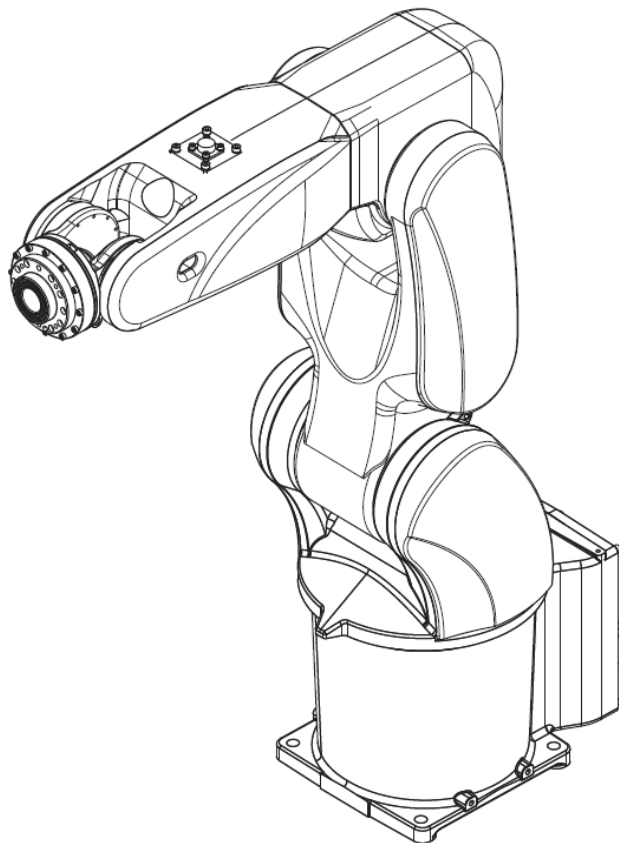


NACHI

Standard specifications

MZ07-02/MZ07P-02
MZ07L-02/MZ07LP-02

2nd edition



NACHI-FUJIKOSHI CORP.

1412, SMZEN-077-002,001

Table of contents

1. Outline.....	1
2. Basic specifications.....	2
3. Robot dimensions and working envelope.....	3
4. Details of load mounting face.....	7
5. Installation procedure.....	8
6. Allowable wrist load.....	10
7. Application wiring and tube diagram.....	12
8. Stickers.....	13
9. Delivery style.....	14
10. Paint color.....	14
11. Warranty.....	14

1. Outline

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

“MZ series” is a small, simple structure, high speed and high accuracy robot which is optimal for material handling and other application. Because of the hollow arm wrist, simplified wiring from the robot body to the tool is possible. This can reduce the wiring burden of customer.

Base type

	5 axes type	6 axes type
Normal arm (reach 723mm)	MZ07P-02	MZ07-02
Long arm (reach 912mm)	MZ07LP-02	MZ07L-02

Note) “5 axes type” does not have axis No.4, comparing with “6 axes type”. This robot is optimal for picking work because its wrist is fixed to downward direction.

- KCS mark is not included.
- Controller is not included.
- Wire harness (between robot and controller) is not included.
- Zeroing pin and block is not included.
- Brand sticker is not included. (👉 Refer to “8. Stickers” for detail)
- Zeroing pin and block is not included.
- 3 pneumatic solenoid vales are built in robot arm. Also I/O partner connector on both base side and wrist side is prepared. (👉 Refer to “7. Application wiring and tube diagram” for detail)
- Document (instruction and maintenance manual) is not included.

Detail type

MZ07 * -02- 0 0 0

<div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; padding: 5px;"> <div style="border-bottom: 1px solid black; margin-bottom: 5px;"> <p>Connection variation</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Mark</th> <th style="width: 40%;">Specification</th> <th colspan="3">Notes</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>Rear connection</td> <td colspan="3">Robot to controller cable is connected at robot rear</td> </tr> </tbody> </table> </div> <div style="border-bottom: 1px solid black; margin-bottom: 5px;"> <p>Installation variation</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Mark</th> <th style="width: 40%;">Specification</th> <th colspan="3">Notes</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>Standard</td> <td colspan="3">Axis 1 working envelope $\pm 30^\circ$ at wall mounting</td> </tr> </tbody> </table> </div> <div style="border-bottom: 1px solid black; margin-bottom: 5px;"> <p>Application variation</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Mark</th> <th style="width: 30%;">Specification</th> <th style="width: 10%;">Solenoid valve</th> <th style="width: 10%;">Signal wires</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>Standard</td> <td style="text-align: center;">3</td> <td style="text-align: center;">10 wires</td> <td></td> </tr> </tbody> </table> </div> <div> <p>Arm variation</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Mark</th> <th style="width: 40%;">Specification</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">(none)</td> <td>6 axes Standard arm</td> <td>Max reach 723mm</td> </tr> <tr> <td style="text-align: center;">L</td> <td>6 axes Long arm</td> <td>Max reach 912mm</td> </tr> <tr> <td style="text-align: center;">P</td> <td>5 axes Standard arm</td> <td>Max reach 723mm (does not have axis No.4)</td> </tr> <tr> <td style="text-align: center;">LP</td> <td>5 axes Long arm</td> <td>Max reach 912mm (does not have axis No.4)</td> </tr> </tbody> </table> </div> </div>	Mark	Specification	Notes			0	Rear connection	Robot to controller cable is connected at robot rear			Mark	Specification	Notes			0	Standard	Axis 1 working envelope $\pm 30^\circ$ at wall mounting			Mark	Specification	Solenoid valve	Signal wires	Notes	0	Standard	3	10 wires		Mark	Specification	Notes	(none)	6 axes Standard arm	Max reach 723mm	L	6 axes Long arm	Max reach 912mm	P	5 axes Standard arm	Max reach 723mm (does not have axis No.4)	LP	5 axes Long arm	Max reach 912mm (does not have axis No.4)
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2. Basic specifications

