



Decision version of energy conservation and troubleshooting of bearings

A D B[®]

Autonomous Decentralized Bearing

Problems such as torque, friction, wear, environment resistance, rust, etc. It was the cage that made the solution difficult.

Lubrication improvement to reduce friction with the cage was a traditional approach.



ADB is a completely new bearing that makes balls noncontact with no cage,
Because it is non-contact, we offer a dramatic solution that does not rely on lubrication.

A D B

Autonomous Decentralized Bearing

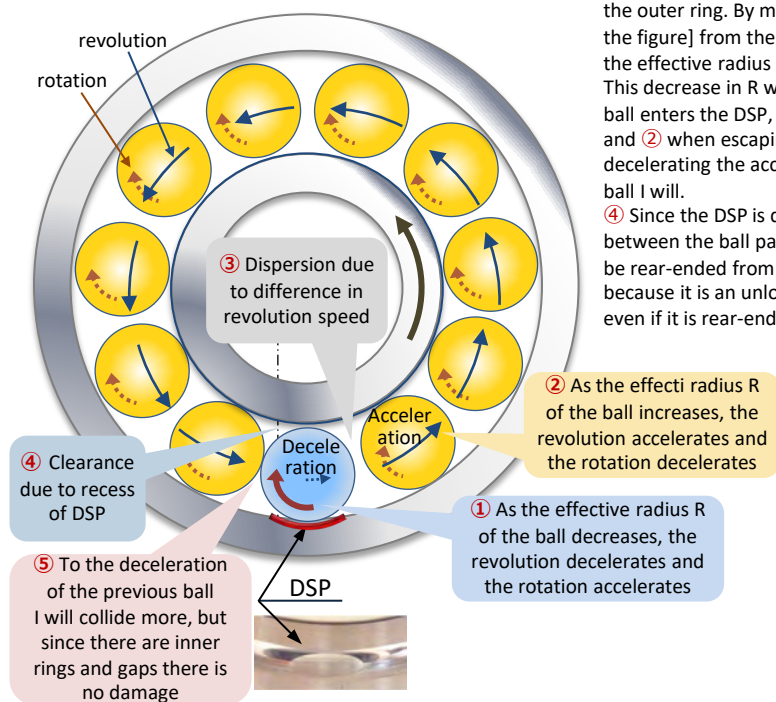
Energy saving · High speed

• Device differentiation by basic performance

Prevent damage

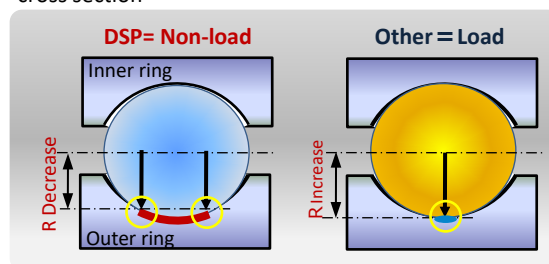
• Bearings to fundamentally solve problems

How it works



In place of the cage, ADB has one to several Dispersion Starting Points (DSP recesses) on the outer ring. By moving the contact point between the ball and the outer ring [○ in the figure] from the groove bottom of the outer ring to the two recesses of the recess, the effective radius R of the ball is decreased (see the figure below). This decrease in R will change the ratio of ball self-revolution (left figure). ① When a ball enters the DSP, the revolution of the ball decelerates and the rotation accelerates, and ② when escaping from this point, the revolution accelerates instead of decelerating the accelerated rotation, and ③ disperses the ball with the succeeding ball I will. ④ Since the DSP is digging down the groove bottom of the outer ring, there is a gap between the ball passing through here and the inner ring. ⑤ The ball of the DSP may be rear-ended from the succeeding ball due to the deceleration of the revolution, but because it is an unloaded ball by ④, it will not be damaged because it is easily extruded even if it is rear-ended.

cross section



Effect

1. Energy saving

~ Eliminate sliding friction between ball and cage

Traditionally balls of bearings generate sliding friction with the cage due to rotation, so oil slip was indispensable. On the other hand, the lubricating oil was agitated with a ball, so it consumed energy.

Since ADBs are not in contact with each other, lubrication to this part is unnecessary, and energy consumption is reduced to a maximum of 1/14 each.

2. Prevention of damage

~ Ball clogging (sliding friction of balls and orbit) cancellation

Jamming may occur due to variations in the revolution speed of the ball. This will cause wear of the cage and premature damage as the ball slides on the track. (It was the reason to prohibit high precision mounting provision and water contamination)

Since the ball of ADB is independent, it does not resist the variation of the revolution speed. Therefore, balls do not slide on the track, even water contributes to lubrication.

