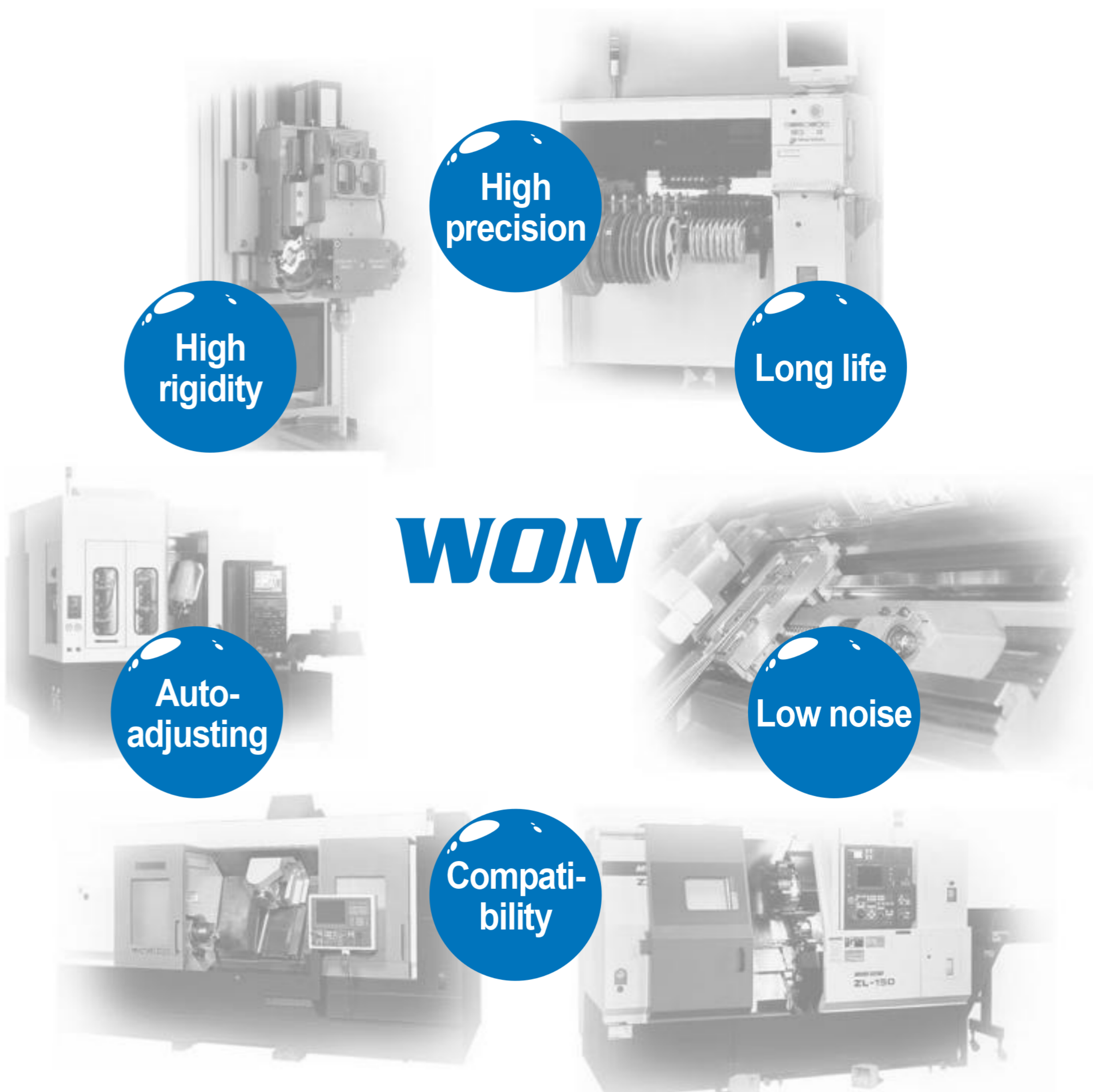
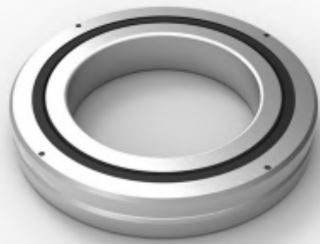
High-quality High-performance
WON Linear Motion Guide

WON ST Linear Motion Guide is a four-row circular face-to-face duplex structure and a 4-direction equal load type which is excellent in bearing high load with high rigidity as well as compatibility between a rail and a block, and allows smooth and precise operation.



Crossed Roller Bearing

CB



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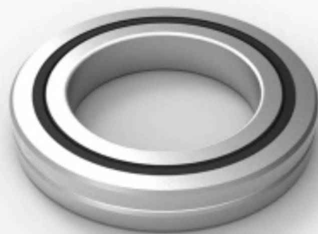
CH



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CA

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CS

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Crossed Roller Bearing
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Crossed Roller Bearing
Contents

1 Structure and characteristic of Crossed Roller Bearing

1. Structure

WON Crossed Roller Bearing has the structure having rolling surface with V-grooved inner & outer ring which is crossed with roller and a spacer-type retainer between rollers reduces the friction between rollers so as to prevent rotational torque from increasing. It's a compact type for convenient use.

