TV800-IP
TV1000-IP/TS3100
Industrial Robot

INSTRUCTION MANUAL

DUST- & DRIP-PROOF TYPE
INDUSTRIAL ROBOT SPECIFICATIONS

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.

The information contained in this manual is subject to change without prior notice to effect improvements.

Preface

This manual describes the specifications of the TV800/TV1000 dust- & drip-proof type industrial robot.

This manual contains the sections relating to the TV800/TV1000 dust- & drip-proof specifications. Before using the robot, be sure to thoroughly read the separate TV800 Instruction Manual for the regular operating procedures.

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.

Warranty

The warranty is the same as that described in the TV800/TV1000 Instruction Manual: Maintenance with the addition of the items below exclusively for the dust- & drip-proof specifications.

Warranty exceptions

1) Faults that occur when using the robot in environments exceeding the protection class for water or dust

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	• Do not burn, disassemble, or try to charge the battery. Doing so could cause the battery to rupture.
 Mandatory	• 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	• The customer must never replace parts or perform modifications except on the items that are described in the manual. Doing co could cause reduced performance, a machine breakdown, or accident.
 Mandatory	• 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 dust- & drip-proof type industrial robot.

Section 2 Transportation

This section describes how to remove the dust- & drip-proof type industrial robot from its box and how to transport it to the installation site.

Section 3 Installation

This section describes the dust- & drip-proof 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 dust- & drip-proof type industrial robot.

Section 5 Maintenance

This section describes the structure of the dust- & drip-proof type industrial robot and all items required for maintenance and inspection of the robot.

Section 6 Replacement Parts for Maintenance

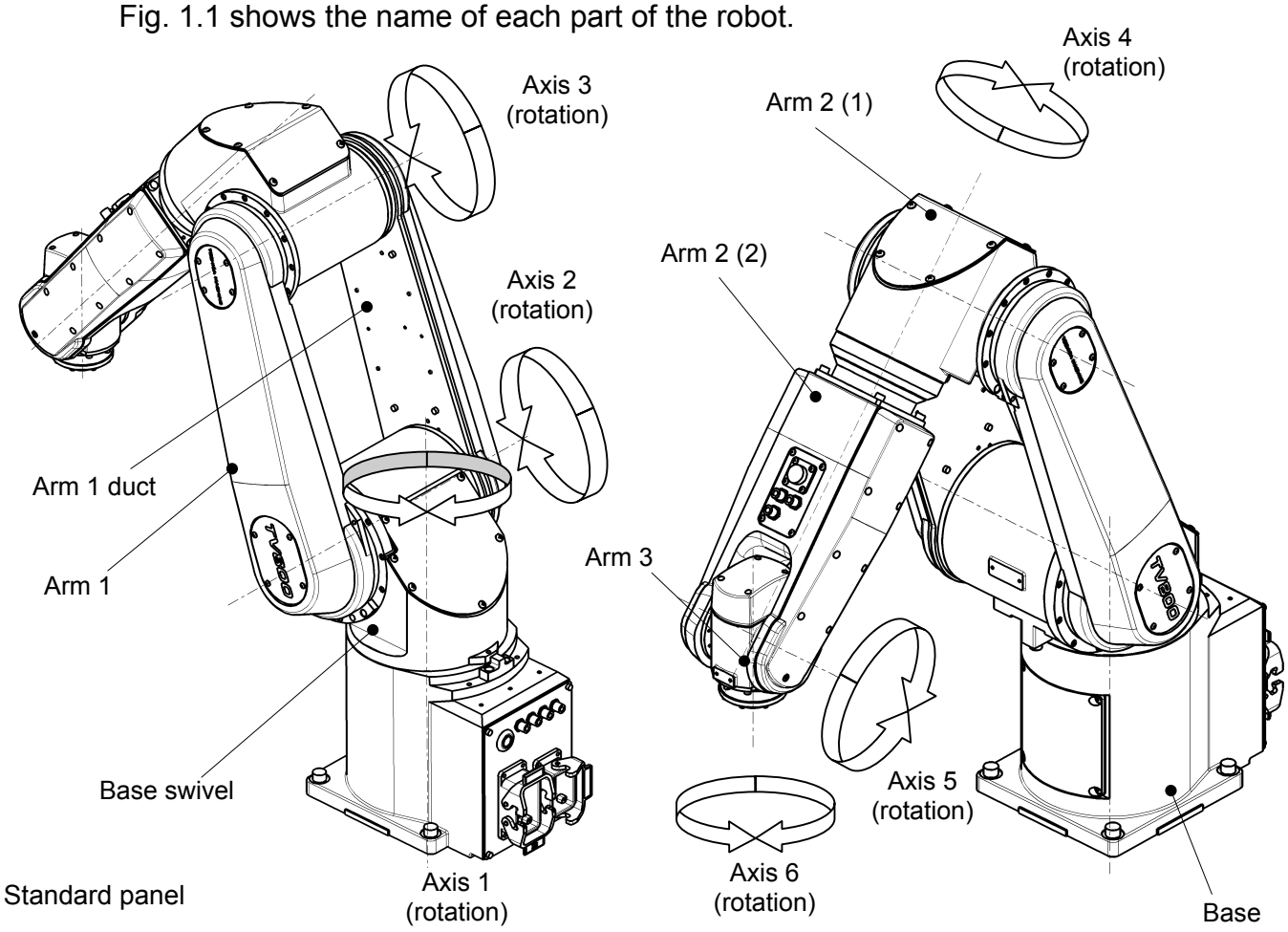
This section describes the replacement parts for maintenance.

