SCARA ROBOT THL Series

Achieving Reliable Quality and Superior Performance

**Low cost**
Impressive performance at affordable prices.

**Light-weight**
Maximum weight reduction of about 60% has been achieved in comparison with our current models. Models capable of reducing environmental impact.

**Energy-efficient**
Maximum power consumption reduction of about 70% has been achieved in comparison with our current models. Low-power consumption robots ideal for energy conservation era.

Examples of Application and Adoption

**Food Manufacturing**
Used for food manufacturing lines to prepare and transport food.

**Food**
Used for food boxing lines to automatically box ready-packed food being transported on the belt conveyor into boxes.

**Pharmaceutical and Medical**
Used for boxing lines of pharmaceutical and medical products to automatically box finished products being transported on the belt conveyor into boxes.

**Medical Examination**
Used to automate the processing of a large quantity of specimen samples at medical institutions. Test tubes picked up by the SCARA robot are read by a barcode reader, allowing uniform work and secure repeatability.

**Assembling and Inspection**
Used to assemble and inspect electronic devices. The SCARA robot has been adopted for manufacturing of precision machines.

**Cutting**
Used as a cutting device. Cardboard boxes being transported by the conveyor are cut by the cutter attached to the SCARA robot.
Diverse Lineup to Meet Your Application Needs

THL Series Model Configuration

<table>
<thead>
<tr>
<th>Model</th>
<th>THL300</th>
<th>THL400</th>
<th>THL500</th>
<th>THL600</th>
<th>THL700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Horizontal multi-pend</td>
<td>Horizontal multi-pend</td>
<td>Horizontal multi-pend</td>
<td>Horizontal multi-pend</td>
<td>Horizontal multi-pend</td>
</tr>
<tr>
<td>No. of controlled axes</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Arm length</td>
<td>300mm (12.19mm x 19.7mm)</td>
<td>400mm (22.5mm x 17.3mm)</td>
<td>500mm (20.1mm x 19.7mm)</td>
<td>600mm (20.1mm x 19.7mm)</td>
<td>700mm (20.1mm x 19.7mm)</td>
</tr>
<tr>
<td>Working envelope</td>
<td>Axis 1</td>
<td>±125°</td>
<td>±90°</td>
<td>±125°</td>
<td>±90°</td>
</tr>
<tr>
<td></td>
<td>Axis 2</td>
<td>±145°</td>
<td>±125°</td>
<td>±145°</td>
<td>±125°</td>
</tr>
<tr>
<td></td>
<td>Axis 3 (2 axes)</td>
<td>0°~150mm</td>
<td>0°~150mm</td>
<td>0°~150mm</td>
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</tr>
<tr>
<td></td>
<td>Axis 4 (2 axes rotation)</td>
<td>±360°</td>
<td>±360°</td>
<td>±360°</td>
<td>±360°</td>
</tr>
<tr>
<td>Maximum speed</td>
<td>Axis 1</td>
<td>180°/s</td>
<td>180°/s</td>
<td>180°/s</td>
<td>180°/s</td>
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<td>450°/s</td>
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<tr>
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<td>Axis 3 (2 axes)</td>
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<td>2000mm/s</td>
<td>2000mm/s</td>
<td>2000mm/s</td>
</tr>
<tr>
<td></td>
<td>Axis 4 (2 axes rotation)</td>
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<td>±660°</td>
<td>±660°</td>
<td>±660°</td>
</tr>
<tr>
<td>Standard cycle time (with 2 kg load)*1</td>
<td>0.45s</td>
<td>0.45s</td>
<td>0.5s</td>
<td>0.5s</td>
<td>0.5s</td>
</tr>
<tr>
<td>Maximum payload mass</td>
<td>10 kg (rated: 2 kg)</td>
<td>10 kg (rated: 2 kg)</td>
<td>10 kg (rated: 2 kg)</td>
<td>10 kg (rated: 2 kg)</td>
<td>10 kg (rated: 2 kg)</td>
</tr>
<tr>
<td>Allowable moment of inertia</td>
<td>0.3kg·m²</td>
<td>0.3kg·m²</td>
<td>0.3kg·m²</td>
<td>0.3kg·m²</td>
<td>0.3kg·m²</td>
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<tr>
<td>Positioning repeatability*2</td>
<td>X/Y</td>
<td>±0.01mm</td>
<td>±0.01mm</td>
<td>±0.01mm</td>
<td>±0.01mm</td>
</tr>
<tr>
<td></td>
<td>Z (Axis 3)</td>
<td>±0.01mm</td>
<td>±0.01mm</td>
<td>±0.01mm</td>
<td>±0.01mm</td>
</tr>
<tr>
<td></td>
<td>Axis 4 (2 axes rotation)</td>
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<td>±0.01mm</td>
<td>±0.01mm</td>
<td>±0.01mm</td>
</tr>
<tr>
<td>Hand wiring</td>
<td>8 inputs / 8 outputs</td>
<td>8 inputs / 8 outputs</td>
<td>8 inputs / 8 outputs</td>
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</tr>
<tr>
<td>Hand pneumatic joints**</td>
<td>Ø 6 x 3 pcs.</td>
<td>Ø 6 x 3 pcs.</td>
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<td>Ø 6 x 3 pcs.</td>
</tr>
<tr>
<td>Position detection</td>
<td>Absolute</td>
<td>Absolute</td>
<td>Absolute</td>
<td>Absolute</td>
<td>Absolute</td>
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<tr>
<td>Robot controller cable</td>
<td>2.5m</td>
<td>2.5m</td>
<td>2.5m</td>
<td>2.5m</td>
<td>2.5m</td>
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<tr>
<td>Power capacity</td>
<td>1.4kVA</td>
<td>1.4kVA</td>
<td>1.4kVA</td>
<td>1.4kVA</td>
<td>1.4kVA</td>
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<tr>
<td>Mass</td>
<td>2.2kg</td>
<td>2.2kg</td>
<td>2.2kg</td>
<td>2.2kg</td>
<td>2.2kg</td>
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</tbody>
</table>

