Crossed Roller Bearing
Contents

1 Structure and Features of WON Crossed Roller Bearing

1. Structure

WON Crossed Roller Bearing has the structure in which a roller as a rolling element is crossed at right angles with the rolling surface with the V-grooved inner ring and outer ring. A spacer-type retainer assembled between rollers prevents the collision and friction of rollers, and the increase in rotational torque. The device has an easy-to-use compact structure.

2. Features

In the rolling surface of the inner and outer rings of a crossed roller bearing, rollers are assembled. Therefore, the device reduces the elastic displacement by external load, and bears all complex loads, such as radial load, axial load, and moment load, at the same time. Since it adopts a spacer retainer, it avoids inclined surface of a roller, uneven wear caused by uneven contact, or hitching. Therefore, the product with high precision and high rigidity implements smooth rotary motion, and support preload adjustment differently depending on service conditions.

3. Use

This product is mainly usable in an environment that needs complex loads, high rigidity and rotational precision. It is applied to various types of equipment, such as industrial robot, machine tool index table, ATC, medical equipment, precise alignment stage, semiconductor manufacture equipment, and DD motor.

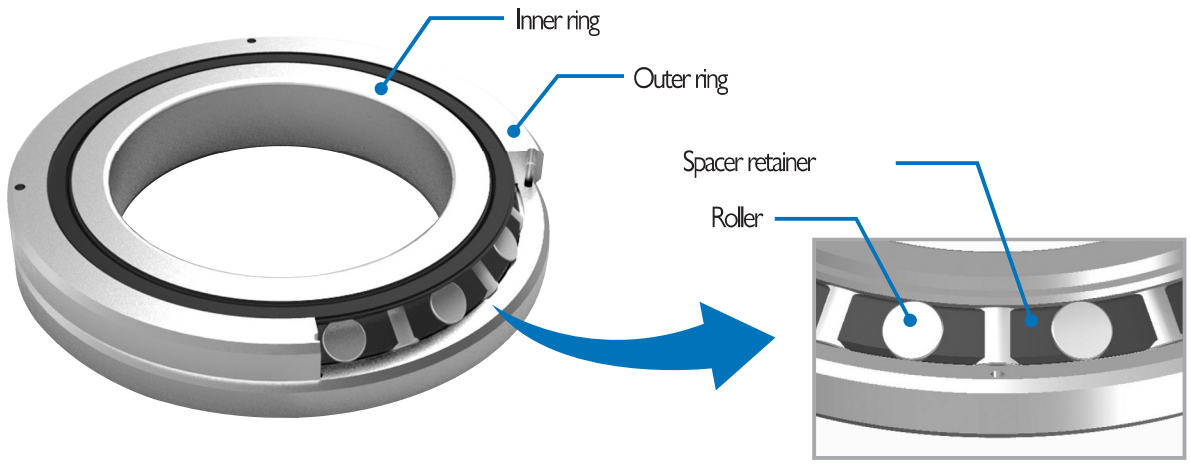


Figure 1. Structure of Crossed Roller Bearing

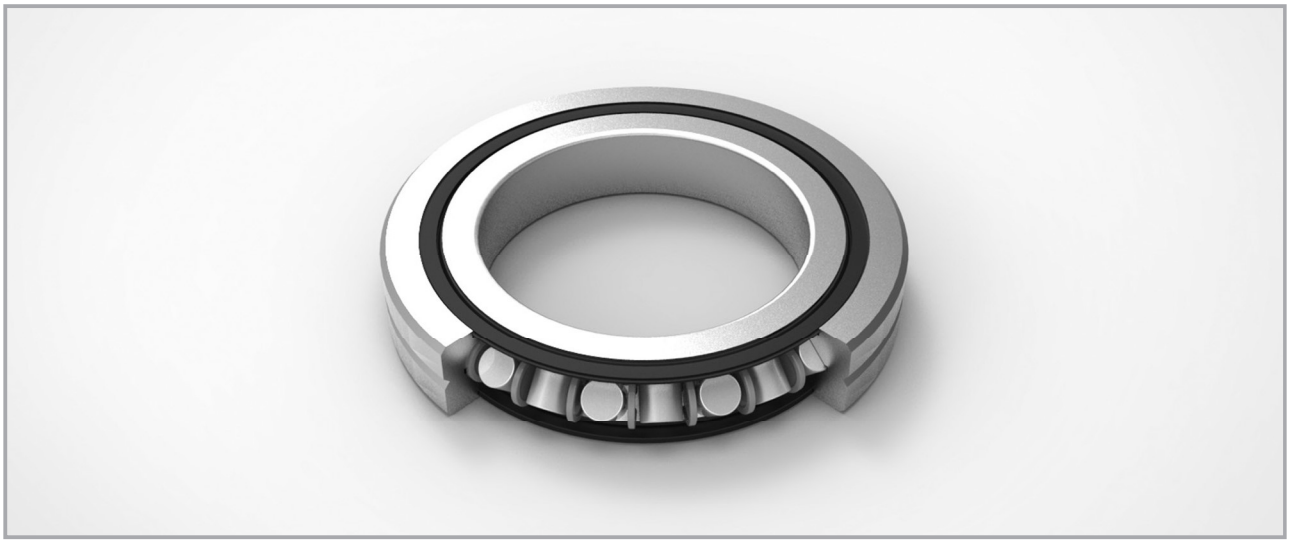
2 Types of Crossed Roller Bearing

1. CB Series for Revolving Inner Ring

1) The inner ring of a crossed roller bearing has an integral type, and its outer ring is separable into upper and lower parts that are bolted for easy handling.
2) This model is mainly applied to the parts that needs the rotational precision of its inner ring, such as the index table of machine tool, or the joint or turning part of industrial robot.

2. CH Series with High Stiffness

1) The inner and outer rings of a crossed roller bearing have an integral type, so that the device has a small installation error. In addition, this model with high precision and high rigidity secures stablerotational precsion.
2) This model is used in an environment where its inner and outer rings need to be rotated simultaneously or individually

