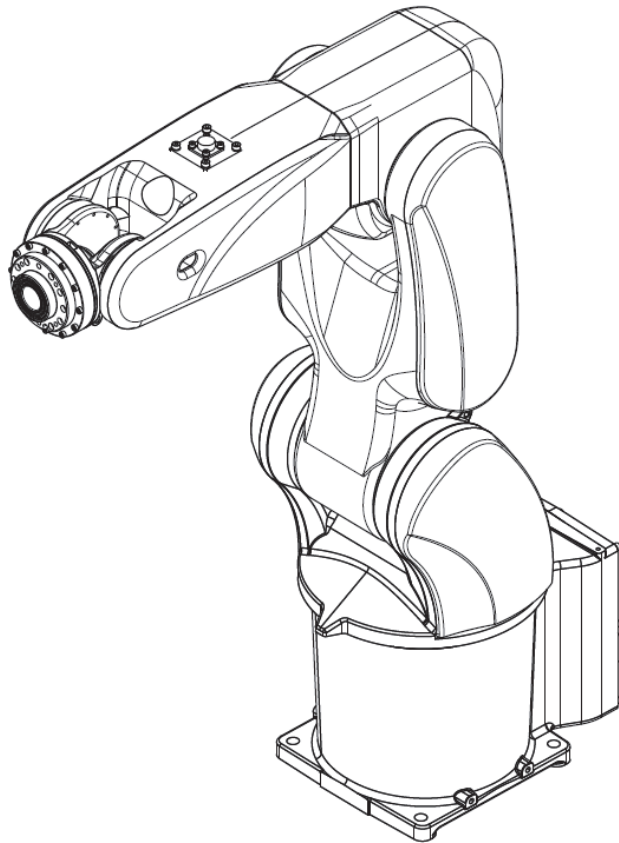


Standard specifications

MZ07	-01-CFD	MZ07	-11-CFD
MZ07P	-01-CFD	MZ07P	-11-CFD
MZ07L	-01-CFD	MZ07L	-11-CFD
MZ07LP-01-CFD		MZ07LP-11-CFD	
MZ03EL-01-CFD		MZ03EL-11-CFD	
MZ10	-01-CFD	MZ10	-11-CFD

16th edition



NACHI-FUJIKOSHI CORP.

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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 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.

MZ series has 4 kind of base type. Each base type has connection variation, installation variation and application variation as shown below.

Base type

	5 axes type		6 axes type	
	Standard specification	Seal performance enhanced specification	Standard specification	Seal performance enhanced specification
Normal arm (reach 723mm)	MZ07P-01	MZ07P-11	MZ07-01	MZ07-11
Long arm (reach 912mm)	MZ07LP-01	MZ07LP-11	MZ07L-01	MZ07L-11
3kg payload long arm (reach 1102mm)	-	-	MZ03EL-01	MZ03EL-11
10kg payload normal arm (reach 723mm)	-	-	MZ10-01	MZ10-11

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.

Detail type

MZ07 * _**_ ***

Connection variation

Mark	Specification	Notes
0	Rear connection	Robot to controller cable is connected at robot rear
B	Bottom connection	Robot to controller cable is connected at robot bottom

Installation variation

Mark	Specification	Notes
0	Standard	Axis 1 working envelope $\pm 30^\circ$ at wall installation
W	Wall installation	Axis 1 working envelope $\pm 170^\circ$ at wall installation

Application variation

Mark	Specification	Solenoid valve	Signal wires	Notes
0	Standard	Max. 3	10 wires	
V	Vision sensor	Max. 2	10 wires	LAN cable, Light cable
U	Vision sensor (cross laser)	Max. 1	10 wires	LAN cable, Light cable, Laser cable
F	Force sensor	Max. 1	10 wires	6 freedom Force sensor cable
S	Additional axis	Max. 1	10 wires	1 motor and 1 encoder cable
E	I/O expansion	Max. 3	20 wires	Connection / Installation Specifications are only Rear / Standard There is no LAN cable

Use environment variation

Mark	Specification	Notes
01	Standard specification	Standard reduction gear specification
11	Seal performance enhanced specification	Seal performance enhanced reduction gear specification

Arm variation

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)



- If the motion range larger than “+/- 30 [deg]” is necessary for the J1 axis, please be sure that the “**W: Wall installation**” type robot must be selected. It is not permitted to use the “**0: Standard**” robot with the motion range larger than “+/- 30 [deg]” with installed on a wall.

- If these robot series are used with the installation styles of “**Wall**”, “**Slanted**” or “**Ceiling (Inverted)**”, please set the installation angle using the following setting menu. If this setting is not done correctly, the robot may be damaged in short time because the motor torque cannot be controlled correctly.

<Constant setting> [12 Format and Configuration] [5 Installation Angle]
 For details, refer to the following instruction manual.
“CFD CONTROLLER INSTRUCTION MANUAL: SETUP MANUAL” Chapter 3 Setup (TCFEN-159-005 or after)

MZ03EL-**-*0*

Connection variation				
Mark	Specification	Notes		
0	Rear connection	Robot to controller cable is connected at robot rear		
B	Bottom connection	Robot to controller cable is connected at robot bottom		
Installation variation				
Mark	Specification	Notes		
0	Standard	Axis 1 working envelope ±30°at wall installation		
Application variation				
Mark	Specification	Solenoid valve	Signal wires	Notes
0	Standard	Max. 3	10 wires	
V	Vision sensor	Max. 2	10 wires	LAN cable, Light cable
F	Force sensor	Max. 1	10 wires	6 freedom Force sensor cable
S	Additional axis	Max. 1	10 wires	1 motor and 1 encoder cable
Use environment variation				
Mark	Specification	Notes		
01	Standard specification	Standard reduction gear specification		
11	Seal performance enhanced specification	Seal performance enhanced reduction gear specification		

MZ10-01-*0*

Connection variation				
Mark	Specification	Notes		
0	Rear connection	Robot to controller cable is connected at robot rear		
B	Bottom connection	Robot to controller cable is connected at robot bottom		
Installation variation				
Mark	Specification	Notes		
0	Standard	Axis 1 working envelope ±30°at wall installation		
Application variation				
Mark	Specification	Solenoid valve	Signal wires	Notes
0	Standard	Max.3	10 wires	
V	Vision sensor	Max.3	10 wires	LAN cable, Light cable
U	Vision sensor (cross-laser)	Max.1	10 wires	LAN cable, Light cable, Laser cable
F	Force sensor	Max.1	10 wires	6 freedom Force sensor cable
S	Additional axis	Max.1	10 wires	1 motor and 1 encoder cable
E	I/O extension	Max.3	20 wires	Connection / Installation Specifications are only Rear / Standard There is no LAN cable
Use environment variation				
Mark	Specification	Notes		
01	Standard specification	Standard reduction gear specification		
11	Seal performance enhanced specification	Seal performance enhanced reduction gear specification		

Concerning the electrical option parts and the robot controller “CFD controller”, please refer to the following specification.

“Standard specifications: CFD controller” (SCFEN-010)



CAUTION

- The machine type of the control software will be "MZ *** - 01" when the use environment variation is "-01" or "- 11". When formatting, please select "MZ *** - 01" and format it.

2. Basic specifications

2.1 Basic specification of Robot body

Item		Specifications				
Robot model		MZ07-01 MZ07-11 *9	MZ07P-01 MZ07P-11 *9	MZ07L-01 MZ07L-11 *9	MZ07LP-01 MZ07LP-11 *9	MZ03EL-01 MZ03EL-11 *9
Construction		Articulated				
Number of axis		6	5	6	5	6
Drive system		AC servo motor				
Max. working envelope	Axis 1	±170 °				
	Axis 2	-135 ~ 80 °				
	Axis 3	-136 ~ 270 °		-139 ~ 270 °		-155 ~ 270 °
	Axis 4	±190 °	—	±190 °	—	±190 °
	Axis 5	±120 °				
	Axis 6	±360 °				
Max. speed *6	Axis 1	450 °/s		300 °/s		
	Axis 2	380 °/s		280 °/s		230 °/s
	Axis 3	520 °/s		360 °/s		360 °/s
	Axis 4	550 °/s	—	550 °/s	—	550 °/s
	Axis 5	550 °/s				
	Axis 6	1000 °/s				
Max. pay load	Wrist	7 kg			3.5kg	
Allowable static load torque	Axis 4	16.6 N·m	—	16.6 N·m	—	6.0 N·m
	Axis 5	16.6 N·m				6.0 N·m
	Axis 6	9.4 N·m				2.9 N·m
Allowable moment of inertia *1	Axis 4	0.47 kg·m ²	—	0.47 kg·m ²	—	0.12 kg·m ²
	Axis 5	0.47 kg·m ²				0.12 kg·m ²
	Axis 6	0.15 kg·m ²				0.03 kg·m ²
Position repeatability *2		±0.02mm		±0.03mm		
Max. reach		723mm		912mm		1102mm
Air tubes		φ6×2				
Application signal wires		10 wires				
Installation *3		Floor / Wall / Tilted / Inverted installation				
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)				
Environment performance *5		IP67 equivalent (dust and drain proof-type)				
Noise *8		70.2 dB				
Robot mass *10		36kg		38kg		39kg

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 specification might change without a previous notice for the improvement.

- Explosion-proof is not available.

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

*3: Working envelop is limited when wall mount and angle 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.

*8: Robot noise is A-weighted equivalent sound level measured under "JIS Z 8737-1" (ISO 11201) with max. payload and max. speed. *9: "MZ***.11" is a series that has seal performance enhanced actuators. The performance of the robot itself is the same as that of "MZ***.01" series. *10: In case of wall installation or bottom cable connection specification, the weight of the robots will increase like shown in "5. Installation procedure".

Item		Specifications
Robot model		MZ10-01, MZ10-11 *9
Construction		Articulated
Number of axis		6
Drive system		AC servo motor
Max. Motion range	Axis 1	±170 °
	Axis 2	-135 ~ 80 °
	Axis 3	-136 ~ 270 °
	Axis 4	±190 °
	Axis 5	±120 °
	Axis 6	±360 °
Max. speed *6	Axis 1	300 °/s
	Axis 2	250 °/s
	Axis 3	360 °/s
	Axis 4	450 °/s
	Axis 5	340 °/s
	Axis 6	700 °/s
Max. pay load	Wrist	10 kg
Allowable static load torque	Axis 4	17.9 N·m
	Axis 5	17.9 N·m
	Axis 6	10.4 N·m
Allowable moment of inertia *1	Axis 4	0.47 kg·m ²
	Axis 5	0.47 kg·m ²
	Axis 6	0.15 kg·m ²
Position repeatability *2		±0.03mm
Max. reach		723mm
Air piping		φ6×2
Application signal wires		10 wires
Installation *3		Floor / Inverted settings
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)
Noise *8		73.2 dB
Robot mass *10		36kg

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.
- For the products improvement, these specifications might change without any notification
- Explosion-proof is not available.

