The Koyo EXSEV Bearing Series is a collection of high-performance bearings compatible with special operating environments and conditions, where conventional bearings are not applicable.

From among our varied collection of EXSEV Series bearings, this Guidebook includes products that are especially contributory to the semiconductor industry, such as in clean-room or vacuum-chamber applications.

Koyo is certain that the high-performance EXSEV Bearing Series, which is the materialization of new values, will assist the many engineers working not only in the semiconductor industry but in a variety of fields.

For your needs in varied extreme special environments

EXSEV Bearing Series

Clean

Corrosion

High temperature

Electric field

Magnetic field

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<td>Clean Pro PRZ Bearing</td>
<td>&lt;10 000</td>
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<tr>
<td>High Corrosion Resistant Ceramic Bearing</td>
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<td>1 000</td>
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<td>High</td>
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<tr>
<td>Corrosion Resistant Ceramic Bearing</td>
<td>&lt;10 000</td>
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<td>Ceramic Bearing</td>
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<td>High</td>
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<tr>
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<td>High</td>
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<tr>
<td>MG Bearing</td>
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<td>500</td>
<td>Approximately 3% of <em>Cr</em> or less</td>
<td>Low</td>
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<td>MO Bearing</td>
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<td>1 000</td>
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<td>Low</td>
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</tr>
<tr>
<td>PN Bearing</td>
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<td>1 000</td>
<td>Approximately 1% of <em>Cr</em> or less</td>
<td>Low</td>
<td>SE_ZZST (PN)</td>
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<td><strong>Magnetic field environment</strong></td>
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<td>(°C)</td>
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<td>(°C)</td>
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<td>1 000</td>
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<td>Hybrid Ceramic Bearing</td>
<td>No less than 12 times that of steel bearings</td>
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<td>3NC_YZ (FG)</td>
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### Notes:

1. *dn* value: Bearing bore diameter (mm) × Rotational speed (min⁻¹)
2. The cleanliness classes may vary depending on operating conditions.
3. The four blank boxes represent the basic number of the bearing. A basic number consists of three or four alphanumeric characters. A bearing number may be used as a convenience in the case of any queries to JTEKT.

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Bearings: Table of Characteristics

## Performance and functions

- **High**: Suitable for high-speed operations.
- **Low**: Suitable for low-speed operations.

## Page References

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Clean environment

**Clean Pro PRZ Bearing**

**Typical bearing number**

SE\[
\]
ZZSTPRZ (YS)

**Advantages**

This bearing has a fluoropolymer gel coating on its rolling surfaces as the lubricant.

**Specifications**

- Outer/inner rings and balls: Martensitic stainless steel
- Cage: Austenitic stainless steel
- Shield: Austenitic stainless steel
- Lubrication: Clean pro PRZ coating

**Performance**

- Cleanliness: Class 10
- Ambient pressure: Atmospheric pressure to 10⁻⁵ Pa
- Temperature: −30 to 200 °C
- Limiting speed: \( \omega < 10,000 \) min⁻¹
- 1,000 min⁻¹ max.
- Permissible radial load: \( \leq 5\% \) of the basic dynamic load rating

**Applications**

- Semiconductor manufacturing equipment
- Lithography equipment
- Transfer systems
- Vacuum motors
- Vacuum equipment

**High Temperature Clean Pro Bearing**

**Typical bearing number**

SE\[
\]
ZZSTPRB (YS)

**Advantages**

This bearing has a fluoropolymer coating on its rolling surface as the lubricant.

**Specifications**

- Outer/inner rings and balls: Martensitic stainless steel
- Cage: Austenitic stainless steel
- Shield: Austenitic stainless steel
- Lubrication: High temperature clean pro coating

**Performance**

- Cleanliness: Class 10
- Ambient pressure: Atmospheric pressure to 10⁻⁵ Pa
- Temperature: −100 to 260 °C
- Limiting speed: \( \omega < 10,000 \) min⁻¹
- 1,000 min⁻¹ max.
- Permissible radial load: \( \leq 3\% \) of the basic dynamic load rating

**Applications**

- Semiconductor manufacturing equipment
- Lithography equipment
- Transfer systems
- Vacuum motors
- Lithography equipment

**Clean Pro Bearing**

**Typical bearing number**

SE\[
\]
ZZSTPR (YS)

**Advantages**

This bearing is lubricated with the packed fluorinated KDL grease, which is suitable for use in clean environments and vacuum environments.

