

Simple  friendly

 **Kawasaki**

**Kawasaki Robot
Y Series**

**Installation and
Connection Manual**

Robot

Kawasaki Heavy Industries, Ltd.

90202—1004DEC

PREFACE

This manual describes installation and connection procedures for Kawasaki Robot Y Series.

Read and understand the contents of this and safety manuals thoroughly and strictly observe all rules for safety before proceeding with any operation. This manual describes only the installation and connection of robot arm. For installation and connection of the controller, see the separate manual, Installation and Connection Manual for the controller.

Never proceed with any operation until you understand the contents of this manual completely. Kawasaki cannot take any responsibility for any accidents and/or damages caused by operations that are based on only the limited part of this manual.

This Manual is applicable to the following Robot Arms
YF003N-A (for food machine, 4-axis (standard) and 3-axis)
YS002N-B (general purpose standard machine)
YF002N-B (for food machine)


-
1. This manual does not constitute a guarantee of the systems in which the robot is utilized. Accordingly, Kawasaki is not responsible for any accidents, damages, and/or problems relating to industrial property rights as a result of using the system.
 2. It is recommended that all personnel assigned for activation of operation, teaching, maintenance or inspection of the robot attend the necessary education/training course(s) prepared by Kawasaki, before assuming their responsibilities.
 3. Kawasaki reserves the right to change, revise, or update this manual without prior notice.
 4. This manual may not, in whole or in part, be reprinted or copied without the prior written consent of Kawasaki.
 5. Store this manual with care and keep it available for use at any time. If the robot is reinstalled or moved to a different site or sold off to a different user, attach this manual to the robot without fail. In the event the manual is lost or damaged severely, contact Kawasaki.

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SAFETY

The items that require special attention in this manual are designated with the following symbols.

Ensure proper and safe operation of the robot and prevent physical injury or property damages by complying with the safety matters given in the boxes with these symbols.

 **DANGER**

Failure to comply with indicated matters can result in imminent injury or death.

 **WARNING**


Failure to comply with indicated matters may possibly lead to injury or death.

 **CAUTION**

Failure to comply with indicated matters may lead to physical injury and/or mechanical damage.

[NOTE]

Denotes precautions regarding robot specification, handling, teaching, operation, and maintenance.

 **WARNING**

- 1. The accuracy and effectiveness of the diagrams, procedures, and detail explanations given in this manual cannot be confirmed with absolute certainty. Should any unexplained questions or problems arise, contact Kawasaki.**
- 2. Safety related contents described in this manual apply to each individual work and not to all robot work. In order to perform every work in safety, read and fully understand the safety manual, all pertinent laws, regulations and related materials as well as all the safety explanation described in each chapter, and prepare safety measures suitable for actual work.**

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1.0 PRECAUTIONS

1.1 PRECAUTIONS TO BE TAKEN DURING TRANSPORTATION, INSTALLATION AND STORAGE

When transporting, installing, and storing the Kawasaki Robot, strictly observe the following precautions.



WARNING

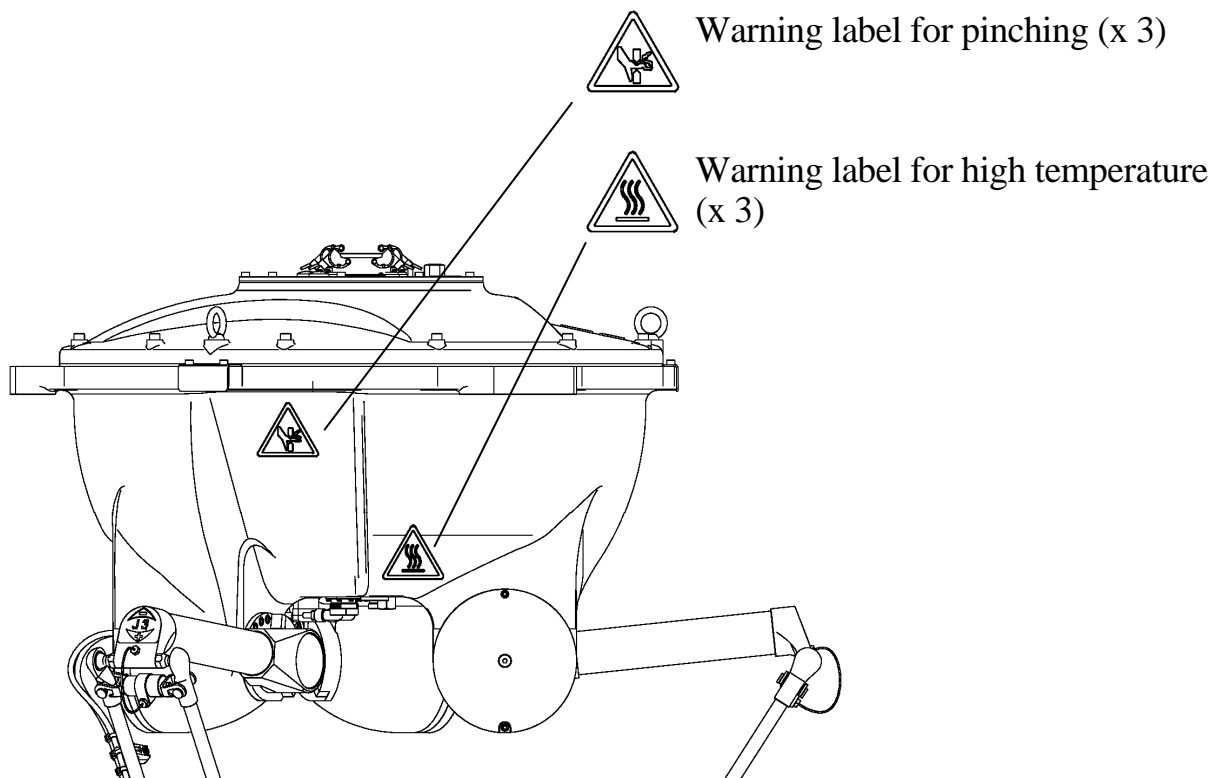
1. When transporting the robot arm using a crane or forklift, never support the robot arm manually.
2. When transporting the robot arm using a crane or forklift, keep the robot level. (YF003N-A)
3. During transportation, never climb on the robot arm or stay under the hoisted robot arm.
4. Prior to installation, turn OFF the main power switch on the controller and the external power switch for shutting down power supply to the controller. Display signs indicating clearly “Installation and Connection in Progress”, and lockout/tagout the external power switch to prevent personnel from accidentally turning ON the power.
5. Prior to driving robot, ensure safety by first confirming no abnormality is observed in installing condition, etc., and then turn ON motor power to set robot to the desired posture. Be careful not to be caught by/between any moving parts due to careless approach to robot and peripheral equipment. After setting robot arm to the specified posture, turn OFF the controller power and the external power switch again as mentioned above. Display signs indicating clearly “Installation and Connection in Progress”, and lockout/ tagout the external power switch before starting inspection and maintenance.



CAUTION

- 1. Since the robot arm is composed of precision parts, be careful not to apply excessive shocks or vibrations during transportation.**
- 2. Prior to transporting the robot, remove all obstacles so the installation is carried out smoothly and safely. Clear a passage to the installation area for transportation of the robot by using a crane or forklift.**
- 3. During transportation and storage,**
 - (1) Keep the ambient temperature within the range of 0 - 45 °C,**
 - (2) Keep the relative humidity within the range of 35 - 85 % RH without dew condensation,**
 - (3) Keep free from excessively large shock and vibration.**

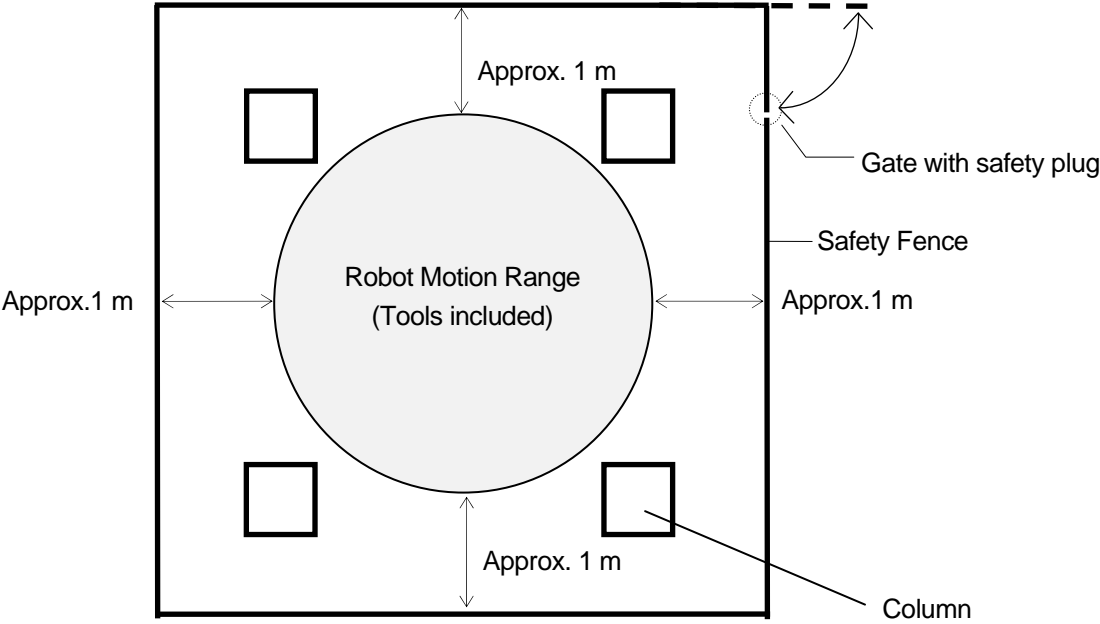
WARNING LABEL



1.2 INSTALLATION ENVIRONMENT OF ROBOT ARM

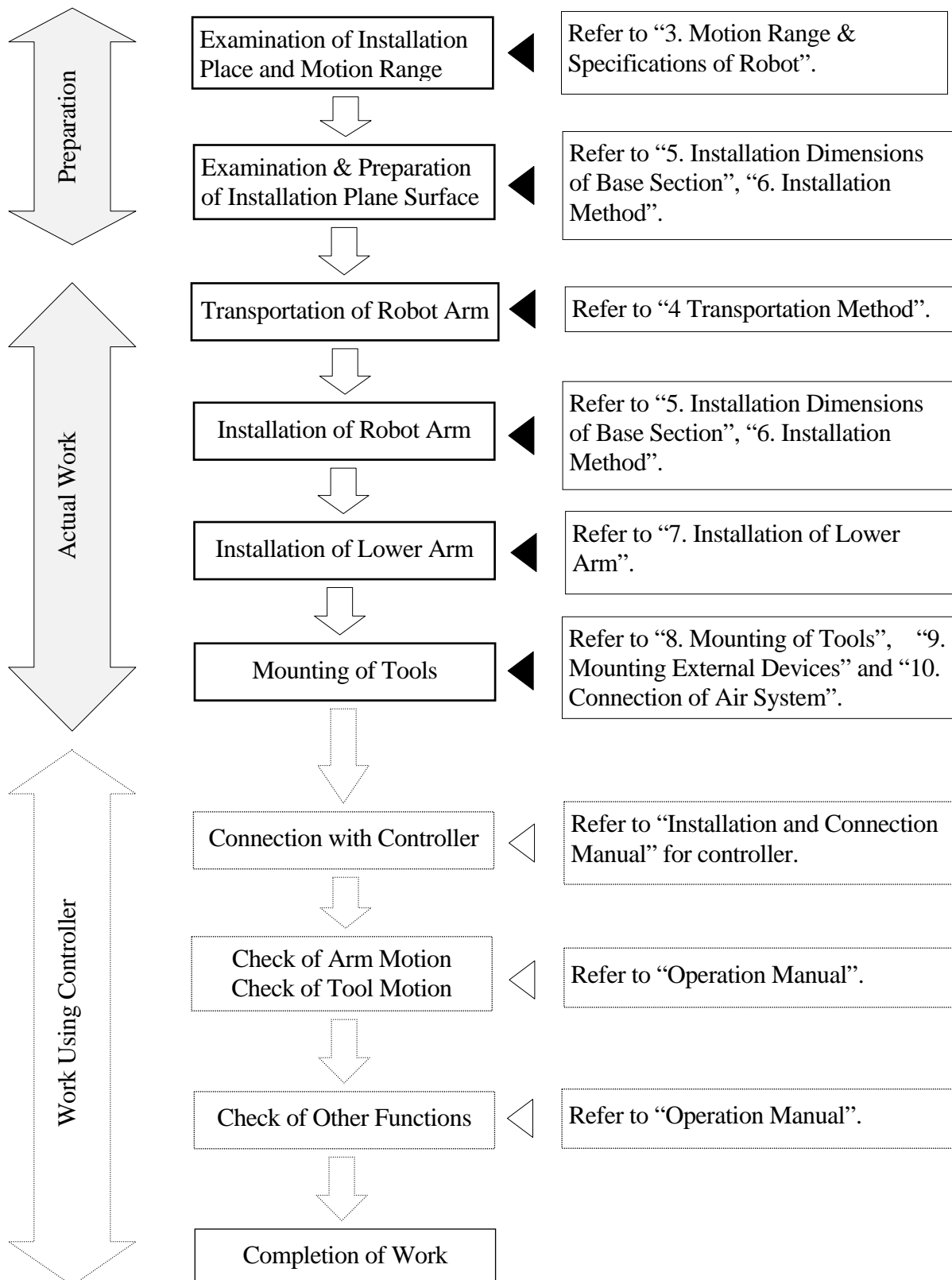
The robot arm must be installed in a place that satisfies all the following environmental conditions:

1. When robot arm is installed on the floor, the levelness must be within $\pm 5^\circ$.
2. Be sure that the installation stand has sufficient rigidity. (Natural frequency is 30 Hz or more)
3. Secure a flat surface of the installation stand to prevent undue force application to the base section of the arm. (Flatness: 0.1 mm or less)
4. Keep the ambient temperature during operation within the range of 0 - 45 °C for YF003N-A.
Keep the ambient temperature during operation within the range of 0 – 40 °C for YS002N-B/YF002N-B.
Keep the ambient temperature during operation within the range of 10 – 35 °C for YF002N-B.
5. Keep the relative humidity during operation within the range of 35 -85 % RH without dew condensation.
6. The installation place should be free from dust, dirt, smoke, water, and other foreign matters.
7. The installation place should be free from flammable or corrosive liquid or gas.
8. The installation place should be free from excessively strong vibration. (0.5G or less)
9. The installation place should be free from electric noise interference.
10. The installation place should be sufficiently larger than the motion range of robot arm.
 - (1) Safety fence must enclose larger area than the maximum motion range of fully equipped robot arm (with tools) so it does not interfere with the robot.
 - (2) Minimize the number of entrance gates (only one is preferable.) and provide safety plug to it.
 - (3) About details of the safety fence, observe the requirements which are established in each region. (e.g. EN953, EN294, EN811, EN1088, ISO13852, ISO13854, and ISO/NP14120)



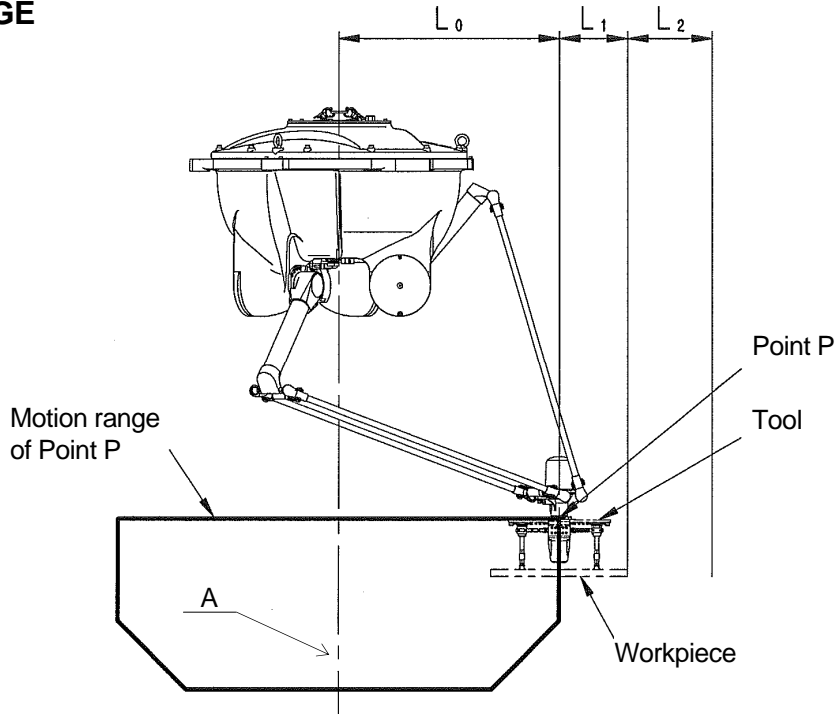
2.0 WORK FLOW AT ARM INSTALLATION AND CONNECTION

This flowchart describes only the robot arm section. For the controller, refer to separate Installation and Connection Manual for Controller.