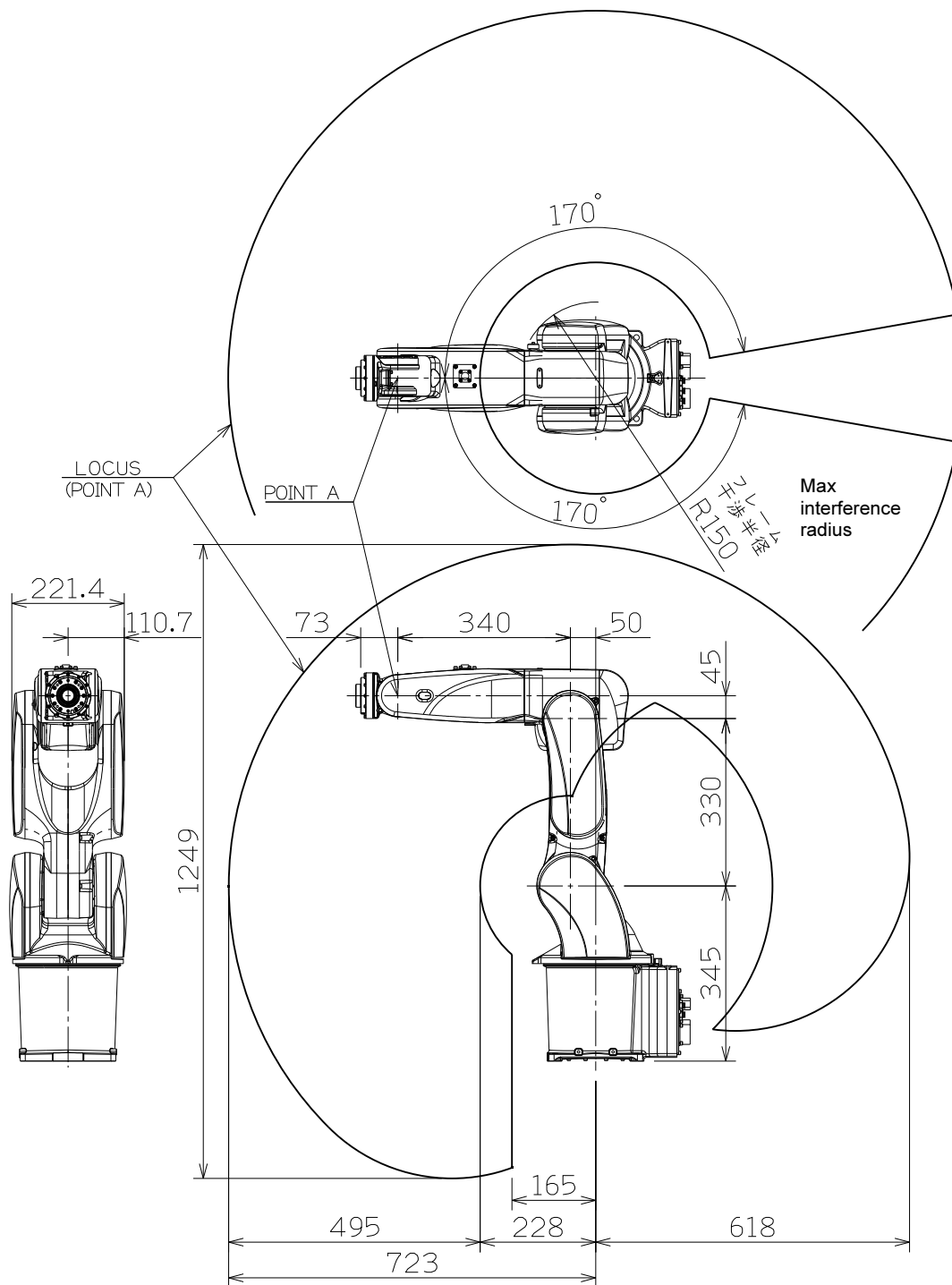
*1: The Allowable moment of inertia of a wrist changes with load conditions of a wrist. *2: This value conforms to "JIS B 8432".
*4: Permitted height is not higher than 1,000m above sea level. If used in higher place, permitted temperature is affected by height. *5: Liquid such as organic compound, acidity, alkalinity, chlorine or gasoline cutting fluid which deteriorates the seal material is 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. *8: Robot noise is A-weighted equivalent sound level measured under "JIS Z 8737-1" (ISO 11201) with max. payload and max. speed. *9: "MZ***-11" is a series that has seal performance enhanced actuators. The performance of the robot itself is the same as that of "MZ***-01" series. *10: In case of bottom cable connection specification, the weight of the robots will increase like shown in "5. Installation procedure".

