

## Products for Metals Industry



# Metals Industry Process

# “NTN” solutions for tough metals mill

Providing high quality bearings to increase reliability.

Bearings are the mechanical elements that support continuous operation. **NTN** is committed to continuous improvement of customer's equipment through its comprehensive sales, service, and engineering support framework for maintaining stable operations for the toughest metals manufacturing.

## Raw materials



Coal

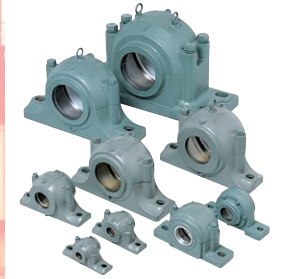


Iron ore (powder ore)



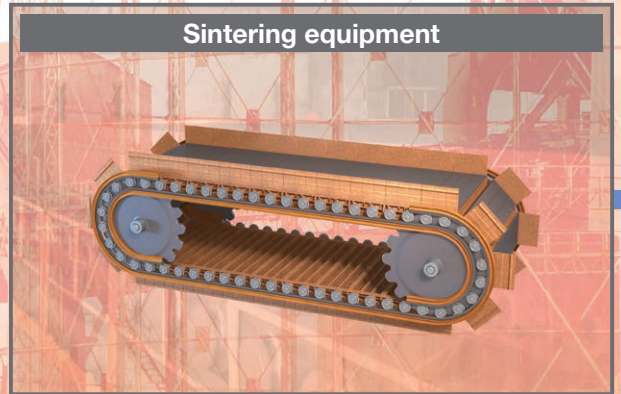
Iron ore (lump ore)

## Bulk material conveyors



Plummer blocks

## Sintering equipment



Bearing units



ULTAGE series sealed spherical roller bearings [Type WA]



Split spherical roller bearings



Sealed double row tapered roller bearings



Triple-lip sealed bearings for bearing units

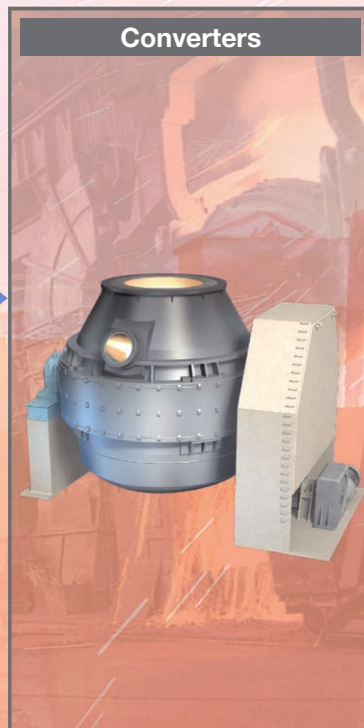


Plummer block assemblies



Sealed double row cylindrical roller bearings

applications....”



Ultra-large split spherical roller bearings



Cylindrical roller bearing w/self-aligning ring



Split cylindrical roller bearings w/self-aligning ring



Ultra-large spherical roller bearings



Long operating life of EA spherical roller bearings

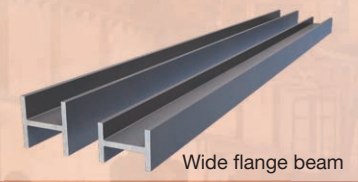


Constant velocity joints (HTJ)

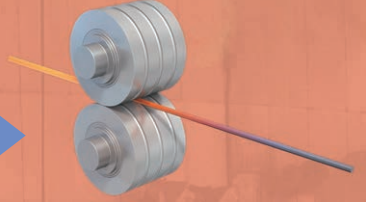
## Rolling Mill Equipment



Structural steel rolling machinery



Wide flange beam



Long products



Steel sheet pile

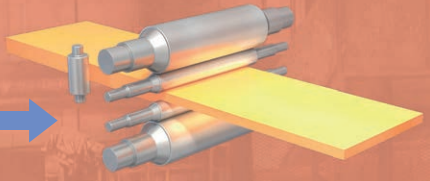
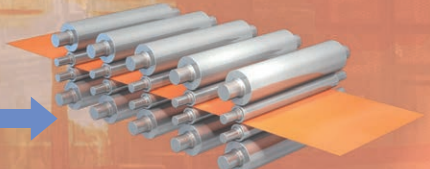


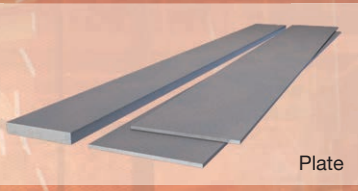
Plate rolling machinery



Long products



Hot rolling machinery



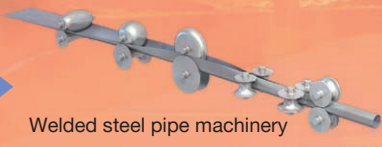
Plate



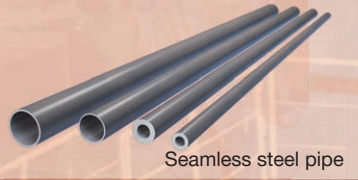
Cold rolling machinery



Welded pipe



Welded steel pipe machinery



Seamless steel pipe



Seamless steel pipe machinery



Four row tapered roller bearings



Four row cylindrical roller bearings



Double row high angle tapered roller bearings



Spot pack deep groove ball bearing



Sealed four row tapered roller bearings



ULTAGE series sealed four row tapered roller bearings for rolling mill roll necks [CROU... LL type]



RustGuard series for corrosion-resistant



Constant velocity joints

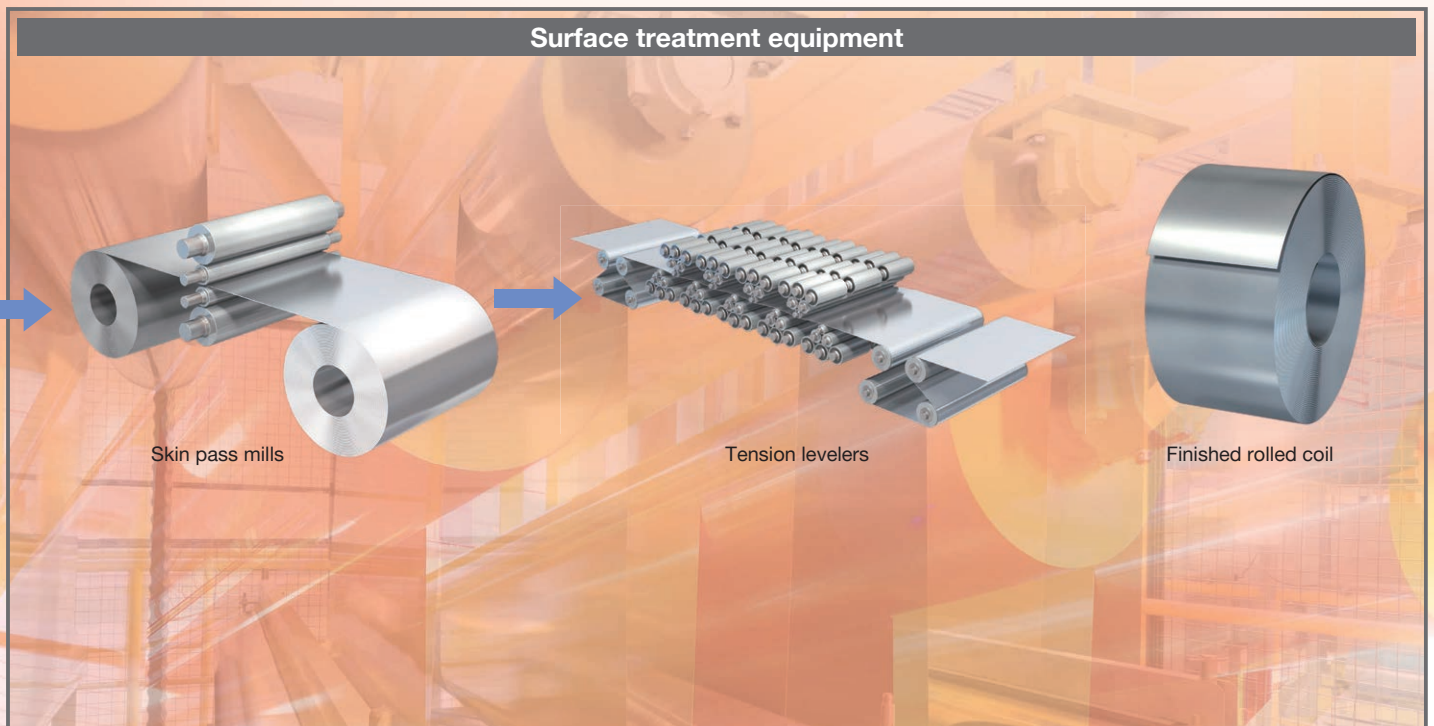
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Inspecting and Maintaining Bearings, Installing Tapered Bore Roller Bearings	65 ~ 66

## Related Catalogs

	Cat. No.
Ball and Roller Bearings	2202/E
Large Bearings	2250/E
ULTAGE Series Spherical Roller Bearings [Type EA, Type EM]	3033/E
ULTAGE Series Sealed Spherical Roller Bearings [Type WA]	3703/E
Large Size, Long Operating Life Bearing – EA type	3024/E
ULTAGE Series Sealed Four Row Tapered Roller Bearings for Rolling Mill Roll Necks [CROU... LL type]	3801/E
Solid Grease Bearings	3022/E
Bearing Units	2400/E
Triple-Lip Sealed Bearings for Bearing Units	3905/E
Plummer Blocks	2500/E
Constant Velocity Joint for Industrial Machines	5603/E
Tri-Ball Joint Constant Velocity Joints (Small and Medium size)	5602/E
Care and Maintenance of Bearings	3017/E

## Surface treatment equipment



Skin pass mills

Tension levelers

Finished rolled coil

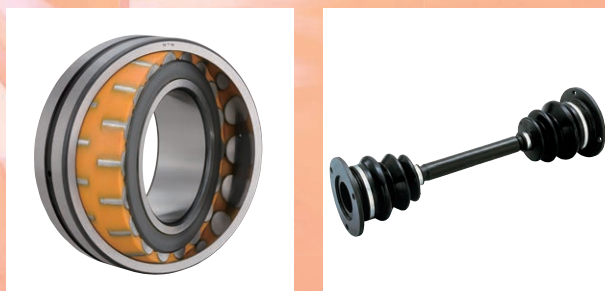
Cartridge units



Ball type (BUB)

Needle type (NKZ)

Tension leveler units



Full pack spherical roller bearing

Constant velocity joints

# Bulk Material Conveyors

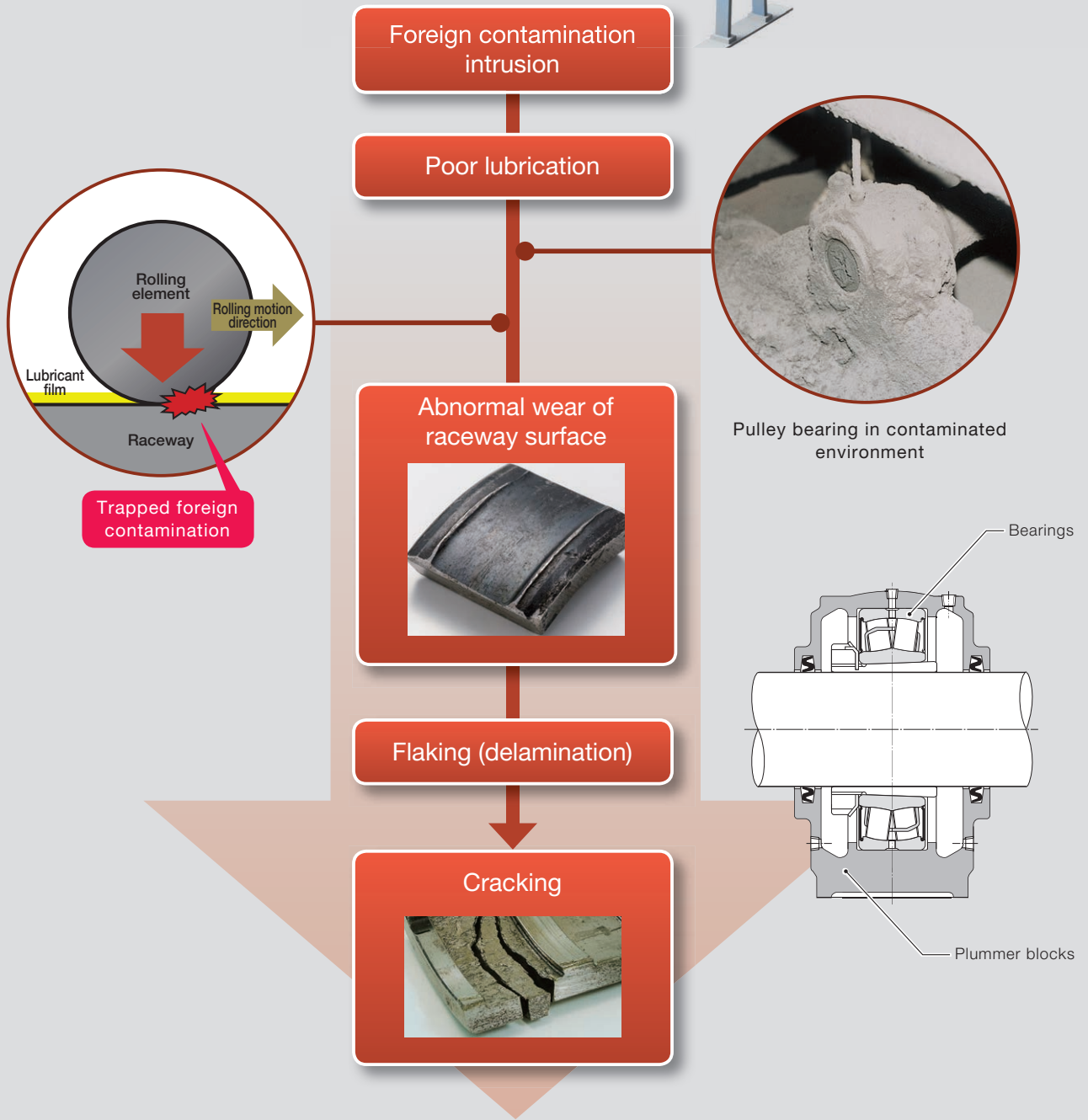
## Equipment Characteristics

### Contamination

Bulk material conveyors are used in heavily contaminated environments.



## Bearing Damage Modes



# ULTAGE

## Solutions from NTN

### ULTAGE Series Sealed Spherical Roller Bearings [Type WA]

#### High-load capacity

Long operating life roller bearings with high-load capacity has been achieved by maximizing the roller diameter, number of rollers, and using stamped steel cages.

#### High sealing performance

Compact design provides excellent sealing performance, while maintaining high load capacity.

#### Long-life grease

The packed grease contributes to reduced maintenance and improved operating life.

#### Fitted with lubrication groove and holes

Re-lubrication via groove and holes found on the outer ring.

#### Interchangeability

Can be assembled into standard type plummer blocks.



Refer to the size charts (p-37)

"ULTAGE" (a name created from the combination of "ultimate," signifying refinement, and "stage," signifying NTN's intention that this series of products be employed in diverse applications) is the general name for NTN's new generation of bearings that are noted for their industry-leading performance.

Actual equipment use example : Bulk material conveyor about six months of use (lubrication cycle : 1time/Month)  
(Bearing Part Number : 22216)

Sealed type



Good with no abnormal wear

Open type



Excessive wear occurred

Long operating life in contaminated environments using contact-type sealed bearings

#### Permissible alignment angle

- 0.009 rad (0.5°)

#### Permissible operating temperature range

- Bearing temperature : -20 to 110 degC (-4 to 230 degF)

#### Permitted rotational speed

- When re-lubricating :  $d_n \leq 60 \times 10^3$
  - When not re-lubricating :  $d_n \leq 80 \times 10^3$
- [ $d_n = d$  (bearing bore diameter [mm])  $\times n$  (operating rotational speed [min<sup>-1</sup>])]

#### Lubricant grease

- Pre lubricated with lithium based grease containing extreme pressure additives
- Grease pack amount : 15 to 25 % of space capacity

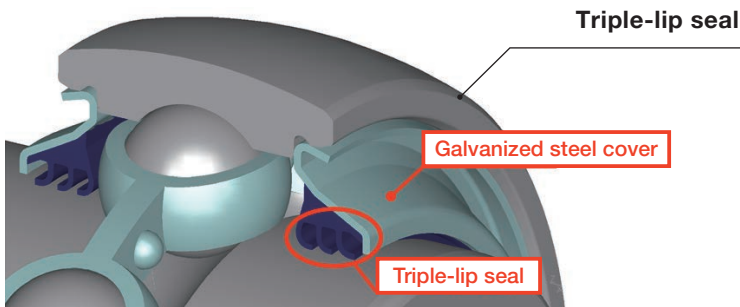
## Bearing Units

- Available with dust covers.
- Easy to install/remove.
- Choose from unit with re-lubrication fitting or without.



## Triple-lip Sealed Bearings for Bearing Units

- Excellent dust and water-resistance.
- Low-torque and high-torque options.

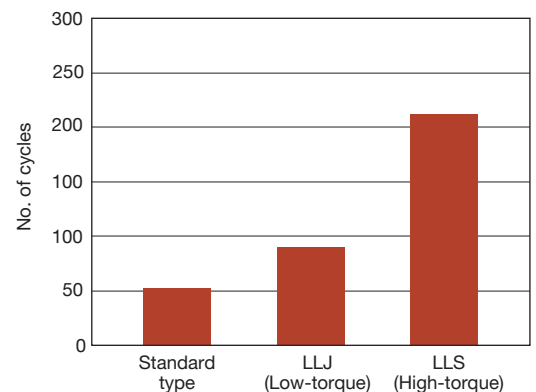


### Water-resistance performance test results

#### [Test conditions]

Bearing	: UC205D1 Standard type, LLJ (low-torque type), LLS (high-torque type)
Rotational speed	: 800 min <sup>-1</sup>
Load	: None (belt tension only)
Test mode	: Intermittent operation (6 hrs. run / 6 hrs. stop = 1 cycle)
Test equipment	: <b>NTN</b> muddy water test equipment
Muddy water specification	: JIS Z8901 Kanto Loam Class 8
Dust to water mixture ratio	: 1:10 (ratio by weight)
Quantity of muddy water	: Outer ring immersion degree 1/4 to 1/3
Termination conditions	: Muddy water ingress into bearing, bearing seizure, 0.6 G vibration when operating

#### [Test results]





## Plummer Blocks



### High sealing performance

The optimal seal selection in accordance to the ambient environment and rotation speed can be selected.

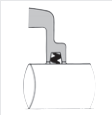
### Vibration resistance

Sufficient bolt tightening force against vibration and shock.

### Fitted with re-lubricating hole

Easy to lubricate.

### ● Plummer block seal types



#### Rubber seal

Rubber seals are mainly used for grease lubrication with a guideline permissible circumferential rotation speed of 5-6 m/s (985-1180 ft/min).



#### Felt seals

Felt seals and rubber seals are interchangeable. These can only be used with grease lubrication. Felt seals are not suitable for use in high dust & humid environments. The guideline permissible circumferential rotation speed for felt seals is approximately 4 m/s (787 ft/min).



#### S-shaped seals

S-shaped seals (synthetic rubber seals w/spring) have excellent sealing performance and are usable for grease and oil-based lubricants (plummer blocks have a special specification). The guideline permissible circumferential rotation speed for S-shaped seals is 10-12 m/s (1970-2360 ft/min). Caution is required regarding the roughness and hardness of the shaft, especially in the seal contact areas.



#### Labyrinth seals

Labyrinth rings are easy to install by O-ring attachment and are loosely fitted to flexibly follow the extension and contraction of the shaft (h9).

### Specially-coated housing are also available



Pulley bearing in extreme contamination conditions (Plummer block)

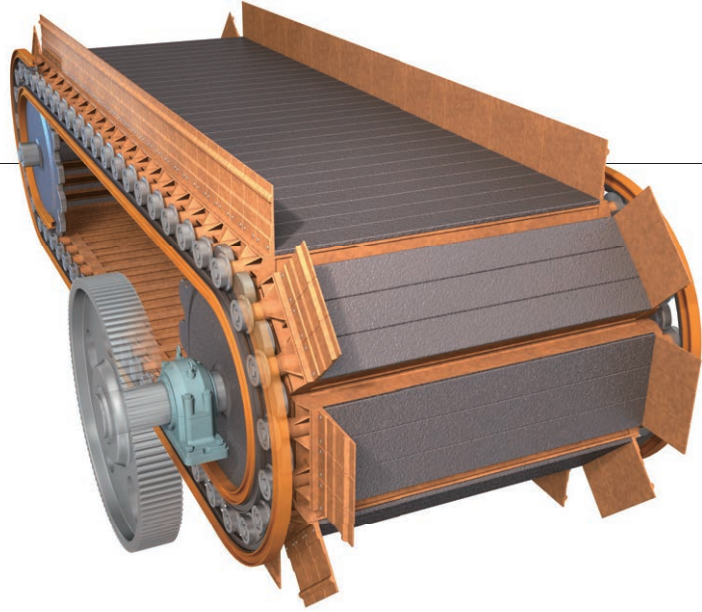


## Sintering Equipment

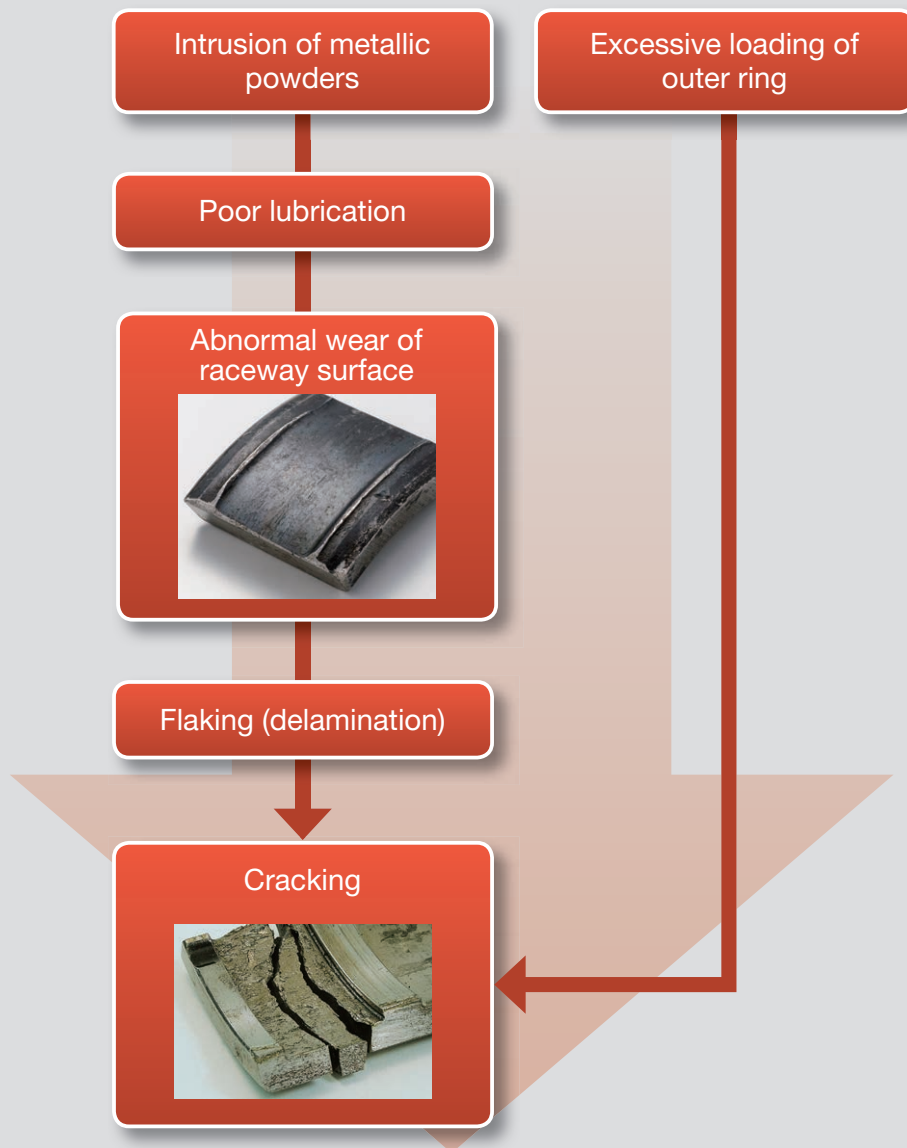
### Equipment Characteristics

#### Sintering of metallic powders

Sintering equipment (pallet truck) is used in environments where metal powders used for sintering is present.



### Bearing Damage Modes



## Solutions from NTN

### Sealed Double Row Tapered Roller Bearings Supports pallet truck wheels

#### High-load capacity

Higher load capacity over conventional bearings has been achieved by a compact seal design to allow for larger rolling elements.

#### High sealing performance

Composite dust lip seals achieve a longer operating life compared to open type bearings.

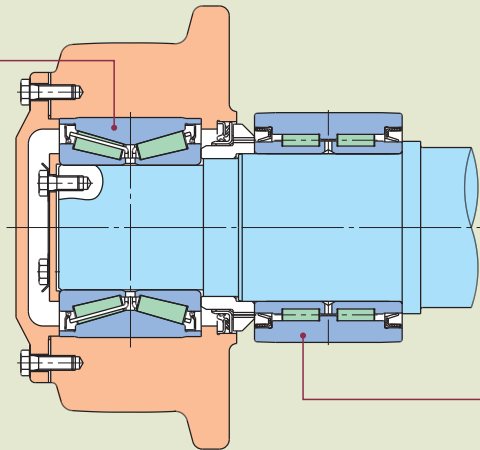
#### Improved easy handling

Double inner rings are inseparable for easier installation.



