

# CERAMIC BEARINGS

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- ☐ **Features of ceramic bearings**
- ☐ **Hybrid ceramic bearings**
- ☐ **Full ceramic bearings**
- ☐ **Applications of ceramic bearings**

## Features of ceramic bearings

- ☐ Low weight (about 0.4 of steel bearings).
- ☐ Exceptional corrosion resistance.
- ☐ High rotation speed and acceleration {centrifugal forces are low due to low weights of the balls/rollers and rings}.
- ☐ High thermal resistance. Maximum operating temperature is 1800°F (982°C).
- ☐ Excellent wear resistance.
- ☐ Long service life.
- ☐ Excellent insulating properties.
- ☐ High dimension stability (coefficient of thermal expansion is about 0.25 of steel).
- ☐ High hardness (about 1500 HV).
- ☐ High stiffness (resistance to elastic deformation) due to high modulus of elasticity.
- ☐ Non-magnetic.
- ☐ Low coefficient of friction due to good surface quality.
- ☐ Good Seizure resistance (compatibility) in vacuum.
- ☐ Greater accuracies.

## Hybrid ceramic bearings

**Hybrid ceramic bearings** consist of ceramic balls (or rollers) and steel races, cages/retainers and seals/shields.

The balls/rollers may be made of the following ceramics:

- ☐ Silicon Nitride ( $\text{Si}_3\text{N}_4$ )
- ☐ Zirconia ceramics ( $\text{ZrO}_2$ )
- ☐ Alumina ceramics ( $\text{Al}_2\text{O}_3$ )

The steel parts are made of Chrome steel (eg. AISI 52100) or Stainless steel AISI 316.

Hybrid ceramic bearings are mainly used in high speed and insulating applications.

## Full ceramic bearings

**Full ceramic bearings** are made only of ceramics (contain no steel parts).

The following ceramics are used for manufacturing full ceramic bearings:

- ☐ Silicon Nitride ( $\text{Si}_3\text{N}_4$ )
- ☐ Zirconia ceramics ( $\text{ZrO}_2$ )
- ☐ Alumina ceramics ( $\text{Al}_2\text{O}_3$ )

Full ceramic bearings are widely used in harsh environments (chemicals, vacuum, high temperature, radiation).

## Applications of ceramic bearings

- ☐ Pumps for domestic hot water circulators, dishwashers and washing machines.
- ☐ Industrial pumps for pumping water from deep wells.
- ☐ Submersible pumps for aquariums and garden ponds.
- ☐ Automotive water pumps.
- ☐ Aircraft valves, transmissions and gearboxes.
- ☐ Gas turbine mainshaft.
- ☐ Dental handpiece turbines.
- ☐ Semiconductors processing equipment.
- ☐ Food processing equipment.
- ☐ High speed spindles.
- ☐ Electroplating equipment.
- ☐ Chemical processing equipment.
- ☐ Furnaces for heat treatment.
- ☐ Aircraft engines.
- ☐ Vacuum apparatus.

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