Table of Contents

1. Specifications

1.1 Name of Each Part

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



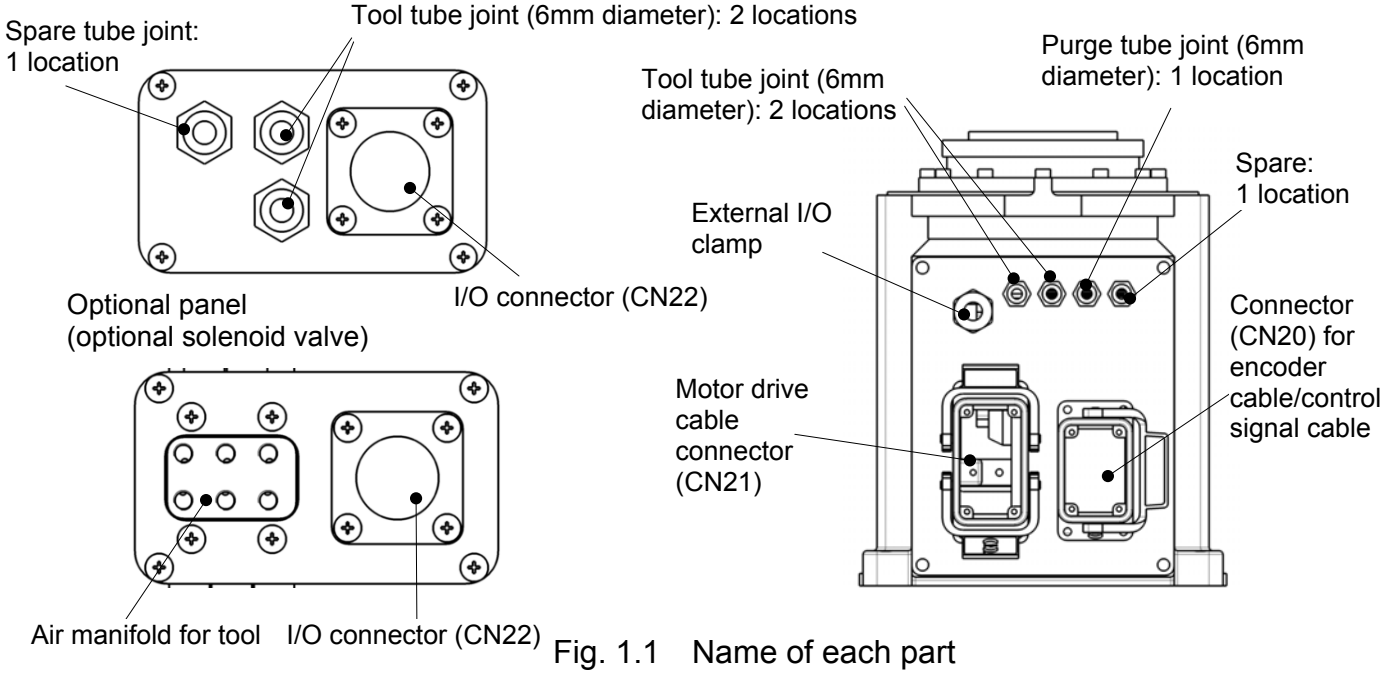


Fig. 1.1 Name of each part

1.2 External Dimensions

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

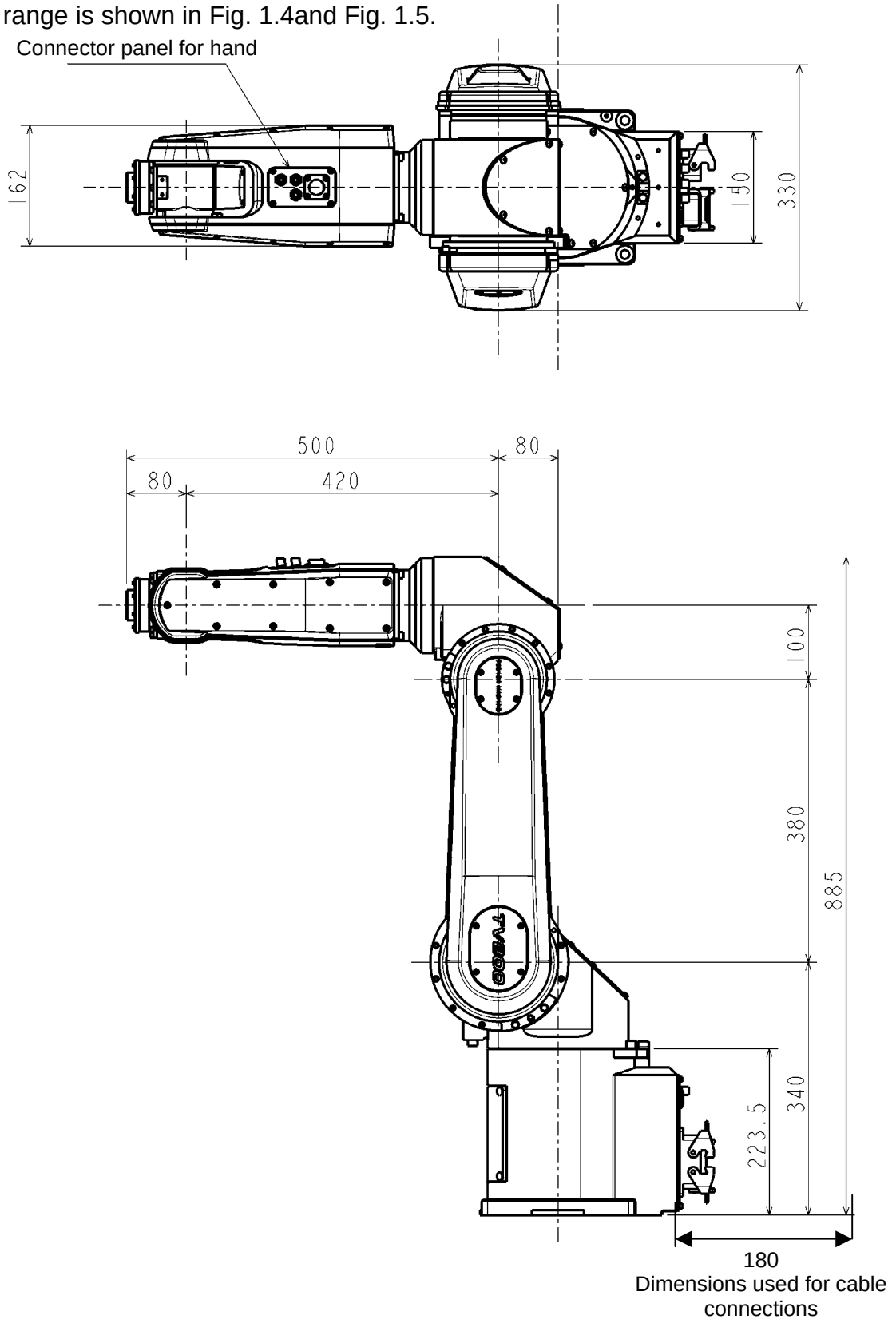


Fig. 1.2 External dimensions of the TV800

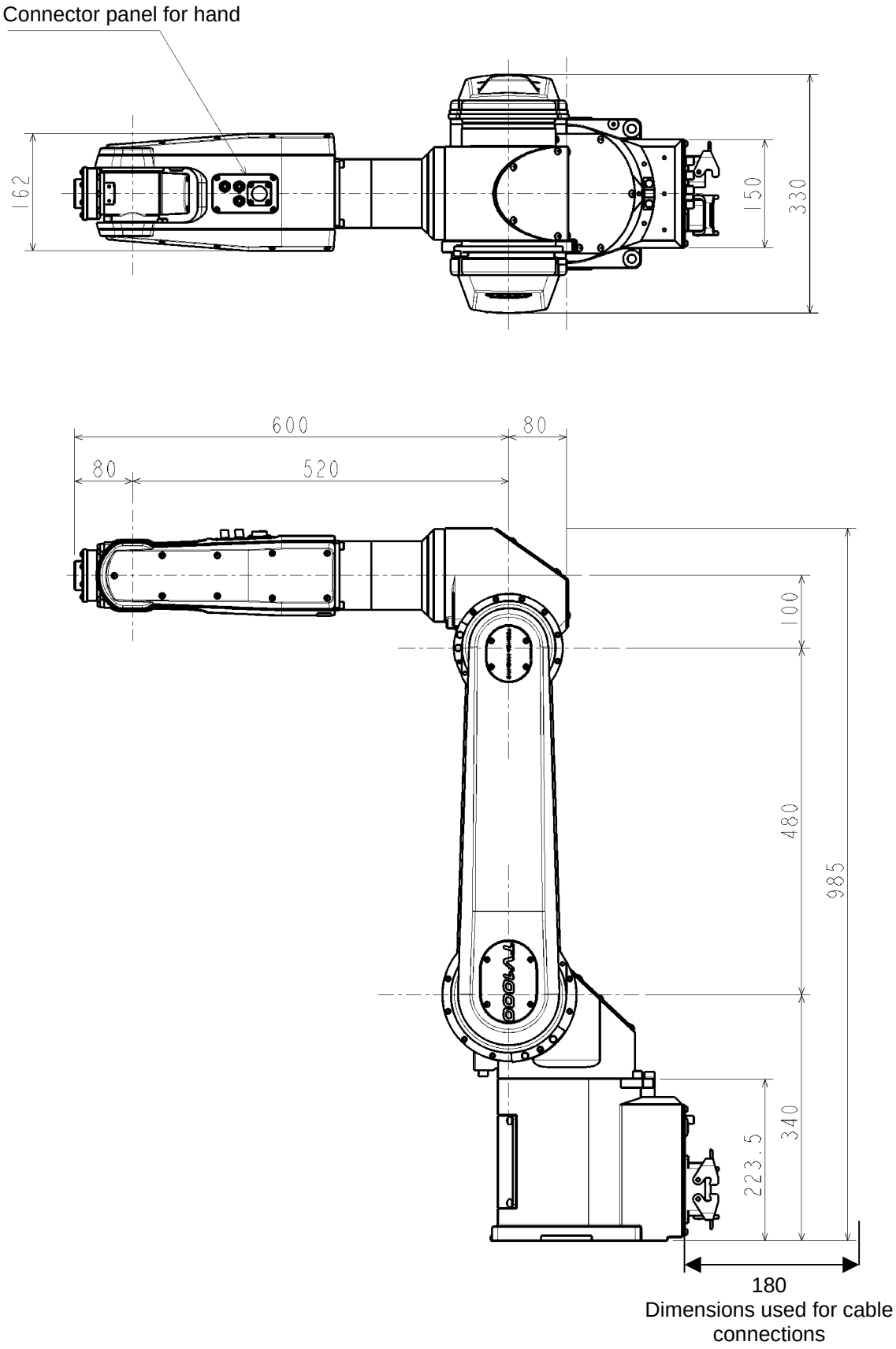


Fig. 1.3 External dimensions of the TV1000

Point P: J6 intersection point operating

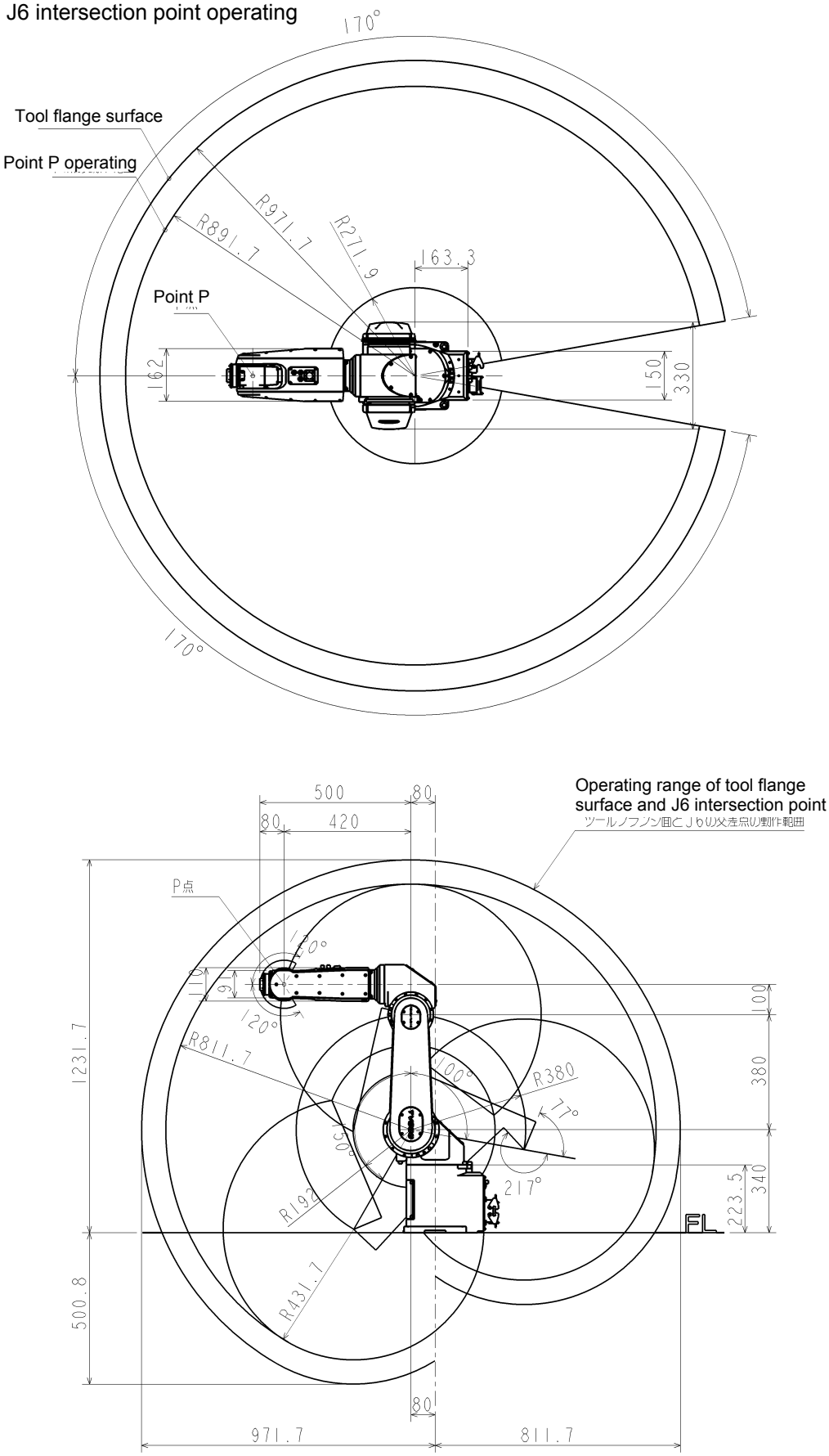


Fig. 1.4 TV800 operating range

Point P: J6 intersection point operating

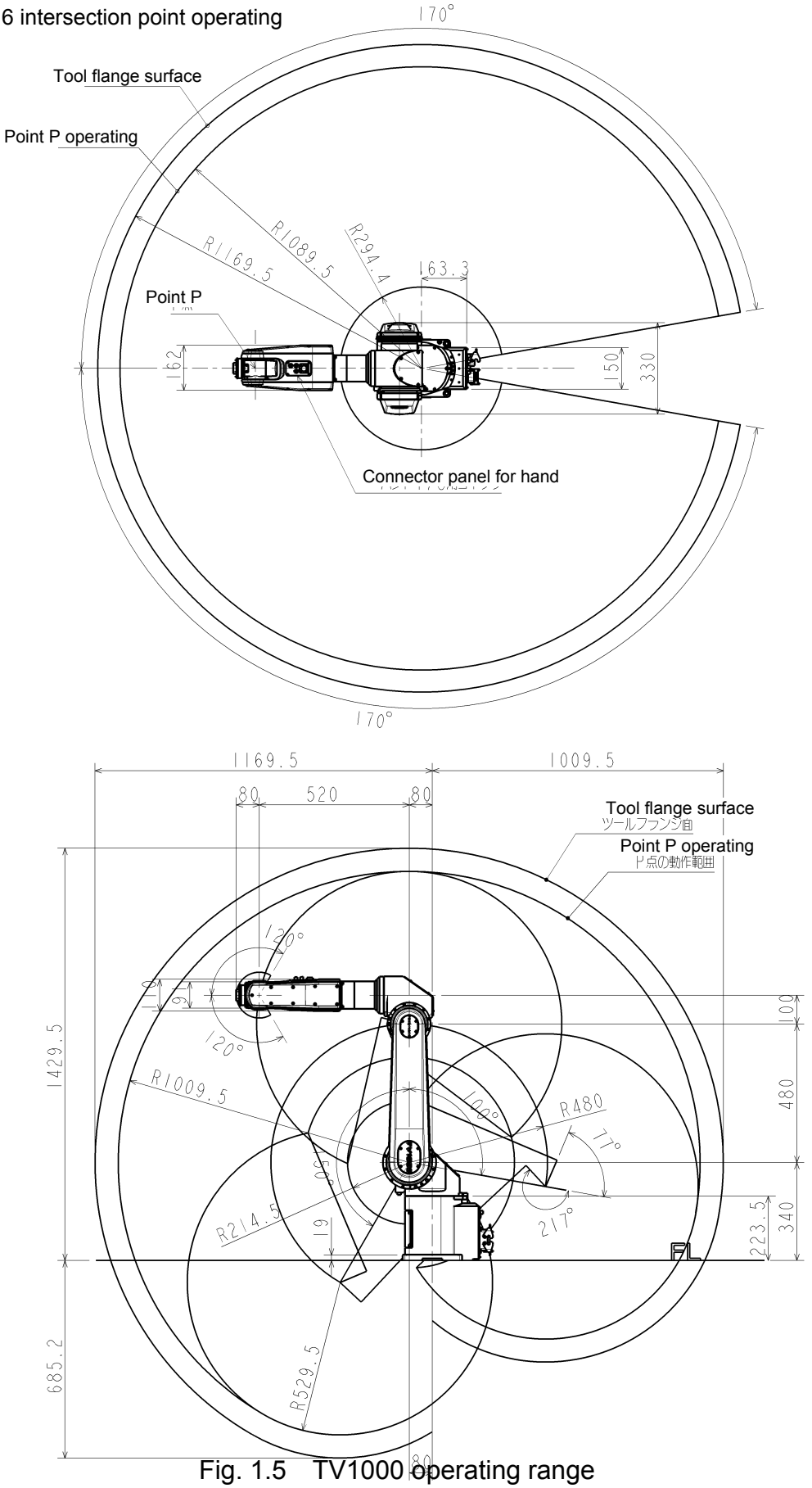


Fig. 1.5 TV1000 operating range

1.3 Specifications Table

Item		Specifications			
Structure		Vertical multi-joint 6-axis robot			
Model		TV800-IP	TV800-IP-BL	TV1000-IP	TV1000-IP-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 *5	AC servomotor All axes with a motor brake	AC servomotor Axes 1, 4, and 6 with no motor brake *5
Position detection method		Absolute			
IP65 specifications		1. Structure that protects against dust ingress 2. Structure that is not adversely affected by water jets from any direction			

*1: The structure of the robot controller is not a dust- & drip-proof 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 axes 2, 3, and 5 are equipped with a motor brake.

2. Transportation

The packaging type, content, weight, and outer dimensions of the wooden crate packaging and corrugated cardboard packaging and the precautions in transporting the robot are identical to those for the standard machine. Refer to the separate **"TV800/TV1000 Instruction Manual: Installation and Transport"**.

