Koyo®

CERAMIC BEARINGS

ISO 9001/QS-9000
Certificate No. 927265

KOYO SEIKO CO., LTD.

CAT.NO.196E

1. Features

1. High Speed
- Centrifugal force reduction due to light ball or roller

2. High Corrosion Resistance
- Can be used under special conditions such as in acid, alkali and salt water, etc.

3. High Vacuum (10^{-10}Pa)
- High seizure resistance with solid lubricant

4. Heat Resistance (800°C)
- No hardness and strength reduction under high temperature

5. Non-magnetism
- Can be used in magnetic field

6. Lightness
- Density is 40% of the bearing steel's

7. Small dimension change by temperature
- Low coefficient of linear expansion (25% of the bearing steel's)

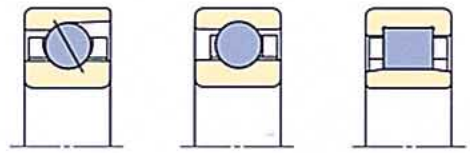
8. High Rigidity
- Higher hardness and longitudinal elasticity modulus greater than the bearing steel

9. Insulation
- Deterioration caused by electric arcing can be prevented

2. Configuration

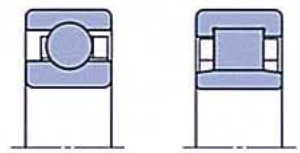
1. 3NC : Hybrid Ceramic Bearing

Angular contact ball bearing | Deep groove ball bearing | Cylindrical roller bearing



2. NC : Full Ceramic Bearing

Deep groove ball bearing | Cylindrical roller bearing



Remark)
Needle roller bearing and tapered roller bearing are also available.
Please contact Koyo for details.

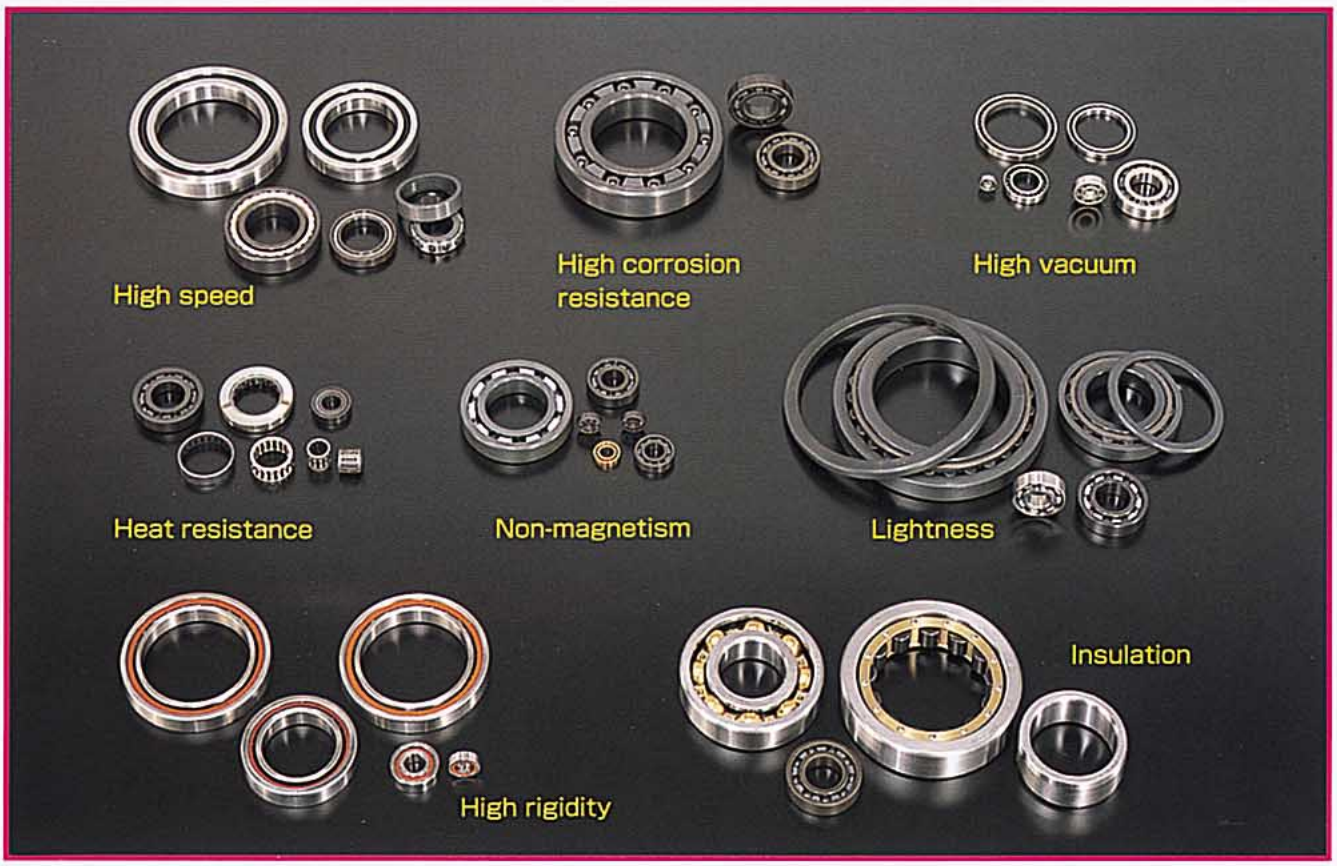
(Ref.) Performance comparison between ceramics (Si_3N_4) and bearing steel (SUJ 2)

