TH850A/TH1050A–IP/TS2100

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.

April, 2009

TOSHIBA MACHINE CO., LTD.

NUMAZU, JAPAN

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

Preface

This manual describes the specifications of the TH–A series dust- and drip-proof type industrial robot.
This manual is essential to keep the robot performance for a long time, to prevent failures and to assure safety. Be sure to look through this manual and set up a maintenance program before actually starting the robot.

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 imminently lead to fatalities or major injuries".
! **WARNING**	This means that "incorrect handling may 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). 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). Details of the actions that must be done are indicated with pictures or words in or near the symbol.
	This means danger or caution. The details of the actual caution are indicated with pictures or words in or near the symbol.

[Maintenance and inspection]

Be sure to observe the following items to use this product safely.

 **DANGER**	
 Prohibited	• DO NOT incinerate, disassemble or charge the batteries. Otherwise, they may rupture.
 Mandatory	• Be sure to turn off the main power switch of the controller before starting inspection or maintenance. • Batteries should be disposed of according to the user's in-house regulations.

! CAUTION	
 Disassembly prohibited	• The user must NEVER replace or modify parts other than those described in the instruction manual. Otherwise, the performance may deteriorate or faults or accidents will be caused.
 Mandatory	• Always use the Toshiba Machine's designated spare parts when replacing the parts. • Maintenance and inspection should be performed regularly. Otherwise, the system may malfunction or accidents will be caused.

This manual is comprised of the following seven (7) sections:

Section 1 Specifications
This section describes the basic specifications and names of respective parts for the dust- and drip-proof type industrial robot.

Section 2 Transportation
This section describes how to remove the dust- and drip-proof type robot from its box and how to transport it to the installation site. This section also deals with the precautions to be taken when the robot is to be stored temporarily after unpacked.

Section 3 Installation
This section discusses the dust- and drip-proof type robot installation environment, space requirements, and how to install the robot.

Section 4 Tool Interface
This section discusses how to connect the cables and pipelines for the tool of the dust- and drip-proof type robot.

Section 5 Maintenance
This section describes the structure of the dust- and drip-proof type robot and all items required for the maintenance and inspection of the same robot.

Section 6 Cleaning of Robot Body
This section describes the precautions to be taken when the robot body is to be cleaned and washed.

Section 7 Replacement Parts for Maintenance
This section explains the replacement parts for the maintenance.

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1. Specifications

1.1 Name of Each Part

The names of respective parts of the dust- and drip-proof type robot are shown in Fig. 1.1 below. (The figure below shows the TH850A robot.)

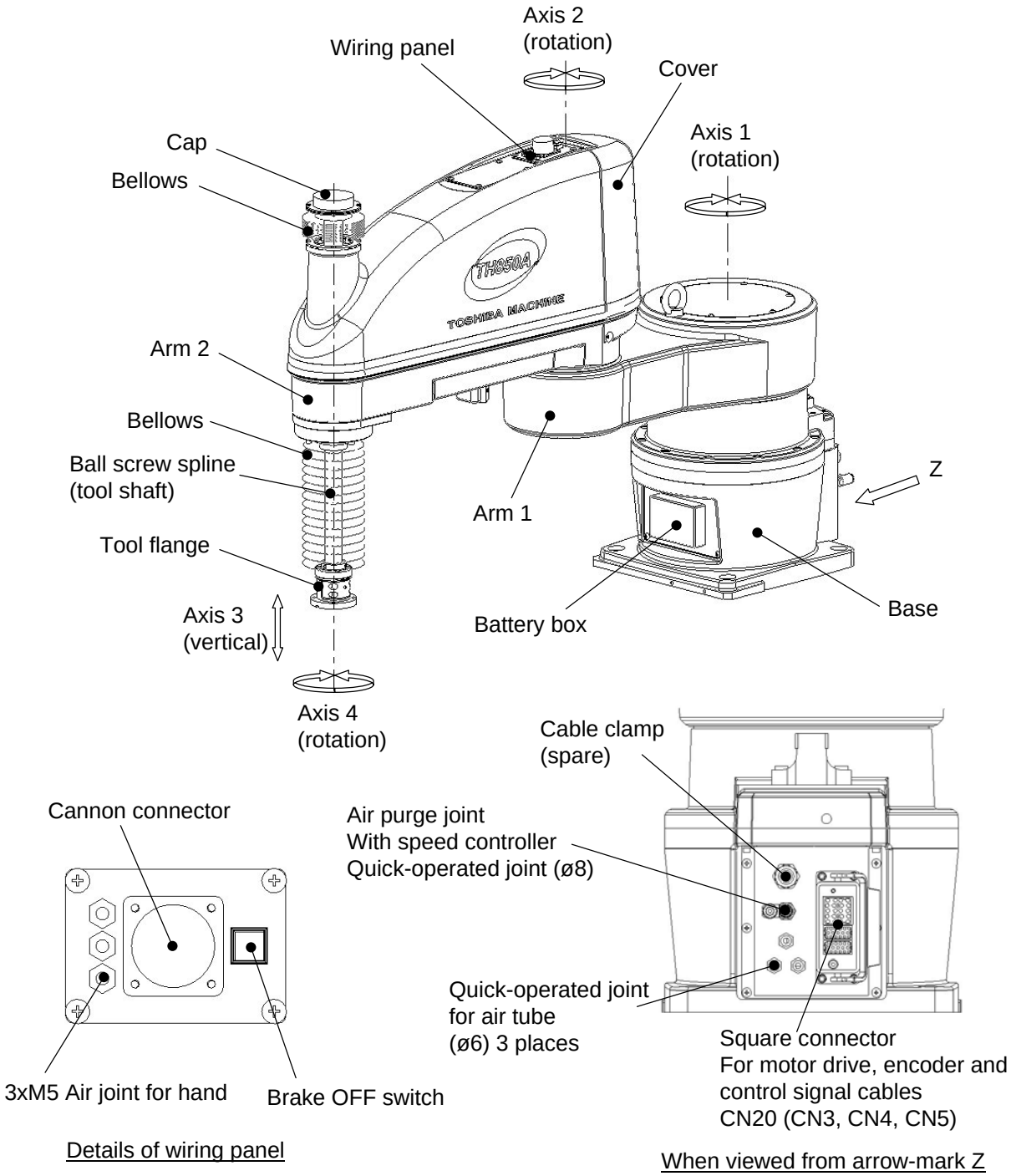


Fig. 1.1 Name of each part

1.2 Outer Dimensions

Fig. 1.2 and Fig. 1.3 show the outer dimensions, and Fig. 1.4 and Fig. 1.5 refer to the operating range of the robot.

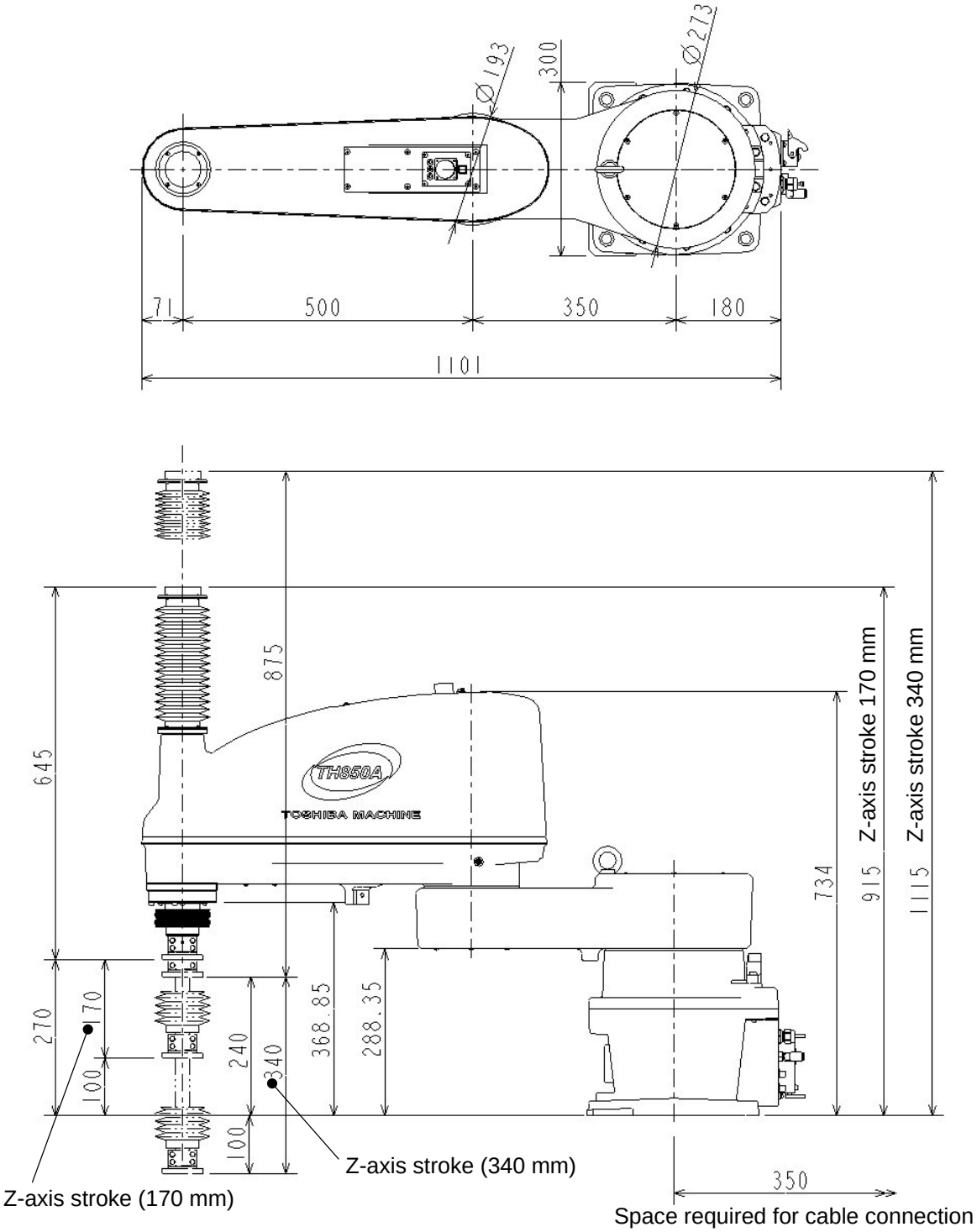


Fig. 1.2 Outer dimensions of the robot (TH850A)

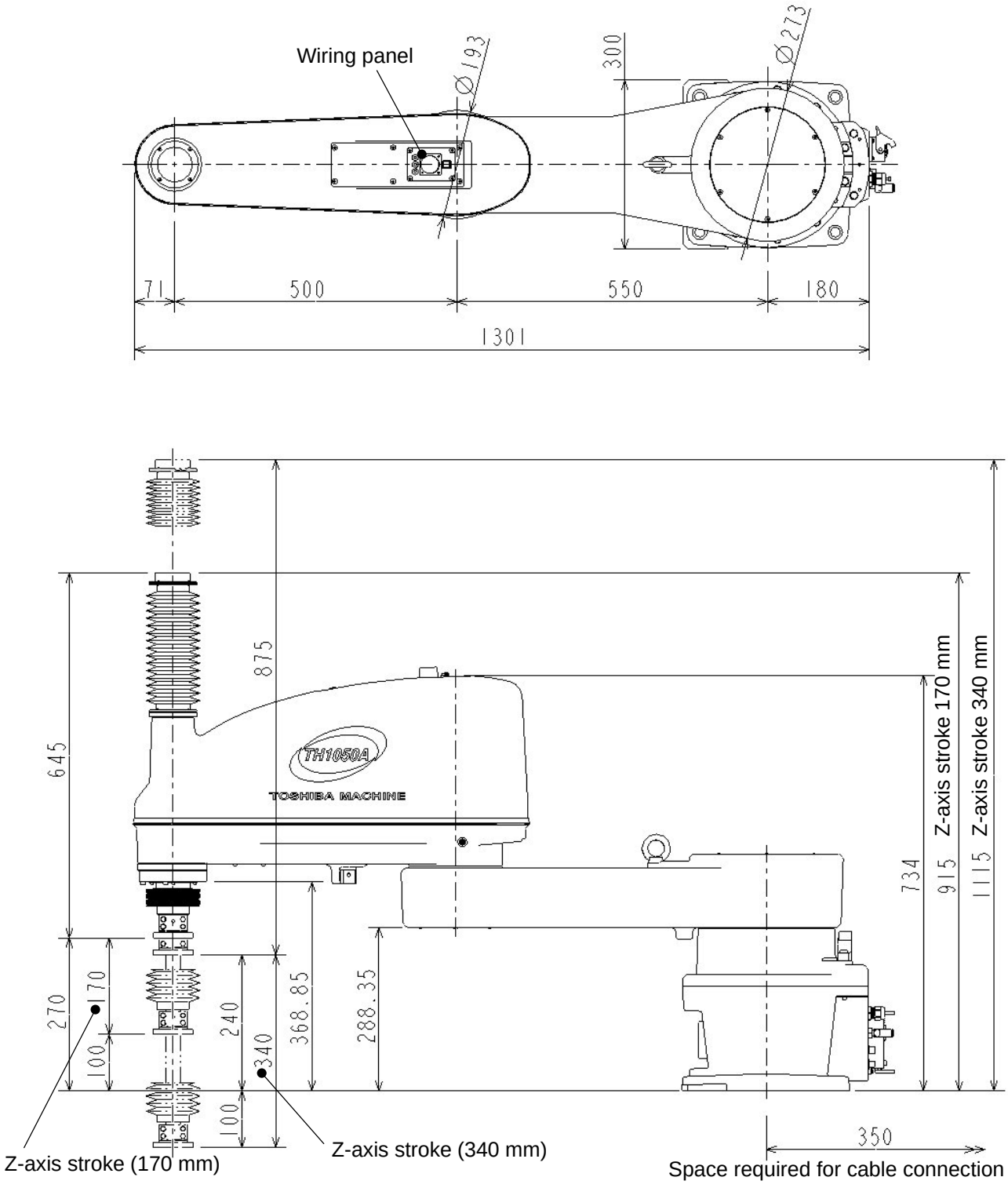


Fig. 1.3 Outer dimensions of the robot (TH1050A)