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.
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.
Dust-proof/ Drip-proof	No location is submerged in liquid. Not used in an environment where small grinding chips are produced during turning, cutting, and other machining processes. Not used in an environment exposed to mists from cutting oil, coolant, and similar substances.

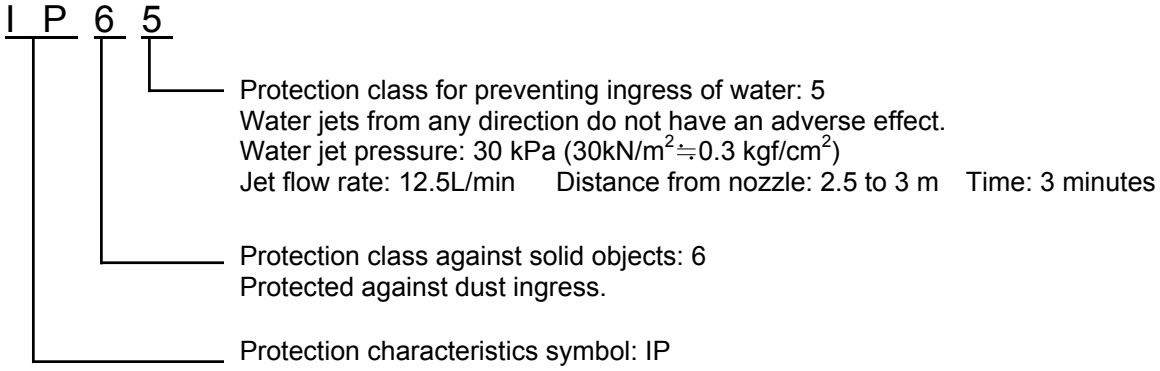
*1: If the robot is used in a place where the temperature rises to 35°C or more, pay special attention to the ambient temperature when the robot is operating. Consider the cooling of the robot body as needed. Please ask us for the cooling of the robot.

DANGER

- 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 Dust- & Drip-proof Specifications Protection Class

The protection class against dust and water in the TV800 dust- & drip-proof specifications is IP65. Be sure to apply an air purge before using the robot. Dust can enter inside if the robot is used in an environment exceeding the protection class.



WARNING

- Do not use with the robot body or any of its parts submerged in water. This can cause the ingress of water.
- Do not use the robot in environments exceeding the protection class for water or dust. This can cause the ingress of water or dust, resulting in a shorter robot lifespan, reduced operating accuracy, or malfunctions.
- The robot controller does not have a dust- & drip-proof design.
- Please contact Toshiba Machine for details about drip protection performance for non-water substances.
