MITSUBISHI ELECTRIC

AC Servo System

MITSUBISHI ELECTRIC SERVO SYSTEM
MELSERVO-J5

# MR-J5-G-N1/MR-J5W-G-N1 User's Manual (Introduction)

-MR-J5-_G_-_N1
-MR-J5W_-_G-_N1

# SAFETY INSTRUCTIONS

Please read the instructions carefully before using the equipment.
To use the equipment correctly, do not attempt to install, operate, maintain, or inspect the equipment until you have read through this manual, installation guide, and appended documents carefully. Do not use the equipment until you have a full knowledge of the equipment, safety information and instructions.
In this manual, the safety instruction levels are classified into "WARNING" and "CAUTION".

| | |
|---|---|
| ⚠ **WARNING** | Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury. |
| ⚠ **CAUTION** | Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight injury. |

Note that the CAUTION level may lead to a serious consequence depending on conditions.
Please follow the instructions of both levels because they are important to personnel safety.
Forbidden actions and required actions are indicated by the following diagrammatic symbols.

| | |
|---|---|
|  | Indicates a forbidden action. For example, "No Fire" is indicated by  . |
|  | Indicates a required action. For example, grounding is indicated by  . |

In this manual, precautions for hazards that can lead to property damage, instructions for other functions, and other information are shown separately in the "Point" area.
After reading this manual, keep it accessible to the operator.

## [Installation/wiring]

### ⚠WARNING

- To prevent an electric shock, turn off the power and wait for 15 minutes or more before starting wiring and/or inspection.
- To prevent an electric shock, ground the servo amplifier.
- To prevent an electric shock, any person who is involved in wiring should be fully competent to do the work.
- To prevent an electric shock, mount the servo amplifier before wiring.
- To prevent an electric shock, connect the protective earth (PE) terminal of the servo amplifier to the protective earth (PE) of the cabinet, then connect the grounding lead wire to the ground.
- To prevent an electric shock, do not touch the conductive parts.

## [Setting/adjustment]

### ⚠WARNING

- To prevent an electric shock, do not operate the switches with wet hands.

## [Operation]

### ⚠WARNING

- To prevent an electric shock, do not operate the switches with wet hands.

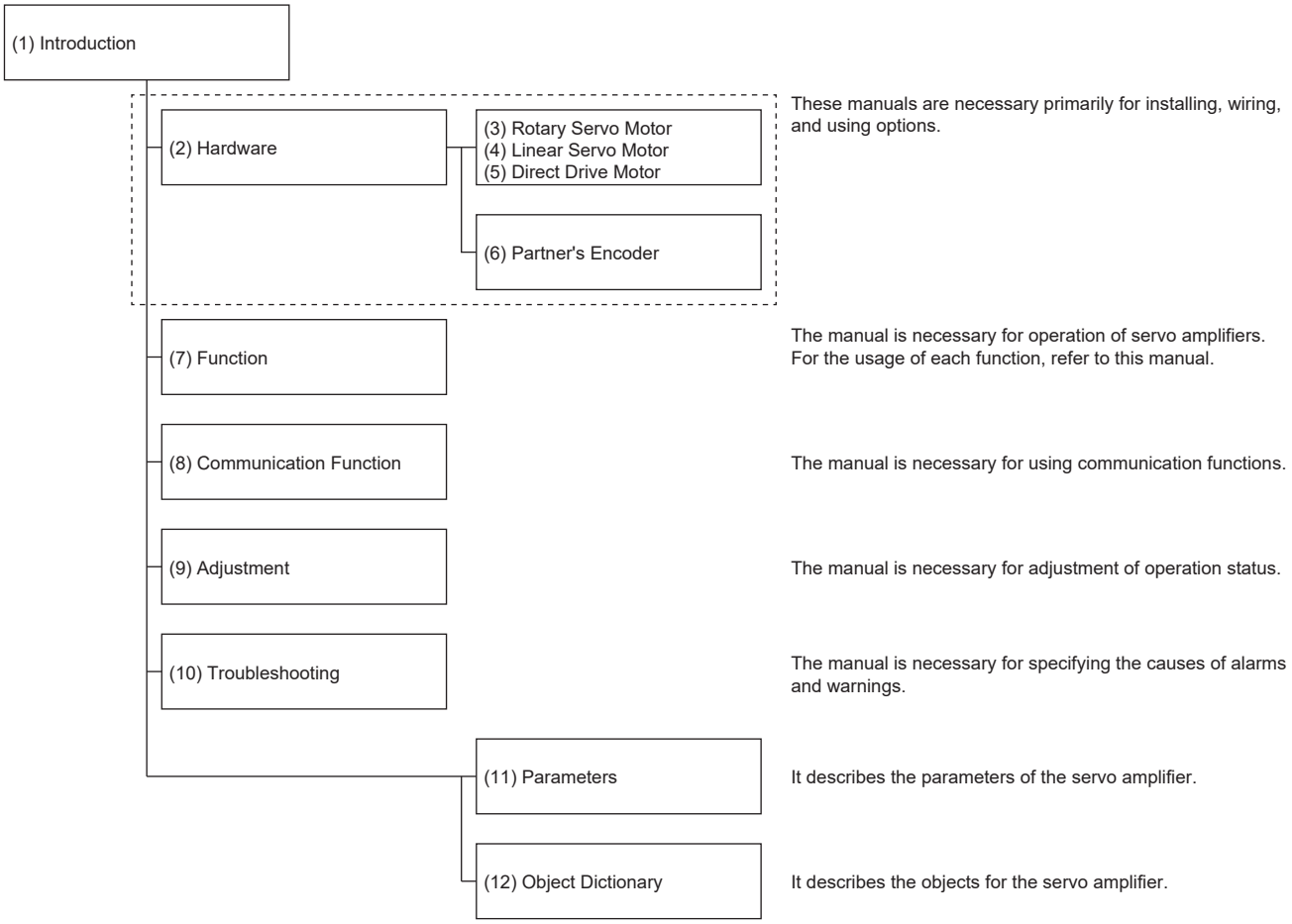
## [Maintenance]

### ⚠WARNING

- To prevent an electric shock, any person who is involved in inspection should be fully competent to do the work.
- To prevent an electric shock, do not operate the switches with wet hands.

# ABOUT THE MANUAL

If using the servo for the first time, prepare and use the following related manuals to ensure that the servo is used safely.

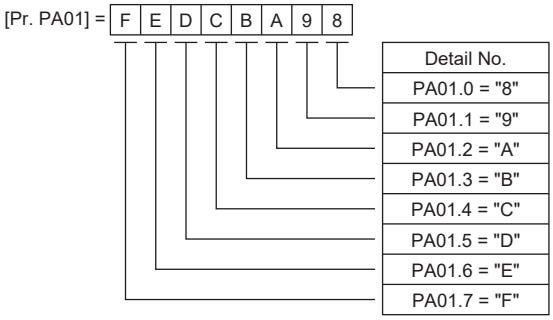



| No. | Manual name | Manual No. |
|---|---|---|
| (1) | MR-J5-G-N1/MR-J5W-G-N1 User's Manual (Introduction) | SH(NA)-030366ENG |
| (2) | MR-J5 User's Manual (Hardware) | SH(NA)-030298ENG |
| (3) | Rotary Servo Motor User's Manual (For MR-J5) | SH(NA)-030314ENG |
| (4) | Linear Servo Motor User's Manual (LM-H3/LM-U2/LM-F/LM-K2 series) | SH(NA)-030316ENG |
| | Linear Servo Motor User's Manual (LM-AJ/LM-AU) | IB(NA)-0300518ENG |
| (5) | Direct Drive Motor User's Manual | SH(NA)-030318ENG |
| (6) | MR-J5 Partner's Encoder User's Manual | SH(NA)-030320ENG |
| (7) | MR-J5 User's Manual (Function) | SH(NA)-030300ENG |
| (8) | MR-J5-G-N1/MR-J5W-G-N1 User's Manual (Communication Function) | SH(NA)-030371ENG |
| (9) | MR-J5 User's Manual (Adjustment) | SH(NA)-030306ENG |
| (10) | MR-J5 User's Manual (Troubleshooting) | SH(NA)-030312ENG |
| (11) | MR-J5-G/MR-J5W-G User's Manual (Parameters) | SH(NA)-030308ENG |
| (12) | MR-J5-G-N1/MR-J5W-G-N1 User's Manual (Object Dictionary) | SH(NA)-030376ENG |

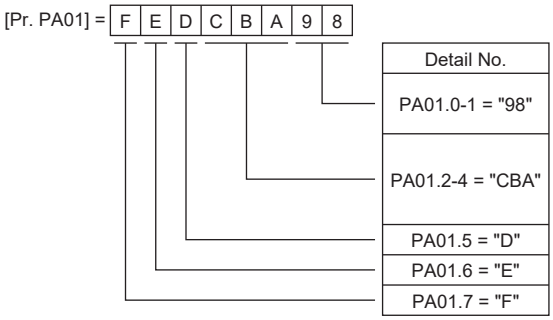
## Interpreting servo parameter numbers

For a servo parameter which uses one particular digit to select a function, the position of its digit indicates the detail number of the servo parameter, and the value in hexadecimal which is set to the digit indicates the selected function.
For example, the detail number of the servo parameter in the last digit is expressed as [Pr. PA01.0]. In addition, a servo parameter which uses a combination of several digits to select a function, is expressed using "-" as seen in [Pr. PA01.0-1].
The following is an example of the servo parameter number PA01 with the setting values of "FEDCBA98" in hexadecimal.

- When setting a servo parameter with one particular digit




- When setting a servo parameter using a combination of several digits




For example, if the servo parameter name is "Function selection A-1", the setting digit name is "Forced stop deceleration function selection", and the setting digit is the fourth last digit in PA04, the servo parameter is expressed as shown below.
[Pr. PA04.3 Forced stop deceleration function selection]

| Servo parameter | Symbol | Name | Summary |
|---|---|---|---|
| PA04.3 | *AOP | Forced stop deceleration function selection | Set "Forced stop deceleration function" to enabled/disabled.<br>Initial value: 1h (enabled) |

## Global standards and regulations

Compliance with the indicated global standards and regulations is current as of the release date of this manual. Some standards and regulations may have been modified or withdrawn.

# DEFINITION OF TERMS IN COMMON BUS CONNECTION

The terms related to the construction of the common bus connection system are defined as follows:
Main unit: The servo amplifier connected to the 3-phase AC input power supply. It is the axis with the largest capacity in the servo system.
Sub unit: The servo amplifier not connected to the 3-phase AC input power supply. It is the axis powered by the bus of the main unit.

# U.S. CUSTOMARY UNITS

U.S. customary units are not shown in this manual. Convert the values if necessary according to the following table.

| Quantity | SI (metric) unit | U.S. customary unit |
|---|---|---|
| Mass | 1 [kg] | 2.2046 [lb] |
| Length | 1 [mm] | 0.03937 [inch] |
| Torque | 1 [N•m] | 141.6 [oz•inch] |
| Moment of inertia | 1 [(× $10^{-4}$ kg•$m^2$)] | 5.4675 [oz•$inch^2$] |
| Load (thrust load/axial load) | 1 [N] | 0.2248 [lbf] |
| Temperature | N [°C] × 9/5 + 32 | N [°F] |

# CONTENTS

# 1 SPECIFICATIONS

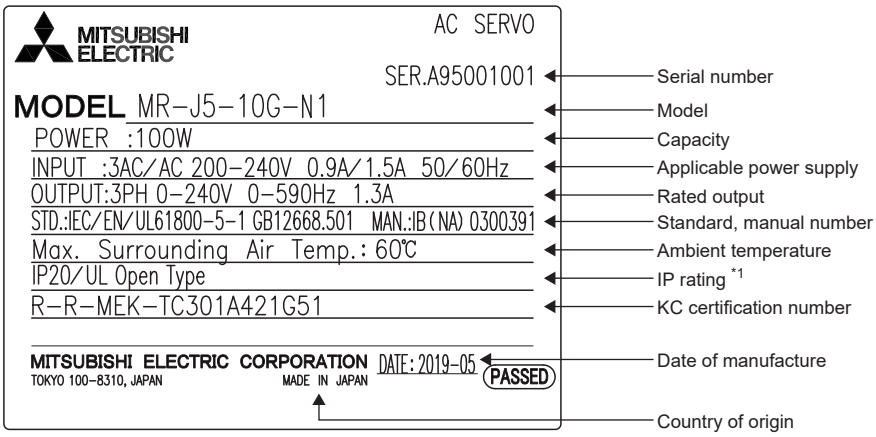
## 1.1 Outline

The MR-J5_-_G_-_N1 are servo amplifiers to be used for EtherCAT and EtherNet/IP.
EtherCAT is an abbreviation of Ethernet for Control Automation Technology. It is open network communication between a master station and slave stations via real-time Ethernet developed by Beckhoff Automation GmbH.
EtherNet/IP is an abbreviation of Ethernet Industrial Protocol. It is an open industrial network that uses the TCP/IP protocol and implements CIP (Common Industrial Protocol) as the control protocol in the application layer, and is controlled by ODVA (Open DeviceNet Vendor Association, Inc.).
One MR-J5W_-_G-N1 servo amplifier can drive two or three servo motors. The footprint of one MR-J5W_-_G-N1 servo amplifier is considerably smaller than that of two or three MR-J5-_G_-_N1 servo amplifiers.

## 1.2 Model designation

### Rating plate

The following shows an example of the rating plate for explanation of each item.




*1 The IP rating of the standard certification. For the actual IP rating, refer to the following.
☞ Page 13 Servo amplifier standard specifications

## Model

The following describes what each block of a model name indicates. Not all combinations of the symbols are available.

### ■MR-J5-_G_-_N1

MR - J5 - 60G4 - RJN1

Series

Rated output

| Symbol | Rated output [kW] |
|---|---|
| 10 | 0.1 |
| 20 | 0.2 |
| 40 | 0.4 |
| 60 | 0.6 |
| 70 | 0.75 |
| 100 | 1 |
| 200 | 2 |
| 350 | 3.5 |
| 500 | 5 |
| 700 | 7 |
| 12K | 12 |
| 17K | 17 |
| 25K | 25 |

Special specification

| Symbol | Special specification |
|---|---|
| None | Standard |
| RJ | Load-side encoder A/B/Z-phase input compatible/Safety sub-function |
| HS | Load-side encoder A/B/Z-phase input compatible/Safety sub-function/ Functional safety I/O signal 3 points |
| ED | Standard model without dynamic brake |
| RU | MR-J5-_G-RJ without dynamic brake |
| HU | MR-J5-_G_-HSN1 without the dynamic brake |
| PX | Standard model without regenerative resistor |
| HZ | MR-J5-_G_-HSN1 without regenerative resistor |
| EB | Standard products with a special coating specification |
| RB | MR-J5-_G_-RJN1 with a special coating specification |
| HB | MR-J5-_G_-HSN1 with a special coating specification |

Power supply *1

| Symbol | Power supply |
|---|---|
| None | 3-phase or 1-phase 200 V AC to 240 V AC |
| 4 | 3-phase 380 V AC to 480 V AC |

*1 When using a servo amplifier with a 1-phase 100 V AC to 120 V AC power supply input, connect an MR-CM08K1 simple converter and a 200 V class 1-axis or multi-axis servo amplifier. The MR-CM08K1 simple converter is available on servo amplifiers with firmware version F0 or later. For details, refer to "MR-CM08K1 simple converter" in the following manual.
MR-J5 User's Manual (Hardware)

| Item | | Special specifications *1 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | None | RJ | HS | ED *3 | RU *3 | HU *3 | PX *4 | HZ *4 | EB *5 | RB *5 | HB *5 |
| Digital input | Touch probe cannot be assigned | 4 points | 3 points | 3 points | 4 points | 3 points | 3 points | 4 points | 3 points | 4 points | 3 points | 3 points |
| | Touch probe can be assigned | 2 points *2 | 3 points | 3 points | 2 points *2 | 3 points | 3 points | 2 points | 3 points | 2 points | 3 points | 3 points |
| Digital output | | 3 points | 3 points | 3 points | 3 points | 3 points | 3 points | 3 points | 3 points | 3 points | 3 points | 3 points |
| Functional safety input signal (double wiring) | | 1 point | 1 point | 3 points | 1 point | 1 point | 3 points | 1 point | 3 points | 1 point | 1 point | 3 points |
| Functional safety output signal (double wiring) | | 1 point | 1 point | 3 points | 1 point | 1 point | 3 points | 1 point | 3 points | 1 point | 1 point | 3 points |
| External wiring diagnostic output | | × | × | ○ | × | × | ○ | × | ○ | × | × | ○ |
| CN2L connector | | × | ○ | ○ | × | ○ | ○ | × | ○ | × | ○ | ○ |
| Linear servo system | Two-wire type | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | Four-wire type | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | A/B/Z-phase differential input | × | ○ | ○ | × | ○ | ○ | × | ○ | × | ○ | ○ |
| Fully closed loop system Scale measurement function | Two-wire type | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | Four-wire type | × | ○ | ○ | × | ○ | ○ | × | ○ | × | ○ | ○ |
| | A/B/Z-phase differential input | × | ○ | ○ | × | ○ | ○ | × | ○ | × | ○ | ○ |
| Touch probe | | ○ *2 | ○ | ○ | ○ *2 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

| Item | | Special specifications *1 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | None | RJ | HS | ED *3 | RU *3 | HU *3 | PX *4 | HZ *4 | EB *5 | RB *5 | HB *5 |
| Functional safety | STO | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | SS1 | × | ○ | ○ | × | ○ | ○ | × | ○ | × | ○ | ○ |
| | SS2 *3 | × | ○ | ○ | × | ○ | ○ | × | ○ | × | ○ | ○ |
| | SOS *3 | × | ○ | ○ | × | ○ | ○ | × | ○ | × | ○ | ○ |
| | SBC | × | ○ | ○ | × | ○ | ○ | × | ○ | × | ○ | ○ |
| | SLS *3 | × | ○ | ○ | × | ○ | ○ | × | ○ | × | ○ | ○ |
| | SSM *3 | × | ○ | ○ | × | ○ | ○ | × | ○ | × | ○ | ○ |
| | SDI *3 | × | ○ | ○ | × | ○ | ○ | × | ○ | × | ○ | ○ |
| | SLI *3 | × | ○ | ○ | × | ○ | ○ | × | ○ | × | ○ | ○ |
| | SLT *3 | × | ○ | ○ | × | ○ | ○ | × | ○ | × | ○ | ○ |
| Built-in dynamic brake | 7 kW or less | ○ | ○ | ○ | × | × | × | — | — | ○ | ○ | ○ |
| | 12 kW or more | × | × | × | × | × | × | × | × | × | × | × |
| Built-in regenerative resistor | | ○ | ○ | ○ | ○ | ○ | ○ | × | × | ○ | ○ | ○ |
| Special coating | | × | × | × | × | × | × | × | × | ○ | ○ | ○ |

*1 ○: The corresponding item is included or supported.
×: The corresponding item is not included or not supported.

*2 Available on servo amplifiers manufactured in June 2021 or later with firmware version C0 or later. Servo amplifiers with both the former and new versions may be distributed in the market around the same time depending on the stock status. When considering introducing the touch probe function, contact your local sales office.

*3 For details of this special specifications, refer to the following.
☞ Page 34 Servo amplifiers without dynamic brake (ED/RU/HU)

*4 For details of this special specification, refer to the following.
☞ Page 34 Servo amplifiers without regenerative resister (PX/HZ)

*5 For details of this special specification, refer to the following.
☞ Page 35 Special coating specification products (EB/RB/HB)

## ■MR-J5W_-_G-N1

**Point**

When using a servo amplifier with a 1-phase 100 V AC to 120 V AC power supply input, connect an MR-CM08K1 simple converter and a 200 V class 1-axis or multi-axis servo amplifier. The MR-CM08K1 simple converter is available on servo amplifiers with firmware version F0 or later. For details, refer to "MR-CM08K1 simple converter" in the following manual.

MR-J5 User's Manual (Hardware)

MR - J5W2 - 44G - EDN1

Series

Number of axes

| Symbol | Number of axes |
|---|---|
| W2 | 2 |
| W3 | 3 |

Special specification

| Symbol | Special specification |
|---|---|
| None | Standard |
| ED | Without dynamic brake |
| EB | Standard products with a special coating specification |

Rated output

| Symbol | Rated output [kW] | | |
|---|---|---|---|
| | A-axis | B-axis | C-axis |
| 22 | 0.2 | 0.2 | - |
| 44 | 0.4 | 0.4 | - |
| 77 | 0.75 | 0.75 | - |
| 1010 | 1 | 1 | - |
| 222 | 0.2 | 0.2 | 0.2 |
| 444 | 0.4 | 0.4 | 0.4 |

| Item | | Special specifications *1 | | |
|---|---|---|---|---|
| | | Not attached (standard model) | ED *4 | EB *5 |
| CN2L connector | | × | × | × |
| Linear servo system | Two-wire type | ○ | ○ | ○ |
| | Four-wire type | ○ | ○ | ○ |
| | A/B/Z-phase differential input | × | × | × |
| Fully closed loop system *2<br>Scale measurement function *2 | Two-wire type | ○ | ○ | ○ |
| | Four-wire type | × | × | × |
| | A/B/Z-phase differential input | × | × | × |
| Touch probe | | ○ | ○ | ○ |
| Functional safety | STO | ○ | ○ | ○ |
| | SS1 | ○ | ○ | ○ |
| | SS2 *3 | ○ | ○ | ○ |
| | SOS *3 | ○ | ○ | ○ |
| | SBC | ○ | ○ | ○ |
| | SLS *3 | ○ | ○ | ○ |
| | SSM *3 | ○ | ○ | ○ |
| | SDI *3 | ○ | ○ | ○ |
| | SLI *3 | ○ | ○ | ○ |
| | SLT *3 | ○ | ○ | ○ |
| Built-in dynamic brake | | ○ | × | ○ |
| Special coating | | × | × | ○ |

*1 ○: The corresponding item is included or supported. ×: The corresponding item is not included or not supported.

*2 Not available on the MR-J5W3-_G-N1.

*3 Available on servo amplifiers with firmware version D8 or later.

*4 For details of this special specifications, refer to the following.

☞ Page 34 Servo amplifiers without dynamic brake (ED/RU/HU)

*5 For details of this special specification, refer to the following.

☞ Page 35 Special coating specification products (EB/RB/HB)

# 1.3 Servo amplifier/motor combinations

Refer to "Servo amplifier/motor combinations" in the following manual.

MR-J5 User's Manual (Hardware)

# 1.4 Servo amplifier standard specifications

**Point**

When using a servo amplifier with a 1-phase 100 V AC to 120 V AC power supply input, connect an MR-CM08K1 simple converter and a 200 V class 1-axis or multi-axis servo amplifier. The MR-CM08K1 simple converter is available on servo amplifiers with firmware version F0 or later. For details, refer to "MR-CM08K1 simple converter" in the following manual.
MR-J5 User's Manual (Hardware)

## MR-J5-_G-_N1

### 200 V class

| Model: MR-J5-_-_N1 | | | 10G | 20G | 40G | 60G | 70G | 100G | 200G | 350G | 500G | 700G | 12KG | 17KG | 25KG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Output | Voltage | | 3-phase 0 V AC to 240 V AC | | | | | | | | | | | | |
| | Rated current [A] | | 1.3 | 1.8 | 2.8 | 3.2 | 5.8 | 6.0 | 11.0 | 17.0 | 28.0 | 37.0 | 68.0 | 87.0 | 126.0 |
| Main circuit power supply input | Voltage/ Frequency | At AC input | 3-phase or 1-phase 200 V AC to 240 V AC, 50 Hz/60 Hz | | | | | 3-phase or 1-phase 200 V AC to 240 V AC, 50 Hz/60 Hz [*4] | | 3-phase 200 V AC to 240 V AC, 50 Hz/60 Hz | | | | | |
| | | At DC input | 283 V DC to 340 V DC | | | | | | | | | | | | |
| | Rated current [A] [*3] | At AC input | 0.9 (1.5) | 1.5 (2.5) | 2.6 (4.5) | 3.2 (5.0) | 3.8 (6.5) | 5.0 (10.5) | 10.5 (15.8) | 16.0 | 21.7 | 28.9 | 52.0 | 72.2 | 109.7 |
| | | At DC input | 1.1 | 1.8 | 3.2 | 3.5 | 4.6 | 6.0 | 12.4 | 19.4 | 26.5 | 38.9 | 63.6 | 77.7 | 132.9 |
| | Permissible voltage fluctuation | At AC input | 3-phase or 1-phase 170 V AC to 264 V AC | | | | | 3-phase or 1-phase 170 V AC to 264 V AC [*4] | | 3-phase 170 V AC to 264 V AC | | | | | |
| | | At DC input | 241 V DC to 374 V DC | | | | | | | | | | | | |
| | Permissible frequency fluctuation | | Within ±5 % | | | | | | | | | | | | |
| | Power supply capacity [kVA] | | Refer to "Power supply capacity and generated loss" in the following manual. MR-J5 User's Manual (Hardware) | | | | | | | | | | | | |
| | Inrush current [A] | | Refer to "Inrush currents at power-on of main circuit and control circuit" in the following manual. MR-J5 User's Manual (Hardware) | | | | | | | | | | | | |
| Control circuit power supply input | Voltage/ Frequency | At AC input | 1-phase 200 V AC to 240 V AC, 50 Hz/60 Hz | | | | | | | | | | | | |
| | | At DC input | 283 V DC to 340 V DC | | | | | | | | | | | | |
| | Rated current [A] | | 0.2 | | | | | | | | 0.3 | | | | |
| | Permissible voltage fluctuation | At AC input | 1-phase 170 V AC to 264 V AC | | | | | | | | | | | | |
| | | At DC input | 241 V DC to 374 V DC | | | | | | | | | | | | |
| | Permissible frequency fluctuation | | Within ±5 % | | | | | | | | | | | | |
| | Power consumption [W] | | 30 | | | | | | | | | | 45 | | |
| | Inrush current [A] | | Refer to "Inrush currents at power-on of main circuit and control circuit" in the following manual. MR-J5 User's Manual (Hardware) | | | | | | | | | | | | |
| Interface power supply | Voltage | | 24 V DC ±10 % | | | | | | | | | | | | |
| | Current capacity [A] | | 0.3 (including CN8 connector signals) [*1] | | | | | | | | | | | | |
| Control method | | | Sine-wave PWM control, current control method | | | | | | | | | | | | |
| Dynamic brake | | | Built-in | | | | | | | | | | External [*6*7] | | |
| EtherCAT | Communication cycle | | 125 µs, 250 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms | | | | | | | | | | | | |
| EtherNet/IP | Cycle time | | Select from 1 ms to 100 ms. | | | | | | | | | | | | |
| Communication function | USB | | Connection to a personal computer or other devices (MR Configurator2-compatible) | | | | | | | | | | | | |
| Encoder output pulses | | | Compatible (A/B/Z-phase pulse) | | | | | | | | | | | | |

| Model: MR-J5-_-_N1 | | 10G | 20G | 40G | 60G | 70G | 100G | 200G | 350G | 500G | 700G | 12KG | 17KG | 25KG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analog monitor | | Two channels | | | | | | | | | | | | |
| Fully closed loop control | | Supported | | | | | | | | | | | | |
| Scale measurement function | | Supported | | | | | | | | | | | | |
| Load-side encoder interface | MR-J5-_G-N1 | Mitsubishi Electric high-speed serial communication | | | | | | | | | | | | |
| | MR-J5-_G-RJN1<br>MR-J5-_G-HSN1 | Mitsubishi Electric high-speed serial communication/A/B/Z-phase differential input signal | | | | | | | | | | | | |
| Protective functions | | Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal), servo motor overheat protection, encoder error protection, regenerative error protection, undervoltage protection, instantaneous power failure protection, overspeed protection, excessive error protection, magnetic pole detection protection, and linear servo control error protection | | | | | | | | | | | | |
| Global standards | CE marking | LVD: EN 61800-5-1, EMC: EN 61800-3, MD: EN ISO 13849-1:2015, EN 61800-5-2, EN IEC 62061 | | | | | | | | | | | | |
| | UKCA marking | LVD: BS EN 61800-5-1, EMC: BS EN IEC 61800-3, MD: BS EN ISO 13849-1:2015, BS EN 61800-5-2, BS EN IEC 62061 | | | | | | | | | | | | |
| | UL standard | UL 61800-5-1 | | | | | | | | | | | | |
| Structure (IP rating) | | Natural cooling, open (IP20) | | | | Force cooling, open (IP20) | | | | Force cooling, open (IP20) *5 | | Force cooling, open (IP20) *8*9 | | |
| Close mounting *2 | 3-phase power supply input | Possible | | | | | | | | | | Impossible | | |
| | 1-phase power supply input | Possible | | | | | Impossible | | — | | | | | |
| Mass [kg] | | 0.8 | | | 1.0 | 1.4 | | 2.2 | | 3.7 | 6.2 | 12.7 | | 18.1 |

*1 This value is applicable when all I/O signals are used. Reducing the number of I/O points decreases the current capacity.

*2 If closely mounting the servo amplifiers, operate them at an ambient temperature of 0 ˚C to 45 ˚C or at 75 % or less of the effective load ratio.

*3 The value in ( ) is the rated current for the 1-phase power supply input.

*4 If using 1-phase power supply in combination with the servo motor of 750 W or higher, operate the servo amplifier at 75 % or less of the effective load ratio.

*5 This does not apply to connectors.

*6 Use an external dynamic brake for this servo amplifier. Otherwise, the servo amplifier coasts without a quick stop and may cause an accident. Ensure the safety in the entire system.

*7 To make the servo amplifier comply with the SEMI-F47 standard, the external dynamic brake cannot be used. Do not assign DB (dynamic brake interlock) to [Pr. PD07] to [Pr. PD09]. If DB (dynamic brake interlock) is assigned, the servo amplifier turns to the servo-off state when an instantaneous power failure occurs.

*8 The terminal block is excluded.

*9 The IP rating of the standard certification is IP00.

