Double-Row Angular Contact Roller Rings

RW

Adopts double-row rollers.
Achieves high rigidity, high accuracy and compactness.
Directly mounts securely, no presser flange required.

For details, visit THK at www.thk.com
*Product information is updated regularly on the THK website.
Double-Row Angular Contact Roller Rings

Double-row, and simple.
Achieves high rigidity, high accuracy and compactness.

By integrating double-row small-diameter rollers on the raceway, the number of rollers incorporated in this new model (RW228) is approximately 5 times that of Cross-Roller Ring model RU*. While maintaining the compactness, it achieves higher rigidity and accuracy and a lower torque. In addition, the inner and outer rings in integrated structures have mounting holes, allowing the product to be directly mounted to the machine.

* Previous Cross-Roller Ring model RU
Model RW adopts small-diameter rollers to reduce the friction coefficient and realize a lower torque and low-temperature rise characteristics.

Adopts Double-row Unidirectional Rollers

Increased rigidity

Despite having almost the same dimensions as the previous Cross-Roller Ring model RU*, model RW has rows of raceways twice that of model RU and has a DB structure to increase the rigidity.

Adopts Inner and Outer Rings that has Integrated Structures

High rigidity and high accuracy

The inner ring and the outer ring of model RW have integral structures to realize a high level of part rigidity. Since the inner ring and the outer ring are machined to have mounting bolt holes, and the size and number of the mounting bolt holes are optimally designed, the deformation of the raceway resulting from the mounting can be minimized and stable rotational performance can be achieved. In addition, the increased machining accuracy results in high rotational accuracy (see Accuracy Standards on page 5).

High rigidity with a integrated outer ring structure

Optimal design of the mounting hole

High rigidity with a integrated inner ring structure

Theoretical Rigidity Comparison between RU228 and RW228

Theoretical Rigidity Comparison between RU297 and RW297

Theoretical Rigidity Comparison between RU445 and RW445

RW228
(outer diameter: 295 mm; inner diameter: 160 mm)

RW297
(outer diameter: 380 mm; inner diameter: 210 mm)

RW445
(outer diameter: 540 mm; inner diameter: 350 mm)
Nominal Life

[Nominal Life]

The service life is obtained from the following equation.

\[ L = \left( \frac{f_T \cdot C}{f_W \cdot P_c} \right)^{\frac{10}{3}} \times 10^6 \]

- **L**: Nominal life (the total number of revolutions that 90% of a group of identical Double-Row Angular Contact Roller Rings units operating under the same conditions can achieve without showing flaking from rolling fatigue)
- **C**: Basic dynamic load rating* [N]
- **Pc**: Dynamic equivalent radial load [N]
- **fT**: Temperature factor (see Fig. 1)
- **fw**: Load factor (see Table 1)

* The basic dynamic load rating (C) of model RW shows the radial load with interlocked direction and magnitude, under which the nominal life (L) is 1 million revolutions when a group of identical model RW units independently operate under the same conditions. The basic dynamic load rating (C) is indicated in the specification tables.

[Dynamic Equivalent Radial Load: Pc]

The dynamic equivalent radial load is obtained from the following equation.

\[ P_c = X \cdot \left( \frac{2M}{dp} \right) + Y \cdot F_a \]

- **Pc**: Dynamic equivalent radial load [N]
- **X**: Dynamic radial factor (see Table 2)
- **Fr**: Radial load [N]
- **Y**: Dynamic axial factor (see Table 2)
- **Fa**: Axial load [N]
- **M**: Moment [N-mm]
- **dp**: Roller pitch circle diameter [mm]

- If Fr = 0 [N] and M = 0 [N-mm], assume that X = 0.67 and Y = 0.67.
- For service life calculation with a preload taken into account, contact THK.

[Calculating the Service Life Time]

The service life time of model RW is obtained from the following equation.