Order model code

THL400-Z-C-E-S

Arm length: 4-axi long stroke
CE Specifications: With cap
With protective belows: B
Dust-proof: IP6X
Ceiling-mount type: C
Low height: LH

THL Series Detailed Specifications

- Special design
- Introduction to the THL Series
- Controller Teach Pendant
- THL Series Detailed Specifications
- Options and Others

THL Series Detailed Specifications

- THL Series Model Configuration
- Controller Teach Pendant
- THL Series Detailed Specifications
- Options and Others

Introduction to the THL Series

THL Series Detailed Specifications

Model

THL300 | THL400 | THL500 | THL600 | THL700

<table>
<thead>
<tr>
<th>Type</th>
<th>Horizontal multi-pend</th>
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<td></td>
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<td>2.2kg</td>
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<td>2.2kg</td>
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<td>2.2kg</td>
</tr>
</tbody>
</table>

*1: Acceleration/deceleration rates may be limited according to the motion pattern, load mass and amount of offset.
*2: Horizontal 300 mm, vertical 25 mm, round-trip with coarse positioning. Continuous operation is not possible beyond the effective load ratio.
*3: Positioning repeatability in one-direction movement, when the environmental temperature and robot temperature are constant. Not absolute positioning accuracy.
*4: Pneumatic joints for hand are provided on the base. Pipes are to be provided by the customers.
**High-performance Teach Pendant TP3000 (Optional)**

Compared to our conventional teaching pendant TP1000, the TP3000 has significantly improved expression capability with the adoption of an LCD color screen.

**Adoption of an easy-to-view vivid color screen**

The keyboard display changes dynamically according to the operation. Required keys can be displayed whenever they are necessary.

**Equipped with language association function**

Language input candidates are displayed according to character input. Compared to the conventional teaching pendant TP1000, the TP3000 makes it easier to input commands more quickly.

**Outline function**

The main program, subprograms and labels in the SCOL program can be displayed hierarchically so that the program structure can be viewed quickly.

**What is IP65?**

IP (International Protection) rating classifies and rates the degree of protection provided against the ingress of solid foreign objects (including dust) and water in mechanical casings and with electrical enclosures.

