High precision components for horizontal knitting machines supporting clothing from around the world

“Whole garments” are woven three-dimensionally directly from whole-garment knitting machines. The cutting and sewing processes are greatly shortened.

The parent company, Shima Seiki Co., Ltd. is a proprietary technology capable of seamlessly knitting “whole garments” of even complex shape shapes, holding 60% of the worldwide market share. It has gained worldwide recognition for both its functionality and for not breaking even when used for long periods of time. Shima Seiki provides the high precision parts necessary for this horizontal knitting machine. Outside the realm of horizontal knitting machines, the company continuously supports the global garment industry with blanking (FB) and ultra-precision injection molding technology.

Using machines to their utmost limits

The company was founded in 1980. Not satisfied with European parts that were adopted at the time, the company aimed to make these parts in-house. President Sadao Nishimura, transferred from Shima Seiki at age 25, said “I had zero mold and molding know-how. What I knew was that we needed to make high-precision parts and that we needed high-precision machines to make them.” So he was very particular with the equipment. The theory is “you can’t make a 1000-part machine by lining up a bunch of 100-part machines.”

Use only the best machines

According to this policy, we have collected all of the finest machines. However, as President Nishimura said, “What is most important is not just the machine, but mastery of the machine.” Considering the safety factor, it is common to use machines in sages that are slightly lower than the champignon data from the manufacturer’s catalog. But we do things differently. We master our machines so that we can use them at the utmost levels defined in the manufacturer’s catalog. That is known as “to ensure that the impressions we are aware of this, they choose their own machines themselves. The highest grade machines, and the ambition to master them. This posture was probably the reason. The reason why we produced the film mold only half a year from our establishment. Eight years later we began injection molding, thinking “there are machines that make molds, so we can make plastic molds.” Although we started this way, the parts we handle now are more sophisticated. For example, the main needle plate component that is indispensable for knitting machine control is composed of a hardened material with a thickness of 1 - 2 mm and a length of 200 - 250 mm. This part which takes thousands of pins will produce over 10,000 of these per day. We also manufacture special parts with wire. There is a part that cuts the fillet on new material such as cloth and carbon fiber according to certain dimensions, plus the film on this part and it will adhere to and cut it. In order to do this clearly, we needed to place 8,100 pins in a square of about 150 mm and it took several months to produce this mold.

Automate things as well as soon as possible

Some may think that because we are a subsidiary, it is wise for us to make high-quality parts, but it is actually the opposite. Because we are a subsidiary, the demands are more severe. For this reason, we are making things less expensively through automation. For example, it used to take two hours to polish the tip portion in the needle plate but in collaboration with specialist manufacturers, we were able to develop a breakthrough method to polish it in about 10 seconds. Also, we have been working on automation measures to process any debris stuck inside the molds.

Without challenge, there is no growth

There are endless challenges to develop devices and new technologies. Recently, considering that “including post-processing, lasers are faster for most parts,” we have begun to make parts using laser processing. Also, we are bring in a 650t class molding machine this year, and construction of large size parts is in progress. In addition, while we have not taken any defensive action, we are considering using injection molding machine developed by Sodick for aluminum. “Even if you are productive and profitable, without attempting new challenges, you cannot grow.” President Nishimura, who serves as a source of company growth.

High precision components for horizontal knitting machines

Supports clothing from around the world

Wakayama City, Wakayama

Shima Fine Press Co., Ltd.

High speed, ultra precision
Large wire-cut EDM

AL800P

Users who offer the latest machining examples

Togo Engineering Corporation
Nigata Precision Co., Ltd.
Mitsubishi Seimitsu Co., Ltd.
M.I.C. Co., Ltd.
Sanko Kasei Co., Ltd.
Shibata-Gosei Co., Ltd.

Shima Fine Press Co., Ltd.

Sodick User Report
This is a high-speed building Metal 3D Printer equipped with a 3D building function that has a greatly improved building speed which is required for the entry model of a Metal 3D Printer, and a reference surface machining function for secondary machining.

