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Gonio Ways and
Cross Roller Bearing



GMT GLOBAL INC.

Headquarters
No. 3, Lane 34, Minzhu Street,
Xiushui Township, Changhua 50442, Taiwan
TEL: +886-4-7688320
FAX: +886-4-7688314
E-mail: sales@gmtglobalinc.com

European Subsidiary
GMT Europe GmbH
Wihelm-Busch-Str. 4, 26655
Westerstede, Germany
TEL: 04488-520-30-47
E-mail: sales@gmt europe.de



www.gmtglobalinc.com

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GMT GLOBAL INC.

Gonio Ways

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Cross Roller Bearing

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Precaution

◎ Lubrication of Retainers

Use lithium soap based lubricating grease.

◎ Deviation of Retainers

Retainers will deviate from their correct positions when gonio ways are used under conditions of high speed, vibrations and unbalanced loads.

To minimize this deviation, maintain additional travel distance and avoid excessive pre-stressed loads.

◎ Dust-Proof

Gonio ways may not realize their ideal performance due to dust or foreign objects likely to penetrate into their interior depending on operating environment. It is recommended to protect gonio ways by using external dust-proof covers on them if they are to be used in harsh environments.

◎ Damping Boards

Screws are installed on the end faces of the gonio ways to prevent the retainers falling.

◎ Environment for Using Gonio Ways

It is recommended to use our gonio ways in environments with temperature ranging from -20° to 110°.

◎ Using a Paired Set Is a Principle

The accuracy for using gonio ways is based on the unit of a complete set to realize a precise control on the mutual deviation range.

The mixed use of gonio ways from different sets will result in a reduction of their accuracy, exercise caution when assembling gonio ways.

◎ Adjustments

When used under such circumstances where the accuracy on the installation face or the pre-load has not been fully adjusted, their movement accuracy will drop, thus resulting in the deflection or distortion and rendering it likely to reduce their use performance and life, exercise extreme caution during adjustment.

◎ Allowable Load

Please refer to the highest values of loads when the total flexible distortion on the contact parts remains small and a smooth rolling can still be performed under the maximal contact stress on the rolling body and rail surface.

In request of high accuracy and smooth environment, please handle within its design and permitted loads.



Product Introduction

Are non-circulating arc movement rails whose precise cross rollers have extremely low friction resistance to provide a stable arc movement.

They are mainly used in locating operations where rotation centers remain unchanged and correct changes of tilting degrees are required, they may also be applied to meet the purposes of optical instruments and measuring devices requiring high accuracy.

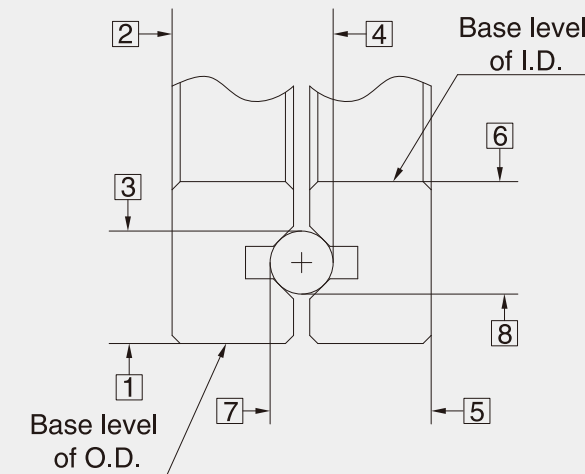
Product Features

- ◎ High rigidity and high loads
- ◎ Identical locations of rotation centers
- ◎ Low friction and accurate movement
- ◎ Easy installation
- ◎ Low noise

Accuracy

© The accuracy of GSRV models of gonio ways is measured by the method shown in the following figure which measures the mutual deviations among the 4 rails along their full length.

| Model No. | Accuracy |
|-----------------|----------|
| GSRV0240-50 | 10 μm |
| GSRV0260-60 | |
| GSRV0370-90 | |
| GSRV0370-110 | |
| GSRV03100-160 | |
| Model No. | Accuracy |
| GSCRV0240-51 | 10 μm |
| GSCRV0240-70 | |
| GSCRV0240-89.5 | |
| GSCRV0260-65 | |
| GSCRV0260-89 | |
| GSCRV0260-113.5 | |
| GSCRV0260-138.5 | |



Rated Life

L_f : Rated life(10^6 reciprocation number)

θ : Rotating angle

C : Basic dynamic rated load(N)

F : Action load(N)

f_t : Temperature coefficient

f_L : Load coefficient

$$L_f = \frac{90}{\theta} \times \left(\frac{f_t}{f_L} \times \frac{C}{F} \right)^{10/3}$$

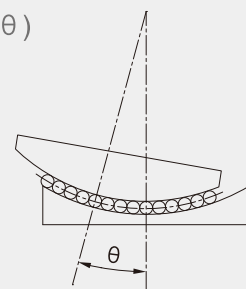
Lifetime

L_t : Lifetime(hr)

r : Reciprocation number per minute(pm)

$$L_t = \frac{L_f \times 10^6}{60 \times r}$$

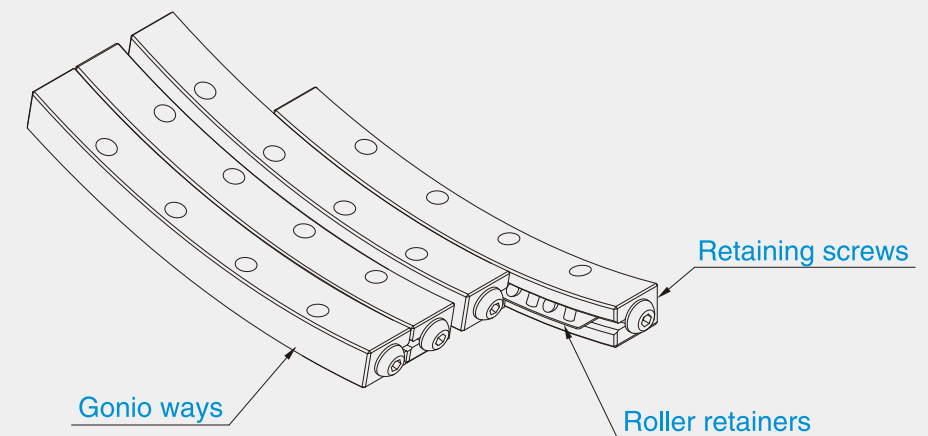
Rotating angle(θ)



Product Structure

GSRV model (figure 1) of gonio ways are made up of precisely ground V-shaped rail and retainers equipped with crossed rollers.

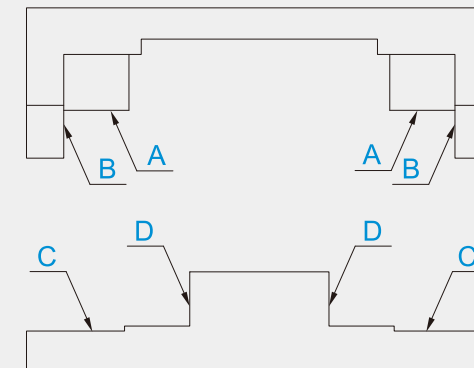
Figure 1



Product Installation

Accuracy of the installation surface as shown in figure 2, surface A, B, C, D accuracy will directly affect the movement accuracy of gonio ways.

Figure 2



Installation Sequence

- (1) Firstly, clean the sliding ways and the installation surface on the seat to prevent the entry of foreign objects during installation.
- (2) Apply low viscocity lubricant onto each installation surface and lock gonio ways a, b, c to each surface intallation by using the suggested torque force.(Figure 3-1)
- (3) Temporarily lock gonio by way d.(Figure 3-2)
- (4) Remove the retaining screws from any end and insert the roller retainers into the central position of the gonio way, upon the completion of the above operations, restore the screw to its original position.(Figure 3-3)
- (5) Try moving the sliding way horizontally to its maximal traveling end and adjust the roller retainer to its central position.(Figure 3-4)
- (6) Install a micrometer at the side of the sliding way base level.(Figure 3~4).