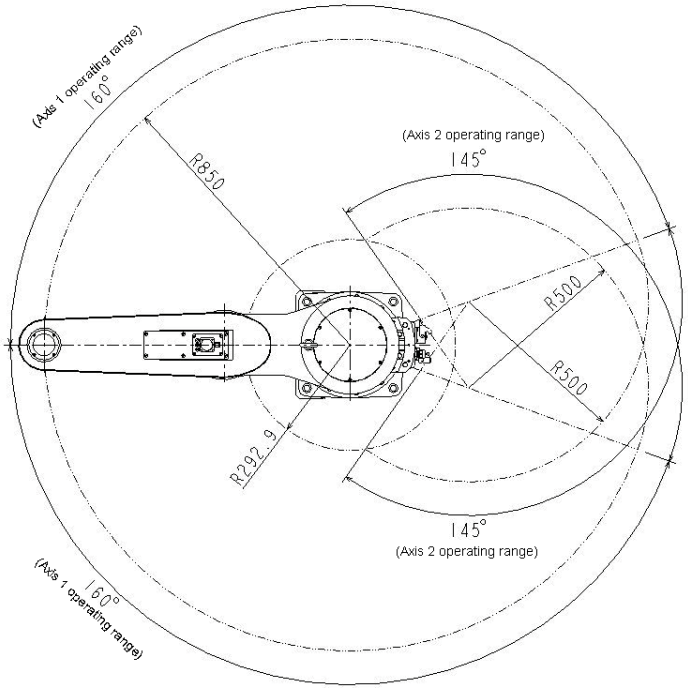


Fig. 1.4 Operating range of the robot (TH850A)

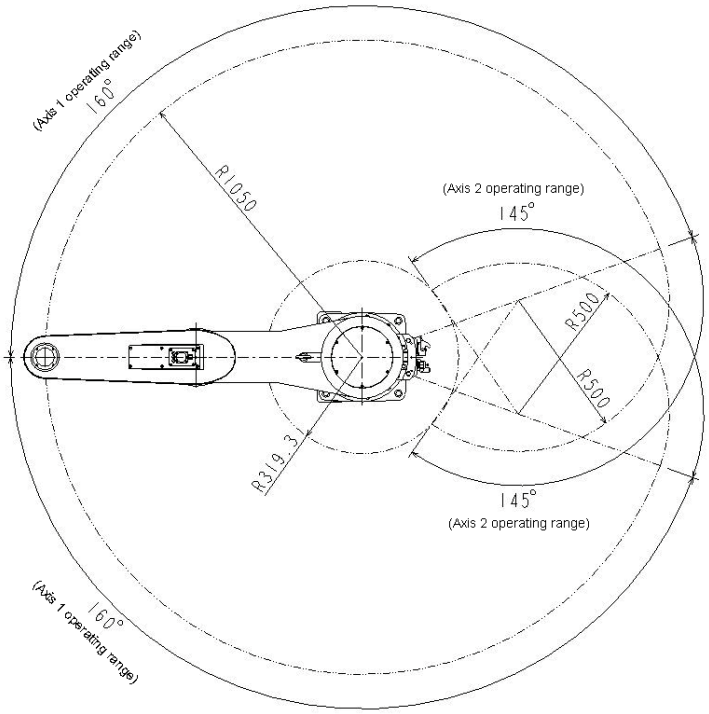


Fig. 1.5 Operating range of the robot (TH1050A)

1.3 Specifications Table

Item		Specifications	
Structure		Horizontal multi-joint type SCARA robot	
Model		TH850A–IP	TH1050A–IP
Ingress protection (IP) class of dust- and drip-proof structure		IP65 (*1)	
Applicable controller		TS2100 (*2)	
Mass of robot body		77 kg	81 kg
No. of controlled axes		Four (4)	
Arm length		850 mm (350+500)	1,050 mm (550+500)
Motor capacity	Axis 1	1,000 (W)	
	Axis 2	1,000 (W)	
	Axis 3	600 (W)	
	Axis 4	750 (W)	
Operating range	Axis 1	±160 (deg)	
	Axis 2	±145 (deg)	
	Axis 3	170 (mm) [Option: 340 (mm)]	
	Axis 4	±360 (deg)	
Maximum speed (*3)	Axis 1	300 (deg/s)	
	Axis 2	420 (deg/s)	
	Axis 3	2,050 (mm/s)	
	Axis 4	1,200 (deg/s)	
	Composite speed of axes 1 and 2	8.13 (m/s)	9.15 (m/s)
Rated payload mass		5 (kg)	
Maximum payload mass		20 (kg)	
Permissible load inertia (*3)		0.2 (kg·m^2)	
Repeatability (*4)	X, Y	±0.01 (mm)	
	Z	±0.01 (mm)	
	C	±0.004 (deg)	
Cycle time (*5) (When payload mass is 5 kg)		0.39 (sec)	
Drive system		By means of AC servo motors	
Position detection method		Absolute	

*1: For details of the IP class, see Para. 3.2.

*2: The structure of the robot controller is not dust- and drip-proof.

*3: When the mass of load exceeds 2 kg, or when the gravity center position of load is away from the axis 4 center position, both the speed and acceleration should be reduced, using the PAYLOAD command.

*4: The ambient temperature is predetermined at 20°C.

*5: Shuttle time for rough positioning in horizontal direction of 300 mm and vertical direction of 25 mm.

2. Transportation

2.1 Unpacking

The robot and controller are shipped separately in wooden crates and corrugated cardboards.
Open the packages in a location easily accessible, where the equipment is to be installed. Take careful precautions not to damage the robot and controller.
After opening the packages, make sure that all the accessories are present and that no part has been damaged during transport.
The package posture and contents are the same as in the standard robot. See the TH850A/TH1050A Installation and Transportation Manual provided separately.
For the dust- and drip-proof type robot, strictly observe the following cautions.

! CAUTION

- The main robot is factory-packed in a vinyl bag for shipment. Carefully remove the bag after the shipment has reached your office. If the vinyl bag is pulled by force, the bellows or cover may be damaged.

2.2 Transportation

Move the robot and controller very carefully. Make sure that no excessive impact or vibration is exerted on the equipment. If the equipment is to be subject to vibration over a long period, be sure to tighten all of the clamp and base set bolts completely and put the equipment back into the wooden crates and corrugated cardboards.

2.2.1 Mass and Outer Dimensions

The mass and outer dimensions of the robot at the time of transport are shown in Fig. 2.1 and Fig. 2.2.

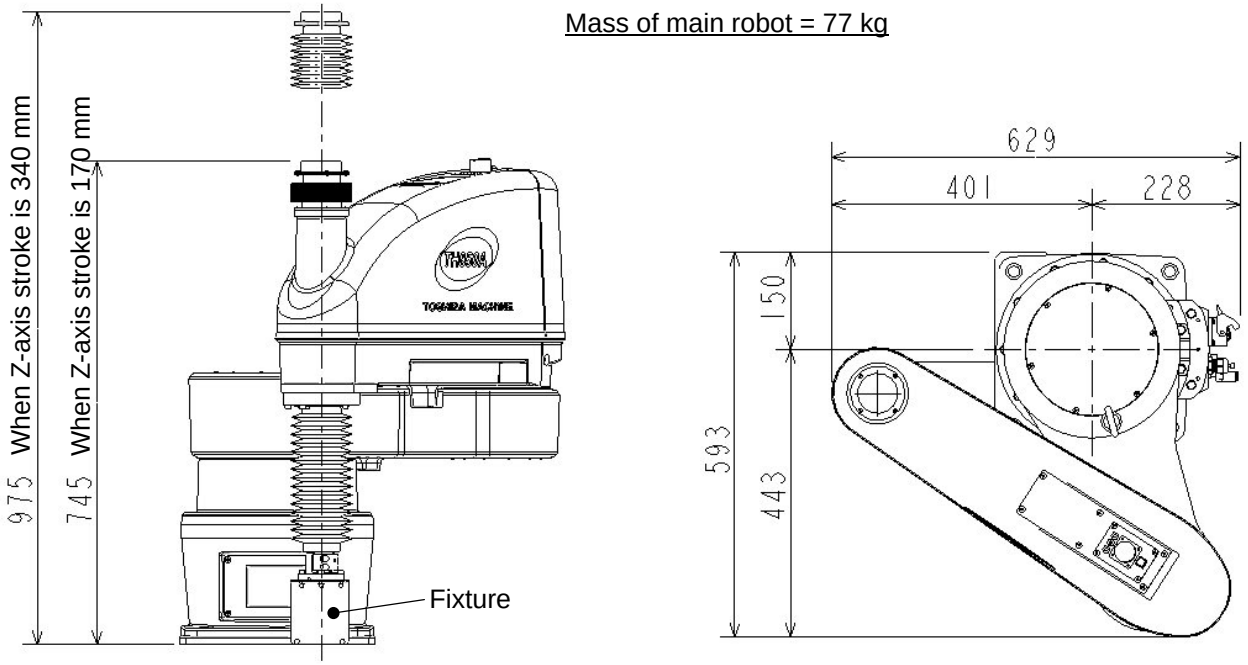


Fig. 2.1 Outer dimensions at transport (TH850A)

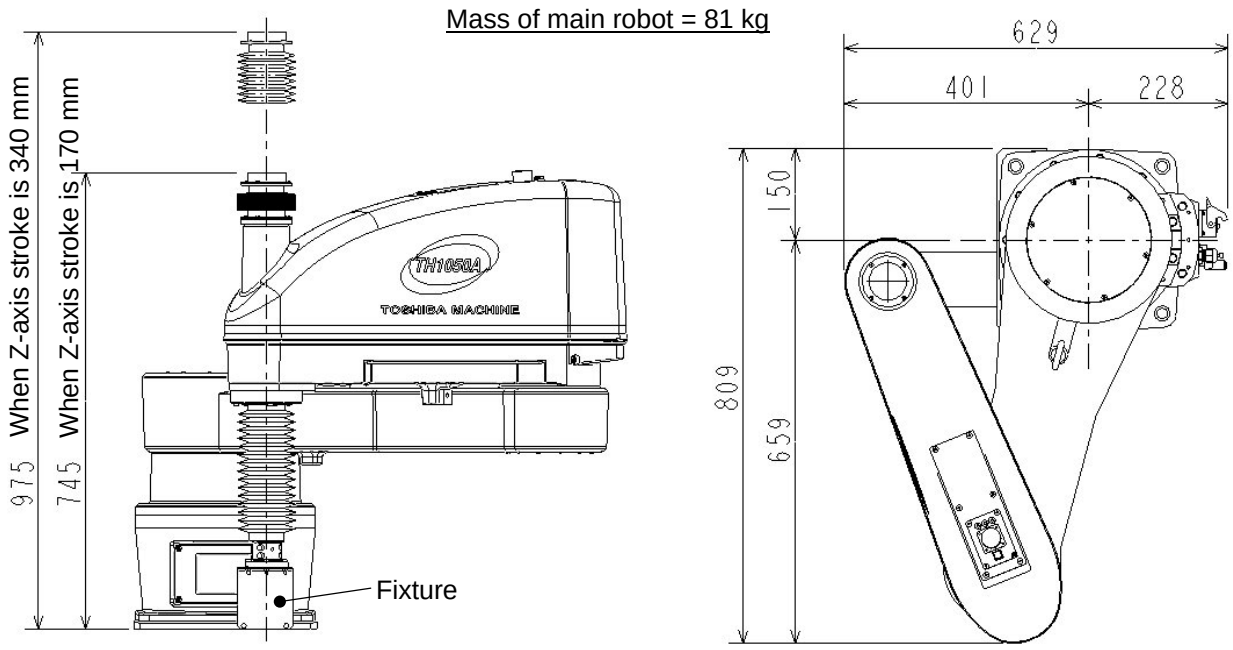


Fig. 2.2 Outer dimensions at transport (TH1050A)

2.2.2 Transporting the Robot

The dust- and drip-proof type robot equals the standard robot added with dust- and drip-proof parts such as bellows. The precautions to be taken at transport are stated below. The precautions other than the below are the same as in the standard robot. See the TH850A/TH1050A Installation and Transportation Manual provided separately. (The figure below shows the TH850A robot.)

