

V-series Hub Joint

A hub joint is integrated with a constant-velocity joint to achieve a **compact, light-weight** hub joint design!



Features

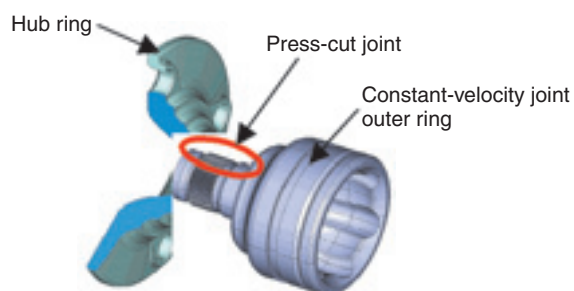
- (1) **Weight:** 12% weight reduction (compared to conventional design)
- (2) **High performance:** No play between hub bearing and constant velocity joint. Prevents stick-sliding noise.
- (3) **Simpler assembly work:** Number of work hours at the user's site is decreased as a hub joint is integrated with a constant-velocity joint.

Applications

- Hub bearing and driveshaft for automotive applications resistance.

Construction [means for realization]

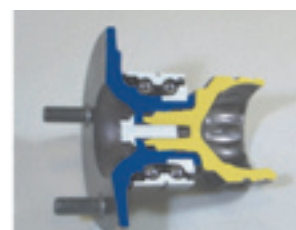
- Adoption of novel joining technique—Press-cut joining



- Two arrangements are available—Consolidated type (hub bearing is consolidated with constant-velocity joint) and separable type (hub bearing can be separated from and joined again to constant-velocity joint).



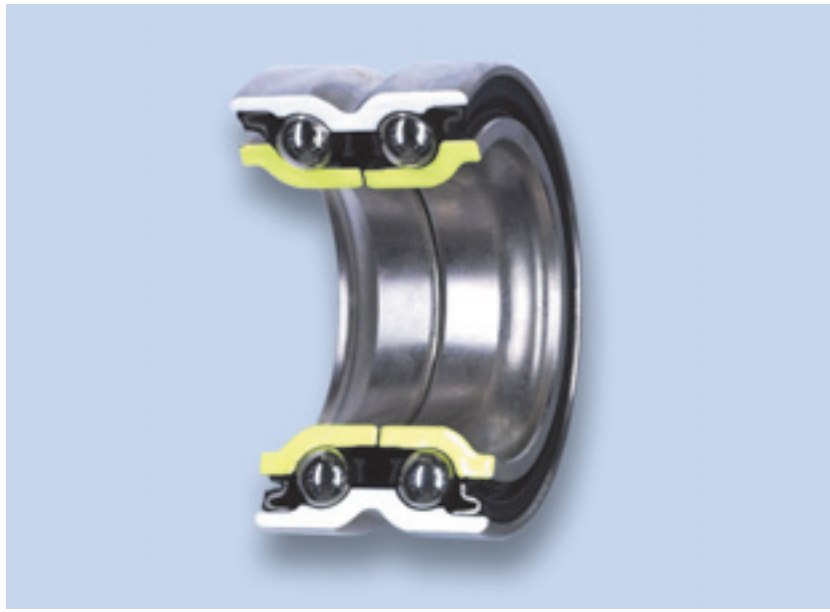
[Consolidated hub joint]



[Separable hub joint]

V-series Angular Unit

Need for **light-weight design** and **decreased material use** are simultaneously achieved while necessary mechanical strength is realized!!



Features (comparison to conventional design)

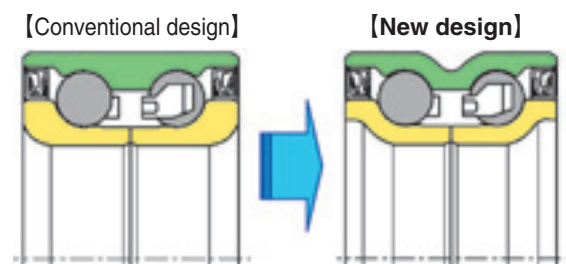
- (1) Weight: 12% lighter
- (2) Amount of material used: 30% reduction
- (3) Simplicity of assembling: Can be assembled with peripheral components in an unmodified conventional process

Applications

- Automotive hub bearing

Construction

- Light-weight shape: Precision metal-forming technique is applied to the inner ring and outer ring.