3. Dimensions

3.1 Robot dimensions and Working envelope

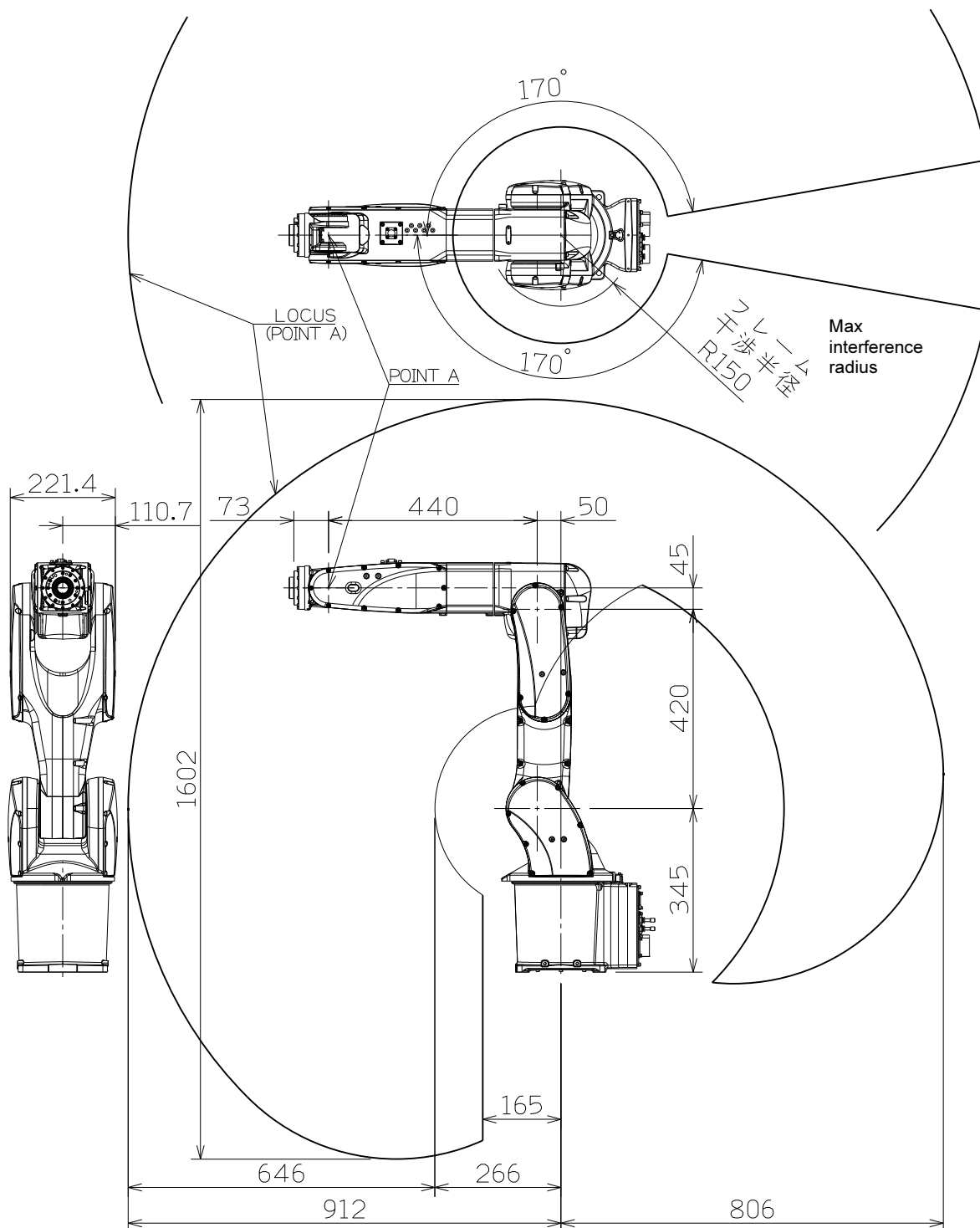
【MZ07-01】 【MZ07P-01】 【MZ10-01】

【MZ07-11】 【MZ07P-11】 【MZ10-11】

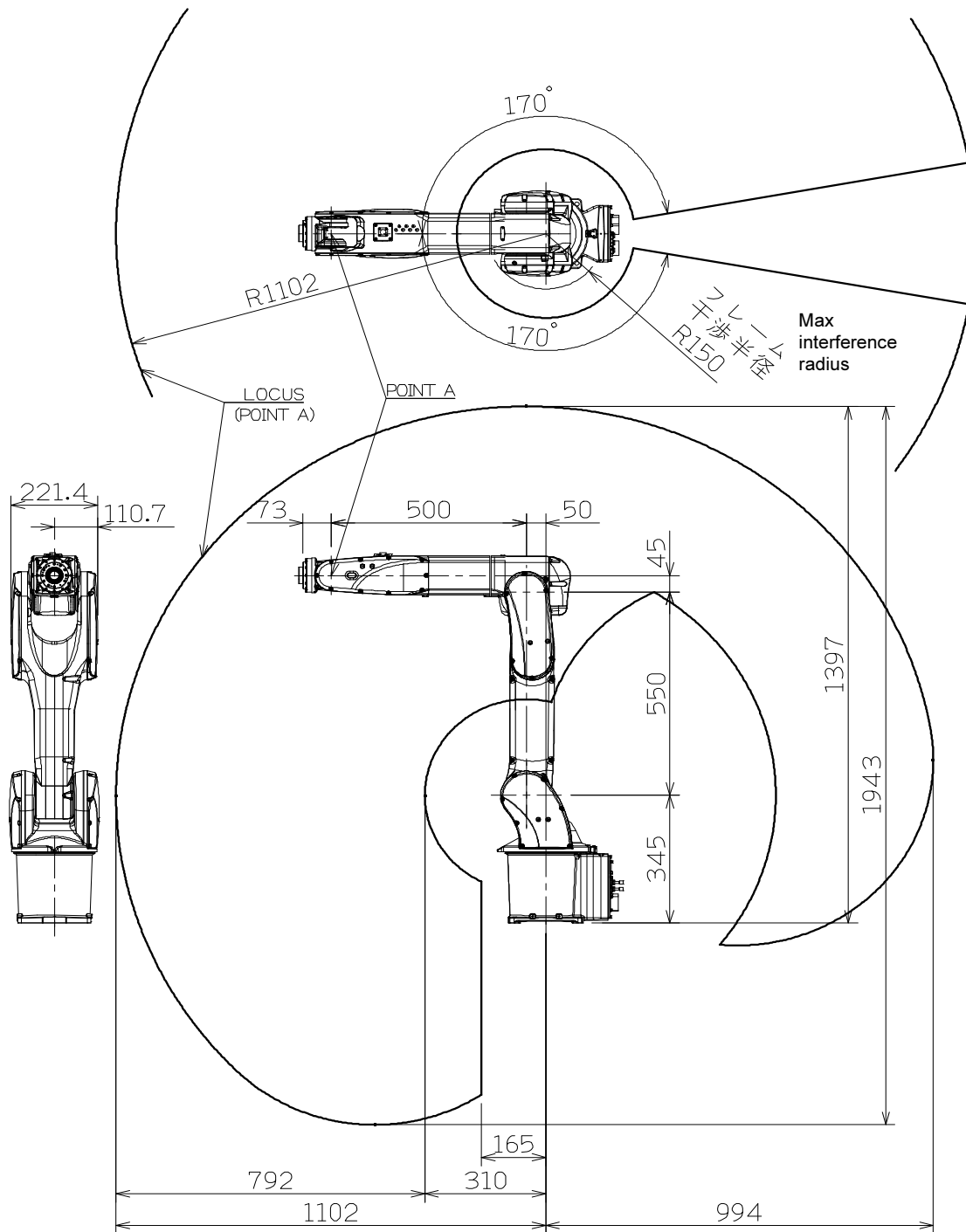


【MZ07L-01】 【MZ07LP-01】

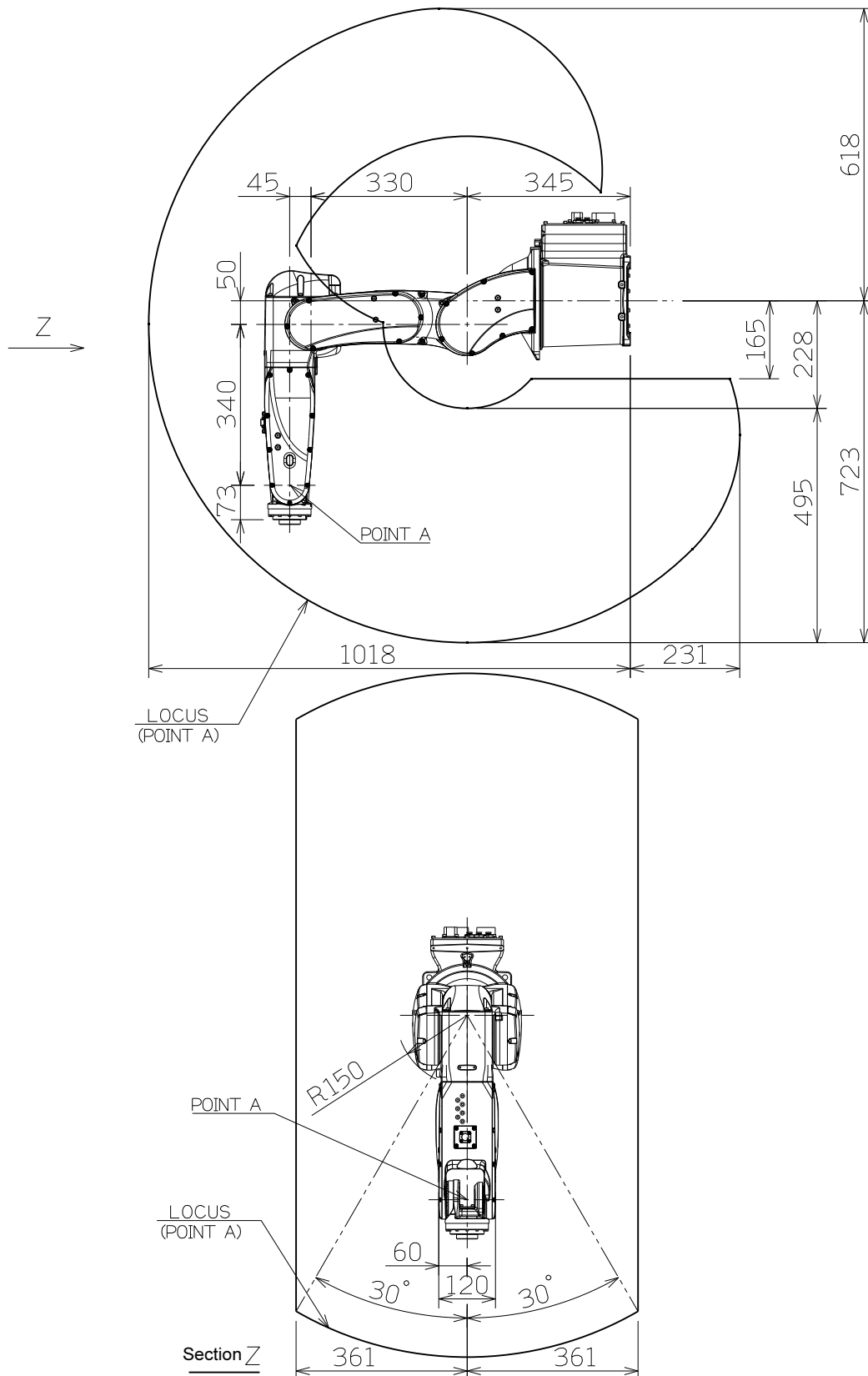
【MZ07L-11】 【MZ07LP-11】



【MZ03EL-01】 【MZ03EL-11】

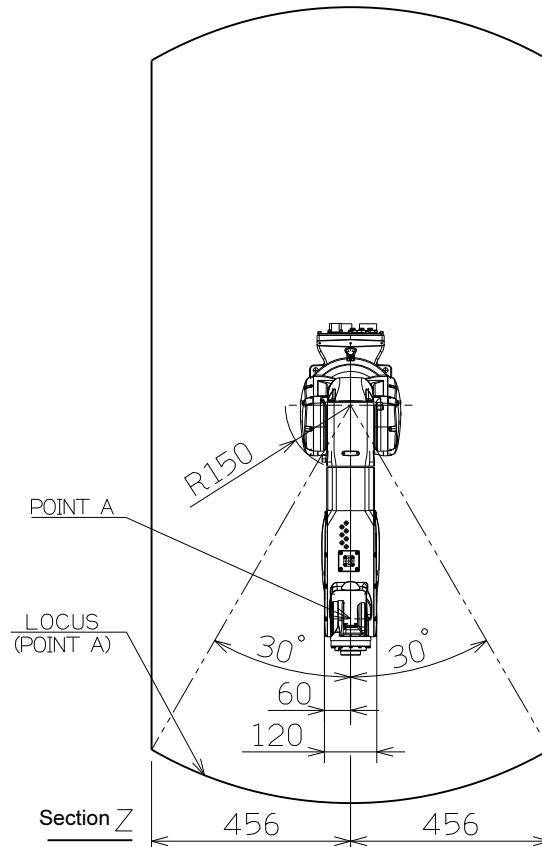
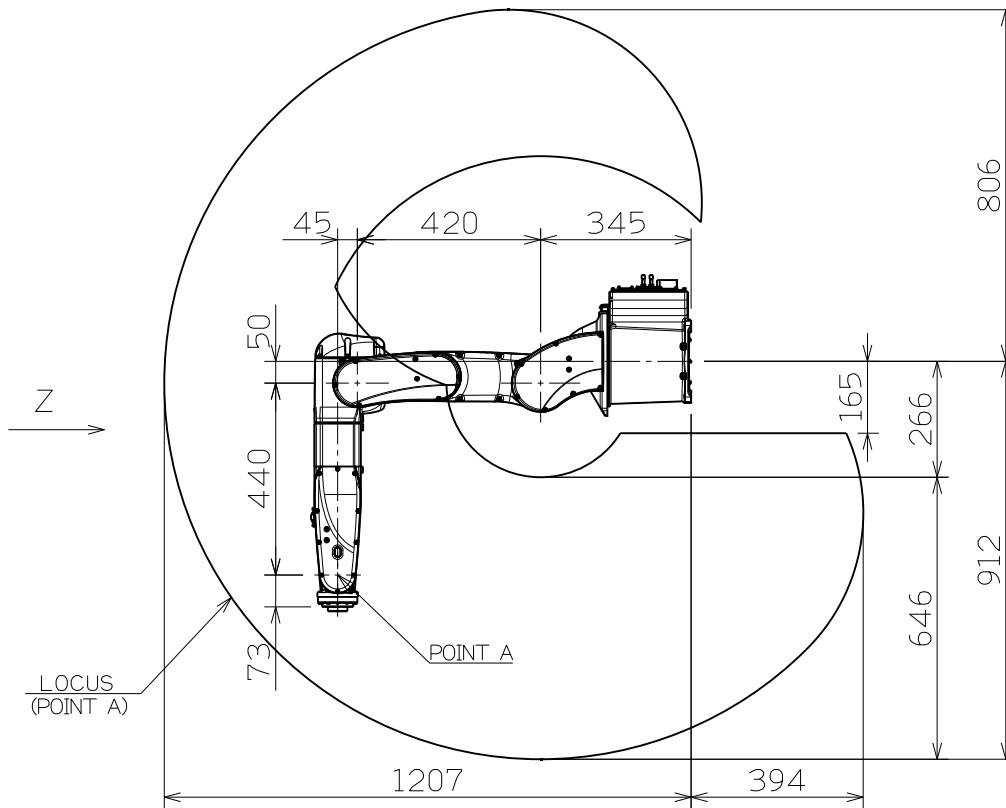


【MZ07-01】 【MZ07P-01】 Wall installation
 【MZ07-11】 【MZ07P-11】 Wall installation



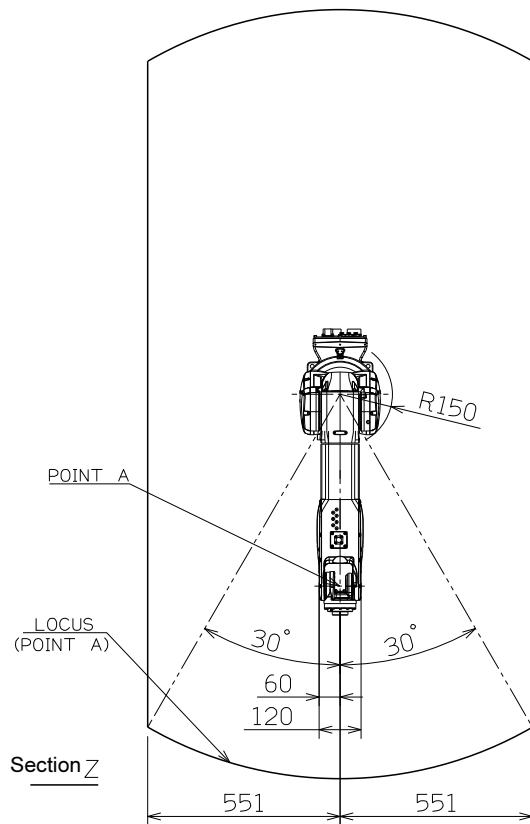
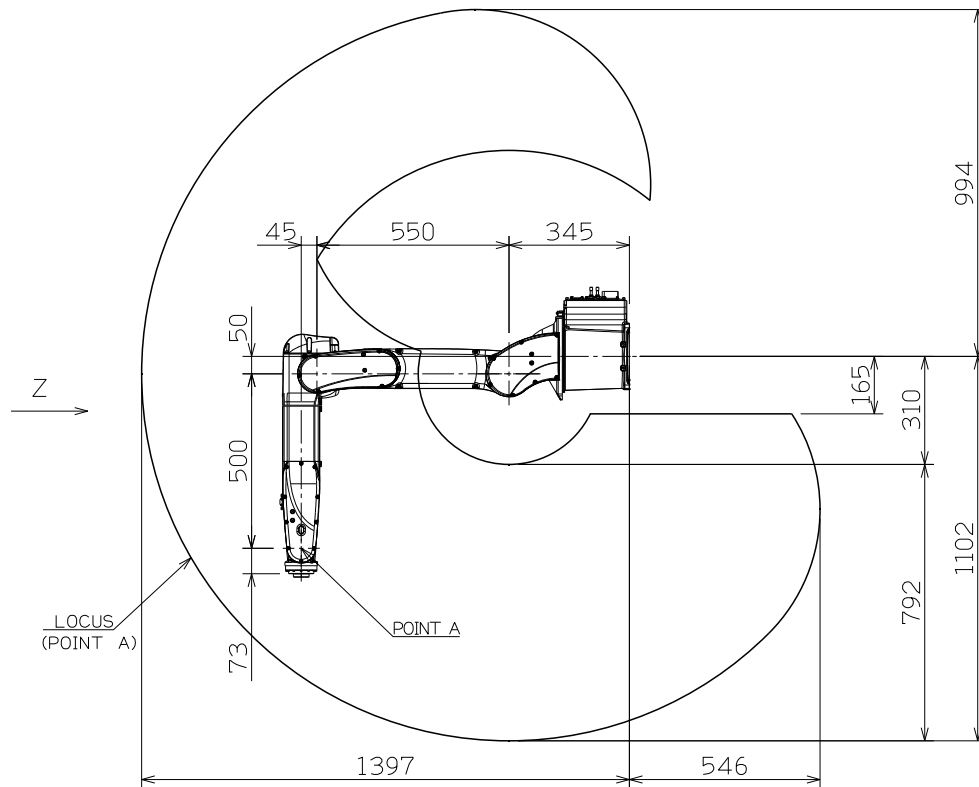
This figure shows the working envelope in case that standard installation robot (MZ07*-*-0*) is installed at wall mount. In this case, software parameter needs to be changed to restrict working envelope as indicated above. If wall mount installation robot (MZ07*-*-W*) is installed at wall mount, working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