## 400 V class

| Model: MR-J5-_-_N1 | | | 60G4 | 100G4 | 200G4 | 350G4 | 500G4 | 700G4 | 12KG4 | 17KG4 | 25KG4 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Output | Voltage | | 3-phase 0 V AC to 480 V AC | | | | | | | | |
| | Rated current [A] | | 1.6 | 2.8 | 5.5 | 8.6 | 14 | 17 | 32.0 | 41.0 | 63.0 |
| Main circuit power supply input | Voltage/ Frequency | At AC input | 3-phase 380 V AC to 480 V AC, 50 Hz/60 Hz | | | | | | | | |
| | Rated current [A] | | 1.4 | 2.5 | 5.1 | 7.9 | 10.8 | 14.4 | 26.0 | 36.1 | 54.8 |
| | Permissible voltage fluctuation | At AC input | 3-phase 323 V AC to 528 V AC | | | | | | | | |
| | Permissible frequency fluctuation | | Within ±5 % | | | | | | | | |
| | Power supply capacity [kVA] | | Refer to "Power supply capacity and generated loss" in the following manual.<br>MR-J5 User's Manual (Hardware) | | | | | | | | |
| | Inrush current [A] | | Refer to "Inrush currents at power-on of main circuit and control circuit" in the following manual.<br>MR-J5 User's Manual (Hardware) | | | | | | | | |
| Control circuit power supply input | Voltage/ Frequency | At AC input | 1-phase 380 V AC to 480 V AC, 50 Hz/60 Hz | | | | | | | | |
| | Rated current [A] | | 0.1 | | | | 0.2 | | | | |
| | Permissible voltage fluctuation | At AC input | 1-phase 323 V AC to 528 V AC | | | | | | | | |
| | Permissible frequency fluctuation | | Within ±5 % | | | | | | | | |
| | Power consumption [W] | | 30 | | | | 45 | | | | |
| | Inrush current [A] | | Refer to "Inrush currents at power-on of main circuit and control circuit" in the following manual.<br>MR-J5 User's Manual (Hardware) | | | | | | | | |
| Interface power supply | Voltage | | 24 V DC ±10 % | | | | | | | | |
| | Current capacity [A] | | 0.3 (including CN8 connector signals) *1 | | | | | | | | |
| Control method | | | Sine-wave PWM control, current control method | | | | | | | | |
| Dynamic brake | | | Built-in | | | | | | External *3*4 | | |
| EtherCAT | Communication cycle | | 125 µs, 250 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms | | | | | | | | |
| EtherNet/IP | Cycle time | | Select from 1 ms to 100 ms. | | | | | | | | |
| Communication function | USB | | Connection to a personal computer or other devices (MR Configurator2-compatible) | | | | | | | | |
| Encoder output pulses | | | Compatible (A/B/Z-phase pulse) | | | | | | | | |
| Analog monitor | | | Two channels | | | | | | | | |
| Fully closed loop control | | | Supported | | | | | | | | |
| Scale measurement function | | | Supported | | | | | | | | |
| Load-side encoder interface | MR-J5-_G4-N1 | | Mitsubishi Electric high-speed serial communication | | | | | | | | |
| | MR-J5-_G4-RJN1<br>MR-J5-_G4-HSN1 | | Mitsubishi Electric high-speed serial communication/A/B/Z-phase differential input signal | | | | | | | | |
| Protective functions | | | Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal), servo motor overheat protection, encoder error protection, regenerative error protection, undervoltage protection, instantaneous power failure protection, overspeed protection, excessive error protection, magnetic pole detection protection, and linear servo control error protection | | | | | | | | |
| Global standards | CE marking | | LVD: EN 61800-5-1, EMC: EN 61800-3, MD: EN ISO 13849-1:2015, EN 61800-5-2, EN IEC 62061 | | | | | | | | |
| | UKCA marking | | LVD: BS EN 61800-5-1, EMC: BS EN IEC 61800-3, MD: BS EN ISO 13849-1:2015, BS EN 61800-5-2, BS EN IEC 62061 | | | | | | | | |
| | UL standard | | UL 61800-5-1 | | | | | | | | |
| Structure (IP rating) | | | Natural cooling, open (IP20) *5 | | Force cooling, open (IP20) *5 | | | | Force cooling, open (IP20) *6*7 | | |
| Close mounting | | | Impossible | | | | | | | | |
| Mass [kg] | | | 1.6 | | 2.2 | 2.3 | 5.2 | 5.4 | 12.7 | | 18.1 |

*1 This value is applicable when all I/O signals are used. Reducing the number of I/O points decreases the current capacity.
*2 The following communication cycles can be used by servo amplifiers with firmware version E0 or later: 1.5 ms, 2.5 ms, 3 ms, 3.5 ms, 4.5 ms, 5 ms, 5.5 ms, 6 ms, 6.5 ms, 7 ms, and 7.5 ms
*3 Use an external dynamic brake for this servo amplifier. Otherwise, the servo amplifier coasts without a quick stop and may cause an accident. Ensure the safety in the entire system.
*4 To make the servo amplifier comply with the SEMI-F47 standard, the external dynamic brake cannot be used. Do not assign DB (dynamic brake interlock) to [Pr. PD07] to [Pr. PD09]. If DB (dynamic brake interlock) is assigned, the servo amplifier turns to the servo-off state when an instantaneous power failure occurs.
*5 The IP rating of the MR-J5-60G4-HSN1 to MR-J5-350G4-HSN1 standard certification is IP00.
*6 The IP rating of the standard certification is IP00.
*7 The terminal block is excluded.

# MR-J5W2-_G-N1

| Model: MR-J5W2-_-N1 | | | 22G | 44G | 77G | 1010G |
|---|---|---|---|---|---|---|
| Output | Voltage | | 3-phase 0 V AC to 240 V AC | | | |
| | Rated current (each axis) [A] | | 1.8 | 2.8 | 5.8 | 6.0 |
| Main circuit power supply input | Voltage/ Frequency | At AC input | 3-phase or 1-phase 200 V AC to 240 V AC, 50 Hz/60 Hz | | | 3-phase 200 V AC to 240 V AC, 50 Hz/60 Hz |
| | | At DC input | 283 V DC to 340 V DC | | | |
| | Rated current [A] *3 | At AC input | 2.9 (5.0) | 5.2 (9.0) | 7.5 (13.0) | 9.8 |
| | | At DC input | 3.5 | 6.4 | 9.2 | 12.0 |
| | Permissible voltage fluctuation | At AC input | 3-phase or 1-phase 170 V AC to 264 V AC | | | 3-phase 170 V AC to 264 V AC |
| | | At DC input | 241 V DC to 374 V DC | | | |
| | Permissible frequency fluctuation | | Within ±5 % | | | |
| | Power supply capacity [kVA] | | Refer to "Power supply capacity and generated loss" in the following manual. 📖MR-J5 User's Manual (Hardware) | | | |
| | Inrush current [A] | | Refer to "Inrush currents at power-on of main circuit and control circuit" in the following manual. 📖MR-J5 User's Manual (Hardware) | | | |
| Control circuit power supply input | Voltage/ Frequency | At AC input | 1-phase 200 V AC to 240 V AC, 50 Hz/60 Hz | | | |
| | | At DC input | 283 V DC to 340 V DC | | | |
| | Rated current [A] | | 0.4 | | | |
| | Permissible voltage fluctuation | At AC input | 1-phase 170 V AC to 264 V AC | | | |
| | | At DC input | 241 V DC to 374 V DC | | | |
| | Permissible frequency fluctuation | | Within ±5 % | | | |
| | Power consumption [W] | | 55 | | | |
| | Inrush current [A] | | Refer to "Inrush currents at power-on of main circuit and control circuit" in the following manual. 📖MR-J5 User's Manual (Hardware) | | | |
| Interface power supply | Voltage | | 24 V DC ±10 % | | | |
| | Current capacity [A] | | 0.35 (including CN8 connector signals) *1 | | | |
| Control method | | | Sine-wave PWM control, current control method | | | |
| Dynamic brake | | | Built-in | | | |
| EtherCAT | Communication cycle | | 250 µs, 250 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms | | | |
| EtherNet/IP | Cycle time | | Select from 1 ms to 100 ms. | | | |
| Communication function | USB | | Connection to a personal computer or other devices (MR Configurator2-compatible) | | | |
| Encoder output pulses | | | Compatible (A/B-phase pulse) | | | |
| Analog monitor | | | Two channels | | | |
| Fully closed loop control | | | Supported | | | |
| Scale measurement function | | | Supported | | | |
| Load-side encoder interface | | | Mitsubishi Electric high-speed serial communication | | | |
| Protective functions | | | Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal), servo motor overheat protection, encoder error protection, regenerative error protection, undervoltage protection, instantaneous power failure protection, overspeed protection, excessive error protection, magnetic pole detection protection, and linear servo control error protection | | | |
| Global standards | CE marking | | LVD: EN 61800-5-1, EMC: EN 61800-3, MD: EN ISO 13849-1:2015, EN 61800-5-2, EN IEC 62061 | | | |
| | UKCA marking | | LVD: BS EN 61800-5-1, EMC: BS EN IEC 61800-3, MD: BS EN ISO 13849-1:2015, BS EN 61800-5-2, BS EN IEC 62061 | | | |
| | UL standard | | UL 61800-5-1 | | | |
| Structure (IP rating) | | | Natural cooling, open (IP20) | Force cooling, open (IP20) | | |
| Close mounting *2 | | | Possible | | | |
| Mass [kg] | | | 1.5 | | 1.9 | |

*1 This value is applicable when all I/O signals are used. Reducing the number of I/O points decreases the current capacity.
*2 If closely mounting the servo amplifiers, operate them at an ambient temperature of 0 ˚C to 45 ˚C or at 75 % or less of the effective load ratio.
*3 The value in ( ) is the rated current for the 1-phase power supply input.

# MR-J5W3-_G-N1

| Model: MR-J5W3-_-N1 | | | 222G | 444G |
|---|---|---|---|---|
| Output | Voltage | | 3-phase 0 V AC to 240 V AC | |
| | Rated current (each axis) [A] | | 1.8 | 2.8 |
| Main circuit power supply input | Voltage/ Frequency | At AC input | 3-phase or 1-phase 200 V AC to 240 V AC, 50 Hz/60 Hz | |
| | | At DC input | 283 V DC to 340 V DC | |
| | Rated current [A] *3 | At AC input | 4.3<br>(7.5) | 7.8<br>(13.5) |
| | | At DC input | 5.3 | 9.5 |
| | Permissible voltage fluctuation | At AC input | 3-phase or 1-phase 170 V AC to 264 V AC | |
| | | At DC input | 241 V DC to 374 V DC | |
| | Permissible frequency fluctuation | | Within ±5 % | |
| | Power supply capacity [kVA] | | Refer to "Power supply capacity and generated loss" in the following manual.<br>MR-J5 User's Manual (Hardware) | |
| | Inrush current [A] | | Refer to "Inrush currents at power-on of main circuit and control circuit" in the following manual.<br>MR-J5 User's Manual (Hardware) | |
| Control circuit power supply input | Voltage/ Frequency | At AC input | 1-phase 200 V AC to 240 V AC, 50 Hz/60 Hz | |
| | | At DC input | 283 V DC to 340 V DC | |
| | Rated current [A] | | 0.4 | |
| | Permissible voltage fluctuation | At AC input | 1-phase 170 V AC to 264 V AC | |
| | | At DC input | 241 V DC to 374 V DC | |
| | Permissible frequency fluctuation | | Within ±5 % | |
| | Power consumption [W] | | 55 | |
| | Inrush current [A] | | Refer to "Inrush currents at power-on of main circuit and control circuit" in the following manual.<br>MR-J5 User's Manual (Hardware) | |
| Interface power supply | Voltage | | 24 V DC ±10 % | |
| | Current capacity [A] | | 0.45 (including CN8 connector signals) *1 | |
| Control method | | | Sine-wave PWM control, current control method | |
| Dynamic brake | | | Built-in | |
| EtherCAT | Communication cycle | | 250 µs, 250 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms | |
| EtherNet/IP | Cycle time | | Select from 1 ms to 100 ms. | |
| Communication function | USB | | Connection to a personal computer or other devices (MR Configurator2-compatible) | |
| Encoder output pulses | | | Not supported | |
| Analog monitor | | | Two channels | |
| Fully closed loop control | | | Not supported | |
| Scale measurement function | | | Not supported | |
| Protective functions | | | Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal), servo motor overheat protection, encoder error protection, regenerative error protection, undervoltage protection, instantaneous power failure protection, overspeed protection, excessive error protection, magnetic pole detection protection, and linear servo control error protection | |
| Global standards | CE marking | | LVD: EN 61800-5-1, EMC: EN 61800-3, MD: EN ISO 13849-1:2015, EN 61800-5-2, EN IEC 62061 | |
| | UKCA marking | | LVD: BS EN 61800-5-1, EMC: BS EN IEC 61800-3, MD: BS EN ISO 13849-1:2015, BS EN 61800-5-2, BS EN IEC 62061 | |
| | UL standard | | UL 61800-5-1 | |
| Structure (IP rating) | | | Force cooling, open (IP20) | |
| Close mounting *2 | | | Possible | |
| Mass [kg] | | | 1.8 | |

*1 This value is applicable when all I/O signals are used. Reducing the number of I/O points decreases the current capacity.

*2 If closely mounting the servo amplifiers, operate them at an ambient temperature of 0 ˚C to 45 ˚C or at 75 % or less of the effective load ratio.

*3 The value in ( ) is the rated current for the 1-phase power supply input.

# Positioning mode

## Point table method (CP)

| Item | | Description |
|---|---|---|
| Command interface | | Object dictionary |
| Operation specifications | | Positioning by specifying the point table number (255 points) |
| System | | Signed absolute value command method |
| Position command input | Absolute value command method | Setting in the point table<br>Setting range of feed length for one point:<br>-2147483648 to 2147483647 [μm],<br>-214748.3648 to 214748.3647 [inch],<br>-2147483648 to 2147483647 [pulse],<br>-360.000 to 360.000 [degree] |
| Speed command input | | Set the servo motor speed in the point table.<br>Set the acceleration/deceleration time constants and acceleration/deceleration in the point table.<br>Set the S-pattern acceleration/deceleration time constant in [Pr. PT51].<br>The speed unit can be selected ([r/min], command unit/s)<br>The acceleration/deceleration unit can be selected ([ms], command unit/$s^2$) |
| Torque limit | | Setting by the servo parameter or object dictionary |
| Point table mode (pt) | One positioning operation | Point table number input method<br>Perform one positioning operation based on the position command and speed command. |
| | Continuous positioning operation | Speed change operation (2nd gear to 255th gear)/<br>Continuous positioning operation (2 points to 255 points)/<br>Continuous operation to the point table selected at startup/<br>Continuous operation to the point table No. 1 |
| JOG operation mode (jg) | JOG operation | Perform inching operation in the network communication function based on the speed command. |
| Homing mode (hm) | | For information on the homing method, refer to "Homing mode (hm)" in the following manual.<br>📖MR-J5 User's Manual (Function) |
| Function on positioning operation | | Absolute position detection/external limit switch/software position limit/ positioning function to the home position, etc. |

# Functional safety



**Restriction**

Functional safety is not available for the MR-J5-_G4-HSN1 in the default state. When using the functional safety, refer to the following manual and set the functional safety parameters.

MR-J5 User's Manual (Function)

## Servo amplifier specifications

| Item | | Specifications | | |
|---|---|---|---|---|
| | | MR-J5-_G(4)-N1 | MR-J5-_G(4)-RJN1/MR-J5W_-_G-N1 | MR-J5-_G4-HSN1 |
| Safety performance | Standards *1 | EN ISO 13849-1:2015 Category 3 PL e, IEC 61508 SIL 3, EN IEC 62061 maximum SIL 3, EN 61800-5-2 | EN ISO 13849-1:2015 Category 4 PL e, IEC 61508 SIL 3, EN IEC 62061 maximum SIL 3, EN 61800-5-2 | EN ISO 13849-1:2015 Category 4 PL e, IEC 61508 SIL 3, EN IEC 62061 maximum SIL 3, EN 61800-5-2 |
| | Mean time to dangerous failure (MTTFd) | MTTFd ≥ 100 [years] (314a) | MTTFd ≥ 100 [years] (750a) | MTTFd ≥ 100 [years] (300a) |
| | Diagnostic coverage (DC) | DC = Medium, 97.6 [%] | DC = Medium, 96.5 [%] | DC = Medium, 96.5 [%] |
| | Probability of dangerous Failure per Hour (PFH) | PFH = $6.4 \times 10^{-9}$ [1/h] | PFH = $3 \times 10^{-9}$ [1/h] | PFH = $7.7 \times 10^{-9}$ [1/h] |
| | Mission time ($T_M$) *2 | $T_M$ = 20 [year] | | |

*1 When DI/O connection (CN8) is used, diagnosis by test pulses is required in order to satisfy Category 4 PL e, SIL 3.

*2 Although the special proof tests within the mission time of the safety observation function is not needed to be performed, the suggested diagnostic test interval in IEC 61800-5-2: 2016 is at least one test per three months for Category 3 PL e, SIL 3.

## Function specifications

| Item | | | Specifications | |
|---|---|---|---|---|
| | | | MR-J5-_G(4)(-RJ)N1<br>MR-J5W_-_G-N1 | MR-J5-_G4-HSN1 |
| Safety sub-function *1 | STO | Shut-off response time<br>(STO input off → energy shut off) | 8 ms or less (when an input device is used)<br>60 ms or less (when a network is used) *5*6*7 | |
| | SS1 | Deceleration delay time | 0 ms to 60000 ms (set by functional safety parameters) | |
| | SS2 | Deceleration delay time | 0 ms to 60000 ms (set by functional safety parameters) | |
| | SOS | Observation position | 0 rev to 1000 rev (set by functional safety parameters) | |
| | SBC | Shut-off response time | 8 ms or less (when an input device is used)<br>60 ms or less (when a network is used) *5*6*7 | |
| | SLS1/2/3/4 | Observation speed | 0 r/min (mm/s) to 10000 r/min (mm/s) (set by functional safety parameters) *4 | |
| | SSM | Observation speed | 0 r/min (mm/s) to 10000 r/min (mm/s) (set by functional safety parameters) | |
| | SDI | Direction monitor delay time | 0 ms to 60000 ms (set by functional safety parameters) | |
| | SLI | Observation position | 0 rev to 1000 rev (set by functional safety parameters) | |
| | SLT | Observation torque | -1000.0 % to 1000.0 % (set by functional safety parameters) | |
| I/O function | Input device | Number of inputs (double wiring) | 1 point | 3 points |
| | | Permissible time for mismatched double inputs | 0 ms to 60000 ms (set by functional safety parameters) *8 | |
| | | Noise elimination filter | 1.000 ms to 32.000 ms (set by functional safety parameters) | |
| | | Test pulse off time *3 | 1 ms or less | |
| | | Test pulse interval *3 | 250 ms to 1000 ms | |
| | Output device | Number of outputs (double wiring) | 1 point | 3 points |
| | | Test pulse off time | 0.500 ms to 2.000 ms (set by functional safety parameters) | |
| | | Test pulse interval | Within 1 s | |
| | External wiring diagnostic output | Number of outputs (double wiring) | — | 1 point |
| | | Test pulse off time | — | 1.000 m/s/2.000 m/s (set by functional safety parameters) |
| | | Test pulse interval | — | Within 1 s |
| Safety communication function | | Response time | 250 ms *2 | |
| | | FSoE Watchdog Time | 16.0 ms to 65534.0 ms (set by objects) (when a network is used) *7 | |
| | | Safety communication delay time | 60 ms or less (when a network is used) *5*7 | |

*1 Available functions and safety levels differ depending on the combination of the servo amplifiers and the servo motors and the firmware version of the servo amplifier.
☞ Page 23 List of safety sub-function compatible units
*2 This value applies when FSoE Watchdog Time is 60.0 ms or less.
*3 A test pulse is a signal which instantaneously turns off a signal to the servo amplifier at a constant period for external circuits to perform self-diagnosis.
*4 The safety observation speed can be set separately.
*5 It applies when FSoE Watchdog Time is 30.0 ms or less.
*6 For the MR-J5-_G(4)-RJN1 and MR-J5-_G4-HSN1, connect to a network with a communication cycle of 250 µs or longer. For the MR-J5W_-_G-N1, connect to a network with a communication cycle of 500 µs or longer.
*7 This specification applies when the safety sub-functions by a network connection is used.
*8 If it is set to 0 ms, no alarm occurs.

## List of safety sub-function compatible units

| Servo amplifier | Function achieving method (wiring destination) | Servo motor type | Safety sub-function (IEC/EN 61800-5-2) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | STO | SS1 | | SS2 *4 | SOS *4 | SBC | SLS *4 | SSM *4 | SDI *4 | SLI *4 | SLT |
| | | | | SS1-t | SS1-r *4 | SS2-t, SS2-r | | | | | | | |
| MR-J5-_G(4)-N1 | DI/O connection (CN8) | Servo motor with functional safety<br>Rotary servo motor<br>Linear servo motor<br>Direct drive motor | Cat. 3PL e, SIL 3 | — *3 | — | — | — | — | — | — | — | — | — |
| MR-J5-_G(4)-RJN1 *6<br>MR-J5-_G4-HSN1<br>MR-J5W_-_G-N1 *2*6 | DI/O connection *1 (CN8/CN3) | Servo motor with functional safety | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 3PL d, SIL 2 |
| | | Rotary servo motor<br>Linear servo motor<br>Direct drive motor | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 3PL d, SIL 2 | — | — | Cat. 4PL e, SIL 3 | Cat. 3PL d, SIL 2 | Cat. 3PL d, SIL 2 | Cat. 3PL d, SIL 2 | — | Cat. 3PL d, SIL 2 |
| | Network connection *5*7 (CN1A/CN1B) | Servo motor with functional safety | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 3PL d, SIL 2 |
| | | Rotary servo motor<br>Linear servo motor<br>Direct drive motor | Cat. 4PL e, SIL 3 | Cat. 4PL e, SIL 3 | Cat. 3PL d, SIL 2 | — | — | Cat. 4PL e, SIL 3 | Cat. 3PL d, SIL 2 | Cat. 3PL d, SIL 2 | Cat. 3PL d, SIL 2 | — | Cat. 3PL d, SIL 2 |

*1 The safety levels in the table apply if the safety sub-function control is performed by test pulse diagnosis using one of the following.
· MR-J5-_G4-HSN1
· Safety CPU or safety controller that complies with Category 4 PL e and SIL 3
If the servo amplifiers are directly connected to emergency stop switches, safety switches, enabling switches, or other similar devices and test pulse diagnosis is not performed, the safety level Category 3 PL d, SIL 2 applies.

*2 STO can be set separately for each axis.

*3 SS1-t is available when the MR-J3-D05 and a servo amplifier are combined.

*4 Fully closed loop control systems do not support SS1-r, SS2, SOS, SLS, SSM, SDI, and SLI.

*5 For MR-J5-_G(4)-RJN1 and MR-J5-_G4-HSN1, connect to a network with a communication cycle of 250 μs or longer. For MR-J5W_-_G-N1, connect to a network with a communication cycle of 500 μs or longer.

*6 SS1-r, SS2, SOS, SLS, SSM, SDI, SLI, and SLT can be used on servo amplifiers with firmware version D8 or later.

*7 The safety sub-function by a network connection is available on servo amplifiers with firmware version D8 or later.

# Environment

| Item | | Operation | Transportation | Storage |
|---|---|---|---|---|
| Ambient temperature | | 0 ˚C to 60 ˚C (non-freezing)<br>Class 3K3 (IEC 60721-3-3) | -25 ˚C to 70 ˚C (non-freezing)<br>Class 2K12 (IEC 60721-3-2) | -25 ˚C to 70 ˚C (non-freezing)<br>Class 1K4 (IEC 60721-3-1) |
| Ambient humidity | | 5 %RH to 95 %RH (non-condensing) | 5 %RH to 95 %RH (non-condensing) | 5 %RH to 95 %RH (non-condensing) |
| Ambience | | Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist or dust | | |
| Altitude/atmospheric pressure | | Altitude: 2000 m or less *1 | Transportation conditions: Must be transported by ground/sea, or air at an atmospheric pressure of 700 hPa or more. | Atmospheric pressure: 700 hPa to 1060 hPa<br>(equivalent to the altitude of -400 m to 3000 m.) |
| Vibration resistance | | Under intermittent vibration:<br>10 Hz to 57 Hz, displacement amplitude 0.075 mm<br>57 Hz to 150 Hz, acceleration amplitude 9.8 $m/s^2$<br>Class 3M1 (IEC 60721-3-3)<br>Under continuous vibration (in each of the X, Y, and Z directions): 10 Hz to 55 Hz, acceleration amplitude 5.9 $m/s^2$ | 2 Hz to 9 Hz, displacement amplitude (half amplitude) 7.5 mm<br>9 Hz to 200 Hz, acceleration amplitude 20 $m/s^2$<br>Class 2M3 (IEC 60721-3-2) | 2 Hz to 9 Hz, displacement amplitude (half amplitude) 1.5 mm<br>9 Hz to 200 Hz, acceleration amplitude 5 $m/s^2$<br>Class 1M2 (IEC 60721-3-1) |
| Dielectric strength | 200 V class | Between main circuit (power supply/power terminal) and PE: 1500 V AC, 1 minute, 50 Hz/60 Hz | | |
| | 400 V class | Between main circuit (power supply/power terminal) and PE: 2000 V AC, 1 minute, 50 Hz/60 Hz | | |
| Insulation resistance | | Between main circuit (power supply/power terminal) and PE: 0.5 MΩ or more (with a 500 V DC megger) | | |

*1 Refer to "Restrictions when using this product at altitude exceeding 1000 m and up to 2000 m" in the following manual for using the product at altitude exceeding 1000 m.
MR-J5 User's Manual (Hardware)

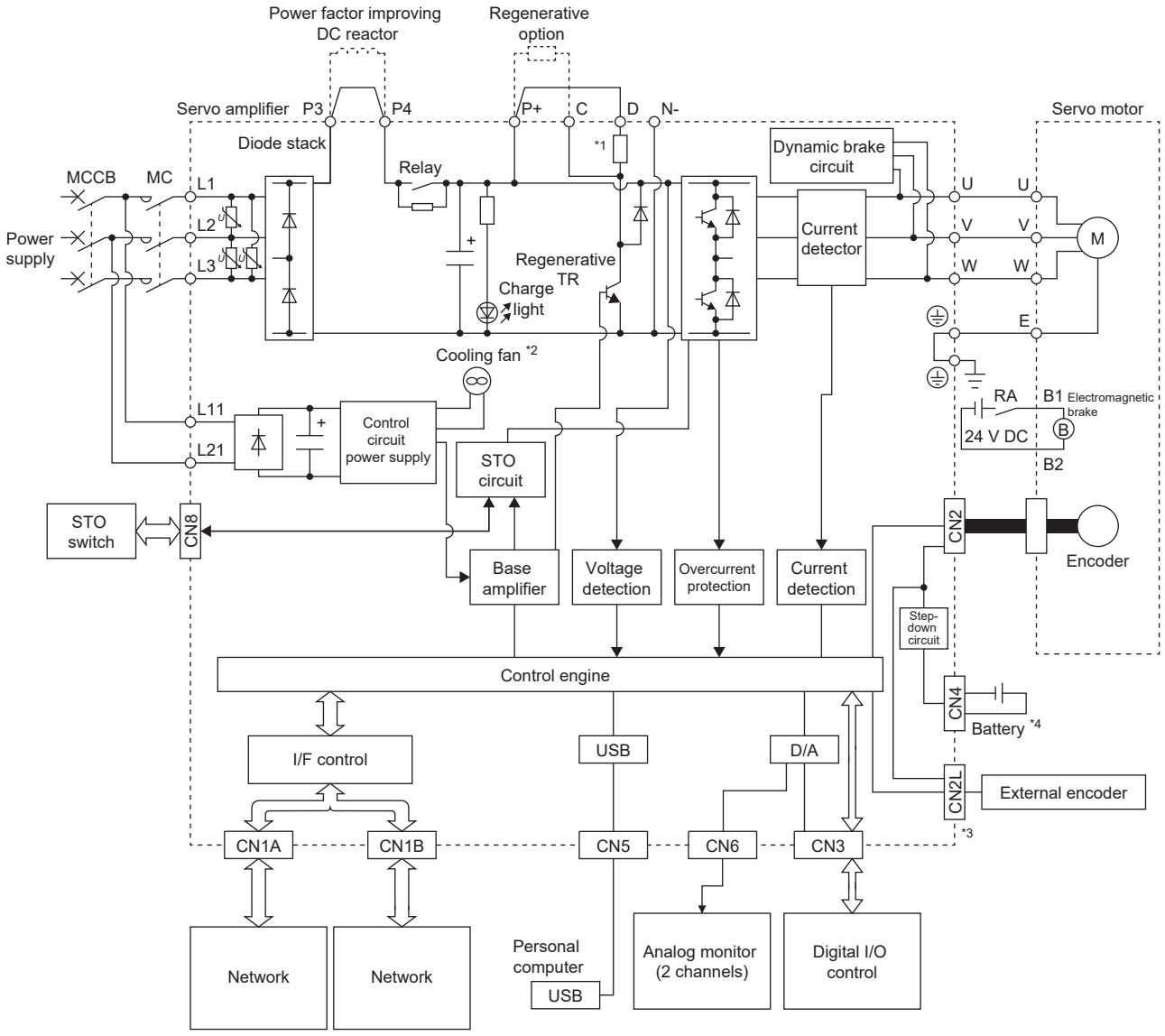
# 1.5 Function block diagram

The following shows the function block diagram of this servo amplifier.

## MR-J5-_G_-_N1 (excluding MR-J5-_G_-HSN1)

### 200 V class

#### ■7 kW or less



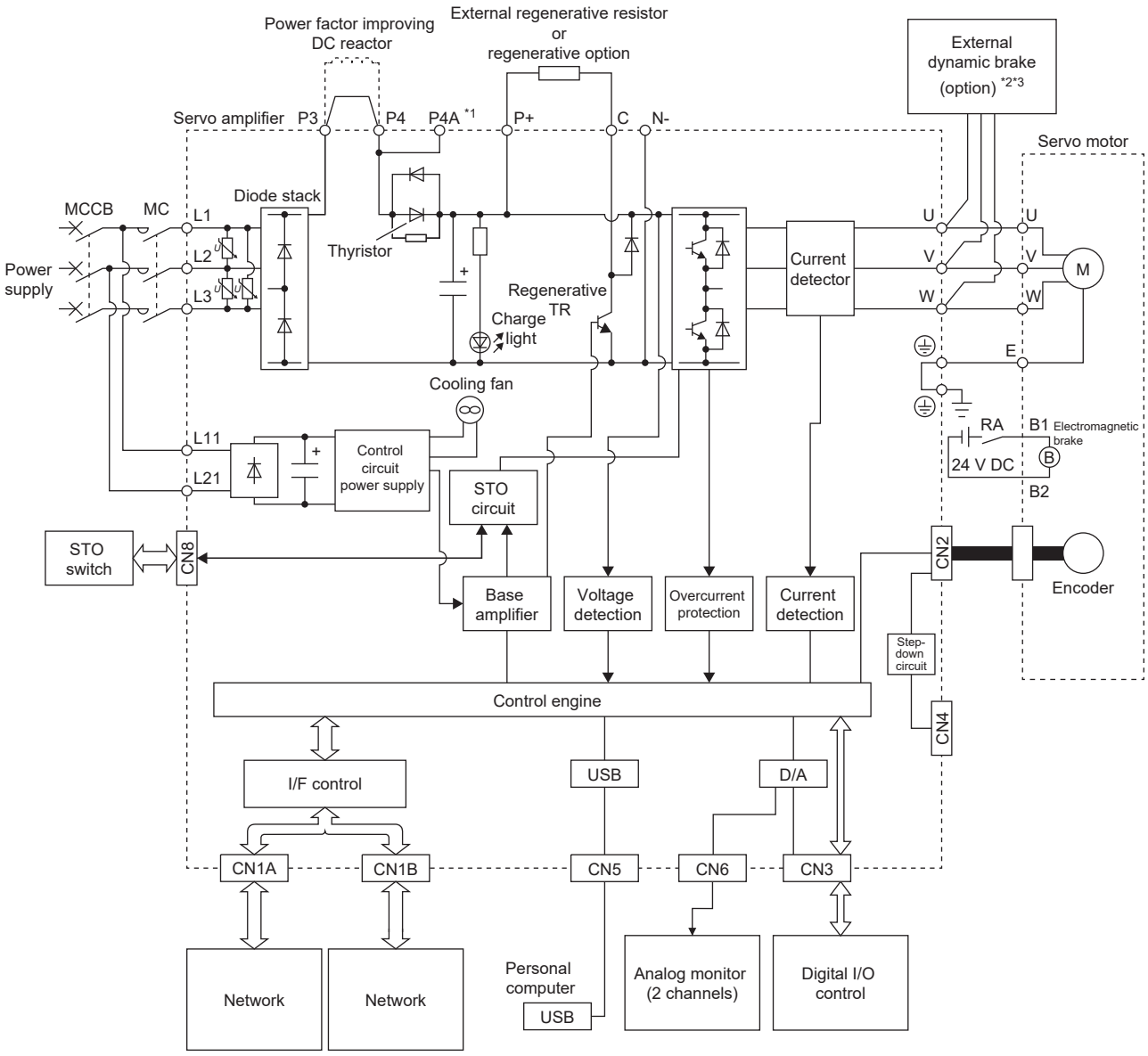

*1 The regenerative resistor is not built into the MR-J5-10G-_N1.

*2 Servo amplifiers with the rated output symbol of 70 (MR-J5-70G-_N1) or greater have a cooling fan.

*3 This is for the MR-J5-_G-RJN1 servo amplifier. The MR-J5-_G-N1 servo amplifier does not have a CN2L connector.

*4 To configure an absolute position detection system by using a direct drive motor, the battery is required. To configure the absolute position detection system by using the HK series servo motor, the battery is not required.

