Robostar Robot Controller N2M Series Installation and handling Manual

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- (8) Damages in cost other than the cost of robot repairing

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For safe use

I. Safety for robot(Generals)

Be sure to fully understand the manuals for safe use of this product. Each manual includes the following notations for subjects requiring carefulness necessary for the safe use of this product, and therefore carefully read the manual before using this product

■ Safety Signs

| Sign | Meaning | |
|-------------|--|--|
| DANGER | This sign indicates that, if handled incorrectly, the serious life or property damage may be caused. | |
| WARNING | This sign indicates that, if handled incorrectly, the product failure, malfunction or accident may arise. | |
| CAUTION | This sign indicates that the product may malfunction or may not work due to incorrect use, and shows a matter requiring attention. | |
| PROHIBITION | This sign shows the matter that is to be prohibited for normal use of the product. E.g.) Never use a fire. | |
| Required | This sign shows the matter that must be performed for normal use of the product. E.g.) Compulsory ground is required. | |

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Since this robot and robot controller are industrial equipment manufactured with advanced technology, please be sure to observe the following matters in order to prepare for accidents that may occur.



For safe and more efficient use, please operate the robot after reading all the documentations.



WARNING

All of the load and power must be used within the range of rated load and power spec. In particular, make sure before use that the input power is AC 220V.



CAUTION

When installed, the robot must be securely fixed so as not to be shaken.

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For safe operation, a safety net must be installed around the robot.



Make sure to check the wirings of a controller before powering on it.Due to the incorrect wirings, the machine may not work properly.



To prevent electrical shock, be sure to install FG (Frame Ground).

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Be careful not to enter into the range of motion of a robot while the robot is operating or in the operable state.

DANGER Please note such subject even if the robot is in stationary state.



If many people work at the same time, especially in powering ON/OFF and driving a motor manually, be sure to check the mutual safety before starting the work.



When in maintenance of the robot, be sure to unplug a power cord of the controller

CAUTION

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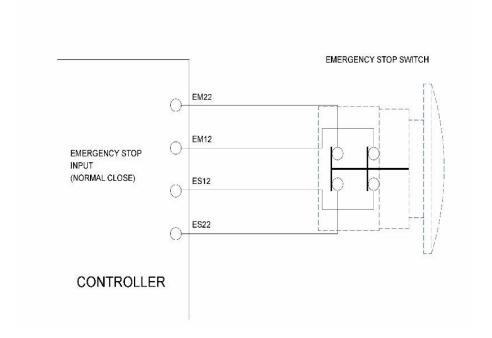
II. Safety for robots(Details)

- (1) For the safety of workers, be sure to wear a helmet, safety shoes, etc.
- (2) When before turn on the power, check that there is no people within the area of robot motion and then operate the robot.
- (3) When entering into the area of the robot motion for maintenance or inspection, be sure to power OFF the robot.
- (4) If a cable of the robot is installed in a pathway, prevent the cable from damage by using a cover or a duct.
- (5) As soon as the cable damage is found, replace it immediately.
- (6) Do not operate the robot under the load exceeding nominal weight.
- (7) Be sure to fully understand the instruction manual before operating the robot.
- (8) In the case of installing a safety net
 - ① Give it sufficient strength to withstand reactions that occur during work, or environmental conditions, and do not have it be easily moved, destroyed, or climbed.
 - ② Remove the dangerous parts, such as sharp edges or burr.
 - ③ Firmly fix it.
 - ④ If you are installing a safety net having a door, install a detector or other sensors so that the robot is stopped immediately after the door is opened.
 - ⑤ The safety net must be distanced by 40 cm or farther from robot motion area and the robot body.

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- (9) External Emergency Stop Switch
 - ① Mount an emergency stop switch at the place where an operator can easily operate the robot.
 - ② The color of the emergency stop switch is to be red with yellow circumferential band for easy discrimination of its position.
 - ③ Use the emergency stop switch which does not automatically return.



- (10) Ground Specification
 - Class 3 Ground (Ground resistance is not more than 100Ω .)
- (11) Lamp indicating the robot power supplying status
 - Install a lamp which indicates whether the power source is being supplied to the robot

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III. Safety Function

- (1) Definition of safety functions.
 - ① Emergency Stop Function IEC 204-1,10,7
 There is one emergency stop switch on the controller and the teach pendant. The emergency stop function is a function that has priority over all control functions of the robot. It stops the power supply of each axis of the robot, stops the operating state, and removes the power so that other dangerous functions controlled by the robot cannot be used
 - Safe stop function EN SIO 10218-1:2006
 A safety stop circuit must be configured, and each robot must allow the safety device and interlock to be connected through this circuit. The robot must have a number of electrical input signals so that it can be connected to and used with external safety devices such as safety gates, safety pads, and safety lights. These signals enable the robot to perform the safety functions of the robot itself and from all facilities such as peripheral equipment.
 - Speed limit function EN ISO 10218-1:2006
 In the manual operation mode, the robot speed is limited to a maximum of 250 mm/s.
 The speed limit applies to all parts of the robot that performs manual operation as well as JOG.
 - Restriction of operation area ANSI/RIA R15.06-1999
 The motion area of each axis is limited by the soft limit. In addition, it is a function to limit the operation area even by a mechanical stopper.
 - Selection of operation mode ANSI/RIA R15.06-1999
 The robot can be operated in manual or automatic mode. In manual mode, the robot is operated only by the teach pendant.
- (2) Safety electric circuit

The robot's safety system consists of a double safety electric circuit that continuously monitors its condition.

If an error is detected, the motor power is cut off immediately and the motor brake is activated. To return to the motor ON state, all switches of the double electric circuit must be connected. If any one of the double switches of the safety circuit is shorted, the motor contact is cut off and the brake is activated to stop the robot.



Make sure that safety circuits are never ignored, modified or altered in any way.

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IV. Install

(1) Safety net installation

Since there is a risk of collision between the robot and the operator during robot operation, install a safety net so that the operator does not come close to the robot. An accident may occur due to accidental entry by workers or others.

For inspection of robots or welding fixtures, tip dressing, or tip exchange, configure the robot to stop when the door of the safety net is opened and the facility is approached while the robot is operating.

- ① The safety net should cover the robot motion area, and secure enough space so that the operator does not interfere with teaching and maintenance work, make it sturdy so that it cannot be moved easily, and make it a structure where people cannot easily cross over.
- ② In principle, the safety net must be installed in a fixed type, and use a safety net that does not have dangerous parts such as irregularities or sharp parts.
- ③ Install a door to allow entry into the safety net, and when the safety net is open, wire so that the robot is ready for operation and the motor is off.
- ④ Install the emergency stop button of the robot where the operator can quickly press it.
- ⑤ If the safety net is not installed, install a detection device such as a sensor so that the robot automatically stops.



➤ Since there is a risk of collision between the robot and the operator during the operation of the robot, provide a safety net so that the operator does not come close to the robot.

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(2) Robot and peripheral device placement

- i. When connecting the primary power of a controller or peripheral device, check whether the supply side power is off before starting the work. Since 220V high voltage is used as the primary power source, there is a risk of electric shock.
- ii. Attach the [Do not enter while driving] label at the entrance of the safety net, and inform the operator of that.
- iii. Arrange all the controllers, interlock panels, and other control panels so that they can be operated from outside the safety net.
- iv. When installing the operation stand, attach the emergency stop button to the operation stand as well. It must be possible to stop in an emergency in all places where the robot is operated.
- v. Do not let the robot body, controller, interlock panel, etc. wiring and piping get caught in the operator's feet or stepped on by a forklift. There is a risk of electric shock to the operator or an accident where the wiring is disconnected.
- vi. Place the controller, interlock panel, and operation stand where the movement of the robot body can be seen sufficiently. There is a risk of a large-scale accident if an abnormality occurs in the robot where the robot's motion is not visible, or the operator is working, or if the robot is operated.
- vii. If the required robot working area is narrower than the robot's operable area, limit the robot's motion area. It can be limited by soft limit or mechanical stopper. Even if a motion outside the restricted area occurs due to an abnormal operation such as an incorrect operation of the robot, the robot automatically stops by the motion area limitation function in advance.
- viii. Do not design a system that carries your hand inside the safety net to carry in or take out work. There is a risk of crushing or cutting accidents.



▶ Be sure to place the robot and peripheral devices in the same way as above.

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Chapter 1 Controller Overview

1. Features

N2M Series Controller is a high-performance robot controller for a wide variety of applications, and has the following features.

- 6 axis Vertical articulated robot
- Controls 2 to 6 axis Cartesian coordinate robot and SCARA robot
- Full-digital servo system
- Supports the multi-robot (2 channels)
- Could be connect up to 8 axes with EtherCAT commercial servo driver
- Easy to change various parameters and the gain (changeable by the software)
- Monitoring available while in operation
- Provides rich input-output interfaces
 - System In/Out(20 points/20 points), Option In/Out(32 points/32 points)
- Plenty of robot commands
- Offers the versatile online program (Unihost)

In addition, the performance of the robot controller has been improved and the following functions are available.

- Palletizing, sealing, etc.
- 2D and 3D interpolation control of the arc, circle, high-speed, and high precision
- Parallel processing of the robot commands while processing the input and output and the movement command depending on the conditions
- Variety of pass motions, such as setting the travel distance (PFOS), travel distance ratio (FOS), etc.

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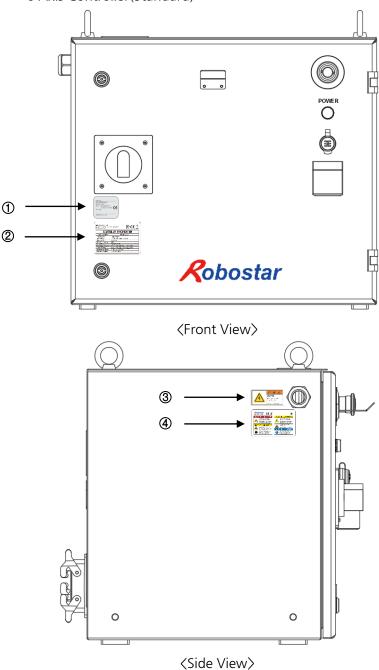


2. Name plate

The model name of the controller is written on a name plate or paper which is attached to a front side and top side of the controller as shown below. For identification of the model name, refer to a code table below.

2.1 Position of name plate

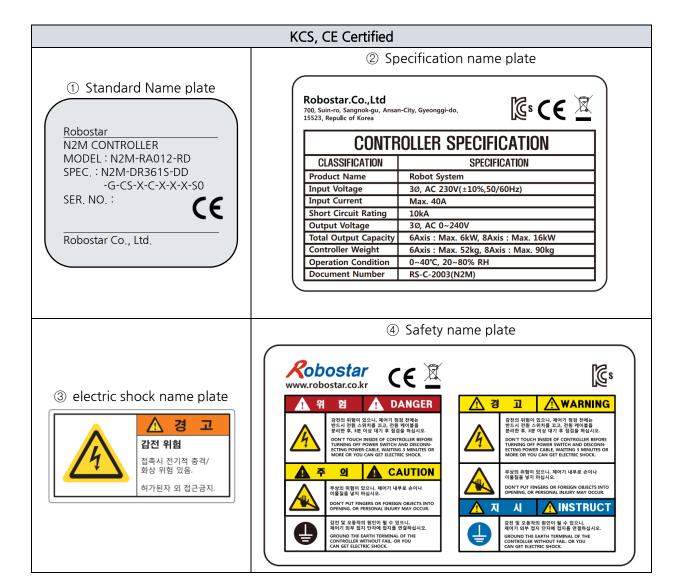
■ 6 Axis Controller(Standard)



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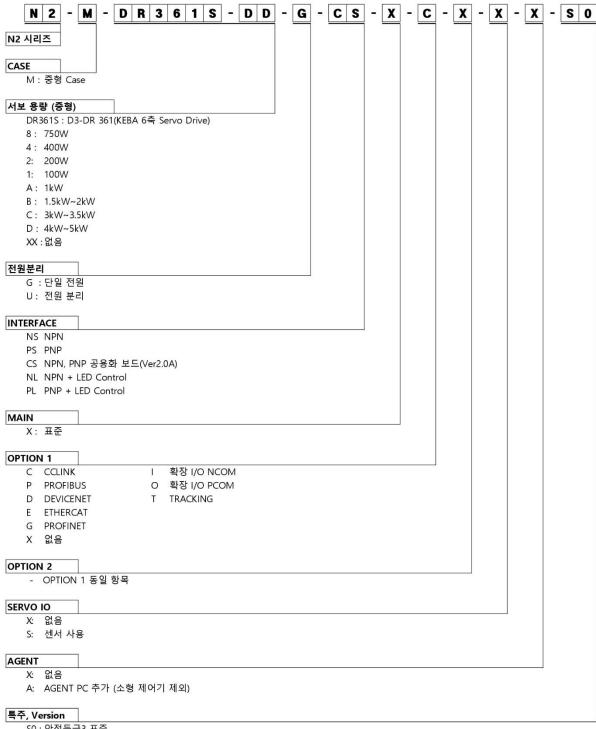
2.2 Name plate



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3. Code table for specification



SO: 안전등급3 표준

S1 : 안전등급3 전원용량 확장

TJ: N2M천진 C3

VH N2MVH OOB 세트 로딩/언로딩

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4. Software version

The version of software in the controller can be checked by a teaching pendant, as shown below.

Step 1.

Teach Pendant

⟨MANUAL MODE⟩
1. JOB 2.RUN
3. HOST 4.PARA
5.ORIGIN 6. I/O
7.GVAL 8. GPNT
9.INFO A. REMOTE
ITEM #

2.CONT Select

After Boot

9. INFO Select

(INFO)

1. ROBOT 2.CONT 3. LOG 4.USB 5. COMM 6.E_STATE

ITEM #

Check Software Version

⟨INFO:CONT(1/3)⟩ N2-SERIES MAIN B/D VER.

01.00.02-C3 (AR 200423_STD)

PRE NEXT EXIT

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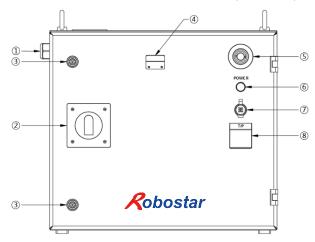


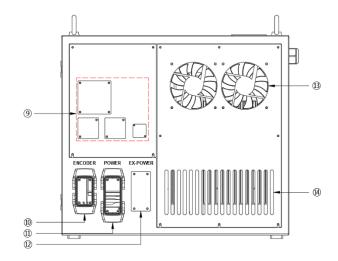
5. Name of Parts

The following shows the names of each part of the appearance of the controller. For more information, see the table below.