Hub Bearing w/ Built-in Load Sensor

The sensor is effective even at a **vehicle speed of 0 km/h**. It detects a cornering force working on a running vehicle on a **real-time** basis in order to help assist control in side skidding of the vehicle!



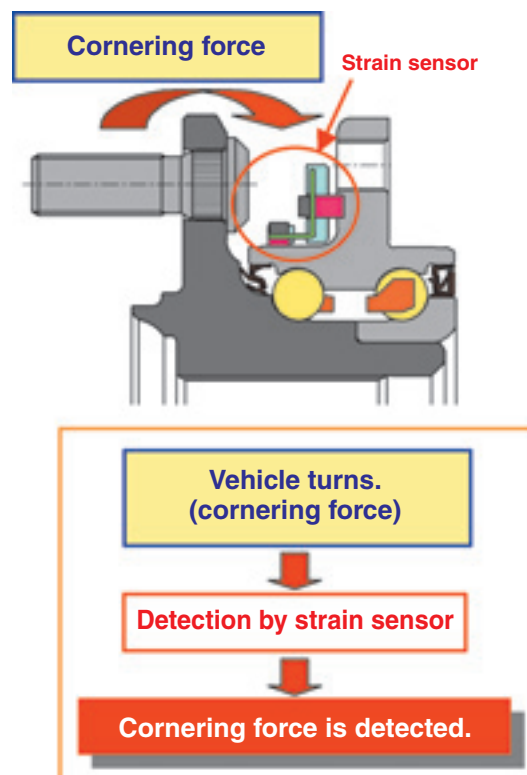
Features

- (1) Sensor installed on each wheel detects the cornering force; the magnitude of detected cornering force is important in controlling the skidding behavior of the vehicle in question.
- (2) Improved response in detecting cornering force
- (3) Even when a particular wheel is locked (zero wheel velocity), a cornering force working on it can be detected.
- (4) Load detection range: -4 kN to 10 kN
- (5) Detection accuracy: $\pm 3\%$ FS (full scale)
Acceleration equivalent to that on a car in 0.6G turn

Applications

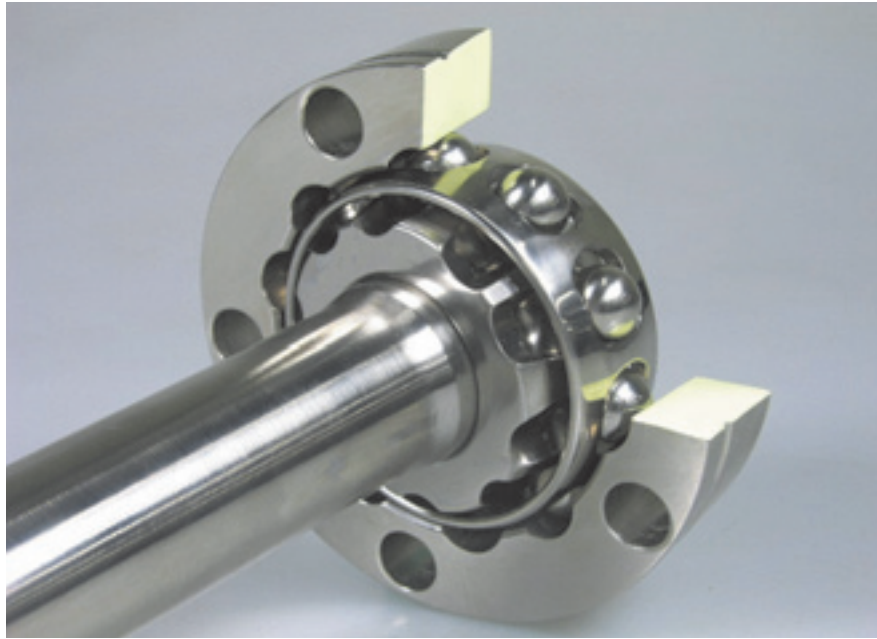
- Hub bearings for passenger cars

Construction



High-Efficiency Compact Constant-Velocity Joint (ELJ)

Compact, light-weight, highly efficient drive shaft constant-velocity joint



Features (comparison with conventional design)