Figure 3 Installation Sequence

Figure 3-1 Fix gonio ways a-c

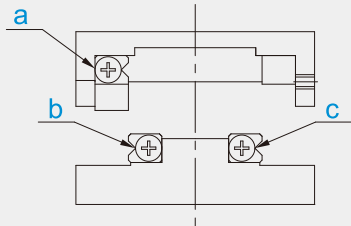


Figure 3-2 Temporarily lock gonio way d

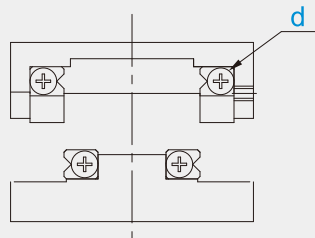


Figure 3-3 Insert the roller retainer

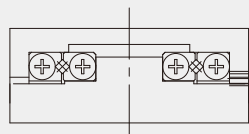
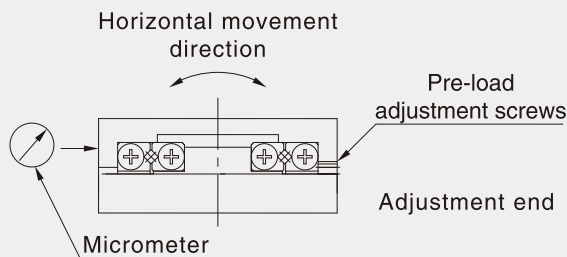


Figure 3-4



- (7) Move the sliding way to the traveling end at any side and slightly lock pre-load adjustment screw above the roller retainer.(Figure 3-5)
- (8) Move the sliding way to the traveling end at the other side and slightly lock pre-load adjustment screw.(Figure 3-6)
- (9) Move the sliding way to the central position and slightly lock the adjustment screw at the central position.(Figure 3-7)
- (10) Repeat operations from (7) to (9) until there is no backlash when moving the slide. Caution against applying excessiye pre-load.
- (11) Once there is no back lash in moving direction, the micromer reading is minimal and stable when the sliding way is moving, at this time, carry out final calibration of the pre-load by repeating operations from (7) to (9) by the torque force recommended to lock.
- (12) Tighten the gonio way d which has been temporarily locked per pre-load adjustment screws in sequence locking available.

Figure 3 Installation Sequence

○ : Adjustment screws locking available
× : Adjustment screws locking prohibited

Figure 3-5

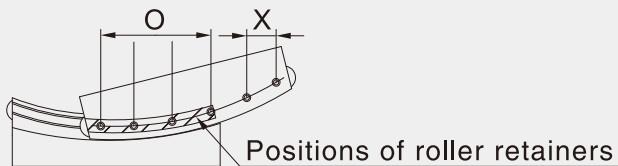


Figure 3-6

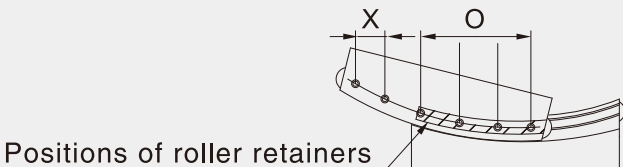
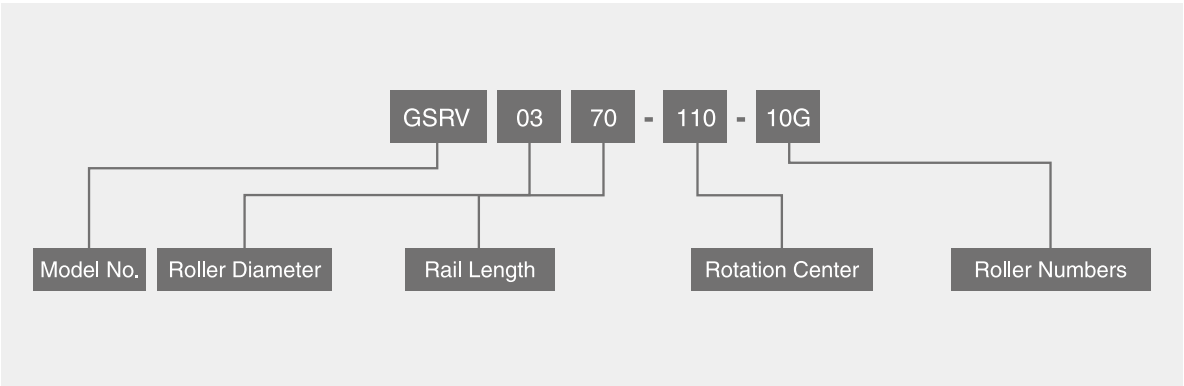


Figure 3-7

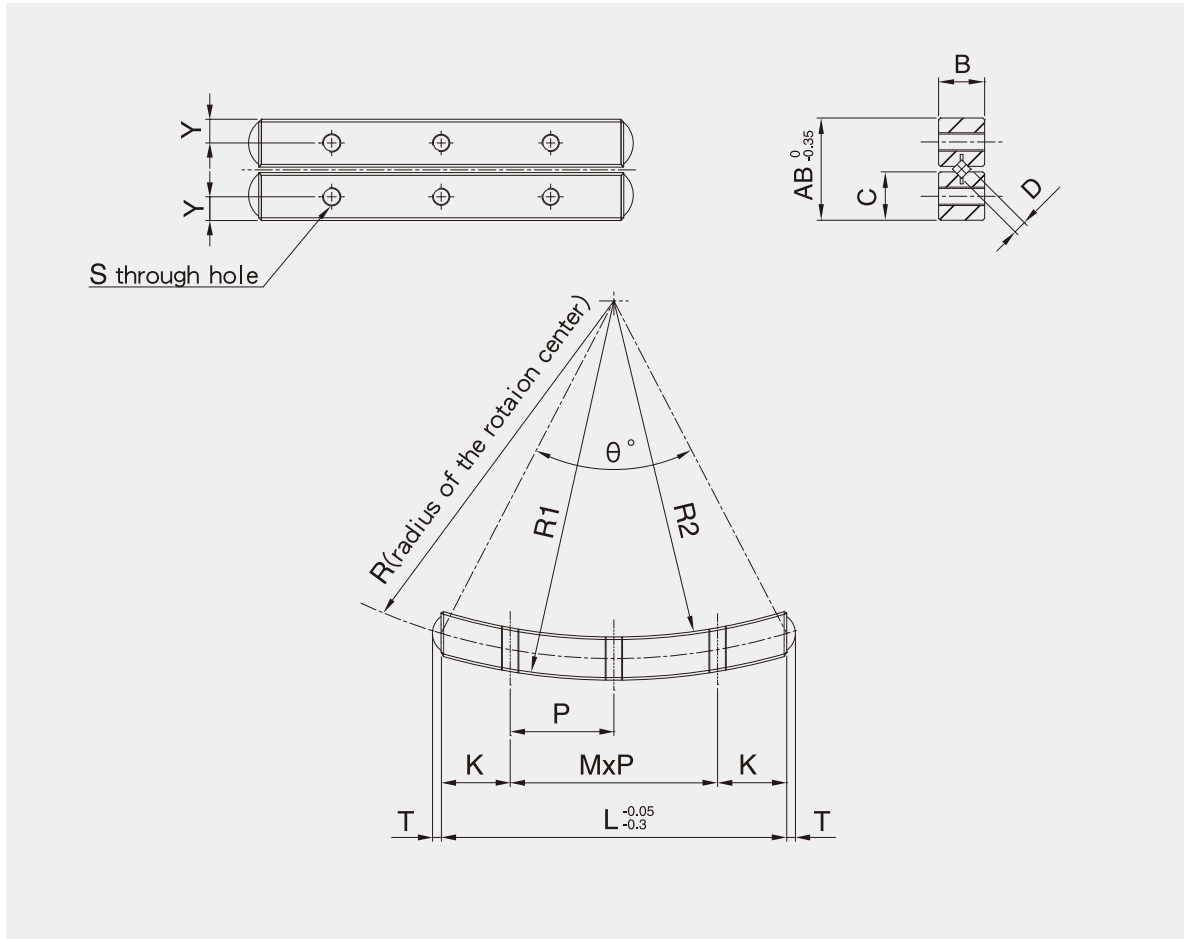


Model No. Introductions



Product Specification

© One set of GSRV models contains 4 gonio way rails, 2 roller retainers and 8 retaining screws.