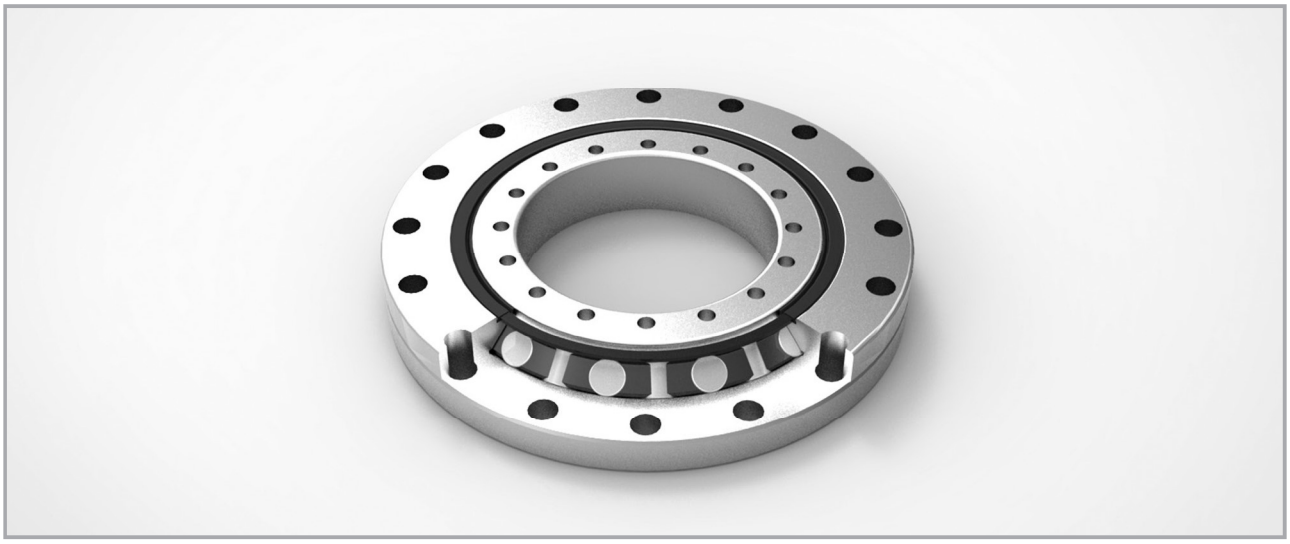


3. CA Series for Slim Revolving Inner Ring

1) As a slim compact type, this model has minimum thickness of its inner and outer rings. Its inner ring has an integral type, and its outer ring is separable into upper and lower parts that are bolted for easy handling.
2) This model is mainly applied to the parts that needs the rotational precision of its inner ring and need to become light weight and small, such as the joint or turning part of industrial robot.

4. Customized Special Type CS Series

1) This is a customized model. If you need a special type in terms of the shape, size, material, and specification of the inner and outer rings, please contact WON ST.



3 Selection of Crossed Roller Bearing

1. Overview

To select a crossed roller bearing, it is necessary to identify the details of requirements, prioritize them, and then choose the one that meets the service conditions.

2. Procedure

1	Determine service conditions	The equipment to be used, requirements, service environments, precision, rigidity, life, and others
2	Select a type	Integral type, Inner ring separation type, Outer ring separation type, General type, High rigidity type
3	Calculate load	Calculate radial load, axial load, moment load, and dynamic equivalent load
4	Calculate rated service life	Calculate a rated service life
5	Calculate static safety factor	Calculate a static safety factor in consideration of the characteristics of equipment, external load, etc.
6	Determine rigidity and preload	Determine clearance and preload values in consideration of motion conditions, rotational precision, etc.
7	Determine precision level	Determine a level of precision in consideration of rotational precision and assembly precision.
8	Determine lubrication	Determine oil, grease, or a special lubricant.
9	Complete selection	

4 Life Calculation

1. Rated service life (L)

It is possible to calculate the basic rated life of cross roller bearing in the following formula.

$$L = \left(\frac{f_T \cdot C}{f_w \cdot P_c}\right)^{\frac{10}{3}} \times 10^6$$

Service life time

$$L_h = \frac{L}{60 \times N}$$

L : Rated service life

C : Basic dynamic load rating(N)

Pc : Dynamic equivalent radial load(N)

f_T : Temperature factor

f_W : Load factor

L_h : Service life time(h)

N : RPM(rpm)

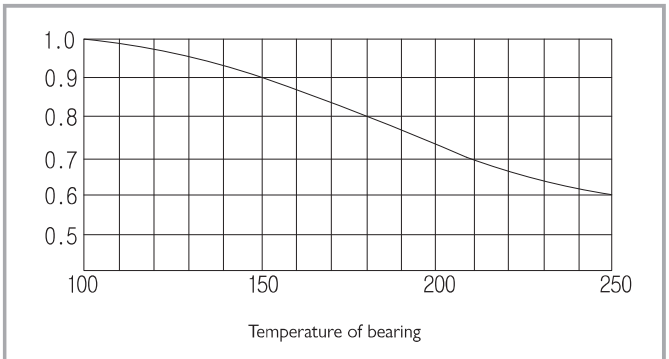


Figure 2. Temperature factor

Note: Usually, workable temperature is 80°C or below.
If above, please contact WON ST.

2. Life calculation under heaving operation condition

Service life of a bearing under heaving operation condition is calculated as follows.

$$L_{0c} = \frac{90}{\theta}\left(\frac{C}{P_c}\right)^P$$

L_{0c} : rated service life 10^6 cycle indicated in heaving frequency of the bearing under heaving operation

θ : heaving angle (See Fig.3.)

P_c : dynamic equivalent radial load

※ If Ø is small, it is hard to generate an oil film on the contact surface between the raceway surface and a rotating body. In addition, it may cause corrosion.

In case of heaving operation

Service life time

$$L_h = \frac{360 \times L}{2 \times \theta \times n_o \times 60}$$

L_h : Service life time (h)

θ : Heaving angle (deg)

(※ See the figure on the right.)

n_o : Number of reciprocating motions (min-1)

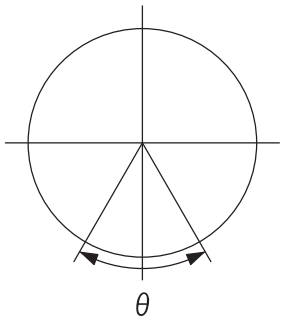


Figure 3.

3. Static safety factor (fs)

Static safety factor(fs) of a crossed roller bearing is calculated as follows. For the general static safety factor, see Table 1.

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

f_s : static safety factor

C_0 : basic static load rating (N)

P_0 : static equivalent radial load (maximum load) (N)

Table 1. Static safety factor (fs)

Working condition	Lower limit of fs
High rotational precision is required.	≥3
Under normal operation condition	≥2
Almost no rotation and no significance of smooth operation under normal operation condition	≥1

4. Static equivalent radial load (P_0)

Static equivalent radial load of a crossed roller bearing is calculated in the following formula.

$$P_0 = F_r + \frac{2M}{D_{PW}} + 0.44\,F_a$$

P_0 : Static equivalent radial load (N)

F_r : Radial load N)

F_a : Axial load (N)

M : Moment (N•mm)

D_{PW} : Roller set pitch diameter ($D_{PW} \approx \frac{d+D}{2}$)

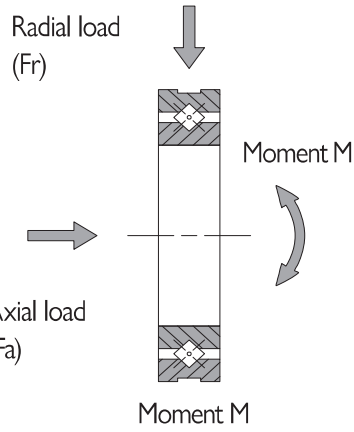


Figure 4. Bearing load

5. Dynamic equivalent radial load (P_c)

Dynamic equivalent radial load of a crossed roller bearing is calculated in the following formula.

$$P_c = X\left(F_r + \frac{2M}{D_{PW}}\right) + Y\,F_a$$

P_c : Dynamic equivalent radial load(N)

F_r : Radial load (N)

F_a : Axial load (N)

M : Moment (N•mm)

X : Radial load factor (See Table 2.)

Y : Axial load factor (See Table 2.)