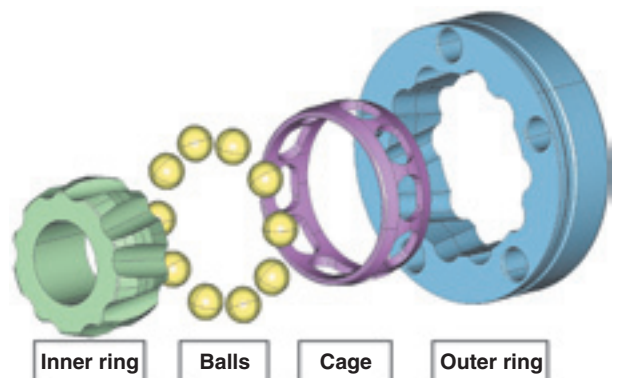
- (1) Compact, light-weight
 - Outer ring outside diameter: 4% size reduction
 - Weight: 18% reduction
- (2) Higher efficiency
 - Torque loss rate: 50% reduction
- (3) Lower slide resistance
 - Slide resistance: 50% reduction

Applications

- Automotive driveshaft

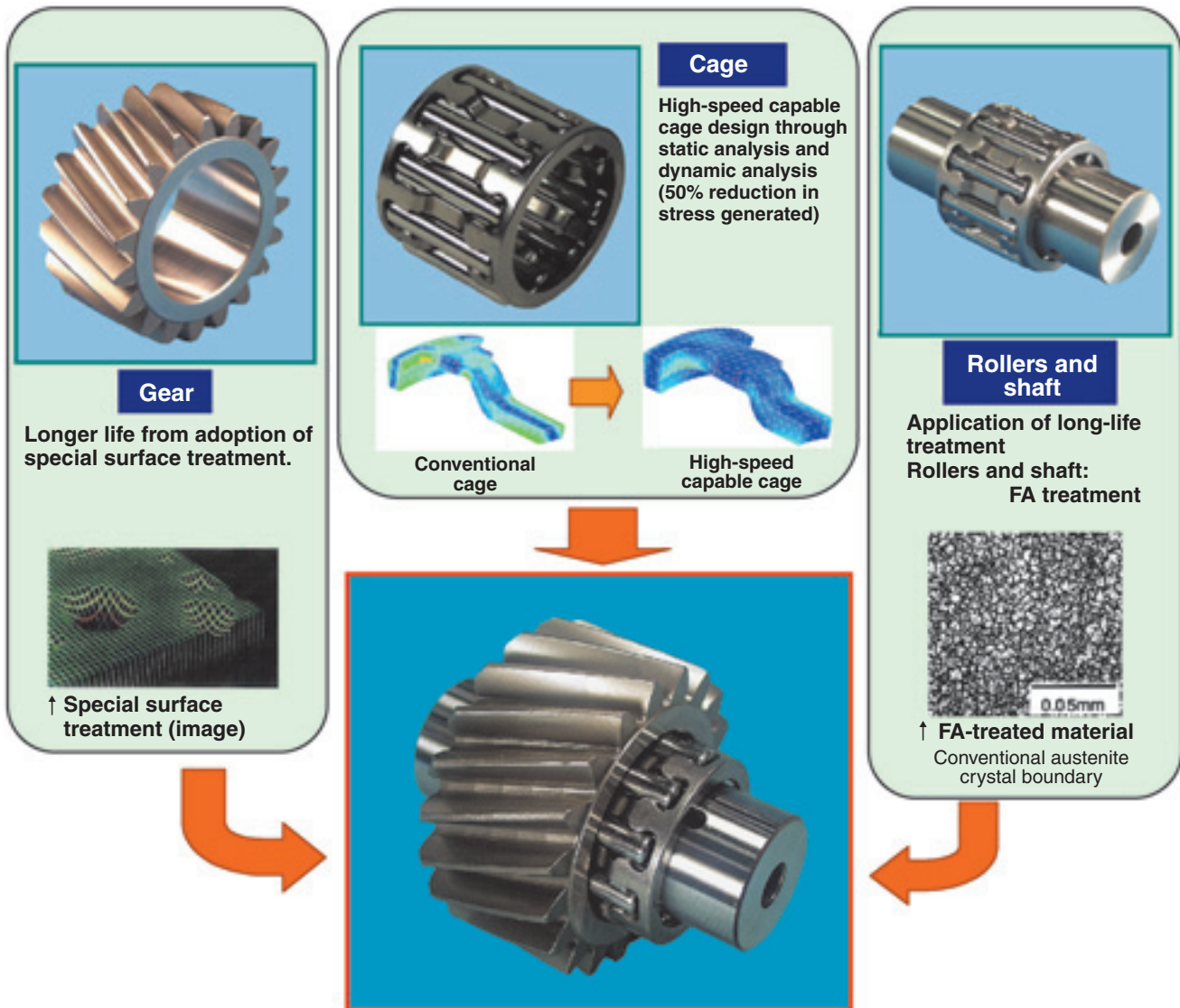
Construction

- Cross groove type constant-velocity joint with ten balls (conventionally, six)



