



# *Roll neck bearings for rolling mill*



**JTEKT**

JTEKT CORPORATION

CAT. NO. B2013E

# Preface

In 1943, JTEKT supplied bearings for rolling mills as the first domestic manufacturer in Japan. Since then, JTEKT has been cultivated advanced technology and technical know-how with customers. To meet with customers' requests, JTEKT strives for development of more highly precise and reliable bearings for rolling mills while using experience and actual achievement for technical development and research.

JTEKT will do a service by customer-oriented "monozukuri" (Japanese way of manufacturing) in the future.

## Features of JTEKT products

**1**

### **High precision**

JTEKT's highly precise bearings contribute to improvement in operating efficiency and reduction in energy consumption.

**2**

### **High reliability**

JTEKT's highly reliable bearings obtained by actual achievement in long years contribute to stable operation.

**3**

### **Reduction in cost for maintenance and inspection**

Development in new technology of bearings lengthens maintenance interval, and reduces cost and time for maintenance and inspection of bearings.

**4**

### **Total service of products for rolling mills**

JTEKT, manufacturer of bearings, drive shafts, and oil seals, offers total service for these products.

# Operating environment of bearings for rolling mill

Bearings in every industry are used under various kinds of severe conditions. For instance, bearings used in automobiles, railway stocks, and aircrafts are required to have ultimate reliability, as due to safety reasons, they are never allowed to fail during operation. While bearings used in machine tool spindles are required to have ultra-high rotational speed performance and high running accuracy. In these examples, operating environment is not so severe. Meanwhile, bearings for rolling mills must withstand heavy load and high speed rotation, as well as very severe operating environment. In various industries, they are used under severe conditions in every respects.

## Load and rotational speed of bearings

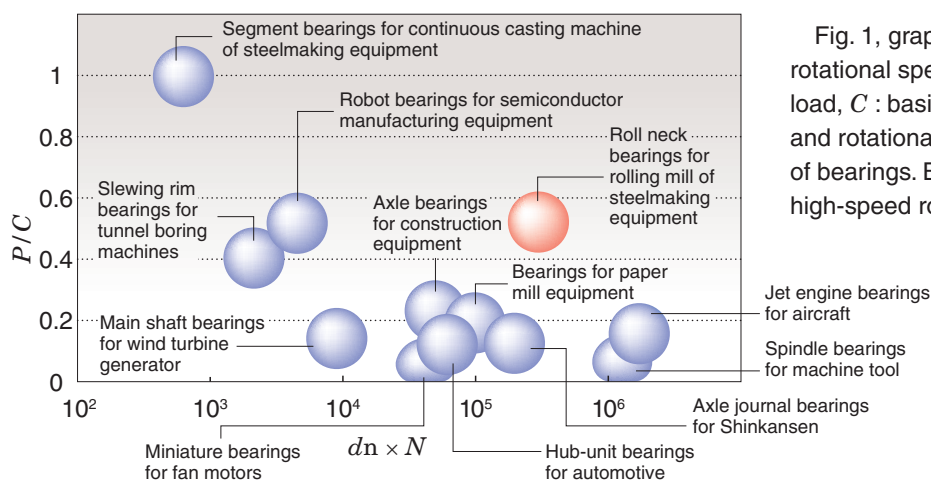


Fig. 1, graph of  $dn \times N$  ( $dn$  : bearing bore dia.,  $N$  : rotational speed) and  $P/C$  ( $P$  : dynamic equivalent load,  $C$  : basic load rating), shows the bearing load and rotational speed required for respective purposes of bearings. Bearings for rolling mills need to withstand high-speed rotation and heavy load.

Fig. 1 Bearing load ratings and rotational speeds

## Operating environment

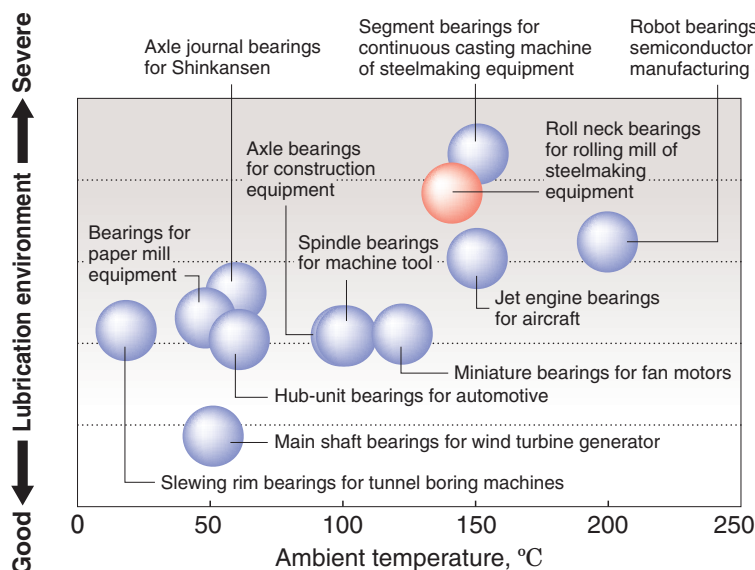


Fig. 2, graph of ambient temperature and lubrication environment, shows the operating environment required for respective purposes of bearings. Bearings for rolling mills, especially in the process of hot rolling, are often used under severe conditions, high temperature and possibility of intrusion of foreign matters. Thus, they must endure these severe conditions.

Fig. 2 Bearing ambient temperature and lubrication conditions



# Roll neck bearings for rolling mill and relevant products

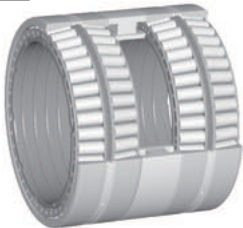
## Four-row tapered roller bearing

Sealed type



These bearings, mainly used for work rolls or intermediate rolls, carry both of radial load and axial load at a time. Adjustment of internal clearance is not required, facilitating handling. Open type is also available.

Open type



Four-row tapered roller bearing (45D type)



Four-row tapered roller bearing (TQO type)

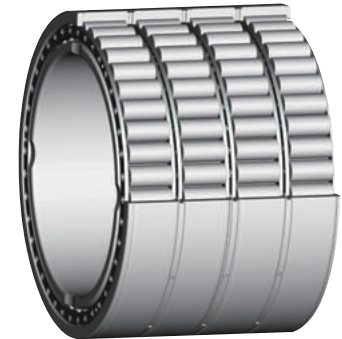
## Double-row tapered roller bearing



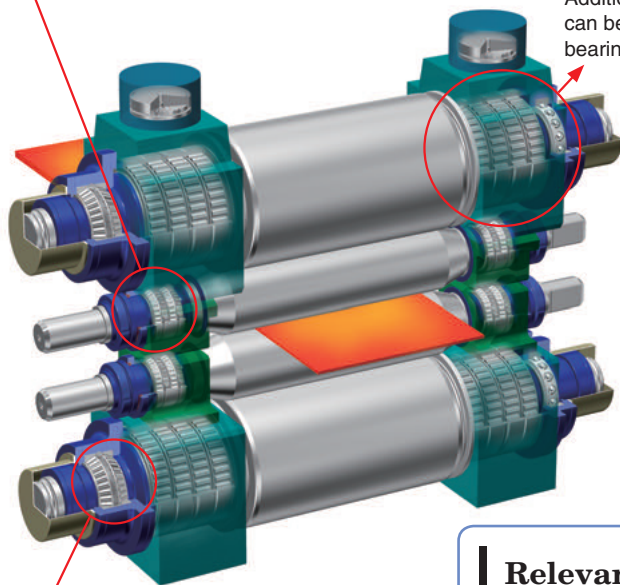
(TDIS type)

These bearings, used for back-up rolls, have a large contact angle, and can load a large axial load. The inner ring has key way applicable to each key. If the outer ring must be preloaded, consult with JTEKT. We propose you of the recommended preload.

## Four-row cylindrical roller bearing



These bearings, used for back-up rolls, have a superior large radial load capacity, and are suitable for high-speed rotation. Rolling accuracy can be improved by applying the tight fitting of the inner ring onto the roll journal, and then applying the integral system grinding of the inner ring raceway. Additionally, the integral system grinding can be applied free adjustment of the bearing clearance.



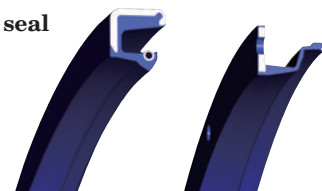
## Relevant products

Drive shaft



For details of drive shafts, see CAT. NO.B2008E.

Oil seal

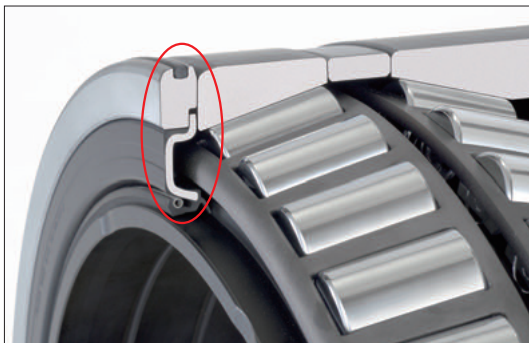


For details of oil seal, see CAT. NO.R2001E.

## Sealed type four-row tapered roller bearing

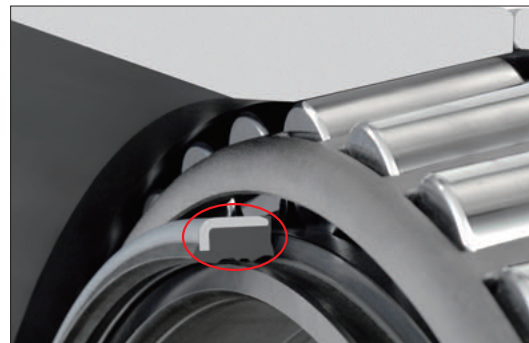
### Features

1. Substantial reduction in grease consumption (compared to open type)
2. Extension of overhaul and cleaning intervals
3. Prevention of intrusion of rolling mill oil and/or scale
4. Reduction in harmful effects on working environment [compared to open type (grease lubrication, oil mist lubrication)]



#### A. Seal cover with seal and O-ring

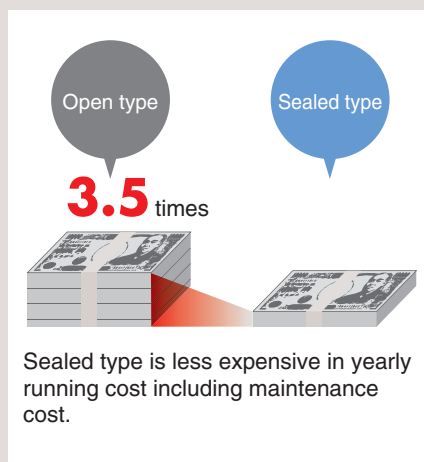
Seal with spring and O-ring prevent intrusion of rolling mill oil and scale causing leak of packed grease in the bearing. Newly-developed compact seal increases the load rating to 1.2 times compared to the conventional sealed type bearing, bearing service life to 1.8 times. (Ratio of our company)



#### B. Seal between inner rings

Seal prevents intrusion of rolling mill oil from roll necks. Integration of case (metal ring) and packing allows compact size and easy handling.

## Comparison of cost for sealed type and open type

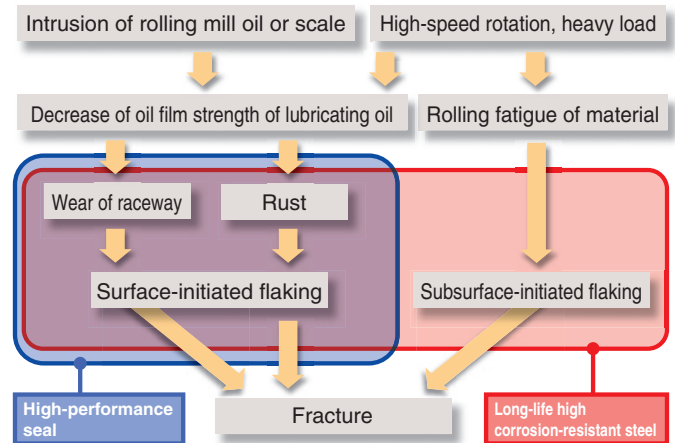


|  | Open type                  | Sealed type           |
|--|----------------------------|-----------------------|
| Number of stands                                       | 5 stands/line              | 5 stands/line         |
| Work roll (number of turnovers)                        | 3 turnovers                | 3 turnovers           |
| Number of bearings (4x5 standsx3 turnovers)            | 60 set                     | 60 set                |
| Initial amount of packed grease (kg)                   | 1.00 kg                    | 1.00 kg               |
| Grease cost (Yen/kg)                                   | ¥500                       | ¥2,000                |
| Roll replacement interval (hour)                       | 6 hours                    | 6 hours               |
| Operation (hour)                                       | 24 hours                   | 24 hours              |
| Greasing frequency per roll replacement                | Once                       | 0                     |
| Greasing amount per roll replacement (kg)/bearing      | 0.05 kg                    | 0 kg                  |
| Greasing amount per roll replacement (kg)/line         | 1 kg                       | 0 kg                  |
| Monthly greasing amount (kg)/line                      | 120 kg                     | 0 kg                  |
| Monthly greasing cost (Yen)/line                       | ¥60,000                    | ¥0                    |
| Yearly greasing amount (kg)/line                       | 1 440 kg                   | 0 kg                  |
| Yearly greasing cost (Yen)/line                        | ¥720,000                   | ¥0                    |
| Overhaul and cleaning interval (month)                 | 3 months (four times/year) | 6 months (twice/year) |
| Greasing amount per overhaul and cleaning (kg)/bearing | 1 kg                       | 1 kg                  |
| Yearly number of overhaul and cleaning bearings/line   | 240                        | 120                   |
| Yearly greasing amount (kg)/line                       | 240 kg                     | 120 kg                |
| Yearly greasing cost (Yen)/line                        | ¥120,000                   | ¥240,000              |
| Yearly total of greasing cost (Yen)/line               | <b>¥840,000</b>            | <b>¥240,000</b>       |
|  | 3.5                        | 1                     |

The currency unit is Japanese Yen.

## Extended service life of sealed type four-row tapered roller bearing

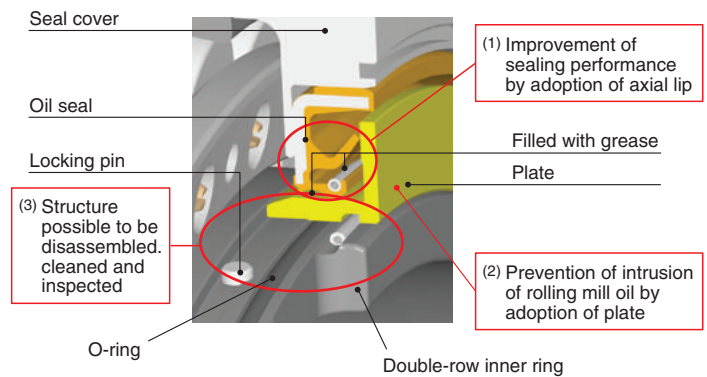
JTEKT has developed the sealed type four-row tapered roller bearing with oil seals integrated for reduction of grease consumption and prevention of intrusion of foreign matters (rolling mill oil or scale) of rolling mill bearings, and contributed to reduction of pollution of surrounding environment due to grease leak and elimination of re-greasing. However, due to the extended overhaul and cleaning intervals, the damage due to their intrusions (wear and/or rust on raceway) has recently occurred. Therefore, JTEKT has pushed forward the project to improve the life of the sealed type four-row tapered roller bearings through failure mode analysis as shown in Fig. 3.



**Fig. 3 Analysis of failure of sealed type four-row tapered roller bearing**

## High-performance seal

JTEKT dramatically extended bearing life by completely preventing the intrusion of rolling mill oil and/or scale into the bearing, which is the major cause of failure through the use of enhanced seals. Moreover, maintenance interval has been also lengthened by maintaining high sealing performance. This product was developed by collaboration of JTEKT and Koyo Sealing Techno Co.,Ltd. in JTEKT group.



**Fig. 4 Structure of high-performance seal**

Fig. 5 and Table 1 show the appearance status and application history of bearing with high-performance seal adopted. Low water content in the grease and little to no rust generation is proof of excellent sealing performance.



**Fig. 5 Post-use appearance of bearing with high-performance seal**

|                         |   |
|-------------------------|---|
| Application             | Hot strip mill work roll                            |
| Service period          | 1 486 h<br>(Without any maintenance or re-greasing) |
| Bearing appearance      | Good, no flaking and slight wear                    |
| Grease penetration      | About 280 (New : 300)                               |
| Water content in grease | About 1%  |

**Table 1 Application history of bearing with high-performance seal**

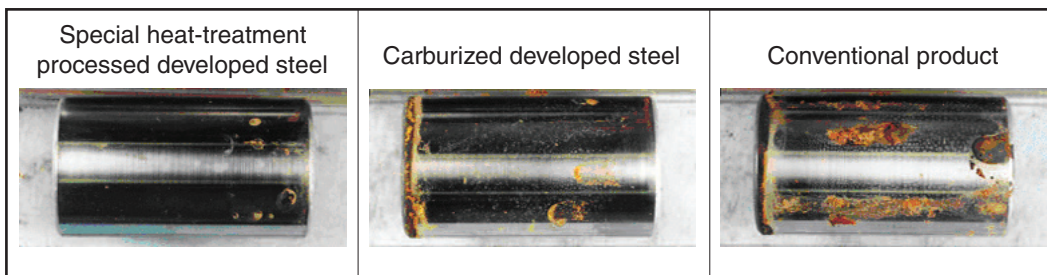


## Long-life, high corrosion-resistant steel

When rolling mill oil intrudes into the bearing, intrusion may cause rust between the raceway and the rollers, from which flaking is initiated. Also, the breakage of oil film due to the intrusion of rolling mill oil may cause wear on the rolling surfaces of raceways and rollers, from which surface-initiated flaking may occur. In order to improve both problems, JTEKT has developed a new long-life, high corrosion-resistant steel with optimized content of chromium and molybdenum. Additionally, original carbonitriding heat treatment has improved corrosion-resistance and wear-resistance qualities while maintaining the toughness of the steel.

### Comparison of rust-resistance

#### Test result



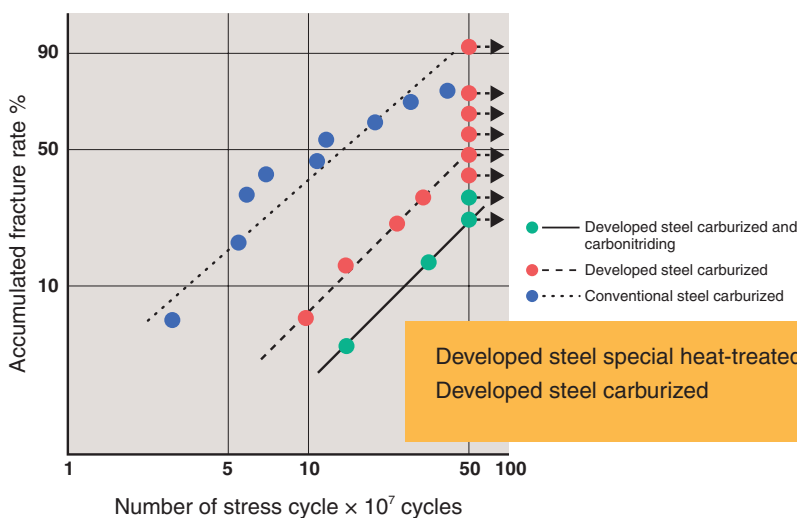
Special heat treatment : Carburizing + Carbonitriding

Fig. 6 Comparison of rust-resistance (humidity cabinet test)

#### ● Humidity cabinet test conditions

Test temperature :  
49 °C ± 1 °C  
Relative humidity :  
95% or more  
Test period : 96 hours

### Rolling fatigue life test



#### ● Life test conditions

Test piece form : 20 mm dia.,  
32 mm length  
Maximum contact stress : 5 800 MPa  
Loading cycle frequency : 285 Hz  
Lubricating oil : Turbine oil (ISO #VG68)  
Oil supply : 2 ℓ/min (room temperature)

\*Test was banned after  $50 \times 10^7$  time

Fig. 7 Result of rolling fatigue life test

Fig. 8 and Table 2 show the appearance and application history of bearing with newly developed steel adopted. Restraining of flaking caused by rust can be seen.



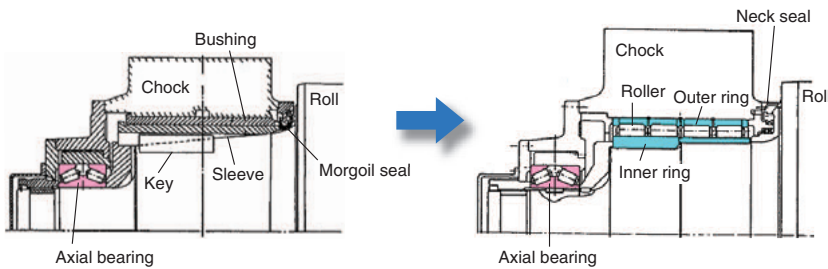
Fig. 8 Post-use appearance of bearing with newly developed steel

|                         |                                       |
|-------------------------|---------------------------------------|
| Application             | Cold strip mill work roll             |
| Service period          | About 9months                         |
| Bearing appearance      | No rust on outer ring raceway surface |
| Water content in grease | About 5%                              |

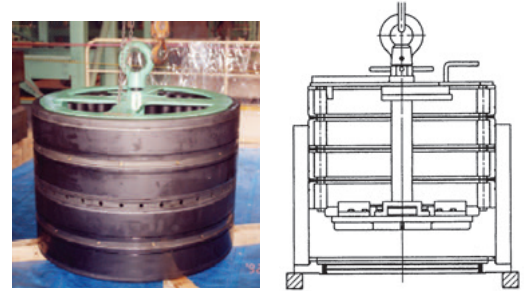
Table 2 Application history of bearing with newly developed steel

# Replacing oil film bearing with rolling bearing

In 1972, JTEKT adopted four-row cylindrical roller bearings for new cold tandem mill tandem back-up rolls (BUR) at first in Japan. Since then, JTEKT has supplied bearings for BUR to many steel manufacturers all over the world. Since JTEKT carried out the modification design and delivered rolling bearings for the modification of the plate mill by replacing the oil film bearing of the back-up roll with the rolling bearing in 1984, JTEKT has completed about twenty-five projects (maximum record in Japan) until 2007 and has contributed to offer highly-precise products for rolling mills.



**Fig. 9 Replacement of oil film bearing with rolling bearing for back-up roll of rolling mill**



**Fig. 10 Lifting tool for rolling bearing assembly**

## Oil Seal

JTEKT can supply oil seals for various purposes for rolling mills or feeding tables.

### Features of Koyo oil seal

#### 1. Lightweight, compact, and energy-saving

- Koyo oil seals offer high sealing performance, while being compact with reduced seal width.
- They help reduction of machine weight, size, and resource consumption.

#### 2. High sealing performance by optimum lip design

- Koyo oil seals adopt a linear-contact lip, which provides proper radial lip load.
- The lip design ensures excellent sealing performance, low torque, proper flexibility and high allowability for eccentricity.

#### 3. Low heat generation and long service life by highly self-lubricating rubber materials

- Based on extensive research and experimentation, JTEKT has succeeded in developing seal rubber materials with high self-lubrication performance. These rubber materials show limited chemical changes such as hardening, softening and/or aging.
- These materials, having excellent durability, can offer long service life with less heat generation even under high-peripheral speed.



**Large-size oil seal**

For details of oil seals, see CAT.NO.R2001E.



# Bearing failures, causes and countermeasures

## Failures

## Characteristics

1

### Flaking

#### Flaking caused by excessive axial load



(Inner ring of four-row tapered roller bearing)

#### Damages

Flaking on bearing raceway surface generated on only rows receiving axial load

#### Causes

- 1) Crossed work rolls causing excessive axial load
  - Roll neck diameter is smaller than the standard one.
  - Chock side liner is worn.
  - Inaccuracy of mill stand.
  - Rigidity of the chock is poor.
  - Corrosion on liner or clearance generated between the liner and the chock.
  - Failure of the keeper plate.