D_{PW} : Roller set pitch diameter ($D_{PW} \approx \frac{d+D}{2}$)

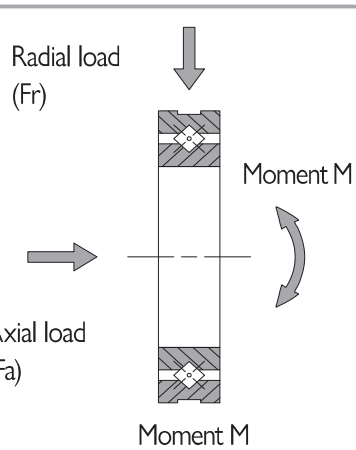


Figure 5.

Table 2. Radial load factor and axial load factor

Classification	X	Y
$\frac{F_a}{F_r + 2M/D_{PW}} \le 1.5$	1	0.45
$\frac{F_a}{F_r + 2M/D_{PW}} > 1.5$	0.67	0.67

6. Load factor (f_W)

When a crossed roller bearing is used, the load imposed on the bearing by vibration and impacts in operation is often greater than the calculated load. To select a crossed roller bearing, it is required to take into account the load factor values in the table shown below.

Table 3. Load factor (fw)

Load condition	fw		
Smooth operation condition without impacts	1	~	1.2
Normal operation condition	1.2	~	1.5
The operation condition with both vibration load and impact load	1.5	~	3

7. Temperature factor (f_T)

Temperature factor is presented in the following graph.

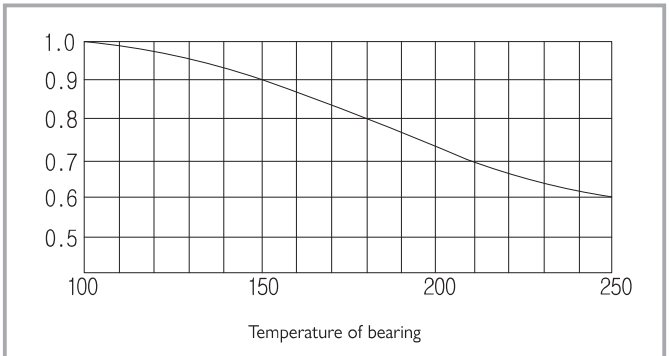


Figure 2. Temperature factor

Note: Usually, workable temperature is 80°C or below.
If above, please contact WON ST

5 Load rating

1. Basic dynamic load rating (C)

It refers to the radial load with a constant size and direction, which makes it possible to meet the condition where over 90% in the group of multiple crossed roller bearings with the same model have no flaking and can rotate a million times.

2. Basic static load rating (C_0)

It refers to the static radial load that imposes a certain level of contact stress on the raceway surface with the maximum load and on the center of the contact part of a rotating body in a crossed roller bearing.

6 Permissible RPM

For the permissible RPM of a crossed roller bearing, see the table below.
A permissible RPM depends on assembly or service conditions.

Table 4. Permissible RPM of crossed roller bearing (dm•n)

Bearing Type	Seal	Grease lubrication	Oil lubrication
Bearing	No seal	75,000	150,000
Spacer retainer	Seals on the both sides	60,000	-

※ dm•n = dm X n

dm : The mean value of inside and outside dimeters (mm)

n : Revolution count (rpm)

7 Lubrication

A crossed roller bearing is commonly lubricated with grease. An oil inlet of the inner ring and outer ring is used for grease supply. A crossed roller bearing with double-sided seal mounting type is filled with Albania EP2 grease.
If a bearing is not filled with a lubricant, please fill it with the grease or oil suitable for service conditions before use. Without lubrication, it is possible to make the rolling surface worn out more and shorten of a bearing life.

8 Cautions in Designing Compression Plate and Housing

A crossed roller bearing is compact and slim. It is required to evaluate the rigidity of a pressure plate or housing plate and the torque of bolts in the process of designing an installation part.
In the case of poor rigidity, it is impossible to assemble the inner and outer rings of a bearing evenly and tightly, and the bearing can be deformed in moment load. In such deformation, a roller fails to make contact uniform and thus performance of the bearing is degraded significantly.

1. Housing design for installation

Housing thickness should be at least 60% of cross-section height of a bearing.

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

T : Housing thickness

D : The outside diameter of the outer ring

d : The outside diameter of the inner ring

2. Tap for separation

If a separation tap is applied to a design, it is easy to separate the inner and outer rings without any damage to a bearing.

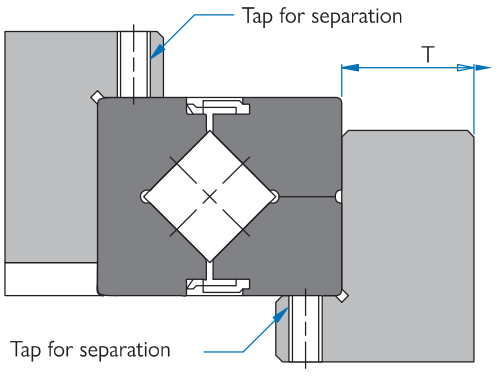
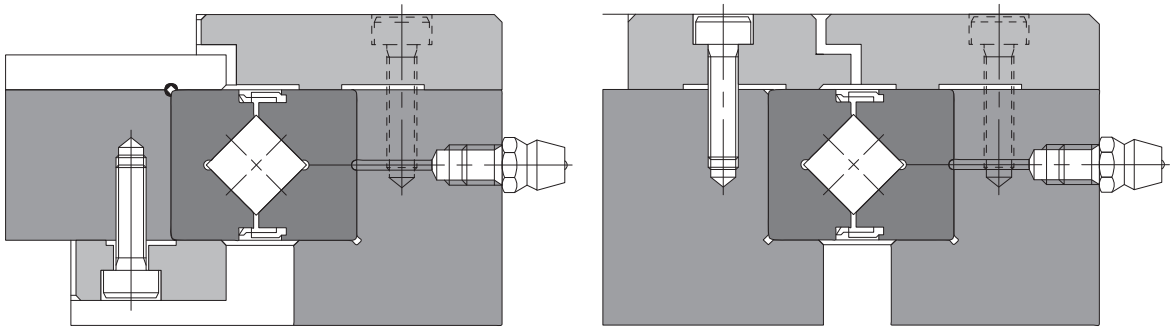


Figure 6.

3. Installation and assembly

For installation and assembly, see the following figure.



Rotation of inner ring of the turning part

Jointing in the same direction of inner and outer rings of the turning part

Figure 7. An example of installation and assembly

4. Selection of compression flange and bolt

The more numbers of the fastening bolts for compression, the more stable. Bolts are arranged in the equimultiples as shown in Table 5. For the thickness (F) and gap (S) of the flange for compression, see the following table of dimensions

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

$H = B^{0}_{-0.1}$

$S = 0.5mm$

To prevent a flange for compression from being loosened, it is required to make firm connection in an appropriate torque level. If a shaft or housing is made of a light alloy material, use steel. For general heavy or light steel, see the following table.