**Specifications**

- Outer/inner rings and balls: Martensitic stainless steel
- Cage: Austenitic stainless steel
- Shield: Austenitic stainless steel
- Lubrication: KDL grease

**Performance**

- Cleanliness: Class 10
- Ambient pressure: Atmospheric pressure to 10⁻⁵ Pa
- Temperature: −30 to 200 °C
- Limiting speed: \( \omega < 10,000 \) min⁻¹
- 1,000 min⁻¹ max.
- Permissible radial load: \( \leq 3\% \) of the basic dynamic load rating

**Applications**

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Transfer robots
- Vacuum pumps

**DL Bearing**

**Typical bearing number**

SV\[
\]
ZZST (YS)

**Advantages**

This bearing is lubricated with the packed fluorinated KDL grease, which is suitable for use in clean environments and vacuum environments.

**Specifications**

- Outer/inner rings and balls: Martensitic stainless steel
- Cage: Austenitic stainless steel
- Shield: Austenitic stainless steel
- Lubrication: KDL grease

**Performance**

- Cleanliness: Class 10
- Ambient pressure: Atmospheric pressure to 10⁻⁵ Pa
- Temperature: −30 to 200 °C
- Limiting speed: \( \omega < 40,000 \) min⁻¹

**Applications**

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Transfer robots
- Vacuum pumps

---

1) The cleanliness class number represents specific environments where the individual products are useful. The cleanliness of the products themselves may vary depending on operating conditions.

2) When used in an environment where cleanliness is not a significant factor, the product can be used at higher speed, reaching the same limiting speed as that of standard products.

3) The permissible radial load indicates the approximate size of radial load the bearing can carry. If the bearing carries an axial load, the permissible radial load may be lower. Refer to the table at the end of the guidebook for each product’s basic dynamic load rating (Cₚ).
Clean environment

**FA Bearing**

![FA Bearing Image]

**High Corrosion Resistant Ceramic Bearing**

![High Corrosion Resistant Ceramic Bearing Image]

**Corrosion Resistant Ceramic Bearing**

![Corrosion Resistant Ceramic Bearing Image]

**Ceramic Bearing**

![Ceramic Bearing Image]

### Typical bearing number

**FA Bearing**

- **SE ZZST (FA)**

**Corrosion Resistant Ceramic Bearing**

- **NCT (FA)**

**Ceramic Bearing**

- **NC ZZST (FA)**

### Advantages

- **FA Bearing**
  - This bearing is lubricated with a solid fluoropolymer lubricant, which offers superior lubrication performance. The cage is made from a low-particle-emission fluorocarbon resin.

- **Corrosion Resistant Ceramic Bearing**
  - This bearing uses a silicon carbide ceramic material, which is resistant to strong acids and alkalis.

- **Ceramic Bearing**
  - This bearing has components made of corrosion resistant silicon nitride and is lubricated with fluoropolymer. This bearing can be used even in a highly corrosive solution.

### Specifications

- **FA Bearing**
  - Outer/inner rings and balls: Martensitic stainless steel
  - Cage: Fluorocarbon resin
  - Shield: Austenitic stainless steel
  - Lubrication: Fluorine polymer (solid lubricant)

- **Corrosion Resistant Ceramic Bearing**
  - Outer/inner rings and balls: Ceramic (silicon nitride)
  - Cage: Fluorocarbon resin
  - Shield: Austenitic stainless steel
  - Lubrication: Fluorine polymer (solid lubricant)

- **Ceramic Bearing**
  - Outer/inner rings and balls: Ceramic (corrosion resistant silicon nitride)
  - Cage: Fluorocarbon resin
  - Shield: Austenitic stainless steel
  - Lubrication: Fluorine polymer (solid lubricant)

### Performance

- **FA Bearing**
  - Cleanliness: Class 1 000
  - Ambient pressure: Atmospheric pressure to 10⁻⁵ Pa
  - Temperature: −100 to 200 °C
  - Limiting speed: \( \omega < 10,000 \) \( 1000 \text{ min}^{-1} \) max.
  - Permissible radial load: \( \leq 1\% \) of the basic dynamic load rating

- **Corrosion Resistant Ceramic Bearing**
  - Cleanliness: Class 1 000
  - Ambient pressure: Atmospheric pressure to 10⁻⁵ Pa
  - Temperature: −100 to 200 °C
  - Limiting speed: \( \omega < 10,000 \) \( 1000 \text{ min}^{-1} \) max.
  - Permissible radial load: \( \leq 1\% \) of the basic dynamic load rating