Item		Specifications			
Robot model		MZ07-02	MZ07P-02	MZ07L-02	MZ07LP-02
Construction		Articulated			
Number of axis		6	5	6	5
Drive system		AC servo motor			
Max. working envelope	Axis 1	±170 °			
	Axis 2	-135 ~ 80 °			
	Axis 3	-136 ~ 270 °		-139 ~ 270 °	
	Axis 4	±190 °	—	±190 °	—
	Axis 5	±120 °			
	Axis 6	±360 °			
Max. speed *6	Axis 1	450 °/s		300 °/s	
	Axis 2	380 °/s		280 °/s	
	Axis 3	520 °/s		360 °/s	
	Axis 4	550 °/s	—	550 °/s	—
	Axis 5	550 °/s			
	Axis 6	1000 °/s			
Max. pay load	Wrist	7 kg			
Allowable static load torque	Axis 4	16.6 N·m	—	16.6 N·m	—
	Axis 5	16.6 N·m			
	Axis 6	9.4 N·m			
Allowable moment of inertia *1	Axis 4	0.47 kg·m ²	—	0.47 kg·m ²	—
	Axis 5	0.47 kg·m ²			
	Axis 6	0.15 kg·m ²			
Position repeatability *2		±0.02mm		±0.03mm	
Max. reach		723mm		912mm	
Air tubes		φ 6×2			
Application signal wires		10 wires			
Installation *3		Floor / Wall / Tilted / Inverted mount			
Ambient conditions		Temperature: 0 to 45 °C *4 Humidity: 20 to 85%RH (No dew condensation allowed) Vibration to the installation face: Not more than 0.5G (4.9 m/s ²)			
Dust-proof / Drip-proof performance *5		IP67 equivalent (dust and drain proof-type)			
Cleanliness *7		ISO 14644-1 Class 4 equivalent			
Noise *8		70.2 dB			
Robot mass		30kg		32kg	

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

- On controller display, axis 1 to 6 is displayed as J1 to J6 for each.

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

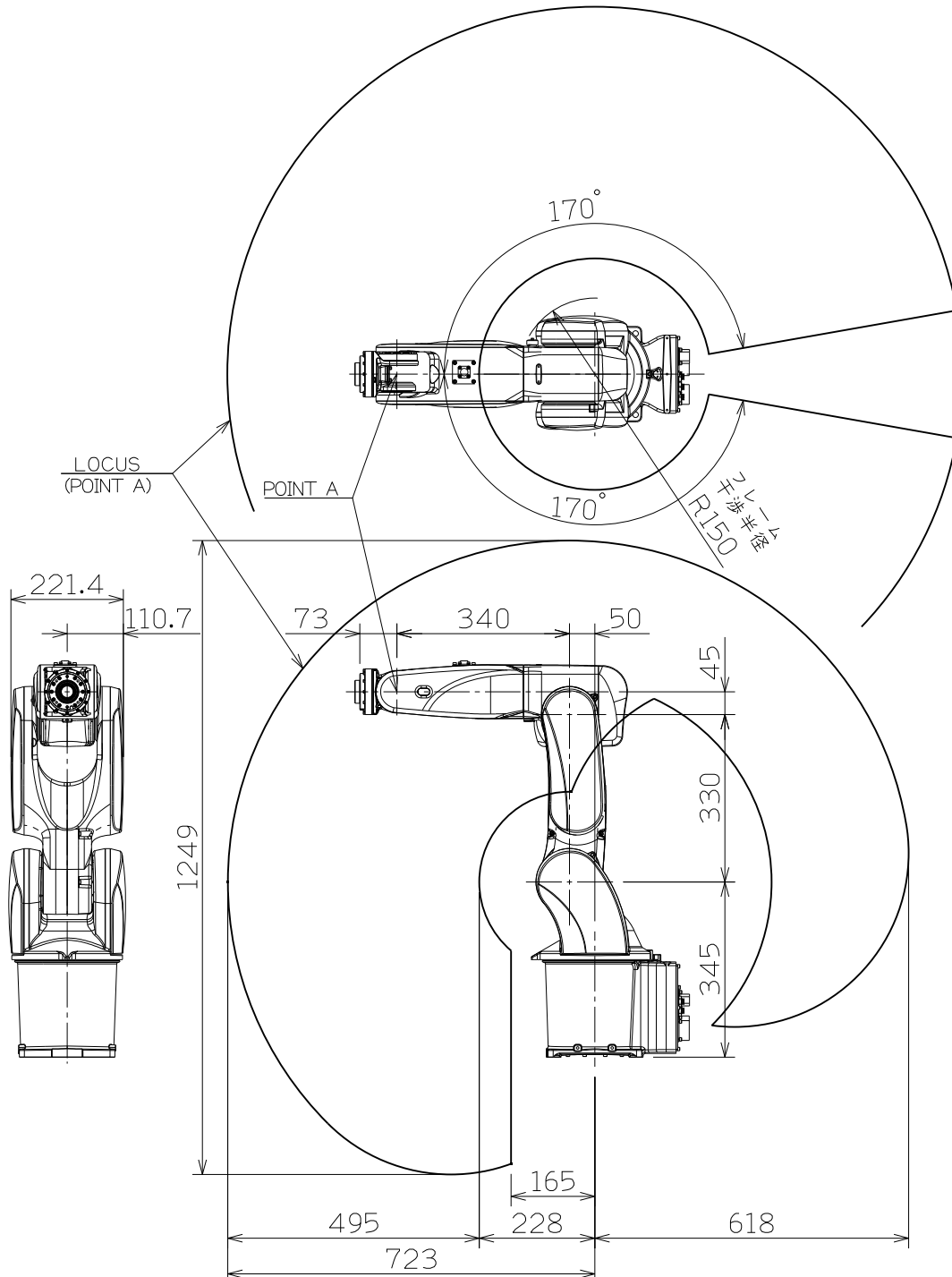
- Explosion-proof is not available.

*1: Allowable moment of inertia of wrist changes due to the load conditions of wrist. *2: This value conforms to "JIS B 8432".