- Be sure to always perform an air purge. If an air purge is not performed, dust and drop protection performance will be reduced.
- The dust- & drip-proof specifications do not provide an explosion-proof structure.

3.3 Air Purge

A specified amount of air is supplied from the suction one-touch joint on the connector cover (base rear section) for enabling compliance with the dust- & drip-proof specifications (IP65).

A pressure-reducing valve (prepared by the customer) is set at the pressure from 0.3MPa to a maximum of 0.58MPa, and is connected to an air tube.

The air supply is adjusted to around 30L/min using a speed controller or other device (prepared by the customer). The air supply source and purge air tube (6mm diameter) should be prepared by the customer.

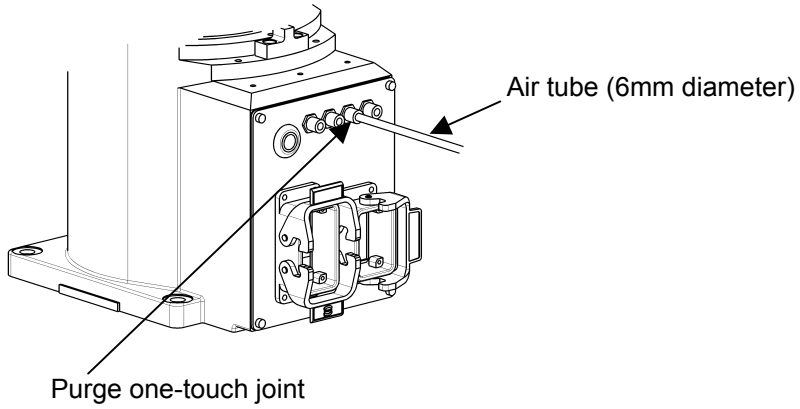


Fig. 3.1 Air Purge

- Air specifications
  - Maximum operating pressure: 0.58MPa (6kgf/cm^2)
  - Tube size: 6mm (outer diameter) x 4mm (inner diameter)
  - Fluid: Clean, dry air not including compressor oil or other substances
    Air filtration 10μm or less
  - Internal pressure air supply: Approx. 30L/min

CAUTION

- The ingress of dust can occur if no air purge is applied.
- The controller is not protected against dust and drip.
- Be sure to always use clean, dry air. If dry air is not used, condensation occurs inside the robot, and the moisture accumulates, resulting in electrical leakage or a malfunction.
- Do not apply a pressure exceeding the maximum specified pressure. This can damage the seals and other components of the joints and reduce dust- & drip-proof performance.

