

NACHI

Standard specifications

Presto

**MC20-01-AX20
MC10L-01-AX20**

9th edition

NACHI-FUJIKOSHI CORP.

1003, SMCEN-017-009,001

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1. Outline

NACHI ROBOT has used mechatronic techniques, cultivated throughout the last few decades, to supply robots suited for industries utilizing welding, spray painting and the material handling techniques.

1.1. MC robot

The MC robot is a 6 axes robot that has characteristics like listed as below.

- Simple structure
- High speed
- High accuracy
- Suitable for material handling applications

Table 1.1 Robot specifications

Arm type Load weight	Standard arm	Long arm
Installation	20 kg (Max.22Kg)	10 kg
Floor mount	Presto MC20-01	Presto MC10L-01
Ceiling mount		

1.2. AX20 controller

The AX20 controller is high performance robot controller based on open concept which used the personal computer as the base. Safe equipment, such as double emergency stop circuit and 3 position enable switch, is carried as standard.

- AX20-0000 Domestic specification (for Japan)
- AX20-1101 Overseas specification (North America spec.)
- AX20-2101 Overseas specification (CE spec.)

2. Characteristic

2.1. MC robot

1. This robot is designed so that the size of the motion range is similar to that of one worker. Therefore, it becomes possible to make a compact robot cell. And, this robot is also suitable for a loading application for randomly workpieces.
2. The wide motion range lightens the limitation of the actual motion range. And examining applicability becomes easier than before.
3. The wrist and the main body become “Dust-proof / Drip-proof performance (IP65 corresponding)”, and the application that can be applied has extended.
4. The motion range suitable for the weight of the workpieces or tools can be selected. Because of this, it becomes possible to use a heavier workpiece, double hand, etc.

2.2. AX20 Controller

1. It is compact even if it adds abundant functions.
2. Large-sized LCD of a color graphic display was adopted as the Teaching pendant. Thereby more easy and intelligible operation is attained and large shortening of teaching time can be aimed at.
3. It is possible to build the optimal operating environment for a robot's work system by the customize function of menus, such as various parameter setup and a peripheral equipment setup, or a screen.
4. It has equipped with safe equipment, such as double emergency stop circuit limit switch and 3 position enable switch, as standard, and ANSI/RIA 15.06-1999 is supported.

3. Basic specifications

Table 3.1 Basic specifications

Item		Specifications	
Robot model		Presto MC20-01	Presto MC10L-01
Construction		Articulated	
Number of axis		6	
Drive system		AC servo motor	
Max. working envelope	J1 axis	± 3.14 rad	
	J2 axis	+ 1.05 ~ - 2.53 rad	
	J3 axis	+ 4.22 ~ - 2.84 rad	
	J4 axis	± 3.14 rad	
	J5 axis	± 2.42 rad	
	J6 axis	± 6.28 rad	
Max. speed	J1 axis	2.96 rad / s	2.62 rad/s
	J2 axis	2.96 rad / s	
	J3 axis	2.96 rad / s	
	J4 axis	6.28 rad / s	
	J5 axis	6.28 rad / s	
	J6 axis	10.5 rad / s	
Max. pay load ^{*1}		20 kg (Max. 22 kg)	10 kg
Allowable static load torque	J4 axis	49 N·m	24.5 N·m
	J5 axis	49 N·m	24.5 N·m
	J6 axis	23.5 N·m	12 N·m
Allowable moment of inertia ^{*2}	J4 axis	1.6 kg·m ²	1.6 kg·m ²
	J5 axis	1.6 kg·m ²	1.6 kg·m ²
	J6 axis	0.8 kg·m ²	0.7 kg·m ²
Position repeatability ^{*4}		± 0.06 mm	
Air pressure		Not more than 0.49 MPa (5.0 kgf / cm ²)	
Ambient temperature		0 ~ 45 °C	
Robot type		Floor mount, Ceiling mount	
Dust-proof / Drip-proof performance ^{*3}		Equivalent to IP65	
Robot mass		220 kg	225 kg

1 [rad] = 180 / π [°], 1 [N·m] = 1 / 9.8 [kgf·m]

^{*1}: Operating range is limited according to the payload weight.

^{*2}: The Allowable moment of inertia of a wrist changes with load conditions of a wrist.

^{*3}: Liquid such as organic compound, acidity, alkalinity, chlorine or gasoline cutting fluid which deteriorates the seal material are not available to use.

^{*4}: This value conforms to "JIS B 8432" standard.

The specification and externals described in this specifications might change without a previous notice for the improvement.

