

SPHERICAL ROLLER BEARINGS and SPHERICAL ROLLER THRUST BEARINGS



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Spherical Roller Bearings

Design and configuration

Spherical Roller Bearings are particularly suitable for applications where misalignment can arise from error in mounting or from shaft deflection.

NACHI Spherical Roller Bearings are manufactured in a number of design and material configurations depending on the type of application and size of the bearing.

See the table below for the roller, guide ring and cage design for NACHI Spherical Roller Bearings. They can sustain radial and axial loads.

Attention

(1) For high axial load applications, the axial load F_a must not exceed 0.6 of the radial load F_r . If the axial load exceeds 0.6 F_r , please contact NACHI engineers for design assistance.

(2) For applications where oscillating loads (such as shaker screen applications) or high speed is involved, please contact NACHI for design assistance.

(3) In very lightly loaded or no load conditions, sliding motion can occur which could damage the bearing.

To prevent this damage, bearings must be subjected to a load greater than 0.02 C_r (basic dynamic load rating).

(4) The material coefficient number of the bearing is taken into consideration for the dynamic load rating.

* This only applies to spherical roller bearing.

Design and configurations

| Series | Type | EX | EX1 | E | E2 | E | AEX | AX | A2X | AX |
|---------------|--------------|---------------|----------|------------------------------|----|------------------------------|-------|-----------------------------|-------|-------|
| 239 | | | | | | 20,26, 44~/1060 | | 28~40 | | |
| 230 | | | | 20~36 | | 38~/1000 | | 20~36 | 38~48 | |
| 240 | | | 24~36 | | | 38~/600, /670,/800 | | | | 24~36 |
| 231 | | | 20~34 | | | 36~/800 | | 20~34 | 36~48 | |
| 241 | | | 22~32 | | | 36~/500 | | | | 22~34 |
| 222 | | 05~30 | | 32 | 32 | 34~68 | 05~30 | | 32 | |
| 232 | | | 18,20~30 | 16,17,19 | | 32~/600 | | 20~30 | 32~40 | |
| 213 | | | 11~22 | 04~10,24 | | | | 06~22 | | |
| 223 | | 08~26 | | | | 28~60 | 07~26 | | 28,30 | |
| Cross section | | | | | | | | | | |
| | Roller | Symmetric | | Symmetric | | Nonsymmetric | | Nonsymmetric | | |
| | Center guide | Floating ring | | Inner ring rib | | Inner ring rib | | Inner ring rib | | |
| | Cage | Pressed steel | | Machined high strength brass | | Machined high strength brass | | Pressed high strength brass | | |

Spherical Roller Bearings

Lubrication holes and groove

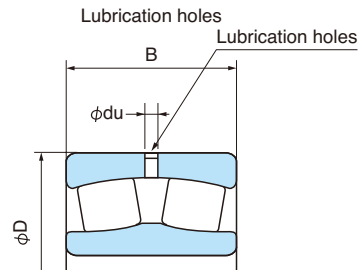
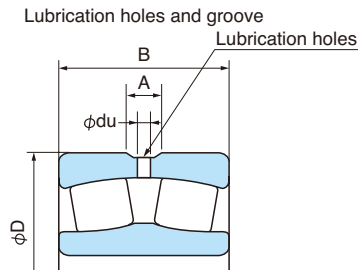
The outer ring of Spherical Roller Bearings are often made with lubrication holes and a groove for feeding lubricant. The outer ring may also be configured with oil holes only depending on fitting, mounting or service conditions.

Heat-stabilized bearings

NACHI Spherical Roller Bearings are subjected to a heat-stabilization treatment as standard. They can be used at operating temperature of up to 200°C with minimal dimensional changes occurring.

Lubrication holes and groove

| Modification to outer ring | Suffix | Part No. Example |
|------------------------------|--------|------------------|
| Lubrication holes and groove | W33 | 22210E W33 |
| Lubrication holes | W20 | 22210E W20 |



Lubrication holes and groove dimensions

| Series | | 23900 | | Others | |
|--------|-------|-------|----|--------|-----------------|
| Over | Incl. | A | du | A | du |
| 18 | 30 | 7 | 3 | 6 | 3 |
| 30 | 35 | 8 | 4 | 8 | 3 ^{#1} |
| 35 | 40 | 8 | 4 | 8 | 4 ^{#2} |
| 40 | 50 | 11 | 5 | 10 | 4 ^{#3} |
| 50 | 65 | 12 | 6 | 11 | 5 ^{#4} |
| 65 | 80 | 14 | 8 | 14 | 6 ^{#5} |
| 80 | 100 | 18 | 10 | 18 | 8 |
| 100 | 120 | 24 | 12 | 20 | 10 |
| 120 | 160 | 28 | 15 | 26 | 12 |
| 160 | 200 | 35 | 20 | 32 | 15 |
| 200 | 250 | 40 | 20 | 40 | 20 |
| 250 | 315 | 45 | 25 | 45 | 20 |
| 315 | 400 | 50 | 25 | 50 | 25 |

Exceptions ; #1 : 22308 = 4, #2 : 21315 = 3, #3 : 22219, 22220, 23022, 23024 = 5
 #4 : 22317, 22318 = 6, #5 : 23036 = 8

Standard Number of Lubrication holes

| Nominal outside dia D (mm) | | Number of lubrication holes |
|----------------------------|-------|-----------------------------|
| Over | Incl. | |
| — | 180 | 4 |
| 180 | 250 | 6 |
| 250 | 315 | 6 |
| 315 | 400 | 6 |
| 400 | 500 | 6 |
| 500 | — | 8 |

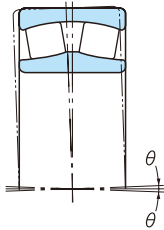
Misalignment

Maximum permissible misalignment angle is about 2° under general service conditions.

But its angle will vary with the series, service condition and surrounding structure.

As rotational speed increases, misaligned bearings will tend to generate more noise.

Due to noise constraints, the practical maximum misalignment in a bearing may be considerably less than the maximum permissible misalignment.



Mounting bearings with tapered bore

Mounting bearings with a tapered bore requires some experience and technique.

Bearings with tapered bore are always mounted with an interference fit on the shaft.

To measure the amount of interference fit on the shaft, the axial displacement of the inner ring or the reduction of radial internal clearance due to the interference fit can be used. Generally, the measurement of reduction in radial internal clearance is a more reliable method than measurement of the axial displacement of the inner ring.

Unit: mm

| Nominal bore diameter d | | Radial clearance reduction | | Axial displacement ¹⁾ | | | | Internal clearance after mounting ²⁾ | | |
|----------------------------|-------|-------------------------------|-------|----------------------------------|------|-------|--------|---|-------|-------|
| | | | | 1 : 12 | | Taper | 1 : 30 | | Min | |
| Over | Incl. | Min | Max | Min | Max | Min | Max | Normal | C3 | C4 |
| 24 | 30 | 0.015 | 0.020 | 0.3 | 0.35 | — | — | 0.015 | 0.020 | 0.035 |
| 30 | 40 | 0.020 | 0.025 | 0.35 | 0.4 | — | — | 0.015 | 0.025 | 0.040 |
| 40 | 50 | 0.025 | 0.030 | 0.34 | 0.45 | — | — | 0.020 | 0.030 | 0.050 |
| 50 | 65 | 0.030 | 0.040 | 0.45 | 0.6 | — | — | 0.025 | 0.035 | 0.055 |
| 65 | 80 | 0.040 | 0.050 | 0.6 | 0.75 | — | — | 0.025 | 0.040 | 0.070 |
| 80 | 100 | 0.045 | 0.060 | 0.7 | 0.9 | 1.7 | 2.2 | 0.035 | 0.050 | 0.080 |
| 100 | 120 | 0.050 | 0.070 | 0.75 | 1.1 | 1.9 | 2.7 | 0.050 | 0.065 | 0.100 |
| 120 | 140 | 0.065 | 0.090 | 1.1 | 1.4 | 2.7 | 3.5 | 0.055 | 0.080 | 0.110 |
| 140 | 160 | 0.075 | 0.100 | 1.2 | 1.6 | 3.0 | 4.0 | 0.055 | 0.090 | 0.130 |
| 160 | 180 | 0.080 | 0.110 | 1.3 | 1.7 | 3.2 | 4.2 | 0.060 | 0.100 | 0.150 |
| 180 | 200 | 0.090 | 0.130 | 1.4 | 2.0 | 3.5 | 5.0 | 0.070 | 0.100 | 0.160 |
| 200 | 225 | 0.100 | 0.140 | 1.6 | 2.2 | 4.0 | 5.5 | 0.080 | 0.120 | 0.180 |
| 225 | 250 | 0.110 | 0.150 | 1.7 | 2.4 | 4.2 | 6.0 | 0.090 | 0.130 | 0.200 |
| 250 | 280 | 0.120 | 0.170 | 1.9 | 2.7 | 4.7 | 6.7 | 0.100 | 0.140 | 0.220 |
| 280 | 315 | 0.130 | 0.190 | 2.0 | 3.0 | 5.0 | 7.5 | 0.110 | 0.150 | 0.240 |
| 315 | 355 | 0.150 | 0.210 | 2.4 | 3.3 | 6.0 | 8.2 | 0.120 | 0.170 | 0.260 |
| 355 | 400 | 0.170 | 0.230 | 2.6 | 3.6 | 6.5 | 9.0 | 0.130 | 0.190 | 0.290 |
| 400 | 450 | 0.200 | 0.260 | 3.1 | 4.0 | 7.7 | 10 | 0.130 | 0.200 | 0.310 |
| 450 | 500 | 0.210 | 0.280 | 3.3 | 4.4 | 8.2 | 11 | 0.160 | 0.230 | 0.350 |
| 500 | 560 | 0.240 | 0.320 | 3.7 | 5.0 | 9.2 | 12.5 | 0.170 | 0.250 | 0.360 |
| 560 | 630 | 0.260 | 0.350 | 4.0 | 5.4 | 10 | 13.5 | 0.200 | 0.290 | 0.410 |
| 630 | 710 | 0.300 | 0.400 | 4.6 | 6.2 | 11.5 | 15.5 | 0.210 | 0.310 | 0.450 |
| 710 | 800 | 0.340 | 0.450 | 5.3 | 7.0 | 13.3 | 17.5 | 0.230 | 0.350 | 0.510 |
| 800 | 900 | 0.370 | 0.500 | 5.7 | 7.8 | 14.3 | 19.5 | 0.270 | 0.390 | 0.570 |
| 900 | 1000 | 0.410 | 0.550 | 6.3 | 8.5 | 15.8 | 21 | 0.300 | 0.430 | 0.640 |
| 1000 | 1120 | 0.450 | 0.600 | 6.8 | 9.0 | 17 | 23 | 0.320 | 0.480 | 0.700 |
| 1120 | 1250 | 0.490 | 0.650 | 7.4 | 9.8 | 18.5 | 25 | 0.340 | 0.540 | 0.770 |

Note: 1) The values are applied for mounting on solid shaft. In case of hollow shaft, larger axial displacement should be applied.

2) In following cases, please make sure radial internal clearance after mounting.

- Initial radial clearance is in the lower half of the tolerance range.

- Large temperature difference exists between inner ring and outer ring in operation.

Internal clearance after mounting must be equal to or over these values.

Tolerance Values for Radial Bearings

Tolerance Values of Inner Ring and of Outer Ring Width

| Nominal bearing bore diameter d (mm) | | Single plane mean bore diameter deviation (2) Δd_{mp} | | | | | | | | Bearing with | |
|--|-------|---|------|-----------------|-----|-----------------|-----|-----------------|-----|--|-----|
| | | Class 0 | | Class 6 | | Class 5 | | Class 4 | | Deviation of a single bore diameter (2) Δd_s | |
| | | High | Low | High | Low | High | Low | High | Low | Class 4 | |
| | | Diameter series | | Diameter series | | Diameter series | | Diameter series | | Diameter series | |
| Over | Incl. | 0,1,2,3,4 | | 0,1,2,3,4 | | 0,1,2,3,4 | | 0,1,2,3,4 | | 0,1,2,3,4 | |
| 0.6 ⁽¹⁾ | 2.5 | 0 | -8 | 0 | -7 | 0 | -5 | 0 | -4 | 0 | -4 |
| 2.5 | 10 | 0 | -8 | 0 | -7 | 0 | -5 | 0 | -4 | 0 | -4 |
| 10 | 18 | 0 | -8 | 0 | -7 | 0 | -5 | 0 | -4 | 0 | -4 |
| 18 | 30 | 0 | -10 | 0 | -8 | 0 | -6 | 0 | -5 | 0 | -5 |
| 30 | 50 | 0 | -12 | 0 | -10 | 0 | -8 | 0 | -6 | 0 | -6 |
| 50 | 80 | 0 | -15 | 0 | -12 | 0 | -9 | 0 | -7 | 0 | -7 |
| 80 | 120 | 0 | -20 | 0 | -15 | 0 | -10 | 0 | -8 | 0 | -8 |
| 120 | 150 | 0 | -25 | 0 | -18 | 0 | -13 | 0 | -10 | 0 | -10 |
| 150 | 180 | 0 | -25 | 0 | -18 | 0 | -13 | 0 | -10 | 0 | -10 |
| 180 | 250 | 0 | -30 | 0 | -22 | 0 | -15 | 0 | -12 | 0 | -12 |
| 250 | 315 | 0 | -35 | 0 | -25 | 0 | -18 | — | — | — | — |
| 315 | 400 | 0 | -40 | 0 | -30 | 0 | -23 | — | — | — | — |
| 400 | 500 | 0 | -45 | 0 | -35 | — | — | — | — | — | — |
| 500 | 630 | 0 | -50 | 0 | -40 | — | — | — | — | — | — |
| 630 | 800 | 0 | -75 | — | — | — | — | — | — | — | — |
| 800 | 1000 | 0 | -100 | — | — | — | — | — | — | — | — |
| 1000 | 1250 | 0 | -125 | — | — | — | — | — | — | — | — |
| 1250 | 1600 | 0 | -160 | — | — | — | — | — | — | — | — |
| 1600 | 2000 | 0 | -200 | — | — | — | — | — | — | — | — |

| Nominal bearing bore diameter d (mm) | | Deviation of a single inner ring width (or a single outer ring width) (3) ΔB_s (or ΔC_s) | | | | | | | | Inner (or outer) ring width variation $V B_s$ (or $V C_s$) | | | |
|--|------|---|-------|---------|------|-------------------------|------|---------|------|---|---------|------------|---------|
| | | Single bearing | | | | Combination bearing (4) | | | | Inner ring (or outer ring) (3) | | Inner ring | |
| | | Class 0 | | Class 5 | | Class 0 | | Class 5 | | Class 0 | Class 6 | Class 5 | Class 4 |
| | | High | Low | High | Low | High | Low | High | Low | Max | Max | Max | Max |
| 0.6 ⁽¹⁾ | 2.5 | 0 | -40 | 0 | -40 | --- | --- | 0 | -250 | 12 | 12 | 5 | 2.5 |
| 2.5 | 10 | 0 | -120 | 0 | -40 | 0 | -250 | 0 | -250 | 15 | 15 | 5 | 2.5 |
| 10 | 18 | 0 | -120 | 0 | -80 | 0 | -250 | 0 | -250 | 20 | 20 | 5 | 2.5 |
| 18 | 30 | 0 | -120 | 0 | -120 | 0 | -250 | 0 | -250 | 20 | 20 | 5 | 2.5 |
| 30 | 50 | 0 | -120 | 0 | -120 | 0 | -250 | 0 | -250 | 20 | 20 | 5 | 3 |
| 50 | 80 | 0 | -150 | 0 | -150 | 0 | -380 | 0 | -250 | 25 | 25 | 6 | 4 |
| 80 | 120 | 0 | -200 | 0 | -200 | 0 | -380 | 0 | -380 | 25 | 25 | 7 | 4 |
| 120 | 150 | 0 | -250 | 0 | -250 | 0 | -500 | 0 | -380 | 30 | 30 | 8 | 5 |
| 150 | 180 | 0 | -250 | 0 | -250 | 0 | -500 | 0 | -380 | 30 | 30 | 8 | 5 |
| 180 | 250 | 0 | -300 | 0 | -300 | 0 | -500 | 0 | -500 | 30 | 30 | 10 | 6 |
| 250 | 315 | 0 | -350 | 0 | -350 | 0 | -500 | 0 | -500 | 35 | 35 | 13 | --- |
| 315 | 400 | 0 | -400 | 0 | -400 | 0 | -630 | 0 | -630 | 40 | 40 | 15 | --- |
| 400 | 500 | 0 | -450 | --- | --- | --- | --- | --- | --- | 50 | 45 | --- | --- |
| 500 | 630 | 0 | -500 | --- | --- | --- | --- | --- | --- | 60 | 50 | --- | --- |
| 630 | 800 | 0 | -750 | --- | --- | --- | --- | --- | --- | 70 | --- | --- | --- |
| 800 | 1000 | 0 | -1000 | --- | --- | --- | --- | --- | --- | 80 | --- | --- | --- |
| 1000 | 1250 | 0 | -1250 | --- | --- | --- | --- | --- | --- | 100 | --- | --- | --- |
| 1250 | 1600 | 0 | -1600 | --- | --- | --- | --- | --- | --- | 120 | --- | --- | --- |
| 1600 | 2000 | 0 | -2000 | --- | --- | --- | --- | --- | --- | 140 | --- | --- | --- |

- Notes: (1) This diameter is included in this group.
(2) Applicable to bearings with cylindrical bore.
(3) Width deviation and variation of outer ring are the same with of inner ring. Outer ring width variation of classes 5 and 4 are listed on page 7.
(4) Applicable to the rings of single bearings made for combination bearing.
(5) Applicable to radial ball bearings such as deep groove ball bearings or angular contact ball bearings.
- Remarks: The high deviation of bearing cylindrical bore diameter specified in this table does not apply within a distance of $1.2 \times r$ (max) from the ring face.

Unit: μm

cylindrical bore

| Bore diameter variation in a single radial plane (2) V_{dp} | | | | | | | | | | Mean bore diameter variation (2) V_{dmp} | | | | Nominal bearing bore diameter d (mm) | |
|--|-----|-------|-----------------|-----|-------|-----------------|-----------|-----------------|-----------|---|---------|---------|---------|--|------|
| Class 0 | | | Class 6 | | | Class 5 | | Class 4 | | Class 0 | Class 6 | Class 5 | Class 4 | | |
| Diameter series | | | Diameter series | | | Diameter series | | Diameter series | | | | | | | |
| 7,8,9 | 0,1 | 2,3,4 | 7,8,9 | 0,1 | 2,3,4 | 7,8,9 | 0,1,2,3,4 | 7,8,9 | 0,1,2,3,4 | Max | Max | Max | Max | | |
| Max | | | Max | | | Max | | Max | | Max | Max | Max | Max | | |
| 10 | 8 | 6 | 9 | 7 | 5 | 5 | 4 | 4 | 3 | 6 | 5 | 3 | 2 | 0.6 ⁽¹⁾ | 2.5 |
| 10 | 8 | 6 | 9 | 7 | 5 | 5 | 4 | 4 | 3 | 6 | 5 | 3 | 2 | 2.5 | 10 |
| 10 | 8 | 6 | 9 | 7 | 5 | 5 | 4 | 4 | 3 | 6 | 5 | 3 | 2 | 10 | 18 |
| 13 | 10 | 8 | 10 | 8 | 6 | 6 | 5 | 5 | 4 | 8 | 6 | 3 | 2.5 | 18 | 30 |
| 15 | 12 | 9 | 13 | 10 | 8 | 8 | 6 | 6 | 5 | 9 | 8 | 4 | 3 | 30 | 50 |
| 19 | 19 | 11 | 15 | 15 | 9 | 9 | 7 | 7 | 5 | 11 | 9 | 5 | 3.5 | 50 | 80 |
| 25 | 25 | 15 | 19 | 19 | 11 | 10 | 8 | 8 | 6 | 15 | 11 | 5 | 4 | 80 | 120 |
| 31 | 31 | 19 | 23 | 23 | 14 | 13 | 10 | 10 | 8 | 19 | 14 | 7 | 5 | 120 | 150 |
| 31 | 31 | 19 | 23 | 23 | 14 | 13 | 10 | 10 | 8 | 19 | 14 | 7 | 5 | 150 | 180 |
| 38 | 38 | 23 | 28 | 28 | 17 | 15 | 12 | 12 | 9 | 23 | 17 | 8 | 6 | 180 | 250 |
| 44 | 44 | 26 | 31 | 31 | 19 | 18 | 14 | — | — | 26 | 19 | 9 | — | 250 | 315 |
| 50 | 50 | 30 | 38 | 38 | 23 | 23 | 18 | — | — | 30 | 23 | 12 | — | 315 | 400 |
| 56 | 56 | 34 | 44 | 44 | 26 | — | — | — | — | 34 | 26 | — | — | 400 | 500 |
| 63 | 63 | 38 | 50 | 50 | 30 | — | — | — | — | 38 | 30 | — | — | 500 | 630 |
| — | — | — | — | — | — | — | — | — | — | — | — | — | — | 630 | 800 |
| — | — | — | — | — | — | — | — | — | — | — | — | — | — | 800 | 1000 |
| — | — | — | — | — | — | — | — | — | — | — | — | — | — | 1000 | 1250 |
| — | — | — | — | — | — | — | — | — | — | — | — | — | — | 1250 | 1600 |
| — | — | — | — | — | — | — | — | — | — | — | — | — | — | 1600 | 2000 |

Unit: μm

| Radial runout of assembled bearing inner ring K_{ia} | | | | Inner ring reference face runout with bore S_d | | Assembled bearing inner ring face runout with raceway S_{ia} (5) | | Nominal bearing bore diameter d (mm) | |
|---|---------|---------|---------|---|---------|---|---------|--|------|
| Class 0 | Class 6 | Class 5 | Class 4 | Class 5 | Class 4 | Class 5 | Class 4 | | |
| Max | Max | Max | Max | Max | Max | Max | Max | | |
| Over | Incl. | Over | Incl. | Over | Incl. | Over | Incl. | | |
| 10 | 5 | 4 | 2.5 | 7 | 3 | 7 | 3 | 0.6 ⁽¹⁾ | 2.5 |
| 10 | 6 | 4 | 2.5 | 7 | 3 | 7 | 3 | 2.5 | 10 |
| 10 | 7 | 4 | 2.5 | 7 | 3 | 7 | 3 | 10 | 18 |
| 13 | 8 | 4 | 3 | 8 | 4 | 8 | 4 | 18 | 30 |
| 15 | 10 | 5 | 4 | 8 | 4 | 8 | 4 | 30 | 50 |
| 20 | 10 | 5 | 4 | 8 | 5 | 8 | 5 | 50 | 80 |
| 25 | 13 | 6 | 5 | 9 | 5 | 9 | 5 | 80 | 120 |
| 30 | 18 | 8 | 6 | 10 | 6 | 10 | 7 | 120 | 150 |
| 30 | 18 | 8 | 6 | 10 | 6 | 10 | 7 | 150 | 180 |
| 40 | 20 | 10 | 8 | 11 | 7 | 13 | 8 | 180 | 250 |
| 50 | 25 | 13 | — | 13 | — | 15 | — | 250 | 315 |
| 60 | 30 | 15 | — | 15 | — | 20 | — | 315 | 400 |
| 65 | 35 | — | — | — | — | — | — | 400 | 500 |
| 70 | 40 | — | — | — | — | — | — | 500 | 630 |
| 80 | — | — | — | — | — | — | — | 630 | 800 |
| 90 | — | — | — | — | — | — | — | 800 | 1000 |
| 100 | — | — | — | — | — | — | — | 1000 | 1250 |
| 120 | — | — | — | — | — | — | — | 1250 | 1600 |
| 140 | — | — | — | — | — | — | — | 1600 | 2000 |

Tolerance Values for Radial Bearings

Tolerance Values of Outer Ring

| Nominal bearing outside diameter D (mm) | | Bearing | | | | | | | | | |
|---|------|--|-------|---------|-----|---------|-----|---------|-----|---|-----|
| | | Single plane mean outside diameter deviation ΔD_{mp} | | | | | | | | Deviation of a single outside diameter ΔD_s | |
| | | Class 0 | | Class 6 | | Class 5 | | Class 4 | | Class 4 | |
| | | Over | Incl. | High | Low | High | Low | High | Low | High | Low |
| 2.5 ⁽¹⁾ | 6 | 0 | -8 | 0 | -7 | 0 | -5 | 0 | -4 | 0 | -4 |
| 6 | 18 | 0 | -8 | 0 | -7 | 0 | -5 | 0 | -4 | 0 | -4 |
| 18 | 30 | 0 | -9 | 0 | -8 | 0 | -6 | 0 | -5 | 0 | -5 |
| 30 | 50 | 0 | -11 | 0 | -9 | 0 | -7 | 0 | -6 | 0 | -6 |
| 50 | 80 | 0 | -13 | 0 | -11 | 0 | -9 | 0 | -7 | 0 | -7 |
| 80 | 120 | 0 | -15 | 0 | -13 | 0 | -10 | 0 | -8 | 0 | -8 |
| 120 | 150 | 0 | -18 | 0 | -15 | 0 | -11 | 0 | -9 | 0 | -9 |
| 150 | 180 | 0 | -25 | 0 | -18 | 0 | -13 | 0 | -10 | 0 | -10 |
| 180 | 250 | 0 | -30 | 0 | -20 | 0 | -15 | 0 | -11 | 0 | -11 |
| 250 | 315 | 0 | -35 | 0 | -25 | 0 | -18 | 0 | -13 | 0 | -13 |
| 315 | 400 | 0 | -40 | 0 | -28 | 0 | -20 | 0 | -15 | 0 | -15 |
| 400 | 500 | 0 | -45 | 0 | -33 | 0 | -23 | - | - | - | - |
| 500 | 630 | 0 | -50 | 0 | -38 | 0 | -28 | - | - | - | - |
| 630 | 800 | 0 | -75 | 0 | -45 | 0 | -35 | - | - | - | - |
| 800 | 1000 | 0 | -100 | 0 | -60 | - | - | - | - | - | - |
| 1000 | 1250 | 0 | -125 | - | - | - | - | - | - | - | - |
| 1250 | 1600 | 0 | -160 | - | - | - | - | - | - | - | - |
| 1600 | 2000 | 0 | -200 | - | - | - | - | - | - | - | - |
| 2000 | 2500 | 0 | -250 | - | - | - | - | - | - | - | - |

| Nominal bearing outside diameter D (mm) | | Bearing outside diameter | | | | Radial runout of assembled bearing outer ring | | | |
|---|-------|-------------------------------------|---------|---------|---------|--|---------|---------|---------|
| | | Mean outside diameter variation (2) | | | | Radial runout of assembled bearing outer ring K_{ea} | | | |
| | | Class 0 | Class 6 | Class 5 | Class 4 | Class 0 | Class 6 | Class 5 | Class 4 |
| Over | Incl. | Max | Max | Max | Max | Max | Max | Max | Max |
| 2.5 ⁽¹⁾ | 6 | 6 | 5 | 3 | 2 | 15 | 8 | 5 | 3 |
| 6 | 18 | 6 | 5 | 3 | 2 | 15 | 8 | 5 | 3 |
| 18 | 30 | 7 | 6 | 3 | 2.5 | 15 | 9 | 6 | 4 |
| 30 | 50 | 8 | 7 | 4 | 3 | 20 | 10 | 7 | 5 |
| 50 | 80 | 10 | 8 | 5 | 3.5 | 25 | 13 | 8 | 5 |
| 80 | 120 | 11 | 10 | 5 | 4 | 35 | 18 | 10 | 6 |
| 120 | 150 | 14 | 11 | 6 | 5 | 40 | 20 | 11 | 7 |
| 150 | 180 | 19 | 14 | 7 | 5 | 45 | 23 | 13 | 8 |
| 180 | 250 | 23 | 15 | 8 | 6 | 50 | 25 | 15 | 10 |
| 250 | 315 | 26 | 19 | 9 | 7 | 60 | 30 | 18 | 11 |
| 315 | 400 | 30 | 21 | 10 | 8 | 70 | 35 | 20 | 13 |
| 400 | 500 | 34 | 25 | 12 | - | 80 | 40 | 23 | - |
| 500 | 630 | 38 | 29 | 14 | - | 100 | 50 | 25 | - |
| 630 | 800 | 55 | 34 | 18 | - | 120 | 60 | 30 | - |
| 800 | 1000 | 75 | 45 | - | - | 140 | 75 | - | - |
| 1000 | 1250 | - | - | - | - | 160 | - | - | - |
| 1250 | 1600 | - | - | - | - | 190 | - | - | - |
| 1600 | 2000 | - | - | - | - | 220 | - | - | - |
| 2000 | 2500 | - | - | - | - | 250 | - | - | - |

- Notes: (1) This diameter is included in this group.
(2) Applicable without internal or external snap ring.
(3) Applicable to radial ball bearings such as deep groove ball bearings or angular contact ball bearings.
(4) Outer ring width variation of class 0 and 6 are listed on page 4.