Table 5. Number of compression bolts and bolt size

Unit : mm

external diameter of outer ring		No. of bolts	Bolt size
Above	Below		
-	100	8 or more	M3 ~ M5
100	200	12 or more	M4 ~ M8
200	300	16 or more	M5 ~ M12

Table 6. Maximum clamping torque of bolts

Unit : N•m

Bolt No.	Clamping torque	Bolt No.	Clamping torque
M3	2	M8	30
M4	4	M10	70
M5	9	M12	120
M6	14	-	-

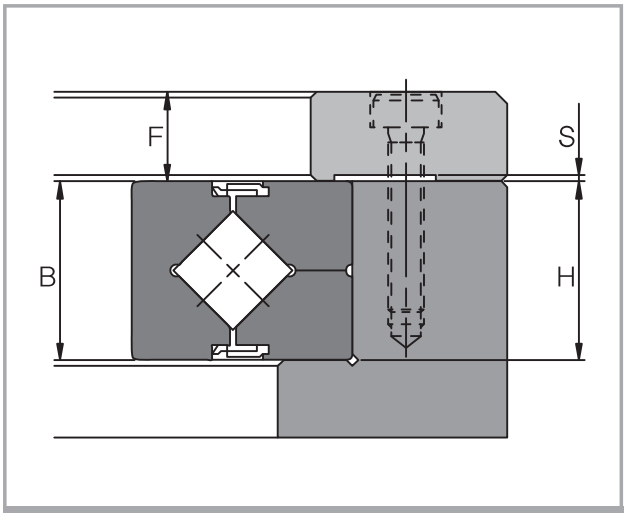


Figure 8.

5. Assembly procedure for installation

The assembly procedure of a crossed roller bearing is as follows.

1. Preliminary check before mounting
Wash a housing or other assembly parts clearly and check if they have any scratch or sharp edge.

2. Axis or housing assembly
Since a bearing is slim, it can be easily inclined in the process of assembly. Make it balanced horizontally with the use of a plastic hammer, and then hammer the cylinder of the outer ring gradually and insert it. Carefully hammer it until the part is set in the contact surface completely.

3. Compression-flange mounting
1) Mount a flange for compression. Check a position for bolt fastening by shaking the flange before assembly.
2) Check that a bolt is positioned well in a hole before fastening the bolt.
3) The bolt fastening process is comprised of 2 to 5 steps from temporary fastening to complete fastening. If the inner ring and outer ring are separated from each other, rotate the integral axis gently and slowly in order to secure an assembly position, and then fasten a bolt in 2 to 5 steps.

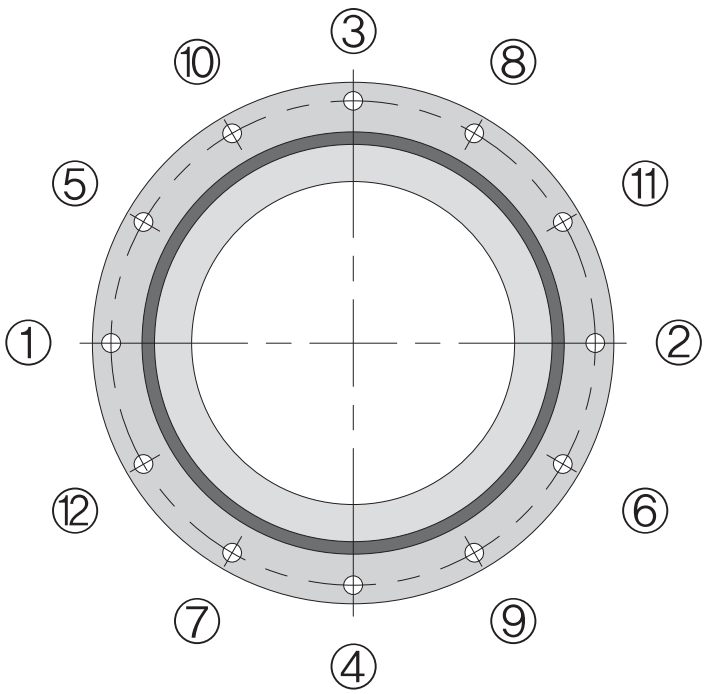


Figure 9.

9 Fitting

For fitting, see the following table

Table 7. Recommended fitting in normal load

Radial internal clearance	Tolerance range class			
	Load fixed to inner ring		Load fixed to outer ring	
	Shaft	Housing bore	Shaft	Housing bore
G_2 clearance	h5	H7	g5	J7[(1)]
G_1 clearance	j5	H7	g5	J7[(1)]

Note[(1)] It is recommended to fit to a small edge according to measured value of a bearing.

Table8. Recommended fitting for the normal clearance of a slim type

Inside diameter of bearing (d)	Load fixed to inner ring				Load fixed to outer ring			
	Shaft		Housing bore		Shaft		Housing bore	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
50	+15	0	+13	0	-15	-30	-13	-25
60	+15	0	+13	0	-15	-30	-13	-25
70	+15	0	+15	0	-15	-30	-15	-30
80	+20	0	+15	0	-20	-40	-15	-30
90	+20	0	+15	0	-20	-40	-15	-30
100	+20	0	+15	0	-20	-40	-15	-30
110	+20	0	+20	0	-20	-40	-20	-40
120	+25	0	+20	0	-25	-50	-20	-40
130	+25	0	+25	0	-25	-50	-25	-50
140	+25	0	+25	0	-25	-50	-25	-50
150	+25	0	+25	0	-25	-50	-25	-50
160	+25	0	+25	0	-25	-50	-25	-50
170	+25	0	+30	0	-25	-50	-30	-60
180	+30	0	+30	0	-30	-60	-30	-60
190	+30	0	+30	0	-30	-60	-30	-60
200	+30	0	+30	0	-30	-60	-30	-60

10 Precision Specification of Crossed Roller Bearing

Precision of a crossed roller bearing and dimensional tolerance are calculated with the dimensions described in Table 9 to Table 18.

Table 9. Rotational precision of the inner ring of CH Series

Unit : μm

Model No.	Inner ring radial runout tolerance			Inner ring axis runout tolerance		
	Precision	Super precision	Ultra precision	Precision	Super precision	Ultra precision
	P5	P4	P2	P5	P4	P2
CH42	4	3	2.5	4	3	2.5
CH66	5	4	2.5	5	4	2.5
CH85	5	4	2.5	5	4	2.5
CH124	5	4	2.5	5	4	2.5
CH148	6	5	2.5	6	5	2.5
CH178	6	5	2.5	6	5	2.5
CH228	8	6	5	8	6	5
CH297	10	8	5	10	8	5
CH445	15	12	7	15	12	7

Note(1): Standard rotational precision of CH series is P5.

Table 10. Rotational precision of the outer ring of CH Series

Unit : μm

Model No.	Inner ring radial runout tolerance			Inner ring axis runout tolerance		
	Precision	Super precision	Ultra precision	Precision	Super precision	Ultra precision
	P5	P4	P2	P5	P4	P2
CH42	8	5	4	8	5	4
CH66	10	6	5	10	6	5
CH85	10	6	5	10	6	5
CH124	13	8	5	13	8	5
CH148	15	10	7	15	10	7
CH178	15	10	7	15	10	7
CH228	18	11	7	18	11	7
CH297	20	13	8	20	13	8
CH445	25	16	10	25	16	10

Note(1): Standard rotational precision of CH series is P5.