The first characteristic numeral indicates the level of protection that the enclosure provides against the ingress of solid foreign objects (including dust) and water in mechanical casings and with electrical enclosures.

The second characteristic numeral indicates the level of protection that the enclosure provides against the ingress of water. “5” means “protection against water jets” so that “water directly projected by a nozzle against the enclosure from any direction shall have no harmful effects”.

Note: To avoid cable damage, please use the cable clamp included with the controller. For cables connected externally, please refer to the relevant specifications.

**Support for IP65**

The Teach Pendant TP3000 is designed to withstand harsh environments with high levels of water and dust protection. It features a durable stainless steel housing that meets IP65 standards, ensuring operation in wet and industrial conditions.

**Controller Specifications**

- **Model**: TSL3000E
- **Power supply**: Single-phase, 190 to 260 V AC, 50/60 Hz
- **Controller Connector Dimensions**: TSL3000E (F400) (mm): 70 (W) x 90 (H) x 35 (D)

**Optional Controller Specifications**

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### THL300

**Model:** THL300  
**Type:** Horizontal multi-joint  
**No. of controlled axes:** 4  
**Arm length:** 400mm (225mm+175mm)  
**Working envelope:** 480mm (242.5mm+237.5mm)  
**Maximum speed**  
<table>
<thead>
<tr>
<th>Axis 1</th>
<th>Axis 2</th>
<th>Axis 3 (Z axis)</th>
<th>Axis 4 (Z-axis rotation)</th>
<th>Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>660°/s</td>
<td>660°/s</td>
<td>1120mm/min</td>
<td>1500°/s</td>
<td>5.1m/s</td>
</tr>
</tbody>
</table>

**Standard cycle time (with 2 kg load)**: 0.49s  
**Maximum payload mass**: 5kg (rated: 2kg)  
**Positioning repeatability**:  
- X-Y: ±0.01 mm  
- Z (Axis 3): ±0.015mm  
- Arc (2-axis rotation): ±0.007°  
**Hand wiring**: 6 inputs/4 outputs  
**Hand pneumatic joints**: ∅4 x 3 pcs.  
**Position detection**: Absolute  
**Robot controller cable**: 3.5m  
**Power capacity**: 0.7kVA  
**Mass**: 12kg

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### THL400

**Model:** THL400  
**Type:** Horizontal multi-joint  
**No. of controlled axes:** 4  
**Arm length:** 400mm (225mm+175mm)  
**Working envelope:** 480mm (242.5mm+237.5mm)  
**Maximum speed**  
<table>
<thead>
<tr>
<th>Axis 1</th>
<th>Axis 2</th>
<th>Axis 3 (Z axis)</th>
<th>Axis 4 (Z-axis rotation)</th>
<th>Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>660°/s</td>
<td>660°/s</td>
<td>1120mm/min</td>
<td>1500°/s</td>
<td>5.1m/s</td>
</tr>
</tbody>
</table>

**Standard cycle time (with 2 kg load)**: 0.47s  
**Maximum payload mass**: 5kg (rated: 2kg)  
**Positioning repeatability**:  
- X-Y: ±0.01 mm  
- Z (Axis 3): ±0.015mm  
- Arc (2-axis rotation): ±0.007°  
**Hand wiring**: 6 inputs/4 outputs  
**Hand pneumatic joints**: ∅4 x 3 pcs.  
**Position detection**: Absolute  
**Robot controller cable**: 3.5m  
**Power capacity**: 0.7kVA  
**Mass**: 13kg