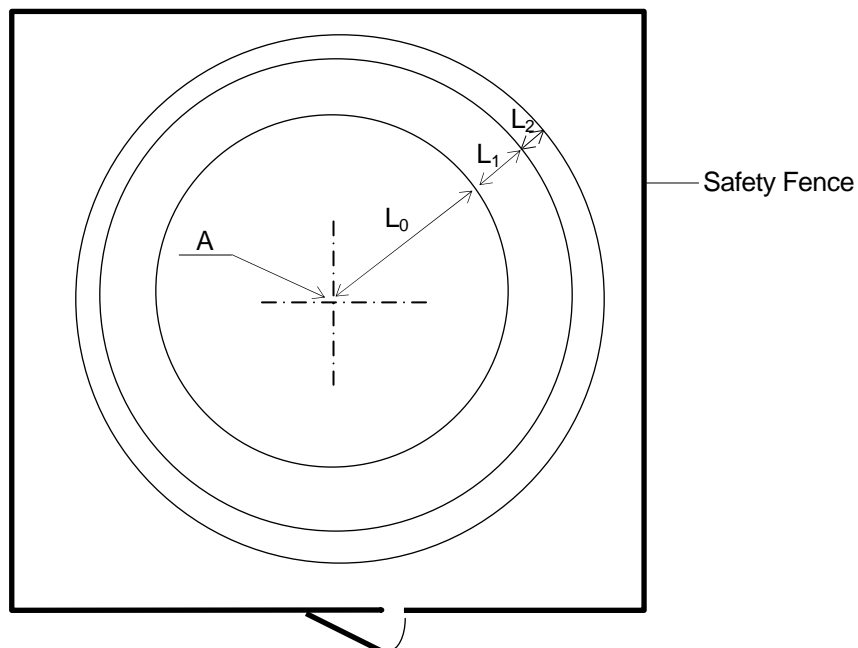


3.0 MOTION RANGE & SPECIFICATIONS OF ROBOT

3.1 DETERMINATION OF SAFETY FENCE DIMENSIONS BASED ON MOTION RANGE

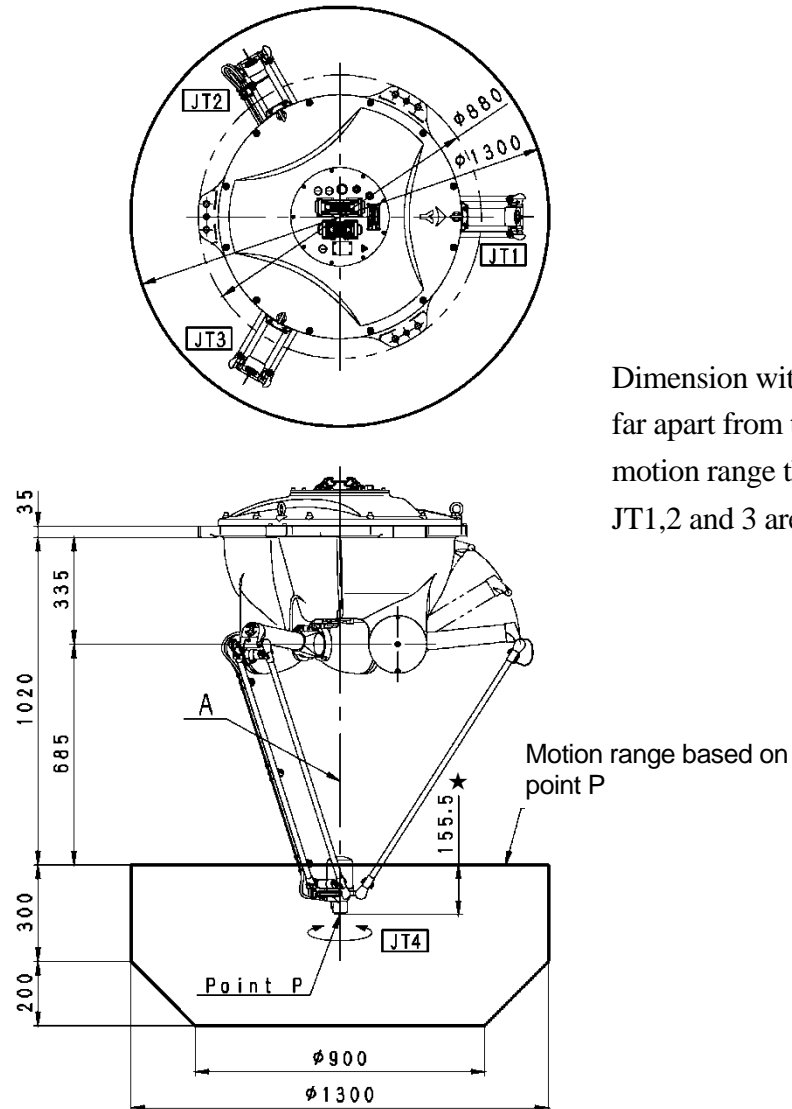


The motion range of the Robot is represented by Point P in the figure above. Accordingly, the dimensions of safety fence should be determined as follows: Calculate sum of L_0 , L_1 and L_2 as minimum dimension. That is; length from the center of arm (Point A shown above) to the center of wrist ($=L_0$) + length from the center of wrist to the edge of tool or workpiece ($=L_1$) + length of allowance ($=L_2$). For the dimension of L_0 , refer to the drawings of 3.2 Motion Range & Specifications of Robot.



3.2 MOTION RANGE & SPECIFICATIONS OF ROBOT

- YF003N-A00x (For food machines, 4-axis (standard))



Dimension with ★ shows how far apart from the upper limit of motion range the Point P is when JT1,2 and 3 are 0°.

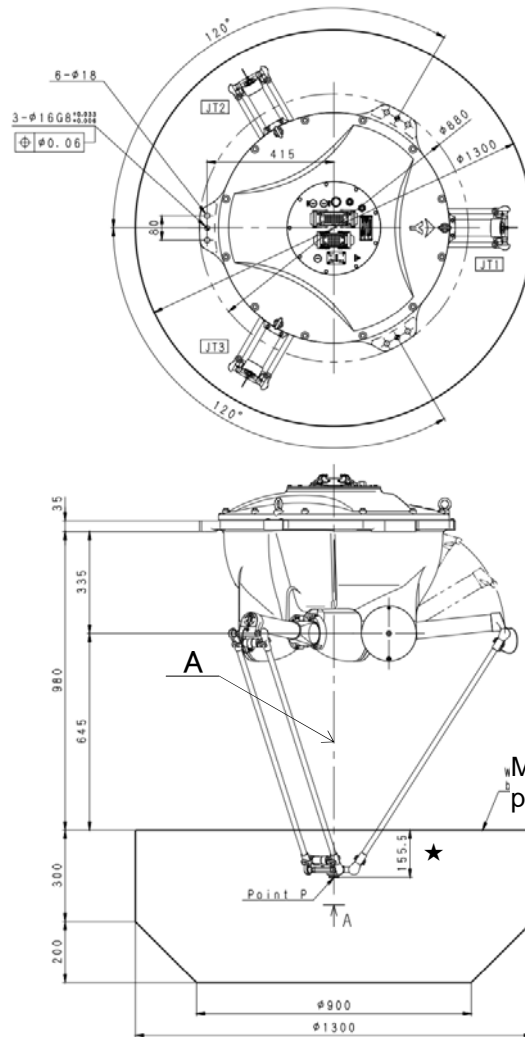
Model	Delta type parallel link		
Degree of Freedom	4		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	+95° - -52.5°	1091 °/s
	2	+95° - -52.5°	1091 °/s
	3	+95° - -52.5°	1091 °/s
	4	±360°	1714 °/s
Max. Payload	3 kg		
Wrist Load Capacity	Depending on load mass. Refer to 8.3 Load Capacity.		
Repeatability	±0.10 mm		
Mass	145 kg		
Acoustic Noise	< 70 dB (A)*		

*measured condition

- Installed on stand of 2150 mm height
- 1650 mm away from A axis

〔 The noise level depends on the conditions. 〕

- YF003N-A10x (For food machines, 3-axis (standard))



Dimension with ★ shows how far apart from the upper limit of motion range the Point P is when JT1,2 and 3 are 0°.

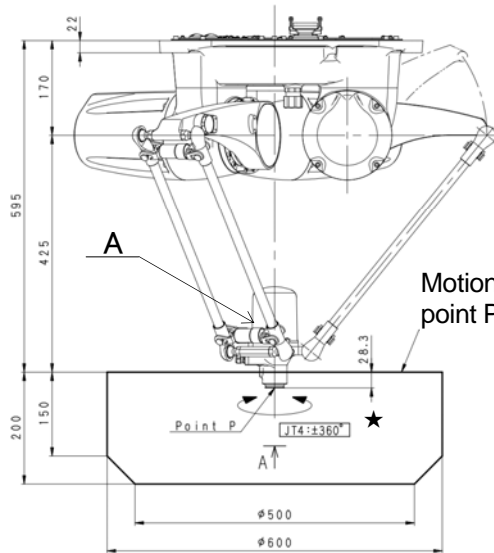
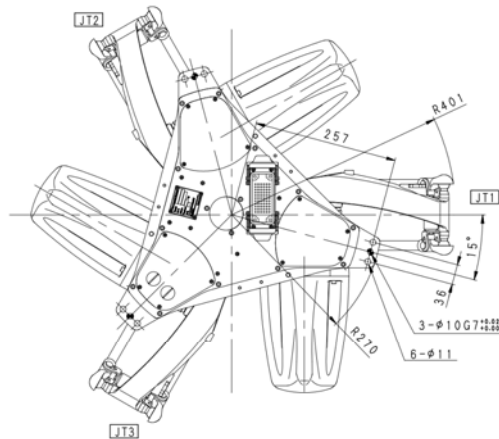
Model	Delta type parallel link		
Degree of Freedom	3		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	+95° - -52.5°	1091 °/s
	2	+95° - -52.5°	1091 °/s
	3	+95° - -52.5°	1091 °/s
	4		
Max. Payload	3 kg		
Wrist Load Capacity	Depending on load mass. Refer to 8.3 Load Capacity.		
Repeatability	±0.10 mm		
Mass	145 kg		
Acoustic Noise	< 70 dB (A) ※		

*measured condition

- Installed on stand of 2150 mm height
- 1650 mm away from A axis

The noise level depends on the conditions.

● YS002N-B/ YF002N-B



Dimension with ★ shows how far apart from the upper limit of motion range the Point P is when JT1,2 and 3 are 0°.

Motion range based on point P

Model	Delta type parallel link		
Degree of Freedom	4		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	+77° - -34.5°	490 °/s
	2	+77° - -34.5°	490 °/s
	3	+77° - -34.5°	490 °/s
	4	±360°	1714 °/s
Max. Payload	2 kg		
Wrist Load Capacity	Depending on load mass. Refer to 8.3 Load Capacity.		
Repeatability	±0.04 mm		
Mass	60 kg		
Acoustic Noise	< 70 dB (A) ※		

*measured condition

- Installed on stand of 1400 mm height
- 1300 mm away from A axis

〔 The noise level depends on the conditions. 〕

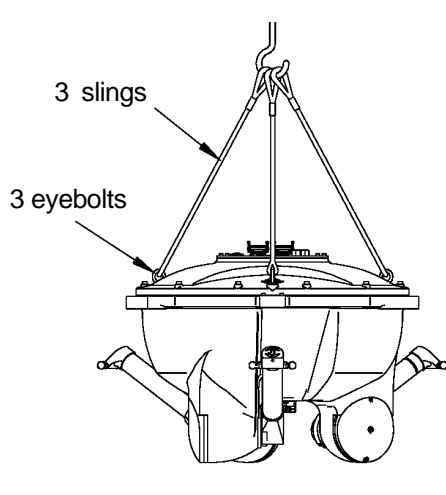
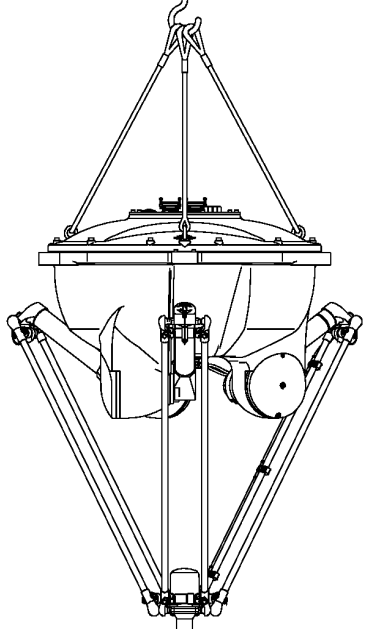
4.0 TRANSPORTATION METHOD

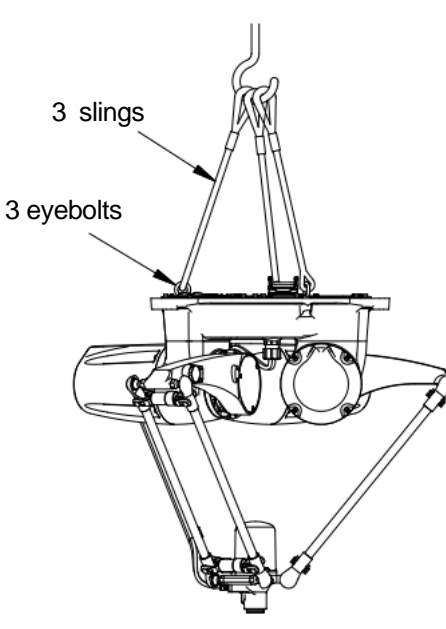
4.1 HOISTING BY WIRE SLING

According to the figure, attach three eyebolts to arm and hoist up by attaching wire slings to the jigs.

⚠ CAUTION

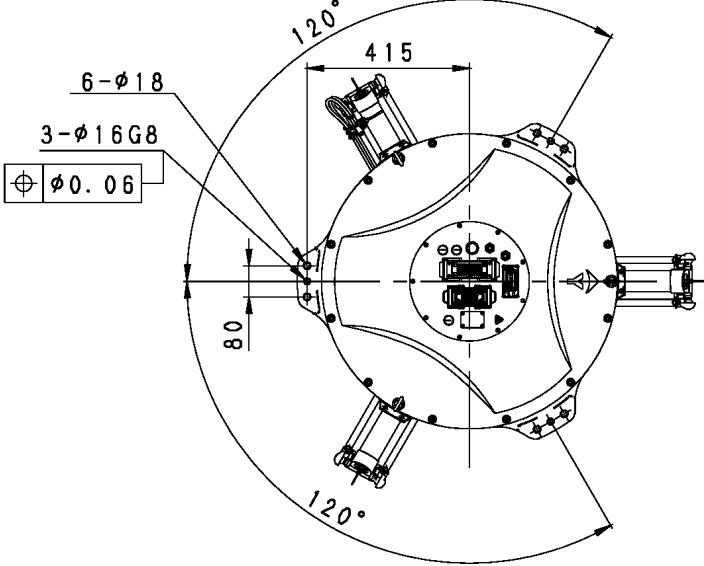
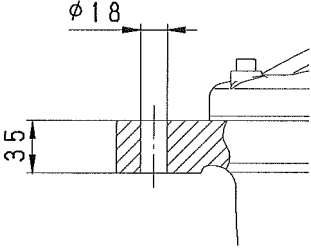
When hoisting up the robot arm, be careful as robot arm may lean forward/backward depending on robot posture and mounting condition of the option devices. If the robot is hoisted up in an inclined posture, it may swing, or the wire may interfere with the harness, piping etc., or it may be damaged from interfering with surrounding objects. Remove the eyebolt mounted on the arm after the transportation is complete.

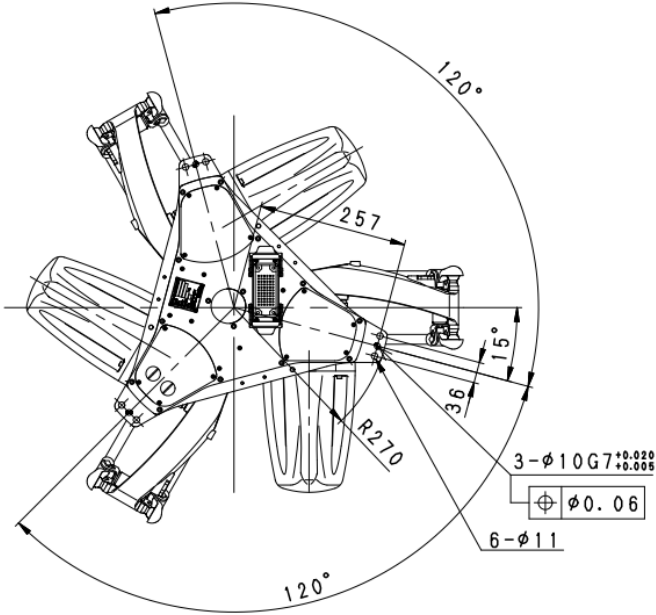
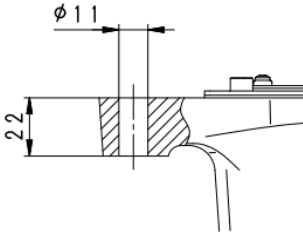
Model	YF003N-A	
Hoisting posture	In shipping	After installing lower arm
	 <p>3 slings 3 eyebolts</p>	
JT angles in hoisting	JT1	-28°
	JT2	-28°
	JT3	-28°
	JT4	0°
Hoisting jigs	60154-1879(Eyebolt) x 3 pcs	

Model	YS002N-B/YF002N-B	
Hoisting posture		
JT angles in hoisting	JT1	0°
	JT2	0°
	JT3	0°
	JT4	0°
Hoisting jigs	0EBM8Z (Eyebolt) x 3	

5.0 INSTALLATION DIMENSIONS OF BASE SECTION

Below shows the specifications of the base section and bolt fixing holes used for installation.