Table 11. Rotational precision of the inner ring of CB Series

Unit : μm

Nominal dimension (mm) of the inside diameter (d) of bearing		Inner ring radial runout tolerance					Inner ring axis runout tolerance				
Above	Below	0	PE6 P6	PE5 P5	PE4 P4	PE2 P2	0	PE6 P6	PE5 P5	PE4 P4	PE2 P2
18	30	13	8	4	3	2.5	13	8	4	3	2.5
30	50	15	10	5	4	2.5	15	10	5	4	2.5
50	80	20	10	5	4	2.5	20	10	5	4	2.5
80	120	25	13	6	5	2.5	25	13	6	5	2.5
120	150	30	18	8	6	2.5	30	18	8	6	2.5
150	180	30	18	8	6	5	30	18	8	6	5
180	250	40	20	10	8	5	40	20	10	8	5
250	315	50	25	13	10	(6)	50	25	13	10	(6)
315	400	60	30	15	12	(7)	60	30	15	12	(7)
400	500	65	35	18	14	(9)	65	35	18	14	(9)
500	630	70	40	20	16	(10)	70	40	20	16	(10)
630	800	80	(45)	(23)	(18)	(11)	80	(45)	(23)	(18)	(11)
800	1000	90	(50)	(25)	(20)	(12)	90	(50)	(25)	(20)	(12)

Table 12. Rotational precision of the inner ring of CA Series

Unit : μm

Nominal dimension (mm) of the inside diameter (d) of bearing		Radial run-out Allowable value of axial run-out
Above	Below	
40	65	13
65	80	15
80	100	15
100	120	20
120	140	25
140	180	25
180	200	30

Table 13. Dimensional tolerance of the inside diameter of bearing

Unit : μm

Nominal dimension (mm) of the inside diameter (d) of bearing		Tolerance of dm Note (2)							
		0,P6,P5,P4,P2,WUP		PE6		PE5		PE4, PE2	
Above	Below	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
18	30	0	-10	0	-8	0	-6	0	-5
30	50	0	-12	0	-10	0	-8	0	-6
50	80	0	-15	0	-12	0	-9	0	-7
80	120	0	-20	0	-15	0	-10	0	-8
120	150	0	-25	0	-18	0	-13	0	-10
150	180	0	-25	0	-18	0	-13	0	-10
180	250	0	-30	0	-22	0	-15	0	-12
250	315	0	-35	0	-25	0	-18	-	-
315	400	0	-40	0	-30	0	-23	-	-
400	500	0	-45	0	-35	-	-	-	-
500	630	0	-50	0	-40	-	-	-	-
630	800	0	-75	0	-	-	-	-	-
800	1000	0	-100	-	-	-	-	-	-

Note(1): Standard precision of the inside diameter of CH series is class 0. For higher precision, please contact WON ST.
Note(2): dm is the mean value between the max diameter and min diameter of the 2-point measurement values of bearing inside diameter.
Note(3): In case of no indication of precision class, the highest of the low precision classes is applied.

Table 14. Dimensional tolerance of the outside diameter of bearing

Unit : μm

Nominal dimension (mm) of the inside diameter (d) of bearing		Tolerance of dm Note (2)							
		0,P6,P5,P4,P2,WUP		PE6		PE5		PE4, PE2	
Above	Below	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
30	50	0	-11	0	-9	0	-7	0	-6
50	80	0	-13	0	-11	0	-9	0	-7
80	120	0	-15	0	-13	0	-10	0	-8
120	150	0	-18	0	-15	0	-11	0	-9
150	180	0	-25	0	-18	0	-13	0	-10
180	250	0	-30	0	-20	0	-15	0	-11
250	315	0	-35	0	-25	0	-18	0	-13
315	400	0	-40	0	-28	0	-20	0	-15
400	500	0	-45	0	-33	0	-23	-	-
500	630	0	-50	0	-38	0	-28	-	-
630	800	0	-75	0	-45	0	-35	-	-
800	1000	0	-100	-	-	-	-	-	-

Note(1): Standard precision of the inside diameter of CH series is class 0. For higher precision, please contact WON ST.
Note(2) : dm is the mean value between the max diameter and min diameter of the 2-point measurement values of bearing outside diameter
Note(3): In case of no indication of precision class, the highest of the low precision classes is applied.

Table 15. Tolerance of the inner & outer ring width of CB Series

Unit : μm

Model No.	Tolerance of B1	
	Max.	Min.
CH42	0	-75
CH66	0	-75
CH85	0	-75
CH124	0	-75
CH148	0	-75
CH178	0	-100
CH228	0	-100
CH297	0	-100
CH445	0	-150

Table 15. Tolerance of the inner & outer ring width of CB Series

Unit : μm

Nominal dimension (mm) of the inside diameter (d) of bearing		Tolerance of B1 Applied to the inner ring of CB		Tolerance of B1 Applied to the outer ring of CB	
Above	Below	Max.	Min.	Max.	Min.
18	30	0	-75	0	-100
30	50	0	-75	0	-100
50	80	0	-75	0	-100
80	120	0	-75	0	-100
120	150	0	-100	0	-120
150	180	0	-100	0	-120
180	250	0	-100	0	-120
250	315	0	-120	0	-150
315	400	0	-150	0	-200
400	500	0	-150	0	-200
500	630	0	-150	0	-200
630	800	0	-150	0	-200
800	1000	0	-300	0	-400

11 Precision Specification of WUP-class Series

1. Rotational precision of WUP-class series (example)

WUP-class Series has higher rotational precision than those of ISO Class2, KS 2, DIN P2, AFBMA ABCE9, and JIS2.

2. Precision specification

The runout precision of CH, CB and WUP-class crossed roller bearing series is based on the Table 17 and Table 18.

Table 17. Runout precision of CH and WUP-class series Unit : μm

Model No.	Runout precision of the inner ring of CH series		Runout precision of the outer ring of CH series	
	Radial runout tolerance	Axis runout tolerance	Radial runout tolerance	Axis runout tolerance
CH42	2	2	3	3
CH66	2	2	3	3
CH85	2	2	3	3
CH124	2	2	3	3
CH148	2	2	4	4
CH178	2	2	4	4
CH228	2.5	2.5	4	4
CH297	3	3	5	5
CH445	4	4	7	7

Table 18. Runout precision of CB and WUP-class series Unit : μm

Nominal dimensions (mm) of the inner diameter (d) and outside diameter (D)		Runout precision of the inner ring of CB series	
Above	Below	Radial runout tolerance	Axis runout tolerance
80	180	2.5	2.5
180	250	3	3
250	315	4	4
315	400	4	4
400	500	5	5
500	630	6	6
630	800	-	-

12 Radial Clearance

The radial clearance of CH, CB, and CA series is shown in the following tables

Table 19. Radial clearance of CH series Unit : μm

Model No.	G_3		G_2	
	Starting torque (N•m)		Radial clearance (μm)	
	Min.	Max.	Min.	Max.
CH42	0.1	0.5	0	25
CH66	0.3	2.2	0	30
CH85	0.4	3	0	40
CH124	1	6	0	40
CH148	1	10	0	40
CH178	3	15	0	50
CH228	5	20	0	60
CH297	10	35	0	70
CH445	20	55	0	100

Note: G3 clearance of CH series is controlled by starting torque, and the starting torque of G3 clearance has no seal resistance.