GSRV Model

| Model No. | Gonio Sliding Range | Roller Dia. (D)(mm) | Roller Number (G) | Main Dimensions | | | | | | |
|-------------------|------------------------------|---------------------------------|--|-------------------------------|-------|----------------|----------------|---------------|---------------|-----------------|
| | | | | L | R | R ₁ | R ₂ | AB | B | C |
| | | | | (mm) | (mm) | (mm) | (mm) | (mm) | (mm) | (mm) |
| GSRV0240-50-7G | ±10° | 2 | 7 | 40 | 50 | 53 | 47 | 15 | 6 | 7.25 |
| GSRV0260-60-12G | | | 12 | 60 | 60 | 63 | 57 | | | |
| GSRV0370-90-11G | | 3 | 11 | 70 | 90 | 94 | 86 | 18 | 8 | 8.5 |
| GSRV0370-110-10G | | | 10 | | 110 | 114 | 106 | | | |
| GSRV03100-160-14G | | | 14 | 100 | 160 | 164 | 156 | | | |
| Model No. | Weight Per Set (g) | Allowable Load (F)(N) | Basic Capacity | | θ ° | T (mm) | S | Y (mm) | K (mm) | MxP (mm) |
| | | | Static Load (C ₀)(N) | Dynamic Load (C)(N) | | | | | | |
| | | | | | | | | | | |
| GSRV0240-50-7G | 47 | 480 | 1420 | 800 | 47.1° | 1.5 | M3 | 2.5 | 7.5 | 2x12.5 |
| GSRV0260-60-12G | 78 | 930 | 2870 | 1430 | 59.9° | | | | 11.25 | 3x12.5 |
| GSRV0370-90-11G | 135 | 1820 | 5480 | 2620 | 45.7° | 1.9 | | 3 | 12.5 | 3x15 |
| GSRV0370-110-10G | 131 | 1800 | 5600 | 2420 | 37° | | | | | |
| GSRV03100-160-14G | 191 | 2600 | 7870 | 2840 | 36.3C | | | | | |

GSCRV Model

| Model No. | Gonio Sliding Range | Roller Dia. (D)(mm) | Roller Number (G) | Main Dim Ensions | | | | | | |
|---------------------|------------------------------|---------------------------------|--|-------------------------------|-------|----------------|----------------|---------------|---------------|-----------------|
| | | | | L | R | R ₁ | R ₂ | AB | B | C |
| | | | | (mm) | (mm) | (mm) | (mm) | (mm) | (mm) | (mm) |
| GSCRV0240-51-7G | ±8° | 2 | 7 | 40 | 51 | 53.5 | 48.5 | 11.3 | 5 | 5.25 |
| GSCRV0240-70-7G | ±6° | | | | 70 | 72.5 | 67.5 | | | |
| GSCRV0240-89.5-7G | ±5° | | | | 89.5 | 92 | 87 | | | |
| GSCRV0260-65-11G | ±8° | | 11 | 60 | 65 | 68 | 62 | 16 | 6 | 7.6 |
| GSCRV0260-89-11G | | | | | 89 | 92 | 86 | | | |
| GSCRV0260-113.5-11G | ±6° | | | | 113.5 | 116.5 | 110.5 | | | |
| GSCRV0260-138.5-9G | ±5° | | 9 | | 138.5 | 141.5 | 135.5 | | | |
| Model No. | Weight Per Set (g) | Allowable Load (F)(N) | Basic Capacity | | θ ° | T (mm) | S | Y (mm) | K (mm) | MxP (mm) |
| | | | Static Load (C _o)(N) | Dynamic Load (C)(N) | | | | | | |
| | | | | | | | | | | |
| GSCRV0240-51-7G | 29 | 480 | 1420 | 800 | 46.2° | 1.5 | M2 | 2 | 8 | 2x12 |
| GSCRV0240-70-7G | | | | | 33.2° | | | | | |
| GSCRV0240-89.5-7G | | | | | 25.8° | | | | | |
| GSCRV0260-65-11G | 79 | 853 | 2629 | 1320 | 55° | 1.5 | M3 | 2.5 | 11.25 | 3x12.5 |
| GSCRV0260-89-11G | 77 | | | | 39.4° | | | | | |
| GSCRV0260-113.5-11G | | | | | 30.7° | | | | | |
| GSCRV0260-138.5-9G | | | | | 25° | | | | | |

Precaution

◎ Precautions on Use

- ① Foreign objects entering the interior of the bearings may damage the rotation path of the rollers or disable their functions, therefore, caution against the entry of foreign objects into the interior.
- ② When foreign objects enter the interior of bearings, apply lubricant again after cleaning.
- ③ Do not attempt to remove the screws and nuts on the split type bearings.
- ④ In csae bearings are used at an ambient temperature above 80°C, contact us first.

◎ Instructions on Lubrication

- ① No. 2 lithium soap based grease is filled into the cross roller bearings during their assembly, so that they can be used directly.
However, the products need lubricating on regular basis and users are required to re-apply grease of the same series at a minimum interval ranging from 6 to 12 months to enable the distribution of grease within the entire internal structure of the bearing.
- ② Avoid using mixed lubrication grease of various kinds.
- ③ When the bearings are used under special conditions such as high vibration, clean rooms, vacuum, low and high temperature, to use general-purpose lubrication grease is improperly contact us first.

Product Introduction

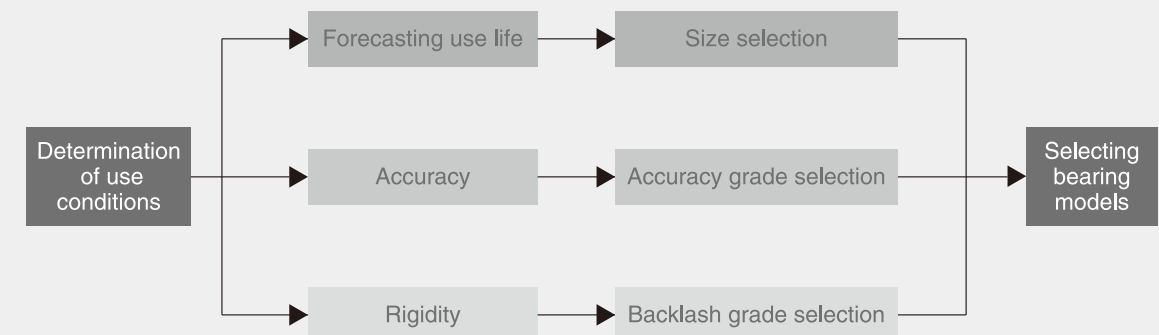
Cross roller bearings are made up of inner rings, outer rings, even-number rollers and retainers, rollers are arranged on the V-shaped groove rolling surface perpendicular to retainers, so the resulting structure is able to withstand radial load, axial load and moment load. Crossed roller bearings have a large load-bearing area because of line contact between the rollers and the rail surface, therefore, the product is the most appropriate bearings to be used on the rotary structure industrial robots, rotating workbenches, and medical equipment etc.

Product Features

- ◎ High load bearing capacity.
- ◎ Available to bear load from any directions simultaneously.
- ◎ High rigidity.
- ◎ Stable rotation accuracy.
- ◎ Easy to install and adjust.

Product Selection

The procedures for the selection and uses of crossed roller bearings are based on the following figure.

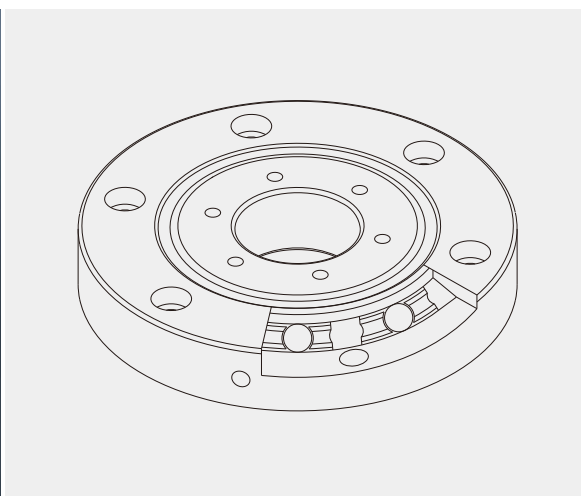
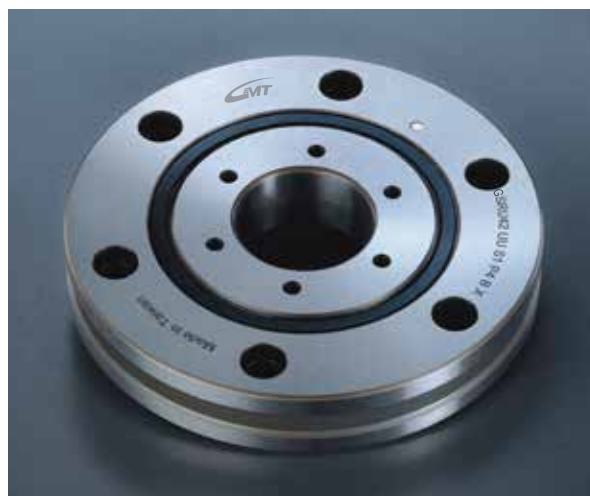


Product Models and Specifications

GSRU

Inner ring integrated with outer ring type

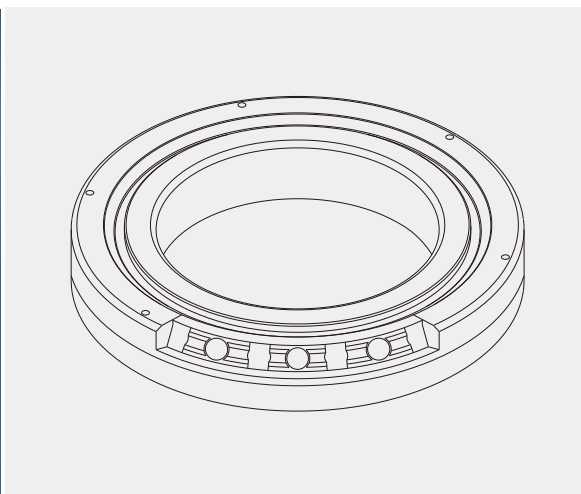
Mounting holes on the assembly base have been fixed, no flange discs and supporting seats needs, therefore, reliable rotation accuracy and torque moments are well performed.