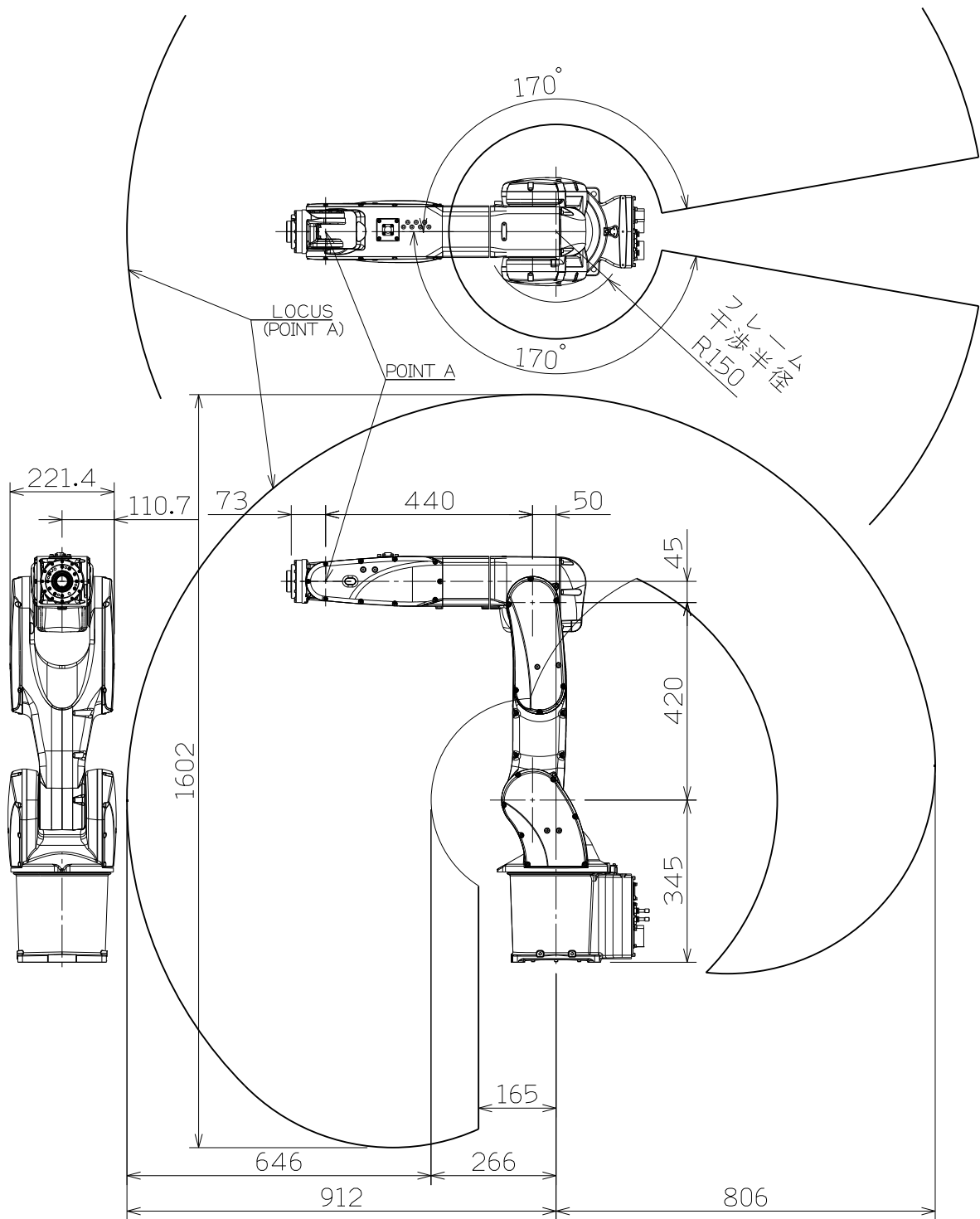
*3: Working envelop is limited when wall mount and tilted mount. (Example; axis 1 working envelop is ±30° in case of wall mount) *4: Permitted height is not higher than 1,000m above sea level. If used in higher place, permitted temperature is affected by height. *5: Liquid such as organic compound, acidity, alkalinity, chlorine or gasoline cutting fluid which deteriorates the seal material are not available to use. *6: The "Max. speed" in this table is the available maximum value and will change depending on the work-program and the wrist load condition. *7: If this cleanliness needs to be kept, use robot in a clean room where down flow air exists. Robot is not dust-tight packaged. If robot is used in clean room, abrasive or fine particles shall be removed before carrying it in clean room. *8: Robot noise is A-weighted equivalent sound level measured under "JIS Z 8737-1" (ISO 11201) with max. payload and max. speed.