For Rotary Motion

\[ L_h = \frac{L}{n \times 60} \]

- **Lh**: Service life time [h]
- **L**: Service life time [revolutions]
- **n**: Rotation speed per minute [min⁻¹]
Static Safety Factor

The basic static load rating $C_0$ refers to the static load with constant direction and magnitude, under which the calculated contact stress in the center of the contact area between the roller and the raceway load is 4,000 [MPa] (if the contact stress exceeds this value, performance may be affected). This value is indicated as “$C_0$” in the specification tables. When a load is statically or dynamically applied, it is necessary to consider the static safety factor as shown below.

\[
\frac{C_0}{P_0} = f_s
\]

- $f_s$: Static safety factor (see Table 3)
- $C_0$: Basic static load rating [N]
- $P_0$: Static equivalent radial load [N]

**Load conditions Lower limit of $f_s$**

- Normal load: 1 to 2
- Impact load: 2 to 3

*Target minimum values for the static safety factor are shown in the table above. For better service life and other aspects of dynamic performance, THK recommends maintaining a figure of 7 or above.*

**Static Equivalent Radial Load: $P_0$**

The static equivalent radial load of model RW is obtained from the following equation.

\[
P_0 = X_0 \times (F_r + \frac{2M}{dp}) + Y_0 \times F_a
\]

- $P_0$: Static equivalent radial load [N]
- $X_0$: Static radial factor ($X_0 = 1$)
- $F_r$: Radial load [N]
- $Y_0$: Static axial factor ($Y_0 = 0.44$)
- $F_a$: Axial load [N]
- $M$: Moment [N-mm]
- $dp$: Roller pitch circle diameter [mm]

Permissible Load

Table 4 shows the permissible load of model RW. The permissible load value takes into account the tightening strength of the mounting bolts. Consider the difference in the permissible loads between with and without a housing. If the applied radial load or moment is large, it is recommended to insert the product into a housing. (For housing design, also see sections “Fit” and “Designing Peripheral Parts” on page 6).

**Permissible Load of Model RW**

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Without housing</th>
<th>With housing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Radial [kN]</td>
<td>Axial [kN]</td>
</tr>
<tr>
<td>RW228</td>
<td>7.5</td>
<td>54.4</td>
</tr>
<tr>
<td>RW297</td>
<td>12.1</td>
<td>97.1</td>
</tr>
<tr>
<td>RW445</td>
<td>16.2</td>
<td>219</td>
</tr>
</tbody>
</table>
Accuracy Standards

Model RW is manufactured with the accuracy and the dimensional tolerance in Tables 5 to 8.

[Rotational Accuracy]

Table 5 Rotational Accuracy of the Inner Ring of Model RW

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Radial runout tolerance of the inner ring</th>
<th>Axial runout tolerance of the inner ring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grade P5</td>
<td>Grade P4</td>
</tr>
<tr>
<td>RW228</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>RW297</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>RW445</td>
<td>15</td>
<td>12</td>
</tr>
</tbody>
</table>

Note) For model RW, grade P5 is the standard rotational accuracy. (Not indicated in model number.)

Table 6 Rotational Accuracy of the Outer Ring of Model RW

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Radial runout tolerance of the outer ring</th>
<th>Axial runout tolerance of the outer ring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grade P5</td>
<td>Grade P4</td>
</tr>
<tr>
<td>RW228</td>
<td>18</td>
<td>11</td>
</tr>
<tr>
<td>RW297</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>RW445</td>
<td>25</td>
<td>16</td>
</tr>
</tbody>
</table>

Note) For model RW, grade P5 is the standard rotational accuracy. (Not indicated in model number.)

[Wobbling Accuracy (Inner Ring of Grade TSP Only)]

Wobbling Accuracy refers to the pure rotational accuracy of the bearing calculated by subtracting the profile accuracy (roundness and flatness) from the rotational accuracy of the bearing.

Measurement conditions: “height measurement” = “roller pitch circle diameter”

Table 7 Wobbling Accuracy of Model RW

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Grade TSP</th>
<th>Radial direction</th>
<th>Axial direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>RW228</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>RW297</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>RW445</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

[Dimensional Accuracy]

Table 8 Dimensional Tolerance of Bearing Inner Diameter, Outer Diameter and Width of Model RW

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Dimensional tolerance of bearing inner diameter (dm)</th>
<th>Dimensional tolerance of bearing outer diameter (Dm)</th>
<th>Dimensional tolerance of bearing width (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upper Lower</td>
<td>Upper Lower</td>
<td>Upper Lower</td>
</tr>
<tr>
<td>RW228</td>
<td>0</td>
<td>−25</td>
<td>0</td>
</tr>
<tr>
<td>RW297</td>
<td>0</td>
<td>−30</td>
<td>0</td>
</tr>
<tr>
<td>RW445</td>
<td>0</td>
<td>−40</td>
<td>0</td>
</tr>
</tbody>
</table>

Note) “dm” and “Dm” represent the arithmetic mean values of the maximum diameter and the minimum diameter obtained through two-point measurement of the bearing inner diameter and the bearing outer diameter.
Radial Clearance

The radial clearance of model RW is adjusted to a negative value (preloaded) before shipment, which is controlled with the starting torque of the product. Table 9 shows the specification values for the starting torque of model RW.

