Handling Precautions and Export Conditions

- Be sure to read and understand the instructions in the operating manual.
- Fully observe all cautions and warnings when handling and operating the product.
- Products in this catalog may be subject to export control restrictions under the Foreign Exchange and Foreign Trade Control Law. When considering the export or transfer of a product overseas, first contact us for confirmation on the controlled status of the product in question as an export license from the Japanese Government is required.
- Without exception, we or our sales agent must be notified before the resale or transfer of ownership of any product in this catalog.

Counterfeit Products

- Beware of counterfeit products. Counterfeit flux cored and other inauthentic Senju solder products have been circulating abroad. Always purchase genuine Senju products from Senju subsidiaries or authorized distributors.
- Our plain bearings have achieved the highest quality based on unique alloying, pressure welding, sintering and processing technologies.
- In order to contribute to the global environment, we have developed eco-friendly "lead-free bearings" following our lead-free solder products.
- With a strong capability in developing resin products, we have developed "Clean Metal" bearings, which have a low friction coefficient.

SMIC’s Plain Bearings
Pursuing the Highest Quality

SMIC’s plain bearings are developed with an excellent powder sintering, high-precision processing, and unique bonding technology. We test their qualities using instruments such as a friction tester, hydraulic bench tester, and friction/abrasion tester in order for you to use our products with assurance.

Motion of the shaft is applied to the "points" of the bearing
"Rolling bearing" "Plain bearing"

Advantages of "Plain Bearings"
- Suitable for heavy and impact load because the face supports the shaft
- Lengthened product life
- Dry lubricated bearings, which do not require a lubricant, are also available
- Simple design allows for ease of downsizing which, in turn, leads to weight and cost reduction

Our plain bearings with excellent shock absorption are the best option for sliding sections with large load changes. They are also cost effective due to their light weight and compact size. SMIC specializes in plain bearings with our advanced technology that allows for us to manufacture with microscopic accuracy and ultra-precision machining with composite material. We have developed, manufactured and sold plain bearings that are better suited compared to competitive rolling bearings and have been recognized as one of the best in the world.

Aesthetics of High Technology

SMIC’s Plain Bearings
Pursuing the Highest Quality

Features
- Our plain bearings have achieved the highest quality based on unique alloying, pressure welding, sintering and processing technologies.
- In order to contribute to the global environment, we have developed eco-friendly "lead-free bearings" following our lead-free solder products.
- With a strong capability in developing resin products, we have developed "Clean Metal" bearings, which have a low friction coefficient.

Advantages of SMIC’s Plain Bearings

Movement of the shaft is applied to the surface of the bearing
"Rolling bearing" "Plain bearing"

Advantages of "Plain Bearings"
- Suitable for heavy and impact load because the face supports the shaft
- Lengthened product life
- Dry lubricated bearings, which do not require a lubricant, are also available
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Design and development processes that ensures high quality

Layer 1
Plain Bearings

Layer 2
Plain Bearings

Layer 3
Plain Bearings

Layer 4
Plain Bearings

Layer 5
Plain Bearings

Layer 6
Plain Bearings

Layer 7
Plain Bearings

Layer 8
Plain Bearings

Layer 9
Plain Bearings

Layer 10
Plain Bearings

Iron Washers for Thrust Control
Best for sliding sections of automobiles and construction equipment due to their high degree of hardness

Copper Washers for Gaskets
Prevents oil leaks from brake controllers of automobiles

Bushing
Suitable for heavy load, impact load, and sliding; as well as a long product life

Plate
Thin plate materials achieve downsizing and weight reduction

CBE Series
Best for sliding sections of automobiles and construction equipment due to their excellent resistance to abrasion

CBR Series
Unique 3 layer bearings constructed for stronger tolerance to pressure
We offer two types of 1 layer bearings: the copper washer, which works as oil seals; and the iron washers with improved resistance to abrasions and sliding property. Our copper washers are most suited to prevent bolts from loosening and most commonly used as gasket washers for brake hoses. Our iron washers, on the other hand, are used as parts for final drive assemblies due to their layer produced with a carbon steel finish for a high degree of hardness.

Our 2 layer bearings are made with bimetal structure that consists of sintering a metal base with copper powder. We also utilize a technique to reduce the amount of CO2 emissions by lining the copper powder to the base used instead of the whole base. In doing so, we have succeeded in reducing the cost of materials and, in turn, reducing the overall price of the product. The bearings are used as plates for hydraulic pumps, and as bushings for undercarriages of construction equipment. Furthermore, we have developed and now produce, a lead-free line of products that is in compliance with the ELV and RoHS guidelines.
Our “Clean Metal” bearings are made with a 3 layer structure that consists of sintering bronze powder on a porous metal base then impregnating it with our very own specialized mixture of fluororesin. This resin works as a dry lubricant, allowing for use without any liquid lubrication. Though it is unnecessary, additional lubrication can extend the product life. Our 3 layer plain bearings are most commonly used for shock absorbers in automobiles due to their compact size and reduced weight. We also offer a wide variation of products from those suited for low friction to those suited for heavy load and high-speed rotation. “Clean Metal” bearings are also eco-friendly and lead-free.

Clean Metal bearings, with its compact design and light weight, uses dry lubricants instead of oil and therefore can be used without any additional lubrications because of its low coefficient of friction. These Clean Metal bearings can prevent the occurrence of vibrations and abnormal noise even while under heavy load, impact load, continuous rotation or oscillatory movements.

Structure and Features of Clean Metal

- **Resin layer**: Serves as the outer layer for protection against wear and tear.
- **Intermediate layer**: Contains the fluororesin mixture that acts as a dry lubricant.
- **Iron base**: Provides the necessary support and structure for the bearing.