## ■12 kW or more



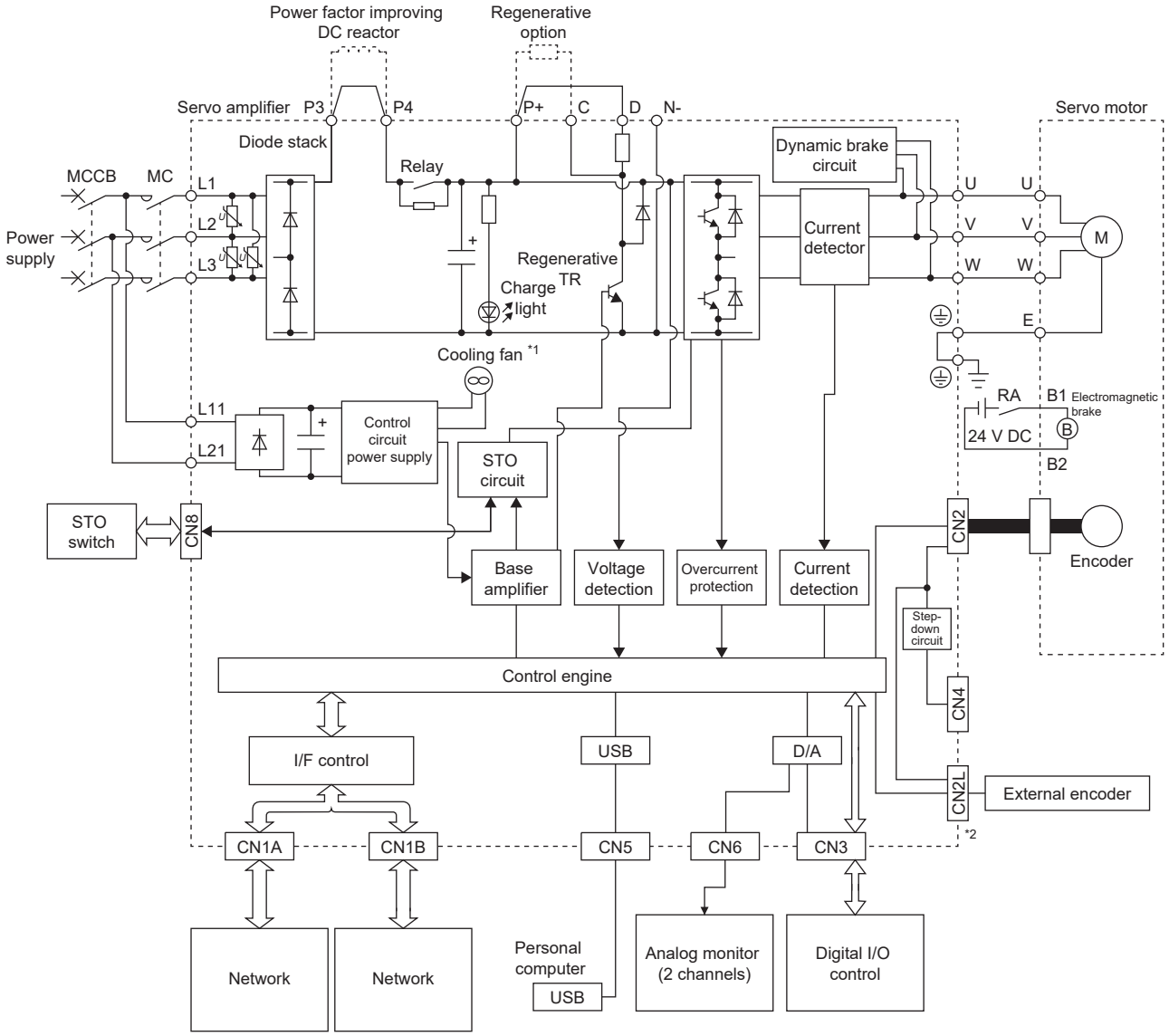

*1 The P4A terminal is connected to the P4 terminal inside the servo amplifier. The terminal is used when a common bus connection using a servo amplifier as the main unit is constructed.

*2 Use an external dynamic brake for this servo amplifier. Otherwise, the servo amplifier coasts without a quick stop after the occurrence of an alarm for which the deceleration stop is not executed. This may cause an accident. Ensure the safety in the entire system.

*3 To make the servo amplifier comply with the SEMI-F47 standard, the external dynamic brake cannot be used. Do not assign DB (dynamic brake interlock) to [Pr. PD07] to [Pr. PD09]. If DB (dynamic brake interlock) is assigned, the servo amplifier turns to the servo-off state when an instantaneous power failure occurs.

## 400 V class

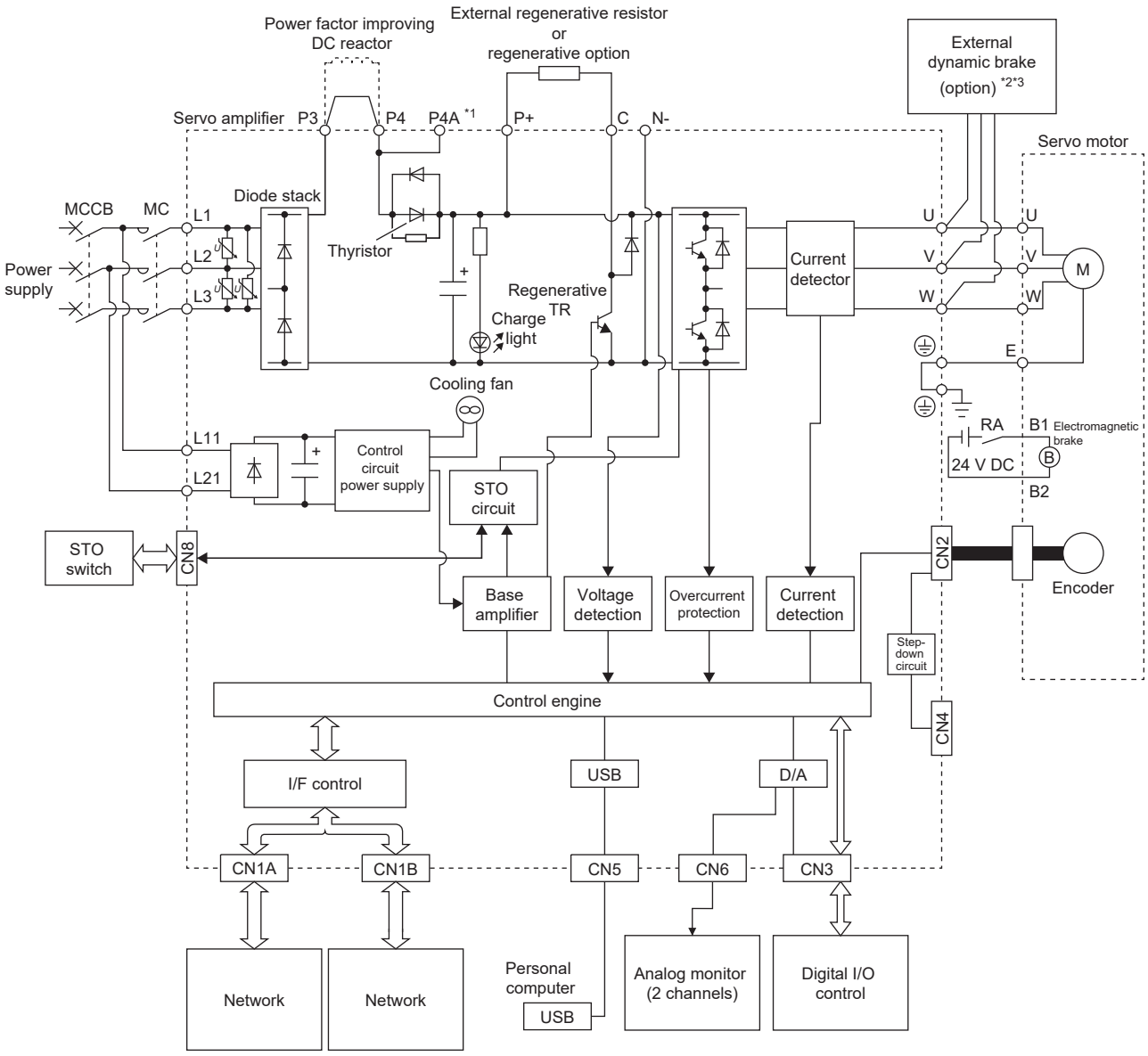
### ■7 kW or less




*1 Servo amplifiers with the rated output symbol of 200 (MR-J5-200G4-_N1) or greater have a cooling fan.

*2 This is for the MR-J5-_G4-RJN1 servo amplifier. The MR-J5-_G4-N1 servo amplifier does not have a CN2L connector.

## ■12 kW or more



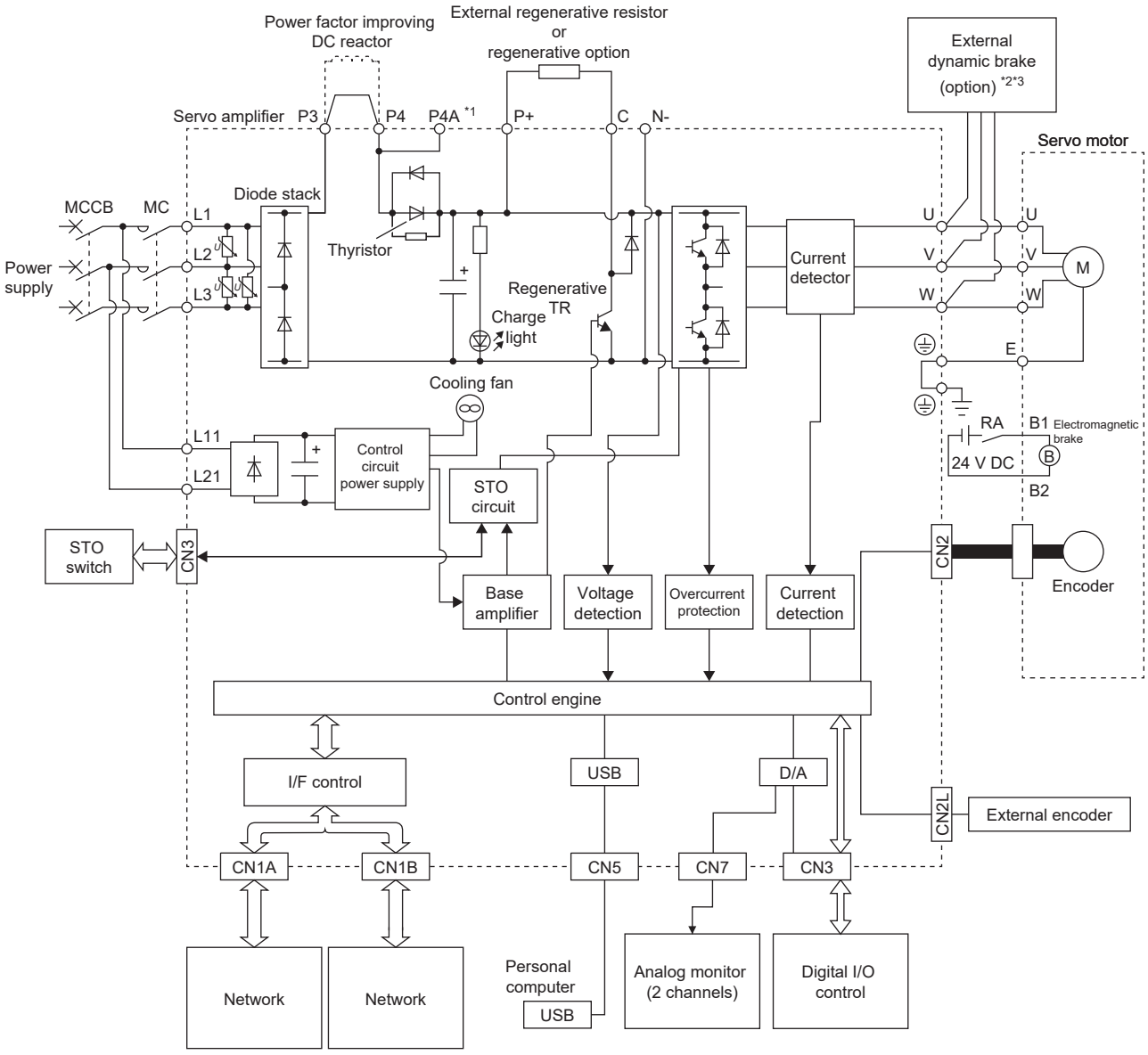

*1 The P4A terminal is connected to the P4 terminal inside the servo amplifier. The terminal is used when a common bus connection using a servo amplifier as the main unit is constructed.

*2 Use an external dynamic brake for this servo amplifier. Otherwise, the servo amplifier coasts without a quick stop after the occurrence of an alarm for which the deceleration stop is not executed. This may cause an accident. Ensure the safety in the entire system.

*3 To make the servo amplifier comply with the SEMI-F47 standard, the external dynamic brake cannot be used. Do not assign DB (dynamic brake interlock) to [Pr. PD07] to [Pr. PD09]. If DB (dynamic brake interlock) is assigned, the servo amplifier turns to the servo-off state when an instantaneous power failure occurs.

## 200 V class

### ■12 kW or more



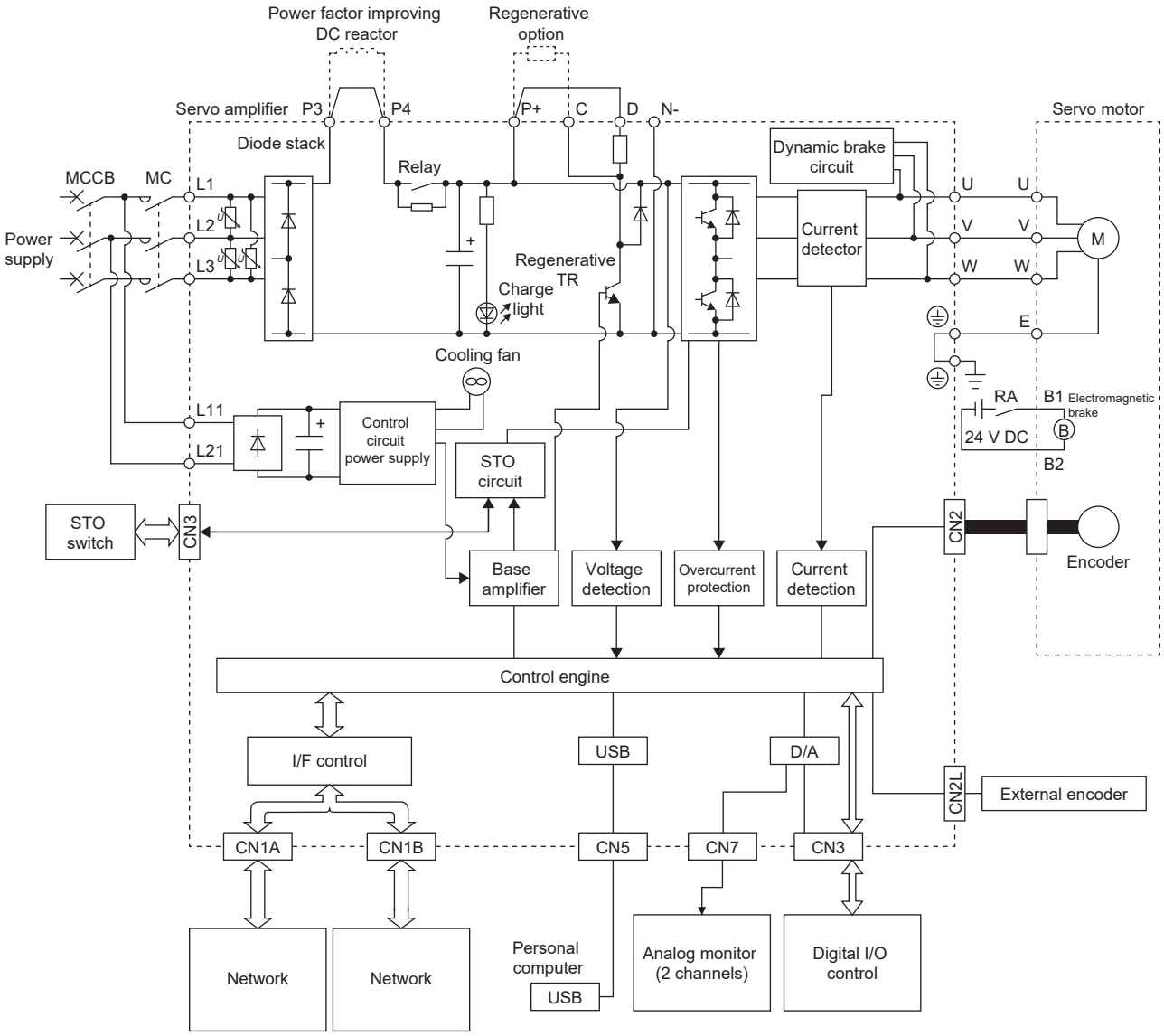

*1 The P4A terminal is connected to the P4 terminal inside the servo amplifier. The terminal is used when a common bus connection using a servo amplifier as the main unit is constructed.

*2 Use an external dynamic brake for this servo amplifier. Otherwise, the servo amplifier coasts without a quick stop after the occurrence of an alarm for which the deceleration stop is not executed. This may cause an accident. Ensure the safety in the entire system.

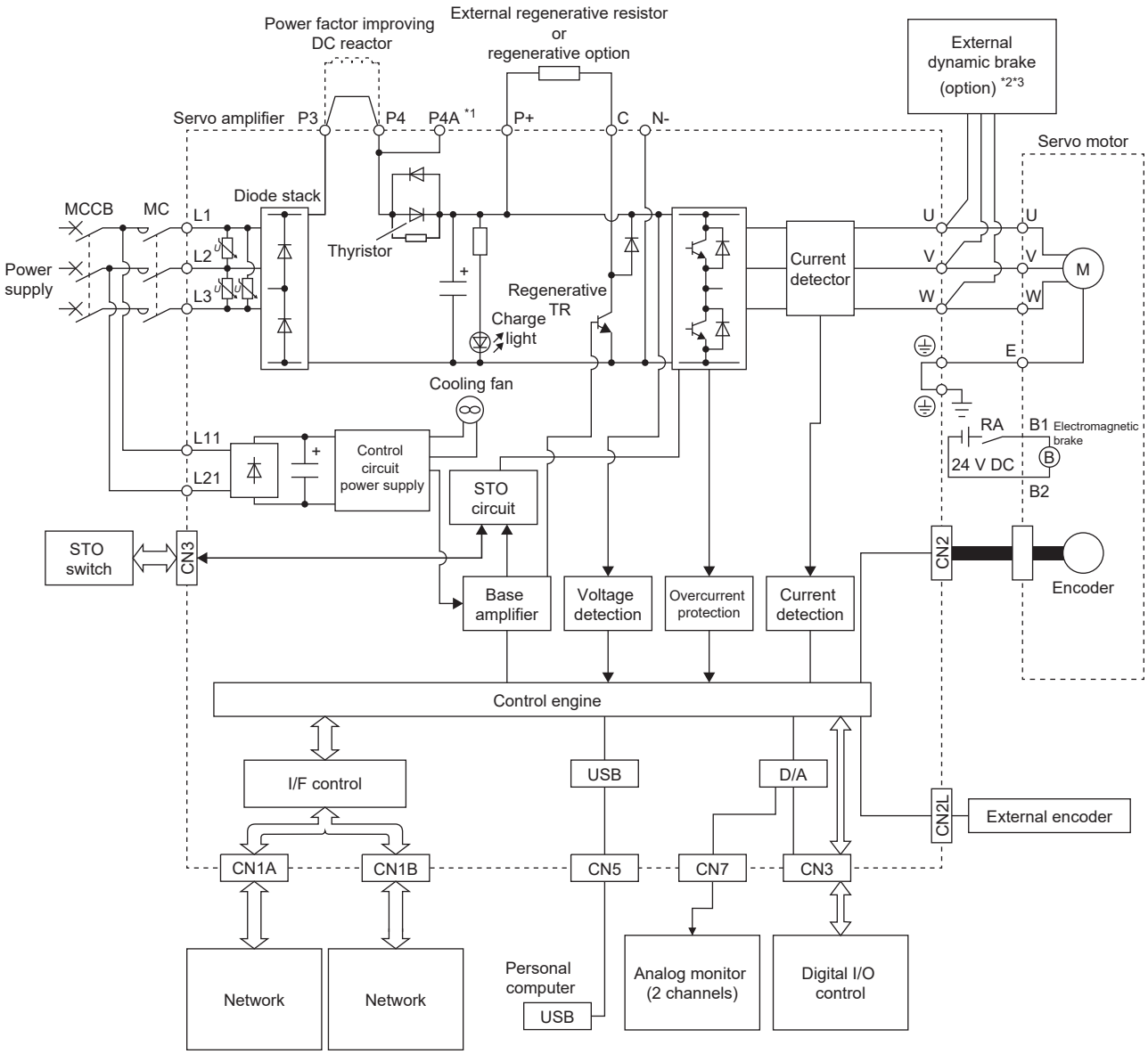
*3 To make the servo amplifier comply with the SEMI-F47 standard, the external dynamic brake cannot be used. Do not assign DB (dynamic brake interlock) to [Pr. PD07] to [Pr. PD09]. If DB (dynamic brake interlock) is assigned, the servo amplifier turns to the servo-off state when an instantaneous power failure occurs.

## 400 V class

### ■7 kW or less



## ■12 kW or more



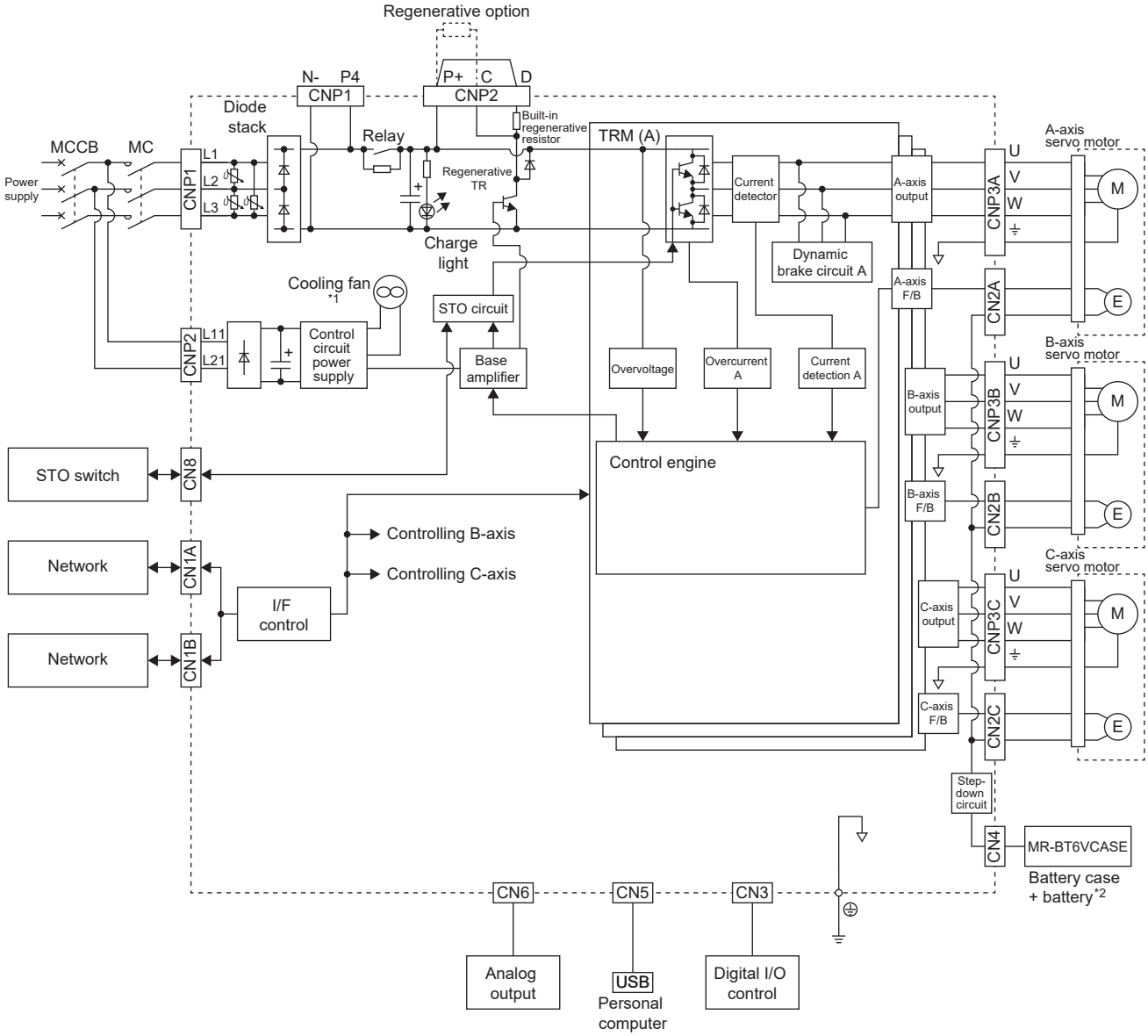

*1 The P4A terminal is connected to the P4 terminal inside the servo amplifier. The terminal is used when a common bus connection using a servo amplifier as the main unit is constructed.

*2 Use an external dynamic brake for this servo amplifier. Otherwise, the servo amplifier coasts without a quick stop after the occurrence of an alarm for which the deceleration stop is not executed. This may cause an accident. Ensure the safety in the entire system.

*3 To make the servo amplifier comply with the SEMI-F47 standard, the external dynamic brake cannot be used. Do not assign DB (dynamic brake interlock) to [Pr. PD07] to [Pr. PD09]. If DB (dynamic brake interlock) is assigned, the servo amplifier turns to the servo-off state when an instantaneous power failure occurs.

# MR-J5W_-_G-N1

The following is an example using MR-J5W3-_G-N1.




*1 The MR-J5W2-22G-N1 does not have a cooling fan.

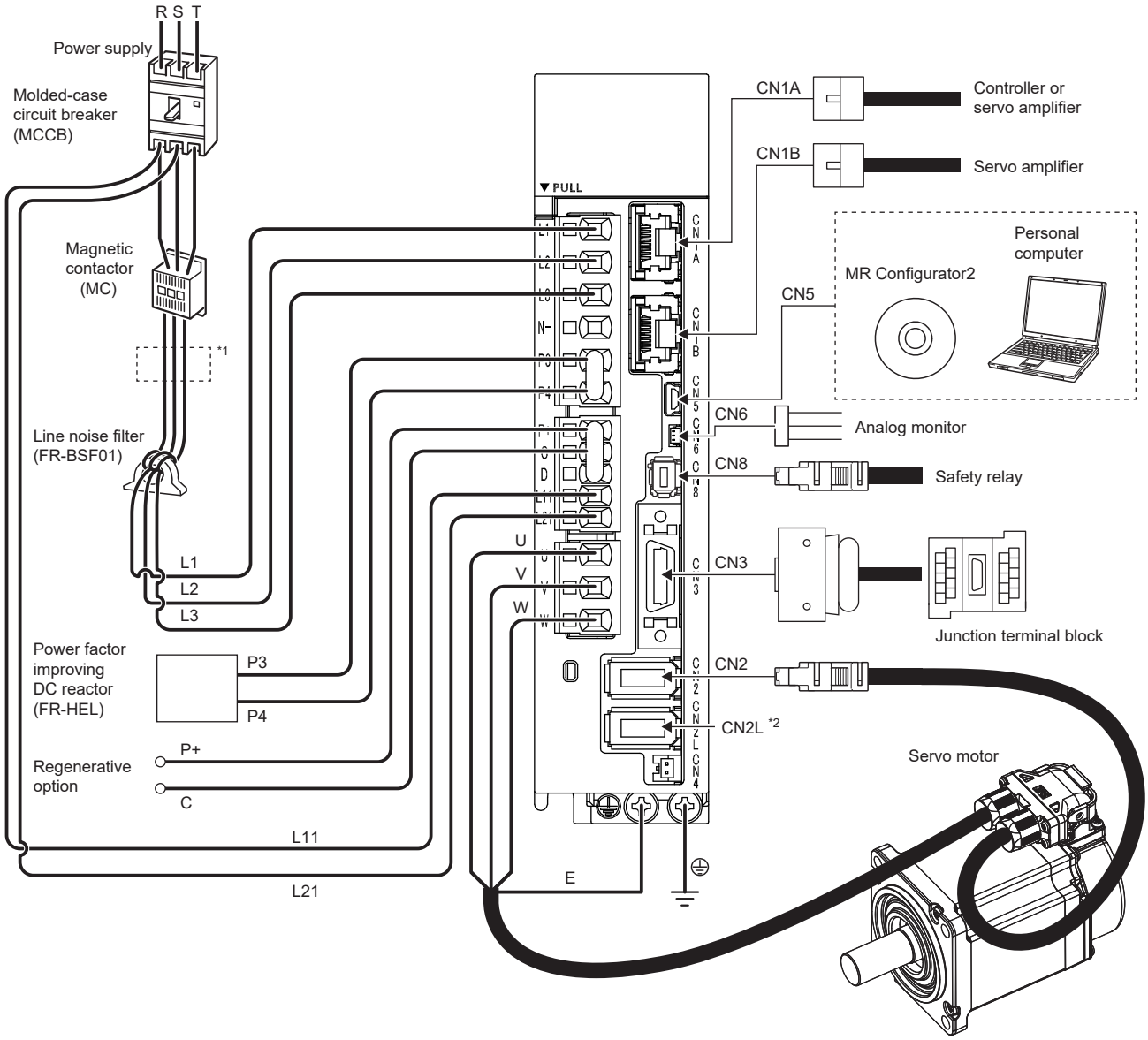
*2 To configure an absolute position detection system by using a direct drive motor, the battery is required. To configure the absolute position detection system by using the HK series servo motor, the battery is not required.

# 1.6 Configuration including peripheral equipment



- To prevent a malfunction, do not connect these connectors to any network other than the specified network.
- Equipment other than the servo amplifier and servo motor is optional or a recommended product.

The following is an example using MR-J5-20G-RJN1.




*1 The power factor improving AC reactor can also be used. In this case, the power factor improving DC reactor cannot be used.

*2 This is for the MR-J5-_G-RJN1 servo amplifier. The MR-J5-_G-N1 servo amplifier does not have a CN2L connector. If using the MR-J5-_G-RJN1 servo amplifier in a linear servo system or a fully closed loop system, connect an external encoder to this connector. Refer to the following for the compatible external encoders.

☞ Page 47 Parts identification

# 1.7 Special specifications

## Servo amplifiers without dynamic brake (ED/RU/HU)

### Summary

This section describes the servo amplifiers without dynamic brake. Items not described in this section are the same as those for the MR-J5-_G(4)(-RJ)N1, MR-J5-_G(4)-HSN1, and MR-J5W_-_G-N1.

### Specifications

The built-in dynamic brakes of the servo amplifiers with capacity of 7 kW or less are removed.

Take safety measures such as providing an extra circuit in case of an emergency stop, alarm, and servo motor stop at power supply shut-off.

When specific servo motors are being used, the electronic dynamic brake may be activated at an alarm occurrence.

For the specific servo motors, refer to "Precautions relating to the dynamic brake characteristics" in the following manual.

MR-J5 User's Manual (Hardware)

Setting the following servo parameter disables the electronic dynamic brake.

| Servo amplifier | Servo parameter | Setting value |
|---|---|---|
| MR-J5-_G(4)-EDN1<br>MR-J5-_G(4)-RUN1<br>MR-J5-_G4-HUN1<br>MR-J5W_-_G-EDN1 | [Pr. PF06.0] | 2 |

When [Pr. PA04.3] is set to "2" (initial value), the forced stop deceleration function may be executed at an alarm occurrence. Setting [Pr. PA04.3] to "0" disables the forced stop deceleration function.

## Servo amplifiers without regenerative resister (PX/HZ)

### Summary

This section describes the servo amplifiers without regenerative resistor. Items not described in this section are the same as those for the MR-J5-_G(4)-N1 and MR-J5-_G(4)-HSN1.

### Specifications

The regenerative resistor, which is a standard accessory of servo amplifiers with a capacity of 12 kW to 25 kW, does not come with this type. When using this type of servo amplifier, use the regenerative option MR-RB5R, MR-RB9F, MR-RB9T, MR-RB5K-4, or MR-RB6K-4.

# Special coating specification products (EB/RB/HB)



## Summary

This section describes the servo amplifiers with the special coating specification. Items not described in this section are the same as those for the MR-J5-_G(4)(-RJ)N1, MR-J5-_G(4)-HSN1, and MR-J5W_-_G-N1.

## Specifications

### ■Special coating

Using the MR-J5 series in the atmosphere containing corrosive gases may result in malfunction due to corrosion over time. For the special coating specification products, coating material is applied on the areas of the printed circuit boards used in the servo amplifiers where it can be technically applied (excluding connectors and terminal boards) to improve the resistance to corrosive gases. In particular, use special coating specification products for applications that tend to be affected by corrosive gases, such as tire manufacturing and water treatment. The resistance to corrosive gases of the special coating specification products is enhanced, however, it does not guarantee the use of the products in such environments. Inspect the products regularly to check for any abnormalities.