Remarks: The low deviation of bearing outside diameter specified in this table does not apply within a distance of $1.2 \times r$ (max) from the ring face.

Unit: μm

| outside diameter | | | | | | | | | | | | | Nominal bearing outside diameter D (mm) | |
|---|-----|-------|-----------------------|-----------------|-----|-------|-----------------------|-----------------|-----------|-----------------|-----------|--------|---|--|
| Outside diameter variation in a single radial plane (2) | | | | | | | | | | | | | | |
| Class 0 | | | | Class 6 | | | | Class 5 | | Class 4 | | | | |
| Open bearing | | | Seal - shield bearing | Open bearing | | | Seal - shield bearing | Open bearing | | Open bearing | | | | |
| Diameter series | | | 2,3,4 | Diameter series | | | 0,1,2,3,4 | Diameter series | | Diameter series | | | | |
| 7,8,9 | 0,1 | 2,3,4 | 2,3,4 | 7,8,9 | 0,1 | 2,3,4 | 0,1,2,3,4 | 7,8,9 | 0,1,2,3,4 | 7,8,9 | 0,1,2,3,4 | Over | Incl. | |
| Max | Max | Max | Max | Max | Max | Max | Max | Max | Max | Max | Max | | | |
| 10 | 8 | 6 | 10 | 9 | 7 | 5 | 9 | 5 | 4 | 4 | 3 | 2.5(1) | 6 | |
| 10 | 8 | 6 | 10 | 9 | 7 | 5 | 9 | 5 | 4 | 4 | 3 | 6 | 18 | |
| 12 | 9 | 7 | 12 | 10 | 8 | 6 | 10 | 6 | 5 | 5 | 4 | 18 | 30 | |
| 14 | 11 | 8 | 16 | 11 | 9 | 7 | 13 | 7 | 5 | 6 | 5 | 30 | 50 | |
| 16 | 13 | 10 | 20 | 14 | 11 | 8 | 16 | 9 | 7 | 7 | 5 | 50 | 80 | |
| 19 | 19 | 11 | 26 | 16 | 16 | 10 | 20 | 10 | 8 | 8 | 6 | 80 | 120 | |
| 23 | 23 | 14 | 30 | 19 | 19 | 11 | 25 | 11 | 8 | 9 | 7 | 120 | 150 | |
| 31 | 31 | 19 | 38 | 23 | 23 | 14 | 30 | 13 | 10 | 10 | 8 | 150 | 180 | |
| 38 | 38 | 23 | — | 25 | 25 | 15 | — | 15 | 11 | 11 | 8 | 180 | 250 | |
| 44 | 44 | 26 | — | 31 | 31 | 19 | — | 18 | 14 | 13 | 10 | 250 | 315 | |
| 50 | 50 | 30 | — | 35 | 35 | 21 | — | 20 | 15 | 15 | 11 | 315 | 400 | |
| 56 | 56 | 34 | — | 41 | 41 | 25 | — | 23 | 17 | — | — | 400 | 500 | |
| 63 | 63 | 38 | — | 48 | 48 | 29 | — | 28 | 21 | — | — | 500 | 630 | |
| 94 | 94 | 55 | — | 56 | 56 | 34 | — | 35 | 26 | — | — | 630 | 800 | |
| 125 | 125 | 75 | — | 75 | 75 | 45 | — | — | — | — | — | 800 | 1000 | |
| — | — | — | — | — | — | — | — | — | — | — | — | 1000 | 1250 | |
| — | — | — | — | — | — | — | — | — | — | — | — | 1250 | 1600 | |
| — | — | — | — | — | — | — | — | — | — | — | — | 1600 | 2000 | |
| — | — | — | — | — | — | — | — | — | — | — | — | 2000 | 2500 | |

Unit: μm

| Variation of bearing outside surface generatrix inclination with outer ring reference face S_D | | | | Assembled bearing outer ring face runout with raceway S_{ea} (3) | | | | Outer ring width variation V_{Cs} | | | | Nominal bearing outside diameter D (mm) | |
|--|-----|---------|-----|--|-----|---------|-----|-------------------------------------|-----|---------|-----|---|------|
| Class 5 | | Class 4 | | Class 5 | | Class 4 | | Class 5 | | Class 4 | | | |
| Max | Max | Max | Max | Max | Max | Max | Max | Max | Max | Max | Max | | |
| 8 | 8 | 8 | 4 | 8 | 8 | 8 | 5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5(1) | 6 |
| 8 | 8 | 8 | 4 | 8 | 8 | 8 | 5 | 2.5 | 2.5 | 2.5 | 2.5 | 6 | 18 |
| 8 | 8 | 8 | 4 | 8 | 8 | 8 | 5 | 2.5 | 2.5 | 2.5 | 2.5 | 18 | 30 |
| 8 | 8 | 8 | 4 | 8 | 8 | 8 | 5 | 2.5 | 2.5 | 2.5 | 2.5 | 30 | 50 |
| 8 | 8 | 8 | 4 | 8 | 8 | 8 | 5 | 2.5 | 2.5 | 2.5 | 2.5 | 50 | 80 |
| 9 | 9 | 9 | 5 | 11 | 11 | 11 | 8 | 4 | 4 | 4 | 4 | 80 | 120 |
| 10 | 10 | 10 | 5 | 13 | 13 | 13 | 8 | 5 | 5 | 5 | 5 | 120 | 150 |
| 10 | 10 | 10 | 5 | 14 | 14 | 14 | 8 | 5 | 5 | 5 | 5 | 150 | 180 |
| 11 | 11 | 11 | 7 | 15 | 15 | 15 | 10 | 7 | 7 | 7 | 7 | 180 | 250 |
| 13 | 13 | 13 | 8 | 18 | 18 | 18 | 11 | 7 | 7 | 7 | 7 | 250 | 315 |
| 13 | 13 | 13 | 10 | 20 | 20 | 20 | 13 | 8 | 8 | 8 | 8 | 315 | 400 |
| 15 | 15 | 15 | — | 23 | 23 | 23 | 15 | — | — | — | — | 400 | 500 |
| 18 | 18 | 18 | — | 25 | 25 | 25 | 18 | — | — | — | — | 500 | 630 |
| 20 | 20 | 20 | — | 30 | 30 | 30 | 20 | — | — | — | — | 630 | 800 |
| — | — | — | — | — | — | — | — | — | — | — | — | 800 | 1000 |
| — | — | — | — | — | — | — | — | — | — | — | — | 1000 | 1250 |
| — | — | — | — | — | — | — | — | — | — | — | — | 1250 | 1600 |
| — | — | — | — | — | — | — | — | — | — | — | — | 1600 | 2000 |
| — | — | — | — | — | — | — | — | — | — | — | — | 2000 | 2500 |

Tolerances for Tapered Bores

Tolerances for Tapered Bores

d : Nominal bearing bore diameter

d₁ : Basic diameter at the theoretical large end of a tapered bore

in case of 1/12 taper $d_1 = d + \frac{1}{12} B$

in case of 1/30 taper $d_1 = d + \frac{1}{30} B$

Δd_{mp} : Mean bore diameter deviation at theoretical small end of a tapered bore

Δd_{1mp} : Mean bore diameter deviation at theoretical large end of a tapered bore

B : Nominal bearing inner ring width

α : Nominal taper angle (half of cone angle)

in case of 1/12 taper $\alpha = 2^\circ 23' 9.4''$

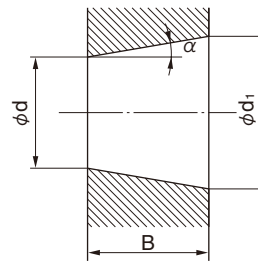
$= 2.38594^\circ$

$= 0.041643 \text{ rad}$

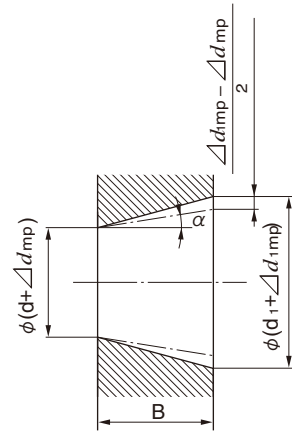
in case of 1/30 taper $\alpha = 0^\circ 57' 17.4''$

$= 0.95484^\circ$

$= 0.016665 \text{ rad}$



Theoretical tapered bore



Tapered bore with actual mean diameters at their deviations

1/12 Tapered Bore (Class 0)

Unit: μm

| Nominal bearing bore dimension d (mm) | Mean bore diameter deviation at theoretical small end of a tapered bore | Δd_{mp} | | $\Delta d_{1mp} - \Delta d_{mp}$ | | Bore diameter variation in a single radial plane (1)(2) V_{dp} |
|---------------------------------------|---|-----------------|-----|----------------------------------|-----|---|
| | | High | Low | High | Low | |
| Over | Incl. | High | Low | High | Low | Max |
| 10 | 10 | +22 | 0 | +15 | 0 | 9 |
| 18 | 18 | +27 | 0 | +18 | 0 | 11 |
| 18 | 30 | +33 | 0 | +21 | 0 | 13 |
| 30 | 50 | +39 | 0 | +25 | 0 | 16 |
| 50 | 80 | +46 | 0 | +30 | 0 | 19 |
| 80 | 120 | +54 | 0 | +35 | 0 | 22 |
| 120 | 180 | +63 | 0 | +40 | 0 | 40 |
| 180 | 250 | +72 | 0 | +46 | 0 | 46 |
| 250 | 315 | +81 | 0 | +52 | 0 | 52 |
| 315 | 400 | +89 | 0 | +57 | 0 | 57 |
| 400 | 500 | +97 | 0 | +63 | 0 | 63 |
| 500 | 630 | +110 | 0 | +70 | 0 | 70 |
| 630 | 800 | +125 | 0 | +80 | 0 | — |
| 800 | 1000 | +140 | 0 | +90 | 0 | — |
| 1000 | 1250 | +165 | 0 | +105 | 0 | — |
| 1250 | 1600 | +195 | 0 | +125 | 0 | — |

Note: (1) Applicable to all radial planes of tapered bore.

(2) Not applicable to bearings of diameter series 7 and 8.

1/30 Tapered Bore (Class 0)

Unit: μm

| Nominal bearing bore dimension d (mm) | Mean bore diameter deviation at theoretical small end of a tapered bore | Δd_{mp} | | $\Delta d_{1mp} - \Delta d_{mp}$ | | Bore diameter variation in a single radial plane (1)(2) V_{dp} |
|---------------------------------------|---|--|--|----------------------------------|-----|---|
| | | High | Low | High | Low | |
| Over | Incl. | High <td>Low <td>High <td>Low</td> <td>Max</td> </td></td> | Low <td>High <td>Low</td> <td>Max</td> </td> | High <td>Low</td> <td>Max</td> | Low | Max |
| 50 | 80 | +15 | 0 | +30 | 0 | 19 |
| 80 | 120 | +20 | 0 | +35 | 0 | 22 |
| 120 | 180 | +25 | 0 | +40 | 0 | 40 |
| 180 | 250 | +30 | 0 | +46 | 0 | 46 |
| 250 | 315 | +35 | 0 | +52 | 0 | 52 |
| 315 | 400 | +40 | 0 | +57 | 0 | 57 |
| 400 | 500 | +45 | 0 | +63 | 0 | 63 |
| 500 | 630 | +50 | 0 | +70 | 0 | 70 |

Note: (1) Applicable to all radial planes of tapered bore.

(2) Not applicable to bearings of diameter series 7 and 8.

Internal Clearance

Radial Internal Clearance of Spherical Roller Bearings with Cylindrical Bore (ISO)

 Unit: μm

| Nominal bearing bore diameter d(mm) | | Radial clearance | | | | | | | | | |
|-------------------------------------|-------|------------------|-----|------------|-----|-----|-----|-----|------|------|------|
| | | C2 | | CN(Normal) | | C3 | | C4 | | C5 | |
| Over | Incl. | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| 14 | 18 | 10 | 20 | 20 | 35 | 35 | 45 | 45 | 60 | 60 | 75 |
| 18 | 24 | 10 | 20 | 20 | 35 | 35 | 45 | 45 | 60 | 60 | 75 |
| 24 | 30 | 15 | 25 | 25 | 40 | 40 | 55 | 55 | 75 | 75 | 95 |
| 30 | 40 | 15 | 30 | 30 | 45 | 45 | 60 | 60 | 80 | 80 | 100 |
| 40 | 50 | 20 | 35 | 35 | 55 | 55 | 75 | 75 | 100 | 100 | 125 |
| 50 | 65 | 20 | 40 | 40 | 65 | 65 | 90 | 90 | 120 | 120 | 150 |
| 65 | 80 | 30 | 50 | 50 | 80 | 80 | 110 | 110 | 145 | 145 | 180 |
| 80 | 100 | 35 | 60 | 60 | 100 | 100 | 135 | 135 | 180 | 180 | 225 |
| 100 | 120 | 40 | 75 | 75 | 120 | 120 | 160 | 160 | 210 | 210 | 260 |
| 120 | 140 | 50 | 95 | 95 | 145 | 145 | 190 | 190 | 240 | 240 | 300 |
| 140 | 160 | 60 | 110 | 110 | 170 | 170 | 220 | 220 | 280 | 280 | 350 |
| 160 | 180 | 65 | 120 | 120 | 180 | 180 | 240 | 240 | 310 | 310 | 390 |
| 180 | 200 | 70 | 130 | 130 | 200 | 200 | 260 | 260 | 340 | 340 | 430 |
| 200 | 225 | 80 | 140 | 140 | 220 | 220 | 290 | 290 | 380 | 380 | 470 |
| 225 | 250 | 90 | 150 | 150 | 240 | 240 | 320 | 320 | 420 | 420 | 520 |
| 250 | 280 | 100 | 170 | 170 | 260 | 260 | 350 | 350 | 460 | 460 | 570 |
| 280 | 315 | 110 | 190 | 190 | 280 | 280 | 370 | 370 | 500 | 500 | 630 |
| 315 | 355 | 120 | 200 | 200 | 310 | 310 | 410 | 410 | 550 | 550 | 690 |
| 355 | 400 | 130 | 220 | 220 | 340 | 340 | 450 | 450 | 600 | 600 | 750 |
| 400 | 450 | 140 | 240 | 240 | 370 | 370 | 500 | 500 | 660 | 660 | 820 |
| 450 | 500 | 140 | 260 | 260 | 410 | 410 | 550 | 550 | 720 | 720 | 900 |
| 500 | 560 | 150 | 280 | 280 | 440 | 440 | 600 | 600 | 780 | 780 | 1000 |
| 560 | 630 | 170 | 310 | 310 | 480 | 480 | 650 | 650 | 850 | 850 | 1100 |
| 630 | 710 | 190 | 350 | 350 | 530 | 530 | 700 | 700 | 920 | 920 | 1190 |
| 710 | 800 | 210 | 390 | 390 | 580 | 580 | 770 | 770 | 1010 | 1010 | 1300 |
| 800 | 900 | 230 | 430 | 430 | 650 | 650 | 860 | 860 | 1120 | 1120 | 1440 |
| 900 | 1000 | 260 | 480 | 480 | 710 | 710 | 930 | 930 | 1220 | 1220 | 1570 |

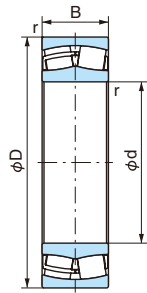
Radial Internal Clearance of Spherical Roller Bearings with Tapered Bore (ISO)

 Unit: μm

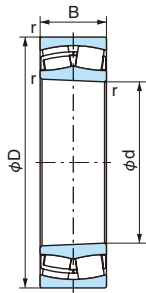
| Nominal bearing bore diameter d(mm) | | Radial clearance | | | | | | | | | |
|-------------------------------------|-------|------------------|-----|------------|-----|-----|------|------|------|------|------|
| | | C2 | | CN(Normal) | | C3 | | C4 | | C5 | |
| Over | Incl. | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| 18 | 24 | 15 | 25 | 25 | 35 | 35 | 45 | 45 | 60 | 60 | 75 |
| 24 | 30 | 20 | 30 | 30 | 40 | 40 | 55 | 55 | 75 | 75 | 95 |
| 30 | 40 | 25 | 35 | 35 | 50 | 50 | 65 | 65 | 85 | 85 | 105 |
| 40 | 50 | 30 | 45 | 45 | 60 | 60 | 80 | 80 | 100 | 100 | 130 |
| 50 | 65 | 40 | 55 | 55 | 75 | 75 | 95 | 95 | 120 | 120 | 160 |
| 65 | 80 | 50 | 70 | 70 | 95 | 95 | 120 | 120 | 150 | 150 | 200 |
| 80 | 100 | 55 | 80 | 80 | 110 | 110 | 140 | 140 | 180 | 180 | 230 |
| 100 | 120 | 65 | 100 | 100 | 135 | 135 | 170 | 170 | 220 | 220 | 280 |
| 120 | 140 | 80 | 120 | 120 | 160 | 160 | 200 | 200 | 260 | 260 | 330 |
| 140 | 160 | 90 | 130 | 130 | 180 | 180 | 230 | 230 | 300 | 300 | 380 |
| 160 | 180 | 100 | 140 | 140 | 200 | 200 | 260 | 260 | 340 | 340 | 430 |
| 180 | 200 | 110 | 160 | 160 | 220 | 220 | 290 | 290 | 370 | 370 | 470 |
| 200 | 225 | 120 | 180 | 180 | 250 | 250 | 320 | 320 | 410 | 410 | 520 |
| 225 | 250 | 140 | 200 | 200 | 270 | 270 | 350 | 350 | 450 | 450 | 570 |
| 250 | 280 | 150 | 220 | 220 | 300 | 300 | 390 | 390 | 490 | 490 | 620 |
| 280 | 315 | 170 | 240 | 240 | 330 | 330 | 430 | 430 | 540 | 540 | 680 |
| 315 | 355 | 190 | 270 | 270 | 360 | 360 | 470 | 470 | 590 | 590 | 740 |
| 355 | 400 | 210 | 300 | 300 | 400 | 400 | 520 | 520 | 650 | 650 | 820 |
| 400 | 450 | 230 | 330 | 330 | 440 | 440 | 570 | 570 | 720 | 720 | 910 |
| 450 | 500 | 260 | 370 | 370 | 490 | 490 | 630 | 630 | 790 | 790 | 1000 |
| 500 | 560 | 290 | 410 | 410 | 540 | 540 | 680 | 680 | 870 | 870 | 1100 |
| 560 | 630 | 320 | 460 | 460 | 600 | 600 | 760 | 760 | 980 | 980 | 1230 |
| 630 | 710 | 350 | 510 | 510 | 670 | 670 | 850 | 850 | 1090 | 1090 | 1360 |
| 710 | 800 | 390 | 570 | 570 | 750 | 750 | 960 | 960 | 1220 | 1220 | 1500 |
| 800 | 900 | 440 | 640 | 640 | 840 | 840 | 1070 | 1070 | 1370 | 1370 | 1690 |
| 900 | 1000 | 490 | 710 | 710 | 930 | 930 | 1190 | 1190 | 1520 | 1520 | 1860 |

Spherical Roller Bearings

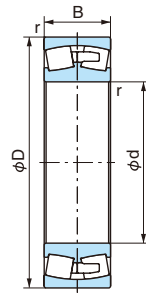
Bore Diameter : 20 ~ 60mm



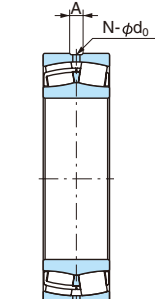
Cylindrical bore



Tapered bore



With machined brass cage

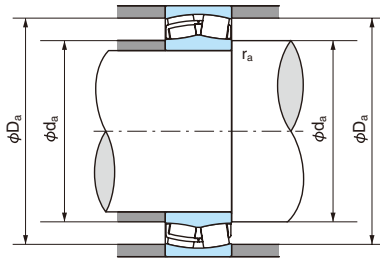


With oil holes / oil groove (W33)

1N=0.102kgf

| Boundary dimensions (mm) | | | | Bearing No. | | Basic dynamic load rating Cr (N) | Basic static load rating Cor (N) | Limiting speed (min ⁻¹) | |
|--------------------------|-----|----|---------|------------------|--------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------|
| d | D | B | r (min) | Cylindrical bore | Tapered bore | | | Grease lubrication | Oil lubrication |
| 20 | 52 | 15 | 1.1 | 21304E | 21304EK | 47000 | 33500 | 11000 | 14000 |
| | 52 | 18 | 1 | 22205EX | 22205EXK | 63000 | 48000 | 10500 | 13000 |
| 25 | 52 | 18 | 1 | 22205AEX | 22205AEXK | 48500 | 34500 | 8900 | 11000 |
| | 62 | 17 | 1.1 | 21305E | 21305EK | 64000 | 47500 | 9000 | 11500 |
| 30 | 62 | 20 | 1 | 22206EX | 22206EXK | 84500 | 65000 | 8500 | 11000 |
| | 62 | 20 | 1 | 22206AEX | 22206AEXK | 68000 | 48500 | 7500 | 9600 |
| | 72 | 19 | 1.1 | 21306E | 21306EK | 83000 | 62500 | 8000 | 9500 |
| | 72 | 19 | 1.1 | 21306AX | 21306AXK | 73000 | 50900 | 6500 | 8500 |
| 35 | 72 | 23 | 1.1 | 22207EX | 22207EXK | 112000 | 88500 | 7500 | 9500 |
| | 72 | 23 | 1.1 | 22207AEX | 22207AEXK | 94500 | 70000 | 6400 | 8300 |
| | 80 | 21 | 1.5 | 21307E | 21307EK | 96000 | 76000 | 7000 | 8500 |
| | 80 | 21 | 1.5 | 21307AX | 21307AXK | 89000 | 63100 | 6000 | 7500 |
| 40 | 80 | 31 | 1.5 | 22307AEX | 22307AEXK | 145000 | 107000 | 6000 | 7700 |
| | 80 | 23 | 1.1 | 22208EX | 22208EXK | 126000 | 102000 | 6700 | 8500 |
| | 80 | 23 | 1.1 | 22208AEX | 22208AEXK | 106000 | 81000 | 5700 | 7300 |
| | 90 | 23 | 1.5 | 21308E | 21308EK | 119000 | 95500 | 6000 | 7500 |
| | 90 | 23 | 1.5 | 21308AX | 21308AXK | 116000 | 84400 | 5000 | 6500 |
| | 90 | 33 | 1.5 | 22308EX | 22308EXK | 185000 | 151000 | 5300 | 6700 |
| 45 | 90 | 33 | 1.5 | 22308AEX | 22308AEXK | 172000 | 134000 | 5200 | 6700 |
| | 85 | 23 | 1.1 | 22209EX | 22209EXK | 133000 | 110000 | 6000 | 7500 |
| | 85 | 23 | 1.1 | 22209AEX | 22209AEXK | 113000 | 85500 | 5300 | 6800 |
| | 100 | 25 | 1.5 | 21309E | 21309EK | 150000 | 124000 | 5000 | 6300 |
| | 100 | 25 | 1.5 | 21309AX | 21309AXK | 143000 | 105000 | 4500 | 6000 |
| 50 | 100 | 36 | 1.5 | 22309EX | 22309EXK | 230000 | 182000 | 4500 | 5600 |
| | 100 | 36 | 1.5 | 22309AEX | 22309AEXK | 208000 | 157000 | 4700 | 6100 |
| | 90 | 23 | 1.1 | 22210EX | 22210EXK | 142000 | 122000 | 5600 | 7100 |
| | 90 | 23 | 1.1 | 22210AEX | 22210AEXK | 119000 | 93500 | 4900 | 6400 |
| | 110 | 27 | 2 | 21310E | 21310EK | 178000 | 151000 | 4500 | 5600 |
| 55 | 110 | 27 | 2 | 21310AX | 21310AXK | 170000 | 127000 | 4000 | 5500 |
| | 110 | 40 | 2 | 22310EX | 22310EXK | 280000 | 235000 | 4300 | 5300 |
| | 110 | 40 | 2 | 22310AEX | 22310AEXK | 254000 | 205000 | 4200 | 5500 |
| | 100 | 25 | 1.5 | 22211EX | 22211EXK | 171000 | 144000 | 5300 | 6700 |
| 60 | 100 | 25 | 1.5 | 22211AEX | 22211AEXK | 150000 | 118000 | 4500 | 5700 |
| | 120 | 29 | 2 | 21311EX1 | 21311EX1K | 200000 | 165000 | 4500 | 5600 |
| | 120 | 29 | 2 | 21311AX | 21311AXK | 206000 | 171000 | 4000 | 5000 |
| | 120 | 43 | 2 | 22311EX | 22311EXK | 325000 | 263000 | 3800 | 4800 |
| | 120 | 43 | 2 | 22311AEX | 22311AEXK | 294000 | 227000 | 4000 | 5100 |
| 60 | 110 | 28 | 1.5 | 22212EX | 22212EXK | 210000 | 179000 | 4800 | 6000 |
| | 110 | 28 | 1.5 | 22212AEX | 22212AEXK | 179000 | 144000 | 4100 | 5200 |
| | 130 | 31 | 2.1 | 21312EX1 | 21312EX1K | 238000 | 193000 | 3800 | 4800 |
| | 130 | 31 | 2.1 | 21312AX | 21312AXK | 228000 | 192000 | 3500 | 4500 |
| | 130 | 46 | 2.1 | 22312EX | 22312EXK | 390000 | 330000 | 3600 | 4500 |
| | 130 | 46 | 2.1 | 22312AEX | 22312AEXK | 340000 | 275000 | 3600 | 4600 |

Note: Suffix K or K30 means tapered bore (1/12 or 1/30).