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**External view**

SCARA ROBOT THL300

**Operation Range**

**Hand Installation Area Detail**

**Z view**

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**External view**

SCARA ROBOT THL400

**Operation Range**

**Hand Installation Area Detail**

**Z view**

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*SHIBAURA MACHINE THL CATALOG*
SCARA ROBOT THL500

**External view**

<table>
<thead>
<tr>
<th>Model</th>
<th>THL500</th>
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</thead>
<tbody>
<tr>
<td>Type</td>
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</tr>
<tr>
<td>No. of controlled axes</td>
<td>4</td>
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<tr>
<td>Arm length</td>
<td>500mm (200mm+300mm)</td>
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<td>Working envelope:</td>
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</tr>
<tr>
<td>Axis 1</td>
<td>±125°</td>
</tr>
<tr>
<td>Axis 2</td>
<td>±140°</td>
</tr>
<tr>
<td>Axis 3 (Z-axis)</td>
<td>0°~150mm</td>
</tr>
<tr>
<td>Axis 4 (Rotation)</td>
<td>±360°</td>
</tr>
<tr>
<td>Maximum speed:</td>
<td></td>
</tr>
<tr>
<td>Axis 1</td>
<td>450°/s</td>
</tr>
<tr>
<td>Axis 2</td>
<td>450°/s</td>
</tr>
<tr>
<td>Axis 3 (Z-axis)</td>
<td>2000mm/s</td>
</tr>
<tr>
<td>Axis 4 (Rotation)</td>
<td>1700°/s</td>
</tr>
<tr>
<td>Composite</td>
<td>6.3kg</td>
</tr>
<tr>
<td>Standard cycle time (with 2 kg load)**</td>
<td>0.45s</td>
</tr>
<tr>
<td>Maximum payload mass</td>
<td>10kg (rated: 2kg)</td>
</tr>
<tr>
<td>Allowable moment of inertia</td>
<td>3.2kgf-cm²</td>
</tr>
<tr>
<td>Positioning repeatability**:</td>
<td></td>
</tr>
<tr>
<td>X-Y</td>
<td>±0.01mm</td>
</tr>
<tr>
<td>Z (Axis 3)</td>
<td>±0.015mm</td>
</tr>
<tr>
<td>Axis 4 (Rotation)</td>
<td>±0.02°</td>
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<td>Hand wiring</td>
<td>6 inputs / 8 outputs</td>
</tr>
<tr>
<td>Hand pneumatic joints**</td>
<td>ø6 x 3 pcs.</td>
</tr>
<tr>
<td>Position detection</td>
<td>Absolute</td>
</tr>
<tr>
<td>Robot controller cable</td>
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<tr>
<td>Power capacity</td>
<td>1.4kVA</td>
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<tr>
<td>Mass</td>
<td>23kg</td>
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</table>

*The air tubes are packed, which need to be installed by the user.

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**External view**

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</tr>
<tr>
<td>Arm length</td>
<td>600mm (300mm+300mm)</td>
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<td>Working envelope:</td>
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</tr>
<tr>
<td>Axis 1</td>
<td>±125°</td>
</tr>
<tr>
<td>Axis 2</td>
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</tr>
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</tr>
<tr>
<td>Maximum speed:</td>
<td></td>
</tr>
<tr>
<td>Axis 1</td>
<td>450°/s</td>
</tr>
<tr>
<td>Axis 2</td>
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</tr>
<tr>
<td>Axis 3 (Z-axis)</td>
<td>2000mm/s</td>
</tr>
<tr>
<td>Axis 4 (Rotation)</td>
<td>1700°/s</td>
</tr>
<tr>
<td>Composite</td>
<td>7.1kg</td>
</tr>
<tr>
<td>Standard cycle time (with 2 kg load)**</td>
<td>0.45s</td>
</tr>
<tr>
<td>Maximum payload mass</td>
<td>10kg (rated: 2kg)</td>
</tr>
<tr>
<td>Allowable moment of inertia</td>
<td>3.2kgf-cm²</td>
</tr>
<tr>
<td>Positioning repeatability**:</td>
<td></td>
</tr>
<tr>
<td>X-Y</td>
<td>±0.01mm</td>
</tr>
<tr>
<td>Z (Axis 3)</td>
<td>±0.015mm</td>
</tr>
<tr>
<td>Axis 4 (Rotation)</td>
<td>±0.02°</td>
</tr>
<tr>
<td>Hand wiring</td>
<td>6 inputs / 8 outputs</td>
</tr>
<tr>
<td>Hand pneumatic joints**</td>
<td>ø6 x 3 pcs.</td>
</tr>
<tr>
<td>Position detection</td>
<td>Absolute</td>
</tr>
<tr>
<td>Robot controller cable</td>
<td>3.5m</td>
</tr>
<tr>
<td>Power capacity</td>
<td>1.4kVA</td>
</tr>
<tr>
<td>Mass</td>
<td>23kg</td>
</tr>
</tbody>
</table>