Refer to the size charts (p-38)

**Pallet truck wheel**  
(Sealed double row tapered roller bearings)



**Pressure roll**  
(Sealed double row cylindrical roller bearings)

### Sealed Double Row Cylindrical Roller Bearings Supports pressure rolls

#### High sealing performance

Dust seals prevent intrusion of metallic powders.

#### Long operating life

While plain bearings wear due to metallic powders, replacing them with this product superbly resolves the wearing to extend the operating life.

#### Improved cracking strength

Cracking strength is improved by using case hardened steel (carburized steel) as the standard specification.

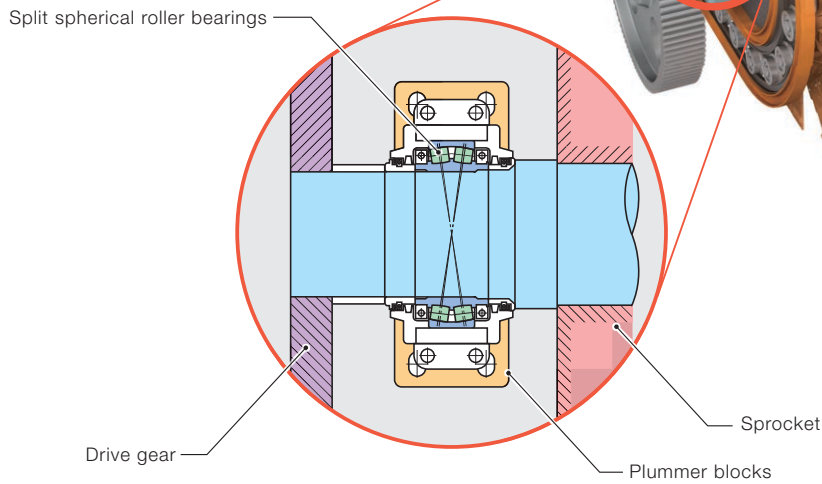


Refer to the size charts (p-39)

## Equipment Characteristics

### Heavy loads

Drive support bearing receive heavy loads between the drive gear and sprocket.



## Drive Support Bearing Problems

The drive gear must be removed and reattached in order to replace the bearing

Increased maintenance costs are incurred due to extended man hours

Maintenance cost reduction

## Solutions from NTN

### Split Spherical Roller Bearings

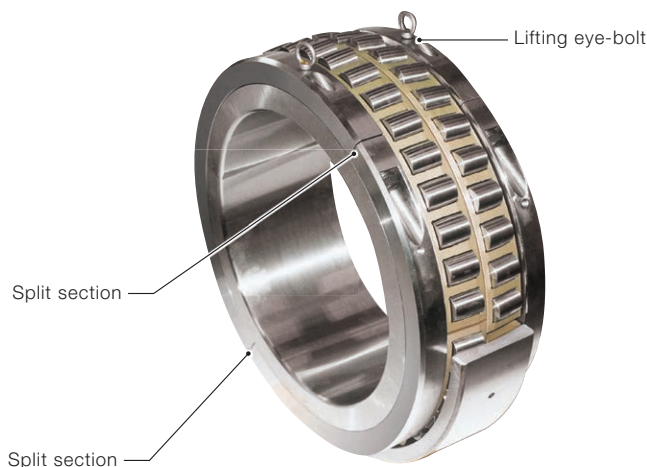
#### Improved easy handling

Maintenance costs are reduced by replaceable bearings without having to detach/reattach large-size drive gears.

Replacement time  
Reduced by  
**90%**

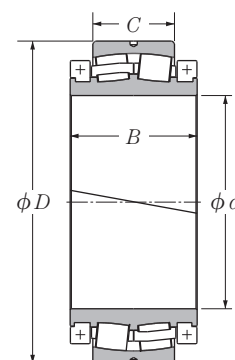
#### Drive support bearing replacement times

Standard bearing type → approx. 200 hrs.  
Split bearing type → approx. 20 hrs.



Typical specifications of split spherical roller bearings for sintering machine drive shafts

Part Number	Basic Dimensions				Basic Dynamic Load Rating	Basic Static Load Rating
	$d$	$D$	$B$	$C$		
2PE7204	360	540	212	134	2 270	4 350
2PE10101	505	750	248	140	2 680	6 200
2PE10603	530	750	248	140	2 680	6 200
2PE11201	560	750	248	140	2 680	6 200



Note : Special plummer blocks are also available for these bearings. Contact **NTN** for more information.

## Converters

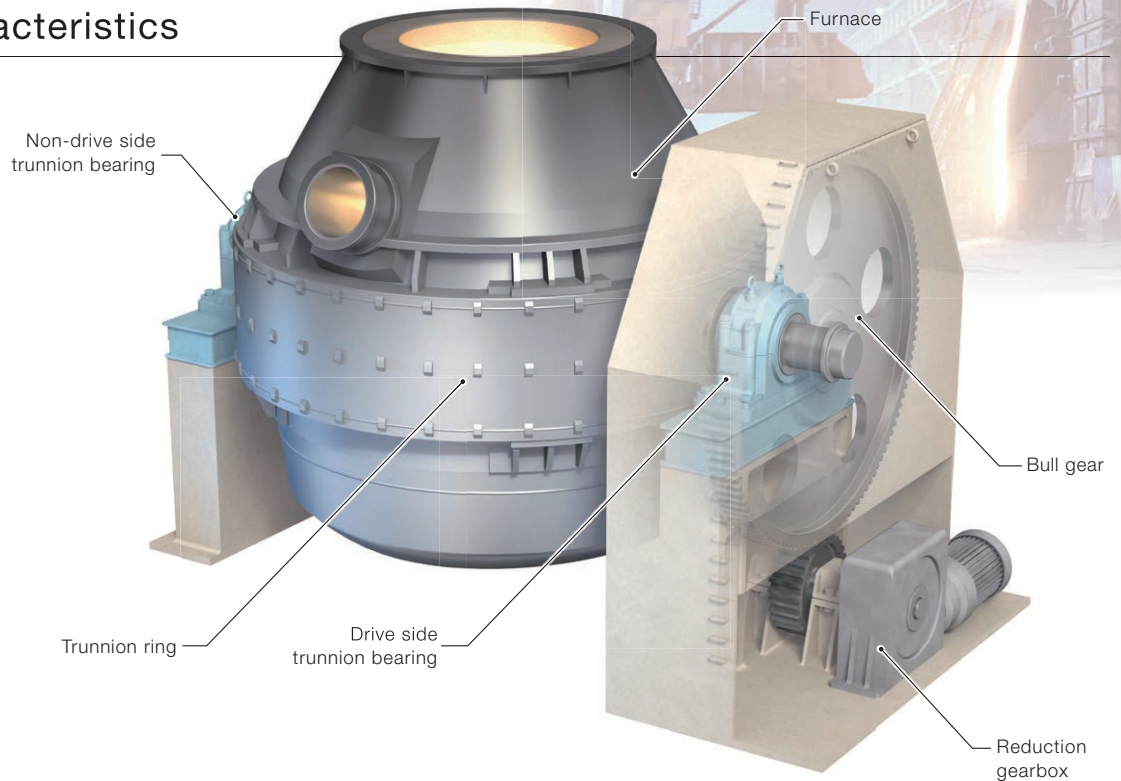
### Equipment Characteristics

#### Heavy loads

Converter furnaces are extremely heavy, applying excessive loads on bearings.

#### Difficult installation

Large equipment and bearings are time consuming and costly to replace.



### Drive side Trunnion Bearing Problems

The bull gear must be removed in order to replace the bearing

High costs are incurred due to long down time

Maintenance cost reduction

## Solutions from NTN

### Ultra-large Spherical Roller Bearings Drive/non-drive side trunnion

#### High-load capacity

This optimal design simultaneously achieves high-load capacity and excellent self-aligning design.



Refer to the size charts (p-40)

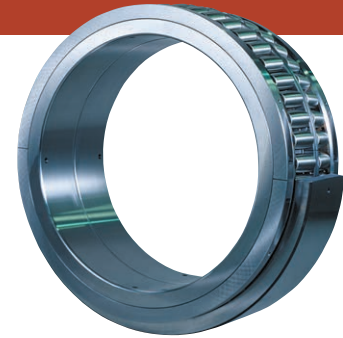
### Ultra-Large Split Spherical Roller Bearings Drive side trunnion

#### Improved easy handling

Bearing replacement is possible without having to remove bull gears, reducing the total cost of down time and man hours.

#### Interchangeability

Bearings can be designed to fit existing housings making replacement easy. The reduction in load capacity by the split-body type is minimized by use of hollow rollers and pin retainers, maximizing roller size.



Replacement time  
Reduced by  
**80%**

### Drive side trunnion bearing replacement times

Standard bearing type ⇒ approx. 10 days

Split bearing type ⇒ approx. 2 days

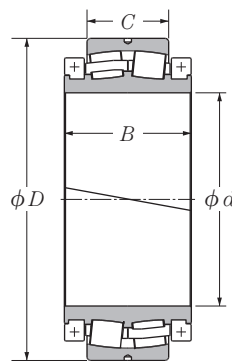


fig. 1

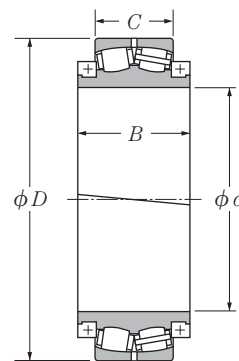


fig. 2

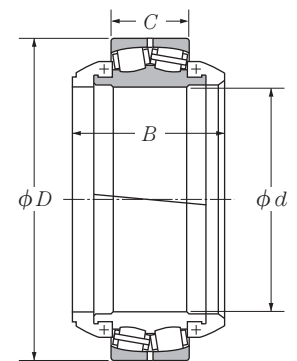


fig. 3

### Typical specifications of ultra-large split spherical roller bearings

Part Number	Basic Dimensions				Allowable Misalignment rad(°)	Basic Dynamic Load Rating C <sub>r</sub> kN	Basic Static Load Rating C <sub>0r</sub> kN	Fig. No.
	d	D	B	C				
2PE17009	850	1 280	375	249	0.009(0.5)	8 800	19 900	1
2PE22401	1 120	1 540	525	355	0.017(1)	14 200	43 500	2
2PE24004	1 200	1 700	790	410	0.026(1.5)	17 200	44 000	3
2PE28001	1 400	1 900	880	530	0.026(1.5)	22 900	65 500	3

# Continuous Casting Machinery

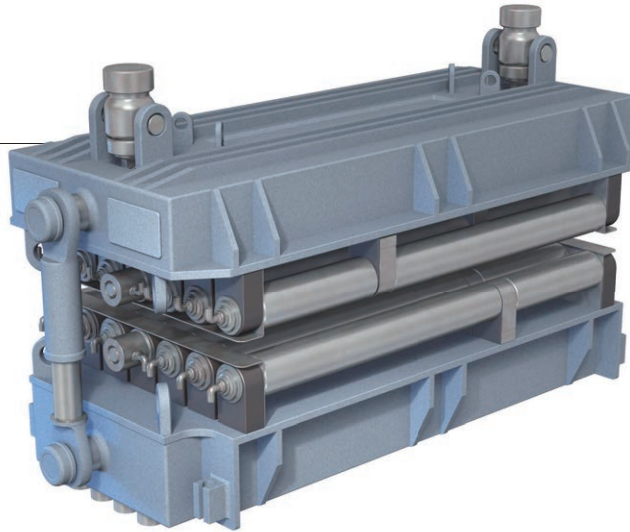
## Equipment Characteristics

Low-speed rotation

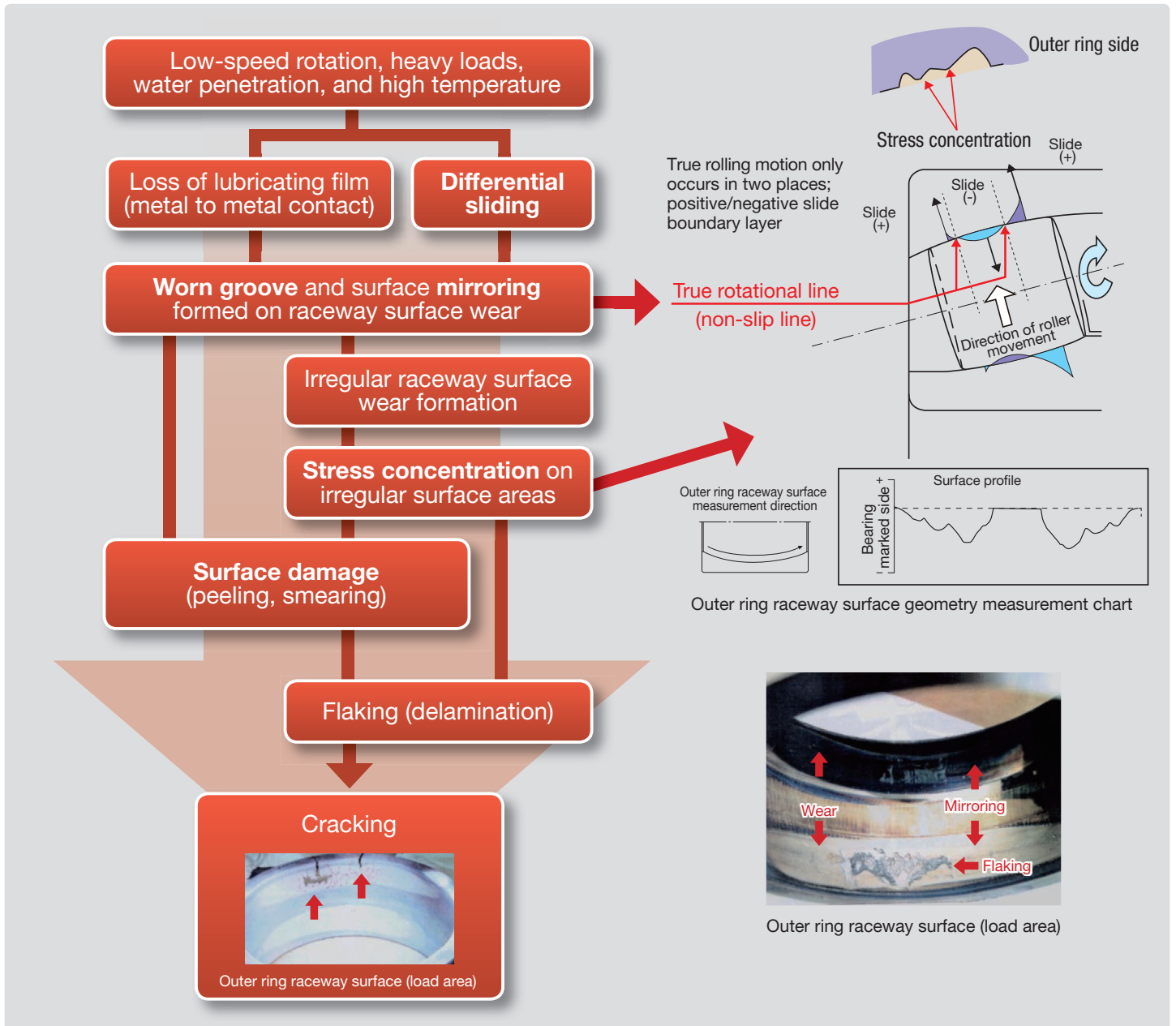
Heavy loads

Water penetration

High temperature

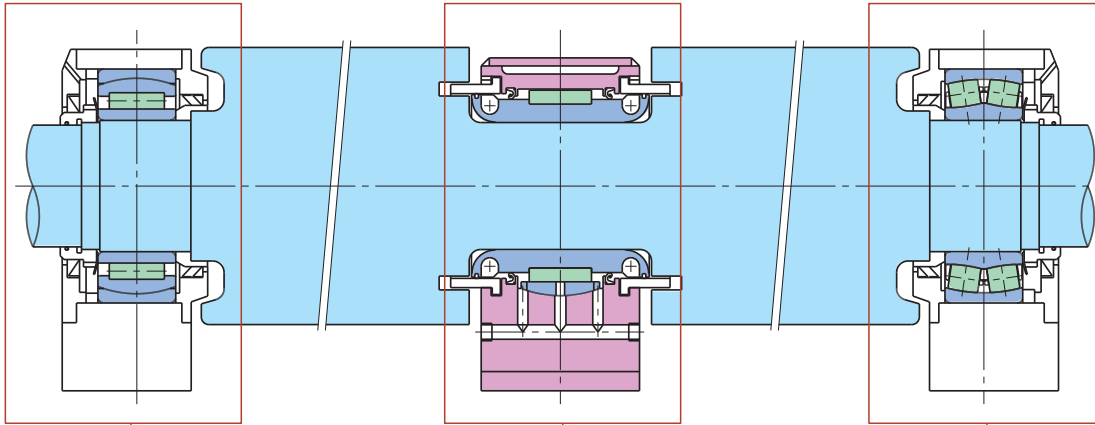


## Types of Bearing Damage





## Solutions from NTN



### Cylindrical roller bearing w/self-aligning ring



#### High-load capacity

Maximizing load capacity by using full complement roller design.

#### Self-aligning design

Excellent self-aligning performance is achieved utilizing two outer rings that work together to allow for any misalignment.

#### Supports thermal expansion

Cylindrical roller design supports axial movement due to thermal expansion/contraction.

#### Controls differential sliding

Differential sliding controlled using cylindrical rollers rather than spherical rollers.

### Split cylindrical roller bearings w/water cooled housing



#### High-load capacity

Maximizing load capacity by using full complement roller design.

#### High sealing performance

Multiple seal configuration prevents water and scale intrusion.

#### High cooling performance

Bearing temperature rise is controlled by the water cooled housing.

#### Self-aligning design

Excellent self-aligning performance is achieved utilizing two outer rings that work together to allow for any misalignment.

#### Supports thermal expansion

Supports axial movement due to thermal expansion/contraction.

#### Controls differential sliding

Differential sliding controlled using cylindrical rollers rather than spherical rollers.

### Long operating life of EA spherical roller bearings



#### High-load capacity

Uses high-load capacity ULTAGE specification.

#### Heat resistance

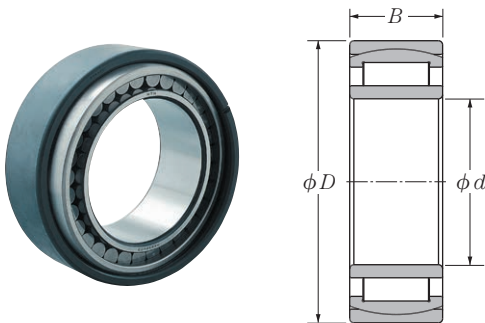
As a result of high resistance to re-tempering, the heat resistance has been improved in the raceway surface.

#### Long operating life

Special heat treatment improves cracking strength and achieves longer life.

Refer to the size charts (p-17)

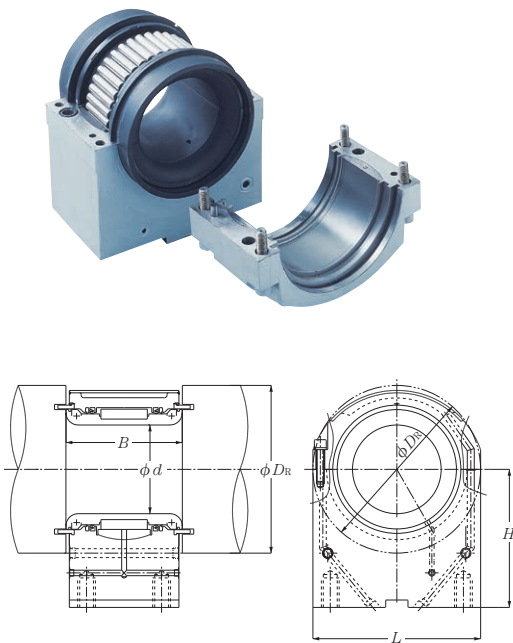
Cylindrical Roller Bearing w/self-aligning Ring



Typical specifications of cylindrical roller bearings w/self-aligning ring

Part Number	Basic Dimensions			Basic Dynamic Load Rating	Basic Static Load Rating
	mm				
	<i>d</i>	<i>D</i>	<i>B</i>	<i>C<sub>r</sub></i>	<i>C<sub>0r</sub></i>
R11A11V	55	90	32	85	203
R1564V	75	130	31	146	236
R2674V	130	200	69	405	935
R2858V	140	210	69	420	990
R3056V	150	250	100	710	1 620
R3646V	180	280	100	785	1 870
R4051V	200	340	112	1 160	2 470

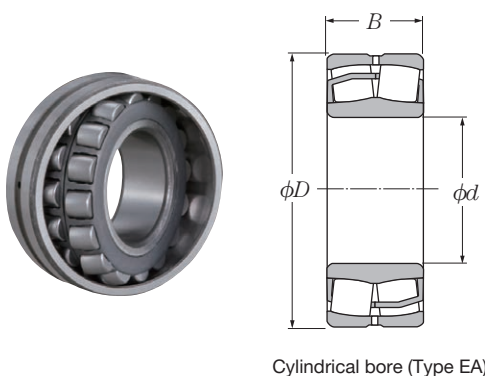
Split Cylindrical Roller Bearings (w/water Cooled Housing)



Typical specifications of split cylindrical roller bearings (w/water cooled housing)

Part Number	Housing Part Number	Basic Dimensions					Basic Dynamic Load Rating	Basic Static Load Rating
		mm						
		<i>d</i>	<i>B</i>	<i>H</i>	<i>L</i>	<i>D<sub>R</sub></i>	<i>C<sub>r</sub></i>	<i>C<sub>0r</sub></i>
RE2039V	SS2021	100	169	132	220	225	475	950
RE2225V	SS2234	110	154	155	230	225	390	930
RE2306V	SS2304	115	173	220	240	240	505	940
RE2824V	SS2825	140	191	250	265	265	525	1 280
RE2906V	SS2908	145	196	260	280	280	630	1 440
RE3036V	SS3043	150	169	180	265	300	695	1 700
RE3311V	SS3303	165	228	280	320	320	930	2 210
RE3621V	SS3616	180	169	217.5	335	335	815	2 010
RE3815V	SS3804	190	233	280	370	370	1 320	3 100
RE4606V	SS4601	230	239	300	450	450	1 590	3 700

Long Operating Life of EA Spherical Roller Bearings



Typical specifications of long operating life EA spherical roller bearings

Part Number	Basic Dimensions			Basic Dynamic Load Rating	Basic Static Load Rating
	mm				
	<i>d</i>	<i>D</i>	<i>B</i>	<i>C<sub>r</sub></i>	<i>C<sub>0r</sub></i>
EA-22211EAD1	55	100	25	155	148
EA-22217EAD1	85	150	36	324	330
EA-23122EAD1	110	180	56	547	669
EA-23022EAD1	110	170	45	417	517
EA-23024EAD1	120	180	46	446	577

## Constant Velocity Joints (HTJ)

Supports segment drive rolls

### High-load capacity

High-load capacity design integrating the shaft and inner ring into a single unit.

### High sealing performance

Excellent heat and water resistant performance due to double metal spherical surface seal configuration.

### Improved easy handling

Easy installation due to independently separable joint body.

### Self-aligning design

Integral self-aligning function requires no phase matching.

Photo showing condition of U-joint after operation



Severe corrosion is visible across the entire cross joint due to lack of sealing.

Replacement of the constant velocity joint



Double metal spherical surface seal configuration prevents scale from penetrating inside the joints.

### Typical specifications of constant velocity joints for continuous casting machinery

Point of use	Part Number
CCM segment support rolls (perpendicular)	HTJ220F4 . .
CCM segment support rolls (perpendicular)	HTJ280F4 . .
CCM segment support rolls (bend)	HTJ260F0 . .
CCM segment support rolls (bend)	HTJ260F4 . .
CCM segment support rolls (bend)	HTJ240F8 . .
CCM segment support rolls (bend)	HTJ300F8 . .

Note : Part number suffixes are serial numbers.