• Dynamic equivalent radial load
 $P_r = XFr + YFa$

| | | | |
|------------------------|-------|---------------------|-------|
| $\frac{Fa}{Fr} \leq e$ | | $\frac{Fa}{Fr} > e$ | |
| X | Y | X | Y |
| 1 | Y_1 | 0.67 | Y_2 |

Values of Y_1 , Y_2 and e from table.

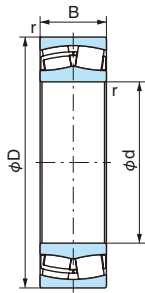
• Static equivalent radial load
 $P_{0r} = Fr + Y_0Fa$

Values Y_0 from table.

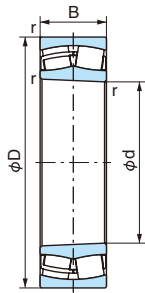
| Dimensions of lubrication holes and grooves | | | Abutment and fillet dimensions (mm) | | | Constant e | Axial load factor | | | Mass (kg) Cylindrical bore (Reference) | Bearing No. | |
|---|-------------------|-----------------|-------------------------------------|----------------|----------------|------------|-------------------|-------|-------|--|------------------|--------------|
| Hole diameter d_o | Groove width A | Hole count N | d_a (min) | D_a (max) | r_a (max) | | Y_1 | Y_2 | Y_0 | | Cylindrical bore | Tapered bore |
| 3 | 6 | 4 | 27.0 | 45.0 | 1.0 | 0.31 | 2.20 | 3.27 | 2.15 | 0.18 | 21304E | 21304EK |
| 3 | 5 | 4 | 30.5 | 46.5 | 1.0 | 0.35 | 1.91 | 2.85 | 1.87 | 0.19 | 22205EX | 22205EXK |
| 3 | 5 | 4 | 30.5 | 46.5 | 1.0 | 0.43 | 1.57 | 2.33 | 1.53 | 0.18 | 22205AEX | 22205AEXK |
| 6 | 6 | 4 | 32.0 | 53.0 | 1.0 | 0.28 | 2.39 | 3.56 | 2.34 | 0.29 | 21305E | 21305EK |
| 3 | 5 | 4 | 35.5 | 56.5 | 1.0 | 0.33 | 2.04 | 3.04 | 2.00 | 0.30 | 22206EX | 22206EXK |
| 3 | 5 | 4 | 35.5 | 56.5 | 1.0 | 0.40 | 1.70 | 2.53 | 1.66 | 0.29 | 22206AEX | 22206AEXK |
| 3 | 5 | 4 | 38.0 | 65.0 | 1.0 | 0.27 | 2.49 | 3.71 | 2.43 | 0.43 | 21306E | 21306EK |
| 3 | 5 | 4 | 38.0 | 65.0 | 1.0 | 0.35 | 1.95 | 2.90 | 1.90 | 0.43 | 21306AX | 21306AXK |
| 3 | 6 | 4 | 42.0 | 65.0 | 1.0 | 0.32 | 2.10 | 3.13 | 2.06 | 0.46 | 22207EX | 22207EXK |
| 3 | 6 | 4 | 42.0 | 65.0 | 1.0 | 0.39 | 1.74 | 2.60 | 1.71 | 0.46 | 22207AEX | 22207AEXK |
| 3 | 5 | 4 | 44.0 | 71.0 | 1.5 | 0.27 | 2.49 | 3.71 | 2.43 | 0.57 | 21307E | 21307EK |
| 3 | 5 | 4 | 44.0 | 71.0 | 1.5 | 0.33 | 2.03 | 3.03 | 1.99 | 0.56 | 21307AX | 21307AXK |
| 3 | 6 | 4 | 43.5 | 71.5 | 1.5 | 0.48 | 1.41 | 2.10 | 1.38 | 0.78 | 22307AEX | 22307AEXK |
| 3 | 6 | 4 | 47.0 | 73.0 | 1.0 | 0.28 | 2.37 | 3.53 | 2.32 | 0.56 | 22208EX | 22208EXK |
| 3 | 6 | 4 | 47.0 | 73.0 | 1.0 | 0.34 | 1.99 | 2.96 | 1.94 | 0.56 | 22208AEX | 22208AEXK |
| 3 | 5 | 4 | 50.0 | 81.0 | 1.5 | 0.26 | 2.55 | 3.80 | 2.50 | 0.78 | 21308E | 21308EK |
| 3 | 5 | 4 | 50.0 | 81.0 | 1.5 | 0.32 | 2.09 | 3.11 | 2.04 | 0.79 | 21308AX | 21308AXK |
| 4 | 7 | 4 | 48.5 | 81.5 | 1.5 | 0.37 | 1.83 | 2.72 | 1.79 | 1.07 | 22308EX | 22308EXK |
| 4 | 7 | 4 | 48.5 | 81.5 | 1.5 | 0.43 | 1.55 | 2.31 | 1.54 | 1.05 | 22308AEX | 22308AEXK |
| 3 | 6 | 4 | 52.0 | 78.0 | 1.0 | 0.26 | 2.55 | 3.80 | 2.50 | 0.61 | 22209EX | 22209EXK |
| 3 | 6 | 4 | 52.0 | 78.0 | 1.0 | 0.31 | 2.15 | 3.21 | 2.11 | 0.60 | 22209AEX | 22209AEXK |
| 3 | 5 | 4 | 55.0 | 92.0 | 1.5 | 0.26 | 2.62 | 3.90 | 2.56 | 1.05 | 21309E | 21309EK |
| 3 | 5 | 4 | 55.0 | 92.0 | 1.5 | 0.31 | 2.16 | 3.22 | 2.11 | 1.05 | 21309AX | 21309AXK |
| 4 | 8 | 4 | 53.5 | 91.5 | 1.5 | 0.37 | 1.83 | 2.72 | 1.79 | 1.41 | 22309EX | 22309EXK |
| 4 | 8 | 4 | 53.5 | 91.5 | 1.5 | 0.43 | 1.57 | 2.34 | 1.54 | 1.41 | 22309AEX | 22309AEXK |
| 3 | 6 | 4 | 57.0 | 83.0 | 1.0 | 0.24 | 2.79 | 4.15 | 2.73 | 0.65 | 22210EX | 22210EXK |
| 3 | 6 | 4 | 57.0 | 83.0 | 1.0 | 0.29 | 2.34 | 3.48 | 2.28 | 0.65 | 22210AEX | 22210AEXK |
| 3 | 5 | 4 | 61.0 | 101.0 | 2.0 | 0.25 | 2.71 | 4.04 | 2.65 | 1.36 | 21310E | 21310EK |
| 3 | 5 | 4 | 61.0 | 101.0 | 2.0 | 0.30 | 2.24 | 3.34 | 2.19 | 1.36 | 21310AX | 21310AXK |
| 4 | 8 | 4 | 60.0 | 100.0 | 2.0 | 0.36 | 1.85 | 2.75 | 1.81 | 1.92 | 22310EX | 22310EXK |
| 4 | 8 | 4 | 60.0 | 100.0 | 2.0 | 0.42 | 1.62 | 2.42 | 1.59 | 1.88 | 22310AEX | 22310AEXK |
| 3 | 6 | 4 | 63.5 | 91.5 | 1.5 | 0.24 | 2.84 | 4.23 | 2.78 | 0.88 | 22211EX | 22211EXK |
| 3 | 6 | 4 | 63.5 | 91.5 | 1.5 | 0.29 | 2.34 | 3.48 | 2.28 | 0.89 | 22211AEX | 22211AEXK |
| 3 | 5 | 4 | 65.0 | 110.0 | 2.0 | 0.25 | 2.71 | 4.03 | 2.65 | 1.70 | 21311EX1 | 21311EX1K |
| 3 | 5 | 4 | 65.0 | 110.0 | 2.0 | 0.29 | 2.32 | 3.45 | 2.27 | 1.77 | 21311AX | 21311AXK |
| 4 | 8 | 4 | 65.0 | 110.0 | 2.0 | 0.36 | 1.85 | 2.75 | 1.81 | 2.40 | 22311EX | 22311EXK |
| 4 | 8 | 4 | 65.0 | 110.0 | 2.0 | 0.43 | 1.56 | 2.33 | 1.53 | 2.39 | 22311AEX | 22311AEXK |
| 3 | 6 | 4 | 68.5 | 101.5 | 1.5 | 0.25 | 2.74 | 4.08 | 2.68 | 1.20 | 22212EX | 22212EXK |
| 3 | 6 | 4 | 68.5 | 101.5 | 1.5 | 0.29 | 2.29 | 3.41 | 2.24 | 1.22 | 22212AEX | 22212AEXK |
| 3 | 5 | 4 | 72.0 | 118.0 | 2.0 | 0.24 | 2.78 | 4.14 | 2.72 | 2.10 | 21312EX1 | 21312EX1K |
| 3 | 5 | 4 | 72.0 | 118.0 | 2.0 | 0.29 | 2.36 | 3.52 | 2.31 | 2.19 | 21312AX | 21312AXK |
| 4 | 8 | 4 | 72.0 | 118.0 | 2.0 | 0.36 | 1.86 | 2.77 | 1.82 | 3.05 | 22312EX | 22312EXK |
| 4 | 8 | 4 | 72.0 | 118.0 | 2.0 | 0.41 | 1.65 | 2.46 | 1.62 | 3.01 | 22312AEX | 22312AEXK |

Spherical Roller Bearings

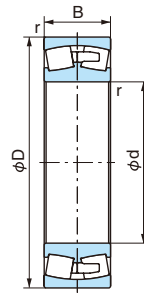
Bore Diameter : 65 ~ 95mm



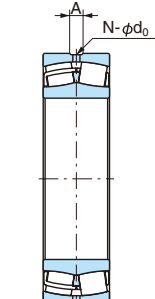
Cylindrical bore



Tapered bore



With machined brass cage

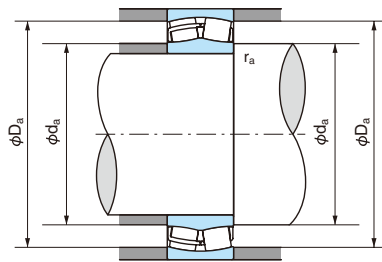


With oil holes / oil groove (W33)

1N=0.102kgf

| Boundary dimensions (mm) | | | | Bearing No. | | Basic dynamic load rating Cr (N) | Basic static load rating Cor (N) | Limiting speed (min ⁻¹) | |
|--------------------------|-----|------|----------|------------------|--------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------|
| d | D | B | r (min) | Cylindrical bore | Tapered bore | | | Grease lubrication | Oil lubrication |
| 65 | 120 | 31 | 1.5 | 22213EX | 22213EXK | 246000 | 209000 | 4300 | 5300 |
| | 120 | 31 | 1.5 | 22213AEX | 22213AEXK | 213000 | 169000 | 3800 | 4800 |
| | 140 | 33 | 2.1 | 21313EX1 | 21313EX1K | 270000 | 232000 | 3600 | 4500 |
| | 140 | 33 | 2.1 | 21313AX | 21313AXK | 261000 | 222000 | 3400 | 4300 |
| | 140 | 48 | 2.1 | 22313EX | 22313EXK | 415000 | 355000 | 3200 | 4000 |
| | 140 | 48 | 2.1 | 22313AEX | 22313AEXK | 380000 | 310000 | 3300 | 4300 |
| 70 | 125 | 31 | 1.5 | 22214EX | 22214EXK | 257000 | 220000 | 4000 | 5300 |
| | 125 | 31 | 1.5 | 22214AEX | 22214AEXK | 225000 | 185000 | 3600 | 4600 |
| | 150 | 35 | 2.1 | 21314EX1 | 21314EX1K | 310000 | 260000 | 3200 | 4000 |
| | 150 | 35 | 2.1 | 21314AX | 21314AXK | 305000 | 268000 | 3000 | 4000 |
| | 150 | 51 | 2.1 | 22314EX | 22314EXK | 480000 | 415000 | 3000 | 3800 |
| 150 | 51 | 2.1 | 22314AEX | 22314AEXK | 445000 | 365000 | 3100 | 4000 | |
| 75 | 130 | 31 | 1.5 | 22215EX | 22215EXK | 265000 | 234000 | 4000 | 5000 |
| | 130 | 31 | 1.5 | 22215AEX | 22215AEXK | 234000 | 191000 | 3400 | 4400 |
| | 160 | 37 | 2.1 | 21315EX1 | 21315EX1K | 340000 | 298000 | 3200 | 4000 |
| | 160 | 37 | 2.1 | 21315AX | 21315AXK | 325000 | 286000 | 2900 | 3700 |
| | 160 | 55 | 2.1 | 22315EX | 22315EXK | 550000 | 475000 | 2800 | 3600 |
| 160 | 55 | 2.1 | 22315AEX | 22315AEXK | 495000 | 415000 | 2900 | 3700 | |
| 80 | 140 | 33 | 2 | 22216EX | 22216EXK | 299000 | 269000 | 3600 | 4500 |
| | 140 | 33 | 2 | 22216AEX | 22216AEXK | 279000 | 230000 | 3200 | 4100 |
| | 140 | 44.4 | 2 | 23216E | 23216EK | 335000 | 335000 | 2200 | 2900 |
| | 170 | 39 | 2.1 | 21316EX1 | 21316EX1K | 380000 | 339000 | 3000 | 3800 |
| | 170 | 39 | 2.1 | 21316AX | 21316AXK | 355000 | 318000 | 2800 | 3500 |
| | 170 | 58 | 2.1 | 22316EX | 22316EXK | 595000 | 520000 | 2600 | 3400 |
| 170 | 58 | 2.1 | 22316AEX | 22316AEXK | 550000 | 465000 | 2700 | 3500 | |
| 85 | 150 | 36 | 2 | 22217EX | 22217EXK | 355000 | 320000 | 3400 | 4300 |
| | 150 | 36 | 2 | 22217AEX | 22217AEXK | 310000 | 260000 | 2800 | 3800 |
| | 150 | 49.2 | 2 | 23217E | 23217EK | 395000 | 405000 | 2100 | 2700 |
| | 180 | 41 | 3 | 21317EX1 | 21317EX1K | 415000 | 372000 | 3000 | 4000 |
| | 180 | 41 | 3 | 21317AX | 21317AXK | 400000 | 364000 | 2600 | 3400 |
| | 180 | 60 | 3 | 22317EX | 22317EXK | 665000 | 585000 | 2400 | 3200 |
| 180 | 60 | 3 | 22317AEX | 22317AEXK | 590000 | 500000 | 2600 | 3300 | |
| 90 | 160 | 40 | 2 | 22218EX | 22218EXK | 410000 | 375000 | 3200 | 4000 |
| | 160 | 40 | 2 | 22218AEX | 22218AEXK | 360000 | 310000 | 2700 | 3600 |
| | 160 | 52.4 | 2 | 23218EX1 | 23218EX1K | 470000 | 482000 | 2100 | 2800 |
| | 190 | 43 | 3 | 21318EX1 | 21318EX1K | 460000 | 410000 | 2800 | 3600 |
| | 190 | 43 | 3 | 21318AX | 21318AXK | 460000 | 416000 | 2500 | 3200 |
| | 190 | 64 | 3 | 22318EX | 22318EXK | 745000 | 660000 | 2400 | 3000 |
| 190 | 64 | 3 | 22318AEX | 22318AEXK | 690000 | 585000 | 2500 | 3200 | |
| 95 | 170 | 43 | 2.1 | 22219EX | 22219EXK | 465000 | 420000 | 3000 | 3800 |
| | 170 | 43 | 2.1 | 22219AEX | 22219AEXK | 410000 | 360000 | 2600 | 3400 |
| | 170 | 55.6 | 2.1 | 23219E | 23219EK | 500000 | 510000 | 1900 | 2400 |
| | 200 | 45 | 3 | 21319EX1 | 21319EX1K | 500000 | 461000 | 1800 | 2300 |
| | 200 | 45 | 3 | 21319AX | 21319AXK | 495000 | 450000 | 2300 | 3000 |
| 200 | 67 | 3 | 22319EX | 22319EXK | 815000 | 725000 | 2200 | 2800 | |
| 200 | 67 | 3 | 22319AEX | 22319AEXK | 755000 | 645000 | 2300 | 3000 | |

Note: Suffix K or K30 means tapered bore (1/12 or 1/30).



• Dynamic equivalent radial load
 $P_r = XFr + YFa$

| $\frac{Fa}{Fr} \leq e$ | | $\frac{Fa}{Fr} > e$ | |
|------------------------|-------|---------------------|-------|
| X | Y | X | Y |
| 1 | Y_1 | 0.67 | Y_2 |

Values of Y_1 , Y_2 and e from table.

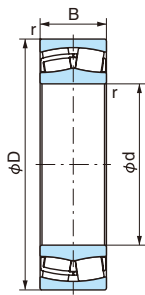
• Static equivalent radial load
 $P_{0r} = Fr + Y_0Fa$

Values Y_0 from table.

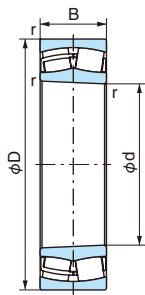
| Dimensions of lubrication holes and grooves | | | Abutment and fillet dimensions (mm) | | | Constant e | Axial load factor | | | Mass (kg) Cylindrical bore (Reference) | Bearing No. | |
|---|-------------------|-----------------|-------------------------------------|----------------|----------------|------------|-------------------|-------|-------|--|------------------|--------------|
| Hole diameter d_o | Groove width A | Hole count N | d_a (min) | D_a (max) | r_a (max) | | Y_1 | Y_2 | Y_0 | | Cylindrical bore | Tapered bore |
| 3 | 6 | 4 | 73.5 | 111.5 | 1.5 | 0.25 | 2.69 | 4.00 | 2.63 | 1.56 | 22213EX | 22213EXK |
| 3 | 6 | 4 | 73.5 | 111.5 | 1.5 | 0.30 | 2.26 | 3.36 | 2.21 | 1.60 | 22213AEX | 22213AEXK |
| 3 | 6 | 4 | 77.0 | 128.0 | 2.0 | 0.24 | 2.83 | 4.21 | 2.76 | 2.60 | 21313EX1 | 21313EX1K |
| 3 | 6 | 4 | 77.0 | 128.0 | 2.0 | 0.28 | 2.40 | 3.57 | 2.35 | 2.69 | 21313AX | 21313AXK |
| 4 | 8 | 4 | 77.0 | 128.0 | 2.0 | 0.34 | 1.98 | 2.94 | 1.93 | 3.67 | 22313EX | 22313EXK |
| 4 | 8 | 4 | 77.0 | 128.0 | 2.0 | 0.39 | 1.72 | 2.55 | 1.68 | 3.64 | 22313AEX | 22313AEXK |
| 3 | 6 | 4 | 78.5 | 116.5 | 1.5 | 0.24 | 2.87 | 4.27 | 2.80 | 1.65 | 22214EX | 22214EXK |
| 3 | 6 | 4 | 78.5 | 116.5 | 1.5 | 0.28 | 2.39 | 3.55 | 2.33 | 1.69 | 22214AEX | 22214AEXK |
| 3 | 6 | 4 | 82.0 | 138.0 | 2.0 | 0.24 | 2.84 | 4.23 | 2.78 | 3.10 | 21314EX1 | 21314EX1K |
| 3 | 6 | 4 | 82.0 | 138.0 | 2.0 | 0.28 | 2.45 | 3.64 | 2.39 | 3.30 | 21314AX | 21314AXK |
| 5 | 10 | 4 | 82.0 | 138.0 | 2.0 | 0.34 | 1.98 | 2.94 | 1.93 | 4.45 | 22314EX | 22314EXK |
| 5 | 10 | 4 | 82.0 | 138.0 | 2.0 | 0.40 | 1.71 | 2.54 | 1.67 | 4.46 | 22314AEX | 22314AEXK |
| 3 | 6 | 4 | 83.5 | 121.5 | 1.5 | 0.22 | 3.07 | 4.58 | 3.01 | 1.74 | 22215EX | 22215EXK |
| 3 | 6 | 4 | 83.5 | 121.5 | 1.5 | 0.27 | 2.51 | 3.73 | 2.46 | 1.76 | 22215AEX | 22215AEXK |
| 3 | 6 | 4 | 87.0 | 148.0 | 2.0 | 0.23 | 2.87 | 4.27 | 2.80 | 3.80 | 21315EX1 | 21315EX1K |
| 3 | 6 | 4 | 87.0 | 148.0 | 2.0 | 0.27 | 2.50 | 3.72 | 2.44 | 3.95 | 21315AX | 21315AXK |
| 5 | 10 | 4 | 87.0 | 148.0 | 2.0 | 0.35 | 1.95 | 2.90 | 1.91 | 5.44 | 22315EX | 22315EXK |
| 5 | 10 | 4 | 87.0 | 148.0 | 2.0 | 0.39 | 1.72 | 2.56 | 1.68 | 5.44 | 22315AEX | 22315AEXK |
| 3 | 6 | 4 | 90.0 | 130.0 | 2.0 | 0.22 | 3.07 | 4.58 | 3.01 | 2.19 | 22216EX | 22216EXK |
| 3 | 6 | 4 | 90.0 | 130.0 | 2.0 | 0.27 | 2.51 | 3.74 | 2.46 | 2.24 | 22216AEX | 22216AEXK |
| 4 | 8 | 4 | 90.0 | 130.0 | 2.0 | 0.29 | 2.35 | 3.50 | 2.30 | 2.95 | 23216E | 23216EK |
| 4 | 8 | 4 | 92.0 | 158.0 | 2.0 | 0.23 | 2.88 | 4.29 | 2.82 | 4.50 | 21316EX1 | 21316EX1K |
| 4 | 8 | 4 | 92.0 | 158.0 | 2.0 | 0.26 | 2.55 | 3.80 | 2.50 | 4.67 | 21316AX | 21316AXK |
| 5 | 10 | 4 | 92.0 | 158.0 | 2.0 | 0.35 | 1.95 | 2.90 | 1.91 | 6.42 | 22316EX | 22316EXK |
| 5 | 10 | 4 | 92.0 | 158.0 | 2.0 | 0.38 | 1.75 | 2.61 | 1.72 | 6.43 | 22316AEX | 22316AEXK |
| 4 | 7 | 4 | 95.0 | 140.0 | 2.0 | 0.22 | 3.01 | 4.48 | 2.94 | 2.75 | 22217EX | 22217EXK |
| 4 | 7 | 4 | 95.0 | 140.0 | 2.0 | 0.27 | 2.47 | 3.67 | 2.41 | 2.82 | 22217AEX | 22217AEXK |
| 4 | 8 | 4 | 95.0 | 140.0 | 2.0 | 0.30 | 2.24 | 3.34 | 2.19 | 3.78 | 23217E | 23217EK |
| 4 | 8 | 4 | 99.0 | 166.0 | 2.5 | 0.23 | 2.89 | 4.30 | 2.83 | 5.30 | 21317EX1 | 21317EX1K |
| 4 | 8 | 4 | 99.0 | 166.0 | 2.5 | 0.26 | 2.55 | 3.79 | 2.49 | 5.52 | 21317AX | 21317AXK |
| 6 | 11 | 4 | 99.0 | 166.0 | 2.5 | 0.33 | 2.02 | 3.00 | 1.97 | 7.46 | 22317EX | 22317EXK |
| 6 | 11 | 4 | 99.0 | 166.0 | 2.5 | 0.38 | 1.78 | 2.65 | 1.74 | 7.47 | 22317AEX | 22317AEXK |
| 4 | 7 | 4 | 100.0 | 150.0 | 2.0 | 0.24 | 2.79 | 4.15 | 2.73 | 3.50 | 22218EX | 22218EXK |
| 4 | 7 | 4 | 100.0 | 150.0 | 2.0 | 0.28 | 2.42 | 3.60 | 2.36 | 3.56 | 22218AEX | 22218AEXK |
| 5 | 10 | 4 | 100.0 | 150.0 | 2.0 | 0.32 | 2.14 | 3.19 | 2.09 | 4.57 | 23218EX1 | 23218EX1K |
| 4 | 8 | 6 | 104.0 | 176.0 | 2.5 | 0.23 | 2.91 | 4.33 | 2.84 | 6.10 | 21318EX1 | 21318EX1K |
| 4 | 8 | 6 | 104.0 | 176.0 | 2.5 | 0.26 | 2.55 | 3.80 | 2.50 | 6.45 | 21318AX | 21318AXK |
| 6 | 11 | 6 | 104.0 | 176.0 | 2.5 | 0.34 | 2.00 | 2.98 | 1.96 | 8.82 | 22318EX | 22318EXK |
| 6 | 11 | 6 | 104.0 | 176.0 | 2.5 | 0.39 | 1.73 | 2.57 | 1.69 | 8.91 | 22318AEX | 22318AEXK |
| 5 | 8 | 4 | 107.0 | 158.0 | 2.0 | 0.24 | 2.76 | 4.11 | 2.70 | 4.24 | 22219EX | 22219EXK |
| 5 | 8 | 4 | 107.0 | 158.0 | 2.0 | 0.28 | 2.38 | 3.55 | 2.33 | 4.35 | 22219AEX | 22219AEXK |
| 5 | 10 | 4 | 107.0 | 158.0 | 2.0 | 0.30 | 2.24 | 3.34 | 2.19 | 5.46 | 23219E | 23219EK |
| 4 | 8 | 6 | 109.0 | 186.0 | 2.5 | 0.23 | 2.92 | 4.35 | 2.86 | 7.10 | 21319EX1 | 21319EX1K |
| 4 | 8 | 6 | 109.0 | 186.0 | 2.5 | 0.27 | 2.54 | 3.79 | 2.49 | 7.44 | 21319AX | 21319AXK |
| 6 | 12 | 6 | 109.0 | 186.0 | 2.5 | 0.33 | 2.02 | 3.00 | 1.97 | 10.2 | 22319EX | 22319EXK |
| 6 | 12 | 6 | 109.0 | 186.0 | 2.5 | 0.39 | 1.74 | 2.59 | 1.70 | 10.3 | 22319AEX | 22319AEXK |

Spherical Roller Bearings

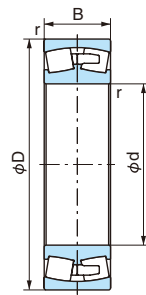
Bore Diameter : 100 ~ 120mm



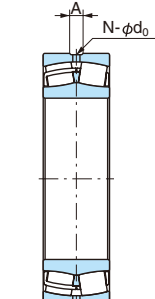
Cylindrical bore



Tapered bore



With machined brass cage

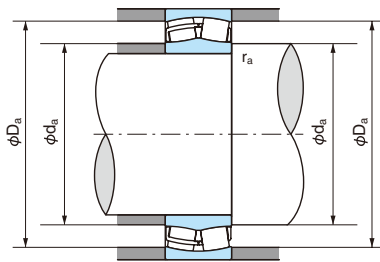


With oil holes / oil groove (W33)

