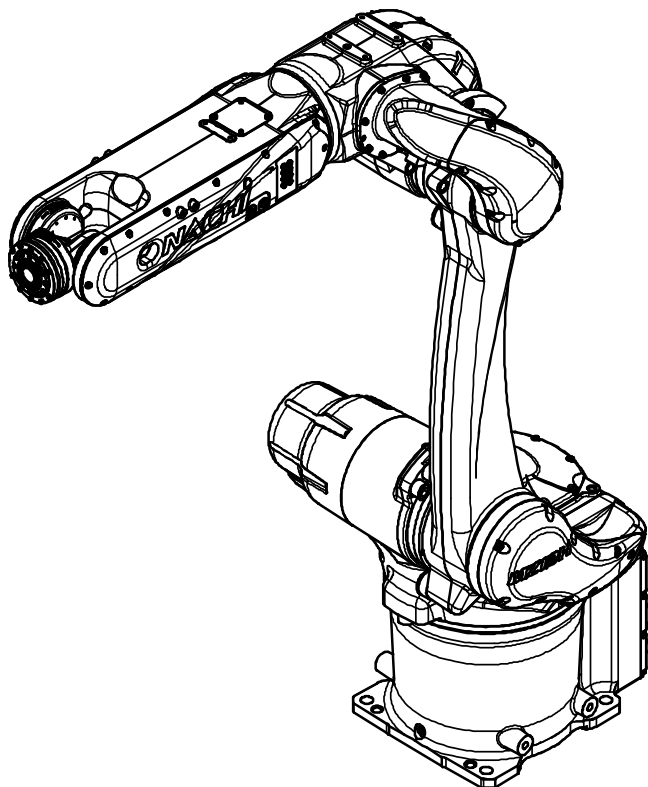


NACHI

Standard specifications

MZ12H-01
[CFDs-3000/CFD-3020]
[CFD-3030/FD11/FD18]

6th 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.

“**MZ12H**” is an articulated 6 axes structure robot that is optimal for material handling and other application due to its fast motion and high accuracy.

Mounting condition	Maximum payload
Floor	12kg MZ12H-01 - CFDs-3000 MZ12H-01 – CFD-3020 MZ12H-01 – CFD-3030 (CFD-3030 is CE specification) MZ12H-01 – FD11 MZ12H-01 – FD18

Features

1. The wrist and the main body become “Protection class (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.

This robot can be driven by CFDs-3000, CFD-3020, CFD-3030, FD11 and FD18 controller. But following case needs FD11 controller.

- 7th axis motor is larger than 600W (CFDs-3000/CFD-3020/3030 can drive up to 600W)
- Axis number is 8 or more.

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

- “Standard specifications: CFDs controller” (SCFEN-022)
- “Standard specifications: CFD controller” (SCFEN-010)
- “Standard specifications: FD11 controller” (SCFEN-006)
- “Standard specifications: FD18 controller” (SCFEN-020)

2. Basic specifications

Item		Specifications
Robot type		MZ12H-01
Structure		Articulated
Degree of Freedom		6
Drive system		AC servo motor
Maximum motion range	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	$\pm 6.28\text{rad}$ ($\pm 360^\circ$)
Maximum Velocity *1	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	12.92 rad/s (740°/s)
Maximum payload	Wrist	12kg
Maximum static load torque	Axis 4	26.5 N·m
	Axis 5	26.5 N·m
	Axis 6	12.0 N·m
Maximum moment of inertia *2	Axis 4	0.9 kg·m ²
	Axis 5	0.9 kg·m ²
	Axis 6	0.3 kg·m ²
Position repeatability *3		$\pm 0.04\text{mm}$
Maximum reach		1454mm
Air tubes		$\phi 6 \times 2$, $\phi 8 \times 1$
Application signal wires		24 wires (including wires for the optional solenoid valves)
Mounting Condition		Floor / Tilted / Inverted
Ambient conditions		Temperature: 0 to 45 °C *4 Humidity: 20 to 85%RH (No dew, nor frost allowed) Vibration to the installation face: Not more than 0.5G (4.9 m/s ²)
Protection class *5		Robot body : IP67 equivalent (dust and drain proof-type)
Noise level *6		73 dB
Robot weight		155kg

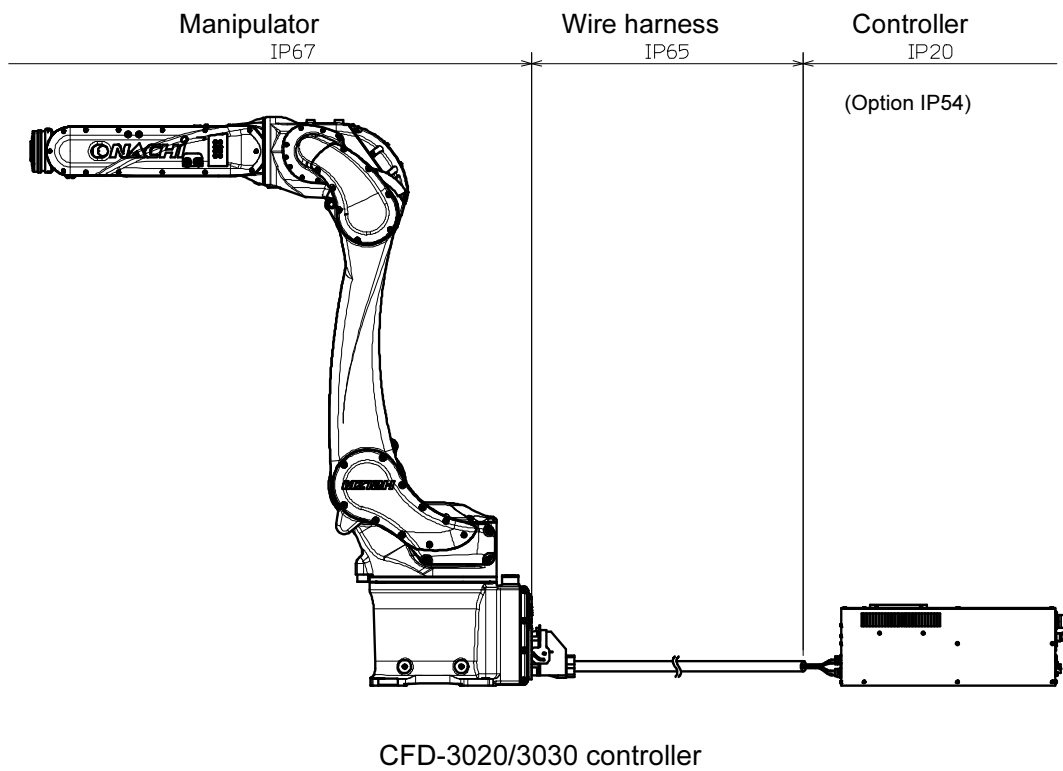
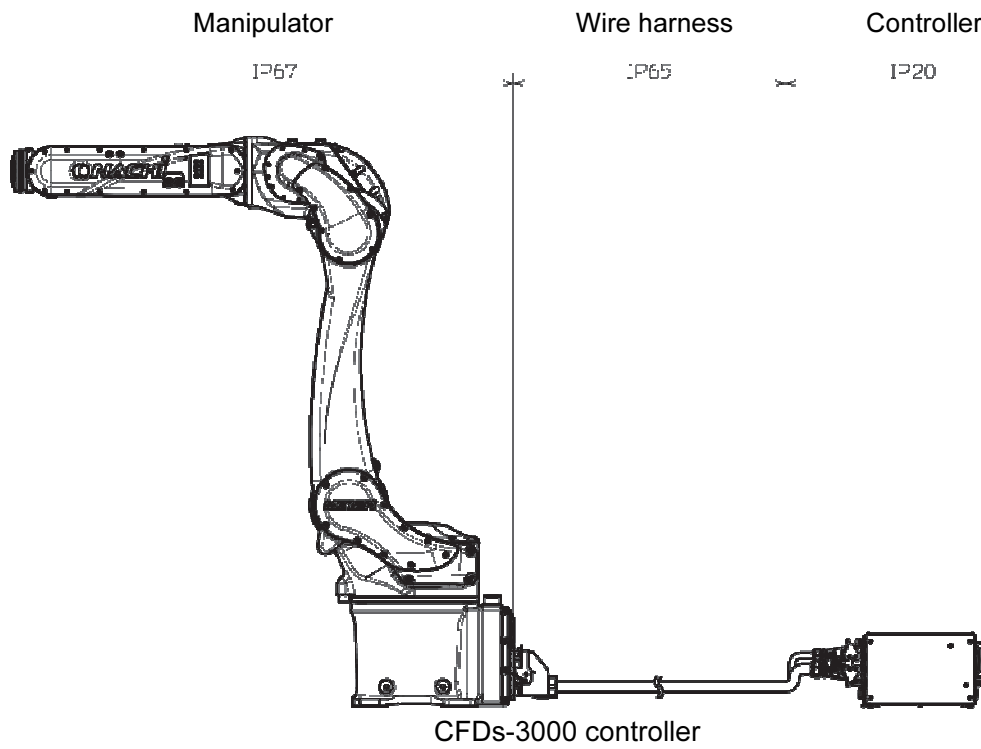
1[rad] = $180/\pi$ [°], 1[N·m] = 1/9.8[kgf·m]

