

TV800-CR

TV1000-CR/TS3100

Industrial Robot

INSTRUCTION MANUAL

CLEAN TYPE INDUSTRIAL ROBOT SPECIFICATIONS MANUAL

Notice

1. Make sure that this instruction manual is delivered to the final user of Toshiba Machine's industrial robot.
2. Before operating the industrial robot, read through and completely understand this manual.
3. After reading through this manual, keep it nearby for future reference.

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TOSHIBA MACHINE CO., LTD.

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Preface

This manual describes the specifications of the TV series clean type industrial robot.

This manual is essential for maintaining robot performance over an extended period of time, preventing a breakdown, and improving safety.




Before actually starting operation, please read through this manual once and set up a maintenance plan beforehand.

Precautions on Safety

Important information on the robot and controller is noted in the instruction manual to prevent injury to the user and persons nearby, prevent damage to assets and to ensure correct use.

Make sure that the following details (indications and symbols) are well understood before reading this manual. Always observe the information that is noted.




[Explanation of indications]

Indication	Meaning of indication
 DANGER	This means that "incorrect handling will lead to fatalities or major injuries".
 WARNING	This means that "incorrect handling will lead to fatalities or serious injuries."
 CAUTION	This means that "incorrect handling may lead to personal injuries *1) or physical damage *2)".

*1) Injuries refer to injuries, burns and electric shocks, etc., which do not require hospitalization or long term treatment.




*2) Physical damage refers to major fires due to destruction of assets or resources.




[Explanation of symbols]

Symbol	Meaning of symbol
	This means that the action is prohibited (must not be done). The details of the actions actually prohibited are indicated with pictures or words in or near the symbol.
	This means that the action is mandatory (must be done). The details of the actions that must be done are indicated with pictures or words in or near the symbol.
	This means danger and caution. The details of the actual caution are indicated with pictures or words in or near the symbol.

[Maintenance and Inspection]

To ensure safe operation of this product, be sure to carefully follow the maintenance and inspection items below.

 DANGER	
 Prohibited	<ul style="list-style-type: none"> Do not burn, disassemble, or try to charge the battery. Doing so could cause the battery to rupture.
 Mandatory	<ul style="list-style-type: none"> Turn off the main power switch of the controller during maintenance and inspection. Dispose of the battery in accordance with the rules and regulations of your company.

 CAUTION	
 Disassembly prohibited	<ul style="list-style-type: none"> The customer must never replace parts or perform modifications except on the items that are described in the manual. Doing so could cause reduced performance, a machine breakdown, or accident.
 Mandatory	<ul style="list-style-type: none"> When replacing parts, use the spare parts specified by Toshiba Machine. Perform maintenance and inspection based on a regular schedule. Failure to perform maintenance and inspection could cause a machine breakdown or accident.

This manual is divided into the following sections:

Section 1 Specifications

This section describes the basic specifications and names of respective units of the clean type industrial robot.

Section 2 Transportation

This section describes how to remove the clean type industrial robot from its box and how to transport it to the installation site.

Section 3 Installation

This section describes the clean type industrial robot installation environment, space requirements, and how to install the robot.

Section 4 Tool Interface

This section describes how to connect the cables and pipelines for the tool of the clean type industrial robot.

Chapter 5: Maintenance

This section describes the structure of the clean type industrial robot and all items required for maintenance and inspection of the robot.

Chapter 6: Replacement Parts for Maintenance

This section describes the replacement parts for maintenance.

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1. Specifications

1.1 Name of Each Part

Fig. 1.1 shows the name of each part of the robot.

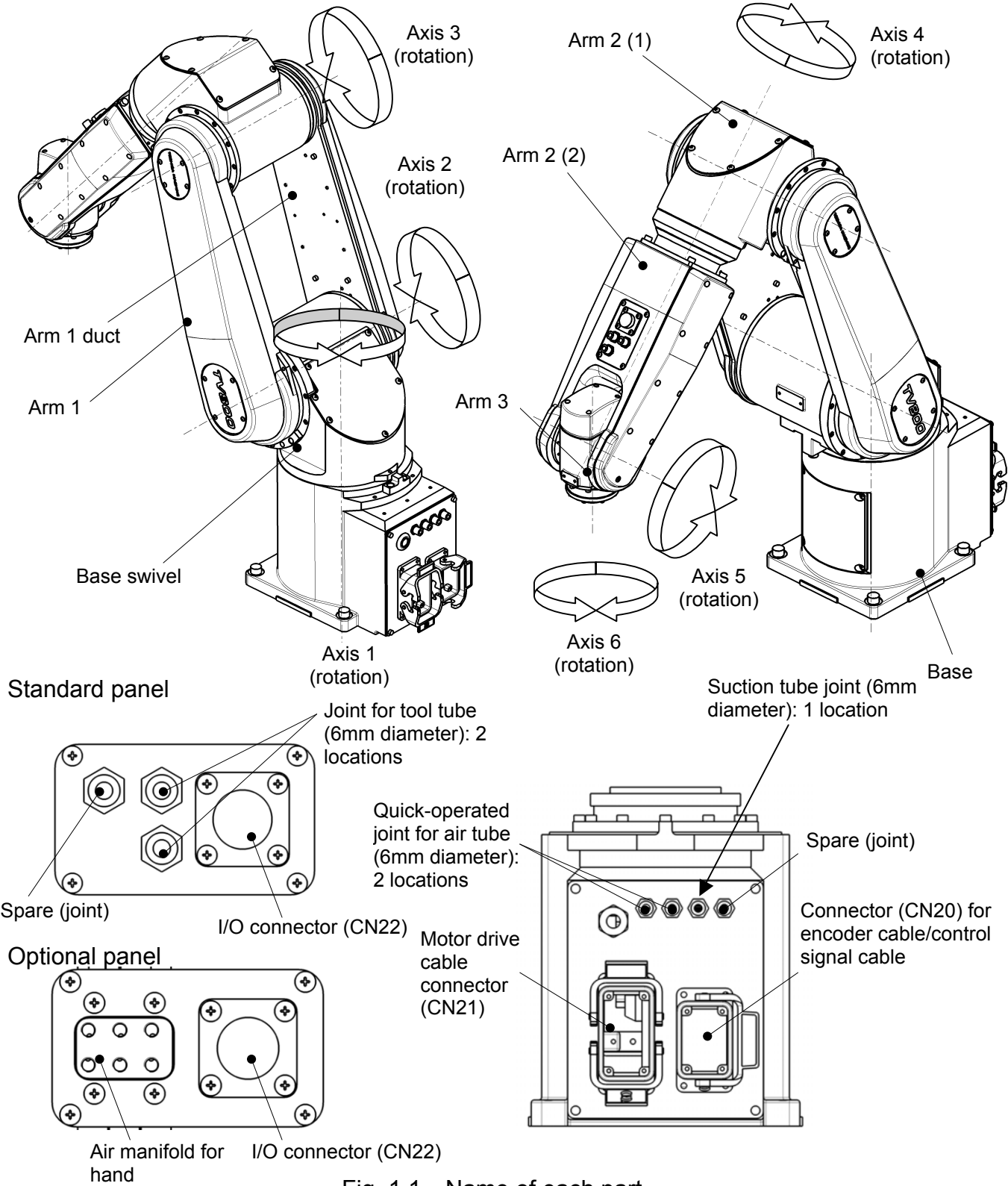


Fig. 1.1 Name of each part

1.2 External Dimensions

The robot external dimensions are shown in Fig. 1.2.and in Fig. 1.3, and the operating range is shown in Fig. 1.4.and in Fig. 1.5.

