



General-Purpose AC Servo

# MELSERVO-J3 Series

SSCNET III Interface Direct Drive Servo  
MODEL (Servo Amplifier)

## MR-J3-□B-RJ080W

MODEL (Direct Drive Motor)

## TM-RFM

INSTRUCTION MANUAL

## ● Safety Instructions ●

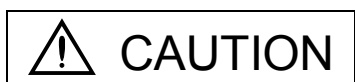
Please read the instructions carefully before using the equipment.

To use the equipment correctly, do not attempt to install, operate, maintain, or inspect the equipment until you have read through this Instruction Manual, MR-J3-□B Servo amplifier Instruction Manual, and appended documents carefully. Do not use the servo amplifier and direct drive motor until you have a full knowledge of the equipment, safety information and instructions.

In this Instruction Manual, the safety instruction levels are classified into "WARNING" and "CAUTION".





Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.





Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight injury to personnel or may cause physical damage.

Note that the CAUTION level may lead to a serious consequence according to conditions. Please follow the instructions of both levels because they are important to personnel safety.

What must not be done and what must be done are indicated by the following diagrammatic symbols.

: Indicates what must not be done. For example, "No Fire" is indicated by .

: Indicates what must be done. For example, grounding is indicated by .

In this Instruction Manual, instructions at a lower level than the above, instructions for other functions, and so on are classified into "POINT".

After reading this Instruction Manual, keep it accessible to the operator.

1. To prevent electric shock, note the following

 **WARNING**

- Before wiring or inspection, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P(+) and N(–) is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, always confirm from the front of the servo amplifier, whether the charge lamp is off or not.
- Connect the servo amplifier and direct drive motor to ground.
- Any person who is involved in wiring and inspection should be fully competent to do the work.
- Do not attempt to wire the servo amplifier and direct drive motor until they have been installed. Otherwise, it may cause an electric shock.
- Operate the switches with dry hand to prevent an electric shock.
- The cables should not be damaged, stressed, loaded, or pinched. Otherwise, it may cause an electric shock.
- During power-on or operation, do not open the front cover of the servo amplifier. Otherwise, it may cause an electric shock.
- Do not operate the servo amplifier with the front cover removed. High-voltage terminals and charging area are exposed and you may get an electric shock.
- Except for wiring or periodic inspection, do not remove the front cover even of the servo amplifier if the power is off. The servo amplifier is charged and you may get an electric shock.
- To prevent an electric shock, always connect the protective earth (PE) terminal (marked  $\oplus$ ) of the servo amplifier to the protective earth (PE) of the cabinet.
- When using a residual current device (RCD), select type B.
- To avoid an electric shock, insulate the connections of the power supply terminals.

2. To prevent fire, note the following

 **CAUTION**

- Install the servo amplifier, direct drive motor and regenerative resistor on incombustible material. Installing them directly or close to combustibles will lead to a fire.
- Always connect a magnetic contactor between the power supply and the main circuit power supply of the servo amplifier (L<sub>1</sub>, L<sub>2</sub>, and L<sub>3</sub>), and configure the wiring to be able to shut down the power supply on the side of the servo amplifier's power supply. If a magnetic contactor is not connected, continuous flow of a large current may cause a fire when the servo amplifier malfunctions.
- When a regenerative resistor is used, use an alarm signal to switch main power off. Otherwise, a regenerative transistor fault or the like may overheat the regenerative resistor, causing a fire.
- Provide adequate protection to prevent screws and other conductive matter, oil and other combustible matter from entering the servo amplifier and direct drive motor.
- Always connect a molded-case circuit breaker to the power supply of the servo amplifier.

### 3. To prevent injury, note the following

#### CAUTION

- Only the voltage specified in the Instruction Manual should be applied to each terminal, Otherwise, a burst, damage, etc. may occur.
- Connect the terminals correctly to prevent a burst, damage, etc.
- Ensure that polarity (+, -) is correct. Otherwise, a burst, damage, etc. may occur.
- The servo amplifier heat sink, regenerative resistor, direct drive motor, etc. may be hot while power is on or for some time after power-off. Take safety measures, e.g. provide covers, to prevent accidental contact of hands and parts (cables, etc.) with them.
- During operation, never touch the rotor of the direct drive motor. Otherwise, it may cause injury.

### 4. Additional instructions

The following instructions should also be fully noted. Incorrect handling may cause a fault, injury, electric shock, etc.

#### (1) Transportation and installation

#### CAUTION

- Transport the products correctly according to their mass.
- Stacking in excess of the specified number of products is not allowed.
- Do not carry the direct drive motor by holding the cables, rotor, encoder or connector.
- Do not hold the front cover to transport the servo amplifier. The servo amplifier may drop.
- Install the servo amplifier in a load-bearing place in accordance with the Instruction Manual.
- Do not get on or put heavy load on the equipment.
- The servo amplifier and direct drive motor must be installed in the specified direction.
- Leave specified clearances between the servo amplifier and cabinet inside walls or other equipment. Otherwise, it may cause a malfunction.
- Do not install or operate the servo amplifier and direct drive motor which has been damaged or has any parts missing.
- Do not block intake and exhaust areas of the servo amplifier. Otherwise, it may cause a malfunction.
- Do not drop or strike servo amplifier or direct drive motor. Isolate from all impact loads.
- Securely attach the direct drive motor to the machine. If you attach it insecurely, the direct drive motor may come off during operation.
- Measure a direct drive motor, and check the motor vibration level. A great vibration may cause the early damage of a bearing, encoder, and brake. The great vibration may also cause the poor connector connection or bolt looseness.
- For the gain adjustment at the equipment startup, check the torque waveform and the speed waveform by using a measurement device, and then check that no vibration occurs. If the vibration occurs due to high gain, the vibration may cause the early damage of the direct drive motor.
- Take safety measures, e.g. provide covers, to prevent accidental access to the rotor of the direct drive motor during operation.
- Never hit the rotor of the direct drive motor, especially when coupling the direct drive motor to the machine. Otherwise, the encoder may malfunction.

## ⚠ CAUTION

- Do not subject the rotor of the direct drive motor to more than the permissible load. Otherwise, the rotor may break.
- When the equipment has been stored for an extended period of time, contact your local sales office.
- When you keep or use it, please fulfill the following environment.

Item		Environment		
		Servo amplifier	Direct drive motor	
Ambient temperature	Operation	[°C]	0 to 55 (non-freezing)	0 to 40 (non-freezing)
		[°F]	32 to 131 (non-freezing)	32 to 104 (non-freezing)
	Storage	[°C]	−20 to 65 (non-freezing)	−15 to 70 (non-freezing)
		[°F]	−4 to 149 (non-freezing)	5 to 158 (non-freezing)
Ambient humidity	Operation	90%RH or less (non-condensing)		
	Storage	90%RH or less (non-condensing)		
Ambience		Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt		
Altitude		Max. 1000m above sea level		
Vibration resistance	5.9 m/s <sup>2</sup> at 10 to 55Hz (directions of X, Y and Z axes)		TM-RFM□C20	X, Y: 49 m/s <sup>2</sup>
			TM-RFM□E20	
		TM-RFM□G20	X, Y: 24.5 m/s <sup>2</sup>	
		TM-RFM□J10		

- When treating the servo amplifier and direct drive motor be careful about the edged parts such as the corners of the servo amplifier and direct drive motor.
- The servo amplifier must be installed in the metal cabinet.

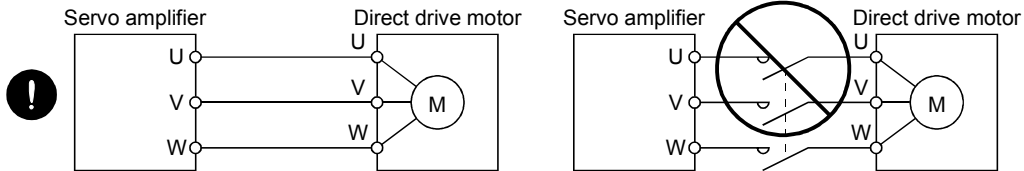
### (2) Wiring

## ⚠ CAUTION

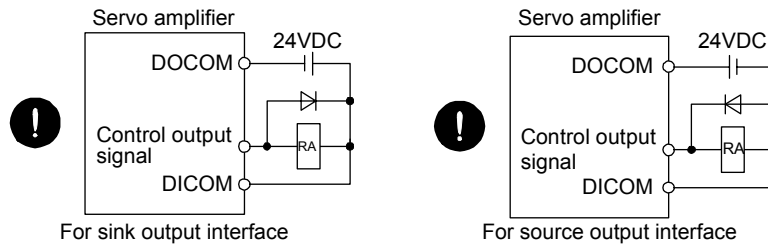
- Wire the equipment correctly and securely. Otherwise, the direct drive motor may operate unexpectedly.
- Do not install a power capacitor, surge killer or radio noise filter (FR-BIF option) between the direct drive motor and servo amplifier.
- To avoid a malfunction, connect the wires to the correct phase terminals (U, V, and W) of the servo amplifier and direct drive motor.