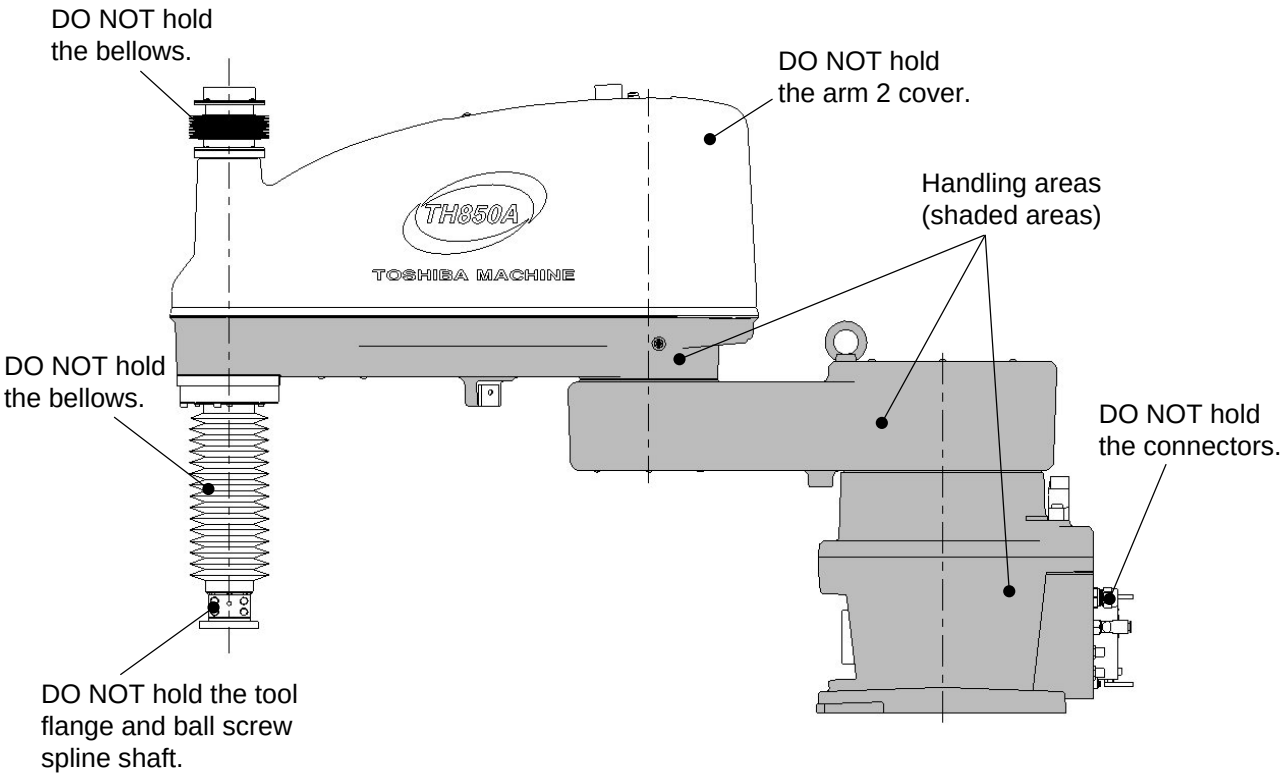


Fig. 2.3 Robot handling prohibited areas

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

! CAUTION

- When lifting up the robot by workers, hold the shaded locations by hands, as shown in Fig. 2.3. If the ball screw spline shaft is held by hands, an unusually large force is exerted, resulting in a malfunction.
- If the bellows is held or gripped by hands, it may be broken due to friction with the parts inside.
- When carrying the robot by workers, take careful precautions to prevent their hand or leg from being caught in the robot.
- The work should always be performed by two (2) 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 40°C In storage : –10 to 50°C
Humidity	20 to 90 % (Non-condensing)
Altitude	1000 m or less
Vibration	In operation : 0.98 m/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 and drip-proof	Any place where the equipment sinks in liquid shall not exist. Small chips involved in turning or cutting operation shall not be contained. Mist of cutting fluid or coolant oil shall not be contained.

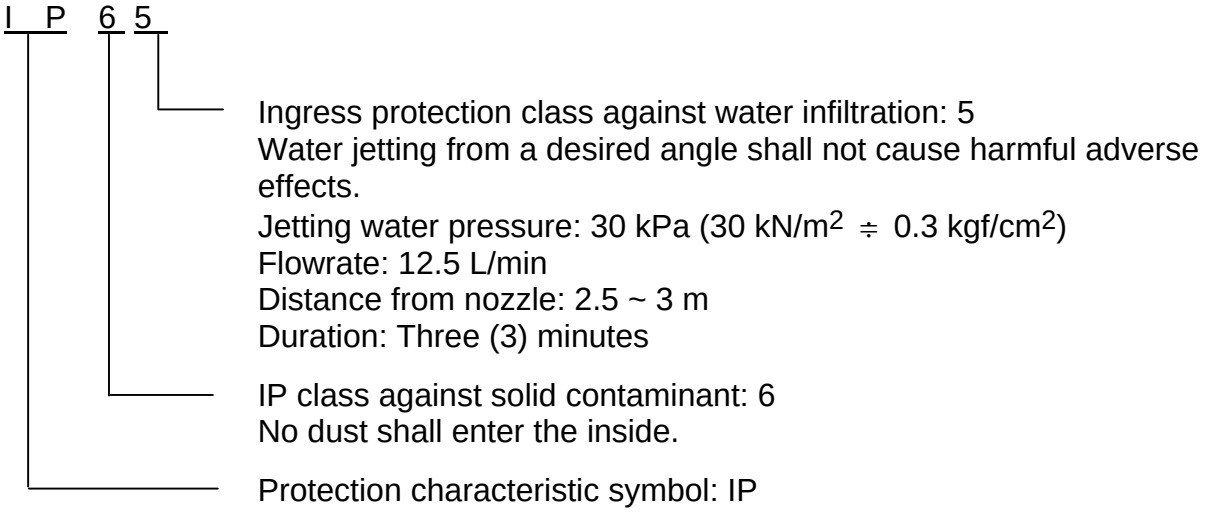
! DANGER

- 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 Ingress Protection (IP) Class of Dust- and Drip-Proof Specification

For the dust- and drip-proof specification of TH850A/TH1050A, the ingress protection (IP) class against dust and water is IP65 or equivalent.

Be sure to perform air purge. Under some operating environment, water or dust may enter.



! WARNING

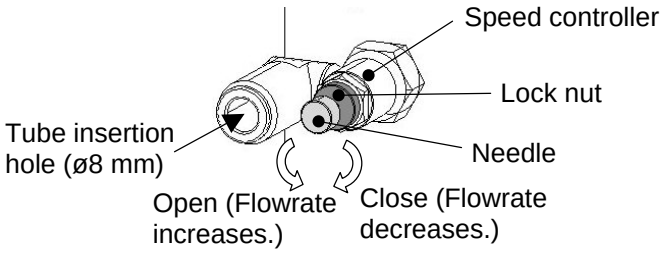
- DO NOT use the entire robot or part of the robot sinking in water. Otherwise, the water will enter the robot interior.
- DO NOT use the robot in an environment exceeding the specified IP class against water and dust. Otherwise, the water or dust may enter the robot interior, resulting in shortening of the robot life, deterioration of operating accuracy or mis-operation of the robot.
- The robot controller does not have dust- and drip-proof specification.
- For the drip-proof ability against other than water, consult us.
- The bellows may discolor under some operating environment, which poses no problem, however, to the dust- and drip-proof performance.
- Be sure to perform air purge. Otherwise, the dust- and drip-proof performance will drop.
- The dust- and drip-proof specification does not mean the explosion-proof structure.

3.3 Air Purge

The dust- and drip-proof type robot is provided with an air supply port for air purge in its base connector unit. See Fig. 1.1. (Quick-operated joint with speed controller)
By feeding air into the air supply port, entry of dust into the robot can be prevented.
The air supply unit (reducer or pressure reducing valve, air filter, etc.) and air tube (8 mm-dia.) should be provided by the customer.

- Air specifications
  Maximum operating pressure: 0.58 MPa (6 kgf/cm^2)
  Tube size: Outer dia. 8 mm × Inner dia. 5 mm
  Fluid used: Fresh dry air not containing compressor oil, etc.
  Filtration accuracy of air filter 10 µm or less

- How to regulate flowrate
  Fully close the speed controller attached to the robot base connector unit.
  Set the pressure to 0.3 MPa ~ 0.58 MPa (maximum pressure), using a regulator (or pressure reducing valve: to be provided by the customer), then connect the air tube.
  Turn the needle of the speed controller counterclockwise from the fully closed state to increase the flowrate. Regulate the flowrate while observing the bellows condition and tighten the lock nut of the speed controller.
  If the air volume fed is too much, the bellows will swell out. Regulate the air to just before the bellows starts expanding.



! CAUTION

- Be sure to use fresh dry air. Otherwise, the robot interior will condense and water stays there, resulting in an electric leak or malfunction.
- DO NOT increase the pressure exceeding the specified maximum pressure. Otherwise, the seal, etc. of each joint will be broken to damage the dust- and drip-proof performance.

3.4 Coordinate System

The robot's joint angle origin (0° or 0 mm position) is factory-calibrated according to the base reference planes. Fig. 3.1 and Fig. 3.2 show the base coordinate system (XB, YB, ZB) and origin of each axis joint angle.

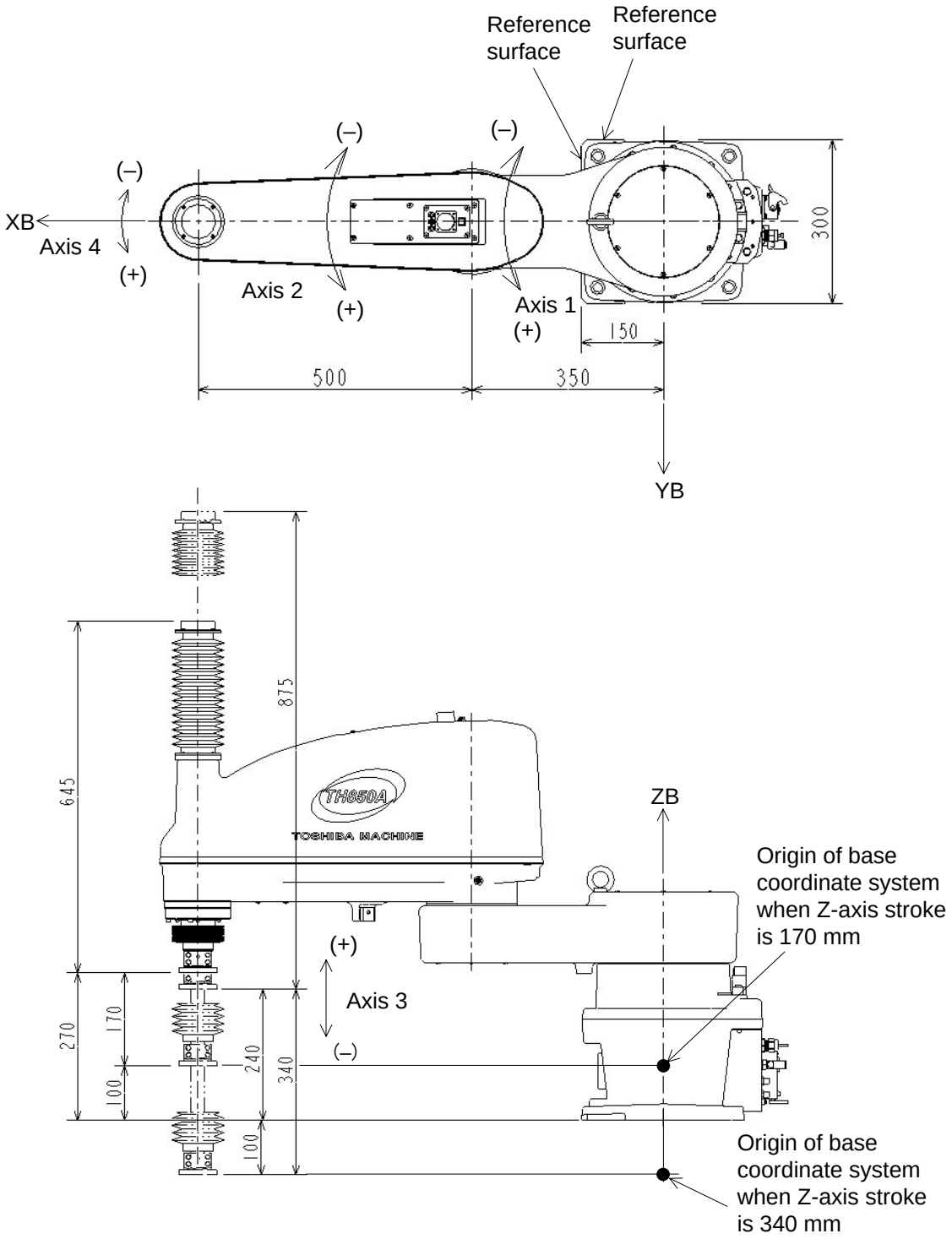


Fig. 3.1 Base coordinate system and joint angle origin (TH850A)