Equipped with a 500 W Fiber Laser
- Implements high-speed, high-quality metal 3D printing

High-speed 3D Building Function
- Improved frame recovery efficiency with an ideal building chamber layout

Reference surface machining function for secondary machining
- New NC unit developed and manufactured in-house
- LN4AZ
- Improved machining accuracy by superfine subdivisions of the control unit

Main Specifications
- Maximum molded object dimensions (width x depth x height): 250 x 250 x 250 mm
- Maximum load weight: 120 kg
- Maximum laser output: 500 W
- Machine dimensions (width x length x height): 1630 x 2525 x 2020 mm (Including peripherals)

High-speed layered modeling in parallel mode

Fluid pump impeller

Machining Tools Used
- Laser sintering
- Laser surface machining
- Total

<table>
<thead>
<tr>
<th>Material</th>
<th>Molded object size</th>
<th>OPW-ULTRA</th>
<th>Ø 15 x 60 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step size:</td>
<td>32 hr 26 min</td>
<td>1 hr 26 min</td>
<td>34 hr 24 min</td>
</tr>
</tbody>
</table>

Manufactured object size
- Laser sintering
- Laser surface machining
- Total

Material | Machining shape | OPW-ULTRA | Ø 15 x 60 mm |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
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</tbody>
</table>

Linear motor drive Nano Machining Center

This is a Nano Machining Center of a unique structure which demonstrates the superiority of high-speed milling machining to the fullest by a built-in cancel axis which is driven in the opposite phase from the machining table and a high-speed spindle with a maximum rotation speed of 120,000 min⁻¹.

Active Vibration-free System “Counter Table Mechanism”
- Suppresses vibrations to the maximum during the cutting process by the cancel axis which is driven in the opposite phase from the machining table

New High-Speed Air Spindle Machining
- Maximum rotation speed: 120,000 min⁻¹
- Realized highly precise and highly efficient high-speed milling excellence at the nano level

New NC unit developed and manufactured in-house
- LN4AZ
- Improved machining accuracy by superfineness subdivisions of the control unit

Main Specifications
- Each axis stroke (X x Y x Z): 380 x 250 x 150 mm
- Machining area (width x depth): 250 x 170 mm
- Main spindle rotation speed: 25,000 ~ 120,000 min⁻¹
- Maximum quantity of machining material: 5 kg

High-speed layered modeling in parallel mode

Fluid pump impeller

Machining Tools Used
- Laser sintering
- Laser surface machining
- Total

<table>
<thead>
<tr>
<th>Material</th>
<th>Machining shape</th>
<th>OPW-ULTRA</th>
<th>Ø 15 x 60 mm</th>
</tr>
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<tbody>
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</tbody>
</table>

Manufactured object size
- Laser sintering
- Laser surface machining
- Total

Material | Machining shape | OPW-ULTRA | Ø 15 x 60 mm |
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<tbody>
<tr>
<td>Step size:</td>
<td>32 hr 26 min</td>
<td>1 hr 26 min</td>
<td>34 hr 24 min</td>
</tr>
</tbody>
</table>

Material | Machining shape | LN4AZ | Ø 8 x 7 |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Step size:</td>
<td>32 hr 26 min</td>
<td>1 hr 26 min</td>
<td>34 hr 24 min</td>
</tr>
</tbody>
</table>

**Note:** The machining results are based on environment specified by us.

Sodick Report 2019 WINTER
Linear motor drive
High-speed and High Precision Die-Sinker EDM

**NEW** AP30L

With the further evolved electric discharge stable machining system “Arc-less 4,” this is a 3-axis (XYZ) linear motor drive high-precision Die-Sinker EDM which realizes various surface finishing at high-speed and highly efficient machining in the fine and precision areas.

**Main Specifications**

<table>
<thead>
<tr>
<th>Each axis stroke (X x Y x Z)</th>
<th>300 x 250 x 200mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table dimensions (width x length)</td>
<td>500 x 350mm</td>
</tr>
<tr>
<td>Maximum electrode suspended mass</td>
<td>5kg</td>
</tr>
<tr>
<td>Maximum quantity of machining material</td>
<td>200kg</td>
</tr>
</tbody>
</table>

**High Speed and High Responsiveness**
High speed and dynamic responsiveness by linear motor and motion controller “K-SMC” developed and manufactured in-house

**Lightweight and Highly Rigid Symmetry Head**
Lightweight and high-rigidity by adoption of our new CFRP and ceramics developed and manufactured in-house

**AI technology**
Equipped with the latest applications which uses AI (artificial intelligence) technology

**Ark-less 4**
Greatly improved machining speeds in all rough, medium and finished machining

**New NC unit developed and manufactured in-house**

**LP4 Power Supply**

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Linear motor drive
High-speed and High Precision Large Wire-Cut EDM

**NEW** AL800P

This is a high-precision large Wire-cut EDM equipped with a new structure and new system that minimizes thermal displacement, which further realizes high-speed and high accuracy in large components related to energy and aircraft, and large molds related to automobiles and electricity.

