | 1.50 | .060 | 17 300 | 26.80 | 190 000 | 42 700 | 290 000 | 65 200 | 1 600 | 2 000 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
For phenolic composition cage, multiply by 1.66 for grease and 2.00 for oil. For machined bronze cage, multiply by 1.25 for grease and 1.50 for oil. For phenolic composition cage, ABEC-5 or 7, multiply by 2.30 for grease and 2.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at 33 1/3 rpm.

# Single-row angular contact ball bearings
# R-type, single bearing

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

$P = XF_R + YF_A$ where,

P=Dynamic equivalent radial load

$F_R$=Radial load

$F_A$=Thrust load

Z=Number of balls

D=Ball diameter

X=Radial load factor

Y=Thrust load factor

e=Limiting factor for $F_A/F_R$

| Contact angle | $F_A/ZD^2$ | | $F_A/F_R > e$ | | e |
|---|---|---|---|---|---|
| | Units N, mm | Units lb, in. | X | Y | |
| | 0.172 | 25 | | 1.47 | 0.38 |
| | 0.345 | 50 | | 1.40 | 0.40 |
| | 0.689 | 100 | | 1.30 | 0.43 |
| | 1.030 | 150 | | 1.23 | 0.46 |
| 15° | 1.380 | 200 | 0.44 | 1.19 | 0.47 |
| | 2.070 | 300 | | 1.12 | 0.50 |
| | 3.450 | 500 | | 1.02 | 0.55 |
| | 5.170 | 750 | | 1.00 | 0.56 |
| | 6.890 | 1000 | | 1.00 | 0.56 |

When $F_A/F_R \leq e$, use X = 1.0, Y = 0.

Values of Y and e for loads not shown are obtained from chart below.

### Life rating

$$L10 = \left(\frac{C}{P}\right)^3 \text{ (millions of revolutions)}$$

or

$$L10_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 \text{ (hours)}$$

C = Basic dynamic load rating

P = Dynamic equivalent radial load

n = Speed in rpm

### Static equivalent radial load

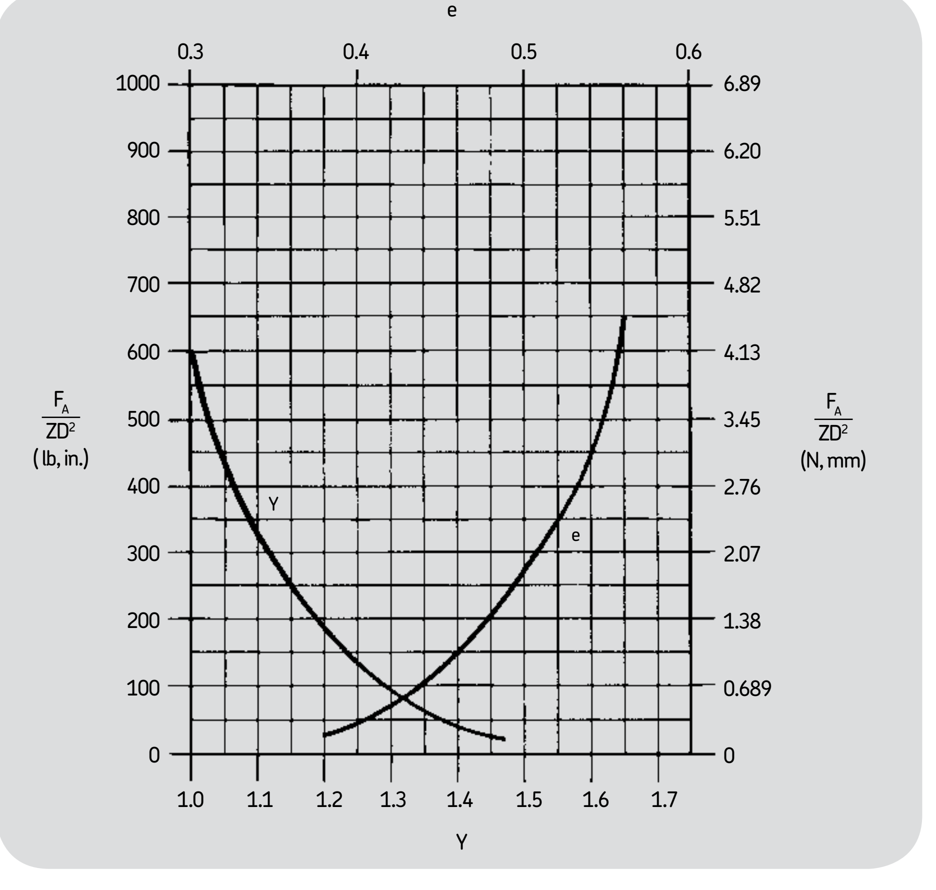
$P_0 = 0.6\,F_R + 0.5\,F_A$

$P_0$ is always $\geq F_R$

$P_0$ = Static equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load



# Single-row angular contact ball bearings R-type, single bearing

## Dynamic equivalent radial load and life calculation examples

Bearing size: 309R
Speed = 2000 rpm
Basic dynamic load rating (C) = 13200 lbf
$ZD^2$ = 4.69

### Case 1

Radial load ($F_R$) = 1890

Equivalent load (P) = $X F_R + Y F_A$

$P = F_R = 1890$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13200}{1890}\right)^3 = 341 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{13200}{1890}\right)^3$$

= 2839 Hrs

### Case 2

Radial load ($F_R$) = 1890

Thrust load ($F_A$) = 1250

Equivalent load (P) = $X F_R + Y F_A$

$F_A/F_R$ = 1250/1890 = 0.66

X = 0.44

Y = 1.15

P = 0.44 × 1890 + 1.15 × 1250 = 2269

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13200}{2269}\right)^3 = 197 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{13200}{2269}\right)^3$$

= 1641 Hrs

### Case 3

Thrust load ($F_A$) = 1250

Equivalent load (P) = $Y F_A$

$F_A/ZD^2$ = 1250/4.69 = 267

Y = 1.15

P = 1.15 × 1250 = 1438

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13200}{1438}\right)^3 = 773 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L\,10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{13200}{1438}\right)^3$$

= 6446 Hrs

# Single-row angular contact ball bearings RD-type, duplex

## Dynamic equivalent radial load

$P = XF_R + YF_A$
P = Dynamic equivalent radial load
$F_R$ = Radial load
$F_A$ = Thrust load
X = Radial load factor
Y = Thrust load factor
Z = Number of balls
D = Ball diameter
e = Limiting factor for $F_A/F_R$

## Static equivalent radial load

$P_0 = 1.0\ F_R + 0.94\ F_A$
$P_0$ is always $\geq F_R$
$P_0$ = Static equivalent radial load
$F_R$ = Radial load
$F_A$ = Thrust load

| Contact angle | $F_A/ZD^2$ | | Tandem DT mounting | | DB or DF mounting | | | | e |
|---|---|---|---|---|---|---|---|---|---|
| | | | $F_A/F_R > e$ | | $F_A/F_R \leq e$ | | $F_A/F_R > e$ | | |
| | Units N, mm | Units lb, in. | X | Y | X | Y | X | Y | |
| | 0.172 | 25 | | 1.47 | | 1.65 | | 2.39 | 0.38 |
| | 0.345 | 50 | | 1.40 | | 1.57 | | 2.28 | 0.40 |
| | 0.689 | 100 | | 1.30 | | 1.46 | | 2.11 | 0.43 |
| | 1.030 | 150 | | 1.23 | | 1.38 | | 2.00 | 0.46 |
| 15° | 1.380 | 200 | 0.44 | 1.19 | 1.00 | 1.34 | 0.72 | 1.93 | 0.47 |
| | 2.070 | 300 | | 1.12 | | 1.26 | | 1.82 | 0.50 |
| | 3.450 | 500 | | 1.02 | | 1.14 | | 1.66 | 0.55 |
| | 5.170 | 750 | | 1.00 | | 1.12 | | 1.63 | 0.56 |
| | 6.890 | 1000 | | 1.00 | | 1.12 | | 1.63 | 0.56 |

For tandem DT, when $F_A/F_R < e$, use X = 1.0, Y = 0.
Values of Y for loads not shown are obtained from chart below.

## Life rating

$$L10 = \left(\frac{C}{P}\right)^3 \text{ (millions of revolutions)}$$

or

$$L10_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 \text{ (hours)}$$

P = Dynamic equivalent radial load
n = Speed in rpm

**For DB or DF mounting:**

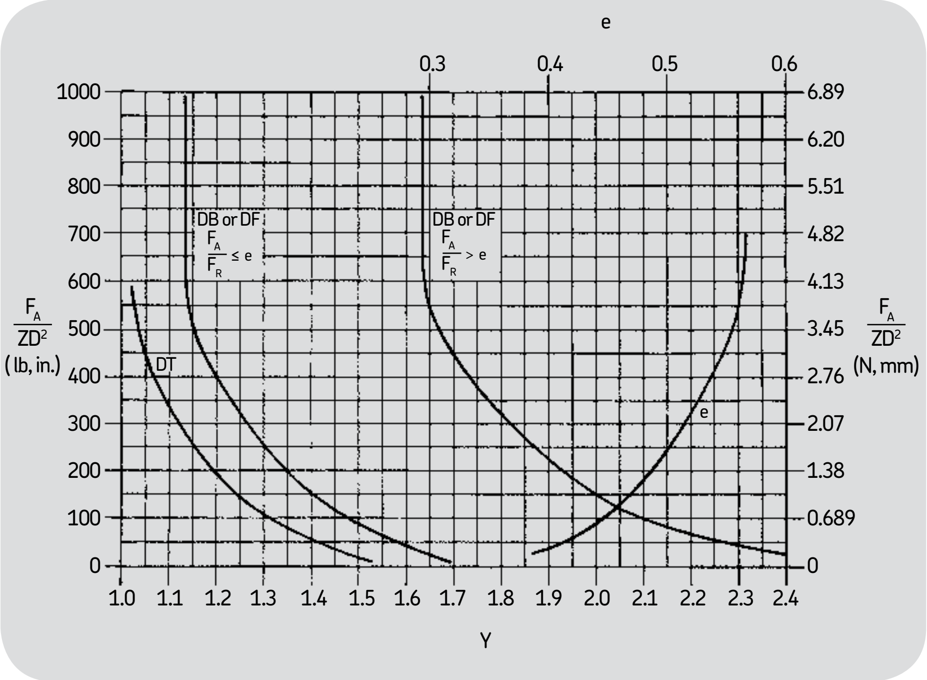
C = Duplex pair dynamic radial load rating (from duplex bearing tables)

or

C = Single-row dynamic radial load rating times $(i)^{0.7}$, where i = 2

**For DT tandem mounting:**

C = Single-row dynamic radial load rating times $(i)^{0.7}$, where i = number of bearings in set






MRC

# Single-row angular contact ball bearings RD-type, duplex

## Dynamic equivalent radial load and life calculation examples

Bearing size: 309RDU (DB or DF Pair)
Speed: 2000 rpm
Duplex pair basic dynamic radial load
Rating (C) = 21500 lbf
$ZD^2 = 4.69$

### Case 1

Radial load ($F_R$) = 1890
Thrust load ($F_A$) = 1250
Equivalent load (P) = $X F_R + Y F_A$
$F_A/F_R = 1250/1890 = 0.66$
$F_A/ZD^2 = 1250/4.69 = 267$
Since $F_A/F_R > e$, X = 0.72, Y = 1.86
$P = 0.72 \times 1890 + 1.86 \times 1250 = 3686$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{21500}{3686}\right)^3 = 198 \times 10^6 \text{ Rev.}$$

or

$$\text{Life }(L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{21500}{3686}\right)^3$$

= 1654 Hrs

### Case 2

Radial load ($F_R$) = 1890
Thrust load ($F_A$) = 450
Equivalent load (P) = $X F_R + Y F_A$
$F_A/F_R = 450/1890 = 0.24$
$F_A/ZD^2 = 450/4.69 = 96$
Since $F_A/F_R < e$, X = 1.0, Y = 1.46
$P = 1.0 \times 1890 + 1.46 \times 450 = 2547$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{21500}{2547}\right)^3 = 601 \times 10^6 \text{ Rev.}$$

or

$$\text{Life }(L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{21500}{2547}\right)^3$$

= 5012 Hrs

### Case 3

Thrust load ($F_A$) = 1250
Equivalent load (P) = $X F_R + Y F_A$
$F_A/F_R = 1250/0 = \infty$
$F_A/ZD^2 = 1250/4.69 = 267$
Since $F_A/F_R > e$, Y = 1.86
$P = 1.86 \times 1250 = 2325$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{21500}{2325}\right)^3 = 791 \times 10^6 \text{ Rev.}$$

or

$$\text{Life }(L\,10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{21500}{2325}\right)^3$$

= 6590 Hrs

Bearing size: 309RDT
3 bearings in tandem
Speed: 2000 rpm
Single-row basic dynamic radial
Load rating (C) = 13200 lbf
$ZD^2 = 4.69$

### Case 1

Thrust load ($F_A$) = 2500
Equivalent load (P = $X F_R + Y F_A$
$F_A/F_R = 2500/0 = \infty$
$F_A/ZD^2 = 2500/4.69 = 533$
Since $F_A/F_R > e$, X = 0.44, Y = 1.02
$P = 1.02 \times 2500 + = 2550$
Load rating = $(i)^{0.7}$ x 13200
= $(3)^{0.7}$ x 13200 = 28481

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{28481}{2550}\right)^3 = 1393 \times 10^6 \text{ Rev.}$$

or

$$\text{Life }(L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{28481}{2550}\right)^3$$

= 11611 Hrs

### Case 2

Radial load ($F_R$) = 1890
Thrust load ($F_A$) = 2500
Equivalent load (P) = $X F_R + Y F_A$
$F_A/F_R = 2500/1890 = 1.32$
$F_A/ZD^2 = 2500/4.69 = 533$
Since $F_A/F_R > e$, X = 0.44, Y = 1.02
$P = 0.44 \times 1890 + 1.02 \times 2500 = 3382$
Load rating = $(i)^{0.7}$ x 13200
= $(3)^{0.7}$ x 13200 = 28481

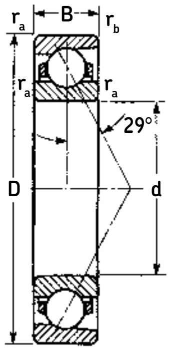
$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{28481}{3382}\right)^3 = 597 \times 10^6 \text{ Rev.}$$

or

$$\text{Life }(L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{28481}{3382}\right)^3$$

= 4977 Hrs

# 7000 series single-row 29° angular contact ball bearings




7000 series bearings are single-row 29° angular contact ball bearings having one heavy race shoulder and one counterbored race shoulder on the outer ring. Because of this construction, it is possible to incorporate a greater number of balls than in the deep groove nonfilling notch bearing. The combination of maximum ball complement and the angular contact feature reduces the specific ball loading under thrust load, resulting in moderate to high thrust load carrying capacity.

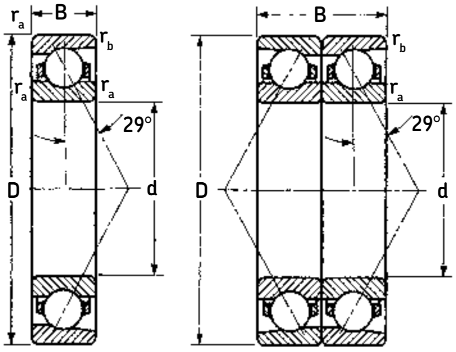
7000 series angular contact ball bearings should be used in applications in which the thrust load is heavy and beyond the capacity of single-row types; for example, for a heavy thrust load in one direction, or a heavy thrust load in one direction combined with a radial load.

## Cage types and materials

For normal usage: heavy stock, two-piece steel formed pockets, with turned-over fingers or riveted together.

For severe vibration, very high speeds, or high operating temperatures: one-piece, inner ring land-guided, machined construction of suitable material (phenolic/Bakelite composition, machined brass, or special material).

# 7100 and 7100D extra large series




7100 series bearings are similar to the 7100KR series but have a larger O.D. and narrower width; and are used for one-directional thrust loads or combined radial and thrust loads where the thrust load is predominant.

**Caution: Single bearings are not to be used where only radial loads are present. For two-directional thrust loads, use duplex bearings.**

Notes:

"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

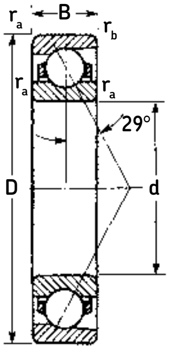
Values for D bearings are for back-to-back (DB) or face-to-face (DF) mounting arrangements.

ABEC-1 and -3 are stocked as half-pairs where available

| MRC bearing number | Bore d | | Outside diameter D | | Width B | | Fillet radius[1] $r_a$ | | $r_b$ | | Basic radial load rating[2] Dynamic C[4] | | Static $C_0$ | | Speed rating[3] Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **7120[5]** | 100 | **3.9370** | 160 | **6.2992** | 28 | **1.1024** | 2.0 | **.08** | 1.0 | **.040** | 85 200 | **19 200** | 86 500 | **19 400** | 2 600 | 4 300 |
| **7122** | 110 | **4.3307** | 175 | **6.8898** | 30 | **1.1811** | 2.0 | **.08** | 1.0 | **.040** | 104 000 | **23 400** | 108 000 | **24 300** | 2 400 | 4 000 |
| **7124[5]** | 120 | **4.7244** | 190 | **7.4803** | 32 | **1.2598** | 2.0 | **.08** | 1.0 | **.040** | 108 000 | **24 300** | 127 000 | **28 600** | 2 200 | 3 700 |
| **7126[5]** | 130 | **5.1181** | 205 | **8.0709** | 34 | **1.3386** | 2.0 | **.08** | 1.0 | **.040** | 121 000 | **27 200** | 134 000 | **30 100** | 2 100 | 3 500 |
| **7128[5]** | 140 | **5.5118** | 220 | **8.6614** | 36 | **1.4173** | 2.0 | **.08** | 1.0 | **.040** | 138 000 | **31 000** | 156 000 | **35 100** | 1 900 | 3 200 |
| **7130** | 150 | **5.9055** | 235 | **9.2520** | 38 | **1.4961** | 2.0 | **.08** | 1.0 | **.040** | 159 000 | **35 700** | 180 000 | **40 500** | 1 700 | 2 800 |
| **7132[5]** | 160 | **6.2992** | 250 | **9.8425** | 40 | **1.5748** | 2.0 | **.08** | 1.0 | **.040** | 174 000 | **39 100** | 204 000 | **45 900** | 1 600 | 2 700 |
| **7134[5]** | 170 | **6.6929** | 265 | **10.4331** | 42 | **1.6535** | 2.5 | **.10** | 1.0 | **.040** | 190 000 | **42 700** | 232 000 | **52 200** | 1 600 | 2 700 |
| **7136[5]** | 180 | **7.0866** | 280 | **11.0236** | 44 | **1.7323** | 2.5 | **.10** | 1.0 | **.040** | 208 000 | **46 800** | 260 000 | **58 500** | 1 600 | 2 600 |
| **7138[5]** | 190 | **7.4803** | 300 | **11.8110** | 46 | **1.8110** | 2.5 | **.10** | 1.0 | **.040** | 242 000 | **54 400** | 315 000 | **70 800** | 1 400 | 2 400 |
| **7140[5]** | 200 | **7.8740** | 320 | **12.5984** | 48 | **1.8898** | 2.5 | **.10** | 1.0 | **.040** | 260 000 | **58 500** | 355 000 | **79 800** | 1 400 | 2 300 |
| **7142[5]** | 210 | **8.2677** | 340 | **13.3858** | 50 | **1.9685** | 2.5 | **.10** | 1.0 | **.040** | 286 000 | **64 300** | 400 000 | **89 900** | 1 400 | 2 300 |
| **7144[5]** | 220 | **8.6614** | 350 | **13.7795** | 51 | **2.0079** | 2.5 | **.10** | 1.0 | **.040** | 291 000 | **65 400** | 415 000 | **93 300** | 1 300 | 2 200 |
| **7146[5]** | 230 | **9.0551** | 370 | **14.5669** | 53 | **2.0866** | 3.0 | **.12** | 1.0 | **.040** | 312 000 | **70 100** | 455 000 | **102 000** | 1 200 | 2 000 |
| **7148[5]** | 240 | **9.4488** | 390 | **15.3543** | 55 | **2.1654** | 3.0 | **.12** | 1.0 | **.040** | 332 000 | **74 600** | 500 000 | **112 000** | 1 100 | 1 900 |
| **7152[5]** | 260 | **10.2362** | 430 | **16.9291** | 59 | **2.3228** | 3.0 | **.12** | 1.0 | **.040** | 364 000 | **81 800** | 585 000 | **132 000** | 1 100 | 1 800 |
| **7156[5]** | 280 | **11.0236** | 460 | **18.1102** | 63 | **2.4803** | 3.0 | **.12** | 1.0 | **.040** | 403 000 | **90 600** | 600 000 | **135 000** | 1 100 | 1 800 |
| **7164[5]** | 320 | **12.5984** | 500 | **19.6850** | 71 | **2.7953** | 3.0 | **.12** | 1.0 | **.040** | 462 000 | **104 000** | 815 000 | **183 000** | 960 | 1 600 |
| **7100D** | | | | | | | | | | | | | | | | |
| **7120D[5]** | 100 | **3.9370** | 160 | **6.2992** | 56 | **2.2047** | 2.0 | **.08** | 1.0 | **.040** | 140 000 | **31 500** | 173 000 | **38 900** | 2 100 | 3 400 |
| **7122D** | 110 | **4.3307** | 175 | **6.8898** | 60 | **2.3622** | 2.0 | **.08** | 1.0 | **.040** | 168 000 | **37 800** | 216 000 | **48 600** | 1 900 | 3 200 |
| **7124D[5]** | 120 | **4.7244** | 190 | **7.4803** | 64 | **2.5197** | 2.0 | **.08** | 1.0 | **.040** | 178 000 | **40 000** | 255 000 | **57 300** | 1 800 | 3 000 |
| **7126D[5]** | 130 | **5.1181** | 205 | **8.0709** | 68 | **2.6772** | 2.0 | **.08** | 1.0 | **.040** | 195 000 | **43 800** | 270 000 | **60 700** | 1 700 | 2 800 |
| **7128D[5]** | 140 | **5.5118** | 220 | **8.6614** | 72 | **2.8346** | 2.0 | **.08** | 1.0 | **.040** | 225 000 | **50 600** | 310 000 | **69 700** | 1 500 | 2 600 |
| **7130D** | 150 | **5.9055** | 235 | **9.2520** | 76 | **2.9921** | 2.0 | **.08** | 1.0 | **.040** | 255 000 | **57 300** | 360 000 | **80 900** | 1 400 | 2 200 |
| **7132D[5]** | 160 | **6.2992** | 250 | **9.8425** | 80 | **3.1496** | 2.0 | **.08** | 1.0 | **.040** | 286 000 | **64 300** | 405 000 | **91 000** | 1 300 | 2 200 |
| **7134D[5]** | 170 | **6.6929** | 265 | **10.4331** | 84 | **3.3071** | 2.5 | **.10** | 1.0 | **.040** | 312 000 | **70 100** | 465 000 | **105 000** | 1 300 | 2 200 |
| **7136D[5]** | 180 | **7.0866** | 280 | **11.0236** | 88 | **3.4646** | 2.5 | **.10** | 1.0 | **.040** | 338 000 | **76 000** | 520 000 | **117 000** | 1 300 | 2 100 |
| **7138D[5]** | 190 | **7.4803** | 300 | **11.8110** | 92 | **3.6220** | 2.5 | **.10** | 1.0 | **.040** | 390 000 | **87 700** | 630 000 | **142 000** | 1 100 | 1 900 |
| **7140D[5]** | 200 | **7.8740** | 320 | **12.5984** | 96 | **3.7795** | 2.5 | **.10** | 1.0 | **.040** | 423 000 | **95 100** | 695 000 | **156 000** | 1 100 | 1 800 |
| **7142D[5]** | 210 | **8.2677** | 340 | **13.3858** | 100 | **3.9370** | 2.5 | **.10** | 1.0 | **.040** | 468 000 | **105 000** | 800 000 | **180 000** | 1 100 | 1 800 |
| **7144D[5]** | 220 | **8.6614** | 350 | **13.7795** | 102 | **4.0157** | 2.5 | **.10** | 1.0 | **.040** | 475 000 | **107 000** | 830 000 | **187 000** | 1 000 | 1 800 |
| **7146D[5]** | 230 | **9.0551** | 370 | **14.5669** | 106 | **4.1732** | 3.0 | **.12** | 1.0 | **.040** | 507 000 | **114 000** | 915 000 | **206 000** | 960 | 1 600 |
| **7148D[5]** | 240 | **9.4488** | 390 | **15.3543** | 110 | **4.3307** | 3.0 | **.12** | 1.0 | **.040** | 540 000 | **121 000** | 1 000 000 | **225 000** | 880 | 1 500 |
| **7152D[5]** | 260 | **10.2362** | 430 | **16.9291** | 118 | **4.6457** | 3.0 | **.12** | 1.0 | **.040** | 592 000 | **133 000** | 1 160 000 | **261 000** | 880 | 1 400 |
| **7156D[5]** | 280 | **11.0236** | 460 | **18.1102** | 126 | **4.9606** | 3.0 | **.12** | 1.0 | **.040** | 663 000 | **149 000** | 1 200 000 | **270 000** | 880 | 1 400 |
| **7164D[5]** | 320 | **12.5984** | 500 | **19.6850** | 142 | **5.5906** | 3.0 | **.12** | 1.0 | **.040** | 761 000 | **171 000** | 1 630 000 | **366 000** | 770 | 1 300 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.32 and $C_0$ by 2.94 (single) and C by 0.81 and $C_0$ by 1.47 (duplex).
3) Listed values are for machined bronze cage, ABEC-1.
For phenolic composition cage, multiply by 1.33 for both grease and oil. For phenolic composition cage, ABEC-5 or 7, multiply by 1.86 for both grease and oil. For pressed steel cage, ABEC-1, multiply by 0.67 for grease and 0.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.
5) Typically non-stocked sizes, please check availability before designing into equipment.

# 7100KR extra light series single ball bearings



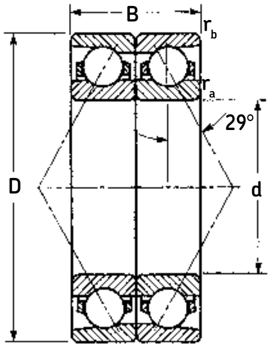

This series is available in bore sizes ranging from 10 mm to 320 mm. One-piece machined nonmetallic or solid bronze cages are considered standard for this series. These bearings are appropriate for use with moderate one-directional thrust loads, or combined radial and thrust loads where the thrust load is predominant.

**Caution: Single bearings are not to be used where only radial loads are present. For two-directional thrust loads, use duplex bearings.**

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1)] $r_a$ mm | in. | $r_b$ mm | in. | Basic radial load rating[2)] Dynamic $C$[4)] N | lbf | Static $C_0$ N | lbf | Speed rating[3)] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7100KR** | 10 | **.3937** | 26 | **1.0236** | 8 | **.3150** | .30 | **.012** | .10 | **.004** | 4 620 | **1 040** | 2 000 | **450** | 30 000 | 39 000 |
| **7101KR** | 12 | **.4724** | 28 | **1.1024** | 8 | **.3150** | .30 | **.012** | .10 | **.004** | 4 940 | **1 110** | 2 500 | **562** | 25 000 | 32 000 |
| **7102KR** | 15 | **.5906** | 32 | **1.2598** | 9 | **.3543** | .30 | **.012** | .10 | **.004** | 5 400 | **1 210** | 2 900 | **652** | 22 000 | 28 000 |
| **7103KR** | 17 | **.6693** | 35 | **1.3780** | 10 | **.3937** | .30 | **.012** | .10 | **.004** | 7 610 | **1 710** | 4 250 | **955** | 19 000 | 25 000 |
| **7104KR** | 20 | **.7874** | 42 | **1.6535** | 12 | **.4724** | .64 | **.025** | .30 | **.012** | 9 560 | **2 150** | 5 700 | **1 280** | 16 000 | 21 000 |
| **7105KR** | 25 | **.9843** | 47 | **1.8504** | 12 | **.4724** | .64 | **.025** | .30 | **.012** | 10 600 | **2 380** | 6 950 | **1 560** | 12 000 | 16 000 |
| **7106KR** | 30 | **1.1811** | 55 | **2.1654** | 13 | **.5118** | 1.00 | **.040** | .30 | **.012** | 13 800 | **3 100** | 9 650 | **2 170** | 11 000 | 14 000 |
| **7107KR** | 35 | **1.3780** | 62 | **2.4409** | 14 | **.5512** | 1.00 | **.040** | .30 | **.012** | 16 800 | **3 780** | 12 000 | **2 700** | 9 200 | 12 000 |
| **7108KR** | 40 | **1.5748** | 68 | **2.6772** | 15 | **.5906** | 1.00 | **.040** | .30 | **.012** | 17 200 | **3 870** | 13 200 | **2 970** | 8 500 | 11 000 |
| **7109KR** | 45 | **1.7717** | 75 | **2.9528** | 16 | **.6299** | 1.00 | **.040** | .30 | **.012** | 21 200 | **4 770** | 17 000 | **3 820** | 7 500 | 9 800 |
| **7110KR** | 50 | **1.9685** | 80 | **3.1496** | 16 | **.6299** | 1.00 | **.040** | .30 | **.012** | 22 100 | **4 970** | 18 300 | **4 110** | 6 900 | 9 000 |
| **7111KR** | 55 | **2.1654** | 90 | **3.5433** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 29 600 | **6 650** | 25 500 | **5 730** | 6 300 | 8 200 |
| **7112KR** | 60 | **2.3622** | 95 | **3.7402** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 30 700 | **6 900** | 27 000 | **6 070** | 5 700 | 7 400 |
| **7113KR** | 65 | **2.5591** | 100 | **3.9370** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 31 200 | **7 010** | 29 000 | **6 520** | 5 400 | 7 000 |
| **7114KR** | 70 | **2.7559** | 110 | **4.3307** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 34 500 | **7 760** | 35 500 | **7 980** | 5 000 | 6 500 |
| **7115KR** | 75 | **2.9528** | 115 | **4.5276** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 37 700 | **8 480** | 37 500 | **8 430** | 4 700 | 6 100 |
| **7116KR** | 80 | **3.1496** | 125 | **4.9213** | 22 | **.8661** | 1.00 | **.040** | .60 | **.024** | 48 800 | **11 000** | 49 000 | **11 000** | 4 500 | 5 800 |
| **7117KR** | 85 | **3.3465** | 130 | **5.1181** | 22 | **.8661** | 1.00 | **.040** | .60 | **.024** | 49 400 | **11 100** | 52 000 | **11 700** | 4 100 | 5 300 |
| **7118KR** | 90 | **3.5433** | 140 | **5.5118** | 24 | **.9449** | 1.50 | **.060** | .60 | **.024** | 58 500 | **13 200** | 61 000 | **13 700** | 3 800 | 4 900 |
| **7119KR** | 95 | **3.7402** | 145 | **5.7087** | 24 | **.9449** | 1.50 | **.060** | .60 | **.024** | 71 500 | **16 100** | 72 000 | **16 200** | 3 600 | 4 700 |
| **7120KR** | 100 | **3.9370** | 150 | **5.9055** | 24 | **.9449** | 1.50 | **.060** | 1.00 | **.040** | 62 400 | **14 000** | 68 000 | **15 300** | 3 500 | 4 500 |
| **7121KR** | 105 | **4.1339** | 160 | **6.2992** | 26 | **1.0236** | 2.00 | **.080** | 1.00 | **.040** | 74 100 | **16 700** | 80 000 | **18 000** | 3 300 | 4 300 |
| **7122KR** | 110 | **4.3307** | 170 | **6.6929** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 87 100 | **19 600** | 91 500 | **20 600** | 3 200 | 3 800 |
| **7124KR** | 120 | **4.7244** | 180 | **7.0866** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 88 400 | **19 900** | 98 000 | **22 000** | 2 900 | 3 800 |
| **7126KR** | 130 | **5.1181** | 200 | **7.8740** | 33 | **1.2992** | 2.00 | **.080** | 1.00 | **.040** | 121 000 | **27 200** | 134 000 | **30 100** | 2 700 | 3 500 |
| **7128KR** | 140 | **5.5118** | 210 | **8.2677** | 33 | **1.2992** | 2.00 | **.080** | 1.00 | **.040** | 121 000 | **27 200** | 137 000 | **30 800** | 2 500 | 3 300 |
| **7130KR** | 150 | **5.9055** | 225 | **8.8583** | 35 | **1.3780** | 2.00 | **.080** | 1.00 | **.040** | 135 000 | **30 300** | 156 000 | **35 100** | 2 200 | 2 900 |
| **7132KR** | 160 | **6.2992** | 240 | **9.4488** | 38 | **1.4961** | 2.00 | **.080** | 1.00 | **.040** | 156 000 | **35 100** | 180 000 | **40 500** | 2 200 | 2 800 |
| **7134KR** | 170 | **6.6929** | 260 | **10.2362** | 42 | **1.6535** | 2.00 | **.080** | 1.00 | **.040** | 186 000 | **41 800** | 220 000 | **49 500** | 2 100 | 2 700 |
| **7136KR** | 180 | **7.0866** | 280 | **11.0236** | 46 | **1.8110** | 2.00 | **.080** | 1.00 | **.040** | 208 000 | **46 800** | 260 000 | **58 500** | 2 000 | 2 600 |
| **7138KR** | 190 | **7.4803** | 290 | **11.4173** | 46 | **1.8110** | 2.00 | **.080** | 1.00 | **.040** | 212 000 | **47 700** | 270 000 | **60 700** | 1 800 | 2 400 |
| **7140KR** | 200 | **7.8740** | 310 | **12.2047** | 51 | **2.0079** | 2.00 | **.080** | 1.00 | **.040** | 238 000 | **53 500** | 320 000 | **71 900** | 1 800 | 2 300 |
| **7144KR** | 220 | **8.6614** | 340 | **13.3858** | 56 | **2.2047** | 2.50 | **.100** | 1.00 | **.040** | 302 000 | **67 900** | 430 000 | **96 700** | 1 700 | 2 200 |
| **7148KR** | 240 | **9.4488** | 360 | **14.1732** | 56 | **2.2047** | 2.50 | **.100** | 1.00 | **.040** | 307 000 | **69 000** | 455 000 | **102 000** | 1 500 | 2 000 |
| **7152KR** | 260 | **10.2362** | 400 | **15.7480** | 65 | **2.5591** | 3.00 | **.120** | 1.50 | **.060** | 377 000 | **84 800** | 585 000 | **132 000** | 1 500 | 1 900 |
| **7156KR** | 280 | **11.0236** | 420 | **16.5354** | 65 | **2.5591** | 3.00 | **.120** | 1.50 | **.060** | 390 000 | **87 700** | 620 000 | **139 000** | 1 500 | 1 900 |
| **7160KR** | 300 | **11.8110** | 460 | **18.1102** | 74 | **2.9134** | 3.00 | **.120** | 1.50 | **.060** | 449 000 | **101 000** | 765 000 | **172 000** | 1 300 | 1 700 |
| **7164KR** | 320 | **12.5984** | 480 | **18.8976** | 74 | **2.9134** | 3.00 | **.120** | 1.50 | **.060** | 462 000 | **104 000** | 815 000 | **183 000** | 1 200 | 1 600 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.32 and $C_0$ by 2.94.
3) Listed values are for machined bronze cage, ABEC-1.
For phenolic composition cage, multiply by 1.33 for both grease and oil. For phenolic composition cage, ABEC-5 or 7, multiply by 1.86 for both grease and oil. For pressed steel cage, ABEC-1, multiply by 0.67 for grease and 0.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.

# 7100KRD extra light series duplex




Notes:

"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

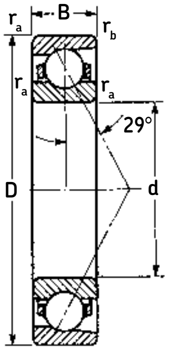
Values for D bearings are for back-to-back (DB) or face-to-face (DF) mounting arrangements.

ABEC-1 and -3 are stocked as half-pairs where available.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | Fillet radius[1] $r_a$ in. | Fillet radius[1] $r_b$ mm | Fillet radius[1] $r_b$ in. | Basic radial load rating[2] Dynamic C[4] N | Basic radial load rating[2] Dynamic C[4] lbf | Basic radial load rating[2] Static $C_0$ N | Basic radial load rating[2] Static $C_0$ lbf | Speed rating[3] Grease rpm | Speed rating[3] Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7100KRD** | 10 | **.3937** | 26 | **1.0236** | 16 | **.6299** | .30 | **.012** | .10 | **.004** | 7 610 | **1 710** | 4 150 | **933** | 24 000 | 31 000 |
| **7101KRD** | 12 | **.4724** | 28 | **1.1024** | 16 | **.6299** | .30 | **.012** | .10 | **.004** | 8 060 | **1 810** | 5 000 | **1 120** | 20 000 | 26 000 |
| **7102KRD** | 15 | **.5906** | 32 | **1.2598** | 18 | **.7087** | .30 | **.012** | .10 | **.004** | 8 840 | **1 990** | 5 850 | **1 320** | 18 000 | 22 000 |
| **7103KRD** | 17 | **.6693** | 35 | **1.3780** | 20 | **.7874** | .30 | **.012** | .10 | **.004** | 12 500 | **2 810** | 8 500 | **1 910** | 15 000 | 20 000 |
| **7104KRD** | 20 | **.7874** | 42 | **1.6535** | 24 | **.9449** | .64 | **.025** | .30 | **.012** | 15 600 | **3 510** | 11 400 | **2 560** | 13 000 | 17 000 |
| **7105KRD** | 25 | **.9843** | 47 | **1.8504** | 24 | **.9449** | .64 | **.025** | .30 | **.012** | 17 400 | **3 910** | 14 000 | **3 150** | 9 600 | 13 000 |
| **7106KRD** | 30 | **1.1811** | 55 | **2.1654** | 26 | **1.0236** | 1.00 | **.040** | .30 | **.012** | 22 500 | **5 060** | 19 300 | **4 340** | 8 800 | 11 000 |
| **7107KRD** | 35 | **1.3780** | 62 | **2.4409** | 28 | **1.1024** | 1.00 | **.040** | .30 | **.012** | 27 600 | **6 200** | 24 000 | **5 400** | 7 400 | 9 600 |
| **7108KRD** | 40 | **1.5748** | 68 | **2.6772** | 30 | **1.1811** | 1.00 | **.040** | .30 | **.012** | 28 100 | **6 320** | 26 000 | **5 850** | 6 800 | 8 800 |
| **7109KRD** | 45 | **1.7717** | 75 | **2.9528** | 32 | **1.2598** | 1.00 | **.040** | .30 | **.012** | 34 500 | **7 760** | 34 000 | **7 640** | 6 000 | 7 800 |
| **7110KRD** | 50 | **1.9685** | 80 | **3.1496** | 32 | **1.2598** | 1.00 | **.040** | .30 | **.012** | 35 800 | **8 050** | 36 500 | **8 210** | 5 500 | 7 200 |
| **7111KRD** | 55 | **2.1654** | 90 | **3.5433** | 36 | **1.4173** | 1.00 | **.040** | .60 | **.024** | 47 500 | **10 700** | 51 000 | **11 500** | 5 000 | 6 600 |
| **7112KRD** | 60 | **2.3622** | 95 | **3.7402** | 36 | **1.4173** | 1.00 | **.040** | .60 | **.024** | 49 400 | **11 100** | 54 000 | **12 100** | 4 600 | 5 900 |
| **7113KRD** | 65 | **2.5591** | 100 | **3.9370** | 36 | **1.4173** | 1.00 | **.040** | .60 | **.024** | 50 700 | **11 400** | 58 500 | **13 200** | 4 300 | 5 600 |
| **7114KRD** | 70 | **2.7559** | 110 | **4.3307** | 40 | **1.5748** | 1.00 | **.040** | .60 | **.024** | 55 900 | **12 600** | 71 000 | **16 000** | 4 000 | 5 200 |
| **7115KRD** | 75 | **2.9528** | 115 | **4.5276** | 40 | **1.5748** | 1.00 | **.040** | .60 | **.024** | 61 800 | **13 900** | 75 000 | **16 900** | 3 800 | 4 900 |
| **7116KRD** | 80 | **3.1496** | 125 | **4.9213** | 44 | **1.7323** | 1.00 | **.040** | .60 | **.024** | 79 300 | **17 800** | 98 000 | **22 000** | 3 600 | 4 600 |
| **7117KRD** | 85 | **3.3465** | 130 | **5.1181** | 44 | **1.7323** | 1.00 | **.040** | .60 | **.024** | 80 600 | **18 100** | 104 000 | **23 400** | 3 300 | 4 200 |
| **7118KRD** | 90 | **3.5433** | 140 | **5.5118** | 48 | **1.8898** | 1.50 | **.060** | .60 | **.024** | 95 600 | **21 500** | 122 000 | **27 400** | 3 000 | 3 900 |
| **7119KRD** | 95 | **3.7402** | 145 | **5.7087** | 48 | **1.8898** | 1.50 | **.060** | .60 | **.024** | 117 000 | **26 300** | 143 000 | **32 100** | 2 900 | 3 800 |
| **7120-KRD** | 100 | **3.9370** | 150 | **5.9055** | 48 | **1.8898** | 1.50 | **.060** | 1.00 | **.040** | 101 000 | **22 700** | 137 000 | **30 800** | 2 800 | 3 600 |
| **7121KRD** | 105 | **4.1339** | 160 | **6.2992** | 52 | **2.0472** | 2.00 | **.080** | 1.00 | **.040** | 121 000 | **27 200** | 160 000 | **36 000** | 2 600 | 3 400 |
| **7122KRD** | 110 | **4.3307** | 170 | **6.6929** | 56 | **2.2047** | 2.00 | **.080** | 1.00 | **.040** | 140 000 | **31 500** | 183 000 | **41 100** | 2 600 | 3 300 |
| **7124KRD** | 120 | **4.7244** | 180 | **7.0866** | 56 | **2.2047** | 2.00 | **.080** | 1.00 | **.040** | 143 000 | **32 100** | 196 000 | **44 100** | 2 300 | 3 000 |
| **7126KRD** | 130 | **5.1181** | 200 | **7.8740** | 66 | **2.5984** | 2.00 | **.080** | 1.00 | **.040** | 195 000 | **43 800** | 270 000 | **60 700** | 2 200 | 2 800 |
| **7128KRD** | 140 | **5.5118** | 210 | **8.2677** | 66 | **2.5984** | 2.00 | **.080** | 1.00 | **.040** | 195 000 | **43 800** | 270 000 | **60 700** | 2 000 | 2 600 |
| **7130KRD** | 150 | **5.9055** | 225 | **8.8583** | 70 | **2.7559** | 2.00 | **.080** | 1.00 | **.040** | 221 000 | **49 700** | 315 000 | **70 800** | 1 800 | 2 300 |
| **7132KRD** | 160 | **6.2992** | 240 | **9.4488** | 76 | **2.9921** | 2.00 | **.080** | 1.00 | **.040** | 255 000 | **57 300** | 360 000 | **80 900** | 1 800 | 2 200 |
| **7134KRD** | 170 | **6.6929** | 260 | **10.2362** | 84 | **3.3071** | 2.00 | **.080** | 1.00 | **.040** | 302 000 | **67 900** | 440 000 | **98 900** | 1 700 | 2 200 |
| **7136KRD** | 180 | **7.0866** | 280 | **11.0236** | 92 | **3.6220** | 2.00 | **.080** | 1.00 | **.040** | 338 000 | **76 000** | 520 000 | **117 000** | 1 600 | 2 100 |
| **7138KRD** | 190 | **7.4803** | 290 | **11.4173** | 92 | **3.6220** | 2.00 | **.080** | 1.00 | **.040** | 345 000 | **77 600** | 540 000 | **121 000** | 1 400 | 1 900 |
| **7140KRD** | 200 | **7.8740** | 310 | **12.2047** | 102 | **4.0157** | 2.00 | **.080** | 1.00 | **.040** | 390 000 | **87 700** | 640 000 | **144 000** | 1 400 | 1 800 |
| **7144KRD** | 220 | **8.6614** | 340 | **13.3858** | 112 | **4.4094** | 2.50 | **.100** | 1.00 | **.040** | 494 000 | **111 000** | 865 000 | **194 000** | 1 400 | 1 800 |
| **7148KRD** | 240 | **9.4488** | 360 | **14.1732** | 112 | **4.4094** | 2.50 | **.100** | 1.00 | **.040** | 494 000 | **111 000** | 915 000 | **206 000** | 1 200 | 1 600 |
| **7152KRD** | 260 | **10.2362** | 400 | **15.7480** | 130 | **5.1181** | 3.00 | **.120** | 1.50 | **.060** | 618 000 | **139 000** | 1 180 000 | **265 000** | 1 200 | 1 500 |
| **7156KRD** | 280 | **11.0236** | 420 | **16.5354** | 130 | **5.1181** | 3.00 | **.120** | 1.50 | **.060** | 637 000 | **143 000** | 1 250 000 | **281 000** | 1 200 | 1 500 |
| **7160KRD** | 300 | **11.8110** | 460 | **18.1102** | 148 | **5.8268** | 3.00 | **.120** | 1.50 | **.060** | 728 000 | **164 000** | 1 580 000 | **355 000** | 1 000 | 1 400 |
| **7164KRD** | 320 | **12.5984** | 480 | **18.8976** | 148 | **5.8268** | 3.00 | **.120** | 1.50 | **.060** | 761 000 | **171 000** | 1 630 000 | **366 000** | 960 | 1 300 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 0.81 and $C_0$ by 1.47.
3) Listed values are for machined bronze cage, ABEC-1.
For phenolic composition cage, multiply by 1.33 for both grease and oil. For phenolic composition cage, ABEC-5 or 7, multiply by 1.86 for both grease and oil. For pressed steel cage, ABEC-1, multiply by 0.67 for grease and 0.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 7200 light series single ball bearings




The 7200 series contains single-row angular contact ball bearings with a counterbored outer ring. Bore sizes range from 10 mm to 320 mm; and most of these bearings are available with a two-piece pressed steel cage, or a one-piece nonmetallic or solid bronze cage. 7000 series bearings are designed with an initial contact angle of 29°, although some small sizes may have a lesser angle.

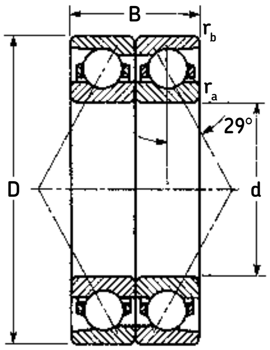
7200 series bearings can be used with moderate to heavy one-directional thrust loads, or combined radial and thrust loads where the thrust load is predominant.

**Caution: Single bearings are not to be used where only radial loads are present. For two-directional thrust loads, use duplex bearings.**

| | Bore | | Outside diameter | | Width | | Fillet radius[1)] | | | | Basic radial load rating[2)] | | | | Speed rating[3)] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d | | D | | B | | $r_a$ | | $r_b$ | | $C^{4)}$ | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **7200** | 10 | **.3937** | 30 | **1.1811** | 9 | **.3543** | .64 | **.025** | .30 | **.012** | 5 400 | **1 210** | 2 750 | **618** | 28 000 | 36 000 |
| **7201** | 12 | **.4724** | 32 | **1.2598** | 10 | **.3937** | .64 | **.025** | .30 | **.012** | 6 240 | **1 400** | 3 200 | **719** | 22 000 | 29 000 |
| **7202** | 15 | **.5906** | 35 | **1.3780** | 11 | **.4331** | .64 | **.025** | .30 | **.012** | 9 040 | **2 030** | 4 750 | **1 070** | 20 000 | 26 000 |
| **7203** | 17 | **.6693** | 40 | **1.5748** | 12 | **.4724** | .64 | **.025** | .30 | **.012** | 11 900 | **2 680** | 6 550 | **1 470** | 18 000 | 23 000 |
| **7204** | 20 | **.7874** | 47 | **1.8504** | 14 | **.5512** | 1.00 | **.040** | .60 | **.024** | 12 700 | **2 860** | 7 200 | **1 620** | 15 000 | 19 000 |
| **7205** | 25 | **.9843** | 52 | **2.0472** | 15 | **.5906** | 1.00 | **.040** | .60 | **.024** | 15 300 | **3 440** | 9 500 | **2 140** | 12 000 | 16 000 |
| **7206** | 30 | **1.1811** | 62 | **2.4409** | 16 | **.6299** | 1.00 | **.040** | .60 | **.024** | 16 800 | **3 780** | 11 800 | **2 650** | 10 000 | 13 000 |
| **7207** | 35 | **1.3780** | 72 | **2.8346** | 17 | **.6693** | 1.00 | **.040** | .60 | **.024** | 23 400 | **5 260** | 17 000 | **3 820** | 9 200 | 12 000 |
| **7208** | 40 | **1.5748** | 80 | **3.1496** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 30 700 | **6 900** | 22 800 | **5 130** | 7 700 | 10 000 |
| **7209** | 45 | **1.7717** | 85 | **3.3465** | 19 | **.7480** | 1.00 | **.040** | .60 | **.024** | 30 700 | **6 900** | 23 200 | **5 220** | 7 300 | 9 500 |
| **7210** | 50 | **1.9685** | 90 | **3.5433** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 33 200 | **7 460** | 27 000 | **6 070** | 6 400 | 8 300 |
| **7211** | 55 | **2.1654** | 100 | **3.9370** | 21 | **.8268** | 1.50 | **.060** | 1.00 | **.040** | 48 800 | **11 000** | 37 500 | **8 430** | 6 000 | 7 800 |
| **7212** | 60 | **2.3622** | 110 | **4.3307** | 22 | **.8661** | 1.50 | **.060** | 1.00 | **.040** | 52 700 | **11 800** | 44 000 | **9 890** | 5 400 | 7 000 |
| **7213** | 65 | **2.5591** | 120 | **4.7244** | 23 | **.9055** | 1.50 | **.060** | 1.00 | **.040** | 63 700 | **14 300** | 54 000 | **12 100** | 4 900 | 6 400 |
| **7214** | 70 | **2.7559** | 125 | **4.9213** | 24 | **.9449** | 1.50 | **.060** | 1.00 | **.040** | 63 700 | **14 300** | 55 000 | **12 400** | 4 600 | 6 000 |
| **7215** | 75 | **2.9528** | 130 | **5.1181** | 25 | **.9843** | 1.50 | **.060** | 1.00 | **.040** | 79 300 | **17 800** | 69 500 | **15 600** | 4 300 | 5 600 |
| **7216** | 80 | **3.1496** | 140 | **5.5118** | 26 | **1.0236** | 2.00 | **.080** | 1.00 | **.040** | 74 100 | **16 700** | 67 000 | **15 100** | 4 100 | 5 300 |
| **7217** | 85 | **3.3465** | 150 | **5.9055** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 90 400 | **20 300** | 83 000 | **18 700** | 3 800 | 4 900 |
| **7218** | 90 | **3.5433** | 160 | **6.2992** | 30 | **1.1811** | 2.00 | **.080** | 1.00 | **.040** | 117 000 | **26 300** | 118 000 | **26 500** | 3 600 | 4 700 |
| **7219** | 95 | **3.7402** | 170 | **6.6929** | 32 | **1.2598** | 2.00 | **.080** | 1.00 | **.040** | 121 000 | **27 200** | 114 000 | **25 600** | 3 500 | 4 500 |
| **7220** | 100 | **3.9370** | 180 | **7.0866** | 34 | **1.3386** | 2.00 | **.080** | 1.00 | **.040** | 138 000 | **31 000** | 129 000 | **29 000** | 3 200 | 4 100 |
| **7221** | 105 | **4.1339** | 190 | **7.4803** | 36 | **1.4173** | 2.00 | **.080** | 1.00 | **.040** | 148 000 | **33 300** | 137 000 | **30 800** | 3 000 | 3 900 |
| **7222** | 110 | **4.3307** | 200 | **7.8740** | 38 | **1.4961** | 2.00 | **.080** | 1.00 | **.040** | 163 000 | **36 600** | 156 000 | **35 100** | 2 900 | 3 800 |
| **7224** | 120 | **4.7244** | 215 | **8.4646** | 40 | **1.5748** | 2.00 | **.080** | 1.00 | **.040** | 174 000 | **39 100** | 176 000 | **39 600** | 2 700 | 3 500 |
| **7226** | 130 | **5.1181** | 230 | **9.0551** | 40 | **1.5748** | 2.50 | **.100** | 1.00 | **.040** | 195 000 | **43 800** | 208 000 | **46 800** | 2 500 | 3 200 |
| **7228** | 140 | **5.5118** | 250 | **9.8425** | 42 | **1.6535** | 2.50 | **.100** | 1.00 | **.040** | 208 000 | **46 800** | 232 000 | **52 200** | 2 300 | 3 000 |
| **7230** | 150 | **5.9055** | 270 | **10.6299** | 45 | **1.7717** | 2.50 | **.100** | 1.00 | **.040** | 242 000 | **54 400** | 280 000 | **62 900** | 2 100 | 2 700 |
| **7232** | 160 | **6.2992** | 290 | **11.4173** | 48 | **1.8898** | 2.50 | **.100** | 1.00 | **.040** | 270 000 | **60 700** | 325 000 | **73 100** | 2 000 | 2 600 |
| **7234** | 170 | **6.6929** | 310 | **12.2047** | 52 | **2.0472** | 3.00 | **.120** | 1.00 | **.040** | 286 000 | **64 300** | 365 000 | **82 100** | 1 900 | 2 500 |
| **7236** | 180 | **7.0866** | 320 | **12.5984** | 52 | **2.0472** | 3.00 | **.120** | 1.00 | **.040** | 302 000 | **67 900** | 390 000 | **87 700** | 1 900 | 2 400 |
| **7238** | 190 | **7.4803** | 340 | **13.3858** | 55 | **2.1654** | 3.00 | **.120** | 1.00 | **.040** | 332 000 | **74 600** | 450 000 | **101 000** | 1 700 | 2 200 |
| **7240** | 200 | **7.8740** | 360 | **14.1732** | 58 | **2.2835** | 3.00 | **.120** | 1.00 | **.040** | 351 000 | **78 900** | 490 000 | **110 000** | 1 600 | 2 100 |
| **7242** | 210 | **8.2677** | 380 | **14.9606** | 61 | **2.4016** | 3.00 | **.120** | 1.00 | **.040** | 390 000 | **87 700** | 560 000 | **126 000** | 1 500 | 2 000 |
| **7244** | 220 | **8.6614** | 400 | **15.7480** | 65 | **2.5591** | 3.00 | **.120** | 1.00 | **.040** | 403 000 | **90 600** | 600 000 | **135 000** | 1 500 | 2 000 |
| **7246** | 230 | **9.0551** | 420 | **16.5354** | 68 | **2.6772** | 3.00 | **.120** | 1.00 | **.040** | 442 000 | **99 400** | 670 000 | **151 000** | 1 500 | 1 900 |
| **7248** | 240 | **9.4488** | 440 | **17.3228** | 72 | **2.8346** | 3.00 | **.120** | 1.00 | **.040** | 475 000 | **107 000** | 750 000 | **169 000** | 1 400 | 1 800 |
| **7250** | 250 | **9.8425** | 460 | **18.1102** | 76 | **2.9921** | 4.00 | **.160** | 1.50 | **.060** | 520 000 | **117 000** | 830 000 | **187 000** | 1 400 | 1 800 |
| **7252** | 260 | **10.2362** | 480 | **18.8976** | 80 | **3.1496** | 4.00 | **.160** | 1.50 | **.060** | 559 000 | **126 000** | 915 000 | **206 000** | 1 300 | 1 700 |
| **7256** | 280 | **11.0236** | 500 | **19.6850** | 80 | **3.1496** | 4.00 | **.160** | 1.50 | **.060** | 572 000 | **129 000** | 980 000 | **220 000** | 1 300 | 1 700 |
| **7260** | 300 | **11.8110** | 540 | **21.2598** | 85 | **3.3465** | 4.00 | **.160** | 1.50 | **.060** | 618 000 | **139 000** | 1 100 000 | **247 000** | 1 200 | 1 600 |
| **7264** | 320 | **12.5984** | 580 | **22.8346** | 92 | **3.6220** | 4.00 | **.160** | 1.50 | **.060** | 650 000 | **146 000** | 1 220 000 | **274 000** | 1 200 | 1 500 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.32 and $C_0$ by 2.94.
3) Listed values are for machined bronze cage, ABEC-1.
For phenolic composition cage, multiply by 1.33 for both grease and oil. For phenolic composition cage, ABEC-5 or 7, multiply by 1.86 for both grease and oil. For pressed steel cage, ABEC-1, multiply by 0.67 for grease and 0.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33\frac{1}{3}$ rpm.

# 7200D light series duplex




Notes:

"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

For duplex sets of 7000 and 9000 series bearings see page 243.

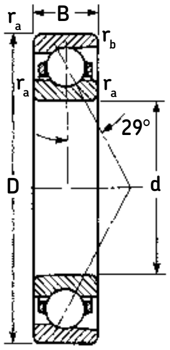
Use these values for back-to-back (DB) or face-to-face (DF) mounting arrangements.

ABEC-1 and -3 are stocked as half-pairs where available.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | Fillet radius[1] $r_a$ in. | Fillet radius[1] $r_b$ mm | Fillet radius[1] $r_b$ in. | Basic radial load rating[2] Dynamic C[4] N | Basic radial load rating[2] Dynamic C[4] lbf | Basic radial load rating[2] Static $C_0$ N | Basic radial load rating[2] Static $C_0$ lbf | Speed rating[3] Grease rpm | Speed rating[3] Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7200D** | 10 | **.3937** | 30 | **1.1811** | 18 | **.7087** | .64 | **.025** | .30 | **.012** | 8 840 | **1 900** | 5 500 | **1 240** | 22 000 | 29 000 |
| **7201D** | 12 | **.4724** | 32 | **1.2598** | 20 | **.7874** | .64 | **.025** | .30 | **.012** | 10 100 | **2 270** | 6 400 | **1 440** | 18 000 | 23 000 |
| **7202D** | 15 | **.5906** | 35 | **1.3780** | 22 | **.8661** | .64 | **.025** | .30 | **.012** | 14 800 | **3 330** | 9 500 | **2 140** | 16 000 | 21 000 |
| **7203D** | 17 | **.6693** | 40 | **1.5748** | 24 | **.9449** | .64 | **.025** | .30 | **.012** | 19 500 | **4 380** | 13 200 | **2 970** | 14 000 | 18 000 |
| **7204D** | 20 | **.7874** | 47 | **1.8504** | 28 | **1.1024** | 1.00 | **.040** | .60 | **.024** | 20 800 | **4 680** | 14 600 | **3 280** | 12 000 | 15 000 |
| **7205D** | 25 | **.9843** | 52 | **2.0472** | 30 | **1.1811** | 1.00 | **.040** | .60 | **.024** | 25 100 | **5 640** | 19 000 | **4 270** | 9 600 | 13 000 |
| **7206D** | 30 | **1.1811** | 62 | **2.4409** | 32 | **1.2598** | 1.00 | **.040** | .60 | **.024** | 27 600 | **6 200** | 23 600 | **5 310** | 8 000 | 10 000 |
| **7207D** | 35 | **1.3780** | 72 | **2.8346** | 34 | **1.3386** | 1.00 | **.040** | .60 | **.024** | 37 700 | **8 480** | 34 000 | **7 640** | 7 400 | 9 600 |
| **7208D** | 40 | **1.5748** | 80 | **3.1496** | 36 | **1.4173** | 1.00 | **.040** | .60 | **.024** | 49 400 | **11 100** | 45 500 | **10 200** | 6 200 | 8 000 |
| **7209D** | 45 | **1.7717** | 85 | **3.3465** | 38 | **1.4961** | 1.00 | **.040** | .60 | **.024** | 49 400 | **11 100** | 46 500 | **10 500** | 5 800 | 7 600 |
| **7210D** | 50 | **1.9685** | 90 | **3.5433** | 40 | **1.5748** | 1.00 | **.040** | .60 | **.024** | 54 000 | **12 100** | 54 000 | **12 100** | 5 100 | 6 600 |
| **7211D** | 55 | **2.1654** | 100 | **3.9370** | 42 | **1.6535** | 1.50 | **.060** | 1.00 | **.040** | 79 300 | **17 800** | 75 000 | **16 900** | 4 800 | 6 200 |
| **7212D** | 60 | **2.3622** | 110 | **4.3307** | 44 | **1.7323** | 1.50 | **.060** | 1.00 | **.040** | 85 200 | **19 100** | 88 000 | **19 800** | 4 300 | 5 600 |
| **7213D** | 65 | **2.5591** | 120 | **4.7244** | 46 | **1.8110** | 1.50 | **.060** | 1.00 | **.040** | 104 000 | **23 400** | 110 000 | **24 700** | 3 900 | 5 100 |
| **7214D** | 70 | **2.7559** | 125 | **4.9213** | 48 | **1.8898** | 1.50 | **.060** | 1.00 | **.040** | 104 000 | **23 400** | 110 000 | **24 700** | 3 700 | 4 800 |
| **7215D** | 75 | **2.9528** | 130 | **5.1181** | 50 | **1.9685** | 1.50 | **.060** | 1.00 | **.040** | 130 000 | **29 200** | 140 000 | **31 500** | 3 400 | 4 500 |
| **7216D** | 80 | **3.1496** | 140 | **5.5118** | 52 | **2.0472** | 2.00 | **.080** | 1.00 | **.040** | 121 000 | **27 200** | 134 000 | **30 100** | 3 300 | 4 200 |
| **7217D** | 85 | **3.3465** | 150 | **5.9055** | 56 | **2.2047** | 2.00 | **.080** | 1.00 | **.040** | 148 000 | **33 300** | 166 000 | **37 300** | 3 000 | 3 900 |
| **7218D** | 90 | **3.5433** | 160 | **6.2992** | 60 | **2.3622** | 2.00 | **.080** | 1.00 | **.040** | 190 000 | **42 700** | 236 000 | **53 100** | 2 900 | 3 800 |
| **7219D** | 95 | **3.7402** | 170 | **6.6929** | 64 | **2.5197** | 2.00 | **.080** | 1.00 | **.040** | 199 000 | **44 700** | 228 000 | **51 300** | 2 800 | 3 600 |
| **7220D** | 100 | **3.9370** | 180 | **7.0866** | 68 | **2.6772** | 2.00 | **.080** | 1.00 | **.040** | 225 000 | **50 600** | 260 000 | **58 500** | 2 600 | 3 300 |
| **7221D** | 105 | **4.1339** | 190 | **7.4803** | 72 | **2.8346** | 2.00 | **.080** | 1.00 | **.040** | 242 000 | **54 400** | 295 000 | **66 300** | 2 400 | 3 100 |
| **7222D** | 110 | **4.3307** | 200 | **7.8740** | 76 | **2.9921** | 2.00 | **.080** | 1.00 | **.040** | 265 000 | **59 600** | 310 000 | **69 700** | 2 300 | 3 000 |
| **7224D** | 120 | **4.7244** | 215 | **8.4646** | 80 | **3.1496** | 2.00 | **.080** | 1.00 | **.040** | 281 000 | **63 200** | 355 000 | **79 800** | 2 200 | 2 800 |
| **7226D** | 130 | **5.1181** | 230 | **9.0551** | 80 | **3.1496** | 2.50 | **.100** | 1.00 | **.040** | 319 000 | **71 700** | 415 000 | **93 300** | 2 000 | 2 600 |
| **7228D** | 140 | **5.5118** | 250 | **9.8425** | 84 | **3.3071** | 2.50 | **.100** | 1.00 | **.040** | 338 000 | **76 000** | 465 000 | **105 000** | 1 800 | 2 400 |
| **7230D** | 150 | **5.9055** | 270 | **10.6299** | 90 | **3.5433** | 2.50 | **.100** | 1.00 | **.040** | 397 000 | **89 200** | 560 000 | **126 000** | 1 700 | 2 200 |
| **7232D** | 160 | **6.2992** | 290 | **11.4173** | 96 | **3.7795** | 2.50 | **.100** | 1.00 | **.040** | 442 000 | **99 400** | 670 000 | **135 000** | 1 600 | 2 100 |
| **7234D** | 170 | **6.6929** | 310 | **12.2047** | 104 | **4.0945** | 3.00 | **.120** | 1.00 | **.040** | 468 000 | **105 000** | 735 000 | **165 000** | 1 500 | 2 000 |
| **7236D** | 180 | **7.0866** | 320 | **12.5984** | 104 | **4.0945** | 3.00 | **.120** | 1.00 | **.040** | 494 000 | **111 000** | 780 000 | **175 000** | 1 500 | 1 900 |
| **7238D** | 190 | **7.4803** | 340 | **13.3858** | 110 | **4.3307** | 3.00 | **.120** | 1.00 | **.040** | 540 000 | **121 000** | 900 000 | **202 000** | 1 400 | 1 800 |
| **7240D** | 200 | **7.8740** | 360 | **14.1732** | 116 | **4.5669** | 3.00 | **.120** | 1.00 | **.040** | 572 000 | **129 000** | 965 000 | **217 000** | 1 300 | 1 700 |
| **7242D** | 210 | **8.2677** | 380 | **14.9606** | 122 | **4.8031** | 3.00 | **.120** | 1.00 | **.040** | 637 000 | **143 000** | 1 120 000 | **252 000** | 1 200 | 1 600 |
| **7244D** | 220 | **8.6614** | 400 | **15.7480** | 130 | **5.1181** | 3.00 | **.120** | 1.00 | **.040** | 650 000 | **146 000** | 1 200 000 | **270 000** | 1 200 | 1 600 |
| **7246D** | 230 | **9.0551** | 420 | **16.5354** | 136 | **5.3543** | 3.00 | **.120** | 1.00 | **.040** | 715 000 | **161 000** | 1 340 000 | **301 000** | 1 200 | 1 500 |
| **7248D** | 240 | **9.4488** | 440 | **17.3228** | 144 | **5.6693** | 3.00 | **.120** | 1.00 | **.040** | 780 000 | **175 000** | 1 500 000 | **337 000** | 1 100 | 1 400 |
| **7250D** | 250 | **9.8425** | 460 | **18.1102** | 152 | **5.9843** | 4.00 | **.160** | 1.50 | **.060** | 852 000 | **192 000** | 1 660 000 | **373 000** | 1 100 | 1 400 |
| **7252D** | 260 | **10.2362** | 480 | **18.8976** | 160 | **6.2992** | 4.00 | **.160** | 1.50 | **.060** | 904 000 | **203 000** | 1 830 000 | **411 000** | 1 000 | 1 400 |
| **7256D** | 280 | **11.0236** | 500 | **19.6850** | 160 | **6.2992** | 4.00 | **.160** | 1.50 | **.060** | 936 000 | **210 000** | 2 000 000 | **450 000** | 1 000 | 1 400 |
| **7260D** | 300 | **11.8110** | 540 | **21.2598** | 170 | **6.6929** | 4.00 | **.160** | 1.50 | **.060** | 1 010 000 | **227 000** | 2 200 000 | **495 000** | 960 | 1 300 |
| **7264D** | 320 | **12.5984** | 580 | **22.8346** | 184 | **7.2441** | 4.00 | **.160** | 1.50 | **.060** | 1 060 000 | **238 000** | 2 400 000 | **540 000** | 960 | 1 200 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 0.81 and $C_0$ by 1.47.
3) Listed values are for machined bronze cage, ABEC-1.
For phenolic composition cage, multiply by 1.33 for both grease and oil. For phenolic composition cage, ABEC-5 or 7, multiply by 1.86 for both grease and oil. For pressed steel cage, ABEC-1, multiply by 0.67 for grease and 0.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33\frac{1}{3}$ rpm.

# 7300 medium series single ball bearings



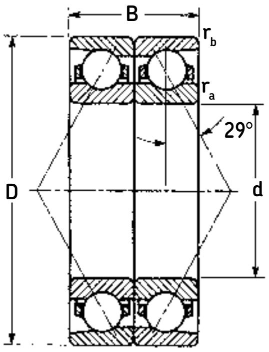

7300 series bearings have the same ring and ball cage construction as the 7200 series but are heavier sectioned bearings with a ball complement capable of handling heavier loads. 7300 series are listed with bore sizes from 10 mm to 280 mm. For two-directional thrust loads, use duplex bearings.

**Caution: Single bearings are not to be used where only radial loads are present. For two-directional thrust loads, use duplex bearings.**

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | $r_a$ in. | $r_b$ mm | $r_b$ in. | Basic radial load rating[2] Dynamic C[4] N | Dynamic C lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[3] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7300** | 10 | **.3937** | 35 | **1.3780** | 11 | **.4331** | .64 | **.025** | .60 | **.024** | 6 370 | **1 430** | 3 200 | **719** | 24 000 | 31 000 |
| **7301** | 12 | **.4724** | 37 | **1.4567** | 12 | **.4724** | 1.00 | **.040** | .60 | **.024** | 7 020 | **1 580** | 3 750 | **843** | 19 000 | 25 000 |
| **7302** | 15 | **.5906** | 42 | **1.6535** | 13 | **.5118** | 1.00 | **.040** | .60 | **.024** | 13 500 | **3 030** | 7 100 | **1 600** | 16 000 | 21 000 |
| **7303** | 17 | **.6693** | 47 | **1.8504** | 14 | **.5512** | 1.00 | **.040** | .60 | **.024** | 15 900 | **3 570** | 8 650 | **1 940** | 15 000 | 19 000 |
| **7304** | 20 | **.7874** | 52 | **2.0472** | 15 | **.5906** | 1.00 | **.040** | .60 | **.024** | 18 600 | **4 180** | 10 600 | **2 380** | 13 000 | 17 000 |
| **7305** | 25 | **.9843** | 62 | **2.4409** | 17 | **.6693** | 1.00 | **.040** | .60 | **.024** | 21 200 | **4 770** | 13 700 | **3 080** | 11 000 | 14 000 |
| **7306** | 30 | **1.1811** | 72 | **2.8346** | 19 | **.7480** | 1.00 | **.040** | .60 | **.024** | 28 100 | **6 320** | 18 600 | **4 180** | 9 200 | 12 000 |
| **7307** | 35 | **1.3780** | 80 | **3.1496** | 21 | **.8268** | 1.50 | **.060** | 1.00 | **.040** | 35 800 | **8 050** | 24 000 | **5 400** | 8 500 | 11 000 |
| **7308** | 40 | **1.5748** | 90 | **3.5433** | 23 | **.9055** | 1.50 | **.060** | 1.00 | **.040** | 44 200 | **9 940** | 30 500 | **6 860** | 7 300 | 9 500 |
| **7309** | 45 | **1.7717** | 100 | **3.9370** | 25 | **.9843** | 1.50 | **.060** | 1.00 | **.040** | 52 700 | **11 800** | 37 500 | **8 430** | 6 400 | 8 300 |
| **7310** | 50 | **1.9685** | 110 | **4.3307** | 27 | **1.0630** | 2.00 | **.080** | 1.00 | **.040** | 74 100 | **16 700** | 53 000 | **11 900** | 5 800 | 7 500 |
| **7311** | 55 | **2.1654** | 120 | **4.7244** | 29 | **1.1417** | 2.00 | **.080** | 1.00 | **.040** | 85 200 | **19 200** | 62 000 | **13 900** | 5 100 | 6 600 |
| **7312** | 60 | **2.3622** | 130 | **5.1181** | 31 | **1.2205** | 2.00 | **.080** | 1.00 | **.040** | 97 500 | **21 900** | 72 000 | **16 200** | 4 900 | 6 400 |
| **7313** | 65 | **2.5591** | 140 | **5.5118** | 33 | **1.2992** | 2.00 | **.080** | 1.00 | **.040** | 108 000 | **24 300** | 86 500 | **19 400** | 4 600 | 6 000 |
| **7314** | 70 | **2.7559** | 150 | **5.9055** | 35 | **1.3780** | 2.00 | **.080** | 1.00 | **.040** | 111 000 | **25 000** | 85 000 | **19 100** | 4 100 | 5 300 |
| **7315** | 75 | **2.9528** | 160 | **6.2992** | 37 | **1.4567** | 2.00 | **.080** | 1.00 | **.040** | 138 000 | **31 000** | 114 000 | **25 600** | 3 900 | 5 000 |
| **7316** | 80 | **3.1496** | 170 | **6.6929** | 39 | **1.5354** | 2.00 | **.080** | 1.00 | **.040** | 143 000 | **32 100** | 120 000 | **27 000** | 3 600 | 4 700 |
| **7317** | 85 | **3.3465** | 180 | **7.0866** | 41 | **1.6142** | 2.50 | **.100** | 1.00 | **.040** | 163 000 | **36 600** | 143 000 | **32 100** | 3 500 | 4 500 |
| **7318** | 90 | **3.5433** | 190 | **7.4803** | 43 | **1.6929** | 2.50 | **.100** | 1.00 | **.040** | 168 000 | **37 800** | 150 000 | **33 700** | 3 200 | 4 200 |
| **7319** | 95 | **3.7402** | 200 | **7.8740** | 45 | **1.7717** | 2.50 | **.100** | 1.00 | **.040** | 178 000 | **40 000** | 166 000 | **37 300** | 3 100 | 4 000 |
| **7320** | 100 | **3.9370** | 215 | **8.4646** | 47 | **1.8504** | 2.50 | **.100** | 1.00 | **.040** | 190 000 | **42 700** | 183 000 | **41 100** | 3 000 | 3 900 |
| **7321** | 105 | **4.1339** | 225 | **8.8583** | 49 | **1.9291** | 2.50 | **.100** | 1.00 | **.040** | 203 000 | **45 600** | 200 000 | **45 000** | 2 900 | 3 800 |
| **7322** | 110 | **4.3307** | 240 | **9.4488** | 50 | **1.9685** | 2.50 | **.100** | 1.00 | **.040** | 229 000 | **51 500** | 236 000 | **53 100** | 2 700 | 3 500 |
| **7324** | 120 | **4.7244** | 260 | **10.2362** | 55 | **2.1654** | 2.50 | **.100** | 1.00 | **.040** | 260 000 | **58 500** | 275 000 | **61 800** | 2 500 | 3 200 |
| **7326** | 130 | **5.1181** | 280 | **11.0236** | 58 | **2.2835** | 3.00 | **.120** | 1.00 | **.040** | 286 000 | **64 300** | 320 000 | **71 900** | 2 300 | 3 000 |
| **7328** | 140 | **5.5118** | 300 | **11.8110** | 62 | **2.4409** | 3.00 | **.120** | 1.00 | **.040** | 312 000 | **70 100** | 375 000 | **84 300** | 2 200 | 2 800 |
| **7330** | 150 | **5.9055** | 320 | **12.5984** | 65 | **2.5591** | 3.00 | **.120** | 1.00 | **.040** | 345 000 | **77 600** | 430 000 | **96 700** | 2 000 | 2 600 |
| **7332** | 160 | **6.2992** | 340 | **13.3858** | 68 | **2.6772** | 3.00 | **.120** | 1.00 | **.040** | 377 000 | **84 800** | 490 000 | **110 000** | 1 900 | 2 500 |
| **7334** | 170 | **6.6929** | 360 | **14.1732** | 72 | **2.8346** | 3.00 | **.120** | 1.00 | **.040** | 397 000 | **89 200** | 520 000 | **117 000** | 1 900 | 2 400 |
| **7336** | 180 | **7.0866** | 380 | **14.9606** | 75 | **2.9528** | 3.00 | **.120** | 1.00 | **.040** | 423 000 | **95 100** | 585 000 | **132 000** | 1 800 | 2 300 |
| **7338** | 190 | **7.4803** | 400 | **15.7480** | 78 | **3.0709** | 4.00 | **.160** | 1.50 | **.060** | 462 000 | **104 000** | 655 000 | **147 000** | 1 600 | 2 100 |
| **7340** | 200 | **7.8740** | 420 | **16.5354** | 80 | **3.1496** | 4.00 | **.160** | 1.50 | **.060** | 494 000 | **111 000** | 720 000 | **162 000** | 1 500 | 2 000 |
| **7342** | 210 | **8.2677** | 440 | **17.3228** | 84 | **3.3071** | 4.00 | **.160** | 1.50 | **.060** | 527 000 | **118 000** | 800 000 | **180 000** | 1 500 | 1 900 |
| **7344** | 220 | **8.6614** | 460 | **18.1102** | 88 | **3.4646** | 4.00 | **.160** | 1.50 | **.060** | 559 000 | **126 000** | 865 000 | **194 000** | 1 400 | 1 800 |
| **7348** | 240 | **9.4488** | 500 | **19.6850** | 95 | **3.7402** | 4.00 | **.160** | 1.50 | **.060** | 605 000 | **136 000** | 965 000 | **217 000** | 1 400 | 1 700 |
| **7352** | 260 | **10.2362** | 540 | **21.2598** | 102 | **4.0157** | 5.00 | **.200** | 2.00 | **.080** | 663 000 | **149 000** | 1 140 000 | **256 000** | 1 300 | 1 600 |
| **7356** | 280 | **11.0236** | 580 | **22.8346** | 108 | **4.2520** | 5.00 | **.200** | 2.00 | **.080** | 741 000 | **167 000** | 1 340 000 | **301 000** | 1 200 | 1 500 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.32 and $C_0$ by 2.94.
3) Listed values are for machined bronze cage, ABEC-1.
For phenolic composition cage, multiply by 1.33 for both grease and oil. For phenolic composition cage, ABEC-5 or 7, multiply by 1.86 for both grease and oil. For pressed steel cage, ABEC-1, multiply by 0.67 for grease and 0.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33\frac{1}{3}$ rpm.

# 7300D medium series duplex




Notes:

"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description. For duplex sets of 7000 and 9000 series bearings see page 243.

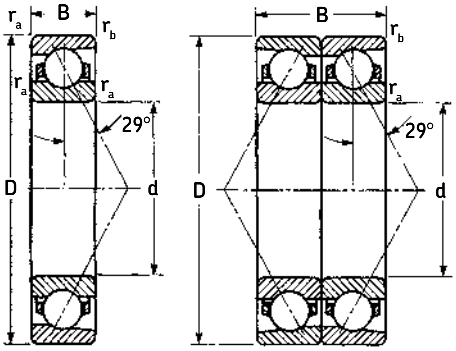
Use these values for back-to-back (DB) or face-to-face (DF) mounting arrangements.

ABEC-1 and -3 are stocked as half-pairs where available.

| MRC bearing number | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | Basic radial load rating[2] | | | | Speed rating[3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Dynamic | | Static | | | |
| | d | | D | | B | | $r_a$ | | $r_b$ | | C[4] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **7300D** | 10 | **.3937** | 35 | **1.3780** | 22 | **.8661** | .64 | **.025** | .60 | **.024** | 10 400 | **2 340** | 6 400 | **1 440** | 19 000 | 25 000 |
| **7301D** | 12 | **.4724** | 37 | **1.4567** | 24 | **.9449** | 1.00 | **.040** | .60 | **.024** | 11 400 | **2 560** | 7 500 | **1 690** | 15 000 | 20 000 |
| **7302D** | 15 | **.5906** | 42 | **1.6535** | 26 | **1.0236** | 1.00 | **.040** | .60 | **.024** | 21 600 | **4 860** | 14 300 | **3 210** | 13 000 | 17 000 |
| **7303D** | 17 | **.6693** | 47 | **1.8504** | 28 | **1.1024** | 1.00 | **.040** | .60 | **.024** | 26 000 | **5 850** | 17 300 | **3 890** | 12 000 | 15 000 |
| **7304D** | 20 | **.7874** | 52 | **2.0472** | 30 | **1.1811** | 1.00 | **.040** | .60 | **.024** | 30 200 | **6 790** | 21 200 | **4 770** | 10 000 | 14 000 |
| **7305D** | 25 | **.9843** | 62 | **2.4409** | 34 | **1.3386** | 1.00 | **.040** | .60 | **.024** | 34 500 | **7 760** | 27 000 | **6 070** | 8 800 | 11 000 |
| **7306D** | 30 | **1.1811** | 72 | **2.8346** | 38 | **1.4961** | 1.00 | **.040** | .60 | **.024** | 46 200 | **10 400** | 37 500 | **8 430** | 7 400 | 9 600 |
| **7307D** | 35 | **1.3780** | 80 | **3.1496** | 42 | **1.6535** | 1.50 | **.060** | 1.00 | **.040** | 58 500 | **13 200** | 48 000 | **10 800** | 6 800 | 8 800 |
| **7308D** | 40 | **1.5748** | 90 | **3.5433** | 46 | **1.8110** | 1.50 | **.060** | 1.00 | **.040** | 71 500 | **16 100** | 61 000 | **13 700** | 5 800 | 7 600 |
| **7309D** | 45 | **1.7717** | 100 | **3.9370** | 50 | **1.9685** | 1.50 | **.060** | 1.00 | **.040** | 85 200 | **19 200** | 75 000 | **16 900** | 5 100 | 6 600 |
| **7310D** | 50 | **1.9685** | 110 | **4.3307** | 54 | **2.1260** | 2.00 | **.080** | 1.00 | **.040** | 121 000 | **27 200** | 106 000 | **23 800** | 4 600 | 6 000 |
| **7311D** | 55 | **2.1654** | 120 | **4.7244** | 58 | **2.2835** | 2.00 | **.080** | 1.00 | **.040** | 140 000 | **31 500** | 125 000 | **28 100** | 4 100 | 5 300 |
| **7312D** | 60 | **2.3622** | 130 | **5.1181** | 62 | **2.4409** | 2.00 | **.080** | 1.00 | **.040** | 159 000 | **35 700** | 146 000 | **32 800** | 3 900 | 5 100 |
| **7313D** | 65 | **2.5591** | 140 | **5.5118** | 66 | **2.5984** | 2.00 | **.080** | 1.00 | **.040** | 178 000 | **40 000** | 173 000 | **38 900** | 3 700 | 4 800 |
| **7314D** | 70 | **2.7559** | 150 | **5.9055** | 70 | **2.7559** | 2.00 | **.080** | 1.00 | **.040** | 182 000 | **40 900** | 170 000 | **38 200** | 3 300 | 4 200 |
| **7315D** | 75 | **2.9528** | 160 | **6.2992** | 74 | **2.9134** | 2.00 | **.080** | 1.00 | **.040** | 225 000 | **50 600** | 228 000 | **51 300** | 3 100 | 4 000 |
| **7316D** | 80 | **3.1496** | 170 | **6.6929** | 78 | **3.0709** | 2.00 | **.080** | 1.00 | **.040** | 234 000 | **52 600** | 240 000 | **54 000** | 2 900 | 3 800 |
| **7317D** | 85 | **3.3465** | 180 | **7.0866** | 82 | **3.2283** | 2.50 | **.100** | 1.00 | **.040** | 265 000 | **59 600** | 285 000 | **64 100** | 2 800 | 3 600 |
| **7318D** | 90 | **3.5433** | 190 | **7.4803** | 86 | **3.3858** | 2.50 | **.100** | 1.00 | **.040** | 276 000 | **62 000** | 300 000 | **67 400** | 2 600 | 3 400 |
| **7319D** | 95 | **3.7402** | 200 | **7.8740** | 90 | **3.5433** | 2.50 | **.100** | 1.00 | **.040** | 291 000 | **65 400** | 325 000 | **73 100** | 2 500 | 3 200 |
| **7320D** | 100 | **3.9370** | 215 | **8.4646** | 94 | **3.7008** | 2.50 | **.100** | 1.00 | **.040** | 312 000 | **70 100** | 365 000 | **82 100** | 2 400 | 3 100 |
| **7321D** | 105 | **4.1339** | 225 | **8.8583** | 98 | **3.8583** | 2.50 | **.100** | 1.00 | **.040** | 332 000 | **74 600** | 400 000 | **89 900** | 2 300 | 3 000 |
| **7322D** | 110 | **4.3307** | 240 | **9.4488** | 100 | **3.9370** | 2.50 | **.100** | 1.00 | **.040** | 371 000 | **83 400** | 475 000 | **107 000** | 2 200 | 2 800 |
| **7324D** | 120 | **4.7244** | 260 | **10.2362** | 110 | **4.3307** | 2.50 | **.100** | 1.00 | **.040** | 423 000 | **95 100** | 560 000 | **126 000** | 2 000 | 2 600 |
| **7326D** | 130 | **5.1181** | 280 | **11.0236** | 116 | **4.5669** | 3.00 | **.120** | 1.00 | **.040** | 468 000 | **105 000** | 640 000 | **144 000** | 1 800 | 2 400 |
| **7328D** | 140 | **5.5118** | 300 | **11.8110** | 124 | **4.8819** | 3.00 | **.120** | 1.00 | **.040** | 507 000 | **114 000** | 735 000 | **165 000** | 1 800 | 2 200 |
| **7330D** | 150 | **5.9055** | 320 | **12.5984** | 130 | **5.1181** | 3.00 | **.120** | 1.00 | **.040** | 559 000 | **126 000** | 865 000 | **194 000** | 1 600 | 2 100 |
| **7332D** | 160 | **6.2992** | 340 | **13.3858** | 136 | **5.3543** | 3.00 | **.120** | 1.00 | **.040** | 618 000 | **139 000** | 965 000 | **217 000** | 1 500 | 2 000 |
| **7334D** | 170 | **6.6929** | 360 | **14.1732** | 144 | **5.6693** | 3.00 | **.120** | 1.00 | **.040** | 650 000 | **146 000** | 1 040 000 | **234 000** | 1 500 | 1 900 |
| **7336D** | 180 | **7.0866** | 380 | **14.9606** | 150 | **5.9055** | 3.00 | **.120** | 1.00 | **.040** | 689 000 | **155 000** | 1 160 000 | **261 000** | 1 400 | 1 800 |
| **7338D** | 190 | **7.4803** | 400 | **15.7480** | 156 | **6.1417** | 4.00 | **.160** | 1.50 | **.060** | 761 000 | **171 000** | 1 290 000 | **270 000** | 1 300 | 1 700 |
| **7340D** | 200 | **7.8740** | 420 | **16.5354** | 160 | **6.2992** | 4.00 | **.160** | 1.50 | **.060** | 806 000 | **181 000** | 1 430 000 | **321 000** | 1 200 | 1 600 |
| **7342D** | 210 | **8.2677** | 440 | **17.3228** | 168 | **6.6142** | 4.00 | **.160** | 1.50 | **.060** | 852 000 | **192 000** | 1 600 000 | **360 000** | 1 200 | 1 500 |
| **7344D** | 220 | **8.6614** | 460 | **18.1102** | 176 | **6.9291** | 4.00 | **.160** | 1.50 | **.060** | 904 000 | **203 000** | 1 730 000 | **389 000** | 1 100 | 1 400 |
| **7348D** | 240 | **9.4488** | 500 | **19.6850** | 190 | **7.4803** | 4.00 | **.160** | 1.50 | **.060** | 975 000 | **219 000** | 1 930 000 | **434 000** | 1 000 | 1 400 |
| **7352D** | 260 | **10.2362** | 540 | **21.2598** | 204 | **8.0315** | 5.00 | **.200** | 2.00 | **.080** | 1 080 000 | **243 000** | 2 280 000 | **513 000** | 960 | 1 300 |
| **7356D** | 280 | **11.0236** | 580 | **22.8346** | 216 | **8.5039** | 5.00 | **.200** | 2.00 | **.080** | 1 210 000 | **272 000** | 2 650 000 | **596 000** | 960 | 1 200 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 0.81 and $C_0$ by 1.47.
3) Listed values are for machined bronze cage, ABEC-1.
For phenolic composition cage, multiply by 1.33 for both grease and oil. For phenolic composition cage, ABEC-5 or 7, multiply by 1.86 for both grease and oil. For pressed steel cage, ABEC-1, multiply by 0.67 for grease and 0.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 7400 and 7400D heavy series




7400 series bearings are similar to the 7200 and 7300 series but are heavier sectioned and are used for heavy one-directional thrust loads or combined radial and thrust loads where the thrust load is predominant.

**Caution: Single bearings are not to be used where only radial loads are present. For two-directional thrust loads, use duplex bearings.**

Notes:

"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

Values for D bearings are for back-to-back or face-to-face (DF) mounting arrangements.

ABEC-1 and -3 are stocked as half-pairs where available.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1)] $r_a$ mm | $r_a$ in. | $r_b$ mm | $r_b$ in. | Basic radial load rating[2)] Dynamic C[4)] N | Dynamic C lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[3)] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7403** | 17 | **.6693** | 62 | **2.4409** | 17 | **.6693** | 1.0 | **.04** | .60 | **.024** | 26 000 | **5 850** | 13 700 | **3 080** | 14 000 | 18 000 |
| **7404** | 20 | **.7874** | 72 | **2.8346** | 19 | **.7480** | 1.0 | **.04** | .60 | **.024** | 32 500 | **7 310** | 17 600 | **3 960** | 12 000 | 15 000 |
| **7405** | 25 | **.9843** | 80 | **3.1496** | 21 | **.8268** | 1.5 | **.06** | 1.00 | **.040** | 42 300 | **9 510** | 24 500 | **5 510** | 9 200 | 12 000 |
| **7406** | 30 | **1.1811** | 90 | **3.5433** | 23 | **.9055** | 1.5 | **.06** | 1.00 | **.040** | 54 000 | **12 100** | 34 000 | **7 640** | 7 700 | 10 000 |
| **7407** | 35 | **1.3780** | 100 | **3.9370** | 25 | **.9843** | 1.5 | **.06** | 1.00 | **.040** | 63 700 | **14 300** | 40 500 | **9 100** | 6 600 | 8 500 |
| **7408** | 40 | **1.5748** | 110 | **4.3307** | 27 | **1.0630** | 2.0 | **.08** | 1.00 | **.040** | 74 100 | **16 700** | 49 000 | **11 000** | 5 400 | 7 700 |
| **7409** | 45 | **1.7717** | 120 | **4.7244** | 29 | **1.1417** | 2.0 | **.08** | 1.00 | **.040** | 85 200 | **19 200** | 57 000 | **12 800** | 5 300 | 6 900 |
| **7410** | 50 | **1.9685** | 130 | **5.1181** | 31 | **1.2205** | 2.0 | **.08** | 1.00 | **.040** | 95 600 | **21 500** | 72 000 | **16 200** | 4 900 | 6 400 |
| **7411** | 55 | **2.1654** | 140 | **5.5118** | 33 | **1.2992** | 2.0 | **.08** | 1.00 | **.040** | 108 000 | **24 300** | 78 000 | **17 500** | 4 500 | 5 800 |
| **7412** | 60 | **2.3622** | 150 | **5.9055** | 35 | **1.3780** | 2.0 | **.08** | 1.00 | **.040** | 127 000 | **28 600** | 93 000 | **20 900** | 4 100 | 5 300 |
| **7413** | 65 | **2.5591** | 160 | **6.2992** | 37 | **1.4567** | 2.0 | **.08** | 1.00 | **.040** | 138 000 | **31 000** | 106 000 | **23 800** | 3 800 | 4 900 |
| **7414** | 70 | **2.7559** | 180 | **7.0866** | 42 | **1.6535** | 2.5 | **.10** | 1.00 | **.040** | 168 000 | **37 800** | 140 000 | **31 500** | 3 500 | 4 600 |
| **7415** | 75 | **2.9528** | 190 | **7.4803** | 45 | **1.7717** | 2.5 | **.10** | 1.00 | **.040** | 182 000 | **40 900** | 156 000 | **35 100** | 3 300 | 4 300 |
| **7416** | 80 | **3.1496** | 200 | **7.8740** | 48 | **1.8898** | 2.5 | **.10** | 1.00 | **.040** | 190 000 | **42 700** | 170 000 | **38 200** | 3 200 | 4 100 |
| **7417** | 85 | **3.3465** | 210 | **8.2677** | 52 | **2.0472** | 3.0 | **.12** | 1.00 | **.040** | 203 000 | **45 600** | 186 000 | **41 800** | 2 900 | 3 800 |
| **7418** | 90 | **3.5433** | 225 | **8.8583** | 54 | **2.1260** | 3.0 | **.12** | 1.00 | **.040** | 229 000 | **51 500** | 220 000 | **49 500** | 2 700 | 3 500 |
| **7419** | 95 | **3.7402** | 250 | **9.8425** | 55 | **2.1654** | 3.0 | **.12** | 1.00 | **.040** | 255 000 | **57 300** | 255 000 | **57 300** | 2 500 | 3 300 |
| **7420** | 100 | **3.9370** | 265 | **10.4331** | 60 | **2.3622** | 3.0 | **.12** | 1.00 | **.040** | 276 000 | **62 000** | 290 000 | **65 200** | 2 400 | 3 200 |
| **7421** | 105 | **4.1339** | 290 | **11.4173** | 65 | **2.5591** | 3.0 | **.12** | 1.00 | **.040** | 332 000 | **74 600** | 325 000 | **73 100** | 2 300 | 3 000 |
| **7422** | 110 | **4.3307** | 320 | **12.5984** | 70 | **2.7559** | 3.0 | **.12** | 1.00 | **.040** | 371 000 | **83 400** | 390 000 | **87 700** | 2 200 | 2 900 |
| **7400D** | | | | | | | | | | | | | | | | |
| **7403D** | 17 | **.6693** | 62 | **2.4409** | 34 | **1.3386** | 1.0 | **.04** | .600 | **.024** | 42 300 | **9 510** | 27 000 | **6 070** | 11 000 | 14 000 |
| **7404D** | 20 | **.7874** | 72 | **2.8346** | 38 | **1.4961** | 1.0 | **.04** | .600 | **.024** | 52 700 | **11 800** | 35 500 | **7 980** | 9 600 | 12 000 |
| **7405D** | 25 | **.9843** | 80 | **3.1496** | 42 | **1.6535** | 1.5 | **.06** | 1.00 | **.040** | 68 900 | **15 500** | 49 000 | **11 000** | 7 400 | 9 600 |
| **7406D** | 30 | **1.1811** | 90 | **3.5433** | 46 | **1.8110** | 1.5 | **.06** | 1.00 | **.040** | 88 400 | **19 900** | 68 000 | **15 300** | 6 200 | 8 000 |
| **7407D** | 35 | **1.3780** | 100 | **3.9370** | 50 | **1.9685** | 1.5 | **.06** | 1.00 | **.040** | 104 000 | **23 400** | 81 500 | **18 300** | 5 300 | 6 800 |
| **7408D** | 40 | **1.5748** | 110 | **4.3307** | 54 | **2.1260** | 2.0 | **.08** | 1.00 | **.040** | 121 000 | **27 200** | 96 500 | **21 700** | 4 300 | 6 200 |
| **7409D** | 45 | **1.7717** | 120 | **4.7244** | 58 | **2.2835** | 2.0 | **.08** | 1.00 | **.040** | 138 000 | **31 000** | 114 000 | **25 600** | 4 200 | 5 500 |
| **7410D** | 50 | **1.9685** | 130 | **5.1181** | 62 | **2.4409** | 2.0 | **.08** | 1.00 | **.040** | 156 000 | **35 100** | 146 000 | **32 800** | 3 900 | 5 100 |
| **7411D** | 55 | **2.1654** | 140 | **5.5118** | 66 | **2.5984** | 2.0 | **.08** | 1.00 | **.040** | 178 000 | **40 000** | 156 000 | **35 100** | 3 600 | 4 600 |
| **7412D** | 60 | **2.3622** | 150 | **5.9055** | 70 | **2.7559** | 2.0 | **.08** | 1.00 | **.040** | 203 000 | **45 600** | 190 000 | **42 700** | 3 300 | 4 200 |
| **7413D** | 65 | **2.5591** | 160 | **6.2992** | 74 | **2.9134** | 2.0 | **.08** | 1.00 | **.040** | 225 000 | **50 600** | 275 000 | **61 800** | 3 000 | 3 900 |
| **7414D** | 70 | **2.7559** | 180 | **7.0866** | 84 | **3.3071** | 2.5 | **.10** | 1.00 | **.040** | 276 000 | **62 000** | 280 000 | **62 900** | 2 800 | 3 700 |
| **7415D** | 75 | **2.9528** | 190 | **7.4803** | 90 | **3.5433** | 2.5 | **.10** | 1.00 | **.040** | 291 000 | **65 400** | 310 000 | **69 700** | 2 600 | 3 400 |
| **7416D** | 80 | **3.1496** | 200 | **7.8740** | 96 | **3.7795** | 2.5 | **.10** | 1.00 | **.040** | 312 000 | **70 100** | 340 000 | **76 400** | 2 500 | 3 300 |
| **7417D** | 85 | **3.3465** | 210 | **8.2677** | 104 | **4.0945** | 3.0 | **.12** | 1.00 | **.040** | 332 000 | **74 200** | 375 000 | **84 300** | 2 300 | 3 000 |
| **7418D** | 90 | **3.5433** | 225 | **8.8583** | 108 | **4.2520** | 3.0 | **.12** | 1.00 | **.040** | 371 000 | **83 400** | 440 000 | **98 900** | 2 200 | 2 800 |
| **7419D** | 95 | **3.7402** | 250 | **9.8425** | 110 | **4.3307** | 3.0 | **.12** | 1.00 | **.040** | 410 000 | **92 200** | 510 000 | **115 000** | 2 000 | 2 600 |
| **7420D** | 100 | **3.9370** | 265 | **10.4331** | 120 | **4.7244** | 3.0 | **.12** | 1.00 | **.040** | 449 000 | **101 000** | 585 000 | **132 000** | 1 900 | 2 600 |
| **7421D** | 105 | **4.1339** | 290 | **11.4173** | 130 | **5.1181** | 3.0 | **.12** | 1.00 | **.040** | 540 000 | **121 000** | 670 000 | **151 000** | 1 800 | 2 400 |
| **7422D** | 110 | **4.3307** | 320 | **12.5984** | 140 | **5.5118** | 3.0 | **.12** | 1.00 | **.040** | 605 000 | **136 000** | 800 000 | **180 000** | 1 700 | 2 300 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.32 and $C_0$ by 2.94 (single) and C by 0.81 and $C_0$ by 1.47 (duplex).
3) Listed values are for machined bronze cage, ABEC-1.
For phenolic composition cage, multiply by 1.33 for both grease and oil. For phenolic composition cage, ABEC-5 or 7, multiply by 1.86 for both grease and oil. For pressed steel cage, ABEC-1, multiply by 0.67 for grease and 0.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33\frac{1}{3}$ rpm.

# 7000 series 29° angular contact ball bearings single bearing

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

$P = F_R$ when $F_A/F_R \leq 0.80$

or

$P = 0.39\ F_R + 0.76\ F_A$ when $F_A/F_R > 0.80$

P = Dynamic equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

### Life rating

$$L10 = \left(\frac{C}{P}\right)^3 \text{ (millions of revolutions)}$$

or

$$L10_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 \text{ (hours)}$$

C = Basic dynamic radial load rating (from single bearing tables)

P = Dynamic equivalent radial load

n = Speed in rpm

### Static equivalent radial load

$P_0 = 0.50\ F_R + 0.34\ F_A$

$P_0$ is always $\geq F_R$

$P_0$ = Static equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

## Minimum thrust load for angular contact ball bearings

Satisfactory operation of angular contact ball bearings requires sufficient traction forces between the balls and races to minimize damage caused by sliding or skidding. This is particularly important at high speeds where the inertia forces of the balls and cage and the viscous drag in the lubricant can have a detrimental influence on the rolling conditions.

The minimum required thrust load can be determined from the following formula.

$$F_A = A\left(\frac{n}{1000}\right)^2 \text{newtons}$$

or

$$F_A = 0.2248\,A\left(\frac{n}{1000}\right)^2 \text{ pounds}$$

Where, $F_A$ = Minimum thrust load

A = Bearing design factor listed in the following tables

n = Speed in rpm

Note: For duplex bearings mounted in tandem, multiply the single-bearing thrust value by the number of bearings in tandem.

## Minimum thrust load A factor

| Size | A | Size | A | Size | A | Size | A |
|---|---|---|---|---|---|---|---|
| 7100KR | 0.06 | 7152KR | 2784.00 | 7212 | 17.51 | 7305 | 1.85 |
| 7101KR | 0.08 | 7156KR | 3121.00 | 7213 | 25.86 | 7306 | 3.45 |
| 7102KR | 0.11 | 7160KR | 4790.00 | 7214 | 27.74 | 7307 | 5.77 |
| 7103KR | 0.20 | 7164KR | 5325.00 | 7215 | 40.59 | 7308 | 9.31 |
| 7104KR | 0.37 | 7120 | 63.09 | 7216 | 41.61 | 7309 | 14.26 |
| 7105KR | 0.52 | 7122 | 94.78 | 7217 | 61.05 | 7310 | 26.44 |
| 7106KR | 0.95 | 7124 | 131.20 | 7218 | 95.12 | 7311 | 36.89 |
| 7107KR | 1.50 | 7126 | 150.30 | 7219 | 108.60 | 7312 | 50.17 |
| 7108KR | 1.83 | 7128 | 200.70 | 7220 | 141.50 | 7313 | 64.73 |
| 7109KR | 2.88 | 7130 | 264.00 | 7221 | 169.80 | 7314 | 73.28 |
| 7110KR | 3.37 | 7132 | 342.50 | 7222 | 212.20 | 7315 | 110.90 |
| 7111KR | 6.14 | 7134 | 435.90 | 7224 | 271.90 | 7316 | 131.40 |
| 7112KR | 7.02 | 7136 | 547.00 | 7226 | 369.40 | 7317 | 178.20 |
| 7113KR | 7.97 | 7138 | 794.20 | 7228 | 466.10 | 7318 | 205.60 |
| 7114KR | 11.45 | 7140 | 977.30 | 7230 | 664.90 | 7319 | 252.80 |
| 7115KR | 12.79 | 7142 | 1289.00 | 7232 | 921.10 | 7320 | 314.00 |
| 7116KR | 20.43 | 7144 | 1408.00 | 7234 | 1182.00 | 7321 | 378.20 |
| 7117KR | 22.59 | 7146 | 1686.00 | 7236 | 1316.00 | 7322 | 516.40 |
| 7118KR | 32.62 | 7148 | 2003.00 | 7238 | 1662.00 | 7324 | 713.30 |
| 7119KR | 44.04 | 7152 | 2769.00 | 7240 | 1965.00 | 7326 | 961.80 |
| 7120KR | 39.28 | 7156 | 3679.00 | 7242 | 2538.00 | 7328 | 1270.00 |
| 7121KR | 54.28 | 7164 | 5481.00 | 7244 | 3048.00 | 7330 | 1628.00 |
| 7122KR | 72.46 | 7200 | 0.07 | 7246 | 3822.00 | 7332 | 2089.00 |
| 7124KR | 82.13 | 7201 | 0.11 | 7248 | 4734.00 | 7334 | 2442.00 |
| 7126KR | 147.60 | 7202 | 0.19 | 7250 | 5799.00 | 7336 | 3061.00 |
| 7128KR | 157.90 | 7203 | 0.30 | 7252 | 7034.00 | 7338 | 3791.00 |
| 7130KR | 211.10 | 7204 | 0.42 | 7256 | 7940.00 | 7340 | 4644.00 |
| 7132KR | 276.80 | 7205 | 0.94 | 7260 | 9950.00 | 7342 | 5634.00 |
| 7134KR | 410.40 | 7206 | 1.41 | 7264 | 12310.00 | 7344 | 6774.00 |
| 7136KR | 546.70 | 7207 | 2.82 | 7300 | 0.11 | 7348 | 8517.00 |
| 7138KR | 600.00 | 7208 | 4.95 | 7301 | 0.15 | 7352 | 11310.00 |
| 7140KR | 831.20 | 7209 | 5.46 | 7302 | 0.29 | 7356 | 15430.00 |
| 7144KR | 1485.00 | 7210 | 6.87 | 7303 | 0.63 | | |
| 7148KR | 1685.00 | 7211 | 13.36 | 7304 | 1.19 | | |

# 7000 series 29° angular contact ball bearings single bearing

## Dynamic equivalent radial load and life calculation examples

Bearing size: 7309
Speed: 2000 rpm
Basic dynamic radial load rating (C) = 11800

### Case 1

Radial load ($F_R$) = 1750
Thrust load ($F_A$) = 1310
Equivalent load (P) = $F_R$ or 0.39 $F_R$ + 0.76 $F_A$
$F_A/F_R$ = 1310/1750 = 0.75
Since $F_A/F_R$ < 0.80, P = $F_R$ = 1750

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11800}{1750}\right)^3 = 307 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{11800}{1750}\right)^3$$

= 2555 Hrs

### Case 2

Radial load ($F_R$) = 1750
Thrust load ($F_A$) = 2100
Equivalent load (P) = $F_R$ or 0.39 $F_R$ + 0.76 $F_A$
$F_A/F_R$ = 2100/1750 = 1.20
Since $F_A/F_R$ > 0.80, P = 0.39 x 1750 + 0.76 x 2100 = 2279

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11800}{2279}\right)^3 = 139 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{11800}{2279}\right)^3$$

= 1157 Hrs

### Case 3

Thrust load ($F_A$) = 2100
Equivalent load (P) = 0.39 $F_R$ + 0.76 $F_A$
$F_A/F_R$ = 2100/0 = ∞
Since $F_A/F_R$ > 0.80, P = 0.76 x 2100 = 1596

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11800}{1596}\right)^3 = 404 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L\,10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{11800}{1596}\right)^3$$

= 3368 Hrs

# 7000D series 29° angular contact ball bearings duplex

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

**DB or DF pair**

$P = 1.0\ F_R\ +\ 0.78\ F_A$ when $F_A / F_R \leq 0.80$

$P = 0.63\ F_R\ +\ 1.24\ F_A$ when $F_A / F_R > 0.80$

**Tandem DT**

$P = 1.0\ F_R$ when $F_A / F_R \leq 0.80$

$P = 0.39\ F_R\ +\ 0.76\ F_A$ when $F_A / F_R > 0.80$

P = Dynamic equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

### Life rating

$L10 = \left(\frac{C}{P}\right)^3$ (millions of revolutions)

or

$L10_h = \frac{10^6}{60n} \left(\frac{C}{P}\right)^3$ (hours)

P = Dynamic equivalent radial load

n = Speed in rpm

**For DB or DF mounting:**

C = Duplex pair dynamic radial load rating (from duplex bearing tables)

or

C = Single-row dynamic radial load rating times $(i)^{0.7}$, where i = 2

**For DT tandem mounting:**

C = Single-row dynamic radial load rating times $(i)^{0.7}$, where i = number of bearings in set

### Static equivalent radial load

$P_0 = 1.0\ F_R + 0.66\ F_R$

$P_0$ is always $\geq F_R$

$P_0$ = Static equivalent radial load

$F_R$ = Radial load

$F_R$ = Thrust load

# 7000D series 29° angular contact ball bearings duplex

## Dynamic equivalent radial load and life calculation examples

Bearing size: 7309DU (DB or DF pair)
Speed: 2000 rpm
Duplex pair basic dynamic radial load rating (C) = 19200

### Case 1

Radial load ($F_R$) = 1750
Thrust load ($F_A$) = 1310
$F_A/F_R$ = 1310/1750 = 0.75
Since $F_A/F_R$ < 0.80, equivalent load
(P) = 1.0 $F_R$ + 0.78 $F_A$
= 1.0 x 1750 + 0.78 x 1310 = 2772

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{19200}{2772}\right)^3 = 332 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L10}_h\text{)} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{19200}{2772}\right)^3$$

= 2769 Hrs

### Case 2

Radial load ($F_R$) = 1750
Thrust load ($F_A$) = 2100
$F_A/F_R$ = 2100/1750 = 1.20
Since $F_A/F_R$ > 0.80, equivalent load
(P) = 0.63 $F_R$ + 1.24 $F_A$
= 0.63 x 1750 + 1.24 x 2100 = 3707

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{19200}{3707}\right)^3 = 332 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L10}_h\text{)} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{19200}{3707}\right)^3$$

= 1158 Hrs

### Case 3

Thrust load ($F_A$) = 2100
$F_A/F_R$ = 2100/0 = ∞
Since $F_A/F_R$ > 0.80, equivalent load
(P) = 0.63 $F_R$ + 1.24 $F_A$ = 1.24 x 2100 = 2604

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{19200}{2604}\right)^3 = 401 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L 10}_h\text{)} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{19200}{2604}\right)^3$$

= 3340 Hrs

Bearing size: 7309DT
3 bearings in tandem
Speed: 2000 rpm
Single-row basic dynamic radial load rating (C) = 11800

### Case 1

Thrust load ($F_A$) = 4200
$F_A/F_R$ = 4200/0 = ∞
Since $F_A/F_R$ > 0.80, equivalent load
(P) = 0.39 $F_R$ + 0.76 $F_A$ = 0.76 x 4200 = 3192
Load rating = $(i)^{0.7}$ 11800 = $(3)^{0.7}$ × 11800 = 25460

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{25460}{3192}\right)^3 = 507 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L10}_h\text{)} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{25460}{3192}\right)^3$$

= 4229 Hrs

### Case 2

Radial load ($F_R$) = 3500
Thrust load ($F_A$) = 4200
$F_A/F_R$ = 4200/3500 = 1.20
Since $F_A/F_R$ > 0.80, equivalent load
(P) = 0.39 $F_R$ + 0.76 $F_A$
= 0.39 x 3500 + 0.76 x 4200 = 4557
Load rating = $(i)^{0.7}$ 11800 = $(3)^{0.7}$ × 11800 = 25460

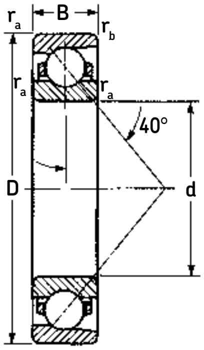
$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{25460}{4557}\right)^3 = 174 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L10}_h\text{)} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{25460}{4557}\right)^3$$

= 1453 Hrs

# 7000P series single-row 40° angular contact ball bearings



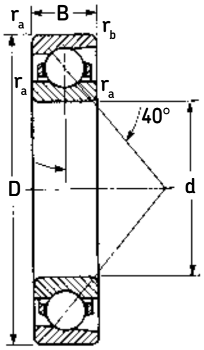

7000P series bearings are similar in design to 7000 series bearings, but the 7000P series bearings have features that give them a greatly increased thrust capacity. They are especially recommended for those applications where maximum thrust capacity is required.

This heavy-duty angular contact ball bearing series is designed with an optimum ball complement and race groove depth, and have a 40° contact angle. 7000P bearings are restricted to applications involving primarily thrust loads. They should **not** be used where the bearing will be subjected to radial load exclusively, or combined radial and thrust load where the radial load is predominant.

## Cage types and materials

Furnished in one-piece, inner-ring land-guided, machined brass, phenolic/Bakelite composition or special material.

# 7200P light series single bearings



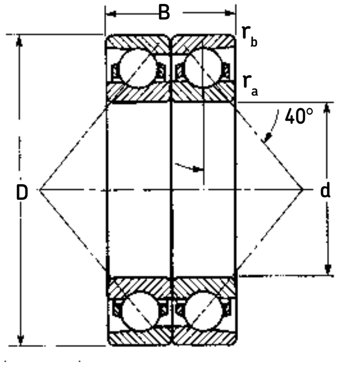

7200P light series bearings are available in bore sizes ranging from 10 mm to 200 mm. They are used with heavy one-directional thrust loads, or combined radial and thrust loads where the thrust load is predominant.

**Caution: Single bearings are not to be used where only radial loads are present. For two-directional thrust loads, use duplex bearings.**

| | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | Basic radial load rating[2] | | | | Speed rating[3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d | | D | | B | | $r_a$ | | $r_b$ | | C[4] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **7200P** | 10 | **.3937** | 30 | **1.1811** | 9 | **.3543** | .64 | **.025** | .30 | **.012** | 7 020 | **1 580** | 3 200 | **719** | 19 000 | 28 000 |
| **7201P** | 12 | **.4724** | 32 | **1.2598** | 10 | **.3937** | .64 | **.025** | .30 | **.012** | 7 610 | **1 710** | 3 750 | **843** | 18 000 | 26 000 |
| **7202P** | 15 | **.5906** | 35 | **1.3780** | 11 | **.4331** | .64 | **.025** | .30 | **.012** | 8 840 | **1 990** | 4 250 | **955** | 17 000 | 24 000 |
| **7203P** | 17 | **.6693** | 40 | **1.5748** | 12 | **.4724** | .64 | **.025** | .30 | **.012** | 11 700 | **2 630** | 6 000 | **1 350** | 15 000 | 20 000 |
| **7204P** | 20 | **.7874** | 47 | **1.8504** | 14 | **.5512** | 1.00 | **.040** | .60 | **.024** | 14 800 | **3 330** | 8 300 | **1 870** | 12 000 | 17 000 |
| **7205P** | 25 | **.9843** | 52 | **2.0472** | 15 | **.5906** | 1.00 | **.040** | .60 | **.024** | 16 800 | **3 780** | 10 400 | **2 340** | 10 000 | 15 000 |
| **7206P** | 30 | **1.1811** | 62 | **2.4409** | 16 | **.6299** | 1.00 | **.040** | .60 | **.024** | 21 200 | **4 770** | 12 700 | **2 860** | 8 500 | 12 000 |
| **7207P** | 35 | **1.3780** | 72 | **2.8346** | 17 | **.6693** | 1.00 | **.040** | .60 | **.024** | 29 100 | **6 540** | 19 300 | **4 340** | 8 000 | 11 000 |
| **7208P** | 40 | **1.5748** | 80 | **3.1496** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 32 500 | **7 310** | 22 400 | **5 040** | 7 000 | 9 500 |
| **7209P** | 45 | **1.7717** | 85 | **3.3465** | 19 | **.7480** | 1.00 | **.040** | .60 | **.024** | 39 000 | **8 770** | 27 500 | **6 180** | 6 700 | 9 000 |
| **7210P** | 50 | **1.9685** | 90 | **3.5433** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 40 300 | **9 060** | 30 000 | **6 740** | 6 000 | 8 000 |
| **7211P** | 55 | **2.1654** | 100 | **3.9370** | 21 | **.8268** | 1.50 | **.060** | 1.00 | **.040** | 48 800 | **11 000** | 37 500 | **8 430** | 5 600 | 7 500 |
| **7212P** | 60 | **2.3622** | 110 | **4.3307** | 22 | **.8661** | 1.50 | **.060** | 1.00 | **.040** | 58 500 | **13 200** | 45 500 | **10 200** | 5 000 | 6 700 |
| **7213P** | 65 | **2.5591** | 120 | **4.7244** | 23 | **.9055** | 1.50 | **.060** | 1.00 | **.040** | 63 700 | **14 300** | 51 000 | **11 500** | 4 500 | 6 000 |
| **7214P** | 70 | **2.7559** | 125 | **4.9213** | 24 | **.9449** | 1.50 | **.060** | 1.00 | **.040** | 68 900 | **15 500** | 56 000 | **12 600** | 4 300 | 5 600 |
| **7215P** | 75 | **2.9528** | 130 | **5.1181** | 25 | **.9843** | 1.50 | **.060** | 1.00 | **.040** | 71 500 | **16 100** | 60 000 | **13 500** | 4 000 | 5 300 |
| **7216P** | 80 | **3.1496** | 140 | **5.5118** | 26 | **1.0236** | 2.00 | **.080** | 1.00 | **.040** | 83 200 | **18 700** | 71 000 | **16 000** | 3 800 | 5 000 |
| **7217P** | 85 | **3.3465** | 150 | **5.9055** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 95 600 | **21 500** | 83 000 | **18 700** | 3 600 | 4 800 |
| **7218P** | 90 | **3.5433** | 160 | **6.2992** | 30 | **1.1811** | 2.00 | **.080** | 1.00 | **.040** | 108 000 | **24 300** | 95 000 | **21 400** | 3 400 | 4 500 |
| **7219P** | 95 | **3.7402** | 170 | **6.6929** | 32 | **1.2598** | 2.00 | **.080** | 1.00 | **.040** | 124 000 | **27 900** | 110 000 | **24 700** | 3 200 | 4 300 |
| **7220P** | 100 | **3.9370** | 180 | **7.0866** | 34 | **1.3386** | 2.00 | **.080** | 1.00 | **.040** | 130 000 | **29 200** | 125 000 | **28 100** | 3 000 | 4 000 |
| **7221P** | 105 | **4.1339** | 190 | **7.4803** | 36 | **1.4173** | 2.00 | **.080** | 1.00 | **.040** | 143 000 | **32 100** | 129 000 | **29 000** | 2 800 | 3 800 |
| **7222P** | 110 | **4.3307** | 200 | **7.8740** | 38 | **1.4961** | 2.00 | **.080** | 1.00 | **.040** | 153 000 | **34 400** | 156 000 | **35 100** | 2 600 | 3 600 |
| **7224P** | 120 | **4.7244** | 215 | **8.4646** | 40 | **1.5748** | 2.00 | **.080** | 1.00 | **.040** | 165 000 | **37 100** | 163 000 | **36 600** | 2 200 | 3 200 |
| **7226P** | 130 | **5.1181** | 230 | **9.0551** | 40 | **1.5748** | 2.50 | **.100** | 1.00 | **.040** | 186 000 | **41 800** | 193 000 | **43 400** | 1 900 | 2 800 |
| **7228P** | 140 | **5.5118** | 250 | **9.8425** | 42 | **1.6535** | 2.50 | **.100** | 1.00 | **.040** | 199 000 | **44 700** | 216 000 | **48 600** | 1 800 | 2 600 |
| **7230P** | 150 | **5.9055** | 270 | **10.6299** | 45 | **1.7717** | 2.50 | **.100** | 1.00 | **.040** | 216 000 | **48 600** | 260 000 | **58 500** | 1 700 | 2 400 |
| **7232P** | 160 | **6.2992** | 290 | **11.4173** | 48 | **1.8898** | 2.50 | **.100** | 1.00 | **.040** | 238 000 | **53 500** | 280 000 | **62 900** | 1 600 | 2 200 |
| **7234P** | 170 | **6.6929** | 310 | **12.2047** | 52 | **2.0472** | 3.00 | **.120** | 1.00 | **.040** | 265 000 | **59 600** | 335 000 | **75 300** | 1 600 | 2 200 |
| **7236P** | 180 | **7.0866** | 320 | **12.5984** | 52 | **2.0472** | 3.00 | **.120** | 1.00 | **.040** | 276 000 | **62 000** | 355 000 | **79 800** | 1 500 | 2 000 |
| **7238P** | 190 | **7.4803** | 340 | **13.3858** | 55 | **2.1654** | 3.00 | **.120** | 1.00 | **.040** | 302 000 | **67 900** | 405 000 | **91 000** | 1 400 | 1 900 |
| **7240P** | 200 | **7.8740** | 360 | **14.1732** | 58 | **2.2835** | 3.00 | **.120** | 1.00 | **.040** | 319 000 | **71 700** | 440 000 | **98 900** | 1 300 | 1 800 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.75 and $C_0$ by 3.85.
3) Listed values are for machined bronze cage, ABEC-1.
For phenolic composition cage, multiply by 1.33 for both grease and oil. For phenolic composition cage, ABEC-5 or 7, multiply by 1.86 for both grease and oil. For pressed steel cage, ABEC-1, multiply by 0.67 for grease and 0.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 7200PD light series duplex




Notes:

"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

For duplex sets of 7000 and 9000 series bearings see page 243.

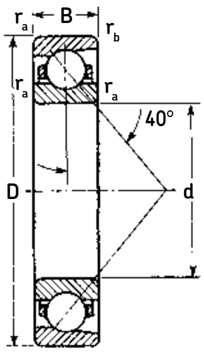
Use these values for back-to-back (DB) or face-to-face (DF) mounting arrangements.

ABEC-1 and -3 are stocked as half-pairs where available.

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1] $r_a$ mm | in. | $r_b$ mm | in. | Basic radial load rating[2] Dynamic $C^{4)}$ N | lbf | Static $C_0$ N | lbf | Speed rating[3] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7200PD | 10 | **.3937** | 30 | **1.1811** | 18 | **.7087** | .64 | **.025** | .30 | **.012** | 11 400 | **2 560** | 6 400 | **1 440** | 16 000 | 22 000 |
| 7201PD | 12 | **.4724** | 32 | **1.2598** | 20 | **.7874** | .64 | **.025** | .30 | **.012** | 12 500 | **2 810** | 7 500 | **1 690** | 13 000 | 18 000 |
| 7202PD | 15 | **.5906** | 35 | **1.3780** | 22 | **.8661** | .64 | **.025** | .30 | **.012** | 14 300 | **3 210** | 8 500 | **1 910** | 12 000 | 17 000 |
| 7203PD | 17 | **.6693** | 40 | **1.5748** | 24 | **.9449** | .64 | **.025** | .30 | **.012** | 19 000 | **4 270** | 12 000 | **2 700** | 11 000 | 16 000 |
| 7204PD | 20 | **.7874** | 47 | **1.8504** | 28 | **1.1024** | 1.00 | **.040** | .60 | **.024** | 24 200 | **5 440** | 16 600 | **3 730** | 9 500 | 14 000 |
| 7205PD | 25 | **.9843** | 52 | **2.0472** | 30 | **1.1811** | 1.00 | **.040** | .60 | **.024** | 27 000 | **6 070** | 20 800 | **4 680** | 8 500 | 12 000 |
| 7206PD | 30 | **1.1811** | 62 | **2.4409** | 32 | **1.2598** | 1.00 | **.040** | .60 | **.024** | 34 500 | **7 760** | 25 500 | **5 730** | 7 500 | 10 000 |
| 7207PD | 35 | **1.3780** | 72 | **2.8346** | 34 | **1.3386** | 1.00 | **.040** | .60 | **.024** | 47 500 | **10 700** | 39 000 | **8 770** | 6 300 | 8 500 |
| 7208PD | 40 | **1.5748** | 80 | **3.1496** | 36 | **1.4173** | 1.00 | **.040** | .60 | **.024** | 52 700 | **11 800** | 45 000 | **10 100** | 5 600 | 7 500 |
| 7209PD | 45 | **1.7717** | 85 | **3.3465** | 38 | **1.4961** | 1.00 | **.040** | .60 | **.024** | 62 400 | **14 000** | 55 000 | **12 400** | 5 300 | 7 000 |
| 7210PD | 50 | **1.9685** | 90 | **3.5433** | 40 | **1.5748** | 1.00 | **.040** | .60 | **.024** | 65 000 | **14 600** | 60 000 | **13 500** | 4 800 | 6 300 |
| 7211PD | 55 | **2.1654** | 100 | **3.9370** | 42 | **1.6535** | 1.50 | **.060** | 1.00 | **.040** | 79 300 | **17 800** | 75 000 | **16 900** | 4 500 | 6 000 |
| 7212PD | 60 | **2.3622** | 110 | **4.3307** | 44 | **1.7323** | 1.50 | **.060** | 1.00 | **.040** | 95 600 | **21 500** | 91 600 | **20 600** | 4 000 | 5 300 |
| 7213PD | 65 | **2.5591** | 120 | **4.7244** | 46 | **1.8110** | 1.50 | **.060** | 1.00 | **.040** | 104 000 | **23 400** | 100 000 | **22 500** | 3 600 | 4 800 |
| 7214PD | 70 | **2.7559** | 125 | **4.9213** | 48 | **1.8898** | 1.50 | **.060** | 1.00 | **.040** | 112 000 | **25 200** | 112 000 | **25 200** | 3 400 | 4 500 |
| 7215PD | 75 | **2.9528** | 130 | **5.1181** | 50 | **1.9685** | 1.50 | **.060** | 1.00 | **.040** | 117 000 | **26 300** | 120 000 | **27 000** | 3 200 | 4 300 |
| 7216PD | 80 | **3.1496** | 140 | **5.5118** | 52 | **2.0472** | 2.00 | **.080** | 1.00 | **.040** | 135 000 | **30 300** | 140 000 | **31 500** | 3 000 | 4 000 |
| 7217PD | 85 | **3.3465** | 150 | **5.9055** | 56 | **2.2047** | 2.00 | **.080** | 1.00 | **.040** | 156 000 | **35 100** | 166 000 | **37 300** | 2 800 | 3 800 |
| 7218PD | 90 | **3.5433** | 160 | **6.2992** | 60 | **2.3622** | 2.00 | **.080** | 1.00 | **.040** | 178 000 | **40 000** | 190 000 | **42 700** | 2 600 | 3 600 |
| 7219PD | 95 | **3.7402** | 170 | **6.6929** | 64 | **2.5197** | 2.00 | **.080** | 1.00 | **.040** | 199 000 | **44 700** | 220 000 | **49 500** | 2 400 | 3 400 |
| 7220PD | 100 | **3.9370** | 180 | **7.0866** | 68 | **2.6772** | 2.00 | **.080** | 1.00 | **.040** | 212 000 | **47 700** | 250 000 | **56 200** | 2 200 | 3 200 |
| 7221PD | 105 | **4.1339** | 190 | **7.4803** | 72 | **2.8346** | 2.00 | **.080** | 1.00 | **.040** | 229 000 | **51 500** | 260 000 | **58 500** | 2 000 | 3 000 |
| 7222PD | 110 | **4.3307** | 200 | **7.8740** | 76 | **2.9921** | 2.00 | **.080** | 1.00 | **.040** | 251 000 | **56 400** | 310 000 | **69 700** | 1 900 | 2 800 |
| 7224PD | 120 | **4.7244** | 215 | **8.4646** | 80 | **3.1496** | 2.00 | **.080** | 1.00 | **.040** | 270 000 | **60 700** | 325 000 | **73 100** | 1 700 | 2 400 |
| 7226PD | 130 | **5.1181** | 230 | **9.0551** | 80 | **3.1496** | 2.50 | **.100** | 1.00 | **.040** | 302 000 | **67 900** | 390 000 | **87 700** | 1 700 | 2 400 |
| 7228PD | 140 | **5.5118** | 250 | **9.8425** | 84 | **3.3071** | 2.50 | **.100** | 1.00 | **.040** | 319 000 | **71 700** | 430 000 | **96 700** | 1 600 | 2 200 |
| 7230PD | 150 | **5.9055** | 270 | **10.6299** | 90 | **3.5433** | 2.50 | **.100** | 1.00 | **.040** | 351 000 | **78 900** | 520 000 | **117 000** | 1 500 | 2 000 |
| 7232PD | 160 | **6.2992** | 290 | **11.4173** | 96 | **3.7795** | 2.50 | **.100** | 1.00 | **.040** | 390 000 | **87 700** | 560 000 | **126 000** | 1 300 | 1 700 |
| 7234PD | 170 | **6.6929** | 310 | **12.2047** | 104 | **4.0945** | 3.00 | **.120** | 1.00 | **.040** | 436 000 | **98 000** | 655 000 | **147 000** | 1 200 | 1 600 |
| 7236PD | 180 | **7.0866** | 320 | **12.5984** | 104 | **4.0945** | 3.00 | **.120** | 1.00 | **.040** | 449 000 | **101 000** | 710 000 | **160 000** | 1 100 | 1 500 |
| 7238PD | 190 | **7.4803** | 340 | **13.3858** | 110 | **4.3307** | 3.00 | **.120** | 1.00 | **.040** | 488 000 | **110 000** | 815 000 | **183 000** | 1 100 | 1 500 |
| 7240PD | 200 | **7.8740** | 360 | **14.1732** | 116 | **4.5669** | 3.00 | **.120** | 1.00 | **.040** | 520 000 | **117 000** | 880 000 | **198 000** | 1 000 | 1 400 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.08 and $C_0$ by 1.93.
3) Listed values are for machined bronze cage, ABEC-1.
For phenolic composition cage, multiply by 1.33 for both grease and oil. For phenolic composition cage, ABEC-5 or 7, multiply by 1.86 for both grease and oil. For pressed steel cage, ABEC-1, multiply by 0.67 for grease and 0.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^{1}/_{3}$ rpm.

# 7300P medium series single ball bearings



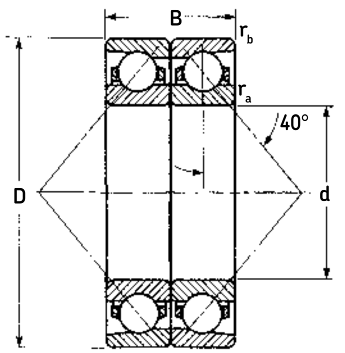

7300P medium series bearings are available in bore sizes from 10 mm to 200 mm. They can accommodate very heavy one-directional thrust loads, or combined radial and thrust loads where the thrust load is predominant.

**Caution: Single bearings are not to be used where only radial loads are present. For two-directional thrust loads, use duplex bearings.**

| | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | Basic radial load rating[2] | | | | Speed rating[3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d mm | in. | D mm | in. | B mm | in. | $r_a$ mm | in. | $r_b$ mm | in. | C[4] N | lbf | $C_0$ N | lbf | Grease rpm | Oil rpm |
| 7300P | 10 | .3937 | 35 | **1.3780** | 11 | **.4331** | .64 | **.025** | .30 | **.012** | 9 360 | **2 100** | 4 150 | **933** | 18 000 | 26 000 |
| 7301P | 12 | .4724 | 37 | **1.4567** | 12 | **.4724** | 1.00 | **.040** | .60 | **.024** | 11 200 | **2 520** | 5 000 | **1 120** | 17 000 | 24 000 |
| 7302P | 15 | .5906 | 42 | **1.6535** | 13 | **.5118** | 1.00 | **.040** | .60 | **.024** | 12 700 | **2 860** | 6 100 | **1 370** | 15 000 | 20 000 |
| 7303P | 17 | .6693 | 47 | **1.8504** | 14 | **.5512** | 1.00 | **.040** | .60 | **.024** | 16 800 | **3 780** | 8 500 | **1 910** | 13 000 | 18 000 |
| 7304P | 20 | .7874 | 52 | **2.0472** | 15 | **.5906** | 1.00 | **.040** | .60 | **.024** | 18 600 | **4 180** | 9 500 | **2 140** | 11 000 | 16 000 |
| 7305P | 25 | .9843 | 62 | **2.4409** | 17 | **.6693** | 1.00 | **.040** | .60 | **.024** | 24 200 | **5 440** | 13 400 | **3 010** | 9 000 | 13 000 |
| 7306P | 30 | **1.1811** | 72 | **2.8346** | 19 | **.7480** | 1.00 | **.040** | .60 | **.024** | 32 500 | **7 310** | 19 600 | **4 410** | 8 000 | 11 000 |
| 7307P | 35 | **1.3780** | 80 | **3.1496** | 21 | **.8268** | 1.50 | **.060** | 1.00 | **.040** | 39 700 | **8 920** | 24 500 | **5 510** | 7 500 | 10 000 |
| 7308P | 40 | **1.5748** | 90 | **3.5433** | 23 | **.9055** | 1.50 | **.060** | 1.00 | **.040** | 47 500 | **10 700** | 30 500 | **6 860** | 6 700 | 9 000 |
| 7309P | 45 | **1.7717** | 100 | **3.9370** | 25 | **.9843** | 1.50 | **.060** | 1.00 | **.040** | 59 200 | **13 300** | 40 000 | **8 990** | 6 000 | 8 000 |
| 7310P | 50 | **1.9685** | 110 | **4.3307** | 27 | **1.0630** | 2.00 | **.080** | 1.00 | **.040** | 68 900 | **15 500** | 52 000 | **11 700** | 5 300 | 7 000 |
| 7311P | 55 | **2.1654** | 120 | **4.7244** | 29 | **1.1417** | 2.00 | **.080** | 1.00 | **.040** | 79 300 | **17 800** | 56 000 | **12 600** | 4 800 | 6 300 |
| 7312P | 60 | **2.3622** | 130 | **5.1181** | 31 | **1.2205** | 2.00 | **.080** | 1.00 | **.040** | 90 400 | **20 300** | 64 000 | **14 400** | 4 500 | 6 000 |
| 7313P | 65 | **2.5591** | 140 | **5.5118** | 33 | **1.2992** | 2.00 | **.080** | 1.00 | **.040** | 101 000 | **22 700** | 80 000 | **18 000** | 4 300 | 5 600 |
| 7314P | 70 | **2.7559** | 150 | **5.9055** | 35 | **1.3780** | 2.00 | **.080** | 1.00 | **.040** | 117 000 | **26 300** | 93 000 | **20 900** | 3 800 | 5 000 |
| 7315P | 75 | **2.9528** | 160 | **6.2992** | 37 | **1.4567** | 2.00 | **.080** | 1.00 | **.040** | 127 000 | **28 600** | 100 000 | **22 500** | 3 600 | 4 800 |
| 7316P | 80 | **3.1496** | 170 | **6.6929** | 39 | **1.5354** | 2.00 | **.080** | 1.00 | **.040** | 138 000 | **31 000** | 110 000 | **24 700** | 3 400 | 4 500 |
| 7317P | 85 | **3.3465** | 180 | **7.0866** | 41 | **1.6142** | 2.50 | **.100** | 1.00 | **.040** | 148 000 | **33 300** | 122 000 | **27 400** | 3 200 | 4 300 |
| 7318P | 90 | **3.5433** | 190 | **7.4803** | 43 | **1.6929** | 2.50 | **.100** | 1.00 | **.040** | 159 000 | **35 700** | 137 000 | **30 800** | 3 000 | 4 000 |
| 7319P | 95 | **3.7402** | 200 | **7.8740** | 45 | **1.7717** | 2.50 | **.100** | 1.00 | **.040** | 168 000 | **37 800** | 150 000 | **33 700** | 2 800 | 3 800 |
| 7320P | 100 | **3.9370** | 215 | **8.4646** | 47 | **1.8504** | 2.50 | **.100** | 1.00 | **.040** | 190 000 | **42 700** | 190 000 | **42 700** | 2 600 | 3 600 |
| 7321P | 105 | **4.1339** | 225 | **8.8583** | 49 | **1.9291** | 2.50 | **.100** | 1.00 | **.040** | 203 000 | **45 600** | 196 000 | **44 100** | 2 400 | 3 400 |
| 7322P | 110 | **4.3307** | 240 | **9.4488** | 50 | **1.9685** | 2.50 | **.100** | 1.00 | **.040** | 212 000 | **47 700** | 228 000 | **51 300** | 2 200 | 3 200 |
| 7324P | 120 | **4.7244** | 260 | **10.2362** | 55 | **2.1654** | 2.50 | **.100** | 1.00 | **.040** | 238 000 | **53 500** | 265 000 | **59 600** | 1 900 | 2 800 |
| 7326P | 130 | **5.1181** | 280 | **11.0236** | 58 | **2.2835** | 3.00 | **.120** | 1.00 | **.040** | 276 000 | **62 000** | 305 000 | **68 600** | 1 800 | 2 600 |
| 7328P | 140 | **5.5118** | 300 | **11.8110** | 62 | **2.4409** | 3.00 | **.120** | 1.00 | **.040** | 302 000 | **67 900** | 345 000 | **77 600** | 1 700 | 2 400 |
| 7330P | 150 | **5.9055** | 320 | **12.5984** | 65 | **2.5591** | 3.00 | **.120** | 1.00 | **.040** | 325 000 | **73 100** | 390 000 | **87 700** | 1 600 | 2 200 |
| 7332P | 160 | **6.2992** | 340 | **13.3858** | 68 | **2.6772** | 3.00 | **.120** | 1.00 | **.040** | 345 000 | **77 600** | 425 000 | **95 500** | 1 500 | 2 000 |
| 7334P | 170 | **6.6929** | 360 | **14.1732** | 72 | **2.8346** | 3.00 | **.120** | 1.00 | **.040** | 377 000 | **84 800** | 490 000 | **110 000** | 1 400 | 1 900 |
| 7336P | 180 | **7.0866** | 380 | **14.9606** | 75 | **2.9528** | 3.00 | **.120** | 1.00 | **.040** | 403 000 | **90 600** | 540 000 | **121 000** | 1 300 | 1 800 |
| 7338P | 190 | **7.4803** | 400 | **15.7480** | 78 | **3.0709** | 4.00 | **.160** | 1.50 | **.060** | 416 000 | **93 500** | 570 000 | **128 000** | 1 200 | 1 700 |
| 7340P | 200 | **7.8740** | 420 | **16.5354** | 80 | **3.1496** | 4.00 | **.160** | 1.50 | **.060** | 449 000 | **101 000** | 655 000 | **147 000** | 1 100 | 1 600 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.75 and $C_0$ by 3.85.
3) Listed values are for machined bronze cage, ABEC-1.
For phenolic composition cage, multiply by 1.33 for both grease and oil. For phenolic composition cage, ABEC-5 or 7, multiply by 1.86 for both grease and oil. For pressed steel cage, ABEC-1, multiply by 0.67 for grease and 0.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 7300PD medium series duplex




Notes:

"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an

additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

For duplex sets of 7000 and 9000 series bearings see page 243.

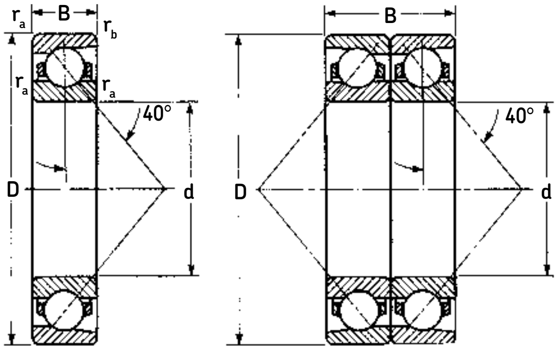
Use these values for back-to-back (DB) or face-to-face (DF) mounting arrangements.

ABEC-1 and -3 are stocked as half-pairs where available.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1)] $r_a$ mm | $r_a$ in. | $r_b$ mm | $r_b$ in. | Basic radial load rating[2)] Dynamic $C$[4)] N | Dynamic $C$ lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[3)] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7300PD | 10 | **.3937** | 35 | **1.3780** | 22 | **.8661** | .64 | **.025** | .30 | **.012** | 15 300 | **3 440** | 8 300 | **1 870** | 15 000 | 21 000 |
| 7301PD | 12 | **.4724** | 37 | **1.4567** | 24 | **.9449** | 1.00 | **.040** | .60 | **.024** | 18 200 | **4 090** | 10 200 | **2 290** | 14 000 | 19 000 |
| 7302PD | 15 | **.5906** | 42 | **1.6535** | 26 | **1.0236** | 1.00 | **.040** | .60 | **.024** | 20 300 | **4 560** | 12 200 | **2 740** | 11 000 | 16 000 |
| 7303PD | 17 | **.6693** | 47 | **1.8504** | 28 | **1.1024** | 1.00 | **.040** | .60 | **.024** | 27 600 | **6 200** | 17 000 | **3 820** | 9 500 | 14 000 |
| 7304PD | 20 | **.7874** | 52 | **2.0472** | 30 | **1.1811** | 1.00 | **.040** | .60 | **.024** | 30 200 | **6 790** | 19 000 | **4 270** | 9 000 | 13 000 |
| 7305PD | 25 | **.9843** | 62 | **2.4409** | 34 | **1.3386** | 1.00 | **.040** | .60 | **.024** | 39 000 | **8 770** | 27 000 | **6 070** | 7 500 | 10 000 |
| 7306PD | 30 | **1.1811** | 72 | **2.8346** | 38 | **1.4961** | 1.00 | **.040** | .60 | **.024** | 52 700 | **11 800** | 39 000 | **8 770** | 6 700 | 9 000 |
| 7307PD | 35 | **1.3780** | 80 | **3.1496** | 42 | **1.6535** | 1.50 | **.060** | 1.00 | **.040** | 63 700 | **14 300** | 49 000 | **11 000** | 6 000 | 8 000 |
| 7308PD | 40 | **1.5748** | 90 | **3.5433** | 46 | **1.8110** | 1.50 | **.060** | 1.00 | **.040** | 76 100 | **17 100** | 61 000 | **13 700** | 5 300 | 7 000 |
| 7309PD | 45 | **1.7717** | 100 | **3.9370** | 50 | **1.9685** | 1.50 | **.060** | 1.00 | **.040** | 97 500 | **21 900** | 80 000 | **18 000** | 4 800 | 6 300 |
| 7310PD | 50 | **1.9685** | 110 | **4.3307** | 54 | **2.1260** | 2.00 | **.080** | 1.00 | **.040** | 112 000 | **25 200** | 104 000 | **23 400** | 4 300 | 5 600 |
| 7311PD | 55 | **2.1654** | 120 | **4.7244** | 58 | **2.2835** | 2.00 | **.080** | 1.00 | **.040** | 130 000 | **29 200** | 112 000 | **25 200** | 3 800 | 5 000 |
| 7312PD | 60 | **2.3622** | 130 | **5.1181** | 62 | **2.4409** | 2.00 | **.080** | 1.00 | **.040** | 148 000 | **33 300** | 129 000 | **29 000** | 3 600 | 4 800 |
| 7313PD | 65 | **2.5591** | 140 | **5.5118** | 66 | **2.5984** | 2.00 | **.080** | 1.00 | **.040** | 165 000 | **37 100** | 160 000 | **36 000** | 3 200 | 4 300 |
| 7314PD | 70 | **2.7559** | 150 | **5.9055** | 70 | **2.7559** | 2.00 | **.080** | 1.00 | **.040** | 190 000 | **42 700** | 186 000 | **41 800** | 3 000 | 4 000 |
| 7315PD | 75 | **2.9528** | 160 | **6.2992** | 74 | **2.9134** | 2.00 | **.080** | 1.00 | **.040** | 208 000 | **46 800** | 200 000 | **45 000** | 2 800 | 3 800 |
| 7316PD | 80 | **3.1496** | 170 | **6.6929** | 78 | **3.0709** | 2.00 | **.080** | 1.00 | **.040** | 225 000 | **50 600** | 220 000 | **49 500** | 2 600 | 3 600 |
| 7317PD | 85 | **3.3465** | 180 | **7.0866** | 82 | **3.2283** | 2.50 | **.100** | 1.00 | **.040** | 238 000 | **53 500** | 245 000 | **55 100** | 2 400 | 3 400 |
| 7318PD | 90 | **3.5433** | 190 | **7.4803** | 86 | **3.3858** | 2.50 | **.100** | 1.00 | **.040** | 255 000 | **57 300** | 270 000 | **60 700** | 2 200 | 3 200 |
| 7319PD | 95 | **3.7402** | 200 | **7.8740** | 90 | **3.5433** | 2.50 | **.100** | 1.00 | **.040** | 276 000 | **62 000** | 300 000 | **67 400** | 2 000 | 3 000 |
| 7320PD | 100 | **3.9370** | 215 | **8.4646** | 94 | **3.7008** | 2.50 | **.100** | 1.00 | **.040** | 307 000 | **69 000** | 380 000 | **85 400** | 1 900 | 2 800 |
| 7321PD | 105 | **4.1339** | 225 | **8.8583** | 98 | **3.8583** | 2.50 | **.100** | 1.00 | **.040** | 325 000 | **73 100** | 390 000 | **87 700** | 1 800 | 2 600 |
| 7322PD | 110 | **4.3307** | 240 | **9.4488** | 100 | **3.9370** | 2.50 | **.100** | 1.00 | **.040** | 345 000 | **77 600** | 455 000 | **102 000** | 1 700 | 2 400 |
| 7324PD | 120 | **4.7244** | 260 | **10.2362** | 110 | **4.3307** | 2.50 | **.100** | 1.00 | **.040** | 390 000 | **87 700** | 530 000 | **119 000** | 1 600 | 2 200 |
| 7326PD | 130 | **5.1181** | 280 | **11.0236** | 116 | **4.5669** | 3.00 | **.120** | 1.00 | **.040** | 449 000 | **101 000** | 610 000 | **137 000** | 1 500 | 2 000 |
| 7328PD | 140 | **5.5118** | 300 | **11.8110** | 124 | **4.8819** | 3.00 | **.120** | 1.00 | **.040** | 488 000 | **110 000** | 695 000 | **156 000** | 1 400 | 1 900 |
| 7330PD | 150 | **5.9055** | 320 | **12.5984** | 130 | **5.1181** | 3.00 | **.120** | 1.00 | **.040** | 540 000 | **121 000** | 780 000 | **175 000** | 1 200 | 1 700 |
| 7332PD | 160 | **6.2992** | 340 | **13.3858** | 136 | **5.3543** | 3.00 | **.120** | 1.00 | **.040** | 553 000 | **124 000** | 850 000 | **191 000** | 1 200 | 1 600 |
| 7334PD | 170 | **6.6929** | 360 | **14.1732** | 144 | **5.6693** | 3.00 | **.120** | 1.00 | **.040** | 605 000 | **136 000** | 965 000 | **217 000** | 1 000 | 1 500 |
| 7336PD | 180 | **7.0866** | 380 | **14.9606** | 150 | **5.9055** | 3.00 | **.120** | 1.00 | **.040** | 650 000 | **146 000** | 1 100 000 | **247 000** | 950 | 1 400 |
| 7338PD | 190 | **7.4803** | 400 | **15.7480** | 156 | **6.1417** | 4.00 | **.160** | 1.50 | **.060** | 676 000 | **152 000** | 1 160 000 | **261 000** | 950 | 1 400 |
| 7340PD | 200 | **7.8740** | 420 | **16.5354** | 160 | **6.2992** | 4.00 | **.160** | 1.50 | **.060** | 741 000 | **167 000** | 1 320 000 | **297 000** | 880 | 1 300 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.08 and $C_0$ by 1.93.
3) Listed values are for machined bronze cage, ABEC-1.
For phenolic composition cage, multiply by 1.33 for both grease and oil. For phenolic composition cage, ABEC-5 or 7, multiply by 1.86 for both grease and oil. For pressed steel cage, ABEC-1, multiply by 0.67 for grease and 0.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 7400P and 7400PD
## heavy series




7400P series bearings are similar to the 7200P and 7300P series, but are heavier sectioned, and are used for very heavy thrust loads or combined radial and thrust loads where the thrust load is predominant.

**Caution: Single bearings are not to be used where only radial loads are present. For two-directional thrust loads, use duplex bearings.**

Notes:

"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

For duplex sets of 7000 and 9000 series bearings see page 243.

Values for D bearings are for back-to-back (DB) or face-to-face (DF) mounting arrangements.

ABEC-1 and -3 are stocked as half-pairs where available.

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1)] $r_a$ mm | in. | $r_b$ mm | in. | Basic radial load rating[2)] Dynamic C[4)] N | lbf | Static $C_0$ N | lbf | Speed rating[3)] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7405P** | 25 | **.9843** | 80 | **3.1496** | 21 | **.8268** | 1.5 | **.060** | 1.0 | **.040** | 39 700 | **8 920** | 23 600 | **5 310** | 7 000 | 10 000 |
| **7406P** | 30 | **1.1811** | 90 | **3.5433** | 23 | **.9055** | 1.5 | **.060** | 1.0 | **.040** | 47 500 | **10 700** | 29 000 | **6 520** | 6 300 | 9 000 |
| **7407P** | 35 | **1.3780** | 100 | **3.9370** | 25 | **.9843** | 1.5 | **.060** | 1.0 | **.040** | 60 500 | **13 600** | 38 000 | **8 540** | 5 600 | 7 500 |
| **7408P** | 40 | **1.5748** | 110 | **4.3307** | 27 | **1.0630** | 2.0 | **.080** | 1.0 | **.040** | 70 200 | **15 800** | 45 000 | **10 100** | 5 300 | 7 000 |
| **7409P** | 45 | **1.7717** | 120 | **4.7244** | 29 | **1.1417** | 2.0 | **.080** | 1.0 | **.040** | 85 200 | **19 200** | 55 000 | **12 400** | 4 800 | 6 300 |
| **7410P** | 50 | **1.9685** | 130 | **5.1181** | 31 | **1.2205** | 2.0 | **.080** | 1.0 | **.040** | 95 600 | **21 500** | 64 000 | **14 400** | 4 300 | 6 000 |
| **7411P** | 55 | **2.1654** | 140 | **5.5118** | 33 | **1.2992** | 2.0 | **.080** | 1.0 | **.040** | 111 000 | **25 000** | 76 500 | **17 200** | 4 000 | 5 600 |
| **7412P** | 60 | **2.3622** | 150 | **5.9055** | 35 | **1.3780** | 2.0 | **.080** | 1.0 | **.040** | 119 000 | **26 800** | 86 500 | **19 400** | 3 600 | 5 000 |
| **7413P** | 65 | **2.5591** | 160 | **6.2992** | 37 | **1.4567** | 2.0 | **.080** | 1.0 | **.040** | 130 000 | **29 200** | 96 500 | **21 700** | 3 400 | 4 800 |
| **7414P** | 70 | **2.7559** | 180 | **7.0866** | 42 | **1.6535** | 2.5 | **.100** | 1.0 | **.040** | 159 000 | **35 700** | 127 000 | **28 600** | 3 000 | 4 300 |
| **7415P** | 75 | **2.9528** | 190 | **7.4803** | 45 | **1.7717** | 2.5 | **.100** | 1.0 | **.040** | 168 000 | **37 800** | 140 000 | **31 500** | 2 800 | 4 000 |
| **7416P** | 80 | **3.1496** | 200 | **7.8740** | 48 | **1.8898** | 2.5 | **.100** | 1.0 | **.040** | 183 000 | **41 100** | 156 000 | **35 100** | 2 600 | 3 800 |
| **7417P** | 85 | **3.3465** | 210 | **8.2677** | 52 | **2.0472** | 3.0 | **.120** | 1.0 | **.040** | 190 000 | **42 700** | 166 000 | **37 300** | 2 500 | 3 600 |
| **7418P** | 90 | **3.5433** | 225 | **8.8583** | 54 | **2.1260** | 3.0 | **.120** | 1.0 | **.040** | 216 000 | **48 600** | 200 000 | **45 000** | 2 400 | 3 400 |
| **7419P** | 95 | **3.7402** | 250 | **9.8425** | 55 | **2.1654** | 3.0 | **.120** | 1.0 | **.040** | 251 000 | **56 400** | 245 000 | **55 100** | 2 200 | 3 000 |
| **7420P** | 100 | **3.9370** | 265 | **10.4331** | 60 | **2.3622** | 3.0 | **.120** | 1.0 | **.040** | 276 000 | **62 000** | 275 000 | **61 800** | 2 000 | 2 800 |
| **7421P** | 105 | **4.1339** | 290 | **11.4173** | 65 | **2.5591** | 3.0 | **.120** | 1.0 | **.040** | 265 000 | **59 600** | 280 000 | **62 900** | 1 900 | 2 600 |
| **7400PD** | | | | | | | | | | | | | | | | |
| **7405PD** | 25 | **.9843** | 80 | **3.1496** | 42 | **1.6535** | 1.5 | **.060** | 1.0 | **.040** | 65 000 | **14 500** | 47 500 | **10 600** | 5 600 | 8 000 |
| **7406PD** | 30 | **1.1811** | 90 | **3.5433** | 46 | **1.8110** | 1.5 | **.060** | 1.0 | **.040** | 78 000 | **17 400** | 58 500 | **13 000** | 5 000 | 7 200 |
| **7407PD** | 35 | **1.3780** | 100 | **3.9370** | 50 | **1.9685** | 1.5 | **.060** | 1.0 | **.040** | 97 500 | **22 100** | 76 500 | **17 100** | 4 500 | 6 000 |
| **7408PD** | 40 | **1.5748** | 110 | **4.3307** | 54 | **2.1260** | 2.0 | **.080** | 1.0 | **.040** | 114 000 | **25 700** | 90 000 | **20 200** | 4 300 | 5 600 |
| **7409PD** | 45 | **1.7717** | 120 | **4.7244** | 58 | **2.2835** | 2.0 | **.080** | 1.0 | **.040** | 138 000 | **31 200** | 110 000 | **24 800** | 3 800 | 5 000 |
| **7410PD** | 50 | **1.9685** | 130 | **5.1181** | 62 | **2.4409** | 2.0 | **.080** | 1.0 | **.040** | 156 000 | **34 900** | 129 000 | **28 800** | 3 400 | 4 800 |
| **7411PD** | 55 | **2.1654** | 140 | **5.5118** | 66 | **2.5984** | 2.0 | **.080** | 1.0 | **.040** | 182 000 | **40 600** | 153 000 | **34 400** | 3 200 | 4 500 |
| **7412PD** | 60 | **2.3622** | 150 | **5.9055** | 70 | **2.7559** | 2.0 | **.080** | 1.0 | **.040** | 195 000 | **43 600** | 173 000 | **38 800** | 2 800 | 4 000 |
| **7413PD** | 65 | **2.5591** | 160 | **6.2992** | 74 | **2.9134** | 2.0 | **.080** | 1.0 | **.040** | 212 000 | **47 400** | 193 000 | **43 400** | 2 700 | 3 800 |
| **7414PD** | 70 | **2.7559** | 180 | **7.0866** | 84 | **3.3071** | 2.5 | **.100** | 1.0 | **.040** | 260 000 | **58 000** | 255 000 | **57 200** | 2 400 | 3 400 |
| **7415PD** | 75 | **2.9528** | 190 | **7.4803** | 90 | **3.5433** | 2.5 | **.100** | 1.0 | **.040** | 276 000 | **61 400** | 280 000 | **63 000** | 2 200 | 3 200 |
| **7416PD** | 80 | **3.1496** | 200 | **7.8740** | 96 | **3.7795** | 2.5 | **.100** | 1.0 | **.040** | 296 000 | **66 500** | 310 000 | **69 700** | 2 000 | 3 000 |
| **7417PD** | 85 | **3.3465** | 210 | **8.2677** | 104 | **4.0945** | 3.0 | **.120** | 1.0 | **.040** | 307 000 | **69 400** | 335 000 | **74 600** | 2 000 | 2 800 |
| **7418PD** | 90 | **3.5433** | 225 | **8.8583** | 108 | **4.2520** | 3.0 | **.120** | 1.0 | **.040** | 351 000 | **78 900** | 400 000 | **89 900** | 1 900 | 2 700 |
| **7419PD** | 95 | **3.7402** | 250 | **9.8425** | 110 | **4.3307** | 3.0 | **.120** | 1.0 | **.040** | 410 000 | **92 200** | 490 000 | **110 000** | 1 800 | 2 400 |
| **7420PD** | 100 | **3.9370** | 265 | **10.4331** | 120 | **4.7244** | 3.0 | **.120** | 1.0 | **.040** | 449 000 | **101 000** | 550 000 | **124 000** | 1 600 | 2 200 |
| **7421PD** | 105 | **4.1339** | 290 | **11.4173** | 130 | **5.1181** | 3.0 | **.120** | 1.0 | **.040** | 436 000 | **96 900** | 560 000 | **126 000** | 1 500 | 2 000 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.75 and $C_0$ by 3.85 (single) and C by 1.08 and $C_0$ by 1.93 (duplex).
3) Listed values are for machined bronze cage, ABEC-1.
For phenolic composition cage, multiply by 1.33 for both grease and oil. For phenolic composition cage, ABEC-5 or 7, multiply by 1.86 for both grease and oil. For pressed steel cage, ABEC-1, multiply by 0.67 for grease and 0.80 for oil. The speed rating adjustment factors have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 7000P series 40° angular contact ball bearings single ball bearing

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

$P = F_R$ when $F_A/F_R \leq 1.14$

or

$P = 0.35\ F_R + 0.57\ F_A$ when $F_A/F_R > 1.14$

P = Dynamic equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

### Life rating

$$L10 = \left(\frac{C}{P}\right)^3 \text{ (millions of revolutions)}$$

or

$$L10_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 \text{ (hours)}$$

C = Basic dynamic radial load rating (from single bearing tables)

P = Dynamic equivalent radial load

n = Speed in rpm

### Static equivalent radial load

$P_0 = 0.5\ F_R + 0.26\ F_A$

$P_0$ is always $\geq F_R$

$P_0$ = Static equivalent radial load

$F_A$ = Radial load

$F_A$ = Thrust load

## Minimum thrust load for angular contact ball bearings

Satisfactory operation of angular contact ball bearings requires sufficient traction forces between the balls and races to minimize damage caused by sliding or skidding. This is particularly important at high speeds where the inertia forces of the balls and cage and the viscous drag in the lubricant can have a detrimental influence on the rolling conditions.