# Rolling Mill Equipment

## Equipment Characteristics

Scale

Heavy loads

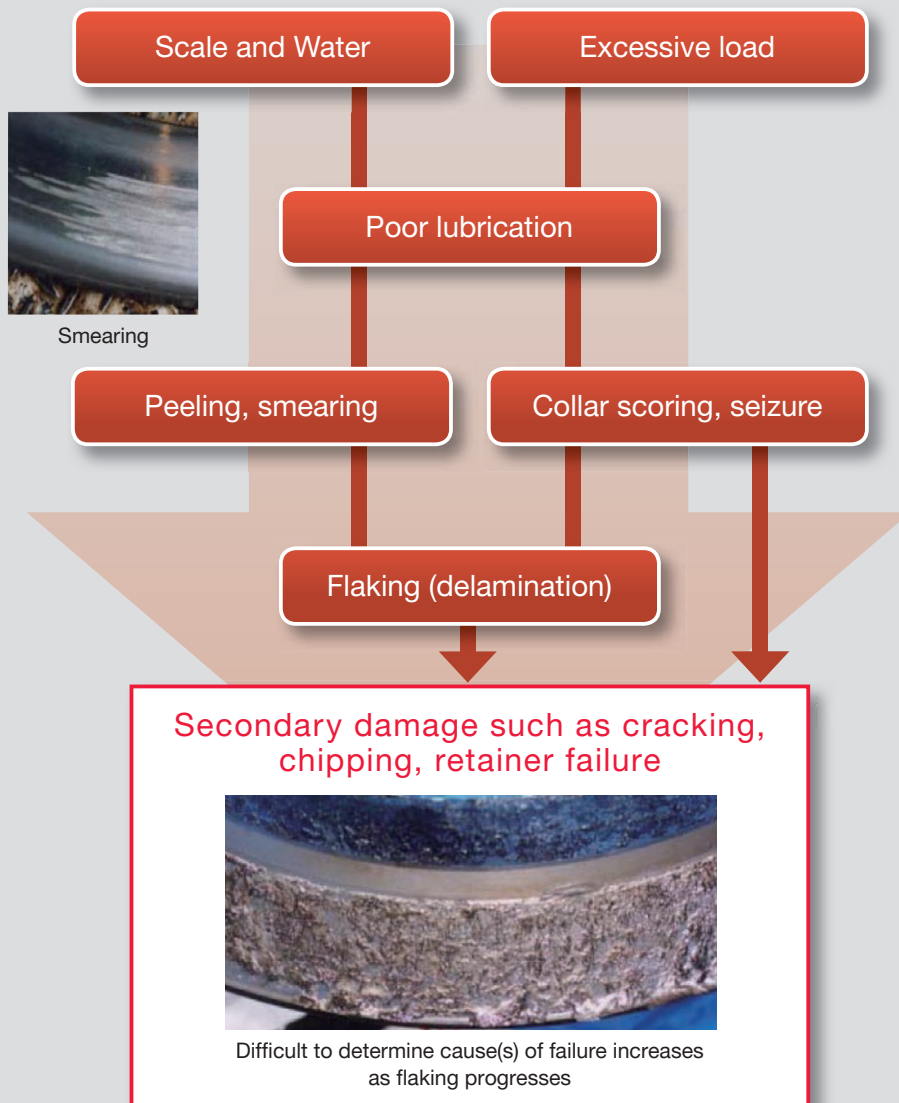
Water

Backup rolls



Work rolls

## Work Roll Bearing Damage Types



# ULTAGE

## Solutions from NTN

### ULTAGE Series Sealed Four Row Tapered Roller Bearings for Rolling Mill Roll Necks [CROU... LL Type]

Load capacity :  
**Up 20%\***

Load resistance performance :  
**2 times\***

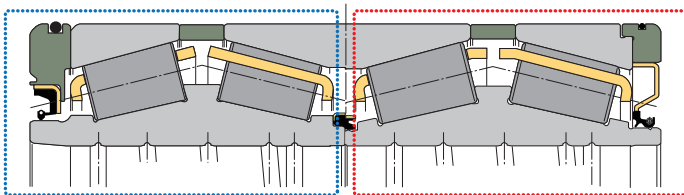
Internal water penetration volume :  
**Down 50%\***

Life :  
**1.8 times\***

\*Compared to NTN conventional product

#### World class high-load capacity design

Long operating life with high-load capacity has been achieved by maximizing the size and number of rollers.

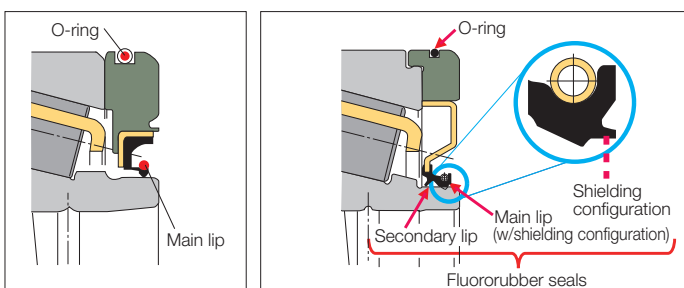


Conventional design of NTN

ULTAGE

#### Compact, high-performance seal design

Utilizing compact seal capacity, highly-sealing fluororubber seals. The volume of external water penetration has been cut by over 50% by optimizing the pressure of the main lip. grease leakage is also prevented by a secondary lip.

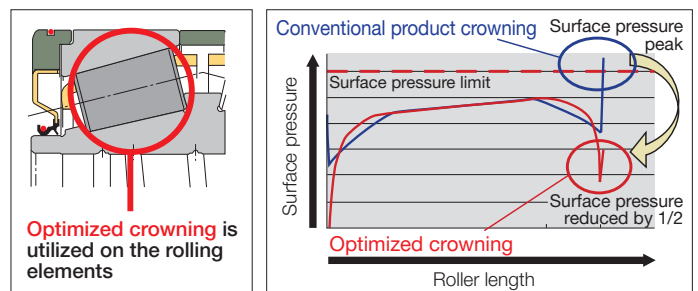


Conventional design of NTN

ULTAGE

#### World class high load resistance performance

The load resistance is significantly improved by equalizing the surface pressure of the bearing's rolling elements with respect to the external load.



#### Long operating life

The inside of the bearings are packed with long-life grease so cleaning and re-greasing during initial installation is not required.

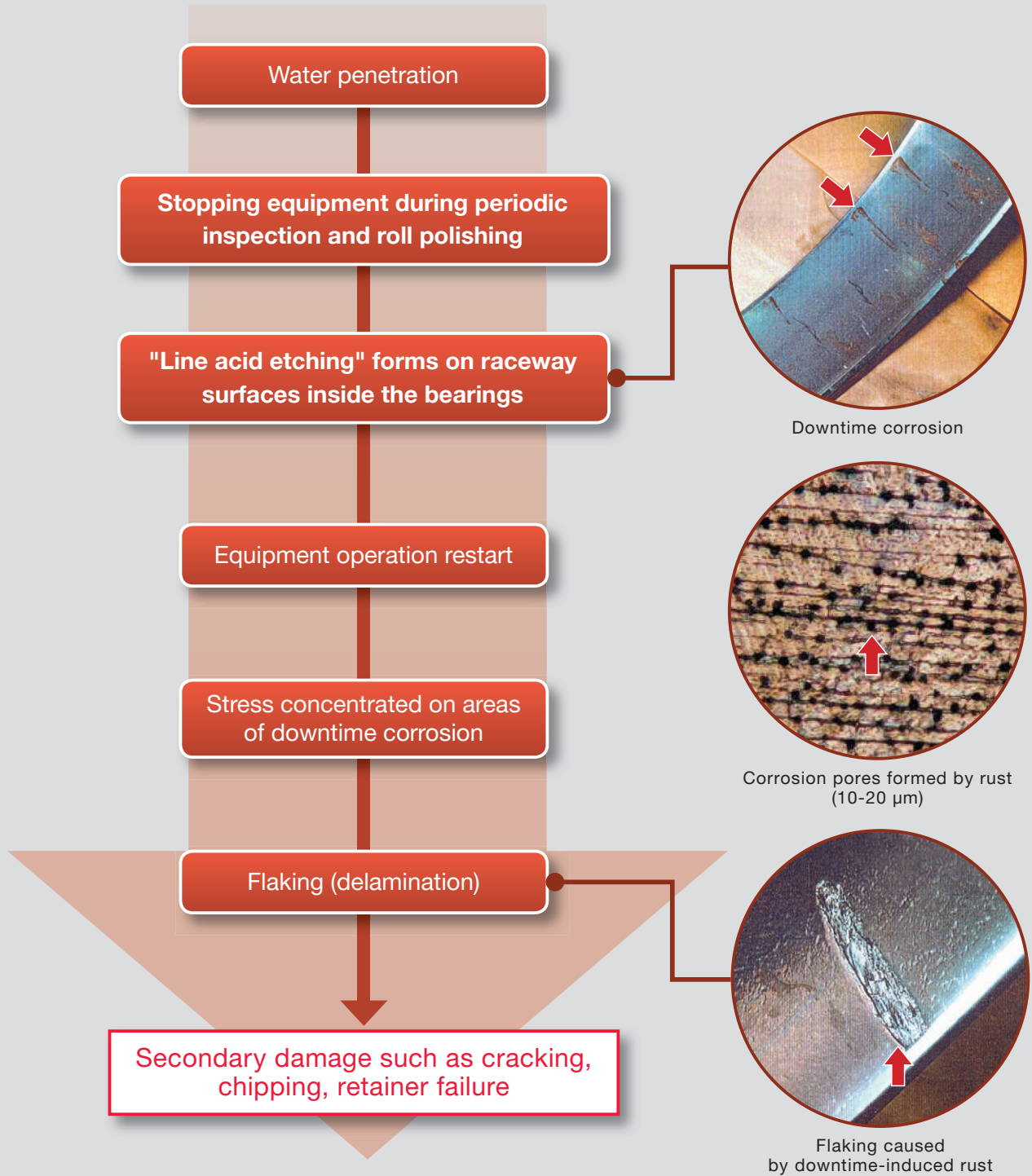
#### Bearing materials

Inner/outer rings	Carburized steel
Rolling element	Through hardened steel (also available in carburized steel)

Refer to the size charts (p-41)

## Damage Methods Due to Downtime Corrosion of Bearings for Roll Necks

Rust (also known as "line acid etching") occurs in roll neck bearings when they are idle and have external water in the bearing. This rust sometimes causes surface peeling.



## Solutions from NTN

# RustGuard

### RustGuard Series for Corrosion-Resistance

#### Factors causing "line acid etching"

- ① Water intrusion
- ② Static bearings with water-saturation

#### Response to line acid etching

Apply phosphate coating

Improved corrosion resistance

Improved coating strength

#### Comparison of anti-corrosion performance

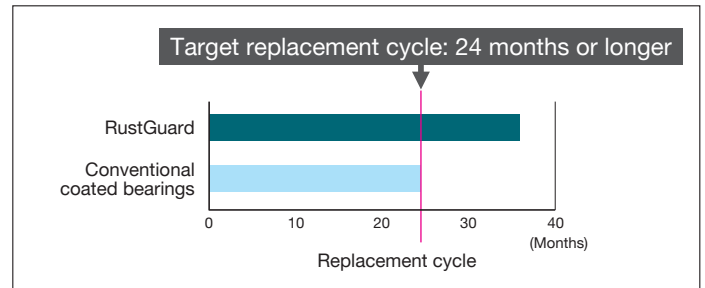
As a result of the corrosion-resistance test comparison between untreated rollers (new) and coated rollers (after the operating test), the coated rollers showed no signs of corrosion, even after the operating test.



#### Results of evaluation from actual test equipment

RustGuard is proven to perform with high reliability and further extend target replacement cycles.

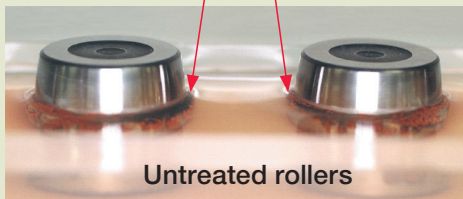
Test equipment : Cold rolling machine work roll  
 Test bearing : MX50-EA-CRO-6936LL



#### Rust occurrence situation : After immersion in tap water for 24 hours

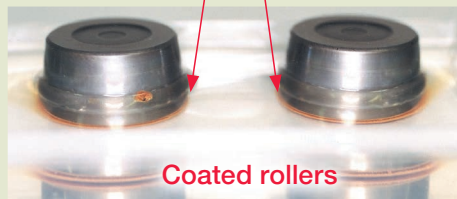
Excessive rusting near water surface

Minimal rusting near water surface



Untreated rollers

(New rollers were immersed in water)



Coated rollers

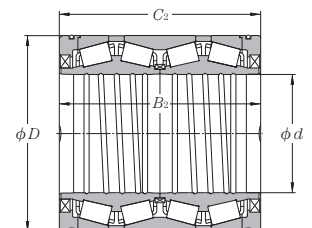
(Immersed in water after operating for 1670 hours)

#### [Operating test conditions]

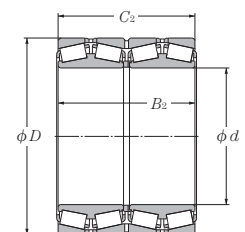
Bearing number : 22318  
 (No. of rolling elements halved)  
 Load : Fr = 88.3 kN  
 Rotational speed : 2500 min<sup>-1</sup>  
 Operation cycle : 1670 hrs.  
 Lubrication : circulating oiling VG220, 2 ℓ/min

#### Typical specifications of improved corrosion-resistant specification RustGuard Series

Seal Yes/No	Part Number	Basic Dimensions				Basic Dynamic Load Rating	Basic Static Load Rating
		mm					
		<i>d</i>	<i>D</i>	<i>B</i> <sub>2</sub>	<i>C</i> <sub>2</sub>	<i>C</i> <sub>r</sub>	<i>C</i> <sub>or</sub>
Sealed Type	MX50-EA-CRO-4906LLA1	245	345	310	310	2 070	5 950
	MX50-EA-CRO-6913X1LL	343.052	457.098	254	254	2 000	5 400
	MX50-EA-CRO-6936LL	343.052	457.098	299	299	2 470	7 100
	MX50-EA-CRO-7226LLA4	360	480	375	375	3 400	10 200
Open Type	MX50-EA-CRO-7702	384.175	546.1	400.05	400.05	4 350	13 300
	MX50-EA-CRD-9613D2 <sup>1)</sup>	482	632	520	520	5 900	20 000
	MX50-EA-CRO-9737	482.6	615.95	330.2	330.2	3 850	12 800



Sealed Type



Open Type

1) No reference to cross section for this type

# Rolling Mill Equipment

## Equipment Characteristics

Heavy loads

Backup rolls



Work rolls

## Backup Roll Bearing Damage Methods

Plowing damage occurs during installation



The lead-in chamfer of the inner ring may become scratched when installing the outer ring assembly

Flaking (delamination)

Damage to the inner ring raceway can lead to flaking

Cracking, chipping





## Solutions from NTN

### Large-size Four Row Tapered Roller Bearings for Backup Rolls Supports combined radial and axial load

#### High-load capacity

High-load capacity design using hollow rollers and pin retainers is also available.

#### Long operating life

Special heat treatment can be applied to rings and rollers to improve cracking resistance and increase bearing life.



Refer to the size charts (p-45)

### Large-size Four Row Cylindrical Roller Bearings for Backup Rolls Bearings for radial load

#### High-load capacity

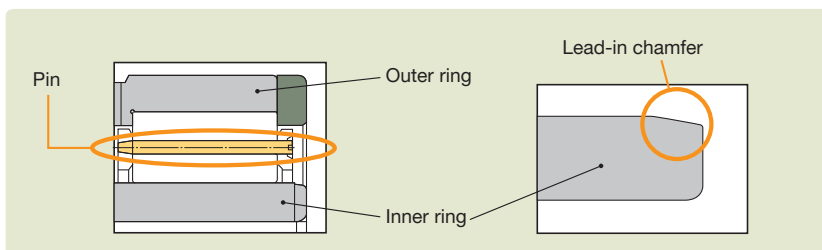
High-load capacity design using hollow rollers and pin retainers.

#### Resistant to scratch damage when installing

Optimal lead-in chamfer on inner ring prevents roller plowing damage during installation.



Refer to the size charts (p-53)



### Double Row Steep Angle Tapered Roller Bearings for Backup Rolls Bearings for axial load

#### High-load capacity

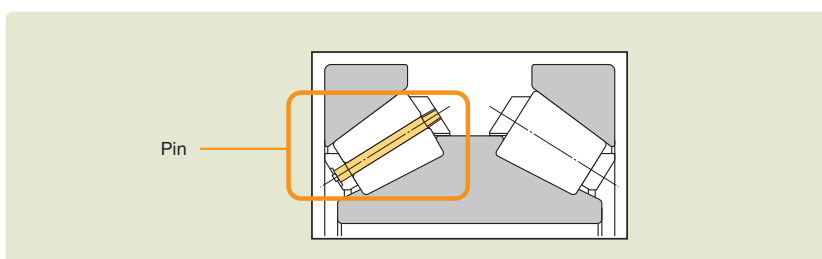
High-load capacity design using hollow rollers and pin retainers.

#### Axial load resistance performance

Improved bearing axial load performance by higher roller contact angle.



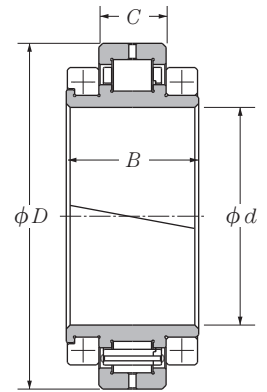
Refer to the size charts (p-61)



## Split Cylindrical Roller Bearings for Pilger Mill Crankshafts Supports pilger mill crankshafts

### Impact resistant

Optimal design yields high load capacity and robust retainer strength to be able to withstand the cranking motion impact.



Typical specifications of split cylindrical roller bearings

Part Number	Basic Dimensions				Basic Dynamic Load Rating $C_r$	Basic Static Load Rating $C_{or}$
	mm					
	$d$	$D$	$B$	$C$		
RE2512	127	254	114.3	63.5	555	720
RE6405	320	622.3	268	160.4	2 810	4 100
RE8401	420	740	320	190	4 000	4 550

## Tapered Roller Thrust Bearings for Rolling Mill Screwdown Applications Supports rolling mill screwdowns

### High load capacity

High load capacity design using full complement roller bearings.

### Shape adaption

Spherical inner ring surface aligned to fit screwdown end geometries.

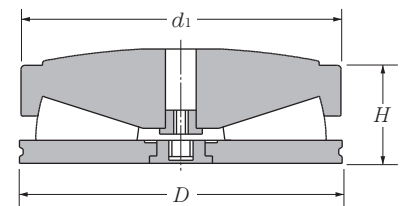


fig. 1

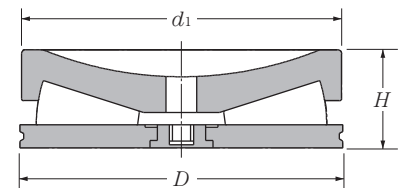


fig. 2

Typical specifications of tapered roller thrust bearings for screwdowns

Part Number	Basic Dimensions			Basic Static Load Rating $C_{oa}$	Fig. No.
	mm				
	$D$	$d_1$	$H$		
CRT0505V	266.700	264.300	94.412	7 750	1
CRT1215V	495.300	492.900	170.612	17 500	1
CRT1206V	554	555	190.5	36 000	2

## Open Bearings for Sendzimir Mill Backup Rolls

### High load capacity

Increased load rating by greater outer ring wall thickness for use as backup roll bearings.

### Thickness variance control

Section height dimensions are controlled.

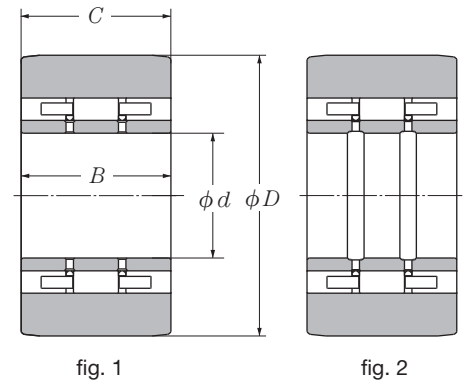
### Multiple service campaigns

The bearings are reusable for several campaigns by regrinding the outer ring outer diameter surface.



Typical specifications of open bearings for Sendzimir mill backup rolls

Part Number	Basic Dimensions				Basic Dynamic Load Rating	Basic Static Load Rating	Fig. No.
	mm						
	$d$	$D$	$B$	$C$	$C_r$	$C_{or}$	
3RCS1414V	70	160	90	90	455	855	—
3RCS2035	100	225	120	120	715	1 350	1
3RCS2659	130	300	160	159.5	1 480	2 700	1
3RCS3615	180	406.4	171.04	171.04	2 060	3 800	2



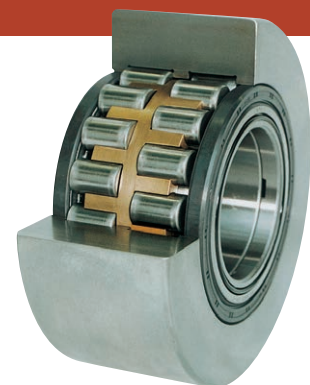
## Sealed Bearings for Sendzimir Mill Backup Rolls

### Long operating life

Long operating life while maintaining high load capacity via compact seal design and specially-designed bearing lubricant.

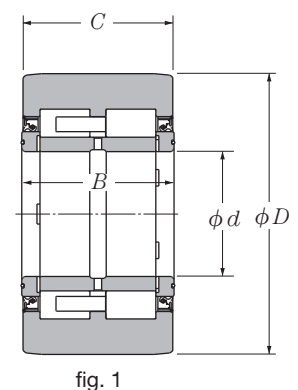
### High sealing performance

Lubricating performance can be achieved by preventing the ingress of mill oil into the bearing.



Typical specifications of sealed bearings for Sendzimir mill backup rolls

Part Number	Basic Dimensions				Basic Dynamic Load Rating	Basic Static Load Rating	Fig. No.
	mm						
	$d$	$D$	$B$	$C$	$C_r$	$C_{or}$	
2R1844LL	90	220	96	94	470	695	1
2R3631LL	179.984	406.4	228	224	1 720	2 200	—
2R3650LL	179.984	406.4	224.25	220.66	1 950	3 550	—
2R3646HTLLA1	180	406.42	171.04	171.04	1 630	2 850	—



## Solid Grease Bearings for Long Product Guide Rolls

Lubricant leakage is minimized by using a solid lubricant composed of lubricating grease and polyethylene (PE).

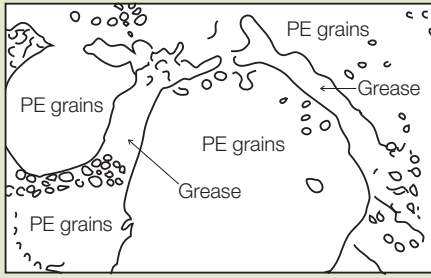
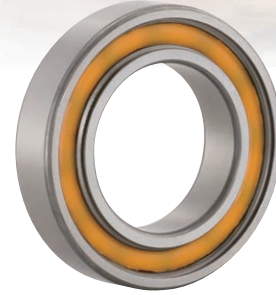


Diagram model of Solid Grease after curing



Spot-pack Deep groove ball bearings (Code : LP03)



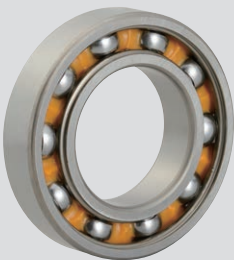
Full-pack Deep groove ball bearings (Code : LP03QT)

## Long Product Guide Roll Bearing Damage Modes

Impact and sudden acceleration when material is introduced into the mill

Large volumes of high-pressure water

Grease emulsification and leakage



Using deep groove ball bearings in guide rollers

Reduction in bearing life due to poor lubrication



Grease packed bearings (failure due to grease leakage)

## Solutions from NTN

### Reduced dispersion of excess lubricant

Lubricant is fed steadily onto the rotating surfaces by the heat and centrifugal force of the bearings, reducing the excess lubricant and preventing contamination of the ambient environment.

### Excellent lubrication characteristics

Compared to general purpose grease, solid grease is less prone to emulsification and leakage even if water is present.

## Bearing specification

### ● Main ingredients and permissible operating temperature range

Solid Grease (product code)	Resin	Lubricant	Permissible operating temperature range
General-purpose Solid Grease (LP03)	Ultra high molecular weight polyethylene	Li-mineral oil grease	-20~80°C (-4~194°F) max. 60°C (140°F) at regular operation conditions

### ● Production range

#### Solid Grease bearing for general use (LP03)

○ : Standard type   △ : Special type   × : Not available

Bearing Configuration	Lubricant Packing Specification		Production Sizes (Bearing Outer Dia. Dimensions)
	Spot-pack	Full-pack	
Deep groove ball bearings	○ <sup>①</sup>	△	dia. 350 mm or less
Miniature/small dia. ball bearings	○ <sup>①</sup>	×	(bearing inner diameter dia. : 6 to 9 mm)
Self-aligning ball bearings	×	○ <sup>①</sup>	dia. 250mm or less
Spherical roller bearings	×	○ <sup>①</sup>	dia. 250mm or less
Bearing units	○ <sup>①</sup>	△	dia. 300mm or less
Needle roller bearings	×	○ <sup>②</sup>	②

① Deep groove ball bearings are equipped with spot-pack, ZZ shields as standard. Certain bearing configurations and model numbers listed as standard specification are not available. Contact **NTN** for further information.

② Available dimensions of the needle roller bearings differ for each bearing configuration. Contact **NTN** for further information.

Note : Standard bearings are not manufactured from corrosion resistant materials. However, stainless steel bearings are also available.

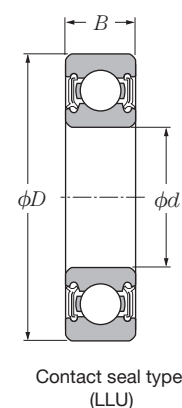
### ● Minimum required load

In case of full-pack, in order for the rolling elements to rotate without sliding, at least approximately 1% of the basic dynamic load rating is required. Contact **NTN** for more information.