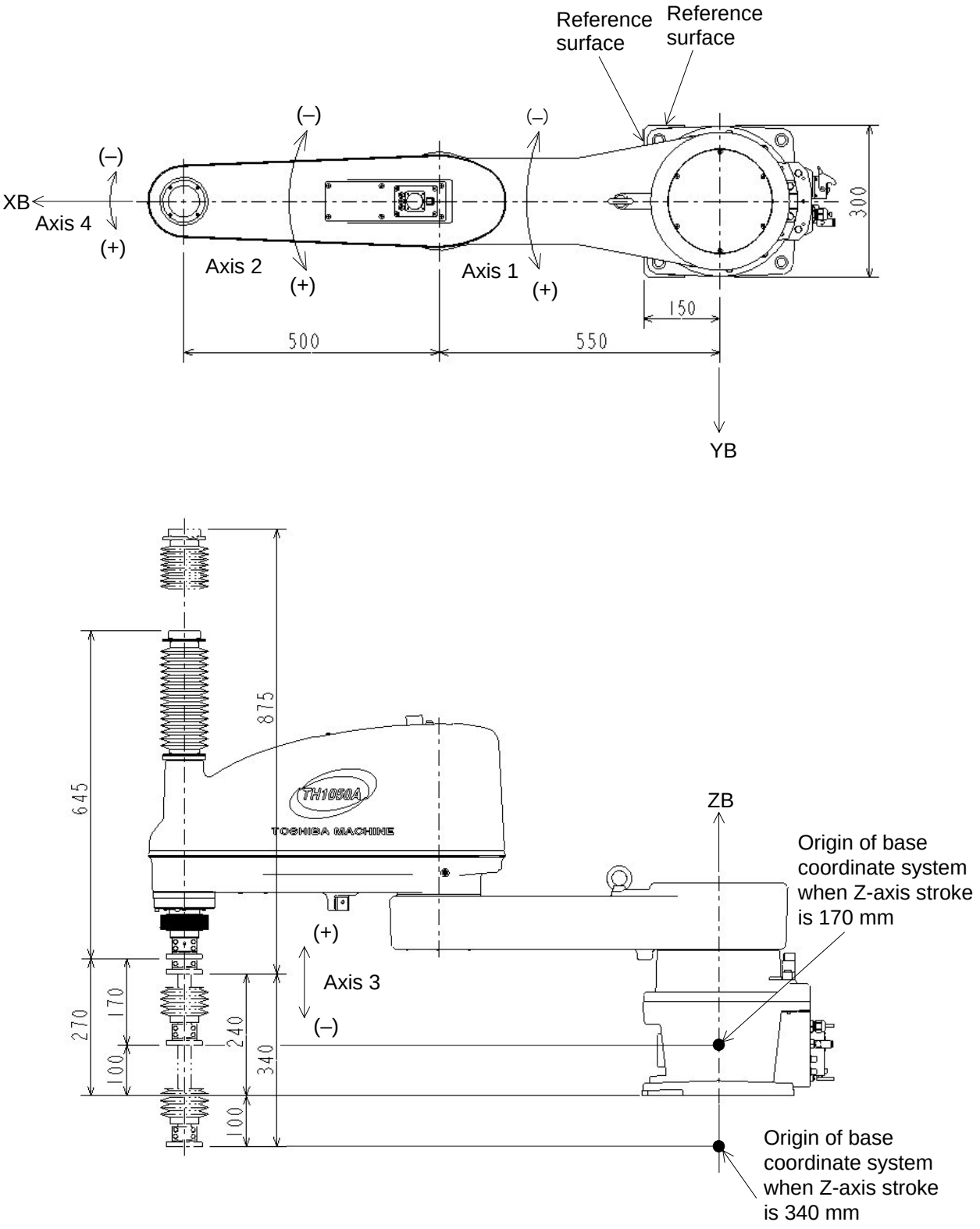


Fig. 3.2 Base coordinate system and joint angle origin (TH1050A)

3.5 Installing the Robot

The robot is secured, using the set holes on the base (four (4) places).
Use M16 hexagon socket head cap screws.
The robot installation method is shown in Fig. 3.3. The reference surfaces are provided on the base.
When you wish to adjust the robot position in the base coordinate system, or replace the robot with another one, provide appropriate reference surfaces and secure the robot by applying them to the reference surfaces of the base.
The base is commonly used by the TH850A and TH1050A robots.

! 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 the robot is installed on the floor, secure it completely with anchor bolts, etc.
- Install the robot on a level place. Failure to do so could lead to a drop in performance or faults.

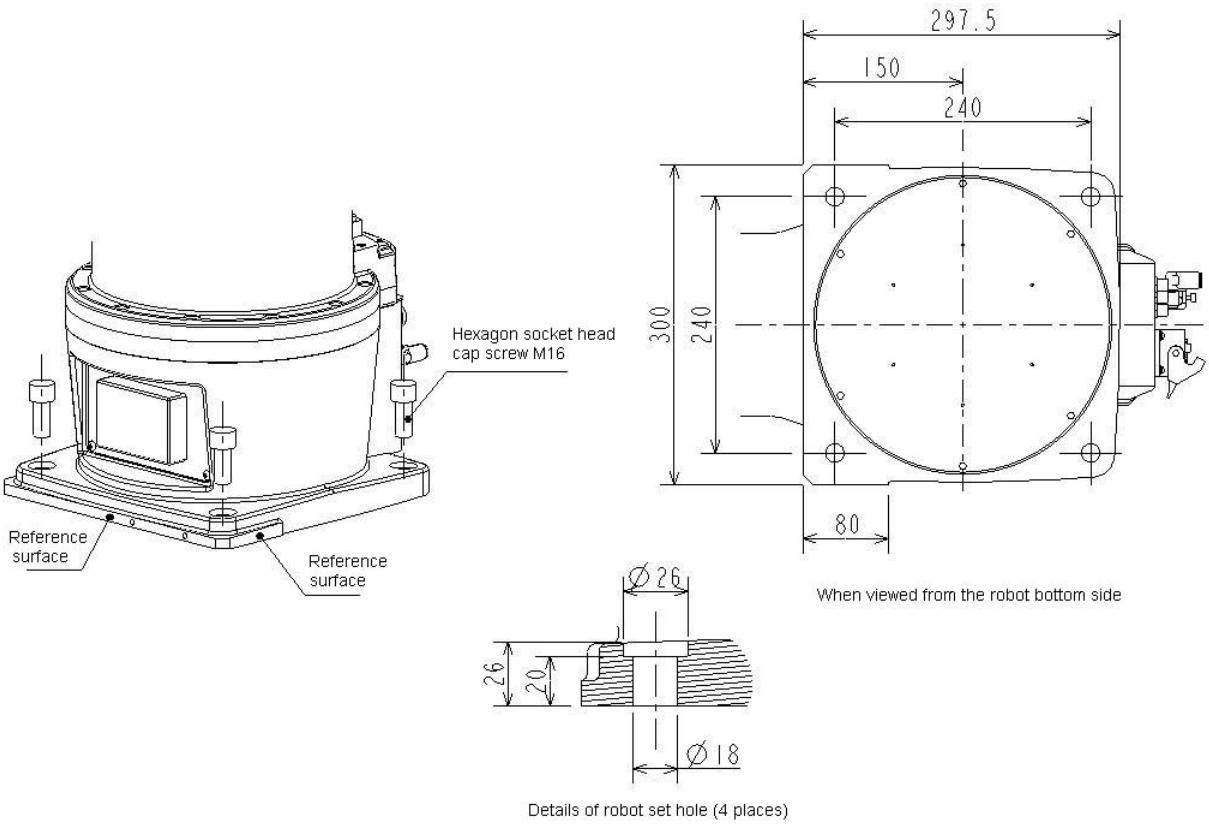


Fig. 3.3 Installation method

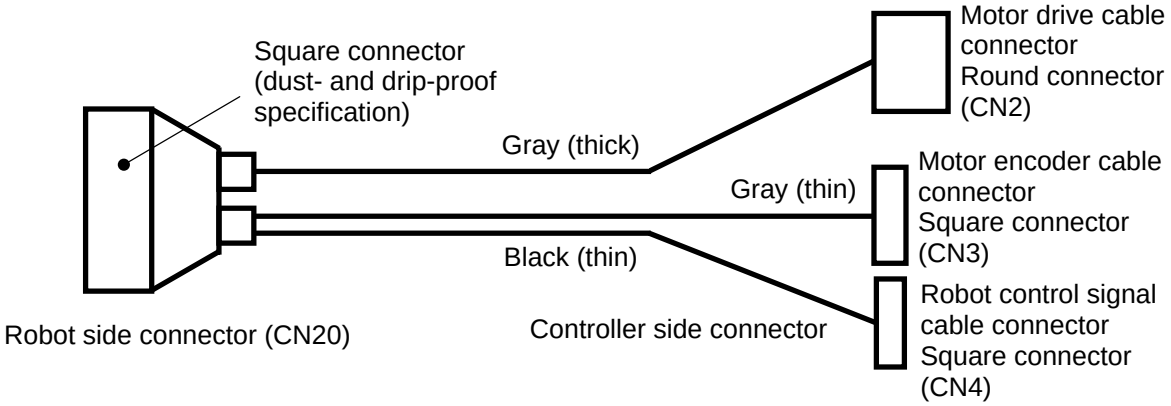
3.6 Cable Connection

The connector layout and connection method on the controller side are the same as in the standard robot. See the TH850A/TH1050A Installation and Transportation Manual provided separately.

For the dust- and drip-proof type robot, the connector on the robot side differs from that of the standard robot.

This paragraph describes the cable connection on the robot side.

3.6.1 Cables between Robot and Controller



! CAUTION

- Neither the robot controller nor the connectors on the robot controller side are dust- and drip-proof.

3.6.2 Connecting and Disconnecting Connectors

! CAUTION

- Before connecting or disconnecting any controller cable, be sure to turn off the main power (“POWER”) switch.
- When disconnecting a cable, be sure to hold the connector body by hand to pull it out. If you pull out the cable, the cable may be broken.

To connect the connector, make sure of the top and bottom sides of the connector, completely insert the cable side connector into the robot side connector, then lock the lever of the robot side connector. A loose lock can cause a contact failure or other accident. To avoid this, make sure that the lever is locked completely.

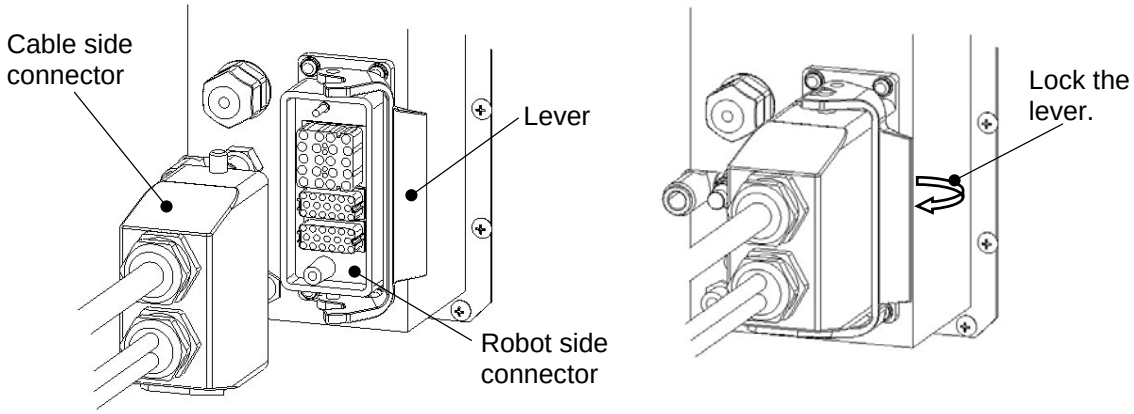
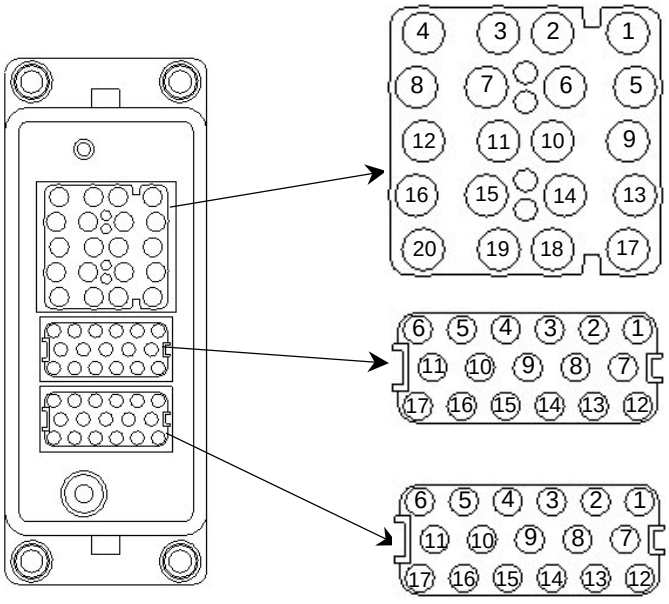


Fig. 3.4 Connecting and disconnecting connectors

3.6.3 Connector Terminal Layout

Square connector on the robot side: CN20
Type: 09300160307 (Body) 09140160313 (Frame)
Maker: Harting



Motor drive cable connector (CN2)
Type: 09140203101
Maker: Harting

Motor encoder cable connector (CN3)
Type: 09140173101
Maker: Harting

Robot control signal cable connector (CN4)
Type: 09140173101
Maker: Harting

4. Tool Interface

Mounting of a tool and tool signals are the same as in the standard robot.
For details, see the TH850A/TH1050A Installation and Transportation Manual provided separately.

4.1 Tool Wiring

Five (5) input signals are provided for sensors, etc. and four (4) control signals for solenoid valves, etc. A power supply signal of DC24 V is also provided. They are connected to the controller. The cables are connected to the connectors on the upper side of the arm 2. The user should provide the following connector to connect the cables.

Cannon connector (dust- and drip-proof type):
Type: JL04–2E–20–29P–R (Maker: JAE)
Adaptive cable: Conductive cross section area: 0.2 mm^2 ~ 0.5 mm^2

Each connector and cable are connected by soldering.

! DANGER

- Be sure to use the designated cables. Otherwise, fires or faults may be caused.
- When connecting the connector and cables, make sure not to mistake the terminal arrangement.
- After making the connection, use a tester, etc., to confirm the connection.

When controlling the robot from the sequencer (i.e., programmable ladder controller: PLC), etc. installed separately, remove the motor cover from the base section, remove connectors JOES and JOFS on the rear side, then connect the cables running from the PLC, etc. through the cable clamp provided on the motor cover. (See Fig. 4.1.) For ahead of the JOES and JOFS connectors, the user should prepare the following plug connectors and connect the cables. The current is 1 A or less per cable.

Type of connector: JOES SMP–07V–BC (Maker: J.S.T. Mfg.)
JOFS SMP–06V–BC (Maker: J.S.T. Mfg.)
Type of contact: BHF–001T–0.8SS (Maker: J.S.T. Mfg.)
Adaptive cable: Conductive cross section area: 0.2 mm^2 ~ 0.3 mm^2

Opposite connector type

Type of connector: JOEP SMR–07V–B (Maker: J.S.T. Mfg.)
JOFP SMR–06V–B (Maker: J.S.T. Mfg.)
Type of contact: BYM–001T–0.6 (Maker: J.S.T. Mfg.)