The minimum required thrust load can be determined from the following formula.

$$F_A = A\left(\frac{n}{1000}\right)^2 \text{ newtons}$$

or

$$F_A = 0.2248\ A\left(\frac{n}{1000}\right)^2 \text{ pounds}$$

Where, $F_A$ = Minimum thrust load

A = Bearing design factor listed in the following tables

n = Speed in rpm

Note: For duplex bearings mounted in tandem, multiply the single-bearing thrust value by the number of bearings in tandem.

## Minimum thrust load A factor

| Size | A | Size | A |
|---|---|---|---|
| 7200P | 0.23 | 7310P | 36.26 |
| 7201P | 0.29 | 7311P | 57.36 |
| 7202P | 0.42 | 7312P | 77.30 |
| 7203P | 0.74 | 7313P | 111.40 |
| 7204P | 1.32 | 7314P | 144.60 |
| 7205P | 1.90 | 7315P | 182.70 |
| 7206P | 3.45 | 7316P | 215.80 |
| 7207P | 6.73 | 7317P | 269.40 |
| 7208P | 9.28 | 7318P | 332.30 |
| 7209P | 13.13 | 7319P | 405.70 |
| 7210P | 15.48 | 7320P | 629.40 |
| 7211P | 23.88 | 7321P | 673.40 |
| 7212P | 35.31 | 7322P | 904.70 |
| 7213P | 44.55 | 7324P | 1227.00 |
| 7214P | 53.74 | 7326P | 1631.00 |
| 7215P | 61.15 | 7328P | 2128.00 |
| 7216P | 84.07 | 7330P | 2731.00 |
| 7217P | 112.90 | 7332P | 3198.00 |
| 7218P | 148.50 | 7334P | 3717.00 |
| 7219P | 191.90 | 7336P | 5006.00 |
| 7220P | 224.10 | 7338P | 5739.00 |
| 7221P | 282.70 | 7340P | 7048.00 |
| 7222P | 352.10 | 7405P | 10.80 |
| 7224P | 450.50 | 7406P | 16.17 |
| 7226P | 604.70 | 7407P | 27.54 |
| 7228P | 761.60 | 7408P | 38.49 |
| 7230P | 1074.00 | 7409P | 58.46 |
| 7232P | 1314.00 | 7410P | 78.46 |
| 7234P | 1777.00 | 7411P | 111.70 |
| 7236P | 1981.00 | 7412P | 143.60 |
| 7238P | 2499.00 | 7413P | 181.90 |
| 7240P | 3081.00 | 7414P | 309.20 |
| 7300P | 0.41 | 7415P | 376.40 |
| 7301P | 0.59 | 7416P | 452.40 |
| 7302P | 0.85 | 7417P | 542.30 |
| 7303P | 1.53 | 7418P | 724.60 |
| 7304P | 1.91 | 7419P | 1083.00 |
| 7305P | 3.85 | 7420P | 1387.00 |
| 7306P | 7.39 | 7421P | 1546.00 |
| 7307P | 11.66 | | |
| 7308P | 17.31 | | |
| 7309P | 29.08 | | |

# 7000P series 40° angular contact ball bearings single bearing

## Dynamic equivalent radial load and life calculation examples

Bearing size: 7309P
Speed: 2000 rpm
Basic dynamic radial load rating (C) = 13300

### Case 1

Radial load ($F_R$) = 1750

Thrust load ($F_A$) = 1960

$F_A/F_R$ = 1960/1750 = 1.12

Since $F_A/F_R < 1.14$, equivalent load (P) = $F_R$ = 1750

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13300}{1750}\right)^3 = 439 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{13300}{1750}\right)^3$$

= 3658 Hrs

### Case 2

Radial load ($F_R$) = 1750

Thrust load ($F_A$) = 2450

$F_A/F_R$ = 2450/1750 = 1.40

Since $F_A/F_R > 1.14$, equivalent load (P) = 0.35 $F_R$ + 0.57 $F_A$

P = 0.35 x 1750 +0.57 x 2450 = 2009

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13300}{2009}\right)^3 = 290 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{13300}{2009}\right)^3$$

= 2418 Hrs

### Case 3

Thrust load ($F_A$) = 2450

$F_A/F_R$ = 2450/0 = ∞

Since $F_A/F_R > 1.14$, equivalent load (P) = 0.35 $F_R$ + W0.57 $F_A$

P = 0.57 x 2450 = 1397

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13300}{1397}\right)^3 = 863 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{13300}{1397}\right)^3$$

= 7191 Hrs

# 7000PD series 40° angular contact ball bearings duplex

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

**DB or DF pair**

$P = 1.0\ F_R + 0.55\ F_A$ when $F_A / F_R \leq 1.14$

$P = 0.57\ F_R + 0.93\ F_A$ when $F_A / F_R > 1.14$

**Tandem DT**

$P = 1.0\ F_R$ when $F_A / F_R \leq 1.14$

$P = 0.35\ F_R + 0.57\ F_A$ when $F_A / F_R > 1.14$

P = Dynamic equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

### Life rating

$$L10 = \left(\frac{C}{P}\right)^3 \text{ (millions of revolutions)}$$

or

$$L10_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 \text{ (hours)}$$

P = Dynamic equivalent radial load

n = Speed in rpm

**For DB or DF mounting:**

C = Duplex pair dynamic radial load rating (from duplex bearing tables)

or

C = Single-row dynamic radial load rating times $(i)^{0.7}$, where i = 2

**For DT tandem mounting:**

C = Single-row dynamic radial load rating times $(i)^{0.7}$, where i = number of bearings in set

### Static equivalent radial load

$P_0 = 1.0\ F_R + 0.52\ F_A$

$P_0$ is always $\geq F_R$

$P_0$ = Static equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

## Dynamic equivalent radial load and life calculation examples

Bearing size: 7309PDT

3 bearings in tandem

Speed: 2000 rpm

Single-row basic dynamic radial load rating (C) = 13300

### Case 1

Thrust load ($F_A$) = 4200

$F_A/F_R = 4200/0 = \infty$

Since $F_A/F_R > 1.14$, equivalent load

(P) = $0.35\ F_R + 0.57\ F_A = 0.57 \times 4200 = 2394$

or

Load rating = $(i)^{0.7} \times 13300 = (3)^{0.7} \times 13300 = 28697$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{28697}{2394}\right)^3 = 1722 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{28697}{2394}\right)^3$$

= 14353 Hrs

### Case 2

Radial load ($F_R$) = 3500

Thrust load ($F_A$) = 4200

$F_A/F_R = 4200/3500 = 1.20$

Since $F_A/F_R > 1.14$, equivalent load

(P) = $0.35\ F_R + 0.57\ F_A$

= $0.35 \times 3500 + 0.57 \times 4200 = 3619$

Load rating = $(i)^{0.7} \times 13300 = (3)^{0.7} \times 13300 = 28697$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{28697}{3619}\right)^3 = 299 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{28697}{3619}\right)^3$$

= 4155 Hrs

# 7000PD series 40° angular contact ball bearings duplex

## Dynamic equivalent radial load and life calculation examples

Bearing size: 7309PDU (DB or DF pair)
Speed: 2000 rpm
Duplex pair basic dynamic radial load rating (C) = 21900

### Case 1

Radial load ($F_R$) = 1750
Thrust load ($F_A$) = 1960
$F_A/F_R$ = 1960/1750 = 1.12
Since $F_A/F_R$ < 1.14, equivalent load
(P) = 1.0 $F_R$ + 0.55 $F_A$
= 1.0 x 1750 +0.55 x 1960 = 2828

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{21900}{2828}\right)^3 = 464 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L10}_h\text{)} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{21900}{2828}\right)^3$$

= 3870 Hrs

### Case 2

Radial load ($F_R$) = 1750
Thrust load ($F_A$) = 2450
$F_A/F_R$ = 2450/1750 = 1.40
Since $F_A/F_R$ > 1.14, equivalent load
(P) = 0.57 $F_R$ + 0.93 $F_A$
= 0.57 x 1750 +0.93 x 2450 = 3276

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{21900}{3276}\right)^3 = 299 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L10}_h\text{)} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{21900}{3276}\right)^3$$

= 2490 Hrs

### Case 3

Thrust load ($F_A$) = 2450
$F_A/F_R$ = 2450/0 = ∞
Since $F_A/F_R$ > 1.14, equivalent load
(P) = 0.57 $F_R$ + 0.93 $F_A$ = 0.93 x 2450 = 2279

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{21900}{2279}\right)^3 = 887 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L 10}_h\text{)} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{21900}{2279}\right)^3$$

= 7395 Hrs

### Case 4

Radial load ($F_R$) = 1750
$F_A/F_R$ = 0/1750 = 0
Since $F_A/F_R$ < 1.14, equivalent load
(P) = 1.0 $F_R$ + 0.55 $F_A$ = 1.0 x 1750 = 1750

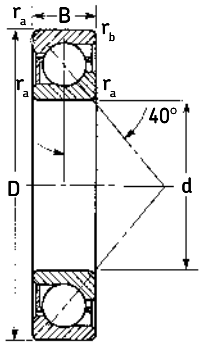
$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{21900}{1750}\right)^3 = 1960 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L10}_h\text{)} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{21900}{1750}\right)^3$$

= 16332 Hrs

# 7000PJ series single-row 40° angular contact ball bearings



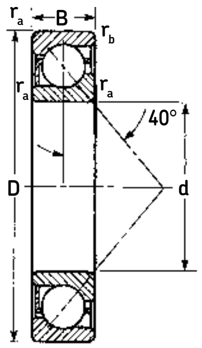

Angular contact ball bearings with a PJ suffix have one heavy race shoulder and one counterbored race shoulder on the outer ring; opposing one heavy race shoulder and one counterbored race shoulder on the inner ring. Because of this construction, it is possible for this bearing to incorporate a greater number of balls than a deep groove, nonfilling notch bearing. The combination of maximum ball complement, optimum race groove depth, and the 40° contact angle results in high thrust load carrying capacity.

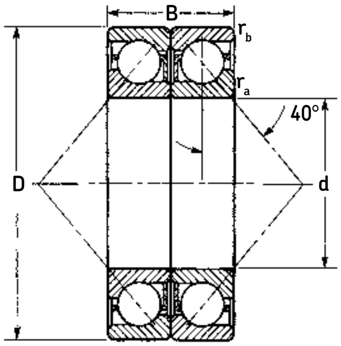
7000PJ series bearings are particularly suitable for positions where the thrust is always present in **one** direction. They should **not** be used where the bearing is subjected to radial load only; or combined radial and thrust load where the radial load is predominant. When heavy thrust must be taken in both directions, the PJD series angular contact ball bearings may be mounted in a back-to-back or face-to-face duplex arrangement with another angular contact bearing.

7000PJ series bearings are available with either pressed brass or machined brass, ball centered cages. The low shoulder diameters on the nonthrust sides of the inner and outer rings, combined with large clearances between the land diameters and the cage allow for large quantities of oil to flow through these bearings. The increased oil flow reduces operating temperature and theoretically increases bearing life.

ABEC-3 bore tolerances reduce the range of interference fits between the shaft and bearing bore. These tighter tolerances result in closer control of preload and minimize the risk of thermal runaway.

# 7200PJ light series and 7200PJD light series duplex




7200PJ and PJD series bearings are used for heavy one-directional thrust loads, or combined radial and thrust loads where the thrust load is predominant.

**Caution: Single bearings are not to be used where only radial loads are present. For two-directional thrust loads, use duplex bearings.**

Notes:
"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

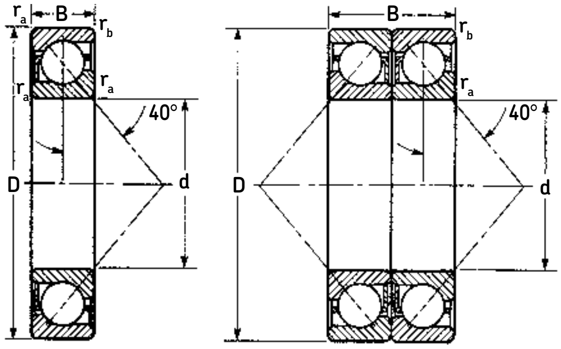
Values for PJD bearings are for back-to-back (DB) or face-to-face (DF) mounting arrangements.

ABEC-1 and -3 are stocked as half-pairs, where available.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | $r_a$ in. | $r_b$ mm | $r_b$ in. | Basic radial load rating[2] Dynamic $C$[4] N | Dynamic lbf | Static $C_0$ N | Static lbf | Speed rating[3] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7205PJ** | 25 | **.9843** | 52 | **2.0472** | 15 | **.5906** | 1.0 | **.04** | .60 | **.024** | 15 600 | **3 510** | 10 200 | **2 290** | 10 000 | 15 000 |
| **7206PJ** | 30 | **1.1811** | 62 | **2.4409** | 16 | **.6299** | 1.0 | **.04** | .60 | **.024** | 23 800 | **5 350** | 15 600 | **3 510** | 8 500 | 12 000 |
| **7207PJ** | 35 | **1.3780** | 72 | **2.8346** | 17 | **.6693** | 1.0 | **.04** | .60 | **.024** | 30 700 | **6 900** | 20 800 | **4 680** | 8 000 | 11 000 |
| **7208PJ** | 40 | **1.5748** | 80 | **3.1496** | 18 | **.7087** | 1.0 | **.04** | .60 | **.024** | 36 400 | **8 180** | 26 000 | **5 850** | 7 000 | 9 500 |
| **7209PJ** | 45 | **1.7717** | 85 | **3.3465** | 19 | **.7480** | 1.0 | **.04** | .60 | **.024** | 37 700 | **8 480** | 28 000 | **6 300** | 6 700 | 9 000 |
| **7210PJ** | 50 | **1.9685** | 90 | **3.5433** | 20 | **.7874** | 1.0 | **.04** | .60 | **.024** | 39 000 | **8 770** | 30 500 | **6 860** | 6 000 | 8 000 |
| **7211PJ** | 55 | **2.1654** | 100 | **3.9370** | 21 | **.8268** | 1.5 | **.06** | 1.00 | **.040** | 48 800 | **11 000** | 38 000 | **8 540** | 5 600 | 7 500 |
| **7212PJ** | 60 | **2.3622** | 110 | **4.3307** | 22 | **.8661** | 1.5 | **.06** | 1.00 | **.040** | 57 200 | **12 900** | 45 500 | **10 200** | 5 000 | 6 700 |
| **7213PJ** | 65 | **2.5591** | 120 | **4.7244** | 23 | **.9055** | 1.5 | **.06** | 1.00 | **.040** | 66 300 | **14 900** | 54 000 | **12 100** | 4 500 | 6 000 |
| **7214PJ** | 70 | **2.7559** | 125 | **4.9213** | 24 | **.9449** | 1.5 | **.06** | 1.00 | **.040** | 71 500 | **16 100** | 60 000 | **13 500** | 4 300 | 5 600 |
| **7215PJ** | 75 | **2.9528** | 130 | **5.1181** | 25 | **.9843** | 1.5 | **.06** | 1.00 | **.040** | 72 800 | **16 400** | 64 000 | **14 400** | 4 000 | 5 300 |
| **7216PJ** | 80 | **3.1496** | 140 | **5.5118** | 26 | **1.0236** | 2.0 | **.08** | 1.00 | **.040** | 83 200 | **18 700** | 73 500 | **16 500** | 3 800 | 5 000 |
| **7217PJ** | 85 | **3.3465** | 150 | **5.9055** | 28 | **1.1024** | 2.0 | **.08** | 1.00 | **.040** | 95 600 | **21 500** | 83 000 | **18 700** | 3 600 | 4 800 |
| **7218PJ** | 90 | **3.5433** | 160 | **6.2992** | 30 | **1.1811** | 2.0 | **.08** | 1.00 | **.040** | 108 000 | **24 300** | 96 500 | **21 700** | 3 400 | 4 500 |
| **7200PJD** | | | | | | | | | | | | | | | | |
| **7205PJD** | 25 | **.9843** | 52 | **2.0472** | 30 | **1.1811** | 1.0 | **.04** | .60 | **.024** | 25 100 | **5 640** | 20 400 | **4 590** | 8 500 | 12 000 |
| **7206PJD** | 30 | **1.1811** | 62 | **2.4409** | 32 | **1.2598** | 1.0 | **.04** | .60 | **.024** | 39 000 | **8 770** | 31 000 | **6 970** | 7 500 | 10 000 |
| **7207PJD** | 35 | **1.3780** | 72 | **2.8346** | 34 | **1.3386** | 1.0 | **.04** | .60 | **.024** | 50 700 | **11 400** | 41 500 | **9 330** | 6 300 | 8 500 |
| **7208PJD** | 40 | **1.5748** | 80 | **3.1496** | 36 | **1.4173** | 1.0 | **.04** | .60 | **.024** | 59 200 | **13 300** | 52 000 | **11 700** | 5 600 | 7 500 |
| **7209PJD** | 45 | **1.7717** | 85 | **3.3465** | 38 | **1.4961** | 1.0 | **.04** | .60 | **.024** | 61 800 | **13 900** | 56 000 | **12 600** | 5 300 | 7 000 |
| **7210PJD** | 50 | **1.9685** | 90 | **3.5433** | 40 | **1.5748** | 1.0 | **.04** | .60 | **.024** | 63 700 | **14 300** | 61 000 | **13 700** | 4 800 | 6 300 |
| **7211PJD** | 55 | **2.1654** | 100 | **3.9370** | 42 | **1.6535** | 1.5 | **.06** | 1.00 | **.040** | 78 000 | **17 500** | 76 500 | **17 200** | 4 500 | 6 000 |
| **7212PJD** | 60 | **2.3622** | 110 | **4.3307** | 44 | **1.7323** | 1.5 | **.06** | 1.00 | **.040** | 93 600 | **21 000** | 91 500 | **20 600** | 4 000 | 5 300 |
| **7213PJD** | 65 | **2.5591** | 120 | **4.7244** | 46 | **1.8110** | 1.5 | **.06** | 1.00 | **.040** | 108 000 | **24 300** | 108 000 | **24 300** | 3 600 | 4 800 |
| **7214PJD** | 70 | **2.7559** | 125 | **4.9213** | 48 | **1.8898** | 1.5 | **.06** | 1.00 | **.040** | 114 000 | **25 600** | 118 000 | **26 500** | 3 400 | 4 500 |
| **7215PJD** | 75 | **2.9528** | 130 | **5.1181** | 50 | **1.9685** | 1.5 | **.06** | 1.00 | **.040** | 119 000 | **26 800** | 127 000 | **28 600** | 3 200 | 4 300 |
| **7216PJD** | 80 | **3.1496** | 140 | **5.5118** | 52 | **2.0472** | 2.0 | **.08** | 1.00 | **.040** | 135 000 | **30 400** | 146 000 | **32 800** | 3 000 | 4 000 |
| **7217PJD** | 85 | **3.3465** | 150 | **5.9055** | 56 | **2.2047** | 2.0 | **.08** | 1.00 | **.040** | 156 000 | **35 100** | 166 000 | **37 300** | 2 800 | 3 800 |
| **7218PJD** | 90 | **3.5433** | 160 | **6.2992** | 60 | **2.3622** | 2.0 | **.08** | 1.00 | **.040** | 178 000 | **40 000** | 193 000 | **43 400** | 2 600 | 3 600 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.75 and $C_0$ by 3.85 (single) and C by 1.08 and $C_0$ by 1.93 (duplex).
3) Listed values are for pressed brass and steel or polyamide cage. The values have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 7300PJ medium series and 7300PJD medium series duplex




7300PJ and PJD series bearings are used for very heavy one-directional thrust loads, or combined radial and thrust loads where the thrust load is predominant.

**Caution: Single bearings are not to be used where only radial loads are present. For two-directional thrust loads, use duplex bearings.**

Notes:
"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

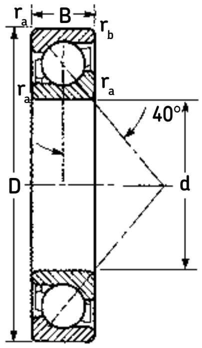
Values for PJD bearings are for back-to-back (DB) or face-to-face (DF) mounting arrangements.

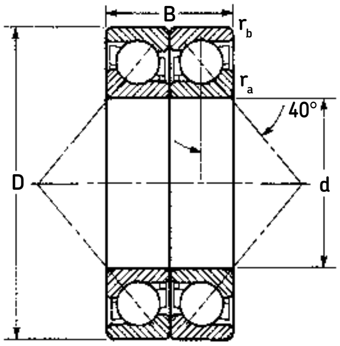
ABEC-1 and -3 ARE stocked as half-pairs, where available.

| | Bore | | Outside diameter | | Width | | Fillet radius[1)] | | | | Basic radial load rating[2)] | | | | Speed rating[3)] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d | | D | | B | | $r_a$ | | $r_b$ | | $C^{4)}$ | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| 7304PJ | 20 | .7874 | 52 | 2.0472 | 15 | .5906 | 1.0 | .04 | .60 | .024 | 19 000 | 4 270 | 10 400 | 2 340 | 11 000 | 16 000 |
| 7305PJ | 25 | .9843 | 62 | 2.4409 | 17 | .6693 | 1.0 | .04 | .60 | .024 | 26 000 | 5 850 | 15 600 | 3 510 | 9 000 | 13 000 |
| 7306PJ | 30 | 1.1811 | 72 | 2.8346 | 19 | .7480 | 1.0 | .04 | .60 | .024 | 34 500 | 7 760 | 21 200 | 4 770 | 8 000 | 11 000 |
| 7307PJ | 35 | 1.3780 | 80 | 3.1496 | 21 | .8268 | 1.5 | .06 | 1.00 | .040 | 39 000 | 8 770 | 24 500 | 5 510 | 7 500 | 10 000 |
| 7308PJ | 40 | 1.5748 | 90 | 3.5433 | 23 | .9055 | 1.5 | .06 | 1.00 | .040 | 49 400 | 11 100 | 33 500 | 7 530 | 6 700 | 9 000 |
| 7309PJ | 45 | 1.7717 | 100 | 3.9370 | 25 | .9843 | 1.5 | .06 | 1.00 | 040 | 60 500 | 13 600 | 41 500 | 9 330 | 6 000 | 8 000 |
| 7310PJ | 50 | 1.9685 | 110 | 4.3307 | 27 | 1.0630 | 2.0 | .08 | 1.00 | .040 | 74 100 | 16 700 | 51 000 | 11 500 | 5 300 | 7 000 |
| 7311PJ | 55 | 2.1654 | 120 | 4.7244 | 29 | 1.1417 | 2.0 | .08 | 1.00 | .040 | 85 200 | 19 200 | 60 000 | 13 500 | 4 800 | 6 300 |
| 7312PJ | 60 | 2.3622 | 130 | 5.1181 | 31 | 1.2205 | 2.0 | .08 | 1.00 | .040 | 95 600 | 21 500 | 69 500 | 15 600 | 4 500 | 6 000 |
| 7313PJ | 65 | 2.5591 | 140 | 5.5118 | 33 | 1.2992 | 2.0 | .08 | 1.00 | .040 | 108 000 | 24 300 | 80 000 | 18 000 | 4 300 | 5 600 |
| 7314PJ | 70 | 2.7559 | 150 | 5.9055 | 35 | 1.3780 | 2.0 | .08 | 1.00 | .040 | 119 000 | 26 800 | 90 000 | 20 200 | 3 800 | 5 000 |
| 7315PJ | 75 | 2.9528 | 160 | 6.2992 | 37 | 1.4567 | 2.0 | .08 | 1.00 | .040 | 133 000 | 29 900 | 106 000 | 23 800 | 3 600 | 4 800 |
| 7316PJ | 80 | 3.1496 | 170 | 6.6929 | 39 | 1.5354 | 2.0 | .08 | 1.00 | .040 | 143 000 | 32 200 | 118 000 | 26 500 | 3 400 | 4 500 |
| 7317PJ | 85 | 3.3465 | 180 | 7.0866 | 41 | 1.6142 | 2.5 | .10 | 1.00 | .040 | 153 000 | 34 400 | 132 000 | 29 700 | 3 200 | 4 300 |
| 7318PJ | 90 | 3.5433 | 190 | 7.4803 | 43 | 1.6929 | 2.5 | .10 | 1.00 | .040 | 165 000 | 37 100 | 146 000 | 32 800 | 3 000 | 4 000 |
| 7319PJ | 95 | 3.7402 | 200 | 7.8740 | 45 | 1.7717 | 2.5 | .10 | 1.00 | .040 | 178 000 | 40 000 | 163 000 | 36 600 | 2 800 | 3 800 |
| **7300PJD** | | | | | | | | | | | | | | | | |
| 7304PJD | 20 | .7874 | 52 | 2.0472 | 30 | 1.1811 | 1.0 | .04 | .60 | .024 | 30 700 | 6 900 | 20 800 | 4 680 | 9 000 | 13 000 |
| 7305PJD | 25 | .9843 | 62 | 2.4409 | 34 | 1.3386 | 1.0 | .04 | .60 | .024 | 42 300 | 9 510 | 31 000 | 6 970 | 7 500 | 10 000 |
| 7306PJD | 30 | 1.1811 | 72 | 2.8346 | 38 | 1.4961 | 1.0 | .04 | .60 | .024 | 55 900 | 12 600 | 42 500 | 9 550 | 6 700 | 9 000 |
| 7307PJD | 35 | 1.3780 | 80 | 3.1496 | 42 | 1.6535 | 1.5 | .06 | 1.00 | .040 | 62 400 | 14 000 | 49 000 | 11 000 | 6 000 | 8 000 |
| 7308PJD | 40 | 1.5748 | 90 | 3.5433 | 46 | 1.8110 | 1.5 | .06 | 1.00 | .040 | 79 300 | 17 800 | 65 500 | 14 700 | 5 300 | 7 000 |
| 7309PJD | 45 | 1.7717 | 100 | 3.9370 | 50 | 1.9685 | 1.5 | .06 | 1.00 | .040 | 97 500 | 21 900 | 81 500 | 18 300 | 4 800 | 6 300 |
| 7310PJD | 50 | 1.9685 | 110 | 4.3307 | 54 | 2.1260 | 2.0 | .08 | 1.00 | .040 | 119 000 | 26 800 | 102 000 | 22 900 | 4 300 | 5 600 |
| 7311PJD | 55 | 2.1654 | 120 | 4.7244 | 58 | 2.2835 | 2.0 | .08 | 1.00 | .040 | 138 000 | 31 000 | 120 000 | 27 000 | 3 800 | 5 000 |
| 7312PJD | 60 | 2.3622 | 130 | 5.1181 | 62 | 2.4409 | 2.0 | .08 | 1.00 | .040 | 156 000 | 35 100 | 140 000 | 31 500 | 3 600 | 4 800 |
| 7313PJD | 65 | 2.5591 | 140 | 5.5118 | 66 | 2.5984 | 2.0 | .08 | 1.00 | .040 | 174 000 | 39 100 | 160 000 | 36 000 | 3 200 | 4 300 |
| 7314PJD | 70 | 2.7559 | 150 | 5.9055 | 70 | 2.7559 | 2.0 | .08 | 1.00 | .040 | 195 000 | 43 800 | 180 000 | 40 500 | 3 000 | 4 000 |
| 7315PJD | 75 | 2.9528 | 160 | 6.2992 | 74 | 2.9134 | 2.0 | .08 | 1.00 | .040 | 212 000 | 47 700 | 212 000 | 47 700 | 2 800 | 3 800 |
| 7316PJD | 80 | 3.1496 | 170 | 6.6929 | 78 | 3.0709 | 2.0 | .08 | 1.00 | .040 | 229 000 | 51 500 | 236 000 | 53 100 | 2 600 | 3 600 |
| 7317PJD | 85 | 3.3465 | 180 | 7.0866 | 82 | 3.2283 | 2.5 | .10 | 1.00 | .040 | 251 000 | 56 400 | 265 000 | 59 600 | 2 400 | 3 400 |
| 7318PJD | 90 | 3.5433 | 190 | 7.4803 | 86 | 3.3858 | 2.5 | .10 | 1.00 | .040 | 270 000 | 60 700 | 290 000 | 65 200 | 2 200 | 3 200 |
| 7319PJD | 95 | 3.7402 | 200 | 7.8740 | 90 | 3.5433 | 2.5 | .10 | 1.00 | .040 | 286 000 | 64 300 | 325 000 | 73 100 | 2 000 | 3 000 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.75 and $C_0$ by 3.85 (single) and C by 1.08 and $C_0$ by 1.93 (duplex).
3) Listed values are for pressed brass and steel or polyamide cage. The values have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 7400PJ heavy series and 7400PJD heavy series duplex




7400PJ and PJD series bearings are similar to the 7200PJ and 7300PJ series, but are heavier sectioned; and are used for very heavy one-directional thrust loads, or combined radial and thrust loads where the thrust load is predominant.

**Caution: Single bearings are not to be used where only radial loads are present. For two-directional thrust loads, use duplex bearings.**

Notes:
"D" indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

Values for D bearings are for back-to-back (DB) or face-to-face (DF) mounting arrangements.

ABEC-1 and 3 are stocked as half-pairs, where available.

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1)] $r_a$ mm | in. | $r_b$ mm | in. | Basic radial load rating[2)] Dynamic $C$[4)] N | lbf | Static $C_0$ N | lbf | Speed rating[3)] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7405PJ | 25 | .9843 | 80 | 3.1496 | 21 | .8268 | 1.5 | .060 | 1.0 | .040 | 39 700 | 8 920 | 23 600 | 5 310 | 7 000 | 10 000 |
| 7406PJ | 30 | 1.1811 | 90 | 3.5433 | 23 | .9055 | 1.5 | .060 | 1.0 | .040 | 47 500 | 10 700 | 29 000 | 6 520 | 6 300 | 9 000 |
| 7407PJ | 35 | 1.3780 | 100 | 3.9370 | 25 | .9843 | 1.5 | .060 | 1.0 | .040 | 60 500 | 13 600 | 38 000 | 8 540 | 5 600 | 7 500 |
| 7408PJ | 40 | 1.5748 | 110 | 4.3307 | 27 | 1.0630 | 2.0 | .080 | 1.0 | .040 | 70 200 | 15 800 | 45 500 | 10 200 | 5 300 | 7 000 |
| 7409PJ | 45 | 1.7717 | 120 | 4.7244 | 29 | 1.1417 | 2.0 | .080 | 1.0 | .040 | 85 200 | 19 200 | 55 000 | 12 400 | 4 800 | 6 300 |
| 7410PJ | 50 | 1.9685 | 130 | 5.1181 | 31 | 1.2205 | 2.0 | .080 | 1.0 | .040 | 95 600 | 21 500 | 64 000 | 14 400 | 4 300 | 6 000 |
| 7411PJ | 55 | 2.1654 | 140 | 5.5118 | 33 | 1.2992 | 2.0 | .080 | 1.0 | .040 | 111 000 | 25 000 | 76 500 | 17 200 | 4 000 | 5 600 |
| 7412PJ | 60 | 2.3622 | 150 | 5.9055 | 35 | 1.3780 | 2.0 | .080 | 1.0 | .040 | 119 000 | 26 800 | 86 500 | 19 400 | 3 600 | 5 000 |
| 7413PJ | 65 | 2.5591 | 160 | 6.2992 | 37 | 1.4567 | 2.0 | .080 | 1.0 | .040 | 130 000 | 29 200 | 96 500 | 21 700 | 3 400 | 4 800 |
| 7414PJ | 70 | 2.7559 | 180 | 7.0866 | 42 | 1.6535 | 2.5 | .100 | 1.0 | .040 | 159 000 | 35 700 | 127 000 | 28 600 | 3 000 | 4 300 |
| 7415PJ | 75 | 2.9528 | 190 | 7.4803 | 45 | 1.7717 | 2.5 | .100 | 1.0 | .040 | 168 000 | 37 800 | 140 000 | 31 500 | 2 800 | 4 000 |
| 7416PJ | 80 | 3.1496 | 200 | 7.8740 | 48 | 1.8898 | 2.5 | .100 | 1.0 | .040 | 178 000 | 40 000 | 153 000 | 34 400 | 2 600 | 3 800 |
| 7417PJ | 85 | 3.3465 | 210 | 8.2677 | 52 | 2.0472 | 3.0 | .120 | 1.0 | .040 | 190 000 | 42 700 | 166 000 | 37 300 | 2 500 | 3 600 |
| 7418PJ | 90 | 3.5433 | 225 | 8.8583 | 54 | 2.1260 | 3.0 | .120 | 1.0 | .040 | 216 000 | 48 600 | 200 000 | 45 000 | 2 400 | 3 400 |
| 7419PJ | 95 | 3.7402 | 250 | 9.8425 | 55 | 2.1654 | 3.0 | .120 | 1.0 | .040 | 251 000 | 56 400 | 245 000 | 55 100 | 2 200 | 3 000 |
| 7420PJ | 100 | 3.9370 | 265 | 10.4331 | 60 | 2.3622 | 3.0 | .120 | 1.0 | .040 | 276 000 | 62 000 | 275 000 | 61 800 | 2 000 | 2 800 |
| 7421PJ | 105 | 4.1339 | 290 | 11.4173 | 65 | 2.5591 | 3.0 | .120 | 1.0 | .040 | 265 000 | 59 600 | 280 000 | 62 900 | 1 900 | 2 600 |
| **7400PJD** | | | | | | | | | | | | | | | | |
| 7405PJD | 25 | .9843 | 80 | 3.1496 | 42 | 1.6535 | 1.5 | .060 | 1.0 | .040 | 65 000 | 14 500 | 47 500 | 10 600 | 5 600 | 8 000 |
| 7406PJD | 30 | 1.1811 | 90 | 3.5433 | 46 | 1.8110 | 1.5 | .060 | 1.0 | .040 | 78 000 | 17 400 | 58 500 | 13 000 | 5 000 | 7 200 |
| 7407PJD | 35 | 1.3780 | 100 | 3.9370 | 50 | 1.9685 | 1.5 | .060 | 1.0 | .040 | 97 500 | 22 100 | 76 500 | 17 100 | 4 500 | 6 000 |
| 7408PJD | 40 | 1.5748 | 110 | 4.3307 | 54 | 2.1260 | 2.0 | .080 | 1.0 | .040 | 114 000 | 25 700 | 91 000 | 20 400 | 4 300 | 5 600 |
| 7409PJD | 45 | 1.7717 | 120 | 4.7244 | 58 | 2.2835 | 2.0 | .080 | 1.0 | .040 | 138 000 | 31 200 | 110 000 | 24 800 | 3 800 | 5 000 |
| 7410PJD | 50 | 1.9685 | 130 | 5.1181 | 62 | 2.4409 | 2.0 | .080 | 1.0 | .040 | 156 000 | 34 900 | 129 000 | 28 800 | 3 400 | 4 800 |
| 7411PJD | 55 | 2.1654 | 140 | 5.5118 | 66 | 2.5984 | 2.0 | .080 | 1.0 | .040 | 182 000 | 40 600 | 153 000 | 34 400 | 3 200 | 4 500 |
| 7412PJD | 60 | 2.3622 | 150 | 5.9055 | 70 | 2.7559 | 2.0 | .080 | 1.0 | .040 | 195 000 | 43 600 | 173 000 | 38 800 | 2 800 | 4 000 |
| 7413PJD | 65 | 2.5591 | 160 | 6.2992 | 74 | 2.9134 | 2.0 | .080 | 1.0 | .040 | 212 000 | 47 400 | 193 000 | 43 400 | 2 700 | 3 800 |
| 7414PJD | 70 | 2.7559 | 180 | 7.0866 | 84 | 3.3071 | 2.5 | .100 | 1.0 | .040 | 260 000 | 58 000 | 255 000 | 57 200 | 2 400 | 3 400 |
| 7415PJD | 75 | 2.9528 | 190 | 7.4803 | 90 | 3.5433 | 2.5 | .100 | 1.0 | .040 | 276 000 | 61 400 | 280 000 | 63 000 | 2 200 | 3 200 |
| 7416PJD | 80 | 3.1496 | 200 | 7.8740 | 96 | 3.7795 | 2.5 | .100 | 1.0 | .040 | 288 000 | 64 800 | 306 000 | 68 800 | 2 000 | 3 000 |
| 7417PJD | 85 | 3.3465 | 210 | 8.2677 | 104 | 4.0945 | 3.0 | .120 | 1.0 | .040 | 307 000 | 69 400 | 335 000 | 74 600 | 2 000 | 2 800 |
| 7418PJD | 90 | 3.5433 | 225 | 8.8583 | 108 | 4.2520 | 3.0 | .120 | 1.0 | .040 | 351 000 | 78 900 | 400 000 | 89 900 | 1 900 | 2 700 |
| 7419PJD | 95 | 3.7402 | 250 | 9.8425 | 110 | 4.3307 | 3.0 | .120 | 1.0 | .040 | 410 000 | 92 200 | 490 000 | 110 000 | 1 800 | 2 400 |
| 7420PJD | 100 | 3.9370 | 265 | 10.4331 | 120 | 4.7244 | 3.0 | .120 | 1.0 | .040 | 449 000 | 101 000 | 550 000 | 124 000 | 1 600 | 2 200 |
| 7421PJD | 105 | 4.1339 | 290 | 11.4173 | 130 | 5.1181 | 3.0 | .120 | 1.0 | .040 | 436 000 | 96 900 | 560 000 | 126 000 | 1 500 | 2 000 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.75 and $C_0$ by 3.85 (single) and C by 1.08 and $C_0$ by 1.93 (duplex).
3) Listed values are for machined bronze cage, ABEC-1. The values have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 7000PJ series 40° angular contact ball bearings single bearing

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

$P = F_R$ when $F_A/F_R \leq 1.14$

or

$P = 0.35\ F_R + 0.57\ F_A$ when $F_A/F_R > 1.14$

P = Dynamic equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

### Life rating

$$L10 = \left(\frac{C}{P}\right)^3 \text{ (millions of revolutions)}$$

or

$$L10_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 \text{ (hours)}$$

C = Basic dynamic radial load rating (from single bearing tables)

P = Dynamic equivalent radial load

n = Speed in rpm

### Static equivalent radial load

$P_0 = 0.5\ F_R + 0.26\ F_A$

$P_0$ is always $\geq F_R$

$P_0$ = Static equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

## Minimum thrust load for angular contact ball bearings

Satisfactory operation of angular contact ball bearings requires sufficient traction forces between the balls and races to minimize damage caused by sliding or skidding. This is particularly important at high speeds where the inertia forces of the balls and cage and the viscous drag in the lubricant can have a detrimental influence on the rolling conditions.

The minimum required thrust load can be determined from the following formula.

$$F_A = A\left(\frac{n}{1000}\right)^2 \text{ newtons}$$

or

$$F_A = 0.2248\ A\left(\frac{n}{1000}\right)^2 \text{ pounds}$$

where, $F_A$ = Minimum thrust load

A = Bearing design factor listed in the following tables

n = Speed in rpm

Note: For duplex bearings mounted in tandem, multiply the single-bearing thrust value by the number of bearings in tandem.

## Minimum thrust load A factor

| Size | A | Size | A |
|---|---|---|---|
| 7205PJ | 1.71 | 7304PJ | 2.07 |
| 7206PJ | 4.07 | 7305PJ | 4.30 |
| 7207PJ | 7.29 | 7306PJ | 8.13 |
| 7208PJ | 10.92 | 7307PJ | 11.10 |
| 7209PJ | 12.80 | 7308PJ | 18.88 |
| 7210PJ | 15.04 | 7309PJ | 29.19 |
| 7211PJ | 23.48 | 7310PJ | 45.54 |
| 7212PJ | 34.61 | 7311PJ | 62.57 |
| 7213PJ | 47.73 | 7312PJ | 84.44 |
| 7214PJ | 56.67 | 7313PJ | 111.50 |
| 7215PJ | 63.52 | 7314PJ | 144.60 |
| 7216PJ | 84.96 | 7315PJ | 184.90 |
| 7217PJ | 113.70 | 7316PJ | 233.80 |
| 7218PJ | 148.60 | 7317PJ | 291.90 |
| | | 7318PJ | 360.00 |
| | | 7319PJ | 439.50 |

# 7000PJ series 40° angular contact ball bearings single bearing

## Dynamic equivalent radial load and life calculation examples

Bearing size: 7309PJ
Speed: 2000 rpm
Basic dynamic radial load rating (C) = 13600

### Case 1

Radial load ($F_R$) = 1750
Thrust load ($F_A$) = 1960
$F_A/F_R$ = 1960/1750 = 1.12
Since $F_A/F_R$ < 1.14, equivalent load (P) = $F_R$ = 1750

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13600}{1750}\right)^3 = 469 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{13600}{1750}\right)^3$$

= 3911 Hrs

### Case 2

Radial load ($F_R$) = 1750
Thrust load ($F_A$) = 2450
$F_A/F_R$ = 2450/1750 = 1.40
Since $F_A/F_R$ > 1.14, equivalent load (P) = 0.35 $F_R$ + 0.57 $F_A$
P = 0.35 x 1750 +0.57 x 2450 = 2009

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13600}{2009}\right)^3 = 310 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{13600}{2009}\right)^3$$

= 2585 Hrs

### Case 3

Thrust load ($F_A$) = 2450
$F_A/F_R$ = 2450/0 = ∞
Since $F_A/F_R$ > 1.14, equivalent load (P) = 0.35 $F_R$ + 0.57 $F_A$
P = 0.57 x 2450 = 1397

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13600}{1397}\right)^3 = 923 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L\ 10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{13600}{1397}\right)^3$$

= 7689 Hrs

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

**DB or DF pair**

$P = 1.0\ F_R + 0.55\ F_A$ when $F_A / F_R \leq 1.14$

$P = 0.57\ F_R + 0.93\ F_A$ when $F_A / F_R > 1.14$

**Tandem DT**

$P = 1.0\ F_R$ when $F_A / F_R \leq 1.14$

$P = 0.35\ F_R + 0.57\ F_A$ when $F_A / F_R > 1.14$

P = Dynamic equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

### Life rating

$L10 = \left(\frac{C}{P}\right)^3$ (millions of revolutions)

or

$L10_h = \frac{10^6}{60n} \left(\frac{C}{P}\right)^3$ (hours)

P = Dynamic equivalent radial load

n = Speed in rpm

**For DB or DF mounting:**

C = Duplex pair dynamic radial load rating (from duplex bearing tables)

or

C = Single-row dynamic radial load rating times $(i)^{0.7}$, where i = 2

**For tandem mounting:**

C = Single-row dynamic radial load rating times $(i)^{0.7}$ where i = number of bearings in set

### Static equivalent radial load

$P_0 = 1.0\ F_R + 0.52\ F_A$

$P_0$ is always $\geq F_R$

$P_0$ = Static equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

## Dynamic equivalent radial load and life calculation examples

Bearing size: 7309PJDT

3 bearings in tandem

Speed: 2000 rpm

Single-row basic dynamic radial load rating (C) = 13600

### Case 1

Thrust load ($F_A$) = 4200

$F_A/F_R = 4200/0 = \infty$

Since $F_A/F_R > 1.14$, equivalent load

(P) = $0.35\ F_R + 0.57\ F_A = 0.57 \times 4200 = 2394$

Load rating = $(i)^{0.7} \times 13600 = (3)^{0.7} \times 13600 = 29344$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{29344}{2394}\right)^3 = 1842 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000} \left(\frac{29344}{2394}\right)^3$$

= 15346 Hrs

### Case 2

Radial load ($F_R$) = 3500

Thrust load ($F_A$) = 4200

$F_A/F_R = 4200/3500 = 1.20$

Since $F_A/F_R > 1.14$, equivalent load

(P) = $0.35\ F_R + 0.57\ F_A$

$= 0.35 \times 3500 + 0.57 \times 4200 = 3619$

Load rating = $(i)^{0.7} \times 13600 = (3)^{0.7} \times 13600 = 29344$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{29344}{3619}\right)^3 = 533 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n} \left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000} \left(\frac{29344}{3619}\right)^3$$

= 4442 Hrs

# 7000PJD series 40° angular contact ball bearings duplex

## Dynamic equivalent radial load and life calculation examples

Bearing size: 7309PJDU (DB or DF pair)
Speed: 2000 rpm
Duplex pair basic dynamic radial load rating (C) = 21900

### Case 1

Radial load ($F_R$) = 1750
Thrust load ($F_A$) = 1960
$F_A/F_R$ = 1960/1750 = 1.12
Since $F_A/F_R$ < 1.14, equivalent load
(P) = 1.0 $F_R$ + 0.55 $F_A$
= 1.0 x 1750 +0.55 x 1960 = 2828

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{21900}{2828}\right)^3 = 464 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{21900}{2828}\right)^3$$

= 3870 Hrs

### Case 2

Radial load ($F_R$) = 1750
Thrust load ($F_A$) = 2450
$F_A/F_R$ = 2450/1750 = 1.40
Since $F_A/F_R$ > 1.14, equivalent load
(P) = 0.57 $F_R$ + 0.93 $F_A$
= 0.57 x 1750 +0.93 x 2450 = 3276

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{21900}{3276}\right)^3 = 299 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{21900}{3276}\right)^3$$

= 2490 Hrs

### Case 3

Thrust load ($F_A$) = 2450
$F_A/F_R$ = 2450/0 = ∞
Since $F_A/F_R$ > 1.14, equivalent load
(P) = 0.57 $F_R$ + 0.93 $F_A$ = 0.93 x 2450 = 2279

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{21900}{2279}\right)^3 = 887 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L\,10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{21900}{2279}\right)^3$$

= 7395 Hrs

### Case 4

Radial load ($F_R$) = 1750
$F_A/F_R$ = 0/1750 = 0
Since $F_A/F_R$ < 1.14, equivalent load
(P) = 1.0 $F_R$ + 0.55 $F_A$ = 1.0 x 1750 = 1750

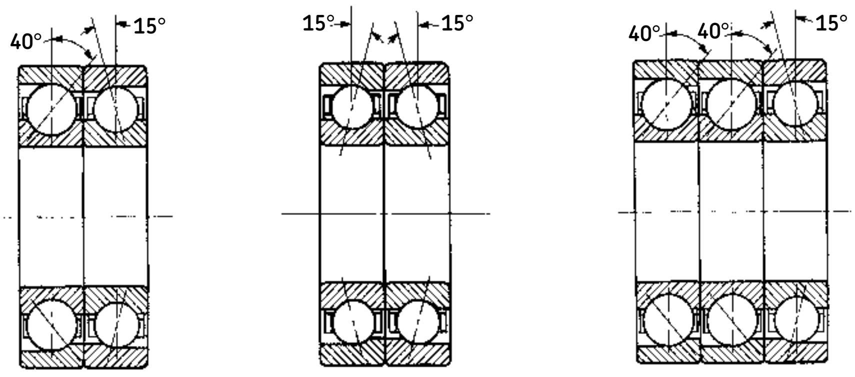
$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{21900}{1750}\right)^3 = 1960 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{21900}{1750}\right)^3$$

= 16332 Hrs

# PumPac® 8000, 8000BB and 8000AAB series




8000 8000BB 8000AAB

The PumPac 8000 series consists of a matched set of 40° (A) and 15° (B) angular contact ball bearings with computer optimized internal design. They are manufactured to ABEC-3 tolerances and are supplied with an inner ring centered machined brass cage.

Also available is the 8000BB PumPac Diamond series consisting of two 15° (B) bearings in a back-to-back (DB) arrangement; and the 8000AAB series consisting of two 40° (A) bearings in tandem, matched back-to-back (DB) with one 15° (B) bearing. Each arrangement incorporates a small amount of axial clearance, when clamped, to compensate for mounting fits and thermal growth.

# PumPac 8000, 8000BB and 8000AAB series

The PumPac 8000 series is used in centrifugal pumps, large vertical electric motors, compressors, centrifuges, and other applications subject to thrust loads operating at relatively high speeds. The bearings are mounted so that the 40° (A) bearing takes the primary thrust load.

Traditionally, matched sets of 40° angular contact ball bearings are used to obtain maximum theoretical fatigue life, but in most instances only a fraction of the calculated life is actually achieved. At the heart of these premature failures are phenomena known as "ball sliding" and "ball shuttling" in the unloaded (or inactive) bearing. Angular contact bearings used in high speed (e.g. 3600 rpm) pumps and other applications require a minimum axial load for proper operation. Without axial load, gyroscopic forces in the unloaded bearing can cause the balls to rotate perpendicular to their true rolling axis and momentarily lose contact with the raceway. As a result, a microscopic wear (or lapping) process occurs giving the appearance of a burnished or polished raceway. The oil film thickness separating the ball and raceway is reduced, producing friction and heat which lowers oil viscosity and accelerates wear. This thermally unstable condition dramatically reduces bearing service life.

The main benefit of the PumPac system is that the 15° (B) bearing is designed with considerably less internal clearance than the 40° (A) bearing, making it less susceptible to the gyroscopic forces which result in ball sliding or shuttling. The 15° bearing also provides additional radial stiffness helping to maintain the integrity of the shaft and mechanical seals. The 40° (loaded) bearing provides sufficient axial rigidity under the imposed thrust load. The 0 is furnished with a one piece, inner ring land-guided, machined brass cage and is manufactured to meet ABEC-3 grade tolerances. Dimensional stability is assured by heat treating the bearing's rings and rolling elements for operation up to 375° F (190° C).

For identification purposes, the 40° bearing is marked with the letter "A," and the 15° bearing with the letter "B". A "V" is etched on the outer ring surface of the pair so that the apex falls on the "B" bearing. The pair should always be mounted so that the "V" points in the same direction as the primary thrust load, which places this load on bearing "A". Any reversing load is carried on bearing "B".

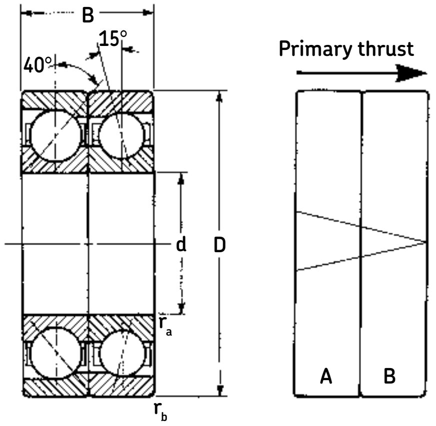
The PumPac is also available in the 8000BB PumPac Diamond series, which consists of a matched set of 15° (B) bearings in a back-to-back arrangement. When mounted correctly, the marking on the outer ring surface forms a diamond. This series is desirable in high speed, lightly loaded applications in which axial loads are balanced, resulting in reduced operating temperatures and increased life.

For applications involving very heavy primary thrust loads, the PumPac may be furnished as a triplex set identified as the 8000AAB series. It consists of two 40° (A) bearings in tandem matched back-to-back (DB) with one 15° (B) bearing. The outer ring surface of the set is marked with a "V" pointing in the direction of primary thrust.

For applications having a rotating shaft and stationary housing, an ISO k5 shaft fit and an ISO H6 housing fit are recommended as shown in the table on page 168.

Note: The basic radial load rating, C, is calculated according to the actual bearing geometry and not according to ISO/ABMA Standards.

# PumPac 8000 series



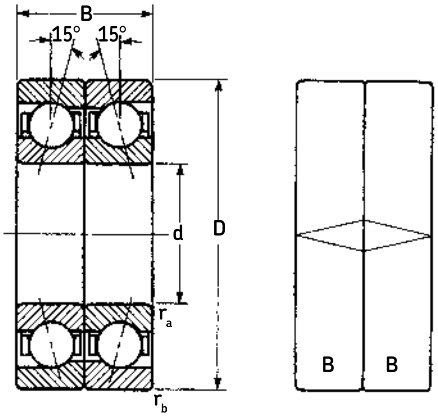

**ABEC-3 tolerances**

The PumPac 8000 series consists of one 40° (A) bearing and one 15° (B) bearing.

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1] $r_a$ mm | in. | $r_b$ mm | in. | Basic radial load rating[2] 40° (A) Dynamic C[4] N | lbf | Static $C_0$ N | lbf | 15° (B) Dynamic C[4] N | lbf | Static $C_0$ N | lbf | Speed rating[3] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **8218** | 90 | **3.5433** | 160 | **6.2992** | 60 | **2.3622** | 2.0 | **.08** | 1.0 | **.04** | 133 000 | **29 900** | 143 000 | **32 100** | 124 000 | **27 900** | 108 000 | **24 300** | 3 400 | 4 500 |
| **8219** | 95 | **3.7402** | 170 | **6.6929** | 64 | **2.5197** | 2.0 | **.08** | 1.0 | **.04** | 151 000 | **33 900** | 163 000 | **36 600** | 133 000 | **29 900** | 118 000 | **26 500** | 3 200 | 4 300 |
| **8220** | 100 | **3.9370** | 180 | **7.0866** | 68 | **2.6772** | 2.0 | **.08** | 1.0 | **.04** | 159 000 | **35 700** | 173 000 | **38 900** | 146 000 | **32 800** | 134 000 | **30 100** | 3 000 | 4 000 |
| **8222** | 110 | **4.3307** | 200 | **7.8740** | 76 | **2.9921** | 2.0 | **.08** | 1.0 | **.04** | 190 000 | **42 700** | 220 000 | **49 500** | 182 000 | **40 900** | 170 000 | **38 200** | 2 600 | 3 600 |
| **8224** | 120 | **4.7244** | 215 | **8.4646** | 80 | **3.1496** | 2.0 | **.08** | 1.0 | **.04** | 238 000 | **53 500** | 245 000 | **55 100** | 199 000 | **44 700** | 193 000 | **43 400** | 2 200 | 3 200 |
| **8238** | 190 | **7.4803** | 340 | **13.3858** | 110 | **4.3307** | 3.0 | **.12** | 1.0 | **.04** | 351 000 | **78 900** | 570 000 | **128 000** | 377 000 | **84 800** | 500 000 | **112 000** | 1 400 | 1 900 |
| **8308** | 40 | **1.5748** | 90 | **3.5433** | 46 | **1.8110** | 1.5 | **.06** | 1.0 | **.04** | 60 500 | **13 600** | 45 500 | **10 200** | 48 800 | **11 000** | 33 500 | **7 530** | 6 700 | 9 000 |
| **8309** | 45 | **1.7717** | 100 | **3.9370** | 50 | **1.9685** | 1.5 | **.06** | 1.0 | **.04** | 76 100 | **17 100** | 61 000 | **13 700** | 58 500 | **13 200** | 40 500 | **9 100** | 6 000 | 8 000 |
| **8310** | 50 | **1.9685** | 110 | **4.3307** | 54 | **2.1260** | 2.0 | **.08** | 1.0 | **.04** | 87 100 | **19 600** | 72 000 | **16 200** | 76 100 | **17 100** | 52 000 | **11 700** | 5 300 | 7 000 |
| **8311** | 55 | **2.1654** | 120 | **4.7244** | 58 | **2.2835** | 2.0 | **.08** | 1.0 | **.04** | 101 000 | **22 700** | 85 000 | **19 100** | 88 400 | **19 900** | 61 000 | **13 700** | 4 800 | 6 300 |
| **8312** | 60 | **2.3622** | 130 | **5.1181** | 62 | **2.4409** | 2.0 | **.08** | 1.0 | **.04** | 114 000 | **25 600** | 96 500 | **21 700** | 101 000 | **22 700** | 71 000 | **16 000** | 4 500 | 6 000 |
| **8313** | 65 | **2.5591** | 140 | **5.5118** | 66 | **2.5984** | 2.0 | **.08** | 1.0 | **.04** | 127 000 | **28 500** | 112 000 | **25 200** | 108 000 | **24 300** | 80 000 | **18 000** | 4 300 | 5 600 |
| **8314** | 70 | **2.7559** | 150 | **5.9055** | 70 | **2.7559** | 2.0 | **.08** | 1.0 | **.04** | 148 000 | **33 300** | 134 000 | **31 500** | 121 000 | **27 200** | 93 000 | **20 900** | 3 800 | 5 000 |
| **8315** | 75 | **2.9528** | 160 | **6.2992** | 74 | **2.9134** | 2.0 | **.08** | 1.0 | **.04** | 159 000 | **35 700** | 150 000 | **33 700** | 146 000 | **32 800** | 114 000 | **25 600** | 3 600 | 4 800 |
| **8316** | 80 | **3.1496** | 170 | **6.6929** | 78 | **3.0709** | 2.0 | **.08** | 1.0 | **.04** | 172 000 | **38 700** | 166 000 | **37 300** | 159 000 | **35 700** | 129 000 | **29 200** | 3 400 | 4 500 |
| **8317** | 85 | **3.3465** | 180 | **7.0866** | 82 | **3.2283** | 2.5 | **.10** | 1.0 | **.04** | 186 000 | **41 800** | 186 000 | **41 800** | 174 000 | **39 100** | 146 000 | **32 800** | 3 200 | 4 300 |
| **8318** | 90 | **3.5433** | 190 | **7.4803** | 86 | **3.3858** | 2.5 | **.10** | 1.0 | **.04** | 199 000 | **44 700** | 204 000 | **45 900** | 186 000 | **41 800** | 160 000 | **36 000** | 3 000 | 4 000 |
| **8319** | 95 | **3.7402** | 200 | **7.8740** | 90 | **3.5433** | 2.5 | **.10** | 1.0 | **.04** | 212 000 | **47 600** | 228 000 | **51 300** | 199 000 | **44 700** | 180 000 | **40 500** | 2 800 | 3 800 |
| **8320** | 100 | **3.9370** | 215 | **8.4646** | 94 | **3.7008** | 2.5 | **.10** | 1.0 | **.04** | 238 000 | **53 500** | 270 000 | **60 700** | 212 000 | **47 700** | 200 000 | **45 000** | 2 600 | 3 600 |
| **8322** | 110 | **4.3307** | 240 | **9.4488** | 100 | **3.9370** | 2.5 | **.10** | 1.0 | **.04** | 265 000 | **59 600** | 320 000 | **71 900** | 255 000 | **57 300** | 255 000 | **57 300** | 2 200 | 3 200 |
| **8326** | 130 | **5.1181** | 280 | **11.0236** | 116 | **4.5669** | 3.0 | **.12** | 1.0 | **.04** | 345 000 | **77 500** | 455 000 | **102 000** | 296 000 | **66 500** | 345 000 | **77 600** | 1 800 | 2 600 |
| **8330** | 150 | **5.9055** | 320 | **12.5984** | 130 | **5.1181** | 3.0 | **.12** | 1.0 | **.04** | 410 000 | **92 100** | 585 000 | **132 000** | 390 000 | **87 700** | 475 000 | **107 000** | 1 600 | 2 200 |
| **8336** | 180 | **7.0866** | 380 | **14.9606** | 150 | **5.9055** | 3.0 | **.12** | 1.0 | **.04** | 507 000 | **114 000** | 815 000 | **183 000** | 475 000 | **107 000** | 640 000 | **144 000** | 1 300 | 1 600 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating of bearing (A), multiply C by 1.75 and $C_0$ by 3.85. For thrust rating of bearing (B), multiply C by 0.83 and $C_0$ by 2.00.
3) Values have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# PumPac Diamond 8000BB series



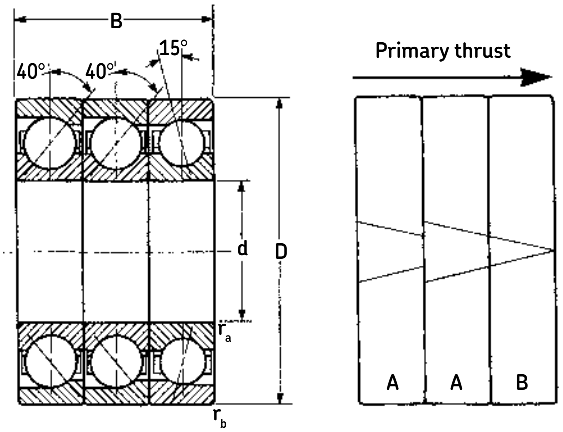

ABEC-3 tolerances

The PumPac 8000BB series consists of two 15° (B) bearings.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1) $r_a$ mm | Fillet radius[1) $r_a$ in. | Fillet radius[1) $r_b$ mm | Fillet radius[1) $r_b$ in. | Basic radial load rating[2) Dynamic $C$[4) N | Basic radial load rating[2) Dynamic $C$[4) lbf | Basic radial load rating[2) Static $C_0$ N | Basic radial load rating[2) Static $C_0$ lbf | Speed rating[3) Grease rpm | Speed rating[3) Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **8218BB** | 90 | **3.5433** | 160 | **6.2992** | 60 | **2.3622** | 2.0 | **.08** | 1.0 | **.04** | 203 000 | **45 600** | 216 000 | **48 600** | 3 800 | 5 400 |
| **8219BB** | 95 | **3.7402** | 170 | **6.6929** | 64 | **2.5197** | 2.0 | **.08** | 1.0 | **.04** | 216 000 | **48 600** | 236 000 | **53 100** | 3 600 | 5 100 |
| **8220BB** | 100 | **3.9370** | 180 | **7.0866** | 68 | **2.6772** | 2.0 | **.08** | 1.0 | **.04** | 238 000 | **53 500** | 270 000 | **60 700** | 3 400 | 4 800 |
| **8222BB** | 110 | **4.3307** | 200 | **7.8740** | 76 | **2.9921** | 2.0 | **.08** | 1.0 | **.04** | 296 000 | **66 500** | 340 000 | **76 400** | 3 000 | 4 400 |
| **8224BB** | 120 | **4.7244** | 215 | **8.4646** | 80 | **3.1496** | 2.0 | **.08** | 1.0 | **.04** | 319 000 | **71 800** | 390 000 | **87 700** | 2 800 | 4 100 |
| **8238BB** | 190 | **7.4803** | 340 | **13.3858** | 110 | **4.3307** | 3.0 | **.12** | 1.0 | **.04** | 605 000 | **136 000** | 1 000 000 | **225 000** | 1 800 | 2 600 |
| **8308BB** | 40 | **1.5748** | 90 | **3.5433** | 46 | **1.8110** | 1.5 | **.06** | 1.0 | **.04** | 79 300 | **17 800** | 67 000 | **15 100** | 7 500 | 11 000 |
| **8309BB** | 45 | **1.7717** | 100 | **3.9370** | 50 | **1.9685** | 1.5 | **.06** | 1.0 | **.04** | 95 600 | **21 500** | 81 500 | **18 300** | 6 800 | 9 600 |
| **8310BB** | 50 | **1.9685** | 110 | **4.3307** | 54 | **2.1260** | 2.0 | **.08** | 1.0 | **.04** | 124 000 | **27 900** | 104 000 | **23 400** | 6 300 | 9 000 |
| **8311BB** | 55 | **2.1654** | 120 | **4.7244** | 58 | **2.2835** | 2.0 | **.08** | 1.0 | **.04** | 143 000 | **32 100** | 122 000 | **27 400** | 5 600 | 8 100 |
| **8312BB** | 60 | **2.3622** | 130 | **5.1181** | 62 | **2.4409** | 2.0 | **.08** | 1.0 | **.04** | 165 000 | **37 100** | 143 000 | **32 100** | 5 000 | 7 200 |
| **8313BB** | 65 | **2.5591** | 140 | **5.5118** | 66 | **2.5984** | 2.0 | **.08** | 1.0 | **.04** | 174 000 | **39 100** | 160 000 | **36 000** | 4 800 | 6 800 |
| **8314BB** | 70 | **2.7559** | 150 | **5.9055** | 70 | **2.7559** | 2.0 | **.08** | 1.0 | **.04** | 199 000 | **44 700** | 190 000 | **42 700** | 4 500 | 6 300 |
| **8315BB** | 75 | **2.9528** | 160 | **6.2992** | 74 | **2.9134** | 2.0 | **.08** | 1.0 | **.04** | 238 000 | **53 500** | 228 000 | **51 300** | 4 300 | 6 000 |
| **8316BB** | 80 | **3.1496** | 170 | **6.6929** | 78 | **3.0709** | 2.0 | **.08** | 1.0 | **.04** | 255 000 | **57 300** | 260 000 | **58 500** | 3 800 | 5 400 |
| **8317BB** | 85 | **3.3465** | 180 | **7.0866** | 82 | **3.2283** | 2.5 | **.10** | 1.0 | **.04** | 281 000 | **63 200** | 292 000 | **65 600** | 3 600 | 5 100 |
| **8318BB** | 90 | **3.5433** | 190 | **7.4803** | 86 | **3.3858** | 2.5 | **.10** | 1.0 | **.04** | 302 000 | **67 900** | 325 000 | **73 100** | 3 400 | 4 800 |
| **8319BB** | 95 | **3.7402** | 200 | **7.8740** | 90 | **3.5433** | 2.5 | **.10** | 1.0 | **.04** | 325 000 | **73 100** | 360 000 | **80 900** | 3 300 | 4 500 |
| **8320BB** | 100 | **3.9370** | 215 | **8.4646** | 94 | **3.7008** | 2.5 | **.10** | 1.0 | **.04** | 345 000 | **77 600** | 400 000 | **89 900** | 3 000 | 4 400 |
| **8322BB** | 110 | **4.3307** | 240 | **9.4488** | 100 | **3.9370** | 2.5 | **.10** | 1.0 | **.04** | 416 000 | **93 500** | 510 000 | **115 000** | 2 600 | 3 900 |
| **8326BB** | 130 | **5.1181** | 280 | **11.0236** | 116 | **4.5669** | 3.0 | **.12** | 1.0 | **.04** | 475 000 | **107 000** | 695 000 | **156 000** | 2 300 | 3 300 |
| **8330BB** | 150 | **5.9055** | 320 | **12.5984** | 130 | **5.1181** | 3.0 | **.12** | 1.0 | **.04** | 624 000 | **140 000** | 950 000 | **214 000** | 2 000 | 2 900 |
| **8336BB** | 180 | **7.0866** | 380 | **14.9606** | 150 | **5.9055** | 3.0 | **.12** | 1.0 | **.04** | 780 000 | **175 000** | 1 270 000 | **286 000** | 1 600 | 2 400 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 0.51 and $C_0$ by 1.00.
3) Values have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# PumPac 8000AAB series




ABEC-3 tolerances

The PumPac 8000AAB series consists of two 40° (A) bearings and one 15° (B) bearing.

| MRC bearing number | Bore d | | Outside diameter D | | Width B | | Fillet radius[1] $r_a$ | | $r_b$ | | Basic radial load rating[2] 40° (A) Dynamic C[4] | | Static $C_0$ | | 15° (B) Dynamic C[4] | | Static $C_0$ | | Speed rating[3] Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | N | lbf | N | lbf | rpm | rpm |
| 8218AAB | 90 | 3.5433 | 160 | 6.2992 | 90 | 3.5433 | 2.0 | .08 | 1.0 | .04 | 216 000 | 48 500 | 285 000 | 64 100 | 124 000 | 27 900 | 108 000 | 24 300 | 3 400 | 4 500 |
| 8219AAB | 95 | 3.7402 | 170 | 6.6929 | 96 | 3.7795 | 2.0 | .08 | 1.0 | .04 | 247 000 | 55 500 | 325 000 | 73 100 | 133 000 | 29 900 | 118 000 | 26 500 | 3 200 | 4 300 |
| 8220AAB | 100 | 3.9370 | 180 | 7.0866 | 102 | 4.0157 | 2.0 | .08 | 1.0 | .04 | 260 000 | 58 400 | 345 000 | 78 700 | 146 000 | 32 800 | 134 000 | 30 100 | 3 000 | 4 000 |
| 8222AAB | 110 | 4.3307 | 200 | 7.8740 | 114 | 4.4882 | 2.0 | .08 | 1.0 | .04 | 307 000 | 69 000 | 440 000 | 98 900 | 182 000 | 40 900 | 170 000 | 38 200 | 2 600 | 3 600 |
| 8224AAB | 120 | 4.7244 | 215 | 8.4646 | 120 | 4.7244 | 2.0 | .08 | 1.0 | .04 | 390 000 | 87 600 | 490 000 | 110 000 | 199 000 | 44 700 | 193 000 | 43 400 | 2 200 | 3 200 |
| 8238AAB | 190 | 7.4803 | 340 | 13.3858 | 165 | 6.4961 | 3.0 | .12 | 1.0 | .04 | 572 000 | 129 000 | 1140 000 | 256 000 | 377 000 | 84 800 | 500 000 | 112 000 | 1 400 | 1 900 |
| 8308AAB | 40 | 1.5748 | 90 | 3.5433 | 69 | 2.7165 | 1.5 | .06 | 1.0 | .04 | 97 500 | 21 900 | 91 500 | 20 600 | 48 800 | 11 000 | 33 500 | 7 530 | 6 700 | 9 000 |
| 8309AAB | 45 | 1.7717 | 100 | 3.9370 | 75 | 2.9528 | 1.5 | .06 | 1.0 | .04 | 124 000 | 27 900 | 122 000 | 27 400 | 58 500 | 13 200 | 40 500 | 9 100 | 6 000 | 8 000 |
| 8310AAB | 50 | 1.9685 | 110 | 4.3307 | 81 | 3.1890 | 2.0 | .08 | 1.0 | .04 | 143 000 | 32 100 | 143 000 | 32 100 | 76 100 | 17 100 | 52 000 | 11 700 | 5 300 | 7 000 |
| 8311AAB | 55 | 2.1654 | 120 | 4.7244 | 87 | 3.4252 | 2.0 | .08 | 1.0 | .04 | 165 000 | 37 100 | 170 000 | 38 200 | 88 400 | 19 900 | 61 000 | 13 700 | 4 800 | 6 300 |
| 8312AAB | 60 | 2.3622 | 130 | 5.1181 | 93 | 3.6614 | 2.0 | .08 | 1.0 | .04 | 186 000 | 41 800 | 193 000 | 43 400 | 101 000 | 22 700 | 71 000 | 16 000 | 4 500 | 6 000 |
| 8313AAB | 65 | 2.5591 | 140 | 5.5118 | 99 | 3.8976 | 2.0 | .08 | 1.0 | .04 | 208 000 | 46 700 | 224 000 | 50 400 | 108 000 | 24 300 | 80 000 | 18 000 | 4 300 | 5 600 |
| 8314AAB | 70 | 2.7559 | 150 | 5.9055 | 105 | 4.1339 | 2.0 | .08 | 1.0 | .04 | 242 000 | 54 400 | 270 000 | 60 700 | 121 000 | 27 200 | 93 000 | 20 900 | 3 800 | 5 000 |
| 8315AAB | 75 | 2.9528 | 160 | 6.2992 | 111 | 4.3701 | 2.0 | .08 | 1.0 | .04 | 260 000 | 58 400 | 300 000 | 67 400 | 146 000 | 32 800 | 114 000 | 25 600 | 3 600 | 4 800 |
| 8316AAB | 80 | 3.1496 | 170 | 6.6929 | 117 | 4.6063 | 2.0 | .08 | 1.0 | .04 | 281 000 | 63 100 | 335 000 | 75 300 | 159 000 | 35 700 | 129 000 | 29 200 | 3 400 | 4 500 |
| 8317AAB | 85 | 3.3465 | 180 | 7.0866 | 123 | 4.8425 | 2.5 | .10 | 1.0 | .04 | 302 000 | 67 900 | 375 000 | 84 300 | 174 000 | 39 100 | 146 000 | 32 800 | 3 200 | 4 300 |
| 8318AAB | 90 | 3.5433 | 190 | 7.4803 | 129 | 5.0787 | 2.5 | .10 | 1.0 | .04 | 325 000 | 73 000 | 405 000 | 91 000 | 186 000 | 41 800 | 160 000 | 36 000 | 3 000 | 4 000 |
| 8319AAB | 95 | 3.7402 | 200 | 7.8740 | 135 | 5.3150 | 2.5 | .10 | 1.0 | .04 | 345 000 | 77 500 | 455 000 | 102 000 | 199 000 | 44 700 | 180 000 | 40 500 | 2 800 | 3 800 |
| 8320AAB | 100 | 3.9370 | 215 | 8.4646 | 141 | 5.5512 | 2.5 | .10 | 1.0 | .04 | 390 000 | 87 600 | 540 000 | 121 000 | 212 000 | 47 700 | 200 000 | 45 000 | 2 600 | 3 600 |
| 8322AAB | 110 | 4.3307 | 240 | 9.4488 | 150 | 5.9055 | 2.5 | .10 | 1.0 | .04 | 436 000 | 98 000 | 640 000 | 144 000 | 255 000 | 57 300 | 255 000 | 57 300 | 2 200 | 3 200 |
| 8326AAB | 130 | 5.1181 | 280 | 11.0236 | 174 | 6.8504 | 3.0 | .12 | 1.0 | .04 | 559 000 | 126 000 | 915 000 | 206 000 | 296 000 | 66 500 | 345 000 | 77 600 | 1 800 | 2 600 |
| 8330AAB | 150 | 5.9055 | 320 | 12.5984 | 195 | 7.6772 | 3.0 | .12 | 1.0 | .04 | 663 000 | 149 000 | 1180 000 | 265 000 | 390 000 | 87 700 | 475 000 | 107 000 | 1 600 | 2 200 |
| 8336AAB | 180 | 7.0866 | 380 | 14.9606 | 225 | 8.8583 | 3.0 | .12 | 1.0 | .04 | 824 000 | 185 000 | 1630 000 | 366 000 | 475 000 | 107 000 | 640 000 | 144 000 | 1 300 | 1 600 |

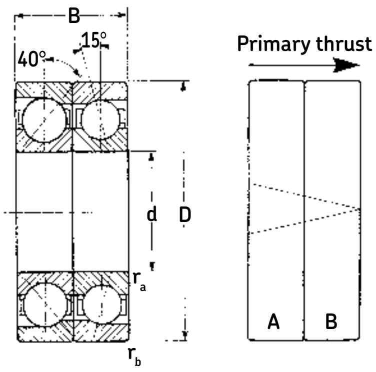
1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating of (AA) multiply C by 1.75 and $C_0$ by 3.85. For thrust rating of (B) multiply C by 0.83 and $C_0$ by 2.00.
3) Values have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.

# PumPac shaft and housing fits

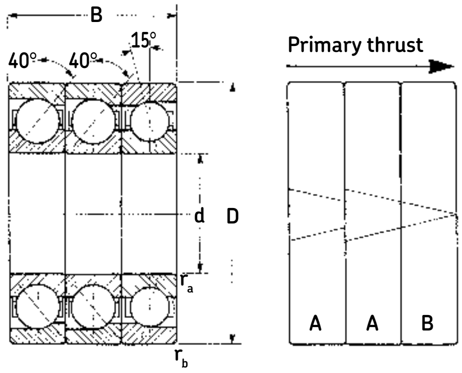
| MRC bearing number | Shaft diameter (k5) Maximum mm | in. | Minimum mm | in. | Fit[2] .001 mm | .0001 in. | Housing diameter (H6)[1] Maximum mm | in. | Minimum mm | in. | Fit[2] .001 mm | .0001 in. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **8218** | 90.018 | **3.5440** | 90.003 | **3.5434** | 3T-33T | **1T-13T** | 160.025 | **6.3002** | 160.000 | **6.2992** | 0-43L | **0-17L** |
| **8219** | 95.018 | **3.7409** | 95.003 | **3.7403** | 3T-33T | **1T-13T** | 170.025 | **6.6939** | 170.000 | **6.6929** | 0-43L | **0-17L** |
| **8220** | 100.018 | **3.9377** | 100.003 | **3.9371** | 3T-33T | **1T-13T** | 180.025 | **7.0876** | 180.000 | **7.0866** | 0-43L | **0-17L** |
| **8222** | 110.018 | **4.3314** | 110.003 | **4,3308** | 3T-33T | **1T-13T** | 200.029 | **7.8751** | 200.000 | **7.8740** | 0-49L | **0-19L** |
| **8224** | 120.018 | **4.7251** | 120.003 | **4.7245** | 3T-33T | **1T-13T** | 215.029 | **8.4657** | 215.000 | **8.4646** | 0-49L | **0-19L** |
| **8238** | 190.024 | **7.4812** | 190.004 | **7.4805** | 4T-46T | **2T-18T** | 340.036 | **13.3872** | 340.000 | **13.3858** | 0-64L | **0-25L** |
| **8308** | 40.013 | **1.5753** | 40.002 | **1.5749** | 2T-23T | **1T-9T** | 90.022 | **3.5442** | 90.000 | **3.5433** | 0-35L | **0-14L** |
| **8309** | 45.013 | **1.7722** | 45.002 | **1.7718** | 2T-23T | **1T-9T** | 100.022 | **3.9379** | 100.000 | **3.9370** | 0-35L | **0-14L** |
| **8310** | 50.013 | **1.9690** | 50.002 | **1.9686** | 2T-23T | **1T-9T** | 110.022 | **4.3316** | 110.000 | **4.3307** | 0-35L | **0-14L** |
| **8311** | 55.015 | **2.1660** | 55.002 | **2.1655** | 2T-27T | **1T-11T** | 120.022 | **4.7253** | 120.000 | **4.7244** | 0-35L | **0-14L** |
| **8312** | 60.015 | **2.3628** | 60.002 | **2.3623** | 2T-27T | **1T-11T** | 130.025 | **5.1191** | 130.000 | **5.1181** | 0-40L | **0-16L** |
| **8313** | 65.015 | **2.5597** | 65.002 | **2.5592** | 2T-27T | **1T-11T** | 140.025 | **5.5128** | 140.000 | **5.5118** | 0-40L | **0-16L** |
| **8314** | 70.015 | **2.7565** | 70.002 | **2.7560** | 2T-27T | **1T-11T** | 150.025 | **5.9065** | 150.000 | **5.9055** | 0-40L | **0-16L** |
| **8315** | 75.015 | **2.9534** | 75.002 | **2.9529** | 2T-27T | **1T-11T** | 160.025 | **6.3002** | 160.000 | **6.2992** | 0-43L | **0-17L** |
| **8316** | 80.015 | **3.1502** | 80.002 | **3.1497** | 2T-27T | **1T-11T** | 170.025 | **6.6939** | 170.000 | **6.6929** | 0-43L | **0-17L** |
| **8317** | 85.018 | **3.3472** | 85.003 | **3.3466** | 3T-33T | **1T-13T** | 180.025 | **7.0876** | 180.000 | **7.0866** | 0-43L | **0-17L** |
| **8318** | 90.018 | **3.5440** | 90.003 | **3.5434** | 3T-33T | **1T-13T** | 190.029 | **7.4814** | 190.000 | **7.4803** | 0-49L | **0-19L** |
| **8319** | 95.018 | **3.7409** | 95.003 | **3.7403** | 3T-33T | **1T-13T** | 200.029 | **7.8751** | 200.000 | **7.8740** | 0-49L | **0-19L** |
| **8320** | 100.018 | **3.9377** | 100.003 | **3.9371** | 3T-33T | **1T-13T** | 215.029 | **8.4657** | 215.000 | **8.4646** | 0-49L | **0-19L** |
| **8322** | 110.018 | **4.3314** | 110.003 | **4.3308** | 3T-33T | **1T-13T** | 240.029 | **9.4499** | 240.000 | **9.4488** | 0-49L | **0-19L** |
| **8326** | 130.021 | **5.1189** | 130.003 | **5.1182** | 3T-39T | **1T-15T** | 280.032 | **11.0249** | 280.000 | **11.0236** | 0-57L | **0-23L** |
| **8330** | 150.021 | **5.9063** | 150.003 | **5.9056** | 3T-39T | **1T-15T** | 320.036 | **12.5998** | 320.000 | **12.5984** | 0-64L | **0-25L** |
| **8336** | 180.021 | **7.0874** | 180.003 | **7.0867** | 3T-39T | **1T-15T** | 380.036 | **14.9620** | 380.000 | **14.9606** | 0-64L | **0-25L** |

1) Cast iron or steel housings. For aluminum or other soft metal housings make housing bore limits same as bearing O.D. limits.
2) "T" indicates tight, "L" indicates loose.

# PumPac mounting instructions




8000




8000AAB

PumPac bearings require proper mounting orientation with respect to the direction of the imposed primary thrust load, which must be taken by the 40° ("A") bearing. They should be installed so that the "V" etched on the O.D. of the bearings points in the direction of the primary thrust load, as illustrated below for PumPac 8000 and 8000AAB arrangements.

# PumPac dynamic and static equivalent radial load and life rating

The following method considers only thrust load in either direction with negligible radial load. For combined radial and thrust loads consult MRC Technical Services for analysis.

## Dynamic equivalent radial load

Primary thrust on bearing A (40°)

$P = 0.57\ F_A$

Reversing thrust on bearing B (15°)

$P = YF_A$

P = Dynamic equivalent radial load

$F_A$ = Thrust load

Y = Thrust load factor

Z = Number of balls

D = Ball diameter

| $\frac{F_A}{ZD^2}$ N, m | $\frac{F_A}{ZD^2}$ lb, in. | Y |
|---|---|---|
| 0.172 | 25 | 1.47 |
| 0.345 | 50 | 1.40 |
| 0.689 | 100 | 1.30 |
| 1.030 | 150 | 1.23 |
| 1.380 | 200 | 1.19 |
| 2.070 | 300 | 1.12 |
| 3.450 | 500 | 1.02 |
| 5.170 | 750 | 1.00 |
| 6.890 | 1,000 | 1.00 |

| Size | $ZD^2$ mm | $ZD^2$ in. | Size | $ZD^2$ mm | $ZD^2$ in. | Size | $ZD^2$ mm | $ZD^2$ in. |
|---|---|---|---|---|---|---|---|---|
| 8218B | 7410 | 11.50 | 8310B | 3990 | 6.19 | 8318B | 11800 | 18.3 |
| 8219B | 7900 | 12.30 | 8311B | 4690 | 7.26 | 8319B | 13100 | 20.3 |
| 8220B | 9070 | 14.10 | 8312B | 5430 | 8.42 | 8320B | 14400 | 22.4 |
| 8222B | 11700 | 18.10 | 8313B | 5930 | 9.19 | 8322B | 18900 | 29.3 |
| 8224B | 13100 | 20.30 | 8314B | 6800 | 10.50 | 8326B | 25700 | 39.8 |
| 8238B | 31200 | 48.40 | 8315B | 8390 | 13.00 | 8330B | 31500 | 48.8 |
| 8308B | 2450 | 3.80 | 8316B | 9470 | 14.70 | 8336B | 45700 | 70.9 |
| 8309B | 3020 | 4.69 | 8317B | 10600 | 16.50 | | | |

Values of Y for loads not shown are obtained from chart at below.

## Static equivalent radial load

Bearing A (40°)

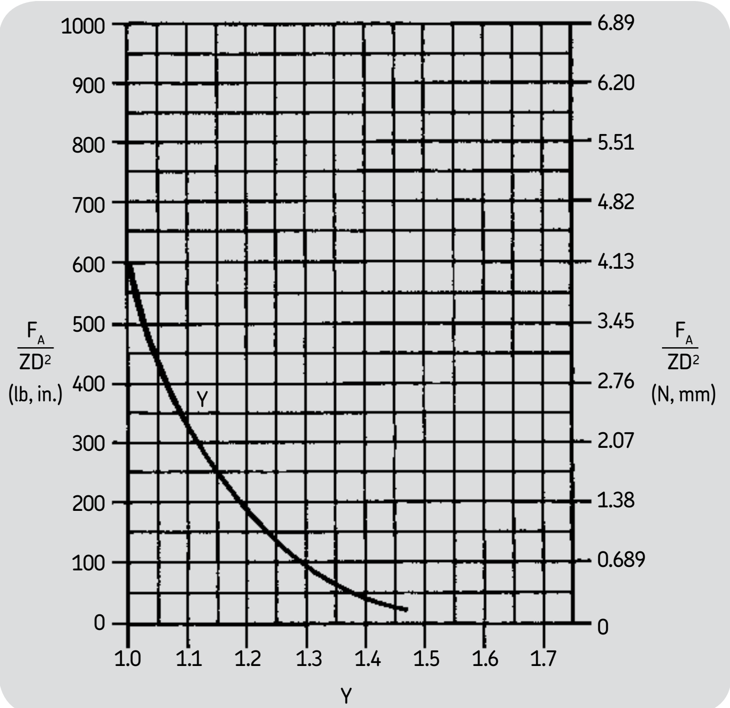
$P_0 = 0.26\ F_A$

Bearing B (15°)

$P_0 = 0.5\ F_A$

$P_0$ = Static equivalent radial load

$F_A$ = Thrust load




## Minimum thrust load for angular contact ball bearings

Satisfactory operation of angular contact ball bearings requires sufficient traction forces between the balls and races to minimize damage caused by sliding or skidding. This is particularly important at high speeds where the inertia forces of the balls and cage and the viscous drag in the lubricant can have a detrimental influence on the rolling conditions.

The minimum required thrust load can be determined from the following formula.

$$F_A = A\left(\frac{n}{1000}\right)^2 \text{ newtons}$$

or

$$F_A = 0.2248\,A\left(\frac{n}{1000}\right)^2 \text{ pounds}$$

where, $F_A$ = Minimum thrust load

A = Bearing design factor listed in the following tables

n = Speed in rpm

Note: For duplex bearings mounted in tandem, multiply the single-bearing thrust value by the number of bearings in tandem.

## Minimum thrust load A factor

| Size | A | Size | A |
|---|---|---|---|
| 8218 | 148.50 | 8313 | 114.40 |
| 8219 | 191.90 | 8314 | 144.60 |
| 8220 | 224.10 | 8315 | 182.70 |
| 8222 | 352.10 | 8316 | 215.80 |
| 8224 | 450.50 | 8317 | 269.40 |
| 8238 | 2499.00 | 8318 | 332.30 |
| 8308 | 17.31 | 8319 | 405.70 |
| 8309 | 29.08 | 8320 | 629.40 |
| 8310 | 36.26 | 8322 | 904.70 |
| 8311 | 57.36 | 8330 | 2731.00 |
| 8312 | 77.30 | 8336 | 5006.00 |

## Life rating

$$L10 = \left(\frac{C}{P}\right)^3 \text{ (millions of revolutions)}$$

or

$$L10_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 \text{ (hours)}$$

C = Basic dynamic radial load rating (from single bearing tables)

P = Dynamic equivalent radial load

n = Speed in rpm

Notes: For 8000BB series, see page 124. For combined radial and thrust loads, please contact MRC.

# PumPac 8000, 8000BB Diamond and 8000AAB series

## Dynamic equivalent radial load and life calculation examples

### PumPac 8000 series

Bearing size: 8310

Speed: 3500 rpm

Basic dynamic radial load rating (C):

Bearing A = 19600 lbf

Bearing B = 17100 lbf

**Bearing A**

Primary thrust load ($F_A$) = 3000

Equivalent load (P) = 0.57 $F_A$

P = 0.57 × 3000 = 1710

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{19600}{1710}\right)^3 = 1506 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 3500}\left(\frac{19600}{1710}\right)^3$$

= 7171 Hrs

**Bearing B**

Reversing thrust load ($F_A$) = 1000

$F_A/ZD^2$ = 1000/6.19 = 162

Equivalent load (P) = Y $F_A$

Y = 1.22

P = 1.22 × 1000 = 1220

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{17100}{1220}\right)^3 = 2754 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 3500}\left(\frac{17100}{1220}\right)^3$$

= 13113 Hrs

### PumPac 8000BB Diamond series

Bearing size: 8317BB

Speed: 3000 rpm

Basic dynamic radial load rating (C):

$$\text{Single bearing} = \frac{C}{(2)^{0.7}} = \frac{63200}{1.625} = 38904 \text{ lbf}$$

**Primary thrust bearing**

Primary thrust load ($F_A$) = 2500

$F_A/ZD^2$ = 2500/16.5 = 152

Equivalent load (P) = Y $F_A$

Y = 1.23

P = 1.23 × 2500 = 3075

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{38904}{3075}\right)^3 = 2025 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 3000}\left(\frac{38904}{3075}\right)^3$$

= 11251 Hrs

**Reversing thrust bearing**

Reversing thrust load ($F_A$) = 1000

$F_A/ZD^2$ = 1000/16.5 = 61

Equivalent load (P) = Y $F_A$

Y = 1.38

P = 1.38 × 1000 = 1380

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{38904}{1380}\right)^3 = 22405 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 3000}\left(\frac{38904}{1380}\right)^3$$

= 124472 Hrs

### PumPac 8000AAB series

Bearing size: 8314 AAB

Speed: 3500 rpm

Basic dynamic radial load rating (C):

Bearings AA = 54400 lbf

Bearing B = 27200 lbf

**Bearings AA**

Primary thrust load ($F_A$) = 5000

Equivalent load (P) = 0.57 $F_A$

P = 0.57 × 5000 = 2850

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{54400}{2850}\right)^3 = 6954 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 3500}\left(\frac{54400}{2850}\right)^3$$

= 33116 Hrs

**Bearing B**

Reversing thrust load ($F_A$) = 1500

$F_A/ZD^2$ = 1500/10.5 = 143

Equivalent load (P) = Y $F_A$

Y = 1.24

P = 1.24 × 1500 = 1860

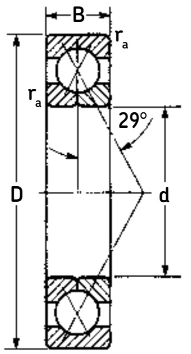
$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{27200}{1860}\right)^3 = 3127 \times 10^6 \text{ Rev.}$$

or

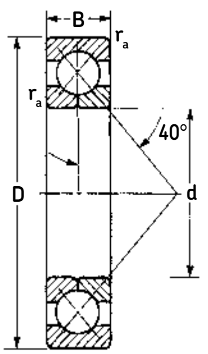
$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 3500}\left(\frac{27200}{1860}\right)^3$$

= 14892 Hrs

# 9000 series single-row 29° and 40° split ring angular contact ball bearings




9000U




9000UP

9000H

9000UH

9000S

Demand for a two-directional maximum thrust capacity bearing requiring minimum space has resulted in extensive use of the MRC 9000 series bearings.

9000U is the standard construction. It is an angular contact ball bearing with one-piece outer ring and two-piece inner ring construction. It has maximum ball complement and a one-piece machined ball cage. The cage construction completely retains the balls for unit handling during installation. The bearings of this series have similar internal characteristics and identical external dimensions to bearings in the MRC 7000 series, which are angular contact, one-directional thrust bearings.

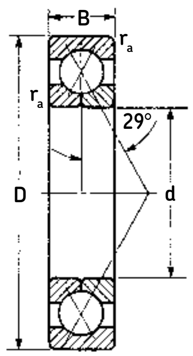
9000UP is similar to the 9000U, except that its internal characteristics provide greater two-directional thrust capacity for applications in which such capacity is the primary requirement. It can be used in combination with a corresponding duplex ground 7000P bearing.

9000H has a two-piece outer ring and a one-piece inner ring. Recommended only where the outer ring can be positively clamped. When duplexed, bearing can be used with a corresponding duplex-ground 7000 series bearing.

9000UH has two-piece construction of both inner and outer rings. The use of this bearing is confined to those applications where endplay must be held to an absolute minimum.

9000S has one-piece construction of both inner and outer ring. Assembly of the ball complement is accomplished by eccentric displacement of the outer ring. The use of this type is recommended where endplay and tilt must be held to a minimum, but where maximum capacity is not required.

# 9100UK and 9200U series split inner ring angular contact ball bearings

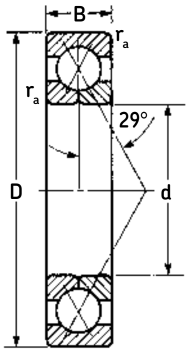



For duplex sets of 7000 and 9000 series bearings see page 243.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | Fillet radius[1] $r_a$ in. | Basic radial load rating[2] Dynamic $C^{4)}$ N | Basic radial load rating[2] Dynamic $C^{4)}$ lbf | Basic radial load rating[2] Static $C_0$ N | Basic radial load rating[2] Static $C_0$ lbf | Speed rating[3] Grease rpm | Speed rating[3] Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **9100UK** | 10 | **.3937** | 26 | **1.0236** | 8 | **.3150** | .30 | **.012** | 4 620 | **1 040** | 2 080 | **468** | 30 000 | 39 000 |
| **9101UK** | 12 | **.4724** | 28 | **1.1024** | 8 | **.3150** | .30 | **.012** | 5 070 | **1 140** | 2 500 | **562** | 25 000 | 32 000 |
| **9102UK** | 15 | **.5906** | 32 | **1.2598** | 9 | **.3543** | .30 | **.012** | 5 400 | **1 210** | 2 900 | **652** | 22 000 | 28 000 |
| **9103UK** | 17 | **.6693** | 35 | **1.3780** | 10 | **.3937** | .30 | **.012** | 7 610 | **1 710** | 4 250 | **955** | 19 000 | 25 000 |
| **9104UK** | 20 | **.7874** | 42 | **1.6535** | 12 | **.4724** | .64 | **.025** | 9 560 | **2 150** | 5 600 | **1 260** | 16 000 | 21 000 |
| **9105UK** | 25 | **.9843** | 47 | **1.8504** | 12 | **.4724** | .64 | **.025** | 10 600 | **2 380** | 6 950 | **1 560** | 12 000 | 16 000 |
| **9106UK** | 30 | **1.1811** | 55 | **2.1654** | 13 | **.5118** | 1.00 | **.040** | 13 800 | **3 100** | 9 650 | **2 170** | 11 000 | 14 000 |
| **9107UK** | 35 | **1.3780** | 62 | **2.4409** | 14 | **.5512** | 1.00 | **.040** | 16 800 | **3 780** | 12 000 | **2 700** | 9 200 | 12 000 |
| **9108UK** | 40 | **1.5748** | 68 | **2.6772** | 15 | **.5906** | 1.00 | **.040** | 17 200 | **3 870** | 13 200 | **2 970** | 8 500 | 11 000 |
| **9109UK** | 45 | **1.7717** | 75 | **2.9528** | 16 | **.6299** | 1.00 | **.040** | 21 200 | **4 770** | 17 000 | **3 820** | 7 500 | 9 800 |
| **9110UK** | 50 | **1.9685** | 80 | **3.1496** | 16 | **.6299** | 1.00 | **.040** | 22 100 | **4 970** | 18 300 | **4 110** | 6 900 | 9 000 |
| **9111UK** | 55 | **2.1654** | 90 | **3.5433** | 18 | **.7087** | 1.00 | **.040** | 29 600 | **6 650** | 25 500 | **5 730** | 6 300 | 8 200 |
| **9112UK** | 60 | **2.3622** | 95 | **3.7402** | 18 | **.7087** | 1.00 | **.040** | 30 200 | **6 790** | 27 000 | **6 070** | 5 700 | 7 400 |
| **9113UK** | 65 | **2.5591** | 100 | **3.9370** | 18 | **.7087** | 1.00 | **.040** | 31 200 | **7 010** | 29 000 | **6 520** | 5 400 | 7 000 |
| **9114UK** | 70 | **2.7559** | 110 | **4.3307** | 20 | **.7874** | 1.00 | **.040** | 34 500 | **7 760** | 35 500 | **7 980** | 5 000 | 6 500 |
| **9115UK** | 75 | **2.9528** | 115 | **4.5276** | 20 | **.7874** | 1.00 | **.040** | 37 700 | **8 480** | 37 500 | **8 430** | 4 700 | 6 100 |
| **9116UK** | 80 | **3.1496** | 125 | **4.9213** | 22 | **.8661** | 1.00 | **.040** | 48 800 | **11 000** | 49 000 | **11 000** | 4 500 | 5 800 |
| **9117UK** | 85 | **3.3465** | 130 | **5.1181** | 22 | **.8661** | 1.00 | **.040** | 49 400 | **11 100** | 52 000 | **11 700** | 4 100 | 5 300 |
| **9118UK** | 90 | **3.5433** | 140 | **5.5118** | 24 | **.9449** | 1.50 | **.060** | 58 500 | **13 200** | 61 000 | **13 700** | 3 800 | 4 900 |
| **9119UK** | 95 | **3.7402** | 145 | **5.7087** | 24 | **.9449** | 1.50 | **.060** | 71 500 | **16 100** | 71 000 | **16 000** | 3 600 | 4 700 |
| **9120UK** | 100 | **3.9370** | 150 | **5.9055** | 24 | **.9449** | 1.50 | **.060** | 62 400 | **14 000** | 68 000 | **15 300** | 3 500 | 4 500 |
| **9121UK** | 105 | **4.1339** | 160 | **6.2992** | 26 | **1.0236** | 2.00 | **.080** | 74 100 | **16 700** | 80 000 | **18 000** | 3 300 | 4 300 |
| **9122UK** | 110 | **4.3307** | 170 | **6.6929** | 28 | **1.1024** | 2.00 | **.080** | 87 100 | **19 600** | 91 500 | **20 600** | 3 200 | 3 800 |
| **9200U** | | | | | | | | | | | | | | |
| **9202U** | 15 | **.5906** | 35 | **1.3780** | 11 | **.4331** | .64 | **.025** | 8 060 | **1 810** | 4 750 | **1 070** | 20 000 | 26 000 |
| **9203U** | 17 | **.6693** | 40 | **1.5748** | 12 | **.4724** | .64 | **.025** | 9 950 | **2 240** | 6 100 | **1 370** | 18 000 | 23 000 |
| **9204U** | 20 | **.7874** | 47 | **1.8504** | 14 | **.5512** | 1.00 | **.040** | 11 900 | **2 680** | 7 100 | **1 600** | 15 000 | 19 000 |
| **9205U** | 25 | **.9843** | 52 | **2.0472** | 15 | **.5906** | 1.00 | **.040** | 14 300 | **3 210** | 8 800 | **1 980** | 12 000 | 16 000 |
| **9206U** | 30 | **1.1811** | 62 | **2.4409** | 16 | **.6299** | 1.00 | **.040** | 16 800 | **3 780** | 11 800 | **2 650** | 10 000 | 13 000 |
| **9207U** | 35 | **1.3780** | 72 | **2.8346** | 17 | **.6693** | 1.00 | **.040** | 23 400 | **5 260** | 17 000 | **3 820** | 9 200 | 12 000 |
| **9208U** | 40 | **1.5748** | 80 | **3.1496** | 18 | **.7087** | 1.00 | **.040** | 30 700 | **6 900** | 22 800 | **5 130** | 7 700 | 10 000 |
| **9209U** | 45 | **1.7717** | 85 | **3.3465** | 19 | **.7480** | 1.00 | **.040** | 31 900 | **7 170** | 25 000 | **5 620** | 7 300 | 9 500 |
| **9210U** | 50 | **1.9685** | 90 | **3.5433** | 20 | **.7874** | 1.00 | **.040** | 33 200 | **7 460** | 27 000 | **6 070** | 6 400 | 8 300 |
| **9211U** | 55 | **2.1654** | 100 | **3.9370** | 21 | **.8268** | 1.50 | **.060** | 48 800 | **11 000** | 37 500 | **8 430** | 6 000 | 7 800 |
| **9212U** | 60 | **2.3622** | 110 | **4.3307** | 22 | **.8661** | 1.50 | **.060** | 52 700 | **11 800** | 44 000 | **9 890** | 5 400 | 7 000 |
| **9213U** | 65 | **2.5591** | 120 | **4.7244** | 23 | **.9055** | 1.50 | **.060** | 63 700 | **14 300** | 54 000 | **12 100** | 4 900 | 6 400 |
| **9214U** | 70 | **2.7559** | 125 | **4.9213** | 24 | **.9449** | 1.50 | **.060** | 63 700 | **14 300** | 55 000 | **12 400** | 4 600 | 6 000 |
| **9215U** | 75 | **2.9528** | 130 | **5.1181** | 25 | **.9843** | 1.50 | **.060** | 76 100 | **17 100** | 65 500 | **14 700** | 4 300 | 5 600 |
| **9216U** | 80 | **3.1496** | 140 | **5.5118** | 26 | **1.0236** | 2.00 | **.080** | 78 000 | **17 500** | 71 000 | **16 000** | 4 100 | 5 300 |
| **9217U** | 85 | **3.3465** | 150 | **5.9055** | 28 | **1.1024** | 2.00 | **.080** | 90 400 | **20 300** | 85 000 | **19 100** | 3 800 | 4 900 |
| **9218U** | 90 | **3.5433** | 160 | **6.2992** | 30 | **1.1811** | 2.00 | **.080** | 112 000 | **25 100** | 98 000 | **22 000** | 3 600 | 4 700 |
| **9219U** | 95 | **3.7402** | 170 | **6.6929** | 32 | **1.2598** | 2.00 | **.080** | 117 000 | **26 300** | 108 000 | **24 300** | 3 500 | 4 500 |
| **9220U** | 100 | **3.9370** | 180 | **7.0866** | 34 | **1.3386** | 2.00 | **.080** | 130 000 | **29 200** | 122 000 | **27 400** | 3 200 | 4 100 |
| **9221U** | 105 | **4.1339** | 190 | **7.4803** | 36 | **1.4173** | 2.00 | **.080** | 148 000 | **33 300** | 137 000 | **30 800** | 3 000 | 3 900 |
| **9222U** | 110 | **4.3307** | 200 | **7.8740** | 38 | **1.4961** | 2.00 | **.080** | 163 000 | **36 600** | 156 000 | **35 100** | 2 900 | 3 800 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.32 and $C_0$ by 2.94.
3) Listed values are for machined bronze cage, ABEC-1. The values have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.

# 9300U series split inner ring angular contact ball bearings

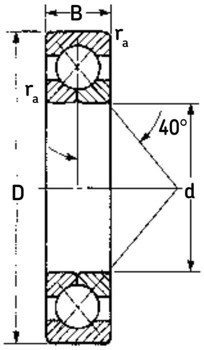



For duplex sets of 7000 and 9000 series bearings see page 243.

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1] $r_a$ mm | in. | Basic radial load rating[2] Dynamic $C$[4] N | lbf | Static $C_0$ N | lbf | Speed rating[3] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **9302U** | 15 | **.5906** | 42 | **1.6535** | 13 | **.5118** | 1.0 | **.04** | 9 950 | **2 240** | 6 100 | **1 370** | 16 000 | 21 000 |
| **9303U** | 17 | **.6693** | 47 | **1.8504** | 14 | **.5512** | 1.0 | **.04** | 12 100 | **2 720** | 7 500 | **1 690** | 15 000 | 19 000 |
| **9304U** | 20 | **.7874** | 52 | **2.0472** | 15 | **.5906** | 1.0 | **.04** | 18 600 | **4 180** | 10 600 | **2 380** | 13 000 | 17 000 |
| **9305U** | 25 | **.9843** | 62 | **2.4409** | 17 | **.6693** | 1.0 | **.04** | 21 200 | **4 770** | 13 700 | **3 080** | 11 000 | 14 000 |
| **9306U** | 30 | **1.1811** | 72 | **2.8346** | 19 | **.7480** | 1.0 | **.04** | 28 100 | **6 320** | 18 600 | **4 180** | 9 200 | 12 000 |
| **9307U** | 35 | **1.3780** | 80 | **3.1496** | 21 | **.8268** | 1.5 | **.06** | 35 800 | **8 050** | 24 000 | **5 400** | 8 500 | 11 000 |
| **9308U** | 40 | **1.5748** | 90 | **3.5433** | 23 | **.9055** | 1.5 | **.06** | 44 200 | **9 940** | 31 000 | **7 000** | 7 300 | 9 500 |
| **9309U** | 45 | **1.7717** | 100 | **3.9370** | 25 | **.9843** | 1.5 | **.06** | 52 700 | **11 800** | 38 000 | **8 540** | 6 400 | 8 300 |
| **9310U** | 50 | **1.9685** | 110 | **4.3307** | 27 | **1.0630** | 2.0 | **.08** | 68 900 | **15 500** | 49 000 | **11 000** | 5 800 | 7 500 |
| **9311U** | 55 | **2.1654** | 120 | **4.7244** | 29 | **1.1417** | 2.0 | **.08** | 80 600 | **18 100** | 57 000 | **12 800** | 5 100 | 6 600 |
| **9312U** | 60 | **2.3622** | 130 | **5.1181** | 31 | **1.2205** | 2.0 | **.08** | 92 300 | **20 700** | 65 500 | **14 700** | 4 900 | 6 400 |
| **9313U** | 65 | **2.5591** | 140 | **5.5118** | 33 | **1.2992** | 2.0 | **.08** | 97 500 | **21 900** | 75 000 | **16 900** | 4 600 | 6 000 |
| **9314U** | 70 | **2.7559** | 150 | **5.9055** | 35 | **1.3780** | 2.0 | **.08** | 111 000 | **25 000** | 85 000 | **19 100** | 4 100 | 5 300 |
| **9315U** | 75 | **2.9528** | 160 | **6.2992** | 37 | **1.4567** | 2.0 | **.08** | 130 000 | **29 200** | 106 000 | **23 800** | 3 900 | 5 000 |
| **9316U** | 80 | **3.1496** | 170 | **6.6929** | 39 | **1.5354** | 2.0 | **.08** | 143 000 | **32 100** | 120 000 | **27 000** | 3 600 | 4 700 |
| **9317U** | 85 | **3.3465** | 180 | **7.0866** | 41 | **1.6142** | 2.5 | **.10** | 153 000 | **34 400** | 134 000 | **30 100** | 3 500 | 4 500 |
| **9318U** | 90 | **3.5433** | 190 | **7.4803** | 43 | **1.6929** | 2.5 | **.10** | 168 000 | **37 800** | 150 000 | **33 700** | 3 200 | 4 200 |
| **9319U** | 95 | **3.7402** | 200 | **7.8740** | 45 | **1.7717** | 2.5 | **.10** | 178 000 | **40 000** | 166 000 | **37 300** | 3 100 | 4 000 |
| **9320U** | 100 | **3.9370** | 215 | **8.4646** | 47 | **1.8504** | 2.5 | **.10** | 190 000 | **42 700** | 183 000 | **41 100** | 3 000 | 3 900 |
| **9321U** | 105 | **4.1339** | 225 | **8.8583** | 49 | **1.9291** | 2.5 | **.10** | 203 000 | **45 600** | 200 000 | **45 000** | 2 900 | 3 800 |
| **9322U** | 110 | **4.3307** | 240 | **9.4488** | 50 | **1.9685** | 2.5 | **.10** | 229 000 | **51 500** | 236 000 | **53 100** | 2 700 | 3 500 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.32 and $C_0$ by 2.94.
3) Listed values are for machined bronze cage, ABEC-1. The values have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 9200UP and 9300UP series split inner ring angular contact ball bearings




For duplex sets of 7000 and 9000 series bearings see page 243.

| | Bore | | Outside diameter | | Width | | Fillet radius[1] | | Basic radial load rating[2] | | | | Speed rating[3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d | | D | | B | | $r_a$ | | $C^{4)}$ | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **9202UP** | 15 | **.5906** | 35 | **1.3780** | 11 | **.4331** | .64 | **.025** | 8 840 | **1 990** | 4 250 | **955** | 17 000 | 24 000 |
| **9203UP** | 17 | **.6693** | 40 | **1.5748** | 12 | **.4724** | .64 | **.025** | 11 700 | **2 630** | 6 000 | **1 350** | 15 000 | 20 000 |
| **9204UP** | 20 | **.7874** | 47 | **1.8504** | 14 | **.5512** | 1.00 | **.040** | 14 800 | **3 330** | 8 300 | **1 870** | 12 000 | 17 000 |
| **9205UP** | 25 | **.9843** | 52 | **2.0472** | 15 | **.5906** | 1.00 | **.040** | 16 800 | **3 780** | 10 400 | **2 340** | 10 000 | 15 000 |
| **9206UP** | 30 | **1.1811** | 62 | **2.4409** | 16 | **.6299** | 1.00 | **.040** | 21 200 | **4 770** | 12 700 | **2 860** | 8 500 | 12 000 |
| **9207UP** | 35 | **1.3780** | 72 | **2.8346** | 17 | **.6693** | 1.00 | **.040** | 29 100 | **6 540** | 19 300 | **4 340** | 8 000 | 11 000 |
| **9208UP** | 40 | **1.5748** | 80 | **3.1496** | 18 | **.7087** | 1.00 | **.040** | 32 500 | **7 310** | 22 400 | **5 040** | 7 000 | 9 500 |
| **9209UP** | 45 | **1.7717** | 85 | **3.3465** | 19 | **.7480** | 1.00 | **.040** | 39 000 | **8 770** | 27 500 | **6 180** | 6 700 | 9 000 |
| **9210UP** | 50 | **1.9685** | 90 | **3.5433** | 20 | **.7874** | 1.00 | **.040** | 40 300 | **9 060** | 30 000 | **6 740** | 6 000 | 8 000 |
| **9211UP** | 55 | **2.1654** | 100 | **3.9370** | 21 | **.8268** | 1.50 | **.060** | 48 800 | **11 000** | 37 500 | **8 430** | 5 600 | 7 500 |
| **9212UP** | 60 | **2.3622** | 110 | **4.3307** | 22 | **.8661** | 1.50 | **.060** | 58 500 | **13 200** | 45 500 | **10 200** | 5 000 | 6 700 |
| **9213UP** | 65 | **2.5591** | 120 | **4.7244** | 23 | **.9055** | 1.50 | **.060** | 63 700 | **14 300** | 51 000 | **11 500** | 4 500 | 6 000 |
| **9214UP** | 70 | **2.7559** | 125 | **4.9213** | 24 | **.9449** | 1.50 | **.060** | 68 900 | **15 500** | 56 000 | **12 600** | 4 300 | 5 600 |
| **9215UP** | 75 | **2.9528** | 130 | **5.1181** | 25 | **.9843** | 1.50 | **.060** | 71 500 | **16 100** | 60 000 | **13 500** | 4 000 | 5 300 |
| **9216UP** | 80 | **3.1496** | 140 | **5.5118** | 26 | **1.0236** | 2.00 | **.080** | 83 200 | **18 700** | 71 000 | **16 000** | 3 800 | 5 000 |
| **9217UP** | 85 | **3.3465** | 150 | **5.9055** | 28 | **1.1024** | 2.00 | **.080** | 95 600 | **21 500** | 83 000 | **18 700** | 3 600 | 4 800 |
| **9218UP** | 90 | **3.5433** | 160 | **6.2992** | 30 | **1.1811** | 2.00 | **.080** | 108 000 | **24 300** | 95 000 | **21 400** | 3 400 | 4 500 |
| **9219UP** | 95 | **3.7402** | 170 | **6.6929** | 32 | **1.2598** | 2.00 | **.080** | 124 000 | **27 900** | 110 000 | **24 700** | 3 200 | 4 300 |
| **9220UP** | 100 | **3.9370** | 180 | **7.0866** | 34 | **1.3386** | 2.00 | **.080** | 130 000 | **29 200** | 125 000 | **28 100** | 3 000 | 4 000 |
| **9221UP** | 105 | **4.1339** | 190 | **7.4803** | 36 | **1.4173** | 2.00 | **.080** | 143 000 | **32 100** | 129 000 | **29 000** | 2 800 | 3 800 |
| **9222UP** | 110 | **4.3307** | 200 | **7.8740** | 38 | **1.4961** | 2.00 | **.080** | 153 000 | **34 400** | 156 000 | **35 100** | 2 600 | 3 600 |
| **9300UP** | | | | | | | | | | | | | | |
| **9302UP** | 15 | **.5906** | 42 | **1.6535** | 13 | **.5118** | 1.00 | **.040** | 12 700 | **2 860** | 6 100 | **1 370** | 15 000 | 20 000 |
| **9303UP** | 17 | **.6693** | 47 | **1.8504** | 14 | **.5512** | 1.00 | **.040** | 16 800 | **3 780** | 8 500 | **1 910** | 13 000 | 18 000 |
| **9304UP** | 20 | **.7874** | 52 | **2.0472** | 15 | **.5906** | 1.00 | **.040** | 18 600 | **4 180** | 9 500 | **2 140** | 11 000 | 16 000 |
| **9305UP** | 25 | **.9843** | 62 | **2.4409** | 17 | **.6693** | 1.00 | **.040** | 24 200 | **5 440** | 13 400 | **3 010** | 9 000 | 13 000 |
| **9306UP** | 30 | **1.1811** | 72 | **2.8346** | 19 | **.7480** | 1.00 | **.040** | 32 500 | **7 310** | 19 600 | **4 410** | 8 000 | 11 000 |
| **9307UP** | 35 | **1.3780** | 80 | **3.1496** | 21 | **.8268** | 1.50 | **.060** | 39 700 | **8 920** | 24 500 | **5 510** | 7 500 | 10 000 |
| **9308UP** | 40 | **1.5748** | 90 | **3.5433** | 23 | **.9055** | 1.50 | **.060** | 47 500 | **10 700** | 30 500 | **6 860** | 6 700 | 9 000 |
| **9309UP** | 45 | **1.7717** | 100 | **3.9370** | 25 | **.9843** | 1.50 | **.060** | 59 200 | **13 300** | 40 000 | **8 990** | 6 000 | 8 000 |
| **9310UP** | 50 | **1.9685** | 110 | **4.3307** | 27 | **1.0630** | 2.00 | **.080** | 68 900 | **15 500** | 52 000 | **11 700** | 5 300 | 7 000 |
| **9311UP** | 55 | **2.1654** | 120 | **4.7244** | 29 | **1.1417** | 2.00 | **.080** | 79 300 | **17 800** | 56 000 | **12 600** | 4 800 | 6 300 |
| **9312UP** | 60 | **2.3622** | 130 | **5.1181** | 31 | **1.2205** | 2.00 | **.080** | 90 400 | **20 300** | 64 000 | **14 400** | 4 500 | 6 000 |
| **9313UP** | 65 | **2.5591** | 140 | **5.5118** | 33 | **1.2992** | 2.00 | **.080** | 101 000 | **22 700** | 80 000 | **18 000** | 4 300 | 5 600 |
| **9314UP** | 70 | **2.7559** | 150 | **5.9055** | 35 | **1.3780** | 2.00 | **.080** | 117 000 | **26 300** | 93 000 | **20 900** | 3 800 | 5 000 |
| **9315UP** | 75 | **2.9528** | 160 | **6.2992** | 37 | **1.4567** | 2.00 | **.080** | 127 000 | **28 600** | 100 000 | **22 500** | 3 600 | 4 800 |
| **9316UP** | 80 | **3.1496** | 170 | **6.6929** | 39 | **1.5354** | 2.00 | **.080** | 138 000 | **31 000** | 110 000 | **24 700** | 3 400 | 4 500 |
| **9317UP** | 85 | **3.3465** | 180 | **7.0866** | 41 | **1.6142** | 2.50 | **.100** | 148 000 | **33 300** | 122 000 | **27 400** | 3 200 | 4 300 |
| **9318UP** | 90 | **3.5433** | 190 | **7.4803** | 43 | **1.6929** | 2.50 | **.100** | 159 000 | **35 700** | 137 000 | **30 800** | 3 000 | 4 000 |
| **9319UP** | 95 | **3.7402** | 200 | **7.8740** | 45 | **1.7717** | 2.50 | **.100** | 168 000 | **37 800** | 150 000 | **33 700** | 2 800 | 3 800 |
| **9320UP** | 100 | **3.9370** | 215 | **8.4646** | 47 | **1.8504** | 2.50 | **.100** | 190 000 | **42 700** | 190 000 | **42 700** | 2 600 | 3 600 |
| **9321UP** | 105 | **4.1339** | 225 | **8.8583** | 49 | **1.9291** | 2.50 | **.100** | 203 000 | **45 600** | 196 000 | **44 100** | 2 400 | 3 400 |
| **9322UP** | 110 | **4.3307** | 240 | **9.4488** | 50 | **1.9685** | 2.50 | **.100** | 212 000 | **47 700** | 228 000 | **51 300** | 2 200 | 3 200 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.75 and $C_0$ by 3.85.
3) Listed values are for machined bronze cage, ABEC-1. The values have been determined through historical application and practice. For a more complete explanation, see page 272.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 9000U series split inner ring 29° angular contact ball bearings single bearing

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

$P = F_R$ when $F_A/F_R \leq 0.80$

or

$P = 0.39\ F_R\ +\ 0.76\ F_A$ when $F_A/F_R > 0.80$

$P$ = Dynamic equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

Consult MRC Bearing Services when

$F_A/F_R > 1.0$

### Static equivalent radial load

$P_0 = 0.50\ F_R + 0.34\ F_A$

$P_0$ is always $\geq F_R$

$P_0$ = Static equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

### Life rating

$$L10 = \left(\frac{C}{P}\right)^3 \text{ (millions of revolutions)}$$

or

$$L10_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 \text{ (hours)}$$

C = Basic dynamic radial load rating (from single bearing tables)

P = Dynamic equivalent radial load

n = Speed in rpm

## Minimum thrust load for angular contact ball bearings

Satisfactory operation of angular contact ball bearings requires sufficient traction forces between the balls and races to minimize damage caused by sliding or skidding. This is particularly important at high speeds where the inertia forces of the balls and cage and the viscous drag in the lubricant can have a detrimental influence on the rolling conditions.

The minimum required thrust load can be determined from the following formula.

$$F_A = A\left(\frac{n}{1000}\right)^2 \text{ newtons}$$

or

$$F_A = 0.2248\,A\left(\frac{n}{1000}\right)^2 \text{ pounds}$$

Where, $F_A$ = Minimum thrust load

A = Bearing design factor listed in the following tables

n = Speed in rpm

Note: For duplex bearings mounted in tandem, multiply the single-bearing thrust value by the number of bearings in tandem.

## Minimum thrust load A factor

| Size | A | Size | A | Size | A | Size | A |
|---|---|---|---|---|---|---|---|
| 9100UK | 0.06 | 9212U | 17.51 | 9203UP | 0.74 | 9315UP | 182.70 |
| 9101UK | 0.08 | 9213U | 25.86 | 9204UP | 1.32 | 9316UP | 215.80 |
| 9102UK | 0.11 | 9214U | 27.74 | 9205UP | 1.90 | 9317UP | 269.40 |
| 9103UK | 0.20 | 9215U | 40.59 | 9206UP | 3.45 | 9318UP | 332.30 |
| 9104UK | 0.37 | 9216U | 41.61 | 9207UP | 6.73 | 9319UP | 405.70 |
| 9105UK | 0.52 | 9217U | 61.05 | 9208UP | 9.28 | 9320UP | 629.40 |
| 9106UK | 0.95 | 9218U | 95.12 | 9209UP | 13.13 | 9321UP | 673.40 |
| 9107UK | 1.50 | 9219U | 108.60 | 9210UP | 15.48 | 9322UP | 904.70 |
| 9108UK | 1.83 | 9220U | 141.50 | 9211UP | 23.88 | | |
| 9109UK | 2.88 | 9221U | 169.80 | 9212UP | 35.31 | | |
| 9110UK | 3.37 | 9222U | 212.20 | 9213UP | 44.55 | | |
| 9111UK | 6.14 | 9302U | 0.29 | 9214UP | 53.74 | | |
| 9112UK | 7.02 | 9303U | 0.63 | 9215UP | 61.15 | | |
| 9113UK | 7.97 | 9304U | 1.19 | 9216UP | 84.07 | | |
| 9114UK | 11.45 | 9305U | 1.85 | 9217UP | 112.9 | | |
| 9115UK | 12.79 | 9306U | 3.45 | 9218UP | 148.5 | | |
| 9116UK | 20.43 | 9307U | 5.77 | 9219UP | 191.9 | | |
| 9117UK | 22.59 | 9308U | 9.31 | 9220UP | 224.1 | | |
| 9118UK | 32.62 | 9309U | 14.26 | 9221UP | 282.7 | | |
| 9119UK | 44.04 | 9310U | 26.44 | 9222UP | 352.1 | | |
| 9120UK | 39.28 | 9311U | 36.89 | 9302UP | 0.85 | | |
| 9121UK | 54.28 | 9312U | 50.17 | 9303UP | 1.53 | | |
| 9122UK | 72.46 | 9313U | 64.73 | 9304UP | 1.91 | | |
| 9202U | 0.19 | 9314U | 73.28 | 9305UP | 3.85 | | |
| 9203U | 0.30 | 9315U | 110.90 | 9306UP | 7.39 | | |
| 9204U | 0.42 | 9316U | 131.40 | 9307UP | 11.66 | | |
| 9205U | 0.94 | 9317U | 178.20 | 9308UP | 17.31 | | |
| 9206U | 1.41 | 9318U | 205.60 | 9309UP | 29.08 | | |
| 9207U | 2.82 | 9319U | 252.80 | 9310UP | 36.26 | | |
| 9208U | 4.95 | 9320U | 314.00 | 9311UP | 57.36 | | |
| 9209U | 5.46 | 9321U | 378.20 | 9312UP | 77.30 | | |
| 9210U | 6.87 | 9322U | 516.40 | 9313UP | 111.40 | | |
| 9211U | 13.36 | 9202UP | 0.42 | 9314UP | 144.60 | | |

# 9000U series split inner ring 29° angular contact ball bearings single bearing

## Dynamic equivalent radial load and life calculation examples

Bearing size: 9309U
Speed: 2000 rpm
Basic dynamic radial load rating (C) = 11800

### Case 1

Radial load ($F_R$) = 1750
Thrust load ($F_A$) = 1310
Equivalent load (P) = $F_R$ or 0.39 $F_R$ + 0.76 $F_A$
$F_A/F_R$ = 1310/1750 = 0.75
Since $F_A/F_R$ < 0.80, P = $F_R$ = 1750

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11800}{1750}\right)^3 = 307\times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60\times 2000}\left(\frac{11800}{1750}\right)^3$$

= 2555 Hrs

### Case 2

Radial load ($F_R$) = 1750
Thrust load ($F_A$) = 2100
Equivalent load (P) = $F_R$ or 0.39 $F_R$ + 0.76 $F_A$
$F_A/F_R$ = 2100/1750 = 1.20
Since $F_A/F_R$ > 0.80, P = 0.39 x 1750 + 0.76 x 2100 = 2279

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11800}{2279}\right)^3 = 139\times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60\times 2000}\left(\frac{11800}{2279}\right)^3$$

= 1157 Hrs

### Case 3

Thrust load ($F_A$) = 2100
Equivalent load (P) = 0.39 $F_R$ + 0.76 $F_A$
$F_A/F_R$ = 2100/0 = ∞
Since $F_A/F_R$ > 0.80, (P) = 0.76 x 2100 = 1596

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{11800}{1596}\right)^3 = 404\times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L\ 10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60\times 2000}\left(\frac{11800}{1596}\right)^3$$

= 3368 Hrs

# 9000UP series split inner ring 40° angular contact ball bearings single bearing

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

$P = F_R$ when $F_A/F_R \leq 1.14$

or

$P = 0.35\ F_R + 0.57\ F_A$ when $F_A/F_R > 1.14$

P = Dynamic equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

Consult MRC Bearing Services when

$F_A/F_R > 1.0$

### Life rating

$$L10 = \left(\frac{C}{P}\right)^3 \text{ (millions of revolutions)}$$

or

$$L10_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 \text{ (hours)}$$

C = Basic dynamic radial load rating (from single bearing tables)

P = Dynamic equivalent radial load

n = Speed in rpm

### Static equivalent radial load

$P_0 = 0.5\ F_R + 0.26\ F_A$

$P_0$ is always ≥ FR

$P_0$ = Static equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

# 9000UP series split inner ring 40° angular contact ball bearings single bearing

## Dynamic equivalent radial load and life calculation examples

Bearing size: 9309UP
Speed: 2000 rpm
Basic dynamic radial load rating (C) = 13300

### Case 1

Radial load ($F_R$) = 1750
Thrust load ($F_A$) = 1960
$F_A/F_R = 1960/1750 = 1.12$
Since $F_A/F_R < 1.14$, equivalent load (P) = $F_R$ = 1750

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13300}{1750}\right)^3 = 439 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L10}_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{13300}{1750}\right)^3$$

= 3658 Hrs

### Case 2

Radial load ($F_R$) = 1750
Thrust load ($F_A$) = 2450
$F_A/F_R = 2450/1750 = 1.40$
Since $F_A/F_R > 1.14$, equivalent load (P) = $0.35\ F_R + 0.57\ F_A$
$P = 0.35 \times 1750 + 0.57 \times 2450 = 2009$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13300}{2009}\right)^3 = 290 \times 10^6 \text{ Rev.}$$

or

$$\text{Life (L10}_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{13300}{2009}\right)^3$$

= 2418 Hrs

### Case 3

Thrust load ($F_A$) = 2450
$F_A/F_R = 2450/0 = \infty$
Since $F_A/F_R > 1.14$, equivalent load (P) = $0.35\ F_R + 0.57\ F_A$

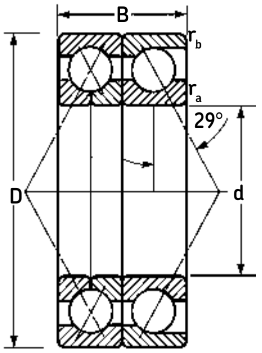
$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{13300}{1397}\right)^3 = 863 \times 10^6 \text{ Rev.}$$

or

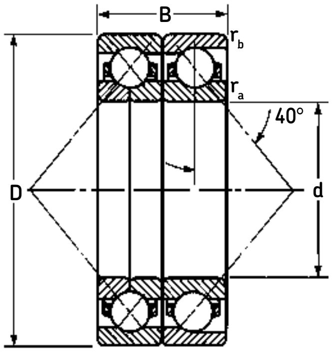
$$\text{Life (L 10}_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 2000}\left(\frac{13300}{1397}\right)^3$$

= 7191 Hrs

# 97000U2 and 97000UP2 series angular contact ball bearings




97000U2




97000UP2

**97000U and 97000H series**

The 97000U series consists of a matched set of 9000UDT and 7000DT flush ground bearings having a 29° contact angle. The 97000H series consists of a matched set of 9000HDT (split outer ring) and 7000DT flush ground bearings.

**97000UP and 97000HP series**

The 97000UP series consists of a matched set of 9000UPDT and 7000PDT flush ground bearings having a 40° contact angle. The 97000HP series consists of a matched set of 9000HPDT (split outer ring) and 7000PDT flush ground bearings.

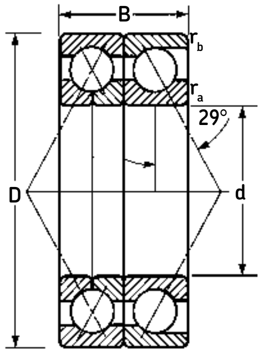
## Typical mountings

The bearings are usually mounted in pairs. This arrangement divides the thrust load in one direction while accommodating reversing thrust load. To increase thrust capacity in one direction it is possible to mount additional 7000DT or 7000PDT bearings in tandem.

## Cage types and materials

Furnished in one-piece, inner ring land-guided, machined brass or special material.

# 97200U2 light series




This series consists of a matched set of 9200UDT and 7200DT flush ground bearings having a 29° contact angle. One-piece, inner ring land-guided, machined brass cages are standard for this series.

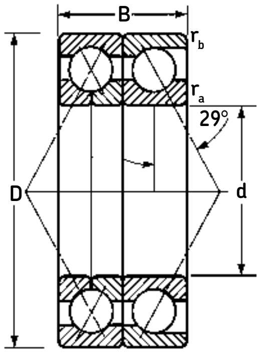
These bearings are mounted in pairs in applications where substantial thrust loads are present. This arrangement divides the thrust load in one direction while accommodating reversing thrust load. To increase thrust capacity in one direction, additional 7200DT bearings may be mounted in tandem.

For proper mounting orientation refer to page 243.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | $r_a$ in. | $r_b$ mm | $r_b$ in. | Basic radial load rating[2] Dynamic C[4] N | Dynamic C lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[3] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **97207U2** | 35 | **1.3780** | 72 | **2.8346** | 34 | **1.3386** | 1.0 | **.04** | .60 | **.024** | 37 700 | **8 480** | 34 000 | **7 640** | 7 400 | 9 600 |
| **97208U2** | 40 | **1.5748** | 80 | **3.1496** | 36 | **1.4173** | 1.0 | **.04** | .60 | **.024** | 49 400 | **11 100** | 45 500 | **10 200** | 6 200 | 8 000 |
| **97209U2** | 45 | **1.7717** | 85 | **3.3465** | 38 | **1.4961** | 1.0 | **.04** | .60 | **.024** | 49 400 | **11 100** | 46 500 | **10 500** | 5 800 | 7 600 |
| **97210U2** | 50 | **1.9685** | 90 | **3.5433** | 40 | **1.5748** | 1.0 | **.04** | .60 | **.024** | 54 000 | **12 100** | 54 000 | **12 100** | 5 100 | 6 600 |
| **97211U2** | 55 | **2.1654** | 100 | **3.9370** | 42 | **1.6535** | 1.5 | **.06** | 1.00 | **.040** | 79 300 | **17 800** | 75 000 | **16 900** | 4 800 | 6 200 |
| **97212U2** | 60 | **2.3622** | 110 | **4.3307** | 44 | **1.7323** | 1.5 | **.06** | 1.00 | **.040** | 85 200 | **19 100** | 88 000 | **19 800** | 4 300 | 5 600 |
| **97213U2** | 65 | **2.5591** | 120 | **4.7244** | 46 | **1.8110** | 1.5 | **.06** | 1.00 | **.040** | 104 000 | **23 400** | 110 000 | **24 700** | 3 900 | 5 100 |
| **97214U2** | 70 | **2.7559** | 125 | **4.9213** | 48 | **1.8898** | 1.5 | **.06** | 1.00 | **.040** | 104 000 | **23 400** | 110 000 | **24 700** | 3 700 | 4 800 |
| **97215U2** | 75 | **2.9528** | 130 | **5.1181** | 50 | **1.9685** | 1.5 | **.06** | 1.00 | **.040** | 130 000 | **29 200** | 140 000 | **31 500** | 3 400 | 4 500 |
| **97216U2** | 80 | **3.1496** | 140 | **5.5118** | 52 | **2.0472** | 2.0 | **.08** | 1.00 | **.040** | 121 000 | **27 200** | 134 000 | **30 100** | 3 300 | 4 200 |
| **97217U2** | 85 | **3.3465** | 150 | **5.9055** | 56 | **2.2047** | 2.0 | **.08** | 1.00 | **.040** | 148 000 | **33 300** | 166 000 | **37 300** | 3 000 | 3 900 |
| **97218U2** | 90 | **3.5433** | 160 | **6.2992** | 60 | **2.3622** | 2.0 | **.08** | 1.00 | **.040** | 190 000 | **42 700** | 236 000 | **53 100** | 2 900 | 3 800 |
| **97219U2** | 95 | **3.7402** | 170 | **6.6929** | 64 | **2.5197** | 2.0 | **.08** | 1.00 | **.040** | 199 000 | **44 700** | 228 000 | **51 300** | 2 800 | 3 600 |
| **97220U2** | 100 | **3.9370** | 180 | **7.0866** | 68 | **2.6772** | 2.0 | **.08** | 1.00 | **.040** | 225 000 | **50 600** | 260 000 | **58 500** | 2 600 | 3 300 |
| **97221U2** | 105 | **4.1339** | 190 | **7.4803** | 72 | **2.8346** | 2.0 | **.08** | 1.00 | **.040** | 242 000 | **54 400** | 295 000 | **66 300** | 2 400 | 3 100 |
| **97222U2** | 110 | **4.3307** | 200 | **7.8740** | 76 | **2.9921** | 2.0 | **.08** | 1.00 | **.040** | 265 000 | **59 600** | 310 000 | **69 700** | 2 300 | 3 000 |
| **97224U2** | 120 | **4.7244** | 215 | **8.4646** | 80 | **3.1496** | 2.0 | **.08** | 1.00 | **.040** | 281 000 | **63 200** | 355 000 | **79 800** | 2 200 | 2 800 |
| **97226U2** | 130 | **5.1181** | 230 | **9.0551** | 80 | **3.1496** | 2.5 | **.10** | 1.00 | **.040** | 319 000 | **71 700** | 415 000 | **93 300** | 2 000 | 2 600 |
| **97228U2** | 140 | **5.5118** | 250 | **9.8425** | 84 | **3.3071** | 2.5 | **.10** | 1.00 | **.040** | 338 000 | **76 000** | 465 000 | **105 000** | 1 800 | 2 400 |
| **97230U2** | 150 | **5.9055** | 270 | **10.6299** | 90 | **3.5433** | 2.5 | **.10** | 1.00 | **.040** | 397 000 | **89 200** | 560 000 | **126 000** | 1 700 | 2 200 |
| **97232U2** | 160 | **6.2992** | 290 | **11.4173** | 96 | **3.7795** | 2.5 | **.10** | 1.00 | **.040** | 442 000 | **99 400** | 670 000 | **135 000** | 1 600 | 2 100 |
| **97234U2** | 170 | **6.6929** | 310 | **12.2047** | 104 | **4.0945** | 3.0 | **.12** | 1.00 | **.040** | 468 000 | **105 000** | 735 000 | **165 000** | 1 500 | 2 000 |
| **97236U2** | 180 | **7.0866** | 320 | **12.5984** | 104 | **4.0945** | 3.0 | **.12** | 1.00 | **.040** | 494 000 | **111 000** | 780 000 | **175 000** | 1 500 | 1 900 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.32 and $C_0$ by 2.94.
3) Listed values are for machined brass cage. Values have been determined through historical application and practice.
4) Rating for one million revolutions or 500 hours at $33\frac{1}{3}$ rpm.

# 97300U2 medium series




This series consists of a matched set of 9300UDT and 7300DT flush ground bearings having a 29° contact angle. One-piece, inner ring land-guided, machined brass cages are standard for this series.

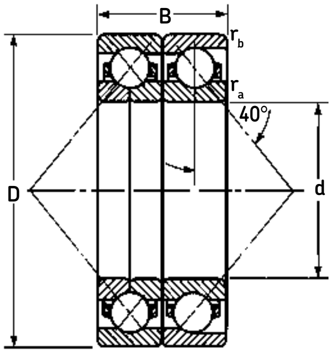
These bearings are mounted in pairs in applications where substantial thrust loads are present. This arrangement divides the thrust load in one direction while accommodating reversing thrust load. To increase thrust capacity in one direction, additional 7300DT bearings may be mounted in tandem.

For proper mounting orientation refer to page 243.

| MRC bearing number | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | Basic radial load rating[2] | | | | Speed rating[3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Dynamic | | Static | | | |
| | d | | D | | B | | $r_a$ | | $r_b$ | | C[4] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **97307U2** | 35 | **1.3780** | 80 | **3.1496** | 42 | **1.6535** | 1.5 | **.06** | 1.0 | **.040** | 58 500 | **13 200** | 48 000 | **10 800** | 6 800 | 8 800 |
| **97308U2** | 40 | **1.5748** | 90 | **3.5433** | 46 | **1.8110** | 1.5 | **.06** | 1.0 | **.040** | 71 500 | **16 100** | 61 000 | **13 700** | 5 800 | 7 600 |
| **97309U2** | 45 | **1.7717** | 100 | **3.9370** | 50 | **1.9685** | 1.5 | **.06** | 1.0 | **.040** | 85 200 | **19 200** | 75 000 | **16 900** | 5 100 | 6 600 |
| **97310U2** | 50 | **1.9685** | 110 | **4.3307** | 54 | **2.1260** | 2.0 | **.08** | 1.0 | **.040** | 121 000 | **27 200** | 106 000 | **23 800** | 4 600 | 6 000 |
| **97311U2** | 55 | **2.1654** | 120 | **4.7244** | 58 | **2.2835** | 2.0 | **.08** | 1.0 | **.040** | 140 000 | **31 500** | 125 000 | **28 100** | 4 100 | 5 300 |
| **97312U2** | 60 | **2.3622** | 130 | **5.1181** | 62 | **2.4409** | 2.0 | **.08** | 1.0 | **.040** | 159 000 | **35 700** | 146 000 | **32 800** | 3 900 | 5 100 |
| **97313U2** | 65 | **2.5591** | 140 | **5.5118** | 66 | **2.5984** | 2.0 | **.08** | 1.0 | **.040** | 178 000 | **40 000** | 173 000 | **38 900** | 3 700 | 4 800 |
| **97314U2** | 70 | **2.7559** | 150 | **5.9055** | 70 | **2.7559** | 2.0 | **.08** | 1.0 | **.040** | 182 000 | **40 900** | 170 000 | **38 200** | 3 300 | 4 200 |
| **97315U2** | 75 | **2.9528** | 160 | **6.2992** | 74 | **2.9134** | 2.0 | **.08** | 1.0 | **.040** | 225 000 | **50 600** | 228 000 | **51 300** | 3 100 | 4 000 |
| **97316U2** | 80 | **3.1496** | 170 | **6.6929** | 78 | **3.0709** | 2.0 | **.08** | 1.0 | **.040** | 234 000 | **52 600** | 240 000 | **54 000** | 2 900 | 3 800 |
| **97317U2** | 85 | **3.3465** | 180 | **7.0866** | 82 | **3.2283** | 2.5 | **.10** | 1.0 | **.040** | 265 000 | **59 600** | 285 000 | **64 100** | 2 800 | 3 600 |
| **97318U2** | 90 | **3.5433** | 190 | **7.4803** | 86 | **3.3858** | 2.5 | **.10** | 1.0 | **.040** | 276 000 | **62 000** | 300 000 | **67 400** | 2 600 | 3 400 |
| **97319U2** | 95 | **3.7402** | 200 | **7.8740** | 90 | **3.5433** | 2.5 | **.10** | 1.0 | **.040** | 291 000 | **65 400** | 325 000 | **73 100** | 2 500 | 3 200 |
| **97320U2** | 100 | **3.9370** | 215 | **8.4646** | 94 | **3.7008** | 2.5 | **.10** | 1.0 | **.040** | 312 000 | **70 100** | 365 000 | **82 100** | 2 400 | 3 100 |
| **97321U2** | 105 | **4.1339** | 225 | **8.8583** | 98 | **3.8583** | 2.5 | **.10** | 1.0 | **.040** | 332 000 | **74 600** | 400 000 | **89 900** | 2 300 | 3 000 |
| **97322U2** | 110 | **4.3307** | 240 | **9.4488** | 100 | **3.9370** | 2.5 | **.10** | 1.0 | **.040** | 371 000 | **83 400** | 475 000 | **107 000** | 2 200 | 2 800 |
| **97324U2** | 120 | **4.7244** | 260 | **10.2362** | 110 | **4.3307** | 2.5 | **.10** | 1.0 | **.040** | 423 000 | **95 100** | 560 000 | **126 000** | 2 000 | 2 600 |
| **97326U2** | 130 | **5.1181** | 280 | **11.0236** | 116 | **4.5669** | 3.0 | **.12** | 1.0 | **.040** | 468 000 | **105 000** | 640 000 | **144 000** | 1 800 | 2 400 |
| **97328U2** | 140 | **5.5118** | 300 | **11.8110** | 124 | **4.8819** | 3.0 | **.12** | 1.0 | **.040** | 507 000 | **114 000** | 735 000 | **165 000** | 1 800 | 2 200 |
| **97330U2** | 150 | **5.9055** | 320 | **12.5984** | 130 | **5.1181** | 3.0 | **.12** | 1.0 | **.040** | 559 000 | **126 000** | 865 000 | **194 000** | 1 600 | 2 100 |
| **97332U2** | 160 | **6.2992** | 340 | **13.3858** | 136 | **5.3543** | 3.0 | **.12** | 1.0 | **.040** | 618 000 | **139 000** | 965 000 | **217 000** | 1 500 | 2 000 |
| **97334U2** | 170 | **6.6929** | 360 | **14.1732** | 144 | **5.6693** | 3.0 | **.12** | 1.0 | **.040** | 650 000 | **146 000** | 1 040 000 | **234 000** | 1 500 | 1 900 |
| **97336U2** | 180 | **7.0866** | 380 | **14.9606** | 150 | **5.9055** | 3.0 | **.12** | 1.0 | **.040** | 689 000 | **155 000** | 1 160 000 | **261 000** | 1 400 | 1 800 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.32 and $C_0$ by 2.94.
3) Listed values are for machined brass cage. Values have been determined through historical application and practice.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 97200UP2 light series




This series consists of a matched set of 9200UPDT and 7200PDT flush ground bearings having a 40° contact angle. One-piece, inner ring land-guided, machined brass cages are standard for this series.

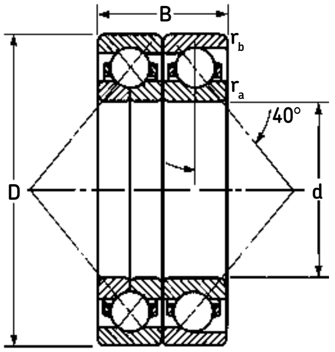
These bearings are mounted in pairs in applications where substantial thrust loads are present. This arrangement divides the thrust load in one direction while accommodating reversing thrust load. To increase thrust capacity in one direction, additional 7200PDT bearings may be mounted in tandem.

For proper mounting orientation refer to page 243.

| MRC bearing number | Bore d | | Outside diameter D | | Width B | | Fillet radius1) $r_a$ | | $r_b$ | | Basic radial load rating2) Dynamic $C^{4)}$ | | Static $C_0$ | | Speed rating3) Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **97207UP2** | 35 | **1.3780** | 72 | **2.8346** | 34 | **1.3386** | 1.0 | **.04** | .60 | **.024** | 47 500 | **10 700** | 39 000 | **8 770** | 6 300 | 8 500 |
| **97208UP2** | 40 | **1.5748** | 80 | **3.1496** | 36 | **1.4173** | 1.0 | **.04** | .60 | **.024** | 52 700 | **11 800** | 45 000 | **10 100** | 5 600 | 7 500 |
| **97209UP2** | 45 | **1.7717** | 85 | **3.3465** | 38 | **1.4961** | 1.0 | **.04** | .60 | **.024** | 62 400 | **14 000** | 55 000 | **12 400** | 5 300 | 7 000 |
| **97210UP2** | 50 | **1.9685** | 90 | **3.5433** | 40 | **1.5748** | 1.0 | **.04** | .60 | **.024** | 65 000 | **14 600** | 60 000 | **13 500** | 4 800 | 6 300 |
| **97211UP2** | 55 | **2.1654** | 100 | **3.9370** | 42 | **1.6535** | 1.5 | **.06** | 1.00 | **.040** | 79 300 | **17 800** | 75 000 | **16 900** | 4 500 | 6 000 |
| **97212UP2** | 60 | **2.3622** | 110 | **4.3307** | 44 | **1.7323** | 1.5 | **.06** | 1.00 | **.040** | 95 600 | **21 500** | 91 600 | **20 600** | 4 000 | 5 300 |
| **97213UP2** | 65 | **2.5591** | 120 | **4.7244** | 46 | **1.8110** | 1.5 | **.06** | 1.00 | **.040** | 104 000 | **23 400** | 100 000 | **22 500** | 3 600 | 4 800 |
| **97214UP2** | 70 | **2.7559** | 125 | **4.9213** | 48 | **1.8898** | 1.5 | **.06** | 1.00 | **.040** | 112 000 | **25 200** | 112 000 | **25 200** | 3 400 | 4 500 |
| **97215UP2** | 75 | **2.9528** | 130 | **5.1181** | 50 | **1.9685** | 1.5 | **.06** | 1.00 | **.040** | 117 000 | **26 300** | 120 000 | **27 000** | 3 200 | 4 300 |
| **97216UP2** | 80 | **3.1496** | 140 | **5.5118** | 52 | **2.0472** | 2.0 | **.08** | 1.00 | **.040** | 135 000 | **30 300** | 140 000 | **31 500** | 3 000 | 4 000 |
| **97217UP2** | 85 | **3.3465** | 150 | **5.9055** | 56 | **2.2047** | 2.0 | **.08** | 1.00 | **.040** | 156 000 | **35 100** | 166 000 | **37 300** | 2 800 | 3 800 |
| **97218UP2** | 90 | **3.5433** | 160 | **6.2992** | 60 | **2.3622** | 2.0 | **.08** | 1.00 | **.040** | 178 000 | **40 000** | 190 000 | **42 700** | 2 600 | 3 600 |
| **97219UP2** | 95 | **3.7402** | 170 | **6.6929** | 64 | **2.5197** | 2.0 | **.08** | 1.00 | **.040** | 199 000 | **44 700** | 220 000 | **49 500** | 2 400 | 3 400 |
| **97220UP2** | 100 | **3.9370** | 180 | **7.0866** | 68 | **2.6772** | 2.0 | **.08** | 1.00 | **.040** | 212 000 | **47 700** | 250 000 | **56 200** | 2 200 | 3 200 |
| **97221UP2** | 105 | **4.1339** | 190 | **7.4803** | 72 | **2.8346** | 2.0 | **.08** | 1.00 | **.040** | 229 000 | **51 500** | 260 000 | **58 500** | 2 000 | 3 000 |
| **97222UP2** | 110 | **4.3307** | 200 | **7.8740** | 76 | **2.9921** | 2.0 | **.08** | 1.00 | **.040** | 251 000 | **56 400** | 310 000 | **69 700** | 1 900 | 2 800 |
| **97224UP2** | 120 | **4.7244** | 215 | **8.4646** | 80 | **3.1496** | 2.0 | **.08** | 1.00 | **.040** | 270 000 | **60 700** | 325 000 | **73 100** | 1 700 | 2 400 |
| **97226UP2** | 130 | **5.1181** | 230 | **9.0551** | 80 | **3.1496** | 2.5 | **.10** | 1.00 | **.040** | 302 000 | **67 900** | 390 000 | **87 700** | 1 700 | 2 400 |
| **97228UP2** | 140 | **5.5118** | 250 | **9.8425** | 84 | **3.3071** | 2.5 | **.10** | 1.00 | **.040** | 319 000 | **71 700** | 430 000 | **96 700** | 1 600 | 2 200 |
| **97230UP2** | 150 | **5.9055** | 270 | **10.6299** | 90 | **3.5433** | 2.5 | **.10** | 1.00 | **.040** | 351 000 | **78 900** | 520 000 | **117 000** | 1 500 | 2 000 |
| **97232UP2** | 160 | **6.2992** | 290 | **11.4173** | 96 | **3.7795** | 2.5 | **.10** | 1.00 | **.040** | 390 000 | **87 700** | 560 000 | **126 000** | 1 300 | 1 700 |
| **97234UP2** | 170 | **6.6929** | 310 | **12.2047** | 104 | **4.0945** | 3.0 | **.12** | 1.00 | **.040** | 436 000 | **98 000** | 655 000 | **147 000** | 1 200 | 1 600 |
| **97236UP2** | 180 | **7.0866** | 320 | **12.5984** | 104 | **4.0945** | 3.0 | **.12** | 1.00 | **.040** | 449 000 | **101 000** | 710 000 | **160 000** | 1 100 | 1 500 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.76 and $C_0$ by 3.86.
3) Listed values are for machined brass cage. Values have been determined through historical application and practice.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 97300UP2 medium series




This series consists of a matched set of 9300UPDT and 7300PDT flush ground bearings having a 40° contact angle. One-piece, inner ring land-guided, machined brass cages are standard for this series.

These bearings are mounted in pairs in applications where substantial thrust loads are present. This arrangement divides the thrust load in one direction while accommodating reversing thrust load. To increase thrust capacity in one direction, additional 7300PDT bearings may be mounted in tandem.