GSRB

Rotating inner rings and with split outer rings

Have split outer ring and inner ring connected with the main, body and it's the most appropriate product for application requiring high rotation accuracy of inner ring.



Basic Rated Life

90% of the bearings of the same specifications running under identical conditions can no longer be used because of the surface peeling resulting from rolling fatigue when a certain revolution number is reached and this number is termed their rated life.

The life of crossed roller bearing is calculated per the following formula

L : Basic rated life

C : Basic dynamic rated load

P : Dynamic-equivalent load

The number of rotation is count in the unit per 10^6

$$L = \left(\frac{C}{P} \right)^{10/3}$$

Dynamic-Equivalent Radial Load : P

The dynamic-equivalent radial load on crossed roller bearings is calculated per following formula.

P : Dynamic-equivalent radial load (kN)

Fr : Radial load (kN)

Fa : Axial loads (kN)

M : Moment (kN · mm)

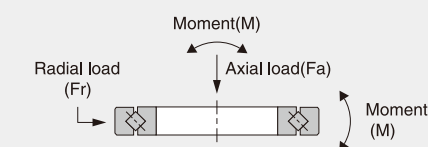
Y : Dynamic axial coefficient (see Table 1)

dw : Pitch circle diameter of rollers (mm)

X : Dynamic radial coefficient (see Table 1)

$$P = X \cdot \left(Fr + \frac{2M}{dw} \right) + Y \cdot Fa$$

Dynamic-equivalent radial load (P)



Dynamic radial and axial coefficients
(Table 2)

| Categories | X | Y |
|--------------------------------|------|------|
| $\frac{Fa}{Fr+2M/dw} \leq 1.5$ | 1 | 0.45 |
| $\frac{Fa}{Fr+2M/dw} > 1.5$ | 0.67 | 0.67 |

Rated Life Calculation Example

Calculate the life when bearings are used under the following conditions :

The model used is GSRB 11020

ID : d=110 (mm)

OD : D=160 (mm)

W₁= 700 (N)

W₂= 2000 (N)

Fr = 2500 (N)

L = 700 (mm)

Pitch circle diameter : dw = 135 (mm)

Basic dynamic rated load C = 34,000 N

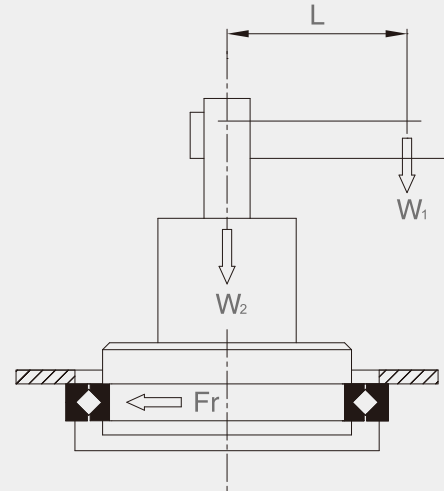
Basic static rated load C₀ = 54,000 N

Radial load : Fr = 2500 (N)

Axial load : Fa=W₁+W₂=700+2000=2700 (N)

Moment : M=W₁xL=700x700=490000 (N•mm)

Pitch circle diameter : dw=(d+D)/2=(110+160)/2=135 (mm)



$$\frac{Fa}{Fr + 2M / dw} = \frac{2700}{2500 + 2 \times 490000 / 135} \approx 0.37 < 1.5$$

Hence, if radial load coefficient : x=1, axial load coefficient : Y=0.45,
then dynamic-equivalent radial load :

$$P = X \cdot \left(Fr + \frac{2M}{dw} \right) + Y \cdot Fa$$

$$= 1 \times \left(2500 + \frac{2 \times 490000}{135} \right) + 0.45 \cdot 2700 = 10974(\text{N})$$

Basic rated life :

$$L = \left(\frac{C}{P} \right)^{10/3} = \left(\frac{34000}{10974} \right)^{10/3} = 46.35(\times 10^6 \text{rev})$$

Static Safety Coefficient

Static safety coefficient is determined by the basic static rated load (C₀) and static-equivalent radial load (P₀). When static or dynamic load is applied, the static safety coefficients shown in the following figure must be considered.

The life of crossed roller bearings is calculated per the following formula :

f_s : Static safety coefficient (see the following table)

C₀ : Basic static rated load (kN)

P₀ : Static-equivalent radial load (kN)

$$f_s = \frac{C_0}{P_0}$$

Static safety coefficient (f_s)

| Load Conditions | Lower Limit of f _s |
|-----------------|-------------------------------|
| Normal load | 1 ~ 2 |
| Impact load | 2 ~ 3 |

Static-Equivalent Radial Load : P₀

The static-equivalent radial load on crossed roller bearings is calculated per the following formula.

P₀ : Static-equivalent radial load (kN)

Fr : Radial load (kN)

Fa : Axial load (kN)

M : Moment (kN•mm)

X₀ : Static radial coefficient (X₀=1)

Y₀ : Static axial coefficient (Y₀=0.44)

Dw : Pitch circle diameter of rollers (mm)

$$P_0 = X_0 \cdot \left(Fr + \frac{2M}{dw} \right) + Y_0 \cdot Fa$$

Accuracy Specifications

Accuracy and dimensional tolerances of crossed roller bearings are in accordance with the specifications shown in tables from 2 through 8.

| Table 2 Rotation accuracy for the inner ring of GSRB modelUnit : μm | | | | | | | | | |
|---|------|--------------------------------|-----------------------|-----------------------|-----------------------|-------------------------------|-----------------------|-----------------------|-----------------------|
| I.D. of Bearings (d) In Metric Units (mm) | | Radial deviation of inner ring | | | | Axial deviation of inner ring | | | |
| More | Less | Grade 0 | Grade PS5 Grade P5 | Grade PS4 Grade P4 | Grade PS2 Grade P2 | Grade 0 | Grade PS5 Grade P5 | Grade PS4 Grade P4 | Grade PS2 Grade P2 |
| 18 | 30 | 12 | 4 | 3 | 2.5 | 12 | 4 | 3 | 2.5 |
| 30 | 50 | 12 | 5 | 4 | 2.5 | 13 | 5 | 4 | 2.5 |
| 50 | 80 | 15 | 5 | 4 | 2.5 | 15 | 5 | 4 | 2.5 |
| 80 | 120 | 20 | 6 | 5 | 2.5 | 20 | 6 | 5 | 2.5 |
| 120 | 150 | 20 | 8 | 6 | 2.5 | 20 | 8 | 6 | 2.5 |
| 150 | 180 | 25 | 8 | 6 | 5 | 25 | 8 | 6 | 5 |
| 180 | 250 | 25 | 10 | 8 | 5 | 25 | 10 | 8 | 5 |
| 250 | 315 | 35 | 13 | 10 | - | 35 | 13 | 10 | - |
| 315 | 400 | 40 | 15 | 12 | - | 40 | 15 | 12 | - |

| Table 3 Rotation accuracy for the inner ring of GSRU modelUnit : μm | | | | | | |
|---|--------------------------------|----------|----------|-------------------------------|----------|----------|
| Model No. | Radial deviation of inner ring | | | Axial deviation of inner ring | | |
| | Grade P5 | Grade P4 | Grade P2 | Grade P5 | Grade P4 | Grade P2 |
| GSRU42 | 4 | 3 | 2.5 | 4 | 3 | 2.5 |
| GSRU66 | 5 | 4 | 2.5 | 5 | 4 | 2.5 |
| GSRU85 | 5 | 4 | 2.5 | 5 | 4 | 2.5 |
| GSRU124 | 5 | 4 | 2.5 | 5 | 4 | 2.5 |
| GSRU148 | 6 | 5 | 2.5 | 5 | 5 | 2.5 |
| GSRU178 | 6 | 5 | 2.5 | 6 | 5 | 2.5 |
| GSRU228 | 8 | 6 | 5 | 8 | 6 | 5 |
| GSRU297 | 10 | 8 | 5 | 10 | 8 | 5 |
| GSRU445 | 15 | 12 | 7 | 15 | 12 | 7 |

