Aluminum Continuous Cast Rod; SHOTIC™
Aluminum Powder Metal; SHORIK™
and Forged Products made from SHOTIC™ /SHORIK™

**SHOTIC™**
Showa Denko’s aluminum forging material (=SHOTIC™) is a continuous cast rod produced by our original technology that has fine and uniform metallurgical structure.

**SHORIK™**
SHORIK™ is Showa Denko’s original powder metal. Since a powder metal has high alloy design flexibility, it is also feasible to add some fine ceramics, such as alumina and SiC-whisker.

**Forged Products made from SHOTIC™/SHORIK™**
SHOTIC™/SHORIK™’s forged products have superior features, such as high strength and wear/heat resistance, which is brought on by our original casting process and alloy. Our products are being utilized in various lightweight applications worldwide.

**Contact us**

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Superior quality acknowledged by customers in world wide Showa Denko’s Aluminum forging and forging stock

What is SHOTIC? It is the bland name of continuous cast aluminum rods that are produced by Showa Denko’s original technology and SHOTIC is derived from its company name “SHOWA” and cast bar name “STICK”.

Aluminum forgings have been applied to a wide range of fields such as automotive and industrial machinery utilizing suitable aluminum alloys according to their application. The innovation of Shotic cast alloy, which has better mechanical properties, makes it possible to produce a material highly suitable for forging. Which is very difficult to achieve by conventional technology.

In 1975, Showa Denko developed an air-pressured vertical continuous casting method and validated that Al-Si material that has high wear resistance, strength and toughness could be used as forging stock. Showa Denko gave it the brand name of “SHOTIC™” and has focused on expanding its applications, emphasizing its superiority of mechanical properties and quality.

With continuous innovations, Showa Denko will soon be expanding the superior performance of both the aluminum forged products and forging material base to meet and exceed the customer expectations.
Business Field of SHOTIC™ Materials

**Strengthen it more, Lighten it more.**

*Superior quality and a diversified product line up that have been utilized in a variety of applications worldwide.*

Showa Denko’s aluminum forging material is a continuous cast rod that has fine and uniform metallurgical structure. This is due to the innovation of our continuous casting technology that has a variety of alloys that can be selected according to customer’s application. Showa Denko has the capability to produce expansion and casting alloys materials to accommodate the customer’s needs. Forging products made from superior forging materials, are being applied to a variety of use such as wear resistance required parts, anti-corrosion structural elements, high temperature strength elements and expanding application range of aluminum forging.
**Showa Denko’s Casting Technology**

**Provide superior forging material with innovative cast technology.**

Showa Denko solely developed two types of continuous cast technology, air pressured hot-top (vertical) continuous cast method and air pressured horizontal continuous cast method. These technologies have made it possible to prevent contact between molten metal and inner mold by air pressure during casting, with which we can produce cast rods with smoother casting surface. They also have enabled us to produce a wide range of alloys; from JIS expansion alloys to alloys with high wear resistance (high Si-contained alloys), since its casting speed is fast in terms of small diameter cast rods (25-100mm). Cast rods produced by these methods have high workability and mechanical property because of their fine and uniform metallurgical structure. These rods are suitable as hot or cold forging materials, and can be used for a wide variety of parts.

**Features of Micro structure**

Examples of metallurgical structure of high wear resistance alloys: Needle-like eutectic Si exists in compared material (Si=11%) became fine grain structure in Showa Denko’s AHS-2 cast rod and can be used as forging material.

**Vertical Hot-top Continuous Casting Process (V-Process)**

Shotic original continuous casting process with air pressure added while casting. Small-diameter cast bar with homogeneous metallurgical structure suitable for forging.

**Horizontal Continuous Casting Process (H-Process)**

Shotic original complete continuous casting process which realize high productivity. Capable of producing smaller diameter cast bar than Vertical process.
Showa Denko can develop suit alloys to meet customer’s required properties.