- **Ceramic Bearing**
  - Cleanliness: Class 1 000
  - Ambient pressure: Atmospheric pressure to 10⁻⁵ Pa
  - Temperature: −100 to 200 °C
  - Limiting speed: \( \omega < 10,000 \) \( 1000 \text{ min}^{-1} \) max.
  - Permissible radial load: \( \leq 1\% \) of the basic dynamic load rating

### Applications

- **FA Bearing**
  - Semiconductor manufacturing equipment
  - LCD manufacturing equipment
  - Transfer systems
  - Inspection systems

- **Corrosion Resistant Ceramic Bearing**
  - Semiconductor manufacturing equipment
  - Ultrasonic motors
  - LCD manufacturing equipment
  - Semiconductor inspection equipment
  - Synthetic fiber manufacturing equipment
  - Canning machinery

- **Ceramic Bearing**
  - Semiconductor manufacturing equipment
  - Ultrasonic motors
  - LCD manufacturing equipment
  - Semiconductor inspection equipment
  - Synthetic fiber manufacturing equipment
  - Canning machinery

---

1) The cleanliness class number represents specific environments where the individual products are useful. The cleanliness of the products themselves may vary depending on operating conditions.

2) When used in an environment where cleanliness is not a significant factor, the product can be used at higher speed, reaching the same limiting speed as that of standard products.

3) The permissible radial load indicates the approximate size of radial load the bearing can carry. If the bearing carries an axial load, the permissible radial load may be lower. Refer to the table at the end of the guidebook for each product’s basic dynamic load rating (C).
Corrosive environment

**Corrosion Resistant Hybrid Ceramic Bearing**

**Typical bearing number**

3NC<sup>1</sup>ZZMD4 (FA)

**Advantages**
This bearing uses a stainless steel variety that has excellent corrosion resistance. As the lubricant, fluoropolymer is used. It is compatible with underwater use.

**Specifications**
- Outer/Inner rings: Precipitation hardening stainless steel
- Balls: Ceramic (silicon nitride)
- Cage: Fluorocarbon resin
- Shield: Austenitic stainless steel
- Lubrication: Lithium polymer

**Performance**
- Cleanliness: Class 1 000<sup>1</sup>
- Ambient pressure: Atmospheric pressure to 10<sup>-5</sup> Pa
- Temperature: -100 to 200 °C
- Limiting speed: \( \omega < 500 \) min<sup>-1</sup>
- Permissible radial load: ≤ 1% of the basic dynamic load rating<sup>5</sup>

**Applications**
- Semiconductor manufacturing equipment
- Chemical manufacturing equipment
- Food machinery
- Transfer systems

---

**SK Bearing**

**Typical bearing number**

SK<sup>1</sup>ZZST (YS)

**Advantages**
This bearing has all components made of stainless steel, and is lubricated with lithium containing KHD grease, which is packed in adequate amounts. This bearing is suitable for use in slightly corrosive environments.

**Specifications**
- Outer/Inner rings and balls: Martensitic stainless steel
- Cage: Austenitic stainless steel
- Shield: Austenitic stainless steel
- Lubrication: KHD grease

**Performance**
- Cleanliness: -
- Ambient pressure: Atmospheric pressure
- Temperature: -30 to 120 °C
- Limiting speed: Equal to the \( \omega \) value of normal bearings

**Applications**
- Semiconductor manufacturing equipment
- Chemical equipment
- Food machinery
- Cleaning equipment

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**Full Complement Ceramic Ball Bearing**

**Typical bearing number**

NC<sup>2</sup>ZZST (WS)

**Advantages**
This bearing has all components made of ceramic for use in an ultrahigh temperature environment. No cage is provided. Being an angular contact ball bearing, this bearing is normally used in pairs.

**Specifications**
- Outer/Inner rings and balls: Ceramic (silicon nitride)
- Cage: Not provided
- Shield: Austenitic stainless steel
- Lubrication: Solid lubricant including tungsten disulfide

**Performance**
- Cleanliness: -
- Ambient pressure: Atmospheric pressure to 10<sup>-10</sup> Pa
- Temperature: -200 to 800 °C
- Limiting speed: \( \omega < 4 000 \) min<sup>-1</sup>
- Permissible radial load: ≤ 1% of the basic dynamic load rating<sup>5</sup>

**Applications**
- Chemical equipment
- Fans in furnaces
- Baking furnace cars
- Fans in furnaces

---

**WS Bearing**

**Typical bearing number**

SE<sup>1</sup>ZZST (WS)

**Advantages**
This bearing has extremely heat resistant tungsten disulfide included in the separator material as the lubricant. We recommend that this bearing is used with horizontal axes. For information on using this bearing with items other than horizontal axes, consult JTEKT.