5.1 Front and Rear View

■ 6 axis Controller(Standard)





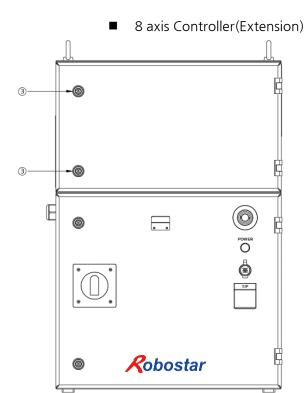
〈Front View〉

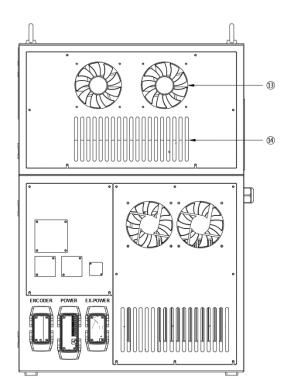
⟨Rear View⟩

| No. | Description | | |
|-----|---------------------------------|--|--|
| 1 | Main power entrance | | |
| 2 | Main power switch | | |
| 3 | door lock | | |
| 4 | Teach pendant and cable hook | | |
| (5) | Emergency stop switch | | |
| 6 | AC Power ramp | | |
| 7 | Ethernet port | | |
| 8 | Teach pendant connector | | |
| 9 | I/O and Fieldbus cable entrance | | |
| 10 | Robot encoder connector | | |
| 11) | Robot power connector | | |
| 12 | External axis power connector | | |
| (3) | Intake fan | | |
| (4) | Exhaust vent | | |

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⟨Front View⟩

⟨Rear View⟩

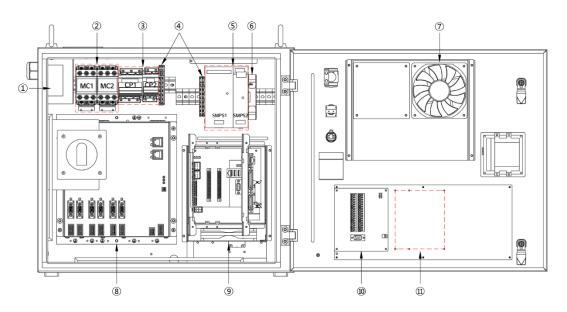
| No. | Description | |
|------|--------------|--|
| 3 | Door lock | |
| (13) | Intake fan | |
| (14) | Exhaust vent | |
| (4) | | |

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5.2 Inside view

■ 6 axis controller(Standard)



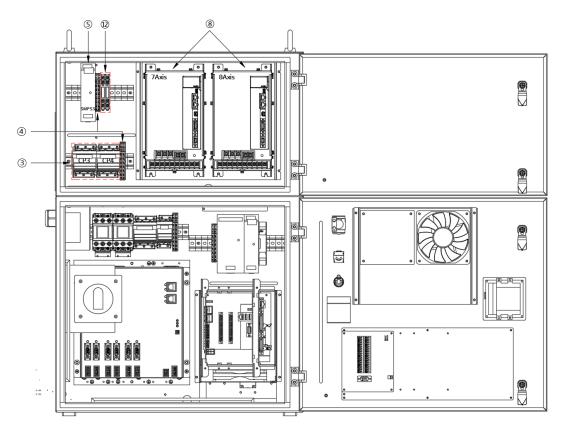
⟨Inside view⟩

| No. | Description |
|-----|---|
| 1 | Noise filter |
| 2 | Magnetic contactor(MC1, MC2) |
| 3 | Circuit protector(CP1, CP2, CP3, CP4) |
| 4 | Terminal block |
| (5) | SMPS(SMPS1,SMPS2,SMPS3) |
| 6 | SAFETY UNIT |
| 7 | Internal circulation fan |
| 8 | Servo Drive |
| 9 | PC Box module |
| 10 | Safety terminal board |
| 11) | Space for User I/O terminal board(OPTION) |

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■ 8 axis Controller(Extension)



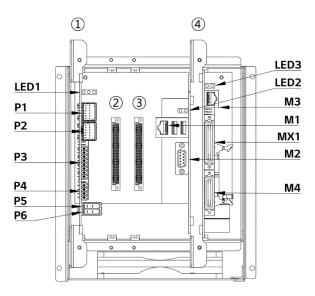
⟨Inside view⟩

| 번호 | 설명 |
|-----|---------------------------------------|
| 3 | Circuit protector(CP1, CP2, CP3, CP4) |
| 4 | Terminal block |
| (5) | SMPS(SMPS1,SMPS2,SMPS3) |
| 8 | Servo drive |
| 12 | 7Axis, 8Axis brake control relay |

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5.3 PC Box Module



⟨PC Box module⟩

| No. | Description | | |
|------|--|--|--|
| 1 | Power Riser Board | | |
| 2 | Option Board slot2(Option I/O, Field Bus, etc.) | | |
| 3 | Option Board slot1 (Option I/O, Field Bus, etc.) | | |
| 4 | Main board and interface board | | |
| P1 | Magnetic contactor connector | | |
| P2 | FAN1~FAN4 connector | | |
| P3 | FAN5~FAN8 connector(option) | | |
| P4 | Power sense connector(option) | | |
| P5 | IO 24V power connector | | |
| P6 | SAFETY 24V power connector | | |
| M1 | Ethernet, USB connector | | |
| M2 | RS-232C connector | | |
| M3 | Field Bus(EtherCAT) connector(interface) | | |
| M4 | Teach Pendant connector | | |
| MX1 | USER I/O connector(input 20/output 20) | | |
| LED1 | MAIN12V, IO24V, SAFETY 24V power LED | | |
| LED2 | MAIN board power LED | | |
| LED3 | Interface board status LED | | |
| LLU3 | (Green: EtherCAT, Red: I/F alarm) | | |

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6. Specifications

6.1 General specifications

■ Installation Environment

| Item | | Description |
|---------------------------------|--------------|---|
| Standard | Supply power | AC 220V(+10% ~ -15%) , 3 Phase, 50 ~ 60Hz, 40A(MAX) |
| Short circuit rating | | 10kVA |
| Encoder specification | | 17bit/23bit Encoder (Serial Type) |
| Ambient temperature for use | | 0 ~ 40°C |
| Ambient humidity for use | | 20 ~ 80% RH (No dew formed) |
| Ambient temperature for storage | | -15 ~ 60°C |
| Ambient humidity for storage | | 10 ~ 90% RH (No dew formed) |

■ Performance

| Item | | Desc | ription |
|----------------------------|-------------------------------|---|--|
| Withstanding Voltage | | AC-FG 1.5kV for 1 min., Prim | ary-Secondary 3kV for 1 min. |
| Immunity to Source Noise | | ±2,500Vp-p , 1usec. , for CON for 1 min. | MMON and Normal each, |
| Noise | Motor/Encoder | ±2,500Vp-p, 1usec, under inc | duced noise for 1 min. |
| Immunity | I/O | ±2,500Vp-p, 1usec, under inc | duced noise for 1 min. |
| Insulation Resistance | | Input power-to-FG: 1MΩ or r | more |
| - | o Instantaneous er Failure | 1/2 cycle per 10 periods of th | e Input power frequency |
| | | J1 ~ J3 axis : Continuous. 6A | (Max. 18A) |
| Serv | o capacity | J4 ~ J6 axis : Continuous. 3A | (Max. 9A) |
| | | E1 axis : Continuous. 32A (Max. 90.88A) (ref. 1) | E2 axis: Continuous, 32A (Max, 90.88A) (ref. 1) |
| 1/0 | Minimum Input Current | 5mA/1point | |
| I/O Maximum Output Current | | 50mA/1point | |
| Brake Control | | 24V motor brake drive | |
| Motor Control | | AC servo motor drive (Sine wa | ave PWM current control) |

ref. 1) Additional shaft specifications are in accordance with the maximum installation specification and are rated for 5 kW servo capacity and maximum current (A).

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■ Specification

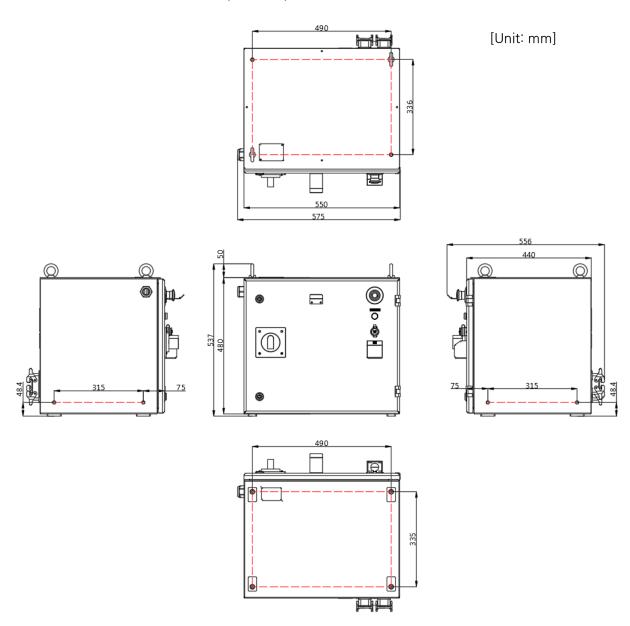
| ltem | | Function | |
|--------------------------------|---------------|---|--|
| CPU/OS | | X86 Quad Core / RTOS | |
| Motion Control Type | | PTP,CP | |
| Controll | able Axes | 8 axes | |
| Servo Dr | ive System | All-axis Full-digital AC Servo | |
| Input/output | User | User In/Out(20pts./20pts.) | |
| (I/O) | Option | Ext. User In/Out (32pts./32pts.), Maximum (64pts./64pts.) | |
| Teaching Type | | Jog Teaching (Teach Pendant) MDI Teaching (Teach Pendant) On-Line Teaching (Uni-Host) | |
| Robot L | _anguage | RRL 2.0 (ROBOSTAR Robot Language Version 2) | |
| Robot | Job | Maximum 250 EA | |
| Program Support | Step | Maximum 10,000 step | |
| Standard | Global Points | Integer 1,000 EA, Real 1,000 EA | |
| External Communication(option) | | CC-Link, CC-Link IE, EtherCAT, Ethernet IP, ProfiNet | |
| Error Ir | ndication | Teach Pendant | |
| On Line | Functions | Job, Point, Parameter Up/Down, Edit, Storage | |
| Protection Functions | | IPM Error , Over Current , Over Load , Over Speed , Position Error, etc. | |
| Special Functions | | 3D Palletizing, In-Out Parallel Processing, Real-time Velocity Control | |
| Cooling Type | | Forceful Blowing | |
| Dimension | | 6Aixs controller: 550 (W) x 440 (D) x 480 (H) | |
| | | 8Aixs controller: 550 (W) x 440 (D) x 800 (H) | |
| Weight | | 6Aixs controller: Max. 52kg | |
| | | 8Aixs controller: Max. 90kg | |

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6.2 Product dimension

■ 6 axis controller(standard)

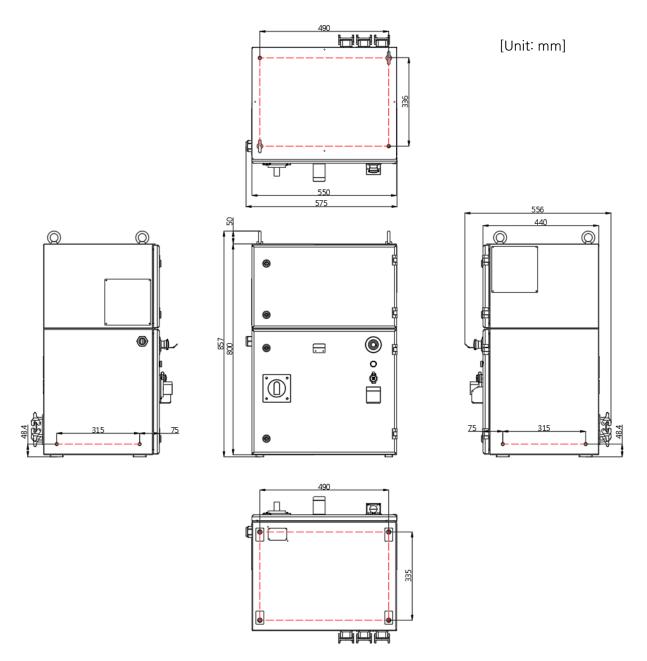


| Item | Size |
|-----------------|-----------------------------|
| Box only | 550 (W) x 440 (D) x 480 (H) |
| With components | 575 (W) x 556 (D) x 537 (H) |

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■ 8 axis controller(extension)



| Item | Size |
|-----------------|-----------------------------|
| Box only | 550 (W) x 440 (D) x 800 (H) |
| With components | 575 (W) x 556 (D) x 857 (H) |

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Chapter 2 Installation of controller

1. Getting proper installation environment

1.1 Conditions for installation environment

- Since the robot and the controller are not intended to be of anti-explosion, dust-proof, or drop-proof standard, they cannot be installed at the following places.
- (1) Environment where flammable gases, flammable liquids, etc. is used
- (2) Environment where conductive materials such as metal processed chip is scattering
- (3) Environments with acid or alkali corrosive gas
- (4) Environments with the mist such as cutting liquid or grinding liquid
- (5) Environments with the mist such as cutting liquid or grinding liquid containing the oil component
- (6) Environment close to the electrical noise sources, such as a large inverter, high-power frequency oscillator, a large conductor, welding machine, etc.

1.2 Ambient temperature and humidity

- \blacksquare Ambient temperature range in operation is to be 0 to 40 $^{\circ}$
- Be the humidity 80% RH (MAX) or less
- Make well-ventilated and be less dust, dirt and moisture.

1.3 Vibration

■ Install the robot at the place where is away from the environment subjected to excessive vibration and shock.



> The installation environment for a robot body and a controller unit is very important. Be sure to observe the following installation environment. If the installation environment is not proper, the function and performance may not be fully accomplished, as well as the life of the device may be shortened and unexpected failures may be caused.