#### Countermeasures

- 1) Keep the correct locations of the chock and work roll.



(Outer ring raceway of four-row tapered roller bearing)

#### Damages

Flaking generated and developed from raceway end face

#### Causes

- 1) Looseness of chock cover/excessive axial clearance.
  - ( As the axial clearance is increased, the loading range becomes narrower, partial load acts, and edge load is generated on the outer ring raceway. )
- 2) Excessive axial clearance is generated because of the mixed use of other bearing spacer or outer ring.

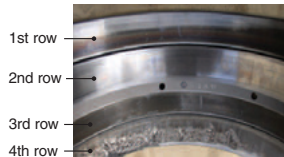
#### Countermeasures

- 1) Adjust shims, select thickness of shims, measure a gap, and tighten bolts correctly.
- 2) Use parts of the same number.

#### Flaking caused by improper mounting

Loading position (1)

Loading position (2)



Loading position (3)

Loading position (4)



(Outer ring raceway of four-row tapered roller bearing)

#### Damages

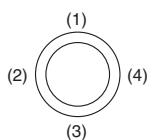
Flaking on raceway surface with slanted contact

#### Causes

- 1) It occurs when the chock is fixed inappropriately and slantingly.
  - Failure of keeper plate
  - Removal, looseness, damage, deformation, bend, unequal tightening, unequal wear, improper parallelism.
  - Damaged, deformed, or bent chock flange.

#### Countermeasures

- 1) Find the cause of damage by periodic inspection of the chock and stand.



# Bearing failures, causes and countermeasures

## Failures

## Characteristics

1

### Flaking

#### Flaking at corroded start point



(Outer ring raceway of four-row tapered roller bearing)

#### Damages

Flaking on raceway surface started from corroded (rusted) portion

#### Causes

- 1) After the bearing was used, it has been left for a long period with moisture mixed in grease.
- 2) Improper rust preventive treatment after the bearing was washed.
- 3) Worn or damaged seal lips.
- 4) Corrosion on the raceway is generated due to the clearance between the roll neck and the sleeve, and flaking occurs with rust.

#### Countermeasures

- 1) Improve seal maintenance and sealing method. Periodically check for wear or damage on the seal lips.
- 2) Fit the "O" ring between the roll neck and the sleeve.
- 3) Immediately after the bearing is removed from the chock, change grease.
- 4) After washing the bearing, remove kerosene and water completely.

#### Flaking on nicks (scratch) start point



(Rolling contact surface of four-row cylindrical roller bearing)

#### Damages

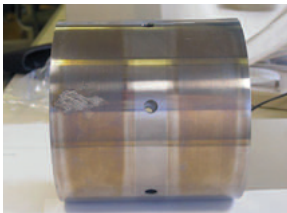
Flaking on rolling contact surface with nicks start point

#### Causes

- 1) Inappropriate handling
  - Mounting / dismounting bearing to / from chock.
  - Replacing roll.

#### Countermeasures

- 1) Proper handling jig (use of a copper hammer).
- 2) Prevention of impact load when replacing roll (use of soft material).
- 3) Improvement in mounting method.
- 4) Change in raceway chamfering.



(Inner ring raceway of double-row cylindrical roller bearing)

#### Damages

Flaking on raceway surface

#### Causes

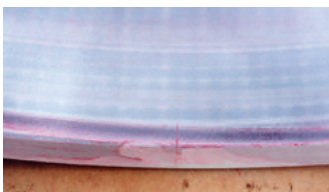
- 1) Low viscosity oil lubrication (improper lubrication).
- 2) Ingress of dusts and foreign matters.

#### Countermeasures

- 1) Improvement in viscosity of oil and oil type.
- 2) Improvement in seal maintenance and sealing method. Periodic check of wear or damage of seal lip.
- 3) Check of oil filter.

2

### Cracking Chipping



(Inner ring side face of four-row tapered roller bearing)

#### Damages

Minute crack on inner ring side face

#### Causes

- 1) Fix the inner ring and the roll with a fillet ring (thrust collar).
- 2) Clearance between the fillet ring (thrust collar) and the inner ring is excessively small.
- 3) Area of the side face of nut/slinger contacting the inner ring side face is too small, the side face is worn due to inner ring creep, causing heat.

#### Countermeasures

- 1) Keep the clearance between the inner ring and the fillet ring (thrust collar) (from 0.5 mm to 1.5 mm).
- 2) Keep the area of the side of fillet ring (thrust collar) (to reduce pressure on the side face).
- 3) Apply and supply grease of adequate amount.

**Failures**

**Characteristics**

**2**

**Cracking  
Chipping**



(Rolling contact surface of four-row cylindrical roller bearing)

**Damages**

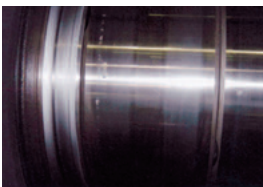
Cracking on rolling elements

**Causes**

- 1) Application of load greater than bearing load rating (Load resistance of roller by use of pin type cage)
- 2) Secondary factor in case of damaged pin of cage (For a reversible mill, pins are broken due to fatigue caused by rapid acceleration and deceleration)
- 3) Other factors
  - Ingress of water due to faulty sealing.
  - Increase of axial clearance of bearing, causing application of partial and excessive load.

**Countermeasures**

- 1) Optimal design of bearing considering load and operating conditions (Examination of optimal cage type)
- 2) Reviewing sealing method and design of strength of cover.



(Inner ring raceway of four-row cylindrical roller bearing)

**Damages**

Grinding burn or crack on inner ring raceway surface

**Causes**

- 1) After fitting an inner ring into the roll neck, grinding burn occurs during grinding with the inner ring and the roll.
- 2) Crack occurs because rollers rolling on the raceway surface of which strength (hardness) is decreased due to grinding burn.

**Countermeasures**

- 1) Reviewing grinding conditions  
Grain size of grinding stone, grinding stone cutting amount, cutting pressure, grinding fluid amount, etc.



(Inner ring raceway of four-row cylindrical roller bearing)

**Damages**

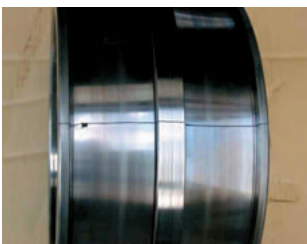
Axial crack occurs on bore surface of inner ring and raceway surface.

**Causes**

- 1) Excessive interference between inner ring and shaft.
- 2) Great fit stress due to excessive difference in temperature of inner ring and that of shaft.

**Countermeasures**

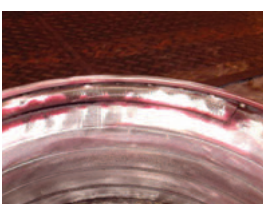
- 1) Appropriate fit conditions of inner ring and shaft.
- 2) Appropriate difference in temperature by checking load, rotation, and temperature conditions. (appropriate fit)



(Inner ring of spherical roller bearing)



(Fractured section of inner ring)



(Inner ring bore surface of four-row tapered roller bearing)

**Damages**

Circumferential crack occurs on bore surface and raceway surface of inner ring.

**Causes**


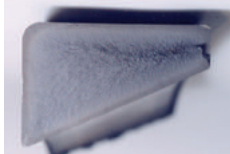


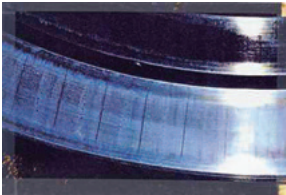



- 1) Step wear occurs on the shaft (roll neck), and the inner ring overrides the shaft, causing great bore surface stress.


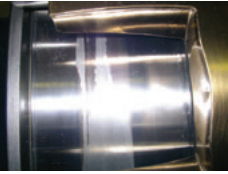
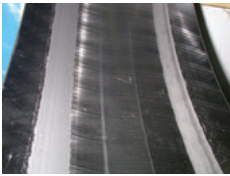
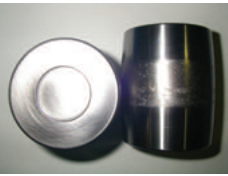
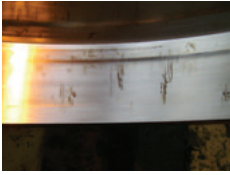



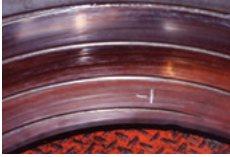
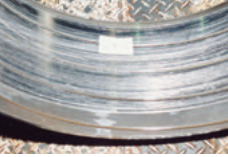
**Countermeasures**

- 1) Provide circumferential groove for the roll neck.
- 2) When using a bearing with different chamfers for a roll, make the chamfers identical.



# Bearing failures, causes and countermeasures

| Failures                             | Characteristics   |  |  |
|--------------------------------------|---|--|--|
| <b>2</b><br><b>Cracking Chipping</b> |  <p>(Outer ring raceway of double-row tapered roller bearing)</p>          |  <p>(Fractured section of outer ring)</p>                           | <p><b>Damages</b></p> <p>Axial crack occurs on outside surface and raceway surface of outer ring.</p> <p><b>Causes</b></p> <ol style="list-style-type: none"> <li>1) Excessive axial load.</li> <li>2) Axial clearance between the bearing and roll is great, and excessive axial load is applied.</li> </ol> <p><b>Countermeasures</b></p> <ol style="list-style-type: none"> <li>1) Check for axial load.</li> <li>2) Check the wear condition of counterpart components.</li> <li>3) Reviewing thickness of the outer ring</li> </ol>   |
|                                      |  <p>(Inner ring raceway of spherical thrust roller bearing)</p>            |  <p>(Assembly of tapered roller bearing)</p>                        | <p><b>Damages</b></p> <p>Crack occurs on inner ring back face rib.</p> <p><b>Causes</b></p> <ol style="list-style-type: none"> <li>1) Excessive axial load.</li> <li>2) Low holding shoulder diameter on the inner ring back face rib.</li> </ol> <p><b>Countermeasures</b></p> <ol style="list-style-type: none"> <li>1) Reviewing operating conditions.</li> <li>2) Reviewing dimensions of counterpart collar. (Dimensions allowing backup of inner ring back face rib)</li> </ol>  |
| <b>3</b><br><b>Brinelling Nicks</b>  |  <p>(Outer ring raceway surface of four-row tapered roller bearing)</p>  |  | <p><b>Damages</b></p> <ol style="list-style-type: none"> <li>1) Brinelling (Nicks) on raceway and rolling contact surfaces (scratch).</li> <li>2) Brinelling on raceway surface at the same interval as rolling element spacing.</li> </ol> <p><b>Causes</b></p> <ol style="list-style-type: none"> <li>1) Nicks occur on the raceway and rollers because of improper handling. <ul style="list-style-type: none"> <li>· Mounting / dismounting bearing to / from chock</li> <li>· Replacing roll</li> </ul> </li> <li>2) Great bending load is applied to the roll neck. (Especially, when faulty rolling occurs)</li> </ol> <p><b>Countermeasures</b></p> <ol style="list-style-type: none"> <li>1) Proper handling jig (use of a copper hammer).</li> <li>2) Application of grease to raceway surface of inner and outer rings. (Apply oil if the bearing is the oil lubricated type)</li> <li>3) Prevention of impact load when replacing roll. (Use of soft material)</li> <li>4) Roll bending compared to bearing static load rating.</li> <li>5) Improvement in mounting method.</li> <li>6) Change in raceway chamfering.</li> <li>7) Check for excessive load on the slant chamfer of the raceway surface.</li> </ol> |
|                                      |  <p>(Rolling contact surface of four-row cylindrical roller bearing)</p> |  |  |
| <b>4</b><br><b>Scratch Scuffing</b>  |  <p>(Roller end face of double-row cylindrical roller bearing)</p>       |  <p>(Outer ring rib of double-row cylindrical roller bearing)</p> | <p><b>Damages</b></p> <p>Scuffing on roller end face, rib of the raceway</p> <p><b>Causes</b></p> <ol style="list-style-type: none"> <li>1) Improper lubrication, ingress of foreign matters.</li> <li>2) Abnormal axial load caused by improper mounting or control of bearing overall thickness.</li> <li>3) Excessive axial load.</li> <li>4) Excessive preload.</li> </ol> <p><b>Countermeasures</b></p> <ol style="list-style-type: none"> <li>1) Selection of appropriate oil type and supply of adequate lubricant.</li> <li>2) Reviewing bearing mounting location.</li> <li>3) Reviewing bearing overall thickness control.</li> <li>4) Reviewing operating conditions.</li> <li>5) Checking preload.</li> </ol>  |
|                                      |  <p>(Roller large end face of double-row tapered roller bearing)</p>     |  |  |
|                                      |   |  |  |

| Failures                               | Characteristics   |   |                               |   |
|--|---|---|-------------------------------|---|
| <p><b>5</b><br/>Smearing</p>           |  <p>(Outer ring raceway surface of four-row tapered roller bearing)</p>          |  <p>(Outer ring raceway surface of spherical roller bearing)</p> | <p><b>Damages</b></p>         | <p>Smearing on raceway or rolling contact surface</p>   |
|  |  <p>(Outer ring raceway surface of spherical roller bearing)</p>                 |  <p>(Rolling element surface of spherical roller bearing)</p>    | <p><b>Causes</b></p>          | <ol style="list-style-type: none"> <li>1) Improper lubrication</li> <li>2) Slip of rolling elements (high speed, light load)</li> <li>3) Ingress of foreign matters during maintenance</li> </ol>   |
|  |   |   | <p><b>Countermeasures</b></p> | <ol style="list-style-type: none"> <li>1) Selection of appropriate oil type and supply of adequate lubricant</li> <li>2) Setup of appropriate preload</li> <li>3) Prevention of ingress of foreign matters</li> </ol>   |
| <p><b>6</b><br/>Rust<br/>Corrosion</p> | <p><b>Corrosion</b></p>  <p>(Outer ring of four-row tapered roller bearing)</p> |  <p>(Outer ring of four-row tapered roller bearing)</p>         | <p><b>Damages</b></p>         | <p>Rust, corrosion on the raceway surface at the same interval as rolling element spacing</p>   |
|  |   |   | <p><b>Causes</b></p>          | <ol style="list-style-type: none"> <li>1) Worn or damaged seal lips</li> <li>2) Ingress of water or corrosive materials into clearance between roll neck and sleeve</li> </ol>  |
|  |   |   | <p><b>Countermeasures</b></p> | <ol style="list-style-type: none"> <li>1) Improve seal maintenance and sealing method. Periodically check for wear or damage on the seal lips.</li> <li>2) Fit the "O" ring between the roll neck and the sleeve.</li> </ol>  |
|  | <p><b>Rust</b></p>  <p>(Outer ring of four-row tapered roller bearing)</p>     |   | <p><b>Damages</b></p>         | <p>Rust on partial or entire surface of bearing</p>   |
|  |   |   | <p><b>Causes</b></p>          | <ol style="list-style-type: none"> <li>1) After the bearing was used, it has been left for a long period with moisture mixed in grease.</li> <li>2) Improper rust preventive treatment after the bearing was washed.</li> </ol>   |
|  |   |   | <p><b>Countermeasures</b></p> | <ol style="list-style-type: none"> <li>1) Immediately after the bearing is removed from the chock, change grease.</li> <li>2) After washing the bearing, remove kerosene and water completely.</li> </ol>   |
| <p><b>7</b><br/>Creeping</p>           |  <p>(Scuffing on rolling mill roll neck)</p>                                   |   | <p><b>Damages</b></p>         | <p>Wear, discoloration, and scuffing due to slip of fitting surface</p>   |
|  |  <p>(Inner ring bore surface of four-row tapered roller bearing)</p>           |    | <p><b>Causes</b></p>          | <ol style="list-style-type: none"> <li>1) Insufficient grease or oil between the inner ring bore surface and the roll neck outside surface<br/> <span style="font-size: 2em; vertical-align: middle;">(</span> When creep occurs between the inner ring and the roll neck, because of loose fit of them. <span style="font-size: 2em; vertical-align: middle;">)</span> </li> </ol> |
|  |   |   | <p><b>Countermeasures</b></p> | <ol style="list-style-type: none"> <li>1) Provide the spiral groove for bore surface of inner ring</li> <li>2) When mounting the bearing, apply grease with molybdenum disulfide or EP grease. (Apply oil if the bearing is the oil lubricated type)</li> </ol>   |

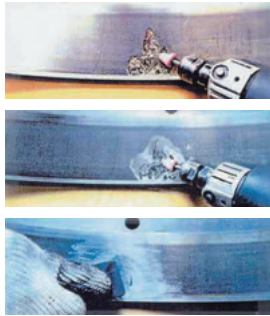
# Bearing failures, causes and countermeasures

| Failures  | Characteristics   |   |   |  |   |   |
|---|---|---|---|--|---|---|
| <b>8</b><br>Seizure   |  <p>(Rolling contact surface of double-row tapered roller bearing)</p> |  <p>(Roller large end face of double-row tapered roller bearing)</p>   | <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"><b>Damages</b></div> Discoloration, deformation, and melting caused by heating in bearing <hr/> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"><b>Causes</b></div> 1) Improper lubrication (insufficient or degraded lubricant)<br>2) Ingress of water due to faulty sealing<br>3) Excessive axial load<br>4) Heat generated by creep of inner ring<br>5) Ingress of dusts or foreign matters<br>6) Excessively small bearing internal clearance <hr/> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"><b>Countermeasures</b></div> 1) Reviewing sealing type and conditions<br>2) Reviewing lubricating method and lubricant, and checking lubricated condition<br>3) Check for axial load<br>4) Reviewing bearing (type, size, etc.)<br>5) Reviewing clearance<br>6) Confirming operating conditions |  |   |   |
|   |  <p>(Inner ring of double-row tapered roller bearing)</p>              |   |   |  |   |   |
|   | <b>9</b><br>Failure in lubrication  |  <p>(Inner ring assembly of four-row tapered roller bearing)</p>  |   |  | <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"><b>Damages</b></div> Grease including large quantity of water mixed in <hr/> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"><b>Causes</b></div> 1) Operated at high temperature ⇒ Grease is carbonized.<br>2) Ingress of water due to improper sealing or wear or damage of seal lip (In this example, 20% or more of water is mixed in grease.) <hr/> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"><b>Countermeasures</b></div> 1) Find the cause of high temperature.<br>( If the temperature cannot be lowered, review the possibility of change to high temperature grease. )<br>2) Checking wear or damage of seal lip<br>Find the cause of and countermeasure against the improper sealing. |   |
|   |   |  <p>(Inner ring assembly of double-row tapered roller bearing)</p>   |   |  <p>(Outer ring of double-row tapered roller bearing)</p> |   | <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"><b>Damages</b></div> Foreign matter attachment and corrosion occur because of ingress of a great deal of foreign matters (scale and water for rolling). <hr/> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"><b>Causes</b></div> 1) Ingress of water due to improper sealing or wear or damage of seal lip <hr/> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"><b>Countermeasures</b></div> 1) Checking wear or damage of seal lip<br>Find the cause of and countermeasure against the improper sealing. |
|   |   |  <p>(Four-row tapered roller bearing)</p>  |   |  |   |   |
|  <p>(Outer ring assembly of four-row cylindrical roller bearing)</p> |  <p>(Outer ring assembly of four-row cylindrical roller bearing)</p> | <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"><b>Damages</b></div> Looseness and breaking of pin <hr/> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"><b>Causes</b></div> 1) Abnormal load due to vibration occurs.<br>2) End of cage's service life because of use for a long period <hr/> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"><b>Countermeasures</b></div> 1) Checking abnormal vibration<br>2) Replace if it has been used for a long period. |   |  |   |   |



[Reference]

**Repair to portion flaking occurred**

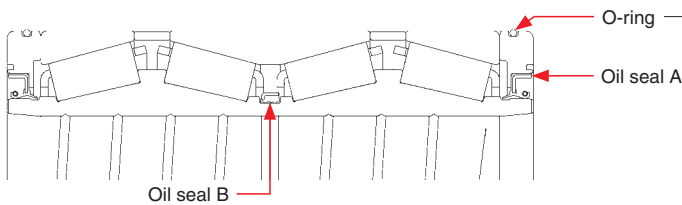


- 1 Remove the edges of the portion flaking occurred (with a polishing grinder).
- 2 Finish of the surface of the portion flaking occurred.
- 3 Finish the surface by lapping the modified portion.

Modification may not be able to be done depending on the status of the portion flaking occurred. Consult with JTEKT.

**Particular failure cases of sealed type bearing**

**Checking oil seals and O-rings**



**Cut, peeling, and yielding of O-ring for seal cover**

**Remedy** Replace with new O-rings.

**Hardening of oil seal A**

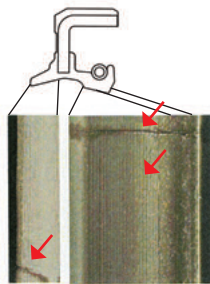
**Remedy** Replacement is recommended.

**Crack, blister of oil seal A**

- Remedy**
- 1 Replace the oil seal. (The figure on the left side shows cracks on the sealing lip and minor lip).
  - 2 If they occurred in a short period, reviewing operating conditions or examination of change of oil seal material are required.

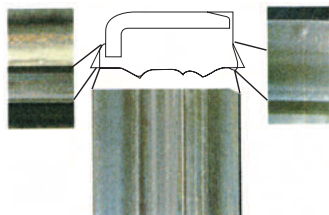
**Abnormal wear to lip of oil seal A**

- Remedy**
- 1 If the interference is restricted, replacement is required.
  - 2 When fitting new oil seals, apply grease to the lips generously.



**Abnormal wear to side and bore surfaces of oil seal B**

- Remedy**
- 1 If the interference is restricted, replacement is required.
  - 2 When fitting new oil seals, apply grease to the side and bore surfaces generously.

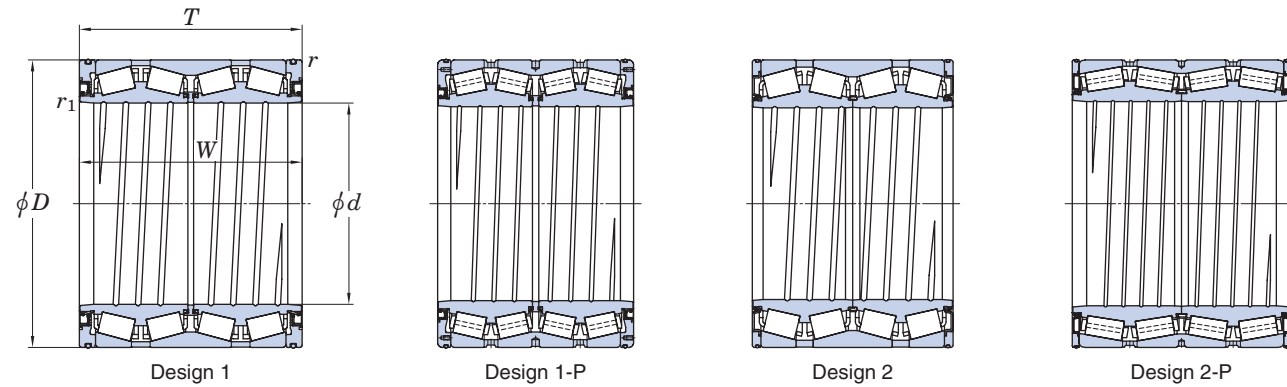


**Oil seals and O-rings**

- 1 Oil seals and O-rings are very important parts to prevent intrusion of water and foreign matters into bearings. Periodic replacement is required, since they are consumables.
- 2 Whenever attaching new oil seals or removed oil seals after overhaul and cleaning, be sure to apply grease to the oil seal lips generously. Service life of seals depends on the grease status.