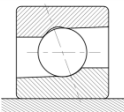
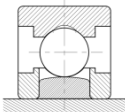
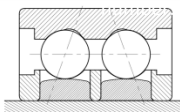
3. There is no constraint by the cage

- 1) There is no temperature constraint (fluororesin Max 200 ° C)
- 2) Number of balls, permissible load greatly increased *
- 3) There is no inner and outer ring separation due to breakage of the cage
- 4) It is easy to produce small quantity without mold retainer

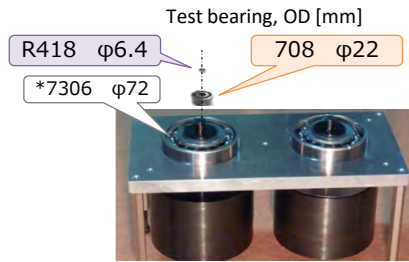
* Deep groove ball bearing, double row angular contact ball bearing

variation

Please refer to the dimension table of attached sheet for the call

Type	Angular contact ball bearing		Deep groove ball bearing		Double row angular contact ball bearing	
Feature	· Supports radial load and axial load in one direction. · 2 pieces also support moment. · It is a simple structure ADB	· Supports radial load and axial load in both directions. · The number of balls is about 1.5 times that of the same type.	· Supports radial load, axial load in both directions, and moment. · The number of balls is about 1.5 times that of the same type.			
Standard	Sample on sale	Not compatible				
Individual compatible	Sale					

The data created by distributed balls is the true performance of rolling

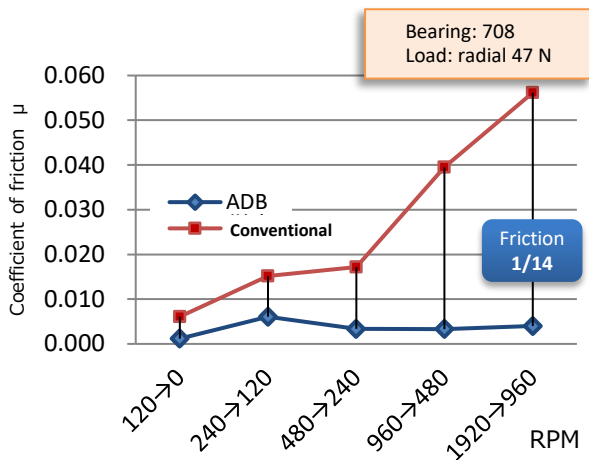


•The data of 7306 is a technical report Please refer to.



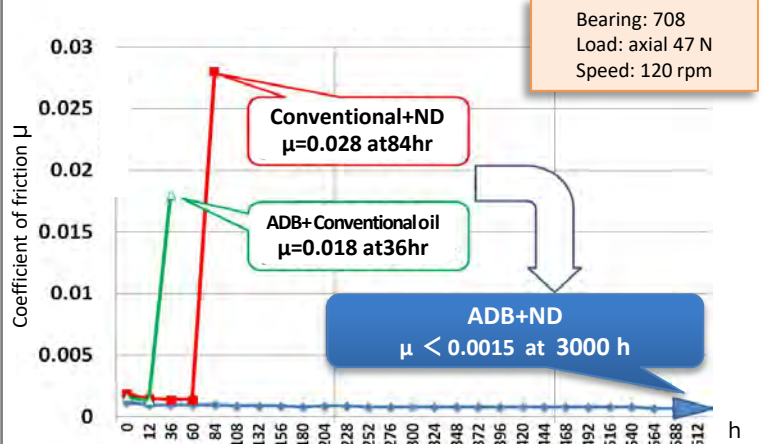
Fa = 40 KN
N = 3000 RPM

1. Speed and coefficient of friction



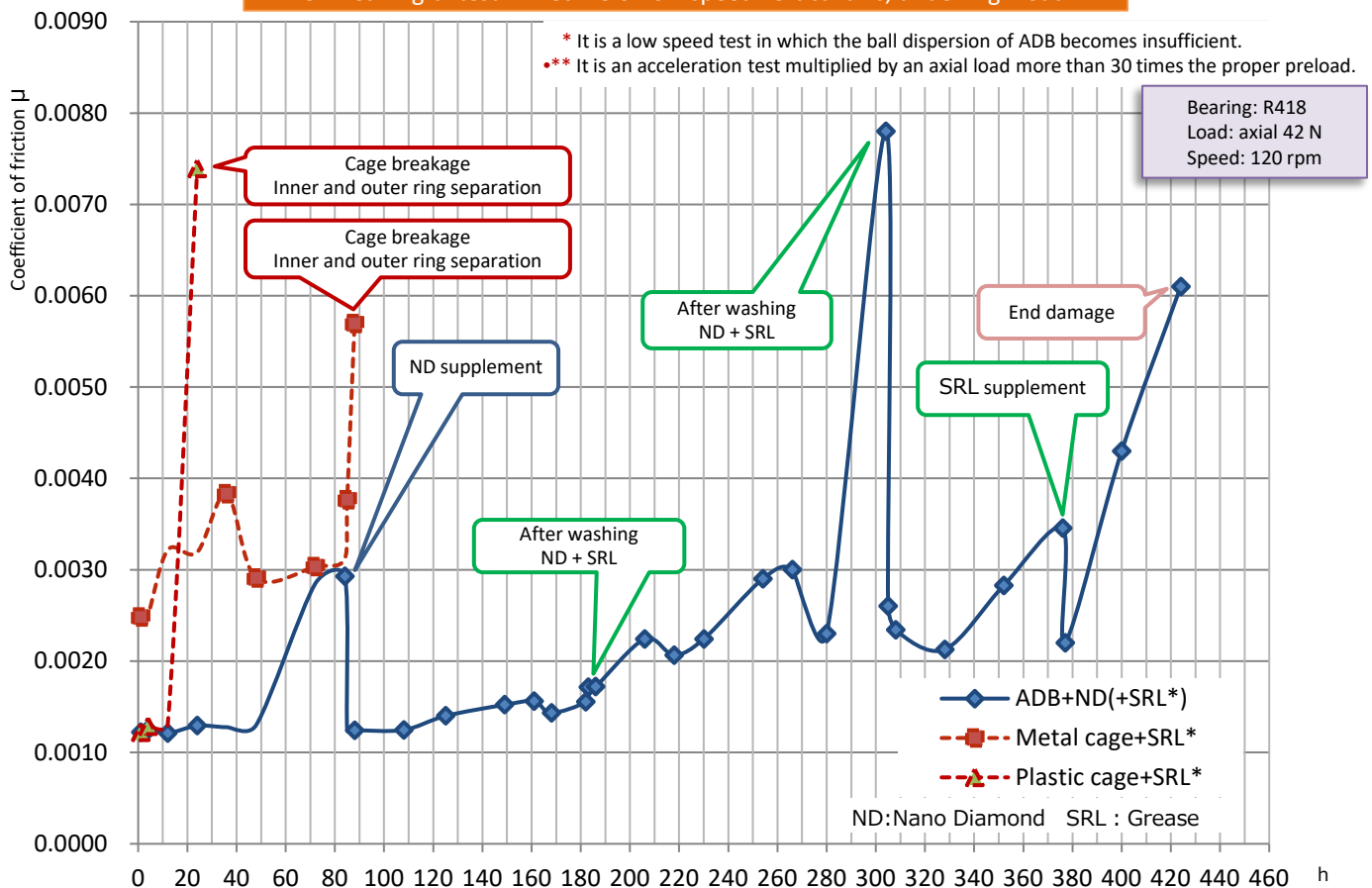
2. Meaningful test * Low speed, lubrication life

