Si-II SERIES

Fully Electric Injection Molding Machine
The Si-II Series Presents Extraordinary Versatility For Your Molding Requirements.

- High precision, high cycle molding
- Versatile control function and system expandability

![Molding machine images]

- User-friendly PLCS-10 controller
- Low energy consumption, low production cost

The Si-II is superb in every aspect of injection molding machine design:
Long lasting accuracy and repeatability.
High plastication and injection performance.
Durability for high cycle operation.
Versatile Injection Molding Machine
The Si-II series has great versatility to cover all the applications you may have.

- High efficiency, new control system PLCS-10
- Network servo control system
- RASMA-L, High rigidity machine frame
- Highly accurate mold clamping unit

- Low investment cost
- Low maintenance cost
- Low running cost

- Low energy requirement
- Low noise level
- Small footprint
The screw runs at a maximum speed of 11.81in/sec (300mm/sec) with a maximum pressure of 34,128psi. Despite the heavy duty and impact, the RASMA-L frame secures high accuracy to a micron level.

RASMA-L frame is as strong as the proven RASMA frame.

The RASMA frame was developed by TOYO a few years ago and has shown superb vibration-suppressing capability. With its unique design, the newly-developed RASMA-L frame is lighter than the RASMA by approximately one-third without losing the features of the RASMA frame.

Hard to vibrate
Vibration-proof design keeps vibration to a minimum.
Thanks to high rigidity die plates, wide-span double-roller supports, twin nozzle-touch ball screws and soft nozzle-touch program, high precision mold clamping can be maintained for years.

- **High rigidity clamping mechanism**
  Total rigidity and strength have been improved with computer analysis of various data.

- **Double-roller supported movable die plate**
  To sustain heavy molds, the movable die plate is supported by wide-span double rollers to maintain better accuracy and parallelism.

- **Soft nozzle-touch system**
  The nozzle-touch ball screws slow down just before nozzle-touching to ease the impact to the mold.

- **Double nozzle-touch mechanism**
  In connecting the injection unit and clamping unit, two nozzle-touch ball screws are adopted. It prevents the inclination of the stationary die plate and imbalance of load on tie-bars during mold opening/closing operation.

- **Si-II (double nozzle-touch system)**

- **General purpose all-electric machines (single nozzle-touch system)**

*In all electric machines, the nozzle-touch force is applied to the mold all the time.*
Totally Integrated Control Panel
All the settings and operations are made on the panel.

All the operation switches are incorporated in the control panel. And a full touch panel sheet is adopted for better man-machine interface.

The control panel can be positioned for perfect visibility of the screen and for easier key operation.

The control panel is beautifully designed covered with smooth-touching plastic. The screen and key layouts are made from the viewpoint of operators.

- One-touch cursor movement
- High brightness, 10.4” TFT color LCD
- Practical screen layout
Network Servo Control System

Reliable servomotor control utilizing Local Area Network with high speed data communication LSI.

Conventional control systems used analog interface between the controller and servomotors, and the command was made using electric voltage. The new PLCS-10 control system adopts Local Area Network where digital command signals from the controller can be delivered to each servo-motor amplifier with complete accuracy. With this system, reproducibility is improved tremendously.

High speed 64-bit RISC microcomputer four times quicker.

The scanning time is greatly reduced to 200μs for each axis. Surprisingly reduced processing time realizes instant execution of command and makes compensation without delay. As a result, the response time is four times quicker.

Four-axis servomotor control board
Low running cost

The electric servomotor driven machines require much less electricity when compared with hydraulically driven machines. Utilizing regenerated electricity efficiently, the Si-II series consumes approximately one-third of the electricity which ordinary hydraulic machines necessitate. When it comes to cooling water, the water consumption will be one-tenth that required by hydraulic machines. In conclusion, the running cost is tremendously low, saving you a lot of utilities.

Electric consumption in molding cycle

Less demanding for factory preparation

The Si-series requires about one third of the electricity when compared with hydraulic machines. The machine itself is designed to take a minimum of floor space. Therefore, a factory with the same floor space and electric capacity accommodates more Si-II series machines. No water is needed for hydraulic oil cooling. Fire hazards are held to a minimum because no hydraulic oil is used. As a result, freedom is widened tremendously in choosing a factory site as well as arranging the factory.