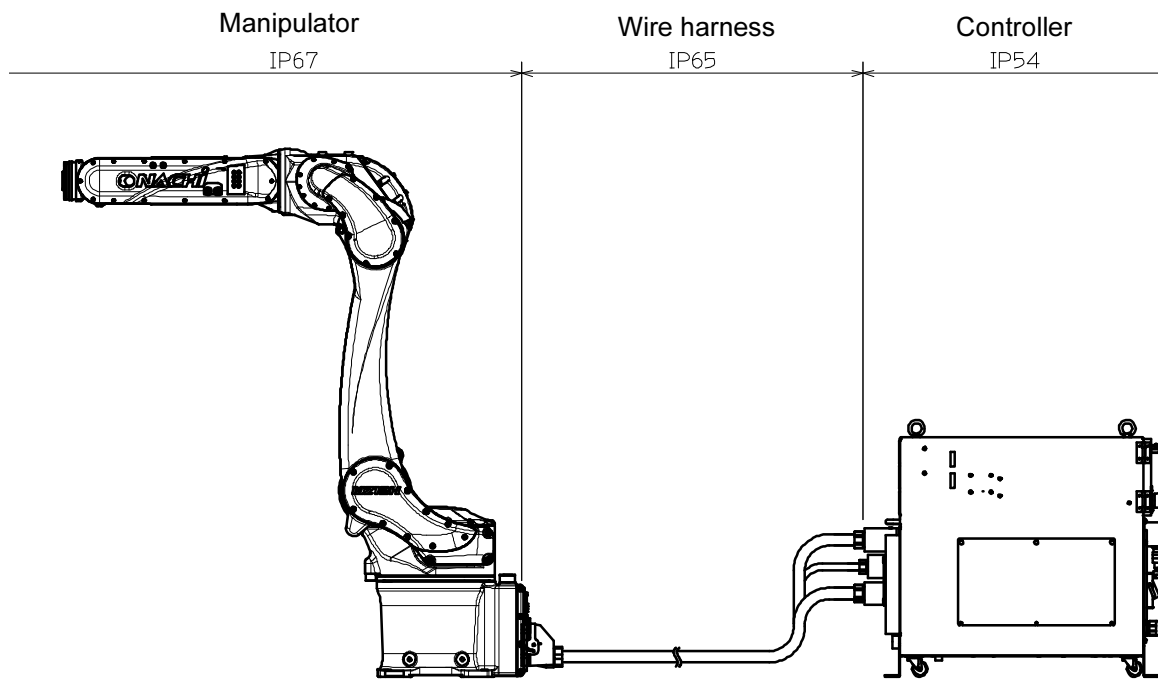
- Axis 1 - Axis 6 are displayed as J1-J6 each on the controller screen.
- Specifications are subject to change without prior notice for technical changes.
- Explosion-proof version is not available.

*1: The maximum velocity in the chart is the maximum value. It will change depending on the operation program and the wrist load condition. *2: Maximum moment of inertia of a wrist changes depending on the load condition.

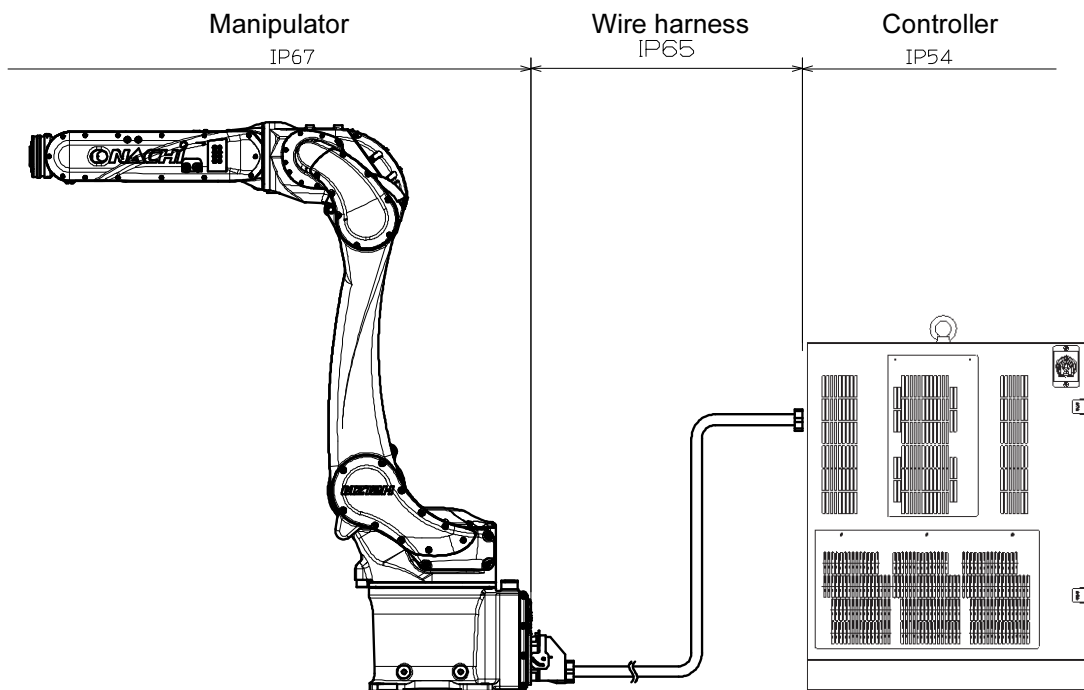
*3: JIS B 8432 conformance. *4: Using at 1000m or lower sea level. Ambient temperature has limitations when allowable altitude is exceeded. *5: Liquid such as organic compound, acidity, alkalinity, chlorine or gasoline cutting fluid which deteriorates the seal material is not available to use. The wire-harness portion is IP65 equivalent, and the robot controller is IP20 equivalent (CFDs-3000/CFD-3020/CFD-3030), IP54 equivalent (FD11/FD18). See the "Supplement: Protection class" on page 3. *6: Robot noise is A-weighted equivalent sound level measured under "JIS Z 8737-1" (ISO 11201) with maximum payload and maximum velocity.

[Supplement : Protection class]