**Specifications**
- Outer/Inner rings and balls: Martensitic stainless steel
- Cage: Not provided
- Shield: Austenitic stainless steel
- Lubrication: Solid lubricant including tungsten disulfide

**Performance**
- Cleanliness: -
- Ambient pressure: Atmospheric pressure to 10<sup>-5</sup> Pa
- Temperature: 100 to 350 °C
- Limiting speed: \( \omega < 4 000 \) min<sup>-1</sup>
- Permissible radial load: ≤ 1% of the basic dynamic load rating<sup>5</sup>

**Applications**
- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Vacuum evaporator
- Plasma display panel manufacturing equipment

---

1) The cleanliness class number represents specific environments where the individual products are useful. The cleanliness of the products themselves may vary depending on operating conditions.

2) The permissible radial load indicates the approximate size of radial load the bearing can carry. If the bearing carries an axial load, the permissible radial load may be lower. Refer to the table at the end of the guidebook for each product’s basic dynamic load rating (C<sub>0</sub>).
### MG Bearing

**Typical bearing number**

SE\(\text{ZZSTMG3}\) (YS)

**Advantages**

This bearing has silver ion plated on the stainless steel balls, as the lubricant.

**Specifications**

- Outer/inner rings and balls: martensitic stainless steel
- Cage: austenitic stainless steel
- Shield: austenitic stainless steel
- Lubrication: Silver ion plating

**Performance**

- Cleanliness: -
- Ambient pressure: \(10\text{ }^{-5}\) to \(10\text{ }^{-1}\) Pa
- Temperature: \(-250\) to \(350\) °C
- Limiting speed: \(1 \text{ 000 min}^{-1}\) max.
- Permissible radial load: ≤ 3% of the basic dynamic load rating

**Applications**

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Vacuum evaporator
- Medical equipment
- Vacuum motors

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### MO Bearing

**Typical bearing number**

SE\(\text{ZZSTMSA7}\) (YS)

**Advantages**

This bearing has molybdenum disulfide baked on the surface of the stainless steel cage, as the lubricant.

**Specifications**

- Outer/inner rings and balls: martensitic stainless steel
- Cage: austenitic stainless steel
- Shield: austenitic stainless steel
- Lubrication: Molybdenum disulfide

**Performance**

- Cleanliness: -
- Ambient pressure: Atmospheric pressure to \(10\text{ }^{-5}\) Pa
- Temperature: \(-100\) to \(300\) °C
- Limiting speed: \(< 1 \text{ 000}\) min
- Permissible radial load: ≤ 3% of the basic dynamic load rating

**Applications**

- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Vacuum evaporator
- Turbo molecular pump
- Rotary furnaces

---

### PN Bearing

**Typical bearing number**

SE\(\text{ZZST}\) (PN)

**Advantages**

This bearing has a highly heat resistant solid lubricant, such as molybdenum disulfide included in the cage material.

**Specifications**

- Outer/inner rings and balls: martensitic stainless steel
- Cage: PEEK resin
- Shield: austenitic stainless steel
- Lubrication: Solid lubricant including molybdenum disulfide

**Performance**

- Cleanliness: -
- Ambient pressure: Atmospheric pressure to \(10\text{ }^{-5}\) Pa
- Temperature: \(-30\) to \(300\) °C
- Limiting speed: \(1 \text{ 000 min}^{-1}\) max.
- Permissible radial load: ≤ 3% of the basic dynamic load rating

**Applications**

- Semiconductor manufacturing equipment
- LCD cleaning equipment
- Vacuum motors
- Medical equipment
- Vacuum evaporator

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### Non-magnetic Hybrid Ceramic Bearing

**Typical bearing number**

3NC\(\text{YH4}\) (FA)

**Advantages**

This bearing uses non-magnetic stainless steel. It includes fluoropolymer as the lubricant. This bearing can be used in a vacuum environment.

**Specifications**

- Outer/inner rings: non-magnetic stainless steel
- Balls: ceramic (silicon nitride)
- Cage: Fluorocarbon resin
- Shield: Austenitic stainless steel
- Lubrication: Fluorine polymer (solid lubricant)

**Performance**

- Cleanliness: Class \(1 \text{ 000}\)
- Ambient pressure: Atmospheric pressure to \(10\text{ }^{-5}\) Pa
- Temperature: \(-250\) to \(350\) °C
- Limiting speed: \(1 \text{ 000 min}^{-1}\) max.
- Permissible radial load: ≤ 1% of the basic dynamic load rating

**Applications**

- Semiconductor manufacturing equipment
- Semiconductor inspection equipment
- Canning machinery
- Superconductivity-related equipment
- Welder

---

1) The cleanliness class number represents specific environments where the individual products are useful. The cleanliness of the products themselves may vary depending on operating conditions.