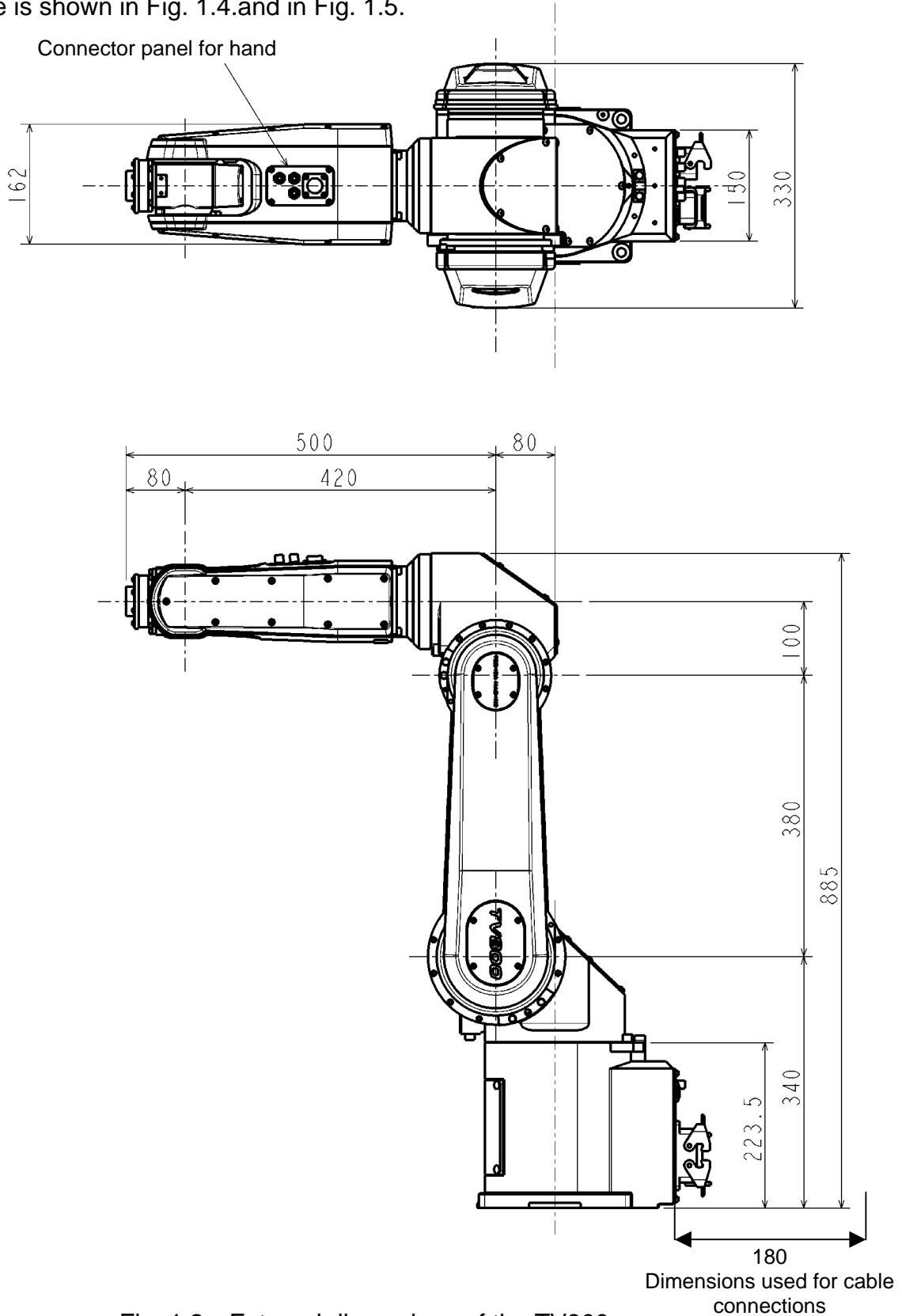


Fig. 1.2 External dimensions of the TV800

Connector panel for hand

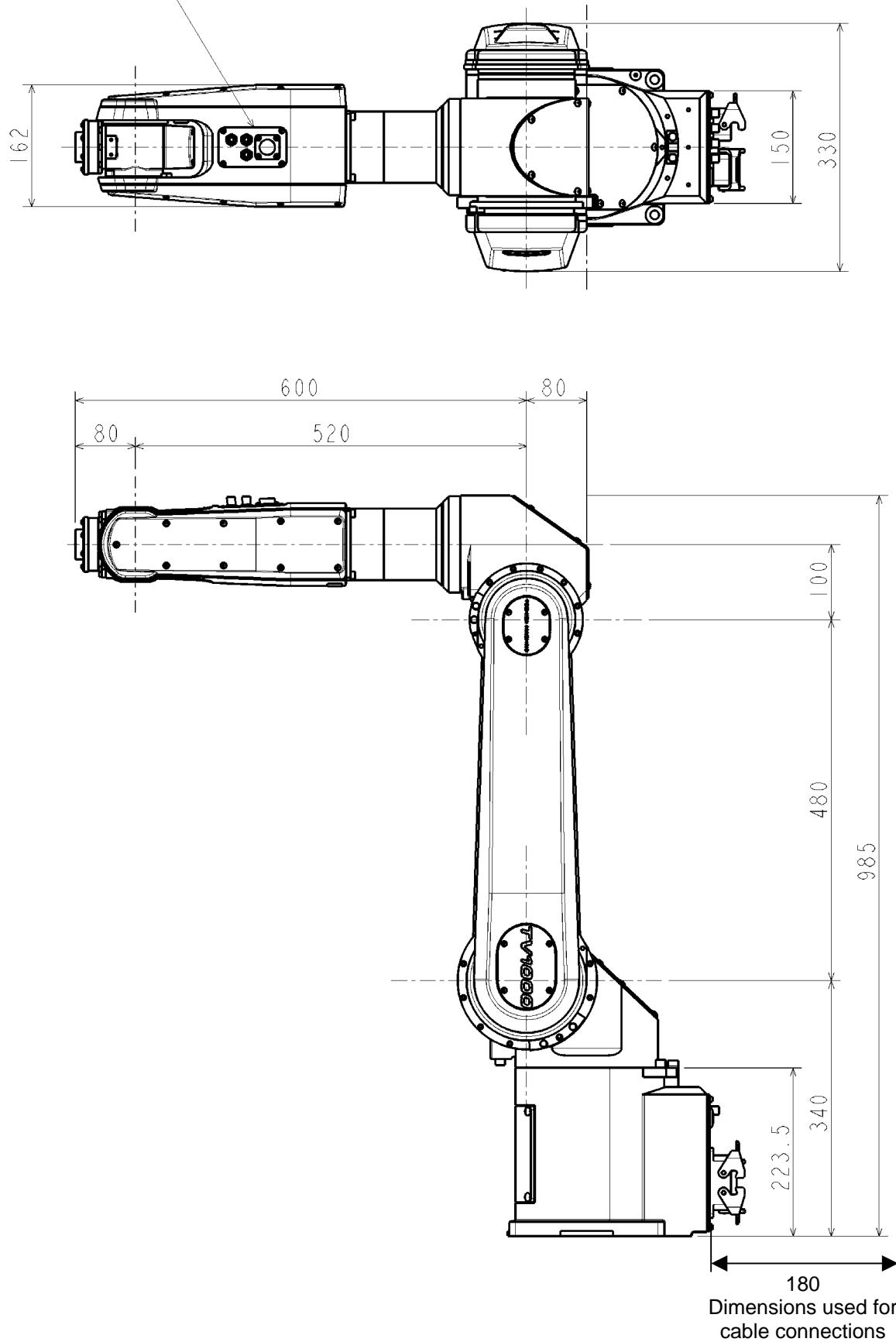


Fig. 1.3 External dimensions of the TV1000

Point P: J6 intersection point operating

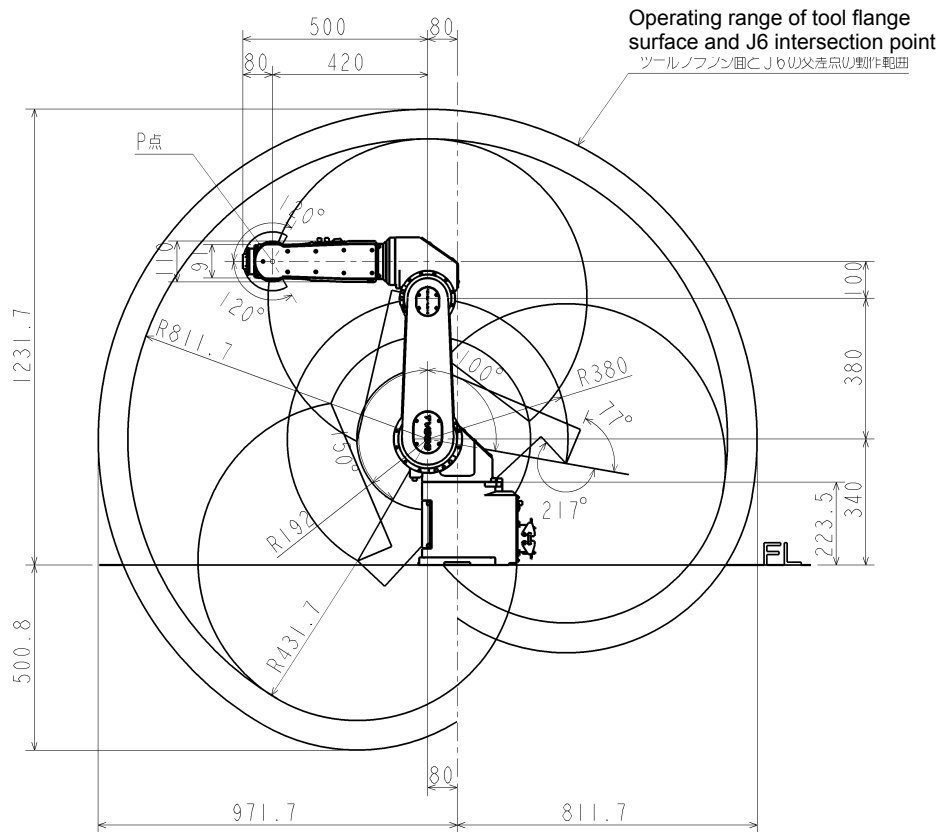
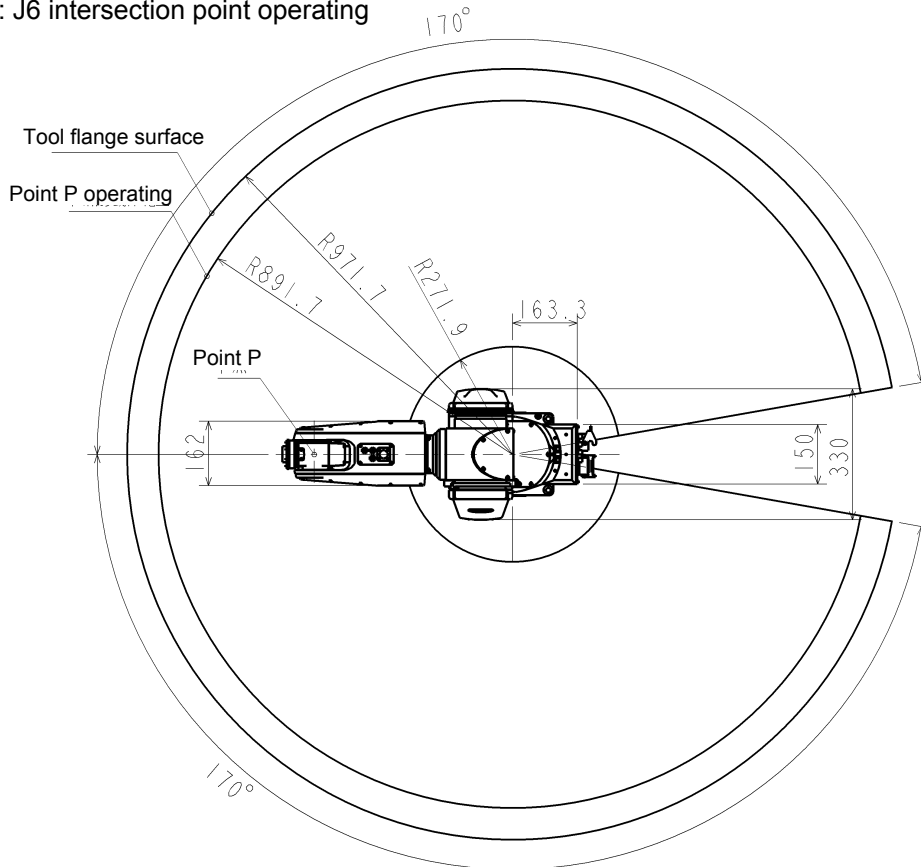