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.

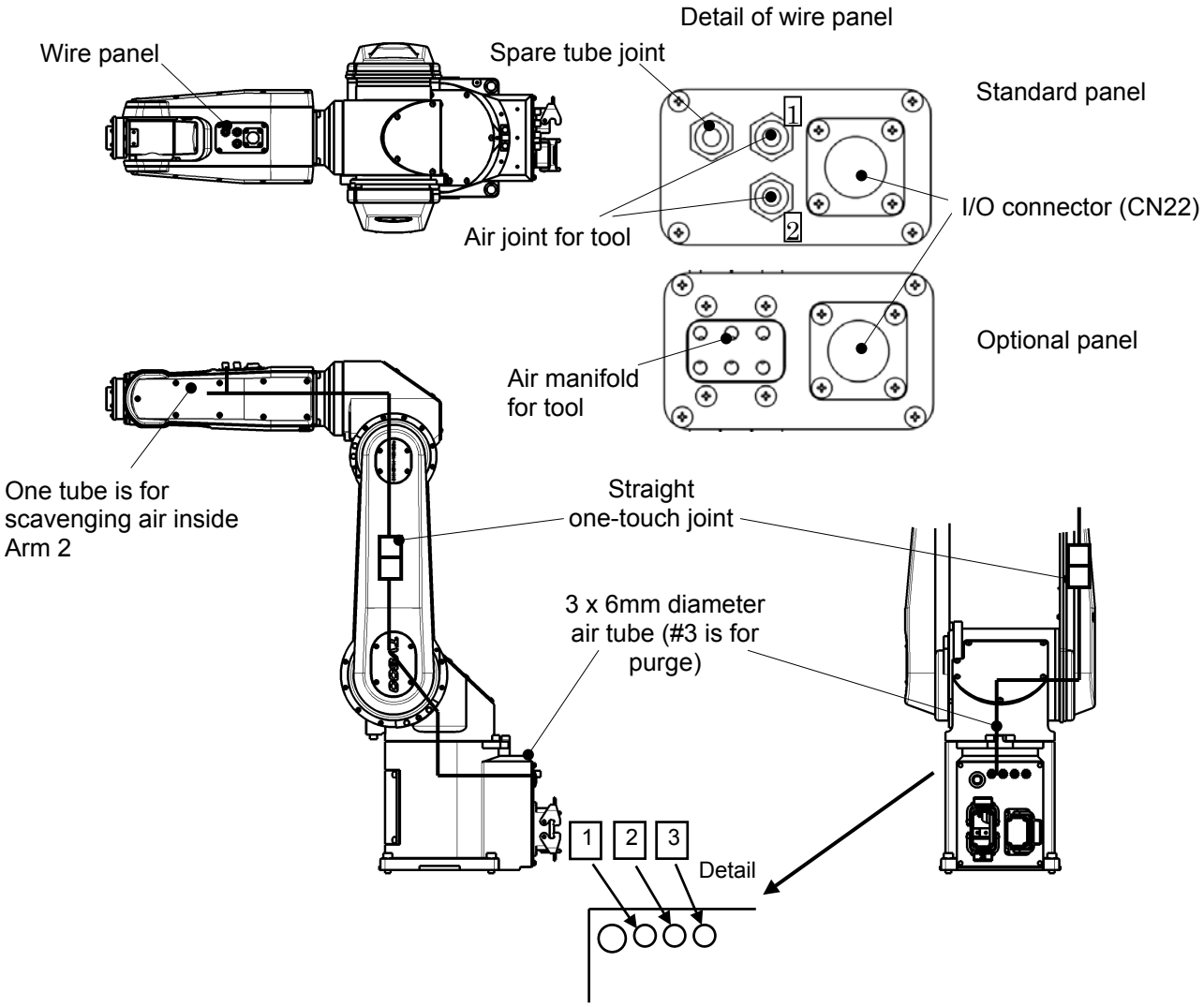


Fig. 4.1 Tool air tubes

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 purge)

5. Maintenance

5.1 Maintenance Items

The inspection items for the dust- & drip-proof 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 purge 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"**.

! CAUTION

- The customer must never replace parts other than those specified in this manual. This can cause reduced dust- & drip-proof performance, faults, or accidents.
- Maintenance parts other than those specified in this manual shall be replaced by the Toshiba Machine service staff. Toshiba Machine will not be liable for any faults or accidents that occur due to replacement by the customer.

! DANGER

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

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
· Scraper

· Liquid gasket (Recommended product: 1221H Manufactured by ThreeBond)
· Loctite (242: Medium strength)

5.3 Mounting and Removing the Covers

Packing is fitted onto the cover mounting surfaces of the dust- & drip-proof 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.

5.3.1 Base Covers

There are two covers for the base section: the base cover and connector panel. 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.

