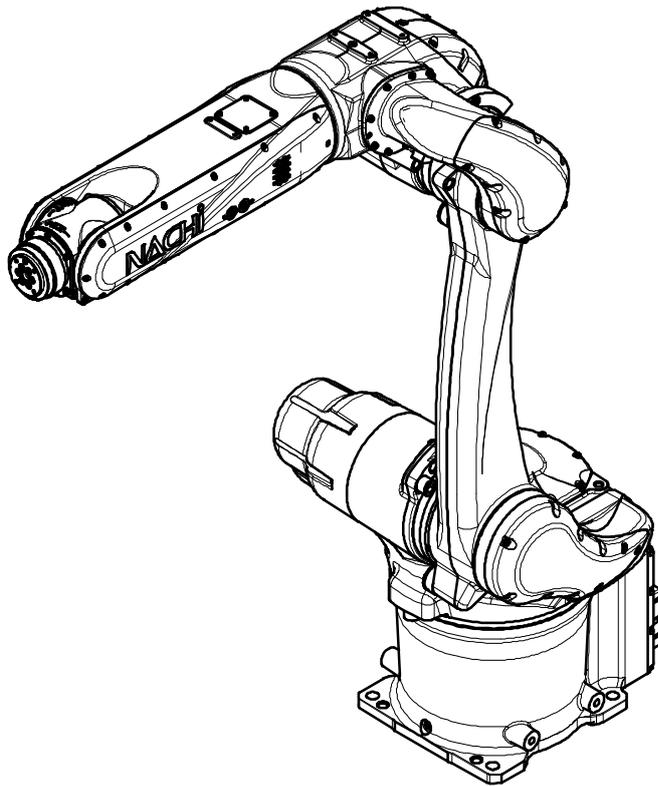


**NACHI**

Standard specifications  
**MZ12-01 [CFD-3020/FD11]**

5th edition



**NACHI-FUJIKOSHI CORP.**

1805, SMZEN-103-005, 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 and the material handling techniques.

“MZ12” is an articulated 6 axes structure robot that is optimal for material handling and other application due to its fast motion and high accuracy.

Installation method	Maximum payload	12kg
Floor, Ceiling, Slanted		MZ12-01

## Features

1. The wrist and the main body become “Dust-proof / Drip-proof performance (IP67 corresponding)”, and “Rust-proof”, and the application that can be applied has extended.
2. The light-weight and high-rigidity body enables the top-level fast motion and the high accuracy motion.
3. The wide motion range lightens the limitation of the actual motion range. And examining applicability becomes easier than before.
4. The compact and light-weight body than our existing robot models
5. A lot of standard application signal wires in the arm enable various applications e.g. material handling etc. And it simplifies the work of the connection and the routing of the cables.

Both CFD-3020 controller and FD11 controller can drive this robot. But following occasions require FD11 controller.

- In case that 7th axis motor is larger than 600W. (CFD-3020 controller can drive up to 600W motor.)
- In case that robot has 8 or more axes.

Concerning the electrical option and CFD-3020 controller, please refer to the following document.

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

Concerning the FD11 controller, please refer to the following document.

*“Standard specifications: FD controller” (SCFEN-006)*

## 2. Basic specifications

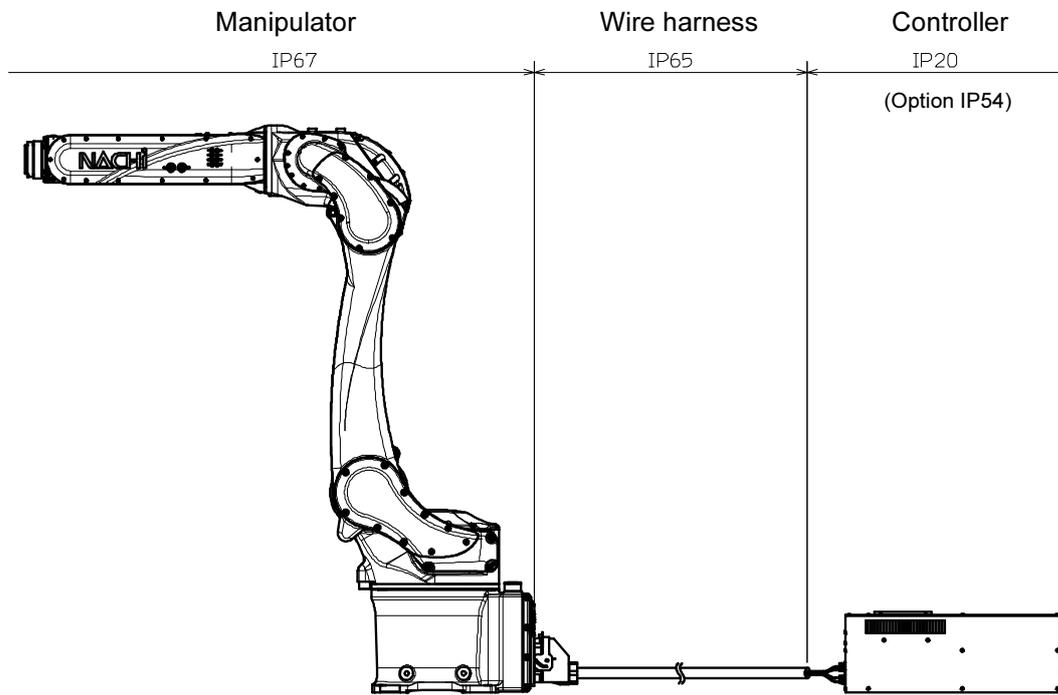
Item		Specifications
Robot model		MZ12-01
Construction		Articulated
Number of axis		6
Drive system		AC servo motor
Maximum rotational range of each axis	Axis 1	$\pm 2.97\text{rad}$ ( $\pm 170^\circ$ )
	Axis 2	$+1.57 \sim -2.79\text{rad}$ ( $+90 \sim -160^\circ$ )
	Axis 3	$+3.67 \sim -2.57\text{rad}$ ( $+210 \sim -147^\circ$ )
	Axis 4	$\pm 3.32\text{rad}$ ( $\pm 190^\circ$ )
	Axis 5	$\pm 2.44\text{rad}$ ( $\pm 140^\circ$ )
	Axis 6	$\pm 6.28\text{rad}$ ( $\pm 360^\circ$ )
Max. speed	Axis 1	4.54rad/s (260°/s)
	Axis 2	4.01rad/s (230°/s)
	Axis 3	4.54rad/s (260°/s)
	Axis 4	8.20rad/s (470°/s)
	Axis 5	8.20rad/s (470°/s)
	Axis 6	12.22rad/s (700°/s)
Max. pay load	Wrist	12kg
Allowable static load torque	Axis 4	25Nm
	Axis 5	25Nm
	Axis 6	9.8Nm
Allowable moment of inertia *1	Axis 4	0.7kgm <sup>2</sup>
	Axis 5	0.7kgm <sup>2</sup>
	Axis 6	0.2kgm <sup>2</sup>
Position repeatability *2		$\pm 0.04\text{mm}$
Max. reach		1454mm
Air tubes		$\phi 6 \times 2$ , $\phi 8 \times 1$
Application signal wires		24 wires (including wires for the optional solenoid valves)
Installation		Floor / Tilted / Inverted installation
Ambient conditions		Temperature: 0 to 45 °C *3 Humidity: 20 to 85%RH (No dew condensation allowed) Vibration to the installation face: Not more than 0.5G (4.9 m/s <sup>2</sup> )
Dust-proof / Drip-proof performance *4		Robot body : IP67 equivalent (dust and drain proof-type)
Noise level *6		70 dB
Robot mass		150kg

1[rad] =  $180/\pi$ [°], 1[N·m] = 1/9.8[kgf·m]