1N=0.102kgf

| Boundary dimensions (mm) | | | | Bearing No. | | Basic dynamic load rating Cr (N) | Basic static load rating Cor (N) | Limiting speed (min ⁻¹) | |
|--------------------------|-----|------|----------|------------------|--------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------|
| d | D | B | r (min) | Cylindrical bore | Tapered bore | | | Grease lubrication | Oil lubrication |
| 100 | 140 | 30 | 1.1 | 23920E | 23920EK | 197000 | 233000 | 2300 | 3000 |
| | 150 | 37 | 1.5 | 23020E | 23020EK | 286000 | 325000 | 2200 | 2800 |
| | 150 | 37 | 1.5 | 23020AX | 23020AXK | 267000 | 298000 | 2800 | 3600 |
| | 165 | 52 | 2 | 23120EX1 | 23120EX1K | 450000 | 500000 | 1700 | 2600 |
| | 165 | 52 | 2 | 23120AX | 23120AXK | 450000 | 538000 | 2200 | 3000 |
| | 180 | 46 | 2.1 | 22220EX | 22220EXK | 520000 | 480000 | 2800 | 3600 |
| | 180 | 46 | 2.1 | 22220AEX | 22220AEXK | 465000 | 410000 | 2500 | 3200 |
| | 180 | 60.3 | 2.1 | 23220EX1 | 23220EX1K | 595000 | 629000 | 1900 | 2500 |
| | 180 | 60.3 | 2.1 | 23220AX | 23220AXK | 575000 | 599000 | 2100 | 2800 |
| | 215 | 47 | 3 | 21320EX1 | 21320EX1K | 580000 | 524000 | 1600 | 2200 |
| | 215 | 47 | 3 | 21320AX | 21320AXK | 545000 | 488000 | 2200 | 2800 |
| | 215 | 73 | 3 | 22320EX | 22320EXK | 975000 | 875000 | 2000 | 2600 |
| | 215 | 73 | 3 | 22320AEX | 22320AEXK | 890000 | 775000 | 2200 | 2800 |
| | 110 | 170 | 45 | 2 | 23022E | 23022EK | 415000 | 475000 | 2000 |
| 170 | | 45 | 2 | 23022AX | 23022AXK | 415000 | 478000 | 2500 | 3200 |
| 180 | | 56 | 2 | 23122EX1 | 23122EX1K | 540000 | 610000 | 1800 | 2400 |
| 180 | | 56 | 2 | 23122AX | 23122AXK | 535000 | 605000 | 2000 | 2700 |
| 180 | | 69 | 2 | 24122EX1 | 24122EX1K30 | 633000 | 743000 | 1800 | 2400 |
| 180 | | 69 | 2 | 24122AX | 24122AXK30 | 620000 | 654000 | 1800 | 2400 |
| 200 | | 53 | 2.1 | 22222EX | 22222EXK | 680000 | 640000 | 2600 | 3200 |
| 200 | | 53 | 2.1 | 22222AEX | 22222AEXK | 605000 | 550000 | 2200 | 2900 |
| 200 | | 69.8 | 2.1 | 23222EX1 | 23222EX1K | 750000 | 793000 | 1700 | 2200 |
| 200 | | 69.8 | 2.1 | 23222AX | 23222AXK | 740000 | 801000 | 1900 | 2500 |
| 240 | | 50 | 3 | 21322EX1 | 21322EX1K | 675000 | 635000 | 1400 | 1900 |
| 240 | | 50 | 3 | 21322AX | 21322AXK | 655000 | 601000 | 2000 | 2500 |
| 240 | | 80 | 3 | 22322EX | 22322EXK | 1150000 | 1040000 | 1900 | 2400 |
| 240 | | 80 | 3 | 22322AEX | 22322AEXK | 1150000 | 940000 | 2000 | 2500 |
| 120 | 180 | 46 | 2 | 23024E | 23024EK | 430000 | 515000 | 1800 | 2200 |
| | 180 | 46 | 2 | 23024AX | 23024AXK | 430000 | 516000 | 2300 | 3000 |
| | 180 | 60 | 2 | 24024EX1 | 24024EX1K30 | 540000 | 683000 | 1700 | 2300 |
| | 180 | 60 | 2 | 24024AX | 24024AXK30 | 540000 | 627000 | 1700 | 2300 |
| | 200 | 62 | 2 | 23124EX1 | 23124EX1K | 675000 | 720000 | 1600 | 2200 |
| | 200 | 62 | 2 | 23124AX | 23124AXK | 645000 | 734000 | 1800 | 2400 |
| | 200 | 80 | 2 | 24124EX1 | 24124EX1K30 | 815000 | 970000 | 1600 | 2200 |
| | 200 | 80 | 2 | 24124AX | 24124AXK30 | 780000 | 850000 | 1600 | 2200 |
| | 215 | 58 | 2.1 | 22224EX | 22224EXK | 785000 | 765000 | 2400 | 3000 |
| | 215 | 58 | 2.1 | 22224AEX | 22224AEXK | 700000 | 650000 | 2100 | 2700 |
| | 215 | 76 | 2.1 | 23224EX1 | 23224EX1K | 860000 | 956000 | 1500 | 2100 |
| | 215 | 76 | 2.1 | 23224AX | 23224AXK | 860000 | 962000 | 1700 | 2300 |
| | 260 | 55 | 3 | 21324E | 21324EK | 790000 | 765000 | 1300 | 1600 |
| | 260 | 86 | 3 | 22324EX | 22324EXK | 1250000 | 1130000 | 1700 | 2200 |
| 260 | 86 | 3 | 22324AEX | 22324AEXK | 1180000 | 1040000 | 1800 | 2300 | |

Note: Suffix K or K30 means tapered bore (1/12 or 1/30).



• Dynamic equivalent radial load

$$Pr = XFr + YFa$$

| $\frac{Fa}{Fr} \leq e$ | | $\frac{Fa}{Fr} > e$ | |
|------------------------|-------|---------------------|-------|
| X | Y | X | Y |
| 1 | Y_1 | 0.67 | Y_2 |

Values of Y_1 , Y_2 and e from table.

• Static equivalent radial load

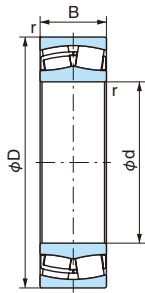
$$Por = Fr + Y_0Fa$$

Values Y_0 from table.

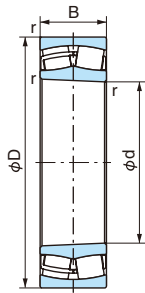
| Dimensions of lubrication holes and grooves | | | Abutment and fillet dimensions (mm) | | | Constant e | Axial load factor | | | Mass (kg) Cylindrical bore (Reference) | Bearing No. | |
|---|------------------|----------------|-------------------------------------|-------------|-------------|--------------|-------------------|-------|-------|--|------------------|--------------|
| Hole diameter d_o | Groove width A | Hole count N | d_a (min) | D_a (max) | r_a (max) | | Y_1 | Y_2 | Y_0 | | Cylindrical bore | Tapered bore |
| 3 | 8 | 4 | 107.0 | 133.0 | 1.0 | 0.20 | 3.42 | 5.08 | 3.34 | 1.46 | 23920E | 23920EK |
| 4 | 7 | 4 | 117.0 | 141.0 | 1.5 | 0.22 | 3.01 | 4.48 | 2.94 | 2.33 | 23020E | 23020EK |
| 4 | 7 | 4 | 117.0 | 141.0 | 1.5 | 0.26 | 2.64 | 3.93 | 2.58 | 2.40 | 23020AX | 23020AXK |
| 5 | 9 | 4 | 110.0 | 155.0 | 2.0 | 0.29 | 2.33 | 3.47 | 2.28 | 4.49 | 23120EX1 | 23120EX1K |
| 5 | 9 | 4 | 110.0 | 155.0 | 2.0 | 0.34 | 1.98 | 2.94 | 1.93 | 4.70 | 23120AX | 23120AXK |
| 5 | 8 | 4 | 112.0 | 168.0 | 2.0 | 0.25 | 2.74 | 4.08 | 2.68 | 5.10 | 22220EX | 22220EXK |
| 5 | 8 | 4 | 112.0 | 168.0 | 2.0 | 0.29 | 2.37 | 3.52 | 2.31 | 5.24 | 22220AEX | 22220AEXK |
| 5 | 10 | 4 | 112.0 | 168.0 | 2.0 | 0.32 | 2.09 | 3.11 | 2.04 | 6.76 | 23220EX1 | 23220EX1K |
| 5 | 10 | 4 | 112.0 | 168.0 | 2.0 | 0.36 | 1.88 | 2.80 | 1.84 | 6.88 | 23220AX | 23220AXK |
| 4 | 8 | 6 | 114.0 | 201.0 | 2.5 | 0.22 | 3.02 | 4.49 | 2.95 | 8.70 | 21320EX1 | 21320EX1K |
| 4 | 8 | 6 | 114.0 | 201.0 | 2.5 | 0.26 | 2.62 | 3.91 | 2.57 | 9.06 | 21320AX | 21320AXK |
| 6 | 12 | 6 | 114.0 | 201.0 | 2.5 | 0.35 | 1.95 | 2.90 | 1.91 | 13.1 | 22320EX | 22320EXK |
| 6 | 12 | 6 | 114.0 | 201.0 | 2.5 | 0.39 | 1.72 | 2.57 | 1.69 | 13.2 | 22320AEX | 22320AEXK |
| 5 | 9 | 4 | 120.0 | 160.0 | 2.0 | 0.24 | 2.84 | 4.23 | 2.78 | 3.84 | 23022E | 23022EK |
| 5 | 9 | 4 | 120.0 | 160.0 | 2.0 | 0.28 | 2.42 | 3.61 | 2.37 | 3.90 | 23022AX | 23022AXK |
| 5 | 9 | 4 | 120.0 | 170.0 | 2.0 | 0.29 | 2.36 | 3.51 | 2.31 | 5.70 | 23122EX1 | 23122EX1K |
| 5 | 9 | 4 | 120.0 | 170.0 | 2.0 | 0.33 | 2.04 | 3.03 | 1.99 | 5.80 | 23122AX | 23122AXK |
| 6 | 11 | 4 | 120.0 | 170.0 | 2.0 | 0.37 | 1.84 | 2.74 | 1.80 | 6.89 | 24122EX1 | 24122EX1K30 |
| 6 | 11 | 4 | 120.0 | 170.0 | 2.0 | 0.37 | 1.80 | 2.69 | 1.76 | 6.85 | 24122AX | 24122AXK30 |
| 5 | 10 | 6 | 122.0 | 188.0 | 2.0 | 0.26 | 2.64 | 3.93 | 2.58 | 7.36 | 22222EX | 22222EXK |
| 6 | 10 | 6 | 122.0 | 188.0 | 2.0 | 0.29 | 2.31 | 3.44 | 2.26 | 7.53 | 22222AEX | 22222AEXK |
| 6 | 11 | 6 | 122.0 | 188.0 | 2.0 | 0.34 | 1.99 | 2.96 | 1.94 | 9.60 | 23222EX1 | 23222EX1K |
| 6 | 11 | 6 | 122.0 | 188.0 | 2.0 | 0.38 | 1.78 | 2.65 | 1.74 | 10.0 | 23222AX | 23222AXK |
| 4 | 8 | 6 | 124.0 | 226.0 | 2.5 | 0.21 | 3.19 | 4.75 | 3.12 | 11.6 | 21322EX1 | 21322EX1K |
| 4 | 8 | 6 | 124.0 | 226.0 | 2.5 | 0.24 | 2.78 | 4.14 | 2.72 | 12.2 | 21322AX | 21322AXK |
| 6 | 12 | 6 | 124.0 | 226.0 | 2.5 | 0.33 | 2.03 | 3.02 | 1.98 | 18.1 | 22322EX | 22322EXK |
| 6 | 12 | 6 | 124.0 | 226.0 | 2.5 | 0.38 | 1.77 | 2.63 | 1.73 | 18.2 | 22322AEX | 22322AEXK |
| 5 | 9 | 4 | 130.0 | 170.0 | 2.0 | 0.23 | 2.95 | 4.39 | 2.89 | 4.20 | 23024E | 23024EK |
| 5 | 9 | 4 | 130.0 | 170.0 | 2.0 | 0.27 | 2.52 | 3.76 | 2.47 | 4.20 | 23024AX | 23024AXK |
| 5 | 9 | 4 | 130.0 | 170.0 | 2.0 | 0.30 | 2.23 | 3.32 | 2.18 | 5.36 | 24024EX1 | 24024EX1K30 |
| 5 | 9 | 4 | 130.0 | 170.0 | 2.0 | 0.31 | 2.21 | 3.29 | 2.16 | 5.26 | 24024AX | 24024AXK30 |
| 5 | 9 | 6 | 130.0 | 190.0 | 2.0 | 0.29 | 2.34 | 3.49 | 2.29 | 7.90 | 23124EX1 | 23124EX1K |
| 5 | 9 | 6 | 130.0 | 190.0 | 2.0 | 0.34 | 2.00 | 2.99 | 1.96 | 8.10 | 23124AX | 23124AXK |
| 6 | 11 | 6 | 130.0 | 190.0 | 2.0 | 0.38 | 1.78 | 2.65 | 1.74 | 10.1 | 24124EX1 | 24124EX1K30 |
| 6 | 11 | 6 | 130.0 | 190.0 | 2.0 | 0.39 | 1.73 | 2.58 | 1.69 | 9.90 | 24124AX | 24124AXK30 |
| 5 | 10 | 6 | 132.0 | 203.0 | 2.0 | 0.26 | 2.60 | 3.87 | 2.54 | 9.28 | 22224EX | 22224EXK |
| 5 | 10 | 6 | 132.0 | 203.0 | 2.0 | 0.30 | 2.28 | 3.40 | 2.23 | 9.35 | 22224AEX | 22224AEXK |
| 6 | 13 | 6 | 132.0 | 203.0 | 2.0 | 0.34 | 1.97 | 2.94 | 1.93 | 12.0 | 23224EX1 | 23224EX1K |
| 6 | 13 | 6 | 132.0 | 203.0 | 2.0 | 0.39 | 1.73 | 2.57 | 1.69 | 12.3 | 23224AX | 23224AXK |
| 5 | 12 | 6 | 134.0 | 246.0 | 2.5 | 0.21 | 3.17 | 4.72 | 3.10 | 15.3 | 21324E | 21324EK |
| 8 | 14 | 6 | 134.0 | 246.0 | 2.5 | 0.33 | 2.03 | 3.02 | 1.98 | 22.6 | 22324EX | 22324EXK |
| 8 | 14 | 6 | 134.0 | 246.0 | 2.5 | 0.38 | 1.77 | 2.64 | 1.73 | 22.2 | 22324AEX | 22324AEXK |

Spherical Roller Bearings

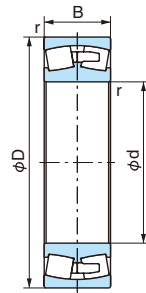
Bore Diameter : 130 ~ 150mm



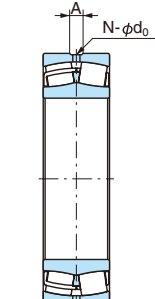
Cylindrical bore



Tapered bore



With machined brass cage

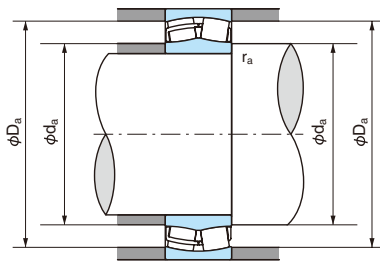


With oil holes / oil groove (W33)

1N=0.102kgf

| Boundary dimensions (mm) | | | | Bearing No. | | Basic dynamic load rating Cr (N) | Basic static load rating Cor (N) | Limiting speed (min ⁻¹) | |
|--------------------------|-----|-----|---------|------------------|--------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------|
| d | D | B | r (min) | Cylindrical bore | Tapered bore | | | Grease lubrication | Oil lubrication |
| 130 | 180 | 37 | 1.5 | 23926E | 23926EK | 284000 | 355000 | 1800 | 2300 |
| | 200 | 52 | 2 | 23026E | 23026EK | 555000 | 660000 | 1700 | 2000 |
| | 200 | 52 | 2 | 23026AX | 23026AXK | 560000 | 664000 | 2100 | 2700 |
| | 200 | 69 | 2 | 24026EX1 | 24026EX1K30 | 710000 | 900000 | 1600 | 2100 |
| | 200 | 69 | 2 | 24026AX | 24026AXK30 | 680000 | 803000 | 1600 | 2100 |
| | 210 | 64 | 2 | 23126EX1 | 23126EX1K | 690000 | 799000 | 1500 | 2000 |
| | 210 | 64 | 2 | 23126AX | 23126AXK | 705000 | 827000 | 1700 | 2200 |
| | 210 | 80 | 2 | 24126EX1 | 24126EX1K30 | 840000 | 1030000 | 1500 | 2000 |
| | 210 | 80 | 2 | 24126AX | 24126AXK30 | 815000 | 918000 | 1500 | 2000 |
| | 230 | 64 | 3 | 22226EX | 22226EXK | 910000 | 915000 | 2200 | 2600 |
| | 230 | 64 | 3 | 22226AEX | 22226AEXK | 815000 | 765000 | 1900 | 2500 |
| | 230 | 80 | 3 | 23226EX1 | 23226EX1K | 980000 | 1090000 | 1400 | 1900 |
| | 230 | 80 | 3 | 23226AX | 23226AXK | 965000 | 1070000 | 1600 | 2100 |
| | 280 | 93 | 4 | 22326EX | 22326EXK | 1450000 | 1340000 | 1300 | 1700 |
| | 280 | 93 | 4 | 22326AEX | 22326AEXK | 1370000 | 1220000 | 1700 | 2200 |
| | 140 | 190 | 37 | 1.5 | 23928AX | 23928AXK | 345000 | 466000 | 1700 |
| 210 | | 53 | 2 | 23028E | 23028EK | 585000 | 710000 | 1600 | 1900 |
| 210 | | 53 | 2 | 23028AX | 23028AXK | 580000 | 711000 | 2000 | 2600 |
| 210 | | 69 | 2 | 24028EX1 | 24028EX1K30 | 720000 | 920000 | 1500 | 2000 |
| 210 | | 69 | 2 | 24028AX | 24028AXK30 | 720000 | 819000 | 1500 | 2000 |
| 225 | | 68 | 2.1 | 23128EX1 | 23128EX1K | 790000 | 940000 | 1400 | 1900 |
| 225 | | 68 | 2.1 | 23128AX | 23128AXK | 790000 | 934000 | 1500 | 2100 |
| 225 | | 85 | 2.1 | 24128EX1 | 24128EX1K30 | 950000 | 1180000 | 1400 | 1900 |
| 225 | | 85 | 2.1 | 24128AX | 24128AXK30 | 930000 | 1030000 | 1400 | 1900 |
| 250 | | 68 | 3 | 22228EX | 22228EXK | 1050000 | 1030000 | 1400 | 1700 |
| 250 | | 68 | 3 | 22228AEX | 22228AEXK | 945000 | 890000 | 1800 | 2300 |
| 250 | | 88 | 3 | 23228EX1 | 23228EX1K | 1130000 | 1290000 | 1300 | 1700 |
| 250 | | 88 | 3 | 23228AX | 23228AXK | 1120000 | 1270000 | 1500 | 1900 |
| 300 | | 102 | 4 | 22328E | 22328EK | 1540000 | 1520000 | 1100 | 1500 |
| 300 | | 102 | 4 | 22328A2X | 22328A2XK | 1560000 | 1540000 | 1500 | 2000 |
| 150 | | 210 | 45 | 2 | 23930AX | 23930AXK | 465000 | 622000 | 1600 |
| | 225 | 56 | 2.1 | 23030E | 23030EK | 640000 | 790000 | 1400 | 1800 |
| | 225 | 56 | 2.1 | 23030AX | 23030AXK | 640000 | 791000 | 1800 | 2400 |
| | 225 | 72 | 2.1 | 24030EX1 | 24030EX1K30 | 815000 | 1060000 | 1400 | 1800 |
| | 225 | 75 | 2.1 | 24030AX | 24030AXK30 | 815000 | 924000 | 1400 | 1800 |
| | 250 | 80 | 2.1 | 23130EX1 | 23130EX1K | 1000000 | 1230000 | 1300 | 1700 |
| | 250 | 80 | 2.1 | 23130AX | 23130AXK | 1030000 | 1310000 | 1400 | 1900 |
| | 250 | 100 | 2.1 | 24130EX1 | 24130EX1K | 1230000 | 1520000 | 1300 | 1700 |
| | 250 | 100 | 2.1 | 24130AX | 24130AXK30 | 1120000 | 1340000 | 1300 | 1700 |
| | 270 | 73 | 3 | 22230EX | 22230EXK | 1200000 | 1200000 | 1300 | 1600 |
| | 270 | 73 | 3 | 22230AEX | 22230AEXK | 1060000 | 1020000 | 1600 | 2100 |
| | 270 | 96 | 3 | 23230EX1 | 23230EX1K | 1340000 | 1540000 | 1200 | 1600 |
| | 270 | 96 | 3 | 23230AX | 23230AXK | 1320000 | 1530000 | 1300 | 1800 |
| | 320 | 108 | 4 | 22330E | 22330EK | 1770000 | 1740000 | 1100 | 1400 |
| | 320 | 108 | 4 | 22330A2X | 22330A2XK | 1720000 | 1710000 | 1400 | 1900 |

Note: Suffix K or K30 means tapered bore (1/12 or 1/30).



• Dynamic equivalent radial load
 $P_r = XFr + YFa$

| $\frac{Fa}{Fr} \leq e$ | | $\frac{Fa}{Fr} > e$ | |
|------------------------|-------|---------------------|-------|
| X | Y | X | Y |
| 1 | Y_1 | 0.67 | Y_2 |

Values of Y_1 , Y_2 and e from table.

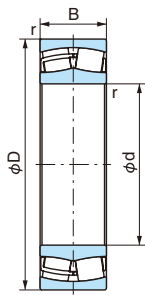
• Static equivalent radial load
 $P_0 = Fr + Y_0 Fa$

Values Y_0 from table.

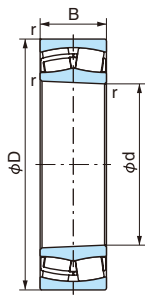
| Dimensions of lubrication holes and grooves | | | Abutment and fillet dimensions (mm) | | | Constant e | Axial load factor | | | Mass (kg) Cylindrical bore (Reference) | Bearing No. | |
|---|-------------------|-----------------|-------------------------------------|----------------|----------------|------------|-------------------|-------|-------|--|------------------|--------------|
| Hole diameter d_o | Groove width A | Hole count N | d_a (min) | D_a (max) | r_a (max) | | Y_1 | Y_2 | Y_0 | | Cylindrical bore | Tapered bore |
| 4 | 8 | 4 | 138.5 | 171.5 | 1.5 | 0.18 | 3.66 | 5.46 | 3.58 | 2.87 | 23926E | 23926EK |
| 5 | 10 | 6 | 140.0 | 190.0 | 2.0 | 0.24 | 2.87 | 4.27 | 2.80 | 6.14 | 23026E | 23026EK |
| 5 | 10 | 6 | 140.0 | 190.0 | 2.0 | 0.27 | 2.50 | 3.72 | 2.44 | 6.10 | 23026AX | 23026AXK |
| 6 | 11 | 6 | 140.0 | 190.0 | 2.0 | 0.32 | 2.14 | 3.18 | 2.09 | 7.93 | 24026EX1 | 24026EX1K30 |
| 6 | 11 | 6 | 140.0 | 190.0 | 2.0 | 0.33 | 2.04 | 3.04 | 2.00 | 7.77 | 24026AX | 24026AXK30 |
| 5 | 9 | 6 | 140.0 | 200.0 | 2.0 | 0.28 | 2.42 | 3.61 | 2.37 | 8.60 | 23126EX1 | 23126EX1K |
| 5 | 9 | 6 | 140.0 | 200.0 | 2.0 | 0.30 | 2.25 | 3.34 | 2.20 | 8.90 | 23126AX | 23126AXK |
| 6 | 11 | 6 | 140.0 | 200.0 | 2.0 | 0.36 | 1.90 | 2.83 | 1.86 | 10.7 | 24126EX1 | 24126EX1K30 |
| 6 | 11 | 6 | 140.0 | 200.0 | 2.0 | 0.37 | 1.83 | 2.72 | 1.79 | 10.5 | 24126AX | 24126AXK30 |
| 5 | 10 | 6 | 144.0 | 216.0 | 2.5 | 0.26 | 2.55 | 3.80 | 2.50 | 11.6 | 22226EX | 22226EXK |
| 5 | 10 | 6 | 144.0 | 216.0 | 2.5 | 0.30 | 2.22 | 3.30 | 2.17 | 11.6 | 22226AEX | 22226AEXK |
| 6 | 13 | 6 | 144.0 | 216.0 | 2.5 | 0.33 | 2.05 | 3.05 | 2.00 | 14.2 | 23226EX1 | 23226EX1K |
| 6 | 13 | 6 | 144.0 | 216.0 | 2.5 | 0.38 | 1.78 | 2.65 | 1.74 | 14.5 | 23226AX | 23226AXK |
| 8 | 16 | 6 | 148.0 | 262.0 | 3.0 | 0.33 | 2.03 | 3.02 | 1.98 | 28.4 | 22326EX | 22326EXK |
| 8 | 16 | 6 | 148.0 | 262.0 | 3.0 | 0.38 | 1.77 | 2.64 | 1.73 | 27.3 | 22326AEX | 22326AEXK |
| 4 | 7 | 6 | 148.5 | 181.5 | 1.5 | 0.18 | 3.79 | 5.65 | 3.71 | 3.13 | 23928AX | 23928AXK |
| 5 | 10 | 6 | 150.0 | 200.0 | 2.0 | 0.23 | 2.98 | 4.44 | 2.91 | 6.61 | 23028E | 23028EK |
| 5 | 10 | 6 | 150.0 | 200.0 | 2.0 | 0.25 | 2.75 | 4.10 | 2.69 | 6.70 | 23028AX | 23028AXK |
| 6 | 11 | 6 | 150.0 | 200.0 | 2.0 | 0.30 | 2.28 | 3.39 | 2.23 | 8.40 | 24028EX1 | 24028EX1K30 |
| 6 | 11 | 6 | 150.0 | 200.0 | 2.0 | 0.31 | 2.15 | 3.20 | 2.10 | 8.22 | 24028AX | 24028AXK30 |
| 6 | 11 | 6 | 152.0 | 213.0 | 2.0 | 0.28 | 2.45 | 3.65 | 2.40 | 10.5 | 23128EX1 | 23128EX1K |
| 6 | 11 | 6 | 152.0 | 213.0 | 2.0 | 0.30 | 2.27 | 3.37 | 2.22 | 10.8 | 23128AX | 23128AXK |
| 8 | 14 | 6 | 152.0 | 213.0 | 2.0 | 0.36 | 1.87 | 2.79 | 1.83 | 13.0 | 24128EX1 | 24128EX1K30 |
| 8 | 14 | 6 | 152.0 | 213.0 | 2.0 | 0.36 | 1.87 | 2.79 | 1.83 | 12.7 | 24128AX | 24128AXK30 |
| 6 | 12 | 6 | 154.0 | 236.0 | 2.5 | 0.26 | 2.60 | 3.87 | 2.54 | 13.9 | 22228EX | 22228EXK |
| 6 | 12 | 6 | 154.0 | 236.0 | 2.5 | 0.30 | 2.26 | 3.37 | 2.21 | 14.8 | 22228AEX | 22228AEXK |
| 8 | 15 | 6 | 154.0 | 236.0 | 2.5 | 0.34 | 1.99 | 2.96 | 1.95 | 18.8 | 23228EX1 | 23228EX1K |
| 8 | 16 | 6 | 154.0 | 236.0 | 2.5 | 0.38 | 1.78 | 2.65 | 1.74 | 19.3 | 23228AX | 23228AXK |
| 10 | 22 | 6 | 158.0 | 282.0 | 3.0 | 0.37 | 1.82 | 2.72 | 1.78 | 35.9 | 22328E | 22328EK |
| 10 | 22 | 6 | 158.0 | 282.0 | 3.0 | 0.40 | 1.69 | 2.52 | 1.65 | 34.5 | 22328A2X | 22328A2XK |
| 5 | 9 | 6 | 200.0 | 160.0 | 2.0 | 0.20 | 3.44 | 5.12 | 3.36 | 5.01 | 23930AX | 23930AXK |
| 5 | 11 | 6 | 162.0 | 213.0 | 2.0 | 0.22 | 3.04 | 4.53 | 2.97 | 8.01 | 23030E | 23030EK |
| 5 | 11 | 6 | 162.0 | 213.0 | 2.0 | 0.24 | 2.79 | 4.16 | 2.73 | 8.20 | 23030AX | 23030AXK |
| 6 | 11 | 6 | 162.0 | 213.0 | 2.0 | 0.30 | 2.23 | 3.32 | 2.18 | 10.5 | 24030EX1 | 24030EX1K |
| 6 | 11 | 6 | 162.0 | 213.0 | 2.0 | 0.32 | 2.10 | 3.13 | 2.06 | 10.4 | 24030AX | 24030AXK30 |
| 6 | 13 | 6 | 162.0 | 238.0 | 2.0 | 0.30 | 2.24 | 3.34 | 2.19 | 16.2 | 23130EX1 | 23130EX1K |
| 6 | 13 | 6 | 162.0 | 238.0 | 2.0 | 0.35 | 1.95 | 2.91 | 1.91 | 16.7 | 23130AX | 23130AXK |
| 8 | 14 | 6 | 162.0 | 238.0 | 2.0 | 0.38 | 1.77 | 2.64 | 1.73 | 19.6 | 24130EX1 | 24130EX1K |
| 8 | 14 | 6 | 162.0 | 238.0 | 2.0 | 0.38 | 1.76 | 2.62 | 1.72 | 19.5 | 24130AX | 24130AXK30 |
| 6 | 14 | 6 | 164.0 | 256.0 | 2.5 | 0.25 | 2.69 | 4.00 | 2.63 | 18.9 | 22230EX | 22230EXK |
| 6 | 14 | 6 | 164.0 | 256.0 | 2.5 | 0.29 | 2.30 | 3.42 | 2.25 | 18.1 | 22230AEX | 22230AEXK |
| 8 | 15 | 6 | 164.0 | 256.0 | 2.5 | 0.34 | 1.96 | 2.93 | 1.92 | 24.2 | 23230EX1 | 23230EX1K |
| 8 | 15 | 6 | 164.0 | 256.0 | 2.5 | 0.40 | 1.70 | 2.53 | 1.66 | 24.8 | 23230AX | 23230AXK |
| 10 | 22 | 6 | 168.0 | 302.0 | 3.0 | 0.37 | 1.82 | 2.70 | 1.78 | 43.3 | 22330E | 22330EK |
| 10 | 22 | 6 | 168.0 | 302.0 | 3.0 | 0.40 | 1.67 | 2.49 | 1.63 | 41.5 | 22330A2X | 22330A2XK |

