Brings overwhelming competitiveness to your production site

VERTICAL ARTICULATED ROBOT TVL/TV Series

A vertical articulated robot allows flexible and three-dimensional motion similar to that of a human being. Based on advanced technologies cultivated with industrial machinery and plenty of expertise gained through a lot of experience of production sites, Toshiba Machine provides high-quality vertical articulated robots for improvement in customer productivity that attain high-speed capability, complete weight saving, and a lot of functionalities, and realize durability and expandability capable of being applied to a wide range of production environments.

Our articulated robots contribute to process automation, labor-saving, and cost reduction in a wide range of the fields including assembly of electronic equipment and inspection/carrying of food and medicinal products.
Application examples of TVL/TV Series

Application examples in our manufacturing sites
Examples of automation in our manufacturing sites using cell production robots

Soldering process
The robot enables stable soldering that produces high quality products efficiently.

Screw tightening process
Sensorless compliance control technologies is utilized in screw tightening.

Examples of injection molding machine systems
Toshiba Machine has accumulated many automation system examples and considerable understanding of corporation between injection molding machines and robots.

Supply of metal nut parts for insert molding

Thickness measurement and appearance inspection of a 13.1-inch thin light guide plate

Sprue cutting of a CFRTP molded item

Picking up of a C(G)FRTP hybrid molded item

Inserting of a semifinished laminated lens product

Print decorating in a decoration system

Low-cost robot with top-class performance
Highly cost-effective compact model
Vertical articulated robot TVL Series

The TVL Series robot achieves high productivity in assembling and transfer processes in small spaces, combining top-class performance with low cost for superior cost effectiveness. A variety of options for convenience and the enhancement of workability, plus suitability for a wide range of work environments, are available.

World-class performance
(standard cycle time of less than 0.4 seconds)

Special features
Tap holes
Tool feature tap holes are provided at four locations on the arm, upper and lower positions. They are useful for fixing external cables and peripheral devices.

Alternative installations
Tap holes on the side of the base unit allow for the robot to be installed sideways. This reduces the need for installation space.

1st arm equipped with a T-groove as standard
The T-groove can be used to place tools, cables and DIN rail in position.

Variety of options
I/O panel options
The I/O panel can be selected from three options. An optional elbow type plug is available on the hand-side connection.

Robot controller cable options
In addition to the standard cabling at the back, cabling can be routed through the base. This eliminates the need for installation space at the rear, and increases flexibility relating to the application and the space available.

IP65 option
Dust-proof and drip-proof protection is available.

Compact controller
Controller TSL3100 specifically designed for the vertical articulated robot. For details, refer to page 11.
World-class performance (standard cycle time of less than 0.4 seconds)

**TVL500**

- Arm length: 500 mm
- Maximum payload mass: 3 kg
- Standard cycle time: 0.3 sec level
- IP65 option
- 3 pcs solenoid valves inside robot arm option

**Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>TVL500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Vertically articulated robot</td>
</tr>
<tr>
<td>Number of axes/rotation axes</td>
<td>5 axes</td>
</tr>
<tr>
<td>Arm length</td>
<td>500 mm</td>
</tr>
<tr>
<td>Reach</td>
<td>360 mm</td>
</tr>
</tbody>
</table>
| Working envelope:
  - Axis 1 (R) | 360° |
  - Axis 2 (Z) | 90° |
  - Axis 3 (Y) | 180° |
  - Axis 4 (X) | 180° |
| Maximum speed (max.) |
  - Axis 1 (R) | 2.5°/sec |
  - Axis 2 (Z) | 2.5°/sec |
| Maximum payload (max.) |
  - 3 kg (rated: 1.5 kg) |
| Standard cycle time (max.) | 0.3 sec level |
| Robot body Mass | 11 kg |

* Specifications values are limited depending on rotation option, payload mass, and effect value.
* * Rated load * is the load capacity of the robot, which is not guaranteed to be met at all times.
* The specifications are not included for the robot body mass.
* When the measurement temperature is constant, the robot body is used at room temperature.
* * Rated load * is the load capacity of the robot, which is not guaranteed to be met at all times.
* The specifications are not included for the robot body mass.
* When the measurement temperature is constant, the robot body is used at room temperature.