### ■Corrosive gases

According to JIS C60721-3-3/IEC 60721-3-3, corrosive gases refer to sea salt, sulfur dioxide, hydrogen sulfide, chlorine, hydrogen chloride, hydrogen fluoride, ammonia, ozone, and nitrogen oxides.
The special coating specification products have improved resistance to corrosion in environments with corrosive gases. Compared to the standard products, enhanced resistance to corrosive gases has been confirmed in a representative model.

# 2 FUNCTION

## 2.1 Restrictions on the MR-J5_-_G_

### Restrictions on EtherCAT

| Category | Detailed functions | Network communication cycle restrictions (minimum) | | | |
|---|---|---|---|---|---|
| | | MR-J5-_G(4)-N1 | MR-J5-_G(4)-RJN1<br>MR-J5-_G4-HSN1 | MR-J5W2-_G-N1 | MR-J5W3-_G-N1 |
| Control mode | Profile position mode (pp) | 250 µs | 250 µs | 500 µs | 500 µs |
| | Profile velocity mode (pv) | 250 µs | 250 µs | 500 µs *1 | 500 µs *1 |
| | Profile torque mode (tq) | 250 µs | 250 µs | 500 µs *1 | 500 µs *1 |
| | Point table method<br>(When [Pr. PA01.0 Control mode selection] is set to "6") | 250 µs | 250 µs | 500 µs | 500 µs |
| Functional safety | Safety sub-function control by network ([Pr. PSA01.1 Input mode selection] = "1") | Not used | 250 µs | 500 µs | 500 µs |
| | Monitor the position/speed using a servo motor with functional safety. ([Pr. PSA02.1 Position/speed monitoring setting] = "1") | Not used | 250 µs | 500 µs | 500 µs |
| — | Command unit selection function (When [Pr. PT01.2 Unit for position data] is set to "2" (degree)) | 250 µs | 250 µs | 500 µs | 500 µs |

*1 Available on servo amplifiers with firmware version E8 or later.

## 2.2 Function list

The function list of this servo amplifier is shown in the following table. For details of the functions, refer to each section indicated in the detailed explanation field.

### Control mode

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| CiA 402 control mode | Cyclic synchronous position mode (csp) *3 | This function operates the servo motor in the cyclic synchronous position mode. | A5 | Refer to "CONTROL MODE" in the following manual.<br>MR-J5 User's Manual (Function) |
| | Cyclic synchronous velocity mode (csv) *3 | This function operates the servo motor in the cyclic synchronous velocity mode. | A5 | |
| | Cyclic synchronous torque mode (cst) *3 | This function operates the servo motor in the cyclic synchronous torque mode. | A5 | |
| | Profile position mode (pp) | This function operates the servo motor in the profile position mode. | A5 | |
| | Profile velocity mode (pv) *2 | This function operates the servo motor in the profile velocity mode. | A5 | |
| | Profile torque mode (tq) *2 | This function operates the servo motor in the profile torque mode. | A5 | |
| | Homing mode (hm) | This function either operates the servo motor in the homing mode or performs homing. | A5 | |
| Point table method | Point table mode (pt) *3 | This function operates the servo motor according to the setting values by selecting the point table with preset 255 points. | B8 | |
| | JOG operation mode (jg) *3 | This control mode enables desired positioning for machine adjustment and home positioning. | B8 | |
| Test operation | Test operation mode | This function requires MR Configurator2 for JOG operation, positioning operation, motor-less operation, DO forced output, and program operation. | A5 | Page 80 Test operation |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.
*2 This control mode is not available for multi-axis servo amplifiers.
*3 When the command interface is EtherNet/IP, this control mode is not available.

## Drive motor

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| Servo motor | Linear servo motor | Using the linear servo motor and linear encoder enables the linear servo system to be configured. | A5 | Refer to "USING A LINEAR SERVO MOTOR" in the following manual. 📖MR-J5 User's Manual (Hardware) |
| | Direct drive motor | Using this function enables the direct drive servo system to be configured to drive the direct drive motor. | A5 | Refer to "USING A DIRECT DRIVE MOTOR" in the following manual. 📖MR-J5 User's Manual (Hardware) |
| Encoder | High-resolution encoder | A 67108864 pulses/rev high-resolution encoder is used for the encoder of the rotary servo motor. | A5 | — |
| | Batteryless absolute position encoder | The rotation position of the servo motor can be backed up without the battery. Using the servo motor with this encoder enables an absolute value detection system to be configured without battery. | A5 | Refer to "ABSOLUTE POSITION DETECTION SYSTEM" in the following manual. 📖MR-J5 User's Manual (Hardware) |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

## Network

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| Open network | EtherCAT communication | This function connects the servo amplifier to equipment such as a controller through EtherCAT communication. | A5 | 📖MR-J5-G-N1/MR-J5W-G-N1 User's Manual (Communication Function) |
| | EtherNet/IP communication | This function connects the servo amplifier to equipment such as a controller through EtherNet/IP communication. | E8 | 📖MR-J5-G-N1/MR-J5W-G-N1 User's Manual (Communication Function) |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

## Position detection

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| Control method | Semi closed loop system | This function uses the servo motor encoder to configure semi closed loop systems. | A5 | — |
| | Fully closed loop system | This function uses the load-side encoder to configure fully closed loop systems. | A5 | Refer to "USING A FULLY CLOSED LOOP SYSTEM" in the following manual. 📖MR-J5 User's Manual (Hardware) |
| | Scale measurement function | This function connects the scale measurement encoder in the state of the semi closed loop control to transmit the position information of the scale measurement encoder to the controller. | A5 | Refer to "Scale measurement function" in the following manual. 📖MR-J5 User's Manual (Function) |
| Absolute position | Absolute position detection system | This function performs homing once, and thereafter does not require homing at every power-on. | A5 | Refer to "ABSOLUTE POSITION DETECTION SYSTEM" in the following manual. 📖MR-J5 User's Manual (Hardware) |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

## Operation function

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| Stop function | Quick Stop | This function stops the servo motor with a specified method and switches to the servo-off status. | A5 | Refer to "Quick stop" in the following manual.<br>MR-J5 User's Manual (Function) |
| | Halt | This function stops the servo motor while the servo-on status is maintained. | A5 | Refer to "Halt" in the following manual.<br>MR-J5 User's Manual (Function) |
| | Stroke limit function | This function uses LSP (Forward rotation stroke end) and LSN (Reverse rotation stroke end) to limit the travel interval of the servo motor. | A5 | Refer to "Stroke limit function" in the following manual.<br>MR-J5 User's Manual (Function) |
| | Software position limit | This function uses servo parameters to limit the travel intervals by address. A function equivalent to the stroke limit function can be set with the servo parameter. | A5 | Refer to "Software position limit" in the following manual.<br>MR-J5 User's Manual (Function) |
| Command generation | Rotation/travel direction selection | This function sets the rotation direction of the servo motor without changing the command polarity. | A5 | Refer to "Rotation/travel direction selection" in the following manual.<br>MR-J5 User's Manual (Function) |
| | Electronic gear | This function performs positioning control with the value obtained by multiplying the position command from the upper controller by a set electronic gear ratio. | A5 | Refer to "Electronic gear function" in the following manual.<br>MR-J5 User's Manual (Function) |
| | Acceleration/deceleration function | This function enables smooth acceleration/deceleration. | A5 | Refer to "Acceleration/deceleration function" in the following manual.<br>MR-J5 User's Manual (Function) |
| | S-pattern acceleration/deceleration time constant | This function performs smooth acceleration and deceleration. | A5 | Refer to "S-pattern acceleration/deceleration time constant" in the following manual.<br>MR-J5 User's Manual (Function) |
| | Torque limit | This function limits the servo motor torque. | A5 | Refer to "Torque limit" in the following manual.<br>MR-J5 User's Manual (Function) |
| | Speed limit | This function limits the servo motor speed in the torque control mode. | A5 | Refer to "Speed limit" in the following manual.<br>MR-J5 User's Manual (Function) |
| | Command offset | This function compensates the position/speed/torque commands by adding a desired amount of offset to the commands. | A5 | Refer to "Command offset" in the following manual.<br>MR-J5 User's Manual (Function) |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

## Positioning function

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| Override function | Override function | This function can change the servo motor speed via communication. The value can be changed to 0% to 360% of the set speed. | D4 | Refer to "Override function" in the following manual.<br>MR-J5 User's Manual (Function) |
| Absolute position | Infinite feed function | In an absolute position detection system, even if the servo motor rotates 32768 rev or more in the same direction, [AL. 0E3.1 Multi-revolution counter travel distance exceeded warning] will not occur and the home position will not be erased. Therefore, the current position will be restored after the power is cycled. When this function is not used, if the servo motor rotates 32768 rev or more in the same direction, [AL. 0E3.1] will occur and the home position will be erased. | B6 | Refer to "Infinite feed function" in the following manual.<br>MR-J5-G-N1/MR-J5W-G-N1 User's Manual (Communication Function) |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

## Control function

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| Vibration suppression | Advanced vibration suppression control II | This function suppresses vibration and residual vibration at an arm end. | A5 | Refer to "Advanced vibration suppression control II" in the following manual.<br>MR-J5 User's Manual (Adjustment) |
| | Machine resonance suppression filter | This function decreases the gain of the specific frequency to suppress the resonance of the mechanical system. | A5 | Refer to "Machine resonance suppression filter" in the following manual.<br>MR-J5 User's Manual (Adjustment) |
| | Shaft resonance suppression filter | When driving the servo motor with a load mounted to the servo motor shaft, resonance due to shaft torsion may generate high frequency mechanical vibration. The shaft resonance suppression filter suppresses this vibration. | A5 | Refer to "Shaft resonance suppression filter" in the following manual.<br>MR-J5 User's Manual (Adjustment) |
| | Robust filter | This function improves a disturbance response when a response performance cannot be increased because of a large load to motor inertia ratio, such as a roll feed axis. | A5 | Refer to "Robust filter" in the following manual.<br>MR-J5 User's Manual (Adjustment) |
| | Slight vibration suppression control | This function suppresses vibration of ±1 pulse generated at each servo motor stop. | A5 | Refer to "SLIGHT VIBRATION SUPPRESSION CONTROL" in the following manual.<br>MR-J5 User's Manual (Adjustment) |
| Tracking control | Lost motion compensation function | This function reduces the response delay generated when the machine moving direction is reversed. | A5 | Refer to "Lost motion compensation function" in the following manual.<br>MR-J5 User's Manual (Adjustment) |
| | Super trace control | This function reduces the droop pulses at the rated speed and at the uniform acceleration/deceleration to almost zero. | A5 | Refer to "Super trace control" in the following manual.<br>MR-J5 User's Manual (Adjustment) |
| | Path tracking model adaptive control | This function reduces tracking errors in reciprocation. | A5 | Refer to "Path tracking model adaptive control" in the following manual.<br>MR-J5 User's Manual (Adjustment) |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

## Adjustment function

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| Automatic adjustment | Quick tuning | This function automatically adjusts the gain at servo-on in a short time without acceleration/deceleration operation of the servo motor. Response without overshoot is possible, saving gain adjustment time. | A5 | Refer to "Quick tuning" in the following manual. 📖MR-J5 User's Manual (Adjustment) |
| | Auto tuning | This function automatically adjusts the gain to an optimum value even if the load applied to the servo motor shaft varies. | A5 | Refer to "ADJUSTMENT FUNCTION TYPES" in the following manual. 📖MR-J5 User's Manual (Adjustment) |
| | One-touch tuning | Gain adjustment is performed with this function just by pressing buttons on the servo amplifier or by clicking a button once on MR Configurator2. One-touch tuning can also be performed via a network. | A5 | Refer to "One-touch tuning" in the following manual. 📖MR-J5 User's Manual (Adjustment) |
| Custom adjustment | Model adaptive control | This function enables control according to the ideal model that is both stable and highly responsive. This is a two-degrees-of-freedom model and can adjust responses to commands and disturbances separately. This function can also be disabled. | A5 | Refer to "MODEL ADAPTIVE CONTROL" in the following manual. 📖MR-J5 User's Manual (Adjustment) |
| | Gain switching function | This function switches gains during rotation and during stop, and uses an input device to switch gains during operation. It supports the gain switching by rotation direction and the 3-step gain switching. Therefore, more detailed gain switching is available. | A5 | Refer to "GAIN SWITCHING FUNCTION" in the following manual. 📖MR-J5 User's Manual (Adjustment) |
| Adjustment support | Machine analyzer | This function analyzes the frequency characteristic of the mechanical system by simply connecting the servo amplifier with an MR Configurator2 installed personal computer. | A5 | Refer to "Adjustment functions available in combination with MR Configurator2" in the following manual. 📖MR-J5 User's Manual (Adjustment) |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

## I/O, monitor

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| DI/DO | Input signal selection (device selection) | This function assigns input devices such as LSP (Forward rotation stroke end) to certain pins of the connector. | A5 | Refer to "Assigning I/O devices" in the following manual.<br>📖IMR-J5 User's Manual (Function) |
| | Output signal selection (device setting) | This function assigns output devices such as MBR (Electromagnetic brake interlock) to certain pins of the connector. | A5 | |
| | Output signal (DO) forced output | This function forcibly switches the output signals on and off regardless of the servo status. Use this function for purposes such as checking output signal wiring. | A5 | ☞ Page 86 Output signal (DO) forced output |
| | A/B/Z-phase output | This function outputs the positions of the encoder and linear encoder in the A/B/Z-phase signal. | A5 | Refer to "A/B/Z-phase pulse output function" in the following manual.<br>📖IMR-J5 User's Manual (Function) |
| LED | Status display | This function shows the servo status on the 7-segment LED display. | A5 | ☞ Page 54 Switch setting and display of the servo amplifier |
| Analog input/output | Analog monitor | This function outputs the servo status in voltage in real time. | A5 | Refer to "MONITORING" in the following manual.<br>📖IMR-J5 User's Manual (Function) |
| Monitor | Power monitoring function | This function calculates the running power and the regenerative power from the data in the servo amplifier such as speed and current. The power consumption and other values are displayed on MR Configurator2. | A5 | |
| Touch probe | Current position latch function | This function latches the current position when TPR1 (Touch probe 1), TPR2 (Touch probe 2), or TPR3 (Touch probe 3) is turned on. | A5 | Refer to "Touch probe" in the following manual.<br>📖IMR-J5 User's Manual (Function) |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

## Option

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| Regenerative capacity enhancement | MR-CM3K simple converter | This function enables servo amplifiers to be used in a common DC bus connection. Utilizing the regenerative power contributes to energy-conservation. In addition, it decreases the number of molded case circuit breakers and magnetic contactors. | A5 | Refer to "MR-CM3K simple converter" in the following manual.<br>📖IMR-J5 User's Manual (Hardware) |
| | MR-CM08K1 simple converter | 200 V class servo amplifiers can be used with a 1-phase 100 V AC power supply input.<br>This function enables servo amplifiers to be used in a common DC bus connection. Utilizing the regenerative power contributes to energy-conservation. In addition, it decreases the number of molded case circuit breakers and magnetic contactors. | F0 | Refer to "MR-CM08K1 simple converter" in the following manual.<br>📖IMR-J5 User's Manual (Hardware) |
| | Regenerative option | Use this function if the built-in regenerative resistor of the servo amplifier does not have sufficient regenerative capacity for the generated regenerative power. | A5 | Refer to "Regenerative option" in the following manual.<br>📖IMR-J5 User's Manual (Hardware) |
| | Multifunction regeneration converter | This function returns the regenerative energy generated at servo motor deceleration to the power supply. The bus voltage can be standardized among multiple servo amplifiers. | B0 | Refer to "FR-XC-(H) multifunction regeneration converter" in the following manual.<br>📖IMR-J5 User's Manual (Hardware) |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

## Engineering software

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| Setup software | MR Configurator2 | This function performs settings (such as servo parameter settings), test operation, and monitoring with a personal computer. | A5 | ☞ Page 63 STARTUP |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

## Protective functions

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| Alarm | Alarm function | This function displays an alarm or warning when an error occurs during operation. When an alarm occurs, ALM (Malfunction) turns off and stops the servo motor. When a warning occurs, WNG (Warning) will turn on. The servo motor may stop or continue operation depending on the warning. | A5 | Refer to "Alarm function" in the following manual.<br>📖MR-J5 User's Manual (Function) |
| Power error detection | Disconnection detection function | This function detects a disconnection in the main circuit power supply input and the servo motor power supply output. | A5 | Refer to "Disconnection/incorrect wiring detection function" in the following manual.<br>📖MR-J5 User's Manual (Function) |
| Coasting distance reduction | Forced stop deceleration function | This function decelerates the servo motor to a stop at EM2 (Forced stop 2) off or when there is an alarm. | A5 | Refer to "Forced stop deceleration function" in the following manual.<br>📖MR-J5 User's Manual (Function) |
| Drop protection | Electromagnetic brake interlock function | This function operates the electromagnetic brake at servo off and error occurrence, and prevents the vertical axis from dropping. | A5 | Refer to "Electromagnetic brake interlock function" in the following manual.<br>📖MR-J5 User's Manual (Function) |
| | Vertical axis freefall prevention function | This function moves the axis up by the mechanical backlash amount of the electromagnetic brake to prevent damage to machines. | A5 | Refer to "Vertical axis freefall prevention function" in the following manual.<br>📖MR-J5 User's Manual (Function) |
| Braking protection | Dynamic brake | During the power shut-off and alarm occurrence, this function shorts between U, V, and W phases and operates the dynamic brake. | A5 | Refer to "Dynamic brake characteristics" in the following manual.<br>📖MR-J5 User's Manual (Hardware) |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

## Functional safety

Available functions and safety levels differ depending on the combination of the servo amplifiers and the servo motors and the firmware version of the servo amplifiers.

☞ Page 23 List of safety sub-function compatible units

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| Safety sub-function | STO (Safe torque off) (When functional safety parameters are not used) | This servo amplifier supports the STO function for functional safety as per IEC/EN 61800-5-2. This allows a safety system to be easily configured for the equipment. | A5 | Refer to "USING STO FUNCTION" in the following manual. 📖MR-J5 User's Manual (Hardware) |
| | STO (Safe torque off) (When functional safety parameters are used) | This function electrically shuts off the servo motor driving energy with input signals from external devices (shut-off by the secondary-side output). This is equivalent to the stop category 0 of IEC/EN 60204-1. | B2 | Refer to "FUNCTIONAL SAFETY" in the following manual. 📖MR-J5 User's Manual (Function) |
| | SS1 (Safe stop 1) | This function starts deceleration with input signals from external devices. After the specified time to confirm the motor stop, the STO function is executed (SS1). This is equivalent to the stop category 1 of IEC/EN 60204-1. | B2 | |
| | SS2 (Safe stop 2) | This function starts deceleration with input signals from external devices. After the specified time to confirm the motor stop, the SOS function is executed (SS2). This is equivalent to the stop category 2 of IEC/EN 60204-1. | D8 | |
| | SOS (Safe operating stop) | This function monitors whether the servo motor stops within the prescribed range. Energy is supplied to the servo motor. | D8 | |
| | SLS (Safely-limited speed) | This function monitors whether the speed is within the prescribed speed limit. If the speed exceeds the specified speed limit, the STO will shut off energy. | D8 | |
| | SSM (Safe speed monitor) | This function outputs signals when the servo motor speed is below the prescribed speed. | D8 | |
| | SBC (Safe brake control) | This function outputs signals for controlling the external brake. | B2 | |
| | SDI (Safe direction) | This function monitors whether the servo motor travels in the specified direction. If the servo motor travels in a direction different from the specified direction, the STO will shut off energy. | D8 | |
| | SLI (Safely-limited increment) | This function monitors whether the travel distance of the servo motor is within the specified range. If the travel distance of the servo motor exceeds the specified range, the STO will shut off energy. | D8 | |
| | SLT (Safely-limited torque) | This function monitors whether the torque is below the specified torque. If the torque exceeds the specified torque, the STO will shut off energy. | D8 | |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

## Instantaneous power failure measures

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| Tough drive | SEMI-F47 function | This function uses the electrical energy charged in the capacitor to avoid triggering [AL. 010 Undervoltage] in case that an instantaneous power failure occurs during operation. Use a 3-phase power supply for the input power supply of the servo amplifier. Using a 1-phase 200 V AC for the input power supply will not comply with SEMI-F47 standard. | A5 | Refer to "Compliance with SEMI-F47 standard" in the following manual.<br>MR-J5 User's Manual (Function) |
| | Tough drive function | This function makes the equipment continue operating even under conditions where an alarm would normally occur. There are two types of tough drive function: the vibration tough drive and the instantaneous power failure tough drive. | A5 | Refer to "Tough drive function" in the following manual.<br>MR-J5 User's Manual (Function) |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

## Diagnostics

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| Drive data diagnosis | Drive recorder | This function continuously monitors the servo status and records the state transition before and after an alarm for a fixed period of time. The recorded data can be checked by the Waveform-Display button on the drive recorder window of MR Configurator2 being clicked. | A5 | Refer to "Drive recorder" in the following manual.<br>MR-J5 User's Manual (Function) |
| | Graph function | This function obtains the servo status in the graph. | A5 | Refer to "Graph function" in the following manual.<br>MR-J5 User's Manual (Function) |
| Failure diagnosis | Encoder communication diagnosis function | This function diagnoses with MR Configurator2 whether the encoder communication error is caused by the circuit malfunction of the servo amplifier or by the malfunction of the cables/ encoder. | A5 | Refer to "Encoder communication diagnosis function" in the following manual.<br>MR-J5 User's Manual (Function) |
| Service life diagnosis | Servo amplifier life diagnosis function | This function enables checking of the cumulative energization time and the number of inrush relay on/off times. It gives an indication of the replacement time for parts on the servo amplifier with a service life (such as the capacitor and the relay) before they malfunction. MR Configurator2 is required for this function. | A5 | Refer to "Servo amplifier life diagnosis function" in the following manual.<br>MR-J5 User's Manual (Function) |
| | Motor life diagnosis function | This function predicts failures of the equipment and the servo motor based on the machine total travel distance. It gives an indication of the replacement time for the servo motor. | A5 | Refer to "Machine diagnosis" in the following manual.<br>MR-J5 User's Manual (Function) |
| | Machine diagnosis function | This function uses the data in the servo amplifier to estimate the friction and vibrational component of the drive system in the equipment and to recognize an error in machine parts such as ball screws and bearings. | A5 | |
| | | This function automatically sets the threshold used for detecting the error of machine parts such as ball screws and bearings. It outputs the warning when the friction, vibrational component, and total revolution of the servo motor are out of the set threshold. The error in the machine parts such as ball screws and bearings can be detected automatically. | A5 | |
| | | This function estimates the friction of gears and loosening of belts (decrease in the belt tension), and detects errors in the gears and belts. | A5 | |
| System diagnosis | System configuration information | This function uses MR Configurator2 to monitor the servo amplifier model, connected servo motor, encoder, and other information. | A5 | Refer to "System configuration display" in the following manual.<br>MR-J5 User's Manual (Function) |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

## History

| Functions | Detailed functions | Description | Ver. *1 | Detailed explanation |
|---|---|---|---|---|
| — | Alarm history | This function saves information of the alarm that occurred in the servo amplifier. The information is saved in chronological order and used for occasions such as analyzing the cause of the alarm. | A5 | Refer to "Alarm history" in the following manual.<br>MR-J5 User's Manual (Function) |

*1 "Ver." indicates the supported firmware version of the servo amplifier. The functions are available on servo amplifiers with the indicated firmware version or later.

# 2.3 Security

To completely prevent unauthorized access to the system from external devices, the user also must take safety measures. Mitsubishi Electric Corporation cannot be held responsible for any problems caused by unauthorized access.

# 3 STRUCTURE

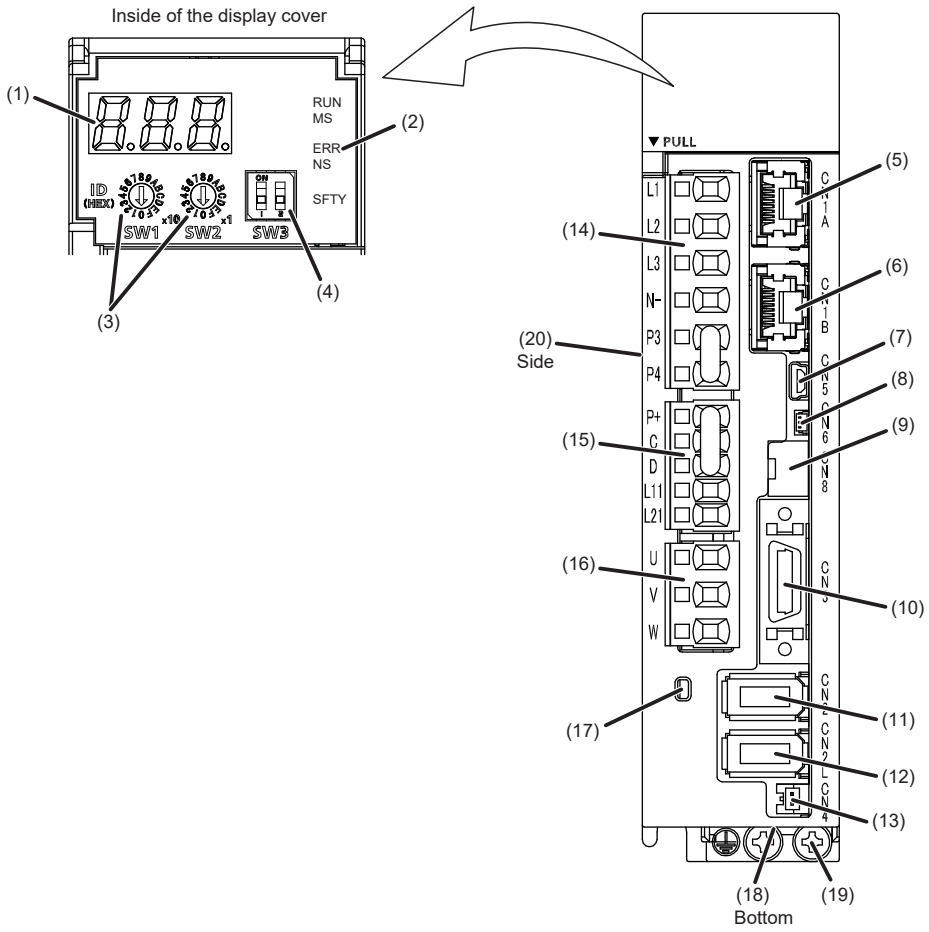
## 3.1 Parts identification

The flame retardancy of the resin material used for the cabinet of the servo amplifier (excluding the display cover) and printing board is UL94 V-0.



### MR-J5-_G(4)-(RJ)N1

The diagram shows the MR-J5-10G-RJN1.




| No. | Name | Application | Detailed explanation |
|---|---|---|---|
| (1) | Display | The 3-digit, 7-segment LED display shows the servo status and alarm number. | ☞ Page 54 Switch setting and display of the servo amplifier |
| (2) | Network status display LED | Displays each network status. | |
| (3) | ID setting switch (SW1/SW2) | Set the node address of the servo amplifier. | |
| (4) | DIP switch (SW3) | To change the mode to the test operation mode, set the switch. (SW3-1) | |
| (5) | Ethernet cable connector (CN1A) | Connect the controller, servo amplifier, or each network connected device. | ☞ Page 59 CN1A/CN1B connector LED<br>For details of the connection, refer to "Connecting Ethernet cables" in the following manual.<br>📖MR-J5-G-N1/MR-J5W-G-N1 User's Manual (Communication Function) |
| (6) | Ethernet cable connector (CN1B) | | |
| (7) | USB communication connector (CN5) | Connect to a personal computer. | — |

| No. | Name | Application | Detailed explanation |
|---|---|---|---|
| (8) | Analog monitor connector (CN6) | Outputs the analog monitor. | Refer to "Connectors and pin assignments" in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (9) | Functional safety I/O signal connector (CN8) | Connect an external safety relay to use the STO function. When using other safety-sub functions, refer to "FUNCTIONAL SAFETY" in the following manual.<br>MR-J5 User's Manual (Function) | Refer to "USING STO FUNCTION" and "USING FUNCTIONAL SAFETY" in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (10) | I/O signal connector (CN3) | Connect the digital I/O signals. | Refer to "Connectors and pin assignments" in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (11) | Encoder connector (CN2) | Connect a servo motor encoder or an external encoder. | ☞ Page 49 External encoder connector |
| (12) *1 | External encoder connector (CN2L) | Connect the external encoder. | |
| (13) | Battery connector (CN4) | To configure the absolute position detection system by using a direct drive motor, connect the battery for absolute position data backup. | Refer to "ABSOLUTE POSITION DETECTION SYSTEM" in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (14) | Main circuit power connector (CNP1) *2 | Connect the input power supply. | Refer to "Explanation of power supply system" in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (15) | Control circuit power connector (CNP2) *2 | Connect the control circuit power supply and regenerative option. | |
| (16) | Servo motor power output connector (CNP3) *2 | Connect the servo motor. | |
| (17) | Charge light | When the main circuit is charged, this light is on. While the light is on, do not change the connections of the wires. | — |
| (18) | Battery holder | Install the battery for absolute position data backup. | Refer to "DIMENSIONS" in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (19) | Protective earth (PE) terminal | Connect this terminal to the protective earth (PE) of the cabinet. | Refer to "Explanation of power supply system" in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (20) | Rating plate | Indicates model, capacity, and other information. | ☞ Page 8 Rating plate |

*1 This is for the MR-J5-_G-RJN1 servo amplifier. The MR-J5-_G-N1 servo amplifier does not have a CN2L connector.

*2 When a servo amplifier with a capacity of 12 kW or more is used, connect the power supply system to the terminal block. For the terminal name/assignment, refer to "DIMENSIONS" in the following manual.
MR-J5 User's Manual (Hardware)

## ■External encoder connector

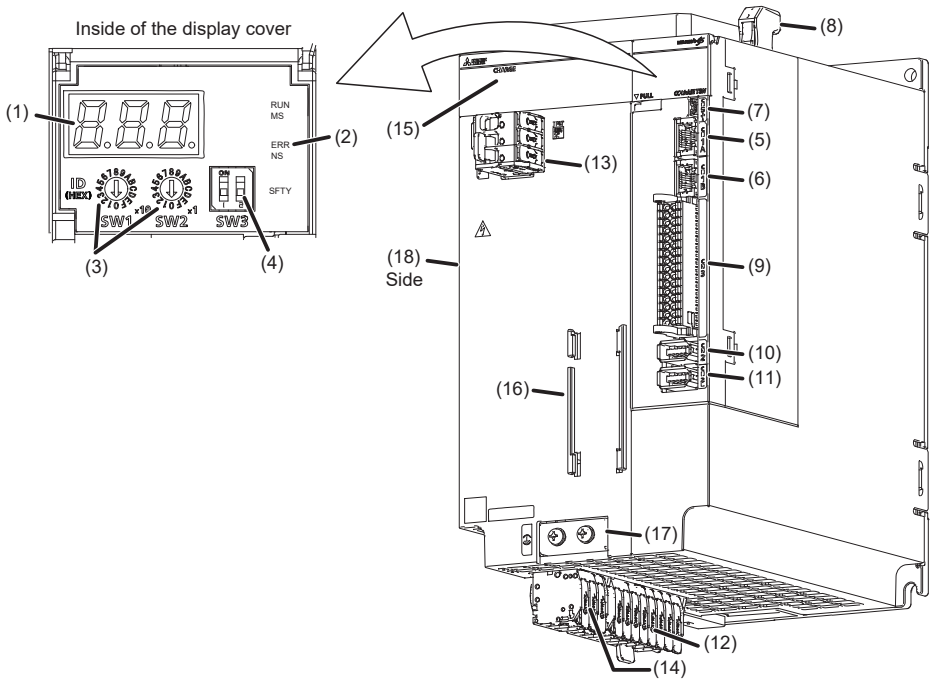
The external encoder of A/B/Z-phase differential output type can be connected using the CN2L connector. The following table shows the communication method of the external encoder compatible with the MR-J5-_G_-N1 and MR-J5-_G_-RJN1 servo amplifiers.

| System configuration | External encoder communication method | Connector | |
|---|---|---|---|
| | | MR-J5-_G_-N1 | MR-J5-_G_-RJN1 |
| Linear servo system | Two-wire type | CN2 *1 | CN2 *1 |
| | Four-wire type | | |
| | A/B/Z-phase differential input | — | CN2L *4 |
| Fully closed loop system | Two-wire type | CN2 *2 *3 | CN2L |
| | Four-wire type | — | |
| | A/B/Z-phase differential input | | |
| Scale measurement function | Two-wire type | CN2 *2 *3 | CN2L |
| | Four-wire type | — | |
| | A/B/Z-phase differential input | | |

*1 An MR-J4THCBL03M branch cable is required.
*2 An MR-J4FCCBL03M branch cable is required.
*3 If the servo motor encoder communication method is the four-wire type, CN2 cannot be used. Use the MR-J5-_G_-RJN1 or MR-J5-_G4-HSN1 servo amplifier.
*4 Connect a thermistor to CN2.