* It is a low speed test in which the ball dispersion of ADB becomes insufficient.



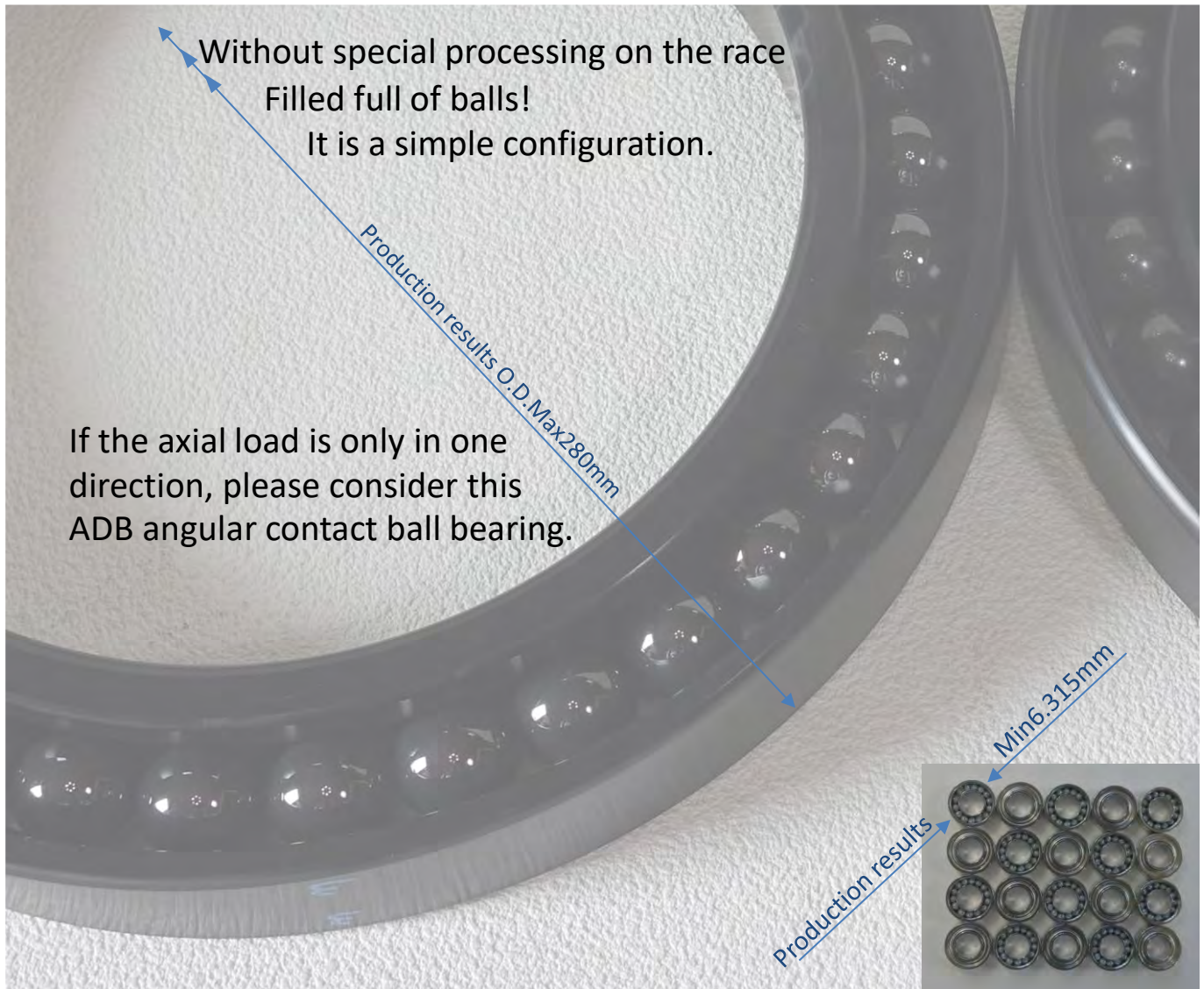
3. Meaningful test * Lifetime of low speed vertical axis, under high load **

* It is a low speed test in which the ball dispersion of ADB becomes insufficient.
** It is an acceleration test multiplied by an axial load more than 30 times the proper preload.