**TVL700**

- Arm length: 700 mm
- Maximum payload mass: 4 kg
- Standard cycle time: 0.4 sec level
- IP65 option
- 3 pcs solenoid valves inside robot arm option

**Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>TVL700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Vertically articulated robot</td>
</tr>
<tr>
<td>Number of axes/rotation axes</td>
<td>6 axes</td>
</tr>
<tr>
<td>Arm length</td>
<td>600 mm</td>
</tr>
<tr>
<td>Reach</td>
<td>403 mm</td>
</tr>
</tbody>
</table>
| Working envelope:
  - Axis 1 (R) | 360° |
  - Axis 2 (Z) | 90° |
  - Axis 3 (Y) | 180° |
  - Axis 4 (X) | 180° |
  - Axis 5 (Z) | 180° |
| Maximum speed (max.) |
  - Axis 1 (R) | 3°/sec |
  - Axis 2 (Z) | 3°/sec |
| Maximum payload (max.) |
  - 4 kg (rated: 1.5 kg) |
| Standard cycle time (max.) | 0.4 sec level |
| Robot body Mass | 11 kg |

* Specifications values are limited depending on rotation option, payload mass, and effect value.
* * Rated load * is the load capacity of the robot, which is not guaranteed to be met at all times.
* The specifications are not included for the robot body mass.
* When the measurement temperature is constant, the robot body is used at room temperature.
* * Rated load * is the load capacity of the robot, which is not guaranteed to be met at all times.
* The specifications are not included for the robot body mass.
* When the measurement temperature is constant, the robot body is used at room temperature.
Compact and lightweight robot that can be introduced into production facilities with ease. Suitable for assembling work such as fitting processes due to the flexible hard control.

**TV600**

- Arm length: 572 mm
- Maximum payload mass: 3 kg
- Compact and lightweight
- User friendly software

**Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>TV600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Vertically articulated robot</td>
</tr>
<tr>
<td>Number of axes</td>
<td>6 axis</td>
</tr>
<tr>
<td>Arm length</td>
<td>1st arm: 270 mm</td>
</tr>
<tr>
<td></td>
<td>2nd arm: 250 mm</td>
</tr>
<tr>
<td></td>
<td>3rd arm: 230 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>450 kg</td>
</tr>
<tr>
<td>Articulation angle A1</td>
<td>125°</td>
</tr>
<tr>
<td>A2</td>
<td>±105°</td>
</tr>
<tr>
<td>A3</td>
<td>±120°</td>
</tr>
<tr>
<td>A4</td>
<td>±105°</td>
</tr>
<tr>
<td>A5</td>
<td>±120°</td>
</tr>
<tr>
<td>A6</td>
<td>±105°</td>
</tr>
<tr>
<td>Maximum speed</td>
<td>0.4 m/sec</td>
</tr>
<tr>
<td>Positioning accuracy (point-to-point)</td>
<td>0.02 mm</td>
</tr>
<tr>
<td>Servo system</td>
<td>AC servo system</td>
</tr>
<tr>
<td>Power supply</td>
<td>2.0 kVA</td>
</tr>
</tbody>
</table>

**Robot body**

- Model: TV600
- Color: White
- Weight: 450 kg

**Examples of work process**

1. **Inserting process**
   - Smooth insertion is realized by imposing horizontal force while pushing vertically with constant insertion force.

2. **Pinning hole searching process**
   - Even when a hole position cannot be figured out exactly, the robot can find it by turning the wrist while pushing vertically.

3. **Screwing process**
   - Synchronization with the screw feed rate is unnecessary. Stable screwing without sticking or failure of a screw can be performed by screwing while pushing vertically with constant force.

**High-performance controller**

Controller T5/990 specifically designed for the vertical articulated robot.

For details, refer to page 12.
Plenty of options available for various environments. Applicable to a wide range of needs including production lines and assembly processes.

**TV800**

- **Arm length**: 800 mm
- **Maximum payload**: 5 kg
- **Standard cycle time**: 0.4 sec level

**Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>TV800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of controlled axis</td>
<td>3 axes</td>
</tr>
<tr>
<td>Arm length</td>
<td>800 mm</td>
</tr>
<tr>
<td>1st arm</td>
<td>350 mm</td>
</tr>
<tr>
<td>2nd arm</td>
<td>500 mm</td>
</tr>
<tr>
<td>3rd arm</td>
<td>500 mm</td>
</tr>
<tr>
<td>Reach</td>
<td>840 mm</td>
</tr>
<tr>
<td>Working envelope</td>
<td></td>
</tr>
<tr>
<td>Axis 1 (θ1)</td>
<td>+15° to -15°</td>
</tr>
<tr>
<td>Axis 2 (θ2)</td>
<td>+90° to -90°</td>
</tr>
<tr>
<td>Axis 3 (θ3)</td>
<td>+120° to -120°</td>
</tr>
<tr>
<td>Axis 4 (θ4)</td>
<td>+90°</td>
</tr>
<tr>
<td>Axis 5 (θ5)</td>
<td>+90°</td>
</tr>
<tr>
<td>Axis 6 (θ6)</td>
<td>+180°</td>
</tr>
</tbody>
</table>

**Maximum speed**

- Axis 1 (θ1): 1000 mm/sec
- Axis 2 (θ2): 700 mm/sec
- Axis 3 (θ3): 300 mm/sec
- Axis 4 (θ4): 200 mm/sec
- Axis 5 (θ5): 150 mm/sec
- Axis 6 (θ6): 130 mm/sec

**Optional**

- Dust and drip proof (IP65)
- Clean
- Safety category 3
- Ceiling mount
- 3 pcs solenoid valves inside robot arm

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Plenty of options available for various environments. Lightest robot in class.

**TV1000/TV1000H**

- **Arm length**: 1000 mm
- **Maximum payload**: 5 kg
- **Standard cycle time**: 0.6 sec level

**Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>TV1000</th>
<th>TV1000H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of controlled axis</td>
<td>4 axes</td>
<td></td>
</tr>
<tr>
<td>Arm length</td>
<td>1000 mm</td>
<td></td>
</tr>
<tr>
<td>1st arm</td>
<td>922 mm</td>
<td></td>
</tr>
<tr>
<td>2nd arm</td>
<td>822 mm</td>
<td></td>
</tr>
<tr>
<td>3rd arm</td>
<td>822 mm</td>
<td></td>
</tr>
<tr>
<td>4th arm</td>
<td>822 mm</td>
<td></td>
</tr>
<tr>
<td>Reach</td>
<td>1060 mm</td>
<td></td>
</tr>
<tr>
<td>Working envelope</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Axis 1 (θ1)</td>
<td>+110°</td>
<td></td>
</tr>
<tr>
<td>Axis 2 (θ2)</td>
<td>+110°</td>
<td></td>
</tr>
<tr>
<td>Axis 3 (θ3)</td>
<td>+150°</td>
<td></td>
</tr>
<tr>
<td>Axis 4 (θ4)</td>
<td>+150°</td>
<td></td>
</tr>
<tr>
<td>Axis 5 (θ5)</td>
<td>+150°</td>
<td></td>
</tr>
<tr>
<td>Axis 6 (θ6)</td>
<td>+150°</td>
<td></td>
</tr>
</tbody>
</table>

**Maximum speed**

- Axis 1 (θ1): 237°/sec
- Axis 2 (θ2): 237°/sec
- Axis 3 (θ3): 247°/sec
- Axis 4 (θ4): 247°/sec
- Axis 5 (θ5): 235°/sec
- Axis 6 (θ6): 276°/sec

**Optional**

- Payload mass 10 kg (TV1000H)
- Dust and water proof (IP67)
- Only for the wrist of TV1000H
- Dust and drip proof (IP65)
- Clean
- Safety category 3
- Ceiling mount
- 3 pcs solenoid valves inside robot arm

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**External view**

- [View A: Details of tool flange]
- [View B: Base mounting dimensions]
- [View C: Operation range]

**Hand IO connector**

- 3 x 8 pin hand joint (pinchock type)
- 3 x 17 holes (for M10 sub mounting)
- connector of encoder connection, hot signal output

**External view**

- [View A: Details of tool flange]
- [View B: Base mounting dimensions]
- [View C: Operation range]
Controllers and teach pendants specifically designed for the vertical articulated robot

**For TVL Series**

**TSL3100**
Cost effective compact controller

**TSL3100E**
Low-cost and compact CE compliant

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### Specifications

<table>
<thead>
<tr>
<th></th>
<th>TSL3100</th>
<th>TSL3100E</th>
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</thead>
<tbody>
<tr>
<td>Number of control axes</td>
<td>Maximum 6 axes</td>
<td>Maximum 5 axes</td>
</tr>
<tr>
<td>Motion control</td>
<td>PTP, CP (Continuous Path, Linear/Linear, Circular)</td>
<td>PTP, CP</td>
</tr>
<tr>
<td>Storage capacity</td>
<td>Approx. Total 8000 point + 30000 shapes</td>
<td>Approx. Total 8000 point + 20000 shapes</td>
</tr>
<tr>
<td>Operator interface</td>
<td>Display</td>
<td>Display</td>
</tr>
<tr>
<td>Programming language</td>
<td>SCOC (similar to BASC)</td>
<td>SCOC (similar to BASC)</td>
</tr>
</tbody>
</table>