# Sealed type four-row tapered roller bearings

$d$  220 ~ (440) mm

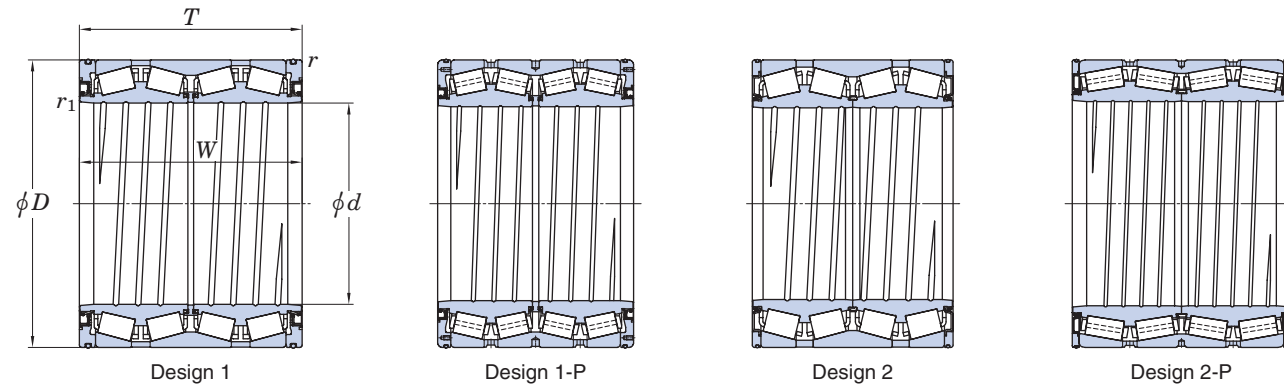


| Boundary dimensions |         |         |         |         |            |         |          |       |       | Basic load ratings (kN) |        | Bearing No.   | Design | Constant $e$ | Axial load factors |      | (Refer.)<br>Mass (kg) |
|---------------------|---------|---------|---------|---------|------------|---------|----------|-------|-------|-------------------------|--------|---------------|--------|--------------|--------------------|------|-----------------------|
| $d$                 | $D$     | $T$     | $W$     | $r$     | $r_1^{1)}$ | $C_r$   | $C_{0r}$ | $Y_2$ | $Y_3$ |                         |        |               |        |              |                    |      |                       |
| mm                  | inch    | mm      | inch    | mm      | inch       | mm      | inch     | min.  | min.  |                         |        |               |        |              |                    |      |                       |
| 220                 | —       | 320     | —       | 290     | —          | 290     | —        | 3     | 2     | 2 200                   | 4 700  | 47TS443229B   | 1      | 0.39         | 1.74               | 2.59 | 73.9                  |
| 240                 | —       | 320     | —       | 294     | —          | 294     | —        | 4     | 1     | 1 880                   | 4 760  | 47TS483229-1  | 1      | 0.33         | 2.03               | 3.02 | 63.6                  |
|                     | —       | 338     | —       | 248     | —          | 248     | —        | 3     | 1.5   | 1 890                   | 4 120  | 47TS483425B   | 1      | 0.47         | 1.43               | 2.12 | 66                    |
|                     | —       | 338     | —       | 340     | —          | 340     | —        | 3     | 1     | 2 450                   | 5 930  | 47TS483434A   | 1      | 0.4          | 1.68               | 2.5  | 88                    |
| 241.478             | 9.5070  | 349.148 | 13.7460 | 228.600 | 9.0000     | 228.600 | 9.0000   | 3.2   | SP    | 2 000                   | 4 110  | 47TS483523A   | 2      | 0.35         | 1.91               | 2.84 | 67.5                  |
| 245                 | —       | 345     | —       | 310     | —          | 310     | —        | 3     | 1.5   | 2 520                   | 6 020  | 47TS493531-2  | 1      | 0.4          | 1.68               | 2.5  | 89.9                  |
| 250                 | —       | 365     | —       | 270     | —          | 270     | —        | 3     | 1.5   | 2 260                   | 4 730  | 47TS503727A-1 | 1      | 0.4          | 1.68               | 2.5  | 94.2                  |
| 254.000             | 10.0000 | 358.775 | 14.1250 | 269.875 | 10.6250    | 269.875 | 10.6250  | 3.2   | 1.5   | 2 520                   | 6 010  | 47TS513627B   | 2      | 0.4          | 1.68               | 2.5  | 85                    |
| 260                 | —       | 365     | —       | 340     | —          | 340     | —        | 3.5   | 1.6   | 2 800                   | 6 530  | 47TS523734-5  | 1      | 0.4          | 1.68               | 2.5  | 110                   |
| 266.700             | 10.5000 | 355.600 | 14.0000 | 228.600 | 9.0000     | 230.188 | 9.0625   | 3.2   | 1.6   | 1 940                   | 4 880  | 47TS533623B   | 2      | 0.36         | 1.87               | 2.79 | 60                    |
| 276.225             | 10.8750 | 393.700 | 15.5000 | 269.875 | 10.6250    | 269.875 | 10.6250  | 3.2   | SP    | 2 770                   | 6 510  | 47TS553927A   | 2      | 0.4          | 1.68               | 2.5  | 105                   |
| 279.400             | 11.0000 | 393.700 | 15.5000 | 269.875 | 10.6250    | 269.875 | 10.6250  | 3.2   | SP    | 2 770                   | 6 510  | 47TS563927B   | 2      | 0.4          | 1.68               | 2.5  | 101                   |
|                     | 11.0000 | 393.700 | 15.5000 | 320.000 | 12.5984    | 320.000 | 12.5984  | 3.2   | 1.5   | 2 880                   | 6 900  | 47TS563932-2  | 1      | 0.4          | 1.68               | 2.5  | 124                   |
| 280                 | —       | 380     | —       | 290     | —          | 290     | —        | 3.2   | SP    | 2 720                   | 6 940  | 47TS563829A   | 2      | 0.33         | 2.03               | 3.02 | 93.8                  |
|                     | —       | 395     | —       | 340     | —          | 340     | —        | 3     | 1.5   | 2 960                   | 7 110  | 47TS564034A   | 1      | 0.4          | 1.68               | 2.5  | 130                   |
|                     | —       | 410     | —       | 268     | —          | 268     | —        | 5.4   | 1.6   | 2 240                   | 4 510  | 47TS564127    | 1      | 0.33         | 2.03               | 3.02 | 118                   |
|                     | —       | 430     | —       | 350     | —          | 350     | —        | 3.5   | 1.5   | 3 940                   | 8 190  | 47TS564335    | 1      | 0.4          | 1.68               | 2.5  | 178                   |
| 304.648             | 11.9940 | 438.048 | 17.2460 | 279.400 | 11.0000    | 279.400 | 11.0000  | 3.2   | 1.6   | 3 140                   | 6 860  | 47TS614428C-1 | 2      | 0.4          | 1.68               | 2.5  | 135                   |
| 304.902             | 12.0040 | 412.648 | 16.2460 | 266.700 | 10.5000    | 266.700 | 10.5000  | 3.2   | 0.8   | 2 750                   | 6 820  | 47TS614127D   | 2      | 0.39         | 1.74               | 2.59 | 99.5                  |
| 310                 | —       | 430     | —       | 310     | —          | 310     | —        | 3     | 1     | 3 010                   | 6 880  | 47TS624331-4  | 1      | 0.4          | 1.68               | 2.5  | 131                   |
|                     | —       | 430     | —       | 350     | —          | 350     | —        | 3.5   | SP    | 3 280                   | 7 870  | 47TS624335B-2 | 1      | 0.4          | 1.68               | 2.5  | 148                   |
| 317.500             | 12.5000 | 447.675 | 17.6250 | 367.000 | 14.4488    | 367.000 | 14.4488  | 4     | 1.6   | 3 680                   | 8 500  | 47TS644537-1  | 1      | 0.4          | 1.68               | 2.5  | 176                   |
| 343.052             | 13.5060 | 457.098 | 17.9960 | 254.000 | 10.0000    | 254.000 | 10.0000  | 3.2   | 0.8   | 2 870                   | 7 030  | 47TS694625D-1 | 2      | 0.4          | 1.68               | 2.5  | 110                   |
|                     | 13.5060 | 457.098 | 17.9960 | 299.000 | 11.7717    | 299.000 | 11.7717  | 3.2   | SP    | 3 310                   | 9 010  | 47TS694630B   | 2      | 0.4          | 1.68               | 2.5  | 135                   |
| 355.600             | 14.0000 | 482.600 | 19.0000 | 269.875 | 10.6250    | 265.112 | 10.4375  | 3.2   | 1.5   | 2 680                   | 6 090  | 47TS714827    | 1-P    | 0.47         | 1.43               | 2.12 | 134                   |
| 360                 | —       | 480     | —       | 375     | —          | 375     | —        | 3     | 1     | 4 120                   | 10 600 | 47TS724838A   | 1      | 0.4          | 1.68               | 2.5  | 181                   |
| 440                 | —       | 590     | —       | 480     | —          | 480     | —        | 4     | SP    | 6 870                   | 18 700 | 47TS885948A-3 | 2-P    | 0.26         | 2.55               | 3.8  | 362                   |

[Note] 1) SP indicates the specially chamfered form.

# Sealed type four-row tapered roller bearings

$d$  (440) ~ 800 mm

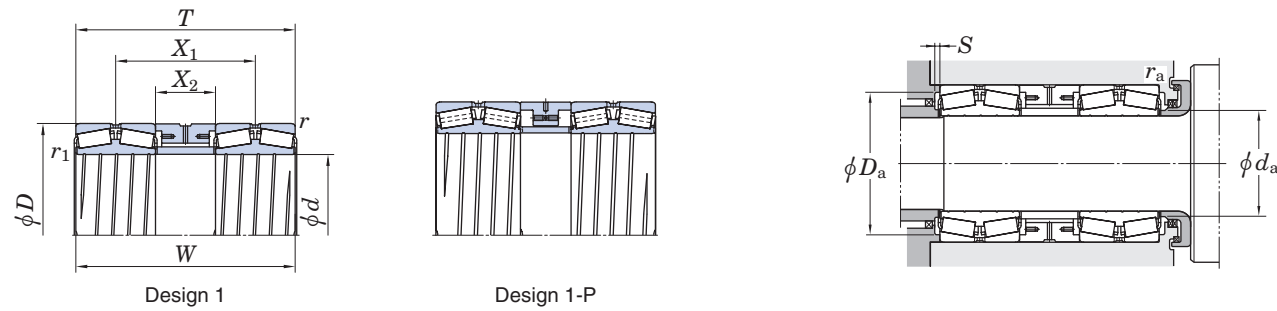


| Boundary dimensions |         |         |         |         |         |         |          |       |       | Basic load ratings (kN) |        | Bearing No.  | Design | Constant $e$ | Axial load factors |      | (Refer.) Mass (kg) |
|---------------------|---------|---------|---------|---------|---------|---------|----------|-------|-------|-------------------------|--------|--------------|--------|--------------|--------------------|------|--------------------|
| $d$                 | $D$     | $T$     | $W$     | $r$     | $r_1$   | $C_r$   | $C_{0r}$ | $Y_2$ | $Y_3$ |                         |        |              |        |              |                    |      |                    |
| mm                  | inch    | mm      | inch    | mm      | inch    | mm      | inch     | min.  | min.  |                         |        |              |        |              |                    |      |                    |
| 440                 | —       | 620     | —       | 454     | —       | 454     | —        | 4     | 1.5   | 6 580                   | 16 100 | 47TS886245-1 | 1-P    | 0.33         | 2.03               | 3.02 | 430                |
| 479.425             | 18.8750 | 679.450 | 26.7500 | 495.300 | 19.5000 | 495.300 | 19.5000  | 6.4   | 2     | 8 030                   | 19 600 | 47TS966850   | 1-P    | 0.33         | 2.03               | 3.02 | 562                |
| 482.600             | 19.0000 | 615.950 | 24.2500 | 330.200 | 13.0000 | 330.200 | 13.0000  | 3.2   | 1.6   | 4 510                   | 12 400 | 4TRS19D      | 2-P    | 0.4          | 1.68               | 2.5  | 239                |
| 492                 | —       | 655     | —       | 480     | —       | 480     | —        | 5     | 1.5   | 7 450                   | 21 200 | 47TS986648   | 1-P    | 0.33         | 2.03               | 3.02 | 449                |
| 585.788             | 23.0625 | 771.525 | 30.3750 | 479.425 | 18.8750 | 479.425 | 18.8750  | 6.4   | 1.5   | 8 730                   | 24 400 | 4TRS586A     | 1-P    | 0.33         | 2.03               | 3.02 | 613                |
| 595.312             | 23.4375 | 844.550 | 33.2500 | 615.950 | 24.2500 | 615.950 | 24.2500  | 6.4   | 3.6   | 12 700                  | 32 200 | 4TRS595B     | 1-P    | 0.33         | 2.03               | 3.02 | 1 120              |
| 609.600             | 24.0000 | 787.400 | 31.0000 | 361.950 | 14.2500 | 361.950 | 14.2500  | 6.4   | 3.2   | 5 920                   | 14 900 | 4TRS610      | 1-P    | 0.4          | 1.68               | 2.5  | 430                |
| 711.200             | 28.0000 | 914.400 | 36.0000 | 387.350 | 15.2500 | 387.350 | 15.2500  | 6.4   | 3.2   | 7 160                   | 19 400 | 4TRS711A     | 1-P    | 0.38         | 1.78               | 2.65 | 615                |
|                     | 28.0000 | 914.400 | 36.0000 | 420.000 | 16.5354 | 420.000 | 16.5354  | 6.4   | 3.2   | 7 870                   | 22 200 | 4TRS711L     | 1-P    | 0.4          | 1.68               | 2.5  | 678                |
| 800                 | —       | 1 130   | —       | 780     | —       | 780     | —        | 6     | 1.5   | 21 900                  | 58 800 | 4TRS800      | 1-P    | 0.26         | 2.55               | 3.8  | 2 520              |



# Four-row tapered roller bearings ... 45D type

$d$  360 ~ 685.800 mm

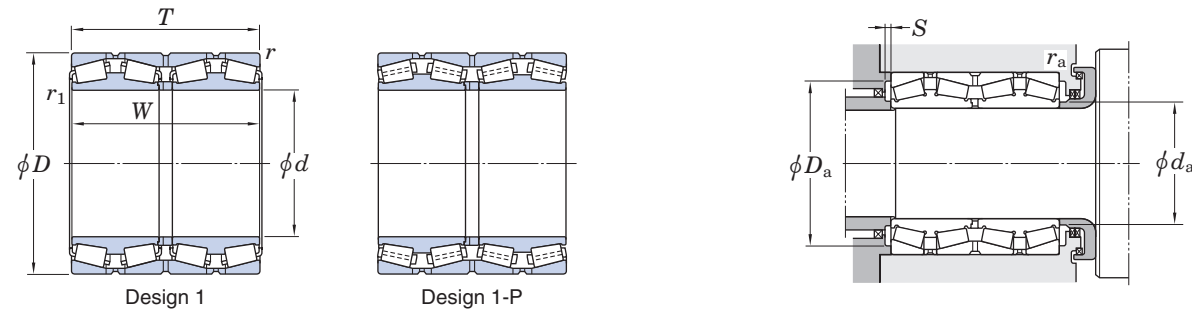


|         |         | Boundary dimensions |         |         |         |         |         |        |          |         |         | Basic load ratings (kN) |       | Bearing No. <sup>1)</sup> | Design | Mounting dimensions (mm) |       |       |       |     |      | Constant $e$ | Axial load factors |      |      | (Refer.) Mass (kg) |
|---------|---------|---------------------|---------|---------|---------|---------|---------|--------|----------|---------|---------|-------------------------|-------|---------------------------|--------|--------------------------|-------|-------|-------|-----|------|--------------|--------------------|------|------|--------------------|
| $d$     | $D$     | $T$                 | $W$     | $X_1$   | $X_2$   | $r$     | $r_1$   | $C_r$  | $C_{0r}$ | $d_a$   | $D_a$   | $S$                     | $r_a$ |                           |        | $r_b$                    | $Y_2$ | $Y_3$ | $Y_0$ |     |      |              |                    |      |      |                    |
| mm      | inch    | mm                  | inch    | mm      | inch    | mm      | inch    | mm     | inch     | mm      | inch    | mm                      | inch  | mm                        | inch   | mm                       | inch  | mm    | inch  | mm  | inch | mm           | inch               | mm   | inch |                    |
| 360     | —       | 450                 | —       | 350     | —       | 350     | —       | 2 660  | 7 460    | 225     | 100     | 2                       | 1.5   | 45D724535                 | 1      | 380                      | 440   | 425   | 5.5   | 2   | 1.5  | 0.29         | 2.32               | 3.45 | 2.26 | 109                |
| 385.762 | 15.1875 | 514.350             | 20.2500 | 317.500 | 12.5000 | 317.500 | 12.5000 | 4 380  | 11 000   | 164.500 | 11.500  | 3.2                     | 3.2   | 45D775132                 | 1      | 415                      | 503   | 483   | 9     | 3.2 | 3.2  | 0.26         | 2.55               | 3.8  | 2.5  | 180                |
| 400     | —       | 530                 | —       | 370     | —       | 370     | —       | 4 930  | 12 900   | 202     | 34      | 3                       | 1     | 45D805337                 | 1      | 428                      | 516   | 497   | 11.5  | 2.5 | 1    | 0.26         | 2.55               | 3.8  | 2.5  | 213                |
| 406.400 | 16.0000 | 562.000             | —       | 381.000 | —       | 381.000 | —       | 5 990  | 15 000   | 196.924 | 12.700  | 6.4                     | 3.2   | 45D815638                 | 1      | 439                      | 545   | 524   | 9.5   | 6.4 | 3.2  | 0.33         | 2.03               | 3.02 | 1.98 | 286                |
| 431.800 | 17.0000 | 571.500             | 22.5000 | 400.000 | 15.7480 | 400.000 | 15.7480 | 4 790  | 12 500   | 238.075 | 76.150  | 6.4                     | 3     | 45D865740                 | 1-P    | 460                      | 554   | 536   | 10.5  | 6.4 | 3    | 0.36         | 1.87               | 2.79 | 1.83 | 281                |
| 460     | —       | 680                 | —       | 390     | —       | 390     | —       | 6 020  | 13 700   | 225     | 60      | 5                       | 1.5   | 45D926839                 | 1      | 518                      | 658   | 619   | 11.5  | 4   | 1.5  | 0.36         | 1.87               | 2.79 | 1.83 | 429                |
| 482     | —       | 632                 | —       | 520     | —       | 520     | —       | 6 840  | 18 800   | 320     | 120     | 1.5                     | 1.5   | 45D966352A                | 1-P    | 510                      | 623.5 | 593   | 7     | 2   | 1.5  | 0.26         | 2.55               | 3.8  | 2.5  | 416                |
| 482.600 | 19.0000 | 615.950             | 24.2500 | 500.000 | 19.6850 | 500.000 | 19.6850 | 4 830  | 13 400   | 314.250 | 182.500 | 6.4                     | 6.4   | 45D976250A                | 1-P    | 512                      | 599   | 583   | 6.5   | 6.4 | 6.4  | 0.44         | 1.54               | 2.3  | 1.51 | 358                |
| 509.948 | 20.0767 | 654.924             | 25.7844 | 500.000 | 19.6850 | 500.000 | 19.6850 | 6 450  | 19 000   | 310.000 | 120.000 | 3                       | 1.5   | 4TR510C                   | 1-P    | 539                      | 642   | 617   | 10    | 3   | 1.5  | 0.28         | 2.43               | 3.61 | 2.37 | 405                |
| 510     | —       | 655                 | —       | 379     | —       | 377     | —       | 6 540  | 18 600   | 199.5   | 12      | 5                       | 2     | 4TR510L-2                 | 1-P    | 540                      | 633   | 619   | 9     | 4   | 2    | 0.26         | 2.55               | 3.8  | 2.5  | 320                |
| 558.800 | 22.0000 | 736.600             | 29.0000 | 514.000 | 20.2362 | 514.000 | 20.2362 | 8 990  | 25 500   | 293.337 | 72.674  | 6.4                     | 3.2   | 4TR559P-1                 | 1-P    | 595                      | 719   | 693   | 11.5  | 6.4 | 3.2  | 0.33         | 2.03               | 3.02 | 1.98 | 576                |
| 685.800 | 27.0000 | 876.300             | 34.5000 | 580.000 | 22.8346 | 580.000 | 22.8346 | 11 000 | 34 900   | 340.000 | 100.000 | 6.4                     | 3.2   | 4TR686J                   | 1-P    | 730                      | 859   | 829   | 14    | 6.4 | 3.2  | 0.26         | 2.55               | 3.8  | 2.5  | 875                |

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 47 for details of applicable tolerance standards.