For proper mounting orientation refer to page 243.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1] $r_a$ mm | $r_a$ in. | $r_b$ mm | $r_b$ in. | Basic radial load rating[2] Dynamic C[4] N | Dynamic C[4] lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[3] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **97307UP2** | 35 | **1.3780** | 80 | **3.1496** | 42 | **1.6535** | 1.5 | **.06** | 1.0 | **.040** | 63 700 | **14 300** | 49 000 | **11 000** | 6 000 | 8 000 |
| **97308UP2** | 40 | **1.5748** | 90 | **3.5433** | 46 | **1.8110** | 1.5 | **.06** | 1.0 | **.040** | 76 100 | **17 100** | 61 000 | **13 700** | 5 300 | 7 000 |
| **97309UP2** | 45 | **1.7717** | 100 | **3.9370** | 50 | **1.9685** | 1.5 | **.06** | 1.0 | **.040** | 97 500 | **21 900** | 80 000 | **18 000** | 4 800 | 6 300 |
| **97310UP2** | 50 | **1.9685** | 110 | **4.3307** | 54 | **2.1260** | 2.0 | **.08** | 1.0 | **.040** | 112 000 | **25 200** | 104 000 | **23 400** | 4 300 | 5 600 |
| **97311UP2** | 55 | **2.1654** | 120 | **4.7244** | 58 | **2.2835** | 2.0 | **.08** | 1.0 | **.040** | 130 000 | **29 200** | 112 000 | **25 200** | 3 800 | 5 000 |
| **97312UP2** | 60 | **2.3622** | 130 | **5.1181** | 62 | **2.4409** | 2.0 | **.08** | 1.0 | **.040** | 148 000 | **33 300** | 129 000 | **29 000** | 3 600 | 4 800 |
| **97313UP2** | 65 | **2.5591** | 140 | **5.5118** | 66 | **2.5984** | 2.0 | **.08** | 1.0 | **.040** | 165 000 | **37 100** | 160 000 | **36 000** | 3 200 | 4 300 |
| **97314UP2** | 70 | **2.7559** | 150 | **5.9055** | 70 | **2.7559** | 2.0 | **.08** | 1.0 | **.040** | 190 000 | **42 700** | 186 000 | **41 800** | 3 000 | 4 000 |
| **97315UP2** | 75 | **2.9528** | 160 | **6.2992** | 74 | **2.9134** | 2.0 | **.08** | 1.0 | **.040** | 208 000 | **46 800** | 200 000 | **45 000** | 2 800 | 3 800 |
| **97316UP2** | 80 | **3.1496** | 170 | **6.6929** | 78 | **3.0709** | 2.0 | **.08** | 1.0 | **.040** | 225 000 | **50 600** | 220 000 | **49 500** | 2 600 | 3 600 |
| **97317UP2** | 85 | **3.3465** | 180 | **7.0866** | 82 | **3.2283** | 2.5 | **.10** | 1.0 | **.040** | 238 000 | **53 500** | 245 000 | **55 100** | 2 400 | 3 400 |
| **97318UP2** | 90 | **3.5433** | 190 | **7.4803** | 86 | **3.3858** | 2.5 | **.10** | 1.0 | **.040** | 255 000 | **57 300** | 270 000 | **60 700** | 2 200 | 3 200 |
| **97319UP2** | 95 | **3.7402** | 200 | **7.8740** | 90 | **3.5433** | 2.5 | **.10** | 1.0 | **.040** | 276 000 | **62 000** | 300 000 | **67 400** | 2 000 | 3 000 |
| **97320UP2** | 100 | **3.9370** | 215 | **8.4646** | 94 | **3.7008** | 2.5 | **.10** | 1.0 | **.040** | 307 000 | **69 000** | 380 000 | **85 400** | 1 900 | 2 800 |
| **97321UP2** | 105 | **4.1339** | 225 | **8.8583** | 98 | **3.8583** | 2.5 | **.10** | 1.0 | **.040** | 325 000 | **73 100** | 390 000 | **87 700** | 1 800 | 2 600 |
| **97322UP2** | 110 | **4.3307** | 240 | **9.4488** | 100 | **3.9370** | 2.5 | **.10** | 1.0 | **.040** | 345 000 | **77 600** | 455 000 | **102 000** | 1 700 | 2 400 |
| **97324UP2** | 120 | **4.7244** | 260 | **10.2362** | 110 | **4.3307** | 2.5 | **.10** | 1.0 | **.040** | 390 000 | **87 700** | 530 000 | **119 000** | 1 600 | 2 200 |
| **97326UP2** | 130 | **5.1181** | 280 | **11.0236** | 116 | **4.5669** | 3.0 | **.12** | 1.0 | **.040** | 449 000 | **101 000** | 610 000 | **137 000** | 1 500 | 2 000 |
| **97328UP2** | 140 | **5.5118** | 300 | **11.8110** | 124 | **4.8819** | 3.0 | **.12** | 1.0 | **.040** | 488 000 | **110 000** | 695 000 | **156 000** | 1 400 | 1 900 |
| **97330UP2** | 150 | **5.9055** | 320 | **12.5984** | 130 | **5.1181** | 3.0 | **.12** | 1.0 | **.040** | 540 000 | **121 000** | 780 000 | **175 000** | 1 200 | 1 700 |
| **97332UP2** | 160 | **6.2992** | 340 | **13.3858** | 136 | **5.3543** | 3.0 | **.12** | 1.0 | **.040** | 553 000 | **124 000** | 850 000 | **191 000** | 1 200 | 1 600 |
| **97334UP2** | 170 | **6.6929** | 360 | **14.1732** | 144 | **5.6693** | 3.0 | **.12** | 1.0 | **.040** | 605 000 | **136 000** | 965 000 | **217 000** | 1 000 | 1 500 |
| **97336UP2** | 180 | **7.0866** | 380 | **14.9606** | 150 | **5.9055** | 3.0 | **.12** | 1.0 | **.040** | 650 000 | **146 000** | 1 100 000 | **247 000** | 950 | 1 400 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.76 and $C_0$ by 3.86.
3) Listed values are for machined brass cage.
Values have been determined through historical application and practice.
4) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

# 97000U2 series 29° angular contact ball bearings duplex

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

$P = F_R$ when $F_A/F_R \leq 0.80$

$P = 0.39\ F_R + 0.76\ F_A$ when $F_A/F_R > 0.80$

P = Dynamic equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

### Life rating

$$L10 = \left(\frac{C}{P}\right)^3 \text{ (millions of revolutions)}$$

or

$$L10_h = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 \text{ (hours)}$$

C = Dynamic radial load rating

P = Dynamic equivalent radial load

n = Speed in rpm

### Static equivalent radial load

$P_0 = 1.0\ F_R + 0.66\ F_A$

$P_0$ is always $\geq F_R$

$P_0$ = Static equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

# 97000U2 series 29° angular contact ball bearings duplex

## Dynamic equivalent radial load and life calculation examples

Bearing size: 97313U2
Speed: 1750 rpm
Basic dynamic radial load rating (C) = 40000

### Case 1

Thrust load ($F_A$) = 5000

$F_A/F_R = 5000/0 = \infty$

Since $F_A/F_R > 0.80$,

$P = 0.39\ F_R + 0.76\ F_A = 0.76 \times 5000$

P = 3800

C = 40000

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{40000}{3800}\right)^3 = 1166 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 1750}\left(\frac{40000}{3800}\right)^3$$

= 11108 Hrs

### Case 2

Radial load ($F_R$) = 3000

Thrust load ($F_A$) = 5000

$F_A/F_R = 5000/3000 = 1.67$

Since $F_A/F_R > 0.80$,

$P = 0.39\ F_R + 0.76\ F_A = 0.39 \times 3000 + 0.76 \times 5000$

P = 4970

C = 40000

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{40000}{4970}\right)^3 = 521 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 1750}\left(\frac{40000}{4970}\right)^3$$

= 4965 Hrs

# 97000UP2 series 40° angular contact ball bearings duplex

## Dynamic and static equivalent radial load and life rating

### Dynamic equivalent radial load

$P = F_R$ when $F_A/F_R \leq 1.14$

$P = 0.35\ F_R + 0.57\ F_A$ when $F_A/F_R > 1.14$

P = Dynamic equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

### Life rating

$L10 = \left(\frac{C}{P}\right)^3$ (millions of revolutions)

or

$L10_h = \frac{10^6}{60n} \left(\frac{C}{P}\right)^3$ (hours)

C = Dynamic radial load rating

P = Dynamic equivalent radial load

n = Speed in rpm

### Static equivalent radial load

$P_0 = 1.0\ F_R + 0.52\ F_A$

$P_0$ is always ≥ FR

$P_0$ = Static equivalent radial load

$F_R$ = Radial load

$F_A$ = Thrust load

# 97000UP2 series 40° angular contact ball bearings duplex

## Dynamic equivalent radial load and life calculation examples

Bearing size: 97314UP2
Speed: 1750 rpm
Basic dynamic radial load rating (C) = 42700

### Case 1

Thrust load ($F_A$) = 5000

$F_A/F_R = 5000/0 = \infty$

Since $F_A/F_R > 1.14$,

$P = 0.35\ F_R + 0.57\ F_A = 0.57 \times 5000$

$P = 2850$

$C = 42700$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{42700}{2850}\right)^3 = 3363 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 1750}\left(\frac{42700}{2850}\right)^3$$

= 32030 Hrs

### Case 2

Radial load ($F_R$) = 3000

Thrust load ($F_A$) = 5000

$F_A/F_R = 5000/3000 = 1.67$

Since $F_A/F_R > 1.14$,

$P = 0.35\ F_R + 0.57\ F_A = 0.35 \times 3000 + 0.57 \times 5000$

$P = 3900$

$C = 42700$

$$\text{Life (L10)} = \left(\frac{C}{P}\right)^3 = \left(\frac{42700}{3900}\right)^3 = 1312 \times 10^6 \text{ Rev.}$$

or

$$\text{Life } (L10_h) = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3 = \frac{10^6}{60 \times 1750}\left(\frac{42700}{3900}\right)^3$$

= 12500 Hrs

# Precision bearings
# ABEC-5 and ABEC-7 tolerance grades

Precision ball bearings in tolerance grades ABEC-5 and ABEC-7 are recommended for applications where high speed and/or extreme running accuracy is required. These bearings have the same nominal external dimensions as equivalent size ABEC-1 grade bearings; however, the running characteristics and external dimensions are held to closer tolerances.

## Standardization

Bearing envelope dimensions and tolerances shown in this catalog comply with standards established in the USA by the Annular Bearing Engineers Committee (ABEC) of the American Bearing Manufacturers Association (ABMA) (see Engineering section; page 229). These standards have also been approved by the American Standard Association (ASA) and the International Standards Organization (ISO). This assures the bearing user of all the advantages of dimensional standardization. However, dimensional interchangeability is not necessarily an indication of functional interchangeability. Other characteristics must also be considered such as cage type, internal clearance, contact angle, configuration of the bearing rings and other details.

In order to meet the running characteristic tolerances specified for precision bearings, it is necessary to assemble them with high precision balls where the size, sphericity and other surface characteristics are held to very close tolerances. Cages generally are of phenolic (Bakelite) composition, which is well-suited for high-speed operation.

## Temperature

The bearings are manufactured from vacuum-processed 52100 steel that can operate satisfactorily to 250° F (121° C). This is well within the requirement of most machine tool applications.

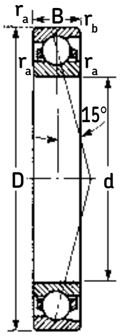
## Duplexed bearings

Precision ball bearings are also duplex ground so they can be used as a component in a pair of bearings or in a bearing set (see duplex bearings section; page 224). Duplex pairs (or sets of bearings) ordered as DB, DF, or DT (or in combinations), are tied together as they are to be mounted.

## Packaging and identification

Bearings are thoroughly cleaned immediately prior to packaging and are usually coated with a lightweight oil compatible with most machine lubricants. Therefore, bearings can be used as received without being washed, with the oil serving as a rust inhibitor. Single-row bearings are packaged in hermetically sealed transparent bags and placed in distinctive boxes identified with the bearing number, tolerance grade and other important bearing data.

# Precision 15° angular contact 1900R extremely light series single bearings




Precision 1900R series angular contact ball bearings are manufactured to meet dimensional and running accuracy to ABEC-7 tolerances. They are supplied with an inner ring-centered phenolic cage designed to minimize centrifugal force.

Notes:

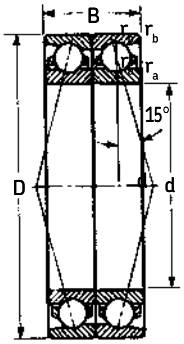
For recommended mounting fits refer to "Shaft and housing fits" in Engineering data section.

For equivalent load and life calculations see pages 122 and 123.

| MRC bearing number | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | | | Basic radial load rating | | | | Speed rating[3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Dynamic | | Static | | | |
| | d | | D | | B | | $r_a$ | | $r_b$ | | $ZD^2$ | | $C$[2] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **1900R** | 10 | **.3937** | 22 | **.8661** | 6 | **.2362** | .30 | **.012** | .10 | **.004** | 110 | **.17** | 3 120 | **701** | 1 560 | **351** | 76 000 | 110 000 |
| **1901R** | 12 | **.4724** | 24 | **.9449** | 6 | **.2362** | .30 | **.012** | .10 | **.004** | 123 | **.19** | 3 250 | **731** | 1 800 | **405** | 69 000 | 100 000 |
| **1902R** | 15 | **.5906** | 28 | **1.1024** | 7 | **.2756** | .30 | **.012** | .10 | **.004** | 187 | **.29** | 4 880 | **1 100** | 2 700 | **607** | 55 000 | 84 000 |
| **1903R** | 17 | **.6693** | 30 | **1.1811** | 7 | **.2756** | .30 | **.012** | .10 | **.004** | 206 | **.32** | 5 400 | **1 210** | 3 000 | **674** | 51 000 | 78 000 |
| **1904R** | 20 | **.7874** | 37 | **1.4567** | 9 | **.3543** | .30 | **.012** | .15 | **.006** | 400 | **.62** | 9 360 | **2 100** | 5 850 | **1 320** | 41 000 | 62 000 |
| **1905R** | 25 | **.9843** | 42 | **1.6535** | 9 | **.3543** | .30 | **.012** | .15 | **.006** | 342 | **.53** | 7 610 | **1 710** | 5 300 | **1 190** | 37 000 | 53 000 |
| **1906R** | 30 | **1.1811** | 47 | **1.8504** | 9 | **.3543** | .30 | **.012** | .15 | **.006** | 452 | **.70** | 9 750 | **2 190** | 7 100 | **1 600** | 32 000 | 48 000 |
| **1907R** | 35 | **1.3780** | 55 | **2.1654** | 10 | **.3937** | .64 | **.025** | .15 | **.006** | 555 | **.86** | 11 200 | **2 520** | 9 000 | **2 020** | 25 000 | 39 000 |
| **1908R** | 40 | **1.5748** | 62 | **2.4409** | 12 | **.4724** | .64 | **.025** | .15 | **.006** | 722 | **1.12** | 14 300 | **3 210** | 11 600 | **2 600** | 23 000 | 36 000 |
| **1909R** | 45 | **1.7717** | 68 | **2.6772** | 12 | **.4724** | .64 | **.025** | .15 | **.006** | 806 | **1.25** | 15 100 | **3 400** | 13 400 | **3 010** | 21 000 | 31 000 |
| **1910R** | 50 | **1.9685** | 72 | **2.8346** | 12 | **.4724** | .64 | **.025** | .15 | **.006** | 1 070 | **1.66** | 19 500 | **4 380** | 17 300 | **3 900** | 20 000 | 28 000 |
| **1911R** | 55 | **2.1654** | 80 | **3.1496** | 13 | **.5118** | 1.00 | **.040** | .30 | **.012** | 1 260 | **1.95** | 22 900 | **5 150** | 20 400 | **4 590** | 18 000 | 27 000 |
| **1912R** | 60 | **2.3622** | 85 | **3.3465** | 13 | **.5118** | 1.00 | **.040** | .30 | **.012** | 1 390 | **2.15** | 24 200 | **5 440** | 22 800 | **5 130** | 17 000 | 25 000 |
| **1913R** | 65 | **2.5591** | 90 | **3.5433** | 13 | **.5118** | 1.00 | **.040** | .30 | **.012** | 1 450 | **2.25** | 24 700 | **5 550** | 24 000 | **5 400** | 15 000 | 22 000 |
| **1914R** | 70 | **2.7559** | 100 | **3.9370** | 16 | **.6299** | 1.00 | **.040** | .30 | **.012** | 1 990 | **3.09** | 33 200 | **7 460** | 32 500 | **7 300** | 14 000 | 21 000 |
| **1915R** | 75 | **2.9528** | 105 | **4.1339** | 16 | **.6299** | 1.00 | **.040** | .30 | **.012** | 2 080 | **3.23** | 34 500 | **7 760** | 34 500 | **7 760** | 14 000 | 20 000 |
| **1916R** | 80 | **3.1496** | 110 | **4.3307** | 16 | **.6299** | 1.00 | **.040** | .30 | **.012** | 2 180 | **3.38** | 34 500 | **7 760** | 36 000 | **8 100** | 13 000 | 19 000 |
| **1917R** | 85 | **3.3465** | 120 | **4.7244** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 2 840 | **4.40** | 44 900 | **10 100** | 46 500 | **10 500** | 12 000 | 18 000 |
| **1918R** | 90 | **3.5433** | 125 | **4.9213** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 3 400 | **5.27** | 52 700 | **11 800** | 56 000 | **12 600** | 12 000 | 17 000 |
| **1919R** | 95 | **3.7402** | 130 | **5.1181** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 3 090 | **4.79** | 47 500 | **10 700** | 52 000 | **11 700** | 11 000 | 16 000 |
| **1920R** | 100 | **3.9370** | 140 | **5.5118** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 3 870 | **6.00** | 58 500 | **13 200** | 64 000 | **14 400** | 10 000 | 15 000 |
| **1921R** | 105 | **4.1339** | 145 | **5.7087** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 4 030 | **6.25** | 60 500 | **13 600** | 67 000 | **15 100** | 10 000 | 14 000 |
| **1922R** | 110 | **4.3307** | 150 | **5.9055** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 3 820 | **5.93** | 55 300 | **12 400** | 64 000 | **14 400** | 9 200 | 13 000 |
| **1924R** | 120 | **4.7244** | 165 | **6.4961** | 22 | **.8661** | 1.00 | **.040** | .60 | **.024** | 5 100 | **7.91** | 74 100 | **16 700** | 85 000 | **19 100** | 8 300 | 12 000 |
| **1926R** | 130 | **5.1181** | 180 | **7.0866** | 24 | **.9449** | 1.50 | **.060** | .60 | **.024** | 6 300 | **9.77** | 90 400 | **20 500** | 106 000 | **23 800** | 7 800 | 11 000 |
| **1928R** | 140 | **5.5118** | 190 | **7.4803** | 24 | **.9449** | 1.50 | **.060** | .60 | **.024** | 6 580 | **10.2** | 95 600 | **21 400** | 110 000 | **24 700** | 7 400 | 11 000 |
| **1930R** | 150 | **5.9055** | 210 | **8.2677** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 9 090 | **14.1** | 125 000 | **28 200** | 150 000 | **33 700** | 6 400 | 9 500 |
| **1932R** | 160 | **6.2992** | 220 | **8.6614** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 9 420 | **14.60** | 127 000 | **28 600** | 156 000 | **35 100** | 6 000 | 9 000 |
| **1934R** | 170 | **6.6929** | 230 | **9.0551** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 10 200 | **15.80** | 133 000 | **29 800** | 170 000 | **38 300** | 5 500 | 8 400 |
| **1936R** | 180 | **7.0866** | 250 | **9.8425** | 33 | **1.2992** | 2.00 | **.080** | 1.00 | **.040** | 12 800 | **19.90** | 168 000 | **36 000** | 212 000 | **47 800** | 5 100 | 7 800 |
| **1938R** | 190 | **7.4803** | 260 | **10.2362** | 33 | **1.2992** | 2.00 | **.080** | 1.00 | **.040** | 13 400 | **20.70** | 174 000 | **39 100** | 224 000 | **50 400** | 5 100 | 7 800 |
| **1940R** | 200 | **7.8740** | 280 | **11.0236** | 38 | **1.4961** | 2.00 | **.080** | 1.00 | **.040** | 16 800 | **26.00** | 216 000 | **48 600** | 275 000 | **61 800** | 4 600 | 7 300 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.
3) Values have been determined through historical application and practice. For a more complete explanation, see page 272.

# Precision 15° angular contact 1900RD extremely light series duplex




Precision 1900RD series angular contact ball bearings are manufactured to meet dimensional and running accuracy to ABEC-7 tolerances. They are supplied with an inner ring-centered phenolic cage designed to minimize centrifugal force.

Notes:

For recommended mounting fits refer to “Shaft and housing fits” in Engineering data section.

“D” indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

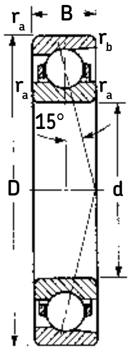
For equivalent load and life calculations see pages 124 and 125.

Use these values for back-to-back (DB) or face-to-face (DF) mounting arrangements.

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1] $r_a$ mm | in. | $r_b$ mm | in. | $ZD^2$ mm | in. | Basic radial load rating: Dynamic $C$[2] N | lbf | Static $C_0$ N | lbf | Speed rating[3] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1900RD** | 10 | **.3937** | 22 | **.8661** | 12 | **.4724** | .30 | **.012** | .10 | **.004** | 110 | **.17** | 5 070 | **1 140** | 3 100 | **697** | 61 000 | 88 000 |
| **1901RD** | 12 | **.4724** | 24 | **.9449** | 12 | **.4724** | .30 | **.012** | .10 | **.004** | 123 | **.19** | 5 270 | **1 180** | 3 550 | **798** | 55 000 | 80 000 |
| **1902RD** | 15 | **.5906** | 28 | **1.1024** | 14 | **.5512** | .30 | **.012** | .10 | **.004** | 187 | **.29** | 7 930 | **1 780** | 5 400 | **1 210** | 44 000 | 67 000 |
| **1903RD** | 17 | **.6693** | 30 | **1.1811** | 14 | **.5512** | .30 | **.012** | .10 | **.004** | 206 | **.32** | 8 710 | **1 960** | 6 100 | **1 370** | 41 000 | 62 000 |
| **1904RD** | 20 | **.7874** | 37 | **1.4567** | 18 | **.7087** | .30 | **.012** | .15 | **.006** | 400 | **.62** | 15 300 | **3 440** | 11 600 | **2 600** | 33 000 | 50 000 |
| **1905RD** | 25 | **.9843** | 42 | **1.6535** | 18 | **.7087** | .30 | **.012** | .15 | **.006** | 342 | **.53** | 12 400 | **2 790** | 10 800 | **2 430** | 30 000 | 42 000 |
| **1906RD** | 30 | **1.1811** | 47 | **1.8504** | 18 | **.7087** | .30 | **.012** | .15 | **.006** | 452 | **.70** | 15 900 | **3 580** | 14 300 | **3 210** | 26 000 | 38 000 |
| **1907RD** | 35 | **1.3780** | 55 | **2.1654** | 20 | **.7874** | .64 | **.025** | .15 | **.006** | 555 | **.86** | 18 200 | **4 090** | 18 000 | **4 050** | 20 000 | 31 000 |
| **1908RD** | 40 | **1.5748** | 62 | **2.4409** | 24 | **.9449** | .64 | **.025** | .15 | **.006** | 722 | **1.12** | 22 900 | **5 150** | 23 200 | **5 220** | 18 000 | 29 000 |
| **1909RD** | 45 | **1.7717** | 68 | **2.6772** | 24 | **.9449** | .64 | **.025** | .15 | **.006** | 806 | **1.25** | 24 700 | **5 550** | 26 500 | **5 960** | 17 000 | 25 000 |
| **1910RD** | 50 | **1.9685** | 72 | **2.8346** | 24 | **.9449** | .64 | **.025** | .15 | **.006** | 1 070 | **1.66** | 31 900 | **7 170** | 34 500 | **7 760** | 16 000 | 22 000 |
| **1911RD** | 55 | **2.1654** | 80 | **3.1496** | 26 | **1.0236** | 1.00 | **.040** | .30 | **.012** | 1 260 | **1.95** | 37 100 | **8 340** | 40 500 | **9 100** | 14 000 | 22 000 |
| **1912RD** | 60 | **2.3622** | 85 | **3.3465** | 26 | **1.0236** | 1.00 | **.040** | .30 | **.012** | 1 390 | **2.15** | 39 000 | **8 770** | 45 500 | **10 200** | 14 000 | 20 000 |
| **1913RD** | 65 | **2.5591** | 90 | **3.5433** | 26 | **1.0236** | 1.00 | **.040** | .30 | **.012** | 1 450 | **2.25** | 39 700 | **8 920** | 48 000 | **10 800** | 12 000 | 18 000 |
| **1914RD** | 70 | **2.7559** | 100 | **3.9370** | 32 | **1.2598** | 1.00 | **.040** | .30 | **.012** | 1 990 | **3.09** | 54 000 | **12 100** | 65 500 | **14 700** | 11 000 | 17 000 |
| **1915RD** | 75 | **2.9528** | 105 | **4.1339** | 32 | **1.2598** | 1.00 | **.040** | .30 | **.012** | 2 080 | **3.23** | 55 900 | **12 600** | 68 000 | **15 300** | 11 000 | 16 000 |
| **1916RD** | 80 | **3.1496** | 110 | **4.3307** | 32 | **1.2598** | 1.00 | **.040** | .30 | **.012** | 2 180 | **3.38** | 57 200 | **12 900** | 72 000 | **16 200** | 10 000 | 15 000 |
| **1917RD** | 85 | **3.3465** | 120 | **4.7244** | 36 | **1.4173** | 1.00 | **.040** | .60 | **.024** | 2 840 | **4.40** | 74 100 | **16 700** | 93 000 | **20 900** | 9 600 | 14 000 |
| **1918RD** | 90 | **3.5433** | 125 | **4.9213** | 36 | **1.4173** | 1.00 | **.040** | .60 | **.024** | 3 400 | **5.27** | 85 200 | **19 200** | 112 000 | **25 200** | 9 600 | 14 000 |
| **1919RD** | 95 | **3.7402** | 130 | **5.1181** | 36 | **1.4173** | 1.00 | **.040** | .60 | **.024** | 3 090 | **4.79** | 76 100 | **17 100** | 104 000 | **23 400** | 8 800 | 13 000 |
| **1920RD** | 100 | **3.9370** | 140 | **5.5118** | 40 | **1.5748** | 1.00 | **.040** | .60 | **.024** | 3 870 | **6.00** | 95 600 | **21 500** | 127 000 | **28 600** | 8 000 | 12 000 |
| **1921RD** | 105 | **4.1339** | 145 | **5.7087** | 40 | **1.5748** | 1.00 | **.040** | .60 | **.024** | 4 030 | **6.25** | 97 500 | **21 900** | 134 000 | **30 100** | 8 000 | 11 000 |
| **1922RD** | 110 | **4.3307** | 150 | **5.9055** | 40 | **1.5748** | 1.00 | **.040** | .60 | **.024** | 3 820 | **5.93** | 90 400 | **20 300** | 129 000 | **29 000** | 7 400 | 10 000 |
| **1924RD** | 120 | **4.7244** | 165 | **6.4961** | 44 | **1.7323** | 1.00 | **.040** | .60 | **.024** | 5 100 | **7.91** | 121 000 | **27 200** | 170 000 | **38 200** | 6 600 | 9 600 |
| **1926RD** | 130 | **5.1181** | 180 | **7.0866** | 48 | **1.8898** | 1.50 | **.060** | .60 | **.024** | 6 300 | **9.77** | 146 000 | **32 800** | 208 000 | **46 800** | 6 200 | 8 800 |
| **1928RD** | 140 | **5.5118** | 190 | **7.4803** | 48 | **1.8898** | 1.50 | **.060** | .60 | **.024** | 6 580 | **10.20** | 156 000 | **35 100** | 220 000 | **49 500** | 5 900 | 8 800 |
| **1930RD** | 150 | **5.9055** | 210 | **8.2677** | 56 | **2.2047** | 2.00 | **.080** | 1.00 | **.040** | 9 090 | **14.10** | 203 000 | **45 600** | 300 000 | **67 400** | 5 100 | 7 600 |
| **1932RD** | 160 | **6.2992** | 220 | **8.6614** | 56 | **2.2047** | 2.00 | **.080** | 1.00 | **.040** | 9 420 | **14.60** | 208 000 | **46 800** | 315 000 | **70 800** | 4 800 | 7 200 |
| **1934RD** | 170 | **6.6929** | 230 | **9.0551** | 56 | **2.2047** | 2.00 | **.080** | 1.00 | **.040** | 10 200 | **15.80** | 216 000 | **48 600** | 340 000 | **76 400** | 4 400 | 6 700 |
| **1936RD** | 180 | **7.0866** | 250 | **9.8425** | 66 | **2.5984** | 2.00 | **.080** | 1.00 | **.040** | 12 800 | **19.90** | 276 000 | **62 000** | 425 000 | **95 600** | 4 100 | 6 200 |
| **1938RD** | 190 | **7.4803** | 260 | **10.2362** | 66 | **2.5984** | 2.00 | **.080** | 1.00 | **.040** | 13 400 | **20.70** | 281 000 | **63 200** | 440 000 | **98 900** | 4 100 | 6 200 |
| **1940RD** | 200 | **7.8740** | 280 | **11.0236** | 76 | **2.9921** | 2.00 | **.080** | 1.00 | **.040** | 16 800 | **26.00** | 351 000 | **78 900** | 550 000 | **124 000** | 3 700 | 5 800 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.
3) Values have been determined through historical application and practice. For a more complete explanation, see page 272.

# Precision 15° angular contact 100KR extra light series single bearings




Precision 100KR series angular contact ball bearings are manufactured to meet dimensional and running accuracy to ABEC-7 tolerances. They are supplied with an inner ring-centered phenolic cage designed to minimize centrifugal force.

Notes:

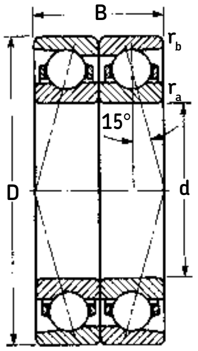
For recommended mounting fits refer to “Shaft and housing fits” in Engineering data section.

For equivalent load and life calculations see pages 122 and 123.

| | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | | | Basic radial load rating | | | | Speed rating[3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d | | D | | B | | $r_a$ | | $r_b$ | | $ZD^2$ | | C[2] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **100KR** | 10 | **.3937** | 26 | **1.0236** | 8 | **.3150** | .30 | **.012** | .10 | **.004** | 181 | **.28** | 4 940 | **1 110** | 2 280 | **513** | 69 000 | 100 000 |
| **101KR** | 12 | **.4724** | 28 | **1.1024** | 8 | **.3150** | .30 | **.012** | .10 | **.004** | 206 | **.32** | 5 530 | **1 240** | 2 650 | **596** | 60 000 | 90 000 |
| **102KR** | 15 | **.5906** | 32 | **1.2598** | 9 | **.3543** | .30 | **.012** | .10 | **.004** | 226 | **.35** | 6 050 | **1 350** | 3 150 | **708** | 51 000 | 78 000 |
| **103KR** | 17 | **.6693** | 35 | **1.3780** | 10 | **.3937** | .30 | **.012** | .10 | **.004** | 342 | **.53** | 8 520 | **1 920** | 4 650 | **1 050** | 44 000 | 67 000 |
| **104KR** | 20 | **.7874** | 42 | **1.6535** | 12 | **.4724** | .64 | **.025** | .30 | **.012** | 445 | **.69** | 10 800 | **2 420** | 6 200 | **1 390** | 39 000 | 56 000 |
| **105KR** | 25 | **.9843** | 47 | **1.8504** | 12 | **.4724** | .64 | **.025** | .30 | **.012** | 522 | **.81** | 12 100 | **2 720** | 7 650 | **1 720** | 35 000 | 50 000 |
| **106KR** | 30 | **1.1811** | 55 | **2.1654** | 13 | **.5118** | 1.00 | **.040** | .30 | **.012** | 716 | **1.11** | 15 600 | **3 500** | 10 600 | **2 380** | 28 000 | 42 000 |
| **107KR** | 35 | **1.3780** | 62 | **2.4409** | 14 | **.5512** | 1.00 | **.040** | .30 | **.012** | 884 | **1.37** | 18 600 | **4 180** | 13 200 | **2 970** | 23 000 | 36 000 |
| **108KR** | 40 | **1.5748** | 68 | **2.6772** | 15 | **.5906** | 1.00 | **.040** | .30 | **.012** | 942 | **1.46** | 19 500 | **4 380** | 14 600 | **3 280** | 22 000 | 34 000 |
| **109KR** | 45 | **1.7717** | 75 | **2.9528** | 16 | **.6299** | 1.00 | **.040** | .30 | **.012** | 1 220 | **1.89** | 24 200 | **5 440** | 19 000 | **4 270** | 21 000 | 31 000 |
| **110KR** | 50 | **1.9685** | 80 | **3.1496** | 16 | **.6299** | 1.00 | **.040** | .30 | **.012** | 1 300 | **2.01** | 25 100 | **5 640** | 20 400 | **4 590** | 20 000 | 28 000 |
| **111KR** | 55 | **2.1654** | 90 | **3.5433** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 1 810 | **2.81** | 33 800 | **7 600** | 28 000 | **6 290** | 17 000 | 25 000 |
| **112KR** | 60 | **2.3622** | 95 | **3.7402** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 1 920 | **2.97** | 35 100 | **7 890** | 30 000 | **6 740** | 15 000 | 22 000 |
| **113KR** | 65 | **2.5591** | 100 | **3.9370** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 2 030 | **3.14** | 35 800 | **8 050** | 32 500 | **7 310** | 14 000 | 21 000 |
| **114KR** | 70 | **2.7559** | 110 | **4.3307** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 2 470 | **3.83** | 42 300 | **9 510** | 40 000 | **8 990** | 14 000 | 20 000 |
| **115KR** | 75 | **2.9528** | 115 | **4.5276** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 2 590 | **4.02** | 43 600 | **9 800** | 42 500 | **9 550** | 13 000 | 19 000 |
| **116KR** | 80 | **3.1496** | 125 | **4.9213** | 22 | **.8661** | 1.00 | **.040** | .60 | **.024** | 3 390 | **5.25** | 55 900 | **12 600** | 54 000 | **12 100** | 12 000 | 18 000 |
| **117KR** | 85 | **3.3465** | 130 | **5.1181** | 22 | **.8661** | 1.00 | **.040** | .60 | **.024** | 3 550 | **5.50** | 57 200 | **12 900** | 57 000 | **12 800** | 12 000 | 17 000 |
| **118KR** | 90 | **3.5433** | 140 | **5.5118** | 24 | **.9449** | 1.50 | **.060** | .60 | **.024** | 4 280 | **6.64** | 68 900 | **15 500** | 68 000 | **15 300** | 11 000 | 16 000 |
| **119KR** | 95 | **3.7402** | 145 | **5.7087** | 24 | **.9449** | 1.50 | **.060** | .60 | **.024** | 5 040 | **7.81** | 83 200 | **18 700** | 80 000 | **18 000** | 10 000 | 15 000 |
| **120KR** | 100 | **3.9370** | 150 | **5.9055** | 24 | **.9449** | 1.50 | **.060** | .60 | **.024** | 4 700 | **7.28** | 71 500 | **16 100** | 76 500 | **17 200** | 10 000 | 14 000 |
| **121KR** | 105 | **4.1339** | 160 | **6.2992** | 26 | **1.0236** | 2.00 | **.080** | 1.00 | **.040** | 5 540 | **8.59** | 85 200 | **19 200** | 90 000 | **20 200** | 9 200 | 13 000 |
| **122KR** | 110 | **4.3307** | 170 | **6.6929** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 6 400 | **9.93** | 99 500 | **22 400** | 102 000 | **23 000** | 8 700 | 13 000 |
| **124KR** | 120 | **4.7244** | 180 | **7.0866** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 6 710 | **10.40** | 101 000 | **22 600** | 110 000 | **24 700** | 7 800 | 11 000 |
| **126KR** | 130 | **5.1181** | 200 | **7.8740** | 33 | **1.2992** | 2.00 | **.080** | 1.00 | **.040** | 9 350 | **14.50** | 138 000 | **31 000** | 150 000 | **33 700** | 7 400 | 11 000 |
| **128KR** | 140 | **5.5118** | 210 | **8.2677** | 33 | **1.2992** | 2.00 | **.080** | 1.00 | **.040** | 9 350 | **14.50** | 135 000 | **30 300** | 153 000 | **34 400** | 6 900 | 10 000 |
| **130KR** | 150 | **5.9055** | 225 | **8.8583** | 35 | **1.3780** | 2.00 | **.080** | 1.00 | **.040** | 10 800 | **16.80** | 156 000 | **35 000** | 176 000 | **39 600** | 6 000 | 9 000 |
| **132KR** | 160 | **6.2992** | 240 | **9.4488** | 38 | **1.4961** | 2.00 | **.080** | 1.00 | **.040** | 12 400 | **19.30** | 178 000 | **40 000** | 204 000 | **45 900** | 5 500 | 8 400 |
| **134KR** | 170 | **6.6929** | 260 | **10.2362** | 42 | **1.6535** | 2.00 | **.080** | 1.00 | **.040** | 15 300 | **23.70** | 212 000 | **47 700** | 245 000 | **55 100** | 5 100 | 7 800 |
| **136KR** | 180 | **7.0866** | 280 | **11.0236** | 46 | **1.8110** | 2.00 | **.080** | 1.00 | **.040** | 17 900 | **27.80** | 234 000 | **52 600** | 290 000 | **65 200** | 4 600 | 7 300 |
| **138KR** | 190 | **7.4803** | 290 | **11.4173** | 46 | **1.8110** | 2.00 | **.080** | 1.00 | **.040** | 18 800 | **29.10** | 242 000 | **54 400** | 305 000 | **68 600** | 4 600 | 7 300 |
| **140KR** | 200 | **7.8740** | 310 | **12.2047** | 51 | **2.0079** | 2.00 | **.080** | 1.00 | **.040** | 22 200 | **34.40** | 276 000 | **62 000** | 355 000 | **79 800** | 4 400 | 6 700 |
| **144KR** | 220 | **8.6614** | 340 | **13.3858** | 56 | **2.2047** | 2.50 | **.100** | 1.00 | **.040** | 30 400 | **47.20** | 345 000 | **77 600** | 480 000 | **108 000** | 4 100 | 6 200 |
| **148KR** | 240 | **9.4488** | 360 | **14.1732** | 56 | **2.2047** | 2.50 | **.100** | 1.00 | **.040** | 31 900 | **49.50** | 351 000 | **78 900** | 510 000 | **115 000** | 3 900 | 5 600 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.
3) Values have been determined through historical application and practice. For a more complete explanation, see page 272.

# Precision 15° angular contact 100KRD extra light series duplex




Precision 100KRD series angular contact ball bearings are manufactured to meet dimensional and running accuracy to ABEC-7 tolerances. They are supplied with an inner ring-centered phenolic cage designed to minimize centrifugal force.

Notes:

For recommended mounting fits refer to “Shaft and housing fits” in Engineering data section.

“D” indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

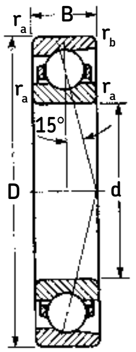
For equivalent load and life calculations see pages 124 and 125.

Use these values for back-to-back (DB) or face-to-face (DF) mounting arrangements.

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1] $r_a$ mm | in. | $r_b$ mm | in. | $ZD^2$ mm | in. | Basic radial load rating Dynamic $C$[2] N | lbf | Static $C_0$ N | lbf | Speed rating[3] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100KRD | 10 | .3937 | 26 | 1.0236 | 16 | .6299 | .30 | .012 | .10 | .004 | 181 | .28 | 8.060 | 1 810 | 4 550 | 1 020 | 55 000 | 80 000 |
| 101KRD | 12 | .4724 | 28 | 1.1024 | 16 | .6299 | .30 | .012 | .10 | .004 | 206 | .32 | 8 840 | 1 990 | 5 300 | 1 190 | 48 000 | 72 000 |
| 102KRD | 15 | .5906 | 32 | 1.2598 | 18 | .7087 | .30 | .012 | .10 | .004 | 226 | .35 | 9 750 | 2 190 | 6 300 | 1 420 | 41 000 | 62 000 |
| 103KRD | 17 | .6693 | 35 | 1.3780 | 20 | .7874 | .30 | .012 | .10 | .004 | 342 | .53 | 13 800 | 3 100 | 9 300 | 2 090 | 35 000 | 54 000 |
| 104KRD | 20 | .7874 | 42 | 1.6535 | 24 | .9449 | .64 | .025 | .30 | .012 | 445 | .69 | 17 400 | 3 910 | 12 500 | 2 810 | 31 000 | 45 000 |
| 105KRD | 25 | .9843 | 47 | 1.8504 | 24 | .9449 | .64 | .025 | .30 | .012 | 522 | .81 | 19 500 | 4 380 | 15 300 | 3 440 | 28 000 | 40 000 |
| 106KRD | 30 | 1.1811 | 55 | 2.1654 | 26 | 1.0236 | 1.00 | .040 | .30 | .012 | 716 | 1.11 | 25 500 | 5 730 | 21 200 | 4 760 | 22 000 | 34 000 |
| 107KRD | 35 | 1.3780 | 62 | 2.4409 | 28 | 1.1024 | 1.00 | .040 | .30 | .012 | 884 | 1.37 | 30 200 | 6 790 | 26 500 | 5 960 | 18 000 | 29 000 |
| 108KRD | 40 | 1.5748 | 68 | 2.6772 | 30 | 1.1811 | 1.00 | .040 | .30 | .012 | 942 | 1.46 | 31 900 | 7 170 | 29 000 | 6 520 | 18 000 | 27 000 |
| 109KRD | 45 | 1.7717 | 75 | 2.9528 | 32 | 1.2598 | 1.00 | .040 | .30 | .012 | 1 220 | 1.89 | 39 000 | 8 770 | 37 500 | 8 430 | 17 000 | 25 000 |
| 110KRD | 50 | 1.9685 | 80 | 3.1496 | 32 | 1.2598 | 1.00 | .040 | .30 | .012 | 1 300 | 2.01 | 40 300 | 9 060 | 40 500 | 9 100 | 16 000 | 22 000 |
| 111KRD | 55 | 2.1654 | 90 | 3.5433 | 36 | 1.4173 | 1.00 | .040 | .60 | .024 | 1 810 | 2.81 | 55 300 | 12 400 | 56 000 | 12 600 | 14 000 | 20 000 |
| 112KRD | 60 | 2.3622 | 95 | 3.7402 | 36 | 1.4173 | 1.00 | .040 | .60 | .024 | 1 920 | 2.97 | 55 900 | 12 600 | 61 000 | 13 700 | 12 000 | 18 000 |
| 113KRD | 65 | 2.5591 | 100 | 3.9370 | 36 | 1.4173 | 1.00 | .040 | .60 | .024 | 2 030 | 3.14 | 58 500 | 13 200 | 64 000 | 14 400 | 11 000 | 17 000 |
| 114KRD | 70 | 2.7559 | 110 | 4.3307 | 40 | 1.5748 | 1.00 | .040 | .60 | .024 | 2 470 | 3.83 | 68 900 | 15 500 | 80 000 | 18 000 | 11 000 | 16 000 |
| 115KRD | 75 | 2.9528 | 115 | 4.5276 | 40 | 1.5748 | 1.00 | .040 | .60 | .024 | 2 590 | 4.02 | 70 200 | 15 800 | 85 000 | 19 100 | 10 000 | 15 000 |
| 116KRD | 80 | 3.1496 | 125 | 4.9213 | 44 | 1.7323 | 1.00 | .040 | .60 | .024 | 3 390 | 5.25 | 90 400 | 20 300 | 110 000 | 24 700 | 9 600 | 14 000 |
| 117KRD | 85 | 3.3465 | 130 | 5.1181 | 44 | 1.7323 | 1.00 | .040 | .60 | .024 | 3 550 | 5.50 | 92 300 | 20 700 | 116 000 | 26 100 | 9 600 | 14 000 |
| 118KRD | 90 | 3.5433 | 140 | 5.5118 | 48 | 1.8898 | 1.50 | .060 | .60 | .024 | 4 280 | 6.64 | 111 000 | 25 000 | 137 000 | 30 800 | 8 800 | 13 000 |
| 119KRD | 95 | 3.7402 | 145 | 5.7087 | 48 | 1.8898 | 1.50 | .060 | .60 | .024 | 5 040 | 7.81 | 135 000 | 30 300 | 160 000 | 36 000 | 8 000 | 12 000 |
| 120KRD | 100 | 3.9370 | 150 | 5.9055 | 48 | 1.8898 | 1.50 | .060 | .60 | .024 | 4 700 | 7.28 | 117 000 | 26 300 | 153 000 | 34 400 | 8 000 | 11 000 |
| 121KRD | 105 | 4.1339 | 160 | 6.2992 | 52 | 2.0472 | 2.00 | .080 | 1.00 | .040 | 5 540 | 8.59 | 138 000 | 31 000 | 180 000 | 40 500 | 7 400 | 10 000 |
| 122KRD | 110 | 4.3307 | 170 | 6.6929 | 56 | 2.2047 | 2.00 | .080 | 1.00 | .040 | 6 400 | 9.93 | 163 000 | 36 600 | 204 000 | 45 900 | 7 000 | 10 000 |
| 124KRD | 120 | 4.7244 | 180 | 7.0866 | 56 | 2.2047 | 2.00 | .080 | 1.00 | .040 | 6 710 | 10.40 | 163 000 | 36 600 | 220 000 | 49 500 | 6 200 | 8 800 |
| 126KRD | 130 | 5.1181 | 200 | 7.8740 | 66 | 2.5984 | 2.00 | .080 | 1.00 | .040 | 9 350 | 14.50 | 225 000 | 50 000 | 300 000 | 67 400 | 5 900 | 8 800 |
| 128KRD | 140 | 5.5118 | 210 | 8.2677 | 66 | 2.5984 | 2.00 | .080 | 1.00 | .040 | 9 350 | 14.50 | 221 000 | 49 700 | 305 000 | 68 600 | 5 500 | 8 000 |
| 130KRD | 150 | 5.9055 | 225 | 8.8583 | 70 | 2.7559 | 2.00 | .080 | 1.00 | .040 | 10 800 | 16.80 | 255 000 | 57 300 | 355 000 | 79 800 | 4 800 | 7 200 |
| 132KRD | 160 | 6.2992 | 240 | 9.4488 | 76 | 2.9921 | 2.00 | .080 | 1.00 | .040 | 12 400 | 19.30 | 286 000 | 64 300 | 405 000 | 91 000 | 4 400 | 6 700 |
| 134KRD | 170 | 6.6929 | 260 | 10.2362 | 84 | 3.3071 | 2.00 | .080 | 1.00 | .040 | 15 300 | 23.70 | 345 000 | 77 600 | 490 000 | 110 000 | 4 100 | 6 200 |
| 136KRD | 180 | 7.0866 | 280 | 11.0236 | 92 | 3.6220 | 2.00 | .080 | 1.00 | .040 | 17 900 | 27.80 | 377 000 | 84 800 | 570 000 | 128 000 | 3 700 | 5 800 |
| 138KRD | 190 | 7.4803 | 290 | 11.4173 | 92 | 3.6220 | 2.00 | .080 | 1.00 | .040 | 18 800 | 29.10 | 390 000 | 87 700 | 610 000 | 137 000 | 3 700 | 5 800 |
| 140KRD | 200 | 7.8740 | 310 | 12.2047 | 102 | 4.0157 | 2.00 | .080 | 1.00 | .040 | 22 200 | 34.40 | 442 000 | 99 400 | 710 000 | 160 000 | 3 500 | 5 400 |
| 144KRD | 220 | 8.6614 | 340 | 13.3858 | 112 | 4.4094 | 2.50 | .100 | 1.00 | .040 | 30 400 | 47.20 | 559 000 | 126 000 | 965 000 | 217 000 | 3 300 | 5 000 |
| 148KRD | 240 | 9.4488 | 360 | 14.1732 | 112 | 4.4094 | 2.50 | .100 | 1.00 | .040 | 31 900 | 49.50 | 572 000 | 129 000 | 1 020 000 | 228 000 | 3 100 | 4 500 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.
3) Values have been determined through historical application and practice. For a more complete explanation, see page 272.

# Precision 15° angular contact 200R light series single bearings




Precision 200R series angular contact ball bearings are manufactured to meet dimensional and running accuracy to ABEC-7 tolerances. They are supplied with an inner ring centered phenolic cage designed to minimize centrifugal force.

Notes:

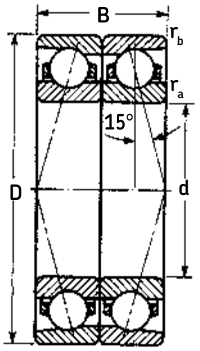
For recommended mounting fits refer to “Shaft and housing fits” in Engineering data section.

For equivalent load and life calculations see pages 122 and 123.

| MRC bearing number | Bore d mm | Bore d in. | Outside diameter D mm | Outside diameter D in. | Width B mm | Width B in. | Fillet radius[1) $r_a$ mm | $r_a$ in. | $r_b$ mm | $r_b$ in. | $ZD^2$ mm | $ZD^2$ in. | Basic radial load rating, Dynamic C[2) N | Dynamic C lbf | Static $C_0$ N | Static $C_0$ lbf | Speed rating[3) Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **200R** | 10 | **.3937** | 30 | **1.1811** | 9 | **.3543** | .64 | **.025** | .30 | **.012** | 284 | **.44** | 7 280 | **1 640** | 3 200 | **719** | 55 000 | 84 000 |
| **201R** | 12 | **.4724** | 32 | **1.2598** | 10 | **.3937** | .64 | **.025** | .30 | **.012** | 323 | **.50** | 8 190 | **1 840** | 3 900 | **877** | 51 000 | 78 000 |
| **202R** | 15 | **.5906** | 35 | **1.3780** | 11 | **.4331** | .64 | **.025** | .30 | **.012** | 406 | **.63** | 9 750 | **2 190** | 5 100 | **1 150** | 44 000 | 67 000 |
| **203R** | 17 | **.6693** | 40 | **1.5748** | 12 | **.4724** | .64 | **.025** | .30 | **.012** | 510 | **.79** | 12 100 | **2 730** | 6 550 | **1 470** | 39 000 | 56 000 |
| **204R** | 20 | **.7874** | 47 | **1.8504** | 14 | **.5512** | 1.00 | **.040** | .60 | **.024** | 562 | **.87** | 13 300 | **2 990** | 7 800 | **1 750** | 35 000 | 50 000 |
| **205R** | 25 | **.9843** | 52 | **2.0472** | 15 | **.5906** | 1.00 | **.040** | .60 | **.024** | 693 | **1.07** | 15 900 | **3 570** | 9 650 | **2 170** | 28 000 | 42 000 |
| **206R** | 30 | **1.1811** | 62 | **2.4409** | 16 | **.6299** | 1.00 | **.040** | .60 | **.024** | 884 | **1.37** | 19 000 | **4 270** | 12 900 | **2 910** | 23 000 | 36 000 |
| **207R** | 35 | **1.3780** | 72 | **2.8346** | 17 | **.6693** | 1.00 | **.040** | .60 | **.024** | 1 270 | **1.97** | 26 000 | **5 850** | 18 600 | **4 180** | 21 000 | 31 000 |
| **208R** | 40 | **1.5748** | 80 | **3.1496** | 18 | **.7087** | 1.00 | **.040** | .60 | **.024** | 1 730 | **2.68** | 34 500 | **7 760** | 25 000 | **5 620** | 20 000 | 28 000 |
| **209R** | 45 | **1.7717** | 85 | **3.3465** | 19 | **.7480** | 1.00 | **.040** | .60 | **.024** | 1 850 | **2.87** | 35 800 | **8 050** | 27 500 | **6 180** | 17 000 | 25 000 |
| **210R** | 50 | **1.9685** | 90 | **3.5433** | 20 | **.7874** | 1.00 | **.040** | .60 | **.024** | 1 970 | **3.06** | 37 700 | **8 480** | 30 000 | **6 740** | 16 000 | 24 000 |
| **211R** | 55 | **2.1654** | 100 | **3.9370** | 21 | **.8268** | 1.50 | **.060** | 1.00 | **.040** | 2 860 | **4.43** | 54 000 | **12 100** | 41 500 | **9 330** | 14 000 | 21 000 |
| **212R** | 60 | **2.3622** | 110 | **4.3307** | 22 | **.8661** | 1.50 | **.060** | 1.00 | **.040** | 3 260 | **5.06** | 59 200 | **13 300** | 49 000 | **11 000** | 14 000 | 20 000 |
| **213R** | 65 | **2.5591** | 120 | **4.7244** | 23 | **.9055** | 1.50 | **.060** | 1.00 | **.040** | 3 780 | **5.86** | 58 500 | **13 200** | 55 000 | **12 400** | 12 000 | 18 000 |
| **214R** | 70 | **2.7559** | 125 | **4.9213** | 24 | **.9449** | 1.50 | **.060** | 1.00 | **.040** | 4 030 | **6.25** | 71 500 | **16 100** | 60 000 | **13 500** | 12 000 | 17 000 |
| **215R** | 75 | **2.9528** | 130 | **5.1181** | 25 | **.9843** | 1.50 | **.060** | 1.00 | **.040** | 4 880 | **7.56** | 85 200 | **19 200** | 72 000 | **16 200** | 11 000 | 16 000 |
| **216R** | 80 | **3.1496** | 140 | **5.5118** | 26 | **1.0236** | 2.00 | **.080** | 1.00 | **.040** | 5 180 | **8.04** | 90 400 | **20 300** | 78 000 | **17 500** | 10 000 | 15 000 |
| **217R** | 85 | **3.3465** | 150 | **5.9055** | 28 | **1.1024** | 2.00 | **.080** | 1.00 | **.040** | 6 170 | **9.56** | 104 000 | **23 400** | 93 000 | **20 900** | 10 000 | 14 000 |
| **218R** | 90 | **3.5433** | 160 | **6.2992** | 30 | **1.1811** | 2.00 | **.080** | 1.00 | **.040** | 7 410 | **11.50** | 124 000 | **27 900** | 108 000 | **24 300** | 8 700 | 13 000 |
| **219R** | 95 | **3.7402** | 170 | **6.6929** | 32 | **1.2598** | 2.00 | **.080** | 1.00 | **.040** | 7 900 | **12.30** | 133 000 | **29 900** | 118 000 | **26 500** | 8 300 | 12 000 |
| **220R** | 100 | **3.9370** | 180 | **7.0866** | 34 | **1.3386** | 2.00 | **.080** | 1.00 | **.040** | 9 070 | **14.10** | 146 000 | **32 800** | 134 000 | **30 100** | 7 800 | 11 000 |
| **221R** | 105 | **4.1339** | 190 | **7.4803** | 36 | **1.4173** | 2.00 | **.080** | 1.00 | **.040** | 10 300 | **16.00** | 168 000 | **37 800** | 153 000 | **34 400** | 7 400 | 11 000 |
| **222R** | 110 | **4.3307** | 200 | **7.8740** | 38 | **1.4961** | 2.00 | **.080** | 1.00 | **.040** | 11 700 | **18.10** | 182 000 | **40 900** | 170 000 | **38 200** | 6 900 | 10 000 |
| **224R** | 120 | **4.7244** | 215 | **8.4646** | 40 | **1.5748** | 2.00 | **.080** | 1.00 | **.040** | 13 000 | **20.20** | 199 000 | **44 700** | 193 000 | **43 300** | 6 400 | 9 500 |
| **226R** | 130 | **5.1181** | 230 | **9.0551** | 40 | **1.5748** | 2.50 | **.100** | 1.00 | **.040** | 15 500 | **24.00** | 221 000 | **49 600** | 232 000 | **52 200** | 6 000 | 9 000 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.
3) Values have been determined through historical application and practice. For a more complete explanation, see page 272.

# Precision 15° angular contact 200RD light series duplex




Precision 200RD series angular contact ball bearings are manufactured to meet dimensional and running accuracy to ABEC-7 tolerances. They are supplied with an inner ring centered phenolic cage designed to minimize centrifugal force.

Notes:

For recommended mounting fits refer to “Shaft and Housing Fits” in Engineering Data Section.

“D” indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

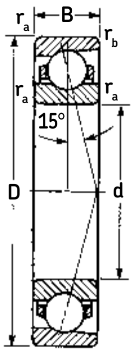
For equivalent load and life calculations see pages 124 and 125.

Use these values for back-to-back (DB) or face-to-face (DF) mounting arrangements.

| | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | | | Basic radial load rating | | | | Speed rating[3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d | | D | | B | | $r_a$ | | $r_b$ | | $ZD^2$ | | C[2] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **200RD** | 10 | **.3937** | 30 | **1.1811** | 18 | **.7087** | .64 | **.025** | .30 | **.012** | 284 | **.44** | 11 900 | **2 680** | 6 400 | **1 440** | 44 000 | 67 000 |
| **201RD** | 12 | **.4724** | 32 | **1.2598** | 20 | **.7874** | .64 | **.025** | .30 | **.012** | 323 | **.50** | 13 300 | **2 990** | 7 800 | **1 750** | 41 000 | 62 000 |
| **202RD** | 15 | **.5906** | 35 | **1.3780** | 22 | **.8661** | .64 | **.025** | .30 | **.012** | 406 | **.63** | 15 900 | **3 570** | 10 200 | **2 290** | 35 000 | 54 000 |
| **203RD** | 17 | **.6693** | 40 | **1.5748** | 24 | **.9449** | .64 | **.025** | .30 | **.012** | 510 | **.79** | 19 900 | **4 470** | 13 200 | **2 970** | 31 000 | 45 000 |
| **204RD** | 20 | **.7874** | 47 | **1.8504** | 28 | **1.1024** | 1.00 | **.040** | .60 | **.024** | 562 | **.87** | 21 600 | **4 860** | 15 600 | **3 510** | 28 000 | 40 000 |
| **205RD** | 25 | **.9843** | 52 | **2.0472** | 30 | **1.1811** | 1.00 | **.040** | .60 | **.024** | 693 | **1.07** | 26 000 | **5 850** | 19 300 | **4 340** | 22 000 | 34 000 |
| **206RD** | 30 | **1.1811** | 62 | **2.4409** | 32 | **1.2598** | 1.00 | **.040** | .60 | **.024** | 884 | **1.37** | 30 700 | **6 900** | 26 000 | **5 850** | 18 000 | 29 000 |
| **207RD** | 35 | **1.3780** | 72 | **2.8346** | 34 | **1.3386** | 1.00 | **.040** | .60 | **.024** | 1 270 | **1.97** | 42 300 | **9 570** | 37 500 | **8 430** | 17 000 | 25 000 |
| **208RD** | 40 | **1.5748** | 80 | **3.1496** | 36 | **1.4173** | 1.00 | **.040** | .60 | **.024** | 1 730 | **2.68** | 55 900 | **12 600** | 50 000 | **11 200** | 16 000 | 22 000 |
| **209RD** | 45 | **1.7717** | 85 | **3.3465** | 38 | **1.4961** | 1.00 | **.040** | .60 | **.024** | 1 850 | **2.87** | 58 500 | **13 200** | 55 000 | **12 400** | 14 000 | 20 000 |
| **210RD** | 50 | **1.9685** | 90 | **3.5433** | 40 | **1.5748** | 1.00 | **.040** | .60 | **.024** | 1 970 | **3.06** | 60 500 | **13 600** | 60 000 | **13 500** | 13 000 | 19 000 |
| **211RD** | 55 | **2.1654** | 100 | **3.9370** | 42 | **1.6535** | 1.50 | **.060** | 1.00 | **.040** | 2 860 | **4.43** | 87 100 | **19 600** | 83 000 | **18 700** | 11 000 | 17 000 |
| **212RD** | 60 | **2.3622** | 110 | **4.3307** | 44 | **1.7323** | 1.50 | **.060** | 1.00 | **.040** | 3 260 | **5.06** | 95 600 | **21 500** | 98 000 | **22 000** | 11 000 | 16 000 |
| **213RD** | 65 | **2.5591** | 120 | **4.7244** | 46 | **1.8110** | 1.50 | **.060** | 1.00 | **.040** | 3 780 | **5.86** | 95 600 | **21 500** | 110 000 | **24 700** | 9 600 | 14 000 |
| **214RD** | 70 | **2.7559** | 125 | **4.9213** | 48 | **1.8898** | 1.50 | **.060** | 1.00 | **.040** | 4 030 | **6.25** | 117 000 | **26 300** | 120 000 | **27 000** | 9 600 | 14 000 |
| **215RD** | 75 | **2.9528** | 130 | **5.1181** | 50 | **1.9685** | 1.50 | **.060** | 1.00 | **.040** | 4 880 | **7.56** | 138 000 | **31 000** | 148 000 | **32 100** | 8 800 | 13 000 |
| **216RD** | 80 | **3.1496** | 140 | **5.5118** | 52 | **2.0472** | 2.00 | **.080** | 1.00 | **.040** | 5 180 | **8.04** | 153 000 | **34 400** | 156 000 | **35 100** | 8 000 | 12 000 |
| **217RD** | 85 | **3.3465** | 150 | **5.9055** | 56 | **2.2047** | 2.00 | **.080** | 1.00 | **.040** | 6 170 | **9.56** | 168 000 | **37 800** | 186 000 | **41 800** | 8 000 | 11 000 |
| **218RD** | 90 | **3.5433** | 160 | **6.2992** | 60 | **2.3622** | 2.00 | **.080** | 1.00 | **.040** | 7 410 | **11.50** | 203 000 | **45 600** | 216 000 | **48 600** | 7 000 | 10 000 |
| **219RD** | 95 | **3.7402** | 170 | **6.6929** | 64 | **2.5197** | 2.00 | **.080** | 1.00 | **.040** | 7 900 | **12.30** | 216 000 | **48 600** | 236 000 | **53 100** | 6 600 | 9 600 |
| **220RD** | 100 | **3.9370** | 180 | **7.0866** | 68 | **2.6772** | 2.00 | **.080** | 1.00 | **.040** | 9 070 | **14.10** | 238 000 | **53 500** | 270 000 | **60 700** | 6 200 | 8 800 |
| **221RD** | 105 | **4.1339** | 190 | **7.4803** | 72 | **2.8346** | 2.00 | **.080** | 1.00 | **.040** | 10 300 | **16.00** | 270 000 | **60 700** | 305 000 | **68 600** | 5 900 | 8 800 |
| **222RD** | 110 | **4.3307** | 200 | **7.8740** | 76 | **2.9921** | 2.00 | **.080** | 1.00 | **.040** | 11 700 | **18.10** | 296 000 | **66 500** | 340 000 | **76 400** | 5 500 | 8 000 |
| **224RD** | 120 | **4.7244** | 215 | **8.4646** | 80 | **3.1496** | 2.00 | **.080** | 1.00 | **.040** | 13 000 | **20.20** | 325 000 | **73 100** | 390 000 | **87 700** | 5 100 | 7 600 |
| **226RD** | 130 | **5.1181** | 230 | **9.0551** | 80 | **3.1496** | 2.50 | **.100** | 1.00 | **.040** | 15 500 | **24.00** | 358 000 | **80 500** | 465 000 | **105 000** | 4 800 | 7 200 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^{1}/_{3}$ rpm.
3) Values have been determined through historical application and practice. For a more complete explanation, see page 272.

# Precision 15° angular contact 300R medium series single bearings




Precision 300R series angular contact ball bearings are manufactured to meet dimensional and running accuracy to ABEC-7 tolerances. They are supplied with an inner ring centered phenolic cage designed to minimize centrifugal force.

Notes:

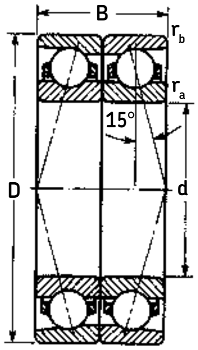
For recommended mounting fits refer to “Shaft and housing fits” in Engineering data section.

For equivalent load and life calculations see pages 122 and 123.

| MRC bearing number | Bore d | | Outside diameter D | | Width B | | Fillet radius[1) ] $r_a$ | | $r_b$ | | $ZD^2$ | | Basic radial load rating Dynamic $C^{2)}$ | | Static $C_0$ | | Speed rating[3)] Grease | Oil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| 300R | 10 | .3937 | 35 | 1.3780 | 11 | .4331 | 1.0 | .04 | .60 | .024 | 439 | .68 | 10 500 | 2 360 | 4 550 | 1 020 | 46 000 | 73 000 |
| 301R | 12 | .4724 | 37 | 1.4567 | 12 | .4724 | 1.0 | .04 | .60 | .024 | 439 | .68 | 10 600 | 2 380 | 4 900 | 1 100 | 44 000 | 67 000 |
| 302R | 15 | .5906 | 42 | 1.6535 | 13 | .5118 | 1.0 | .04 | .60 | .024 | 510 | .79 | 12 100 | 2 720 | 6 550 | 1 470 | 39 000 | 56 000 |
| 303R | 17 | .6693 | 47 | 1.8504 | 14 | .5512 | 1.0 | .04 | .60 | .024 | 632 | .98 | 14 800 | 3 330 | 8 150 | 1 830 | 37 000 | 53 000 |
| 304R | 20 | .7874 | 52 | 2.0472 | 15 | .5906 | 1.0 | .04 | .60 | .024 | 909 | 1.41 | 20 300 | 4 560 | 11 400 | 2 560 | 30 000 | 45 000 |
| 305R | 25 | .9843 | 62 | 2.4409 | 17 | .6693 | 1.0 | .04 | .60 | .024 | 1 090 | 1.69 | 23 400 | 5 260 | 15 300 | 3 440 | 25 000 | 39 000 |
| 306R | 30 | 1.1811 | 72 | 2.8346 | 19 | .7480 | 1.0 | .04 | .60 | .024 | 1 480 | 2.30 | 31 200 | 7 010 | 20 000 | 4 500 | 21 000 | 31 000 |
| 307R | 35 | 1.3780 | 80 | 3.1496 | 21 | .8268 | 1.5 | .06 | 1.00 | .040 | 1 940 | 3.00 | 39 700 | 8 920 | 26 000 | 5 850 | 20 000 | 28 000 |
| 308R | 40 | 1.5748 | 90 | 3.5433 | 23 | .9055 | 1.5 | .06 | 1.00 | .040 | 2 450 | 3.80 | 48 800 | 11 000 | 33 500 | 7 530 | 17 000 | 25 000 |
| 309R | 45 | 1.7717 | 100 | 3.9370 | 25 | .9843 | 1.5 | .06 | 1.00 | .040 | 3 030 | 4.69 | 58 500 | 13 200 | 40 500 | 9 100 | 15 000 | 22 000 |
| 310R | 50 | 1.9685 | 110 | 4.3307 | 27 | 1.0630 | 2.0 | .08 | 1.00 | .040 | 3 990 | 6.19 | 76 100 | 17 100 | 52 000 | 11 700 | 14 000 | 21 000 |
| 311R | 55 | 2.1654 | 120 | 4.7244 | 29 | 1.1417 | 2.0 | .08 | 1.00 | .040 | 4 690 | 7.26 | 88 400 | 19 900 | 61 000 | 13 700 | 13 000 | 19 000 |
| 312R | 60 | 2.3622 | 130 | 5.1181 | 31 | 1.2205 | 2.0 | .08 | 1.00 | .040 | 5 430 | 8.42 | 101 000 | 22 700 | 71 000 | 16 000 | 12 000 | 17 000 |
| 313R | 65 | 2.5591 | 140 | 5.5118 | 33 | 1.2992 | 2.0 | .08 | 1.00 | .040 | 5 930 | 9.19 | 108 000 | 24 300 | 80 000 | 18 000 | 11 000 | 16 000 |
| 314R | 70 | 2.7559 | 150 | 5.9055 | 35 | 1.3780 | 2.0 | .08 | 1.00 | .040 | 6 770 | 10.50 | 121 000 | 27 200 | 93 000 | 20 900 | 10 000 | 15 000 |
| 315R | 75 | 2.9528 | 160 | 6.2992 | 37 | 1.4567 | 2.0 | .08 | 1.00 | .040 | 8 390 | 13.00 | 146 000 | 32 800 | 114 000 | 25 600 | 9 900 | 14 000 |
| 316R | 80 | 3.1496 | 170 | 6.6929 | 39 | 1.5354 | 2.0 | .08 | 1.00 | .040 | 9 480 | 14.70 | 159 000 | 35 700 | 129 000 | 29 000 | 8 700 | 13 000 |
| 317R | 85 | 3.3465 | 180 | 7.0866 | 41 | 1.6142 | 2.5 | .10 | 1.00 | .040 | 10 600 | 16.50 | 174 000 | 39 100 | 146 000 | 32 800 | 8 300 | 12 000 |
| 318R | 90 | 3.5433 | 190 | 7.4803 | 43 | 1.6929 | 2.5 | .10 | 1.00 | .040 | 11 800 | 18.30 | 186 000 | 41 800 | 160 000 | 36 000 | 7 800 | 11 000 |
| 319R | 95 | 3.7402 | 200 | 7.8740 | 45 | 1.7717 | 2.5 | .10 | 1.00 | .040 | 13 100 | 20.30 | 199 000 | 44 700 | 180 000 | 40 500 | 7 400 | 11 000 |
| 320R | 100 | 3.9370 | 215 | 8.4646 | 47 | 1.8504 | 2.5 | .10 | 1.00 | .040 | 14 400 | 22.40 | 212 000 | 47 700 | 200 000 | 45 000 | 6 900 | 10 000 |
| 321R | 105 | 4.1339 | 225 | 8.8583 | 49 | 1.9291 | 2.5 | .10 | 1.00 | .040 | 15 900 | 24.60 | 229 000 | 51 500 | 204 000 | 45 900 | 6 400 | 9 500 |
| 322R | 110 | 4.3307 | 240 | 9.4488 | 50 | 1.9685 | 2.5 | .10 | 1.00 | .040 | 18 800 | 29.20 | 255 000 | 57 300 | 255 000 | 57 300 | 6 000 | 9 000 |
| 324R | 120 | 4.7244 | 260 | 10.2362 | 55 | 2.1654 | 2.5 | .10 | 1.00 | .040 | 22 100 | 34.30 | 265 000 | 59 600 | 300 000 | 67 400 | 5 800 | 8 400 |
| 326R | 130 | 5.1181 | 280 | 11.0236 | 58 | 2.2835 | 3.0 | .12 | 1.00 | .040 | 25 700 | 39.80 | 296 000 | 66 500 | 345 000 | 77 600 | 5 300 | 7 800 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.
3) Values have been determined through historical application and practice. For a more complete explanation, see page 272.

# Precision 15° angular contact 300RD medium series duplex




Precision 300RD series angular contact ball bearings are manufactured to meet dimensional and running accuracy to ABEC-7 tolerances. They are supplied with an inner ring centered phenolic cage designed to minimize centrifugal force.

Notes:

For recommended mounting fits refer to “Shaft and housing fits” in Engineering data section.

“D” indicates a duplex ground half pair matched with an identical half pair and is followed by an additional suffix letter to describe the type of duplex. See pages 240 and 241 for suffix description.

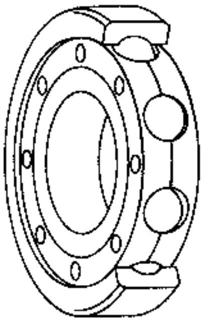
For equivalent load and life calculations see pages 124 and 125.

Use these values for back-to-back (DB) or face-to-face (DF) mounting arrangements.

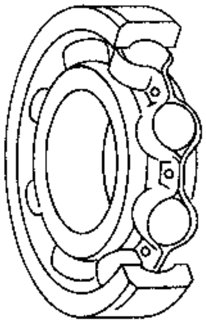
| | Bore | | Outside diameter | | Width | | Fillet radius[1] | | | | | | Basic radial load rating | | | | Speed rating[3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d | | D | | B | | $r_a$ | | $r_b$ | | $ZD^2$ | | C[2] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| 300RD | 10 | **.3937** | 35 | **1.3780** | 22 | **.8661** | 1.0 | **.04** | .60 | **.024** | 439 | **.68** | 17 200 | **3 870** | 9 150 | **2 060** | 37 000 | 58 000 |
| 301RD | 12 | **.4724** | 37 | **1.4567** | 24 | **.9449** | 1.0 | **.04** | .60 | **.024** | 439 | **.68** | 17 200 | **3 870** | 9 800 | **2 200** | 35 000 | 54 000 |
| 302RD | 15 | **.5906** | 42 | **1.6535** | 26 | **1.0236** | 1.0 | **.04** | .60 | **.024** | 510 | **.79** | 19 900 | **4 470** | 13 200 | **2 970** | 31 000 | 45 000 |
| 303RD | 17 | **.6693** | 47 | **1.8504** | 28 | **1.1024** | 1.0 | **.04** | .60 | **.024** | 632 | **.98** | 24 200 | **5 440** | 16 300 | **3 660** | 30 000 | 42 000 |
| 304RD | 20 | **.7874** | 52 | **2.0472** | 30 | **1.1811** | 1.0 | **.04** | .60 | **.024** | 909 | **1.41** | 33 200 | **7 460** | 22 800 | **5 130** | 24 000 | 36 000 |
| 305RD | 25 | **.9843** | 62 | **2.4409** | 34 | **1.3386** | 1.0 | **.04** | .60 | **.024** | 1 090 | **1.69** | 37 700 | **8 480** | 30 500 | **6 860** | 20 000 | 31 000 |
| 306RD | 30 | **1.1811** | 72 | **2.8346** | 38 | **1.4961** | 1.0 | **.04** | .60 | **.024** | 1 480 | **2.30** | 50 700 | **11 400** | 40 000 | **8 990** | 17 000 | 25 000 |
| 307RD | 35 | **1.3780** | 80 | **3.1496** | 42 | **1.6535** | 1.5 | **.06** | 1.00 | **.040** | 1 940 | **3.00** | 65 000 | **14 600** | 52 000 | **11 700** | 16 000 | 22 000 |
| 308RD | 40 | **1.5748** | 90 | **3.5433** | 46 | **1.8110** | 1.5 | **.06** | 1.00 | **.040** | 2 450 | **3.80** | 79 300 | **17 800** | 67 000 | **15 100** | 14 000 | 20 000 |
| 309RD | 45 | **1.7717** | 100 | **3.9370** | 50 | **1.9685** | 1.5 | **.06** | 1.00 | **.040** | 3 030 | **4.69** | 95 600 | **21 500** | 81 500 | **18 300** | 12 000 | 18 000 |
| 310RD | 50 | **1.9685** | 110 | **4.3307** | 54 | **2.1260** | 2.0 | **.08** | 1.00 | **.040** | 3 990 | **6.19** | 124 000 | **27 900** | 104 000 | **23 400** | 11 000 | 17 000 |
| 311RD | 55 | **2.1654** | 120 | **4.7244** | 58 | **2.2835** | 2.0 | **.08** | 1.00 | **.040** | 4 690 | **7.26** | 143 000 | **32 100** | 122 000 | **27 400** | 10 000 | 15 000 |
| 312RD | 60 | **2.3622** | 130 | **5.1181** | 62 | **2.4409** | 2.0 | **.08** | 1.00 | **.040** | 5 430 | **8.42** | 165 000 | **37 100** | 143 000 | **32 100** | 9 600 | 14 000 |
| 313RD | 65 | **2.5591** | 140 | **5.5118** | 66 | **2.5984** | 2.0 | **.08** | 1.00 | **.040** | 5 930 | **9.19** | 174 000 | **39 100** | 160 000 | **36 000** | 8 800 | 13 000 |
| 314RD | 70 | **2.7559** | 150 | **5.9055** | 70 | **2.7559** | 2.0 | **.08** | 1.00 | **.040** | 6 770 | **10.50** | 195 000 | **43 800** | 186 000 | **41 800** | 8 000 | 12 000 |
| 315RD | 75 | **2.9528** | 160 | **6.2992** | 74 | **2.9134** | 2.0 | **.08** | 1.00 | **.040** | 8 390 | **13.00** | 238 000 | **53 500** | 228 000 | **51 300** | 8 000 | 11 000 |
| 316RD | 80 | **3.1496** | 170 | **6.6929** | 78 | **3.0709** | 2.0 | **.08** | 1.00 | **.040** | 9 480 | **14.70** | 260 000 | **58 500** | 260 000 | **58 500** | 7 000 | 10 000 |
| 317RD | 85 | **3.3465** | 180 | **7.0866** | 82 | **3.2283** | 2.5 | **.10** | 1.00 | **.040** | 10 600 | **16.50** | 281 000 | **63 200** | 290 000 | **65 200** | 6 600 | 9 600 |
| 318RD | 90 | **3.5433** | 190 | **7.4803** | 86 | **3.3858** | 2.5 | **.10** | 1.00 | **.040** | 11 800 | **18.30** | 302 000 | **67 900** | 320 000 | **71 900** | 6 200 | 8 800 |
| 319RD | 95 | **3.7402** | 200 | **7.8740** | 90 | **3.5433** | 2.5 | **.10** | 1.00 | **.040** | 13 100 | **20.30** | 325 000 | **73 100** | 360 000 | **80 900** | 5 900 | 8 800 |
| 320RD | 100 | **3.9370** | 215 | **8.4646** | 94 | **3.7008** | 2.5 | **.10** | 1.00 | **.040** | 14 400 | **22.40** | 345 000 | **77 600** | 400 000 | **89 900** | 5 500 | 8 000 |
| 321RD | 105 | **4.1339** | 225 | **8.8583** | 98 | **3.8583** | 2.5 | **.10** | 1.00 | **.040** | 15 900 | **24.60** | 371 000 | **83 400** | 405 000 | **91 000** | 5 100 | 7 600 |
| 322RD | 110 | **4.3307** | 240 | **9.4488** | 100 | **3.9370** | 2.5 | **.10** | 1.00 | **.040** | 18 800 | **29.20** | 416 000 | **93 500** | 510 000 | **115 000** | 4 800 | 7 200 |
| 324RD | 120 | **4.7244** | 260 | **10.2362** | 110 | **4.3307** | 2.5 | **.10** | 1.00 | **.040** | 22 100 | **34.30** | 436 000 | **98 000** | 600 000 | **135 000** | 4 600 | 6 700 |
| 326RD | 130 | **5.1181** | 280 | **11.0236** | 116 | **4.5669** | 3.0 | **.12** | 1.00 | **.040** | 25 700 | **39.80** | 475 000 | **107 000** | 695 000 | **156 000** | 4 200 | 6 200 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Rating for one million revolutions or 500 hours at $33^{1}/_{3}$rpm.
3) Values have been determined through historical application and practice. For a more complete explanation, see page 272.

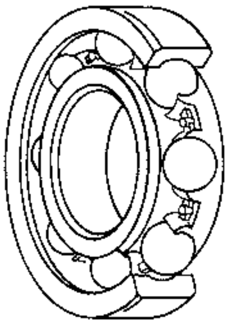
# MRC ABEC-5 high precision deep groove ball bearings for woodworking machinery



Bakelite



Brass



Polyamide

## General information

Ball bearings manufactured specifically for the woodworking industry often carry special specifications in order to meet the requirements of both high speed and accuracy. As a result of actively participating in this market for many years, MRC has designed a line of deep groove ball bearings that meet the special needs of the woodworking industry. They are high precision bearings with carefully controlled internal characteristics, providing very good shaft rigidity and precise control of axial and radial runout.

The bearings are available with Bakelite (phenolic), pressed brass, or glass reinforced polyamide cages, as illustrated at left.

## Bearing identification

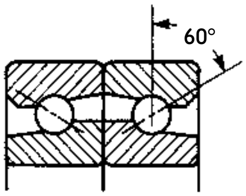
Example of marking on MRC bearing box: **207S-BRS#5 C2**

### Identification of marking

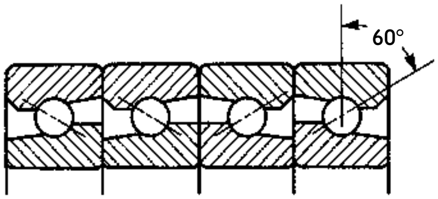
**2 07 S BRS #5 C2**

- **Series** — 2
- **Bore size** — 07
- **Single-row deep groove** — S
- **Cage material** — BRS
  - **BRS = brass**
  - **BKE = Bakelite**
  - **NYL = polyamide**
- **Precision class ABEC-5** — #5
- **Internal radial clearance** — C2
  - **C2 = tight**
  - **C0 = standard**
  - **C3 = loose**

# Ball screw support bearings




Duplex DF




Quadruplex DFDT

The MRC ball screw support bearing is a single-row angular contact nonseparable bearing with one heavy race shoulder and one counterbored race shoulder on the outer ring. The inner ring is similar in design having a counterbored race shoulder.

Construction and ring design permit a greater number of balls than the standard angular contact types, and result in a very high thrust load-carrying capacity. The 60° initial contact angle provides maximum axial rigidity. As heavy thrust must be taken in both directions, these angular contact bearings are mounted in duplex pairs. For even stiffer screw support, the bearings can be mounted in quadruple sets.

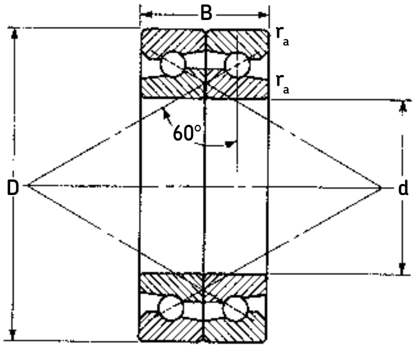
These bearings are made in ABEC-7 tolerance grade only. Inner and outer rings and balls are of AISI 52100 steel. Retainers are a ball-riding type of molded polyamide composition.

These ball screw support bearings are designed for use in numerically controlled machine tools where standard angular contact bearings or roller bearings cannot deliver the rigidity levels required. The 60° contact angle contributes to maximum axial rigidity and gives very stiff screw support to maintain the accuracy of the ball screw.

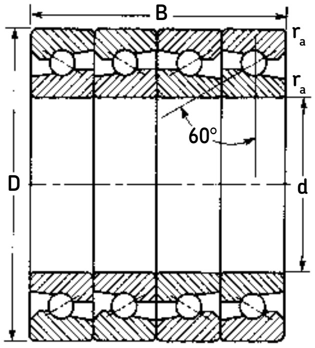
## Cage types and materials

One-piece molded polyamide, ball-riding cages are supplied with ball screw support bearings.

# Ball screw support bearings




Duplex sets




Quadruplex sets

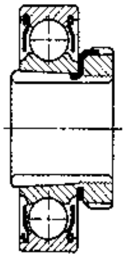
| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1] $r_a$ mm | in. | Lateral eccentricity Max mm | in. | Basic radial load rating[2] Dynamic $C^{3)}$ N | lbf | Static $C_0$ N | lbf |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **J078DF** | 20.000 | **.7874** | 47.000 | **1.8504** | 31.750 | **1.2500** | .80 | **.031** | .003 | **.0001** | 12 100 | **2 720** | 10 000 | **2 250** |
| **J093DF** | 23.838 | **.9385** | 62.000 | **2.4409** | 31.750 | **1.2500** | .80 | **.031** | .003 | **.0001** | 13 800 | **3 100** | 13 700 | **3 080** |
| **J098DF** | 25.000 | **.9843** | 62.000 | **2.4409** | 31.750 | **1.2500** | .80 | **.031** | .003 | **.0001** | 13 800 | **3 100** | 13 700 | **3 080** |
| **J150DF** | 38.100 | **1.5000** | 72.000 | **2.8346** | 31.750 | **1.2500** | .80 | **.031** | .003 | **.0001** | 14 600 | **3 280** | 15 300 | **3 440** |
| **J175DF** | 44.475 | **1.7510** | 76.200 | **3.0000** | 31.750 | **1.2500** | .80 | **.031** | .003 | **.0001** | 15 100 | **3 390** | 16 600 | **3 730** |
| **J225DF** | 57.150 | **2.2500** | 90.000 | **3.5433** | 31.750 | **1.2500** | .80 | **.031** | .003 | **.0001** | 16 300 | **3 660** | 20 000 | **4 500** |
| **J300DF** | 76.200 | **3.0000** | 110.000 | **4.3307** | 31.750 | **1.2500** | .80 | **.031** | .003 | **.0001** | 17 800 | **4 000** | 25 500 | **5 730** |
| **J400DF** | 101.600 | **4.0000** | 145.000 | **5.7087** | 44.450 | **1.7500** | 1.00 | **.040** | .003 | **.0001** | 36 400 | **8 180** | 52 000 | **11 700** |
| **Quadruplex sets** | | | | | | | | | | | | | | |
| **J078DFDT** | 20.000 | **.7874** | 47.000 | **1.8504** | 63.500 | **2.5000** | .80 | **.031** | .003 | **.0001** | 19 500 | **4 380** | 20 000 | **4 500** |
| **J093DFDT** | 23.838 | **.9385** | 62.000 | **2.4409** | 63.500 | **2.5000** | .80 | **.031** | .003 | **.0001** | 22 500 | **5 060** | 26 500 | **5 960** |
| **J098DFDT** | 25.000 | **.9843** | 62.000 | **2.4409** | 63.500 | **2.5000** | .80 | **.031** | .003 | **.0001** | 22 500 | **5 060** | 26 500 | **5 960** |
| **J150DFDT** | 38.100 | **1.5000** | 72.000 | **2.8346** | 63.500 | **2.5000** | .80 | **.031** | .003 | **0001** | 23 800 | **5 350** | 30 500 | **6 860** |
| **J175DFDT** | 44.475 | **1.7510** | 76.200 | **3.0000** | 63.500 | **2.5000** | .80 | **.031** | .003 | **.0001** | 24 700 | **5 550** | 33 500 | **7 530** |
| **J225DFDT** | 57.150 | **2.2500** | 90.000 | **3.5433** | 63.500 | **2.5000** | .80 | **.031** | .003 | **.0001** | 26 500 | **5 960** | 40 000 | **8 990** |
| **J300DFDT** | 76.200 | **3.0000** | 110.000 | **4.3307** | 63.500 | **2.5000** | .80 | **.031** | .003 | **.0001** | 29 100 | **6 540** | 51 000 | **11 500** |
| **J400DFDT** | 101.600 | **4.0000** | 145.000 | **5.7087** | 88.900 | **3.5000** | 1.00 | **.040** | .003 | **.0001** | 59 200 | **13 300** | 104 000 | **23 400** |

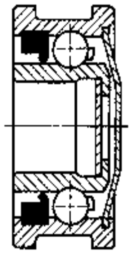
1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) For thrust rating multiply C by 1.70 and $C_0$ by 4.00.
3) Rating for one million revolutions or 500 hours at $33\frac{1}{3}$ rpm.



MRC

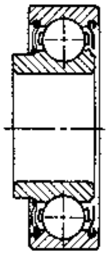
# Specialty bearings

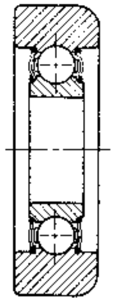

Adapter

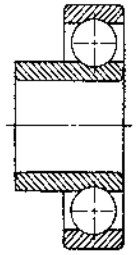

Conveyor


Dynamometer


Electric motor quality


Felt seal replacement


Mast guide


Wide inner ring

In addition to our standard line of bearing products, MRC also has the capability of supplying several nonstandard or specialty bearings. The bearings shown above and described on the following pages are a few examples of our specialty bearings. If you need information about a bearing type not shown please contact our engineering department.

The following are brief descriptions of our specialty bearings.

## Adapter

Adapter bearings have a 1:12 tapered bore and are used with either an adapter sleeve or directly on a tapered shaft. MRC does not furnish adapter sleeves.

## Conveyor

Conveyor bearings may be mounted directly into a conveyor roll or designed with O.D. slots for bracket mounting. They are equipped with closures for protection and lubricant retention.

## Dynamometer

Dynamometer bearings are designed to minimize temperature, noise and vibration. Included are special tolerances and an inner ring land guided phenolic composition cage.

## Electric motor quality

Electric motor quality bearings are designed to provide quiet and smooth operation in electric motors. They are available in various configurations including open and single or double sealed or shielded types.

## Felt seal replacement

Felt seal replacement bearings incorporate synthetic rubber seals and are a direct replacement for the felt seal type.

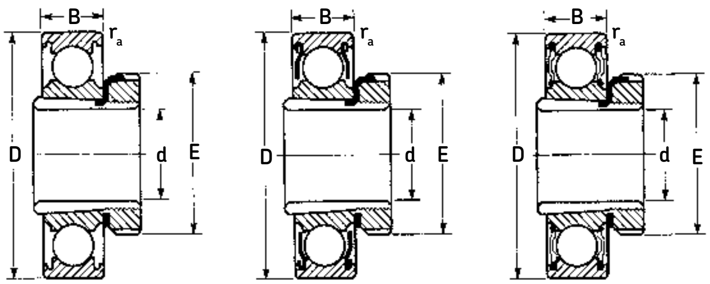
## Mast guide

Mast guide bearings consist of a family of special bearings designed to meet the rigorous demands of industrial truck service. For protection they are equipped with synthetic rubber or polypropylene seals.

## Wide inner ring

Wide inner ring bearings are used in electric motors. The wide inner ring permits the bearing to be mounted without using a lock nut on the shaft.

# Adapter-type bearings
# tapered bore




SX

SFFX
Two shields

SZZX
Two seals

Adapter-type bearings, when used with adapter sleeves, are designed for mounting on inch size shafting without machining the shaft. The tapered sleeve is drawn into the tapered bore of the bearing as the nut is tightened. Soft steel sleeve adapts to the shaft and grips it tightly. Tapered bore of bearing is 1:12 (included angle 4° 46´19˝). Adapter sleeve designation includes nut and lock washer. (MRC does not supply adapter sleeves.) For mounting instructions see page 76.

Note: Adapter and nut are not furnished with bearings.

| Shaft diameter | | MRC bearing number | Outside diameter | | Width | | Fillet radius[1] | | Adapter sleeve | | | Basic radial load rating | | | | Speed rating[2] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Dynamic | | Static | | Open and shielded | | Single and double sealed |
| d | | | D | | B | | $r_a$ | | | $ZD^2$ | | $C$[3] | | $C_0$ | | Grease | Oil | Grease |
| in inches | | | mm | in. | mm | in. | mm | in. | | mm | in. | N | lbf | N | lbf | rpm | rpm | rpm |
| 15/16 | **1** | **206SFFX** | 62 | **2.4409** | 16 | **.6299** | 1.0 | **.04** | SNW6 | 819 | **1.27** | 19 500 | **4 380** | 10 000 | **2 250** | 10 000 | 13 000 | — |
| 15/16 | **1** | **206SZZX** | 62 | **2.4409** | 16 | **.6299** | 1.0 | **.04** | SNW6 | 819 | **1.27** | 19 500 | **4 380** | 10 000 | **2 250** | — | — | 7 500 |
| 1 1/8 | **1 3/16** | **207SFFX** | 72 | **2.8346** | 17 | **.6693** | 1.0 | **.04** | SNW7 | 1 140 | **1.76** | 27 000 | **6 070** | 15 300 | **3 440** | 9 000 | 11 000 | — |
| 1 1/8 | **1 3/16** | **207SZZX** | 72 | **2.8346** | 17 | **.6693** | 1.0 | **.04** | SNW7 | 1 140 | **1.76** | 27 000 | **6 070** | 15 300 | **3 440** | — | — | 6 300 |
| | **1 7/16** | **209SZZX** | 85 | **3.3465** | 19 | **.7480** | 1.0 | **.04** | SNW9 | 1 640 | **2.54** | 36 400 | **8 180** | 22 800 | **5 130** | — | — | 5 000 |
| | **1 3/4** | **210SX** | 90 | **3.5433** | 20 | **.7874** | 1.0 | **.04** | SNW10 | 1 610 | **2.50** | 35 100 | **7 890** | 23 200 | **5 210** | 7 000 | 8 500 | 4 800 |
| | **1 15/16** | **211SX** | 100 | **3.9370** | 21 | **.8268** | 1.5 | **.06** | SNW11 | 2 040 | **3.16** | 43 600 | **9 800** | 30 000 | **6 740** | 6 300 | 7 500 | 4 300 |
| | **2 1/16** | **212SZZX** | 110 | **4.3307** | 22 | **.8661** | 1.5 | **.06** | SNW12 | 2 520 | **3.91** | 47 500 | **10 700** | 32 500 | **7 310** | — | — | 4 000 |
| | **2 7/16** | **215SZZX** | 130 | **5.1181** | 25 | **.9843** | 1.5 | **.06** | SNW15 | 3 350 | **5.20** | 66 300 | **14 900** | 49 000 | **11 000** | — | — | 3 200 |
| | **3** | **217SZZX** | 150 | **5.9055** | 28 | **1.1024** | 2.0 | **.08** | SNW17 | 4 260 | **6.60** | 83 200 | **18 700** | 64 000 | **14 400** | — | — | 2 800 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at 33 1/3 rpm.

# Dynamometer bearings

For several years, MRC has supplied specially designed bearings for dynamometer applications. These bearings are manufactured with the following characteristics.

- ABEC-5 inner ring tolerances.
- Inner ring eccentricity value, not to exceed 0.0005″, marked on the inner ring face at the location of maximum lateral runout.
- Special internal radial clearance.
- Special “E” grade balls.
- High speed, lightweight, inner ring land-guided phenolic (Bakelite) separators.

These bearings were developed to minimize operating temperatures, noise and vibration in dynamometer applications. To achieve best results, the value of eccentricity marked on the inner ring face should be aligned 180° opposite the high point of eccentricity measured at the shaft journal. If the bearings are grease lubricated, they should be carefully hand packed prior to installation to make sure that grease is worked into the close running clearance between the O.D. of the inner ring and the I.D. of the separator.

## Dynamometer bearing identification

3 16 R DM - BKE

**Series (300)** — 3

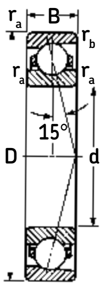
**Bore diameter code (80 mm)** — 16

**“R” type, single-row, maximum capacity** — R

**Special dynamometer quality features** — DM

**Phenolic (Bakelite) separator** — BKE

# 300RDM series




300RDM series dynamometer bearings are made with bore diameters ranging from 35 mm to 160 mm. These bearings are recommended for high speed dynamometers or any application involving moderate to heavy radial loads, moderate thrust loads in one direction, or for combinations of both.

| MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width B mm | in. | Fillet radius[1)] $r_a$ mm | in. | $r_b$ mm | in. | $ZD^2$ mm | in. | Basic radial load rating Dynamic C[3)] N | lbf | Static $C_0$ N | lbf | Speed rating[2)] Grease rpm | Oil rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 307RDM[4)] | 35 | **1.3780** | 80 | **3.1496** | 21 | **.8268** | 1.5 | **.06** | 1.0 | **.040** | 1 940 | **3.00** | 39 000 | **8 770** | 26 000 | **5 850** | 19 500 | 28 000 |
| 309RDM[4)] | 45 | **1.7717** | 100 | **3.9370** | 25 | **.9843** | 1.5 | **.06** | 1.0 | **.040** | 3 030 | **4.69** | 58 500 | **13 200** | 40 500 | **9 100** | 15 400 | 22 400 |
| 310RDM[4)] | 50 | **1.9685** | 110 | **4.3307** | 27 | **1.0630** | 2.0 | **.08** | 1.0 | **.040** | 4 350 | **6.75** | 80 600 | **18 100** | 57 000 | **12 800** | 14 500 | 21 000 |
| 311RDM[4)] | 55 | **2.1654** | 120 | **4.7244** | 29 | **1.1417** | 2.0 | **.08** | 1.0 | **.040** | 5 110 | **7.92** | 93 600 | **21 000** | 67 000 | **15 100** | 12 900 | 18 700 |
| 312RDM[4)] | 60 | **2.3622** | 130 | **5.1181** | 31 | **1.2205** | 2.0 | **.08** | 1.0 | **.040** | 5 930 | **9.19** | 108 000 | **24 300** | 78 000 | **17 500** | 11 500 | 16 800 |
| 313RDM[4)] | 65 | **2.5591** | 140 | **5.5118** | 33 | **1.2992** | 2.0 | **.08** | 1.0 | **.040** | 6 900 | **10.70** | 121 000 | **27 200** | 93 000 | **20 900** | 11 000 | 15 700 |
| 315RDM | 75 | **2.9528** | 160 | **6.2992** | 37 | **1.4567** | 2.0 | **.08** | 1.0 | **.040** | 9 050 | **14.00** | 153 000 | **34 400** | 122 000 | **27 400** | 9 900 | 14 000 |
| 316RDM | 80 | **3.1496** | 170 | **6.6929** | 39 | **1.5354** | 2.0 | **.08** | 1.0 | **.040** | 9 480 | **14.70** | 159 000 | **35 700** | 129 000 | **29 000** | 8 700 | 12 600 |
| 318RDM | 90 | **3.5433** | 190 | **7.4803** | 43 | **1.6929** | 2.5 | **.10** | 1.0 | **.040** | 11 800 | **18.30** | 185 000 | **41 600** | 160 000 | **36 000** | 7 800 | 11 200 |
| 320RDM | 100 | **3.9370** | 215 | **8.4646** | 47 | **1.8504** | 2.5 | **.10** | 1.0 | **.040** | 14 400 | **22.40** | 212 000 | **47 700** | 200 000 | **45 000** | 6 900 | 10 100 |
| 321RDM[4)] | 105 | **4.1339** | 225 | **8.8583** | 49 | **1.9291** | 2.5 | **.10** | 1.0 | **.040** | 15 900 | **24.60** | 229 000 | **51 500** | 204 000 | **45 900** | 6 400 | 9 500 |
| 322RDM[4)] | 110 | **4.3307** | 240 | **9.4488** | 50 | **1.9685** | 2.5 | **.10** | 1.0 | **.040** | 18 800 | **29.20** | 255 000 | **57 300** | 255 000 | **57 300** | 6 000 | 9 000 |
| 324RDM[4)] | 120 | **4.7244** | 260 | **10.2352** | 55 | **2.1654** | 2.5 | **.10** | 1.0 | **.040** | 22 100 | **34.30** | 265 000 | **59 600** | 300 000 | **67 400** | 6 000 | 8 400 |
| 326RDM[4)] | 130 | **5.1181** | 280 | **11.0236** | 58 | **2.2835** | 3.0 | **.12** | 1.0 | **.040** | 25 700 | **39.80** | 296 000 | **66 500** | 345 000 | **77 600** | 5 300 | 7 800 |
| 328RDM[4)] | 140 | **5.5118** | 300 | **11.8110** | 62 | **2.4409** | 3.0 | **.12** | 1.0 | **.040** | 29 500 | **45.70** | 351 000 | **78 900** | 400 000 | **89 900** | 4 800 | 7 300 |
| 330RDM[4)] | 150 | **5.9055** | 320 | **12.5984** | 65 | **2.5591** | 3.0 | **.12** | 1.0 | **.040** | 33 900 | **52.60** | 390 000 | **87 700** | 475 000 | **107 000** | 4 600 | 6 700 |
| 332RDM[4)] | 160 | **6.2992** | 340 | **13.3853** | 68 | **2.6772** | 3.0 | **.12** | 1.0 | **.040** | 38 400 | **59.60** | 423 000 | **95 100** | 530 000 | **119 000** | 4 100 | 6 200 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for inner ring land guided, phenolic composition cage.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.
4) Typically non-stocked sizes, please check availability before designing into equipment.

# ABMA cross reference

MRC manufactures its deep groove ball bearings to meet the high demands for quiet and smooth running bearings for the electric motor market. MRC boxes are clearly labeled with the letters EMQ to identify them as being Electric Motor Quality.

Many electric motor specification plates identify the bearings to be used in the motor with an American Bearing Manufacturers Association (ABMA) number. For your convenience, an ABMA identification code chart is provided along with a list of popular ABMA numbers and their corresponding MRC part number. MRC EMQ bearings are packaged with a premium quality polyurea grease having an NLGI no. 2 rating.

# ABMA identification code (ABMA Standard 20, 1987)

The ABMA (American Bearing Manufacturers Association) method of identification is arranged in five sections. An abbreviated explanation of each section is provided below. This information will allow identification of most general purpose bearings. If additional assistance is required please contact MRC.

## Schematic arrangement of radial bearings

| Radial ball and roller bearings | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Basic number | | | Supplementary number | | | | | | |
| Section 1 | | | Section 2 | | | Section 3 | | Section 4 | Section 5 |
| Type and boundary dimensions | | | Modification of design | | | Internal fit and tolerances | | | |
| Bore | Type | Outside diameter and width | Cage and separators | Shields and seals | Bearing rings | Internal fit | Tolerances | Lubricants and preservatives | Special requirements |
| | | | | Duplex mounting modification | | | | | |
| 0000 | AAA | 00 | A | AA | A | 0 | 0 | A | 000 |

## Section 1

**Bore - Bore diameter in mm**

**Type**

| | | | | | |
|---|---|---|---|---|---|
| BC | -S | BD | 5000 | BS | 1200E |
| BL | -M | BE | 5000M | BY | 9000H |
| BH | -R | BG | 5000C | BZ | 9000U |
| BA | 7000 | BF | 5000M* | BIC | R (INCH) |
| BT | 7000P | BK | 5000C** | BIH | XLS |

**Outside diameter and width**

| | |
|---|---|
| 02 = 200 | 19 = 1900 |
| 03 = 300 | 32 = 5200 |
| 04 = 400 | 33 = 5300 |
| 10 = 100 | 34 = 5400 |

## Section 2

**Cage**

J = Pressed steel
Y = Pressed brass
K = Machined bronze, land guided
D = Non-metallic, land guided
T = Non-metallic, ball guided
V = No cage
X = Any cage acceptable

**Shields and seals**

P = Permanently fastened shield
D = Removable contact seal
H = Labyrinth seal
G = Contact seal, any type
X = Spacer used when no closure required

**Bearing ring modification**

G = Snap-ring in normal position
C = Snap-ring in opposite position
N = Snap-ring groove, less snap-ring
A = Snap-ring groove in opposite position, less snap-ring

**Duplex mounting**

D = Universally ground single bearing (DU)
R = DB pair
U = DF pair
T = DT pair

## Section 3

**Internal fit**

0 = Normal (ST)
2 = Tight (TI)
3 = Loose (LO)
4 = Extra loose (XL)
5 = Greater than symbol 4

**Duplex bearings**

7 = Light preload
8 = Medium preload
9 = Heavy preload

**Tolerance**

0 = ABEC-1
6 = ABEC-3
5 = ABEC-5
4 = ABEC-7
2 = ABEC-9

## Section 4

**Lubricant**

X = Manufacturers standard
A = Specific lube to satisfy a particular condition

## Section 5

**Special requirements**

See following page

*Radial type, 0° contact angle substitute 5000M.
**Radial type, 0° contact angle substitute 5000C.

# ABMA identification code (ABMA Standard 20, 1987)

## Section 5

**Special requirements**

08 = High point of inner ring eccentricity marked on face
09 = High point of outer ring eccentricity marked on face
10 = High points of inner and outer ring eccentricities marked on faces
11 = Surfaces of all steel bearing parts coated by black iron oxide process
16 = Bore of inner ring copper plated, .0003 inches thick per side
17 = Bore of inner ring and outside surface of outer ring copper plated, .0003 inches thick per side
19 = Width tolerance for assembled bearing from thrust face of inner ring to opposite face of outer ring under applied endplay gauging load 0 to -.005 inches
20 = Rings, rolling elements and cages made of stainless steel
25 = Inner and outer rings to be chrome plated
26 = Stabilize for size change of less than 0.010% at 300° F after 2500 hours
28 = Stabilize for size change of less than 0.015% at 390° F after 2500 hours
29 = Stabilize for size change of less than 0.015% at 480° F after 2500 hours
30 = Stabilize for size change of less than 0.015% at 570° F after 2500 hours
31 = Stabilize for size change of less than 0.015% at 660° F after 2500 hours
100 = Government requirements not otherwise coded. Detailed information must be obtained from the appropriate government activity.

## ABMA identification code examples

**210SFFG**
**50BC02JPPG30X**

50 = Bore in mm
BC = Type S
02 = 200 Series
J = Pressed steel cage
PP = Two shields
G = Snap-ring
3 = Loose fit (LO)
0 = ABEC-1
X = Standard lube

**113KRDB**
**65BH10DXXR74**

65 = Bore in mm
BH = Type R
10 = 100 series
D = Phenolic cage
XX = Spacers
R = DB pair
7 = Light preload
4 = ABEC-7

**5307CFG**
**35BG03JPXG00**

35 = Bore in mm
BG = Type 5000C
03 = 300 series
J = Pressed steel cage
P = Shield
X = Spacer
G = Snap-ring
0 = Normal fit (ST)
0 = ABEC-1

**318SG**
**90BC03KXXN4026**

90 = Bore in mm
BC = Type S
03 = 300 series
K = Machined bronze cage
XX = Spacers
N = Snap-ring groove, less snap-ring
4 = Extra loose fit (XL)
0 = ABEC-1
26 = Stabilize for operation at 300° F

**7205DU**
**25BA02DXXD0**

25 = Bore in mm
BA = Type 7000
02 = 200 series
D = Phenolic cage
XX = Spacers
D = DU, half-pair
0 = ABEC-1

# ABMA numbers and MRC equivalent

| ABMA Number | Bearing size |
|---|---|
| 8BIC00X30 | R8 |
| 8BIC10XD30 | R8Z |
| 8BIC10XDD30 | R8ZZ |
| 8BIC10XP30 | R8F |
| 8BIC10XPP30 | R8FF |
| 10BIC10X30 | R10 |
| 10BIC10XD30 | R10Z |
| 10BIC10XDD30 | R10ZZ |
| 10BIC10XP30 | R10F |
| 10BIC10XPP30 | R10FF |
| 12BIC10X30 | R12 |
| 12BIC10XD30 | R12Z |
| 12BIC10XDD30 | R12ZZ |
| 12BIC10XP30 | R12F |
| 12BIC10XPP30 | R12FF |
| 14BIC10X30 | R14 |
| 14BIC10XD30 | R14Z |
| 14BIC10XDD30 | R14ZZ |
| 14BIC10XP30 | R14F |
| 14BIC10XPP30 | R14FF |
| 15BC02X30 | 202S |
| 15BC02XD30 | 202SZ |
| 15BC02XDD30 | 202SZZ |
| 15BC02XDDG30 | 202SZZG |
| 15BC02XDXG30 | 202SZG |
| 15BC02XP30 | 202SF |
| 15BC02XPP30 | 202SFF |
| 15BC02XPPG30 | 202SFFG |
| 15BC02XPXG30 | 202SFG |

| ABMA Number | Bearing size |
|---|---|
| 15BC02XXXG30 | 202SG |
| 15BC03X30 | 302S |
| 15BC03XD30 | 302SZ |
| 15BC03XDD30 | 302SZZ |
| 15BC03XDDG30 | 302SZZG |
| 15BC03XDXG30 | 302SZG |
| 15BC03XP30 | 302SF |
| 15BC03XPP30 | 302SFF |
| 15BC03XPPG30 | 302SFFG |
| 15BC03XPXG30 | 302SFG |
| 15BC03XXXG30 | 302SG |
| 15BC10X30 | 102KS |
| 15BC10XD30 | 102KSZ |
| 15BC10XDD30 | 102KSZZ |
| 15BC10XDDG30 | 102KSZZG |
| 15BC10XDXG30 | 102KSZG |
| 15BC10XPP30 | 102KSFF |
| 15BC10XP30 | 102KSF |
| 15BC10XPPG30 | 102KSFFG |
| 15BC10XPXG30 | 102KSFG |
| 15BC10XXXG30 | 102KSG |
| 15BC19X30 | 1902S |
| 15BC19XD30 | 1902SZ |
| 15BC19XDD30 | 1902SZZ |
| 15BC19XP30 | 1902SF |
| 15BC19XPP30 | 1902SFF |
| 15BC32XDD30 | 202SZZC |
| 15BC32XDDG30 | 202SZZCG |

| ABMA Number | Bearing size |
|---|---|
| 15BC32XPP30 | 202SFFC |
| 15BC32XPPG30 | 202SFFCG |
| 15BC33XDD30 | 302SZZC |
| 15BC33XDDG30 | 302SZZCG |
| 15BC33XPP30 | 302SFFC |
| 15BC33XPPG30 | 302SFFCG |
| 16BIC10X30 | R16 |
| 16BIC10XD30 | R16Z |
| 16BIC10XDD30 | R16ZZ |
| 16BIC10XP30 | R16F |
| 16BIC10XPP30 | R16FF |
| 17BC02X30 | 203S |
| 17BC02XD30 | 203SZ |
| 17BC02XDD30 | 203SZZ |
| 17BC02XDDG30 | 203SZZG |
| 17BC02XDXG30 | 203SZG |
| 17BC02XP30 | 203SF |
| 17BC02XPP30 | 203SFF |
| 17BC02XPXG30 | 203SFG |
| 17BC02XPPG30 | 203SFFG |
| 17BC02XXXG30 | 203SG |
| 17BC03X30 | 303S |
| 17BC03XD30 | 303SZ |
| 17BC03XDD30 | 303SZZ |
| 17BC03XDDG30 | 303SZZG |
| 17BC03XDXG30 | 303SZG |
| 17BC03XP30 | 303SF |
| 17BC03XPP30 | 303SFF |

# ABMA numbers and MRC equivalent

| ABMA Number | Bearing size |
|---|---|
| 17BC03XPPG30 | 303SFFG |
| 17BC03XPXG30 | 303SFG |
| 17BC03XXXG30 | 303SG |
| 17BC04X30 | 403S |
| 17BC04XD30 | 403SZ |
| 17BC04XDD30 | 403SZZ |
| 17BC04XP30 | 403SF |
| 17BC04XPP30 | 403SFF |
| 17BC10X30 | 103KS |
| 17BC10XD30 | 103KSZ |
| 17BC10XDD30 | 103KSZZ |
| 17BC10XDDG30 | 103KSZZG |
| 17BC10XDXG30 | 103KSZG |
| 17BC10XP30 | 103KSF |
| 17BC10XPP30 | 103KSFF |
| 17BC10XPPG30 | 103KSFFG |
| 17BC10XPXG30 | 103KSFG |
| 17BC10XXXG30 | 103KSG |
| 17BC19X30 | 1903S |
| 17BC19XD30 | 1903SZ |
| 17BC19XDD30 | 1903SZZ |
| 17BC19XP30 | 1903SF |
| 17BC19XPP30 | 1903SFF |
| 17BC32XDD30 | 203SZZC |
| 17BC32XDDG30 | 203SZZCG |
| 17BC32XPP30 | 203SFFC |
| 17BC32XPPG30 | 203SFFCG |
| 17BC33XDD30 | 303SZZC |

| ABMA Number | Bearing size |
|---|---|
| 17BC33XDDG30 | 303SZZCG |
| 17BC33XPP30 | 303SFFC |
| 17BC33XPPG30 | 303SFFCG |
| 18BIC10X30 | R18 |
| 18BIC10XD30 | R18Z |
| 18BIC10XDD30 | R18ZZ |
| 18BIC10XP30 | R18F |
| 18BIC10XPP30 | R18FF |
| 20BC02X30 | 204S |
| 20BC02XD30 | 204SZ |
| 20BC02XDD30 | 204SZZ |
| 20BC02XDDG30 | 204SZZG |
| 20BC02XDXG30 | 204SZG |
| 20BC02XP30 | 204SF |
| 20BC02XPP30 | 204SFF |
| 20BC02XPPG30 | 204SFFG |
| 20BC02XPXG30 | 204SFG |
| 20BC02XXXG30 | 204SG |
| 20BC03X30 | 304S |
| 20BC03XD30 | 304SZ |
| 20BC03XDD30 | 304SZZ |
| 20BC03XDDG30 | 304SZZG |
| 20BC03XDXG30 | 304SZG |
| 20BC03XP30 | 304SF |
| 20BC03XPP30 | 304SFF |
| 20BC03XPPG30 | 304SFFG |
| 20BC03XPXG30 | 304SFG |
| 20BC03XXXG30 | 304SG |

| ABMA Number | Bearing size |
|---|---|
| 20BC04X30 | 404S |
| 20BC04XD30 | 404SZ |
| 20BC04XDD30 | 404SZZ |
| 20BC04XP30 | 404SF |
| 20BC04XPP30 | 404SFF |
| 20BC10X30 | 104KS |
| 20BC10XD30 | 104KSZ |
| 20BC10XDD30 | 104KSZZ |
| 20BC10XDDG30 | 104KSZZG |
| 20BC10XDXG30 | 104KSZG |
| 20BC10XP30 | 104KSF |
| 20BC10XPP30 | 104KSFF |
| 20BC10XPPG30 | 104KSFFG |
| 20BC10XPXG30 | 104KSFG |
| 20BC10XXXG30 | 104KSG |
| 20BC19X30 | 1904S |
| 20BC19XD30 | 1904SZ |
| 20BC19XDD30 | 1904SZZ |
| 20BC19XP30 | 1904SF |
| 20BC19XPP30 | 1904SFF |
| 20BC32XDD30 | 204SZZC |
| 20BC32XDDG30 | 204SZZCG |
| 20BC32XPP30 | 204SFFC |
| 20BC32XPPG30 | 204SFFCG |
| 20BC33XDD30 | 304SZZC |
| 20BC33XDDG30 | 304SZZCG |
| 20BC33XPP30 | 304SFFC |
| 20BC33XPPG30 | 304SFFCG |

# ABMA numbers and MRC equivalent

| ABMA Number | Bearing size |
|---|---|
| 20BIC10X30 | R20 |
| 20BIC10XD30 | R20Z |
| 20BIC10XDD30 | R20ZZ |
| 20BIC10XP30 | R20F |
| 20BIC10XPP30 | R20FF |
| 24BIC10X30 | R24 |
| 24BIC10XD30 | R24Z |
| 24BIC10XDD30 | R24ZZ |
| 24BIC10XP30 | R24F |
| 24BIC10XPP30 | R24FF |
| 25BC02X30 | 205S |
| 25BC02XD30 | 205SZ |
| 25BC02XDD30 | 205SZZ |
| 25BC02XDDG30 | 205SZZG |
| 25BC02XDXG30 | 205SZG |
| 25BC02XP30 | 205SF |
| 25BC02XPP30 | 205SFF |
| 25BC02XPPG30 | 205SFFG |
| 25BC02XPXG30 | 205SFG |
| 25BC02XXXG30 | 205SG |
| 25BC03X30 | 305S |
| 25BC03XD30 | 305SZ |
| 25BC03XDD30 | 305SZZ |
| 25BC03XDDG30 | 305SZZG |
| 25BC03XDXG30 | 305SZG |
| 25BC03XP30 | 305SF |
| 25BC03XPP30 | 305SFF |
| 25BC03XPPG30 | 305SFFG |

| ABMA Number | Bearing size |
|---|---|
| 25BC03XPXG30 | 305SFG |
| 25BC03XXXG30 | 305SG |
| 25BC04X30 | 405S |
| 25BC04XD30 | 405SZ |
| 25BC04XDD30 | 405SZZ |
| 25BC04XP30 | 405SF |
| 25BC04XPP30 | 405SFF |
| 25BC10X30 | 105KS |
| 25BC10XD30 | 105KSZ |
| 25BC10XDD30 | 105KSZZ |
| 25BC10XDDG30 | 105KSZZG |
| 25BC10XDXG30 | 105KSZG |
| 25BC10XP30 | 105KSF |
| 25BC10XPP30 | 105KSFF |
| 25BC10XPPG30 | 105KSFFG |
| 25BC10XPXG30 | 105KSFG |
| 25BC10XXXG30 | 105KSG |
| 25BC19X30 | 1905S |
| 25BC19XD30 | 1905SZ |
| 25BC19XDD30 | 1905SZZ |
| 25BC19XP30 | 1905SF |
| 25BC19XPP30 | 1905SFF |
| 25BC32XDD30 | 205SZZC |
| 25BC32XDDG30 | 205SZZCG |
| 25BC32XPP30 | 205SFFC |
| 25BC32XPPG30 | 205SFFCG |
| 25BC33XDD30 | 305SZZC |
| 25BC33XDDG30 | 305SZZCG |

| ABMA Number | Bearing size |
|---|---|
| 25BC33XPP30 | 305SFFC |
| 25BC33XPPG30 | 305SFFCG |
| 30BC02X30 | 206S |
| 30BC02XD30 | 206SZ |
| 30BC02XDD30 | 206SZZ |
| 30BC02XDDG30 | 206SZZG |
| 30BC02XDXG30 | 206SZG |
| 30BC02XP30 | 206SF |
| 30BC02XPP30 | 206SFF |
| 30BC02XPPG30 | 206SFFG |
| 30BC02XPXG30 | 206SFG |
| 30BC02XXXG30 | 206SG |
| 30BC03X30 | 306S |
| 30BC03XD30 | 306SZ |
| 30BC03XDD30 | 306SZZ |
| 30BC03XDDG30 | 306SZZG |
| 30BC03XDXG30 | 306SZG |
| 30BC03XP30 | 306SF |
| 30BC03XPP30 | 306SFF |
| 30BC03XPPG30 | 306SFFG |
| 30BC03XPXG30 | 306SFG |
| 30BC03XXXG30 | 306SG |
| 30BC04X30 | 406S |
| 30BC04XD30 | 406SZ |
| 30BC04XDD30 | 406SZZ |
| 30BC04XP30 | 406SF |
| 30BC04XPP30 | 406SFF |
| 30BC10X30 | 106KS |

# ABMA numbers and MRC equivalent

| ABMA Number | Bearing size |
|---|---|
| 30BC10XD30 | 106KSZ |
| 30BC10XDD30 | 106KSZZ |
| 30BC10XDDG30 | 106KSZZG |
| 30BC10XDXG30 | 106KSZG |
| 30BC10XP30 | 106KSF |
| 30BC10XPP30 | 106KSFF |
| 30BC10XPPG30 | 106KSFFG |
| 30BC10XPXG30 | 106KSFG |
| 30BC10XXXG30 | 106KSG |
| 30BC19X30 | 1906S |
| 30BC19XD30 | 1906SZ |
| 30BC19XDD30 | 1906SZZ |
| 30BC19XP30 | 1906SF |
| 30BC19XPP30 | 1906SFF |
| 30BC32XDD30 | 206SZZC |
| 30BC32XDDG30 | 206SZZCG |
| 30BC32XPP30 | 206SFFC |
| 30BC32XPPG30 | 206SFFCG |
| 30BC33XDD30 | 306SZZC |
| 30BC33XDDG30 | 306SZZCG |
| 30BC33XPP30 | 306SFFC |
| 30BC33XPPG30 | 306SFFCG |
| 35BC02X30 | 207S |
| 35BC02XD30 | 207SZ |
| 35BC02XDD30 | 207SZZ |
| 35BC02XDDG30 | 207SZZG |
| 35BC02XDXG30 | 207SZG |
| 35BC02XP30 | 207SF |

| ABMA Number | Bearing size |
|---|---|
| 35BC02XPP30 | 207SFF |
| 35BC02XPPG30 | 207SFFG |
| 35BC02XPXG30 | 207SFG |
| 35BC02XXXG30 | 207SG |
| 35BC03X30 | 307S |
| 35BC03XD30 | 307SZ |
| 35BC03XDD30 | 307SZZ |
| 35BC03XDDG30 | 307SZZG |
| 35BC03XDXG30 | 307SZG |
| 35BC03XP30 | 307SF |
| 35BC03XPP30 | 307SFF |
| 35BC03XPPG30 | 307SFFG |
| 35BC03XPXG30 | 307SFG |
| 35BC03XXXG30 | 307SG |
| 35BC04X30 | 407S |
| 35BC04XD30 | 407SZ |
| 35BC04XDD30 | 407SZZ |
| 35BC04XP30 | 407SF |
| 35BC04XPP30 | 407SFF |
| 35BC10X30 | 107KS |
| 35BC10XD30 | 107KSZ |
| 35BC10XDD30 | 107KSZZ |
| 35BC10XDDG30 | 107KSZZG |
| 35BC10XDXG30 | 107KSZG |
| 35BC10XP30 | 107KSF |
| 35BC10XPP30 | 107KSFF |
| 35BC10XPPG30 | 107KSFFG |
| 35BC10XPXG30 | 107KSFG |

| ABMA Number | Bearing size |
|---|---|
| 35BC10XXXG30 | 107KSG |
| 35BC19X30 | 1907S |
| 35BC19XD30 | 1907SZ |
| 35BC19XDD30 | 1907SZZ |
| 35BC19XP30 | 1907SF |
| 35BC19XPP30 | 1907SFF |
| 35BC32XDD30 | 207SZZC |
| 35BC32XDDG30 | 207SZZCG |
| 35BC32XPP30 | 207SFFC |
| 35BC32XPPG30 | 207SFFCG |
| 35BC33XDD30 | 307SZZC |
| 35BC33XDDG30 | 307SZZCG |
| 35BC33XPP30 | 307SFFC |
| 35BC33XPPG30 | 307SFFCG |
| 40BC02X30 | 208S |
| 40BC02XD30 | 208SZ |
| 40BC02XDD30 | 208SZZ |
| 40BC02XDDG30 | 208SZZG |
| 40BC02XDXG30 | 208SZG |
| 40BC02XP30 | 208SF |
| 40BC02XPP30 | 208SFF |
| 40BC02XPPG30 | 208SFFG |
| 40BC02XPXG30 | 208SFG |
| 40BC02XXXG30 | 208SG |
| 40BC03X30 | 308S |
| 40BC03XD30 | 308SZ |
| 40BC03XDD30 | 308SZZ |

# ABMA numbers and MRC equivalent

| ABMA Number | Bearing size |
|---|---|
| **40BC03XDDG30** | 308SZZG |
| **40BC03XDXG30** | 308SZG |
| **40BC03XP30** | 308SF |
| **40BC03XPP30** | 308SFF |
| **40BC03XPPG30** | 308SFFG |
| **40BC03XPXG30** | 308SFG |
| **40BC03XXXG30** | 308SG |
| **40BC04X30** | 408S |
| **40BC04XD30** | 408SZ |
| **40BC04XDD30** | 408SZZ |
| **40BC04XP30** | 408SF |
| **40BC04XPP30** | 408SFF |
| **40BC10X30** | 108KS |
| **40BC10XD30** | 108KSZ |
| **40BC10XDD30** | 108KSZZ |
| **40BC10XDDG30** | 108KSZZG |
| **40BC10XDXG30** | 108KSZG |
| **40BC10XP30** | 108KSF |
| **40BC10XPP30** | 108KSFF |
| **40BC10XPPG30** | 108KSFFG |
| **40BC10XPXG30** | 108KSFG |
| **40BC10XXXG30** | 108KSG |
| **40BC19X30** | 1908S |
| **40BC19XD30** | 1908SZ |
| **40BC19XDD30** | 1908SZZ |
| **40BC19XP30** | 1908SF |
| **40BC19XPP30** | 1908SFF |
| **40BC32XDD30** | 208SZZC |

| ABMA Number | Bearing size |
|---|---|
| **40BC32XDDG30** | 208SZZCG |
| **40BC32XPP30** | 208SFFC |
| **40BC32XPPG30** | 208SFFCG |
| **40BC33XDD30** | 308SZZC |
| **40BC33XDDG30** | 308SZZCG |
| **40BC33XPP30** | 308SFFC |
| **40BC33XPPG30** | 308SFFCG |
| **45BC02X30** | 209S |
| **45BC02XD30** | 209SZ |
| **45BC02XDD30** | 209SZZ |
| **45BC02XDDG30** | 209SZZG |
| **45BC02XDXG30** | 209SZG |
| **45BC02XP30** | 209SF |
| **45BC02XPP30** | 209SFF |
| **45BC02XPPG30** | 209SFFG |
| **45BC02XPXG30** | 209SFG |
| **45BC02XXXG30** | 209SG |
| **45BC03X30** | 309S |
| **45BC03XD30** | 309SZ |
| **45BC03XDD30** | 309SZZ |
| **45BC03XDDG30** | 309SZZG |
| **45BC03XDXG30** | 309SZG |
| **45BC03XP30** | 309SF |
| **45BC03XPP30** | 309SFF |
| **45BC03XPPG30** | 309SFFG |
| **45BC03XPXG30** | 309SFG |
| **45BC03XXXG30** | 309SG |
| **45BC04X30** | 409S |

| ABMA Number | Bearing size |
|---|---|
| **45BC04XD30** | 409SZ |
| **45BC04XDD30** | 409SZZ |
| **45BC04XP30** | 409SF |
| **45BC04XPP30** | 409SFF |
| **45BC10X30** | 109KS |
| **45BC10XD30** | 109KSZ |
| **45BC10XDD30** | 109KSZZ |
| **45BC10XDDG30** | 109KSZZG |
| **45BC10XDXG30** | 109KSZG |
| **45BC10XP30** | 109KSF |
| **45BC10XPP30** | 109KSFF |
| **45BC10XPPG30** | 109KSFFG |
| **45BC10XPXG30** | 109KSFG |
| **45BC10XXXG30** | 109KSG |
| **45BC19X30** | 1909S |
| **45BC19XD30** | 1909SZ |
| **45BC19XDD30** | 1909SZZ |
| **45BC19XP30** | 1909SF |
| **45BC19XPP30** | 1909SFF |
| **45BC32XDD30** | 209SZZC |
| **45BC32XDDG30** | 209SZZCG |
| **45BC32XPP30** | 209SFFC |
| **45BC32XPPG30** | 209SFFCG |
| **45BC33XDD30** | 309SZZC |
| **45BC33XDDG30** | 309SZZCG |
| **45BC33XPP30** | 309SFFC |
| **45BC33XPPG30** | 309SFFCG |
| **50BC02X30** | 210S |

# ABMA numbers and MRC equivalent

| ABMA Number | Bearing size |
|---|---|
| 50BC02XD30 | 210SZ |
| 50BC02XDD30 | 210SZZ |
| 50BC02XDDG30 | 210SZZG |
| 50BC02XDXG30 | 210SZG |
| 50BC02XP30 | 210SF |
| 50BC02XPP30 | 210SFF |
| 50BC02XPPG30 | 210SFFG |
| 50BC02XPXG30 | 210SFG |
| 50BC02XXXG30 | 210SG |
| 50BC03X30 | 310S |
| 50BC03XD30 | 310SZ |
| 50BC03XDD30 | 310SZZ |
| 50BC03XDDG30 | 310SZZG |
| 50BC03XDXG30 | 310SZG |
| 50BC03XP30 | 310SF |
| 50BC03XPP30 | 310SFF |
| 50BC03XPPG30 | 310SFFG |
| 50BC03XPXG30 | 310SFG |
| 50BC03XXXG30 | 310SG |
| 50BC04X30 | 410S |
| 50BC04XD30 | 410SZ |
| 50BC04XDD30 | 410SZZ |
| 50BC04XP30 | 410SF |
| 50BC04XPP30 | 410SFF |
| 50BC10X30 | 110KS |
| 50BC10XD30 | 110KSZ |
| 50BC10XDD30 | 110KSZZ |
| 50BC10XDDG30 | 110KSZZG |

| ABMA Number | Bearing size |
|---|---|
| 50BC10XDXG30 | 110KSZG |
| 50BC10XP30 | 110KSF |
| 50BC10XPP30 | 110KSFF |
| 50BC10XPPG30 | 110KSFFG |
| 50BC10XPXG30 | 110KSFG |
| 50BC10XXXG30 | 110KSG |
| 50BC19X30 | 1910S |
| 50BC19XD30 | 1910SZ |
| 50BC19XDD30 | 1910SZZ |
| 50BC19XP30 | 1910SF |
| 50BC19XPP30 | 1910SFF |
| 50BC32XDD30 | 210SZZC |
| 50BC32XDDG30 | 210SZZCG |
| 50BC32XPP30 | 210SFFC |
| 50BC32XSPPG30 | 210SFFCG |
| 50BC33XDD30 | 310SZZC |
| 50BC33XDDG30 | 310SZZCG |
| 50BC33XPP30 | 310SFFC |
| 50BC33XPPG30 | 310SFFCG |
| 55BC02X30 | 211S |
| 55BC02XD30 | 211SZ |
| 55BC02XDD30 | 211SZZ |
| 55BC02XDDG30 | 211SZZG |
| 55BC02XDXG30 | 211SZG |
| 55BC02XP30 | 211SF |
| 55BC02XPP30 | 211SFF |
| 55BC02XPPG30 | 211SFFG |
| 55BC02XPXG30 | 211SFG |

| ABMA Number | Bearing size |
|---|---|
| 55BC02XXXG30 | 211SG |
| 55BC03X30 | 311S |
| 55BC03XD30 | 311SZ |
| 55BC03XDD30 | 311SZZ |
| 55BC03XDDG30 | 311SZZG |
| 55BC03XDXG30 | 311SZG |
| 55BC03PP30 | 311SFF |
| 55BC03XP30 | 311SF |
| 55BC03XPPG30 | 311SFFG |
| 55BC03XPXG30 | 311SFG |
| 55BC03XXXG30 | 311SG |
| 55BC04X30 | 411S |
| 55BC04XD30 | 411SZ |
| 55BC04XDD30 | 411SZZ |
| 55BC04XP30 | 411SF |
| 55BC04XPP30 | 411SFF |
| 55BC10X30 | 111KS |
| 55BC10XD30 | 111KSZ |
| 55BC10XDD30 | 111KSZZ |
| 55BC10XDDG30 | 111KSZZG |
| 55BC10XDXG30 | 111KSZG |
| 55BC10XP30 | 111KSF |
| 55BC10XPP30 | 111KSFF |
| 55BC10XPPG30 | 111KSFFG |
| 55BC10XPXG30 | 111KSFG |
| 55BC10XXXG30 | 111KSG |
| 55BC19X30 | 1911S |
| 55BC19XD30 | 1911SZ |

# ABMA numbers and MRC equivalent

| ABMA Number | Bearing size |
|---|---|
| 55BC19XDD30 | 1911SZZ |
| 55BC19XP30 | 1911SF |
| 55BC19XPP30 | 1911SFF |
| 55BC32XDD30 | 211SZZC |
| 55BC32XDDG30 | 211SZZCG |
| 55BC32XPP30 | 211SFFC |
| 55BC32XPPG30 | 211SFFCG |
| 55BC33XDD30 | 311SZZC |
| 55BC33XDDG30 | 311SZZCG |
| 55BC33XPP30 | 311SFFC |
| 55BC33XPPG30 | 311SFFCG |
| 60BC02X30 | 212S |
| 60BC02XD30 | 212SZ |
| 60BC02XDD30 | 212SZZ |
| 60BC02XDDG30 | 212SZZG |
| 60BC02XDXG30 | 212SZG |
| 60BC02XP30 | 212SF |
| 60BC02XPP30 | 212SFF |
| 60BC02XPPG30 | 212SFFG |
| 60BC02XPXG30 | 212SFG |
| 60BC02XXXG30 | 212SG |
| 60BC03X30 | 312S |
| 60BC03XD30 | 312SZ |
| 60BC03XDD30 | 312SZZ |
| 60BC03XDDG30 | 312SZZG |
| 60BC03XDXG30 | 312SZG |
| 60BC03XP30 | 312SF |
| 60BC03XPP30 | 312SFF |

| ABMA Number | Bearing size |
|---|---|
| 60BC03XPPG30 | 312SFFG |
| 60BC03XPXG30 | 312SFG |
| 60BC03XXXG30 | 312SG |
| 60BC04X30 | 412S |
| 60BC04XD30 | 412SZ |
| 60BC04XDD30 | 412SZZ |
| 60BC04XP30 | 412SF |
| 60BC04XPP30 | 412SFF |
| 60BC10X30 | 112KS |
| 60BC10XD30 | 112KSZ |
| 60BC10XDD30 | 112KSZZ |
| 60BC10XDDG30 | 112KSZZG |
| 60BC10XDXG30 | 112KSZG |
| 60BC10XP30 | 112KSF |
| 60BC10XPP30 | 112KSFF |
| 60BC10XPPG30 | 112KSFFG |
| 60BC10XPXG30 | 112KSFG |
| 60BC10XXXG30 | 112KSG |
| 60BC19X30 | 1912S |
| 60BC19XD30 | 1912SZ |
| 60BC19XDD30 | 1912SZZ |
| 60BC19XP30 | 1912SF |
| 60BC19XPP30 | 1912SFF |
| 60BC32XDD30 | 212SZZC |
| 60BC32XDDG30 | 212SZZCG |
| 60BC32XPP30 | 212SFFC |
| 60BC32XPPG30 | 212SFFCG |
| 60BC33XDD30 | 312SZZC |

| ABMA Number | Bearing size |
|---|---|
| 60BC33XDDG30 | 312SZZCG |
| 60BC33XPP30 | 312SFFC |
| 60BC33XPPG30 | 312SFFCG |
| 65BC02X30 | 213S |
| 65BC02XD30 | 213SZ |
| 65BC02XDD30 | 213SZZ |
| 65BC02XDDG30 | 213SZZG |
| 65BC02XDXG30 | 213SZG |
| 65BC02XP30 | 213SF |
| 65BC02XPP30 | 213SFF |
| 65BC02XPPG30 | 213SFFG |
| 65BC02XPXG30 | 213SFG |
| 65BC02XXXG30 | 213SG |
| 65BC03X30 | 313S |
| 65BC03XD30 | 313SZ |
| 65BC03XDD30 | 313SZZ |
| 65BC03XDDG30 | 313SZZG |
| 65BC03XDXG30 | 313SZG |
| 65BC03XP30 | 313SF |
| 65BC03XPP30 | 313SFF |
| 65BC03XPPG30 | 313SFFG |
| 65BC03XPXG30 | 313SFG |
| 65BC03XXXG30 | 313SG |
| 65BC04X30 | 413S |
| 65BC04XD30 | 413SZ |
| 65BC04XDD30 | 413SZZ |
| 65BC04XP30 | 413SF |
| 65BC04XPP30 | 413SFF |

# ABMA numbers and MRC equivalent

| ABMA Number | Bearing size |
|---|---|
| 65BC10X30 | 113KS |
| 65BC10XD30 | 113KSZ |
| 65BC10XDD30 | 113KSZZ |
| 65BC10XDDG30 | 113KSZZG |
| 65BC10XDXG30 | 113KSZG |
| 65BC10XP30 | 113KSF |
| 65BC10XPP30 | 113KSFF |
| 65BC10XPPG30 | 113KSFFG |
| 65BC10XPXG30 | 113KSFG |
| 65BC10XXXG30 | 113KSG |
| 65BC19X30 | 1913S |
| 65BC19XD30 | 1913SZ |
| 65BC19XDD30 | 1913SZZ |
| 65BC19XP30 | 1913SF |
| 65BC19XPP30 | 1913SFF |
| 65BC32XDD30 | 213SZZC |
| 65BC32XDDG30 | 213SZZCG |
| 65BC32XPP30 | 213SFFC |
| 65BC32XPPG30 | 213SFFCG |
| 65BC33XDD30 | 313SZZC |
| 65BC33XDDG30 | 313SZZCG |
| 65BC33XPP30 | 313SFFC |
| 65BC33XPPG30 | 313SFFCG |
| 70BC02X30 | 214S |
| 70BC02XD30 | 214SZ |
| 70BC02XDD30 | 214SZZ |
| 70BC02XDDG30 | 214SZZG |
| 70BC02XDXG30 | 214SZG |

| ABMA Number | Bearing size |
|---|---|
| 70BC02XP30 | 214SF |
| 70BC02XPP30 | 214SFF |
| 70BC02XPPG30 | 214SFFG |
| 70BC02XPXG30 | 214SFG |
| 70BC02XXXG30 | 214SG |
| 70BC03X30 | 314S |
| 70BC03XD30 | 314SZ |
| 70BC03XDD30 | 314SZZ |
| 70BC03XDDG30 | 314SZZG |
| 70BC03XDXG30 | 314SZG |
| 70BC03XP30 | 314SF |
| 70BC03XPP30 | 314SFF |
| 70BC03XPPG30 | 314SFFG |
| 70BC03XPXG30 | 314SFG |
| 70BC03XXXG30 | 314SG |
| 70BC04X30 | 414S |
| 70BC04XD30 | 414SZ |
| 70BC04XDD30 | 414SZZ |
| 70BC04XP30 | 414SF |
| 70BC04XPP30 | 414SFF |
| 70BC10X30 | 114KS |
| 70BC10XD30 | 114KSZ |
| 70BC10XDD30 | 114KSZZ |
| 70BC10XDDG30 | 114KSZZG |
| 70BC10XDXG30 | 114KSZG |
| 70BC10XP30 | 114KSF |
| 70BC10XPP30 | 114KSFF |
| 70BC10XPPG30 | 114KSFFG |

| ABMA Number | Bearing size |
|---|---|
| 70BC10XPXG30 | 114KSFG |
| 70BC10XXXG30 | 114KSG |
| 70BC19X30 | 1914S |
| 70BC19XD30 | 1914SZ |
| 70BC19XDD30 | 1914SZZ |
| 70BC19XP30 | 1914SF |
| 70BC19XPP30 | 1914SFF |
| 70BC32XDD30 | 214SZZC |
| 70BC32XDDG30 | 214SZZCG |
| 70BC32XPP30 | 214SFFC |
| 70BC32XPPG30 | 214SFFCG |
| 70BC33XDD30 | 314SZZC |
| 70BC33XDDG30 | 314SZZCG |
| 70BC33XPP30 | 314SFFC |
| 70BC33XPPG30 | 314SFFCG |
| 75BC02X30 | 215S |
| 75BC02XD30 | 215SZ |
| 75BC02XDD30 | 215SZZ |
| 75BC02XDDG30 | 215SZZG |
| 75BC02XDXG30 | 215SZG |
| 75BC02XP30 | 215SF |
| 75BC02XPP30 | 215SFF |
| 75BC02XPPG30 | 215SFFG |
| 75BC02XPXG30 | 215SFG |
| 75BC02XXXG30 | 215SG |
| 75BC03X30 | 315S |
| 75BC03XD30 | 315SZ |
| 75BC03XDD30 | 315SZZ |

# ABMA numbers and MRC equivalent

| ABMA Number | Bearing size |
|---|---|
| 75BC03XDDG30 | 315SZZG |
| 75BC03XDXG30 | 315SZG |
| 75BC03XP30 | 315SF |
| 75BC03XPP30 | 315SFF |
| 75BC03XPPG30 | 315SFFG |
| 75BC03XPXG30 | 315SFG |
| 75BC03XXXG30 | 315SG |
| 75BC04X30 | 415S |
| 75BC04XD30 | 415SZ |
| 75BC04XDD30 | 415SZZ |
| 75BC04XP30 | 415SF |
| 75BC04XPP30 | 415SFF |
| 75BC10X30 | 115KS |
| 75BC10XD30 | 115KSZ |
| 75BC10XDD30 | 115KSZZ |
| 75BC10XDDG30 | 115KSZZG |
| 75BC10XDXG30 | 115KSZG |
| 75BC10XP30 | 115KSF |
| 75BC10XPP30 | 115KSFF |
| 75BC10XPPG30 | 115KSFFG |
| 75BC10XPXG30 | 115KSFG |
| 75BC10XXXG30 | 115KSG |
| 75BC19X30 | 1915S |
| 75BC19XD30 | 1915SZ |
| 75BC19XDD30 | 1915SZZ |
| 75BC19XP30 | 1915SF |
| 75BC19XPP30 | 1915SFF |
| 75BC32XDD30 | 215SZZC |

| ABMA Number | Bearing size |
|---|---|
| 75BC32XDDG30 | 215SZZCG |
| 75BC32XPP30 | 215SFFC |
| 75BC32XPPG30 | 215SFFCG |
| 75BC33XDD30 | 315SZZC |
| 75BC33XDDG30 | 315SZZCG |
| 75BC33XPP30 | 315SFFC |
| 75BC33XPPG30 | 315SFFCG |
| 80BC02X30 | 216S |
| 80BC02XD30 | 216SZ |
| 80BC02XDD30 | 216SZZ |
| 80BC02XDDG30 | 216SZZG |
| 80BC02XDXG30 | 216SZG |
| 80BC02XP30 | 216SF |
| 80BC02XPP30 | 216SFF |
| 80BC02XPPG30 | 216SFFG |
| 80BC02XPXG30 | 216SFG |
| 80BC02XXXG30 | 216SG |
| 80BC03X30 | 316S |
| 80BC03XD30 | 316SZ |
| 80BC03XDD30 | 316SZZ |
| 80BC03XDDG30 | 316SZZG |
| 80BC03XDXG30 | 316SZG |
| 80BC03XP30 | 316SF |
| 80BC03XPP30 | 316SFF |
| 80BC03XPPG30 | 316SFFG |
| 80BC03XPXG30 | 316SFG |
| 80BC03XXXG30 | 316SG |
| 80BC04X30 | 416S |

| ABMA Number | Bearing size |
|---|---|
| 80BC04XD30 | 416SZ |
| 80BC04XDD30 | 416SZZ |
| 80BC04XP30 | 416SF |
| 80BC04XPP30 | 416SFF |
| 80BC10X30 | 116KS |
| 80BC10XD30 | 116KSZ |
| 80BC10XDD30 | 116KSZZ |
| 80BC10XDDG30 | 116KSZZG |
| 80BC10XDXG30 | 116KSZG |
| 80BC10XP30 | 116KSF |
| 80BC10XPP30 | 116KSFF |
| 80BC10XPPG30 | 116KSFFG |
| 80BC10XPXG30 | 116KSFG |
| 80BC10XXXG30 | 116KSG |
| 80BC19X30 | 1916S |
| 80BC19XD30 | 1916SZ |
| 80BC19XDD30 | 1916SZZ |
| 80BC19XP30 | 1916SF |
| 80BC19XPP30 | 1916SFF |
| 80BC32XDD30 | 216SZZC |
| 80BC32XDDG30 | 216SZZCG |
| 80BC32XPP30 | 216SFFC |
| 80BC32XPPG30 | 216SFFCG |
| 80BC33XDD30 | 316SZZC |
| 80BC33XDDG30 | 316SZZCG |
| 80BC33XPP30 | 316SFFC |
| 80BC33XPPG30 | 316SFFCG |
| 85BC02X30 | 217S |

# ABMA numbers and MRC equivalent

| ABMA Number | Bearing size |
|---|---|
| 85BC02XD30 | 217SZ |
| 85BC02XDD30 | 217SZZ |
| 85BC02XDDG30 | 217SZZG |
| 85BC02XDXG30 | 217SZG |
| 85BC02XP30 | 217SF |
| 85BC02XPP30 | 217SFF |
| 85BC02XPPG30 | 217SFFG |
| 85BC02XPXG30 | 217SFG |
| 85BC02XXXG30 | 217SG |
| 85BC03X30 | 317S |
| 85BC03XD30 | 317SZ |
| 85BC03XDD30 | 317SZZ |
| 85BC03XDDG30 | 317SZZG |
| 85BC03XDXG30 | 317SZG |
| 85BC03XP30 | 317SF |
| 85BC03XPP30 | 317SFF |
| 85BC03XPPG30 | 317SFFG |
| 85BC03XPXG30 | 317SFG |
| 85BC03XXXG30 | 317SG |
| 85BC04X30 | 417S |
| 85BC04XD30 | 417SZ |
| 85BC04XDD30 | 417SZZ |
| 85BC04XP30 | 417SF |
| 85BC04XPP30 | 417SFF |
| 85BC10X30 | 117KS |
| 85BC10XD30 | 117KSZ |
| 85BC10XDD30 | 117KSZZ |
| 85BC10XDDG30 | 117KSZZG |

| ABMA Number | Bearing size |
|---|---|
| 85BC10XDXG30 | 117KSZG |
| 85BC10XP30 | 117KSF |
| 85BC10XPP30 | 117KSFF |
| 85BC10XPPG30 | 117KSFFG |
| 85BC10XPXG30 | 117KSFG |
| 85BC10XXXG30 | 117KSG |
| 85BC19X30 | 1917S |
| 85BC19XD30 | 1917SZ |
| 85BC19XDD30 | 1917SZZ |
| 85BC19XP30 | 1917SF |
| 85BC19XPP30 | 1917SFF |
| 85BC32XDD30 | 217SZZC |
| 85BC32XDDG30 | 217SZZCG |
| 85BC32XPP30 | 217SFFC |
| 85BC32XPPG30 | 217SFFCG |
| 85BC33XDD30 | 317SZZC |
| 85BC33XDDG30 | 317SZZCG |
| 85BC33XPP30 | 317SFFC |
| 85BC33XPPG30 | 317SFFCG |
| 90BC02X30 | 218S |
| 90BC02XD30 | 218SZ |
| 90BC02XDD30 | 218SZZ |
| 90BC02XDDG30 | 218SZZG |
| 90BC02XDXG30 | 218SZG |
| 90BC02XP30 | 218SF |
| 90BC02XPP30 | 218SFF |
| 90BC02XPPG30 | 218SFFG |
| 90BC02XPXG30 | 218SFG |

| ABMA Number | Bearing size |
|---|---|
| 90BC02XXXG30 | 218SG |
| 90BC03X30 | 318S |
| 90BC03XD30 | 318SZ |
| 90BC03XDD30 | 318SZZ |
| 90BC03XDDG30 | 318SZZG |
| 90BC03XDXG30 | 318SZG |
| 90BC03XP30 | 318SF |
| 90BC03XPP30 | 318SFF |
| 90BC03XPPG30 | 318SFFG |
| 90BC03XPXG30 | 318SFG |
| 90BC03XXXG30 | 318SG |
| 90BC04X30 | 418S |
| 90BC04XD30 | 418SZ |
| 90BC04XDD30 | 418SZZ |
| 90BC04XP30 | 418SF |
| 90BC04XPP30 | 418SFF |
| 90BC10X30 | 118KS |
| 90BC10XD30 | 118KSZ |
| 90BC10XDD30 | 118KSZZ |
| 90BC10XDDG30 | 118KSZZG |
| 90BC10XDXG30 | 118KSZG |
| 90BC10XP30 | 118KSF |
| 90BC10XPP30 | 118KSFF |
| 90BC10XPPG30 | 118KSFFG |
| 90BC10XPXG30 | 118KSFG |
| 90BC10XXXG30 | 118KSG |
| 90BC19X30 | 1918S |
| 90BC19XD30 | 1918SZ |

# ABMA numbers and MRC equivalent

| ABMA Number | Bearing size |
|---|---|
| 90BC19XDD30 | 1918SZZ |
| 90BC19XP30 | 1918SF |
| 90BC19XPP30 | 1918SFF |
| 90BC32XDD30 | 218SZZC |
| 90BC32XDDG30 | 218SZZCG |
| 90BC32XPP30 | 218SFFC |
| 90BC32XPPG30 | 218SFFCG |
| 90BC33XDD30 | 318SZZC |
| 90BC33XDDG30 | 318SZZCG |
| 90BC33XPP30 | 318SFFC |
| 90BC33XPPG30 | 318SFFCG |
| 95BC02X30 | 219S |
| 95BC02XD30 | 219SZ |
| 95BC02XDD30 | 219SZZ |
| 95BC02XDDG30 | 219SZZG |
| 95BC02XDXG30 | 219SZG |
| 95BC02XP30 | 219SF |
| 95BC02XPP30 | 219SFF |
| 95BC02XPPG30 | 219SFFG |
| 95BC02XPXG30 | 219SFG |
| 95BC02XXXG30 | 219SG |
| 95BC03X30 | 319S |
| 95BC03XD30 | 319SZ |
| 95BC03XDD30 | 319SZZ |
| 95BC03XDDG30 | 319SZZG |
| 95BC03XDXG30 | 319SZG |
| 95BC03XP30 | 319SF |
| 95BC03XPP30 | 319SFF |

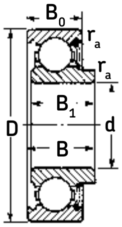
| ABMA Number | Bearing size |
|---|---|
| 95BC03XPPG30 | 319SFFG |
| 95BC03XPXG30 | 319SFG |
| 95BC03XXXG30 | 319SG |
| 95BC04X30 | 419S |
| 95BC04XD30 | 419SZ |
| 95BC04XDD30 | 419SZZ |
| 95BC04XP30 | 419SF |
| 95BC04XPP30 | 419SFF |
| 95BC10X30 | 119KS |
| 95BC10XD30 | 119KSZ |
| 95BC10XDD30 | 119KSZZ |
| 95BC10XDDG30 | 119KSZZG |
| 95BC10XDXG30 | 119KSZG |
| 95BC10XP30 | 119KSF |
| 95BC10XPP30 | 119KSFF |
| 95BC10XPPG30 | 119KSFFG |
| 95BC10XPXG30 | 119KSFG |
| 95BC10XXXG30 | 119KSG |
| 95BC19X30 | 1919S |
| 95BC19XD30 | 1919SZ |
| 95BC19XDD30 | 1919SZZ |
| 95BC19XP30 | 1919SF |
| 95BC19XPP30 | 1919SFF |
| 95BC32XDD30 | 219SZZC |
| 95BC32XDDG30 | 219SZZCG |
| 95BC32XPP30 | 219SFFC |
| 95BC32XPPG30 | 219SFFCG |
| 95BC33XDD30 | 319SZZC |

| ABMA Number | Bearing size |
|---|---|
| 95BC33XDDG30 | 319SZZCG |
| 95BC33XPP30 | 319SFFC |
| 95BC33XPPG30 | 319SFFCG |
| 100BC02X30 | 220S |
| 100BC02XD30 | 220SZ |
| 100BC02XDD30 | 220SZZ |
| 100BC02XDDG30 | 220SZZG |
| 100BC02XDXG30 | 220SZG |
| 100BC02XP30 | 220SF |
| 100BC02XPP30 | 220SFF |
| 100BC02XPPG30 | 220SFFG |
| 100BC02XPXG30 | 220SFG |
| 100BC02XXXG30 | 220SG |
| 100BC03X30 | 320S |
| 100BC03XD30 | 320SZ |
| 100BC03XDD30 | 320SZZ |
| 100BC03XDDG30 | 320SZZG |
| 100BC03XDXG30 | 320SZG |
| 100BC03XP30 | 320SF |
| 100BC03XPP30 | 320SFF |
| 100BC03XPPG30 | 320SFFG |
| 100BC03XPXG30 | 320SFG |
| 100BC03XXXG30 | 320SG |
| 100BC04X30 | 420S |
| 100BC04XD30 | 420SZ |
| 100BC04XDD30 | 420SZZ |
| 100BC04XP30 | 420SF |
| 100BC04XPP30 | 420SFF |

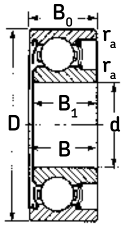
# ABMA numbers and MRC equivalent

| ABMA Number | Bearing size |
|---|---|
| 100BC10X30 | 120KS |
| 100BC10XD30 | 120KSZ |
| 100BC10XDD30 | 120KSZZ |
| 100BC10XDDG30 | 120KSZZG |
| 100BC10XDXG30 | 120KSZG |
| 100BC10XP30 | 120KSF |
| 100BC10XPP30 | 120KSFF |
| 100BC10XPPG30 | 120KSFFG |
| 100BC10XPXG30 | 120KSFG |
| 100BC10XXXG30 | 120KSG |
| 100BC19X30 | 1920S |
| 100BC19XD30 | 1920SZ |
| 100BC19XDD30 | 1920SZZ |
| 100BC19XP30 | 1920SF |
| 100BC19XPP30 | 1920SFF |
| 100BC32XDD30 | 220SZZC |
| 100BC32XDDG30 | 220SZZCG |
| 100BC32XPP30 | 220SFFC |
| 100BC32XPPG30 | 220SFFCG |
| 100BC33XDD30 | 320SZZC |
| 100BC33XDDG30 | 320SZZCG |
| 100BC33XPP30 | 320SFFC |
| 100BC33XPPG30 | 320SFFCG |

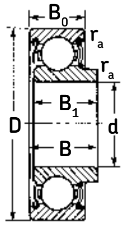
# Felt seal replacement bearings basic dimensions




**8000**
**One seal**




**WC87000**
**Shield and seal**




**87000**
**Shield and seal**

MRC felt seal replacement bearings have synthetic rubber seals.