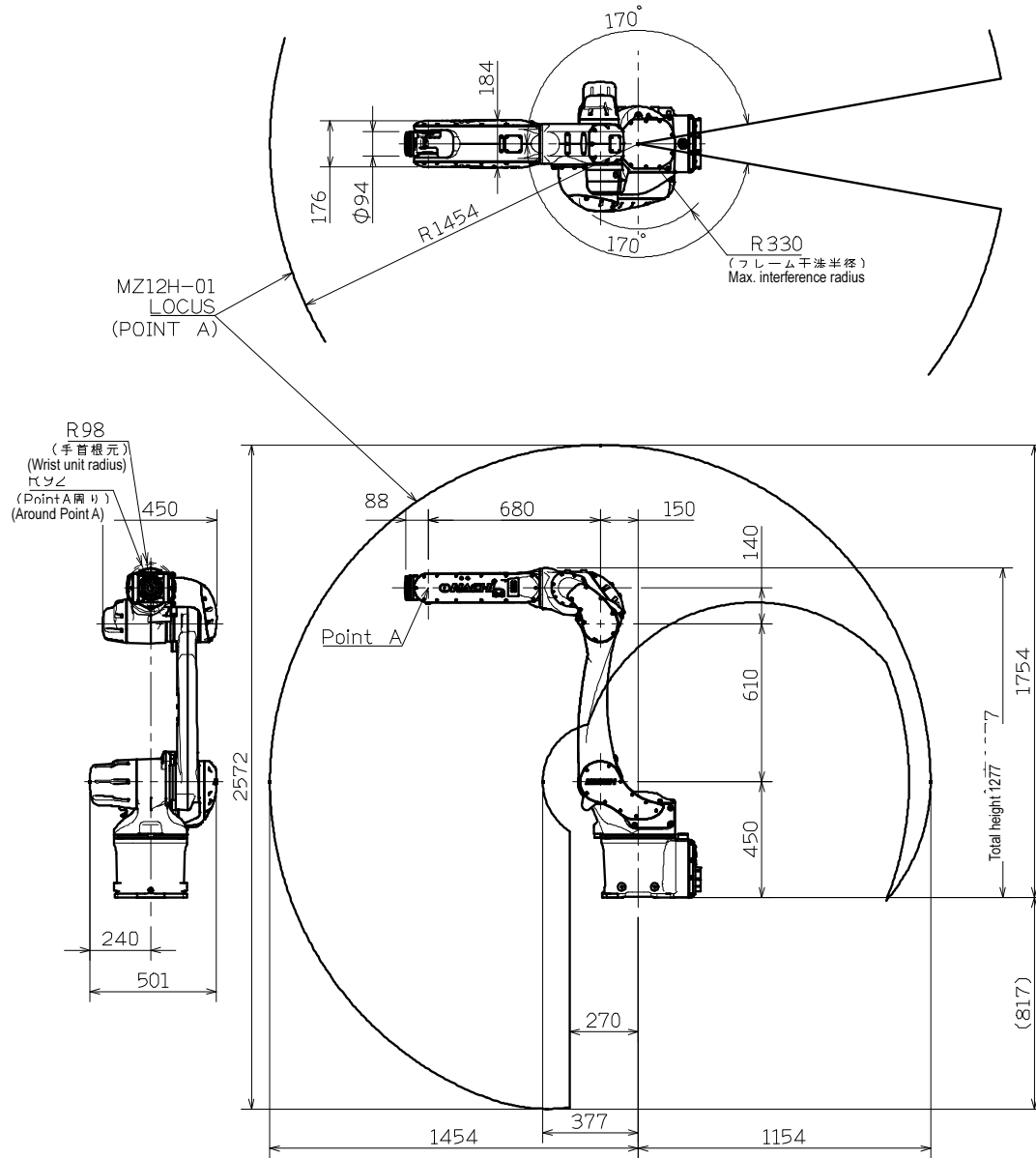
FD18 controller



FD11 controller


3. Dimensions and motion range

【MZ12H-01】

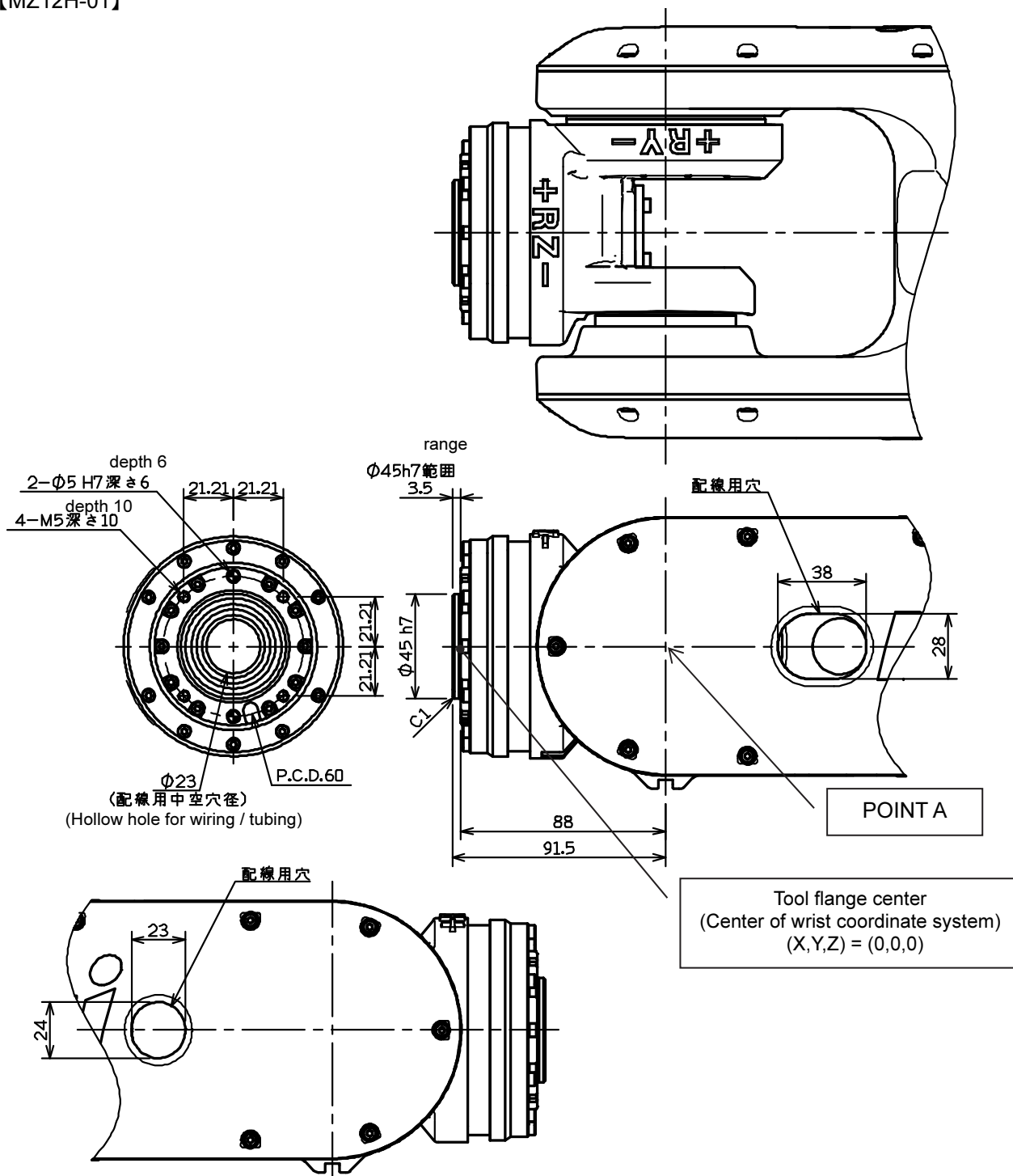


4. Details of load mounting face

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. And the depth should be longer than the diameter of the bolt(5mm). Screwing the bolts deeper than the screw depth may damage the wrist.
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【MZ12H-01】




5. Installation procedure

The installation location and the installation procedure of the robot are critical factors to maintain robot functions. The ambient conditions of installation location not only have influence on the life of mechanical sections of the robot, but also get involved in safety issues. Consequently, strictly observe the environmental conditions shown below. Furthermore, utmost care should be exerted for the installation procedure and the foundation for the robot in order to maintain the robot performance. Strictly observe the installation procedure for the robot provided below.









■ Safety measures against entry in the robot operating area

 WARNING	While the robot is in operation, workers are in danger of coming in contact with the robot. To avoid that, install a guard fence so as to keep the worker away from the robot. Not doing so will cause the workers or other persons to accidentally enter the operating area, thus resulting in accidents.
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■ Safety measures for the robot and peripheral equipment locations

 WARNING	Do not install the operation and the adjustment part within the robot operating area. Install the robot control panel, interlock panel, and all the other operation panels where it's safe, so that they can be operated outside of the guard fence . In case those operation panels are installed near the robot, workers can get caught in the robot, when the robot operation fails.
--	--



■ Safety measures for installation work

 WARNING	To install the robot, it is important to position the robot so that no workers will get pinched by the robot. Robot installing position needs to be determined by considering the motion range of robot with tool mounted. If necessary, provide a margin outside the motion range to ensure safety.
 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%.
 CAUTION	Installation structures (robot raiser, etc.) may cause problems such as vibration and servo tracking error. If such problem occurs, please promptly improve the installation structure. If installation structures are kept using as they are, reliability and lifetime of not only the robot but also the installation structures may be damaged, due to the vibration and sudden braking of robot.

■ 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.

 IMPORTANT	<p>Special environment such as X-ray environment</p> <p>Our company's robot, controller and related option equipment are designed for general industrial use. Unless otherwise specified in the specifications or manuals, operations in special conditions and environments such as outdoor, X-ray environment, radiation environment, nuclear power control, aerospace equipment, public transportation, medical equipment, etc. are not assumed. Our company and its subsidiaries are not liable for any accidents, failures, etc., that may occur if the robot is used in such an environment without asking our company to do so.</p>
 IMPORTANT	<p>Using mounting condition that does not comply with specifications may cause the robot system to malfunction or fail prematurely. In that case, robot will be out of warranty. Please understand it in advance.</p>

■ 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	MZ12H-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.

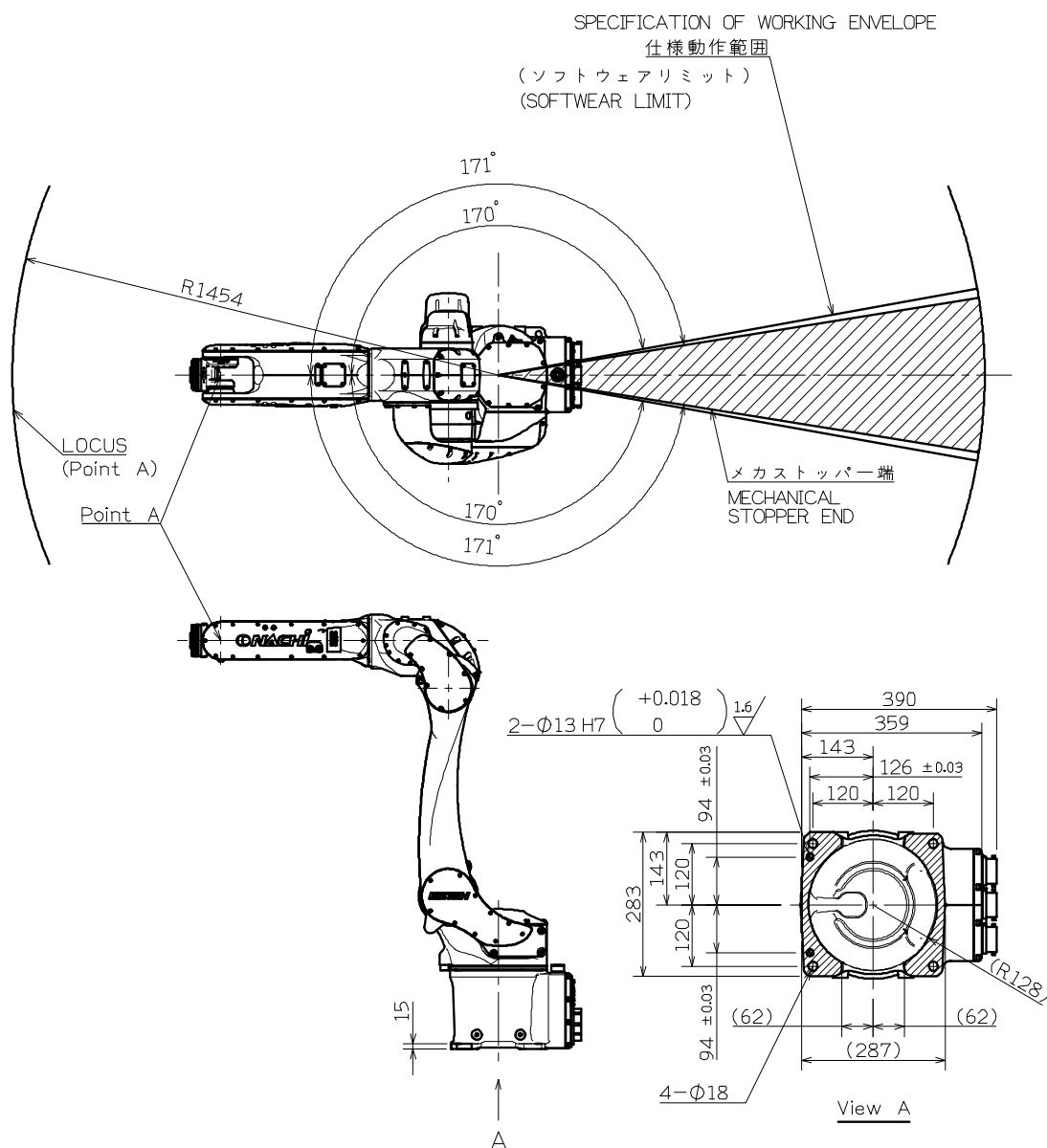
*3 : This tensile is per installation bolt when robot is installed with all bolts written in table above.