# Four-row tapered roller bearings ... TQO type

$d$  170 ~ 279.578 mm

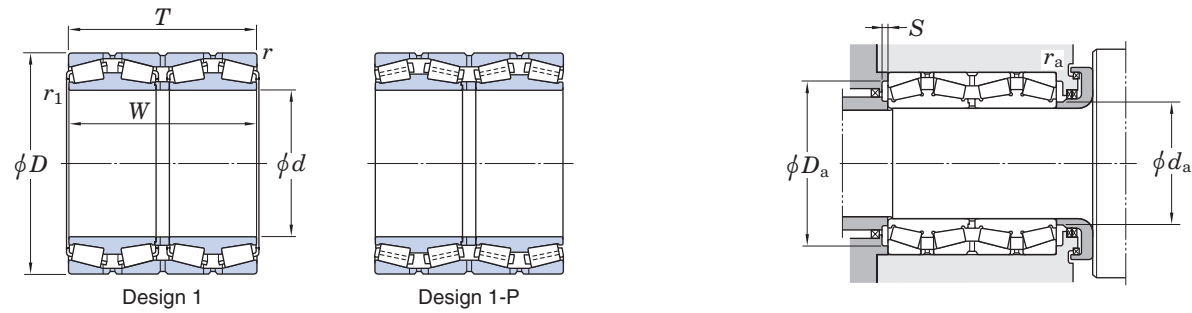


|         |         | Boundary dimensions |         |         |         |         |          |       |       | Basic load ratings (kN) |       | Bearing No. <sup>1)</sup> | De-sign | Mounting dimensions (mm) |       |       |       |     |     | Con-stant<br>$e$ | Axial load factors |      |      | (Refer.)<br>Mass (kg) |
|---------|---------|---------------------|---------|---------|---------|---------|----------|-------|-------|-------------------------|-------|---------------------------|---------|--------------------------|-------|-------|-------|-----|-----|------------------|--------------------|------|------|-----------------------|
| $d$     | $D$     | $T$                 | $W$     | $r$     | $r_1$   | $C_r$   | $C_{0r}$ | $d_a$ | $D_a$ | $S$                     | $r_a$ |                           |         | $r_b$                    | $Y_2$ | $Y_3$ | $Y_0$ |     |     |                  |                    |      |      |                       |
| mm      | inch    | mm                  | inch    | mm      | inch    | mm      | inch     | min.  | min.  |                         |       | max.                      | max.    | min.                     | min.  | max.  | max.  |     |     |                  |                    |      |      |                       |
| 170     | —       | 240                 | —       | 175     | —       | 175     | —        | 2.5   | 3     | 1 020                   | 2 310 | 37234A                    | 1       | 189                      | 228   | 218   | 5     | 2   | 2.5 | 0.33             | 2.03               | 3.02 | 1.98 | 24.2                  |
| 180     | —       | 254                 | —       | 185     | —       | 185     | —        | 2.5   | 3     | 1 140                   | 2 550 | 37236                     | 1       | 198                      | 242   | 232   | 6     | 2   | 2.5 | 0.33             | 2.03               | 3.02 | 1.98 | 29.1                  |
| 187     | —       | 270                 | —       | 210     | —       | 210     | —        | 2.5   | 1     | 1 660                   | 3 570 | 47T372721B                | 1       | 205                      | 258   | 248   | 8     | 2   | 1   | 0.33             | 2.03               | 3.02 | 1.98 | 39.1                  |
| 187.325 | 7.3750  | 269.875             | 10.6250 | 211.138 | 8.3125  | 211.138 | 8.3125   | 3.2   | 1.6   | 1 410                   | 3 220 | M238849D/810/810D         | 1       | 206                      | 257   | 245   | 5     | 3.2 | 1.6 | 0.33             | 2.03               | 3.02 | 1.98 | 39.5                  |
| 190     | —       | 268                 | —       | 196     | —       | 196     | —        | 2.5   | 3     | 1 210                   | 2 760 | 37238                     | 1       | 210                      | 256   | 246   | 6     | 2   | 2.5 | 0.33             | 2.03               | 3.02 | 1.98 | 33.4                  |
| 190.500 | 7.5000  | 266.700             | 10.5000 | 188.913 | 7.4375  | 187.325 | 7.3750   | 3.2   | 1.6   | 1 160                   | 2 810 | 67885D/67820/67820D       | 1       | 208.5                    | 255.3 | 245.1 | 6     | 3.2 | 1.6 | 0.48             | 1.42               | 2.11 | 1.38 | 32.4                  |
| 200     | —       | 282                 | —       | 206     | —       | 206     | —        | 2.5   | 3     | 1 490                   | 3 380 | 37240                     | 1       | 223                      | 270   | 260   | 5.5   | 2   | 2.5 | 0.28             | 2.43               | 3.61 | 2.37 | 39.6                  |
| 216.103 | 8.5080  | 330.200             | 13.0000 | 269.875 | 10.6250 | 263.525 | 10.3750  | 3.2   | 1.6   | 2 500                   | 5 120 | 47T433327                 | 1       | 237                      | 316   | 300   | 7     | 3.2 | 1.6 | 0.46             | 1.47               | 2.19 | 1.44 | 81.6                  |
| 220     | —       | 300                 | —       | 230     | —       | 230     | —        | 2.5   | 3     | 1 750                   | 4 040 | 47T443023                 | 1       | 231                      | 288   | 278   | 6.5   | 2   | 2.5 | 0.40             | 1.68               | 2.50 | 1.64 | 45.1                  |
|         | —       | 310                 | —       | 226     | —       | 226     | —        | 3     | 4     | 1 690                   | 3 880 | 37244                     | 1       | 242                      | 296   | 285   | 6     | 2.5 | 3   | 0.33             | 2.03               | 3.02 | 1.98 | 52                    |
|         | —       | 320                 | —       | 250     | —       | 250     | —        | 2.5   | 3     | 1 930                   | 4 230 | 47T443225                 | 1       | 244                      | 308   | 293   | 6.5   | 2   | 2.5 | 0.35             | 1.95               | 2.90 | 1.91 | 64.7                  |
|         | —       | 330                 | —       | 260     | —       | 260     | —        | 3     | 1     | 2 350                   | 5 070 | 47T443326A                | 1       | 243                      | 316   | 299   | 9     | 2.5 | 1   | 0.40             | 1.68               | 2.50 | 1.64 | 78.4                  |
| 220.663 | 8.6875  | 314.325             | 12.3750 | 239.713 | 9.4375  | 239.713 | 9.4375   | 3.2   | 1.6   | 2 100                   | 4 890 | M244249D/210/210D         | 1       | 241                      | 300   | 288   | 5     | 3.2 | 1.6 | 0.33             | 2.03               | 3.02 | 1.98 | 59                    |
| 228.600 | 9.0000  | 311.150             | 12.2500 | 200.025 | 7.8750  | 200.025 | 7.8750   | 3.2   | 1.6   | 1 660                   | 3 760 | LM245149D/110/110D        | 1       | 247                      | 297   | 287   | 5.5   | 3.2 | 1.6 | 0.33             | 2.03               | 3.02 | 1.98 | 41.8                  |
| 240     | —       | 338                 | —       | 248     | —       | 248     | —        | 3     | 4     | 2 360                   | 5 360 | 37248                     | 1       | 259                      | 324   | 312   | 8.5   | 2.5 | 3   | 0.39             | 1.74               | 2.59 | 1.70 | 68.4                  |
| 241.478 | 9.5070  | 349.148             | 13.7460 | 228.600 | 9.0000  | 228.600 | 9.0000   | 3.2   | 1.6   | 2 190                   | 4 920 | 47T483523A                | 1       | 267                      | 335   | 319   | 8.5   | 3.2 | 1.6 | 0.35             | 1.91               | 2.84 | 1.86 | 72.9                  |
| 244.475 | 9.6250  | 327.025             | 12.8750 | 193.675 | 7.6250  | 193.675 | 7.6250   | 3.2   | 1.6   | 1 470                   | 3 500 | 47T493319                 | 1       | 259                      | 313   | 303   | 5.5   | 3.2 | 1.6 | 0.55             | 1.24               | 1.84 | 1.21 | 44.4                  |
|         | 9.6250  | 327.025             | 12.8750 | 193.675 | 7.6250  | 193.675 | 7.6250   | 3.2   | 1.6   | 1 570                   | 3 780 | LM247748D/710/710D        | 1       | 265                      | 313   | 305   | 7.5   | 3.2 | 1.6 | 0.32             | 2.10               | 3.13 | 2.06 | 44.4                  |
| 250     | —       | 365                 | —       | 270     | —       | 270     | —        | 3     | 1.5   | 2 650                   | 6 340 | 47T503627                 | 1       | 277                      | 351   | 330   | 8     | 2.5 | 1.5 | 0.33             | 2.03               | 3.02 | 1.98 | 96.7                  |
| 254.000 | 10.0000 | 358.775             | 14.1250 | 269.875 | 10.6250 | 269.875 | 10.6250  | 3.2   | 3.2   | 2 650                   | 6 340 | M249748D/710/710D         | 1       | 277                      | 345   | 330   | 8     | 3.2 | 3.2 | 0.33             | 2.03               | 3.02 | 1.98 | 86                    |
| 260     | —       | 368                 | —       | 268     | —       | 268     | —        | 4     | 5     | 2 510                   | 6 020 | 37252                     | 1       | 286                      | 350   | 338   | 6     | 3   | 4   | 0.33             | 2.03               | 3.02 | 1.98 | 88.4                  |
| 266.700 | 10.5000 | 355.600             | 14.0000 | 228.600 | 9.0000  | 230.188 | 9.0625   | 3.2   | 1.6   | 2 230                   | 5 690 | 47T533623B                | 1       | 285                      | 342   | 332   | 8     | 3.2 | 1.6 | 0.36             | 1.87               | 2.79 | 1.83 | 62.7                  |
| 279.400 | 11.0000 | 393.700             | 15.5000 | 269.875 | 10.6250 | 269.875 | 10.6250  | 6.4   | 1.6   | 2 660                   | 5 990 | 47T563927B                | 1       | 305                      | 373   | 363   | 9.5   | 6.4 | 1.6 | 0.40             | 1.68               | 2.50 | 1.64 | 101                   |
| 279.578 | 11.0070 | 380.898             | 14.9960 | 244.475 | 9.6250  | 244.475 | 9.6250   | 3.2   | 1.6   | 2 280                   | 5 650 | LM654644D/610/610D        | 1       | 303                      | 367   | 356   | 6.5   | 3.2 | 1.6 | 0.43             | 1.57               | 2.34 | 1.53 | 80.4                  |

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 47 for details of applicable tolerance standards.

# Four-row tapered roller bearings ... TQO type

$d$  280 ~ (380) mm

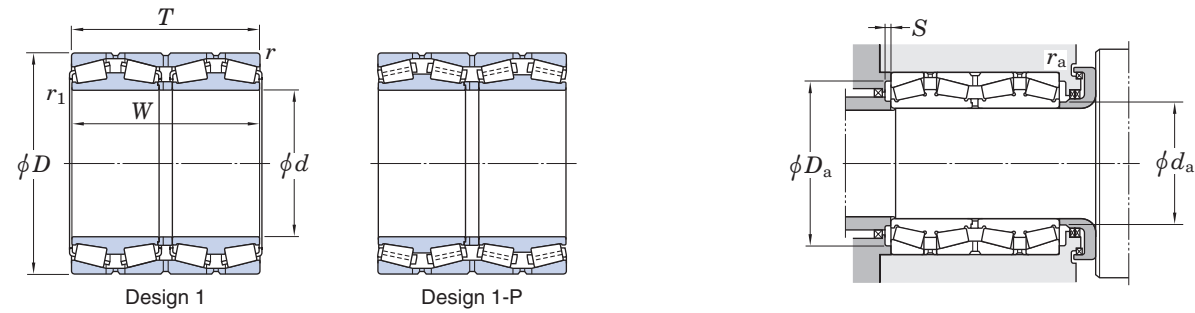


| Boundary dimensions |         |         |         |         |         |         |          |       |       | Basic load ratings (kN) |        | Bearing No. <sup>1)</sup>                              | De-sign | Mounting dimensions (mm) |       |       |       |     |     | Con-stant $e$ | Axial load factors |      |      | (Refer.) Mass (kg) |
|---------------------|---------|---------|---------|---------|---------|---------|----------|-------|-------|-------------------------|--------|--|---------|--------------------------|-------|-------|-------|-----|-----|---------------|--------------------|------|------|--------------------|
| $d$                 | $D$     | $T$     | $W$     | $r$     | $r_1$   | $C_r$   | $C_{0r}$ | $d_a$ | $D_a$ | $S$                     | $r_a$  |  |         | $r_b$                    | $Y_2$ | $Y_3$ | $Y_0$ |     |     |               |                    |      |      |                    |
| mm                  | inch    | mm      | inch    | mm      | inch    | mm      | inch     | min.  | min.  |                         |        | max.   | max.    | min.                     | min.  | max.  | max.  |     |     |               |                    |      |      |                    |
| 280                 | —       | 380     | —       | 290     | —       | 290     | —        | 2     | 2     | 2 810                   | 6 940  | 47T563829<br>37256X                                    | 1       | 300                      | 370   | 354   | 6     | 2   | 2   | 0.33          | 2.03               | 3.02 | 1.98 | 91.8               |
|                     | —       | 395     | —       | 288     | —       | 288     | —        | 4     | 2     | 2 880                   | 6 900  |  | 1       | 303                      | 377   | 363   | 8     | 3   | 2   | 0.40          | 1.68               | 2.50 | 1.64 | 110                |
| 285.750             | 11.2500 | 380.898 | 14.9960 | 244.475 | 9.6250  | 244.475 | 9.6250   | 3.2   | 1.6   | 2 280                   | 5 650  | LM654648D/610/610D                                     | 1       | 303                      | 367   | 356   | 6.5   | 3.2 | 1.6 | 0.43          | 1.57               | 2.34 | 1.53 | 75.6               |
| 288.925             | 11.3750 | 406.400 | 16.0000 | 298.450 | 11.7500 | 298.450 | 11.7500  | 3.2   | 3.2   | 3 450                   | 8 840  | M255449D/410/410D                                      | 1       | 316                      | 392   | 373   | 9     | 3.2 | 3.2 | 0.34          | 2.00               | 2.97 | 1.95 | 127                |
| 300                 | —       | 420     | —       | 310     | —       | 310     | —        | 3     | 1     | 3 390                   | 8 050  | 47T604231<br>37260<br>47T604330                        | 1       | 325                      | 406   | 388   | 8.5   | 2.5 | 1   | 0.34          | 2.00               | 2.98 | 1.96 | 132                |
|                     | —       | 424     | —       | 310     | —       | 310     | —        | 4     | 5     | 3 000                   | 6 570  |  | 1       | 334                      | 406   | 391   | 6     | 3   | 4   | 0.28          | 2.37               | 3.53 | 2.32 | 134                |
|                     | —       | 430     | —       | 300     | —       | 300     | —        | 3     | 4     | 3 320                   | 7 630  |  | 1       | 328                      | 416   | 393   | 10    | 2.5 | 3   | 0.35          | 1.95               | 2.90 | 1.91 | 141                |
| 300.038             | 11.8125 | 422.275 | 16.6250 | 311.150 | 12.2500 | 311.150 | 12.2500  | 3.2   | 3.2   | 3 390                   | 8 050  | HM256849D/810/810D                                     | 1       | 325                      | 407   | 388   | 7     | 3.2 | 3.2 | 0.34          | 2.00               | 2.98 | 1.96 | 136                |
| 304.800             | 12.0000 | 419.100 | 16.5000 | 269.875 | 10.6250 | 269.875 | 10.6250  | 6.4   | 1.6   | 2 840                   | 6 950  | M257149D/110/110D                                      | 1       | 331                      | 398   | 387   | 7     | 6.4 | 1.6 | 0.33          | 2.03               | 3.02 | 1.98 | 110                |
| 304.902             | 12.0040 | 412.648 | 16.2460 | 266.7   | 10.5000 | 266.7   | 10.5000  | 3.2   | 3.2   | 2 990                   | 7 280  | M257248D/210/210D                                      | 1       | 328                      | 398   | 383   | 7     | 3.2 | 3.2 | 0.32          | 2.12               | 3.15 | 2.07 | 101                |
| 310                 | —       | 430     | —       | 310     | —       | 310     | —        | 3     | 3     | 3 520                   | 8 420  | 47T624331A<br>47T6246A                                 | 1       | 332                      | 416   | 399   | 10    | 2.5 | 2.5 | 0.40          | 1.68               | 2.50 | 1.64 | 135                |
|                     | —       | 460     | —       | 325     | —       | 325     | —        | 4     | 5     | 4 200                   | 9 500  |  | 1       | 346                      | 442   | 421   | 12    | 3   | 4   | 0.32          | 2.12               | 3.15 | 2.07 | 188                |
| 317.500             | 12.5000 | 422.275 | 16.6250 | 269.875 | 10.6250 | 269.875 | 10.6250  | 3.2   | 1.6   | 2 930                   | 7 450  | LM258649D/610/610D<br>47T644533L                       | 1       | 341                      | 407   | 392   | 8.5   | 3.2 | 1.6 | 0.32          | 2.12               | 3.15 | 2.07 | 104                |
|                     | 12.5000 | 447.675 | 17.6250 | 327.025 | 12.8750 | 327.025 | 12.8750  | 6.4   | 1.6   | 4 280                   | 10 100 |  | 1       | 344                      | 426   | 411   | 11.5  | 6.4 | 1.6 | 0.33          | 2.03               | 3.02 | 1.98 | 161                |
| 320                 | —       | 460     | —       | 325     | —       | 325     | —        | 4     | 2.5   | 4 030                   | 9 420  | 47T644633<br>37264<br>47T644825                        | 1       | 349                      | 442   | 424   | 10    | 3   | 2.5 | 0.42          | 1.62               | 2.42 | 1.59 | 175                |
|                     | —       | 460     | —       | 338     | —       | 338     | —        | 4     | 5     | 3 500                   | 8 590  |  | 1       | 356                      | 442   | 421   | 8.5   | 3   | 4   | 0.33          | 2.03               | 3.02 | 1.98 | 183                |
|                     | —       | 480     | —       | 254     | —       | 254     | —        | 4     | 2.5   | 3 400                   | 6 940  |  | 1-P     | 358                      | 462   | 437   | 9     | 3   | 2   | 0.40          | 1.68               | 2.50 | 1.64 | 161                |
| 337.375             | 13.2825 | 469.900 | 18.5000 | 342.900 | 13.5000 | 342.900 | 13.5000  | 3.2   | 1.6   | 4 630                   | 11 400 | HM261049D/010/010D                                     | 1-P     | 360                      | 455   | 432   | 9     | 3.2 | 1.6 | 0.33          | 2.02               | 3.01 | 1.97 | 190                |
| 340                 | —       | 480     | —       | 350     | —       | 350     | —        | 5     | 6     | 4 700                   | 11 700 | 37268A   | 1-P     | 371                      | 458   | 443   | 9.5   | 4   | 6   | 0.33          | 2.03               | 3.02 | 1.98 | 198                |
| 343.052             | 13.5060 | 457.098 | 17.9960 | 254.000 | 10.0000 | 254.000 | 10.0000  | 3.2   | 1.6   | 2 850                   | 6 950  | 47T694625  | 1       | 363                      | 442   | 425   | 6     | 3.2 | 1.6 | 0.47          | 1.43               | 2.12 | 1.40 | 111                |
| 346.075             | 13.6250 | 488.950 | 19.2500 | 358.775 | 14.1250 | 358.775 | 14.1250  | 3.2   | 3.2   | 4 620                   | 11 600 | HM262749D/10/10D                                       | 1       | 378                      | 474   | 449   | 8     | 3.2 | 3.2 | 0.33          | 2.02               | 3.00 | 1.97 | 214                |
| 355.600             | 14.0000 | 482.600 | 19.0000 | 269.875 | 10.6250 | 265.112 | 10.4375  | 3.2   | 1.6   | 3 060                   | 7 020  | LM763449D/410/410D<br>47T714827-1<br>M263349D/310/310D | 1       | 381                      | 468   | 450   | 3.5   | 3.2 | 1.6 | 0.47          | 1.43               | 2.14 | 1.40 | 136                |
|                     | 14.0000 | 482.600 | 19.0000 | 269.875 | 10.6250 | 265.113 | 10.4375  | 3.2   | 1.6   | 3 390                   | 7 860  |  | 1       | 386                      | 468   | 450   | 8     | 3.2 | 1.6 | 0.26          | 2.55               | 3.80 | 2.50 | 139                |
|                     | 14.0000 | 488.950 | 19.2500 | 317.500 | 12.5000 | 317.500 | 12.5000  | 3.2   | 1.6   | 4 370                   | 10 900 |  | 1-P     | 383                      | 474   | 452   | 7.5   | 3.2 | 1.6 | 0.33          | 2.03               | 3.02 | 1.98 | 182                |
| 360                 | —       | 508     | —       | 370     | —       | 370     | —        | 5     | 6     | 4 840                   | 11 500 | 47T725137  | 1       | 392                      | 486   | 471   | 7     | 4   | 6   | 0.33          | 2.03               | 3.02 | 1.98 | 232                |
| 368.300             | 14.5000 | 523.875 | 20.6250 | 382.588 | 15.0625 | 382.588 | 15.0625  | 6.4   | 3.2   | 5 920                   | 14 500 | 47T745238J   | 1-P     | 401                      | 502   | 485   | 10.5  | 6.4 | 3.2 | 0.33          | 2.03               | 3.02 | 1.98 | 268                |
| 380                 | —       | 536     | —       | 390     | —       | 390     | —        | 5     | 6     | 5 760                   | 12 900 | 37276  | 1       | 415                      | 514   | 496   | 7.5   | 4   | 5   | 0.40          | 1.68               | 2.50 | 1.64 | 268                |

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 47 for details of applicable tolerance standards.

# Four-row tapered roller bearings ... TQO type

$d$  (380) ~ 490 mm



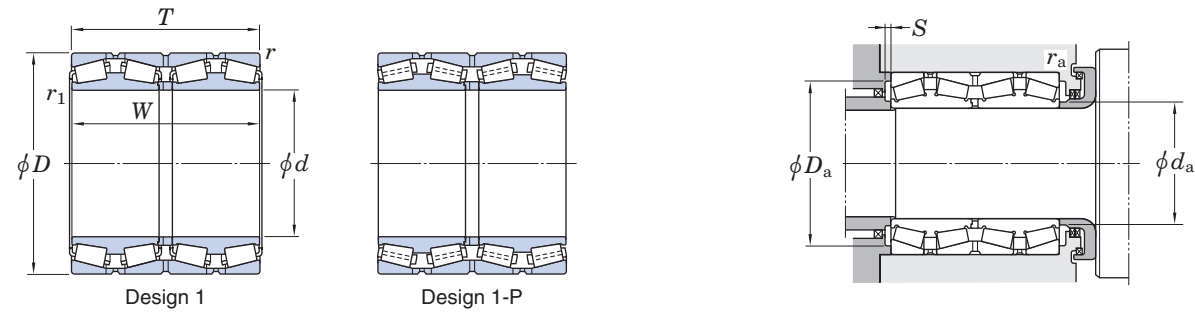
| Boundary dimensions |         |         |         |         |         |         |          |       |       | Basic load ratings (kN) |        | Bearing No. <sup>1)</sup> | De-sign            | Mounting dimensions (mm) |       |       |       |      |     | Con-stant $e$ | Axial load factors |      |      | (Refer.) Mass (kg) |     |
|---------------------|---------|---------|---------|---------|---------|---------|----------|-------|-------|-------------------------|--------|---------------------------|--------------------|--------------------------|-------|-------|-------|------|-----|---------------|--------------------|------|------|--------------------|-----|
| $d$                 | $D$     | $T$     | $W$     | $r$     | $r_1$   | $C_r$   | $C_{0r}$ | $d_a$ | $D_a$ | $S$                     | $r_a$  |                           |                    | $r_b$                    | $Y_2$ | $Y_3$ | $Y_0$ |      |     |               |                    |      |      |                    |     |
| mm                  | inch    | mm      | inch    | mm      | inch    | mm      | inch     | min.  | min.  |                         |        | max.                      | max.               | min.                     | min.  | max.  | max.  |      |     |               |                    |      |      |                    |     |
| 380                 | —       | 560     | —       | 285     | —       | 285     | —        | 4     | 5     | 4 600                   | 10 000 |                           | 47T765629          | 1-P                      | 428   | 542   | 513   | 11   | 3   | 4             | 0.27               | 2.47 | 3.67 | 2.41               | 246 |
| 384.175             | 15.1250 | 546.100 | 21.5000 | 470.000 | 18.5039 | 470.000 | 18.5039  | 6.4   | 3.2   | 6 220                   | 16 200 |                           | 47T775547          | 1                        | 418   | 524   | 503   | 7.5  | 6.4 | 3.2           | 0.33               | 2.03 | 3.02 | 1.98               | 360 |
| 390                 | —       | 510     | —       | 350     | —       | 350     | —        | 3     | 1.5   | 4 300                   | 11 700 |                           | 47T785135A         | 1                        | 413   | 496   | 478   | 10.5 | 2.5 | 1.5           | 0.33               | 2.03 | 3.02 | 1.98               | 186 |
| 400                 | —       | 560     | —       | 380     | —       | 380     | —        | 4     | 1.5   | 5 970                   | 15 200 |                           | 47T805638A         | 1-P                      | 435   | 542   | 519   | 10   | 3   | 1.5           | 0.33               | 2.03 | 3.02 | 1.98               | 296 |
|                     | —       | 590     | —       | 304     | —       | 304     | —        | 4     | 1.5   | 4 760                   | 10 200 |                           | 47T805930A         | 1-P                      | 449   | 572   | 540   | 7.5  | 3   | 1.5           | 0.33               | 2.03 | 3.02 | 1.98               | 289 |
| 406.400             | 16.0000 | 562.000 | 22.1260 | 381.000 | 15.0000 | 381.000 | 15.0000  | 6.4   | 3.2   | 5 990                   | 15 000 |                           | 47T815638          | 1                        | 439   | 540   | 524   | 9.5  | 6.4 | 3.2           | 0.33               | 2.03 | 3.02 | 1.98               | 284 |
| 415.925             | 16.3750 | 590.550 | 23.2500 | 434.975 | 17.1250 | 434.975 | 17.1250  | 6.4   | 3.2   | 7 060                   | 18 800 |                           | 47T835943A         | 1-P                      | 455   | 568   | 543   | 10   | 6.4 | 3.2           | 0.33               | 2.03 | 3.02 | 1.98               | 391 |
| 420                 | —       | 592     | —       | 432     | —       | 432     | —        | 5     | 6     | 6 030                   | 15 700 |                           | 37284              | 1                        | 460   | 570   | 544   | 7.5  | 4   | 5             | 0.33               | 2.03 | 3.02 | 1.98               | 374 |
| 431.800             | 17.0000 | 571.500 | 22.5000 | 336.550 | 13.2500 | 336.550 | 13.2500  | 6.4   | 1.6   | 5 070                   | 13 500 |                           | 47T865734          | 1-P                      | 460   | 549   | 534   | 10   | 6.4 | 1.6           | 0.36               | 1.87 | 2.79 | 1.83               | 232 |
| 440                 | —       | 580     | —       | 420     | —       | 420     | —        | 4     | 1.5   | 5 730                   | 15 400 |                           | 47T885842          | 1-P                      | 467   | 562   | 544   | 1.5  | 3   | 1.5           | 0.26               | 2.55 | 3.80 | 2.50               | 288 |
|                     | —       | 620     | —       | 454     | —       | 454     | —        | 6     | 6     | 7 110                   | 17 500 |                           | 37288              | 1                        | 482   | 592   | 576   | 9    | 5   | 5             | 0.40               | 1.68 | 2.50 | 1.64               | 417 |
|                     | —       | 620     | —       | 454     | —       | 454     | —        | 4     | 5     | 7 610                   | 19 800 |                           | 47T886246          | 1-P                      | 474   | 602   | 573   | 10.5 | 3   | 5             | 0.40               | 1.68 | 2.50 | 1.64               | 436 |
| 449.949             | 17.7145 | 594.949 | 23.4232 | 368.000 | 14.4882 | 368.000 | 14.4882  | 5     | 2.5   | 5 980                   | 16 200 |                           | M270449D/10/10D    | 1-P                      | 478   | 573   | 557   | 9    | 5   | 2             | 0.33               | 2.03 | 3.02 | 1.98               | 278 |
| 450                 | —       | 580     | —       | 450     | —       | 450     | —        | 6     | 1.5   | 5 130                   | 14 600 |                           | 47T905845          | 1                        | 475   | 552   | 537   | 2    | 5   | 1.5           | 0.26               | 2.55 | 3.80 | 2.50               | 286 |
| 457.200             | 18.0000 | 596.900 | 23.5000 | 279.400 | 11.0000 | 276.225 | 10.8750  | 3.2   | 1.6   | 4 260                   | 11 400 |                           | 47T916028A         | 1-P                      | 485   | 581   | 560   | 8.5  | 3.2 | 1.6           | 0.47               | 1.43 | 2.12 | 1.40               | 307 |
| 460                 | —       | 586     | —       | 280     | —       | 280     | —        | 3     | 1     | 3 710                   | 9 810  |                           | 47T925928          | 1                        | 483   | 572   | 555   | 10.5 | 2.5 | 1             | 0.44               | 1.52 | 2.26 | 1.49               | 177 |
|                     | —       | 615     | —       | 360     | —       | 360     | —        | 3     | 1     | 5 000                   | 13 300 |                           | 47T926236          | 1                        | 490   | 601   | 572   | 8    | 2.5 | 1             | 0.47               | 1.43 | 2.12 | 1.40               | 292 |
| 475.000             | 18.7008 | 600.000 | 23.6220 | 368.000 | 14.4882 | 368.000 | 14.4882  | 4.8   | 1.6   | 4 970                   | 15 100 |                           | 47T956037A         | 1                        | 501   | 581   | 566   | 10.5 | 4.8 | 1.6           | 0.26               | 2.55 | 3.80 | 2.50               | 246 |
| 479.425             | 18.8750 | 679.450 | 26.7500 | 495.300 | 19.5000 | 495.300 | 19.5000  | 6.4   | 3.2   | 9 660                   | 25 400 |                           | 47T966850          | 1-P                      | 523   | 656   | 641   | 12.5 | 6.4 | 3.2           | 0.33               | 2.03 | 3.02 | 1.98               | 591 |
| 480                 | —       | 678     | —       | 494     | —       | 494     | —        | 6     | 6     | 9 160                   | 23 300 |                           | 37296              | 1-P                      | 520   | 650   | 629   | 9.5  | 5   | 5             | 0.33               | 2.03 | 3.02 | 1.98               | 563 |
| 482.600             | 19.0000 | 615.950 | 24.2500 | 330.200 | 13.0000 | 330.200 | 13.0000  | 6.4   | 4.8   | 5 270                   | 15 000 |                           | 4TR19B             | 1-P                      | 509   | 593   | 573   | 10.5 | 6.4 | 4.8           | 0.33               | 2.03 | 3.02 | 1.98               | 243 |
|                     | 19.0000 | 615.950 | 24.2500 | 330.200 | 13.0000 | 330.200 | 13.0000  | 6.4   | 3.2   | 5 210                   | 15 000 |                           | 4TR19D             | 1                        | 508   | 593   | 573   | 10   | 6.4 | 3.2           | 0.36               | 1.87 | 2.79 | 1.83               | 240 |
|                     | 19.0000 | 615.950 | 24.2500 | 420.000 | 16.5354 | 420.000 | 16.5354  | 4     | 2.5   | 5 810                   | 16 700 |                           | 47T976242          | 1                        | 508   | 597   | 577   | 6    | 4   | 2.5           | 0.26               | 2.55 | 3.80 | 2.50               | 296 |
| 489.026             | 19.2530 | 634.873 | 24.9950 | 320.675 | 12.6250 | 320.675 | 12.6250  | 3.2   | 3.2   | 4 930                   | 13 700 |                           | LM772749D/710/710D | 1                        | 513   | 618   | 594   | 9.5  | 3.2 | 3.2           | 0.47               | 1.43 | 2.12 | 1.40               | 261 |
| 490                 | —       | 625     | —       | 385     | —       | 385     | —        | 4     | 1.5   | 5 540                   | 16 600 |                           | 47T986339B         | 1                        | 517   | 607   | 587   | 4.5  | 3   | 1.5           | 0.32               | 2.12 | 3.15 | 2.07               | 285 |