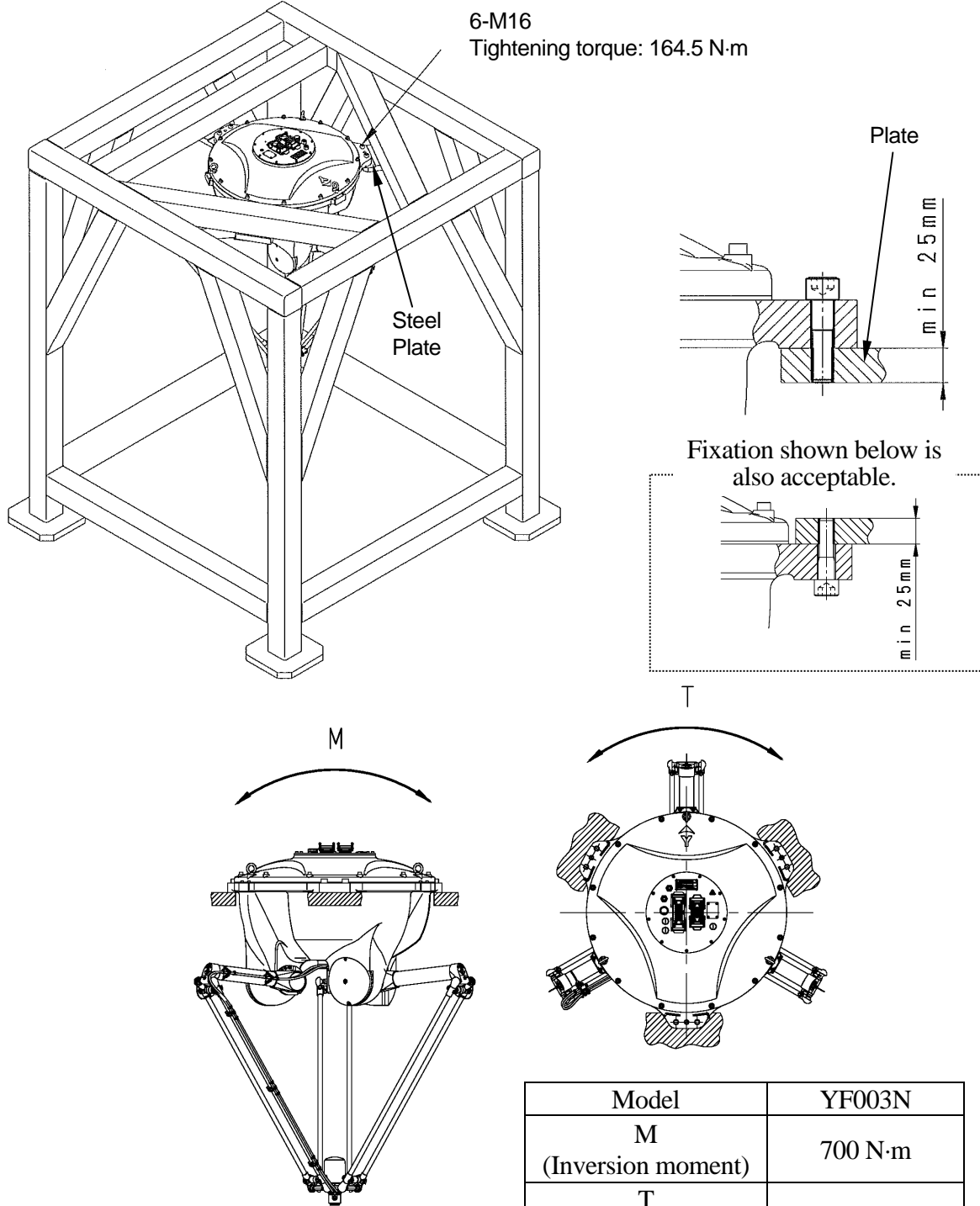
Model	YF003N-A
Installation dimensions of base section	
Cross-section of base installation part	
Bolt hole	6-φ18
Bolt	6-M16 Material: SUS304
Tightening torque	164.5 N·m
Levelness of installation surface	Within ±5°

Model	YS002N-B/YF002N-B
Base section	
Cross section of base part	
Bolt hole	6- ϕ 11
Bolt	6-M10 Material: SUS304 Tensile strength rank: A2-70
Tightening torque	39.0 N·m
Inclination of the base section	Within $\pm 5^\circ$

6.0 INSTALLATION METHOD

● YF003N-A

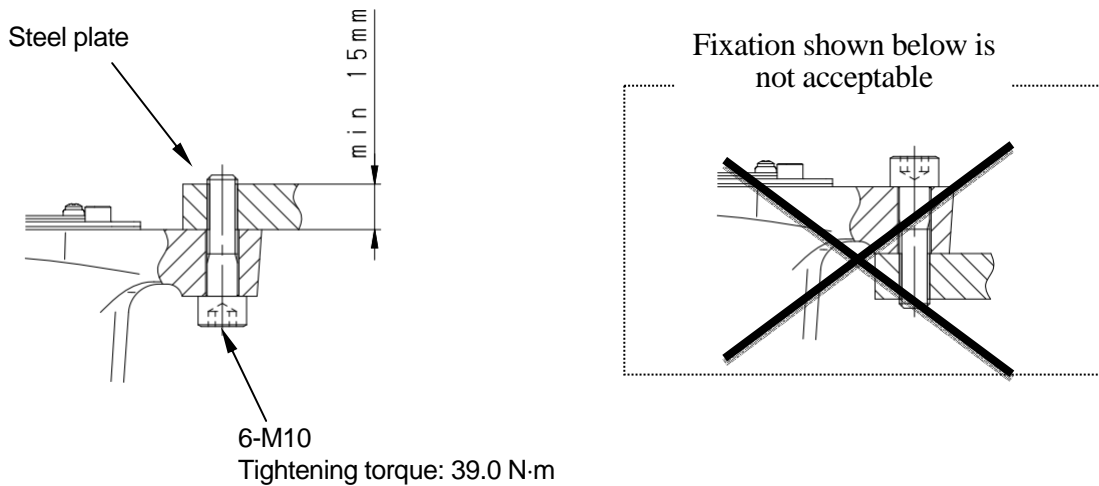
As in the figure below, embed steel plate (25 mm or more) on the stand whose natural frequency is 30 Hz or more. The steel plate should be fixed firmly so as to sustain the reaction forces from the robot.



Model	YF003N
M (Inversion moment)	700 N·m
T (Rotating torque)	500 N·m

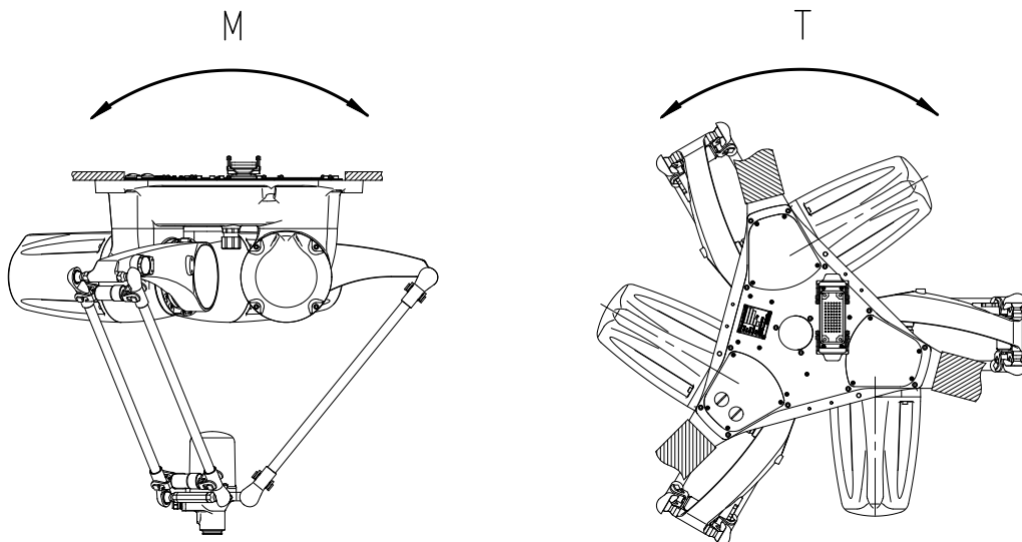
● YS002N-B/YF002N-B

As in the figure below, embed steel plate (15 mm or more) on the stand whose natural frequency is 30 Hz or more. The steel plate should be fixed firmly so as to sustain the reaction forces from the robot.



⚠ CAUTION

Unlike YF003N-A, YS002N-B/YF002N-B can be installed from one direction. If not installed correctly, the robot may interfere with the stand. Fix the robot to the stand following the given instruction. When the arm has to be installed from a different direction, please consult Kawasaki.



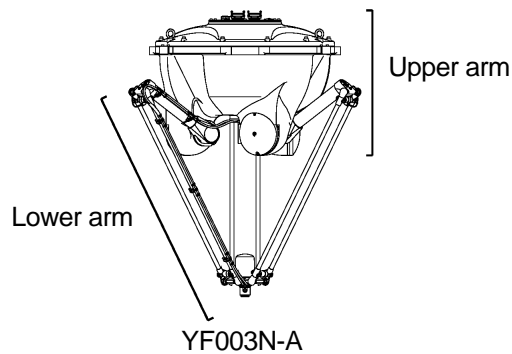
Model	YS/YF002N-B
M (Inversion moment)	400 N·m
T (Rotating torque)	200 N·m

7.0 INSTALLATION OF LOWER ARM

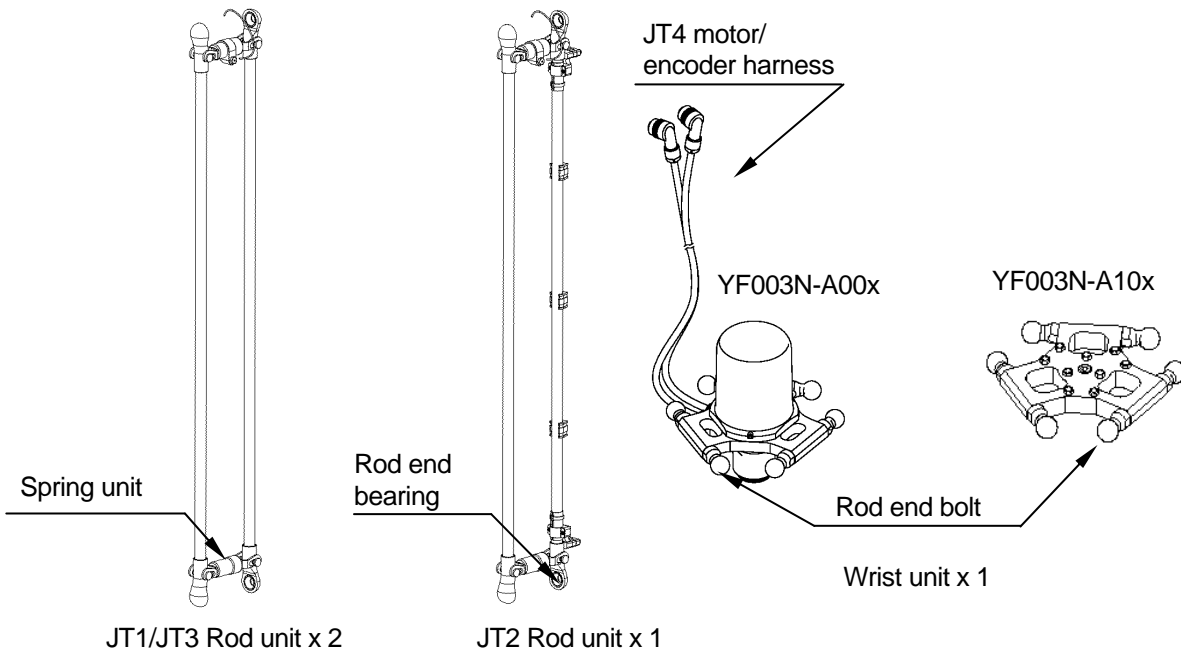
In shipping of YF003N-A, upper arms and lower arms are packed separately. Accordingly, for YF003N-A, the lower arms need to be installed after the upper arm is installed on the installation stand. For YS002N-B/ YF002N-B, the installation procedure will be the same when the upper arm and lower arms are separated.

7.1 EXPLANATION OF THE UNITS

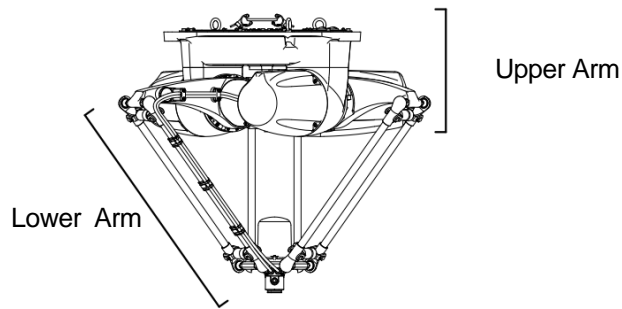
YF003N-A



Lower arm consists of 4 units in the 3 types.

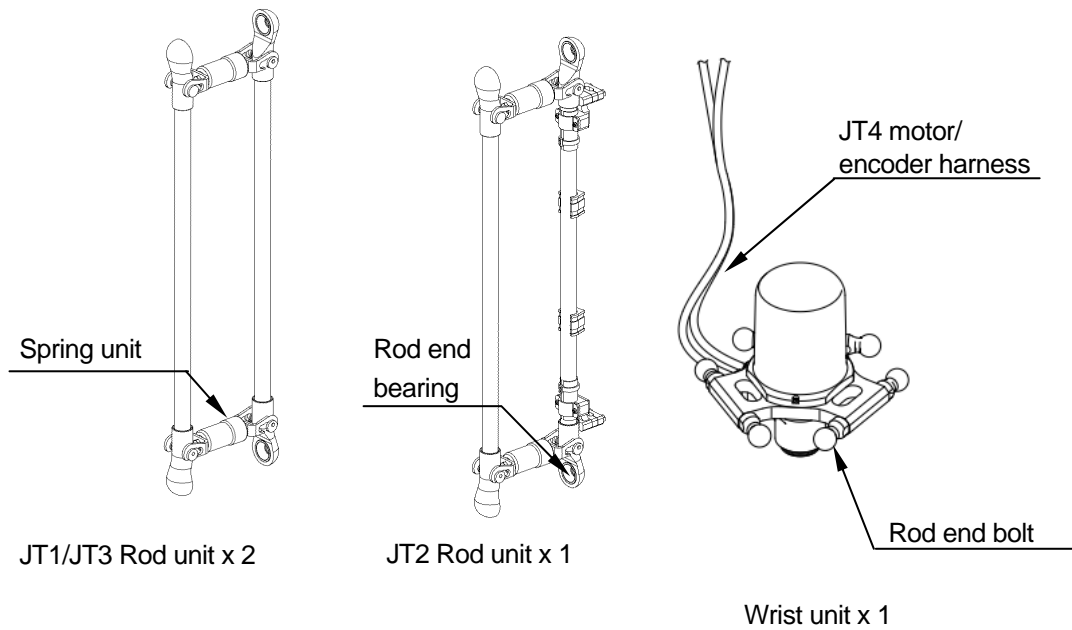


● YS002N-B/YF002N-B



YS002N-B/YF002N-B

The lower arm consists of 3 types of units (4 parts) shown below. For YS002N-B/YF002N-B, the wrist unit and the upper arm are connected with JT4 harness, therefore cannot be separated as with YF003N-A.



7.2 NECESSARY PARTS FOR INSTALLATION

The following parts are necessary for installation. These parts are included with shipment of YF003N-A. (For YS002N-B/YF002N-B, these parts are not necessary, so they are listed as options.)

● YF003N-A

Parts	Part number	Num.
Rod unit mounting jig	50154-0023	1 pc
Tying band for clamping harness (Metal content)	60770-0044	8 pc
Grease for rod end bearing (Paraliq GTE703)	60499-0004	60 g
Locking material for wire mounting bolt (Locktite #243)	60296-0006	10 ml

● YS002N-B/YF002N-B

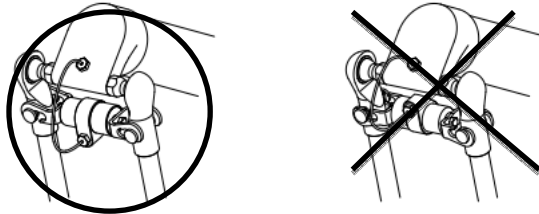
Parts	Part number	Num.
Rod unit mounting jig	50154-0023	1pc
Tying band for clamping harness (Metal content)	60770-0044	6 pc
Grease for rod end bearing (Paraliq GTE703)	60499-0004	60g

7.3 INSTALLATION PROCEDURE

● YF003N-A

Procedure 1:

Be careful with the installation direction of the rod unit. Always confirm before installation if the rod unit is not upside down or flipped around horizontally.