【MZ07L-01】 【MZ07LP-01】 Wall installation
【MZ07L-11】 【MZ07LP-11】 Wall installation



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


【MZ03EL-01】 【MZ03EL-11】 Wall installation



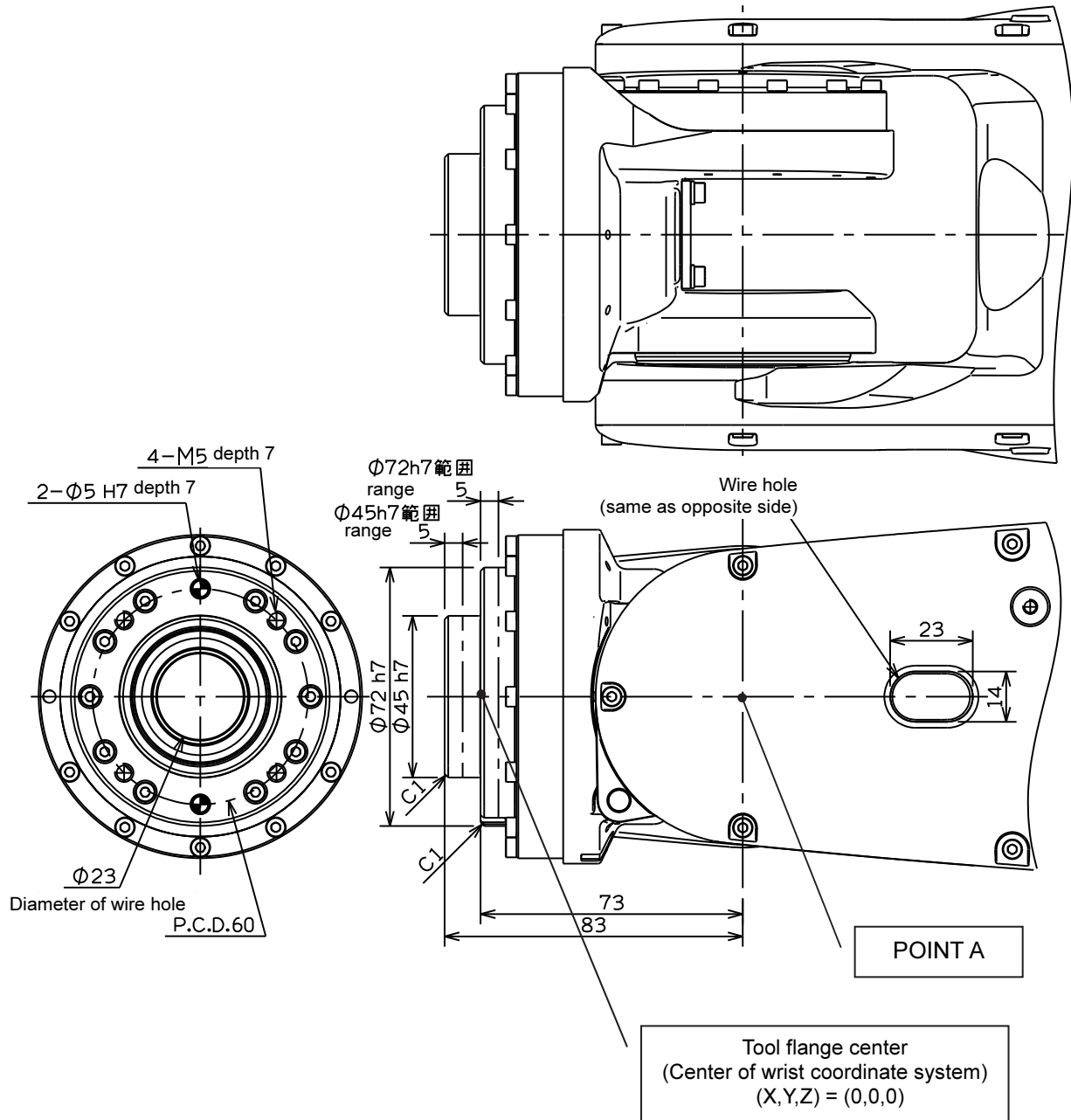
This figure shows the working envelope in case that standard installation robot (MZ03EL-**-0*) is installed at wall mount. In this case, software parameter needs to be changed to restrict working envelope as indicated above.

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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【MZ07-01】【MZ07P-01】【MZ07L-01】【MZ07LP-01】【MZ03EL-01】【MZ10-01】
 【MZ07-11】【MZ07P-11】【MZ07L-11】【MZ07LP-11】【MZ03EL-11】【MZ10-11】



5. Installation procedure

5.1 Installation of Robot body

 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.
 CAUTION	If ambient temperature is low, vibration, overload error and tracking error may occur at the beginning of starting robot (due to the condition of movement and payload). In such case, please start robot under 30% to 50% velocity override in approximately 5 minutes as test running, and gradually raise the speed up to 100%.

■ 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	Wall mount and Rear connection Any mount and Bottom 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	4 bolts of M10 X 35 (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.

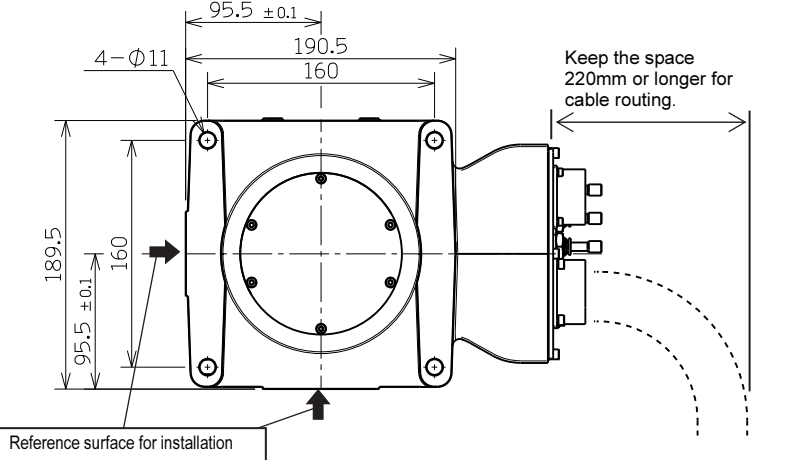
*3 : This tensile is per installation bolt when robot is installed with all bolts written in table above.

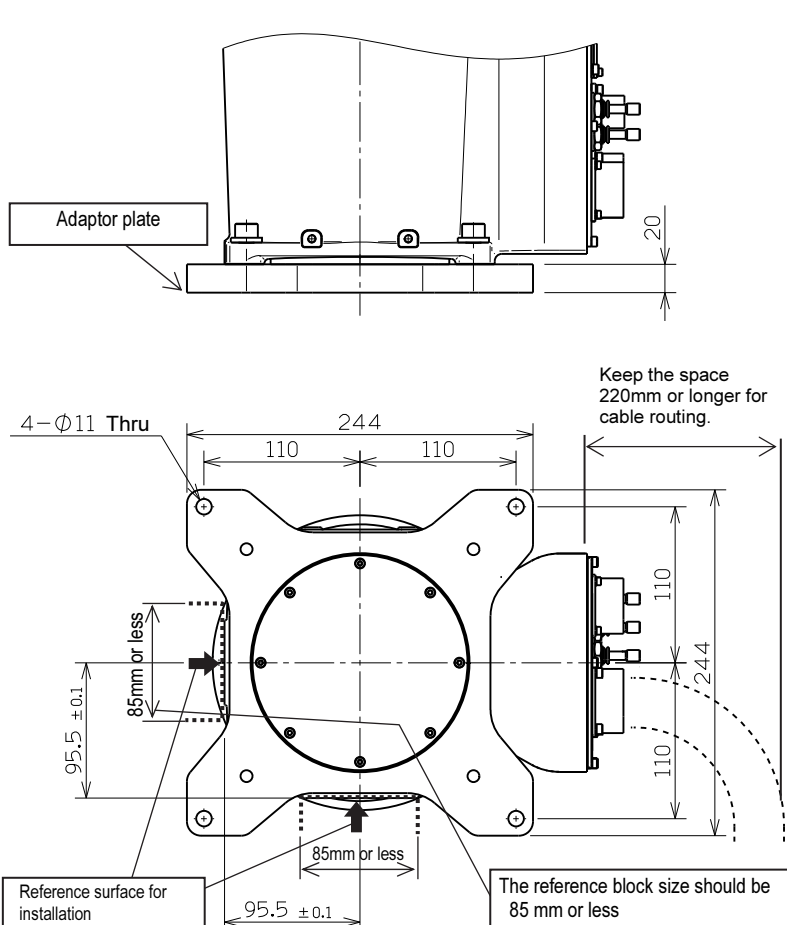
■ Installation space

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

 WARNING	<p>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.</p>
 WARNING	<p>On axis 1, 2 and 3, the robot working envelope can be regulated for safety. Optional part is necessary to enable this function.</p>

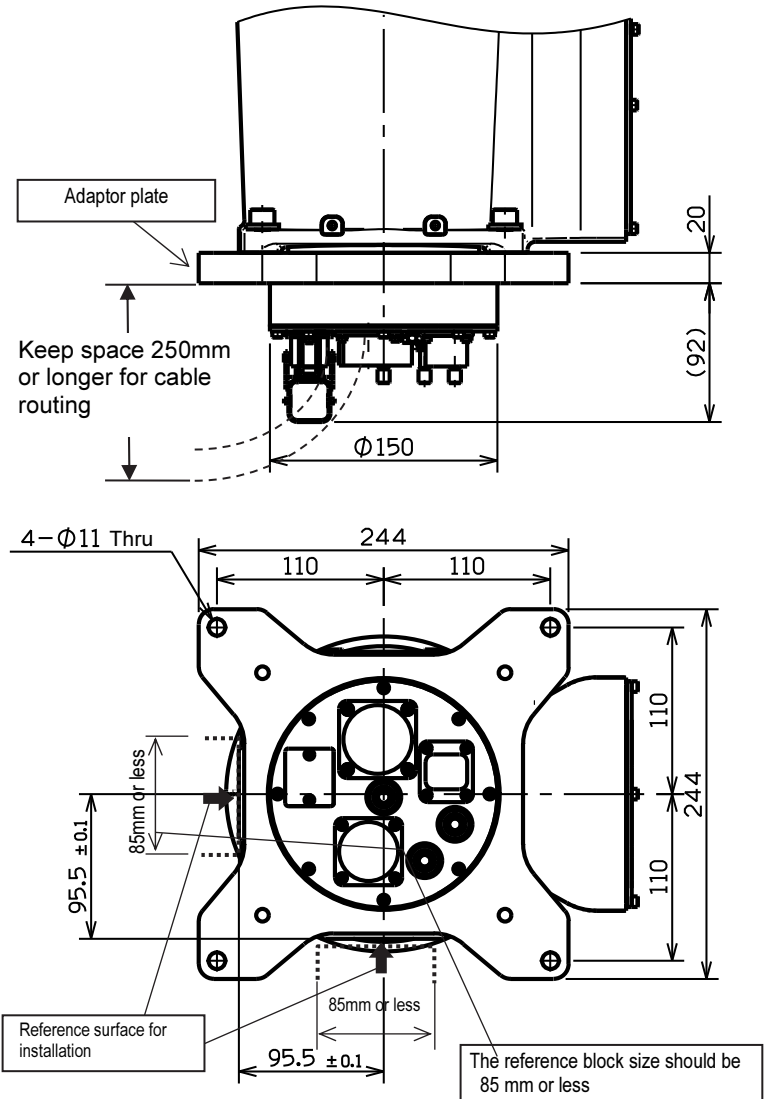
In case of the wall- installation or the cable bottom connection type, before designing the reference block, please refer to the CAD data of the robot and pay attention to make a clearance at least 2mm or more between the reference block and the adaptor plate of the robot. Concerning the CAD data, please contact our service department or sales department.