3. Robot dimensions and working envelope

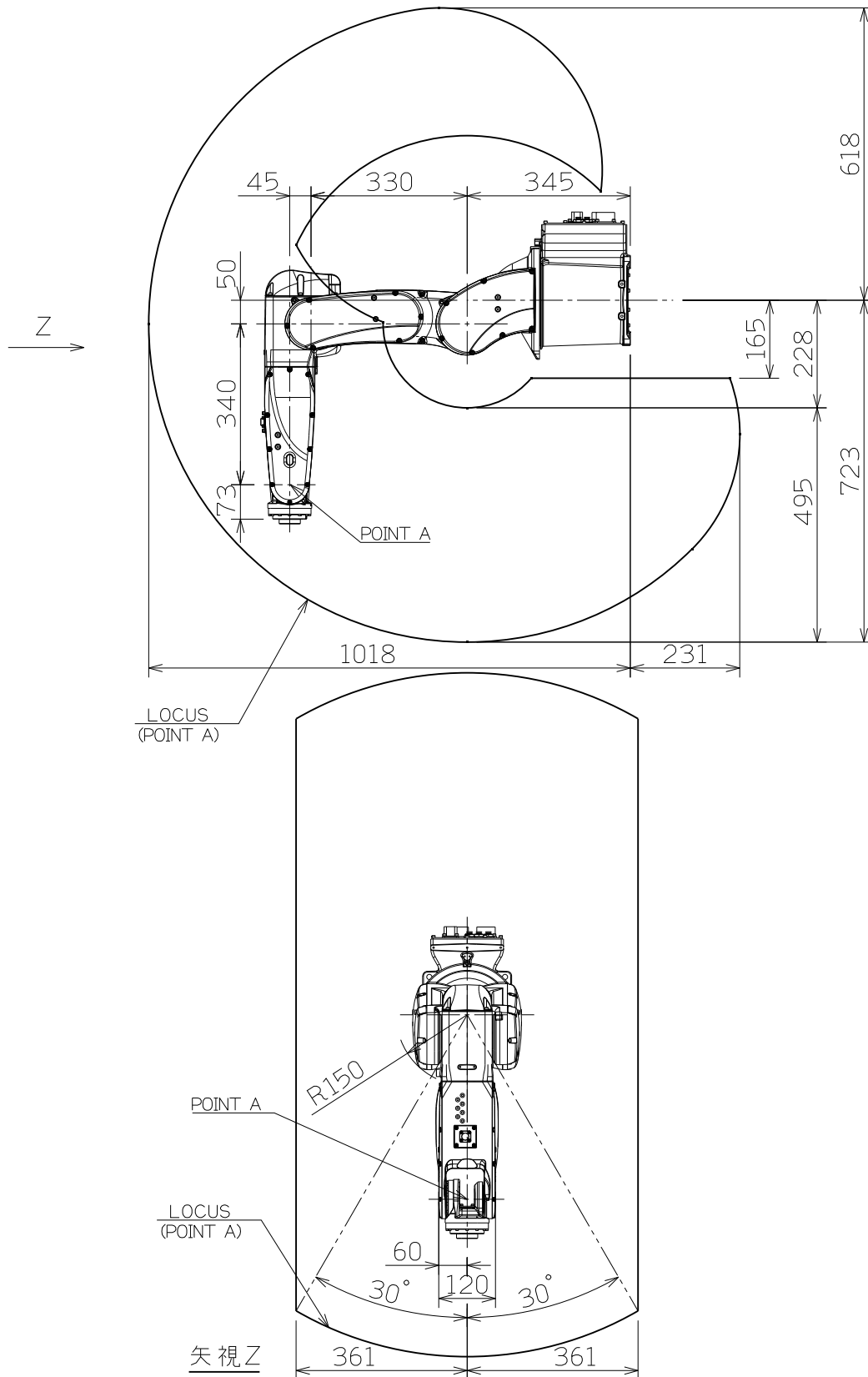
【MZ07-02】 【MZ07P-02】



【MZ07L-02】 【MZ07LP-02】

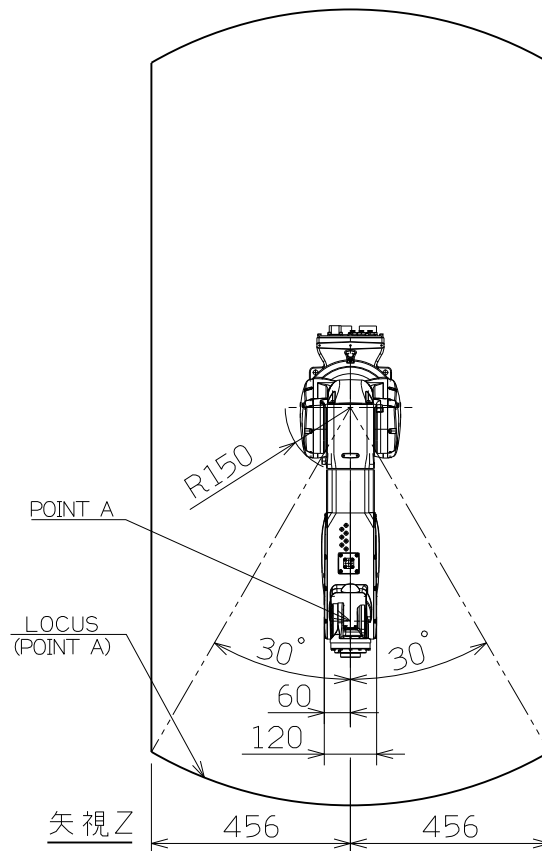
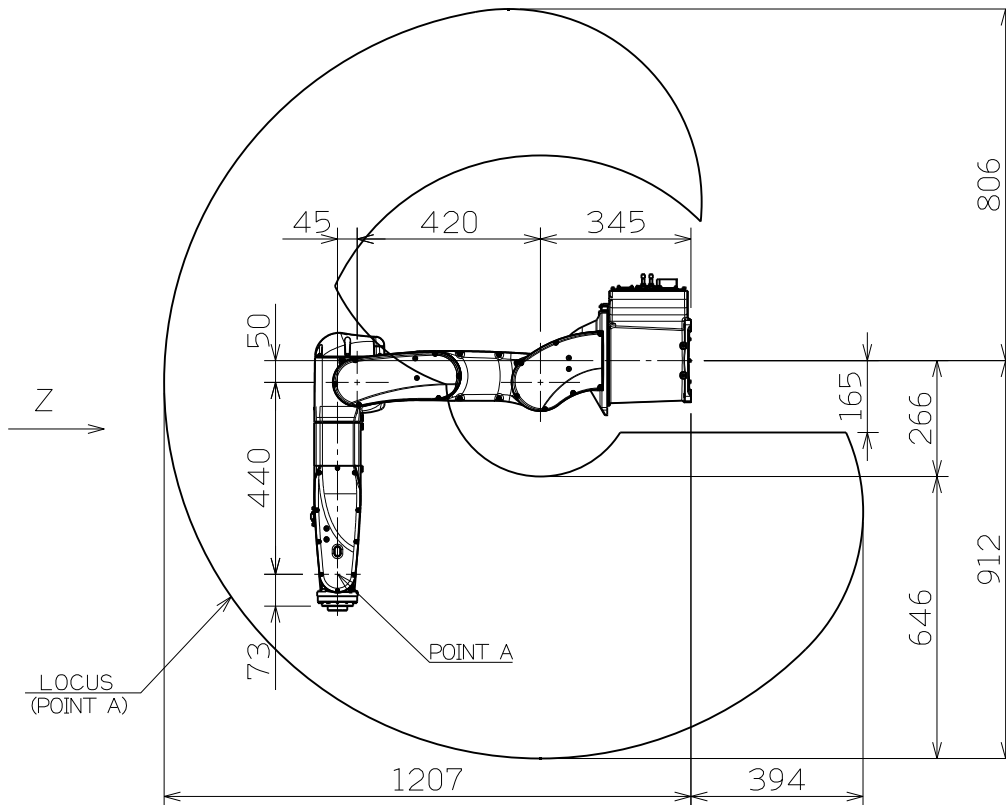


【MZ07-02】 【MZ07P-02】 Wall mount



This figure shows the working envelope in case that standard installation robot (MZ07-*-02-*0*) is installed at wall mount. In this case, software parameter needs to be changed to restrict working envelope as indicated above.