2. Characteristics

As roller is assembled to rolling surface of inner & outer ring of Crossed Roller Bearing, it reduces the elastic displacement by external load and accommodates the complex load including radial load, axial load and moment load and using spacer retainer avoids uneven wear by roller on inclined surface or uneven contact as well as hitching but helps rolling smoothly and it's a high precision and high stiffness type which allows pre-load depending surrounding environment.

3. Use

It's optimal to the use requiring complex load and high stiffness.
The uses are industrial robot, machine tool index table, ATC, medical equipment, precise alignment stage, semiconductor manufacture equipment, DD motor and others

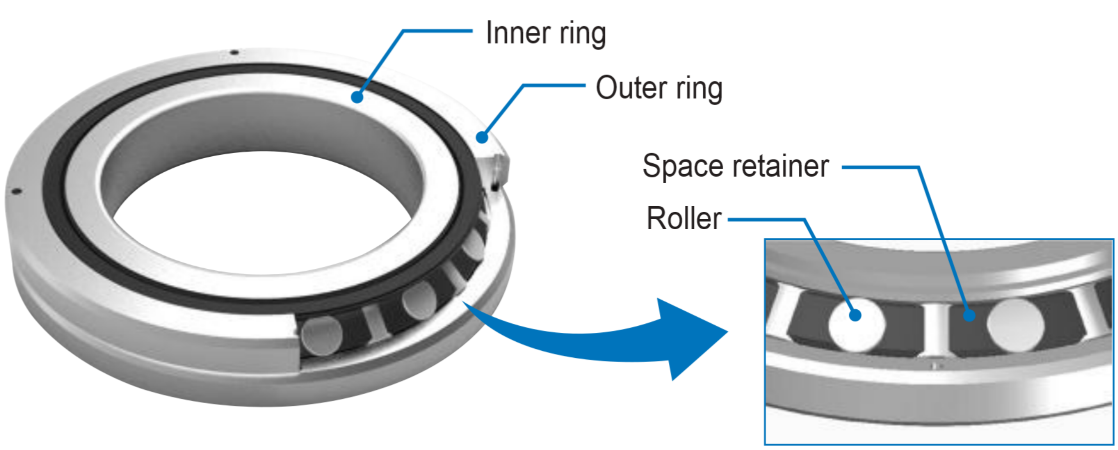


Fig 1. Structure of Crossed Roller Bearing

2 Kind of Crossed Roller Bearing

1. CB series of revolving inner ring.

1) Inner ring of Crossed Roller Bearing is integral type while outer ring is separable to upper and lower part which is bolted for easy handling
2) It's used for the part requiring inner ring rotating such as index table of machine tool or joint or turning part of industrial robot

2. High stiffness CH series

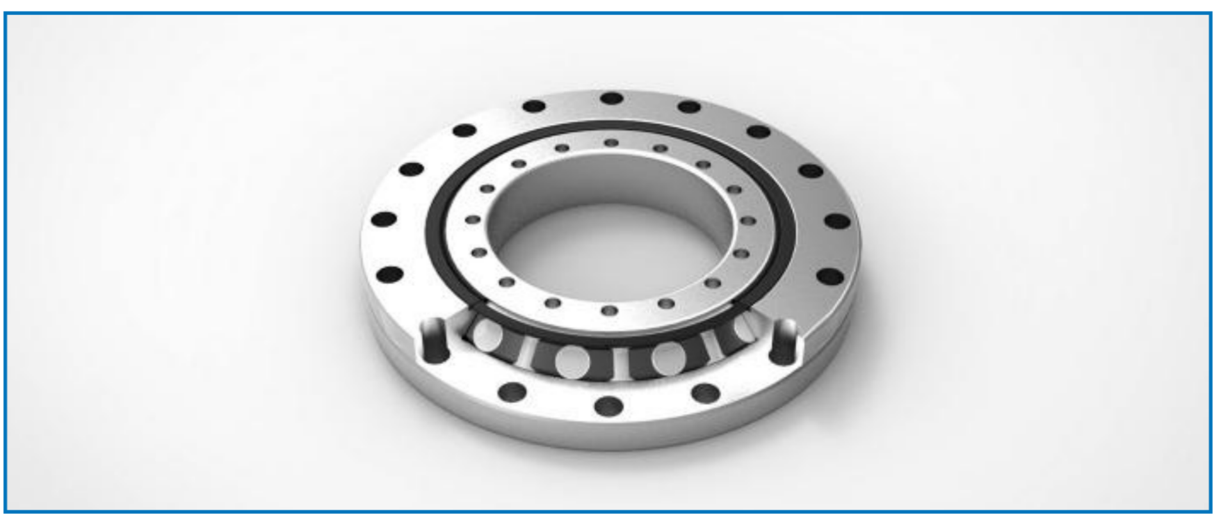
1) Inner & outer ring are integral, high precision and high stiffness type with less installation error which leads to stable running accuracy
2) It's used for the part requiring inner & outer ring rotating simultaneously or independently

3. CA series of slim-typed revolving inner ring

1) Inner ring of crossed roller bearing is slim-compact type while outer ring is separable to upper and lower part which is bolted for easy handling.
2) It is used for the part requiring inner ring rotating such as index table of machine tool or joint or turning part of industrial robot.