<p>Standard mount Cable rear connection</p> <p>MZ07(P)-01-*00 MZ07(P)-11-*00 MZ07L(P)-01-*00 MZ07L(P)-11-*00 MZ03EL-01-*00 MZ03EL-11-*00 MZ10-01-*00 MZ10-11-*00</p>	
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<p>Wall mount Cable rear connection (Body weight is 6kg heavier than standard setting)</p> <p>MZ07(P)-01-*W0 MZ07(P)-11-*W0 MZ07L(P)-01-*W0 MZ07L(P)-11-*W0</p>	
--	--

Any mount
Cable bottom connection
(Body weight is 8kg heavier than standard setting)

- MZ07(P)-01-**B
- MZ07(P)-11-**B
- MZ07L(P)-01-**B
- MZ07L(P)-11-**B
- MZ03EL-01-*0B
- MZ03EL-11-**B
- MZ10-01-*0B
- MZ10-11-*0B



■ Accuracy of installation surface

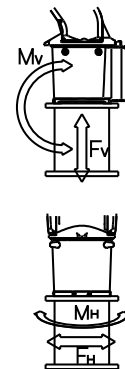
When installing robot, strictly observe precautions listed below to cause no deformation in the base.

- (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
MZ07-01 MZ07P-01 MZ07-11 MZ07P-11	1,600N	1,200N	1,000Nm	900Nm
MZ07L-01 MZ07LP-01 MZ07L-11 MZ07LP-11 MZ10-01 MZ10-11	2,000N	1,500N	1,250Nm	1,130Nm
MZ03EL-01 MZ03EL-11	1900N	1400N	1400N	1200N



6. Allowable wrist load

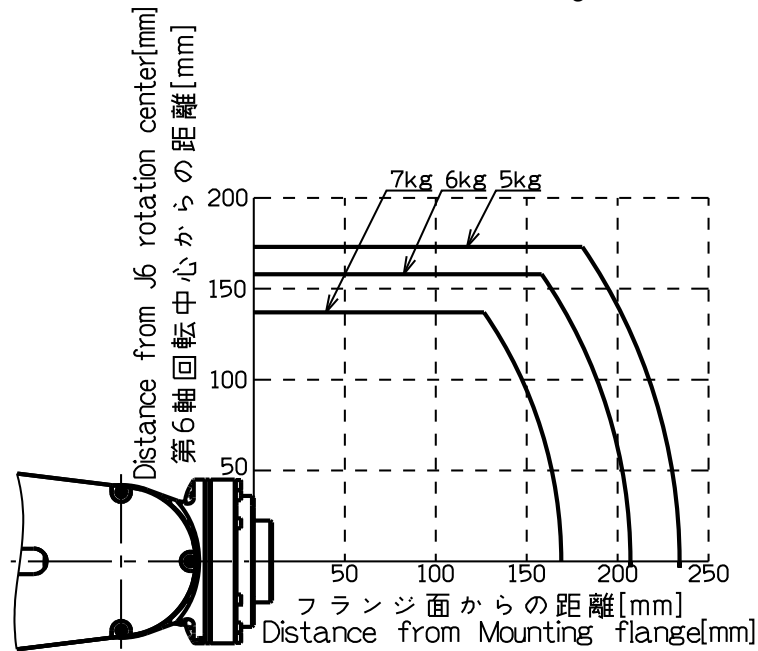


Load fixed on the tip of wrist is regulated by “allowable payload mass”, “allowable static load torque”, and “allowable moment of inertia”. Strictly keep the wrist load within each allowable value. If wrist load exceeds the allowable value, this robot is out of guarantee. Refer to the table of “2. Basic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

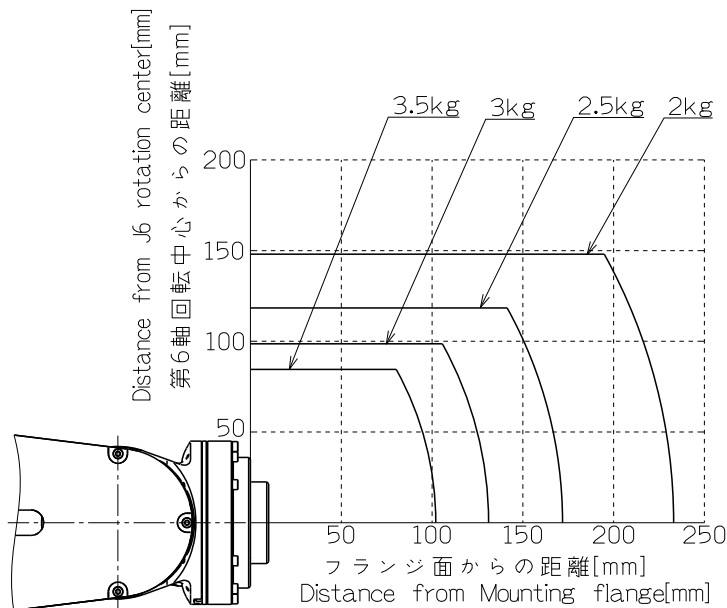
6.1 Torque map for wrist load

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

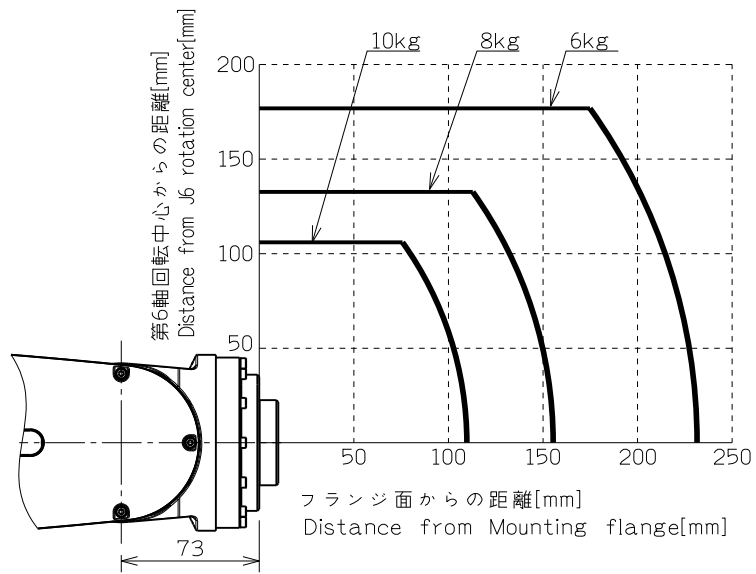
- 【MZ07-01】
- 【MZ07P-01】
- 【MZ07-11】
- 【MZ07P-11】
- 【MZ07L-01】
- 【MZ07LP-01】
- 【MZ07L-11】
- 【MZ07LP-11】



- 【MZ03EL-01】
- 【MZ03EL-11】



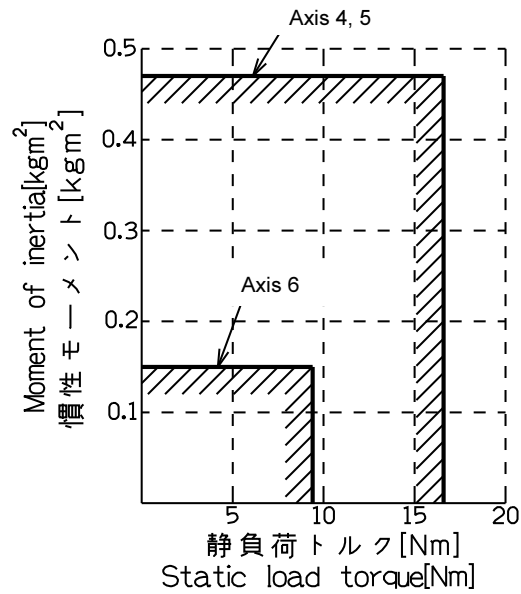
【MZ10-01】
【MZ10-11】



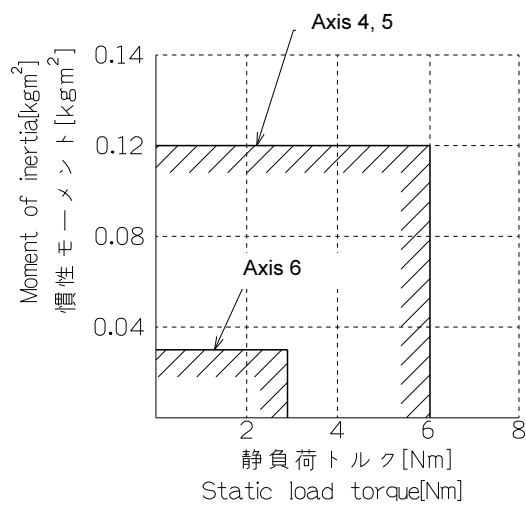
6.2 Moment of inertia map for wrist load

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

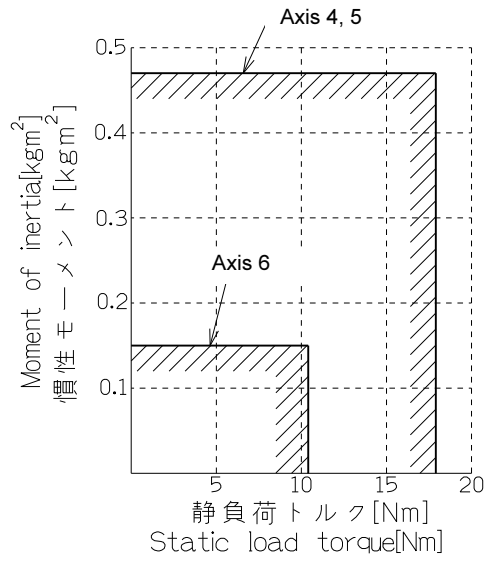
- 【MZ07-01】
- 【MZ07P-01】
- 【MZ07-11】
- 【MZ07P-11】
- 【MZ07L-01】
- 【MZ07LP-01】
- 【MZ07L-11】
- 【MZ07LP-11】



- 【MZ03EL-01】
- 【MZ03EL-11】



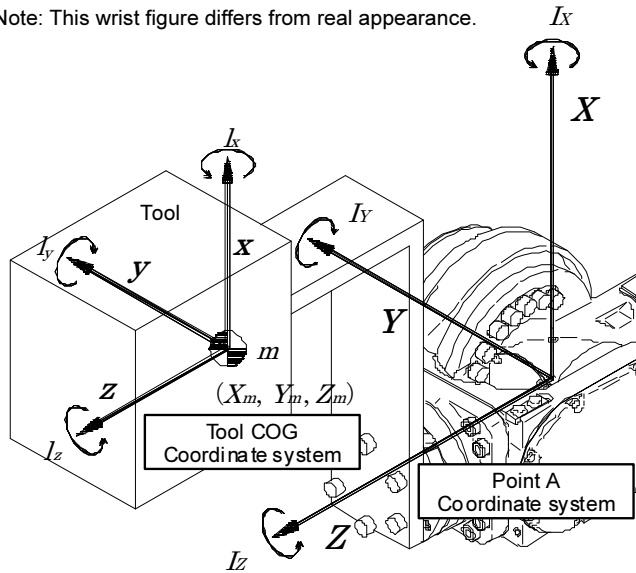
【MZ10-01】
【MZ10-11】



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

6.3 How to find the inertia moment of each axis

Note: This wrist figure differs from real appearance.