■ Installation space

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

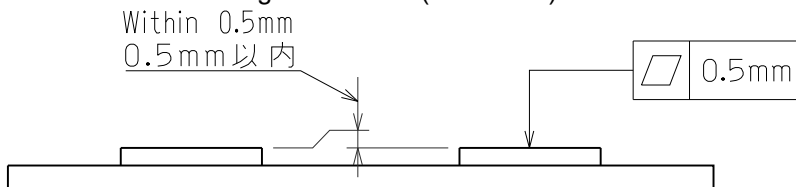
 WARNING	The mechanical stopper end is located in a position exceeding the specified working envelope (software limit) of axis 1. To install the safety fence, with consideration given to the wrist configuration and the shape of tool.
 WARNING	On axis 1, 2 and 3, the robot working envelope can be regulated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

【MZ12H-01】



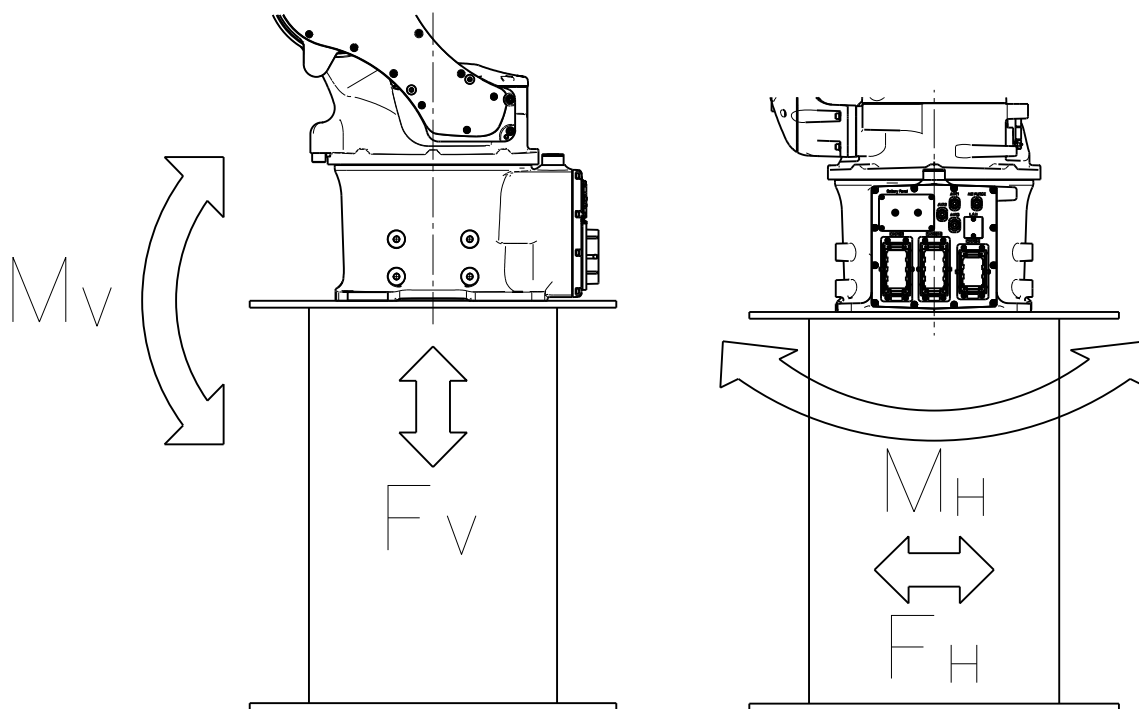
■ Accuracy of installation surface

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 (± 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
MZ12H-01	5,400 N	3,800 N	4,900 N·m	4,200 N·m



6. Allowable wrist load

 CAUTION	<p>Load fixed on the tip of wrist is regulated by “maximum payload”, “maximum static load torque”, and “maximum 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.</p> <p>Refer to “2. Basic specifications” and following figures for the detail.</p>						
 CAUTION	<p>Before using the robot, please register the "weight", "COG (center of gravity) position" and "inertia Moment" of wrist payload as the load condition. Robot is controlled to minimize the operating time according to the registered value.</p> <p>Therefore, even if the load condition was within the specifications, if that is incorrect, excessive acceleration will be generated, and reliability and life may be damaged.</p> <p>Even if the correct value is registered, vibration or servo tracking error may occur due to the insufficient rigidity of the payload. If such problem occurs, please adjust the “speed”, “acceleration” and “smoothness”. Those factors can be adjusted in every step. See the instruction manual for details.</p> <table border="1" data-bbox="352 824 1007 909"> <thead> <tr> <th>Speed</th> <th>Acceleration(D)</th> <th>Smoothness(S)</th> </tr> </thead> <tbody> <tr> <td>10.0 mm/s</td> <td>LIN A1 T1</td> <td>D3S3</td> </tr> </tbody> </table> <p><u>CFDs-3000 controller</u> CFDs//CFDq controller instruction manual BASIC OPERATIONS (CFDs-EN-002) 4.3 Teaching</p> <p><u>CFD-3020/3030 controller</u> CFD/CFDL/CCZ controller instruction manual BASIC OPERATIONS (TCFEN-160) 4.3 Teaching</p> <p><u>FD11 controller</u> FD11 controller instruction manual BASIC OPERATIONS (TFDEN-002) 4.3 Teaching</p> <p><u>FD18 controller</u> FD18 controller instruction manual BASIC OPERATIONS (TFDEN-224) 4.3 Teaching</p>	Speed	Acceleration(D)	Smoothness(S)	10.0 mm/s	LIN A1 T1	D3S3
Speed	Acceleration(D)	Smoothness(S)					
10.0 mm/s	LIN A1 T1	D3S3					
 CAUTION	<p>If robot is going to be operated in an environment where interference likely occurs, set "High speed interference detection" function.</p> <p>When interference occurs, robot is quickly stopped by detecting collision between tool and peripherals. This helps protecting tool, robot wrist and peripherals. See the instruction manual for details.</p> <p><u>CFDs-3000 controller</u> CFDs/CFDq controller instruction manual SETUP (CFDs-EN-001) 3.9 High Speed Interference Detection</p> <p><u>CFD-3020/3030 controller</u> CFD/CFDL controller instruction manual SETUP (TCFEN-159) 3.9 High Speed Interference Detection</p> <p><u>FD11 controller</u> FD11 controller instruction manual SETUP (TFDEN-001) 4.9 High Speed Interference Detection</p> <p><u>FD18 controller</u> FD18 controller instruction manual SETUP (TFDEN-223) 4.9 High Speed Interference Detection</p>						



When robot is going to be operated to press an object, like deburring application, "Interference detection level selection function" needs to be set to "High sensibility" during the operation. "Normal sensibility" or "Low sensibility" may damage the tool or wrist axis. See the instruction manual for details.

CFDs-3000 controller

CFDs/CFDq controller instruction manual SETUP (CFDs-EN-001)
3.9.5 Switching Detection Level by Function

CFD-3020/3030 controller

CFD/CFDL controller instruction manual SETUP (TCFEN-159)
3.9.5 Switching Detection Level by Function

FD11 controller

FD11 controller instruction manual SETUP (TFDEN-001)
4.9.5 Switching Detection Level by Function

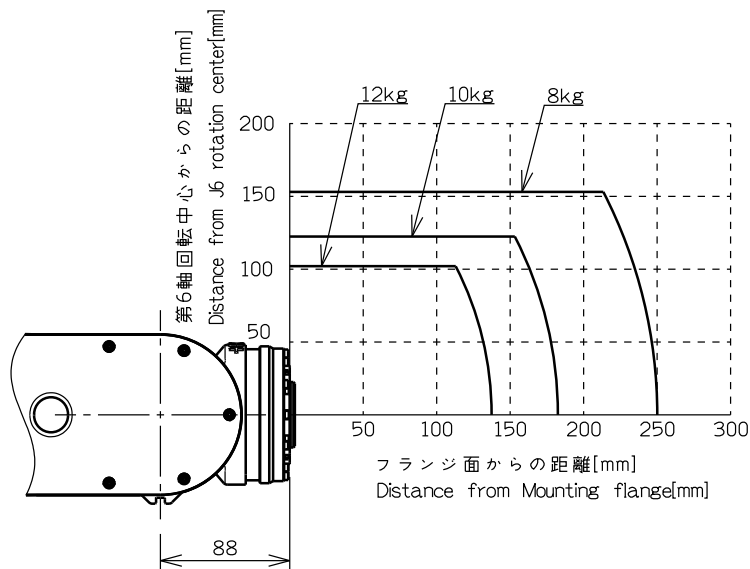
FD18 controller

FD18 controller instruction manual SETUP (TFDEN-223)
4.9.5 Switching Detection Level by Function

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.

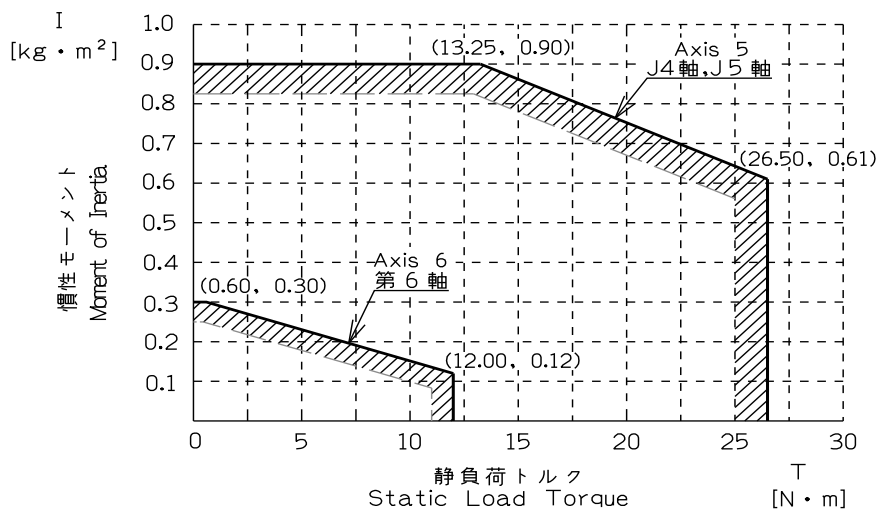
[MZ12H-01]



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.