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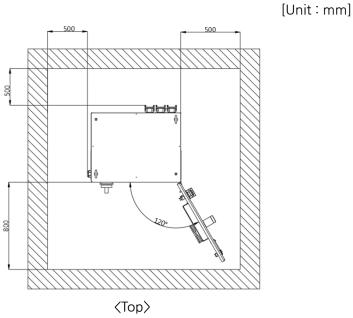
2. Installation space

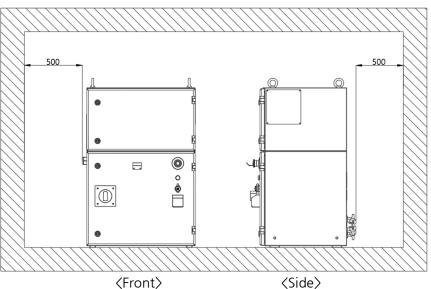
Prepare the enough space taking into consideration the robot cable bending, cooling fan interference or the like, as shown below

■ The minimum clearances

- Install at least 400mm above the ground.
- Install at least 500mm away from walls.

(1) N2M Controller





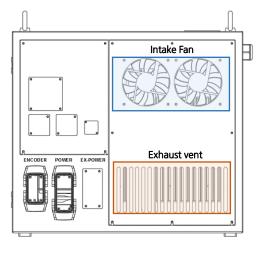
Robostar Co., Ltd. 30 / 87

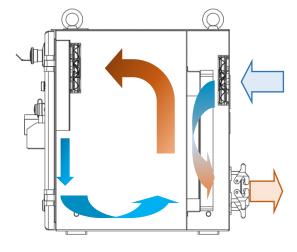


3. Ventilation direction

Ventilation direction of the controller is as follows. Consider it when in controller installation

■ 6 axis controller(standard)

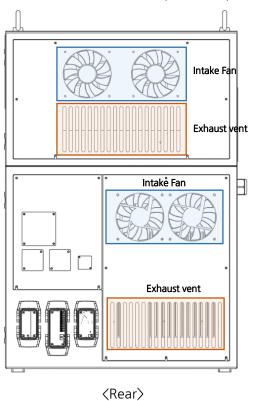


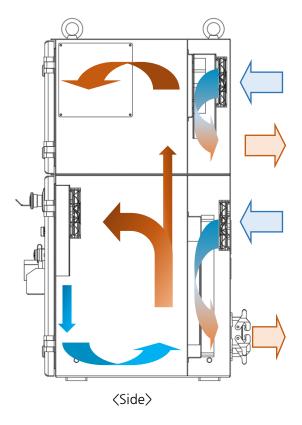


⟨Side⟩

⟨Rear⟩

■ 8 axis controller(extension)







The cooling method of the controller is a forced blowing method using fans.

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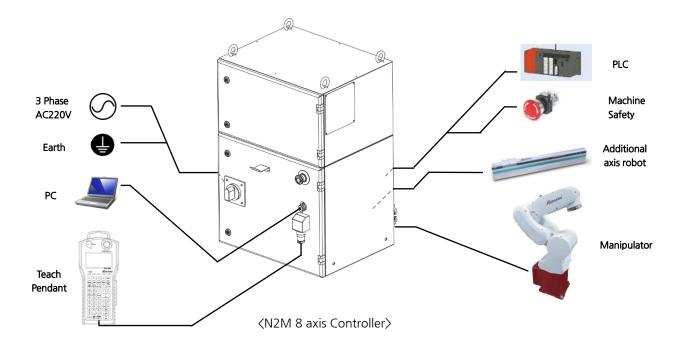


Chapter 3 Robot Connection and External Interface

1. Construction of robot system

N2M Series Robot System is constructed as follows. For the interface of each part, see the next chapter.

■ Construction of robot system



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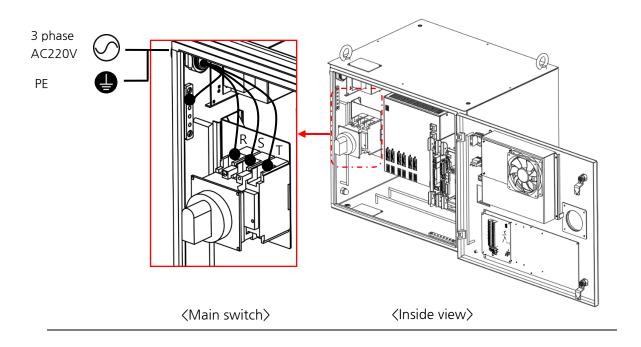
2. Controller connection

2.1 AC power cable

Interface for feeding AC power supply to the motor.

■ AC power connector

| Controller Connection | BW50SAG-3P040, FUJI |
|-----------------------|---------------------|
| Cable Specification | 4C, AWG 10, UL1015 |



CAUTION

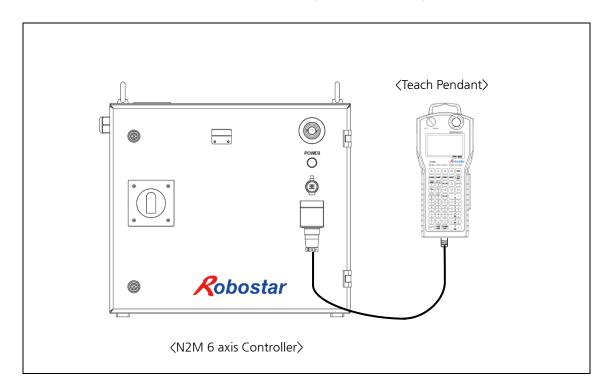
▶ In case the connector of the power cable to robot is wrongly connected, a circuit breaker shuts off or the inside of the controller may be damaged.

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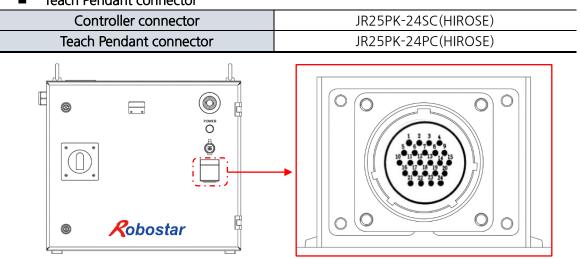


2.2 Teach pendant connection

The picture below shows how to connect the Teach Pendant. Refer to the table below for connector specifications and pin-out.



■ Teach Pendant connector



CAUTION

▶ Be sure screw-lock with connection. If the connector is disconnected, controller status will be emergency stop.

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| Teach Pendant Connector pin out | | | |
|---------------------------------|-----------------|-----------------------------|--|
| No. | Signal | Description | |
| 1 | P12V-1 | D 43V | |
| | P12V-2 | Power 12V | |
| 2 | G12V-1 | Danier CND | |
| | G12V-2 | Power GND | |
| 3 | RS-232 RX | RS232 data receive | |
| 4 | RS-232 TX | RS232 data transmit | |
| 5 | TP DEADMAN NC11 | DeadMan NC contact 11 | |
| 6 | TP DEADMAN NC12 | DeadMan NC contact 12 | |
| 7 | ETHERNET RX+ | Ethernet data receive+ | |
| 8 | TP EMG NC12 | T/P Emergency NC contact 12 | |
| 9 | TP EMG NC22 | T/P Emergency NC contact 22 | |
| 10 | TP DEADMAN NC21 | DeadMan NC contact 21 | |
| 11 | TP DEADMAN NC22 | DeadMan NC contact 22 | |
| 12 | ETHERNET RX- | Ethernet data receive- | |
| 13 | ETHERNET TX+ | Ethernet data transmit+ | |
| 14 | TP EMG NC11 | T/P Emergency NC contact 11 | |
| 15 | TP EMG NC21 | T/P Emergency NC contact 21 | |
| 16 | TP MODE NC | T/P Mode NC contact | |
| 17 | TP MODE NO | T/P Mode NO contact | |
| 18 | ETHERNET TX- | Ethernet data transmit- | |
| 19 | GP OPEN | G T/P Connection open input | |
| 20 | TP OPEN | T/P connection open input | |
| 21 | TP MODE COM | T/P mode common contact | |
| 22 | TP MODE | T/P mode status input | |
| 23 | TP DM | Deadman status Input | |
| 24 | TP EMG | T/P Emergency status Input | |

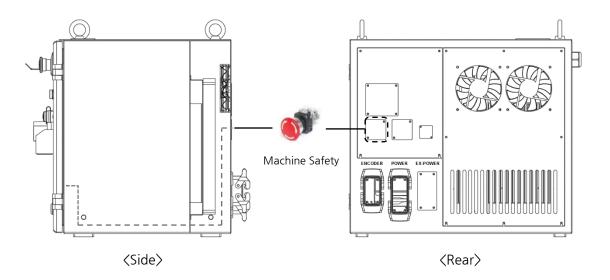
Robostar Co., Ltd. 35 / 87

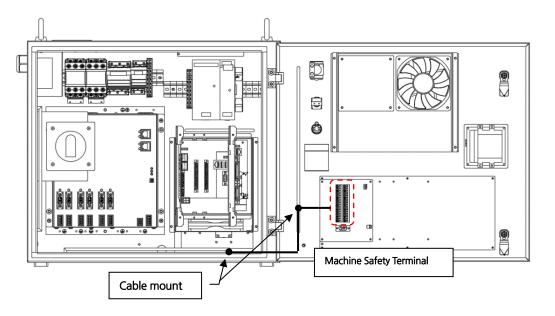


2.3 Machine Safety Circuit Interface

This indicates how to connect machine safety input/output interfaces. It is possible to construct safety circuit(more than 3 of Safety Category) through machine safety input/output interfaces

■ Path of cable





⟨Path of Cable⟩

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■ Machine safety input terminal block(CN2)

| Controller terminal block | 250-516(Wago) | |
|--|----------------------|--|
| Connection terminal | 20AWG, 8 mm, Ferrule | |
| 1 2 3 4 5 6 7 8 9 10 11 11 12 13 14 15 16 16 | | |

CAUTION

- ▶ Make sure that Safety Input Jumper must be connected unless higher level emergency is used.
- ► The contacts 11,12 and 21,22 must operate simultaneously.

| | Machine safety input terminal block pin out(CN2) | | | |
|-----|--|----------------------|--------------------------------------|--|
| No. | Mark | Signal | Description | |
| 1 | SE1 | SYS EMG NC11 | User Emergency Stop NC contact 11 | |
| 2 | SE2 | SYS EMG NC12 | User Emergency Stop NC contact 12 | |
| 3 | SE3 | SYS EMG NC21 | User Emergency Stop NC contact 21 | |
| 4 | SE4 | SYS EMG NC22 | User Emergency Stop NC contact 22 | |
| 5 | IA1 | INTERLOCK A NC11 | Interlock Auto-mode NC contact 11 | |
| 6 | IA2 | INTERLOCK A NC12 | Interlock Auto-mode NC contact 12 | |
| 7 | IA3 | INTERLOCK A NC21 | Interlock Auto-mode NC contact 21 | |
| 8 | IA4 | INTERLOCK A NC22 | Interlock Auto-mode NC contact 22 | |
| 9 | IM1 | INTERLOCK M NC11 | Interlock Manual-mode NC contact 11 | |
| 10 | IM2 | INTERLOCK M NC12 | Interlock Manual-mode NC contact 12 | |
| 11 | IM3 | INTERLOCK M NC21 | Interlock Manual-mode NC contact 21 | |
| 12 | IM4 | INTERLOCK M NC22 | Interlock Manual-mode NC contact 22 | |
| 13 | AM1 | EXT. AUTO MODE NC1 | External Operation Mode NC contact 1 | |
| 14 | AM2 | EXT. AUTO MODE NC2 | External Operation Mode NC contact 2 | |
| 15 | MM1 | EXT. MANUAL MODE NO1 | External Operation Mode NO contact 1 | |
| 16 | MM2 | EXT. MANUAL MODE NO2 | External Operation Mode NO contact 2 | |

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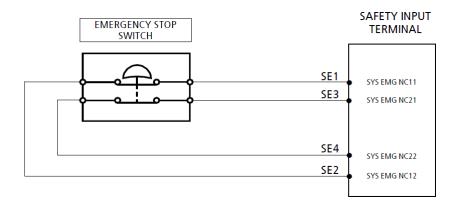


■ SYS EMG Input Signal (2NC)

SYS EMG input is safety circuit for blocking the power for motor when emergency status.

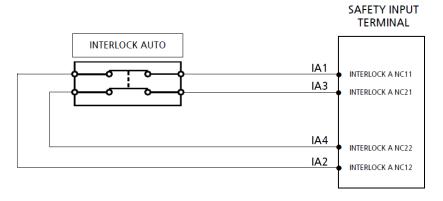
Connect two lines of EMG switch with contact(2NC).

If one contact is open, a System Emergency alarm turn on and motor will be shut off.



■ INTERLOCK A input signal(2NC)

It is an emergency stop signal in automatic(system) mode. The customer have to input NC when normal state. If an alarm occurs, the customer has to input NO. If the signal is NO, Interlock Auto alarm turns on and motor will be shut off.

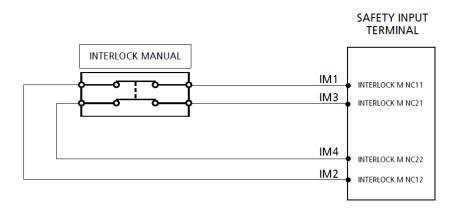


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■ INTERLOCK M input signal(2NC)

It is emergency stop signal in manual mode. The customer have to input NC when normal state. If an alarm occurs, the customer has to input NO. If the signal is NO, Interlock Manual alarm turn on and motor will be shut off.





- ▶ NC 11 \leftrightarrow NC 12, NC 21 \leftrightarrow NC 22
- ► The contacts must be ON-OFF simultaneously. (2B / 2B-1A contact applied)
- ► Normal state : Normal Close signal input Alarm state : Normal Open signal input

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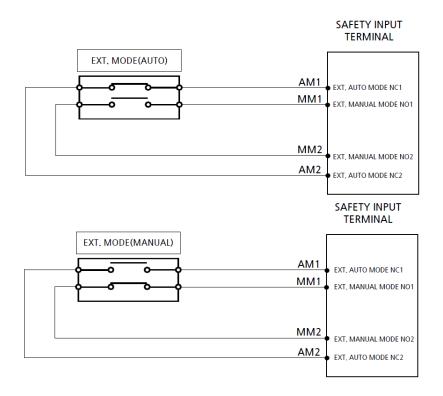


■ External operation mode input signal (1NC, 1NO)

Signal to input status of external device. Status of the controller must be matched to perform normal operation. Operation mode of the controller can be converted into AUTO when controller MODE is SYSTEM (AUTO) MODE and external device signal input is AUTO as well.