【MZ07L-02】 【MZ07LP-02】 Wall mount



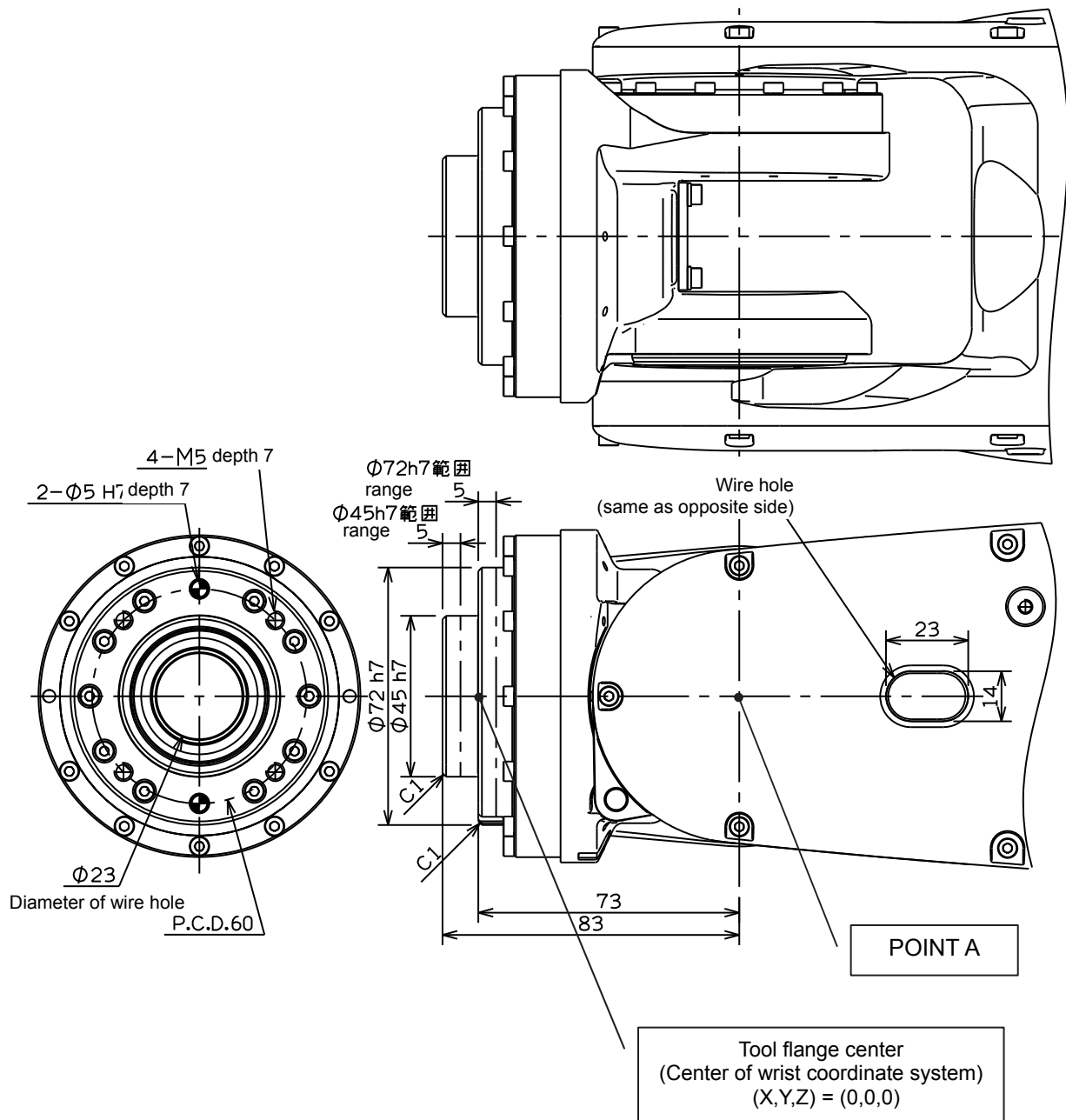
This figure shows the working envelope in case that standard installation robot (MZ07-*-02-*0*) is installed at wall mount. In this case, software parameter needs to be changed to restrict working envelope as indicated above.

4. Details of load mounting face








For the tool fixing bolts, use the mounting P.C.D. shown in the following figures.

 CAUTION	Be sure to screw the M5 tool fixing bolts in the wrist not deeper than the screw depth in the mounting face. Screwing the bolts deeper than the screw depth may damage the wrist.
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【MZ07-02】【MZ07P-02】【MZ07L-02】【MZ07LP-02】



5. Installation procedure

 WARNING	To install the robot, it is important to position the robot so that no workers will get pinched by the robot inside or around a device to use the robot. The robot must not come into contact with any peripheral equipment when operating in the maximum operating range with a tool mounted on it.
 WARNING	Be sure to install the robot according to the specified procedure. Otherwise it will cause the robot to move or topple over while in operation, thus inducing an imminent hazardous situation.
 WARNING	To make wire connections between the robot and the controller or the peripheral equipment, fully understand the connection procedure for proper wire connections. Making wire connections according to improper procedure will cause the robot to malfunction.
 WARNING	Be sure to establish a proper ground for the robot. If equipment such as a welder that causes substantial noises is needed to use, establish the specified ground for the equipment.
 WARNING	During transport or installation 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.
 IMPORTANT	Robot is not dust-tight packaged. If robot is used in clean room, abrasive or fine particles shall be removed before carrying it in clean room. It is recommended that robot should be cleaned by swabbing with isopropyl alcohol (IPA). Use of other solvents or pure water could contribute rust or peel of coating materials.
 IMPORTANT	It is to be noted that cleanliness of robot is worse if it has operated in poor conditions for a long time or if it has been left as it was.

■ Installation location and ambient conditions

Conditions (temperature, humidity, height and vibration) are written in “Chapter 2 Basic Specifications”. Further ambient conditions listed below must be observed.

- (1) Location with the drainage structure so that swivel base is not flooded, when the liquid such as water or cutting fluid is splashed on the robot body
- (2) Location with no flammable or corrosive fluid or gas.
- (3) Type D grounding (the grounding resistance is 100Ω or less) is necessary.

■ Installation procedure

While robot moves, large reaction force is applied to the swiveling base from all directions. Consequently, the robot should be installed in such a manner that the foundation endures reaction force caused by accelerating or decelerating the speed to lock the robot, not to mention that it endures static loads. Repair uneven spots, cracks, and others on the floor, and then install the robot by following to the table below. If thickness of floor concrete is less than needed level, an independent foundation should be constructed. Inspect the foundation prior to the robot installation, and then construct the foundation, if necessary.

	Standard mount and Rear connection
Thickness of floor concrete	Not less than 150 mm
Installation parts *1	4 bolts of M10 X 30 (JIS: Strength class 12.9) 4 plain washers of not less than 3.2 mm in thickness and HRC35 in hardness
Tightening torque *2	67 N·m
Allowable repeated tensile *3	Approximately 700 N



*1 : Installation parts are not accessory of robot.