4. Robot dimensions and working envelope

Robot type; Presto MC20-01

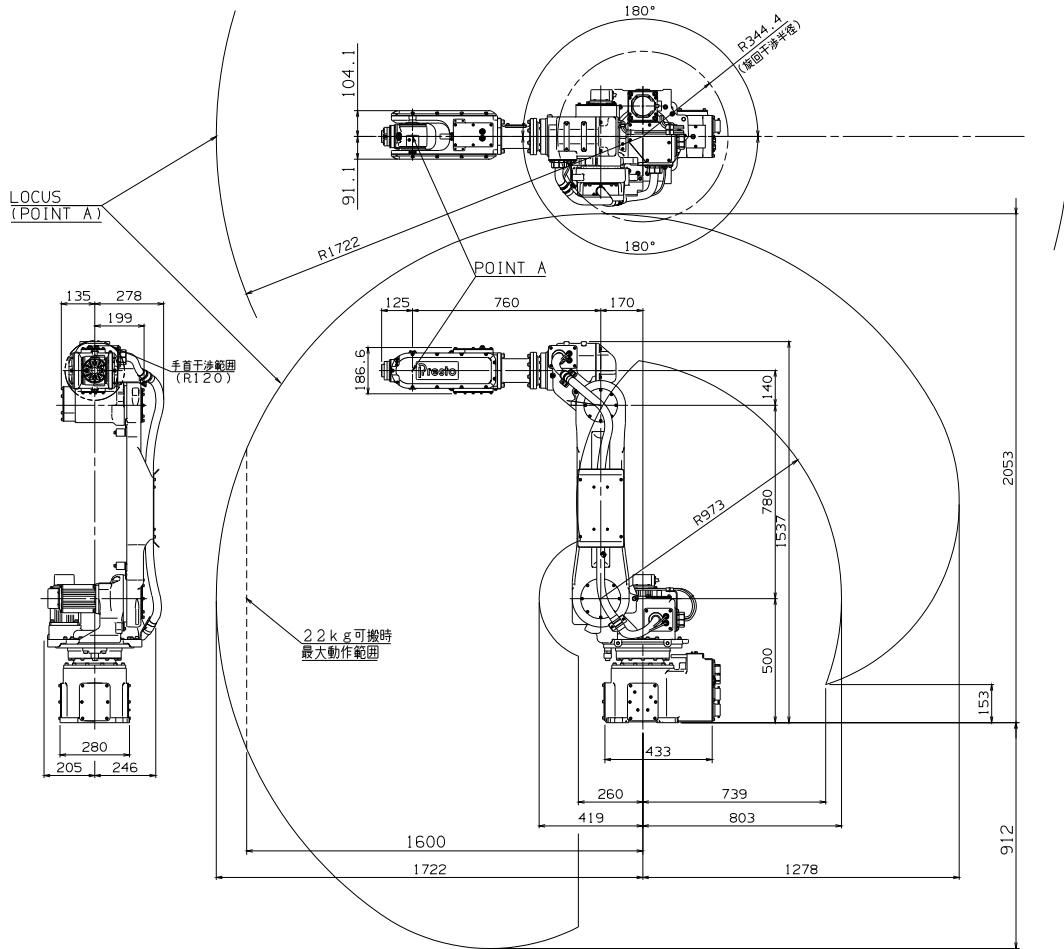


Fig. 4.1 Robot dimensions and working envelope

Robot type; Presto MC10L-01

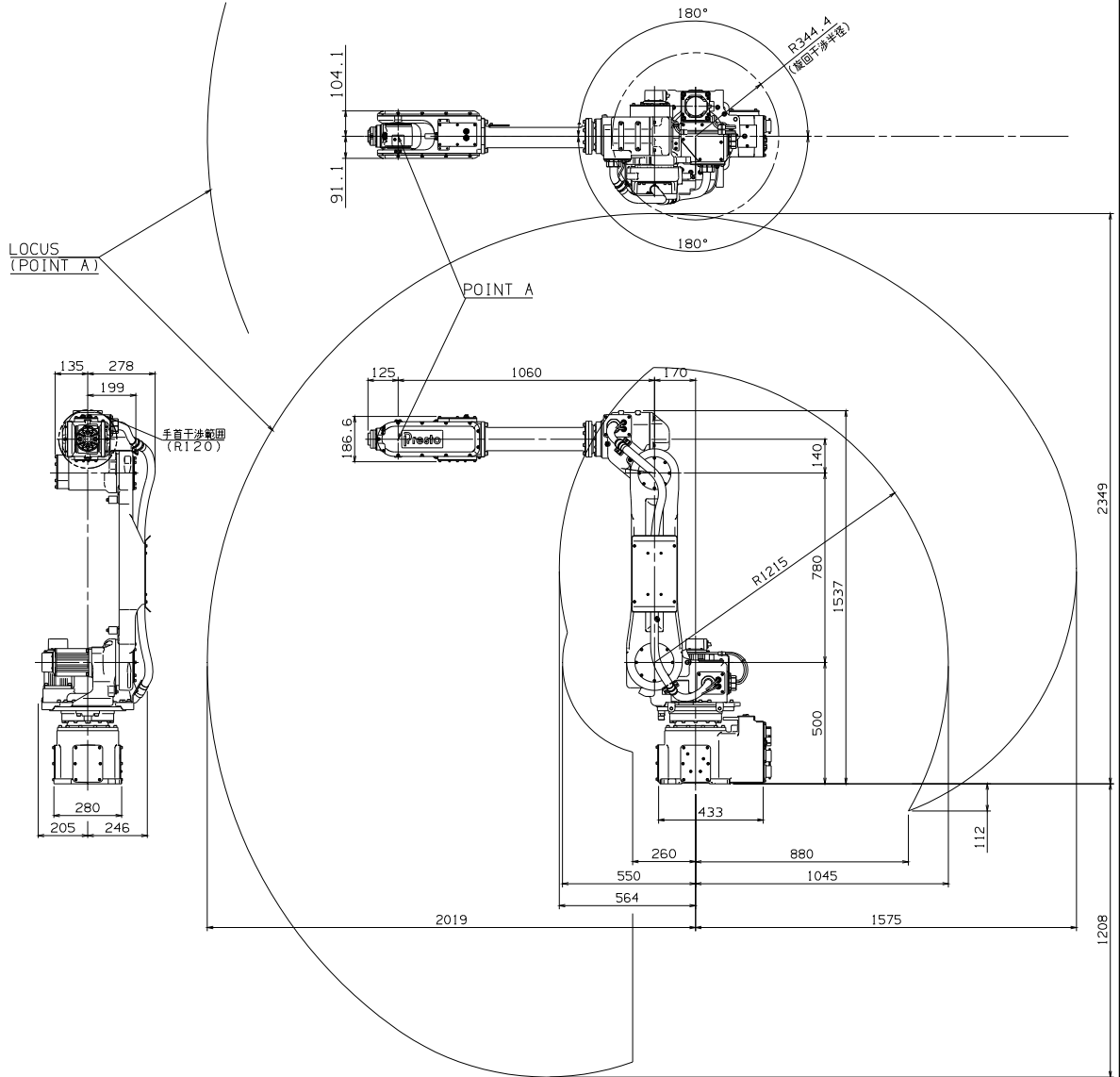


Fig. 4.2 Robot dimensions and working envelope

5. Detail of tool mounting plate

Please use installation P.C.D. of Fig. 5.1, when you tighten the end effector installation bolt.



CAUTION

Don't screw in installation bolts (M6) over thread tap depth. Installation bolts over thread tap depth may damage the wrist.

Robot type; Presto MC20-01, Presto MC10L-01

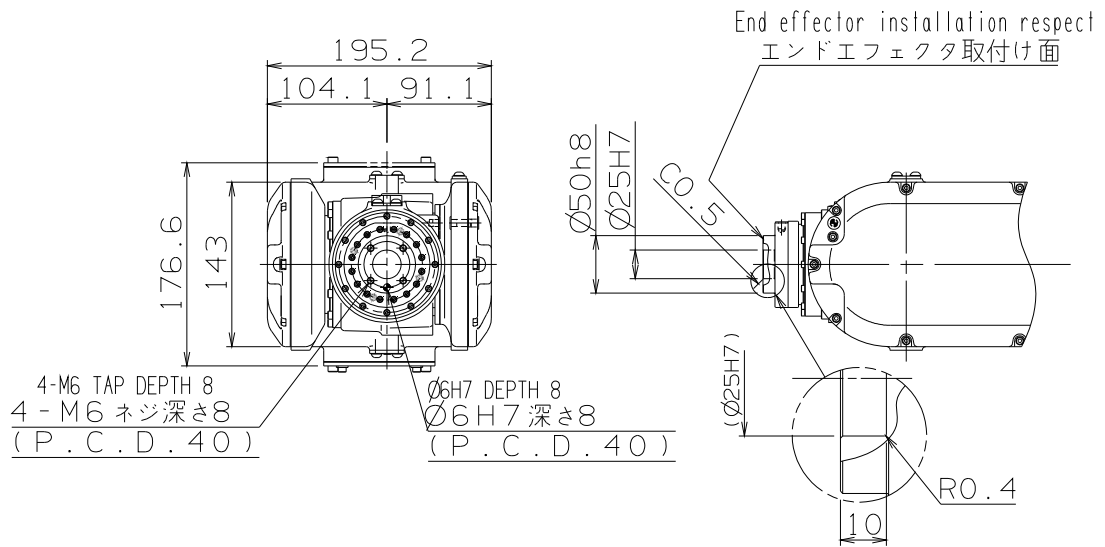


Fig. 5.1 Detail of tool mounting plate

6. Installation dimensions

6.1. Installation space

To install the robot, fix the swiveling base of the robot.