Note) The starting torque does not include seal resistance.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Starting torque [N-m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>RW228</td>
<td>1</td>
</tr>
<tr>
<td>RW297</td>
<td>3</td>
</tr>
<tr>
<td>RW445</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 9 Radial Clearance of Model RW

Fit

Although the design of model RW does not require a fitted housing, if positioning accuracy is required or a large load is applied, it is recommended to insert the product into a housing with a fit tolerance of g6 for the shaft and H7 for the hole (also see section "Permissible Load" on page 4, and section "Designing Peripheral Parts" below). If higher rigidity is required, it is recommended to measure the inner and outer diameters of the bearing and to use a slight interference fit (approximately 0 to 5 μm) that corresponds to the measurements.

* If an interference fit is used, provide tapped hole for ring removal in the bearing/housing.

Table 10 shows the recommended machining accuracy for the peripheral parts (shaft and housing) to which model RW is to be installed.

<table>
<thead>
<tr>
<th>Standard dimension d, D [mm]</th>
<th>Roundness Perpendicularity Flatness [μm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above</td>
<td>Or less</td>
</tr>
<tr>
<td>120</td>
<td>180</td>
</tr>
<tr>
<td>180</td>
<td>250</td>
</tr>
<tr>
<td>250</td>
<td>315</td>
</tr>
<tr>
<td>315</td>
<td>400</td>
</tr>
<tr>
<td>400</td>
<td>500</td>
</tr>
<tr>
<td>500</td>
<td>630</td>
</tr>
</tbody>
</table>

Table 10 Recommended Machining Accuracy of Model RW’s Mating Part

For the fit depth of the housing, see Table 11 as a guide.

Table 11 Housing Fit Depth for Model RW

<table>
<thead>
<tr>
<th>Use of fit</th>
<th>Fit depth: H</th>
</tr>
</thead>
<tbody>
<tr>
<td>If positioning accuracy is required</td>
<td>0.15 to 0.25×B</td>
</tr>
<tr>
<td>If an applied load is large</td>
<td>0.50 to 0.75×B</td>
</tr>
<tr>
<td>If high rigidity is required</td>
<td>0.75 to 1.00×B</td>
</tr>
</tbody>
</table>

For the mating bolt holes for securing model RW-X, the values in Table 12 are recommended.

Table 12 Recommended Bolt Hole Dimensions of the Mating Part for Model RW-X Unit: mm

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Bolt size</th>
<th>Recommended bolt hole dimensions</th>
<th>d1</th>
<th>d2</th>
<th>h</th>
</tr>
</thead>
<tbody>
<tr>
<td>RW228</td>
<td>M6</td>
<td></td>
<td>7</td>
<td>11</td>
<td>6.5</td>
</tr>
<tr>
<td>RW297</td>
<td>M8</td>
<td></td>
<td>9.3</td>
<td>14.5</td>
<td>8.6</td>
</tr>
<tr>
<td>RW445</td>
<td>M8</td>
<td></td>
<td>9.3</td>
<td>14.5</td>
<td>8.6</td>
</tr>
</tbody>
</table>
Procedure for Assembly

When assembling model RW, follow the steps below.

[Inspect the parts prior to assembly]

Thoroughly clean the housing and other parts to be assembled, and make sure that no burrs or knots are present.

[Install the bearing to the housing or shaft]

The product tends to tilt during installation. To prevent this, gradually drive the product into the housing or onto the shaft by gently tapping it with a plastic or copper mallet while keeping it perpendicular. Continue to tap until the bearing is properly contacting the reference surface.

Note) When installing the inner ring, only tap the inner ring; when installing the outer ring, only tap the outer ring.