Planetary Gear Unit for Automotive Transmission

Realization of both **higher speed** and **compact size!!**



Features

- (1) High-speed capability:
Capable of 25,000 rpm (47% increase over conventional design)
- (2) Compact design:
20% size reduction in gear width (when conventional gear unit life is maintained)

Applications

- Automotive transmissions (AT, CVT, hybrid system)

Oilless Chain Tensioner

Oil supply from the engine is not needed!



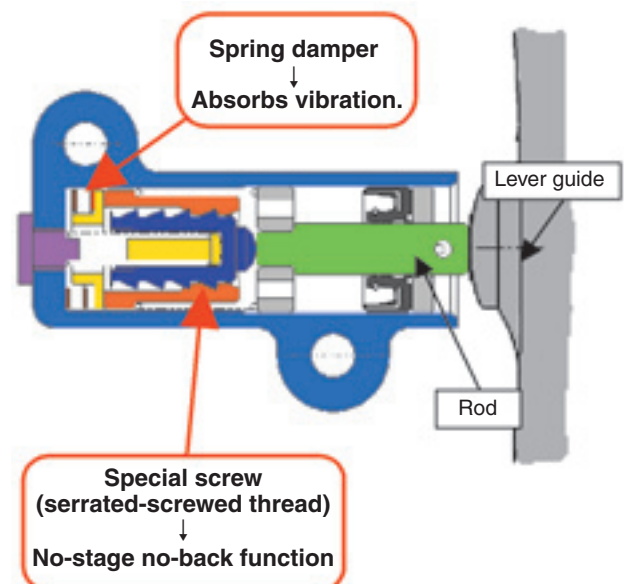
Features

- (1) Oil supply from the engine is not needed.
- (2) Provision of oil piping in the engine is not needed.
- (3) Efficiency of a chain tension adjustment function is equivalent with that of a conventional hydraulic chain tensioner.
- (4) Complete with no-stage no-back function

<No-stage no-back function>

Conventionally, when the engine is shut off while the chain remains tensioned, then the rod may remain in the pushed-in position: then if, in this situation, the engine is restarted and the chain gets loosened, noise will occur at the mesh points with the camshaft and crankshaft. In contrast, the rod in our new product can be retained (no-back) at an arbitrary (no-stage) projected position; noise occurrence is prevented.

Construction

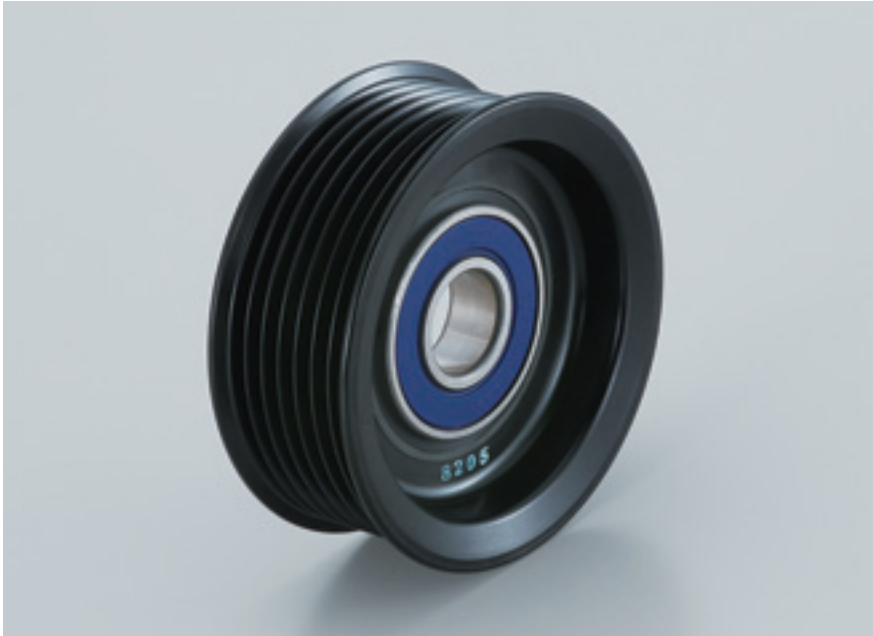


Applications

- Auto-tensioner for timing chain on four- and two-wheeled vehicles

High-Temperature Resin Pulley Unit for Automotive Auxiliaries

Light weight—its life is equivalent to or better than that with conventional iron pulley unit!