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 47 for details of applicable tolerance standards.



# Four-row tapered roller bearings ... TQO type

$d$  500 ~ 708.025 mm



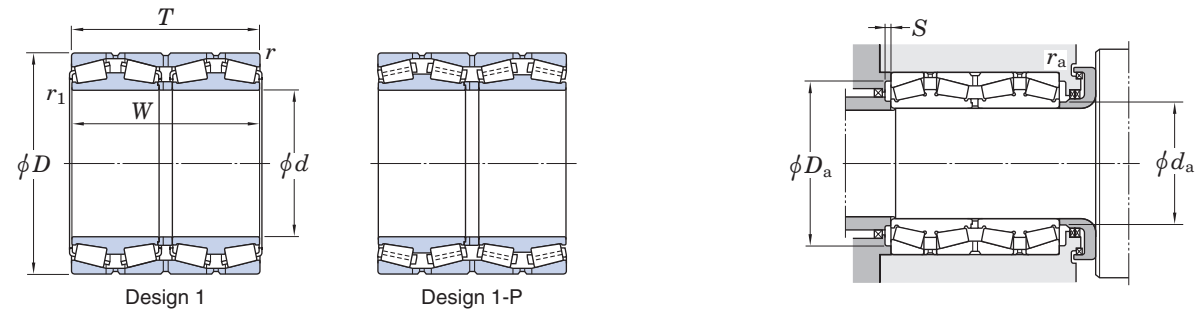
| Boundary dimensions |         |         |         |         |            |         |          |       |       | Basic load ratings (kN) |        | Bearing No. <sup>1)</sup> | De-sign | Mounting dimensions (mm) |       |       |       |     |     | Con-stant $e$ | Axial load factors |      |      | (Refer.) Mass (kg) |
|---------------------|---------|---------|---------|---------|------------|---------|----------|-------|-------|-------------------------|--------|---------------------------|---------|--------------------------|-------|-------|-------|-----|-----|---------------|--------------------|------|------|--------------------|
| $d$                 | $D$     | $T$     | $W$     | $r$     | $r_1^{2)}$ | $C_r$   | $C_{0r}$ | $d_a$ | $D_a$ | $S$                     | $r_a$  |                           |         | $r_b$                    | $Y_2$ | $Y_3$ | $Y_0$ |     |     |               |                    |      |      |                    |
| mm                  | inch    | mm      | inch    | mm      | inch       | mm      | inch     | min.  | min.  |                         |        | max.                      | max.    | min.                     | min.  | max.  | max.  |     |     |               |                    |      |      |                    |
| 500                 | —       | 670     | —       | 515     | —          | 515     | —        | 5     | 6     | 9 110                   | 25 700 | 4TR500B<br>372/500        | 1-P     | 530                      | 648   | 626   | 11    | 4   | 5   | 0.32          | 2.12               | 3.15 | 2.07 | 510                |
|                     | —       | 705     | —       | 515     | —          | 515     | —        | 6     | SP    | 9 530                   | 24 500 |                           | 1-P     | 544                      | 677   | 651   | 8.5   | 5   | 6   | 0.37          | 1.80               | 2.69 | 1.76 | 641                |
| 509.948             | 20.0767 | 654.924 | 25.7844 | 379.000 | 14.9213    | 377.000 | 14.8425  | 6.4   | 1.6   | 5 780                   | 16 700 | 4TR510A                   | 1-P     | 534                      | 632   | 612   | 7     | 6.4 | 1.6 | 0.41          | 1.64               | 2.44 | 1.60 | 315                |
| 510                 | —       | 655     | —       | 379     | —          | 377     | —        | 5     | 2.5   | 6 540                   | 18 600 | 4TR510L                   | 1-P     | 540                      | 633   | 613   | 9     | 4   | 2.5 | 0.26          | 2.55               | 3.80 | 2.50 | 320                |
| 514.350             | 20.2500 | 673.100 | 26.5000 | 422.275 | 16.6250    | 422.275 | 16.6250  | 6.4   | 3.2   | 7 190                   | 20 100 | 4TR514A                   | 1       | 545                      | 650   | 630   | 11    | 6.4 | 3.2 | 0.33          | 2.03               | 3.02 | 1.98 | 392                |
| 519.113             | 20.4375 | 736.600 | 29.0000 | 536.575 | 21.1250    | 536.575 | 21.1250  | 6.4   | 3.2   | 10 600                  | 27 200 | M275349D/310/310D         | 1-P     | 562                      | 712   | 681   | 10.5  | 6.4 | 3.2 | 0.33          | 2.03               | 3.02 | 1.98 | 743                |
| 536.575             | 21.1250 | 761.873 | 29.9950 | 558.800 | 22.0000    | 558.800 | 22.0000  | 6.4   | 3.2   | 11 300                  | 28 800 | M276449D/410/410D         | 1-P     | 578                      | 738   | 700   | 9     | 6.4 | 3.2 | 0.33          | 2.03               | 3.02 | 1.98 | 820                |
| 558.800             | 22.0000 | 736.600 | 29.0000 | 322.263 | 12.6875    | 322.263 | 12.6875  | 6.4   | 3.2   | 5 920                   | 16 100 | EE843221D/290/291D        | 1-P     | 607                      | 712   | 692   | 9.5   | 6.4 | 3.2 | 0.34          | 1.97               | 2.93 | 1.93 | 371                |
|                     | 22.0000 | 736.600 | 29.0000 | 409.575 | 16.1250    | 409.575 | 16.1250  | 6.4   | 3.2   | 7 660                   | 21 500 | 4TR559N                   | 1-P     | 594                      | 712   | 689   | 10.5  | 6.4 | 3.2 | 0.35          | 1.95               | 2.90 | 1.91 | 477                |
|                     | 22.0000 | 736.600 | 29.0000 | 450.000 | 17.7165    | 450.000 | 17.7165  | 4     | 3     | 8 220                   | 23 100 | 4TR559A                   | 1-P     | 594                      | 717   | 692   | 9     | 4   | 3   | 0.35          | 1.95               | 2.90 | 1.91 | 525                |
| 570                 | —       | 780     | —       | 515     | —          | 515     | —        | 5     | 2.5   | 10 100                  | 27 400 | 4TR570A                   | 1-P     | 618                      | 758   | 726   | 10    | 4   | 2   | 0.42          | 1.61               | 2.39 | 1.57 | 737                |
| 571.500             | 22.5000 | 812.800 | 32.0000 | 593.725 | 23.3750    | 593.725 | 23.3750  | 6.4   | 3.2   | 13 000                  | 35 000 | M278749D/710/710D         | 1-P     | 625                      | 789   | 751   | 14    | 6.4 | 3.2 | 0.33          | 2.03               | 3.02 | 1.98 | 1 020              |
| 584.200             | 23.0000 | 730.250 | 28.7500 | 349.250 | 13.7500    | 342.900 | 13.5000  | 3.2   | 1.6   | 5 580                   | 17 300 | 4TR584                    | 1-P     | 613                      | 712   | 692   | 6.5   | 3.2 | 1.6 | 0.43          | 1.57               | 2.34 | 1.53 | 326                |
|                     | 23.0000 | 762.000 | 30.0000 | 401.638 | 15.8125    | 396.875 | 15.6250  | 6.4   | 3.2   | 7 330                   | 20 800 | LM778549D/510/510D        | 1-P     | 617                      | 738   | 715   | 8.5   | 6.4 | 3.2 | 0.47          | 1.43               | 2.12 | 1.40 | 468                |
| 595.312             | 23.4375 | 844.550 | 33.2500 | 615.950 | 24.2500    | 615.950 | 24.2500  | 6.4   | 3.2   | 13 600                  | 36 900 | M280049D/010/010D         | 1-P     | 651                      | 820   | 780   | 8     | 6.4 | 3.2 | 0.33          | 2.03               | 3.02 | 1.98 | 1 130              |
| 600                 | —       | 855     | —       | 620     | —          | 620     | —        | 5     | 6     | 14 000                  | 37 900 | 4TR600B                   | 1-P     | 658                      | 833   | 792   | 13    | 4   | 5   | 0.33          | 2.03               | 3.02 | 1.98 | 1 160              |
| 603.250             | 23.7500 | 857.250 | 33.7500 | 622.300 | 24.5000    | 622.300 | 24.5000  | 6.4   | 3.2   | 14 500                  | 38 500 | M280249D/210/210XD        | 1-P     | 652                      | 833   | 788   | 12    | 6.4 | 3.2 | 0.33          | 2.03               | 3.02 | 1.98 | 1 170              |
| 609.600             | 24.0000 | 787.400 | 31.0000 | 361.950 | 14.2500    | 361.950 | 14.2500  | 6.4   | 3.2   | 6 790                   | 19 900 | EE649241D/310/311D        | 1-P     | 650                      | 763   | 739   | 13    | 6.4 | 3.2 | 0.37          | 1.82               | 2.70 | 1.78 | 459                |
| 630                 | —       | 920     | —       | 457.15  | —          | 457.15  | —        | 6     | 3     | 11 500                  | 26 200 | 4TR630B                   | 1-P     | 698                      | 892   | 846   | 11.5  | 5   | 2.5 | 0.33          | 2.03               | 3.02 | 1.98 | 1 050              |
| 646.112             | 25.4375 | 857.250 | 33.7500 | 542.925 | 21.3750    | 542.925 | 21.3750  | 6.4   | 3.2   | 11 400                  | 34 100 | LM281049D/10/10D          | 1-P     | 690                      | 833   | 801   | 13    | 6.4 | 3.2 | 0.33          | 2.03               | 3.02 | 1.98 | 881                |
| 657.225             | 25.8750 | 933.450 | 36.7500 | 676.275 | 26.6250    | 676.275 | 26.6250  | 6.4   | 3.3   | 17 300                  | 46 000 | M281649D/610/610D         | 1-P     | 713                      | 909   | 864   | 9.5   | 6.4 | 3.3 | 0.33          | 2.03               | 3.02 | 1.98 | 1 530              |
| 670                 | —       | 960     | —       | 700     | —          | 700     | —        | 7.5   | 5     | 17 800                  | 48 100 | 4TR670                    | 1-P     | 732                      | 924   | 884   | 13    | 6   | 4   | 0.33          | 2.03               | 3.02 | 1.98 | 1 710              |
| 679.450             | 26.7500 | 901.700 | 35.5000 | 552.450 | 21.7500    | 552.450 | 21.7500  | 6.4   | 3.2   | 12 800                  | 36 100 | LM281849D/810/810D        | 1-P     | 724                      | 877   | 847   | 11.5  | 6.4 | 3.2 | 0.33          | 2.03               | 3.02 | 1.98 | 973                |
| 685.800             | 27.0000 | 876.300 | 34.5000 | 355.600 | 14.0000    | 352.425 | 13.8750  | 6.4   | 3.2   | 7 390                   | 23 100 | 4TR686A                   | 1-P     | 734                      | 852   | 824   | 11    | 6.4 | 3.2 | 0.42          | 1.62               | 2.42 | 1.59 | 554                |
| 708.025             | 27.8750 | 930.275 | 36.6250 | 565.150 | 22.2500    | 565.150 | 22.2500  | 6.4   | 3.2   | 13 800                  | 40 300 | 4TR708B                   | 1-P     | 753                      | 906   | 878   | 11    | 6.4 | 3.2 | 0.33          | 2.03               | 3.02 | 1.98 | 1 050              |

[Notes] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 47 for details of applicable tolerance standards.

2) SP indicates the specially chamfered form.

# Four-row tapered roller bearings ... TQO type

$d$  710.000 ~ 939.800 mm

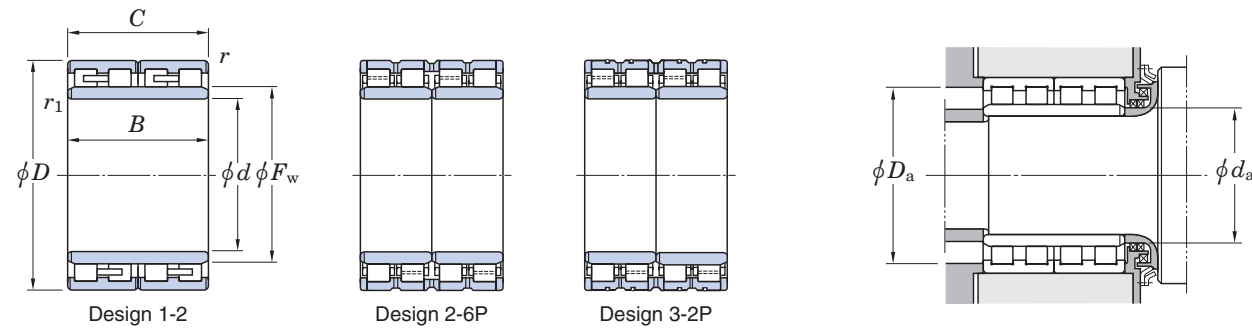


| Boundary dimensions |         |           |         |         |         |         |         |          |            | Basic load ratings (kN) |          | Bearing No. <sup>1)</sup> | De-sign | Mounting dimensions (mm) |            |            |          |            |            | Con-stant<br>$e$ | Axial load factors |       |       | (Refer.)<br>Mass (kg) |
|---------------------|---------|-----------|---------|---------|---------|---------|---------|----------|------------|-------------------------|----------|---------------------------|---------|--------------------------|------------|------------|----------|------------|------------|------------------|--------------------|-------|-------|-----------------------|
| $d$                 |         | $D$       |         | $T$     |         | $W$     |         | $r$ min. | $r_1$ min. | $C_r$                   | $C_{0r}$ |                           |         | $d_a$ max.               | $D_a$ max. | $D_a$ min. | $S$ min. | $r_a$ max. | $r_b$ max. |                  | $Y_2$              | $Y_3$ | $Y_0$ |                       |
| 710.000             | 27.9528 | 900.000   | 35.4331 | 410.000 | 16.1417 | 410.000 | 16.1417 | 6        | 3          | 9 190                   | 27 300   | 4TR710                    | 1-P     | 750                      | 877        | 853        | 11.5     | 6          | 2.5        | 0.35             | 1.95               | 2.90  | 1.91  | 636                   |
| 711.200             | 28.0000 | 914.400   | 36.0000 | 317.500 | 12.5000 | 317.500 | 12.5000 | 6.4      | 6.4        | 6 810                   | 18 800   | 4TR711                    | 1-P     | 774                      | 890        | 868        | 11.5     | 6.4        | 6.4        | 0.38             | 1.78               | 2.65  | 1.74  | 538                   |
|                     | 28.0000 | 914.400   | 36.0000 | 355.600 | 14.0000 | 355.600 | 14.0000 | 6.4      | 3.2        | 7 850                   | 21 200   | 47T1429136                | 1-P     | 753                      | 890        | 860        | 10.5     | 6.4        | 3.2        | 0.38             | 1.78               | 2.65  | 1.74  | 598                   |
| 717.550             | 28.2500 | 946.150   | 37.2500 | 565.150 | 22.2500 | 565.150 | 22.2500 | 6.4      | 3.2        | 13 600                  | 39 500   | LM282847D/810/810D        | 1-P     | 764                      | 922        | 890        | 12.5     | 6.4        | 3.2        | 0.33             | 2.03               | 3.02  | 1.98  | 1 090                 |
| 749.300             | 29.5000 | 990.600   | 39.0000 | 605.000 | 23.8189 | 605.000 | 23.8189 | 6.4      | 3.2        | 15 700                  | 47 700   | LM283649D/610/610D        | 1-P     | 801                      | 966        | 929        | 13       | 6.4        | 3.2        | 0.32             | 2.12               | 3.15  | 2.07  | 1 320                 |
| 750.000             | 29.5276 | 950.000   | 37.4016 | 410.000 | 16.1417 | 410.000 | 16.1417 | 4        | 2.5        | 9 700                   | 29 000   | 4TR750                    | 1-P     | 791                      | 929        | 900        | 11.5     | 4          | 2          | 0.40             | 1.68               | 2.50  | 1.68  | 705                   |
| 762.000             | 30.0000 | 1 079.500 | 42.5000 | 787.400 | 31.0000 | 787.400 | 31.0000 | 12.7     | 4.8        | 22 200                  | 62 700   | M284249D/210/210XD        | 1-P     | 831                      | 1 043      | 998        | 11       | 12.7       | 4.8        | 0.33             | 2.03               | 3.02  | 1.98  | 2 360                 |
| 825.500             | 32.5000 | 1 168.400 | 46.0000 | 844.550 | 33.2500 | 844.550 | 33.2500 | 12.7     | 4.8        | 26 000                  | 72 300   | M285848D/10/10D           | 1-P     | 897                      | 1 132      | 1 083      | 15.5     | 12.7       | 4.8        | 0.33             | 2.03               | 3.02  | 1.98  | 2 980                 |
|                     | 34.0000 | 1 130.300 | 44.5000 | 669.925 | 26.3750 | 669.925 | 26.3750 | 12.7     | 4.8        | 19 100                  | 59 600   | LM286249D/210/210D        | 1-P     | 920                      | 1 093      | 1 063      | 15       | 12.7       | 4.8        | 0.32             | 2.08               | 3.10  | 2.04  | 1 840                 |
| 863.600             | 34.0000 | 1 219.200 | 48.0000 | 889.000 | 35.0000 | 876.300 | 34.5000 | 12.7     | 4.8        | 28 500                  | 84 600   | EE547341D/480/481D        | 1-P     | 947                      | 1 182      | 1 130      | 9        | 12.7       | 4.8        | 0.33             | 2.03               | 3.02  | 1.98  | 3 390                 |
| 938.213             | 36.9375 | 1 270.000 | 50.0000 | 825.500 | 32.5000 | 825.500 | 32.5000 | 12.7     | 4.8        | 26 800                  | 79 800   | LM287649D/610/610D        | 1-P     | 1 007                    | 1 233      | 1 187      | 17.5     | 12.7       | 4.8        | 0.33             | 2.03               | 3.02  | 1.98  | 3 130                 |
| 939.800             | 37.0000 | 1 333.500 | 52.5000 | 952.500 | 37.5000 | 952.500 | 37.5000 | 12.7     | 4.8        | 33 500                  | 95 400   | LM287849D/810/810D        | 1-P     | 1 022                    | 1 297      | 1 235      | 15.5     | 12.7       | 4.8        | 0.33             | 2.03               | 3.02  | 1.98  | 4 380                 |

[Note] 1) While metric series bearings have minus tolerances for bore and OD, inch series have plus tolerances. Refer to page 47 for details of applicable tolerance standards.