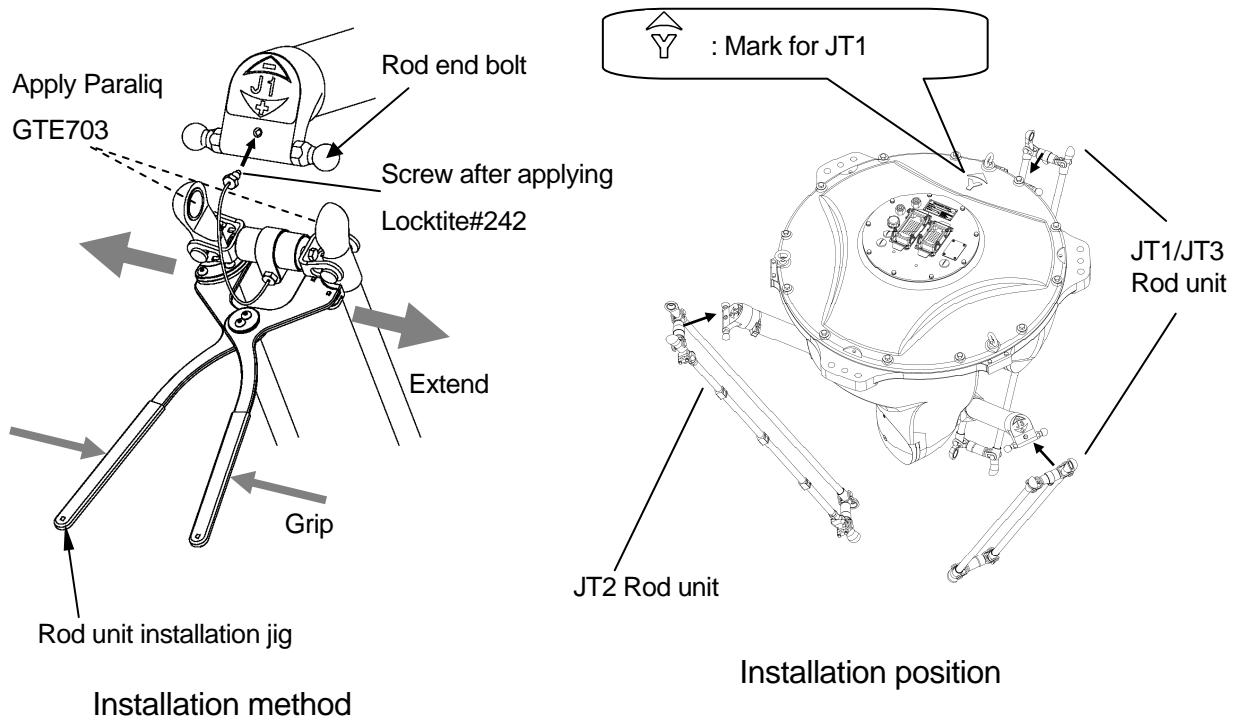


Procedure 2:

Apply Paralig GTE703 (about 0.2 to 0.5 ml for each part) on the surface of rod end bolt. Extend the spring on upper part of rod unit with rod unit installation jig and fit the rod end bolts of the upper arm into the rod end bearings. (Same procedure for JT1, 2 and 3)

Procedure 3:

Apply Locktite#243 on the screw part of wire end and screw it into the hole on upper arm.

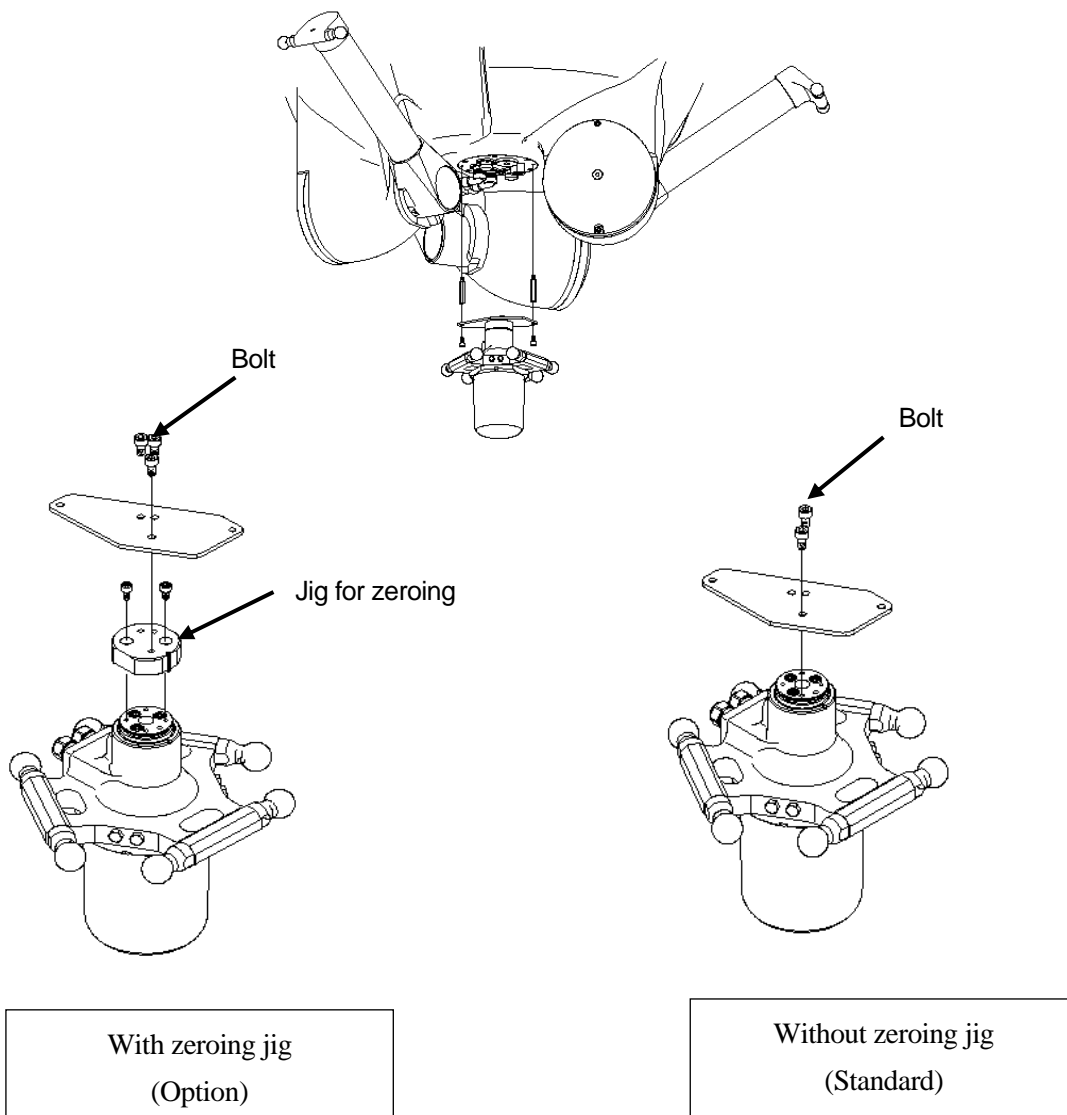


⚠ CAUTION

1. Pay attention so as not to get your hands and fingers caught when fitting the rod ends into rod end bolts.
2. After installation, confirm that the rod end bolts are fitted to the rod end bearings securely.
3. Rod unit of JT2 has difference in shape between left and right parts. Install the 3 rod units to upper arm in the way shown in the figure above, paying attention to the installation positions and orientations.
4. Not confirming the rod unit direction as in procedure 1 and installing the unit in wrong direction may result in robot interference during operation.

Procedure 4:

Note* This procedure necessary only installing for the first time after shipment.



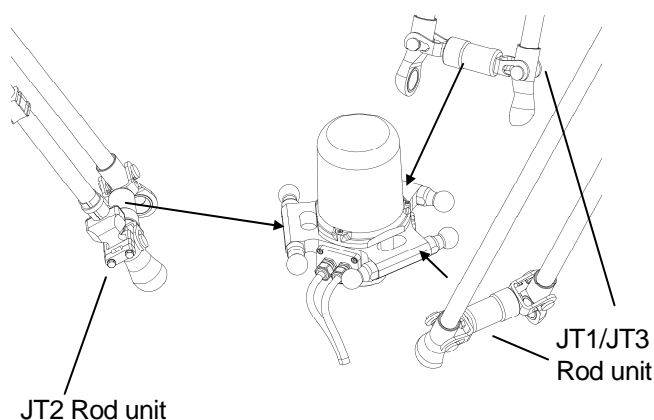
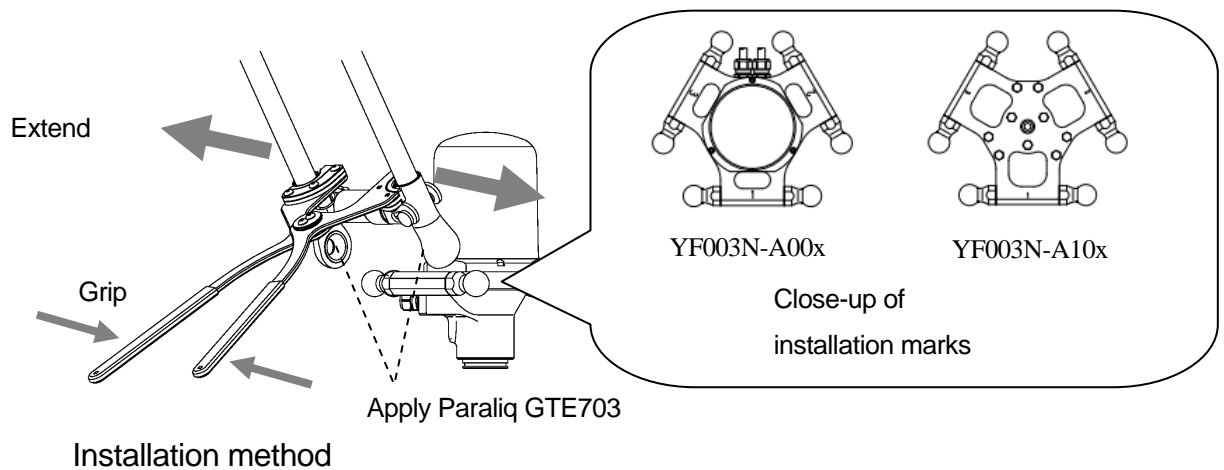


WARNING

1. After removing the wrist unit, remove all the fixing devices.
2. The fixing devices for the wrist unit are exclusive for this purpose. Do not use these devices for purposes other than fixing the wrist unit.
3. After removing the wrist unit, confirm that JT4 harness is not twisted.

Procedure 5:

Apply Paraliq GTE703 (about 0.2 to 0.5 ml for each part) on the surface of rod end bearing as in Procedure 1. Extend the spring on lower part of rod unit with rod unit installation jig and fit the rod end bearings into rod ends of the wrist unit (3 positions). Installation positions are shown with the numbers on the wrist unit.



Installing position

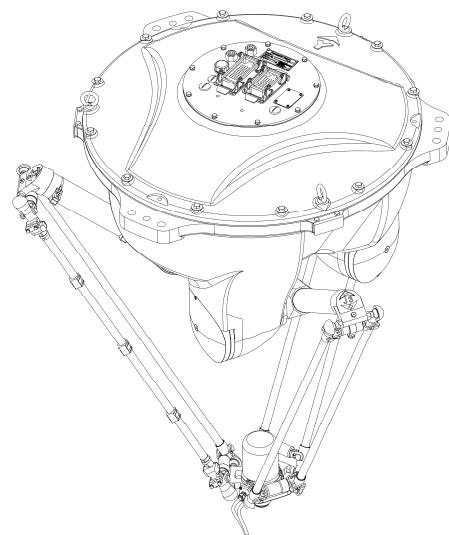


Figure shows the state after completion of procedure 4.

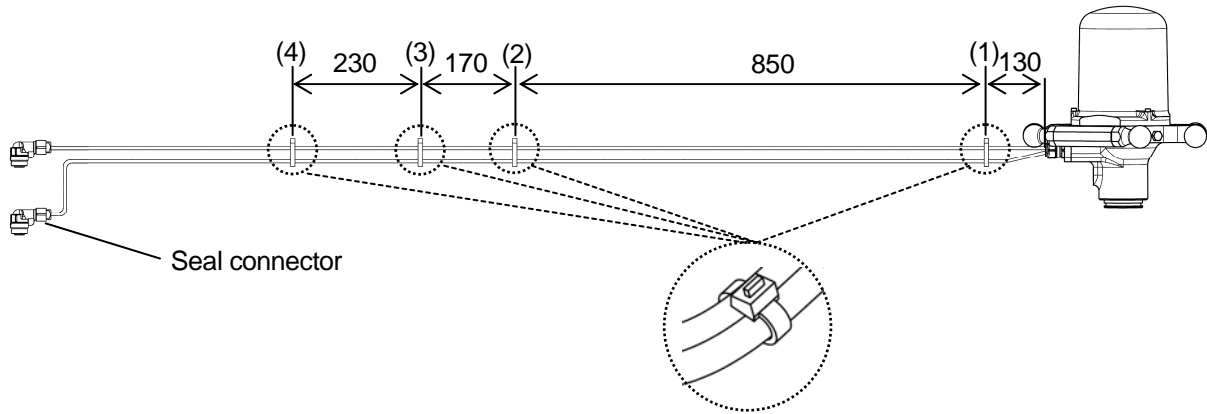


CAUTION

- 1. Pay attention so as not to get your hands and fingers caught when fitting the rod ends into rod end bolts.**
- 2. After installation, confirm that the rod end bolts are fitted to the rod end bearings securely.**
- 3. Be careful with the direction of the wrist unit. Install following the marks on the wrist unit.**
- 4. Be careful so that the wrist unit does not fall before securing at all three positions.**

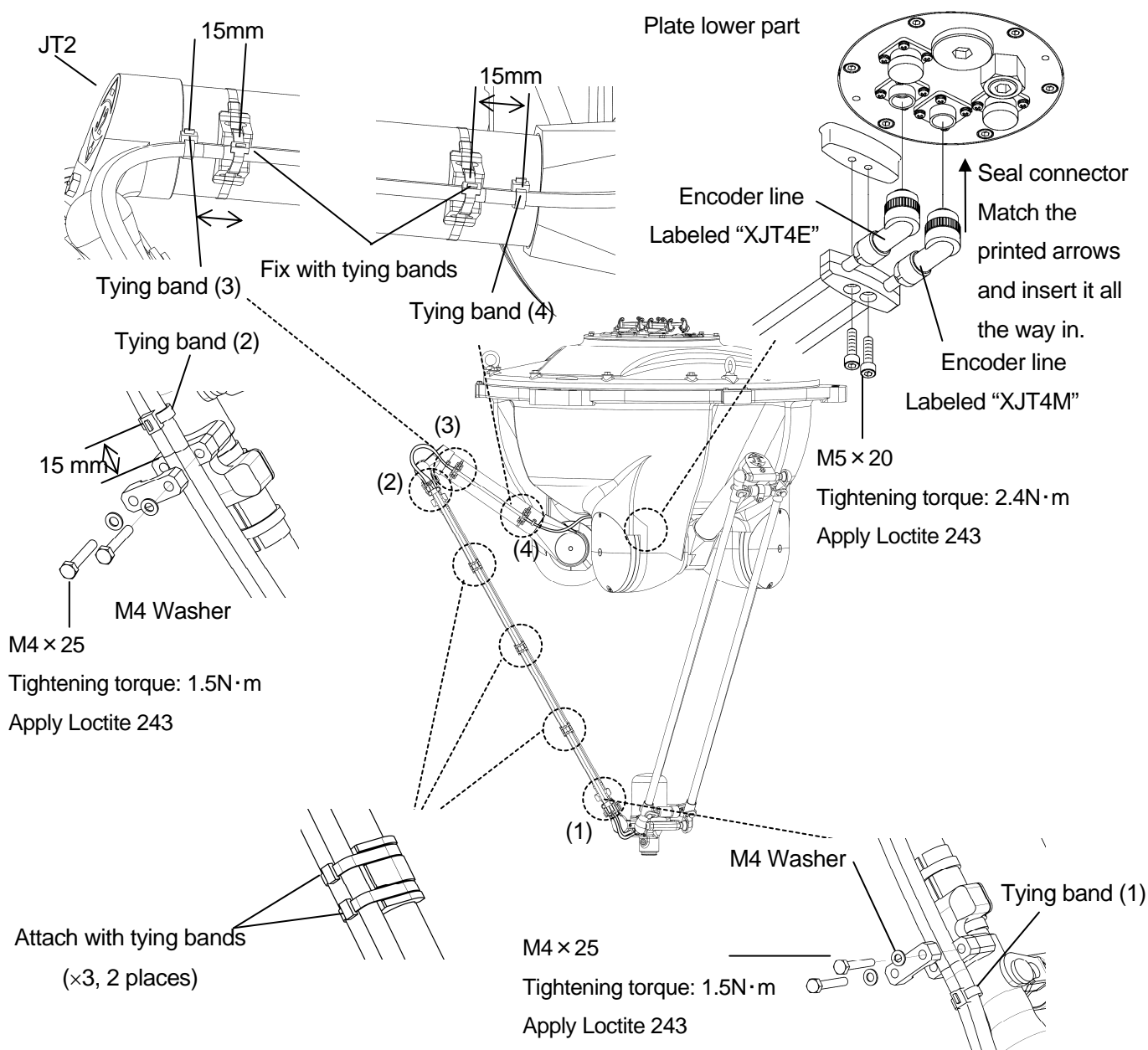
Procedure 6: (* This procedure not necessary for YF003N-A10x)

Tie the JT4 harness together at the locations (1) - (4) shown in the figure below using tying bands. These tying bands will serve as guides when mounting the harness to the arm. (If there is any tying band attached from time of robot installation, check its location.)



Procedure7: (* This procedure not necessary for YF003N-A10x)

Using the tying bands (1) to (4) as guides, fix the harness to JT2 arm at the locations shown in the figure below. Referring to the figure, connect the harness starting from the lower position using tying bands, cable clamps, seal connectors, etc. Cut off the extra tying bands using nippers, etc. Tightening torque for the screws are 1.5N·m for M4 and 2.4N·m for M5. Apply Loctite 2436 to all the screws.