Fig. 1.4 TV800 operating range

Point P: J6 intersection point operating

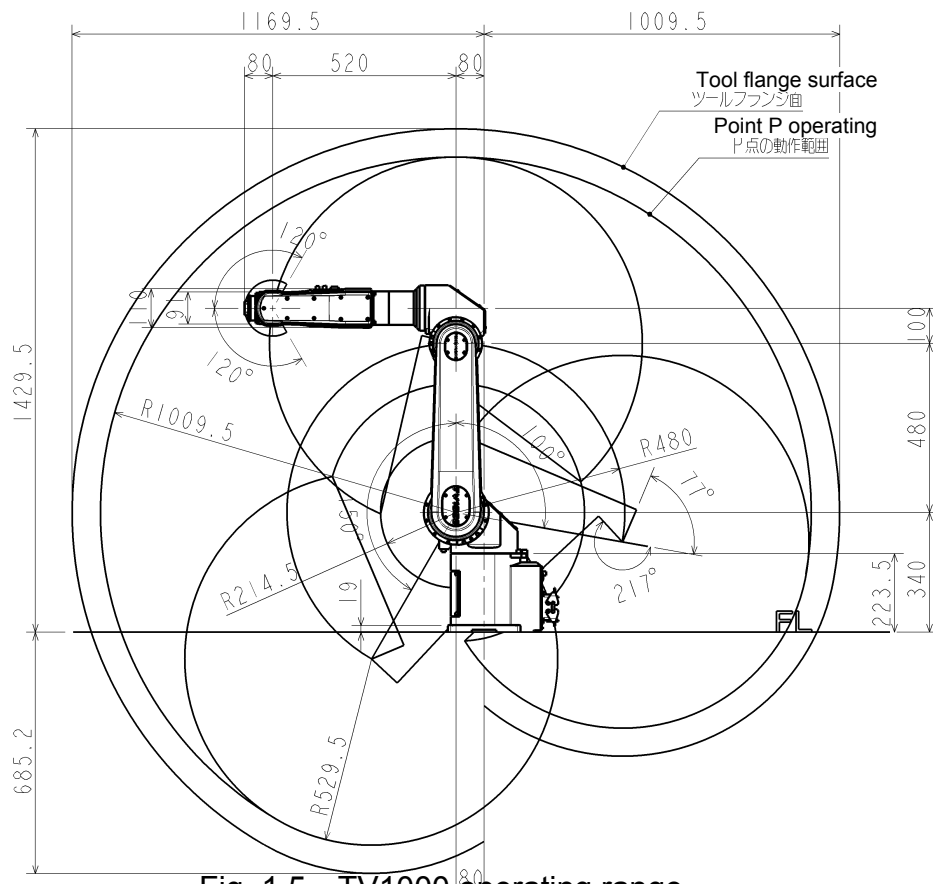
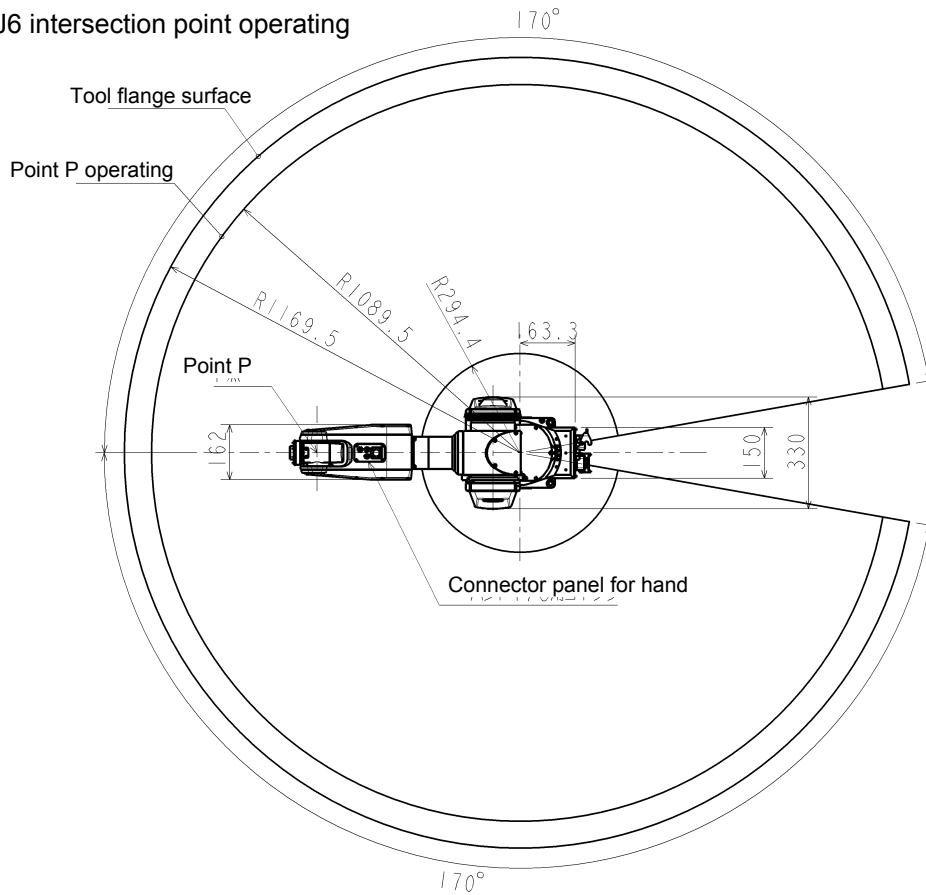


Fig. 1.5 TV1000 operating range

1.3 Specifications Table

Item		Specifications			
Structure		Vertical multi-joint 6-axis robot			
Model		TV800-CR	TV800-CR-BL	TV1000-CR	TV1000-CR-BL
Applicable controller		TS3100 *1			
Mass of actuator		45.5kg		47kg	
No. of controlled axes		6			
Arm length		800mm (380mm + 420mm) Reach: 892mm		1000mm (480mm + 520mm) Reach: 1090mm	
Operating range	Axis 1	±170 (deg)			
	Axis 2	+150 to -100 (deg)			
	Axis 3	+167 to -127 (deg)			
	Axis 4	±190 (deg)			
	Axis 5	±120 (deg)			
	Axis 6	±360 (deg)			
Maximum speed *2	Axis 1	237 (deg/s)			
	Axis 2	240 (deg/s)			
	Axis 3	288 (deg/s)			
	Axis 4	350.5 (deg/s)			
	Axis 5	484 (deg/s)			
	Axis 6	576 (deg/s)			
	Maximum composite speed	8058 (mm/s)		9610 (mm/s)	
Rated payload mass		2 (kg)			
Maximum payload mass		5 (kg)			
Maximum allowable inertia moment around axes 4 and 5		0.3 (kg•m ²) *2			
Maximum allowable inertia moment around axis 6		0.05 (kg•m ²) *2			
Repeatability	X, Y, Z	±0.02 (mm) *3		±0.03 (mm) *3	
Cycle time *4		0.4 (sec) unit		0.6 (sec) unit	
Drive system		AC servomotor All axes with a motor brake	AC servomotor Axes 1, 4, and 6 with no motor brake *6	AC servomotor All axes with a motor brake	AC servomotor Axes 1, 4, and 6 with no motor brake *6
Position detection method		Absolute			
Cleanness level *5		ISO class 3 0.1µm			
Suction rate		30NI/min			

*1: The structure of the robot controller is not a clean type.

*2: The speed and acceleration are limited in accordance with the operation pattern, the load mass, and the offset value.

*3: In environment in which the ambient temperature is constant

*4: Continuous operation cannot be performed if the effective load factor of the standard cycle operation pattern is exceeded.

Shuttle time for rough positioning in horizontal direction of 300mm and vertical direction of 25mm

*5: The clean room downflow current rate is 0.4m/s or higher at a suction of 30NI/min

*6: The axes 2, 3, and 5 are equipped with a motor brake.

2. Delivery

2.1 Unpacking and Transport

Based on the customer's request, the robot and controller are shipped in clean packaging (equivalent to ISO class 5), wooden crate packaging, or cardboard packaging. Open the packaging at a location suitable for future transport and installation, and be careful at all times that you do not damage the robot or controller. After opening the packaging, first check for any damage that may have occurred during transportation and the accessory quantities.

The packaging type and contents of wooden crate packaging and cardboard packaging are identical to the standard machine. Refer to the separate **"TV800/TV1000 Instruction Manual: Installation and Transport"**.

The clean packaging appears as shown in Fig. 2.1 below.