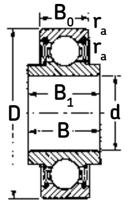
| | | Bore | | Outside diameter | | Width | | | | | | Fillet radius[1] | | | | Basic radial load rating | | | | Speed rating[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | Dynamic | | Static | | Single and double sealed grease |
| MRC bearing number | Old MRC bearing number | d | | D | | $B_0$ | | $B_1$ | | B | | $r_a$ | | $ZD^2$ | | $C^{3)}$ | | $C_0$ | | |
| | | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm |
| **8008** | 38FS1 | 8 | **.3150** | 24 | **.9449** | 8.0 | **.315** | 9.8 | **.386** | 10.3 | **.406** | .30 | **.012** | 110 | **.17** | 3 320 | **746** | 1 430 | **321** | 23 000 |
| **8013** | 201FS2 | 13 | **.5118** | 32 | **1.2598** | 10.0 | **.394** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 245 | **.38** | 6 890 | **1 550** | 3 050 | **686** | 15 000 |
| **8014** | 202FS1 | 14 | **.5512** | 35 | **1.3780** | 11.0 | **.433** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 284 | **.44** | 7 610 | **1 710** | 3 650 | **821** | 13 000 |
| **8016** | 202FS3 | 16 | **.6299** | 35 | **1.3780** | 11.0 | **.433** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 284 | **.44** | 7 610 | **1 710** | 3 650 | **821** | 13 000 |
| **8026** | 205FS3 | 26 | **1.0236** | 52 | **2.0472** | 15.0 | **.591** | 15.2 | **.600** | 15.9 | **.625** | 1.00 | **.040** | 568 | **.88** | 14 000 | **3 150** | 8 000 | **1 800** | 8 500 |
| **8038** | 38FS | 8 | **.3150** | 22 | **.8661** | 8.0 | **.315** | 9.8 | **.386** | 10.3 | **.406** | .30 | **.012** | 110 | **.17** | 3 320 | **746** | 1 370 | **308** | 23 000 |
| **8500** | 200FS | 10 | **.3937** | 30 | **1.1811** | 9.0 | **.354** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 155 | **.24** | 5 070 | **1 140** | 2 400 | **540** | 17 000 |
| **8501** | 201FS | 12 | **.4724** | 32 | **1.2598** | 10.0 | **.394** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 245 | **.38** | 6 760 | **1 520** | 3 050 | **685** | 15 000 |
| **8502** | 202FS | 15 | **.5906** | 35 | **1.3780** | 11.0 | **.433** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 277 | **.43** | 7 610 | **1 710** | 3 750 | **843** | 13 000 |
| **8503** | 203FS | 17 | **.6693** | 40 | **1.5748** | 12.0 | **.472** | 13.7 | **.538** | 14.3 | **.563** | .64 | **.025** | 361 | **.56** | 9 560 | **2 150** | 4 800 | **1 080** | 12 000 |
| **8504** | 204FS | 20 | **.7874** | 47 | **1.8504** | 14.0 | **.551** | 15.2 | **.600** | 15.9 | **.625** | 1.00 | **.040** | 503 | **.78** | 13 000 | **2 920** | 6 700 | **1 510** | 10 000 |
| **8505** | 205FS | 25 | **.9843** | 52 | **2.0472** | 15.0 | **.591** | 15.2 | **.600** | 15.9 | **.625** | 1.00 | **.040** | 568 | **.88** | 14 000 | **3 150** | 8 000 | **1 800** | 8 500 |
| **8506** | 206FS | 30 | **1.1811** | 62 | **2.4409** | 16.0 | **.630** | 19.0 | **.748** | 20.0 | **.787** | 1.00 | **.040** | 813 | **1.26** | 19 500 | **4 380** | 11 400 | **2 560** | 7 500 |
| **8507** | 207FS | 35 | **1.3780** | 72 | **2.8346** | 17.0 | **.669** | 20.0 | **.787** | 21.0 | **.827** | 1.00 | **.040** | 1 109 | **1.72** | 25 500 | **5 730** | 15 300 | **3 440** | 6 300 |
| **8508** | 208FS | 40 | **1.5748** | 80 | **3.1496** | 21.0 | **.827** | 24.0 | **.945** | 24.0 | **.945** | 1.00 | **.040** | 1 320 | **2.05** | 29 100 | **6 540** | 18 000 | **4 050** | 5 600 |
| **8605** | 305FS | 25 | **.9843** | 62 | **2.4409** | 17.0 | **.669** | 21.0 | **.827** | 21.0 | **.827** | 1.00 | **.040** | 632 | **.98** | 15 900 | **3 570** | 8 000 | **1 800** | 7 500 |
| **WC87008** | 38FSF2 | 8 | **.3150** | 24 | **.9449** | 10.3 | **.406** | 9.8 | **.386** | 10.3 | **.406** | .30 | **.012** | 110 | **.17** | 3 320 | **746** | 1 430 | **321** | 23 000 |
| **WC87016** | — | 16 | **.6299** | 35 | **1.3780** | 12.7 | **.500** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 284 | **.44** | 7 610 | **1 710** | 3 750 | **843** | 13 000 |
| **WC87500** | 200FSF1 | 10 | **.3937** | 30 | **1.1811** | 12.7 | **.500** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 155 | **.24** | 5 070 | **1 140** | 2 400 | **540** | 17 000 |
| **WC87501** | 201FSF1 | 12 | **.4724** | 32 | **1.2598** | 12.7 | **.500** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 245 | **.38** | 6 890 | **1 550** | 2 400 | **540** | 15 000 |
| **WC87502** | 202FSF1 | 15 | **.5906** | 35 | **1.3780** | 12.7 | **.500** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 277 | **.43** | 7 610 | **1 710** | 3 750 | **843** | 13 000 |
| **WC87503** | 203FSF1 | 17 | **.6693** | 40 | **1.5748** | 14.3 | **.563** | 13.7 | **.538** | 14.3 | **.563** | .64 | **.025** | 361 | **.56** | 9 560 | **2 150** | 4 800 | **1 080** | 12 000 |
| **WC87504** | 204FSF1 | 20 | **.7874** | 47 | **1.8504** | 15.9 | **.625** | 15.2 | **.600** | 15.9 | **.625** | 1.00 | **.040** | 503 | **.78** | 13 000 | **2 920** | 6 700 | **1 510** | 10 000 |
| **87007** | 37FSF1 | 7 | **.2756** | 24 | **.9449** | 8.0 | **.315** | 9.8 | **.386** | 10.3 | **.406** | .30 | **.012** | 110 | **.17** | 3 320 | **746** | 1 430 | **321** | 23 000 |
| **87008** | 38FSF1 | 8 | **.3150** | 24 | **.9449** | 8.0 | **.315** | 9.8 | **.386** | 10.3 | **.406** | .30 | **.012** | 110 | **.17** | 3 320 | **746** | 1 430 | **321** | 23 000 |
| **87013** | 201FSF3 | 13 | **.5118** | 32 | **1.2598** | 10.0 | **.394** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 245 | **.38** | 6 890 | **1 550** | 3 050 | **686** | 15 000 |
| **87014** | — | 14 | **.5512** | 35 | **1.3780** | 11.0 | **.433** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 284 | **.44** | 7 610 | **1 710** | 3 650 | **821** | 13 000 |
| **87016** | 202FSF4 | 16 | **.6299** | 35 | **1.3780** | 11.0 | **.433** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 284 | **.44** | 7 610 | **1 710** | 3 750 | **843** | 13 000 |
| **87026** | — | 26 | **1.0236** | 52 | **2.0472** | 15.0 | **.591** | 15.2 | **.600** | 15.9 | **.625** | 1.00 | **.040** | 568 | **.88** | 14 000 | **3 150** | 8 000 | **1 800** | 8 500 |
| **87036** | 36FSF | 6 | **.2362** | 19 | **.7480** | 8.0 | **.315** | 9.8 | **.386** | 10.3 | **.406** | .30 | **.012** | 97 | **.15** | 2 810 | **632** | 1 080 | **243** | 26 000 |
| **87037** | 37FSF | 7 | **.2756** | 22 | **.8661** | 8.0 | **.315** | 9.8 | **.386** | 10.3 | **.406** | .30 | **.012** | 110 | **.17** | 3 320 | **746** | 1 340 | **301** | 23 000 |
| **87038** | 38FSF | 8 | **.3150** | 22 | **.8661** | 8.0 | **.315** | 9.8 | **.386** | 10.3 | **.406** | .30 | **.012** | 110 | **.17** | 3 320 | **746** | 1 370 | **308** | 23 000 |
| **87500** | 200FSF | 10 | **.3937** | 30 | **1.1811** | 9.0 | **.354** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 155 | **.24** | 5 070 | **1 140** | 2 400 | **540** | 17 000 |
| **87501** | 201FSF | 12 | **.4724** | 32 | **1.2598** | 10.0 | **.394** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 245 | **.38** | 8 190 | **1 840** | 3 650 | **821** | 15 000 |
| **87502** | 202FSF | 15 | **.5906** | 35 | **1.3780** | 11.0 | **.433** | 12.2 | **.480** | 12.7 | **.500** | .64 | **.025** | 277 | **.43** | 7 610 | **1 710** | 3 750 | **843** | 13 000 |
| **87503** | 203FSF | 17 | **.6693** | 40 | **1.5748** | 12.0 | **.472** | 13.7 | **.538** | 14.3 | **.563** | .64 | **.025** | 361 | **.56** | 9 560 | **2 150** | 4 800 | **1 080** | 12 000 |
| **87504** | 204FSF | 20 | **.7874** | 47 | **1.8504** | 14.0 | **.551** | 15.2 | **.600** | 15.9 | **.625** | 1.00 | **.040** | 503 | **.78** | 13 000 | **2 920** | 6 700 | **1 510** | 10 000 |
| **87505** | 205FSF | 25 | **.9843** | 52 | **2.0472** | 15.0 | **.591** | 15.2 | **.600** | 15.9 | **.625** | 1.00 | **.040** | 568 | **.88** | 14 000 | **3 150** | 8 000 | **1 800** | 8 500 |
| **87506** | 206FSF | 30 | **1.1811** | 62 | **2.4409** | 16.0 | **.630** | 19.0 | **.748** | 20.0 | **.787** | 1.00 | **.040** | 813 | **1.26** | 19 500 | **4 380** | 11 400 | **2 560** | 7 500 |
| **87507** | 207FSF | 35 | **1.3780** | 72 | **2.8346** | 17.0 | **.669** | 20.0 | **.787** | 21.0 | **.827** | 1.00 | **.040** | 1 110 | **1.72** | 25 500 | **5 730** | 15 300 | **3 440** | 6 300 |
| **87508** | 208FSF | 40 | **1.5748** | 80 | **3.1496** | 21.0 | **.827** | 24.0 | **.945** | 24.0 | **.945** | 1.00 | **.040** | 1 320 | **2.05** | 29 100 | **6 540** | 18 000 | **4 050** | 5 000 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/_3$ rpm.

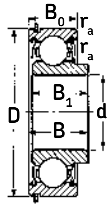


MRC

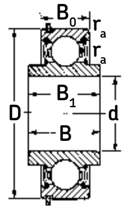
# Felt seal replacement bearings basic dimensions




**88000**
**Two seals**




**487000[4)]**
**Shield, seal and snap-ring**



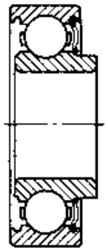

**488000**
**Two seals and snap-ring**

MRC felt seal replacement bearings have synthetic rubber seals.

| MRC bearing number | Old MRC bearing number | Bore d mm | in. | Outside diameter D mm | in. | Width $B_0$ mm | in. | $B_1$ mm | in. | B mm | in. | Fillet radius[1)] $r_a$ mm | in. | $ZD^2$ mm | in. | Basic radial load rating Dynamic $C$[3)] N | lbf | Static $C_0$ N | lbf | Speed rating[2)] Single and double sealed grease rpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 88007 | — | 7 | .2756 | 24 | .9449 | 8 | .315 | 12.6 | .497 | 12.6 | .497 | .30 | .012 | 110 | .17 | 3 320 | 746 | 1 430 | 321 | 23 000 |
| 88008 | 38FFS2 | 8 | .3150 | 24 | .9449 | 8 | .315 | 12.6 | .497 | 12.6 | .497 | .30 | .012 | 110 | .17 | 3 320 | 746 | 1 430 | 321 | 23 000 |
| 88009 | — | 9 | .3543 | 30 | 1.1811 | 9 | .354 | 16.4 | .646 | 16.4 | .646 | .64 | .025 | 155 | .24 | 4 620 | 1 040 | 2 040 | 459 | 17 000 |
| 88011 | — | 11 | .4331 | 32 | 1.2598 | 10 | .394 | 15.4 | .606 | 15.4 | .606 | .64 | .025 | 245 | .38 | 6 760 | 1 520 | 3 000 | 674 | 15 000 |
| 88013 | 201FFS2 | 13 | .5118 | 32 | 1.2598 | 10 | .394 | 15.4 | .606 | 15.4 | .606 | .64 | .025 | 245 | .38 | 6 890 | 1 550 | 3 050 | 686 | 15 000 |
| 88016 | 202FFS5 | 16 | .6299 | 35 | 1.3780 | 11 | .433 | 14.4 | .567 | 14.4 | .567 | .64 | .025 | 284 | .44 | 7 610 | 1 710 | 3 750 | 843 | 13 000 |
| 88500 | 200FFS | 10 | .3937 | 30 | 1.1811 | 9 | .354 | 16.4 | .646 | 16.4 | .646 | .64 | .025 | 155 | .24 | 5 070 | 1 140 | 2 400 | 540 | 17 000 |
| 88501 | 201FFS | 12 | .4724 | 32 | 1.2598 | 10 | .394 | 15.4 | .606 | 15.4 | .606 | .64 | .025 | 245 | .38 | 6 760 | 1 520 | 3 050 | 685 | 15 000 |
| 88502 | 202FFS | 15 | .5906 | 35 | 1.3780 | 11 | .433 | 14.4 | .567 | 14.4 | .567 | .64 | .025 | 277 | .43 | 7 610 | 1 710 | 3 750 | 843 | 13 000 |
| 88503 | 203FFS | 17 | .6693 | 40 | 1.5748 | 12 | .472 | 16.6 | .654 | 16.6 | .654 | .64 | .025 | 361 | .56 | 9 560 | 2 150 | 4 800 | 1 080 | 12 000 |
| 88504 | 204FFS | 20 | .7874 | 47 | 1.8504 | 14 | .551 | 17.8 | .699 | 17.8 | .699 | 1.00 | .040 | 503 | .78 | 13 000 | 2 920 | 6 700 | 1 510 | 10 000 |
| 88505 | 205FFS | 25 | .9843 | 52 | 2.0472 | 15 | .591 | 16.7 | .659 | 16.7 | .659 | 1.00 | .040 | 568 | .88 | 14 000 | 3 150 | 8 000 | 1 800 | 8 500 |
| 88506 | 206FFS | 30 | 1.1811 | 62 | 2.4409 | 16 | .630 | 24.0 | .945 | 24.0 | .945 | 1.00 | .040 | 813 | 1.26 | 19 500 | 4 380 | 11 400 | 2 560 | 7 500 |
| 88507 | 207FFS | 35 | 1.3780 | 72 | 2.8346 | 17 | .669 | 25.0 | .984 | 25.0 | .984 | 1.00 | .040 | 1 110 | 1.72 | 25 500 | 5 730 | 15 300 | 3 440 | 6 300 |
| 88508 | 208FFS | 40 | 1.5748 | 80 | 3.1496 | 21 | .827 | 27.0 | 1.063 | 27.0 | 1.063 | 1.00 | .040 | 1 320 | 2.05 | 29 100 | 6 540 | 18 000 | 4 050 | 5 600 |
| 487502 | G202FSF | 15 | .5906 | 35 | 1.3780 | 11 | .433 | 12.2 | .480 | 12.7 | .500 | .64 | .025 | 277 | .43 | 7 610 | 1 710 | 3 750 | 843 | 13 000 |
| 487503 | G203FSF | 17 | .6693 | 40 | 1.5748 | 12 | .472 | 13.7 | .538 | 14.3 | .563 | .64 | .025 | 361 | .56 | 9 560 | 2 150 | 4 800 | 1 080 | 12 000 |
| 487508 | G208FSF | 40 | 1.5748 | 80 | 3.1496 | 21 | .827 | 24.0 | .945 | 24.0 | .945 | 1.00 | .040 | 1 320 | 2.05 | 29 100 | 6 540 | 18 000 | 4 050 | 5 600 |
| 488016 | 202FFS2G | 16 | .6299 | 35 | 1.3780 | 11 | .433 | 14.4 | .567 | 14.4 | .567 | .64 | .025 | 284 | .44 | 7 610 | 1 710 | 3 750 | 843 | 13 000 |
| 488502 | 202FFSG | 15 | .5906 | 35 | 1.3780 | 11 | .433 | 14.4 | .567 | 14.4 | .567 | .64 | .025 | 277 | .43 | 7 610 | 1 710 | 3 750 | 843 | 13 000 |
| 488503 | 203FFSG | 17 | .6693 | 40 | 1.5748 | 12 | .472 | 16.6 | .654 | 16.6 | .654 | .64 | .025 | 361 | .56 | 9 560 | 2 150 | 4 800 | 1 080 | 12 000 |
| 488504 | 204FFSG | 20 | .7874 | 47 | 1.8504 | 14 | .551 | 17.8 | .699 | 17.8 | .699 | 1.00 | .040 | 503 | .78 | 13 000 | 2 920 | 6 700 | 1 510 | 10 000 |
| 488505 | 205FFSG | 25 | .9843 | 52 | 2.0472 | 15 | .591 | 16.7 | .659 | 16.7 | .659 | 1.00 | .040 | 568 | .88 | 14 000 | 3 150 | 8 000 | 1 800 | 8 500 |
| 488506 | 206FFSG | 30 | 1.1811 | 62 | 2.4409 | 16 | .630 | 24.0 | .945 | 24.0 | .945 | 1.00 | .040 | 813 | 1.26 | 19 500 | 4 380 | 11 400 | 2 560 | 7 500 |
| 488507 | 207FFSG | 35 | 1.3780 | 72 | 2.8346 | 17 | .669 | 25.0 | .984 | 25.0 | .984 | 1.00 | .040 | 1 110 | 1.72 | 25 500 | 5 730 | 15 300 | 3 440 | 6 300 |
| 488508 | 208FFSG | 40 | 1.5748 | 80 | 3.1496 | 21 | .827 | 27.0 | 1.063 | 27.0 | 1.063 | 1.00 | .040 | 1 320 | 2.05 | 29 100 | 6 540 | 18 000 | 4 050 | 5 600 |

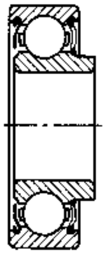
1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at $33^1/3$ rpm.
4) Add suffix "V" when snap-ring is on seal side

# Felt seal replacement bearings interchange

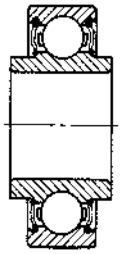


8000
One seal

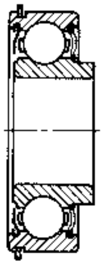
WC87000
Shield and seal



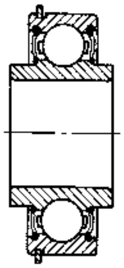
87000
Shield and seal



88000
Two seals



487000
Shield, seal
and snap-ring



488000
Two seals
and snap-ring

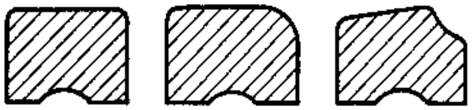
MRC felt seal replacement bearings have synthetic rubber seals.

| MRC bearing number | Basic interchange | | |
|---|---|---|---|
| | BCA | FAF | NDH NTN |
| **8008** | — | 38KVL | 8008 |
| **8013** | 8013 | — | 8013 |
| **8014** | — | 202KL4 | 8014 |
| **8016** | 8016 | 202KL3 | 8016 |
| **8026** | 8026 | — | 8026 |
| **8038** | — | 38KL | 8038 |
| **8500** | 8500 | 200KL | 8500 |
| **8501** | 8501 | 201KL | 8501 |
| **8502** | 8502 | 202KL | 8502 |
| **8503** | 8503 | 203KL | 8503 |
| **8504** | 8504 | 204KL | 8504 |
| **8505** | 8505 | 205KL | 8505 |
| **8506** | 8506 | 206KL | 8506 |
| **8507** | 8507 | 207KL | 8507 |
| **8508** | 8508 | — | 8508 |
| **8605** | 8605 | — | 8605 |
| **WC87008** | — | 38KVTD | WC87008 |
| **WC87016** | — | 202KTD3 | WC87016 |
| **WC87500** | WC87500 | 200KTD | WC87500 |
| **WC87501** | WC87501 | 201KTD | WC87501 |
| **WC87502** | WC87502 | 202KTD | WC87502 |
| **WC87503** | WC87503 | 203KTD8 | WC87503 |
| **WC87504** | WC87504 | — | WC87504 |
| **87007** | — | 37KVLD | 87007 |
| **87008** | 87008 | 38KVLD | 87008 |
| **87013** | 87013 | 201KLD2 | 87013 |

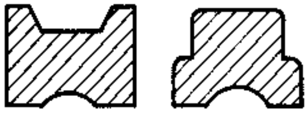
| MRC bearing number | Basic interchange | | |
|---|---|---|---|
| | BCA | FAF | NDH NTN |
| **87014** | — | — | 87014 |
| **87016** | 87016 | 202KLD3 | 87016 |
| **87026** | — | — | 87026 |
| **87036** | — | 36KLD | 87036 |
| **87037** | — | 37KLD | 87037 |
| **87038** | — | 38KLD | 87038 |
| **87500** | 87500 | 200KLD | 87500 |
| **87501** | 87501 | 201KLD | 87501 |
| **87502** | 87502 | 202KLD | 87502 |
| **87503** | 87503 | 203KLD | 87503 |
| **87504** | 87504 | 204KLD | 87504 |
| **87505** | 87505 | 205KLD | 87505 |
| **87506** | 87506 | 206KLD | 87506 |
| **87507** | 87507 | 207KLD | 87507 |
| **87508** | — | — | 87508 |
| **88007** | — | — | 88007 |
| **88008** | 38KVLL2 | 88008 | — |
| **88009** | — | — | 88009 |
| **88011** | — | — | 88011 |
| **88013** | 88013 | 201KLL3 | 88013 |
| **88016** | 88016 | 202KLL3 | 88016 |
| **88500** | 88500 | 200KLL2 | 88500 |
| **88501** | 88501 | 201KLL2 | 88501 |
| **88502** | 88502 | 202KLL2 | 88502 |
| **88503** | 88503 | 203KLL2 | 88503 |
| **88504** | 88504 | 204KLL2 | 88504 |

| MRC bearing number | Basic interchange | | |
|---|---|---|---|
| | BCA | FAF | NDH NTN |
| **88505** | 88505 | 205KLL2 | 88505 |
| **88506** | 88506 | 205KLL | 88506 |
| **88507** | — | 207KLL | 88507 |
| **88508** | 88508 | — | 88508 |
| **487502** | — | — | 487502 |
| **487503** | — | — | 487503 |
| **487508** | — | — | 487508 |
| **488016** | — | — | 488016 |
| **488502** | — | — | 488502 |
| **488503** | — | — | 488503 |
| **488504** | — | — | 488504 |
| **488505** | — | — | 488505 |
| **488506** | — | — | 488506 |
| **488507** | — | — | 488507 |
| **488508** | — | — | 488508 |

# Industrial truck mast guide bearings



Mast guide type



Chain sheave type

## Outer ring design

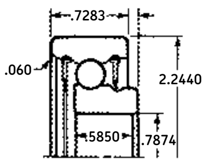
Industrial truck mast guide ball bearings are a family of special bearings tailored to meet the requirements of the industrial truck industry. These bearings must be able to accommodate heavy radial loads, withstand heavy shock loads, and handle overturning moments produced by combined radial and thrust loads.

Special lubricants are selected to meet the rigorous demands of industrial truck service. To retain the lubricant and protect the bearing from adverse environmental conditions, the bearings are equipped with either synthetic rubber or polypropylene seals.

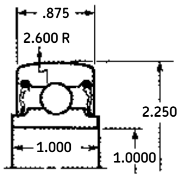
| MRC bearing number [1] | Basic interchange | | | | | |
|---|---|---|---|---|---|---|
| | SKF | BCA | Hoover / NSK | McGill | NDH | Split |
| **204SZZ27** | BNTB316574 | — | — | — | — | — |
| **205SZZ29** | — | — | — | — | — | — |
| **207SZZ20** | — | — | — | — | — | — |
| **207SZZ31** | — | — | — | — | — | — |
| **208SZZ15** | — | MG207FFH | — | BB1705 | — | TB104 |
| **305SZZ3** | — | MG305DD | X421 | BB849 | ZMG605ATY1Z8 | — |
| **305SZZ6** | — | MG305DDA | — | — | — | — |
| **306SZZ5** | 361885 | MG306DD | X555 | — | — | — |
| **307SZZ4** | — | — | — | — | — | — |
| **307SZZ9** | — | MG307FFK | X549RS | — | — | — |
| **307SZZ10** | 360858C | MG307FF | X3762S | BB816 | Z99607BTY1Z8 | — |
| **307SZZ14** | — | — | — | — | — | — |
| **307SZZ18** | — | — | — | — | — | — |
| **307SZZ19** | — | — | — | — | — | — |
| **308SZZ4** | — | — | — | — | — | — |
| **308SZZ5** | 362480 | EX4989 | — | BB1747 | — | — |
| **308SZZ6** | — | — | — | — | — | — |
| **309SZZ1** | — | MG309DD | — | BB850 | — | — |
| **309SZZ4** | — | MG309DDA | X501RS | BB1652 | ZMG609XRY1Z8 | — |
| **309SZZ5** | — | — | — | — | — | — |
| **309SZZ9** | — | — | — | — | — | — |
| **309SZZ12** | — | — | — | — | — | — |
| **311SZZ1** | — | — | — | BB16493 | — | — |
| **311SZZ2** | — | — | — | — | — | — |
| **311SZZ5** | — | — | — | — | — | — |

[1] Check availability before designing into new equipment.

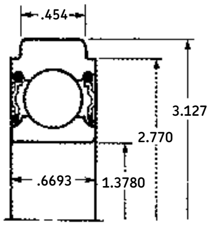
# Mast guide bearings



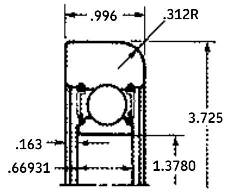
204SZZ27



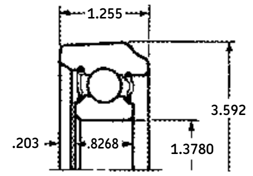
205SZZ29



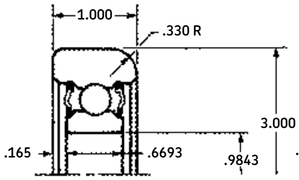
207SZZ20



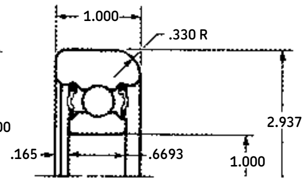
207SZZ31



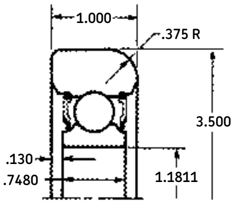
208SZZ15



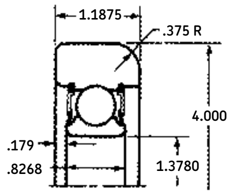
305SZZ3



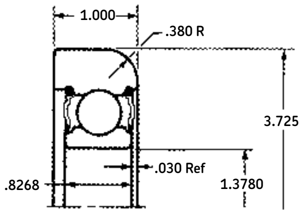
305SZZ6



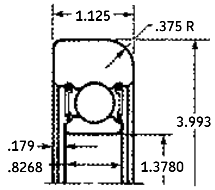
306SZZ5



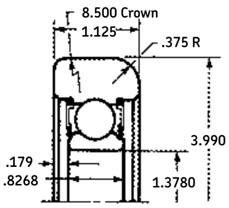
307SZZ4



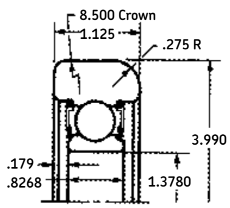
307SZZ9



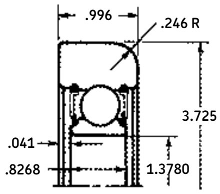
307SZZ10



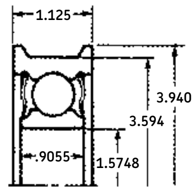
307SZZ14



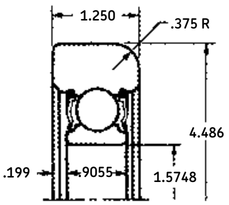
307SZZ18



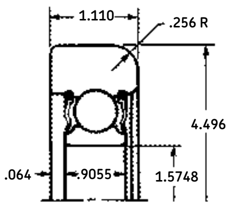
307SZZ19



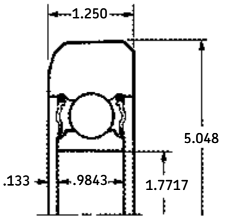
308SZZ4



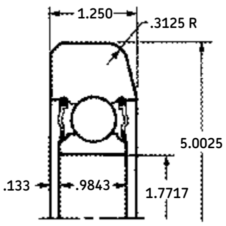
308SZZ5



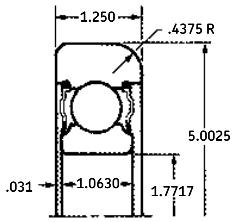
308SZZ6



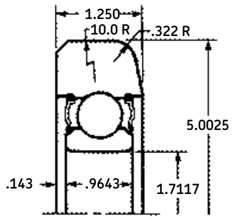
309SZZ1



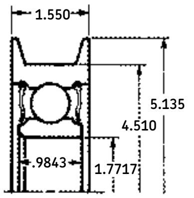
309SZZ4



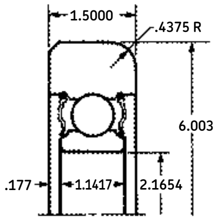
309SZZ5



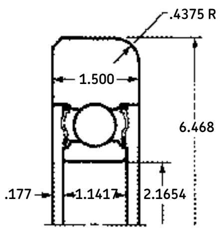
309SZZ9



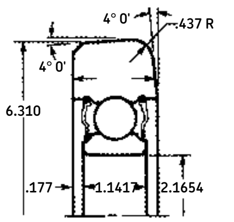
309SZZ12



311SZZ1



311SZZ2



311SZZ5

# Mast guide bearings

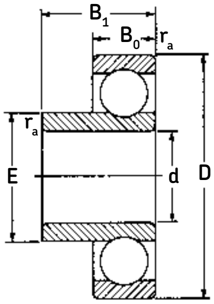
## Original equipment manufacturers part number reference guide

| Original equipment part number | MRC bearing number |
|---|---|
| **Allis Chamers** | |
| 1001732 | **208-SZZ-15** |
| 1002841-02 | **5309-BZZ-1** |
| 1005603 | **309-SZZ-4** |
| 4756413 | **5206-BKFF-1** |
| 4769905 | **5306-BZZ-1** |
| 4774102 | **5108-BZZ-1** |
| 4797550 | **5209-BZZ-1** |
| 4798050 | **5210-BZZ-1** |
| 4803599 | **5109-BZZ-2** |
| 4803665 | **5109-BZZ-1** |
| 4812920 | **307-SZZ-9** |
| 4817265 | **207-SZZ-20** |
| 4820659 | **309-SZZ-4** |
| 4832744 | **311-SZZ-2** |
| 4842106 | **5209-BZZ-2** |
| 4859065 | **5109-BZZ-3** |
| 4863104 | **5309-RZZ-1** |
| 48206693 | **309-SZZ-4** |
| 71005603 | **309-SZZ-4** |
| 8612154 | **311-SZZ-5** |
| **American Manufacturing Co.** | |
| 305-SZZ-3 | **305-SZZ-3** |
| 305-SZZ-6 | **305-SZZ-6** |
| 307-SZZ-10 | **307-SZZ-10** |
| 309-SZZ-4 | **309-SZZ-4** |
| **Arrow Fork Lift** | |
| 35A11111 | **307-SZZ-8** |
| 305-SZZ-3 | **305-SZZ-3** |
| 306-SZZ-5 | **306-SZZ-5** |
| 307-SZZ-10 | **307-SZZ-10** |
| 309-SZZ-1 | **309-SZZ-1** |
| 309-SZZ-4 | **309-SZZ-4** |
| 5108-BZZ-1 | **5108-BZZ-1** |
| 5208-BTZ-1 | **5208-BTZ-1** |
| 185531 | **208-SZZ-16** |
| 746623 | **305-SZZ-3** |
| 789401 | **308-SZZ-1** |
| 4812920 | **307-SZZ-9** |
| **Baker Material Handling** | |
| 102916 | **206-SZZ-16** |
| 104744 | **309-SZZ-4** |
| 105475 | **306-SZZ-5** |
| 105476 | **204-SZZ-20** |
| 120891 | **307-SZZ-10** |
| 504001 | **307-SZZ-10** |
| 504002 | **309-SZZ-4** |
| **Barrett Electronics** | |
| A10650 | **5306-BZZ-1** |
| A27690-2 | **307-SZZ-10** |

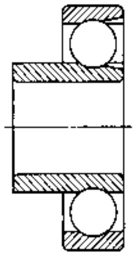
| Original equipment part number | MRC bearing number |
|---|---|
| **Caterpillar Tractor** | |
| 091132 | **307-SZZ-14** |
| 308918 | **305-SZZ-3** |
| 314046 | **309-SZZ-9** |
| 314047 | **309-SZZ-1** |
| 346114 | **308-SZZ-4** |
| 371202 | **307-SZZ-18** |
| **Clark Equipment** | |
| 342957 | **307-SZZ-10** |
| 665619 | **208-SZZ-9** |
| 738752-J | **309-SZZ-1** |
| 746623 | **305-SZZ-3** |
| 746624 | **307-SZZ-10** |
| 996829 | **307-SZZ-10** |
| 1654614 | **309-SZZ-4** |
| 1695854 | **306-SZZ-5** |
| 1697663 | **311-SZZ-1** |
| 1764714 | **5316-SZZ-1** |
| 2306335 | **307-SZZ-11** |
| 2306336 | **305-SZZ-7** |
| 2326653 | **308-SZZ-5** |
| 2357128 | **309-SZZ-12** |
| 2357723 | **308-SZZ-6** |
| 2359625 | **204-SZZ-27** |
| 2359446 | **5309-BZZ-2** |
| 2359447 | **5307-BZZ-1** |
| **Criterion Engineering Ltd.** | |
| 205-SZZ-29 | **205-SZZ-29** |
| 305-SZZ-6 | **305-SZZ-6** |
| 309-SZZ-4 | **309-SZZ-4** |
| **Crown Controls** | |
| 74020-B | **305-SZZ-3** |
| 74668-1 | **307-SZZ-10** |
| 79943 | **309-SZZ-4** |
| **Dyna-Power Corporation** | |
| R1 | **307-SZZ-10** |
| **Eaton Corporation** | |
| 260100-18-001-00 | **307-SZZ-16** |
| **Fiat-Allis** | |
| 74820659 | **309-SZZ-4** |
| 74832744 | **311-SZZ-2** |
| **Hyster** | |
| 87905 | **307-SZZ-10** |
| 89219 | **5205-BKZZ-1** |
| 129002 | **5206-BKZZ-1** |
| 143493 | **5208-BKT-1** |
| 185530 | **208-SZZ-15** |
| 185531 | **208-SZZ-16** |
| 186711 | **5208-BTT-2** |
| 193557 | **5208-BTZ-1** |
| 212956 | **307-SZZ-10** |
| 231020 | **5207-BKZZ-1** |

| Original equipment part number | MRC bearing number |
|---|---|
| **K-D Manufacturing Co.** | |
| R2 | **309-SZZ-4** |
| R-186 | **5309-RZZ-1** |
| R 5182 | **308-SZZ-4** |
| 307-SZZ-10 | **307-SZZ-10** |
| 309-SZZ-1 | **309-SZZ-1** |
| **Knickerbocker Co.** | |
| 30451 | **307-SZZ-10** |
| 30487 | **305-SZZ-3** |
| 30719 | **309-SZZ-4** |
| **Massey Ferguson** | |
| 311-SZZ-1 | **311-SZZ-1** |
| 672896M1 | **309-SZZ-1** |
| **Pettibone Corporation** | |
| 31486 | **206-SZZ-16** |
| F11201 | **307-SZZ-10** |
| **Pettibone-Mercury** | |
| 30076 | **206-SZZ-16** |
| 33569 | **309-SZZ-4** |
| 33799 | **307-SZZ-10** |
| **Petti-Mulliken** | |
| F11205 | **307-SZZ-10** |
| P45900 | **309-SZZ-4** |
| **Raymond** | |
| 449033 | **309-SZZ-4** |
| **Schreck** | |
| 31-42014 | **307-SZZ-10** |
| 31-42015 | **309-SZZ-4** |
| 31-43450 | **305-SZZ-3** |
| **Taylor Machine Works** | |
| 309-SZZ-1 | **309-SZZ-1** |
| **Towmotor Corporation: see Caterpillar Tractor** | |
| **White Farm Equipment** | |
| 20-3004059 | **309-SZZ-5** |
| **White Material Handling** | |
| 35A11111 | **307-SZZ-8** |
| 35A12631 | **307-SZZ-10** |
| **Wiggins Lift Co.** | |
| 307-SZZ-10 | **307-SZZ-10** |
| 309-SZZ-1 | **309-SZZ-1** |
| 309-SZZ-4 | **309-SZZ-4** |
| 311-SZZ-1 | **311-SZZ-1** |
| 311-SZZ-2 | **311-SZZ-2** |

# Wide inner ring medium series




SWI
300SWI Non-filling
notch type



WI
300WI Filling
notch type

To determine bearing life, refer to page 47 for SWI, and page 68 for WI.

| | Bore | | Outside diameter | | Width | | | | | | Fillet radius[1] | | | | Basic radial load rating | | | | Speed rating[2] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | Dynamic | | Static | | | |
| MRC bearing number | d | | D | | $B_0$ | | $B_1$ | | E | | $r_a$ | | $ZD^2$ | | C[3] | | $C_0$ | | Grease | Oil |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | N | lbf | N | lbf | rpm | rpm |
| **305SWI** | 25 | **.9843** | 62 | **2.4409** | 17 | **.6693** | 25.40 | **1** | 38.1 | **1.499** | 1.0 | **.04** | 850 | **1.32** | 20 800 | **4 680** | 11 200 | **2 520** | 11 000 | 14 000 |
| **306SWI** | 30 | **1.1811** | 72 | **2.8346** | 19 | **.7480** | 30.16 | **1 3/6** | 43.1 | **1.698** | 1.0 | **.04** | 1 290 | **2.00** | 29 600 | **6 650** | 16 600 | **3 730** | 9 000 | 11 000 |
| **307SWI** | 35 | **1.3780** | 80 | **3.1496** | 21 | **.8268** | 34.93 | **1 3/8** | 48.7 | **1.917** | 1.5 | **.06** | 1 630 | **2.53** | 36 400 | **8 180** | 20 800 | **4 680** | 8 500 | 10 000 |
| **309SWI** | 45 | **1.7717** | 100 | **3.9370** | 25 | **.9843** | 39.69 | **1 9/16** | 61.1 | **2.405** | 1.5 | **.06** | 2 440 | **3.78** | 52 700 | **11 900** | 31 500 | **7 080** | 6 700 | 8 000 |
| **310SWI** | 50 | **1.9685** | 110 | **4.3307** | 27 | **1.0630** | 44.45 | **1 3/4** | 67.5 | **2.659** | 2.0 | **.08** | 2 900 | **4.50** | 61 800 | **13 900** | 38 000 | **8 540** | 6 300 | 7 500 |
| **311SWI** | 55 | **2.1654** | 120 | **4.7244** | 29 | **1.1417** | 49.21 | **1 15/16** | 74.0 | **2.915** | 2.0 | **.08** | 3 410 | **5.28** | 71 500 | **16 100** | 45 000 | **10 100** | 5 600 | 6 700 |
| **313SWI** | 65 | **2.5591** | 140 | **5.5118** | 33 | **1.2992** | 58.74 | **2 5/16** | 85.1 | **3.350** | 2.0 | **.08** | 4 540 | **7.03** | 92 300 | **20 800** | 60 000 | **13 500** | 4 800 | 5 600 |
| **315SWI** | 75 | **2.9528** | 160 | **6.2992** | 37 | **1.4567** | 68.26 | **2 11/16** | 98.9 | **3.895** | 2.0 | **.08** | 6 530 | **10.1** | 121 000 | **27 200** | 85 000 | **19 100** | 4 300 | 5 000 |
| **318SWI** | 90 | **3.5433** | 190 | **7.4803** | 43 | **1.6929** | 73.03 | **2 7/8** | 121.0 | **4.750** | 2.5 | **.10** | 7 280 | **11.3** | 133 000 | **29 900** | 98 000 | **22 000** | 3 400 | 4 000 |
| **320SWI** | 100 | **3.9370** | 215 | **8.4646** | 47 | **1.8504** | 82.55 | **3 1/4** | 132.0 | **5.210** | 2.5 | **.10** | 11 600 | **18.0** | 182 000 | **40 900** | 150 000 | **33 700** | 3 000 | 3 600 |
| **308WI**[4] | 40 | **1.5748** | 90 | **3.5433** | 23 | **.9055** | 36.51 | **1 7/16** | 54.8 | **2.159** | 1.5 | **.06** | 2 770 | **4.30** | 46 800 | **10 500** | 36 000 | **8 090** | 6 200 | 7 500 |
| **311WI** | 55 | **2.1654** | 120 | **4.7244** | 29 | **1.1417** | 44.45 | **1 3/4** | 72.7 | **2.863** | 2.0 | **.08** | 4 690 | **7.26** | 74 800 | **16 800** | 61 000 | **13 700** | 4 600 | 5 600 |
| **312WI**[4] | 60 | **2.3622** | 130 | **5.1181** | 31 | **1.2205** | 53.98 | **2 1/8** | 79.1 | **3.114** | 2.0 | **.08** | 5 430 | **8.42** | 91 300 | **20 500** | 78 000 | **17 500** | 4 300 | 5 300 |
| **314WI**[4] | 70 | **2.7559** | 150 | **5.9055** | 35 | **1.3780** | 63.50 | **2 1/2** | 94.5 | **3.719** | 2.0 | **.08** | 7 740 | **12.0** | 114 000 | **25 600** | 102 000 | **22 900** | 3 700 | 4 500 |
| **315WI**[4] | 75 | **2.9528** | 160 | **6.2992** | 37 | **1.4567** | 68.26 | **2 11/16** | 101.0 | **3.976** | 2.0 | **.08** | 8 740 | **13.6** | 125 000 | **28 000** | 116 000 | **26 000** | 3 500 | 4 300 |
| **316WI**[4] | 80 | **3.1496** | 170 | **6.6929** | 39 | **1.5354** | 68.26 | **2 11/16** | 109.0 | **4.282** | 2.0 | **.08** | 9 470 | **14.7** | 138 000 | **31 000** | 129 000 | **29 000** | 3 300 | 4 000 |
| **318WI**[4] | 90 | **3.5433** | 190 | **7.4803** | 43 | **1.6929** | 73.03 | **2 7/8** | 121.0 | **4.750** | 2.5 | **.10** | 12 100 | **18.8** | 157 000 | **35 300** | 160 000 | **36 000** | 2 800 | 3 400 |

1) Fillet radius indicates maximum fillet radius on shaft or in housing which bearing corner will clear.
2) Listed values are for pressed steel or polyamide cage, ABEC-1.
The values have been determined through historical application and practice. For a more complete explanation, see page 272.
3) Rating for one million revolutions or 500 hours at 33 1/3 rpm.
4) Check availability before designing into new equipment.

# Engineering data

# Section 3-Engineering data

## Table of contents

page

# Duplex bearings

An MRC duplex bearing is specifically manufactured with a controlled relationship between the axial location of the inner and outer ring faces. Duplex bearings are ordinarily supplied as half pairs unless they are high precision machine tool bearings that typically come in pairs. Combinations of three or more bearings are also available.

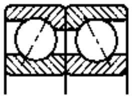
MRC duplex bearings may be used to advantage in applications where:

1 Axial and radial deflections must be held to a minimum
2 Maximum radial capacity is required
3 Heavy single direction or reversing thrust loads must be supported
4 Axial shaft location must be maintained under reversing thrust loads
5 Moment loading is present

## Standard methods of mounting

Duplex bearings can be mounted in three different ways to suit different loading conditions and requirements for rigidity. The three different positions bear the identification symbols "DB," "DF," and "DT".

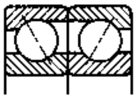
### DB—Back-to-back



The sketch above shows the back-to-back (DB) position where the two halves are placed so that the contact angle lines of the two bearings diverge inwardly. For all MRC duplex bearings, this means that the marked faces of the outer rings are adjacent. 7000 series and type R bearings have the low shoulder sides of the outer rings facing outward.

A DB pair may be used to carry: (1) heavy radial loads; (2) combined radial and thrust loads; (3) reversing thrust loads; (4) moment loads. Due to its construction, the DB pair has great angular rigidity and may be used in applications where it is necessary to restrict misalignment or shaft deflection. DB pairs are axially clamped on the shaft but may float in the housing to provide for thermal expansion.

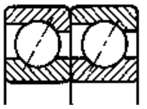
### DF—Face-to-face



This sketch shows the face-to-face (DF) position, where the two halves are placed so that the contact angle lines of the two bearings converge inwardly. For all MRC duplex bearings, this means that the unmarked faces of the outer rings are together. On all angular contact and type R bearings, the low shoulder sides of the outer rings will be adjacent.

The DF position may be used to advantage where the duplex pair carries: (1) a heavy radial load; (2) a combined radial and thrust load; (3) a reversing thrust load. This mounting arrangement allows the bearings to handle a small amount of misalignment. DF pairs are axially clamped in the housing and on the shaft.

### DT—Tandem



This illustration shows the tandem mounting arrangement, where the two halves are placed so that the contact angle lines are parallel. For all MRC duplex bearings, this means that the stamped face of one bearing is in contact with the unstamped face of the other bearing.

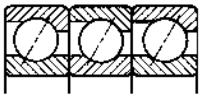
The DT mounting is used to carry extremely high thrust loads in one direction where high speeds or space limitations prevent the use of a larger bearing.

# Duplex bearings

## Special methods of mounting

The three methods of mounting duplex pairs—DB, DF, and DT—are basic. However, other combinations may frequently be used to advantage. A few of these combinations are shown below.

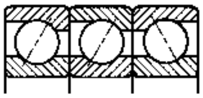
### Duplex stack of three bearings (1½ pair) mounted in tandem



This arrangement shows three bearings mounted in the tandem relationship and will provide greater thrust load carrying capacity, since three bearings are sharing the thrust load.

Additional thrust carrying capacity may be obtained by increasing the number of bearings in the stack.

### Duplex arrangement of a DT pair mounted in DB relationship with a single bearing

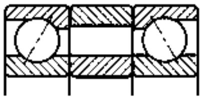


An arrangement such as this will provide extremely high load-carrying capacity in the direction of the heavy outer ring shoulder of the two tandem mounted bearings as well as considerable reversing thrust. If the thrust load in both directions is equal in magnitude and duration, an arrangement of four bearings could be used in which a DT pair would be mounted in DB relationship to another DT pair. The set would have the suffix DTDB.

### Duplex arrangement of a DT mounted in DF relationship with a single bearing

This arrangement provides the same capabilities as the DB mounting except the bearings are mounted in a DF relationship. The set would have the suffix DTDF.

### DB pair separated by spacers



It is sometimes desirable to separate duplex bearings by equal length spacers mounted between the two inner rings and the two outer rings. This mounting arrangement is desirable when the pair is subjected to a heavy moment load, when it is necessary to minimize shaft deflection, or when the bearings are running too hot next to each other. Care should be taken to make certain that these spacers are parallel and equal in length.

### Single bearings (half pair)—DU, DS, DE

MRC bearings with controlled axial relationship of faces are available as single bearings (half pair). These are ordinarily specified when the customer uses duplex bearings in a number of different mounting arrangements and wishes to simplify the problem of stocking prearranged pairs. Single duplex bearings are ground for universal mounting and may be matched with any other bearing from a carton having identical markings.

Type DU bearings have flush ground faces and when mounted in pairs and clamped, have neither preload nor endplay.

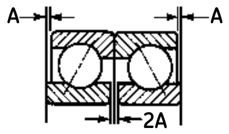
Type DS bearings are furnished with preload and are also identified on the bearing with the designation DL, DM, DH or DX for light, medium, heavy, or special preload respectively.

Type DE bearings are furnished with endplay as clamped and are also identified on the bearing with the designation CA, CB, CC or CX for specific endplay values with CX calling for special endplay.

# Duplex bearings

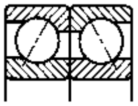
## Before clamping

### Preloaded bearings




Preloaded duplex pairs are made from single bearings having inner and outer rings of equal width but in which the stamped face of the outer ring protrudes beyond the face of the inner. The sketches show this relationship for a DB pair. "A" is known as  the bearing offset.

## Clamped



When the inner and outer rings are clamped together an elastic deformation takes place in the contact between the balls and races. Since the deflection rate of a bearing decreases with increasing load, it is possible to eliminate the major portion of the potential deflection of a bearing under load through preloading.

In order to suit the customers' application requirements, MRC bearings are available with light, medium, heavy or special preload. Please consult our Technical Services Department for the proper selection of preload.

### Endplay

Duplex pairs with endplay are made from single bearings having inner and outer rings of equal width but in which the face of the inner protrudes beyond the stamped face of the outer. Endplay in duplex pairs is desirable where there is misalignment, high operating temperatures or when the bearings are mounted with a heavy press fit on the shaft and/or in the housing.

### Interchangeability

Types DU, DS and DE (single bearings) may be mounted in the DB, DF, or DT relationship. However, these bearings should not be used with bearings from any other box unless the markings on both boxes are identical.

In the case of making replacements for bearings which have been installed and run, we recommend that both bearings be replaced. This avoids the dangers involved in attempting to match two bearings, one of which has unknown internal characteristics.

### Shaft and housing fitting practices

The control of the axial location of inner and outer ring faces found in all duplex bearings is dependent upon the internal clearance in the bearing. A change in internal clearance will result in a change in the flushness or offset of the faces.

In mounting a duplex pair, it is particularly important  that excessive press fits on the shaft or in the housing be avoided. Otherwise, the individual bearings in the set will be axially preloaded against each other which might result in excessive heating and early failure. In those cases where heavy press fits are imperative, duplex sets with endplay should be used.

Refer to page 238 for mounting recommendations.

### Packaging

Types DB, DF, and DT duplex pairs are ordinarily supplied wired together in the same relationship as they are to be used. The pair is then packaged together and the carton is stamped with the appropriate symbol.

Types DU, DS, and DE (single bearings) are typically packed separately. If special packaging is required, please consult MRC's Application Engineering group.

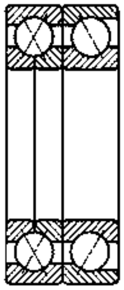
# Duplex bearings

## 97000U and 97000UP series

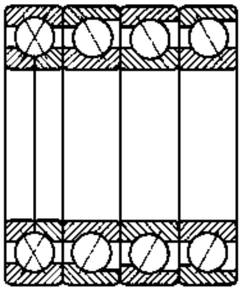
The 97000U series consists of a matched set of 9000UDT (split inner ring) and 7000DT flush ground bearings having a 29° contact angle. The 97000UP series consists of a matched set of 9000UPDT (split inner ring) and 7000PDT flush ground bearings having a 40° contact angle.

### Typical mountings

The bearings are usually mounted in pairs. This arrangement divides the thrust load in one direction while accommodating reversing thrust load. To increase thrust capacity in one direction it is possible to mount additional bearings in tandem. The number of bearings in the set will be identified by a number at the end of the bearing designation. For example, a set of three bearings (triplex) is identified as the 97000U3 and a set of four (quadruplex) as the 97000U4. Numbers 2 through 9 only will apply. Numbers 10 and higher indicate some special characteristic. Illustration of typical mountings are shown below.



97000U2

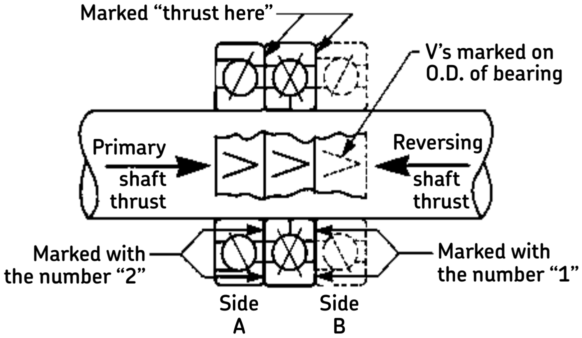


98000U4

### Mounting orientation

**Caution:** To obtain proper load distribution, it is necessary to orient mating bearing ring faces, and the inner ring halves of the split ring bearing (9000UDT), according to the illustration below. The counterbored outer ring bearing (7000DT) can be mounted either at side (A) or side (B) of the split ring bearing as shown.

In addition, each bearing in the set will be marked with a "V" etched on the outer ring surface with the apex pointing in the main shaft thrust direction.




Notes:

The numbers "1" and "2" marked on the bearing with the split inner ring, are to keep the proper relationship between the inner rings and the outer ring.

The counterbore bearing(s) can be mounted on either side (A) or (B) (above or below) the split bearing, provided that the "V" 's marked on the O.D. of bearings are pointed in the direction of the "primary shaft thrust".

### Bearing identification marking

The box and bearings will be marked according to the following example.

Bearing size: 97314UP2

Box: 97314UP2-BRZ 0001

BRZ=Machined bronze cage

0001=MRC specification code suffix

Bearing: All bearings in the set will be marked

97314UP2 0001

Previous marking: The bearing set was identified on the box as 9314UPDT/7314PDT; and on the bearings as 9314UPDT and 7314PDT.

# ABEC-1 ABMA/ISO tolerances for single-row, double-row, and duplex bearings

## Tolerances in inches (shaded) and millimeters

### Inner ring

| Bore diameter (mm) | | Over<br>incl | 2.5<br>10 | 10<br>18 | 18<br>30 | 30<br>50 | 50<br>80 | 80<br>120 | 120<br>150 | 150<br>180 | 180<br>250 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bore diameter | +.0000 | | –.0003 | –.0003 | –.0004 | –.00045 | –.0006 | –.0008 | –.0010 | –.0010 | –.0012 |
| | | | –.008 | –.008 | –.010 | –.012 | –.015 | –.020 | –.025 | –.025 | –.030 |
| Bore out-of-round (Max) | | 1800, 1900 series | .0004 | .0004 | .0005 | .0006 | .00075 | .0010 | .0012 | .0012 | .0015 |
| | | | .010 | .010 | .013 | .015 | .019 | .025 | .031 | .031 | .038 |
| | | 100 series | .0003 | .0003 | .0004 | .00045 | .00075 | .0010 | .0012 | .0012 | .0015 |
| | | | .008 | .008 | .010 | .012 | .019 | .025 | .031 | .031 | .038 |
| | | 200 300 400 series | .00025 | .00025 | .0003 | .00035 | .00045 | .0006 | .00075 | .00075 | .0009 |
| | | | .006 | .006 | .008 | .009 | .011 | .015 | .019 | .019 | .023 |
| Radial runout (Max) | | | .0004 | .0004 | .0005 | .0006 | .0008 | .0010 | .0012 | .0012 | .0016 |
| | | | .010 | .010 | .013 | .015 | .020 | .025 | .030 | .030 | .040 |
| Width variation (Max) | | | .0006 | .0008 | .0008 | .0008 | .0010 | .0010 | .0012 | .0012 | .0012 |
| | | | .015 | .020 | .020 | .020 | .025 | .025 | .030 | .030 | .030 |
| Side runout with bore (Max) | | | .0008 | .0008 | .0008 | .0008 | .0010 | .0010 | .0012 | .0012 | .0012 |
| | | | .020 | .020 | .020 | .020 | .025 | .025 | .030 | .030 | .030 |
| Raceway runout with side (Max) | | | .0008 | .0008 | .0008 | .0008 | .0010 | .0010 | .0012 | .0012 | .0016 |
| | | | .020 | .020 | .020 | .020 | .025 | .025 | .030 | .030 | .040 |
| Ring width single bearing | +.0000 | | –.0047 | –.0047 | –.0047 | –.0047 | –.0059 | –.0079 | –.0098 | –.0098 | –.0118 |
| | | | –.120 | –.120 | –.120 | –.120 | –.150 | –.200 | –.250 | –.250 | –.300 |
| Ring width duplex bearing | +.0000 | | –.0098 | –.0098 | –.0098 | –.0098 | –.0150 | –.0150 | –.0197 | –.0197 | –.0197 |
| | | | –.250 | –.250 | –.250 | –.250 | –.380 | –.380 | –.500 | –.500 | –.500 |

### Outer ring

| Outside diameter (mm) | | Over<br>incl | 6<br>18 | 18<br>30 | 30<br>50 | 50<br>80 | 80<br>120 | 120<br>150 | 150<br>180 | 180<br>250 | 250<br>315 | 315<br>400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Outside diameter | +.0000 | | –.0003 | –.00035 | –.00045 | –.0005 | –.0006 | –.0007 | –.0010 | –.0012 | –.0014 | –.0016 |
| | | | –.008 | –.009 | –.011 | –.013 | –.015 | –.018 | –.025 | –.030 | –.035 | –.040 |
| Outside diameter out-of-round (Max) | | 1800, 1900 series | .0004 | .00045 | .00055 | .00065 | .00075 | .0009 | .0012 | .0015 | .0017 | .0020 |
| | | | .010 | .012 | .014 | .016 | .019 | .023 | .031 | .038 | .044 | .050 |
| | | 100 series | .0003 | .00035 | .00045 | .0005 | .00075 | .0009 | .0012 | .0015 | .0017 | .0020 |
| | | | .008 | .009 | .011 | .013 | .019 | .023 | .031 | .038 | .044 | .050 |
| | | 200, 300, 400 series | .00025 | .0003 | .0003 | .0004 | .00045 | .00055 | .00075 | .0009 | .0010 | .0012 |
| | | | .006 | .007 | .008 | .010 | .011 | .014 | .019 | .023 | .026 | .030 |
| | | 100, 200, 300, 400 series shielded* and sealed | .0004 | .00045 | .00065 | .0008 | .0010 | .0012 | .0015 | — | — | — |
| | | | .010 | .012 | .016 | .020 | .026 | .030 | .038 | — | — | — |
| Radial runout (Max) | | | .0006 | .0006 | .0008 | .0010 | .0014 | .0016 | .0018 | .0020 | .0024 | .0028 |
| | | | .015 | .015 | .020 | .025 | .035 | .040 | .045 | .050 | .060 | .070 |
| Width variation (Max) | | | Identical to inner ring of same bearing | | | | | | | | | |
| Outside diameter runout with side (Max) | | | .0008 | .0008 | .0008 | .0010 | .0010 | .0012 | .0012 | .0012 | .0014 | .0016 |
| | | | .020 | .020 | .020 | .025 | .025 | .030 | .030 | .030 | .035 | .040 |
| Raceway runout with side (Max) | | | .0012 | .0012 | .0012 | .0012 | .0014 | .0016 | .0020 | .0024 | .0028 | .0031 |
| | | | .030 | .030 | .030 | .030 | .035 | .040 | .050 | .060 | .070 | .080 |
| Ring width single bearing | | | Identical to inner ring of same bearing | | | | | | | | | |
| Ring width duplex bearing | | | | | | | | | | | | |

*No values established for 1800 and 1900 series.

# ABEC-3 ABMA/ISO tolerances for single-row, double-row, and duplex bearings

## Tolerances in inches (shaded) and millimeters

### Inner ring

| Bore diameter (mm) | | Over<br>incl | 2.5<br>10 | 10<br>18 | 18<br>30 | 30<br>50 | 50<br>80 | 80<br>120 | 120<br>150 | 150<br>180 | 180<br>250 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bore diameter | +.0000 | | –.0003 | –.0003 | –.0003 | –.00045 | –.0005 | –.0006 | –.0007 | –.0007 | –.00085 |
| | | | –.007 | –.007 | –.008 | –.010 | –.012 | –.015 | –.018 | –.018 | –.022 |
| Bore out-of-round (Max) | | 1800, 1900 series | .00035 | .00035 | .0004 | .0005 | .0006 | .00075 | .0009 | .0009 | .0011 |
| | | | .009 | .009 | .010 | .013 | .015 | .019 | .023 | .023 | .028 |
| | | 100 series | .0003 | .0003 | .0003 | .0004 | .0006 | .00075 | .0009 | .0009 | .0011 |
| | | | .007 | .007 | .008 | .010 | .015 | .019 | .023 | .023 | .028 |
| | | 200, 300, 400 series | .0002 | .0002 | .00025 | .0003 | .00035 | .00045 | .00055 | .00055 | .00065 |
| | | | .005 | .005 | .006 | .008 | .009 | .011 | .014 | .014 | .017 |
| Radial runout (Max) | | | .00025 | .0003 | .0003 | .0004 | .0004 | .0005 | .0007 | .0007 | .0008 |
| | | | .006 | .007 | .008 | .010 | .010 | .013 | .018 | .018 | .020 |
| Width variation (Max) | | | .0006 | .0008 | .0008 | .0008 | .0010 | .0010 | .0012 | .0012 | .0012 |
| | | | .015 | .020 | .020 | .020 | .025 | .025 | .030 | .030 | .030 |
| Side runout with bore (Max) | | | .0004 | .0004 | .0004 | .0004 | .0005 | .0005 | .0006 | .0006 | .0006 |
| | | | .010 | .010 | .010 | .010 | .013 | .013 | .015 | .015 | .015 |
| Raceway runout with side (Max) | | | .0006 | .0006 | .0006 | .0006 | .0007 | .0007 | .0009 | .0009 | .0009 |
| | | | .015 | .015 | .015 | .015 | .018 | .018 | .023 | .023 | .023 |
| Ring width single bearing | +.0000 | | –.0047 | –.0047 | –.0047 | –.0047 | –.0059 | –.0079 | –.0098 | –.0098 | –.0118 |
| | | | –.120 | –.120 | –.120 | –.120 | –.150 | –.200 | –.250 | –.250 | –.300 |
| Ring width duplex bearing | +.0000 | | –.0098 | –.0098 | –.0098 | –.0098 | –.0150 | –.0150 | –.0197 | –.0197 | –.0197 |
| | | | –.250 | –.250 | –.250 | –.250 | –.380 | –.380 | –.500 | –.500 | –.500 |

### Outer ring

| Outside diameter (mm) | | Over<br>incl | 6<br>18 | 18<br>30 | 30<br>50 | 50<br>80 | 80<br>120 | 120<br>150 | 150<br>180 | 180<br>250 | 250<br>315 | 315<br>400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Outside diameter | +.0000 | | –.0003 | –.0003 | –.0004 | –.0004 | –.0005 | –.0006 | –.0007 | –.0008 | –.0010 | –.0011 |
| | | | –.007 | –.008 | –.009 | –.011 | –.013 | –.015 | –.018 | –.020 | –.025 | –.028 |
| Outside diameter out-of-round (Max) | | 1800, 1900 series | .0004 | .0004 | .0004 | .0006 | .0006 | .0007 | .0009 | .0010 | .0012 | .0014 |
| | | | .009 | .010 | .011 | .014 | .016 | .019 | .023 | .025 | .031 | .035 |
| | | 100 series | .0003 | .0003 | .0004 | .0004 | .0006 | .0007 | .0009 | .0010 | .0012 | .0014 |
| | | | .007 | .008 | .009 | .011 | .016 | .019 | .023 | .025 | .031 | .035 |
| | | 200, 300, 400 series | .0002 | .0002 | .0003 | .0003 | .0004 | .0004 | .0006 | .0006 | .0007 | .0008 |
| | | | .005 | .006 | .007 | .008 | .010 | .011 | .014 | .015 | .019 | .021 |
| | | 100, 200, 300, 400 series shielded* and sealed | .0004 | .0004 | .0005 | .0006 | .0008 | .0010 | .0012 | — | — | — |
| | | | .009 | .010 | .013 | .016 | .020 | .025 | .030 | — | — | — |
| Radial runout (Max) | | | .0003 | .0004 | .0004 | .0005 | .0007 | .0008 | .0009 | .0010 | .0012 | .0014 |
| | | | .008 | .009 | .010 | .013 | .018 | .020 | .023 | .025 | .030 | .035 |
| Width variation (Max) | | | Identical to inner ring of same bearing | | | | | | | | | |
| Outside diameter runout with side (Max) | | | .0004 | .0004 | .0004 | .0005 | .0005 | .0006 | .0006 | .0006 | .0007 | .0008 |
| | | | .010 | .010 | .010 | .013 | .013 | .015 | .015 | .015 | .018 | .020 |
| Raceway runout with side (Max) | | | .0008 | .0008 | .0008 | .0008 | .0009 | .0010 | .0012 | .0014 | .0016 | .0018 |
| | | | .020 | .020 | .020 | .020 | .023 | .025 | .030 | .035 | .040 | .045 |
| Ring width single bearing | | | Identical to inner ring of same bearing | | | | | | | | | |
| Ring width duplex bearing | | | | | | | | | | | | |

*No values established for 1800 and 1900 series.

# ABEC-5 ABMA/ISO tolerances for single-row, double-row, and duplex bearings

## Tolerances in inches (shaded) and millimeters

### Inner ring

| Bore diameter (mm) | | Over<br>incl | 2.5<br>10 | 10<br>18 | 18<br>30 | 30<br>50 | 50<br>80 | 80<br>120 | 120<br>150 | 150<br>180 | 180<br>250 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bore diameter | +.0000 | | –.0002 | –.0002 | –.00025 | –.0003 | –.00035 | –.0004 | –.0005 | –.0005 | –.0006 |
| | | | –.005 | –.005 | –.006 | –.008 | –.009 | –.010 | –.013 | –.013 | –.015 |
| Bore out-of-round (Max) | | 1800, 1900 series | .0002 | .0002 | .00025 | .0003 | .00035 | .0004 | .0005 | .0005 | .0006 |
| | | | .005 | .005 | .006 | .008 | .009 | .010 | .013 | .013 | .015 |
| | | 100,200, 300, 400 series | .00015 | .00015 | .0002 | .00025 | .0003 | .0003 | .0004 | .0004 | .00045 |
| | | | .004 | .004 | .005 | .006 | .007 | .008 | .010 | .010 | .012 |
| Radial runout (Max) | | | .00015 | .00015 | .00015 | .0002 | .0002 | .00025 | .0003 | .0003 | .0004 |
| | | | .004 | .004 | .004 | .005 | .005 | .006 | .008 | .008 | .010 |
| Width variation (Max) | | | .0002 | .0002 | .0002 | .0002 | .00025 | .0003 | .0003 | .0003 | .0004 |
| | | | .005 | .005 | .005 | .005 | .006 | .007 | .008 | .008 | .010 |
| Side runout with bore (Max) | | | .0003 | .0003 | .0003 | .0003 | .0003 | .00035 | .0004 | .0004 | .00045 |
| | | | .007 | .007 | .008 | .008 | .008 | .009 | .010 | .010 | .011 |
| Raceway runout with side (Max) | | | .0003 | .0003 | .0003 | .0003 | .0003 | .00035 | .0004 | .0004 | .0005 |
| | | | .007 | .007 | .008 | .008 | .008 | .009 | .010 | .010 | .013 |
| Ring width single bearing | +.0000 | | –.0016 | –.0031 | –.0047 | –.0047 | –.0059 | –.0079 | –.0098 | –.0098 | –.0118 |
| | | | –.040 | –.080 | –.120 | –.120 | –.150 | –.200 | –.250 | –.250 | –.300 |
| Ring width duplex bearing | +.0000 | | –.0098 | –.0098 | –.0098 | –.0098 | –.0098 | –.0150 | –.0150 | –.0150 | –.0197 |
| | | | –.250 | –.250 | –.250 | –.250 | –.250 | –.380 | –.380 | –.380 | –.500 |

### Outer ring

| Outside diameter (mm) | | Over<br>incl | 6<br>18 | 18<br>30 | 30<br>50 | 50<br>80 | 80<br>120 | 120<br>150 | 150<br>180 | 180<br>250 | 250<br>315 | 315<br>400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Outside diameter | +.0000 | | –.0002 | –.00025 | –.0003 | –.00035 | –.0004 | –.00045 | –.0005 | –.0006 | –.0007 | –.0008 |
| | | | –.005 | –.006 | –.007 | –.009 | –.010 | –.011 | –.013 | –.015 | –.018 | –.020 |
| Outside diameter out-of-round (Max) | | 1800, 1900 series | .0002 | .00025 | .0003 | .00035 | .0004 | .00045 | .0005 | .0006 | .0007 | .0008 |
| | | | .005 | .006 | .007 | .009 | .010 | .011 | .013 | .015 | .018 | .020 |
| | | 100, 200, 300,400 series | .00015 | .0002 | .0002 | .0003 | .0003 | .0003 | .0004 | .00045 | .00055 | .0006 |
| | | | .004 | .005 | .005 | .007 | .008 | .008 | .010 | .011 | .014 | .015 |
| Radial runout (Max) | | | .0002 | .00025 | .0003 | .0003 | .0004 | .00045 | .0005 | .0006 | .0007 | .0008 |
| | | | .005 | .006 | .007 | .008 | .010 | .011 | .013 | .015 | .018 | .020 |
| Width variation (Max) | | | Identical to inner ring of same bearing | | | | | | | | | |
| Outside diameter runout with side (Max) | | | .0003 | .0003 | .0003 | .0003 | .00035 | .0004 | .0004 | .00045 | .0005 | .0005 |
| | | | .008 | .008 | .008 | .008 | .009 | .010 | .010 | .011 | .013 | .013 |
| Raceway runout with side (Max) | | | .0003 | .0003 | .0003 | .0004 | .00045 | .0005 | .00055 | .0006 | .0007 | .0008 |
| | | | .008 | .008 | .008 | .010 | .011 | .013 | .014 | .015 | .018 | .020 |
| Ring width single bearing | | | Identical to inner ring of same bearing | | | | | | | | | |
| Ring width duplex bearing | | | | | | | | | | | | |

# ABEC-7 ABMA/ISO tolerances for single row, double-row, and duplex bearings

## Tolerances in inches (shaded) and millimeters

### Inner ring

| Bore diameter (mm) | | Over<br>incl | 2.5<br>10 | 10<br>18 | 18<br>30 | 30<br>50 | 50<br>80 | 80<br>120 | 120<br>150 | 150<br>180 | 180<br>250 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bore diameter | +.0000 | | **–.00015** | **–.00015** | **–.0002** | **–.00025** | **–.0003** | **–.0003** | **–.0004** | **–.0004** | **–.00045** |
| | | | –.004 | –.004 | –.005 | –.006 | –.007 | –.008 | –.010 | –.010 | –.012 |
| Bore out-of-round (Max) | | 1800, 1900 series | **.00015** | **.00015** | **.0002** | **.00025** | **.0003** | **.0003** | **.0004** | **.0004** | **.00045** |
| | | | .004 | .004 | .005 | .006 | .007 | .008 | .010 | .010 | .012 |
| | | 100, 200, 300, 400 series | **.0001** | **.0001** | **.00015** | **.0002** | **.0002** | **.00025** | **.0003** | **.0003** | **.00035** |
| | | | .003 | .003 | .004 | .005 | .005 | .006 | .008 | .008 | .009 |
| Radial runout (Max) | | | **.0001** | **.0001** | **.0001** | **.00015** | **.00015** | **.0002** | **.00025** | **.00025** | **.0003** |
| | | | .0025 | .0025 | .003 | .004 | .004 | .005 | .006 | .006 | .008 |
| Width variation (Max) | | | **.0001** | **.0001** | **.0001** | **.0001** | **.00015** | **.00015** | **.0002** | **.0002** | **.00025** |
| | | | .0025 | .0025 | .0025 | .003 | .004 | .004 | .005 | .005 | .006 |
| Side runout with bore (Max) | | | **.0001** | **.0001** | **.00015** | **.00015** | **.0002** | **.0002** | **.00025** | **.00025** | **.0003** |
| | | | .003 | .003 | .004 | .004 | .005 | .005 | .006 | .006 | .007 |
| Raceway runout with side (Max) | | | **.0001** | **.0001** | **.00015** | **.00015** | **.0002** | **.0002** | **.0003** | **.0003** | **.0003** |
| | | | .003 | .003 | .004 | .004 | .005 | .005 | .007 | .007 | .008 |
| Ring width single bearing | +.0000 | | **–.0016** | **–.0031** | **–.0047** | **–.0047** | **–.0059** | **–.0079** | **–.0098** | **–.0098** | **–.0118** |
| | | | –.040 | –.080 | –.120 | –.120 | –.150 | –.200 | –.250 | –.250 | –.300 |
| Ring width duplex bearing | +.0000 | | **–.0098** | **–.0098** | **–.008** | **–.0098** | **–.0098** | **–.0150** | **–.0150** | **–.0150** | **–.0197** |
| | | | –.250 | –.250 | –.250 | –.250 | –.250 | –.380 | –.380 | –.380 | –.500 |

### Outer ring

| Outside diameter (mm) | | Over<br>incl | 6<br>18 | 18<br>30 | 30<br>50 | 50<br>80 | 80<br>120 | 120<br>150 | 150<br>180 | 180<br>250 | 250<br>315 | 315<br>400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Outside diameter | +.0000 | | **–.00015** | **–.0002** | **–.00025** | **–.0003** | **–.0003** | **–.00035** | **–.0004** | **–.00045** | **–.0005** | **–.0006** |
| | | | –.004 | –.005 | –.006 | –.007 | –.008 | –.009 | –.010 | –.011 | –.013 | –.015 |
| Outside diameter out-of-round (Max) | | 1800, 1900 series | **.00015** | **.0002** | **.00025** | **.0003** | **.0003** | **.00035** | **.0004** | **.00045** | **.0005** | **.0006** |
| | | | .004 | .005 | .006 | .007 | .008 | .009 | .010 | .011 | .013 | .015 |
| | | 100, 200, 300,400 series | **.0001** | **.00015** | **.0002** | **.0002** | **.00025** | **.0003** | **.0003** | **.0003** | **.0004** | **.00045** |
| | | | .003 | .004 | .005 | .005 | .006 | .007 | .008 | .008 | .010 | .011 |
| Radial runout (Max) | | | **.0001** | **.00015** | **.0002** | **.0002** | **.00025** | **.0003** | **.0003** | **.0004** | **.00045** | **.0005** |
| | | | .003 | .004 | .005 | .005 | .006 | .007 | .008 | .010 | .011 | .013 |
| Width variation (Max) | | | Identical to inner ring of same bearing | | | | | | | | | |
| Outside diameter runout with side (Max) | | | **.00015** | **.00015** | **.00015** | **.00015** | **.0002** | **.0002** | **.0002** | **.0003** | **.0003** | **.0004** |
| | | | .004 | .004 | .004 | .004 | .005 | .005 | .005 | .007 | .008 | .010 |
| Raceway runout with side (Max) | | | **.0002** | **.0002** | **.0002** | **.0002** | **.00025** | **.0003** | **.0003** | **.0004** | **.0004** | **.0005** |
| | | | .005 | .005 | .005 | .005 | .006 | .007 | .008 | .010 | .010 | .013 |
| Ring width single bearing | | | Identical to inner ring of same bearing | | | | | | | | | |
| Ring width duplex bearing | | | | | | | | | | | | |

# ABEC-9 ABMA/ISO tolerances for single row, double-row, and duplex bearings

## Tolerances in inches (shaded) and millimeters

### Inner ring

| Bore diameter (mm) | | Over<br>incl | 2.5<br>10 | 10<br>18 | 18<br>30 | 30<br>50 | 50<br>80 | 80<br>120 | 120<br>150 | 150<br>180 | 180<br>250 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bore diameter | +.0000 | | **–.0001** | **–.0001** | **–.0001** | **–.0001** | **–.00015** | **–.0002** | **–.0003** | **–.0003** | **–.0003** |
| | | | –.0025 | –.0025 | –.0025 | –.0025 | –.004 | –.005 | –.007 | –.007 | –.008 |
| Bore out-of-round (Max) | | | **.0001** | **.0001** | **.0001** | **.0001** | **.0015** | **.0002** | **.0003** | **.0003** | **.0003** |
| | | | .0025 | .0025 | .0025 | .0025 | .004 | .005 | .007 | .007 | .008 |
| Radial runout (Max) | | | **.00005** | **.00005** | **.0001** | **.0001** | **.0001** | **.0001** | **.0001** | **.0002** | **.0002** |
| | | | .0015 | .0015 | .0025 | .0025 | .0025 | .0025 | .0025 | .005 | .005 |
| Width variation (Max) | | | **.00005** | **.00005** | **.00005** | **.00005** | **.00005** | **.0001** | **.0001** | **.00015** | **.0002** |
| | | | .0015 | .0015 | .0015 | .0015 | .0015 | .0025 | .0025 | .004 | .005 |
| Side runout with bore (Max) | | | **.00005** | **.00005** | **.00005** | **.00005** | **.00005** | **.0001** | **.0001** | **.00015** | **.0002** |
| | | | .0015 | .0015 | .0015 | .0015 | .0015 | .0025 | .0025 | .004 | .005 |
| Raceway runout with side (Max) | | | **.00005** | **.00005** | **.0001** | **.0001** | **.0001** | **.0001** | **.0001** | **.0002** | **.0002** |
| | | | .0015 | .0015 | .0025 | .0025 | .0025 | .0025 | .0025 | .005 | .005 |
| Ring width single bearing | +.0000 | | **–.0016** | **–.0031** | **–.0047** | **–.0047** | **–.0059** | **–.0079** | **–.0098** | **–.0118** | **–.0138** |
| | | | –.040 | –.080 | –.120 | –.120 | –.150 | –.200 | –.250 | –.300 | –.350 |
| Ring width duplex bearing | +.0000 | | **–.0098** | **–.0098** | **–.0098** | **–.0098** | **–.0098** | **–.0150** | **–.0150** | **–.0197** | **–.0197** |
| | | | –.250 | –.250 | –.250 | –.250 | –.250 | –.380 | –.380 | –.500 | –.500 |

### Outer ring

| Outside diameter (mm) | | Over<br>incl | 6<br>18 | 18<br>30 | 30<br>50 | 50<br>80 | 80<br>120 | 120<br>150 | 150<br>180 | 180<br>250 | 250<br>315 | 315<br>400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Outside diameter | +.0000 | | **–.0001** | **–.00015** | **–.00015** | **–.00015** | **–.0002** | **–.0002** | **–.0003** | **–.0003** | **–.0003** | **–.0004** |
| | | | –.0025 | –.004 | –.004 | –.004 | –.005 | –.005 | –.007 | –.008 | –.008 | –.010 |
| Outside diameter out-of-round (Max) | | | **.0001** | **.00015** | **.00015** | **.00015** | **.0002** | **.0002** | **.0003** | **.0003** | **.0003** | **.0004** |
| | | | .0025 | .004 | .004 | .004 | .005 | .005 | .007 | .008 | .008 | .010 |
| Radial runout (Max) | | | **.00005** | **.0001** | **.0001** | **.00015** | **.0002** | **.0002** | **.0002** | **.0003** | **.0003** | **.0005** |
| | | | .0015 | .0025 | .0025 | .004 | .005 | .005 | .005 | .007 | .007 | .008 |
| Width variation (Max) | | | **Identical to inner ring of same bearing** | | | | | | | | | |
| Outside diameter runout with side (Max) | | | **.00005** | **.00005** | **.00005** | **.00005** | **.0001** | **.0001** | **.0001** | **.00015** | **.0002** | **.0003** |
| | | | .0015 | .0015 | .0015 | .0015 | .0025 | .0025 | .0025 | .004 | .005 | .007 |
| Raceway runout with side (Max) | | | **.00005** | **.0001** | **.0001** | **.00015** | **.0002** | **.0002** | **.0002** | **.0003** | **.0003** | **.0003** |
| | | | .0015 | .0025 | .0025 | .004 | .005 | .005 | .005 | .007 | .007 | .008 |
| Ring width single bearing | | | Identical to inner ring of same bearing | | | | | | | | | |
| Ring width duplex bearing | | | | | | | | | | | | |

# Shaft and housing fits

## Table of contents

page

# Shaft and housing fits

## Radial location of bearings

If the load carrying ability of a bearing is to be fully utilized, its rings or washers must be supported around their complete circumference and across the whole width of the raceway. The support must be firm and even and, for inner rings, can be provided by a cylindrical or tapered seating or, for washers, by a flat (plane) support surface. This means that the seatings must be made with adequate accuracy and that they have a surface which is uninterrupted by grooves, holes or other features. In addition the rings must be reliably secured to prevent them from turning on or in their seatings under load. Inadequately or incorrectly secured bearing rings generally produce damage to the bearings and associated components.

A satisfactory radial location and an adequate support can generally only be obtained when the rings are mounted with an appropriate degree of interference. However, when simple mounting and dismounting are desirable, or when axial displacement is required with a non-locating bearing, interference fits cannot be used.

### Selection of fit

When selecting a fit, the factors discussed in the following and the general guidelines in respect of them should be considered.

**1 Conditions of rotation**

Conditions of rotation refer to the movement of the bearing ring being considered in relation to the direction of the load. Essentially there are three different conditions: "rotating load", "stationary load", and "direction of load indeterminate".

If the bearing ring rotates and the load is stationary, or if the ring is stationary and the load rotates so that all points on the raceway are subjected to load in the course of one revolution, the load is defined as a "rotating load". Heavy loads which do not rotate but oscillate (for example, those acting on the outer rings of connecting rod bearings) are generally considered as rotating loads.

"Stationary load" applies if the bearing ring is stationary and the load is also stationary, or if the ring and load rotate at the same speed so that the load is always directed to the same point on the raceway.

Variable external loads, shock loads, vibrations and unbalanced loads in high-speed machines give rise to changes in the direction of load which cannot be accurately described. Such conditions are classified as "direction of load indeterminate".

A bearing ring subjected to a rotating load will turn (creep) on its own seating if mounted with a clearance fit, and wear (fretting corrosion) of the contacting surfaces will occur. To prevent this, interference fits must be used. The degree of interference needed is dictated by the operating conditions (see points 2 and 4).

When a stationary load exists, a bearing ring will not normally turn on its seating. Therefore, the ring need not necessarily have an interference fit unless this is required for other reasons.

When the direction of load is indeterminate and particularly where heavy loads are involved, it is desirable that both rings have an interference fit. For the inner ring, the fit recommended for rotating load is normally used. However, when the outer ring must be free to move axially in the housing and the load is not heavy, a somewhat looser fit than that recommended for rotating load may be used. When interference fits are used on both the inner ring and outer ring, the remaining internal clearance of the bearing should be considered to avoid excessive clearance reduction, i.e. internal preloading.

**2 Magnitude of the load**

The interference fit of a bearing inner ring on its seating will be loosened with increasing load as the ring will expand. Under the influence of rotating load, the ring may begin to creep. The degree of interference must therefore be related to the magnitude of the load: the heavier the load, particularly if it is of shock character, the greater the interference required.

**3 Bearing internal clearance**

An interference fit of a bearing on the shaft or in the housing means that the ring is elastically deformed (expanded or compressed) and the bearing internal clearance reduced. A certain minimum clearance should remain, however (see also "Bearing radial clearance", page 268). The initial clearance and permissible reduction depend on the type and size of the bearing. The reduction in clearance due to the interference fit can be so large that bearings with increased radial clearance have to be used in order to prevent the bearing from becoming preloaded.

**4 Temperature conditions**

In service, bearing rings normally reach a temperature which is higher than that of the components to which they are fitted. This can result in an easing of the fit of the inner ring on its seating, while outer ring expansion may prevent the desired axial displacement of the ring in its housing. Temperature differentials and the direction of heat flow must therefore be carefully considered.

*(continued on next page)*

# Shaft and housing fits

## Radial location of bearings

**5 Running accuracy requirements**

To reduce resilience and vibration, clearance fits should generally not be used for bearings where high demands are placed on running accuracy. Bearing seatings on the shaft and in the housing should be made to narrow dimensional tolerances.

**6 Design and material of shaft and housing**

**Caution: The fit of a bearing ring on its seating must not lead to uneven distortion of the ring (out-of-round).** This can be caused for example by discontinuities in the seating surface. Split housings are therefore not generally suitable where outer rings are to have an interference fit.

To ensure adequate support for bearing rings mounted in thin-walled housings, light alloy housings or on hollow shafts, heavier interference fits than those normally selected for thick-walled steel or cast iron housings or for solid shafts should be used (see also "Fits for hollow shafts", page 254).

For stainless steel shafts, reduced shaft interference or increased bearing internal clearance should be considered because of the high coefficient of expansion of stainless steel.

**7 Ease of mounting and dismounting**

Bearings with clearance fits are usually easier to mount or dismount than those with interference fits. Where operating conditions necessitate interference fits and it is essential that mounting and dismounting can be done easily, separable bearings, or bearings with tapered bore and adapter or withdrawal sleeve may be used.

**8 Displacement of non-locating bearing**

If non-separable bearings are used as non-locating bearings it is imperative that one of the bearing rings is free to move axially at all times during operation. This is ensured by adopting a clearance fit for that ring which carries a stationary load. When the outer ring is under stationary load so that axial displacement has to take place in the housing bore, a hardened intermediate bushing is often fitted to the outer ring, for example, where light alloy housings are employed. In this way a "hammering out" of the housing seating because of the lower material hardness is avoided; it would otherwise result in the axial displacement being restricted or even impossible after a time. If cylindrical or needle roller bearings having one ring without flanges are used, both bearing rings may be mounted with an interference fit because axial displacement will take place within the bearing.

# Shaft and housing fits

## Recommended fits

The general recommendation for shaft and housing diameters and resulting fits are shown in the tables on pages 256-259 for ABEC-1 tolerance grade and either rotating or stationary shaft or housing. They apply to single-row, double-row and duplex bearings mounted on steel shafts and in steel or cast iron housings. For special bearing applications and arrangements, other fits may be required as shown in the tables on pages 261-268.

## Duplex bearings

MRC 7000PJ series, 40° contact angle, bearings are supplied in several different clearance/preload classes. These bearings are identified with additional suffix letters of either DE, DU, or DS for endplay, free-running no endplay, or preload respectively. The PJDE suffix would indicate a bearing specifically designed for paired mounting and axial endplay or looseness. The "DE" clearance class, without any additional suffix code letters is equivalent to a "CB" clearance range (see table below). However, the "DE" clearance class can also specify other clearance ranges if an additional 4-digit suffix code follows the "DE". The other ranges include the "CA", "CC", and "CX" ranges which will be marked on the bearing box.

Duplex bearings may also be supplied without axial clearance and without preload. This range would be considered "free-running" or "no endplay" and is designated by the suffix letters "DU". Ex. 7200PJDU.

Bearings with preload are identified with the suffix letters "DS" on the bearing itself and the bearing box would have an additional marking of either "DL", "DM", "DH", or "DX" and a 4-digit MRC specification code, signifying light, medium, heavy, or special preload respectively.

The normal shaft and housing tolerances for duplexed bearings with endplay (DE) are "k5" and "H6" respectively. For the "DU" and "DS" variants, the recommended shaft and housing tolerances are "h5" and "H6" respectively. The reduced shaft interference resulting from the ISO "h5" fit minimizes the loss of internal clearance caused by expansion of the inner ring. Loss of internal clearance changes the bearing preload that can lead to excessive heating and premature failure. See pages 262 and 266 for specific tolerance dimensions. These recommendations are valid for solid steel shafts and cast iron or steel housings. If different shaft materials are being used, MRC Application Engineering should be contacted in order to select more appropriate fit tolerances.

| Bore diameter (mm) | | "CB" endplay per set Minimum | | Maximum | |
|---|---|---|---|---|---|
| Over | Incl | .001 mm | .0001 inch | .001 mm | .0001 inch |
| – | 10 | 14 | 6 | 22 | 9 |
| 10 | 18 | 15 | 6 | 23 | 9 |
| 18 | 30 | 18 | 7 | 26 | 10 |
| 30 | 50 | 22 | 9 | 30 | 12 |
| 50 | 80 | 26 | 10 | 38 | 15 |
| 80 | 120 | 32 | 13 | 44 | 17 |
| 120 | 180 | 35 | 14 | 47 | 19 |
| 180 | 250 | 45 | 18 | 61 | 24 |
| 250 | 315 | 52 | 21 | 68 | 27 |

## Tapered bore bearings

Bearings with tapered bores are mounted either on tapered shafts or on slotted sleeves having an external taper and mounted on cylindrical shafts. In these cases, the fit of the inner ring is not determined by the selected shaft tolerance but by the distance through which the ring is driven up on the tapered shaft or sleeve. Special precautions with respect to reduction in internal clearance must be observed. For the recommended mounting procedure refer to pages 86 and 87 in the self-aligning ball bearing section.

## Fits for hollow shafts

If bearings are to be mounted with an interference fit on a hollow shaft, it is generally necessary to use a heavier interference fit than that used for a solid shaft in order to achieve the same surface pressure between the inner ring and shaft seating. The following diameter ratios are important when deciding on the fit to be used:

$$c_i = \frac{d_i}{d} \quad \text{and} \quad c_e = \frac{d}{d_e}$$

where

$c_i$ = diameter ratio of hollow shaft
$c_e$ = diameter ratio of inner ring
d = outside diameter of hollow shaft
(= bore diameter of bearing)
$d_i$ = internal diameter of hollow shaft
$d_e$ = mean outside diameter of inner ring

The fit is not appreciably affected until the diameter ratio of the hollow shaft $c_i \geq 0.5$.
If the outside diameter of the inner ring is not known, the diameter ratio $c_e$ can be calculated with sufficient accuracy from the equation.

$$c_e = \frac{d}{K\,(D-d) + d}$$

where

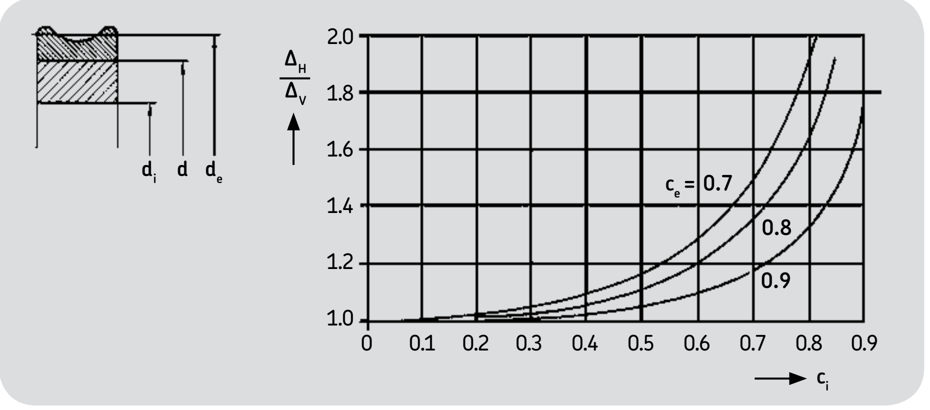
d = bore diameter of bearing
D = outside diameter of bearing
k = a factor for the bearing type
k = 0.25 for self-aligning ball bearings series 22 and 23 and for cylindrical roller bearings
k = 0.3 for all other bearings

To determine the requisite interference fit for a bearing to be mounted on a hollow shaft, use is made of the mean probable interference between shaft diameter and bearing bore obtained for the tolerance recommended for a solid shaft of the same diameter. If the plastic deformation (smoothing) of the mating surfaces produced during mounting is neglected, then the effective interference can be equated to the mean probable interference.

# Shaft and housing fits

The interference $\Delta_H$ needed for a hollow shaft of steel can then be determined in relation to the known interference $\Delta_V$ for the solid shaft from the diagram below. $\Delta_V$ equals the mean value of the smallest and largest values of the probable interference given in the tables.

The tolerance for the hollow shaft is then selected so that the mean probable interference is as close as possible to the interference $\Delta_H$ obtained from the diagram below.




Example:
A 208S deep groove ball bearing is to be mounted on a hollow shaft having a diameter ratio of $C_i$ = 0.8. The recommended mean probable interference for a solid steel shaft is 0.00055 determined from the tables for an ABEC-1 grade bearing with a 40 mm bore diameter.

For $C_i = 0.8$ and $C_e = \dfrac{40}{0.3\,(80 - 40) + 40} = 0.77$,

The ratio $\Delta_H/\Delta_V$ =1.7 from the diagram.
Thus the required interference for the hollow shaft is $\Delta_H$ =1.7 × .00055 = .0009.

### Shaft and housing surface finish

For ABEC-1 bearings, finishes should not exceed 32 AA for shafts up to 2 inches in diameter and 63 AA maximum over 2 inches. Housing bores should not exceed 125 AA.

# Shaft limits - ABEC-1

## General recommended shaft limits for metric bearings—ISO k5 and g6

| | Bearing bore diameter | | | | Shaft rotating | | | | | | Shaft stationary | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Max | | Min | | Shaft diameter (k5) | | | | Fit | | Shaft diameter (g6) | | | | Fit | |
| mm | | | | | Max | | Min | | .001 | .0001 | Max | | Min | | .001 | .0001 |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. |
| 4 | 4 | **0.1575** | 3.992 | **0.1572** | 4.006 | **0.1577** | 4.001 | **0.1575** | | | 3.996 | **0.1573** | 3.988 | **0.1570** | | |
| 5 | 5 | **0.1969** | 4.992 | **0.1966** | 5.006 | **0.1971** | 5.001 | **0.1969** | 1T | **0** | 4.996 | **0.1967** | 4.988 | **0.1964** | 12L | **5L** |
| 6 | 6 | **0.2362** | 5.992 | **0.2359** | 6.006 | **0.2364** | 6.001 | **0.2362** | 14T | **5T** | 5.996 | **0.2360** | 5.988 | **0.2357** | 4T | **1T** |
| 7 | 7 | **0.2756** | 6.992 | **0.2753** | 7.007 | **0.2759** | 7.001 | **0.2756** | | | 6.995 | **0.2754** | 6.986 | **0.2750** | | |
| 8 | 8 | **0.3150** | 7.992 | **0.3147** | 8.007 | **0.3153** | 8.001 | **0.3150** | 1T | **0** | 7.995 | **0.3148** | 7.986 | **0.3144** | 14L | **6L** |
| 9 | 9 | **0.3543** | 8.992 | **0.3540** | 9.007 | **0.3546** | 9.001 | **0.3543** | 15T | **6T** | 8.995 | **0.3541** | 8.986 | **0.3537** | 3T | **1T** |
| 10 | 10 | **0.3937** | 9.992 | **0.3934** | 10.007 | **0.3940** | 10.001 | **0.3937** | | | 9.995 | **0.3935** | 9.986 | **0.3931** | | |
| 12 | 12 | **0.4724** | 11.992 | **0.4721** | 12.009 | **0.4728** | 12.001 | **0.4724** | | | 11.994 | **0.4722** | 11.983 | **0.4717** | | |
| 15 | 15 | **0.5906** | 14.992 | **0.5903** | 15.009 | **0.5910** | 15.001 | **0.5906** | 1T | **0** | 14.994 | **0.5904** | 14.983 | **0.5899** | 17L | **7L** |
| 17 | 17 | **0.6693** | 16.992 | **0.6690** | 17.009 | **0.6697** | 17.001 | **0.6693** | 17T | **7T** | 16.994 | **0.6691** | 16.983 | **0.6686** | 2T | **1T** |
| 20 | 20 | **0.7874** | 19.990 | **0.7870** | 20.011 | **0.7878** | 20.002 | **0.7875** | | | 19.993 | **0.7871** | 19.980 | **0.7866** | | |
| 25 | 25 | **0.9843** | 24.990 | **0.9839** | 25.011 | **0.9847** | 25.002 | **0.9844** | 2T | **1T** | 24.993 | **0.9840** | 24.980 | **0.9835** | 20L | **8L** |
| 30 | 30 | **1.1811** | 29.990 | **1.1807** | 30.011 | **1.1815** | 30.002 | **1.1812** | 21T | **8T** | 29.993 | **1.1808** | 29.980 | **1.1803** | 3T | **1T** |
| 35 | 35 | **1.3780** | 34.987 | **1.3775** | 35.013 | **1.3785** | 35.002 | **1.3781** | | | 34.991 | **1.3776** | 34.975 | **1.3770** | | |
| 40 | 40 | **1.5748** | 39.987 | **1.5743** | 40.013 | **1.5753** | 40.002 | **1.5749** | 2T | **1T** | 39.991 | **1.5744** | 39.975 | **1.5738** | 25L | **10L** |
| 45 | 45 | **1.7717** | 44.987 | **1.7712** | 45.013 | **1.7722** | 45.002 | **1.7718** | 26T | **10T** | 44.991 | **1.7713** | 44.975 | **1.7707** | 4T | **1T** |
| 50 | 50 | **1.9685** | 49.987 | **1.9680** | 50.013 | **1.9690** | 50.002 | **1.9686** | | | 49.991 | **1.9681** | 49.975 | **1.9675** | | |
| 55 | 55 | **2.1654** | 54.985 | **2.1648** | 55.015 | **2.1660** | 55.002 | **2.1655** | | | 54.990 | **2.1650** | 54.971 | **2.1643** | | |
| 60 | 60 | **2.3622** | 59.985 | **2.3616** | 60.015 | **2.3628** | 60.002 | **2.3623** | | | 59.990 | **2.3618** | 59.971 | **2.3611** | | |
| 65 | 65 | **2.5591** | 64.985 | **2.5585** | 65.015 | **2.5597** | 65.002 | **2.5592** | 2T | **1T** | 64.990 | **2.5587** | 64.971 | **2.5580** | 29L | **11L** |
| 70 | 70 | **2.7559** | 69.985 | **2.7553** | 70.015 | **2.7565** | 70.002 | **2.7560** | 30T | **12T** | 69.990 | **2.7555** | 69.971 | **2.7548** | 5T | **2T** |
| 75 | 75 | **2.9528** | 74.985 | **2.9522** | 75.015 | **2.9534** | 75.002 | **2.9529** | | | 74.990 | **2.9524** | 74.971 | **2.9517** | | |
| 80 | 80 | **3.1496** | 79.985 | **3.1490** | 80.015 | **3.1502** | 80.002 | **3.1497** | | | 79.990 | **3.1492** | 79.971 | **3.1485** | | |
| 85 | 85 | **3.3465** | 84.980 | **3.3457** | 85.018 | **3.3472** | 85.003 | **3.3466** | | | 84.988 | **3.3460** | 84.966 | **3.3452** | | |
| 90 | 90 | **3.5433** | 89.980 | **3.5425** | 90.018 | **3.5440** | 90.003 | **3.5434** | | | 89.988 | **3.5428** | 89.966 | **3.5420** | | |
| 95 | 95 | **3.7402** | 94.980 | **3.7394** | 95.018 | **3.7409** | 95.003 | **3.7403** | 3T | **1T** | 94.988 | **3.7397** | 94.966 | **3.7389** | 34L | **13L** |
| 100 | 100 | **3.9370** | 99.980 | **3.9362** | 100.018 | **3.9377** | 100.003 | **3.9371** | 38T | **15T** | 99.988 | **3.9365** | 99.966 | **3.9357** | 8T | **3T** |
| 105 | 105 | **4.1339** | 104.980 | **4.1331** | 105.018 | **4.1346** | 105.003 | **4.1340** | | | 104.988 | **4.1334** | 104.966 | **4.1326** | | |
| 110 | 110 | **4.3307** | 109.980 | **4.3299** | 110.018 | **4.3314** | 110.003 | **4.3308** | | | 109.988 | **4.3302** | 109.966 | **4.3294** | | |
| 115 | 115 | **4.5276** | 114.980 | **4.5268** | 115.018 | **4.5283** | 115.003 | **4.5277** | | | 114.988 | **4.5271** | 114.966 | **4.5263** | | |
| 120 | 120 | **4.7244** | 119.980 | **4.7236** | 120.018 | **4.7251** | 120.003 | **4.7245** | | | 119.988 | **4.7239** | 119.966 | **4.7231** | | |
| 125 | 125 | **4.9213** | 124.975 | **4.9203** | 125.021 | **4.9221** | 125.003 | **4.9214** | | | 124.986 | **4.9207** | 124.961 | **4.9198** | | |
| 130 | 130 | **5.1181** | 129.975 | **5.1171** | 130.021 | **5.1189** | 130.003 | **5.1182** | | | 129.986 | **5.1175** | 129.961 | **5.1166** | | |
| 140 | 140 | **5.5118** | 139.975 | **5.5108** | 140.021 | **5.5126** | 140.003 | **5.5119** | 3T | **1T** | 139.986 | **5.5112** | 139.961 | **5.5103** | 39L | **15L** |
| 150 | 150 | **5.9055** | 149.975 | **5.9045** | 150.021 | **5.9063** | 150.003 | **5.9056** | 46T | **18T** | 149.986 | **5.9049** | 149.961 | **5.9040** | 11T | **4T** |
| 160 | 160 | **6.2992** | 159.975 | **6.2982** | 160.021 | **6.3000** | 160.003 | **6.2993** | | | 159.986 | **6.2986** | 159.961 | **6.2977** | | |
| 170 | 170 | **6.6929** | 169.975 | **6.6919** | 170.021 | **6.6937** | 170.003 | **6.6930** | | | 169.986 | **6.6923** | 169.961 | **6.6914** | | |
| 180 | 180 | **7.0866** | 179.975 | **7.0856** | 180.021 | **7.0874** | 180.003 | **7.0867** | | | 179.986 | **7.0860** | 179.961 | **7.0851** | | |
| 190 | 190 | **7.4803** | 189.970 | **7.4791** | 190.024 | **7.4812** | 190.004 | **7.4805** | | | 189.985 | **7.4797** | 189.956 | **7.4786** | | |
| 200 | 200 | **7.8740** | 199.970 | **7.8728** | 200.024 | **7.8749** | 200.004 | **7.8742** | | | 199.985 | **7.8734** | 199.956 | **7.8723** | | |
| 210 | 210 | **8.2677** | 209.970 | **8.2665** | 210.024 | **8.2626** | 210.004 | **8.2679** | 4T | **2T** | 209.985 | **8.2671** | 209.956 | **8.2660** | 44L | **17L** |
| 220 | 220 | **8.6614** | 219.970 | **8.6602** | 220.024 | **8.6623** | 220.004 | **8.6616** | 54T | **21T** | 219.985 | **8.6608** | 219.956 | **8.6597** | 15T | **6T** |
| 230 | 230 | **9.0551** | 229.970 | **9.0539** | 230.024 | **9.0560** | 230.004 | **9.0553** | | | 229.985 | **9.0545** | 229.956 | **9.0534** | | |
| 240 | 240 | **9.4488** | 239.970 | **9.4476** | 240.024 | **9.4497** | 240.004 | **9.4490** | | | 239.985 | **9.4482** | 239.956 | **9.4471** | | |
| 250 | 250 | **9.8425** | 249.970 | **9.8413** | 250.024 | **9.8434** | 250.004 | **9.8427** | | | 249.985 | **9.8419** | 249.956 | **9.8408** | | |
| 260 | 260 | **10.2362** | 259.965 | **10.2348** | 260.027 | **10.2373** | 260.004 | **10.2364** | 4T | **2T** | 259.983 | **10.2355** | 259.951 | **10.2343** | 49L | **19L** |
| 280 | 280 | **11.0236** | 279.965 | **11.0222** | 280.027 | **11.0247** | 280.004 | **11.0238** | 62T | **25T** | 279.983 | **11.0229** | 279.951 | **11.0217** | 18T | **7T** |
| 300 | 300 | **11.8110** | 299.965 | **11.8096** | 300.027 | **11.8121** | 300.004 | **11.8112** | | | 299.983 | **11.8103** | 299.951 | **11.8091** | | |
| 320 | 320 | **12.5984** | 319.960 | **12.5968** | 320.029 | **12.5995** | 320.004 | **12.5986** | 4T | **2T** | 319.982 | **12.5977** | 319.946 | **12.5963** | 54L | **21L** |
| | | | | | | | | | 69T | **27T** | | | | | 22T | **9T** |

# Shaft limits - ABEC-1

## General recommended shaft limits for inch-size bearings—ISO k5 and g6

| | Bearing bore diameter | | | | Shaft rotating | | | | | | Shaft stationary | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Max | | Min | | Shaft diameter (k5) | | | | Fit | | Shaft diameter (g6) | | | | Fit | |
| mm | | | | | Max | | Min | | .001 | .0001 | Max | | Min | | .001 | .0001 |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. |
| R2 | 3.175 | 0.1250 | 3.167 | 0.1247 | 3.181 | 0.1252 | 3.175 | 0.1250 | 0 | 0 | 3.171 | 0.1248 | 3.163 | 0.1245 | 12L | 5L |
| R2A | 3.175 | 0.1250 | 3.167 | 0.1247 | 3.181 | 0.1252 | 3.175 | 0.1250 | 14T | 5T | 3.171 | 0.1248 | 3.163 | 0.1245 | 4T | 1T |
| R3 | 4.763 | 0.1875 | 4.755 | 0.1872 | 4.769 | 0.1877 | 4.763 | 0.1875 | | | 4.759 | 0.1873 | 4.751 | 0.1870 | | |
| R4 | 6.350 | 0.2500 | 6.342 | 0.2497 | 6.357 | 0.2503 | 6.350 | 0.2500 | 0 | 0 | 6.345 | 0.2498 | 6.336 | 0.2494 | 14L | 6L |
| R4A | 6.350 | 0.2500 | 6.342 | 0.2497 | 6.357 | 0.2503 | 6.350 | 0.2500 | 15T | 6T | 6.345 | 0.2498 | 6.336 | 0.2494 | 3T | 1T |
| R6 | 9.525 | 0.3750 | 9.517 | 0.3747 | 9.532 | 0.3753 | 9.525 | 0.3750 | | | 9.520 | 0.3748 | 9.511 | 0.3744 | | |
| R8 | 12.700 | 0.5000 | 12.692 | 0.4997 | 12.709 | 0.5004 | 12.700 | 0.5000 | 0 | 0 | 12.694 | 0.4998 | 12.683 | 0.4993 | 17L | 7L |
| R10 | 15.875 | 0.6250 | 15.867 | 0.6247 | 15.884 | 0.6254 | 15.875 | 0.6250 | 17T | 7T | 15.869 | 0.6248 | 15.858 | 0.6243 | 2T | 1T |
| R12 | 19.050 | 0.7500 | 19.040 | 0.7496 | 19.061 | 0.7504 | 19.052 | 0.7501 | | | 19.043 | 0.7497 | 19.030 | 0.7492 | | |
| R14 | 22.225 | 0.8750 | 22.215 | 0.8746 | 22.236 | 0.8754 | 22.227 | 0.8751 | 2T | 1T | 22.218 | 0.8747 | 22.205 | 0.8742 | 20L | 8L |
| R16 | 25.400 | 1.0000 | 25.390 | 0.9996 | 25.411 | 1.0004 | 25.402 | 1.0001 | 21T | 8T | 25.393 | 0.9997 | 25.380 | 0.9992 | 3T | 1T |
| R18 | 28.575 | 1.1250 | 28.565 | 1.1246 | 28.586 | 1.1254 | 28.577 | 1.1251 | | | 28.568 | 1.1247 | 28.555 | 1.1242 | | |
| R20 | 31.750 | 1.2500 | 31.737 | 1.2495 | 31.763 | 1.2505 | 31.752 | 1.2501 | | | 31.741 | 1.2496 | 31.725 | 1.2490 | | |
| R24 | 38.100 | 1.5000 | 38.087 | 1.4995 | 38.113 | 1.5005 | 38.102 | 1.5001 | | | 38.091 | 1.4996 | 38.075 | 1.4990 | | |
| XLS1 3/8 | 34.925 | 1.3750 | 34.912 | 1.3745 | 34.938 | 1.3755 | 34.927 | 1.3751 | 2T | 1T | 34.916 | 1.3746 | 34.900 | 1.3740 | 25L | 10L |
| XLS1 1/2 | 38.100 | 1.5000 | 38.087 | 1.4995 | 38.113 | 1.5005 | 38.102 | 1.5001 | 26T | 10T | 38.091 | 1.4996 | 38.075 | 1.4990 | 4T | 1T |
| XLS1 5/8 | 41.275 | 1.6250 | 41.262 | 1.6245 | 41.288 | 1.6255 | 41.277 | 1.6251 | | | 41.266 | 1.6246 | 41.250 | 1.6240 | | |
| XLS1 3/4 | 44.450 | 1.7500 | 44.437 | 1.7495 | 44.463 | 1.7505 | 44.452 | 1.7501 | | | 44.441 | 1.7496 | 44.425 | 1.7490 | | |
| XLS1 7/8 | 47.625 | 1.8750 | 47.612 | 1.8745 | 47.638 | 1.8755 | 47.627 | 1.8751 | | | 47.616 | 1.8746 | 47.600 | 1.8740 | | |
| XLS2 | 50.800 | 2.0000 | 50.785 | 1.9994 | 50.815 | 2.0006 | 50.802 | 2.0001 | | | 50.790 | 1.9996 | 50.771 | 1.9989 | | |
| XLS2 1/8 | 53.975 | 2.1250 | 53.960 | 2.1244 | 53.990 | 2.1256 | 53.977 | 2.1251 | | | 53.965 | 2.1246 | 53.946 | 2.1239 | | |
| XLS2 1/4 | 57.150 | 2.2500 | 57.135 | 2.2494 | 57.165 | 2.2506 | 57.152 | 2.2501 | 2T | 1T | 57.140 | 2.2496 | 57.121 | 2.2489 | 29L | 11L |
| XLS2 1/2 | 63.500 | 2.5000 | 63.485 | 2.4994 | 63.515 | 2.5006 | 63.502 | 2.5001 | 30T | 12T | 63.490 | 2.4996 | 63.471 | 2.4989 | 5T | 2T |
| XLS2 5/8 | 66.675 | 2.6250 | 66.660 | 2.6244 | 66.690 | 2.6256 | 66.677 | 2.6251 | | | 66.665 | 2.6246 | 66.646 | 2.6239 | | |
| XLS2 3/4 | 69.850 | 2.7500 | 69.835 | 2.7494 | 69.865 | 2.7506 | 69.852 | 2.7501 | | | 69.840 | 2.7496 | 69.821 | 2.7489 | | |
| XLS3 | 76.200 | 3.0000 | 76.185 | 2.9994 | 76.215 | 3.0006 | 76.202 | 3.0001 | | | 76.190 | 2.9996 | 76.171 | 2.9989 | | |
| XLS3 1/4 | 82.550 | 3.2500 | 82.530 | 3.2492 | 82.568 | 3.2507 | 82.553 | 3.2501 | | | 82.538 | 3.2495 | 82.516 | 3.2487 | | |
| XLS3 1/2 | 88.900 | 3.5000 | 88.880 | 3.4992 | 88.918 | 3.5007 | 88.903 | 3.5001 | 3T | 1T | 88.888 | 3.4995 | 88.866 | 3.4987 | 34L | 13L |
| XLS3 3/4 | 95.250 | 3.7500 | 95.230 | 3.7492 | 95.268 | 3.7507 | 95.253 | 3.7501 | 38T | 15T | 95.238 | 3.7495 | 95.216 | 3.7487 | 8T | 3T |
| XLS4 1/4 | 107.950 | 4.2500 | 107.935 | 4.2492 | 107.973 | 4.2507 | 107.953 | 4.2501 | | | 107.943 | 4.2495 | 107.916 | 4.2487 | | |
| XLS4 1/2 | 114.300 | 4.5000 | 114.285 | 4.4992 | 114.323 | 4.5007 | 114.303 | 4.5001 | | | 114.293 | 4.4995 | 114.266 | 4.4987 | | |
| XLS4 3/4 | 120.650 | 4.7500 | 120.625 | 4.7490 | 120.671 | 4.7508 | 120.653 | 4.7501 | | | 120.636 | 4.7494 | 120.611 | 4.7485 | | |
| XLS5 | 127.000 | 5.0000 | 126.975 | 4.9990 | 127.021 | 5.0008 | 127.003 | 5.0001 | | | 126.986 | 4.9994 | 126.961 | 4.9985 | | |
| XLS5 1/2 | 139.700 | 5.5000 | 139.675 | 5.4990 | 139.721 | 5.5008 | 139.703 | 5.5001 | 3T | 1T | 139.686 | 5.4994 | 139.661 | 5.4985 | 39L | 15L |
| XLS6 | 152.400 | 6.0000 | 152.375 | 5.9990 | 152.421 | 6.0008 | 152.403 | 6.0001 | 46T | 18T | 152.386 | 5.9994 | 152.361 | 5.9985 | 11T | 4T |
| XLS6 1/4 | 158.750 | 6.2500 | 158.735 | 6.2490 | 158.781 | 6.2508 | 158.753 | 6.2501 | | | 158.746 | 6.2494 | 158.711 | 6.2485 | | |
| XLS6 1/2 | 165.100 | 6.5000 | 165.075 | 6.4990 | 165.121 | 6.5008 | 165.103 | 6.5001 | | | 165.086 | 6.4994 | 165.061 | 6.4985 | | |
| XLS7 | 177.800 | 7.0000 | 177.775 | 6.9990 | 177.821 | 7.0008 | 177.803 | 7.0001 | | | 177.786 | 6.9994 | 177.761 | 6.9985 | | |
| XLS7 1/4 | 184.150 | 7.2500 | 184.120 | 7.2488 | 184.174 | 7.2509 | 184.154 | 7.2502 | | | 184.135 | 7.2494 | 184.106 | 7.2483 | | |
| XLS7 3/4 | 196.850 | 7.7500 | 196.820 | 7.7488 | 196.874 | 7.7509 | 196.854 | 7.7502 | | | 196.835 | 7.7494 | 196.806 | 7.7483 | 44L | 17L |
| XLS8 | 203.200 | 8.0000 | 203.170 | 7.9988 | 203.224 | 8.0009 | 203.204 | 8.0002 | 4T | 2T | 203.185 | 7.9994 | 203.156 | 7.9983 | 15T | 6T |
| XLS8 1/4 | 209.950 | 8.2500 | 209.520 | 8.2488 | 209.574 | 8.2509 | 209.554 | 8.2502 | 54T | 21T | 209.535 | 8.2494 | 209.506 | 8.2483 | | |
| XLS8 1/2 | 215.900 | 8.5000 | 215.870 | 8.4988 | 215.924 | 8.5009 | 215.904 | 8.5002 | | | 215.885 | 8.4994 | 215.856 | 8.4983 | | |
| XLS9 | 228.600 | 9.0000 | 228.570 | 8.9988 | 228.624 | 9.0009 | 228.604 | 9.0002 | | | 228.585 | 8.9994 | 228.556 | 8.9983 | | |
| XLS10 | 254.000 | 10.0000 | 253.965 | 9.9986 | 254.027 | 10.0011 | 254.004 | 10.0002 | 4T | 2T | 253.983 | 9.9993 | 253.951 | 9.9981 | 49L | 19L |
| | | | | | | | | | 62T | 25T | | | | | 18T | 7T |

# Housing bore limits - ABEC-1

## General recommended housing bore limits for metric bearings—ISO H6 and N6

| | Bearing outside diameter | | | | Housing stationary | | | | | | Housing rotating | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Max | | Min | | Housing bore (H6) | | | | Fit | | Housing bore (N6) | | | | Fit | |
| mm | | | | | Max | | Min | | .001 | .0001 | Max | | Min | | .001 | .0001 |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. |
| 16 | 16 | **0.6299** | 15.992 | **0.6296** | 16.011 | **0.6303** | 16 | **0.6299** | 19L | **7L** | 15.993 | **0.6295** | 15.980 | **0.6291** | 2T | **1T** |
| | | | | | | | | | 0 | **0** | | | | | 20T | **8T** |
| 19 | 19 | **0.7480** | 18.991 | **0.7476** | 19.013 | **0.7485** | 19 | **0.7480** | | | 18.989 | **0.7476** | 18.976 | **0.7471** | | |
| 21 | 21 | **0.8268** | 20.991 | **0.8264** | 21.013 | **0.8273** | 21 | **0.8268** | | | 20.989 | **0.8264** | 20.976 | **0.8259** | | |
| 22 | 22 | **0.8661** | 21.991 | **0.8657** | 22.013 | **0.8666** | 22 | **0.8661** | | | 21.989 | **0.8657** | 21.976 | **0.8652** | | |
| 24 | 24 | **0.9449** | 23.991 | **0.9445** | 24.013 | **0.9454** | 24 | **0.9449** | 22L | **9L** | 23.989 | **0.9445** | 23.976 | **0.9440** | 2T | **0** |
| 26 | 26 | **1.0236** | 25.991 | **1.0232** | 26.013 | **1.0241** | 26 | **1.0236** | 0 | **0** | 25.989 | **1.0232** | 25.976 | **1.0227** | 24T | **9T** |
| 28 | 28 | **1.1024** | 27.991 | **1.1020** | 28.013 | **1.1029** | 28 | **1.1024** | | | 27.989 | **1.1020** | 27.976 | **1.1015** | | |
| 30 | 30 | **1.1811** | 29.991 | **1.1807** | 30.013 | **1.1816** | 30 | **1.1811** | | | 29.989 | **1.1807** | 29.976 | **1.1802** | | |
| 32 | 32 | **1.2598** | 31.989 | **1.2593** | 32.016 | **1.2604** | 32 | **1.2598** | | | 31.988 | **1.2593** | 31.972 | **1.2587** | | |
| 35 | 35 | **1.3780** | 34.989 | **1.3775** | 35.016 | **1.3786** | 35 | **1.3780** | | | 34.988 | **1.3775** | 34.972 | **1.3769** | | |
| 37 | 37 | **1.4567** | 36.989 | **1.4562** | 37.016 | **1.4573** | 37 | **1.4567** | 27L | **11L** | 36.988 | **1.4562** | 36.972 | **1.4556** | 1T | **0** |
| 40 | 40 | **1.5748** | 39.989 | **1.5743** | 40.016 | **1.5754** | 40 | **1.5748** | 0 | **0** | 39.988 | **1.5743** | 39.972 | **1.5737** | 28T | **11T** |
| 42 | 42 | **1.6535** | 41.989 | **1.6530** | 42.016 | **1.6541** | 42 | **1.6535** | | | 41.988 | **1.6530** | 41.972 | **1.6524** | | |
| 47 | 47 | **1.8504** | 46.989 | **1.8499** | 47.016 | **1.8510** | 47 | **1.8504** | | | 46.988 | **1.8499** | 46.972 | **1.8493** | | |
| 52 | 52 | **2.0472** | 51.987 | **2.0467** | 52.019 | **2.0479** | 52 | **2.0472** | | | 51.986 | **2.0466** | 51.967 | **2.0459** | | |
| 55 | 55 | **2.1654** | 54.987 | **2.1649** | 55.019 | **2.1661** | 55 | **2.1654** | | | 54.986 | **2.1648** | 54.967 | **2.1641** | | |
| 58 | 58 | **2.2835** | 57.987 | **2.2830** | 58.019 | **2.2842** | 58 | **2.2835** | | | 57.986 | **2.2829** | 57.967 | **2.2822** | | |
| 62 | 62 | **2.4409** | 61.987 | **2.4404** | 62.019 | **2.4416** | 62 | **2.4409** | | | 61.986 | **2.4403** | 61.967 | **2.4396** | | |
| 65 | 65 | **2.5591** | 64.987 | **2.5586** | 65.019 | **2.5598** | 65 | **2.5591** | 32L | **12L** | 64.986 | **2.5585** | 64.967 | **2.5578** | 1T | **1T** |
| 68 | 68 | **2.6772** | 67.987 | **2.6767** | 68.019 | **2.6779** | 68 | **2.6772** | 0 | **0** | 67.986 | **2.6766** | 67.967 | **2.6759** | 33T | **13T** |
| 70 | 70 | **2.7559** | 69.987 | **2.7554** | 70.019 | **2.7566** | 70 | **2.7559** | | | 69.986 | **2.7553** | 69.967 | **2.7546** | | |
| 72 | 72 | **2.8346** | 71.987 | **2.8341** | 72.019 | **2.8353** | 72 | **2.8346** | | | 71.986 | **2.8340** | 71.967 | **2.8333** | | |
| 75 | 75 | **2.9528** | 74.987 | **2.9523** | 75.019 | **2.9535** | 75 | **2.9528** | | | 74.986 | **2.9522** | 74.967 | **2.9515** | | |
| 78 | 78 | **3.0709** | 77.987 | **3.0704** | 78.019 | **3.0716** | 78 | **3.0709** | | | 77.986 | **3.0703** | 77.967 | **3.0696** | | |
| 80 | 80 | **3.1496** | 79.987 | **3.1491** | 80.019 | **3.1503** | 80 | **3.1496** | | | 79.986 | **3.1490** | 79.967 | **3.1483** | | |
| 85 | 85 | **3.3465** | 84.985 | **3.3459** | 85.022 | **3.3474** | 85 | **3.3465** | | | 84.984 | **3.3459** | 84.962 | **3.3450** | | |
| 90 | 90 | **3.5433** | 89.985 | **3.5427** | 90.022 | **3.5442** | 90 | **3.5433** | | | 89.984 | **3.5427** | 89.962 | **3.5418** | | |
| 95 | 95 | **3.7402** | 94.985 | **3.7396** | 95.022 | **3.7411** | 95 | **3.7402** | | | 94.984 | **3.7396** | 94.962 | **3.7387** | | |
| 100 | 100 | **3.9370** | 99.985 | **3.9364** | 100.022 | **3.9379** | 100 | **3.9370** | 37L | **15L** | 99.984 | **3.9364** | 99.962 | **3.9355** | 1T | **0** |
| 105 | 105 | **4.1339** | 104.985 | **4.1333** | 105.022 | **4.1348** | 105 | **4.1339** | 0 | **0** | 104.984 | **4.1333** | 104.962 | **4.1324** | 38T | **15T** |
| 110 | 110 | **4.3307** | 109.985 | **4.3301** | 110.022 | **4.3316** | 110 | **4.3307** | | | 109.984 | **4.3301** | 109.962 | **4.3292** | | |
| 115 | 115 | **4.5276** | 114.985 | **4.5270** | 115.022 | **4.5285** | 115 | **4.5276** | | | 114.984 | **4.5270** | 114.962 | **4.5261** | | |
| 120 | 120 | **4.7244** | 119.985 | **4.7238** | 120.022 | **4.7253** | 120 | **4.7244** | | | 119.984 | **4.7238** | 119.962 | **4.7229** | | |
| 125 | 125 | **4.9213** | 124.982 | **4.9206** | 125.025 | **4.9223** | 125 | **4.9213** | | | 124.980 | **4.9205** | 124.955 | **4.9195** | | |
| 130 | 130 | **5.1181** | 129.982 | **5.1174** | 130.025 | **5.1191** | 130 | **5.1181** | | | 129.980 | **5.1173** | 129.955 | **5.1163** | | |
| 135 | 135 | **5.3150** | 134.982 | **5.3143** | 135.025 | **5.3160** | 135 | **5.3150** | | | 134.980 | **5.3142** | 134.955 | **5.3132** | | |
| 140 | 140 | **5.5118** | 139.982 | **5.5111** | 140.025 | **5.5128** | 140 | **5.5118** | 43L | **17L** | 139.980 | **5.5110** | 139.955 | **5.5100** | 2T | **1T** |
| 145 | 145 | **5.7087** | 144.982 | **5.7080** | 145.025 | **5.7097** | 145 | **5.7087** | 0 | **0** | 144.980 | **5.7079** | 144.955 | **5.7069** | 45T | **18T** |
| 150 | 150 | **5.9055** | 149.982 | **5.9048** | 150.025 | **5.9065** | 150 | **5.9055** | | | 149.980 | **5.9047** | 149.955 | **5.9037** | | |
| 160 | 160 | **6.2992** | 159.975 | **6.2982** | 160.025 | **6.3002** | 160 | **6.2992** | | | 159.980 | **6.2984** | 159.955 | **6.2973** | | |
| 165 | 165 | **6.4961** | 164.975 | **6.4951** | 165.025 | **6.4971** | 165 | **6.4961** | 50L | **20L** | 164.980 | **6.4953** | 164.955 | **6.4942** | 5L | **2L** |
| 170 | 170 | **6.6929** | 169.975 | **6.6919** | 170.025 | **6.6939** | 170 | **6.6929** | 0 | **0** | 169.980 | **6.6921** | 169.955 | **6.6910** | 45T | **19T** |
| 175 | 175 | **6.8898** | 174.975 | **6.8888** | 175.025 | **6.8908** | 175 | **6.8898** | | | 174.980 | **6.8890** | 174.955 | **6.8879** | | |
| 180 | 180 | **7.0866** | 179.975 | **7.0856** | 180.025 | **7.0876** | 180 | **7.0866** | | | 179.980 | **7.0858** | 179.955 | **7.0847** | | |
| 190 | 190 | **7.4803** | 189.970 | **7.4791** | 190.029 | **7.4814** | 190 | **7.4803** | | | 189.978 | **7.4794** | 189.949 | **7.4783** | | |
| 200 | 200 | **7.8740** | 199.970 | **7.8728** | 200.029 | **7.8751** | 200 | **7.8740** | | | 199.978 | **7.8731** | 199.949 | **7.8720** | | |
| 205 | 205 | **8.0709** | 204.970 | **8.0697** | 205.029 | **8.0720** | 205 | **8.0709** | | | 204.978 | **8.0700** | 204.949 | **8.0689** | | |
| 210 | 210 | **8.2677** | 209.970 | **8.2665** | 210.029 | **8.2688** | 210 | **8.2677** | | | 209.978 | **8.2668** | 209.949 | **8.2657** | | |
| 215 | 215 | **8.4646** | 214.970 | **8.4634** | 215.029 | **8.4657** | 215 | **8.4646** | 59L | **23L** | 214.978 | **8.4637** | 214.949 | **8.4626** | 8L | **3L** |
| 220 | 220 | **8.6614** | 219.970 | **8.6602** | 220.029 | **8.6625** | 220 | **8.6614** | 0 | **0** | 219.978 | **8.6605** | 219.949 | **8.6594** | 51T | **20T** |
| 225 | 225 | **8.8583** | 224.970 | **8.8571** | 225.029 | **8.8594** | 225 | **8.8583** | | | 224.978 | **8.8574** | 224.949 | **8.8563** | | |
| 230 | 230 | **9.0551** | 229.970 | **9.0539** | 230.029 | **9.0562** | 230 | **9.0551** | | | 229.978 | **9.0542** | 229.949 | **9.0531** | | |
| 235 | 235 | **9.2520** | 234.970 | **9.2508** | 235.029 | **9.2531** | 235 | **9.2520** | | | 234.978 | **9.2511** | 234.949 | **9.2500** | | |
| 240 | 240 | **9.4488** | 239.970 | **9.4476** | 240.029 | **9.4499** | 240 | **9.4488** | | | 239.978 | **9.4479** | 239.949 | **9.4468** | | |
| 250 | 250 | **9.8425** | 249.970 | **9.8413** | 250.029 | **9.8436** | 250 | **9.8425** | | | 249.978 | **9.8416** | 249.949 | **9.8405** | | |
| 260 | 260 | **10.2362** | 259.965 | **10.2348** | 260.032 | **10.2375** | 260 | **10.2362** | | | 259.975 | **10.2352** | 259.943 | **10.2340** | | |
| 265 | 265 | **10.4331** | 264.965 | **10.4317** | 265.032 | **10.4344** | 265 | **10.4331** | | | 264.975 | **10.4321** | 264.943 | **10.4309** | | |
| 270 | 270 | **10.6299** | 269.965 | **10.6285** | 270.032 | **10.6312** | 270 | **10.6299** | | | 269.975 | **10.6289** | 269.943 | **10.6277** | | |
| 280 | 280 | **11.0236** | 279.965 | **11.0222** | 280.032 | **11.0249** | 280 | **11.0236** | 67L | **27L** | 279.975 | **11.0226** | 279.943 | **11.0214** | 10L | **4L** |
| 290 | 290 | **11.4173** | 289.905 | **11.4159** | 290.032 | **11.4186** | 290 | **11.4173** | 0 | **0** | 289.975 | **11.4163** | 289.943 | **11.4151** | 57T | **22T** |
| 300 | 300 | **11.8110** | 299.965 | **11.8096** | 300.032 | **11.8123** | 300 | **11.8110** | | | 299.975 | **11.8100** | 299.943 | **11.8088** | | |
| 310 | 310 | **12.2047** | 309.965 | **12.2033** | 310.032 | **12.2060** | 310 | **12.2047** | | | 309.975 | **12.2037** | 309.943 | **12.2025** | | |
| 320 | 320 | **12.5984** | 319.960 | **12.5968** | 320.036 | **12.5998** | 320 | **12.5984** | | | 319.974 | **12.5974** | 319.939 | **12.5960** | | |
| 340 | 340 | **13.3858** | 339.960 | **13.3842** | 340.036 | **13.3872** | 340 | **13.3858** | | | 339.974 | **13.3848** | 339.939 | **13.3834** | | |
| 350 | 350 | **13.7795** | 349.960 | **13.7779** | 350.036 | **13.7809** | 350 | **13.7795** | | | 349.974 | **13.7785** | 349.939 | **13.7771** | | |
| 360 | 360 | **14.1732** | 359.960 | **14.1716** | 360.036 | **14.1746** | 360 | **14.1732** | 76L | **30L** | 359.974 | **14.1722** | 359.939 | **14.1708** | 14L | **6L** |
| 370 | 370 | **14.5669** | 369.960 | **14.5653** | 370.036 | **14.5683** | 370 | **14.5669** | 0 | **0** | 369.974 | **14.5659** | 369.939 | **14.5645** | 61T | **24T** |
| 380 | 380 | **14.9606** | 379.960 | **14.9590** | 380.036 | **14.9620** | 380 | **14.9606** | | | 379.974 | **14.9596** | 379.939 | **14.9582** | | |
| 390 | 390 | **15.3543** | 389.960 | **15.3527** | 390.036 | **15.3557** | 390 | **15.3543** | | | 389.974 | **15.3533** | 389.939 | **15.3519** | | |
| 400 | 400 | **15.7480** | 399.960 | **15.7464** | 400.036 | **15.7494** | 400 | **15.7480** | | | 399.974 | **15.7470** | 399.939 | **15.7456** | | |
| 410 | 410 | **16.1417** | 409.955 | **16.1399** | 410.040 | **16.1433** | 410 | **16.1417** | | | 409.973 | **16.1406** | 409.933 | **16.1391** | | |
| 420 | 420 | **16.5354** | 419.955 | **16.5336** | 420.040 | **16.5370** | 420 | **16.5354** | | | 419.973 | **16.5343** | 419.933 | **16.5328** | | |
| 430 | 430 | **16.9291** | 429.955 | **16.9273** | 430.040 | **16.9307** | 430 | **16.9291** | | | 429.973 | **16.9280** | 429.933 | **16.9265** | | |
| 440 | 440 | **17.3228** | 439.955 | **17.3210** | 440.040 | **17.3244** | 440 | **17.3228** | 85L | **34L** | 439.973 | **17.3217** | 439.933 | **17.3202** | 18L | **7L** |
| 460 | 460 | **18.1102** | 459.955 | **18.1084** | 460.040 | **18.1118** | 460 | **18.1102** | 0 | **0** | 459.973 | **18.1091** | 459.933 | **18.1076** | 67T | **26T** |
| 480 | 480 | **18.8976** | 479.955 | **18.8958** | 480.040 | **18.8992** | 480 | **18.8976** | | | 479.973 | **18.8965** | 479.933 | **18.8950** | | |
| 500 | 500 | **19.6850** | 499.955 | **19.6832** | 500.040 | **19.6866** | 500 | **19.6850** | | | 499.973 | **19.6839** | 499.933 | **19.6824** | | |
| 520 | 520 | **20.4724** | 519.950 | **20.4704** | 520.044 | **20.4741** | 520 | **20.4724** | | | 519.956 | **20.4707** | 519.911 | **20.4689** | | |
| 540 | 540 | **21.2598** | 539.950 | **21.2578** | 540.044 | **21.2615** | 540 | **21.2598** | | | 539.956 | **21.2581** | 539.911 | **21.2563** | | |
| 560 | 560 | **22.0472** | 559.950 | **22.0452** | 560.044 | **22.0489** | 560 | **22.0472** | 94L | **37L** | 559.956 | **22.0455** | 559.911 | **22.0437** | 6L | **3L** |
| 580 | 580 | **22.8346** | 579.950 | **22.8326** | 580.044 | **22.8363** | 580 | **22.8346** | 0 | **0** | 579.956 | **22.8329** | 579.911 | **22.8311** | 89T | **35T** |
| 600 | 600 | **23.6220** | 599.950 | **23.6200** | 600.044 | **23.6237** | 600 | **23.6220** | | | 599.956 | **23.6203** | 599.911 | **23.6185** | | |
| 620 | 620 | **24.4094** | 619.950 | **24.4074** | 620.044 | **24.4111** | 620 | **24.4094** | | | 619.956 | **24.4077** | 619.911 | **24.4059** | | |

For aluminum or other soft metal housings, make bore limits same as bearing O.D. limits.

# Housing bore limits - ABEC-1

## General recommended housing bore limits for inch-size bearings— ISO H6 and N6

| | Bearing outside diameter | | | | Housing stationary | | | | | | Housing rotating | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Max | | Min | | Housing bore (H6) | | | | Fit | | Housing bore (N6) | | | | Fit | |
| mm | | | | | Max | | Min | | .001 | .0001 | Max | | Min | | .001 | .0001 |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. |
| R2 | 9.525 | **0.3750** | 9.517 | **0.3747** | 9.536 | **0.3754** | 9.525 | **0.3750** | | | 9.515 | **0.3746** | 9.505 | **0.3742** | | |
| R2A | 12.700 | **0.5000** | 12.692 | **0.4997** | 12.711 | **0.5004** | 12.700 | **0.5000** | 19L | **7L** | 12.690 | **0.4996** | 12.680 | **0.4992** | 2T | **1T** |
| R3 | 12.700 | **0.5000** | 12.692 | **0.4997** | 12.711 | **0.5004** | 12.700 | **0.5000** | 0 | **0** | 12.690 | **0.4996** | 12.680 | **0.4992** | 20T | **8T** |
| R4 | 15.875 | **0.6250** | 15.867 | **0.6247** | 15.886 | **0.6254** | 15.875 | **0.6250** | | | 15.865 | **0.6246** | 15.855 | **0.6242** | | |
| R4A | 19.050 | **0.7500** | 19.041 | **0.7496** | 19.063 | **0.7505** | 19.050 | **0.7500** | 22L | **9L** | 19.039 | **0.7496** | 19.026 | **0.7491** | 2T | **0** |
| R6 | 22.225 | **0.8750** | 22.216 | **0.8746** | 22.238 | **0.8755** | 22.225 | **0.8750** | 0 | **0** | 22.214 | **0.8746** | 22.201 | **0.8741** | 24T | **9T** |
| R8 | 28.575 | **1.1250** | 28.566 | **1.1246** | 28.588 | **1.1255** | 28.575 | **1.1250** | | | 28.564 | **1.1246** | 28.551 | **1.1241** | | |
| R10 | 34.925 | **1.3750** | 34.914 | **1.3745** | 34.941 | **1.3756** | 34.925 | **1.3750** | 27L | **11L** | 34.913 | **1.3744** | 34.897 | **1.3739** | 1T | **1T** |
| R12 | 41.275 | **1.6250** | 41.264 | **1.6245** | 41.291 | **1.6256** | 41.275 | **1.6250** | 0 | **0** | 41.263 | **1.6244** | 41.247 | **1.6239** | 28T | **11T** |
| R14 | 47.625 | **1.8750** | 47.614 | **1.8745** | 47.641 | **1.8756** | 47.625 | **1.8750** | | | 47.613 | **1.8744** | 47.597 | **1.8739** | | |
| R16 | 50.800 | **2.0000** | 50.787 | **1.9995** | 50.819 | **2.0007** | 50.800 | **2.0000** | | | 50.786 | **1.9994** | 50.767 | **1.9987** | | |
| R18 | 53.975 | **2.1250** | 53.962 | **2.1245** | 53.994 | **2.1257** | 53.975 | **2.1250** | | | 53.961 | **2.1244** | 53.942 | **2.1237** | | |
| R20 | 57.150 | **2.2500** | 57.137 | **2.2495** | 57.169 | **2.2507** | 57.150 | **2.2500** | 32L | **12L** | 57.136 | **2.2494** | 57.117 | **2.2487** | 1T | **1T** |
| R24 | 66.675 | **2.6250** | 66.662 | **2.6245** | 66.694 | **2.6257** | 66.675 | **2.6250** | 0 | **0** | 66.661 | **2.6244** | 66.642 | **2.6237** | 33T | **13T** |
| XLS$1\frac{3}{8}$ | 65.088 | **2.5625** | 65.151 | **2.5620** | 65.183 | **2.5632** | 65.088 | **2.5625** | | | 65.150 | **2.5619** | 65.055 | **2.5612** | | |
| XLS$1\frac{1}{2}$ | 68.263 | **2.6875** | 68.250 | **2.6870** | 68.282 | **2.6882** | 68.263 | **2.6875** | | | 68.249 | **2.6869** | 68.230 | **2.6862** | | |
| XLS$1\frac{3}{8}$ | 73.025 | **2.8750** | 73.012 | **2.8745** | 73.044 | **2.8757** | 73.025 | **2.8750** | | | 73.011 | **2.8744** | 72.992 | **2.8737** | | |
| XLS$1\frac{3}{4}$ | 76.200 | **3.0000** | 76.187 | **2.9995** | 76.219 | **3.0007** | 76.200 | **3.0000** | | | 76.186 | **2.9994** | 76.167 | **2.9987** | | |
| XLS$1\frac{7}{8}$ | 80.963 | **3.1875** | 80.948 | **3.1869** | 80.985 | **3.1884** | 80.963 | **3.1875** | | | 80.947 | **3.1869** | 80.925 | **3.1860** | | |
| XLS2 | 84.138 | **3.3125** | 84.123 | **3.3119** | 84.160 | **3.3134** | 84.138 | **3.3125** | | | 84.122 | **3.3119** | 84.100 | **3.3110** | | |
| XLS$2\frac{1}{8}$ | 87.313 | **3.4375** | 87.298 | **3.4369** | 87.335 | **3.4384** | 87.313 | **3.4375** | 37L | **15L** | 87.297 | **3.4369** | 87.275 | **3.4360** | 1T | **0** |
| XLS$2\frac{1}{4}$ | 90.488 | **3.5625** | 90.473 | **3.5619** | 90.510 | **3.5634** | 90.488 | **3.5625** | 0 | **0** | 90.472 | **3.5619** | 90.450 | **3.5610** | 38T | **15T** |
| XLS$2\frac{1}{2}$ | 98.425 | **3.8750** | 98.410 | **3.8744** | 98.447 | **3.8759** | 98.425 | **3.8750** | | | 98.409 | **3.8744** | 98.387 | **3.8735** | | |
| XLS$2\frac{5}{8}$ | 104.775 | **4.1250** | 104.760 | **4.1244** | 104.797 | **4.1259** | 104.775 | **4.1250** | | | 104.759 | **4.1244** | 104.737 | **4.1235** | | |
| XLS$2\frac{3}{4}$ | 104.775 | **4.1250** | 104.760 | **4.1244** | 104.797 | **4.1259** | 104.775 | **4.1250** | | | 104.759 | **4.1244** | 104.737 | **4.1235** | | |
| XLS3 | 114.300 | **4.5000** | 114.285 | **4.4994** | 114.322 | **4.5009** | 114.300 | **4.5000** | | | 114.284 | **4.4994** | 114.262 | **4.4985** | | |
| XLS$3\frac{1}{4}$ | 120.650 | **4.7500** | 120.632 | **4.7493** | 120.675 | **4.7510** | 120.650 | **4.7500** | 43L | **17L** | 120.630 | **4.7492** | 120.605 | **4.7482** | 2T | **1T** |
| XLS$3\frac{1}{2}$ | 127.000 | **5.0000** | 126.982 | **4.9993** | 126.995 | **5.0010** | 127.000 | **5.0000** | 0 | **0** | 126.980 | **4.9992** | 126.955 | **4.9982** | 45T | **18T** |
| XLS$3\frac{3}{4}$ | 133.350 | **5.2500** | 133.332 | **5.2493** | 133.375 | **5.2510** | 133.350 | **5.2500** | | | 133.330 | **5.2492** | 133.305 | **5.2482** | | |
| XLS$4\frac{1}{4}$ | 152.400 | **6.0000** | 152.375 | **5.9990** | 152.425 | **6.0010** | 152.400 | **6.0000** | | | 152.380 | **5.9992** | 152.355 | **5.9981** | | |
| XLS$4\frac{1}{2}$ | 158.750 | **6.2500** | 158.725 | **6.2490** | 158.775 | **6.2510** | 158.750 | **6.2500** | 50L | **20L** | 158.730 | **6.2492** | 158.705 | **6.2481** | 5L | **2L** |
| XLS$4\frac{3}{4}$ | 165.100 | **6.5000** | 165.075 | **6.4990** | 165.125 | **6.5010** | 165.100 | **6.5000** | 0 | **0** | 165.080 | **6.4992** | 165.055 | **6.4981** | 45T | **18T** |
| XLS5 | 177.800 | **7.0000** | 177.775 | **6.9990** | 177.825 | **7.0010** | 177.800 | **7.0000** | | | 177.780 | **6.9992** | 177.755 | **6.9981** | | |
| XLS$5\frac{1}{2}$ | 190.500 | **7.5000** | 190.470 | **7.4988** | 190.529 | **7.5011** | 190.500 | **7.5000** | | | 190.478 | **7.4991** | 190.449 | **7.4980** | | |
| XLS6 | 203.200 | **8.0000** | 203.170 | **7.9988** | 203.229 | **8.0011** | 203.200 | **8.0000** | | | 203.178 | **7.9991** | 203.149 | **7.9980** | | |
| XLS$6\frac{1}{4}$ | 215.900 | **8.5000** | 215.870 | **8.4988** | 215.929 | **8.5011** | 215.900 | **8.5000** | 59L | **23L** | 215.878 | **8.4991** | 215.849 | **8.4980** | 8L | **3L** |
| XLS$6\frac{1}{2}$ | 222.250 | **8.7500** | 222.220 | **8.7488** | 222.279 | **8.7511** | 222.250 | **8.7500** | 0 | **0** | 222.228 | **8.7491** | 222.199 | **8.7480** | 51T | **20T** |
| XLS7 | 241.300 | **9.5000** | 241.270 | **9.4988** | 241.329 | **9.5011** | 241.300 | **9.5000** | | | 241.278 | **9.4991** | 241.249 | **9.4980** | | |
| XLS$7\frac{1}{4}$ | 247.650 | **9.7500** | 247.620 | **9.7488** | 247.679 | **9.7511** | 247.650 | **9.7500** | | | 247.628 | **9.7491** | 247.599 | **9.7480** | | |
| XLS$7\frac{3}{4}$ | 266.700 | **10.5000** | 266.665 | **10.4986** | 266.732 | **10.5013** | 266.700 | **10.5000** | | | 266.675 | **10.4990** | 266.643 | **10.4978** | | |
| XLS8 | 273.051 | **10.7500** | 273.016 | **10.7486** | 273.083 | **10.7513** | 273.051 | **10.7500** | 67L | **27L** | 273.026 | **10.7490** | 272.994 | **10.7478** | 10L | **4L** |
| XLS$8\frac{1}{4}$ | 279.401 | **11.0000** | 279.366 | **10.9986** | 279.433 | **11.0013** | 279.401 | **11.0000** | 0 | **0** | 279.376 | **10.9990** | 279.344 | **10.9978** | 57T | **22T** |
| XLS$8\frac{1}{2}$ | 292.101 | **11.5000** | 292.066 | **11.4986** | 292.133 | **11.5013** | 292.101 | **11.5000** | | | 292.076 | **11.4990** | 292.044 | **11.4978** | | |
| XLS9 | 304.801 | **12.0000** | 304.766 | **11.9986** | 304.833 | **12.0013** | 304.801 | **12.0000** | | | 304.776 | **11.9990** | 304.744 | **11.9978** | | |
| XLS10 | 336.551 | **13.2500** | 336.514 | **13.2484** | 336.587 | **13.2514** | 336.551 | **13.2500** | 76L | **30L** | 336.525 | **13.2490** | 336.489 | **13.2476** | 14L | **6L** |
| | | | | | | | | | 0 | **0** | | | | | 62T | **24T** |

For aluminum or other soft metal housings, make bore limits same as bearing O.D. limits.

# Shaft fit tolerances for solid steel shafts

**Classification for metric radial ball and roller bearings with cylindrical bore, Classes ABEC-1, RBEC-1 (except inch dimensioned taper roller bearings)**

| Conditions | Examples | Shaft diameter, mm<br>Ball bearings[1] | Tolerance[6] |
|---|---|---|---|
| Rotating inner ring load or direction of load indeterminate | | | |
| Light and variable loads<br>(P ≤ 0.05 C) | Conveyors, lightly loaded gearbox bearings | ≤ 17<br>18 to 100<br>101 to 140 | js5 (h5)[2]<br>j6 (js5)[2]<br>k6 |
| Normal to heavy loads<br>(P > 0.05 C) | Bearing applications generally, electric motors, turbines, pumps, gearing, wood working machines, windmills | ≤ 10<br>11 to 17<br>18 to 100<br>101 to 140<br>141 to 200<br>201 to 500 | js5<br>j5 (js5)[2]<br>k5[3]<br>m5<br>m6<br>n6[4] |
| High demands on running accuracy with light loads (P ≤ 0.05 C) | Machine tools | 8 to 240 | js4 |
| Stationary inner ring load | | | |
| Easy axial displacement of inner ring on shaft desirable | Wheels on non-rotating axles | | g6[5] |
| Easy axial displacement of inner ring on shaft unnecessary | Tension pulleys, rope sheaves | | h6 |
| Axial loads only | Bearing applications of all kinds | ≤ 250 | j6 |

1) For normally to heavily loaded ball bearings (P > 0.05 C), radial clearance greater than normal is often needed when the shaft tolerances in the table above are used. Sometimes the working conditions require tighter fits to prevent ball bearing inner rings from turning (creeping) on the shaft. If proper clearance, mostly larger than normal clearance is selected, the following tolerances can then be used: k4 for shaft diameters 10 to 17 mm, k5 for shaft diameters 18 to 25 mm, m5 for shaft diameters 26 to 140 mm, n6 for shaft diameters 141 to 300 mm, p6 for shaft diameters 301 to 500 mm
For additional information please contact SKF Application Engineering.
2) The tolerance in brackets applies to stainless steel bearings.
3) For stainless steel bearings within the diameter range 17 to 30 mm, tolerance j5 applies.
4) Bearings with radial internal clearance greater than normal are recommended for d ≤ 150 mm. For d > 150 mm bearings with radial internal clearance greater than normal may be necessary.
5) Tolerance f6 can be selected for large bearings to provide easy displacement.
6) See page 262 for specific shaft diameters.

# ISO fits for solid steel shafts

## Shaft bearing-seat diameters (values in inches)

| Bearing bore diameter | | | g6 | | | h5 | | | h6 | | | j5 | | | j6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | inches | | Shaft diameter | | Resultant fit[1] in 0.0001″ | Shaft diameter | | Resultant fit[1] in 0.0001″ | Shaft diameter | | Resultant fit[1] in 0.0001″ | Shaft diameter | | Resultant fit[1] in 0.0001″ | Shaft diameter | | Resultant fit[1] in 0.0001″ |
| mm | Max | Min | Max | Min | | Max | Min | | Max | Min | | Max | Min | | Max | Min | |
| 4 | 0.1575 | 0.1572 | 0.1573 | 0.1570 | | 0.1575 | 0.1573 | | 0.1575 | 0.1572 | | 0.1576 | 0.1574 | | 0.1577 | 0.1574 | |
| 5 | 0.1969 | 0.1966 | 0.1967 | 0.1964 | 5 L | 0.1969 | 0.1967 | 2 L | 0.1969 | 0.1966 | 3 L | 0.1970 | 0.1968 | 1 L | 0.1971 | 0.1968 | 1 L |
| 6 | 0.2362 | 0.2359 | 0.2360 | 0.2357 | 1 T | 0.2362 | 0.2360 | 3 T | 0.2362 | 0.2359 | 3 T | 0.2363 | 0.2361 | 4 T | 0.2364 | 0.2361 | 5 T |
| 7 | 0.2756 | 0.2753 | 0.2754 | 0.2750 | | 0.2756 | 0.2754 | | 0.2756 | 0.2752 | | 0.2758 | 0.2755 | | 0.2759 | 0.2755 | |
| 8 | 0.3150 | 0.3147 | 0.3148 | 0.3144 | 6 L | 0.3150 | 0.3148 | 2 L | 0.3150 | 0.3146 | 4 L | 0.3152 | 0.3149 | 1 L | 0.3153 | 0.3149 | 1 L |
| 9 | 0.3543 | 0.3540 | 0.3541 | 0.3537 | 1 T | 0.3543 | 0.3541 | 3 T | 0.3543 | 0.3539 | 3 T | 0.3545 | 0.3542 | 5 T | 0.3546 | 0.3542 | 6 T |
| 10 | 0.3937 | 0.3934 | 0.3935 | 0.3931 | | 0.3937 | 0.3935 | | 0.3937 | 0.3933 | | 0.3939 | 0.3936 | | 0.3940 | 0.3936 | |
| 12 | 0.4724 | 0.4721 | 0.4722 | 0.4717 | | 0.4724 | 0.4721 | | 0.4724 | 0.4720 | | 0.4726 | 0.4723 | | 0.4727 | 0.4723 | |
| 15 | 0.5906 | 0.5903 | 0.5904 | 0.5899 | 7 L | 0.5906 | 0.5903 | 3 L | 0.5906 | 0.5902 | 4 L | 0.5908 | 0.5905 | 1 L | 0.5909 | 0.5905 | 1 L |
| 17 | 0.6693 | 0.6690 | 0.6691 | 0.6686 | 1 T | 0.6693 | 0.6690 | 3 T | 0.6693 | 0.6689 | 3 T | 0.6695 | 0.6692 | 5 T | 0.6696 | 0.6692 | 6 T |
| 20 | 0.7874 | 0.7870 | 0.7871 | 0.7866 | | 0.7874 | 0.7870 | | 0.7874 | 0.7869 | | 0.7876 | 0.7872 | | 0.7878 | 0.7872 | |
| 25 | 0.9843 | 0.9839 | 0.9840 | 0.9835 | 8 L | 0.9843 | 0.9839 | 4 L | 0.9843 | 0.9838 | 5 L | 0.9845 | 0.9841 | 2 L | 0.9847 | 0.9841 | 2 L |
| 30 | 1.1811 | 1.1807 | 1.1808 | 1.1803 | 1 T | 1.1811 | 1.1807 | 4 T | 1.1811 | 1.1806 | 4 T | 1.1813 | 1.1809 | 6 T | 1.1815 | 1.1809 | 8 T |
| 35 | 1.3780 | 1.3775 | 1.3776 | 1.3770 | | 1.3780 | 1.3776 | | 1.3780 | 1.3774 | | 1.3782 | 1.3778 | | 1.3784 | 1.3778 | |
| 40 | 1.5748 | 1.5743 | 1.5744 | 1.5738 | 10 L | 1.5748 | 1.5744 | 4 L | 1.5748 | 1.5742 | 6 L | 1.5750 | 1.5746 | 2 L | 1.5752 | 1.5746 | 2 L |
| 45 | 1.7717 | 1.7712 | 1.7713 | 1.7707 | 1 T | 1.7717 | 1.7713 | 5 T | 1.7717 | 1.7711 | 5 T | 1.7719 | 1.7715 | 7 T | 1.7721 | 1.7715 | 9 T |
| 50 | 1.9685 | 1.9680 | 1.9681 | 1.9675 | | 1.9685 | 1.9681 | | 1.9685 | 1.9679 | | 1.9687 | 1.9683 | | 1.9689 | 1.9683 | |
| 55 | 2.1654 | 2.1648 | 2.1650 | 2.1643 | | 2.1654 | 2.1649 | | 2.1654 | 2.1647 | | 2.1656 | 2.1651 | | 2.1659 | 2.1651 | |
| 60 | 2.3622 | 2.3616 | 2.3618 | 2.3611 | | 2.3622 | 2.3617 | | 2.3622 | 2.3615 | | 2.3624 | 2.3619 | | 2.3627 | 2.3619 | |
| 65 | 2.5591 | 2.5585 | 2.5587 | 2.5580 | 11 L | 2.5591 | 2.5586 | 5 L | 2.5591 | 2.5584 | 7 L | 2.5593 | 2.5588 | 3 L | 2.5596 | 2.5588 | 3 L |
| 70 | 2.7559 | 2.7553 | 2.7555 | 2.7548 | 2 T | 2.7559 | 2.7554 | 6 T | 2.7559 | 2.7552 | 6 T | 2.7561 | 2.7556 | 8 T | 2.7564 | 2.7556 | 11 T |
| 75 | 2.9528 | 2.9522 | 2.9524 | 2.9517 | | 2.9528 | 2.9523 | | 2.9528 | 2.9521 | | 2.9530 | 2.9525 | | 2.9533 | 2.9525 | |
| 80 | 3.1496 | 3.1490 | 3.1492 | 3.1485 | | 3.1496 | 3.1491 | | 3.1496 | 3.1489 | | 3.1498 | 3.1493 | | 3.1501 | 3.1493 | |
| 85 | 3.3465 | 3.3457 | 3.3460 | 3.3452 | | 3.3465 | 3.3459 | | 3.3465 | 3.3456 | | 3.3467 | 3.3461 | | 3.3470 | 3.3461 | |
| 90 | 3.5433 | 3.5425 | 3.5428 | 3.5420 | | 3.5433 | 3.5427 | | 3.5433 | 3.5424 | | 3.5435 | 3.5429 | | 3.5438 | 3.5429 | |
| 95 | 3.7402 | 3.7394 | 3.7397 | 3.7389 | | 3.7402 | 3.7396 | | 3.7402 | 3.7393 | | 3.7404 | 3.7398 | | 3.7407 | 3.7398 | |
| 100 | 3.9370 | 3.9362 | 3.9365 | 3.9357 | 13 L | 3.9370 | 3.9364 | 6 L | 3.9370 | 3.9361 | 9 L | 3.9372 | 3.9366 | 4 L | 3.9375 | 3.9366 | 4 L |
| 105 | 4.1339 | 4.1331 | 4.1334 | 4.1326 | 3 T | 4.1339 | 4.1333 | 8 T | 4.1339 | 4.1330 | 8 T | 4.1341 | 4.1335 | 10 T | 4.1344 | 4.1335 | 13 T |
| 110 | 4.3307 | 4.3299 | 4.3302 | 4.3294 | | 4.3307 | 4.3301 | | 4.3307 | 4.3298 | | 4.3309 | 4.3303 | | 4.3312 | 4.3303 | |
| 115 | 4.5276 | 4.5268 | 4.5271 | 4.5263 | | 4.5276 | 4.5270 | | 4.5276 | 4.5267 | | 4.5278 | 4.5272 | | 4.5281 | 4.5272 | |
| 120 | 4.7244 | 4.7236 | 4.7239 | 4.7231 | | 4.7244 | 4.7238 | | 4.7244 | 4.7235 | | 4.7246 | 4.7240 | | 4.7249 | 4.7240 | |
| 125 | 4.9213 | 4.9203 | 4.9207 | 4.9198 | | 4.9213 | 4.9206 | | 4.9213 | 4.9203 | | 4.9216 | 4.9209 | | 4.9219 | 4.9209 | |
| 130 | 5.1181 | 5.1171 | 5.1175 | 5.1166 | | 5.1181 | 5.1174 | | 5.1181 | 5.1171 | | 5.1184 | 5.1177 | | 5.1187 | 5.1177 | |
| 140 | 5.5118 | 5.5108 | 5.5112 | 5.5103 | | 5.5118 | 5.5111 | | 5.5118 | 5.5108 | | 5.5121 | 5.5114 | | 5.5124 | 5.5114 | |
| 150 | 5.9055 | 5.9045 | 5.9049 | 5.9040 | 15 L | 5.9055 | 5.9048 | 7 L | 5.9055 | 5.9045 | 10 L | 5.9058 | 5.9051 | 4 L | 5.9061 | 5.9051 | 4 L |
| 160 | 6.2992 | 6.2982 | 6.2986 | 6.2977 | 4 T | 6.2992 | 6.2985 | 10 T | 6.2992 | 6.2982 | 10 T | 6.2995 | 6.2988 | 13 T | 6.2998 | 6.2988 | 16 T |
| 170 | 6.6929 | 6.6919 | 6.6923 | 6.6914 | | 6.6929 | 6.6922 | | 6.6929 | 6.6919 | | 6.6932 | 6.6925 | | 6.6935 | 6.6925 | |
| 180 | 7.0866 | 7.0856 | 7.0860 | 7.0851 | | 7.0866 | 7.0859 | | 7.0866 | 7.0856 | | 7.0869 | 7.0862 | | 7.0872 | 7.0862 | |
| 190 | 7.4803 | 7.4791 | 7.4797 | 7.4786 | | 7.4803 | 7.4795 | | 7.4803 | 7.4792 | | 7.4806 | 7.4798 | | 7.4809 | 7.4798 | |
| 200 | 7.8740 | 7.8728 | 7.8734 | 7.8723 | 17 L | 7.8740 | 7.8732 | 8 L | 7.8740 | 7.8729 | 11 L | 7.8743 | 7.8735 | 5 L | 7.8746 | 7.8735 | 5 L |
| 220 | 8.6614 | 8.6602 | 8.6608 | 8.6597 | 6 T | 8.6614 | 8.6606 | 12 T | 8.6614 | 8.6603 | 12 T | 8.6617 | 8.6609 | 15 T | 8.6620 | 8.6609 | 18 T |
| 240 | 9.4488 | 9.4476 | 9.4482 | 9.4471 | | 9.4488 | 9.4480 | | 9.4488 | 9.4477 | | 9.4491 | 9.4483 | | 9.4494 | 9.4483 | |
| 250 | 9.8425 | 9.8413 | 9.8419 | 9.8408 | | 9.8425 | 9.84170 | | 9.8425 | 9.8414 | | 9.8428 | 9.8420 | | 9.8431 | 9.8420 | |
| 260 | 10.2362 | 10.2348 | 10.2355 | 10.2343 | | 10.2362 | 10.2353 | | 10.2362 | 10.2349 | | 10.2365 | 10.2356 | | 10.2368 | 10.2356 | |
| 280 | 11.0236 | 11.0222 | 11.0229 | 11.0217 | 19 L | 11.0236 | 11.0227 | 9 L | 11.0236 | 11.0223 | 13 L | 11.0239 | 11.0230 | 6 L | 11.0242 | 11.0230 | 6 L |
| 300 | 11.8110 | 11.8096 | 11.8103 | 11.8091 | 7 T | 11.8110 | 11.8101 | 14 T | 11.8110 | 11.8097 | 14 T | 11.8113 | 11.8104 | 17 T | 11.8116 | 11.8104 | 20 T |
| 310 | 12.2047 | 12.2033 | 12.2040 | 12.2028 | | 12.2047 | 12.2038 | | 12.2047 | 12.2034 | | 12.2050 | 12.2041 | | 12.2053 | 12.2041 | |
| 320 | 12.5984 | 12.5968 | 12.5977 | 12.5963 | | 12.5984 | 12.5974 | | 12.5984 | 12.5970 | | 12.5987 | 12.5977 | | 12.5991 | 12.5977 | |
| 340 | 13.3858 | 13.3842 | 13.3851 | 13.3837 | | 13.3858 | 13.3848 | | 13.3858 | 13.3844 | | 13.3861 | 13.3851 | | 13.3865 | 13.3851 | |
| 350 | 13.7795 | 13.7779 | 13.7788 | 13.7774 | 21 L | 13.7795 | 13.7785 | 10 L | 13.7795 | 13.7781 | 14 L | 13.7798 | 13.7788 | 7 L | 13.7802 | 13.7788 | 7 L |
| 360 | 14.1732 | 14.1716 | 14.1725 | 14.1711 | 9 T | 14.1732 | 14.1722 | 16 T | 14.1732 | 14.1718 | 16 T | 14.1735 | 14.1725 | 19 T | 14.1739 | 14.1725 | 23 T |
| 380 | 14.9606 | 14.959 | 14.9599 | 14.9585 | | 14.9606 | 14.9596 | | 14.9606 | 14.9592 | | 14.9609 | 14.9599 | | 14.9613 | 14.9599 | |
| 400 | 15.7480 | 15.7464 | 15.7473 | 15.7459 | | 15.7480 | 15.7470 | | 15.7480 | 15.7466 | | 15.7483 | 15.7473 | | 15.7487 | 15.7473 | |
| 420 | 16.5354 | 16.5336 | 16.5346 | 16.5330 | | 16.5354 | 16.5343 | | 16.5354 | 16.5338 | | 16.5357 | 16.5346 | | 16.5362 | 16.5346 | |
| 440 | 17.3228 | 17.3210 | 17.3220 | 17.3204 | 24 L | 17.3228 | 17.3217 | 11 L | 17.3228 | 17.3212 | 16 L | 17.3231 | 17.3220 | 8 L | 17.3236 | 17.3220 | 8 L |
| 460 | 18.1102 | 18.1084 | 18.1094 | 18.1078 | 10 T | 18.1102 | 18.1091 | 18 T | 18.1102 | 18.1086 | 18 T | 18.1105 | 18.1094 | 21 T | 18.1110 | 18.1094 | 26 T |
| 480 | 18.8976 | 18.8958 | 18.8968 | 18.8952 | | 18.8976 | 18.8965 | | 18.8976 | 18.8960 | | 18.8979 | 18.8968 | | 18.8984 | 18.8968 | |
| 500 | 19.6850 | 19.6832 | 19.6842 | 19.6826 | | 19.6850 | 19.6839 | | 19.6850 | 19.6834 | | 19.6853 | 19.6842 | | 19.6858 | 19.6842 | |
| 530 | 20.8661 | 20.8641 | 20.8652 | 20.8635 | | — | — | | 20.8661 | 20.8644 | | — | — | | 20.8670 | 20.8652 | |
| 560 | 22.0472 | 22.0452 | 22.0463 | 22.0446 | 26 L | — | — | | 22.0472 | 22.0455 | 17 L | — | — | | 22.0481 | 22.0463 | 9 L |
| 600 | 23.6220 | 23.6200 | 23.6211 | 23.6194 | 11 T | — | — | | 23.6220 | 23.6203 | 20 T | — | — | | 23.6229 | 23.6211 | 29 T |
| 630 | 24.8031 | 24.8011 | 24.8022 | 24.8005 | | — | — | | 24.8031 | 24.8014 | | — | — | | 24.8040 | 24.8022 | |
| 660 | 25.9843 | 25.9813 | 25.9834 | 25.9814 | | — | — | | 25.9843 | 25.9823 | | — | — | | 25.9853 | 25.9833 | |
| 670 | 26.3780 | 26.3750 | 26.3771 | 26.3751 | | — | — | | 26.3780 | 26.3760 | | — | — | | 26.3790 | 26.3770 | |
| 710 | 27.9528 | 27.9498 | 27.9519 | 27.9499 | 29 L | — | — | | 27.9528 | 27.9508 | 20 L | — | — | | 27.9538 | 27.9518 | 10 L |
| 750 | 29.5276 | 29.5246 | 29.5267 | 29.5247 | 21 T | — | — | | 29.5276 | 29.5256 | 30 T | — | — | | 29.5286 | 29.5266 | 40 T |
| 780 | 30.7087 | 30.7057 | 30.7078 | 30.7058 | | — | — | | 30.7087 | 30.7067 | | — | — | | 30.7097 | 30.7077 | |
| 800 | 31.4961 | 31.4931 | 31.4952 | 31.4932 | | — | — | | 31.4961 | 31.4941 | | — | — | | 31.4971 | 31.4951 | |
| 850 | 33.4646 | 33.4607 | 33.4636 | 33.4614 | | — | — | | 33.4646 | 33.4624 | | — | — | | 33.4657 | 33.4635 | |
| 900 | 35.4331 | 35.4292 | 35.4321 | 35.4299 | 32 L | — | — | | 35.4331 | 35.4309 | 22 L | — | — | | 35.4342 | 35.4320 | 11 L |
| 950 | 37.4016 | 37.3977 | 37.4006 | 37.3984 | 29 T | — | — | | 37.4016 | 37.3994 | 39 T | — | — | | 37.4027 | 37.4005 | 50 T |
| 1000 | 39.3701 | 39.3662 | 39.3691 | 39.3669 | | — | — | | 39.3701 | 39.3679 | | — | — | | 39.3712 | 39.3690 | |

Note: To convert inches to mm, multiply inches by 25.4.
[1] L indicates "LOOSE" fit, T indicates "TIGHT" fit.