Spherical Roller Bearings

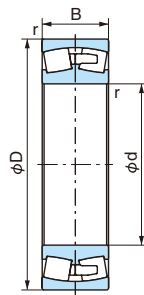
Bore Diameter : 160 ~ 170mm



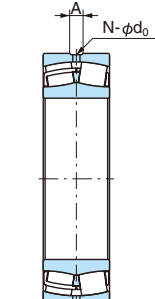
Cylindrical bore



Tapered bore



With machined brass cage

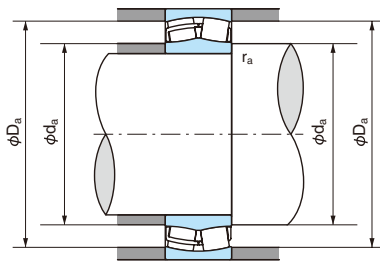


With oil holes / oil groove (W33)

1N=0.102kgf

| Boundary dimensions (mm) | | | | Bearing No. | | Basic dynamic load rating Cr (N) | Basic static load rating Cor (N) | Limiting speed (min ⁻¹) | |
|--------------------------|-----|-----|---------|------------------|--------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------|
| d | D | B | r (min) | Cylindrical bore | Tapered bore | | | Grease lubrication | Oil lubrication |
| 160 | 220 | 45 | 2 | 23932AX | 23932AXK | 475000 | 649000 | 1500 | 1900 |
| | 240 | 60 | 2.1 | 23032E | 23032EK | 735000 | 915000 | 1300 | 1700 |
| | 240 | 60 | 2.1 | 23032AX | 23032AXK | 735000 | 917000 | 1700 | 2200 |
| | 240 | 80 | 2.1 | 24032EX1 | 24032EX1K30 | 950000 | 1280000 | 1300 | 1700 |
| | 240 | 80 | 2.1 | 24032AX | 24032AXK30 | 915000 | 1110000 | 1300 | 1700 |
| | 270 | 86 | 2.1 | 23132EX1 | 23132EX1K | 1180000 | 1430000 | 1200 | 1600 |
| | 270 | 86 | 2.1 | 23132AX | 23132AXK | 1200000 | 1460000 | 1300 | 1700 |
| | 270 | 109 | 2.1 | 24132EX1 | 24132EX1K30 | 1450000 | 1810000 | 1200 | 1600 |
| | 270 | 109 | 2.1 | 24132AX | 24132AXK30 | 1340000 | 1610000 | 1200 | 1600 |
| | 290 | 80 | 3 | 22232E | 22232EK | 1230000 | 1330000 | 1200 | 1500 |
| | 290 | 80 | 3 | 22232E2 | 22232E2K | 1230000 | 1320000 | 1200 | 1600 |
| | 290 | 80 | 3 | 22232A2X | 22232A2XK | 1210000 | 1300000 | 1500 | 2000 |
| | 290 | 104 | 3 | 23232E | 23232EK | 1500000 | 1710000 | 900 | 1200 |
| | 290 | 104 | 3 | 23232A2X | 23232A2XK | 1460000 | 1650000 | 1300 | 1600 |
| 170 | 340 | 114 | 4 | 22332E | 22332EK | 1950000 | 1950000 | 1100 | 1300 |
| | 230 | 45 | 2 | 23934AX | 23934AXK | 490000 | 691000 | 1400 | 1800 |
| | 260 | 67 | 2.1 | 23034E | 23034EK | 880000 | 1080000 | 1200 | 1600 |
| | 260 | 67 | 2.1 | 23034AX | 23034AXK | 880000 | 1080000 | 1600 | 2100 |
| | 260 | 90 | 2.1 | 24034EX1 | 24034EX1K | 1120000 | 1480000 | 1200 | 1600 |
| | 260 | 90 | 2.1 | 24034AX | 24034AXK30 | 1030000 | 1320000 | 1200 | 1600 |
| | 280 | 88 | 2.1 | 23134EX1 | 23134EX1K | 1260000 | 1530000 | 1100 | 1500 |
| | 280 | 88 | 2.1 | 23134AX | 23134AXK | 1260000 | 1500000 | 1200 | 1500 |
| | 280 | 109 | 2.1 | 24134AX | 24134AXK30 | 1360000 | 1650000 | 1100 | 1500 |
| | 310 | 86 | 4 | 22234E | 22234EK | 1390000 | 1510000 | 1100 | 1300 |
| | 310 | 110 | 4 | 23234E | 23234EK | 1720000 | 1970000 | 900 | 1200 |
| | 310 | 110 | 4 | 23234A2X | 23234A2XK | 1680000 | 1910000 | 1200 | 1500 |
| | 360 | 120 | 4 | 22334E | 22334EK | 2150000 | 2200000 | 1000 | 1200 |

Note: Suffix K or K30 means tapered bore (1/12 or 1/30).



• Dynamic equivalent radial load
 $P_r = XFr + YFa$

| | | | |
|------------------------|-------|---------------------|-------|
| $\frac{Fa}{Fr} \leq e$ | | $\frac{Fa}{Fr} > e$ | |
| X | Y | X | Y |
| 1 | Y_1 | 0.67 | Y_2 |

Values of Y_1 , Y_2 and e from table.

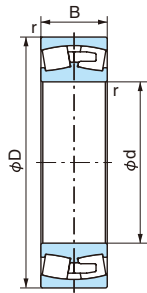
• Static equivalent radial load
 $P_{0r} = Fr + Y_0 Fa$

Values Y_0 from table.

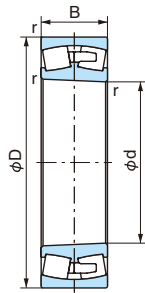
| Dimensions of lubrication holes and grooves | | | Abutment and fillet dimensions (mm) | | | Constant e | Axial load factor | | | Mass (kg) Cylindrical bore (Reference) | Bearing No. | |
|---|----------------|--------------|-------------------------------------|----------|----------|------------|-------------------|-------|-------|--|------------------|--------------|
| Hole diameter do | Groove width A | Hole count N | da (min) | Da (max) | ra (max) | | Y_1 | Y_2 | Y_0 | | Cylindrical bore | Tapered bore |
| 5 | 10 | 6 | 170.0 | 210.0 | 2.0 | 0.19 | 3.60 | 5.37 | 3.52 | 5.29 | 23932AX | 23932AXK |
| 5 | 11 | 6 | 172.0 | 228.0 | 2.0 | 0.22 | 3.01 | 4.48 | 2.94 | 9.74 | 23032E | 23032EK |
| 5 | 11 | 6 | 172.0 | 228.0 | 2.0 | 0.24 | 2.79 | 4.16 | 2.73 | 9.90 | 23032AX | 23032AXK |
| 6 | 11 | 6 | 172.0 | 228.0 | 2.0 | 0.30 | 2.24 | 3.34 | 2.19 | 12.7 | 24032EX1 | 24032EX1K30 |
| 6 | 11 | 6 | 172.0 | 228.0 | 2.0 | 0.32 | 2.12 | 3.15 | 2.07 | 12.4 | 24032AX | 24032AXK30 |
| 8 | 16 | 6 | 172.0 | 258.0 | 2.0 | 0.30 | 2.22 | 3.30 | 2.17 | 20.5 | 23132EX1 | 23132EX1K |
| 8 | 16 | 6 | 172.0 | 258.0 | 2.0 | 0.34 | 1.96 | 2.91 | 1.91 | 21.2 | 23132AX | 23132AXK |
| 10 | 17 | 6 | 172.0 | 258.0 | 2.0 | 0.39 | 1.74 | 2.59 | 1.70 | 25.5 | 24132EX1 | 24132EX1K30 |
| 10 | 17 | 6 | 172.0 | 258.0 | 2.0 | 0.39 | 1.74 | 2.59 | 1.70 | 25.5 | 24132AX | 24132AXK30 |
| 6 | 14 | 6 | 174.0 | 276.0 | 2.5 | 0.26 | 2.57 | 3.83 | 2.52 | 23.7 | 22232E | 22232EK |
| 6 | 14 | 6 | 174.0 | 276.0 | 2.5 | 0.28 | 2.37 | 3.53 | 2.32 | 24.0 | 22232E2 | 22232E2K |
| 6 | 14 | 6 | 174.0 | 276.0 | 2.5 | 0.31 | 2.20 | 3.27 | 2.15 | 23.8 | 22232A2X | 22232A2XK |
| 10 | 22 | 6 | 174.0 | 276.0 | 2.5 | 0.37 | 1.82 | 2.71 | 1.78 | 30.4 | 23232E | 23232EK |
| 10 | 22 | 6 | 174.0 | 276.0 | 2.5 | 0.39 | 1.72 | 2.56 | 1.68 | 30.7 | 23232A2X | 23232A2XK |
| 10 | 22 | 6 | 178.0 | 322.0 | 3.0 | 0.36 | 1.85 | 2.75 | 1.81 | 51.4 | 22332E | 22332EK |
| 5 | 10 | 6 | 180.0 | 220.0 | 2.0 | 0.18 | 3.78 | 5.63 | 3.70 | 5.58 | 23934AX | 23934AXK |
| 6 | 13 | 6 | 182.0 | 248.0 | 2.0 | 0.23 | 2.89 | 4.31 | 2.83 | 13.1 | 23034E | 23034EK |
| 6 | 13 | 6 | 182.0 | 248.0 | 2.0 | 0.27 | 2.51 | 3.74 | 2.45 | 13.1 | 23034AX | 23034AXK |
| 8 | 14 | 6 | 182.0 | 248.0 | 2.0 | 0.32 | 2.11 | 3.15 | 2.07 | 17.3 | 24034EX1 | 24034EX1K |
| 8 | 14 | 6 | 182.0 | 248.0 | 2.0 | 0.34 | 2.00 | 2.97 | 1.95 | 17.0 | 24034AX | 24034AXK30 |
| 8 | 16 | 6 | 182.0 | 268.0 | 2.0 | 0.29 | 2.30 | 3.43 | 2.25 | 21.6 | 23134EX1 | 23134EX1K |
| 8 | 16 | 6 | 182.0 | 268.0 | 2.0 | 0.34 | 2.01 | 3.00 | 1.97 | 22.2 | 23134AX | 23134AXK |
| 10 | 17 | 6 | 182.0 | 268.0 | 2.0 | 0.37 | 1.82 | 2.70 | 1.78 | 26.4 | 24134AX | 24134AXK30 |
| 8 | 18 | 6 | 188.0 | 292.0 | 3.0 | 0.29 | 2.33 | 3.47 | 2.28 | 30.0 | 22234E | 22234EK |
| 10 | 22 | 6 | 188.0 | 292.0 | 3.0 | 0.36 | 1.85 | 2.75 | 1.81 | 37.0 | 23234E | 23234EK |
| 10 | 22 | 6 | 188.0 | 292.0 | 3.0 | 0.39 | 1.71 | 2.54 | 1.67 | 37.6 | 23234A2X | 23234A2XK |
| 10 | 22 | 6 | 188.0 | 342.0 | 3.0 | 0.36 | 1.85 | 2.75 | 1.81 | 60.6 | 22334E | 22334EK |

Spherical Roller Bearings

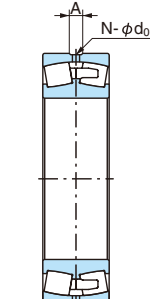
Bore Diameter : 180 ~ 220mm



Cylindrical bore



Tapered bore

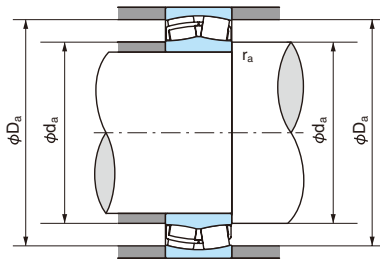


With oil holes / oil groove (W33)

1N=0.102kgf

| Boundary dimensions (mm) | | | | Bearing No. | | Basic dynamic load rating Cr (N) | Basic static load rating Cor (N) | Limiting speed (min ⁻¹) | | |
|--------------------------|-----|-----|---------|------------------|--------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------|------|
| d | D | B | r (min) | Cylindrical bore | Tapered bore | | | Grease lubrication | Oil lubrication | |
| 180 | 250 | 52 | 2 | 23936AX | 23936AXK | 665000 | 939000 | 1300 | 1700 | |
| | 280 | 74 | 2.1 | 23036E | 23036EK | 1070000 | 1330000 | 1200 | 1500 | |
| | 280 | 74 | 2.1 | 23036AX | 23036AXK | 1040000 | 1280000 | 1500 | 1900 | |
| | 280 | 100 | 2.1 | 24036EX1 | 24036EX1K | 1330000 | 1760000 | 1100 | 1400 | |
| | 280 | 100 | 2.1 | 24036AX | 24036AXK30 | 1230000 | 1580000 | 1100 | 1400 | |
| | 300 | 96 | 3 | 23136E | 23136EK | 1490000 | 1810000 | 900 | 1200 | |
| | 300 | 96 | 3 | 23136A2X | 23136A2XK | 1450000 | 1740000 | 1200 | 1500 | |
| | 300 | 118 | 3 | 24136E | 24136EK30 | 1640000 | 2040000 | 900 | 1200 | |
| | 320 | 86 | 4 | 22236E | 22236EK | 1460000 | 1610000 | 1100 | 1300 | |
| | 320 | 112 | 4 | 23236E | 23236EK | 1790000 | 2100000 | 850 | 1100 | |
| | 320 | 112 | 4 | 23236A2X | 23236A2XK | 1750000 | 2070000 | 1200 | 1500 | |
| | 380 | 126 | 4 | 22336E | 22336EK | 2380000 | 2400000 | 950 | 1200 | |
| | 190 | 260 | 52 | 2 | 23938AX | 23938AXK | 675000 | 969000 | 1200 | 1600 |
| | | 290 | 75 | 2.1 | 23038E | 23038EK | 1080000 | 1330000 | 1100 | 1400 |
| 290 | | 75 | 2.1 | 23038A2X | 23038A2XK | 1080000 | 1310000 | 1400 | 1900 | |
| 290 | | 100 | 2.1 | 24038E | 24038EK30 | 1420000 | 1920000 | 900 | 1200 | |
| 320 | | 104 | 3 | 23138E | 23138EK | 1720000 | 2120000 | 850 | 1100 | |
| 320 | | 104 | 3 | 23138A2X | 23138A2XK | 1710000 | 2090000 | 1100 | 1400 | |
| 320 | | 128 | 3 | 24138E | 24138EK30 | 1900000 | 2380000 | 850 | 1100 | |
| 340 | | 92 | 4 | 22238E | 22238EK | 1590000 | 1740000 | 1000 | 1200 | |
| 340 | | 120 | 4 | 23238E | 23238EK | 2070000 | 2450000 | 800 | 1000 | |
| 340 | | 120 | 4 | 23238A2X | 23238A2XK | 2000000 | 2370000 | 1100 | 1400 | |
| 400 | | 132 | 5 | 22338E | 22338EK | 2600000 | 2670000 | 900 | 1100 | |
| 200 | 280 | 60 | 2.1 | 23940AX | 23940AXK | 840000 | 1190000 | 1200 | 1500 | |
| | 310 | 82 | 2.1 | 23040E | 23040EK | 1270000 | 1560000 | 1000 | 1300 | |
| | 310 | 82 | 2.1 | 23040A2X | 23040A2XK | 1270000 | 1570000 | 1300 | 1700 | |
| | 310 | 109 | 2.1 | 24040E | 24040EK30 | 1640000 | 2230000 | 850 | 1100 | |
| | 340 | 112 | 3 | 23140E | 23140EK | 1950000 | 2390000 | 800 | 1000 | |
| | 340 | 112 | 3 | 23140A2X | 23140A2XK | 1900000 | 2330000 | 1100 | 1400 | |
| | 340 | 140 | 3 | 24140E | 24140EK30 | 2220000 | 2820000 | 800 | 1000 | |
| | 360 | 98 | 4 | 22240E | 22240EK | 1810000 | 1990000 | 950 | 1200 | |
| | 360 | 128 | 4 | 23240E | 23240EK | 2290000 | 2750000 | 800 | 1000 | |
| | 360 | 128 | 4 | 23240A2X | 23240A2XK | 2240000 | 2680000 | 1000 | 1300 | |
| 420 | 138 | 5 | 22340E | 22340EK | 2890000 | 3000000 | 850 | 1000 | | |
| 220 | 300 | 60 | 2.1 | 23944E | 23944EK | 840000 | 1190000 | 1000 | 1300 | |
| | 340 | 90 | 3 | 23044E | 23044EK | 1470000 | 1880000 | 950 | 1200 | |
| | 340 | 90 | 3 | 23044A2X | 23044A2XK | 1460000 | 1860000 | 1200 | 1600 | |
| | 340 | 118 | 3 | 24044E | 24044EK30 | 1950000 | 2670000 | 800 | 1000 | |
| | 370 | 120 | 4 | 23144E | 23144EK | 2250000 | 2870000 | 700 | 900 | |
| | 370 | 120 | 4 | 23144A2X | 23144A2XK | 2210000 | 2780000 | 1000 | 1200 | |
| | 370 | 150 | 4 | 24144E | 24144EK30 | 2530000 | 3250000 | 750 | 950 | |
| | 400 | 108 | 4 | 22244E | 22244EK | 2140000 | 2380000 | 850 | 1000 | |
| | 400 | 144 | 4 | 23244E | 23244EK | 2920000 | 3500000 | 670 | 850 | |
| 460 | 145 | 5 | 22344E | 22344EK | 3350000 | 3600000 | 750 | 950 | | |

Note: Suffix K or K30 means tapered bore (1/12 or 1/30).



• Dynamic equivalent radial load
 $P_r = XFr + YFa$

| $\frac{Fa}{Fr} \leq e$ | | $\frac{Fa}{Fr} > e$ | |
|------------------------|-------|---------------------|-------|
| X | Y | X | Y |
| 1 | Y_1 | 0.67 | Y_2 |

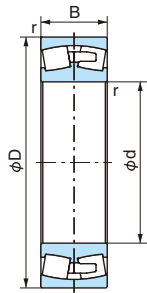
Values of Y_1 , Y_2 and e from table.

• Static equivalent radial load
 $P_0 = Fr + Y_0 Fa$
 Values Y_0 from table.

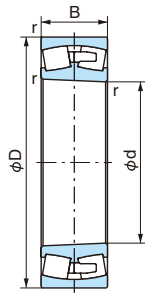
| Dimensions of lubrication holes and grooves | | | Abutment and fillet dimensions (mm) | | | Constant e | Axial load factor | | | Mass (kg) Cylindrical bore (Reference) | Bearing No. | |
|---|-------------------|-----------------|-------------------------------------|----------------|----------------|------------|-------------------|-------|-------|--|------------------|--------------|
| Hole diameter d_o | Groove width A | Hole count N | d_a (min) | D_a (max) | r_a (max) | | Y_1 | Y_2 | Y_0 | | Cylindrical bore | Tapered bore |
| 6 | 10 | 6 | 190.0 | 240.0 | 2.0 | 0.19 | 3.55 | 5.29 | 3.48 | 8.10 | 23936AX | 23936AXK |
| 8 | 15 | 6 | 192.0 | 268.0 | 2.0 | 0.24 | 2.84 | 4.23 | 2.78 | 17.4 | 23036E | 23036EK |
| 8 | 15 | 6 | 192.0 | 268.0 | 2.0 | 0.27 | 2.47 | 3.67 | 2.41 | 17.5 | 23036AX | 23036AXK |
| 8 | 16 | 6 | 192.0 | 268.0 | 2.0 | 0.33 | 2.04 | 3.03 | 1.99 | 22.7 | 24036EX1 | 24036EX1K |
| 8 | 16 | 6 | 192.0 | 268.0 | 2.0 | 0.32 | 2.12 | 3.15 | 2.07 | 22.5 | 24036AX | 24036AXK30 |
| 8 | 18 | 6 | 194.0 | 286.0 | 2.5 | 0.32 | 2.12 | 3.15 | 2.07 | 27.9 | 23136E | 23136EK |
| 8 | 18 | 6 | 194.0 | 286.0 | 2.5 | 0.33 | 2.04 | 3.04 | 2.00 | 28.2 | 23136A2X | 23136A2XK |
| 10 | 22 | 6 | 194.0 | 286.0 | 2.5 | 0.39 | 1.73 | 2.57 | 1.69 | 33.7 | 24136E | 24136EK30 |
| 8 | 18 | 6 | 198.0 | 302.0 | 3.0 | 0.28 | 2.43 | 3.61 | 2.37 | 30.9 | 22236E | 22236EK |
| 10 | 22 | 6 | 198.0 | 302.0 | 3.0 | 0.36 | 1.87 | 2.79 | 1.83 | 39.4 | 23236E | 23236EK |
| 10 | 22 | 6 | 198.0 | 302.0 | 3.0 | 0.39 | 1.75 | 2.61 | 1.71 | 39.0 | 23236A2X | 23236A2XK |
| 12 | 26 | 6 | 198.0 | 362.0 | 3.0 | 0.36 | 1.87 | 2.78 | 1.83 | 70.5 | 22336E | 22336EK |
| 6 | 10 | 6 | 200.0 | 250.0 | 2.0 | 0.18 | 3.69 | 5.50 | 3.61 | 8.46 | 23938AX | 23938AXK |
| 6 | 14 | 6 | 202.0 | 278.0 | 2.0 | 0.25 | 2.69 | 4.00 | 2.63 | 18.4 | 23038E | 23038EK |
| 6 | 14 | 6 | 202.0 | 278.0 | 2.0 | 0.26 | 2.55 | 3.80 | 2.50 | 17.8 | 23038A2X | 23038A2XK |
| 8 | 18 | 6 | 202.0 | 278.0 | 2.0 | 0.34 | 1.98 | 2.94 | 1.93 | 24.6 | 24038E | 24038EK30 |
| 10 | 22 | 6 | 204.0 | 306.0 | 2.5 | 0.32 | 2.09 | 3.11 | 2.04 | 35.0 | 23138E | 23138EK |
| 10 | 22 | 6 | 204.0 | 306.0 | 2.5 | 0.34 | 1.96 | 2.92 | 1.92 | 33.5 | 23138A2X | 23138A2XK |
| 12 | 26 | 6 | 204.0 | 306.0 | 2.5 | 0.40 | 1.68 | 2.50 | 1.64 | 42.0 | 24138E | 24138EK30 |
| 8 | 18 | 6 | 208.0 | 322.0 | 3.0 | 0.28 | 2.39 | 3.56 | 2.34 | 37.2 | 22238E | 22238EK |
| 10 | 22 | 6 | 208.0 | 322.0 | 3.0 | 0.36 | 1.87 | 2.79 | 1.83 | 48.0 | 23238E | 23238EK |
| 10 | 22 | 6 | 208.0 | 322.0 | 3.0 | 0.39 | 1.72 | 2.59 | 1.68 | 47.5 | 23238A2X | 23238A2XK |
| 12 | 26 | 6 | 212.0 | 378.0 | 4.0 | 0.36 | 1.89 | 2.81 | 1.85 | 81.8 | 22338E | 22338EK |
| 6 | 11 | 6 | 212.0 | 268.0 | 2.0 | 0.20 | 3.44 | 5.13 | 3.37 | 11.9 | 23940AX | 23940AXK |
| 8 | 18 | 6 | 212.0 | 298.0 | 2.0 | 0.26 | 2.64 | 3.93 | 2.58 | 23.4 | 23040E | 23040EK |
| 8 | 18 | 6 | 212.0 | 298.0 | 2.0 | 0.28 | 2.45 | 3.64 | 2.39 | 23.3 | 23040A2X | 23040A2XK |
| 10 | 22 | 6 | 212.0 | 298.0 | 2.0 | 0.35 | 1.95 | 2.90 | 1.91 | 31.2 | 24040E | 24040EK30 |
| 10 | 22 | 6 | 214.0 | 326.0 | 2.5 | 0.33 | 2.06 | 3.06 | 2.01 | 42.7 | 23140E | 23140EK |
| 10 | 22 | 6 | 214.0 | 326.0 | 2.5 | 0.35 | 1.94 | 2.83 | 1.89 | 42.5 | 23140A2X | 23140A2XK |
| 12 | 26 | 6 | 214.0 | 326.0 | 2.5 | 0.41 | 1.63 | 2.43 | 1.60 | 52.9 | 24140E | 24140EK30 |
| 8 | 18 | 6 | 218.0 | 342.0 | 3.0 | 0.29 | 2.35 | 3.50 | 2.30 | 44.8 | 22240E | 22240EK |
| 12 | 26 | 6 | 218.0 | 342.0 | 3.0 | 0.37 | 1.85 | 2.75 | 1.80 | 57.7 | 23240E | 23240EK |
| 12 | 26 | 6 | 218.0 | 342.0 | 3.0 | 0.39 | 1.71 | 2.54 | 1.67 | 57.0 | 23240A2X | 23240A2XK |
| 12 | 26 | 6 | 222.0 | 398.0 | 4.0 | 0.35 | 1.93 | 2.87 | 1.88 | 93.7 | 22340E | 22340EK |
| 6 | 12 | 6 | 232.0 | 288.0 | 2.0 | 0.18 | 3.75 | 5.59 | 3.67 | 12.6 | 23944E | 23944EK |
| 8 | 18 | 6 | 234.0 | 326.0 | 2.5 | 0.26 | 2.64 | 3.39 | 2.58 | 30.7 | 23044E | 23044EK |
| 8 | 18 | 6 | 234.0 | 326.0 | 2.5 | 0.27 | 2.51 | 3.74 | 2.45 | 30.5 | 23044A2X | 23044A2XK |
| 10 | 22 | 6 | 234.0 | 326.0 | 2.5 | 0.34 | 1.98 | 2.95 | 1.94 | 40.3 | 24044E | 24044EK30 |
| 10 | 22 | 6 | 238.0 | 352.0 | 3.0 | 0.33 | 2.06 | 3.07 | 2.02 | 54.3 | 23144E | 23144EK |
| 10 | 22 | 6 | 238.0 | 352.0 | 3.0 | 0.34 | 1.98 | 2.94 | 1.93 | 54.6 | 23144A2X | 23144A2XK |
| 12 | 26 | 6 | 238.0 | 352.0 | 3.0 | 0.41 | 1.66 | 2.47 | 1.62 | 66.3 | 24144E | 24144EK30 |
| 10 | 22 | 6 | 238.0 | 382.0 | 3.0 | 0.29 | 2.36 | 3.52 | 2.31 | 61.9 | 22244E | 22244EK |
| 12 | 26 | 6 | 238.0 | 382.0 | 3.0 | 0.37 | 1.83 | 2.72 | 1.79 | 81.4 | 23244E | 23244EK |
| 12 | 26 | 6 | 242.0 | 438.0 | 4.0 | 0.34 | 2.00 | 2.98 | 1.95 | 119 | 22344E | 22344EK |