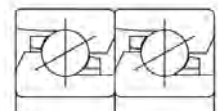
ADB Angular contact ball bearing

Please refer to the dimension table of attached sheet for the call number.

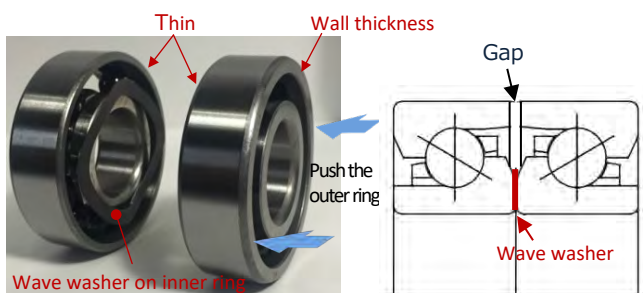


[Warning]

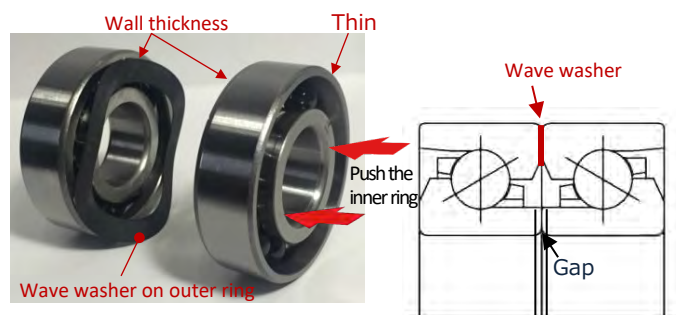
Angular bearings have only one axial load, there is a front and back.
Please beware that if the mounting direction is wrong, the inner and outer rings may separate.



✗ The same direction combination
Prohibited with bidirectional axial load



○ Arrangement, DF : High alignment



○ Arrangement, DB : High moment of resistance

It is recommended to use spring preload by wave washer as shown in the figure. A slight preload sufficient to prevent the ball from falling by its own weight is sufficient.

ADB deep groove ball bearing

ADB double row angular contact ball bearing

Please refer to the dimension table of attached sheet for the call number.

Feature

1. It can receive radial load and axial load in both directions.
2. Shield, with Nano Diamond coat (standard item).
3. There are no front and back (mounting direction) like angular ball bearings.
4. Even during wear and failure, the structure that balls fall off and inner and outer ring separation hardly occurs.

Traditionally, when removing the cage of this type of bearing, the ball was filled only about half the circumference of the track.



Conventional full ball bearings with filling slots had to have the filling slots facing up to prevent the ball from falling off. Also because of the slots it was impossible to seal.



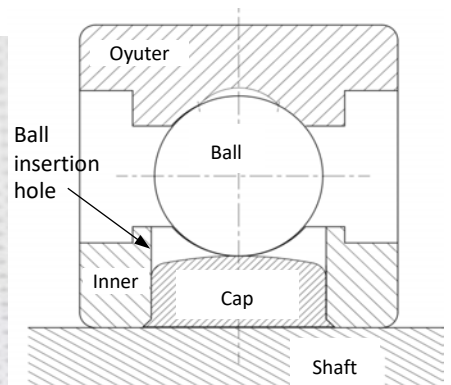
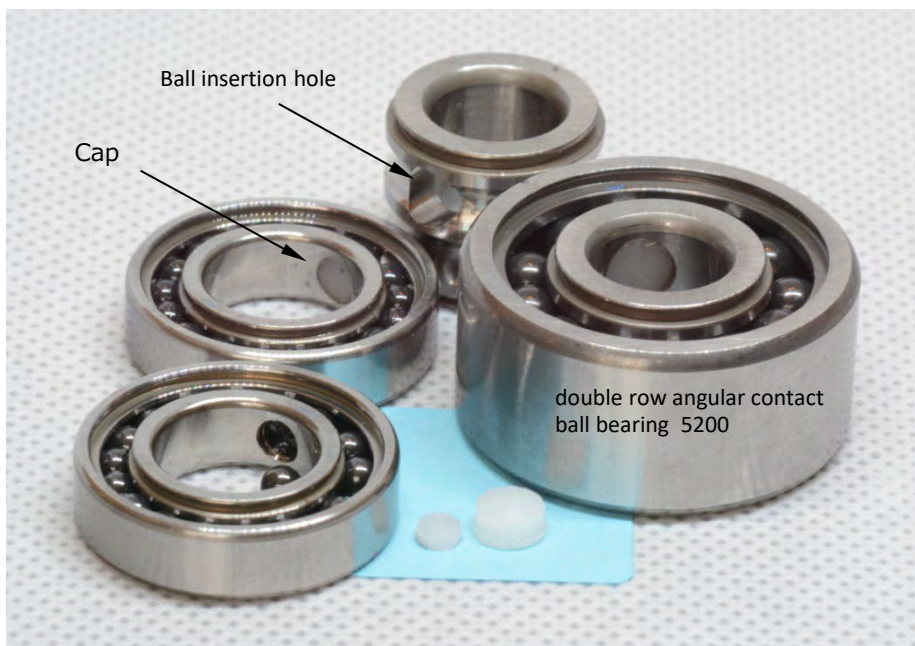
filling slots

In order to solve this problem, a ball is filled from the ball insertion hole provided in the inner ring, and the cap is closed with a cap

We developed the structure * to be installed in ADB.