**Teach pendant**

- TP1000-6ax
- TP3000
- TP1000-4ax
- TP3000

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### External View

**TSL3100**

- Front view
- Right-side view
- Rear view

**TSL3100E**

- Front view
- Right-side view
- Rear view

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### For TVL Series

**For TVL Series 6ax**

Standard teach pendant

Teach pendant equipped with graphic operation keys

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### For TV Series

**For TV Series 6ax**

Standard teach pendant

Teach pendant equipped with graphic operation keys

---

### For TV Series

**For TV Series**

Controller for vertical articulated robot TVL600 with up to six axes simultaneous control.

**TS3100V2**

Controller for vertical articulated robot TVL600 with up to six axes simultaneous control.

**TS3100**

High performance controller with up to six axes simultaneous control.

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### Specifications

<table>
<thead>
<tr>
<th></th>
<th>TS3100V2</th>
<th>TS3100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of control axes</td>
<td>Maximum 6 axes</td>
<td>Maximum 6 axes</td>
</tr>
<tr>
<td>Motion control</td>
<td>PTP, CP (Continuous Path, Linear/Linear, Circular)</td>
<td>PTP, CP</td>
</tr>
<tr>
<td>Storage capacity</td>
<td>Approx. Total 8000 point + 20000 shapes</td>
<td>Approx. Total 8000 point + 20000 shapes</td>
</tr>
<tr>
<td>Operator interface</td>
<td>Display</td>
<td>Display</td>
</tr>
<tr>
<td>Programming language</td>
<td>SCOC (similar to BASC)</td>
<td>SCOC (similar to BASC)</td>
</tr>
</tbody>
</table>

**Teach pendant**

- TP1000-6ax
- TP3000
- TP5000-6ax
- TP5000

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### External View

**TS3100V2**

- Front view
- Right-side view
- Rear view

**TS3100**

- Front view
- Right-side view
- Rear view

---

### Notes

- **For TVL Series**:
  - 6ax teach pendant
  - 4ax teach pendant

- **For TV Series**:
  - 6ax teach pendant
  - 4ax teach pendant

- **Common Features**:
  - SCOC (similar to BASC)
  - Teach pendant TP1000 and TP1000-ax (Program can also be used on PC)
Various functions to support the operation

Options and functions that maximize the robot performance and PC software for efficient robot system building.

Support for Sample Projects

Sample Projects are a collaborative system between Toshiba Machine Co., Ltd. and Digital Electronics Corporation. They enable 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 below 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 for 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.

For product information about the touch panel that is compatible with this system, please contact Digital Electronics Corporation,

Built-In PLC

The robot controller has a built-in PLC (TCmini).

Input and output signals can be controlled by a ladder program, independent from robot motion.

[Features and Advantages]

- TCmini converts input/output signals of standard I/O, extension I/O and touch-screen panel by a ladder program and exchanges data with the robot program.
- By changing the ladder program, system I/O signals can be used as standard I/O signals, and system I/O signals can be assigned as expansion I/O signals and field network I/O signals.
- Flexible system design and control of peripheral equipment are possible without the added cost of an outside PLC.
- C2 and debugging of a ladder program are possible with powerful programming support software “TCPRGS-W” (optional).
- The scan time is 5ms per 1 K-Word (TSL100), Connection is possible with various programmable controllers and display units etc.

Field Network

Various field network protocols are supported.

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.

TSPC: For robot programming

1. Powerful simulation function

- Off-line robot program creation and simulation, with simulated I/O. Lead time up to the start of robot operation can be shortened. Robot programs can be pre-checked without stopping the production line.

2. User-friendly programming environment

- Extensive help information, powerful diagnostic check, direct, online editing of programs in the controller memory.

3. Multi-functional monitor and support

- Monitoring functions such as active program display, position display, motion status monitor by 3D model and alarm history display. Operation from on-screen operation panel. Connection via Ethernet (optional) is also supported.