Accuracy Specifications

| Table 4 | Rotation accuracy for the outer ring of GSRU | | | | | Unit : μm |
|-----------|--|----------|----------|-------------------------------|----------|-----------|
| Model No. | Radial deviation of inner ring | | | Axial deviation of inner ring | | |
| | Grade P5 | Grade P4 | Grade P2 | Grade P5 | Grade P4 | Grade P2 |
| GSRU42 | 8 | 5 | 4 | 8 | 5 | 4 |
| GSRU66 | 10 | 6 | 5 | 10 | 6 | 5 |
| GSRU85 | 10 | 6 | 5 | 10 | 6 | 5 |
| GSRU124 | 12 | 8 | 5 | 12 | 8 | 5 |
| GSRU148 | 15 | 10 | 7 | 15 | 10 | 7 |
| GSRU178 | 15 | 10 | 7 | 15 | 10 | 7 |
| GSRU228 | 18 | 11 | 7 | 18 | 11 | 7 |
| GSRU297 | 20 | 13 | 8 | 20 | 13 | 8 |
| GSRU445 | 24 | 15 | 10 | 24 | 15 | 10 |

| Table 5 Bearing I.D. toleranceUnit : μm | | | | | | | |
|--|------|---------------------|------|-----------|------|----------------|------|
| I.D. of Bearings (d) In Metric Units (mm) | | Tolerance Dm (dm) | | | | | |
| | | Grade 0, P5, P4, P2 | | Grade PS5 | | Grade PS4, PS2 | |
| More | Less | More | Less | More | Less | More | Less |
| 18 | 30 | 0 | -10 | 0 | -6 | 0 | -5 |
| 30 | 50 | 0 | -12 | 0 | -8 | 0 | -6 |
| 50 | 80 | 0 | -15 | 0 | -9 | 0 | -7 |
| 80 | 120 | 0 | -20 | 0 | -10 | 0 | -8 |
| 120 | 150 | 0 | -24 | 0 | -12 | 0 | -9 |
| 150 | 180 | 0 | -24 | 0 | -12 | 0 | -10 |
| 180 | 250 | 0 | -30 | 0 | -14 | 0 | -12 |
| 250 | 315 | 0 | -34 | 0 | -17 | - | - |
| 315 | 400 | 0 | -38 | 0 | -22 | - | - |
| 400 | 500 | 0 | -44 | - | - | - | - |

Accuracy Specifications

| Table 6 | | Bearing O. D. | | | | | | Unit : μm | |
|--|------|---------------------|------|-----------|------|----------------|------|-----------|--|
| I.D. of Bearings (d) In Metric Units (mm) | | Tolerance Dm(dm) | | | | | | | |
| | | Grade 0, P5, P4, P2 | | Grade PS5 | | Grade PS4, PS2 | | | |
| More | Less | More | Less | More | Less | More | Less | | |
| 30 | 50 | 0 | -11 | 0 | -7 | 0 | -6 | | |
| 50 | 80 | 0 | -13 | 0 | -9 | 0 | -7 | | |
| 80 | 120 | 0 | -15 | 0 | -10 | 0 | -8 | | |
| 120 | 150 | 0 | -18 | 0 | -10 | 0 | -9 | | |
| 150 | 180 | 0 | -24 | 0 | -12 | 0 | -9 | | |
| 180 | 250 | 0 | -30 | 0 | -15 | 0 | -10 | | |
| 250 | 315 | 0 | -34 | 0 | -18 | 0 | -12 | | |
| 315 | 400 | 0 | -40 | 0 | -20 | 0 | -15 | | |
| 400 | 500 | 0 | -44 | 0 | -23 | - | - | | |

| Table 7 | | Width tolerance of inner & outer rings of GSRB (Fits for all grades) | | | | Unit : μm | |
|---|------|--|------|--------------------|------|-----------|--|
| I.D. of Bearing (d) In Metric Units (mm) | | T Tolerance | | T1 Tolerance | | | |
| | | Inner ring of GSRB | | Outer ring of GSRB | | | |
| More | Less | More | Less | More | Less | | |
| 18 | 30 | 0 | -70 | 0 | -90 | | |
| 30 | 50 | 0 | -70 | 0 | -90 | | |
| 50 | 80 | 0 | -70 | 0 | -90 | | |
| 80 | 120 | 0 | -70 | 0 | -90 | | |
| 120 | 150 | 0 | -80 | 0 | -110 | | |
| 150 | 180 | 0 | -80 | 0 | -110 | | |
| 180 | 250 | 0 | -80 | 0 | -110 | | |
| 250 | 315 | 0 | -80 | 0 | -130 | | |
| 315 | 400 | 0 | -80 | 0 | -150 | | |
| 400 | 500 | 0 | -100 | 0 | -150 | | |

| Table 8 | | Width tolerance of inner & outer rings of GSRU | | Unit : μm | |
|-----------|--|--|------|-----------|--|
| Model No. | | T Tolerance | | | |
| | | More | Less | | |
| GSRU42 | | 0 | -70 | | |
| GSRU66 | | 0 | -70 | | |
| GSRU85 | | 0 | -70 | | |
| GSRU124 | | 0 | -70 | | |
| GSRU148 | | 0 | -70 | | |
| GSRU178 | | 0 | -80 | | |
| GSRU228 | | 0 | -80 | | |
| GSRU297 | | 0 | -80 | | |
| GSRU445 | | 0 | -100 | | |

Radial Clearance

Table 9 shows the adial backlsh of standard GSRB, and Table 10 shows those of GSRU models.

| Table 9 | | Radial backlash of GSRB Models | | | | Unit : μm | |
|---------------------------|------|--------------------------------|------|------|------|-----------|--|
| Diameter of roller (d.p.) | | S1 | | C1 | | | |
| | | Min. | Max. | Min. | Max. | | |
| More | Less | | | | | | |
| 18 | 30 | -8 | 0 | 0 | 14 | | |
| 30 | 50 | -8 | 0 | 0 | 24 | | |
| 50 | 80 | -8 | 0 | 0 | 28 | | |
| 80 | 120 | -8 | 0 | 0 | 38 | | |
| 120 | 140 | -8 | 0 | 0 | 38 | | |
| 140 | 160 | -10 | 0 | 0 | 38 | | |
| 160 | 180 | -10 | 0 | 0 | 48 | | |
| 180 | 200 | -10 | 0 | 0 | 48 | | |
| 200 | 225 | -10 | 0 | 0 | 58 | | |
| 225 | 250 | -10 | 0 | 0 | 58 | | |
| 250 | 280 | -14 | 0 | 0 | 78 | | |
| 280 | 315 | -14 | 0 | 25 | 98 | | |
| 315 | 355 | -14 | 0 | 25 | 108 | | |
| 355 | 400 | -14 | 0 | 25 | 118 | | |
| 400 | 450 | -18 | 0 | 25 | 128 | | |

| Table 10 | | Radial backlash for GSRU | | | | Unit : μm | |
|-----------|--|--------------------------|------|------|------|-----------|--|
| Model No. | | Radial backlash | | | | | |
| | | S1 | | C1 | | | |
| | | Min. | Max. | Min. | Max. | | |
| GSRU42 | | -8 | 0 | 0 | 24 | | |
| GSRU66 | | -8 | 0 | 0 | 28 | | |
| GSRU85 | | -8 | 0 | 0 | 38 | | |
| GSRU124 | | -12 | 0 | 0 | 38 | | |
| GSRU148 | | -12 | 0 | 0 | 38 | | |
| GSRU178 | | -12 | 0 | 0 | 48 | | |
| GSRU228 | | -12 | 0 | 0 | 58 | | |
| GSRU297 | | -14 | 0 | 0 | 68 | | |
| GSRU445 | | -16 | 0 | 0 | 98 | | |

Matings

- ◎ Recommended tolerance of GSRU
h7 and H7 are the recommended tolerance for accuracy of installation locations of GSRU models.
- ◎ Recommended sizes of GSRB
It is recommended to use the combinations shown in the following table for the GSRB models:

| Suitability for GSRB Models | | | | |
|-----------------------------|-----------------------------|---------------------------|------|------------------|
| Radial Backlash | Use Conditions | | Axis | Supporting Seats |
| C1 | Rotating load on inner ring | General load | h5 | H7 |
| | | Large impacts and moments | | |
| | Rotating load on outer ring | General load | g5 | Js7 |
| | | Large impacts and moments | | |

Methods & Design of the Supporting Seats and Fixed Flange Discs

Due to the thin wall structure of the crossed roller bearings, full consideration must be given to the rigidity of the supporting seats or flange discs.

When the bearings are split types, they can not evenly fixate inner and outer rings if the supporting seat or flange disc is not rigid enough and if they bear moment loads, distortion will occur, resulting in significant degradation of bearing performance due to the contact conditions of the rollers becoming uneven. To prevent this from occurring, it is recommended to design the supporting seats and flange discs through the following methods

Supporting Seat : it is advised to design the wall thickness of the seats based on more than 60% of the section height of bearings.