(1) External operation mode input

| External operation mode input | NC contacts | NO contacts |
|-------------------------------|-------------|-------------|
| MANUAL | OPEN | CLOSE |
| AUTO(SYSTEM) | CLOSE | OPEN |



(2) Controller mode

| Controller (T/P) mode | External operation mode | Controller active mode |
|-----------------------|-------------------------|------------------------|
| MANUAL | MANUAL | MANUAL |
| AUTO(SYSTEM) | MANUAL | MANUAL |
| MANUAL | AUTO | MANUAL |
| AUTO(SYSTEM) | AUTO | AUTO(SYSTEM) |



For index mode input contact, NC and NO signals must be entered simultaneously.

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Machine safety output terminal block (CN3)

| Controller terminal block | 250-516(Wago) |
|---------------------------|----------------------|
| Connection terminal | 20AWG, 8 mm, Ferrule |
| 17 | |

| Machine safety output terminal block pin out(CN3) | | | | |
|---|------|------------------|-------------------------------------|--|
| No. | Mark | Signal | Description | |
| 17 | EO1 | SYS EMG OUT NC11 | User emergency output NC contact 11 | |
| 18 | EO2 | SYS EMG OUT NC12 | User emergency output NC contact 12 | |
| 19 | EO3 | SYS EMG OUT NC21 | User emergency output NC contact 21 | |
| 20 | EO4 | SYS EMG OUT NC22 | User emergency output NC contact 22 | |
| 21 | AO1 | MODE OUT NC1 | User mode output NC contact 1 | |
| 22 | AO2 | MODE OUT NC2 | User mode output NC contact 2 | |
| 23 | MO1 | MODE OUT NO1 | User mode output NO contact 1 | |
| 24 | MO2 | MODE OUT NO2 | User mode output NO contact 2 | |
| 25 | P1S | EXT. SAFETY 24V | External safety power input 24V | |
| 26 | P1S | EXT. SAFETY 24V | External safety power input 24V | |
| 27 | M1S | EXT. SAFETY 0V | External safety power input 0V | |
| 28 | M1S | EXT. SAFETY 0V | External safety power input 0V | |
| 29 | DM1 | DEADMAN NC11 | Manufacturer DEADMAN NC contact 11 | |
| 30 | DM2 | DEADMAN NC12 | Manufacturer DEADMAN NC contact 12 | |
| 31 | DM3 | DEADMAN NC21 | Manufacturer DEADMAN NC contact 21 | |
| 32 | DM4 | DEADMAN NC21 | Manufacturer DEADMAN NC contact 22 | |

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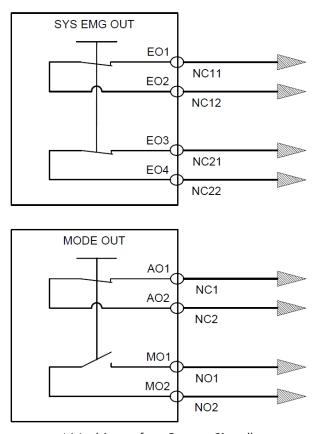
SYS EMG Output Signal (2NC)

In case of Emergency situation of the controller and alarm occurrence, it is possible to configure the safety circuit so that the external emergency circuit can be connected in serial with duplex to shut off the power of other robot and motor.

MODE Output Signal (1NO, 1NC)

This is a signal outputting status of controller, outputting the status of controller to external device with contact.

| Controller mode | NC Contact | NO Contact |
|-----------------|------------|------------|
| MANUAL | OPEN | CLOSE |
| AUTO(SYSTEM) | CLOSE | OPEN |



< Machine safety Output Signal>

CAUTION

- NC contact is an abbreviation of Normally Close, which means that the contact is closed when it is in the default condition.
- NO contact is an abbreviation of Normally Open, which means that the contact is opened when it is in the default condition.

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■ Manufacturer used DEADMAN Contacts (2NC)

Machine safety DEADMAN signal monitoring contact of Teach pendant. <u>The user should not use this signal to construct a safety circuit.</u>

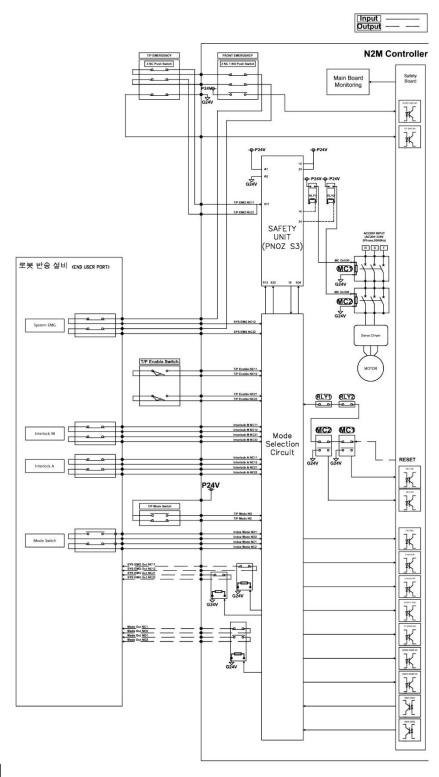
CAUTION

- ► Safety level is no recognized when used as an interface used in the robot manufacturing process.
- ► The user must use the contact with open.

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2.4 Controller Safety circuit block diagram



CAUTION

- ► Emergency consists of 'T/P Emergency' and 'System Emergency'.
- ▶ The contacts of SYS EMG NC 11 \leftrightarrow SYS EMG NC 12, SYS EMG NC 21 \leftrightarrow SYS EMG NC 22 N.C의 must be ON/-OFF.. (Use 2B or 2B-1A contact)
- Use after connecting teach pendant, as, if not, 'T/P Emergency Alarm' is generated.

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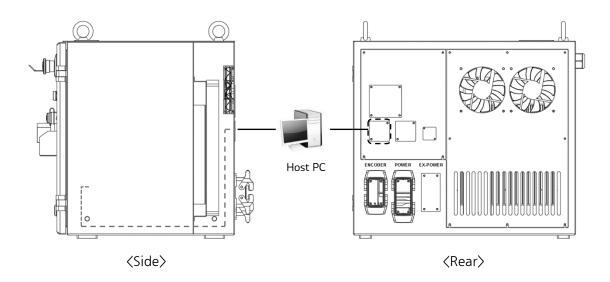


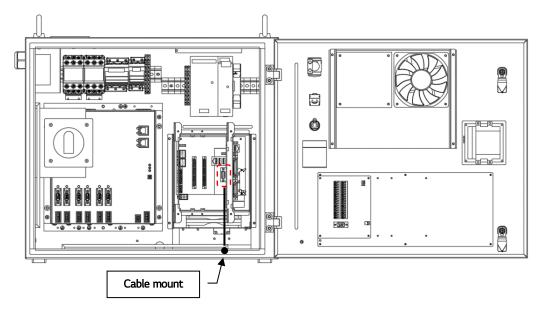
3. Online connection

The figure below shows the cabling path when connecting cables to the host computer. The robot can be operated automatically by serial(RS-232C) communication with the host computer.

For detail operation instructions, refer to the 'Uni Host Manual(N2-HM-E□□)'
Before using the host mode, after setting the parameters of the controller using the teach pendant, Set the same baud rate for the controller and computer.

■ Cabling path





<Cabling patch>

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(1) Serial(RS-232C) connector pin out

| Comp | outer | Cont | roller |
|--------|-------|--------|--------|
| Signal | Pin | Signal | Pin |
| Name | No. | Name | No. |
| RXD | 2 | 2 | RXD |
| TXD | 3 | 3 | TXD |
| GND | 5 | 5 | GND |

(2) Cable specification

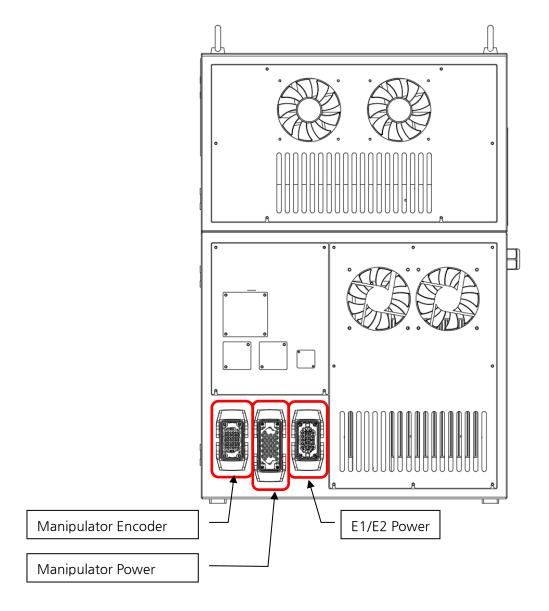
- Use a cable with a shield whose minimum core wire diameter is 0.3mm² or more.
- Connect both lateral shields (Controller and Computer) of a case with each other.
- Have FG(Frame Ground) Level of the Controller be the same as that of the Host Computer. (Using a wire 2 mm² or more, connect the FG terminal of the controller with the FG terminal of the host computer.
- Use a serial cable not longer than 10m.
- Connector Spec.: D-Sub 9s (Socket Type)

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4. Robot connection

The robot and the controller are connected with each other by using a robot cable. The robot cable is composed of a motor power cable, and an encoder cable.



CAUTION

- After connecting the robot cable, make sure that housing locks (a connector locking device) of the controller-side connector are completely engaged with each other.
- ► Controller label can be changed according to robot.

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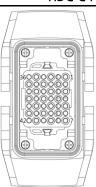


4.1 Manipulator interface

An interface for manipulator with encoder, brake and power.

■ Encoder interface

| Housing, Protection cap | HDC-10B-ABU-N/ HDC-10B-DC (Weidmuller) |
|-------------------------|--|
| Insert | HDC-HEEE-42-FC(Weidmuller) |
| Crimp contact | HDC-C-HE-BM0.14-0.37AG(Weidmuller) |



| Encoder connector pin out | | | |
|---------------------------|----------|-----|----------|
| No. | Signal | No. | Signal |
| 1 | Data+(1) | 22 | Data+(4) |
| 2 | Data-(1) | 23 | Data-(4) |
| 3 | P5V(1) | 24 | P5V(4) |
| 4 | GND(1) | 25 | GND(4) |
| 5 | SL(7) | 26 | P5V(8) |
| 6 | /SL(7) | 27 | GND(8) |
| 7 | - | 28 | - |
| 8 | Data+(2) | 29 | Data+(5) |
| 9 | Data-(2) | 30 | Data-(5) |
| 10 | P5V(2) | 31 | P5V(5) |
| 11 | GND(2) | 32 | GND(5) |
| 12 | P5V(7) | 33 | - |
| 13 | GND(7) | 34 | - |
| 14 | - | 35 | - |
| 15 | Data+(3) | 36 | Data+(6) |
| 16 | Data-(3) | 37 | Data-(6) |
| 17 | P5V(3) | 38 | P5V(6) |
| 18 | GND(3) | 39 | GND(6) |
| 19 | SL(8) | 40 | - |
| 20 | /SL(8) | 41 | - |
| 21 | - | 42 | - |

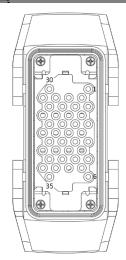
^{&#}x27;-' sign means the unused pin.

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■ Power interface

| Housing, Protection cap | HDC-16B-ABU-N/ HDC-16B-DC (Weidmuller) |
|-------------------------|--|
| Insert | HDC-HEEE-40-FC(Weidmuller) |
| Crimp contact | HDC-C-HE-BM2.5AG(Weidmuller) |



| Power connector pin out | | | |
|-------------------------|----------|-----|----------|
| No. | Signal | No. | Signal |
| 1 | U(1) | 22 | Data+(4) |
| 2 | Data-(1) | 23 | Data-(4) |
| 3 | P5V(1) | 24 | P5V(4) |
| 4 | GND(1) | 25 | GND(4) |
| 5 | SL(7) | 26 | P5V(8) |
| 6 | /SL(7) | 27 | GND(8) |
| 7 | - | 28 | - |
| 8 | Data+(2) | 29 | Data+(5) |
| 9 | Data-(2) | 30 | Data-(5) |
| 10 | P5V(2) | 31 | P5V(5) |
| 11 | GND(2) | 32 | GND(5) |
| 12 | P5V(7) | 33 | - |
| 13 | GND(7) | 34 | - |
| 14 | - | 35 | - |
| 15 | Data+(3) | 36 | Data+(6) |
| 16 | Data-(3) | 37 | Data-(6) |
| 17 | P5V(3) | 38 | P5V(6) |
| 18 | GND(3) | 39 | GND(6) |
| 19 | SL(8) | 40 | - |

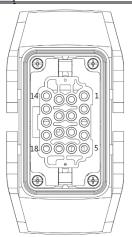
^{• &#}x27;-' sign means the unused pin.

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■ Extension axis power interface

| Housing, Protection cap | HDC-10B-ABU-N/ HDC-10B-DC (Weidmuller) |
|-------------------------|--|
| Insert | HDC-HEEE-18-FC(Weidmuller) |
| Crimp contact | HDC-C-HE-BM4.0AG(Weidmuller) |



| Extension axis power connector pin out | | | | | | |
|--|--------|-----|--------|--|--|--|
| No. | Signal | No. | Signal | | | |
| 1 | U(7) | 10 | W(7) | | | |
| 2 | U(7) | 11 | W(7) | | | |
| 3 | FG(7 | 12 | W(8) | | | |
| 4 | U(8) | 13 | W(8) | | | |
| 5 | U(8) | 14 | BK+(7) | | | |
| 6 | V(7) | 15 | BK-(7) | | | |
| 7 | V(7) | 16 | FG(8) | | | |
| 8 | V(8) | 17 | BK+(8) | | | |
| 9 | V(8) | 18 | BK-(8) | | | |

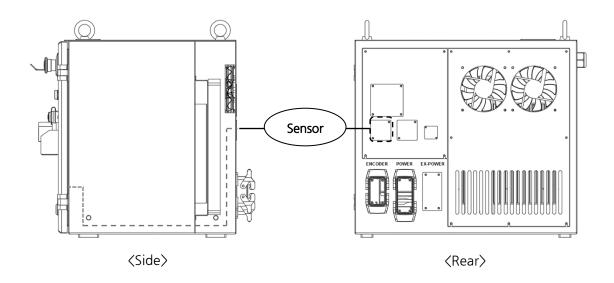
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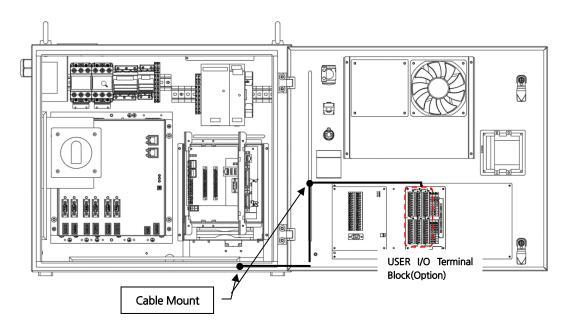


5. Input/output Connection

It describes how to connect I/O with the host controller and external devices. Make sure to connect correctly after checking the pin number of each I/O.