#### Typical specifications of Solid Grease bearings for guide rolls

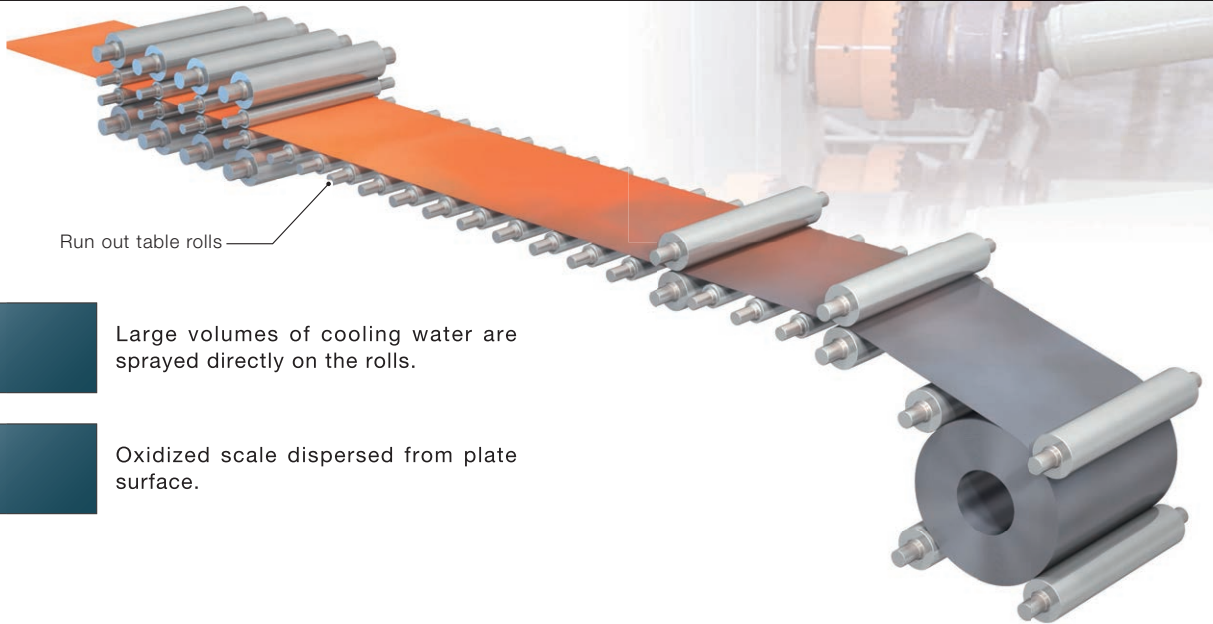
Part Number	Basic Dimensions			Basic Dynamic Load Rating $C_r$	Basic Static Load Rating $C_{or}$
	mm				
	$d$	$D$	$B$		
6302LLU/LP03QT	15	42	13	11.4	5.45
6204LLU/LP03QT	20	47	14	12.8	6.65
6006LLU/LP03QT	30	55	13	13.2	8.3
6012LLB/LP03QT	60	95	18	29.5	23.2
6213ZZ/LP03	65	120	23	57.5	40

Note : Those with "QT" indicate deep groove ball bearings full-pack specifications.



## Rolling Mill Equipment (Constant Velocity Joints)

### Equipment Characteristics



Water

Large volumes of cooling water are sprayed directly on the rolls.

Scale

Oxidized scale dispersed from plate surface.

### Rolling Machinery Constant Velocity Joint Damage Modes

Scale build-up

Boot damage

Poor lubrication due to  
grease leakage

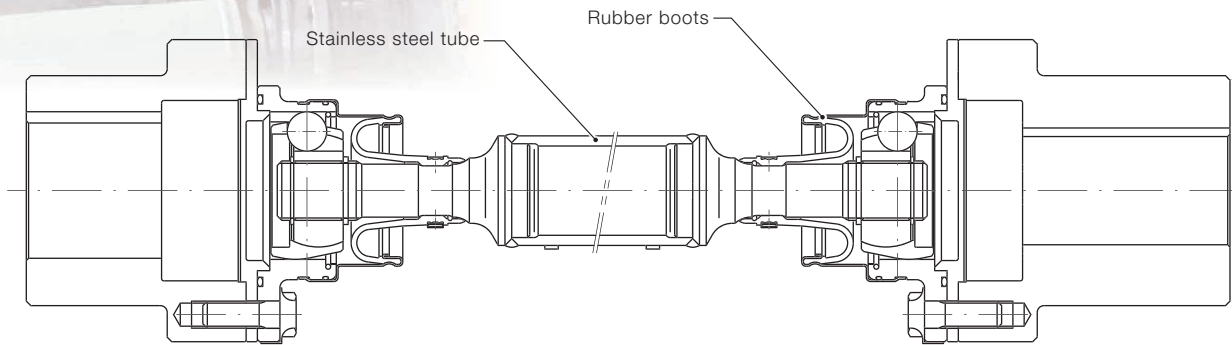
Failure

Abnormal wear of internal components  
(Constant velocity joint inner ring)



## Solutions from NTN

### Constant Velocity Joints (Long Shaft BC Coupling) for Run Out Tables



#### Corrosion resistance

Corrosion-resistant stainless steel tubes are used in the intermediate shafts.

#### Maintenance-free

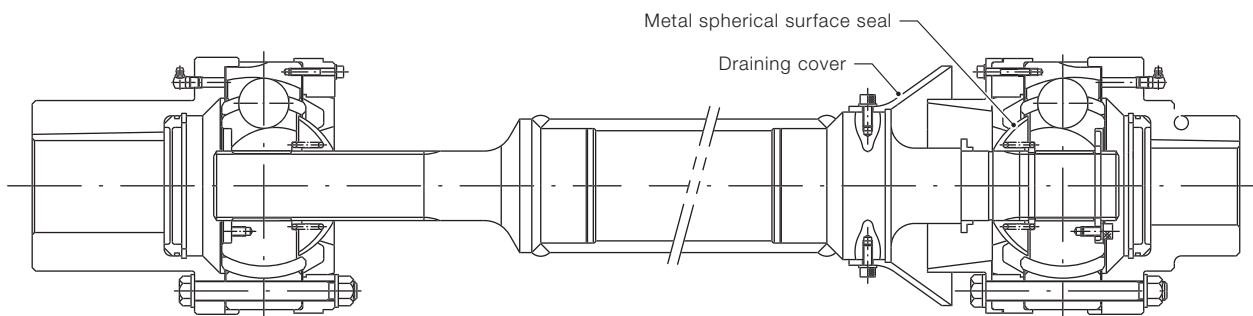
Rubber boot seals provide excellent sealing performance without re-lubricating.

Typical specifications of constant velocity joints for run out table rolls

Equipment Applications	Part Number
Run out table rolls	BC87ACP7 · ·
Run out table rolls	BC125ACP7 · ·

Note : Part number suffixes are serial numbers.

### Constant Velocity Joints for Down-coiler Wrapper Rolls



#### Long operating life

Long operating life is achieved by constant velocity joints utilizing a spherical metal seal for severe environments (unsuitable for rubber boots), such as high temperature, water and scale.

Typical specifications of constant velocity joints for down-coiler wrapper rolls

Equipment Applications	Part Number
Down-coiler rolls	BJ225ACD3 · ·
Down-coiler rolls	BJ300ACD3 · ·

Note : Part number suffixes are serial numbers.

## Surface Treatment Equipment

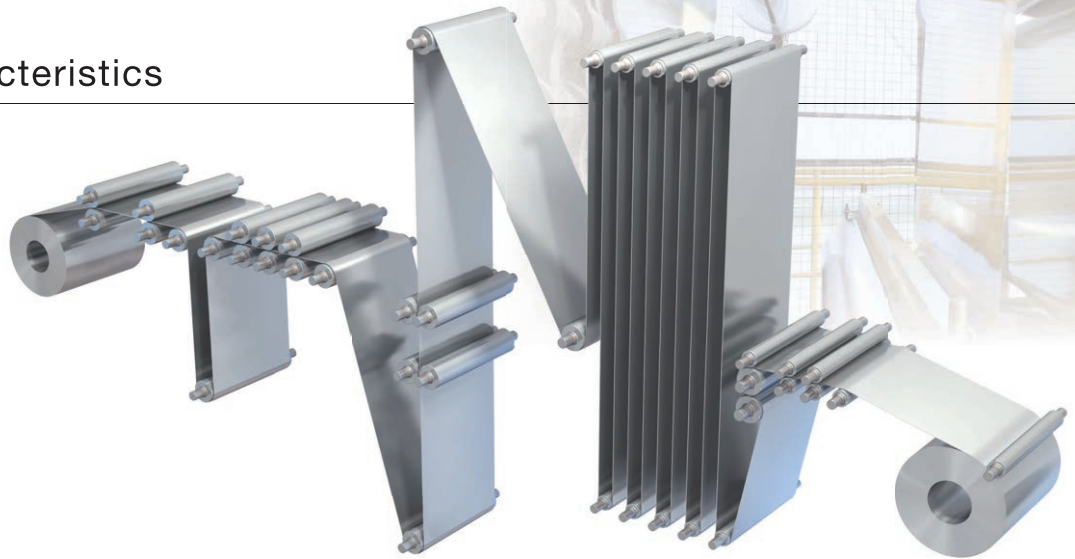
### Equipment Characteristics

#### Process liquid

Bearings come into contact with metal surface processing liquids.

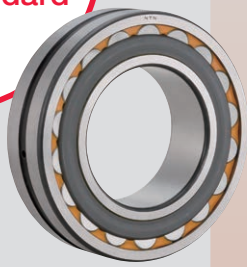
#### High precision

High bearing precision is required for high-quality metal manufacturing.

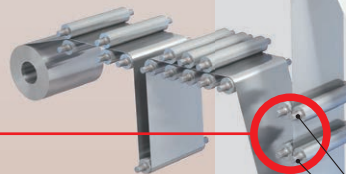


### Bearing Issues

Spherical roller bearings are full-pack as standard



Process liquid penetration



Grease emulsification and leakage

Reduction in bearing life due to poor lubrication

Wringer rolls



## Solutions from NTN

### Solid Grease Bearings for Surface Treatment Equipment

#### Long operating life

Long operating life was achieved due to the fact that water does not emulsify with the lubricant if it penetrates into the bearing.

#### Clean

Lubricant does not easily disperse, preventing contamination of the ambient environment.



Full-pack  
Spherical roller bearings  
(Code : LP03)

Actual test equipment used : multi-coating line looper carriage elevator roll

Test bearing : #22218  
Rotational speed : 120 min<sup>-1</sup>

Product after 3 yrs +  
10 months use

Use Solid  
Grease  
bearings

No grease leakage

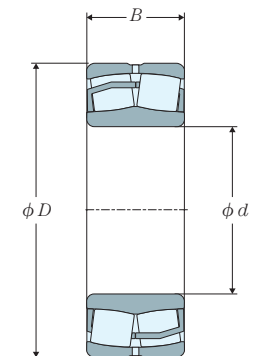


Prevent grease  
leakage to the  
product

Solid Grease oil remains  
after prolonged use, enabling  
continuous operation.

Typical specifications of Solid Grease bearings for surface treatment equipment

Part Number	Basic Dimensions			Basic Dynamic Load Rating	Basic Static Load Rating
	mm				
	<i>d</i>	<i>D</i>	<i>B</i>	<i>C<sub>r</sub></i>	<i>C<sub>0r</sub></i>
22214EAD1/LP03	70	125	31	235	240
22218EAD1/LP03	90	160	40	384	398
22220EAD1/LP03	100	180	46	472	495
22226EAD1/LP03	130	230	64	808	898



Cylindrical bore (Type EA)

### Constant Velocity Joints (BJ75-150) for CGL/ETL Equipment

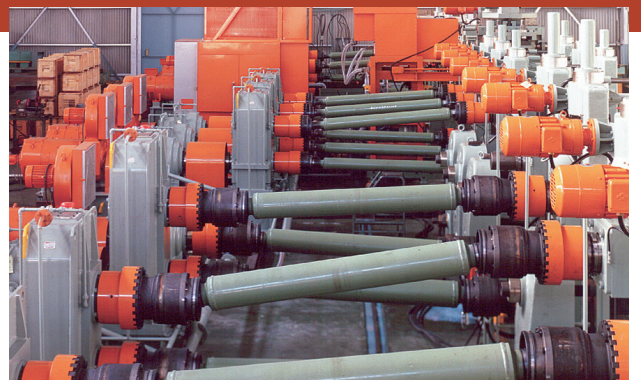
#### Maintenance-free

Operation without re-lubricating is possible by rubber boot seals providing excellent sealing performance.

Typical specifications of constant velocity joints for CGL/ETL equipment

Equipment Applications	Part Number
Chemical coaters	BJ125ACC9 . .
Chemical coaters	BJ150ACC8 . .

Note : Part number suffixes are serial numbers.





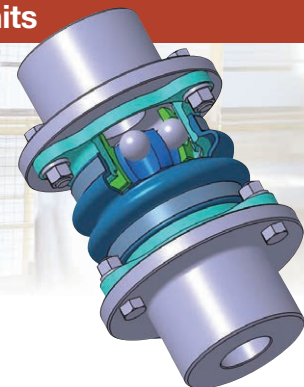
## Constant Velocity Joints (Short Shaft BC Coupling) for Furnace Roll Drive Units

### Maintenance-free

Operation without re-lubricating is possible by rubber boot seals providing excellent sealing performance.

### Expandability

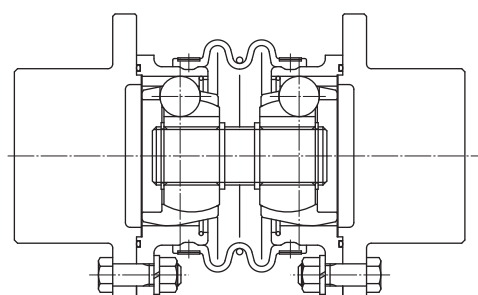
The internal construction allows for expansion and contraction due to thermal growth of furnace rolls in high temperature environments.



Typical specifications of constant velocity joints for hearth rolls (furnace rolls)

Equipment Applications	Part Number
Hearth rolls	BC75ACP6 . .
Hearth rolls	BC125ACP6 . .
Hearth rolls	BC150ACP6 . .
Hearth rolls	BC175ACP6 . .

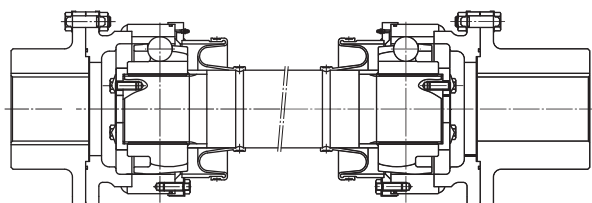
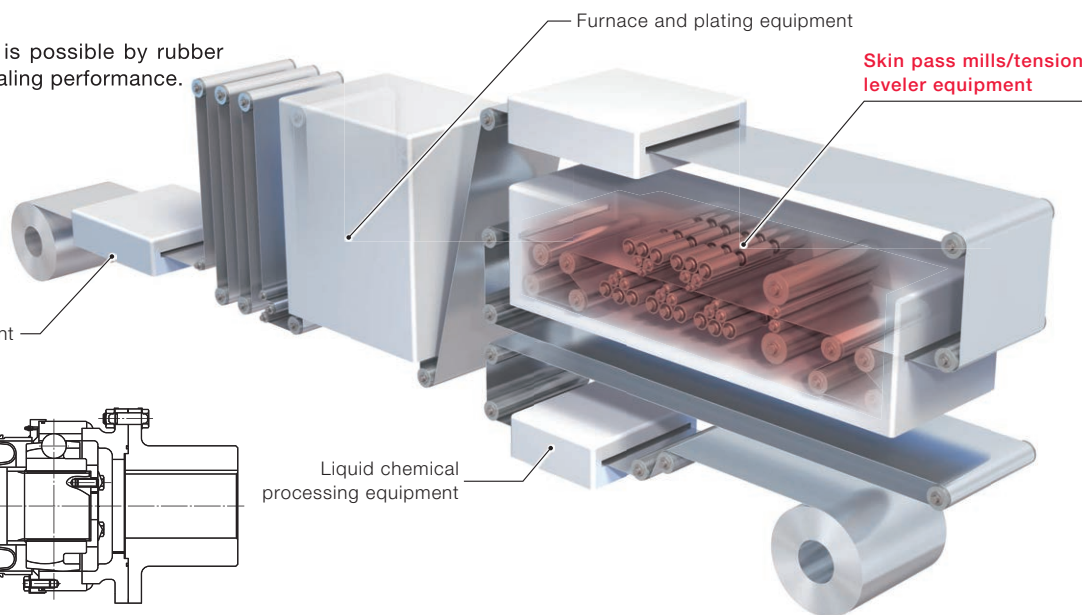
Note : Part number suffixes are serial numbers.



## Constant Velocity Joints (Large-Sized DOJ) for Tension Leveler Equipment

### Maintenance-free

Operation without re-lubricating is possible by rubber boot seals providing excellent sealing performance.



Typical specifications of constant velocity joints for tension leveler equipment

Equipment Applications	Part Number
Bridle rolls	DOJ625F6 . .

Note : Part number suffixes are serial numbers.

## Cartridge Units for Tension Leveler Work Rolls and Intermediate Rolls

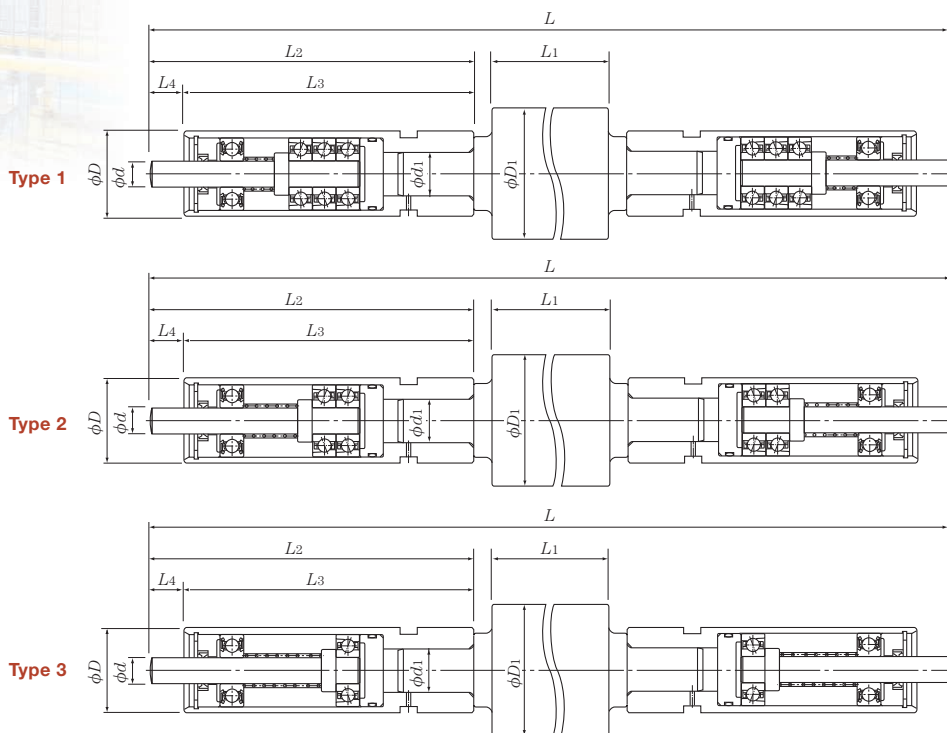
### High sealing performance

Low torque and high sealing performance achieved by labyrinth structure with light contact seals.

### High precision

High precision rolls reduce roundness and cylindricity deviation.

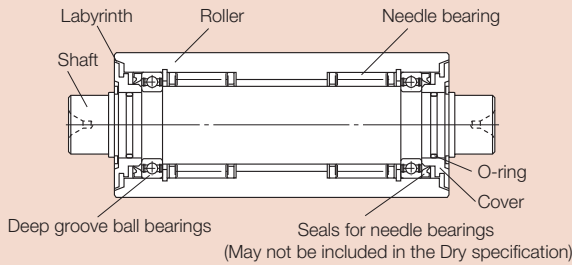
The number of internal angular ball bearing columns varies according to the requisite permissible axial load. The number of columns varies for types 1 to 3.



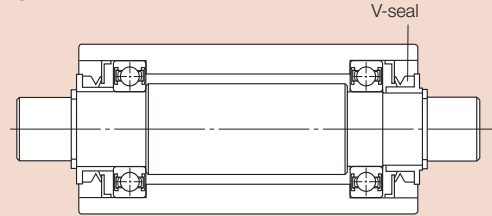
Part Number	Basic Dimensions mm									Permissible Axial Load N	Type	Mass kg (Ref.)
	$d$	$D$	$D_1$	$L$	$L_1$	$d_1$	$L_2$	$L_3$	$L_4$			
CU8A05W+WK30/185X01	8	26	30	2 066	1 850	14	102	92	10	3 300	1	11.5
CU8A07W+IM38/150X02	8	26	38	1 716	1 500	14	102	92	10	3 300	1	15.5
CU8A12W+WK20/150X02	8	23.5	20	1 716	1 500	10	102	92	10	2 200	1	4.4
CU8A14W+WK50/150X03	8	26	50	1 716	1 500	16	102	92	10	3 300	1	23.6
CU8A28W+WK30/125	8	26	30	1 466	1 250	16	102	92	10	3 300	1	7.5
CU8C01W+WK25/85	8	24	25	1 082	850	15	110	100	10	290	3	4.0
CU10B01W+WK20/180	10	24	20	2 033.5	1 800	10	91.75	80	11.75	1 370	2	4.9
CU10B06W+WK25/180X02	10	24	25	2 032	1 800	10	91	80	11	1 370	2	7.5
CU12B07W+WK30/220	12	28	30	2 433.5	2 200	18	96.75	85	11.75	1 600	2	13.1
CU12B07W+IM38/180	12	28	38	2 033.5	1 800	18	96.75	85	11.75	1 600	2	16.9
CU12B08W+WK40/210	12	38	40	2 332	2 100	20	110	100	10	2 510	2	23.0
CU12B12W+WK40/150X01	12	32	40	1 716	1 500	16	102	92	10	2 510	2	15.6
CU12B13W+IM52/185	12	32	52	2 066	1 850	16	102	92	10	2 510	2	32.0
CU12B16W+WK30/70	12	28	30	933.5	700	18	96.75	85	11.75	1 600	2	4.7
CU12B32W+IM38/160X01	12	28	38	1 760	1 600	18	80	70	10	1 600	2	14.7
CU12C01W+IM40/85	12	28	40	1 010	850	16	74	63	11	800	3	4.7
CU15A06W+IM60/180	15	38	60	2 033.5	1 800	20	108.75	94	14.75	4 820	1	41.4
CU15A12W+WK40/210X02	15	38	40	2 333.5	2 100	20	108.75	94	14.75	4 820	1	22.1
CU15B01W+IM40/210	15	38	40	2 330	2 100	22	100	85	15	3 210	2	21.7
CU15B02W+IM60/180X01	15	38	60	1 960	1 800	20	80	70	10	3 210	2	40.9
CU35C02W+WK80/210	35	73	80	2 410	2 100	35	125	110	15	6 000	3	90.8

## Unit Bearings for Tension Reels

### ● Needle type (NKZ)



### ● Ball type (BUB)



### High sealing performance

Low torque and high sealing performance achieved by labyrinth structure with light contact seals

### Thickness variance control

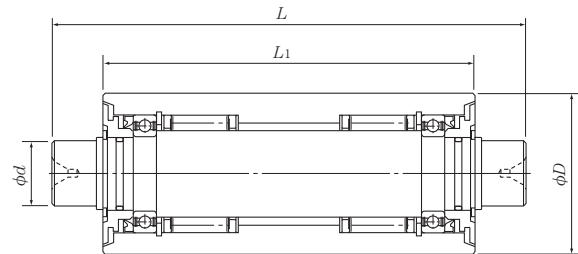
High precision OD variance control in accordance to the specifications.

### High precision

High precision roll specifications with minimum roundness and cylindricity deviation.

### Type 1 : Wet spec., needle type

- Specification using seals for needle bearings
- Standard format wet specification



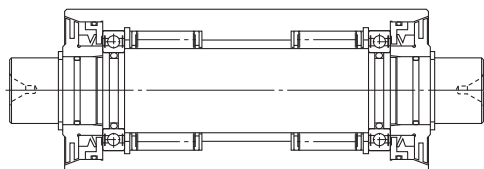
Part Number	Basic Dimensions				Basic Dynamic Load Rating		Basic Static Load Rating	Type	Mass kg (Ref.)
	<i>D</i>	<i>d</i>	<i>L</i>	<i>L</i> <sub>1</sub>	<i>C</i> <sub>r</sub>	<i>C</i> <sub>or</sub>	<i>C</i> <sub>or</sub>		
	mm				kN				
NKZ10×24×78	24	10	78	60	18.8		28.9	1	0.5
NKZ13×34×190-2	34	13	190	150	42.0		68.0	3	1.0
BUB14×34×124-01	34	14	124	91	5.65		4.0	5	0.6
BUB14×34×180-01	34	14	180	145	5.95		4.0	7	1.0
BUB14×34×186-01	34	14	186	153	5.65		4.0	5	4.2
BUB14×34×270-01	34	14	270	235	5.95		4.0	7	1.6
NKZ20×50×168	50	20	168	130	77.5		116	3	1.9
NKZ20×50×228	50	20	228	190	77.5		116	3	2.7
NKZ22×59×209	59	22	209	150	78.5		111	4	3.1
BUB24×63.5×150-01	63.5	24	150	100	26.6		23.4	6	2.2
BUB24×63.5×190-01	63.5	24	190	140	26.6		23.4	6	3.1
BUB24×65×154-02	65	24	154	113	19.2		14.8	5	3.1
NKZ24×65×200	65	24	200	150	98		153	2	3.6
NKZ24×65×205-6	65	24	205	155	82.5		122	3	3.9
BUB24×65×216-06	65	24	216	166	20.2		14.8	5	3.8
NKZ24×65×294	65	24	294	244	98		153	2	5.8
NKZ24×65×308-6	65	24	308	208	82.5		122	3	6.3
BUB24×65×324-06	65	24	324	274	20.2		14.8	5	6.2

Note 1) Contact NTN for further information about the use of each bearing and consideration of bearing specifications.  
2) Please test with an actual machine before using.