*The air tubes are packed, which need to be installed by the user.
SCARA ROBOT THL700

Model: THL700
Type: Horizontal multi-joint

- No. of controlled axes: 4
- Arm length: 700mm (400mm+300mm)
- Working envelope:
  - Axis 1: ±125°
  - Axis 2: ±145°
  - Axis 3 (Z-axis): 0° ~ 150°
  - Axis 4 (Z-axis rotation): ±360°
- Maximum speed:
  - Axis 1: 450°/s
  - Axis 2: 450°/s
  - Axis 3 (Z-axis): 2000 mm/s
  - Axis 4 (Z-axis rotation): 1700°/s

- Standard cycle time (with 2 kg load): 0.5 s
- Maximum payload mass: 10 kg (rated: 2 kg)
- Allowable moment of inertia: 0.2 kg-m²
- Repeatability: ±0.015 mm
- Positioning repeatability:
  - X-Y: ±0.01 mm
  - Z (Axis 3): ±0.015 mm
  - Axis 4 (Z-axis rotation): ±0.02°
- Hand wiring: 8 inputs, 8 outputs
- Hand pneumatic joints: 6 x 3 pcs.
- Position detection: Absolute
- Robot controller cable: 3.5 m
- Power capacity: 1.4 kVA
- Mass: 24 kg

SCARA ROBOT THL800

Model: THL800
Type: Horizontal multi-joint

- No. of controlled axes: 4
- Arm length: 800mm (350mm+450mm)
- Working envelope:
  - Axis 1: ±125°
  - Axis 2: ±145°
  - Axis 3 (Z-axis): 0° ~ 150°
  - Axis 4 (Z-axis rotation): ±360°
- Maximum speed:
  - Axis 1: 187.5°/s
  - Axis 2: 217.5°/s
  - Axis 3 (Z-axis): 2000 mm/s
  - Axis 4 (Z-axis rotation): 1700°/s

- Standard cycle time (with 2 kg load): 0.47 s
- Maximum payload mass: 10 kg (rated: 2 kg)
- Allowable moment of inertia: 0.2 kg-m²
- Repeatability: ±0.02 mm
- Positioning repeatability:
  - X-Y: ±0.01 mm
  - Z (Axis 3): ±0.015 mm
  - Axis 4 (Z-axis rotation): ±0.02°
- Hand wiring: 8 inputs, 8 outputs
- Hand pneumatic joints: 6 x 3 pcs.
- Position detection: Absolute
- Robot controller cable: 3.5 m
- Power capacity: 1.4 kVA
- Mass: 33 kg
These functional optional specifications are designed with consideration for applications, environment, and system-layout requirements.

**Z-Axis Long Stroke (-Z)**

Applicable Models: THL500, THL600, THL700

The Z-axis stroke range is extended.

Useful in an application with large up-down movements and handling of long workpieces.

(Note: If a stroke length other than 300mm is required, please contact us.)

**Protective Bellows for Z-Axis (-B)**

Applicable Models: all models of the THL Series

Protection of the Z-axis shaft lower side in an environment where liquid or chips may scatter.

(Note: The cycle time and Z-axis stroke differ from the standard specifications. Please contact us for details.)

**Z-Axis Cap (-C)**

Applicable Models: all models of the THL Series

Protection of the Z-axis shaft upper side in an environment where liquid or chips may scatter. It also prevents intrusion and jamming by cables and other peripheral items.

**Ceiling-mount type (-T)**

Applicable Models: THL400, THL500, THL600, THL700, THL800, THL900, THL1000

To enable more freedom in system layout and effective use of space, the robot is suspended from the upper side of the working area.

(Note: The working envelopes differ from the standard-type robots. Please contact us for details.)

**Optional Cables Length**

In all models of the THL Series SCARA robots, the length of the cable between a SCARA robot and its controller can be extended to a maximum of 15m.

**Dust-proof (-IP6X)**

Applicable models: THL500, THL600, THL700

Dust-proof structure with protection rating IP6X.