**Main Specifications**

<table>
<thead>
<tr>
<th>X-axis Stroke</th>
<th>800 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y-axis Stroke</td>
<td>600 x 250mm</td>
</tr>
<tr>
<td>Maximum quantity of machining material</td>
<td>150kg</td>
</tr>
<tr>
<td>Wire electrode diameter</td>
<td>φ0.4 ~ φ1.1mm</td>
</tr>
</tbody>
</table>

**Ultra-Precision Machining**
Adopted ceramic for machine structure
Thermal commit system (TH-EDM)

**Automation of High Precision Machining**
High-speed automatic wire threading unit "AKM-4P" New core processing unit "SCORE (Score)"

**Pitch Machining Accuracy ±1.5 µm at the Long Plate**

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**Greatly improved in all areas of Pitch, Shape, Position and Speed**

*Developed to allow circulation of to control the overall temperature.*

**Overall temperature control**

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**Ultra-fine connector machining**

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**Linear motor drive**
High-speed and High Precision Large Wire-Cut EDM

---

**Pitch Machining Accuracy ±1.5 µm**

---

**Material**
SLD

**Workpiece size**
800 x 650 x 20mm

**Wire**
φ0.4 mm Tsubame Wire Plus

**Maximum pitch distance**
X direction: 700mm Y direction: 500mm

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Sodick Report 2019 WINTER
Linear motor drive
High-Speed and High Performance Wire-Cut EDM

ALN600G + Erowa Robot Compact 80

All of the underlying technology is developed and manufactured in-house, including linear motors mounted on the XYUV4 axes. Demonstrates excellent affinity for automated system construction and with Advanced Smart Pulse and Advanced Smart Linear, it is a high-speed, high-performance wire-cut EDM with a top class linear motor drive.

- **Large wire-cut EDM control technology**
  - Drum-less control II
  - TMP control II
  - Digital-PHA-W Plus
- **Developed and manufactured in-house XYUV4 Linear Motor Drive**
  - Maintains semi-permanent precise axis movements without backlash
- **Automation of High Precision Machining**
  - High-speed automatic wire threading unit “FJ-AWT”
  - New core processing unit “S3CORE (Score)” (optional)
- **Developed and manufactured in-house Uses ceramics**
  - Insulation structure of the wire running system and workpiece securing part

Main Specifications

<table>
<thead>
<tr>
<th>Each axis stroke (X x Y x Z)</th>
<th>680 x 460 x 350mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>U x V axis stroke</td>
<td>150 x 150mm</td>
</tr>
<tr>
<td>Maximum quantity of machining material</td>
<td>100kg</td>
</tr>
<tr>
<td>Wire electrode diameter</td>
<td>φ0.05 ~ φ0.3 mm*</td>
</tr>
</tbody>
</table>

Increased operating rate by robots for automatic work pallet exchange

New core processing unit “S3CORE” (optional)

Material 20 x 20 x 5mm
Machining conditions
- Spindle rotation speed 14,000 min⁻¹
- Feed speed 40 mm/min
- Tools Used Center drill φ0.08 mm (for positioning/drilling)

Features
- Can machine large numbers of holes in high-hardness workpieces such as ceramics and super engineering plastics, with high precision and accurate pitch

Linear motor drive
Ultra High Speed Milling Center

UH430L

This is a an ultra-high speed milling center with linear motor drives developed and manufactured in-house mounted on the XYZ3 axes, supports increased speed of direct engraving by using diamond tools and high quality mirror surface machining of optical lenses, etc.

- **Developed and manufactured in-house XYZ 3 Linear Motor Drive**
  - High accuracy and high quality at high speeds
- **SEPTune**
  - SEPT (high-speed, high-precision contour control function) configuration support mode
  - Sped up control cycles for each axis
  - High-quality finish machining in fine precision areas
- **Lightweight head using CFRP**
  - Lightweight, highly rigid, high vibrational dampening (HSK-E25 type)
- **New software using AI (artificial intelligence)**

Main Specifications

<table>
<thead>
<tr>
<th>Table dimensions (width x length)</th>
<th>680 x 460mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each axis stroke (X x Y x Z)</td>
<td>420 x 350 x 200mm</td>
</tr>
<tr>
<td>Maximum quantity of machining material</td>
<td>100kg</td>
</tr>
<tr>
<td>Main spindle rotation speed</td>
<td>1500 ~ 60000 min⁻¹ (HSK-E25IK)</td>
</tr>
</tbody>
</table>