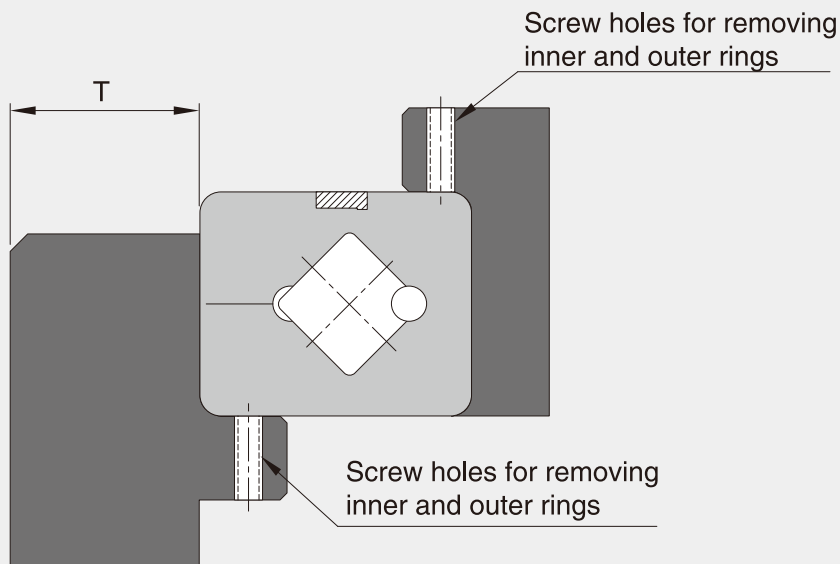
D : O.D. of outer rings

d : I.D. of inner rings

T : Thickness of support seat wall

$$T = \frac{(D - d)}{2} \times 0.6 \text{ (more)}$$

Alternatively, screw holes for removing bearings may be set up on the seats, when it is necessary to remove the bearings from seats, the screws may be locked into the threading holes and no damage will occur during the disassembly of bearings by using the screws to top the bearings from the seats.



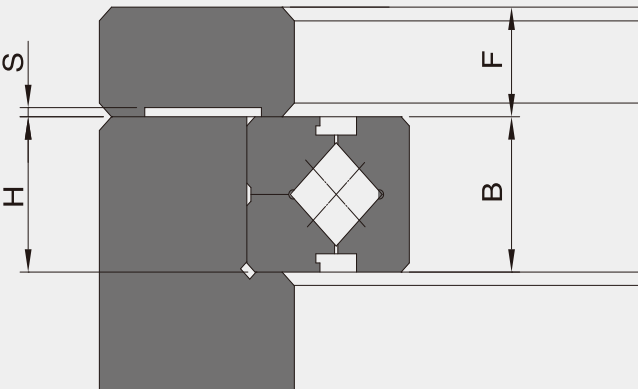
Flange Discs and Locking Screws

The values of the wall thickness (F) or the clearance (S) of the flange discs may be designed per the following formula. As for the quantity of locking screws, they may be configured at equal intervals by using the quantity shown in Table 11

$$F = B \times 0.5 \sim B \times 1.2$$

$$H = B_{-0.1}^{0.1}$$

$$S = 0.5 \text{ (mm)}$$



It is recommended to fixate the flange discs using materials made of iron.

It is advised to firmly lock the screws by using the torque wrench. See-Table 12 for the locking torques of supporting seats or flange discs which are made of general medium hardened steel.

| Table 11 Locking Screw Qty & Size Unit : mm | | | | Table 12 Locking Torque of Screws Unit : mm | | | |
|---|------|------------|---------------------------|---|----------------|--------------|----------------|
| O.D. of outer rings (D) | | Screw Qty | Screw Sizes (Base Values) | Screw Model | Tighten Torque | Screw Models | Tighten Torque |
| More | Less | | | | | | |
| — | 100 | 8 or more | M3~M5 | M3 | 2.1 | M10 | 72 |
| 100 | 200 | 12 or more | M4~M8 | M4 | 3.9 | M12 | 122 |
| 200 | 500 | 16 or more | M5~M12 | M5 | 9 | M16 | 201 |
| 500 | — | 24 or more | M12 or more | M6 | 13 | M20 | 392 |
| | | | | M8 | 31 | M22 | 531 |

Installation Steps

Follow the following steps when installing crossed roller bearings:

① Check each part and component before installing

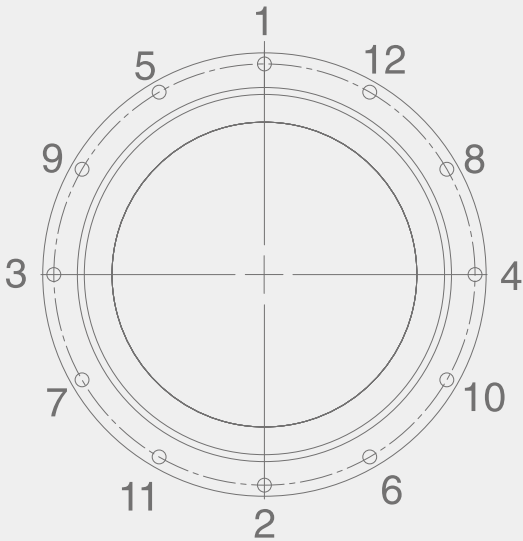
Wash clean the supporting seat and other installation parts, remove dirt from them and confirm that each part and components are deburred.

② Insert the crossed roller bearings into supporting seat or shaft

Thin wall bearings are prone to tilt when being inserted. Level one side, and insert bearings gradually by evenly knocking along the circumference using a rubber hammer until a sound arises confirming that the bearing is fully aligned with the contact surface.

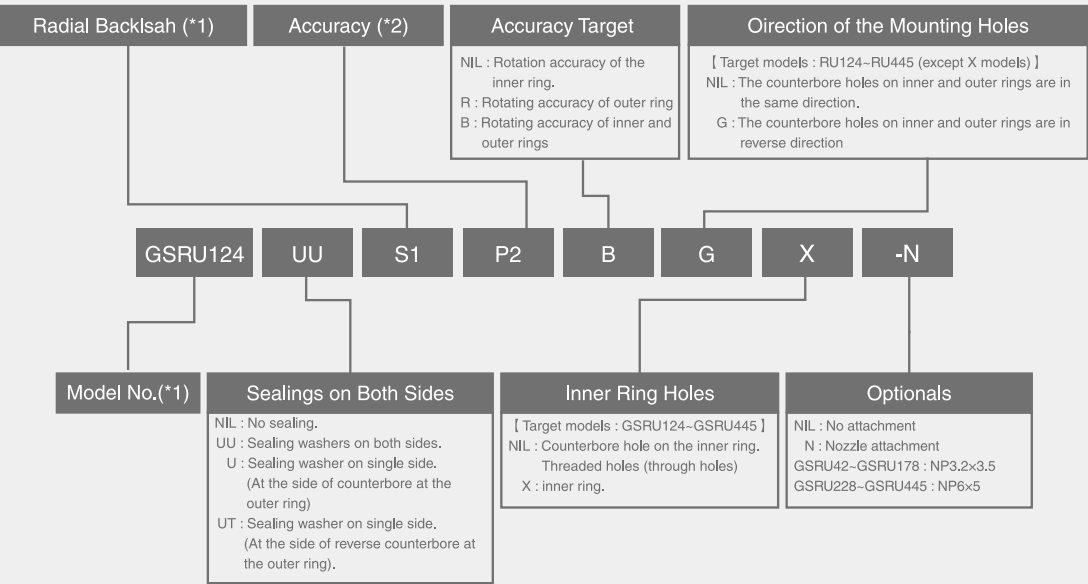
③ Installation of the flange disc

- (1) Place the disc into position, shake it along its circumference back and forth several times to adjust the locations of installation screws.
- (2) Install screws: When manually turning the screws, confirm that no deviation of screw holes renders it hard to thread screws into position.
- (3) The following figure shows that the locking of screws is divided into several phases from temporary to final tightening, tighten the screws in the order shown on the diagonal repeatedly. When locking split inner and outer rings, slightly turn the uni-body outer ring or inner ring to correct their deviations form the bearing body.