By installing the bearing on the shaft, the ball and cap will not be able to fall off.

* The configuration of the ball entry hole is difficult with conventional bearings because balls may push the cap of the inner ring due to ball clogging, but ADB is not in contact with the cap due to centrifugal force because the balls are dispersed.



Inner ring and Cap

Special specifications

1. Sealed and lubricated angular contact ball bearings

Features

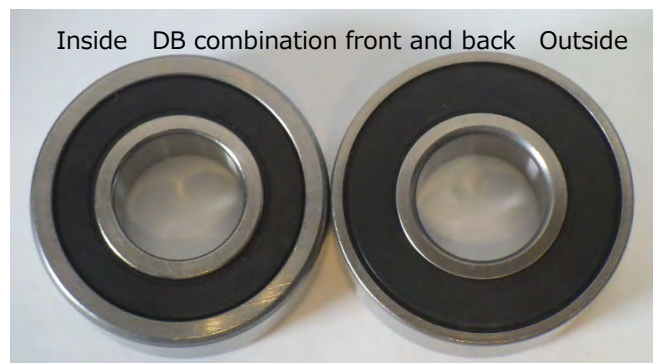
1. A non-contact rubber seal is incorporated into the cage space of an angular contact ball bearing.
2. Lubrication (Nano-Diamond Coating) is included.
3. Mass-produced and affordable as a replacement for deep groove ball bearings with seals and grease.
4. Resolves the problems of caged angular contact bearings used in harsh environments.
5. Different diameter seals on the front and back prevent incorrect assembly.

Photo: ADB-7202VVND

ID/OD/Width: 15/35/11 mm

ADB with this specification is available at a low price. Quantity: 1000 pieces/lot (Mass production available from raw materials)

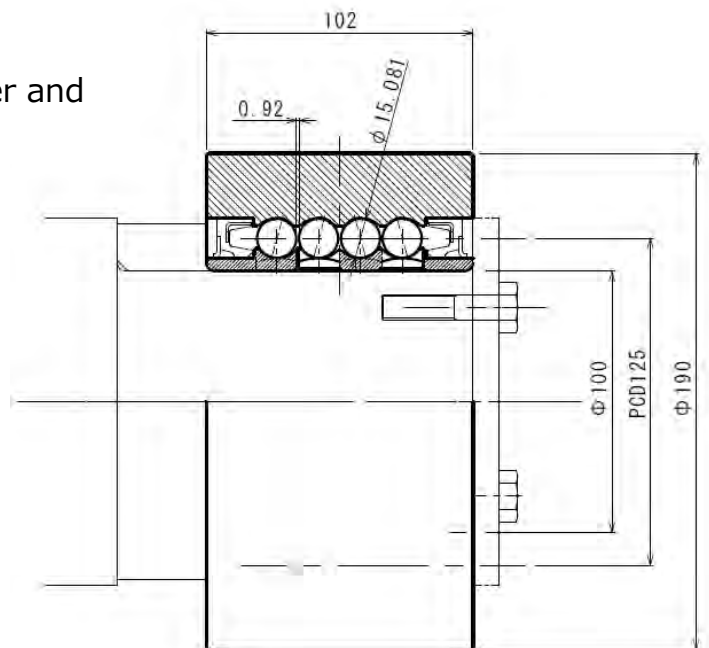
*Only one-way axial load is permitted. For bidirectional loads, use two pieces per set.



2. Multi-row ball bearings

Features

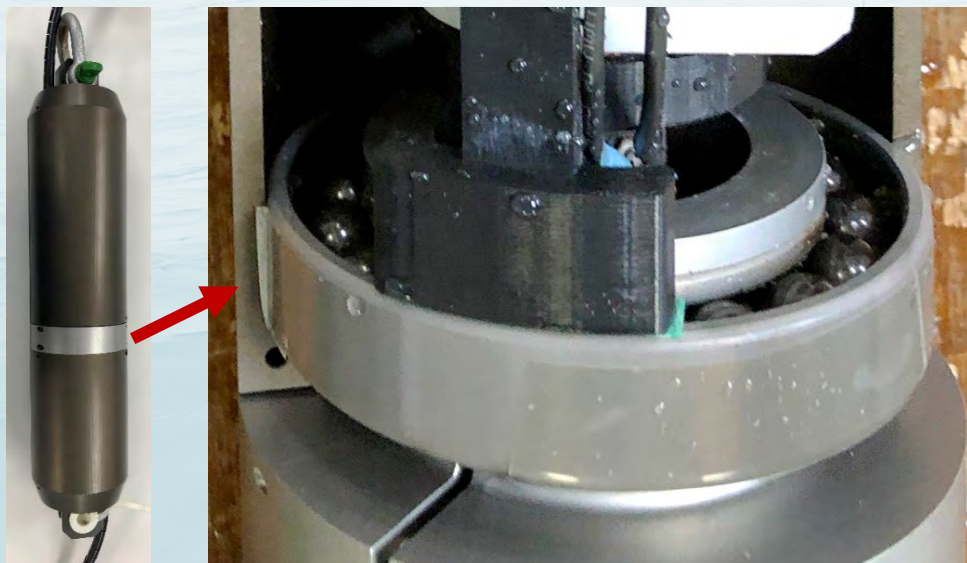
1. Multi-row bearing with integral inner and outer rings, extremely compact.
2. Inner ring bore filling structure, deep groove, or angular contact configuration