*2 : Apply a coating of lubricating oil to the threaded parts of bolts, and then tighten bolts by using torque wrench to the specified tightening torque.

*3 : This tensile is per installation bolt when robot is installed with all bolts written in table above.

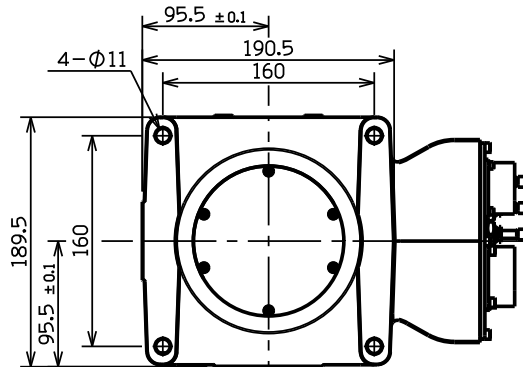
■ Installation space

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

 WARNING	The mechanical stopper end is located in a position exceeding the specified working envelope (software limit) of axis 1. To install the safety fence, with consideration given to the wrist configuration and the shape of tool.
 WARNING	On axis 1, 2 and 3, the robot working envelope can be regulated for safety. Optional part is necessary to enable this function.

Standard mount
Cable rear connection

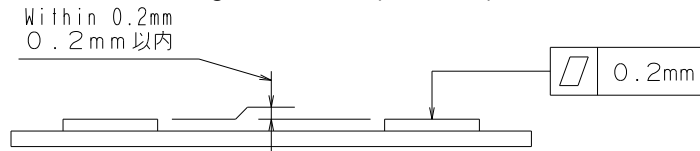
MZ07(P)-02-000
MZ07L(P)-02-000



■ Accuracy of installation surface

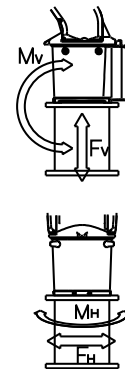
When installing robot, strictly observe precautions listed below to cause no deformation in the base.

- (1) Make the deviation from the flatness of the 4 plates on the robot installation surface fall within 0.2 mm.
- (2) Make the deviation in height between the 4 places of each base plate installation surface and the robot installation surface fall in the range of 0.2 mm (±0.1 mm).



■ Maximum robot generative force

Robot model	Maximum Vertical generative force F_v	Maximum horizontal generative force F_H	Maximum Vertical generative moment M_v	Maximum horizontal generative moment M_H
MZ07-02 MZ07P-02	1,600N	1,200N	1,000Nm	900Nm
MZ07L-02 MZ07LP-02	2,000N	1,500N	1,250Nm	1,130Nm



6. Allowable wrist load

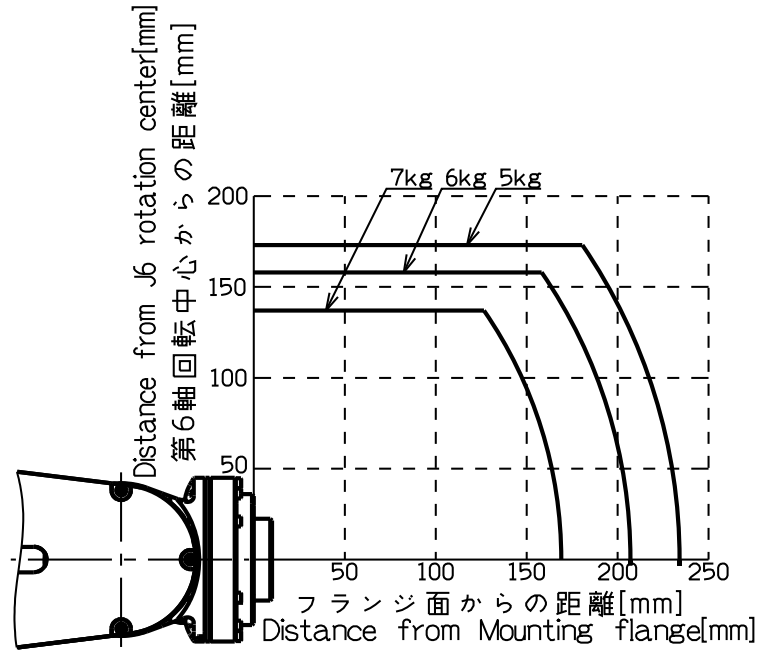


Load fixed on the tip of wrist is regulated by “allowable payload mass”, “allowable static load torque”, and “allowable moment of inertia”. Strictly keep the wrist load within each allowable value. If wrist load exceeds the allowable value, this robot is out of guarantee. Refer to the table of “2. Basic specifications” and following figures for the detail of each specification.

■ Torque map for wrist load

Use the robot under condition that COG of wrist load falls in the range shown in the torque map.

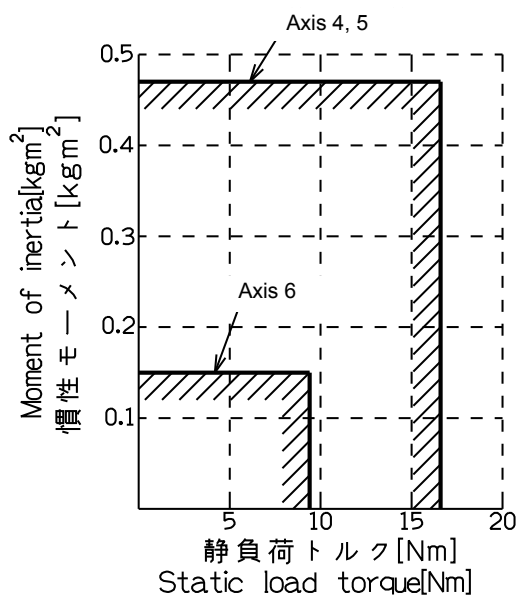
- 【MZ07-02】
- 【MZ07P-02】
- 【MZ07L-02】
- 【MZ07LP-02】



■ Moment of inertia map for wrist load

Use the robot under condition that static load torque and moment of inertia fall in the range shown in the figures below.