CAUTION

A mechanical stopper is mounted 4 degrees over the J1 working envelope (software limit). When installing a guard fence (safety fence), please make sure to consider the motion range, wrist posture, and the shape of the end effector.



DANGER

To operate safely, range of the motion can be restricted in J1, J2 and J3 (Option). Because the option parts are always necessary to restrict the motion range, do not move the standard parts (mechanical stopper block etc.) alone.

Robot type; Presto MC20-01

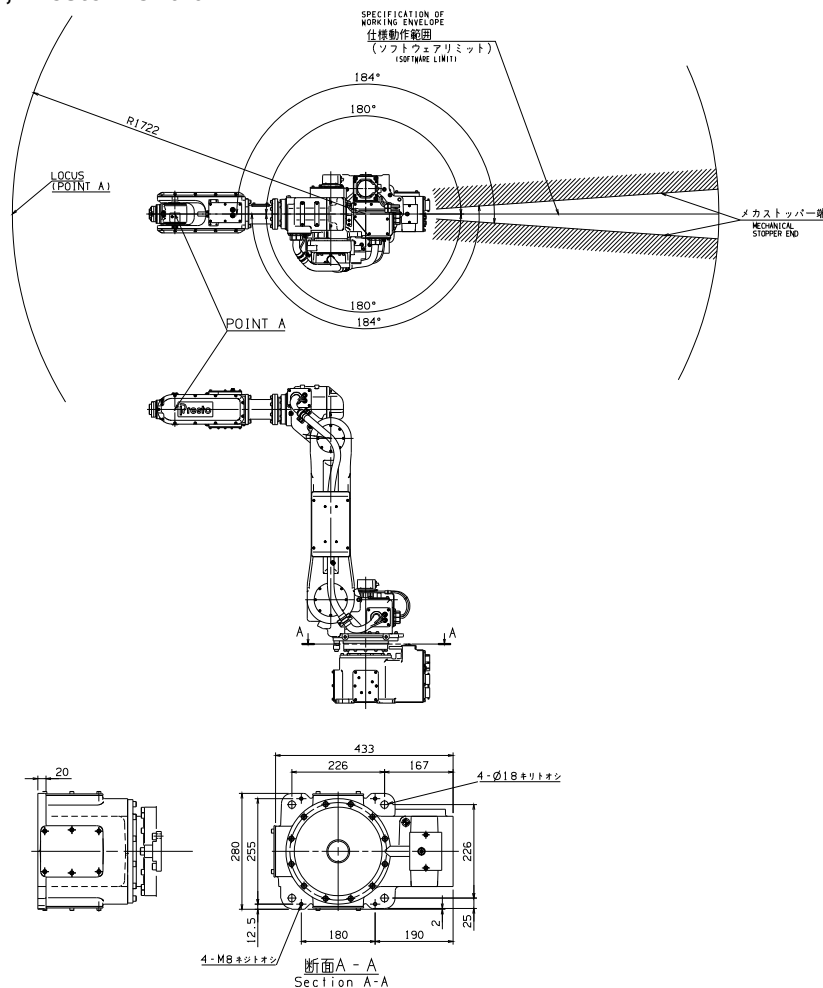


Fig. 6.1 Robot installation space

Robot type; Presto MC10L-01

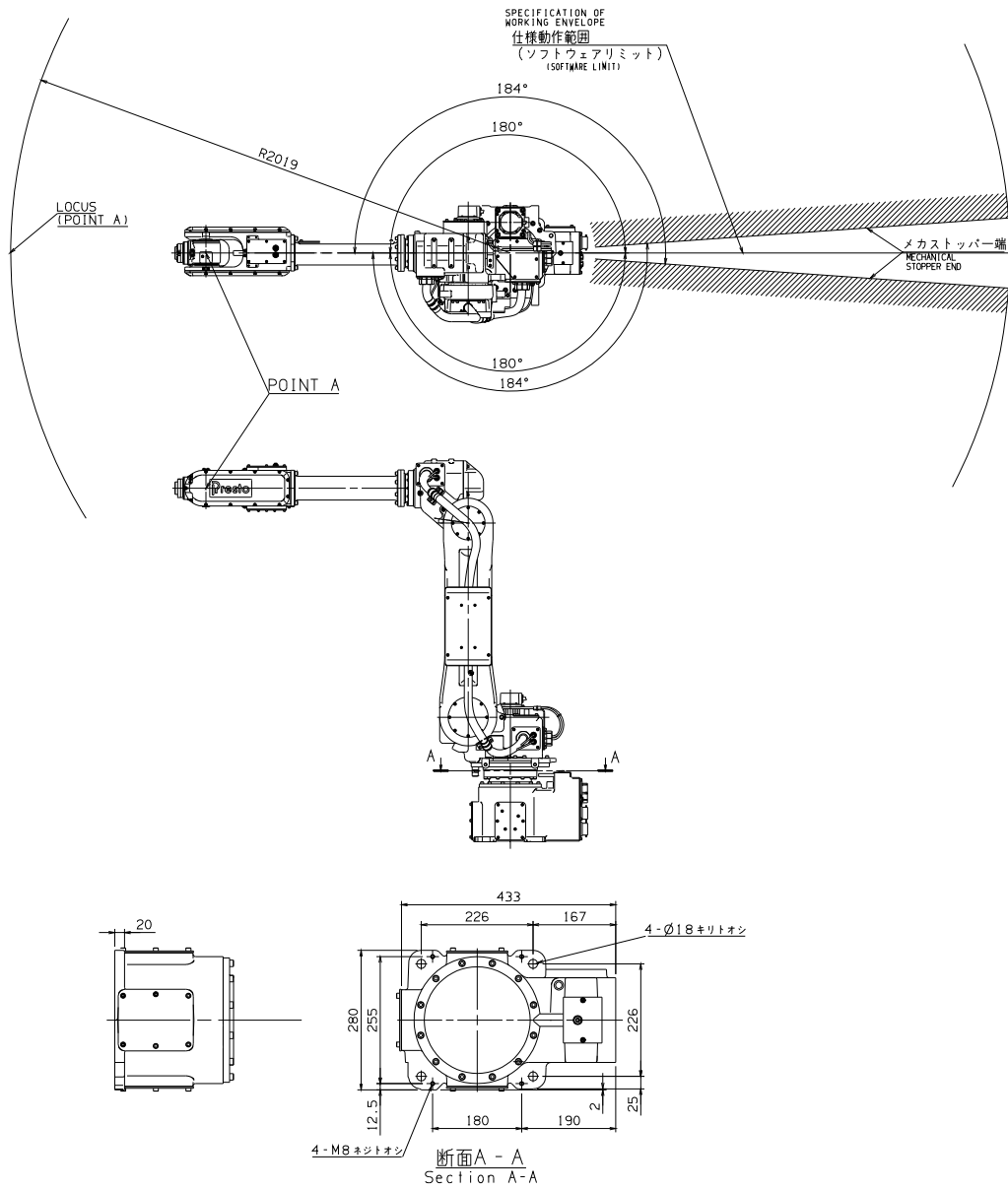


Fig. 6.2 Robot installation space

6.2. Accuracy of installation surface

In order to install the robot, strictly observe precautions listed below to cause no deformation in the swiveling base.