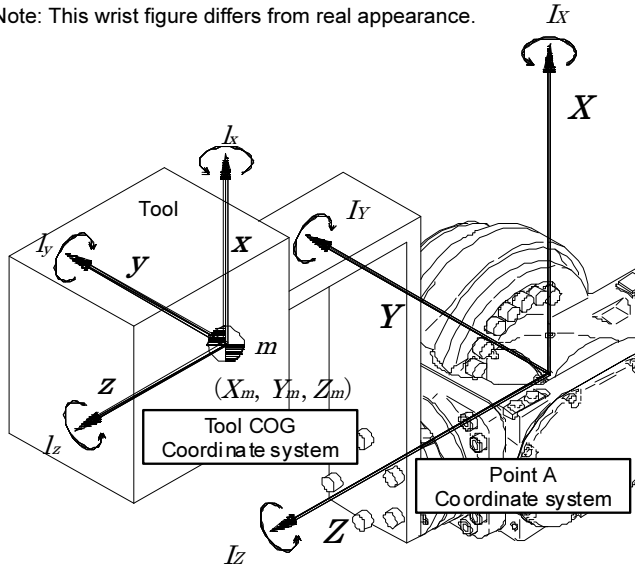
[MZ12H-01]



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
 I_x: Around X on point A coordinate system
 I_y: Around Y on point A coordinate system
 I_z: Around Z on point A coordinate system
 I_x: Around x on tool COG coordinate system
 I_y: Around y on tool COG coordinate system
 I_z: Around z on tool COG coordinate system

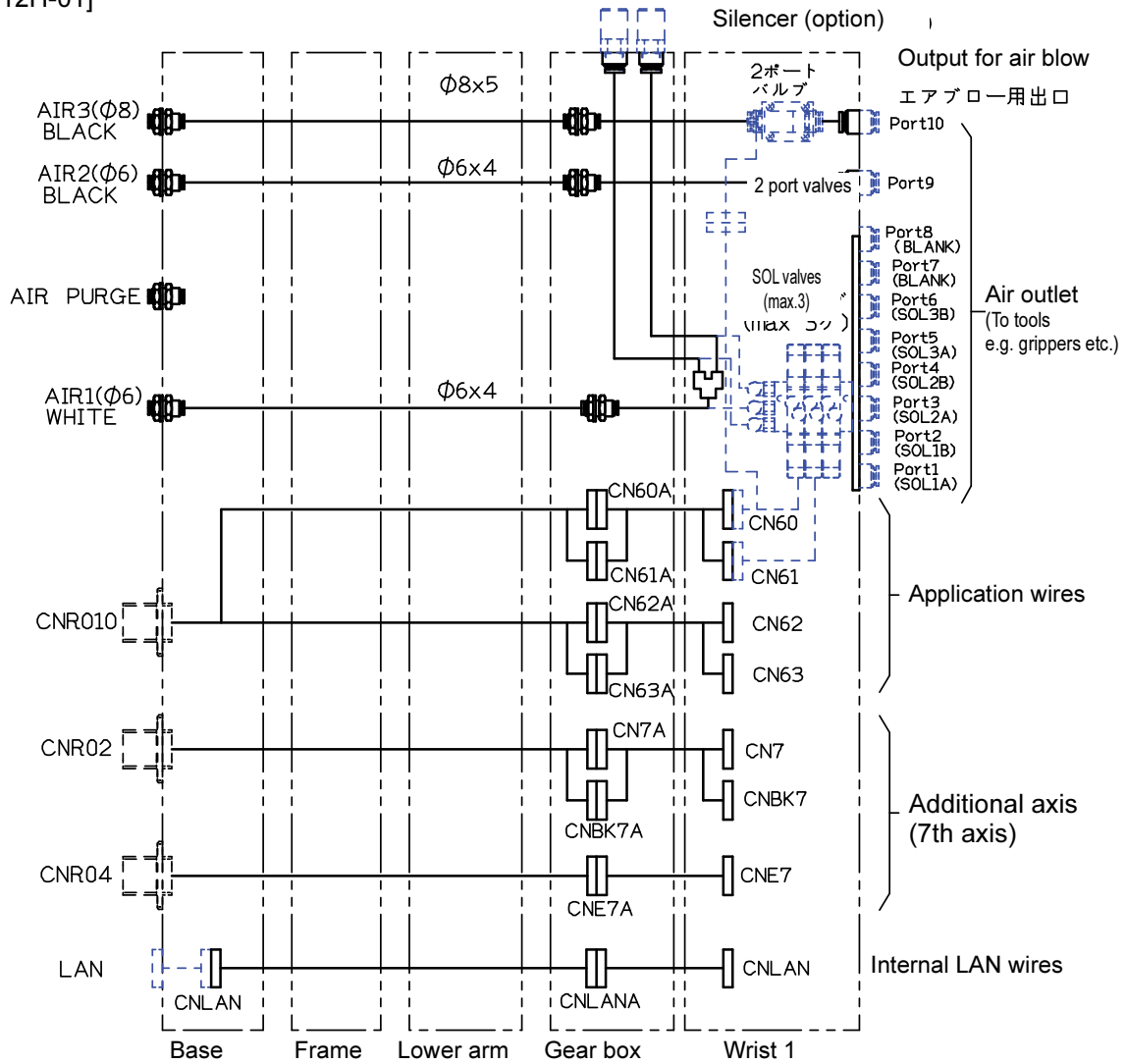
m: Tool mass
 (X_m, Y_m, Z_m): COG of tool on point A coordinate system

<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 (I_x, I_y, I_z) 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 I_x and I_y, because this depends on axis 6 position. Axis 6 inertia moment is I_z 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

[MZ12H-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.

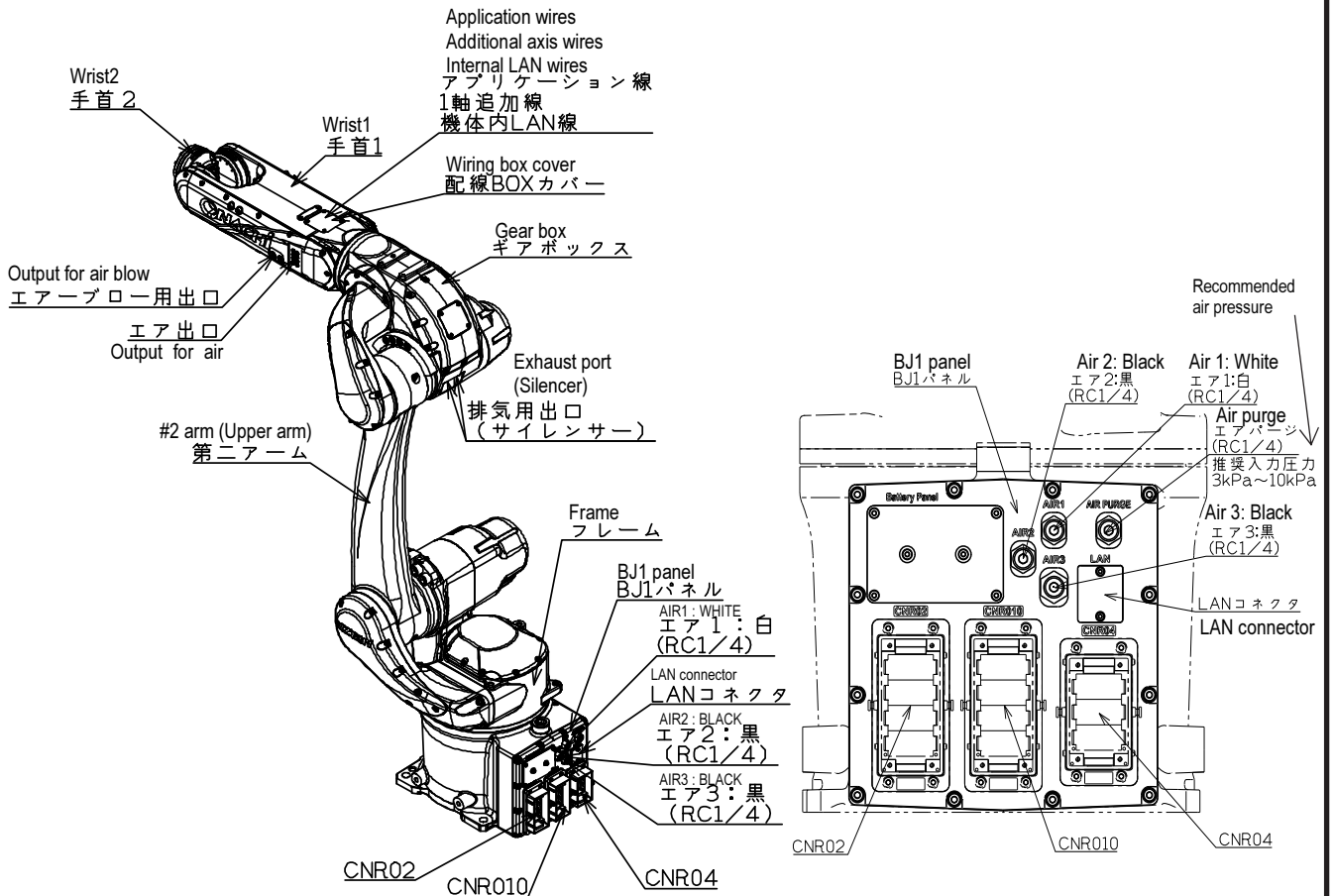
- Solenoid valves, 2 port valves, and silencer and the joints in this figure are mounted when "solenoid valve" option is selected.