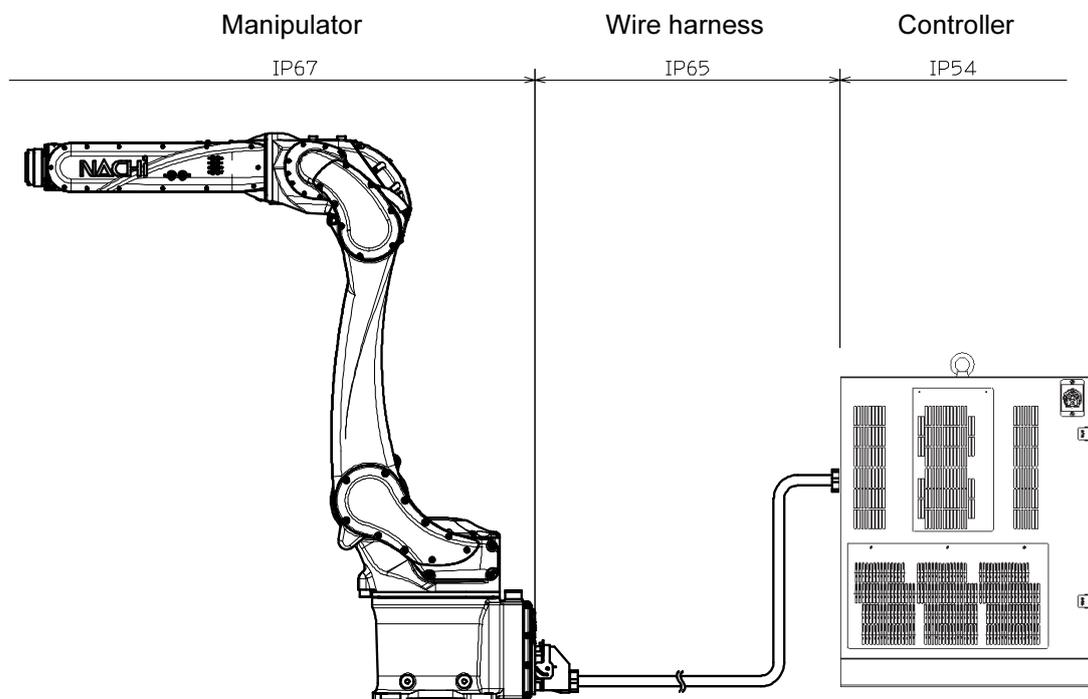
- On teach pendant display, axis 1 to 6 is displayed as J1 to J6 for each.
- The specification and externals described in this specification might change without a previous notice for the improvement.
- Explosion-proof is not available.

\*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: Permitted height is not higher than 1,000m above sea level. If used in higher place, permitted temperature is affected by height.  
\*4: Liquid such as organic compound, acidity, alkalinity, chlorine or gasoline cutting fluid which deteriorates the seal material is not available to use. The wire-harness portion is IP65 equivalent, and the robot controller is IP20 equivalent (CFD-3020), IP54 equivalent (FD11). See the "Supplement: Dust-proof / Drip-proof performance" on page 3.  
\*5: The "Max. speed" in this table is the available maximum value and will change depending on the work-program and the wrist load condition.  
\*6: Robot noise is A-weighted equivalent sound level measured under "JIS Z 8737-1" (ISO 11201) with maximum payload and maximum speed.

[Supplement : Dust-proof / Drip-proof performance]