CAUTION

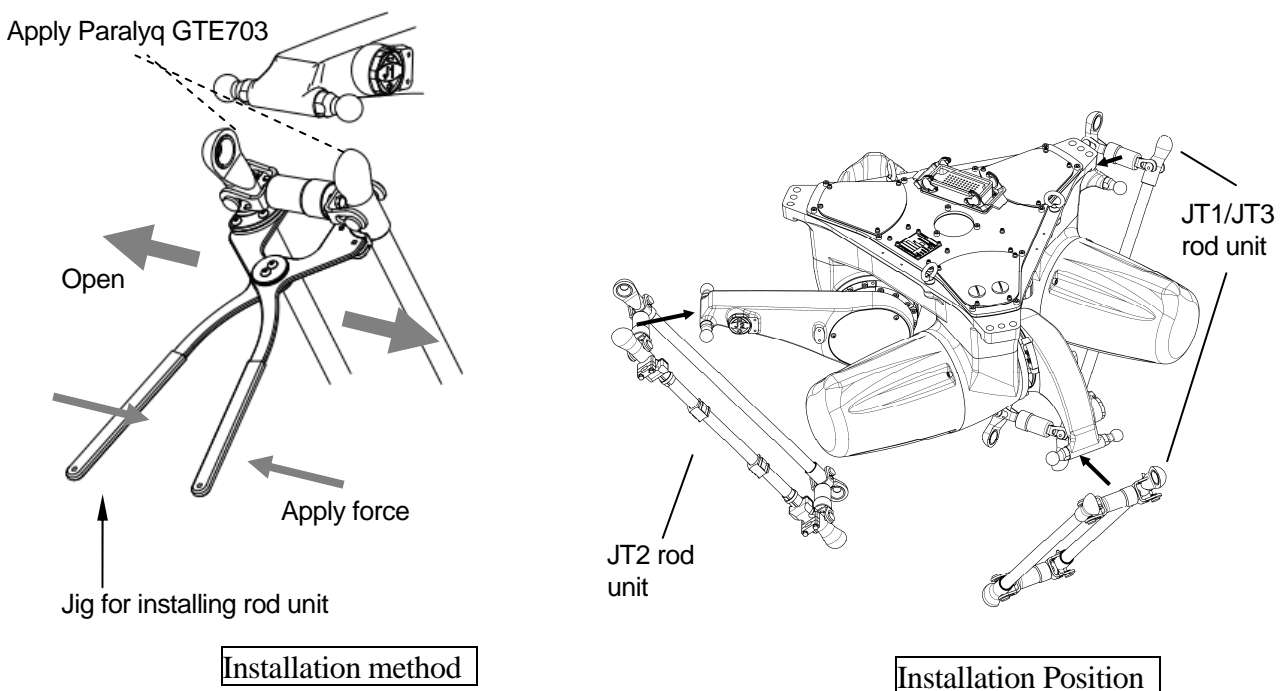
1. Fasten tying bands securely when fixing the harness cables to the arm.
2. Securely insert the connectors to the lower plate.
3. Before fixing the harness connector confirm that the harness is not twisted.

● YS002N-B/YF002N-B

For YS002N-B/YF002N-B, the rod units and the arm are not separated at time of shipment so this procedure is not necessary. Below shows the installation procedure as a reference for when reassembly is necessary.

Procedure 1:

Apply Paralyq GTE703 (about 0.2 to 0.5 ml for each part) on the surface of rod end bearing. Spread the spring on upper part of the rod unit with rod unit installation jig and fit the rod end bearings into rod end bolts of the upper arm. (All JT1, 2 and 3).

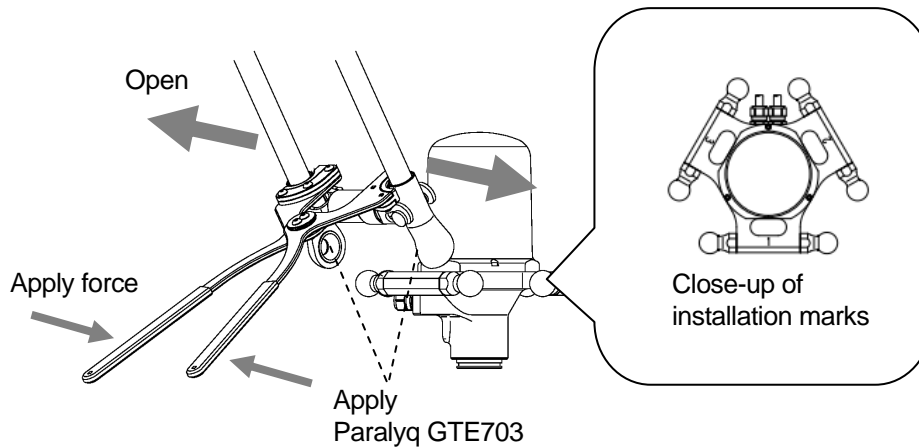


CAUTION

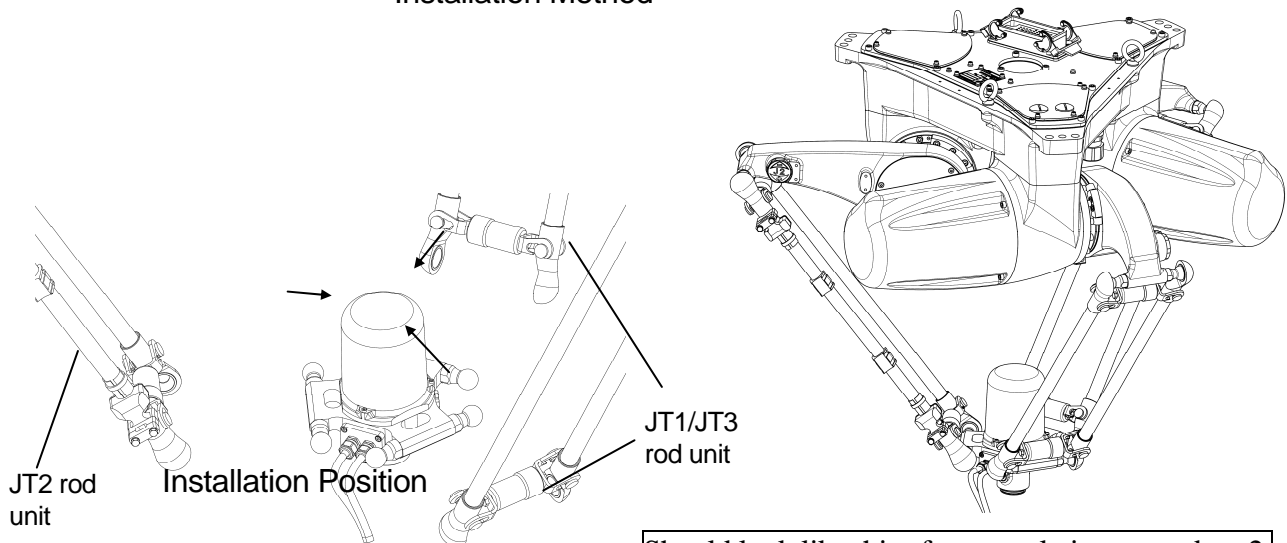
1. Pay attention so as not to get your hands and fingers caught when fitting the rod ends into rod end bolts.
2. After installation, confirm that the rod end bolts are fitted to the rod end bearings securely.
3. Rod unit of JT2 has difference in shape between left and right parts. Install the 3 rod units to upper arm in the way shown in the figure above, paying attention to the installation positions and orientations.

Procedure 2:

In the same way as procedure 1, apply Paralyq GTE703 (about 0.2 to 0.5 ml for each part) on the surface of the rod end bearing. Then, using the jig for installing rod unit, spread the spring at the lower part of the rod unit and fit the rod end bearings into rod end bolts of the wrist unit (3 places). See the installation marks on the wrist unit for the installation positions (JT1/2/3).



Installation Method



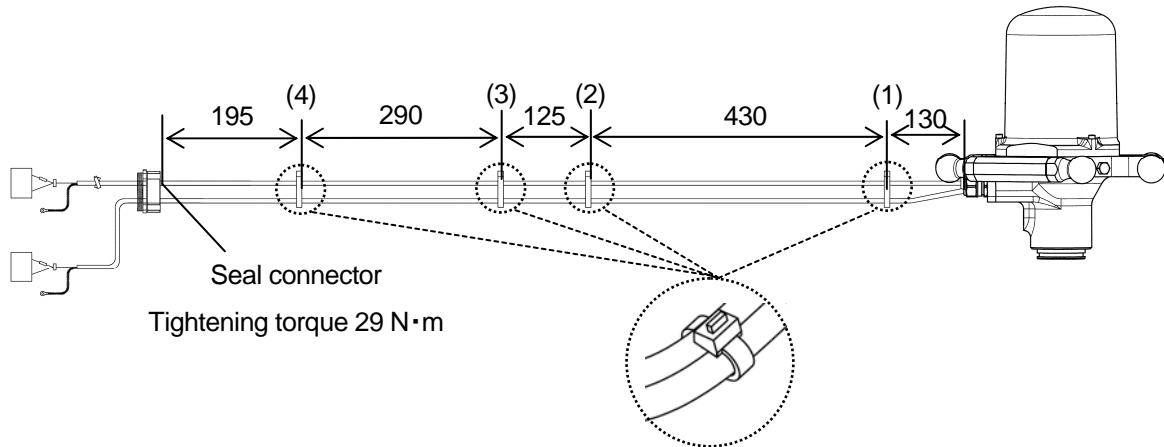
Should look like this after completing procedure 2.

⚠ CAUTION

1. Pay attention so as not to get your hands and fingers caught when fitting the rod ends into rod end bolts.
2. After installation, confirm that the rod end bolts are fitted to the rod end bearings securely.
3. Be careful with the direction of the JT4 rotor unit assy. Install following the marks on the wrist unit.
4. Be careful so that the wrist unit does not fall before securing at all three positions.

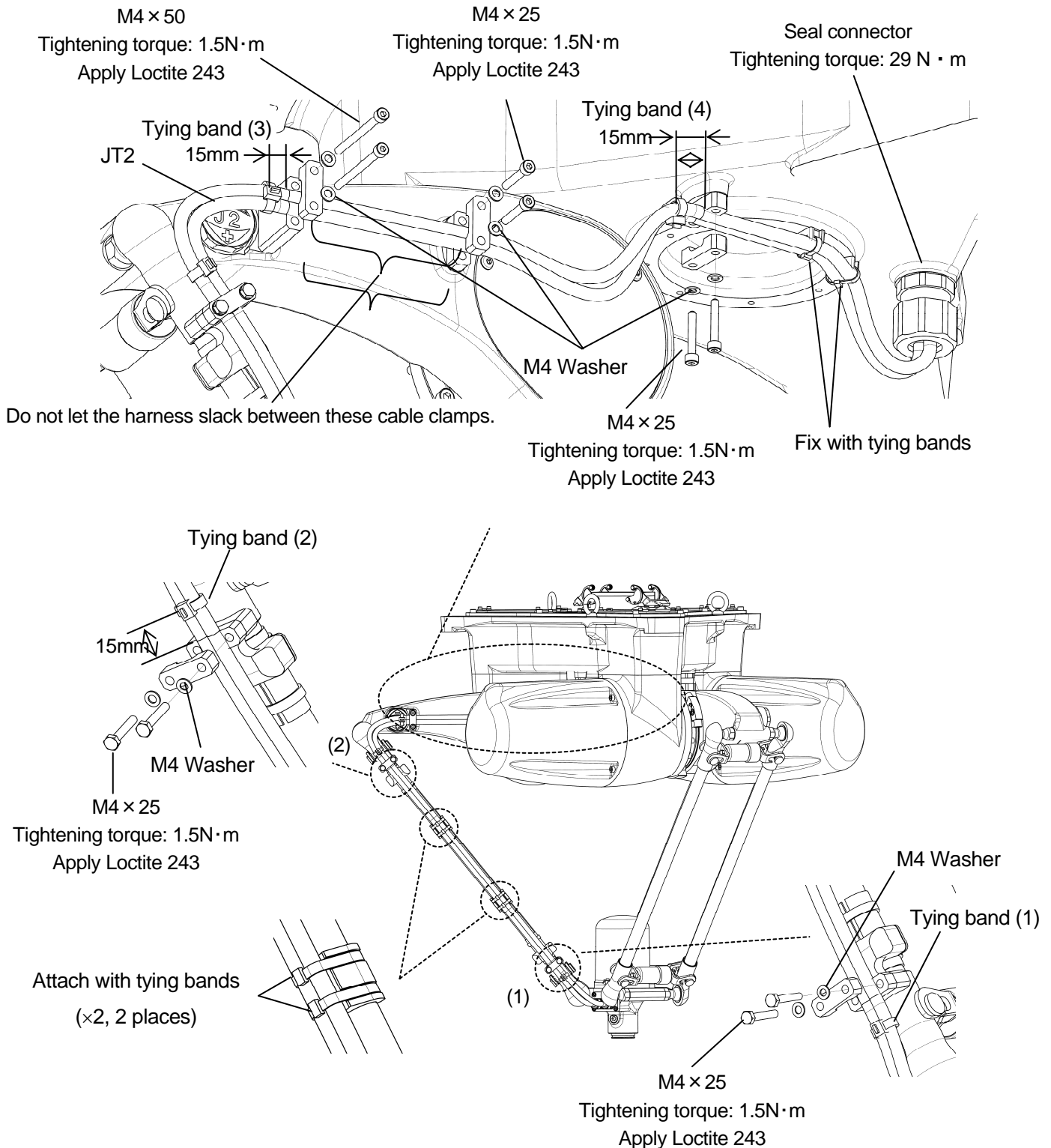
Procedure 3:

1. Tie the JT4 harness together at the locations (1) -(4) shown in the figure below using tying bands. These tying bands will serve as guides when mounting the harness to the arm. (If there is any tying band attached from time of robot installation, check its location.) Fix the seal connector at the location shown in the figure and tighten it to tightening torque of $29\text{N}\cdot\text{m}$.



Procedure 4:

Using the tying bands (1) to (4) as guides, fix the harness to JT2 arm at the locations shown in the figure below. Referring to the figure, connect the harness starting from the lower position using tying bands, cable clamps, seal connectors, etc. Cut off the extra tying bands using nippers, etc. Tightening torque for the screws are 1.5N·m for M4. Apply Loctite 2436 to all the screws.





CAUTION

- 1. Fasten tying bands securely when fixing the harness cables to the arm.**
- 2. The harness between tying bands (3) - (4) should not be slack near the cable clamp (3) (refer to the figure above).**
- 3. Before fixing the harness connector confirm that the harness is not twisted.**

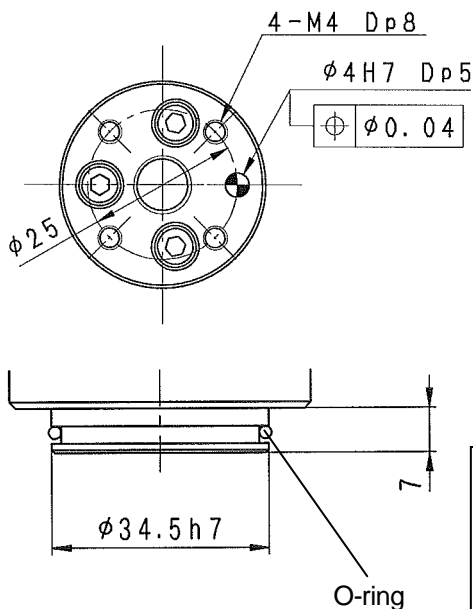
8.0 MOUNTING OF TOOLS



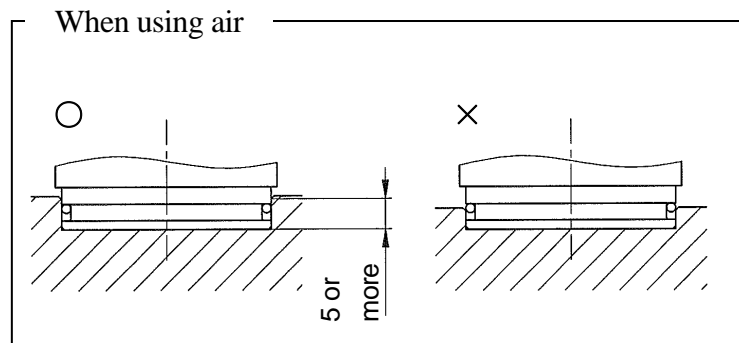
WARNING

When mounting tools, turn OFF the controller power up to the external power switch. Display signs indicating clearly “Installation and Connection in Progress”, and lockout/tagout the external power switch to prevent personnel from accidentally turning ON the power.

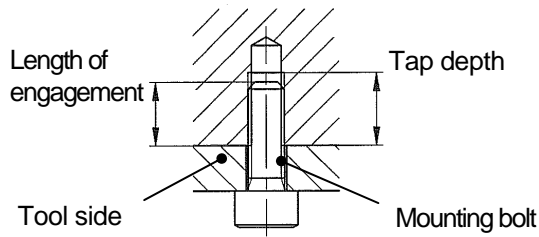
8.1 DEMENSION OF FLANGE



At the end of robot arm, a flange is provided for mounting tools. Tighten the mounting bolts into the tapped holes on the circumference of $\phi 25$ on the flange. Moreover, position tools with pin hole and the spigot. When using air tools, make the depth (excluding chamfered part) of spigot hole of tool 5 mm or more in order to prevent air leakage.



8.2 SPECIFICATION OF MOUNTING BOLT



Select the length of mounting bolts according to the tap depth of tool mounting flange.

Length of engagement	6-7 mm
Bolt size	M4
Bolt material	SUS304
Tightening torque	2.4 N·m

! CAUTION

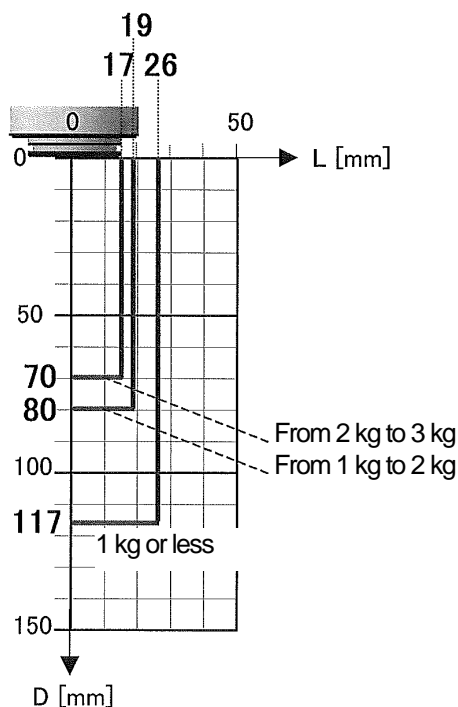
If the length of engagement exceeds the specified length, the mounting bolt bottoms out and the tool cannot be fixed securely.