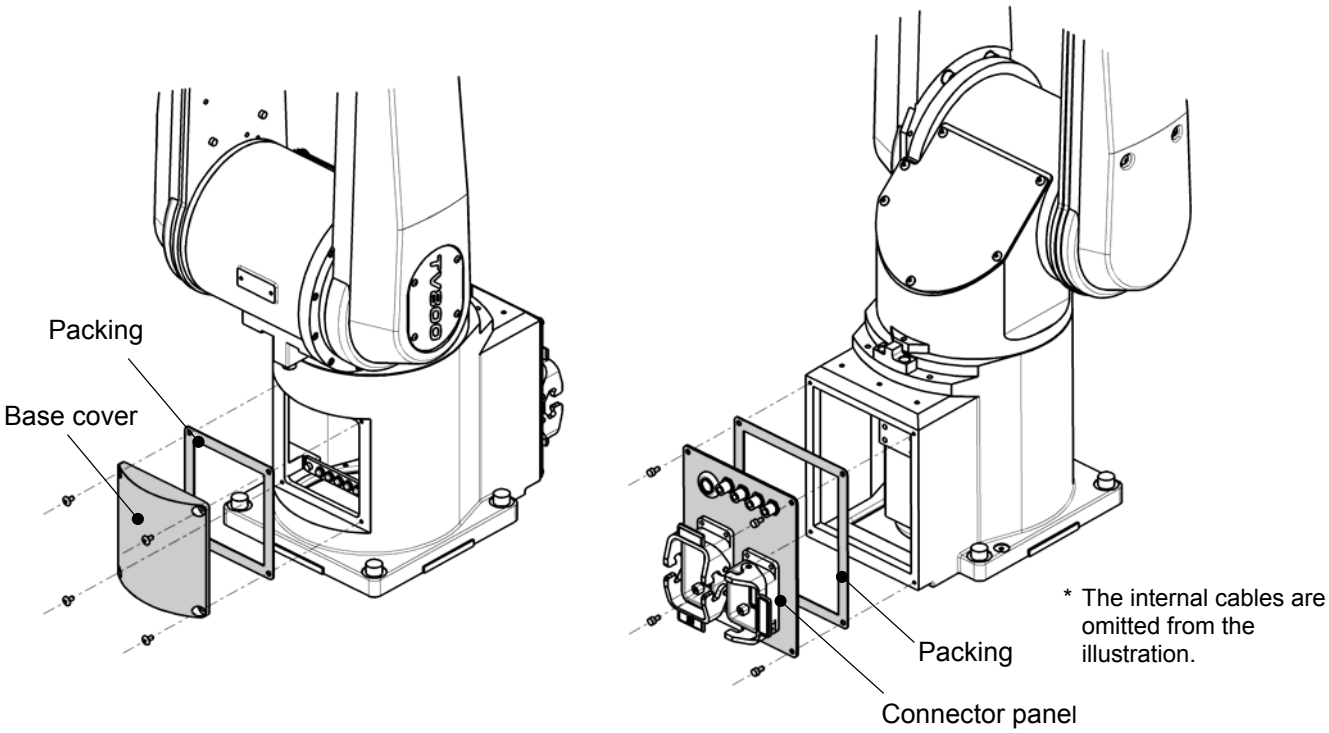


Fig. 5.1 Base cover and connector cover

! CAUTION

- Be sure to always insert the packing. Also, be sure to apply Loctite to the mounting bolts. Failure to apply Loctite will result in reduced dust- & drip-proof performance and the ingress of water and dust.
- Packing that has been removed cannot be reused. Replace with new packing.

5.3.2 Base Swivel Cover

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

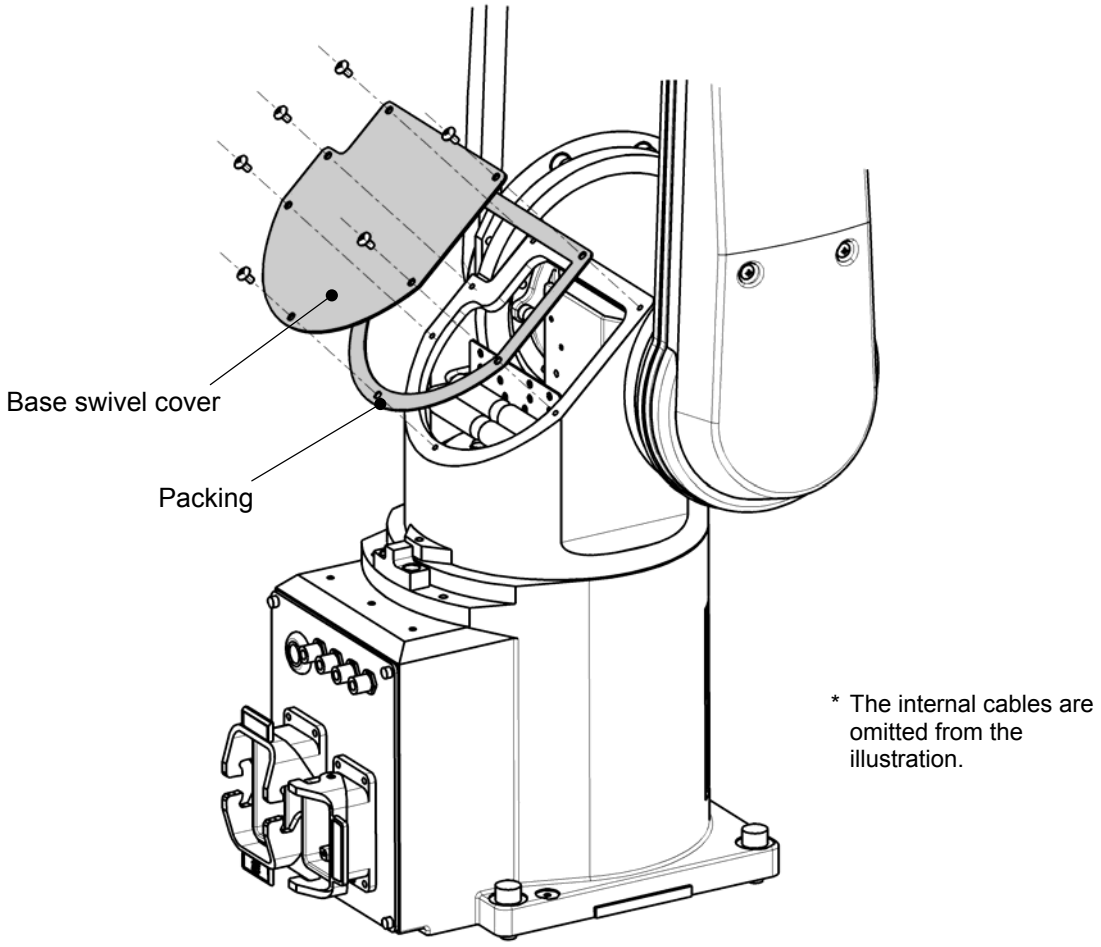


Fig. 5.2 Base swivel cover

! CAUTION

- Be sure to always insert the packing. Also, be sure to apply Loctite to the mounting bolts. Failure to apply Loctite will result in reduced dust- & drip-proof performance and the ingress of water and dust.
- Packing that has been removed cannot be reused. Replace with new packing.

5.3.3 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).
Liquid gasket is applied to the mounting surface of the packing. Therefore, when removing the packing, remove the cover while using a scraper or other tool to gradually peel off the liquid gasket.
When mounting the cover, fit the cover into the groove along the duct plate side.
Be careful that the packing does not come off.
Apply liquid gasket to the bearing faces of the Phillips truss head screws (M4x8) for mounting the cover, and after mounting the cover, use liquid gasket to fill a gap between the duct plate and cover.