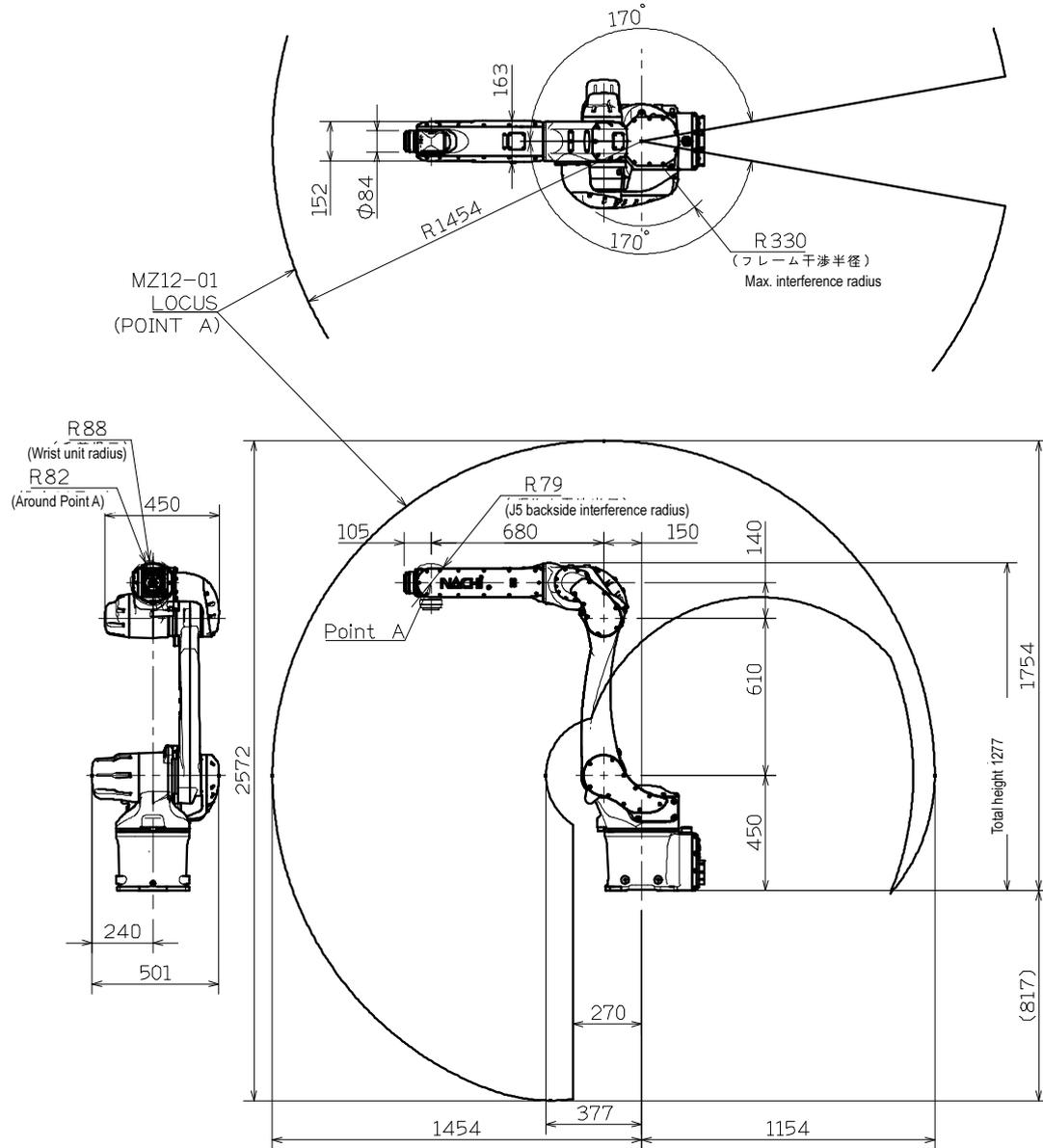
CFD-3020 controller



FD11 controller

### 3. Dimensions

【MZ12-01】

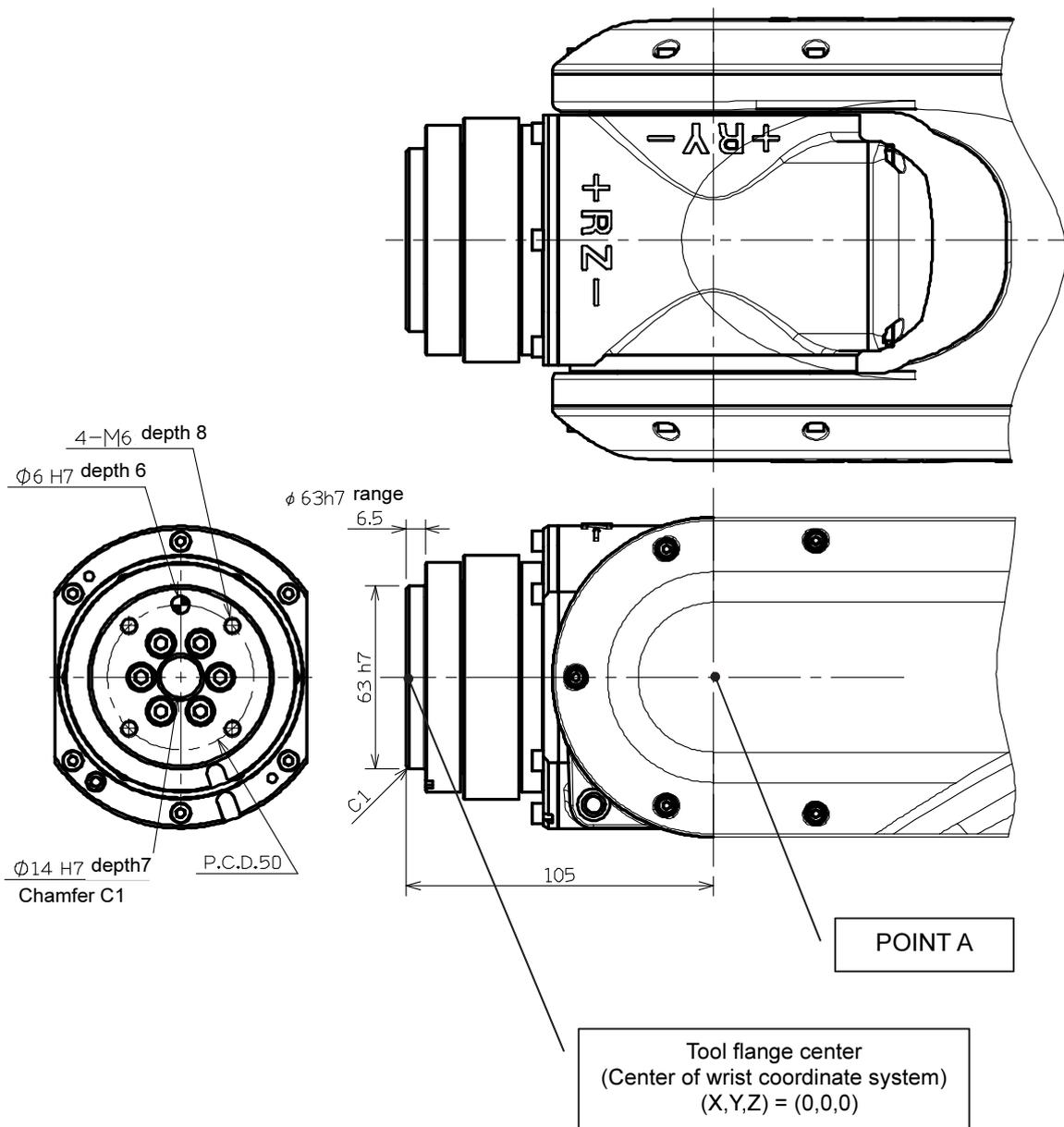


### 4. Details of load mounting face

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

 <b>CAUTION</b>	Be sure to screw the M6 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.
---	---

【MZ12-01】



## 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	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.

Robot model	MZ12-01
Thickness of floor concrete	Not less than 150 mm
Installation parts *1	4 bolts of M16 X 40 (JIS: Strength class 12.9) 4 plain washers of not less than 4.5 mm in thickness, outer diameter φ32, and HRC35 in hardness
Tightening torque *2	287±30 N·m
Allowable repeated tensile *3	Approximately 5,200 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.

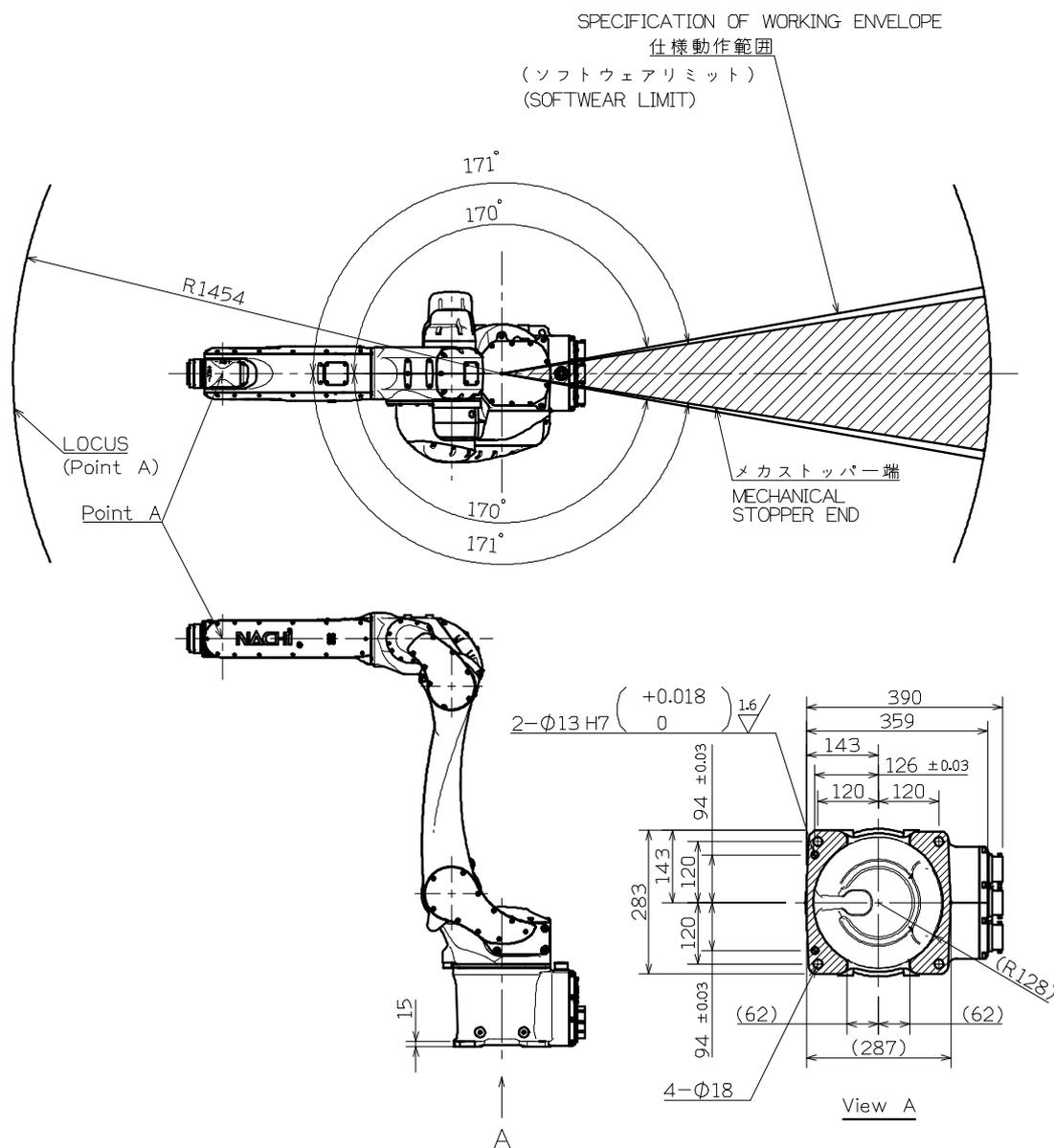
\*3 : This tensile is per installation bolt when robot is installed with all bolts written in table above.

■ 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.

【MZ12-01】



■ 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 0.5 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 0.5 mm ( $\pm 0.25$  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 $M_H$	
MZ12-01	5,400 N	3,800 N	4,900 N·m	4,200 N·m	

## 6. Allowable wrist load

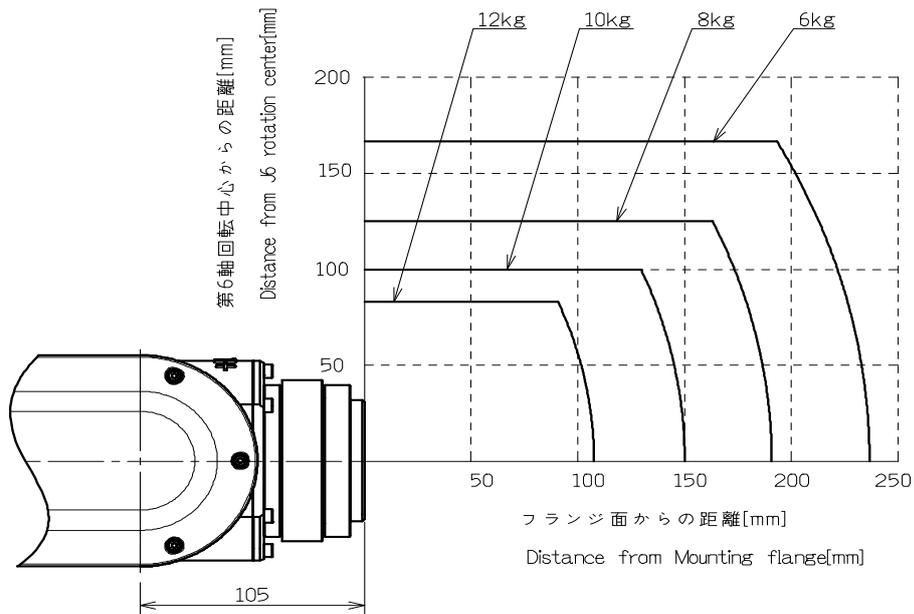


Load fixed on the tip of wrist is regulated by “allowable payload mass”, “allowable static load torque”, and “allowable moment of inertia”. Strictly keep the wrist load within each allowable value. If wrist load exceeds the allowable value, this robot is out of guarantee. Refer to the table of “2. Basic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