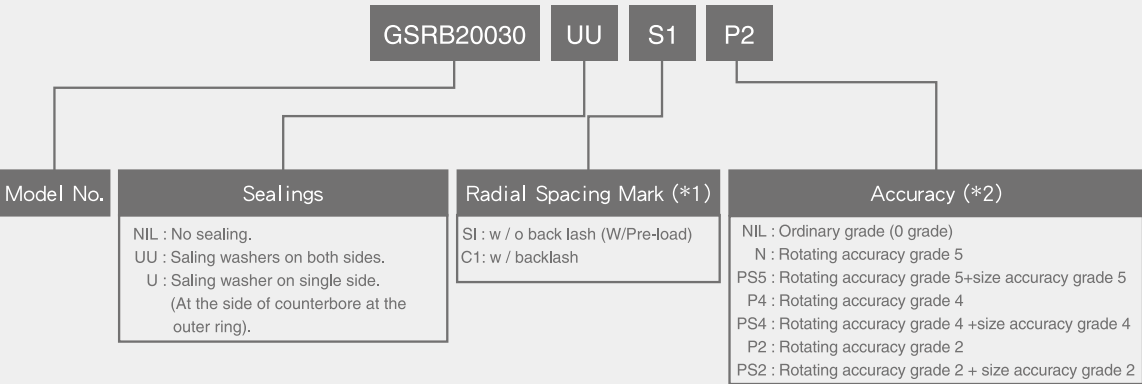
Model Specification

◎ GSRU Models (Inner ring integrated with outer ring)



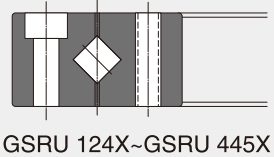
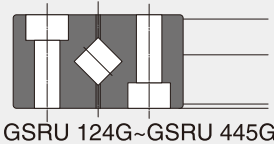
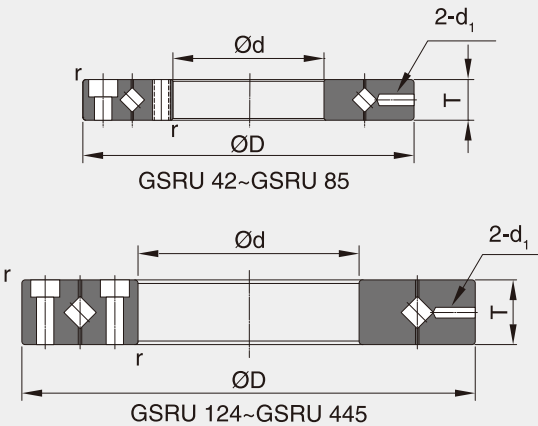
(*1) see tables 9 to 10.
(*2) see tables 2 to 8.

◎ Gsrb Models (Outer Ring Split Type)



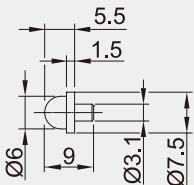
(*1) see tables 9 to 10.
(*2) see tables 2 to 8.

GSRU Model (Inner Ring Integrated with Outer Ring)

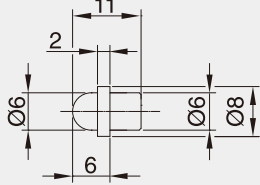


| Axial | Model No. | Main Dimensions | | | | | Flange Height | | Basic Load | | Weight |
|-------|------------------------|-----------------|------|-----------|----------------|--------------------|---------------|-----|------------|----------------|--------|
| | | I.D. | O.D. | Thickness | LH | Chamfer (r/min) | Øda | ØDh | C | C ₀ | |
| | | Ød | ØD | T | d ₁ | r _{min} | | | KN | KN | |
| 20 | GSRU42 | 20 | 70 | 12 | 3 | 0.5 | 36 | 46 | 7.3 | 8.33 | 0.28 |
| 35 | GSRU66 | 35 | 95 | 15 | 3 | 0.5 | 58 | 75 | 17.53 | 22.31 | 0.6 |
| 55 | GSRU85 | 55 | 120 | 15 | 3 | 0.5 | 78 | 94 | 20.31 | 29.55 | 1.1 |
| 80 | GSRU124(G) GSRU124X | 80 | 165 | 22 | 3 | 1 | 115 | 133 | 33 | 50.85 | 2.61 |
| 90 | GSRU148(G) GSRU148X | 90 | 210 | 25 | 3 | 1.5 | 134 | 161 | 49 | 76.83 | 4.95 |
| 115 | GSRU178(G) GSRU178X | 115 | 240 | 28 | 3 | 1.5 | 162 | 194 | 80.32 | 134.9 | 6.78 |
| 160 | GSRU228(G) GSRU228X | 160 | 295 | 35 | 6.1 | 2 | 207 | 247 | 103.5 | 172.8 | 11.42 |
| 210 | GSRU297(G) GSRU297X | 210 | 380 | 40 | 6.1 | 2.5 | 271 | 321 | 155.8 | 281.3 | 21.33 |
| 350 | GSRU445(G) GSRU445X | 350 | 540 | 45 | 6.1 | 2.5 | 418 | 472 | 222.3 | 473.4 | 35.2 |

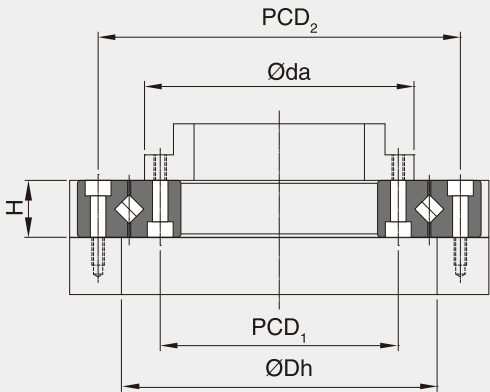
NP3.2x3.5



NP6x5



© Lubricant nozzle is available to be specified as "-N" by GSRU models as below.



GSRU Type



GSRU...U Type



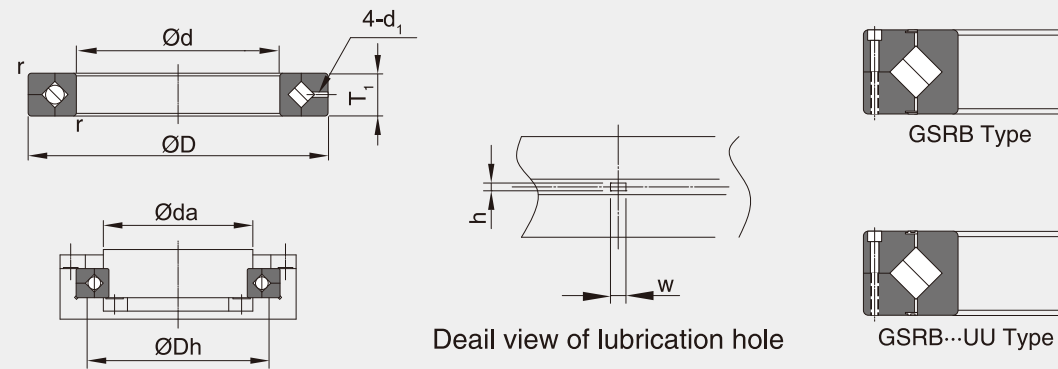
GSRU...UU Type



GSRU...UT Type

| Mounting Hole Specifications | | | |
|------------------------------|---|------------------|-------------------------------------|
| Inner Ring | | Outer Ring | |
| PCD ₁ | Mounting Hole | PCD ₂ | Mounting Hole |
| 28 | 6-M3 through | 57 | 6-Ø3.5 6 through, Ø6x3.5L sunk bore |
| 45 | 8-M4 through | 83 | 8-Ø4.5 through, Ø8x4.5L sunk bore |
| 65 | 8-M5 through | 105 | 8-Ø5.5 through, Ø10x5.5L sunk bore |
| 97 | 10-Ø5.5 through, Ø10x5.5L sunk bore 10-M5 through | 148 | 10-Ø5.5 through, Ø10x5.5L sunk bore |
| 112 | 12-Ø9.0 through, Ø14x8.5L sunk bore 12-M8 through | 187 | 12-Ø9.0 through, Ø14x8.5L sunk bore |
| 139 | 12-Ø9.0 through, Ø14x8.5L sunk bore 12-M8 through | 217 | 12-Ø9.0 through, Ø14x8.5L sunk bore |
| 184 | 12-Ø11 through, Ø18x10.5L sunk bore 12-M10 through | 270 | 12-Ø11 through, Ø18x10.5L sunk bore |
| 240 | 16-Ø14 through, Ø20x12.5L sunk bore 16-M12 through | 350 | 16-Ø14 through, Ø20x12.5L sunk bore |
| 385 | 24-Ø14 through, Ø20x12.5L sunk bore 24-M12 through | 505 | 24-Ø14 through, Ø20x12.5L sunk bore |