## MR-J5-_G4-HSN1

The diagram shows the MR-J5-500G4-HSN1.




| No. | Name | Application | Detailed explanation |
|---|---|---|---|
| (1) | Display | The 3-digit, 7-segment LED display shows the servo status and alarm number. | ☞ Page 54 Switch setting and display of the servo amplifier |
| (2) | Network status display LED | Displays each network status. | |
| (3) | ID setting switch (SW1/SW2) | Set the node address of the servo amplifier. | |
| (4) | DIP switch (SW3) | To change to the test operation mode, set this. (SW3-1) | |
| (5) | Ethernet cable connector (CN1A) | Connect the controller, servo amplifier or each network connected device. | ☞ Page 59 CN1A/CN1B connector LED<br>For details of the connection, refer to "Connecting Ethernet cables" in the following manual.<br>📖MR-J5-G-N1/MR-J5W-G-N1 User's Manual (Communication Function) |
| (6) | Ethernet cable connector (CN1B) | | |
| (7) | USB communication connector (CN5) | Connect with a personal computer. | — |
| (8) | Analog monitor and A/B/Z-phase pulse output connector (CN7) | Outputs the analog monitor and the ABZ pulses. | Refer to "Connectors and pin assignments" in the following manual.<br>📖MR-J5 User's Manual (Hardware) |
| (9) | I/O signal connector (CN3) | Connect the digital I/O signals.<br>When using the safety-sub functions, refer to "FUNCTIONAL SAFETY" in the following manual.<br>📖MR-J5 User's Manual (Function) | Refer to "Connectors and pin assignments" and "USING FUNCTIONAL SAFETY" in the following manual.<br>📖MR-J5 User's Manual (Hardware) |
| (10) | Encoder connector (CN2) | Connect a servo motor encoder or an external encoder. | ☞ Page 51 External encoder connector |
| (11) | External encoder connector (CN2L) | Connect an external encoder. | |
| (12) | Power connector (CNP1) *1 | Connect the input power supply, control circuit power supply, and regenerative option. | Refer to "Explanation of power supply system" in the following manual.<br>📖MR-J5 User's Manual (Hardware) |
| (13) | External converter connector (CNP2) *1 | Connect the FR-XC multifunction regeneration converter. | |
| (14) | Servo motor power output connector (CNP3) *1 | Connect the servo motor. | |
| (15) | Charge light | When the main circuit is charged, this light is on. While the light is on, do not change the connections of the wires. | — |

| No. | Name | Application | Detailed explanation |
|---|---|---|---|
| (16) | Battery holder | Store the battery for absolute position data backup. | Refer to "DIMENSIONS in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (17) | Protective earth (PE) terminal | Connect this terminal to the protective earth (PE) of the cabinet. | Refer to "Explanation of power supply system" in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (18) | Rating plate | Indicates model, capacity, and other information. | Page 8 Rating plate |

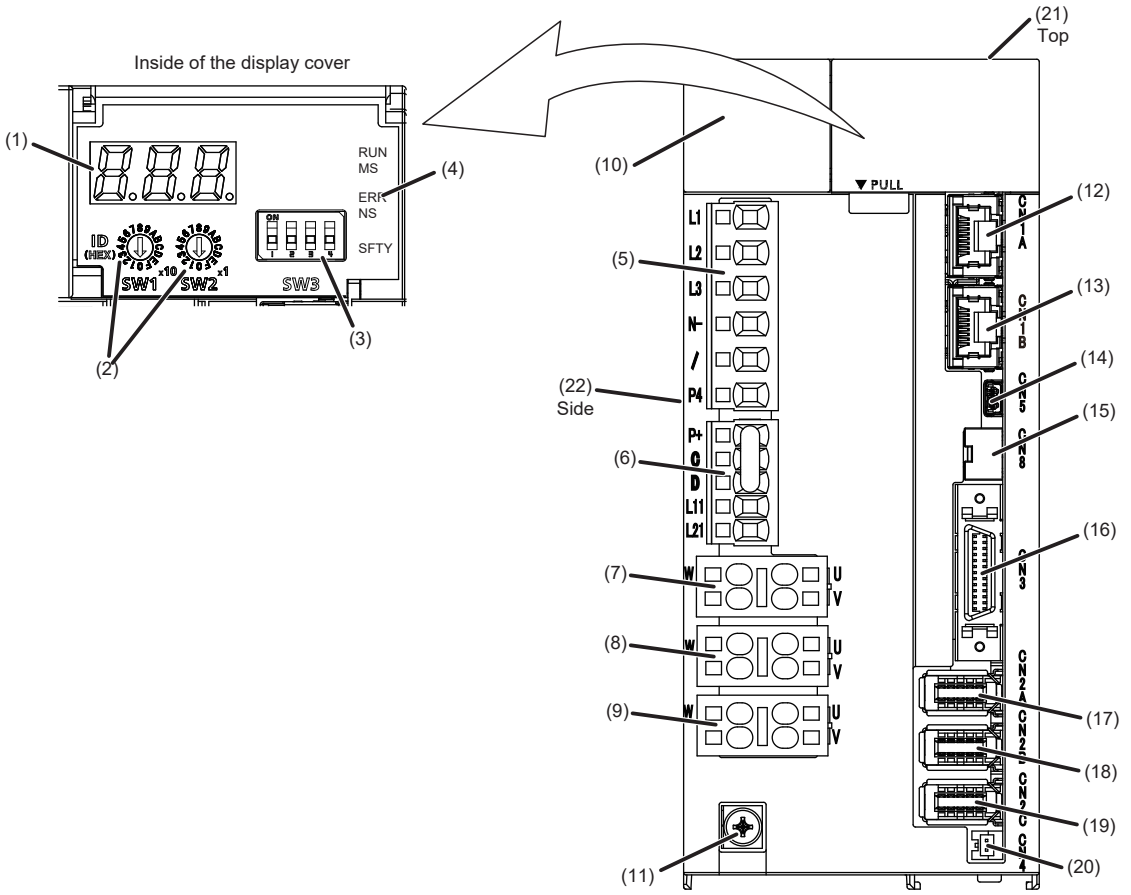
*1 When a servo amplifier with a capacity of 12 kW or more is used, connect the power supply system to the terminal block. For the terminal name/assignment, refer to "DIMENSIONS" in the following manual.
MR-J5 User's Manual (Hardware)

## ■External encoder connector

The external encoder of A/B/Z-phase differential output type can be connected using the CN2L connector. The following table shows the communication methods of the external encoders compatible with the MR-J5-_G4-HSN1 servo amplifiers.

| System configuration | External encoder communication method | Connector |
|---|---|---|
| | | MR-J5-_G4-HSN1 |
| Fully closed loop system | Two-wire type | CN2L |
| | Four-wire type | |
| | A/B/Z-phase differential input | |
| Scale measurement function | Two-wire type | CN2L |
| | Four-wire type | |
| | A/B/Z-phase differential input | |

## MR-J5W_-_G-N1




| No. | Name | Application | Detailed explanation |
|---|---|---|---|
| (1) | Display | The 3-digit, 7-segment LED display shows the servo status and alarm number. | ☞ Page 54 Switch setting and display of the servo amplifier |
| (2) | ID setting switch (SW1/SW2) | Set the node address of the servo amplifier. | |
| (3) | DIP switch (SW3) | Consists of the test operation switch and control axis deactivation switch. | |
| (4) | Network status display LED | Displays each network status. | |
| (5) | Main circuit power connector (CNP1) | Connect the input power supply. | Refer to "Explanation of power supply system" in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (6) | Control circuit power connector (CNP2) | Connect the control circuit power supply and regenerative option. | |
| (7) | A-axis servo motor power connector (CNP3A) | Connect the A-axis servo motor. | |
| (8) | B-axis servo motor power connector (CNP3B) | Connect the B-axis servo motor. | |
| (9) *1 | C-axis servo motor power connector (CNP3C) | Connect the C-axis servo motor. | |
| (10) | Charge light | When the main circuit is charged, this light is on. While the light is on, do not change the connections of the wires. | — |
| (11) | Protective earth (PE) terminal | Connect this terminal to the protective earth (PE) of the cabinet. | Refer to "Explanation of power supply system" in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (12) | Ethernet cable connector (CN1A) | Connect the controller, servo amplifier or each network connected device. | ☞ Page 59 CN1A/CN1B connector LED<br>For details of the connection, refer to "Connecting Ethernet cables" in the following manual.<br>MR-J5-G-N1/MR-J5W-G-N1 User's Manual (Communication Function) |
| (13) | Ethernet cable connector (CN1B) | | |

| No. | Name | Application | Detailed explanation |
|---|---|---|---|
| (14) | USB communication connector (CN5) | Connect with a personal computer. | — |
| (15) | Functional safety I/O signal connector (CN8) | Connect an external safety relay to use the STO function. When using other safety-sub functions, refer to "FUNCTIONAL SAFETY" in the following manual.<br>MR-J5 User's Manual (Function) | Refer to "USING STO FUNCTION" and "USING FUNCTIONAL SAFETY" in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (16) | I/O signal connector (CN3) | Connect the digital I/O signals. | Refer to "Connectors and pin assignments" in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (17) | A-axis encoder connector (CN2A) | Connect the A-axis servo motor encoder or external encoder. | Page 53 External encoder connector |
| (18) | B-axis encoder connector (CN2B) | Connect the B-axis servo motor encoder or external encoder. | |
| (19) *1 | C-axis encoder connector (CN2C) | Connect the C-axis servo motor encoder or external encoder. | |
| (20) | Battery connector (CN4) | To configure the absolute position detection system by using a direct drive motor, connect the battery for absolute position data backup. | Refer to "ABSOLUTE POSITION DETECTION SYSTEM" in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (21) | Analog monitor connector (CN6) | Outputs the analog monitor. | Refer to "Connectors and pin assignments" in the following manual.<br>MR-J5 User's Manual (Hardware) |
| (22) | Rating plate | Indicates model, capacity, and other information. | Page 8 Rating plate |

*1 For the MR-J5 3-axis servo amplifier

## ■External encoder connector

The following table shows the communication method of the external encoder compatible with the MR-J5W2-_G-N1 and MR-J5W3-_G-N1 servo amplifiers.

| System configuration | External encoder communication method | Connector | |
|---|---|---|---|
| | | MR-J5W2-_G-N1 | MR-J5W3-_G-N1 |
| Linear servo system | Two-wire type | CN2A *1<br>CN2B *1 | CN2A *1<br>CN2B *1<br>CN2C *1 |
| | Four-wire type | | |
| | A/B/Z-phase differential input | — | — |
| Fully closed loop system | Two-wire type | CN2A *2 *3<br>CN2B *2 *3 | — |
| | Four-wire type | — | |
| | A/B/Z-phase differential input | | |
| Scale measurement function | Two-wire type | CN2A *2 *3<br>CN2B *2 *3 | — |
| | Four-wire type | — | |
| | A/B/Z-phase differential input | | |

*1 An MR-J4THCBL03M branch cable is required.
*2 An MR-J4FCCBL03M branch cable is required.
*3 If the servo motor encoder communication method is the four-wire type, the MR-J5W2-_G-N1 servo amplifier cannot be used. Use the MR-J5-_G_-RJN1 or MR-J5-_G4-HSN1 servo amplifier.

# 3.2 Switch setting and display of the servo amplifier

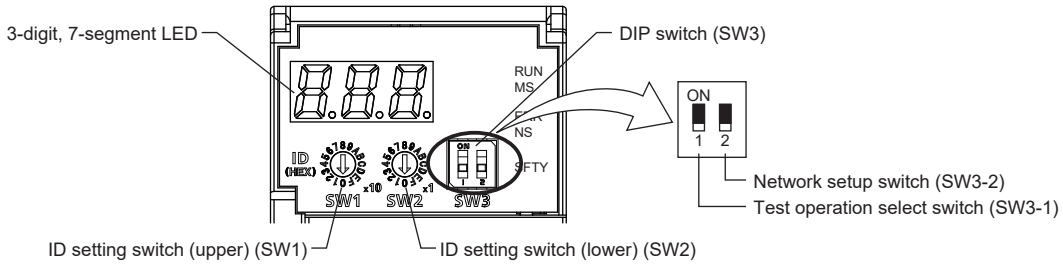
Switching to the test operation mode and configuring network setting can be done with switches on the servo amplifier. The network communication status and alarm status can also be checked on the display (3-digit, 7-segment LED) of the servo amplifier.

## Switches

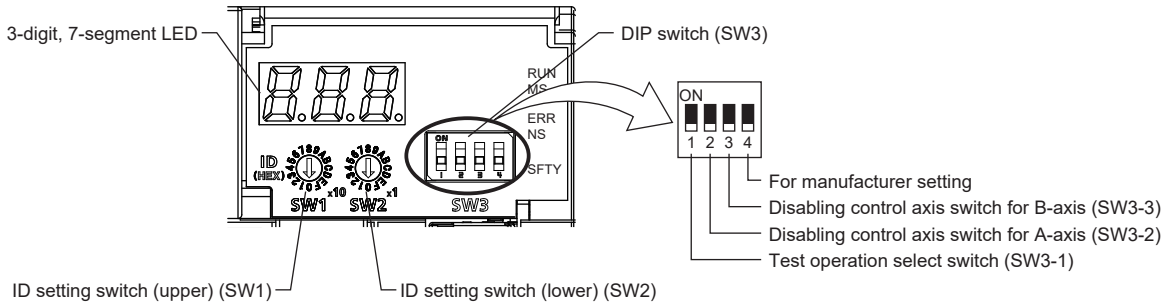
If a metal screw driver contacts with the conductive areas, the switches may malfunction. Therefore, use an insulated screw driver instead of the metal screw driver to operate ID setting switches (SW1/SW2) and DIP switches (SW3).
If all the DIP switches (SW3) are turned "ON (up)", the servo amplifier is switched to the operation mode for manufacturer setting and "off" will be displayed. The servo amplifier cannot be used in this mode. Thus, set the DIP switches (SW3) correctly according to this section.
To apply the settings of all switches, cycle the control circuit power supply or reset the software.
The following explains the ID setting switches (SW1/SW2) and DIP switches (SW3).

### Switch identification

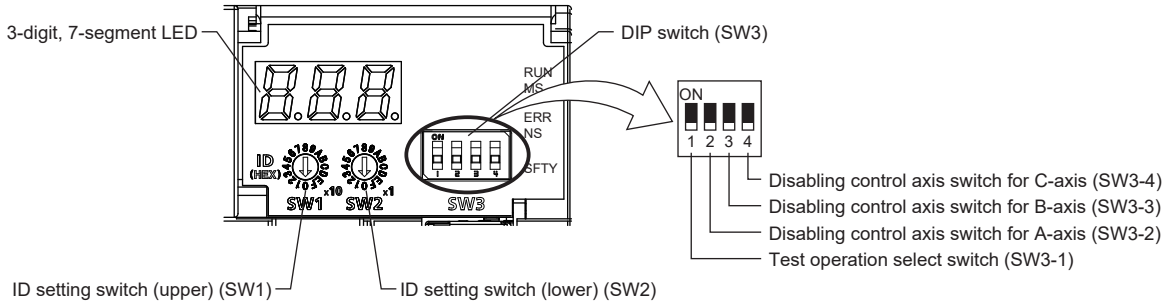
#### ■1-axis servo amplifier




#### ■2-axis servo amplifier




#### ■3-axis servo amplifier



## Test operation select switch (SW3-1)

Turning "ON (up)" the test operation select switch enables the test operation mode. In the test operation mode, functions such as JOG operation, positioning operation, and machine analyzer are available using MR Configurator2.

☞ Page 80 Test operation

## Disabling control axis switches (SW3-2, SW3-3, and SW3-4)

Turning "ON (up)" the disabling control axis switch disables the corresponding servo motor. The servo motor will become in the disabled-axis state and will not be recognized by the controller.

## ID setting switches (SW1/SW2)

The node address can be set with the ID setting switches (SW1/SW2) of the servo amplifier. SW1 indicates an upper digit and SW2 indicates a lower digit of a hexadecimal. The ID setting switches are set to 01h when shipped from the factory.

For how to set node addresses, refer to "Node address setting" in the following manual.

📖MR-J5-G-N1/MR-J5W-G-N1 User's Manual (Communication Function)

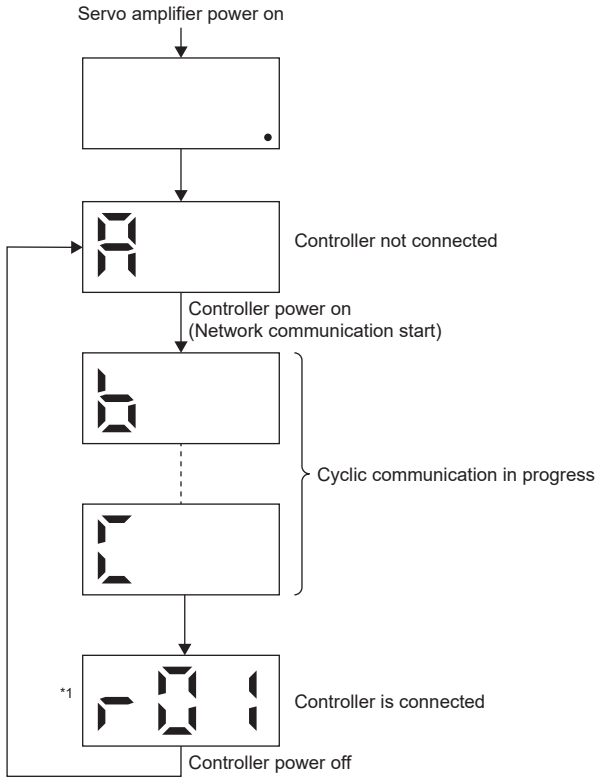
# 7-segment LED

The network connection status, servo status, and alarm/warning occurrence statuses can be checked on the 7-segment LED display.

## Display sequence

The following shows the display sequence of the 7-segment LED display after power-on. Once a system check is complete and the servo amplifier is started, the network connection status will be displayed.

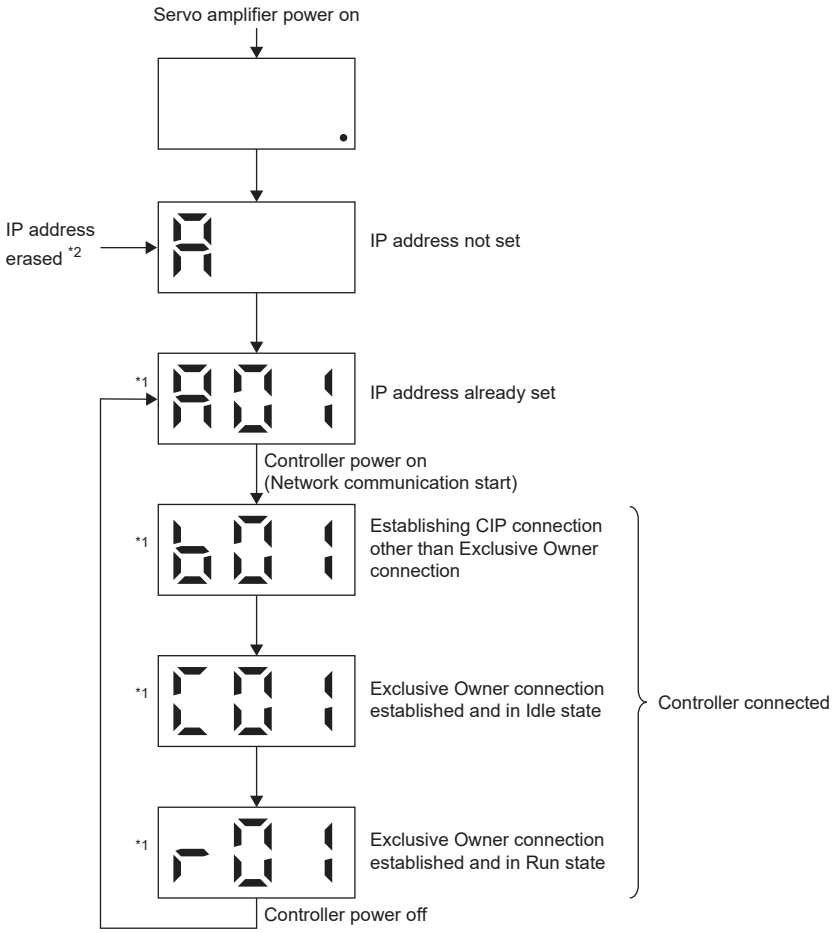
### ■For EtherCAT




*1 The segment of the last 2 digits shows the node address.

☞ Page 57 When the network is connected

## ■For EtherNet/IP




*1 The segment of the last 2 digits shows the IP address.

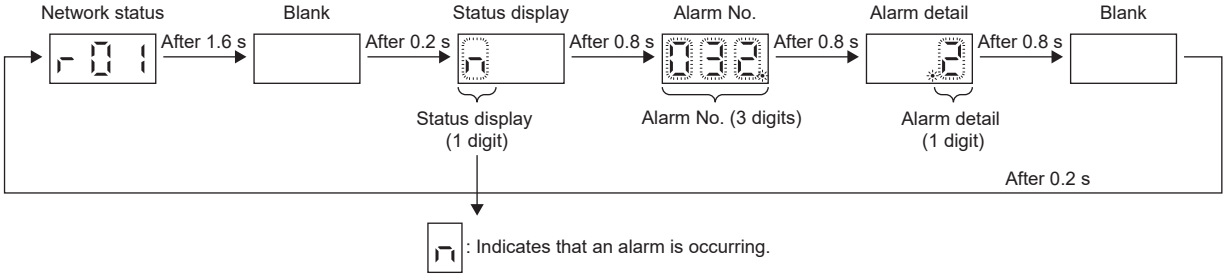
*2 The IP address is erased under the following conditions.

- The DHCP function was enabled with the DHCP function enabled and the IP address set.
- The servo amplifier is disconnected from the network it belongs to while the ACD function is enabled.
- Duplication of IP addresses on the same network is detected while the ACD function is enabled.

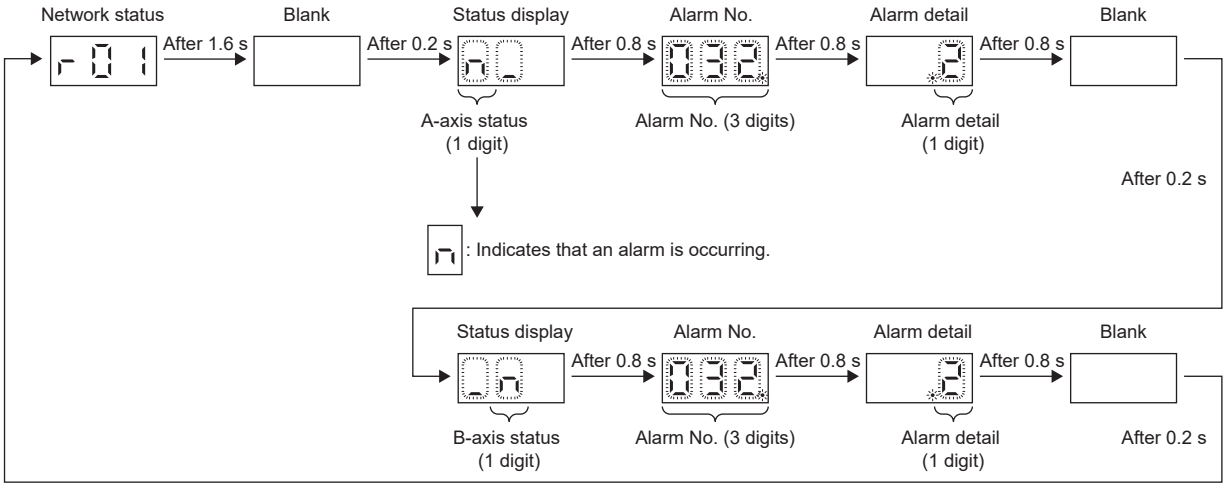
## Alarm display

When an alarm/warning occurs, the alarm status is displayed after the network connection status. This is an example of the alarm display for when [AL. 032.2 Overcurrent] is occurring.

### ■1-axis servo amplifier



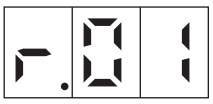
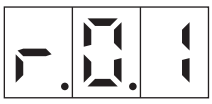
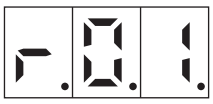

### ■For multi-axis servo amplifiers




When a 3-axis servo amplifier is used, the alarm occurrence status in the B-axis is indicated before the alarm occurrence in the C-axis.

## When the network is connected

The network connection status is displayed as follows. The servo status is expressed in decimal points.

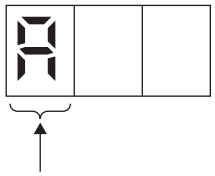
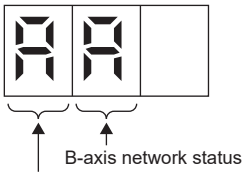
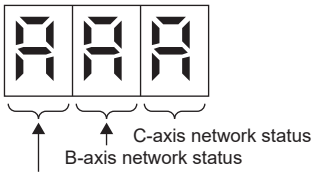
| 1-axis servo amplifier | 2-axis servo amplifier | 3-axis servo amplifier |
|---|---|---|
|  |  |  |
| Servo status<br>Off: Indicates ready-off and servo-off status.<br>Blinking: Indicates ready-on and servo-off status.<br>On: Indicates ready-on and servo-on status. | B-axis servo status<br>A-axis servo status<br>Off: Indicates ready-off and servo-off status.<br>Blinking: Indicates ready-on and servo-off status.<br>On: Indicates ready-on and servo-on status. | C-axis servo status<br>B-axis servo status<br>A-axis servo status<br>Off: Indicates ready-off and servo-off status.<br>Blinking: Indicates ready-on and servo-off status.<br>On: Indicates ready-on and servo-on status. |

The last 2 digits indicate a network address corresponding to each network.

| Network | Address |
|---|---|
| EtherCAT | A node address is displayed in hexadecimal. |
| EtherNet/IP | The 4th octet of the IP address is displayed in hexadecimal. |

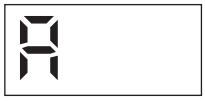
## When the network is not connected

The network connection status is displayed for each axis.

| 1-axis servo amplifier | 2-axis servo amplifier | 3-axis servo amplifier |
|---|---|---|
|  |  |  |

### ■For EtherCAT

The 7-segment LED display during initialization is as follows.

| Display | Description |
|---|---|
|  | Indicates that the servo amplifier is not connected to the controller. |
|  | Indicates the Pre-Operational state shown in the state transition diagram of the ESM state machine. |
|  | Indicates the Safe-Operational state shown in the state transition diagram of the ESM state machine. |
|  | Indicates the BootStrap state shown in the state transition diagram of the ESM state machine. |

### ■For EtherNet/IP

The 7-segment LED display during communication is as follows.

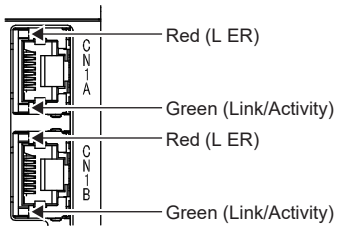
| Display | Description |
|---|---|
|  | Indicates that the IP address is not set or determined.<br>The IP address is not set or determined under the following conditions.<br>• The IP address is not set from the DHCP server while the DHCP function is enabled.<br>• The servo amplifier is disconnected from the network with the ACD function enabled.<br>• Duplication of IP addresses on the same network is detected while the ACD function is enabled. |
|  | Indicates that the CIP connection is not established even though the IP address is already set. |
|  | Indicates that the CIP connection other than the Exclusive Owner connection is established. |
|  | Indicates that the Exclusive Owner connection is being established and its communication status is in the Idle state. |
|  | Indicates that the Exclusive Owner connection is being established and its communication status is in the Run state. |

## Other status displays

| Display | Status | Description |
|---|---|---|
|  | Test operation mode | Indicates that the test operation mode is set. |
|  | CPU error | Indicates that a CPU watchdog error has occurred. |
|  | — | This is for manufacturer setting. |
|  | Initialization in progress | Indicates that initialization of settings such as parameters is in progress. |
|  | IP address setting in progress | Indicates that the IP address is being set via a network. |
|  | EtherCAT | Indicates that the network protocol setting is "EtherCAT" in the network setting mode. |
|  | EtherNet/IP | Indicates that the network protocol setting is "EtherNet/IP" in the network setting mode. |

# CN1A/CN1B connector LED

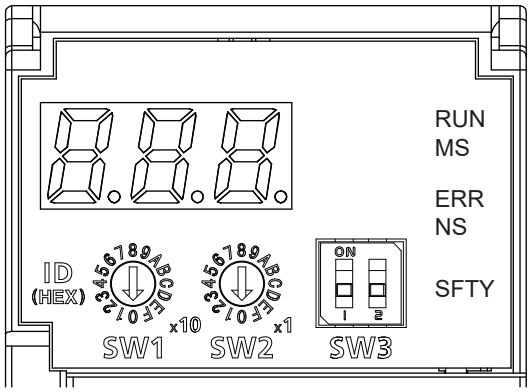
The following shows the LED display of the CN1A and CN1B connectors.




| LED | Name | Lighting status | Description |
|---|---|---|---|
| L ER (CN1A/CN1B) | Line error status | On | Indicates that erroneous data is being received. |
| Link/Activity (CN1A/CN1B) | ☞ Page 61 LED display (for EtherCAT) | | |

# Status LEDs

The LED states (RUN MS/ERR NS) indicate the network status of the servo amplifier.




| LED | Description |
|---|---|
| RUNMS<br>(green) | ☞ Page 61 LED display (for EtherCAT) |
| ERRNS<br>(red) | |
| SFTY<br>(green) | Off: Indicates that the functional safety cannot be activated.<br>On: Indicates that the functional safety can be activated. |

# LED display (for EtherCAT)

RUN MS (RUN LED), ERR NS (ERROR LED), and Link/Activity operate in compliance with the EtherCAT standard (ETG.1300 EtherCAT Indicator and Labeling Specification).

## LED status definitions

The following shows the LED status definitions.

| LED status | Definition |
|---|---|
| On | The LED is lit steady. |
| Off | The LED is unlit. |
| Flickering | The LED turns on and off repeatedly in a 10 Hz cycle (every 50 ms). |
| Blinking | The LED turns on and off repeatedly in a 2.5 Hz cycle (every 200 ms). |
| Single flash | The LED turns on for 200 ms and off for 1000 ms repeatedly. |
| Double flash | The LED repeats the cycle of turning on for 200 ms -> off for 200 ms -> on for 200 ms -> off for 1000 ms. |

## Explanations of LED statuses

### ■RUN MS (RUN LED)

The RUN LED indicates the EtherCAT communication status (ESM status).

| LED | | Description |
|---|---|---|
| Status | Color | |
| Off | — | Indicates the power supply being shut off or the Init state. |
| Blinking | Green | Indicates the Pre-Operational state. |
| Single flash | | Indicates the Safe-Operational state. |
| On | | Indicates the Operational state. |

### ■ERR NS (ERROR LED)

The ERROR LED indicates an error occurrence in EtherCAT communication.

| LED | | Description |
|---|---|---|
| Status | Color | |
| Off | — | No errors |
| Blinking | Red | Indicates that the EtherCAT state cannot be changed as instructed from the master station. |
| Single flash | | Indicates that the EtherCAT state has been changed autonomously because of an internal error. |
| Double flash | | Indicates a watchdog error in the Sync manager. |
| On | | Indicates critical errors such as a watchdog timeout. |

### ■Link/Activity LED (OUT port/IN port)

The Link/Activity LEDs indicate the link status of each EtherCAT communication port.

| LED | | Description |
|---|---|---|
| Status | Color | |
| Off | — | Indicates that the power supply is being shut off or the link is not established. |
| On | Green | Indicates that the link is established but no traffic. |
| Flickering | | Indicates that the link is established with traffic. |

# LED display (for EtherNet/IP)

Network Status and Module Status operate in compliance with the EtherNet/IP standard (THE CIP NETWORKS LIBRARY Volume 2: EtherNet/IP Adaptation of CIP).