Spherical Roller Bearings

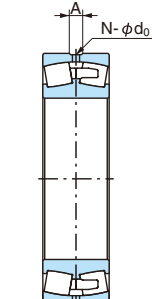
Bore Diameter : 240 ~ 340mm



Cylindrical bore



Tapered bore

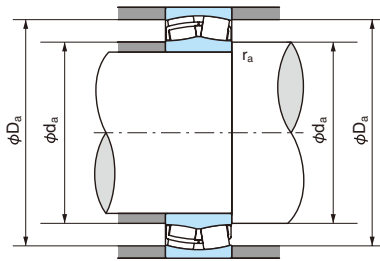


With oil holes / oil groove (W33)

1N=0.102kgf

| d | Boundary dimensions (mm) | | | Bearing No. | | Basic dynamic load rating Cr (N) | Basic static load rating Cor (N) | Limiting speed (min ⁻¹) | |
|-----|--------------------------|-----|---------|------------------|--------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------|
| | D | B | r (min) | Cylindrical bore | Tapered bore | | | Grease lubrication | Oil lubrication |
| 240 | 320 | 60 | 2.1 | 23948E | 23948EK | 870000 | 1260000 | 950 | 1200 |
| | 360 | 92 | 3 | 23048E | 23048EK | 1530000 | 2000000 | 850 | 1100 |
| | 360 | 92 | 3 | 23048A2X | 23048A2XK | 1570000 | 2090000 | 1100 | 1500 |
| | 360 | 118 | 3 | 24048E | 24048EK30 | 1990000 | 2800000 | 700 | 900 |
| | 400 | 128 | 4 | 23148E | 23148EK | 2610000 | 3350000 | 670 | 850 |
| | 400 | 128 | 4 | 23148A2X | 23148A2XK | 2540000 | 3250000 | 900 | 1100 |
| | 400 | 160 | 4 | 24148E | 24148EK30 | 2850000 | 3700000 | 670 | 850 |
| | 440 | 120 | 4 | 22248E | 22248EK | 2630000 | 2930000 | 750 | 950 |
| | 440 | 160 | 4 | 23248E | 23248EK | 3400000 | 4100000 | 630 | 800 |
| 500 | 155 | 5 | 22348E | 22348EK | 3850000 | 4100000 | 670 | 850 | |
| 260 | 360 | 75 | 2.1 | 23952E | 23952EK | 1240000 | 1780000 | 850 | 1000 |
| | 400 | 104 | 4 | 23052E | 23052EK | 1950000 | 2530000 | 800 | 950 |
| | 400 | 140 | 4 | 24052E | 24052EK30 | 2630000 | 3700000 | 630 | 850 |
| | 440 | 144 | 4 | 23152E | 23152EK | 3100000 | 4000000 | 600 | 800 |
| | 440 | 180 | 4 | 24152E | 24152EK30 | 3550000 | 4650000 | 600 | 800 |
| | 480 | 130 | 5 | 22252E | 22252EK | 3100000 | 3500000 | 670 | 850 |
| | 480 | 174 | 5 | 23252E | 23252EK | 3950000 | 4800000 | 560 | 750 |
| 540 | 165 | 6 | 22352E | 22352EK | 4350000 | 4750000 | 630 | 800 | |
| 280 | 380 | 75 | 2.1 | 23956E | 23956EK | 1260000 | 1840000 | 800 | 950 |
| | 420 | 106 | 4 | 23056E | 23056EK | 2030000 | 2720000 | 710 | 900 |
| | 420 | 140 | 4 | 24056E | 24056EK30 | 2680000 | 3900000 | 600 | 800 |
| | 460 | 146 | 5 | 23156E | 23156EK | 3200000 | 4200000 | 560 | 750 |
| | 460 | 180 | 5 | 24156E | 24156EK30 | 3550000 | 4800000 | 560 | 750 |
| | 500 | 130 | 5 | 22256E | 22256EK | 3200000 | 3700000 | 630 | 800 |
| | 500 | 176 | 5 | 23256E | 23256EK | 4150000 | 5200000 | 530 | 670 |
| | 580 | 175 | 6 | 22356E | 22356EK | 4950000 | 5450000 | 560 | 710 |
| 300 | 420 | 90 | 3 | 23960E | 23960EK | 1740000 | 2520000 | 710 | 900 |
| | 460 | 118 | 4 | 23060E | 23060EK | 2500000 | 3300000 | 670 | 850 |
| | 460 | 160 | 4 | 24060E | 24060EK30 | 3350000 | 4850000 | 560 | 710 |
| | 500 | 160 | 5 | 23160E | 23160EK | 3650000 | 4750000 | 530 | 670 |
| | 500 | 200 | 5 | 24160E | 24160EK30 | 4450000 | 6100000 | 530 | 670 |
| | 540 | 140 | 5 | 22260E | 22260EK | 3700000 | 4300000 | 600 | 750 |
| | 540 | 192 | 5 | 23260E | 23260EK | 4950000 | 6250000 | 480 | 630 |
| 620 | 185 | 7.5 | 22360E | 22360EK | 5500000 | 6050000 | 520 | 650 | |
| 320 | 440 | 90 | 3 | 23964E | 23964EK | 1770000 | 2610000 | 670 | 850 |
| | 480 | 121 | 4 | 23064E | 23064EK | 2590000 | 3500000 | 630 | 800 |
| | 480 | 160 | 4 | 24064E | 24064EK30 | 3400000 | 5100000 | 530 | 670 |
| | 540 | 176 | 5 | 23164E | 23164EK | 4350000 | 5700000 | 480 | 600 |
| | 540 | 218 | 5 | 24164E | 24164EK30 | 5050000 | 6900000 | 480 | 600 |
| | 580 | 150 | 5 | 22264E | 22264EK | 4250000 | 4900000 | 550 | 680 |
| | 580 | 208 | 5 | 23264E | 23264EK | 5600000 | 7200000 | 450 | 600 |
| 340 | 460 | 90 | 3 | 23968E | 23968EK | 1830000 | 2790000 | 630 | 800 |
| | 520 | 133 | 5 | 23068E | 23068EK | 3150000 | 4300000 | 560 | 710 |
| | 520 | 180 | 5 | 24068E | 24068EK30 | 4100000 | 6050000 | 480 | 600 |
| | 580 | 190 | 5 | 23168E | 23168EK | 5150000 | 6750000 | 450 | 560 |
| | 580 | 243 | 5 | 24168E | 24168EK30 | 6050000 | 8300000 | 450 | 560 |
| | 620 | 165 | 6 | 22268E | 22268EK | 5600000 | 6850000 | 500 | 620 |
| 620 | 224 | 6 | 23268E | 23268EK | 6300000 | 8000000 | 400 | 530 | |

Note: Suffix K or K30 means tapered bore (1/12 or 1/30).



• Dynamic equivalent radial load
 $P_r = XFr + YFa$

| | | | |
|------------------------|-------|---------------------|-------|
| $\frac{Fa}{Fr} \leq e$ | | $\frac{Fa}{Fr} > e$ | |
| X | Y | X | Y |
| 1 | Y_1 | 0.67 | Y_2 |

Values of Y_1 , Y_2 and e from table.

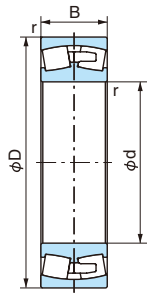
• Static equivalent radial load
 $P_0 = Fr + Y_0 Fa$

Values Y_0 from table.

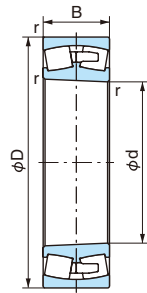
| Dimensions of lubrication holes and grooves | | | Abutment and fillet dimensions (mm) | | | Constant e | Axial load factor | | | Mass (kg) Cylindrical bore (Reference) | Bearing No. | |
|---|----------------|--------------|-------------------------------------|----------|----------|------------|-------------------|-------|-------|---|------------------|--------------|
| Hole diameter do | Groove width A | Hole count N | da (min) | Da (max) | ra (max) | | Y_1 | Y_2 | Y_0 | | Cylindrical bore | Tapered bore |
| 6 | 12 | 6 | 252.0 | 308.0 | 2.0 | 0.17 | 3.95 | 5.87 | 3.86 | 13.7 | 23948E | 23948EK |
| 8 | 18 | 6 | 254.0 | 346.0 | 2.5 | 0.24 | 2.76 | 4.11 | 2.70 | 33.5 | 23048E | 23048EK |
| 8 | 18 | 6 | 254.0 | 346.0 | 2.5 | 0.27 | 2.53 | 3.77 | 2.47 | 33.5 | 23048A2X | 23048A2XK |
| 10 | 22 | 6 | 254.0 | 346.0 | 2.5 | 0.32 | 2.10 | 3.13 | 2.05 | 43.3 | 24048E | 24048EK30 |
| 12 | 26 | 6 | 258.0 | 382.0 | 3.0 | 0.32 | 2.13 | 3.17 | 2.08 | 66.6 | 23148E | 23148EK |
| 12 | 26 | 6 | 258.0 | 382.0 | 3.0 | 0.33 | 2.02 | 3.00 | 1.97 | 68.5 | 23148A2X | 23148A2XK |
| 12 | 26 | 6 | 258.0 | 382.0 | 3.0 | 0.40 | 1.69 | 2.51 | 1.65 | 81.6 | 24148E | 24148EK30 |
| 10 | 22 | 6 | 258.0 | 422.0 | 3.0 | 0.28 | 2.37 | 3.53 | 2.32 | 82.8 | 22248E | 22248EK |
| 12 | 26 | 6 | 258.0 | 422.0 | 3.0 | 0.37 | 1.80 | 2.68 | 1.76 | 109 | 23248E | 23248EK |
| 12 | 26 | 6 | 262.0 | 487.0 | 4.0 | 0.34 | 2.00 | 2.98 | 1.96 | 151 | 22348E | 22348EK |
| 8 | 14 | 6 | 272.0 | 348.0 | 2.0 | 0.19 | 3.54 | 5.27 | 3.46 | 24.9 | 23952E | 23952EK |
| 10 | 22 | 6 | 278.0 | 382.0 | 3.0 | 0.25 | 2.66 | 3.97 | 2.61 | 52.7 | 23052E | 23052EK |
| 12 | 26 | 6 | 278.0 | 382.0 | 3.0 | 0.34 | 1.98 | 2.94 | 1.93 | 69.6 | 24052E | 24052EK30 |
| 12 | 26 | 6 | 278.0 | 422.0 | 3.0 | 0.33 | 2.06 | 3.06 | 2.01 | 98.4 | 23152E | 23152EK |
| 15 | 32 | 6 | 278.0 | 422.0 | 3.0 | 0.42 | 1.59 | 2.37 | 1.56 | 120 | 24152E | 24152EK30 |
| 12 | 26 | 6 | 282.0 | 458.0 | 4.0 | 0.28 | 2.40 | 3.57 | 2.34 | 113 | 22252E | 22252EK |
| 15 | 32 | 6 | 282.0 | 458.0 | 4.0 | 0.38 | 1.78 | 2.65 | 1.74 | 152 | 23252E | 23252EK |
| 15 | 32 | 8 | 288.0 | 512.0 | 5.0 | 0.33 | 2.04 | 3.03 | 1.99 | 228 | 22352E | 22352EK |
| 8 | 14 | 6 | 292.0 | 368.0 | 2.0 | 0.18 | 3.75 | 5.59 | 3.67 | 39.7 | 23956E | 23956EK |
| 10 | 22 | 6 | 298.0 | 402.0 | 3.0 | 0.24 | 2.79 | 4.15 | 2.73 | 72.8 | 23056E | 23056EK |
| 12 | 26 | 6 | 298.0 | 402.0 | 3.0 | 0.32 | 2.09 | 3.11 | 2.04 | 98.7 | 24056E | 24056EK30 |
| 12 | 26 | 6 | 302.0 | 438.0 | 4.0 | 0.32 | 2.12 | 3.15 | 2.07 | 129 | 23156E | 23156EK |
| 15 | 32 | 6 | 302.0 | 438.0 | 4.0 | 0.39 | 1.74 | 2.59 | 1.70 | 160 | 24156E | 24156EK30 |
| 12 | 26 | 6 | 302.0 | 478.0 | 4.0 | 0.27 | 2.53 | 3.77 | 2.47 | 144 | 22256E | 22256EK |
| 15 | 32 | 6 | 302.0 | 478.0 | 4.0 | 0.36 | 2.87 | 2.79 | 1.83 | 196 | 23256E | 23256EK |
| 15 | 32 | 8 | 308.0 | 552.0 | 5.0 | 0.33 | 2.07 | 3.09 | 2.03 | 279 | 22356E | 22356EK |
| 10 | 18 | 6 | 314.0 | 406.0 | 2.5 | 0.20 | 3.42 | 5.08 | 3.34 | 23.7 | 23960E | 23960EK |
| 10 | 22 | 6 | 318.0 | 442.0 | 3.0 | 0.25 | 2.71 | 4.04 | 2.65 | 48.9 | 23060E | 23060EK |
| 12 | 26 | 6 | 318.0 | 442.0 | 3.0 | 0.34 | 1.99 | 2.96 | 1.94 | 65.7 | 24060E | 24060EK30 |
| 12 | 26 | 6 | 322.0 | 478.0 | 4.0 | 0.33 | 2.06 | 3.06 | 2.01 | 92.0 | 23160E | 23160EK |
| 15 | 32 | 6 | 322.0 | 478.0 | 4.0 | 0.40 | 1.68 | 2.50 | 1.64 | 113 | 24160E | 24160EK30 |
| 12 | 26 | 8 | 322.0 | 518.0 | 4.0 | 0.27 | 2.49 | 3.71 | 2.43 | 107 | 22260E | 22260EK |
| 15 | 32 | 8 | 322.0 | 518.0 | 4.0 | 0.37 | 1.84 | 2.73 | 1.80 | 142 | 23260E | 23260EK |
| 15 | 32 | 8 | 336.0 | 584.0 | 6.0 | 0.32 | 2.09 | 3.11 | 2.04 | 187 | 22360E | 22360EK |
| 10 | 18 | 6 | 334.0 | 426.0 | 2.5 | 0.19 | 3.58 | 5.33 | 3.50 | 41.8 | 23964E | 23964EK |
| 12 | 26 | 6 | 338.0 | 462.0 | 3.0 | 0.24 | 2.76 | 4.11 | 2.70 | 78.6 | 23064E | 23064EK |
| 12 | 26 | 6 | 338.0 | 462.0 | 3.0 | 0.32 | 2.09 | 3.11 | 2.04 | 104 | 24064E | 24064EK30 |
| 15 | 32 | 8 | 342.0 | 518.0 | 4.0 | 0.33 | 2.03 | 3.02 | 1.98 | 168 | 23164E | 23164EK |
| 15 | 35 | 4 | 342.0 | 518.0 | 4.0 | 0.41 | 1.65 | 2.46 | 1.61 | 206 | 24164E | 24164EK30 |
| 12 | 26 | 8 | 342.0 | 558.0 | 4.0 | 0.27 | 2.51 | 3.73 | 2.45 | 179 | 22264E | 22264EK |
| 20 | 40 | 8 | 342.0 | 558.0 | 4.0 | 0.37 | 1.83 | 2.72 | 1.76 | 244 | 23264E | 23264EK |
| 10 | 18 | 6 | 354.0 | 446.0 | 2.5 | 0.18 | 3.80 | 5.66 | 3.72 | 44.1 | 23968E | 23968EK |
| 12 | 26 | 8 | 362.0 | 498.0 | 4.0 | 0.25 | 2.74 | 4.08 | 2.68 | 104 | 23068E | 23068EK |
| 15 | 32 | 8 | 362.0 | 498.0 | 4.0 | 0.34 | 1.98 | 2.94 | 1.93 | 141 | 24068E | 24068EK30 |
| 15 | 32 | 8 | 362.0 | 558.0 | 4.0 | 0.33 | 2.03 | 3.02 | 1.98 | 212 | 23168E | 23168EK |
| 20 | 40 | 8 | 362.0 | 558.0 | 4.0 | 0.42 | 1.62 | 2.42 | 1.59 | 267 | 24168E | 24168EK30 |
| 15 | 32 | 8 | 368.0 | 592.0 | 5.0 | 0.27 | 2.49 | 3.71 | 2.43 | 224 | 22268E | 22268EK |
| 20 | 40 | 8 | 368.0 | 592.0 | 5.0 | 0.37 | 1.82 | 2.70 | 1.78 | 299 | 23268E | 23268EK |

Spherical Roller Bearings

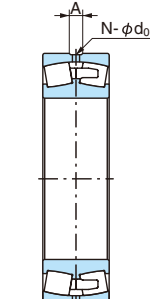
Bore Diameter : 360 ~ 500mm



Cylindrical bore



Tapered bore

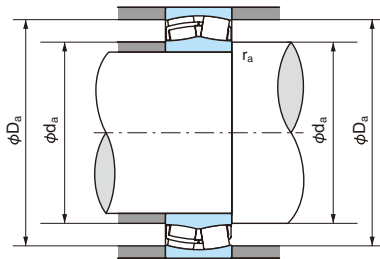


With oil holes / oil groove (W33)

1N=0.102kgf

| Boundary dimensions (mm) | | | | Bearing No. | | Basic dynamic load rating Cr (N) | Basic static load rating Cor (N) | Limiting speed (min ⁻¹) | |
|--------------------------|-----|-----|---------|------------------|--------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------|
| d | D | B | r (min) | Cylindrical bore | Tapered bore | | | Grease lubrication | Oil lubrication |
| 360 | 480 | 90 | 3 | 23972E | 23972EK | 1890000 | 2960000 | 600 | 750 |
| | 540 | 134 | 5 | 23072E | 23072EK | 3200000 | 4500000 | 530 | 670 |
| | 540 | 180 | 5 | 24072E | 24072EK30 | 4250000 | 6350000 | 450 | 600 |
| | 600 | 192 | 5 | 23172E | 23172EK | 5350000 | 7250000 | 430 | 530 |
| | 600 | 243 | 5 | 24172E | 24172EK30 | 6250000 | 8750000 | 430 | 530 |
| | 650 | 232 | 6 | 23272E | 23272EK | 6950000 | 9000000 | 380 | 500 |
| 380 | 520 | 106 | 4 | 23976E | 23976EK | 2390000 | 3650000 | 530 | 670 |
| | 560 | 135 | 5 | 23076E | 23076EK | 3300000 | 4700000 | 530 | 630 |
| | 560 | 180 | 5 | 24076E | 24076EK30 | 4300000 | 6650000 | 450 | 560 |
| | 620 | 194 | 5 | 23176E | 23176EK | 5400000 | 7400000 | 400 | 500 |
| | 620 | 243 | 5 | 24176E | 24176EK30 | 6450000 | 9300000 | 400 | 500 |
| | 680 | 240 | 6 | 23276E | 23276EK | 7500000 | 9800000 | 360 | 480 |
| 400 | 540 | 106 | 4 | 23980E | 23980EK | 2470000 | 3900000 | 530 | 630 |
| | 600 | 148 | 5 | 23080E | 23080EK | 3900000 | 5500000 | 480 | 600 |
| | 600 | 200 | 5 | 24080E | 24080EK30 | 5000000 | 7650000 | 400 | 500 |
| | 650 | 200 | 6 | 23180E | 23180EK | 5750000 | 7900000 | 380 | 480 |
| | 650 | 250 | 6 | 24180E | 24180EK30 | 6900000 | 9850000 | 380 | 480 |
| | 720 | 256 | 6 | 23280E | 23280EK | 8500000 | 11100000 | 340 | 450 |
| 420 | 560 | 106 | 4 | 23984E | 23984EK | 2520000 | 4000000 | 500 | 600 |
| | 620 | 150 | 5 | 23084E | 23084EK | 4050000 | 5850000 | 450 | 560 |
| | 620 | 200 | 5 | 24084E | 24084EK30 | 5150000 | 8000000 | 380 | 480 |
| | 700 | 224 | 6 | 23184E | 23184EK | 6800000 | 9250000 | 360 | 450 |
| | 700 | 280 | 6 | 24184E | 24184EK30 | 8350000 | 12000000 | 360 | 450 |
| | 760 | 272 | 7.5 | 23284E | 23284EK | 9400000 | 12500000 | 330 | 430 |
| 440 | 600 | 118 | 4 | 23988E | 23988EK | 3100000 | 4900000 | 450 | 560 |
| | 650 | 157 | 6 | 23088E | 23088EK | 4300000 | 6250000 | 430 | 530 |
| | 650 | 212 | 6 | 24088E | 24088EK30 | 5750000 | 9000000 | 360 | 450 |
| | 720 | 226 | 6 | 23188E | 23188EK | 7150000 | 10000000 | 340 | 430 |
| | 720 | 280 | 6 | 24188E | 24188EK30 | 8550000 | 12700000 | 340 | 430 |
| | 790 | 280 | 7.5 | 23288E | 23288EK | 10000000 | 13300000 | 320 | 400 |
| 460 | 620 | 118 | 4 | 23992E | 23992EK | 3050000 | 4900000 | 430 | 530 |
| | 680 | 163 | 6 | 23092E | 23092EK | 4700000 | 6850000 | 400 | 500 |
| | 680 | 218 | 6 | 24092E | 24092EK30 | 6100000 | 9650000 | 340 | 430 |
| | 760 | 240 | 7.5 | 23192E | 23192EK | 8000000 | 11200000 | 320 | 400 |
| | 760 | 300 | 7.5 | 24192E | 24192EK30 | 9450000 | 13900000 | 320 | 400 |
| | 830 | 296 | 7.5 | 23292E | 23292EK | 10600000 | 14500000 | 300 | 380 |
| 480 | 650 | 128 | 5 | 23996E | 23996EK | 3300000 | 5450000 | 430 | 530 |
| | 700 | 165 | 6 | 23096E | 23096EK | 4850000 | 7250000 | 400 | 480 |
| | 700 | 218 | 6 | 24096E | 24096EK30 | 6300000 | 10100000 | 340 | 430 |
| | 790 | 248 | 7.5 | 23196E | 23196EK | 8500000 | 12000000 | 300 | 380 |
| | 790 | 308 | 7.5 | 24196E | 24196EK30 | 9950000 | 14800000 | 300 | 380 |
| | 870 | 310 | 7.5 | 23296E | 23296EK | 11300000 | 15400000 | 280 | 360 |
| 500 | 670 | 128 | 5 | 239/500E | 239/500EK | 3400000 | 5700000 | 400 | 500 |
| | 720 | 167 | 6 | 230/500E | 230/500EK | 5050000 | 7650000 | 380 | 480 |
| | 720 | 218 | 6 | 240/500E | 240/500EK30 | 6450000 | 10500000 | 320 | 400 |
| | 830 | 264 | 7.5 | 231/500E | 231/500EK | 9300000 | 13000000 | 280 | 360 |
| | 830 | 325 | 7.5 | 241/500E | 241/500EK30 | 11000000 | 16200000 | 280 | 360 |
| | 920 | 336 | 7.5 | 232/500E | 232/500EK | 13200000 | 17800000 | 260 | 340 |

Note: Suffix K or K30 means tapered bore (1/12 or 1/30).



• Dynamic equivalent radial load
 $P_r = XFr + YFa$

| | | | |
|------------------------|-------|---------------------|-------|
| $\frac{Fa}{Fr} \leq e$ | | $\frac{Fa}{Fr} > e$ | |
| X | Y | X | Y |
| 1 | Y_1 | 0.67 | Y_2 |

Values of Y_1 , Y_2 and e from table.

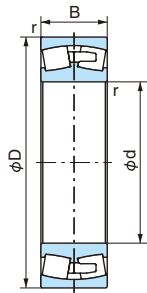
• Static equivalent radial load
 $P_0 = Fr + Y_0 Fa$

Values Y_0 from table.

