Koyo®

CERAMIC BEARINGS



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 (10-10Pa)

· 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

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 (Si₃N₄) and bearing steel (SUJ 2)

Items	Units	Ceramics (Si ₃ N ₄)	Bearing steel (SUJ 2)
Density	g/ml	3.2	7.8
Corrosion resistance	-	good	poor
Heat resistance	°C	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

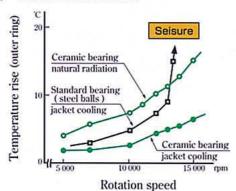
5. Performance

5.1 Load capacity

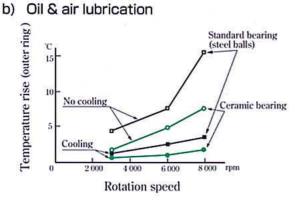
Bearing type	Basic dynamic load rating	Basic static load rating	
C _r	Cor	Judgement	
Hybrid ceramic bearing	same as standard bearing	85% of standard bearing (steel rolling element)	lard bearing permanent deformation dard bearing
Full ceramic bearing	(steel rolling element)	same as standard bearing (steel rolling element)	crack

5.2 High speed

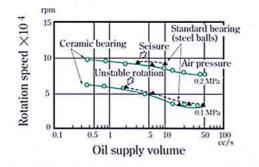
a) Grease lubrication



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c) Oil jet 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.

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 N ℓ /min

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

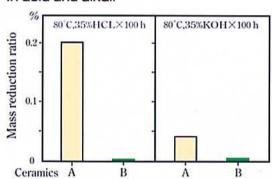
bearing basic number 5001 boundary dimension ϕ 12 × ϕ 28 × 8 axial 100 N oil ASTO 500

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

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5.3 Corrosion resistance

a) In acid and alkali



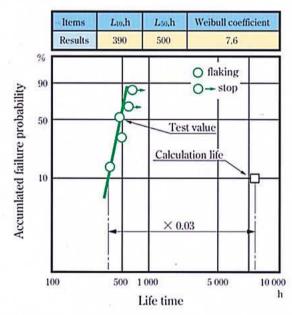
sample A: standard ceramic

B: corosion resistance ceramic sive 80°C, 35%HCL × 100h

corrosive 80°C, 35%HCL × 100h environment 80°C, 35%K0H × 100h soak

Corrosion resistance ceramics is recommended under excessive corrosive environment.

b) In water



bearing basic number NC6206

boundary dimension $\phi 30 \times \phi 62 \times 16$

load radial 1470 N

rotation speed 1 500 rpm lubricant water

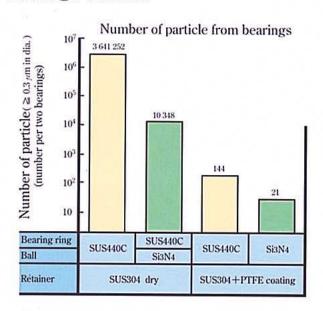
Service life in water is about 3% of calculation life.

[Notes]

- Material of inner and outer ring of hybrid ceramic bearing should be decided according to applications and their conditions.
- 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.



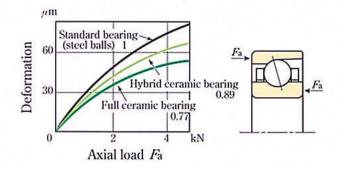
5.4 High vacuum



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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