Precautions

1. Make the deviation from the flatness of the four plates on the robot installation surface fall within 0.5 mm
2. Make the deviation in height between the four places of each base plate installation surface and the robot installation surface fall in the range of 0.5 mm (± 0.25 mm).

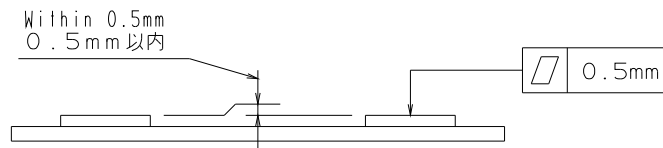


Fig. 6.3 Accuracy of robot installation surface

3. If the two precautions above cannot be observed, use jack bolts to bring the four places into even contact with the installation surface.

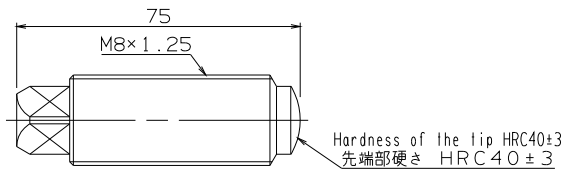


Fig. 6.4 Jack bolt

6.3. Maximum Robot Generative Force

Table 6.1 Maximum robot generative force

Robot type	Maximum vertical generative force F_v	Maximum horizontal generative force F_H	Maximum vertical generative moment M_v	Maximum horizontal generative moment M_H
Presto MC20-01 Presto MC10L-01	8,300 N	6,000 N	9,400 N·m	8,100 N·m

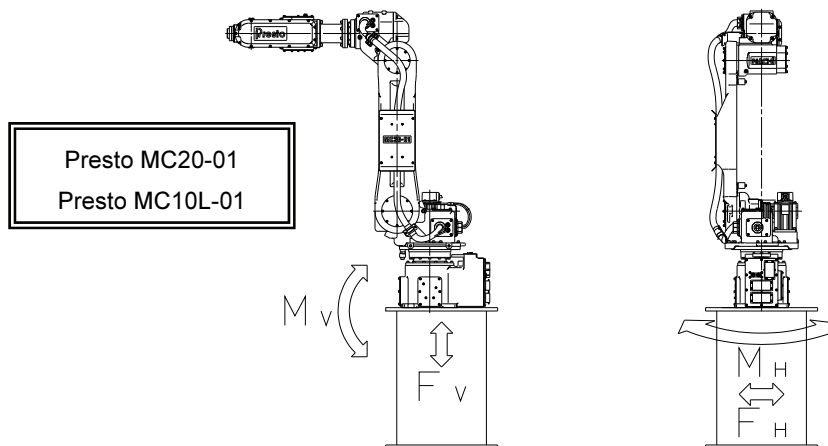


Fig. 6.5 Maximum Robot Generative Force

7. Maximum wrist load



CAUTION

A mass limit, allowable load torque and allowable moment of inertia restrict the load attached to the robot wrist tool flange. Moreover, the allowable static load torque value changes by the actual load inertia moment.

Loads must be kept below maximum conditions.

1. Allowable maximum payload mass (weight)

Table 7.1 Allowable maximum payload mass

Robot type	Maximum pay load mass
Presto MC20-01	20 kg or less (Maximum 22 kg)
Presto MC10L-01	10 kg or less

2. Allowable static load torque

Table 7.2 Allowable static load torque

Robot type	Maximum static load torque		
	Around J4 axis	Around J5 axis	Around J6 axis
Presto MC20-01	49.0 N·m or less	49.0 N·m or less	23.5 N·m or less
Presto MC10L-01	24.5 N·m or less	24.5 N·m or less	12.0 N·m or less

By referring

Fig. 7.1, please use the robot in a condition in which the center of gravity of the wrist load is inside the rated area in the wrist torque map.

3. Allowable moment of inertia

Table 7.3 Allowable moment of inertia

Robot type	Maximum moment of inertia		
	Around J4 axis	Around J5 axis	Around J6 axis
Presto MC20-01	1.6 kg·m ² or less	1.6 kg·m ² or less	0.8 kg·m ² or less
Presto MC10L-01	1.6 kg·m ² or less	1.6 kg·m ² or less	0.7 kg·m ² or less

By referring Fig 7.2, please use the robot in a condition in which both of the static load torque and the moment of inertia are inside the rated area.