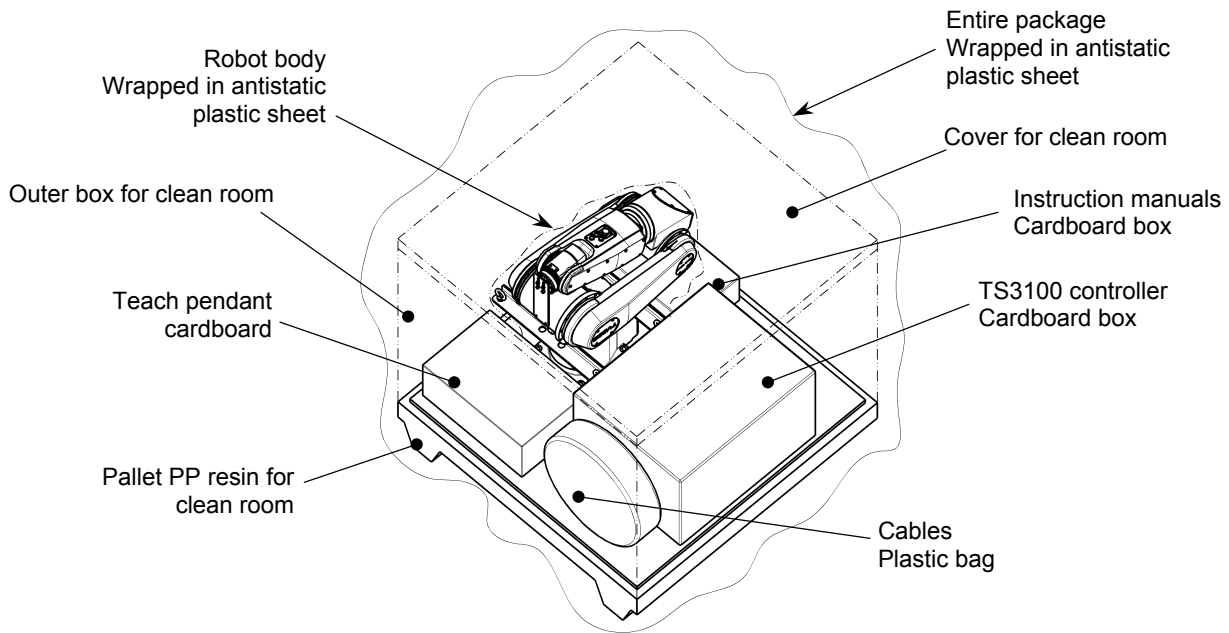


Fig. 2.1 Clean packaging

The packaging is opened using the procedure below.

- Use a lifter or other device to transport the package to the entry room of the clean room in the state shown in Fig. 2.1
- In the entry room, remove the outer antistatic plastic sheet, cover, and outer box.
- Lower all the cardboard boxes for the teach pendant, controller, and other items.
- Remove the antistatic plastic sheet wrapped around the robot body.
- Use the lifter (provided by the customer) for clean room to transport into the clean room.
- When transporting the robot into the clean room, wipe the entire robot with alcohol.

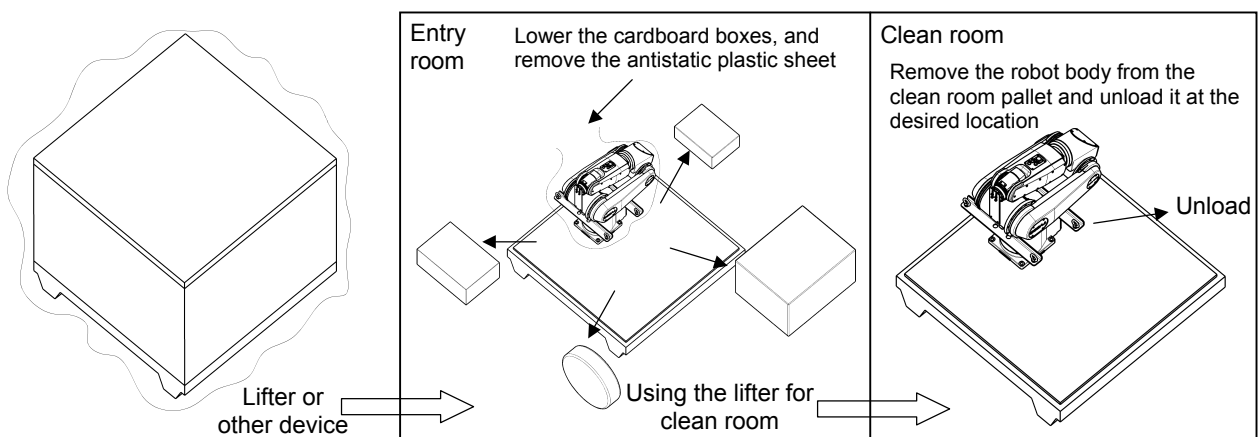


Fig. 2.2 Package opening procedure



CAUTION

- The clean packaging is equivalent to ISO class 5. (Pallet resin: PP resin)
- When transporting the robot and controller, be careful not to subject them to jolts or vibrations.

2.2 Weight and External Dimensions

The robot weight and external dimensions during transport are shown in Fig. 2.3.

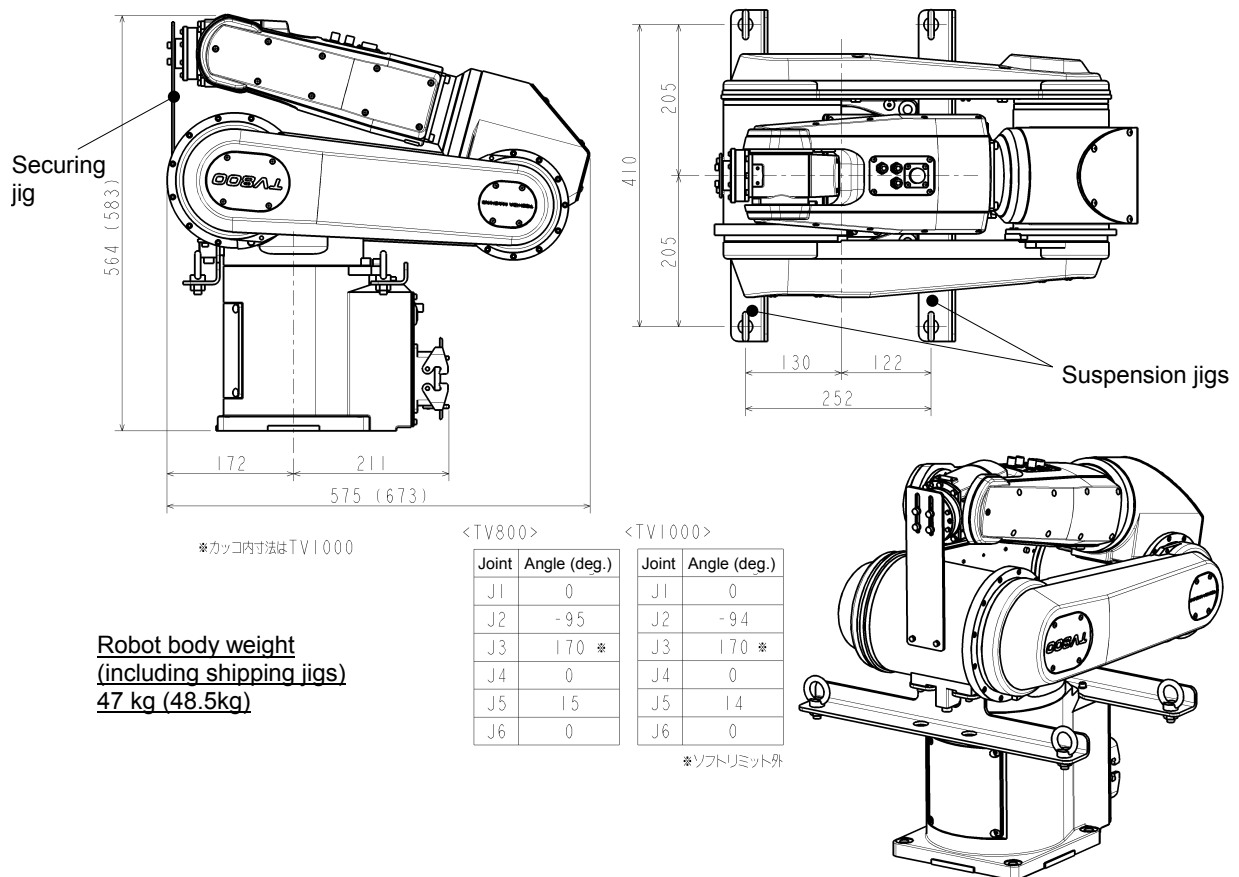


Fig. 2.3 External dimensions during transport

2.3 Robot Transport Notes

Important points during transport are provided below. Additional points not provided below are identical to the standard machine. Refer to the separate “**TV800/TV1000 Instruction Manual: Installation and Transport**”.

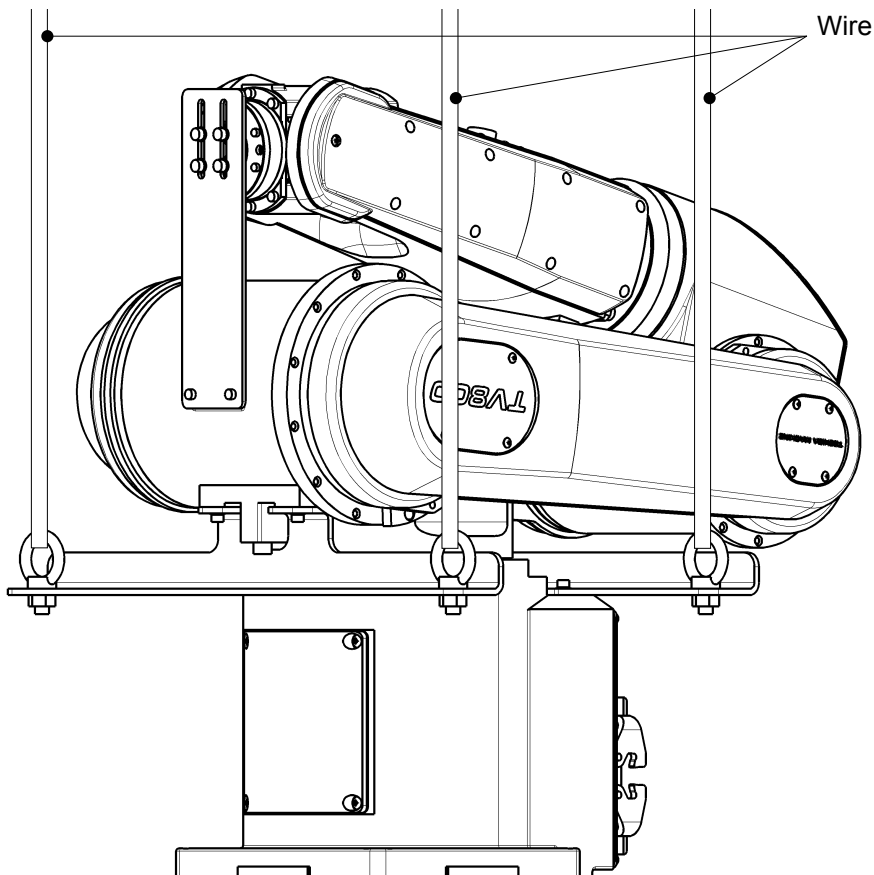


Fig. 2.4 Lifting up the robot



CAUTION

- The wire to be used should be such that can well withstand the mass of the robot.
- When lifting up the robot, it may tilt a little. Lift it up slowly.
- Lifting up and down should be performed carefully so that any impact cannot be exerted on the robot.
- When carrying the robot by workers, take careful precautions to prevent their hand or leg from being caught in the robot.