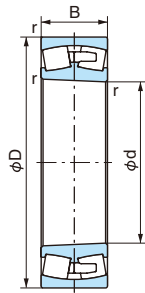
| Dimensions of lubrication holes and grooves | | | Abutment and fillet dimensions (mm) | | | Constant e | Axial load factor | | | Mass (kg) Cylindrical bore (Reference) | Bearing No. | |
|---|-------------------|-----------------|-------------------------------------|----------------|----------------|------------|-------------------|-------|-------|--|------------------|--------------|
| Hole diameter d_o | Groove width A | Hole count N | d_a (min) | D_a (max) | r_a (max) | | Y_1 | Y_2 | Y_0 | | Cylindrical bore | Tapered bore |
| 10 | 18 | 6 | 374.0 | 466.0 | 2.5 | 0.17 | 4.05 | 6.03 | 3.96 | 46.2 | 23972E | 23972EK |
| 12 | 26 | 8 | 382.0 | 518.0 | 4.0 | 0.24 | 2.84 | 4.23 | 2.78 | 110 | 23072E | 23072EK |
| 15 | 32 | 8 | 382.0 | 518.0 | 4.0 | 0.33 | 2.06 | 3.06 | 2.01 | 148 | 24072E | 24072EK30 |
| 15 | 32 | 8 | 382.0 | 578.0 | 4.0 | 0.33 | 2.07 | 3.09 | 2.03 | 225 | 23172E | 23172EK |
| 20 | 40 | 8 | 382.0 | 578.0 | 4.0 | 0.42 | 1.60 | 2.39 | 1.57 | 279 | 24172E | 24172EK30 |
| 20 | 40 | 8 | 388.0 | 622.0 | 5.0 | 0.37 | 1.82 | 2.70 | 1.78 | 342 | 23272E | 23272EK |
| 12 | 24 | 8 | 398.0 | 502.0 | 3.0 | 0.19 | 3.58 | 5.33 | 3.50 | 68.2 | 23976E | 23976EK |
| 12 | 26 | 8 | 402.0 | 538.0 | 4.0 | 0.23 | 2.92 | 4.35 | 2.86 | 116 | 23076E | 23076EK |
| 15 | 32 | 8 | 402.0 | 538.0 | 4.0 | 0.31 | 2.15 | 3.20 | 2.10 | 154 | 24076E | 24076EK30 |
| 15 | 32 | 8 | 402.0 | 598.0 | 4.0 | 0.32 | 2.13 | 3.17 | 2.08 | 236 | 23176E | 23176EK |
| 20 | 40 | 8 | 402.0 | 598.0 | 4.0 | 0.40 | 1.70 | 2.53 | 1.66 | 290 | 24176E | 24176EK30 |
| 20 | 40 | 8 | 408.0 | 652.0 | 5.0 | 0.36 | 1.86 | 2.77 | 1.82 | 383 | 23276E | 23276EK |
| 12 | 24 | 8 | 418.0 | 522.0 | 3.0 | 0.18 | 3.75 | 5.59 | 3.67 | 71.4 | 23980E | 23980EK |
| 12 | 26 | 8 | 422.0 | 578.0 | 4.0 | 0.24 | 2.81 | 4.19 | 2.75 | 151 | 23080E | 23080EK |
| 15 | 32 | 8 | 422.0 | 578.0 | 4.0 | 0.33 | 2.03 | 3.02 | 1.98 | 204 | 24080E | 24080EK30 |
| 15 | 32 | 8 | 428.0 | 622.0 | 5.0 | 0.31 | 2.18 | 3.24 | 2.13 | 266 | 23180E | 23180EK |
| 20 | 40 | 8 | 428.0 | 622.0 | 5.0 | 0.39 | 1.73 | 2.57 | 1.69 | 330 | 24180E | 24180EK30 |
| 20 | 45 | 8 | 428.0 | 692.0 | 5.0 | 0.36 | 1.86 | 2.77 | 1.82 | 461 | 23280E | 23280EK |
| 12 | 24 | 8 | 438.0 | 542.0 | 3.0 | 0.18 | 3.85 | 5.73 | 3.76 | 74.4 | 23984E | 23984EK |
| 12 | 26 | 8 | 442.0 | 598.0 | 4.0 | 0.23 | 2.92 | 4.35 | 2.86 | 158 | 23084E | 23084EK |
| 15 | 32 | 8 | 442.0 | 598.0 | 4.0 | 0.32 | 2.09 | 3.11 | 2.04 | 212 | 24084E | 24084EK30 |
| 20 | 40 | 8 | 448.0 | 672.0 | 5.0 | 0.33 | 2.06 | 3.06 | 2.01 | 354 | 23184E | 23184EK |
| 20 | 45 | 8 | 448.0 | 672.0 | 5.0 | 0.40 | 1.68 | 2.50 | 1.64 | 437 | 24184E | 24184EK30 |
| 20 | 45 | 8 | 456.0 | 724.0 | 6.0 | 0.37 | 1.84 | 2.74 | 1.80 | 548 | 23284E | 23284EK |
| 12 | 24 | 8 | 458.0 | 582.0 | 3.0 | 0.18 | 3.66 | 5.46 | 3.58 | 101 | 23988E | 23988EK |
| 12 | 26 | 8 | 468.0 | 622.0 | 5.0 | 0.24 | 2.87 | 4.27 | 2.80 | 183 | 23088E | 23088EK |
| 20 | 40 | 8 | 468.0 | 622.0 | 5.0 | 0.32 | 2.09 | 3.11 | 2.04 | 247 | 24088E | 24088EK30 |
| 20 | 40 | 8 | 468.0 | 692.0 | 5.0 | 0.32 | 2.13 | 3.17 | 2.08 | 371 | 23188E | 23188EK |
| 20 | 45 | 8 | 468.0 | 692.0 | 5.0 | 0.39 | 1.73 | 2.58 | 1.69 | 460 | 24188E | 24188EK30 |
| 20 | 45 | 8 | 476.0 | 754.0 | 6.0 | 0.36 | 1.86 | 2.77 | 1.82 | 605 | 23288E | 23288EK |
| 12 | 24 | 8 | 478.0 | 602.0 | 3.0 | 0.18 | 3.85 | 5.73 | 3.76 | 105 | 23992E | 23992EK |
| 15 | 32 | 8 | 488.0 | 652.0 | 5.0 | 0.23 | 2.92 | 4.35 | 2.86 | 208 | 23092E | 23092EK |
| 20 | 40 | 8 | 488.0 | 652.0 | 5.0 | 0.32 | 2.12 | 3.15 | 2.07 | 279 | 24092E | 24092EK30 |
| 20 | 40 | 8 | 496.0 | 724.0 | 6.0 | 0.32 | 2.12 | 3.15 | 2.07 | 446 | 23192E | 23192EK |
| 20 | 45 | 8 | 496.0 | 724.0 | 6.0 | 0.40 | 1.69 | 2.52 | 1.65 | 550 | 24192E | 24192EK30 |
| 20 | 45 | 8 | 496.0 | 794.0 | 6.0 | 0.36 | 1.85 | 2.75 | 1.81 | 709 | 23292E | 23292EK |
| 15 | 32 | 8 | 502.0 | 628.0 | 4.0 | 0.18 | 3.75 | 5.59 | 3.67 | 126 | 23996E | 23996EK |
| 15 | 32 | 8 | 508.0 | 672.0 | 5.0 | 0.22 | 3.01 | 4.48 | 2.94 | 217 | 23096E | 23096EK |
| 20 | 40 | 8 | 508.0 | 672.0 | 5.0 | 0.31 | 2.20 | 3.27 | 2.15 | 290 | 24096E | 24096EK30 |
| 20 | 40 | 8 | 516.0 | 754.0 | 6.0 | 0.32 | 2.12 | 3.15 | 2.07 | 495 | 23196E | 23196EK |
| 20 | 45 | 8 | 516.0 | 754.0 | 6.0 | 0.39 | 1.71 | 2.54 | 1.67 | 625 | 24196E | 24196EK30 |
| 20 | 45 | 8 | 516.0 | 834.0 | 6.0 | 0.37 | 1.82 | 2.70 | 1.78 | 820 | 23296E | 23296EK |
| 15 | 28 | 8 | 522.0 | 648.0 | 4.0 | 0.18 | 3.85 | 5.73 | 3.76 | 130 | 239/500E | 239/500EK |
| 15 | 32 | 8 | 528.0 | 692.0 | 5.0 | 0.22 | 3.07 | 4.57 | 3.00 | 228 | 230/500E | 230/500EK |
| 20 | 40 | 8 | 528.0 | 692.0 | 5.0 | 0.30 | 2.26 | 3.37 | 2.21 | 300 | 240/500E | 240/500EK30 |
| 20 | 45 | 8 | 536.0 | 794.0 | 6.0 | 0.32 | 2.09 | 3.11 | 2.04 | 584 | 231/500E | 231/500EK |
| 25 | 50 | 8 | 536.0 | 794.0 | 6.0 | 0.40 | 1.70 | 2.53 | 1.66 | 718 | 241/500E | 241/500EK30 |
| 25 | 50 | 8 | 536.0 | 884.0 | 6.0 | 0.38 | 1.78 | 2.65 | 1.74 | 1000 | 232/500E | 232/500EK |

Spherical Roller Bearings

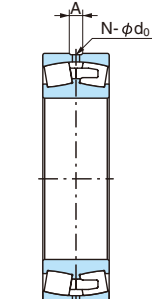
Bore Diameter : 530 ~ 1060mm



Cylindrical bore



Tapered bore

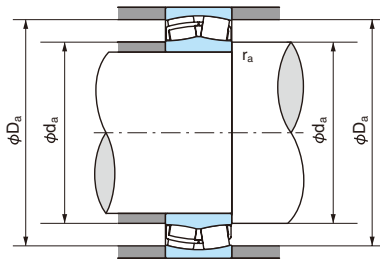


With oil holes / oil groove (W33)

1N=0.102kgf

| Boundary dimensions (mm) | | | | Bearing No. | | Basic dynamic load rating Cr (N) | Basic static load rating Cor (N) | Limiting speed (min ⁻¹) | |
|--------------------------|------|-----|---------|------------------|--------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------|
| d | D | B | r (min) | Cylindrical bore | Tapered bore | | | Grease lubrication | Oil lubrication |
| 530 | 710 | 136 | 5 | 239/530E | 239/530EK | 4100000 | 6800000 | 360 | 450 |
| | 780 | 185 | 6 | 230/530E | 230/530EK | 6250000 | 9450000 | 370 | 450 |
| | 780 | 250 | 6 | 240/530E | 240/530EK30 | 7800000 | 12500000 | 300 | 370 |
| | 870 | 272 | 7.5 | 231/530E | 231/530EK | 10200000 | 14600000 | 260 | 340 |
| 560 | 980 | 355 | 9.5 | 232/530E | 232/530EK | 15300000 | 21000000 | 240 | 300 |
| | 750 | 140 | 5 | 239/560E | 239/560EK | 4250000 | 6950000 | 340 | 430 |
| | 820 | 195 | 6 | 230/560E | 230/560EK | 7000000 | 10800000 | 340 | 430 |
| | 820 | 258 | 6 | 240/560E | 240/560EK30 | 8350000 | 13500000 | 280 | 350 |
| 600 | 920 | 280 | 7.5 | 231/560E | 231/560EK | 11000000 | 15800000 | 240 | 320 |
| | 1030 | 365 | 9.5 | 232/560E | 232/560EK | 16000000 | 22000000 | 220 | 280 |
| | 800 | 150 | 5 | 239/600E | 239/600EK | 4800000 | 8050000 | 320 | 400 |
| | 870 | 200 | 6 | 230/600E | 230/600EK | 7650000 | 12000000 | 320 | 400 |
| 630 | 870 | 272 | 6 | 240/600E | 240/600EK30 | 9050000 | 14900000 | 260 | 330 |
| | 980 | 300 | 7.5 | 231/600E | 231/600EK | 12100000 | 17500000 | 220 | 280 |
| | 1090 | 388 | 9.5 | 232/600E | 232/600EK | 17900000 | 25100000 | 200 | 260 |
| | 850 | 165 | 6 | 239/630E | 239/630EK | 5750000 | 9700000 | 300 | 360 |
| 670 | 920 | 212 | 7.5 | 230/630E | 230/630EK | 8350000 | 13100000 | 290 | 380 |
| | 1030 | 315 | 7.5 | 231/630E | 231/630EK | 13500000 | 19800000 | 200 | 260 |
| | 900 | 170 | 6 | 239/670E | 239/670EK | 6200000 | 10500000 | 260 | 340 |
| | 980 | 230 | 7.5 | 230/670E | 230/670EK | 9650000 | 15300000 | 270 | 340 |
| 710 | 980 | 308 | 7.5 | 240/670E | 240/670EK30 | 12000000 | 19800000 | 230 | 290 |
| | 1090 | 336 | 7.5 | 231/670E | 231/670EK | 15300000 | 23000000 | 190 | 240 |
| | 950 | 180 | 6 | 239/710E | 239/710EK | 6950000 | 12100000 | 240 | 320 |
| | 1030 | 236 | 7.5 | 230/710E | 230/710EK | 10300000 | 16600000 | 250 | 320 |
| 750 | 1150 | 345 | 9.5 | 231/710E | 231/710EK | 16800000 | 25300000 | 170 | 220 |
| | 1000 | 185 | 6 | 239/750E | 239/750EK | 7500000 | 13200000 | 220 | 300 |
| | 1090 | 250 | 7.5 | 230/750E | 230/750EK | 11700000 | 18900000 | 230 | 300 |
| | 1220 | 365 | 9.5 | 231/750E | 231/750EK | 18100000 | 27700000 | 170 | 210 |
| 800 | 1060 | 195 | 6 | 239/800E | 239/800EK | 8150000 | 14500000 | 220 | 280 |
| | 1150 | 258 | 7.5 | 230/800E | 230/800EK | 12200000 | 20900000 | 210 | 270 |
| | 1150 | 345 | 7.5 | 240/800E | 240/800EK30 | 15400000 | 27200000 | 200 | 250 |
| | 1280 | 375 | 9.5 | 231/800E | 231/800EK | 20000000 | 31000000 | 160 | 210 |
| 850 | 1120 | 200 | 6 | 239/850E | 239/850EK | 8600000 | 15600000 | 190 | 260 |
| | 1220 | 272 | 7.5 | 230/850E | 230/850EK | 13600000 | 22500000 | 190 | 240 |
| 900 | 1180 | 206 | 6 | 239/900E | 239/900EK | 9300000 | 17000000 | 180 | 240 |
| | 1280 | 280 | 7.5 | 230/900E | 230/900EK | 14600000 | 25400000 | 180 | 220 |
| 950 | 1250 | 224 | 7.5 | 239/950E | 239/950EK | 10800000 | 19900000 | 170 | 220 |
| | 1360 | 300 | 7.5 | 230/950E | 230/950EK | 16100000 | 27200000 | 160 | 200 |
| 1000 | 1320 | 236 | 7.5 | 239/1000E | 239/1000EK | 11600000 | 21300000 | 150 | 200 |
| | 1420 | 308 | 7.5 | 230/1000E | 230/1000EK | 17200000 | 29700000 | 150 | 190 |
| 1060 | 1400 | 250 | 7.5 | 239/1060E | 239/1060EK | 13200000 | 24500000 | 140 | 180 |

Note: Suffix K or K30 means tapered bore (1/12 or 1/30).



• Dynamic equivalent radial load
 $P_r = XFr + YFa$

| $\frac{Fa}{Fr} \leq e$ | | $\frac{Fa}{Fr} > e$ | |
|------------------------|-------|---------------------|-------|
| X | Y | X | Y |
| 1 | Y_1 | 0.67 | Y_2 |

Values of Y_1 , Y_2 and e from table.

• Static equivalent radial load
 $P_0 = Fr + Y_0 Fa$

Values Y_0 from table.

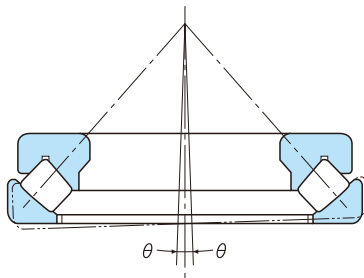
| Dimensions of lubrication holes and grooves | | | Abutment and fillet dimensions (mm) | | | Constant e | Axial load factor | | | Mass (kg) Cylindrical bore (Reference) | Bearing No. | |
|---|----------------|--------------|-------------------------------------|----------|----------|------------|-------------------|-------|-------|--|------------------|--------------|
| Hole diameter do | Groove width A | Hole count N | da (min) | Da (max) | ra (max) | | Y_1 | Y_2 | Y_0 | | Cylindrical bore | Tapered bore |
| 15 | 28 | 8 | 552.0 | 688.0 | 4.0 | 0.18 | 3.85 | 5.73 | 3.76 | 156 | 239/530E | 239/530EK |
| 15 | 32 | 8 | 558.0 | 752.0 | 5.0 | 0.23 | 2.98 | 4.44 | 2.91 | 308 | 230/530E | 230/530EK |
| 20 | 40 | 8 | 558.0 | 752.0 | 5.0 | 0.32 | 2.12 | 3.15 | 2.07 | 417 | 240/530E | 240/530EK30 |
| 20 | 45 | 8 | 566.0 | 834.0 | 6.0 | 0.32 | 2.13 | 3.17 | 2.08 | 640 | 231/530E | 231/530EK |
| 25 | 60 | 8 | 574.0 | 936.0 | 8.0 | 0.37 | 1.80 | 2.69 | 1.76 | 1215 | 232/530E | 232/530EK |
| 15 | 28 | 8 | 582.0 | 728.0 | 4.0 | 0.17 | 3.90 | 5.80 | 3.81 | 177 | 239/560E | 239/560EK |
| 15 | 32 | 8 | 588.0 | 792.0 | 5.0 | 0.23 | 2.95 | 4.39 | 2.89 | 359 | 230/560E | 230/560EK |
| 20 | 45 | 8 | 588.0 | 792.0 | 5.0 | 0.31 | 2.21 | 3.29 | 2.16 | 468 | 240/560E | 240/560EK30 |
| 20 | 45 | 8 | 596.0 | 884.0 | 6.0 | 0.31 | 2.20 | 3.27 | 2.15 | 732 | 231/560E | 231/560EK |
| 25 | 50 | 8 | 612.0 | 992.0 | 8.0 | 0.37 | 1.82 | 2.70 | 1.78 | 1390 | 232/560E | 232/560EK |
| 20 | 35 | 8 | 622.0 | 778.0 | 4.0 | 0.17 | 3.95 | 5.87 | 3.86 | 214 | 239/600E | 239/600EK |
| 15 | 32 | 8 | 628.0 | 842.0 | 5.0 | 0.22 | 3.10 | 4.62 | 3.03 | 408 | 230/600E | 230/600EK |
| 20 | 45 | 8 | 628.0 | 842.0 | 5.0 | 0.31 | 2.20 | 3.27 | 2.15 | 551 | 240/600E | 240/600EK30 |
| 20 | 45 | 8 | 636.0 | 944.0 | 6.0 | 0.31 | 0.22 | 3.27 | 2.15 | 887 | 231/600E | 231/600EK |
| 25 | 50 | 8 | 654.0 | 1048 | 8.0 | 0.37 | 1.82 | 2.70 | 1.78 | 1640 | 232/600E | 232/600EK |
| 20 | 35 | 8 | 658.0 | 822.0 | 5.0 | 0.18 | 3.71 | 5.52 | 3.62 | 273 | 239/630E | 239/630EK |
| 20 | 40 | 8 | 666.0 | 884.0 | 6.0 | 0.22 | 3.07 | 4.57 | 3.00 | 487 | 230/630E | 230/630EK |
| 20 | 45 | 8 | 666.0 | 994.0 | 6.0 | 0.31 | 2.20 | 3.27 | 2.15 | 1070 | 231/630E | 231/630EK |
| 20 | 35 | 8 | 698.0 | 872.0 | 5.0 | 0.17 | 3.90 | 5.80 | 3.81 | 316 | 239/670E | 239/670EK |
| 20 | 40 | 8 | 706.0 | 944.0 | 6.0 | 0.22 | 3.01 | 4.48 | 2.94 | 603 | 230/670E | 230/670EK |
| 20 | 45 | 8 | 706.0 | 944.0 | 6.0 | 0.31 | 2.21 | 3.29 | 2.16 | 801 | 240/670E | 240/670EK30 |
| 25 | 50 | 8 | 706.0 | 1054 | 6.0 | 0.31 | 2.18 | 3.24 | 2.13 | 1260 | 231/670E | 231/670EK |
| 20 | 35 | 8 | 738.0 | 922.0 | 5.0 | 0.17 | 3.90 | 5.80 | 3.81 | 369 | 239/710E | 239/710EK |
| 20 | 40 | 8 | 746.0 | 994.0 | 6.0 | 0.22 | 3.10 | 4.62 | 3.03 | 676 | 230/710E | 230/710EK |
| 25 | 50 | 8 | 754.0 | 1106 | 8.0 | 0.30 | 2.24 | 3.34 | 2.19 | 1432 | 231/710E | 231/710EK |
| 20 | 35 | 8 | 778.0 | 972.0 | 5.0 | 0.17 | 4.00 | 5.95 | 3.91 | 417 | 239/750E | 239/750EK |
| 20 | 40 | 8 | 786.0 | 1054 | 6.0 | 0.22 | 3.10 | 4.62 | 3.03 | 803 | 230/750E | 230/750EK |
| 25 | 50 | 8 | 794.0 | 1176 | 8.0 | 0.30 | 2.25 | 3.34 | 2.20 | 1710 | 231/750E | 231/750EK |
| 20 | 35 | 8 | 825.0 | 1032 | 5.0 | 0.17 | 4.00 | 5.96 | 3.91 | 470 | 239/800E | 239/800EK |
| 20 | 45 | 8 | 836.0 | 1114 | 6.0 | 0.21 | 3.20 | 4.77 | 3.13 | 910 | 230/800E | 230/800EK |
| 25 | 50 | 8 | 836.0 | 1114 | 6.0 | 0.28 | 2.43 | 3.61 | 2.37 | 1200 | 240/800E | 240/800EK30 |
| 25 | 50 | 8 | 844.0 | 1236 | 8.0 | 0.29 | 2.32 | 3.45 | 2.26 | 1910 | 231/800E | 231/800EK |
| 20 | 40 | 8 | 878.0 | 1092 | 5.0 | 0.16 | 4.16 | 6.20 | 4.07 | 546 | 239/850E | 239/850EK |
| 20 | 40 | 8 | 886.0 | 1184 | 6.0 | 0.21 | 3.20 | 4.77 | 3.13 | 1059 | 230/850E | 230/850EK |
| 20 | 40 | 8 | 928.0 | 1152 | 5.0 | 0.16 | 4.22 | 6.28 | 4.13 | 618 | 239/900E | 239/900EK |
| 20 | 45 | 8 | 936.0 | 1244 | 6.0 | 0.21 | 3.27 | 4.87 | 3.20 | 1200 | 230/900E | 230/900EK |
| 20 | 40 | 8 | 986.0 | 1214 | 6.0 | 0.16 | 4.11 | 6.12 | 4.02 | 763 | 239/950E | 239/950EK |
| 20 | 45 | 8 | 986.0 | 1324 | 6.0 | 0.21 | 3.23 | 4.82 | 3.16 | 1450 | 230/950E | 230/950EK |
| 25 | 48 | 8 | 1036 | 1284 | 6.0 | 0.17 | 4.05 | 6.03 | 3.96 | 895 | 239/1000E | 239/1000EK |
| 20 | 45 | 8 | 1036 | 1384 | 6.0 | 0.21 | 3.27 | 4.87 | 3.20 | 1610 | 230/1000E | 230/1000EK |
| 25 | 48 | 8 | 1096 | 1364 | 6.0 | 0.17 | 4.05 | 6.03 | 3.96 | 1077 | 239/1060E | 239/1060EK |



Spherical Roller Thrust Bearings

Aligning angle

Maximum permissible misalignment angle is about 2° under general service conditions. If the aligning advantages of this bearing type are to be realized, care must be taken to provide clearance for parts in the surrounding structure.



Minimum axial load

To prevent damage caused by sliding motion between the rollers and raceway, spherical roller thrust bearings must be subjected to a load more than the minimum load, $F_{a \min}$.

$$F_{a \min} = \frac{C_{0a}}{1000}$$

Lubrication

Because there are many sliding surfaces in E type Spherical Roller Thrust Bearings (cage-to-guide-sleeve and roller-ends-to-rib), oil lubricant (not grease) should be applied.

Safety-factor

The safety-factor "So" must be over 4.

Tolerance Values of Spherical Roller Thrust Bearings (Class 0)

Tolerance Values of Inner Rings

Unit: μm

| Nominal bearing bore diameter d (mm) | | Single plane mean bore diameter deviation Δd_{mp} | | Bore diameter variation, in a single radial plane Vd_p | References | | | |
|--------------------------------------|-------|---|-----|--|--|------|--|--|
| | | | | | Inner ring reference face runout with bore S_d | | Deviation of single height, ΔI_s | |
| Over | Incl. | High | Low | High | Low | High | Low | |
| 50 | 80 | 0 | -15 | 11 | 25 | +150 | -150 | |
| 80 | 120 | 0 | -20 | 15 | 25 | +200 | -200 | |
| 120 | 180 | 0 | -25 | 19 | 30 | +250 | -250 | |
| 180 | 250 | 0 | -30 | 23 | 30 | +300 | -300 | |
| 250 | 315 | 0 | -35 | 26 | 35 | +350 | -350 | |
| 315 | 400 | 0 | -40 | 30 | 40 | +400 | -400 | |
| 400 | 500 | 0 | -45 | 34 | 45 | +450 | -450 | |

Tolerance Values of Outer Rings

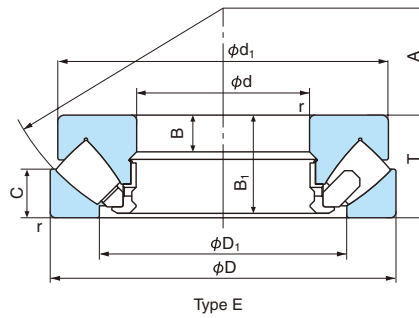
Unit: μm

| Nominal bearing outside diameter D (mm) | | Outside diameter deviation ΔD_{mp} | |
|---|-------|--|------|
| | | High | Low |
| Over | Incl. | High | Low |
| 120 | 180 | 0 | -25 |
| 180 | 250 | 0 | -30 |
| 250 | 315 | 0 | -35 |
| 315 | 400 | 0 | -40 |
| 400 | 500 | 0 | -45 |
| 500 | 630 | 0 | -50 |
| 630 | 800 | 0 | -75 |
| 800 | 1000 | 0 | -100 |

Remarks: The high deviation of bearing bore diameter specified in this table does not apply within a distance of $1.2 \times r$ (max) from the ring face.
The low deviation of bearing outside diameter specified in this table does not apply within a distance of $1.2 \times r$ (max) from the ring face.