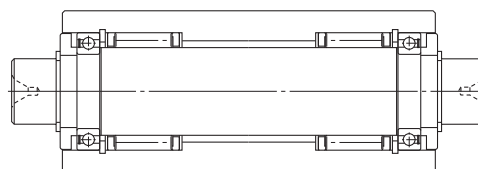
**Type 2 : Wet spec., needle type**

- Specification using V-seals (axial seals)
- Torque can be stabilized by comparison to Type 1



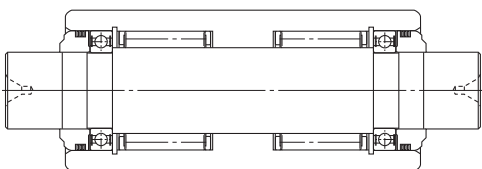
**Type 3 : Dry spec., needle type**

- Standard specification for use without cleaning fluids (Dry spec.)
- Lower torque usable due to absence of contact seals



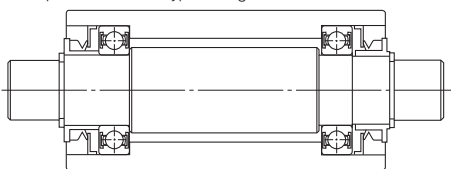
**Type 4 : Dry spec., needle type**

- Specification with labyrinth ring included is available for Type 3 upon request



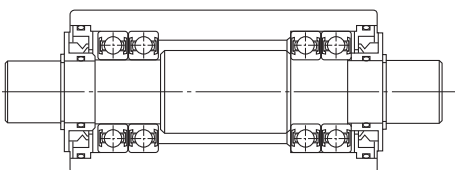
**Type 5 : Wet spec., ball type**

- Specification does not include needle bearings
- Torque can be further lowered although load capacity is smaller compared to needle type configuration



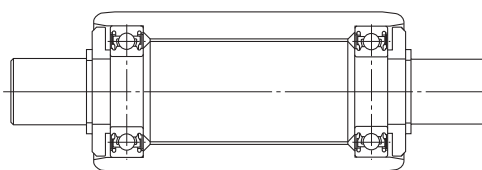
**Type 6 : Wet spec., ball type**

- Specification in which ball bearings have been increased for Type 5
- Load capacity can be greatly increased by comparison to Type 5



**Type 7 : Dry spec., ball type**

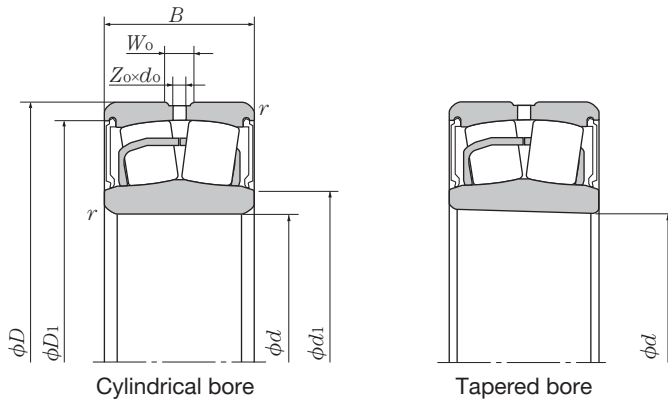
- Standard specification for use without cleaning fluids (Dry spec.)
- Lower torque usable due to absence of contact seals



Part Number	Basic Dimensions				Basic Dynamic Load Rating	Basic Static Load Rating	Type	Mass
	<i>D</i>	<i>d</i>	<i>L</i>	<i>L</i> <sub>1</sub>				
	mm				kN			
NKZ26×75×208-5	75	26	208	160	112	163	1	5.1
NKZ26×75×288-5	75	26	288	240	112	163	1	7.5
NKZ28×75×150	75	28	150	108	112	163	1	3.6
NKZ28×75×225	75	28	225	183	112	163	1	5.8
NKZ30×65×196-1	65	30	196	146	114	186	1	3.8
NKZ30×65×274-1	65	30	274	224	114	186	1	4.5
NKZ30×75×150-24	75	30	150	110	125	187	1	3.7
NKZ30×75×196-3	75	30	196	150	151	228	3	4.0
NKZ30×75×205-29	75	30	205	155	151	228	1	4.9
NKZ30×75×225-23	75	30	225	185	125	187	1	5.8
NKZ30×75×230-13	75	30	230	180	151	228	1	5.8
NKZ30×75×296-3	75	30	296	250	151	228	3	6.3
NKZ30×75×308-27	75	30	308	183	125	187	1	8.0
NKZ30×75×326-10	75	30	326	276	151	228	1	8.5
NKZ31×90×208-3	90	31	208	160	133	202	1	7.3
NKZ31×90×308-3	90	31	308	260	133	202	1	11.6
NKZ40×90×195	90	40	195	145	128	214	1	7.0
NKZ50×114×265	114	50	265	200	305	590	4	12.0
NKZ70×150×345-4	150	70	345	250	515	905	4	34.5



ULTAGE Series Sealed Spherical Roller Bearings [Type WA]



No. of outer ring outer diameter oil holes

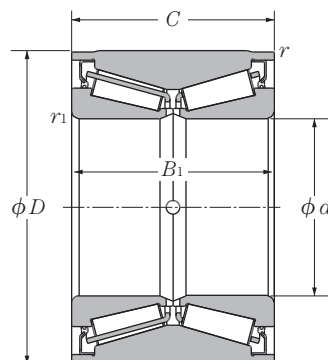
Z <sub>o</sub>	
D1	W33
4	3

Note  
 D1 : With oil inlet/oil groove (D1 specification only)  
 W33 : With oil inlet/oil groove (European market specification)

Basic Dimensions						Basic Dynamic Load Rating	Basic Static Load Rating	Basic Dynamic Load Rating	Basic Static Load Rating	Part Number	
mm						kN		kgf		Cylindrical Bore	Tapered Bore <sup>①</sup>
d	D	B	r <sub>s min</sub> <sup>②</sup>	W <sub>0</sub>	d <sub>o</sub>	C <sub>r</sub>	C <sub>or</sub>	C <sub>r</sub>	C <sub>or</sub>		
25	52	23	1	3	1.5	57.3	46.1	5 840	4 700	WA22205EALLSW33	—
30	62	25	1	4	2	75.7	64.5	7 720	6 580	WA22206EALLSW33	—
35	72	28	1.1	5	2	100	92	10 200	9 380	WA22207EALLSW33	WA22207EALLSKW33
40	80	28	1.1	5	2.5	116	105	11 800	10 700	WA22208EALLSD1	WA22208EALLSKD1
45	85	28	1.1	6	2.5	121	113	12 300	11 500	WA22209EALLSD1	WA22209EALLSKD1
50	90	28	1.1	6	2.5	130	124	13 300	12 600	WA22210EALLSD1	WA22210EALLSKD1
55	100	31	1.5	6	3	155	148	15 800	15 100	WA22211EALLSD1	WA22211EALLSKD1
60	110	34	1.5	7	3	187	181	19 100	18 400	WA22212EALLSD1	WA22212EALLSKD1
65	120	38	1.5	8	3.5	226	224	23 100	22 900	WA22213EALLSD1	WA22213EALLSKD1
70	125	38	1.5	7	3.5	235	240	24 000	24 400	WA22214EALLSD1	WA22214EALLSKD1
75	130	38	1.5	7	3.5	244	249	24 800	25 400	WA22215EALLSD1	WA22215EALLSKD1
80	140	40	2	8	3.5	278	287	28 400	29 300	WA22216EALLSD1	WA22216EALLSKD1
85	150	44	2	8	3.5	324	330	33 000	33 600	WA22217EALLSD1	WA22217EALLSKD1
90	160	48	2	10	4.5	384	398	39 200	40 600	WA22218EALLSD1	WA22218EALLSKD1
100	180	55	2.1	11	5	472	495	48 100	50 500	WA22220EALLSD1	WA22220EALLSKD1
110	200	63	2.1	12	6	602	643	61 400	65 600	WA22222EALLSD1	WA22222EALLSKD1
120	215	69	2.1	12	6	688	753	70 100	76 800	WA22224EALLSD1	WA22224EALLSKD1
130	230	75	3	13	6	808	898	82 400	91 600	WA22226EALLSD1	WA22226EALLSKD1

① Indicates bearings with a bore taper ratio of 1/12. ② Indicates the minimum permissible chamfer dimension r.

## Sealed Double Row Tapered Roller Bearings

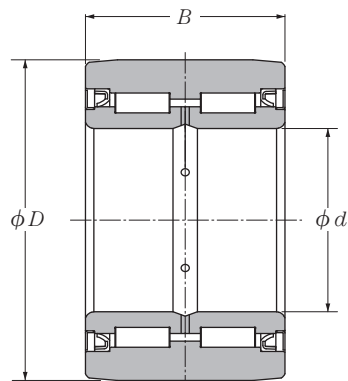


Basic Dimensions						Basic Dynamic Load Rating	Basic Static Load Rating	Basic Dynamic Load Rating	Basic Static Load Rating	Part Number
mm						kN		kgf		
$d$	$D$	$B_1$	$C$	$r_s \text{ min}^{\text{①}}$	$r_{1s} \text{ min}^{\text{①}}$	$C_r$	$C_{or}$	$C_r$	$C_{or}$	
85	180	115	115	0.6	2.5	440	715	45 000	73 000	CRI-1760LL
95	180	100	100	1	3	530	835	54 500	85 500	CRI-1959LL *
100	180	100	100	0.8	2.5	440	675	45 000	68 500	CRI-2070LL
110	200	100	100	1	3	605	965	61 500	98 500	CRI-2272LL
130	230	138	138	0.3	3	820	1 660	83 500	169 000	CRI-2666LL

① Indicates the minimum permissible chamfer dimension  $r^*$  or  $r_1^*$ .

Note 1) Nominal numbers showing the asterisk \* indicate bearings without oil holes.

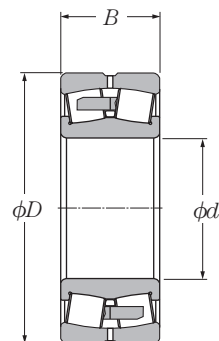
## Sealed Double Row Cylindrical Roller Bearings



Part Number	Basic Dimensions			Basic Dynamic Load Rating	Basic Static Load Rating
	$d$	$D$	$B$		
SLX120×210×114	120	210	114	500	1 120
SLX120×210×132	120	210	132	580	1 360
SLX130×210×132	130	210	132	500	1 640
SLX130×210×150	130	210	150	600	1 810
SLX140×210×130	140	210	126	420	1 310
SLX160×250×140	160	250	140	605	1 930



## Ultra-Large Spherical Roller Bearings



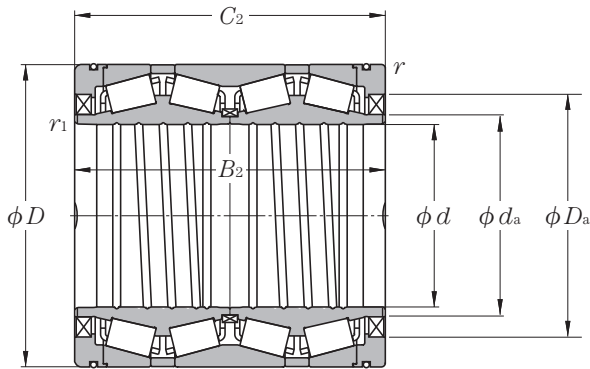
Cylindrical bore

Part Number	Basic Dimensions			Allowable Misalignment rad(°)	Basic Dynamic Load Rating $C_r$	Basic Static Load Rating $C_{or}$
	$d$	$D$	$B$			
2P17011	850	1 220	290	0.026(1.5)	9 700	22 700
2P19022	950	1 360	320	0.026(1.5)	11 500	28 000
2P19019	950	1 400	380	0.026(1.5)	14 100	33 500
2P20005	1 000	1 420	320	0.026(1.5)	12 000	29 400
2P21001	1 050	1 500	412	0.026(1.5)	15 400	41 500
2P24011	1 200	1 700	410	0.026(1.5)	17 900	45 500
2P30002	1 500	1 900	375	0.026(1.5)	15 900	49 000

**ULTAGE**

ULTAGE Series Sealed Four Row Tapered Roller Bearings for Rolling Mill Roll Necks [CROU... LL Type]

Size charts \* Contact **NTN** for information about bearing model numbers that are not presented in the tables.



**Dynamic equivalent radial load**

$$P_r = XF_r + YF_a$$

$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	$Y_1$	0.67	$Y_2$

**Static equivalent radial load**

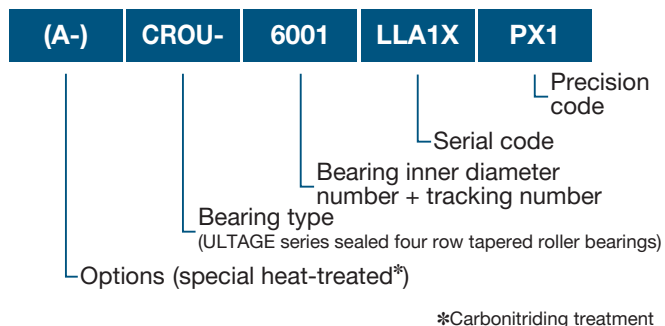
$$P_{or} = F_r + Y_0 F_a$$

$e$ ,  $Y_1$ ,  $Y_2$  and  $Y_0$  are obtained from the tables below.

Series	Part Number	Basic Dimensions						(Ref) Standard Radial Internal Clearances	Standard Axial Internal Clearances
		mm							
		$d$	$D$	$B_2$	$C_2$	$r^{\text{①}}$ min	$r_{1s}$ min	mm <sup>②</sup>	mm <sup>②</sup>
Metric size series	CROU-4401LLA1X	220	295	315	315	1	2.5	0.093 ~ 0.106	0.420 ~ 0.480
	CROU-4501LLA1X	225	320	230	230	1	2.5	0.099 ~ 0.115	0.360 ~ 0.420
	CROU-4801LLA1X	240	338	248	248	1	2.5	0.104 ~ 0.118	0.450 ~ 0.510
	CROU-4802LLA1X	240	338	340	340	1	2.5	0.107 ~ 0.123	0.400 ~ 0.460
	CROU-5001LLA1X	250	365	270	270	1	2.5	0.113 ~ 0.129	0.420 ~ 0.480
	CROU-5201LLA1X	260	365	340	340	1	2.5	0.115 ~ 0.131	0.430 ~ 0.490
	CROU-6001LLA1X	300	420	310	310	1	2.5	0.131 ~ 0.147	0.490 ~ 0.550
	CROU-6201LLA1X	310	430	350	350	1	2.5	0.136 ~ 0.154	0.520 ~ 0.590
	CROU-8201LLA1X	410	546	400	400	1.5	2.5	0.173 ~ 0.188	0.780 ~ 0.850
	CROU-8801LLA1X	440	590	480	480	1.5	2.5	0.188 ~ 0.204	0.850 ~ 0.920
	CROU-8802LLA1X	440	620	454	454	3	2.5	0.195 ~ 0.211	0.880 ~ 0.950
	CROU-10601LLA1X *	530	780	570	570	3	2.5	0.244 ~ 0.259	1.100 ~ 1.170
Inch size series	CROU-4402LLA1X	220.662	314.325	239.712	239.712	1	2.5	0.098 ~ 0.111	0.450 ~ 0.510
	CROU-5101LLA1X	254.000	358.775	269.875	269.875	1	2.5	0.111 ~ 0.127	0.430 ~ 0.490
	CROU-6101LLA1X	304.902	412.648	266.700	266.700	1	2.5	0.130 ~ 0.150	0.450 ~ 0.520
	CROU-6901LLA1X	343.052	457.098	254.000	254.000	1	2.5	0.136 ~ 0.158	0.430 ~ 0.500
	CROU-6902LLA1X	343.052	457.098	299.000	299.000	1	2.5	0.143 ~ 0.163	0.500 ~ 0.570
	CROU-10001LLA1X	501.650	711.200	520.700	520.700	3	2.5	0.206 ~ 0.226	0.730 ~ 0.800
	CROU-11901LLA1X *	595.312	844.550	615.950	615.950	3	2.5	0.266 ~ 0.282	1.200 ~ 1.270

① Indicates the minimum permissible chamfer dimension  $r^*$  or  $r_1^*$ . ② Proper values may vary depending on the conditions of use. Contact **NTN** for more information.

### Nominal numbers



### Operating temperature range

- - 20 to 120°C (-4 to 250 °F)

### Fitting (recommended)

- Metric : Shaft d6/housing G7
- Inches : Contact **NTN** for information

### Standard Prelubricating grease

- Bearing pre-filled from the factory
- Fill amount : Space volume ratio 35%

### Permitted rotational speed

- $dm \cdot n \leq 300 \times 10^3$

$dm$  : Bearing core dia. (mm) =  $(d + D) / 2$

$d$  : Bearing inner dia. (mm)

$D$  : Bearing outer dia. (mm)

$n$  : Rotational speed ( $\text{min}^{-1}$ )

The above are guideline values. These values may not satisfy depending on the conditions of use. Contact **NTN** for more information.

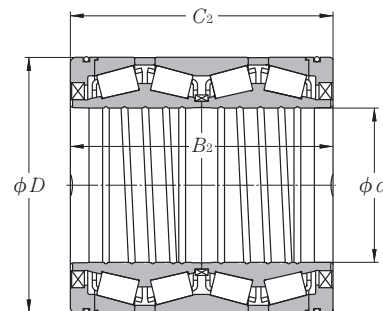
### Materials

- Inner/outer rings : Case hardened steel with through hardened steel rolling elements (standard for CROU design).
- \*Indicates all components as special heat treatment

Basic Dynamic Load Rating	Basic Static Load Rating	Basic Dynamic Load Rating	Basic Static Load Rating	Installation Dimensions		Constant	Axial Load Coefficient		
				$d_a$	$D_a$		$e$	$Y_1$	$Y_2$
1 880	4 650	192 000	475 000	235	267	0.33	2.03	3.02	1.98
1 870	3 700	190 000	375 000	241	294	0.41	1.64	2.44	1.60
2 320	4 600	236 000	470 000	259	309	0.35	1.95	2.90	1.91
2 960	6 850	302 000	700 000	257	299	0.40	1.68	2.50	1.64
2 760	5 300	280 000	540 000	272	333	0.40	1.68	2.50	1.64
3 340	7 450	340 000	760 000	275	327	0.40	1.68	2.50	1.64
3 600	7 650	366 000	780 000	318	382	0.40	1.68	2.50	1.64
4 020	8 900	410 000	910 000	329	388	0.39	1.72	2.56	1.68
5 520	13 300	562 000	1 350 000	434	504	0.33	2.03	3.02	1.98
6 600	16 200	670 000	1 650 000	462	540	0.33	2.03	3.02	1.98
7 600	16 700	780 000	1 700 000	473	570	0.33	2.03	3.02	1.98
13 400	29 400	1 370 000	3 000 000	581	710	0.33	2.03	3.02	1.98
2 240	4 350	228 000	440 000	240	290	0.33	2.07	3.09	2.03
2 760	5 700	282 000	580 000	274	328	0.39	1.74	2.59	1.70
2 800	5 850	286 000	600 000	323	379	0.43	1.56	2.32	1.52
2 820	5 950	288 000	605 000	364	423	0.47	1.43	2.12	1.40
3 500	8 150	356 000	830 000	364	423	0.43	1.57	2.34	1.53
10 000	23 900	1 020 000	2 440 000	542	642	0.42	1.60	2.38	1.56
13 900	33 000	1 420 000	3 350 000	638	770	0.33	2.03	3.02	1.98

## Sealed Four Row Tapered Roller Bearings

Shaft diameter  $d$  140 ~ 711.200 mm

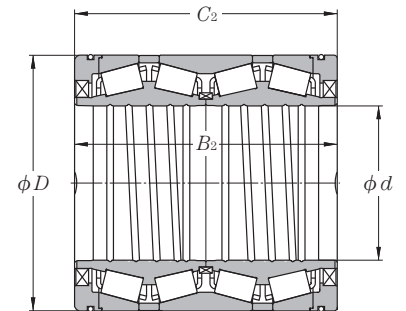


$d$	Basic Dimensions mm			Basic Dynamic Load Rating $C_r$	Basic Static Load Rating $C_{or}$	Part Number	Mass kg (Ref.)
	$D$	$B_2$	$C_2$				
140	198	174	174	595	1 470	CRO-2810LL	16
	198	174	174	615	1 510	CRO-2812LL	15.5
200	282	206	206	950	2 450	CRO-4022LL	39
216.103	330.200	263.525	269.875	1 770	4 000	● CRO-4303LL	78.2
220	295	315	315	1 270	3 850	CRO-4424LL	57.5
	310	280	280	1 590	4 100	CRO-4427LL	63.5
	320	290	290	1 780	4 850	CRO-4436LL	77
240	338	248	248	1 590	4 200	CRO-4811LL	67.8
	338	340	340	2 040	6 000	CRO-4817LL	94.4
245	345	310	310	2 070	5 950	CRO-4906LL	90.5
250	365	270	270	1 920	4 750	CRO-5015LL	90
254.000	358.775	269.875	269.875	1 940	4 900	● CRO-5117LL	83
	358.775	269.875	269.875	1 850	4 750	● CRO-5116LL	81.7
260	365	339	339	2 250	5 950	CRO-5224LL	103
260.350	422.275	314.325	317.500	2 680	5 950	● CRO-5227LL	177
279.400	393.700	269.875	269.875	2 000	4 950	● CRO-5652LL	96.4
280	380	290	290	2 060	5 750	CRO-5660LL	90
	395	290	290	2 120	5 450	CRO-5665LL	108
	395	340	340	2 590	7 150	CRO-5664LL	126
	410	268	268	2 140	5 000	CRO-5639LL	116
285	400	340	340	2 560	7 650	CRO-5709LL	134
290	400	346	346	2 560	7 650	CRO-5814LL	129

Note 1) Part number showing the asterisk ● indicates bearing size in inches.

2) Materials : Bearing Steel

Carburized steel may be used to prevent cracking. Please contact **NTN** Engineering for more information.



<i>d</i>	Basic Dimensions			Basic Dynamic Load Rating <i>C<sub>r</sub></i>	Basic Static Load Rating <i>C<sub>0r</sub></i>	Part Number	Mass kg (Ref.)
	<i>D</i>	<i>B<sub>2</sub></i>	<i>C<sub>2</sub></i>				
	mm			kN			
300	400	254	254	1 920	5 300	CRO-6038LL	84.6
	420	310	310	2 510	6 850	CRO-6042LL	128
	430	295	305	2 150	5 550	CRO-6031LL	136
304.648	438.048	280.990	279.400	2 250	5 450	● CRO-6143LL	136
310	430	310	310	2 340	6 600	CRO-6220LL	133
	430	350	350	2 820	7 950	CRO-6222LL	150
320	480	360	360	3 600	8 850	CRO-6426LL	228
343.052	457.098	254.000	254.000	2 060	5 500	● CRO-6930LL	105
	457.098	254.000	254.000	1 900	5 050	● CRO-6920LL	107
	457.098	299.000	299.000	2 470	7 100	● CRO-6936LL	130
355	490	316	316	2 520	6 600	CRO-7109LL	159
360	480	375	375	3 400	10 200	CRO-7226LL	180
410	546	400	400	3 850	11 900	CRO-8204LL	253
420	620	395	320	4 550	11 800	CRO-8412LL	384
440	590	480	480	4 550	13 900	CRO-8830LL	358
	620	454	454	5 800	16 600	CRO-8832LL	426
457.200	596.900	276.225	279.400	2 540	6 800	● CRO-9107LL	192
479.425	679.450	495.300	495.300	6 450	18 400	● CRO-9610LL	565
482.600	615.950	330.200	330.200	3 200	9 650	● CRO-9725LL	225
530	715	590	590	8 200	26 900	CRO-10607LL	700
595.312	844.550	615.950	615.950	10 600	32 000	● CRO-11919LL	1 130
711.200	914.400	387.350	387.350	6 300	19 600	● CRO-14214LL	616
	914.400	410.000	410.000	6 400	20 700	● CRO-14209LL	596

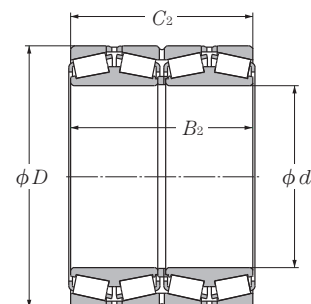
Note 1) Nominal numbers showing the asterisk ● indicate bearing sizes in inches.

2) Materials : Bearing Steel

Carburized steel may be used to prevent cracking. Please contact **NTN** Engineering for more information.

## Four Row Tapered Roller Bearings

Shaft diameter  $\phi$  100 ~ 244.475 mm

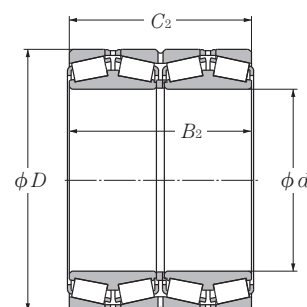


$d$	Basic Dimensions			Basic Dynamic Load Rating $C_r$	Basic Static Load Rating $C_{or}$	Part Number	Mass kg (Ref.)
	$D$	$B_2$	$C_2$				
100	170	155	155	595	1 170	CRO-2008	14.5
105	190	210	210	760	1 630	CRO-2151	26
110	150	150	150	505	1 280	CRO-2252	7.7
120	170	124	124	390	1 020	625924	8.97
	180	100	100	395	745	623024	8.87
	200	132	132	640	1 220	623124	16.7
	210	174	174	855	1 710	CRO-2418	22.2
120.650	174.625	141.288	139.703	510	1 220	● M224749D/M224710/M224710D	11.5
127.000	182.562	158.750	158.750	660	1 730	● T-48290D/48220/48220D	14.3
130	184	134	134	480	1 190	625926	11.3
135	180	160	160	500	1 360	CRO-2701	13.5
136.525	190.500	161.925	161.925	695	1 900	● T-48393D/48320/48320D	14.8
139.700	200.025	157.165	160.340	700	1 950	● T-48680D/48620/48620D	17.3
140	198	144	144	575	1 460	625928	14
	210	114	114	515	1 070	623028	13.8
	210	115	115	515	1 070	CRO-2817	13.9
146.050	244.475	192.088	187.325	955	1 980	● 81576D/81962/81963D	36.8
150	210	190	190	860	2 240	CRO-3052	20.3
	212	155	155	660	1 700	625930	16.9
152.400	222.250	174.625	174.625	930	2 350	● T-M231649D/M231610/M231610D	24.7
160	226	165	165	775	2 030	625932	20.2
	265	173	173	1 100	2 270	CRO-3209 (CRO-3210)	33.6
165.100	225.425	165.100	168.275	745	2 220	● T-46791D/46720/46721D	20.7
170	240	175	175	835	2 200	625934	24.4
	260	144	144	840	1 730	623034	27.5
	280	181	181	1 150	2 420	CRO-3409	44
	280	185	185	1 240	2 540	623134	45.2
177.800	247.650	192.088	192.088	1 000	2 760	● 67791D/67720/67721D (CRO-3664)	29.4
	279.400	234.950	234.947	1 420	3 400	● 82681D/82620/82620D	55.3
	304.800	238.227	233.365	1 580	3 100	● EE280700D/281200/281201D (CRO-3663)	69.9

Note 1) Part number showing the asterisk ● indicates inch size series bearing. 2) Inner ring spacers are discontinued for those indicated with ( ).