DO NOT hold the arms 2 and 3.

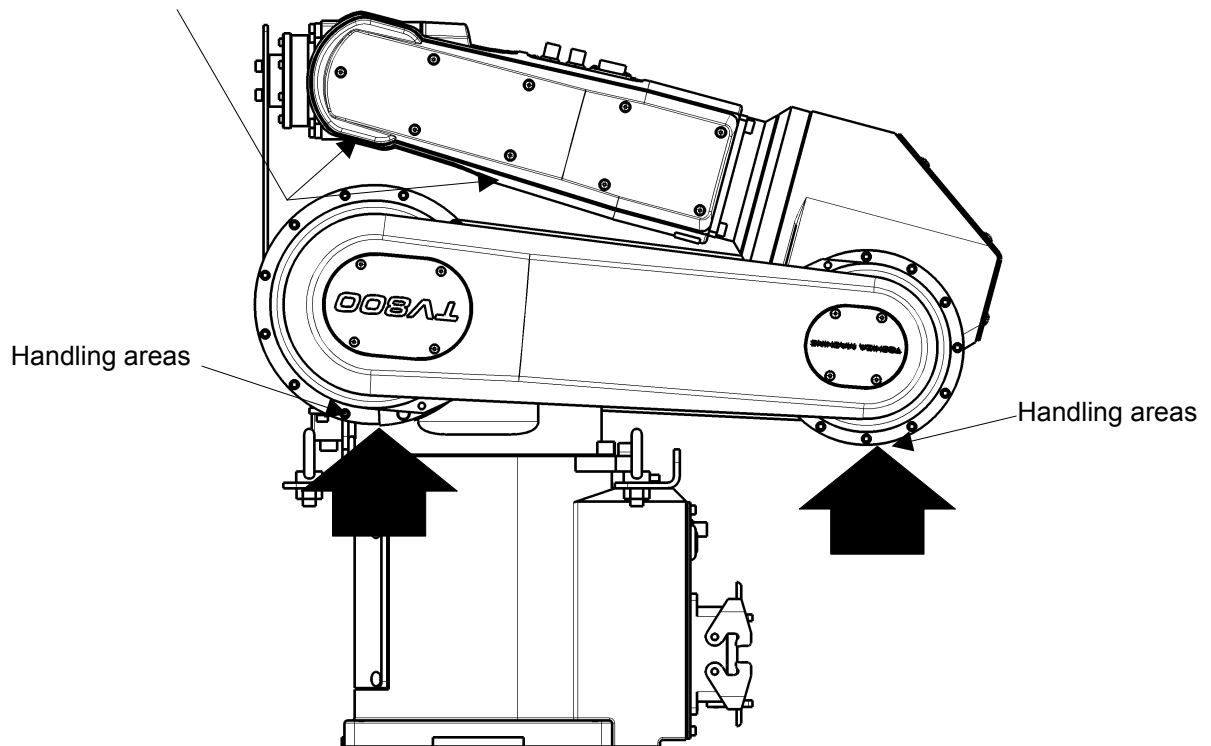


Fig. 2.5 Robot handling areas

After the installation, remove the clamp and eyebolt used for transport.



CAUTION

- When lifting up the robot by workers, hold the locations (arrowed parts) by hands as shown in Fig. 2.5. If the arm 2 and arm 3 are held by hands, an unusually large force is exerted, resulting in a malfunction.
- When carrying the robot by workers, take careful precautions to prevent their hand or leg from being caught in the robot.
- Do not hold the arm-1 duct cover when handling the robot. Otherwise, it will be deformed.
- The work should be performed by three or more workers.

3. Installation

3.1 Installation Environment

Table 3.1 shows the environmental conditions for the location in which the robot and controller are to be installed.

Table 3.1 Environmental conditions for robot and controller

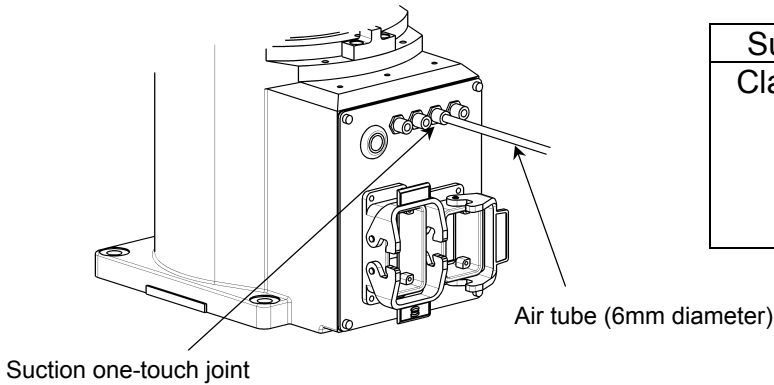
Item	Specifications
Temperature	In operation : 0 to 35°C *1 In storage : -10 to 50°C
Humidity	20 to 90 % (Non-condensing) DO NOT install the robot where it may be subject to fluids such as water.
Altitude	1000m or less
Vibration	In operation : 0.98m/s ² or less
Dust	No inductive dust should exist. Consult with Toshiba Machine first if you wish to use the robot and controller in a dusty environment.
Gas	No corrosive or combustible gas should exist.
Sunlight	The robot and controller should not be exposed to direct sunlight.
Power noise	A heavy noise source should not exist nearby.
Magnetic field	A heavy magnetic field source should not exist nearby.

*1: If the robot is used in a place where the temperature rises to 35°C or more, pay special attention to the ambient temperature when the robot is operating. Consider the cooling of the robot body as needed. Please ask us for the cooling of the robot.

 DANGER
<ul style="list-style-type: none"> • Do not place the robot or controller near combustible. Doing so could lead to fires if it ignites due to a fault, etc.

3.2 Suction Rate

A specified rate of suction air is supplied from the suction one-touch joint on the connector cover (base rear section) for enabling a cleanness of ISO class 3. The suction device and suction air tubes (6mm diameter) must be obtained by the customer.

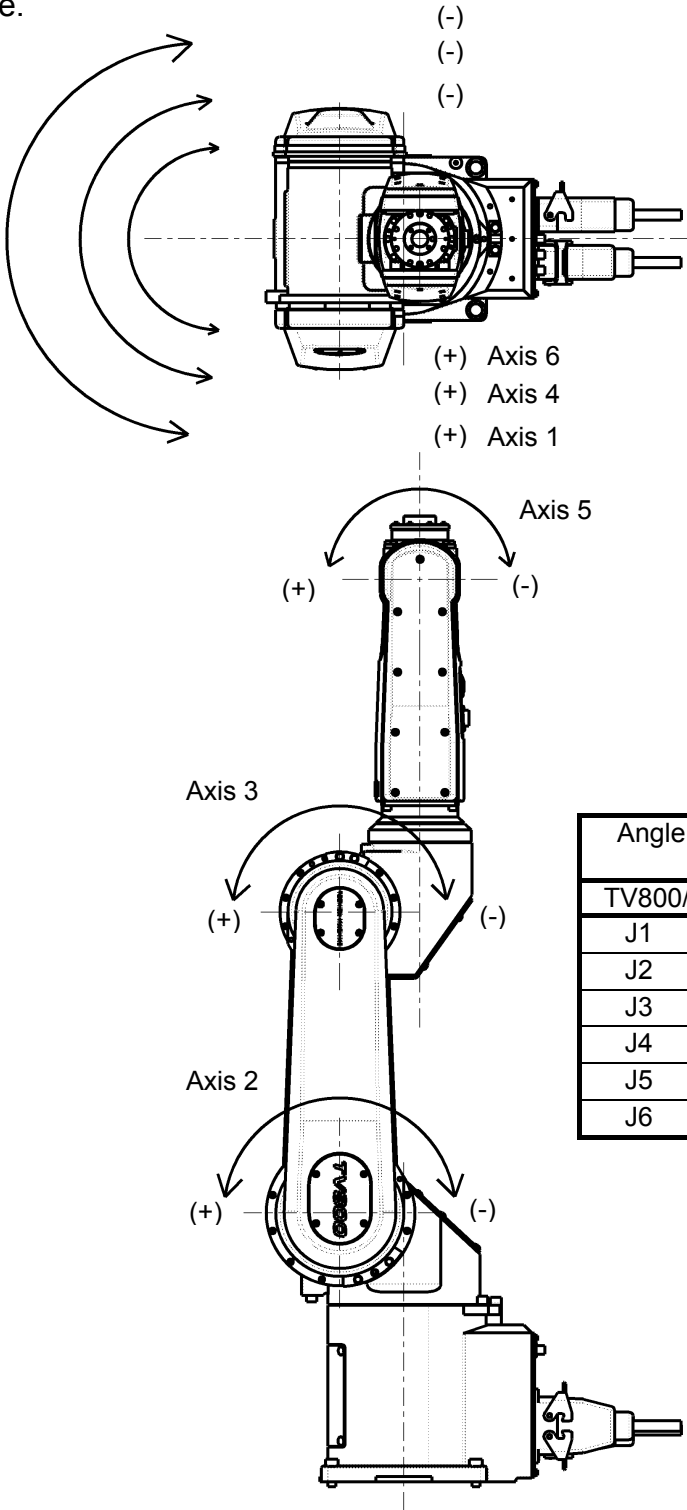


Suction rate	30NI/min
Class 3 (ISO)	Number of particles with diameter 0.1µm or more within a sample area of 1m ³ is 1000 or less

	CAUTION
<ul style="list-style-type: none"> • The clean room must be an environment with a downflow rate of 0.4m/s or higher. • Failure to perform suction will result in dust. • The cleanness level does not apply to the controller. 	