Spherical Roller Thrust Bearings

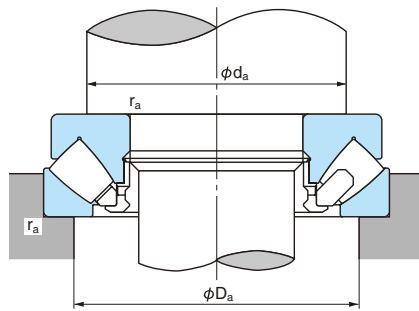
Bore Diameter : 60 ~ 180mm



1N=0.102kgf

| Boundary dimensions (mm) | | | | Bearing No. | Basic dynamic load rating Ca (N) | Basic static load rating Coa (N) | Limiting speed (min ⁻¹) | |
|--------------------------|-----|-----|---------|-------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------|
| d | D | T | r (min) | | | | Grease lubrication | Oil lubrication |
| 60 | 130 | 42 | 1.5 | 29412E | 299000 | 890000 | – | 2800 |
| | 130 | 42 | 1.5 | 29412EX | 350000 | 915000 | 1800 | 2800 |
| 65 | 140 | 45 | 2 | 29413E | 345000 | 1040000 | – | 2700 |
| | 140 | 45 | 2 | 29413EX | 410000 | 1110000 | 1700 | 2700 |
| 70 | 150 | 48 | 2 | 29414E | 375000 | 1110000 | – | 2400 |
| | 150 | 48 | 2 | 29414EX | 490000 | 1350000 | – | 2400 |
| 75 | 160 | 51 | 2 | 29415E | 445000 | 1380000 | – | 2300 |
| | 160 | 51 | 2 | 29415EX | 525000 | 1470000 | 1600 | 2300 |
| 80 | 170 | 54 | 2.1 | 29416E | 480000 | 1490000 | – | 2100 |
| | 170 | 54 | 2.1 | 29416EX | 580000 | 1630000 | 1500 | 2100 |
| 85 | 150 | 39 | 1.5 | 29317E | 293000 | 990000 | – | 2700 |
| | 150 | 39 | 1.5 | 29317EX | 365000 | 1060000 | 1600 | 2700 |
| | 180 | 58 | 2.1 | 29417E | 540000 | 1720000 | – | 2000 |
| | 180 | 58 | 2.1 | 29417EX | 640000 | 1810000 | 1300 | 2000 |
| 90 | 155 | 39 | 1.5 | 29318E | 300000 | 1040000 | – | 2700 |
| | 155 | 39 | 1.5 | 29318EX | 355000 | 1070000 | 1600 | 2700 |
| | 190 | 60 | 2.1 | 29418E | 620000 | 2020000 | – | 1900 |
| | 190 | 60 | 2.1 | 29418EX | 710000 | 2080000 | 1300 | 1900 |
| 100 | 170 | 42 | 1.5 | 29320E | 355000 | 1260000 | – | 2500 |
| | 170 | 42 | 1.5 | 29320EX | 435000 | 1400000 | 1500 | 2500 |
| | 210 | 67 | 3 | 29420E | 690000 | 2230000 | – | 1700 |
| | 210 | 67 | 3 | 29420EX | 870000 | 2530000 | 1100 | 1700 |
| 110 | 190 | 48 | 2 | 29322E | 470000 | 1680000 | – | 2100 |
| | 190 | 48 | 2 | 29322EX | 550000 | 1730000 | 1300 | 2100 |
| | 230 | 73 | 3 | 29422E | 845000 | 2820000 | – | 1500 |
| | 230 | 73 | 3 | 29422EX | 1060000 | 3150000 | 950 | 1500 |
| 120 | 210 | 54 | 2.1 | 29324E | 565000 | 2030000 | – | 1900 |
| | 210 | 54 | 2.1 | 29324EX | 670000 | 2160000 | 1100 | 1900 |
| | 250 | 78 | 4 | 29424E | 1030000 | 3450000 | – | 1400 |
| | 250 | 78 | 4 | 29424EX | 1210000 | 3750000 | 900 | 1400 |
| 130 | 225 | 58 | 2.1 | 29326E | 665000 | 2420000 | – | 1800 |
| | 225 | 58 | 2.1 | 29326EX | 770000 | 2440000 | 1000 | 1800 |
| | 270 | 85 | 4 | 29426E | 1140000 | 3850000 | – | 1200 |
| | 270 | 85 | 4 | 29426EX | 1400000 | 4300000 | 850 | 1200 |
| 140 | 240 | 60 | 2.1 | 29328E | 700000 | 2560000 | – | 1600 |
| | 240 | 60 | 2.1 | 29328EX | 860000 | 2840000 | 950 | 1600 |
| | 280 | 85 | 4 | 29428E | 1200000 | 4050000 | – | 1200 |
| | 280 | 85 | 4 | 29428EX | 1410000 | 4350000 | 850 | 1200 |
| 150 | 215 | 39 | 1.5 | 29230E | 335000 | 1390000 | – | 2100 |
| | 250 | 60 | 2.1 | 29330E | 735000 | 2840000 | – | 1600 |
| | 300 | 90 | 4 | 29430E | 1330000 | 4600000 | – | 1100 |
| | 300 | 90 | 4 | 29430EX | 1630000 | 5150000 | 800 | 1100 |
| 160 | 225 | 39 | 1.5 | 29232E | 345000 | 1470000 | – | 2100 |
| | 270 | 67 | 3 | 29332E | 880000 | 3400000 | – | 1400 |
| | 270 | 67 | 3 | 29332EX | 1040000 | 3500000 | 850 | 1400 |
| | 320 | 95 | 5 | 29432E | 1510000 | 5350000 | – | 1000 |
| 170 | 320 | 95 | 5 | 29432EX | 1820000 | 5750000 | 750 | 1000 |
| | 240 | 42 | 1.5 | 29234E | 390000 | 1700000 | – | 1900 |
| | 280 | 67 | 3 | 29334E | 900000 | 3550000 | – | 1400 |
| | 340 | 103 | 5 | 29434E | 1670000 | 5900000 | – | 950 |
| 180 | 250 | 42 | 1.5 | 29236E | 420000 | 1900000 | – | 1900 |
| | 300 | 73 | 3 | 29336E | 1020000 | 3950000 | – | 1300 |
| | 360 | 109 | 5 | 29436E | 1950000 | 7000000 | – | 860 |

Note: For heavy load application, d_s should be large enough to support the shaft washer rib.



• Dynamic equivalent axial load

$$P_a = F_a + 1.2F_r$$

• Static equivalent axial load

$$P_{0a} = F_a + 2.7F_r$$

where, F_a : Axial load

F_r : Radial load

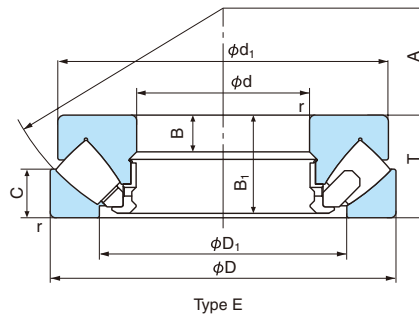
$$\text{However } \frac{F_r}{F_a} \leq 0.55$$

However $F_r/F_a \leq 0.55$ must be satisfied

| Reference Dimensions (mm) | | | | | | Abutment and fillet dimensions (mm) | | | Spacer dimensions (mm) | | Mass (kg) (Reference) | Bearing No. |
|---------------------------|-------|------|-------|------|-----|-------------------------------------|----------------|----------------|------------------------|-----------------|--------------------------|-------------|
| d_1 | D_1 | B | B_1 | C | A | d_a (min) | D_a (max) | r_a (max) | db_1 (max) | db_2 (max) | | |
| 123 | 89 | 15 | 39.5 | 20 | 38 | 91 | 108 | 1.5 | — | — | 2.75 | 29412E |
| 113 | 87 | 27 | 37.1 | 20 | 38 | 91 | 108 | 1.5 | 66.0 | 66.0 | 2.50 | 29412EX |
| 133 | 96 | 16 | 42.5 | 21 | 42 | 99 | 115 | 2.0 | — | — | 3.41 | 29413E |
| 123 | 93.5 | 29.5 | 40 | 21 | 42 | 99 | 115 | 2.0 | 72.0 | 72.0 | 3.20 | 29413EX |
| 142 | 103 | 17 | 45.5 | 23 | 44 | 106 | 125 | 2.0 | — | — | 4.16 | 29414E |
| 128.3 | 98.4 | 32 | 42.7 | 23 | 44 | 106 | 125 | 2.0 | 75.5 | 77.5 | 3.82 | 29414EX |
| 152 | 109 | 18 | 48 | 24 | 47 | 113 | 132 | 2.0 | — | — | 4.98 | 29415E |
| 140 | 105.6 | 34.5 | 45.6 | 24 | 47 | 113 | 132 | 2.0 | 82.5 | 82.5 | 4.70 | 29415EX |
| 162 | 117 | 19 | 51 | 26 | 50 | 120 | 140 | 2.0 | — | — | 5.95 | 29416E |
| 149 | 113 | 36 | 48.2 | 26 | 50 | 120 | 140 | 2.0 | 88.0 | 88.0 | 5.60 | 29416EX |
| 143.5 | 114 | 13 | 37 | 19 | 50 | 115 | 135 | 1.5 | — | — | 2.87 | 29317E |
| 134 | 110.5 | 25 | 35 | 19 | 50 | 115 | 135 | 1.5 | 90.0 | 90.0 | 2.67 | 29317EX |
| 170 | 125 | 21 | 55 | 28 | 54 | 130 | 150 | 2.0 | — | — | 7.19 | 29417E |
| 158.2 | 120.5 | 37 | 50.6 | 28 | 54 | 130 | 150 | 2.0 | 94.0 | 94.0 | 6.69 | 29417EX |
| 148.5 | 117 | 13 | 37 | 19 | 52 | 120 | 140 | 1.5 | — | — | 3.06 | 29318E |
| 135.2 | 116 | 23.8 | 35.1 | 19 | 52 | 120 | 140 | 1.5 | 95.0 | 95.0 | 2.75 | 29318EX |
| 180 | 132 | 22 | 57 | 29 | 56 | 135 | 157 | 2.0 | — | — | 8.28 | 29418E |
| 162 | 127 | 40.5 | 53 | 29 | 56 | 135 | 157 | 2.0 | 99.0 | 99.0 | 7.83 | 29418EX |
| 163 | 129 | 14 | 40 | 20.8 | 58 | 130 | 150 | 1.5 | — | — | 3.91 | 29320E |
| 146.9 | 126 | 27 | 38.2 | 20.8 | 58 | 130 | 150 | 1.5 | 105.0 | 107.0 | 3.61 | 29320EX |
| 200 | 146 | 24 | 64 | 32 | 62 | 150 | 175 | 2.5 | — | — | 11.2 | 29420E |
| 181 | 139 | 44.5 | 59.6 | 32 | 62 | 150 | 175 | 2.5 | 108.0 | 110.0 | 10.6 | 29420EX |
| 182 | 143 | 16 | 45.5 | 23 | 64 | 145 | 165 | 2.0 | — | — | 5.67 | 29322E |
| 165.1 | 140.6 | 30.9 | 44 | 23 | 64 | 145 | 165 | 2.0 | 116.0 | 117.0 | 5.22 | 29322EX |
| 220 | 162 | 26 | 69 | 35 | 69 | 165 | 190 | 2.5 | — | — | 14.7 | 29422E |
| 199.6 | 153.4 | 48 | 64.4 | 35 | 69 | 165 | 190 | 2.5 | 119.5 | 120.0 | 14.0 | 29422EX |
| 200 | 159 | 18 | 51 | 26 | 70 | 160 | 180 | 2.0 | — | — | 7.90 | 29324E |
| 184.5 | 155 | 34.5 | 48.7 | 26 | 70 | 160 | 180 | 2.0 | 127.0 | 128.0 | 7.30 | 29324EX |
| 236 | 174 | 29 | 74 | 37 | 74 | 180 | 205 | 3.0 | — | — | 18.5 | 29424E |
| 218 | 166.5 | 54 | 70.9 | 37 | 74 | 180 | 205 | 3.0 | 131.0 | 132.0 | 17.6 | 29424EX |
| 215 | 171 | 19 | 55 | 28 | 76 | 170 | 195 | 2.0 | — | — | 9.45 | 29326E |
| 197.4 | 165.8 | 36.8 | 52.7 | 28 | 76 | 170 | 195 | 2.0 | 136.0 | 138.0 | 8.82 | 29326EX |
| 255 | 189 | 31 | 81 | 41 | 81 | 195 | 225 | 3.0 | — | — | 23.5 | 29426E |
| 236.4 | 181 | 56 | 75 | 41 | 81 | 195 | 225 | 3.0 | 141.5 | 143.0 | 22.3 | 29426EX |
| 230 | 183 | 20 | 57 | 29 | 82 | 185 | 205 | 2.0 | — | — | 11.2 | 29328E |
| 218.4 | 179 | 38.5 | 54.8 | 29 | 82 | 185 | 205 | 2.0 | 147.5 | 149.0 | 10.5 | 29328EX |
| 268 | 199 | 31 | 81 | 41 | 86 | 205 | 235 | 3.0 | — | — | 24.6 | 29428E |
| 246 | 196 | 53.6 | 74.4 | 41 | 86 | 205 | 235 | 3.0 | 153.0 | 160.0 | 22.8 | 29428EX |
| 208 | 178 | 14 | 37 | 19 | 82 | 179 | 196 | 1.5 | — | — | 4.60 | 29230E |
| 240 | 194 | 20 | 57 | 29 | 87 | 195 | 215 | 2.0 | — | — | 11.7 | 29330E |
| 285 | 214 | 32 | 86 | 44 | 92 | 220 | 250 | 3.0 | — | — | 29.6 | 29430E |
| 264.4 | 207.5 | 58.5 | 80.8 | 44 | 92 | 220 | 250 | 3.0 | 163.0 | 169.0 | 27.8 | 29430EX |
| 219 | 188 | 14 | 37 | 19 | 85 | 189 | 206 | 1.5 | — | — | 4.70 | 29232E |
| 260 | 208 | 23 | 64 | 32 | 92 | 210 | 235 | 2.5 | — | — | 15.5 | 29332E |
| 243.4 | 199.8 | 44 | 61.4 | 32 | 92 | 210 | 235 | 2.5 | 166.0 | 174.0 | 14.5 | 29332EX |
| 306 | 229 | 34 | 91 | 45 | 99 | 230 | 265 | 4.0 | — | — | 35.9 | 29432E |
| 283.8 | 222 | 62.5 | 85.7 | 45 | 99 | 230 | 265 | 4.0 | 174.5 | 181.0 | 33.4 | 29432EX |
| 233 | 198 | 15 | 40 | 20 | 92 | 201 | 218 | 1.5 | — | — | 6.00 | 29234E |
| 270 | 216 | 23 | 64 | 32 | 96 | 220 | 245 | 2.5 | — | — | 16.3 | 29334E |
| 324 | 243 | 37 | 99 | 50 | 104 | 245 | 285 | 4.0 | — | — | 44.0 | 29434E |
| 243 | 208 | 15 | 40 | 21 | 95 | 211 | 228 | 1.5 | — | — | 6.30 | 29236E |
| 290 | 232 | 25 | 69 | 35 | 103 | 235 | 260 | 2.5 | — | — | 20.7 | 29336E |
| 342 | 255 | 39 | 105 | 52 | 110 | 260 | 300 | 4.0 | — | — | 52.2 | 29436E |

Spherical Roller Thrust Bearings

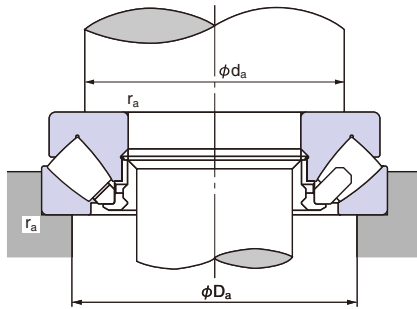
Bore Diameter : 190 ~ 530mm



1N=0.102kgf

| Boundary dimensions (mm) | | | | Bearing No. | Basic dynamic load rating Ca (N) | Basic static load rating Coa (N) | Limiting speed (min ⁻¹) | |
|--------------------------|-----|-----|---------|-------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------|
| d | D | T | r (min) | | | | Grease lubrication | Oil lubrication |
| 190 | 270 | 48 | 2 | 29238E | 540000 | 2300000 | — | 1800 |
| | 320 | 78 | 4 | 29338E | 1170000 | 4550000 | — | 1100 |
| | 380 | 115 | 5 | 29438E | 2120000 | 7750000 | — | 800 |
| 200 | 280 | 48 | 2 | 29240E | 550000 | 2410000 | — | 1800 |
| | 340 | 85 | 4 | 29340E | 1350000 | 5250000 | — | 1000 |
| | 400 | 122 | 5 | 29440E | 2350000 | 8450000 | — | 740 |
| 220 | 300 | 48 | 2 | 29244E | 595000 | 2750000 | — | 1600 |
| | 360 | 85 | 4 | 29344E | 1410000 | 5750000 | — | 1000 |
| | 420 | 122 | 6 | 29444E | 2410000 | 8950000 | — | 720 |
| 240 | 340 | 60 | 2.1 | 29248E | 890000 | 4000000 | — | 1300 |
| | 380 | 85 | 4 | 29348E | 1410000 | 5850000 | — | 980 |
| | 440 | 122 | 6 | 29448E | 2480000 | 9450000 | — | 720 |
| 260 | 360 | 60 | 2.1 | 29252E | 915000 | 4250000 | — | 1300 |
| | 420 | 95 | 5 | 29352E | 1810000 | 7500000 | — | 860 |
| | 480 | 132 | 6 | 29452E | 2940000 | 11600000 | — | 640 |
| 280 | 380 | 60 | 2.1 | 29256E | 935000 | 4500000 | — | 1200 |
| | 440 | 95 | 5 | 29356E | 1850000 | 7950000 | — | 840 |
| | 520 | 145 | 6 | 29456E | 3450000 | 13500000 | — | 580 |
| 300 | 420 | 73 | 3 | 29260E | 1220000 | 5850000 | — | 1000 |
| | 480 | 109 | 5 | 29360E | 2310000 | 10000000 | — | 720 |
| | 540 | 145 | 6 | 29460E | 3650000 | 14800000 | — | 540 |
| 320 | 440 | 73 | 3 | 29264E | 1270000 | 6150000 | — | 980 |
| | 500 | 109 | 5 | 29364E | 2370000 | 10600000 | — | 720 |
| | 580 | 155 | 7.5 | 29464E | 4050000 | 16800000 | — | 480 |
| 340 | 460 | 73 | 3 | 29268E | 1290000 | 6350000 | — | 950 |
| | 540 | 122 | 5 | 29368E | 2850000 | 12400000 | — | 630 |
| | 620 | 170 | 7.5 | 29468E | 4750000 | 19300000 | — | 430 |
| 360 | 500 | 85 | 4 | 29272E | 1650000 | 8050000 | — | 830 |
| | 560 | 122 | 5 | 29372E | 2900000 | 12900000 | — | 600 |
| | 640 | 170 | 7.5 | 29472E | 4900000 | 20500000 | — | 410 |
| 380 | 520 | 85 | 4 | 29276E | 1780000 | 8800000 | — | 800 |
| | 600 | 132 | 6 | 29376E | 3400000 | 15300000 | — | 540 |
| | 670 | 175 | 7.5 | 29476E | 5200000 | 22000000 | — | 400 |
| 400 | 540 | 85 | 4 | 29280E | 1840000 | 9250000 | — | 800 |
| | 620 | 132 | 6 | 29380E | 3550000 | 16300000 | — | 530 |
| | 710 | 185 | 7.5 | 29480E | 5850000 | 25000000 | — | 360 |
| 420 | 580 | 95 | 5 | 29284E | 2260000 | 11300000 | — | 700 |
| | 650 | 140 | 6 | 29384E | 3900000 | 17900000 | — | 480 |
| | 730 | 185 | 7.5 | 29484E | 6050000 | 26000000 | — | 360 |
| 440 | 600 | 95 | 5 | 29288E | 2290000 | 11800000 | — | 660 |
| | 680 | 145 | 6 | 29388E | 4050000 | 19000000 | — | 450 |
| | 780 | 206 | 9.5 | 29488E | 6950000 | 30000000 | — | 300 |
| 460 | 620 | 95 | 5 | 29292E | 2290000 | 11900000 | — | 660 |
| | 710 | 150 | 6 | 29392E | 4600000 | 21700000 | — | 430 |
| | 800 | 206 | 9.5 | 29492E | 7150000 | 31500000 | — | 290 |
| 480 | 650 | 103 | 5 | 29296E | 2530000 | 13200000 | — | 600 |
| | 730 | 150 | 6 | 29396E | 4630000 | 21900000 | — | 410 |
| | 850 | 224 | 9.5 | 29496E | 8250000 | 36000000 | — | 260 |
| 500 | 670 | 103 | 5 | 292/500E | 2590000 | 13800000 | — | 600 |
| | 750 | 150 | 6 | 293/500E | 4700000 | 22600000 | — | 410 |
| | 870 | 224 | 9.5 | 294/500E | 8250000 | 35000000 | — | 250 |
| 530 | 710 | 109 | 5 | 292/530E | 2820000 | 15100000 | — | 540 |

Note: For heavy load application, d_s should be large enough to support the shaft washer rib.



- Dynamic equivalent axial load
 $P_a = F_a + 1.2F_r$
- Static equivalent axial load
 $P_{0a} = F_a + 2.7F_r$
 where, F_a : Axial load
 F_r : Radial load

$$\text{However } \frac{F_r}{F_a} \leq 0.55$$

However $F_r/F_a \leq 0.55$ must be satisfied

| Reference Dimensions (mm) | | | | | | Abutment and fillet dimensions (mm) | | | Spacer dimensions (mm) | | Mass (kg) (Reference) | Bearing No. |
|---------------------------|-------|----|-------|-----|-----|-------------------------------------|----------------|----------------|------------------------|-----------------|--------------------------|-------------|
| d_i | D_1 | B | B_1 | C | A | d_a (min) | D_a (max) | r_a (max) | db_1 (max) | db_2 (max) | | |
| 262 | 223 | 15 | 45 | 24 | 104 | 225 | 245 | 2.0 | — | — | 8.50 | 29238E |
| 308 | 246 | 27 | 74 | 38 | 110 | 250 | 275 | 3.0 | — | — | 25.5 | 29338E |
| 360 | 271 | 41 | 111 | 55 | 117 | 275 | 320 | 4.0 | — | — | 61.4 | 29438E |
| 271 | 236 | 15 | 45 | 24 | 108 | 235 | 255 | 2.0 | — | — | 9.08 | 29240E |
| 325 | 261 | 29 | 81 | 41 | 116 | 265 | 295 | 3.0 | — | — | 32.0 | 29340E |
| 380 | 286 | 43 | 117 | 59 | 122 | 290 | 335 | 4.0 | — | — | 73.0 | 29440E |
| 292 | 254 | 15 | 45 | 24 | 117 | 260 | 275 | 2.0 | — | — | 9.84 | 29244E |
| 345 | 280 | 29 | 81 | 41 | 125 | 285 | 315 | 3.0 | — | — | 34.5 | 29344E |
| 400 | 308 | 43 | 117 | 58 | 132 | 310 | 355 | 5.0 | — | — | 74.2 | 29444E |
| 330 | 283 | 19 | 57 | 30 | 130 | 285 | 305 | 2.0 | — | — | 17.1 | 29248E |
| 365 | 300 | 29 | 81 | 41 | 135 | 300 | 330 | 3.0 | — | — | 36.3 | 29348E |
| 420 | 326 | 43 | 117 | 59 | 142 | 330 | 375 | 5.0 | — | — | 83.0 | 29448E |
| 350 | 302 | 19 | 57 | 30 | 139 | 305 | 325 | 2.0 | — | — | 18.5 | 29252E |
| 405 | 329 | 32 | 91 | 45 | 148 | 330 | 365 | 4.0 | — | — | 51.5 | 29352E |
| 460 | 357 | 48 | 127 | 64 | 154 | 360 | 405 | 5.0 | — | — | 106 | 29452E |
| 370 | 323 | 19 | 57 | 30 | 150 | 325 | 345 | 2.0 | — | — | 19.5 | 29256E |
| 423 | 348 | 32 | 91 | 46 | 158 | 350 | 390 | 4.0 | — | — | 54.0 | 29356E |
| 495 | 387 | 52 | 140 | 68 | 166 | 390 | 440 | 5.0 | — | — | 137 | 29456E |
| 405 | 353 | 21 | 69 | 38 | 162 | 355 | 380 | 2.5 | — | — | 31.0 | 29260E |
| 460 | 379 | 37 | 105 | 50 | 168 | 380 | 420 | 4.0 | — | — | 75.4 | 29360E |
| 515 | 402 | 52 | 140 | 70 | 175 | 410 | 460 | 5.0 | — | — | 146 | 29460E |
| 430 | 372 | 21 | 69 | 38 | 172 | 375 | 400 | 2.5 | — | — | 32.8 | 29264E |
| 482 | 399 | 37 | 105 | 53 | 180 | 400 | 440 | 4.0 | — | — | 80.0 | 29364E |
| 555 | 435 | 55 | 149 | 75 | 191 | 435 | 495 | 6.0 | — | — | 179 | 29464E |
| 445 | 395 | 21 | 69 | 37 | 183 | 395 | 420 | 2.5 | — | — | 34.5 | 29268E |
| 520 | 428 | 41 | 117 | 59 | 192 | 430 | 470 | 4.0 | — | — | 106 | 29368E |
| 590 | 462 | 61 | 164 | 82 | 201 | 465 | 530 | 6.0 | — | — | 228 | 29468E |
| 485 | 423 | 25 | 81 | 44 | 194 | 420 | 455 | 3.0 | — | — | 50.4 | 29272E |
| 540 | 448 | 41 | 117 | 59 | 202 | 450 | 495 | 4.0 | — | — | 111 | 29372E |
| 610 | 480 | 61 | 164 | 82 | 210 | 485 | 550 | 6.0 | — | — | 234 | 29472E |
| 505 | 441 | 27 | 81 | 42 | 202 | 440 | 475 | 3.0 | — | — | 52.8 | 29276E |
| 580 | 477 | 44 | 127 | 63 | 216 | 480 | 525 | 5.0 | — | — | 140 | 29376E |
| 640 | 504 | 63 | 168 | 85 | 230 | 510 | 575 | 6.0 | — | — | 263 | 29476E |
| 526 | 460 | 27 | 81 | 42 | 212 | 460 | 490 | 3.0 | — | — | 55.1 | 29280E |
| 596 | 494 | 44 | 127 | 64 | 225 | 500 | 550 | 5.0 | — | — | 146 | 29380E |
| 680 | 534 | 67 | 178 | 89 | 236 | 540 | 610 | 6.0 | — | — | 314 | 29480E |
| 564 | 489 | 30 | 91 | 46 | 225 | 490 | 525 | 4.0 | — | — | 74.9 | 29284E |
| 626 | 520 | 48 | 135 | 68 | 235 | 525 | 575 | 5.0 | — | — | 170 | 29384E |
| 700 | 556 | 67 | 178 | 89 | 244 | 560 | 630 | 6.0 | — | — | 325 | 29484E |
| 585 | 508 | 30 | 91 | 49 | 235 | 510 | 545 | 4.0 | — | — | 79.0 | 29288E |
| 655 | 548 | 49 | 140 | 70 | 245 | 550 | 600 | 5.0 | — | — | 192 | 29388E |
| 745 | 588 | 74 | 199 | 100 | 260 | 595 | 670 | 8.0 | — | — | 421 | 29488E |
| 605 | 530 | 30 | 91 | 46 | 245 | 530 | 570 | 4.0 | — | — | 80.9 | 29292E |
| 685 | 567 | 51 | 144 | 72 | 257 | 575 | 630 | 5.0 | — | — | 216 | 29392E |
| 765 | 608 | 74 | 199 | 100 | 272 | 615 | 690 | 8.0 | — | — | 435 | 29492E |
| 635 | 556 | 33 | 99 | 55 | 259 | 555 | 595 | 4.0 | — | — | 97.5 | 29296E |
| 705 | 590 | 51 | 144 | 72 | 270 | 595 | 650 | 5.0 | — | — | 224 | 29396E |
| 810 | 638 | 81 | 216 | 108 | 280 | 645 | 730 | 8.0 | — | — | 543 | 29496E |
| 654 | 574 | 33 | 99 | 55 | 268 | 575 | 615 | 4.0 | — | — | 101 | 292/500E |
| 725 | 611 | 51 | 144 | 74 | 280 | 615 | 670 | 5.0 | — | — | 231 | 293/500E |
| 830 | 661 | 81 | 216 | 107 | 290 | 670 | 750 | 8.0 | — | — | 559 | 294/500E |
| 692 | 612 | 35 | 105 | 57 | 288 | 615 | 653 | 4.0 | — | — | 106 | 292/530E |

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