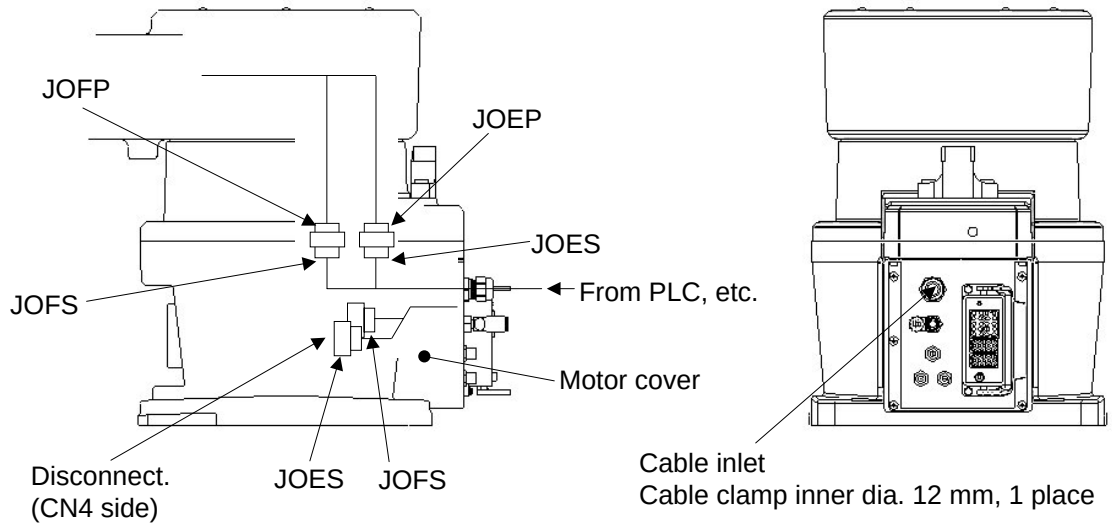


Fig. 4.1 Wiring to PLC, etc.

4.1.1 How to Connect Connectors

The motor cover of the dust- and drip-proof type robot base is equipped with a cable clamp (dust- and drip-proof construction). To connect the cables from the separate PLC, etc., use this cable clamp to connect them with the connectors in the robot.
For the cable clamp, use a cable with shield, whose outer diameter is 6.0 to 12.0 mm.

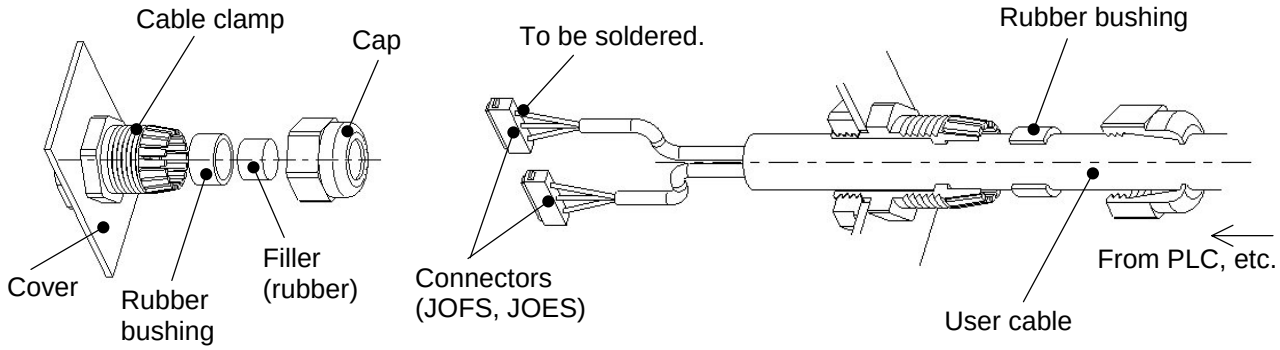


Fig. 4.2 How to connect connectors

[1] Remove the motor cover of the base unit. For the dust- and drip-proof specification, liquid gasket is coated on the motor cover set surface. For the dismantling procedures, see Section 5.

[2] Remove the cap of the cable clamp, then the rubber bushing and filler. This filler is unnecessary and is not used any more.

[3] Pass the cables running from the PLC, etc. through the cap, rubber bushing and cable clamp in this order, then solder the connectors.

[4] Make sure, using a tester, etc., that the power is supplied to the specified poles and cables.

[5] Push the rubber bushing into the cable clamp, and completely tighten the cap.

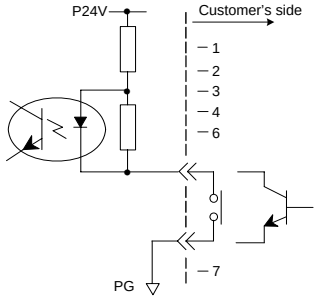
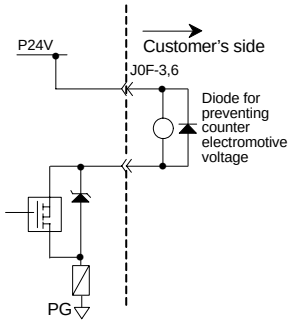
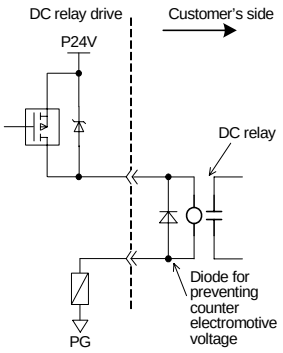
[6] Connect the cables with connectors JOFP and JOEP on the robot side.

[7] Mount the motor cover in the manner described in Section 5.

! DANGER

- Before connecting or disconnecting the cables, be sure to turn off the main power (“POWER”) switch. Otherwise, the robot may malfunction.
- Be sure to use the cable of the designated specification. Otherwise, the cable may be heated to cause a fire or electric leak.
- At the time of connection, be sure to attach the rubber bushing. Unless the rubber bushing is present, the dust- and drip-proof performance is damaged to cause entry of water or dust.
- Unless wiring is performed by the user, DO NOT remove the filler. Otherwise, the dust- and drip-proof performance is damaged to cause entry of water or dust.

Input/output signal connector CN0

<table>
<tr><th>Pin (Cannon)</th><th colspan="2">Signal name</th><th>Signal No.</th><th colspan="2">Input/output circuit and example of connections</th></tr>
<tr><td>A</td><td>Not used</td><td></td><td></td><td colspan="2" rowspan="8"> 
</td></tr>
<tr><td>B</td><td>Not used</td><td></td><td></td></tr>
<tr><td>C</td><td>Not used</td><td></td><td></td></tr>
<tr><td>D</td><td>GRP1 OPN</td><td>Grip 1 open</td><td>201</td></tr>
<tr><td>E</td><td>GRP1 CLS</td><td>Grip 1 close</td><td>202</td></tr>
<tr><td>F</td><td>GRP2 OPN</td><td>Grip 2 open</td><td>203</td></tr>
<tr><td>G</td><td>GRP2 CLS</td><td>Grip 2 close</td><td>204</td></tr>
<tr><td>H</td><td>WORK</td><td>Workpiece</td><td>205</td></tr>
<tr><td>J</td><td>PG</td><td>0 V</td><td></td><td>Minus common (X8HN)
 
</td><td>Plus common (X8HI)
 
</td></tr>
<tr><td>K</td><td>Not used</td><td></td><td></td></tr>
<tr><td>L</td><td>GRP1</td><td>Grip 1</td><td>201</td></tr>
<tr><td>M</td><td>$\overline{\text{GRP1}}$</td><td>– Grip 1</td><td>202</td></tr>
<tr><td>N</td><td>P24V</td><td>DC24 V power supply</td><td></td></tr>
<tr><td>P</td><td>GRP2</td><td>Grip 2</td><td>203</td></tr>
<tr><td>R</td><td>$\overline{\text{GRP2}}$</td><td>– Grip 2</td><td>204</td></tr>
<tr><td>S</td><td>P24V</td><td>DC24 V power supply</td><td></td></tr>
<tr><td>T</td><td>Shield</td><td></td><td></td></tr>
</table>

As input signals, no-voltage contacts or transistor open collector inputs are used.

No-voltage contact specification:

Contact rating: DC24 V, 10 mA or over (circuit current: approx. 7 mA)

Minimum contact current: DC24 V, 1 mA

Contact impedance: 100 Ω or less

Transistor specification:

Withhold voltage between collector and emitter: 30 V or over

Current between collector and emitter: 10 mA or over (circuit current: approx. 7 mA)

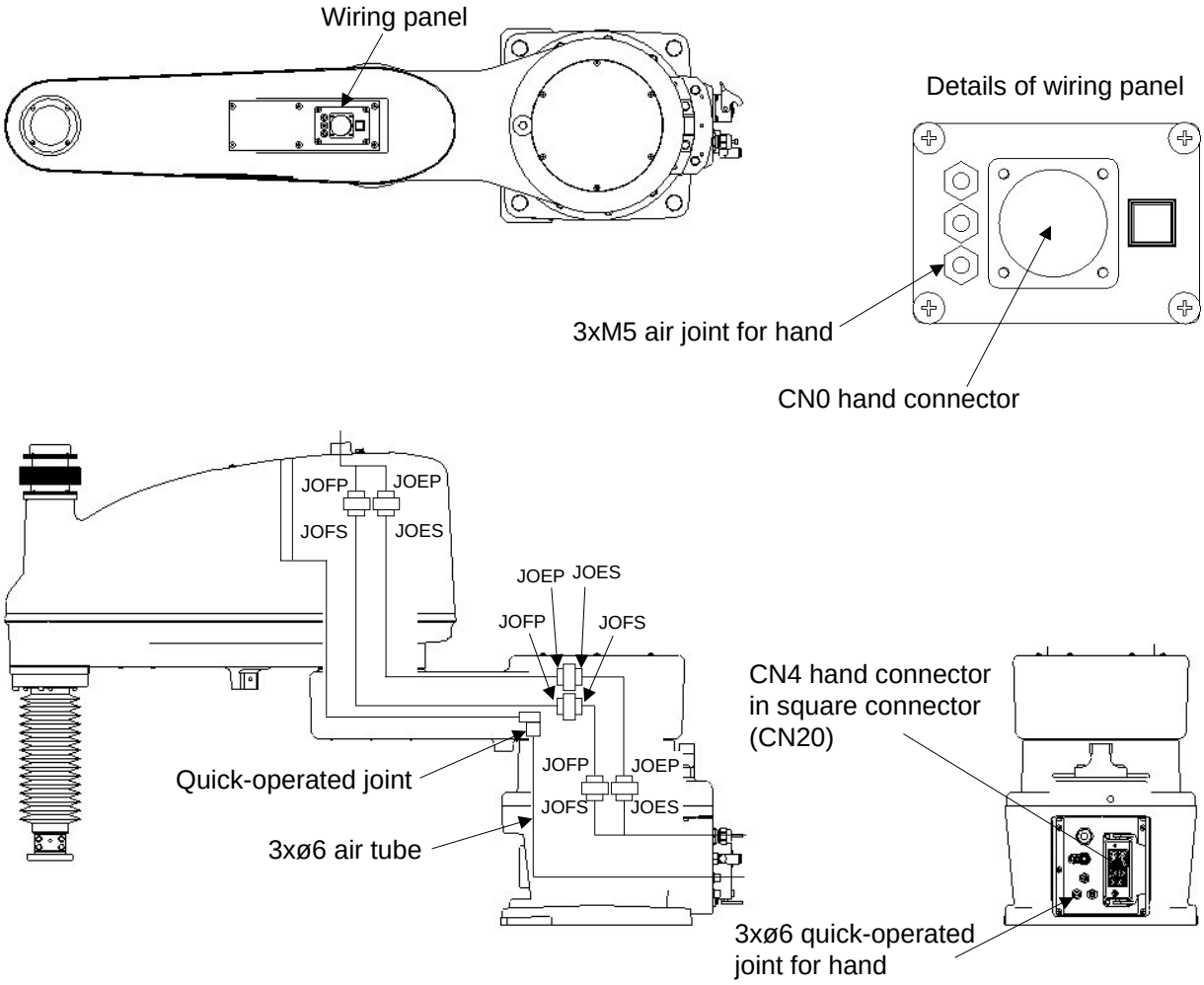
Leak current between collector and emitter: 100 μA or less

By using the DC24 V power of the controller, a relay, solenoid valve, etc., can be driven. When the external power is used, GND of the external power should be common to GND (PG) of the robot controller.

Output specification:

Rated voltage	:	DC24 V (max. DC30 V)
Rated current	:	1 A
Leak current	:	100 μA or less

- If the DC24 V power is supplied from the robot controller, the total current should be 2 A or less.
- When the external power is used, the total current should also be 2 A or less.
- When a relay, solenoid valve, etc., are connected, it is necessary to use a surge killer or diode to absorb the surge voltage.