For Auto Tensioners

For Moving Power Seats

For Door Hinges

For Shock Absorbers of Cars

For Shock Absorbers of Motorcycles

For CVTs and Solenoid Valves

For Pedals

For quiet and smooth operating doors

For smooth acceleration and braking

For a smooth and automatic seat recline

To adjust tension belts
**Features**

- High-quality products supported by a leading edge evaluation technology using one of the best instruments in the industry
- Lead-free products with excellent resistance to abrasion which can withstand heavy load without lubrication
- Ability to select desired material of resin layer most suited for the intended use
- Thin plate materials allow weight reduction and downsizing to realize high performance
- Functional in a wide temperature range from -200 °C to +280 °C
- Ability to select product types, shapes and sizes according to specifications of usage and characteristics

**Criteria of Selecting Products**

- “CB90” is a series of general-purpose plain bearings that is lead-free.
- Select “CBE1” for a moving part where surface pressure is important.
- Select “CBE2” for a moving part where a good balance between both the properties is important.

The capability of plain bearings are measured by their PV values, in which P expresses pressure or the load placed on the projected area of the bearing; and V expresses the velocity or the surface speed at which an object, such as a shaft, moves. This is calculated by finding the product of maximum pressure and maximum velocity.

```
Maximum pressure = Maximum load ÷ Projected area of the bearing
Maximum velocity = Relative velocity between the bearing and the moving object
```

**Diagram of a standard Clean Metal bearing**

```
Diagram of a standard Clean Metal bearing
```

**Part number codes**

```
Part number codes
```

**Dimension table**

```
<table>
<thead>
<tr>
<th>Internal diameter of the bearing</th>
<th>External diameter of the bearing</th>
<th>Length of bushing L</th>
<th>Clearance T</th>
<th>Plane thickness P</th>
</tr>
</thead>
<tbody>
<tr>
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<td>8</td>
<td>10</td>
<td>12</td>
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<td>0.105</td>
<td>0.025</td>
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</table>
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* T: Clearance is the calculated value of the difference between the shaft and the inner diameter of the Clean Metal bearing press-fitted into a housing with high rigidity.

```
Diagram of a standard flanged Clean Metal bearing
```

**Part number codes**

```
Part number codes
```

**Dimension table**

```
<table>
<thead>
<tr>
<th>Internal diameter of the bearing</th>
<th>External diameter of the bearing</th>
<th>Flange diameter of the flange</th>
<th>Length of the bushing under the flange</th>
<th>Clearance T</th>
<th>Thickness of the flange T1</th>
<th>Thickness of the flange T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>8</td>
<td>10</td>
<td>12</td>
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<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>
```

* T: Clearance is the calculated value of the difference between the shaft and the inner diameter of the Clean Metal bearing press-fitted into a housing with high rigidity.
The Design and Development Process that Ensures High Quality

Unique Technologies to Achieve Maximum Strength and Reliability

It is necessary for bearings to have maximum strength and reliability in order to safely and comfortably function throughout their product life. We use atomic level technology for sintering, metalworking and pressure welding, and other unique technologies to establish strong and reliable bearings. We are also ISO/TS 16949 certified to attest to our high quality.

- **Spraying**
  Produces high-precision plain bearings with less variations using a unique spraying technology.

- **Resin Impregnation**
  Files porous layer with resin using an impregnation technology that influences abrasion resistant property.

- **High-Precision Processing**
  High precision deformation processing of composite materials of different physical properties with a unique technology.

- **Cutting**
  Cuts combined metals and resins of different physical properties with high dimensional precision.

- **Powder Sintering**
  Powder sintering technology that achieves a resin impregnated structure with excellent resistance to abrasion.

- **Automation**
  Excellent work environment and one hundred percent visual inspection ensures security and high quality.

- **Rolling**
  Rolls combined metals and resins of different physical properties with high dimensional precision.

- **Automatic Inspection Equipment**
  Automatic inspection instrument that measures every product to ensure high dimensional precision.

- **Eco-Friendly**
  Environment-friendly facilities which includes ovens with efficient thermal insulation that contributes to saving energy.

- **Rolls combined metals and resins of different physical properties with high dimensional precision**

Development of High-Quality Alloy Powder and Resin Materials through Tests under Severe Environments

Our bearing development team is driven to develop new products that affirm reliability. They conduct tests under severe conditions to assess the pressure tolerance and strength of our products. They have also developed a new alloy and resin material that has excellent resistance to abrasions, and has come to realize the next generation of plain bearings. Our products are used for variety of purposes all over the world and are highly regarded and trusted as one of the best in the world.

**Friction Test**

We conduct an endurance test with a friction tester that is able to reproduce the loads imposed on shock absorbers when driving a car or motorcycle. With this, we are able to check the deterioration of frictional resistance and the attenuation, which affects the comfort of the ride. The evaluation results are, then, utilized to develop new materials.

**Hydraulic Bench Test**

Our hydraulic bench tester is able to replace testing with an actual product. We conduct a 500-hour life test to assess the displacement of the product. If the displacement has changed, we disassemble the product to find the cause by visually checking for wears and damages. The results are utilized to improve our products and to develop new products.

**Friction and Abrasion Test**

We conduct an endurance test on variety of our sintered bimetal plates made of resin composite materials to assess the most basic properties of bearing materials: friction and abrasion. Our test is set according to the customers’ use conditions to assess the changes in friction coefficient, thickness, temperature, burns, and more. The results are utilized to develop materials that can satisfy customers’ needs.