■ Cabling path





⟨Cabling path⟩



Pay particular attention that incorrect connection could damage the controller, as well as the peripherals.

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5.1 I/O assignment

- I/O for N2M-Series is composed of User I/O (20 points/20 points), and Option I/O (32 points/32 points).
- System I/O Assignment is used in a teaching pendant as follows.
- The detailed information can be obtained from "Operation Manual".

| Teach pendant menu | MAIN MENU → 6. I/O → 1. GPIO | | | | |
|---------------------|------------------------------|---|--|--|--|
| | 0 | User I/O(20/20) | | | |
| User I/O assignment | 1 | User I/O(20/20) + Option I/O (32/32) Ref 1) | | | |
| | 2 | User I/O(20/20) + Option I/O (64/64) Ref 1) | | | |

Ref 1) The customer can be use max Option I/O(64/64) with use secondary card.

5.2 I/O specification

| Item | User Input | User Output | | |
|----------------------|--------------------------------------|----------------|--|--|
| Voltage rating | DC 24V ± 10% (External power source) | | | |
| Current rating | Min. each 5mA | Max. each 50mA | | |
| Insulation | Photo coupler | Photomos Relay | | |
| Input Resistance | 4.7kΩ | - | | |
| I/O Contacts | 20pts | 20pts | | |
| Controller Connector | MDR 10250-52A2PL, 3M | | | |
| External Connector | MDR 10250-3000PE, 3M | | | |



N2M-Series does not provide internal power source for I/O. Be sure to use the external power source.

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5.3 USER I/O interface

■ USER I/O Connector(MX1)

| Controller connector | MDR 10250-52A2PL, 3M |
|----------------------|----------------------|
| External connector | MDR 10250-3000PE, 3M |
| 50 25 26 1 | |

Ref. 1) Connected 1:1 to the pins of I/O external connector

CAUTION

▶ N • P Type can be decided by the common power connection.

N type : Input \rightarrow Positive Common (24V+), Output \rightarrow Negative Common (24V-)

P type : Input \rightarrow Negative Common (24V-), Output \rightarrow Positive Common (24V+)

► Connect the power supply N • P type distinctly. Incorrect wiring may cause damage to the controller.

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| User I/O connector (MX1) pin out | | | | | |
|----------------------------------|------------|--|--|--|--|
| PIN No. | Signal | Description | | | |
| 1 | IN_COM0 | N type: VCC Common for USER INPUT | | | |
| I | IIV_COIVIO | P type: GND Common for USER INPUT (Ref. 1) | | | |
| 2 | USER IN 0 | User Input Contact 0 | | | |
| 3 | USER IN 1 | User Input Contact 1 | | | |
| 4 | USER IN 2 | User Input Contact 2 | | | |
| 5 | USER IN 3 | User Input Contact 3 | | | |
| 6 | USER IN 4 | User Input Contact 4 | | | |
| 7 | USER IN 5 | User Input Contact 5 | | | |
| 8 | USER IN 6 | User Input Contact 6 | | | |
| 9 | USER IN 7 | User Input Contact 7 | | | |
| 10 | IN_COM1 | N type: VCC Common for USER INPUT | | | |
| 10 | IIV_COIVI1 | P type: GND Common for USER INPUT(Ref. 1) | | | |
| 11 | USER IN 8 | User Input Contact 8 | | | |
| 12 | USER IN 9 | User Input Contact 9 | | | |
| 13 | USER IN 10 | User Input Contact 10 | | | |
| 14 | USER IN 11 | User Input Contact 11 | | | |
| 15 | USER IN 12 | User Input Contact 12 | | | |
| 16 | USER IN 13 | User Input Contact 13 | | | |
| 17 | USER IN 14 | User Input Contact 14 | | | |
| 18 | USER IN 15 | User Input Contact 15 | | | |
| 19 | IN_COM2 | N type: VCC Common for USER INPUT | | | |
| 19 | IIV_COIVIZ | P type: GND Common for USER INPUT(Ref. 1) | | | |
| 20 | USER IN 16 | User Input Contact 16 | | | |
| 21 | USER IN 17 | User Input Contact 17 | | | |
| 22 | USER IN 18 | User Input Contact 18 | | | |
| 23 | USER IN 19 | User Input Contact 19 | | | |
| 24 | - | - | | | |
| 25 | - | - | | | |

^{• &#}x27;-' sign means the unused pin.

Ref. 1) refer to 5.4 User I/O circuit diagram

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| PIN No. | Signal | Description |
|-------------|-------------|---|
| 26 | OUT_COM0 | N type: GND Common for USER Output P type: VCC Common for USER Output (Ref.1) |
| 27 | USER OUT 0 | User Output Contact 0 |
| 28 | USER OUT 1 | User Output Contact 1 |
| 29 | USER OUT 2 | User Output Contact 2 |
| 30 | USER OUT 3 | User Output Contact 3 |
| 31 | USER OUT 4 | User Output Contact 4 |
| 32 | USER OUT 5 | User Output Contact 5 |
| 33 | USER OUT 6 | User Output Contact 6 |
| 34 | USER OUT 7 | User Output Contact 7 |
| 35 | OUT_COM1 | N type: GND Common for USER Output |
| | | P type: VCC Common for USER Output (Ref.1) |
| 36 | USER OUT 8 | User Output Contact 8 |
| 37 | USER OUT 9 | User Output Contact 9 |
| 38 | USER OUT 10 | User Output Contact 10 |
| 39 | USER OUT 11 | User Output Contact 11 |
| 40 | USER OUT 12 | User Output Contact 12 |
| 41 | USER OUT 13 | User Output Contact 13 |
| 42 | USER OUT 14 | User Output Contact 14 |
| 43 | USER OUT 15 | User Output Contact 15 |
| 44 | OUT_COM2 | N type: GND Common for USER Output |
| | OUT_CONIZ | P type: VCC Common for USER Output (Ref.1) |
| 45 | USER OUT 16 | User Output Contact 16 |
| 46 | USER OUT 17 | User Output Contact 17 |
| 47 | USER OUT 18 | User Output Contact 18 |
| 48 | USER OUT 19 | User Output Contact 19 |
| 49 | - | - |
| 50 | - | - |
| | | |

^{• &#}x27;-' sign means the unused pin.

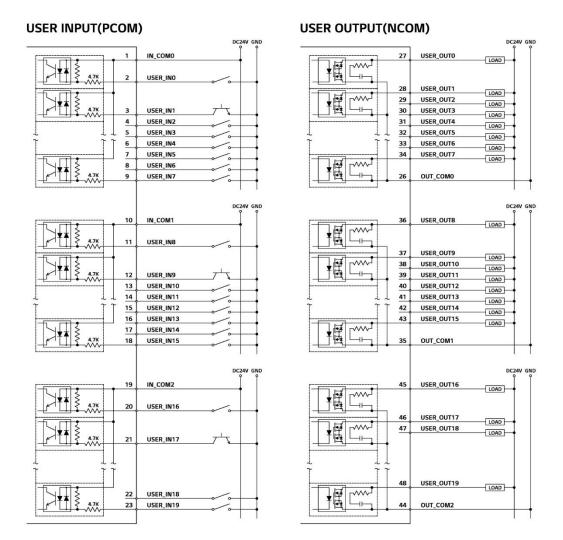
Ref. 1) refer to 5.4 User I/O circuit diagram

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5.4 USER I/O circuit diagram

■ N-type USER I/O circuit diagram(Input: PCOM, Output: NCOM)



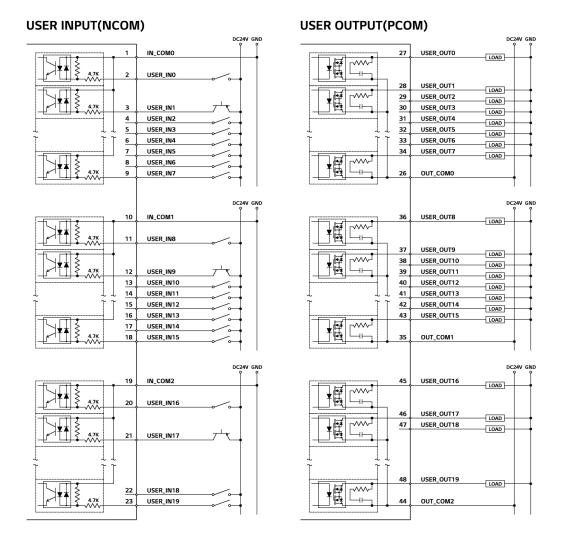
CAUTION

- ▶ When wiring the power source, confirm that the connection polarity of DC 24V is correct.
- ▶ Mis-wiring may cause the internal parts to be destroyed. Pay special attention to the polarity of the common contacts.
- ► The external supply voltage has to be DC 24V±10%
- When soldering connector pins, provide pins with tubes to prevent short-circuit of pins.

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■ P-type USER I/O circuit diagram(Input: NCOM, Output: PCOM)





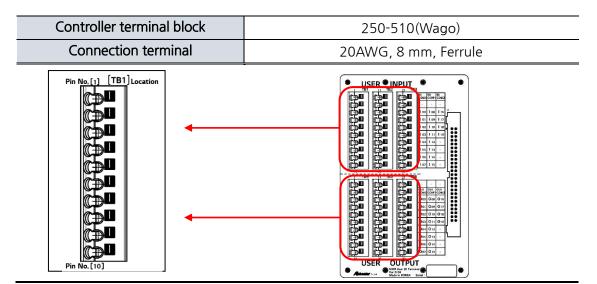
- ▶ When wiring the power source, confirm that the connection polarity of DC 24V is correct.
- ▶ Mis-wiring may cause the internal parts to be destroyed. Pay special attention to the polarity of the common contacts.
- ► The external supply voltage has to be DC 24V±10%
- ▶ When soldering connector pins, provide pins with tubes to prevent short-circuit of pins.

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5.5 USER I/O Terminal Block

■ If the user I/O Terminal block is configured as an option, the terminal block is installed on door inside.



| | User I/O terminal block pin out | | | | | | | |
|------|---------------------------------|------------|------|-----|-------------|------|-----|-------------|
| Loc. | PIN | Signal | Loc. | PIN | Signal | Loc. | PIN | Signal |
| | No. | | | No. | | | No. | |
| | 1 | IN_COM0 | | 11 | IN_COM1 | | 21 | IN_COM2 |
| | 2 | - | | 12 | - | | 22 | - |
| | 3 | USER IN 0 | | 13 | USER IN 8 | | 23 | USER IN 16 |
| | 4 | USER IN 1 | | 14 | USER IN 9 | | 24 | USER IN 17 |
| TB1 | 5 | USER IN 2 | TB2 | 15 | USER IN 10 | TB3 | 25 | USER IN 18 |
| 101 | 6 | USER IN 3 | IDZ | 16 | USER IN 11 | כטו | 26 | USER IN 19 |
| | 7 | USER IN 4 | | 17 | USER IN 12 | | 27 | - |
| | 8 | USER IN 5 | | 18 | USER IN 13 | | 28 | - |
| | 9 | USER IN 6 | | 19 | USER IN 14 | | 29 | - |
| | 10 | USER IN 7 | | 20 | USER IN 15 | | 30 | - |
| | 1 | - | | 11 | - | | 21 | - |
| | 2 | OUT_COM0 | | 12 | OUT_COM1 | | 22 | OUT_COM2 |
| | 3 | USER OUT 0 | | 13 | USER OUT 8 | | 23 | USER OUT 16 |
| | 4 | USER OUT 1 | | 14 | USER OUT 9 | | 24 | USER OUT 17 |
| TB4 | 5 | USER OUT 2 | TB5 | 15 | USER OUT 10 | TB6 | 25 | USER OUT 18 |
| 104 | 6 | USER OUT 3 | IDO | 16 | USER OUT 11 | 100 | 26 | USER OUT 19 |
| | 7 | USER OUT 4 | | 17 | USER OUT 12 | | 27 | - |
| | 8 | USER OUT 5 | | 18 | USER OUT 13 | | 28 | - |
| | 9 | USER OUT 6 | | 19 | USER OUT 14 | | 29 | - |
| / () | 10 | USER OUT 7 | | 20 | USER OUT 15 | | 30 | - |

^{&#}x27;-' sign means the unused pin.