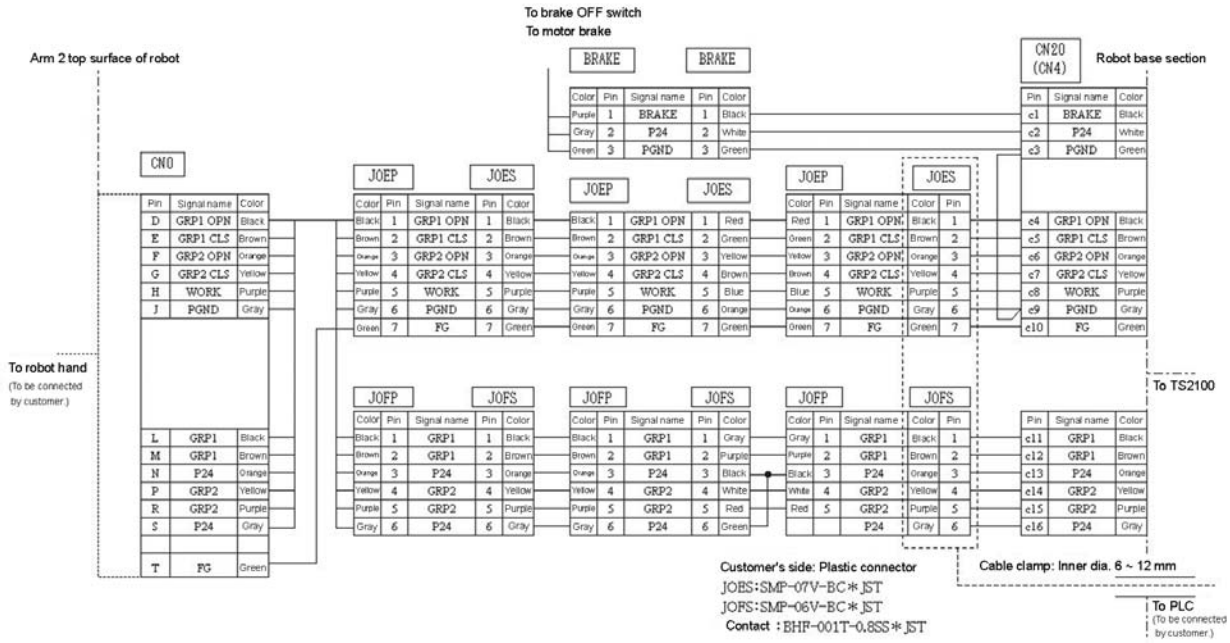
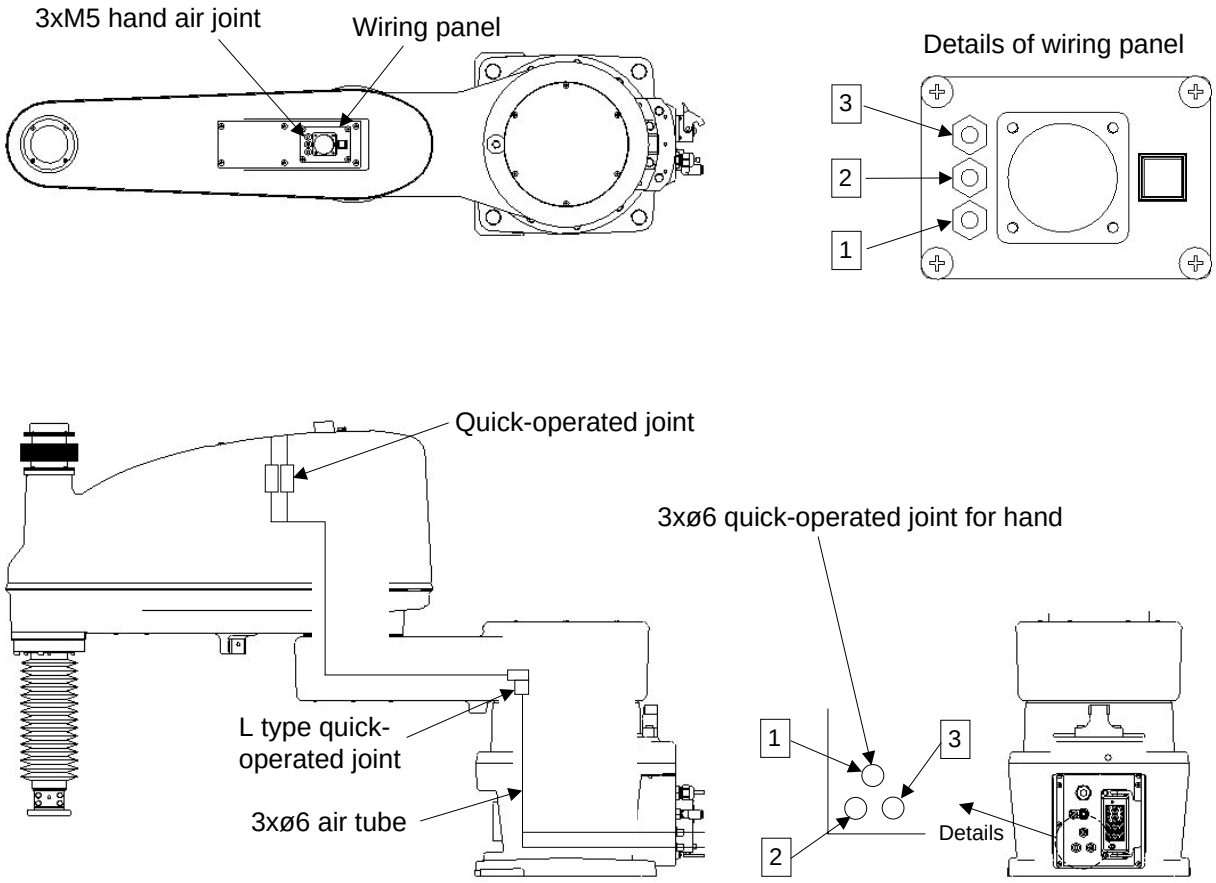


Fig. 4.3 Tool wiring

4.2 Tool Air Piping

The robot is provided with three (3) air lines for the tool.
The outer diameter of the air pipelines is 6 mm. Fig. 4.4 shows the tool air piping.
The air control unit (oiler, regulator with gage and filter) and solenoid valves should be provided by the user.



The air tube is identified by the number and color. At piping, make sure that each tube is connected properly, referring to the below-mentioned.

1 : Red 2 : White 3 : Blue

Air joint pitches of the panel

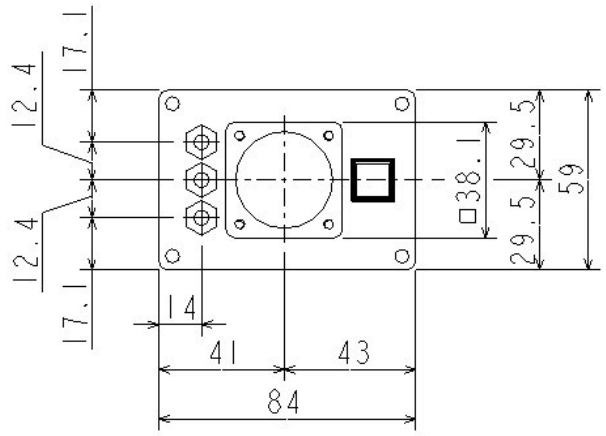


Fig. 4.4 Tool air piping

5. Maintenance

The basic structure of the dust- and drip proof type robot is the same as that of the standard robot. For the contents of inspection, etc., see the TH850A/TH1050A Maintenance Manual provided separately.
This section deals with the layout of the robot mechanical components and the procedures for replacing the bellows (upper and lower sides) and for mounting and dismounting the covers.

5.1 Layout of Robot Components

The layout of the robot mechanical components is shown in Fig. 5.1. (The figure below shows the TH850A robot.)

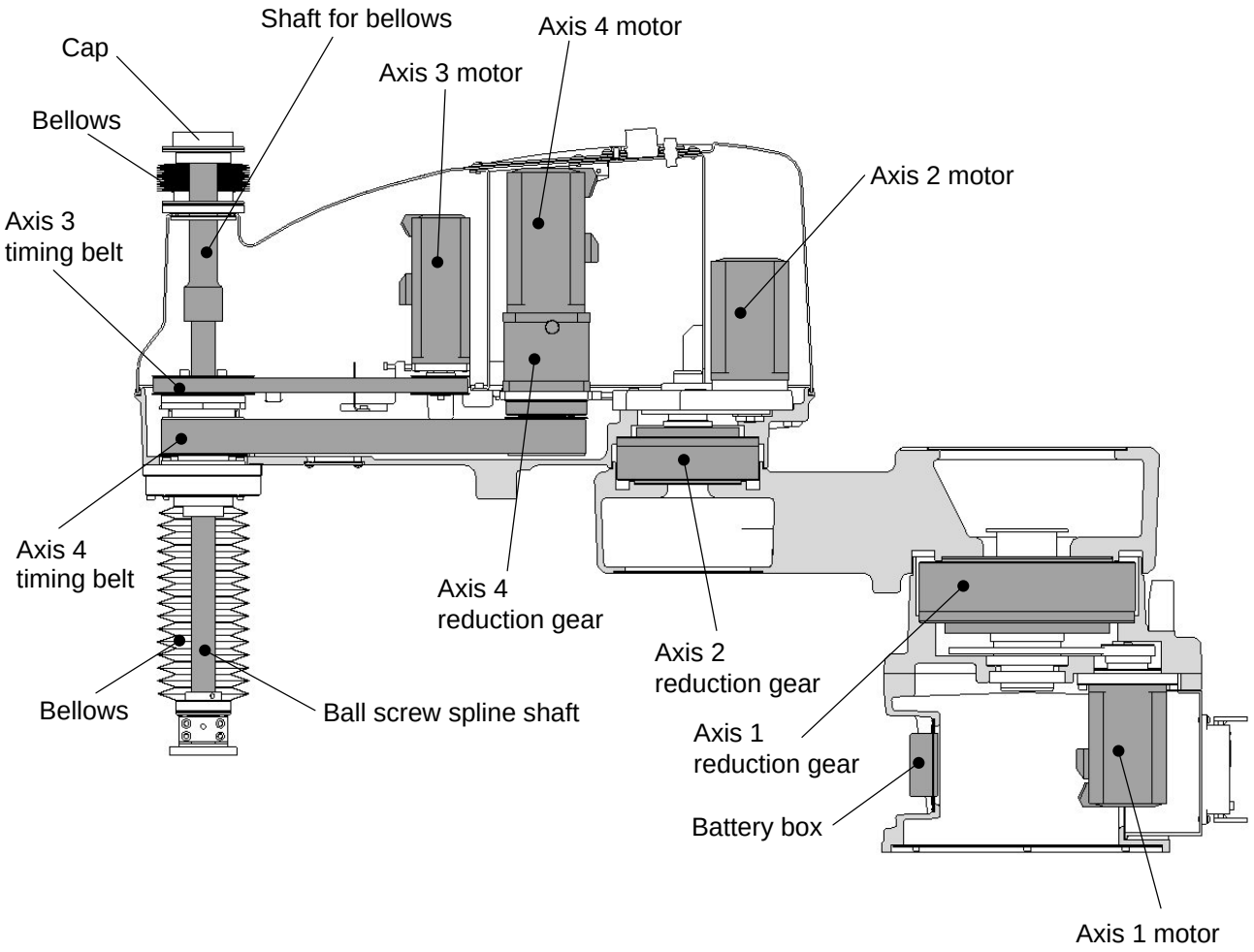


Fig. 5.1 Layout of robot mechanical components

5.2 Maintenance Tools and Provisions

It is recommended to prepare the following items for the maintenance.
For the tools and provisions other than the below-mentioned, see the TH850A/1050A Maintenance Manual provided separately.

- Screwdrivers (Phillips head screwdriver and slotted screwdriver)
- A kit of hexagonal wrench key (M3 ~ M16)
- Cutter knife
- Liquid gasket (Recommendation: 1211 made by ThreeBond)
- Loctite adhesives (242 mid-strength)

5.3 Replacing Bellows

Replacement of the bellows is performed by our after-sale service engineer. If the bellows is replaced by the customer, we will not guarantee any consequential troubles or accidents.

! DANGER

- Before replacing the bellows with a new one, be sure to turn off the controller power and remove the power plug.

5.3.1 Procedures for Replacing Lower Bellows

1) Remove the tool flange, followed by the keep plate under the bellows.
2) Remove the keep plate above the bellows, then pull the bellows downward.

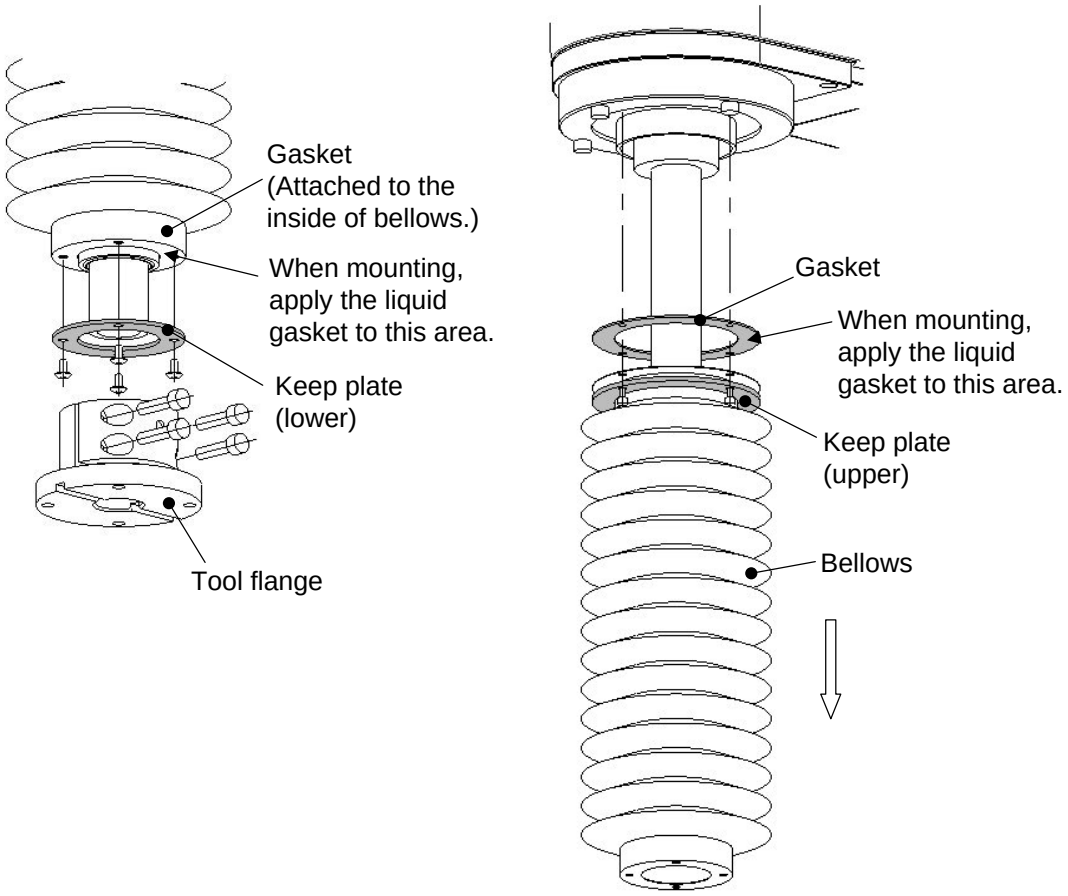


Fig. 5.2 Lower bellows

3) To mount the bellows, observe the above steps in the reversed order.
Be sure to attach the gasket, and apply the Loctite adhesives to all set bolts.