4. CS series for customized special type

1) It's customized to meet customer's own requirements in shape, dimension and material of inner & outer ring and bolt dimension.



3 Selection of Crossed Roller Bearing

1. Selection summary

After identifying the requirements specifically, the priority shall be determined considering the needs and then the optimal type shall be selected

2. Selection sequence

1 Determination of the needs	Equipment to be used, requirements, environment, precision, stiffness, service life and others
2 Selection of the type	Integral type, separable inner ring, separable outer ring, normal, high stiffness
3 Load calculation	Supporting load including radial load, axial load, moment load and dynamic equivalent load
4 Calculation of rating service life	Calculation of rating service life
5 Calculation of static safety factor	Static safety factor considering equipment characteristic and external load
6 Determination of stiffness and pre-load	Determination of clearance and pre-load considering kinetic condition and rotation accuracy
7 Accuracy level	Determination of accuracy level considering rotation accuracy and assembly accuracy
8 Determination of lubrication	Determination of lubrication such as oil, grease or special lubricant

9 Final determination

4 Nominal numbering

Numbering system of Crossed Roller Bearing manufactured by WON comprises of model, inner/outer ring size, seal, preload and grade symbol. See the following example for details.

CH124	G	Blank	UU	G_2	P_5	F
Part No.	Form		Seal	Pre-load	Accuracy Grade	Additional symbols

Seal	Pre-load	Accuracy Grade	Additional symbols
UU : Normal Type - Radial Contact Type	G_3 : Heavy load	No symbol : Normal	F : Raydent
LL : Normal Type - Face Contact Type	G_2 : Light load	P6 : High	N : Nipple
DD : Special Type - Special Heavy Duty Seal Type	G_1 : Normal load	P5 : Accurate	
	G_S : Special load	P4 : Highly Accurate	
		P2 : Extremely Accurate	

5 Calculation of service life

1. Rated service life

You can calculate the rated service life of Crossed Roller Bearing by using the formula below.

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

service life time

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

L : rated service life
C : basic dynamic rated load(N)
P_C : dynamic equivalent radial load (N)
f_T : temperature factor
f_W : load factor
L_h : service life time(h)
N : rpm

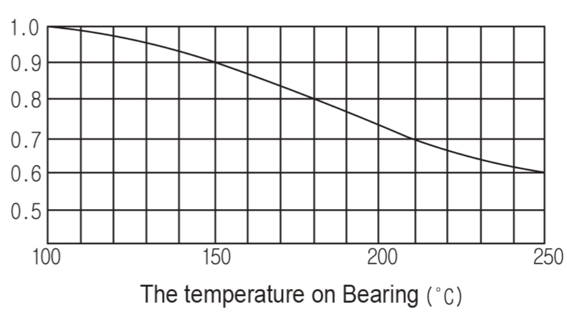


Fig 2. Temperature factor

* Note : workable temperature is 80℃ or below When the temperature is more than above, please contact WON ST

2. Calculation of service life under heaving operation condition

Bearing service life under heaving 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 bearing heaving frequency under heaving operation

θ : heaving angle (see Fig)

P_c : dynamic equivalent radial load

※ when Ø is small, oil film can hardly be formed on contact surface between orbital plane and rotating body so 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 (seg)

(※see Fig on right)

n_o : number of reciprocating motion (min^{-1})

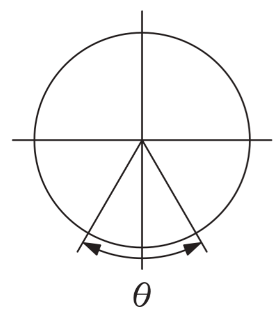


Fig 3.

3. Static safety factor(f_s)

Static safety factor of Crossed Roller Bearing is calculated as follows.
Please see Table 1 for static safety factor in general

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

f_s : static safety factor
C_0 : basic static rated load (N)
P_0 : static equivalent radial load (maximum load) (N)

Table 1 static safety factor (fs)

Working condition	fs Lower bound
Requires high running accuracy	≥ 3
When using under normal operation condition	≥ 2
Few rotation under normal operation condition and smooth operation is less important	≥ 1

4. Static equivalent load (P_0)

Static equivalent load of Crossed Roller Bearing is calculated as follows

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

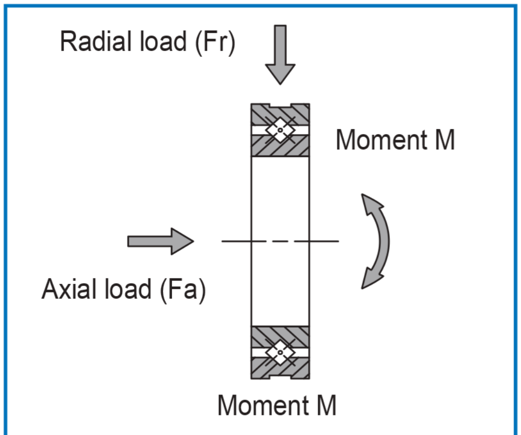


Fig 4. Bearing load

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 ($D_{PW} \fallingdotseq \frac{d+D}{2}$)