## LED status definitions

The following shows LED status definitions.

| LED status | Definition |
|---|---|
| On | The LED is lit steady. |
| Off | The LED is unlit. |
| Blinking | The LED turns on and off repeatedly in a 1 Hz cycle (every 500 ms). |
| Flickering | The blinking cycle is not steady. The blinking cycle fluctuates depending on the packet amount of EtherNet/IP. |

## Explanations of LED statuses

### ■RUN MS (Module Status LED)

The Module Status LED indicates the status of the servo amplifier.

| LED | | Description |
|---|---|---|
| Status | Color | |
| Off | — | Indicates that no voltage is supplied. |
| On | Green | Indicates that the servo motor driving is available. |
| Blinking | | Indicates that the servo motor driving is not available. |
| Blinking | Red | Indicates that a recoverable error (Major Recoverable Fault) is occurring. |
| On | | Indicates that an unrecoverable error (Major Unrecoverable Fault) is occurring. |
| Blinking alternately | Green/Red | Indicates that the self-diagnosis at power-on is in progress. |

### ■ERR NS (Network Status LED)

The Network Status LED indicates the EtherNet/IP communication status and an error occurrence in EtherNet/IP communication.

| LED | | Description |
|---|---|---|
| Status | Color | |
| Off | — | Indicates that no voltage is supplied or the IP address is not set. |
| Blinking | Green | Indicates that the connection is not established even though the IP address is already set. |
| On | | Indicates that the connection is established and operating normally. |
| Blinking | Red | Indicates that a time-out has occurred in the Exclusive Owner connection. |
| On | | Indicates that duplication of IP addresses has been detected. |
| Blinking alternately | Green/Red | Indicates that the self-diagnosis at power-on is in progress. |

### ■Link/Activity LED

The Link/Activity LEDs indicate the link status of each EtherNet/IP communication port.

| LED | | Description |
|---|---|---|
| Status | Color | |
| Off | — | Indicates that the power supply is being shut off or the link is not established. |
| On | Green | Indicates that the link is established but no traffic. |
| Flickering | | Indicates that the link is established with traffic. |

# 4 STARTUP

**Point**

- MR-J5_-_G-_N1 servo amplifiers can only be set with MR Configurator2 version 1.105K or later.
- Before starting operation, check each servo parameter. Depending on the machine, an unexpected operation may occur.
- [Pr. PN13.0-3 Network protocol setting] is set to "0100h" (EtherCAT) at the factory setting. When using Ethernet/IP, change [Pr. PN13.0-3] to "0800h" (EtherNet/IP).
- The setting value of [Pr.PN13.0-3] can be automatically changed by setting the servo amplifier to the network switching mode to detect EtherNet/IP communication automatically. Refer to the following for details.

☞ Page 72 Network protocol switching methods

When using a linear servo motor, the terms below have the following meanings.

- Load to motor inertia ratio → Load to motor mass ratio
- Torque → Thrust

## Servo parameter setting method

**Point**

- Servo parameters may be changed by the controller via a network. In this case, take measures such as not turning on the controller or not connecting the network cable to the controller, so that the servo parameter setting does not change.

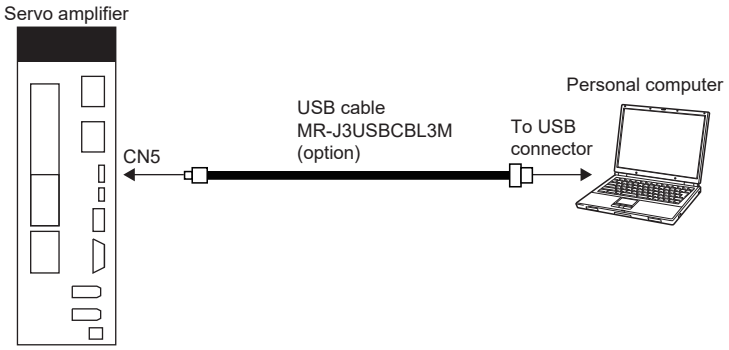
MR Configurator2 is the software used for purposes such as servo parameter settings, graph measurement/display, and test operation. This chapter describes the startup procedure of the servo amplifier when the servo amplifier is connected to a personal computer which has MR Configurator2 installed. To learn more about using MR Configurator2, refer to Help in MR Configurator2.

### ■For USB communication

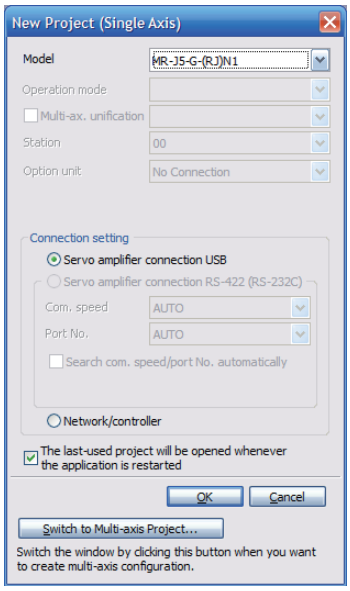
**Point**

- The USB communication may be disconnected by operations such as servo parameter settings and drive recorder readout, depending on the load on the servo amplifier. If this is the case, remove the USB cable, then connect it again.

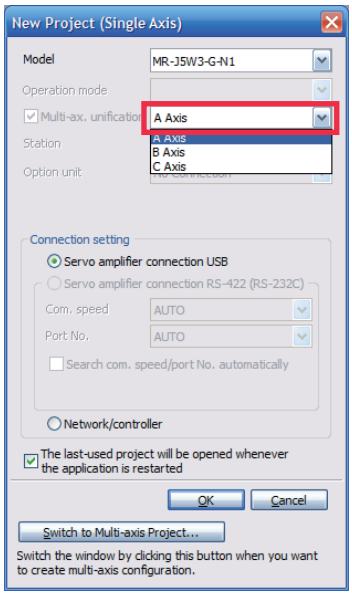
***1.*** Connect the servo amplifier and the personal computer with a USB cable. Turn on the servo amplifier control circuit power supply.



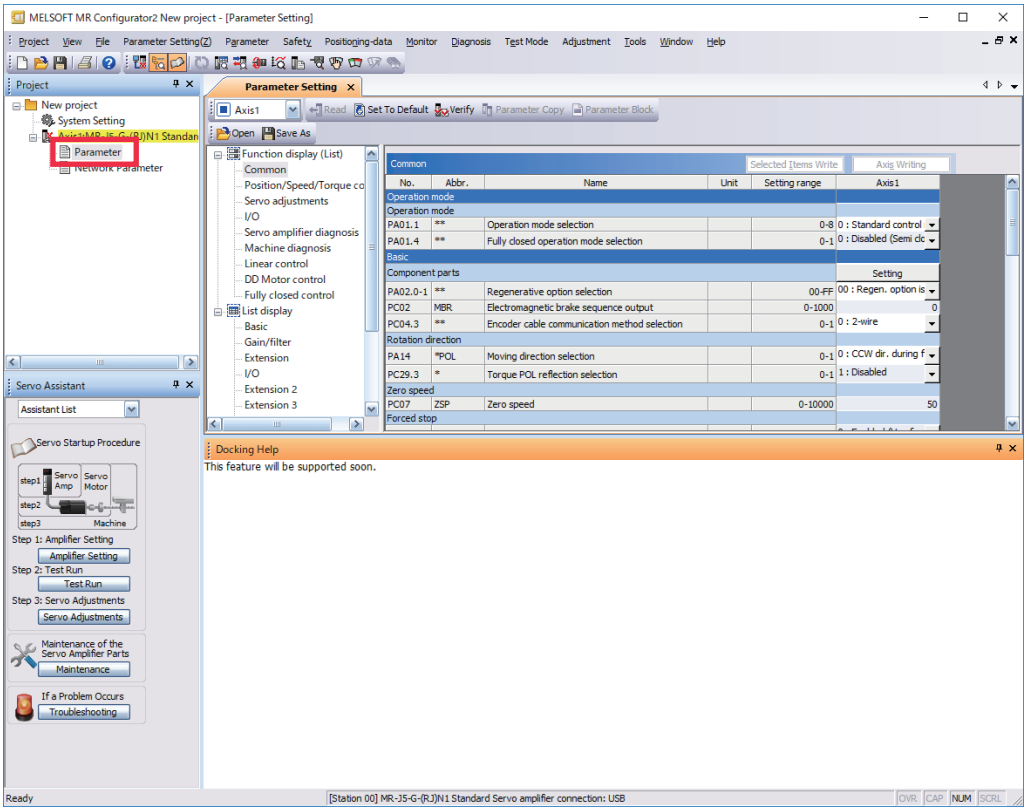
**2.** Start MR Configurator2 and create a new project. For the connection setting, select USB. Select the servo amplifier model.



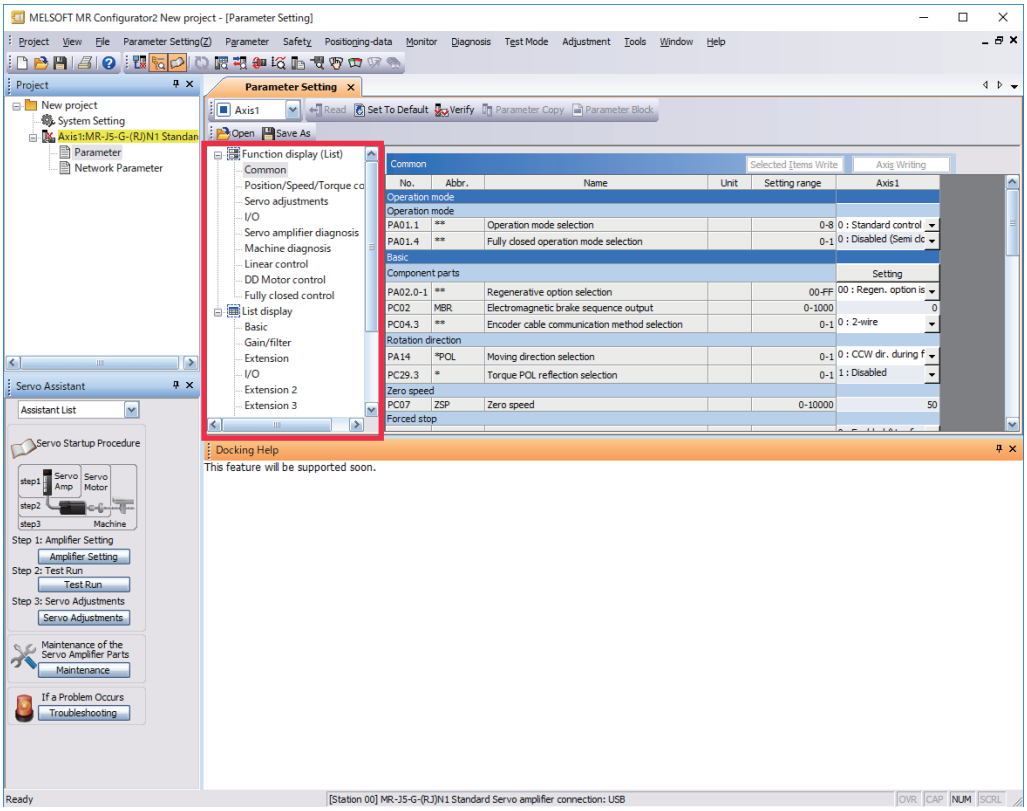

For a multi-axis servo amplifier, select an axis to be connected.



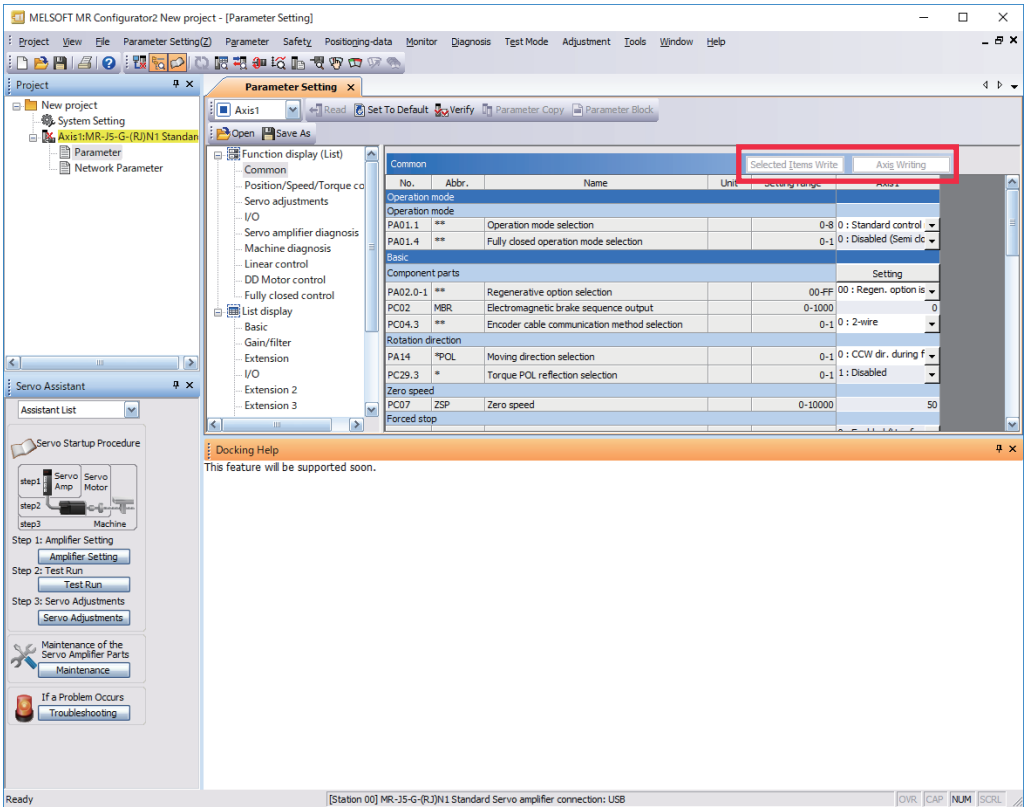
**3.** Selecting "Parameter" from the project tree opens the "Parameter Setting" screen.



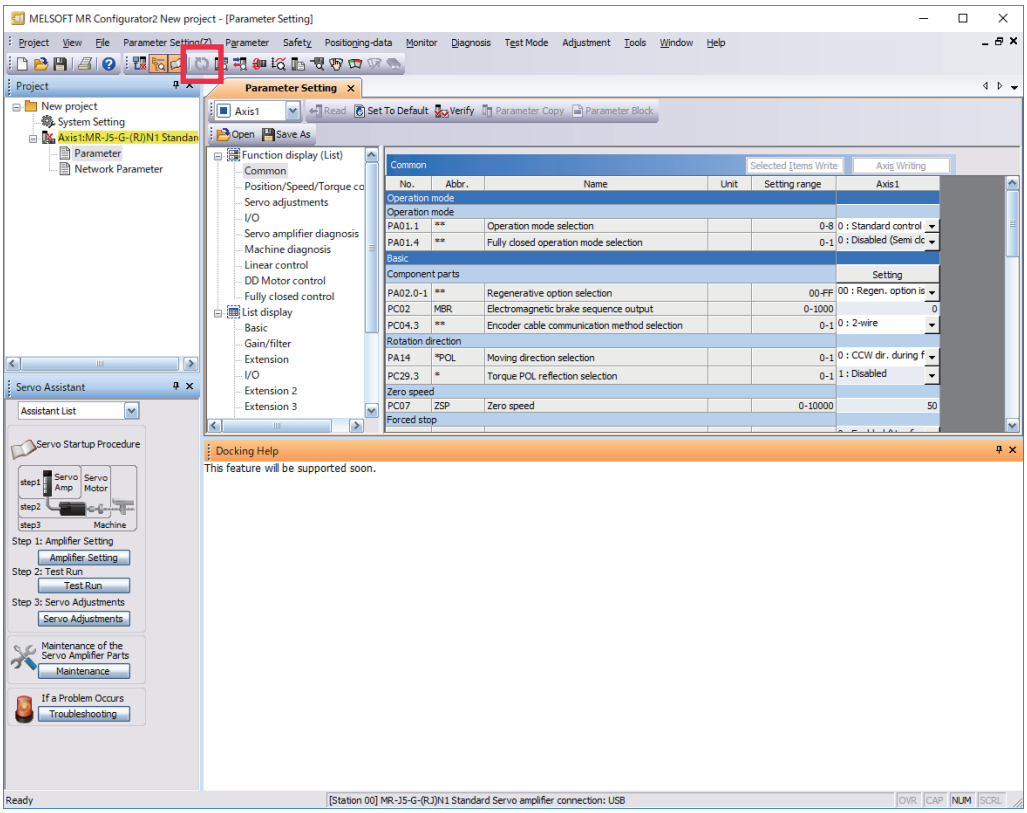

**4.** Select a group of servo parameters in the selection tree of the "Parameter Setting" window to display and configure the settings.



**5.** After changing the servo parameter, click "Selected Items Write" or "Axis Writing".



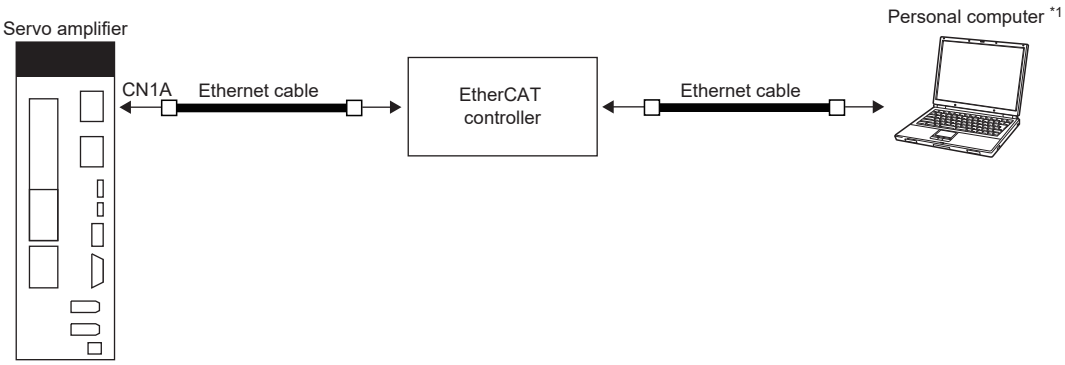

**6.** Abbreviated servo parameters prefixed with * and servo parameters marked with ** are enabled after the power is cycled or a software reset is performed. Click "Software Reset" in MR Configurator2 to perform the software reset.



## ■For EoE communication

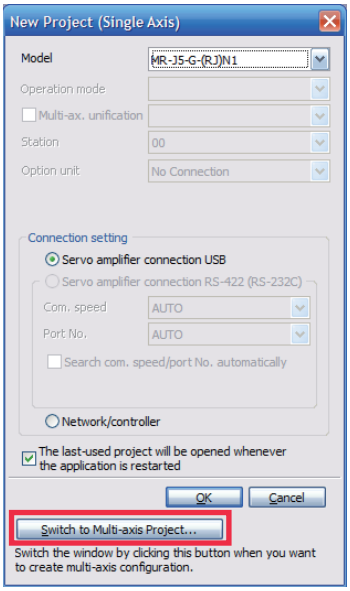
Connection via a controller is available on servo amplifiers with firmware version C4 or later being used with MR Configurator2 with software version 1.130L or later.

***1.*** Connect the servo amplifier with the EtherCAT controller and the EtherCAT controller with the personal computer using an Ethernet cable between each equipment. Turn on the servo amplifier control circuit power supply. Establish the EoE communication between the EtherCAT controller and servo amplifier according to the manual of the EtherCAT controller to be used.

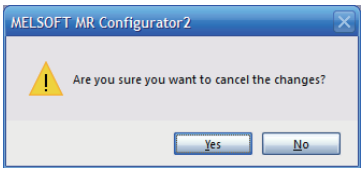



*1 When using a personal computer as the EtherCAT controller, connect the servo amplifier and the personal computer with an Ethernet cable.

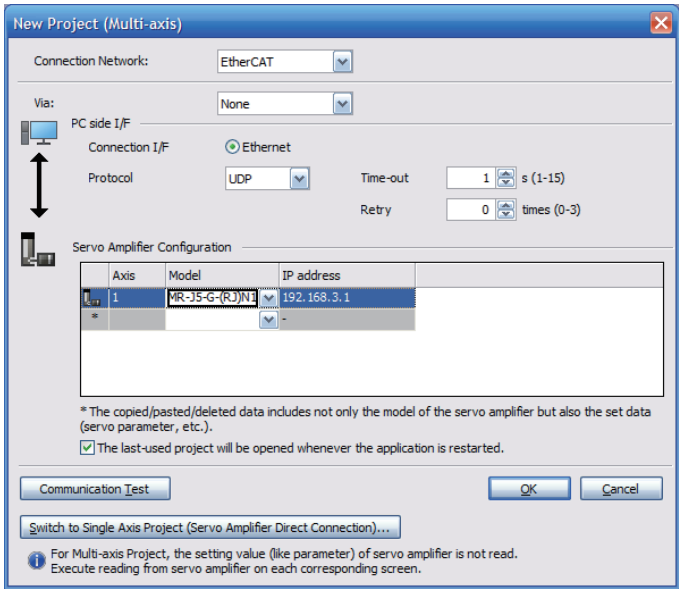
***2.*** Start MR Configurator2 and create a new project. Select the servo amplifier model. Click the "Switch to Multi-axis Project" button.



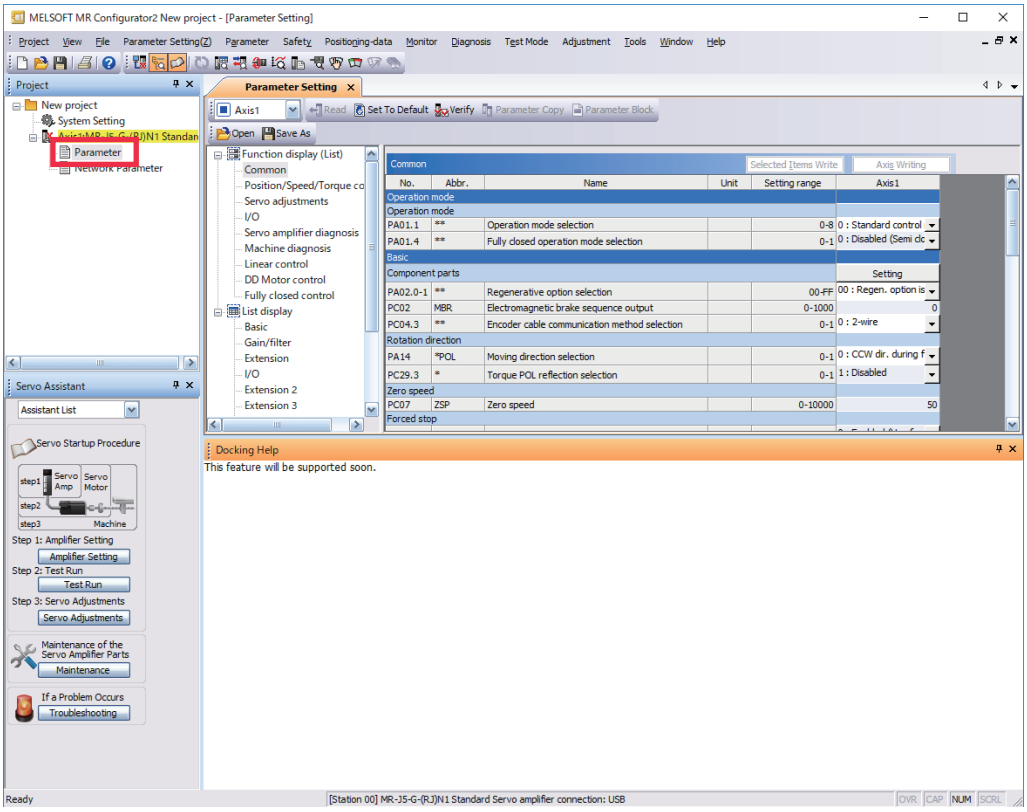

***3.*** When the message "Are you sure you want to cancel the changes?" appears, click the "Yes" button.



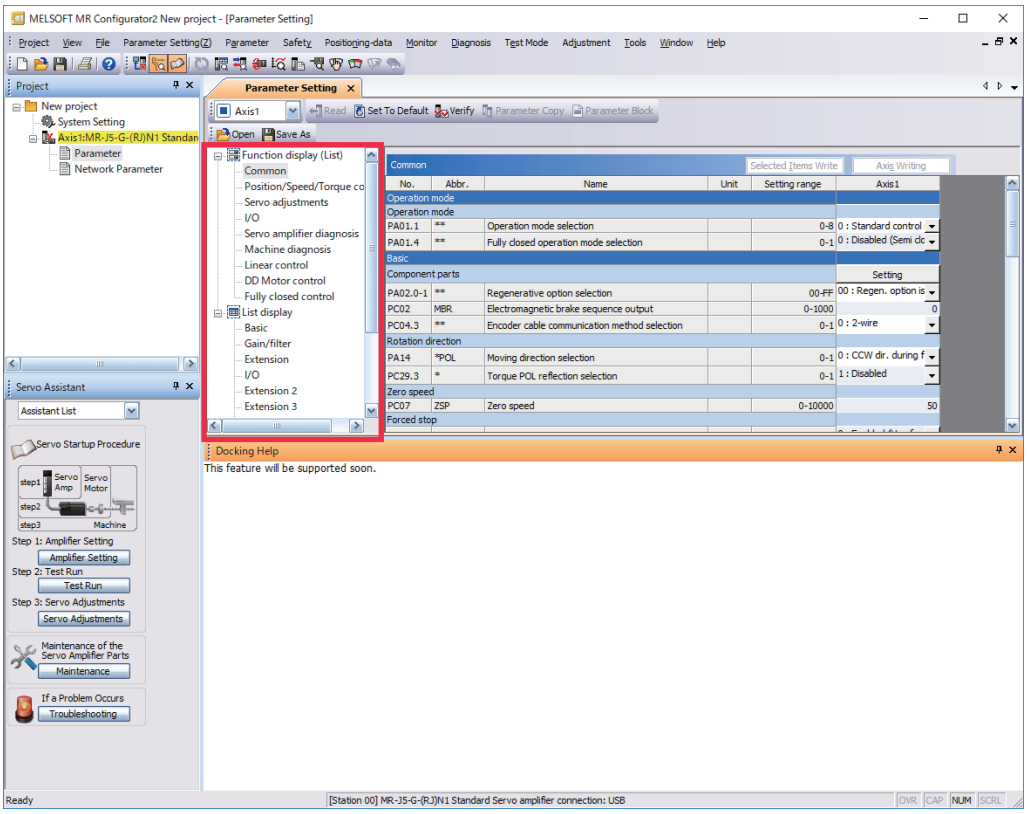
**4.** Select "EtherCAT" for the connection network. Only "UDP" can be selected for the protocol. Set the time-out and retry as required. Set the servo amplifier and its IP address for the servo amplifier configuration. The axis number can be set as desired.



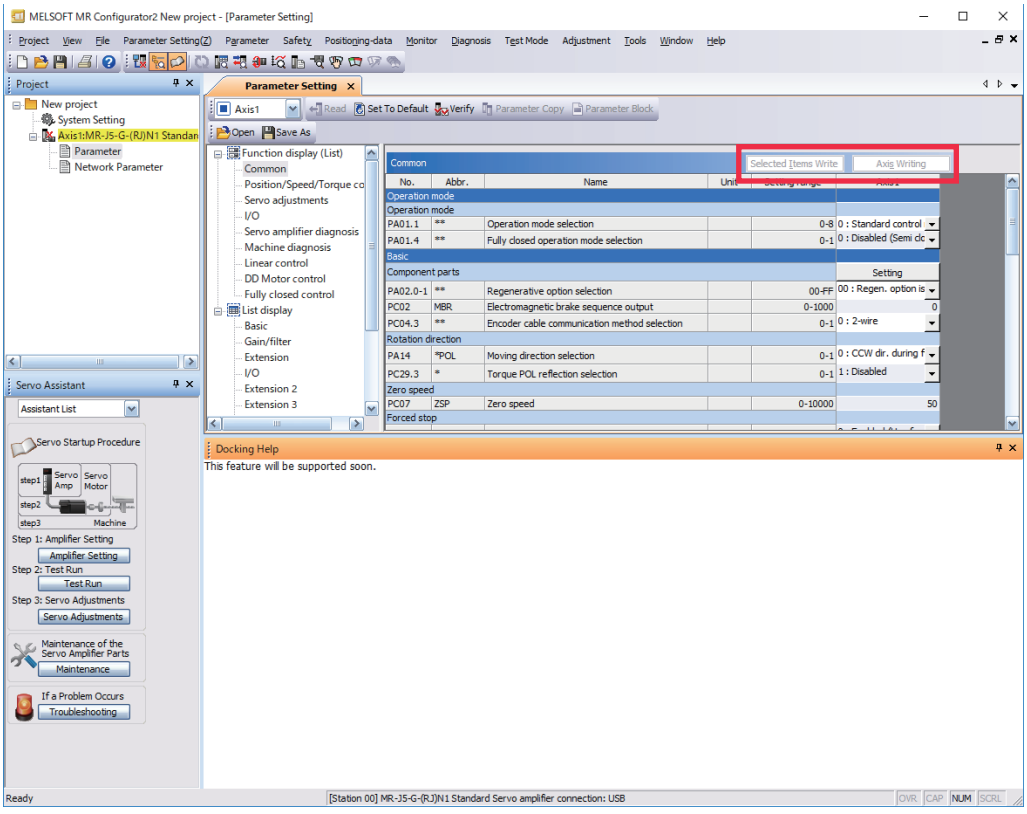

**5.** Selecting "Parameter" from the project tree opens the "Parameter Setting" screen.



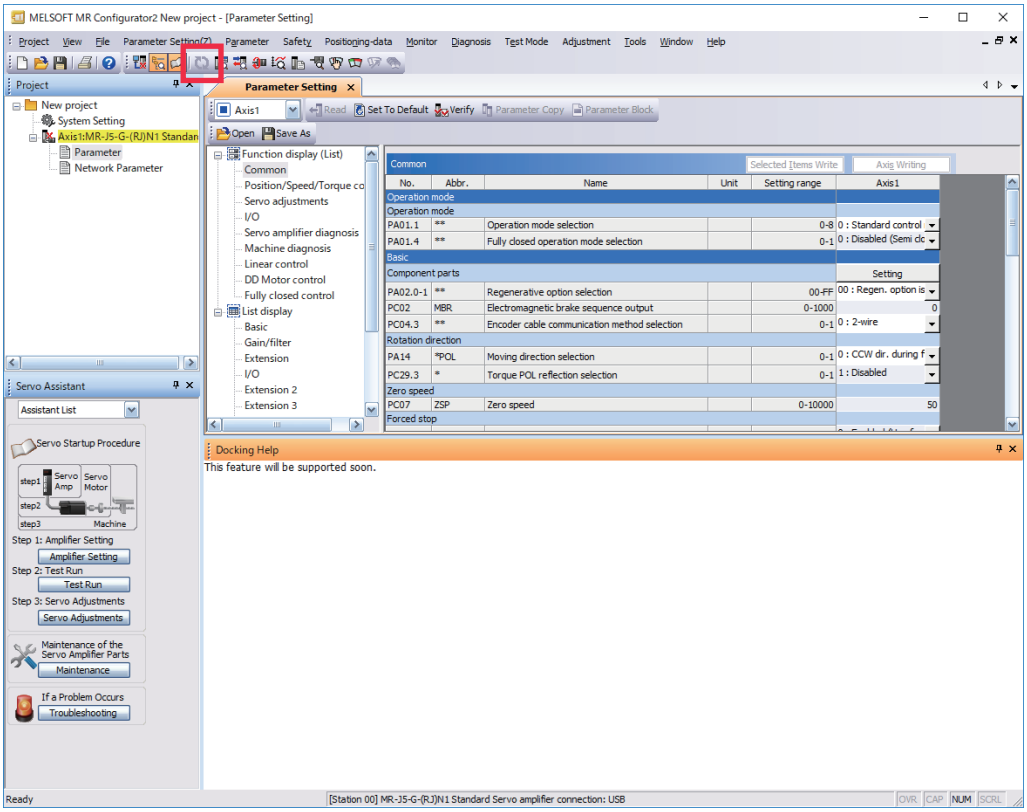
**6.** Select a group of servo parameters in the selection tree of the "Parameter Setting" window to display and configure the settings.