Machinable Ceramic Drilling

Material STAVAX (52HRC)
Machining conditions
- Spindle rotation speed 22,000 ~ 40,000 min⁻¹
- Feed speed 350 ~ 3,000 mm/min
- Tools Used Ball end mill R1.5-R0.05, Finished CBN ball end mill R0.05

Features
- High precision, high definition surface finishing (Ra 0.1μm or less)
- We designed a mold shape for creating small diameter (R0.05) automobile headlights

Stair-shaped optical forms

Material SU690 (52HRC)
Machining conditions
- Spindle rotation speed 22,000 ~ 40,000 min⁻¹
- Feed speed 350 ~ 3,000 mm/min

Features
- High precision, high definition surface finishing (Ra 0.1μm or less)
- We designed a mold shape for creating small diameter (R0.05) automobile headlights

*The machining results are based on environment specified by us.
eV-LINE Electric Injection Molding Machine

MS50

Based on "V-LINE" which has excellent performance, high precision and repetition stability, we developed this energy saving eV-LINE all-electric injection molding machine with motorized responsiveness, a new mold clamping mechanism and improved productivity through high cycle.

Connect, Master, Sodick-IoT

NEW S-HARMNY

Access from anywhere with a smartphone or PC

S-Viewer

- Operating state
  Collective management
- Detailed information
  Can be viewed
- Maintainability improvements

Main Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum mold clamping force</td>
<td>490 kN</td>
</tr>
<tr>
<td>Injection tonnage</td>
<td>350 kN</td>
</tr>
<tr>
<td>Minimum/machine mold thickness</td>
<td>150/350 mm</td>
</tr>
<tr>
<td>Machine body dimensions (L x W x H)</td>
<td>810 x 1155 x 1970 mm</td>
</tr>
</tbody>
</table>

Connect!
Collect molding data
Collects molding data
for quality control

Collecting molding data
Displays operating state
Displays condition changes of the molding machine
Displays the history of errors, operation and condition changes of the molding machine
Displays molding data in tabular or graph format

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Displays operating state
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Displays molding data in tabular or graph format

S-Viewer

Production control Support
Simple screen layout
- Corresponds to telecommunications standards
  MTConnect, OPC-UA

Users who offer the latest machining examples

Togo Engineering Corporation

Ultra-high precision stamping dies
Designed and manufactured at Togo Engineering Corporation
Various dies are available

Niigata Precision Co., Ltd.

"Uesugi’s clan 35 chosen swords"
Takasenagamitsu
TAKASENAGAMITSU
Sword Inscription Nagafune Nagamitsu

Meticulous precision machining without compromise

Striving for the best QCD (quality, cost, delivery time and service), we aim to be the first and only one to achieve high customer satisfaction. We introduce each measuring instrument used to evaluate the precision. We work hard every day as experts of ultra-precision machining to deliver more accurate and safe parts.

Component production

- Precision static machine components
- Precision metal components
- Cemented carbide components
- Ceramic components

We use cutting, grinding, wire EDM, and die-engraving EDM to produce small quantities of various kinds of products. We offer the best materials and machining methods to suit customer needs.

Imaginative component

- Expressing technical and engineering skill

Mirror ball (Sphere diameter 30 mm)

This is a sample of the results of serious, imaginative work. We aim for "manufacturing without limits.”
Electrode shape is concentrated as much as possible, leading to reduced discharge setup time.

Consider what can be improved by creating with a metal 3D printer.

**Study contents**
- Differences in the amount of molded object deformation for each cooling system and cooling time

**Comparison method**
- **Mold**: We used two molds for mass production. One incorporates a 3D cooling die.
- **Molding material**: PA + GF50 (CM3531G-50 B3), PA6 (CM3001N) PC (SD Polica 301-15 0303030), POM (NW-01), PP (Novatoch M4)
- **Conditions**: Uses PA + GF50 mass production conditions. Fixed conditions, except for cooling time.
- **Evaluation**: Measurement of each molded item in the illustrated position. Compare the values and verify the effect.

**Results**
- **Suction hole area**: 10x
- **Unit weight**: 40% Down

**Warp deformation improvements**
- **3D cooling effect verification**
  - The closer to the ideal value, the smaller the warp deformation.
  - For normal cooling, even if the cooling time is extended, there is hardly any improvement in warp deformation.
  - For 3D cooling, even if the cooling time is shortened, warp deformation improves.
  - **3D cooling results**: Can shorten freezing time by 1/3

**Improved process problems**
- Able to produce finer details than expected
- Create new ideas by overcoming normal machining constraints