Table 20. Radial clearance of CB and WUP-class series Unit : μm

Pitch circle diameter of roller (dp) (mm)		G_3		G_2	
Above	Below	Min.	Max.	Min.	Max.
120	160	-10	0	0	40
160	200	-10	0	0	50
200	250	-10	0	0	60
250	280	-15	0	0	80
280	315	-15	0	0	100
315	355	-15	0	0	110
355	400	-15	0	0	120
400	500	-20	0	0	130
500	560	-20	0	0	150
560	630	-20	0	0	170
630	710	-20	0	0	190

Table 21. Radial clearance of CB series

Unit : μm

Pitch circle diameter of roller (dp) (mm)		G3		G2		G1	
Above	Below	Min.	Max.	Min.	Max.	Min.	Max.
18	30	-8	0	0	15	15	35
30	50	-8	0	0	25	25	50
50	80	-10	0	0	30	30	60
80	120	-10	0	0	40	40	70
120	140	-10	0	0	40	40	80
140	160	-10	0	0	40	40	90
160	180	-10	0	0	50	50	100
180	200	-10	0	0	50	50	110
200	225	-10	0	0	60	60	120
225	250	-10	0	0	60	60	130
250	280	-15	0	0	80	80	150
280	315	-15	0	30	100	100	170
315	355	-15	0	30	110	110	190

Unit : μm

Pitch circle diameter of roller (dp) (mm)		G3		G2		G1	
Above	Below	Min.	Max.	Min.	Max.	Min.	Max.
355	400	-15	0	30	120	120	210
400	450	-20	0	30	130	130	230
450	500	-20	0	30	130	130	250
500	560	-20	0	30	150	150	280
560	630	-20	0	40	170	170	310
630	710	-20	0	40	190	190	350
710	800	-30	0	40	210	210	390
800	900	-30	0	40	230	230	430
900	1000	-30	0	50	260	260	480
1000	1120	-30	0	60	290	290	530
1120	1250	-30	0	60	320	320	580
1250	1400	-30	0	70	350	350	630

Table 22. Radial clearance of CA series

Unit : μm

Pitch circle diameter of roller (dp) (mm)		G3		G2	
Above	Below	Min.	Max.	Min.	Max.
50	80	-8	0	0	15
80	120	-8	0	0	15
120	140	-8	0	0	15
140	160	-8	0	0	15
160	180	-10	0	0	20
180	200	-10	0	0	20
200	225	-10	0	0	20

13 Dimensions of Crossed Roller Bearing

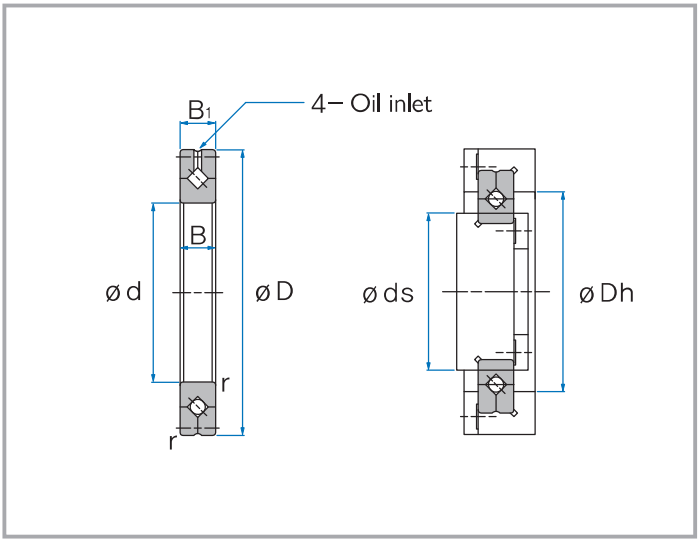
1. CB Series

Composition of Model Name & Number

CB3010	UU	G2	P5	E
1	2	3	4	5

1. Model No.
2. No symbol- No seal / UU- Two-side seal / U- One-side seal
3. Symbol of clearance: G_1–Normal preload / G_2–Light preload / G_3-Heavy preload / G_S–Special preload
4. Symbol of precision: No symbol–Moderate / H6–High / P4–Super Precision / P2–Ultra Precision
5. No symbol–Standard product /E-special specification

- Standard type, The structure inner ring rotation and outer ring separation



Unit : mm

Shaft diameter	Model No.	Major dimensions							Assembly dimensions		Basic load rating (radial)		Mass
		Inner diameter d	Outside diameter D	Pitch circle diameter of roller dp	Width B B_1	Oil inlet a	Oil inlet b	r min	ds max	Dh min	C kN	C_0 kN	kg
20	CB 2008	20	36	27	8	2	0.8	0.5	23.5	30.5	3.23	3.1	0.04
25	CB 2508	25	41	32	8	2	0.8	0.5	28.5	35.5	3.63	3.83	0.05
30	CB 3010	30	55	41.5	10	2.5	1	0.6	37	47	7.35	8.36	0.12
35	CB 3510	35	60	46.5	10	2.5	1	0.6	41	51.5	7.64	9.12	0.13
40	CB 4010	40	65	51.5	10	2.5	1	0.6	47.5	57.5	8.33	10.6	0.16
45	CB 4510	45	70	56.5	10	2.5	1	0.6	51	61.5	8.62	11.3	0.17
50	CB 5013	50	80	64	13	2.5	1.6	0.6	57.4	72	16.7	20.9	0.27
60	CB 6013	60	90	74	13	2.5	1.6	0.6	68	82	18	24.3	0.3
70	CB 7013	70	100	84	13	2.5	1.6	0.6	78	92	19.4	27.7	0.35
80	CB 8016	80	120	98	16	3	1.6	0.6	91	111	30.1	42.1	0.7
90	CB 9016	90	130	108	16	3	1.6	1	98	118	31.4	45.3	0.75
100	CB 10016	100	140	119.3	16	3.5	1.6	1	109	129	31.7	48.6	0.83
	CB 10020		150	123	20	3.5	1.6	1	113	133	33.1	50.9	1.45
110	CB 11012	110	135	121.8	12	2.5	1	0.6	117	127	12.5	24.1	0.4
	CB 11015		145	126.5	15	3.5	1.6	0.6	122	136	23.7	41.5	0.75
	CB 11020		160	133	20	3.5	1.6	1	120	143	34	54	1.56