## ⚠ CAUTION

- Connect the servo amplifier power supply output (U, V, and W) to the direct drive motor power supply input (U, V, and W) directly. Do not let a magnetic contactor, etc. intervene. Otherwise, it may cause a malfunction.



- Do not connect AC power directly to the direct drive motor. Otherwise, it may cause a malfunction.
- The surge absorbing diode installed on the DC relay for control output should be fitted in the specified direction. Otherwise, the emergency stop and other protective circuits may not operate.



- When the cable is not tightened enough to the terminal block (connector), the cable or terminal block (connector) may generate heat because of the poor contact. Be sure to tighten the cable with specified torque.

### (3) Test run adjustment

## ⚠ CAUTION

- Before operation, check the parameter settings. Improper settings may cause some machines to perform unexpected operation.
- The parameter settings must not be changed excessively. Operation will be instable.

### (4) Usage

## ⚠ CAUTION

- Provide an external emergency stop circuit to ensure that operation can be stopped and power switched off immediately.
- Any person who is involved in disassembly and repair should be fully competent to do the work.
- Before resetting an alarm, make sure that the run signal of the servo amplifier is off to prevent an accident. A sudden restart is made if an alarm is reset with the run signal on.
- Do not modify the equipment.
- Use a noise filter, etc. to minimize the influence of electromagnetic interference. Electromagnetic interference may be given to electronic equipment used near the servo amplifier.
- Burning or breaking a servo amplifier may cause a toxic gas. Do not burn or break a servo amplifier.
- Use the servo amplifier with the specified direct drive motor.

(5) Corrective actions

 CAUTION

- When it is assumed that a hazardous condition may take place at the occur due to a power failure or a product fault, use a direct drive motor with an external brake mechanism for the purpose of prevention.
- When any alarm has occurred, eliminate its cause, ensure safety, and deactivate the alarm before restarting operation.
- Design the machine in order to avoid sudden restarting in case of after an instantaneous power failure.

(6) Maintenance, inspection and parts replacement

 CAUTION

- With age, the electrolytic capacitor of the servo amplifier will deteriorate. To prevent a secondary accident due to a fault, it is recommended to replace the electrolytic capacitor every 10 years when used in general environment.
- Please contact your local sales office.

(7) Storage

 CAUTION

Note the following points when storing the direct drive motor for an extended period of time (guideline: three or more months).

- Always store the direct drive motor indoors in a clean and dry place.
- If it is stored in a dusty or damp place, make adequate provision, e.g. cover the whole product.
- If the insulation resistance of the winding decreases, reexamine the storage method.
- Though the direct drive motor is rust-proofed before shipment using paint or rust prevention oil, rust may be produced depending on the storage conditions or storage period.  
If the direct drive motor is to be stored for longer than six months, apply rust prevention oil again especially to the machined surfaces of the rotor, etc.
- Before using the product after storage for an extended period of time, hand-turn the direct drive motor rotor (output shaft) to confirm that nothing is wrong with the direct drive motor.
- When the equipment has been stored for an extended period of time, contact your local sales office.

(8) General instruction

- To illustrate details, the equipment in the diagrams of this Specifications and Instruction Manual may have been drawn without covers and safety guards. When the equipment is operated, the covers and safety guards must be installed as specified. Operation must be performed in accordance with this Specifications and Instruction Manual.

## ● DISPOSAL OF WASTE ●

Please dispose a servo amplifier, battery (primary battery) and other options according to your local laws and regulations.



### EEP-ROM life

The number of write times to the EEPROM, which stores parameter settings, etc., is limited to 100,000. If the total number of the following operations exceeds 100,000, the servo amplifier may fail when the EEPROM reaches the end of its useful life.

- Write to the EEPROM due to parameter setting changes
- Write to the EEPROM due to device changes

### Precautions for Choosing the Products

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; machine damage or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

## COMPLIANCE WITH THE CE MARKING

Refer to Appendix 5 for the compliance with CE marking.

<<About the manuals>>

This Instruction Manual and the following manuals are required if you use this direct drive servo for the first time. Always purchase them and use the direct drive servo safely.



Relevant manuals

Manual name	Manual No.
MELSERVO-J3 Series Instructions and Cautions for Safe Use of AC Servos	IB(NA)0300077
MELSERVO-J3 Series MR-J3-□B Servo Amplifier Instruction Manual	SH(NA)030051

This Instruction Manual describes the functions unique to the SSCNETⅢ Interface Direct Drive Servo. Therefore, when using the MR-J3-□B-RJ080W, refer to the SSCNETⅢ Interface MR-J3-□B Servo Amplifier Instruction Manual as well. However, the following items are not described in this Instruction Manual. For details of these items, refer to the MR-J3-□B Servo Amplifier Instruction Manual.

Item	MR-J3-□B Servo Amplifier Instruction Manual
INSTALLATION	CHAPTER 2
STARTUP	CHAPTER 4
GENERAL GAIN ADJUSTMENT	CHAPTER 6
SPECIAL ADJUSTMENT FUNCTIONS	CHAPTER 7
OPTIONS AND AUXILIARY EQUIPMENT	CHAPTER 11

<<Wiring>>

Wires mentioned in this instruction manual are selected based on the ambient temperature of 40°C (104°F).

## CONTENTS

<b>1. FUNCTIONS AND CONFIGURATION</b>	<b>1 - 1 to 1-12</b>
1.1 Summary .....	1 - 1
1.2 Servo amplifier standard specifications .....	1 - 3
1.3 Function list .....	1 - 4
1.4 Model code definition .....	1 - 5
1.5 Combinations of servo amplifiers and direct drive motor .....	1 - 5
1.6 Parts identification .....	1 - 6
1.7 Configuration including auxiliary equipment .....	1 - 9
<b>2. DIRECT DRIVE MOTOR</b>	<b>2 - 1 to 2-34</b>
2.1 Rating plate .....	2 - 1
2.2 Parts identification .....	2 - 1
2.3 Installation .....	2 - 2
2.3.1 Equipment configuration .....	2 - 3
2.3.2 Installation orientation .....	2 - 4
2.3.3 Load remove precautions .....	2 - 4
2.3.4 Permissible load for the rotor .....	2 - 4
2.3.5 Protection from oil and water .....	2 - 5
2.3.6 Inspection .....	2 - 6
2.3.7 Life .....	2 - 6
2.3.8 Machine accuracies .....	2 - 7
2.3.9 Flange surface size .....	2 - 7
2.4 Connectors used for direct drive motor wiring .....	2 - 8
2.4.1 Selection of connectors .....	2 - 8
2.4.2 Wiring connectors (Connector configurations A • B • C • D • E • F) .....	2 - 9
2.4.3 Connector outline drawings .....	2 - 11
2.5 TM-RFM series direct drive motor .....	2 - 15
2.5.1 Model code definition .....	2 - 15
2.5.2 Specification list .....	2 - 16
2.5.3 Torque characteristic .....	2 - 19
2.5.4 Outline dimension drawings .....	2 - 20
2.5.5 Connection of servo amplifier and direct drive motor .....	2 - 32
<b>3. SIGNALS AND WIRING</b>	<b>3 - 1 to 3-12</b>
3.1 Precautions for this chapter .....	3 - 2
3.2 Input power supply circuit .....	3 - 2
3.2.1 Selection example of wires .....	3 - 3
3.2.2 Connection example .....	3 - 4
3.3 I/O signal connection example .....	3 - 7
3.4 Connector and signal arrangements .....	3 - 9
3.5 Internal connection diagram .....	3 - 10
3.5.1 Incremental system .....	3 - 10
3.5.2 Absolute position detection system .....	3 - 11