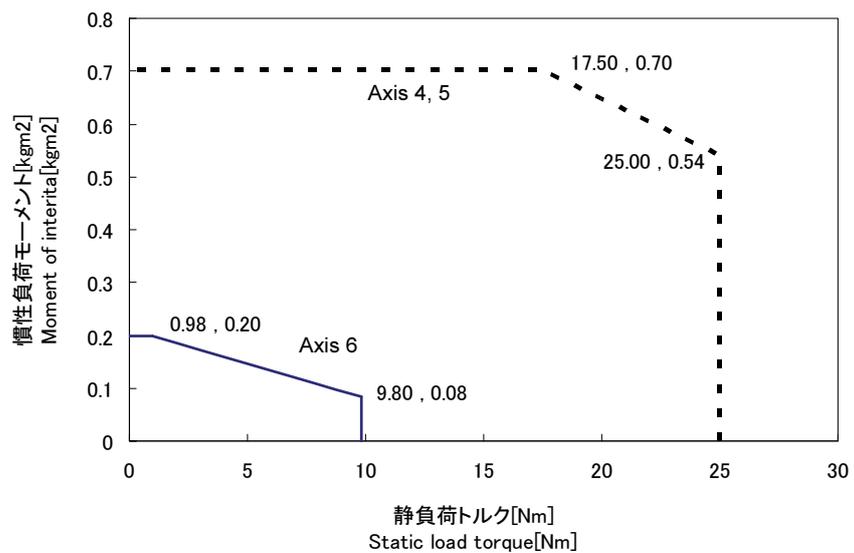
[MZ12-01]



### 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 figure below.

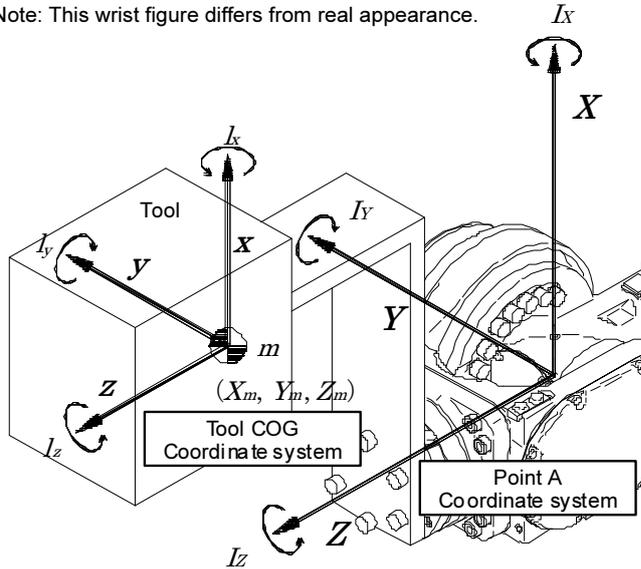
[MZ12-01]



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

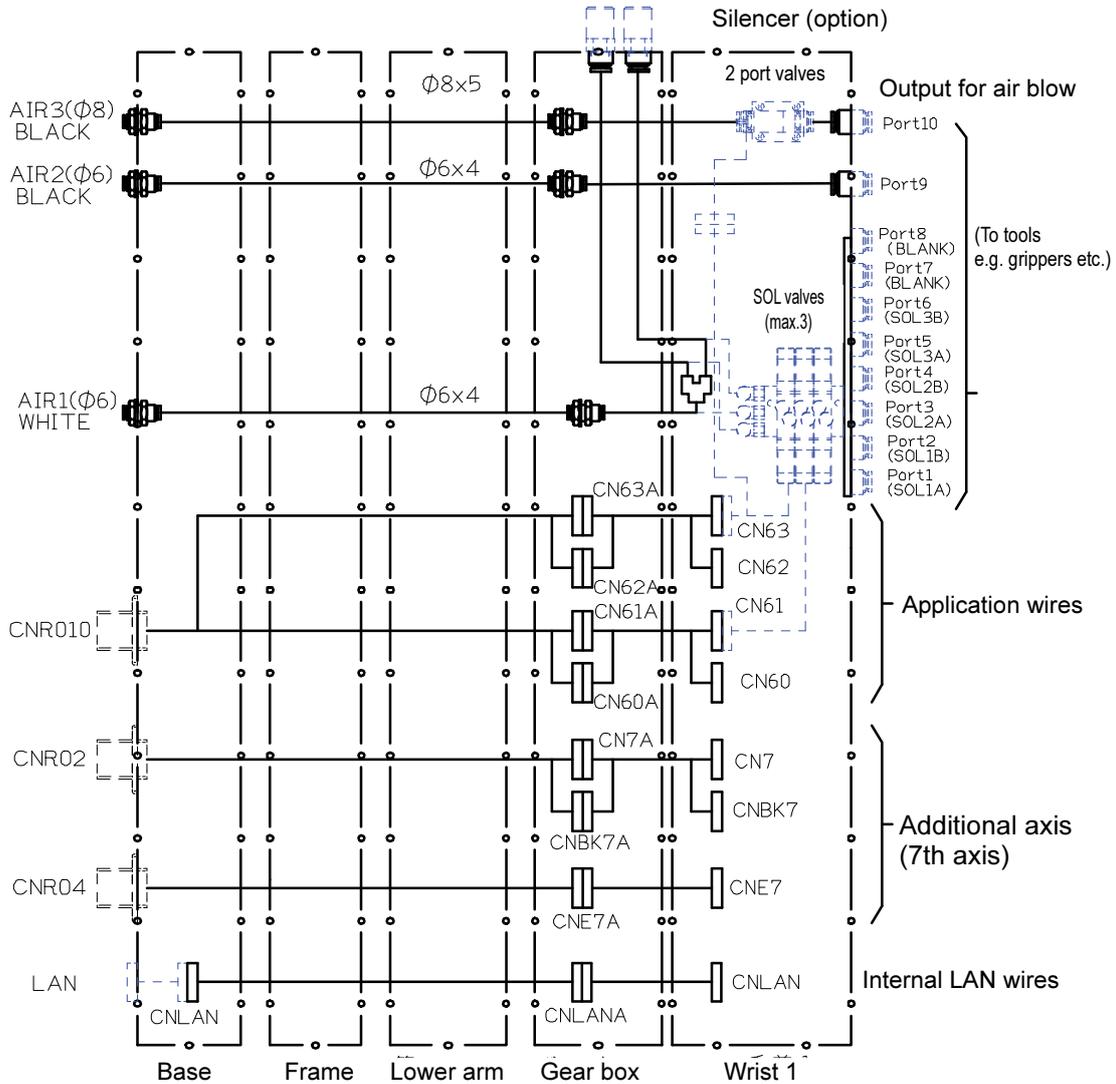
m: Tool mass  
 (Xm, Ym, Zm) : COG of tool on point A coordinate system

<p><b>1</b> 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><b>2</b> 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

[MZ12-01]



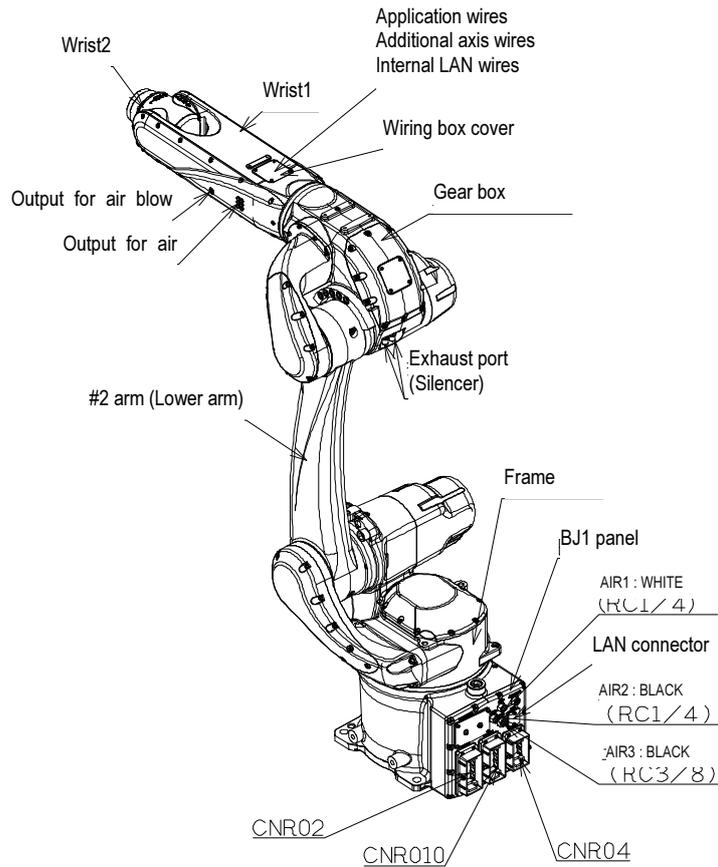
Note)

- In standard specification;  
AIR1 is connected to the exhaust outlet. AIR2 is connected to the Port9. AIR3 is connected to the Port10. At the exit of the air, plugs are installed.
- Solenoid valves, 2 port valves, and silencer and the joints in this figure are mounted when "solenoid valve" option is selected.
- Depending on the number of the solenoid valves, the available number of the signal wires will change. See the following table.