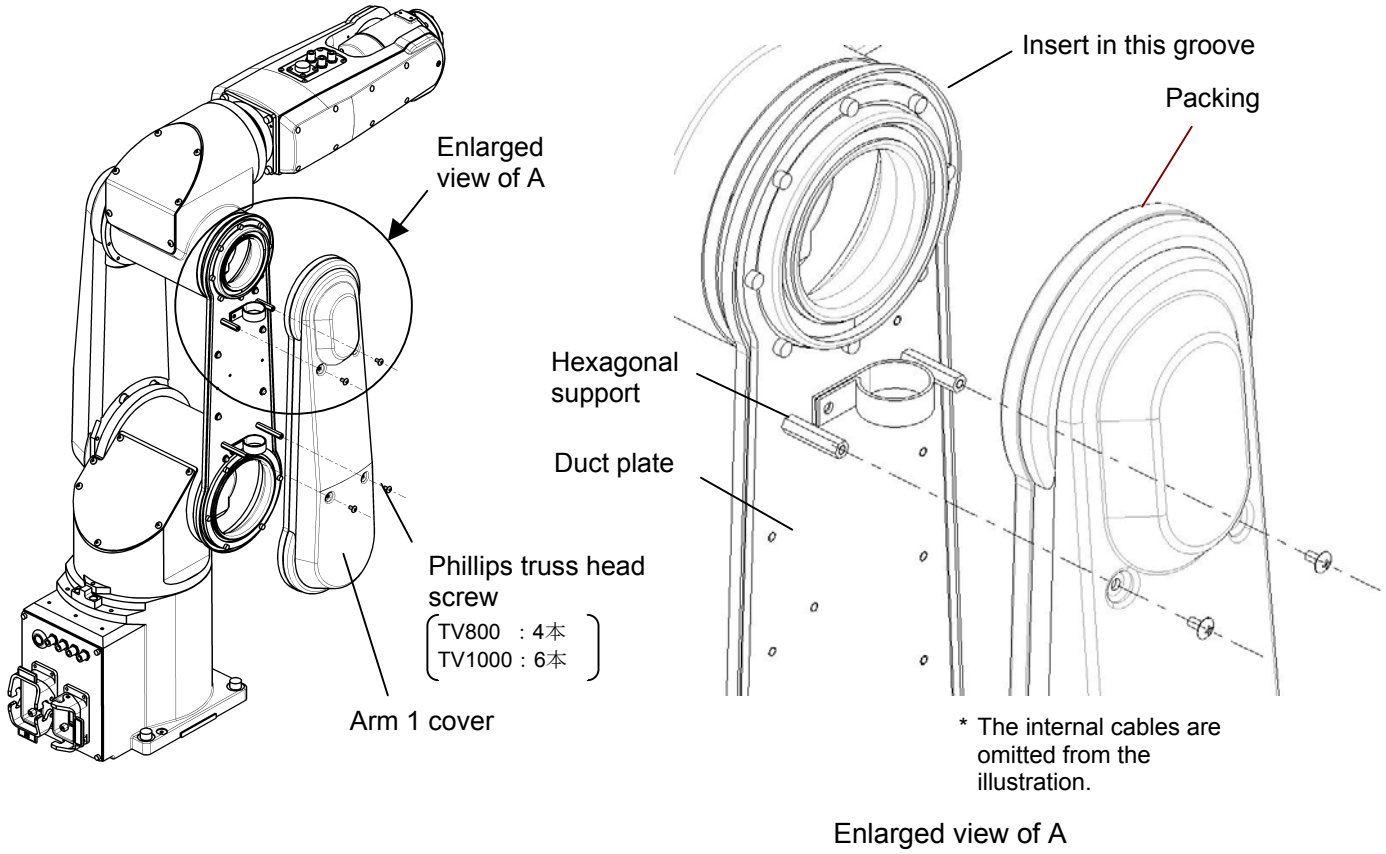


Fig. 5.3 Arm 1 cover

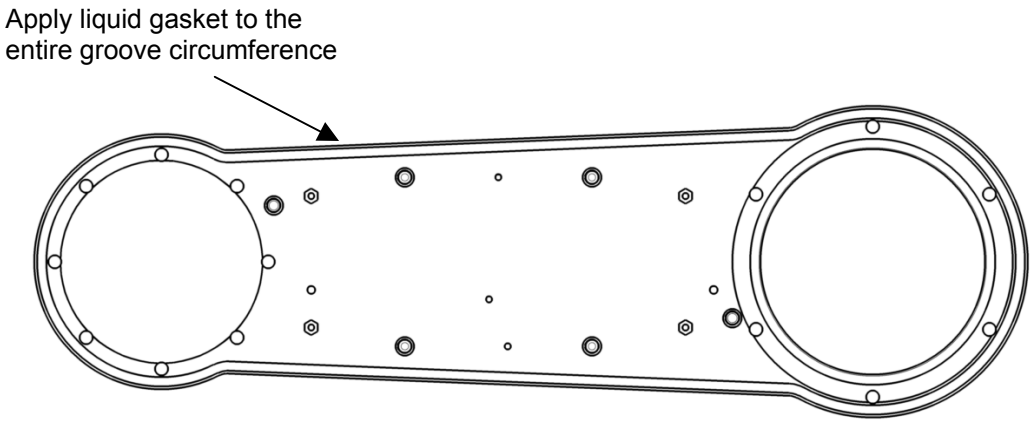


Fig. 5.4 Arm 1 duct plate

! CAUTION

- Apply liquid gasket.
  Also, be sure to apply Loctite to the mounting bolts. Failure to apply Loctite will result in reduced dust- & drip-proof performance and the ingress of water and dust.

5.3.4 Arm 2 Cover (1)

The arm 2 cover (1) is secured to arm 2 (1) by six Phillips truss head screws (M4x8) with a rubber packing inserted in between.
Before mounting the cover, be sure to first apply liquid gasket to the bearing faces of the six Phillips truss head screws (M4x8), and be careful that no cables get pinched in between when mounting.

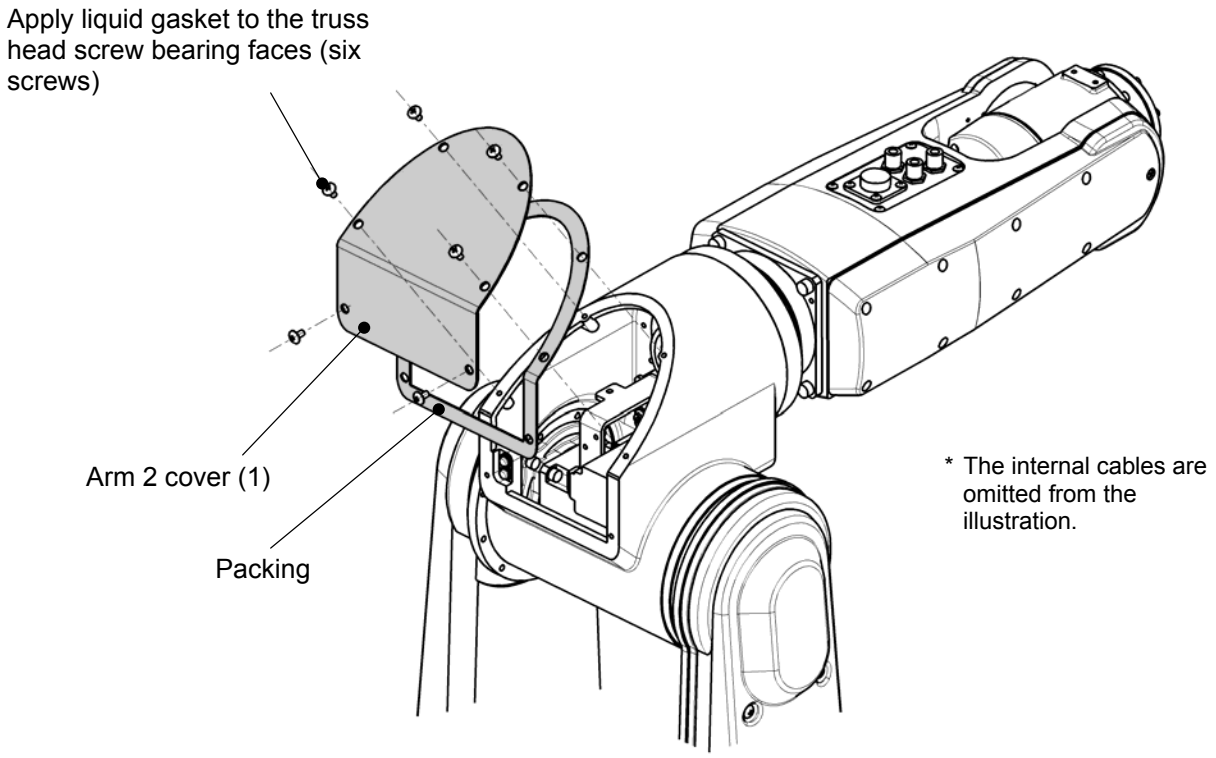


Fig. 5.5 Arm 2 cover (1)

! CAUTION

- Be sure to always insert the packing. Be sure to apply liquid gasket to the bearing faces of the mounting bolts. Failure to apply Loctite will result in reduced dust- & drip-proof performance and the ingress of water and dust.
- Packing that has been removed cannot be reused. Replace with new packing.