4. OPERATION AND FUNCTIONS	4 - 1 to 4 -18
----------------------------	----------------

4.1 Startup .....	4 - 1
4.2 Magnetic pole detection .....	4 - 2
4.2.1 Preparation for the magnetic pole detection .....	4 - 2
4.2.2 Driving when magnetic pole is detected.....	4 - 3
4.2.3 Magnetic pole detection method setting.....	4 - 6
4.2.4 Setting the magnetic pole detection voltage level of the position detection method .....	4 - 6
4.2.5 Magnetic pole detection method using MR Configurator.....	4 - 8
4.3 Operation from the controller .....	4 -10
4.3.1 Operation method.....	4 -10
4.3.2 Servo system controller setting.....	4 -11
4.4 Servo control error detection function .....	4 -16

5. PARAMETERS	5 - 1 to 5 -12
---------------	----------------

5.1 Parameter write inhibit (Parameter No.PA19).....	5 - 1
5.2 Basic setting parameters (No.PA□□).....	5 - 2
5.2.1 Parameter list .....	5 - 2
5.2.2 List of details.....	5 - 3
5.3 Gain/Filter parameters (No.PB□□) .....	5 - 5
5.3.1 Parameter list .....	5 - 5
5.4 Extension setting parameters (No.PC□□) .....	5 - 6
5.4.1 Parameter list .....	5 - 6
5.5 I/O setting parameters (No.PD□□) .....	5 - 7
5.5.1 Parameter list .....	5 - 7
5.6 Special setting parameters (No.PS□□) .....	5 - 8
5.6.1 Parameter list .....	5 - 8
5.6.2 List of details.....	5 - 9

6. TROUBLESHOOTING	6 - 1 to 6 - 8
--------------------	----------------

6.1 Alarms and warning list.....	6 - 1
6.2 Remedies for alarms.....	6 - 2
6.3 Remedies for warnings .....	6 - 6

7. SERVO AMPLIFIER OUTLINE DRAWINGS	7 - 1 to 7 - 6
-------------------------------------	----------------

8. CHARACTERISTICS	8 - 1 to 8 - 4
--------------------	----------------

8.1 Overload protection characteristics .....	8 - 1
8.2 Dynamic brake characteristics.....	8 - 3
8.2.1 Dynamic brake operation .....	8 - 3
8.2.2 The dynamic brake at the load inertia moment ratio.....	8 - 4

9. OPTIONS FOR DIRECT DRIVE SERVO	9 - 1 to 9 -12
-----------------------------------	----------------

9.1 Cable/connector sets .....	9 - 1
--------------------------------	-------

9.1.1 Combinations of cable and connector set .....	9 - 2
9.1.2 Encoder connector set .....	9 - 4
9.2 Absolute position storage unit MR-BTAS01 .....	9 -10

APPENDIX	App.- 1 to App.- 8
----------	--------------------

App. 1 Parameter list.....	App.- 1
App. 2 Signal layout recording paper .....	App.- 3
App. 3 Handling of AC servo amplifier batteries for the United Nations Recommendations on the Transport of Dangerous Goods .....	App.- 3
App. 4 Symbol for the new EU Battery Directive .....	App.- 5
App. 5 Compliance with the CE marking.....	App.- 6



# 1. FUNCTIONS AND CONFIGURATION

---

## 1. FUNCTIONS AND CONFIGURATION

### 1.1 Summary

To meet high-accuracy and high-efficiency requirements in areas including semiconductor and liquid crystal related machines, and surface mount device placement machines, a system with a direct drive motor in a drive axis has been increased. The direct drive servo system includes the following features.

- (1) Performance
  - (a) Since load is directly coupled to the direct drive motor, gear reducer and transmission elements can be eliminated, offering greater rigidity and torque.
  - (b) The high-resolution encoder contributes to high-accuracy control.
  - (c) Due to the gearless structure, error caused by backlash can be eliminated, offering high-accuracy operation and shorter settling time.
  - (d) Because of no reduction gear or others, the direct drive motor does not deteriorate with time.
- (2) Mechanism
  - (a) The motor's low profile design contributes to compact construction and a low center of gravity for enhanced machine stability.
  - (b) The motor has an inner rotor with hollow shaft which enables cables and pipes to be passed through.
  - (c) Lubrication and maintenance due to abrasion is not required.

The following shows the differences between the direct drive servo and the MR-J3-□B.

# 1. FUNCTIONS AND CONFIGURATION

Classification	Item	Differences		Remarks
		Direct drive servo (MR-J3-□B-RJ080W)	MR-J3-□B	
External I/O signal	Stroke limit input signal (FLS, RLS)	Required (when magnetic pole is detected)	Not required	Automatically turns on in the parameter setting.
Motor pole adjustment	Magnetic pole detection operation	Required	Not required (adjusted at shipment)	Automatically executed at the first servo-on after turning the power on. For the absolute position detection system, the magnetic polarity detection can be made invalid in the setting of parameter No.PS01. (Refer to section 4.2.2 (2).)
Absolute position detection system	Battery for absolute position encoder (MR-J3BAT)	Required	Required	/
	Absolute position storage unit (MR-BTAS01)	Required	Not required	
Alarm/warning	Alarm/warning designed exclusively for the direct drive servo	Addition	/	Alarm/warning which is added or the contents is changed <ul style="list-style-type: none"> <li>▪ Encoder combination error (1F)</li> <li>▪ Encoder error2 (20)</li> <li>▪ Encoder error3 (21)</li> <li>▪ Absolute position erase (25)</li> <li>▪ Initial magnetic pole detection error (27)</li> <li>▪ Encoder counter error (2B)</li> <li>▪ Servo control error (42)</li> <li>▪ Direct drive motor overheat (46)</li> <li>▪ Battery cable disconnection warning (92)</li> <li>▪ Battery warning (9F)</li> <li>▪ Direct drive motor overheat warning (E2)</li> </ul>

# 1. FUNCTIONS AND CONFIGURATION

## 1.2 Servo amplifier standard specifications

Servo amplifier MR-J3-□-RJ080W			20B	40B	60B	70B	100B	350B	500B	
Item										
Output	Rated voltage		3-phase 170VAC							
	Rated current [A]		1.5	2.8	3.2	5.8	6.0	17.0	28.0	
Main circuit power supply	Voltage/frequency		3-phase or 1-phase 200 to 230VAC, 50/60Hz				3-phase 200 to 230VAC, 50/60Hz			
	Rated current [A]		1.5	2.6	3.2	3.8	5.0	16.0	21.7	
Permissible voltage fluctuation			3-phase or 1-phase 170 to 253VAC				3-phase 170 to 253VAC			
Permissible frequency fluctuation			Within ±5%							
Power supply capacity			Refer to section 2.5.2							
Inrush current			Refer to section 10.5 "MR-J3-□B Servo Amplifier Instruction Manual"							
Control circuit power supply	Voltage, frequency		1-phase 200 to 230VAC, 50/60Hz							
	Rated current [A]		0.2						0.3	
	Permissible voltage fluctuation		1-phase 170 to 253VAC							
	Permissible frequency fluctuation		Within ±5%							
	Power consumption [W]		30						45	
	Input		30W						45W	
	Inrush current			Refer to section 10.5 "MR-J3-□B Servo Amplifier Instruction Manual"						
Interface power supply	Voltage		24VDC ± 10%							
	Power supply capacity [A]		(Note 1) 0.15							
Control system			Sine-wave PWM control, current control system							
Dynamic brake			Built-in							
Protective functions			Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal relay), direct drive motor overheat protection, encoder error protection, regenerative error protection, undervoltage, instantaneous power failure protection, overspeed protection, excessive error protection, magnetic pole detection protection, servo control error protection							
Close mounting (Note 2)			○							
Structure			Natural-cooling, open (IP rating: IP00)				Force-cooling, open (IP rating: IP00)			
Environmental conditions	Ambient temperature	Operation	[°C]	(Note 2) 0 to 55 (non-freezing)						
			[°F]	(Note 2) 32 to 131 (non-freezing)						
		Storage	[°C]	-20 to 65 (non-freezing)						
			[°F]	-4 to 149 (non-freezing)						
	Ambient humidity	Operation		90%RH or less (non-condensing)						
		Storage								
	Ambient			Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt						
	Altitude			Max. 1000m above sea level						
	Vibration resistance			5.9m/s <sup>2</sup> 10 to 55Hz (directions of X, Y and Z axes)						
	Mass	[kg]		0.8	1.0	1.0	1.4	1.4	2.3	4.6
[lb]		1.8	2.2	2.2	3.1	3.1	5.1	10		

Note 1. 0.15A is the value applicable when all I/O signals are used. The current capacity can be decreased by reducing the number of I/O points.