3) Materials : Bearing Steel

Carburized steel may be used to prevent cracking. Please contact NTN Engineering for more information.



$d$	Basic Dimensions			Basic Dynamic Load Rating $C_r$	Basic Static Load Rating $C_{or}$	Part Number	Mass kg (Ref.)
	mm						
	$D$	$B_2$	$C_2$	kN			
180	250	185	185	895	2 350	CRO-3658	27.5
	254	185	185	910	2 390	625936	28.9
	300	280	280	2 160	4 800	CRO-3617	69.4
187.325	269.875	211.138	211.138	1 240	3 400	● M238849D/M238810/M238810D	41.8
190.000	268	196	196	1 060	2 850	625938	34.7
	270	190	190	1 080	2 940	CRO-3812	34.7
	270	190	190	1 220	3 050	CRO-3813	34.5
	292.100	225.425	225.425	1 570	4 150	● M241538D/M241510/M241510D	59.6
190.500	266.700	187.325	188.912	1 040	2 990	● T-67885D/67820/67820D	33.6
198.438	284.162	225.425	225.425	1 530	4 000	● M240648D/M240611/M240611D	46
200	282	206	206	1 200	3 300	625940	40.5
	290	160	160	925	2 210	CRO-4013	35.1
	310	200	200	1 530	3 300	CRO-4014	54
203.200	317.500	215.900	209.550	1 270	2 820	● EE132082D/132125/132126D	62.5
206.375	282.575	190.500	190.500	1 120	2 890	● T-67986D/67920/67920D	35.4
215.900	288.925	177.800	177.800	1 110	3 250	● T-LM742749D/LM742714/LM742714D	34.3
216.103	330.200	263.525	269.875	2 000	5 150	● 9974D/9920/9920D	82.1
220	300	230	230	1 360	3 650	CRO-4412	42.1
	310	226	226	1 380	3 800	625944	53.5
	320	200	200	1 390	3 400	CRO-4411	53
	340	190	190	1 510	3 300	623044	63.2
	340	194	194	1 510	3 300	CRO-4409	64.5
220.662	314.325	239.712	239.712	1 840	4 900	● T-M244249D/M244210/M244210D	60.2
228.600	364.000	296.875	296.875	2 370	5 550	● CRO-4606	117.9
	425.450	349.250	361.950	3 450	8 250	● EE700090D/700167/700168D	232
234.950	327.025	196.850	196.850	1 370	3 700	● T-8576D/8520/8520D	53.6
240	338	248	248	1 870	4 950	625948A (CRO-4825)	70
241.478	350.838	228.600	228.600	1 610	4 000	● EE127097D/127137/127137D	76.4
244.475	327.025	193.675	193.675	1 430	4 100	● LM247748D/LM247710/LM247710DA	46.1
	381.000	304.800	304.800	2 220	5 750	● EE126096D/126150/126151D	132

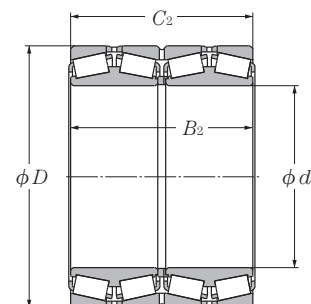
Note 1) Part number showing the asterisk ● indicates inch size series bearing. 2) Inner ring spacers are discontinued for those indicated with ( ).

3) Materials : Bearing Steel

Carburized steel may be used to prevent cracking. Please contact NTN Engineering for more information.

## Four Row Tapered Roller Bearings

Shaft diameter  $\phi$  245 ~ 341.312 mm



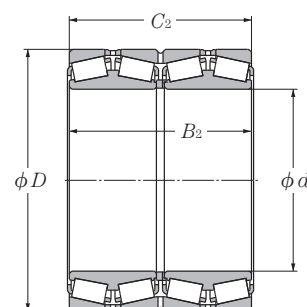
d	Basic Dimensions			Basic Dynamic Load Rating Cr	Basic Static Load Rating Cor	Part Number	Mass kg (Ref.)
	D	B <sub>2</sub>	C <sub>2</sub>				
245	380	255.5	254	2 060	4 750	CRO-4901	106.7
250	365	270	270	2 150	6 150	CRO-5004	82.1
	365	270	270	2 150	6 150	CRO-5012	96.7
	370	220	220	2 050	5 750	CRO-5001	87
254.000	358.775	269.875	269.875	2 390	6 550	● T-M249748D/M249710/M249710D	85.6
	368.300	204.622	204.470	1 350	3 250	● EE171000D/171450/171451D	71.8
	444.500	279.400	279.400	2 890	5 900	● EE822101D/822175/822176D	185
260	360	272	272	2 080	5 750	CRO-5218	74.2
	368	268	268	1 990	5 700	625952	90.3
	400	220	220	1 970	4 400	623052	98.9
	400	255	255	2 210	5 300	CRO-5215	106
260.350	365.125	228.600	228.600	1 750	4 550	● EE134102D/134143/134144D	76.5
	400.050	255.588	253.995	2 090	4 950	● EE221027D/221575/221576D	117
	422.275	314.325	317.500	2 980	7 100	● HM252349D/HM252310/HM252310D	180
266.700	355.600	230.188	228.600	1 840	5 350	● T-LM451349D/LM451310/LM451310D (CRO-5307)	62
	355.600	230.188	228.600	1 430	4 350	● CRO-5305	62.3
	393.700	269.878	269.878	2 110	6 000	● EE275106D/275155/275156D	116
269.875	381.000	282.575	282.575	2 470	6 850	● T-M252349D/M252310/M252310D	97.5
270	410	222	222	1 910	4 550	CRO-5403	91
275	385	200	200	1 610	4 250	CRO-5501	62.5
276.225	406.400	268.290	260.355	2 110	6 000	● EE275109D/275160/275161D	122
279.400	381.000	269.875	269.875	2 240	6 450	● CRO-5628	79.6
	393.700	269.875	269.875	1 940	5 350	● EE135111D/135155/135156D	103
	419.100	292.100	292.100	2 770	6 950	● CRO-5614	141
	469.900	346.075	349.250	3 500	8 700	● EE722111D/722185/722186D	258
279.578	380.898	244.475	244.475	1 950	6 200	● T-LM654644D/LM654610/LM654610D (CRO-5679)	83.2
280	380	290	290	2 470	7 250	CRO-5650 (CRO-5676)	105
	395	288	288	2 560	7 100	625956 (CRO-5684)	111
285.750	380.898	244.475	244.475	1 950	6 200	● T-LM654648D/LM654610/LM654610D (CRO-5710)	82.5
288.925	406.400	298.450	298.450	2 980	8 300	● M255449D/M255410/M255410DA	125

Note 1) Part number showing the asterisk ● indicates inch size series bearing. 2) Inner ring spacers are discontinued for those indicated with ( ).

3) Materials : Bearing Steel

Carburized steel may be used to prevent cracking. Please contact NTN Engineering for more information.





<i>d</i>	Basic Dimensions			Basic Dynamic Load Rating <i>C<sub>r</sub></i>	Basic Static Load Rating <i>C<sub>0r</sub></i>	Part Number	Mass kg (Ref.)
	mm						
	<i>D</i>	<i>B<sub>2</sub></i>	<i>C<sub>2</sub></i>	kN			
292.100	476.250	296.047	292.100	3 050	6 800	● EE921150D/921875/921876D	208
300	424	310	310	2 570	7 450	625960	138
	430	280	280	2 690	7 100	CRO-6019	132
	430	300	300	2 690	7 100	CRO-6022	141
	460	360	360	4 050	10 100	CRO-6015	180
	470	270	270	3 200	7 250	☆ CRO-6012	152
	470	292	292	3 500	8 300	☆ CRO-6013 (CRO-6033)	164
	500	332	332	3 600	8 100	623160	257
300.038	422.275	311.150	311.150	3 350	9 600	☆● T-HM256849D/HM256810/HM256810DG2	143
304.648	438.048	279.400	279.400	2 470	6 500	● EE329119D/329172/329173D	143
	438.048	280.990	279.400	2 630	6 900	● M757448D/M757410/M757410D	140
304.800	419.100	269.875	269.875	2 390	6 850	● M257149D/M257110/M257110D	115
	444.500	247.650	241.300	1 850	4 600	● EE291202D/291750/291751D	127
	495.300	342.900	349.250	3 650	9 400	● EE724121D/724195/724196D	273
304.902	412.648	266.700	266.700	2 610	7 450	● M257248D/M257210/M257210D	107
305.003	438.048	280.990	279.400	2 630	6 900	● M757449D/M757410/M757410D	139
310	430	310	310	2 880	8 100	CRO-6213	133
	430	310	310	3 050	8 600	CRO-6204	136
317.500	422.275	269.875	269.875	2 260	7 050	● LM258649D/LM258610/LM258610D (CRO-6431)	110
	447.675	327.025	327.025	3 400	9 550	● T-HM259049D/HM259010/HM259010D	161
320	460	338	338	2 940	8 650	625964	183
327	445	230	230	2 150	5 650	CRO-6501	99.8
330	470	340	340	3 150	10 200	CRO-6604	141
	510	340	340	3 900	9 650	CRO-6602	221
330.200	482.600	306.388	311.150	2 810	7 900	● EE526131D/526190/526191D	197
	533.400	254.000	254.000	3 200	6 750	● CRO-6606	221
333.375	469.900	342.900	342.900	4 000	11 000	● HM261049D/HM261010/HM261010DA	187
340	480	350	350	3 450	10 400	625968	200
	520	278	278	3 250	7 500	623068	213
341.312	457.098	254.000	254.000	2 370	6 900	● LM761648D/LM761610/LM761610D	125

Note 1) Part number showing the asterisk ● indicates inch size series bearing. 2) Part numbers showing the ☆ mark indicates bearing fitted with hollow rollers and pin retainers.

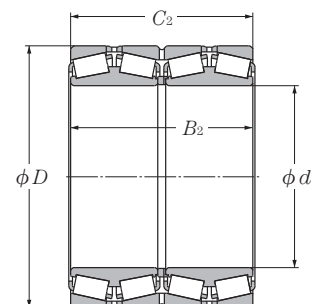
3) Inner ring spacers are discontinued for those indicated with ( ).

4) Materials : Bearing Steel

Carburized steel may be used to prevent cracking. Please contact NTN Engineering for more information.

## Four Row Tapered Roller Bearings

Shaft diameter  $\phi$  342.900 ~ 480 mm



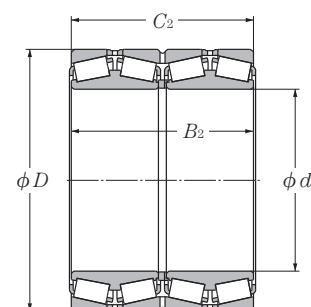
d	Basic Dimensions			Basic Dynamic Load Rating Cr	Basic Static Load Rating Cor	Part Number	Mass kg (Ref.)
	mm						
	D	B <sub>2</sub>	C <sub>2</sub>	kN			
342.900	533.400	307.985	301.625	3 150	6 900	● EE971355D/972100/972103D	252
343.052	457.098	254.000	254.000	2 370	6 900	● LM761649D/LM761610/LM761610D (CRO-6945)	117
	457.098	254.000	254.000	2 430	6 750	● CRO-6910 (CRO-6944)	105
346.075	488.950	358.775	358.775	4 350	12 800	☆ ● T-HM262749D/HM262710/HM262710DG2	227
347.662	469.900	292.100	292.100	3 200	9 100	● M262449D/M262410/M262410D	148
355	490	316	316	3 500	10 000	CRO-7105	170
355.600	444.500	241.300	241.300	1 760	6 200	● L163149D/L163110/L163110D	89.5
	457.200	252.412	252.412	2 470	7 850	● LM263149D/LM263110/LM263110D	106
	482.600	265.112	269.875	2 790	7 650	● LM763449D/LM763410/LM763410D (CRO-7123)	145
	488.950	317.500	317.500	3 500	10 000	● M263349D/M263310/M263310D	173
360	508	370	370	3 700	11 200	625972 (CRO-7227)	236
	520	370	370	4 500	12 300	CRO-7220	260
	520	410	410	5 150	14 700	☆ CRO-7217	297
	540	340	340	4 350	11 100	CRO-7211	270
	600	540	540	6 700	18 100	CRO-7210	520
	600	396	396	5 500	13 000	623172 (CRO-7228)	447
368.300	523.875	382.588	382.588	4 450	13 100	☆ ● HM265049D/HM265010/HM265010DG2 (CRO-7406)	280
	596.900	342.900	342.900	4 600	10 600	● EE181455D/182350/182351D	373
374.650	501.650	250.825	260.350	2 360	6 250	● LM765149D/LM765110/LM765110D	145
380	536	390	390	4 900	14 100	625976	277
	560	282	282	3 550	8 700	623076	240
	560	285	285	3 250	7 700	CRO-7612	208
	560	360	360	4 650	12 100	CRO-7622	302.22
	560	360	360	5 050	13 500	☆ CRO-7621	312
	384.175	546.100	400.050	400.050	5 400	16 100	☆ ● T-HM266449D/HM266410/HM266410DG2
385.762	514.350	317.500	317.500	3 650	11 100	● LM665949D/LM665910/LM665910D	240
390	510	350	350	3 700	11 800	CRO-7801	186
393.700	546.100	288.925	288.925	3 200	10 200	● LM767745D/LM767710/LM767710D	219
395	545	268.7	288.7	2 970	8 650	CRO-7901	200

Note 1) Part number showing the asterisk ● indicates inch size series bearing. 2) Part number showing the ☆ mark indicates bearing fitted with hollow rollers and pin retainers.

3) Inner ring spacers are discontinued for those indicated with ( ).

4) Materials : Bearing Steel

Carburized steel may be used to prevent cracking. Please contact NTN Engineering for more information.



d	Basic Dimensions			Basic Dynamic Load Rating Cr	Basic Static Load Rating Cor	Part Number	Mass kg (Ref.)
	mm						
	D	B <sub>2</sub>	C <sub>2</sub>	kN			
400	560	380	380	4 800	14 100	☆ CRO-8005	300
	564	412	412	4 850	14 700	625980	324
	635	470	470	7 200	18 000	CRO-8010	564
406.400	546.100	268.288	288.925	2 290	6 550	● EE234161D/234215/234216D	190
	546.100	288.925	288.925	3 200	10 200	● LM767749D/LM767710/LM767710D	201
	565.150	381.000	381.000	4 750	14 100	● CRO-8103	310
	590.550	400.050	400.050	4 850	13 600	● EE833161D/833232/833233D	395
	609.600	309.562	317.500	3 700	9 600	● EE911603D/912400/912401D	332
409.575	546.100	334.962	334.962	4 100	12 700	☆ ● M667947D/M667911/M667911DG2	226
415.925	590.550	434.975	434.975	6 300	18 900	☆ ● T-M268749D/M268710/M268710DG2	421
420	592	432	432	5 350	16 300	625984 (CRO-8414)	374
	650	460	460	6 950	18 300	CRO-8402	600
431.800	571.500	279.400	279.400	3 200	9 850	● T-LM869449D/LM869410/LM869410D	193
	571.500	336.550	336.550	3 700	11 800	● LM769349D/LM769310/LM769310D	232
	635.000	355.600	355.600	5 650	15 000	☆ ● EE931170D/931250/931251XDG2	402
432.003	609.524	317.500	317.500	4 350	11 500	● EE736173D/736238/736239D	297
440	620	454	454	6 500	19 900	625988 (CRO-8839)	430
	635	470	470	7 100	22 100	☆ CRO-8808	498
	650	355	355	5 350	13 400	☆ CRO-8807	400
	650	460	460	6 750	20 700	CRO-8806	600
447.675	635.000	463.550	463.550	7 100	22 100	☆ ● M270749D/M270710/M270710DG2	509
457.200	596.900	276.225	279.400	2 900	9 150	● L770849D/L770810/L770810D	201
	596.900	276.225	279.400	2 870	9 400	● EE244181D/244235/244236D	207
	660.400	323.850	323.847	4 150	11 200	● EE737179D/737260/737260D	379
460	650	474	474	6 500	19 900	625992A	493
475	660	450	450	6 300	20 400	CRO-9501	465
480	678	494	494	6 250	19 600	625996	563
	678	494	494	6 250	19 600	CRO-9612	554
	700	390	390	4 700	13 400	CRO-9602	436

Note 1) Part number showing the asterisk ● indicates inch size series bearing. 2) Part number showing the ☆ mark indicates bearing fitted with hollow rollers and pin retainers.

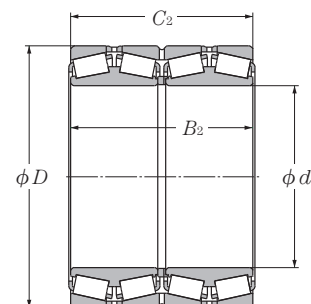
3) Inner ring spacers are discontinued for those indicated with ( ).

4) Materials : Bearing Steel

Carburized steel may be used to prevent cracking. Please contact NTN Engineering for more information.

## Four Row Tapered Roller Bearings

Shaft diameter  $d$  482.600 ~ 1200.150 mm



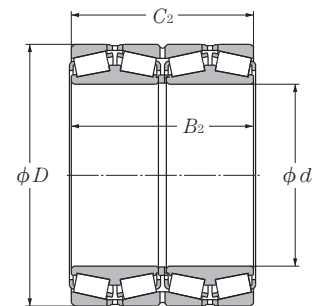
Basic Dimensions				Basic Dynamic Load Rating	Basic Static Load Rating	Part Number	Mass
mm							
$d$	$D$	$B_2$	$C_2$	$C_r$	$C_{or}$		kg (Ref.)
482.600	615.950	330.200	330.200	4 000	13 400	☆ ● LM272249D/LM272210/LM272210DG2	250
488.950	660.400	365.125	361.950	5 350	16 100	☆ ● T-EE640193D/640260/640261DG2	364
489.026	634.873	320.675	320.675	3 650	12 000	● LM772749D/LM772710/LM772710DA	268
500	670	515	515	6 900	24 600	CRO-10008	598
	690	480	480	6 000	19 900	CRO-10005	600
	705	515	515	8 450	27 100	6259/500	632
	730	420	420	7 450	19 900	☆ CRO-10023	606
	730	440	440	7 200	20 600	☆ CRO-10003	535
501.650	711.200	520.700	520.700	8 650	27 300	☆ ● M274149D/M274110/M274110DG2	726
508.000	762.000	463.550	463.550	7 800	21 400	☆ ● EE531201D/531300/531301XDG2	740
509.948	654.924	377.000	379.000	5 100	17 600	☆ ● CRO-10208 (CRO-10214)	320
514.350	673.100	422.275	422.275	5 950	20 500	● LM274449D/LM274410/LM274410D	390
519.112	736.600	536.575	536.575	9 100	28 700	☆ ● M275349D/M275310/M275310DG2 (CRO-10408)	761
520	735	535	535	9 100	28 700	☆ CRO-10402	750
533.400	965.200	495.300	495.300	11 100	28 700	☆ ● CRO-10702	1 662
536.575	761.873	558.800	558.800	10 100	30 500	☆ ● M276449D/M276410/M276410DG2	890
539.750	784.225	339.725	342.900	4 800	12 200	● EE522126D/523087/523088D	552
555.625	698.500	349.250	349.250	4 350	14 300	● CRO-11101 (CRO-11103)	298
558.800	736.600	322.265	322.268	4 300	13 500	● EE843221D/843290/843291D (CRO-11217)	388
	736.600	409.575	409.575	6 100	20 500	☆ ● LM377449D/LM377410/LM377410DG2 (CRO-11216)	502
570	780	515	515	9 200	31 000	☆ CRO-11402	625
	810	590	590	11 000	35 500	☆ CRO-11403	845
571.500	812.800	593.725	593.725	11 900	36 500	☆ ● M278749D/M278710/M278710DAG2	1 080
584.200	762.000	396.875	401.638	6 550	22 300	☆ ● LM778549D/LM778510/LM778510DG2	511
585.788	771.525	479.425	479.425	8 550	29 000	● LM278849D/LM278810/LM278810D	750
	771.525	479.425	479.425	7 350	25 700	☆ ● CRO-11701	610
595.312	844.550	615.950	615.950	12 300	39 000	☆ ● CRO-11913	1 135
	844.550	615.950	615.950	12 600	40 500	☆ ● M280049D/M280010/M280010DG2	1 160
609.600	787.400	361.950	361.950	6 450	20 300	☆ ● EE649241D/649310/649311DG2	458
	863.600	660.400	660.400	13 500	42 000	☆ ● M280349D/M280310/M280310DG2	1 250

Note 1) Part number showing the asterisk ● indicates inch size series bearing. 2) Part number showing the ☆ mark indicates bearing fitted with hollow rollers and pin retainers.

3) Inner ring spacers are discontinued for those indicated with ( ).

4) Materials : Bearing Steel

Carburized steel may be used to prevent cracking. Please contact NTN Engineering for more information.



Basic Dimensions				Basic Dynamic Load Rating $C_r$	Basic Static Load Rating $C_{or}$	Part Number	Mass kg (Ref.)
$d$	$D$	$B_2$	$C_2$				
mm				kN			
611.500	832.800	593.725	593.725	11 500	37 500	☆● CRO-12202	960
630	920	600	600	13 100	39 000	☆ CRO-12604	1 390
650	1 030	560	560	13 500	35 000	☆ CRO-13001	1 760
657.225	933.450	676.275	676.275	15 300	48 000	☆● M281649D/M281610/M281610DG2	1 630
660	1 070	642	642	15 400	43 500	☆ CRO-13202	1 950
660.400	812.800	365.125	365.125	6 200	23 200	☆● L281149D/L281110/L281110DG2	448
670	960	700	700	16 700	51 500	☆ CRO-13401	1 600
	1 090	710	710	19 100	50 000	☆ CRO-13404	2 690
	1 090	710	710	17 400	47 500	☆ CRO-13402	2 600
679.450	901.700	552.450	552.450	11 200	38 000	☆● LM281849D/LM281810/LM281810DG2	1 040
680	870	460	460	7 500	27 400	CRO-13602	582
682.625	965.200	701.675	701.675	16 100	50 500	☆● M282249D/M282210/M282210DG2	1 770
685.800	876.300	352.425	355.600	6 050	21 800	☆● EE655271D/655345/655346DG2 (CRO-13708)	539
710	900	410	410	7 650	26 900	☆ CRO-14208	620
711.200	914.400	317.500	317.500	5 350	17 900	☆● EE755281D/755360/755361DG2	527
	914.400	317.500	317.500	5 350	17 900	☆● EE755280D/755360/755361DG2	527
730	1 070	642	642	15 400	46 500	☆ CRO-14601	1 900
730.250	1 035.050	755.650	755.650	18 100	59 500	☆● M283449D/M283410/M283410DG2	2 210
749.300	990.600	605.000	605.000	12 600	45 500	☆● LM283649D/LM283610/LM283610DG2	1 250
762.000	1 066.800	723.900	736.600	17 700	58 500	☆● M284148D/M284111/M284110DG2	2 220
	1 079.500	787.400	787.400	19 200	65 000	☆● M284249D/M284210/M284210DG2	2 480
800	1 120	820	820	21 000	72 500	☆ CRO-16001	3 960
825.500	1 168.400	844.550	844.550	22 300	76 500	☆● M285848D/M285810/M285810DG2	3 010
840	1 170	840	840	21 900	76 500	☆ CRO-16803	3 970
863.600	1 130.300	669.925	669.925	15 800	59 500	☆● LM286249D/LM286210/LM286210DG2	1 950
	1 219.200	876.300	889.000	24 100	83 000	☆● EE547341D/547480/547481DG2 (CRO-17301)	3 640
938.212	1 270.000	825.500	825.500	22 500	80 000	☆● LM287649D/LM287610/LM287610DG2	4 100
950	1 360	880	880	27 000	89 000	☆ CRO-19001	4 100
1 200.150	1 593.850	990.600	990.600	33 500	132 000	☆● LM288949D/LM288910/LM288910DG2	6 130

Note 1) Part number showing the asterisk ● indicates inch size series bearing. 2) Part number showing the ☆ mark indicates bearing fitted with hollow rollers and pin retainers.

3) Inner ring spacers are discontinued for those indicated with ( ).

4) Materials : Bearing Steel

Carburized steel may be used to prevent cracking. Please contact NTN Engineering for more information.