Items	Units	Ceramics (Si_3N_4)	Bearing steel (SUJ 2)
Density	g/mℓ	3.2	7.8
Corrosion resistance	——	good	poor
Heat resistance	℃	800	180
Magnetism	——	non-magnetic	magnetic
Coefficient of linear expansion	1/℃	3.2×10^{-6}	12.5×10^{-6}
Vickers hardness	HV	1 500	750
Modulus of longitudial elasticity	GPa	320	208
Poisson's ratio	——	0.29	0.3
Conductivity	——	insulator	conductor
Coupling scheme	——	covalent bond	metallic bond

For Adventurers Opening Up New Frontiers

3. Bearing Type (typical examples)

Several types of ceramic bearings that apply the optimum characteristics of ceramic material



High speed, High corrosion resistance, High vacuum, Heat resistance, Non-magnetism, Lightness, High rigidity, Insulation

4. Application Examples

Utilized example	Application example
High speed	machine tool main spindle, turbo charger, gas turbine, centrifuge, spindle motor, dental handpiece, poligonal mirror scanning motor, twine spindle
High corrosion resistance	semiconductor equipment, plating equipment, composite fiber equipment, optical film equipment, drug equipment
High vacuum	semiconductor equipment, vacuum apparatus, stepping motor
Heat resistance	heat treatment furnace, heat roller, medical supplies equipment, chemical fiber instruments
Non-magnetism	semiconductor equipment, superconduction equipment, atomic power installation
Lightness	crankshaft of racing motorcycle, space appliance, aircraft engine
High rigidity	machine tool main spindle
Insulation	plating equipment, traction motor, motor

Active Commitment to Every Extreme Special Environment

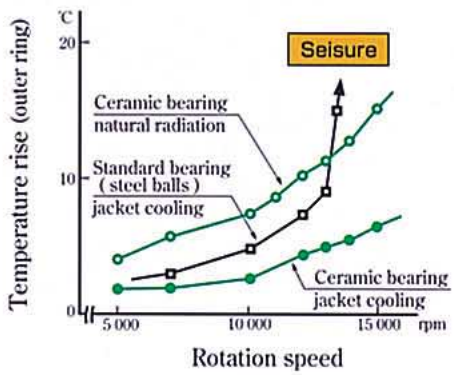
5. Performance

5.1 Load capacity

Bearing type	Basic dynamic load rating C_r	Basic static load rating	
		C_{or}	Judgement
Hybrid ceramic bearing	same as standard bearing (steel rolling element)	85% of standard bearing (steel rolling element)	permanent deformation
Full ceramic bearing		same as standard bearing (steel rolling element)	crack

5.2 High speed

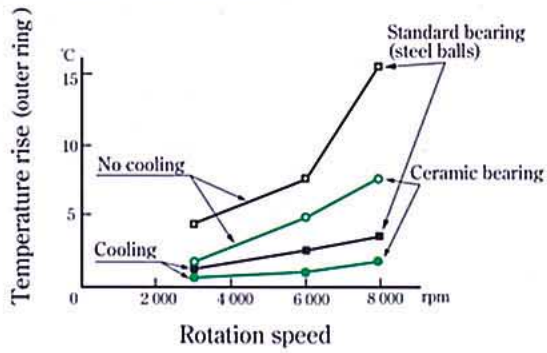
a) Grease lubrication



bearing basic number	ACH014CDBD
boundary dimension	ϕ 70 × ϕ 110 × 20
load	radial 100 N
grease	ISOFLEX NBU15
	10% of bearing free space filling

Test result shows small temperature rise and high speed performance of ceramic bearing.

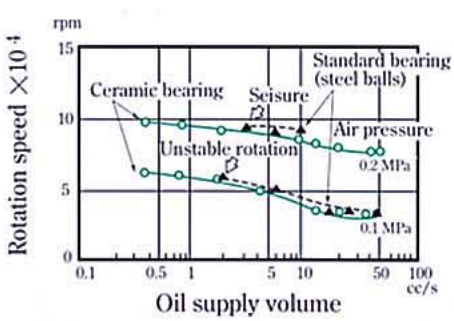
b) Oil & air lubrication



bearing basic number	ACH018CDBD
boundary dimension	ϕ 90 × ϕ 140 × 24
load	radial 100 N, axial 588 N
oil	ISO VG10 0.004 cc/min
air	60 Nℓ /min

Test result shows small temperature rise and high speed performance of ceramic bearing.

c) Oil jet lubrication

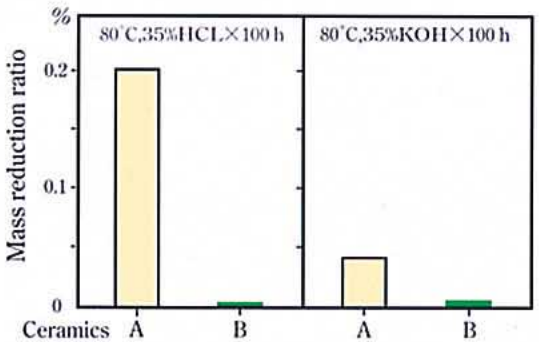


bearing basic number	7001
boundary dimension	ϕ 12 × ϕ 28 × 8
load	axial 100 N
oil	ASTO 500

Test result shows high seisure resistance of ceramic bearing at high speed.