3.3 Coordinate System

The robot's joint angle origin (0° position) is factory-calibrated according to the base reference planes. Fig. 3.1 shows the base coordinate system and origin of each axis joint angle.



Angle of axis		Base coordinate system (mm)		
TV800/TV1000			TV800	TV1000
J1	0°	X	-20	-20
J2	0°	Y	0	0
J3	0°	Z	1220	1420
J4	0°	A	0	0
J5	0°	B	0	0
J6	0°	C	0	0


Fig. 3.1 Base coordinate system and joint angle origin

3.4 Installing the Robot

The robot is secured, using the set holes on the base (four (4) places). Use M10 hexagon socket head cap screws (made of stainless steel).

The robot installation method is shown in Fig. 3.4. Reference planes are provided on the base unit.

To align the robot position in the base coordinate system, or to replace the robot, provide adequate reference planes. Then, contact such reference planes to the base reference planes and secure the robot.



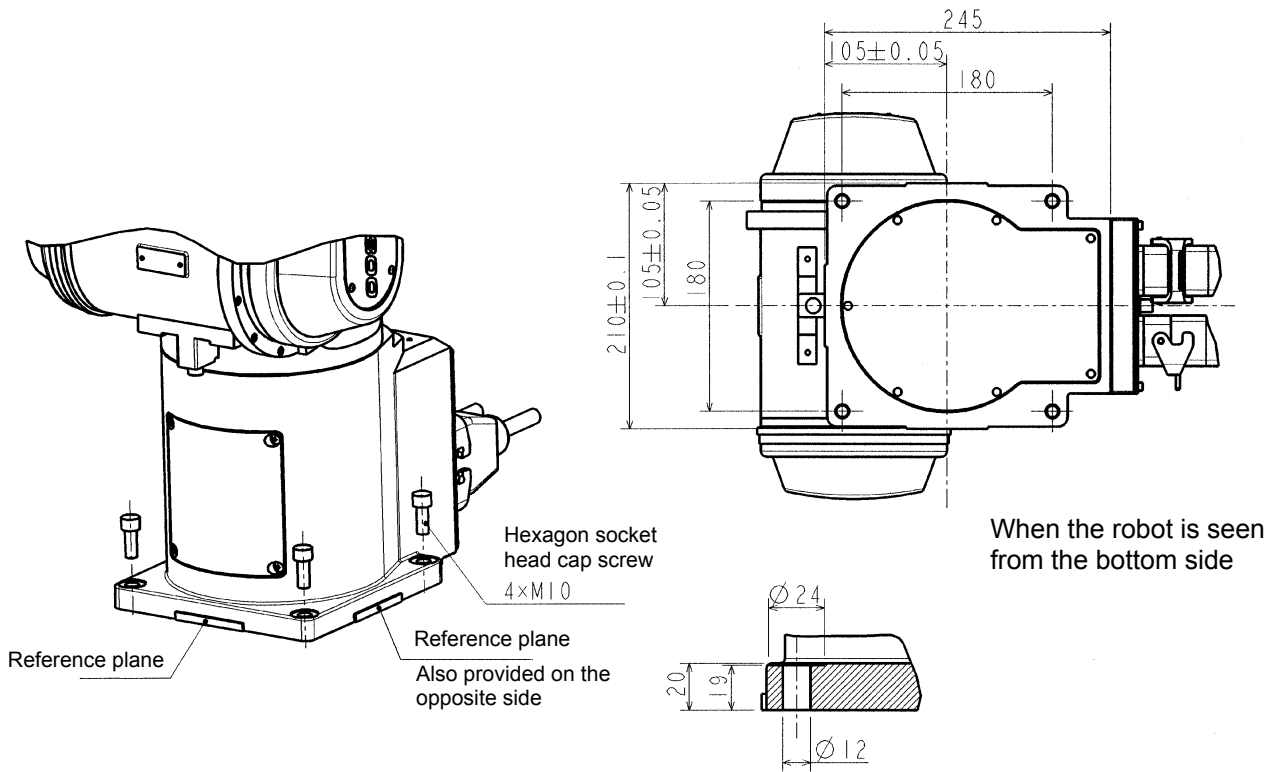
CAUTION

- The robot will suddenly accelerate and decelerate during operation. When installing it on a frame, make sure that the frame has sufficient strength and rigidity.

If the robot is installed on a frame that does not have sufficient rigidity, vibration will occur while the robot is operating, and could lead to faults.

When installing the robot on the floor, secure the robot with anchor bolts, etc.

- Install the robot on a level place. Failure to do so could lead to a drop in performance or faults.



Details of robot mounting hole (4 places)

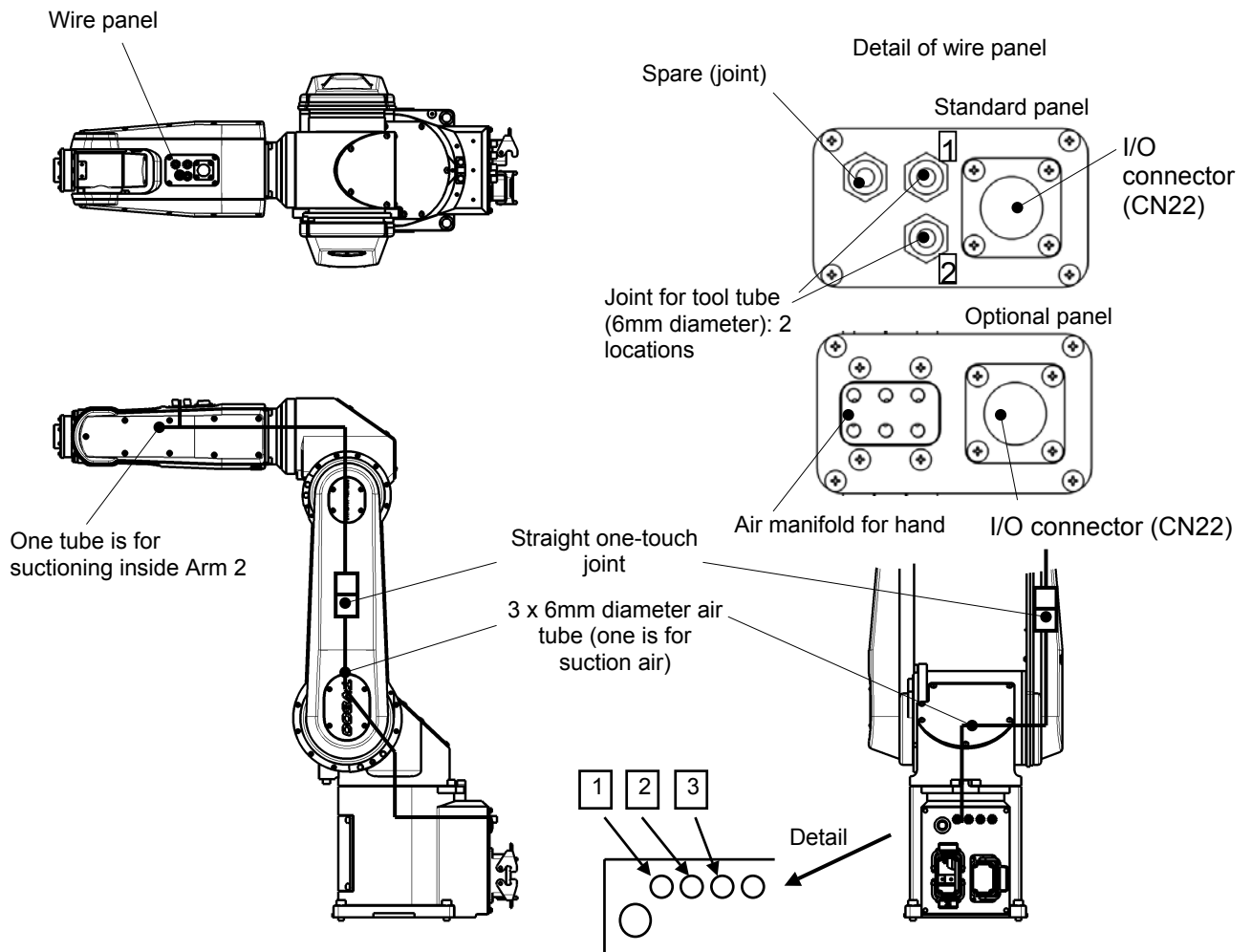
Fig. 3.2 Setting method

4. Tool Interface

Tool mounting and tool signals are identical to the standard machine. Refer to the separate “TV800 Instruction Manual: Installation and Transport”.

4.1 Tool Air Tubes

Two lines are provided for tool air tubes. The outer diameter of the air tubes is 6mm. These tubes are shown in Fig. 4.1.



The air tubes are divided by number and color. When connecting the tubes, refer to the information below to prevent connecting errors.

- 1: Red
- 2: White
- 3: Blue (for suction)

Fig. 4.1 Tool air tubes

5. Maintenance

5.1 Maintenance Items

The inspection items for the clean specifications are shown below.

Inspection item	Location of inspection	Inspection	Daily inspection	2-year inspection
Each packing	Each cover	Visual inspection for cracks and other defects in packing Listening for abnormal leaks of intake air	○	Replacement (Recommended)

The other structure is identical to the standard machine. For information about the maintenance schedule, maintenance procedures, and inspection details, refer to the separate “**TV800/TV1000 Instruction Manual: Maintenance**”.



DANGER

- Before moving near the robot to start maintenance or inspection, be sure to turn off the main power switch on the controller.



CAUTION

- Dust can occur when mounting or removing the covers.
Perform this work by moving the robot to a location where dust will not cause a problem.

5.2 Maintenance Tools and Required Items

Preparation of the maintenance tools and items below is recommended.