# ISO fits for solid steel shafts

## Shaft bearing-seat diameters (values in inches)

| Bearing bore diameter | | | js4 Shaft diameter | | Resultant fit[1] in 0.0001″ | js5 Shaft diameter | | Resultant fit[1] in 0.0001″ | js6 Shaft diameter | | Resultant fit[1] in 0.0001″ | k5 Shaft diameter | | Resultant fit[1] in 0.0001″ | k6 Shaft diameter | | Resultant fit[1] in 0.0001″ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | inches Max | Min | Max | Min | | Max | Min | | Max | Min | | Max | Min | | Max | Min | |
| 4 | 0.1575 | 0.1572 | — | — | | 0.1576 | 0.1574 | | 0.1577 | 0.1573 | | 0.1577 | 0.1575 | | 0.1579 | 0.1575 | |
| 5 | 0.1969 | 0.1966 | — | — | | 0.1970 | 0.1968 | 1 L | 0.1971 | 0.1967 | 2 L | 0.1971 | 0.1969 | 0 T | 0.1973 | 0.1969 | 0 T |
| 6 | 0.2362 | 0.2359 | — | — | | 0.2363 | 0.2361 | 4 T | 0.2364 | 0.2360 | 5 T | 0.2364 | 0.2362 | 5 T | 0.2366 | 0.2362 | 7 T |
| 7 | 0.2756 | 0.2753 | 0.2757 | 0.2755 | | 0.2757 | 0.2755 | | 0.2758 | 0.2754 | | 0.2759 | 0.2756 | | 0.2760 | 0.2756 | |
| 8 | 0.3150 | 0.3147 | 0.3151 | 0.3149 | 1 L | 0.3151 | 0.3149 | 1 L | 0.3152 | 0.3148 | 2 L | 0.3153 | 0.3150 | 0 T | 0.3154 | 0.3150 | 0 T |
| 9 | 0.3543 | 0.3540 | 0.3544 | 0.3542 | 4 T | 0.3544 | 0.3542 | 4 T | 0.3545 | 0.3541 | 5 T | 0.3546 | 0.3543 | 6 T | 0.3547 | 0.3543 | 7 T |
| 10 | 0.3937 | 0.3934 | 0.3938 | 0.3936 | | 0.3938 | 0.3936 | | 0.3939 | 0.3935 | | 0.3940 | 0.3937 | | 0.3941 | 0.3937 | |
| 12 | 0.4724 | 0.4721 | 0.4725 | 0.4723 | | 0.4726 | 0.4722 | | 0.4726 | 0.4722 | | 0.4728 | 0.4724 | | 0.4729 | 0.4724 | |
| 15 | 0.5906 | 0.5903 | 0.5907 | 0.5905 | 1 L | 0.5908 | 0.5904 | 2 L | 0.5908 | 0.5904 | 2 L | 0.5910 | 0.5906 | 0 T | 0.5911 | 0.5906 | 0 T |
| 17 | 0.6693 | 0.6690 | 0.6694 | 0.6692 | 4 T | 0.6695 | 0.6691 | 5 T | 0.6695 | 0.6691 | 5 T | 0.6697 | 0.6693 | 7 T | 0.6698 | 0.6693 | 8 T |
| 20 | 0.7874 | 0.7870 | 0.7875 | 0.7872 | | 0.7876 | 0.7872 | | 0.7876 | 0.7871 | | 0.7878 | 0.7875 | | 0.7880 | 0.7875 | |
| 25 | 0.9843 | 0.9839 | 0.9844 | 0.9841 | 2 L | 0.9845 | 0.9841 | 2 L | 0.9845 | 0.9840 | 3 L | 0.9847 | 0.9844 | 1 T | 0.9849 | 0.9844 | 1 T |
| 30 | 1.1811 | 1.1807 | 1.1812 | 1.1809 | 5 T | 1.1813 | 1.1809 | 6 T | 1.1813 | 1.1808 | 6 T | 1.1815 | 1.1812 | 8 T | 1.1817 | 1.1812 | 10 T |
| 35 | 1.3780 | 1.3775 | 1.3781 | 1.3778 | | 1.3782 | 1.3778 | | 1.3783 | 1.3777 | | 1.3785 | 1.3781 | | 1.3787 | 1.3781 | |
| 40 | 1.5748 | 1.5743 | 1.5749 | 1.5746 | 2 L | 1.5750 | 1.5746 | 2 L | 1.5751 | 1.5745 | 3 L | 1.5753 | 1.5749 | 1 T | 1.5755 | 1.5749 | 1 T |
| 45 | 1.7717 | 1.7712 | 1.7718 | 1.7715 | 6 T | 1.7719 | 1.7715 | 7 T | 1.7720 | 1.7714 | 8 T | 1.7722 | 1.7718 | 10 T | 1.7724 | 1.7718 | 12 T |
| 50 | 1.9685 | 1.9680 | 1.9686 | 1.9683 | | 1.9687 | 1.9683 | | 1.9688 | 1.9682 | | 1.9690 | 1.9686 | | 1.9692 | 1.9686 | |
| 55 | 2.1654 | 2.1648 | 2.1655 | 2.1652 | | 2.1656 | 2.1651 | | 2.1658 | 2.1650 | | 2.1660 | 2.1655 | | 2.1662 | 2.1655 | |
| 60 | 2.3622 | 2.3616 | 2.3623 | 2.3620 | | 2.3624 | 2.3619 | | 2.3626 | 2.3618 | | 2.3628 | 2.3623 | | 2.3630 | 2.3623 | |
| 65 | 2.5591 | 2.5585 | 2.5592 | 2.5589 | 2 L | 2.5593 | 2.5588 | 3 L | 2.5595 | 2.5587 | 4 L | 2.5597 | 2.5592 | 1 T | 2.5599 | 2.5592 | 1 T |
| 70 | 2.7559 | 2.7553 | 2.7560 | 2.7557 | 7 T | 2.7561 | 2.7556 | 8 T | 2.7563 | 2.7555 | 10 T | 2.7565 | 2.7560 | 12 T | 2.7567 | 2.7560 | 14 T |
| 75 | 2.9528 | 2.9522 | 2.9529 | 2.9526 | | 2.9530 | 2.9525 | | 2.9532 | 2.9524 | | 2.9534 | 2.9529 | | 2.9536 | 2.9529 | |
| 80 | 3.1496 | 3.1490 | 3.1497 | 3.1494 | | 3.1498 | 3.1493 | | 3.1500 | 3.1492 | | 3.1502 | 3.1497 | | 3.1504 | 3.1497 | |
| 85 | 3.3465 | 3.3457 | 3.3467 | 3.3463 | | 3.3468 | 3.3462 | | 3.3469 | 3.3461 | | 3.3472 | 3.3466 | | 3.3475 | 3.3466 | |
| 90 | 3.5433 | 3.5425 | 3.5435 | 3.5431 | | 3.5436 | 3.5430 | | 3.5437 | 3.5429 | | 3.5440 | 3.5434 | | 3.5443 | 3.5434 | |
| 95 | 3.7402 | 3.7394 | 3.7404 | 3.7400 | | 3.7405 | 3.7399 | | 3.7406 | 3.7398 | | 3.7409 | 3.7403 | | 3.7412 | 3.7403 | |
| 100 | 3.9370 | 3.9362 | 3.9372 | 3.9368 | 2 L | 3.9373 | 3.9367 | 3 L | 3.9374 | 3.9366 | 4 L | 3.9377 | 3.9371 | 1 T | 3.9380 | 3.9371 | 1 T |
| 105 | 4.1339 | 4.1331 | 4.1341 | 4.1337 | 10 T | 4.1342 | 4.1336 | 11 T | 4.1343 | 4.1335 | 12 T | 4.1346 | 4.1340 | 15 T | 4.1349 | 4.1340 | 18 T |
| 110 | 4.3307 | 4.3299 | 4.3309 | 4.3305 | | 4.3310 | 4.3304 | | 4.3311 | 4.3303 | | 4.3314 | 4.3308 | | 4.3317 | 4.3308 | |
| 115 | 4.5276 | 4.5268 | 4.5278 | 4.5274 | | 4.5279 | 4.5273 | | 4.5280 | 4.5272 | | 4.5283 | 4.5277 | | 4.5286 | 4.5277 | |
| 120 | 4.7244 | 4.7236 | 4.7246 | 4.7242 | | 4.7247 | 4.7241 | | 4.7248 | 4.7240 | | 4.7251 | 4.7245 | | 4.7254 | 4.7245 | |
| 125 | 4.9213 | 4.9203 | 4.9215 | 4.9210 | | 4.9216 | 4.9209 | | 4.9218 | 4.9208 | | 4.9221 | 4.9214 | | 4.9224 | 4.9214 | |
| 130 | 5.1181 | 5.1171 | 5.1183 | 5.1178 | | 5.1184 | 5.1177 | | 5.1186 | 5.1176 | | 5.1189 | 5.1182 | | 5.1192 | 5.1182 | |
| 140 | 5.5118 | 5.5108 | 5.5120 | 5.5115 | | 5.5121 | 5.5114 | | 5.5123 | 5.5113 | | 5.5126 | 5.5119 | | 5.5129 | 5.5119 | |
| 150 | 5.9055 | 5.9045 | 5.9057 | 5.9052 | 3 L | 5.9058 | 5.9051 | 4 L | 5.9060 | 5.9050 | 5 L | 5.9063 | 5.9056 | 1 T | 5.9066 | 5.9056 | 1 T |
| 160 | 6.2992 | 6.2982 | 6.2994 | 6.2989 | 12 T | 6.2995 | 6.2988 | 13 T | 6.2997 | 6.2987 | 15 T | 6.3000 | 6.2993 | 18 T | 6.3003 | 6.2993 | 21 T |
| 170 | 6.6929 | 6.6919 | 6.6931 | 6.6926 | | 6.6932 | 6.6925 | | 6.6934 | 6.6924 | | 6.6937 | 6.6930 | | 6.6940 | 6.6930 | |
| 180 | 7.0866 | 7.0856 | 7.0868 | 7.0863 | | 7.0869 | 7.0862 | | 7.0871 | 7.0861 | | 7.0874 | 7.0867 | | 7.0877 | 7.0867 | |
| 190 | 7.4803 | 7.4791 | 7.4806 | 7.4800 | | 7.4807 | 7.4799 | | 7.4809 | 7.4797 | | 7.4812 | 7.4805 | | 7.4815 | 7.4805 | |
| 200 | 7.8740 | 7.8728 | 7.8743 | 7.8737 | 3 L | 7.8744 | 7.8736 | 4 L | 7.8746 | 7.8734 | 6 L | 7.8749 | 7.8742 | 2 T | 7.8753 | 7.8742 | 2 T |
| 220 | 8.6614 | 8.6602 | 8.6617 | 8.6611 | 15 T | 8.6618 | 8.6610 | 16 T | 8.6620 | 8.6608 | 18 T | 8.6623 | 8.6616 | 21 T | 8.6627 | 8.6616 | 25 T |
| 240 | 9.4488 | 9.4476 | 9.4491 | 9.4485 | | 9.4492 | 9.4484 | | 9.4494 | 9.4482 | | 9.4497 | 9.4490 | | 9.4501 | 9.4490 | |
| 250 | 9.8425 | 9.8413 | 9.8428 | 9.8422 | | 9.8429 | 9.8421 | | 9.8431 | 9.8419 | | 9.8434 | 9.8427 | | 9.8438 | 9.8427 | |
| 260 | 10.2362 | 10.2348 | 10.2365 | 10.2359 | | 10.2366 | 10.2357 | | 10.2368 | 10.2356 | | 10.2373 | 10.2364 | | 10.2376 | 10.2364 | |
| 280 | 11.0236 | 11.0222 | 11.0239 | 11.0233 | 3 L | 11.0240 | 11.0231 | 5 L | 11.0242 | 11.0230 | 6 L | 11.0247 | 11.0238 | 2 T | 11.0250 | 11.0238 | 2 T |
| 300 | 11.8110 | 11.8096 | 11.8113 | 11.8107 | 17 T | 11.8114 | 11.8105 | 18 T | 11.8116 | 11.8104 | 20 T | 11.8121 | 11.8112 | 25 T | 11.8124 | 11.8112 | 28 T |
| 310 | 12.2047 | 12.2033 | 12.2050 | 12.2044 | | 12.2051 | 12.2042 | | 12.2053 | 12.2041 | | 12.2058 | 12.2049 | | 12.2061 | 12.2049 | |
| 320 | 12.5984 | 12.5968 | — | — | | 12.5989 | 12.5979 | | 12.5991 | 12.5977 | | 12.5995 | 12.5986 | | 12.6000 | 12.5986 | |
| 340 | 13.3858 | 13.3842 | — | — | | 13.3863 | 13.3853 | | 13.3865 | 13.3851 | | 13.3869 | 13.3860 | | 13.3874 | 13.3860 | |
| 350 | 13.7795 | 13.7779 | — | — | | 13.7800 | 13.7790 | 5 L | 13.7802 | 13.7788 | 7 L | 13.7806 | 13.7797 | 2 T | 13.7811 | 13.7797 | 2 T |
| 360 | 14.1732 | 14.1716 | — | — | | 14.1737 | 14.1727 | 21 T | 14.1739 | 14.1725 | 23 T | 14.1743 | 14.1734 | 27 T | 14.1748 | 14.1734 | 32 T |
| 380 | 14.9606 | 14.9590 | — | — | | 14.9611 | 14.9601 | | 14.9613 | 14.9599 | | 14.9617 | 14.9608 | | 14.9622 | 14.9608 | |
| 400 | 15.7480 | 15.7464 | — | — | | 15.7485 | 15.7475 | | 15.7487 | 15.7473 | | 15.7491 | 15.7482 | | 15.7496 | 15.7482 | |
| 420 | 16.5354 | 16.5336 | — | — | | 16.5359 | 16.5349 | | 16.5362 | 16.5346 | | 16.5367 | 16.5356 | | 16.5372 | 16.5356 | |
| 440 | 17.3228 | 17.3210 | — | — | | 17.3233 | 17.3223 | 5 L | 17.3236 | 17.3220 | 8 L | 17.3241 | 17.3230 | 2 T | 17.3246 | 17.3230 | 2 T |
| 460 | 18.1102 | 18.1084 | — | — | | 18.1107 | 18.1097 | 23 T | 18.1110 | 18.1094 | 26 T | 18.1115 | 18.1104 | 31 T | 18.1120 | 18.1104 | 36 T |
| 480 | 18.8976 | 18.8958 | — | — | | 18.8981 | 18.8971 | | 18.8984 | 18.8968 | | 18.8989 | 18.8978 | | 18.8994 | 18.8978 | |
| 500 | 19.6850 | 19.6832 | — | — | | 19.6855 | 19.6845 | | 19.6858 | 19.6842 | | 19.6863 | 19.6852 | | 19.6868 | 19.6852 | |
| 530 | 20.8661 | 20.8641 | — | — | | 20.8666 | 20.8655 | | 20.8669 | 20.8652 | | 20.8673 | 20.8661 | | 20.8678 | 20.8661 | |
| 560 | 22.0472 | 22.0452 | — | — | | 22.0477 | 22.0466 | 6 L | 22.0480 | 22.0463 | 9 L | 22.0484 | 22.0472 | 0 T | 22.0489 | 22.0472 | 0 T |
| 600 | 23.6220 | 23.6200 | — | — | | 23.6225 | 23.6214 | 25 T | 23.6228 | 23.6211 | 28 T | 23.6232 | 23.6220 | 32 T | 23.6237 | 23.6220 | 37 T |
| 630 | 24.8031 | 24.8011 | — | — | | 24.8036 | 24.8025 | | 24.8039 | 24.8022 | | 24.8043 | 24.8031 | | 24.8048 | 24.8031 | |
| 660 | 25.9843 | 25.9813 | — | — | | 25.9849 | 25.9837 | | 25.9852 | 25.9833 | | 25.9857 | 25.9843 | | 25.9862 | 25.9843 | |
| 670 | 26.3780 | 26.3750 | — | — | | 26.3786 | 26.3774 | | 26.3789 | 26.3770 | | 26.3794 | 26.3780 | | 26.3799 | 26.3780 | |
| 710 | 27.9528 | 27.9498 | — | — | | 27.9534 | 27.9522 | 6 L | 27.9537 | 27.9518 | 10 L | 27.9542 | 27.9528 | 0 T | 27.9547 | 27.9528 | 0 T |
| 750 | 29.5276 | 29.5246 | — | — | | 29.5282 | 29.5270 | 36 T | 29.5285 | 29.5266 | 39 T | 29.5290 | 29.5276 | 44 T | 29.5295 | 29.5276 | 49 T |
| 780 | 30.7087 | 30.7057 | — | — | | 30.7093 | 30.7081 | | 30.7096 | 30.7077 | | 30.7101 | 30.7087 | | 30.7106 | 30.7087 | |
| 800 | 31.4961 | 31.4931 | — | — | | 31.4967 | 31.4955 | | 31.4970 | 31.4951 | | 31.4975 | 31.4961 | | 31.4980 | 31.4961 | |
| 850 | 33.4646 | 33.4607 | — | — | | 33.4653 | 33.4639 | | 33.4657 | 33.4635 | | 33.4662 | 33.4646 | | 33.4668 | 33.4646 | |
| 900 | 35.4331 | 35.4292 | — | — | | 35.4338 | 35.4324 | 7 L | 35.4342 | 35.4320 | 11 L | 35.4347 | 35.4331 | 0 T | 35.4353 | 35.4331 | 0 T |
| 950 | 37.4016 | 37.3977 | — | — | | 37.4023 | 37.4009 | 46 T | 37.4027 | 37.4005 | 50 T | 37.4032 | 37.4016 | 55 T | 37.4038 | 37.4016 | 61 T |
| 1000 | 39.3701 | 39.3662 | — | — | | 39.3708 | 39.3694 | | 39.3712 | 39.3690 | | 39.3717 | 39.3701 | | 39.3723 | 39.3701 | |

Note: To convert inches to mm, multiply inches by 25.4.
[1] L indicates "LOOSE" fit, T indicates "TIGHT" fit.

# ISO fits for solid steel shafts

## Shaft bearing-seat diameters (values in inches)

| Bearing bore diameter | | | m5 | | | m6 | | | n6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | inches | | Shaft diameter | | Resultant fit[1] in 0.0001″ | Shaft diameter | | Resultant fit[1] in 0.0001″ | Shaft diameter | | Resultant fit[1] in 0.0001″ |
| mm | Max | Min | Max | Min | | Max | Min | | Max | Min | |
| 4 | **0.1575** | **0.1572** | 0.1579 | 0.1577 | | 0.1580 | 0.1577 | | 0.1581 | 0.1578 | |
| 5 | **0.1969** | **0.1966** | 0.1973 | 0.1971 | 2 T | 0.1974 | 0.1971 | 2 T | 0.1975 | 0.1972 | 3 T |
| 6 | **0.2362** | **0.2359** | 0.2366 | 0.2364 | 7 T | 0.2367 | 0.2364 | 8 T | 0.2368 | 0.2365 | 9 T |
| 7 | **0.2756** | **0.2753** | 0.2761 | 0.2758 | | 0.2762 | 0.2758 | | 0.2763 | 0.2760 | |
| 8 | **0.3150** | **0.3147** | 0.3155 | 0.3152 | 2 T | 0.3156 | 0.3152 | 2 T | 0.3157 | 0.3154 | 4 T |
| 9 | **0.3543** | **0.3540** | 0.3548 | 0.3545 | 8 T | 0.3549 | 0.3545 | 9 T | 0.3550 | 0.3547 | 10 T |
| 10 | **0.3937** | **0.3934** | 0.3942 | 0.3939 | | 0.3943 | 0.3939 | | 0.3944 | 0.3941 | |
| 12 | **0.4724** | **0.4721** | 0.4730 | 0.4727 | | 0.4731 | 0.4727 | | 0.4733 | 0.4729 | |
| 15 | **0.5906** | **0.5903** | 0.5912 | 0.5909 | 3 T | 0.5913 | 0.5909 | 3 T | 0.5915 | 0.5911 | 5 T |
| 17 | **0.6693** | **0.6690** | 0.6699 | 0.6696 | 9 T | 0.6700 | 0.6696 | 10 T | 0.6702 | 0.6698 | 12 T |
| 20 | **0.7874** | **0.7870** | 0.7881 | 0.7877 | | 0.7882 | 0.7877 | | 0.7885 | 0.7880 | |
| 25 | **0.9843** | **0.9839** | 0.9850 | 0.9846 | 3 T | 0.9851 | 0.9846 | 3 T | 0.9854 | 0.9849 | 6 T |
| 30 | **1.1811** | **1.1807** | 1.1818 | 1.1814 | 11 T | 1.1819 | 1.1814 | 12 T | 1.1822 | 1.1817 | 15 T |
| 35 | **1.3780** | **1.3775** | 1.3788 | 1.3784 | | 1.3790 | 1.3784 | | 1.3793 | 1.3787 | |
| 40 | **1.5748** | **1.5743** | 1.5756 | 1.5752 | 4 T | 1.5758 | 1.5752 | 4 T | 1.5761 | 1.5755 | 7 T |
| 45 | **1.7717** | **1.7712** | 1.7725 | 1.7721 | 13 T | 1.7727 | 1.7721 | 15 T | 1.7730 | 1.7724 | 18 T |
| 50 | **1.9685** | **1.9680** | 1.9693 | 1.9689 | | 1.9695 | 1.9689 | | 1.9698 | 1.9692 | |
| 55 | **2.1654** | **2.1648** | 2.1663 | 2.1658 | | 2.1666 | 2.1658 | | 2.1669 | 2.1662 | |
| 60 | **2.3622** | **2.3616** | 2.3631 | 2.3626 | | 2.3634 | 2.3626 | | 2.3637 | 2.3630 | |
| 65 | **2.5591** | **2.5585** | 2.5600 | 2.5595 | 4 T | 2.5603 | 2.5595 | 4 T | 2.5606 | 2.5599 | 8 T |
| 70 | **2.7559** | **2.7553** | 2.7568 | 2.7563 | 15 T | 2.7571 | 2.7563 | 18 T | 2.7574 | 2.7567 | 21 T |
| 75 | **2.9528** | **2.9522** | 2.9537 | 2.9532 | | 2.9540 | 2.9532 | | 2.9543 | 2.9536 | |
| 80 | **3.1496** | **3.1490** | 3.1505 | 3.1500 | | 3.1508 | 3.1500 | | 3.1511 | 3.1504 | |
| 85 | **3.3465** | **3.3457** | 3.3476 | 3.3470 | | 3.3479 | 3.3470 | | 3.3483 | 3.3474 | |
| 90 | **3.5433** | **3.5425** | 3.5444 | 3.5438 | | 3.5447 | 3.5438 | | 3.5451 | 3.5442 | |
| 95 | **3.7402** | **3.7394** | 3.7413 | 3.7407 | | 3.7416 | 3.7407 | | 3.7420 | 3.7411 | |
| 100 | **3.9370** | **3.9362** | 3.9381 | 3.9375 | 5 T | 3.9384 | 3.9375 | 5 T | 3.9388 | 3.9379 | 9 T |
| 105 | **4.1339** | **4.1331** | 4.1350 | 4.1344 | 19 T | 4.1353 | 4.1344 | 22 T | 4.1357 | 4.1348 | 26 T |
| 110 | **4.3307** | **4.3299** | 4.3318 | 4.3312 | | 4.3321 | 4.3312 | | 4.3325 | 4.3316 | |
| 115 | **4.5276** | **4.5268** | 4.5287 | 4.5281 | | 4.5290 | 4.5281 | | 4.5294 | 4.5285 | |
| 120 | **4.7244** | **4.7236** | 4.7255 | 4.7249 | | 4.7258 | 4.7249 | | 4.7262 | 4.7253 | |
| 125 | **4.9213** | **4.9203** | 4.9226 | 4.9219 | | 4.9229 | 4.9219 | | 4.9233 | 4.9224 | |
| 130 | **5.1181** | **5.1171** | 5.1194 | 5.1187 | | 5.1197 | 5.1187 | | 5.1201 | 5.1192 | |
| 140 | **5.5118** | **5.5108** | 5.5131 | 5.5124 | | 5.5134 | 5.5124 | | 5.5138 | 5.5129 | |
| 150 | **5.9055** | **5.9045** | 5.9068 | 5.9061 | 6 T | 5.9071 | 5.9061 | 6 T | 5.9075 | 5.9066 | 11 T |
| 160 | **6.2992** | **6.2982** | 6.3005 | 6.2998 | 23 T | 6.3008 | 6.2998 | 26 T | 6.3012 | 6.3003 | 30 T |
| 170 | **6.6929** | **6.6919** | 6.6942 | 6.6935 | | 6.6945 | 6.6935 | | 6.6949 | 6.6940 | |
| 180 | **7.0866** | **7.0856** | 7.0879 | 7.0872 | | 7.0882 | 7.0872 | | 7.0886 | 7.0877 | |
| 190 | **7.4803** | **7.4791** | 7.4818 | 7.4810 | | 7.4821 | 7.4810 | | 7.4827 | 7.4815 | |
| 200 | **7.8740** | **7.8728** | 7.8755 | 7.8747 | 7 T | 7.8758 | 7.8747 | 7 T | 7.8764 | 7.8752 | 12 T |
| 220 | **8.6614** | **8.6602** | 8.6629 | 8.6621 | 27 T | 8.6632 | 8.6621 | 30 T | 8.6638 | 8.6626 | 36 T |
| 240 | **9.4488** | **9.4476** | 9.4503 | 9.4495 | | 9.4506 | 9.4495 | | 9.4512 | 9.4500 | |
| 250 | **9.8425** | **9.8413** | 9.8440 | 9.8432 | | 9.8443 | 9.8432 | | 9.8449 | 9.8437 | |
| 260 | **10.2362** | **10.2348** | 10.2379 | 10.2370 | | 10.2382 | 10.2370 | | 10.2388 | 10.2375 | |
| 280 | **11.0236** | **11.0222** | 11.0253 | 11.0244 | 8 T | 11.0256 | 11.0244 | 8 T | 11.0262 | 11.0249 | 13 T |
| 300 | **11.8110** | **11.8096** | 11.8127 | 11.8118 | 31 T | 11.8130 | 11.8118 | 34 T | 11.8136 | 11.8123 | 40 T |
| 310 | **12.2047** | **12.2033** | 12.2064 | 12.2055 | | 12.2067 | 12.2055 | | 12.2073 | 12.2060 | |
| 320 | **12.5984** | **12.5968** | 12.6002 | 12.5992 | | 12.6006 | 12.5992 | | 12.6013 | 12.5999 | |
| 340 | **13.3858** | **13.3842** | 13.3876 | 13.3866 | | 13.3880 | 13.3866 | | 13.3887 | 13.3873 | |
| 350 | **13.7795** | **13.7779** | 13.7813 | 13.7803 | 8 T | 13.7817 | 13.7803 | 8 T | 13.7824 | 13.7810 | 15 T |
| 360 | **14.1732** | **14.1716** | 14.1750 | 14.1740 | 34 T | 14.1754 | 14.1740 | 38 T | 14.1761 | 14.1747 | 45 T |
| 380 | **14.9606** | **14.9590** | 14.9624 | 14.9614 | | 14.9628 | 14.9614 | | 14.9635 | 14.9621 | |
| 400 | **15.7480** | **15.7464** | 15.7498 | 15.7488 | | 15.7502 | 15.7488 | | 15.7509 | 15.7495 | |
| 420 | **16.5354** | **16.5336** | 16.5374 | 16.5363 | | 16.5379 | 16.5363 | | 16.5385 | 16.5370 | |
| 440 | **17.3228** | **17.3210** | 17.3248 | 17.3237 | 9 T | 17.3253 | 17.3237 | 9 T | 17.3259 | 17.3244 | 16 T |
| 460 | **18.1102** | **18.1084** | 18.1122 | 18.1111 | 38 T | 18.1127 | 18.1111 | 43 T | 18.1133 | 18.1118 | 49 T |
| 480 | **18.8976** | **18.8958** | 18.8996 | 18.8985 | | 18.9001 | 18.8985 | | 18.9007 | 18.8992 | |
| 500 | **19.6850** | **19.6832** | 19.6870 | 19.6859 | | 19.6875 | 19.6859 | | 19.6881 | 19.6866 | |
| 530 | **20.8661** | **20.8641** | 20.8683 | 20.8671 | | — | — | | 20.8696 | 20.8678 | |
| 560 | **22.0472** | **22.0452** | 22.0494 | 22.0482 | 10 T | — | — | | 22.0507 | 22.0489 | 17 T |
| 600 | **23.6220** | **23.6200** | 23.6242 | 23.6230 | 42 T | — | — | | 23.6255 | 23.6237 | 55 T |
| 630 | **24.8031** | **24.8011** | 24.8053 | 24.8041 | | — | — | | 24.8066 | 24.8048 | |
| 660 | **25.9843** | **25.9813** | 25.9869 | 25.9855 | | — | — | | 25.9882 | 25.9863 | |
| 670 | **26.3780** | **26.3750** | 26.3806 | 26.3792 | | — | — | | 26.3819 | 26.3800 | |
| 710 | **27.9528** | **27.9498** | 27.9554 | 27.9540 | 12 T | — | — | | 27.9567 | 27.9548 | 20 T |
| 750 | **29.5276** | **29.5246** | 29.5302 | 29.5288 | 56 T | — | — | | 29.5315 | 29.5296 | 69 T |
| 780 | **30.7087** | **30.7057** | 30.7113 | 30.7099 | | — | — | | 30.7126 | 30.7107 | |
| 800 | **31.4961** | **31.4931** | 31.4987 | 31.4973 | | — | — | | 31.5000 | 31.4981 | |
| 850 | **33.4646** | **33.4607** | 33.4675 | 33.4659 | | — | — | | 33.4690 | 33.4668 | |
| 900 | **35.4331** | **35.4292** | 35.4360 | 35.4344 | 13 T | — | — | | 35.4375 | 35.4353 | 22 T |
| 950 | **37.4016** | **37.3977** | 37.4045 | 37.4029 | 68 T | — | — | | 37.4060 | 37.4038 | 83 T |
| 1000 | **39.3701** | **39.3662** | 39.3730 | 39.3714 | | — | — | | 39.3745 | 39.3723 | |

Note: To convert inches to mm, multiply inches by 25.4.
[1] L indicates "LOOSE" fit, T indicates "TIGHT" fit.

# ISO fits for cast iron and steel housings

## Radial bearings

The ISO housing tolerances listed are shown in the tables on pages 266 and 267.

| Conditions | Examples | Tolerance | Displacement of outer ring |
|---|---|---|---|
| **Inner ring rotation** | | | |
| Loads of all kinds | General bearing applications, railway axleboxes | H6[1)] | Can be displaced |
| Light and normal loads ($P \leq 0.10C$) with simple working conditions | General bearing applications | H8 | Can be displaced |
| Heat conduction through shaft | Drying cylinders, large electrical machines with spherical roller bearings | G7[2)] | Can be displaced |
| **Direction of load indeterminate*** | | | |
| Light and normal loads ($P \leq 0.10C$); axial displacement of outer ring desirable | Medium-size electrical machines, pumps, crankshaft bearings | J7 | Can usually be displaced |
| Heavy shock loads | Electric traction motors | M7 | Cannot be displaced |
| Normal and heavy loads ($P > 0.06C$); axial displacement of outer ring unnecessary | Electrical motors, pumps, crankshaft bearings | K7 | Cannot usually be displaced |
| **Outer ring rotation**** | | | |
| Heavy loads on bearings in thin-walled housings, heavy shock loads | Roller bearing wheel hubs, big end bearings | P7 | Cannot be displaced |
| Normal and heavy loads ($P > 0.06C$) | Ball bearing wheel hubs, big end bearings, crane traveling wheels | N7 | Cannot be displaced |
| Light and variable loads ($P \leq 0.06C$) | Conveyor rollers, rope sheaves, belt tension pulleys | M7 | Cannot be displaced |
| **Accurate or silent running[3)]** | | | |
| Light loads | Small electric motors | J6[2)] | Can be displaced |

*Variable external loads, shock loads, and vibratory and unbalanced loads in high-speed machinery cannot be accurately described and are classified as "direction of load indeterminate."
**Warning: If a press fit is also being used on the shaft, special consideration should be given to assembly and bearing internal clearance.
1) For large bearings ($D > 250$ mm) and temperature difference between outer ring and housing >10° C, use G7.
2) For large bearings ($D > 250$ mm) and temperature difference between outer ring and housing >10° C, use F7.
3) Not applicable to high precision bearings.

# ISO fits for cast iron and steel housings

## Housing bearing-seat diameters (values in inches)

| Bearing outside diameter mm | inches Max | Min | F7 Housing bore Min | Max | Resultant fit[1] in 0.0001″ | G7 Housing bore Min | Max | Resultant fit[1] in 0.0001″ | H6 Housing bore Min | Max | Resultant fit[1] in 0.0001″ | H8 Housing bore Min | Max | Resultant fit[1] in 0.0001″ | J6 Housing bore Min | Max | Resultant fit[1] in 0.0001″ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | **0.6299** | **0.6296** | 0.6305 | 0.6312 | 16 L 6 L | 0.6301 | 0.6308 | 12 L 2 L | 0.6299 | 0.6303 | 7 L 0 L | 0.6299 | 0.6310 | 14 L 0 L | 0.6297 | 0.6301 | 5 L 2 T |
| 19 | **0.7480** | **0.7476** | 0.7488 | 0.7496 | | 0.7483 | 0.7491 | | 0.7480 | 0.7485 | | 0.7480 | 0.7493 | | 0.7478 | 0.7483 | |
| 22 | **0.8661** | **0.8657** | 0.8669 | 0.8677 | | 0.8664 | 0.8672 | | 0.8661 | 0.8666 | | 0.8661 | 0.8674 | | 0.8659 | 0.8664 | |
| 24 | **0.9449** | **0.9445** | 0.9457 | 0.9465 | 20 L | 0.9452 | 0.9460 | 15 L | 0.9449 | 0.9454 | 9 L | 0.9449 | 0.9462 | 17 L | 0.9447 | 0.9452 | 7 L |
| 26 | **1.0236** | **1.0232** | 1.0244 | 1.0252 | 8 L | 1.0239 | 1.0247 | 3 L | 1.0236 | 1.0241 | 0 L | 1.0236 | 1.0249 | 0 L | 1.0234 | 1.0239 | 2 T |
| 28 | **1.1024** | **1.1020** | 1.1032 | 1.1040 | | 1.1027 | 1.1035 | | 1.1024 | 1.1029 | | 1.1024 | 1.1037 | | 1.1022 | 1.1027 | |
| 30 | **1.1811** | **1.1807** | 1.1819 | 1.1827 | | 1.1814 | 1.1822 | | 1.1811 | 1.1816 | | 1.1811 | 1.1824 | | 1.1809 | 1.1814 | |
| 32 | **1.2598** | **1.2594** | 1.2608 | 1.2618 | | 1.2602 | 1.2611 | | 1.2598 | 1.2604 | | 1.2598 | 1.2613 | | 1.2596 | 1.2602 | |
| 35 | **1.3780** | **1.3776** | 1.3790 | 1.4000 | | 1.3784 | 1.3793 | | 1.3780 | 1.3786 | | 1.3780 | 1.3795 | | 1.3778 | 1.3784 | |
| 37 | **1.4567** | **1.4563** | 1.4577 | 1.4587 | 24 L | 1.4571 | 1.4580 | 17 L | 1.4567 | 1.4573 | 10 L | 1.4567 | 1.4582 | 19 L | 1.4565 | 1.4571 | 8 L |
| 40 | **1.5748** | **1.5744** | 1.5758 | 1.5768 | 10 L | 1.5752 | 1.5761 | 4 L | 1.5748 | 1.5754 | 0 L | 1.5748 | 1.5763 | 0 L | 1.5746 | 1.5752 | 2 T |
| 42 | **1.6535** | **1.6531** | 1.6545 | 1.6555 | | 1.6539 | 1.6548 | | 1.6535 | 1.6541 | | 1.6535 | 1.6550 | | 1.6533 | 1.6539 | |
| 47 | **1.8504** | **1.8500** | 1.8514 | 1.8524 | | 1.8508 | 1.8517 | | 1.8504 | 1.8510 | | 1.8504 | 1.8519 | | 1.8502 | 1.8508 | |
| 52 | **2.0472** | **2.0467** | 2.0484 | 2.0496 | | 2.0476 | 2.0488 | | 2.0472 | 2.0479 | | 2.0472 | 2.0490 | | 2.0470 | 2.0477 | |
| 55 | **2.1654** | **2.1649** | 2.1666 | 2.1678 | | 2.1658 | 2.1670 | | 2.1654 | 2.1661 | | 2.1654 | 2.1672 | | 2.1652 | 2.1659 | |
| 62 | **2.4409** | **2.4404** | 2.4421 | 2.4433 | 29 L | 2.4413 | 2.4425 | 21 L | 2.4409 | 2.4416 | 12 L | 2.4409 | 2.4427 | 23 L | 2.4407 | 2.4414 | 10 L |
| 68 | **2.6772** | **2.6767** | 2.6784 | 2.6796 | 12 L | 2.6776 | 2.6788 | 4 L | 2.6772 | 2.6779 | 0 L | 2.6772 | 2.6790 | 0 L | 2.6770 | 2.6777 | 2 T |
| 72 | **2.8346** | **2.8341** | 2.8358 | 2.8370 | | 2.8350 | 2.8362 | | 2.8346 | 2.8353 | | 2.8346 | 2.8364 | | 2.8344 | 2.8351 | |
| 75 | **2.9527** | **2.9522** | 2.9539 | 2.9551 | | 2.9532 | 2.9543 | | 2.9527 | 2.9534 | | 2.9527 | 2.9545 | | 2.9525 | 2.9532 | |
| 80 | **3.1496** | **3.1491** | 3.1508 | 3.1520 | | 3.1500 | 3.1512 | | 3.1496 | 3.1503 | | 3.1496 | 3.1514 | | 3.1494 | 3.1501 | |
| 85 | **3.3465** | **3.3459** | 3.3479 | 3.3493 | | 3.3470 | 3.3484 | | 3.3465 | 3.3474 | | 3.3465 | 3.3486 | | 3.3463 | 3.3471 | |
| 90 | **3.5433** | **3.5427** | 3.5447 | 3.5461 | | 3.5438 | 3.5452 | | 3.5433 | 3.5442 | | 3.5433 | 3.5454 | | 3.5431 | 3.5439 | |
| 95 | **3.7402** | **3.7396** | 3.7416 | 3.7430 | | 3.7407 | 3.7421 | | 3.7402 | 3.7411 | | 3.7402 | 3.7423 | | 3.7400 | 3.7408 | |
| 100 | **3.9370** | **3.9364** | 3.9384 | 3.9398 | 34 L | 3.9375 | 3.9389 | 25 L | 3.9370 | 3.9379 | 15 L | 3.9370 | 3.9391 | 27 L | 3.9368 | 3.9376 | 12 L |
| 110 | **4.3307** | **4.3301** | 4.3321 | 4.3335 | 14 L | 4.3312 | 4.3326 | 5 L | 4.3307 | 4.3316 | 0 L | 4.3307 | 4.3328 | 0 L | 4.3305 | 4.3313 | 2 T |
| 115 | **4.5276** | **4.5270** | 4.5290 | 4.5304 | | 4.5281 | 4.5295 | | 4.5276 | 4.5285 | | 4.5276 | 4.5297 | | 4.5274 | 4.5282 | |
| 120 | **4.7244** | **4.7238** | 4.7258 | 4.7272 | | 4.7249 | 4.7263 | | 4.7244 | 4.7253 | | 4.7244 | 4.7265 | | 4.7242 | 4.7250 | |
| 125 | **4.9213** | **4.9206** | 4.9230 | 4.9246 | | 4.9219 | 4.9234 | | 4.9213 | 4.9223 | | 4.9213 | 4.9238 | | 4.9210 | 4.9220 | |
| 130 | **5.1181** | **5.1174** | 5.1198 | 5.1214 | | 5.1187 | 5.1202 | | 5.1181 | 5.1191 | | 5.1181 | 5.1206 | | 5.1178 | 5.1188 | |
| 140 | **5.5118** | **5.5111** | 5.5135 | 5.5151 | 40 L | 5.5124 | 5.5139 | 28 L | 5.5118 | 5.5128 | 17 L | 5.5118 | 5.5143 | 32 L | 5.5115 | 5.5125 | 14 L |
| 145 | **5.7087** | **5.7080** | 5.7104 | 5.7120 | 17 L | 5.7093 | 5.7108 | 6 L | 5.7087 | 5.7097 | 0 L | 5.7087 | 5.7112 | 0 L | 5.7084 | 5.7094 | 3 T |
| 150 | **5.9055** | **5.9048** | 5.9072 | 5.9088 | | 5.9061 | 5.9076 | | 5.9055 | 5.9065 | | 5.9055 | 5.9080 | | 5.9052 | 5.9062 | |
| 160 | **6.2992** | **6.2982** | 6.3009 | 6.3025 | | 6.2998 | 6.3013 | | 6.2992 | 6.3002 | | 6.2992 | 6.3017 | | 6.2989 | 6.2999 | |
| 165 | **6.4961** | **6.4951** | 6.4978 | 6.4994 | 43 L | 6.4967 | 6.4982 | 31 L | 6.4961 | 6.4971 | 20 L | 6.4961 | 6.4986 | 35 L | 6.4958 | 6.4968 | 17 L |
| 170 | **6.6929** | **6.6919** | 6.6946 | 6.6962 | 17 L | 6.6935 | 6.6950 | 6 L | 6.6929 | 6.6939 | 0 L | 6.6929 | 6.6954 | 0 L | 6.6926 | 6.6936 | 3 T |
| 180 | **7.0866** | **7.0856** | 7.0883 | 7.0899 | | 7.0872 | 7.0887 | | 7.0866 | 7.0876 | | 7.0866 | 7.0891 | | 7.0863 | 7.0873 | |
| 190 | **7.4803** | **7.4791** | 7.4823 | 7.4841 | | 7.4809 | 7.4827 | | 7.4803 | 7.4814 | | 7.4803 | 7.4831 | | 7.4800 | 7.4812 | |
| 200 | **7.8740** | **7.8728** | 7.8760 | 7.8778 | | 7.8746 | 7.8764 | | 7.8740 | 7.8751 | | 7.8740 | 7.8768 | | 7.8737 | 7.8749 | |
| 210 | **8.2677** | **8.2665** | 8.2697 | 8.2715 | | 8.2683 | 8.2701 | | 8.2677 | 8.2688 | | 8.2677 | 8.2705 | | 8.2674 | 8.2686 | |
| 215 | **8.4646** | **8.4634** | 8.4666 | 8.4684 | 50 L | 8.4652 | 8.4670 | 36 L | 8.4646 | 8.4657 | 23 L | 8.4646 | 8.4674 | 40 L | 8.4643 | 8.4655 | 21 L |
| 220 | **8.6614** | **8.6602** | 8.6634 | 8.6652 | 20 L | 8.6602 | 8.6638 | 6 L | 8.6614 | 8.6625 | 0 L | 8.6614 | 8.6642 | 0 L | 8.6611 | 8.6623 | 3 T |
| 225 | **8.8583** | **8.8571** | 8.8603 | 8.8621 | | 8.8589 | 8.8607 | | 8.8583 | 8.8594 | | 8.8583 | 8.8611 | | 8.8580 | 8.8592 | |
| 230 | **9.0551** | **9.0539** | 9.0571 | 9.0589 | | 9.0557 | 9.0575 | | 9.0551 | 9.0562 | | 9.0551 | 9.0579 | | 9.0548 | 9.0560 | |
| 240 | **9.4488** | **9.4476** | 9.4508 | 9.4526 | | 9.4494 | 9.4512 | | 9.4488 | 9.4499 | | 9.4488 | 9.4516 | | 9.4485 | 9.4497 | |
| 250 | **9.8425** | **9.8413** | 9.8445 | 9.8463 | | 9.8431 | 9.8449 | | 9.8425 | 9.8436 | | 9.8425 | 9.8453 | | 9.8422 | 9.8434 | |
| 260 | **10.2362** | **10.2348** | 10.2384 | 10.2405 | | 10.2369 | 10.2389 | | 10.2362 | 10.2375 | | 10.2362 | 10.2394 | | 10.2359 | 10.2372 | |
| 270 | **10.6299** | **10.6285** | 10.6321 | 10.6342 | | 10.6306 | 10.6326 | | 10.6299 | 10.6312 | | 10.6299 | 10.6331 | | 10.6296 | 10.6309 | |
| 280 | **11.0236** | **11.0222** | 11.0258 | 11.0279 | 57 L | 11.0243 | 11.0263 | 41 L | 11.0236 | 11.0249 | 27 L | 11.0236 | 11.0268 | 46 L | 11.0233 | 11.0246 | 24 L |
| 290 | **11.4173** | **11.4159** | 11.4195 | 11.4216 | 22 L | 11.4180 | 11.4200 | 7 L | 11.4173 | 11.4186 | 0 L | 11.4173 | 11.4205 | 0 L | 11.4170 | 11.4183 | 3 T |
| 300 | **11.8110** | **11.8096** | 11.8132 | 11.8153 | | 11.8117 | 11.8137 | | 11.8110 | 11.8123 | | 11.8110 | 11.8142 | | 11.8107 | 11.8120 | |
| 310 | **12.2047** | **12.2033** | 12.2069 | 12.2090 | | 12.2054 | 12.2074 | | 12.2047 | 12.2060 | | 12.2047 | 12.2079 | | 12.2044 | 12.2057 | |
| 320 | **12.5984** | **12.5968** | 12.6008 | 12.6031 | | 12.5991 | 12.6014 | | 12.5984 | 12.5998 | | 12.5984 | 12.6019 | | 12.5981 | 12.5995 | |
| 340 | **13.3858** | **13.3842** | 13.3882 | 13.3905 | | 13.3865 | 13.3888 | | 13.3858 | 13.3872 | | 13.3858 | 13.3893 | | 13.3855 | 13.3869 | |
| 360 | **14.1732** | **14.1716** | 14.1756 | 14.1779 | 63 L | 14.1739 | 14.1762 | 46 L | 14.1732 | 14.1746 | 30 L | 14.1732 | 14.1767 | 51 L | 14.1729 | 14.1743 | 27 L |
| 370 | **14.5669** | **14.5654** | 14.5694 | 14.5717 | 24 L | 14.5677 | 14.5700 | 7 L | 14.5669 | 14.5684 | 0 L | 14.5670 | 14.5705 | 0 L | 14.5666 | 14.5681 | 3 T |
| 380 | **14.9606** | **14.9590** | 14.9630 | 14.9653 | | 14.9613 | 14.9636 | | 14.9606 | 14.9620 | | 14.9606 | 14.9641 | | 14.9603 | 14.9617 | |
| 400 | **15.7480** | **15.7464** | 15.7504 | 15.7527 | | 15.7487 | 15.7510 | | 15.7480 | 15.7494 | | 15.7480 | 15.7515 | | 15.7477 | 15.7491 | |
| 420 | **16.5354** | **16.5336** | 16.5381 | 16.5406 | | 16.5362 | 16.5387 | | 16.5354 | 16.5370 | | 16.5354 | 16.5392 | | 16.5351 | 16.5367 | |
| 440 | **17.3228** | **17.3210** | 17.3255 | 17.3280 | 70 L | 17.3236 | 17.3261 | 51 L | 17.3228 | 17.3244 | 34 L | 17.3228 | 17.3266 | 56 L | 17.3225 | 17.3241 | 31 L |
| 460 | **18.1102** | **18.1084** | 18.1129 | 18.1154 | 27 L | 18.1110 | 18.1135 | 8 L | 18.1102 | 18.1118 | 0 L | 18.1102 | 18.1140 | 0 L | 18.1099 | 18.1115 | 3 T |
| 480 | **18.8976** | **18.8958** | 18.9003 | 18.9028 | | 18.8984 | 18.9009 | | 18.8976 | 18.8992 | | 18.8976 | 18.9014 | | 18.8973 | 18.8989 | |
| 500 | **19.6850** | **19.6832** | 19.6877 | 19.6902 | | 19.6858 | 19.6883 | | 19.6850 | 19.6866 | | 19.6850 | 19.6888 | | 19.6847 | 19.6863 | |
| 520 | **20.4724** | **20.4704** | 20.4754 | 20.4781 | | 20.4733 | 20.4760 | | 20.4724 | 20.4741 | | 20.4724 | 20.4767 | | 20.4721 | 20.4739 | |
| 540 | **21.2598** | **21.2578** | 21.2628 | 21.2655 | | 21.2607 | 21.2634 | | 21.2598 | 21.2615 | | 21.2598 | 21.2641 | | 21.2595 | 21.2613 | |
| 560 | **22.0472** | **22.0452** | 22.0502 | 22.0529 | 77 L | 22.0481 | 22.0508 | 56 L | 22.0472 | 22.0489 | 37 L | 22.0472 | 22.0515 | 63 L | 22.0469 | 22.0487 | 35 L |
| 580 | **22.8346** | **22.8326** | 22.8376 | 22.8403 | 30 L | 22.8355 | 22.8382 | 9 L | 22.8346 | 22.8363 | 0 L | 22.8346 | 22.8389 | 0 L | 22.8343 | 22.8361 | 3 T |
| 600 | **23.6220** | **23.6200** | 23.6250 | 23.6277 | | 23.6229 | 23.6256 | | 23.6220 | 23.6237 | | 23.6202 | 23.6263 | | 23.6217 | 23.6235 | |
| 620 | **24.4094** | **24.4074** | 24.4124 | 24.4151 | | 24.4103 | 24.4130 | | 24.4094 | 24.4111 | | 24.4094 | 24.4137 | | 24.4091 | 24.4109 | |
| 650 | **25.5906** | **25.5876** | 25.5937 | 25.5969 | | 25.5915 | 25.5947 | | 25.5906 | 25.5926 | | 25.5906 | 25.5955 | | 25.5902 | 25.5922 | |
| 670 | **26.3780** | **26.3750** | 26.3811 | 26.3843 | | 26.3789 | 26.3821 | | 26.3780 | 26.3800 | | 26.3780 | 26.3829 | | 26.3776 | 26.3796 | |
| 680 | **26.7717** | **26.7687** | 26.7748 | 26.7780 | | 26.7726 | 26.7758 | | 26.7717 | 26.7737 | | 26.7717 | 26.7766 | | 26.7713 | 26.7733 | |
| 700 | **27.5591** | **27.5561** | 27.5622 | 27.5654 | | 27.5600 | 27.5632 | | 27.5591 | 27.5611 | | 27.5591 | 27.5640 | | 27.5587 | 27.5607 | |
| 720 | **28.3465** | **28.3435** | 28.3496 | 28.3528 | 93 L | 28.3474 | 28.3506 | 71 L | 28.3465 | 28.3485 | 50 L | 28.3465 | 28.3514 | 79 L | 28.3461 | 28.3481 | 46 L |
| 750 | **29.5276** | **29.5246** | 29.5307 | 29.5339 | 31 L | 29.5285 | 29.5317 | 9 L | 29.5276 | 29.5296 | 0 L | 29.5276 | 29.5325 | 0 L | 29.5272 | 29.5292 | 4 T |
| 760 | **29.9213** | **29.9183** | 29.9244 | 29.9276 | | 29.9222 | 29.9254 | | 29.9213 | 29.9233 | | 29.9213 | 29.9262 | | 29.9209 | 29.9229 | |
| 780 | **30.7087** | **30.7057** | 30.7118 | 30.7150 | | 30.7096 | 30.7128 | | 30.7087 | 30.7107 | | 30.7087 | 30.7136 | | 30.7083 | 30.7103 | |
| 790 | **31.1024** | **31.0994** | 31.1055 | 31.1087 | | 31.1033 | 31.1065 | | 31.1024 | 31.1044 | | 31.1024 | 31.1073 | | 31.1020 | 31.1040 | |
| 800 | **31.4961** | **31.4931** | 31.4992 | 31.5024 | | 31.4970 | 31.5002 | | 31.4961 | 31.4981 | | 31.4961 | 31.5010 | | 31.4957 | 31.4968 | |

Note: To convert inches to mm, multiply inches by 25.4.
[1] L indicates "LOOSE" fit, T indicates "TIGHT" fit.

# ISO fits for cast iron and steel housings

## Housing bearing-seat diameters (values in inches)

| Bearing outside diameter | | | J7 | | | K7 | | | M7 | | | N7 | | | P7 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | inches | | Housing bore | | Resultant fit[1] in | Housing bore | | Resultant fit[1] in | Housing bore | | Resultant fit[1] in | Housing bore | | Resultant fit[1] in | Housing bore | | Resultant fit[1] in |
| mm | Max | Min | Min | Max | 0.0001″ | Min | Max | 0.0001″ | Min | Max | 0.0001″ | Min | Max | 0.0001″ | Min | Max | 0.1000″ |
| 16 | 0.6299 | 0.6296 | 0.6296 | 0.6303 | 7 L 3 T | 0.6294 | 0.6301 | 5 L 5 T | 0.6292 | 0.6299 | 3 L 7 T | 0.6290 | 0.6297 | 1 L 9 T | 0.6288 | 0.6295 | 1 T 11 T |
| 19 | 0.7480 | 0.7476 | 0.7476 | 0.7485 | | 0.7474 | 0.7482 | | 0.7472 | 0.7480 | | 0.7469 | 0.7477 | | 0.7466 | 0.7474 | |
| 22 | 0.8661 | 0.8657 | 0.8657 | 0.8666 | | 0.8655 | 0.8663 | | 0.8653 | 0.8661 | | 0.8650 | 0.8658 | | 0.8647 | 0.8655 | |
| 24 | 0.9449 | 0.9445 | 0.9445 | 0.9454 | 9 L | 0.9443 | 0.9451 | 6 L | 0.9441 | 0.9449 | 4 L | 0.9438 | 0.9446 | 1 L | 0.9435 | 0.9443 | 2 T |
| 26 | 1.0236 | 1.0232 | 1.0232 | 1.0241 | 4 T | 1.0230 | 1.0238 | 6 T | 1.0228 | 1.0236 | 8 T | 1.0225 | 1.0233 | 11 T | 1.0222 | 1.0230 | 14 T |
| 28 | 1.1024 | 1.1020 | 1.1020 | 1.1029 | | 1.1018 | 1.1026 | | 1.1016 | 1.1024 | | 1.1013 | 1.1021 | | 1.1010 | 1.1018 | |
| 30 | 1.1811 | 1.1807 | 1.1807 | 1.1816 | | 1.1805 | 1.1813 | | 1.1803 | 1.1811 | | 1.1800 | 1.1808 | | 1.1797 | 1.1805 | |
| 32 | 1.2598 | 1.2594 | 1.2594 | 1.2604 | | 1.2591 | 1.2601 | | 1.2588 | 1.2598 | | 1.2585 | 1.2595 | | 1.2581 | 1.2591 | |
| 35 | 1.3780 | 1.3776 | 1.3776 | 1.3786 | | 1.3773 | 1.3783 | | 1.3770 | 1.3780 | | 1.3767 | 1.3777 | | 1.3763 | 1.3773 | |
| 37 | 1.4567 | 1.4563 | 1.4563 | 1.4573 | 10 L | 1.4560 | 1.4570 | 7 L | 1.4557 | 1.4567 | 4 L | 1.4554 | 1.4564 | 1 L | 1.4550 | 1.4560 | 3 T |
| 40 | 1.5748 | 1.5744 | 1.5744 | 1.5754 | 4 T | 1.5741 | 1.5751 | 7 T | 1.5738 | 1.5748 | 10 T | 1.5735 | 1.5745 | 13 T | 1.5731 | 1.5741 | 17 T |
| 42 | 1.6535 | 1.6531 | 1.6531 | 1.6541 | | 1.6528 | 1.6538 | | 1.6525 | 1.6535 | | 1.6522 | 1.6532 | | 1.6518 | 1.6528 | |
| 47 | 1.8504 | 1.8500 | 1.8500 | 1.8510 | | 1.8497 | 1.8507 | | 1.8494 | 1.8504 | | 1.8491 | 1.8501 | | 1.8487 | 1.8497 | |
| 52 | 2.0472 | 2.0467 | 2.0467 | 2.0479 | | 2.0464 | 2.0476 | | 2.0460 | 2.0472 | | 2.0457 | 2.0468 | | 2.0452 | 2.0464 | |
| 55 | 2.1654 | 2.1649 | 2.1649 | 2.1661 | | 2.1646 | 2.1658 | | 2.1642 | 2.1654 | | 2.1639 | 2.1650 | | 2.1634 | 2.1646 | |
| 62 | 2.4409 | 2.4404 | 2.4404 | 2.4416 | 12 L | 2.4401 | 2.4413 | 9 L | 2.4397 | 2.4409 | 5 L | 2.4394 | 2.4405 | 1 L | 2.4389 | 2.4401 | 3 T |
| 68 | 2.6772 | 2.6767 | 2.6767 | 2.6779 | 5 T | 2.6764 | 2.6776 | 8 T | 2.6760 | 2.6772 | 12 T | 2.6760 | 2.6770 | 15 T | 2.6752 | 2.6763 | 20 T |
| 72 | 2.8346 | 2.8341 | 2.8341 | 2.8353 | | 2.8338 | 2.8350 | | 2.8334 | 2.8346 | | 2.8331 | 2.8342 | | 2.8326 | 2.8338 | |
| 75 | 2.9527 | 2.9522 | 2.9522 | 2.9534 | | 2.9519 | 2.9531 | | 2.9516 | 2.9528 | | 2.9510 | 2.9520 | | 2.9507 | 2.9519 | |
| 80 | 3.1496 | 3.1491 | 3.1491 | 3.1503 | | 3.1488 | 3.1500 | | 3.1484 | 3.1496 | | 3.1481 | 3.1492 | | 3.1476 | 3.1488 | |
| 85 | 3.3465 | 3.3459 | 3.3460 | 3.3474 | | 3.3455 | 3.3469 | | 3.3451 | 3.3465 | | 3.3447 | 3.3461 | | 3.3442 | 3.3456 | |
| 90 | 3.5433 | 3.5427 | 3.5428 | 3.5442 | | 3.5423 | 3.5437 | | 3.5419 | 3.5433 | | 3.5415 | 3.5429 | | 3.5410 | 3.5424 | |
| 95 | 3.7402 | 3.7396 | 3.7397 | 3.7411 | | 3.7392 | 3.7406 | | 3.7388 | 3.7402 | | 3.7380 | 3.7400 | | 3.7378 | 3.7392 | |
| 100 | 3.9370 | 3.9364 | 3.9365 | 3.9379 | 15 L | 3.9360 | 3.9374 | 10 L | 3.9356 | 3.9370 | 6 L | 3.9352 | 3.9366 | 2 L | 3.9347 | 3.9361 | 3 T |
| 110 | 4.3307 | 4.3301 | 4.3302 | 4.3316 | 5 T | 4.3297 | 4.3311 | 10 T | 4.3293 | 4.3307 | 14 T | 4.3289 | 4.3303 | 18 T | 4.3284 | 4.3298 | 23 T |
| 115 | 4.5276 | 4.5270 | 4.5271 | 4.5285 | | 4.5266 | 4.5280 | | 4.5262 | 4.5276 | | 4.5258 | 4.5272 | | 4.5253 | 4.5267 | |
| 120 | 4.7244 | 4.7238 | 4.7239 | 4.7253 | | 4.7234 | 4.7248 | | 4.7230 | 4.7244 | | 4.7226 | 4.7240 | | 4.7221 | 4.7235 | |
| 125 | 4.9213 | 4.9206 | 4.9207 | 4.9223 | | 4.9202 | 4.9218 | | 4.9197 | 4.9213 | | 4.9193 | 4.9208 | | 4.9186 | 4.9202 | |
| 130 | 5.1181 | 5.1174 | 5.1175 | 5.1191 | | 5.1170 | 5.1186 | | 5.1165 | 5.1181 | | 5.1161 | 5.1176 | | 5.1154 | 5.1170 | |
| 140 | 5.5118 | 5.5111 | 5.5112 | 5.5128 | 17 L | 5.5107 | 5.5123 | 12 L | 5.5102 | 5.5118 | 7 L | 5.5098 | 5.5113 | 2 L | 5.5091 | 5.5107 | 4 T |
| 145 | 5.7087 | 5.7080 | 5.7081 | 5.7097 | 6 T | 5.7076 | 5.7092 | 11 T | 5.7071 | 5.7087 | 16 T | 5.7067 | 5.7082 | 20 T | 5.7060 | 5.7076 | 27 T |
| 150 | 5.9055 | 5.9048 | 5.9049 | 5.9065 | | 5.9044 | 5.9060 | | 5.9039 | 5.9055 | | 5.9035 | 5.9050 | | 5.9028 | 5.9044 | |
| 160 | 6.2992 | 6.2982 | 6.2986 | 6.3002 | | 6.2981 | 6.2997 | | 6.2976 | 6.2992 | | 6.2972 | 6.2987 | | 6.2965 | 6.2981 | |
| 165 | 6.4961 | 6.4951 | 6.4955 | 6.4971 | 20 L | 6.4950 | 6.4966 | 15 L | 6.4945 | 6.4961 | 10 L | 6.4940 | 6.4960 | 5 L | 6.4934 | 6.4950 | 1 T |
| 170 | 6.6929 | 6.6919 | 6.6923 | 6.6939 | 6 T | 6.6918 | 6.6934 | 11 T | 6.6913 | 6.6929 | 16 T | 6.6909 | 6.6924 | 20 T | 6.6902 | 6.6918 | 27 T |
| 180 | 7.0866 | 7.0856 | 7.0860 | 7.0876 | | 7.0855 | 7.0871 | | 7.0850 | 7.0866 | | 7.0846 | 7.0861 | | 7.0839 | 7.0855 | |
| 190 | 7.4803 | 7.4791 | 7.4797 | 7.4815 | | 7.4790 | 7.4808 | | 7.4785 | 7.4803 | | 7.4779 | 7.4797 | | 7.4772 | 7.4790 | |
| 200 | 7.8740 | 7.8728 | 7.8734 | 7.8752 | | 7.8727 | 7.8745 | | 7.8722 | 7.8740 | | 7.8716 | 7.8734 | | 7.8709 | 7.8727 | |
| 210 | 8.2677 | 8.2665 | 8.2671 | 8.2689 | | 8.2664 | 8.2682 | | 8.2659 | 8.2677 | | 8.2653 | 8.2671 | | 8.2646 | 8.2664 | |
| 215 | 8.4646 | 8.4634 | 8.4640 | 8.4658 | 24 L | 8.4633 | 8.4651 | 17 L | 8.4628 | 8.4646 | 12 L | 8.4622 | 8.4640 | 6 L | 8.4615 | 8.4633 | 1 T |
| 220 | 8.6614 | 8.6602 | 8.6608 | 8.6626 | 6 T | 8.6601 | 8.6619 | 13 T | 8.6596 | 8.6614 | 18 T | 8.6590 | 8.6610 | 24 T | 8.6583 | 8.6601 | 31 T |
| 225 | 8.8583 | 8.8571 | 8.8577 | 8.8595 | | 8.8570 | 8.8588 | | 9.0571 | 8.8583 | | 8.8559 | 8.8577 | | 8.8552 | 8.8570 | |
| 230 | 9.0551 | 9.0539 | 9.0545 | 9.0563 | | 9.0538 | 9.0556 | | 9.0533 | 9.0551 | | 9.0530 | 9.0550 | | 9.0520 | 9.0538 | |
| 240 | 9.4488 | 9.4476 | 9.4482 | 9.4500 | | 9.4475 | 9.4493 | | 9.4470 | 9.4488 | | 9.4464 | 9.4482 | | 9.4457 | 9.4475 | |
| 250 | 9.8425 | 9.8413 | 9.8419 | 9.8437 | | 9.8412 | 9.8430 | | 9.8407 | 9.8425 | | 9.8401 | 9.8419 | | 9.8394 | 9.8412 | |
| 260 | 10.2362 | 10.2348 | 10.2356 | 10.2376 | | 10.2348 | 10.2368 | | 10.2342 | 10.2362 | | 10.2336 | 10.2356 | | 10.2327 | 10.2348 | |
| 270 | 10.6299 | 10.6285 | 10.6293 | 10.6313 | | 10.6285 | 10.6305 | | 10.6279 | 10.6299 | | 10.6270 | 10.6290 | | 10.6265 | 10.6285 | |
| 280 | 11.0236 | 11.0222 | 11.0230 | 11.0250 | 28 L | 11.0222 | 11.0242 | 20 L | 11.0216 | 11.0236 | 14 L | 11.0210 | 11.0230 | 8 L | 11.0201 | 11.0222 | 0 T |
| 290 | 11.4173 | 11.4159 | 11.4167 | 11.4187 | 6 T | 11.4159 | 11.4179 | 14 T | 11.4153 | 11.4173 | 20 T | 11.4150 | 11.4170 | 26 T | 11.4139 | 11.4159 | 35 T |
| 300 | 11.8110 | 11.8096 | 11.8104 | 11.8124 | | 11.8096 | 11.8116 | | 11.8090 | 11.8110 | | 11.8084 | 11.8104 | | 11.8075 | 11.8096 | |
| 310 | 12.2047 | 12.2033 | 12.2041 | 12.2061 | | 12.2033 | 12.2053 | | 12.2027 | 12.2047 | | 12.2021 | 12.2041 | | 12.2012 | 12.2033 | |
| 320 | 12.5984 | 12.5968 | 12.5977 | 12.5999 | | 12.5968 | 12.5991 | | 12.5962 | 12.5984 | | 12.5955 | 12.5978 | | 12.5945 | 12.5968 | |
| 340 | 13.3858 | 13.3842 | 13.3851 | 13.3873 | | 13.3842 | 13.3865 | | 12.3836 | 12.3858 | | 13.3829 | 13.3852 | | 13.3819 | 13.3842 | |
| 360 | 14.1732 | 14.1716 | 14.1725 | 14.1747 | 31 L | 14.1716 | 14.1739 | 23 L | 14.1710 | 14.1732 | 16 L | 14.1703 | 14.1726 | 10 L | 14.1693 | 14.1716 | 0 T |
| 370 | 14.5669 | 14.5654 | 14.5662 | 14.5685 | 7 T | 14.5653 | 14.5677 | 16 T | 14.5647 | 14.5669 | 22 T | 14.5640 | 14.5660 | 29 T | 14.5631 | 14.5653 | 39 T |
| 380 | 14.9606 | 14.9590 | 14.9599 | 14.9621 | | 14.9590 | 14.9613 | | 14.9584 | 14.9606 | | 14.9577 | 14.9600 | | 14.9567 | 14.9590 | |
| 400 | 15.7480 | 15.7464 | 15.7473 | 15.7495 | | 15.7464 | 15.7487 | | 15.7458 | 15.7480 | | 15.7451 | 15.7474 | | 15.7441 | 15.7464 | |
| 420 | 16.5354 | 16.5336 | 16.5346 | 16.5371 | | 16.5336 | 16.5361 | | 16.5329 | 16.5354 | | 16.5323 | 16.5347 | | 16.5311 | 16.5336 | |
| 440 | 17.3228 | 17.321 | 17.3220 | 17.3245 | 35 L | 17.3210 | 17.3235 | 25 L | 17.3203 | 17.3228 | 18 L | 17.3197 | 17.3221 | 11 L | 17.3185 | 17.3210 | 0 T |
| 460 | 18.1102 | 18.1084 | 18.1094 | 18.1119 | 8 T | 18.1084 | 18.1109 | 18 T | 18.1077 | 18.1102 | 25 T | 18.1071 | 18.1095 | 31 T | 18.1059 | 18.1084 | 43 T |
| 480 | 18.8976 | 18.8958 | 18.8968 | 18.8993 | | 18.8958 | 18.8983 | | 18.8951 | 18.8976 | | 18.8945 | 18.8969 | | 18.8933 | 18.8958 | |
| 500 | 19.6850 | 19.6832 | 19.6842 | 19.6867 | | 19.6832 | 19.6857 | | 19.6825 | 19.6850 | | 19.6819 | 19.6843 | | 19.6807 | 19.6832 | |
| 520 | 20.4724 | 20.4704 | 20.4715 | 20.4743 | | 20.4696 | 20.4724 | | 20.4686 | 20.4714 | | 20.4679 | 20.4707 | | 20.4666 | 20.4693 | |
| 540 | 21.2598 | 21.2578 | 21.2589 | 21.2617 | | 21.2570 | 21.2598 | | 21.2560 | 21.2588 | | 21.2553 | 21.2581 | | 21.2540 | 21.2567 | |
| 560 | 22.0472 | 22.0452 | 22.0463 | 22.0491 | 39 L | 22.0444 | 22.0472 | 20 L | 22.0435 | 22.0462 | 10 L | 22.0430 | 22.0460 | 3 L | 22.0414 | 22.0442 | 11 T |
| 580 | 22.8346 | 22.8326 | 22.8337 | 22.8365 | 9 T | 22.8318 | 22.8346 | 28 T | 22.8308 | 22.8336 | 38 T | 22.8301 | 22.8329 | 45 T | 22.8288 | 22.8315 | 58 T |
| 600 | 23.6220 | 23.6200 | 23.6211 | 23.6239 | | 23.6192 | 23.6220 | | 23.6182 | 23.6210 | | 23.6175 | 23.6203 | | 23.6162 | 23.6189 | |
| 620 | 24.4094 | 24.4074 | 24.4085 | 24.4113 | | 24.4066 | 24.4094 | | 24.4056 | 24.4084 | | 24.4049 | 24.4077 | | 24.4036 | 24.4063 | |
| 650 | 25.5906 | 25.5876 | 25.5897 | 25.5928 | | 25.5875 | 25.5906 | | 25.5863 | 25.5894 | | 25.5855 | 25.5886 | | 25.5840 | 25.5871 | |
| 670 | 26.3780 | 26.3750 | 26.3771 | 26.3802 | | 26.3749 | 26.3780 | | 26.3737 | 26.3768 | | 26.3729 | 26.3760 | | 26.3714 | 26.3745 | |
| 680 | 26.7717 | 26.7687 | 26.7708 | 26.7739 | | 26.7686 | 26.7717 | | 26.7674 | 26.7705 | | 26.7666 | 26.7697 | | 26.7651 | 26.7682 | |
| 700 | 27.5591 | 27.5561 | 27.5582 | 27.5613 | | 27.5560 | 27.5591 | | 27.5548 | 27.5579 | | 27.5540 | 27.5571 | | 27.5525 | 27.5556 | |
| 720 | 28.3465 | 28.3435 | 28.3456 | 28.3487 | 52 L | 28.3434 | 28.3465 | 30 L | 28.3422 | 28.3453 | 18 L | 28.3414 | 28.3445 | 10 L | 28.3399 | 28.3430 | 5 T |
| 750 | 29.5276 | 29.5246 | 29.5267 | 29.5298 | 9 T | 29.5245 | 29.5276 | 31 T | 29.5233 | 29.5264 | 43 T | 29.5225 | 29.5256 | 51 T | 29.5210 | 29.5241 | 66 T |
| 760 | 29.9213 | 29.9183 | 29.9204 | 29.9235 | | 29.9182 | 29.9213 | | 29.9169 | 29.9201 | | 29.9160 | 29.9190 | | 29.9146 | 29.9178 | |
| 780 | 30.7087 | 30.7057 | 30.7078 | 30.7109 | | 30.7056 | 30.7087 | | 30.7044 | 30.7075 | | 30.7036 | 30.7077 | | 30.7021 | 30.7052 | |
| 790 | 31.1024 | 31.0994 | 31.1015 | 31.1046 | | 31.0993 | 31.1024 | | 31.0981 | 31.1012 | | 31.0973 | 31.1004 | | 31.0958 | 31.0989 | |
| 800 | 31.4961 | 31.4931 | 31.4952 | 31.4974 | | 31.4930 | 31.4952 | | 31.4917 | 31.4949 | | 31.4910 | 31.4940 | | 31.4894 | 31.4926 | |

Note: To convert inches to mm, multiply inches by 25.4.
[1] L indicates "LOOSE" fit, T indicates "TIGHT" fit.

# Internal radial clearance tolerances for single-row ball bearings

ABMA tolerances are listed up to and including 200 mm.

MRC tolerances are listed from 200 mm up to and including 500 mm.

Tolerance limits are listed in ten thousandths inches (.0001″) and micrometers (µm).

Axial and radial clearance for double row bearings are shown on page 95.

| Bore over | | Including | | Bearing Series | | ABMA C2 | | C0 | | C3 | | C4 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Inch sizes R, XLS | Metric sizes 30, 100K, 200, 300, 400, 1900 | MRC TI | | ST | | LO | | XL | |
| mm | in. | mm | in. | | | in. | (µm) | in. | (µm) | in. | (µm) | in. | (µm) |
| 2.50 | — | 10 | — | — | 34-39 | 0-3 | 0-8 | 1-5 | 3-13 | 3-9 | 8-23 | 6-12* | 15-30* |
| 2.50 | .0984 | 10 | .3937 | R2–R6 | 00 | 0-3 | 0-8 | 1-5 | 3-13 | 3-9 | 8-23 | 6-12* | 15-30* |
| 10 | .3937 | 18 | .7087 | R8–R10 | 01-03 | 0-3.5 | 0-9 | 1-7 | 3-18 | 4-10 | 10-25 | 7-13 | 18-33 |
| 18 | .7087 | 24 | .9449 | R12–R14 | 04 | 0-4 | 0-10 | 2-8 | 5-20 | 5-11 | 13-28 | 8-14 | 20-36 |
| 24 | .9449 | 30 | 1.1811 | R16–R18 | 05-06 | 0-4.5 | 0-11 | 2-8 | 5-20 | 5-11 | 13-28 | 9-16 | 23-41 |
| 30 | 1.1811 | 40 | 1.5748 | R20 | 07-08 | 0-4.5 | 0-11 | 2-8 | 5-20 | 6-13 | 15-33 | 11-18 | 28-46 |
| — | 1.1811 | — | 1.5748 | 1 3/8–1 1/2 | — | 0-4.5 | 0-11 | 2-8 | 5-20 | 6-13 | 15-33 | 11-18 | 28-46 |
| 40 | 1.5748 | 50 | 1.9665 | 1 5/8–1 7/8 | 09-10 | 0-4.5 | 0-11 | 2-9 | 5-23 | 7-14 | 18-36 | 12-20 | 30-51 |
| 50 | 1.9685 | 65 | 2.5591 | 2–2 1/2 | 11-13 | 0-6 | 0-15 | 3-11 | 8-28 | 9-17 | 23-43 | 15-24 | 38-61 |
| 65 | 2.5591 | 80 | 3.1496 | 2 5/8–3 1/8 | 14-16 | 0-6 | 0-15 | 4-12 | 10-30 | 10-20 | 25-51 | 18-28 | 45-71 |
| 80 | 3.1496 | 100 | 3.9370 | 3 1/4–3 7/8 | 17-20 | 0-7 | 0-18 | 5-14 | 13-36 | 12-23 | 30-58 | 21-33 | 53-64 |
| 100 | 3.9370 | 120 | 4.7244 | 4–4 5/8 | 21-24 | 0-8 | 0-20 | 6-16 | 15-41 | 14-26 | 36-66 | 24-38 | 61-97 |
| 120 | 4.7244 | 140 | 5.5118 | 4 3/4–5 1/2 | 26-28 | 0-9 | 0-23 | 7-19 | 18-48 | 16-32 | 41-81 | 28-45 | 71-114 |
| 140 | 5.5118 | 160 | 6.2992 | 5 3/8–6 1/4 | 30-32 | 0-9 | 0-23 | 7-21 | 18-53 | 18-36 | 46-91 | 32-51 | 81-130 |
| 160 | 6.2992 | 180 | 7.0866 | 6 1/2–7 | 34-36 | 0-10 | 0-25 | 8-24 | 20-61 | 21-40 | 53-102 | 36-58 | 91-147 |
| 180 | 7.0866 | 200 | 7.8740 | 7 1/4–7 3/4 | 38-40 | 0-12 | 0-30 | 10-28 | 25-71 | 25-46 | 64-117 | 42-64 | 107-163 |
| 200 | 7.8740 | 220 | 8.6614 | 8–8 1/2 | 42-44 | 0-12 | 0-30 | 12-30 | 30-76 | 29-50 | 74-127 | 47-69 | 119-175 |
| 220 | 8.6614 | 240 | 9.4488 | 8 3/4–9 | 46-48 | 1-13 | 3-33 | 15-33 | 38-84 | 35-56 | 89-142 | 55-77 | 140-196 |
| 240 | 9.4485 | 260 | 10.2362 | 9 1/2–10 | 50-52 | 2-14 | 5-36 | 18-36 | 45-91 | 42-63 | 107-160 | 64-86 | 163-218 |
| 260 | 10.2352 | 280 | 11.0236 | 10 1/2–11 | 56 | 2-14 | 5-36 | 21-39 | 53-99 | 49-70 | 124-178 | 74-96 | 188-244 |
| 280 | 11.0236 | 300 | 11.8110 | 11 1/2 | 60 | 3-15 | 8-38 | 25-43 | 64-109 | 57-78 | 145-198 | 85-107 | 216-272 |
| 300 | 11.8110 | 320 | 12.5984 | 12 | 64 | 4-16 | 10-41 | 29-47 | 74-119 | 67-88 | 107-223 | 98-120 | 249-304 |
| 320 | 12.5984 | 340 | 13.3858 | — | — | 4-16 | 10-41 | 33-51 | 84-130 | 78-99 | 198-251 | 113-135 | 287-343 |
| 340 | 13.3858 | 360 | 14.1732 | — | — | 5-17 | 13-43 | 38-56 | 96-142 | 91-112 | 231-284 | 129-151 | 327-384 |
| 360 | 14.1732 | 380 | 14.9606 | — | — | 6-18 | 15-46 | 43-61 | 109-155 | 106-127 | 269-323 | 149-171 | 378-434 |
| 380 | 14.9606 | 400 | 15.7480 | — | — | 7-19 | 18-48 | 48-66 | 122-168 | 126-147 | 320-373 | 169-191 | 429-485 |
| 400 | 15.7480 | 420 | 16.5354 | — | — | 7-19 | 18-48 | 54-72 | 137-183 | 148-169 | 376-429 | 193-215 | 490-546 |
| 420 | 16.5354 | 440 | 17.3223 | — | — | 8-20 | 20-51 | 60-78 | 152-198 | 173-194 | 439-493 | 220-242 | 559-615 |
| 440 | 17.3223 | 460 | 18.1102 | — | — | 9-21 | 23-53 | 67-85 | 170-216 | 202-223 | 513-566 | 251-273 | 638-693 |
| 460 | 18.1106 | 480 | 18.8976 | — | — | 10-22 | 25-56 | 74-92 | 188-234 | 234-255 | 594-648 | 285-307 | 724-780 |
| 480 | 18.8976 | 500 | 19.6850 | — | — | 12-24 | 30-61 | 82-100 | 208-254 | 269-290 | 683-737 | 326-348 | 828-884 |

*Not ABMA Value

# Definition of dynamic and static radial load ratings

The size of a bearing to be used for an application is initially selected on the basis of its load carrying capacity in relation to the loads to be carried and the requirements regarding life and reliability. Numerical values of basic load ratings are used in calculations to express load carrying capacity. The basic dynamic load rating C and the basic static load rating $C_0$ are quoted in the bearing tables. All values expressed are radial ratings.

## Dynamic radial load rating

The basic dynamic load rating C is used for calculations involving the selection of bearings which rotate under load. It expresses the bearing radial load which will give a basic rating life of one million revolutions. The actual calculated life depends on the magnitude of the imposed load. The imposed load produces rolling element and raceway deformation as illustrated in Figure 1, resulting in tensile (t) and compressive (c) stresses as each rolling element passes through the loaded zone. As these stress cycles are repeated, as determined by the number of revolutions of calculated life, sub-surface metal fatigue cracks occur which eventually propagate to the raceway surface causing metal flaking, or spalling, at which time the bearing has achieved its useful life.

The basic dynamic radial load ratings of MRC bearings have been determined in accordance with the latest ISO and ABMA standards and are based on the material and manufacturing techniques used for MRC standard production. They apply to radial loads acting on radial and angular contact bearings which are constant in magnitude and direction. For single row angular contact bearings, the radial load rating refers to the radial component of that load which causes a purely radial displacement of the bearing rings in relation to each other.

## Static radial load rating

The basic static radial load rating $C_0$ is used when bearings rotate at very slow speeds, are subjected to very slow oscillations, or stationary under load. It also must be considered when heavy shock loads of short duration act on a rotating bearing.

The basic static radial load rating is defined in accordance with ISO and ABMA standards as the static radial load which corresponds to a calculated contact stress at the center of the most heavily loaded rolling element/raceway contact of 609000 PSI for all radial and angular contact ball bearings. For this contact stress, a total permanent deformation of rolling element and raceway occurs which is approximately 0.0001 of the rolling element diameter as shown in Figure 2.

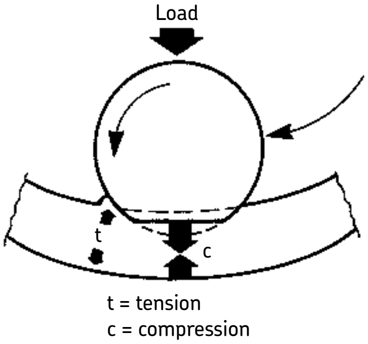



Figure 1

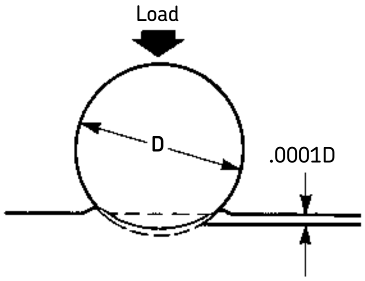



Figure 2

# Bearing life

## Definition of bearing life

The life of a rolling bearing is defined as the number of revolutions or the number of hours at a given speed which the bearing is capable of enduring before the first sign of fatigue failure occurs on one of its rings or rolling elements.

The fatigue failure usually takes the form of surface spalling or flaking which progresses to the point where the bearing becomes inoperative. The load ratings shown in this catalog are based on the useful life of a bearing as limited by this type of failure.

When a group of identical bearings are run under a set condition of speed and load, there will be considerable variation in the fatigue lives in the group. As a result, life must be treated statistically.

The life which 90% of a group of bearings will exceed is known as the "minimum life" or "rating life". A commonly used term as used in this catalog is "$L_{10}$". The life which 50% of a group of bearings will exceed is the "median life" ($L_{50}$) and is approximately five times the "minimum life".

The actual life of a specific bearing is referred to as "service life" and unlike "minimum" or "rating" life, is not generated by fatigue. It is the result of contamination, corrosion, misalignment, etc., significantly reducing life.

**Life adjustment factor for reliability, $a_1$**

To determine bearing life in accordance with reliability greater than 90%, the $L_{10}$ life must be multiplied by the factor $a_1$ as shown in the table below.

**Life adjustment factor for reliability, $a_1$**

| Reliability % | $L_{ma}$ | $a_1$ |
|---|---|---|
| 90 | $L_{10}$ | 1 |
| 95 | $L_5$ | 0.62 |
| 96 | $L_4$ | 0.53 |
| 97 | $L_3$ | 0.44 |
| 98 | $L_2$ | 0.33 |
| 99 | $L_1$ | 0.21 |

When bearings are stationary, rotate or oscillate very slowly or subjected to heavy shock loads, the basic static load rating ($C_0$) must not be exceeded. As specified in ABMA and ISO standards, the static load rating is that load which produces a total permanent deformation of the rolling element or raceway which is approximately 0.0001 of the rolling element diameter. Deformation greater than this amount may result in noisy operation and premature failure.

## Determination of bearing life

Bearing "rating life" can be calculated by referring to the procedure and example located at the back of each bearing section. Both dynamic (C) and static ($C_0$) load ratings are listed on the preceding pages. The load ratings and life calculation method agree with ABMA and ISO standards, with the exception of mast guide and PumPac bearings. The rating of these bearings has been modified to reflect raceway curvatures less than a total of 54%.

# Speed factors for dynamic load ratings

The speed factors shown in the table below are used to convert the basic dynamic radial load rating (C) to speeds other than 33¹/3 rpm, by multiplying C by the speed factor. The values of C are listed in the bearing dimension tables.

Example:
Find dynamic radial load rating of 309S
bearing at 2000 rpm
Basic dynamic radial loading rating (C) = 11900 lbs
Speed factor at 2000 rpm = .255
Rating at 2000 rpm = 11900 × .255 = 3035

For speed factors at speeds not shown, use the following formula:

Speed factor = $3.218\left(\frac{1}{n}\right)^{1/3}$ where n = operating rpm

| rpm | Factor | rpm | Factor | rpm | Factor | rpm | Factor | rpm | Factor | rpm | Factor | rpm | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | .9838 | 420 | .4297 | 870 | .3371 | 1 640 | .2729 | 2 600 | .2340 | 6 100 | .1761 | 16 000 | .1277 |
| 40 | .9409 | 430 | .4263 | 880 | .3358 | 1 660 | .2718 | 2 650 | .2325 | 6 200 | .1752 | 17 000 | .1252 |
| 45 | .9047 | 440 | .4231 | 890 | .3345 | 1 680 | .2707 | 2 700 | .2311 | 6 300 | .1742 | 18 000 | .1228 |
| 50 | .8735 | 450 | .4199 | 900 | .3333 | 1 700 | .2696 | 2 750 | .2297 | 6 400 | .1733 | 19 000 | .1206 |
| 55 | .8462 | 460 | .4169 | 910 | .3321 | 1 720 | .2686 | 2 800 | .2283 | 6 500 | .1724 | 20 000 | .1186 |
| 60 | .8220 | 470 | .4139 | 920 | .3309 | 1 740 | .2675 | 2 850 | .2270 | 6 600 | .1716 | 21 000 | .1166 |
| 65 | .8004 | 480 | .4110 | 930 | .3297 | 1 760 | .2665 | 2 900 | .2257 | 6 700 | .1707 | 22 000 | .1148 |
| 70 | .7808 | 490 | .4082 | 940 | .3285 | 1 780 | .2655 | 2 950 | .2244 | 6 800 | .1699 | 23 000 | .1132 |
| 75 | .7631 | 500 | .4054 | 950 | .3273 | 1 800 | .2645 | 3 000 | .2231 | 6 900 | .1690 | 24 000 | .1116 |
| 80 | .7468 | 510 | .4028 | 960 | .3262 | 1 820 | .2636 | 3 050 | .2219 | 7 000 | .1682 | 25 000 | .1101 |
| 85 | .7319 | 520 | .4002 | 970 | .3251 | 1 840 | .2626 | 3 100 | .2207 | 7 100 | .1674 | 26 000 | .1086 |
| 90 | .7181 | 530 | .3976 | 980 | .3240 | 1 860 | .2617 | 3 150 | .2195 | 7 200 | .1667 | 27 000 | .1073 |
| 95 | .7053 | 540 | .3952 | 990 | .3229 | 1 880 | .2607 | 3 200 | .2184 | 7 300 | .1659 | 28 000 | .1060 |
| 100 | .6933 | 550 | .3928 | 1 000 | .3218 | 1 900 | .2598 | 3 250 | .2172 | 7 400 | .1651 | 29 000 | .1047 |
| 110 | .6716 | 560 | .3904 | 1 020 | .3197 | 1 920 | .2589 | 3 300 | .2161 | 7 500 | .1644 | 30 000 | .1036 |
| 120 | .6524 | 570 | .3881 | 1 040 | .3176 | 1 940 | .2580 | 3 350 | .2151 | 7 600 | .1637 | 31 000 | .1024 |
| 130 | .6352 | 580 | .3859 | 1 060 | .3156 | 1 960 | .2571 | 3 400 | .2140 | 7 700 | .1630 | 32 000 | .1014 |
| 140 | .6197 | 590 | .3837 | 1 080 | .3136 | 1 980 | .2563 | 3 450 | .2130 | 7 800 | .1623 | 33 000 | .1003 |
| 150 | .6057 | 600 | .3815 | 1 100 | .3117 | 2 000 | .2554 | 3 500 | .2119 | 7 900 | .1616 | 34 000 | .0993 |
| 160 | .5928 | 610 | .3794 | 1 120 | .3098 | 2 020 | .2546 | 3 550 | .2109 | 8 000 | .1609 | 35 000 | .0984 |
| 170 | .5809 | 620 | .3774 | 1 140 | .3080 | 2 040 | .2537 | 3 600 | .2100 | 8 100 | .1602 | 40 000 | .0941 |
| 180 | .5699 | 630 | .3754 | 1 160 | .3063 | 2 060 | .2529 | 3 700 | .2081 | 8 200 | .1596 | 45 000 | .0905 |
| 190 | .5598 | 640 | .3734 | 1 180 | .3045 | 2 080 | .2521 | 3 800 | .2062 | 8 300 | .1589 | 50 000 | .0873 |
| 200 | .5503 | 650 | .3715 | 1 200 | .3028 | 2 100 | .2513 | 3 900 | .2044 | 8 400 | .1583 | 55 000 | .0846 |
| 210 | .5414 | 660 | .3696 | 1 220 | .3012 | 2 120 | .2505 | 4 000 | .2027 | 8 500 | .1577 | 60 000 | .0822 |
| 220 | .5331 | 670 | .3678 | 1 240 | .2995 | 2 140 | .2497 | 4 100 | .2011 | 8 600 | .1571 | 70 000 | .0781 |
| 230 | .5252 | 680 | .3659 | 1 260 | .2979 | 2 160 | .2489 | 4 200 | .1995 | 8 700 | .1565 | 80 000 | .0747 |
| 240 | .5178 | 690 | .3642 | 1 280 | .2964 | 2 180 | .2482 | 4 300 | .1979 | 8 800 | .1559 | 90 000 | .0718 |
| 250 | .5108 | 700 | .3624 | 1 300 | .2949 | 2 200 | .2474 | 4 400 | .1964 | 8 900 | .1552 | 100 000 | .0693 |
| 260 | .5042 | 710 | .3607 | 1 320 | .2934 | 2 220 | .2467 | 4 500 | .1949 | 9 000 | .1547 | | |
| 270 | .4979 | 720 | .3590 | 1 340 | .2919 | 2 240 | .2459 | 4 600 | .1935 | 9 100 | .1541 | | |
| 280 | .4919 | 730 | .3574 | 1 360 | .2905 | 2 260 | .2452 | 4 700 | .1921 | 9 200 | .1536 | | |
| 290 | .4862 | 740 | .3558 | 1 380 | .2890 | 2 280 | .2445 | 4 800 | .1908 | 9 300 | .1530 | | |
| 300 | .4807 | 750 | .3542 | 1 400 | .2877 | 2 300 | .2438 | 4 900 | .1895 | 9 400 | .1525 | | |
| 310 | .4755 | 760 | .3526 | 1 420 | .2863 | 2 320 | .2431 | 5 000 | .1882 | 9 500 | .1519 | | |
| 320 | .4705 | 770 | .3511 | 1 440 | .2850 | 2 340 | .2424 | 5 100 | .1870 | 9 600 | .1514 | | |
| 330 | .4657 | 780 | .3496 | 1 460 | .2837 | 2 360 | .2417 | 5 200 | .1857 | 9 700 | .1509 | | |
| 340 | .4611 | 790 | .3481 | 1 480 | .2824 | 2 380 | .2410 | 5 300 | .1846 | 9 800 | .1504 | | |
| 350 | .4566 | 800 | .3466 | 1 500 | .2811 | 2 400 | .2404 | 5 400 | .1834 | 9 900 | .1499 | | |
| 360 | .4524 | 810 | .3452 | 1 520 | .2799 | 2 420 | .2397 | 5 500 | .1823 | 10 000 | .1494 | | |
| 370 | .4482 | 820 | .3438 | 1 540 | .2787 | 2 440 | .2390 | 5 600 | .1812 | 11 000 | .1447 | | |
| 380 | .4443 | 830 | .3424 | 1 560 | .2775 | 2 460 | .2384 | 5 700 | .1801 | 12 000 | .1406 | | |
| 390 | .4405 | 840 | .3411 | 1 580 | .2763 | 2 480 | .2377 | 5 800 | .1791 | 13 000 | .1369 | | |
| 400 | .4367 | 850 | .3397 | 1 600 | .2751 | 2 500 | .2371 | 5 900 | .1781 | 14 000 | .1335 | | |
| 410 | .4332 | 860 | .3384 | 1 620 | .2740 | 2 550 | .2355 | 6 000 | .1771 | 15 000 | .1305 | | |

# Speed ratings

There is a limit to the speed at which rolling bearings can be operated. Generally it is the operating temperature which can be permitted, with respect to the lubricant being used or to the material of the bearing components, that sets the limit. The speed at which this bearing temperature is reached depends on the frictional heat generated in the bearing (including any externally applied heat) and the amount of heat which can be transported away from the bearing. Bearing type and size, internal design, load, lubrication and cooling conditions as well as cage design, accuracy and internal clearance all play a part in determining the permissible speed.

## Speed ratings

Speed ratings for grease and oil lubrication are quoted in the bearing tables. The speed rating for a given bearing represents the speed at which, under normal loading conditions there is a balance between the heat which can be removed from the bearing via the shaft and housing and sometimes via the lubricant and the heat generated in the bearing by friction at an acceptable temperature interval above ambient.

The speed ratings apply to bearings where the inner ring rotates. Some reduction may be necessary where bearings are to operate with rotating outer ring. More detailed information will be supplied on request.

When heavier loads are applied to the bearing, the friction in the bearing will be increased so that the bearing cannot be operated at such high speeds as the speed rating would indicate unless higher temperatures can be permitted. However, the influence of heavier loads on the permissible speed is generally only of importance for large bearings (≥ 100 mm).

## Speeds above the speed ratings

It is possible to operate bearings at speeds above the speed ratings given in the bearing tables if the bearing friction can be reduced by lubrication considerations or when heat can be removed from the bearing by circulating oil lubrication with cooling of the oil, by cooling ribs on the housing or by directed cold air streams. Any increase in speed above the speed rating without taking any of these precautions would only cause the temperature to rise excessively. An increase of bearing temperature means that lubricant viscosity is reduced and lubricant film formation is made more difficult, thus leading to higher friction and further temperature increases. If, at the same time, the operational clearance in the bearing is reduced because of increased inner ring temperature, the final consequence would be bearing seizure. Any increase in speed above the speed rating generally means that the temperature difference between the inner and outer rings is greater than normal. Usually, therefore, an internal clearance greater than normal ($C_3$) is required, and it may be necessary to look more closely at the temperature distribution in the bearing.

The speed limit as defined by the speed rating is the first limit to be reached with almost all bearing types. Above this limit, other criteria have a stronger influence, depending on bearing type. These criteria include the form stability or strength of the cage, lubrication of cage guiding surfaces, centrifugal and gyratory forces acting on the rolling elements and other speed-limiting factors.

Another limit is set with grease lubrication by the grease used. The base oil viscosity and thickener determine the shear strength of the lubricant, which in turn determines the permissible operating speed for the particular bearing.

For high speed bearing arrangements, all components, particularly those which rotate, must have a higher accuracy than normal to take account of the vibrating behavior. Special cage designs may also be required and it is therefore advisable to contact MRC.

For satisfactory bearing operation, especially at high speeds, a minimum load must be applied.

The speed ratings listed in the tables may be modified due to grade and cage variants. The multiplying factors shown in the footnotes are based on historical application and experience.

# Materials and limitations

## Materials for rolling bearings

The performance and reliability of rolling bearings are determined to a large degree by the materials from which the bearing components are made.

### Steels for bearing rings and rolling elements

Steels used for bearing rings and rolling elements must be capable of high fatigue strength and wear resistance. The structural and dimensional stability of the bearing components must be satisfactory at the operating temperatures which can be expected. In most cases the choice of a particular steel is dictated by the application requirements.

### Through-hardening steels

The most common through-hardening steel used for rolling bearings is a carbon chromium steel containing approximately 1% carbon and 1.5% chromium. For bearing components having large cross sections of steels alloyed with manganese and molybdenum are used because of their superior through-hardening properties.

Much development has been accomplished in the area of through-hardened steels. Particular attention has been paid to cleanliness and modern bearing steels have such small contents of inclusions that it is now recognized that under ideal conditions bearings should no longer fail from fatigue.

### Case-hardening steels

Chromium-nickel and manganese-chromium alloyed steels with a carbon content of approximately 0.15% are those case-hardening steels most commonly used for rolling bearings.

### Steels for MRC rolling bearings

In the majority of applications there is virtually no difference in behavior between bearings made of through-hardened or case-hardened steels. This fact has been acknowledged by ISO in that no distinction is made between steel types in the life calculation. In fact, steel cleanliness and proper manufacturing methods as well as bearing design are the decisive factors. However, there are applications where a particular type of steel has certain advantages.

Because MRC has both the competence and the facilities for through hardening, case hardening and induction hardening, attention is paid to the main application fields for each particular bearing and the steel and method of heat treatment are chosen to give the best performance in these applications.

### Steels for temperature-resistant bearings

MRC rolling bearings can generally be used at operating temperatures up to 250° F (121° C). If the operating temperatures are higher than this, the bearings must be subjected to a special heat treatment (stabilization) so that inadmissible changes in dimensions do not occur as a result of microstructural changes. However, the bearings should not be stabilized for a higher temperature than the expected operating temperature.

For bearings which are required to operate at temperatures in excess of 450° F (232° C) special steels with high hot-hardness are required. In such cases it is advisable to contact MRC Engineering.

### Steels for corrosion-resistant bearings

For bearings that come into contact with corrosive media during operation, there are a couple options. Historically, chromium or chromium/molybdenum stainless steel has been used. Because of the reduced hardness of these steels, the bearings do not have the same high load carrying capacity as bearings made of conventional steels. The corrosion resistance is only available when the whole surface is perfectly polished and if it is not roughened or damaged during mounting. Some specialty high nitrogen steels have been developed which provide better corrosion resistance than the chromium stainless steels as well as the same high load carrying capacity as conventional bearing steels. For more information on the different types of corrosion resistant steels and their application, it is recommended to contact MRC Application Engineering.

### Hybrid bearings with ceramic balls

MRC hybrid bearings use steel inner and outer rings with ceramic balls. This combination provides a bearing that has greater stiffness, is able to handle higher speeds and higher temperatures.

The lower density of the silicon nitride ceramic balls creates less centrifugal force than steel balls. Lower density combined with the reduced friction due to the ball's smooth surface, allows the bearing to run at much higher speeds. The low thermal expansion of the ceramic balls makes them less sensitive to differences in temperature between the inner and outer rings. The higher modulus of elasticity makes the bearings much stiffer.

## Materials for cages

The main purpose of the cage is to keep the rolling elements at an appropriate distance from each other and to prevent immediate contact between two neighboring rolling elements in order to keep friction and thus heat generation in the bearing at a minimum.

In grease lubricated bearings some of the grease inside the bearing will adhere to the cage forming a lubricant reservoir and ensuring good lubrication of the operating surfaces of the bearing.

The cage is guided either on the rolling elements or on one of the bearing rings and is thus radially centered. Pressed steel or brass cages are generally guided on the rolling elements. Inner or outer ring land-guided machined cages generally permit operation at higher speeds and are necessary when

*(continued on next page)*

movements additional to the pure rotational are superimposed, particularly when conditions of high acceleration prevail. Suitable steps must be taken (e.g. oil lubrication) to ensure that there is a sufficient supply of lubricant to the guiding surfaces of the cage and to the inside of the bearing.

Rolling bearing cages are mechanically stressed by frictional, strain and inertia forces. They may also be subjected to the chemical action of certain lubricants, lubricant additives or products of their aging, organic solvents, coolants (halogenated hydrocarbons, ammonia), etc. Thus the design and choice of material are of paramount importance for the performance of the cage as well as for the operational reliability of the bearing as a whole.

### Standard cages

As rolling bearings have been developed, various cage types and designs for the different bearing types and sizes have emerged; the cages differ as to form, material, manufacturing methods, cost of production and operational limits.

In the text preceding each section, information is provided regarding the standard cages with which the bearings are fitted and also the possible alternatives. The standard cage is always well proven in service and is the design considered most suitable for the majority of applications. With reference to the viability of production, the costs and the different application areas of the bearings, the standard cage for the larger bearings may be different from that for the smaller bearings in one and the same series. If a bearing with a non-standard cage is required it is always advisable to check availability before ordering.

### Molded polyamide cages

For some bearing types, e.g. double row deep groove ball bearings, and angular contact ball bearings, the small and medium-sized bearings are available with molded cages of heat stabilized, glass fiber reinforced polyamide 6.6. Heat stabilized, unfilled polyamide cages are available for a limited number of sizes. This material is characterized by a favorable combination of strength and elasticity. The good sliding properties of polyamide on lubricated steel surfaces and the smoothness of the cage surfaces in contact with the rolling elements mean that little friction is generated by the cage so that heat generation and wear in the bearing are at a minimum. The low density of the material means that the inertia of the cage is small. All these factors plus inherently superior dynamic balance result in smoother and quieter running bearings.

The injection molding process used to produce the cages allows functionally suitable designs to be made. The excellent running properties of polyamide cages under lubricant starvation conditions permit continued operation of the bearing for a time, reducing the risk of seizure and secondary damage.

When using bearings with polyamide cages, the permissible operating temperatures for the material and its resistance to the lubricant used must be observed. At operating temperatures up to the values given in the table below for the various oils and greases which are used as bearing lubricants, cage properties are unaffected. If the permissible temperature is exceeded, the cage material will age, this process being accelerated the longer the cage is exposed to the excessive temperature. Brief periods at up to 70° F (21° C) above the recommended maximum temperatures can be tolerated provided they are interspersed with longer periods at operating temperatures below the recommended values, and provided the maximum operating temperature for the lubricant is not exceeded. When operating temperatures are constantly above 250° F (121° C) bearings fitted with metallic cages are recommended. Molded polyamide cages are also unsuitable for operating temperatures below -40° F (-40° C) as they lose their elasticity.

The organic solvents normally used to clean rolling bearings such as white mineral spirits or trichloroethane do not affect cage properties, nor do they dilute alkaline cleaners (e.g. soda) if they are at room temperature and the period during which they are in contact is short. The chlorofluorocarbons or ammonia used in refrigeration do not attack polyamide. In vacuum, polyamide cages become brittle because they become dehydrated.

**Permissible operating temperatures for cages of glass fiber reinforced polyamide 6.6 with various bearing lubricants**

| Lubricant | Permissible operating temperature[1)] | |
|---|---|---|
| | ° C | ° F |
| **Mineral oils** | | |
| Oils without EP additives e.g. machine oils, hydraulic oils | 120 | 248 |
| EP oils e.g. industrial and automotive gearbox oils | 110 | 230 |
| EP oils e.g. rear axle and differential gear oils (automotive), hypoid gear oils | 100 | 212 |
| **Synthetic oils** | | |
| Polyglycols, poly-a-olefins | 120 | 248 |
| Diesters, silicones | 110 | 230 |
| Phosphate esters | 80 | 176 |
| **Greases** | | |
| Lithium base[2)], polyurea bentonite, calcium complex | 120 | 248 |

1) Measured on the outside surface of the outer ring.
2) For sodium and calcium based greases and other bearing greases with a maximum operating temperature below 120° C, the maximum temperature for the polyamide cage is the same as the maximum temperature for the grease, otherwise the permissible operating temperature is 120° C.

# Materials and limitations

### Steel cages

Pressed cages of steel sheet are standard for many deep groove ball bearings. These cages have relatively high strength and weigh little. To reduce friction and wear they may be hardened and surface treated. High strength, machined steel cages, often silver plated are also available for critical and extra heavy duty applications.

### Machined bronze

Machined bronze cages are used for heavy duty applications and larger size bearings. Machined bronze cages can be used at operating temperatures up to 450° F (232° C). They are not affected by the mineral or synthetic oil based lubricants normally used for rolling bearings nor by the organic solvents used to clean bearings. They are very resistant to corrosive attack.

### Brass cages

Pressed brass cages are used for some small and medium-sized bearings, but most brass cages are machined from cast or wrought material. Brass cages should not be used at temperatures in excess of 450° F (232° C). They are unaffected by most of the commonly used bearing lubricants, including synthetic oils and greases, and can be cleaned using normal organic solvents. The use of alkaline cleaning agents is not recommended. Ammonia (e.g. in refrigeration) causes embrittlement in brass so that brass cages are unsuitable and other alternatives should be considered.

### Phenolic (Bakelite) cages

Phenolic cages are used primarily for angular contact ball bearings. These cages are composed of machined, cotton fabric impregnated with phenolic resin. The light weight construction of the phenolic cage makes it ideal for high speed applications. Phenolic cages should not be used in temperatures in excess of 225° F (107° C).

# Materials and limitations

| Bearing component | Material | Description | Dynamic operating temperature limits |
|---|---|---|---|
| Race way rings and balls | SAE 52100 (AISI E-52100) | Vacuum processed high carbon chromium steel. Special heat treatment increases maximum temperatures and improves dimensional stability.[1] | 250° F (121° C) Max<br>Special heat treatment up to 400° F (204° C) max[1] |
| | 440C martensitic stainless steel[1] | Moderate corrosive environments | 300° F (148° C) Max<br>Special heat treatment up to 800° F (426° C) max[1] |
| | XD15NW | High corrosive environments | 300° F (150° C) Max |
| | M50 tool steel[1] | High temperature service, improved life at elevated temperatures | 600° F (315° C) Max |
| Seals | Nitrile rubber | Standard MRC seal material, identified by black color | -70° F to 250° F<br>-56° C to 121° C |
| | Fluorocarbon seals (Viton®)[1] | Better temperature and chemical resistance, identified by grey or brown color | -40° F to 400° F<br>-40° C to 204° C |
| | PTFE seals (Teflon)[1] | Superior chemical and heat resistance, identified by tan color and "woven" appearance | -450° F to 550° F<br>-267° C to 288° C |
| Shields | 1010 low carbon steel | Standard MRC shield material | 450° F (232° C) Max |
| | 302 stainless pressed steel[1] | Corrosive environments | 450° F (232° C) Max |
| Ball cages[2] (separator) | 1010 pressed steel | Standard MRC pressed cage material | 450° F (232° C) Max |
| | Machined phenolic (Bakelite) | Composition made from a cotton fabric impregnated with phenolic resin; two piece riveted or one piece machined design | 225° F (110° C) Max |
| | Molded polyamide | Heat stabilized 6.6 polyamide, identified by natural (cream) color; ball guided design | 250° F (121° C) Max |
| | Molded reinforced polyamide | Heat stabilized 6.6 polyamide reinforced with glass fiber; ball guided design, identified by dark grey color | 250° F (121° C) Max |
| | 302 pressed stainless steel | Corrosive environments; ball guided two piece riveted design | 450° F (232° C) Max |
| | Pressed brass | Stamped one piece ball guided or two piece ball guided riveted design | 450° F (232° C) Max |
| | 4340 machined steel | One piece land or ball guided design | 575° F (302° C) Max |
| | Machined bronze | One piece land or ball guided design | 450° F (232° C) Max |

1) Contact MRC for availability.
2) Contact MRC for ball cages available for specific sizes.

# Lubrication

Table of contents page

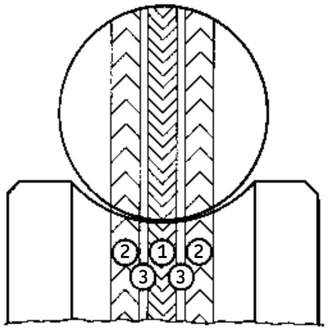
## Lubrication of anti-friction bearings

### Introduction

Although the basic principle of ball and roller bearings is the rolling of one element over another, some sliding friction is generated during operation of anti-friction bearings. Successful operation of an anti-friction bearing requires a lubricating film in the areas of sliding contact. In cageless bearings, the rolling elements slide against each other. When a cage is present the rolling elements slide against this and under some operating conditions, the cage slides against ring guiding surfaces. When a ball under load rolls in a curved bearing raceway, pure rolling occurs only along two lines in the contact area; other contact points on the ball slide or spin along areas of the raceway. This is because the effective diameter of the ball is smaller at points distant from the bottom of the race-groove. See Figure 1.

- The forces of slippage between zone 1 and the two zones 2 are equal in magnitude.
- The slippage in zone 1 is in opposite direction from that in zone 2.
- Technically the zones of pure rolling in 3 are very narrow but there are larger areas that approach pure rolling.
- These conditions exist, although less obvious, even when loads are lighter and the ball paths narrower.

Without lubrication in the highly loaded contact areas, very high friction will be encountered in ball bearings. High friction generally creates high heat and thermal expansion, usually concentrated in the rolling elements and inner ring races which may cause a loss of internal clearance and radial preloading. This frequently causes surface degeneration and early fatigue. Cage breakage may also result from extreme stresses.




**1** Central slippage zone
**2** Outboard slippage zone
**3** Zones of rolling

**Figure 1**

### Bearing construction

An anti-friction bearing is a precision device and a marvel of engineering. It is unlikely that any other mass produced item is machined to such close tolerances. While boundary dimensions are usually held to tenths of a thousandth of an inch, rolling contact surfaces and geometries are maintained to millionths of an inch. It is for this obvious reason that very little surface degradation can be tolerated.

Bearing steels are hard, durable alloys, highly free of impurities in order to withstand the high unit stresses which occur at the point of contact between a rolling element and the race. Also, they must be sufficiently elastic to quickly regain their original shape after deformation through loading.

Race and rolling element finish are also critical since even minute surface imperfections can cause high stress concentrations resulting in premature failure.

## Principle of operation

When a ball in a bearing is subjected to load, an elliptical area of contact results between the ball and the race. In operation, as each ball enters the loaded area, slight deformation of both the ball and the race occurs. The ball flattens out in the lower front quadrant and bulges in the lower rear quadrant. See Figure 2. The amount of deformation is a function of the magnitude and direction of load, ball size, race geometry, and elasticity of the bearing materials. Any particular point on the race goes through a cycle of these stress reversals as each ball passes it. One source of heat developed in a bearing results from these stresses and the deformation of the bearing material associated with them.

The life of an anti-friction bearing running under good operating conditions is usually limited by fatigue failure rather than by wear. Under optimum operating conditions, the fatigue life of a bearing is determined by the number of stress reversals and by the cube of the load causing these stresses. As examples, if the load on the bearing is doubled, the theoretical fatigue life is reduced to one-eighth. Also, if speed is doubled, the theoretical fatigue is reduced to one-half.

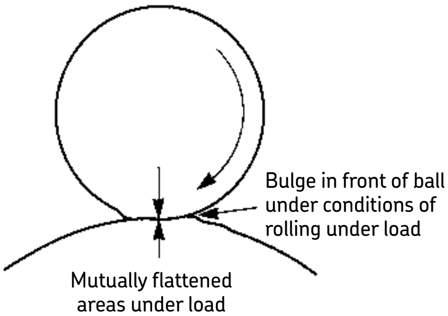



**Figure 2**

# Lubrication of anti-friction bearings

## Friction torque

The friction torque in an anti-friction bearing consists essentially of two components. One of these is a function of the bearing design and the load imposed on the bearing. The other is a function of the lubricant type, the quantity, and the speed of the bearing.

It has been found that the friction torque in a bearing is lowest with a quantity of the correct viscosity oil just sufficient to form a film over the contacting surfaces. The friction will increase with greater quantity and/or high viscosity of the oil. With more oil than just enough to make a film, the friction torque will also increase with the speed.

## Function of the lubricant

1 To lubricate sliding contact between the cage and other parts of the bearing.
2 To provide a film of oil between rolling contact surfaces (elastohydrodynamic lubrication).
3 To lubricate the sliding contact between the rolls and guiding elements in roller bearings.
4 In some cases, to carry away the heat developed in the bearing.
5 To protect the highly finished surfaces from corrosion.
6 To provide a sealing barrier against foreign matter.

## Oil versus grease

The ideal lubricant for rolling element bearings is oil. Grease, formed by combining oil with soap or non-soap thickeners, is simply a means of effecting greater utilization of the oil. In a grease, the thickener acts fundamentally as a carrier and not as a lubricant.

Greases are now used for lubricating by far the larger number of rolling bearings. The extensive use of grease has been dictated by the possibilities of simpler housing designs, less maintenance, less difficulty with leakage, and better sealing against dirt. On the other hand, there are limitations which do not permit the use of grease. Where a lubricant must dissipate heat rapidly, grease should not be used. In many cases, associated machine elements that are oil lubricated dictate the use of oil for anti-friction bearings. Listed below are some of the advantages and disadvantages of grease lubrication.

### Advantages

1 Simpler housing designs are possible; piping is greatly reduced or eliminated.
2 Maintenance is greatly reduced since oil levels do not have to be maintained.
3 Being a solid when not under shear, grease forms an effective collar at bearing edges to help seal against dirt and water.
4 With grease lubrication, leakage is minimized where contamination of products must be avoided.
5 During start-up periods, the bearing is instantly lubricated whereas with pressure or splash oil systems, there can be a time interval during which the bearing may operate before oil flow reaches the bearing.

### Disadvantages

1 Extreme loads at low speed or moderate loads at high speed may create sufficient heat in the bearing to make grease lubrication unsatisfactory.
2 Oil may flush debris out of the bearing, grease will not.
3 The correct amount of lubricant is not easily controlled as with oil.

## Oil characteristics

The ability of any oil to meet the requirements of specific operating conditions depends upon certain physical and chemical properties.

### Viscosity

The single most important property of oil is viscosity. It is the relative resistance to flow. A high viscosity oil will flow less readily than a thinner, low viscosity oil.

### Lubrication viscosity

There are a number of instruments used for determining the viscosity of oil. In the United States, the instruments that are usually used are the Viscosimeter or the Viscometer. The Saybolt Universal Viscosimeter measures the time in seconds required for 60 cc of oil to drain through a standard hole at some fixed temperature. When this unit is used, the viscosities are quoted in terms of Saybolt Universal Seconds (SUS).

When the Kinematic Viscometer is used to measure oil viscosity, the time required for a fixed amount of oil to flow through a calibrated capillary is used as an intermediate value for calculating viscosity. The unit of kinematic viscosity is the stoke or the centistoke (cSt). The common temperatures for reporting viscosity are 104° F and 212° F (40° C and 100° C).

Generally, for ball bearings and cylindrical roller bearings, it is a good rule to select an oil which will have a viscosity of at least 70 SUS (15 cSt) at operating temperature.

# Lubrication of anti-friction bearings

### Viscosity index

All oils are more viscous when cold and become thinner when heated. However, some oils resist this change of viscosity more than others. Such oils are said to have a high viscosity index (V.I.). Viscosity index is most important in an oil where it must be used over a wide range of temperatures. Such an oil should resist excessive changes in viscosity. A high V.I. is usually associated with good oxidation stability and can be used as a rough indication of such quality.

### Pour point

Any oil, when cooled, eventually reaches a temperature below which it will no longer flow. This temperature is said to be the pour point of the oil. At temperatures below its pour point an oil will not feed into the bearing and lubricant starvation may result.

In selecting an oil for anti-friction bearings, the pour point must be considered in relation to the operating temperature.

### Flash and fire point

As an oil is heated, the lighter fractions tend to volatilize. With any oil, there is some temperature at which enough vapor is liberated to flash into momentary flame when ignition is applied. This temperature is called the flash point of the oil. At a somewhat higher temperature enough vapors are liberated to support continuous combustion. This is called the fire point of the oil. The flash and fire points are significant indications of the tendency of an oil to volatilize at high operating temperatures. High V.I. base oils generally have higher flash and fire points than lower V.I. base oils of the same viscosity.

### Oxidation resistance

All petroleum oils are subject to oxidation by chemical reaction with oxygen of air. This reaction results in the formation of acids, gum, sludge, and varnish residues which can reduce bearing clearances, plug oil lines and cause corrosion.

Some lubricating fluids are more resistant to this action than others. Oxidation resistance depends upon the fluid type, the methods and degree of refining used, and whether oxidation inhibitors are used.

There are many factors which contribute to the oxidation of oils and practically all of these are present in lubricating systems. These include temperature, agitation, and the effects of metals and various contaminants which increase the rate of oxidation.

Temperature is a primary accelerator of oxidation. It is well known that rates of chemical reaction double for every 18° F (10° C) increase in temperature. Below 140° F (60° C), the rate of oxidation of oil is rather slow. Above this temperature, however, the rate of oxidation increases to such an extent that it becomes an important factor in the life of the oil. It is for this reason that it is desirable that oil systems operate at as low an overall temperature as is practical.

The oxidation rate of oil is accelerated by metals such as copper and copper-containing alloys and to a much lesser extent by steel. Contaminants such as water and dust also act as catalysts to promote oxidation of the oil.

### Emulsification

Generally, water and straight oils do not mix. However, when an oil becomes dirty, the contaminating particles act as agents to promote emulsification. In anti-friction bearing lubricating systems, emulsification is undesirable and the oil should separate readily from any water present. The oil should have good demulsibility characteristics.

### Rust prevention

Although straight petroleum oils have some rust protective properties, they cannot be depended upon to do an unfailing job of protecting rust-susceptible metallic surfaces. In many instances, water can displace the oil from the surfaces and cause rusting. Rust is particularly undesirable in an anti-friction bearing because it can seriously abrade the bearing elements and areas that are pitted by rust will cause rough operation or failure of the bearing.

### Additives

High grade lubricating fluids are formulated to contain small amounts of special chemical materials called additives. Additives are used to increase the viscosity index, fortify oxidation resistance, improve rust protection, provide detergent properties, increase film strength, provide extreme pressure properties, or lower the pour point.

## Application of lubrication fluids

The amount of oil needed to maintain a satisfactory lubricant film in an anti-friction bearing is extremely small. The minimum quantity required is a film averaging only a few micro-inches in thickness. Once this small amount has been supplied, make-up is required only to replace that lost by vaporization, atomization, and creepage from the bearing surfaces. Some idea of the small quantity of oil required can be realized when it is known that 1/1000 of a drop of oil, having a viscosity of 300 SUS at 100° F (38° C) per hour can lubricate a 50 mm bore bearing running at 3,600 rpm. Although this small amount of oil can adequately lubricate a bearing, much more oil is needed to dissipate heat generated in high speed, heavily loaded bearings.

# Lubrication of anti-friction bearings

Oil may be supplied to anti-friction bearings in a number of ways. These include bath oiling, oil mist from an external supply, wick feed, drip feed, circulating system, oil jet, and splash or spray from a slinger or nearby machine parts.

One of the simplest methods of oil lubrication is to provide a bath of oil through which the rolling element will pass during a portion of each revolution. Where cooling is required in high speed and heavily loaded bearings, oil jets and circulating systems should be considered. If necessary, the oil can be passed through a heat exchanger before returning to the bearing.

## Selection of oil

The most important property of lubricating oil is the viscosity. Figures 3 and 4 should be used to assure that the viscosity is adequate in an application. Figure 3 yields the minimum required viscosity as a function of bearing size and rotational speed.

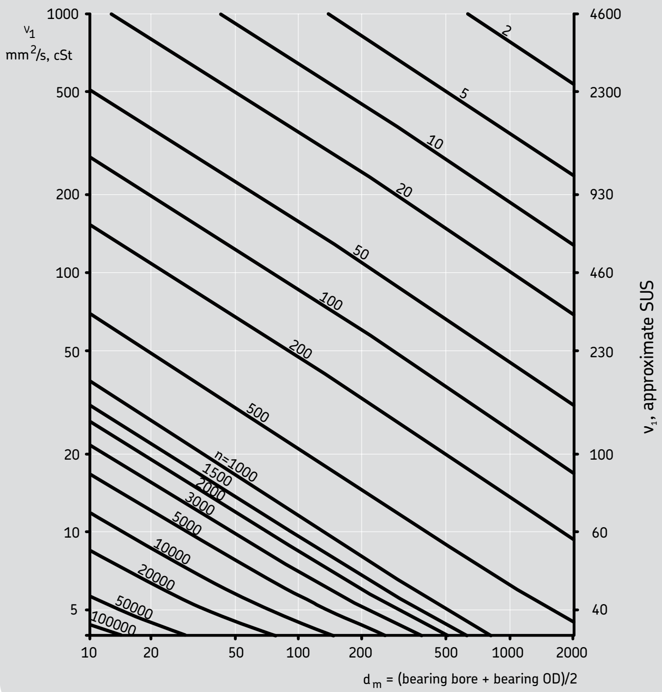
The viscosity of a lubricating oil, however, varies with temperature. It decreases with increasing temperature. Therefore, the viscosity at the operating temperature must be used, rather than the viscosity grade (VG) which is based on the viscosity at the internationally standardized reference temperature of 40° C (104° F). Figure 4 can be used to determine the actual viscosity at the operating temperature, which, however, varies with bearing design. For instance tapered and spherical roller bearings usually have a higher operating temperature than ball bearings or cylindrical roller bearings under comparable operating conditions.

Example:
A bearing having a bore diameter of 45 mm and an outside diameter of 85 mm is required to operate at a speed of 2000 rpm. The pitch diameter $d_m = 0.5\ (d + D) = 0.5\ (45 + 85) =$ 65 mm. As shown in Figure 3, the intersection of $d_m$ = 65 mm with the oblique line representing 2000 rpm yields a minimum viscosity required of 13 mm²/s. Now let us assume that the operating temperature is 80° C (176° F). In Figure 4, the intersection between temperature 80° C and required viscosity 13 mm²/s is between the oblique lines for VG46 and VG68. Therefore, a lubricant with the viscosity grade of at least VG46 should be used, i.e. a lubricant of at least 46 mm²/s viscosity at the standard reference temperature of 40° C.

When determining the operating temperature, it should be kept in mind that the temperature of the oil is usually 3° C to 11° C (5° F to 20° F) higher than that of the bearing housing. For example, assuming that the temperature of the bearing housing is 77° C (170° F), the temperature of the oil will usually be 80° C to 88° C (176° F to 190° F).

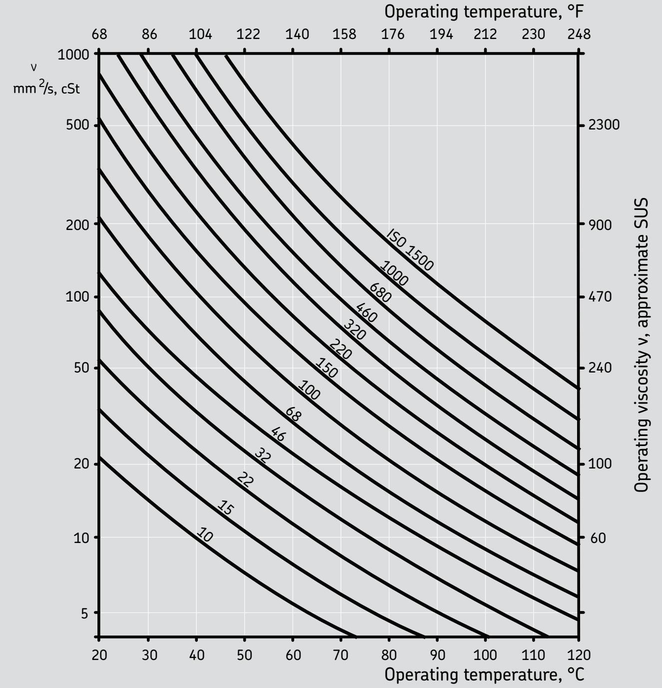
If a lubricant with higher than required viscosity is selected, an improvement in bearing performance (life) can be expected.

**Figure 3**
**Estimation of the required viscosity $\nu_1$ at operating temperature**




$\nu_1$ = required lubricant viscosity for adequate lubrication at the operating temperature

**Figure 4**
**Estimation of viscosity, ν at operating temperature assumes VI=95 and a mineral oil**




Note: Viscosity classification numbers are according to International Standard ISO 3448–1975 for oils having a viscosity index of 95.

# Lubrication of anti-friction bearings

However, since increased viscosity raises the bearing operating temperature, there is frequently a practical limit to the lubrication improvement which can be obtained by this means. Additionally, only solvent refined mineral oil should be used.

For exceptionally low or high speeds, for critical loading conditions or for unusual lubrication conditions, please consult MRC Applications Engineering.

For all calculations, the viscosity should be expressed in mm²/s (cSt) rather than in Saybolt Universal Seconds (SUS), as the conversion between these two viscosity units is nonlinear. However, the SUS scale shown on the right of Figures 3 and 4 can be used for approximate conversion of SUS to mm²/s (cSt).

For viscosity equivalents see next page.

**Oil flow requirement**

For high speed and/or high temperature applications, a major function of the lubricant is to remove heat, and circulating oil lubrication is necessary.

Unfortunately, excessive quantity of lubricant within the bearing boundary dimensions, i.e., within the free volume, causes increased friction and hence increased heat generation owing to fluid churning. Therefore the lubricant flow rate through the bearing should be as little as possible, consistent with good lubricant film formation and heat removal. This minimum acceptable flow rate can be achieved using air-oil mist lubrication. Care must be exercised to assure that the lubricant flow rate is sufficient to avoid lubricant starvation in high speed applications. In this condition, insufficient lubricant enters the rolling element-raceway contacts to permit formation of lubricant films thick enough to separate the components.

From a heat removal standpoint and as a starting point to determine the required lubricant flow rate in gallons per minute (W), the following approximate formula may be used:

In English system units, the flow rate in gallons per minute (W) is:

$$W = \frac{1.9 \times 10^{-4}\, \mu\, P d_m n}{(T_0 - T_i)}$$

in which μ is the bearing coefficient of friction, P is imposed load in pounds, $d_m$ is bearing pitch diameter in inches, n is bearing net speed (shaft speed minus outer ring speed) in rpm, $T_0$ is lubricant outlet temperature in degrees F and $T_i$ is lubricant inlet temperature in degrees F. The table below gives appropriate values of μ.

**Coefficient of friction (μ)**

| | |
|---|---|
| Radial ball bearings | 0.0015 |
| Angular-contact ball bearings | 0.0020 |
| Split inner ring ball bearings | 0.0024 |
| Cylindrical roller bearings | 0.0011 |

## Grease lubrication

Most greases are composed of a soap thickening agent in petroleum oil. Soap is formed by combining a metallic alkali such as the hydroxide of sodium or lithium with a fatty material. The type and quality of soap determines the grease consistency, texture, melting point, and solubility in water. Sometimes a mixture of soaps is used to alter the properties. Additives are used to impart such properties as increase in load carrying capacity, rust prevention, and oxidation stability.

Lithium soap petroleum greases are widely used because of their good water resistance, relatively good high and low temperature characteristics, and good mechanical stability. Sodium soap greases are not water resistant and are readily washed away by large amounts of water. However, they have excellent rust preventive properties due to their ability to absorb minor amounts of water contamination.

Greases containing thickeners other than metallic soaps are being used increasingly because they offer greater resistance to heat. They are a multi-purpose type and have good water resistance. Surface treated clay is an inorganic thickener used in many greases.

Intensive research in the development of oxidation resistant formulations has resulted in great increases in the life which lubricating greases can provide. Through the use of synthetic oily compounds and non-soap thickeners, grease lubrication can now be achieved over a temperature range of -100° F to +500° F (-73° C to 260° C) and higher in some cases.

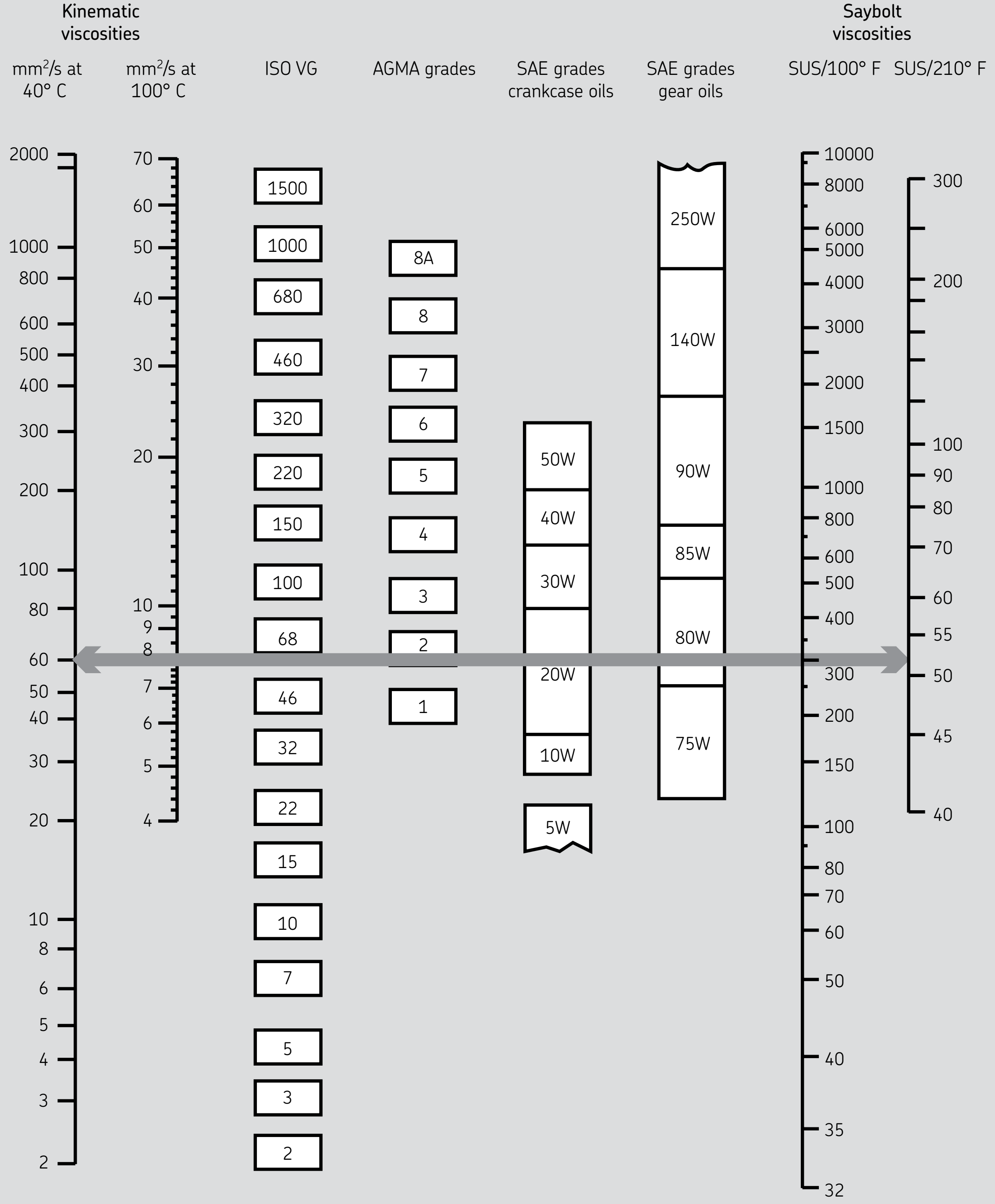
Synthetic greases are formulated with synthetic fluids such as silicones, esters, perfluoroalkyl ethers, or polyphenyl ethers instead of petroleum oil. The thickener may be soap or non-soap. Synthetic greases are used in extremely high or low temperature applications that are outside the range for petroleum greases. They are relatively expensive and therefore are not usually recommended if petroleum greases will serve the purpose.

In the great majority of applications where the operating conditions are normal, many different greases can be used satisfactorily. However, each grease has certain limitations and properties. In applications where elevated temperature, high speed, heavy loading, high humidity, or other extreme conditions are encountered, consideration must be given to the choice of a grease. In some instances it will be found that no available grease has all the properties to satisfy the requirements and the choice must be a compromise.

It is recommended that the bearing user consult with MRC Engineering to determine the lubricant which will be most suitable for the application.

# Lubrication of anti-friction bearings

## Viscosity equivalents




Viscosities based on 95 V. I. single-grade oils.
ISO grades are specified at 40° C.
AGMA grades are specified at 100°F.
SAE 75W, 80W, 85W, and 5 and 10W are specified at low temperature (below -17° F = 0° C).
Equivalent viscosities for 100° F and 210°F are shown.
SAE 90 to 250 and 20 to 50 specified at 210° F (100° C).

Comparison of various viscosity classification methods

# Lubrication of anti-friction bearings

## Grease characteristics

### Consistency

Greases vary in consistency from semi-fluids to hard, brick type greases which are cut with a knife. The method for measuring grease consistency (ASTM D-217), established by the American Society for Testing and Materials, uses a penetrometer with which a cone of standard shape and weight is dropped into the grease and the depth of penetration in five seconds at 77° F (25° C) is measured in tenths of a millimeter. The penetration is usually measured on both unworked grease as it comes from its shipping container and also after it has been worked 60 strokes by a perforated disc plunger.

Usually greases become softer when subjected to mechanical working action. These consistency measurements are expressed as unworked and worked. The 60 stroke working is done to minimize the effects of any previous manipulation of the grease in sampling. Also, the worked penetration indicates the relative softening after a limited amount of shear. However, this working cannot be correlated to the much more severe shearing action that occurs in a bearing.

Listed in the table below is a classification of the consistency of grease in terms of worked penetration as developed by the National Lubricating Grease Institute.

Most rolling bearing greases fall into classes 1–4. By far the greater portion of bearing applications use NLGI grade 2 grease.

| NLGI no. | Worked penetration |
|---|---|
| 000 | 445–475 |
| 00 | 400–430 |
| 0 | 355–385 |
| 1 | 310–340 |
| 2 | 265–295 |
| 3 | 220–250 |
| 4 | 175–205 |
| 5 | 130–160 |
| 6 | 85–115 |

### Dropping point

When a grease is heated, it softens. The temperature at which a drop falls from a sample in a standard test (ASTM D-566) is called its dropping point. The dropping point cannot be used to indicate the maximum operating temperature for a grease since some greases oxidize or decompose rapidly at temperatures below the dropping point. Dropping point is of little significance to the grease user but it is of significant value to the grease maker as means of quality control.

### Oxidation stability

Reaction with oxygen in the air, which is accelerated with higher temperatures, is one of the main factors limiting the life of bearing greases. This reaction ultimately results in drying and hardening of the grease with total loss of lubricating properties.

The standard test used to measure the oxidation stability of grease is the Oxygen Bomb Method (ASTM D-942). In this test, the rate of absorption of oxygen by the grease at 210° F (99° C) and 110 PSI is recorded. This test is conducted under static conditions and is intended only to be useful in estimating the shelf life of greases. However, it has been found that greases which show low oxygen absorption usually perform reasonably well in service.

### Water resistance

Water resistance varies with the different types of greases. Most sodium soap greases emulsify and thin out when mixed with water. Other types are less affected but their resistance to washout varies with the viscosity of the oil and the amount and type of thickener. No lubricating grease is completely water resistant. Even those classed as water insoluble or water resistant can be washed out of a bearing if exposed to large volumes of water.

The ability of a grease to withstand water washout from a bearing is determined by ASTM Method D-1264. A ball bearing with a specified quantity of the test grease is mounted in a housing with specified clearances to allow entry of water from a jet. After one hour of operation at 600 rpm with the water at a controlled temperature impinging on the housing at a specified rate, the bearing is reweighed and the amount of grease lost is determined.

### Shear stability (mechanical stability)

This is the resistance of a grease to structural breakdown when subjected to the shearing action of being worked.

Two grease working tests are used to measure softening of grease due to working. ASTM Method D-217, described earlier under Consistency, forces the grease through a perforated plate at a rate of 60 times per minute. The Shell Roll Test subjects the grease to the working action of a roll inside a rotating cylinder. Penetration values are determined before and after rolling. The degree of softening that results from working is important from the aspect of leakage from the bearing. However, the results cannot be correlated to bearing performance since greases which have appeared unsatisfactory in these tests have been found to provide very satisfactory bearing performance.

### Oil separation

Most greases show some tendency to allow oil separation in certain circumstances. During storage, depressions in the grease surface or voids collect oil.

This separation increases with higher storage temperatures as the viscosity of the oil phase is lowered. Oil separation, unless excessive, is not reason for rejection of a rolling bearing grease. Five percent is typically permitted. Usually the separated oil can be easily stirred back into the grease body.

The standard test method for determining oil separation from grease during storage is ASTM D-1742. This is a simple test where the sample is placed on a sieve strainer in a pressure cell with inlet air pressure maintained at 0.25 PSI. The test is conducted at 77° F (25° C) and after 24 hours the separated oil that has collected on the bottom of the cell is weighed and expressed as a percentage by weight of the original sample. This test is only intended to measure the tendency of a grease to separate oil during storage. It is not intended to predict the stability of grease under dynamic service conditions.

# Lubrication of anti-friction bearings

### Channeling

Channeling is a term referring to the tendency of a grease to separate and form a channel after the passage of the balls and cage around the ball race. Some greases channel very little and flow back rapidly to fill the voids left by the rotating elements to cause higher torque and higher operating temperatures from the shear stresses within the lubricant. Poor channeling characteristics can make some greases unsatisfactory for high speed operation when a channeling type grease will provide minimum torque and heat rise. Channeling type greases are usually of NLGI No. 3 or No. 4 consistency.

### Special properties

There are many special grease formulations to meet a variety of unusual requirements. Special properties, which have been listed below, are often required in a grease. These special requirements may include:

1. Extra tackiness or adhesiveness to resist leakage or throw-out
2. Proper structure for sealing to exclude contaminates
3. Resistance to the action of certain chemicals
4. Resistance to the action of solvents
5. Electrical conductivity
6. Resistance to the effects of nuclear radiation
7. Resistance to the effects of high vacuum
8. Nontoxic for use where there may be contact with food
9. High oil bleed rates ≥ 2.5% for machined land guided cages

## Operating conditions

### Low temperature

Oils and greases tend to thicken and resist flow as temperatures are decreased. For oil lubricated bearings operating at cold temperatures, an oil that has a sufficiently low pour point to remain fluid at the low temperature and the proper viscosity for the operating temperature should be chosen. If the oil is subjected to low temperature start-up but operates at higher temperatures, a high viscosity index is desirable.

Usually the most important consideration in selecting a grease for low temperature operation is start-up torque. Some greases may function satisfactorily during operation but require excessive torque for start-up. Starting torque is not a function of the consistency or the channeling properties of a grease. It appears to be a function of the individual properties of the grease and is difficult to measure. Experience alone will show whether one grease is better than another in this respect. Greases formulated with synthetic oils are available which provide very low starting and running torque at temperatures as low as -100° F (-73° C). Generally, a correctly selected grease provides lower torque than an oil.

### High temperature

In oil lubricated bearing applications where ambient temperatures are high, such as in ovens, some means of cooling is usually necessary to avoid excessive bearing temperatures and premature lubricant failure. Some of the commonly used methods for decreasing the oil temperature are cooling coils, water jackets, oil cooling tanks, cooling discs, and fans.

The rate of oxidation of lubricating fluids increases rapidly with temperature rise. As mentioned earlier, the rate of oxidation doubles for each 18° F (10° C) temperature rise above 140° F (60° C). Above 250° F (121° C), petroleum oils tend to oxidize rapidly and sometimes it becomes necessary to use special petroleum oils or synthetic oils to increase the service life of the lubricant.

Where the only heat is that generated by the bearing, temperature rise can usually be held to a reasonable level by the use of a suitable lubricant in proper quantity.

The high temperature limit for greases, i.e. the maximum temperature at which a grease will provide a reasonable life in a non-relubricable bearing, is largely a function of the oxidation stability of the fluid and the thickener. The oxidation process is greatly accelerated with increasing temperature. Another factor is evaporation of the fluid phase. Also, greases thin out at high temperatures. If the grease consistency becomes too soft at operating temperatures there may be leakage from the bearing.

### High speeds

Small size anti-friction bearings are often successfully grease lubricated at high speeds. Larger sizes usually require oil to remove heat as well as to lubricate.

Where extensive cooling is required in high speed and heavily loaded bearings operating with high frictional heat, oil jets and circulating systems should be considered. For small and medium size bearings rotating at high speeds, an oil circulating system, drip feed or oil mist is satisfactory.

With other influences being equal, increasingly lower viscosities are needed with increasing speeds. The quantity of oil needed for successful operation becomes greater with increasing temperature, load, speed, and bearing size.

# Lubrication of anti-friction bearings

**Extreme pressures**

Various extreme pressure agents are compounded into some greases and oils. These include additives such as sulfur, phosphorus, and chlorine compounds, graphite, and molybdenum disulfide. However, such additives are generally not required in anti-friction bearing lubricants and should be avoided unless their use is dictated by other associated equipment such as gears.

For most applications, higher viscosity oils are required to prevent metal to metal contact if pressures are higher than normal or if shock loading occurs. In cases where heavily loaded bearings operate at high speeds, the selection of oil viscosity must be a compromise between a heavy oil which is desirable for heavy loading and a light oil which is desirable for high speeds.

**Wet conditions**

Whenever possible, an anti-friction bearing should be protected from water and moisture to avoid corrosion. Even slight corrosion on the internal surfaces may initiate bearing failure.

Ball and roller bearings are, however, often used successfully where moisture is present. The presence of moisture will affect the choice of a grease with the selection depending upon the quantity of moisture present.

Water soluble sodium base greases will form a non-corrosive emulsion when mixed with a limited quantity of water. However, agitation is necessary to form this emulsion. If water should enter an idle bearing, the bearing may become corroded. There is a limit to the amount of water which a water soluble grease can absorb and still protect the bearing surfaces.

A water resistant grease, such as a lithium base grease that contains an effective rust inhibitor should be used where large amounts of water are present. The term "water resistant grease" is actually a misnomer since no grease will totally resist large amounts of water for extended periods.

Slow moving bearings can be packed full of a cohesive, water resistant grease formulated with a very heavy oil to afford maximum protection against large amounts of water. Where wet conditions are so severe that satisfactory protection cannot be provided by a lubricant, it is sometimes necessary to use bearings fabricated of special corrosion resistant alloys or bearings with corrosion resistant coatings.

**Fretting**

Anti-friction bearings are sometimes damaged by a wear effect that is variously called fretting corrosion, fretting, friction oxidation and false brinneling. This effect evidences itself by the formation of rust-like wear debris and the formation of wear spots.

Fretting can occur in bearings subjected to vibration, vibratory loads, or oscillation of small amplitudes. It is sometimes seen in the bearings of idle machinery that has been subjected to the vibrations of nearby machines. The wear spots can be recognized as depressions or indentations in the races at the points where they have been in contact with the balls or rolls. If allowed to progress, the wear in these contact areas will become so extensive as to prevent functioning of the bearings.

Fretting can be eliminated or minimized by the selection of a lubricant which has good feed ability. Low viscosity oils minimize fretting to a greater extent than oils of higher viscosities.

With grease lubrication in applications where fretting is a problem, it is good general practice to use a soft grease such as an NLGI no. 0 or 1 grade, or a harder grease, which tends to soften considerably upon working.

**Dust and dirt**

A high percentage of ball and roller bearing troubles can be attributed to foreign matter entering the bearing after mounting. Because anti-friction bearings are highly sensitive to dust and dirt, elaborate protective devices are necessary in some applications.

Oil lubricated bearings are generally protected from foreign particle contamination by the use of oil filters and the properly designed seals required in oil lubricated systems.

Grease in sealed and shielded bearings can provide an effective barrier against dust and dirt. Where the bearings operate in a dusty or dirty atmosphere, the grease should be chosen with its sealing properties in mind. Such a product should have good resistance to structural breakdown on working. Usually, the stiff consistency of an NLGI grade 3 grease will provide a good sealing barrier.

**Operating temperature range**

The temperature range over which a grease can be used depends on the type of base oil and thickener used as well as the additives. The lower temperature limit; i.e., the lowest temperature at which the grease will allow the bearing to be started up without difficulty, is determined by the base oil and its viscosity. The upper temperature limit is governed mainly by the type of thickener and indicates the maximum temperature at which the grease will provide lubrication for a bearing. It should be remembered that a grease will age (deteriorate) and oxidize with increasing rapidity as the temperature increases and that oxidation products have a detrimental effect on lubrication. The upper temperature limit should not be confused with the grease dropping point quoted by lubricant manufacturers as this value only indicates the temperature at which the grease loses its consistency and becomes fluid.

The following table gives the operating temperature ranges for the types of grease normally used for rolling bearing lubrication. The values are based on extensive testing and are valid for commonly available greases having a mineral oil base and no EP (extreme pressure) additives.

# Lubrication of anti-friction bearings

**Operating temperature ranges for mineral oil-based greases**

| Grease type recommended operating temperature range (thickener) | °C | | | °F | | |
|---|---|---|---|---|---|---|
| Lithium base | -30 | to | 110 | -22 | to | 230 |
| Lithium complex | -20 | | 140 | -4 | | 284 |
| Sodium base | -30 | | 80 | -22 | | 176 |
| Sodium complex | -20 | | 140 | -4 | | 284 |
| Calcium base | -10 | | 60 | 14 | | 140 |
| Calcium complex | -20 | | 130 | -4 | | 266 |
| Barium complex | -20 | | 130 | -4 | | 266 |
| Aluminum complex | -30 | | 110 | -22 | | 230 |
| Inorganic thickeners (bentonite, silica gel, etc.) | -30 | | 130 | -22 | | 266 |
| Polyurea | -30 | | 140 | -22 | | 284 |

Greases based on synthetic oils; e.g., ester oils, synthetic hydrocarbons or silicone oils, may be used at temperatures above and below the operating temperature range of mineral oil-based greases. If grease-lubricated bearings are to operate at such temperatures, MRC Bearings Applications Engineering should be contacted for advice.

## Grease relubrication

In order for a bearing to be properly lubricated with grease, oil must bleed from the grease. The oil that is picked up by the bearing components is gradually broken down by oxidation or lost by evaporation, centrifugal force, etc. In time, the grease will oxidize or the oil in the grease near the bearing will be depleted. Therefore, depending upon the life requirement for the bearing, relubrication may be necessary. There are two critical factors to proper relubrication: the quantity of grease supplied and the frequency at which it is supplied.

If the service life of the grease is shorter than the expected service life of the bearing, the bearing has to be relubricated. Relubrication should occur when the condition of the existing lubricant is still satisfactory. The relubrication interval depends on many related factors. These include bearing type and size, speed, operating temperature, grease type, space around the bearing, and the bearing environment. The relubrication charts and information provided are based on statistical rules. The relubrication intervals are defined as the time period, at the end of which 99% of the bearings are still reliably lubricated. This represents the $L_1$ grease life.