SOL valve		On arm I/O cable (*2)	
Number of valves	Product number	Number of wires	Product number
1	OP-H4-019 / OP-H4-020	12	IOCABLE-80-01M
		18 (*1)	IOCABLE-80-01M+IOCABLE-80B-01M
2	OP-H5-017 / OP-H5-018	12	IOCABLE-80-01M
		18 (*1)	IOCABLE-80-01M+IOCABLE-80B-01M
3	OP-H6-019 / OP-H6-020	12	IOCABLE-80-01M

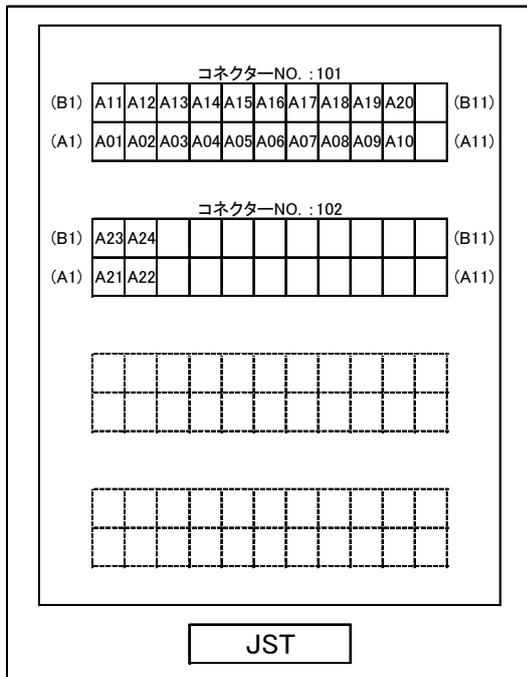
(\*1) When selecting the internal valve for air blow, IOCABLE-80B-01M cannot be selected.

(\*2) When selecting the "Coolant resistance spec. on arm cable set" A-D, the "On arm I/O cable (12 wires)" is included. So it is not necessary to select the I/O cables shown in this table. In this case, 18 wires are not available. (Max. 12 wires)



## 7.2 Detailed diagram of the application connectors

### 7.2.1 BJ1 side connector CNR010



#### User-side Connectors

- Wire-side shell : JFM-WSA-4-A (JST)  
JFM-WSA-4-C (JST)
- Guide plate A kit : JFM-GPAK-4 (JST)
- Receptacle housing : JFM2FDN-22V-K (JST)

- Receptacle contact
- a SJ2F-01GF-P1.0 (JST) 0.20~0.50sq
- b: SJ2F-01GF-P1.0 (JST) 0.30~0.75sq

#### Manual crimp tool

- a: YRS-8861
- b: YRF-1120

#### Cable diameter suitable for wire-side shell

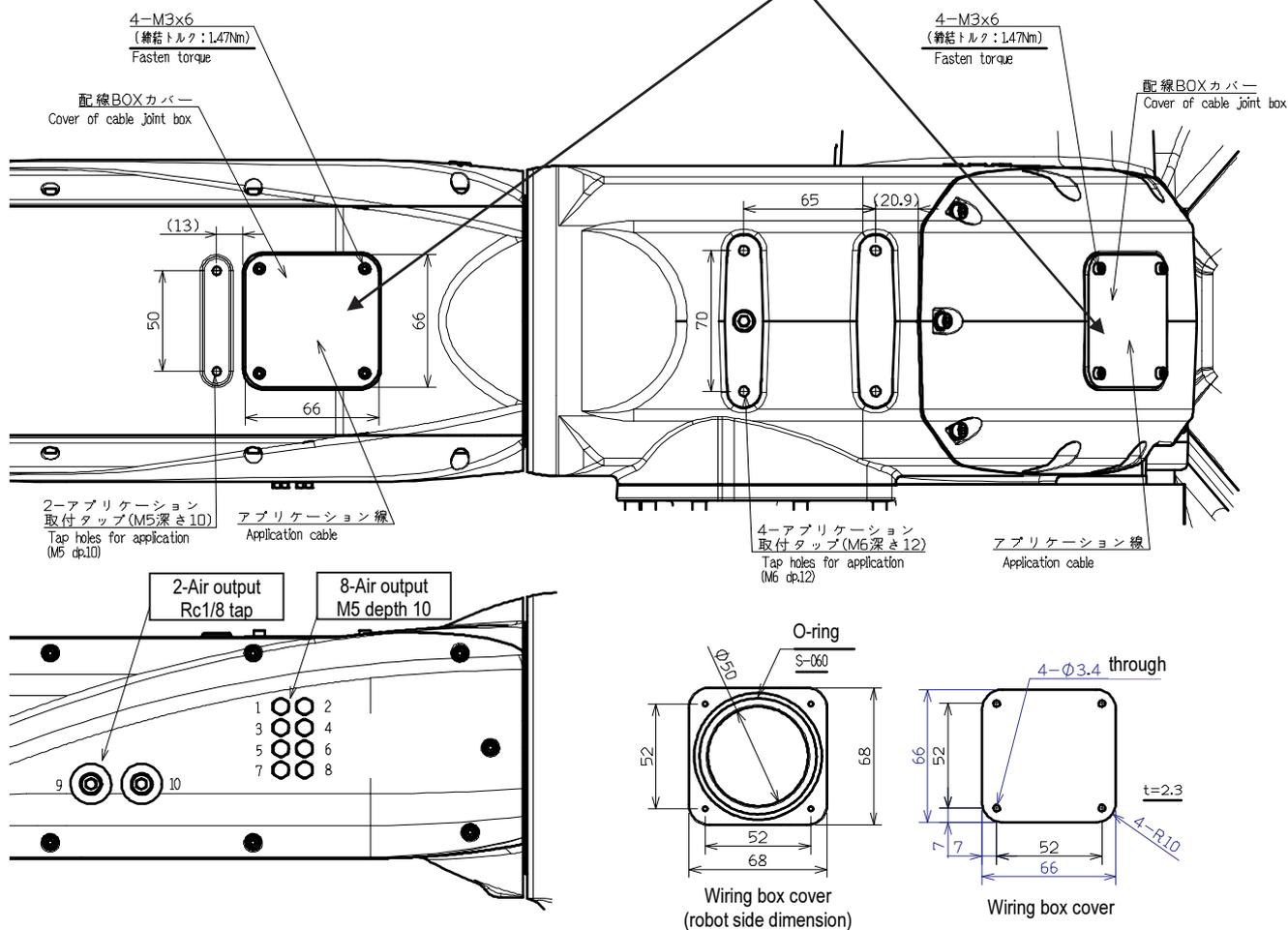
- JFM-WSA-4-A : φ26.2~φ28.0
- JFM-WSA-4-C : φ15.5~φ16.5

(Pin location shows the connector equipped on robot body and is the view from connecting side.)

(NOTE) Concerning the I/O harness for the CNR010, refer to "8.3 I/O harness (IOCABLE-90)".

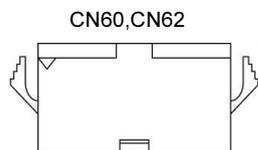
7.2.2 Wrist side (connector) wiring box cover portion and gear box cover portion

**(CAUTION)**  
 The application signal wires are in this cover. To use those signal wires, it is necessary to drill a hole on the cover and attach a cable clamp. In this case, please be sure to use a water-proof type cable clamp. Or water etc get inside the robot arm and malfunction may occur.