# Four-row cylindrical roller bearings

$d$  180 ~ 560 mm



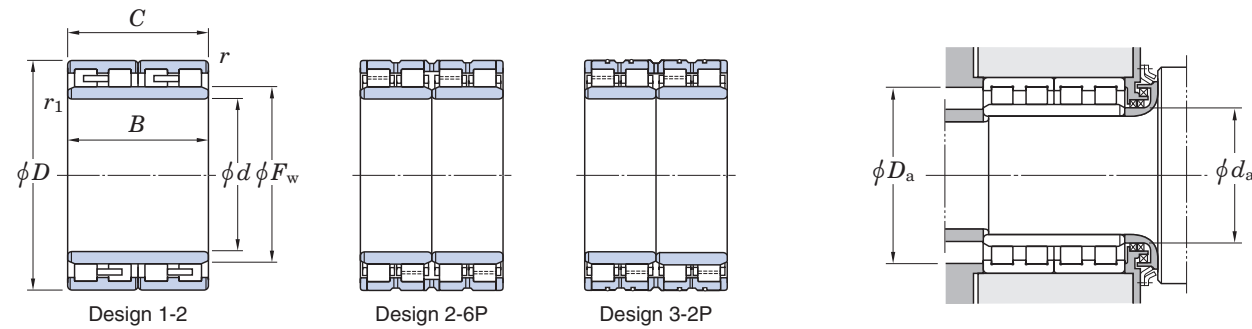
| $d$ | Boundary dimensions (mm) |     |     |       |          |            | Basic load ratings (kN) |          | Bearing No.                                | Design               | Mounting dimensions (mm) |            |            |            |            | (Refer.) Mass (kg) |            |
|-----|--------------------------|-----|-----|-------|----------|------------|-------------------------|----------|--|----------------------|--------------------------|------------|------------|------------|------------|--------------------|------------|
|     | $D$                      | $B$ | $C$ | $F_w$ | $r$ min. | $r_1$ min. | $C_r$                   | $C_{0r}$ |  |                      | $d_a$ min.               | $D_a$ max. | $r_a$ min. | $r_a$ max. | $r_b$ min. |                    | $r_b$ max. |
| 180 | 250                      | 156 | 156 | 200   | 2        | 2          | 1 020                   | 2 130    | 36FC25156A<br>36FC26168                    | 1-2                  | 190                      | 240        | 234        | 2          | 2          | 23.3               |            |
|     | 260                      | 168 | 168 | 202   | 2.1      | 2.1        | 1 230                   | 2 420    |  |                      | 1-2                      | 192        | 248        | 242        | 2          |                    | 2          |
| 190 | 260                      | 168 | 168 | 212   | 2.1      | 2.1        | 1 140                   | 2 600    | 38FC26168-1                                | 1-2                  | 202                      | 248        | 244        | 2          | 2          | 26.5               |            |
| 200 | 280                      | 200 | 200 | 222   | 2        | 2          | 1 450                   | 3 090    | 313893-1<br>313811                         | 1-2                  | 210                      | 270        | 262        | 2          | 2          | 37.7               |            |
|     | 290                      | 192 | 192 | 226   | 2.1      | 2.1        | 1 460                   | 3 030    |  |                      | 1-2                      | 212        | 278        | 268        | 2          |                    | 2          |
| 220 | 310                      | 192 | 192 | 247   | 2.1      | 2.1        | 1 520                   | 3 270    | 313837-1<br>313837A                        | 1-2                  | 232                      | 298        | 289        | 2          | 2          | 45.5               |            |
|     | 310                      | 192 | 192 | 246   | 2        | 2          | 1 630                   | 3 420    |  |                      | 1-2                      | 230        | 300        | 291        | 2          |                    | 2          |
| 230 | 330                      | 206 | 206 | 260   | 2.1      | 2.1        | 1 880                   | 3 980    | 313824A                                    | 1-2                  | 242                      | 318        | 308        | 2          | 2          | 57.5               |            |
| 240 | 330                      | 220 | 220 | 264   | 2.1      | 2.1        | 1 830                   | 4 120    | 48FC33220<br>48FC34220                     | 1-2                  | 252                      | 318        | 308        | 2          | 2          | 54.3               |            |
|     | 340                      | 220 | 220 | 268   | 3        | 3          | 2 000                   | 4 240    |  |                      | 1-2                      | 254        | 326        | 318        | 2.5        |                    | 2.5        |
| 260 | 370                      | 220 | 220 | 292   | 3        | 3          | 2 000                   | 4 330    | 313823<br>313823A                          | 1-2                  | 274                      | 356        | 342        | 2.5        | 2.5        | 76.0               |            |
|     | 370                      | 220 | 220 | 290   | 3        | 3          | 2 180                   | 4 480    |  |                      | 1-2                      | 274        | 356        | 346        | 2.5        |                    | 2.5        |
| 280 | 390                      | 220 | 220 | 312   | 3        | 3          | 2 320                   | 5 100    | 313822D                                    | 1-2                  | 294                      | 376        | 366        | 2.5        | 2.5        | 80.1               |            |
| 300 | 420                      | 300 | 300 | 332   | 2        | 2          | 3 750                   | 8 690    | 60FC42300L-2                               | 2-6P                 | 310                      | 410        | 395        | 2          | 2          | 129                |            |
| 330 | 460                      | 340 | 340 | 364   | 2.1      | 2.1        | 3 860                   | 9 150    | 66FC46340                                  | 1-2                  | 342                      | 448        | 428        | 2          | 2          | 172                |            |
| 340 | 480                      | 385 | 350 | 378   | 2.1      | SP         | 4 780                   | 11 500   | 68FC48350N                                 | 2-6P                 | 358                      | 468        | 448        | 2          | 3          | 209                |            |
| 380 | 540                      | 400 | 380 | 422   | 4        | 4          | 6 010                   | 14 300   | 76FC54380<br>76FC54400DW                   | 2-6P<br>3-2P         | 398                      | 522        | 504        | 3          | 3          | 287                |            |
|     | 540                      | 400 | 400 | 422   | 4        | 4          | 6 040                   | 14 600   |  |                      | 398                      | 522        | 502        | 3          | 3          |                    | 298        |
| 400 | 560                      | 410 | 410 | 445   | 2        | 5          | 6 470                   | 16 300   | 80FC56410                                  | 2-6P                 | 422                      | 550        | 525        | 2          | 4          | 315                |            |
| 440 | 620                      | 450 | 450 | 487   | 4        | 4          | 7 900                   | 20 000   | 88FC62450AW                                | 2-6P                 | 458                      | 602        | 577        | 3          | 3          | 440                |            |
| 480 | 680                      | 500 | 500 | 534   | 5        | 5          | 8 620                   | 22 000   | 4CR480B<br>96FC68500A                      | 3-2P<br>2-6P         | 502                      | 658        | 630        | 4          | 4          | 580                |            |
|     | 680                      | 500 | 500 | 532   | 5        | 5          | 9 550                   | 24 300   |  |                      | 502                      | 658        | 632        | 4          | 4          |                    | 595        |
| 500 | 670                      | 450 | 450 | 540   | 5        | SP         | 8 460                   | 22 500   | 100FC67450A-3<br>100FC68450<br>100FC72530C | 2-6P<br>2-6P<br>2-6P | 522                      | 648        | 630        | 4          | 4          | 451                |            |
|     | 680                      | 450 | 450 | 542.5 | 4        | 4          | 8 980                   | 23 100   |  |                      | 518                      | 662        | 639        | 3          | 3          |                    | 495        |
|     | 720                      | 530 | 530 | 568   | 5        | 4          | 11 000                  | 28 900   |  |                      | 518                      | 698        | 672        | 4          | 3          |                    | 742        |
| 550 | 740                      | 510 | 510 | 600   | 6        | 6          | 10 400                  | 28 100   | 110FC74510                                 | 2-6P                 | 578                      | 712        | 700        | 5          | 5          | 635                |            |
| 560 | 820                      | 600 | 600 | 625   | 6        | 6          | 14 600                  | 36 300   | 112FC82600                                 | 2-6P                 | 588                      | 792        | 759        | 5          | 5          | 1 120              |            |

[Notes] 1) SP indicates the specially chamfered form.

2)  $r_a$  indicates housing chamfer dimension corresponding to outer ring chamfer dimension  $r$ .  $r_b$  indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension  $r_1$ .

# Four-row cylindrical roller bearings

$d$  600 ~ 920 mm



| $d$            | Boundary dimensions (mm) |       |       |       |          |                 | Basic load ratings (kN) |          | Bearing No.         | Design | Mounting dimensions (mm) |            |            |                 |                 | (Refer.) Mass (kg) |
|----------------|--------------------------|-------|-------|-------|----------|-----------------|-------------------------|----------|---------------------|--------|--------------------------|------------|------------|-----------------|-----------------|--------------------|
|                | $D$                      | $B$   | $C$   | $F_w$ | $r$ min. | $r_1^{1)}$ min. | $C_r$                   | $C_{0r}$ |                     |        | $d_a$ min.               | $D_a$ max. | $D_a$ min. | $r_a^{2)}$ max. | $r_b^{2)}$ max. |                    |
| 600            | 820                      | 575   | 575   | 660   | 5        | 5               | 13 000                  | 36 000   | <b>120FC82575B</b>  | 2-6P   | 622                      | 798        | 772        | 4               | 4               | 925                |
|                | 850                      | 600   | 600   | 664   | 4        | 4               | 14 600                  | 38 100   | <b>120FC85600</b>   | 3-2P   | 618                      | 832        | 792        | 3               | 3               | 1 120              |
|                | 870                      | 640   | 640   | 682   | 4        | 4               | 15 500                  | 40 800   | <b>4CR600A</b>      | 2-6P   | 618                      | 852        | 812        | 3               | 3               | 1 330              |
| 650            | 920                      | 670   | 670   | 723   | 7.5      | 7.5             | 16 700                  | 45 500   | <b>130FC92670</b>   | 2-6P   | 686                      | 884        | 855        | 6               | 6               | 1 450              |
| 665            | 968.6                    | 732   | 732   | 734.5 | 6        | SP              | 21 200                  | 53 300   | <b>133FC97732</b>   | 2-6P   | 693                      | 940        | 899        | 5               | 5               | 1 870              |
| 690            | 980                      | 750   | 750   | 766   | 6        | 7.5             | 19 300                  | 52 300   | <b>138FC98750A</b>  | 2-6P   | 726                      | 952        | 910        | 5               | 6               | 1 860              |
| 700            | 980                      | 700   | 700   | 774   | 6        | 6               | 17 800                  | 48 200   | <b>140FC98700A</b>  | 3-2P   | 728                      | 952        | 914        | 5               | 5               | 1 680              |
|                | 980                      | 700   | 700   | 766   | 4        | 4               | 19 300                  | 51 300   | <b>140FC98700C</b>  | 2-6P   | 718                      | 962        | 914        | 3               | 3               | 1 710              |
| 730            | 1 030                    | 750   | 750   | 809   | 6        | 6               | 21 600                  | 59 500   | <b>146FC103750</b>  | 2-6P   | 758                      | 1 002      | 961        | 5               | 5               | 2 060              |
| 750            | 1 000                    | 670   | 670   | 813   | 6        | 6               | 18 300                  | 54 200   | <b>150FC100670</b>  | 2-6P   | 778                      | 972        | 941        | 5               | 5               | 1 520              |
| 755            | 1 070                    | 750   | 750   | 837   | 7.5      | 7.5             | 22 300                  | 60 300   | <b>151FC107750A</b> | 3-2P   | 791                      | 1 034      | 997        | 6               | 6               | 2 240              |
| 760            | 1 079.5                  | 787   | 787   | 846   | 7.5      | 7.5             | 23 800                  | 65 700   | <b>152FC108787D</b> | 3-2P   | 796                      | 1 043      | 1 006      | 6               | 6               | 2 420              |
| <b>761.425</b> | 1 079.602                | 787.4 | 787.4 | 846   | 7.5      | 7.5             | 23 800                  | 65 700   | <b>152FC108787C</b> | 2-6P   | 798                      | 1 043      | 1 006      | 6               | 6               | 2 420              |
| 765            | 1 065                    | 662   | 652   | 840   | 6        | 6               | 19 200                  | 51 700   | <b>153FC107652</b>  | 2-6P   | 793                      | 1 037      | 992        | 5               | 5               | 1 870              |
| 770            | 1 075                    | 770   | 770   | 847   | 7.5      | 6               | 23 100                  | 63 500   | <b>154FC108770A</b> | 2-6P   | 798                      | 1 039      | 1 007      | 6               | 5               | 2 250              |
| 780            | 1 070                    | 780   | 780   | 852   | 6        | 6               | 22 800                  | 65 100   | <b>156FC107780A</b> | 2-6P   | 808                      | 1 042      | 1 002      | 5               | 5               | 2 140              |
| 820            | 1 130                    | 800   | 800   | 903   | 7.5      | 7.5             | 23 400                  | 66 900   | <b>164FC113800D</b> | 2-6P   | 856                      | 1 094      | 1 059      | 6               | 6               | 2 510              |
| 850            | 1 180                    | 850   | 850   | 940   | 7.5      | 7.5             | 25 400                  | 72 700   | <b>170FC118850B</b> | 2-6P   | 886                      | 1 144      | 1 104      | 6               | 6               | 2 900              |
| 855            | 1 178                    | 714   | 704   | 928.5 | 6        | 6               | 23 600                  | 62 900   | <b>171FC118704</b>  | 2-6P   | 883                      | 1 150      | 1 104      | 5               | 5               | 2 410              |
| 860            | 1 160                    | 780   | 780   | 932   | 6        | 6               | 24 800                  | 72 600   | <b>172FC116780</b>  | 2-6P   | 888                      | 1 132      | 1 088      | 5               | 5               | 2 470              |
| 870            | 1 145                    | 705   | 685   | 940   | 6        | 6               | 21 500                  | 63 700   | <b>174FC115685B</b> | 2-6P   | 898                      | 1 117      | 1 085      | 5               | 5               | 1 980              |
|                | 1 181.1                  | 750   | 750   | 942   | 9.5      | SP              | 24 600                  | 68 600   | <b>174FC118750</b>  | 3-2P   | 906                      | 1 137      | 1 110      | 8               | 6               | 2 470              |
| 880            | 1 230                    | 850   | 850   | 970   | 7.5      | 7.5             | 29 000                  | 82 100   | <b>176FC123850A</b> | 2-6P   | 916                      | 1 194      | 1 148      | 6               | 6               | 3 280              |
| 900            | 1 220                    | 840   | 840   | 989   | 7.5      | 7.5             | 27 600                  | 83 300   | <b>180FC122840A</b> | 2-6P   | 936                      | 1 184      | 1 150      | 6               | 6               | 2 980              |
| 920            | 1 280                    | 815   | 800   | 1 010 | 7.5      | 7.5             | 28 700                  | 79 900   | <b>184FC128800</b>  | 3-2P   | 956                      | 1 244      | 1 196      | 6               | 6               | 3 280              |

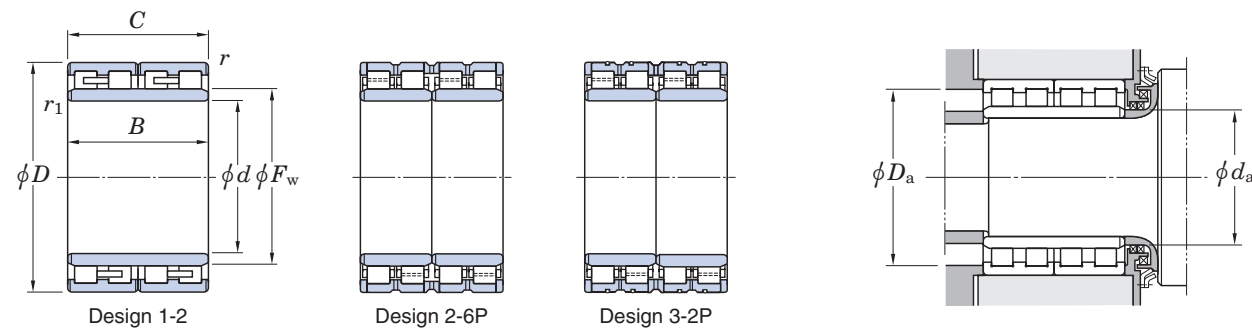
[Notes] 1) SP indicates the specially chamfered form.

2)  $r_a$  indicates housing chamfer dimension corresponding to outer ring chamfer dimension  $r$ .  $r_b$  indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension  $r_1$ .



# Four-row cylindrical roller bearings

$d$  950 ~ 1 349.04 mm

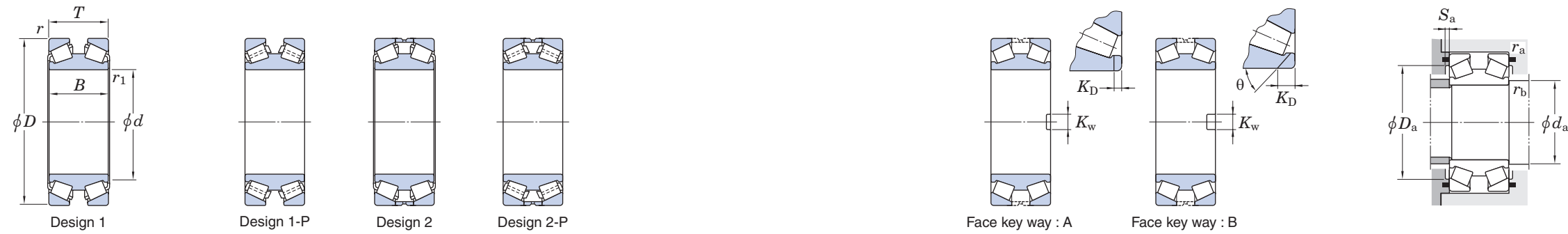


| $d$      | Boundary dimensions (mm) |       |       |       |             |               | Basic load ratings (kN) |          | Bearing No. | Design | Mounting dimensions (mm) |               |                    |                    |                    | (Refer.)<br>Mass (kg) |
|----------|--------------------------|-------|-------|-------|-------------|---------------|-------------------------|----------|-------------|--------|--------------------------|---------------|--------------------|--------------------|--------------------|-----------------------|
|          | $D$                      | $B$   | $C$   | $F_w$ | $r$<br>min. | $r_1$<br>min. | $C_r$                   | $C_{0r}$ |             |        | $d_a$<br>min.            | $D_a$<br>max. | $r_a^{1)}$<br>min. | $r_a^{1)}$<br>max. | $r_b^{1)}$<br>min. |                       |
| 950      | 1 330                    | 950   | 950   | 1 053 | 9.5         | 9.5           | 33 300                  | 97 200   | 190FC133950 | 2-6P   | 994                      | 1 286         | 1 241              | 8                  | 8                  | 4 330                 |
| 1 000    | 1 360                    | 1 025 | 1 000 | 1 092 | 7.5         | 7.5           | 36 100                  | 111 000  | 200FC136100 | 2-6P   | 1 036                    | 1 324         | 1 276              | 6                  | 6                  | 4 480                 |
| 1 300    | 1 655                    | 890   | 880   | 1 391 | 7.5         | 7.5           | 36 000                  | 121 000  | 260FC165880 | 2-6P   | 1 336                    | 1 619         | 1 571              | 6                  | 6                  | 4 830                 |
| 1 349.04 | 1 745                    | 1 010 | 1 000 | 1 446 | 7.5         | 7.5           | 44 200                  | 146 000  | 270FC175110 | 2-6P   | 1 386                    | 1 709         | 1 651              | 6                  | 6                  | 6 450                 |

[Note] 1)  $r_a$  indicates housing chamfer dimension corresponding to outer ring chamfer dimension  $r$ .  
 $r_b$  indicates the shaft chamfer dimension corresponding to inner ring chamfer dimension  $r_1$ .