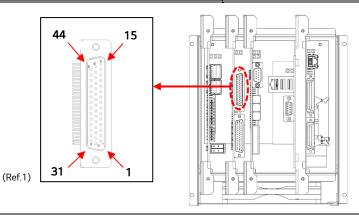
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5.6 Extension user I/O interface (Option)

■ Extension user input connector (DX1)

| Controller input connector(Option) | 5510-44S-02A-01(NELTRON) |
|------------------------------------|---------------------------|
| External input connector(Option) | 5508-44P-02A-01 (NELTRON) |



Ref. 1) Connected 1:1 to the pins of I/O external input connector

| | Extension user input connector(DX1) pin out | | | | | | |
|------------|---|---|----|----------------|---|--|--|
| PIN No. | Signal | Description | | Signal | Description | | |
| 3 | IN_COM0 | N type: VCC Common P type: GND Common (Ref. 2) | 9 | IN_COM2 | N type: VCC Common P type: GND Common (Ref. 2) | | |
| 31 | USER IN 20(52) | Extended User Input Contact 20(52) | 37 | USER IN 36(68) | Extended User Input Contact 36(68) | | |
| 17 | USER IN 21(53) | Extended User Input Contact 21(53) | 23 | USER IN 37(69) | Extended User Input Contact 37(69) | | |
| 1 | USER IN 22(54) | Extended User Input Contact 22(54) | 7 | USER IN 38(70) | Extended User Input Contact 38(70) | | |
| 32 | USER IN 23(55) | Extended User Input Contact 23(55) | 38 | USER IN 39(71) | Extended User Input Contact 39(71) | | |
| 18 | USER IN 24(56) | Extended User Input Contact 24(56) | 24 | USER IN 40(72) | Extended User Input Contact 40(72) | | |
| 2 | USER IN 25(57) | Extended User Input Contact 25(57) | 8 | USER IN 41(73) | Extended User Input Contact 41(73) | | |
| 33 | USER IN 26(58) | Extended User Input Contact 26(58) | 39 | USER IN 42(74) | Extended User Input Contact 42(74) | | |
| 19 | USER IN 27(59) | Extended User Input Contact 27(59) | 25 | USER IN 43(75) | Extended User Input Contact 43(75) | | |
| 6 | IN_COM1 | N type : VCC Common P type : GND Common (Ref. 2) | 12 | IN_COM3 | N type : VCC Common P type : GND Common (Ref. 2) | | |
| 34 | USER IN 28(60) | Extended User Input Contact 28(60) | 40 | USER IN 44(76) | Extended User Input Contact 44(76) | | |
| 20 | USER IN 29(61) | Extended User Input Contact 29(61) | 26 | USER IN 45(77) | Extended User Input Contact 45(77) | | |
| 4 | USER IN 30(62) | Extended User Input Contact 30(62) | 10 | USER IN 46(78) | Extended User Input Contact 46(78) | | |
| 35 | USER IN 31(63) | Extended User Input Contact 31(63) | 41 | USER IN 47(79) | Extended User Input Contact 47(79) | | |
| 21 | USER IN 32(64) | Extended User Input Contact 32(64) | 27 | USER IN 48(80) | Extended User Input Contact 48(80) | | |
| 5 | USER IN 33(65) | Extended User Input Contact 33(65) | 11 | USER IN 49(81) | Extended User Input Contact 49(81) | | |
| 36 | USER IN 34(66) | Extended User Input Contact 34(66) | 42 | USER IN 50(82) | Extended User Input Contact 50(82) | | |
| 22 | USER IN 35(67) | Extended User Input Contact 35(67) | 28 | USER IN 51(83) | Extended User Input Contact 51(83) | | |
| 13 | - | - | 29 | - | _ | | |
| 14 | - | - | 30 | - | - | | |
| 15 | - | - | 43 | - | _ | | |
| 16 | - | - | 44 | - | - | | |

- '-' sign means the unused pin.
- The numbers in '()' apply with secondary Ext. user I/O board.

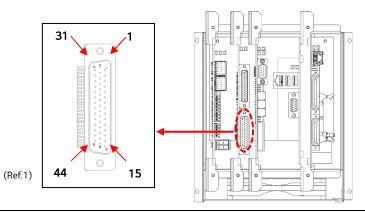
Ref. 2) refer to 5.7 User I/O circuit diagram

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■ Extension user output connector (DX2)

| Controller output connector(Option) | 5510-44P-02A-01(NELTRON) | | |
|-------------------------------------|--------------------------|--|--|
| External output connector(Option) | 5508-44S-02A-01(NELTRON) | | |



Ref. 1) Connected 1:1 to the pins of I/O external output connector

| | Extension user output connector (DX2) pin out | | | | | | |
|------------|---|-------------------------------------|------------|-----------------|-------------------------------------|--|--|
| PIN No. | Signal | Description | PIN No. | Signal | Description | | |
| 31 | USER OUT 20(52) | Extended User Output Contact 20(52) | 37 | USER OUT 36(68) | Extended User Output Contact 36(68) | | |
| 17 | USER OUT 21(53) | Extended User Output Contact 21(53) | 23 | USER OUT 37(69) | Extended User Output Contact 37(69) | | |
| 1 | USER OUT 22(54) | Extended User Output Contact 22(54) | 7 | USER OUT 38(70) | Extended User Output Contact 38(70) | | |
| 32 | USER OUT 23(55) | Extended User Output Contact 23(55) | 38 | USER OUT 39(71) | Extended User Output Contact 39(71) | | |
| 18 | USER OUT 24(56) | Extended User Output Contact 24(56) | 24 | USER OUT 40(72) | Extended User Output Contact 40(72) | | |
| 2 | USER OUT 25(57) | Extended User Output Contact 25(57) | 8 | USER OUT 41(73) | Extended User Output Contact 41(73) | | |
| 33 | USER OUT 26(58) | Extended User Output Contact 26(58) | 39 | USER OUT 42(74) | Extended User Output Contact 42(74) | | |
| 19 | USER OUT 27(59) | Extended User Output Contact 27(59) | 25 | USER OUT 43(75) | Extended User Output Contact 43(75) | | |
| | | N type: GND Common | 0 | OUT_COM2 | N type: GND Common | | |
| 3 | OUT_COM0 | P type: VCC Common (Ref. 2) | 9 | | P type: VCC Common (Ref. 2) | | |
| 34 | USER OUT 28(60) | Extended User Output Contact 28(60) | 40 | USER OUT 44(76) | Extended User Output Contact 44(76) | | |
| 20 | USER OUT 29(61) | Extended User Output Contact 29(61) | 26 | USER OUT 45(77) | Extended User Output Contact 45(77) | | |
| 4 | USER OUT 30(62) | Extended User Output Contact 30(62) | 10 | USER OUT 46(78) | Extended User Output Contact 46(78) | | |
| 35 | USER OUT 31(63) | Extended User Output Contact 31(63) | 41 | USER OUT 47(79) | Extended User Output Contact 47(79) | | |
| 21 | USER OUT 32(64) | Extended User Output Contact 32(64) | 27 | USER OUT 48(80) | Extended User Output Contact 48(80) | | |
| 5 | USER OUT 33(65) | Extended User Output Contact 33(65) | 11 | USER OUT 49(81) | Extended User Output Contact 49(81) | | |
| 36 | USER OUT 34(66) | Extended User Output Contact 34(66) | 42 | USER OUT 50(82) | Extended User Output Contact 50(82) | | |
| 22 | USER OUT 35(67) | Extended User Output Contact 35(67) | 28 | USER OUT 51(83) | Extended User Output Contact 51(83) | | |
| | OUT COMM | N type: GND Common | 4.5 | OLIT COMA | N type: GND Common | | |
| 6 | OUT_COM1 | P type: VCC Common (Ref. 2) | 12 | OUT_COM3 | P type: VCC Common (Ref. 2) | | |
| 13 | - | - | 29 | - | - | | |
| 14 | - | - | 30 | - | - | | |
| 15 | - | - | 43 | - | - | | |
| 16 | - | - | 44 | - | - | | |

- '-' sign means the unused pin.
- The numbers in '()' apply with secondary Ext. user I/O board.

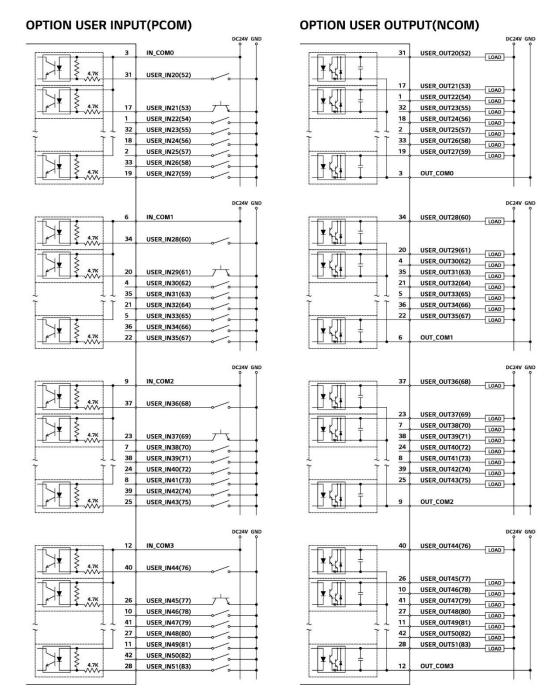
Ref. 2) refer to 5.7 User I/O circuit diagram

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5.7 Extension user I/O circuit diagram

■ N-type Extension user I/O Circuit diagram(Input: PCOM, Output: NCOM)



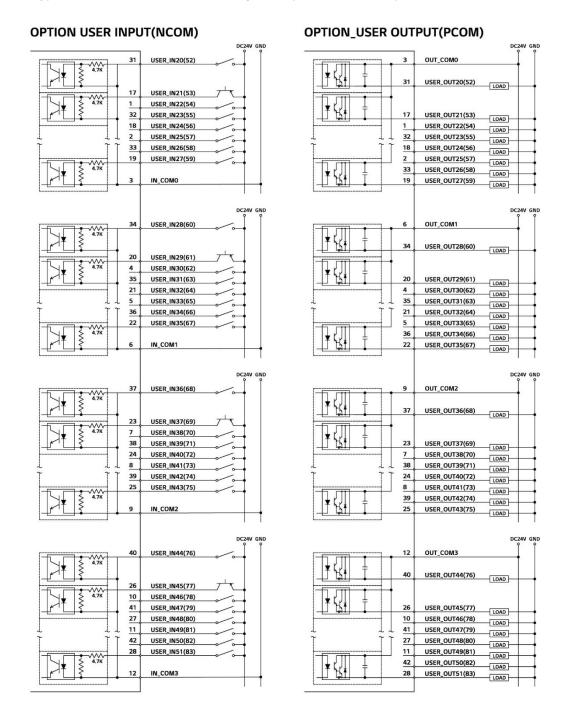
CAUTION

- ▶ When wiring the power source, confirm that the connection polarity of DC 24V is correct.
- ▶ Mis-wiring may cause the internal parts to be destroyed. Pay special attention to the polarity of the common contacts.
- ► The external supply voltage has to be DC 24V±10%
- ▶ When soldering connector pins, provide pins with tubes to prevent short-circuit of pins.

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■ P-type Extension User I/O Circuit diagram(Input: NCOM, Output: PCOM)



CAUTION

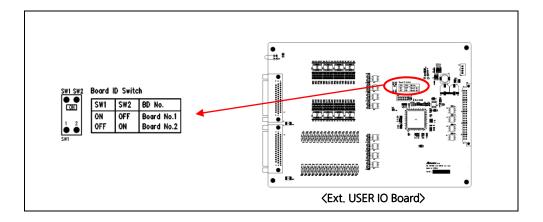
- ▶ When wiring the power source, confirm that the connection polarity of DC 24V is correct.
- ▶ Mis-wiring may cause the internal parts to be destroyed. Pay special attention to the polarity of the common contacts.
- ► The external supply voltage has to be DC 24V±10%
- ▶ When soldering connector pins, provide pins with tubes to prevent short-circuit of pins.

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5.8 Board ID Setting about extension user I/O Board

- Extended USER IO board should be set to Board ID so that it is recognized by software.
- Refer to 'Operation and Operation Manual' for detailed software setting.



■ When using two extension boards, an IO No. is assigned according to the board ID sequence.

| IO No. assistament | Board ID 1 | USER IN 20~51, USER OUT 20~51 |
|--------------------|------------|-------------------------------|
| IO No. assignment | Board ID 2 | USER IN 52~83, USER OUT 52~83 |



▶ When using two extension boards, be sure to set different board IDs.

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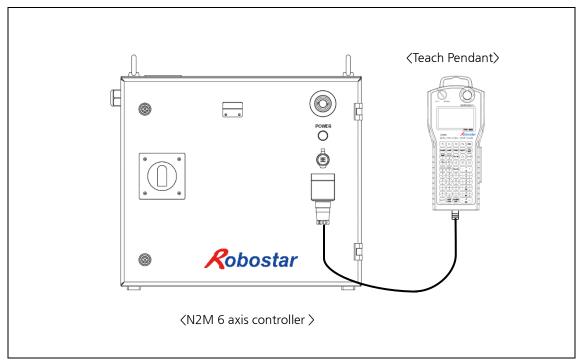


Chapter 4 About Teach Pendant

1. Connection of Teach Pendant

As shown below, connect T/P connector of the robot controller to the teaching pendant.

(1) N2M 6 axis controller



Connection of Teach Pendant



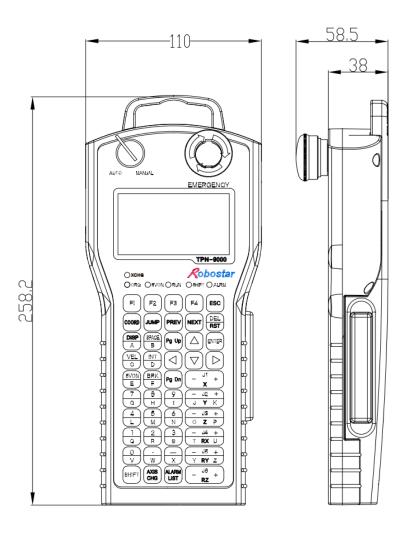
- ▶ After connector connection, be sure to engage a screw-lock of the connector.
- ▶ If the connector is unexpectedly separated, the controller will fall into the emergency state.
- ▶ If the connector is separated, the controller doesn't apply to KCs certification.

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2. Appearance and operation

2.1 Full size

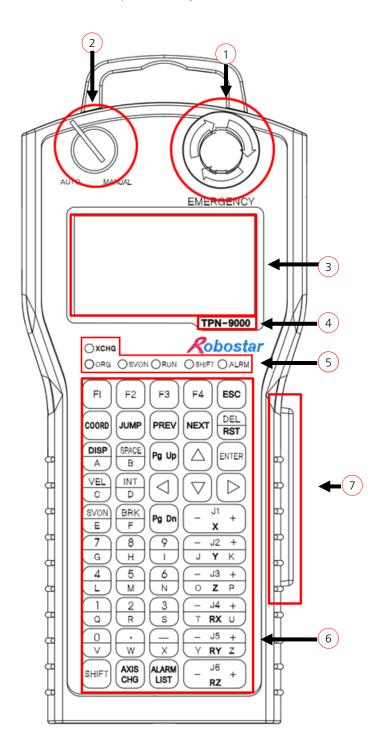


| Model | Size | |
|----------|------------------------------|--|
| TPN-9000 | 110 (W) x 258.2 (D) x 38 (H) | |

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2.2 Operation keys



1: Emergency stop switch

②: Mode select switch

③:LCD display

④: Model name of teach pendant

⑤: LED indicator

6 : Function key

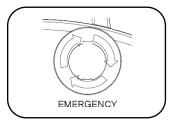
⑦: Deadman switch

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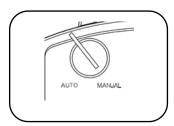
2.3 Operation keys description

(1) Emergency Stop Switch



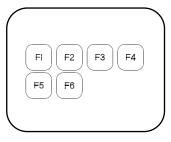
- ▶ In emergency situation, the robot operation is stopped.
- ▶ Power source for a motor is shut down.