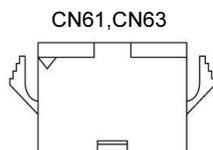


**7.2.3 Wrist side connector (inside the arm)**

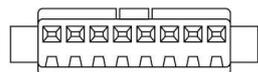
CN60, CN61, CN62, CN63 connectors



CN60, CN62



CN61, CN63

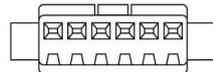


CN60

8	7	6	5	4	3	2	1
ECE		A06	A05	A04	A03	A02	A01

CN62

8	7	6	5	4	3	2	1
ECE		A18	A17	A16	A15	A14	A13



CN61

6	5	4	3	2	1
A12	A11	A10	A09	A08	A07

CN63

6	5	4	3	2	1
A24	A23	A22	A21	A20	A19

Connector models (CN60, CN62)

Housing SMP-08V-BC(JST)

User-side connectors

Housing SMR-08V-B (JST)

Contact SYM-001T-P0.6 (Suitable cable: AWG#22~28)

Manual crimp tool: YRS-121

Connector models (CN61, CN63)

Housing SMP-06V-BC(JST)

User-side connectors

Housing SMR-06V-B (JST)

Contact SYM-001T-P0.6 (Suitable cable: AWG#22~28)

Manual crimp tool: YRS-121

(Pin location shows the connector equipped on robot body and is the view from connecting side.)

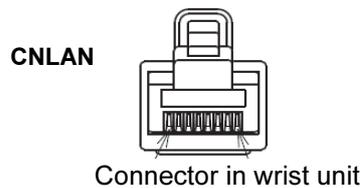
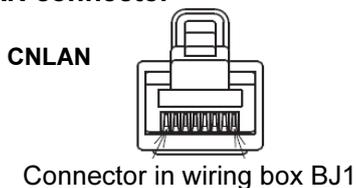
(NOTE)

-When purchasing the integrated solenoid valve option, the following connectors are used to control the solenoid valves depending on the combination.

- 1 valve or 2 valves : CN61 only
- 3 valves : CN60 and CN61

- The user side connectors are available as option parts. (The part number is OPJ-EL-0055)

7.2.4 LAN connector



		CNLAN	CNLAN
Connector	RJ45 plug connector	6-2111989-3 (Tyco)	6-2111989-3 (Tyco)
User-side connector	Hood	RJ45 type connector	RJ45 type connector

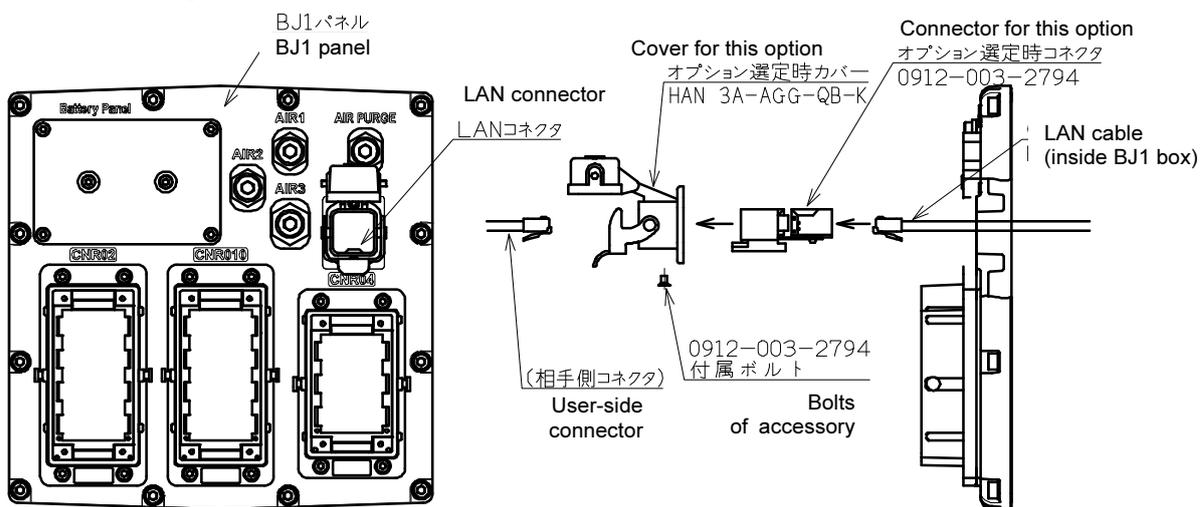
(These pictures show the connectors in robot body and are the view from connecting side.)  
Adequate contact and manual crimp tool should be used for each cable.

(NOTE) The following options are available for LAN connection.

BJ1 panel LAN connector: OP-E2-008

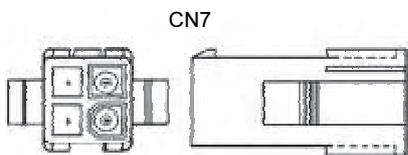
On arm LAN cable: OP-E4-019

Refer to the figure below for the detail of BJ1 panel LAN connector (OP-E2-008).



For OP-E2-008	
Connector	0912-003-2794 (HARTING)
User-side connector	RJ45 plug connector

**7.2.5 CN7, CNBK7 connector (for additional axis)**



1	U7	2	V7
3	W7	4	G

Connector model (CN7)

Housing 172159-1 (TYCO)

User-side connector

Housing 172167-1(TYCO)

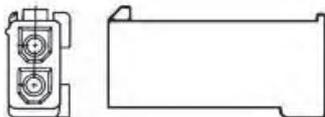
Contact

a: 170360-1 (Applicable wire: AWG#18~22)

Manual crimp tool

a: 1901260-1

**CNBK7**



1	PB
2	BA7

Connector model (CNBK7)

Housing 172233-1 (TYCO)

User-side connector

Housing 172165-1 (TYCO)

Contact

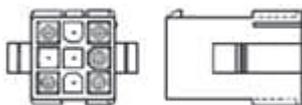
a: 170360-1 (Applicable wire: AWG#18~22)

Manual crimp tool

a: 1901260-1

**7.2.6 CNE7 connector (for additional axis)**

**CNE7**



(1)	(2)	(3)
P3E7	M3E7	ECE
(4)	(5)	(6)
S7+	S7-	
(7)	(8)	(9)
P5E7	M5E7	

Connector model (CNE7)

Housing 172161-1 (TYCO)

User-side connector

Housing 172169-1 (TYCO)

Contact

a: 170359-1 (Applicable wire: AWG#22~28)

(ECE)b:170360-1 (Applicable wire: AWG#18~22)

Manual crimp tool (a or b)

a: 90870-1

b: 1901260-1

(NOTE) The user-side connectors are available as option parts. (Part No. : OPJ-EL-0056)