7.1. Wrist axis torque map

Robot type; Presto MC20-01

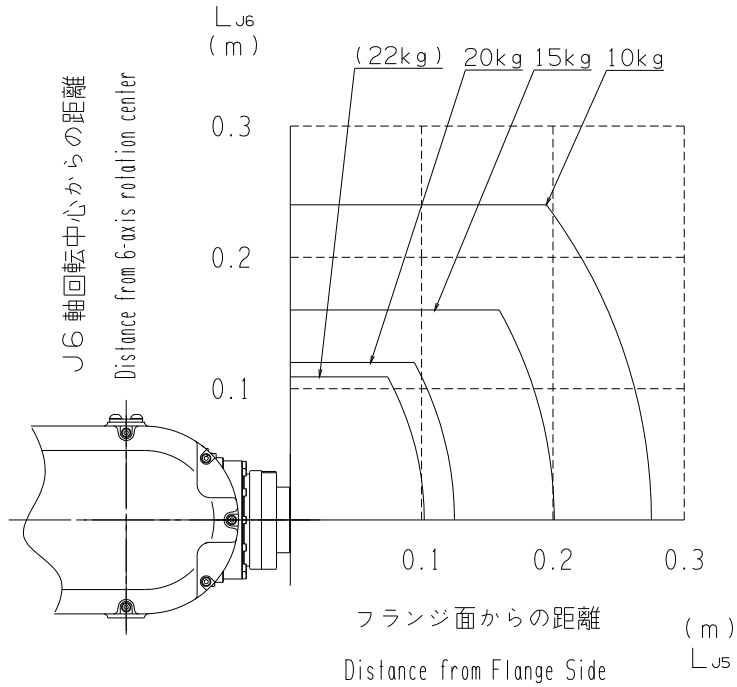


Fig. 7.1.1 Wrist axis torque map

Robot type; Presto MC10L-01

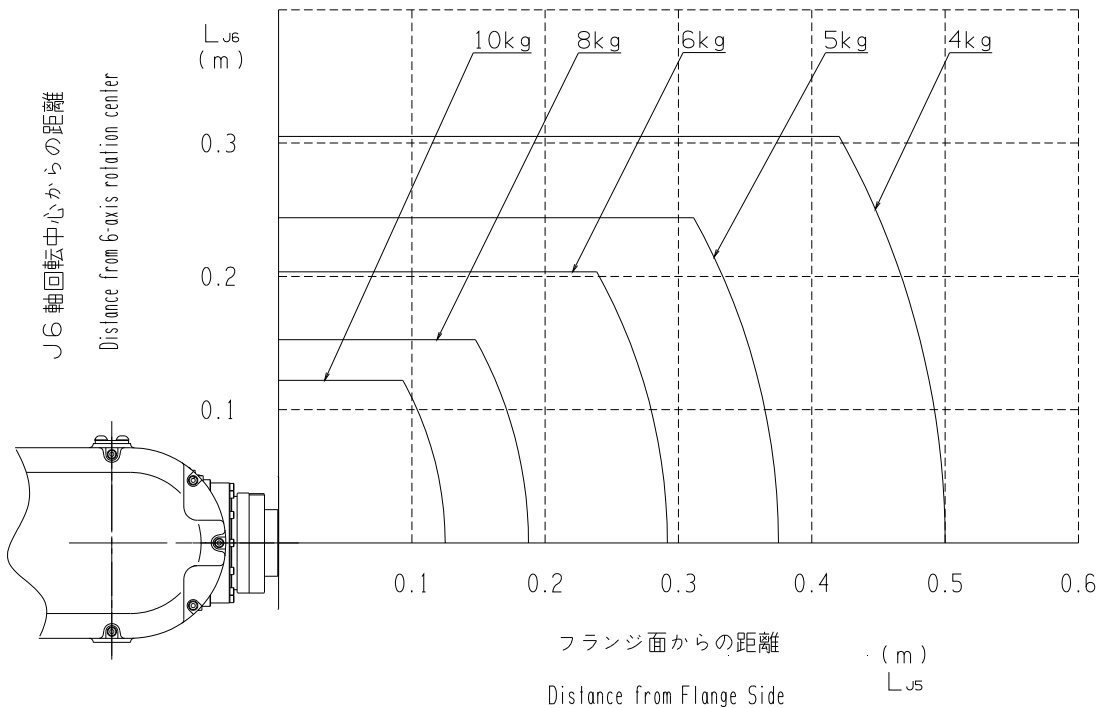


Fig. 7.1.2 Wrist axis torque map

7.2. Wrist axis load conditions

Robot type; Presto MC20-01

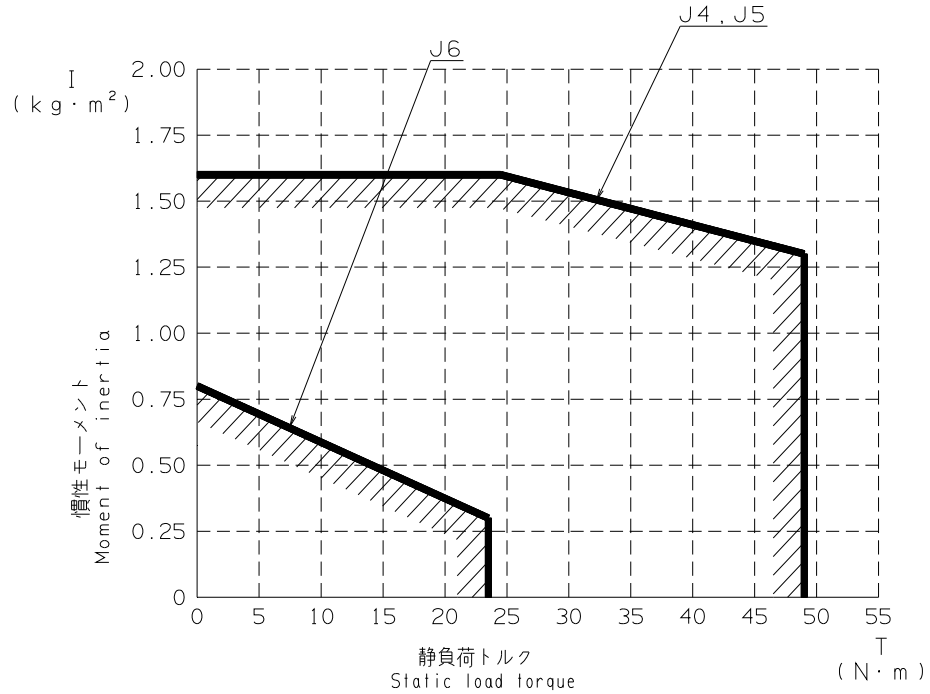


Fig. 7.2.1 Wrist axis load conditions

Robot type; Presto MC10L-01

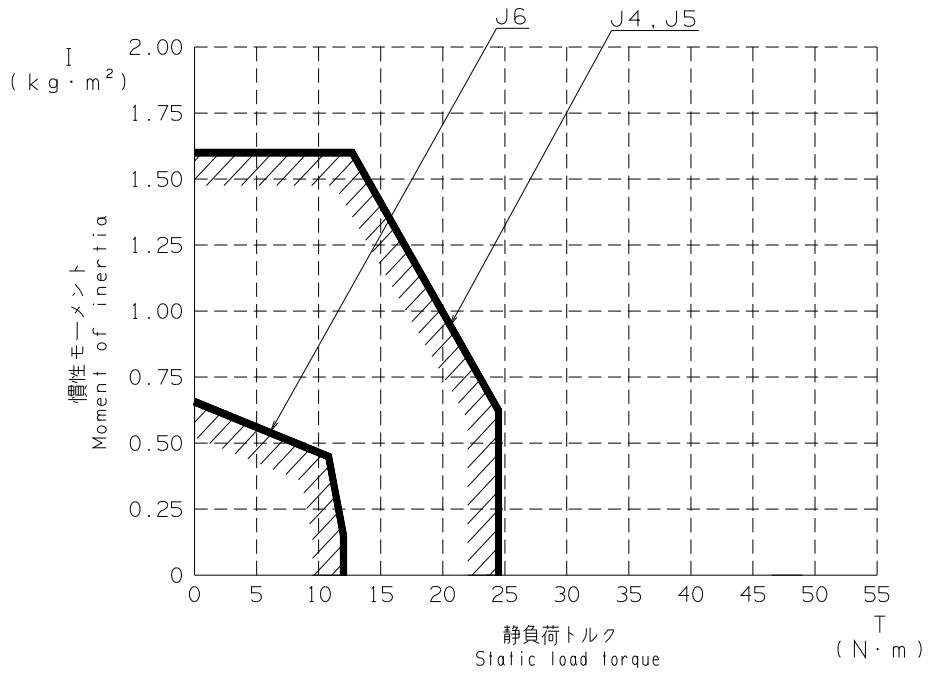


Fig. 7.2.2 Wrist axis load conditions

7.3. How to calculate inertia moment of wrist axes

The method of calculating the inertia moment around a general each axis is shown below.