## Four Row Cylindrical Roller Bearings

Shaft diameter  $d$  100 ~ 220 mm

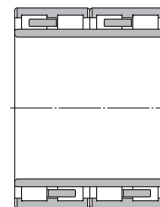
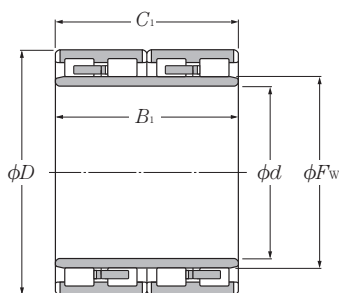


fig. 1

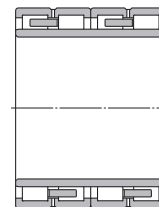
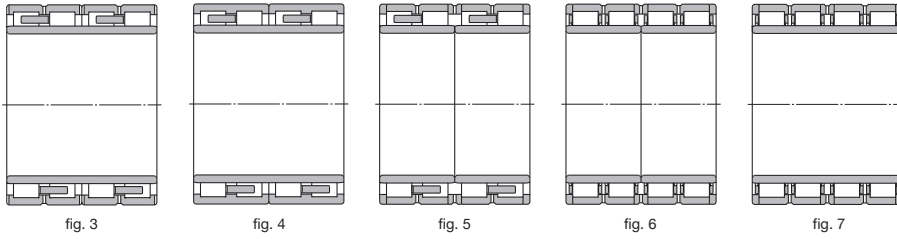


fig. 2

$d$	Basic Dimensions			Basic Dynamic Load Rating	Basic Static Load Rating	Part Number	Fig. No.	$F_w$	Mass
	$D$	$B_1$	$C_1$						
100	150	74	74	262	510	4R2035	1	115	4.68
120	180	92	92	400	785	4R2437	1	137	8.2
	180	105	105	445	855	4R2438	1	135	9.3
130	200	104	104	490	955	4R2628	1	150	12.1
140	190	119	119	495	1 190	4R2832	2 <sup>2)</sup>	154	9.93
	210	116	116	510	1 030	4R2823	1	160	13.9
145	210	155	155	705	1 640	4R2906	1	166	18
	225	156	156	810	1 750	4R2904	1	169	23.3
150	220	127	120	615	1 280	4R3036	1	168	15.7
	220	150	150	750	1 640	4R3031	1	168	19.4
	220	150	150	750	1 640	4R3056	1	168	19.6
	230	130	130	725	1 520	4R3029	1	174	20
	230	156	156	930	2 040	4R3040	1	174	24.5
	230	168	168	845	1 950	4R3042	1	178	25.8
	250	150	150	885	1 640	4R3039	1	177	29.6
160	220	180	180	920	2 490	4R3224	4 <sup>3)</sup>	177	20.2
	230	130	130	665	1 340	4R3226	1	180	16.6
	230	168	168	915	2 170	4R3232	1	179	23.4
	230	168	168	895	2 200	4R3229	1	180	23.2
	230	168	168	895	2 210	4R3231	1	182	23.2
	230	180	180	920	2 490	4R3228	4 <sup>3)</sup>	177	24.8
	240	170	170	980	2 290	4R3225	1	183	27.8
170	230	120	120	620	1 520	4R3426	1	187	14.2
	230	120	120	620	1 520	4R3443	3	187	14.6
	240	156	156	905	2 170	4R3429	1	189	22.2
	240	160	160	905	2 180	4R3423	1	190	22.8
	250	168	168	970	2 220	4R3432	1	193	28.2
	250	168	168	1 030	2 390	4R3428	1	193	28.5
	255	180	180	1 100	2 430	4R3425	1	193	19.3
	260	150	150	835	1 750	4R3433	1	192	29.5
	260	225	225	1 310	3 150	4R3431	1	196	44



(Note)

Figures 1 to 5 are bearings with solid rollers and machined retainer. Figures 6 to 7 are bearings with hollow rollers and pin retainers.

(Figure No. suffix codes)

M : w/fitting nozzle for oil misting lubrication holes in the outer ring  
 R : w/helical groove in the inner ring inner diameter surface  
 S : Special specification

Notes 1 : w/oil groove on both sides of the inner ring  
 2 : w/oil groove on one side of the inner ring  
 3 : w/oil groove on one side of the outer ring  
 4 : wo/oil groove or holes in the outer ring spacer

<i>d</i>	Basic Dimensions			Basic Dynamic Load Rating	Basic Static Load Rating	Part Number	Fig. No.	<i>F</i> 'w	Mass
	<i>D</i>	<i>B</i> <sub>1</sub>	<i>C</i> <sub>1</sub>						
	mm			kN					
180	250	156	156	895	2 180	4R3625	1	200	23.2
	250	168	168	885	2 470	4R3639	1	202	25.6
	260	168	168	1 020	2 400	4R3628	1	202	29.4
	265	180	180	1 090	2 510	4R3618	1	204	34.2
190	260	168	168	980	2 600	4R3820	1	212	26.9
	270	170	170	1 090	2 660	4R3818	1	213	31.7
	270	200	200	1 260	3 100	4R3821	1	212	37.5
	270	200	200	1 230	3 200	4R3817	1	212	37.2
	280	200	200	1 240	2 910	4R3823	2	214	41.5
	280	200	200	1 240	2 910	4R3830	3	214	42.8
200	270	170	170	970	2 610	4R4039	1	222	28.5
	280	152	152	1 000	2 320	4R4054	2 <sup>2)</sup>	222	29.5
	280	170	170	1 040	2 430	4R4048	1	222	33
	280	190	190	1 190	3 150	4R4026	1	223	36.7
	280	200	200	1 310	3 300	4R4037	1	222	40.5
	280	200	200	1 250	3 350	4R4027	1	224	38.8
	290	192	192	1 290	3 150	4R4041	1	226	42.5
210	290	192	192	1 230	3 350	4R4206	1	236	39.5
220	290	192	192	1 190	3 350	4R4413	1	239	33.8
	300	160	160	1 000	2 590	4R4419	1	245	32.8
	300	160	160	1 000	2 590	4R4445	3	245	33.7
	310	192	192	1 350	3 550	4R4410	1	247	46.3
	310	192	192	1 390	3 400	4R4426	1	246	46.9
	310	204	204	1 420	3 750	4R4425	1	247	49.8
	310	215	215	1 530	3 750	4R4420	1	242	51.5
	310	225	225	1 480	3 950	4R4416	1	245	54.9
	310	225	225	1 590	3 950	4R4449	1	244	54.3
	320	160	160	1 190	2 550	4R4428	1	245	46.5
	320	210	210	1 550	3 650	4R4429	1	248	60.5
	320	210	210	1 560	3 600	4R4444	1	246	57.3

## Four Row Cylindrical Roller Bearings

Shaft diameter  $d$  230 ~ 360 mm

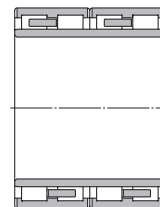
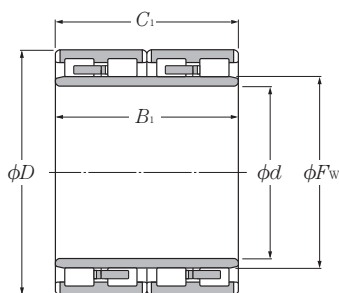


fig. 1

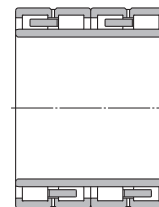
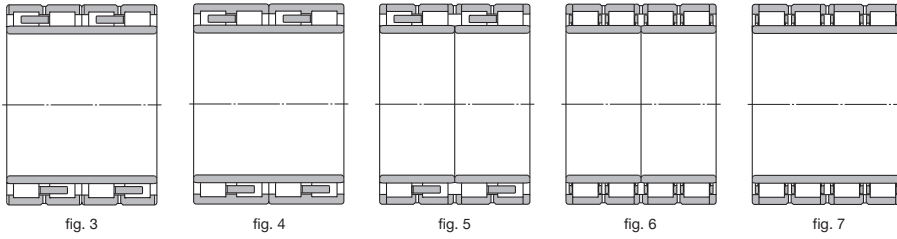


fig. 2

$d$	Basic Dimensions			Basic Dynamic Load Rating	Basic Static Load Rating	Part Number	Fig. No.	$F_w$	Mass
	$D$	$B_1$	$C_1$						
230	330	206	206	1 510	3 900	4R4610	1	260	58.3
	330	206	206	1 520	3 800	4R4614	1	258	58.6
	340	260	260	2 050	5 100	4R4611	1	261	82.6
240	330	220	220	1 490	4 150	4R4811	3	270	56.8
	330	220	220	1 610	4 250	4R4819	1	264	57.1
	330	220	220	1 490	4 150	4R4821	3	268	57.1
	330	220	220	1 520	4 250	4R4804	1	270	57.1
	340	220	220	1 670	4 200	4R4806	1	268	63.6
	360	220	220	1 760	4 050	4R4807	1	274	79.6
	360	220	220	1 760	4 050	4R4813	1	274	80.1
250	350	220	220	1 730	4 300	4R5008	1	278	66
260	360	220	200	1 540	4 150	4R5221	4	292	62.7
	360	260	260	1 830	4 850	4R5231	3 <sup>1)</sup>	287	81.5
	370	220	220	1 760	4 450	4R5208	1	292	77.1
	370	220	220	1 760	4 450	4R5217	1 <sup>1)</sup>	292	76.5
	380	280	280	2 420	6 250	4R5213	1	294	109
	400	290	290	3 050	7 150	4R5218	5 <sup>4)</sup>	296	135
265	370	234	234	2 020	5 000	4R5306	1 <sup>1)</sup>	300	78.9
270	380	280	280	2 260	5 750	4R5407	1	297	101
	380	280	280	2 580	6 850	4R5405	6 <sup>4)</sup>	299.7	105
280	350	208	208	1 290	3 950	4R5614	1	298	46.4
	390	220	220	1 780	4 650	4R5611	1	312	81.3
	390	220	220	1 820	4 800	4R5604	1	312	82
	390	275	275	2 290	6 250	4R5612	4 <sup>3)</sup>	312	105
	420	280	280	2 430	6 150	4R5605	1	323	139
290	410	240	240	2 240	5 550	4R5806	1	320	103
	420	300	300	2 830	7 500	4R5805	1	327	141





(Note)

Figures 1 to 5 are bearings with solid rollers and machined retainer. Figures 6 to 7 are bearings with hollow rollers and pin retainers.

(Figure No. suffix codes)

M : w/fitting nozzle for oil misting lubrication holes in the outer ring  
 R : w/helical groove in the inner ring inner diameter surface  
 S : Special specification

Notes 1 : w/oil groove on both sides of the inner ring  
 2 : w/oil groove on one side of the inner ring  
 3 : w/oil groove on one side of the outer ring  
 4 : wo/oil groove or holes in the outer ring spacer

d	Basic Dimensions			Basic Dynamic Load Rating	Basic Static Load Rating	Part Number	Fig. No.	F <sub>w</sub>	Mass
	D	B <sub>1</sub>	C <sub>1</sub>						
300	400	300	300	2 480	7 500	4R6014	1	328	104
	420	240	240	2 020	5 450	4R6017	1 <sup>1)</sup>	334	106
	420	240	240	2 020	5 450	4R6012	1	334	105
	420	240	240	2 010	5 450	4R6023	1 <sup>1)</sup>	336	105
	420	240	240	2 280	5 750	4R6027	1	332	105
	420	300	300	2 990	8 150	4R6030	6 <sup>1)</sup>	331	136
	420	300	300	2 720	7 600	4R6015	1	334	125
	420	300	300	2 900	7 850	4R6020	6 <sup>1)</sup>	332	130
	420	320	300	2 900	7 850	4R6018	6 <sup>2)</sup>	332	136
	430	240	240	2 160	5 150	4R6021	1	338	115
	460	270	270	2 510	5 350	4R6019	1	344	162
310	430	240	240	2 240	5 950	4R6202	1	344.5	108
320	440	240	230	2 290	6 050	4R6414	1	351	106
	450	240	240	2 370	6 150	4R6411	1	358	125
	460	340	340	3 400	9 450	4R6412	1	360	178
	470	350	350	4 150	10 900	4R6406	6 <sup>4)</sup>	361.7	212
330	440	200	200	1 820	4 850	4R6603	2	360	83.6
	440	200	200	1 720	4 550	4R6608	2 <sup>1)</sup>	360	85.6
	460	340	340	3 250	8 850	4R6605	1	365	181
	460	340	340	3 300	9 550	4R6602	1	368	177
340	480	350	350	3 950	10 900	4R6819	6M <sup>1)</sup>	378	211
	480	370	350	3 450	9 650	4R6811	1	378	198
	490	300	300	3 350	8 300	4R6804	1	377	187
	490	300	300	3 100	7 950	4R6805	1	380	189
360	480	290	290	2 990	8 150	4R7207	1	388	148
	510	370	370	3 550	9 700	4R7212	3	400	244
	510	400	380	4 350	11 900	4R7205	5 <sup>1)</sup>	399	251
	510	400	400	4 250	11 500	4R7203	2	397	262

Four Row Cylindrical Roller Bearings

Shaft diameter  $d$  370 ~ 570 mm

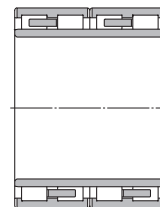
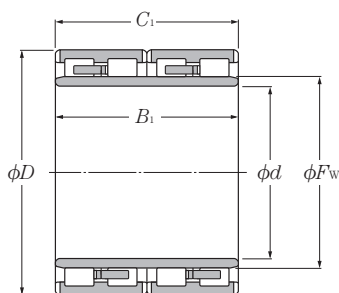


fig. 1

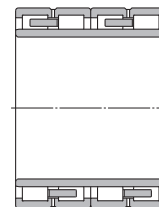
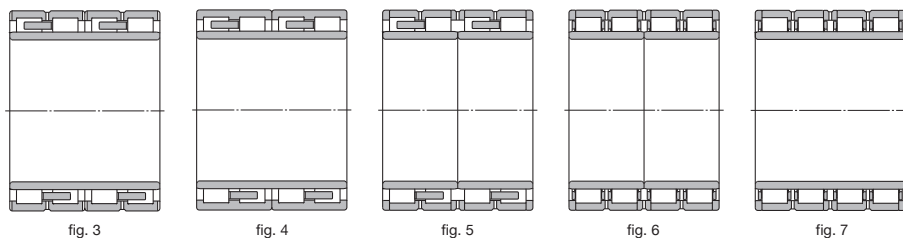


fig. 2

$d$	Basic Dimensions			Basic Dynamic Load Rating	Basic Static Load Rating	Part Number	Fig. No.	$F_w$	Mass
	$D$	$B_1$	$C_1$						
370	480	230	230	2 100	6 250	4R7405	1	400	106
	480	250	250	2 200	6 450	4R7408	1	401	118
	520	380	380	3 900	10 800	4R7411	1	409	256
	520	400	400	4 650	13 500	4R7404	1	409	273
380	520	280	280	3 400	9 150	4R7605	1	417	174
	520	290	290	3 400	9 150	4R7617	1	417	185
	520	300	300	3 550	9 600	4R7607	7 <sup>1)</sup>	416	210
	540	400	400	5 200	15 200	4R7604	7 <sup>2)</sup>	422	325
	540	400	400	4 950	14 400	4R7618	6M <sup>1)</sup>	422	309
	540	400	400	4 550	12 700	4R7613	2 <sup>1)3)</sup>	424	298
400	560	400	400	4 250	11 800	4R8007	2	446	303
	560	410	410	5 750	17 000	4R8010	6	445	349
	590	420	420	5 150	13 000	4R8011	1	450	399
420	560	280	280	3 150	8 750	4R8403	1	457	189
	580	230	230	2 430	6 250	4R8404	1	466	181
	600	440	440	6 350	18 100	4R8407	6 <sup>1)</sup>	469.6	423
	620	400	400	5 000	13 400	4R8401	4 <sup>3)</sup>	478	410
430	591	420	420	5 500	17 400	4R8605	6M <sup>1)4)</sup>	476	362
440	600	450	450	6 000	17 900	4R8806	6R <sup>2)</sup>	480	392
	600	450	450	6 350	19 100	4R8805	6R <sup>1)</sup>	480	392
	620	450	450	6 450	18 700	4R8803	6 <sup>1)</sup>	487	450
	620	450	450	6 450	18 700	4R8801	6	487	437
460	620	400	400	5 350	16 700	4R9211	7S	502	383
	620	400	400	4 950	15 000	4R9209	1	502	341
	620	460	460	5 950	19 100	4R9223	6M <sup>1)</sup>	502	417
	650	470	470	7 150	20 600	4R9216	6 <sup>1)</sup>	509	540
470	660	470	470	7 300	21 300	4R9403	6M <sup>1)</sup>	517	529



(Note)

Figures 1 to 5 are bearings with solid rollers and machined retainer. Figures 6 to 7 are bearings with hollow rollers and pin retainers.

(Figure No. suffix codes)

M : w/fitting nozzle for oil misting lubrication holes in the outer ring

R : w/helical groove in the inner ring inner diameter surface

S : Special specification

Notes 1 : w/oil groove on both sides of the inner ring

2 : w/oil groove on one side of the inner ring

3 : w/oil groove on one side of the outer ring

4 : wo/oil groove or holes in the outer ring spacer

<i>d</i>	Basic Dimensions			Basic Dynamic Load Rating	Basic Static Load Rating	Part Number	Fig. No.	<i>F<sub>w</sub></i>	Mass
	<i>D</i>	<i>B<sub>1</sub></i>	<i>C<sub>1</sub></i>						
480	600	236	236	2 620	7 850	4R9610	1	510	155
	650	420	420	5 700	17 200	4R9613	7 <sup>1)</sup>	523	423
	650	420	420	5 950	18 100	4R9607	7	523	369
	680	500	500	7 950	24 000	4R9604	6	532	640
500	680	420	405	7 100	22 900	4R10010	6 <sup>2)</sup>	550	495
	680	420	405	6 300	18 800	4R10020	6 <sup>2)</sup>	550	451
	690	470	470	7 650	22 500	4R10016	6 <sup>1)</sup>	547	590
	690	510	510	7 750	24 600	4R10006	6	552	640
	700	515	515	7 900	24 100	4R10011	6	554	680
	710	480	480	8 650	24 700	4R10008	6 <sup>1)</sup>	556	675
	720	530	530	8 250	25 000	4R10015	6 <sup>1)</sup>	568	780
	720	530	530	8 250	25 000	4R10024	6M <sup>1)</sup>	568	745
510	670	320	320	4 550	13 500	4R10201	7 <sup>1)</sup>	554	335
	700	540	540	8 300	25 000	4R10202	6 <sup>1)</sup>	558	689
520	700	540	540	8 200	25 500	4R10403	6 <sup>1)</sup>	564	658
	720	550	550	9 400	27 700	4R10406	6R <sup>1)</sup>	566	715
	735	535	535	9 000	26 600	4R10402	6 <sup>2)</sup>	574.5	740
530	700	540	540	7 850	25 400	4R10603	6 <sup>1)</sup>	574	626
	760	520	520	9 150	26 700	4R10601	6 <sup>1)</sup>	590	800
	780	570	570	10 300	29 100	4R10602	6 <sup>1)</sup>	601	1 010
	780	570	570	10 300	29 100	4R10606	6M <sup>1)</sup>	595	978
550	800	520	520	9 450	27 000	4R11001	6 <sup>1)</sup>	622	965
560	680	360	360	4 650	16 500	4R11202	1	590	265
570	800	514	514	10 200	29 200	4R11404	6R <sup>1)</sup>	626	849
	815	594	594	11 800	34 500	4R11402	6	628	1 040

## Four Row Cylindrical Roller Bearings

Shaft diameter  $d$  600 ~ 1200 mm

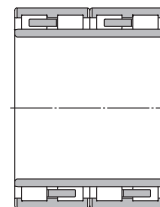
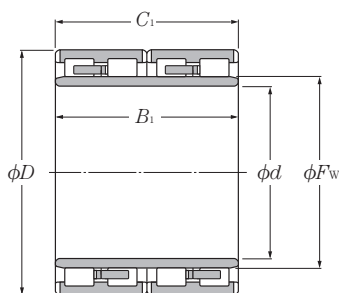


fig. 1

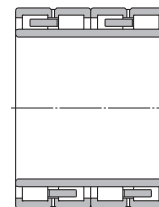
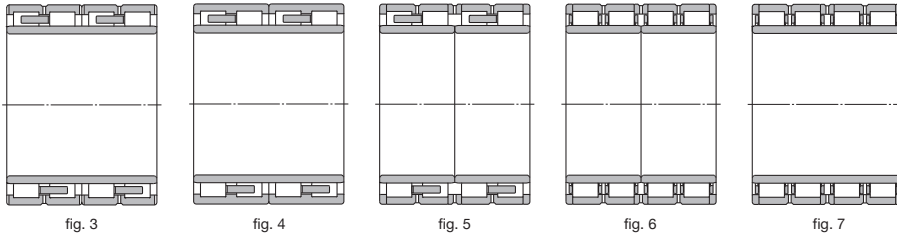


fig. 2

$d$	Basic Dimensions			Basic Dynamic Load Rating	Basic Static Load Rating	Part Number	Fig. No.	$F_w$	Mass
	$D$	$B_1$	$C_1$						
600	820	575	575	10 000	31 500	4R12006	6M <sup>1)</sup>	660	941
	870	540	540	10 600	29 600	4R12002	6 <sup>1)</sup>	672	1 150
	870	640	640	13 600	40 500	4R12001	6	672	1 330
610	870	660	660	12 600	40 000	4R12202	6 <sup>1) 4)</sup>	680	1 400
628	922	600	600	13 600	38 500	4R12602	6 <sup>1)</sup>	702	1 430
640	880	600	600	11 500	36 000	4R12802	6 <sup>2)</sup>	700	1 150
650	920	670	670	14 600	46 000	4R13005	6 <sup>1)</sup>	723	1 500
	920	680	680	14 800	47 000	4R13010	6R <sup>1)</sup>	723	1 510
	920	690	690	14 300	46 500	4R13003	6	723	1 550
660	820	440	440	7 300	27 800	4R13201	6	702	580
680	1 020	650	650	15 700	48 000	4R13603	6M <sup>2)</sup>	803	1 970
	1 020	680	680	17 300	49 500	4R13604	6 <sup>2)</sup>	775	2 060
690	980	715	715	16 800	54 500	4R13802	6 <sup>2)</sup>	767.5	1 850
	980	750	750	16 500	53 000	4R13803	6M <sup>2)</sup>	766	1 900
710	1 000	715	715	16 800	54 500	4R14205	6S <sup>4)</sup>	787.5	1 900
725	1 000	700	700	15 900	53 500	4R14501	6 <sup>1)</sup>	796	1 730
750	1 050	745	720	17 600	58 000	4R15001	6M <sup>2)</sup>	830	2 180
	1 090	745	720	19 100	60 500	4R15002	6M <sup>2)</sup>	845	2 530
755	1 070	750	750	18 700	58 500	4R15101	6 <sup>1)</sup>	837	2 260
760	1 030	750	750	17 300	59 500	4R15204	6M <sup>1)</sup>	828	2 000
	1 080	805	790	18 700	61 000	4R15207	6M <sup>2)</sup>	845	2 550
	1 100	745	720	19 100	60 500	4R15203	6M <sup>2)</sup>	855	2 560
800	1 080	700	700	16 500	55 000	4R16004	6 <sup>1)</sup>	870	1 950
	1 080	750	750	17 300	59 000	4R16005	6 <sup>1)</sup>	880	2 090
820	1 130	800	800	19 600	66 500	4R16406	6M <sup>1)</sup>	903	2 450
	1 130	800	800	21 500	72 000	4R16413	6MS <sup>2)</sup>	903	2 530
	1 130	800	800	19 600	66 500	4R16415	6 <sup>2)</sup>	903	2 530
	1 130	825	800	19 600	66 500	4R16405	6M <sup>1)</sup>	903	2 520
	1 160	840	840	21 600	71 000	4R16403	6 <sup>2)</sup>	910	2 930
830	1 080	710	710	16 200	59 500	4R16601	6 <sup>2)</sup>	896	1 780
840	1 160	840	840	21 600	71 000	4R16801	6 <sup>1)</sup>	920	2 840



(Note)

Figures 1 to 5 are bearings with solid rollers and machined retainer. Figures 6 to 7 are bearings with hollow rollers and pin retainers.

(Figure No. suffix codes)

M : w/fitting nozzle for oil misting lubrication holes in the outer ring  
 R : w/helical groove in the inner ring inner diameter surface  
 S : Special specification

Notes 1 : w/oil groove on both sides of the inner ring  
 2 : w/oil groove on one side of the inner ring  
 3 : w/oil groove on one side of the outer ring  
 4 : wo/oil groove or holes in the outer ring spacer

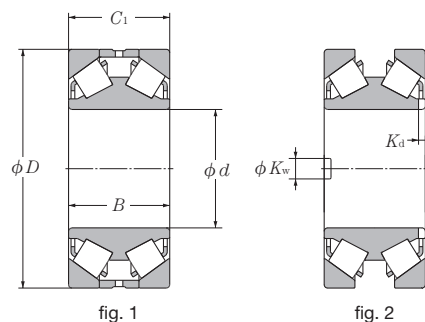
<i>d</i>	Basic Dimensions			Basic Dynamic Load Rating	Basic Static Load Rating	Part Number	Fig. No.	<i>F</i> 'w	Mass
	<i>D</i>	<i>B</i> <sub>1</sub>	<i>C</i> <sub>1</sub>						
mm									
kN									
850	1 150	650	650	15 700	51 000	4R17001	6 <sup>1)</sup>	941	1 980
	1 150	800	800	19 700	71 000	4R17003	6 <sup>1)</sup>	930	2 430
	1 150	840	840	22 000	77 500	4R17009	6 <sup>1)</sup>	928	2 640
	1 180	650	650	16 400	51 500	4R17004	6 <sup>1)</sup>	945	2 270
	1 180	850	850	24 100	78 500	4R17002	6	928	2 970
	1 180	850	850	21 700	72 000	4R17014	6 <sup>2)</sup>	940	2 980
860	1 140	750	750	17 200	61 000	4R17202	6 <sup>2)</sup>	938	2 200
	1 160	735	710	17 800	62 500	4R17201	6 <sup>1)</sup>	940	2 310
900	1 230	895	870	24 700	88 000	4R18001	6M <sup>2)</sup>	985	3 250
920	1 280	865	850	26 200	88 500	4R18401	6	1 015	3 560
1000	1 310	880	880	23 400	88 500	4R20001	6 <sup>1)</sup>	1 080	3 260
	1 360	800	800	25 000	85 000	4R20002	6 <sup>1)</sup>	1 090	3 530
1030	1 380	850	850	24 400	89 000	4R20601	6 <sup>1)</sup>	1 124	3 800
1200	1 590	1 050	1 050	36 000	133 000	4R24002	6S	1 295	6 220

**Characteristics of Four Row Cylindrical Roller Bearings**

- Designed mainly for use in rolling machinery roll necks to provide maximum load rating for the space permitted by the roll neck. Carburized steel may also be used to prevent cracking of the inner ring and improve resistance to impact.
- Contact **NTN** for information about bearing internal clearances when installing for use in rolling machinery backup rolls.
- Special design bearings, such as tapered bore roller bearings, high-speed application bearings, creep-resistant bearings, and bearings fitted with dust/water-resistant seals, etc., are also available. Contact **NTN** for more information.