Features

(1) Weight: 65% reduction

[Compared to conventional iron pulley unit]

(2) Bearing life: At least twice as long

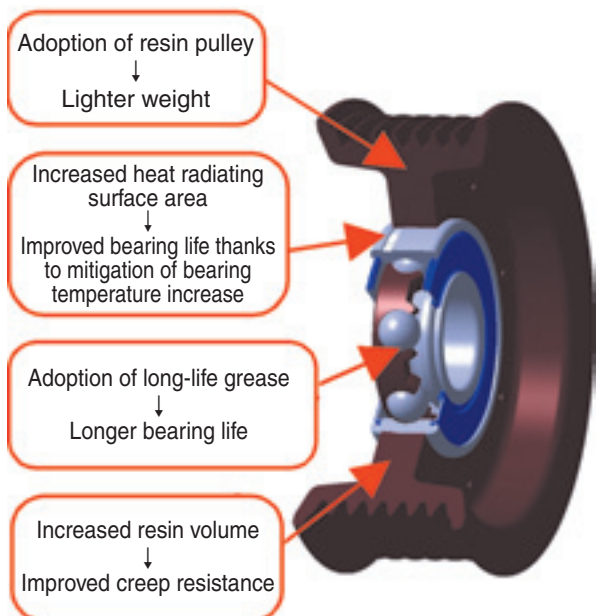
(3) Creep resistance: At least twice as strong

[Compared to conventional resin pulley unit]

Applications

- Idler pulley for belt on automotive auxiliary

Construction [means for realization]



Super-High Load Carrying Cylindrical Roller Bearing

The number and length of rollers have been maximized to help realize a bearing design featuring a much **smaller size** and **lighter weight!**



Features

[Comparison to bearing of same bearing life and rigidity]

- (1) **Lighter weight: 58% weight reduction**
- (2) **Compacter size: 17% reduction in outside diameter and 25% reduction in width**

[Comparison to bearing of same size]

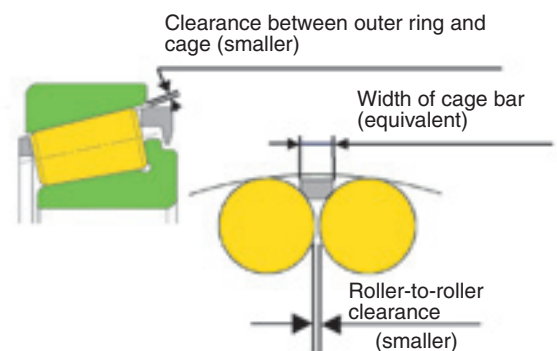
- (3) **Higher rigidity: 16% increase in rigidity**
- (4) **Longer life: five times as long (in clean oil-lubrication environment)**

Applications

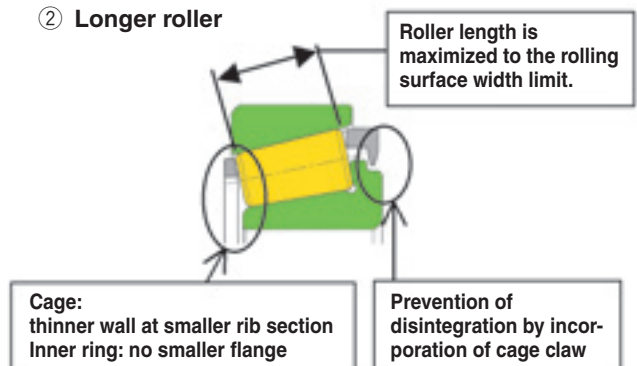
- **Differential gearing in automotive transmission**

Construction [means for realization]

① Increased number of rollers



② Longer roller



Low-Friction Capable Needle Roller Bearing for Automotive Engine

Approximately 3% improvement in **fuel economy** (10.15 mode)
 Helps promote introduction of **compact, lighter** oil pump and starter!!