**Bearings with integral seals and shields**

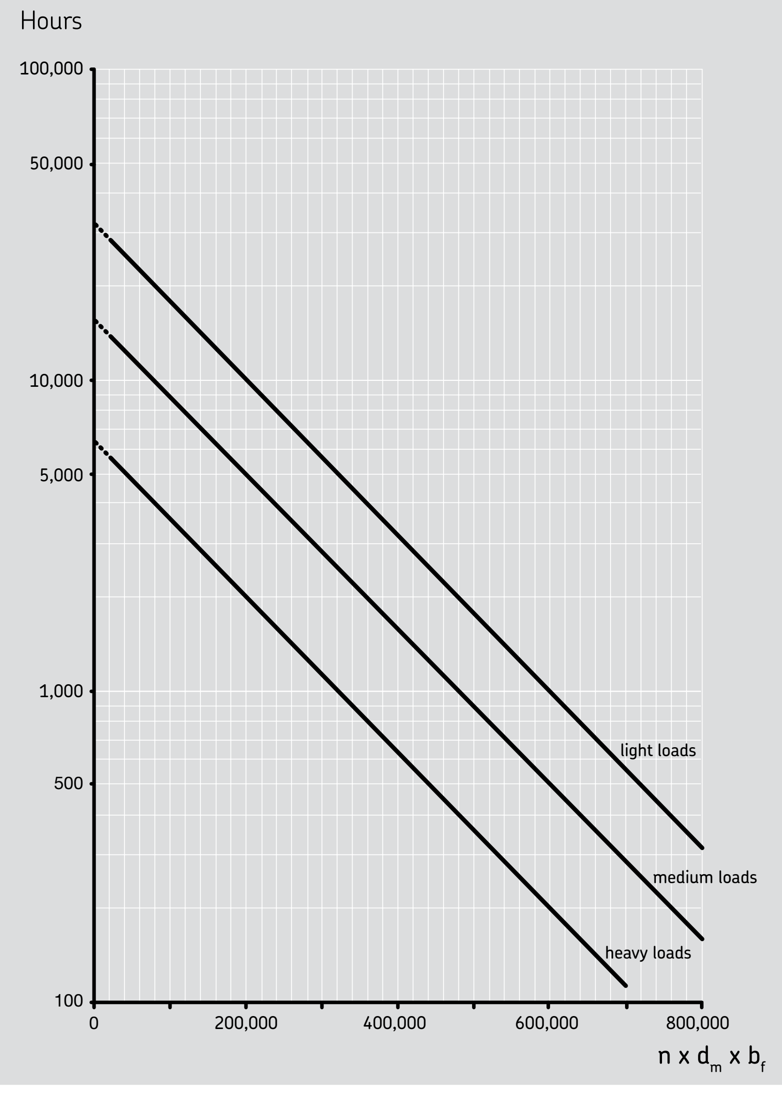
The information and recommendations to follow relate to bearings without integral seals or shields. Bearings and bearing units with integral seals and shields on both sides are typically already supplied with grease from the manufacturer. Bearings with integral seals and shields are very difficult to re-grease. Therefore, when estimating the service life of sealed or shielded bearings, consideration needs to be given to bearing fatigue life and grease life. The service life of a bearing with integral seals or shields is determined by the shorter of the two lives. For information about the grease life of a bearing with integral seals or shields, MRC Bearings Applications Engineering should be contacted.

## Relubrication intervals

The relubrication intervals $t_f$ for bearings with rotating inner ring on horizontal shafts under normal and clean conditions can be obtained from Figure 5 as a function of:

- the bearing rotational speed (n), rpm
- the bearing pitch diameter ($d_m$)
  $d_m$ = [bearing bore (mm) + bearing OD (mm)]/2
- the relevant bearing factor, $b_f$, depending on bearing type and load conditions, (see table on page 290)
- the load ratio (dynamic capacity/applied resultant load), C/P

**Figure 5 - Relubrication intervals at 158° F (70° C)**



# Lubrication of anti-friction bearings

The relubrication interval $t_f$ is an estimated value based on an operating temperature of 70° C (158° F), using good quality lithium thickener/mineral oil greases. When bearing operating conditions differ, adjust the relubrication intervals obtained from Figure 5, according to the information given under “Relubrication interval adjustments”, below.

If the $n \times d_m$ exceeds 70% of the recommended limit according to the table below or if ambient temperatures are high, then extra consideration should be given to the lubrication methods. When using high performance greases, a longer relubrication interval can be achieved. MRC Bearings Applications Engineering should be consulted in these instances.

## Relubrication interval adjustments

### Operating temperature

Since grease aging is accelerated with increasing temperature, it is recommended to halve the intervals obtained from Figure 5 for every 27° F (15° C) increase in operating temperature above 158° F (70° C). The alternate also applies for lower temperatures. The relubrication interval $t_f$ may be extended at temperatures below 158° F (70° C) if the temperature is not so low as to prevent the grease from bleeding oil. In the case of full complement bearings and thrust roller bearings, $t_f$ values obtained from Figure 5 should not be extended. It is also not advisable to use relubrication intervals in excess of 30,000 hours.

In general, specialty greases are required for bearing temperatures in excess of 210° F (100° C). In addition, the material limitations of the bearing components should also be taken into consideration such as the cage, seals, and the temperature stability of the bearing steel.

### Vertical shaft

For bearings on vertical shafts, the intervals obtained from Figure 5 should be halved. A good seal or retaining shield below the bearing is required to prevent the grease from exiting the bearing cavity. As a reminder, NLGI no. 3 greases help reduce the amount of grease leakage and churning that occurs in vertical shaft applications.

### Vibration

Moderate vibration should not have a negative effect on grease life. But high vibration and shock levels, such as those in vibrating screen applications, can cause the grease to “slump” more quickly, resulting in churning. In these cases the relubrication interval should be reduced. If the grease becomes too soft, grease with a better mechanical stability or grease with higher stiffness up to NLGI no. 3 should be used.

### Outer ring rotation

In applications where the outer ring rotates or where there is an eccentric shaft weight, the speed factor $n \times d_m$ is calculated differently: in this case use the bearing outside diameter D instead of $d_m$. The use of a good sealing mechanism is also required to avoid grease loss.

Under conditions of high outer ring speeds (i.e. > 40% of the bearing reference speed), greases with reduced bleed rates should be selected. For spherical roller thrust bearings with a rotating housing washer, oil lubrication is recommended.

### Contamination

When considering contamination, grease aging isn’t as much an issue as the detrimental effects of the contaminants to the bearing surfaces. Therefore, more frequent relubrication than indicated by the relubrication interval will reduce the negative effects of foreign particles on the grease while reducing the damaging effects caused by over-rolling the particles. Fluid contaminants (water, process fluids, etc.) also call for a reduced interval. In case of severe contamination, continuous relubrication should be considered.

Since there are no formulas to determine the frequency of relubrication because of contamination, experience is the best indicator of how often to relubricate. It is generally accepted that the more frequent the relubrication the better. However, care should be taken to avoid overgreasing a bearing in an attempt to flush out contaminated grease. Using less grease on a more frequent basis rather than the full amount of grease each time is recommended. Excessive regreasing without the ability to purge will cause higher operating temperatures because of churning. The grease amount required for relubrication is discussed later in this section.

### Very low speeds

Bearings that operate at very low speeds under light loads call for a grease with low consistency while bearings that operate at low speeds and heavy loads require a grease having a high viscosity, and if possible, good EP characteristics. Selecting the proper grease and grease fill is important in low speed applications. In some cases, 100% fills may be appropriate. In general, grease aging is not an issue for very low speed applications when bearing temperatures are less than 158° F (70° C), so relubrication is rarely needed unless contamination is an issue.

### High speeds

Relubrication intervals for bearings used at high speeds, i.e. above the speed factor $n \times d_m$ in the table to the left, only apply when using special greases or special bearings, e.g. hybrid bearings. In these cases continuous relubrication techniques such as circulating oil, oil-spot, etc. are more suitable than grease lubrication.

### Very heavy loads

For bearings operating at a speed factor $n \times d_m > 20{,}000$ and with a load ratio $C/P < 4$, the relubrication interval should be reduced. Under these very heavy load conditions, continuous grease relubrication or oil bath lubrication is recommended.

In applications where the speed factor $n \times d_m < 20{,}000$ and the load ratio $C/P = 1\text{–}2$, see information under “Very low speeds”, above. For heavy loads and high speeds, circulating oil lubrication with cooling is generally recommended.

**Bearing factors and recommended limits for $n \times d_m$**

| Bearing type[1] | Bearing factor $b_f$ | Recommended limits for $n \times d_m$ | | |
|---|---|---|---|---|
| | | light load | medium load | heavy load |
| Deep groove ball bearings | 1 | 500,000 | 400,000 | 300,000 |
| Angular contact ball bearings | 1 | 500,000 | 400,000 | 300,000 |
| Self-aligning ball bearings | 1 | 500,000 | 400,000 | 300,000 |

1) The bearing factors and recommended practical $n \times d_m$ limits apply to bearings with standard internal geometry and standard cage execution.

**Very light loads**

In many cases the relubrication interval may be extended if the loads are light (C/P = 30 to 50). Be aware that bearings do have minimum load requirements for satisfactory operation.

**Misalignment**

A constant misalignment within the permissible limits of the bearing does not adversely affect the grease life in self-aligning type bearings. However, misalignment in other bearing types will typically generate higher operating temperatures and require more frequent relubrication. Reference "Operating temperature" (page 274).

**Very short intervals**

If the determined value for the relubrication interval $t_f$ is too short for a particular application, it is recommended to:

- check the bearing operating temperature
- check whether the grease is contaminated by solid particles or fluids
- check the bearing application conditions such as load or misalignment
- consider a more suitable grease

**Relubrication quantity**

The amount of grease needed for relubrication can be obtained from:

$Gp = 0.005\ D\ B$

where

$Gp$ = grease quantity, g

$D$ = bearing outside diameter, mm

$B$ = total bearing width, mm

When operating conditions are such that relubrication can be carried out at infrequent intervals, it is sufficient if the bearing housing is accessible and can be opened easily. The cap of split housings and the cover of one-piece housings can usually be taken off to expose the bearing. After removing the used grease, fresh grease should first be packed between the rolling elements.

Where more frequent relubrication is required, provision should be made for regreasing; preferably a grease nipple should be fitted to the housing. A grease gun (lubricator) can then be used. To ensure that fresh grease actually reaches the bearing and replaces the old grease, the lubrication duct in the housing should either feed the grease adjacent to the outer ring side face, or, better still, into the bearing.

After a number of such relubrications the housing should be opened and the used grease removed before fresh grease is added.

**Relubrication intervals—oil**

The frequency at which the oil must be changed is mainly dependent on the operating conditions and on the quantity of oil used.

Where oil bath lubrication is employed it is normally sufficient to change the oil once a year, provided the bearing temperature does not exceed 50° C (120° F) and there is no contamination. Higher temperatures or more arduous running conditions necessitate more frequent changes, e.g. at a temperature of 100° C (220° F) the oil should be changed every 3 months.

For circulating oil systems the period between complete oil changes is dependent on how often the oil is circulated over a given period of time and whether it is cooled, etc. The most suitable period can generally only be determined by trial runs and frequent examination of the oil. The same practice also applies to oil jet lubrication.

In oil mist lubrication, most of the oil is lost, as it is conveyed to the bearing only once.

## Bearing cleaning

New bearings should be cleaned only if they have been exposed to dirt after removal from their package or lubricated with an oil or grease that is incompatible with the preservative. (See "Compatibility and storage", page 293). Bearings which have been in service and require cleaning due to accumulated dirt or deteriorated lubricant may be cleaned as follows: all cleaning operations should be done in a dirt free area and only clean solvents of good quality should be used. Light transformer oils, spindle oils, or automotive flushing oils are suitable for cleaning bearings but oils heavier than SAE 10 motor oils are not recommended. The use of chlorinated solvents of any kind is not recommended in bearing cleaning operations because of the rust hazard involved. The use of compressed air for blowing dirt out of bearings and drying solvents is not recommended unless the air system is filtered to remove moisture and dirt. Bearings should never be spun at high speed by a stream of compressed air during cleaning as this may cause damage to the balls and raceways.

**Cleaning unmounted used bearings**

Place bearings in a wire or mesh basket and suspend the basket in a suitable container of clean petroleum solvent or kerosene. Allow them to soak, preferably overnight or longer, until all hard deposits have softened. Bearings which contain badly oxidized grease may require soaking in hot, light oil (200° F to 240° F) to soften the deposits. The basket should be agitated slowly through the oil from time to time. After deposits have softened, the bearings should be immersed in solvent for cleaning. In extreme cases, boiling in emulsified cleaners (i.e. grinding, cutting, or floor cleaning compounds) may be more effective to soften hard deposits. A stiff brush may be used to dislodge solid particles. If hot emulsion solutions have been used, it is important that all entrapped water be removed from the bearings. This may be accomplished by draining and slowly rotating the individual bearings while hot until the water has been completely evaporated.

A more preferable method of removing entrapped water after draining is to spin the bearings in a water displacing type rust preventive oil. After removing the water, the bearings should immediately be immersed in clean petroleum solvent for further cleaning. After the used bearings have been thoroughly cleaned, their condition may be judged by hand. A light hand thrust should be applied against one bearing ring while slowly rotating the other ring. The degree of smoothness felt in rotation will indicate whether the bearing is satisfactory for further service. Bearings which are satisfactory for further service should be immediately rotated in light oil to displace the solvent. Those which will not be installed immediately should be coated with a good rust preventive oil and wrapped in clean oil-proof paper.

# Lubrication of anti-friction bearings

**Cleaning mounted used bearings**

For cleaning bearings without removing them from their mounted assembly, hot, light oil at 180° F (82° C) may be flushed through the housing while the shaft or spindle is slowly rotated. In cases of badly oxidized grease and oil, hot water emulsions can be used in place of flushing oil. The solution should be drained thoroughly and the housing flushed with hot, light oil. The shaft should be rotated slowly throughout these operations.

In some cases where deposits are extremely difficult to remove, an intermediate flushing with a mixture of alcohol and light petroleum solvent, after the emulsion treatment, may be helpful. The flushing oil should be drained completely and oil passages checked to make sure they are not clogged before adding new lubricant.

If the bearing is lubricated with grease, new grease may be forced through the bearing to purge the old grease and contaminates. This may be done, however, only if contamination is not severe and vent openings are provided in the housing for exhausting the old grease. After purging with grease, the bearings should be operated for about ten minutes before the vent plugs are replaced to avoid serious overheating of the bearing due to churning of excess grease.

**Cleaning sealed or shielded used bearings**

Bearings which have non-removable double shields or seals cannot be cleaned. These bearings are normally inspected and reused or rejected on the basis of smoothness and looseness.

Bearings having one seal or one shield may be cleaned satisfactorily by the methods outlined here. Bearings having two shields that are held in place by snap rings can be cleaned and regreased by carefully removing the shields and reinstalling them.

Bearings having two removable rubber seals can be cleaned and regreased if care is exercised in removing and reinstalling the seals. The best procedure for removing the seal is to insert a thin, knife-like blade between the O.D. of the seal and the seal groove in the outer ring, then slowly work around the periphery of the seal, working the seal from the groove. It is important to work around the periphery rather than exert too much pressure at one point, which may damage the seal. Usually the seal can be removed without damage.

## Things you should know about lubrication

MRC bearings that have seals or shields are generally lubricated for the life of the bearing. Bearings that do not have seals or shields are protected from corrosion by coating the bearing with a preservative. The preservative is compatible with petroleum base oils and lubricants. It is not necessary to remove the preservative from the bearing surfaces when the bearing will be lubricated with either a petroleum base oil or grease.

It is possible that either synthetic oil or greases compounded with synthetic oils, will not be compatible with a petroleum base preservative. It is recommended that the preservative be removed from the bearing surfaces before lubricating with either of these products. Synthetic hydrocarbons are an exception. It is also possible that greases compounded with a polyurea thickener may cause excessive grease softening due to incompatibility with a petroleum base preservative.

Synthetic oils and greases compounded with synthetic oils are classified as special condition lubricants. They are usually not the best choice for operating conditions that fall within the capability of petroleum base lubricants. They are expensive and lack some of the desirable lubricating qualities of petroleum base lubricants. Synthetic hydrocarbon may be an exception.

Because machined phenolic or metal separators occupy a considerable amount of the space between the bore of the outer ring and the O.D. of the inner ring in a bearing, special care must be exercised when introducing grease into these bearings to ensure that it is uniformly distributed in the bearing. Operation of the bearing will eventually uniformly distribute the grease, but it is possible to initiate a heating-type failure or to cause damage to the active surfaces in the bearing before this occurs. This precaution is especially important when there is a close running clearance between the separator and one of the rings. One method of introducing grease between the rings and the separator is to use a plastic bag. If grease is sealed in a plastic bag and a small opening is cut across one of the corners, the bag can be inserted between the separator and either ring. Grease can then be forced into the bearing by squeezing it from the bag.

In applications where either water or air is used to dissipate heat from the bearing cavity, care must be exercised not to create a significant temperature differential between the bearing inner ring and outer ring. Some cooling methods, i.e. water jacketed housings, very efficiently dissipate heat from the housing and outer ring of the bearing, but have little effect on the shaft and bearing inner ring. Under these conditions, internal clearance in the bearing is removed as the result of thermal expansion of the inner ring and thermal contraction of the outer ring. The loss of internal clearance can result in premature bearing failures due to a significant increase in ball and race stresses, and also due to excessive heat generation. One way to avoid this problem is to circulate and cool the oil.

# Lubrication of anti-friction bearings

## Compatibility and storage

It is important when relubricating bearings, not to mix different types of greases or oils. Mixing greases often causes the mixture to become either softer or stiffer. Incompatibility results when the mixture is too soft or too stiff to effectively lubricate the bearing. The mixing of the same type of grease or oil from two different manufacturers can also cause a performance loss unless the manufacturers use the same additives.

There are several environmental considerations when selecting an area for storing bearings. The shelf life of the grease or preservative can be significantly shortened if bearings are stored in an unsatisfactory environment. Because both temperature and humidity accelerate the deterioration of either grease or a preservative, bearings should be stored at a temperature not greater than 80° F (27° C) and at a humidity not exceeding 55%. It is also desirable to select an area where there is not a great fluctuation in temperature that might produce condensation. Also, in order to reduce the likelihood of bearings being held in storage for excessively long periods of time, bearing stocks should be rotated to make certain that the oldest bearings in stock are used first.

## Lubrication methods

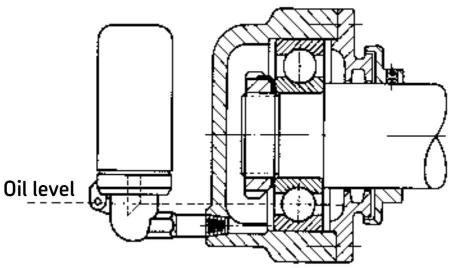



**Figure 6**

**Oil bath lubrication**

A simple oil bath method is satisfactory for low and moderate speeds. The static oil level should not exceed the center line of the lowermost ball or roller. A greater amount of oil can cause churning which results in abnormally high operating temperatures. Systems of this type generally employ sight gauges to facilitate inspection of the oil level.

Figure 6 shows a constant level arrangement for maintaining the correct oil level.

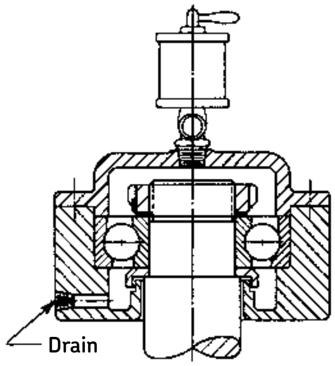



**Figure 7**

**Drip feed lubrication**

This system is widely used for small and medium ball and roller bearings operating at moderate to high speeds where extensive cooling is not required. The oil, introduced through a filter-type, sight feed oiler, has a controllable flow rate which is determined by the operating temperature of the bearings.

Figure 7 illustrates a typical design and shows the preferred location of the oiler with respect to the bearings.

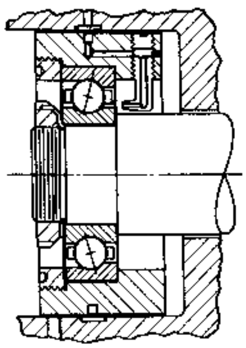


**Figure 8**

**Forced feed circulation**

This type of system uses a circulating pump and is particularly suitable for low to moderate speed, heavily loaded applications where the oil has a major function as a coolant in addition to lubrication. If necessary, the oil can be passed through a heat exchanger before returning to the bearing. Entry and exit of the oil should be on opposite sides of the bearing. An adequate drainage system must be provided to prevent an excess accumulation of oil. Oil filters and magnetic drain plugs should be used to minimize contamination.

In applications of large, heavily loaded, high speed bearings operating at high temperatures, it may be necessary to use high velocity oil jets. In such cases the use of several jets on both sides of the bearing provides more uniform cooling and minimizes the danger of complete lubrication loss from plugging. The jet stream should be directed at the opening between the cage bore and inner ring O.D., see Figure 8. Adequate scavenging drains must be provided to prevent churning of excess oil after the oil has passed through the bearing. In special cases, scavenging may be required on both sides of the bearing.

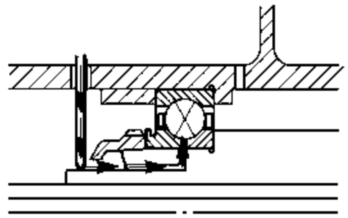


**Figure 9**

At extremely high speeds, the bearing tends to reject the entry of sufficient oil to provide adequate cooling and lubrication with conventional oil jet and flood systems. Figure 9 shows an under-race lubrication system with a 9000 series bearing having a split inner ring with oil slots. This method insures positive entrance of oil into the bearing to provide lubrication and cooling of the inner ring.

# Lubrication of anti-friction bearings

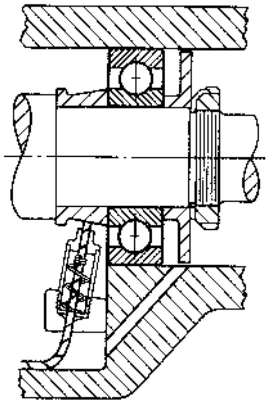


Figure 10

### Wick feed lubrication

Wick oilers function either by gravity or capillary action to transfer a small quantity of filtered oil from a reservoir to the bearing. Wick feed is satisfactory for high speed operation with no danger of excessive oil churning. Attention must be given to wicks to assure that they are not clogged and they must be replaced occasionally.

Figure 10 shows an arrangement whereby the wick conveys oil by capillary action to a rotating flinger where it is thrown off by centrifugal force and drains back through the bearing.

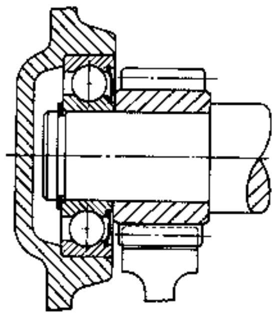


Figure 11

### Oil splash lubrication

This method of lubrication is used mainly in gear boxes where the gear oil splash is used to lubricate the bearings.

In applications where the oil splash is heavy, shielded bearings are sometimes used to reduce the amount of oil reaching the bearing to prevent heating from excessive churning. See Figure 11.

In applications where normal splash does not provide adequate lubrication, oil feeder trails should be designed into the gear case to direct oil into the bearings.

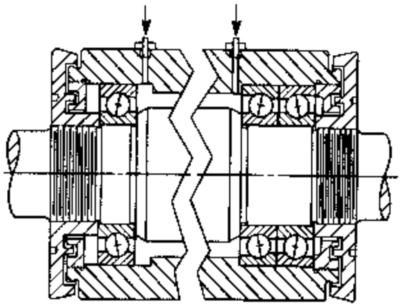


Figure 12

### Oil mist lubrication

Oil mist systems, see Figure 12, are usually reserved for high speed applications. In mist lubrication systems, the oil is atomized and transported in an airstream through tubing to the bearings. Bearings are constantly fed with an optimum quantity of oil thus minimizing bearing heating due to oil churning. While not as effective as flood lubrication for heat removal, mist lubrication does provide some cooling from the continuous forced circulation of air. A rule of thumb on the use of oil mist is obtained from the formula:

$K < 10^9$

where

$K = DNL$

$D$ = bearing bore in mm

$N$ = inner ring speed rpm

$L$ = load in pounds.

Systems can be designed so that a positive pressure is maintained within the housing thereby preventing the entrance of contaminates.

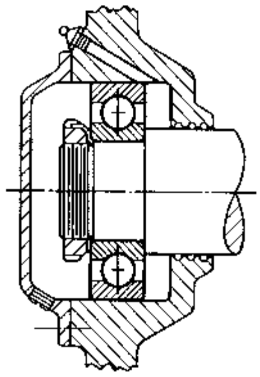


Figure 13

### Regreaseable mounting

Recommended for moderate speeds and loads. Where prelubricated sealed bearings are not suitable for some reason, consideration must be given to use of an open type bearing with provision for relubrication. The grease plug at the bottom should be removed while the grease is being inserted through the fitting at the top. The direction of flow tends to remove the old grease.

# Lubrication of anti-friction bearings

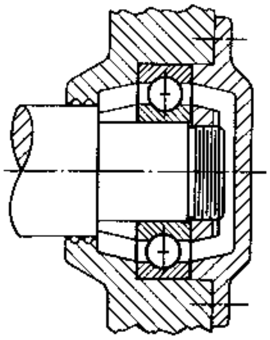


Figure 14

### High temperature grease mounting

The life of permanently lubricated installations at high temperatures is a function of the volume of grease present and the design of the mounting. Note that ample grease space has been provided and that the configuration of parts adjacent to the bearing is such as to urge the lubricant into contact with the active bearing parts.

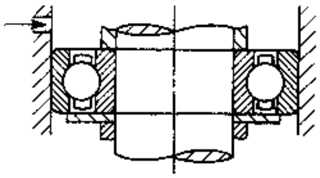


Figure 15

### Deep groove ball bearings on vertical shaft

In vertical applications where grease is admitted above the bearing, the bearing should be provided with a shield on the lower side, or a separate plate, as shown in Figure 15, to retain the grease.

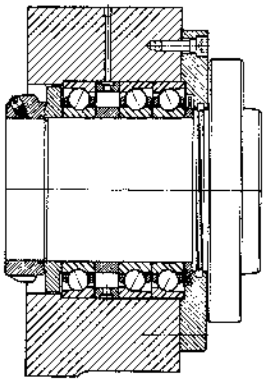


Figure 16

### Grease lubrication for duplex arrangements

For duplex mountings it is important that all bearings in the set receive an adequate supply of grease. Typical arrangements to accomplish this are shown above. In Figure 16, the spacer between the outer rings is provided with a circumferential groove and radial holes so that grease applied through the grease fitting and hole in the housing is directed between the bearings.

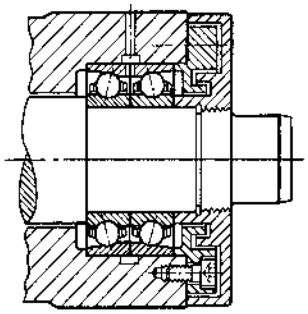


Figure 17

In Figure 17, the bearing outer rings are slotted on the mating faces while the housing has a circumferential groove, grease fitting and hole, thus allowing grease to be applied to both bearings.

# Bearing vibration data

## Bearing frequency data

Vibration monitoring is becoming an important tool in preventive maintenance of equipment. Vibration monitoring can detect abnormalities in equipment components and indicate their replacement before a catastrophic failure occurs. This reduces expensive unplanned breakdown and loss of production.

To assist you in this monitoring, the following pages include frequency data for many of our popular bearing sizes. The bearing suffix code, which is printed on the bearing carton, identifies particular design features of the bearing. Although a change in suffix code for a bearing size normally causes little or no change in the frequency data for that bearing, if you are unable to match your suffix code to one in the chart and your application is sensitive, please call MRC Engineering for exact values.

The frequency data in the following pages is supplied based on a speed of one rpm. To obtain the frequency at your shaft or housing speed, simply multiply the number given in the table by your speed.

Example:
What is the inner ring ball pass frequency for a 100KR with inner ring rotation of 1,000 rpm?

Inner ring frequency at 1 rpm =
5.0159 cycles/min. (CPM) (from the following tables)
Inner ring frequency at 1,000 rpm = 5.0159 CPM × 1000
Inner ring frequency at 1,000 rpm = 5015.9 CPM

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| | | Inner rotation | Outer rotation | Inner or outer ring rotation | | Inner rotation | Outer rotation |
|---|---|---|---|---|---|---|---|
| Bearing size | Suffix | Cage speed frequency (rpm) | Cage speed frequency (rpm) | Inner ring frequency | Outer ring frequency | Rolling element frequency | Rolling element frequency |
| **100KR** | 0012 | 0.3730 | 0.6270 | 5.0159 | 2.9841 | 3.5324 | 3.5324 |
| **100KS** | H501 | 0.3677 | 0.6323 | 4.4260 | 2.5740 | 3.5152 | 3.5152 |
| **101KR** | XXXX | 0.3865 | 0.6135 | 5.5216 | 3.4784 | 3.9830 | 3.9830 |
| **101KS** | H501 | 0.3809 | 0.6191 | 4.9525 | 3.0475 | 3.9613 | 3.9613 |
| **102KR** | H102 | 0.4034 | 0.5966 | 5.9660 | 4.0340 | 4.7502 | 4.7502 |
| **102KS** | H501 | 0.3987 | 0.6013 | 5.4120 | 3.5880 | 4.7317 | 4.7317 |
| **102S** | XXXX | 0.3918 | 0.6082 | 4.8660 | 3.1340 | 4.4027 | 4.4027 |
| **103KR** | H102 | 0.3974 | 0.6026 | 6.6286 | 4.3714 | 4.4812 | 4.4812 |
| **103KS** | H501 | 0.4084 | 0.5916 | 5.9159 | 4.0841 | 5.2760 | 5.2760 |
| **103S** | XXXX | 0.3735 | 0.6265 | 4.3852 | 2.6148 | 3.7011 | 3.7011 |
| **104KR** | H101 | 0.4017 | 0.5983 | 6.5815 | 4.4185 | 4.6932 | 4.6932 |
| **104KS** | H501 | 0.3976 | 0.6024 | 5.4218 | 3.5782 | 4.6772 | 4.6772 |
| **104S** | XXXX | 0.3976 | 0.6024 | 5.4218 | 3.5782 | 4.6772 | 4.6772 |
| **105KR** | 0013 | 0.4153 | 0.5847 | 7.6006 | 5.3994 | 5.5070 | 5.5070 |
| **105KS** | H501 | 0.4063 | 0.5937 | 5.9369 | 4.0631 | 5.1492 | 5.1492 |
| **105S** | 0005 | 0.4077 | 0.5923 | 5.3309 | 3.6691 | 5.2309 | 5.2309 |
| **106KR** | 0015 | 0.4189 | 0.5811 | 8.1350 | 5.8650 | 5.7921 | 5.7921 |
| **106KS** | H501 | 0.4159 | 0.5841 | 6.4246 | 4.5754 | 5.7803 | 5.7803 |
| **106S** | H502 | 0.4137 | 0.5863 | 5.8628 | 4.1372 | 5.6226 | 5.6226 |
| **107KR** | 0017 | 0.4213 | 0.5787 | 8.1020 | 5.8980 | 5.9590 | 5.9590 |
| **107KS** | H502 | 0.4182 | 0.5818 | 6.4001 | 4.5999 | 5.9467 | 5.9467 |
| **107S** | XXXX | 0.4286 | 0.5714 | 6.8571 | 5.1429 | 6.8571 | 6.8571 |
| **108KR** | 0011 | 0.4293 | 0.5707 | 8.5605 | 6.4395 | 6.6672 | 6.6672 |
| **108KS** | H501 | 0.4118 | 0.5882 | 5.8819 | 4.1181 | 5.4929 | 5.4929 |
| **108S** | 0C01 | 0.4339 | 0.5661 | 7.3599 | 5.6401 | 7.4267 | 7.4267 |
| **109KR** | 0008 | 0.4297 | 0.5703 | 9.1245 | 6.8755 | 6.7074 | 6.7074 |
| **109KS** | 0012 | 0.4203 | 0.5797 | 6.9559 | 5.0441 | 6.1172 | 6.1172 |
| **109S** | XXXX | 0.4398 | 0.5602 | 8.9638 | 7.0362 | 8.1797 | 8.1797 |
| **110KR** | 0022 | 0.4351 | 0.5649 | 9.6026 | 7.3974 | 7.2900 | 7.2900 |
| **110KS** | 0020 | 0.4267 | 0.5733 | 7.4525 | 5.5475 | 6.6777 | 6.6777 |
| **110M** | 0C01 | 0.4451 | 0.5549 | 10.5440 | 8.4560 | 8.9899 | 8.9899 |
| **110S** | XXXX | 0.4442 | 0.5558 | 8.8929 | 7.1071 | 8.8484 | 8.8484 |
| **111KR** | 0011 | 0.4317 | 0.5683 | 9.6615 | 7.3385 | 6.8942 | 6.8942 |
| **111KS** | 0020 | 0.4288 | 0.5712 | 7.4252 | 5.5748 | 6.8830 | 6.8830 |
| **111S** | XXXX | 0.4431 | 0.5569 | 8.9107 | 7.0893 | 8.6703 | 8.6703 |
| **112KR** | 0011 | 0.4361 | 0.5639 | 10.1505 | 7.8495 | 7.3870 | 7.3870 |
| **112KS** | 0017 | 0.4283 | 0.5717 | 7.4320 | 5.5680 | 6.8308 | 6.8308 |
| **112S** | XXXX | 0.4444 | 0.5556 | 8.8889 | 7.1111 | 8.8889 | 8.8889 |
| **113KR** | 0011 | 0.4400 | 0.5600 | 10.6408 | 8.3592 | 7.8791 | 7.8791 |
| **113KS** | 0015 | 0.4327 | 0.5673 | 7.9429 | 6.0571 | 7.2895 | 7.2895 |
| **113M** | XXXX | 0.4427 | 0.5573 | 11.7040 | 9.2960 | 8.6065 | 8.6065 |
| **113S** | XXXX | 0.4444 | 0.5556 | 8.8889 | 7.1111 | 8.8889 | 8.8889 |
| **114KR** | 0013 | 0.4409 | 0.5591 | 11.1818 | 8.8182 | 7.9858 | 7.9858 |
| **114KS** | 0016 | 0.4294 | 0.5706 | 7.4172 | 5.5828 | 6.9455 | 6.9455 |
| **114S** | XXXX | 0.4464 | 0.5536 | 8.8576 | 7.1424 | 9.2209 | 9.2209 |
| **115KR** | 0020 | 0.4440 | 0.5560 | 11.6756 | 9.3244 | 8.4419 | 8.4419 |
| **115KS** | 0020 | 0.4332 | 0.5668 | 7.9358 | 6.0642 | 7.3467 | 7.3467 |
| **115S** | XXXX | 0.4380 | 0.5620 | 7.8673 | 6.1327 | 7.9471 | 7.9471 |
| **116KR** | 0004 | 0.4404 | 0.5596 | 11.7522 | 9.2478 | 7.9562 | 7.9562 |
| **116KS** | 0007 | 0.4303 | 0.5697 | 7.4060 | 5.5940 | 7.0348 | 7.0348 |
| **116S** | 0006 | 0.4419 | 0.5581 | 8.3721 | 6.6279 | 8.4837 | 8.4837 |
| **117KR** | XXXX | 0.4435 | 0.5565 | 12.2427 | 9.7573 | 8.3566 | 8.3566 |
| **117KS** | 0009 | 0.4335 | 0.5665 | 7.9303 | 6.0697 | 7.3912 | 7.3912 |
| **117M** | XXXX | 0.4379 | 0.5621 | 11.8045 | 9.1955 | 7.9248 | 7.9248 |
| **117S** | XXXX | 0.4379 | 0.5621 | 7.8697 | 6.1303 | 7.9248 | 7.9248 |
| **118KR** | 0006 | 0.4403 | 0.5597 | 11.7588 | 9.2462 | 7.9243 | 7.9243 |
| **118KS** | 0010 | 0.4310 | 0.5690 | 7.3973 | 5.6027 | 7.1061 | 7.1061 |
| **118S** | XXXX | 0.4405 | 0.5595 | 7.8334 | 6.1666 | 8.2799 | 8.2799 |
| **119KR** | XXXX | 0.4362 | 0.5638 | 11.2766 | 8.7234 | 7.4360 | 7.4360 |
| **119KS** | XXXX | 0.4372 | 0.5628 | 8.4425 | 6.5575 | 7.8319 | 7.8319 |
| **119S** | XXXX | 0.4378 | 0.5622 | 7.8704 | 6.1296 | 7.9182 | 7.9182 |
| **120KR** | XXXX | 0.4451 | 0.5549 | 12.7633 | 10.2367 | 8.6434 | 8.6434 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation | Outer rotation | Inner or outer ring rotation | | Inner rotation | Outer rotation |
|---|---|---|---|---|---|---|---|
| | | Cage speed frequency (rpm) | Cage speed frequency (rpm) | Inner ring frequency | Outer ring frequency | Rolling element frequency | Rolling element frequency |
| 120KS | H502 | 0.4365 | 0.5635 | 7.8890 | 6.1110 | 7.7471 | 7.7471 |
| 120M | XXXX | 0.4194 | 0.5806 | 10.4509 | 7.5491 | 6.0419 | 6.0419 |
| 120R | 0011 | 0.4347 | 0.5653 | 11.3056 | 8.6944 | 7.2895 | 7.2895 |
| 121KR | XXXX | 0.4425 | 0.5575 | 12.2652 | 9.7348 | 8.2361 | 8.2361 |
| 121KS | XXXX | 0.4371 | 0.5629 | 8.4434 | 6.5566 | 7.8238 | 7.8239 |
| 122KR | 0010 | 0.4399 | 0.5601 | 11.7621 | 9.2379 | 7.9013 | 7.9013 |
| 122KS | H501 | 0.4348 | 0.5652 | 7.9129 | 6.0871 | 7.5376 | 7.5376 |
| 122R | 0008 | 0.4351 | 0.5649 | 11.2971 | 8.7029 | 7.3267 | 7.3267 |
| 124KR | 0008 | 0.4439 | 0.5561 | 12.2340 | 9.7660 | 8.4817 | 8.4817 |
| 124KS | H501 | 0.4391 | 0.5609 | 8.4129 | 6.5871 | 8.0941 | 8.0941 |
| 124M | XXXX | 0.4283 | 0.5717 | 10.8622 | 8.1378 | 6.8308 | 6.8308 |
| 124R | 0012 | 0.4352 | 0.5648 | 11.8600 | 9.1400 | 7.3573 | 7.3573 |
| 126KR | 0012 | 0.4398 | 0.5602 | 12.3250 | 9.6750 | 7.8792 | 7.8792 |
| 126KS | H501 | 0.4375 | 0.5625 | 8.4381 | 6.5619 | 7.8701 | 7.8701 |
| 126M | 0001 | 0.4289 | 0.5711 | 10.8506 | 8.1494 | 6.8920 | 6.8920 |
| 126R | 0012 | 0.4404 | 0.5596 | 12.3105 | 9.6895 | 7.9689 | 7.9688 |
| 128KR | XXXX | 0.4432 | 0.5568 | 12.2493 | 9.7507 | 8.3704 | 8.3704 |
| 128KS | XXXX | 0.4365 | 0.5635 | 7.8890 | 6.1110 | 7.7471 | 7.7471 |
| 128M | XXXX | 0.4294 | 0.5706 | 10.8406 | 8.1594 | 6.9455 | 6.9455 |
| 128R | 0006 | 0.4401 | 0.5599 | 12.3168 | 9.6832 | 7.9514 | 7.9514 |
| 130KR | 0004 | 0.4430 | 0.5570 | 12.2535 | 9.7465 | 8.3269 | 8.3269 |
| 130KS | XXXX | 0.4323 | 0.5677 | 7.3805 | 5.6195 | 7.2464 | 7.2464 |
| 130R | 0005 | 0.4401 | 0.5599 | 12.3168 | 9.6832 | 7.9373 | 7.9373 |
| 132KR | XXXX | 0.4426 | 0.5574 | 12.2625 | 9.7375 | 8.2883 | 8.2883 |
| 132KS | XXXX | 0.4365 | 0.5635 | 7.8890 | 6.1110 | 7.7470 | 7.7470 |
| 132M | 0004 | 0.4303 | 0.5697 | 11.3939 | 8.6061 | 7.0347 | 7.0347 |
| 132R | 0010 | 0.4399 | 0.5601 | 12.3220 | 9.6780 | 7.9239 | 7.9239 |
| 134KR | 0006 | 0.4395 | 0.5605 | 11.7707 | 9.2293 | 7.8500 | 7.8500 |
| 134KS | XXXX | 0.4299 | 0.5701 | 7.4119 | 5.5881 | 6.9878 | 6.9878 |
| 134R | 0006 | 0.4400 | 0.5600 | 12.3209 | 9.6791 | 7.9131 | 7.9131 |
| 136KR | XXXX | 0.4400 | 0.5600 | 12.3209 | 9.6791 | 7.9330 | 7.9330 |
| 136KS | XXXX | 0.4379 | 0.5621 | 7.8697 | 6.1303 | 7.9247 | 7.9247 |
| 136R | 0005 | 0.4398 | 0.5602 | 12.3252 | 9.6748 | 7.9026 | 7.9026 |
| 138KR | XXXX | 0.4428 | 0.5572 | 12.8152 | 10.1848 | 8.2891 | 8.2891 |
| 138KS | XXXX | 0.4355 | 0.5645 | 7.9029 | 6.0971 | 7.6242 | 7.6242 |
| 138R | 0003 | 0.4373 | 0.5627 | 12.3802 | 9.6198 | 7.5663 | 7.5663 |
| 140KR | XXXX | 0.4400 | 0.5600 | 12.3210 | 9.6790 | 7.9157 | 7.9157 |
| 140KS | XXXX | 0.4315 | 0.5685 | 7.3902 | 5.6098 | 7.1644 | 7.1644 |
| 140R | XXXX | 0.4381 | 0.5619 | 12.3624 | 9.6376 | 7.6794 | 7.6794 |
| 142R | XXXX | 0.4359 | 0.5641 | 11.8466 | 9.1534 | 7.4078 | 7.4078 |
| 144KR | XXXX | 0.4342 | 0.5658 | 11.8817 | 9.1183 | 7.2218 | 7.2218 |
| 144KS | XXXX | 0.4348 | 0.5652 | 7.9128 | 6.0872 | 7.5385 | 7.5385 |
| 144R | 0005 | 0.4379 | 0.5621 | 12.3663 | 9.6337 | 7.6544 | 7.6544 |
| 146R | XXXX | 0.4387 | 0.5613 | 12.3494 | 9.6506 | 7.7555 | 7.7555 |
| 148KR | XXXX | 0.4389 | 0.5611 | 12.3440 | 9.6560 | 7.7565 | 7.7565 |
| 148KS | XXXX | 0.4378 | 0.5622 | 7.8705 | 6.1295 | 7.9169 | 7.9169 |
| 148R | XXXX | 0.4391 | 0.5609 | 12.3387 | 9.6613 | 7.8195 | 7.8195 |
| 150R | XXXX | 0.4396 | 0.5604 | 12.3290 | 9.6710 | 7.8784 | 7.8784 |
| 152KR | XXXX | 0.4352 | 0.5648 | 11.8613 | 9.1387 | 7.2993 | 7.2993 |
| 152KS | XXXX | 0.4375 | 0.5625 | 7.8755 | 6.1245 | 7.8701 | 7.8701 |
| 152R | XXXX | 0.4400 | 0.5600 | 12.3201 | 9.6799 | 7.9331 | 7.9331 |
| 156KR | XXXX | 0.4392 | 0.5608 | 12.3377 | 9.6623 | 7.7576 | 7.7576 |
| 156KS | XXXX | 0.4388 | 0.5612 | 7.8573 | 6.1427 | 8.0432 | 8.0432 |
| 156R | XXXX | 0.4399 | 0.5601 | 12.3220 | 9.6780 | 7.9208 | 7.9208 |
| 160KR | XXXX | 0.4360 | 0.5640 | 11.8445 | 9.1555 | 7.3577 | 7.3577 |
| 160KS | XXXX | 0.4373 | 0.5627 | 7.8773 | 6.1227 | 7.8537 | 7.8537 |
| 164KR | XXXX | 0.4396 | 0.5604 | 12.3293 | 9.6707 | 7.7590 | 7.7590 |
| 164KS | XXXX | 0.4405 | 0.5595 | 8.3930 | 6.6070 | 8.2799 | 8.2799 |
| 164R | XXXX | 0.4402 | 0.5598 | 12.3165 | 9.6835 | 7.9552 | 7.9552 |
| 1800S | H501 | 0.4178 | 0.5822 | 6.4037 | 4.5963 | 5.9221 | 5.9221 |
| 1801S | H501 | 0.4278 | 0.5722 | 6.8666 | 5.1334 | 6.7788 | 6.7788 |
| 1802S | H501 | 0.4389 | 0.5611 | 7.8553 | 6.1447 | 8.0623 | 8.0623 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation<br>Cage speed frequency (rpm) | Outer rotation<br>Cage speed frequency (rpm) | Inner or outer ring rotation<br>Inner ring frequency | Inner or outer ring rotation<br>Outer ring frequency | Inner rotation<br>Rolling element frequency | Outer rotation<br>Rolling element frequency |
|---|---|---|---|---|---|---|---|
| **1803S** | H501 | 0.4446 | 0.5554 | 8.8865 | 7.1135 | 8.9137 | 8.9137 |
| **1804S** | H501 | 0.4389 | 0.5611 | 7.8548 | 6.1452 | 8.0667 | 8.0667 |
| **1805S** | H501 | 0.4432 | 0.5568 | 8.3523 | 6.6477 | 8.6861 | 8.6861 |
| **1806S** | H501 | 0.4559 | 0.5441 | 9.7938 | 8.2062 | 11.2502 | 11.2502 |
| **1807S** | H501 | 0.4613 | 0.5387 | 10.7744 | 9.2256 | 12.8362 | 12.8362 |
| **1808S** | H501 | 0.4655 | 0.5345 | 11.7592 | 10.2408 | 14.4190 | 14.4190 |
| **1809S** | H501 | 0.4615 | 0.5385 | 10.7709 | 9.2291 | 12.8954 | 12.8954 |
| **1810S** | H501 | 0.4655 | 0.5345 | 11.7595 | 10.2405 | 14.4146 | 14.4146 |
| **1811S** | H501 | 0.4625 | 0.5375 | 10.7500 | 9.2500 | 13.2583 | 13.2583 |
| **1812S** | H501 | 0.4655 | 0.5345 | 11.7592 | 10.2408 | 14.4190 | 14.4190 |
| **1813S** | H501 | 0.4630 | 0.5370 | 11.8151 | 10.1849 | 13.4213 | 13.4213 |
| **1814S** | H501 | 0.4653 | 0.5347 | 12.8336 | 11.1664 | 14.3254 | 13.3254 |
| **1815S** | H501 | 0.4673 | 0.5327 | 13.8500 | 12.1500 | 15.2294 | 15.2294 |
| **1816S** | H501 | 0.4691 | 0.5309 | 13.8028 | 12.1972 | 16.1325 | 16.1325 |
| **1817S** | H501 | 0.4634 | 0.5366 | 12.8794 | 11.1206 | 13.5726 | 13.5726 |
| **1818S** | H501 | 0.4651 | 0.5349 | 13.3714 | 11.6286 | 14.2758 | 14.2758 |
| **1819S** | H501 | 0.4668 | 0.5332 | 13.8640 | 12.1360 | 14.9790 | 14.9790 |
| **1820S** | H501 | 0.4682 | 0.5318 | 14.3574 | 12.6426 | 15.6816 | 15.6816 |
| **1821S** | H501 | 0.4696 | 0.5304 | 15.3817 | 13.6183 | 16.3843 | 16.3843 |
| **1822S** | H501 | 0.4651 | 0.5349 | 13.3732 | 11.6268 | 14.2446 | 14.2446 |
| **1824S** | H501 | 0.4677 | 0.5323 | 14.3732 | 12.6268 | 15.3949 | 15.3949 |
| **1826S** | H501 | 0.4650 | 0.5350 | 13.3746 | 11.6254 | 14.2227 | 14.2227 |
| **1828S** | H501 | 0.4672 | 0.5328 | 14.3846 | 12.6154 | 15.1961 | 15.1961 |
| **1830S** | H501 | 0.4650 | 0.5350 | 13.3756 | 11.6244 | 14.2066 | 14.2066 |
| **1832S** | H501 | 0.4669 | 0.5331 | 13.8600 | 12.1400 | 15.0503 | 15.0503 |
| **1834S** | H501 | 0.4649 | 0.5351 | 13.3763 | 11.6237 | 14.1943 | 14.1943 |
| **1836S** | H501 | 0.4667 | 0.5333 | 13.8664 | 12.1336 | 14.9388 | 14.9388 |
| **1838S** | H501 | 0.4649 | 0.5351 | 13.3769 | 11.6231 | 14.1848 | 14.1848 |
| **1840S** | H501 | 0.4665 | 0.5335 | 13.8714 | 12.1286 | 14.8510 | 14.8510 |
| **1844S** | H501 | 0.4692 | 0.5308 | 14.8619 | 13.1381 | 16.1825 | 16.1825 |
| **1848S** | H501 | 0.4662 | 0.5338 | 13.8791 | 12.1209 | 14.7208 | 14.7208 |
| **1852S** | H501 | 0.4685 | 0.5315 | 14.8814 | 13.1186 | 15.8209 | 15.8209 |
| **1856S** | H501 | 0.4672 | 0.5328 | 14.3845 | 12.6155 | 15.1980 | 15.1980 |
| **1860S** | H501 | 0.4650 | 0.5350 | 13.3755 | 11.6245 | 14.2081 | 14.2081 |
| **1864S** | H501 | 0.4669 | 0.5331 | 13.8599 | 12.1401 | 15.0519 | 15.0519 |
| **1868S** | H501 | 0.4687 | 0.5313 | 14.8773 | 13.1227 | 15.8953 | 15.8953 |
| **1872S** | H501 | 0.4702 | 0.5298 | 15.3632 | 13.6368 | 16.7383 | 16.7383 |
| **1876S** | H501 | 0.4649 | 0.5351 | 13.3768 | 11.6232 | 14.1859 | 14.1859 |
| **1880S** | H501 | 0.4665 | 0.5335 | 13.8714 | 12.1286 | 14.8521 | 14.8521 |
| **1884S** | H501 | 0.4679 | 0.5321 | 14.3664 | 12.6336 | 15.5181 | 15.5181 |
| **1888S** | H501 | 0.4692 | 0.5308 | 14.8618 | 13.1382 | 16.1837 | 16.1837 |
| **1892S** | H501 | 0.4649 | 0.5351 | 13.3777 | 11.6223 | 14.1715 | 14.1715 |
| **1896S** | H501 | 0.4662 | 0.5338 | 13.8790 | 12.1210 | 14.7218 | 14.7218 |
| **1900R** | XXXX | 0.4067 | 0.5933 | 6.5268 | 4.4732 | 4.8597 | 4.8597 |
| **1900S** | H501 | 0.4008 | 0.5992 | 4.7938 | 3.2062 | 4.8408 | 4.8408 |
| **1901R** | XXXX | 0.4180 | 0.5820 | 6.9842 | 5.0158 | 5.5171 | 5.5171 |
| **1901S** | H501 | 0.4118 | 0.5882 | 5.8819 | 4.1181 | 5.4932 | 5.4932 |
| **1902R** | XXXX | 0.4129 | 0.5871 | 7.0452 | 4.9548 | 5.2549 | 5.2549 |
| **1902S** | H101 | 0.4077 | 0.5923 | 5.3309 | 3.6691 | 5.2312 | 5.2312 |
| **1902S** | H501 | 0.4077 | 0.5923 | 5.3309 | 3.6691 | 5.2312 | 5.2312 |
| **1903R** | XXXX | 0.4203 | 0.5797 | 7.5360 | 5.4640 | 5.7727 | 5.7727 |
| **1903S** | H501 | 0.4155 | 0.5845 | 5.8447 | 4.1553 | 5.7504 | 5.7504 |
| **1904R** | XXXX | 0.4070 | 0.5930 | 7.7095 | 5.2905 | 4.9509 | 4.9509 |
| **1904S** | H501 | 0.4165 | 0.5835 | 6.4190 | 4.5810 | 5.8174 | 5.8174 |
| **1905R** | XXXX | 0.4327 | 0.5673 | 8.5093 | 6.4907 | 6.9067 | 6.9067 |
| **1905S** | H501 | 0.4289 | 0.5711 | 6.8530 | 5.1470 | 6.8920 | 6.8920 |
| **1906R** | XXXX | 0.4363 | 0.5637 | 9.5829 | 7.4171 | 7.3422 | 7.3422 |
| **1906S** | H501 | 0.4330 | 0.5670 | 6.2369 | 4.7631 | 7.3293 | 7.3293 |
| **1907R** | XXXX | 0.4416 | 0.5584 | 10.0512 | 7.9488 | 7.9869 | 7.9869 |
| **1907S** | H501 | 0.4338 | 0.5662 | 6.7938 | 5.2062 | 7.4261 | 7.4261 |
| **1908R** | XXXX | 0.4407 | 0.5593 | 10.0673 | 7.9327 | 7.9186 | 7.9186 |
| **1908S** | H501 | 0.4300 | 0.5700 | 6.8406 | 5.1594 | 6.9978 | 6.9978 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation<br>Cage speed frequency (rpm) | Outer rotation<br>Cage speed frequency (rpm) | Inner or outer ring rotation<br>Inner ring frequency | Inner or outer ring rotation<br>Outer ring frequency | Inner rotation<br>Rolling element frequency | Outer rotation<br>Rolling element frequency |
|---|---|---|---|---|---|---|---|
| **1909R** | XXXX | 0.4468 | 0.5532 | 11.0648 | 8.9352 | 8.7971 | 8.7971 |
| **1909S** | H501 | 0.4438 | 0.5562 | 6.1181 | 4.8819 | 8.7856 | 8.7856 |
| **1910R** | XXXX | 0.4442 | 0.5558 | 11.6725 | 9.3275 | 8.4310 | 8.4310 |
| **1910S** | H501 | 0.4414 | 0.5586 | 7.2613 | 5.7387 | 8.4204 | 8.4204 |
| **1911R** | XXXX | 0.4443 | 0.5557 | 11.1148 | 8.8852 | 8.3983 | 8.3982 |
| **1911S** | H501 | 0.4471 | 0.5529 | 8.8468 | 7.1532 | 9.3414 | 9.3414 |
| **1912R** | XXXX | 0.4481 | 0.5519 | 12.1416 | 9.8584 | 9.0357 | 9.0357 |
| **1912S** | H501 | 0.4507 | 0.5493 | 9.3377 | 7.6623 | 10.0486 | 10.0486 |
| **1913R** | XXXX | 0.4515 | 0.5485 | 12.6166 | 10.3834 | 9.6718 | 9.6718 |
| **1913S** | H501 | 0.4539 | 0.5461 | 10.3758 | 8.6242 | 10.7546 | 10.7546 |
| **1914R** | XXXX | 0.4468 | 0.5532 | 12.1710 | 9.8290 | 8.8229 | 8.8229 |
| **1914S** | H501 | 0.4486 | 0.5514 | 9.3732 | 7.6268 | 9.6311 | 9.6311 |
| **1915R** | XXXX | 0.4497 | 0.5503 | 12.6562 | 10.3438 | 9.3535 | 9.3535 |
| **1915S** | XXXX | 0.4515 | 0.5485 | 9.8782 | 8.1268 | 10.2095 | 10.2095 |
| **1916R** | XXXX | 0.4524 | 0.5476 | 13.1430 | 10.8570 | 9.8834 | 9.8834 |
| **1916S** | H501 | 0.4540 | 0.5460 | 10.3732 | 8.6268 | 10.7871 | 10.7871 |
| **1917R** | XXXX | 0.4485 | 0.5515 | 12.6844 | 10.3156 | 9.1262 | 9.1262 |
| **1917S** | H501 | 0.4497 | 0.5503 | 9.3558 | 7.6442 | 9.8316 | 9.8316 |
| **1918R** | XXXX | 0.4472 | 0.5528 | 13.2672 | 10.7328 | 8.9273 | 8.9273 |
| **1918S** | XXXX | 0.4520 | 0.5480 | 9.8640 | 8.1360 | 10.3207 | 10.3207 |
| **1919R** | XXXX | 0.4531 | 0.5469 | 13.6730 | 11.3270 | 10.0347 | 10.0347 |
| **1919S** | XXXX | 0.4541 | 0.5459 | 10.3715 | 8.6285 | 10.8096 | 10.8096 |
| **1920R** | XXXX | 0.4494 | 0.5506 | 13.2144 | 10.7856 | 9.3520 | 9.3520 |
| **1920S** | XXXX | 0.4504 | 0.5496 | 9.8931 | 8.1069 | 9.9784 | 9.9784 |
| **1921R** | XXXX | 0.4517 | 0.5483 | 13.7065 | 11.2935 | 9.7509 | 9.7509 |
| **1921S** | XXXX | 0.4524 | 0.5476 | 10.4050 | 8.5950 | 10.4024 | 10.4024 |
| **1922R** | XXXX | 0.4566 | 0.5434 | 14.6706 | 12.3294 | 10.8354 | 10.8354 |
| **1922S** | XXXX | 0.4542 | 0.5458 | 10.3702 | 8.6298 | 10.8259 | 10.8259 |
| **1924R** | XXXX | 0.4521 | 0.5479 | 13.6975 | 11.3025 | 9.8823 | 9.8823 |
| **1924S** | H501 | 0.4499 | 0.5501 | 10.4525 | 8.5475 | 9.8736 | 9.8736 |
| **1926R** | XXXX | 0.4512 | 0.5488 | 13.7188 | 11.2812 | 9.6710 | 9.6710 |
| **1926S** | XXXX | 0.4514 | 0.5486 | 9.8756 | 8.1244 | 10.1813 | 10.1813 |
| **1928R** | XXXX | 0.4542 | 0.5458 | 14.1907 | 11.8093 | 10.3066 | 10.3066 |
| **1928S** | XXXX | 0.4543 | 0.5457 | 10.3682 | 8.6318 | 10.8503 | 10.8503 |
| **1930R** | XXXX | 0.4495 | 0.5505 | 13.7634 | 11.2366 | 9.3523 | 9.3523 |
| **1930S** | XXXX | 0.4515 | 0.5485 | 10.4216 | 8.5784 | 10.2108 | 10.2108 |
| **1932R** | XXXX | 0.4521 | 0.5479 | 14.2448 | 11.7552 | 9.8823 | 9.8823 |
| **1932S** | XXXX | 0.4520 | 0.5480 | 9.8647 | 8.1353 | 10.3120 | 10.3120 |
| **1934R** | XXXX | 0.4548 | 0.5452 | 15.2657 | 12.7343 | 10.4129 | 10.4129 |
| **1934S** | XXXX | 0.4544 | 0.5456 | 10.3671 | 8.6329 | 10.8646 | 10.8646 |
| **1936R** | XXXX | 0.4506 | 0.5494 | 14.2853 | 11.7147 | 9.5793 | 9.5793 |
| **1936S** | XXXX | 0.4520 | 0.5480 | 10.4119 | 8.5881 | 10.3220 | 10.3220 |
| **1938R** | XXXX | 0.4531 | 0.5469 | 14.7658 | 12.2342 | 10.0348 | 10.0348 |
| **1938S** | XXXX | 0.4541 | 0.5459 | 10.3714 | 8.6286 | 10.8108 | 10.8108 |
| **1940R** | XXXX | 0.4494 | 0.5506 | 14.3148 | 11.6852 | 9.3521 | 9.3521 |
| **1940S** | XXXX | 0.4504 | 0.5496 | 9.8930 | 8.1070 | 9.9795 | 9.9795 |
| **1944S** | H501 | 0.4542 | 0.5458 | 10.3701 | 8.6299 | 10.8270 | 10.8270 |
| **1948S** | H501 | 0.4575 | 0.5425 | 11.3930 | 9.6070 | 11.6735 | 11.6735 |
| **1952S** | H501 | 0.4514 | 0.5486 | 9.8757 | 8.1243 | 10.1803 | 10.1803 |
| **1956S** | H501 | 0.4543 | 0.5457 | 10.3683 | 8.6317 | 10.8493 | 10.8493 |
| **1960S** | H501 | 0.4493 | 0.5507 | 9.3621 | 7.6379 | 9.7582 | 9.7582 |
| **1964S** | H501 | 0.4520 | 0.5480 | 9.8648 | 8.1352 | 10.3113 | 10.3113 |
| **1968S** | H501 | 0.4544 | 0.5456 | 10.3672 | 8.6328 | 10.8638 | 10.8638 |
| **1972S** | H501 | 0.4565 | 0.5435 | 10.8693 | 9.1307 | 11.4160 | 11.4160 |
| **1976S** | H501 | 0.4541 | 0.5459 | 10.3714 | 8.6286 | 10.8107 | 10.8107 |
| **1980S** | H501 | 0.4561 | 0.5439 | 10.8782 | 9.1218 | 11.2992 | 11.2992 |
| **1984S** | H501 | 0.4579 | 0.5421 | 11.3845 | 9.6155 | 11.7873 | 11.7873 |
| **1988S** | H501 | 0.4542 | 0.5458 | 10.3701 | 8.6299 | 10.8270 | 10.8270 |
| **1992S** | H501 | 0.4559 | 0.5441 | 10.8819 | 9.1181 | 11.2504 | 11.2504 |
| **200R** | XXXX | 0.3460 | 0.6540 | 4.5779 | 2.4221 | 2.8509 | 2.8509 |
| **200S** | H501 | 0.3809 | 0.6191 | 4.9525 | 3.0475 | 3.9613 | 3.9613 |
| **200SZZC** | H401 | 0.3838 | 0.6162 | 4.9293 | 3.0707 | 4.0722 | 4.0722 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation | Outer rotation | Inner or outer ring rotation | | Inner rotation | Outer rotation |
|---|---|---|---|---|---|---|---|
| | | Cage speed frequency (rpm) | Cage speed frequency (rpm) | Inner ring frequency | Outer ring frequency | Rolling element frequency | Rolling element frequency |
| **201R** | XXXX | 0.3607 | 0.6393 | 5.1142 | 2.8858 | 3.1956 | 3.1956 |
| **201S** | H501 | 0.3636 | 0.6364 | 4.4545 | 2.5455 | 3.3941 | 3.3941 |
| **201SZZC** | H401 | 0.3647 | 0.6353 | 4.4472 | 2.5528 | 3.4243 | 3.4243 |
| **202M** | XXXX | 0.3730 | 0.6270 | 6.2699 | 3.7301 | 3.6832 | 3.6832 |
| **202R** | H102 | 0.3872 | 0.6128 | 5.5154 | 3.4846 | 4.0490 | 4.0490 |
| **202S** | H501 | 0.3812 | 0.6188 | 4.9500 | 3.0500 | 3.9729 | 3.9729 |
| **202SZZC** | H401 | 0.3833 | 0.6167 | 4.9340 | 3.0660 | 4.0494 | 4.0494 |
| **203M** | XXXX | 0.3886 | 0.6114 | 6.7254 | 4.2746 | 4.2656 | 4.2656 |
| **203R** | H102 | 0.3875 | 0.6125 | 5.5124 | 3.4876 | 4.0810 | 4.0810 |
| **203S** | H501 | 0.3817 | 0.6183 | 4.9468 | 3.0532 | 3.9881 | 3.9881 |
| **203SZZC** | H401 | 0.3837 | 0.6163 | 4.9305 | 3.0695 | 4.0659 | 4.0659 |
| **204M** | 0001 | 0.3815 | 0.6185 | 6.1847 | 3.8153 | 3.9835 | 3.9835 |
| **204R** | 0022 | 0.3971 | 0.6029 | 7.2342 | 4.7658 | 4.4902 | 4.4902 |
| **204R** | 0C02 | 0.3971 | 0.6029 | 7.2342 | 4.7658 | 4.4902 | 4.4902 |
| **204RDS** | 0022 | 0.3971 | 0.6029 | 6.6314 | 4.3686 | 4.4902 | 4.4902 |
| **204S** | H501 | 0.3815 | 0.6185 | 4.9478 | 3.0522 | 3.9835 | 3.9835 |
| **204SFFC** | H401 | 0.3850 | 0.6150 | 4.9203 | 3.0797 | 4.1165 | 4.1165 |
| **204SZZC** | H401 | 0.3850 | 0.6150 | 4.9203 | 3.0797 | 4.1165 | 4.1165 |
| **205M** | XXXX | 0.3866 | 0.6134 | 6.7475 | 4.2525 | 4.1821 | 4.1821 |
| **205R** | 0032 | 0.4002 | 0.5998 | 7.1974 | 4.8026 | 4.6574 | 4.6574 |
| **205R** | 0028 | 0.4002 | 0.5998 | 7.1974 | 4.8026 | 4.6574 | 4.6574 |
| **205RDS** | 0028 | 0.4002 | 0.5998 | 6.5976 | 4.4024 | 4.6574 | 4.6574 |
| **205S** | H501 | 0.3983 | 0.6017 | 5.4149 | 3.5851 | 4.7151 | 4.7151 |
| **205SFFC** | 0099 | 0.3866 | 0.6134 | 4.9072 | 3.0928 | 4.1821 | 4.1821 |
| **205SZZC** | 0027 | 0.3866 | 0.6134 | 4.9072 | 3.0928 | 4.1821 | 4.1821 |
| **206M** | 0012 | 0.3878 | 0.6122 | 7.3461 | 4.6539 | 4.2329 | 4.2329 |
| **206R** | 0014 | 0.4165 | 0.5835 | 8.1693 | 5.8307 | 5.6335 | 5.6335 |
| **206RDS** | 0032 | 0.4165 | 0.5835 | 8.1693 | 5.8307 | 5.6335 | 5.6335 |
| **206S** | 0129 | 0.3878 | 0.6122 | 4.8974 | 3.1026 | 4.2329 | 4.2329 |
| **206S** | 0055 | 0.3878 | 0.6122 | 4.8974 | 3.1026 | 4.2329 | 4.2329 |
| **206S** | H501 | 0.3965 | 0.6035 | 5.4318 | 3.5682 | 4.6223 | 4.6223 |
| **206SFFC** | 0250 | 0.3878 | 0.6122 | 5.4318 | 3.5682 | 4.6223 | 4.6223 |
| **206SZZC** | 0025 | 0.3878 | 0.6122 | 5.4318 | 3.5682 | 4.6223 | 4.6223 |
| **207M** | 0022 | 0.3887 | 0.6113 | 7.3354 | 4.6646 | 4.2704 | 4.2704 |
| **207R** | 0020 | 0.4138 | 0.5862 | 8.2068 | 5.7932 | 5.4499 | 5.4499 |
| **207RDS** | 0017 | 0.4138 | 0.5862 | 8.2068 | 5.7932 | 5.4499 | 5.4499 |
| **207S** | 0118 | 0.3887 | 0.6113 | 4.8903 | 3.1097 | 4.2704 | 4.2704 |
| **207S** | H201 | 0.3961 | 0.6039 | 5.4347 | 3.5653 | 4.6067 | 4.6067 |
| **207SFFC** | 0131 | 0.3887 | 0.6113 | 4.8903 | 3.1097 | 4.2704 | 4.2704 |
| **207SZZC** | 0024 | 0.3887 | 0.6113 | 4.8903 | 3.1097 | 4.2704 | 4.2704 |
| **208M** | 0012 | 0.3942 | 0.6058 | 7.2700 | 4.7300 | 4.5127 | 4.5127 |
| **208R** | 0024 | 0.4099 | 0.5901 | 8.2613 | 5.7387 | 5.2240 | 5.2240 |
| **208S** | 0154 | 0.3942 | 0.6058 | 5.4525 | 3.5475 | 4.5127 | 4.5127 |
| **208S** | H201 | 0.3975 | 0.6025 | 5.4228 | 3.5772 | 4.6715 | 4.6715 |
| **208SFFC** | 0147 | 0.3942 | 0.6058 | 5.4525 | 3.5475 | 4.5127 | 4.5127 |
| **208SZZC** | 0017 | 0.3942 | 0.6058 | 5.4525 | 3.5475 | 4.5127 | 4.5127 |
| **209M** | 0022 | 0.3962 | 0.6038 | 7.8495 | 5.1505 | 4.6091 | 4.6091 |
| **209R** | 0023 | 0.4171 | 0.5829 | 8.1609 | 5.8391 | 5.6885 | 5.6885 |
| **209RDS** | 0025 | 0.4171 | 0.5829 | 8.7438 | 6.2562 | 5.6885 | 5.6885 |
| **209S** | 0071 | 0.3962 | 0.6038 | 5.4343 | 3.5657 | 4.6091 | 4.6091 |
| **209S** | H201 | 0.4054 | 0.5946 | 5.9464 | 4.0536 | 5.0937 | 5.0937 |
| **209SFFC** | 0058 | 0.3962 | 0.6038 | 5.4343 | 3.5657 | 4.6091 | 4.6091 |
| **209SZZC** | 0018 | 0.3962 | 0.6038 | 5.4343 | 3.5657 | 4.6091 | 4.6091 |
| **210M** | 0016 | 0.4093 | 0.5907 | 8.8607 | 6.1393 | 5.3304 | 5.3304 |
| **210R** | 0014 | 0.4230 | 0.5770 | 9.2320 | 6.7680 | 6.1498 | 6.1498 |
| **210S** | 0071 | 0.4093 | 0.5907 | 5.9071 | 4.0929 | 5.3304 | 5.3304 |
| **210S** | H201 | 0.4093 | 0.5907 | 5.9071 | 4.0929 | 5.3304 | 5.3304 |
| **210SFFC** | 0157 | 0.4093 | 0.5907 | 5.9071 | 4.0929 | 5.3304 | 5.3304 |
| **210SZZC** | 0009 | 0.4093 | 0.5907 | 5.9071 | 4.0929 | 5.3304 | 5.3304 |
| **211M** | 0017 | 0.4078 | 0.5922 | 8.8827 | 6.1173 | 5.2400 | 5.2400 |
| **211R** | 0C01 | 0.4105 | 0.5895 | 8.2532 | 5.7468 | 5.2505 | 5.2505 |
| **211S** | 0057 | 0.4078 | 0.5922 | 5.9218 | 4.0782 | 5.2400 | 5.2400 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation<br>Cage speed frequency (rpm) | Outer rotation<br>Cage speed frequency (rpm) | Inner or outer ring rotation<br>Inner ring frequency | Inner or outer ring rotation<br>Outer ring frequency | Inner rotation<br>Rolling element frequency | Outer rotation<br>Rolling element frequency |
|---|---|---|---|---|---|---|---|
| **211S** | H201 | 0.4078 | 0.5922 | 5.9218 | 4.0782 | 5.2400 | 5.2400 |
| **211SZZC** | 0004 | 0.4078 | 0.5922 | 5.9218 | 4.0782 | 5.2400 | 5.2400 |
| **212M** | 0005 | 0.4066 | 0.5934 | 8.3073 | 5.6927 | 5.1676 | 5.1676 |
| **212R** | 0012 | 0.4184 | 0.5816 | 9.3058 | 6.6942 | 5.7908 | 5.7908 |
| **212S** | 0064 | 0.4066 | 0.5934 | 5.9338 | 4.0662 | 5.1676 | 5.1676 |
| **212S** | H201 | 0.4108 | 0.5892 | 5.8924 | 4.1076 | 5.4241 | 5.4241 |
| **213M** | 0001 | 0.4056 | 0.5944 | 8.9159 | 6.0841 | 5.1084 | 5.1084 |
| **213M** | H201 | 0.4099 | 0.5901 | 8.8516 | 6.1484 | 5.3686 | 5.3686 |
| **213R** | 0016 | 0.4164 | 0.5836 | 9.3372 | 6.6618 | 5.6641 | 5.6641 |
| **213RDS** | 0013 | 0.4168 | 0.5832 | 8.7485 | 6.2515 | 5.6641 | 5.6641 |
| **213S** | 0010 | 0.4056 | 0.5944 | 5.9439 | 4.0561 | 5.1084 | 5.1084 |
| **213S** | H201 | 0.4145 | 0.5855 | 6.4409 | 4.5591 | 5.6745 | 5.6745 |
| **213SFFC** | 0026 | 0.4056 | 0.5944 | 5.9439 | 4.0561 | 5.1084 | 5.1084 |
| **214M** | 0001 | 0.4186 | 0.5814 | 9.3026 | 6.6974 | 5.9789 | 5.9789 |
| **214M** | H201 | 0.4104 | 0.5896 | 8.8433 | 6.1567 | 5.4043 | 5.4043 |
| **214R** | 0014 | 0.4210 | 0.5790 | 10.4214 | 7.5786 | 5.9886 | 5.9886 |
| **214RDS** | 0010 | 0.4210 | 0.5790 | 9.2635 | 6.7365 | 5.9886 | 5.9886 |
| **214S** | 0037 | 0.4104 | 0.5896 | 5.8955 | 4.1045 | 5.4043 | 5.4043 |
| **214S** | H201 | 0.4145 | 0.5855 | 6.4404 | 4.5596 | 5.6779 | 5.6779 |
| **214SFFC** | 0034 | 0.4104 | 0.5896 | 5.8955 | 4.1045 | 5.4043 | 5.4043 |
| **215M** | 0003 | 0.4109 | 0.5891 | 8.8359 | 6.1641 | 5.4361 | 5.4361 |
| **215M** | H201 | 0.4148 | 0.5852 | 9.3629 | 6.6371 | 5.6993 | 5.6993 |
| **215R** | 0015 | 0.4171 | 0.5829 | 9.9086 | 7.0914 | 5.7086 | 5.7086 |
| **215RDS** | 0013 | 0.4171 | 0.5829 | 9.3257 | 6.6743 | 5.7086 | 5.7086 |
| **215S** | 0024 | 0.4148 | 0.5852 | 6.4370 | 4.5630 | 5.6995 | 5.6995 |
| **215S** | H201 | 0.4148 | 0.5852 | 6.4370 | 4.5630 | 5.6995 | 5.6995 |
| **216M** | 0004 | 0.4098 | 0.5902 | 8.8531 | 6.1469 | 5.3625 | 5.3625 |
| **216R** | 0018 | 0.4228 | 0.5772 | 9.2354 | 6.7646 | 6.1490 | 6.1490 |
| **216RDM** | 0001 | 0.4228 | 0.5772 | 9.8126 | 7.1874 | 6.1490 | 6.1490 |
| **216RDS** | 0018 | 0.4228 | 0.5772 | 9.8126 | 7.1874 | 6.1490 | 6.1490 |
| **216S** | 0015 | 0.4134 | 0.5866 | 5.8659 | 4.1341 | 5.6011 | 5.6011 |
| **216SFFC** | 0031 | 0.4134 | 0.5866 | 5.8659 | 4.1341 | 5.6011 | 5.6011 |
| **216SZZC** | 0005 | 0.4134 | 0.5866 | 5.8659 | 4.1341 | 5.6011 | 5.6011 |
| **217M** | 0001 | 0.4189 | 0.5811 | 9.8781 | 7.1219 | 6.0059 | 6.0059 |
| **217R** | 0012 | 0.4213 | 0.5787 | 9.8379 | 7.1621 | 6.0152 | 6.0152 |
| **217S** | 0022 | 0.4122 | 0.5878 | 5.8782 | 4.1218 | 5.5179 | 5.5179 |
| **218M** | H501 | 0.4111 | 0.5889 | 9.4224 | 6.5776 | 5.4465 | 5.4465 |
| **218R** | 0014 | 0.4133 | 0.5867 | 9.3868 | 6.6132 | 5.4553 | 5.4553 |
| **218RDM** | 0001 | 0.4133 | 0.5867 | 8.8001 | 6.1999 | 5.4553 | 5.4553 |
| **218RDS** | 0007 | 0.4133 | 0.5867 | 8.8001 | 6.1999 | 5.4553 | 5.4553 |
| **218S** | H501 | 0.4145 | 0.5855 | 6.4408 | 4.5592 | 5.6752 | 5.6752 |
| **219M** | H501 | 0.4101 | 0.5899 | 8.8479 | 6.1521 | 5.3847 | 5.3847 |
| **219R** | XXXX | 0.4182 | 0.5818 | 9.8901 | 7.1099 | 5.8024 | 5.8024 |
| **219RDM** | XXXX | 0.4188 | 0.5812 | 9.2996 | 6.7004 | 5.8434 | 5.8434 |
| **219RDS** | H701 | 0.4195 | 0.5805 | 9.2875 | 6.7125 | 5.8464 | 5.8464 |
| **219S** | H501 | 0.4101 | 0.5899 | 5.8986 | 4.1014 | 5.3847 | 5.3847 |
| **220M** | H501 | 0.4093 | 0.5907 | 8.8607 | 6.1393 | 5.3304 | 5.3304 |
| **220R** | 0016 | 0.4169 | 0.5831 | 9.9120 | 7.0880 | 5.7170 | 5.7170 |
| **220R-BKE** | 0015 | 0.4169 | 0.5831 | 9.3290 | 6.6710 | 5.7170 | 5.7170 |
| **220RDM** | XXXX | 0.4169 | 0.5831 | 9.3290 | 6.6710 | 5.7170 | 5.7170 |
| **220S** | H501 | 0.4093 | 0.5907 | 5.9071 | 4.0929 | 5.3304 | 5.3304 |
| **221M** | 0002 | 0.4139 | 0.5861 | 9.3776 | 6.6224 | 5.6349 | 5.6349 |
| **221R** | XXXX | 0.4160 | 0.5840 | 9.3432 | 6.6568 | 5.6434 | 5.6434 |
| **221RDM** | XXXX | 0.4160 | 0.5840 | 9.3432 | 6.6568 | 5.6434 | 5.6434 |
| **221S** | H501 | 0.4085 | 0.5915 | 5.9148 | 4.0852 | 5.2825 | 5.2825 |
| **222M** | XXXX | 0.4078 | 0.5922 | 9.3929 | 6.6071 | 5.5693 | 5.5693 |
| **222R** | 0007 | 0.4150 | 0.5850 | 9.3601 | 6.6399 | 5.5774 | 5.5774 |
| **222S** | H501 | 0.4078 | 0.5922 | 5.9218 | 4.0782 | 5.2400 | 5.2400 |
| **224M** | 0001 | 0.4100 | 0.5900 | 8.8506 | 6.1494 | 5.3732 | 5.3732 |
| **224R** | 0013 | 0.4166 | 0.5834 | 9.3345 | 6.6655 | 5.6987 | 5.6987 |
| **224S** | XXXX | 0.4147 | 0.5853 | 6.4383 | 4.5617 | 5.6912 | 5.6912 |
| **226M** | 0001 | 0.4162 | 0.5838 | 9.3406 | 6.6594 | 5.8001 | 5.8001 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation | Outer rotation | Inner or outer ring rotation | | Inner rotation | Outer rotation |
|---|---|---|---|---|---|---|---|
| | | Cage speed frequency (rpm) | Cage speed frequency (rpm) | Inner ring frequency | Outer ring frequency | Rolling element frequency | Rolling element frequency |
| 226R | 0008 | 0.4183 | 0.5817 | 9.8883 | 7.1117 | 5.8085 | 5.8085 |
| 226RDM | XXXX | 0.4183 | 0.5817 | 9.8883 | 7.1117 | 5.8085 | 5.8085 |
| 228R | 0006 | 0.4205 | 0.5795 | 9.8507 | 7.1493 | 5.9867 | 5.9867 |
| 230R | 0003 | 0.4189 | 0.5811 | 9.8789 | 7.1211 | 5.8546 | 5.8546 |
| 232R | 0007 | 0.4172 | 0.5828 | 9.9069 | 7.0931 | 5.7437 | 5.7437 |
| 234R | XXXX | 0.4160 | 0.5840 | 9.3435 | 6.6565 | 5.8001 | 5.8001 |
| 236R | 0003 | 0.4194 | 0.5806 | 9.8704 | 7.1296 | 5.8995 | 5.8995 |
| 238R | 0001 | 0.4213 | 0.5787 | 10.4174 | 7.5826 | 6.0292 | 6.0292 |
| 240R | XXXX | 0.4226 | 0.5774 | 10.3925 | 7.6075 | 6.1484 | 6.1484 |
| 242R | XXXX | 0.4214 | 0.5786 | 10.4147 | 7.5853 | 6.0412 | 6.0412 |
| 244R | XXXX | 0.4201 | 0.5799 | 9.8585 | 7.1415 | 5.9465 | 5.9465 |
| 246R | XXXX | 0.4192 | 0.5808 | 9.8738 | 7.1262 | 5.8640 | 5.8640 |
| 248R | XXXX | 0.4181 | 0.5819 | 9.8926 | 7.1074 | 5.7895 | 5.7895 |
| 250R | XXXX | 0.4174 | 0.5826 | 9.9045 | 7.0955 | 5.7241 | 5.7241 |
| 252R | XXXX | 0.4164 | 0.5836 | 9.9205 | 7.0795 | 5.6640 | 5.6640 |
| 256R | XXXX | 0.4210 | 0.5790 | 10.4218 | 7.5782 | 5.9884 | 5.9884 |
| 260R | XXXX | 0.4232 | 0.5768 | 10.3828 | 7.6172 | 6.1505 | 6.1505 |
| 264R | XXXX | 0.4251 | 0.5749 | 10.3478 | 7.6522 | 6.2979 | 6.2979 |
| 300S | H501 | 0.3391 | 0.6609 | 3.9656 | 2.0344 | 2.7851 | 2.7851 |
| 301R | XXXX | 0.3425 | 0.6575 | 4.6021 | 2.3979 | 2.7806 | 2.7806 |
| 301S | H501 | 0.3380 | 0.6620 | 3.9719 | 2.0281 | 2.7628 | 2.7628 |
| 302R | XXXX | 0.3786 | 0.6214 | 6.2145 | 3.7855 | 3.7536 | 3.7536 |
| 302S | H501 | 0.3608 | 0.6392 | 4.4747 | 2.5253 | 3.3122 | 3.3122 |
| 303M | XXXX | 0.3512 | 0.6488 | 5.1906 | 2.8094 | 3.0621 | 3.0621 |
| 303R | XXXX | 0.3795 | 0.6205 | 6.2055 | 3.7945 | 3.7973 | 3.7973 |
| 303S | H501 | 0.3636 | 0.6364 | 4.4551 | 2.5449 | 3.3918 | 3.3918 |
| 304M | XXXX | 0.3677 | 0.6323 | 5.6906 | 3.3094 | 3.5149 | 3.5149 |
| 304R | 0013 | 0.3712 | 0.6288 | 6.2877 | 3.7123 | 3.5288 | 3.5288 |
| 304S | H501 | 0.3677 | 0.6323 | 4.4261 | 2.5739 | 3.5149 | 3.5149 |
| 304SFFC | H401 | 0.3677 | 0.6323 | 4.4261 | 2.5739 | 3.5149 | 3.5149 |
| 304SZZC | H401 | 0.3677 | 0.6323 | 4.4261 | 2.5739 | 3.5149 | 3.5149 |
| 305M | 0006 | 0.3723 | 0.6277 | 6.2773 | 3.7227 | 3.6591 | 3.6591 |
| 305R | 0019 | 0.3934 | 0.6066 | 7.2788 | 4.7212 | 4.3595 | 4.3595 |
| 305S | 0059 | 0.3723 | 0.6277 | 4.3941 | 2.6059 | 3.6591 | 3.6591 |
| 305SFFC | 0091 | 0.3723 | 0.6277 | 4.3936 | 2.6064 | 3.6615 | 3.6615 |
| 305SWI | 0011 | 0.3845 | 0.6155 | 4.9239 | 3.0761 | 4.0983 | 4.0983 |
| 305SZZC | 0012 | 0.3723 | 0.6277 | 4.3936 | 2.6064 | 3.6615 | 3.6615 |
| 306M | 0009 | 0.3755 | 0.6245 | 6.2451 | 3.7549 | 3.7668 | 3.7668 |
| 306R | 0020 | 0.3935 | 0.6065 | 7.2775 | 4.7225 | 4.3814 | 4.3814 |
| 306S | 0104 | 0.3755 | 0.6245 | 4.9961 | 3.0039 | 3.7668 | 3.7668 |
| 306S | H201 | 0.3817 | 0.6183 | 4.9465 | 3.0535 | 3.9896 | 3.9896 |
| 305S | 0059 | 0.3723 | 0.6277 | 4.4254 | 2.5746 | 3.5179 | 3.5179 |
| 306SFFC | 0092 | 0.3755 | 0.6245 | 4.9961 | 3.0039 | 3.7668 | 3.7668 |
| 306SWI | 0005 | 0.3761 | 0.6239 | 4.9912 | 3.0088 | 3.7878 | 3.7878 |
| 306SZZC | 0034 | 0.3755 | 0.6245 | 4.9961 | 3.0039 | 3.7668 | 3.7668 |
| 307M | 0014 | 0.3688 | 0.6312 | 6.3115 | 3.6885 | 3.5501 | 3.5501 |
| 307R | 0014 | 0.3922 | 0.6078 | 7.2937 | 4.7063 | 4.3171 | 4.3171 |
| 307RDM | XXXX | 0.3922 | 0.6078 | 7.2937 | 4.7063 | 4.3171 | 4.3171 |
| 307S | 0091 | 0.3688 | 0.6312 | 4.4181 | 2.5819 | 3.5501 | 3.5501 |
| 307S | H201 | 0.3827 | 0.6173 | 4.9388 | 3.0612 | 4.0262 | 4.0262 |
| 307SFFC | 0094 | 0.3688 | 0.6312 | 4.4181 | 2.5819 | 3.5501 | 3.5501 |
| 307SWI | 0006 | 0.3758 | 0.6242 | 4.9939 | 3.0061 | 3.7761 | 3.7761 |
| 307SZZC | 0023 | 0.3688 | 0.6312 | 4.4181 | 2.5819 | 3.5501 | 3.5501 |
| 308M | 0006 | 0.3779 | 0.6221 | 6.8432 | 4.1568 | 3.8503 | 3.8503 |
| 308R | 0021 | 0.3924 | 0.6076 | 7.2910 | 4.7090 | 4.3389 | 4.3389 |
| 308S | 0058 | 0.3779 | 0.6221 | 4.9769 | 3.0231 | 3.8503 | 3.8503 |
| 308S | H201 | 0.3840 | 0.6160 | 4.9281 | 3.0719 | 4.0777 | 4.0777 |
| 308SFFC | 0096 | 0.3779 | 0.6221 | 4.9769 | 3.0231 | 3.8503 | 3.8503 |
| 308SZZC | 0025 | 0.3779 | 0.6221 | 4.9769 | 3.0231 | 3.8503 | 3.8503 |
| 308WI | XXXX | 0.3779 | 0.6221 | 6.8433 | 4.1567 | 3.8502 | 3.8502 |
| 309M | 0002 | 0.3741 | 0.6259 | 6.8850 | 4.1150 | 3.7192 | 3.7192 |
| 309R | 0019 | 0.3928 | 0.6072 | 7.2862 | 4.7138 | 4.3572 | 4.3572 |
| 309RDM | XXXX | 0.3928 | 0.6072 | 7.2862 | 4.7138 | 4.3572 | 4.3572 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation<br>Cage speed frequency (rpm) | Outer rotation<br>Cage speed frequency (rpm) | Inner or outer ring rotation<br>Inner ring frequency | Inner or outer ring rotation<br>Outer ring frequency | Inner rotation<br>Rolling element frequency | Outer rotation<br>Rolling element frequency |
|---|---|---|---|---|---|---|---|
| **309S** | 0069 | 0.3741 | 0.6259 | 4.3814 | 2.6186 | 3.7192 | 3.7192 |
| **309S** | H201 | 0.3796 | 0.6204 | 4.9635 | 3.0365 | 3.9108 | 3.9108 |
| **309SFFC** | 0075 | 0.3741 | 0.6259 | 4.3814 | 2.6186 | 3.7192 | 3.7192 |
| **309SWI** | 0005 | 0.3796 | 0.6204 | 4.9635 | 3.0365 | 3.9108 | 3.9108 |
| **309SZZC** | 0021 | 0.3741 | 0.6259 | 4.3814 | 2.6186 | 3.7192 | 3.7192 |
| **310M** | 0004 | 0.3809 | 0.6191 | 6.8097 | 4.1903 | 3.9613 | 3.9613 |
| **310R** | 0015 | 0.3830 | 0.6170 | 7.4038 | 4.5962 | 3.9696 | 3.9696 |
| **310RDS** | 0005 | 0.3830 | 0.6170 | 6.7868 | 4.2132 | 3.9696 | 3.9696 |
| **310S** | 0088 | 0.3809 | 0.6191 | 4.9525 | 3.0475 | 3.9613 | 3.9613 |
| **310S** | H201 | 0.3809 | 0.6191 | 4.9525 | 3.0475 | 3.9613 | 3.9613 |
| **310SFFC** | 0091 | 0.3809 | 0.6191 | 4.9525 | 3.0475 | 3.9613 | 3.9613 |
| **310SWI** | 0013 | 0.3809 | 0.6191 | 4.9525 | 3.0475 | 3.9613 | 3.9613 |
| **310SZZC** | 0011 | 0.3809 | 0.6191 | 4.9525 | 3.0475 | 3.9613 | 3.9613 |
| **311M** | 0018 | 0.3775 | 0.6225 | 6.8472 | 4.1528 | 3.8377 | 3.8377 |
| **311M** | H201 | 0.3821 | 0.6179 | 7.4151 | 4.5849 | 4.0040 | 4.0040 |
| **311R** | 0016 | 0.3844 | 0.6156 | 7.3868 | 4.6132 | 4.0134 | 4.0134 |
| **311RDM** | XXXX | 0.3844 | 0.6156 | 6.7713 | 4.2287 | 4.0134 | 4.0134 |
| **311RDS** | H701 | 0.3844 | 0.6156 | 6.7713 | 4.2287 | 4.0134 | 4.0134 |
| **311S** | 0052 | 0.3821 | 0.6179 | 4.9434 | 3.0566 | 4.0040 | 4.0040 |
| **311S** | H201 | 0.3821 | 0.6179 | 4.9434 | 3.0566 | 4.0040 | 4.0040 |
| **311SFFC** | 0052 | 0.3821 | 0.6179 | 4.9434 | 3.0566 | 4.0040 | 4.0040 |
| **311SWI** | 0003 | 0.3821 | 0.6179 | 4.9434 | 3.0566 | 4.0040 | 4.0040 |
| **311SZZC** | 0027 | 0.3821 | 0.6179 | 4.9434 | 3.0566 | 4.0040 | 4.0040 |
| **311WI** | 0014 | 0.3791 | 0.6209 | 6.8296 | 4.1704 | 3.8949 | 3.8949 |
| **312M** | 0002 | 0.3830 | 0.6170 | 6.7867 | 4.2133 | 4.0406 | 4.0406 |
| **312M** | H201 | 0.3830 | 0.6170 | 7.4037 | 4.5963 | 4.0406 | 4.0406 |
| **312R** | 0019 | 0.3852 | 0.6148 | 7.3776 | 4.6224 | 4.0492 | 4.0492 |
| **312RDM** | XXXX | 0.3852 | 0.6148 | 6.7628 | 4.2372 | 4.0492 | 4.0492 |
| **312RDS** | 0006 | 0.3852 | 0.6148 | 6.7628 | 4.2372 | 4.0492 | 4.0492 |
| **312S** | 0013 | 0.3830 | 0.6170 | 4.9358 | 3.0642 | 4.0406 | 4.0406 |
| **312S** | H201 | 0.3830 | 0.6170 | 4.9358 | 3.0642 | 4.0406 | 4.0406 |
| **312SFFC** | 0046 | 0.3830 | 0.6170 | 4.9358 | 3.0642 | 4.0406 | 4.0406 |
| **312SZZC** | 0017 | 0.3830 | 0.6170 | 4.9358 | 3.0642 | 4.0406 | 4.0406 |
| **312WI** | XXXX | 0.3801 | 0.6199 | 6.8186 | 4.1814 | 3.9315 | 3.9315 |
| **313M** | 0002 | 0.3838 | 0.6162 | 7.3939 | 4.6061 | 4.0722 | 4.0722 |
| **313M** | H201 | 0.3838 | 0.6162 | 7.3939 | 4.6061 | 4.0722 | 4.0722 |
| **313R** | 0012 | 0.3936 | 0.6064 | 8.4896 | 5.5104 | 4.4032 | 4.4032 |
| **313RDM** | 0001 | 0.3936 | 0.6064 | 7.2768 | 4.7232 | 4.4032 | 4.4032 |
| **313RDU** | H701 | 0.3936 | 0.6064 | 7.2768 | 4.7232 | 4.4032 | 4.4032 |
| **313S** | 0030 | 0.3838 | 0.6162 | 4.9293 | 3.0707 | 4.0722 | 4.0722 |
| **313S** | H201 | 0.3838 | 0.6162 | 4.9293 | 3.0707 | 4.0732 | 4.0732 |
| **313SFFC** | 0057 | 0.3838 | 0.6162 | 4.9293 | 3.0707 | 4.0732 | 4.0732 |
| **313SWI** | 0003 | 0.3816 | 0.6184 | 4.9470 | 3.0530 | 3.9873 | 3.9873 |
| **314M** | 0001 | 0.3845 | 0.6155 | 7.3855 | 4.6145 | 4.0998 | 4.0998 |
| **314M** | H201 | 0.3845 | 0.6155 | 7.3855 | 4.6145 | 4.0998 | 4.0998 |
| **314R** | 0012 | 0.3939 | 0.6061 | 7.2729 | 4.7271 | 4.4115 | 4.4115 |
| **314S** | 0022 | 0.3845 | 0.6155 | 4.9236 | 3.0764 | 4.0998 | 4.0998 |
| **314S** | H201 | 0.3845 | 0.6155 | 4.9236 | 3.0764 | 4.0998 | 4.0998 |
| **314SFFC** | 0052 | 0.3845 | 0.6155 | 4.9236 | 3.0764 | 4.0998 | 4.0998 |
| **314WI** | XXXX | 0.3846 | 0.6154 | 7.3854 | 4.6146 | 4.1000 | 4.1000 |
| **315M** | H501 | 0.3852 | 0.6148 | 7.3781 | 4.6219 | 4.1242 | 4.1242 |
| **315R** | 0024 | 0.3939 | 0.6061 | 8.4848 | 5.5152 | 4.4179 | 4.4179 |
| **315R-BKE** | 0025 | 0.3939 | 0.6061 | 7.8788 | 5.1212 | 4.4179 | 4.4179 |
| **315RDM** | 0003 | 0.3939 | 0.6061 | 7.8788 | 5.1212 | 4.4179 | 4.4179 |
| **315S** | H501 | 0.3852 | 0.6148 | 4.9187 | 3.0813 | 4.1242 | 4.1242 |
| **315SWI** | 0005 | 0.3787 | 0.6213 | 4.9707 | 3.0293 | 3.8782 | 3.8782 |
| **315SZZC** | 0013 | 0.3784 | 0.6216 | 4.9728 | 3.0272 | 3.8688 | 3.8688 |
| **315WI** | XXXX | 0.3854 | 0.6146 | 7.3751 | 4.6249 | 4.1341 | 4.1341 |
| **316M** | H501 | 0.3857 | 0.6143 | 7.3716 | 4.6284 | 4.1459 | 4.1459 |
| **316R** | 0009 | 0.3940 | 0.6060 | 7.8786 | 5.1214 | 4.4235 | 4.4235 |
| **316RDM** | 0001 | 0.3940 | 0.6060 | 7.8786 | 5.1214 | 4.4235 | 4.4235 |
| **316S** | H501 | 0.3857 | 0.6143 | 4.9144 | 3.0856 | 4.1459 | 4.1459 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation<br>Cage speed frequency (rpm) | Outer rotation<br>Cage speed frequency (rpm) | Inner or outer ring rotation<br>Inner ring frequency | Outer ring frequency | Inner rotation<br>Rolling element frequency | Outer rotation<br>Rolling element frequency |
|---|---|---|---|---|---|---|---|
| 316SZZC | 0015 | 0.3794 | 0.6206 | 4.9652 | 3.0348 | 3.9030 | 3.9030 |
| 316WI | XXXX | 0.3921 | 0.6079 | 7.9033 | 5.0967 | 4.4162 | 4.4162 |
| 317M | H501 | 0.3862 | 0.6138 | 7.3659 | 4.6341 | 4.1652 | 4.1652 |
| 317R | 0007 | 0.3943 | 0.6057 | 8.4803 | 5.5197 | 4.4295 | 4.4295 |
| 317RDU | H701 | 0.3943 | 0.6057 | 7.8746 | 5.1254 | 4.4295 | 4.4295 |
| 317S | H501 | 0.3862 | 0.6138 | 4.9106 | 3.0894 | 4.1652 | 4.1652 |
| 318M | H501 | 0.3866 | 0.6134 | 7.3607 | 4.6393 | 4.1827 | 4.1827 |
| 318R | 0011 | 0.3943 | 0.6057 | 7.8746 | 5.1254 | 4.4339 | 4.4339 |
| 318RDM | 0003 | 0.3943 | 0.6057 | 7.8746 | 5.1254 | 4.4339 | 4.4339 |
| 318S | H501 | 0.3866 | 0.6134 | 4.9071 | 3.0929 | 4.1827 | 4.1827 |
| 318SFFC | H501 | 0.3866 | 0.6134 | 4.9071 | 3.0929 | 4.1827 | 4.1827 |
| 318SWI | H501 | 0.3923 | 0.6077 | 4.8618 | 3.1382 | 4.4261 | 4.4261 |
| 318WI | XXXX | 0.3866 | 0.6134 | 7.3607 | 4.6393 | 4.1827 | 4.1827 |
| 319M | 0001 | 0.3924 | 0.6076 | 7.8991 | 5.1009 | 4.4304 | 4.4304 |
| 319R | 0014 | 0.3943 | 0.6057 | 7.8747 | 5.1253 | 4.4379 | 4.4379 |
| 319S | H501 | 0.3870 | 0.6130 | 4.9041 | 3.0959 | 4.1984 | 4.1984 |
| 320M | 0001 | 0.3841 | 0.6159 | 7.3909 | 4.6091 | 4.0818 | 4.0818 |
| 320R | XXXX | 0.3959 | 0.6041 | 7.8529 | 5.1471 | 4.5198 | 4.5198 |
| 320RDM | 0001 | 0.3959 | 0.6041 | 7.8529 | 5.1471 | 4.5198 | 4.5198 |
| 320S | XXXX | 0.3790 | 0.6210 | 4.9676 | 3.0324 | 3.8920 | 3.8920 |
| 320SWI | H501 | 0.3790 | 0.6210 | 4.9676 | 3.0324 | 3.8920 | 3.8920 |
| 321M | 0001 | 0.3845 | 0.6155 | 7.3854 | 4.6146 | 4.0998 | 4.0998 |
| 321R | 0006 | 0.3961 | 0.6039 | 7.8508 | 5.1492 | 4.5204 | 4.5204 |
| 321RDM | XXXX | 0.3961 | 0.6039 | 7.8508 | 5.1492 | 4.5204 | 4.5204 |
| 321S | XXXX | 0.3845 | 0.6155 | 4.9236 | 3.0764 | 4.0998 | 4.0998 |
| 322M | 0001 | 0.3866 | 0.6134 | 7.3607 | 4.6393 | 4.1827 | 4.1827 |
| 322R | 0004 | 0.3930 | 0.6070 | 7.8915 | 5.1085 | 4.3827 | 4.3827 |
| 322RDM | XXXX | 0.3930 | 0.6070 | 7.8915 | 5.1085 | 4.3827 | 4.3827 |
| 322S | XXXX | 0.3821 | 0.6179 | 4.9434 | 3.0566 | 4.0040 | 4.0040 |
| 323S | XXXX | 0.3994 | 0.6006 | 5.4057 | 3.5943 | 4.7670 | 4.7670 |
| 324R | 0010 | 0.3930 | 0.6070 | 7.8903 | 5.1097 | 4.3927 | 4.3927 |
| 324RDM | XXXX | 0.3930 | 0.6070 | 7.8903 | 5.1097 | 4.3927 | 4.3927 |
| 326R | XXXX | 0.3934 | 0.6066 | 7.8852 | 5.1148 | 4.4025 | 4.4025 |
| 326RDM | XXXX | 0.3934 | 0.6066 | 7.8852 | 5.1148 | 4.4025 | 4.4025 |
| 328R | XXXX | 0.3935 | 0.6065 | 7.8852 | 5.1148 | 4.4025 | 4.4025 |
| 328RDM | XXXX | 0.3935 | 0.6065 | 7.8852 | 5.1148 | 4.4025 | 4.4025 |
| 330R | XXXX | 0.3971 | 0.6029 | 8.4404 | 5.5596 | 4.5730 | 4.5730 |
| 330RDM | XXXX | 0.3971 | 0.6029 | 8.4404 | 5.5596 | 4.5730 | 4.5730 |
| 332R | XXXX | 0.3969 | 0.6031 | 8.4404 | 5.5572 | 4.5694 | 4.5694 |
| 332RDM | XXXX | 0.3969 | 0.6031 | 8.4404 | 5.5572 | 4.5694 | 4.5694 |
| 334R | XXXX | 0.4000 | 0.6000 | 8.4002 | 5.5998 | 4.7133 | 4.7133 |
| 336R | XXXX | 0.3997 | 0.6003 | 8.4046 | 5.5954 | 4.7021 | 4.7021 |
| 338R | XXXX | 0.3997 | 0.6003 | 8.4046 | 5.5954 | 4.7021 | 4.7021 |
| 34 | H001 | 0.3449 | 0.6551 | 3.9303 | 2.0697 | 2.8511 | 2.8511 |
| 340R | XXXX | 0.3994 | 0.6006 | 8.4084 | 5.5916 | 4.6842 | 4.6842 |
| 342R | XXXX | 0.3992 | 0.6008 | 8.4118 | 5.5882 | 4.6761 | 4.6761 |
| 344R | XXXX | 0.3991 | 0.6009 | 8.4118 | 5.5882 | 4.6761 | 4.6761 |
| 348R | XXXX | 0.4033 | 0.5967 | 8.3542 | 5.6458 | 4.8771 | 4.8771 |
| 35 | XXXX | 0.3449 | 0.6551 | 3.9303 | 2.0697 | 2.8511 | 2.8511 |
| 352R | XXXX | 0.4068 | 0.5932 | 8.8975 | 6.1025 | 5.0671 | 5.0671 |
| 356R | XXXX | 0.4062 | 0.5938 | 8.9069 | 6.0931 | 5.0257 | 5.0257 |
| 36 | H401 | 0.3440 | 0.6560 | 3.9362 | 2.0638 | 2.8418 | 2.8418 |
| 37 | H503 | 0.3697 | 0.6303 | 4.4123 | 2.5877 | 3.4045 | 3.4045 |
| 37 | H501 | 0.3664 | 0.6336 | 4.4352 | 2.5648 | 3.3918 | 3.3918 |
| 38 | H501 | 0.3682 | 0.6318 | 4.4226 | 2.5774 | 3.4452 | 3.4452 |
| 38 | H503 | 0.3682 | 0.6318 | 4.4266 | 2.5774 | 3.4452 | 3.4452 |
| 38ZZC | 0016 | 0.3656 | 0.6344 | 4.4410 | 2.5590 | 3.4507 | 3.4507 |
| 39 | H502 | 0.3689 | 0.6311 | 4.4177 | 2.5823 | 3.4806 | 3.4806 |
| 403M | XXXX | 0.3392 | 0.6608 | 5.2861 | 2.7139 | 2.7887 | 2.7887 |
| 403R | XXXX | 0.3417 | 0.6583 | 5.2666 | 2.7334 | 2.7984 | 2.7984 |
| 403S | H501 | 0.3392 | 0.6608 | 3.9646 | 2.0354 | 2.7887 | 2.7887 |
| 404M | 0001 | 0.3447 | 0.6553 | 5.2424 | 2.7576 | 2.9090 | 2.9090 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation<br>Cage speed frequency (rpm) | Outer rotation<br>Cage speed frequency (rpm) | Inner or outer ring rotation<br>Inner ring frequency | Inner or outer ring rotation<br>Outer ring frequency | Inner rotation<br>Rolling element frequency | Outer rotation<br>Rolling element frequency |
|---|---|---|---|---|---|---|---|
| **404R** | XXXX | 0.3471 | 0.6529 | 5.8765 | 3.1235 | 2.9183 | 2.9183 |
| **404S** | H501 | 0.3361 | 0.6639 | 3.9837 | 2.0163 | 2.7220 | 2.7220 |
| **405M** | 0002 | 0.3488 | 0.6512 | 5.2095 | 2.7905 | 3.0048 | 3.0048 |
| **405R** | XXXX | 0.3511 | 0.6489 | 5.8400 | 3.1600 | 3.0139 | 3.0139 |
| **405S** | H501 | 0.3608 | 0.6392 | 4.4746 | 2.5254 | 3.3128 | 3.3128 |
| **406M** | 0C01 | 0.3779 | 0.6221 | 6.8432 | 4.1568 | 3.8503 | 3.8503 |
| **406R** | 0009 | 0.3566 | 0.6434 | 6.4341 | 3.5659 | 3.1533 | 3.1533 |
| **406S** | H501 | 0.3611 | 0.6389 | 4.4724 | 2.5276 | 3.3214 | 3.3214 |
| **407M** | 0001 | 0.3741 | 0.6259 | 6.8850 | 4.1150 | 3.7192 | 3.7192 |
| **407R** | 0014 | 0.3611 | 0.6389 | 6.3888 | 3.6112 | 3.2700 | 3.2700 |
| **407S** | H501 | 0.3609 | 0.6391 | 4.4734 | 2.5266 | 3.3173 | 3.3173 |
| **408M** | 0001 | 0.3624 | 0.6376 | 6.3758 | 3.6242 | 3.3591 | 3.3591 |
| **408R** | 0011 | 0.3644 | 0.6356 | 6.3557 | 3.6443 | 3.3670 | 3.3670 |
| **408S** | H501 | 0.3624 | 0.6376 | 4.4631 | 2.5369 | 3.3591 | 3.3591 |
| **409M** | 0001 | 0.3653 | 0.6347 | 6.3469 | 3.6531 | 3.4427 | 3.4427 |
| **409R** | XXXX | 0.3674 | 0.6326 | 6.3265 | 3.6735 | 3.4508 | 3.4508 |
| **409S** | H501 | 0.3605 | 0.6395 | 4.4766 | 2.5234 | 3.3049 | 3.3049 |
| **410M** | 0001 | 0.3677 | 0.6323 | 6.3229 | 3.6771 | 3.5149 | 3.5149 |
| **410R** | XXXX | 0.3697 | 0.6303 | 6.9331 | 4.0669 | 3.5229 | 3.5229 |
| **410S** | XXXX | 0.3589 | 0.6411 | 4.4878 | 2.5122 | 3.2611 | 3.2611 |
| **411M** | 0002 | 0.3697 | 0.6303 | 6.3026 | 3.6974 | 3.5781 | 3.5781 |
| **411R** | XXXX | 0.3717 | 0.6283 | 6.9110 | 4.0890 | 3.5859 | 3.5859 |
| **411S** | H501 | 0.3616 | 0.6384 | 4.4688 | 2.5312 | 3.3360 | 3.3360 |
| **412M** | 0001 | 0.3715 | 0.6285 | 6.9136 | 4.0864 | 3.6337 | 3.6337 |
| **412R** | XXXX | 0.3734 | 0.6266 | 6.8921 | 4.1079 | 3.6415 | 3.6415 |
| **412S** | H501 | 0.3639 | 0.6361 | 4.4525 | 2.5475 | 3.4024 | 3.4024 |
| **413M** | 0001 | 0.3784 | 0.6216 | 6.8375 | 4.1625 | 3.8688 | 3.8688 |
| **413R** | 0015 | 0.3748 | 0.6252 | 6.8768 | 4.1232 | 3.6904 | 3.6904 |
| **413S** | H501 | 0.3659 | 0.6341 | 4.4384 | 2.5616 | 3.4617 | 3.4617 |
| **414M** | 0001 | 0.3794 | 0.6206 | 7.4478 | 4.5522 | 3.9030 | 3.9030 |
| **414R** | XXXX | 0.3687 | 0.6313 | 6.9446 | 4.0554 | 3.4909 | 3.4909 |
| **414S** | H501 | 0.3603 | 0.6397 | 4.4779 | 2.5221 | 3.2997 | 3.2997 |
| **415M** | 0001 | 0.3862 | 0.6138 | 7.3658 | 4.6342 | 4.1653 | 4.1653 |
| **415R** | XXXX | 0.3702 | 0.6298 | 6.9277 | 4.0723 | 3.5383 | 3.5383 |
| **415S** | H501 | 0.3622 | 0.6378 | 4.4645 | 2.5355 | 3.3534 | 3.3534 |
| **416M** | 0001 | 0.3809 | 0.6191 | 7.4288 | 4.5712 | 3.9613 | 3.9613 |
| **416R** | XXXX | 0.3716 | 0.6284 | 6.9126 | 4.0874 | 3.5814 | 3.5814 |
| **416S** | H501 | 0.3639 | 0.6361 | 4.4525 | 2.5475 | 3.4024 | 3.4024 |
| **417M** | 0001 | 0.3816 | 0.6184 | 7.4207 | 4.5793 | 3.9866 | 3.9866 |
| **417R** | XXXX | 0.3728 | 0.6272 | 6.8991 | 4.1009 | 3.6209 | 3.6209 |
| **417S** | H502 | 0.3655 | 0.6345 | 4.4417 | 2.5583 | 3.4475 | 3.4475 |
| **418M** | 0001 | 0.3790 | 0.6210 | 7.4514 | 4.5486 | 3.8920 | 3.8920 |
| **418R** | XXXX | 0.3710 | 0.6290 | 6.9194 | 4.0806 | 3.5617 | 3.5617 |
| **418S** | XXXX | 0.3639 | 0.6361 | 4.4525 | 2.5475 | 3.4024 | 3.4024 |
| **419M** | XXXX | 0.3666 | 0.6334 | 6.3344 | 3.6656 | 3.4801 | 3.4801 |
| **419R** | XXXX | 0.3731 | 0.6269 | 6.8957 | 4.1043 | 3.6309 | 3.6309 |
| **419S** | XXXX | 0.3712 | 0.6288 | 4.4019 | 2.5981 | 3.6231 | 3.6231 |
| **420M** | XXXX | 0.3652 | 0.6348 | 6.3483 | 3.6517 | 3.4388 | 3.4388 |
| **420R** | XXXX | 0.3715 | 0.6285 | 6.9135 | 4.0865 | 3.5790 | 3.5790 |
| **420S** | XXXX | 0.3695 | 0.6305 | 4.4133 | 2.5867 | 3.5711 | 3.5711 |
| **421R** | XXXX | 0.3654 | 0.6346 | 6.3457 | 3.6543 | 3.3941 | 3.3941 |
| **421S** | XXXX | 0.3714 | 0.6286 | 4.4003 | 2.5997 | 3.6306 | 3.6306 |
| **422R** | XXXX | 0.3655 | 0.6345 | 6.3452 | 3.6548 | 3.3954 | 3.3954 |
| **422S** | XXXX | 0.3745 | 0.6255 | 4.3787 | 2.6213 | 3.7323 | 3.7323 |
| **5200SB** | H301 | 0.3969 | 0.6031 | 4.2218 | 2.7782 | 4.0209 | 4.0209 |
| **5200SB** | H501 | 0.3881 | 0.6119 | 4.8951 | 3.1049 | 3.9892 | 3.9892 |
| **5201SB** | H301 | 0.3906 | 0.6094 | 4.2657 | 2.7343 | 3.7689 | 3.7689 |
| **5201SB** | H501 | 0.3873 | 0.6127 | 4.9014 | 3.0986 | 3.8177 | 3.8177 |
| **5202SB** | H501 | 0.3849 | 0.6151 | 4.3057 | 2.6943 | 3.7286 | 3.7286 |
| **5202SB** | H301 | 0.4037 | 0.5963 | 4.7700 | 3.2300 | 4.3319 | 4.3319 |
| **5203SB** | H501 | 0.3966 | 0.6034 | 4.8268 | 3.1732 | 4.1975 | 4.1975 |
| **5204C** | H501 | 0.3956 | 0.6044 | 4.8349 | 3.1651 | 3.9684 | 3.9684 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| | | Inner rotation | Outer rotation | Inner or outer ring rotation | | Inner rotation | Outer rotation |
|---|---|---|---|---|---|---|---|
| Bearing size | Suffix | Cage speed frequency (rpm) | Cage speed frequency (rpm) | Inner ring frequency | Outer ring frequency | Rolling element frequency | Rolling element frequency |
| **5204M** | H501 | 0.3956 | 0.6044 | 6.6480 | 4.3520 | 3.9684 | 3.9684 |
| **5205C** | H501 | 0.4088 | 0.5912 | 5.3207 | 3.6793 | 4.5905 | 4.5905 |
| **5205M** | H501 | 0.4088 | 0.5912 | 7.6855 | 5.3145 | 4.5905 | 4.5905 |
| **5206C** | H501 | 0.4103 | 0.5897 | 5.3070 | 3.6930 | 4.6740 | 4.6740 |
| **5206M** | H501 | 0.4103 | 0.5897 | 7.0760 | 4.9240 | 4.6740 | 4.6740 |
| **5207C** | H501 | 0.4083 | 0.5917 | 5.3251 | 3.6749 | 4.5642 | 4.5642 |
| **5207M** | H501 | 0.4083 | 0.5917 | 7.1002 | 4.8998 | 4.5642 | 4.5642 |
| **5208C** | H501 | 0.4093 | 0.5907 | 5.3164 | 3.6836 | 4.6162 | 4.6162 |
| **5208M** | H501 | 0.4093 | 0.5907 | 7.6793 | 5.3207 | 4.6162 | 4.6162 |
| **5209C** | H501 | 0.4180 | 0.5820 | 5.8196 | 4.1804 | 5.1411 | 5.1411 |
| **5209M** | H501 | 0.4180 | 0.5820 | 8.1475 | 5.8525 | 5.1411 | 5.1411 |
| **5210C** | H501 | 0.4226 | 0.5774 | 5.7738 | 4.2262 | 5.4620 | 5.4620 |
| **5210M** | H501 | 0.4226 | 0.5774 | 8.6607 | 6.3393 | 5.4620 | 5.4620 |
| **5211C** | H501 | 0.4225 | 0.5775 | 5.7751 | 4.2249 | 5.4524 | 5.4524 |
| **5211M** | H501 | 0.4225 | 0.5775 | 9.2401 | 6.7599 | 5.4524 | 5.4524 |
| **5212C** | H501 | 0.4208 | 0.5792 | 5.7920 | 4.2080 | 5.3300 | 5.3300 |
| **5212M** | H501 | 0.4208 | 0.5792 | 8.6880 | 6.3120 | 5.3300 | 5.3300 |
| **5213C** | H501 | 0.4265 | 0.5735 | 6.3086 | 4.6914 | 5.7636 | 5.7636 |
| **5213M** | H501 | 0.4265 | 0.5735 | 9.1761 | 6.8239 | 5.7636 | 5.7636 |
| **5214C** | H501 | 0.4260 | 0.5740 | 6.3144 | 4.6856 | 5.7206 | 5.7206 |
| **5214M** | H501 | 0.4260 | 0.5740 | 9.7586 | 7.2414 | 5.7206 | 5.7206 |
| **5215C** | H501 | 0.4255 | 0.5745 | 6.3196 | 4.6804 | 5.6826 | 5.6826 |
| **5215M** | H501 | 0.4255 | 0.5745 | 9.7666 | 7.2334 | 5.6826 | 5.6826 |
| **5216C** | H501 | 0.4239 | 0.5761 | 5.7608 | 4.2392 | 5.5596 | 5.5596 |
| **5216M** | H501 | 0.4239 | 0.5761 | 9.7934 | 7.2066 | 5.5596 | 5.5596 |
| **5217C** | H501 | 0.4227 | 0.5773 | 5.7732 | 4.2268 | 5.4663 | 5.4663 |
| **5217M** | H501 | 0.4227 | 0.5773 | 9.2371 | 6.7629 | 5.4663 | 5.4663 |
| **5218C** | H501 | 0.4249 | 0.5751 | 5.7514 | 4.2486 | 5.6330 | 5.6330 |
| **5218M** | H501 | 0.4249 | 0.5751 | 9.2022 | 6.7978 | 5.6330 | 5.6330 |
| **5220** | H501 | 0.4250 | 0.5750 | 9.1993 | 6.8007 | 5.6470 | 5.6470 |
| **5222** | H501 | 0.4232 | 0.5768 | 9.2282 | 6.7718 | 5.5082 | 5.5082 |
| **5300SB** | H501 | 0.3832 | 0.6168 | 4.9344 | 3.0656 | 3.8034 | 3.8034 |
| **5302SB** | H502 | 0.3967 | 0.6033 | 4.8265 | 3.1735 | 4.1991 | 4.1991 |
| **5303SB** | H501 | 0.3910 | 0.6090 | 4.8717 | 3.1283 | 3.9612 | 3.9612 |
| **5304C** | H501 | 0.3966 | 0.6034 | 4.8267 | 3.1733 | 4.0112 | 4.0112 |
| **5304M** | H501 | 0.3966 | 0.6034 | 6.6480 | 4.3520 | 3.9684 | 3.9684 |
| **5305C** | H501 | 0.3973 | 0.6027 | 4.8218 | 3.1782 | 4.0372 | 4.0372 |
| **5305M** | H501 | 0.3973 | 0.6027 | 7.2327 | 4.7673 | 4.0372 | 4.0372 |
| **5306C** | H501 | 0.3962 | 0.6038 | 4.8301 | 3.1699 | 3.9935 | 3.9935 |
| **5306M** | H501 | 0.3962 | 0.6038 | 7.2451 | 4.7549 | 3.9935 | 3.9935 |
| **5307C** | H501 | 0.3961 | 0.6039 | 4.8314 | 3.1686 | 3.9868 | 3.9868 |
| **5307M** | H501 | 0.3961 | 0.6039 | 6.6431 | 4.3569 | 3.9868 | 3.9868 |
| **5308C** | H501 | 0.3963 | 0.6037 | 4.8298 | 3.1702 | 3.9952 | 3.9952 |
| **5308M** | H501 | 0.3963 | 0.6037 | 7.2446 | 4.7554 | 3.9952 | 3.9952 |
| **5309C** | H501 | 0.3968 | 0.6032 | 4.8254 | 3.1746 | 4.0182 | 4.0182 |
| **5309M** | H501 | 0.3968 | 0.6032 | 7.2381 | 4.7619 | 4.0182 | 4.0182 |
| **5310C** | H501 | 0.3980 | 0.6020 | 4.8161 | 3.1839 | 4.0682 | 4.0682 |
| **5310M** | H501 | 0.3980 | 0.6020 | 7.2241 | 4.7759 | 4.0682 | 4.0682 |
| **5311C** | H501 | 0.3964 | 0.6036 | 4.8291 | 3.1709 | 3.9988 | 3.9988 |
| **5311M** | H501 | 0.3964 | 0.6036 | 7.2436 | 4.7564 | 3.9988 | 3.9988 |
| **5312C** | H501 | 0.3970 | 0.6030 | 4.8242 | 3.1758 | 4.0246 | 4.0246 |
| **5312M** | H501 | 0.3970 | 0.6030 | 7.2363 | 4.7637 | 4.0246 | 4.0246 |
| **5313C** | H501 | 0.3979 | 0.6021 | 4.8169 | 3.1831 | 4.0636 | 4.0636 |
| **5313M** | H501 | 0.3979 | 0.6021 | 7.2254 | 4.7746 | 4.0636 | 4.0636 |
| **5314C** | H501 | 0.3992 | 0.6008 | 4.8065 | 3.1935 | 4.1208 | 4.1208 |
| **5314M** | H501 | 0.3992 | 0.6008 | 7.2097 | 4.7903 | 4.1208 | 4.1208 |
| **5315C** | H501 | 0.3974 | 0.6026 | 4.8203 | 3.1797 | 4.0455 | 4.0455 |
| **5315M** | H501 | 0.3974 | 0.6026 | 7.2304 | 4.7696 | 4.0455 | 4.0455 |
| **5316M** | H501 | 0.4002 | 0.5998 | 7.1978 | 4.8022 | 4.1652 | 4.1652 |
| **5317** | H501 | 0.4014 | 0.5986 | 7.1828 | 4.8172 | 4.2222 | 4.2222 |
| **5318** | H501 | 0.4018 | 0.5982 | 7.1784 | 4.8216 | 4.2394 | 4.2394 |
| **5319** | H501 | 0.4068 | 0.5932 | 7.7117 | 5.2883 | 4.4842 | 4.4842 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| | | Inner rotation | Outer rotation | Inner or outer ring rotation | | Inner rotation | Outer rotation |
|---|---|---|---|---|---|---|---|
| Bearing size | Suffix | Cage speed frequency (rpm) | Cage speed frequency (rpm) | Inner ring frequency | Outer ring frequency | Rolling element frequency | Rolling element frequency |
| **5320** | H501 | 0.3996 | 0.6004 | 7.2046 | 4.7954 | 4.1397 | 4.1397 |
| **5321** | H501 | 0.4000 | 0.6000 | 7.1998 | 4.8002 | 4.1576 | 4.1576 |
| **5322** | H501 | 0.4018 | 0.5982 | 7.1784 | 4.8216 | 4.2394 | 4.2394 |
| **5406C** | H501 | 0.3748 | 0.6252 | 4.3767 | 2.6233 | 3.4184 | 3.4184 |
| **5407C** | H501 | 0.3711 | 0.6289 | 3.7735 | 2.2265 | 3.3078 | 3.3078 |
| **5408C** | H501 | 0.3743 | 0.6257 | 3.7541 | 2.2459 | 3.4046 | 3.4046 |
| **5409C** | H501 | 0.3776 | 0.6225 | 4.3572 | 2.6428 | 3.5063 | 3.5063 |
| **5410C** | H502 | 0.3722 | 0.6278 | 4.3946 | 2.6054 | 3.3405 | 3.3405 |
| **5411C** | H501 | 0.3810 | 0.6190 | 4.3329 | 2.6671 | 3.6212 | 3.6212 |
| **5412C** | H501 | 0.3826 | 0.6174 | 4.3218 | 2.6782 | 3.6762 | 3.6762 |
| **5413C** | H501 | 0.3722 | 0.6278 | 4.3943 | 2.6057 | 3.3417 | 3.3417 |
| **5414C** | H502 | 0.3840 | 0.6160 | 4.3121 | 2.6879 | 3.7251 | 3.7251 |
| **5415C** | H501 | 0.3742 | 0.6258 | 4.3806 | 2.6194 | 3.7229 | 3.7229 |
| **5416C** | H501 | 0.3753 | 0.6247 | 4.3731 | 2.6269 | 3.7591 | 3.7591 |
| **5417C** | H501 | 0.3709 | 0.6292 | 4.4041 | 2.5960 | 3.6130 | 3.6130 |
| **5418C** | H501 | 0.3690 | 0.6310 | 4.4172 | 2.5828 | 3.5538 | 3.5538 |
| **7100KR** | XXXX | 0.3843 | 0.6157 | 4.9256 | 3.0744 | 3.5773 | 3.5773 |
| **7101KR** | XXXX | 0.3959 | 0.6041 | 5.4372 | 3.5628 | 4.0173 | 4.0173 |
| **7102KR** | XXXX | 0.4114 | 0.5886 | 5.8862 | 4.1138 | 4.7794 | 4.7794 |
| **7103KR** | XXXX | 0.4065 | 0.5935 | 6.5281 | 4.4719 | 4.5152 | 4.5152 |
| **7104KR** | XXXX | 0.4104 | 0.5896 | 6.4853 | 4.5147 | 4.7253 | 4.7253 |
| **7105KR** | XXXX | 0.4229 | 0.5771 | 7.5027 | 5.4973 | 5.5347 | 5.5347 |
| **7106KR** | XXXX | 0.4265 | 0.5735 | 8.0292 | 5.9708 | 5.8199 | 5.8199 |
| **7107KR** | XXXX | 0.4284 | 0.5716 | 8.0020 | 5.9980 | 5.9852 | 5.9852 |
| **7108KR** | XXXX | 0.4357 | 0.5643 | 8.4642 | 6.5358 | 6.6908 | 6.6908 |
| **7109KR** | XXXX | 0.4363 | 0.5637 | 9.0183 | 6.9817 | 6.7598 | 6.7598 |
| **7110KR** | XXXX | 0.4412 | 0.5588 | 9.4987 | 7.5013 | 7.3408 | 7.3408 |
| **7111KR** | XXXX | 0.4377 | 0.5623 | 9.5582 | 7.4418 | 6.9165 | 6.9165 |
| **7112KR** | XXXX | 0.4418 | 0.5582 | 10.0482 | 7.9518 | 7.4079 | 7.4079 |
| **7113KR** | XXXX | 0.4453 | 0.5547 | 10.5393 | 8.4607 | 7.8987 | 7.8987 |
| **7114KR** | XXXX | 0.4460 | 0.5540 | 11.0799 | 8.9201 | 8.0045 | 8.0045 |
| **7115KR** | XXXX | 0.4488 | 0.5512 | 11.5742 | 9.4258 | 8.4595 | 8.4595 |
| **7116KR** | XXXX | 0.4458 | 0.5542 | 11.6378 | 9.3622 | 7.9762 | 7.9762 |
| **7117KR** | XXXX | 0.4483 | 0.5517 | 12.1366 | 9.8634 | 8.3742 | 8.3742 |
| **7118KR** | XXXX | 0.4457 | 0.5543 | 11.6409 | 9.3591 | 7.9540 | 7.9540 |
| **7119KR** | XXXX | 0.4421 | 0.5579 | 11.1570 | 8.8430 | 7.4580 | 7.4580 |
| **7120** | XXXX | 0.4410 | 0.5590 | 11.1794 | 8.8206 | 7.3127 | 7.3127 |
| **7120KR** | XXXX | 0.4500 | 0.5500 | 12.6496 | 10.3504 | 8.6615 | 8.6615 |
| **7121KR** | XXXX | 0.4476 | 0.5524 | 12.1527 | 9.8473 | 8.2549 | 8.2549 |
| **7122** | XXXX | 0.4413 | 0.5587 | 11.7323 | 9.2677 | 7.3495 | 7.3495 |
| **7122KR** | XXXX | 0.4454 | 0.5546 | 11.6455 | 9.3545 | 7.9217 | 7.9217 |
| **7124** | XXXX | 0.4418 | 0.5582 | 11.7227 | 9.2773 | 7.4088 | 7.4088 |
| **7124KR** | XXXX | 0.4491 | 0.5509 | 12.1200 | 9.8800 | 8.5008 | 8.5008 |
| **7126** | XXXX | 0.4461 | 0.5539 | 12.1854 | 9.8146 | 8.0221 | 8.0221 |
| **7126KR** | XXXX | 0.4453 | 0.5547 | 12.2033 | 9.7967 | 7.8995 | 7.8995 |
| **7128** | XXXX | 0.4458 | 0.5542 | 12.1926 | 9.8074 | 7.9721 | 7.9721 |
| **7128KR** | XXXX | 0.4484 | 0.5516 | 12.1346 | 9.8654 | 8.3895 | 8.3895 |
| **7130** | XXXX | 0.4457 | 0.5543 | 12.1947 | 9.8053 | 7.9577 | 7.9577 |
| **7130KR** | XXXX | 0.4482 | 0.5518 | 12.1404 | 9.8596 | 8.3458 | 8.3458 |
| **7132** | XXXX | 0.4458 | 0.5542 | 12.1920 | 9.8080 | 7.9761 | 7.9761 |
| **7132KR** | XXXX | 0.4479 | 0.5521 | 12.1455 | 9.8545 | 8.3079 | 8.3079 |
| **7134** | XXXX | 0.4457 | 0.5543 | 12.1938 | 9.8062 | 7.9644 | 7.9644 |
| **7134KR** | XXXX | 0.4451 | 0.5549 | 11.6527 | 9.3473 | 7.8707 | 7.8707 |
| **7136** | XXXX | 0.4457 | 0.5543 | 12.1953 | 9.8047 | 7.9539 | 7.9539 |
| **7136KR** | XXXX | 0.4457 | 0.5543 | 12.1953 | 9.8047 | 7.9539 | 7.9539 |
| **7138** | XXXX | 0.4433 | 0.5567 | 12.2468 | 9.7532 | 7.6174 | 7.6174 |
| **7138KR** | XXXX | 0.4479 | 0.5521 | 12.6975 | 10.3025 | 8.3079 | 8.3079 |
| **7140** | XXXX | 0.4439 | 0.5561 | 12.2336 | 9.7664 | 7.7009 | 7.7009 |
| **7140KR** | XXXX | 0.4455 | 0.5545 | 12.1979 | 9.8021 | 7.9363 | 7.9363 |
| **7142** | XXXX | 0.4419 | 0.5581 | 11.7193 | 9.2807 | 7.4301 | 7.4301 |
| **7144** | XXXX | 0.4440 | 0.5560 | 12.2326 | 9.7674 | 7.7076 | 7.7076 |
| **7144KR** | XXXX | 0.4405 | 0.5595 | 11.7496 | 9.2504 | 7.2450 | 7.2450 |
| **7146** | XXXX | 0.4445 | 0.5555 | 12.2218 | 9.7782 | 7.7769 | 7.7769 |
| **7148** | XXXX | 0.4449 | 0.5551 | 12.2121 | 9.7879 | 7.8406 | 7.8406 |
| **7148KR** | XXXX | 0.4445 | 0.5555 | 12.2218 | 9.7782 | 7.7769 | 7.7769 |
| **7152** | XXXX | 0.4457 | 0.5543 | 12.1953 | 9.8047 | 7.9540 | 7.9540 |
| **7152KR** | XXXX | 0.4411 | 0.5589 | 11.7370 | 9.2630 | 7.3210 | 7.3210 |
| **7156** | XXXX | 0.4456 | 0.5544 | 12.1971 | 9.8029 | 7.9417 | 7.9417 |
| **7156KR** | XXXX | 0.4445 | 0.5555 | 12.2218 | 9.7782 | 7.7769 | 7.7769 |
| **7160KR** | XXXX | 0.4415 | 0.5585 | 11.7277 | 9.2723 | 7.3780 | 7.3780 |
| **7164** | XXXX | 0.4458 | 0.5542 | 12.1920 | 9.8080 | 7.9761 | 7.9761 |
| **7164KR** | XXXX | 0.4445 | 0.5555 | 12.2218 | 9.7782 | 7.7769 | 7.7769 |
| **7200P** | XXXX | 0.3784 | 0.6216 | 4.9729 | 3.0271 | 2.9633 | 2.9633 |
| **7200S** | 0003 | 0.3741 | 0.6259 | 4.3814 | 2.6186 | 3.3705 | 3.3705 |
| **7201P** | XXXX | 0.3894 | 0.6106 | 5.4950 | 3.5050 | 3.2950 | 3.2950 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation<br>Cage speed frequency (rpm) | Outer rotation<br>Cage speed frequency (rpm) | Inner or outer ring rotation<br>Inner ring frequency | Inner or outer ring rotation<br>Outer ring frequency | Inner rotation<br>Rolling element frequency | Outer rotation<br>Rolling element frequency |
|---|---|---|---|---|---|---|---|
| **7201S** | 0001 | 0.3705 | 0.6295 | 4.4063 | 2.5937 | 3.2653 | 3.2653 |
| **7202** | H401 | 0.3855 | 0.6145 | 6.1449 | 3.8551 | 3.7505 | 3.7505 |
| **7202P** | XXXX | 0.3905 | 0.6095 | 4.8757 | 3.1243 | 3.3314 | 3.3314 |
| **7203** | H401 | 0.3858 | 0.6142 | 6.1419 | 3.8581 | 3.7614 | 3.7614 |
| **7203P** | XXXX | 0.3933 | 0.6067 | 5.4600 | 3.5400 | 3.4273 | 3.4273 |
| **7204** | 0001 | 0.4038 | 0.5962 | 6.5578 | 4.4422 | 4.5381 | 4.5381 |
| **7204-BKE** | XXXX | 0.4038 | 0.5962 | 6.5578 | 4.4422 | 4.5381 | 4.5381 |
| **7204P** | XXXX | 0.4001 | 0.5999 | 5.9984 | 4.0016 | 3.6833 | 3.6833 |
| **7205** | H501 | 0.4079 | 0.5921 | 7.1051 | 4.8949 | 4.5874 | 4.5874 |
| **7205DU** | 0004 | 0.4079 | 0.5921 | 6.5130 | 4.4870 | 4.5874 | 4.5874 |
| **7205P** | XXXX | 0.4131 | 0.5869 | 7.0425 | 4.9575 | 4.2759 | 4.2759 |
| **7205P-BKE** | XXXX | 0.4131 | 0.5869 | 6.4553 | 4.5447 | 4.2772 | 4.2772 |
| **7205PJ** | H501 | 0.4210 | 0.5790 | 8.1055 | 5.8945 | 4.7296 | 4.7296 |
| **7206** | 0C01 | 0.4249 | 0.5751 | 8.0512 | 5.9488 | 5.6930 | 5.6930 |
| **7206** | 0001 | 0.4249 | 0.5751 | 8.0512 | 5.9488 | 5.6930 | 5.6930 |
| **7206P** | XXXX | 0.4140 | 0.5860 | 6.4452 | 4.5548 | 4.3256 | 4.3256 |
| **7206PJ** | H501 | 0.4140 | 0.5860 | 7.6171 | 5.3829 | 4.3256 | 4.3256 |
| **7207** | 0001 | 0.4225 | 0.5775 | 8.0846 | 5.9154 | 5.5093 | 5.5093 |
| **7207P** | XXXX | 0.4147 | 0.5853 | 7.0230 | 4.9770 | 4.3624 | 4.3624 |
| **7207PJ** | H501 | 0.4147 | 0.5853 | 7.6082 | 5.3918 | 4.3624 | 4.3624 |
| **7208** | 0C01 | 0.4190 | 0.5810 | 8.1339 | 5.8661 | 5.2576 | 5.2576 |
| **7208P** | XXXX | 0.4189 | 0.5811 | 6.9729 | 5.0271 | 4.6002 | 4.6002 |
| **7208PJ** | H501 | 0.4194 | 0.5806 | 8.1275 | 5.8725 | 4.6324 | 4.6324 |
| **7209** | 0C01 | 0.4252 | 0.5748 | 8.0467 | 5.9533 | 5.7186 | 5.7186 |
| **7209-BKE** | XXXX | 0.4252 | 0.5748 | 8.6214 | 6.3786 | 5.7186 | 5.7186 |
| **7209P** | XXXX | 0.4205 | 0.5795 | 7.5338 | 5.4662 | 4.6948 | 4.6948 |
| **7209PJ** | H501 | 0.4251 | 0.5749 | 8.6225 | 6.3775 | 5.0035 | 5.0035 |
| **7210** | 0001 | 0.4309 | 0.5691 | 9.1052 | 6.8948 | 6.2099 | 6.2099 |
| **7210P** | XXXX | 0.4261 | 0.5739 | 8.0338 | 5.9662 | 5.0740 | 5.0740 |
| **7210PJ** | H501 | 0.4305 | 0.5695 | 9.1119 | 6.8881 | 5.4053 | 5.4053 |
| **7211** | 0001 | 0.4183 | 0.5817 | 8.1441 | 5.8559 | 5.2082 | 5.2082 |
| **7211P** | XXXX | 0.4254 | 0.5746 | 8.0434 | 5.9566 | 5.0251 | 5.0251 |
| **7211PJ** | H501 | 0.4294 | 0.5706 | 9.1297 | 6.8703 | 5.3165 | 5.3165 |
| **7212** | 0001 | 0.4268 | 0.5732 | 9.1703 | 6.8297 | 5.8511 | 5.8511 |
| **7212P** | XXXX | 0.4249 | 0.5751 | 8.0516 | 5.9484 | 4.9840 | 4.9840 |
| **7212PJ** | H501 | 0.4274 | 0.5726 | 8.5885 | 6.4115 | 5.1672 | 5.1672 |
| **7213** | 0001 | 0.4249 | 0.5751 | 9.2008 | 6.7992 | 5.6954 | 5.6954 |
| **7213-BKE** | XXXX | 0.4249 | 0.5751 | 8.6258 | 6.3742 | 5.6954 | 5.6954 |
| **7213DB** | H701 | 0.3977 | 0.6023 | 6.6254 | 4.3746 | 4.0954 | 4.0954 |
| **7213P** | XXXX | 0.4277 | 0.5723 | 8.0123 | 5.9877 | 5.1864 | 5.1864 |
| **7213PJ** | H501 | 0.4277 | 0.5723 | 8.5846 | 6.4154 | 5.1864 | 5.1864 |
| **7214** | 0004 | 0.4291 | 0.5709 | 9.1336 | 6.8664 | 6.0485 | 6.0485 |
| **7214P** | XXXX | 0.4283 | 0.5717 | 8.0041 | 5.9959 | 5.2304 | 5.2304 |
| **7214PJ** | H501 | 0.4305 | 0.5695 | 9.1124 | 6.8876 | 5.4024 | 5.4024 |
| **7215** | 0001 | 0.4255 | 0.5745 | 9.7666 | 7.2334 | 5.7393 | 5.7393 |
| **7215-BKE** | XXXX | 0.4255 | 0.5745 | 9.1921 | 6.8079 | 5.7393 | 5.7393 |
| **7215P** | XXXX | 0.4318 | 0.5682 | 8.5234 | 6.4766 | 5.5097 | 5.5097 |
| **7215PJ** | H501 | 0.4338 | 0.5662 | 9.6243 | 7.3757 | 5.6902 | 5.6902 |
| **7216** | 0001 | 0.4306 | 0.5694 | 9.1108 | 6.8892 | 6.1778 | 6.1778 |
| **7216-BKE** | XXXX | 0.4306 | 0.5694 | 9.6802 | 7.3198 | 6.1778 | 6.1778 |
| **7216P** | XXXX | 0.4336 | 0.5664 | 9.0613 | 6.9387 | 5.6726 | 5.6726 |
| **7216PJ** | H501 | 0.4336 | 0.5664 | 9.6277 | 7.3723 | 5.6726 | 5.6726 |
| **7217** | 0001 | 0.4291 | 0.5709 | 9.7053 | 7.2947 | 6.0440 | 6.0440 |
| **7217P** | XXXX | 0.4301 | 0.5699 | 8.5480 | 6.4520 | 5.3753 | 5.3753 |
| **7217PJ** | H501 | 0.4315 | 0.5685 | 9.0953 | 6.9047 | 5.4902 | 5.4902 |
| **7218** | 0001 | 0.4222 | 0.5778 | 9.2441 | 6.7559 | 5.4882 | 5.4882 |
| **7218DT** | 0001 | 0.4222 | 0.5778 | 8.6663 | 6.3337 | 5.4882 | 5.4882 |
| **7218P** | XXXX | 0.4294 | 0.5706 | 8.5581 | 6.4419 | 5.3220 | 5.3220 |
| **7218PJ** | H501 | 0.4310 | 0.5690 | 9.1031 | 6.8969 | 5.4501 | 5.4501 |
| **7219** | 0001 | 0.4266 | 0.5734 | 9.7470 | 7.2530 | 5.8334 | 5.8334 |
| **7219-BKE** | XXXX | 0.4266 | 0.5734 | 9.1736 | 6.8264 | 5.8334 | 5.8334 |
| **7219P** | XXXX | 0.4306 | 0.5694 | 9.1101 | 6.8899 | 5.4144 | 5.4144 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation<br>Cage speed frequency (rpm) | Outer rotation<br>Cage speed frequency (rpm) | Inner or outer ring rotation<br>Inner ring frequency | Inner or outer ring rotation<br>Outer ring frequency | Inner rotation<br>Rolling element frequency | Outer rotation<br>Rolling element frequency |
|---|---|---|---|---|---|---|---|
| **7220** | 0001 | 0.4260 | 0.5740 | 9.7582 | 7.2418 | 5.7792 | 5.7792 |
| **7220-BKE** | XXXX | 0.4214 | 0.5786 | 9.2575 | 6.7425 | 5.4268 | 5.4268 |
| **7220P** | XXXX | 0.4305 | 0.5695 | 9.1119 | 6.8881 | 5.4053 | 5.4053 |
| **7221** | 0003 | 0.4251 | 0.5749 | 9.1989 | 6.8011 | 5.7050 | 5.7050 |
| **7221P** | XXXX | 0.4299 | 0.5701 | 8.5512 | 6.4488 | 5.3581 | 5.3581 |
| **7222** | 0002 | 0.4238 | 0.5762 | 9.2183 | 6.7817 | 5.6102 | 5.6102 |
| **7222P** | XXXX | 0.4294 | 0.5706 | 8.5592 | 6.4408 | 5.3162 | 5.3162 |
| **7224** | 0002 | 0.4250 | 0.5750 | 9.1991 | 5.8009 | 5.7042 | 5.7042 |
| **7224P** | XXXX | 0.4311 | 0.5689 | 8.5331 | 6.4669 | 5.4557 | 5.4557 |
| **7226** | 0001 | 0.4268 | 0.5732 | 9.7436 | 7.2564 | 5.8499 | 5.8499 |
| **7226P** | XXXX | 0.4325 | 0.5675 | 9.0795 | 6.9205 | 5.5738 | 5.5738 |
| **7228** | XXXX | 0.4284 | 0.5716 | 9.7163 | 7.2837 | 5.9873 | 5.9873 |
| **7228P** | XXXX | 0.4345 | 0.5655 | 9.0477 | 6.9523 | 5.7490 | 5.7490 |
| **7230** | XXXX | 0.4273 | 0.5727 | 9.7364 | 7.2636 | 5.8857 | 5.8857 |
| **7230P** | XXXX | 0.4334 | 0.5666 | 9.0655 | 6.9345 | 5.6494 | 5.6494 |
| **7232** | XXXX | 0.4259 | 0.5741 | 9.7589 | 7.2411 | 5.7760 | 5.7760 |
| **7232P** | XXXX | 0.4351 | 0.5649 | 9.0377 | 6.9623 | 5.8062 | 5.8062 |
| **7234** | XXXX | 0.4248 | 0.5752 | 9.2033 | 6.7967 | 5.6831 | 5.6831 |
| **7234P** | XXXX | 0.4341 | 0.5659 | 9.0540 | 6.9460 | 5.7137 | 5.7137 |
| **7236** | XXXX | 0.4278 | 0.5722 | 9.7274 | 7.2726 | 5.9306 | 5.9306 |
| **7236P** | XXXX | 0.4367 | 0.5633 | 9.5750 | 7.4250 | 5.9600 | 5.9600 |
| **7238** | XXXX | 0.4293 | 0.5707 | 10.2732 | 7.7268 | 6.0588 | 6.0588 |
| **7238P** | XXXX | 0.4380 | 0.5620 | 10.1151 | 7.8849 | 6.0877 | 6.0877 |
| **7240** | XXXX | 0.4306 | 0.5694 | 10.2496 | 7.7504 | 6.1778 | 6.1778 |
| **7240P** | XXXX | 0.4370 | 0.5630 | 9.5706 | 7.4294 | 5.9855 | 5.9855 |
| **7242** | XXXX | 0.4294 | 0.5706 | 10.2708 | 7.7292 | 6.0707 | 6.0707 |
| **7244** | XXXX | 0.4283 | 0.5717 | 9.7183 | 7.2817 | 5.9770 | 5.9770 |
| **7246** | XXXX | 0.4274 | 0.5726 | 9.7347 | 7.2653 | 5.8943 | 5.8943 |
| **7248** | XXXX | 0.4265 | 0.5735 | 9.7496 | 7.2504 | 5.8207 | 5.8207 |
| **7250** | XXXX | 0.4257 | 0.5743 | 9.7633 | 7.2367 | 5.7548 | 5.7548 |
| **7252** | XXXX | 0.4249 | 0.5751 | 9.7759 | 7.2241 | 5.6955 | 5.6955 |
| **7256** | XXXX | 0.4288 | 0.5712 | 10.2817 | 7.7183 | 6.0172 | 6.0172 |
| **7260** | XXXX | 0.4306 | 0.5694 | 10.2496 | 7.7504 | 6.1778 | 6.1778 |
| **7264** | XXXX | 0.4321 | 0.5679 | 10.2218 | 7.7782 | 6.3236 | 6.3236 |
| **7300P** | XXXX | 0.3648 | 0.6352 | 4.4458 | 2.5542 | 2.6279 | 2.6279 |
| **7300S** | XXXX | 0.3705 | 0.6295 | 4.4063 | 2.5937 | 3.2653 | 3.2653 |
| **7301P** | XXXX | 0.3634 | 0.6366 | 4.4556 | 2.5444 | 2.5965 | 2.5965 |
| **7301S** | XXXX | 0.3777 | 0.6223 | 6.2228 | 3.7772 | 3.4843 | 3.4843 |
| **7302P** | XXXX | 0.3826 | 0.6174 | 4.9388 | 3.0612 | 3.0840 | 3.0840 |
| **7303** | XXXX | 0.3915 | 0.6085 | 6.0847 | 3.9153 | 3.8419 | 3.8419 |
| **7303P** | XXXX | 0.3764 | 0.6236 | 4.9882 | 3.0118 | 2.9117 | 2.8117 |
| **7304** | 0001 | 0.3834 | 0.6166 | 6.1654 | 3.8346 | 3.5487 | 3.5487 |
| **7304P** | XXXX | 0.3947 | 0.6053 | 5.4470 | 3.5530 | 3.4789 | 3.4789 |
| **7304PJ** | H501 | 0.3947 | 0.6053 | 6.0522 | 3.9478 | 3.4789 | 3.4789 |
| **7305** | 0001 | 0.4047 | 0.5953 | 7.1433 | 4.8567 | 4.4232 | 4.4232 |
| **7305P** | XXXX | 0.3951 | 0.6049 | 5.4436 | 3.5564 | 3.4925 | 3.4925 |
| **7305PJ** | H501 | 0.3987 | 0.6013 | 6.6140 | 4.3860 | 3.6271 | 3.6271 |
| **7306** | 0001 | 0.4052 | 0.5948 | 7.1378 | 4.8622 | 4.4465 | 4.4465 |
| **7306P** | XXXX | 0.3986 | 0.6014 | 6.0135 | 3.9865 | 3.6239 | 3.6239 |
| **7306PJ** | H501 | 0.3986 | 0.6014 | 6.6148 | 4.3852 | 3.6239 | 3.6239 |
| **7307** | 0C01 | 0.4039 | 0.5961 | 7.1533 | 4.8467 | 4.3821 | 4.3821 |
| **7307P** | XXXX | 0.3995 | 0.6005 | 6.0047 | 3.9953 | 3.6585 | 3.6585 |
| **7307PJ** | H501 | 0.4048 | 0.5952 | 6.5469 | 4.4531 | 3.8787 | 3.8787 |
| **7308** | 0001 | 0.4043 | 0.5957 | 7.1477 | 4.8523 | 4.4050 | 4.4050 |
| **7308P** | XXXX | 0.4064 | 0.5936 | 6.5290 | 4.4710 | 3.9512 | 3.9512 |
| **7308PJ** | H501 | 0.4064 | 0.5936 | 7.1225 | 4.8775 | 3.9512 | 3.9512 |
| **7309** | 0001 | 0.4047 | 0.5953 | 7.1433 | 4.8567 | 4.4233 | 4.4233 |
| **7309P** | XXXX | 0.4035 | 0.5965 | 6.5610 | 4.4390 | 3.8233 | 3.8233 |
| **7309PJ** | H501 | 0.4065 | 0.5935 | 7.1221 | 4.8779 | 3.9530 | 3.9530 |
| **7310** | 0001 | 0.3959 | 0.6041 | 7.2496 | 4.7504 | 4.0173 | 4.0173 |
| **7310DU** | 0002 | 0.3959 | 0.6041 | 6.6455 | 4.3545 | 4.0173 | 4.0173 |
| **7310P** | XXXX | 0.4055 | 0.5945 | 7.1331 | 4.8669 | 3.9118 | 3.9118 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation<br>Cage speed frequency (rpm) | Outer rotation<br>Cage speed frequency (rpm) | Inner or outer ring rotation<br>Inner ring frequency | Inner or outer ring rotation<br>Outer ring frequency | Inner rotation<br>Rolling element frequency | Outer rotation<br>Rolling element frequency |
|---|---|---|---|---|---|---|---|
| 7310PJ | XXXX | 0.4055 | 0.5945 | 7.1331 | 4.8669 | 3.9118 | 3.9118 |
| 7311 | 0002 | 0.3943 | 0.6057 | 7.2686 | 4.7314 | 3.9517 | 3.9517 |
| 7311P | XXXX | 0.4063 | 0.5937 | 6.5308 | 4.4692 | 3.9436 | 3.9436 |
| 7311PJ | H501 | 0.4063 | 0.5937 | 7.1245 | 4.8755 | 3.9436 | 3.9436 |
| 7312 | 0001 | 0.3977 | 0.6023 | 7.2277 | 4.7723 | 4.0954 | 4.0954 |
| 7312P | XXXX | 0.4072 | 0.5928 | 6.5209 | 4.4791 | 3.9847 | 3.9847 |
| 7312PJ | H501 | 0.4073 | 0.5927 | 7.1126 | 4.8874 | 3.9891 | 3.9891 |
| 7313 | 0001 | 0.4056 | 0.5944 | 8.3209 | 5.6791 | 4.4700 | 4.4700 |
| 7313P | XXXX | 0.4080 | 0.5920 | 7.1034 | 4.8966 | 4.0246 | 4.0246 |
| 7313PJ | H501 | 0.4080 | 0.5920 | 7.1034 | 4.8966 | 4.0246 | 4.0246 |
| 7314 | 0001 | 0.4053 | 0.5947 | 7.1360 | 4.8640 | 4.4538 | 4.4538 |
| 7314P | XXXX | 0.4088 | 0.5912 | 7.0945 | 4.9055 | 4.0595 | 4.0595 |
| 7314PJ | H501 | 0.4088 | 0.5912 | 7.0945 | 4.9055 | 4.0595 | 4.0595 |
| 7315 | 0004 | 0.4059 | 0.5941 | 8.3169 | 5.6831 | 4.4846 | 4.4846 |
| 7315DT | 0003 | 0.4059 | 0.5941 | 8.3169 | 5.6831 | 4.4846 | 4.4846 |
| 7315P | XXXX | 0.4068 | 0.5932 | 6.5246 | 4.4754 | 3.9693 | 3.9693 |
| 7315PJ | H501 | 0.4120 | 0.5880 | 7.6436 | 5.3564 | 4.2191 | 4.2191 |
| 7316 | 0001 | 0.4056 | 0.5944 | 7.7274 | 5.2726 | 4.4666 | 4.4666 |
| 7316P | XXXX | 0.4124 | 0.5876 | 7.0507 | 4.9493 | 4.2403 | 4.2403 |
| 7316PJ | H501 | 0.4124 | 0.5876 | 7.6383 | 5.3617 | 4.2403 | 4.2403 |
| 7317 | 0001 | 0.4061 | 0.5939 | 8.3138 | 5.6862 | 4.4960 | 4.4960 |
| 7317DU | 0004 | 0.4061 | 0.5939 | 7.7199 | 5.2801 | 4.4960 | 4.4960 |
| 7317P | XXXX | 0.4128 | 0.5872 | 7.0463 | 4.9537 | 4.2593 | 4.2593 |
| 7317PJ | H501 | 0.4128 | 0.5872 | 7.6335 | 5.3665 | 4.2593 | 4.2593 |
| 7318 | 0003 | 0.4058 | 0.5942 | 7.7248 | 5.2752 | 4.4767 | 4.4767 |
| 7318P | XXXX | 0.4131 | 0.5869 | 7.0424 | 4.9576 | 4.2764 | 4.2764 |
| 7318PJ | H501 | 0.4131 | 0.5869 | 7.6292 | 5.3708 | 4.2764 | 4.2764 |
| 7319 | 0002 | 0.4059 | 0.5941 | 7.7237 | 5.2763 | 4.4810 | 4.4810 |
| 7319P | XXXX | 0.4134 | 0.5866 | 7.0388 | 4.9612 | 4.2918 | 4.2918 |
| 7319PJ | H501 | 0.4134 | 0.5866 | 7.6254 | 5.3746 | 4.2918 | 4.2918 |
| 7320 | 0002 | 0.4074 | 0.5926 | 7.7033 | 5.2967 | 4.5624 | 4.5624 |
| 7320P | XXXX | 0.4077 | 0.5923 | 7.1077 | 4.8923 | 4.0080 | 4.0080 |
| 7321 | 0004 | 0.4074 | 0.5926 | 7.7033 | 5.2967 | 4.5624 | 4.5624 |
| 7321P | XXXX | 0.4115 | 0.5885 | 7.0613 | 4.9387 | 4.1952 | 4.1952 |
| 7322 | 0001 | 0.4053 | 0.5947 | 7.7316 | 5.2684 | 4.4504 | 4.4504 |
| 7322P | XXXX | 0.4098 | 0.5902 | 7.0820 | 4.9180 | 4.1099 | 4.1099 |
| 7324 | XXXX | 0.4044 | 0.5956 | 7.7425 | 5.2575 | 4.4083 | 4.4083 |
| 7324P | XXXX | 0.4104 | 0.5896 | 7.0753 | 4.9247 | 4.1372 | 4.1372 |
| 7326 | XXXX | 0.4046 | 0.5954 | 7.7401 | 5.2599 | 4.4175 | 4.4175 |
| 7326P | XXXX | 0.4110 | 0.5890 | 7.0678 | 4.9322 | 4.1682 | 4.1682 |
| 7328 | XXXX | 0.4048 | 0.5952 | 7.7380 | 5.2620 | 4.4256 | 4.4256 |
| 7328P | XXXX | 0.4115 | 0.5885 | 7.0613 | 4.9387 | 4.1952 | 4.1952 |
| 7330 | 0004 | 0.4078 | 0.5922 | 8.2900 | 5.7100 | 4.5849 | 4.5849 |
| 7330P | XXXX | 0.4120 | 0.5880 | 7.0557 | 4.9443 | 4.2191 | 4.2191 |
| 7332 | XXXX | 0.4078 | 0.5922 | 8.2907 | 5.7093 | 4.5822 | 4.5822 |
| 7332P | XXXX | 0.4148 | 0.5852 | 7.0215 | 4.9785 | 4.3690 | 4.3690 |
| 7334 | XXXX | 0.4103 | 0.5897 | 8.2551 | 5.7449 | 4.7210 | 4.7210 |
| 7334P | XXXX | 0.4174 | 0.5826 | 7.5738 | 5.4262 | 4.5104 | 4.5104 |
| 7336 | XXXX | 0.4107 | 0.5893 | 8.2496 | 5.7504 | 4.7432 | 4.7432 |
| 7336P | XXXX | 0.4175 | 0.5825 | 7.5728 | 5.4272 | 4.5151 | 4.5151 |
| 7338 | XXXX | 0.4106 | 0.5894 | 8.2520 | 5.7480 | 4.7338 | 4.7338 |
| 7338P | XXXX | 0.4196 | 0.5804 | 7.5450 | 5.4550 | 4.6416 | 4.6416 |
| 7340 | XXXX | 0.4104 | 0.5896 | 8.2541 | 5.7459 | 4.7252 | 4.7252 |
| 7340P | XXXX | 0.4215 | 0.5785 | 8.0984 | 5.9016 | 4.7617 | 4.7617 |
| 7342 | XXXX | 0.4103 | 0.5897 | 8.2560 | 5.7440 | 4.7175 | 4.7175 |
| 7344 | XXXX | 0.4101 | 0.5899 | 8.2578 | 5.7422 | 4.7104 | 4.7104 |
| 7348 | XXXX | 0.4137 | 0.5863 | 8.2083 | 5.7917 | 4.9158 | 4.9158 |
| 7352 | XXXX | 0.4167 | 0.5833 | 8.7496 | 6.2504 | 5.1036 | 5.1036 |
| 7356 | XXXX | 0.4160 | 0.5840 | 8.7593 | 6.2407 | 5.0621 | 5.0621 |
| 7403 | XXXX | 0.3594 | 0.6406 | 5.1248 | 2.8752 | 2.8642 | 2.8642 |
| 7404 | 0002 | 0.3648 | 0.6352 | 5.0812 | 2.9188 | 2.9993 | 2.9993 |
| 7405 | XXXX | 0.3678 | 0.6322 | 5.6901 | 3.3099 | 3.0759 | 3.0759 |