## 8. Option specification

### 8.1 Mechanism option

No.	Item	Specification	Parts No.
1	Parts for installation <sup>*1</sup>	Chemical anchor specification Installation plate + 4 base plates (without pin hole) + chemical anchor bolts	OP-F1-044
		Chemical anchor specification Installation plate + 4 base plates (2 with pin hole, 2 without pin hole) + chemical anchor bolts	OP-F1-045
		Hammer drive anchor specification Installation plate + 4 base plates (without pin hole) + hammer drive anchor bolts	OP-F2-026
		Hammer drive anchor specification Installation plate + 4 base plates (2 with pin hole, 2 without pin hole) + hammer drive anchor bolts	OP-F2-027
		Robot installation bolts and washers	OP-F1-042
		Pin set	OP-F1-043
2	Axis 1 adjustable stopper <sup>*1</sup>	Restriction of axis 1 operation edge ( $\pm 120^\circ$ , every $10^\circ$ )	OP-S5-037
3	Axis 2 adjustable stopper <sup>*1</sup>	Restriction of axis 2 operation edge ( $-15^\circ$ , $-30^\circ$ , $-45^\circ$ from the forward and backward motion edge)	OP-A5-035
4	Axis 3 adjustable stopper <sup>*1</sup>	Restriction of axis 3 operation edge ( $-15^\circ$ , $-30^\circ$ , and $-45^\circ$ from the backside of the motion edge)	OP-A6-033
5	Tools <sup>*1</sup>	Zeroing pin & Zeroing block	OP-T2-102
6	Hanging jig <sup>*1</sup>	Jig for ceiling installation (a jig to invert the robot body)	OP-S7-012
7	Solenoid valves in the arm <sup>*1</sup>	2-position double x1 <sup>*2</sup>	OP-H4-019
		2-position double x2 <sup>*2</sup>	OP-H5-017
		2-position double x3 <sup>*2</sup>	OP-H6-019
		3-position all port block x1 <sup>*3</sup>	OP-H4-020
		3-position all port block x2 <sup>*3</sup>	OP-H5-018
		3-position all port block x3 <sup>*3</sup>	OP-H6-020
8	Internal valve for air blow <sup>*1</sup>	2 port valve x1 <sup>*4</sup>	OP-H7-006
9	Transfer jig <sup>*3</sup>	For forklift (1 set including 2 jigs)	OP-S2-052
10	BJ1 panel LAN connector <sup>*1,6</sup>	BJ1 panel, LAN connector	OP-E2-008
11	On arm multi connector <sup>*1,7</sup>	Wiring BOX cover and multi-connector	OP-E3-017
12	On arm I/O cable <sup>*1,8</sup>	I/O cable (connector + cable) 1.5m (12 wires)	IOCABLE-80-01M
13	On arm additional I/O cable <sup>*1,8</sup>	I/O cable (connector + cable) 1.5m (6 wires)	IOCABLE-80B-01M
14	On arm LAN cable <sup>*1,8</sup>	LAN cable (connector + cable) 1.3m	CFD-OP139-CC002
15	On arm motor cable <sup>*1,8</sup>	Motor / encoder harness 1.5m (for 100,400,600W)	CFD-OP79-C03
16	On arm motor cable <sup>*1,8</sup>	Motor / encoder harness 1.5m (for 200W)	CFD-OP79-C04
17	Coolant resistance spec. on arm cable set A <sup>*1,9</sup>	Multi-connector (coolant resistance spec.) + I/O cable (12 wires) + LAN cable	CFD-OP176-A
18	Coolant resistance spec. on arm cable set B <sup>*1,9</sup>	Multi-connector (coolant resistance spec.) + I/O cable (12 wires) + LAN cable + Motor (100, 400, 600W)	CFD-OP176-B
19	Coolant resistance spec. on arm cable set C <sup>*1,9</sup>	Multi-connector (coolant resistance spec.) + I/O cable (12 wires) + LAN cable + Motor (200W)	CFD-OP176-C
20	Coolant resistance spec. on arm cable set D <sup>*1,9</sup>	Multi-connector (coolant resistance spec.) + I/O cable (12 wires) + Motor cable (100,400,600W)	CFD-OP176-D
21	Coolant resistance spec. on arm cable set E <sup>*1,9</sup>	Multi-connector (coolant resistance spec.) + I/O cable (12 wires) + Motor cable (200W)	CFD-OP176-E
22	Coolant resistance spec. on arm cable set F <sup>*1,9</sup>	Multi-connector (coolant resistance spec.) + I/O cable (12 wires)	CFD-OP176-F
23	BJ1 application plug <sup>*1</sup>	CNR010 connector parts set	OPJ-EL-0040
24	MZ12 internal I/O connector <sup>*1</sup>	CN60, 61, 62, 63 user-side connector parts set	OPJ-EL-0055
25	MZ12 internal additional axis connector <sup>*1</sup>	CN7, CNBK7, CNE7 user-side connector parts set	OPJ-EL-0056

\*1: This option is shipped with the robot. But not attached on the robot.

\*2: Solenoid valve, Model: 4GB129R-00-A2NH-3 (CKD), individual wiring manifold, pressure range 0.2 to 0.5MPa, coil rated voltage DC24V, 2-position double solenoid, consuming power 0.40w, with surge voltage protection circuit (Non-polar type), non-lock push style manual operation, without piping sub-plate, without bracket. The number of the valves depends on the specification.

\*3: Solenoid valve, Model: 4GB139R-00-A2N-3(CKD), individual wiring manifold, pressure range 0.2 to 0.5MPa, coil rated voltage DC24V, 2-position double solenoid, consuming power 0.40w, with surge voltage protection circuit (Non-polar type), non-lock push style manual operation, without piping sub-plate, without bracket. The number of the valves depends on the specification.

\*4: 2 port valve, Model: EXA-X106-FL-DC24V (CKD), pressure range 0.01 to 0.7MPa, coil rated voltage DC24V, consuming power 0.60w, without surge voltage protection circuit, with bracket

\*5: When transporting the robot using a forklift, install these 2 jigs to the robot frame using bolts (M12×20, total 4 bolts)

\*6: When using the internal LAN cable, please select this.

\*7: When connecting the on arm cable to the internal wiring, select this.

\*8: Select this with the on arm multi-connector.

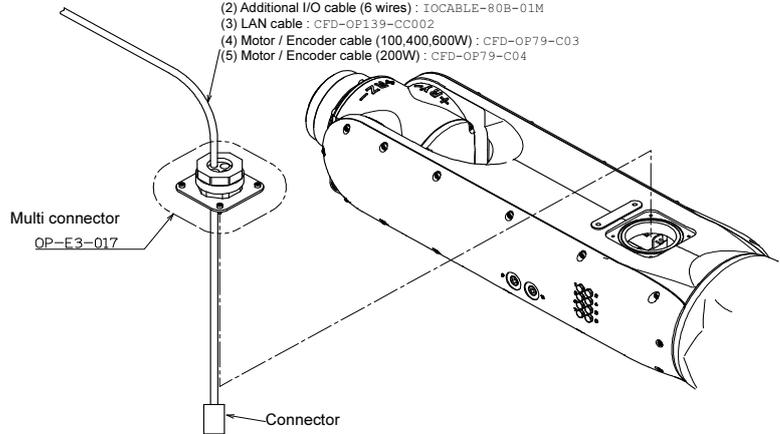
When selecting "On arm motor cable", either "On arm I/O additional cable (IOCABLE-80B-01M)" or "On arm LAN cable (CFD-OP139-CC002)" can be used together. The examples of the available combination are shown in the following table.

On arm multi connector (OP-E3-017)	On arm motor cable (CFD-OP79-C03) or (CFD-OP79-C04)	On arm I/O cable (12 wires) (IOCABLE-80-01M)	On arm additional I/O cable (6 wires) (IOCABLE-80B-01M)	On arm LAN cable (CFD-OP139-CC002)	Number of SOL
◎	○	○	○	×	1 to 2
◎	○	○	×	○	1 to 3
◎	×	○	○	○	1 to 2

◎: Required ○:Selectable ×: Not selectable

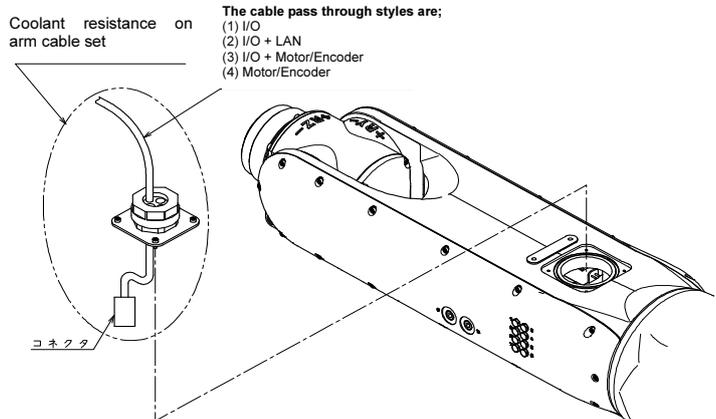
Select among the following cables.

- (1) I/O cable (12 wires) : IOCABLE-80-01M
- (2) Additional I/O cable (6 wires) : IOCABLE-80B-01M
- (3) LAN cable : CFD-OP139-CC002
- (4) Motor / Encoder cable (100,400,600W) : CFD-OP79-C03
- (5) Motor / Encoder cable (200W) : CFD-OP79-C04



\*9: As for the "Coolant resistance on arm cable set", please select one from the table shown as below.

Name	On arm I/O cable (12 wires)	On arm I/O cable (6 wires)	On arm LAN cable	On arm motor cable (100,400,600W)	On arm motor cable (200W)
Coolant resistance on arm cable set A (CFD-OP176-A)	○		○		
Coolant resistance on arm cable set B (CFD-OP176-B)	○		○	○	
Coolant resistance on arm cable set C (CFD-OP176-C)	○		○		○
Coolant resistance on arm cable set D (CFD-OP176-D)	○			○	
Coolant resistance on arm cable set E (CFD-OP176-E)	○				○
Coolant resistance on arm cable set F (CFD-OP176-F)	○				



(NOTE) Refer to the following specification also.  
"Standard specification CFD Controller" (SCFEN-010)

### 8.2 Wire-harness

“Wire-harness” is a set of cables to connect the manipulator and the controller. Its type varies according to the controller.