- When closely mounting servo amplifiers, operate them at the ambient temperatures of 0 to 45°C (32 to 113°F) or at 75% or smaller effective load ratio.



# 1. FUNCTIONS AND CONFIGURATION

## 1.3 Function list

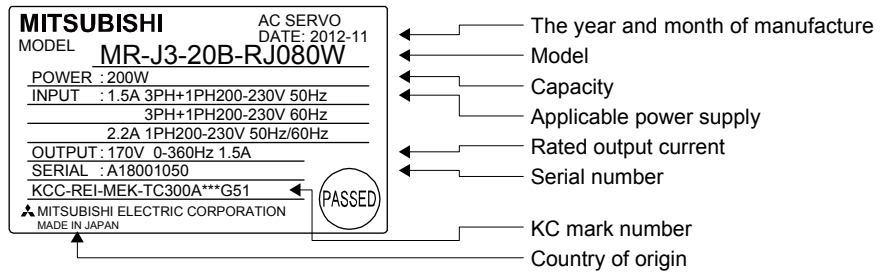
The following table lists the functions of this servo. For details of the functions, refer to the reference field.

Function	Description	Reference
Absolute position detection system	Merely setting a home position once makes home position return unnecessary at every power-on. A battery (MR-J3BAT) and an absolute position storage unit (MR-BTAS01) are required.	Chapter 9
Gain changing function	You can switch between gains during rotation and gains during stop or use an input device to change gains during operation.	MR-J3-□B Servo Amplifier Instruction Manual
Advanced vibration suppression control	This function suppresses vibration at the arm end or residual vibration.	
Adaptive filter II	Servo amplifier detects mechanical resonance and sets filter characteristics automatically to suppress mechanical vibration.	
Low-pass filter	Suppresses high-frequency resonance which occurs as servo system response is increased.	
Machine analyzer function	Analyzes the frequency characteristic of the mechanical system by simply connecting MR Configurator installed personal computer and servo amplifier. MR Configurator is necessary for this function. Make sure to execute the machine analyzer function after the magnetic pole detection. If the magnetic pole detection is not executed, this function may not operate properly.	
Machine simulation	Can simulate machine motions on a personal computer screen on the basis of the machine analyzer results. MR Configurator is necessary for this function.	
Gain search function	Personal computer with MR Configurator changes gains automatically and searches for overshoot-free gains in a short time. MR Configurator is necessary for this function.	
Robust disturbance compensation	This function provides better disturbance response in case of low response level due to high load inertia moment ratio for the roll send axis. MR Configurator is necessary for this function.	
Advanced Gain search	Advanced Gain search automatically searches for the optimum parameter for settle time to be short. The gain can be adjusted by setting sequentially in accordance with wizard screens. MR Configurator is necessary for this function.	
Slight vibration suppression control	Suppresses vibration of $\pm 1$ pulse produced at a direct drive motor stop.	MR-J3-□B Servo Amplifier Instruction Manual
Auto tuning	Automatically adjusts the gain to optimum value if load applied to the direct drive motor rotor varies.	
Brake unit	Used when the regenerative option cannot provide enough regenerative power. Can be used the 5kW or more servo amplifier.	
Power regenerative converter	Used when the regenerative option cannot provide enough regenerative power. Can be used the 5kW or more servo amplifier.	
Regenerative option	Used when the built-in regenerative resistor of the servo amplifier does not have sufficient regenerative capability for the regenerative power generated.	
Alarm history clear	Alarm history is cleared.	
Output signal selection (Device settings)	The pins that output the output devices, including the malfunction (ALM) and the dynamic brake interlock (DB), can be changed to certain pins of the CN3 connectors.	
Output signal (DO) forced output	Output signal can be forced on/off independently of the servo status. Use this function for output signal wiring check, etc.	
Test operation mode	JOG operation positioning operation DO forced output. However, MR Configurator is necessary for positioning operation.	
Analog monitor output	Servo status is output in terms of voltage in real time.	
MR Configurator (C2 or later)	Using a personal computer, parameter setting, test operation, status display, etc. can be performed.	

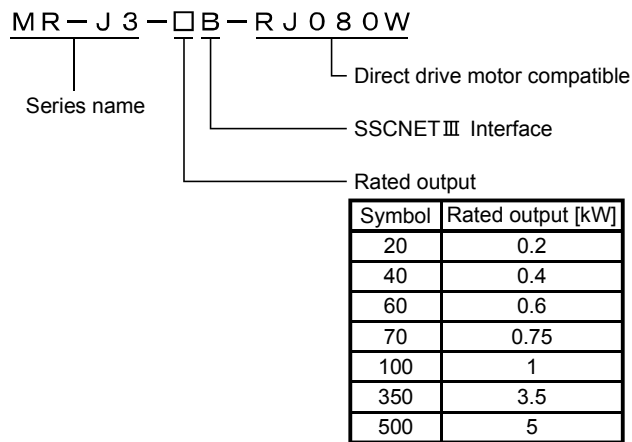
# 1. FUNCTIONS AND CONFIGURATION

## 1.4 Model code definition

### (1) Rating plate



### (2) Model



## 1.5 Combinations of servo amplifiers and direct drive motor

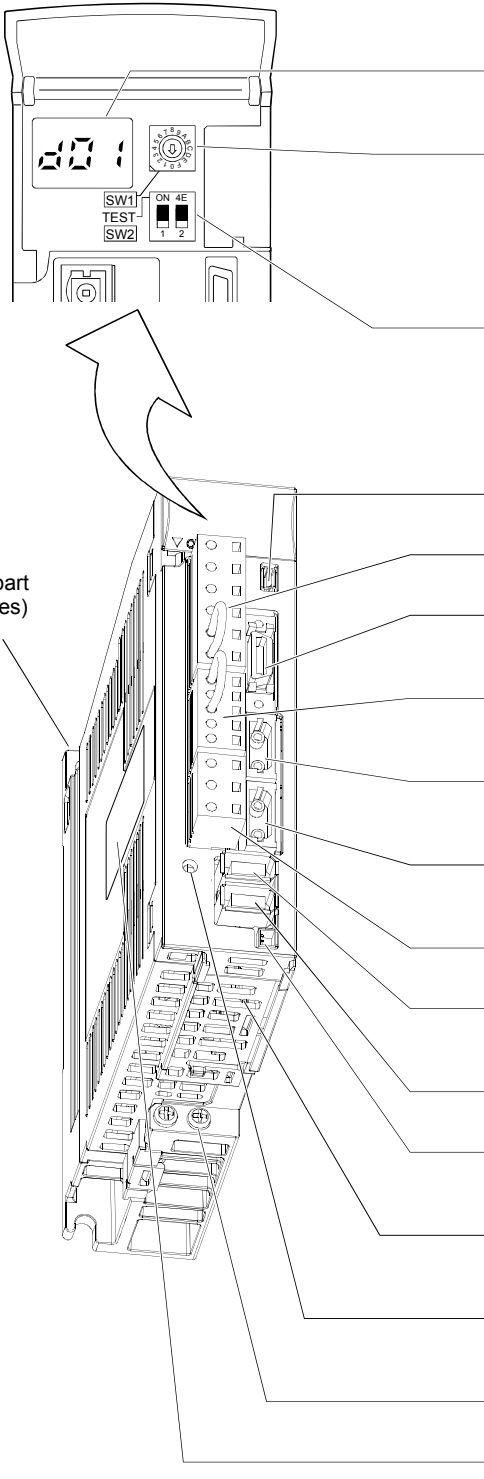
The following table lists combinations of servo amplifiers and direct drive motors.