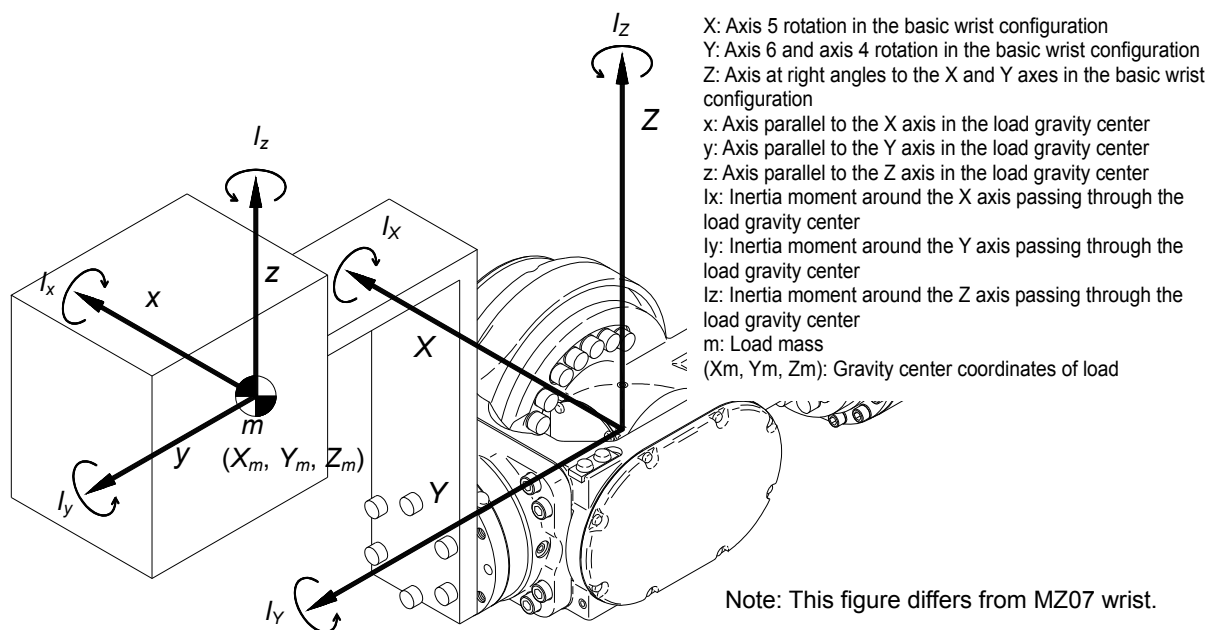
- 【MZ07-02】
- 【MZ07P-02】
- 【MZ07L-02】
- 【MZ07LP-02】



If the moment of inertia exceeds the specification, maximum speed is automatically limited by the software to protect the robot.

■ How to find the inertia moment of each axis

The following section shows general methods of calculating the inertia moment around each axis.



• Inertia moment around axis 6

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

• Inertia moment around axis 4 and axis 5 (The inertia moment around axis 4 and axis 5 varies with axis 6 configuration. Consequently, in order to simplify the calculation, take a maximum value around the X and Z axes in above figure, as the inertia moment.)

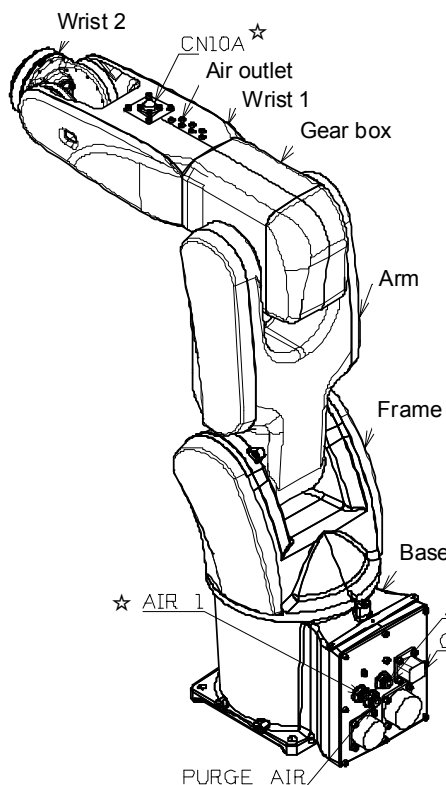
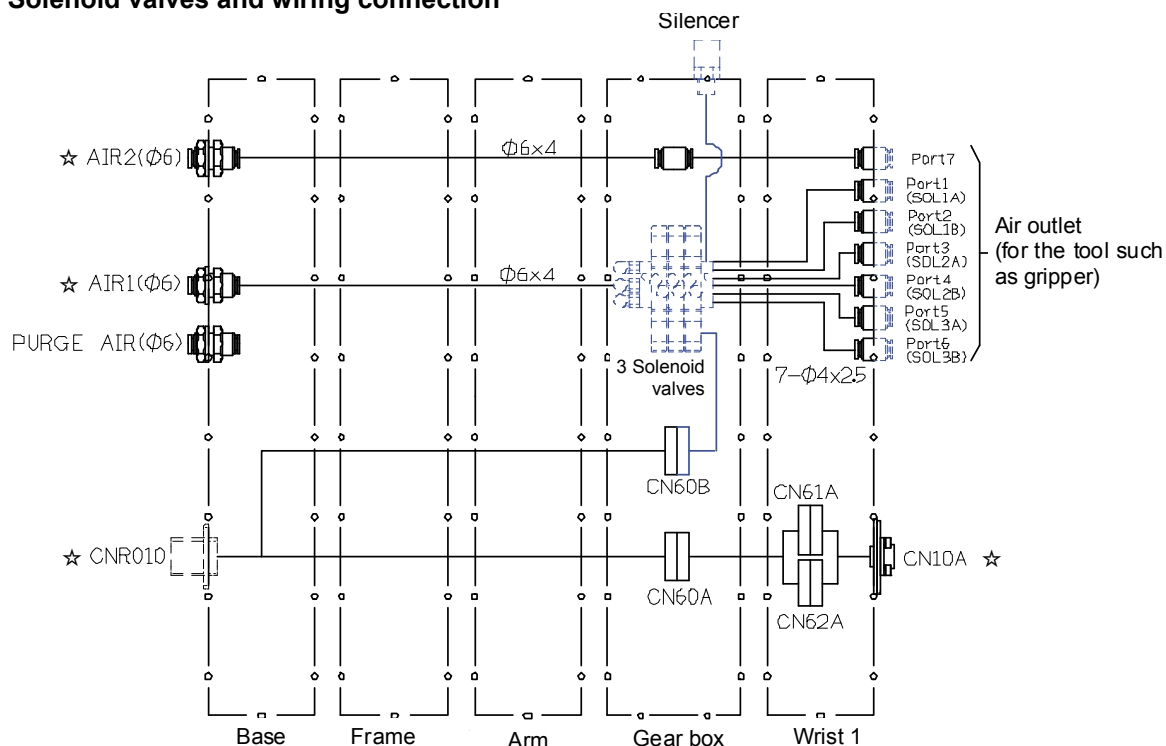
$$I_{J4J5} = \max (I_X , I_Z)$$