# Double-row tapered roller bearings for axial support ... TDIS type

$d$  200 ~ 510 mm



| $d$     | Boundary dimensions (mm) |         |         |                           |                             | Basic load ratings (kN) |          |       |          | Bearing No. <sup>1)</sup> | De-<br>sign | Con-<br>stant<br>$e$ | Axial load factors |       |       | Face key way |               |               |                   |                            | Mounting dimensions (mm) |               |               |               |               | Mass (kg) |     |
|---------|--------------------------|---------|---------|---------------------------|-----------------------------|-------------------------|----------|-------|----------|---------------------------|-------------|----------------------|--------------------|-------|-------|--------------|---------------|---------------|-------------------|----------------------------|--------------------------|---------------|---------------|---------------|---------------|-----------|-----|
|         | $D$                      | $B$     | $T$     | $r$ <sup>3)</sup><br>min. | $r_1$ <sup>3)</sup><br>min. | $C_r$                   | $C_{0r}$ | $C_r$ | $C_{0r}$ |                           |             |                      | $Y_2$              | $Y_3$ | $Y_0$ | Type         | $K_w$<br>(mm) | $K_D$<br>(mm) | $\theta$<br>(deg) | qty×Position <sup>2)</sup> | $d_a$<br>max.            | $D_a$<br>max. | $S_a$<br>min. | $r_a$<br>max. | $r_b$<br>max. |           |     |
| 200     | 380                      | 180     | 180     | 4                         | SP                          | 1 780                   | 3 240    | 1 410 | 3 900    | 45T403818                 | 2-P         | 0.8                  | 0.85               | 1.26  | 0.83  | B            | 30            | 25            | 45                | 1×2                        | 236                      | 328           | 294           | 5.5           | 3             | 3         | 94  |
| 260     | 459                      | 155     | 155     | 4                         | 5                           | 1 570                   | 2 780    | 1 360 | 3 650    | 45T524616                 | 2-P         | 0.87                 | 0.78               | 1.16  | 0.76  | A            | 32.1          | 15            | —                 | 2×2                        | 292                      | 400           | 370           | 5.5           | 3             | 4         | 95  |
| 300     | 440                      | 105     | 105     | 4                         | 4                           | 1 070                   | 2 300    | 922   | 3 030    | 45T604411M                | 1-P         | 0.87                 | 0.78               | 1.16  | 0.76  | B            | 32.1          | 22.225        | 45                | 1×2                        | 324                      | 398           | 378           | 7.5           | 3             | 3         | 50  |
| 305     | 480                      | 200     | 200     | 4                         | SP                          | 2 060                   | 4 670    | 1 780 | 6 140    | 45T614820-1               | 2           | 0.87                 | 0.78               | 1.16  | 0.76  | B            | 40            | 28            | 45                | 1×2                        | 337                      | 420           | 377           | —             | 3             | 2.5       | 136 |
|         | 500                      | 200     | 200     | 5                         | 6                           | 2 320                   | 4 720    | 1 770 | 5 490    | 45T615020-1               | 1-P         | 0.76                 | 0.88               | 1.31  | 0.86  | B            | 50.9          | 35            | 45                | 2×2                        | 339                      | 441           | 400           | —             | 4             | 5         | 150 |
|         | 560                      | 200     | 200     | 20                        | 6.5                         | 2 170                   | 4 370    | 2 360 | 7 160    | 45T615620D                | 1           | 1.09                 | 0.62               | 0.92  | 0.61  | A            | 50.8          | 19.05         | —                 | 2×2                        | 373                      | 482           | 436           | —             | 10            | 5         | 146 |
| 320     | 480                      | 160     | 160     | 2.5                       | SP                          | 1 630                   | 4 090    | 1 400 | 5 380    | 45T644816A                | 1           | 0.87                 | 0.78               | 1.16  | 0.76  | B            | 51.3          | 22            | 45                | 2×1                        | 349                      | 419           | 386           | 5             | 2             | 2.5       | 101 |
| 340     | 590                      | 192     | 192     | SP                        | SP                          | 2 940                   | 5 870    | 2 040 | 6 240    | 45T685919-1               | 1-P         | 0.7                  | 0.97               | 1.44  | 0.94  | B            | 50            | 30            | 45                | 1×2                        | 392                      | 518           | 488           | 10            | 1             | 4         | 209 |
| 345     | 550                      | 200     | 270     | 6                         | 4                           | 2 430                   | 5 740    | 2 090 | 7 550    | 45T695520                 | 1           | 0.87                 | 0.78               | 1.16  | 0.76  | A            | 32            | 16            | —                 | 1×2                        | 373                      | 482           | 440           | 2             | 5             | 3         | 176 |
| 350     | 590                      | 192     | 192     | 5                         | SP                          | 2 540                   | 6 570    | 2 760 | 10 800   | 45T705919D                | 1-P         | 1.09                 | 0.62               | 0.92  | 0.61  | A            | 32            | 12            | —                 | 1×2                        | 401                      | 520           | 470           | 11.5          | 4             | 5         | 227 |
| 365.6   | 514.35                   | 140     | 140     | 4                         | SP                          | 1 390                   | 3 730    | 1 190 | 4 910    | 45T735114A                | 1           | 0.87                 | 0.78               | 1.16  | 0.76  | B            | 40            | 20            | 45                | 2×2                        | 394                      | 457           | 428           | 5.5           | 3             | 2.5       | 89  |
| 381     | 695                      | 280     | 280     | 6                         | SP                          | 4 780                   | 9 970    | 4 120 | 13 100   | 45T767028A                | 2-P         | 0.87                 | 0.78               | 1.16  | 0.76  | B            | 50            | 45            | 45                | 2×2                        | 448                      | 602           | 547           | 10            | 5             | 5         | 479 |
| 390     | 548                      | 180     | 180     | 4                         | SP                          | 2 050                   | 5 540    | 1 770 | 7 290    | 45T765518                 | 1           | 0.87                 | 0.78               | 1.16  | 0.76  | B            | 51.3          | 16            | 45                | 1×2                        | 418                      | 495           | 457           | 3             | 3             | 2.5       | 169 |
|         | 562                      | 180     | 180     | 4.5                       | SP                          | 2 110                   | 5 530    | 1 820 | 7 280    | 45T785618                 | 1           | 0.87                 | 0.78               | 1.16  | 0.76  | A            | 32            | 11.7          | —                 | 2×2                        | 420                      | 501           | 463           | 4.5           | 4             | 2.5       | 145 |
| 400     | 650                      | 200     | 200     | 6                         | 6                           | 2 930                   | 6 500    | 2 520 | 8 560    | 45T806520D                | 1           | 0.87                 | 0.78               | 1.16  | 0.76  | A            | 50.8          | 19            | —                 | 2×2                        | 465                      | 582           | 542           | 4.5           | 5             | 5         | 243 |
|         | 650                      | 240     | 240     | 6                         | SP                          | 3 770                   | 8 390    | 3 250 | 11 000   | 2TR400L                   | 1-P         | 0.87                 | 0.78               | 1.16  | 0.76  | B            | 64.3          | 32            | 45                | 1×2                        | 437                      | 580           | 534           | 5.5           | 5             | 2         | 296 |
| 406.4   | 546.1                    | 138.112 | 138.112 | 6.4                       | SP                          | 1 490                   | 3 920    | 1 280 | 5 160    | 45T815514                 | 1           | 0.87                 | 0.78               | 1.16  | 0.76  | A            | 50            | 11            | —                 | 1×2                        | 436                      | 502           | 474           | 5             | 5             | 3         | 89  |
| 410     | 580                      | 160     | 160     | 4                         | 7                           | 2 180                   | 5 430    | 1 880 | 7 140    | 45T825816A-1              | 2           | 0.87                 | 0.78               | 1.16  | 0.76  | A            | 50.8          | 10            | —                 | 1×2                        | 434                      | 532           | 500           | 9             | 3             | 5         | 133 |
| 440     | 650                      | 155     | 155     | 6                         | SP                          | 2 220                   | 5 110    | 1 910 | 6 720    | 45T886516A                | 2-P         | 0.87                 | 0.78               | 1.16  | 0.76  | SP           | 50            | 15            | 45                | 1×2                        | 484                      | 593           | 564           | 8             | 5             | 4         | 172 |
| 450     | 830                      | 320     | 320     | 7.5                       | 7.5                         | 5 570                   | 10 900   | 5 800 | 17 200   | 45T908332-1               | 1-P         | 1.05                 | 0.64               | 0.96  | 0.63  | B            | 60            | 55            | 45                | 2×2                        | 501                      | 706           | 636           | 1             | 6             | 6         | 691 |
| 482     | 655                      | 160     | 170     | 4                         | 4                           | 1 890                   | 5 270    | 1 630 | 6 930    | 45T966616-1               | 1           | 0.87                 | 0.78               | 1.16  | 0.76  | B            | 40            | 20            | 45                | 2×2                        | 518                      | 590           | 554           | —             | 3             | 3         | 157 |
| 482.6   | 733.5                    | 190     | 190     | SP                        | SP                          | 3 230                   | 8 000    | 2 620 | 9 880    | 45T977319                 | 1-P         | 0.81                 | 0.83               | 1.23  | 0.81  | B            | 64.2          | 44.45         | 45                | 1×2                        | 547                      | 669           | 635           | 7.5           | 2             | 2         | 283 |
|         | 733.501                  | 200.025 | 200     | 17.5                      | 6.4                         | 2 950                   | 7 100    | 3 200 | 11 600   | 45T977320J                | 1-P         | 1.09                 | 0.62               | 0.92  | 0.61  | A            | 50.8          | 19.05         | —                 | 1×2                        | 513                      | 651           | 603           | 5             | 10            | 5         | 280 |
| 509.998 | 733.5                    | 200.02  | 200.02  | 5                         | 6                           | 3 230                   | 8 000    | 2 620 | 9 880    | 2TR510L-1                 | 1-P         | 0.81                 | 0.83               | 1.23  | 0.81  | B            | 50.8          | 38.1          | 45                | 2×2                        | 560                      | 667           | 630           | 3.5           | 4             | 5         | 261 |
| 510     | 800                      | 285     | 285     | 6                         | SP                          | 5 370                   | 12 300   | 4 260 | 14 800   | 2TR510-2                  | 1-P         | 0.8                  | 0.85               | 1.26  | 0.83  | B            | 70.2          | 44.45         | 45                | 1×2                        | 570                      | 716           | 662           | 7             | 6             | 6         | 506 |

[Notes] 1) Since there are many bearings of special tolerances for specific applications, consult with JTEKT for details of tolerances.

2) [x1]...one face, [x2]...both face.

3) SP indicates the specially chamfered form.

# Double-row tapered roller bearings for axial support ... TDIS type

$d$  635 ~ 717.55 mm



| Boundary dimensions (mm) |       |     |       | Basic load ratings (kN) |     |       |        | Bearing No. <sup>1)</sup> | Design | Constant $e$ | Axial load factors |          |       | Face key way |       |      |            | Mounting dimensions (mm) |                |                            |            |            | Mass (kg) |            |            |            |            |     |
|--------------------------|-------|-----|-------|-------------------------|-----|-------|--------|---------------------------|--------|--------------|--------------------|----------|-------|--------------|-------|------|------------|--------------------------|----------------|----------------------------|------------|------------|-----------|------------|------------|------------|------------|-----|
| $d$                      | $D$   | $B$ | $T$   | Radial                  |     | Axial |        |                           |        |              | $C_r$              | $C_{0r}$ | $Y_2$ | $Y_3$        | $Y_0$ | Type | $K_w$ (mm) | $K_D$ (mm)               | $\theta$ (deg) | qty×Position <sup>2)</sup> | $d_a$ max. | $D_a$ max. |           | $D_a$ min. | $S_a$ min. | $r_a$ max. | $r_b$ max. |     |
| 635                      | 940   | 260 | 260   | 5.4                     | 3.2 | 4 570 | 10 600 | 5 320                     | 19 000 | 2TR635B-1    | 1-P                | 1.17     |       | 0.58         | 0.86  | 0.56 | B          | 70.3                     | 51             | 45                         | 1×2        | 674        | 852       | 793        | —          | 5          | 3          | 477 |
| 685.8                    | 939.8 | 235 | 228.6 | SP                      | SP  | 4 930 | 12 800 | 3 760                     | 14 900 | 2TR686A      | 1-P                | 0.76     |       | 0.88         | 1.31  | 0.86 | B          | 63.6                     | 38.5           | 45                         | 1×2        | 730        | 868       | 827        | 8.5        | 1          | 3          | 455 |
| 717.55                   | 1 000 | 200 | 200   | 6                       | SP  | 4 070 | 12 400 | 3 510                     | 16 300 | 2TR718       | 1-P                | 0.87     |       | 0.78         | 1.16  | 0.76 | B          | 70.3                     | 44.5           | 45                         | 1×2        | 800        | 914       | 874        | 9          | 5          | 5          | 482 |

[Notes] 1) Since there are many bearings of special tolerances for specific applications, consult with JTEKT for details of tolerances.

2) [×1]...one face, [×2]...both face.

3) SP indicates the specially chamfered form.

## 1. Recommended fits for rolling mill roll neck bearing

A rolling mill roll neck bearing is subject to inner ring rotating load. Its inner ring always receives a load on its entire circumference, and a load is applied to the outer ring at only one location.

Thus, interference fit is required for the inner ring to prevent any creep, and clearance fit should be used for the outer ring, in principle. For easy attachment, clearance fit has been used for roll neck bearings (because recombination and replacement must be frequently done for roll grinding).

However, with more increase in rolling speed and rolling load, interference fit has been more commonly used to

prevent danger of creep to be generated when clearance fit is used and improve in accuracy of products.

Clearance fit is used for the inner rings of deep groove ball bearings and angular ball bearings used as bearings receiving axial load. Between the outer ring and the chock, adequate clearance should be provided in order to prevent any radial load applied to the outer ring.

Tables 1-1 through 1-4 show the recommended fits for roll neck bearings.

When machining a roll neck or chock, its roundness must not exceed 50 % of the allowable tolerances shown in Tables 1-1 through 1-4. If its roundness is poor, fretting corrosion may frequently occur.

**Table 1-1 Recommended fits for roll neck metric series four-row tapered roller bearing**

| Double inner ring and roll neck (shaft) |       |  |       |  |       | Outer ring and chock (housing)     |       |   |       |   |       |
|---|-------|--|-------|--|-------|------------------------------------|-------|---|-------|---|-------|
| Nominal bore diameter $d$<br>mm         |       | Single plane mean bore diameter deviation $\Delta_{dmp}$ $\mu\text{m}$ |       | Roll neck diameter deviation $\mu\text{m}$ |       | Nominal outside diameter $D$<br>mm |       | Single plane mean outside diameter deviation $\Delta_{Dmp}$ $\mu\text{m}$ |       | Chock bore diameter deviation $\mu\text{m}$ |       |
| over                                    | up to | upper  | lower | upper                                      | lower | over                               | up to | upper   | lower | upper                                       | lower |
| 80                                      | 120   | 0  | -20   | -120                                       | -150  | 120                                | 150   | 0   | -20   | +57   | +25   |
| 120                                     | 180   | 0  | -25   | -150                                       | -175  | 150                                | 180   | 0   | -25   | +100  | +50   |
| 180                                     | 250   | 0  | -30   | -175                                       | -200  | 180                                | 250   | 0   | -30   | +120  | +50   |
| 250                                     | 315   | 0  | -35   | -210                                       | -250  | 250                                | 315   | 0   | -35   | +115  | +50   |
| 315                                     | 400   | 0  | -40   | -240                                       | -300  | 315                                | 400   | 0   | -40   | +110  | +50   |
| 400                                     | 500   | 0  | -45   | -245                                       | -300  | 400                                | 500   | 0   | -45   | +105  | +50   |
| 500                                     | 630   | 0  | -50   | -250                                       | -300  | 500                                | 630   | 0   | -50   | +100  | +50   |
| 630                                     | 800   | 0  | -75   | -325                                       | -400  | 630                                | 800   | 0   | -75   | +150  | +75   |
| 800                                     | 1 000 | 0  | -100  | -350                                       | -425  | 800                                | 1 000 | 0   | -100  | +150  | +75   |
| 1 000                                   | 1 250 | 0  | -125  | -425                                       | -500  | 1 000                              | 1 250 | 0   | -125  | +175  | +100  |
| 1 250                                   | 1 600 | 0  | -160  | -510                                       | -600  | 1 250                              | 1 600 | 0   | -160  | +215  | +125  |
|   |       |  |       |  |       | 1 600                              | 2 000 | 0   | -200  | +250  | +150  |

**Table 1-2 Recommended fits for roll neck inch series four-row tapered roller bearing**

| Double inner ring and roll neck (shaft)  |                |  |       |  |       | Outer ring and chock (housing)              |                |   |       |   |       |
|--|----------------|--|-------|--|-------|---|----------------|---|-------|---|-------|
| Nominal bore diameter $d$<br>mm (1/25.4) |                | Single bore diameter deviation $\Delta_{ds}$ $\mu\text{m}$ |       | Roll neck diameter deviation $\mu\text{m}$ |       | Nominal outside diameter $D$<br>mm (1/25.4) |                | Single outside diameter deviation $\Delta_{Ds}$ $\mu\text{m}$ |       | Chock bore diameter deviation $\mu\text{m}$ |       |
| over                                     | up to          | upper  | lower | upper                                      | lower | over  | up to          | upper   | lower | upper                                       | lower |
| 76.2 (3.0)                               | 101.6 (4.0)    | +25  | 0     | -75  | -100  | -   | 304.8 (12.0)   | +25   | 0     | +75   | +50   |
| 101.6 (4.0)                              | 127.0 (5.0)    | +25  | 0     | -100                                       | -125  | 304.8 (12.0)                                | 609.6 (24.0)   | +51   | 0     | +150  | +100  |
| 127.0 (5.0)                              | 152.4 (6.0)    | +25  | 0     | -125                                       | -150  | 609.6 (24.0)                                | 914.4 (36.0)   | +76   | 0     | +225  | +150  |
| 152.4 (6.0)                              | 203.2 (8.0)    | +25  | 0     | -150                                       | -175  | 914.4 (36.0)                                | 1 219.2 (48.0) | +102  | 0     | +300  | +200  |
| 203.2 (8.0)                              | 304.8 (12.0)   | +25  | 0     | -175                                       | -200  | 1 219.2 (48.0)                              | 1 524.0 (60.0) | +127  | 0     | +375  | +250  |
| 304.8 (12.0)                             | 609.6 (24.0)   | +51  | 0     | -200                                       | -250  | 1 524.0 (60.0)                              |                | +127  | 0     | +450  | +300  |
| 609.6 (24.0)                             | 914.4 (36.0)   | +76  | 0     | -250                                       | -325  |   |                |   |       |   |       |
| 914.4 (36.0)                             | 1 219.2 (48.0) | +102   | 0     | -300                                       | -400  |   |                |   |       |   |       |
| 1 219.2 (48.0)                           |                | +127   | 0     | -375                                       | -475  |   |                |   |       |   |       |



**Table 1-3 Recommended fits for roll neck four-row cylindrical roller bearing (inner ring interference fit)**

| Inner ring and roll neck (shaft)   |       |  |       |   |           | Outer ring and chock (housing)        |       |   |       |  |           |
|------------------------------------|-------|--|-------|---|-----------|---------------------------------------|-------|---|-------|--|-----------|
| Nominal bore diameter<br>$d$<br>mm |       | Single plane mean bore diameter deviation<br>$\Delta d_{mp}$ $\mu\text{m}$ |       | Roll neck diameter deviation<br>$\mu\text{m}$ |           | Nominal outside diameter<br>$D$<br>mm |       | Single plane mean outside diameter deviation<br>$\Delta D_{mp}$ $\mu\text{m}$ |       | Chock bore diameter deviation<br>$\mu\text{m}$ |           |
| over                               | up to | upper  | lower | upper   | lower     | over                                  | up to | upper   | lower | upper  | lower     |
| 80                                 | 120   | 0  | -20   | +59   | +37 (p6)  | 120                                   | 150   | 0   | -18   | +40  | 0 (H7)    |
| 120                                | 180   | 0  | -25   | +68   | +43 (p6)  | 150                                   | 180   | 0   | -25   | +40  | 0 (H7)    |
| 180                                | 250   | 0  | -30   | +79   | +50 (p6)  | 180                                   | 250   | 0   | -30   | +46  | 0 (H7)    |
| 250                                | 280   | 0  | -35   | +126  | +94 (r6)  | 250                                   | 315   | 0   | -35   | +52  | 0 (H7)    |
| 280                                | 315   | 0  | -35   | +130  | +98 (r6)  |                                       |       |   |       |  |           |
| 315                                | 355   | 0  | -40   | +144  | +108 (r6) | 315                                   | 400   | 0   | -40   | +75  | +18 (G7)  |
| 355                                | 400   | 0  | -40   | +150  | +114 (r6) |                                       |       |   |       |  |           |
| 400                                | 450   | 0  | -45   | +166  | +126 (r6) | 400                                   | 500   | 0   | -45   | +83  | +20 (G7)  |
| 450                                | 500   | 0  | -45   | +172  | +132 (r6) |                                       |       |   |       |  |           |
| 500                                | 560   | 0  | -50   | +194  | +150 (r6) | 500                                   | 630   | 0   | -50   | +92  | +22 (G7)  |
| 560                                | 630   | 0  | -50   | +354  | +310 (s6) |                                       |       |   |       |  |           |
| 630                                | 710   | 0  | -75   | +390  | +340 (s6) | 630                                   | 800   | 0   | -75   | +160   | +80 (F7)  |
| 710                                | 800   | 0  | -75   | +430  | +380 (s6) |                                       |       |   |       |  |           |
| 800                                | 900   | 0  | -100  | +486  | +430 (s6) | 800                                   | 1 000 | 0   | -100  | +176   | +86 (F7)  |
| 900                                | 1 000 | 0  | -100  | +526  | +470 (s6) |                                       |       |   |       |  |           |
| 1 000                              | 1 120 | 0  | -125  | +588  | +520 (s6) | 1 000                                 | 1 250 | 0   | -125  | +203   | +98 (F7)  |
| 1 120                              | 1 250 | 0  | -125  | +646  | +580 (s6) |                                       |       |   |       |  |           |
|                                    |       |  |       |   |           | 1 250                                 | 1 400 | 0   | -160  | +235   | +110 (F7) |
|                                    |       |  |       |   |           | 1 400                                 | 1 600 | 0   | -160  | +345   | +220 (E7) |

[Note] The table above shows general values. JTEKT determines recommended fit on a case by case basis according to bearing materials and operating conditions to prevent the inner ring from creeping.

Consult with JTEKT when referring to this table.

**Table 1-4 Recommended fits of bearing types for support of axial loading**

| Bearing type  | Inner ring and roll neck (shaft) |  | Outer ring and chock (housing)    |                   |
|---|----------------------------------|--|-----------------------------------|-------------------|
|   | Shaft tolerance range class      | Mounted to chock   |                                   | Mounted to sleeve |
|   |                                  | Chock bore tolerance range class   | Sleeve bore tolerance range class |                   |
| Double row tapered roller bearing (bearings for support of axial loading) ... TDIS type | e6 or f6                         | Nominal chock bore (mm) =<br>Outer ring outer dia.<br>+ [0.5 to 1.0]<br>H8 |                                   | G7                |

[Remark] When installing a sleeve, clearance of 0.5 mm or more should be provided between the outer diameter of the sleeve and the bore of the chock.

## 2. Tolerances

### 2-1. Four-row cylindrical roller bearings

[Applicable tolerance for cylindrical roller bearings]

| Type of cylindrical roller bearings | Applicable tolerance   |
|-------------------------------------|--|
| Four-row cylindrical bore bearings  | Class 0, class 6, class 5 of JIS B 1514                        |
| Four-row tapered bore bearings      | Class 0, class 6 of JIS B 1514 (Refer to Table 2-2 on page 45) |

**Table 2-1 Tolerances of roller set bore diameter and roller set outside diameter of interchangeable bearings**

Unit :  $\mu\text{m}$

| Nominal bore diameter<br>$d$ (mm) |       | Roller set bore diameter deviation<br>$\Delta_{Fw}$ |       | Roller set outside diameter deviation<br>$\Delta_{Ew}$ |       |
|-----------------------------------|-------|---|-------|--|-------|
| over                              | up to | upper   | lower | upper  | lower |
| 50                                | 120   | + 20  | 0     | 0  | - 20  |
| 120                               | 200   | + 25  | 0     | 0  | - 25  |
| 200                               | 250   | + 30  | 0     | 0  | - 30  |
| 250                               | 315   | + 35  | 0     | 0  | - 35  |
| 315                               | 400   | + 40  | 0     | 0  | - 40  |
| 400                               | 500   | + 45  | 0     | 0  | - 45  |
| 500                               | 600   | + 50  | 0     | 0  | - 50  |
| 600                               | 700   | + 55  | 0     | 0  | - 55  |
| 700                               | 800   | + 60  | 0     | 0  | - 60  |
| 800                               | 900   | + 70  | 0     | 0  | - 70  |
| 900                               | 1 000 | + 80  | 0     | 0  | - 80  |
| 1 000                             | 1 250 | + 90  | 0     | 0  | - 90  |
| 1 250                             | 1 600 | +100  | 0     | 0  | -100  |
| 1 600                             | 2 000 | +120  | 0     | 0  | -120  |
| 2 000                             | 2 500 | +150  | 0     | 0  | -150  |

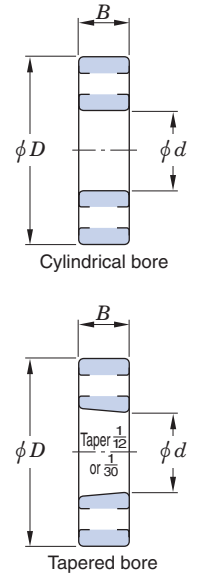
[Remark] Interchangeable bearings have an inner ring with rollers that can be matched with the outer ring, or an outer ring with rollers that can be matched with the inner ring, without affecting performance in the bearing that has the same bearing number in one category.