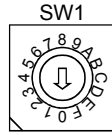
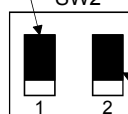
Servo amplifier	Direct drive motor			
	TM-RFM□C20	TM-RFM□E20	TM-RFM□G20	TM-RFM□J10
MR-J3-20B-RJ080W	002			
MR-J3-40B-RJ080W	004			
MR-J3-60B-RJ080W	006	006		
MR-J3-70B-RJ080W		012	012	040
MR-J3-100B-RJ080W		018		
MR-J3-350B-RJ080W			048 · 072	120
MR-J3-500B-RJ080W				240

# 1. FUNCTIONS AND CONFIGURATION

## 1.6 Parts identification

(1) MR-J3-100B-RJ080W or less



Name/Application	Detailed explanation
<b>Display</b> The 3-digit, seven-segment LED shows the servo status and alarm number.	Refer to the MR-J3-□B Servo Amplifier Instruction Manual.
<b>Rotary axis setting switch (SW1)</b> SW1  Used to set the axis No. of servo amplifier.	
<b>Test operation select switch (SW2-1)</b> Used to perform the test operation mode by using MR Configurator.	
 For manufacturer setting (Be sure to set to the "Down" position).	
<b>USB communication connector (CN5)</b> Connect the personal computer.	
<b>Main circuit power supply connector (CNP1)</b> Connect the input power supply.	Section 3.2
<b>I/O signal connector (CN3)</b> Used to connect digital I/O signals. More over an analog monitor is output.	Section 3.3
<b>Control circuit connector (CNP2)</b> Connect the control circuit power supply/regenerative option.	Section 3.2
<b>SSCNET III cable connector (CN1A)</b> Used to connect the servo system controller or the front axis servo amplifier.	Refer to the MR-J3-□B Servo Amplifier Instruction Manual.
<b>SSCNET III cable connector (CN1B)</b> Used to connect the rear axis servo amplifier. For the final axis, puts a cap.	
<b>Direct drive motor power output connector (CNP3)</b> Connect the direct drive motor.	Chapter 2 Section 3.2
<b>Encoder connector (CN2)</b> Used to connect the direct drive motor encoder.	Chapter 2 Section 3.4 Chapter 9
<b>Connector for manufacturer setting (CN2L)</b> Not used for this servo amplifier.	
<b>Battery connector (CN4)</b> Used to connect the battery for absolute position data backup.	Refer to the MR-J3-□B Servo Amplifier Instruction Manual.
<b>Battery holder</b> Install the battery MR-J3BAT.	
<b>Charge lamp</b> Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
<b>Protective earth (PE) terminal (⊕)</b> Ground terminal.	Section 3.2
<b>Rating plate</b>	Section 1.4

Fixed part (2 places)

# 1. FUNCTIONS AND CONFIGURATION

## (2) MR-J3-350B-RJ080W

The diagram illustrates the MR-J3-350B-RJ080W servo amplifier. The top view shows the front panel with a 3-digit seven-segment LED display showing '201', a rotary axis setting switch (SW1) with positions A through 9 and a downward arrow, and a test operation select switch (SW2) with positions 1 and 2. The bottom view shows the rear panel with various connectors and terminals. A cooling fan is located at the bottom left, and three fixed parts are indicated at the bottom left. A table on the right provides detailed explanations for each component.

Name/Application	Detailed explanation
Display The 3-digit, seven-segment LED shows the servo status and alarm number.	Refer to the MR-J3-□B Servo Amplifier Instruction Manual.
Rotary axis setting switch (SW1) SW1  Used to set the axis No. of servo amplifier.	
Test operation select switch (SW2-1) SW2  Used to perform the test operation mode by using MR Configurator. For manufacturer setting (Be sure to set to the "Down" position).	
USB communication connector (CN5) Connect the personal computer.	
Main circuit power supply connector (CNP1) Connect the input power supply.	Section 3.2
I/O signal connector (CN3) Used to connect digital I/O signals. More over an analog monitor is output.	Section 3.3
Direct drive motor power output connector (CNP3) Connect the direct drive motor.	Chapter 2 Section 3.2
SSCNET III cable connector (CN1A) Used to connect the servo system controller or the front axis servo amplifier.	Refer to the MR-J3-□B Servo Amplifier Instruction Manual.
SSCNET III cable connector (CN1B) Used to connect the rear axis servo amplifier. For the final axis, puts a cap.	
Encoder connector (CN2) Used to connect the direct drive motor encoder.	Chapter 2 Section 3.4 Chapter 9
Connector for manufacturer setting (CN2L) Not used for this servo amplifier.	
Battery connector (CN4) Used to connect the battery for absolute position data backup.	Refer to the MR-J3-□B Servo Amplifier Instruction Manual.
Battery holder Install the battery MR-J3BAT.	
Control circuit connector (CNP2) Connect the control circuit power supply/regenerative option.	Section 3.2
Charge lamp Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
Protective earth (PE) terminal (⊕) Ground terminal.	Section 3.2
Rating plate	Section 1.4

# 1. FUNCTIONS AND CONFIGURATION

## (3) MR-J3-500B-RJ080W

**POINT**

- The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.7.2 of the MR-J3-□B Servo Amplifier Instruction Manual.

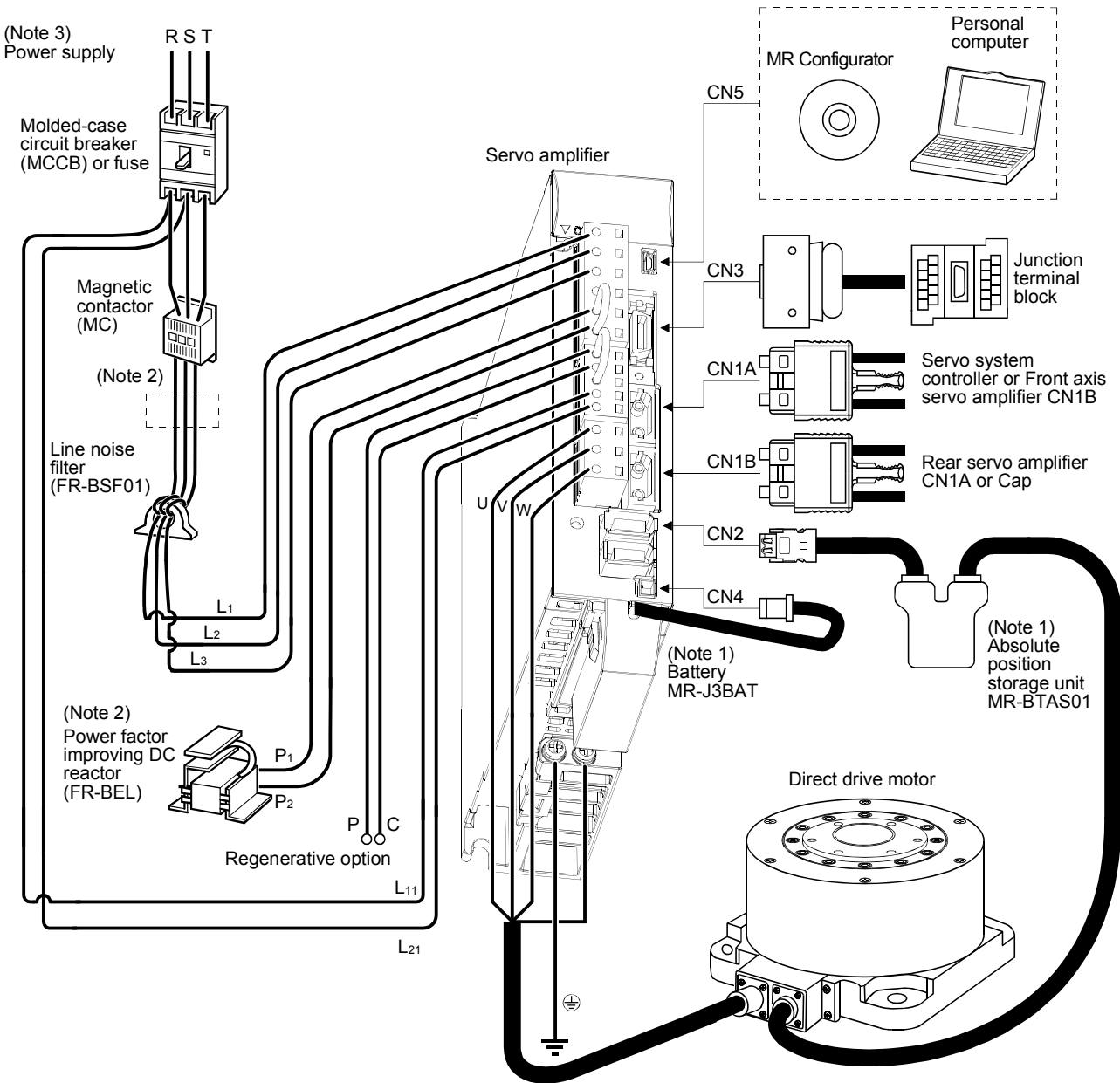
Name/Application	Detailed explanation
<b>Display</b> The 3-digit, seven-segment LED shows the servo status and alarm number.	Refer to the MR-J3-□B Servo Amplifier Instruction Manual.
<b>Rotary axis setting switch (SW1)</b> SW1 Used to set the axis No. of servo amplifier.	
<b>Test operation select switch (SW2-1)</b> SW2 Used to perform the test operation mode by using MR Configurator.	
For manufacturer setting (Be sure to set to the "Down" position).	
<b>USB communication connector (CN5)</b> Connect the personal computer.	Section 3.3
<b>I/O signal connector (CN3)</b> Used to connect digital I/O signals. More over an analog monitor is output.	
<b>Battery holder</b> Install the battery MR-J3BAT.	Refer to the MR-J3-□B Servo Amplifier Instruction Manual.
<b>SSCNET III cable connector (CN1A)</b> Used to connect the servo system controller or the front axis servo amplifier.	
<b>SSCNET III cable connector (CN1B)</b> Used to connect the rear axis servo amplifier. For the final axis, puts a cap.	Chapter 2 Section 3.4 Chapter 9
<b>Encoder connector (CN2)</b> Used to connect the direct drive motor encoder.	
<b>Connector for manufacturer setting (CN2L)</b> Not used for this servo amplifier.	Refer to the MR-J3-□B Servo Amplifier Instruction Manual.
<b>Battery connector (CN4)</b> Used to connect the battery for absolute position data backup.	
<b>Power factor improving DC reactor terminal block (TE3)</b> Used to connect the power factor improving DC reactor.	Section 3.2
<b>Charge lamp</b> Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.	
<b>Main circuit terminal block (TE1)</b> Used to connect the input power supply and direct drive motor.	Section 3.2
<b>Control circuit terminal block (TE2)</b> Used to connect the control circuit power supply.	
<b>Protective earth (PE) terminal (⊕)</b> Ground terminal.	
<b>Rating plate</b>	Section 1.4