5. Dynamic equivalent radial load (P_c)

Dynamic equivalent radial load of Crossed Roller Bearing is calculated using following equation

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

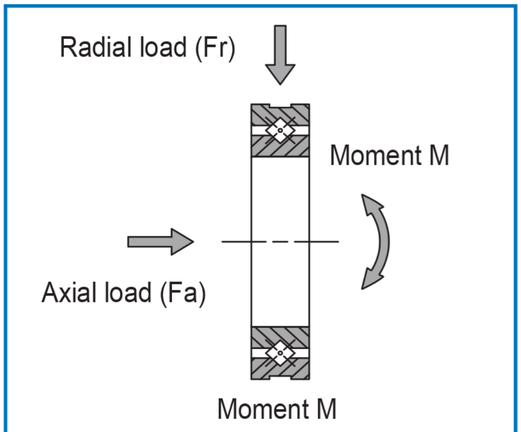


Fig 5.

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 ($D_{PW} \fallingdotseq \frac{d+D}{2}$)

Table 2. Radial load factor and axial load factor

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

6. Load factor (f_W)

When using Crossed Roller Bearing, the load imposed on bearing by vibration and impact during operation is often greater than calculated load. Thus flowing load factors need to be considered when selecting the bearing.

Table 3. Load factor(f_W)

Load condition	fw
Smooth condition without impact	1 ~ 1.2
Normal condition	1.2 ~ 1.5
Vibration and impact load together during operation	1.5 ~ 3

7. Temperature factor (f_T)

The temperature factor is shown in the following graph.

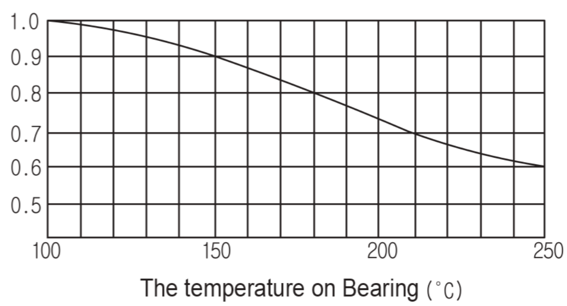


Fig 2. Temperature factor

* Note : workable temperature is 80℃ or below When the temperature is more than above, please contact WON ST

6 Static load

1. Basic dynamic rated load (C)

It refers to radial load with a constant size and direction which is able to rotate a million times with more than 90% proved no flaking occurred due to rolling fatigue when driving a bearing group comprising a number of same crossed roller bearing

2. Basic static rated load (C_0)

It refers to the static radial load which imposes a certain level of contact stress on center of contact part of revolving body and orbital plane exposed to maximum load

7 Permissible rpm

Please see the following table for permissible rpm
But permissible rpm may vary depending on assembly and working condition

Table 4. Permissible rpm of Crossed Roller Bearing (dm·n)

Bearing \ Classification	Seal	Grease	Oil
Bearing	No seal	75,000	150,000
Spacer retainer	Both seals	60,000	-

※ dm·n = dm x n
dm : mean value of bearing inner and outer ring (mm)
n : rpm

8 Lubrication

Grease lubrication is commonly used for Crossed Roller Bearing and lubricant is injected through oil inlet.
Albanian EP2 grease is filled
Bearing without lubricant shall be filled with grease or oil prior to starting operation, otherwise, wearing is accelerated and service life is reduced.

9 Cautions in designing compression plate and housing

Crossed roller bearing is compact and slim and thus plate and housing stiffness and bolt torque shall be evaluated when designing the installation.
Should the stiffness of the plate or housing be insufficient, tight assembly of inner and outer ring would be difficult and deformation by moment load causes uneven contact and poor performance significantly.

1. Housing design for installation

Housing thickness shall be more than 60% of bearing section height

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

T : housing thickness
D : outer ring dimension
d : inner ring dimension

2. Tap for separation

Separation tap would help separate the inner & outer ring without damage to bearing

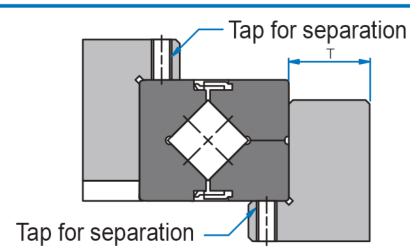


Fig 6.