8.3 LOAD CAPACITY

The load capacity of robot is specified for each model and includes the mass of tool. Strictly observe the following restriction on center of gravity in below figure.

! CAUTION

Using the robot beyond its specified load capacity may result in degradation of movement performance and shortening of machine service life. The load mass includes all the tool mass including workpiece, etc. To use the robot in excess of its load capacity, first contact Kawasaki without fail.



Design tool so that the center of gravity is inside the line in the left diagram.

* the line is determined according to load mass.

L: Distance in horizontal direction (X-Y direction) from Z axis to center of gravity

D: Distance in vertical direction (Z direction) from X-Y plane to center of gravity

*This is same for YF003N-A10x.

9.0 MOUNTING EXTERNAL DEVICES

9.1 PRECAUTIONS

Please read and understand the below precautions before mounting external devices.



WARNING

1. **Confirm the motion without fail so that the mounted external devices and fitting devices do not interfere with the surrounding or with the robot arm.**
2. **When laying the cables and tubes attached to the robot arm, do not use the fixing jig for JT4 harness. The jig may fall off because of the weight of the extra cable, and interfere with the robot arm. Set the cables along the JT1/ JT3 side.**



CAUTION

When using the fixing device on the CFRP part of the robot arm, add a cushioning between the fixing jig and CFRP to avoid damage. Even a small scratch may lead to a greater damage.

9.2 SERVICE TAPPED HOLE LOCATIONS

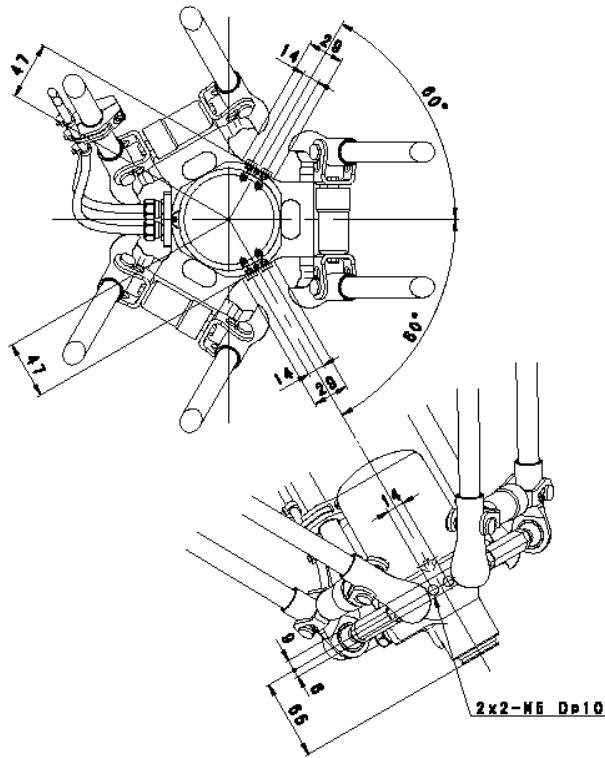
As shown in the following figure, tapped holes used for mounting of external devices and wiring brackets are provided in each part of the robot.



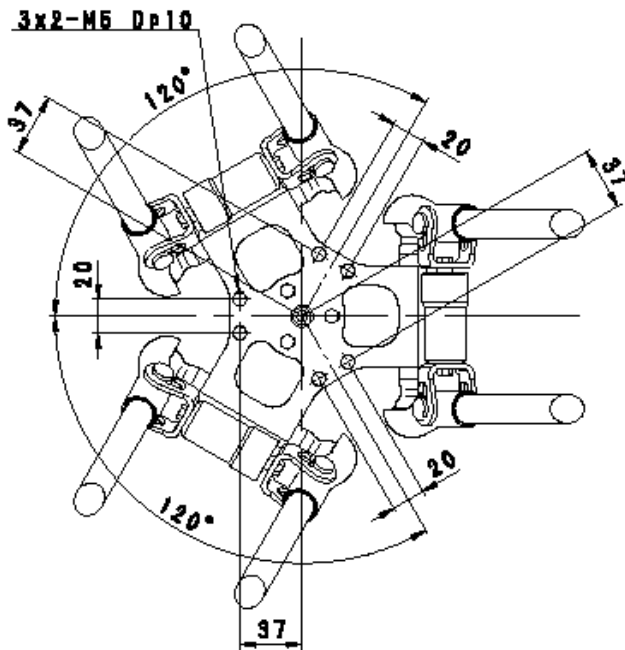
WARNING

1. **The tapped holes may be covered with sealing (resin bolts, sockets, sealants, etc.) to avoid rust, invasion of dust, etc. Do not use the sealing for other purposes.**
2. **The steel hexagon socket bolts and hexagon head bolts are component parts of the robot arm. Do not loosen these bolts, for the robot parts may come off.**

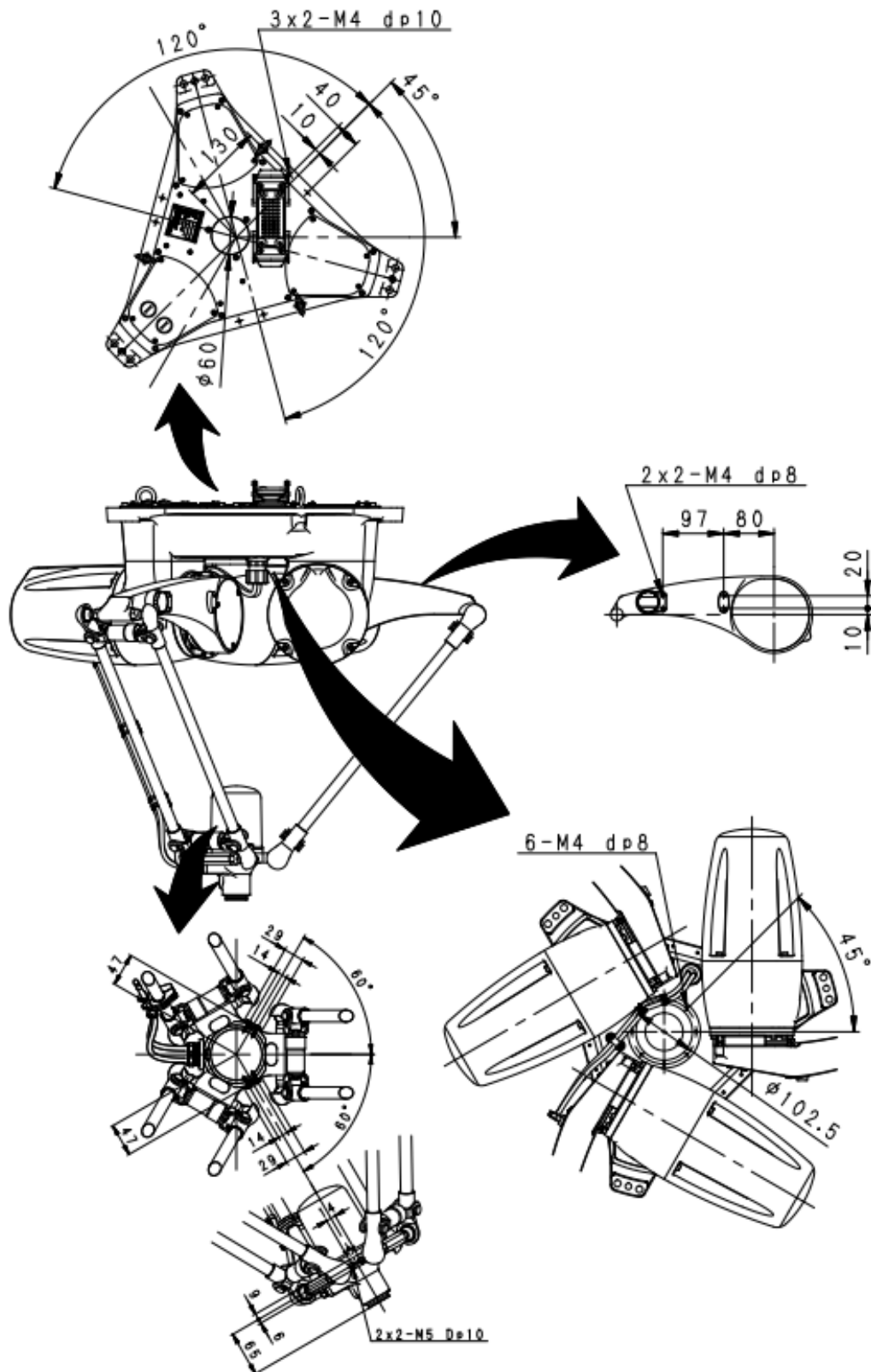
● YF003N-A00x



● YF003N-A10x



● YS002N-B/YF002N-B



9.3 LOAD MASS ON THE EXTERNAL DEVICES

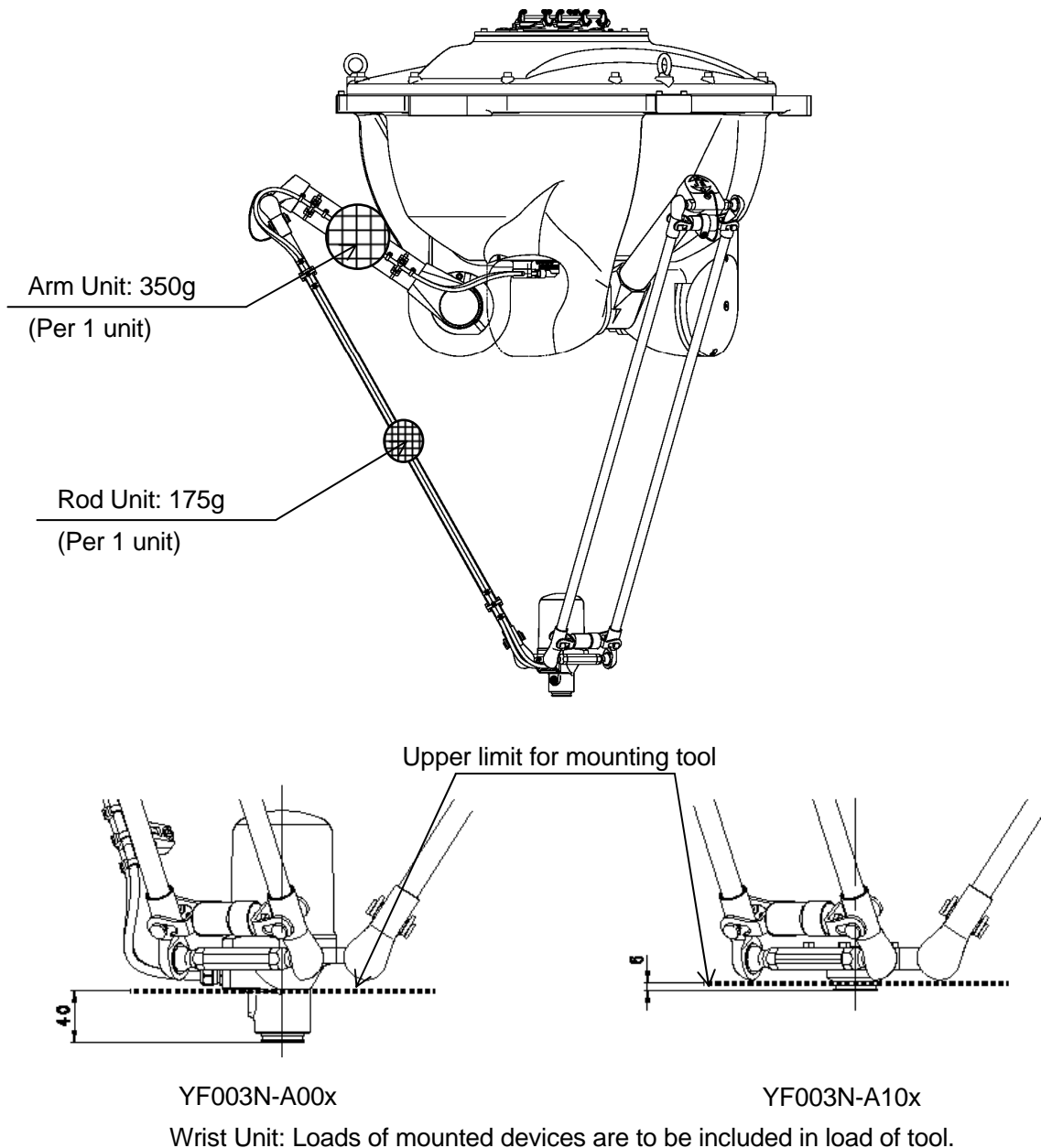
The load mass limits of the robot differ according the robot model. Also, there are limiting conditions to the loads on the arm as shown below. Never fail to obey these limits.

⚠ CAUTION

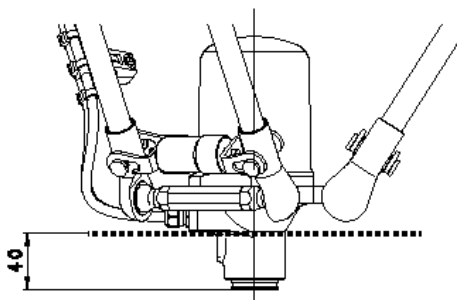
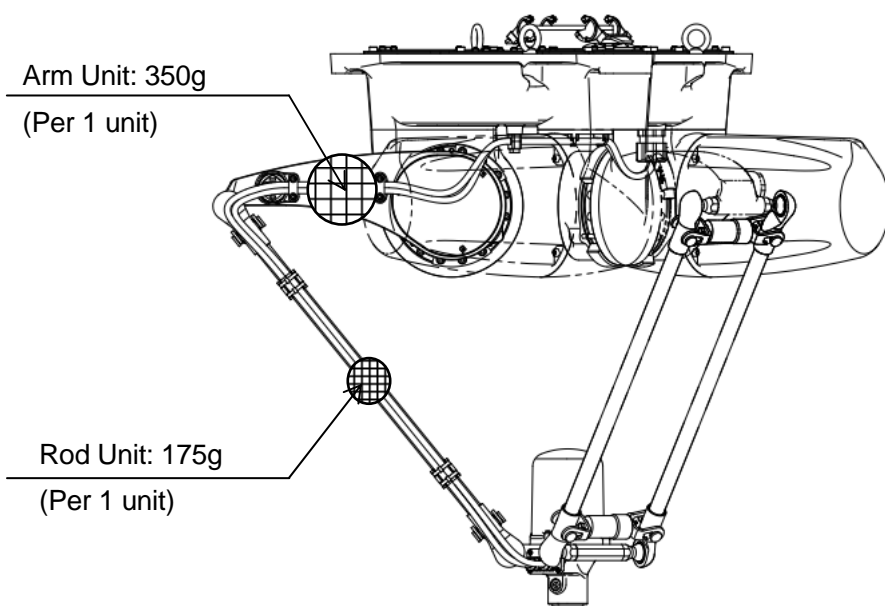
Using the robot exceeding the load limit may deteriorate the robot performance and machine life. Please consult Kawasaki, if the robot is to be used under conditions exceeding the limit load.

Do not exceed the limit values shown below.

● YF003N-A



● YS002N-B/YF002N-B



Wrist Unit: Loads of mounted devices are to be included in load of tool.

9.4 INSTALLING THE PIPINGS TO ROBOT ARM (OPTION)

Installation of piping such as air hose is optional, so contact Kawasaki before installation. The robot harness is fixed to JT2 arm so fix the piping to J1 or JT3 arm. This section explains how to install two pipes of 6 mm diameter as an example.



CAUTION

Installation of piping such as air hose is optional, so contact Kawasaki before installation.