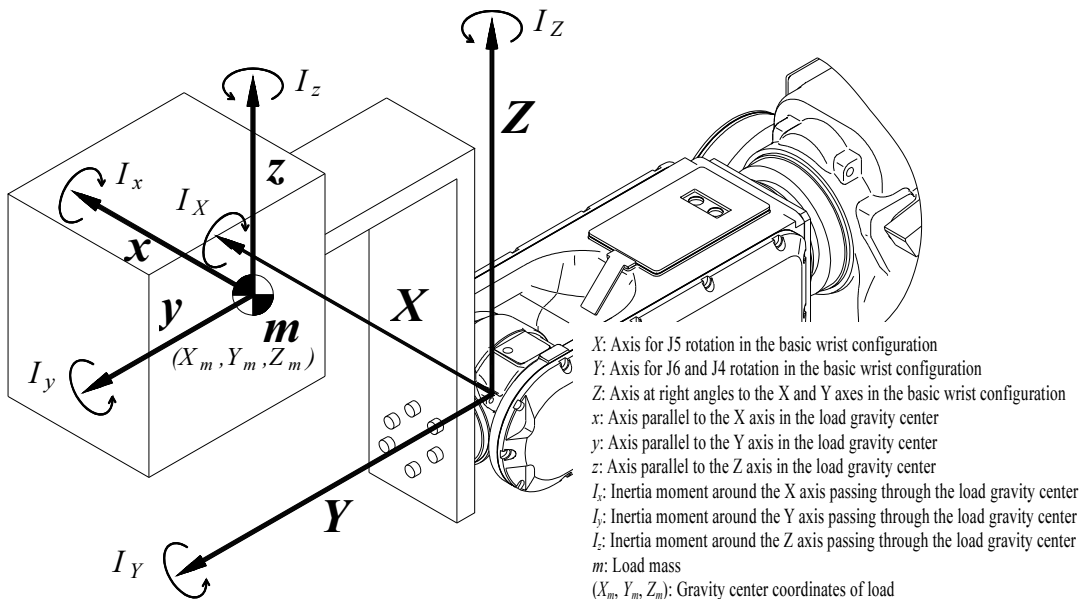


Fig. 7.2 Wrist load outline chart

1. Inertia moment around the J6

The inertia moment around the J6 becomes the following expressions.

$$I_{J6} = I_Y = m \cdot (X_m^2 + Z_m^2) + I_y$$

2. Inertia moment around the J4 and J5

The value changes into the inertia moment around the J4 and J5 depending on the posture of the J6. The maximum value around X axis and Z axis in Fig. 7.2 is assumed to be an inertia moment.

$$I_{J4J5} = \max (I_X , I_Z)$$

$$\therefore I_X = m \cdot (Y_m^2 + Z_m^2) + I_x$$

$$\therefore I_Z = m \cdot (X_m^2 + Y_m^2) + I_x$$

8. Option specifications

Robot type; Presto MC20-01, Presto MC10L-01

Table 8.1 Option specifications

No.	Item	Specifications	Parts No.
1	Parts for installation	Chemical anchor specification (Base plate + chemical anchor bolts)	OP-F1-019
		Ore anchor specification (Base plate + ore anchor bolts)	OP-F2-015
2	J1 adjustable stopper	Restriction of J1 operation edge ($\pm 3.14 \pm 0.52$ rad, every 0.17 rad)	OP-S5-015
3	J2 adjustable limit switch	J2 adjustable limit switch (+ 2.62 ~ + 1.83, - 0.39 ~ - 1.04 rad, every 0.39 rad)	OP-A5-019
4	J3 adjustable limit switch	J3 adjustable limit switch (+ 3.14 ~ + 2.35, - 1.43 ~ + 0.64 rad, every 0.39 rad)	OP-A6-016
5	Solenoid valve plate ^{*1}	For storage in wrist of solenoid valve	OP-H1-018
6	Additional tools	Zeroing pin & Zeroing block	OP-T2-047
7	Hanging jig	Jig for installation of ceiling mount robot	OP-S7-007
8	Assembly jig	Jig for assembling option parts	OP-TY-004

*1: When solenoid valve is installed inside, exhaust air must be exhausted to the outside of the robot (not inside).

9. Application wiring and piping diagram for standard

9.1. Wiring and piping system diagram

Robot type; Presto MC20-01, Presto MC10L-01

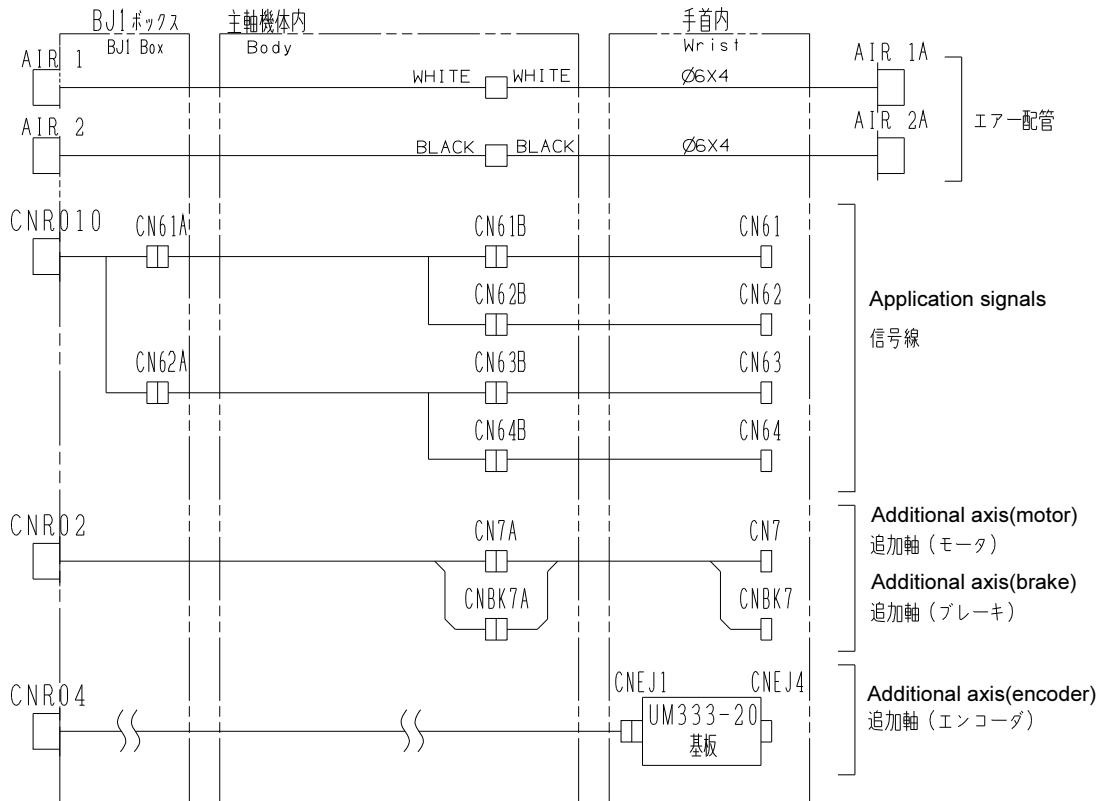


Fig. 9.1 Wiring and piping system diagram

For additional axis encoder, it is necessary to use a bus-connection type encoder that is designated by NACHI. For more details, please contact our technical department.

9.2. Detailed diagram of the base frame



IMPORTANT

- When not using air, attach plugs to the air in/out holes so that water or oil can not get into the robot arm. (The plugs are attached when the robot is shipped)
- When attaching air valves or cable brackets etc., please use “Tap holes for application (4-M5)” shown in the figure. Tightening those things with the cover fixing bolts or making holes on the box cover itself may cause water leakage or oil leakage into the arm and the parts of the robot may be damaged.