- 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

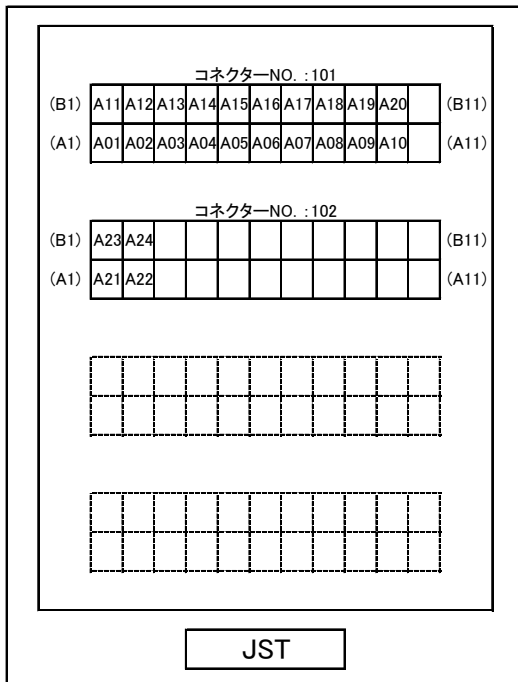
(*1) When selecting the internal valve for air blow, IOCABLE-80B-01M cannot be selected.

(*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

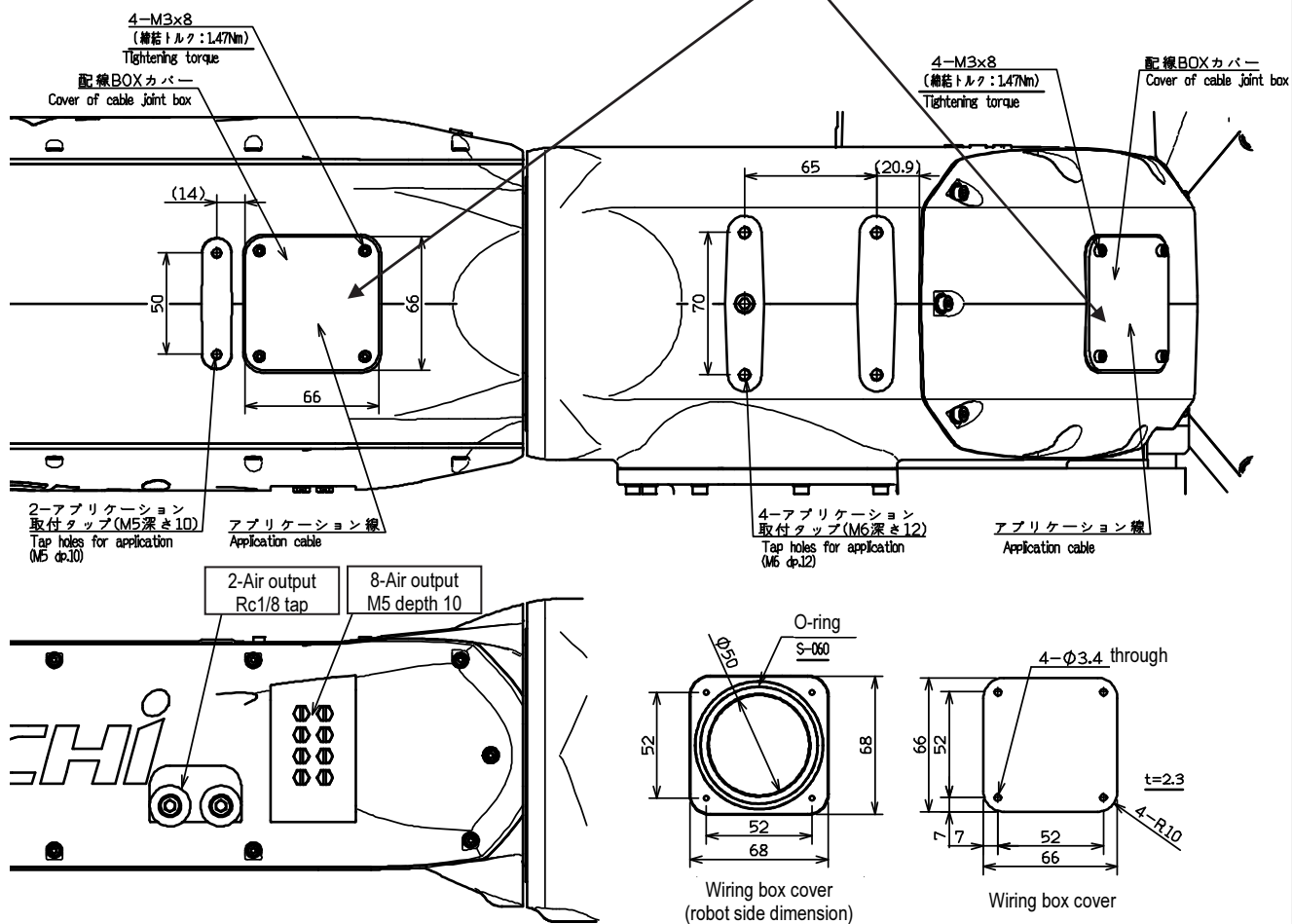
- JFM-WSA-4-A : φ26.2~φ28.0
- JFM-WSA-4-C : φ15.5~φ16.5

(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)".
Opposite side connector is available as option part "OPJ-EL-0040"

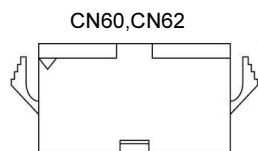
7.2.2 Wrist side (connector) wiring box cover portion and gear box cover portion

(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.

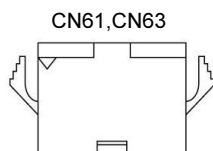


7.2.3 Wrist side connector (inside the arm)

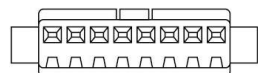
CN60, CN61, CN62, CN63 connectors



CN60, CN62



CN61, CN63

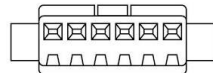


CN60

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



Connector in wiring box BJ1



Connector in wrist unit

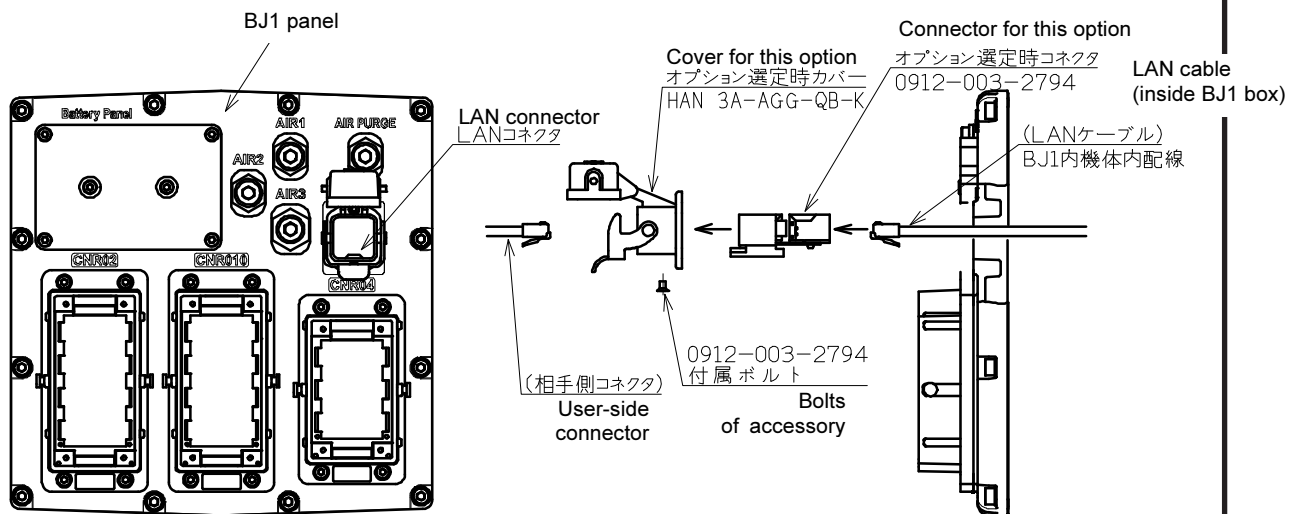
		CNLAN	CNLAN
Connector	RJ45 plug connector	6-2111989-3 (Tyco)	6-2111989-3 (Tyco)
User-side connector	Hood	RJ45 type connector	RJ45 type connector

(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.