(2) Mode Select Switch



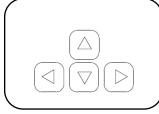
- ▶ MANUAL : Manual mode is the mode for setup work.
- ► AUTO: Automatic mode is only permissible for system control. Edit key doesn't work at the mode. (System Mode)

(3) Function Key



- Menus on a screen(LCD) are selected.
- A menu is changed according to a mode. For menu selection and its function, refer to 'Program Manual'.

(4) Direction Key



- ▶ A cursor on a screen is moved in the direction of arrow.
- ► How to use the direction key depends on a mode. Ex.) When to write a robot program in JOB mode
- ▶ Only four commands can be displayed on 1 screen and so, if the direction key is used when more than 4 commands are necessary, other commands can be shown.

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(5) Page Up/Down Key



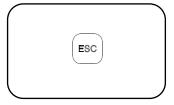
- ▶ A cursor can be moved on a basis of screen.
- Pg Up' key moves up a screen, and 'Pg Dn' key moves down a screen. If these keys are used in point teaching, the point number can be increased or decreased.

(6) Shift Key



- ► This key enables 1 key to perform 2 functions.
- ▶ If this key is pressed, LED at the upper right of the teaching pendant lights up.
- ► When in lit state the bottom function of the key is executed. (E.g., entering Alphabet)
- ▶ When in turned off state the upper function of the key is executed.

(7) Escape Key



▶ Used to escape from the state displayed on LCD screen to the previous state or mode.

(8) Reset/Delete Key



- ▶ RST Reset the alarmed state.
- ► DEL Delete the wrong used letter, number, and commands.

(9) Enter Key



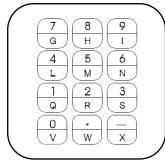
- Used to input the desired data.
- Usage is dependent on a mode.
- ex.) Parameter mode→ The sign changes when this key is pressed.

JOB mode \rightarrow This key is used to input the command when writing a program.

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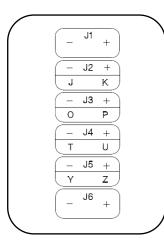


(10) Number & Sign Key



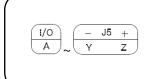
- Used to enter the numerals.
- ▶ Used to select a mode or for MDI teaching, in which this key is used to enter the numerals among the command.
- ▶ When 16-ary number is used in commands or when the output contact is checked, numerals 0 to F are used.

(11) Axis Moving Key



- Used to move each axis of the robot.
- ▶ When these keys are pressed in an initial menu screen or on a point teaching (CURR) screen, the axis moves in the direction of the arrow
- JOG movement and INCH movement can be performed.

(12) Character Key

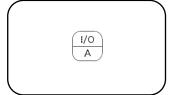


- Used to enter the characters.
- ▶ Used to type JOB name, or to enter variable name, label name, sub-execution sentence name in commands

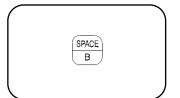
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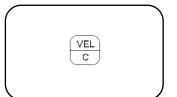
(13) Special Function Key



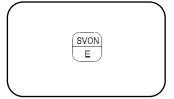
- ▶ On a point teaching (CURR) screen, I/O (In/Out) state can be seen.
- ▶ While in operation, I/O and internal contact is monitored.



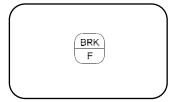
- ▶ Block setting function when the program is corrected, deleted, and moved.
- On a point teaching (CURR) screen, JOG movement and INCH movement are selected.



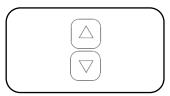
- ▶ On a point teaching (CURR) screen, the velocity of the axis moving key is set up in 3 steps.
- ► In INCH movement, the moving distance is set up, and in point checking (Forward), the moving velocity is set up.



- ▶ While in operation, the velocity (RPM) of a motor of each axis is checked.
- ► On a point teaching (CURR) screen, Servo ON/OFF can be done.



► On a point teaching (CURR) screen, the brake of each axis can be turned on/off.



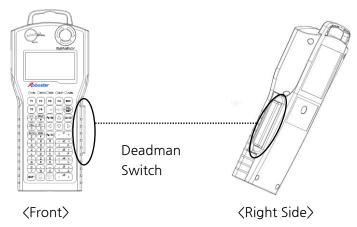
- ▶ While in operation (RUN mode), robot moving velocity is increased.
- ▶ While in operation (RUN mode), robot moving velocity is decreased.

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2.4 Deadman Switch

When performing teaching using a teaching pendant, press the following shown part and then operate the robot.



Deadman Switch is used to automatically, safely stop the robot, when the robot cannot normally operate due to the unexpected situations, such as power failure, full discharge, or other emergency situation, during a manual mode (Jog mode) of robot operation based on the teaching pendant. If such situation occurs, a user can stop the robot operation by changing the pressure pressing the deadman switch.

Deadman Switch has the following three behavior conditions.

| Pressing Strength | Switch State | Robot Operation |
|--|--------------|--------------------|
| When the switch is not pressed, or weakly pressed | OFF | X |
| When the moderate pressure is loaded on the switch | ON | 0 |
| When too strong pressure is loaded on the switch | OFF | Х |

If the Deadman Switch is turned OFF, the robot does not operate or stops while in operation.

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Chapter 5 Alarm code

For details, refer to N2-AM-E $\Box\Box$ (Alarm and Maintenance Manual)

1. Alarm Summary List

| No. | Code | Message | Description |
|-----|------|----------------------|--|
| 1 | 1003 | Out of Memory | Memory Allocation Error Prevention |
| 2 | 1021 | Job step info error | Mismatch in the number of lines of JOB program |
| 3 | 1091 | FAN error | FAN failure occurred |
| 4 | 1092 | FBUS Mismatch error | In case that field bus type is not in line with the parameter value |
| 5 | 1104 | Servo On Error | Transition failure to servo on state |
| 6 | 1105 | Servo Off Error | Transition failure to servo off state |
| 7 | 1107 | ORIGIN FAIL | Origin Work Failure Alarm |
| 8 | 1108 | Not Completed Org | It occurs when conducting other works during Origin work. |
| 9 | 1178 | MC OFF error | MC (Magnetic Contact) Alarm |
| 10 | 1179 | Safety relay fault | The relay of Safety module were not in contact. |
| 11 | 1186 | In range error | Exceed the robot's range |
| 12 | 1199 | DEADMAN error | Dead Man switch was not in contact when operating the robot in the manual mode |
| 13 | 1204 | Not Teaching Point | It occurs when using the point that teaching was not performed. |
| 14 | 1219 | Range Over error | It occurs when the teaching point exceeded to the maximum movable distance. |
| 15 | 1236 | Interpreter error | It occurs when having problems in the command interpretation during execution of JOB program. |
| 16 | 1237 | Invalid ThreadID | It occurs in case of Thread ID allocation error in JOB program |
| 17 | 1315 | Compile error | JOB Program Syntax Error |
| 18 | 1414 | ik isnan error | In case that the calculated result is not the number, when interpreting the inverse kinematics of robot. |
| 19 | 1415 | ik position error | Coordinate conversion error occurs when interpreting the inverse kinematics of robot. |
| 20 | 1422 | Time Sched, error | Failure in time plan for motion command |
| 21 | 1423 | Over Range error | In case that a position command exceeds RANG(SW-Limit) setting range |
| 22 | 1424 | Over Speed error | In case that the speed command exceeds the allowed range |
| 23 | 1425 | Over Accel. error | In case that the acceleration command exceeds the allowed range |
| 24 | 1426 | Inposition error | In case of exceeding the position error tolerance range |
| 25 | 1427 | TG TimeOut error | In case that the calculation time of a position command exceeds the execution cycle time. |
| 26 | 1428 | TG Mode error | It occurs in case of violation in trajectory status transition |
| 27 | 1429 | ENC Count error | It occurs when the variation of a feedback pulse exceeds the allowed range. |
| 28 | 1430 | REF Count error | It occurs when the variation of a command pulse exceeds the allowed range. |
| 29 | 1431 | Servo ON/OFF TimeOut | It occurs when the status of servo doesn't match. |
| 30 | 1434 | Over Trq error | It occurs when the defined torque limit value was exceeded. |
| 31 | 2101 | T/P emergency | It occurs when the T/P stops by an emergency stop switch. |

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| | | T | The second subsection of the second s |
|----------|--------|-----------------------------------|--|
| 32 | 2102 | Front emergency | It occurs when the system is in emergency stop state by an emergency stop switch on the front panel. |
| | | | It occurs when the system was in emergency stop due to system |
| 33 | 2103 | System emergency | I/O operation. |
| 34 | 2104 | Auto emergency | It occurs when any one of contacts in Interlock A was disconnected in Auto Mode. |
| 35 | 2105 | Manual emergency | It occurs when any of contacts in Interlock M was disconnected in Manual Mode. |
| 36 | 2108 | Mode mismatch error | It occurs when the Safety Input Signals in pair were being entered differently. |
| 37 | 2115 | Main Board Tmp error | It occurs when the temperature of main board was higher than the set temperature. |
| 38 | 4210 | IPM fault | It occurs when an over-current (HW) flows in IPM. |
| 39 | 4211 | IPM temperature | It occurs when IPM is over-heated. |
| 40 | 4214 | Over current | It occurs when an over-current flows. |
| 41 | 4215 | Current offset | Current Offset error occurs |
| 42 | 4216 | Current limit exceed | It occurs when the Current limit value was exceeded. |
| 43 | 4221 | Continuous overload | It occurs in case of continuous overload. |
| 44 | 4222 | Driver temperature 1 | It occurs in case of driver over-heating1. |
| 45 | 4223 | Regeneration overload | It occurs in case of Regeneration overload. |
| 46 | 4224 | Motor cable open | It occurs when motor cable was disconnected. |
| 47 | 4225 | Driver temperature 2 | It occurs in case of driver over-heating2. |
| 48 | 4226 | Encoder temperature | Encoder over-heat |
| 49 | 4227 | Motor temperature | Motor over-heat |
| 50 | 4230 | Encoder comm err | Encoder Communication Error |
| 51 | 4230 | Encoder cable open | It occurs when encoder cable was cut. |
| 52 | 4231 | Encoder data err | In case of encoder data error |
| 53 | 4232 | Motor ID setting | In case of wrong setting in Motor ID |
| 54 | 4233 | + | |
| 55 | 4234 | Z phase open err Low battery err | It occurs when the Motor Z phase was opened. It occurs when the encoder battery became low voltage state. |
| - | | | |
| 56 57 | 4236 | Sin ENC amplitude | In case of errors in the amplitude of encoder sine waves |
| | 4237 | Sin ENC frequency | In case of errors in the frequency of encoder sine waves |
| 58 | 4238 | Encoder setting | In case of errors in encoder setting |
| 59 | 4239 | Encoder Over Current | It occurs when the over-current flows in encoder |
| 60 | 4240 | Under voltage | It occurs in case of low voltage |
| 61 | 4241 | Over voltage | It occurs when the over-current flows. |
| 62 | 4242 | Main power fail | Problem occurs in main power source. |
| 63 | 4243 | Control power fail | It occurs in case of the control power source. |
| 64 | 4244 | DC Fan Trip | It occurs when driver Fan doesn't operate. |
| 65 | 4250 | Over speed limit | It occurs in case of over speed. |
| 66 | 4251 | POS following | It occurs in case of significant position error |
| 67 | 4253 | Excessive deviation | In case that a significant speed error occurred |
| 68 | 4263 | Parameter checksum | It occurs when there is a problem in driver parameter data. |
| 69 | 4271 | Factory setting | Abnormal value in factory setting |
| 70 | 4501 | Ethercat stop | In case of complete loss in EtherCAT communication |
| 71 | 4502 | Ethercat Comm fail | In case of error during EtherCAT communication |
| 72 | 5010-0 | General overcurrent | General overcurrent |
| 73 | 5010-1 | Hardware overcurrent | Hardware overcurrent detected |

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| | | T | |
|-----|---------|----------------------|--|
| 74 | 5010-2 | Software overcurrent | Software overcurrent detected |
| 75 | 5010-3 | Inverter error | Inverter error |
| 76 | 5010-4 | DC overcurrent | DC overcurrent detected |
| 77 | 5010-6 | Poser stage overload | Power stage high overload I2T limit exceeded |
| 78 | 5010-7 | Maximum current err | Actual current exceeds motor maximum current |
| 79 | 5010-8 | Motor wirebreak err | Motor wirebreak detected |
| 80 | 5010-9 | Sum current too high | Sum current u+v+w too high, possible short circuit to ground |
| 81 | 5011-0 | I2T limit exceeded | I2T limit exceeded (device protection) |
| 82 | 5011-1 | I2T limit exceeded | I2T limit exceeded (device protection) |
| 83 | 5012-0 | I2T limit exceeded | I2T limit exceeded (device protection) |
| 84 | 5012-1 | I2T limit exceeded | I2T limit exceeded (device protection) |
| 85 | 5013-0 | Motion control error | General Motion control error |
| 86 | 5013-1 | To many point cmmand | Set of set points: Stack overflow, to many set points commanded |
| 87 | 5013-2 | Software limit | Software limit switch would be violated by new profile mode command. Command is discarded. |
| 88 | 5013-3 | Failed to move axis | Failed to move axis to TargetPosition: distance too large |
| 89 | 5014-0 | Over voltage detect | Over voltage detected |
| 90 | 5014-1 | Over voltage detect | Device monitoring: Over voltage detected |
| 91 | 5014-2 | DC link out of range | DC link center out of range |
| 92 | 5015-0 | Under voltage detect | Under voltage detected |
| 93 | 5015-1 | Under voltage detect | Device monitoring: Under voltage detected |
| 94 | 5018-0 | Over temperature | Over temperature Detected |
| 95 | 5018-1 | High in temperature | Interior temperature too high |
| 96 | 5018-2 | High power temp | Power stage temperature too high |
| 97 | 5020-1 | Power controller err | Power stage controller framing error |
| 98 | 5020-2 | Power controller err | Power stage controller checksum error |
| 99 | 5020-3 | Power controller err | Power stage controller I/O error |
| 100 | 5020-4 | Power controller err | Initialization of power stage parameters failed |
| 101 | 5020-5 | Supply para init err | Initialization of supply parameters failed |
| 102 | 5021-1 | Unspecified brake er | Motor brake wire break detected |
| 103 | 5021-2 | Brake not release | Motor brake not released though release requested |
| 104 | 5021-3 | Brake current limit | Brake check: Current reached limit. |
| 105 | 5021-4 | Brake torque limit | Brake check: Reached torque limit |
| 106 | 5021-6 | Brake wrong mode | Brake Check: wrong mode |
| 107 | 5021-7 | Brake no direction | Brake Check: no direction defined |
| 108 | 5021-8 | Brake grind timeout | Brake Check: Grind in timeout |
| 109 | 5021-9 | Brake power off | Brake Check: power stage off |
| 110 | 5024-0 | Unspecified error | Supply unit: Unspecified error |
| 111 | 5024-2 | Above chopper limit | Supply unit: Line voltage above chopper limit |
| 112 | 5024-7 | 24V Power supply err | Supply unit: Error in 24V power supply unit |
| 113 | 5024-16 | DC link overvoltage | Supply unit: DC link overvoltage |
| 114 | 5024-24 | Brake resistor over | Supply unit: Brake resistor overcurrent |
| 115 | 5024-27 | Undervoltage grid | Supply unit: Undervoltage grid |
| 116 | 5024-28 | Rectifier overload | Supply unit: Rectifier Overload |
| 117 | 5024-29 | DC link balance err | Supply unit: DC link voltage balance out of range |
| 118 | 5024-30 | Short circuit detect | Supply unit: Brake transistor or DC link short circuit detected |
| | | | |