Point A coordinate system
 Origin is Point A (intersection point of axis 6, 4 rotation center and axis 5 rotation center) and its X, Y and Z direction are defined as
 X: Perpendicular coordinate with Y, Z
 Y: Axis 5 rotation center when wrist is in reference position
 Z: Axis 6 and 4 rotation center when wrist is in reference position

Tool COG coordinate system
 Origin is COG of tool, and parallel to point A coordinate system
 x: Parallel to X
 y: Parallel to Y
 z: Parallel to Z

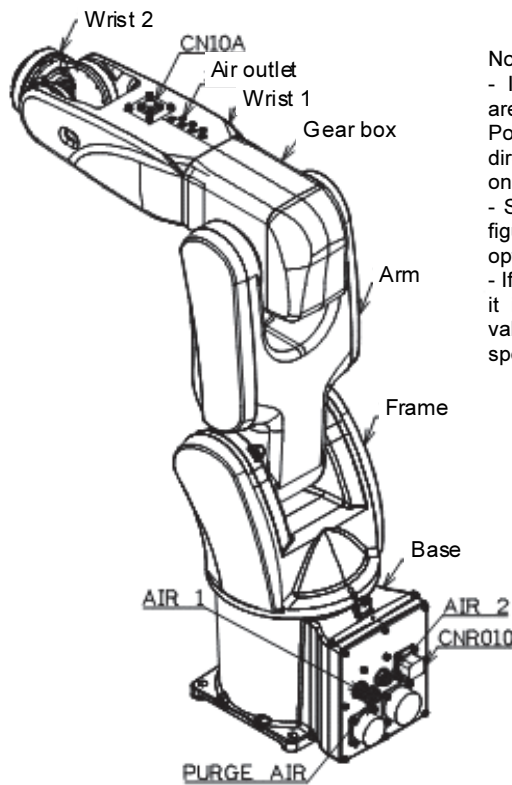
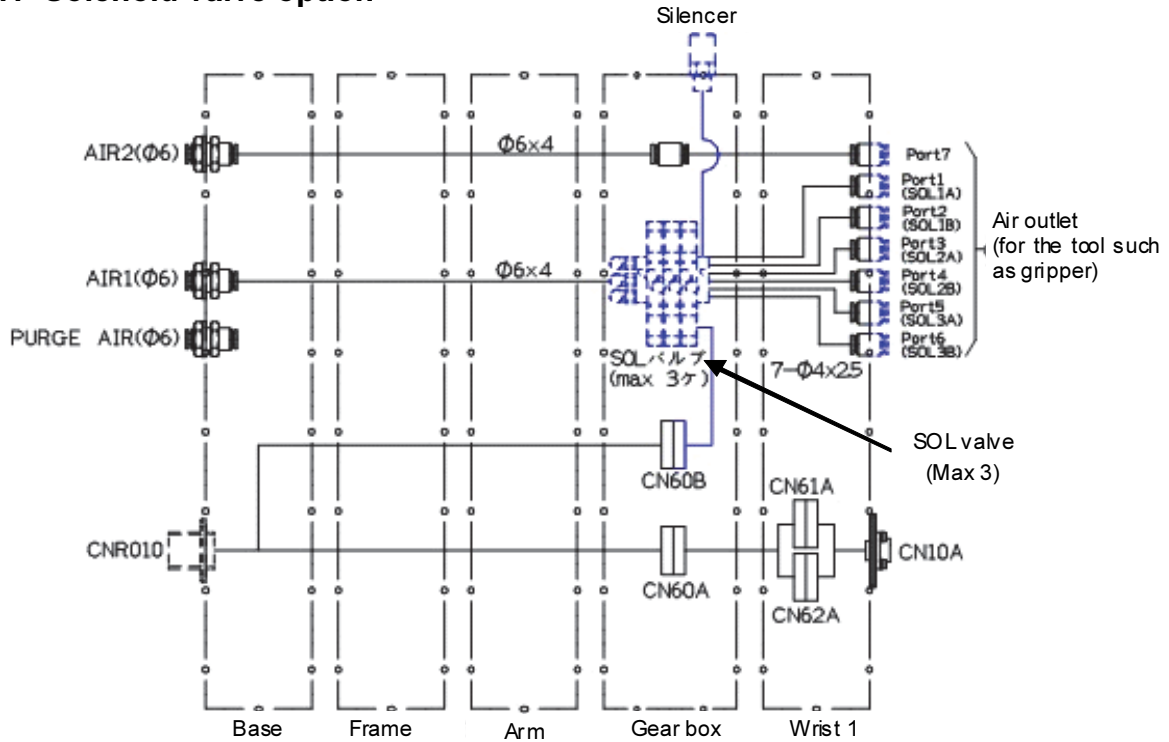
Inertia moment
 Ix: Around X on point A coordinate system
 Iy: Around Y on point A coordinate system
 Iz: Around Z on point A coordinate system
 Ix: Around x on tool COG coordinate system
 Iy: Around y on tool COG coordinate system
 Iz: Around z on tool COG coordinate system

m: Tool mass
 (Xm, Ym, Zm) : COG of tool on point A coordinate system

<p>1 Calculate inertia moment defined on tool COG coordinate system (xyz). If tool is regarded as prism, it is calculated as right formula.</p>	<p>Inertia moment example on tool COG coordinate system</p> <p>If tool is regarded as prism</p> $I_x = \frac{1}{12} m \cdot (A^2 + B^2)$ $I_y = \frac{1}{12} m \cdot (A^2 + C^2)$ $I_z = \frac{1}{12} m \cdot (B^2 + C^2)$ <p>These values (Ix, Iy, Iz) are registered to controller.</p> <p>Inertia moment on tool COG coordinate system</p> <p>This is different from "allowable moment of inertia" written in robot specification sheet.</p>
<p>2 Calculate inertia moment defined on point A coordinate system (XYZ), then calculate inertia moment around robot wrist joint (axis 4, 5 and 6). This result must not be larger than "Allowable moment of inertia" written in robot specification sheet.</p>	<p>Inertia moment on point A coordinate system (XYZ) is</p> $I_X = m \cdot (Y_m^2 + Z_m^2) + I_x$ $I_Y = m \cdot (X_m^2 + Z_m^2) + I_y$ $I_Z = m \cdot (X_m^2 + Y_m^2) + I_z$ <p>Axis 4 and 5 inertia moment is larger value of Ix and Iy, because this depends on axis 6 position. Axis 6 inertia moment is Iz itself.</p> $I_{J4} = I_{J5} = \max(I_X, I_Y)$ $I_{J6} = I_Z$

7. Application wiring and tube diagram

7.1 Solenoid valve option

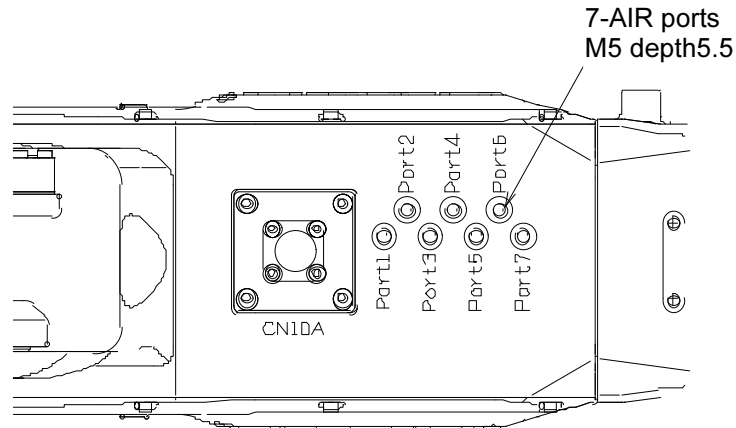


Note)

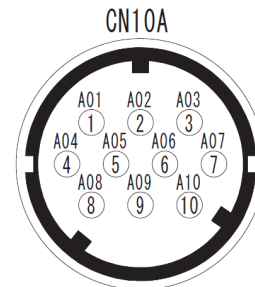
- In standard specification, solenoid valves are not installed. Only 2 air lines (AIR1 to Port1 and AIR2 to Port7) are connected directly inside gear box. Plugs are attached on air outlet.
- Solenoid valves and silencer written in this figure are mounted when "solenoid valve" option is selected.
- If Mini I/O board and IOCABLE-40 are used, it is possible to turn ON/OFF the solenoid valves easily. For details, refer to the specification of the CFD controller.

7.2 Detailed diagram of the application connectors

■ Application connector 10 wires(Standard)



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

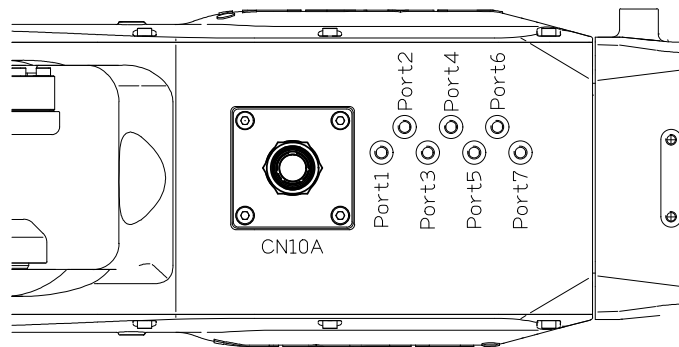


Connector CNR010 on base
 Tyco AMP 1939839-1, 1939840-1, 1903112-2
 Partner connector type
 Tyco AMP 1939847-1, 1939850-1, 1827570-2

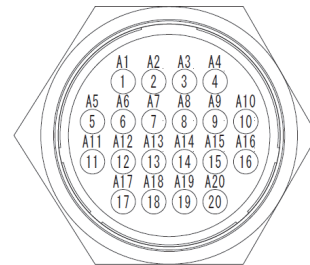
Connector CN10A on wrist 1
 JAE JN1AS10ML1-R
 Partner connector type
 JAE JN1DS10SL2

The pin arrangement is a view of the connector on the robot main body side as seen from the engagement surface.

■ Application connector 20 wires(OPTION) installed



	1	2	3	4	5	6	7	8
D	A16	A17	A18	A19	A20	A24	G	
C	A11	A12	A13	A14	A15	A23	A27	
B	A06	A07	A08	A09	A10	A22	A26	A29
A	A01	A02	A03	A04	A05	A21	A25	A28



Connector CNR010 on base
 Tyco AMP 1981914-1, 1981913-1, 1903112-2
 Partner connector type
 Tyco AMP 1981919-1, 1981921-1, 1827570-2

Connector CN10A on wrist 1
 Hirose HR22-12WTRA-20SC(73)
 Partner connector type
 Hirose HR22-12WTLP-20PC

The pin arrangement is a view of the connector on the robot main body side as seen from the engagement surface.