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

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

7. Application wiring and tube diagram

■ Solenoid valves and wiring connection



Note

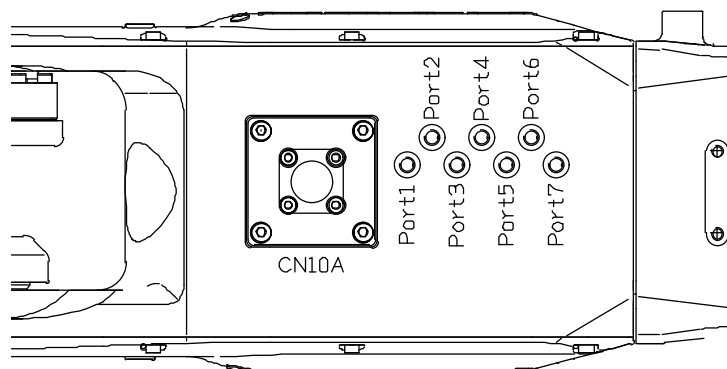
- Only 2 air lines (AIR1 to Port1 and AIR2 to Port7) are connected directly inside gear box. Plugs are attached on air outlet.
- Solenoid valves and silencer are mounted.

Solenoid valve type;

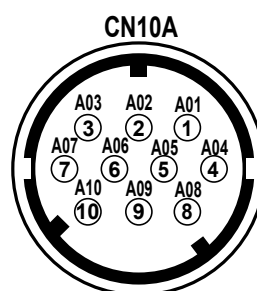
SYJ3220-5GR-M3 (SMC), 2 position double solenoid, Coil voltage DC24V, Consuming power 0.35W, With surge voltage protector circuit (no pole), No-lock push type manual operation, Without sub-plate for tube, Without bracket (Pressure range : 0.1 to 0.5MPa, Coil voltage : DC24V)

☆ marks indicate the names only for NACHI.

■ Detailed diagram of the application connectors



	6	5	4	3	2	1
D	G	A20	A19	A18	A17	A16
C		A15	A14	A13	A12	A11
B	A22	A10	A09	A08	A07	A06
A	A21	A05	A04	A03	A02	A01



Connector CNR010 on base
 Tyco AMP 1939839-1, 1939840-1, 1903112-2
 Partner connector type
 Tyco AMP 1939847-1, 1939850-1, 1827570-2

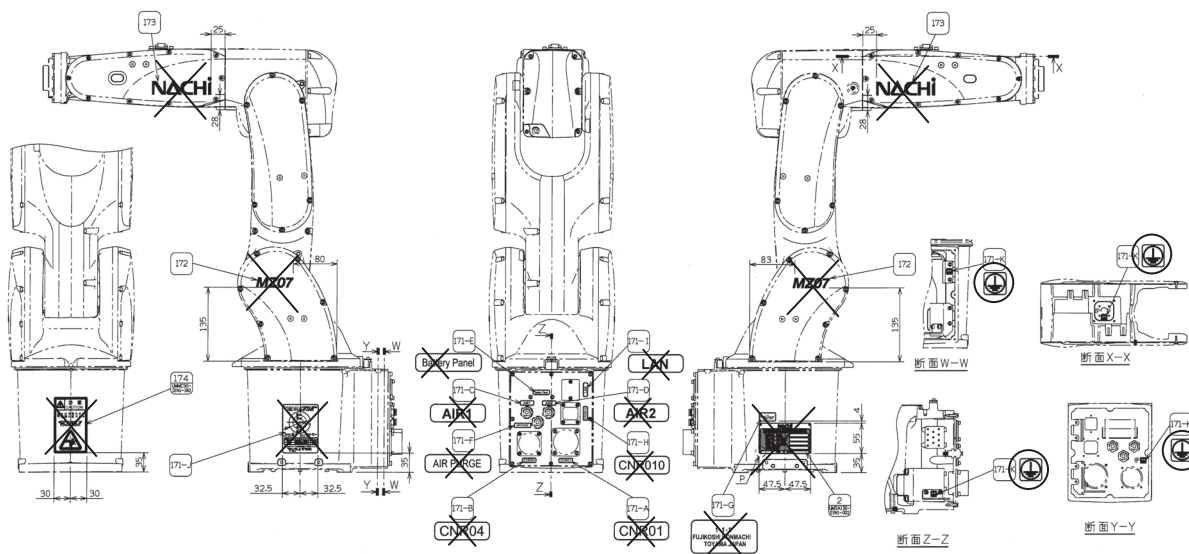
Connector CN10A on wrist 1
 JAE JN1AS10ML1-R
 Partner connector type
 JAE JN1DS10SL2

Partner connector on both base side (CNR010) and wrist side (CN10A) is prepared.

(NOTE) The "CNR010" and the "CN01A" are the connector names only in case of NACHI.

8. Stickers

Brand sticker (NACHI), machine type sticker (MZ07), working envelope sticker, pinch point sticker, and connector name stickers etc. are not affixed. We will affix Adept sticker before shipment, if provided.



(NOTE1) The stickers of X mark are omitted.

(NOTE2) The stickers of O mark are attached in NACHI factory.

9. Delivery style

	Style	Details
1	Delivery on the truck	Robot is delivered on the truck near the entrance of customer's plant. (Installation and test-run is not included)

10. Paint color

Standard color	Robot cover and wrist 1	Munsell 6.5PB9/1
	Arm	Munsell N5.5
	Base	Munsell N5.5

11. Warranty

Elapse of 1 year after delivery. (8 hours/day running)
 But following case is out of warranty even within warranty term.

- 1) Damage happened because robot was used under condition of exceeding robot specification or reduction gear specification or motor specification.
- 2) Damage happened because of customer's controller trouble or peripheral equipment (for example; primary power).
- 3) Damage happened because robot was used under condition that its lifespan is estimated shorter than 1 year.

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