(Note: The number of hand signals and pneumatic pipes differ from the standard design. Please contact us for details.)

**Support of Safety Category 3**

Applicable Models: all models of the THL Series

By adding necessary safety design, conformance to the safety category 3, which is required in the ANSI and CE marking, is achieved.

(Note: this is possible with TSL3000E controller.)

**Tool Flange for End Effectors Mounting**

Applicable Models: all models of the THL Series

Tool flange for securing the robot’s hand is available.

*The photo right shows the tool flange for the THL500 - THL1000 SCARA robots.

The shape of the tool flange for the THL300 and THL4000 SCARA robots is different from the photo right.

**Additional Axis**

Applicable Models: all models of the THL Series

Additional axis can be added and controlled, for such purpose as mounting a robot on a traverse axis.

**Simple Cleanroom specification (-SC)**

Applicable Models: all models of the THL Series

Cleanroom design equivalent of ISO clean Class 5.

Effective for dust-averse applications such as semiconductor and electronics manufacturing.

**Low Height Design (-LH)**

Applicable Models: THL1000

Total height is lower than standard design by alternative wire harness design. It allows for installation in tight space.

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<td>×</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

- ○: Applicable  
- ×: Not applicable  
- THL-Series is recommended for dust and splash proof (IP) design.

Please contact us for the latest optional designs supported.
Introduction to the THL Series

Controller Teach Pendant

THL Series Detailed Specifications

Options and Others

Support for Connection Device Samples

Shibaura Machine

Field Network

Connection Device Samples is a collaborative system between Shibaura Machine Co., Ltd. and Digital Electronics Corporation. It enables users to check the status of the robot on the touch panel display device.

[Features and advantages]
- When an error occurs in the robot, the error information or details can be checked on the Alarm Monitor Screen (see the left figure).
- Additionally, various other screens for functions including Robot I/O Monitor, Current Position Monitor, I/O Time Chart and Connected Device Data Transfer are provided. The above robot screens can be downloaded from the website of Digital Electronics Corporation free of charge. There is no need to create these screens and they can be used immediately after product purchase.
- The status of the robot can be checked even by people who cannot operate the teach pendant.
- Because the information about both the robot and the system is displayed on the same display device, troubleshooting is much easier.

Field Network

Built-In PLC

The TSL3000 controller has a built-in PLC (TCmini). Input and output signals can be handled by ladder-style programming logic, independent from robot motion.

[Features and advantages]
- TCmini controls input/output signals of standard I/O, extension I/O and touch-sensitive panel by ladder program and exchanges data with robot program.
- Thus, flexible system design and control of peripheral equipment is possible without the added cost of an outside host PLC.
- Creation, monitoring and debug of ladder-logic programming with powerful programming support software TC-WORX (optional).
- The scan time is 5ms per 1 K-Word. Connection is possible with various programmable controllers and display units etc.

Field Network

PC Software for Programming Support

The following PC software tools are provided to shorten the time and increase the efficiency of system designing and installation work.

1. High Performance 3D Simulation

Accurate simulation with interference check, locus display, timer (cycle time measurement), placing simple workpieces and model shapes, loading 3D CAD data, saving 3D simulation to a video file, and multi-angle view.

These functions enable highly-accurate and a high-quality estimation of robot-automation processes. From simple outline simulation to “get the picture” to accurate simulation closer to actual machine implementation, TSAssist powerfully assists all phases of robot-automation system life cycle, from initial “sketch,” planning, proposal, designing and installation, to improvement and re-purposing of existing facilities.

2. Highly Functional Program Editor

With these functions, programming can be done efficiently and with minimum mistakes.

Robot language input support (keyword suggestions), Outline display, Split display,
- Point data (taught position information) editor with, sort, search, filter functions.
- And in 3D Editor Mode, robot can be guided by mouse dragging and by clicking on object model surface. No complex position calculation is necessary. With these functions, programming can be done efficiently and with minimum mistakes.

3. Easy Operation

Easy-to-understand, intuitive screen design, ribbon interface, window-dock function for customize-able operator panels.

Beginners will find it easy to understand and can quickly learn robot programming skills. For experienced robot users, TSAssist helps making robot programs efficient by customization.