Investment costs for cooling water and air conditioning facilities for a factory accommodating 50 55-ton injection molding machines.

This graph indicates that the Si-II series will pay off in a few years, even though the machine itself is more costly than its hydraulic counterpart. Furthermore, the Si-II series requires smaller utility installations.

Note:
Cost comparison is made based on conditions in Japan using our hydraulic model.
Electricity saving
Utilizing regenerated electricity efficiently, the Si-11 series achieves greater electricity saving over the previous model.

<table>
<thead>
<tr>
<th>Electric consumption (Kwh)</th>
<th>Approx.10% of saving</th>
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</thead>
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<td>0.60</td>
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<td>0.40</td>
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<tr>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>0.00</td>
<td></td>
</tr>
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</table>

Product: Bobbin (0.5t)
Material: PBT
Cycle time: 13.0 sec.

Automatic greasing
Greasing to each area is made automatically. The replacement of grease cartridge is made simple with its timing indicated on the screen.

Clean up of workspace
The Si-11 series is equipped with easy-to-take-out grease pans below injection unit and clamping unit.

Low noise power delivery system
By adopting a plastic pulley and low noise type timing belt, the noise level has been much reduced. The timing belt also serves as a shock absorber that minimizes the impact to mechanical parts.

Easy maintenance
Adoption of a rod joint for the connection between the stationary die plate and the nozzle-touch rod makes the injection unit swivel facilitating easy screw removal.

Accommodation
A cabinet was built-in the machine frame below the control panel. Hand tools can be put away in the cabinet.
The SRC-II metering system (standard) offers highly constant metering. And the SRC-III (optional) offers even more exact metering. Minimized sliding friction in recovery motion and a 16-bit high resolution digital load cell bring the SRC-II and SRC-III to the ultimate level.

Variation of melt weight is greatly reduced with the SRC-II metering system.

Highly constant metering of the Si-II series is achieved thanks to the exact repeatability of the servomotor-driven injection molding machine and Toyo’s own SRC-II metering control system. With the SRC-II system, the screw applies pressure to the melt for a fraction of time after the metering. This process makes the melt density even and brings about constant product weight in every molding cycle. (PAT.PEND.)

Conventional system

- Set point for metering
  - Injection stroke
  - Uneven

 SRC-II

- Injection starts after melt density becomes even.
- Narrow cushion variation
- Variation of metering density 0.5~0.6%

 SRC-III

- Screw check triplet for SRC-III (PAT.PEND.)
- The SRC-III metering system is optional.

Features

1. Structure is simple.
2. Check ring is standard.
3. Standard metering is available even with SRC-III screw check fitted.

During plastication

- Locking mechanism

After metering

- Check ring is locked

During suckback

- Suck back made with check ring locked.
### Standard features

- Injection / Plastication
- SRC-II metering system
- SNF control
- Closed-loop control for injection speeds, positions and pressures
- Programmable injection speeds and pressures (2-7 steps of speeds and pressures)
- Programmable metering system (1-3 steps of speeds and pressures)
- Holding pressure changeover via position, time and pressure
- Slope control for injection pressure and speed
- Suck-back control (before or after metering)
- Automatic melt purge
- Hopper throat temperature control (PID)
- No-back pressure metering in manual mode
- Nozzle reciprocating function
- Injection during high pressure clamping motion
- Injection unit swivelling mechanism (with nozzle alignment mechanism)
- Melt run-out detection system
- SSR control for heaters
- Heater temperature holding control
- 5-zone heater temperature control (‡2)
- Purge cover (with interlock)

### Optional features

- Closed-loop control for speed and position in mold opening / closing
- Multi-step mold opening control (2-5 steps of speeds and pressures)
- Multi-step mold closing control (3-5 steps of speeds and pressures)
- Programmable ejector advancing motion (1-3 steps of speeds and pressures)
- Mold exchanging mode (low pressure, low speed)
- Automatic clamping force setup system
- Low pressure mold protection system
- Mold protection in mold opening and ejecting
- Ejecting during mold opening (via timer)
- Moveable die plate supported by double rollers
- Double safety system (electrical and mechanical)
- Emergency-stop pushbutton on back side