[Tighten the mounting bolts]

(1) Install and align the ring with the required rotational accuracy.
(2) Place model RW onto the housing. Align model RW with the mounting holes.
(3) Insert the securing bolts into the holes. Turn the bolts by hand to make sure they do not show skewing which indicates misalignment of the holes.
(4) Fasten the mounting bolts in three to four steps from loose to fully fastened. Secure the bolts in a diagonal order. (Figure 1)
(5) When tightening the securing bolts, use a torque wrench and evenly tighten the bolts according to the values in Table 13.

Permissible Rotation Speed

Table 14 shows the permissible rotation speed of model RW.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Permissible rotation speed [min⁻¹]</th>
</tr>
</thead>
<tbody>
<tr>
<td>RW228</td>
<td>350</td>
</tr>
<tr>
<td>RW297</td>
<td>270</td>
</tr>
<tr>
<td>RW445</td>
<td>180</td>
</tr>
</tbody>
</table>

Note 1) The values in Table 14 assume operation under no load. If a large load is applied or the permissible rotation speed is exceeded, contact THK.

Note 2) Depending on the lubrication or the load conditions, the product may generate considerable heat.

Lubrication Specifications

For the lubrication specifications of model RW, the lubricants in Table 15 are recommended. Model RW contains THK AFB-LF Grease as standard.

<table>
<thead>
<tr>
<th>Lubrication specifications</th>
<th>Recommended lubricant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grease lubrication</td>
<td>THK AFB-LF Grease</td>
</tr>
<tr>
<td></td>
<td>(standard grease)</td>
</tr>
<tr>
<td>Oil lubrication</td>
<td>ISO VG68 Oil</td>
</tr>
</tbody>
</table>
Model Number Coding

RW297 UU CC0 P2 B G X -N

Option symbol
No Symbol : No accessory
-N : Grease nipple attached (A-PT1/8)

Inner Ring Hole symbol
No Symbol : Inner ring counterbore hole
X : Inner ring tapped hole (through hole)

Mounting Hole Orientation symbol [excluding X type]
No Symbol : The counterbore holes of the inner and outer rings face the same direction
G : The counterbore holes of the inner and outer rings face opposite direction

Sub-part Accuracy symbol
No Symbol : Rotational Accuracy of the Inner Ring
R : Rotational Accuracy of the Outer Ring
B : Rotational Accuracy of the Inner/Outer Rings

Accuracy symbol
No Symbol : 5-grade rotational accuracy
P4 : 4-grade rotational accuracy
P2 : 2-grade rotational accuracy
USP : USP-grade rotational accuracy
TSP : TSP-grade rotational accuracy
+ wobbling accuracy

Radial clearance symbol
CC0 : Minus clearance (preload)

Seal symbol
No Symbol : Without seal
UU : Seal attached on both ends
U : Seal attached on either end
(counterbore side of the outer ring)
UT : Seal attached on either end
(opposite to the counter-bore of the outer ring)

Model No.
## Dimensional Table

### Double-Row Angular Contact Roller Rings (<RW>)

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Inner diameter</th>
<th>Outer diameter</th>
<th>Roller pitch circle diameter</th>
<th>Width</th>
<th>Greasing hole diameter</th>
<th>Shoulder height</th>
<th>Basic load rating (radial)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RW228 (G)</td>
<td>160</td>
<td>295</td>
<td>228.8</td>
<td>35</td>
<td>Rc1/8</td>
<td>220</td>
<td>240</td>
</tr>
<tr>
<td>RW228X</td>
<td>160</td>
<td>295</td>
<td>228.8</td>
<td>35</td>
<td>Rc1/8</td>
<td>220</td>
<td>240</td>
</tr>
<tr>
<td>RW297 (G)</td>
<td>210</td>
<td>380</td>
<td>299.2</td>
<td>40</td>
<td>Rc1/8</td>
<td>285</td>
<td>315</td>
</tr>
<tr>
<td>RW297X</td>
<td>210</td>
<td>380</td>
<td>299.2</td>
<td>40</td>
<td>Rc1/8</td>
<td>285</td>
<td>315</td>
</tr>
<tr>
<td>RW445 (G)</td>
<td>350</td>
<td>540</td>
<td>445.4</td>
<td>50</td>
<td>Rc1/8</td>
<td>425</td>
<td>465</td>
</tr>
<tr>
<td>RW445X</td>
<td>350</td>
<td>540</td>
<td>445.4</td>
<td>50</td>
<td>Rc1/8</td>
<td>425</td>
<td>465</td>
</tr>
</tbody>
</table>
**Mass Mounting hole dimensions**