2) When used in an environment where cleanliness is not a significant factor, the product can be used at higher speed, reaching the same limiting speed as that of standard products.

3) The permissible radial load indicates the approximate size of radial load the bearing can carry. If the bearing carries an axial load, the permissible radial load may be lower. Refer to the table at the end of the guidebook for each product’s basic dynamic load rating.
1) The cleanliness class number represents specific environments where the individual products are useful. The cleanliness of the products themselves may vary depending on operating conditions.
## Handling the special-environment usage bearing series

- Pay special attention to items marked with “V” when using the bearing.
- For details, please refer to the Koyo ceramic bearings & EXSEV bearing series catalog (CAT.NO.B2004E).

### Advantages

This is low-particle-emission fluorocarbon grease for use in vacuum environments.
- KDL grease expresses its high properties when used with rolling bearings, linear-motion bearings, and ball screws.
- JTEKT also respond to requests only for grease, so consult JTEKT with such requests.
- This grease can be used up to an atmospheric pressure of 10^5 Pa, but consult JTEKT for information on using this grease under conditions combining high temperature and high vacuum.

### Performance

#### Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Fluorocarbon resin</th>
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<td>Base oil</td>
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<td>Dropping point</td>
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<td>Evaporation amount</td>
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<tr>
<td>Degree of oil separation</td>
<td>2 wt% or less</td>
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<tr>
<td>Operating temperature</td>
<td>Atmospheric: −30 to 200 °C, Vacuum: −30 to 100 °C</td>
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</tbody>
</table>

#### Advantages

- JTEKT also supplies Ceramic Balls (silicon nitride), which have excellent resistance to wear and seizure, and are usable in corrosive environments and ultrahigh vacuums. Other major features of these balls are excellent heat resistance (up to 800°C), high rigidity, lightweight (40% compared to bearing steel), non-magnetic, and have insulating characteristics.

### Table of Dimensions and Masses

#### Ceramic Balls

<table>
<thead>
<tr>
<th>Nominal outside diameter (mm)</th>
<th>Nominal outside diameter (inch)</th>
<th>Precision grade</th>
<th>Mass (g) (per piece)</th>
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<th>Mass (g) (per piece)</th>
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**Notes:**
1. For the grades, those specified in JIS B 1501 shall apply.
2. The masses are calculated on the basis of 3.23 g/cm³ in density.
### Bearing : Table of standard delivery times

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<th>Boundary dimensions (mm)</th>
<th>Basic load ratings(^1) (kN)</th>
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<th>High Temperature Clean Pro Bearing</th>
<th>Clean Pro Bearing</th>
<th>DL Bearing</th>
<th>FA Bearing</th>
<th>High Curlan Resistant Ceramic Bearing</th>
<th>Ceramic Bearing</th>
<th>Clean Pro Resistant Hybrid Ceramic Bearing</th>
<th>SK Bearing</th>
<th>SK Bearing (Fixed)</th>
<th>Full Complement Ceramic Ball Bearing</th>
<th>SI Bearing</th>
<th>MO Bearing</th>
<th>MO Bearing</th>
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Note: As a general rule, the internal clearance of bearings is as shown on the right.

1) The basic load rating (C) indicates the value for high-carbon steel chrome bearings. These values are used in the calculation of the permissible radial load.
2) The bearing number marked with an asterisk have a C3 clearance.
3) Because the configuration of these bearings is that of angular contact ball bearings, their basic bearing number and basic load ratings differ from those shown in this table.
For details on EXSEV products, please refer to the CERAMIC BEARINGS AND EXSEV BEARINGS FOR EXTREME SPECIAL ENVIRONMENTS catalog (CAT.NO.B2004E).

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FAX: +52-55-5-257-3873

KOYO LATIN AMERICA, S.A.
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FAX: +507-282-2782-507-289-7579

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FAX: +55-11-3387-3039

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FAX: +97-1-4329-3700

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C/o Jyothy Commercial Services PVT.LTD, Ground Floor, The Bosch, E-1, Mangala Embassy Business Park, Outer Ring Road, Bangalore-560045, INDIA
TEL: +91-80-4226-6567 (Reception Desk of Service Office)
FAX: +91-80-4226-0058

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FAX: +66-28-330-7778

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FAX: +62-21-9398-3274

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FAX: +65-6882-8123

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FAX: +63-2-586-0455

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