**7.** After changing the servo parameter, click "Selected Items Write" or "Axis Writing".



**8.** Abbreviated servo parameters prefixed with * and servo parameters marked with ** are enabled after the power is cycled or a software reset is performed. Click "Software Reset" in MR Configurator2 to perform the software reset.



# 4.1 Turning on servo amplifier for the first time

**Point**

- For the controller settings, refer to the relevant controller manual.
- For the gain adjustment, refer to the following manual.

MR-J5 User's Manual (Adjustment)

When turning on the servo amplifier for the first time, follow the steps below.

| Procedure | Description | Reference |
|---|---|---|
| **1.** Installation and wiring | Install and wire the servo amplifier and servo motor. | MR-J5 User's Manual (Hardware) |
| **2.** Network protocol setting | When using EtherNet/IP, switch the network protocol to EtherNet/IP. | Page 72 Network protocol switching methods |
| **3.** Test operation of the servo motor alone in test operation mode | With the servo motor disconnected from the machine, operate the servo motor at the lowest speed possible, and check whether the servo motor operates correctly. | Page 76 Test operation of the servo motor alone in test operation mode |
| **4.** Equipment configuration setting | Set each servo parameter according to the equipment configuration. | Page 77 Equipment configuration setting |
| **5.** Controller-related setting | Perform necessary settings according to commands from the controller. | Page 77 Controller-related setting |
| **6.** Operation by controller command | Operate the servo motor at the lowest speed possible by giving commands to the servo amplifier from the controller, and check whether the servo motor operates correctly. | Page 78 Operation by controller command |
| **7.** Actual operation | — | — |

# Network protocol switching methods

When switching the network protocol to be used, follow the procedures described in this section.

The network protocol to be used can be set in [Pr. PN13.0-3 Network protocol setting].

[Pr. PN13.0-3] is set to "0100h" (EtherCAT) at the factory setting. When using Ethernet/IP, change [Pr. PN13.0-3] to "0800h" (EtherNet/IP).

| Setting value of [Pr. PN13.0-3] | Setting details |
|---|---|
| 0100h | EtherCAT |
| 0800h | EtherNet/IP |

There are multiple setting methods. Select the optimum one for your usage.

For the connection of Ethernet cables, refer to "Connecting Ethernet cables" in the following manual.

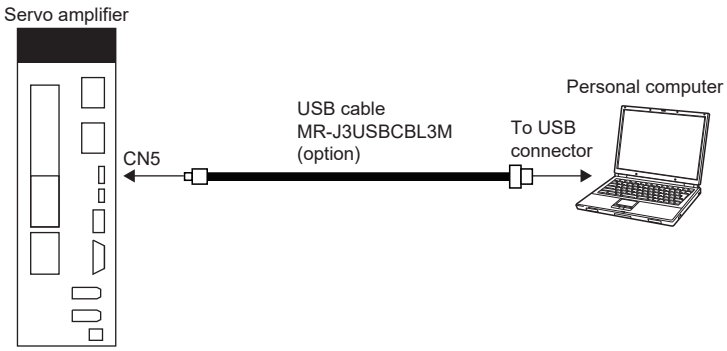
📖MR-J5-G-N1/MR-J5W-G-N1 User's Manual (Communication Function)

| Item | Description | Reference |
|---|---|---|
| Setting using MR Configurator2 via a USB connection | Manually set each axis using MR Configulator2. Use this method when switching the network protocol of each axis individually via a USB connection. | ☞ Page 73 Setting using MR Configurator2 via a USB connection |
| Setting using MR Configurator2 via a network | Manually set [Pr. PN13] of multiple axes in a batch using the multi-axis project in MR Configulator2. Use this method when connecting multiple axes by Ethernet and switching the network protocol for them in a batch. | ☞ Page 73 Setting using MR Configurator2 via a network |
| Automatic setting using a controller connection | Connect to a controller to automatically set [Pr. PN13] without MR Configurator2. Use this method when switching the network protocol of multiple axes in a batch without MR Configurator2. | ☞ Page 74 Automatic setting using a controller connection |
| Setting with a switch | Configure specific rotary switch setting to set [Pr. PN13] at startup of the servo amplifier. Use this method when switching the network protocol of each axis individually without MR Configurator2. | ☞ Page 74 Setting with a switch |

## Switching procedures

### ■Setting using MR Configurator2 via a USB connection

1. Start the servo amplifier and connect it to a personal computer using a USB cable.
2. Set [Pr. PN13].
3. Power off the servo amplifier. Communication will be available with the set network protocol at the next power-on.

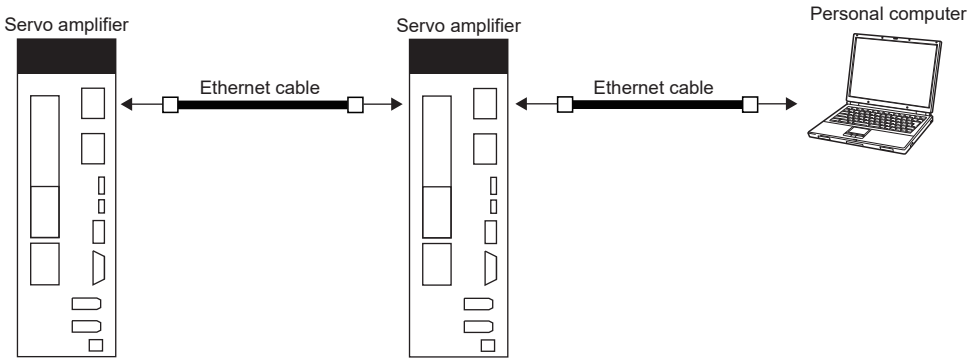



### ■Setting using MR Configurator2 via a network

1. Start the servo amplifier in the network setting mode.

☞ Page 75 Starting up the network setting mode

2. Connect the servo amplifier and personal computer using a Ethernet cable.
3. Start the multi-axis project in MR Configurator2 and set the IP address of the servo amplifier in the "Servo amplifier IP address change" window.
4. Set [Pr. PN13].
5. Power off the servo amplifier and set SW3-2 to SW3-4 to "OFF (down)". Communication will be available with the set network protocol at the next power-on.



## ■Automatic setting using a controller connection

**Point**

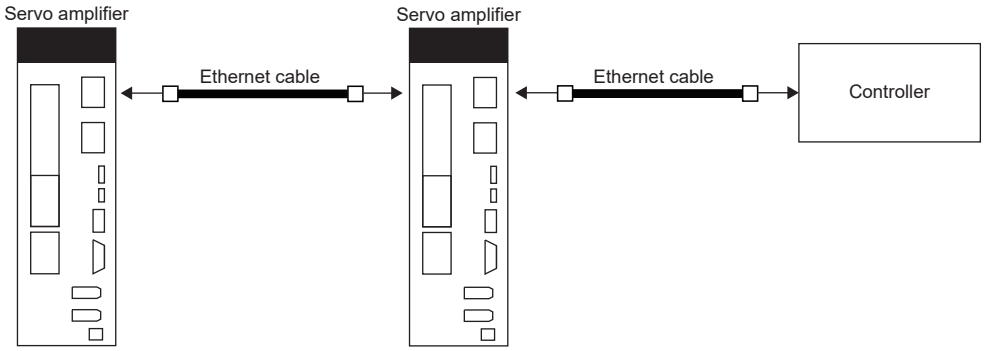
- Set the network protocol detected first after startup of the servo amplifier.
- The 7-segment LED display changes from on to blinking approximately one second after the completion of setting.
- Automatic setting using a controller connection is unavailable depending on the network configuration such as the termination axis. If the setting has failed, refer to the following and set it again.

☞ Page 74 Setting with a switch

1. Start the servo amplifier in the network setting mode.

☞ Page 75 Starting up the network setting mode

2. Connect the servo amplifier to a controller. When connection to an upper controller is detected, [Pr. PN13] is automatically set and the display blinks according to the network protocol being set.
3. Power off the servo amplifier and set SW3-2 to SW3-4 to "OFF (down)". Communication will be available with the set network protocol at the next power-on.




## ■Setting with a switch

1. Set the rotary switch according to the network protocol to be used.

| SW1 | SW2 | Network protocol |
|---|---|---|
| F | 0 to B | For manufacturer setting |
| F | C | For manufacturer setting |
| F | D | EtherNet/IP |
| F | E | EtherCAT |

2. Start the servo amplifier in the network setting mode.

☞ Page 75 Starting up the network setting mode

3. The display blinks according to the network protocol being set. At this time, [Pr. PN13] is not reset even though the connection with an upper controller is detected.
4. Power off the servo amplifier and set SW3-2 to SW3-4 to "OFF (down)". Communication will be available with the set network protocol at the next power-on.

## Starting up the network setting mode

The network setting mode can be set with the DIP switches. In the network setting mode, the connection to an upper controller can be detected and [Pr. PN13] can be automatically set.

**Point**

When the servo amplifier is not connected to an upper controller, MR Configurator2 can be used by Ethernet by setting the IP address of the servo amplifier from the multi-axis project in MR Configurator2. Some IP addresses including the broad cast address cannot be set. Check the available IP addresses for the network to be used.

### ■Startup method

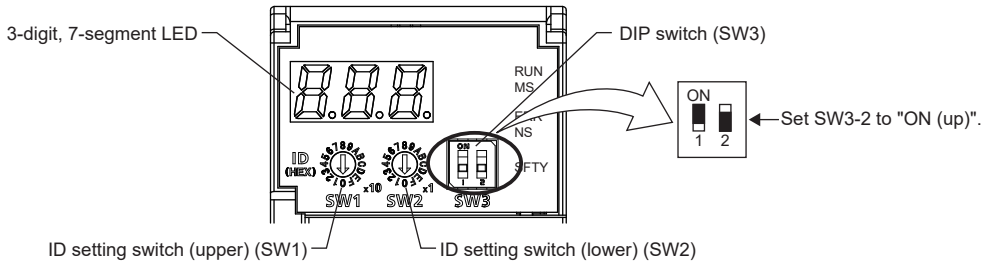
**1.** Power off the servo amplifier.

**2.** Set the network setting switch (SW3-2) or disabling control axis switches (SW3-2 to SW3-4) to "ON (up)". Set the test operation select switch (SW3-1) to "OFF (down)" at this time.

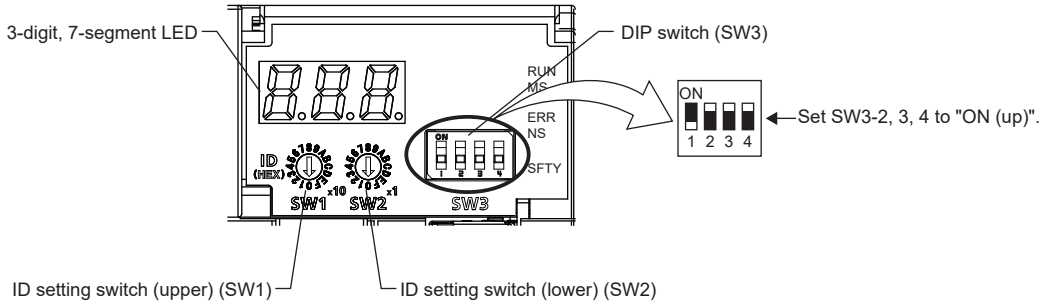
**Point**

- If all the DIP switches (SW3) are set to "ON (up)", the servo amplifier is switched to the operation mode for manufacturer setting and "off" will be displayed. The servo amplifier cannot be used in this mode. Thus, set the DIP switches (SW3) correctly according to this section.
- To apply the settings of all switches, cycle the control circuit power supply.

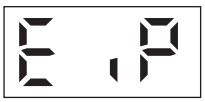
- For 1-axis servo amplifiers




- For 2-axis and 3-axis servo amplifiers




**3.** Power on the servo amplifier. The servo amplifier starts up in the network setting mode. When connection to an upper controller is detected, the display turns on as follows according to the network protocol in [Pr. PN13] for the next startup.

| Network protocol | Display |
|---|---|
| EtherCAT |  |
| EtherNet/IP |  |

**Point**

When the drive unit is started up in the network setting mode with the rotary switches (SW1/SW2) set to F0 to FE, [Pr. PN13] will be set according to the value set with the rotary switches at startup of the servo amplifier. Refer to the following for details.

☞ Page 74 Setting with a switch

# Test operation of the servo motor alone in test operation mode

**Point**

- If the servo motor operates in an unintended manner, stop the servo motor with EM2 (Forced stop 2).

Check that the servo amplifier and servo motor operate normally. With the servo motor disconnected from the machine, use the test operation mode and check whether the servo motor operates correctly. This section describes how to check the servo motor operation in the JOG operation. The test operation also includes the positioning operation and program operation.

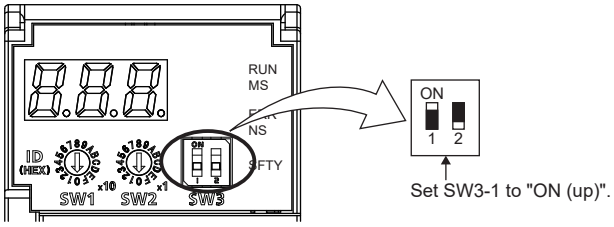
☞ Page 80 Test operation

In the linear servo motor control mode, the JOG operation cannot be performed. Check the linear servo motor operation status by using the positioning operation or by other means.

☞ Page 81 Motor driving by test operation

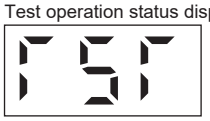
***1.*** Turn off the power.

***2.*** Turn "ON (up)" the test operation select switch (SW3-1).



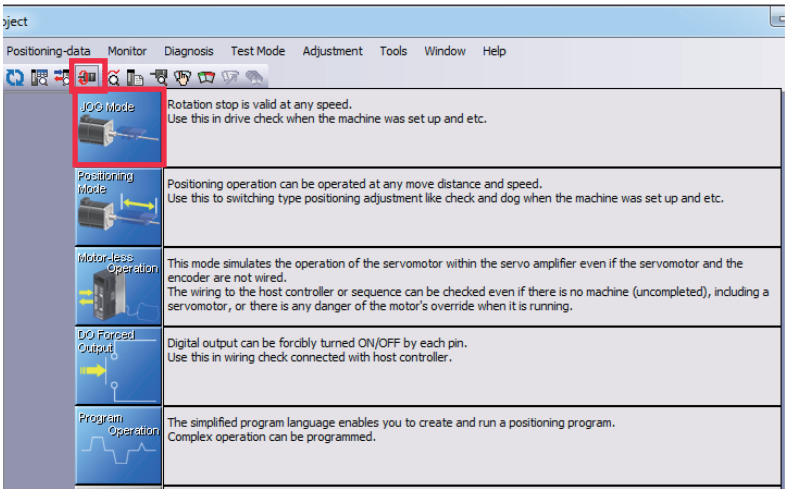

***3.*** Turn on the power supply of the servo amplifier. Once initialization is complete, the display will change as follows.

Test operation status display

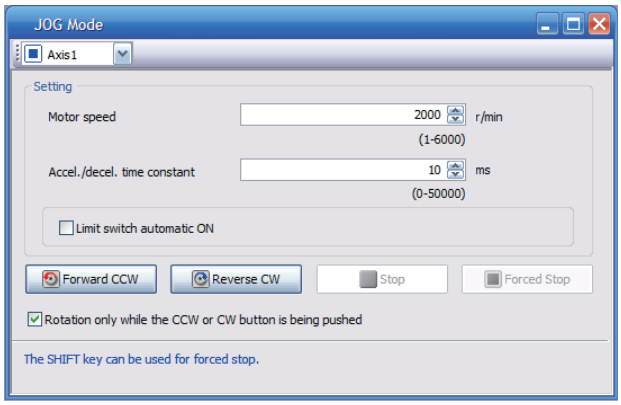


The display of a 1-axis servo amplifier is shown as an example.

***4.*** Open the "JOG Mode" screen of MR Configurator2.



**5.** To operate the servo motor, input the motor speed and acceleration/deceleration time constants, then click "Forward CCW" or "Reverse CW". The servo motor operates only while the button is being clicked. Give a low speed command at first and check the operation status.




**6.** After the test operation is complete, turn off the power and "OFF (down)" the test operation select switch (SW3-1).

# Equipment configuration setting

Set the servo parameters for each function according to the equipment configuration. For details, refer to the following manual.

MR-J5 User's Manual (Function)

| Item | Description |
|---|---|
| Rotation/travel direction selection | To change the rotation/travel direction (POL), change the servo parameter. |
| Stroke limit function | Limit switches can be used to limit travel intervals of the servo motor. Configure the settings according to the connection method of the limit switch. |
| In-position setting | Positioning completion status can be checked with in-position. Set this as necessary. |
| Forced stop deceleration function | Stops the servo motor at EM2 (Forced stop 2) off. Perform settings such as the deceleration time constant. |
| Vertical axis freefall prevention function | For vertical axes, this function pulls up the shaft slightly. When using a servo motor with an electromagnetic brake for a vertical axis, perform settings as required. |

# Controller-related setting

Refer to the applicable network instruction manual for the network connection setting.

| Network | Reference |
|---|---|
| EtherCAT | Refer to "Startup" in the following manual.<br>MR-J5-G-N1/MR-J5W-G-N1 User's Manual (Communication Function) |
| EtherNet/IP | |

Set the servo parameter using the controller according to the control mode to be used.

| Item | Description | Reference |
|---|---|---|
| Network standard mode | Operates in the modes such as csp/csv/cst specified in CiA 402. | Refer to "CONTROL MODE" in the following manual.<br>MR-J5 User's Manual (Function) |
| Positioning mode (point table method) | This function operates the servo motor according to the setting values by selecting the point table with preset 255 points. | Refer to "POSITIONING MODE (POINT TABLE METHOD) (CP)" in the following manual.<br>MR-J5 User's Manual (Function) |

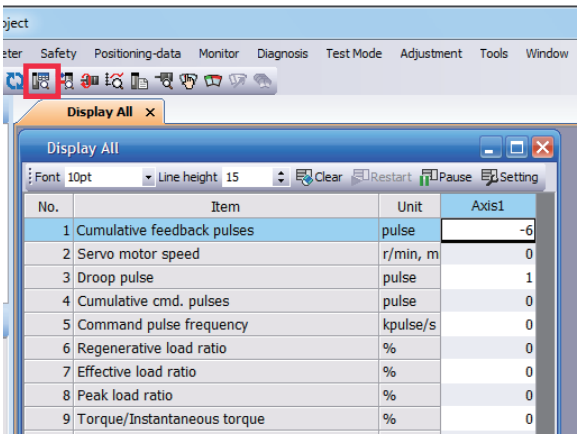
Set each servo parameter that is necessary for the operation using controller commands.

| Item | Description | Reference |
|---|---|---|
| Command unit selection function | This function enables the unit of speed command to be selected.<br>The initial setting for the unit of speed command is pulses/s. | Refer to "Command unit selection function" in the following manual.<br>MR-J5 User's Manual (Function) |
| Electronic gear setting | Perform the settings related to the controller command unit and amplifier command unit. | Refer to "Electronic gear function" in the following manual.<br>MR-J5 User's Manual (Function) |
| Homing | To perform homing with the function of the amplifier without using the homing function of the controller, perform the necessary settings. | Refer to "CONTROL MODE" in the following manual.<br>MR-J5 User's Manual (Function) |

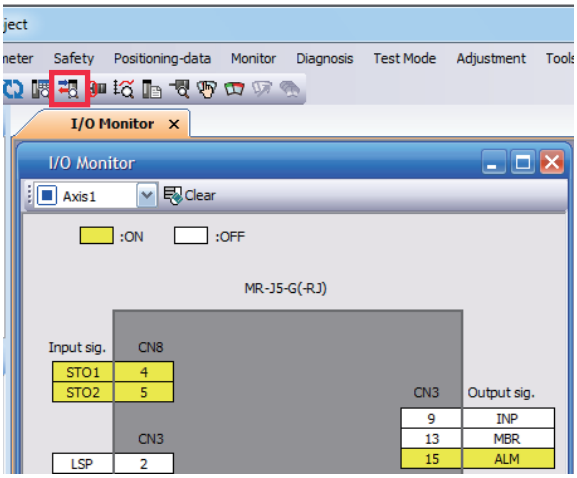
# Operation by controller command

Confirm that the servo motor operates correctly under the commands from the controller. Give a low speed command at first to check the servo motor operations such as the rotation direction. If the servo motor does not operate in the intended direction, check the input signal.

***1.*** Display the Display All window in MR Configurator2. Confirm that there is no error in the items such as servo motor speed and load ratio.




***2.*** Display the I/O Monitor window. Confirm that there is no error in the I/O signal.



# 4.2 Instructions on startup

## Instructions for power-on

- When the absolute position detection system is used in a rotary servo motor, [AL. 025 Absolute position erased] occurs the first time that the power is turned on and the servo motor cannot be changed to servo-on status. Shut off the power once, then cycle the power to deactivate the alarm.
- If the power is turned on while the servo motor is being rotated by an external force, an alarm may occur. Make sure that the servo motor is not operating before turning on the power. In addition, refer to the manual for the servo motor or encoder being used.



## Stop

If any of the following situations occur, the servo amplifier suspends and stops the operation of the servo motor. If the servo motor is operated by the network command, the servo motor may be stopped by the controller command.

| Operation/command | Stopping condition |
|---|---|
| Alarm occurrence | The servo motor decelerates to a stop. There are also alarms that activate and stop the dynamic brake. For details of alarms, refer to the following manual.<br>📖MR-J5 User's Manual (Troubleshooting) |
| EM2 (Forced stop 2) off | The servo motor decelerates to a stop. [AL. 0E6 Servo forced stop warning] occurs. In the torque mode, EM2 functions the same as EM1. |
| STO (STO1 and STO2) off | The base circuit is shut off and the dynamic brake operates to stop the servo motor. |
| Limit switch off | If LSP (Forward rotation stroke end), LSN (Reverse rotation stroke end), FLS (Upper stroke limit), or RLS (Lower stroke limit) is turned off, the servo motor will stop slowly and become in the servo-lock state. Operation in the opposite direction is possible. |

## Instructions for network disconnection

To turn off the system power and disconnect the servo amplifier from the network, specific procedures may be required. For details, refer to "Disconnecting the communication" in the following manual.

📖MR-J5-G-N1/MR-J5W-G-N1 User's Manual (Communication Function)

# 4.3 Troubleshooting at startup

## Investigation by using MR Configurator2.

The reason that the servo motor does not rotate can be investigated via MR Configurator2.

The cause that the servo motor fails to rotate is acquired from the servo amplifier of the target axis, and displayed on "No Motor Rotation". The window will remain blank when no cause exists. "- - - -" is displayed when off-line or the cause cannot be acquired.

# 4.4 Duplicate setting

Servo amplifier parameters for which setting has been completed can be copied to another servo amplifier. Use this function when replacing the servo amplifier of equipment with another servo amplifier during operation, and when starting up multiple devices with the same configuration.

### Restrictions

**■The following data is not duplicated. Set them as required after the duplication.**

| Item | Description |
|---|---|
| Homing | The information of the home position is not duplicated. Execute homing again. |
| Machine service life diagnosis | Machine service life diagnosis information may not be duplicated. Refer to "Machine diagnosis" in the following manual, and perform required settings.<br>📖MR-J5 User's Manual (Function) |

**■The following data is not duplicated.**

- Alarm history data
- Drive recorder data

## Duplication using MR Configurator2

1. The data set in MR Configurator2 can be saved as a project.
2. To copy the project to a different servo amplifier, open the project and then connect the servo amplifier and a personal computer via a USB cable. Turn on the servo amplifier control circuit power supply.
3. Write the required data in MR Configurator2. After the writing is completed, cycle the power or reset the software as necessary.

# 4.5 Test operation

Using the test operation function enables the machine operation to be checked before the actual operation. With a personal computer and MR Configurator2, operations such as the JOG operation, positioning operation, output signal forced output, and program operation can be performed.

### Precautions

- The test operation mode is designed for checking servo operation. This mode is not for checking machine operation. Do not use this mode with the machine. Use this mode only with the servo motor.

## Execution method

Test operation mode is enabled by MR Configurator2. To set to the normal operation mode again after executing the test operation mode, cycle the power or reset the software.

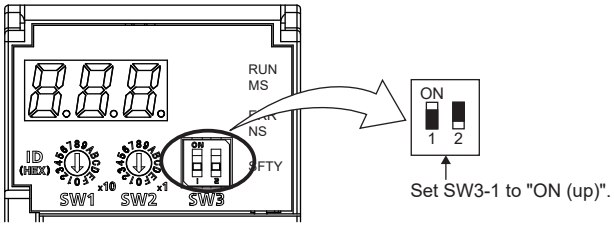
- Perform the test operation after the forced stop has been released. For details of the forced stop, refer to "Forced stop deceleration function" in the following manual.

📖MR-J5 User's Manual (Function)

# Test operation mode

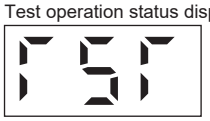
Setting the servo amplifier to the test operation mode enables the test operation while the personal computer and servo amplifier are connected via a USB cable.

1. Turn off the power.
2. Turn "ON (up)" the test operation select switch (SW3-1).




3. Turn on the power supply of the servo amplifier. Once initialization is complete, the display will change as follows.

Test operation status display



4. Use MR Configurator2 to perform the test operation.

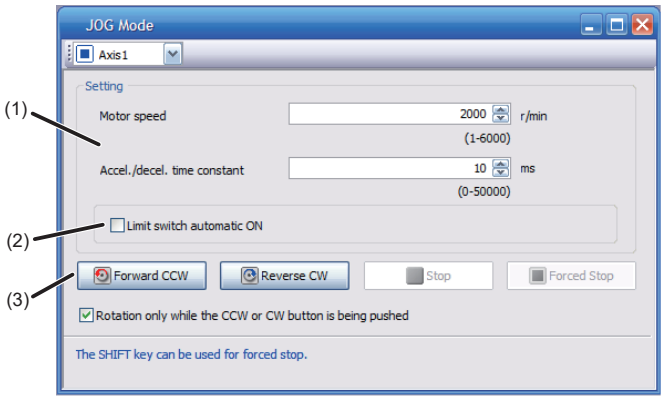
☞ Page 81 Motor driving by test operation

5. After the test operation is complete, turn off the power and "OFF (down)" the test operation select switch (SW3-1).

# Motor driving by test operation

## JOG operation

The JOG operation can be performed when there is no command from the controller. The motor can be operated at the specified speed. Operate the motor using the JOG Mode screen of MR Configurator2.




### ■Motor operation setting (1)

Set the motor speed and acceleration/deceleration time constants for JOG operation. When changing the speed to the permissible speed, set the speed in [Pr. PA28.4 Speed range limit selection].

### ■Limit switch automatic ON (2)

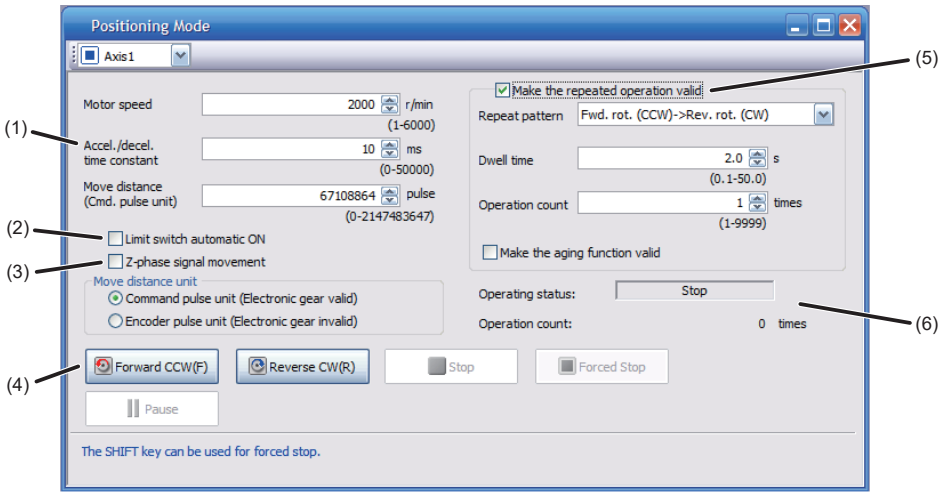
JOG operation can be performed when the limit switch is not connected. Be sure to avoid causing a collision while performing the operation.

### ■Operation (3)

The servo motor can be started (CCW/CW), paused, stopped, or forcibly stopped. Clicking "Start" starts the operation. When "Rotation only while the CCW or CW button is being pushed" is selected, clicking "Forward CCW" or "Reverse CW" will perform operation until "Stop" or "Forced Stop" is clicked.

## Positioning operation

Positioning operation can be performed without the controller. Operate the motor using the Positioning Mode screen of MR Configurator2.




### ■Motor operation setting (1)

Set the motor speed, acceleration/deceleration time constants, and travel distance in the positioning operation mode. When changing the speed to the permissible speed, set the speed in [Pr. PA28.4 Speed range limit selection].

### ■Limit switch (2)

Select "Limit switch automatic ON" to perform the positioning operation when the limit switch is not connected. Be sure to avoid causing a collision while performing the operation.

### ■Move until Z-phase signal (3)

When "Z-phase signal movement" is selected, the servo motor moves until the first Z-phase signal after positioning operation.

### ■Operation (4)

The servo motor can be started (CCW/CW), paused, stopped, or forcibly stopped. Clicking "Operation Start" starts the operation in the specified operation condition.

### ■Repeat operation (5)

Selecting "Make the repeated operation valid" enables the repeat operation. Selecting "Make the aging function valid" enables the continuous operation until clicking "Stop" or "Forced Stop". Set the repeat pattern, the dwell time, and the number of operations.

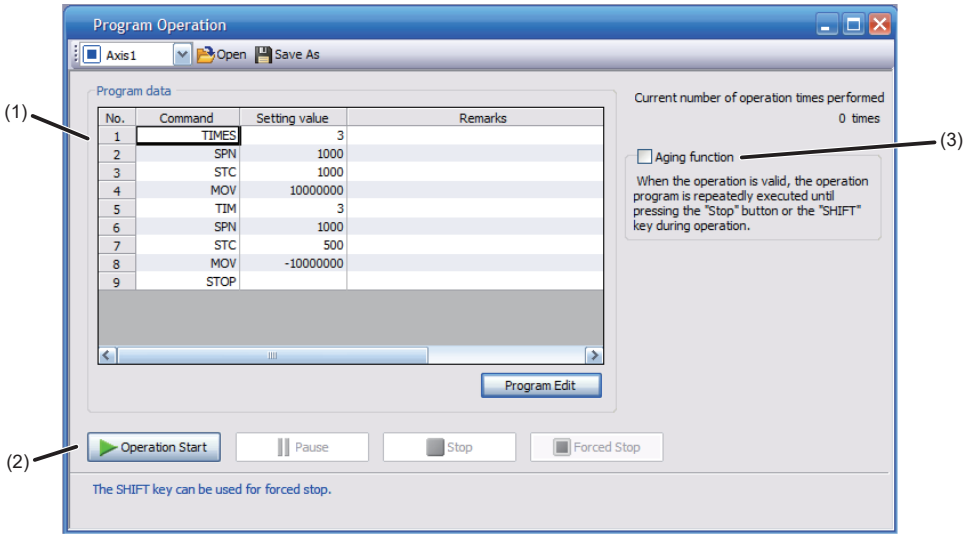
### ■Operation status (6)

The operation status during the repeat operation and the number of operations are displayed.

## Program operation

Positioning operation using multiple operation patterns can be performed without a controller. Operate the motor using the Program Operation screen of MR Configurator2. For details, refer to Help of MR Configurator2.