Unit : mm

Shaft diameter	Model No.	Major dimensions							Assembly dimensions		Basic load rating (radial)		Mass
		Inner diameter d	Outside diameter D	Pitch circle diameter of roller dp	Width B B_1	Oil inlet a	Oil inlet b	r min	ds max	Dh min	C kN	C_0 kN	kg
120	CB 12016	120	150	134.2	16	3.5	1.6	0.6	127	141	24.2	43.2	0.72
	CB 12025		180	148.7	25	3.5	2	1.5	133	164	66.9	100	2.62
130	CB 13015	130	160	144.5	15	3.5	1.6	0.6	137	152	25	46.7	0.72
	CB 13025		190	158	25	3.5	2	1.5	143	174	69.5	107	2.82
140	CB 14016	140	175	154.8	16	2.5	1.6	1	147	162	25.9	50.1	1
	CB 14025		200	168	25	3.5	2	1.5	154	185	74.8	121	2.96
150	CB 15013	150	180	164	13	2.5	1.6	0.6	157	172	27	53.5	0.68
	CB 15025		210	178	25	3.5	2	1.5	164	194	76.8	128	3.16
	CB 15030		230	188	30	4.5	3	1.5	173	211	100	156	5.3
160	CB 16025	160	220	188.6	25	3.5	2	1.5	173	204	81.7	135	3.14
170	CB 17020	170	220	191	20	3.5	1.6	1.5	184	198	29	62.1	2.21
180	CB 18025	180	240	210	25	3.5	2	1.5	195	225	84	143	3.44
190	CB 19025	190	240	211.9	25	3.5	1.6	1	202	222	41.7	82.9	2.99
200	CB 20025	200	260	230	25	3.5	2	2	215	245	84.2	157	4
	CB 20030		280	240	30	4.5	3	2	221	258	114	200	6.7
	CB 20035		295	247.7	35	5	3	2	225	270	151	252	9.6
220	CB 22025	220	280	250.1	25	3.5	2	2	235	265	92.3	171	4.1
240	CB 24025	240	300	269	25	3.5	2	2.5	256	281	68.3	145	4.5
250	CB 25025	250	310	277.5	25	3.5	2	2.5	265	290	69.3	150	5
	CB 25030		330	287.5	30	4.5	3	2.5	269	306	126	244	8.1
	CB 25040		355	300.7	40	6	3.5	2.5	275	326	195	348	14.8
300	CB 30025	300	360	328	25	3.5	2	2.5	315	340	76.3	178	5.9
	CB 30035		395	345	35	5	3	2.5	322	368	183	367	13.4
	CB 30040		405	351.6	40	6	3.5	2.5	326	377	212	409	17.2
350	CB 35020	350	400	373.4	20	3.5	1.6	2.5	363	383	54.1	143	3.9
400	CB 40035	400	480	440.3	35	5	3	2.5	422	459	156	370	14.5
	CB 40040		510	453.4	40	6	3.5	2.5	428	479	241	531	23.5
450	CB 45025	450	500	474	25	3.5	1.6	1	464	484	61.7	182	6.6
500	CB 50025	500	550	524.2	25	3.5	1.6	1	514	534	65.5	201	7.3
	CB 50040		600	548.8	40	6	3	2.5	526	572	239	607	26
	CB 50050		625	561.6	50	6	3.5	2.5	536	587	267	653	41.7
600	CB 60040	600	700	650	40	6	3	3	627	673	264	721	29
700	CB 70045	700	815	753.5	45	6	3	3	731	777	281	836	46
800	CB 80070	800	950	868.1	70	6	4	4	836	900	468	1330	105
900	CB 90070	900	1050	969	70	6	4	4	937	1001	494	1490	120

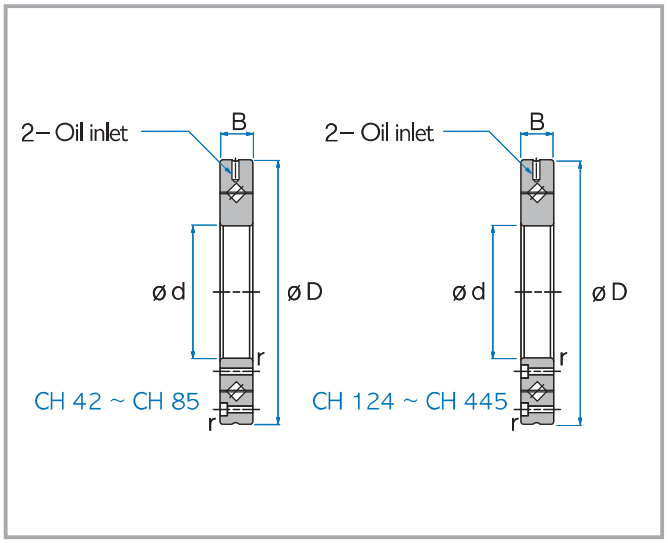
2. CH Series

Composition of Model Name & Number

CH124	G	UU	G2	P5	E
1	2	3	4	5	6

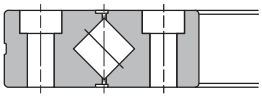
1. Model No.
2. Shape: No symbol-The same direction of counterbore / G-Opposite direction of counterbore/ X-inner ring tap hole
3. No symbol- No seal / UU- Two-side seal / U- One-side seal (one-side seal of the counterbore of outer ring)/UT-One-side seal (the opposite of the counterbore of outer ring)
4. Symbol of clearance: G_1–Normal preload / G_2–Light preload / G_3-Heavy preload / G_S–Special preload
5. Symbol of precision: No symbol–Moderate / H6–High / P4–Super Precision / P2–Ultra Precision
6. No symbol–Standard product /E-special specification

- High-rigidity type, Integral structure of the inner and outer rings

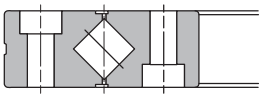


Unit : mm

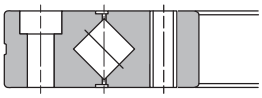
Shaft diameter	Model No.	Major dimensions						Assembly dimensions		Basic load rating (radial)		Mass
		Inner diameter d	Outside diameter D	Pitch circle diameter of roller dp	Width B	Oil inlet d_1	r min	ds max	Dh min	C kN	C_0 kN	kg
20	CH 42	20	70	41.5	12	3.1	0.6	37	47	7.35	8.35	0.29
35	CH 66	35	95	66	15	3.1	0.6	59	74	17.5	22.3	0.62
55	CH 85	55	120	85	15	3.1	0.6	79	93	20.3	29.5	1
80	CH 124(G)	80	165	124	22	3.1	1	114	134	33.1	50.9	2.6
	CH 124X											
90	CH 148(G)	90	210	147.5	25	3.1	1.5	133	162	49.1	76.8	4.9
	CH 148X											
115	CH 178(G)	115	240	178	28	3.1	1.5	161	195	80.3	135	6.8
	CH 178X											
160	CH 228(G)	160	295	227.5	35	6	2	208	246	104	173	11.4
	CH 228X											
210	CH 297(G)	210	380	297.3	40	6	2.5	272	320	156	281	21.3
	CH 297X											
350	CH 445(G)	350	540	445.4	45	6	2.5	417	473	222	473	35.4
	CH 445X											