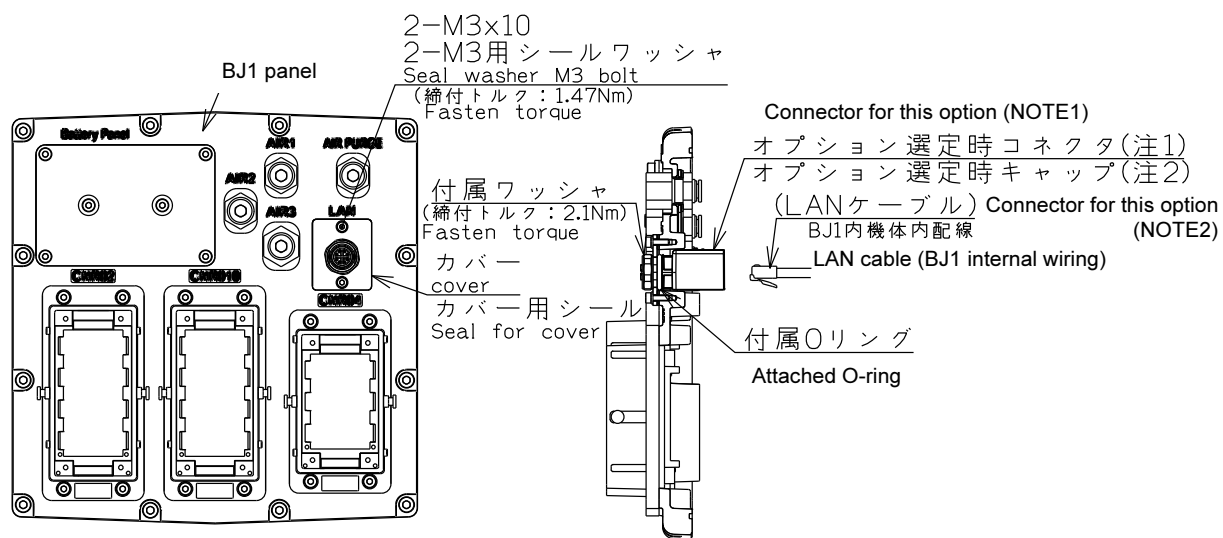
Name	Model number	Remarks
BJ1 panel LAN connector	OP-E2-008	RJ45 type
BJ1 panel LAN connector	OP-E2-010	M12 type (4pin (D code))
BJ1 panel LAN connector	OP-E2-011	M12 type (8pin (X code))
On arm LAN cable	CFD-OP139-CC003	

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

Refer to the figure below for the detail of BJ1 panel LAN connector (OP-E2-010,OP-E2-011).

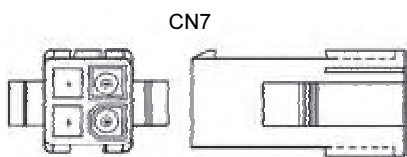


(NOTE1) The connector model to be used changes depending on the OP number.

	Connector	Cap
OP-E2-010	21033812401 (HARTING)	21010000003 (HARTING)
OP-E2-011	21033812800 (HARTING)	21010000003 (HARTING)

(NOTE2) The cap is not shown in this picture.

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

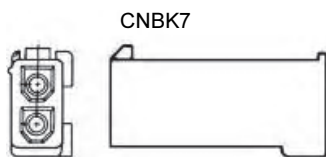
Housing 172167-1(TYCO)

Contact

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

Manual crimp tool

a: 1901260-1



1	PB
2	BA7

Connector model (CNBK7)

Housing 172233-1 (TYCO)

User-side connector

Housing 172165-1 (TYCO)

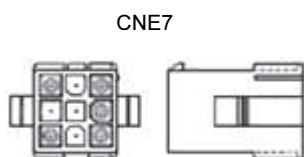
Contact

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

Manual crimp tool

a: 1901260-1

7.2.6 CNE7 connector (for additional axis)



(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

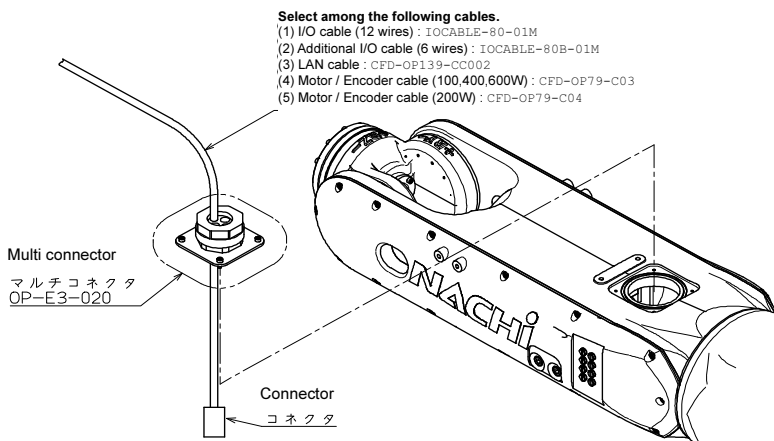
8.1 Mechanism option

No.	Item	Specification	Parts No.
1	Parts for installation *1	Chemical anchor specification (No welding) *10 Installation plate + 4 base plates (without pin hole) + chemical anchor bolts	OP-F1-044
		Chemical anchor specification(No welding) *10 Installation plate + 4 base plates (2 with pin hole, 2 without pin hole) + chemical anchor bolts	OP-F1-045
		Hammer drive anchor specification(No welding) *10 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*1	Restriction of axis 1 operation edge ($\pm 120^\circ$, every 10°)	OP-S5-037
3	Axis 2 adjustable stopper*1	Restriction of axis 2 operation edge (-15° , -30° , -45° from the forward and backward motion edge)	OP-A5-035
4	Axis 3 adjustable stopper*1	Restriction of axis 3 operation edge (-15° , -30° , and -45° from the backside of the motion edge)	OP-A6-033
5	Tools *1	Zeroing pin & Zeroing block	OP-T2-111
6	Hanging jig *1	Jig for ceiling installation (a jig to invert the robot body)	OP-S7-012
7	Solenoid valves in the arm *1	2-position double x1 *2	OP-H4-028
		2-position double x2 *2	OP-H5-029
		2-position double x3 *2	OP-H6-027
		3-position all port block x1 *3	OP-H4-029
		3-position all port block x2 *3	OP-H5-030
		3-position all port block x3 *3	OP-H6-028
8	Internal valve for air blow*1	2 port valve x1 *4	OP-H7-008
9	Transfer jig *5	For forklift (1 set including 2 jigs)	OP-S2-052
10	BJ1 panel LAN connector *1*6	BJ1 panel, LAN connector RJ45 specification	OP-E2-008
		BJ1 panel, LAN connector M12 specification (4pins (D code))	OP-E2-010
		BJ1 panel, LAN connector M12 specification (8pins (X code))	OP-E2-011
11	Wrist wiring clamp *1	Wiring/piping clamp parts set for J6 axis hollow hole	OP-W3-023
12	ISO flange *1	P.C.D.40	OP-W2-019
13	On arm multi connector *1*7	Wiring BOX cover and multi-connector	OP-E3-020
14	On arm I/O cable *1*8	I/O cable (connector + cable) 1.5m (12 wires)	IOCABLE-80-01M
15	On arm additional I/O cable *1*8	I/O cable (connector + cable) 1.5m (6 wires)	IOCABLE-80B-01M
16	On arm LAN cable *1*8	LAN cable (connector + cable) 1.3m	CFD-OP139-CC003
17	On arm motor cable *1*8	Motor / encoder harness 1.5m (for 100,400,600W)	CFD-OP79-C03
18	On arm motor cable *1*8	Motor / encoder harness 1.5m (for 200W)	CFD-OP79-C04
19	On arm motor cable *1*8	Motor / encoder harness 1.5m (for 100,400,600W compact connector type)	CFD-OP79-C08
20	Coolant resistance spec. on arm cable set A *1*9	Multi-connector (coolant resistance spec.) + I/O cable (12 wires) + LAN cable	CFD-OP176-A
21	Coolant resistance spec. on arm cable set B *1*9	Multi-connector (coolant resistance spec.) + I/O cable (12 wires) + LAN cable + Motor (100, 400, 600W)	CFD-OP176-B
22	Coolant resistance spec. on arm cable set C *1*9	Multi-connector (coolant resistance spec.) + I/O cable (12 wires) + LAN cable + Motor (200W)	CFD-OP176-C
23	Coolant resistance spec. on arm cable set D *1*9	Multi-connector (coolant resistance spec.) + I/O cable (12 wires) + Motor cable (100,400,600W)	CFD-OP176-D
24	Coolant resistance spec. on arm cable set E *1*9	Multi-connector (coolant resistance spec.) + I/O cable (12 wires) + Motor cable (200W)	CFD-OP176-E
25	Coolant resistance spec. on arm cable set F *1*9	Multi-connector (coolant resistance spec.) + I/O cable (12 wires)	CFD-OP176-F
26	BJ1 application plug*1	CNR010 connector parts set	OPJ-EL-0040
27	MZ12 internal I/O connector*1	CN60, 61, 62, 63 user-side connector parts set	OPJ-EL-0055
28	MZ12 internal additional axis connector*1	CN7, CNB7, 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-CC003)" 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) or (CFD-OP79-C08)	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-CC003)	Number of SOL
◎	○	○	○	×	1 to 2
◎	○	○	×	○	1 to 3
◎	×	○	○	○	1 to 2

◎: Required ○: Selectable ×: Not selectable

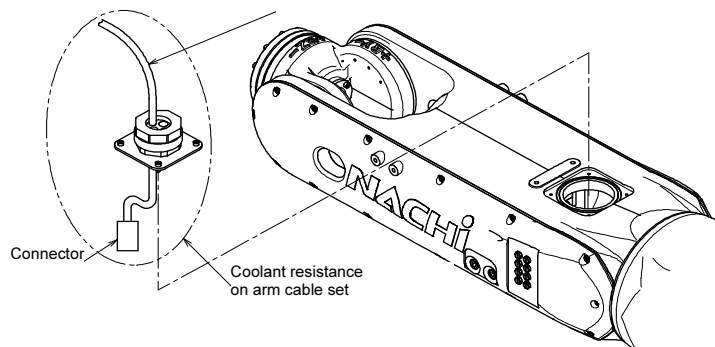


*9: As for the **“Coolant resistance on arm cable set”**, please select one from the table shown as below.

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 standard, Compact connector type)	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)	○				

The cable pass through styles are;

- (1) I/O
- (2) I/O + LAN
- (3) I/O + Motor/Encoder
- (4) Motor/Encoder



(NOTE) Refer to the following specification also.