5.3 Corrosion resistance

a) In acid and alkali

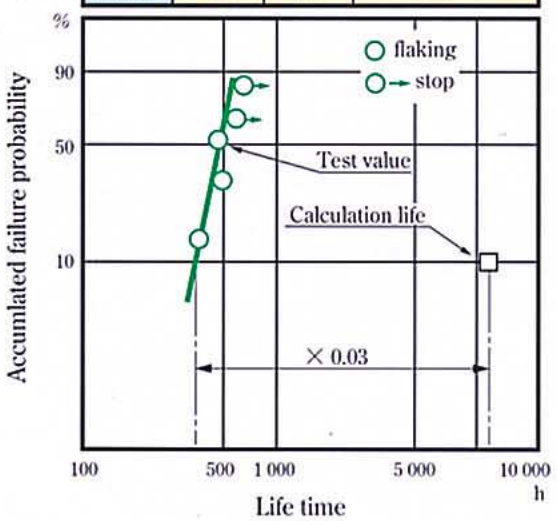


sample	A :	standard ceramic
	B :	corosion resistance ceramic
corrosive environment		80° C, 35%HCL × 100h
		80° C, 35%KOH × 100h soak

Corrosion resistance ceramics is recommended under excessive corrosive environment.

b) In water

Items	L_{10},h	L_{50},h	Weibull coefficient
Results	390	500	7.6



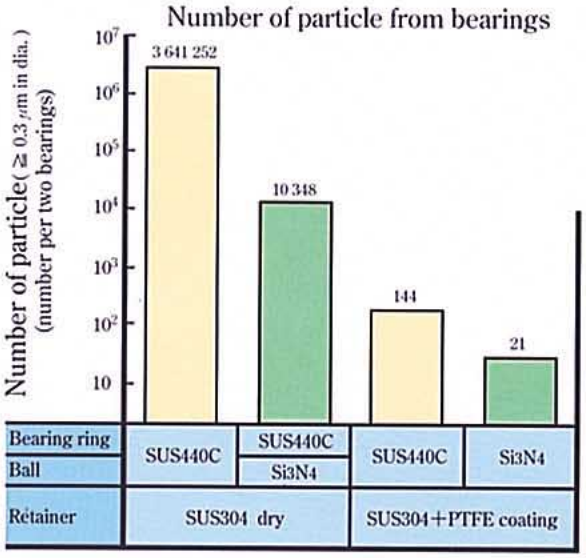
bearing basic number	NC6206
boundary dimension	φ 30 × φ 62 × 16
load	radial 1470 N
rotation speed	1 500 rpm
lubricant	water

Service life in water is about 3% of calculation life.

[Notes]

1. Material of inner and outer ring of hybrid ceramic bearing should be decided according to applications and their conditions.
2. Material and type of retainer should be decided according to applications and their conditions.
3. The availability of full ceramic bearings is limited to the range of bearing sizes from 4 mm of the inner ring bore diameter to 250 mm of the outer ring outside diameter.

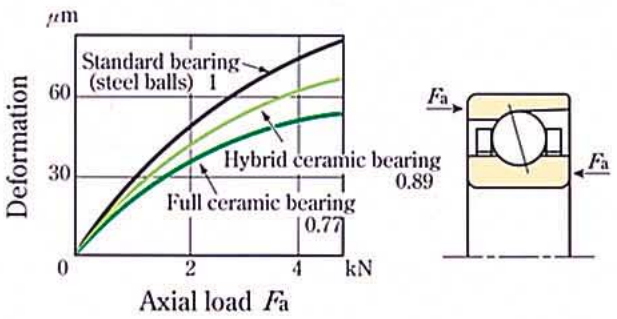
5.4 High vacuum



bearing basic number	SEML6012
boundary dimension	ϕ 6 × ϕ 12 × 3
load	radial 2.9 N
rotation speed	200 rpm
atmosphere	class 10 clean bench room temperature no lubricant
test time	20 hours

Less contamination generation from bearings can be achieved by ceramic bearing in combination with solid lubricant.

5.5 Rigidity



bearing basic number	ACH014C
boundary dimension	ϕ 70 × ϕ 110 × 20

Ceramic bearing has high regidity.

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(KOYO SEIKO CO.,LTD.(japan) is certified to ISO 9001 and QS-9000.)

● Contact the following Koyo representative for any requirement of bearings.

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