### PLC

- PLC—10 microprocessor-aided control (TFT color LCD with touch panel)
- Graphic display of injection and metering motion
- Digital setting of all parameters
- Internal memory for 32 mold setups
- RS232C interface (1pc.)
- Printer terminal
- 100V plug socket for printer (1pc.)
- Screw cold-start prevention system
- Fine PID temperature control (with slope ramp up)
- One-week automatic heater on-off calendar
- Manned-unmanned operation selection
- Hour meter (operated hours indication)
- Monitoring function (32 items selected from a total of 75 items including positions, speeds, pressures, times, revolutions)
- Statistical processing of monitored data (SPC)
- Monitor graph indication
- Alarm function (cycle time, up-down tolerance, heater disconnection, thermocouple disconnection, safety door, etc.)
- Counters
- Machine starts indication function
- Production control function (Job completion ratio, Prospective time of job completion, etc.)
- Self-diagnosing function
- Maintenance function (one cycle graph, alarm history, greasing timing indication, communication with servo amplifier)
- Parameter setting history

### Others

- Automatic ball-screw greasing device
- Chute (Si–300II or smaller models)
- Memory card for 128 mold setups
- Wiring for robot
- Standard accessories (Mold fixtures, tools, spare grease, hand grease pump)
- Installation pads

### Notes

† Please consult us for the specifications on special screws such as acrylic screw, nylon screw and sub-fight screw.

‡ Standard band heaters can be used at a maximum temperature of 690°F.

§ Please consult us for the local language available.
## Specifications

### Injection

<table>
<thead>
<tr>
<th>System</th>
<th>Si - 35 II</th>
<th>Si - 55 II</th>
<th>Si - 110 II</th>
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<tbody>
<tr>
<td>Injection unit</td>
<td>H55U</td>
<td>H75U</td>
<td>H150U</td>
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<td>Injection stroke</td>
<td>in</td>
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<td>Screw diameter</td>
<td>in/mm</td>
<td>0.63(16)</td>
<td>0.71(18)</td>
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<td>Nominal injection capacity</td>
<td>in³</td>
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<tr>
<td>Injection capacity</td>
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<tr>
<td>Injection rate</td>
<td>in³/s</td>
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<td>Max. Injection speed</td>
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<td>Max. Injection pressure</td>
<td>psi</td>
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<tr>
<td>Max. holding pressure</td>
<td>psi</td>
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<td>Screw revolution</td>
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<td>Nozzle pressing force</td>
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<td>Hopper capacity</td>
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### Clamping

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<td>55</td>
<td>110</td>
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<td>Clamping stroke</td>
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<td>Min. mold height</td>
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<td>Max. mold height</td>
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<td>Die plate size (H×V)</td>
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<td>Ejecting force</td>
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<td>Ejecting stroke</td>
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<td>2.76</td>
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</table>

### Others

| Heater capacity         | kw            | 2.55          | 3.50          | 5.7           | 7.3           |
| Machine dimensions (L×W×H) | in          | 118.10×34.24×59.06 | 134.02×36.79×60.63 | 167.76×43.07×64.48 | 176.36×43.58×64.48 |
| Machine weight          | U.S.ton       | 1.8           | 2.53          | 4.51          | 4.73          |

### Notes:
1. *Mark figure varies depending on molding conditions.
2. Figures in [ ] are optional.
3. The applicable max. injection pressure and holding pressure will be restricted according to the material in the real molding operation.
4. The figures for the max. injection rate and the max. injection speed are calculated ones. The actual injection rate and injection speed will be restricted by pressure. Actual setting pressure may be restricted by molding conditions and cycle time.
5. The figures are subject to change without any legal obligation on the part of the manufacturer.
6. A large-sized screw may not be applicable to some kinds of material.
<table>
<thead>
<tr>
<th>Si - 150II</th>
<th>Si - 200II</th>
<th>Si - 300II</th>
<th>Si - 400II</th>
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MEMO