(NOTE)

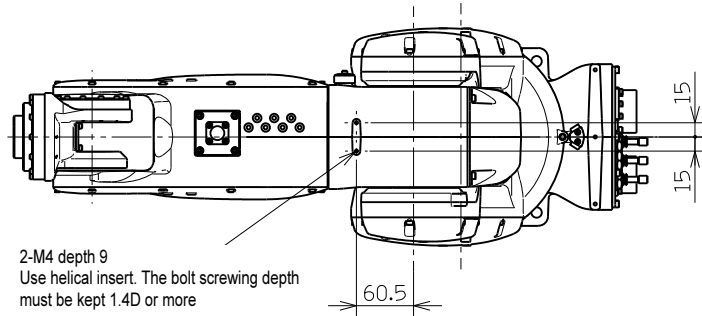
The cables for the CNR010 and the CN10A are available as option parts.
 For details, see the following documents.

- “Standard specifications: CFD controller” (SCFEN-010)
- “CFD CONTROLLER INSTRUCTION MANUAL: OPTION (I/O CONNECTION)” (TCFEN-183)
- “INSTRUCTION MANUAL: OPTION (MZ series)” (TCFEN-184)

7.3 Locations of service taps for application wiring/piping installation

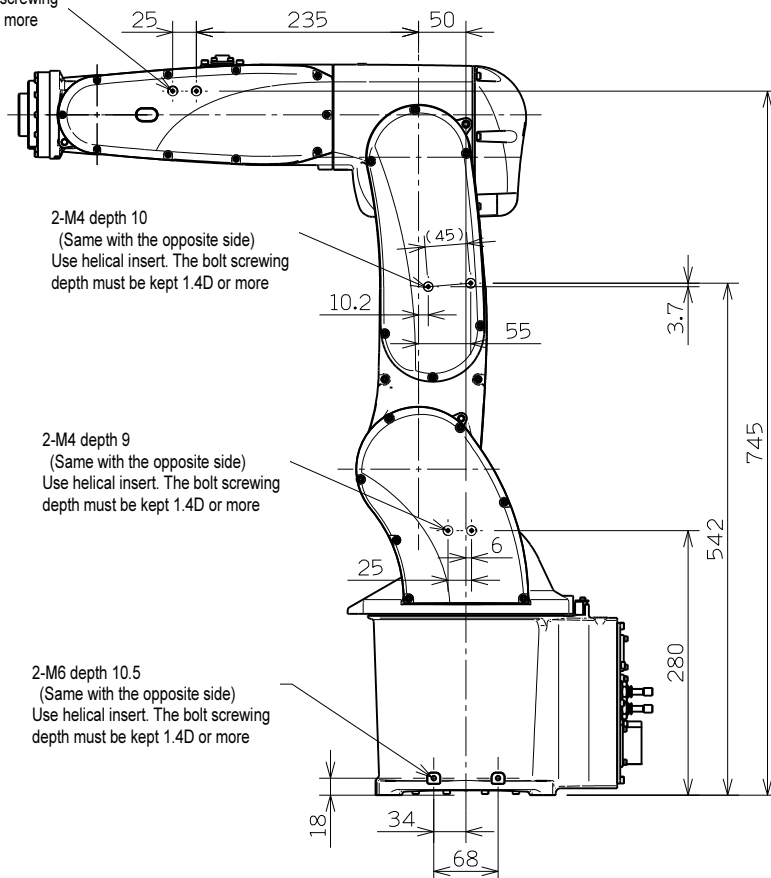
【MZ07-01】 【MZ07P-01】 【MZ10-01】

【MZ07-11】 【MZ07P-11】 【MZ10-11】



2-M4 depth 9
Use helical insert. The bolt screwing depth must be kept 1.4D or more

2-M4 depth 9
(Same with the opposite side)
Use helical insert. The bolt screwing depth must be kept 1.4D or more

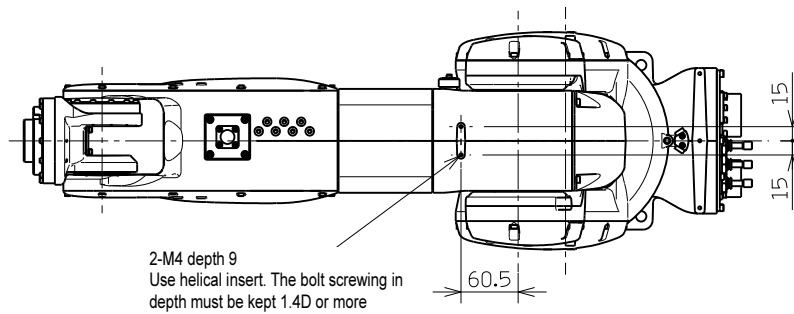


2-M4 depth 10
(Same with the opposite side)
Use helical insert. The bolt screwing depth must be kept 1.4D or more

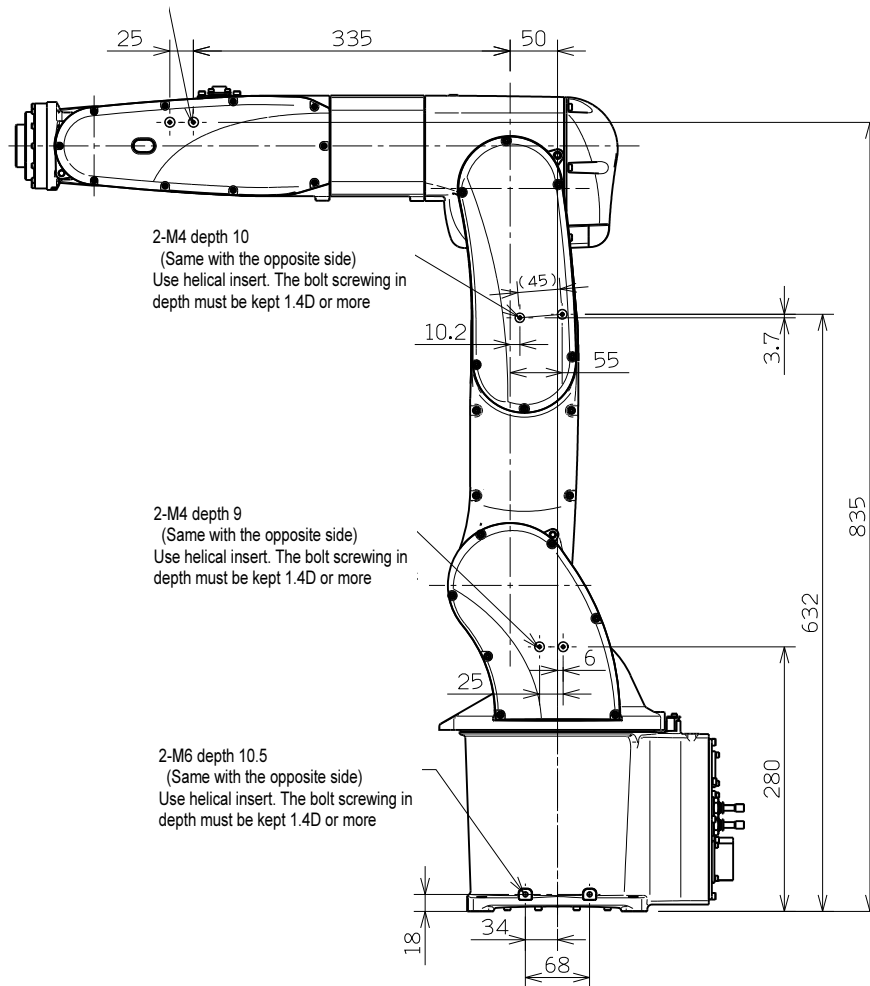
2-M4 depth 9
(Same with the opposite side)
Use helical insert. The bolt screwing depth must be kept 1.4D or more

2-M6 depth 10.5
(Same with the opposite side)
Use helical insert. The bolt screwing depth must be kept 1.4D or more

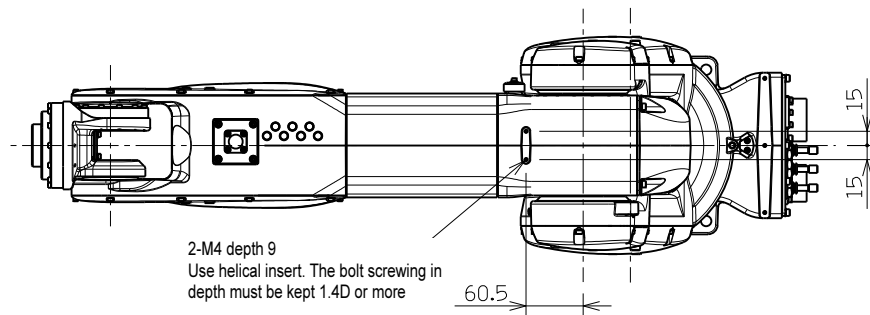
【MZ07L-01】 【MZ07LP-01】
【MZ07L-11】 【MZ07LP-11】



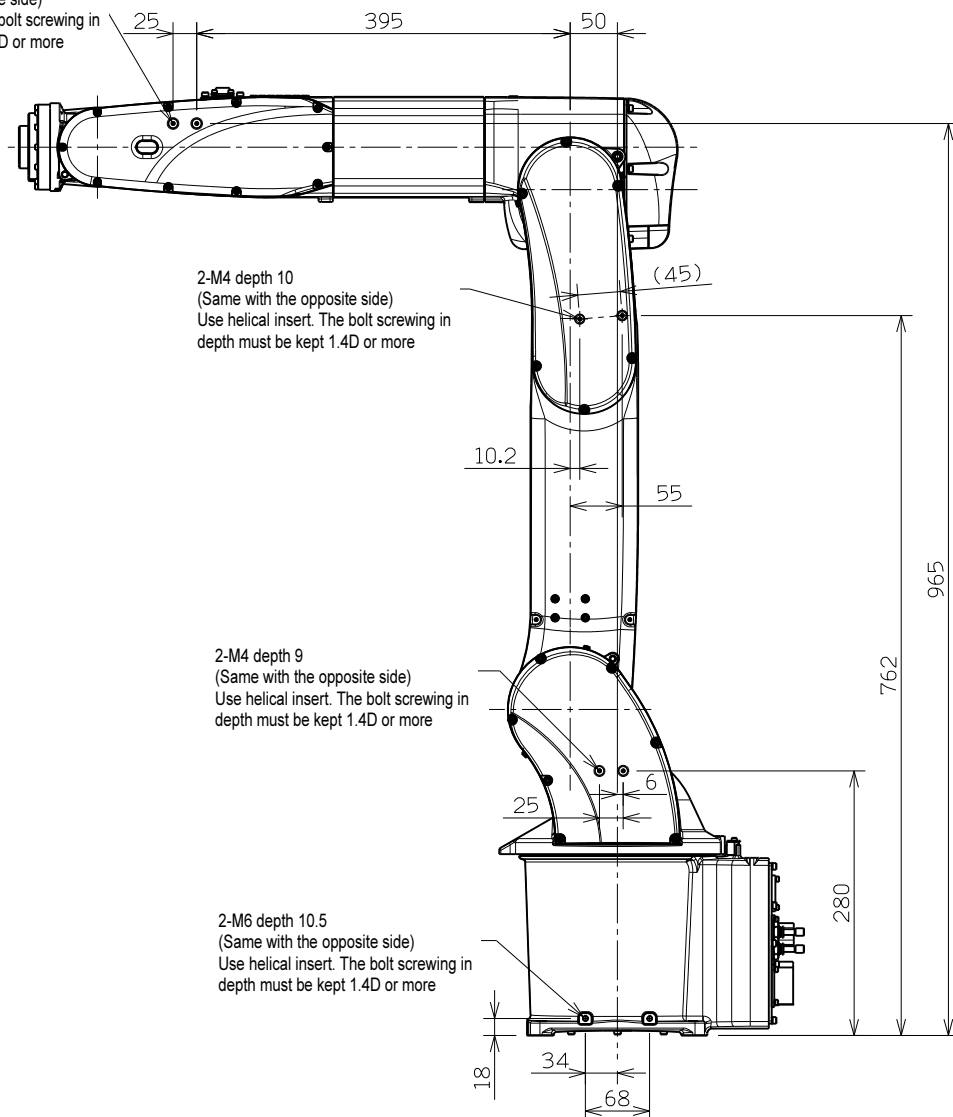
2-M4 depth 9
 (Same with the opposite side)
 Use helical insert. The bolt screwing in depth must be kept 1.4D or more