### Representative alloy series

**Al-Si Eutectic alloy “AHS™” series**
Showa Denko’s original alloy and superior mechanical property and lower cost than A4032 extruded rod.

**Al-Si Hyper-eutectic alloy “A390” series**
Contains higher percentage of silicon and has better wear resistance compared to AHS™.

Although A390 had been primarily used only to cast parts, our continuous casting technology distributes the primary silicon grains in a fine and uniform pattern enabling it to be used as a forging alloy.

**A6000 type alloy “SU” series**
SHOTIC’s original alloy and applicable to light weight anti-corrosion structural parts that is 1.2 times stronger than conventional A6061 extruded rod while maintaining the same anti-corrosiveness.

**Aluminum powder metal “SHORIK™”**
SHOWA DENKO was the first company in the world to make practical use of an aluminum powder metal and to show superior performance beyond conventional aluminum alloys.

### Main type of aluminum alloy and its characteristic produced by SHOTIC

<table>
<thead>
<tr>
<th>Required Properties</th>
<th>Alloy Name</th>
<th>Material Production Method</th>
<th>Si Content (Wt%)</th>
<th>Mechanical Properties (T6)</th>
<th>Other Properties</th>
<th>Application</th>
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<tbody>
<tr>
<td>Anti-Corrosiveness, High strength</td>
<td>6061</td>
<td>Extrusion</td>
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<td>Tensile Strength (MPa)</td>
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<td>284</td>
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<td></td>
<td>6061</td>
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<td>YS Strength (MPa)</td>
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<td></td>
<td>SU610</td>
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<td>Elongation (%)</td>
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<td>357</td>
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<td></td>
<td>4032</td>
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<td>Tensile Strength (MPa)</td>
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<td>315</td>
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<td></td>
<td>AHS-9</td>
<td>Drawing</td>
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<td>YS Strength (MPa)</td>
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<td>314</td>
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<td></td>
<td>AHS-1</td>
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<td>Elongation (%)</td>
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<td></td>
<td>AHS-7</td>
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<td>Hardness (HRB)</td>
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<td>AHS-G</td>
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<td>Hardness (HRB)</td>
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<td>A390</td>
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<td>Hardness (HRB)</td>
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<td>A390-5</td>
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<td>ASCM 16-5Fe</td>
<td>Extrusion (Powder)</td>
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</table>

*Other properties: Excellent A-B-C-D Bad  *Above values are typical ones and not guaranteed.
SHOWA DENKO’s Forging Technology

**Offer efficient designs by developing a wide variety of forging process and CAE technologies.**

Showa Denko has a wide variety of forging processes such as hot forging and cold forging, and a suitable process to the required design can be developed. This enables us to deliver forging designs with complexity, like left-right asymmetry products.

In addition, Showa Denko has CAE and evaluation technologies for products, such as deformation analysis, structural analysis and performance testing. This enables us to design the lightest product shape that satisfies required characteristics of products.

### Closed Die Forging Process

**Features:**
- Form material in the cavity that is closed between the upper and lower dies.
- Good material yield by our capability of high-accuracy-forging.

### Back Pressure Forging Process

**Features:**
- By applying back-pressure from below the bottom die, control of metal flow can be achieved that enables the forming of uniform height.
- Forge with high yield results even if the product has an imbalanced design in volume.

### CAE and Evaluation Technologies

**Features:** Based on Deformation and Structural analysis, the most suitable shape, that satisfies both forging workability and functionality, is designed.

Deformation Analysis  Structural Analysis  trial  Performance Testing

( Parts Design )
SHOTIC™ forgings have superior features, such as high strength and wear/heat resistance, which is brought on by our original casting process and alloy. Our products are being utilized in various lightweight applications worldwide.
For meeting the expectation of customer around world,

Showa Denko has a global manufacturing and sales footprint of 5 sites. The main plant is located in Japan, forging plant in Portugal and Singapore, casting plant in Malaysia and sales branch in the United States. Based on this global network, Showa Denko can efficiently supply our products worldwide.