For details about tools and items other than those shown below, refer to the TV800 Instruction Manual: Maintenance.

- Phillips-head screwdriver
- Hexagonal spanner set M3 to M16

5.2 Mounting and Removing the Covers

Rubber packing is fitted onto the cover mounting surfaces of the clean type industrial robot. Be sure to carefully follow the procedures in this section when mounting and removing the covers.



DANGER

- Be sure to always turn off the main power (POWER) switch before mounting or removing the covers.
- When opening a cover, be careful that no moisture or foreign matter gets inside the robot. Turning on the power with moisture or foreign matter inside can cause an electrical shock and failure and is extremely dangerous.

5.2.1 Base Covers

There are two covers for the base section: the base cover and connector panel. Each cover is mounted and removed using the same procedure as the standard machine.

Each cover is secured to the base by four bolts with a rubber packing inserted in between. The connector panel is connected to connectors inside the robot, and so it must not be pulled with excessive force. When mounting the cover, be careful that no cables get pinched in between.

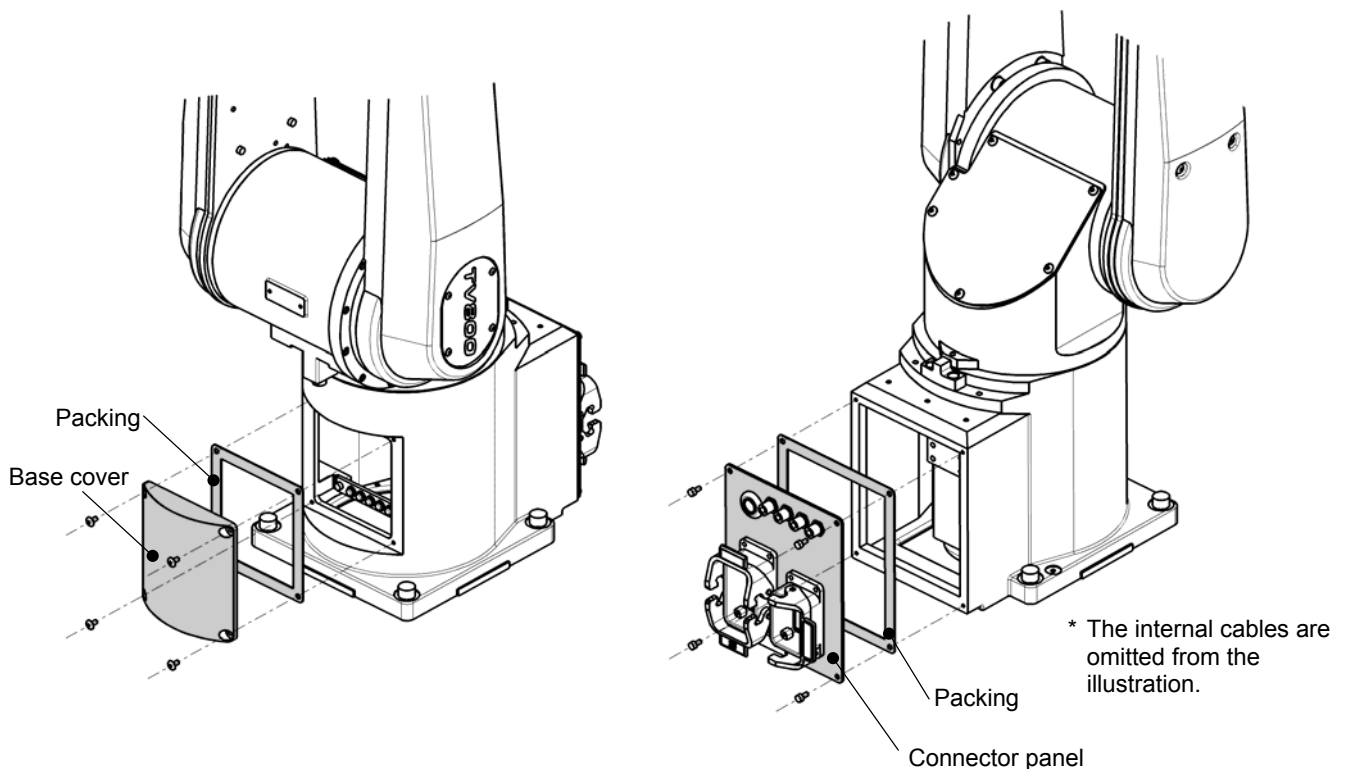


Fig. 5.1 Base cover and connector cover



CAUTION

- When mounting the covers, be sure to always insert the rubber packing. The cleanness level will be reduced if the rubber packing is not used.

5.2.2 Base Swivel Cover

The base swivel cover is secured to the base swivel unit by six Phillips truss head screws (M4x8) with a rubber packing inserted in between. When mounting the cover, be careful that no cables get pinched in between.

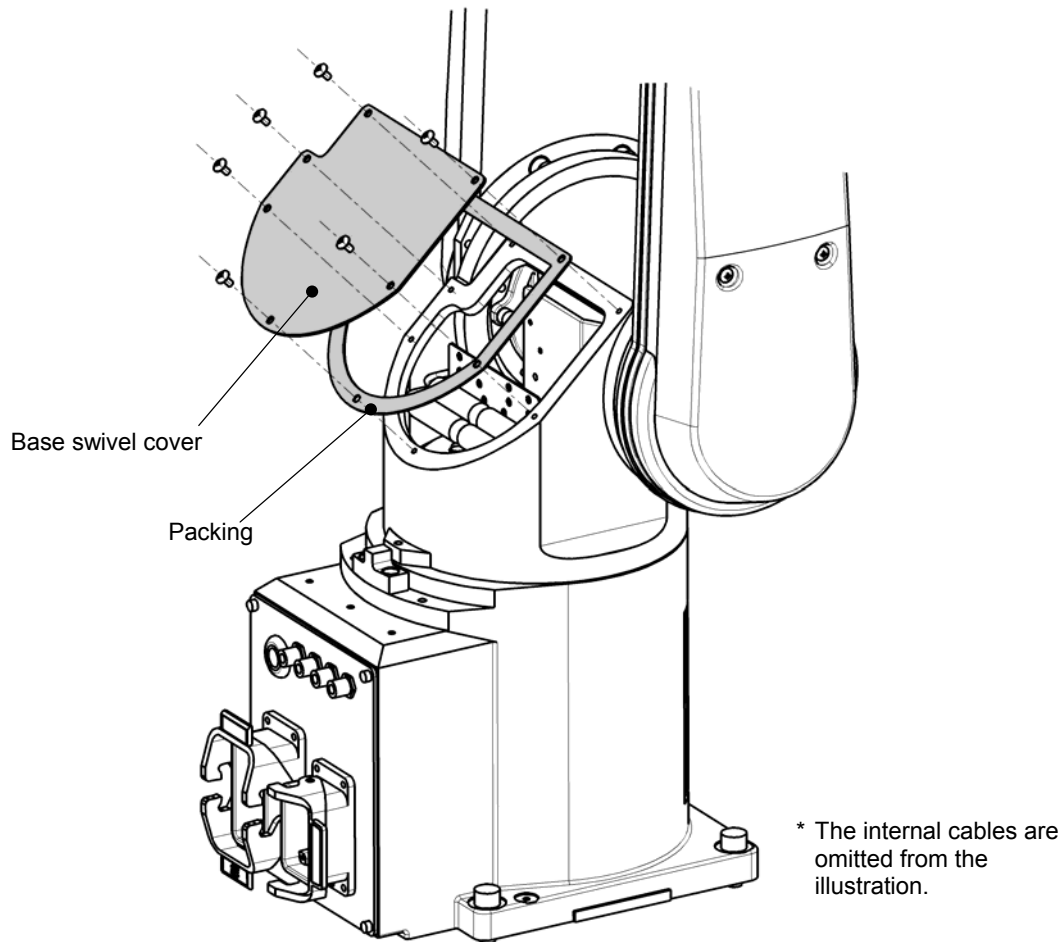


Fig. 5.2 Base swivel cover



CAUTION

- When mounting the covers, be sure to always insert the rubber packing. The cleanliness level will be reduced if the rubber packing is not used.

5.2.3 Arm 1 Cover

The arm 1 cover is secured to the hexagonal supports attached to the arm 1 duct plate by Phillips truss head screws (M4x8).

When mounting the cover, fit the cover into the groove along the duct plate side.

Be careful that the packing for the cover does not come off.