“Standard specification CFDs Controller” (SCFEN-022)

“Standard specification CFD Controller” (SCFEN-010)

*10 This is not welded. When using this option, it is necessary to weld the plates when installing the robot. (Be careful not to damage the cables)

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	CFDs-3000	Motor / encoder harness (fixed)	C101S-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.
2	CFD-3020 /CFD-3030	Motor / encoder harness (fixed)	C101C-J1-##-A (## : cable length / 02,05,10,15,20,25[m])	
3		Motor / encoder harness (flexible)	C111C-J1-##-A (## : cable length / 02,05,10,15,20,25[m])	
4	FD11 (Direct inlet type)	Motor / encoder harness	A000F-J1-##-B (## : cable length / 05,10,15,20,25[m])	
5	FD18 (Connector type)	Motor / encoder harness	A100F-J1-##-B (## : cable length / 05,10,15,20,25[m])	
6	CFDs-3000 CFD-3020 /CFD-3030 FD11 FD18	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.

(NOTE)

- This option must be purchased without fail. If CFD-3020/3030 controller is connected, select one among No.1 and No.2. If FD11 controller is connected, select No.3. If FD18 controller is connected, select No.4. (If harness length is not enough, No.5 can be purchased in addition. This is not indispensable.)

- 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)

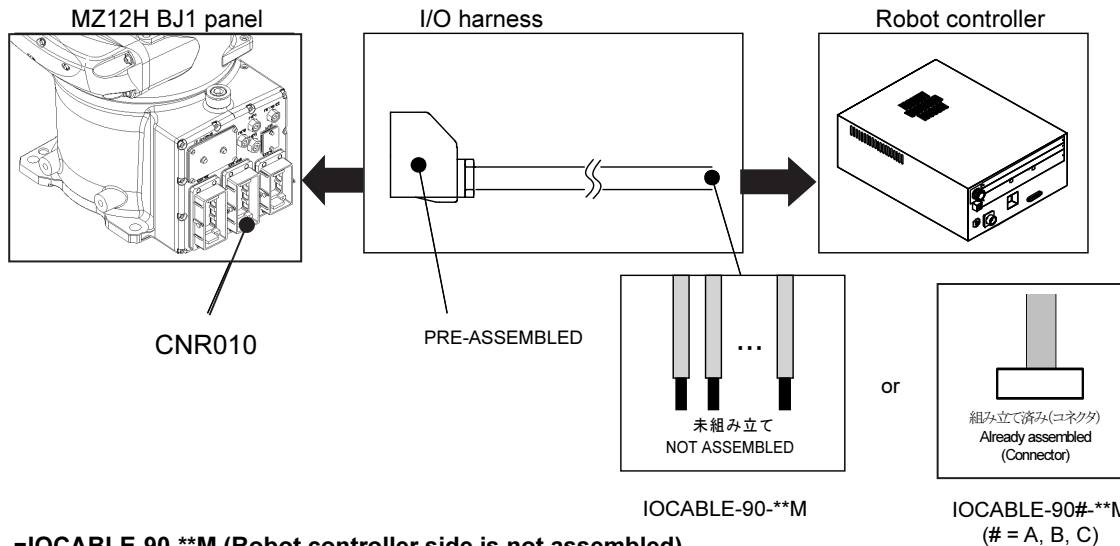
But, the wire-harness of the CFDs-3000 cannot be separated because the motor power cable and the encoder cable come out from 1 connector.

- CFD-3020/3030 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-3020/3030 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-3020/3030 Motor / encoder extension harness (flexible)
 - Motor cable diameter φ18.5mm, minimum bending radius: 120mm
 - Encoder cable diameter φ16.7mm, minimum bending radius: 100mm
- FD11/FD18 Motor / encoder extension harness
 - Motor cable diameter φ27mm, minimum bending radius: 162mm
 - Encoder cable diameter φ13.2mm, minimum bending radius: 80mm

Total length is 25m at maximum.

8.3 I/O harness (IOCABLE-90)

The I/O harness that is connected to the CNR010 is available as an option part.



■IOCABLE-90-**M (Robot controller side is not assembled)

The controller side is not assembled.

It is necessary to assemble the controller side considering the I/O interface type (e.g. "Digital I/O board" etc.). This cable can be used for CFDs controller, CFD controller and FD controller.

Connection type	I/O harness type	I/O interface (CFD controller side)	Remarks
Not considered	IOCABLE-90-**M (** : cable length[m]= 02,05, 10, 15, 20, 25)	Not considered	It is necessary to assemble the controller side considering the I/O interface type (e.g. "Digital I/O board" etc.).

■IOCABLE-90#-**M (Robot controller side is also assembled)

The controller side is already assembled. When using "Mini I/O board", please use this cable.

Depending on the connection type of the output signal (NPN / Relay / and PNP connection), different cable must be selected. Please refer to the following table and the standard specification "Standard specifications / CFD controller (SCFEN-010)", "4.4 I/O option".

The CFDs controller does not have an IO cable with a pre-assembled connector on the control panel side. It is not supported.

Connection Type	I/O harness type	I/O interface (CFD controller side)	Remarks
NPN connection	IOCABLE-90 <u>A</u> -**M (** : cable length[m]= 02, 05, 10, 15, 20, 25)	Mini I/O board CFD-OP150-A or -C	The model of the Mini I/O board may differ depending on the presence or the absence of the RMU (*2), but the same I/O harness model can be used.
Relay connection	IOCABLE-90 <u>B</u> -**M (** : cable length[m]= 02, 05, 10, 15, 20, 25)	Mini I/O board CFD-OP150-B or -D	The model of the Mini I/O board may differ depending on the presence or the absence of the RMU (*2), but the same I/O harness model can be used.
PNP connection (*1)	IOCABLE-90 <u>C</u> -**M (** : cable length[m]= 02, 05, 10, 15, 20, 25)	Mini I/O board CFD-OP150-B or -D	The model of the Mini I/O board may differ depending on the presence or the absence of the RMU (*2), but the same I/O harness model can be used.




*1; PNP connection type is mainly for Europe.

*2; Concerning the "RMU (Robot Monitoring Unit)" and the "Mini I/O board", please refer to "Standard specifications / CFD controller (SCFEN-010)", "4.4 I/O option".

For details of the connection, please refer to the following manual.

- ➔ "CFD/CFDL/CCZ CONTROLLER INSTRUCTION MANUAL: OPTION (I/O CONNECTION)"(TCFEN-183)
"Chapter 2 Mini I/O", "2.5 Mini I/O board cable "IOCABLE-90" for MZ12 (option) "
- ➔ "INSTRUCTION MANUAL OPTION (MZ12H)"(TCFEN-248)
"Chapter 8 MZ12H I/O harness"

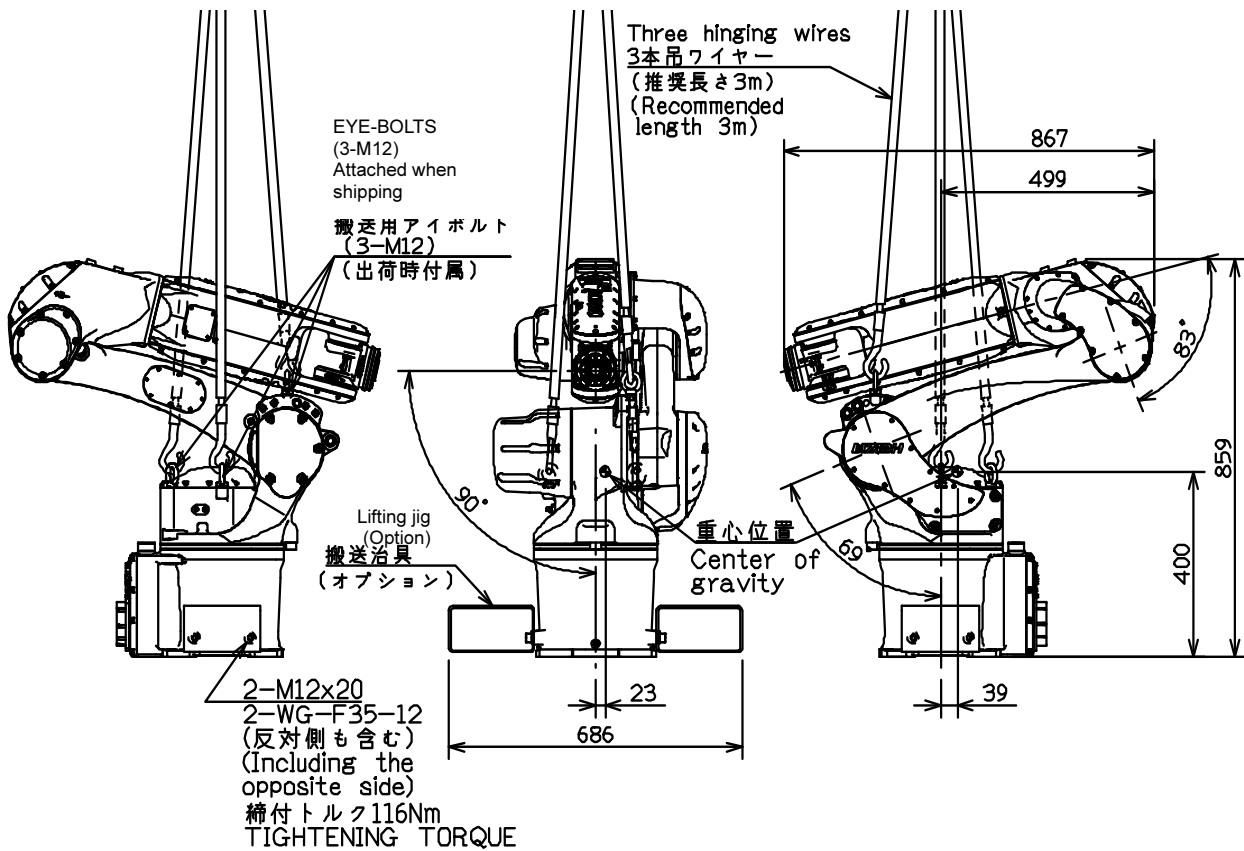
9. Delivery style (specification which contains a robot)

 WARNING	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.)
 WARNING	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.)
 WARNING	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.

[MZ12H-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)

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






12. Paint color (Robot)

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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