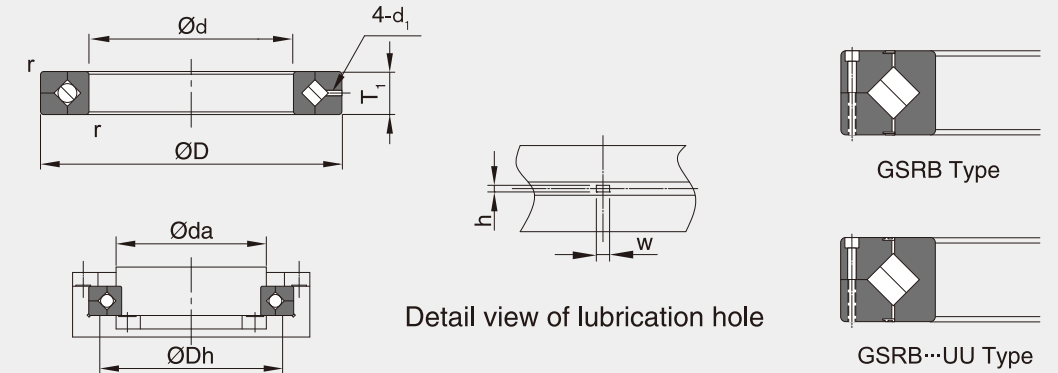
GSRB Model(Outer Ring Split Type)



Unit : mm

| Axial | Model No. | Main Dimensions | | | | | | Flange Height | | Basic Load | | Weight |
|-------|-----------|-----------------|-------------|-----------------------------|-----|-----|------------------|---------------|------|------------|----------------|--------|
| | | I. D. Ød | O. D. ØD | Thickness T ₁ | LH | | r _{min} | Øda | ØDh | C | C ₀ | |
| | | | | | w | h | | | | KN | KN | |
| 20 | GSRB2008 | 20 | 36 | 8 | 2.1 | 0.7 | 0.6 | 24 | 30 | 3.2 | 3.1 | 0.06 |
| 25 | GSRB2508 | 25 | 41 | 8 | 2.1 | 0.7 | 0.6 | 29 | 35 | 3.6 | 3.8 | 0.07 |
| 30 | GSRB3010 | 30 | 55 | 10 | 2.6 | 0.8 | 1.2 | 37.5 | 46.5 | 7.4 | 8.4 | 0.14 |
| 35 | GSRB3510 | 35 | 60 | 10 | 2.6 | 0.8 | 1.2 | 41.5 | 51 | 7.6 | 9.1 | 0.12 |
| 40 | GSRB4010 | 40 | 65 | 10 | 2.6 | 0.8 | 1.2 | 47 | 58 | 8.3 | 10.8 | 0.18 |
| 45 | GSRB4510 | 45 | 70 | 10 | 2.6 | 0.8 | 1.2 | 51.5 | 61 | 8.6 | 11.1 | 0.15 |
| 50 | GSRB5013 | 50 | 80 | 13 | 2.6 | 1.5 | 1.2 | 57 | 72.5 | 16.6 | 20.7 | 0.28 |
| 60 | GSRB6013 | 60 | 90 | 13 | 2.6 | 1.5 | 1.2 | 67.5 | 82.5 | 18 | 24.1 | 0.32 |
| 70 | GSRB7013 | 70 | 100 | 13 | 2.6 | 1.5 | 1.2 | 78.5 | 91.5 | 19.5 | 27.9 | 0.37 |
| 80 | GSRB8016 | 80 | 120 | 16 | 3.1 | 1.5 | 1.2 | 91.5 | 110 | 30 | 42 | 0.72 |
| 90 | GSRB9016 | 90 | 130 | 16 | 3.1 | 1.5 | 1.5 | 98.8 | 117 | 31.3 | 45.1 | 0.77 |
| 100 | GSRB10016 | 100 | 140 | 16 | 3.6 | 1.5 | 1.5 | 110 | 128 | 31.8 | 48.8 | 0.82 |
| | GSRB10020 | | 150 | 20 | 3.6 | 1.5 | 1.5 | 114 | 132 | 33 | 51 | 1.47 |
| 110 | GSRB11012 | 110 | 135 | 12 | 2.6 | 0.8 | 1.2 | 118 | 126 | 12.6 | 24 | 0.42 |
| | GSRB11015 | | 145 | 15 | 3.6 | 1.5 | 1.2 | 123 | 135 | 23.8 | 41.8 | 0.76 |
| | GSRB11020 | | 160 | 20 | 3.6 | 1.5 | 1.5 | 121 | 139 | 34 | 54 | 1.58 |
| 120 | GSRB12016 | 120 | 150 | 16 | 3.6 | 1.5 | 1.2 | 128 | 140 | 24.3 | 43.4 | 0.74 |
| | GSRB12025 | | 180 | 25 | 3.6 | 2.1 | 2 | 134 | 163 | 66.8 | 100.2 | 2.62 |
| 130 | GSRB13015 | 130 | 160 | 15 | 3.6 | 1.5 | 1.2 | 136 | 151 | 25 | 46.9 | 0.74 |
| | GSRB13025 | | 190 | 25 | 3.6 | 2.1 | 2 | 144 | 173 | 69.7 | 107.3 | 2.8 |

© The model GSRB...UL contains sealing, and suitable for inner rotation applications.



Unit : mm

| Axial | Model No. | Main Dimensions | | | | | | Flang Height | | Basic Load | | Weight |
|-------|-----------|-----------------|-------------|-----------------------------|-----|-----|------------------|--------------|-----|------------|----------------|--------|
| | | I. D. Ød | O. D. ØD | Thickness T ₁ | LH | | r _{min} | Øda | ØDh | C | C ₀ | |
| | | | | | w | h | | | | KN | KN | |
| 140 | GSRB14016 | 140 | 175 | 16 | 2.6 | 1.5 | 0.8 | 148 | 163 | 26 | 50.3 | 1.1 |
| | GSRB14025 | | 200 | 25 | 3.6 | 2.1 | 1.3 | 155 | 184 | 74.7 | 121 | 2.98 |
| 150 | GSRB15013 | 150 | 180 | 13 | 2.6 | 1.5 | 0.5 | 158 | 171 | 27.1 | 53.7 | 0.66 |
| | GSRB15025 | | 210 | 25 | 3.6 | 2.1 | 1.2 | 165 | 193 | 76.5 | 128 | 3.18 |
| | GSRB15030 | | 230 | 30 | 4.6 | 3.1 | 1.2 | 174 | 210 | 100 | 156 | 5.2 |
| 160 | GSRB16025 | 160 | 220 | 25 | 3.6 | 2.1 | 1.2 | 172 | 205 | 81.6 | 135 | 3.12 |
| 170 | GSRB17020 | 170 | 220 | 20 | 3.6 | 1.5 | 1.2 | 185 | 197 | 29.2 | 62 | 2.2 |
| 180 | GSRB18025 | 180 | 240 | 25 | 3.6 | 1.8 | 1.2 | 196 | 224 | 84.3 | 143 | 3.41 |
| 190 | GSRB19025 | 190 | 240 | 25 | 3.6 | 1.5 | 0.8 | 203 | 221 | 41.8 | 82.7 | 2.97 |
| 200 | GSRB20025 | 200 | 260 | 25 | 3.6 | 1.8 | 1.8 | 214 | 246 | 84.1 | 157 | 4.2 |
| | GSRB20030 | | 280 | 30 | 4.6 | 2.8 | 1.8 | 222 | 257 | 113 | 202 | 6.8 |
| | GSRB20035 | | 295 | 35 | 5.1 | 2.8 | 1.8 | 224 | 271 | 151 | 251 | 9.8 |
| 220 | GSRB22025 | 220 | 280 | 25 | 3.6 | 1.8 | 1.8 | 236 | 264 | 92.1 | 173 | 4 |
| 240 | GSRB24025 | 240 | 300 | 25 | 3.6 | 1.8 | 2.2 | 255 | 282 | 68.4 | 146 | 4.7 |
| 250 | GSRB25025 | 250 | 310 | 25 | 3.6 | 1.8 | 2.2 | 264 | 291 | 69.2 | 152 | 5.2 |
| | GSRB25030 | | 330 | 30 | 4.6 | 2.8 | 2.5 | 268 | 304 | 126 | 242 | 8 |
| | GSRB25040 | | 355 | 40 | 6.1 | 3.4 | 2.2 | 276 | 325 | 195 | 347 | 14.6 |
| 300 | GSRB30025 | 300 | 360 | 25 | 3.6 | 1.8 | 2.2 | 314 | 341 | 76.1 | 179 | 6 |
| | GSRB30035 | | 395 | 35 | 5.1 | 2.8 | 2.2 | 321 | 369 | 183 | 365 | 13.2 |
| | GSRB30040 | | 405 | 40 | 6.1 | 3.6 | 2.2 | 325 | 378 | 212 | 407 | 17.1 |
| 350 | GSRB35020 | 350 | 400 | 20 | 3.6 | 1.5 | 2.2 | 364 | 382 | 54 | 141 | 3.7 |

© The model GSRB...UL contains sealing, and suitable for inner rotation applications.