# 1. FUNCTIONS AND CONFIGURATION

## 1.7 Configuration including auxiliary equipment

POINT
<ul style="list-style-type: none"> <li>Equipment other than the servo amplifier and direct drive motor are optional or recommended products.</li> </ul>

### (1) MR-J3-100B-RJ080W or less



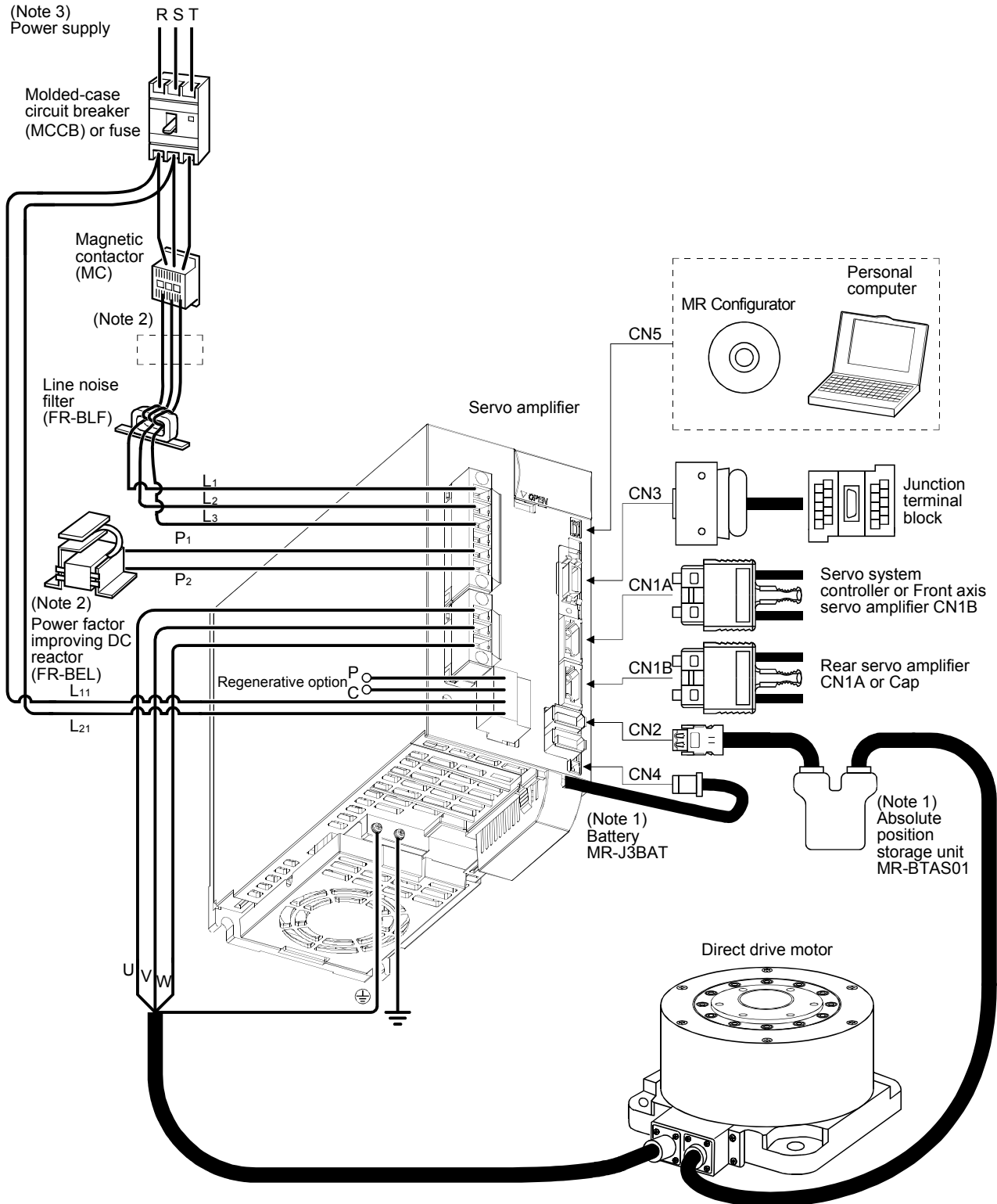
Note 1. The battery (option) and absolute position storage unit (option) are used for the absolute position detection system. (Refer to chapter 9.)

2. The power factor improving AC reactor can also be used. In this case, the power factor improving DC reactor cannot be used. When not using the power factor improving DC reactor, short P<sub>1</sub> and P<sub>2</sub>.

3. A 1-phase 200V to 230VAC power supply may be used with the servo amplifier of MR-J3-70B-RJ080W or less. For 1-phase 200V to 230VAC, connect the power supply to L<sub>1</sub> · L<sub>2</sub> and leave L<sub>3</sub> open. Refer to section 1.2 for the power supply specification.