【MZ03EL-01】 【MZ03EL-11】

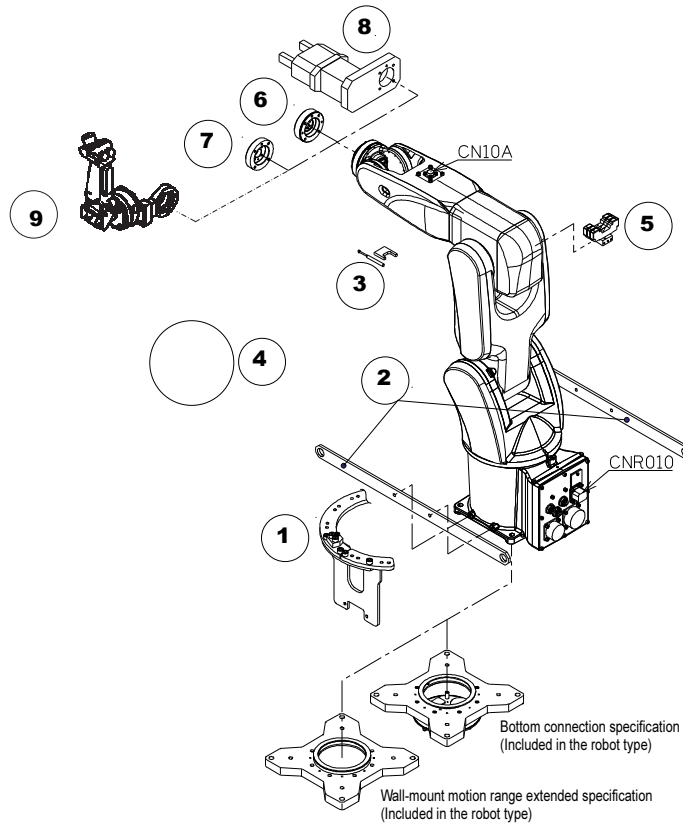


2-M4 depth 9
(Same with the opposite side)
Use helical insert. The bolt screwing in depth must be kept 1.4D or more



8. Option specification

8.1 MZ07 / MZ03EL / MZ10 mechanism option



No.	Item	Specification	Parts No.	Remarks
1	Adjustable stopper	Restriction of axis 1 to 3 working envelope	OP-S5-022	
2	Transfer jig	Common for crane transporting, inverted and wall mount	OP-S2-042	
3	Tools	Zeroing pin & Zeroing block	OP-T2-078	
4	IP67 set	Air purge unit in robot body	OP-H9-004	
5	Solenoid valve	1 valve	OP-H4-004	Pressure range : 0.1 to 0.5MPa Coil voltage : DC24V
		2 valves	OP-H5-008	
		3 valves	OP-H6-004	
6	Wires clamp	Clamp for wires and air tubes inside axis 6 hole	OP-W3-012	Air (φ4: 7 lines), signals
7	ISO flange	P.C.D.31.5	OP-W2-012	
8	Standard gripper The following grippers cannot be used for MZ03EL OP-F-10-003 OP-F-10-004 OP-F-10-006 OP-F-10-008	Parallel gripper single S	OP-F10-002	Grip force 320N (air source 0.5MPa), 24mm stroke
		Parallel gripper double S	OP-F10-003	
		Parallel gripper single M	OP-F10-004	Grip force 600N (air source 0.5MPa), 30mm stroke
		Three fingers single S	OP-F10-005	
		Three fingers double S	OP-F10-006	Grip force 300N (air source 0.5MPa), 8mm stroke
		Three fingers single M	OP-F10-007	
		Three fingers double M	OP-F10-008	Grip force 410N (air source 0.5MPa), 10mm stroke
9	Direct teach	For the controller without RMU	CFD-OP170A-MZ07-04	
		For the controller with RMU	CFD-OP170B-MZ07-04	

- 5: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
(The number of the valves depend on the specification. See "1. Outline" also.)
- 6:This option includes flange1, flange2, clamp, and bolts (4-M5x20), and positioning pin MDP-5x25. For details, refer to the instruction manual "INSTRUCTION MANUAL: OPTION (MZ series)"(TCFEN-184).
- 7:This option includes ISO flange and installation bolts (4-M5x15). For details, refer to the instruction manual "INSTRUCTION MANUAL: OPTION (MZ series)"(TCFEN-184).
- 8:Standard Gripper; Grip force may vary according to the supplied air pressure (0.3 to 0.5 MPa) and finger length. The following grippers cannot be used for the MZ03EL-01. (OP-F10-003, OP-F10-004, OP-F10-006, OP-F10-008)
- 9:Direct teach; is for MZ07/07L and MZ10. MZ03EL is not available.

8.2 Wire-harness

The “wire-harness” is a set of cables to connect the robot controller and the robot. This option must be selected when purchasing the robot.

No.	Name	Product number	Remarks
1	Wire-harness	Z101C-J1-##-A (## is the cable length: 02,05,10,15,20[m])	

For details, refer to the following specification.
 “Standard specifications: CFD controller” (SCFEN-010)

9. Delivery style (specification which contains a robot)

1. There are three styles as shown below.

	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)
2	Delivery after installation and test-run	Robot is installed and test-run is done. (Teaching with work piece is not included.)
3	Delivery after installation and teaching with work piece	After style 2, teaching with work piece is done.

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

2. Operation and maintenance education

The special spot operation guide and the special spot preservation guide are the outside of the estimation. Consult with each NACHI-FUJIKOSHI office for the details as for the schooling system.

10. Consuming power (Robot + Controller)

0.4 kVA at maximum (may vary according to the application and motion pattern.)

11. Paint color (Robot and controller)




Standard color	Robot cover and wrist 1	Munsell 6.5PB9/1
	Arm	Munsell N5.5
	Base	Munsell N2.5
	Controller	Munsell N1.5

12. Warranty

Elapse of 1 year after delivery. (8 hours/day running)

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

13. Precautions for handling

 CAUTION	<p>Although tool setting was correctly done, sometimes arm vibration may occur at the beginning of starting robot according to the robot movement or shape of tool. Reason is that arm driving vibration frequency and arm natural vibration frequency is very closed.</p> <p>In such case, following countermeasures can reduce vibration by making the resonance point different.</p> <ul style="list-style-type: none">• Change the step speed of robot program• Change the tool weight or moment of inertia• Change the robot pose
 CAUTION	<p>If ambient temperature is low, vibration, overload error and tracking error may occur at the beginning of starting robot.</p> <p>In such case, please start robot under 30% to 50% velocity override in approximately 5 minutes as test running, and gradually raise the speed up to 100%.</p>
 CAUTION	<p>When transporting robot without fixing, robot may be damaged due to the vibration or crush during transportation.</p> <p>When transporting robot, certainly fix arms with the bracket which is used when shipped.</p>

NOTE

NACHI NACHI-FUJIKOSHI CORP.		http://www.nachi-fujikoshi.co.jp/	
Japan Main Office	Phone: +81-3-5568-5245	Fax: +81-3-5568-5236	Shiodome Sumitomo Bldg. 17F, 1-9-2 Higashi-Shinbashi Minato-ku, TOKYO, 105-0021 JAPAN
Nachi Robotic Systems Inc. (NRS)		http://www.nachirobotics.com/	
North America Headquarters	Phone: 248-305-6545	Fax: 248-305-6542	42775 W. 9 Mile Rd. Novi, Michigan 48375, U.S.A
Indiana Service Center	Phone: 248-305-6545	Fax: 248-305-6542	Greenwood, Indiana
Ohio Service Center	Phone: 248-305-6545	Fax: 248-305-6542	Cincinnati, Ohio
South Carolina Service Center	Phone: 248-305-6545	Fax: 248-305-6542	Greenville, South Carolina
Canada Branch Office	Phone: 905-760-9542	Fax: 905-760-9477	89 Courtland Ave., Unit No.2, Concord, Ontario, L4K 3T4, CANADA
Mexico Branch Office	Phone :+52-555312-6556	Fax:+52-55-5312-7248	Urbina No.54, Parque Industrial Naucalpan, Naucalpan de Juarez, Estado de Mexico C.P. 53489, MEXICO
NACHI EUROPE GmbH		http://www.nachi.de/	
Central Office Germany	Phone: +49-2151-65046-0	Fax: +49-2151-65046-90	Bischofstrasse 99, 47809, Krefeld, GERMANY
U.K. branch	Phone: +44-0121-423-5000	Fax: +44-0121-421-7520	Unit 3, 92, Kettles Wood Drive, Woodgate Business Park, Birmingham B32 3DB, U.K.
Czech branch	Phone: + 420-255-734-000	Fax: +420-255-734-001	Obchodni 132, 251 01 Cestice, PRAGUE-EAST CZECH REPUBLIC
Turkey branch	Phone: + 90-(0)216-688-4457	Fax: +90-(0)216-688-4458	Ataturk Mah. Mustafa Kemal Cad. No:10/1A 34758 Atasehir / Istanbul - TURKEY
NACHI AUSTRALIA PTY. LTD.		http://www.nachi.com.au/	
Robotic Division & Victoria office	Phone: +61-(0)3-9796-4144	Fax: +61-(0)3-9796-3899	38, Melverton Drive, Hallam, Victoria 3803, , AUSTRALIA
Sydney office	Phone: +61-(0)2-9898-1511	Fax: +61-(0)2-9898-1678	Unit 1, 23-29 South Street, Rydalmere, N.S.W, 2116, AUSTRALIA
Brisbane office	Phone: +61-(0)7-3272-4714	Fax: +61-(0)7-3272-5324	7/96 Gardens Dr,Willawong,QLD 4110, , AUSTRALIA
NACHI SHANGHAI CO., LTD.		http://www.nachi.com.cn/	
Shanghai office	Phone: +86-(0)21-6915-2200	Fax: +86-(0)21-6915-2200	11F Royal Wealth Centre, No.7 Lane 98 Danba Road Putuo District, Shanghai 200062, China
NACHI KOREA		http://www.nachi-korea.co.kr/	
Seoul office	Phone: +82-(0)2-469-2254	Fax: +82-(0)2-469-2264	2F Dongsan Bldg. 276-4, Sungsu 2GA-3DONG, Sungdong-ku, Seoul 133-123, KOREA

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Robot Division

1-1-1, FUJIKOSHIHONMACHI, TOYAMA CITY, JAPAN 930-8511

Phone +81-76-423-5137

Fax +81-76-493-5252

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