3. Angular contact ball bearings
with corrosion resistance for inner and outer rings

Torque is 1/100! **JAMSTEC adopted for** **underwater sealless rotation mechanism**

During underwater observation using an umbilical cable
Solves problems such as device rotation and cable twisting.



Seawater sealless rotation mechanism

<Machine> The starting torque to make the rotation of both ends of the swivel independent is very small.
(Under 0.01 Nm, which is about 1/100 of the conventional product when there is no load in the air) Excellent effect.

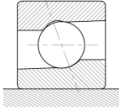
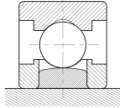
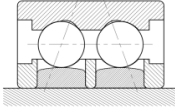
<Electricity> Power supply and communication are possible by contactless power supply and communication device.

Angular or deep groove?

ADB, a standard deep groove ball bearing, requires filling slots. The basic type of ADB is a high-performance angular contact ball bearing that does not require this, so please consider it.

Variations

Please refer to the attached dimension table for the nominal number.

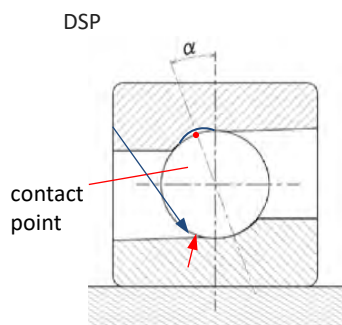
Ball filling	Not required	Ball filling required, Vibrations occur as the balls pass through during startup and at low speeds.	
Type	Angular 	Deep groove 	Double-row ang 
Features	Supports radial and unidirectional axial loads.	Supports radial and bidirectional axial loads.	Supports radial loads, bidirectional axial loads, and moments.

Selection - Reasons for recommending angular contact ball bearings

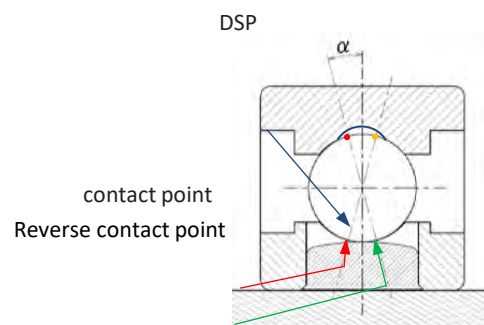
Typical shaft support involves pressing a deep groove ball bearing with a wave washer to eliminate axial clearance and secure it in place (central diagram on page 9), resulting in a contact angle of approximately 13° .

The basic principle for ADB is to have a dispersion starting recess at this contact angle position, but since deep groove ball bearings do not have a front or back distinction, the recess is sized to cover an angle of -13 to $+13^\circ$.

This results in slightly greater operating vibration. For applications such as "understanding the basic performance of ADB" and "requiring low vibration," we recommend ADB angular contact ball bearings. However, if axial loads in both directions are to be supported, such as when using a single bearing, a deep groove ball bearing is required.



Angular contact ball bearings



Deep groove ball bearing

Q&A

Q: What is an angular contact ball bearing? How is it different from a deep groove ball bearing?

A: Basically, an angular contact ball bearing is a deep groove ball bearing without one shoulder.

Q: I've never seen a motor that uses angular contact ball bearings. Why?

A: I think the reason is that angular contact ball bearings are cheaper for ADBs, while caged bearings are more expensive.

Q: I heard that deep groove ball bearings have lower torque?

A: Caged bearings have less balls, meaning fewer friction points, and therefore lower torque. However, ADBs lack this, so angular contact ball bearings, which have more balls, have lower torque (according to the Hertz formula of 1881).

Q: I've heard that a special clearance (CM) is required for motors, but...?

A: The special clearance is a clearance adjustment that reduces the cage friction of conventional bearings. Because ADBs have no friction, there is no need for delicate clearance adjustments to prevent damage to the raceway surface, etc.

3. Noise and vibration caused by balls passing through the inner ring hole

Q&A

Are you dissatisfied with the current situation, but could switching to ADB solve the problem? If you have any problems, please contact us by e-mail.

1. Is the load capacity okay in adverse environments?

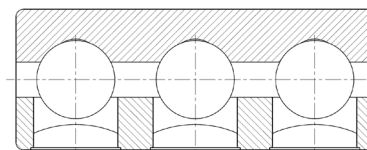
1) I need environmental resistance to corrosive gases, etc., but will this be okay?- Please check the actual product. If the damage other than driving marks is minor, the cause is likely "rolling quality rather than the environment." There is a high chance that ADB will improve the situation.

Driving tracks



2) Is the load capacity OK?- Compare the actual product's lifespan with the calculated lifespan. If it does not match the calculation, the cause of damage is different from the load capacity, and replacing the roller bearing may be possible.