! CAUTION

- When dismantling the bellows, DO NOT pull it out by force. Otherwise, the bellows may rupture.
- Be sure to apply the Loctite adhesives to all set bolts. Otherwise, the dust- and drip-proof performance is damaged to cause entry of water or dust.
- Be sure to attach the gasket. Otherwise, the dust- and drip-proof performance is damaged to cause entry of water or dust.

5.3.2 Procedures for Replacing Upper Bellows

1) Remove the cap and upper keep plate, then the three (3) set screws. Remove the wiring guide.

2) Remove the lower keep plate, then pull the bellows upward.

3) When disconnecting the arm 2 cover, pull the bearing case upward.
For the procedures for disconnecting the arm 2 cover, see Para. 5.3.3.

4) When replacing the ball screw, remove the three (3) set screws securing the shaft for bellows, then pull the shaft for bellows upward. When this happens, remove the collar at the same time as it is set between the ball screw shaft and shaft for bellows.
This collar is provided only for the machine with 170 mm Z-axis stroke. It is not provided for the machine with 340 mm Z-axis stroke.
For how to replace the ball screw, see the TH850A/1050A Maintenance Manual provided separately.

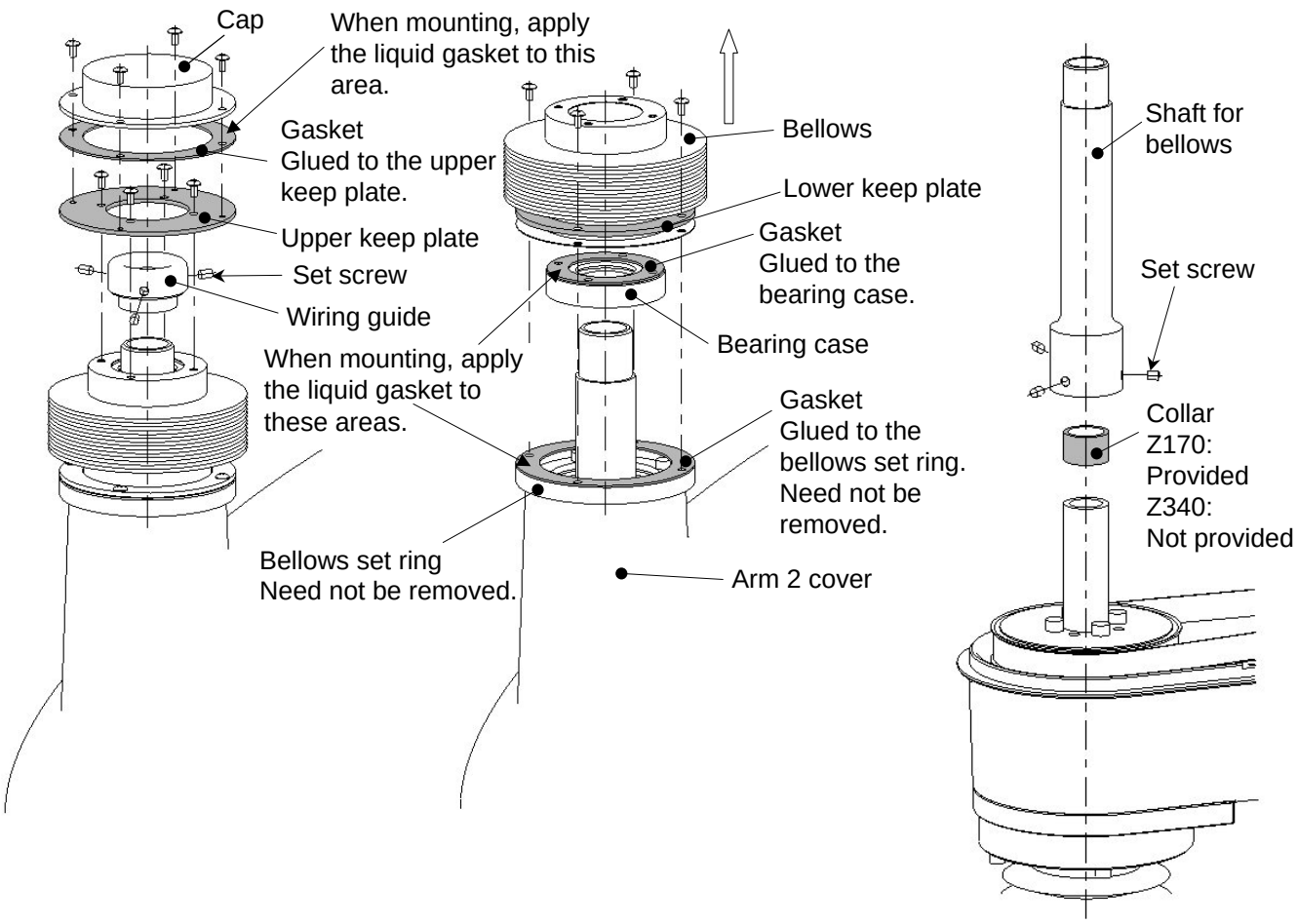


Fig. 5.3 Upper bellows

5) To mount the bellows, observe the above steps in the reversed order.
Be sure to attach the gasket, and apply the Loctite adhesives to all set bolts.

! CAUTION

- When dismantling the bellows, DO NOT pull it out by force. Otherwise, the bellows may rupture.
- Be sure to apply the Loctite adhesives to all set bolts. Otherwise, the dust- and drip-proof performance is damaged to cause entry of water or dust.
- Be sure to attach the gasket. Otherwise, the dust- and drip-proof performance is damaged to cause entry of water or dust.

5.4 Mounting and Dismounting Covers

A gasket (i.e., rubber packing) is attached to each cover set surface of the dust- and drip-proof type robot. Also, as the liquid gasket is coated to some areas, the mounting and dismounting procedures of each cover differ from those of the standard robot. Strictly observe the following procedures to mount and dismount each cover.

! DANGER

- Before mounting and dismounting each cover, be sure to turn off the main power (“POWER”) switch.
- When opening each cover, make sure that water or contaminant will not enter the robot. If the power is supplied while water or contaminant is left in the robot, you may get an electric shock or the robot may be damaged, which is very dangerous.

5.4.1 Base Cover

In all, two (2) base covers are provided; the cover concurrently used for connector panel and the cover concurrently used for battery box.

1) The former cover is secured to the base with six (6) cross-recessed truss head screws (M4 × 6; SUS) and two (2) hexagon socket head cap screws (M4 × 6; SUS) by inserting the gasket. The gasket set surface is coated with the liquid gasket. Remove the cover while carefully peeling off the liquid gasket, using a slotted screwdriver, etc. As the cover is connected with the connectors inside, DO NOT pull out the cover by force.

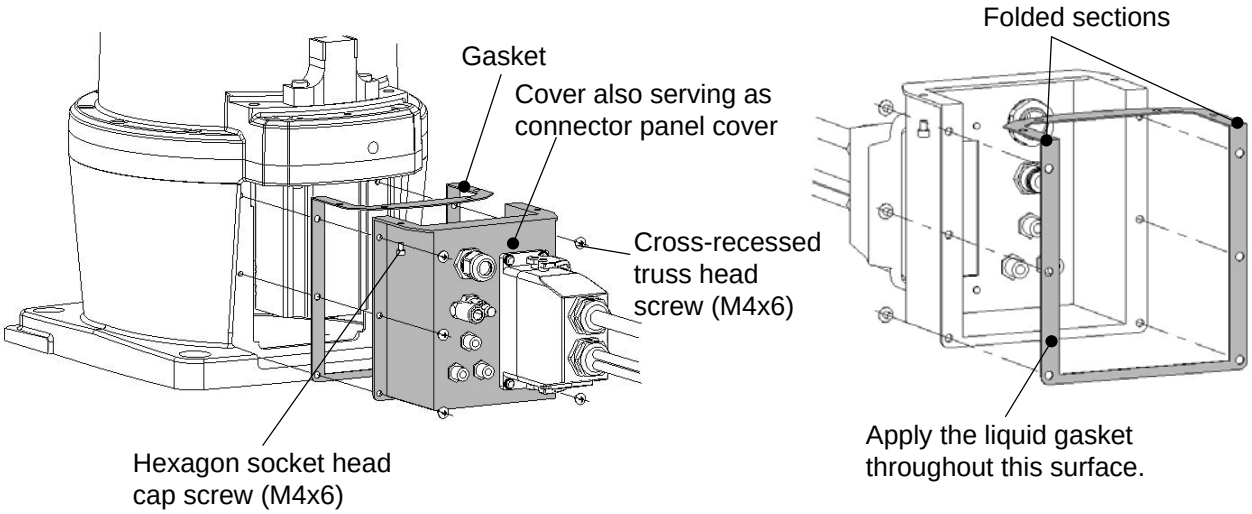


Fig. 5.4 Cover concurrently used for connector panel

When mounting the cover, apply the liquid gasket to the area shown in Fig. 5.4 above. Especially, apply much more liquid gasket to the cover folded sections. After the assembly, coat the liquid gasket throughout the cover set surface to fill a gap between the gasket, cover and base. Also, apply the Loctite adhesives to all set bolts.

! CAUTION

- Be sure to attach the gasket and apply the liquid gasket. Also, be sure to coat the Loctite adhesives to all set bolts. Otherwise, the dust- and drip-proof performance is damaged to cause entry of water or dust.

2) The latter cover is secured to the base with four (4) cross-recessed truss head screws (M4 × 6) by inserting the gasket. The gasket set surface is coated with the liquid gasket. Remove the cover while carefully peeling off the liquid gasket, using a slotted screwdriver, etc. As the cover is connected with the connectors inside, DO NOT pull out the cover by force.

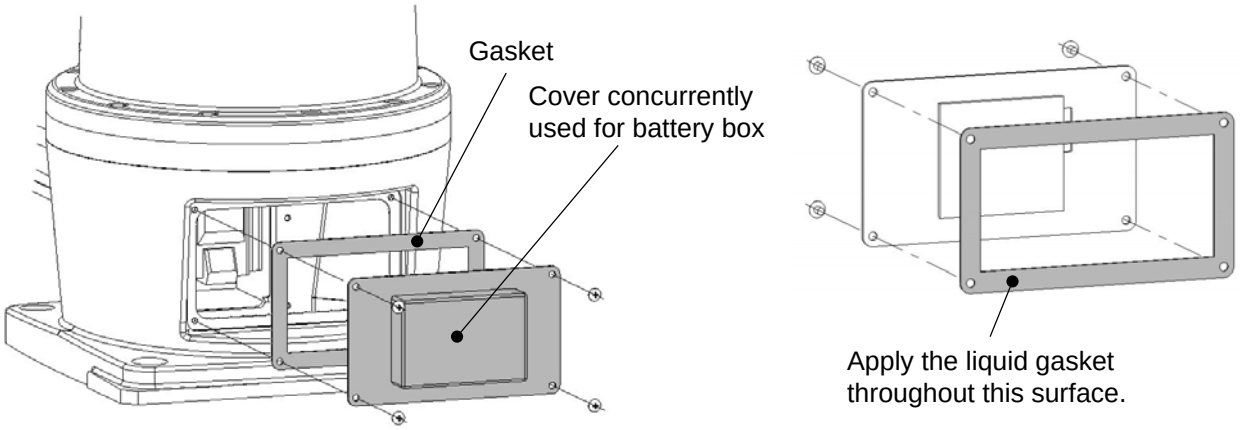


Fig. 5.5 Cover concurrently used for battery box

When mounting the cover, apply the liquid gasket to the area shown in Fig. 5.5 above. Also, apply the Loctite adhesives to all set bolts.

! CAUTION

- Be sure to attach the gasket and apply the liquid gasket. Also, be sure to coat the Loctite adhesives to all set bolts. Otherwise, the dust- and drip-proof performance is damaged to cause entry of water or dust.

5.4.2 Arm 1 Covers

The arm 1 covers are provided above the axis 1 (arm cover 1) and under the axis 2 (arm cover 2). Each cover is secured to the arm 1 with six (6) cross-recessed truss head screws (M4 × 6) by inserting the gasket. The gasket set surface is coated with the liquid gasket. Remove the cover while carefully peeling off the liquid gasket, using a slotted screwdriver, etc.