3. Installation & assembly

Please see the Fig below for installation & assembly

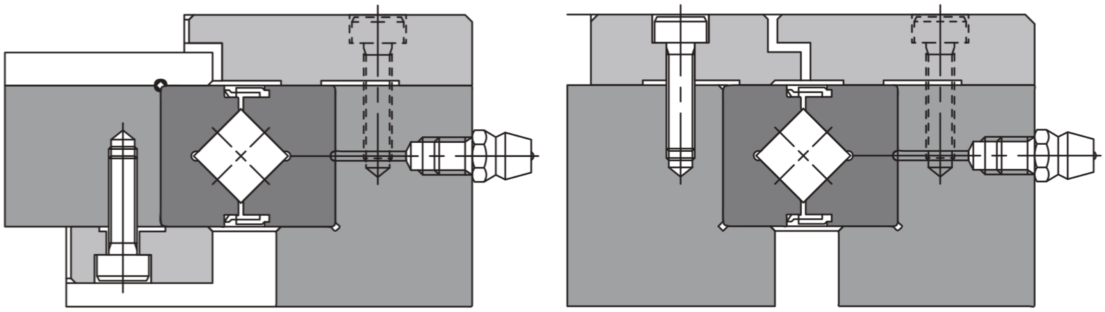


Fig 7. Example of installation and assembly

4. Selection of compression flange and bolt

The more compression bolt, the higher the stability. See Table 5 for layout
Please see the Table below for flange thickness (F) and gap (S)

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

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

$S = 0.5mm$

Bolts shall be tightened with appropriate torque to prevent them from loosened and when axis and housing are in a light alloy, steel shall be used.
When using common medium or hard steel, please refer to the Table below

Table 5. No and size of compression bolt Unit : mm

An external diameter of Outer ring(D)		Number of bolt	Bolt size
More	Less		
-	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 bolt Unit : N•m

Symbol	Clamping Torque	Symbol	Clamping Torque
M3	2	M8	30
M4	4	M10	70
M5	9	M12	120
M6	14	-	-

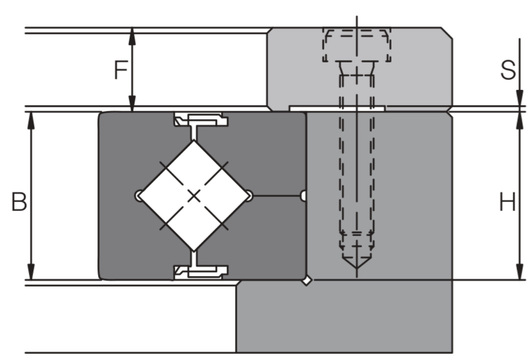


Fig 8.

※ Assembly sequence

Assembly sequence of Crossed Roller Bearing is as follows

1. Pre-inspection before assembly
Check to ensure no contaminant, scratch or sharp edge in housing or parts

2. Assembly of axis or housing
Because the bearing is compact type, it's easily inclined during assembly process and thus it shall be inserted gradually after making it horizontally balanced using plastic hammer and while hammering the circumference of outer ring till the part is set in place completely

3. Installation of compression flange
1) After putting the flange in place, it shall be assembled while checking the bolt if it's in right place
2) Bolt shall be tightened after confirming the bolts are in place accurately
3) Bolt shall be tightened over two to 5 stages from temporary tightening till complete tightening. In case that inner ring and outer ring are separated, check the position while turning the integral axis slowly and tighten the bolts over two to five stages gradually.

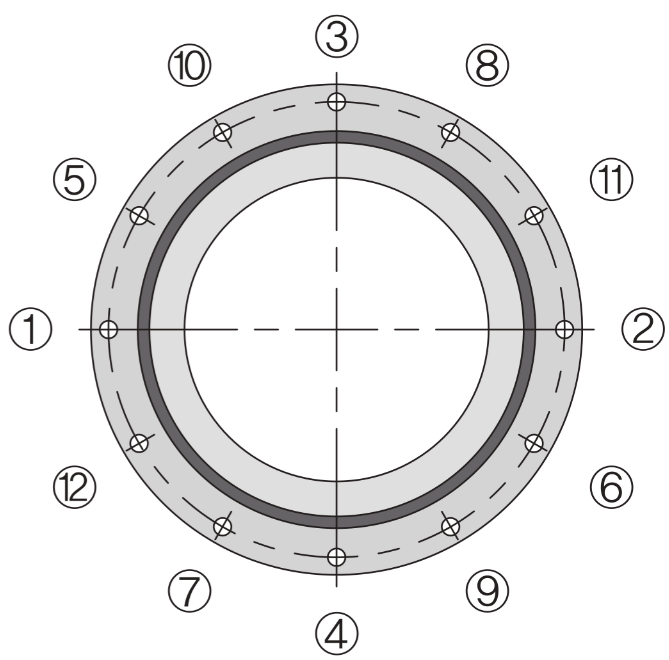


Fig 9.

10 Fitting

Please refer to the Table below for fitting

Table 7. Recommended fitting under average load

Radial Clearance	Tolerance range class			
	Load fixed to inner ring rotation		Load fixed to outer ring rotation	
	Shaft	Housing Bore	Shaft	Housing Bore
G_2 Clearance	h5	H7	g5	J7(1)
G_1 Clearance	j5	H7	g5	J7(1)

Note(1) small edge joint according to measured value is recommended

Table 8. Recommended fitting for normal gap of slip type

Bearing internal diameter (d) mm	Load fixed to inner ring rotation				Load fixed to outer ring rotation			
	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

11 Precision of Crossed Roller Bearing

Precision and tolerance of Crossed Roller Bearing are in accordance with Table 9 through 18.