Features

- (1) Reduction in friction
 Reduction in bearing running torque:
 approx. 50% reduction
- (2) Compacter starter may be adopted.
 Reduction in bearing start torque:
 approx. 90% reduction
- (3) Compacter oil pump may be adopted.
 Necessary quantity of lubricating oil can
 be decreased to 1/10.



- (1) Improved fuel economy for cars
 ⇒Improvement of approx. 3% in
 10.15 mode (desk study)
- (2) A total package can be adopted in
 VAVE applications.

Construction [means for realization]

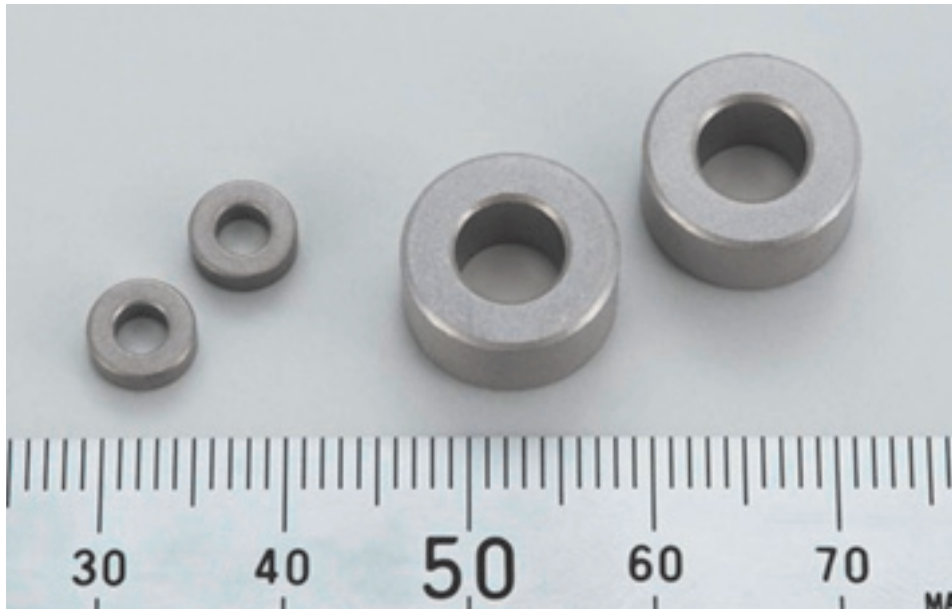
- **Crankshaft support**
 - Thanks to newly developed split outer ring design, the bearing can have a much lower profile: outer ring wall can be as thin as 2 mm.
 - Cage design is optimized for application to engine, boasting improved seizure resistance and enhanced mechanical strength.
- **Camshaft support**
 - Outer ring is formed by pressing process, and the bearing can have a much lower profile: outer ring wall can be as thin as 0.6 mm.
 - Shape of the outer ring is optimized through utilization of FEM analysis, and the outer ring boasts enhanced mechanical strength.

Applications

- **Automotive engine**
 (for supporting crankshaft and camshaft)

MnS-Blended Stainless Steel Sintered Oil-impregnated Bearing

NTN has developed and commercialized a low-friction bearing that excels in **corrosion resistance**, **seizure resistance** and **wear resistance**!!



Features

- (1) **Corrosion resistance**
Uses stainless steel as base metal.
- (2) **Seizure resistance and wear resistance**
Blended MnS (manganese sulfide) helps form a sulfur-based lubricant film, achieving excellent seizure resistance and wear resistance.

Applications

- IT (information technology) equipment, automotive fuel pump, medical equipment, food machinery, etc.

This product has been developed in cooperation with Nagoya Municipal Industrial Research Institute.

Construction [means for realization]

Challenges of conventional technology to be addressed

- (1) Graphite (C) and molybdenum disulfide (MoS_2), etc. are blended into stainless steel base metal.
⇒ Chemical compound is formed as result of sintering, and this compound is harder than the base metal, attacking the mating shaft.
- (2) Lead (Pb), which is highly sliding material, is added as lubricant.
⇒ Use of lead is regulated or banned because it is hazardous to human health.



Newly developed technology that has solved previous challenges

- ※ Appropriate amount of manganese sulfide is added to stainless steel base metal.
- ⇒ Sulfur deriving from manganese sulfide helps form a highly lubricating film boasting excellent extreme pressure performance.

The newly developed bearing product boasts excellent corrosion resistance, seizure resistance and wear resistance.