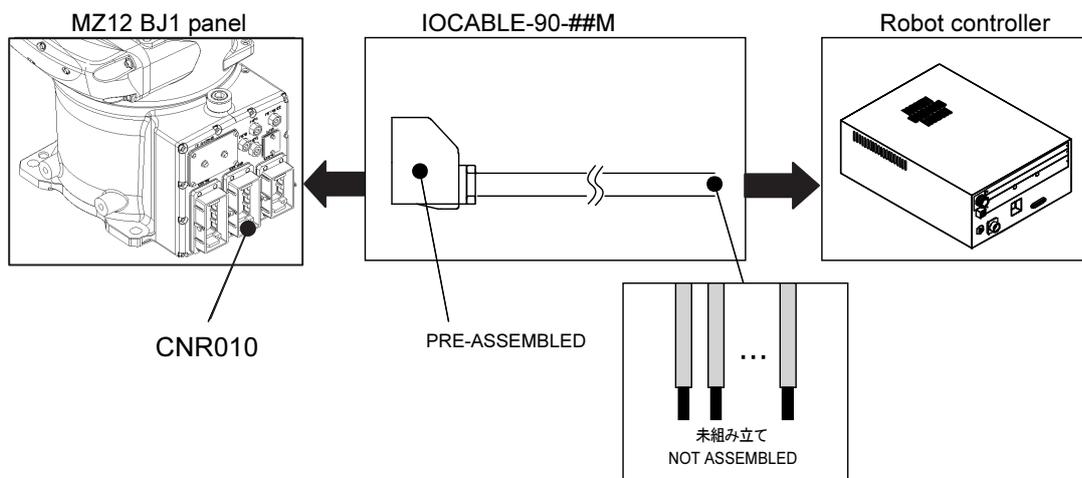
No.	Controller	Name	Parts No.	Notes
1	CFD-3020	Motor / encoder harness (fixed)	C101C-J1-##-A (## : cable length / 02,05,10,15,20,25[m])	Cables to connect the manipulator and the controller. This option must be selected when purchasing the robot without fail.
		Motor / encoder harness (flexible)	C111C-J1-##-A (## : cable length / 02,05,10,15,20,25[m])	
2		Motor/ encoder extension harness	HK201X-J1-##-B (## : cable length / 05,10,15,20[m])	One set at maximum. Possible total length after the extension is 25m at maximum. Both sides are connectors.
3	FD11	Motor / encoder harness	A000F-J1-##-B (## : cable length / 05,10,15, 20, 25[m])	Cables to connect the manipulator and the controller. This option must be selected when purchasing the robot without fail.

(NOTE)

- This option No.1 or No.3 must be selected when purchasing the robot without fail.
- Please be sure to select the cable length. The part of “##” shows the length in [m].  
(Example) “C101C-J1-05-A” is 5m.
- This part includes 2 cables. (Motor power + Encoder)
- CFD-3020 Motor / encoder harness (fixed)
  - Motor cable diameter φ16.6mm, minimum bending radius: 100mm
  - Encoder cable diameter φ13.2mm, minimum bending radius: 80mm
  - Total length after the extension is 25m at maximum
- CFD-3020 Motor / encoder harness (flexible)
  - Motor cable diameter φ25mm, minimum bending radius: 150mm
  - Encoder cable diameter φ16mm, minimum bending radius: 100mm
  - Total length after the extension is 25m at maximum
- CFD-3020 Motor / encoder extension harness (flexible)
  - Motor cable diameter φ18.5mm, minimum bending radius: 120mm
  - Encoder cable diameter φ16.7mm, minimum bending radius: 100mm

### 8.3 I/O harness (IOCABLE-90)

The I/O harness that is connected to the CNR010 is available as an option part.  
(Part No.: IOCABLE-90-##M) # is for the cable length in [m] (02, 05, 10, 15, 20, 25)



This cable can be used for both CFD and FD controller.  
Please refer to the instruction manual “Option for MZ12” (TCFEN-203) for detail

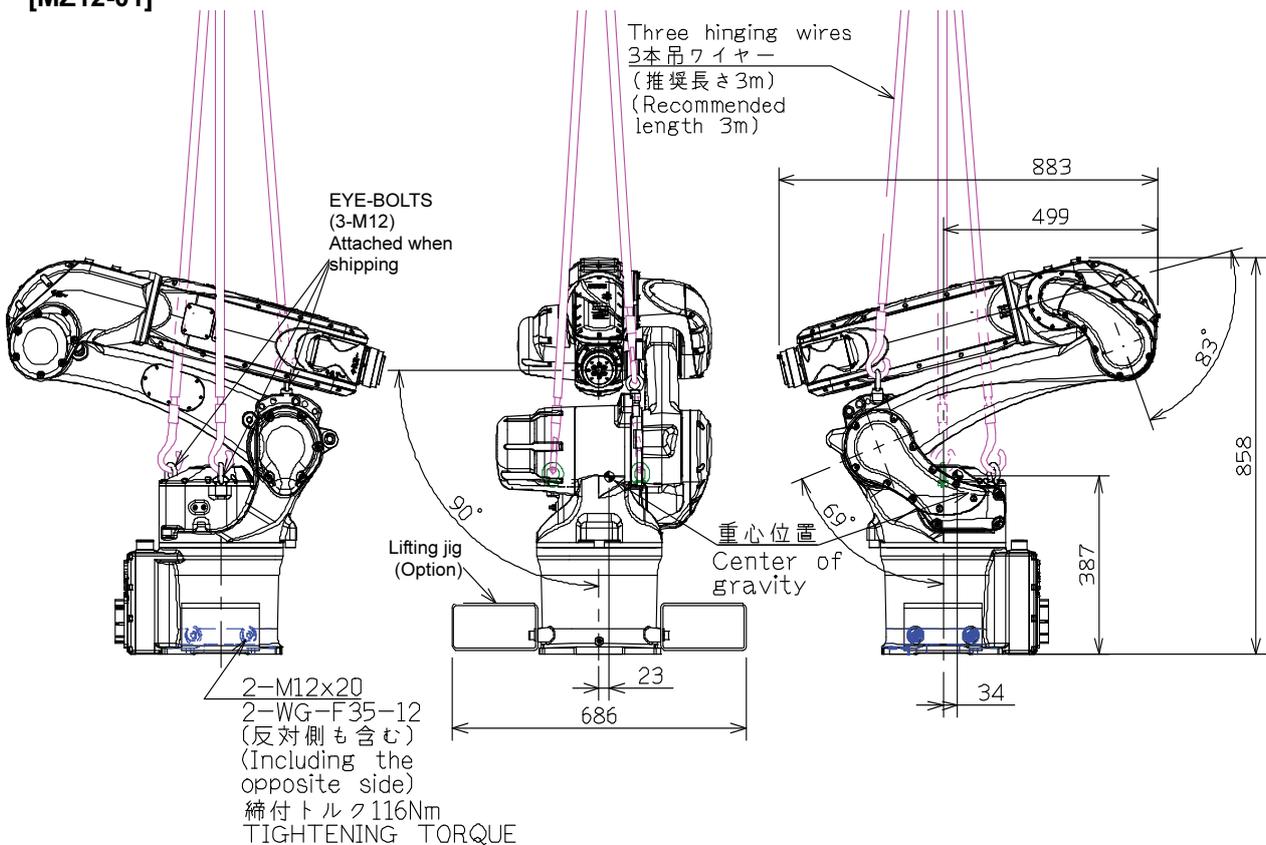
### 9. Delivery style (specification which contains a robot)

 <b>WARNING</b>	The robot and controller must be transported by personnel who have licenses required for slinging work, crane operation, forklift truck operation, and others. If the transportation works are not performed by people like that, accidents may occur. (e.g. turnover, fall, etc.)
 <b>WARNING</b>	Before transporting the robot and the controller, be sure to check the weight of them and the transportation procedures which are described in the Maintenance Service Manual of the robot. If the transportation works are not performed by following the appropriate procedures, accidents may occur. (e.g. turnover, fall, etc.)
 <b>WARNING</b>	During transport of the robot and controller, pay utmost care not to cause damage to wirings. Furthermore, after installing the robot, take protective measures such as using protective covers so that the wirings will not be damaged by workers or other persons, or forklift trucks or else.

To transport the robot, set a rule to use crane. Make the robot posture shown below and install eyebolts on the robot. Then, lift the robot using 3 hanging wires. The recommended length is 3m.

And, when transporting a robot using a forklift truck, install the lifting jigs (option) to the robot frame using fixing bolts (M12x20: total 4 bolts / WG-F35-12: total 4 washers). The tightening torque is 116Nm.

[MZ12-01]



## 10. 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.

The price differs from the style, please consider and confirm enough in advance.

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.

## 11. Consuming power (Robot + Controller CFD-3020/FD11)

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

## 12. Paint color (Robot and controller)

Standard color	Robot cover and upper arm	Munsell 6.5PB9/1
	Lower Arm	Munsell N5.5
	Base	Munsell N2.5

## 13. Warranty

Elapse of 1 year after delivery.

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

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