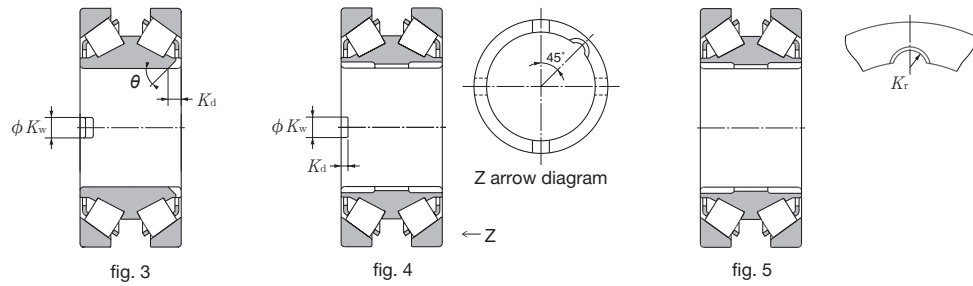
## Double Row Step Angle Tapered Roller Bearing Inside Direction

Shaft diameter  $\phi$  100 ~ 305.105 mm



Basic Dimensions				Basic Dynamic Load Rating	Basic Static Load Rating	Part Number	Fig. No.	Groove Size					Mass kg (Ref.)
mm								kN		mm		Groove Angle $\theta^\circ$	
$d$	$D$	$B$	$C_1$	$C_r$	$C_{or}$	Groove Width $K_w$	Groove Depth $K_d$						
100	215	105	110	585	825	CRD-2005	1	—	—	—	—	—	19.7
	250	120	120	750	1 080	CRD-2011	1	—	—	—	—	—	31.2
110	240	118	118	750	1 080	CRD-2214	1	—	—	—	—	—	26.6
120	260	130	130	830	1 200	CRD-2410	1	—	—	—	—	—	34.2
125	305	180	180	1 410	2 250	CRD-2503	2	30.2	11	90	1-2	—	68.9
140	305	160	160	1 160	1 850	CRD-2819	1	—	—	—	—	—	58.1
150	320	144	144	1 050	1 490	CRD-3013	1	—	—	—	—	—	56.9
	380	235	235	2 320	4 000	CRD-3011	1	—	—	—	—	—	142
160	260	130	130	880	1 740	CRD-3253	1	—	—	—	—	—	27.0
170	300	100	100	845	1 450	CRD-3423	1	—	—	—	—	—	30.2
	360	144	160	1 270	2 000	CRD-3414	1	—	—	—	—	—	79.7
	360	144	160	1 440	2 300	CRD-3416	1	—	—	—	—	—	79.7
180	330	190	190	1 710	3 250	CRD-3615	1	—	—	—	—	—	71.9
	380	158	158	1 380	1 980	CRD-3623	1	—	—	—	—	—	87.6
	400	232	232	2 090	3 600	CRD-3622	1	—	—	—	—	—	146.5
190	320	104	104	810	1 460	CRD-3801	1	—	—	—	—	—	34.1
	320	104	104	850	1 540	CRD-3813	1	—	—	—	—	—	34.1
	350	135	135	1 130	1 950	CRD-3811	1	—	—	—	—	—	57.7
210	480	230	230	2 690	4 300	CRD-4209	1	—	—	—	—	—	212
228.600	431.800	177.800	177.800	1 630	3 100	● CRD-4604	1	—	—	—	—	—	118
240	460	140	140	1 380	2 510	☆ CRD-4808	2	50	15	90	2-2	—	107
254	585	260	285	3 700	6 450	☆ CRD-5102	1	—	—	—	—	—	392
260	458	155	155	1 740	3 150	☆ CRD-5214	2	32	15	90	2-2	—	109
	459	155	155	1 740	3 150	☆ CRD-5216	1	—	—	—	—	—	110
	459	155	155	1 740	3 150	☆ CRD-5224	2	32	15	90	2-2	—	110
279.400	533.400	241.300	266.700	3 150	6 100	☆ ● CRD-5613	1	—	—	—	—	—	272
280	410	110	110	985	1 960	CRD-5616	1	—	—	—	—	—	49.0
285	380	92	92	730	1 720	CRD-5704	3	32	13	45	1-2	—	29.0

Note 1) Part number showing the asterisk ● indicates bearing size in inches. 2) Part number showing the ☆ mark indicates bearing fitted with hollow rollers and pin retainers.



d	Basic Dimensions			Basic Dynamic Load Rating Cr	Basic Static Load Rating Cor	Part Number	Fig. No.	Groove Size					Mass kg (Ref.)
	mm							mm					
	D	B	C <sub>1</sub>					Groove Width K <sub>w</sub>	Groove Depth K <sub>d</sub>	Groove Angle θ°	No. x Side Surfaces	mm Key Groove K <sub>r</sub>	
300	440	105	105	1 000	2 150	CRD-6025	3	32.13	22.225	45	1-2	—	54
	440	105	105	1 000	2 150	CRD-6027	3	32.1	22.2	45	1-2	—	54
	500	180	180	1 720	3 300	CRD-6006	2	40	15	90	2-2	—	143
	500	200	200	2 460	5 300	☆ CRD-6028	3	50.8	34.925	45	2-2	—	158
	500	200	200	2 480	5 400	☆ CRD-6030	1	—	—	—	—	—	158
	520	180	210	2 200	4 650	CRD-6026	1	—	—	—	—	—	187
304.800	499.948	158.750	203.200	1 670	3 300	● CRD-6109	1	—	—	—	—	—	158
	499.948	200.000	200.000	1 670	3 300	● CRD-6123	1	—	—	—	—	—	155
305.000	500.000	200.000	200.000	2 170	5 050	● CRD-6120	3	51.5	35	45	2-2	—	135
	500.000	200.000	200.000	2 460	5 300	☆ ● CRD-6148	3	50.9	35	45	2-2	—	155
	500.000	200.000	200.000	2 170	5 050	● CRD-6151	3	40.5	35	45	2-2	—	155
	500.000	200.000	200.000	2 460	5 300	☆ ● CRD-6137	3	50.8	34.925	45	1-2	—	155
	559.968	169.977	176.434	2 020	3 950	● CRD-6140	1	—	—	—	—	—	193
	560.000	200.000	200.000	2 340	4 700	☆ ● CRD-6146	2	50	19	90	2-2	—	218
	560.000	200.000	200.000	2 340	4 700	☆ ● CRD-6154	2	50	19	90	2-2	—	218
305.003	560.000	200.000	200.000	2 270	4 500	☆ ● CRD-6135	3	50.7	39.7	45	1-2	—	218
	559.867	169.977	176.352	2 010	3 950	☆ ● CRD-6113	1	—	—	—	—	—	192
305.069	559.999	200.000	200.000	2 270	4 500	● CRD-6112	4	50.8	19.05	90	2-2	14.5	218
	559.999	200.000	200.000	2 270	4 500	● CRD-6152	3	50.8	39.69	45	2-2	—	218
	560.000	200.000	200.000	2 530	4 700	☆ ● CRD-6136	2	50.8	19.05	90	2-2	—	218
305.079	500.000	200.000	200.000	2 170	5 050	● CRD-6125	3	50.8	34.9	45	1-2	—	155
	500.000	200.000	200.000	2 440	5 900	● CRD-6101	5	—	—	—	—	7.938	155
	500.000	200.000	200.000	2 440	5 900	● CRD-6116	5	—	—	—	—	7.938	155
305.105	559.867	169.977	200.000	2 160	4 300	● CRD-6104	1	—	—	—	—	—	217
	559.867	169.977	200.508	2 230	4 500	☆ ● CRD-6117	1	—	—	—	—	—	217
	559.968	200.000	200.000	2 530	4 700	☆ ● CRD-6110	2	50.7	19	90	2-2	—	217
	599.968	170.434	170.434	2 040	4 000	☆ ● CRD-6115	1	—	—	—	—	—	169

Note 1) Part number showing the asterisk ● indicates bearing size in inches. 2) Part number showing the ☆ mark indicates bearing fitted with hollow rollers and pin retainers.

Double Row Step Angle Tapered Roller Bearing Inside Direction

Shaft diameter  $d$  330 ~ 1400 mm

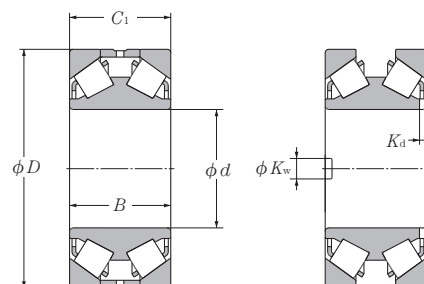


fig. 1

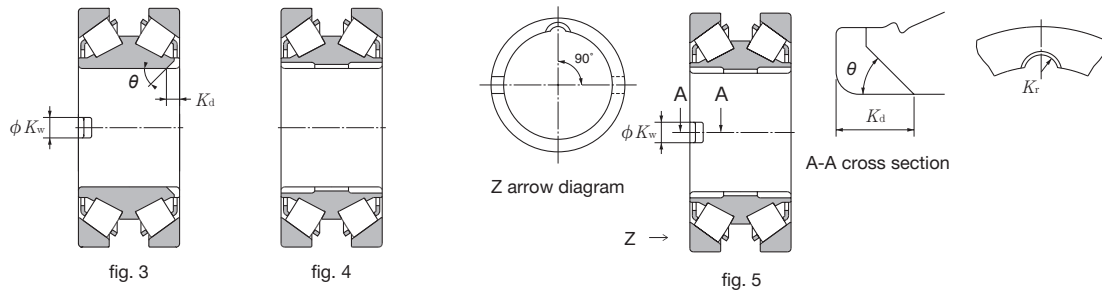
fig. 2

Basic Dimensions				Basic Dynamic Load Rating	Basic Static Load Rating	Part Number	Fig. No.	Groove Size					Mass kg (Ref.)
mm								mm					
$d$	$D$	$B$	$C_1$	Cr	Cor		Groove Width $K_w$	Groove Depth $K_d$	Groove Angle $\theta^\circ$	No. x Side Surfaces	mm Key Groove $K_r$		
330	458	120	120	990	2 220	CRD-6604	2	32	12	90	2-2	—	59.7
	650	248	248	3 450	6 500	CRD-6608	1	—	—	—	—	—	383
350	590	192	192	2 990	6 400	☆ CRD-7017	2 <sup>①</sup>	32	12	90	2-2	—	209
	618	200	200	3 000	5 700	☆ CRD-7004	1 <sup>①</sup>	50	20	90	2-2	—	252
360	540	200	200	2 480	6 150	CRD-7201	2	40	12	90	2-2	—	160
370	630	240	240	3 550	7 450	☆ CRD-7401	2	34	20	90	2-2	—	316
380	559.5	160	160	1 890	4 250	CRD-7614	1	—	—	—	—	—	133
	650	240	240	3 600	7 950	☆ CRD-7623	3	50.8	40	45	2-2	—	329
	650	240	240	3 600	7 950	☆ CRD-7612	2	50	15	90	2-2	—	338.2
400	650	200	200	3 050	6 100	☆ CRD-8010	3	50.4	38.1	45	1-2	—	260
	650	240	240	3 350	7 450	☆ CRD-8013	3	64.3	32	45	1-2	—	303
	650	240	240	3 600	8 450	☆ CRD-8026	3	63.6	32	45	1-2	—	303
	650	240	240	3 350	7 450	☆ CRD-8027	3	64.3	32	45	1-2	—	303
	650	240	240	3 600	8 450	☆ CRD-8032	3	64.3	32	45	1-2	—	303
	650	240	240	3 600	8 450	☆ CRD-8034	3	64.3	32	45	1-2	—	303
	650	240	240	3 600	8 450	☆ CRD-8035	3	64.3	32	45	1-2	—	303
	650	240	240	3 600	8 450	☆ CRD-8038	3	63.6	32	45	2-2	—	302
	650	240	240	3 600	8 450	☆ CRD-8039	3	64.3	32	45	1-2	—	303
	650	240	240	3 600	8 450	☆ CRD-8042	3	64.3	32	45	1-2	—	303
	650	240	240	3 350	7 450	☆ CRD-8044	3	64.3	32	45	1-2	—	292
	650	240	240	3 600	8 450	☆ CRD-8046	4	—	—	—	—	11.25	303
	650	240	240	3 600	8 450	☆ CRD-8047	3	64.3	32	45	1-2	—	303
	650	240	240	3 600	8 450	☆ CRD-8048	3	64.3	32	45	2-2	—	303
	650	240	240	3 600	8 450	☆ CRD-8049	5	63.6	32	45	1-2	11.25	303
	650	240	240	3 350	7 450	☆ CRD-8014	3	64.3	32	45	1-2	—	303
650	240	240	3 350	7 450	☆ CRD-8023	4	—	—	—	—	11.25	303	

① A notch is added to the inner ring side surface.

Note 1) Part number showing the ☆ mark indicates bearing fitted with hollow rollers and pin retainers.





Basic Dimensions				Basic Dynamic Load Rating	Basic Static Load Rating	Part Number	Fig. No.	Groove Size					Mass kg (Ref.)
mm								kN		mm		Groove Angle $\theta^\circ$	
$d$	$D$	$B$	$C_1$	$C_r$	$C_{or}$	Groove Width $K_w$	Groove Depth $K_d$						
410	580	160	160	1 890	4 550	CRD-8201	2	50.8	10	90	1-2	—	133
440	650	155	155	2 330	5 300	☆ CRD-8808	1	—	—	—	—	—	163
460	618	150	150	1 720	4 400	CRD-9202	2	50	15	90	2-2	—	126
	618	150	150	1 720	4 400	CRD-9211	1	—	—	—	—	—	120
	720	250	250	4 450	10 100	☆ CRD-9214	3	50.8	35	45	2-2	—	388
470	720	216	216	2 790	6 800	CRD-9404	2	63.6	30	90	1-2	—	315
480	689.5	180	180	2 670	6 400	☆ CRD-9609	2	50	15	90	2-2	—	223
	690	180	180	2 670	6 400	☆ CRD-9603	2	50	15	90	2-1	—	224
482.600	615.950	158.750	158.750	2 240	6 450	☆ ● CRD-9709	1 <sup>①</sup>	—	—	—	—	—	115
	733.500	200.000	200.000	2 740	6 550	☆ ● CRD-9704	3	50.8	38	45	2-2	—	301
509.948	733.425	200.020	200.020	3 250	8 350	☆ ● CRD-10208	3	50.8	38.1	45	2-2	—	256
510.134	800.001	284.493	284.493	5 200	12 100	☆ ● CRD-10206	3	70.358	44.45	45	1-2	12.865	511
550	920	330	330	6 800	15 700	☆ CRD-11001	2	56	22	90	1-2	—	914
600	1 000	350	350	8 250	19 500	☆ CRD-12002	1	—	—	—	—	—	1 130
660.000	814.000	176.212	176.212	2 600	8 200	☆ ● CRD-13208	3	50	20	45	2-2	—	202
685.800	939.800	234.950	228.575	4 950	13 500	☆ ● CRD-13702	2	63.5	19.05	90	2-2	—	478
685.876	939.876	234.950	227.813	4 950	13 500	☆ ● CRD-13701	3	63.5	38.1	45	2-2	—	435
720	920	130	150	2 760	7 300	☆ CRD-14403	1	—	—	—	—	—	240
780	1 000	200	200	4 200	12 900	☆ CRD-15601	3	90	35	45	1-2	—	384
1 400	1 600	180	180	4 400	16 300	CRD-28003	1	—	—	—	—	—	532

① A notch and helical groove are added to the inner ring side surface and inner ring inner diameter surface respectively.

Note 1) Part number showing the asterisk ● indicates bearing size in inches. 2) Part number showing the ☆ mark indicates bearing fitted with hollow rollers and pin retainers.

## Bearing Inspection and Maintenance

### ● Bearing inspection and maintenance

Performing periodic inspections and maintenance of the bearings makes it possible to maintain the original performance of the bearing for a long time, and also detect any early-stage bearing abnormalities.

Therefore, inspections and maintenance can increase productivity and economic efficiency by preventing bearing failures before they occur.

The inspection items on the right are generally accepted methods for bearing maintenance. Depending on the importance of the system or machinery being used, implementing periodic inspection cycles is an important aspect of bearing maintenance and management.

#### ① Inspect the bearings while the equipment is operating

Check the temperature, sound, and vibration of the bearings. Examine the characteristics of the lubricant and determine the cycle for refilling or replacing the lubricant.

#### ② Visually monitor the bearings

Carefully monitor any visible problems that appear when carrying out periodic inspections and after the bearings have been in use. If there are visible signs of damage, take measures to prevent recurrence.

#### \*Bearing Damage – Typical Examples & Causes

Refer to the related catalog : Care and Maintenance of Bearings (Cat. No. 3017) for more details.

## Installing Tapered Bore Roller Bearings

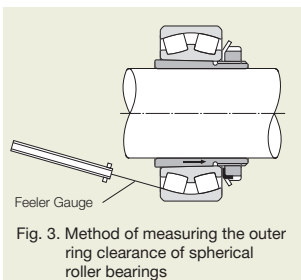
### ● Installing tapered bore roller bearings

Install small-sized bearings by using a tapered shaft, withdrawal sleeve, or adapter sleeve. Secure the bearing by tightening the locking nut. Furthermore, tighten the nut with a mallet or impact spanner (See Fig. 1).

Use hydraulic pressure when installing large-size bearings, which require a greater force. Figure 2 (a) shows the method of pushing the bearing onto a tapered shaft using a hydraulic nut. Figures 2 (b) and (c) show the hydraulic nut installation method when using an adapter sleeve or withdrawal sleeve.

With tapered bore bearings, as the inner ring is driven axially onto the tapered shaft, adapter or withdrawal sleeve, the interference will increase and the bearing internal radial clearance will decrease. Interference can be estimated by measuring the decrease in internal radial clearance.

Figure 3 shows the method for measuring the radial internal clearance of a spherical roller bearing by inserting a feeler gauge (thickness gauge) in between the rollers and the outer ring while the rollers are sitting correctly in a non-load position.



The appropriate interference fit is obtained by pushing in the axial direction until the correct clearance reduction is achieved. It is also possible to measure the distance the bearing has been driven axially from the point of initial contact on the taper to achieve the recommended clearance reduction.

A larger interference fit and bearings with a radial internal clearance of C3 or higher are required when heavy loads are applied, when the bearings are running at high speed, and when there is a large temperature difference between the inner and outer rings. Table 1 shows the maximum values for the radial internal clearance reduction and axial displacement amount used during installation. It is necessary to set the residual clearance above the minimum residual clearance value shown in Table 1.

[Ref.] Table 2 shows an example calculation for determining the nut rotation angle when installing a spherical roller bearing using an adapter sleeve.

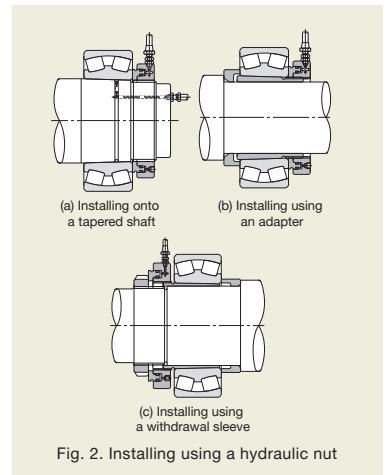
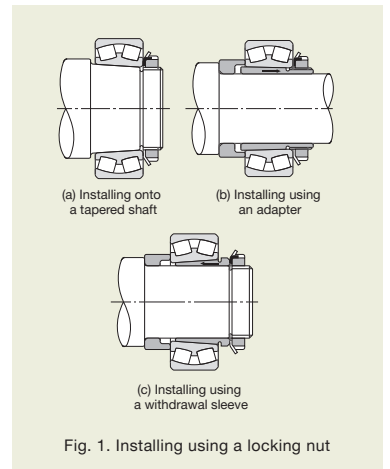


Table 1. Tapered bore spherical roller bearing installation specifications – Type EA/EM

Units : mm

Nominal Bearing Inside Diameter $d$		Radial Internal Clearance (Pre-installation)						Radial Internal Clearance Reduction		Axial Movement Amount (ref.)				Minimum Residual Radial Internal Clearance		
		CN		C3		C4				1/12		Taper Ratio 1/30				
Greater Than	Equal to or Less Than	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	CN	C3	C4
24	30	0.030	0.040	0.040	0.055	0.055	0.075	0.010	0.015	0.15	0.20	—	—	0.015	0.025	0.040
30	40	0.035	0.050	0.050	0.065	0.065	0.085	0.015	0.020	0.25	0.30	—	—	0.015	0.030	0.045
40	50	0.045	0.060	0.060	0.080	0.080	0.100	0.020	0.025	0.35	0.40	—	—	0.020	0.035	0.055
50	65	0.055	0.075	0.075	0.095	0.095	0.120	0.025	0.030	0.40	0.45	—	—	0.025	0.045	0.065
65	80	0.070	0.095	0.095	0.120	0.120	0.150	0.035	0.040	0.50	0.60	—	—	0.030	0.055	0.080
80	100	0.080	0.110	0.110	0.140	0.140	0.180	0.040	0.050	0.60	0.70	—	—	0.030	0.060	0.090
100	120	0.100	0.135	0.135	0.170	0.170	0.220	0.055	0.065	0.80	0.90	1.80	2.30	0.035	0.070	0.105
120	140	0.120	0.160	0.160	0.200	0.200	0.260	0.065	0.075	0.90	1.00	1.95	2.70	0.045	0.085	0.125
140	160	0.130	0.180	0.180	0.230	0.230	0.300	0.075	0.090	1.00	1.20	2.35	3.10	0.040	0.090	0.140
160	180	0.140	0.200	0.200	0.260	0.260	0.340	0.080	0.100	1.10	1.40	2.80	3.55	0.040	0.100	0.160
180	200	0.160	0.220	0.220	0.290	0.290	0.370	0.090	0.110	1.20	1.50	3.20	3.95	0.050	0.110	0.180
200	225	0.180	0.250	0.250	0.320	0.320	0.410	0.110	0.130	1.50	1.80	3.85	4.60	0.050	0.120	0.190
225	250	0.200	0.270	0.270	0.350	0.350	0.450	0.120	0.140	1.60	1.90	4.20	4.95	0.060	0.130	0.210
250	280	0.220	0.300	0.300	0.390	0.390	0.490	0.130	0.160	1.60	2.10	4.25	5.40	0.060	0.140	0.230

Note 1) Applies to solid shaft normal, C3 and C4 clearances.

2) For type 213, refer to the related Ball and Roller Bearings catalog (Cat. No. 2202).

3) When clearance C2 and  $Pr$  are  $> 0.15 C_T$ , a separate evaluation is required. Contact NTN for more information.

Table 2. Example calculation for determining the nut rotation angle

## Calculation example (approximation)

## Conditions

Bearing model No : 22216EAKD1

Inner dia. : 80 mm, outer dia. : 140 mm, width : 33 mm

EA : Type EA, K : bore taper ratio 1/12, D1 : w/lubricant groove/holes

CN clearance : 0.070-0.095 mm

Adapter sleeve : H316X

Nut : M80 × 2 (inside diameter × pitch)

## Reference formula

$$\text{Clearance reduction} = \frac{\text{Axial movement amount}}{\text{Taper ratio}} \times \text{Inner ring expansion coefficient}$$

$$\text{Axial movement amount} = \frac{\text{Nut thread pitch} \times \text{nut rotation angle}}{360^\circ}$$

$$\text{Inner ring expansion coefficient} = \frac{\text{Inner ring inside diameter}}{\text{Inner ring average groove diameter}} = \frac{80}{100} = 0.8$$

$$\begin{aligned} \text{Inner ring average groove diameter} &= \frac{2 \times \text{inner ring inside diameter} + \text{outer ring outside diameter}}{3} \\ &= \frac{2 \times 80 + 140}{3} = 100 \text{ mm} \end{aligned}$$

## Nut rotation angle calculation

$$\text{Radial internal clearance reduction (max.)} = 0.04 \text{ mm}$$

$$\text{Clearance after installation} = \text{Initial clearance (meas. value)} - \text{clearance reduction} = 0.09 - 0.04 = 0.05 \text{ mm}$$

$$\text{Axial movement amount} = \frac{\text{Clearance reduction} \times \text{taper ratio}}{\text{Inner ring expansion coefficient}} = \frac{0.04 \times 12}{0.8} = 0.6 \text{ mm}$$

$$\text{Nut rotation angle} = \frac{\text{Axial movement amount} \times 360^\circ}{\text{Nut pitch}} = \frac{0.6 \times 360}{2} = 108^\circ$$

Note : For open type bearings, measure the clearances by using a feeler gauge (thickness gauge).