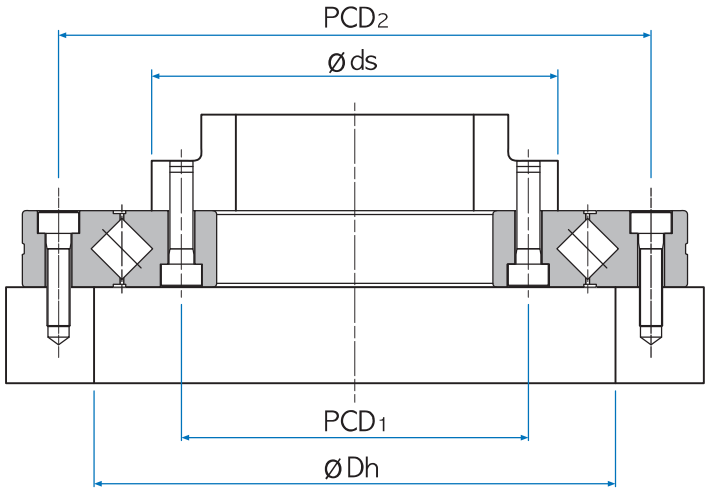
CH 124 ~ CH 445



CH 124G ~ CH 445G



CH 124X ~ CH 445X



Unit : mm

Shaft diameter	Model No.	Inner ring		Outer ring	
		PCD 1	Mounting hole	PCD 2	Mounting hole
20	CH 42	28	6-M3 penetrated	57	6-ø3.4 penetrated, ø6.5 counterbore depth 3.3
35	CH 66	45	8-M4 penetrated	83	8-ø4.5 penetrated, ø8 counterbore depth 4.4
55	CH 85	65	8-M5 penetrated	105	8-ø5.5 penetrated, ø9.5 counterbore depth 5.4
80	CH 124(G)	97	10-ø5.5 penetrated, ø9.5 counterbore depth 5.4	148	10-ø5.5 penetrated, ø9.5 counterbore depth 5.4
	CH 124X		10-M5 penetrated		
90	CH 148(G)	112	12-ø9 penetrated, ø14 counterbore depth 8.6	187	12-ø9 penetrated, ø14 counterbore depth 8.6
	CH 148X		12-M8 penetrated		
115	CH 178(G)	139	12-ø9 penetrated, ø14 counterbore depth 8.6	217	12-ø9 penetrated, ø14 counterbore depth 8.6
	CH 178X		12-M8 penetrated		
160	CH 228(G)	184	12-ø11 penetrated, ø17.5 counterbore depth 10.8	270	12-ø11 penetrated, ø17.5 counterbore depth 10.8
	CH 228X		12-M10 penetrated		
210	CH 297(G)	240	16-ø14 penetrated, ø20 counterbore depth 13	350	16-ø14 penetrated, ø20 counterbore depth 13
	CH 297X		16-M12 penetrated		
350	CH 445(G)	385	24-ø14 penetrated, ø20 counterbore depth 13	505	24-ø14 penetrated, ø20 counterbore depth 13
	CH 445X		24-M12 penetrated		

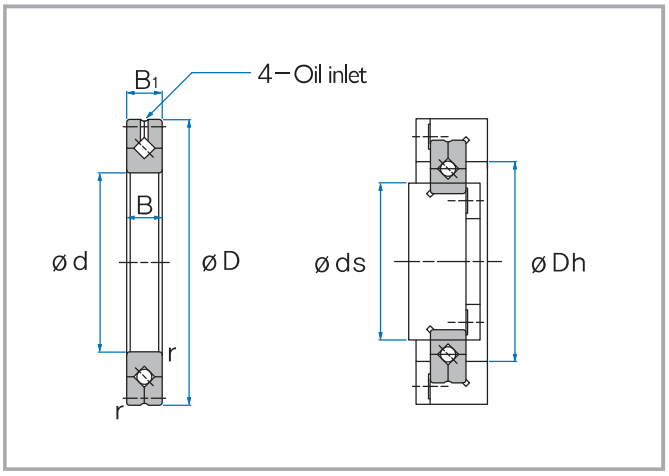
3. CA Series

Composition of Model Name & Number

CA5008	UU	G_2	P5	E
1	2	3	4	5

1. Model No.
2. No symbol- No seal / UU- Two-side seal / U- One-side seal
3. Symbol of clearance: G_1–Normal preload / G_2–Light preload / G_3-Heavy preload / G_S–Special preload
4. Symbol of precision: No symbol–Moderate / H6–High / P4–Super Precision / P2–Ultra Precision
5. No symbol–Standard product /E-special specification

- Slim type, The structure inner ring rotation and outer ring separation



Unit : mm

Shaft diameter	Model No.	Major dimensions							Assembly dimensions		Basic load rating (radial)		Mass
		Inner diameter d	Outside diameter D	Pitch circle diameter of roller dp	Width B B1	Oil inlet a	Oil inlet b	rmin	ds (max)	Dh (min)	C kN	C0 kN	kg
50	CA 5008	50	66	57	8	2	0.8	0.5	53.5	60.5	5.1	7.19	0.08
60	CA 6008	60	76	67	8	2	0.8	0.5	63.5	700.5	5.68	8.68	0.09
70	CA 7008	70	86	77	8	2	0.8	0.5	73.5	80.5	5.98	9.8	0.1
80	CA 8008	80	96	87	8	2	0.8	0.5	83.5	90.5	6.37	11.3	0.11
90	CA 9008	90	106	97	8	2	0.8	0.5	93.5	100.5	6.76	12.4	0.12
100	CA 10008	100	116	107	8	2	0.8	0.5	103.5	110.5	7.15	13.9	0.14
110	CA 11008	110	126	117	8	2	0.8	0.5	113.5	120.5	7.45	15	0.15
120	CA 12008	120	136	127	8	2	0.8	0.5	123.5	130.5	7.84	16.5	0.17
130	CA 13008	130	146	137	8	2	0.8	0.5	133.5	140.5	7.94	17.6	0.18
140	CA 14008	140	156	147	8	2	0.8	0.5	143.5	150.5	8.33	19.1	0.19
150	CA 15008	150	166	157	8	2	0.8	0.5	153.5	160.5	8.82	20.6	0.2
160	CA 16013	160	186	172	13	2.5	1.6	0.8	165	179	23.3	44.9	0.59
170	CA 17013	170	196	182	13	2.5	1.6	0.8	175	189	23.5	46.5	0.64
180	CA 18013	180	206	192	13	2.5	1.6	0.8	185	199	24.5	49.8	0.68
190	CA 19013	190	216	202	13	2.5	1.6	0.8	195	209	24.9	51.5	0.69
200	CA 20013	200	226	212	13	2.5	1.6	0.8	205	219	25.8	54.7	0.71

14 Precautions for Handling Crossed Roller Bearing

1. If the assembly part for installation fails to have sufficient rigidity, the contact part of the rollers has intensive stress that severely degrades the performance of a bearing. In an environment with large moment, it is required to evaluate the rigidity of housing and bolts in the process of design.

2. Some parts of a crossed roller bearing are made of special synthetic rubber and synthetic resin. For the use at above 80°C, please contact WONST.

3. It is required to manage dimensional tolerance of assembly parts according to standards in order to make the inner and outer rings in tight contact with the sides.

4. A crossed roller bearing may be damaged by its fall or hit. Any impact to the bearing may cause functional loss even if there is no damage to its appearance. Be careful to handle the product.

5. If foreign substances flow in a crossed roller bearing, they may cause its functional loss. It is required to take measures to prevent cutting chips or dust from intruding in the device.

6. A crossed roller bearing is already filled with lithium soap grease at the time of shipment. So, it can be used without refilling at the time of assembly. It is necessary to connect a lubrication hole with the oil inlet of the inner or outer ring. Regardless of rotation frequency, it is required to refill enough not for a lubricant to ooze out in the cycle of six months to one year.

7. Avoid lubricants with different thickeners or additives, if possible.

8. If you need to use the product in a place with impact or vibration load, in cleanroom, or in a special environment with vacuum, low temperature, or high temperature. please contact WON ST.