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| 119 | 5024-31 | Short ground detect | Supply unit: Short circuit to ground detected. |
|-----|----------|----------------------|--|
| 120 | 5024-32 | IGBT short circuit | Supply unit: Load IGBT short circuit detected |
| 121 | 5024-33 | Brake resistor error | Supply unit: Brake resistor not connected |
| 122 | 5024-34 | Interior temp high | Supply unit: Interior temperature too high |
| 123 | 5024-37 | Interior temp high | Supply unit: 24V supply: interior temperature too high |
| 124 | 5024-41 | 24V supply overload | Supply unit: 24V supply: overload |
| 125 | 5024-49 | DC link overload | Supply unit: DC link supply overload |
| 126 | 5024-53 | Chopper current low | Supply unit: Chopper current too low |
| 127 | 5024-54 | Chopper error | Supply unit: Chopper current too low |
| 128 | 5024-55 | Grid choke temp err | Supply unit: grid choke temperature |
| 129 | 5025-0 | Motor temp too high | Motor temperature too high |
| 130 | 5025-1 | Max motor temp | Motor temperature reached TMax value |
| 131 | 5025-4 | Encoder temp high | Encoder temperature too high |
| 132 | 5032-3 | Motor parameter err | Error in motor parameters |
| 133 | 5032-4 | No motor type | No motor type was specified |
| 134 | 5032-7 | Motor parameter err | Error in motor parameters/ synchronous motor |
| 135 | 5036-220 | Multiturn pos lost#1 | Encoder #1: Battery low, multiturn position is lost (Encoder error while switched off) |
| 136 | 5036-230 | SmartAbs encoder err | Encoder #1: SmartAbs encoder error (Encoder error while switched off) |

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2. How to clear Alarms and Warnings

In general, if the alarm can be released by simple action without shutting down the controller, release the alarm in the following sequence.

ECODE: 1423

[1/1]

Over range error

ROBOT: 1 AXIS: J5

[Description]

J5 111.140[deg]

Example at over range alarm

- ① If the alarm LED is lit or blinking, press the Up or Down key to see the full message of the alarm or warning.
- ② Refer to Chapter 3 Alarm List to find the cause of the alarm and take appropriate action.
- ③ To display the Alarm List window, press the Alarm List key. In most cases, the alarm list key is activated first.



4 After confirming the contents of the alarm and warning, press the reset button to release the alarm or warning.



- ⑤ If the alarm is not released, the alarm message is occurred again.
- When the alarm release is completed, the alarm message window disappears and the alarm LED is turned off, and the controller and the robot can be driven normally.

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Chapter 6 Maintenance

1. Check and Measures

Make sure to periodically check items on the table below.

| No. | Part | Points | Daily | 3 Monthly | Remarks |
|-----|-----------------------|---|-------|--------------|--------------------|
| 1 | Environment | Check if the environment is proper for installing controller. | 0 | | |
| 2 | Input power | Check if input power is normal. | 0 | | |
| 3 | Internal power | Using SMPS LED display on inner panel, check if the internal power is normal. | 0 | | |
| 4 | Controller appearance | Check connection status of parts(connector, terminal etc.) and screw. | | 0 | |
| 5 | Cables | Check insulation status or deterioration | | 0 | |
| 6 | Internal status | Check inflow status of dust or mist | | 0 | Clean using air |
| 7 | Cooling system | Check top dust filter clearance and if the bottom fan works. | | 0 | |

2. Parts Replacement

The following parts are subject to deterioration as the using time elapses. Please replace them if any problem is found.

| No. | Parts Name | Standard Parts | Standard Replacement Period | Remarks |
|-----|-------------|--------------------|--------------------------------|---------|
| 1 | Cooling fan | 4710KL-05W-B49-E00 | 5 years | |
| 3 | RTC battery | CR2032 3V | 3 years | |

Refer to the robot manual for robot encoder battery installation position and how to replace it.

(The normal exchange cycle is 3 years under the condition of operating 8 hours a day.)



Make sure to turn the power off when replacing parts.

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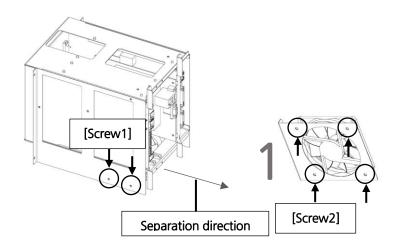


2.1 Check and replace the cooling fan

- .The 6-axis standard controller is equipped with one inside with a PC box, one inside with a door, and two cooling fans on the rear exhaust side.
- The 8-axis expansion controller is equipped with a fan of a 6-axis standard controller and two cooling fans on the rear exhaust side.
- If the cooling fan does not operate properly, the internal heat may cause deterioration of performance.
- When the cooling fan does not operate properly, the following warning message is generated. Check and replace according to the following method.

| Code | 1091 | Message | FAN error |
|---|------|---------|-----------|
| Description FAN fault occurrence | | | |

(1) Inside fan with a PC box



⟨Inside fan1 with a PC box⟩

■ How to check

- ① Turn off the power.
- ② Remove the [Screw1] for fixing with a PC Box.
- ③ Separate the Inside fan1 with [separation direction].
- 4) Check the condition of connector to the fan.
- ⑤ Check whether there is polluted substance and clean.

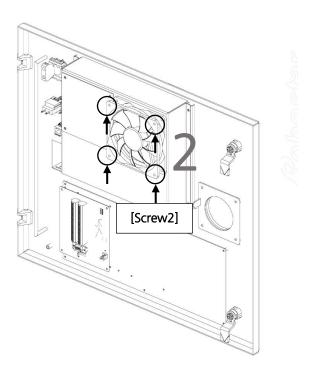
■ How to replace

- ① Turn off the power.
- ② Remove the [Screw1] for fixing with a PC Box.
- ③ Separate the Inside fan1 with [separation direction].
- 4 Disconnect the connector to the fan.
- ⑤ Remove the [Screw2] and separate the fan.
- ⑥ Install new fan in order from ⑤ to ②

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(2) Inside fan with a door



⟨Inside fan2 with a door⟩

■ How to check

- ① Turn off the power.
- ② Check the condition of connector to the fan.
- ③ Check whether there is polluted substance and clean.

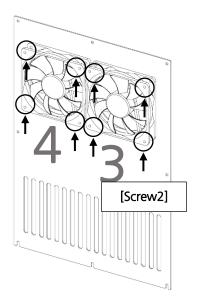
■ How to replace

- ① Turn off the power.
- ② Disconnect the connector to the fan.
- ③ Remove the [Screw2] and separate the fan.
- 4 Install new fan in order from 3 to 2

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(3) Rear exhaust fans



⟨Rear exhaust fans 3, 4⟩

■ How to check

- ① Turn off the power.
- ② Remove the rear cover fixing screw.
- ③ Remove the rear cover.
- ④ Check the condition of connector to the fan.
- ⑤ Check whether there is polluted substance and clean.

■ How to replace

- ① Turn off the power.
- ② Remove the rear cover fixing screw.
- ③ Remove the rear cover.
- 4 Disconnect the connector to the fan.
- ⑤ Remove the [Screw2] and separate the fan.
- 6 Install new fan in order from 5 to 2

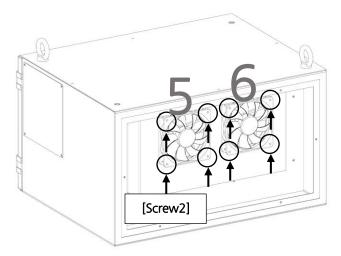


▶ When removing the rear cover, be careful not to pull the connected cable.

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(4) Rear exhaust fans with 8 axis controller



⟨Rear exhaust fans 3, 4⟩

■ How to check

- ① Turn off the power.
- ② Remove the rear cover fixing screw.
- ③ Remove the rear cover.
- 4 Check the condition of connector to the fan.
- ⑤ Check whether there is polluted substance and clean.

■ How to replace

- 7 Turn off the power.
- 8 Remove the rear cover fixing screw.
- Remove the rear cover.
- 10 Disconnect the connector to the fan.
- (1) Remove the [Screw2] and separate the fan.
- ② Install new fan in order from ⑤ to ②

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2.2 Check and replace the RTC battery

- The N2S controller does not have a battery for memory backup. However, a battery is installed to maintain the date and time.
- The life of the battery is theoretically about 3 years when the board is not powered. Depending on the usage environment, the lifetime of the battery may be shortened (if the board is powered, the life of the battery may be extended).
- If the voltage of the battery is less than 2V or the controller is powered on when it is discharged, it will not boot normally.

■ How to check

- ① Turn off the power.
- ② Remove the front main module fixing screws(4 places).
- ③ Check the main board battery position of the main module.
- With the battery mounted on the board, measure the DC voltage by contacting the ground of the board and the + pole of the battery with the multimeter probe.



[Picture] Measurement example

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■ How to replace

- ① Turn off the power.
- ② Remove the front main module fixing screws(4 places).
- 3 Check the main board battery position on the left side of the main module.
- ④ Open the + pole terminal of the battery socket and remove the battery.
- ⑤ Check the + pole and pole of the new battery and insert it in the correct direction in the socket.
- ⑥ Reset the system time(STIME) after turning on the power.

| STIME | PUB - ETC - TIME - STIME |
|-------|--------------------------|
|-------|--------------------------|

■ Battery specification

| Model No. | CR2032 | <u> </u> | | | |
|---|--------------|---|---------|------------------------|--|
| | | | | | |
| Manufacture | Panasonic | | | | |
| Voltage | 3V | | | | |
| Capacity | 225 mAh | | | | |
| Operating Temp. | -30 to 60 °C | | | | |
| Recommend Storage Condition | Tempera | Temperature : 5℃ to 35℃ Humidity : 45 ~ 85%RH | | | |
| | | Temp. | Initial | After 1 year room temp | |
| Continuous Discharge Duration (Load:15kΩ, Cut off V:2.0V) | Std. | 20 ±2℃ | 1183h | 1133h | |
| (LOdd: 15Km, Cat Off V.2.0V) | Min. | | 1041h | 1019h | |
| Height | 3.2mm | | | | |
| Diameter | 20mm | | | | |
| | + Pole | | | - Pole | |
| Pole | | Panasonic CR 2032 | | 1 18 | |

? CAUTION

▶ When replacing the battery, be careful of terminal shorting and ESD inflow.

▶ Batteries should be stored within the manufacturer's recommended temperature and humidity, otherwise life may be reduced.

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3. To do after replacing parts

The N2M controller is factory shipped with the basic settings of robot and controller. When replacing or adding the following parts, please follow the prescribed procedure.

3.1 Setting Home Position

- Proceed with matching the position of the robot and the position of the absolute encoder.
- When you need to set the home position
 - ① When the combination of robot and controller is changed
 - ② When the motor or absolute encoder battery is replaced
 - ③ When the reducer or belt inside the robot is adjusted
 - 4 When the origin is displaced due to the collision of robot

■ Procedure

① Initialize the multi-turn data of motor for each axis(M-TURN).

|) - BODY -MOTOR(2) - M-TURN | PA | M-TURN | |
|-----------------------------|----|----------|--|
| DODY MOTOR(2) MITURN | D | NA-TUDNI | |

- ② Move to the home position of robot by manual operation of robot.
- ③ Initialize the multi-turn data of motor for each axis once more(M-TURN).

| M-TURN | PARA(1) - BODY -MOTOR(2) - M-TURN |
|--------|-----------------------------------|
| | |

④ Zero calibration is performed after moving the robot home point(ZCAL).

| ZCAL | PARA(1) - BODY - OFFS - ZCAL - MDI |
|------|------------------------------------|
|------|------------------------------------|

CAUTION

- ▶ Origin position and posture are different according to robot capacity and model. Please refer to the corresponding robot manual.
- ► For detailed operation, refer to N2 Controller Operating Manual.

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Chapter 7 Revision

| Revision | Date | Revised Detail |
|----------|------------|----------------------|
| 0 | 2020-08-21 | Initial Distribution |

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A. Literature Reference

All the literature, which are required for performing services, repair or installation of all robot system that uses this product, are specified in this chapter.

In the ID of all literature, the very first word indicates the controller name and the second word means the abbreviation of corresponding literature. The last indicates language and its version.

Language is marked according to the rules below.

Korean: KEnglish: EChinese: CVietnam: V

| Document ID | Description |
|-------------|---|
| N2M-IM-E□□ | Installation and handling manual This explains the controller structure and installation as well as the methods to interface with external devices. |
| N2-OM-E□□ | Operation manual This explains the method to use the controller and teach pendant, parameter setting, JOB program editing and additional functions. |
| N2-PM-E□□ | Programming manual This explains the method to create RRL (Robostar robot language) that is the Robostar robot program and describes the commands. |
| N2-HM-E□□ | Unihost manual This explains about Unihost that is Robostar on-line PC program. |
| N2-AM-E□□ | Alarm and maintenance manual This explains the information on problems occurred in the controller - based robot system as well as solutions and procedure for the problems. |

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N2M Series Controller

Installation and handling Manual First edition, August 21, 2020

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