Table 9. CH series inner ring rotation accuracy

Unit : ㎛

Part No.	Inner ring radial Runout			Inner ring axis Runout		
	Precision	High precision	Ultra high precision	Precision	High precision	Ultra high 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 rotation accuracy of CH series is P5

Table 10. CH series outer ring rotation accuracy

Unit : ㎛

Part No.	Outer ring radial Runout			Ourter ring axis Runout		
	Precision	High precision	Ultra high precision	Precision	High precision	Ultra high 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 rotation accuracy of CH series is P5

Table 11. CB series inner ring rotation accuracy

Unit : ㎛

Nominal dimension of bearing internal diameter(d)(mm)		Inner ring radial Runout					Inner ring axis Runout				
		0	PE6	PE5	PE4	PE2	0	PE6	PE5	PE4	PE2
Over	Below		P6	P5	P4	P2		P6	P5	P4	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. CA series inner ring rotation accuracy

Unit : ㎛

Nominal dimension of bearing internal diameter(d)(mm)		Radial swing axial Runout
Over	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 bearing internal diameter

Unit : ㎛

Nominal dimension of bearing internal diameter (d)(mm)		Tolerance of dm[note2)]							
		0, P6, P5, P4, P2, WUP		PE6		PE5		PE4, PE2	
Over	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 internal diameter of CH series is 0 class, Please contact WON ST for higher class
Note(2) : dm refers to mean value between max diameter and min diameter of 2 points of bearing
Note(3) : In case of no precision class indicated, the highest value of the low precision class is applied

Table 14. Dimensional tolerance of bearing external diameter

Unit : ㎛

Nominal dimension of bearing internal diameter (D)(mm)		Tolerance of Dm[note2)]							
		0, P6, P5, P4, P2, WUP		PE6		PE5		PE4, PE2	
Over	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 internal diameter of CH series is 0 class, Please contact WON ST for higher class
Note(2) : Dm refers to mean value between max diameter and min diameter of 2 points of bearing
Note(3) : In case of no precision class indicated, the highest value of the low precision class is applied

Table 15. Tolerance of inner & outer ring width of CH series

Unit : ㎛

Part No.	Tolerance of B	
	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 16. Tolerance of inner & outer ring width of CB series

Unit : ㎛

Nominal dimension of bearing internal diameter (d) (mm)		Tolerance of B		Tolerance of B_1	
		Applied to CB outer ring		Applied to CB inner ring	
Over	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

12 Precision of WUP class

1. Rotation accuracy of WUP class of Crossed Roller Bearing (example)

Precision of WUP class is in accordance with ISO Class 2, DIN P2, AFBMA, ABCE9 ad JIS 2 or greater

2. Precision standard

Swing precision of CH, CB and WUP series of Crossed Roller Bearing is in accordance with Table 17 & 18

Table 17. Swing precision of WUP class of CH series Unit : ㎛

Part No.	Inner ring swing precision of CH		Outer ring swing precision of CH	
	Radial swing tolerance	Axial swing tolerance	Radial swing tolerance	Axial swing 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. Swing precision of WUP class of CB series Unit : ㎛

Nominal dimension of bearing internal diameter (d) (mm) & external diameter (D) (mm)		Swing precision of inner ring of CB series	
Over	Below	Radial swing tolerance	Axial swing 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	-	-

13 Radial clearance

Radial clearance of CH series, CB series and CA series is as follows.

Table 19. Radial clearance of CH series Unit : ㎛

Part No.	G_3 Starting torque (N•m)		G_2 Radial clearance (㎛)	
	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 : G_3 clearance of CH series is controlled by starting torque and starting torque of G_3 clearance is in the status without seal resistance

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

Pitch Circle diameter of roller (dp)(mm)		G_3		G_2	
Over	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 : ㎛

Pitch Circle diameter of roller (dp)(mm)		G3		G2		G1	
Over	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 : ㎛

Pitch Circle diameter of roller (dp)(mm)		G3		G2		G1	
Over	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

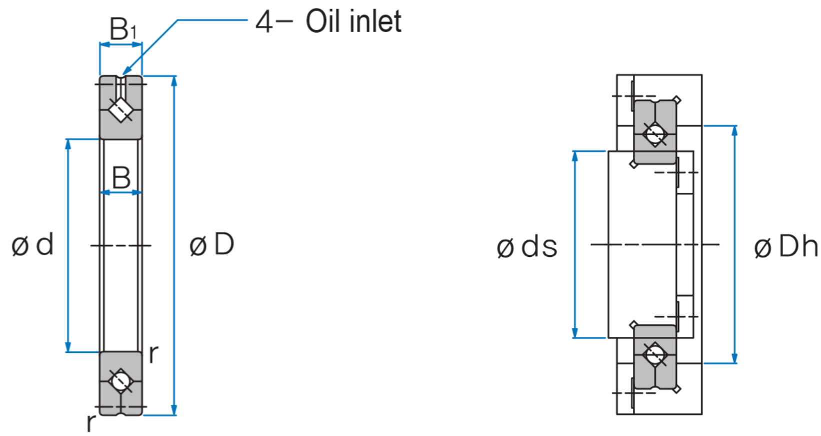
Unit : ㎛

Pitch Circle diameter of roller (dp)(mm)		G3		G2	
Over	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