Robot type; Presto MC20-01, Presto MC10L-01

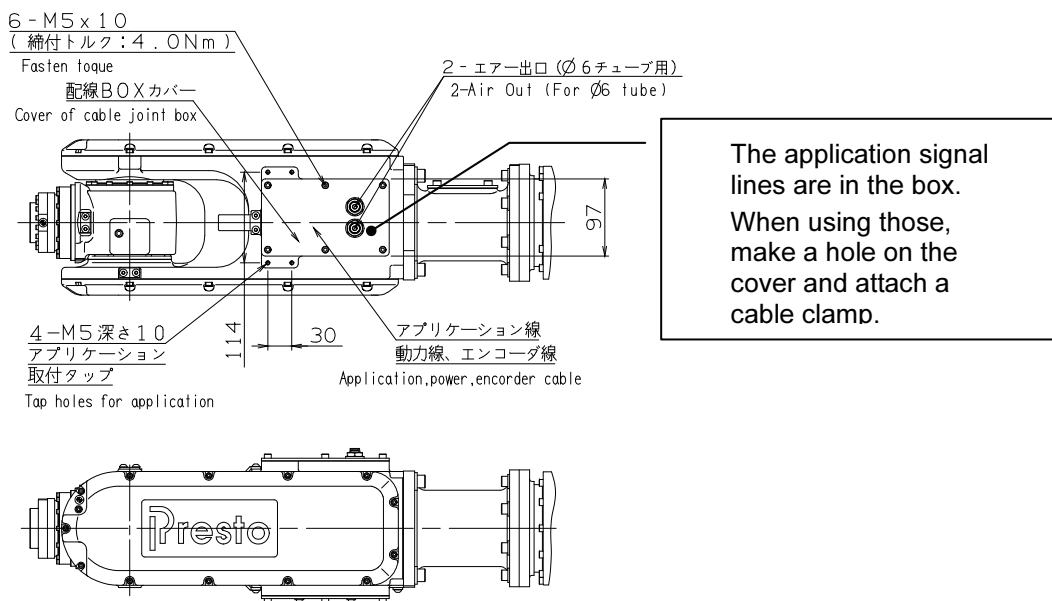


Fig. 9.2 Application wiring and piping diagram on the arm

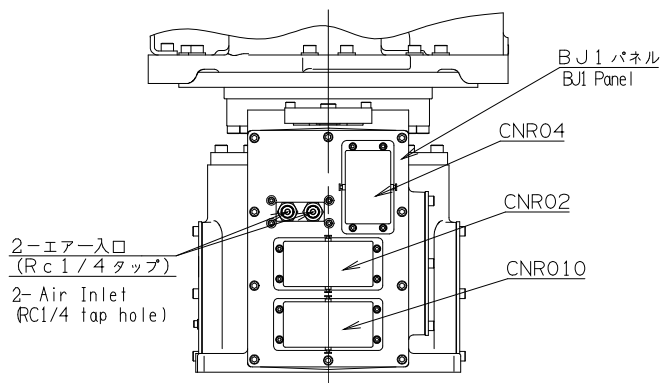
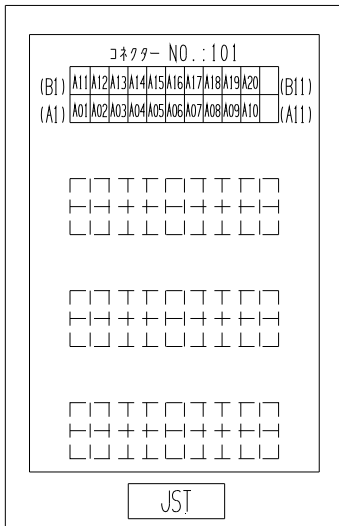


Fig. 9.3 Application wiring and piping diagram on the base

9.3. Detailed diagram of the connectors

1. BJ1 side (connector)



Connector for application cable

Wire-side shell: JFM-WSA-4-A (JST)

Guide plate A kit: FM-GPAK-4 (JST)

Receptacle housing: JFM2FDN-22V-K (JST)

Receptacle contact:

(a) SJ2F-01GF-P1.0 (JST) (0.20 ~ 0.50 mm²)

(b) SJ2F-21GF-P1.0 (JST) (0.30 ~ 0.75 mm²)

Manual crimp tool:

for (a), YRS-8861

for (b), YRF-1120

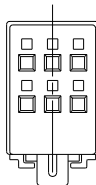
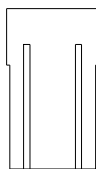
Cable diameter suitable for wire-side shell: $\phi 26.2 \sim \phi 28.0$

(This figure is drawn seeing from the backside of the robot.)

Fig. 9.4 Details of Connectors for Application

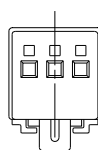
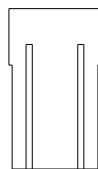
2. BJ3 side (junction connector)

CN61, CN62, CN63



A1	A2	A3
A01	A03	A05
B1	B2	B3
A02	A04	A06

CN64



A1	A2	A3
A07	A09	
B1	B2	B3
A08	A10	

A1	A2	A3
A11	A13	A15
B1	B2	B3
A12	A14	A16

1	2	3
A17	A18	ECE

Connector form (CN61, CN62 and CN63)

Housing: J21DF-06V-KX (JST)

Partner connector

Housing: J21DPM-06-KX (JST)

Contact:

(a) SJ2M-01GF-M1.0N (0.20 ~ 0.50 mm²)

(b) SJ2M-21GF-M1.0N (0.30 ~ 0.75 mm²)

(c) SJ2M-01GF-M1.0S (0.20 ~ 0.50 mm²)

Manual crimp tool: (one of a, b or c)

for (a)(c), YRS-8861

for (b), YRF-1120

Connector form (CN64)

Housing: J21SF-03V-KX (JST)

Partner connector

Housing: J21SPM-03V-KX (JST)

(a) SJ2M-01GF-M1.0N (0.20 ~ 0.50 mm²)

(b) SJ2M-21GF-M1.0N (0.30 ~ 0.75 mm²)

(c) SJ2M-01GF-M1.0S (0.20 ~ 0.50 mm²)

Manual crimp tool: (one of a, b or c)

for (a)(c), YRS-8861

for (b), YRF-1120

(This figure is drawn seeing from the backside of the robot.)

Fig. 9.5 Details of Connectors for Application

10. Transport procedure

Safety measures against transport

The following describes precautions for transporting the robot. Fully understand the precautions for safe transport work.



WARNING

The robot must be transported by personnel who have licenses required for slinging work, crane operation, forklift truck operation, and others.



WARNING

To lift the robot or the controller, follow the procedures specified in the Maintenance Manual.
Following any procedures other than those specified will cause the robot to topple over or drop during transport, thus resulting in accidents.



CAUTION

During transport or installation work of the robot, pay utmost care not to cause damage to wirings.
Furthermore, after installing the robot, take protective measures such as using protective guards so that the wirings will not be damaged by workers or other persons, or forklift trucks or else.

To transport the robot, make it a rule to use a crane.

First, put the robot into the configuration shown in Fig.14.1 and mount the two carrier brackets dedicated to the transport of the robot to both sides of the robot frame. Then, lift the robot using four hanging wires. Fix these dedicated brackets with the two M12 X 30 bolts.