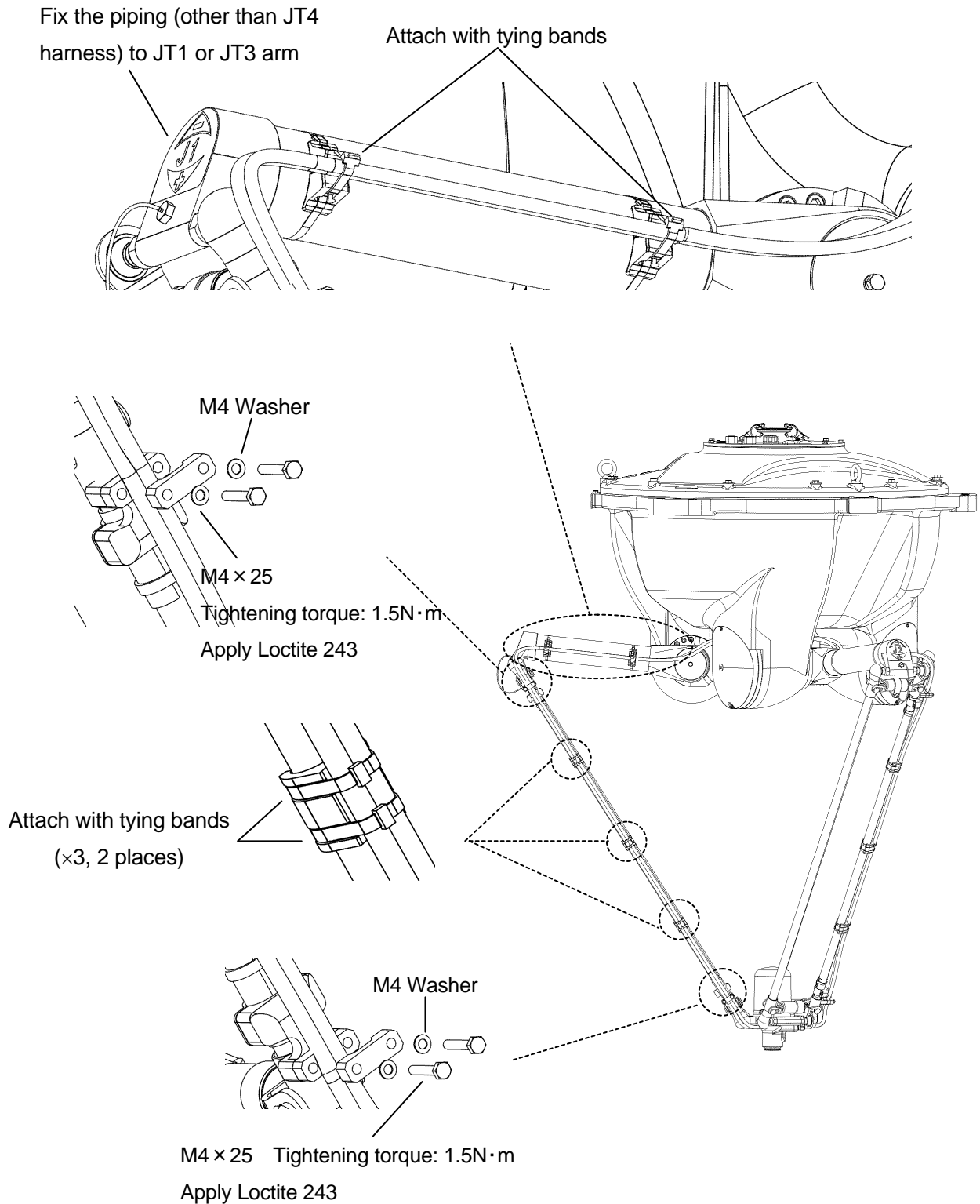


WARNING

- 1. Confirm the robot motions without fail so that the piping installed to the arm do not interfere with the peripheral devices or robot arm itself.**
- 2. When fixing additional piping to the robot arm, do not use the harness fixing jigs on JT2 arm. The fixing jig may be pull off by the piping and may interfere with the arm. When adding piping, use JT1 or JT3 arm.**

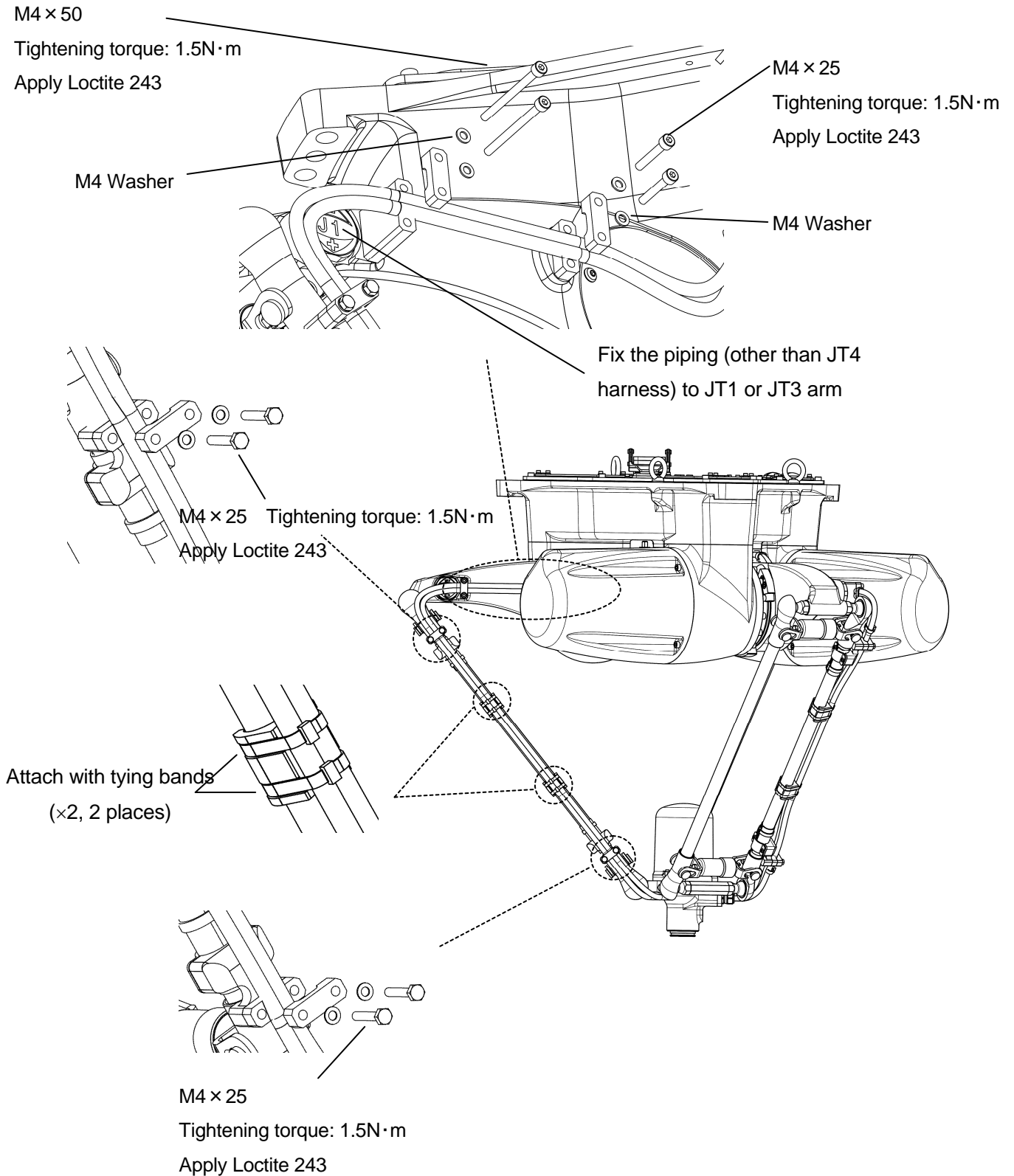
○YF003N-A

As shown in the figure below, fix the piping to JT1 or JT3 arm using tying bands or cable clamps. Cut off the extra tying bands using nippers, etc. Apply Loctite 243 to the screws and tighten them to tightening torque $1.5\text{N}\cdot\text{m}$.



○YS002N-B/YF002N-B

As shown in the figure below, fix the piping to JT1 or JT3 arm using tying bands or cable clamps. Cut off the extra tying bands using nippers, etc. Apply Loctite 243 to the screws and tighten them to tightening torque $1.5\text{N}\cdot\text{m}$.



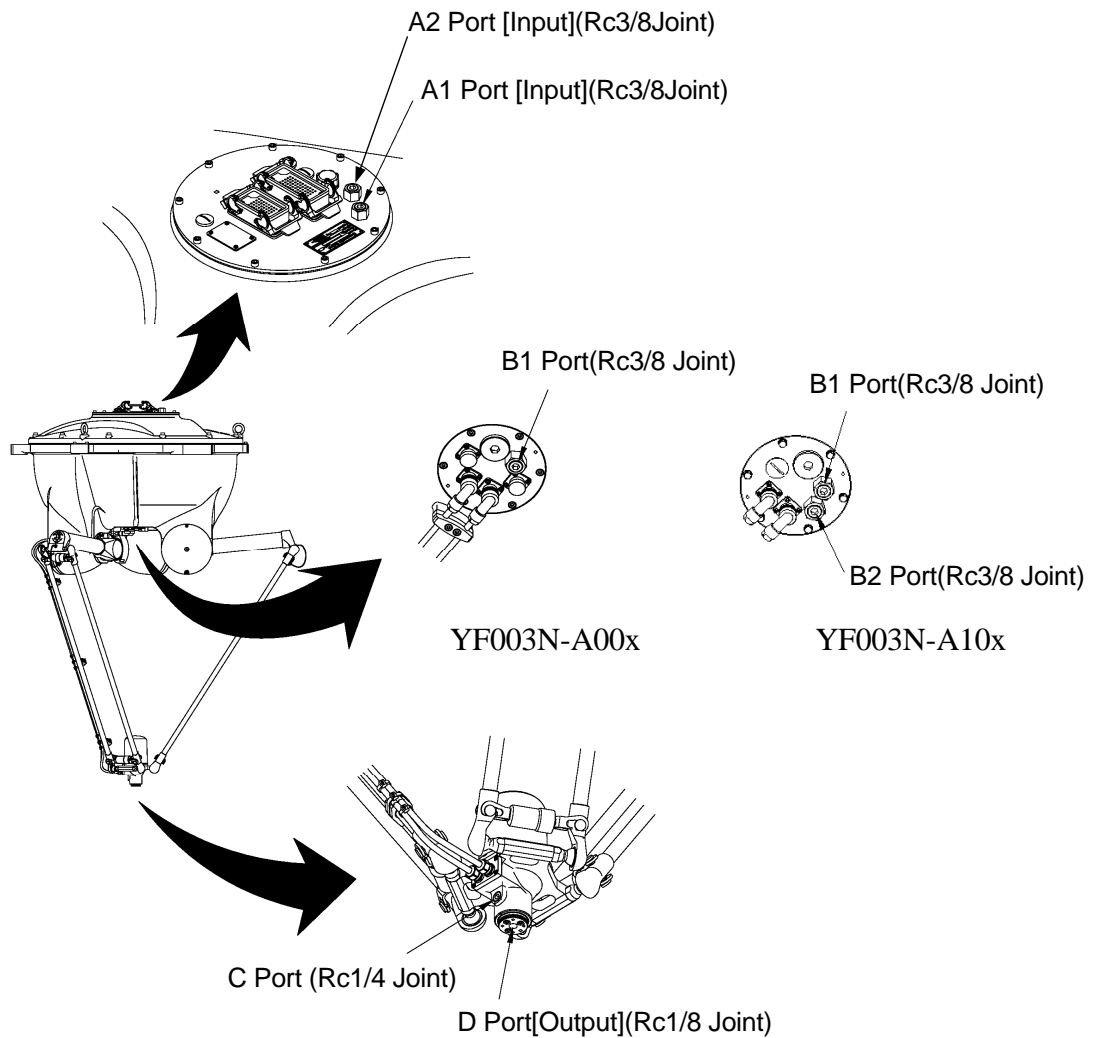
10.0 CONNECTION OF AIR SYSTEM

● YF003N-A

As shown in the following figure, air input ports (Rc3/8 Joint) are provided at base section and air output ports (Rc3/8 Joint) at wrist section (option). When using air, connect B port with C port by hose and fix it to arm. Please contact Kawasaki for details.

The following valves can be connected.

Standard	No Valve	
Option	Double Solenoid/Single Solenoid	Maximum 4 valves

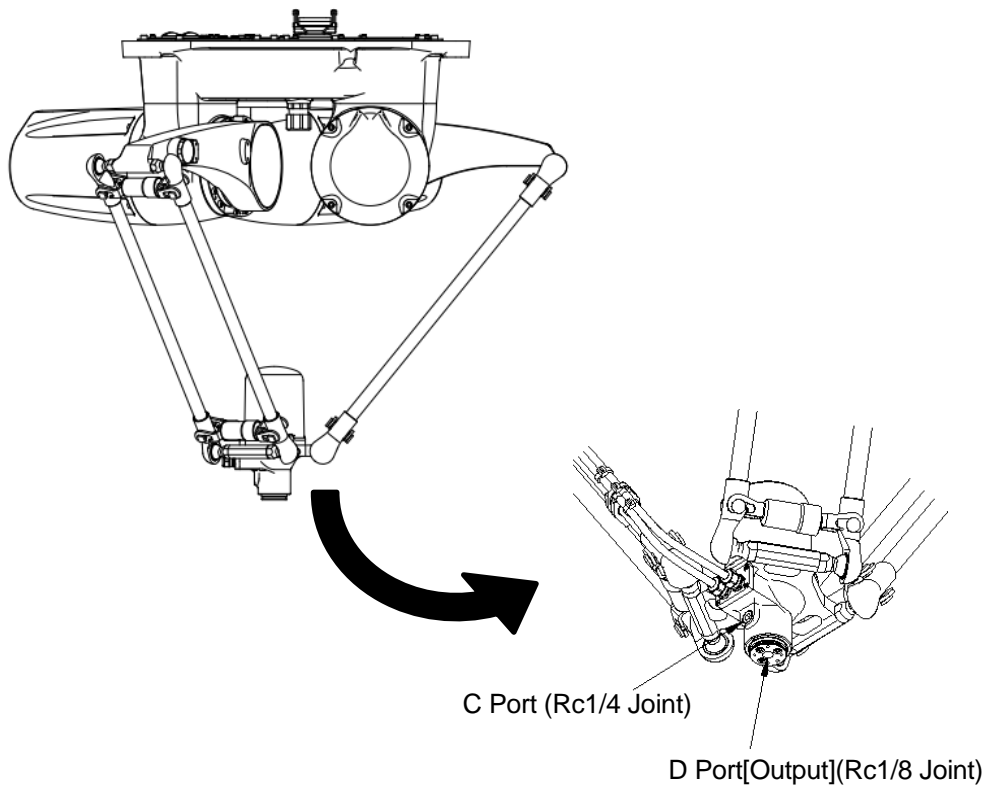


● **YS002N-B/YF002N-B**

As shown in the following figure, air output port (Rc1/8 Joint) is provided at wrist section (option). Please contact Kawasaki for details.

The following valves can be connected.

Standard	No Valve	
Option	Double Solenoid/Single Solenoid	Maximum 4 valves

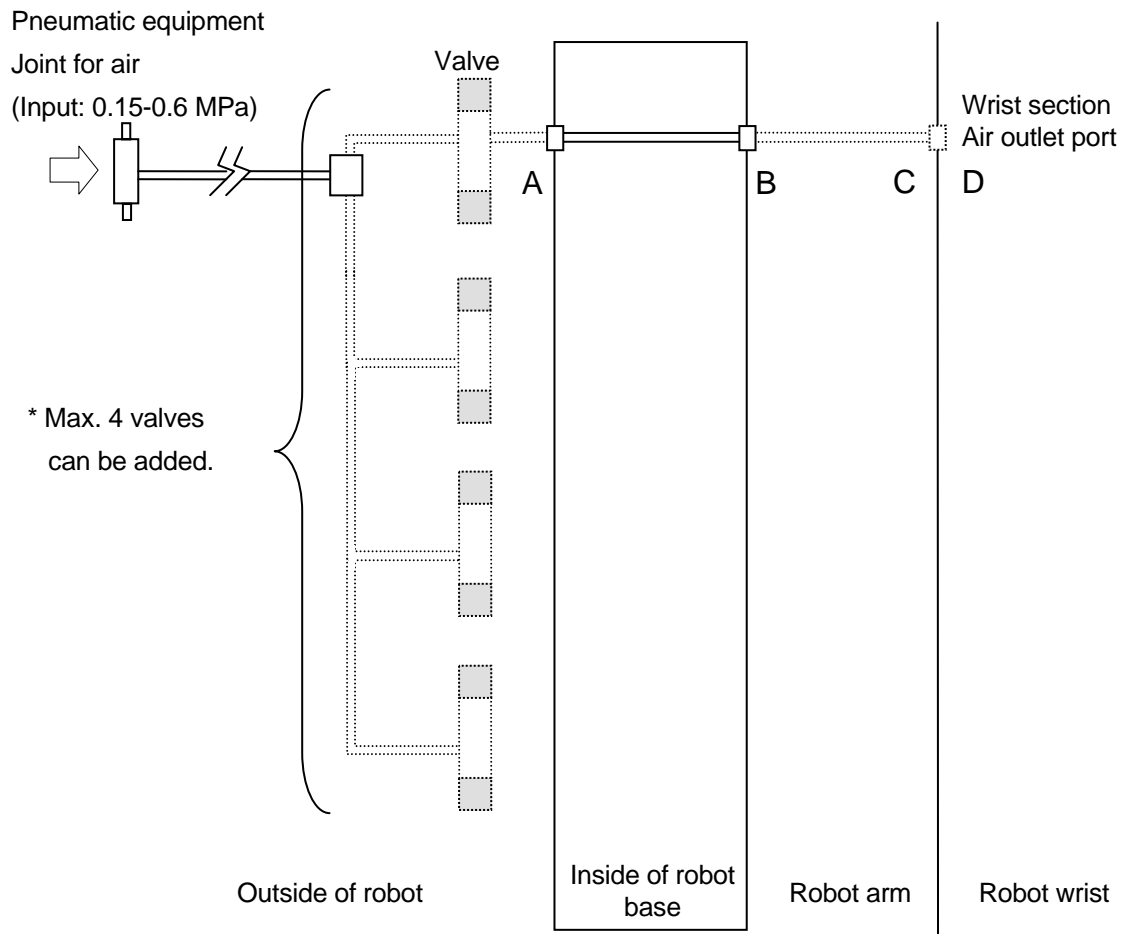


10.1 AIR PIPING ARRANGEMENT

● YF003N-A

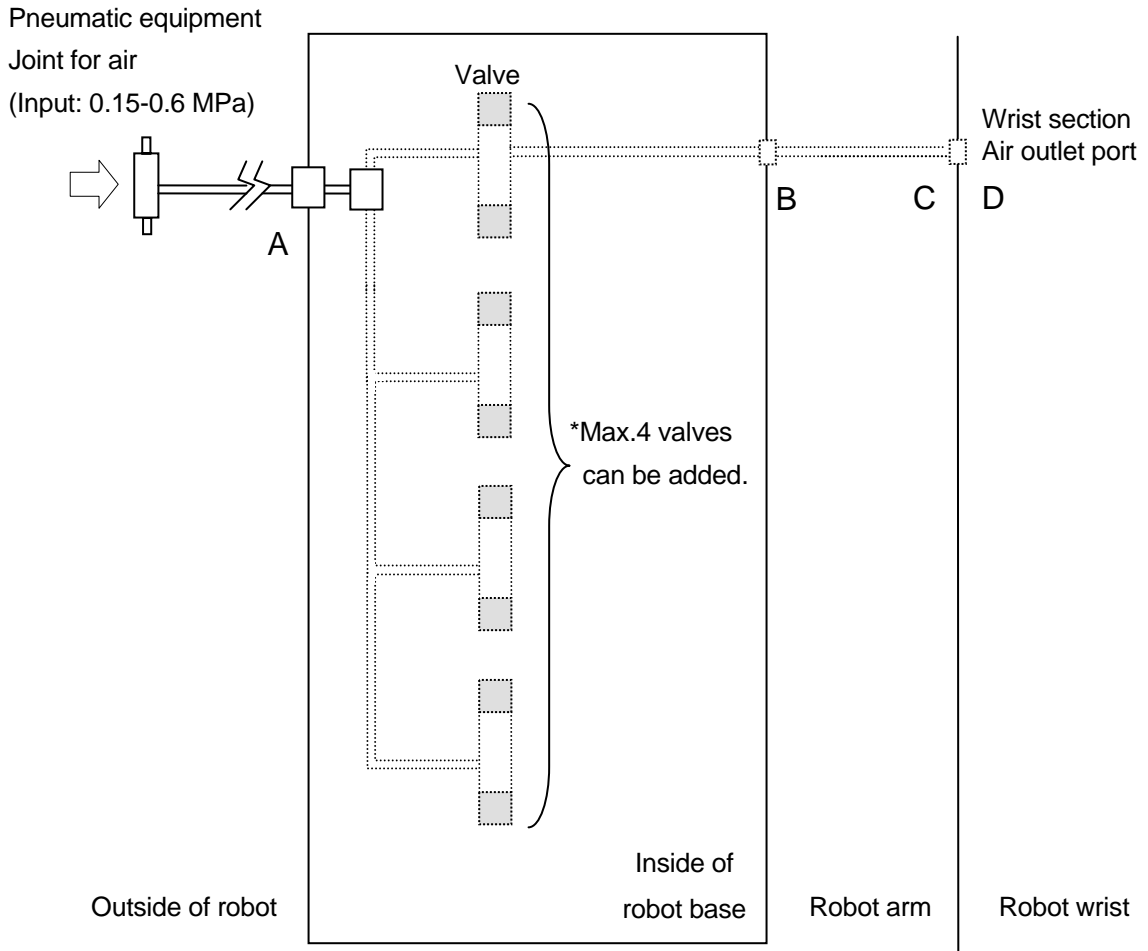
Valve for driving tools can be mounted inside/outside robot (option). Each valve can be turned ON/OFF by Teach Pendant without any interlocks.