14 Dimension of Crossed Roller Bearing

1. CB series

- Standard type, inner ring rotating outer ring separable structure



Unit : ㎜

Bore diameter	Part No.	Major dimension							Assembly size		Basic Load Rated(Radial)		Mass
		I/D d	O/D D	PCD dp	W B B1	Oil inlet a	Oil inlet b	r min	ds	Dh	C kN	C0 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
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

1N ≒ 0.102kgf

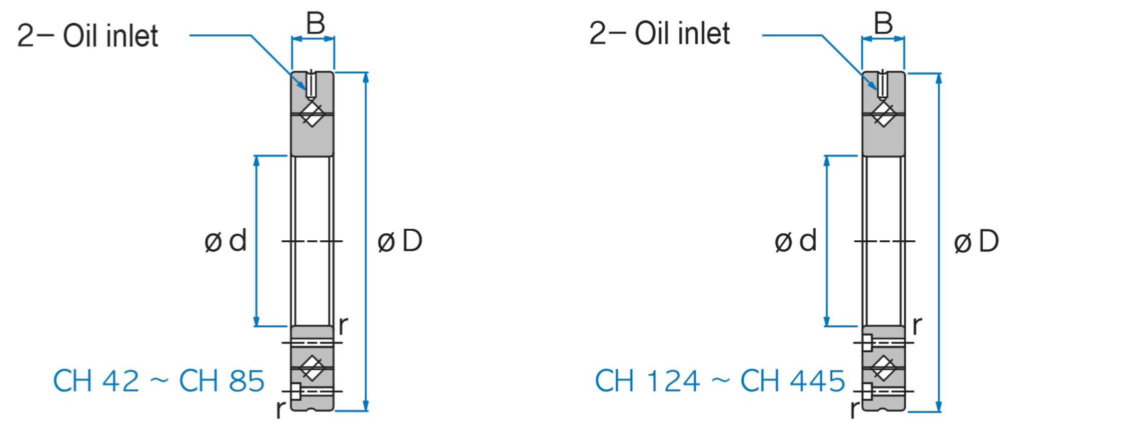
Unit : ㎜

Bore diameter	Part No.	Major dimension							Assembly size		Basic Load Rated(Radial)		Mass
		I/D d	O/D D	PCD dp	W B B1	Oil inlet a	Oil inlet b	r min	ds	Dh	C kN	Co kN	kg
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

1N ≒ 0.102kgf

2. CH series

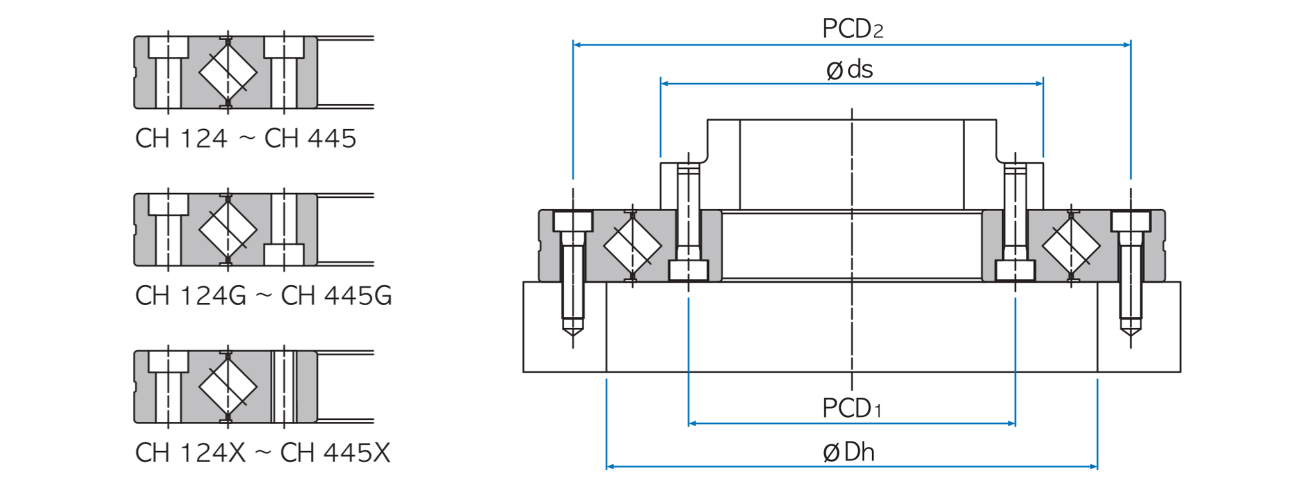
- High stiffness, inner & outer ring integrated structure



Unit : ㎜

Bore diameter	Part No.	Major dimension						Assembly size		Basic Load Rated(Radial)		Mass
		I/D d	O/D D	PCD dp	W B	Oil inlet d1	r min	ds	Dh	C kN	C0 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) CH 124X	80	165	124	22	3.1	1	114	134	33.1	50.9	2.6
90	CH 148(G) CH 148X	90	210	147.5	25	3.1	1.5	133	162	49.1	76.8	4.9
115	CH 178(G) CH 178X	115	240	178	28	3.1	1.5	161	195	80.3	135	6.8
160	CH 228(G) CH 228X	160	295	227.5	35	6	2	208	246	104	173	11.4
210	CH 297(G) CH 297X	210	380	297.3	40	6	2.5	272	320	156	281	21.3
350	CH 445(G) CH 445X	350	540	445.4	45	6	2.5	417	473	222	473	35.4