5.3.5 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 packing inserted in between.
When mounting the cover, be careful that no cables get pinched in between.
Apply liquid gasket to the bearing faces of the truss head screws (one M3x8 on each side, total of two screws) located at the cover end (see Fig. 5.7).

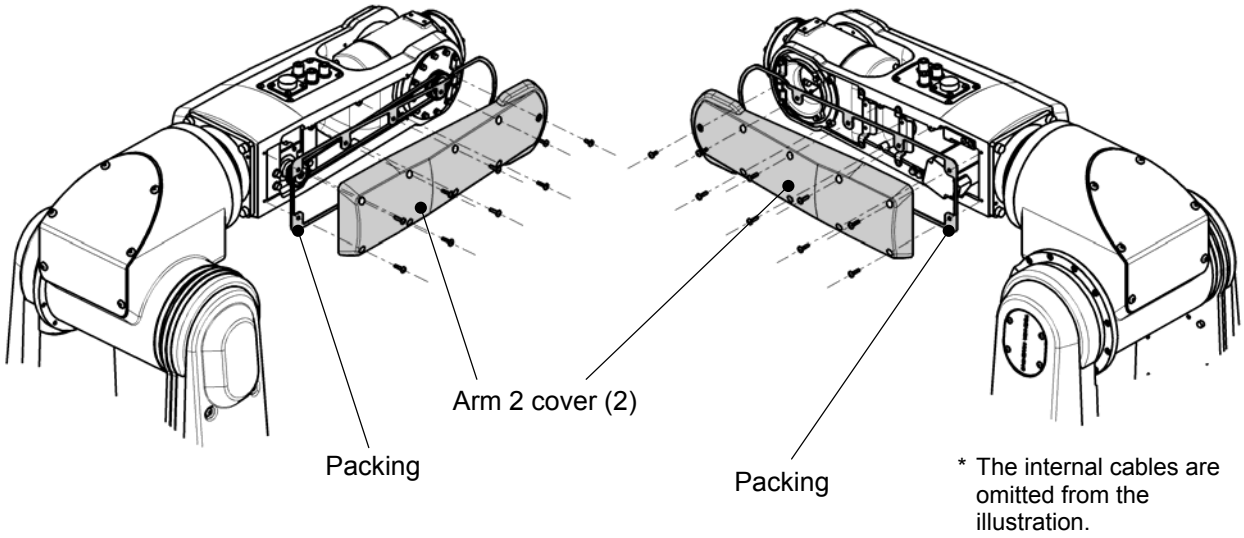


Fig. 5.6 Arm 2 cover (2)

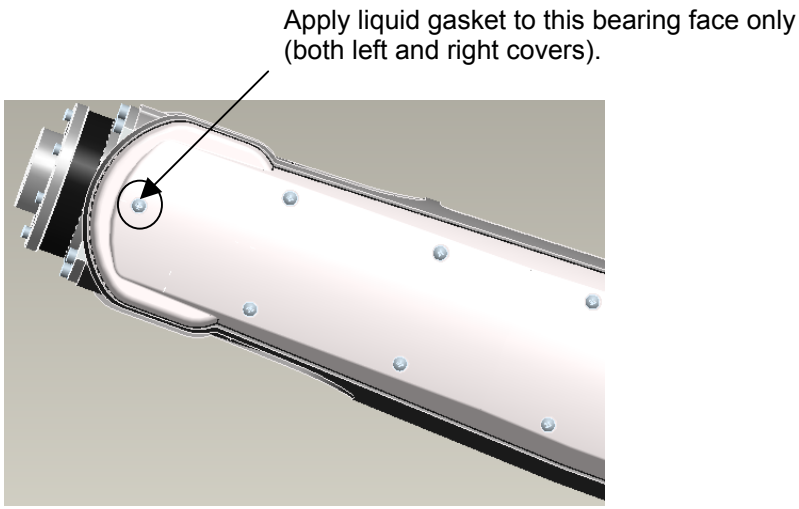


Fig. 5.7 Enlarged view of arm 2 cover (2)

CAUTION

- Be sure to always insert the packing. Also, be sure to apply Loctite to the mounting bolts. Failure to apply Loctite will result in reduced dust- & drip-proof performance and the ingress of water and dust.
- Packing that has been removed cannot be reused. Replace with new packing.

5.3.6 Arm 3 Cover

The arm 3 cover is secured to arm 3 by four hexagon socket head cap screws (M3x35) with a packing inserted in between.
When mounting the cover, be careful that no cables get pinched in between.

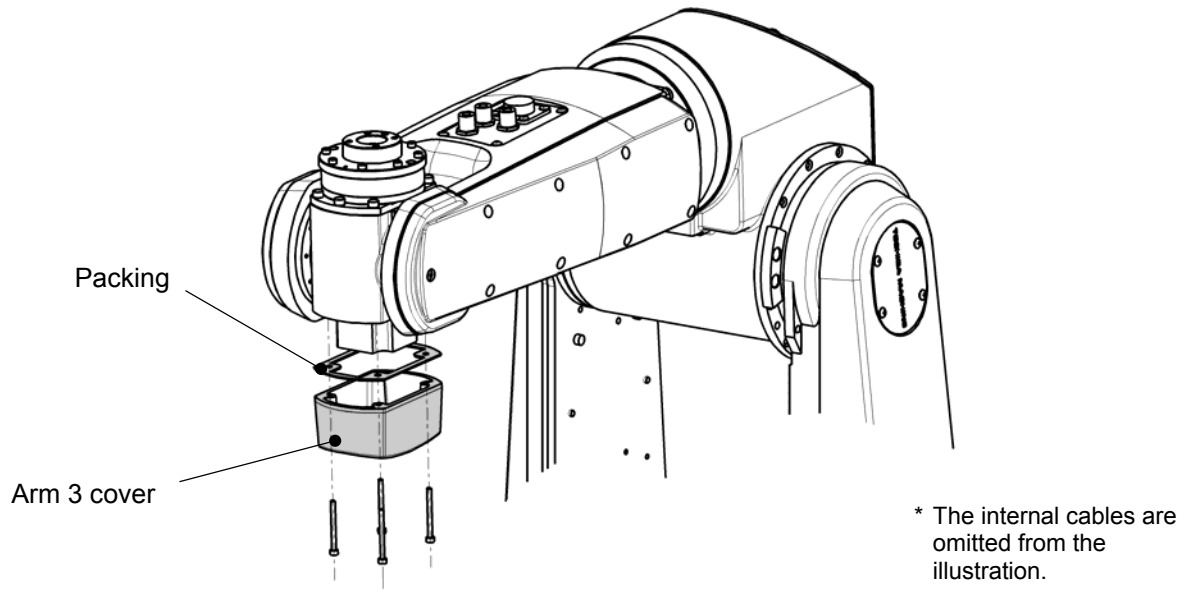


Fig. 5.6 Arm 3 cover

CAUTION

- Be sure to always insert the packing. Also, be sure to apply Loctite to the mounting bolts. Failure to apply Loctite will result in reduced dust- & drip-proof performance and the ingress of water and dust.
- Packing that has been removed cannot be reused. Replace with new packing.

6. Replacement Parts for Maintenance

6.1 Replacement Parts List for Maintenance (Dust- & drip-proof specifications)

Replacement parts for maintenance that are used only in the dust- & drip-proof specifications are shown below.

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