# 1. FUNCTIONS AND CONFIGURATION

## (2) MR-J3-350B-RJ080W



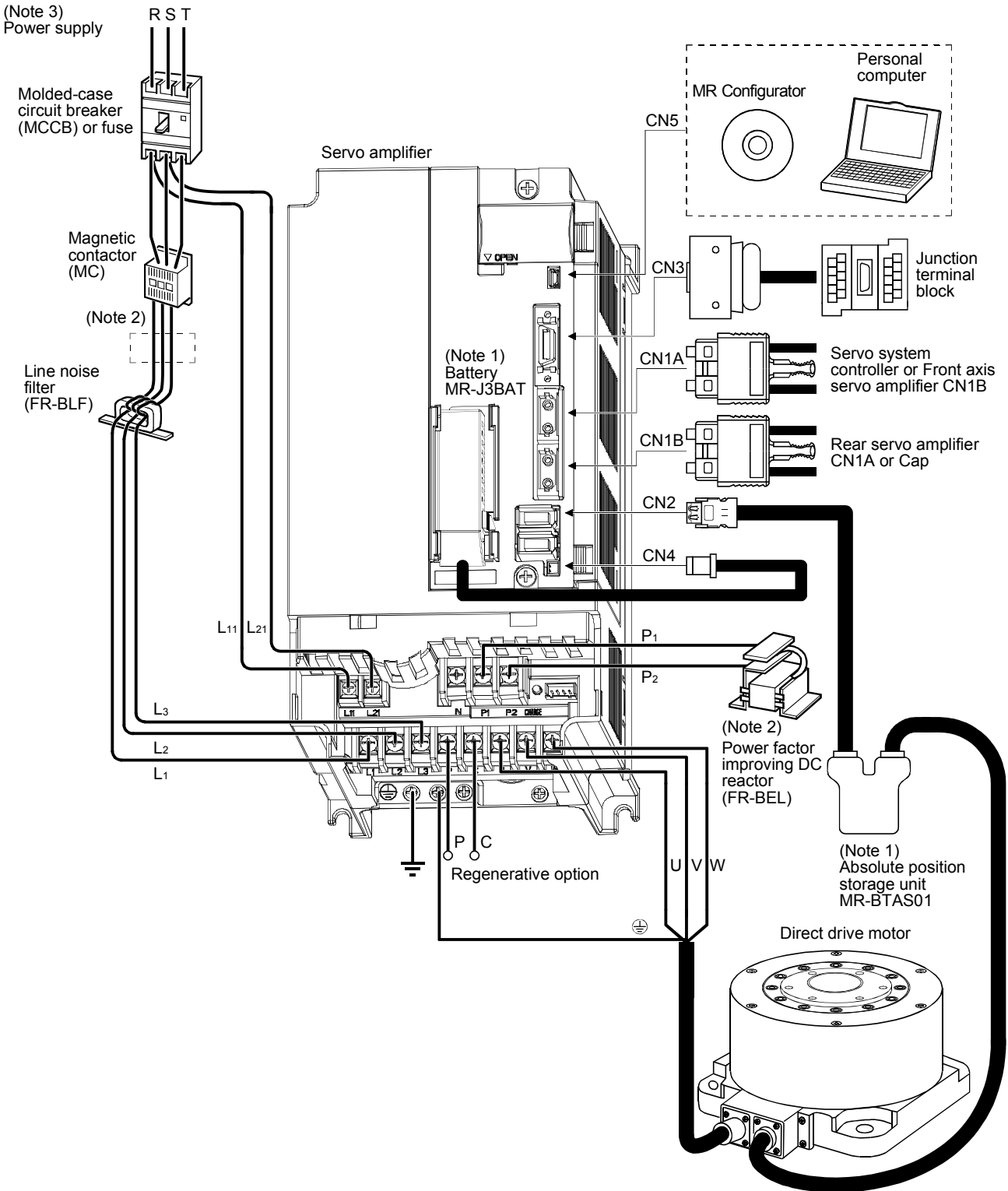
Note 1. The battery (option) and absolute position storage unit (option) are used for the absolute position detection system. (Refer to chapter 9.)

2. The power factor improving AC reactor can also be used. In this case, the power factor improving DC reactor cannot be used. When not using the power factor improving DC reactor, short P<sub>1</sub> and P<sub>2</sub>.

3. Refer to section 1.2 for the power supply specification.

# 1. FUNCTIONS AND CONFIGURATION

## (3) MR-J3-500B-RJ080W



Note 1. The battery (option) and absolute position storage unit (option) are used for the absolute position detection system. (Refer to chapter 9.)

2. The power factor improving AC reactor can also be used. In this case, the power factor improving DC reactor cannot be used. When not using the power factor improving DC reactor, short P<sub>1</sub> and P<sub>2</sub>.

3. Refer to section 1.2 for the power supply specification.

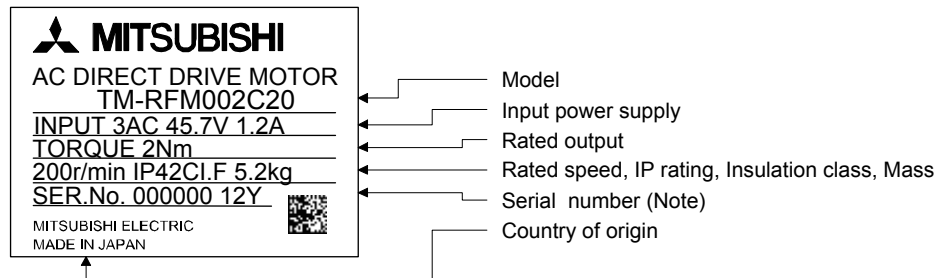




## 2. DIRECT DRIVE MOTOR

### 2. DIRECT DRIVE MOTOR

#### 2.1 Rating plate

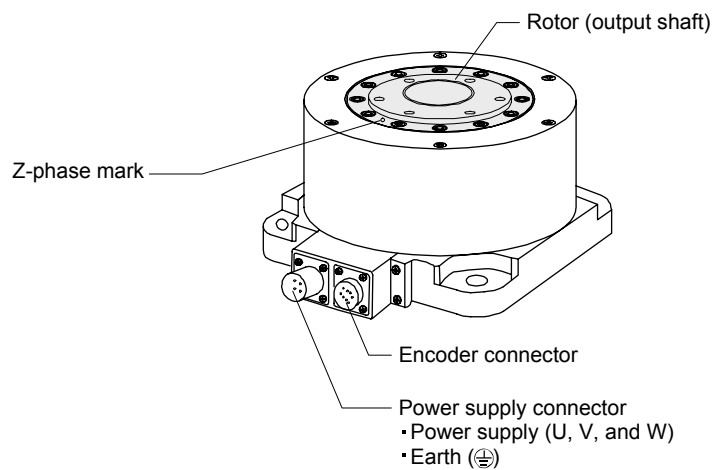


Note. Production year and month of the direct drive motor are indicated in a serial number on the rating plate.

The year and month of manufacture are indicated by the last two digits of the year and one digit of the month [1 to 9, X(10), Y(11), and Z(12)].

For Nov. 2012, the Serial No. is like, "SER. No.□□□□□□12Y".

#### 2.2 Parts identification



## 2. DIRECT DRIVE MOTOR

---

### 2.3 Installation



#### WARNING

- To prevent electric shock, ground each equipment securely.



#### CAUTION

- Stacking in excess of the limited number of product packages is not allowed.
- Install the equipment on incombustible material. Installing it directly or close to combustibles will lead to a fire.
- Install the equipment in a load-bearing place in accordance with this Instruction Manual.
- Do not get on or put heavy load on the equipment to prevent injury.
- Use the equipment within the specified environmental condition range. Refer to the specifications of the direct drive motor series.
- Do not subject the direct drive motor to drop impact or shock loads as they are precision equipment.
- Do not install or operate the direct drive motor which has been damaged or has any parts missing.
- Do not carry the direct drive motor by holding the cables, rotor, encoder or connector. Otherwise, a fault or injury may occur.
- Securely fix the direct drive motor to the machine. If fixed insecurely, the direct drive motor will come off during operation, leading to injury.
- Measure a direct drive motor, and check the motor vibration level. A great vibration may cause the early damage of a bearing, encoder, and brake. The great vibration may also cause the poor connector connection or bolt looseness.
- For the gain adjustment at the equipment startup, check the torque waveform and the speed waveform by using a measurement device, and then check that no vibration occurs. If the vibration occurs due to high gain, the vibration may cause the early damage of the direct drive motor.
- When coupling the rotor end of the direct drive motor, do not subject the rotor end to impact, such as hammering. The encoder may become faulty.
- When coupling a load to the direct drive motor, make sure to align and center the load on the motor flange rabbet. Particularly, when the rigid coupling is used, the slight center deviation may cause the decline of the position accuracy, and may cause the rotor damage.
- Balance the load to the extent possible. Failure to do so can cause vibration during direct drive motor operation or damage the bearings and encoder.
- Take safety measures, e.g. provide covers, to prevent accidental access to the rotor of the direct drive motor during operation.
- Do not subject the direct drive motor rotor to more than the permissible load. Otherwise, the rotor may break, leading to injury.
- When the product has been stored for an extended period of time, contact your local sales office.
- When treating the direct drive motor, be careful about the edged parts such as the corners of the direct drive motor.

## 2. DIRECT DRIVE MOTOR

---

### 2.3.1 Equipment configuration

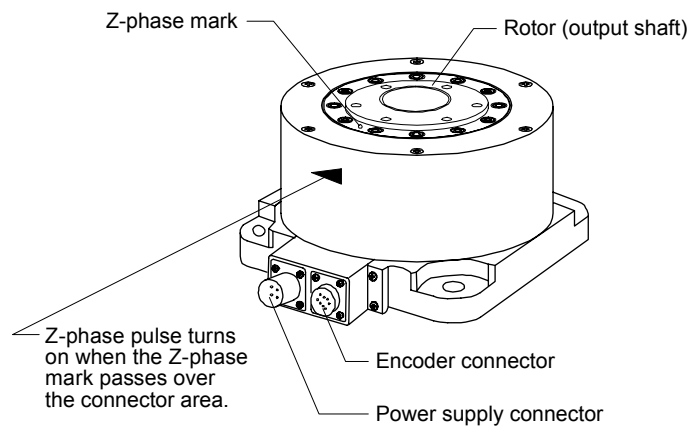
This section explains the system configuration with a direct drive motor. Note the following points when using a direct drive motor.