•When mounting valve outside robot

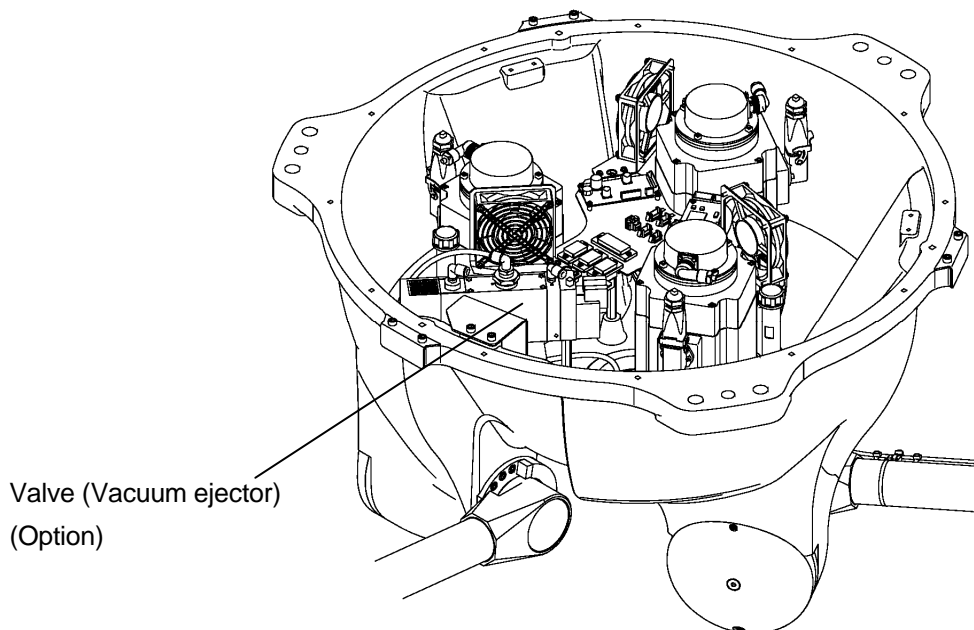


* (dotted line) indicates optional equipment.

•When mounting valve inside robot



* (dotted line) indicates optional equipment.



Use the following built-in valve.

Standard	No built-in valve
Option	Double Solenoid/Single Solenoid

Note* Valve specification: CV value 0.2, 2- position.

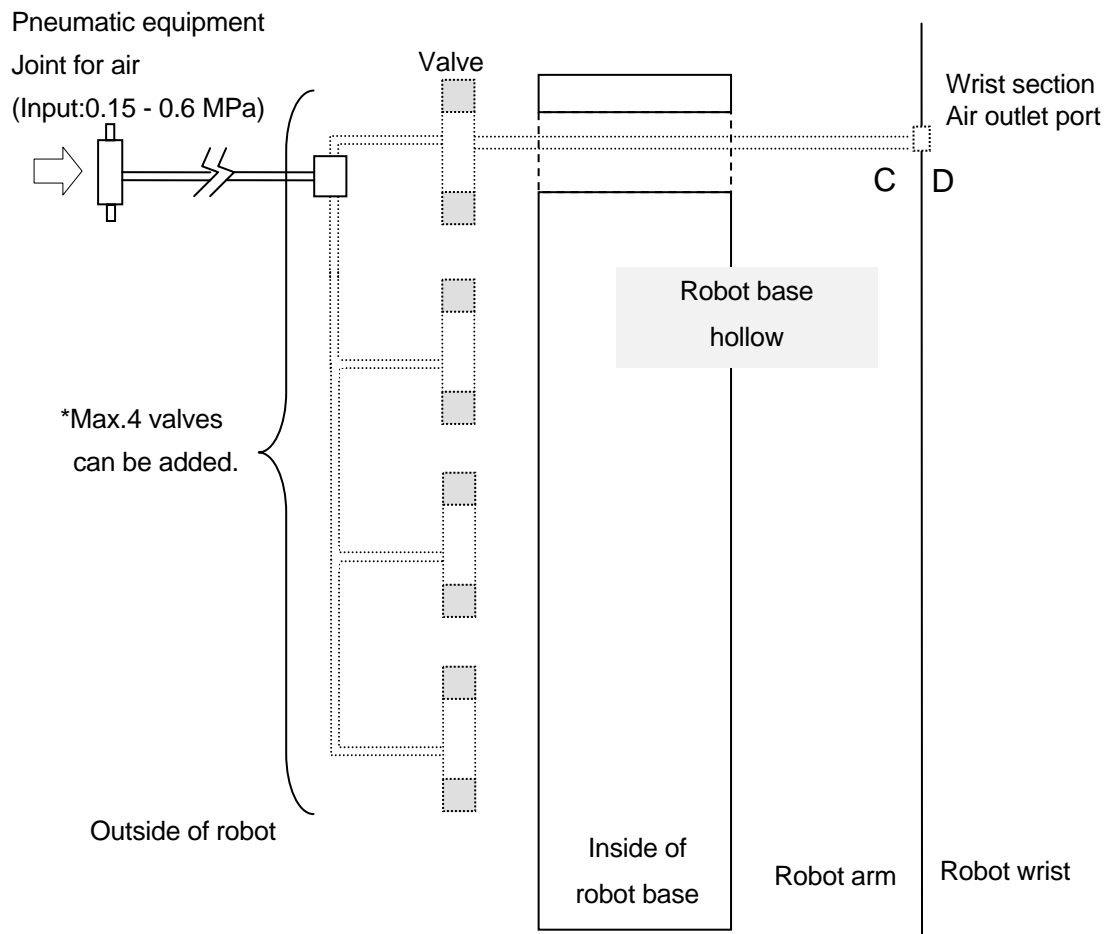
[NOTE]

If not using the valve with the specification indicated above, the valve cannot be built-in in the arm. Please contact Kawasaki about the air system specification when using valves with different specifications.

● **YS002N-B/YF002N-B**

The valve for driving the tool can be mounted outside of the robot (option). The valve can be turned ON/ OFF via the tool pendant without using the interlock panel.





-When mounting valve outside robot (via robot base hollow)




※ (dotted line) indicates optional equipment.

APPENDIX 1 LIST OF TIGHTENING TORQUES

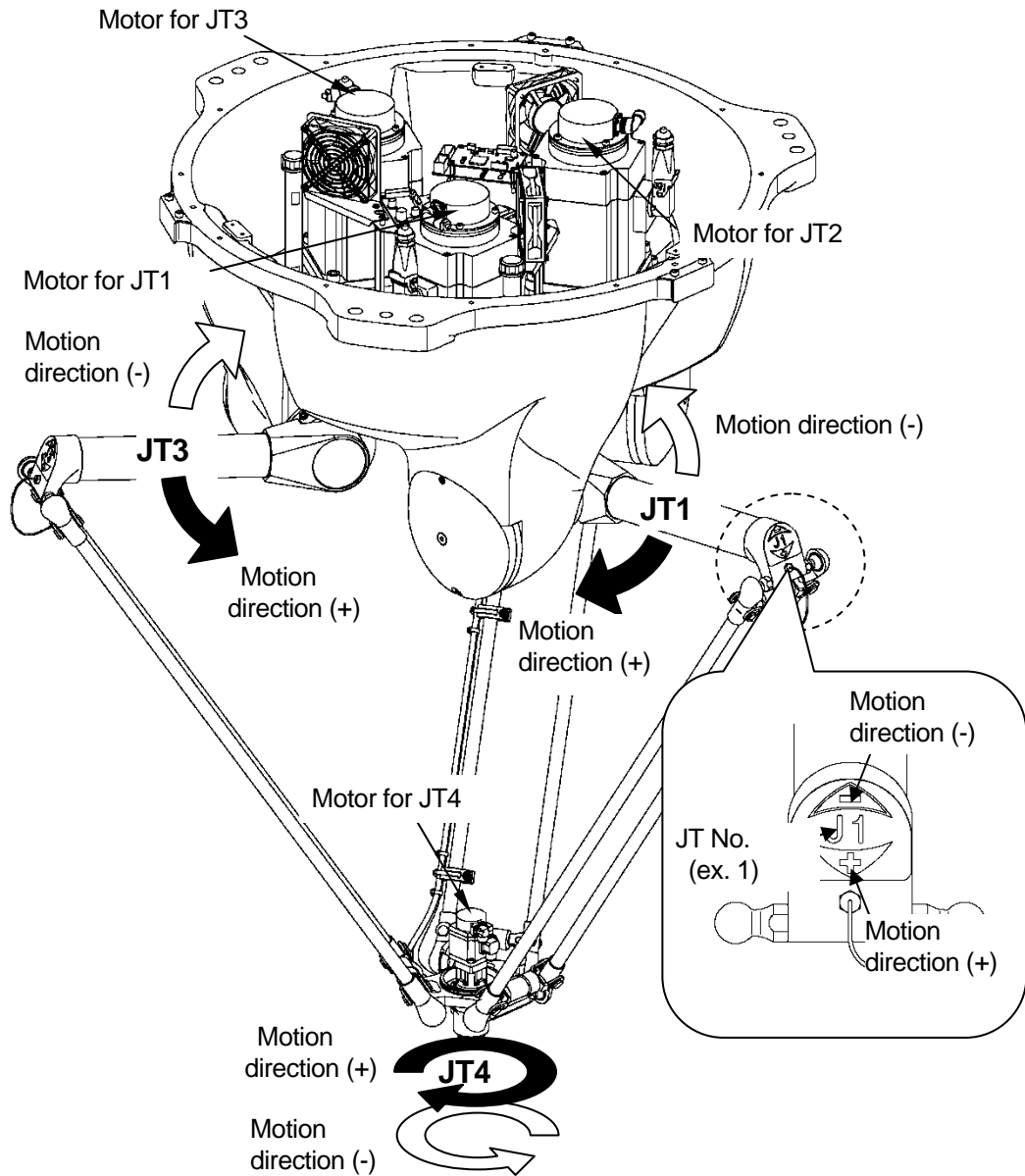
The tightening torques of the bolts used with this robot are listed below. If the tightening torques is indicated otherwise within the manual, follow the description in the manual.

Type	Hexagon socket head cap screw		Hexagon socket button head screw Hexagon socket countersunk head screw
			 
Nominal diameter [mm]	SUS304 Stainless Steel Tightening torque [N·m]	SCM435 Steel Tightening torque [N·m]	SCM435 Steel Tightening torque [N·m]
M2	0.3	0.4	-
M2.5	0.6	0.8	0.4
M3	1.1	1.5	0.8
M4	2.4	3.4	1.5
M5	4.	6.9	3.4
M6	8.3	12.0	6.9
M8	20.0	29.0	12.0
M10	39.0	57.0	29.0
M12	69.0	98.0	57.0
M14	-	155.0	98.0
M16	165.0	235.0	155.0
M18	-	333.0	235.0
M20	-	431.0	333.0
M24	-	785.0	431.0

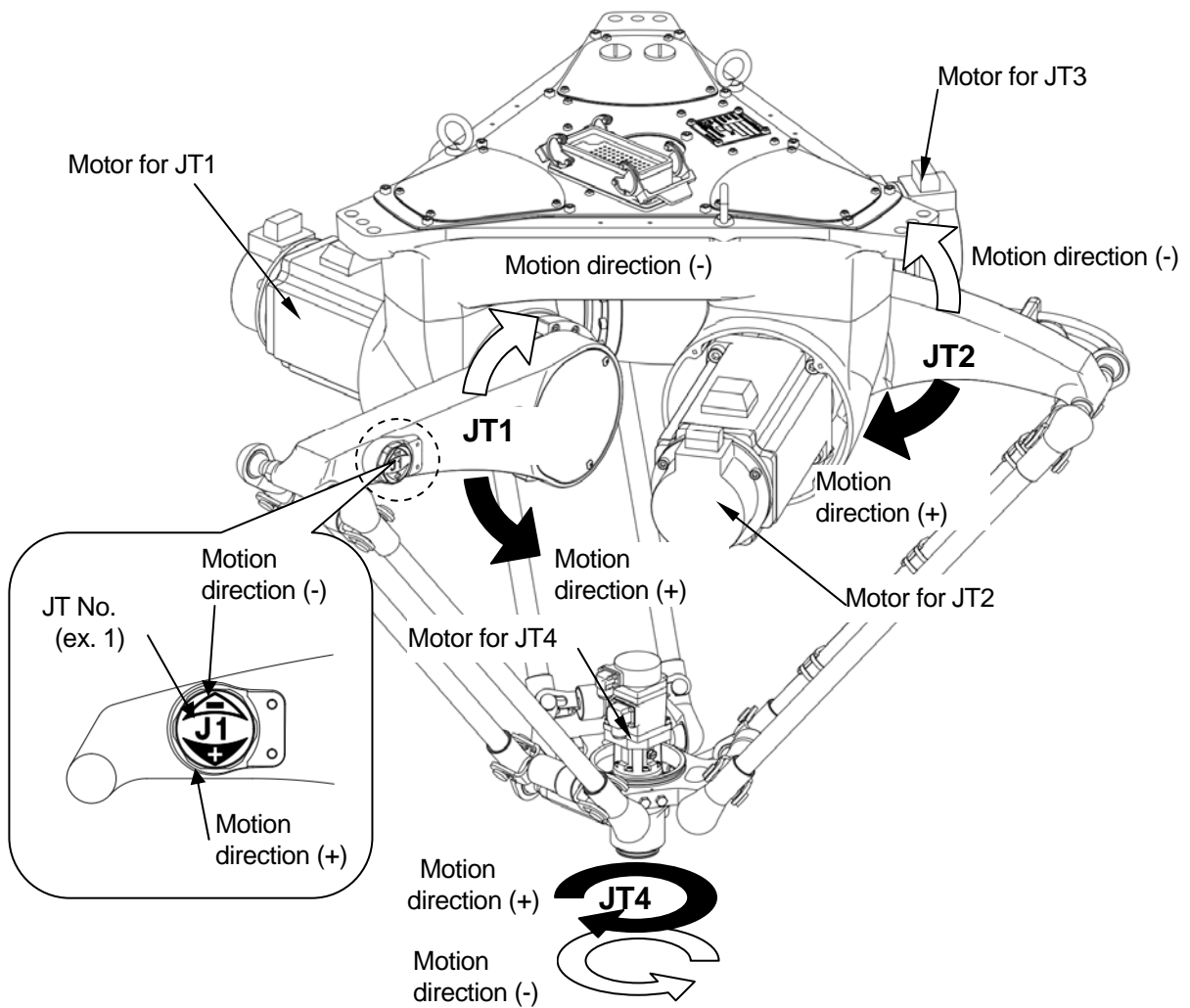
Type		Hex socket headless tapered pipe plug 
Nominal diameter [mm]	Width across flat [mm]	Tightening torque [N·m]
R1/8	5	5.9
R1/4	6	6.9
R3/8	8	11.8
R1/2	10	29.4
R3/4	14	29.4

APPENDIX 2 MOTOR LOCATIONS AND MOTION DIRECTION

YF003N-A



YS002N-B/ YF002N-B



Kawasaki Robot Y Series
Installation and Connection Manual

April 2010 : 1st Edition
April 2014: 3rd Edition

Publication: KAWASAKI HEAVY INDUSTRIES, LTD.

90202-1004DEC

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