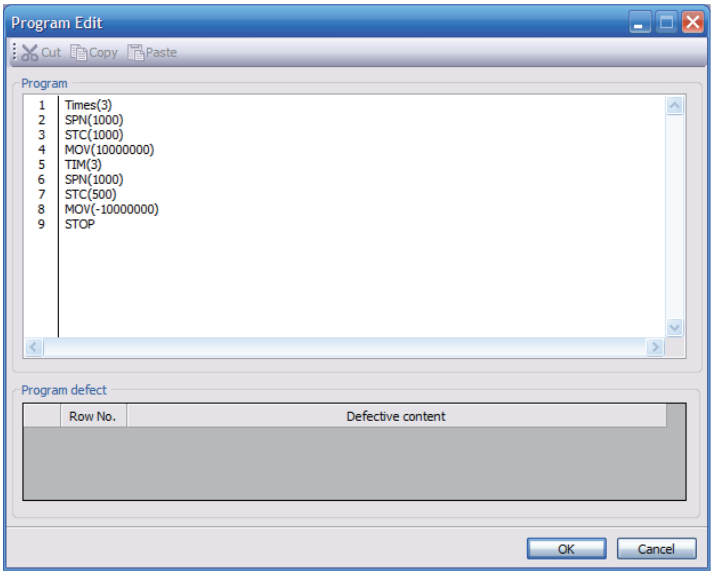
***1.*** Open the Program Operation screen of MR Configurator2.




| No. | Item | Screen operation |
|---|---|---|
| (1) | Program display | Displays the program. To edit the display item, click "Program Edit". |
| (2) | Operation | The servo motor can be started (CCW/CW), paused, stopped, or forcibly stopped. Clicking "Operation Start" starts the operation. |
| (3) | Repeat execution | Displays the number of execution times. Selecting "Aging function" enables the repeated operation of the operation program. |

***2.*** Clicking "Program Edit" in the program operation screen opens the Program Edit screen.

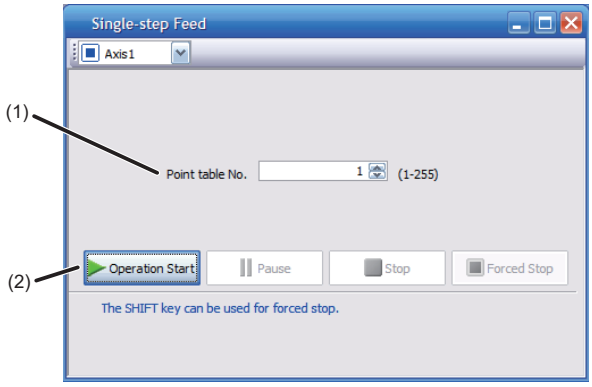
Input the program and click "OK". For program commands, refer to Help of MR Configurator2.



## Single-step Feed

This function enables test operation in accordance with the point table. Configure the settings of the point table operation in advance. For the point table operation, refer to "POSITIONING MODE (POINT TABLE METHOD) (CP)" in the following manual.

MR-J5 User's Manual (Function)




| No. | Item | Screen operation |
|---|---|---|
| (1) | Point table No. | Specify the point table number to be operated. |
| (2) | Operation | The servo motor can be started (CCW/CW), paused, stopped, or forcibly stopped. Clicking "Operation Start" starts the operation in accordance with the point table. |

# Motor-less operation

**Point**

- The motor-less operation cannot be used in the fully closed loop control mode, linear servo motor control mode or direct drive motor control mode.

Without connecting a servo motor to the servo amplifier, output signals or status displays can be provided in response to the controller commands as if the servo motor is actually running. This operation can be used to check the sequence of a controller. Use this operation after the forced stop has been released. Use this operation with the servo amplifier connected to the controller.

To perform the motor-less operation, set [Pr. PC05.0 Motor-less operation selection] to "1" (enabled). To terminate the motor-less operation, set [Pr. PC05.0] to "0" (disabled).

To apply the motor-less operation settings, cycle the power or reset the software.



## Load conditions

The operation is performed in the following conditions. Note that the conditions may differ from those of actual machines.

| Load item | Condition |
|---|---|
| Load torque | 0 |
| Load to motor inertia ratio | [Pr. PB06 Load to motor inertia ratio/load to motor mass ratio] |

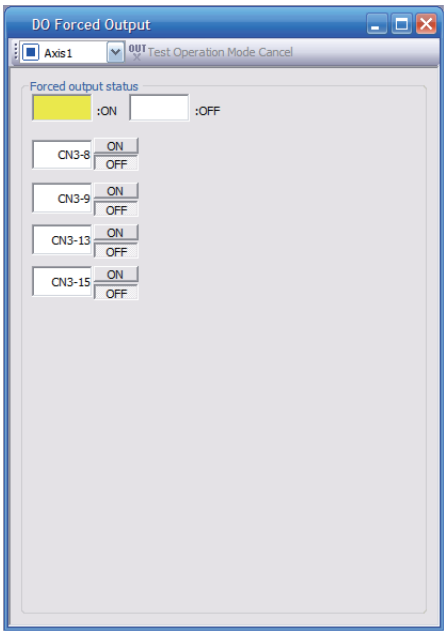
## Alarm

In the motor-less operation, some alarms and warnings are not generated. The following are examples of alarms which do not occur.

- [AL. 016 Encoder initial communication error 1]
- [AL. 01E Encoder initial communication error 2]
- [AL. 01F Encoder initial communication error 3]
- [AL. 020 Encoder normal communication error 1]
- [AL. 021 Encoder normal communication error 2]
- [AL. 025 Absolute position erased]
- [AL. 092 Battery cable disconnection warning]
- [AL. 09F Battery warning]

# Output signal (DO) forced output

This function forcibly switches the output signals on and off regardless of the servo status. Use this function for purposes such as checking output signal wiring. Operate this function on the DO Forced Output screen of MR Configurator2.




Each output signal can be turned on/off by clicking the ON/OFF button next to its name. After checking, click "Test Operation Mode Cancel" and terminate the output signal (DO) forced output.

# 4.6 Servo amplifier setting initialization

Servo amplifier settings can be initialized by using the engineering software (MR Mode Change packed with MR Configurator2).
However, information related to the servo amplifier, including power-on cumulative time and the number of relays on/off, is not initialized.

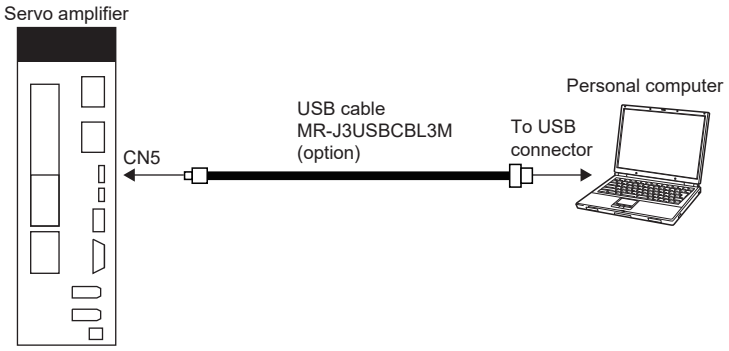
**Point**

- The storage area of the servo amplifier has a limit for the number of writings. Do not use this function frequently.
- Execute the initialization with the servo amplifier disconnected from the network and directly connected to MR Mode Change via a USB cable.

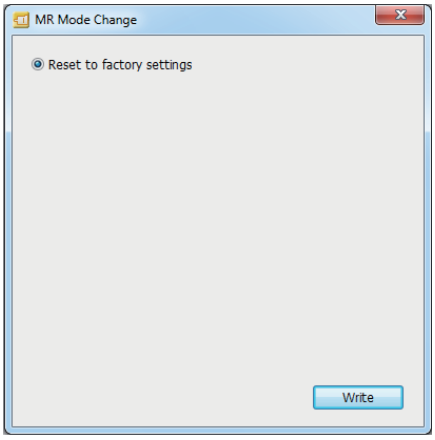


## Initialization procedure by MR Mode Change

Open MR Mode Change and use a USB cable to connect the servo amplifier that will be initialized with a personal computer.
Turn on the servo amplifier control circuit power supply.




Confirm that "Reset to factory settings" is selected, then click "Write". After the writing is completed, cycle the power or reset the software.




Cycling the power or resetting the software initializes the setting of the servo amplifier at startup. Confirm that the initialization has completed by reading the settings from the servo amplifier.

# 5 MAINTENANCE, INSPECTION AND PARTS REPLACEMENT

## 5.1 Inspection items

### Precautions

- Do not disassemble, repair, or modify the product.
- For repair and parts replacement, contact your local sales office.
- To prevent a malfunction, do not perform an insulation resistance test (megger test) on the servo amplifier.

### Periodic inspection

Perform the following inspections.

- Check for loose terminal block screws. Retighten any loose screws.
- Check the cables and the like for scratches or cracks. Inspect them periodically according to operating conditions especially when the servo motor is movable.
- Check that the connector is securely connected to the servo amplifier.
- Check that the wires are not coming out from the connector.
- Check for dust accumulation on the servo amplifier.
- Check for unusual noise generated from the servo amplifier.
- Make sure that the emergency stop circuit operates properly such that an operation can be stopped immediately and a power is shut off by the emergency stop switch.

## 5.2 Parts with a service life

This section describes the service life of parts. The service life varies depending on the operating methods and environment. If any fault is found in a part, it is necessary to replace it immediately regardless of its service life. For parts replacement, please contact your local sales office. Customers can replace the cooling fan by purchasing a fan unit.
For details, refer to "Fan unit replacement procedure" in the following manual.
MR-J5 User's Manual (Hardware)

| Part name | Recommended service life |
|---|---|
| Smoothing capacitor | 10 years |
| Relay | Total number of power-on, operation of dynamic brake, and forced stops: 100,000 times |
| Cooling fan | 50,000 hours to 70,000 hours (7 to 8 years) |
| Absolute position battery | Refer to "ABSOLUTE POSITION DETECTION SYSTEM" in the following manual.<br>MR-J5 User's Manual (Hardware) |

#### Smoothing capacitor

The service life of the capacitor is 10 years (with a three-phase power supply input) under continuous operation in air-conditioned environments (ambient temperatures of 40 °C or less at altitudes of up to 1000 m and 30 °C or less at altitudes of over 1000 m and up to 2000 m). Ripple currents or other factors will deteriorate the characteristic of the smoothing capacitor. The service life of the capacitor greatly varies depending on ambient temperature and operating conditions.

## Relays

A relay will reach the end of its service life if the following actions are performed a total of 100,000 times: powering on the servo amplifier, inputting the dynamic brake operation, and inputting the forced stop. In addition, the service life of a relay may vary depending on the power supply capacity.

For the approximate number of times a dynamic brake can be used, refer to "Dynamic brake characteristics" in the following manual.

MR-J5 User's Manual (Hardware)

## Servo amplifier cooling fan

The cooling fan bearings will reach the end of their service life in 50,000 hours to 70,000 hours. Therefore, the cooling fan must be replaced after seven to eight years of continuous operation as a guideline. If unusual noise or vibration is found during inspection, the cooling fan must also be replaced. The service life has been calculated in an environment which contains no corrosive gas, flammable gas, oil mist, or dust. The average annual ambient temperature was 40 ˚C.

# 6 COMPLIANCE WITH GLOBAL LAWS AND REGULATIONS

This chapter provides information common among AC servo amplifiers. Information that is not applicable to MR-J5 servo amplifier/other equipment combinations is also included.

## 6.1 Compliance with global standards

For compliance with the standards of Europe/UK, United States/Canada, and South Korea, refer to the following manual.
Safety Instructions and Precautions for MR-J5 AC Servos (IB(NA)-0300391)

## 6.2 Handling of AC servo amplifier batteries for the United Nations Recommendations on the Transport of Dangerous Goods

The transportation of lithium metal batteries is regulated under the Technical Instruction (ICAO-TI) by the International Civil Aviation Organization (ICAO) and the International Maritime Dangerous Goods Code (IMDG Code) by the International Maritime Organization (IMO), which are based on the United Nations Recommendations on the Transport of Dangerous Goods (hereinafter Recommendations of the United Nations).
This section describes the handling of lithium metal batteries in air transportation that has been changed in response to the IATA (International Air Transport Association) Dangerous Goods Regulations 63rd Edition issued on January 1, 2022, and the handling of lithium metal batteries in maritime transportation that has also been changed.

### Target model

#### Battery (cell)

| Model | Option model | Type | Lithium content | Mass of battery | Remark |
|---|---|---|---|---|---|
| ER6 | MR-J3BAT | Cell | 0.65 g | 16 g | Each battery (cell) contains more than 0.3 grams of lithium content and must be handled as dangerous goods (Class 9) for certain packaging requirements. |
| | MR-J3W03BATSET | Cell | 0.65 g | 16 g | |
| ER17330 | MR-BAT | Cell | 0.48 g | 13 g | |
| | A6BAT | Cell | 0.48 g | 13 g | |

#### Battery unit (assembled)

| Model | Option model | Type | Lithium content | Mass of battery | Remark |
|---|---|---|---|---|---|
| ER6 | MR-J2M-BT_ | Assembled battery (Seven cells) | 4.55 g | 112 g | The assembled battery contains more than two grams of lithium content and must be handled as dangerous goods (Class 9) regardless of packaging requirements. |
| CR17335A | MR-BAT6V1 | Assembled battery (Two cells) | 1.20 g | 34 g | Each battery (cell) contains more than 0.3 grams of lithium content and must be handled as dangerous goods (Class 9) for certain packaging requirements. |
| | MR-BAT6V1SET_ | Assembled battery (Two cells) | 1.20 g | 34 g | |
| | MR-BAT6V1BJ | Assembled battery (Two cells) | 1.20 g | 34 g | |

# Purpose

To enable safer transportation of lithium metal batteries.

# Handling during transportation

This section describes how to handle lithium metal batteries in transportation. The batteries alone transported by air are classified as UN3090, and the batteries packed with or contained in equipment transported by air are classified as UN3091. Lithium metal batteries are classified as SP188 when transported by sea as non-dangerous goods.

## Air transportation of lithium metal batteries alone

| Packaging requirements | Classification | Main requirements |
|---|---|---|
| Lithium content per cell ≤ 1 g<br>Lithium content per battery ≤ 2 g | UN3090 PI968 Section IB | The total battery weight per package must be 10 kg or less. The package must pass a 1.2 m drop test, and a lithium battery mark (size: 100 × 100 mm) must be attached on the package. The batteries must be handled conforming to Class 9 Dangerous Goods Regulations (e.g.: displaying the lithium battery hazard label). |
| Lithium content per cell > 1 g<br>Lithium content per battery > 2 g | UN3090 PI968 Section IA | The total battery weight per package must be 35 kg or less. The package must comply with UN specification packing requirements and be handled complying with Class 9 Dangerous Goods Regulations (e.g.: displaying the lithium battery hazard label). |

Transportation of lithium metal batteries alone as cargo on passenger aircraft has been prohibited since January 1, 2015. Lithium metal batteries can be transported by sea or cargo aircraft.

## Air transportation of lithium metal batteries packed with or contained in equipment

Lithium metal batteries packed with or contained in equipment can be transported as cargo on passenger aircraft.

### ■For batteries packed with equipment, follow the requirements of UN3091 PI969.

Batteries are classified into either Section II or Section I depending on the lithium content/packaging requirements.

### ■For batteries contained in equipment, follow the requirements of UN3091 PI970.

Batteries are classified into either Section II or Section I depending on the lithium content/packaging requirements. The special handling may be unnecessary depending on the number of batteries and gross mass per package.

## Maritime transportation of lithium metal batteries

| Packaging requirements | Classification | Main requirements |
|---|---|---|
| Lithium content per cell ≤ 1 g<br>Lithium content per battery ≤ 2 g | SP188 | For transportation of batteries alone, the total weight of the package must be 30 kg or less. The package must pass a 1.2 m drop test, and the lithium battery mark (size: 100 × 100 mm) must be attached on the package. For transportation of batteries packed with or contained in equipment, the special handling may be unnecessary depending on the number of batteries per package. |
| Lithium content per cell > 1 g<br>Lithium content per battery > 2 g | — | The package must comply with UN specification packaging requirements and be handled complying with Class 9 Dangerous Goods Regulations (e.g.: displaying the lithium battery hazard label). |

# Package at our shipment

When the packages containing the target batteries are shipped overseas directly from us, the lithium battery mark (Figure 1) is displayed on the packages.
If the packages are shipped domestically, the mark (Figure 1) is not displayed.
Thus, when customers transport the domestic-bound packages overseas, the lithium battery mark (Figure 1) must be displayed on the packages by customers. The responsibility for the cargo lies with the customers. Please contact a transportation company for details on the lithium battery mark (Figure 1).
For both domestic and overseas shipments, the target battery units which must be handled as Class 9 Dangerous Goods are packaged according to UN specification packaging requirements, and the packages bear the lithium battery hazard label (Figure 2).

## Figure 1: Lithium battery mark example


* UN number(s)
** Telephone number for additional information

## Figure 2: Lithium battery hazard label example


# Transportation precaution for customers

For maritime or air transportation, the lithium battery mark (Figure 1) is required also for the outer package containing several packages of Mitsubishi Electric cells or batteries. When the content of a package must be handled as dangerous goods (Class 9), the package must comply with UN specification packaging requirements. Please issue Shipper's Declaration for Dangerous Goods and an Air Waybill (AWB) and attach the lithium battery hazard label (Figure 2) to the packages for transportation.
This section outlines the IATA Dangerous Goods Regulations 63rd Edition and the conditions of SP188 for non-dangerous goods transported by sea. The IATA Dangerous Goods Regulations are revised, and the requirements are changed annually. When customers transport lithium batteries by themselves, the responsibility for the cargo lies with the customers. Thus, be sure to check the latest version of the IATA Dangerous Goods Regulations and International Maritime Dangerous Goods Code (IMDG Code).

# 6.3 Symbol for EU

The contents of the regulations described in this section apply in countries within the EU.

## EU Battery Regulation

To comply with the requirements of the EU Battery Regulation (REGULATION (EU) 2023/1542) newly enacted by the European Commission, which took effect on August 18, 2024, the batteries incorporated in the AC servo amplifier products are marked with the CE mark.

The symbol that is affixed to the battery inside the product is explained here.

**Point**

- This symbol is valid only in EU.

This symbol is specified in Article 13 "Labelling and marking of batteries" and Annex IV of the EU battery regulation (REGULATION(EU) 2023/1542).
MITSUBISHI ELECTRIC products are designed and manufactured with high quality materials and components which can be recycled and/or reused.
This symbol means that batteries and accumulators, at their end-of-life, should be disposed of separately from household waste.
If a chemical symbol is shown beneath the above symbol, a heavy metal of the corresponding chemical symbol is contained in the battery or the accumulator with the following standard concentration or more.
This will be indicated as follows.
Hg: mercury (0.0005 %), Cd: cadmium (0.002 %), Pb: lead (0.004 %)
In the European Union, there are separate collection systems for used batteries and accumulators. Batteries and accumulators must be disposed of properly.
Help us to conserve the environment we live in.

# 6.4 Compliance with China Compulsory Certification (CCC)

## Introduction

Some products are required to comply with China Compulsory Certification (hereinafter referred to as CCC) if exported, distributed, or sold to China. An outline of CCC is explained in this section. Mitsubishi Electric servo products are not subject to CCC.

CCC mark

## Outline of CCC

CCC is a system for product certification that has been in effect in China since August 2003, the purpose of which is to protect consumers and ensure safety domestically in China. The certification system currently has five types of certification: safety, electromagnetic compatibility (EMC), safety + EMC, fire-fighting equipment, and wireless LAN. Products subject to the certification are allowed to be exported, distributed, or sold to China only if they are certified by this system.
Products that have received certification proving compliance with the relevant technical standards (or products declared by the manufacturer as being compliant) must carry the specified mark (CCC mark). Many of the technical standards to be applied are GB standards (Chinese national standards), which comply with global standards such as those set forth by the IEC (International Electrotechnical Commission) and CISPR (International Special Committee on Radio Interference).
As part of the State Administration for Market Supervision and Administration Announcement No. 36 of 2023 ("Administration for Market Supervision and Administration Announcement on the Description of the Catalogue of Compulsory Product Certification and Issue of the List of Products" (Thursday, August 10, 2023)), a revised list of products subject to CCC certification (2023 version) has been published. Simultaneously, the description of the catalogue of compulsory product certification and the list of products in Announcement No. 18 of 2020 (revised 2020) was repealed.

## Judgment

16 product groups divided into 96 categories are specified as the subject products (announcement No. 36 of 2023). The following table shows the judgment rendered regarding the CCC compliance requirement for servo products.

| Product | Judgment |
|---|---|
| AC servo amplifier | Not subject |
| AC servo motor *1 | Not subject |
| Options *2 | Not subject |

*1 AC servo motors are included in the list of low-power motors (small motors 750 W or less) in the list of products subject to compulsory certification, but are not subject to certification requirements for the following reason.
Explosion proof motors and controlled motors (servo motors, stepping motors, etc.) are excluded from the subject small capacity motors.

*2 Mitsubishi Electric option cables use the wires that is not classified into the cable category in the catalog.

# 6.5 Compliance with the China RoHS directive

## Outline

The China RoHS directive: 电子信息产品污染控制管理办法 (Management Methods for Controlling Pollution by Electronic Information Products) came into effect on March 1, 2007. The China RoHS directive was replaced by the following China RoHS directive: 电器电子产品有害物质限制使用管理办法 (Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products). The succeeding China RoHS directive has been in effect since July 1, 2016.

The China RoHS directive restricts the following hazardous substances: six hazardous substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE)) which are also restricted by EU RoHS 2 (directive 2011/65/EU), and other hazardous substances specified by the State (currently no applicable substances).

## Status of our products for compliance with the China RoHS directive

The following table shows the logo types for the environmental protection use period, and whether the six hazardous substances are contained in our products or not. This table was created based on the standard SJ/T11364.

| Part name | | Hazardous substance (substance/threshold/standard) *1 | | | | | | Logo for environmental protection use period *2 | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | | Lead (Pb) | Mercury (Hg) | Cadmium (Cd) | Hexavalent chromium (Cr(VI)) | PBB | PBDE | | |
| | | Threshold: cadmium: 0.01 wt% (100 ppm), other than cadmium: 0.1 wt% (1000 ppm) | | | | | | | |
| Servo amplifier<br>Servo system controller | Mounting board | × | ○ | ○ | ○ | ○ | ○ |  | — |
| | Heat sink | × | ○ | ○ | ○ | ○ | ○ | | |
| | Resin cabinet | ○ | ○ | ○ | ○ | ○ | ○ | | |
| | Plate and screw | ○ | ○ | ○ | ○ | ○ | ○ | | |
| Servo motor | Bracket | × | ○ | ○ | ○ | ○ | ○ |  | — |
| | Mounting board | × | ○ | ○ | ○ | ○ | ○ | | |
| | Resin cabinet | ○ | ○ | ○ | ○ | ○ | ○ | | |
| | Core and cable | ○ | ○ | ○ | ○ | ○ | ○ | | |
| Cable product | Wire | ○ | ○ | ○ | ○ | ○ | ○ |  | Including connector set |
| | Connector | ○ | ○ | ○ | ○ | ○ | ○ | | |
| Optional unit | Mounting board | × | ○ | ○ | ○ | ○ | ○ |  | — |
| | Resin cabinet | ○ | ○ | ○ | ○ | ○ | ○ | | |
| | Plate and screw | ○ | ○ | ○ | ○ | ○ | ○ | | |

*1 ○: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T26572.
×: Indicates that said hazardous substance contained in at least one of the homogeneous materials for this part is above the limit requirement of GB/T26572.

*2 Indications based on "Marking for the restriction of the use of hazardous substances in electrical and electronic products" [SJ/T11364-2014]

Indicates that a certain hazardous substance is contained in the product manufactured or sold in China.
Follow safety and usage precautions for the product, and use the product within a limited number of years from the production date. Doing so prevents any hazardous substances in the product from causing environmental pollution or seriously affecting human health or property.

Indicates that no certain hazardous substance is contained in the product.

## Difference between the China RoHS directive and the EU RoHS directive

The China RoHS directive allows no restriction exemption unlike the EU RoHS directive. Although a product complies with the EU RoHS directive, a hazardous substance in the product may be considered to be above the limit requirement (marked "×") in the China RoHS directive.

The following shows some restriction exemptions and their examples according to the EU RoHS directive.

- Lead as an alloying element in steel for machining purposes and in galvanized steel containing up to 0.35 % lead by weight, lead as an alloying element in aluminum containing up to 0.4 % lead by weight, and copper alloy containing up to 4 % lead by weight, e.g. brass-made insert nuts
- Lead in high melting temperature type solders (i.e. lead-based alloys containing 85 % by weight or more lead)
- Electrical and electronic components (such as piezoelectric sensors) containing lead in glass or ceramic materials, but not including the dielectric ceramics used in capacitors
- Electrical and electronic components containing lead in a glass or ceramic matrix compound, e.g. chip resistors

## Status of our products for compliance with the China RoHS directive (Chinese)

The following table is given in Chinese according with a request by "Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products".

☞ Page 95 Status of our products for compliance with the China RoHS directive

| 部件名称 | | 有害物质（物质名称/阈值/基准）*1 | | | | | | 环境保护使用期限标识*2 | 备注 |
|---|---|---|---|---|---|---|---|---|---|
| | | 铅 (Pb) | 汞 (Hg) | 镉 (Cd) | 六价铬 (Cr(VI)) | PBB | PBDE | | |
| | | 阈值：镉：0.01wt%（100ppm）、镉以外：0.1wt%（1000ppm） | | | | | | | |
| 伺服放大器 伺服系统控制器 | 电路板组件 | × | ○ | ○ | ○ | ○ | ○ |  | — |
| | 散热片 | × | ○ | ○ | ○ | ○ | ○ | | |
| | 树脂壳体 | ○ | ○ | ○ | ○ | ○ | ○ | | |
| | 金属板、螺丝 | ○ | ○ | ○ | ○ | ○ | ○ | | |
| 伺服电机 | 托架 | × | ○ | ○ | ○ | ○ | ○ |  | — |
| | 电路板组件 | × | ○ | ○ | ○ | ○ | ○ | | |
| | 树脂壳体 | ○ | ○ | ○ | ○ | ○ | ○ | | |
| | 铁心、电线 | ○ | ○ | ○ | ○ | ○ | ○ | | |
| 电缆加工品 | 电线 | ○ | ○ | ○ | ○ | ○ | ○ |  | 包括连接器组件 |
| | 连接器 | ○ | ○ | ○ | ○ | ○ | ○ | | |
| 选件模块 | 电路板组件 | × | ○ | ○ | ○ | ○ | ○ |  | — |
| | 树脂壳体 | ○ | ○ | ○ | ○ | ○ | ○ | | |
| | 金属板、螺丝 | ○ | ○ | ○ | ○ | ○ | ○ | | |

*1 ○：表示该有害物质在该部件所有均质材料中的含量均在GB/T26572规定的限量要求以下。
×：表示该有害物质在该部件的至少一种均质材料中的含量超出GB/T26572规定的限量要求。

*2 根据“电子电气产品有害物质限制使用标识要求”、[SJ/T11364-2014]的表示

该标志表示在中国制造/销售的产品中含有特定有害物质。
只要遵守本产品的安全及使用方面的注意事项，从生产日算起的环保使用期限内不会造成环境污染或对人体、财产产生深刻的影响。

该标志表示制造的产品中不含有特定有害物质。

# MEMO

# REVISIONS

*The manual number is given on the bottom left of the back cover.

| Revision date | *Manual number | Description |
|---|---|---|
| January 2020 | SH(NA)-030366ENG-A | First edition |
| July 2020 | SH(NA)-030366ENG-B | ■The MR-J5-500G-_N1, MR-J5-700G-_N1, and models without the dynamic brake are added.<br>■The following functions are added:<br>Multifunction regeneration converter, SS1, SBC<br>■Added:<br>Section 1.3, Section 1.7, Section 6.4, Section 8.2, Chapter 9 |
| October 2020 | SH(NA)-030366ENG-C | ■The MR-J5-60G4-_N1, MR-J5-100G4-_N1, MR-J5-200G4-_N1, and MR-J5-350G4-_N1 are added.<br>■Added/edited:<br>Section 1.1, Section 1.2, Section 1.4, Section 1.5, Section 1.7, Section 3.1, Section 5.3, Section 7.5, Section 7.6, Section 7.8, Section 7.9, Section 8.1, Section 9.4, Chapter 2 |
| March 2021 | SH(NA)-030366ENG-D | ■The following function is added:<br>Positioning mode (point table method)<br>■Added/edited:<br>Section 1.4, Chapter 2, Section 2.1, Section 4.1, Section 4.5, Section 5.2, Section 7.1, Section 7.2, Section 7.3, Section 7.5, Section 7.8, Section 7.9 |
| June 2021 | SH(NA)-030366ENG-E | ■HK-MT series servo motors are added.<br>■Added/edited:<br>Section 1.2, Section 1.4, Section 1.7, Section 2.1, Section 2.2, Section 7.5, Section 7.6, Section 7.8, Section 7.9 |
| July 2022 | SH(NA)-030366ENG-F | ■Complied with UKCA<br>■Added/edited:<br>Section 1.4, Section 1.7, Chapter 4, Chapter 6, Section 6.1, Section 6.2, Section 6.4, Section 7.4, Section 7.6, Section 7.7, Section 7.8, Section 7.9, Section 7.10 |
| January 2023 | SH(NA)-030366ENG-G | ■The following function is added:<br>Override function<br>■EU WEEE Directive is added.<br>■Added/edited:<br>Section 2.2, Section 3.1, Section 3.2, Section 4.1, Section 4.5, Section 5.2, Section 5.3, Section 6.3, Section 7.7, Section 7.9, Section 7.10 |
| July 2023 | SH(NA)-030366ENG-H | ■The following functions are added:<br>FSoE, SS2, SOS, SLS, SSM, SDI, SLI<br>■Added/edited:<br>Section 1.2, Section 1.4, Section 2.1, Section 2.2, Section 5.3, Section 6.3, Section 9.1, Section 9.2, Section 9.3, Section 9.4, Chapter 10 |
| January 2024 | SH(NA)-030366ENG-J | ■The MR-J5-500G4-_N1 and MR-J5-700G4-_N1 are added.<br>■Edited:<br>Section 1.1, Section 1.2, Section 1.4, Section 1.5, Section 1.7, Section 2.1, Section 3.1, Section 5.2, Section 7.1, Section 7.6, Section 7.7, Section 7.10, Section 9.1, Section 9.2, Section 9.3, Section 9.4 |
| July 2024 | SH(NA)-030366ENG-K | ■Added/edited:<br>Section 1.4, Section 2.2, Chapter 3, Chapter 6, Section 6.4<br>■Deleted:<br>Chapter 7, Chapter 8, Chapter 9, Chapter 10 |
| January 2025 | SH(NA)-030366ENG-L | ■The MR-J5-60G4-HSN1, MR-J5-100G4-HSN1, MR-J5-200G4-HSN1, MR-J5-350G4-HSN1, MR-J5-12KG(4)-_N1, MR-J5-17KG(4)-_N1, and MR-J5-25KG(4)-_N1 are added.<br>■The following function is added:<br>EtherNet/IP<br>■Edited:<br>Section 1.1, Section 1.2, Section 1.4, Section 1.5, Section 1.7, Section 2.1, Section 2.2, Section 3.1, Section 3.2, Chapter 4, Section 4.1 |
| July 2025 | SH(NA)-030366ENG-M | ■MR-CM08K1 and special coating specification products are added.<br>■Added/edited:<br>Section 1.2, Section 1.4, Section 1.7, Section 2.2, Section 6.2, Section 6.3 |

# WARRANTY

## Warranty

### 1. Warranty period and coverage

We will repair any failure or defect hereinafter referred to as "failure" in our FA equipment hereinafter referred to as the "Product" arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

[Term]

For terms of warranty, please contact your original place of purchase.

[Limitations]

(1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule.
It can also be carried out by us or our service company upon your request and the actual cost will be charged. However, it will not be charged if we are responsible for the cause of the failure.

(2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.

(3) Even during the term of warranty, the repair cost will be charged on you in the following cases;

1. a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
2. a failure caused by any alteration, etc. to the Product made on your side without our approval
3. a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
4. a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
5. any replacement of consumable parts (battery, fan, smoothing capacitor, etc.)
6. a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
7. a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
8. any other failures which we are not responsible for or which you acknowledge we are not responsible for

### 2. Term of warranty after the stop of production

(1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.

(2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

### 3. Service in overseas countries

Our regional FA Center in overseas countries will accept the repair work of the Product. However, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

### 4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:

(1) Damages caused by any cause found not to be the responsibility of Mitsubishi.

(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.

(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.

(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

### 5. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

### 6. Application and use of the Product

(1) For the use of our AC Servo, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in AC Servo, and a backup or fail-safe function should operate on an external system to AC Servo when any failure or malfunction occurs.

(2) Our AC Servo is designed and manufactured as a general purpose product for use at general industries.
Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used.
In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used.
We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

(3) Mitsubishi Electric shall have no responsibility or liability for any problems involving programmable controller trouble and system trouble caused by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

# TRADEMARKS

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