Table 2-2 (1) Radial bearing tolerances (tapered roller bearings excluded) = JIS B 1514-1 =

(1) Inner ring (bore diameter)

Unit :  $\mu\text{m}$

| Nominal bore diameter $d$<br>mm |       | Single plane mean bore diameter deviation $\Delta_{dmp}$ |         |       |         |       |         | Single plane bore diameter variation $V_{dsp}$ |         |         |                         |         |         | Mean bore diameter variation $V_{dmp}$ |         |      |
|---------------------------------|-------|--|---------|-------|---------|-------|---------|--|---------|---------|-------------------------|---------|---------|--|---------|------|
|                                 |       |  |         |       |         |       |         | Diameter series 0, 1                           |         |         | Diameter series 2, 3, 4 |         |         | class 0                                |         |      |
|                                 |       | class 0  | class 6 |       | class 5 |       | class 0 | class 6  | class 5 | class 0 | class 6                 | class 5 | class 0 | class 6                                | class 5 | max. |
| over                            | up to | upper  | lower   | upper | lower   | upper | lower   | max.   |         |         | max.                    |         |         | max.                                   |         |      |
| 120                             | 150   | 0  | -25     | 0     | -18     | 0     | -13     | 31   | 23      | 10      | 19                      | 14      | 10      | 19                                     | 14      | 7    |
| 150                             | 180   | 0  | -25     | 0     | -18     | 0     | -13     | 31   | 23      | 10      | 19                      | 14      | 10      | 19                                     | 14      | 7    |
| 180                             | 250   | 0  | -30     | 0     | -22     | 0     | -15     | 38   | 28      | 12      | 23                      | 17      | 12      | 23                                     | 17      | 8    |
| 250                             | 315   | 0  | -35     | 0     | -25     | 0     | -18     | 44   | 31      | 14      | 26                      | 19      | 14      | 26                                     | 19      | 9    |
| 315                             | 400   | 0  | -40     | 0     | -30     | 0     | -23     | 50   | 38      | 18      | 30                      | 23      | 18      | 30                                     | 23      | 12   |
| 400                             | 500   | 0  | -45     | 0     | -35     | 0     | -28     | 56   | 44      | 21      | 34                      | 26      | 21      | 34                                     | 26      | 14   |
| 500                             | 630   | 0  | -50     | 0     | -40     | 0     | -35     | 63   | 50      | 26      | 38                      | 30      | 26      | 38                                     | 30      | 18   |
| 630                             | 800   | 0  | -75     | 0     | -50     | 0     | -45     | 94   | 63      | 34      | 56                      | 38      | 34      | 56                                     | 38      | 23   |
| 800                             | 1 000 | 0  | -100    | 0     | -60     | 0     | -60     | 125  | 75      | 45      | 75                      | 45      | 45      | 75                                     | 45      | 30   |
| 1 000                           | 1 250 | 0  | -125    | 0     | -75     | 0     | -75     | 156  | 94      | 56      | 94                      | 56      | 56      | 94                                     | 56      | 38   |
| 1 250                           | 1 600 | 0  | -160    | -     | -       | -     | -       | 200  | -       | -       | 120                     | -       | -       | 120                                    | -       | -    |
| 1 600                           | 2 000 | 0  | -200    | -     | -       | -     | -       | 250  | -       | -       | 150                     | -       | -       | 150                                    | -       | -    |



(2) Inner ring (running accuracy and width)

Unit :  $\mu\text{m}$

| Nominal bore diameter $d$<br>mm |       | Radial runout of assembled bearing inner ring $K_{ia}$ |       |         |    | $S_d$ | Single inner ring width deviation $\Delta_{Bs}$ |      |         |       |         |       | Single inner ring width deviation $\Delta_{Bs}^{1)}$ |       |                       |       |                       |       | Inner ring width variation $V_{Bs}$ |       |         |      |         |  |         |
|---------------------------------|-------|--|-------|---------|----|-------|---|------|---------|-------|---------|-------|--|-------|-----------------------|-------|-----------------------|-------|-------------------------------------|-------|---------|------|---------|--|---------|
|                                 |       | class 0  |       | class 6 |    |       | class 5   |      | class 0 |       | class 6 |       | class 5  |       | class 0 <sup>2)</sup> |       | class 6 <sup>2)</sup> |       | class 5 <sup>2)</sup>               |       | class 0 |      | class 6 |  | class 5 |
|                                 |       | over   | up to | max.    |    |       |   | max. |         | upper | lower   | upper | lower  | upper | lower                 | upper | lower                 | upper | lower                               | upper | lower   | max. |         |  |         |
| 120                             | 150   | 30   | 18    | 8       | 10 | 0     | -250  | 0    | -250    | 0     | -250    | 0     | -500   | 0     | -500                  | 0     | -380                  | 30    | 30                                  | 8     |         |      |         |  |         |
| 150                             | 180   | 30   | 18    | 8       | 10 | 0     | -250  | 0    | -250    | 0     | -250    | 0     | -500   | 0     | -500                  | 0     | -380                  | 30    | 30                                  | 8     |         |      |         |  |         |
| 180                             | 250   | 40   | 20    | 10      | 11 | 0     | -300  | 0    | -300    | 0     | -300    | 0     | -500   | 0     | -500                  | 0     | -500                  | 30    | 30                                  | 10    |         |      |         |  |         |
| 250                             | 315   | 50   | 25    | 13      | 13 | 0     | -350  | 0    | -350    | 0     | -350    | 0     | -500   | 0     | -500                  | 0     | -500                  | 35    | 35                                  | 13    |         |      |         |  |         |
| 315                             | 400   | 60   | 30    | 15      | 15 | 0     | -400  | 0    | -400    | 0     | -400    | 0     | -630   | 0     | -630                  | 0     | -630                  | 40    | 40                                  | 15    |         |      |         |  |         |
| 400                             | 500   | 65   | 35    | 20      | 18 | 0     | -450  | 0    | -450    | 0     | -450    | -     | -  | -     | -                     | -     | -                     | 50    | 45                                  | 18    |         |      |         |  |         |
| 500                             | 630   | 70   | 40    | 25      | 25 | 0     | -500  | 0    | -500    | 0     | -500    | -     | -  | -     | -                     | -     | -                     | 60    | 50                                  | 20    |         |      |         |  |         |
| 630                             | 800   | 80   | 50    | 30      | 30 | 0     | -750  | 0    | -750    | 0     | -750    | -     | -  | -     | -                     | -     | -                     | 70    | 60                                  | 23    |         |      |         |  |         |
| 800                             | 1 000 | 90   | 60    | 40      | 40 | 0     | -1 000  | 0    | -1 000  | 0     | -1 000  | -     | -  | -     | -                     | -     | -                     | 80    | 60                                  | 35    |         |      |         |  |         |
| 1 000                           | 1 250 | 100  | 70    | 50      | 50 | 0     | -1 250  | 0    | -1 250  | 0     | -1 250  | -     | -  | -     | -                     | -     | -                     | 100   | 60                                  | 45    |         |      |         |  |         |
| 1 250                           | 1 600 | 120  | -     | -       | -  | 0     | -1 600  | -    | -       | -     | -       | -     | -  | -     | -                     | -     | -                     | 120   | -                                   | -     |         |      |         |  |         |
| 1 600                           | 2 000 | 140  | -     | -       | -  | 0     | -2 000  | -    | -       | -     | -       | -     | -  | -     | -                     | -     | -                     | 140   | -                                   | -     |         |      |         |  |         |

$S_d$  : perpendicularity of inner ring face with respect to the bore

[Notes] 1) These shall be applied to individual bearing rings manufactured for matched pair or stack bearings.

2) Also applicable to the inner ring with tapered bore of  $d \geq 50$  mm.

[Remark] Values in Italics are prescribed in JTEKT standards.

**Table 2-2 (2) Radial bearing tolerances (tapered roller bearings excluded)**

**(3) Outer ring (outside diameter)**

Unit :  $\mu\text{m}$

| Nominal outside dia.<br>$D$<br>mm |       | Single plane mean outside diameter deviation<br>$\Delta D_{mp}$ |         |       |         |       |                       | Single plane outside diameter variation $V_{Dsp}$ |         |                       |                         |         |                       | Mean outside diameter variation<br>$V_{Dmp}$ |         |    |
|-----------------------------------|-------|---|---------|-------|---------|-------|-----------------------|---|---------|-----------------------|-------------------------|---------|-----------------------|--|---------|----|
|                                   |       |   |         |       |         |       |                       | Diameter series 0, 1                              |         |                       | Diameter series 2, 3, 4 |         |                       |  |         |    |
|                                   |       | class 0   | class 6 |       | class 5 |       | class 0 <sup>1)</sup> | class 6 <sup>1)</sup>                             | class 5 | class 0 <sup>1)</sup> | class 6 <sup>1)</sup>   | class 5 | class 0 <sup>1)</sup> | class 6 <sup>1)</sup>                        | class 5 |    |
| over                              | up to | upper   | lower   | upper | lower   | upper | lower                 | max.  |         |                       | max.                    |         |                       | max.   |         |    |
| 150                               | 180   | 0   | -25     | 0     | -18     | 0     | -13                   | 31  | 23      | 10                    | 19                      | 14      | 10                    | 19   | 14      | 7  |
| 180                               | 250   | 0   | -30     | 0     | -20     | 0     | -15                   | 38  | 25      | 11                    | 23                      | 15      | 11                    | 23   | 15      | 8  |
| 250                               | 315   | 0   | -35     | 0     | -25     | 0     | -18                   | 44  | 31      | 14                    | 26                      | 19      | 14                    | 26   | 19      | 9  |
| 315                               | 400   | 0   | -40     | 0     | -28     | 0     | -20                   | 50  | 35      | 15                    | 30                      | 21      | 15                    | 30   | 21      | 10 |
| 400                               | 500   | 0   | -45     | 0     | -33     | 0     | -23                   | 56  | 41      | 17                    | 34                      | 25      | 17                    | 34   | 25      | 12 |
| 500                               | 630   | 0   | -50     | 0     | -38     | 0     | -28                   | 63  | 48      | 21                    | 38                      | 29      | 21                    | 38   | 29      | 14 |
| 630                               | 800   | 0   | -75     | 0     | -45     | 0     | -35                   | 94  | 56      | 26                    | 55                      | 34      | 26                    | 55   | 34      | 18 |
| 800                               | 1 000 | 0   | -100    | 0     | -60     | 0     | -50                   | 125   | 75      | 38                    | 75                      | 45      | 38                    | 75   | 45      | 25 |
| 1 000                             | 1 250 | 0   | -125    | 0     | -75     | 0     | -63                   | 156   | 94      | 47                    | 94                      | 56      | 47                    | 94   | 56      | 31 |
| 1 250                             | 1 600 | 0   | -160    | 0     | -90     | 0     | -80                   | 200   | 113     | 60                    | 120                     | 68      | 60                    | 120  | 68      | 40 |
| 1 600                             | 2 000 | 0   | -200    | 0     | -120    | -     | -                     | 250   | 150     | -                     | 150                     | 90      | -                     | 150  | 90      | -  |
| 2 000                             | 2 500 | 0   | -250    | -     | -       | -     | -                     | 313   | -       | -                     | 188                     | -       | -                     | 188  | -       | -  |

**(4) Outer ring (running accuracy and width)**

Unit :  $\mu\text{m}$

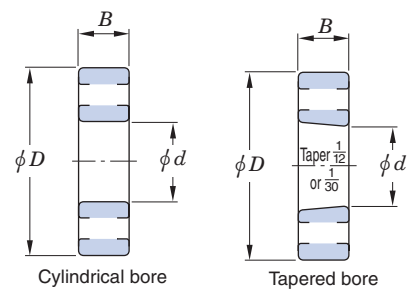
| Nominal outside dia.<br>$D$<br>mm |       | Radial runout of assembled bearing outer ring<br>$K_{ea}$ |         |         | $S_D^{2)}$ | $S_{ea}^{2)}$ |
|-----------------------------------|-------|---|---------|---------|------------|---------------|
|                                   |       | class 0   | class 6 | class 5 |            |               |
|                                   |       | over  | up to   | max.    |            |               |
| 150                               | 180   | 45  | 23      | 13      | 10         | 14            |
| 180                               | 250   | 50  | 25      | 15      | 11         | 15            |
| 250                               | 315   | 60  | 30      | 18      | 13         | 18            |
| 315                               | 400   | 70  | 35      | 20      | 13         | 20            |
| 400                               | 500   | 80  | 40      | 23      | 15         | 23            |
| 500                               | 630   | 100   | 50      | 25      | 18         | 25            |
| 630                               | 800   | 120   | 60      | 30      | 20         | 30            |
| 800                               | 1 000 | 140   | 75      | 40      | 23         | 40            |
| 1 000                             | 1 250 | 160   | 85      | 45      | 30         | 45            |
| 1 250                             | 1 600 | 190   | 95      | 60      | 45         | 60            |
| 1 600                             | 2 000 | 220   | 110     | -       | -          | -             |
| 2 000                             | 2 500 | 250   | -       | -       | -          | -             |

[Notes]

- 1) Shall be applied when locating snap ring is not fitted.
- 2) These shall not be applied to flanged bearings.

[Remark]

Values in Italics are prescribed in JTEKT standards.



$d$  : nominal bore diameter  
 $D$  : nominal outside diameter  
 $B$  : nominal assembled bearing width

$S_D$  : perpendicularity of outer ring outside surface with respect to the face

$S_{ea}$  : axial runout of assembled bearing outer ring



## 2-2. Tapered roller bearings

[Applicable tolerance for tapered roller bearings]

| Type of tapered roller bearings |               | Applicable tolerance*   |  |
|---------------------------------|---------------|---|--|
| Double-row<br>·<br>Four-row     | Metric series | 45200, 45300, 46200 (A), 46300 (A)<br>46T30200JR, 46T32200JR, 46T30300JR, 46T32300JR<br>37200, 47200, 47300 | Class 0 of BAS 1002<br>(Refer to Table 2-3 on page 46)                         |
|                                 | Inch series   | (LM377449D/LM377410, 67388/67322D )<br>(EE127094D/127138/127139D etc.)                                      | Class 4 of ABMA 19<br>(Refer to Table 2-4 on page 47)                          |
|                                 | The others    | 45T..., 46T..., 47T..., 2TR..., 4TR...  | Special tolerances for required are used in many cases.<br>Consult with JTEKT. |

\* Consult with JTEKT if a higher tolerance class than that shown in this table is necessary.

**Table 2-3 Tolerances for metric series double-row and four-row tapered roller bearings (class 0)**  
= BAS 1002 =

### (1) Inner ring, outer ring width and overall width

Unit :  $\mu\text{m}$

| Nominal bore diameter<br>$d$<br>mm |       | Single plane mean bore diameter deviation<br>$\Delta_{dmp}$ |       | Single plane bore diameter variation<br>$V_{dsp}$ | Mean bore diameter variation<br>$V_{dmp}$ | $K_{ia}$ | Single outer ring or inner ring width deviation<br>$\Delta_{Bs}, \Delta_{Cs}$ |       | Actual overall inner rings/outer rings width deviation |       |  |       |
|------------------------------------|-------|---|-------|---|---|----------|---|-------|--|-------|--|-------|
|                                    |       |   |       |   |   |          |   |       | Double-row<br>$\Delta_{Ts}$                            |       | Four-row<br>$\Delta_{Ts}, \Delta_{Ws}$ |       |
| over                               | up to | upper   | lower | max.  | max.                                      | max.     | upper   | lower | upper  | lower | upper                                  | lower |
| 120                                | 180   | 0   | -25   | 25  | 19  | 35       | 0   | -250  | +500   | -500  | +600                                   | -600  |
| 180                                | 250   | 0   | -30   | 30  | 23  | 50       | 0   | -300  | +600   | -600  | +750                                   | -750  |
| 250                                | 315   | 0   | -35   | 35  | 26  | 60       | 0   | -350  | +700   | -700  | +900                                   | -900  |
| 315                                | 400   | 0   | -40   | 40  | 30  | 70       | 0   | -400  | +800   | -800  | +1000                                  | -1000 |
| 400                                | 500   | 0   | -45   | 45  | 34  | 80       | 0   | -450  | +900   | -900  | +1200                                  | -1200 |
| 500                                | 630   | 0   | -60   | 60  | 40  | 90       | 0   | -500  | +1000  | -1000 | +1200                                  | -1200 |
| 630                                | 800   | 0   | -75   | 75  | 45  | 100      | 0   | -750  | +1500  | -1500 | -                                      | -     |
| 800                                | 1000  | 0   | -100  | 100   | 55  | 115      | 0   | -1000 | +1500  | -1500 | -                                      | -     |

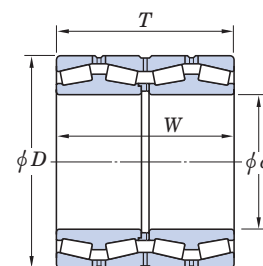
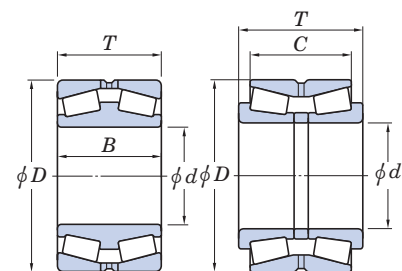
$K_{ia}$  : radial runout of assembled bearing inner ring

### (2) Outer ring

Unit :  $\mu\text{m}$

| Nominal outside diameter<br>$D$<br>mm |       | Single plane mean outside diameter deviation<br>$\Delta_{Dmp}$ |       | Single plane outside diameter variation<br>$V_{Dsp}$ | Mean outside diameter variation<br>$V_{Dmp}$ | $K_{ea}$ |
|---------------------------------------|-------|--|-------|--|--|----------|
|                                       |       |  |       |  |  |          |
| over                                  | up to | upper  | lower | max.   | max.   | max.     |
| 150                                   | 180   | 0  | -25   | 25   | 19   | 45       |
| 180                                   | 250   | 0  | -30   | 30   | 23   | 50       |
| 250                                   | 315   | 0  | -35   | 35   | 26   | 60       |
| 315                                   | 400   | 0  | -40   | 40   | 30   | 70       |
| 400                                   | 500   | 0  | -45   | 45   | 34   | 80       |
| 500                                   | 630   | 0  | -50   | 60   | 38   | 100      |
| 630                                   | 800   | 0  | -75   | 80   | 55   | 120      |
| 800                                   | 1000  | 0  | -100  | 100  | 75   | 140      |
| 1000                                  | 1250  | 0  | -125  | 130  | 90   | 160      |
| 1250                                  | 1600  | 0  | -160  | 170  | 100  | 180      |

$K_{ea}$  : radial runout of assembled bearing outer ring



$d$  : nominal bore diameter  
 $D$  : nominal outside diameter  
 $B$  : nominal double inner ring width  
 $C$  : nominal double outer ring width  
 $T, W$  : nominal overall width of outer rings (inner rings)

**Table 2-4 Tolerances and permissible values for inch series tapered roller bearings = ABMA 19 =**

**(1) Inner ring**

Unit :  $\mu\text{m}$

| Applied bearing type | Nominal bore diameter<br>$d$ , mm (1/25.4) |                       | Deviation of a single bore diameter $\Delta_{ds}$ |       |         |       |         |       |         |       |
|----------------------|--|-----------------------|---|-------|---------|-------|---------|-------|---------|-------|
|                      |  |                       | Class 4   |       | Class 2 |       | Class 3 |       | Class 0 |       |
|                      | over                                       | up to                 | upper   | lower | upper   | lower | upper   | lower | upper   | lower |
| All types            | –  | <b>76.2</b> ( 3.0)    | + 13  | 0     | +13     | 0     | +13     | 0     | +13     | 0     |
|                      | <b>76.2</b> ( 3.0)                         | <b>266.7</b> (10.5)   | + 25  | 0     | +25     | 0     | +13     | 0     | +13     | 0     |
|                      | <b>266.7</b> (10.5)                        | <b>304.8</b> (12.0)   | + 25  | 0     | +25     | 0     | +13     | 0     | +13     | 0     |
|                      | <b>304.8</b> (12.0)                        | <b>609.6</b> (24.0)   | + 51  | 0     | +51     | 0     | +25     | 0     | –       | –     |
|                      | <b>609.6</b> (24.0)                        | <b>914.4</b> (36.0)   | + 76  | 0     | –       | –     | +38     | 0     | –       | –     |
|                      | <b>914.4</b> (36.0)                        | <b>1 219.2</b> (48.0) | +102  | 0     | –       | –     | +51     | 0     | –       | –     |
|                      | <b>1 219.2</b> (48.0)                      | –                     | +127  | 0     | –       | –     | +76     | 0     | –       | –     |

**(2) Outer ring**

Unit :  $\mu\text{m}$

| Applied bearing type | Nominal outside diameter<br>$D$ , mm (1/25.4) |                       | Deviation of a single outside diameter $\Delta_{Ds}$ |       |         |       |         |       |         |       |
|----------------------|---|-----------------------|--|-------|---------|-------|---------|-------|---------|-------|
|                      |   |                       | Class 4  |       | Class 2 |       | Class 3 |       | Class 0 |       |
|                      | over  | up to                 | upper  | lower | upper   | lower | upper   | lower | upper   | lower |
| All types            | –   | <b>266.7</b> (10.5)   | + 25   | 0     | +25     | 0     | +13     | 0     | +13     | 0     |
|                      | <b>266.7</b> (10.5)                           | <b>304.8</b> (12.0)   | + 25   | 0     | +25     | 0     | +13     | 0     | +13     | 0     |
|                      | <b>304.8</b> (12.0)                           | <b>609.6</b> (24.0)   | + 51   | 0     | +51     | 0     | +25     | 0     | –       | –     |
|                      | <b>609.6</b> (24.0)                           | <b>914.4</b> (36.0)   | + 76   | 0     | +76     | 0     | +38     | 0     | –       | –     |
|                      | <b>914.4</b> (36.0)                           | <b>1 219.2</b> (48.0) | +102   | 0     | –       | –     | +51     | 0     | –       | –     |
|                      | <b>1 219.2</b> (48.0)                         | –                     | +127   | 0     | –       | –     | +76     | 0     | –       | –     |

**(3) Radial runout of assembled bearing inner ring/outer ring**

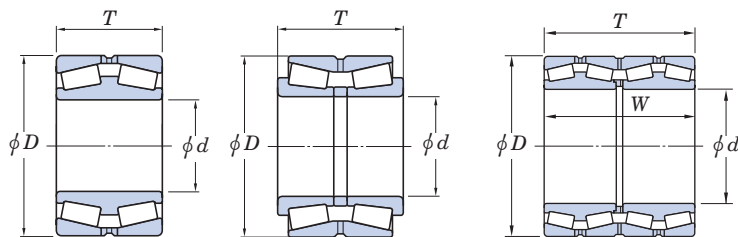
Unit :  $\mu\text{m}$

| Applied bearing type | Nominal outside diameter<br>$D$ , mm (1/25.4) |                       | Radial runout of inner ring/outer ring $K_{ia}, K_{ea}$ |         |         |         |
|----------------------|---|-----------------------|---|---------|---------|---------|
|                      |   |                       | Class 4   | Class 2 | Class 3 | Class 0 |
|                      | over  | up to                 | max.  | max.    | max.    | max.    |
| All types            | –   | <b>266.7</b> (10.5)   | 51  | 38      | 8       | 4       |
|                      | <b>266.7</b> (10.5)                           | <b>304.8</b> (12.0)   | 51  | 38      | 8       | 4       |
|                      | <b>304.8</b> (12.0)                           | <b>609.6</b> (24.0)   | 51  | 38      | 18      | –       |
|                      | <b>609.6</b> (24.0)                           | <b>914.4</b> (36.0)   | 76  | 51      | 51      | –       |
|                      | <b>914.4</b> (36.0)                           | <b>1 219.2</b> (48.0) | 76  | –       | 76      | –       |
|                      | <b>1 219.2</b> (48.0)                         | –                     | 76  | –       | 76      | –       |

(4) Assembled bearing width and overall width

Unit :  $\mu\text{m}$

| Applied bearing type  | Nominal bore diameter<br>$d$ , mm (1/25.4) |              | Nominal outside diameter<br>$D$ , mm (1/25.4) |              | Deviation of the actual bearing width and overall width of inner rings/outer rings $\Delta T_s, \Delta W_s$ |        |         |        |         |        |         |        |
|-----------------------|--|--------------|---|--------------|---|--------|---------|--------|---------|--------|---------|--------|
|                       | over                                       | up to        | over  | up to        | Class 4   |        | Class 2 |        | Class 3 |        | Class 0 |        |
|                       |  |              |   |              | upper   | lower  | upper   | lower  | upper   | lower  | upper   | lower  |
| Double-row            | –  | 101.6 ( 4.0) | –   | –            | + 406   | 0      | + 406   | 0      | + 406   | – 406  | + 406   | – 406  |
|                       | 101.6 ( 4.0)                               | 266.7 (10.5) | –   | –            | + 711   | – 508  | + 406   | – 203  | + 406   | – 406  | + 406   | – 406  |
|                       | 266.7 (10.5)                               | 304.8 (12.0) | –   | –            | + 711   | – 508  | + 406   | – 203  | + 406   | – 406  | + 406   | – 406  |
|                       | 304.8 (12.0)                               | 609.6 (24.0) | –   | 508.0 (20.0) | –   | –      | + 762   | – 762  | + 406   | – 406  | –       | –      |
|                       | 304.8 (12.0)                               | 609.6 (24.0) | 508.0 (20.0)                                  | –            | –   | –      | + 762   | – 762  | + 762   | – 762  | –       | –      |
| Double-row (TNA type) | –  | 127.0 ( 5.0) | –   | –            | –   | –      | + 254   | 0      | + 254   | 0      | –       | –      |
|                       | 127.0 ( 5.0)                               | –            | –   | –            | –   | –      | + 762   | 0      | + 762   | 0      | –       | –      |
| Four-row              | Total dimensional range                    |              | –   | –            | +1 524  | –1 524 | +1 524  | –1 524 | +1 524  | –1 524 | +1 524  | –1 524 |



$d$  : nominal bore diameter  
 $D$  : nominal outside diameter  
 $T, W$  : nominal assembled bearing width and nominal overall width of outer rings (inner rings)

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