1N ≒ 0.102kgf



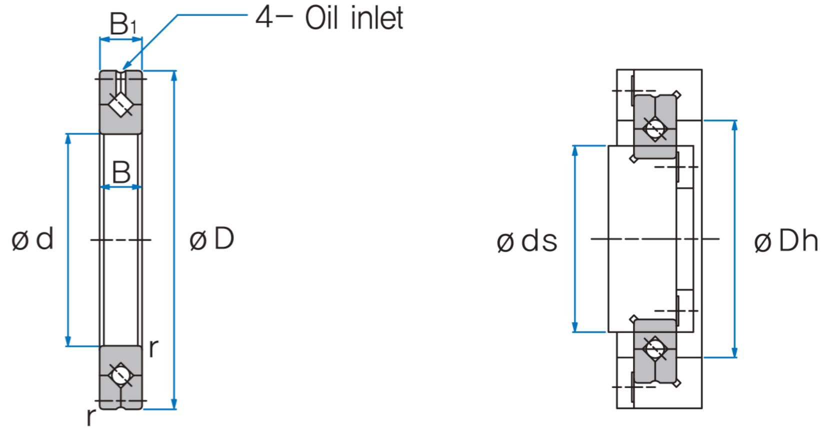
Unit : ㎜

Bore dia-meter	Part No.	Inner ring		Inner ring	
		PCD1	Fixing hole	PCD2	Fixing hole
20	CH 42	28	6-M3 penetrated	57	10-ø5.5 penetrated, ø9.5 counter bore, depth 5.4
35	CH 66	45	8-M4 penetrated	83	8-ø4.5 penetrated, ø8 counter bore, depth 4.4
55	CH 85	65	8-M5 penetrated	105	8-ø5.5 penetrated, ø9.5 counter bore, depth 5.4
80	CH 124(G)	97	10-ø5.5 penetrated, ø9.5 counter bore, depth 5.4	148	10-ø5.5 penetrated, ø9.5 counter bore, depth 5.4
	CH 124X		10-M5 penetrated		
90	CH 148(G)	112	12-ø9 penetrated, ø14 counter bore, depth 8.6	187	12-ø9 penetrated, ø14 counter bore, depth 8.6
	CH 148X		12-M8penetrated		
115	CH 178(G)	139	12-ø9 penetrated, ø14 counter bore, depth 8.6	217	12-ø9 penetrated, ø14 counter bore, depth 8.6
	CH 178X		12-M8 penetrated		
160	CH 228(G)	184	12-ø11 penetrated, ø17.5 counter bore, depth 10.8	270	12-ø11 penetrated, ø17.5 counter bore, depth 10.8
	CH 228X		12-M10 penetrated		
210	CH 297(G)	240	16-ø14 penetrated, ø20 counter bore, depth 13	350	16-ø14 penetrated, ø20 counter bore, depth 13
	CH 297X		16-M12 penetrated		
350	CH 445(G)	385	24-ø14 penetrated, ø20 counter bore, depth 13	505	24-ø14 penetrated, ø20 counter bore, depth 13
	CH 445X		24-M12 penetrated		

1N ≒ 0.102kgf

3. CA series

- Slim type, inner ring rotating outer ring separable structure



Unit : ㎜

Bore diameter	Part No.	Major dimension							Assembly size		Basic Load Rated(Radial)		Mass
		I/D d	O/D D	PCD dp	W B B1	Oil inlet a	Oil inlet b	r min	ds max	Dh min	C kN	Co kN	kg
50	CA 5008	50	66	57	8	2	0.8	0.5	53.5	60.5	5.1	7.19	0.08
50	CA 6008	60	76	67	8	2	0.8	0.5	63.5	70.5	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

1N≒0.102kgf

15 Cautions when handling Crossed Roller Bearing

1. Insufficient stiffness of the parts to be assembled causes the stress concentrated on contact surface between orbital plane and roller, thereby weakening the performance of the bearing. At the environment with greater moment, housing stiffness and bolt strength shall be thoroughly evaluated.

2. Special synthetic rubber and resin are included in the parts of Crossed Roller Bearing and thus please contact WON ST when using at 80℃ or higher temperature

3. Dimensional tolerance shall be in accordance with the requirements to ensure inner & out ring will be tightly contacted with the sides

4. Crossed roller bearing is vulnerable to impact by falling or striking and thus when exposed to impact, check carefully if any functional defect is found despite of no damage is visually found

5. Foreign material once penetrated into the bearing may cause the damage to function and thus protection the bearing from dust or cutting chip shall be provided.

6. Bearing when shipped out is filled with lithium grease and thus it may be used without filling grease. Oil inlet shall be designed to inject oil into inner & outer ring. Lubricant shall be injected at least every 6 months irrespective of working hours.

7. Additive or other lubricant needs to be avoided if possible

8. Please contact WON ST when using at particular environment with high impact or vibration load, clean room, vibration or low / high temperature