The tightening torque is 116 N·m. Recommended length of the hanging wires is 3 m.

Robot type; Presto MC20-01

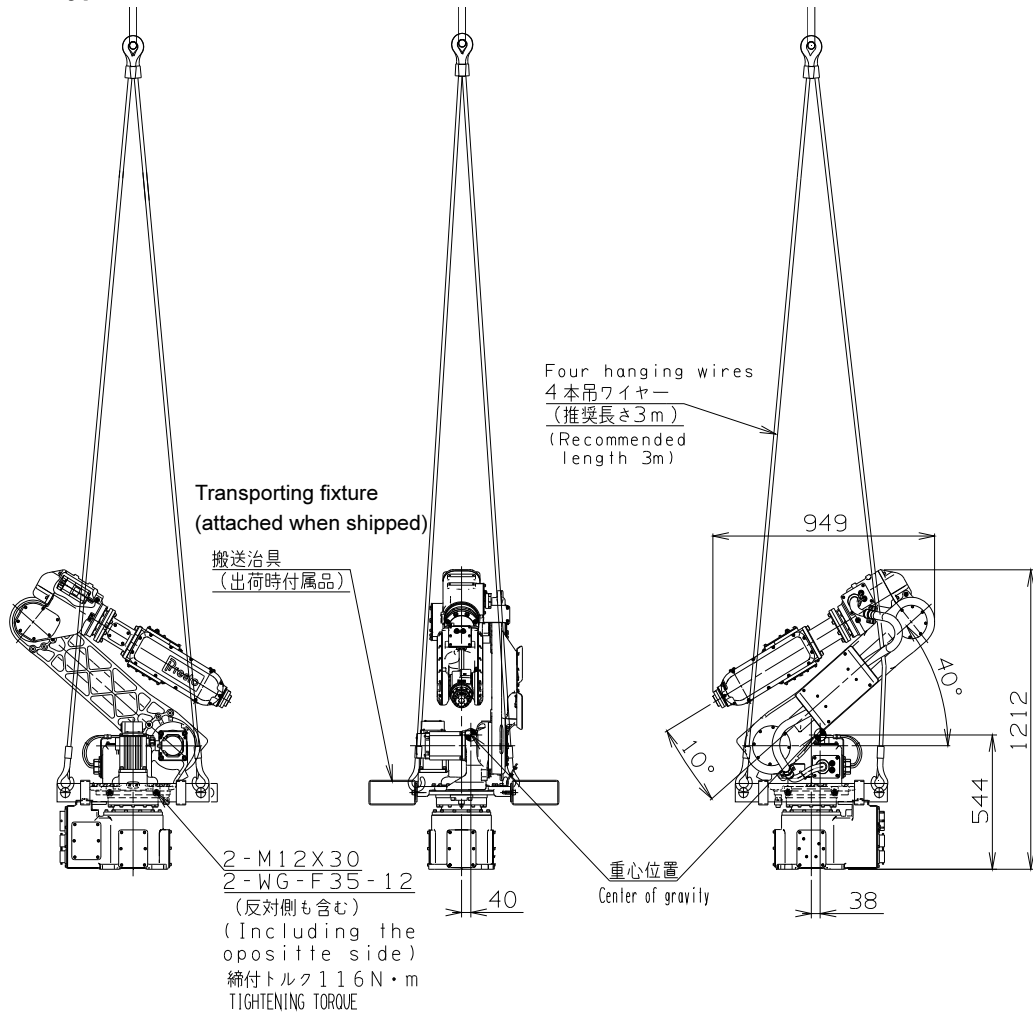


Fig. 10.1.1 Transport procedure

Robot type; Presto MC10L-01

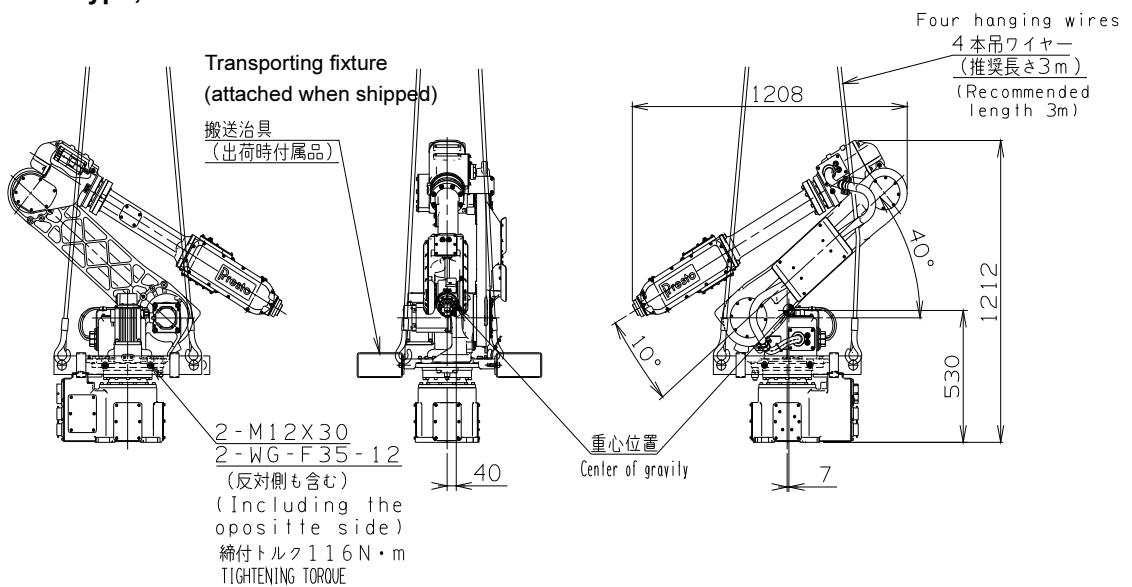


Fig. 10.1.2 Transport procedure

11. Installation (specification which contains a robot)

1. Delivery condition

Because the expense is different, which form to choose be sufficiently examined.

Style	Condition	Details
1	Delivery on the truck	Robot is delivered on the truck near the entrance of customer's plant.
2	Delivery after installation and test-run	Robot is installed and test-run done.
3	Delivery after installation and test-run with work piece	After style 2, teaching with work piece is done.

2. Operation and maintenance education

The special spot operation guide and the special spot preservation guide are the outside of the estimation. Also, there is schooling system in the Toyama factory, too.

Consult with each NACHI-FUJIKOSHI office for the details.

3. The earth wire construction of controller is class D earthing things above mentioned are necessary.

12. Paint color

Standard color	Controller cabinet	Munsell 10GY9/1
	Robot body	Munsell 2.5YR-5.5/14

13. Warranty

1. The guarantee period is 1year after check of incoming merchandize (8 hours / day, 2,000 h operation). It makes gratis about the trouble of NACHI responsibility. The lack in case of handling, it strikes each other and our making the replenishment of troubling outside, and the consumption parts, the spare parts the object outside.
2. Consult with each NACHI-FUJIKOSHI office on the fixed period check and the maintenance after the guarantee period elapse.

The specifications and appearances in this document might change without a previous notice for the improvement.