Tapered roller bearing and compatible ADB design example

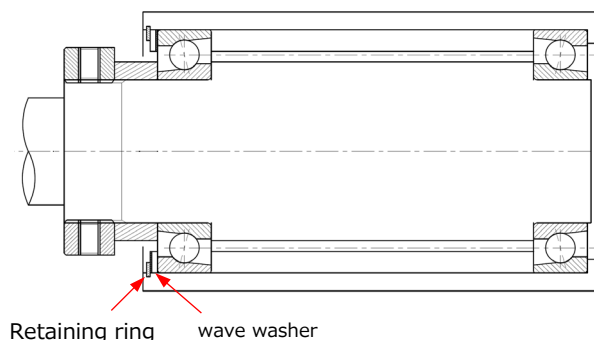


2. Torque increases on the horizontal axis?

When using an ADB on a horizontal shaft, the balls that have been carefully dispersed will fall under their own weight and re-contact each other, resulting in little torque reduction. In this case, we recommend using a spring preload. A spring force of several Newtons (for an outer diameter of approximately 50mm) is sufficient, and we recommend using a wave washer (see diagram on the right). We also manufacture space-saving special wave washers (see diagram below).



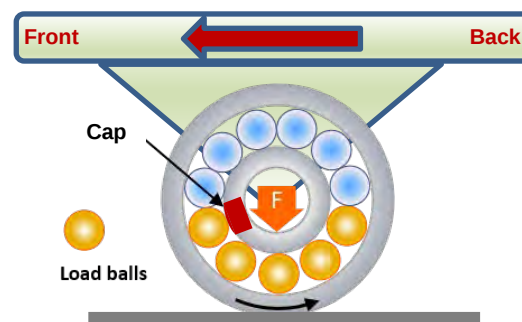
Wave washer for locking onto outer ring, for 7901 (Preload 3N, Mounting thickness 0.7mm, DB combination)



Example of peripheral design of ADB with wave washer preload (DF combination)

3. Noise and vibration caused by balls passing through the inner ring hole

Noise and vibration occur when the ball passes through the cap of the inner ring hole at low speeds. In this case, this can be reduced by setting the fixed phase of the inner ring (orientation of the cap) to the position shown in the illustration (diagonally downward and forward in the direction of travel). At high speeds, the ball does not come into contact with the cap due to centrifugal force.



Application example

We offer a dramatic solution that does not rely on lubrication.

火 Fire

- Rotary kiln bearing damage countermeasures
- Measures against noise of chain conveyor bearings
- Energy saving of blower

Material: inner and outer rings / ball: SUS 440C / Si3N4
Lubrication: no lubrication / (Tungsten disulfide)

Under non-lubricating performance is decided at high temperature.



地 Earth

- Friction reduction $\Rightarrow$ Low torque
- Damage prevention of tensioner bearings
- Compact and lightweight pillow block
- Simplified bearing mounting (accuracy relaxation)

High basic performance with no lubrication lives.



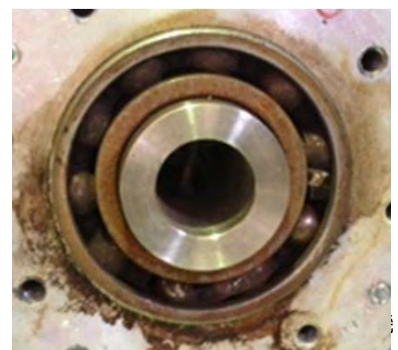
風 Wind

- Efficiency of wind power generation UP
- Damage countermeasures for low speed applications
- Rust prevention measures for bearings



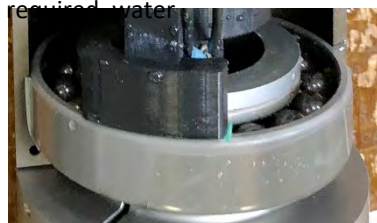
Wind power generation

Cage was difficult due to new design It enables short delivery times and cost reduction of large bearings.

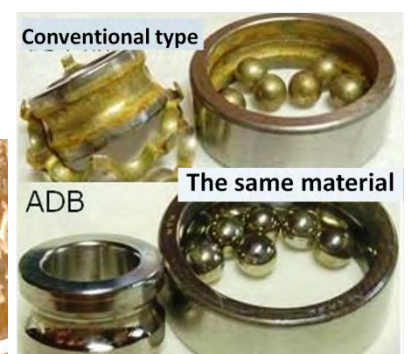


水 water

- Prevention of damage to water-bath bearings
- Energy-saving water-lubricated plain bearings
- Sterilization equipment
- Hydraulic, wave, and geothermal power generation bearings
- No seals required, water lubrication possible. Reduced maintenance.