# MRC ball bearing vibration data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation<br>Cage speed frequency (rpm) | Outer rotation<br>Cage speed frequency (rpm) | Inner or outer ring rotation<br>Inner ring frequency | Outer ring frequency | Inner rotation<br>Rolling element frequency | Outer rotation<br>Rolling element frequency |
|---|---|---|---|---|---|---|---|
| 7405P | H501 | 0.3936 | 0.6064 | 6.0639 | 3.9361 | 3.4372 | 3.4372 |
| 7406 | 0001 | 0.3733 | 0.6267 | 6.2664 | 3.7336 | 3.2316 | 3.2316 |
| 7406P | H501 | 0.3938 | 0.6062 | 6.0615 | 3.9385 | 3.4456 | 3.4456 |
| 7407 | XXXX | 0.3772 | 0.6228 | 6.2280 | 3.7720 | 3.3463 | 3.3463 |
| 7407P | H501 | 0.3937 | 0.6063 | 6.0627 | 3.9373 | 3.4413 | 3.4413 |
| 7408 | 0001 | 0.3803 | 0.6197 | 6.1973 | 3.8027 | 3.4430 | 3.4430 |
| 7408P | H501 | 0.3948 | 0.6052 | 6.0514 | 3.9486 | 3.4817 | 3.4817 |
| 7409 | XXXX | 0.3822 | 0.6178 | 6.1781 | 3.8219 | 3.5060 | 3.5060 |
| 7409P | H501 | 0.3934 | 0.6066 | 6.0662 | 3.9338 | 3.4292 | 3.4292 |
| 7410 | XXXX | 0.3843 | 0.6157 | 6.7728 | 4.2272 | 3.5771 | 3.5771 |
| 7410P | H501 | 0.3955 | 0.6045 | 6.0448 | 3.9552 | 3.5059 | 3.5059 |
| 7411 | XXXX | 0.3861 | 0.6139 | 6.7532 | 4.2468 | 3.6393 | 3.6393 |
| 7411P | H501 | 0.3942 | 0.6058 | 6.0576 | 3.9424 | 3.4596 | 3.4596 |
| 7412 | XXXX | 0.3876 | 0.6124 | 6.7364 | 4.2636 | 3.6941 | 3.6941 |
| 7412P | H501 | 0.3960 | 0.6040 | 6.0399 | 3.9601 | 3.5240 | 3.5240 |
| 7413 | XXXX | 0.3889 | 0.6111 | 6.7218 | 4.2782 | 3.7428 | 3.7428 |
| 7413P | H501 | 0.3975 | 0.6025 | 6.0245 | 3.9755 | 3.5815 | 3.5815 |
| 7414 | XXXX | 0.3834 | 0.6166 | 6.7829 | 4.2171 | 3.5455 | 3.5455 |
| 7414P | H501 | 0.3932 | 0.6068 | 6.0676 | 3.9324 | 3.4241 | 3.4241 |
| 7415 | XXXX | 0.3847 | 0.6153 | 6.7679 | 4.2321 | 3.5923 | 3.5923 |
| 7415P | H501 | 0.3947 | 0.6053 | 6.0530 | 3.9470 | 3.4760 | 3.4760 |
| 7416 | XXXX | 0.3859 | 0.6141 | 6.7546 | 4.2454 | 3.6348 | 3.6348 |
| 7416P | H501 | 0.3957 | 0.6043 | 6.0424 | 3.9576 | 3.5146 | 3.5146 |
| 7417 | XXXX | 0.3870 | 0.6130 | 6.7425 | 4.2575 | 3.6738 | 3.6738 |
| 7417P | XXXX | 0.3971 | 0.6029 | 6.0286 | 3.9714 | 3.5660 | 3.5660 |
| 7418 | XXXX | 0.3854 | 0.6146 | 6.7606 | 4.2394 | 3.6154 | 3.6154 |
| 7418P | XXXX | 0.3957 | 0.6043 | 6.0424 | 3.9576 | 3.5146 | 3.5146 |
| 7419 | XXXX | 0.3873 | 0.6127 | 6.7395 | 4.2605 | 3.6837 | 3.6837 |
| 7419P | H501 | 0.3897 | 0.6103 | 6.1025 | 3.8975 | 3.4457 | 3.4457 |
| 7420 | XXXX | 0.3859 | 0.6141 | 6.7553 | 4.2447 | 3.6324 | 3.6324 |
| 7420P | H501 | 0.3888 | 0.6112 | 6.1116 | 3.8884 | 3.4147 | 3.4147 |
| 7421 | XXXX | 0.3805 | 0.6195 | 6.1951 | 3.8049 | 3.4500 | 3.4500 |
| 7422 | XXXX | 0.3805 | 0.6195 | 6.1947 | 3.8053 | 3.4514 | 3.4514 |
| 8008 | H401 | 0.3806 | 0.6194 | 4.3360 | 2.6640 | 3.7585 | 3.7585 |
| 8013 | H401 | 0.3726 | 0.6274 | 4.3916 | 2.6084 | 3.5338 | 3.5338 |
| 8014 | H401 | 0.3830 | 0.6170 | 4.9357 | 3.0643 | 3.8900 | 3.8900 |
| 8016 | H401 | 0.3876 | 0.6124 | 4.8990 | 3.1010 | 4.0669 | 4.0669 |
| 8026 | H401 | 0.4015 | 0.5985 | 5.3866 | 3.6134 | 4.7226 | 4.7226 |
| 8038 | H401 | 0.3740 | 0.6260 | 4.3818 | 2.6182 | 3.5388 | 3.5388 |
| 8218A | 0001 | 0.4297 | 0.5703 | 8.5542 | 6.4458 | 5.3424 | 5.3424 |
| 8218B | 0001 | 0.4144 | 0.5856 | 8.7842 | 6.2158 | 5.4760 | 5.4760 |
| 8219A | 0001 | 0.4291 | 0.5709 | 8.5630 | 6.4370 | 5.2960 | 5.2960 |
| 8219B | 0001 | 0.4195 | 0.5805 | 9.2875 | 6.7125 | 5.8464 | 5.8464 |
| 8220A | XXXX | 0.4307 | 0.5693 | 8.5386 | 6.4614 | 5.4257 | 5.4257 |
| 8220B | XXXX | 0.4188 | 0.5812 | 9.2990 | 6.7010 | 5.7917 | 5.7917 |
| 8222A | 0001 | 0.4296 | 0.5704 | 8.5553 | 6.4447 | 5.3365 | 5.3365 |
| 8222B | 0001 | 0.4169 | 0.5831 | 9.3295 | 6.6705 | 5.6516 | 5.6516 |
| 8224A | 0001 | 0.4313 | 0.5687 | 8.5308 | 6.4692 | 5.4681 | 5.4681 |
| 8224B | 0001 | 0.4178 | 0.5822 | 9.3153 | 6.6847 | 5.7164 | 5.7164 |
| 8238A | XXXX | 0.4382 | 0.5618 | 9.5498 | 7.4502 | 6.1079 | 6.1079 |
| 8238B | XXXX | 0.4220 | 0.5780 | 9.8258 | 7.1742 | 6.0419 | 6.0419 |
| 8308A | 0C01 | 0.4017 | 0.5983 | 5.9823 | 4.0177 | 3.7488 | 3.7488 |
| 8308B | 0C01 | 0.3944 | 0.6056 | 7.2675 | 4.7325 | 4.3682 | 4.3682 |
| 8309A | 0C01 | 0.4035 | 0.5965 | 6.5610 | 4.4390 | 3.8233 | 3.8233 |
| 8309B | 0C01 | 0.3948 | 0.6052 | 7.2627 | 4.7373 | 4.3866 | 4.3866 |
| 8310A | 0C01 | 0.4050 | 0.5950 | 6.5451 | 4.4549 | 3.8857 | 3.8857 |
| 8310B | 0C01 | 0.3832 | 0.6168 | 6.7843 | 4.2157 | 3.9111 | 3.9111 |
| 8311A | 0001 | 0.4062 | 0.5938 | 6.5320 | 4.4680 | 3.9389 | 3.9389 |
| 8311B | 0001 | 0.3832 | 0.6168 | 6.7843 | 4.2157 | 3.9111 | 3.9111 |
| 8312A | 0001 | 0.4072 | 0.5928 | 6.5209 | 4.4791 | 3.9847 | 3.9847 |
| 8312B | 0001 | 0.3870 | 0.6130 | 6.7429 | 4.2571 | 4.0561 | 4.0561 |
| 8313A | 0001 | 0.4080 | 0.5920 | 6.5115 | 4.4885 | 4.0246 | 4.0246 |

# MRC ball bearing vibration data
# Data based on a speed of 1 rpm

## Values in cycles per minute

| | | Inner rotation | Outer rotation | Inner or outer ring rotation | | Inner rotation | Outer rotation |
|---|---|---|---|---|---|---|---|
| Bearing size | Suffix | Cage speed frequency (rpm) | Cage speed frequency (rpm) | Inner ring frequency | Outer ring frequency | Rolling element frequency | Rolling element frequency |
| **8313B** | 0001 | 0.3958 | 0.6042 | 7.2504 | 4.7496 | 4.4338 | 4.4338 |
| **8314A** | 0001 | 0.4060 | 0.5940 | 6.5337 | 4.4663 | 3.9320 | 3.9320 |
| **8314B** | 0001 | 0.3960 | 0.6040 | 7.2484 | 4.7516 | 4.4416 | 4.4416 |
| **8315A** | 0001 | 0.4068 | 0.5932 | 6.5246 | 4.4754 | 3.9693 | 3.9693 |
| **8315B** | 0001 | 0.3961 | 0.6039 | 7.8505 | 5.1495 | 4.4484 | 4.4484 |
| **8316A** | 0001 | 0.4076 | 0.5924 | 6.5166 | 4.4834 | 4.0027 | 4.0027 |
| **8316B** | 0001 | 0.3962 | 0.6038 | 7.8488 | 5.1512 | 4.4545 | 4.4545 |
| **8317A** | 0001 | 0.4082 | 0.5918 | 6.5096 | 4.4904 | 4.0327 | 4.0327 |
| **8317B** | 0001 | 0.3964 | 0.6036 | 7.8473 | 5.1527 | 4.4600 | 4.4600 |
| **8318A** | 0001 | 0.4088 | 0.5912 | 6.5033 | 4.4967 | 4.0597 | 4.0597 |
| **8318B** | 0001 | 0.3959 | 0.6041 | 7.8527 | 5.1473 | 4.4405 | 4.4405 |
| **8319A** | 0001 | 0.4093 | 0.5907 | 6.4976 | 4.5024 | 4.0844 | 4.0844 |
| **8319B** | 0001 | 0.3966 | 0.6034 | 7.8448 | 5.1552 | 4.4690 | 4.4690 |
| **8320A** | 0001 | 0.4112 | 0.5888 | 7.0655 | 4.9345 | 4.1776 | 4.1776 |
| **8320B** | 0001 | 0.3983 | 0.6017 | 7.8223 | 5.1777 | 4.5515 | 4.5515 |
| **8322A** | 0001 | 0.4131 | 0.5869 | 7.0424 | 4.9576 | 4.2764 | 4.2764 |
| **8322B** | 0001 | 0.3954 | 0.6046 | 7.8601 | 5.1399 | 4.4140 | 4.4140 |
| **8326A** | 0001 | 0.4110 | 0.5890 | 7.0678 | 4.9322 | 4.1682 | 4.1682 |
| **8326B** | 0001 | 0.3946 | 0.6054 | 7.8695 | 5.1305 | 4.3809 | 4.3809 |
| **8330A** | 0002 | 0.4120 | 0.5880 | 7.0557 | 4.9443 | 4.2191 | 4.2191 |
| **8330B** | 0002 | 0.3982 | 0.6018 | 7.8229 | 5.1771 | 4.5495 | 4.5495 |
| **8336A** | 0002 | 0.4175 | 0.5825 | 7.5728 | 5.4272 | 4.5151 | 4.5151 |
| **8500** | H401 | 0.3885 | 0.6115 | 4.8921 | 3.1079 | 4.0904 | 4.0904 |
| **8501** | H401 | 0.3517 | 0.6483 | 4.5379 | 2.4621 | 2.9741 | 2.9741 |
| **8502** | H401 | 0.3876 | 0.6124 | 4.8991 | 3.1009 | 4.0665 | 4.0665 |
| **8503** | H401 | 0.3875 | 0.6125 | 4.8999 | 3.1001 | 4.0810 | 4.0810 |
| **8504** | H401 | 0.3886 | 0.6114 | 4.8908 | 3.1092 | 4.1310 | 4.1310 |
| **8505** | H401 | 0.4015 | 0.5985 | 5.3866 | 3.6134 | 4.7226 | 4.7226 |
| **8506** | H401 | 0.3992 | 0.6008 | 5.4070 | 3.5930 | 4.6332 | 4.6332 |
| **8507** | H401 | 0.3990 | 0.6010 | 5.4093 | 3.5907 | 4.6178 | 4.6178 |
| **8508** | H401 | 0.4033 | 0.5967 | 5.3705 | 3.6295 | 4.8503 | 4.8503 |
| **8605** | H401 | 0.3712 | 0.6288 | 4.4014 | 2.5986 | 3.5288 | 3.5288 |
| **87007** | H401 | 0.3781 | 0.6219 | 4.3534 | 2.6466 | 3.6726 | 3.6726 |
| **87008** | H401 | 0.3819 | 0.6181 | 4.3267 | 2.6733 | 3.8058 | 3.8058 |
| **87013** | H401 | 0.3726 | 0.6274 | 4.3916 | 2.6084 | 3.5338 | 3.5338 |
| **87014** | H401 | 0.3830 | 0.6170 | 4.9357 | 3.0643 | 3.8900 | 3.8900 |
| **87016** | H401 | 0.3876 | 0.6124 | 4.8990 | 3.1010 | 4.0669 | 4.0669 |
| **87026** | H401 | 0.4015 | 0.5985 | 5.3866 | 3.6134 | 4.7226 | 4.7226 |
| **87036** | H401 | 0.3488 | 0.6512 | 3.9071 | 2.0929 | 2.8606 | 2.8606 |
| **87037** | H401 | 0.3697 | 0.6303 | 4.4123 | 2.5877 | 3.4045 | 3.4045 |
| **87038** | H401 | 0.3740 | 0.6260 | 4.3818 | 2.6182 | 3.5388 | 3.5388 |
| **87500** | H401 | 0.3885 | 0.6115 | 4.8921 | 3.1079 | 4.0904 | 4.0904 |
| **87501** | H401 | 0.3697 | 0.6303 | 4.4119 | 2.5881 | 3.4441 | 3.4441 |
| **87502** | H401 | 0.3876 | 0.6124 | 4.8991 | 3.1009 | 4.0665 | 4.0665 |
| **87503** | H401 | 0.3875 | 0.6125 | 4.8999 | 3.1001 | 4.0810 | 4.0810 |
| **87504** | H401 | 0.3886 | 0.6114 | 4.8908 | 3.1092 | 4.1310 | 4.1310 |
| **87505** | H401 | 0.4015 | 0.5985 | 5.3866 | 3.6134 | 4.7226 | 4.7226 |
| **87506** | H401 | 0.3992 | 0.6008 | 5.4070 | 3.5930 | 4.6332 | 4.6332 |
| **87507** | H401 | 0.3990 | 0.6010 | 5.4093 | 3.5907 | 4.6178 | 4.6178 |
| **87508** | H401 | 0.4033 | 0.5967 | 5.3705 | 3.6295 | 4.8503 | 4.8503 |
| **88007** | H401 | 0.3781 | 0.6219 | 4.3534 | 2.6466 | 3.6726 | 3.6726 |
| **88008** | H401 | 0.3819 | 0.6181 | 4.3267 | 2.6733 | 3.8058 | 3.8058 |
| **88009** | H401 | 0.3828 | 0.6172 | 4.3206 | 2.6794 | 3.8693 | 3.8693 |
| **88011** | H401 | 0.3667 | 0.6333 | 4.4330 | 2.5670 | 3.3547 | 3.3547 |
| **88013** | H401 | 0.3726 | 0.6274 | 4.3916 | 2.6084 | 3.5338 | 3.5333 |
| **88016** | H401 | 0.3882 | 0.6118 | 4.2824 | 2.7176 | 4.0688 | 4.0683 |
| **88500** | H401 | 0.3885 | 0.6115 | 4.8921 | 3.1079 | 4.0904 | 4.0904 |
| **88501** | H401 | 0.3697 | 0.6303 | 4.4119 | 2.5881 | 3.4441 | 3.4441 |
| **88502** | H401 | 0.3876 | 0.6124 | 4.8991 | 3.1009 | 4.0665 | 4.0665 |
| **88503** | H401 | 0.3875 | 0.6125 | 4.8999 | 3.1001 | 4.0810 | 4.0810 |
| **88504** | H401 | 0.3886 | 0.6114 | 4.8908 | 3.1092 | 4.1310 | 4.1310 |
| **88505** | H401 | 0.4015 | 0.5985 | 5.3866 | 3.6134 | 4.7226 | 4.7226 |

# MRC ball bearing vibration data
# Data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation<br>Cage speed frequency (rpm) | Outer rotation<br>Cage speed frequency (rpm) | Inner or outer ring rotation<br>Inner ring frequency | Inner or outer ring rotation<br>Outer ring frequency | Inner rotation<br>Rolling element frequency | Outer rotation<br>Rolling element frequency |
|---|---|---|---|---|---|---|---|
| 88506 | H401 | 0.3992 | 0.6008 | 5.4070 | 3.5930 | 4.6332 | 4.6332 |
| 88507 | H401 | 0.3990 | 0.6010 | 5.4093 | 3.5907 | 4.6178 | 4.6178 |
| 88508 | H401 | 0.4033 | 0.5967 | 5.3705 | 3.6295 | 4.8503 | 4.8503 |
| 9202U | XXXX | 0.3889 | 0.6111 | 6.1107 | 3.8893 | 3.7429 | 3.7429 |
| 9202UP | XXXX | 0.3905 | 0.6095 | 4.8757 | 3.1243 | 3.3314 | 3.3314 |
| 9203U | XXXX | 0.3904 | 0.6096 | 6.0959 | 3.9041 | 3.7987 | 3.7987 |
| 9203UP | XXXX | 0.3933 | 0.6067 | 5.4600 | 3.5400 | 3.4273 | 3.4273 |
| 9204U | XXXX | 0.4067 | 0.5933 | 7.1189 | 4.8811 | 4.5272 | 4.5272 |
| 9204UP | XXXX | 0.4001 | 0.5999 | 5.9984 | 4.0016 | 3.6833 | 3.6833 |
| 9205U | XXXX | 0.4098 | 0.5902 | 7.0819 | 4.9181 | 4.6925 | 4.6925 |
| 9205UP | XXXX | 0.4131 | 0.5869 | 7.0425 | 4.9575 | 4.2759 | 4.2759 |
| 9206U | XXXX | 0.4245 | 0.5755 | 8.0564 | 5.9436 | 5.6632 | 5.6632 |
| 9206UP | XXXX | 0.4140 | 0.5860 | 6.4452 | 4.5548 | 4.3256 | 4.3256 |
| 9207U | XXXX | 0.4221 | 0.5779 | 8.0900 | 5.9100 | 5.4806 | 5.4806 |
| 9207UP | XXXX | 0.4147 | 0.5853 | 7.0230 | 4.9770 | 5.3624 | 5.3624 |
| 9208U | 0005 | 0.4190 | 0.5810 | 8.1339 | 5.8661 | 5.2576 | 5.2576 |
| 9208UP | XXXX | 0.4189 | 0.5811 | 6.9729 | 5.0271 | 4.6002 | 4.6002 |
| 9209U | XXXX | 0.4252 | 0.5748 | 8.0467 | 5.9533 | 5.7186 | 5.7186 |
| 9209UP | XXXX | 0.4205 | 0.5795 | 7.5338 | 5.4662 | 4.6948 | 4.6948 |
| 9210U | XXXX | 0.4306 | 0.5694 | 9.1108 | 6.8892 | 6.1778 | 6.1778 |
| 9210UP | XXXX | 0.4261 | 0.5739 | 8.0338 | 5.9662 | 5.0740 | 5.0740 |
| 9211U | 0003 | 0.4194 | 0.5806 | 8.1287 | 5.8713 | 5.2833 | 5.2833 |
| 9211UP | XXXX | 0.4254 | 0.5746 | 8.0436 | 5.9564 | 5.0242 | 5.0242 |
| 9212U | XXXX | 0.4265 | 0.5735 | 9.1761 | 6.8239 | 5.8208 | 5.8208 |
| 9212UP | XXXX | 0.4249 | 0.5751 | 8.0516 | 5.9484 | 4.9840 | 4.9840 |
| 9213U | XXXX | 0.4249 | 0.5751 | 9.2008 | 6.7992 | 5.6956 | 5.6956 |
| 9213UP | XXXX | 0.4277 | 0.5723 | 8.0123 | 5.9877 | 5.1864 | 5.1864 |
| 9214U | XXXX | 0.4288 | 0.5712 | 9.1392 | 6.8608 | 6.0172 | 6.0172 |
| 9214UP | XXXX | 0.4283 | 0.5717 | 8.0041 | 5.9959 | 5.2304 | 5.2304 |
| 9215U | 0002 | 0.4255 | 0.5745 | 9.7665 | 7.2335 | 5.7395 | 5.7395 |
| 9215UP | XXXX | 0.4317 | 0.5683 | 8.5239 | 6.4761 | 5.5069 | 5.5069 |
| 9216U | XXXX | 0.4306 | 0.5694 | 9.1108 | 6.8892 | 6.1778 | 6.1778 |
| 9216UP | XXXX | 0.4309 | 0.5691 | 8.5365 | 6.4635 | 5.4371 | 5.4371 |
| 9217U | XXXX | 0.4291 | 0.5709 | 9.7053 | 7.2947 | 6.0440 | 6.0440 |
| 9217UP | XXXX | 0.4301 | 0.5699 | 8.5480 | 6.4520 | 5.3753 | 5.3753 |
| 9218U | XXXX | 0.4222 | 0.5778 | 9.2441 | 6.7559 | 5.4882 | 5.4882 |
| 9218UP | XXXX | 0.4294 | 0.5706 | 8.5581 | 6.4419 | 5.3220 | 5.3220 |
| 9219U | XXXX | 0.4266 | 0.5734 | 9.7470 | 7.2530 | 5.8335 | 5.8335 |
| 9219UP | XXXX | 0.4288 | 0.5712 | 8.5670 | 6.4330 | 5.2756 | 5.2756 |
| 9220U | XXXX | 0.4256 | 0.5744 | 9.7645 | 7.2355 | 5.7491 | 5.7491 |
| 9220UP | XXXX | 0.4305 | 0.5695 | 8.5424 | 6.4576 | 5.4053 | 5.4053 |
| 9221U | XXXX | 0.4247 | 0.5753 | 9.2049 | 6.7951 | 5.6754 | 5.6754 |
| 9221UP | XXXX | 0.4299 | 0.5701 | 8.5512 | 6.4488 | 5.3581 | 5.3581 |
| 9222U | 0002 | 0.4238 | 0.5762 | 9.2183 | 6.7817 | 5.6102 | 5.6102 |
| 9222UP | XXXX | 0.4294 | 0.5706 | 8.5592 | 6.4408 | 5.3162 | 5.3162 |
| 9302U | XXXX | 0.3904 | 0.6096 | 6.0963 | 3.9037 | 3.7972 | 3.7972 |
| 9302UP | XXXX | 0.3826 | 0.6174 | 4.9388 | 3.0612 | 3.0840 | 3.0840 |
| 9303U | XXXX | 0.3915 | 0.6085 | 6.0847 | 3.9153 | 3.8419 | 3.8419 |
| 9303UP | XXXX | 0.3764 | 0.6236 | 4.9882 | 3.0118 | 2.9117 | 2.9117 |
| 9304U | XXXX | 0.3843 | 0.6157 | 6.1571 | 3.8429 | 3.5771 | 3.5771 |
| 9304UP | XXXX | 0.3902 | 0.6098 | 5.4882 | 3.5118 | 3.3200 | 3.3201 |
| 9305U | 0008 | 0.4042 | 0.5958 | 7.1491 | 4.8509 | 4.3994 | 4.3994 |
| 9305UP | XXXX | 0.3951 | 0.6049 | 5.4436 | 3.5564 | 3.4925 | 3.4925 |
| 9306U | XXXX | 0.4047 | 0.5953 | 7.1434 | 4.8566 | 4.4228 | 4.4228 |
| 9306UP | XXXX | 0.3986 | 0.6014 | 6.0135 | 3.9865 | 3.6239 | 3.6239 |
| 9307U | 0C01 | 0.4034 | 0.5966 | 7.1591 | 4.8409 | 4.3586 | 4.3586 |
| 9307UP | XXXX | 0.3995 | 0.6005 | 6.0047 | 3.9953 | 3.6585 | 3.6585 |
| 9308U | XXXX | 0.4039 | 0.5961 | 7.1535 | 4.8465 | 4.3814 | 4.3814 |
| 9308UP | XXXX | 0.4017 | 0.5983 | 5.9823 | 4.0177 | 3.7488 | 3.7488 |
| 9309U | 0C01 | 0.4042 | 0.5958 | 7.1490 | 4.8510 | 4.3995 | 4.3995 |
| 9309UP | XXXX | 0.4035 | 0.5965 | 6.5610 | 4.4390 | 3.8233 | 3.8233 |
| 9310U | 0001 | 0.3959 | 0.6041 | 7.2496 | 4.7504 | 4.0173 | 4.0173 |

# MRC ball bearing vibration data
# Data based on a speed of 1 rpm

## Values in cycles per minute

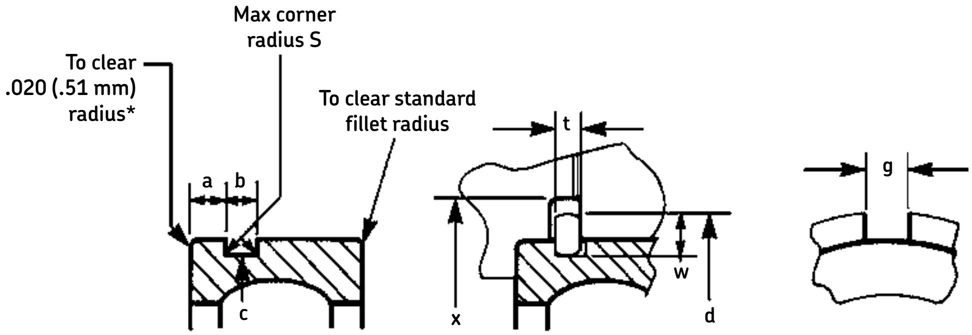
| | | Inner rotation | Outer rotation | Inner or outer ring rotation | | Inner rotation | Outer rotation |
|---|---|---|---|---|---|---|---|
| Bearing size | Suffix | Cage speed frequency (rpm) | Cage speed frequency (rpm) | Inner ring frequency | Outer ring frequency | Rolling element frequency | Rolling element frequency |
| 9310UP | XXXX | 0.4050 | 0.5950 | 6.5451 | 4.4549 | 3.8857 | 3.8857 |
| 9311U | 0002 | 0.3968 | 0.6032 | 7.2377 | 4.7623 | 4.0595 | 4.0595 |
| 9311UP | XXXX | 0.4062 | 0.5938 | 6.5320 | 4.4680 | 3.9389 | 3.9389 |
| 9312U | XXXX | 0.3977 | 0.6023 | 7.2277 | 4.7723 | 4.0956 | 4.0956 |
| 9312UP | XXXX | 0.4072 | 0.5928 | 6.5209 | 4.4791 | 3.9847 | 3.9847 |
| 9313U | XXXX | 0.4052 | 0.5948 | 8.3275 | 5.6725 | 4.4461 | 4.4461 |
| 9313UP | XXXX | 0.4080 | 0.5920 | 6.5115 | 4.4885 | 4.0246 | 4.0246 |
| 9314U | 0006 | 0.4053 | 0.5947 | 7.1360 | 4.8640 | 4.4538 | 4.4538 |
| 9314UP | XXXX | 0.4060 | 0.5940 | 6.5337 | 4.4663 | 3.9320 | 3.9320 |
| 9315U | XXXX | 0.4055 | 0.5945 | 8.3235 | 5.6765 | 4.4606 | 4.4606 |
| 9315UP | XXXX | 0.4068 | 0.5932 | 6.5246 | 4.4754 | 3.9693 | 3.9693 |
| 9316U | XXXX | 0.4056 | 0.5944 | 7.7274 | 5.2726 | 4.4667 | 4.4667 |
| 9316UP | XXXX | 0.4076 | 0.5924 | 6.5166 | 4.4834 | 4.0027 | 4.0027 |
| 9317U | XXXX | 0.4057 | 0.5943 | 8.3203 | 5.6797 | 4.4720 | 4.4720 |
| 9317UP | XXXX | 0.4082 | 0.5918 | 6.5096 | 4.4904 | 4.0327 | 4.0327 |
| 9318U | 0004 | 0.4058 | 0.5942 | 7.7248 | 5.2752 | 4.4767 | 4.4767 |
| 9318UP | 0001 | 0.4088 | 0.5912 | 6.5033 | 4.4967 | 4.0597 | 4.0597 |
| 9319U | XXXX | 0.4059 | 0.5941 | 7.7237 | 5.2763 | 4.4810 | 4.4810 |
| 9319UP | XXXX | 0.4093 | 0.5907 | 6.4976 | 4.5024 | 4.0844 | 4.0844 |
| 9320U | 0001 | 0.4074 | 0.5926 | 7.7033 | 5.2967 | 4.5625 | 4.5625 |
| 9320UP | XXXX | 0.4112 | 0.5888 | 7.0655 | 4.9345 | 4.1776 | 4.1776 |
| 9321U | XXXX | 0.4074 | 0.5926 | 7.7033 | 5.2967 | 4.5625 | 4.5625 |
| 9321UP | XXXX | 0.4115 | 0.5885 | 7.0613 | 4.9387 | 4.1952 | 4.1952 |
| 9322U | 0002 | 0.4048 | 0.5952 | 7.7377 | 5.2623 | 4.4267 | 4.4267 |
| 9322UP | XXXX | 0.4131 | 0.5869 | 7.0424 | 4.9576 | 4.2764 | 4.2764 |
| J078DF | 0002 | 0.4539 | 0.5461 | 8.1909 | 6.8091 | 5.3819 | 5.3819 |
| J093DF | XXXX | 0.4669 | 0.5331 | 11.1938 | 9.8062 | 7.5338 | 7.5338 |
| J098DF | XXXX | 0.4669 | 0.5331 | 11.1938 | 9.8062 | 7.5338 | 7.5338 |
| J150DF | 0004 | 0.4711 | 0.5289 | 12.6921 | 11.3079 | 8.6404 | 8.6404 |
| J175DF | 0002 | 0.4737 | 0.5263 | 13.6841 | 12.3159 | 9.4757 | 9.4757 |
| J225DF | XXXX | 0.4784 | 0.5216 | 16.6905 | 15.3095 | 11.5648 | 11.5648 |
| J300DF | XXXX | 0.4829 | 0.5171 | 21.1991 | 19.8009 | 14.6445 | 14.6445 |
| J400DF | XXXX | 0.4807 | 0.5193 | 19.2146 | 17.7854 | 12.9258 | 12.9258 |
| R10 | H401 | 0.4125 | 0.5875 | 5.8746 | 4.1254 | 5.3940 | 5.3940 |
| R10 | H501 | 0.3906 | 0.6094 | 4.8752 | 3.1248 | 4.3516 | 4.3516 |
| R12 | H401 | 0.4001 | 0.5999 | 5.3987 | 3.6013 | 4.6873 | 4.6873 |
| R12 | H501 | 0.3947 | 0.6053 | 5.4474 | 3.5536 | 4.5395 | 4.5395 |
| R14 | H401 | 0.4128 | 0.5872 | 5.8720 | 4.1280 | 5.4204 | 5.4204 |
| R14 | H501 | 0.3977 | 0.6023 | 4.8183 | 3.1817 | 4.6834 | 4.6834 |
| R16 | H401 | 0.4174 | 0.5826 | 5.8255 | 4.1745 | 5.7446 | 5.7446 |
| R16 | H501 | 0.4167 | 0.5833 | 5.8333 | 4.1667 | 5.8333 | 5.8333 |
| R18 | H401 | 0.4178 | 0.5822 | 5.8219 | 4.1781 | 5.7874 | 5.7874 |
| R18 | H501 | 0.4134 | 0.5866 | 5.8655 | 4.1345 | 5.6036 | 5.6036 |
| R2 | H501 | 0.3866 | 0.6134 | 4.2939 | 2.7061 | 3.9308 | 3.9308 |
| R20 | H401 | 0.4216 | 0.5784 | 6.9409 | 5.0591 | 6.0816 | 6.0816 |
| R20 | H501 | 0.4196 | 0.5804 | 6.3841 | 4.6159 | 6.0604 | 6.0604 |
| R24 | XXXX | 0.4284 | 0.5716 | 6.8593 | 5.1407 | 6.6884 | 6.6884 |
| R24 | H501 | 0.4167 | 0.5833 | 6.4168 | 4.5832 | 5.8324 | 5.8324 |
| R2A | H401 | 0.3866 | 0.6134 | 4.2939 | 2.7061 | 3.9308 | 3.9308 |
| R3 | H401 | 0.3685 | 0.6315 | 4.4202 | 2.5798 | 3.3990 | 3.3990 |
| R4 | H501 | 0.3971 | 0.6029 | 4.8233 | 3.1767 | 4.4666 | 4.4666 |
| R4A | H501 | 0.3787 | 0.6213 | 4.3487 | 2.6513 | 3.7648 | 3.7648 |
| R6 | H401 | 0.3782 | 0.6218 | 4.3529 | 2.6471 | 3.7673 | 3.7673 |
| R8 | H501 | 0.3869 | 0.6131 | 4.9045 | 3.0955 | 4.0844 | 4.0844 |
| WC87008 | H401 | 0.3819 | 0.6181 | 4.3267 | 2.6733 | 3.8058 | 3.8058 |
| WC87016 | H401 | 0.3876 | 0.6124 | 4.8990 | 3.1010 | 4.0669 | 4.0669 |
| WC87500 | H401 | 0.3885 | 0.6115 | 4.8921 | 3.1079 | 4.0904 | 4.0904 |
| WC87501 | H401 | 0.3697 | 0.6303 | 4.4119 | 2.5881 | 3.4441 | 3.4441 |
| WC87502 | H401 | 0.3876 | 0.6124 | 4.8991 | 3.1009 | 4.0665 | 4.0665 |
| WC87503 | H401 | 0.3875 | 0.6125 | 4.8999 | 3.1001 | 4.0810 | 4.0810 |
| WC87504 | H401 | 0.3886 | 0.6114 | 4.8908 | 3.1092 | 4.1310 | 4.1310 |
| XLS10 | 0007 | 0.4651 | 0.5349 | 18.7216 | 16.2784 | 13.1869 | 13.1869 |

# MRC ball bearing vibration data
# Data based on a speed of 1 rpm

## Values in cycles per minute

| Bearing size | Suffix | Inner rotation<br>Cage speed frequency (rpm) | Outer rotation<br>Cage speed frequency (rpm) | Inner or outer ring rotation<br>Inner ring frequency | Inner or outer ring rotation<br>Outer ring frequency | Inner rotation<br>Rolling element frequency | Outer rotation<br>Rolling element frequency |
|---|---|---|---|---|---|---|---|
| XLS11V2 | 0003 | 0.4204 | 0.5796 | 8.6947 | 6.3053 | 5.9073 | 5.9073 |
| XLS13V4 | 0003 | 0.4319 | 0.5681 | 9.6573 | 7.3427 | 6.9336 | 6.9336 |
| XLS13V8 | XXXX | 0.4157 | 0.5843 | 8.1802 | 5.8198 | 5.5638 | 5.5638 |
| XLS15V8 | 0008 | 0.4261 | 0.5739 | 9.1816 | 6.8184 | 6.3699 | 6.3699 |
| XLS17V8 | XXXX | 0.4295 | 0.5705 | 9.6984 | 7.3016 | 6.7054 | 6.7054 |
| XLS2 | 0007 | 0.4322 | 0.5678 | 10.2207 | 7.7793 | 6.9236 | 6.9236 |
| XLS21V2 | XXXX | 0.4437 | 0.5563 | 11.6818 | 9.3182 | 8.3923 | 8.3923 |
| XLS21V2S | 0003 | 0.4435 | 0.5565 | 8.3474 | 6.6526 | 8.3586 | 8.3586 |
| XLS21V4 | 0C01 | 0.4380 | 0.5620 | 10.6772 | 8.3228 | 7.6015 | 7.6015 |
| XLS21V8 | 0002 | 0.4339 | 0.5661 | 10.1900 | 7.8100 | 7.2575 | 7.2575 |
| XLS23V4 | 0004 | 0.4389 | 0.5611 | 11.2217 | 8.7783 | 7.7174 | 7.7174 |
| XLS25V8 | XXXX | 0.4380 | 0.5620 | 11.2407 | 8.7593 | 7.5955 | 7.5955 |
| XLS3 | 0007 | 0.4440 | 0.5560 | 12.2324 | 9.7676 | 8.4346 | 8.4346 |
| XLS31V2 | 0008 | 0.4510 | 0.5490 | 13.7261 | 11.2739 | 9.5925 | 9.5925 |
| XLS31V4 | 0004 | 0.4479 | 0.5521 | 12.6987 | 10.3013 | 9.0153 | 9.0153 |
| XLS33V4 | 0006 | 0.4537 | 0.5463 | 14.2041 | 11.7959 | 10.1692 | 10.1692 |
| XLS41V2 | 0006 | 0.4557 | 0.5443 | 14.6964 | 12.3036 | 10.6358 | 10.6358 |
| XLS41V4 | 0015 | 0.4535 | 0.5465 | 14.2084 | 11.7916 | 10.1317 | 10.1317 |
| XLS43V4 | 0008 | 0.4581 | 0.5419 | 15.1729 | 12.8271 | 11.1412 | 11.1412 |
| XLS5 | 0009 | 0.4555 | 0.5445 | 14.7016 | 12.2984 | 10.5513 | 10.5513 |
| XLS51V2 | 0006 | 0.4589 | 0.5411 | 15.6911 | 13.3089 | 11.4467 | 11.4467 |
| XLS6 | 0010 | 0.4621 | 0.5379 | 16.6737 | 14.3263 | 12.3422 | 12.3422 |
| XLS61V2 | 0005 | 0.4614 | 0.5386 | 16.6961 | 14.3039 | 12.0955 | 12.0955 |
| XLS61V4 | 0008 | 0.4598 | 0.5402 | 16.2058 | 13.7942 | 11.6920 | 11.6920 |
| XLS7 | 0007 | 0.4605 | 0.5395 | 16.7234 | 14.2766 | 11.8927 | 11.8927 |
| XLS71V4 | 0007 | 0.4621 | 0.5379 | 17.2138 | 14.7862 | 12.2599 | 12.2599 |
| XLS73V4 | XXXX | 0.4613 | 0.5387 | 16.6987 | 14.3013 | 12.0939 | 12.0939 |
| XLS8 | 0005 | 0.4625 | 0.5375 | 17.1989 | 14.8011 | 12.3967 | 12.3967 |
| XLS81V2 | XXXX | 0.4618 | 0.5382 | 17.2215 | 14.7785 | 12.2360 | 12.2360 |
| XLS81V4 | XXXX | 0.4636 | 0.5364 | 17.7010 | 15.2990 | 12.7653 | 12.7653 |
| XLS9 | 0002 | 0.4609 | 0.5391 | 16.7106 | 14.2894 | 11.8984 | 11.8984 |
| X0155RBDS | 0002 | 0.4276 | 0.5724 | 9.1591 | 6.8409 | 6.5267 | 6.5267 |
| X0155RBDS | 0001 | 0.4276 | 0.5724 | 9.1591 | 6.8409 | 6.5267 | 6.5267 |
| X0155RBDS | 0004 | 0.4276 | 0.5724 | 9.1591 | 6.8409 | 6.5267 | 6.5267 |
| X0165RBDS | 0002 | 0.4138 | 0.5862 | 8.7936 | 6.2064 | 5.4336 | 5.4336 |
| X030RBDS | 0002 | 0.3864 | 0.6136 | 5.5227 | 3.4773 | 4.0305 | 4.0305 |
| X057RBDS | 0002 | 0.3991 | 0.6009 | 7.2103 | 4.7897 | 4.5937 | 4.5937 |
| X057RBDS | 0001 | 0.3991 | 0.6009 | 7.2103 | 4.7897 | 4.5937 | 4.5937 |
| X067RBDS | 0005 | 0.4095 | 0.5905 | 7.6771 | 5.3229 | 5.1590 | 5.1590 |
| X067RBDS | 0001 | 0.4095 | 0.5905 | 7.6771 | 5.3229 | 5.1590 | 5.1590 |
| X090RBDS | 0005 | 0.4062 | 0.5938 | 7.7191 | 5.2809 | 4.9688 | 4.9688 |
| X090RBDS | 0003 | 0.4062 | 0.5938 | 7.7191 | 5.2809 | 4.9688 | 4.9688 |
| X090RBDS | 0002 | 0.4062 | 0.5938 | 7.7191 | 5.2809 | 4.9688 | 4.9688 |
| X090RBDS | 0001 | 0.4062 | 0.5938 | 7.7191 | 5.2809 | 4.9688 | 4.9688 |

# Snap-ring, groove and housing dimensions




Snap-ring mounting data on these pages conforms to ABMA Standard 20.

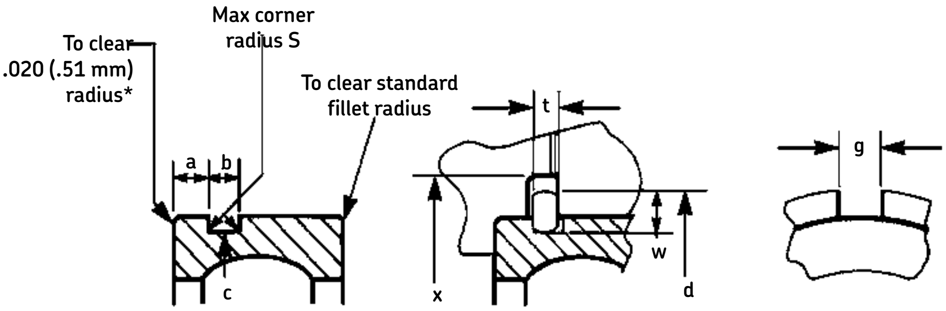
5200 and 5300 series—use dimensions listed for 200 and 300 series.

Cartridge width bearings—"a" dimension varies depending on bearing size. Dimensions shown on page 321.

* Where standard bearing corner is .020 (.51 mm) or less, the corner remains same as standard.

| Basic bearing | | | | Dimensions of ring, groove and housing | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Groove | | | | | | | | | | | | | | Ring | | | | | | | | Counterbore | |
| 1900 | 100K | 200 | 300 | a | | | | b | | | | c | | | | s | | d | | t | | w | | g | | x | |
| | | | | inch | | mm | | inch | | mm | | inch | | mm | | | | | | ±.002 | ±.05 | ±.003 | ±.08 | | | Minimum | |
| | | | | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm |
| **1900** | | | | **.041** | **.035** | 1.05 | .90 | **.041** | **.031** | 1.05 | .80 | **.819** | **.807** | 20.8 | 20.5 | **.008** | .20 | **.984** | 25.0 | **.026** | .65 | **.076** | 1.93 | **.094** | 2.5 | **1.016** | 25.8 |
| **1901** | | | | **.041** | **.035** | 1.05 | .90 | **.041** | **.031** | 1.05 | .80 | **.898** | **.888** | 22.8 | 22.5 | **.008** | .20 | **1.06** | 27.0 | **.026** | .65 | **.076** | 1.93 | **.094** | 2.5 | **1.094** | 27.8 |
| **1902** | | | | **.051** | **.045** | 1.30 | 1.15 | **.047** | **.037** | 1.20 | .95 | **1.051** | **1.039** | 26.7 | 26.4 | **.010** | .25 | **1.20** | 30.6 | **.031** | .80 | **.078** | 1.98 | **.125** | 3.0 | **1.234** | 31.3 |
| | 101K | | | **.068** | **.062** | 1.73 | 1.57 | **.047** | **.037** | 1.20 | .95 | **1.050** | **1.040** | 26.7 | 26.4 | **.016** | .40 | **1.20** | 30.6 | **.031** | .80 | **.078** | 1.98 | **.125** | 3.0 | **1.234** | 31.3 |
| **1903** | | | | **.051** | **.045** | 1.30 | 1.15 | **.047** | **.037** | 1.20 | .95 | **1.130** | **1.118** | 28.7 | 28.4 | **.010** | .25 | **1.28** | 32.5 | **.031** | .80 | **.078** | 1.98 | **.125** | 3.0 | **1.312** | 33.3 |
| | | 200 | | **.081** | **.075** | 2.06 | 1.90 | **.065** | **.053** | 1.65 | 1.35 | **1.109** | **1.099** | 28.2 | 27.9 | **.016** | .40 | **1.36** | 34.5 | **.042** | 1.07 | **.125** | 3.18 | **.125** | 3.0 | **1.391** | 35.3 |
| | 102K | 201 | | **.081** | **.075** | 2.06 | 1.90 | **.065** | **.053** | 1.65 | 1.35 | **1.187** | **1.177** | 30.2 | 29.0 | **.016** | .40 | **1.44** | 36.5 | **.042** | 1.07 | **.125** | 3.18 | **.125** | 3.0 | **1.469** | 37.3 |
| | 103K | 202 | 300 | **.081** | **.075** | 2.06 | 1.90 | **.065** | **.053** | 1.65 | 1.35 | **1.306** | **1.296** | 33.2 | 32.9 | **.016** | .40 | **1.55** | 39.3 | **.042** | 1.07 | **.125** | 3.18 | **.125** | 3.0 | **1.578** | 40.0 |
| **1904** | | | | **.067** | **.061** | 1.70 | 1.55 | **.047** | **.037** | 1.20 | .95 | **1.406** | **1.394** | 35.7 | 35.4 | **.010** | .25 | **1.56** | 39.7 | **.031** | .80 | **.078** | 1.98 | **.125** | 3.0 | **1.594** | 40.5 |
| | | | 301 | **.081** | **.075** | 2.06 | 1.90 | **.065** | **.053** | 1.65 | 1.35 | **1.369** | **1.359** | 34.8 | 34.5 | **.016** | .40 | **1.61** | 40.9 | **.042** | 1.07 | **.125** | 3.18 | **.125** | 3.0 | **1.641** | 41.7 |
| | | 203 | | **.081** | **.075** | 2.06 | 1.90 | **.065** | **.053** | 1.65 | 1.35 | **1.500** | **1.490** | 38.1 | 37.9 | **.016** | .40 | **1.75** | 44.5 | **.042** | 1.07 | **.125** | 3.18 | **.125** | 3.0 | **1.781** | 45.2 |
| **1905** | | | | **.067** | **.061** | 1.70 | 1.55 | **.047** | **.037** | 1.20 | .95 | **1.602** | **1.590** | 40.7 | 40.4 | **.010** | .25 | **1.75** | 44.5 | **.031** | .80 | **.078** | 1.98 | **.125** | 3.0 | **1.781** | 45.2 |
| | 104K | | 302 | **.081** | **.075** | 2.06 | 1.90 | **.065** | **.053** | 1.65 | 1.35 | **1.565** | **1.555** | 39.8 | 38.5 | **.016** | .40 | **1.81** | 46.0 | **.042** | 1.07 | **.125** | 3.18 | **.125** | 3.0 | **1.844** | 46.8 |
| **1906** | | | | **.067** | **.061** | 1.70 | 1.55 | **.047** | **.037** | 1.20 | .95 | **1.799** | **1.787** | 45.7 | 45.4 | **.010** | .25 | **1.95** | 49.6 | **.031** | .80 | **.078** | 1.98 | **.125** | 3.0 | **1.984** | 50.4 |
| | 105K | | | **.081** | **.075** | 2.06 | 1.90 | **.065** | **.053** | 1.65 | 1.35 | **1.756** | **1.746** | 44.6 | 44.4 | **.016** | .40 | **2.06** | 52.4 | **.042** | 1.07 | **.156** | 3.96 | **.125** | 3.0 | **2.094** | 53.2 |
| | | 204 | 303 | **.097** | **.091** | 2.46 | 2.31 | **.065** | **.053** | 1.65 | 1.35 | **1.756** | **1.746** | 44.6 | 44.4 | **.016** | .40 | **2.06** | 52.4 | **.042** | 1.07 | **.156** | 3.96 | **.125** | 3.0 | **2.094** | 53.2 |
| | | 205 | 304 | **.097** | **.091** | 2.46 | 2.31 | **.065** | **.053** | 1.65 | 1.35 | **1.958** | **1.948** | 49.7 | 49.5 | **.016** | .40 | **2.27** | 57.6 | **.042** | 1.07 | **.156** | 3.96 | **.188** | 5.0 | **2.297** | 58.3 |
| **1907** | | | | **.067** | **.061** | 1.70 | 1.55 | **.047** | **.037** | 1.20 | .95 | **2.114** | **2.102** | 53.7 | 53.4 | **.010** | .25 | **2.28** | 57.9 | **.031** | .80 | **.078** | 1.98 | **.188** | 5.0 | **2.312** | 58.7 |
| | 106K | | | **.082** | **.074** | 2.08 | 1.88 | **.065** | **.053** | 1.65 | 1.35 | **2.071** | **2.061** | 52.8 | 52.4 | **.016** | .40 | **2.38** | 60.3 | **.042** | 1.07 | **.156** | 3.96 | **.188** | 5.0 | **2.406** | 61.1 |
| **1908** | | | | **.067** | **.061** | 1.70 | 1.55 | **.047** | **.037** | 1.20 | .95 | **2.390** | **2.374** | 60.7 | 60.3 | **.010** | .25 | **2.56** | 65.1 | **.031** | .80 | **.078** | 1.98 | **.188** | 5.0 | **2.594** | 65.9 |
| | 107K | | | **.082** | **.074** | 2.08 | 1.88 | **.087** | **.075** | 2.20 | 1.90 | **2.347** | **2.327** | 59.6 | 59.1 | **.024** | .60 | **2.66** | 67.5 | **.065** | 1.65 | **.156** | 3.96 | **.188** | 5.0 | **2.688** | 68.3 |
| | | 206 | 305 | **.129** | **.121** | 3.28 | 3.07 | **.087** | **.075** | 2.20 | 1.90 | **2.347** | **2.327** | 59.6 | 59.1 | **.024** | .60 | **2.66** | 67.5 | **.065** | 1.65 | **.156** | 3.96 | **.188** | 5.0 | **2.688** | 68.3 |
| **1909** | | | | **.067** | **.061** | 1.70 | 1.55 | **.047** | **.037** | 1.20 | .95 | **2.626** | **2.610** | 66.7 | 66.3 | **.010** | .25 | **2.80** | 71.0 | **.031** | .80 | **.078** | 1.98 | **.188** | 5.0 | **2.828** | 71.8 |
| | 108K | | | **.098** | **.090** | 2.49 | 2.20 | **.087** | **.075** | 2.20 | 1.90 | **2.552** | **2.532** | 64.8 | 61.3 | **.024** | .60 | **2.92** | 74.2 | **.065** | 1.65 | **.156** | 3.96 | **.188** | 5.0 | **2.984** | 75.8 |
| **1910** | | | | **.067** | **.061** | 1.70 | 1.55 | **.047** | **.037** | 1.20 | .95 | **2.783** | **2.769** | 70.7 | 70.3 | **.010** | .25 | **2.95** | 75.0 | **.031** | .80 | **.078** | 1.98 | **.188** | 5.0 | **2.984** | 75.8 |
| | | 207 | 306 | **.129** | **.121** | 3.28 | 3.07 | **.087** | **.075** | 2.20 | 1.90 | **2.709** | **2.689** | 68.8 | 68.3 | **.024** | .60 | **3.08** | 78.2 | **.065** | 1.65 | **.188** | 4.78 | **.188** | 5.0 | **3.141** | 79.8 |
| | 109K | | | **.098** | **.090** | 2.49 | 2.20 | **.087** | **.075** | 2.20 | 1.90 | **2.828** | **2.808** | 71.8 | 71.3 | **.024** | .60 | **3.20** | 81.4 | **.065** | 1.65 | **.188** | 4.78 | **.188** | 5.0 | **3.266** | 83.0 |
| **1911** | | | | **.083** | **.075** | 2.11 | 1.90 | **.063** | **.051** | 1.60 | 1.30 | **3.067** | **3.051** | 77.9 | 77.5 | **.016** | .40 | **3.31** | 84.1 | **.042** | 1.07 | **.125** | 3.18 | **.188** | 5.0 | **3.375** | 85.7 |
| | 110K | | | **.098** | **.090** | 2.49 | 2.20 | **.087** | **.075** | 2.20 | 1.90 | **3.024** | **3.004** | 76.8 | 76.3 | **.024** | .60 | **3.40** | 86.5 | **.065** | 1.65 | **.188** | 4.78 | **.188** | 5.0 | **3.469** | 88.1 |
| | | 208 | 307 | **.129** | **.121** | 3.28 | 3.07 | **.087** | **.075** | 2.20 | 1.90 | **3.024** | **3.004** | 76.8 | 76.3 | **.024** | .60 | **3.40** | 86.5 | **.065** | 1.65 | **.188** | 4.78 | **.188** | 5.0 | **3.469** | 88.1 |
| **1912** | | | | **.083** | **.075** | 2.10 | 1.90 | **.063** | **.051** | 1.60 | 1.30 | **3.264** | **3.248** | 82.9 | 82.5 | **.016** | .40 | **3.52** | 89.3 | **.042** | 1.07 | **.125** | 3.18 | **.188** | 5.0 | **3.578** | 90.9 |
| | | 209 | | **.129** | **.121** | 3.28 | 3.07 | **.087** | **.075** | 2.20 | 1.90 | **3.221** | **3.201** | 81.8 | 81.3 | **.024** | .60 | **3.59** | 91.3 | **.065** | 1.65 | **.188** | 4.78 | **.188** | 5.0 | **3.656** | 92.9 |
| **1913** | | | | **.083** | **.075** | 2.10 | 1.90 | **.063** | **.051** | 1.60 | 1.30 | **3.461** | **3.445** | 87.9 | 87.5 | **.016** | .40 | **3.70** | 94.1 | **.042** | 1.07 | **.125** | 3.18 | **.188** | 5.0 | **3.766** | 95.7 |
| | 111K | | | **.113** | **.105** | 2.87 | 2.67 | **.118** | **.106** | 3.00 | 2.70 | **3.417** | **3.397** | 86.8 | 86.3 | **.024** | .60 | **3.80** | 96.4 | **.095** | 2.41 | **.188** | 4.78 | **.188** | 5.0 | **3.859** | 98.0 |
| | | 210 | 308 | **.129** | **.121** | 3.28 | 3.07 | **.118** | **.106** | 3.00 | 2.70 | **3.417** | **3.397** | 86.8 | 86.3 | **.024** | .60 | **3.80** | 96.4 | **.095** | 2.41 | **.188** | 4.78 | **.188** | 5.0 | **3.859** | 98.0 |
| | 112K | | | **.113** | **.105** | 2.87 | 2.67 | **.118** | **.106** | 3.00 | 2.70 | **3.615** | **3.595** | 91.8 | 91.3 | **.024** | .60 | **3.98** | 101.2 | **.095** | 2.41 | **.188** | 4.78 | **.188** | 5.0 | **4.047** | 102.9 |
| **1914** | | | | **.098** | **.090** | 2.50 | 2.30 | **.063** | **.051** | 1.60 | 1.30 | **3.854** | **3.838** | 97.9 | 97.5 | **.016** | .40 | **4.11** | 104.4 | **.042** | 1.07 | **.125** | 3.18 | **.188** | 5.0 | **4.172** | 106.0 |
| | 113K | | | **.113** | **.105** | 2.87 | 2.67 | **.118** | **.106** | 3.00 | 2.70 | **3.811** | **3.791** | 96.8 | 96.3 | **.024** | .60 | **4.19** | 106.4 | **.095** | 2.41 | **.188** | 4.78 | **.188** | 5.0 | **4.250** | 108.0 |
| | | 211 | 309 | **.129** | **.121** | 3.28 | 3.07 | **.118** | **.106** | 3.00 | 2.70 | **3.811** | **3.791** | 96.8 | 96.3 | **.024** | .60 | **4.19** | 106.4 | **.095** | 2.41 | **.188** | 4.78 | **.188** | 5.0 | **4.250** | 108.0 |

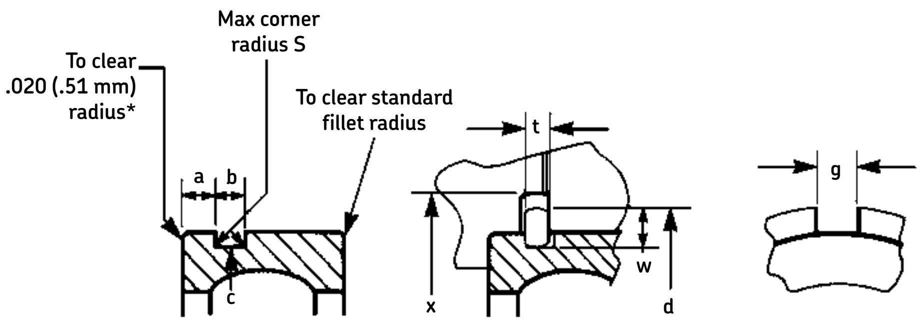
# Snap-ring, groove and housing dimensions




* Where standard bearing corner is .020 (.51 mm) or less, the corner remains same as standard.

| Basic bearing | | | | Dimensions of ring, groove and housing | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Groove | | | | | | | | | | | | | | Ring | | | | | | | | Counterbore | |
| 1900 | 100K | 200 | 300 | a | | | | b | | | | c | | | | s | | d | | t | | w | | g | | x | |
| | | | | inch | | mm | | inch | | mm | | inch | | mm | | | | | | ±.002 | ±.05 | ±.003 | ±.08 | | | Minimum | |
| | | | | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm |
| 1915 | | | | .098 | .090 | 2.50 | 2.30 | .063 | .051 | 1.60 | 1.30 | 4.039 | 4.019 | 102.6 | 102.1 | .016 | .40 | 4.36 | 110.7 | .042 | 1.07 | .156 | 3.96 | .188 | 5.0 | 4.422 | 112.3 |
| 1916 | | | | .098 | .090 | 2.50 | 2.30 | .063 | .051 | 1.60 | 1.30 | 4.236 | 4.216 | 107.6 | 107.1 | .016 | .40 | 4.55 | 115.5 | .042 | 1.07 | .156 | 3.96 | .188 | 5.0 | 4.609 | 117.1 |
| | 114K | | | .113 | .105 | 2.87 | 2.67 | .118 | .106 | 3.00 | 2.70 | 4.205 | 4.185 | 106.8 | 106.3 | .024 | .60 | 4.58 | 116.3 | .095 | 2.41 | .188 | 4.78 | .188 | 5.0 | 4.641 | 117.9 |
| | | 212 | 310 | .129 | .121 | 3.28 | 3.07 | .118 | .106 | 3.00 | 2.70 | 4.205 | 4.185 | 106.8 | 106.3 | .024 | .60 | 4.58 | 116.3 | .095 | 2.41 | .188 | 4.78 | .188 | 5.0 | 4.641 | 117.9 |
| | 115K | | | .113 | .105 | 2.87 | 2.67 | .118 | .106 | 3.00 | 2.70 | 4.402 | 4.382 | 111.9 | 111.3 | .024 | .60 | 4.78 | 121.4 | .095 | 2.41 | .188 | 4.78 | .188 | 5.0 | 4.844 | 123.0 |
| 1917 | | | | .130 | .122 | 3.30 | 3.10 | .063 | .051 | 1.60 | 1.30 | 4.630 | 4.610 | 117.6 | 117.1 | .016 | .40 | 4.94 | 125.4 | .042 | 1.07 | .156 | 3.96 | .281 | 7.0 | 5.000 | 127.0 |
| | | 213 | 311 | .160 | .152 | 4.06 | 3.86 | .134 | .122 | 3.40 | 3.10 | 4.536 | 4.516 | 115.2 | 114.7 | .024 | .60 | 5.09 | 129.4 | .109 | 2.77 | .281 | 7.14 | .281 | 7.0 | 5.156 | 131.0 |
| 1918 | | | | .130 | .122 | 3.30 | 3.10 | .063 | .051 | 1.60 | 1.30 | 4.827 | 4.807 | 122.6 | 122.1 | .016 | .40 | 5.14 | 130.6 | .042 | 1.07 | .156 | 3.96 | .281 | 7.0 | 5.203 | 132.2 |
| | 116K | | | .113 | .105 | 2.87 | 2.67 | .134 | .122 | 3.40 | 3.10 | 4.733 | 4.713 | 120.2 | 119.7 | .024 | .60 | 5.30 | 134.5 | .109 | 2.77 | .281 | 7.14 | .281 | 7.0 | 5.359 | 136.1 |
| | | 214 | | .160 | .152 | 4.06 | 3.86 | .134 | .122 | 3.40 | 3.10 | 4.733 | 4.713 | 120.2 | 119.7 | .024 | .60 | 5.30 | 134.5 | .109 | 2.77 | .281 | 7.14 | .281 | 7.0 | 5.359 | 136.1 |
| 1919 | | | | .130 | .122 | 3.30 | 3.10 | .063 | .051 | 1.60 | 1.30 | 5.024 | 5.004 | 127.6 | 127.1 | .016 | .40 | 5.33 | 135.3 | .042 | 1.07 | .156 | 3.96 | .281 | 7.0 | 5.391 | 136.9 |
| | 117K | | | .113 | .105 | 2.87 | 2.67 | .134 | .122 | 3.40 | 3.10 | 4.930 | 4.910 | 125.2 | 124.7 | .024 | .60 | 5.50 | 139.7 | .109 | 2.77 | .281 | 7.14 | .281 | 7.0 | 5.562 | 141.3 |
| | | 215 | 312 | .160 | .152 | 4.06 | 3.86 | .134 | .122 | 3.40 | 3.10 | 4.930 | 4.910 | 125.2 | 124.7 | .024 | .60 | 5.50 | 139.7 | .109 | 2.77 | .281 | 7.14 | .281 | 7.0 | 5.562 | 141.3 |
| 1920 | | | | .130 | .122 | 3.30 | 3.10 | .087 | .075 | 2.20 | 1.90 | 5.417 | 5.397 | 137.6 | 137.1 | .024 | .60 | 5.73 | 145.7 | .065 | 1.65 | .156 | 3.96 | .281 | 7.0 | 5.797 | 147.2 |
| | 118K | | | .146 | .136 | 3.71 | 3.45 | .134 | .122 | 3.40 | 3.10 | 5.324 | 5.304 | 135.2 | 134.7 | .024 | .60 | 5.89 | 149.6 | .109 | 2.77 | .281 | 7.14 | .281 | 7.0 | 5.953 | 151.2 |
| | | 216 | 313 | .193 | .183 | 4.90 | 4.65 | .134 | .122 | 3.40 | 3.10 | 5.324 | 5.304 | 135.2 | 134.7 | .024 | .60 | 5.89 | 149.6 | .109 | 2.77 | .281 | 7.14 | .281 | 7.0 | 5.953 | 151.2 |
| 1921 | | | | .130 | .122 | 3.30 | 3.10 | .087 | .075 | 2.20 | 1.90 | 5.614 | 5.594 | 142.6 | 142.1 | .024 | .60 | 5.92 | 150.4 | .065 | 1.65 | .156 | 3.96 | .281 | 7.0 | 5.984 | 152.0 |
| | 119K | | | .146 | .136 | 3.71 | 3.45 | .134 | .122 | 3.40 | 3.10 | 5.521 | 5.501 | 140.2 | 139.7 | .024 | .60 | 6.08 | 154.4 | .109 | 2.77 | .281 | 7.14 | .281 | 7.0 | 6.141 | 156.0 |
| 1922 | | | | .130 | .122 | 3.30 | 3.10 | .087 | .075 | 2.20 | 1.90 | 5.811 | 5.791 | 147.6 | 147.1 | .024 | .60 | 6.13 | 155.6 | .065 | 1.65 | .156 | 3.96 | .281 | 7.0 | 6.188 | 157.2 |
| | 120K | | | .146 | .136 | 3.71 | 3.45 | .134 | .122 | 3.40 | 3.10 | 5.718 | 5.698 | 145.2 | 144.7 | .024 | .60 | 6.28 | 159.5 | .109 | 2.77 | .281 | 7.14 | .281 | 7.0 | 6.344 | 161.1 |
| | | 217 | 314 | .193 | .183 | 4.90 | 4.65 | .134 | .122 | 3.40 | 3.10 | 5.718 | 5.698 | 145.2 | 144.7 | .024 | .60 | 6.28 | 159.5 | .109 | 2.77 | .281 | 7.14 | .281 | 7.0 | 6.344 | 161.1 |
| | 121K | | | .146 | .136 | 3.71 | 3.45 | .134 | .122 | 3.40 | 3.10 | 6.111 | 6.091 | 155.2 | 154.7 | .024 | .60 | 6.67 | 169.5 | .109 | 2.77 | .281 | 7.14 | .281 | 7.0 | 6.734 | 171.0 |
| | | 218 | 315 | .193 | .183 | 4.90 | 4.65 | .134 | .122 | 3.40 | 3.10 | 6.111 | 6.091 | 155.2 | 154.7 | .024 | .60 | 6.67 | 169.5 | .109 | 2.77 | .281 | 7.14 | .281 | 7.0 | 6.734 | 171.0 |
| 1924 | | | | .146 | .138 | 3.70 | 3.50 | .087 | .075 | 2.20 | 1.90 | 6.370 | 6.350 | 161.8 | 161.3 | .024 | .60 | 6.75 | 171.5 | .065 | 1.65 | .188 | 4.78 | .281 | 7.0 | 6.812 | 173.0 |
| | 122K | | | .146 | .136 | 3.70 | 3.45 | .150 | .138 | 3.80 | 3.50 | 6.443 | 6.423 | 163.7 | 163.1 | .024 | .60 | 7.19 | 182.6 | .120 | 3.05 | .375 | 9.53 | .375 | 10.0 | 7.250 | 184.2 |
| | | 219 | 316 | .224 | .214 | 5.69 | 5.44 | .150 | .138 | 3.80 | 3.50 | 6.443 | 6.423 | 163.7 | 163.1 | .024 | .60 | 7.19 | 182.6 | .120 | 3.05 | .375 | 9.53 | .375 | 10.0 | 7.250 | 184.2 |
| 1926 | | | | .146 | .138 | 3.70 | 3.50 | .087 | .075 | 2.20 | 1.90 | 6.961 | 6.941 | 176.8 | 176.3 | .024 | .60 | 7.34 | 186.5 | .065 | 1.65 | .188 | 4.78 | .375 | 10.0 | 7.406 | 188.0 |
| | 124K | | | .146 | .136 | 3.70 | 3.45 | .150 | .138 | 3.80 | 3.50 | 6.837 | 6.817 | 173.7 | 173.2 | .024 | .60 | 7.59 | 192.9 | .120 | 3.05 | .375 | 9.53 | .375 | 10.0 | 7.656 | 194.5 |
| | | 220 | 317 | .224 | .214 | 5.69 | 5.44 | .150 | .138 | 3.80 | 3.50 | 6.837 | 6.817 | 173.7 | 173.2 | .024 | .60 | 7.59 | 192.9 | .120 | 3.05 | .375 | 9.53 | .375 | 10.0 | 7.656 | 194.5 |
| 1928 | | | | .146 | .138 | 3.70 | 3.50 | .087 | .075 | 2.20 | 1.90 | 7.354 | 7.334 | 186.8 | 186.3 | .024 | .60 | 7.73 | 196.5 | .065 | 1.65 | .188 | 4.78 | .375 | 10.0 | 7.797 | 198.0 |
| | | 221 | 318 | .224 | .214 | 5.69 | 5.44 | .150 | .138 | 3.80 | 3.50 | 7.230 | 7.210 | 183.6 | 183.1 | .024 | .60 | 7.98 | 202.8 | .120 | 3.05 | .375 | 9.53 | .375 | 10.0 | 8.047 | 204.4 |
| | 126K | 222 | 319 | .224 | .214 | 5.69 | 5.44 | .150 | .138 | 3.80 | 3.50 | 7.624 | 7.604 | 193.7 | 193.1 | .024 | .60 | 8.38 | 212.7 | .120 | 3.05 | .375 | 9.53 | .375 | 10.0 | 8.438 | 214.3 |
| | 128K | | | .224 | .214 | 5.69 | 5.44 | .150 | .138 | 3.80 | 3.50 | 8.018 | 7.998 | 203.7 | 203.2 | .024 | .60 | 8.77 | 222.7 | .120 | 3.05 | .375 | 9.53 | .375 | 10.0 | 8.828 | 224.2 |
| | | 224 | 320 | .224 | .214 | 5.69 | 5.44 | .150 | .138 | 3.80 | 3.50 | 8.215 | 8.195 | 208.7 | 208.2 | .024 | .60 | 8.97 | 227.8 | .120 | 3.05 | .375 | 9.53 | .375 | 10.0 | 9.031 | 229.4 |
| | 130K | | 321 | .224 | .214 | 5.69 | 5.44 | .150 | .138 | 3.80 | 3.50 | 8.608 | 8.588 | 218.6 | 218.1 | .024 | .60 | 9.36 | 237.7 | .120 | 3.05 | .375 | 9.53 | .375 | 10.0 | 9.422 | 239.3 |
| | | 226 | | .224 | .214 | 5.69 | 5.44 | .150 | .138 | 3.80 | 3.50 | 8.805 | 8.785 | 223.7 | 223.1 | .024 | .60 | 9.56 | 242.9 | .120 | 3.05 | .375 | 9.53 | .375 | 10.0 | 9.625 | 244.5 |
| | 132K | | 322 | .224 | .214 | 5.69 | 5.44 | .150 | .138 | 3.80 | 3.50 | 9.199 | 9.179 | 233.7 | 233.2 | .024 | .60 | 9.95 | 252.8 | .120 | 3.05 | .375 | 9.53 | .375 | 10.0 | 10.020 | 254.4 |
| | | 228 | | .224 | .214 | 5.69 | 5.44 | .150 | .138 | 3.80 | 3.50 | 9.589 | 9.569 | 243.6 | 243.1 | .024 | .60 | 10.3 | 262.7 | .120 | 3.05 | .375 | 9.53 | .375 | 10.0 | 10.410 | 264.3 |
| | | 230 | | .224 | .214 | 5.69 | 5.44 | .150 | .138 | 3.80 | 3.50 | 10.38 | 10.36 | 263.6 | 263.0 | .024 | .60 | 11.1 | 282.6 | .120 | 3.05 | .375 | 9.53 | .375 | 10.0 | 11.200 | 284.6 |

# Snap-ring, groove and housing dimensions

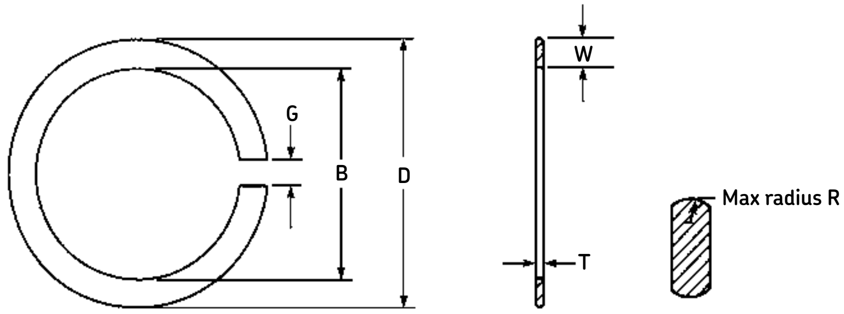



* Where standard bearing corner is .020 (.51 mm) or less, the corner remains same as standard

## Cartridge width bearings

| Basic bearing | | Dimensions of ring, groove and housing | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Groove | | | | | | | | | | | | | | Ring | | | | | | | | Counterbore | |
| 200 | 300 | a | | | | b | | | | c | | | | s | | d | | t | | w | | g | | x | |
| | | inch | | mm | | inch | | mm | | inch | | mm | | | | | | ±.002 | ±.05 | ±.003 | ±.08 | | | Minimum | |
| | | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm |
| 203 | | **.147** | **.139** | 3.73 | 3.53 | **.065** | **.053** | 1.65 | 1.35 | **1.500** | **1.490** | 38.1 | 37.9 | **.016** | .40 | **1.75** | 44.5 | **.042** | 1.07 | **.125** | 3.18 | **.125** | 3 | **1.781** | 45.2 |
| 204 | | **.187** | **.179** | 4.75 | 4.55 | **.065** | **.053** | 1.65 | 1.35 | **1.756** | **1.746** | 44.6 | 44.4 | **.016** | .40 | **2.06** | 52.4 | **.042** | 1.07 | **.156** | 3.96 | **.125** | 3 | **2.094** | 53.2 |
| 205 | 304 | **.187** | **.179** | 4.75 | 4.55 | **.065** | **.053** | 1.65 | 1.35 | **1.958** | **1.948** | 49.7 | 49.5 | **.016** | .40 | **2.27** | 57.6 | **.042** | 1.07 | **.156** | 3.96 | **.188** | 5 | **2.297** | 58.3 |
| 206 | 305 | **.181** | **.173** | 4.60 | 4.40 | **.087** | **.075** | 2.20 | 1.90 | **2.347** | **2.327** | 59.6 | 59.1 | **.024** | .60 | **2.66** | 67.5 | **.065** | 1.65 | **.156** | 3.96 | **.188** | 5 | **2.688** | 68.3 |
| 207 | 306 | **.181** | **.173** | 4.60 | 4.40 | **.087** | **.075** | 2.20 | 1.90 | **2.709** | **2.689** | 68.8 | 68.3 | **.024** | .60 | **3.08** | 78.2 | **.065** | 1.65 | **.188** | 4.78 | **.188** | 5 | **3.141** | 79.8 |
| 208 | 307 | **.181** | **.173** | 4.60 | 4.40 | **.087** | **.075** | 2.20 | 1.90 | **3.024** | **3.004** | 76.8 | 76.3 | **.024** | .60 | **3.40** | 86.5 | **.065** | 1.65 | **.188** | 4.78 | **.188** | 5 | **3.469** | 88.1 |
| 209 | | **.181** | **.173** | 4.60 | 4.40 | **.087** | **.075** | 2.20 | 1.90 | **3.221** | **3.201** | 81.8 | 81.3 | **.024** | .60 | **3.59** | 91.3 | **.065** | 1.65 | **.188** | 4.78 | **.188** | 5 | **3.656** | 92.9 |
| 210 | 308 | **.179** | **.171** | 4.55 | 4.35 | **.118** | **.106** | 3.00 | 2.70 | **3.417** | **3.397** | 86.8 | 86.3 | **.024** | .60 | **3.80** | 96.4 | **.095** | 2.41 | **.188** | 4.78 | **.188** | 5 | **3.859** | 98.0 |
| 211 | 309 | **.179** | **.171** | 4.55 | 4.35 | **.118** | **.106** | 3.00 | 2.70 | **3.811** | **3.791** | 96.8 | 96.3 | **.024** | .60 | **4.19** | 106.4 | **.095** | 2.41 | **.188** | 4.78 | **.188** | 5 | **4.250** | 108.0 |
| 212 | 310 | **.179** | **.171** | 4.55 | 4.35 | **.118** | **.106** | 3.00 | 2.70 | **4.205** | **4.185** | 106.8 | 106.3 | **.024** | .60 | **4.58** | 116.3 | **.095** | 2.41 | **.188** | 4.78 | **.188** | 5 | **4.641** | 117.9 |
| 213 | 311 | **.291** | **.283** | 7.39 | 7.19 | **.134** | **.122** | 3.40 | 3.10 | **4.536** | **4.516** | 115.2 | 114.7 | **.024** | .60 | **5.09** | 129.4 | **.109** | 2.77 | **.281** | 7.14 | **.281** | 7 | **5.156** | 131.0 |
| 214 | | **.291** | **.283** | 7.39 | 7.19 | **.134** | **.122** | 3.40 | 3.10 | **4.733** | **4.713** | 120.2 | 119.7 | **.024** | .60 | **5.30** | 134.5 | **.109** | 2.77 | **.281** | 7.14 | **.281** | 7 | **5.359** | 136.1 |
| 215 | 312 | **.291** | **.283** | 7.39 | 7.19 | **.134** | **.122** | 3.40 | 3.10 | **4.930** | **4.910** | 125.2 | 124.7 | **.024** | .60 | **5.50** | 139.7 | **.109** | 2.77 | **.281** | 7.14 | **.281** | 7 | **5.562** | 141.3 |
| | 313 | **.315** | **.307** | 8.00 | 7.80 | **.134** | **.122** | 3.40 | 3.10 | **5.324** | **5.304** | 135.2 | 134.7 | **.024** | .60 | **5.89** | 149.6 | **.109** | 2.77 | **.281** | 7.14 | **.281** | 7 | **5.953** | 151.2 |
| | 314 | **.315** | **.307** | 8.00 | 7.80 | **.134** | **.122** | 3.40 | 3.10 | **5.718** | **5.698** | 145.2 | 144.7 | **.024** | .60 | **6.28** | 159.5 | **.109** | 2.77 | **.281** | 7.14 | **.281** | 7 | **6.344** | 161.1 |
| | 315 | **.315** | **.307** | 8.00 | 7.80 | **.134** | **.122** | 3.40 | 3.10 | **6.111** | **6.091** | 155.2 | 154.7 | **.024** | .60 | **6.67** | 169.5 | **.109** | 2.77 | **.281** | 7.14 | **.281** | 7 | **6.784** | 171.0 |

# Snap ring dimensions




| Ring section[1) gauge T | (Typical R) |
|---|---|
| .042 | .035 |
| .065 | .050 |
| .095 | .060 |
| .109 | .075 |
| .120 | .090 |

| | Bearing number | | | | Snap ring dimensions | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Thickness | Radial thick | Radial[2) gap |
| Snap-ring number | Extra light (KR-KS) | Light | Medium | Heavy | Bearing O.D. | Groove dia. C | Bore B + .000 | O.D. D | T ±.002 | W + .003 | G |
| **0** | | 200 | | | 1.1811 | 1.109 | 1.094–.020 | 1.344 | .042 | .125 | 3/32 ± 1/32 |
| **1** | 102 | 201 | | | 1.2598 | 1.187 | 1.172–.020 | 1.422 | .042 | .125 | 3/32 ± 1/32 |
| **2** | 103 | 202 | 300 | | 1.3780 | 1.306 | 1.291–.020 | 1.541 | .042 | .125 | 3/32 ± 1/32 |
| **2a** | | | 301 | | 1.4567 | 1.369 | 1.354–.020 | 1.604 | .042 | .125 | 3/32 ± 1/32 |
| **3** | | 203 | | | 1.5748 | 1.500 | 1.485–.020 | 1.735 | .042 | .125 | 3/32 ± 1/32 |
| **3a** | 104 | | 302 | | 1.6535 | 1.565 | 1.550–.020 | 1.800 | .042 | .125 | 3/32 ± 1/32 |
| **4** | 105 | 204 | 303 | | 1.8504 | 1.756 | 1.741–.030 | 2.053 | .042 | .156 | 1/8 ± 1/32 |
| **5** | | 205 | 304 | | 2.0472 | 1.958 | 1.943–.030 | 2.255 | .042 | .156 | 1/8 ± 1/32 |
| **5a** | 106 | | | | 2.1654 | 2.071 | 2.056–.030 | 2.368 | .042 | .156 | 1/8 ± 1/32 |
| **6** | 107 | 206 | 305 | 403 | 2.4409 | 2.347 | 2.322–.030 | 2.634 | .065 | .156 | 1/8 ± 1/32 |
| **6b** | 108 | | | | 2.6772 | 2.616 | 2.591–.030 | 2.922 | .065 | .156 | 1/8 ± 1/32 |
| **7** | | 207 | 306 | 404 | 2.8346 | 2.709 | 2.684–.030 | 3.060 | .065 | .188 | 1/8 ± 1/32 |
| **7a** | 109 | | | | 2.9528 | 2.828 | 2.803–.030 | 3.179 | .065 | .188 | 1/8 ± 1/32 |
| **8** | 110 | 208 | 307 | 405 | 3.1496 | 3.024 | 2.999–.046 | 3.375 | .065 | .188 | 5/32 ± 3/64 |
| **9** | | 209 | | | 3.3465 | 3.221 | 3.196–.046 | 3.572 | .065 | .188 | 5/32 ± 3/64 |
| **10** | 111 | 210 | 308 | 406 | 3.5433 | 3.417 | 3.392–.046 | 3.768 | .095 | .188 | 5/32 ± 3/64 |
| **10a** | 112 | | | | 3.7402 | 3.615 | 3.590–.046 | 3.966 | .095 | .188 | 5/32 ± 3/64 |
| **11** | 113 | 211 | 309 | 407 | 3.9370 | 3.811 | 3.786–.046 | 4.162 | .095 | .188 | 5/32 ± 3/64 |
| **12** | 114 | 212 | 310 | 408 | 4.3307 | 4.205 | 4.180–.062 | 4.556 | .095 | .188 | 3/16 ± 1/16 |
| **12a** | 115 | | | | 4.5276 | 4.402 | 4.377–.062 | 4.753 | .095 | .188 | 3/16 ± 1/16 |
| **13** | | 213 | 311 | 409 | 4.7244 | 4.536 | 4.506–.062 | 5.068 | .109 | .281 | 3/16 ± 1/16 |
| **14** | 116 | 214 | | | 4.9213 | 4.733 | 4.703–.062 | 5.265 | .109 | .281 | 3/16 ± 1/16 |
| **15** | 117 | 215 | 312 | 410 | 5.1181 | 4.930 | 4.900–.062 | 5.462 | .109 | .281 | 3/16 ± 1/16 |
| **16** | 118 | 216 | 313 | 411 | 5.5118 | 5.324 | 5.294–.093 | 5.856 | .109 | .281 | 3/16 ± 1/16 |
| **16a** | 119 | | | | 5.7087 | 5.521 | 5.491–.093 | 6.053 | .109 | .281 | 9/32 ± 1/16 |
| **17** | 120 | 217 | 314 | 412 | 5.9055 | 5.718 | 5.688–.093 | 6.250 | .109 | .281 | 9/32 ± 1/16 |
| **18** | 121 | 218 | 315 | 413 | 6.2992 | 6.111 | 6.081–.093 | 6.643 | .109 | .281 | 9/32 ± 1/16 |
| **19** | 122 | 219 | 316 | | 6.6929 | 6.443 | 6.413–.125 | 7.163 | .120 | .375 | 3/8 ± 1/16 |
| **20** | 124 | 220 | 317 | 414 | 7.0866 | 6.837 | 6.807–.125 | 7.557 | .120 | .375 | 3/8 ± 1/16 |
| **21** | | 221 | 318 | 415 | 7.4803 | 7.230 | 7.200–.125 | 7.950 | .120 | .375 | 3/8 ± 1/16 |
| **22** | 126 | 222 | 319 | 416 | 7.8740 | 7.624 | 7.594–.125 | 8.344 | .120 | .375 | 3/8 ± 1/16 |
| **23** | 128 | | | 417 | 8.2677 | 8.018 | 7.987–.125 | 8.737 | .120 | .375 | 3/8 ± 1/16 |
| **24** | | 224 | 320 | | 8.4646 | 8.215 | 8.184–.125 | 8.934 | .120 | .375 | 3/8 ± 1/16 |
| **25** | 130 | | 321 | 418 | 8.8583 | 8.608 | 8.578–.156 | 9.328 | .120 | .375 | 15/32 ± 3/32 |
| **26** | | 226 | | | 9.0551 | 8.805 | 8.775–.156 | 9.525 | .120 | .375 | 15/32 ± 3/32 |
| **27** | 132 | | 322 | | 9.4488 | 9.199 | 9.168–.156 | 9.918 | .120 | .375 | 15/32 ± 3/32 |

1) Snap-ring need not conform to cross section shown but all 4 corners must clear .016 Max. fillet (snap rings 0 through 5a) or .024 (snap rings 6 through 27).
2) Gap dimension and tolerance apply when snap ring bore B is nominal diameter shown (Max. bore).

Break all sharp corners and remove all burs.

# Bearing accessories

## Lock nuts, lock washers and lock plates

Lock nuts and lock washers are commonly used as effective means for holding bearing inner rings axially on the shaft. They are also frequently used to secure gears, belt pulleys and other machine components. The lock nuts are accurately made to insure that the abutment face will be square with the shaft axis, thus avoiding distortion of the shaft during tightening.

The lock washers are made from selected high quality steel, heat treated, and they must pass a final inspection that requires their finish to be smooth and free from burrs.

The lock plate is a steel stamping that engages the slot of the sleeve and is secured to the end face of larger nuts by two screws. This unit is used in place of lock washers.

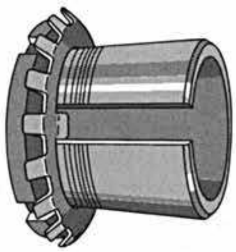
Wherever bearings must be held in permanent or correct position, use lock nuts, lock washers and lock plates.

**Lock nuts**

**Lock washers**

## Removable sleeves and removal nuts

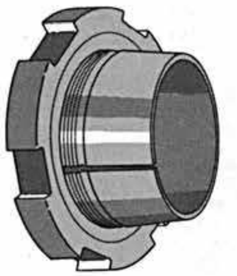
Removable sleeves have a taper on the outside diameter corresponding to the taper in the bore of the bearings. These sleeves are used for applications where bearings must be removed occasionally for the inspection of machine parts and at the same time will be positively located on the shaft with the equivalent of a press fit. A removal nut is used to remove the sleeve from the bearing. In assembling, the sleeve is locked on a threaded shaft by means of lock nuts, lock washers and lock plates.



**Adapters**

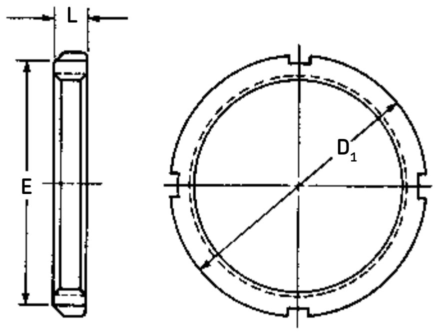
## Adapters

The adapter is used to hold and locate a tapered bore bearing on a cylindrical seat. It permits relatively wide tolerances for the shaft diameter and makes it unnecessary to heat the bearing or use a press when mounting in order to obtain an interference fit of the inner race on the shaft. Adapters are manufactured with the same precise techniques and care used in the manufacture of bearings.

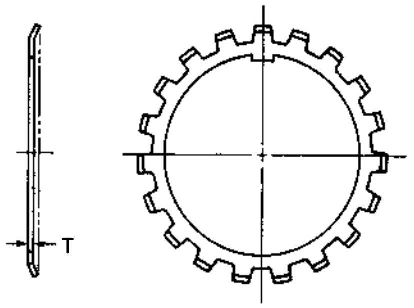


**Removable sleeves and removable nuts**

# Lock nuts and lock washers for ball bearings ABMA standards



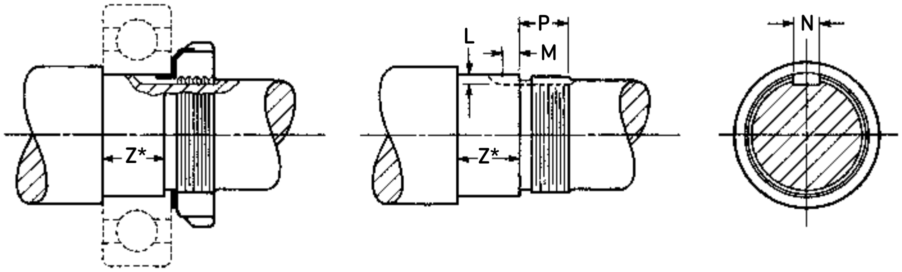

Lock nut




Lock washer

| Lock nut number | Nominal bearing bore diameter | | Lock nut: Outside diameter $D_1$ | | Thickness L | | | | Face diameter E | | | | Lock washer: Lock washer number | Thickness T | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | +.13 -.38 | +.005 -.015 | Minimum | | Maximum | | Minimum | | Maximum | | | | |
| | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | | mm | in. |
| **N00** | 10 | **.3937** | 19.0 | **3/4** | 5.31 | **.209** | 5.81 | **.229** | 15.4 | **.605** | 15.9 | **.625** | W00 | 1.07 | **.042** |
| **N01** | 12 | **.4724** | 22.2 | **7/8** | 7.70 | **.303** | 8.20 | **.323** | 17.8 | **.699** | 18.3 | **.719** | W01 | 1.07 | **.042** |
| **N02** | 15 | **.5906** | 25.4 | **1** | 7.70 | **.303** | 8.20 | **.323** | 20.1 | **.793** | 20.7 | **.813** | W02 | 1.07 | **.042** |
| **N03** | 17 | **.6693** | 28.6 | **1 1/8** | 8.48 | **.334** | 8.99 | **.354** | 23.3 | **.918** | 23.8 | **.938** | W03 | 1.07 | **.042** |
| **N04** | 20 | **.7874** | 34.9 | **1 3/8** | 9.27 | **.365** | 9.78 | **.385** | 28.1 | **1.105** | 28.6 | **1.125** | W04 | 1.07 | **.042** |
| **N05** | 25 | **.9843** | 39.7 | **1 9/16** | 10.1 | **.396** | 10.6 | **.416** | 32.0 | **1.261** | 32.5 | **1.281** | W05 | 1.27 | **.050** |
| **N06** | 30 | **1.1811** | 44.4 | **1 3/4** | 10.1 | **.396** | 10.6 | **.416** | 37.6 | **1.480** | 38.1 | **1.500** | W06 | 1.27 | **.050** |
| **N07** | 35 | **1.3780** | 52.4 | **2 1/16** | 10.9 | **.428** | 11.4 | **.448** | 45.5 | **1.793** | 46.1 | **1.813** | W07 | 1.27 | **.050** |
| **N08** | 40 | **1.5748** | 57.2 | **2 1/4** | 10.9 | **.428** | 11.4 | **.448** | 50.3 | **1.980** | 50.8 | **2.000** | W08 | 1.47 | **.058** |
| **N09** | 45 | **1.7717** | 64.3 | **2 17/32** | 10.9 | **.428** | 11.4 | **.448** | 57.4 | **2.261** | 57.9 | **2.281** | W09 | 1.47 | **.058** |
| **N10** | 50 | **1.9685** | 68.3 | **2 11/16** | 12.4 | **.490** | 13.0 | **.510** | 61.4 | **2.418** | 61.9 | **2.438** | W10 | 1.47 | **.058** |
| **N11** | 55 | **2.1654** | 75.4 | **2 31/32** | 12.4 | **.490** | 13.0 | **.510** | 67.0 | **2.636** | 67.5 | **2.656** | W11 | 1.60 | **.063** |
| **N12** | 60 | **2.3622** | 80.2 | **3 5/32** | 13.2 | **.521** | 13.7 | **.541** | 71.7 | **2.824** | 72.2 | **2.844** | W12 | 1.60 | **.063** |
| **N13** | 65 | **2.5591** | 85.7 | **3 3/8** | 14.0 | **.553** | 14.6 | **.573** | 77.3 | **3.043** | 77.8 | **3.063** | W13 | 1.60 | **.063** |
| **N14** | 70 | **2.7559** | 92.1 | **3 5/8** | 14.0 | **.553** | 14.6 | **.573** | 83.4 | **3.283** | 84.2 | **3.313** | W14 | 1.60 | **.063** |
| **AN15** | 75 | **2.9528** | 98.4 | **3 7/8** | 14.8 | **.584** | 15.3 | **.604** | 89.7 | **3.533** | 90.5 | **3.563** | W15 | 1.83 | **.072** |
| **AN16** | 80 | **3.1496** | 105.6 | **4 5/32** | 14.8 | **.584** | 15.3 | **.604** | 96.9 | **3.814** | 97.6 | **3.844** | W16 | 1.83 | **.072** |
| **AN17** | 85 | **3.3465** | 111.9 | **4 13/32** | 15.6 | **.615** | 16.1 | **.635** | 101.6 | **4.001** | 102.4 | **4.031** | W17 | 1.83 | **.072** |
| **AN18** | 90 | **3.5433** | 118.3 | **4 21/32** | 17.2 | **.678** | 17.7 | **.698** | 108.0 | **4.251** | 108.7 | **4.281** | W18 | 2.39 | **.094** |
| **AN19** | 95 | **3.7402** | 125.4 | **4 15/16** | 18.0 | **.709** | 18.5 | **.729** | 115.1 | **4.533** | 115.9 | **4.563** | W19 | 2.39 | **.094** |
| **AN20** | 100 | **3.9370** | 131.8 | **5 3/16** | 18.7 | **.735** | 19.3 | **.760** | 121.5 | **4.783** | 122.3 | **4.813** | W20 | 2.39 | **.094** |
| **AN21** | 105 | **4.1339** | 138.1 | **5 7/16** | 18.7 | **.735** | 19.3 | **.760** | 126.2 | **4.970** | 127.0 | **5.000** | W21 | 2.39 | **.094** |
| **AN22** | 110 | **4.3307** | 145.3 | **5 23/32** | 19.5 | **.766** | 20.1 | **.791** | 133.4 | **5.251** | 134.1 | **5.281** | W22 | 3.18 | **.125** |
| **AN24** | 120 | **4.7244** | 155.6 | **6 1/8** | 20.3 | **.798** | 20.9 | **.823** | 143.7 | **5.658** | 144.5 | **5.688** | W24 | 3.18 | **.125** |
| **AN26** | 130 | **5.1181** | 171.4 | **6 3/4** | 21.8 | **.860** | 22.5 | **.885** | 156.4 | **6.158** | 157.2 | **6.188** | W26 | 3.18 | **.125** |
| **AN28** | 140 | **5.5118** | 180.2 | **7 3/32** | 23.4 | **.923** | 24.1 | **.948** | 165.1 | **6.501** | 165.9 | **6.531** | W28 | 3.18 | **.125** |
| **AN30** | 150 | **5.9055** | 195.3 | **7 11/16** | 24.2 | **.954** | 24.9 | **.979** | 178.6 | **7.033** | 179.4 | **7.063** | W30 | 3.96 | **.156** |
| **AN32** | 160 | **6.2992** | 204.8 | **8 1/16** | 25.8 | **1.016** | 26.4 | **1.041** | 187.9 | **7.398** | 188.9 | **7.438** | W32 | 3.96 | **.156** |
| **AN34** | 170 | **6.6929** | 219.9 | **8 21/32** | 26.6 | **1.048** | 27.3 | **1.073** | 203.0 | **7.991** | 204.0 | **8.031** | W34 | 3.96 | **.156** |
| **AN36** | 180 | **7.0866** | 230.2 | **9 1/16** | 27.4 | **1.079** | 28.0 | **1.104** | 211.7 | **8.335** | 212.7 | **8.375** | W36 | 3.96 | **.156** |
| **AN38** | 190 | **7.4803** | 240.5 | **9 15/32** | 28.2 | **1.110** | 28.8 | **1.135** | 222.0 | **8.741** | 223.0 | **8.781** | W38 | 3.96 | **.156** |
| **AN40** | 200 | **7.8740** | 250.0 | **9 27/32** | 29.8 | **1.173** | 30.4 | **1.198** | 231.5 | **9.116** | 232.6 | **9.156** | W40 | 3.96 | **.156** |
| **N44** | 220 | **8.6614** | 279.4 | **11** | 31.2 | **1.230** | 32.0 | **1.260** | 249.0 | **9.803** | 250.0 | **9.843** | W44 | 3.96 | **.156** |

# Shaft dimensions for lock nuts




Threads—American (National) Standard Form, Fine Pitch Class 3 Fit

| Lock nut number | Threads per inch | Dimensions of shaft threads | | | | | | | | Keyway | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Major diameter | | | | Pitch diameter | | | | Length P | | Full length L | | Full depth length M | | Width N | |
| | | | | | | | | | | +.40 | +1/64 | +.40 | +1/64 | +.40 | +1/64 | +.40 | +1/64 |
| | | Maximum | | Minimum | | Maximum | | Minimum | | -0 | -0 | -0 | -0 | -0 | -0 | -0 | -0 |
| | | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. |
| **N00** | 32 | 9.93 | **.391** | 9.794 | **.3856** | 9.416 | **.3707** | 9.350 | **.3681** | 7.1 | **9/32** | 1.6 | **1/16** | 2.4 | **3/32** | 3.2 | **1/8** |
| **N01** | 32 | 11.91 | **.469** | 11.775 | **.4636** | 11.397 | **.4487** | 11.331 | **.4461** | 9.5 | **3/8** | 1.6 | **1/16** | 2.4 | **3/32** | 3.2 | **1/8** |
| **N02** | 32 | 14.88 | **.586** | 14.747 | **.5806** | 14.369 | **.5657** | 14.293 | **.5627** | 9.5 | **3/8** | 2.0 | **5/64** | 2.4 | **3/32** | 3.2 | **1/8** |
| **N03** | 32 | 16.87 | **.664** | 16.728 | **.6586** | 16.350 | **.6437** | 16.274 | **.6407** | 10.3 | **13/32** | 2.0 | **5/64** | 2.4 | **3/32** | 3.2 | **1/8** |
| **N04** | 32 | 19.84 | **.781** | 19.700 | **.7756** | 19.322 | **.7607** | 19.235 | **.7573** | 11.1 | **7/16** | 2.0 | **5/64** | 2.4 | **3/32** | 4.8 | **3/16** |
| **N05** | 32 | 24.61 | **.969** | 24.475 | **.9636** | 24.097 | **.9487** | 24.011 | **.9453** | 11.9 | **15/32** | 2.4 | **3/32** | 3.2 | **1/8** | 4.8 | **3/16** |
| **N06** | 18 | 29.79 | **1.173** | 29.586 | **1.1643** | 28.877 | **1.1369** | 28.776 | **1.1329** | 11.9 | **15/32** | 2.4 | **3/32** | 3.2 | **1/8** | 4.8 | **3/16** |
| **N07** | 18 | 34.95 | **1.376** | 34.742 | **1.3678** | 34.034 | **1.3399** | 33.932 | **1.3359** | 12.7 | **1/2** | 2.4 | **3/32** | 3.2 | **1/8** | 4.8 | **3/16** |
| **N08** | 18 | 39.70 | **1.563** | 39.492 | **1.5548** | 38.783 | **1.5269** | 38.669 | **1.5224** | 13.5 | **17/32** | 2.4 | **3/32** | 3.2 | **1/8** | 7.9 | **5/16** |
| **N09** | 18 | 44.88 | **1.767** | 44.674 | **1.7588** | 43.965 | **1.7309** | 43.851 | **1.7264** | 13.5 | **17/32** | 2.4 | **3/32** | 4.0 | **5/32** | 7.9 | **5/16** |
| **N10** | 18 | 49.96 | **1.967** | 49.754 | **1.9588** | 49.045 | **1.9309** | 48.931 | **1.9264** | 15.1 | **19/32** | 2.4 | **3/32** | 4.0 | **5/32** | 7.9 | **5/16** |
| **N11** | 18 | 54.79 | **2.157** | 54.580 | **2.1488** | 53.871 | **2.1209** | 53.741 | **2.1158** | 15.1 | **19/32** | 3.2 | **1/8** | 4.0 | **5/32** | 7.9 | **5/16** |
| **N12** | 18 | 59.94 | **2.360** | 59.736 | **2.3518** | 59.027 | **2.3239** | 58.898 | **2.3188** | 15.9 | **5/8** | 3.2 | **1/8** | 4.0 | **5/32** | 7.9 | **5/16** |
| **N13** | 18 | 64.72 | **2.548** | 64.511 | **2.5398** | 63.802 | **2.5119** | 63.673 | **2.5068** | 16.7 | **21/32** | 3.2 | **1/8** | 4.0 | **5/32** | 7.9 | **5/16** |
| **N14** | 18 | 69.88 | **2.751** | 69.667 | **2.7428** | 68.959 | **2.7149** | 68.829 | **2.7098** | 16.7 | **21/32** | 3.2 | **1/8** | 6.4 | **1/4** | 7.9 | **5/16** |
| **AN15** | 12 | 74.50 | **2.933** | 74.214 | **2.9218** | 73.124 | **2.8789** | 72.987 | **2.8735** | 17.5 | **11/16** | 3.2 | **1/8** | 6.4 | **1/4** | 7.9 | **5/16** |
| **AN16** | 12 | 79.68 | **3.137** | 79.395 | **3.1258** | 78.306 | **3.0829** | 78.156 | **3.0770** | 17.5 | **11/16** | 3.2 | **1/8** | 6.4 | **1/4** | 9.5 | **3/8** |
| **AN17** | 12 | 84.84 | **3.340** | 84.552 | **3.3288** | 83.462 | **3.2859** | 83.274 | **3.2785** | 18.3 | **23/32** | 3.2 | **1/8** | 6.4 | **1/4** | 9.5 | **3/8** |
| **AN18** | 12 | 89.59 | **3.527** | 89.301 | **3.5153** | 88.212 | **3.4729** | 88.024 | **3.4655** | 20.6 | **13/16** | 4.0 | **5/32** | 6.4 | **1/4** | 9.5 | **3/8** |
| **AN19** | 12 | 94.74 | **3.730** | 94.458 | **3.7188** | 93.368 | **3.6759** | 93.180 | **3.6685** | 21.4 | **27/32** | 4.0 | **5/32** | 6.4 | **1/4** | 9.5 | **3/8** |
| **AN20** | 12 | 99.52 | **3.918** | 99.233 | **3.9068** | 98.143 | **3.8639** | 97.955 | **3.8565** | 22.2 | **7/8** | 4.0 | **5/32** | 7.9 | **5/16** | 9.5 | **3/8** |
| **AN21** | 12 | 104.70 | **4.122** | 104.415 | **4.1108** | 103.325 | **4.0679** | 103.114 | **4.0596** | 22.2 | **7/8** | 4.0 | **5/32** | 7.9 | **5/16** | 9.5 | **3/8** |
| **AN22** | 12 | 109.86 | **4.325** | 109.571 | **4.3138** | 108.481 | **4.2709** | 108.270 | **4.2626** | 23.0 | **29/32** | 4.8 | **3/16** | 7.9 | **5/16** | 9.5 | **3/8** |
| **AN24** | 12 | 119.79 | **4.716** | 119.502 | **4.7048** | 118.412 | **4.6619** | 118.202 | **4.6536** | 23.8 | **15/16** | 4.8 | **3/16** | 7.9 | **5/16** | 9.5 | **3/8** |
| **AN26** | 12 | 129.69 | **5.106** | 129.408 | **5.0948** | 128.319 | **5.0519** | 128.108 | **5.0436** | 25.4 | **1** | 4.8 | **3/16** | 7.9 | **5/16** | 12.7 | **1/2** |
| **AN28** | 12 | 139.62 | **5.497** | 139.340 | **5.4858** | 138.250 | **5.4429** | 138.039 | **5.4346** | 27.0 | **1 1/16** | 4.8 | **3/16** | 7.9 | **5/16** | 15.9 | **5/8** |
| **AN30** | 12 | 149.56 | **5.888** | 149.271 | **5.8768** | 148.181 | **5.8339** | 147.971 | **5.8256** | 28.6 | **1 1/8** | 5.6 | **7/32** | 9.5 | **3/8** | 15.9 | **5/8** |
| **AN32** | 8 | 159.61 | **6.284** | 159.228 | **6.2638** | 157.551 | **6.2028** | 157.320 | **6.1937** | 30.2 | **1 3/16** | 6.0 | **15/64** | 9.5 | **3/8** | 15.9 | **5/8** |
| **AN34** | 8 | 169.14 | **6.659** | 168.753 | **6.6438** | 167.076 | **6.5778** | 166.845 | **6.5687** | 31.0 | **1 7/32** | 6.0 | **15/64** | 9.5 | **3/8** | 19.1 | **3/4** |
| **AN36** | 8 | 179.48 | **7.066** | 179.091 | **7.0508** | 177.414 | **6.9848** | 177.183 | **6.9757** | 31.8 | **1 1/4** | 6.0 | **15/64** | 9.5 | **3/8** | 19.1 | **3/4** |
| **AN38** | 8 | 189.79 | **7.472** | 189.403 | **7.4568** | 187.727 | **7.3908** | 187.496 | **7.3817** | 32.5 | **1 9/32** | 6.0 | **15/64** | 9.5 | **3/8** | 19.1 | **3/4** |
| **AN40** | 8 | 199.31 | **7.847** | 198.928 | **7.8318** | 197.252 | **7.7658** | 196.962 | **7.7544** | 34.1 | **1 11/32** | 6.0 | **15/64** | 9.5 | **3/8** | 22.2 | **7/8** |
| **N44** | 8 | 219.15 | **8.628** | 218.766 | **8.6128** | 217.089 | **8.5468** | 216.782 | **8.5347** | 34.9 | **1 3/8** | 9.5 | **3/8** | 4.8 | **3/16** | 27.0 | **1 1/16** |

*Z = Minimum bearing width: .016 ± .010 in. (.406 ± .254 mm).

# Lock nut torque and clamping force

Lock nut torques are standardized regardless of the type of lock nut used. Acceptable lock nut torques for dry thread engagement are shown in the following table. Bearing lock nuts shall be tightened using a torque wrench and a two-point lock nut wrench or other suitable torque wrench adapter.

| Bearing bore (mm) | Lock nut torque (ft-lb) | Approximate clamping force (lb) |
|---|---|---|
| 10 | 10-20 | 1 620-3 240 |
| 12 | 10-20 | 1 340-2 680 |
| 15 | 10-20 | 1 070-2 140 |
| 17 | 10-20 | 940-1 880 |
| 20 | 12-35 | 950-2 770 |
| 25 | 23-50 | 1 450-3 170 |
| 30 | 32-60 | 1 690-3 170 |
| 35 | 39-70 | 1 750-3 140 |
| 40 | 50-80 | 1 970-3 140 |
| 45 | 64-90 | 2 220-3 120 |
| 50 | 67-100 | 2 090-3 120 |
| 55 | 82-125 | 2 330-3 540 |
| 60 | 99-150 | 2 560-3 880 |
| 65 | 131-175 | 3 130-4 190 |
| 70 | 152-200 | 3 360-4 430 |
| 75 | 173-250 | 3 610-5 220 |
| 80 | 197-275 | 3 840-5 350 |
| 85 | 222-325 | 4 060-5 940 |
| 90 | 248-375 | 4 280-6 480 |
| 95 | 277-425 | 4 520-6 950 |
| 100 | 345-475 | 5 360-7 380 |
| 105 | 380-550 | 5 620-8 120 |
| 110 | 380-550 | 5 340-7 740 |
| 120 | 380-550 | 4 900-7 080 |
| 130 | 380-550 | 4 510-6 540 |
| 140 | 380-550 | 4 190-6 070 |
| 150 | 380-550 | 3 910-5 660 |
| 160 | 380-550 | 3 680-5 330 |

# Installation procedures

For the precision ball and roller bearings supplied by MRC Bearings, skill and cleanliness while handling, mounting and dismounting are necessary to ensure satisfactory bearing performance. As precision components, rolling bearings must be handled with appropriate care during transportation, storage, mounting and dismounting. For example, it is well known that minute dents, and small amounts of contact surface corrosion and contaminants will seriously shorten bearing endurance. Such damages can be caused by improper handling.

## Bearing storage and transportation

Before packaging, MRC precision bearings are treated with a high-grade preservative and they should be stored in the original, unbroken package. **The relative humidity in the storage room should not exceed 60%.** When transporting bearings into and out of the storage room, care must be exercised not to drop the bearings or apply heavy or even moderate impact loading of any kind to prevent damage to, or dislodging of, any of the bearing components. Also care must be exercised to assure the package remains unbroken to prevent contaminants from being introduced into the bearings.

## Preparations for bearing mounting

Mounting should be carried out in a dry, dust free room away from metal-working or other machines producing swarf and dust and operating with contaminating agents. Before mounting the bearings, all the necessary parts, tools and equipment should be at hand. It is also important that any drawings or instructions be studied to determine the correct order in which the various components are to be mounted.

All components of the bearing arrangement (housings, shafts, etc.) must be carefully cleaned and any burrs removed; unmachined internal surfaces of cast housings must be free of core grit. The dimensional and form accuracy of all components in contact with the bearings must be checked. The bearings will only perform satisfactorily if the prescribed tolerances of the mounting structures are adhered to. The bearings should be left in their original packages until immediately before mounting.

There is usually no need to remove preservative protecting the bearings. If, however, the bearings are to be grease-lubricated and used at very high or very low temperatures, or when the grease has been determined to be incompatible with the preservative, it is necessary to wash the bearings in a suitable, non-contaminated fluid and carefully dry the bearings prior to mounting. This is to prevent any detrimental effect on the lubricating properties of the grease.

**Bearings which have become contaminated because of improper handling (damaged package, etc.) must be carefully washed and dried before mounting.**

**Bearings which are supplied ready-greased and which have seals, shields or polymerized lubricant must never be washed before mounting.**

## Bearing mounting

The method (mechanical, hydraulic or thermal) used to mount a bearing depends on the type and size of the bearing and complexity of the application assembly.

In all cases, it is extremely important that neither the bearing, nor any of its components (rings, cage or rolling elements), receive any impact loading (hammer blows, etc.) as this would damage the bearing and could dislodge components. Also, under no circumstances must pressure be applied to one ring in order to mount the other ring.

With non-separable bearings, the ring which is to have the tighter fit is generally mounted first. The seating surface should be lightly oiled before mounting. Pressure may be uniformly applied against a sleeve abutting the bearing ring face; the use of a mounting dolly instead of a sleeve, as shown in Figure 1, permits a mounting force to be applied centrally.

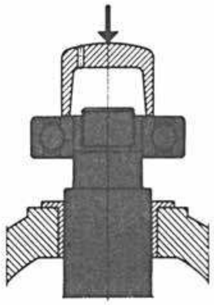


**Figure 1**

If a non-separable bearing is to be pressed onto the shaft and into the housing simultaneously, the tool set shown by Figure 2, in which a mounting ring is inserted between the dolly and the bearing to simultaneously abut the side faces of the inner and outer rings, may be used. For the mounting forces to be applied equally to both rings, the abutment surfaces of the mounting ring must lie in the same plane.

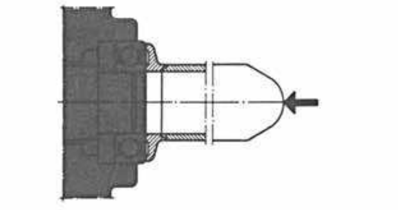


**Figure 2**

## Bearing mounting

Most split inner ring ball bearings, cylindrical roller bearings and tapered roller bearings are designed as separable bearings. In the case of split inner ring ball bearings and cylindrical roller bearings, this means that the outer ring, cage and rolling elements comprise a non-separable unit when the inner ring is removed. Sometimes the inner ring, cage and rolling elements comprise the non-separable unit; this is usually the case for tapered roller bearings.

With separable bearings, the inner ring can be mounted independently of the outer ring. This simplifies mounting, particularly where each ring is to have an interference fit. When inserting the shaft, with the inner ring already mounted, into the housing containing the outer ring, care must be taken that the shaft is correctly aligned with the housing to prevent scoring the raceways and damaging the rolling elements.

**For a cylindrical roller bearing, should either part of the bearing be mounted askew, damage may easily be caused to the rings or rollers especially if the rollers and raceways are not oiled or if the parts are rotated during fitting.**

It is generally not possible to mount larger bearings in the cold state, as the force required to mount a bearing increases very considerably with bearing size. The bearings, the inner rings or the housings are heated prior to mounting. The required difference in temperature between the bearing ring and shaft or housing depends on the degree of interference and the diameter of the bearing seating. Guideline values for the temperature differences required for some of the most commonly employed fits of bearings may be found in the accompanying diagram (Figure 3). Bearings fabricated from AISI 52100 steel, or other steels suitable for normal operating temperatures (for example, 150° C (300° F) should not be heated to more than 125° C (250° F) since dimensional changes caused by alterations in the material structure may occur.

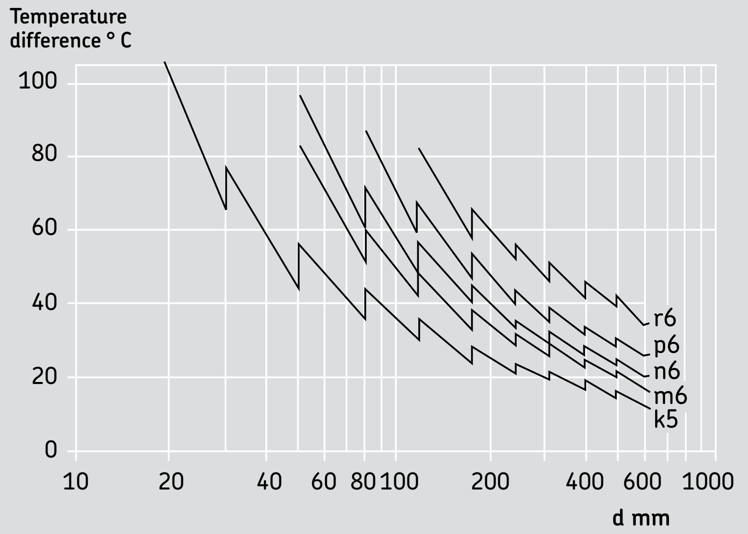



Figure 3

Bearings fabricated from steels capable of operation at higher temperatures may be heated to somewhat higher temperatures; e.g., 205° C [400° F] for mounting purposes. The indicated temperature is more dictated by the preserving lubricant temperature limit than by the steel. Ready-greased bearings fitted with seals and/or shields should not be heated.

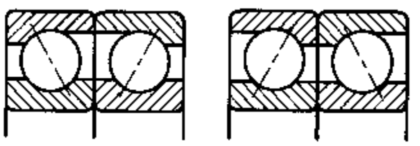
Local overheating must be avoided when heating bearings. Uniform, risk-free heating can be achieved using induction heaters, electric heaters, heating cabinets and oil baths. If hotplates are used, the bearing must be turned over a number of times. The inner rings of medium and large cylindrical roller bearings, which have no flange or an integral flange on one side only, may be heated using an induction heating tool or heating ring.

## Bearing adjustment

The internal clearance of single row, angular contact ball bearings is only established, in contrast to other radial bearings, when one bearing is adjusted against a second bearing. Usually these bearings are arranged in face-to-face or back-to-back pairs, and one bearing ring is axially displaced until a given clearance or preload is attained (Figure 4).

The appropriate value for the clearance to be obtained when mounting is determined by the conditions when the bearing is under load and at the operating temperature. Depending on the size and arrangement of the bearings, the materials from which the shaft and housing are fabricated and the distance between the two bearings, the initial clearance obtained on mounting may be smaller or larger in actual operation. If, for example, differential thermal expansion will cause a reduction in clearance, the initial clearance must be sufficiently large so that distortion of the bearings and resultant detrimental effects are avoided.

**Figure 4**
**Angular contact ball bearings pair mounting arrangements**



**Face-to-face**

Bearings are placed so that the unmarked (low shoulder side) of the outer rings are together. Contact angle lines of two bearings converge inwardly toward the bore of the bearing.

**Back-to-back**

Bearings are placed so that the marked backs (full shoulder side) of the outer rings are together. Contact angle lines of the bearings converge outwardly, away from the bearing bores.

# Installation procedures

Since there is a definite relationship between radial and axial internal clearance of angular contact ball bearings, it is sufficient to specify a single value, generally the axial internal clearance. This specified value is then obtained, starting from a condition of zero clearance, by loosening or tightening a nut on the shaft or a threaded ring in the housing bore, or by inserting calibrated shims between one of the bearing rings and its abutment. The actual methods used to adjust the clearance and measure the set clearance are determined by whether a few or many bearings are to be mounted.

## Dismounting of bearings

If bearings are to be reused after removal from the application, the force used to dismount them must never be applied through the rolling elements. With separable bearings, the ring with the rolling element and cage assembly can be removed independently of the other ring. With non-separable bearings, the ring having the looser fit should be removed from its seating first. To dismount a bearing ring having an interference fit, the tools and accessories described in the following may be used depending on bearing type and size.

## Bearing ring puller

Small bearings may be removed from their seatings by using a puller as illustrated in Figure 5.

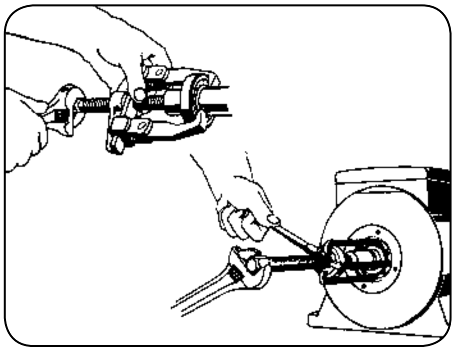


**Figure 5**

The claws of the puller should be placed against the side face of the ring to be removed or an adjacent component; e.g., a labyrinth ring, etc. Dismounting is made easier if, when designing the bearing arrangement, slots are provided in the shaft and housing shoulders to accommodate the claws of the puller. Outer rings can be removed more easily from their housings if tapped holes are provided in the shoulders to take withdrawal screws (Figure 6).

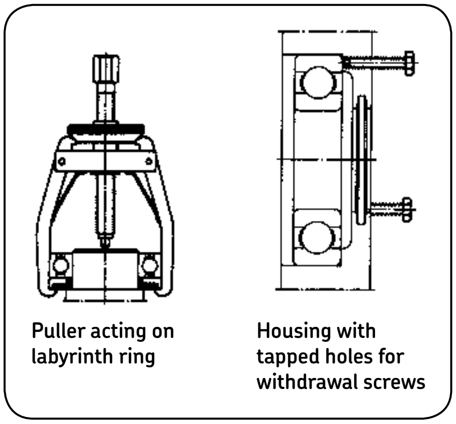
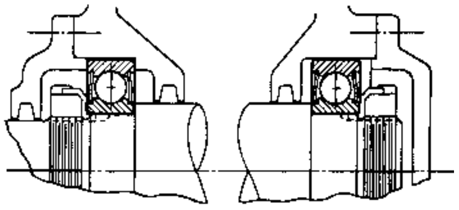



**Figure 6**

## Installation procedures

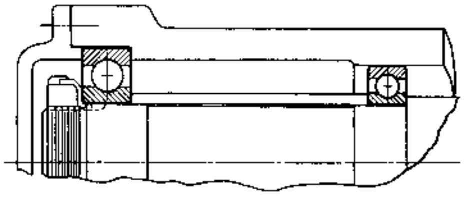
### Typical horizontal mountings for single-row radial and double-row bearings



**Standard mounting**

This is the ideal mounting for a shaft supported by two ball bearings, and has these advantages:

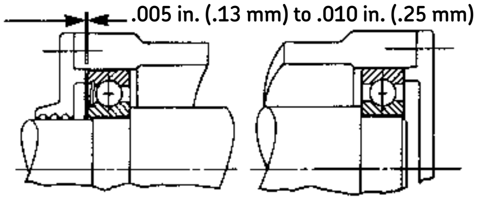
1 It permits one bearing to take thrust in either direction.
2 Axial shaft expansion is provided for by the "floating" of the unclamped bearing.
3 The bearings cannot be axially preloaded through improper adjustment of the lock nuts. The lock nuts serve to clamp the bearing inner rings against the shaft shoulder.
4 This mounting arrangement is suitable for a wide range of speed and temperature conditions.



**Standard mounting (with spacer)**

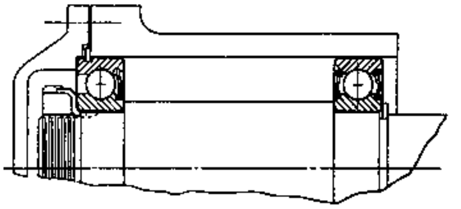
This is an alternate mounting with that shown above, and should be used where the bearings are assembled from one end of the shaft. Note that the inner rings of both bearings, together with the spacer which separates them, are clamped against the shaft shoulder by means of one lock nut at the end of the shaft. (Compare mounting above which requires two lock nuts.) This construction has the same advantages as those enumerated above.

The mounting shown below employs no lock nuts on the shaft and permits through bore in the housing. Due to tolerance build-up of the various components, it is difficult to control the axial play of the shaft unless shims are used. These shims are usually mounted between the face of the bearing outer ring and the end cover shoulder. Axial play of the shaft should be sufficiently large to eliminate any possibility of preloading due to thermal expansions, yet small enough to eliminate excessive chucking under reversing thrust load.




**Mounting with no lock nut or snap-ring**

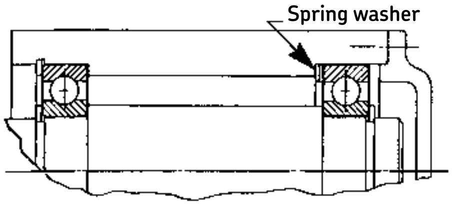
This means of mounting may be effectively employed where there is no rapid alternation in the direction of the thrust load. It is also adaptable for locations where shaft length is short.



**Mounting with lock nut and snap-ring**

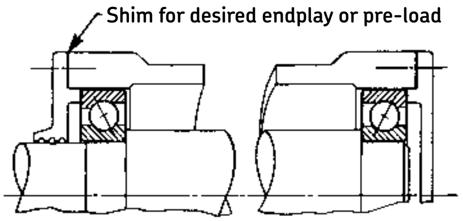
The type of mounting above differs from the standard mounting in that the bearing on the right end is held on the shaft by a snap-ring, which eliminates the lock nut and the necessity of threading the shaft. Use of a snap-ring bearing on the left above, makes use of a through bore housing possible, thereby allowing economies in manufacture.

# Installation procedures




**Mounting with snap-rings and spring washer**

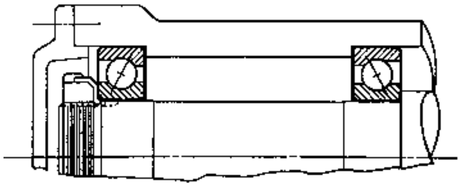
The above mounting can be used where both shaft and housing have shoulders, and where thrust is not excessive. The commercially available spring washer provides a small preload to the bearings. This eliminates shaft endplay and enhances quiet bearing operation.




**Pair of angular-contact bearings mounted opposed to take thrust in either direction**

This construction requires a shoulder on the shaft, and a clamping member of the outer ring, with shim adjustment.

Lock nuts on the shaft can in general be dispensed with, but should be used where the inner ring must be very firmly secured to resist shock or vibratory loads.



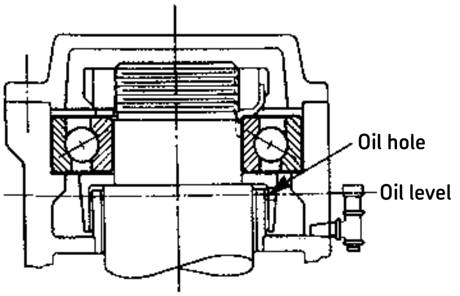
This construction requires housing shoulders, and a lock nut on the shaft. Adjustment is made by means of the lock nut. The left hand bearing should have a sliding fit on the shaft.

Owing to the difficulty of accurate adjustment and danger of excessive tightening, this mounting is not often recommended.

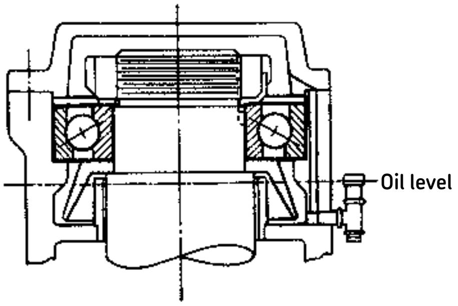
If the thrust in one direction is substantially less than in the opposite direction, the bearings can be of different sizes so as to give approximately equal safety factors. Also the reverse thrust can, if desired, be taken care of by a smaller angular-contact bearing, or by a radial bearing.

## Typical vertical mountings for angular-contact bearings

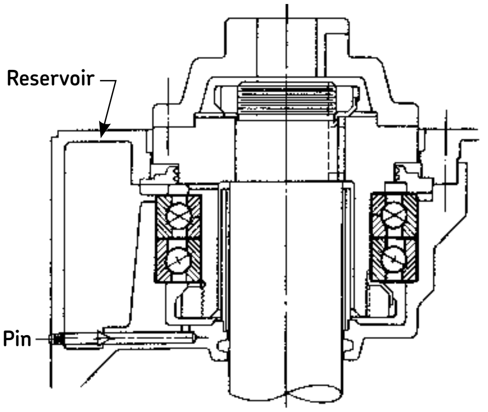
Vertical mountings are frequently used with oil lubrication. This requires a means for lifting the oil into contact with the bearings. The sketches on this page show three approved mounting arrangements.




The design above is suited for uni-directional thrust. If reversing thrust is present, it must be taken by an opposed bearing mounted at the bottom of the shaft. Note that the oil is lifted into the bearing by means of the inverted rotating cone. Attention is called to the drilled hole which prevents possible siphoning out of the oil when the shaft is stationary.




The sketch above shows the conventional method of circulating oil in a vertical application. Note that the dish-shaped oil thrower pumps the oil up through the drilled hole in the housing from which the oil flows downward through the bearing by gravity. Reverse thrust loads must be carried by an opposed bearing.




**Application of MRC 97000 series**

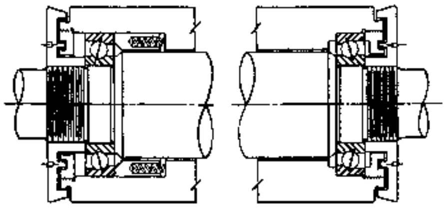
The bearing arrangement above is capable of supporting extremely heavy thrust in the downward direction as well as substantially heavy thrust loads in the upward direction. The radial support bearing at the bottom of the shaft need not be shimmed to carry the up-thrust. The 9000UD bearing may be mounted above (as shown) or below, the 7000D, but maintaining the same orientation of bearing faces. (See page 243)

In the lubricating arrangement shown, the bearings serve as a pump to elevate the oil from the chamber immediately below the bearings to a passageway at the top of the bearings. From this point the oil returns by gravity to the reservoir shown at the left. Oil flow into the chamber below the bearings is adjusted by means of a metering pin. This system has a unique advantage in that the bearings may be completely covered by the oil level during shut-down, thereby protecting them against damage through corrosion.

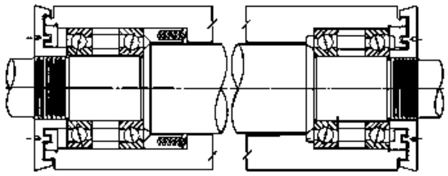
## Installation procedures

### Typical methods of mounting bearings for high speed operation

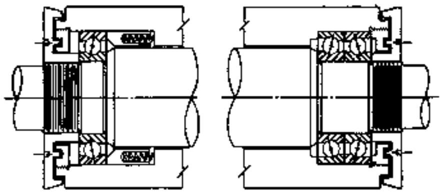
The drawings here illustrate proven designs for high speed service, primarily for machine tool spindles. Note the rugged sections for minimizing deflection and the labyrinth flinger seals for protecting the bearings against the entrance of foreign material. Additional sealing protection is often provided by introducing air-oil mist in the chamber between the two bearings. This not only lubricates the bearings, but also assures a positive outward flow of air through the labyrinth passage. The radial clearances in the labyrinth should be .005 in. (.13mm) to .010 in. (.25 mm) and the axial clearances should be approximately 1/32 in. (.080 mm) to 1/16 in. (1.59 mm).



This is the simplest high speed mounting arrangement and is used for a wide variety of applications involving extremely high speeds. The spring pack bears against the face of the outer ring on the bearing at the left in order to preload the two bearings. Bearing on left end of shaft must be free to float in housing for preload to be effective. For extremely high speeds, the floating bearing is sometimes mounted in a cartridge in order to improve the length-to-diameter ratio of the sliding member.

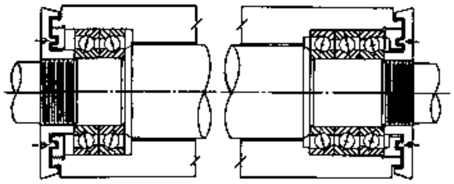


In the arrangement above, the duplex tandem pair on the left end of the shaft is spring preloaded against another duplex tandem pair on the right. The pairs at either end are separated by equal length spacers between bearing outer rings and inner rings. This arrangement produces good shaft rigidity due to the multiple shaft support.

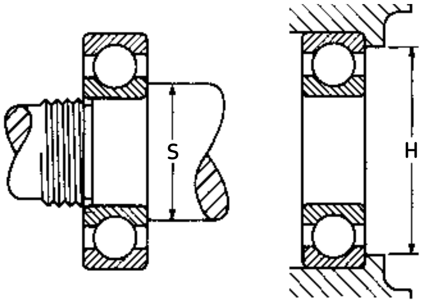


In this arrangement the shaft is supported at the right end by a duplex pair mounted in the back-to-back relationship. These bearings may be supplied as a preloaded set if operating conditions require that deflections be minimized. The bearing on the left end of the shaft is a single-row deep-groove bearing which floats axially in the housing and is lightly spring loaded to remove residual clearances.

The shaft below is located axially by the arrangement on the right end of the shaft, which consists of a pair of tandem bearings opposed back-to-back against a single bearing. The duplex back-to-back pair on the left end of the shaft is free to move axially in the housing. This mounting arrangement has great rigidity.