<table>
<thead>
<tr>
<th>Mass [kg]</th>
<th>Inner ring</th>
<th>Mounting hole dimensions</th>
<th>Outer ring</th>
<th>Mounting hole dimensions</th>
<th>Model No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>PCD₁ 184</td>
<td>24-φ7 through φ11 counterbore depth 24.5</td>
<td>PCD₂ 270</td>
<td>24-φ7 through φ11 counterbore depth 24.5</td>
<td>RW228 (G)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24-M6 depth 18</td>
<td></td>
<td></td>
<td>RW228X</td>
</tr>
<tr>
<td>22</td>
<td>PCD₁ 240</td>
<td>24-φ9.3 through φ14.5 counterbore depth 28</td>
<td>PCD₂ 350</td>
<td>24-φ9.3 through φ14.5 counterbore depth 28</td>
<td>RW297 (G)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24-M8 depth 24</td>
<td></td>
<td></td>
<td>RW297X</td>
</tr>
<tr>
<td>47</td>
<td>PCD₁ 385</td>
<td>32-φ9.3 through φ14.5 counterbore depth 35</td>
<td>PCD₂ 505</td>
<td>32-φ9.3 through φ14.5 counterbore depth 35</td>
<td>RW445 (G)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>32-M8 depth 24</td>
<td></td>
<td></td>
<td>RW445X</td>
</tr>
</tbody>
</table>

* Accessories for lubrication (piping joint, grease fitting, etc.) other than the standard option may also be attached.

For inquiry, contact THK (for other accessories for lubrication, see section "Lubrication Accessories" in the general catalog).

**Option**

Grease nipple (type A-PT1/8)

---

Unit: mm
Precautions on Handling

Do not disassemble the Double-Row Angular Contact Roller Rings unit.

Dropping or hitting the Double-Row Angular Contact Roller Rings unit may damage it. Applying an impact force to the product could cause functional loss even if the product looks intact.

Lubrication

Since each Double-Row Angular Contact Roller Rings unit contains high-quality lithium soap group grease No. 2 (THK AFB-LF Grease), you can start using the product without replenishing grease. However, the product requires regular lubrication since it has a smaller internal space than ordinary roller bearings and because the rollers need frequent lubrication due to their rolling contact structure.

To replenish grease, it is necessary to provide a grease path that leads to the oil holes formed on the circumference of the outer ring. As for the lubrication interval, normally replenish grease of the same type while rotating the ring so that it is distributed throughout the interior of the bearing at least every six to twelve months even if the product rotates infrequently.

When the bearing is filled up with grease, the initial rotational torque temporarily increases due to the resistance of the grease. However, surplus grease will run out of the seals and the torque will return to the normal level in a short period.

Do not mix greases with different physical properties.

In locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, normal lubricants may not be used. Contact THK for details.

When planning to use a special lubricant, or use the product other than with grease lubrication, contact THK before use.

Precautions on Use

- Entrance of foreign material may cause functional loss. Prevent foreign material, such as dust or cutting chips, from entering the product.
- Contact THK if you desire to use the product at a temperature above 80°C.
- Avoid an environment where a coolant may penetrate into the Double-Row Angular Contact Roller Rings unit.
- If foreign material adheres to the product, replenish the lubricant after cleaning the product with clean kerosene.
- When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.
- The seal of the Double-Row Angular Contact Roller Rings unit is a dust seal, and cannot prevent the entrance of fine dust or liquid foreign material.

- The appearance and specifications of the product are subject to change without notice. Contact THK before placing an order.
- Although great care has been taken in the production of this catalog, THK will not take any responsibility for damage resulting from typographical errors or omissions.
- For the export of our products or technologies and for the sale for exports, THK in principle complies with the foreign exchange law and the Foreign Exchange and Foreign Trade Control Law as well as other relevant laws.

For export of THK products as single items, contact THK in advance.

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