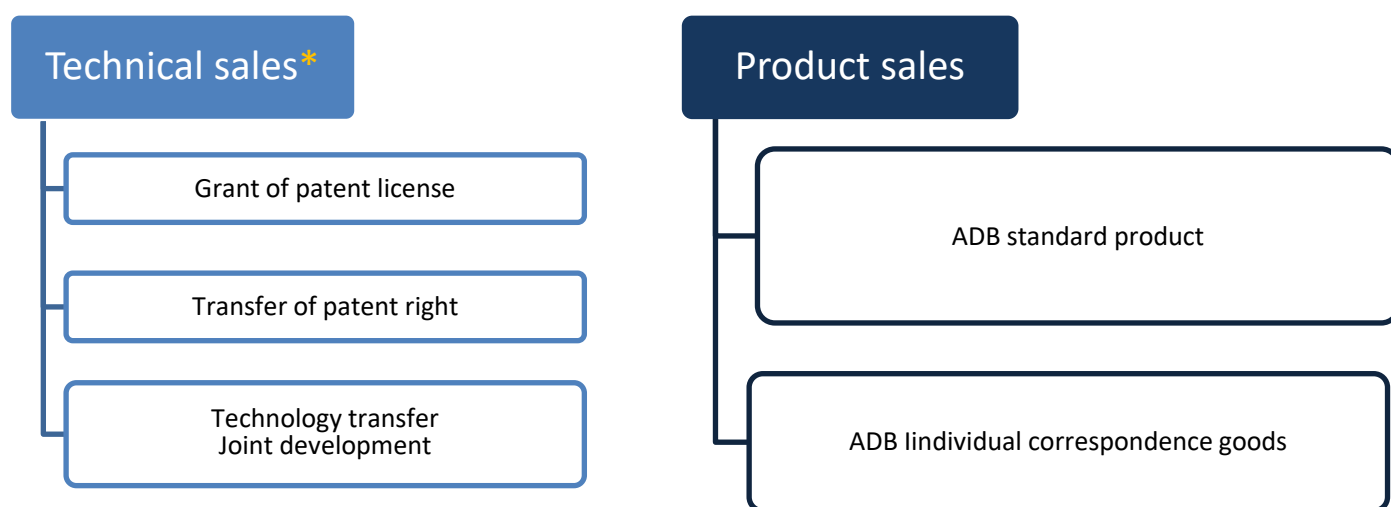
Adopted by JAMSTEC, starting torque improved to 1/100



Company Profile

Company	Coo Space CO., Ltd.	Establishment	14/9/2006
C.E.O.	Sosuke Kawashima	Capital	JPY 5,000,000
Address	3-4-26, Higashi-cho, koganei-shi Tokyo JAPAN	U R L	http://coo-space.com/
		E-Mail	brg@coo-space.com

Business Portfolio



* We are looking for manufacturing and sales partner of ADB. Please inquire. Mail:brg@coo-space.com

Main patent

JP3964926 US8052330

Basic patent on ADB's "Autonomous Decentralize". US has almost the same contents.
Ball bearing and ball screws are the main focus.

JP5320547 US8783958 CN ZL200880015918.6

Basic patent on ADB's "Autonomous Decentralize". US and CN has almost the same contents.
Roller bearing is the main focus.

JP6106830

In ADB of the roller bearing type, maintainability is improved by becoming a preload bearing during operation and becoming a skimmer bearing during stoppage.

JP6476377

The nano-diamond particles dispersed in the lubricant change the minute slip in the rolling contact surface to rolling and reduce friction and wear.

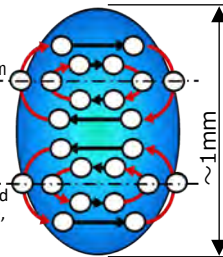
Selection of lubricant

lubricant	Feature	Remarks
Non-lubrication	Non-lubrication realizes super low friction operation at light loads outside the common sense of rolling bearings.	Rust preventive treatment is required for steel bearings. (It will rust with hand grease)
Nano Diamond coat [ND] (Dispersed in machine oil)	Semi-dry lubricating oil which made use of ADB's characteristics, balanced low friction and long service life in a high level.	The amount is about 1/100 of the conventional amount, the extent to present the iris is a standard. 【Bottom view】
Grease	-Add a small amount to Nano Diamond at heavy load. -To make maintenance free, there is also a way to continuously supply grease separation oil to the orbit. 【Bottom right】	Applying grease to the rolling parts with medium and light load increases the torque.
Water etc.	It can be examined in areas where oil can not be used, oil seal waterproofing reduction and abolition, substitution for underwater sliding bearings, and so on.	The kinematic viscosity of water is 1 close to high speed spindle oil.

N D

Diamond particles of several nm
Sliding of the rolling contact
surface It turns into rolling. *

* It is an operation estimated from a long lubrication life, not confirmed.



Nano-diamond lubrication OK

Nano-diamond supply timing

Approximate Supply: When the torque is twice the initial value, or when the ball gloss decreases.

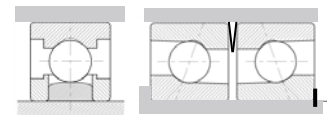


Grease retention on the back of the seal without contact with the ball

Inquiry sheet

To Coo Space CO., Ltd.

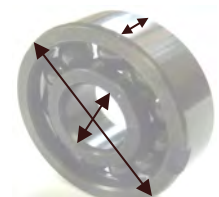
Mail brg@coo-space.com

This image shows a full page of blank graph paper. The grid consists of thin, light gray horizontal and vertical lines that intersect to form a uniform pattern of small squares across the entire page. There are no margins, text, or other markings present.

1 piece / multiple use



Direction of use
Horizontal axis / vertical axis



Dimensions or Brg number

Radia load

N

Axial load

N

Moment

 $\text{N} \cdot \text{m}$

Rotating inner / outer

Speed rpm

Temp _____ °C

Lube Non / Discretion

About seal of remodeling source bearing

It is limited to seal that can be reattached (left and center in the photo). Caulking attachment (right photo) can not be installed on ADB.