# Shaft and housing shoulder diameters




Shoulder diameters for millimeter and inch-size MRC ball bearings

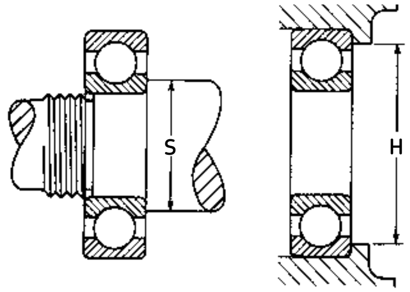
The tables on these pages show minimum shaft shoulder diameters and maximum housing shoulder diameters as established by MRC Engineering. However, the user may wish to modify these diameters to meet specific requirements such as assembly or disassembly problems or extremely heavy thrust loads. Please consult MRC Engineering for specific recommendations concerning your requirements.

| MRC bearing number | S Minimum | | H Maximum | |
|---|---|---|---|---|
| | mm | in. | mm | in. |
| 34 | 5.51 | .22 | 14.2 | .56 |
| 35 | 6.61 | .26 | 17.0 | .67 |
| 36 | 7.61 | .30 | 17.0 | .67 |
| 37 | 8.61 | .34 | 20.0 | .79 |
| 38 | 9.71 | .38 | 20.0 | .79 |
| 39 | 11.4 | .45 | 23.4 | .92 |
| R2 | 4.60 | .179 | 8.3 | .33 |
| R2A | 4.60 | .179 | 11.8 | .47 |
| R3 | 6.20 | .24 | 11.8 | .47 |
| R4 | 7.90 | .31 | 14.4 | .57 |
| R4A | 8.20 | .32 | 17.2 | .68 |
| R6 | 11.50 | .45 | 20.3 | .80 |
| R8 | 15.90 | .63 | 26.0 | 1.03 |
| R10 | 19.10 | .75 | 31.8 | 1.25 |
| R12 | 22.20 | .88 | 38.1 | 1.50 |
| R14 | 25.40 | 1.00 | 44.5 | 1.75 |
| R16 | 28.60 | 1.13 | 47.6 | 1.88 |
| R18 | 31.80 | 1.25 | 50.8 | 2.00 |
| R20 | 34.90 | 1.38 | 54.0 | 2.13 |
| R22 | 38.10 | 1.50 | 60.3 | 2.38 |
| R24 | 41.30 | 1.63 | 63.5 | 2.50 |
| 102 | 17.00 | .67 | 30.0 | 1.18 |
| 103 | 19.10 | .75 | 35.1 | 1.38 |
| 104 | 22.60 | .89 | 37.1 | 1.46 |
| 105 | 27.40 | 1.08 | 46.7 | 1.84 |
| 106 | 34.00 | 1.34 | 56.1 | 2.21 |
| 107 | 38.90 | 1.53 | 64.0 | 2.52 |
| 108 | 43.90 | 1.73 | 73.9 | 2.91 |
| 109 | 49.30 | 1.94 | 79.0 | 3.11 |
| 110 | 54.10 | 2.13 | 83.1 | 3.27 |
| 111 | 59.20 | 2.33 | 92.9 | 3.66 |
| 112 | 64.30 | 2.53 | 98.0 | 3.86 |
| 113 | 69.10 | 2.72 | 108.0 | 4.25 |
| 114 | 73.90 | 2.91 | 113.0 | 4.45 |
| 115 | 79.00 | 3.11 | 123.0 | 4.84 |
| 116 | 84.10 | 3.31 | 128.0 | 5.05 |
| 117 | 88.90 | 3.50 | 136.0 | 5.35 |
| 118 | 97.50 | 3.84 | 141.0 | 5.55 |
| 119 | 102.00 | 4.05 | 150.0 | 5.91 |
| 120 | 107.00 | 4.23 | 150.0 | 5.91 |
| 122 | 120.00 | 4.72 | 165.0 | 6.49 |
| 124 | 130.00 | 5.12 | 180.0 | 7.09 |
| 126 | 140.00 | 5.51 | 195.0 | 7.68 |
| 128 | 150.00 | 5.91 | 208.0 | 8.19 |
| 130 | 162.00 | 6.38 | 223.0 | 8.78 |

| MRC bearing number | S Minimum | | H Maximum | |
|---|---|---|---|---|
| | mm | in. | mm | in. |
| 132 | 172.0 | 6.77 | 238.0 | 9.37 |
| 134 | 182.0 | 7.17 | 253.0 | 9.96 |
| 136 | 192.0 | 7.56 | 266.0 | 10.55 |
| 138 | 202.0 | 7.95 | 288.0 | 11.34 |
| 140 | 212.0 | 8.35 | 308.0 | 12.13 |
| 142 | 222.0 | 8.74 | 326.0 | 12.84 |
| 144 | 234.0 | 9.21 | 336.0 | 13.23 |
| 146 | 244.0 | 9.61 | 356.0 | 14.02 |
| 148 | 254.0 | 10.00 | 372.0 | 14.65 |
| 150 | 266.0 | 10.47 | 392.0 | 15.43 |
| 152 | 278.0 | 10.95 | 412.0 | 16.22 |
| 156 | 298.0 | 11.73 | 442.0 | 17.40 |
| 164 | 338.0 | 13.31 | 482.0 | 18.98 |
| 100K | 11.9 | .47 | 24.1 | .95 |
| 101K | 14.0 | .55 | 25.9 | 1.02 |
| 102K | 17.0 | .67 | 30.0 | 1.18 |
| 103K | 19.1 | .75 | 33.0 | 1.30 |
| 104K | 22.6 | .89 | 37.1 | 1.46 |
| 105K | 27.4 | 1.08 | 41.9 | 1.65 |
| 106K | 34.0 | 1.34 | 49.0 | 1.93 |
| 107K | 38.9 | 1.53 | 56.1 | 2.21 |
| 108K | 43.9 | 1.73 | 62.0 | 2.44 |
| 109K | 49.3 | 1.94 | 69.0 | 2.72 |
| 110K | 54.1 | 2.13 | 73.9 | 2.91 |
| 111K | 59.2 | 2.33 | 83.1 | 3.27 |
| 112K | 64.3 | 2.53 | 88.1 | 3.47 |
| 113K | 69.1 | 2.72 | 92.9 | 3.66 |
| 114K | 73.9 | 2.91 | 103.0 | 4.06 |
| 115K | 79.0 | 3.11 | 108.0 | 4.25 |
| 116K | 84.1 | 3.31 | 118.0 | 4.65 |
| 117K | 88.9 | 3.50 | 123.0 | 4.84 |
| 118K | 97.5 | 3.84 | 131.0 | 5.16 |
| 119K | 102.0 | 4.05 | 136.0 | 5.35 |
| 120K | 107.0 | 4.23 | 141.0 | 5.55 |
| 121K | 115.0 | 4.53 | 150.0 | 5.91 |
| 122K | 120.0 | 4.72 | 160.0 | 6.30 |
| 124K | 130.0 | 5.12 | 170.0 | 6.69 |
| 126K | 140.0 | 5.51 | 190.0 | 7.48 |
| 128K | 150.0 | 5.91 | 200.0 | 7.87 |
| 130K | 162.0 | 6.38 | 213.0 | 8.39 |
| 132K | 172.0 | 6.77 | 228.0 | 8.98 |
| 134K | 182.0 | 7.17 | 248.0 | 9.76 |
| 136K | 192.0 | 7.56 | 266.0 | 10.55 |
| 138K | 202.0 | 7.95 | 278.0 | 10.95 |
| 140K | 212.0 | 8.35 | 298.0 | 11.73 |

| MRC bearing number | S Minimum | | H Maximum | |
|---|---|---|---|---|
| | mm | in. | mm | in. |
| 144K | 234.0 | 9.21 | 326.0 | 12.84 |
| 148K | 254.0 | 10.00 | 346.0 | 13.62 |
| 152K | 278.0 | 10.95 | 382.0 | 15.04 |
| 156K | 298.0 | 11.73 | 402.0 | 15.83 |
| 160K | 318.0 | 12.52 | 442.0 | 17.40 |
| 164K | 338.0 | 13.31 | 462.0 | 18.19 |
| 200 | 12.7 | .50 | 24.9 | .98 |
| 201 | 14.7 | .58 | 26.9 | 1.06 |
| 202 | 17.5 | .69 | 30.0 | 1.18 |
| 203 | 19.6 | .77 | 34.0 | 1.34 |
| 204 | 23.9 | .94 | 40.9 | 1.61 |
| 205 | 29.0 | 1.14 | 46.0 | 1.81 |
| 206 | 34.0 | 1.34 | 56.1 | 2.21 |
| 207 | 38.9 | 1.53 | 65.0 | 2.56 |
| 208 | 43.9 | 1.73 | 72.9 | 2.87 |
| 209 | 49.3 | 1.94 | 78.0 | 3.07 |
| 210 | 54.1 | 2.13 | 83.1 | 3.27 |
| 211 | 61.2 | 2.41 | 93.5 | 3.68 |
| 212 | 67.8 | 2.67 | 101.0 | 3.98 |
| 213 | 72.6 | 2.86 | 111.0 | 4.37 |
| 214 | 77.7 | 3.06 | 116.0 | 4.57 |
| 215 | 82.6 | 3.25 | 121.0 | 4.76 |
| 216 | 90.2 | 3.55 | 130.0 | 5.12 |
| 217 | 95.3 | 3.75 | 140.0 | 5.51 |
| 218 | 100.0 | 3.94 | 150.0 | 5.91 |
| 219 | 107.0 | 4.21 | 158.0 | 6.22 |
| 220 | 112.0 | 4.41 | 168.0 | 6.61 |
| 221 | 117.0 | 4.61 | 178.0 | 7.01 |
| 222 | 122.0 | 4.80 | 188.0 | 7.40 |
| 224 | 132.0 | 5.20 | 203.0 | 7.99 |
| 226 | 144.0 | 5.67 | 216.0 | 8.50 |
| 228 | 154.0 | 6.05 | 236.0 | 9.29 |
| 230 | 164.0 | 6.46 | 256.0 | 10.08 |
| 232 | 174.0 | 6.85 | 276.0 | 10.87 |
| 234 | 188.0 | 7.40 | 292.0 | 11.50 |
| 236 | 198.0 | 7.80 | 302.0 | 11.89 |
| 238 | 208.0 | 8.19 | 322.0 | 12.68 |
| 240 | 218.0 | 8.58 | 342.0 | 13.47 |
| 242 | 232.0 | 9.13 | 359.0 | 14.13 |
| 244 | 238.0 | 9.37 | 382.0 | 15.04 |
| 246 | 254.0 | 10.00 | 397.0 | 15.63 |
| 248 | 258.0 | 10.16 | 422.0 | 16.61 |
| 250 | 277.0 | 10.92 | 434.0 | 17.07 |
| 252 | 282.0 | 11.10 | 458.0 | 18.03 |
| 256 | 302.0 | 11.89 | 478.0 | 18.82 |
| 260 | 322.0 | 12.68 | 518.0 | 20.39 |
| 264 | 342.0 | 13.47 | 558.0 | 21.97 |

# Shaft and housing shoulder diameters



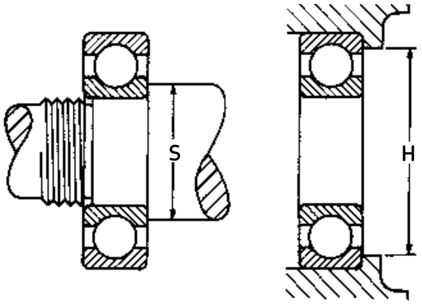

Shoulder diameters for millimeter and inch-size MRC ball bearings

| MRC bearing number | S Minimum | | H Maximum | |
|---|---|---|---|---|
| | mm | in. | mm | in. |
| **300** | 12.7 | **.50** | 30.0 | **1.18** |
| **301** | 16.0 | **.63** | 31.0 | **1.22** |
| **302** | 19.1 | **.75** | 36.1 | **1.42** |
| **303** | 21.1 | **.83** | 40.9 | **1.61** |
| **304** | 23.9 | **.94** | 45.0 | **1.77** |
| **305** | 29.0 | **1.14** | 55.1 | **2.17** |
| **306** | 34.0 | **1.34** | 65.0 | **2.56** |
| **307** | 42.9 | **1.69** | 71.1 | **2.80** |
| **308** | 49.0 | **1.93** | 81.0 | **3.19** |
| **309** | 54.1 | **2.13** | 90.9 | **3.58** |
| **310** | 59.9 | **2.36** | 100.0 | **3.94** |
| **311** | 65.0 | **2.56** | 110.0 | **4.33** |
| **312** | 72.1 | **2.84** | 118.0 | **4.65** |
| **313** | 77.0 | **3.03** | 128.0 | **5.04** |
| **314** | 82.0 | **3.23** | 138.0 | **5.43** |
| **315** | 87.1 | **3.43** | 148.0 | **5.83** |
| **316** | 91.9 | **3.62** | 158.0 | **6.22** |
| **317** | 99.1 | **3.90** | 166.0 | **6.54** |
| **318** | 104.0 | **4.09** | 176.0 | **6.93** |
| **319** | 109.0 | **4.29** | 186.0 | **7.32** |
| **320** | 114.0 | **4.49** | 201.0 | **7.91** |
| **321** | 119.0 | **4.69** | 211.0 | **8.31** |
| **322** | 124.0 | **4.88** | 226.0 | **8.90** |
| **324** | 134.0 | **5.28** | 246.0 | **9.69** |
| **326** | 148.0 | **5.83** | 262.0 | **10.32** |
| **328** | 158.0 | **6.22** | 282.0 | **11.10** |
| **330** | 168.0 | **6.61** | 302.0 | **11.89** |
| **332** | 178.0 | **7.01** | 322.0 | **12.68** |
| **334** | 188.0 | **7.40** | 342.0 | **13.47** |
| **336** | 198.0 | **7.80** | 362.0 | **14.25** |
| **338** | 212.0 | **8.35** | 378.0 | **14.88** |
| **340** | 222.0 | **8.74** | 398.0 | **15.67** |
| **342** | 240.0 | **9.43** | 412.0 | **16.21** |
| **344** | 242.0 | **9.53** | 438.0 | **17.24** |
| **348** | 262.0 | **10.32** | 478.0 | **18.82** |
| **352** | 288.0 | **11.34** | 512.0 | **20.16** |
| **356** | 308.0 | **12.13** | 552.0 | **21.73** |
| **403** | 24.1 | **.95** | 55.1 | **2.17** |
| **404** | 26.9 | **1.06** | 65.0 | **2.56** |
| **405** | 34.0 | **1.34** | 71.1 | **2.80** |
| **406** | 39.1 | **1.54** | 81.0 | **3.19** |
| **407** | 43.9 | **1.73** | 90.9 | **3.58** |
| **408** | 50.0 | **1.97** | 100.0 | **3.94** |
| **409** | 55.1 | **2.17** | 110.0 | **4.33** |
| **410** | 62.0 | **2.44** | 118.0 | **4.65** |
| **411** | 67.1 | **2.64** | 128.0 | **5.04** |
| **412** | 72.1 | **2.84** | 138.0 | **5.43** |
| **413** | 77.0 | **3.03** | 148.0 | **5.83** |
| **414** | 84.1 | **3.31** | 166.0 | **6.54** |
| **415** | 88.9 | **3.50** | 176.0 | **6.93** |
| **416** | 94.0 | **3.70** | 186.0 | **7.32** |
| **417** | 103.0 | **4.06** | 192.0 | **7.56** |

| MRC bearing number | S Minimum | | H Maximum | |
|---|---|---|---|---|
| | mm | in. | mm | in. |
| **418** | 108.0 | **4.25** | 207.0 | **8.15** |
| **419** | 109.0 | **4.30** | 231.0 | **9.10** |
| **420** | 121.0 | **4.75** | 245.0 | **9.64** |
| **421** | 130.0 | **5.10** | 267.0 | **10.52** |
| **422** | 138.0 | **5.42** | 294.0 | **11.57** |
| **1800** | 12.0 | **.47** | 17.0 | **.67** |
| **1801** | 14.0 | **.55** | 19.0 | **.75** |
| **1802** | 17.0 | **.67** | 22.0 | **.87** |
| **1803** | 19.0 | **.75** | 24.0 | **.95** |
| **1804** | 22.0 | **.87** | 30.0 | **1.18** |
| **1805** | 27.0 | **1.06** | 35.0 | **1.38** |
| **1806** | 32.0 | **1.26** | 40.0 | **1.58** |
| **1807** | 37.0 | **1.46** | 45.0 | **1.77** |
| **1808** | 42.0 | **1.65** | 50.0 | **1.97** |
| **1809** | 47.0 | **1.85** | 56.0 | **2.21** |
| **1810** | 52.0 | **2.05** | 63.0 | **2.48** |
| **1811** | 57.0 | **2.24** | 70.0 | **2.76** |
| **1812** | 62.0 | **2.44** | 76.0 | **2.99** |
| **1813** | 69.0 | **2.72** | 81.0 | **3.19** |
| **1814** | 74.0 | **2.91** | 86.0 | **3.39** |
| **1815** | 79.0 | **3.11** | 91.0 | **3.58** |
| **1816** | 84.0 | **3.31** | 96.0 | **3.78** |
| **1817** | 90.0 | **3.54** | 105.0 | **4.13** |
| **1818** | 95.0 | **3.74** | 110.0 | **4.33** |
| **1819** | 100.0 | **3.94** | 115.0 | **4.53** |
| **1820** | 105.0 | **4.13** | 120.0 | **4.72** |
| **1821** | 110.0 | **4.33** | 125.0 | **4.92** |
| **1822** | 115.0 | **4.53** | 135.0 | **5.32** |
| **1824** | 125.0 | **4.92** | 145.0 | **5.71** |
| **1826** | 136.5 | **5.37** | 158.5 | **6.24** |
| **1828** | 146.5 | **5.77** | 168.5 | **6.63** |
| **1830** | 156.5 | **6.16** | 183.5 | **7.22** |
| **1832** | 166.5 | **6.56** | 193.5 | **7.62** |
| **1834** | 176.5 | **6.95** | 208.5 | **8.21** |
| **1836** | 186.5 | **7.34** | 218.5 | **8.61** |
| **1838** | 198.0 | **7.80** | 232.0 | **9.13** |
| **1840** | 208.0 | **8.19** | 242.0 | **9.53** |
| **1844** | 228.0 | **8.98** | 262.0 | **10.32** |
| **1848** | 249.0 | **9.81** | 291.0 | **11.46** |
| **1852** | 269.0 | **10.59** | 311.0 | **12.24** |
| **1856** | 289.0 | **11.38** | 341.0 | **13.43** |
| **1860** | 311.0 | **12.24** | 369.0 | **14.53** |
| **1864** | 331.0 | **13.03** | 389.0 | **15.32** |
| **1868** | 351.0 | **13.82** | 409.0 | **16.10** |
| **1872** | 371.0 | **14.61** | 429.0 | **16.89** |
| **1876** | 391.0 | **15.39** | 469.0 | **18.47** |
| **1880** | 411.0 | **16.18** | 489.0 | **19.25** |
| **1884** | 431.0 | **16.97** | 509.0 | **20.04** |
| **1888** | 451.0 | **17.76** | 529.0 | **20.83** |
| **1892** | 473.0 | **18.62** | 567.0 | **22.32** |
| **1896** | 493.0 | **19.41** | 587.0 | **23.11** |

| MRC bearing number | S Minimum | | H Maximum | |
|---|---|---|---|---|
| | mm | in. | mm | in. |
| **1900** | 11.2 | **.44** | 20.8 | **.82** |
| **1901** | 13.2 | **.52** | 22.9 | **.90** |
| **1902** | 16.3 | **.64** | 26.9 | **1.06** |
| **1903** | 18.0 | **.71** | 29.0 | **1.14** |
| **1904** | 21.6 | **.85** | 35.3 | **1.39** |
| **1905** | 26.7 | **1.05** | 39.9 | **1.57** |
| **1906** | 31.8 | **1.25** | 45.5 | **1.79** |
| **1907** | 37.1 | **1.46** | 52.8 | **2.08** |
| **1908** | 42.7 | **1.68** | 59.4 | **2.34** |
| **1909** | 47.8 | **1.88** | 65.3 | **2.57** |
| **1910** | 52.3 | **2.06** | 69.6 | **2.74** |
| **1911** | 58.2 | **2.29** | 76.7 | **3.0** |
| **1912** | 63.2 | **2.49** | 81.8 | **3.22** |
| **1913** | 68.1 | **2.68** | 86.9 | **3.42** |
| **1914** | 73.9 | **2.91** | 96.0 | **3.78** |
| **1915** | 78.5 | **3.09** | 101.0 | **3.99** |
| **1916** | 83.8 | **3.30** | 106.0 | **4.18** |
| **1917** | 89.4 | **3.52** | 116.0 | **4.56** |
| **1918** | 94.2 | **3.71** | 121.0 | **4.75** |
| **1919** | 99.8 | **3.93** | 125.0 | **4.93** |
| **1920** | 105.0 | **4.13** | 135.0 | **5.33** |
| **1921** | 110.0 | **4.33** | 140.0 | **5.51** |
| **1922** | 115.0 | **4.52** | 145.0 | **5.70** |
| **1924** | 125.0 | **4.93** | 160.0 | **6.28** |
| **1926** | 136.0 | **5.36** | 174.0 | **6.85** |
| **1928** | 146.0 | **5.76** | 184.0 | **7.24** |
| **1930** | 158.0 | **6.21** | 202.0 | **7.97** |
| **1932** | 168.0 | **6.62** | 212.0 | **8.33** |
| **1934** | 178.0 | **7.01** | 222.0 | **8.74** |
| **1936** | 189.0 | **7.44** | 241.0 | **9.50** |
| **1938** | 199.0 | **7.83** | 251.0 | **9.89** |
| **1940** | 210.0 | **8.27** | 269.0 | **10.61** |
| **1944** | 231.0 | **9.09** | 289.0 | **11.38** |
| **1948** | 251.0 | **9.88** | 309.0 | **12.17** |
| **1952** | 271.0 | **10.67** | 349.0 | **13.74** |
| **1956** | 291.0 | **11.46** | 369.0 | **14.53** |
| **1960** | 313.0 | **12.32** | 407.0 | **16.02** |
| **1964** | 333.0 | **13.11** | 427.0 | **16.81** |
| **1968** | 353.0 | **13.90** | 447.0 | **17.60** |
| **1972** | 373.0 | **14.69** | 467.0 | **18.39** |
| **1976** | 396.0 | **15.59** | 504.0 | **19.84** |
| **1980** | 416.0 | **16.38** | 524.0 | **20.63** |
| **1984** | 436.0 | **17.17** | 544.0 | **21.42** |
| **1988** | 456.0 | **17.95** | 584.0 | **22.99** |
| **1992** | 476.0 | **18.74** | 604.0 | **23.78** |
| **XLS1$^{3}/_{8}$** | 39.7 | **1.56** | 60.3 | **2.38** |
| **XLS1$^{1}/_{2}$** | 49.2 | **1.69** | 63.5 | **2.50** |
| **XLS1$^{5}/_{8}$** | 46.0 | **1.81** | 68.3 | **2.69** |
| **XLS1$^{3}/_{4}$** | 49.2 | **1.94** | 71.4 | **2.81** |
| **XLS1$^{7}/_{8}$** | 52.4 | **2.06** | 76.2 | **3.00** |
| **XLS2** | 55.6 | **2.19** | 79.4 | **3.13** |
| **XLS2$^{1}/_{8}$** | 60.3 | **2.38** | 81.0 | **3.19** |

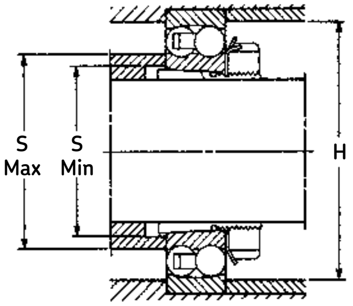
# Shaft and housing shoulder diameters




Shoulder diameters for millimeter and inch-size MRC ball bearings

| MRC bearing number | S Minimum | | H Maximum | |
|---|---|---|---|---|
| | mm | in. | mm | in. |
| XLS2 1/4 | 63.5 | **2.50** | 84.1 | **3.31** |
| XLS2 3/8 | 66.7 | **2.63** | 88.9 | **3.50** |
| XLS2 1/2 | 69.9 | **2.75** | 92.1 | **3.63** |
| XLS2 5/8 | 73.0 | **2.88** | 98.4 | **3.88** |
| XLS2 3/4 | 76.2 | **3.00** | 98.4 | **3.88** |
| XLS2 7/8 | 81.0 | **3.19** | 106.0 | **4.19** |
| XLS3 | 84.1 | **3.31** | 106.0 | **4.19** |
| XLS3 1/8 | 87.3 | **3.44** | 113.0 | **4.44** |
| XLS3 1/4 | 90.5 | **3.56** | 113.0 | **4.44** |
| XLS3 3/8 | 93.7 | **3.69** | 119.0 | **4.69** |
| XLS3 1/2 | 96.8 | **3.81** | 119.0 | **4.69** |
| XLS3 5/8 | 100.0 | **3.94** | 122.0 | **4.81** |
| XLS3 3/4 | 103.0 | **4.06** | 122.0 | **4.81** |
| XLS3 7/8 | 106.0 | **4.19** | 135.0 | **5.31** |
| XLS4 | 110.0 | **4.31** | 135.0 | **5.31** |
| XLS4 1/8 | 113.0 | **4.44** | 144.0 | **5.69** |
| XLS4 1/4 | 116.0 | **4.56** | 144.0 | **5.69** |
| XLS4 3/8 | 119.0 | **4.69** | 151.0 | **5.94** |
| XLS4 1/2 | 122.0 | **4.81** | 151.0 | **5.94** |
| XLS4 5/8 | 125.0 | **4.94** | 157.0 | **6.19** |
| XLS4 3/4 | 129.0 | **5.06** | 157.0 | **6.19** |
| XLS4 7/8 | 132.0 | **5.19** | 170.0 | **6.69** |
| XLS5 | 135.0 | **5.31** | 170.0 | **6.69** |
| XLS5 1/8 | 140.0 | **5.50** | 175.0 | **6.88** |
| XLS5 1/4 | 143.0 | **5.63** | 175.0 | **6.88** |
| XLS5 3/8 | 146.0 | **5.75** | 181.0 | **7.13** |
| XLS5 1/2 | 149.0 | **5.88** | 181.0 | **7.13** |
| XLS5 5/8 | 152.0 | **6.00** | 187.0 | **7.38** |
| XLS5 3/4 | 156.0 | **6.13** | 187.0 | **7.38** |
| XLS5 7/8 | 159.0 | **6.25** | 194.0 | **7.63** |
| XLS6 | 162.0 | **6.38** | 194.0 | **7.63** |
| XLS6 1/4 | 168.0 | **6.63** | 206.0 | **8.13** |
| XLS6 1/2 | 175.0 | **6.88** | 213.0 | **8.38** |
| XLS6 3/4 | 184.0 | **7.25** | 216.0 | **8.50** |
| XLS7 | 191.0 | **7.50** | 229.0 | **9.00** |
| XLS7 1/4 | 197.0 | **7.75** | 235.0 | **9.25** |
| XLS7 1/2 | 203.0 | **8.00** | 241.0 | **9.50** |
| XLS7 3/4 | 210.0 | **8.25** | 254.0 | **10.00** |
| XLS8 | 216.0 | **8.50** | 260.0 | **10.25** |
| XLS8 1/4 | 222.0 | **8.75** | 267.0 | **10.50** |
| XLS8 1/2 | 229.0 | **9.00** | 279.0 | **11.00** |
| XLS8 3/4 | 235.0 | **9.25** | 286.0 | **11.25** |
| XLS9 | 241.0 | **9.50** | 292.0 | **11.50** |
| XLS9 1/2 | 257.0 | **10.13** | 308.0 | **12.13** |
| XLS10 | 270.0 | **10.63** | 321.0 | **12.63** |
| XLS10 1/2 | 283.0 | **11.13** | 340.0 | **13.38** |
| XLS11 | 295.0 | **11.63** | 352.0 | **13.88** |
| XLS11 1/2 | 308.0 | **12.13** | 371.0 | **14.63** |
| XLS12 | 321.0 | **12.63** | 391.0 | **15.38** |
| 135 | 7.0 | **.28** | 17.0 | **.67** |
| 126 | 8.0 | **.32** | 17.0 | **.67** |
| 127 | 9.0 | **.35** | 20.0 | **.79** |
| 108 | 10.0 | **.39** | 20.0 | **.79** |
| 129 | 13.0 | **.51** | 22.0 | **.87** |
| 1200E | 14.0 | **.55** | 26.0 | **1.02** |
| 1201E | 16.0 | **.63** | 28.0 | **1.10** |
| 1202E | 19.0 | **.75** | 31.0 | **1.22** |
| 1203E | 21.0 | **.83** | 36.0 | **1.42** |
| 1204E | 25.0 | **.98** | 42.0 | **1.65** |
| 1205E | 30.0 | **1.18** | 47.0 | **1.85** |
| 1206E | 35.0 | **1.38** | 57.0 | **2.24** |
| 1207E | 41.5 | **1.63** | 65.5 | **2.58** |
| 1208E | 46.5 | **1.83** | 73.5 | **2.89** |
| 1209E | 51.5 | **2.03** | 78.5 | **3.09** |
| 1210E | 56.5 | **2.22** | 83.5 | **3.29** |
| 1211E | 63.0 | **2.48** | 95.0 | **3.74** |
| 1212E | 68.0 | **2.68** | 102.0 | **4.02** |
| 1213E | 73.0 | **2.87** | 112.0 | **4.41** |
| 1214 | 78.0 | **3.07** | 117.0 | **4.61** |
| 1215 | 83.0 | **3.27** | 122.0 | **4.80** |
| 1216 | 89.0 | **3.51** | 131.0 | **5.16** |
| 1217 | 94.0 | **3.70** | 141.0 | **5.55** |
| 1218 | 99.0 | **3.90** | 151.0 | **5.95** |
| 1219 | 106.0 | **4.17** | 159.0 | **6.26** |
| 1220 | 111.0 | **4.37** | 169.0 | **6.65** |
| 1221 | 116.0 | **4.57** | 178.0 | **7.05** |
| 1222 | 121.0 | **4.76** | 189.0 | **7.44** |
| 1224 | 131.0 | **5.16** | 204.0 | **8.03** |
| 1226 | 143.0 | **5.63** | 217.0 | **8.54** |
| 1301E | 17.0 | **.67** | 32.0 | **1.26** |
| 1302E | 20.0 | **.79** | 37.0 | **1.46** |
| 1303E | 22.0 | **.87** | 42.0 | **1.65** |
| 1304E | 26.5 | **1.04** | 45.5 | **1.79** |
| 1305E | 31.5 | **1.24** | 55.5 | **2.19** |
| 1306E | 36.5 | **1.44** | 65.5 | **2.58** |
| 1307E | 43.0 | **1.69** | 72.0 | **2.84** |
| 1308E | 48.0 | **1.89** | 82.0 | **3.23** |
| 1309E | 53.0 | **2.09** | 92.0 | **3.62** |
| 1310E | 59.0 | **2.32** | 101.0 | **3.98** |
| 1311E | 64.0 | **2.52** | 111.0 | **4.37** |
| 1312E | 71.0 | **2.80** | 119.0 | **4.69** |
| 1313E | 76.0 | **2.99** | 129.0 | **5.08** |
| 1314 | 81.0 | **3.19** | 139.0 | **5.47** |
| 1315 | 86.0 | **3.39** | 149.0 | **5.87** |
| 1316 | 91.0 | **3.58** | 159.0 | **6.26** |
| 1317 | 98.0 | **3.86** | 167.0 | **6.58** |
| 1318 | 103.0 | **4.06** | 177.0 | **6.97** |
| 1319 | 108.0 | **4.25** | 187.0 | **7.36** |
| 1320 | 113.0 | **4.45** | 202.0 | **7.95** |
| 1322 | 123.0 | **4.84** | 227.0 | **8.94** |
| 1406 | 38.0 | **1.50** | 82.0 | **3.23** |
| 1407 | 43.0 | **1.69** | 92.0 | **3.62** |
| 1408 | 49.0 | **1.93** | 101.0 | **3.98** |
| 1409 | 54.0 | **2.13** | 111.0 | **4.37** |
| 1410 | 61.0 | **2.40** | 119.0 | **4.69** |
| 1411 | 66.0 | **2.60** | 129.0 | **5.08** |
| 1412 | 71.0 | **2.80** | 139.0 | **5.47** |
| 2200E | 14.0 | **.55** | 26.0 | **1.02** |
| 2201E | 16.0 | **.63** | 28.0 | **1.10** |
| 2202E | 19.0 | **.75** | 31.0 | **1.22** |
| 2203E | 21.0 | **.83** | 36.0 | **1.41** |
| 2204E | 25.0 | **.98** | 42.0 | **1.65** |
| 2205E | 30.0 | **1.18** | 47.0 | **1.85** |
| 2206E | 35.0 | **1.38** | 57.0 | **2.24** |
| 2207E | 41.5 | **1.63** | 65.5 | **2.58** |
| 2208E | 46.5 | **1.83** | 73.5 | **2.89** |
| 2209E | 51.5 | **2.03** | 78.5 | **3.09** |
| 2210E | 56.5 | **2.22** | 83.5 | **3.29** |
| 2211E | 63.0 | **2.48** | 92.0 | **3.62** |
| 2212E | 68.0 | **2.68** | 102.0 | **4.02** |
| 2213E | 73.0 | **2.87** | 112.0 | **4.41** |
| 2214 | 78.0 | **3.07** | 117.0 | **4.61** |
| 2215 | 83.0 | **3.27** | 122.0 | **4.81** |
| 2216E | 89.0 | **3.50** | 131.0 | **5.16** |
| 2217 | 94.0 | **3.70** | 141.0 | **5.55** |
| 2218 | 99.0 | **3.90** | 151.0 | **5.95** |
| 2219 | 106.0 | **4.17** | 159.0 | **6.26** |
| 2220 | 111.0 | **4.37** | 169.0 | **6.65** |
| 2221 | 116.0 | **4.57** | 179.0 | **7.05** |
| 2222 | 121.0 | **4.76** | 189.0 | **7.44** |
| 2301 | 17.0 | **.67** | 32.0 | **1.26** |
| 2302 | 20.0 | **.79** | 37.0 | **1.46** |
| 2303 | 22.0 | **.87** | 42.0 | **1.65** |
| 2304 | 26.5 | **1.04** | 45.5 | **1.79** |
| 2305 | 31.5 | **1.24** | 55.5 | **2.19** |
| 2306 | 36.5 | **1.44** | 65.5 | **2.58** |
| 2307E | 43.0 | **1.69** | 72.0 | **2.84** |
| 2308E | 48.0 | **1.89** | 82.0 | **3.23** |
| 2309E | 53.0 | **2.09** | 92.0 | **3.62** |
| 2310 | 59.0 | **2.32** | 101.0 | **3.98** |
| 2311 | 64.0 | **2.52** | 111.0 | **4.37** |
| 2312 | 71.0 | **2.80** | 119.0 | **4.69** |
| 2313 | 76.0 | **2.99** | 129.0 | **5.08** |
| 2314 | 81.0 | **3.19** | 139.0 | **5.47** |
| 2315 | 86.0 | **3.39** | 149.0 | **5.87** |
| 2316 | 91.0 | **3.58** | 159.0 | **6.26** |
| 2317 | 98.0 | **3.86** | 167.0 | **6.58** |
| 2318 | 103.0 | **4.06** | 177.0 | **6.97** |
| 2319 | 108.0 | **4.25** | 187.0 | **7.36** |
| 2320 | 113.0 | **4.45** | 202.0 | **7.95** |
| 2322 | 123.0 | **4.84** | 227.0 | **8.94** |
| 11204E | — | **—** | 42.0 | **1.65** |
| 11205E | — | **—** | 47.0 | **1.85** |
| 11206E | — | **—** | 57.0 | **2.24** |

# Shaft and housing shoulder diameters




Shoulder diameters for millimeter and inch-size MRC ball bearings

| MRC bearing number | S Minimum mm | S Minimum in. | H Maximum mm | H Maximum in. |
|---|---|---|---|---|
| **11207E** | — | — | 65.5 | **2.58** |
| **11208E** | — | — | 73.5 | **2.89** |
| **11209E** | — | — | 78.5 | **3.09** |
| **11210E** | — | — | 83.5 | **3.29** |
| **11212E** | — | — | 102.5 | **4.02** |
| **11305E** | — | — | 55.5 | **2.19** |
| **11306E** | — | — | 65.5 | **2.58** |
| **11307E** | — | — | 72.0 | **2.84** |
| **11308E** | — | — | 82.0 | **3.23** |
| **11310E** | — | — | 101.0 | **3.98** |
| Ball screw supports | | | | |
| **J078DF** | 27.3 | **1.07** | 41.7 | **1.64** |
| **J093DF** | 33.3 | **1.31** | 55.3 | **2.18** |
| **J098DF** | 36.3 | **1.43** | 55.3 | **2.18** |
| **J150DF** | 47.1 | **1.86** | 63.0 | **2.48** |
| **J175DF** | 52.0 | **2.05** | 67.9 | **2.67** |
| **J225DF** | 65.2 | **2.57** | 81.2 | **3.20** |
| **J300DF** | 85.6 | **3.37** | 102.0 | **4.00** |
| **J400DF** | 112.0 | **4.41** | 135.0 | **5.30** |

Self-aligning bearing with adapter sleeve

| MRC bearing number | S Maximum mm | S Maximum in. | S Minimum mm | S Minimum in. | H Maximum mm | H Maximum in. |
|---|---|---|---|---|---|---|
| **1204EK** | 28.5 | **1.12** | 23.0 | **.91** | 42.0 | **1.65** |
| **1205EK** | 33.0 | **1.30** | 28.0 | **1.10** | 47.0 | **1.85** |
| **1206EK** | 40.0 | **1.58** | 33.0 | **1.30** | 57.0 | **2.24** |
| **1207EK** | 47.0 | **1.85** | 38.0 | **1.50** | 65.5 | **2.58** |
| **1208EK** | 53.0 | **2.09** | 43.0 | **1.69** | 73.5 | **2.89** |
| **1209EK** | 57.0 | **2.24** | 48.0 | **1.89** | 78.5 | **3.09** |
| **1210EK** | 62.0 | **2.44** | 53.0 | **2.09** | 83.5 | **3.29** |
| **1211EK** | 70.0 | **2.76** | 60.0 | **2.36** | 95.0 | **3.74** |
| **1212EK** | 78.0 | **3.07** | 64.0 | **2.52** | 102.0 | **4.02** |
| **1213K** | 85.0 | **3.35** | 70.0 | **2.76** | 112.0 | **4.41** |
| **1215K** | 93.0 | **3.66** | 80.0 | **3.15** | 122.0 | **4.81** |
| **1216K** | 101.0 | **3.98** | 85.0 | **3.35** | 131.0 | **5.16** |
| **1217K** | 107.0 | **4.21** | 90.0 | **3.54** | 141.0 | **5.55** |
| **1218K** | 112.0 | **4.41** | 95.0 | **3.74** | 151.0 | **5.95** |
| **1219K** | 120.0 | **4.72** | 100.0 | **3.94** | 159.0 | **6.26** |
| **1220K** | 127.0 | **5.00** | 106.0 | **4.17** | 169.0 | **6.65** |
| **1221K** | 134.0 | **5.28** | 111.0 | **4.37** | 179.0 | **7.05** |
| **1222K** | 140.0 | **5.51** | 116.0 | **4.57** | 189.0 | **7.44** |
| **1224K** | 150.0 | **5.91** | 127.0 | **5.00** | 204.0 | **8.03** |
| **1304EK** | 33.0 | **1.30** | 23.0 | **.91** | 45.5 | **1.79** |
| **1305EK** | 37.0 | **1.46** | 28.0 | **1.10** | 55.5 | **2.19** |
| **1306EK** | 44.0 | **1.73** | 33.0 | **1.30** | 65.5 | **2.58** |
| **1307EK** | 51.0 | **2.01** | 39.0 | **1.54** | 72.0 | **2.84** |
| **1308EK** | 61.0 | **2.40** | 44.0 | **1.73** | 82.0 | **3.23** |
| **1309EK** | 67.0 | **2.64** | 50.0 | **1.97** | 92.0 | **3.62** |
| **1310EK** | 70.0 | **2.76** | 55.0 | **2.17** | 101.0 | **3.98** |
| **1311EK** | 77.0 | **3.03** | 60.0 | **2.36** | 111.0 | **4.37** |
| **1312EK** | 87.0 | **3.43** | 65.0 | **2.56** | 119.0 | **4.69** |
| **1313EK** | 89.0 | **3.50** | 70.0 | **2.76** | 129.0 | **5.08** |
| **1315K** | 104.0 | **4.09** | 80.0 | **3.15** | 149.0 | **5.87** |
| **1316K** | 109.0 | **4.29** | 85.0 | **3.35** | 159.0 | **6.26** |
| **1317K** | 117.0 | **4.61** | 91.0 | **3.58** | 167.0 | **6.58** |
| **1318K** | 122.0 | **4.80** | 96.0 | **3.78** | 177.0 | **6.97** |
| **1319K** | 127.0 | **5.00** | 102.0 | **4.02** | 187.0 | **7.36** |
| **1320K** | 136.0 | **5.35** | 108.0 | **4.25** | 202.0 | **7.95** |
| **1322K** | 154.0 | **6.06** | 118.0 | **4.65** | 227.0 | **8.94** |
| **2205EK** | 32.0 | **1.26** | 28.0 | **1.10** | 47.0 | **1.85** |
| **2206EK** | 38.0 | **1.50** | 33.0 | **1.30** | 57.0 | **2.24** |
| **2207EK** | 45.0 | **1.77** | 39.0 | **1.54** | 65.5 | **2.58** |
| **2208EK** | 52.0 | **2.05** | 44.0 | **1.73** | 73.5 | **2.89** |
| **2209EK** | 55.0 | **2.17** | 50.0 | **1.97** | 78.5 | **3.09** |
| **2210EK** | 61.0 | **2.40** | 55.0 | **2.17** | 83.5 | **3.29** |
| **2211EK** | 67.0 | **2.64** | 60.0 | **2.36** | 92.0 | **3.62** |
| **2212EK** | 74.0 | **2.91** | 65.0 | **2.56** | 102.0 | **4.02** |
| **2213EK** | 80.0 | **3.15** | 70.0 | **2.76** | 112.0 | **4.41** |
| **2215K** | 93.0 | **3.66** | 80.0 | **3.15** | 122.0 | **4.80** |
| **2216EK** | 99.0 | **3.90** | 85.0 | **3.35** | 131.0 | **5.16** |
| **2217K** | 105.0 | **4.13** | 91.0 | **3.58** | 141.0 | **5.55** |
| **2218K** | 112.0 | **4.41** | 96.0 | **3.78** | 151.0 | **5.95** |
| **2219K** | 118.0 | **4.65** | 102.0 | **4.02** | 159.0 | **6.26** |
| **2220K** | 124.0 | **4.88** | 108.0 | **4.25** | 169.0 | **6.65** |

Self-aligning bearing with adapter sleeve

| MRC bearing number | S Maximum mm | S Maximum in. | S Minimum mm | S Minimum in. | H Maximum mm | H Maximum in. |
|---|---|---|---|---|---|---|
| **2221K** | 131.0 | **5.16** | 113.0 | **4.45** | 179.0 | **7.05** |
| **2222K** | 137.0 | **5.39** | 118.0 | **4.65** | 189.0 | **7.44** |
| **2305K** | 35.0 | **1.38** | 30.0 | **1.18** | 55.0 | **2.19** |
| **2306K** | 41.0 | **1.61** | 35.0 | **1.38** | 65.5 | **2.58** |
| **2307EK** | 46.0 | **1.81** | 40.0 | **1.58** | 72.0 | **2.84** |
| **2308EK** | 53.0 | **2.09** | 45.0 | **1.77** | 82.0 | **3.23** |
| **2309EK** | 60.0 | **2.36** | 50.0 | **1.97** | 92.0 | **3.62** |
| **2310K** | 65.0 | **2.56** | 56.0 | **2.21** | 101.0 | **3.98** |
| **2311K** | 72.0 | **2.84** | 61.0 | **2.40** | 111.0 | **4.37** |
| **2312K** | 76.0 | **2.99** | 66.0 | **2.60** | 119.0 | **4.69** |
| **2313K** | 85.0 | **3.35** | 72.0 | **2.84** | 129.0 | **5.08** |
| **2315K** | 97.0 | **3.82** | 82.0 | **3.23** | 149.0 | **5.87** |
| **2316K** | 104.0 | **4.09** | 88.0 | **3.47** | 159.0 | **6.26** |
| **2317K** | 111.0 | **4.37** | 94.0 | **3.70** | 167.0 | **6.58** |
| **2318K** | 115.0 | **4.53** | 100.0 | **3.94** | 177.0 | **6.97** |
| **2319K** | 121.0 | **4.76** | 105.0 | **4.13** | 187.0 | **7.36** |
| **2320K** | 130.0 | **5.12** | 110.0 | **4.33** | 202.0 | **7.95** |
| **2322K** | 145.0 | **5.71** | 121.0 | **4.76** | 227.0 | **8.94** |

# Millimeter-inch equivalents (one inch = 25.4 millimeters)

Note: The + or – sign indicates that the decimal equivalent is larger or smaller than the fractional equivalent.

| mm | in. | | | mm | in. | | | mm | in. | | | mm | in. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0394 | 1/32 | + | 56 | 2.2047 | 2 7/32 | – | 111 | 4.3701 | 4 3/8 | – | 166 | 6.5354 | 6 17/32 | + |
| 2 | 0.0787 | 3/32 | – | 57 | 2.2441 | 2 1/4 | – | 112 | 4.4094 | 4 13/32 | + | 167 | 6.5748 | 6 9/16 | + |
| 3 | 0.1181 | 1/8 | – | 58 | 2.2835 | 2 9/32 | + | 113 | 4.4488 | 4 7/16 | + | 168 | 6.6142 | 6 5/8 | – |
| 4 | 0.1575 | 5/32 | + | 59 | 2.3228 | 2 5/16 | + | 114 | 4.4882 | 4 1/2 | – | 169 | 6.6535 | 6 21/32 | – |
| 5 | 0.1969 | 3/16 | + | 60 | 2.3622 | 2 3/8 | – | 115 | 4.5276 | 4 17/32 | – | 170 | 6.6929 | 6 11/16 | + |
| 6 | 0.2362 | 1/4 | – | 61 | 2.4016 | 2 13/32 | – | 116 | 4.5669 | 4 9/16 | + | 171 | 6.7323 | 6 23/32 | + |
| 7 | 0.2756 | 9/32 | – | 62 | 2.4409 | 2 7/16 | + | 117 | 4.6063 | 4 19/32 | + | 172 | 6.7717 | 6 25/32 | – |
| 8 | 0.3150 | 5/16 | + | 63 | 2.4803 | 2 15/32 | + | 118 | 4.6457 | 4 21/32 | – | 173 | 6.8110 | 6 13/16 | – |
| 9 | 0.3543 | 11/32 | + | 64 | 2.5197 | 2 17/32 | – | 119 | 4.6850 | 4 11/16 | – | 174 | 6.8504 | 6 27/32 | + |
| 10 | 0.3937 | 13/32 | – | 65 | 2.5591 | 2 9/16 | – | 120 | 4.7244 | 4 23/32 | + | 175 | 6.8898 | 6 7/8 | + |
| 11 | 0.4331 | 7/16 | – | 66 | 2.5984 | 2 19/32 | + | 121 | 4.7638 | 4 3/4 | + | 176 | 6.9291 | 6 15/16 | – |
| 12 | 0.4724 | 15/32 | + | 67 | 2.6378 | 2 5/8 | + | 122 | 4.8031 | 4 13/16 | – | 177 | 6.9685 | 6 31/32 | – |
| 13 | 0.5118 | 1/2 | + | 68 | 2.6772 | 2 11/16 | – | 123 | 4.8425 | 4 27/32 | – | 178 | 7.0079 | 7 | + |
| 14 | 0.5512 | 9/16 | – | 69 | 2.7165 | 2 23/32 | – | 124 | 4.8819 | 4 7/8 | + | 179 | 7.0472 | 7 1/16 | – |
| 15 | 0.5906 | 19/32 | – | 70 | 2.7559 | 2 3/4 | + | 125 | 4.9213 | 4 29/32 | + | 180 | 7.0866 | 7 3/32 | – |
| 16 | 0.6299 | 5/8 | + | 71 | 2.7953 | 2 25/32 | + | 126 | 4.9606 | 4 31/32 | – | 181 | 7.1260 | 7 1/8 | + |
| 17 | 0.6693 | 21/32 | + | 72 | 2.8346 | 2 27/32 | – | 127 | 5.0000 | 5 | | 182 | 7.1654 | 7 5/32 | + |
| 18 | 0.7087 | 23/32 | – | 73 | 2.8740 | 2 7/8 | – | 128 | 5.0394 | 5 1/32 | + | 183 | 7.2047 | 7 7/32 | – |
| 19 | 0.7480 | 3/4 | – | 74 | 2.9134 | 2 29/32 | + | 129 | 5.0787 | 5 3/32 | – | 184 | 7.2441 | 7 1/4 | – |
| 20 | 0.7874 | 25/32 | + | 75 | 2.9528 | 2 15/16 | + | 130 | 5.1181 | 5 1/8 | – | 185 | 7.2835 | 7 9/32 | + |
| 21 | 0.8268 | 13/16 | + | 76 | 2.9921 | 3 | – | 131 | 5.1575 | 5 5/32 | + | 186 | 7.3228 | 7 5/16 | + |
| 22 | 0.8661 | 7/8 | – | 77 | 3.0315 | 3 1/32 | + | 132 | 5.1969 | 5 3/16 | + | 187 | 7.3622 | 7 3/8 | – |
| 23 | 0.9055 | 29/32 | – | 78 | 3.0709 | 3 1/16 | + | 133 | 5.2362 | 5 1/4 | – | 188 | 7.4016 | 7 13/32 | – |
| 24 | 0.9449 | 15/16 | + | 79 | 3.1102 | 3 1/8 | – | 134 | 5.2756 | 5 9/32 | – | 189 | 7.4409 | 7 7/16 | + |
| 25 | 0.9843 | 31/32 | + | 80 | 3.1496 | 3 5/32 | – | 135 | 5.3150 | 5 5/16 | + | 190 | 7.4803 | 7 15/32 | + |
| 26 | 1.0236 | 1 1/32 | – | 81 | 3.1890 | 3 3/16 | + | 136 | 5.3543 | 5 11/32 | + | 191 | 7.5197 | 7 17/32 | – |
| 27 | 1.0630 | 1 1/16 | + | 82 | 3.2283 | 3 7/32 | + | 137 | 5.3937 | 5 13/32 | – | 192 | 7.5591 | 7 9/16 | – |
| 28 | 1.1024 | 1 3/32 | + | 83 | 3.2677 | 3 9/32 | – | 138 | 5.4331 | 5 7/16 | – | 193 | 7.5984 | 7 19/32 | + |
| 29 | 1.1417 | 1 5/32 | – | 84 | 3.3071 | 3 5/16 | – | 139 | 5.4724 | 5 15/32 | + | 194 | 7.6378 | 7 5/8 | + |
| 30 | 1.1811 | 1 3/16 | – | 85 | 3.3465 | 3 11/32 | + | 140 | 5.5118 | 5 1/2 | + | 195 | 7.6772 | 7 11/16 | – |
| 31 | 1.2205 | 1 7/32 | + | 86 | 3.3858 | 3 3/8 | + | 141 | 5.5512 | 5 9/16 | – | 196 | 7.7165 | 7 23/32 | – |
| 32 | 1.2598 | 1 1/4 | + | 87 | 3.4252 | 3 7/16 | – | 142 | 5.5906 | 5 19/32 | – | 197 | 7.7559 | 7 3/4 | + |
| 33 | 1.2992 | 1 5/16 | – | 88 | 3.4646 | 3 15/32 | – | 143 | 5.6299 | 5 5/8 | + | 198 | 7.7953 | 7 25/32 | + |
| 34 | 1.3386 | 1 11/32 | – | 89 | 3.5039 | 3 1/2 | + | 144 | 5.6693 | 5 21/32 | + | 199 | 7.8346 | 7 27/32 | – |
| 35 | 1.3780 | 1 3/8 | + | 90 | 3.5433 | 3 17/32 | + | 145 | 5.7087 | 5 23/32 | – | 200 | 7.8740 | 7 7/8 | – |
| 36 | 1.4173 | 1 13/32 | + | 91 | 3.5827 | 3 19/32 | – | 146 | 5.7480 | 5 3/4 | – | 201 | 7.9134 | 7 29/32 | + |
| 37 | 1.4567 | 1 15/32 | – | 92 | 3.6220 | 3 5/8 | – | 147 | 5.7874 | 5 25/32 | + | 202 | 7.9528 | 7 15/16 | + |
| 38 | 1.4961 | 1 1/2 | – | 93 | 3.6614 | 3 21/32 | + | 148 | 5.8268 | 5 13/16 | + | 203 | 7.9921 | 8 | – |
| 39 | 1.5354 | 1 17/32 | + | 94 | 3.7008 | 3 11/16 | + | 149 | 5.8661 | 5 7/8 | – | 204 | 8.0315 | 8 1/32 | + |
| 40 | 1.5748 | 1 9/16 | + | 95 | 3.7402 | 3 3/4 | – | 150 | 5.9055 | 5 29/32 | – | 205 | 8.0709 | 8 1/16 | + |
| 41 | 1.6142 | 1 5/8 | – | 96 | 3.7795 | 3 25/32 | – | 151 | 5.9449 | 5 15/16 | + | 206 | 8.1102 | 8 1/8 | – |
| 42 | 1.6535 | 1 21/32 | – | 97 | 3.8189 | 3 13/16 | + | 152 | 5.9843 | 5 31/32 | + | 207 | 8.1496 | 8 5/32 | – |
| 43 | 1.6929 | 1 11/16 | + | 98 | 3.8583 | 3 27/32 | + | 153 | 6.0236 | 6 1/32 | – | 208 | 8.1890 | 8 3/16 | + |
| 44 | 1.7323 | 1 23/32 | + | 99 | 3.8976 | 3 29/32 | – | 154 | 6.0630 | 6 1/16 | + | 209 | 8.2283 | 8 7/32 | + |
| 45 | 1.7717 | 1 25/32 | – | 100 | 3.9370 | 3 15/16 | – | 155 | 6.1024 | 6 3/32 | + | 210 | 8.2677 | 8 9/32 | – |
| 46 | 1.8110 | 1 13/16 | – | 101 | 3.9764 | 3 31/32 | + | 156 | 6.1417 | 6 5/32 | – | 211 | 8.3071 | 8 5/16 | – |
| 47 | 1.8504 | 1 27/32 | + | 102 | 4.0157 | 4 1/32 | – | 157 | 6.1811 | 6 3/16 | – | 212 | 8.3465 | 8 11/32 | + |
| 48 | 1.8898 | 1 7/8 | + | 103 | 4.0551 | 4 1/16 | – | 158 | 6.2205 | 6 7/32 | + | 213 | 8.3858 | 8 3/8 | + |
| 49 | 1.9291 | 1 15/16 | – | 104 | 4.0945 | 4 3/32 | + | 159 | 6.2598 | 6 1/4 | + | 214 | 8.4252 | 8 7/16 | – |
| 50 | 1.9685 | 1 31/32 | – | 105 | 4.1339 | 4 1/8 | + | 160 | 6.2992 | 6 5/16 | – | 215 | 8.4646 | 8 15/32 | – |
| 51 | 2.0079 | 2 | + | 106 | 4.1732 | 4 3/16 | – | 161 | 6.3386 | 6 11/32 | – | 216 | 8.5039 | 8 1/2 | + |
| 52 | 2.0472 | 2 1/16 | – | 107 | 4.2126 | 4 7/32 | – | 162 | 6.3780 | 6 3/8 | + | 217 | 8.5433 | 8 17/32 | + |
| 53 | 2.0866 | 2 3/32 | – | 108 | 4.2520 | 4 1/4 | + | 163 | 6.4173 | 6 13/32 | + | 218 | 8.5827 | 8 19/32 | – |
| 54 | 2.1260 | 2 1/8 | + | 109 | 4.2913 | 4 9/32 | + | 164 | 6.4567 | 6 15/32 | – | 219 | 8.6220 | 8 5/8 | – |
| 55 | 2.1654 | 2 5/32 | + | 110 | 4.3307 | 4 11/32 | – | 165 | 6.4961 | 6 1/2 | – | 220 | 8.6614 | 8 21/32 | + |

# Millimeter-inch equivalents (one inch = 25.4 millimeters)

Note: The + or – sign indicates that the decimal equivalent is larger or smaller than the fractional equivalent.

| mm | in. | | | mm | in. | | | mm | in. | | | mm | in. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 221 | 8.7008 | $8\frac{11}{16}$ | + | 276 | 10.8661 | $10\frac{7}{8}$ | – | 331 | 13.0315 | $13\frac{1}{32}$ | + | 386 | 15.1969 | $15\frac{3}{16}$ | + |
| 222 | 8.7402 | $8\frac{3}{4}$ | – | 277 | 10.9055 | $10\frac{29}{32}$ | – | 332 | 13.0709 | $13\frac{1}{16}$ | + | 387 | 15.2362 | $15\frac{1}{4}$ | – |
| 223 | 8.7795 | $8\frac{25}{32}$ | – | 278 | 10.9449 | $10\frac{15}{16}$ | + | 333 | 13.1102 | $13\frac{1}{8}$ | – | 388 | 15.2756 | $15\frac{9}{32}$ | – |
| 224 | 8.8189 | $8\frac{13}{16}$ | + | 279 | 10.9843 | $10\frac{31}{32}$ | + | 334 | 13.1496 | $13\frac{5}{32}$ | – | 389 | 15.3150 | $15\frac{5}{16}$ | + |
| 225 | 8.8583 | $8\frac{27}{32}$ | + | 280 | 11.0236 | $11\frac{1}{32}$ | – | 335 | 13.1890 | $13\frac{3}{16}$ | + | 390 | 15.3543 | $15\frac{11}{32}$ | + |
| 226 | 8.8976 | $8\frac{29}{32}$ | – | 281 | 11.0630 | $11\frac{1}{16}$ | + | 336 | 13.2283 | $13\frac{7}{32}$ | + | 391 | 15.3937 | $15\frac{13}{32}$ | – |
| 227 | 8.9370 | $8\frac{15}{16}$ | – | 282 | 11.1024 | $11\frac{3}{32}$ | + | 337 | 13.2677 | $13\frac{9}{32}$ | – | 392 | 15.4331 | $15\frac{7}{16}$ | – |
| 228 | 8.9764 | $8\frac{31}{32}$ | + | 283 | 11.1417 | $11\frac{5}{32}$ | – | 338 | 13.3071 | $13\frac{5}{16}$ | – | 393 | 15.4724 | $15\frac{15}{32}$ | + |
| 229 | 9.0157 | $9\frac{1}{32}$ | – | 284 | 11.1811 | $11\frac{3}{16}$ | – | 339 | 13.3465 | $13\frac{11}{32}$ | + | 394 | 15.5118 | $15\frac{1}{2}$ | + |
| 230 | 9.0551 | $9\frac{1}{16}$ | – | 285 | 11.2205 | $11\frac{7}{32}$ | + | 340 | 13.3858 | $13\frac{3}{8}$ | + | 395 | 15.5512 | $15\frac{9}{16}$ | – |
| 231 | 9.0945 | $9\frac{3}{32}$ | + | 286 | 11.2598 | $11\frac{1}{4}$ | + | 341 | 13.4252 | $13\frac{7}{16}$ | – | 396 | 15.5906 | $15\frac{19}{32}$ | – |
| 232 | 9.1339 | $9\frac{1}{8}$ | + | 287 | 11.2992 | $11\frac{5}{16}$ | – | 342 | 13.4646 | $13\frac{15}{32}$ | – | 397 | 15.6299 | $15\frac{5}{8}$ | + |
| 233 | 9.1732 | $9\frac{3}{16}$ | – | 288 | 11.3386 | $11\frac{11}{32}$ | – | 343 | 13.5039 | $13\frac{1}{2}$ | + | 398 | 15.6693 | $15\frac{21}{32}$ | + |
| 234 | 9.2126 | $9\frac{7}{32}$ | – | 289 | 11.3780 | $11\frac{3}{8}$ | + | 344 | 13.5433 | $13\frac{17}{32}$ | + | 399 | 15.7087 | $15\frac{23}{32}$ | – |
| 235 | 9.2520 | $9\frac{1}{4}$ | + | 290 | 11.4173 | $11\frac{13}{32}$ | + | 345 | 13.5827 | $13\frac{19}{32}$ | – | 400 | 15.7480 | $15\frac{3}{4}$ | – |
| 236 | 9.2913 | $9\frac{9}{32}$ | + | 291 | 11.4567 | $11\frac{15}{32}$ | – | 346 | 13.6220 | $13\frac{5}{8}$ | – | 401 | 15.7874 | $15\frac{25}{32}$ | + |
| 237 | 9.3307 | $9\frac{11}{32}$ | – | 292 | 11.4961 | $11\frac{1}{2}$ | – | 347 | 13.6614 | $13\frac{21}{32}$ | + | 402 | 15.8268 | $15\frac{13}{16}$ | + |
| 238 | 9.3701 | $9\frac{3}{8}$ | – | 293 | 11.5354 | $11\frac{17}{32}$ | + | 348 | 13.7008 | $13\frac{11}{16}$ | + | 403 | 15.8661 | $15\frac{7}{8}$ | – |
| 239 | 9.4094 | $9\frac{13}{32}$ | + | 294 | 11.5748 | $11\frac{9}{16}$ | + | 349 | 13.7402 | $13\frac{3}{4}$ | – | 404 | 15.9055 | $15\frac{29}{32}$ | – |
| 240 | 9.4488 | $9\frac{7}{16}$ | + | 295 | 11.6142 | $11\frac{5}{8}$ | – | 350 | 13.7795 | $13\frac{25}{32}$ | – | 405 | 15.9449 | $15\frac{15}{16}$ | + |
| 241 | 9.4882 | $9\frac{1}{2}$ | – | 296 | 11.6535 | $11\frac{21}{32}$ | – | 351 | 13.8189 | $13\frac{13}{16}$ | + | 406 | 15.9843 | $15\frac{31}{32}$ | + |
| 242 | 9.5276 | $9\frac{17}{32}$ | – | 297 | 11.6929 | $11\frac{11}{16}$ | + | 352 | 13.8583 | $13\frac{27}{32}$ | + | 407 | 16.0236 | $16\frac{1}{32}$ | – |
| 243 | 9.5669 | $9\frac{9}{16}$ | + | 298 | 11.7323 | $11\frac{23}{32}$ | + | 353 | 13.8976 | $13\frac{29}{32}$ | – | 408 | 16.0630 | $16\frac{1}{16}$ | + |
| 244 | 9.6063 | $9\frac{19}{32}$ | + | 299 | 11.7717 | $11\frac{25}{32}$ | – | 354 | 13.9370 | $13\frac{15}{16}$ | – | 409 | 16.1024 | $16\frac{3}{32}$ | + |
| 245 | 9.6457 | $9\frac{21}{32}$ | – | 300 | 11.8110 | $11\frac{13}{16}$ | – | 355 | 13.9764 | $13\frac{31}{32}$ | + | 410 | 16.1417 | $16\frac{5}{32}$ | – |
| 246 | 9.6850 | $9\frac{11}{16}$ | – | 301 | 11.8504 | $11\frac{27}{32}$ | + | 356 | 14.0157 | $14\frac{1}{32}$ | – | 411 | 16.1811 | $16\frac{3}{16}$ | – |
| 247 | 9.7244 | $9\frac{23}{32}$ | + | 302 | 11.8898 | $11\frac{7}{8}$ | + | 357 | 14.0551 | $14\frac{1}{16}$ | – | 412 | 16.2205 | $16\frac{7}{32}$ | + |
| 248 | 9.7638 | $9\frac{3}{4}$ | + | 303 | 11.9291 | $11\frac{15}{16}$ | – | 358 | 14.0945 | $14\frac{3}{32}$ | + | 413 | 16.2598 | $16\frac{1}{4}$ | + |
| 249 | 9.8031 | $9\frac{13}{16}$ | – | 304 | 11.9685 | $11\frac{31}{32}$ | – | 359 | 14.1339 | $14\frac{1}{8}$ | + | 414 | 16.2992 | $16\frac{5}{16}$ | – |
| 250 | 9.8425 | $9\frac{27}{32}$ | – | 305 | 12.0079 | $12$ | + | 360 | 14.1732 | $14\frac{3}{16}$ | – | 415 | 16.3386 | $16\frac{11}{32}$ | – |
| 251 | 9.8819 | $9\frac{7}{8}$ | + | 306 | 12.0472 | $12\frac{1}{16}$ | – | 361 | 14.2126 | $14\frac{7}{32}$ | – | 416 | 16.3780 | $16\frac{3}{8}$ | + |
| 252 | 9.9213 | $9\frac{29}{32}$ | + | 307 | 12.0866 | $12\frac{3}{32}$ | – | 362 | 14.2520 | $14\frac{1}{4}$ | + | 417 | 16.4173 | $16\frac{13}{32}$ | + |
| 253 | 9.9606 | $9\frac{31}{32}$ | – | 308 | 12.1260 | $12\frac{1}{8}$ | + | 363 | 14.2913 | $14\frac{9}{32}$ | + | 418 | 16.4567 | $16\frac{15}{32}$ | – |
| 254 | 10.0000 | $10$ | | 309 | 12.1654 | $12\frac{5}{32}$ | + | 364 | 14.3307 | $14\frac{11}{32}$ | – | 419 | 16.4961 | $16\frac{1}{2}$ | – |
| 255 | 10.0394 | $10\frac{1}{32}$ | + | 310 | 12.2047 | $12\frac{7}{32}$ | – | 365 | 14.3701 | $14\frac{3}{8}$ | – | 420 | 16.5354 | $16\frac{17}{32}$ | + |
| 256 | 10.0787 | $10\frac{3}{32}$ | – | 311 | 12.2441 | $12\frac{1}{4}$ | – | 366 | 14.4094 | $14\frac{13}{32}$ | + | 421 | 16.5748 | $16\frac{9}{16}$ | + |
| 257 | 10.1181 | $10\frac{1}{8}$ | – | 312 | 12.2835 | $12\frac{9}{32}$ | + | 367 | 14.4488 | $14\frac{7}{16}$ | + | 422 | 16.6142 | $16\frac{5}{8}$ | – |
| 258 | 10.1575 | $10\frac{5}{32}$ | + | 313 | 12.3228 | $12\frac{5}{16}$ | + | 368 | 14.4882 | $14\frac{1}{2}$ | – | 423 | 16.6535 | $16\frac{21}{32}$ | – |
| 259 | 10.1969 | $10\frac{3}{16}$ | + | 314 | 12.3622 | $12\frac{3}{8}$ | – | 369 | 14.5276 | $14\frac{17}{32}$ | – | 424 | 16.6929 | $16\frac{11}{16}$ | + |
| 260 | 10.2362 | $10\frac{1}{4}$ | – | 315 | 12.4016 | $12\frac{13}{32}$ | – | 370 | 14.5669 | $14\frac{9}{16}$ | + | 425 | 16.7323 | $16\frac{23}{32}$ | + |
| 261 | 10.2756 | $10\frac{9}{32}$ | – | 316 | 12.4409 | $12\frac{7}{16}$ | + | 371 | 14.6063 | $14\frac{19}{32}$ | + | 426 | 16.7717 | $16\frac{25}{32}$ | – |
| 262 | 10.3150 | $10\frac{5}{16}$ | + | 317 | 12.4803 | $12\frac{15}{32}$ | + | 372 | 14.6457 | $14\frac{21}{32}$ | – | 427 | 16.8110 | $16\frac{13}{16}$ | – |
| 263 | 10.3543 | $10\frac{11}{32}$ | + | 318 | 12.5197 | $12\frac{17}{32}$ | – | 373 | 14.6850 | $14\frac{11}{16}$ | – | 428 | 16.8504 | $16\frac{27}{32}$ | + |
| 264 | 10.3937 | $10\frac{13}{32}$ | – | 319 | 12.5591 | $12\frac{9}{16}$ | – | 374 | 14.7244 | $14\frac{23}{32}$ | + | 429 | 16.8898 | $16\frac{7}{8}$ | + |
| 265 | 10.4331 | $10\frac{7}{16}$ | – | 320 | 12.5984 | $12\frac{19}{32}$ | + | 375 | 14.7638 | $14\frac{3}{4}$ | + | 430 | 16.9291 | $16\frac{15}{16}$ | – |
| 266 | 10.4724 | $10\frac{15}{32}$ | + | 321 | 12.6378 | $12\frac{5}{8}$ | + | 376 | 14.8031 | $14\frac{13}{16}$ | – | 431 | 16.9685 | $16\frac{31}{32}$ | – |
| 267 | 10.5118 | $10\frac{1}{2}$ | + | 322 | 12.6772 | $12\frac{11}{16}$ | – | 377 | 14.8425 | $14\frac{27}{32}$ | – | 432 | 17.0079 | $17$ | + |
| 268 | 10.5512 | $10\frac{9}{16}$ | – | 323 | 12.7165 | $12\frac{23}{32}$ | – | 378 | 14.8819 | $14\frac{7}{8}$ | + | 433 | 17.0472 | $17\frac{1}{16}$ | – |
| 269 | 10.5906 | $10\frac{19}{32}$ | – | 324 | 12.7559 | $12\frac{3}{4}$ | + | 379 | 14.9213 | $14\frac{29}{32}$ | + | 434 | 17.0866 | $17\frac{3}{32}$ | – |
| 270 | 10.6299 | $10\frac{5}{8}$ | + | 325 | 12.7953 | $12\frac{25}{32}$ | + | 380 | 14.9606 | $14\frac{31}{32}$ | – | 435 | 17.1260 | $17\frac{1}{8}$ | + |
| 271 | 10.6693 | $10\frac{21}{32}$ | + | 326 | 12.8346 | $12\frac{27}{32}$ | – | 381 | 15.0000 | $15$ | | 436 | 17.1654 | $17\frac{5}{32}$ | + |
| 272 | 10.7087 | $10\frac{23}{32}$ | – | 327 | 12.8740 | $12\frac{7}{8}$ | – | 382 | 15.0394 | $15\frac{1}{32}$ | + | 437 | 17.2047 | $17\frac{7}{32}$ | – |
| 273 | 10.7480 | $10\frac{3}{4}$ | – | 328 | 12.9134 | $12\frac{29}{32}$ | + | 384 | 15.0787 | $15\frac{3}{32}$ | – | 438 | 17.2441 | $17\frac{1}{4}$ | – |
| 274 | 10.7874 | $10\frac{25}{32}$ | + | 329 | 12.9528 | $12\frac{15}{16}$ | + | 384 | 15.1181 | $15\frac{1}{8}$ | – | 439 | 17.2835 | $17\frac{9}{32}$ | + |
| 275 | 10.8268 | $10\frac{13}{16}$ | + | 330 | 12.9921 | $13$ | – | 385 | 15.1575 | $15\frac{5}{32}$ | + | 440 | 17.3228 | $17\frac{5}{16}$ | + |

# Decimal equivalents of fractions of an inch

| Fraction | Decimal | Fraction | Decimal |
|---|---|---|---|
| 1/64 | .0156 | 33/64 | .5156 |
| 1/32 | .0313 | 17/32 | .5313 |
| 3/64 | .0469 | 35/64 | .5469 |
| 1/16 | .0625 | 9/16 | .5625 |
| 5/64 | .0781 | 37/64 | .5781 |
| 3/32 | .0938 | 19/32 | .5938 |
| 7/64 | .1094 | 39/64 | .6094 |
| 1/8 | .1250 | 5/8 | .6250 |
| 9/64 | .1406 | 41/64 | .6406 |
| 5/32 | .1563 | 21/32 | .6563 |
| 11/64 | .1719 | 43/64 | .6719 |
| 3/16 | .1875 | 11/16 | .6875 |
| 13/64 | .2031 | 45/64 | .7031 |
| 7/32 | .2188 | 23/32 | .7188 |
| 15/64 | .2344 | 47/64 | .7344 |
| 1/4 | .2500 | 3/4 | .7500 |
| 17/64 | .2656 | 49/64 | .7656 |
| 9/32 | .2813 | 25/32 | .7813 |
| 19/64 | .2969 | 51/64 | .7969 |
| 5/16 | .3125 | 13/16 | .8125 |
| 21/64 | .3281 | 53/64 | .8281 |
| 11/32 | .3438 | 27/32 | .8438 |
| 23/64 | .3594 | 55/64 | .8594 |
| 3/8 | .3750 | 7/8 | .8750 |
| 25/64 | .3906 | 57/64 | .8906 |
| 13/32 | .4063 | 29/32 | .9063 |
| 27/64 | .4219 | 59/64 | .9219 |
| 7/16 | .4375 | 15/16 | .9375 |
| 29/64 | .4531 | 61/64 | .9531 |
| 15/32 | .4688 | 31/32 | .9688 |
| 31/64 | .4844 | 63/64 | .9844 |
| 1/2 | .5000 | 1 | 1.0000 |

# Metric conversion factors

| Multiply | by | to obtain |
|---|---|---|
| British thermal unit (BTU) | 1055.056 | Joule (J) |
| British thermal unit (BTU/hour) | 0.2930711 | Watt (W) |
| Celsius temperature ($t_C$) | $1.8t_C + 32 = t_F$ | Fahrenheit temperature ($t_F$) |
| Celsius temperature ($t_C$) | $t_C+273.15 = t_K$ | Kelvin temperature ($t_K$) |
| Centimeter (cm) | 0.03280840 | Foot (ft) |
| Centimeter (cm) | 0.3937 | Inch (in.) |
| Centimeter (cm) | 0.01 | Meter (m) |
| Centimeter (cm) | 10 | Millimeter (mm) |
| Centimeter per minute (cm/Min) | 0.3937008 | Inch per minute (ipm) |
| Centimeter per second (cm/s) | 1.968504 | Foot per minute (fpm) |
| Centimeter per second (cm/s) | 0.03280840 | Foot per second (fps) |
| Cubic centimeter ($cm^3$) | 0.061023 | Cubic Inch ($in^3$) |
| Cubic foot ($ft^3$) | 0.02832 | Cubic meter ($m^3$) |
| Cubic foot ($ft^3$) | 28.31685 | Liter (l) |
| Cubic foot per minute ($ft^3$/Min) | 0.004719474 | Cubic meter per second ($m^3$/s) |
| Cubic foot per minute ($ft^3$/Min) | 28.31685 | Liter per minute (l/min) |
| Cubic inch ($in^3$) | 16.38706 | Cubic centimeter ($cm^3$) |
| Cubic inch ($in^3$) | 0.00001638706 | Cubic meter ($m^3$) |
| Cubic inch ($in^3$) | 16.387.06 | Cubic millimeter ($mm^3$) |
| Cubic meter ($m^3$) | 61,023.76 | Cubic inch ($in^3$) |
| Cubic meter ($m^3$) | 35.3147 | Cubic foot ($ft^3$) |
| Cubic meter ($m^3$) | 264.1720 | Gallon, U.S. liquid (gal) |
| Cubic meter ($m^3$) | 1000.0 | Liter (l) |
| Cubic meter per minute ($m^3$/Min) | 264.1720 | Gallon per minute, U.S. liquid (gpm) |
| Cubic meter per second ($m^3$/s) | 2118.880 | Cubic foot per minute ($ft^3$/Min) |
| Cubic meter per second ($m^3$/s) | 15,850.32 | Gallon per minute U.S. liquid (gpm) |
| Cubic millimeter ($mm^3$) | 0.00006102376 | Cubic inch ($in^3$) |
| Dyne | 0.00001 | Newton (N) |
| Dyne-centimeter | 0.0000001 | Newton-meter (N-m) |
| Fahrenheit temperature ($t_F$) | $(T_F-32)/1.8 = t_C$ | ($t_C$) |
| Fahrenheit temperature ($t_F$) | $(t_F+459.67)/1.8 = t_K$ | Kelvin temperature ($t_K$) |
| Foot (ft) | 30.48 | Centimeter (cm) |
| Foot (ft) | 0.3048 | Meter (m) |
| Foot per hour (fph) | 0.3048 | Meter per hour (m/hr) |
| Foot per hour (fph) | 0.00508 | Meter per minute (m/min) |
| Foot per hour (fph) | 0.00008466667 | Meter per second (m/s) |
| Foot per minute (fpm) | 0.508 | Centimeter per second (cm/s) |
| Foot per minute (fpm) | 18.288 | Meter per hour (m/hr) |
| Foot per minute (fpm) | 0.3048 | Meter per minute (m/min) |
| Foot per minute (fpm) | 0.00508 | Meter per second (m/s) |
| Foot per second (fps) | 30.48 | Centimeter per second (cm/s) |
| Foot per second (fps) | 18.288 | Meter per minute (m/min) |
| Foot per second (fps) | 0.3048 | Meter per second (m/s) |
| Foot per second per second | 0.3048 | Meter per second per second ($m/s^2$) |
| Foot-pound-force (ft-lbf) | 1.3558:8 | Joule (J) |
| Foot-poundal | 0.04214011 | Joule (J) |
| Foot-pound per hour (ft-lb/hr) | 0.0003766161 | Watt (W) |
| Foot-pound per minute (ft-lb/min) | 0.02259697 | Watt (W) |
| Gallon, U.S. liquid (gal) | 0.003785412 | Cubic meter ($m^3$) |
| Gallon, U.S. liquid (gal) | 3.785412 | Liter (l) |
| Gallon per minute, U.S. liquid (gpm) | 3.785412 | Liter per minute (l/min) |
| Gallon per minute, U.S. liquid (gpm) | 0.06309020 | Liter per second (l/s) |
| Gallon per minute, U.S. liquid (gpm) | 0.003785412 | Cubic meter per minute ($m^3$/min) |
| Gallon per minute, U.S. liquid (gpm) | 0.00006309020 | Cubic meter per second ($m^3$/s) |
| Gram (g) | 0.03527397 | Ounce, (Av) (oz) |
| Gram (g) | 0.03215074 | Ounce, (troy) (oz) |
| Gram per cubic centimeter ($g/cm^3$) | 0.3612730 | Pound per cubic inch ($lb/in^3$) |
| Horsepower (hp) | 0.7456999 | Kilowatt (kW) |
| Horsepower (hp) | 745.6999 | Watt (W) |
| Horsepower, Metric (hp) | 735.499 | Watt (W) |
| Inch (in.) | 2.540 | Centimeter (cm) |
| Inch (in.) | 0.0254 | Meter (m) |
| Inch (in.) | 25.4 | Millimeter (mm) |
| Inch of mercury, 32° F | 3386.39 | Newton per square meter ($N/m^2$) |
| Inch per minute (ipm) | 2.54 | Centimeter per minute (cm/min) |
| Inch per minute (ipm) | 0.0254 | Meter per minute (m/min) |
| Inch per minute (ipm) | 25.4 | Millimeter per minute (mm/min) |
| Joule (J) | 0.0009478170 | British thermal unit (BTU) |
| Joule (J) | 0.7375621 | Foot-pound-force (ft-lbf) |
| Joule (J) | 23.73036 | Foot-poundal |
| Joule (J) | 0.0002777778 | Watt-hour (W-h) |
| Kelvin temperature ($t_K$) | $t_K - 273.15 = t_C$ | Celsius temperature ($t_C$) |
| Kelvin temperature ($t_K$) | $1.8t_K - 459.67 = t_F$ | Fahrenheit temperature ($t_F$) |

# Metric conversion factors

| Multiply | by | to obtain |
|---|---|---|
| Kilogram (kg) | 0.0009842064 | Ton (long) |
| Kilogram (kg) | 0.001 | Ton (metric) |
| Kilogram (kg) | 0.001102311 | Ton (short) |
| Kilogram (kg) | 35.27397 | Ounce, (Av) (oz) |
| Kilogram (kg) | 32.15074 | Ounce, (Troy) (oz) |
| Kilogram (kg) | 2.20462 | Pound, (Av) (lb) |
| Kilogram-force (kgf) or kilopound | 9.80665 | Newton (N) |
| Kilogram force per square millimeter (kgf/mm$^2$) | 9.806650 | Megapascal (MPa) or (MN/m$^2$) |
| Kilogram-force-meter (kgf-m) | 9.806650 | Newton-meter (N-m) |
| Kilogram-meter per second (kg-m/s) second | 7.233011 | Pound-foot per second (lb-ft/s) |
| Kilogram-meter per second (kg-m/s) | 86.79614 | Pound-inch per second (lb-in./s) |
| Kilogram per cubic meter (kg/m$^3$) | 0.06242797 | Pound per cubic foot (lb/ft$^3$) |
| Kilometer (km) | 0.6213712 | Mile, (U.S. statute) |
| Kilometer per hour (kph) | 0.6213712 | Mile per hour, (U.S. statute) (mph) |
| Kilogram-force per square centimeter (kgf/cm$^2$) | 14.22334 | Pound per square inch (psi) |
| Kilogram-force per square meter (kgf/m$^2$) | 9.806650 | Newton per square meter (N/m$^2$) |
| Kilogram-force per square meter (kgf/m$^2$) | 9.806650 | Pascal (Pa) |
| Kilogram-force per square meter (kgf/m$^2$) | 0.2048161 | Pound per square foot (lb/ft$^2$ ) |
| Kilogram-force per square meter (kgf/m$^2$) | 0.001422 | Pound per square inch (psi) |
| Kilowatt (kW) | 1.341022 | Horsepower (hp) |
| Kilowatt-hour (kwh) | 3,600,000 | Joule (J) |
| Kilonewton per square meter kN/m$^2$) | 0.1450377 | Pound per square inch (psi) |
| Liter (l) | 0.03531466 | Cubic foot (ft$^3$) |
| Liter (l) | 0.001 | Cubic meter (m$^3$) |
| Liter (l) | 0.2641720 | Gallon, U.S. liquid (gal) |
| Liter per minute (lpm) | 0.03531466 | Cubic foot per minute (ft$^3$/min) |
| Liter per minute (lpm) | 0.2641720 | Gallon per minute, U.S. liquid (gpm) |
| Liter per second (lps) | 15.85032 | Gallon per minute, U.S. liquid (gpm) |
| Megapascal (MPa) | 145.0377 | Pound per square inch (psi) |
| Meter (m) | 39.37008 | Inch (in.) |
| Meter (m) | 3.280840 | Foot (ft) |
| Meter (m) | 1.0936 | Yard (yd) |

| Multiply | by | to obtain |
|---|---|---|
| Meter per hour (m/hr) | 3.280840 | Foot per hour (fph) |
| Meter per hour (m/hr) | 0.5468067 | Foot per minute (fpm) |
| Meter per minute (m/min) | 3.280840 | Foot per minute (fpm) |
| Meter per minute (m/min) | 0.05468067 | Foot per second (fps) |
| Meter per minute (m/min) | 39.37008 | Inch per minute (ipm) |
| Meter per second (m/s) | 11,811.02 | Foot per hour (fph) |
| Meter per second (m/s) | 196.8504 | Foot per minute (fpm) |
| Meter per second (m/s) | 3.280840 | Foot per second (fps) |
| Microinch | 0.0254 | Micrometer or micron |
| Micron | 0.00000132 | Atmosphere |
| Micron | 0.0000394 | Inch of mercury |
| Micron | 0.001 | Millimeter of mercury (Torr) |
| Micron | 0.0000195 | Pound per square inch (psi) |
| Micrometer or micron | 39.37008 | Microinch |
| Mile (U.S. statute) | 1.609344 | Kilometer (km) |
| Mile per hour (mph) (kph) | 1.609344 | Kilometer per hour |
| Millimeter (mm) | 0.03937008 | Inch (in.) |
| Millimeter (mm) | 0.003280840 | Foot (ft) |
| Millimeter of mercury (Torr) | 0.00132 | Atmosphere |
| Millimeter of mercury (Torr) | 0.0394 | Inch of mercury |
| Millimeter of mercury (Torr) | 1000 | Micron |
| Millimeter of mercury (Torr) | 0.0195 | Pound per square inch (psi) |
| Millimeter per minute (mm/Min) | 0.3937008 | Inch per minute (ipm) |
| Newton (N) | 100,000 | Dyne |
| Newton (N) | 0.1019716 | Kilogram-force or kilo pound (kgf) |
| Newton (N) | 3.596942 | Ounce-force (ozf) |
| Newton (N) | 7.23301 | Poundal |
| Newton (N) | 0.2248089 | Pound-force (lbf) |
| Newton-meter (N-m) | 10,000,000 | Dyne-centimeter |
| Newton-meter (N-m) | 0.1019716 | Kilogram-force-meter (kgf-m) |
| Newton-meter (N-m) | 141.6119 | Ounce-force-inch (ozf-in.) |
| Newton-meter (N-m) | 0.73756 | Pound-force-foot (lbf-ft) |
| Newton-millimeter (N-mm) | 0.1416119 | Ounce-force-inch (ozf-in.) |
| Newton per meter (N/m) | 0.06852178 | Pound-force per foot (lbf/ft) |
| Newton per meter (N/m) | 0.005710148 | Pound-force per inch (lbf/in.) |
| Newton per square centimeter (N/cm$^2$) | 1.450377 | Pound per square inch (psi) |

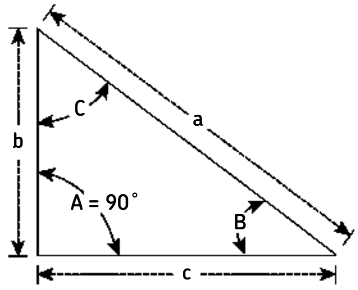
# Metric conversion factors

| Multiply | by | to obtain |
|---|---|---|
| Newton per square meter ($N/m^2$) | 0.0002953 | Inch of mercury |
| Newton per square meter ($N/m^2$) | 0.1019716 | Kilogram per square meter ($kg/m^2$) |
| Newton per square meter ($N/m^2$) | 1.0 | Pascal (Pa) |
| Newton per square meter ($N/m^2$) | 0.0001450 | Pound per square inch (psi) |
| Newton per square millimeter ($N/mm^2$) | 145.0377 | Pound per square inch (psi) |
| Ounce, (Av) (oz) | 28.3495 | Gram (g) |
| Ounce, (troy) (oz) | 31.10348 | Gram (g) |
| Ounce, (Av) (oz) | 0.02834952 | Kilogram (kg) |
| Ounce, (Troy) (oz) | 0.03110348 | Kilogram (kg) |
| Ounce-force (ozf) | 0.2780139 | Newton (N) |
| Ounce-force-inch (ozf-in.) | 0.007061552 | Newton-meter (N-m) |
| Ounce-force-inch (ozf-in.) | 7.061552 | Newton-millimeter (N-mm) |
| Pascal (Pa) | 0.1019716 | Kilogram per square meter ($kg/m^2$) |
| Pascal (Pa) | 1.0 | Newton per square meter ($N/m^2$) |
| Pascal (Pa) | 0.02088543 | Pound per square foot ($lb/ft^2$) |
| Pascal (Pa) | 0.0001450377 | Pound per square inch (psi) |
| Pound, (Av) (lb) | 0.453592 | Kilogram (kg) |
| Poundal | 0.1382550 | Newton (N) |
| Pound-foot-(lb-ft) | 1.355818 | Newton-meter (N-m) |
| Pound-foot per second (lb-ft/s) | 0.1382550 | Kilogram-meter per second (kg-m/s) |
| Pound-force (lbf) | 4.448222 | Newton (N) |
| Pound-inch per second (lb-in./s) | 0.01152125 | Kilogram-meter per second (kg-m/s) |
| Pound per cubic inch ($lb/in.^2$) | 27.67990 | Gram per cubic centimeter ($g/cm^3$) |
| Pound per cubic foot ($lb/ft^3$) | 16.01846 | Kilogram per cubic meter ($kg/m^3$) |
| Pound per foot (lb/ft) | 14.59390 | Newton per meter (N/m) |
| Pound per inch (lb/in.) | 175.1268 | Newton per meter (N/m) |
| Pound per square foot ($lb/ft^2$) | 4.882429 | Kilogram per square meter ($kg/m^2$ ) |
| Pound per square foot ($lb/ft^2$) | 47.88026 | Newton per square meter ($N/m^2$) |
| Pound per square foot ($lb/ft^2$) | 47.88026 | Pascal (Pa) |
| Pound per square inch (psi) | 0.063 | Atmosphere |
| Pound per square inch (psi) | 2.036 | Inch of Mercury |
| Pound per square inch (psi) | 0.70730697 | Kilogram per square centimeter ($kg/cm^2$) |

| Multiply | by | to obtain |
|---|---|---|
| Pound per square inch (psi) | 703.1 | Kilogram per square meter ($kg/m^2$) |
| Pound per square inch (psi) | 6.8948 | Kilonewton per square meter ($kN/m^2$) |
| Pound per square inch (psi) | 51,500 | Micron |
| Pound per square inch (psi) | 51.5 | Millimeter of mercury (Torr) |
| Pound per square inch (psi) | 0.6894757 | Newton per square centimeter ($N/cm^2$) |
| Pound per square inch (psi) | 6894.76 | Newton per square meter ($N/m^2$) |
| Pound per square inch (psi) | 0.006895 | Newton per square millimeter ($N/mm^2$) |
| Pound per square inch (psi) | 6894.757 | Pascal (Pa) |
| Square centimeter ($cm^2$) | 0.001076391 | Square foot ($ft^2$) |
| Square centimeter ($cm^2$) | 0.1550003 | Square inch ($in.^2$) |
| Square foot ($ft^2$) | 929.0304 | Square centimeter ($cm^2$) |
| Square foot ($ft^2$) | 0.09290304 | Square meter ($m^2$) |
| Square foot ($ft^2$) | 92,903.04 | Square millimeter (mm2) |
| Square foot per second ($ft^2/s$) | 0.092900304 | Square meter per second ($m^2/s$) |
| Square inch ($in.^2$) | 6.4516 | Square centimeter (cm2) |
| Square inch ($in.^2$) | 0.00064516 | Square meter ($m^2$) |
| Square inch ($in.^2$) | 645.16 | Square millimeter ($mm^2$) |
| Square meter ($m^2$) | 10.763910 | Square foot ($ft^2$) |
| Square meter ($m^2$) | 1550.003 | Square inch ($in.^2$) |
| Square millimeter ($mm^2$) | 0.0001076387 | Square foot ($ft^2$) |
| Square millimeter ($mm^2$) | 0.001550003 | Square inch ($in.^2$) |
| Ton (metric) | 1000 | Kilogram (kg) |
| Ton (long) | 1016.047 | Kilogram (kg) |
| Ton (short) | 907.1847 | Kilogram (kg) |
| Torr (mm Hg) | 133.322 | Pascal (Pa) |
| Watt (W) | 3.412141 | British thermal unit (BTU/hour) |
| Watt (W) | 2655.224 | Foot-pound per hour (ft-lb/hour) |
| Watt (W) | 44.25372 | Foot-pound per minute (ft-lb/min) |
| Watt (W) | 0.001341022 | Horsepower (hp) |
| Watt (W) | 0.001359621 | Horsepower (metric) (hp) |
| Watt-hour (W-h) | 3600 | Joule (J) |
| Yard (yd) | 0.9144 | Meter (m) |

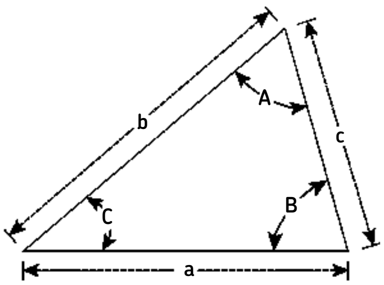
# Trigonometric solutions

## Solutions of triangles




### Right-angled triangles

| Sides and angles known | Formulas for sides and angles to be found | | |
|---|---|---|---|
| Sides a and b | $c = \sqrt{a^2 - b^2}$ | $\sin B = \frac{b}{a}$ | C= 90°- B |
| Sides a and c | $b = \sqrt{a^2 - c^2}$ | $\sin C = \frac{c}{a}$ | B= 90°– C |
| Sides b and c | $a = \sqrt{b^2 + c^2}$ | $\tan B = \frac{b}{c}$ | C= 90°– B |
| Side a; angle B | $b = a \times \sin B$ | $c = a \times \cos B$ | C= 90°– B |
| Side b; angle B | $a = \frac{b}{\sin B}$ | $c = a \times \cot B$ | C= 90°– B |
| Side c; angle B | $a = \frac{c}{\cos B}$ | $b = c \times \tan B$ | C= 90°– B |

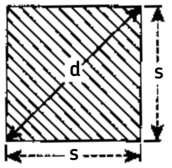



### Oblique–angled triangles

| Sides and angles known | Formulas for sides and angles to be found | | |
|---|---|---|---|
| Side a; angles A, B | C = 180°– (A + B) | $b = \frac{a \times \sin B}{\sin A}$ | $c = \frac{a + \sin C}{\sin A}$ |
| Sides a, b; angle C | $\tan A = \frac{a + \sin C}{b - a \times \cos C}$ | $c = \frac{a \times \sin C}{\sin A}$ | B = 180°– (A + C) |
| Sides a, b; angle A | $\sin B = \frac{b + \sin A}{a}$ | C = 180°– (A + B) | $c = \frac{a \times \sin C}{\sin A}$ |
| Sides a, b, c | $\cos A = \frac{b^2 + c^2 - a^2}{2\,bc}$ | $\sin B = \frac{b \times \sin A}{a}$ | C = 180°– (A + B) |

# Trigonometric solutions

## Areas of plane figures
## A = area



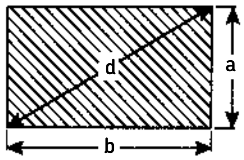

Square

$A = s^2$

$A = \frac{1}{2} d^2$

$s = 0.707d = \sqrt{A}$

$d = 1.414s = 1.414\sqrt{A}$




Rectangle

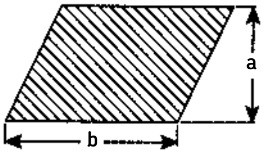
$A = ab$

$A = a\sqrt{d^2 - a^2} = b\sqrt{d^2 - b^2}$

$d = \sqrt{a^2 + b^2}$

$a = \sqrt{d^2 - b^2} = A \div b$

$b = \sqrt{d^2 - a^2} = A \div a$

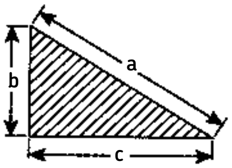



Parallelogram

$A = ab$

$a = A \div b$

$b = A \div a$



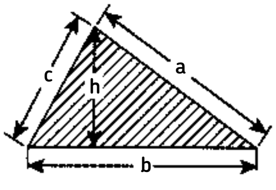

Right-angled triangle

$A = \frac{bc}{2}$

$a = \sqrt{b^2 + c^2}$

$b = \sqrt{a^2 - c^2}$

$c = \sqrt{a^2 - b^2}$

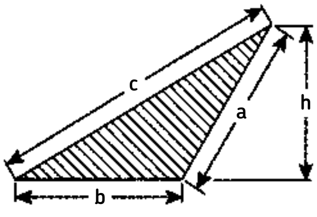



Acute-angled triangle

$A = \frac{bh}{2} = \frac{b}{2}\sqrt{c^2 - \left(\frac{a^2 + b^2 - c^2}{2b}\right)^2}$

If $S = \frac{1}{2}(a + b + c)$, then

$A = \sqrt{S(S - a)(S - b)(S - c)}$




Obtuse-angled triangle

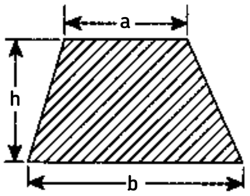
$A = \frac{bh}{2} = \frac{b}{2}\sqrt{a^2 - \left(\frac{c^2 - a^2 - b^2}{2b}\right)^2}$

If $S = \frac{1}{2}(a + b + c)$, then

$A = \sqrt{S(S - a)(S - b)(S - c)}$

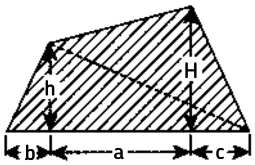
# Trigonometric solutions

## Areas of plane figures
## A = area




Trapezoid

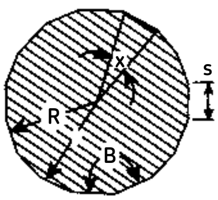
$$A = \frac{(a + b)\,h}{2}$$




Trapezium

$$A = \frac{(H + h)\,a + bh + cH}{2}$$

A trapezium can also be divided into two triangles as indicated by the dotted line. The area of each of the triangles is computed, and the results added to find the area of the trapezium.



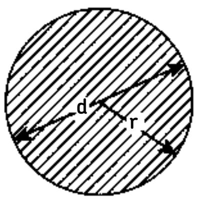

Regular polygon

n = number of sides

$\alpha = 360° \div n$; $ß = 180° - \alpha$

$$A = \frac{nsr}{2} = \frac{ns}{2}\sqrt{R^2 - \frac{s^2}{4}}$$

$$R = \sqrt{r^2 + \frac{s^2}{4}}\ ,\quad r = \sqrt{R^2 + \frac{s^2}{4}}\ ,\quad s = 2\sqrt{R^2 - r^2}$$




Circle

C = circumference

$A = \pi r^2 = 3.1416r^2 = 0.7854\ d^2$

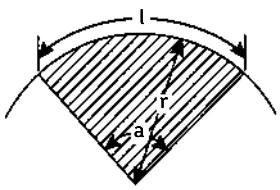
$C = 2\pi r = 6.2832\ r = 3.1416\ d$

$r = C \div 6.2832 = \sqrt{A \div 3.1416} = 0.564\ \sqrt{A}$

$d = C \div 3.1416 = \sqrt{A \div 0.7854} = 1.128\ \sqrt{A}$

Length of arc for center-angle of 1° = 0.008727 d

Length of arc for center-angle of n° = 0.008727 nd



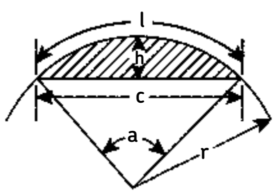

Circular sector

l = length of arc; α = angle in degrees

$$l = \frac{r \times \alpha \times 3.1416}{180} = 0.01745\ r\alpha = \frac{2A}{r}$$

$$A = \frac{1}{2}rl = 008727\alpha r^2$$

$$\alpha = \frac{57.296\ l}{r} \qquad r = \frac{2A}{l} = \frac{57.296\ l}{\alpha}$$




Circular segment

l= length of arc; α = angle in degrees

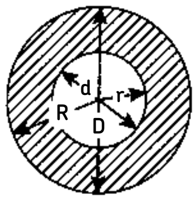
$$C = 2\sqrt{h\,(2r - h)} \qquad A = \frac{1}{2}\,[\,rl - c\,(rh)\,]$$

$$r = \frac{c^2 + 4h^2}{8h} \qquad l = 0.01745\ r\alpha$$

$$h = r - \frac{1}{2}\sqrt{4\,r^2 - c^2} \qquad \alpha = \frac{57.296\ l}{r}$$

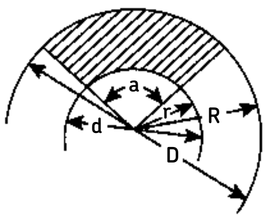
# Trigonometric solutions

## Areas of plane figures
## A = area




**Circular ring**

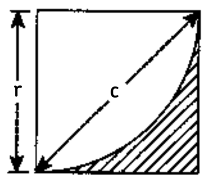
$$A = \pi (R^2 - r^2) = 3.1416 (R^2 - r^2)$$
$$= 3.1416 (R + r)(R - r)$$
$$= 0.7854 (D^2 - d^2) = 0.7854 (D + d)(D - d)$$




**Circular ring sector**

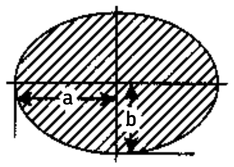
$\alpha$ = angle in degrees

$$A = \frac{\alpha\pi}{360}(R^2 - r^2) = 0.00873\, \alpha (R^2 - r^2)$$
$$= \frac{\alpha\pi}{4 \times 360}(D^2 - d^2) = 0.00218\, \alpha (D^2 - d^2)$$




**Spandrel or fillet**

$$A = r^2 - \frac{\pi r^2}{4} = 0.215\, r^2$$
$$= 0.1075\, c^2$$




**Ellipse**

P= perimeter or circumference

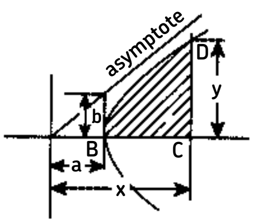
A= $\pi ab$ = 3.1416 ab

An approximate formula for the perimeter is:

$$P = 3.1416 \sqrt{2 (a^2 + b^2)}$$

A closer approximation is:

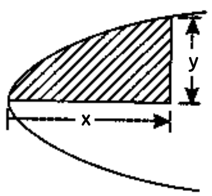
$$P = 3.1416 \sqrt{2 (a^2 + b^2) - \frac{(a - b)^2}{2.2}}$$




**Hyperbola**

A = area BCD

$$A = \frac{xy}{2} - \frac{ab}{2} \text{ hyp. log} \left(\frac{x}{a} + \frac{y}{b}\right)$$



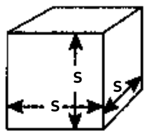

**Parabola**

$$A = \frac{2}{3} xy$$

The area is equal to two-thirds of the rectangle which has x for its base and y for its height.

# Trigonometric solutions

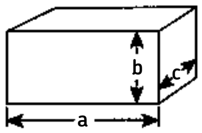
## Volumes of solids
## V = volume




Cube

$V = s^3$

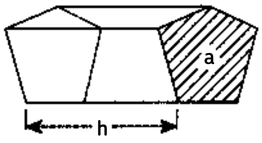
$s = \sqrt[3]{V}$




Square prism

$V = abc$

$a = \frac{V}{bc}$ $\quad b = \frac{V}{ac}$ $\quad c = \frac{V}{ab}$

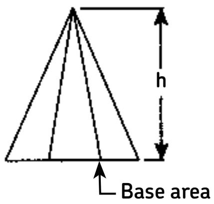



Prism

A = area of end surface

$V = h \times A$

The area A of the end surface is found by the formulas for areas of plane figures on the preceding pages.

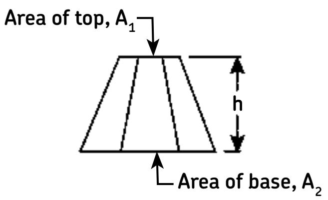



Pyramid

$V = \frac{1}{3} h \times \text{area of base}$

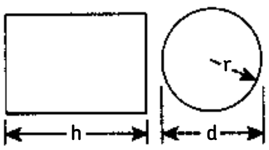
If the base is a regular polygon with n sides, and s= length of side, r= radius of inscribed circle, and R= radius of circumscribed circle, then:

$V = \frac{nsrh}{6} = \frac{nsh}{6} \sqrt{R^2 - \frac{s^2}{4}}$




Frustrum of prism

$V = \frac{h}{3} (A_1 + A_2 + \sqrt{A_1 \times A_2})$




Cylinder

S = area of cylindrical surface

$V = 3.1416\, r^2 h = 0.7854\, d^2 h$

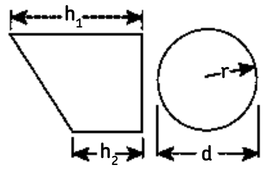
$S = 6.2832\, rh = 3.1416\, dh$

Total area A of cylindrical surface and end surfaces:

$A = 6.2832\, r\,(r + h) = 3.1416\, d\,(\frac{1}{2} d + h)\, 2$

# Trigonometric solutions

## Volumes of solids
## V = volume

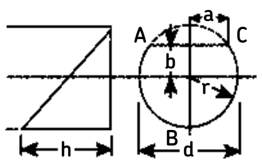



**Portion of a cylinder**

S = area of cylindrical surface

$V = 1.5708\, r^2 (h_1 + h_2) = 0.3927\ d^2 (h_1 + h_2)$

$S = 3.1416\, r (h_1 + h_2) = 1.5708\ d (h_1 + h_2)$



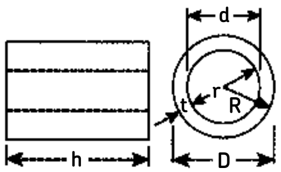

**Portion of a cylinder**

S = area of cylindrical surface

$$V = \left(\frac{2}{3} a^3 \pm b \times \text{area } ABC\right) \frac{h}{r \pm b}$$

$$S = (ad \pm b \times \text{length of arc } ABC) \frac{h}{r \pm b}$$

Use + when base area is larger, and – when base area is less than one-half the base circle.




**Hollow cylinder**

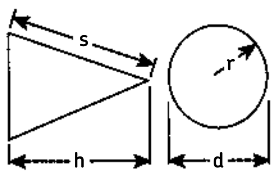
V = volume of cylinder

$V = 3.1416\, h (R^2 - r^2) = 0.7854\, h (D^2 - d^2)$

$= 3.1416\, ht (2R - t) = 3.1416\, ht (D - t)$

$= 3.1416\, ht (2r + t) = 3.1416\, ht (d + t)$

$= 3.1416\, ht (R + r) = 1.5708\, ht (D + d)$



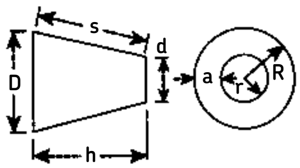

**Cone**

A = area of conical surface

$$V = \frac{3.1416\, r^2 h}{3} = 1.0472\, r^2 h = 0.2618\, d^2 h$$

$$A = 3.1416\, r \sqrt{r^2 + h^2} = 3.1416\, rs = 1.5708\, ds$$

$$s = \sqrt{r^2 + h^2} = \sqrt{\frac{d^2}{4} + h^2}$$



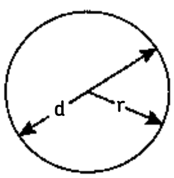

**Frustrum cone**

A = area of conical surface

$V = 1.0472\, h (R^2 + Rr + r^2) = 0.2618\, h (D^2 + Dd + d^2)$

$A = 3.1416\, s (R + r) = 1.5708\, s (D + d)$

$a = R - r \qquad s = \sqrt{a^2 + h^2} = \sqrt{(R - r)^2 + h^2}$




**Sphere**

A = area of surface

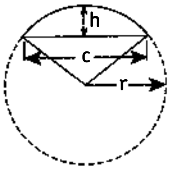
$$V = \frac{4\pi r^3}{3} = \frac{\pi d^3}{6} = 4.1888\, r^3 = 0.5236\, d^3$$

$$A = 4\pi r^2 = \pi d^2 = 12.5664 r^2 = 3.1416\, d^2$$

$$r = \sqrt[3]{\frac{3V}{4\pi}} = 0.6204 \sqrt[3]{V}$$

# Trigonometric solutions

## Volumes of solids
V = volume



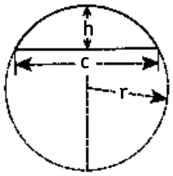

**Spherical sector**

A = total area of conical and spherical surface

$$V = \frac{2\pi r^2 h}{3} = 2.0944\ r^2\ h$$

$$A = 3.1416\ r\left(2\ h + \frac{1}{2}\ c\right)$$

$$c = 2\sqrt{h\,(2\ r - h)}$$



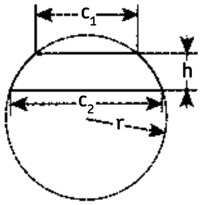

**Spherical segment**

A = area of spherical surface

$$V = 3.1416\ h^2\left(r - \frac{h}{3}\right) = 3.1416\ h\left(\frac{c^2}{8} + \frac{h^2}{6}\right)$$

$$A = 2\ \pi rh = 6.2832\ rh = 3.1416\left(\frac{c^2}{4} + h^2\right)$$

$$c = 2\sqrt{h\,(2\ r - h)}\ ; \quad r = \frac{c^2 + 4h^2}{8h}$$



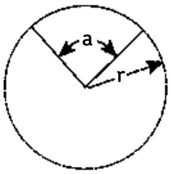

**Spherical zone**

A = area of spherical surface

$$V = 0.5236\ h\left(\frac{3c_1^{\,2}}{4} + \frac{3c_2^{\,2}}{4} + h^2\right)$$

$$A = 2\ \pi\ rh = 6.2832\ rh$$

$$r = \sqrt{\frac{c_2^{\,2}}{4} + \left(\frac{c_2^{\,2} - c_1^{\,2} - 4h^2}{8h}\right)^2}$$



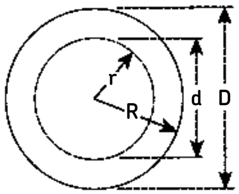

**Spherical wedge**

A = area of spherical surface

α = center angle in degrees

$$V = \frac{\alpha}{360} \times \frac{4\ \pi r^3}{3} = 0.0116\ \alpha r^3$$

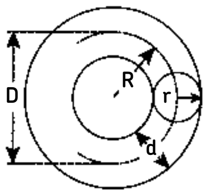
$$A = \frac{\alpha}{360} \times 4\ \pi\ r^2 = 0.0349\ \alpha r^2$$




**Hollow sphere**

$$V = \frac{4\ \pi}{3}\ (R^3 - r^3) = 4.1888\ (R^3 - r^3)$$

$$= \frac{\pi}{6}\ (D^3 - d^3) = 0.5236\ (D^3 - d^3)$$




**Torus**

A = area of surface

$$V = 2\pi^2\ Rr^2 = 19.739\ Rr^2$$

$$= \frac{\pi^2}{4}\ Dd^2 = 2.4674\ Dd^2$$

$$A = 4\ \pi^2\ Rr = 39.478\ Rr$$

$$= \pi^2\ Dd = 9.8696\ Dd$$

# Load computations

## Horsepower and torque

Shaft torque, or twisting movement of the shaft, can be determined from the applied horsepower and speed in the following relationship:

$$Q = \frac{H \times 63000}{R} \quad \text{where,}$$

Q = Torque in in.-lbs

H = Horsepower

R = Speed in rpm

The torque used in computations is usually that of the main driving shaft or that of the engine or motor. The power is generally transmitted to another shaft by means of gears, pulleys, chains or other drives. The torque of the driving and driven shafts is inversely proportional to the rpm, so that if the torque of the driving shaft and rpm of both shafts are known, the torque of the driven shaft can be determined.

If the rpm of the shafts is known, the torque is figured directly from the horsepower. For instance the torque of shaft (2) is:

$$\frac{35 \times 63000}{400} = 5520 \text{ in.-lbs}$$

In some cases, such as on auxiliary drives, a shaft absorbs a certain amount of power from the drive shaft. The torque of the auxiliary shaft is easily computed by substituting values of “H” and “R” in the formula.

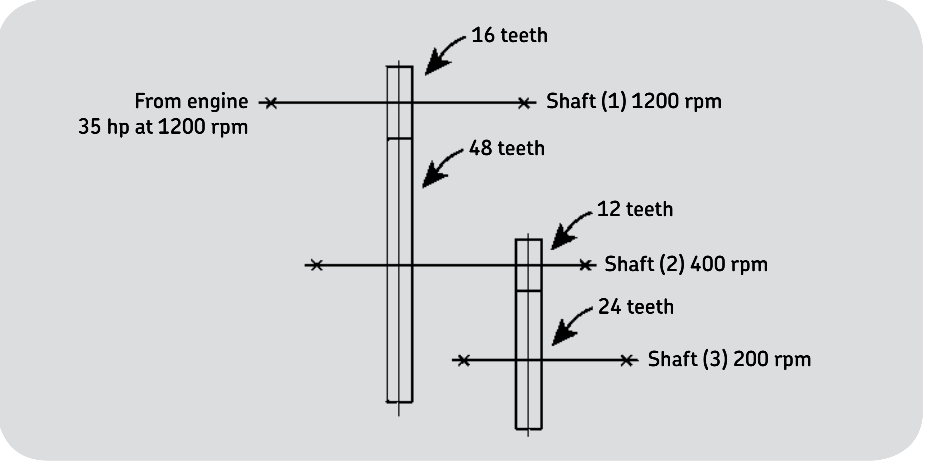



**Figure 1**

Example:
Figure 1 shows a gear train, shaft (1) coupled with engine developing 35 horsepower at 1200 rpm. The torque of shaft (1) is therefore:

$$\frac{63000 \times 35}{12000} = 1840 \text{ in.-lbs}$$

Torque of shaft (2) = 1840 × 48/16 = 5520 in.-lbs
Torque of shaft (3) = 5520 × 24/12 = 11040 in.-lbs

# Load computations

## Bearing loads

### Radial and thrust loads

**Radial loads**

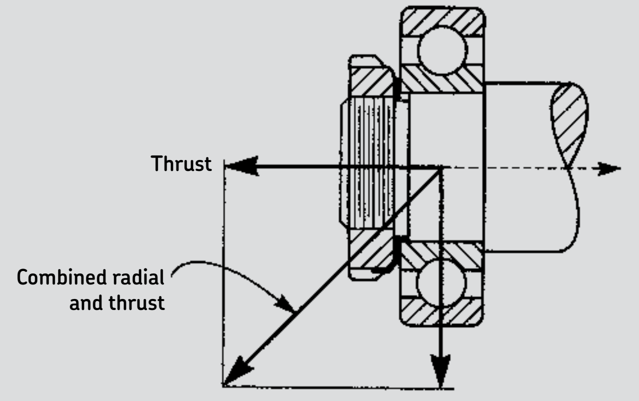
A radial load is one applied at right angles to the axis of the shaft. This load passes from the shaft to the inner ring through the balls to the outer ring and thence to the housing. In some cases this condition may be reversed, i.e., the radial load passing from a revolving housing through the bearing to a stationary shaft. A radial load is sustained by not more than one-half of the balls in the bearing.

A radial load may be due to a single force, such as weights of shaft and other revolving parts. More often, however, the radial load is due to two or more components such as tangential forces, separating forces, overturning moments, etc. which are combined into one load acting in a single direction at right angles to the axis of the shaft and the axis of the bearing.

Radial loads are supported by a pair of bearings which are mounted in one of two different manners: (1) straddle; (2) overhung. (See following page.)

In the straddle mounting, the radial load is divided in inverse proportion to the distance from the point of application of the load to the center of the bearing. The reactions at the bearings act in a direction opposite to the direction of the load. (See Figure 2) The straddle mounting is the most commonly used in supporting shafts.

The overhung mounting produces an entirely dissimilar result. In this, the load is applied at a point outside of the two bearings. The effect of this is to produce on the nearest bearing a load greater than the original radial load. The load on the opposite end bearing is generally relatively small. The load on the bearing nearest to the point of application acts in the same direction as that of the applied load. The load at the other bearing acts in the opposite direction to that of the applied load. (See Figure 3.)




**Thrust loads**

A thrust or end thrust load is one that acts in the same direction as the axis of the shaft. Its effect is to push the entire circle of balls against the race shoulder. The thrust may act from left to right or from right to left, or it may alternate. In the majority of cases, however, the thrust acts in one direction only. Horizontal mountings always require provision for thrust in both directions, although generally the thrust in one direction may be only a “locating” or nominal thrust. The ideal mounting for a ball bearing is where one bearing takes thrust in both directions. The “opposed” method of mounting allows one bearing to take thrust in one direction, and the other bearing to take thrust in the opposite direction.

**Combined radial and thrust loads**

One bearing of the pair sustains both radial and thrust loads. The resultant load is indicated by the diagonal line, which also shows the direction in which the shaft would move if not restrained by the bearing.

# Load computations

## Bearing loads

### Straddle mounting

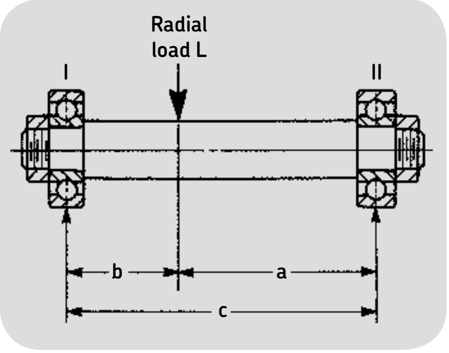



**Figure 2**
**Straddle mounting**

Radial load on bearing I = $\dfrac{L \times a}{c}$

Radial load on bearing II = $\dfrac{L \times b}{c}$

### Overhung mounting

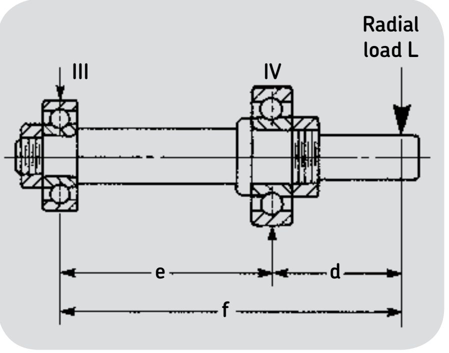
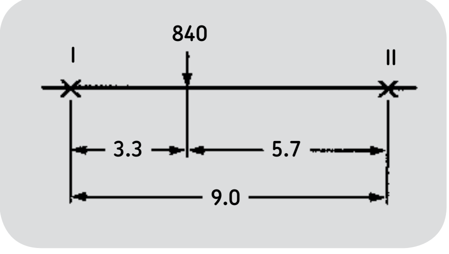



**Figure 3**
**Overhung mounting**

Radial load on bearing III = $\dfrac{L \times d}{e}$

Radial load on bearing IV = $\dfrac{L \times f}{e}$

### Example: straddle mounting

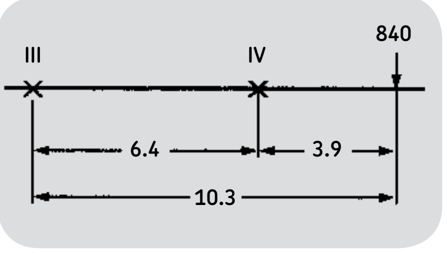



Radial load on I = $\dfrac{840 \times 5.7}{9.0}$ = 530 lbs

Radial load on II = $\dfrac{840 \times 3.3}{9.0}$ = 310 lbs

(530 + 310 = 840 check)

### Example: overhung mounting




Radial load on III = $\dfrac{840 \times 3.9}{6.4}$ = 510 lbs

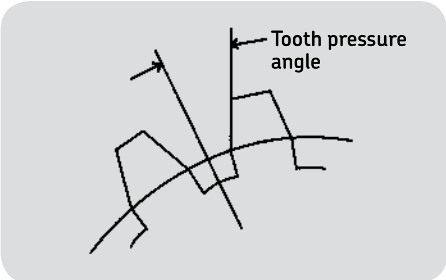
Radial load on IV = $\dfrac{840 \times 10.3}{6.4}$ = 1350 lbs

(1350 – 510 = 840 check)

# Load computations

## Radial loads due to spur gears

To compute radial loads on the bearings, obtain following data:
Horsepower (H) or torque (Q)
rpm of driving gear
Speed (R)
Number of teeth (t) in driving gear
Diametral pitch (p) of gears
Pitch diameter (D) of driving gear in inches
Tooth pressure angle
Gear ratio
Follow the example step by step in solving similar problems.

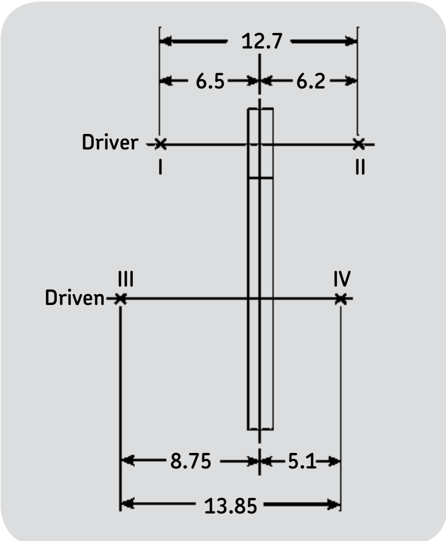



Example:
Horsepower (H) = 35 rpm
Speed (R) = 1200
Number of teeth (t) in driving gear = 18
Diametral pitch (p) of gears = 6
Pitch diameter (D) of driving gear = 18/6 = 3
Tooth pressure angle = A = $17^{1}/_{2}°$ cos $17^{1}/_{2}$ = .954
Gear ratio = 4

$$\text{Torque (Q)} = \frac{63000\ H}{R} = \frac{63000 \times 35}{1200} = 1840\ \text{in.-lbs}$$

$$\text{Tooth load} = \frac{2\ Q}{D \cos A} = \frac{2 \times 1840}{3 \times .954} = 1290\ \text{lbs}$$

**Example: straddle mounting**



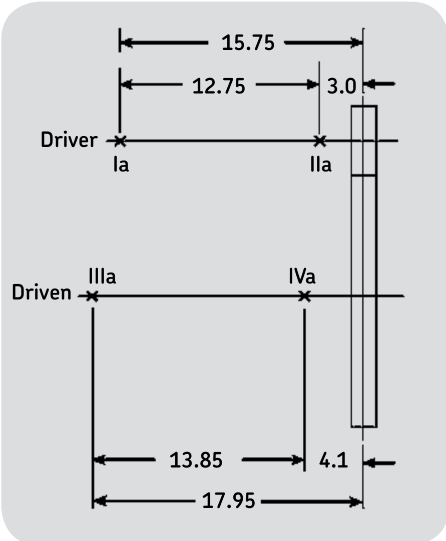

Radial load on I
1290 × 6.2/12.7 = 630 lbs at 1200 rpm

Radial load on II
1290 × 6.5/12.7 = 660 lbs at 1200 rpm

Radial load on III
1290 × 5.1/13.85 = 480 lbs at 300 rpm

Radial load on IV
1290 × 8.75/13.85 = 810 lbs at 300 rpm

**Example: overhung mounting**




Radial load on Ia
1290 × 3.0/12.75 = 300 lbs at 1200 rpm

Radial load on IIa
1290 ×15.75/12.75 =1590 lbs at 1200 rpm

Radial load on IIIa
1290 × 4.1/13.85 = 380 lbs at 300 rpm

Radial load on IVa
1290 ×17.95/13.85 =1670 lbs at 300 rpm

# Load computations

## Radial loads due to spur gears

**Idler and intermediate shafts graphic method**

Where loads are due both to driver and driven gears, plot end view and determine resultant load graphically as shown below.
Proceed as follows:

**1** Draw gears in correct position, preferably to full or half scale.
**2** Indicate direction of rotation with arrows.
**3** Draw tangent (same direction as arrows).
**4** Complete triangle making hypotenuse (tooth load) intersect driven gear.
**5** Combine two forces as indicated in Figure 5.
**6** Compute reactions on the bearings. (See page 353)

**Example:**
Horsepower (H) = 35
rpm (R) of driver =1200
Number of teeth in gears 18, 36, 72
Diametral pitch (p) of gears = 6
Tooth pressure angle $= 17^1/_2°$

Torque (Q) $= \dfrac{63000 \times 35}{1200} = 1840$ in.-lbs

Pitch diameter of driver $= \dfrac{18}{6} = 3$ in.

Tooth pressure angle = A $= 17^1/_2°$ cos $17^1/_2 = .954$

Tooth load $= \dfrac{2\,Q}{D \cos A} = \dfrac{2 \times 1840}{3 \times .954} = 1290$ lbs

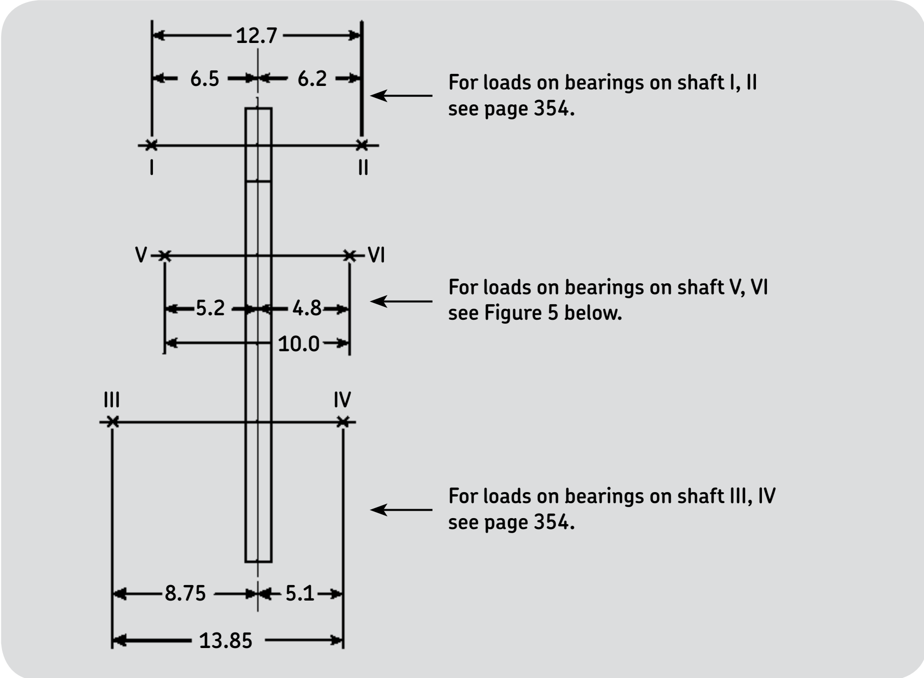



**Figure 4**

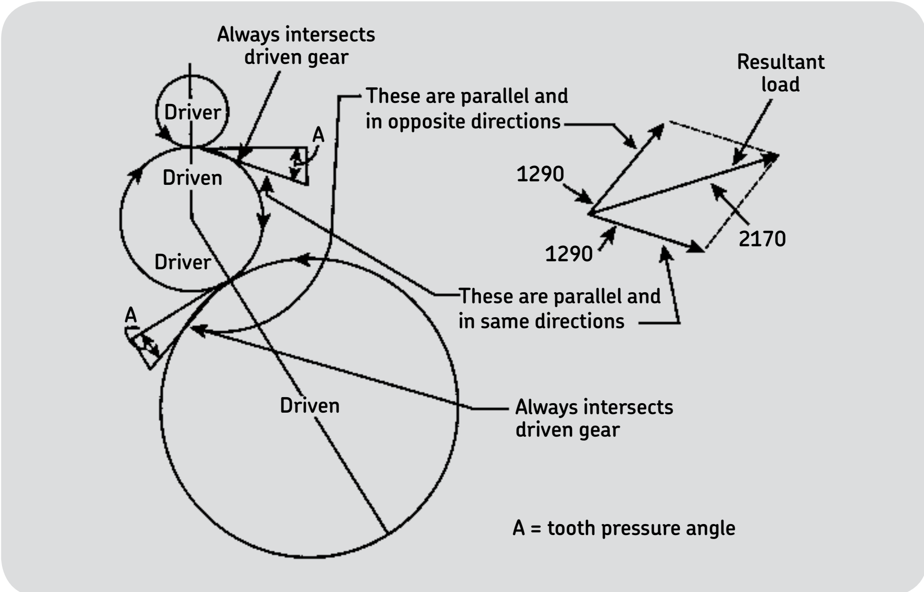



**Figure 5**

Load on V 2170 × 4.8/10 = 1040 lbs at 600 rpm
Load on VI 2170 – 1040 = 1130 lbs at 600 rpm

# Load computations

## Radial loads due to spur gears

### Idler and intermediate shafts solution by formulas

**Case 1:** Where centers of driver, idler and driven shafts lie on one line. (See Figure 6)

Direction of rotation of gears is immaterial.

H = Horsepower

Q = Torque

R = rpm of driver

D = Pitch diameter of driver

Resultant tooth load on bearings V and VI

$$= \frac{4Q}{D} \text{ or } \frac{252000\ H}{RD}$$

Example: H = 35, R =1200, D = 3 in.

Gear reduction = 2

$$\text{Resultant tooth load} = \frac{252000 \times 35}{1200 \times 3}$$

= 2450 lbs

Radial load on V = 2450 × 4.8/10

= 1180 lbs at 600 rpm

Radial load on VI = 2450 – 1180

= 1270 lbs at 600 rpm

Radial loads on I, II, III and IV—see page 354.

**Case 2:** Where end view of gears is as shown in Figure 7.

Note direction of rotation (compare Figure 8).

A = Tooth pressure angle

Z = Angle (Figure 7)

$$K = \frac{2A + Z}{2}$$

Other symbols as in Case 1.

Resultant tooth load on bearings V and VI

$$= \frac{4\ Q \cos K}{D \cos A} \text{ or } \frac{252000\ H \cos K}{RD \cos A}$$

Example: H = 35 R = 1200 D = 3 in.

Gear reduction = 2

Tooth pressure angle =$17\frac{1}{2}°$ cos $17\frac{1}{2}°$ = .954

Z = 30°

$$K = \frac{35 + 30}{2} = 32\frac{1}{2}°$$

cos $32\frac{1}{2}°$ = .843

$$\text{Resultant tooth load} = \frac{252000 \times 35 \times .843}{1200 \times 3 \times .954}$$

= 2170 lbs

Radial load on V = 2170 × 4.8/10

= 1040 lbs at 600 rpm

Radial loads on VI = 2170 – 1040

= 1130 lbs at 600 rpm

Radial loads on I, II, III and IV—see page 354.

**Case 3:** Where end view of gears is as shown in Figure 8.

Note direction of rotation (compare Figure 7).

A = Tooth pressure angle

Z = Angle (Figure 7)

$$J = \frac{2A - Z}{2}$$

Other symbols as in Case 1.

Resultant tooth load on bearings. V and VI

$$= \frac{4\ Q \cos J}{D \cos A} \text{ or } \frac{252000\ H \cos J}{RD \cos A}$$

Example: H = 35 R =1200 D = 3 in.

Gear reduction = 2

Tooth pressure angle =$17\frac{1}{2}°$ cos $17\frac{1}{2}°$ = .954

Z = 30°

$$J = \frac{35 + 30}{2} = 2\frac{1}{2}°$$

cos $2\frac{1}{2}°$ = .999

$$\text{Resultant tooth load} = \frac{252000 \times 35 \times .999}{1200 \times 3 \times .954}$$

= 2570 lbs

Radial load on V = 2570 × 4.8/10

= 1230 lbs at 600 rpm

Radial load on VI = 2570 – 1230

= 1340 lbs at 600 rpm

Radial loads on I, II, III and IV—see page 354.

# Load computations

## Radial loads due to spur gears

### Idler and intermediate shafts solution by formulas

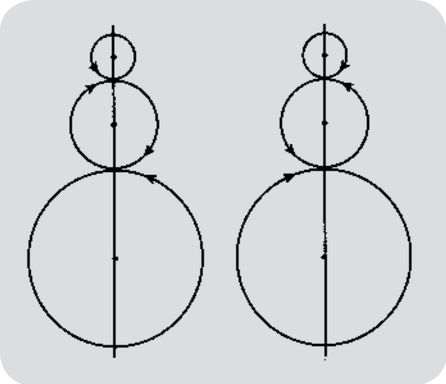


Figure 6

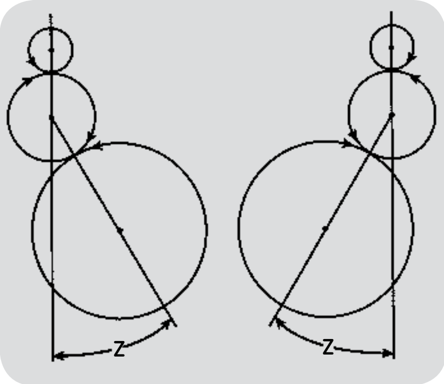



Figure 7

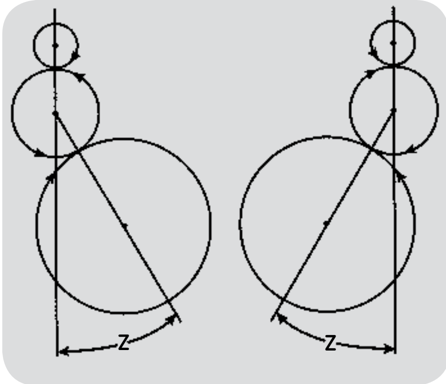



Figure 8

**Case 1:** Where centers of driver, idler and driven shafts lie on one line. (See Figure 6)

Direction of rotation of gears is immaterial.

**Case 2:** Where end view of gears is as shown in Figure 7.

Note direction of rotation (compare Figure 8).

**Case 3:** Where end view of gears is as shown in Figure 8.

Note direction of rotation (compare Figure 7).

# Load computations

## Loads due to planetary gears

**The methods shown consider simple planetary spur gear arrangements only**

To compute radial loads on the bearings:

**1** Refer to page 353 for distribution of load (L) on bearings.

**2** Obtain following data:
Horsepower (H) or Torque (Q)

Torque in in.-lbs (Q) = $\frac{63000\ H}{\text{rpm of driver}}$

Pitch diameter (s) of sun gear
Pitch diameter (p) of planet gear
Pitch diameter (g) of internal gear
Tooth pressure angle (necessary for single planet drive only)

**3** See table on opposite page which gives resultant radial loads on bearings, and also the rpm's of the members. Note that the portion of the table devoted to loads is divided into two parts. The first is for the resultant radial load "L" on bearings III and IV for single planet, two planets or three planets. The second is for the resultant radial load "P" on bearings I and II and V and VI for single planet.

**4** Consider first bearings III and IV. Select the proper expression for "L" according to whether your particular problem involves single planet, two planets or three planets.

**5** Resultant radial load "L" is imposed on bearings III and IV. Compute individual loads on III and IV by method shown on page 353, unless planet is supported by a single centrally located bearing in which case "L" is the resultant bearing load.

**6** Bearings III and IV are also subjected to centrifugal forces (except in combinations 3 and 4, see opposite page) which, if the speeds are very high, should be computed and combined with "L" as obtained in **5** above.

These centrifugal forces can be computed from the formula shown below, noting that: "W" equals the weight of the planet gear and shaft; rpm is that of the cage; "r" is as shown in Figure 11 on the opposite page.

Centrifugal force (CF) and "L" are combined as follows: $\sqrt{(CF)^2 + L^2}$ . Use this instead of "L" when considering centrifugal force. The loads on the individual bearings must be computed as described on page 353.

Note: the centrifugal force to weight ratio $\frac{CF}{W}$ is of prime importance in the proper selection of the cage used in the bearing, or bearings, on the planet shaft.

**7** When the planetary drive has a single planet there are also loads on the bearings supporting the driving and driven members. These values are given in the table on the opposite page as load "P" and are imposed on bearings I, II, V and VI. (Note: the expression for "P" is given in terms of "L" as obtained for bearings III and IV due to a single planet.)

Compute the loads on the individual bearings as described on page 353. For two or more planets, there is no theoretical load on bearings I, II, V and VI.

Actually there is some load due to mechanical unbalance and machining inaccuracies, but generally it can be neglected.

**Centrifugal Force**

Centrifugal force = $\frac{W \times r \times R^2}{35200}$

where, W = weight in pounds
r = radius in inches
R = rpm

# Load computations

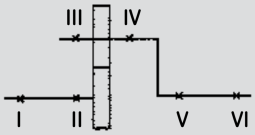



Figure 9
Combination 1 and 2

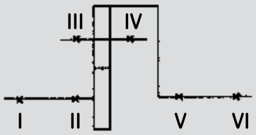



Figure 10
Combination 3 and 4

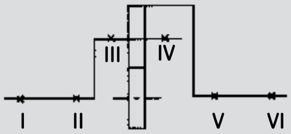



Figure 11
Combination 5 and 6

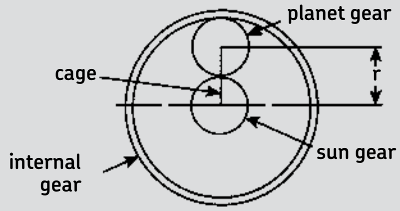



Figure 12

| Element | | Combination | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| **Sun gear cage internal gear** | | **Driving Driven Stationary** | **Driven Driving Stationary** | **Driving Stationary Driven** | **Driven Stationary Driving** | **Stationary Driving Driven** | **Stationary Driven Driving** |
| Resultant radial load (L) on III and IV | Single planet | $\frac{4Q}{s}$ | $\frac{2Q}{(s+p)}$ | $\frac{2Q}{s}$ | $\frac{4Q}{g}$ | $\frac{2Q}{(s+p)}$ | $\frac{4Q}{g}$ |
| | Two planets | $\frac{2Q}{s}$ | $\frac{Q}{(s+p)}$ | $\frac{2Q}{s}$ | $\frac{2Q}{g}$ | $\frac{Q}{(s+p)}$ | $\frac{2Q}{g}$ |
| | Three planets | $\frac{4Q}{3s}$ | $\frac{2Q}{3(s+p)}$ | $\frac{4Q}{3s}$ | $\frac{4Q}{3g}$ | $\frac{2Q}{3(s+p)}$ | $\frac{4Q}{3g}$ |
| Resultant radial load (P) due to single planet | See sketch | Figure 9 | | Figure 10 | | Figure 11 | |
| | On I and II | $\frac{L}{2 \cos A}$ | | $\frac{L}{2 \cos A}$ | | L | |
| | On V and VI | L | | $\frac{L}{2 \cos A}$ | | $\frac{L}{2 \cos A}$ | |
| rpm* | Sun gear | R | $R \times \frac{(g+s)}{s}$ | R | $R \times \frac{g}{s}$ | 0 | 0 |
| | Planet about own center | $R \times \frac{s}{(g+s)} \times \frac{g}{p}$ | $R \times \frac{g}{p}$ | $R \times \frac{s}{p}$ | $R \times \frac{g}{p}$ | $R \times \frac{s}{p}$ | $R \times \frac{g}{(g+s)} \times \frac{s}{p}$ |
| | Cage | $R \times \frac{s}{(g+s)}$ | R | 0 | 0 | R | $R \times \frac{g}{(g+s)}$ |
| | Internal gear | 0 | 0 | $R \times \frac{s}{g}$ | R | $R \times \frac{(g+s)}{g}$ | R |

*In computing rpm it may be more convenient to use number of teeth of gears, that is: s = number of teeth of sun gear; p = number of teeth of planet gear; g = number of teeth of internal gear.

# Load computations

## Loads due to belt, rope and chain drives and cutting or working tools

**General formula**

$$L = \frac{K \times 126000 \times H}{DR} \quad \text{where,}$$

L = radial load (lbf)

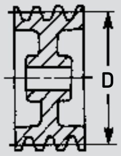
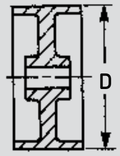
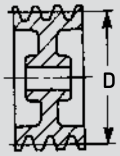
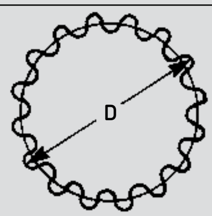
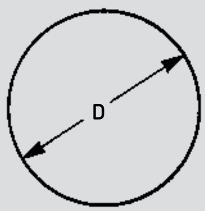
H = horsepower (hp)

D = pitch diameter of pulley sprocket or cutting tool (inches)

R = rpm

K = service factor

For distribution of load (L) on bearings, refer to page 353.

| | Drive | K |
|---|---|---|
|   | V-Belt | 1.5 |
|   | Flat belt | |
| | Single ply | 2.0 |
| | Double ply | 2.5 |
| | Triple ply, small pulley diameter | 3.0 |
|   | Rope | |
| | Pulley groove included angle 45° | 2.0 |
| | Pulley groove included angle 45°—60° | 2.5 |
|   | Chain | 1.25 |
|   | Cutting or working tool | 5.0 |

# Load computations

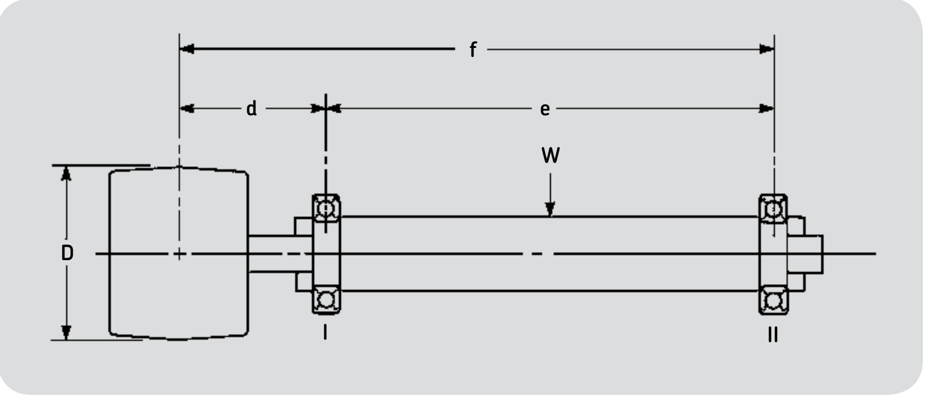
## Loads on electric motor bearings

**Horizontal belted motors**

H = Horsepower
R = rpm
W = Weight of rotor in pounds*
D = Diameter of pulley (or pitch diameter of driving gear) in inches

Belt pull = $\frac{252000\ H}{RD}$ = B

Radial load on I = (B × f/e) + W/2
Radial load on II = (B × d/e) + W/2




Example:

| | |
|---|---|
| H = 30 | d = 8 |
| R = 1200 | e = 24 |
| W = 240 | f = 32 |
| D = 10 | |

Belt pull = $\frac{252000 \times 30}{1200 \times 10}$ = 630 pounds

Radial load on I = 630 × 32/24 + 240/2
= 960 lbs at 1200 rpm

Radial load on II = 630 × 8/24 + 240/2
= 330 lbs at 1200 rpm

**Vertical belted motors**

Radial load on I = B × f/e
Radial load on II = B × d/e
Thrust load on I (or II) = W
(See formula above for "B")

**Horizontal geared motors**

Tooth Load = $\frac{132000\ H}{RD}$ = C

Radial load on I = (C × f/e) + W/2
Radial load on II = (C × d/e) + W/2

**Direct coupled motors**

| | |
|---|---|
| Horizontal motors | Radial load = W/2 on each bearing |
| Vertical motors | Thrust load = W on I (or II) |

In addition to the above loads there is often a shock load due to the coupling which should be considered in the selection of bearing sizes.

*If unbalanced, "W" equals two or three times the weight of the rotor in the formulas for radial loads.

# Load computations

## Thrust loads

**Aircraft, motor boats, twist drills**
**Thrust due to propellers**
H = Brake horsepower of engine
E = Propeller efficiency
R = rpm of engine at rated horsepower
r = rpm of propeller
M = Land miles per hour of motor boat
N = Level flight air speed of aircraft in miles per hour
n = Air speed of aircraft in climb in miles per hour
F = Pitch of propeller in feet

| Wanted | Data given | Formula |
|---|---|---|
| Aircraft propeller thrust in level flight | 1 Brake horsepower of engine "H"<br>2 Level flight air speed of aircraft in miles per hour "N"<br>3 Propeller efficiency assumed 85% | $\frac{320\ H}{N}$ |
| Aircraft propeller thrust in level flight | 1 Brake horsepower of engine "H"<br>2 Level flight air speed of aircraft in miles per hour "N"<br>3 Propeller efficiency "E" | $\frac{375\ H\ E}{N}$ |
| Aircraft propeller thrust in climb | 1 Brake horsepower of engine "H"<br>2 Air speed of aircraft in climb in miles per hour "n"<br>3 rpm of engine "R"<br>(This formula does not apply to variable pitch propellers, where full power and rpm are maintained in climb.) | $\frac{250\ H}{n}$<br>at approx.<br>.9 "R" rpm |
| Motor boat propeller thrust | 1 Brake horsepower of engine "H"<br>2 Propeller efficiency (.60 to .70) "E"<br>3 Miles per hour of boat "M" | $\frac{375\ H\ E}{M}$ |
| | 1 Brake horsepower of engine "H"<br>2 Propeller efficiency (.60 to .70) "E"<br>3 rpm of propeller<br>4 Pitch of propeller in feet "F" | $\frac{33000\ H\ E}{r\ F}$ |

**Thrust due to twist drills**

| Drill size diameter (in.) | Drill feed* inches per one revolution | Thrust load Mild steel | Thrust load Soft cast iron |
|---|---|---|---|
| 1/16 | .003 | 160 | 65 |
| 1/8 | .004 | 300 | 130 |
| 3/16 | .005 | 460 | 200 |
| 1/4 | .006 | 620 | 290 |
| 5/16 | .007 | 800 | 380 |
| 3/8 | .008 | 990 | 480 |
| 7/16 | .009 | 1180 | 580 |
| 1/2 | .010 | 1380 | 690 |
| 5/8 | .011 | 1710 | 870 |
| 3/4 | .012 | 2040 | 1050 |
| 7/8 | .013 | 2390 | 1240 |
| 1 | .014 | 2740 | 1440 |

*recommended maximum

# Load computations

## Formulas for automobile bearing loads

H = Horsepower of engine
D = Diameter of tire in inches
Q = Torque in inch-pounds
G = Rear axle reduction
R = rpm of crankshaft
M = Miles per hour
C = Radius to brake pin in inches
—transmission or propeller shaft brake

J = Proportion of weight carried on front axle (generally .45 for passenger cars)
K = Proportion of weight carried on rear axle (generally .55 for passenger cars)
W = Total weight, including passengers or payload in pounds

| Wanted | Data given | Formula |
|---|---|---|
| Torque (in inch-pounds) | 1 Torque in foot-pounds | Q = (Torque in foot-pounds) × 12 |
| Torque (Q) | 1 Horsepower<br>2 rpm | $Q = \frac{63000\ H}{R}$ |
| Horsepower of engine | 1 Torque in inch-pounds<br>2 rpm | $H = \frac{QR}{63000}$ |
| Braking torque at rear wheels | 1 Weight on rear axle<br>2 Diameter of tire | .3 K W D |
| Braking torque at pinion | 1 Weight on rear axle<br>2 Diameter of tire<br>3 Axle reduction | $\frac{.3\ K\ W\ D}{G}$ |
| Transmission or propeller shaft brake load (pivoted brakes) | 1 Weight on rear axle<br>2 Diameter of tire<br>3 Axle reduction<br>4 Radius to brake pin | $\frac{.3\ K\ W\ D}{G\ C}$ |
| Radial load on front wheel bearings | 1 Weight on front axle | $\frac{J\ W}{2}$ |
| Thrust load on front wheel bearings due to side skid | 1 Weight on front axle | .3 J W |
| Radial load on rear wheel bearings | 1 Weight on rear axle | .64 K W |
| Thrust load on rear wheel bearings due to side skid | 1 Weight on rear axle | .3 K W |
| Miles per hour of automobile | 1 rpm of engine<br>2 Diameter of tire<br>3 Axle reduction | $\frac{D\ R}{336\ G}$ |
| rpm of engine | 1 Miles per hour<br>2 Diameter of tire<br>3 Axle reduction | $\frac{336\ M\ G}{D}$ |
| rpm of axle | 1 Miles per hour<br>2 Diameter of tire | $\frac{336\ M}{D}$ |
| Axle reduction | 1 Miles per hour<br>2 Diameter of tire<br>3 rpm of engine | $\frac{R\ D}{336\ M}$ |

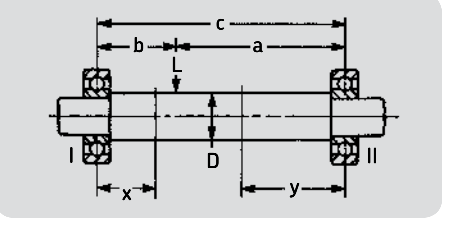
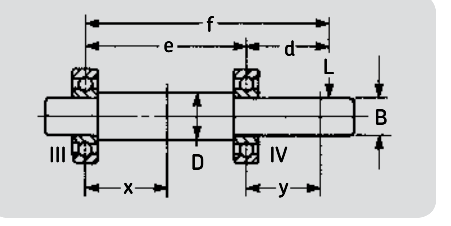
# Load computations

## Shaft stresses and deflections

$L$ = Radial load in pounds
$D$ = Shaft diameter in inches
$H$ = Horsepower transmitted
$R$ = Revolutions per minute of shaft
$B$ = Bore of bearing in inches
$Q$ =Torque in inch-pounds
$E$ = Young's modulus (30,000,000 for steel)
$S_B$ = Bending stresses in pounds per square inch

$S_M$ = Maximum bending stress in pounds per square inch
$S_Q$ = Maximum torsional stress in pounds per square inch
$M$ = Deflection of shaft in inches
$M_M$ = Maximum deflection of shaft in inches
$A$ = Angularity of shaft at bearing support (subscript indicates support)

For hollow shafts, substitute $\left(\dfrac{D^4 - D_1^{\,4}}{D}\right)$ for $D^3$ and $(D^4 - D_1^{\,4})$ for $D^4$ (where, $D_1$ = inside diameter of hollow shaft or tube).

| Mounting | Straddle mounting | Overhung mounting |
|---|---|---|
| |  |  |
| **Bending stress** | | |
| $S_B$ at x | $S_B = \dfrac{10.2\ L\ a\ x}{D^3\ c}$ | $S_B = \dfrac{10.2\ L\ d\ x}{D^3\ e}$ |
| $S_B$ at y | $S_B = \dfrac{10.2\ L\ b\ y}{D^3\ c}$ | $S_B = \dfrac{10.2\ L\ (d - y)}{B^3}$ |
| Maximum stress $S_M$ | $S_M = \dfrac{10.2\ L\ a\ b}{D^3\ c}$ (at L) | $S_M = \dfrac{10.2\ L\ a\ b}{D^3\ c}$ (at IV) |
| Torsional stress $S_Q$ | $S_Q = \dfrac{321{,}000\ H}{R\ D^3}$ or $\dfrac{5.1\ Q}{D^3}$ | |
| **Shaft deflection** | | |
| M at x | $M = \dfrac{3.40\ L\ a\ x\ (c^2 - x^2 - a^2)}{c\ E\ D^4}$ | $M = \dfrac{3.40\ L\ d\ x\ (e^2 - x^2)}{e\ E\ D^4}$ |
| M at y | $M = \dfrac{3.40\ L\ b\ y\ (c^2 - y^2 - b^2)}{c\ E\ D^4}$<br>Let a be greater than b | $M = \dfrac{3.40\ L\ y\ (3\ d\ y - y^2 + 2\ d\ e)}{E\ B^4}$ |
| Maximum deflection between supports $M_M$ | Calculate $Y_1 = a + \sqrt{\dfrac{1}{3} + \dfrac{2\ B}{3\ a}}$<br>$M_M = \dfrac{6.80\ L\ b\ Y_1^{\,3}}{c\ E\ D^4}$ | $M_M = \dfrac{1.312\ L\ d\ e^2}{E\ D^4}$ |
| Deflection at load M at L | $M = \dfrac{6.80\ L\ a^2\ b^2}{c\ E\ D^4}$ | $M = \dfrac{6.80\ L\ d^2\ f}{E\ B^4}$ |
| Angularity of shaft at bearing supports | $\tan A_I = \dfrac{3.40\ L\ a\ (c^2 - a^2)}{c\ E\ D^4}$<br>$\tan A_{II} = \dfrac{3.40\ L\ b\ (c^2 - b^2)}{c\ E\ D^4}$ | $\tan A_{III} = \dfrac{3.40\ L\ d\ e}{E\ D^4}$<br>$\tan A_{IV} = \dfrac{6.80\ L\ d\ e}{E\ B^4}$ |

# Load computations

## Loads due to plain bevel gears

### General procedure

To compute loads on plain bevel gear, proceed as follows:

1) Compute torque of driving gear shaft

$$\text{Torque (Q)} = \frac{\text{Horsepower} \times 63000}{\text{rpm of drive shaft}}$$

or $\frac{H \times 63000}{R}$

2) Determine tangential pressure (P)

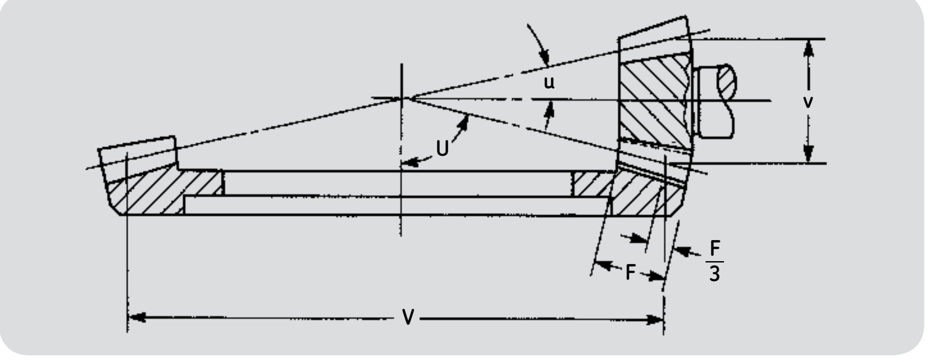
$$P = \frac{\text{Torque} \times 2}{\text{Mean pitch diameter of driving gear}}$$

or $\frac{Q \times 2}{v}$

3) Obtain gear thrust by solving for "X" (See below).

4) Compute radial load on bearings (See example on page 366).

### Thrust loads




Direction of rotation (clockwise or counterclockwise) viewed from this side.

Note: Mean pitch diameter taken on pitch line 1/3 face length from pitch diameter, is approximately at the center of the contact area of the gears.

$$\text{Thrust} = \frac{2\,Q\,X}{v}$$

X = See below

Q = Engine torque in inch-pounds

G = Gear ratio

v = Mean pitch diameter of bevel driving gear in inches (taken on pitch line 1/3 face length from pitch diameter)

V = Mean pitch diameter of bevel drive gear in inches (taken on pitch line 1/3 face length from pitch diameter)

A = Tooth pressure angle

u = Pitch angle of driving gear

$$\tan u = \frac{\text{No. of teeth in driving gear}}{\text{No. of teeth in driven gear}}$$

Value of X

Driving gear: X = tan A sin u

Driven gear: X = tan A cos u

# Load computations

## Loads due to plain bevel gears

Obtain following data:
Horsepower (H) or torque (Q)
rpm (R) of driving gear shaft
Mean pitch diameter (v) of driving gear
Tooth pressure angle
Number of teeth in driving gear
Number of teeth in driven gear
Bearing and gear locations
(see Figures 13 and 14)

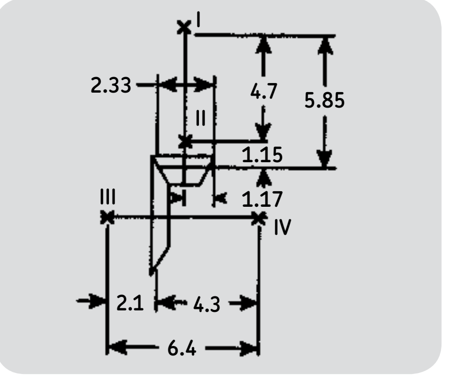



**Figure 13**
**Overhung driving gear**

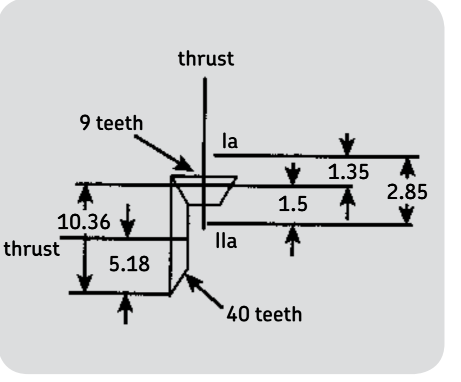



**Figure 14**
**Straddle driving gear**

**Example:**
Horsepower (H) = 35
rpm (R) =1200
Tooth pressure angle =$17^1/_2°$
Mean pitch diameter (v) of driving gear = 2.33
Gear ratio = 40/9 = 4.44
Mean pitch diameter (V) of driven gear
= 2.33 × 4.44 =10.36
Pitch angle of driving gear = u
= $\tan^{-1}$ 9/40 =12.68°

Torque (Q) = $\frac{63000\ H}{R} = \frac{63000 \times 35}{1200}$
= 1840 in.-lbs

Tangential pressure (P) = $\frac{2\ Q}{v} = \frac{2 \times 1840}{2.33}$
= 1580 lbs

Value of “X” (See page 365)
Driver X = tan a sin u = tan 17.5 sin 12.68
= .07

Driven X = tan a cos u = tan 17.5 cos 12.68
= .31

Thrust on driving gear (Tp) = P × X
= 1580 × .07 =110 lbs
Thrust on driven gear (Tg) = P × X
= 1580 × .31 = 490 lbs
Overturning moment on driving gear =
$\frac{Tp \times v/2}{4.7} = \frac{110 \times 1.17}{4.7}$ = 30*

Overturning moment on driven gear =
$\frac{Tg \times V/2}{6.4} = \frac{490 \times 5.18}{6.4}$ = 400**

| P | Tp | Tg | v/2 | V/2 |
|---|---|---|---|---|
| **1580** | **110** | **490** | **1.17** | **5.18** |

Driving gear thrust = Tp = 110 pounds thrust on bearing I or Ia
Driven gear thrust = Tg = 490 pounds thrust on bearing III

| | | | |
|---|---|---|---|
| Bearing I | 1580 × 1.15/4.7 = 390 | 490 × 1.15/4.7 = 120 | 30* |
| | $\sqrt{390^2 + (120 - 30)^2}$ = 400 pounds radial load at 1200 rpm | | |
| Bearing II | 1580 + 390 = 1970 | 490 + 120 = 610 | 30* |
| | $\sqrt{1970^2 + (610 - 30)^2}$ = 2050 pounds radial load at 1200 rpm | | |
| Bearing III | 1580 × 4.3/6.4 = 1060 | 110 × 4.3/6.4 = 70 | 400** |
| | $\sqrt{1060^2 + (400 + 70)^2}$ = 1160 pounds radial load at 270 rpm | | |
| Bearing IV | 1580 – 1060 = 520 | 110 – 70 = 40 | 400** |
| | $\sqrt{520^2 + (400 - 40)^2}$ = 630 pounds radial load at 270 rpm | | |
| Bearing Ia | 1580 × 1.5/2.85 = 830 | 490 × 1.5/2.85 = 260 | 110 × 1.17/2.85 = 50 |
| | $\sqrt{830^2 + (260 + 50)^2}$ = 890 pounds radial load at 1200 rpm | | |
| Bearing IIa | 1580 – 830 = 750 490 – 260 = 230 | 110 × 1.17/2.85 = 50 | |
| | $\sqrt{750^2 + (230 - 50)^2}$ = 770 pounds radial load at 1200 rpm | | |

# Product index numerical order

# Product index numerical order

# Product index numerical order

# Product index numerical order

# Product index numerical order

# Product index
alphabetical order




# Marathon® series corrosion resistant mounted products and bearing units

Order publication #M660-710

# Marathon series corrosion-resistant mounted products and bearing units

Few industries challenge bearings with a harsher operating environment than the food and beverage industries. Perhaps no industry works as hard to meet regulations governing contamination. When MRC® introduced the Marathon® series composite mounted bearing units, it was possibly the best solution to the problems associated with bearing failures.

Since then, in addition to the composite units, our HDi—heavy-duty cast iron—and XDs—extreme-duty cast stainless steel—have been introduced to more thoroughly meet the needs of the industry.

The HDi series combines corrosion resistance together with the strength of cast iron—without the problem of flaking nickel plating—and are priced competitively with nickel-plated versions. (See page 3 for details.)

For extremely challenging applications, the XDs series provides top-of-the-line corrosion resistance and the greatest housing strength available within the Marathon line. (See page 4 for details.)

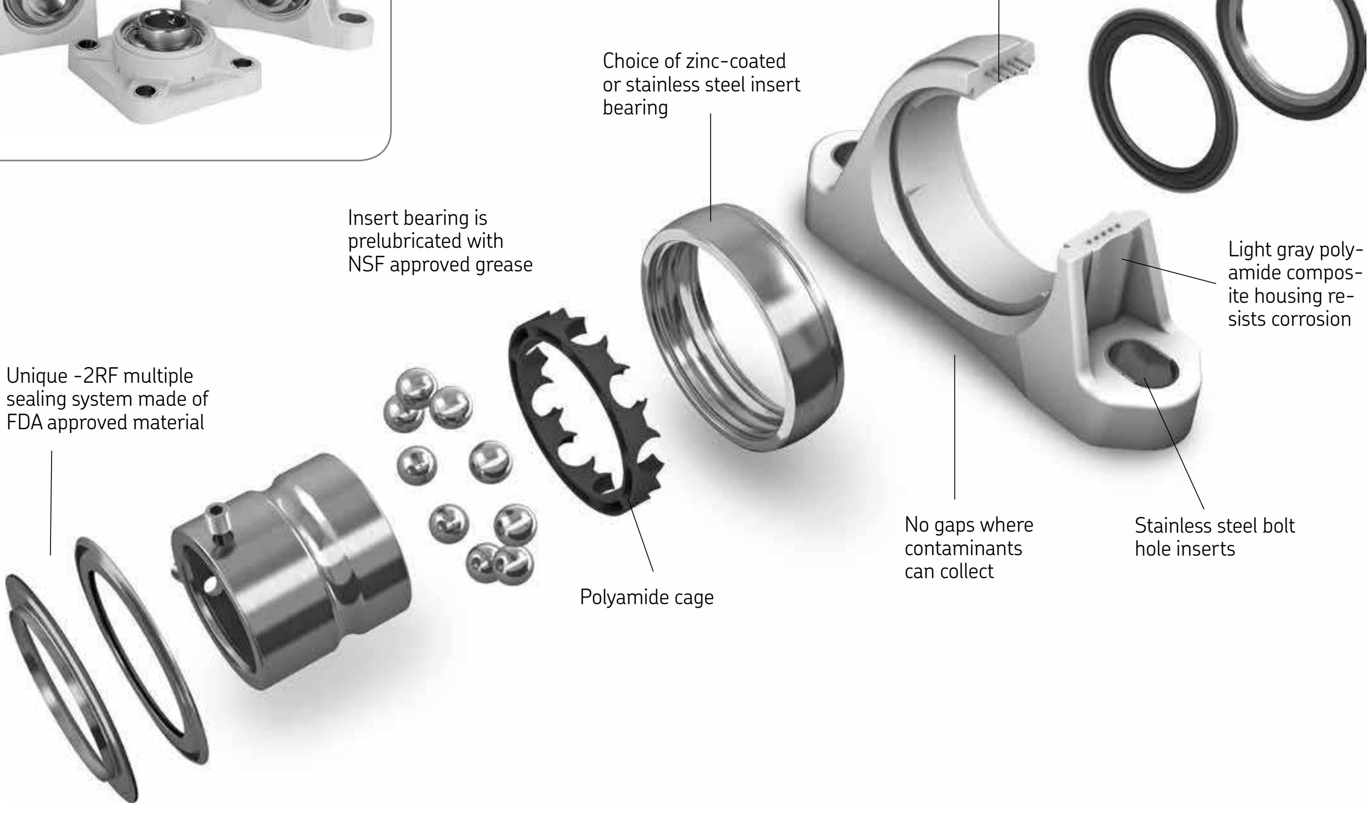
At the heart of the Marathon units are high-quality, corrosion-resistant insert bearings, available with MRC's ZMaRC® coating or with stainless steel construction. The units' multifunction rubber seals are bonded to AISI 304 stainless steel for superior corrosion resistance, and sealed-for-life lubricants are USDA compliant.

# A composite housing with integrated performance features

The Marathon series' composite housing resists citric acids, cooking fats and most chemicals used in food and beverage processing. It is constructed of a thermoplastic composite material that can be up to 61% lighter than cast iron housings. Its spherical bore accommodates the insert bearing's spherical outer surface, enabling the unit to fully compensate for initial bearing seating misalignment.

Plus, the housing is loaded with design and performance advantages:

- Steel coils embedded in the housing contribute to the housing's fracture strength. Radial breaking load is far greater than the static load rating of the bearing. Marathon series housings have possibly the highest fracture strength of any composite unit available.
- A nylon-filled housing base enables the unit to meet flush with its mounting surface. Flush surface-to-surface mounting eliminates gaps—potential areas for contaminants to collect.
- 300 series stainless steel bolt hole inserts provide added strength to each housing foot and prevent corrosion.
- Marathon series units are available in the following housing designs to meet the needs of most food and beverage processing applications:
  – pillow block
  – two- or four-bolt flange
  – tapped base
  – three-bolt bracket flange
  – narrow and wide slot take-up
  – low backing height pillow block
  – low profile two- and three-bolt flange
  – four-bolt piloted flange
  – hanger



# Marathon $XD_S$ unit—
# MRC's top-of-the-line units

Extremely challenging applications require an extremely durable unit—the $XD_S$ units. These housings are AISI 300 series cast stainless steel with MRC's proven stainless steel insert bearings.

The extra strength and toughness of the cast stainless housings are beneficial where loads are very heavy or where shock loads are possible. Also, the safety factor inherent in the cast steel housing is desirable in applications where housing failure could result in injury.

While composite and plated housings are resistant to most of the chemicals in use today, these stainless units are not affected by the strong concentrations of chlorine, hydrogen peroxide and other chemicals sometimes used in washdown procedures

The $XD_S$ cast stainless housings were designed especially for use in food and beverage applications. The bases have no recesses to trap debris and bacteria; the exposed surfaces of the housings have no unnecessary crevices or pockets; and the smooth finish minimizes material trapped on the surface allowing a more thorough cleaning.

Like the other members of the Marathon family, the $XD_S$ series incorporates the proven insert bearing design and patented sealing arrangement (see page 5), and are also greased for life and maintenance free.

Housing styles available include:

– pillow block
– two- and four-bolt flange
– tapped base

## MRC $XD_S$ extreme duty machined stainless steel mounted units

MRC can also offer additional housing styles in machined stainless steel. Made of AISI 300 series stainless steel, these units are machined from solid stainless steel plate rather than cast. These are especially suited for applications where surface roughness is critical, such as instances where chronic bacterial problems have existed. As with the cast housings, there are no unnecessary recesses or cavities to trap debris.

And like the cast stainless units, MRC's excellent stainless steel insert bearings are used.

The Marathon units' high quality insert bearings are available with MRC's proprietary ZMaRC coating on the inner and outer rings. ZMaRC resists frequent washdowns with water and with acidic and caustic solutions far better than conventional insert bearings and conventional coatings, such as black oxide. That means greater protection against rust, greater protection against contaminant-related bearing failure and greater assurance that your equipment will pass USDA inspections.

If you prefer stainless steel, MRC will supply the Marathon series with AISI 420C stainless inner and outer rings and balls. The insert bearing's stainless steel set-screws, positioned 120 degrees apart, minimize inner ring distortion while maintaining good gripping strength.

ZMaRC-coated insert bearing

Stainless steel insert bearing

## Marathon composite units with ZMaRC-coated bearing inserts are also available from stock with eccentric locking collar mounting.

Eccentric locking collars provide a nearly 360-degree shaft contact for reduced slippage and improved mounting integrity. The eccentric locking collar mounting is primarily intended for use in applications where the direction of rotation is constant. This alternative to setscrew mounting also makes bearing removal easier by providing access to the setscrew dimple created on the shaft surface during the initial mounting procedure. The mechanic is then able to file down the raised edges around the dimple in order to easily slide the bearing off the shaft.

Other Marathon style units with ZMaRC inserts can be ordered with the eccentric locking collar through our Made-to-Order program.

ZMaRC-coated insert bearing
with eccentric locking collar

## Stainless steel sealing arrangement

A double-protection seal keeps the Marathon units running contaminant free. The sealing arrangement consists of a double-lip, AISI 304 stainless steel integral seal, an AISI 304 stainless steel flinger and a rubber-backed seal gasket. The flinger and seal's low-friction rubber lips, with optimized axial contact, form a double barrier against pollutants and washdowns. The seal gasket prevents contaminants from migrating around the seal insert's O.D., and the flinger adds mechanical and centrifugal protection against contaminant entry. The space between the insert seal and flinger is filled with USDA food-grade grease for even greater sealing efficiency.

## USDA-compliant grease

Marathon units are prelubricated-for-life with USDA H1-approved grease. The high quality synthetic grease is odorless and tasteless, and is approved for use in all food processing industries.

Other Marathon mounted bearing unit grease benefits:

- Excellent internal and external bearing corrosion protection.
- High aging resistance for extended lubricant life.
- High load carrying capacity, which helps prevent premature bearing wear.

# End covers

## Secure fit, operator safety

If needed to comply with health and safety regulations, composite, stainless steel and cast iron zinc coated MRC Marathon units can be supplied with effective end covers.

ECWM (→ **fig. 1**) is for composite and stainless steel MRC Marathon units. It has an optional drainage hole that can be easily opened by the user as required.

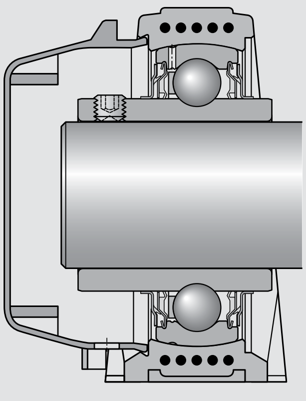
ECWM end covers are tested to withstand 100 bar pressure wash and will not dislocate during washing.

End covers are not included with the bearing units and must be ordered separately.


NOTE: drain hole faces down when in use

**Fig. 1**

**ECWM cover**



# Made-To-Order
## Solutions from MRC

Order publication #M200-111

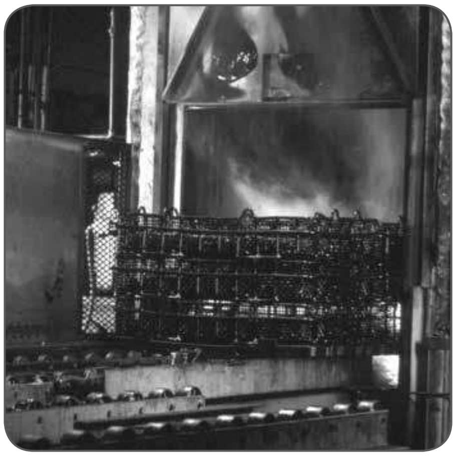
# Made-To-Order (MTO) solutions from MRC

- **Hard to find or discontinued product?**
- **Cannot identify product or source?**
- **Difficult application, insufficient bearing service life or poor performance?**
- **Special lubrication, material or design requirements?**

MRC's MTO group has the technical expertise and wide bearing industry experience to help identify and source the hard-to-find, discontinued or special products you need. With manufacturing and rework/modification capabilities covering virtually all ball bearing designs and size ranges, MTO can satisfy your special or custom needs often in lot sizes as small as one. In addition, our flexible rework capabilities allow MTO to meet your tight time frame restrictions.

## MRC Engineering

- Applications engineering reviews all MTO requests for application suitability and assignment of proper engineering specifications.
- Application engineering has extensive experience in bearing lubrication (low and high temperature, food grade, solid oil), materials (standard bearing steel, stainless steels, M50 steel, and ceramics), and all ball bearing designs in order to specify the most appropriate bearing solution to meet your needs.



**Heat treatment**

**Design flexibility**

## MRC Customer Service

- MRC's customer service representatives, engineers, planners, and field sales personnel are committed to providing fast responses to your special bearing inquiries.
- 70% of inquiries for routine modifications of stocked product and repeat inquiries for custom product are responded to within one workday.
- Response time for special bearing designs and custom manufacture will depend upon the complexity of the request as well as the availability of components and raw materials.

## MRC Commitment

All MTO reworked and modified products are done according to MRC's rigid standards and practices and are therefore sold with the same original manufacturer's warranty as our standard product.

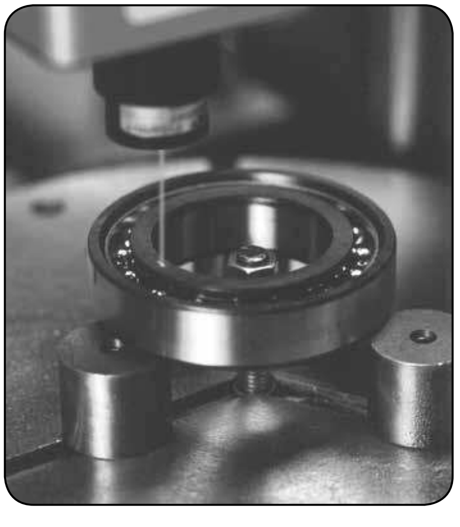
**Lubrication**

# Capabilities

## Bearing designs

MTO Product offers a broad range of single and double row ball bearing designs, including:

- Inch dimension – R, XLS, LS, MS series
- Thin section – 1800 and 1900 series
- Single row deep groove – S type
- Single row max type – M type
- Single row 15° angular contact – R type
- Single row angular contact – 7000, 7000P and 7000PJ series
- Single row angular contact split ring 9000 and 9000P Series
- PumPac 8000 Series
- Double row angular contact – 5000 series
- Self-aligning ball bearings
- Hybrid (ceramic) ball bearings
- Precision grades to ABEC 7+
- Custom designed product



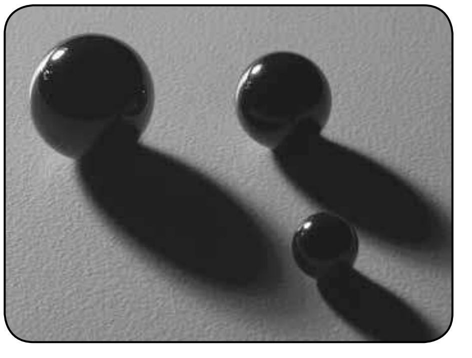
**Non-contact measurement**

## Manufacturing, rework and modification

The MTO group offers wide ranging manufacturing, rework and modification capabilities, including:

- Bore modification – increase bore size, rework cylindrical bore to taper bore, slotting
- OD modification – reduce OD, add spherical crown, anti-rotation slots, snap ring grooves or lubrication holes
- Face modification – add anti-rotation slots or lubrication grooves
- Duplex grinding – matching bearing sets produce axial preload or clearance
- Width modification – reduce width, flush grinding, etc.
- Snap rings – grind snap ring groove in OD and add snap ring
- Lubrication – relubricate sealed or shielded product with special grease and custom fill or add solid oil
- Closures – change, add or remove closures. Shields are available in steel or stainless steel. Seals are available in nitrile rubber, Viton and Teflon.
- Cages – change existing cages to other materials: brass, phenolic (Bakelite), polyamide.
- Material – offering bearing components in standard 52100 steel, 440C stainless, M50 tool steel, HNCR "super stainless", silicon nitride (ceramic)
- Coatings – applying thin dense chrome, silver, cadmium, black oxide, NoWear® ("diamond like") or INSOCOAT® to bearing surfaces
- Heat treatment – dimensional stabilization of bearing components for extreme temperature environments
- Identification – special or custom marking of bearings and packaging
- Packaging – re-wrap, re-box or custom package bearing product

**Cage designs**



**Ceramics**

MRC®

SKF USA Inc.
Lansdale, PA 19446, USA

Customer service: 1-888-753-3477
Technical support: 1-888-753-2000

www.skfusa.com/mrc

 **Publication M190-730** (5M/CW 7/2015) 8th Edition Version 7/2015 Printed in U.S.A.