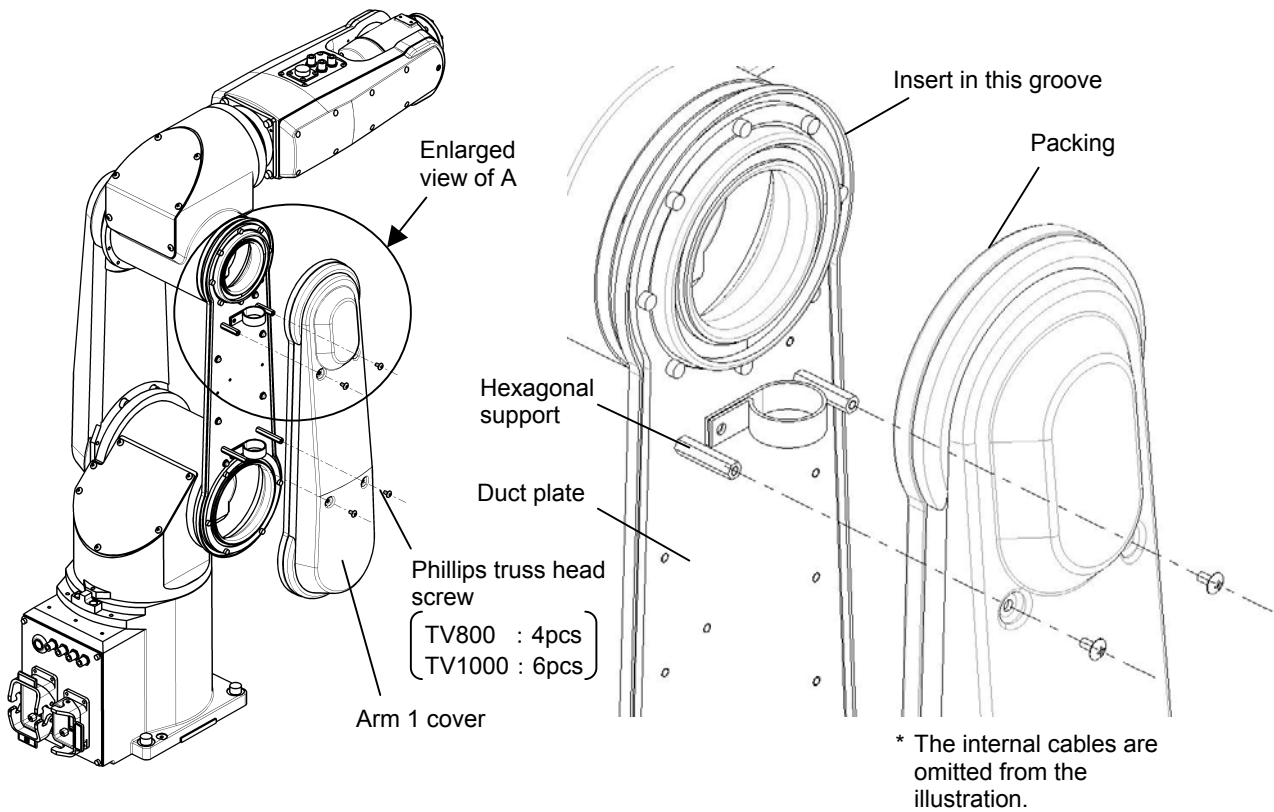


Fig. 5.3 Arm 1 cover

5.2.4 Arm 2 Cover (1)

The arm 2 cover (1) is secured to arm 2 by six Phillips truss head screws (M4x8) with a rubber packing inserted in between.

When mounting the cover, be careful that no cables get pinched in between.

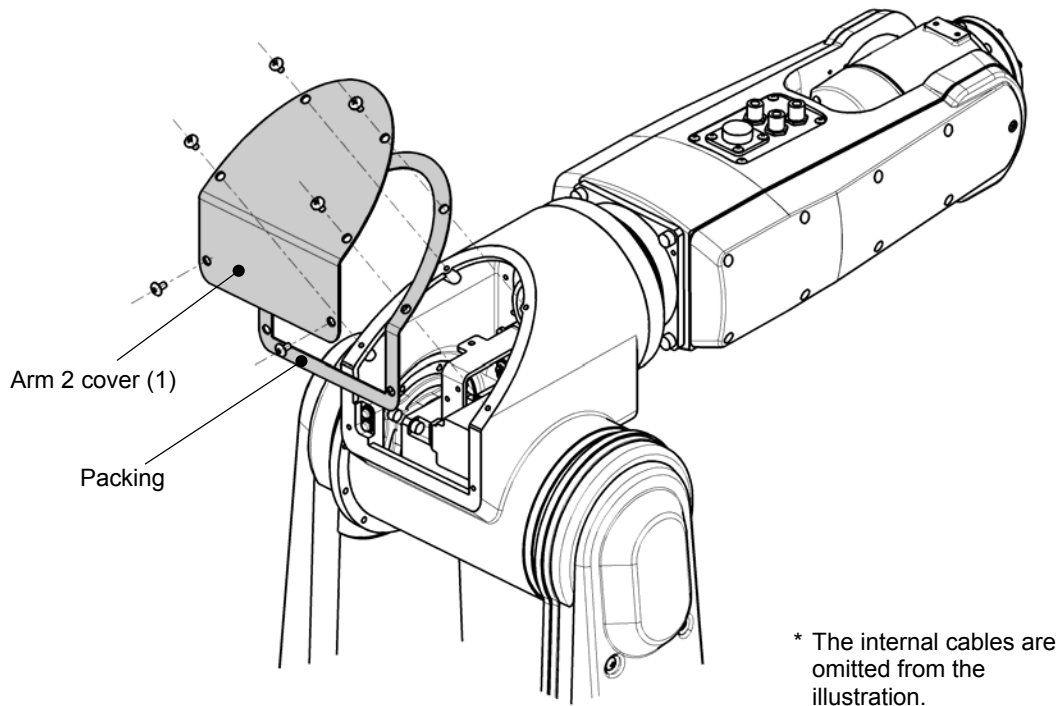


Fig. 5.4 Arm 2 cover (1)



CAUTION

- When mounting the covers, be sure to always insert the rubber packing. The cleanliness level will be reduced if the rubber packing is not used.

5.2.5 Arm 2 Cover (2)

The arm 2 cover (2) is secured to arm 2 by 9 Phillips truss head screws on each side for a total of 18 screws (M3x12 and M3x8) with a rubber packing inserted in between. When mounting the cover, be careful that no cables get pinched in between.

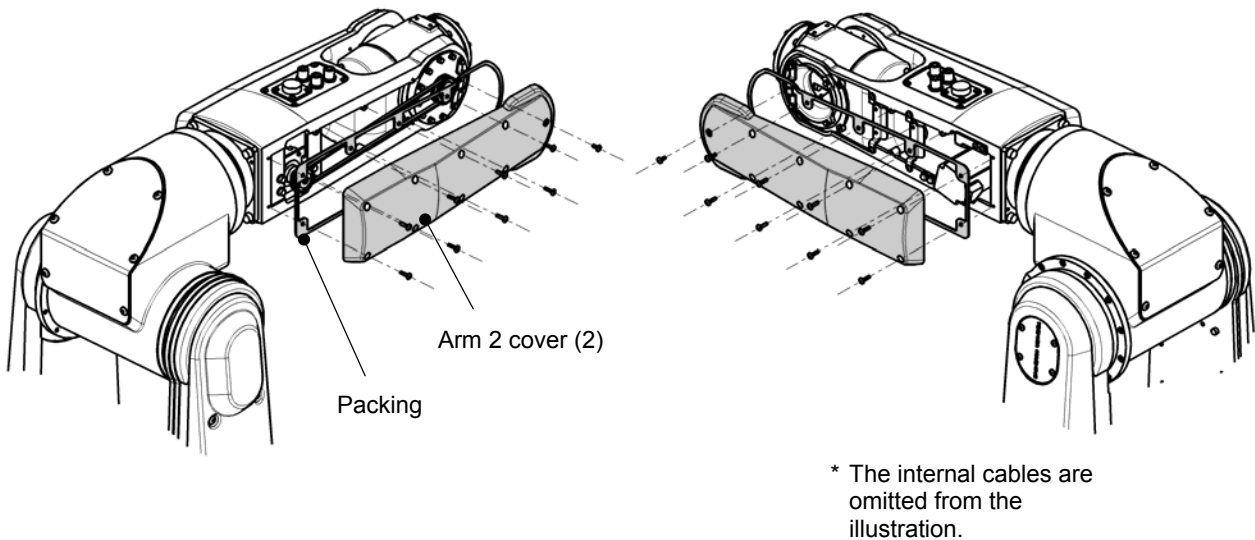


Fig. 5.5 Arm 2 cover (2)



CAUTION

- When mounting the covers, be sure to always insert the rubber packing. The cleanliness level will be reduced if the rubber packing is not used.

5.2.6 Arm 3 Cover

The arm 3 cover is secured to arm 3 by four hexagon socket head cap screws (M3 x 35) with a rubber packing inserted in between.

When mounting the cover, be careful that no cables get pinched in between.

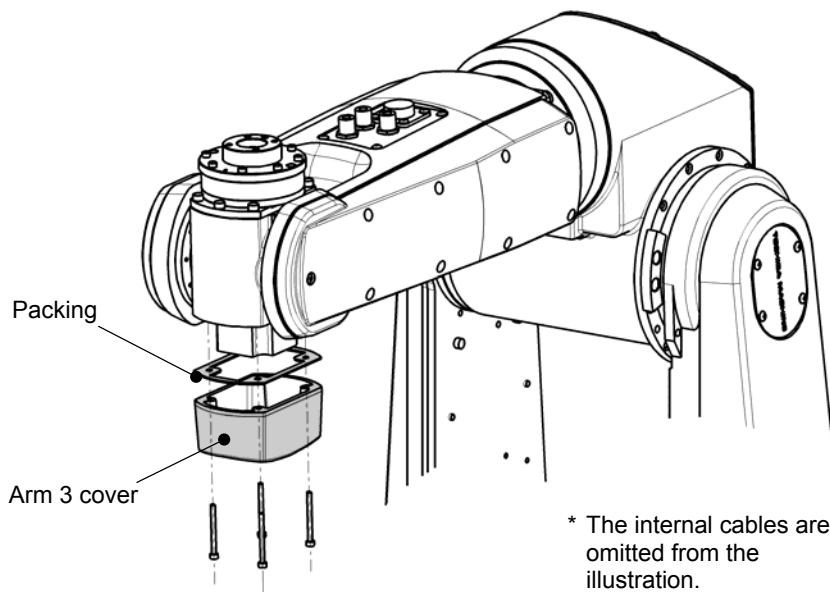


Fig. 5.6 Arm 3 cover



CAUTION

- When mounting the covers, be sure to always insert the rubber packing. The cleanness level will be reduced if the rubber packing is not used.

6. Replacement Parts for Maintenance

6.1 Replacement Parts List for Maintenance (Clean specifications)

Replacement parts for maintenance that are used only in the clean specifications are shown below.

	Item name	Toshiba Machine drawing no.	Unit code	Manufacturer	Qt'y	Remarks
1	Packing assembly	-	Y610A3BN0	TOSHIBA MACHINE	1	-

The other replacement parts for maintenance are identical to the TV800/TV1000 standard machine.

For further information, refer to the “**TV800/TV1000 Instruction Manual: Maintenance**”.

To purchase the replacement parts for maintenance, be sure to first check the robot body serial number before contacting Toshiba Machine.

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