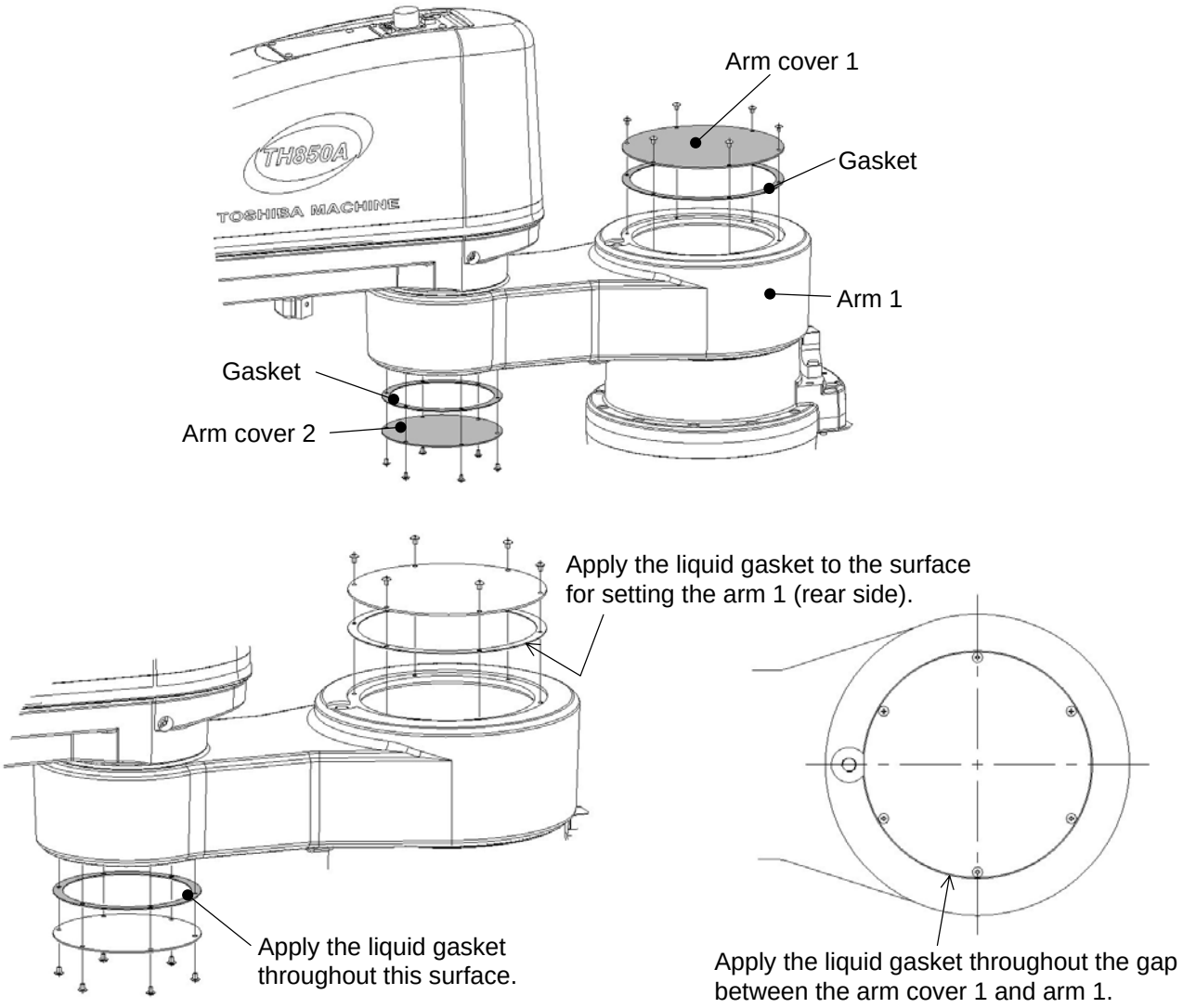


Fig. 5.6 Arm 1 covers

When mounting the cover, apply the liquid gasket to the area shown in Fig. 5.6 above. After mounting the arm cover 1, coat the liquid gasket to fill the gap with the arm 1. Also, apply the Loctite adhesives to all set bolts.

! CAUTION

- Be sure to attach the gasket and apply the liquid gasket. Also, be sure to coat the Loctite adhesives to all set bolts. Otherwise, the dust- and drip-proof performance is damaged to cause entry of water or dust.

5.4.3 Arm 2 Cover

1) Be sure to disconnect the arm 2 cover only while the upper bellows is removed. For how to disconnect the upper bellows, see Para. 5.2.2 above.
The arm 2 cover is secured to the cover securing bracket with six (6) cross-recessed truss head screws (M4 × 10) and panel by inserting the gasket. Firstly, remove the wiring panel attached to the panel. Though the gasket (packing) is provided between the panel and wiring panel, it is glued to the wiring panel and they can be disconnected all together. As the wiring panel is connected with the connectors inside, DO NOT pull it out by force. After disconnecting the wiring panel, remove the connectors inside, then the six (6) truss head screws (M4 × 10) securing the panel. As in the wiring panel, the gasket is glued to the panel, and the gasket is also glued to the cover with the liquid gasket. This is why the panel cannot be disconnected from the cover. Take careful precautions not to disconnect them by force.

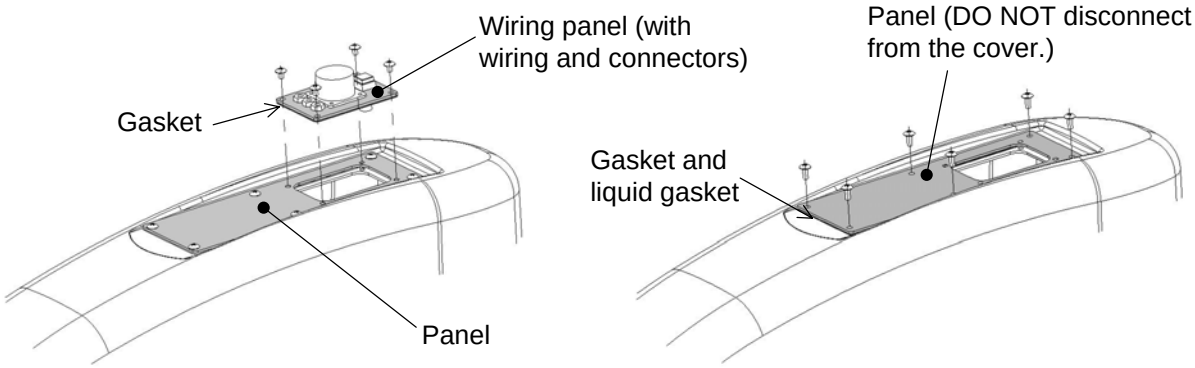


Fig. 5.7 Arm 2 cover (1)

2) Though the cover is embedded to the arm 2, the liquid gasket is applied to the full circumference of the packing under the cover to maintain the dust- and drip-proof feature. When disconnecting the cover, peel off the liquid gasket between the arm 2 and packing, using a full circumferential cutter, etc. Then carefully peel off the liquid gasket to remove the cover, using a slotted screwdriver, etc. DO NOT peel off the liquid gasket between the cover and packing. Disconnect the cover together with the packing.

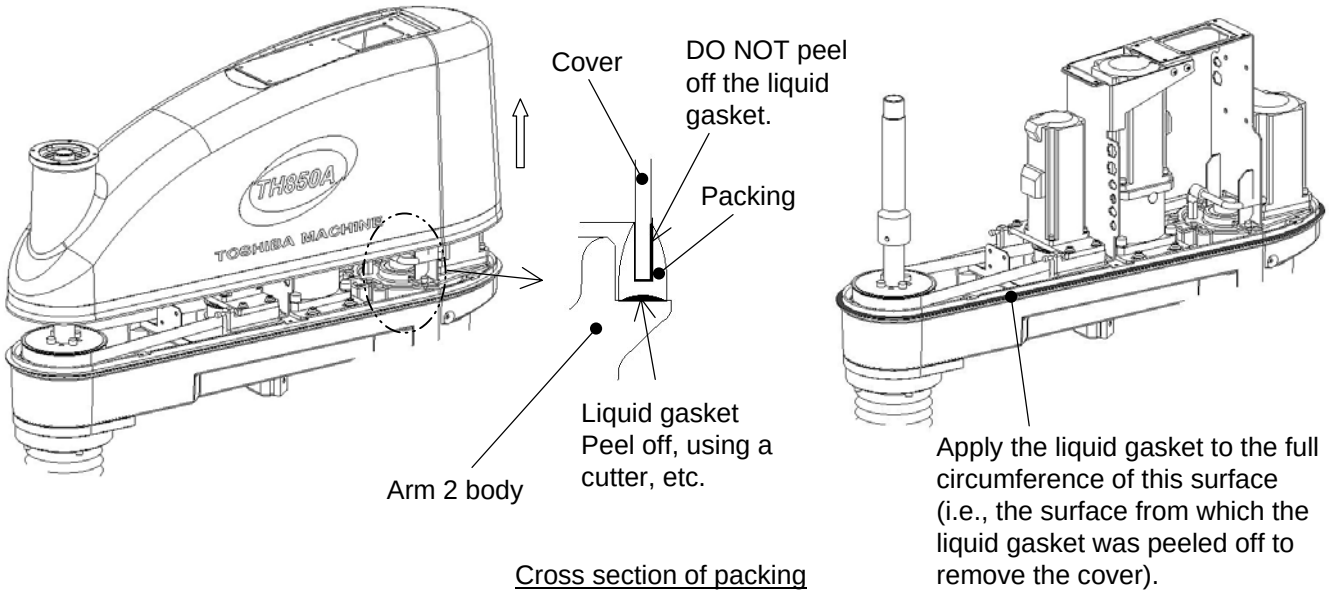


Fig. 5.8 Arm 2 cover (2)

When mounting the cover, apply the liquid gasket to the area shown in Fig. 5.8 above. Also, apply the Loctite adhesives to all set bolts.

! CAUTION

- When using the cutter, take careful precautions not to cut the packing body.
- DO NOT peel off the liquid gasket between the cover and packing. Otherwise, the dust- and drip-proof performance is damaged to cause entry of water or dust.
- Under some circumstances, the packing may be separated from the cover. When this happens, apply the liquid gasket to between the cover and packing at the time of cover mounting.
- Be sure to attach the gasket and apply the liquid gasket. Also, be sure to coat the Loctite adhesives to all set bolts. Otherwise, the dust- and drip-proof performance is damaged to cause entry of water or dust.

5.4.4 Arm 2 Panel Cover

The cover is provided under the arm 2 so that the wiring panel can be mounted.
See the TH850A/TH1050A Installation and Transportation Manual provided separately.
The cover is secured to the arm 2 with four (4) cross-recessed truss head screws (M4 × 6) by inserting the gasket.
No liquid gasket is coated to the cover and gasket. Remove the four (4) cross-recessed truss head screws, and you can dismantle the cover. As the gasket is glued to the cover, they can be removed all together.
When mounting the cover, apply the Loctite adhesives to all set bolts and mount the gasket together with the cover.

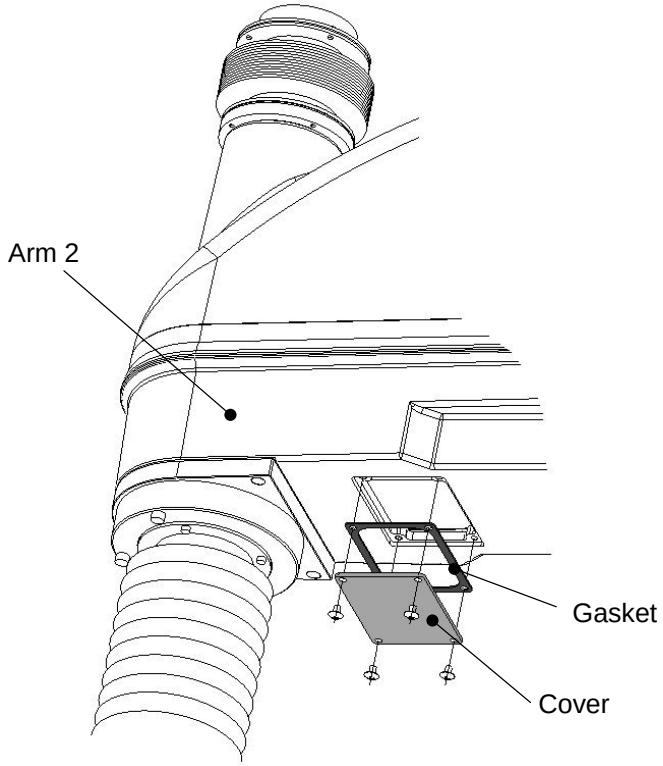


Fig. 5.9 Arm 2 panel cover

! CAUTION

- Be sure to attach the gasket . Also, be sure to coat the Loctite adhesives to all set bolts. Otherwise, the dust- and drip-proof performance is damaged to cause entry of water or dust.

6. Cleaning Robot Body

To clean and wash the robot body, be sure to use a neutral detergent. Use a soft sponge and waste cloth, and take careful precautions not to cut or scratch the robot body.

To wash the robot body with water, strictly observe the IP class in terms of water. Be sure to water the robot body while conducting air purge.

DANGER

- Before cleaning the robot body, be sure to turn off the controller power and remove the power plug. Otherwise, you will get an electric shock or the robot will malfunction, which is very dangerous.
- After the cleaning, completely wipe out the water.

CAUTION

- Be sure to use a neutral detergent to clean and wash the robot body. If a detergent (such as chlorine detergent and acid detergent) other than the neutral detergent is used, the paint may deteriorate, or the cover or bellows may be damaged.
- Be sure to water the robot body during air purging. Unless air purge is executed, the dust- and drip-proof performance is damaged to cause entry of water or dust.

7. Replacement Parts for Maintenance

7.1 Replacement Parts List for Maintenance

No.	Part name	Type	Our dwg. No.	Unit code	Maker	Q'ty	Remarks
1	Bellows		S828912	Y610A38Z0	Toshiba Machine	2	When Z-axis stroke is 170 mm
2	Bellows		S835831	Y610A38Y0	Toshiba Machine	2	When Z-axis stroke is 340 mm

The replacement parts for maintenance other than the above are the same as those of the TH850A/TH1050A robot. For details, see the TH850A/TH1050A Maintenance Manual provided separately.

- When you wish to purchase the replacement parts for maintenance, make sure of the serial number of the main robot and contact us.

APPROVED BY: Y. Yamaguchi

CHECKED BY: K. Kabe

PREPARED BY: K. Kido