(1) Minimum oscillation angle

If the direct drive motor rotates repeatedly by a small angle (by  $70^\circ$  or less), make the direct drive motor rotate by  $90^\circ$  or more at least once a day in order to keep the bearing lubricated.

(2) Z-phase position

A Z-phase pulse turns on (Z-phase mark passing) when the Z-phase mark on the rotor end of the direct drive motor passes over the connector area. Keep the Z-phase position visible even after the direct drive motor is installed to a machine.



(3) Precautions for Z-phase mark passing

After power on, the Z-phase mark of the direct drive motor must pass the connector area once. In a system which prevents the direct drive motor from making a full rotation, install the direct drive motor in a position where the Z-phase mark can pass over the connector area.

(4) Vertical axis (lift)

For the system where the unbalanced torque occurs, such as a vertical axis system (lift), use the motor in the absolute position detection system. In the absolute position detection system, the absolute position is established when the Z-phase mark passes the connector area once.

At the system startup, make the Z-phase mark pass over the connector area, and switch the servo amplifier's power supply from off to on.

If the direct drive motor can be rotated manually, make the Z-phase mark pass over the connector area while only the servo amplifier's control power supply is on. After that, switch the servo amplifier's power supply from off to on.

If the direct drive motor cannot be rotated manually, detect the magnetic poles while the torque is balanced, then run the direct drive motor in the test mode to make its Z-phase mark pass over the connector area.

After that, switch the servo amplifier's power supply from off to on.

After the Z-phase mark passes through the connector area once, magnetic pole detection is not required.

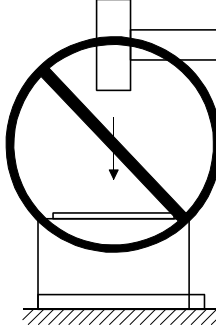
## 2. DIRECT DRIVE MOTOR

### 2.3.2 Installation orientation

The following table indicates the installation orientation of the direct drive motor.

Direct drive motor series	Direction of installation
TM-RFM	May be installed in any direction.

### 2.3.3 Load remove precautions

POINT
<ul style="list-style-type: none"><li>▪ During assembling, the rotor end must not be hammered. Doing so can cause the encoder to fail.</li></ul> 

- (1) The orientation of the encoder on the direct drive motor cannot be changed.
- (2) For installation of the direct drive motor, use spring washers, etc. and fully tighten the bolts so that they do not become loose due to vibration.

### 2.3.4 Permissible load for the rotor

POINT
<ul style="list-style-type: none"><li>▪ Because the rigid coupling may damage the rotor, make sure to align and center the load on the rotor.</li></ul>

For the permissible rotor load specific to the direct drive motor, refer to section 2.5.2.

- (1) When coupling a load to the direct drive motor, the load applied to the rotor must be under the permissible load.
- (2) Excess of the permissible load can cause the bearing life to reduce and the rotor to break.
- (3) The load indicated in this section is static load in a single direction and does not include eccentric load. Make eccentric load as small as possible. Not doing so can cause the direct drive motor to be damaged.

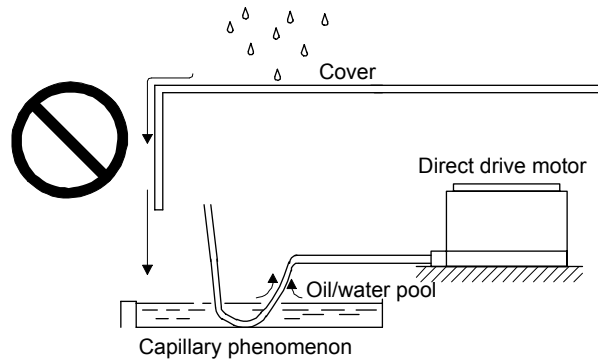
## 2. DIRECT DRIVE MOTOR

---

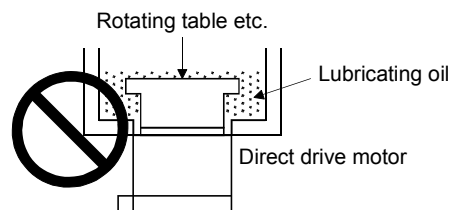
### 2.3.5 Protection from oil and water

Provide adequate protection to prevent foreign matter, such as oil and water from entering the direct drive motor rotor. When installing the direct drive motor, consider the items in this section.

- (1) Do not use the direct drive motor with its cable soaked in oil or water.



- (2) Provide measures so that the direct drive motor is not exposed to oil and water entering from the machine side, rotating table, etc.



- (3) If the direct drive motor is exposed to cutting fluid, etc., the sealant, packing, cable and others may be affected depending on the fluid type.
- (4) In the environment where the direct drive motor is exposed to oil mist, oil, water, grease and/or like, a standard specification direct drive motor may not be usable. Provide measures to prevent dust and/or water on the machine side.

## 2. DIRECT DRIVE MOTOR

### 2.3.6 Inspection



#### WARNING

- Before starting maintenance and/or inspection, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P(+) and N(–) is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, always confirm from the front of the servo amplifier, whether the charge lamp is off or not.
- To avoid the risk of electric shock, only qualified personnel should attempt inspections. For repair, contact your local sales office.



#### CAUTION

- Do not disassemble and/or repair the equipment on customer side.

It is recommended to make the following checks periodically.

- (a) Check the direct drive motor bearings, etc. for unusual noise.
- (b) Check the cables and the like for scratches and cracks. Especially when the junction cable is movable, perform periodic inspection according to operating conditions.
- (c) Check the direct drive motor rotor (output shaft) and coupling for misalignment.
- (d) Check the power supply connector and encoder connector tightening for looseness.

### 2.3.7 Life

The following parts must be replaced periodically as listed below. If any part is found faulty, it must be replaced immediately even when it has not yet reached the end of its life, which depends on the operating method and environmental conditions. For parts replacement, please contact your local sales office.

Parts name	Guideline of life	Remarks
Bearings	20,000 to 30,000 hours	The Guideline of Life field gives the reference time. If any fault is found before this time is reached, the parts must be replaced.
Encoder	20,000 to 30,000 hours	
Absolute position storage unit (option)	20,000 to 30,000 hours	
Battery MR-J3BAT (option)	5,000 hours (battery life with power off)	

When the direct drive motor is run at rated speed under rated load, bearings should be exchanged in 20,000 to 30,000 hours as a guideline. This differs on the operating conditions. The bearings must also be replaced if unusual noise or vibration is found during inspection.

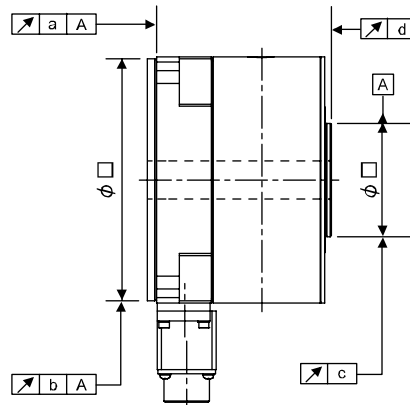
## 2. DIRECT DRIVE MOTOR

### 2.3.8 Machine accuracies

The following table indicates the machine accuracies of the direct drive motor around the rotor (output shaft) and mounting. (except the optional products)

Item	Measured part	Accuracy [mm]
Runout of flange surface about rotor (output shaft)	a	0.05
Runout of fitting outer diameter of flange surface	b	0.07
Runout of rotor (output shaft)	c	0.04
Runout of rotor (output shaft) end	d	0.02

Reference diagram



### 2.3.9 Flange surface size

The rated torque of the direct drive motor indicates the permissible continuous torque value that can be generated at the specific ambient temperature (0 to 40°C). The direct drive motor is installed on the specified aluminum surface shown in this table.

Flange surface size [mm]	Direct drive motor TM-RFM□
400 × 400 × 20	002C20
	004C20
	006C20
450 × 450 × 12	006E20
	012E20
	018E20
550 × 550 × 12	012G20
	048G20
	072G20
750 × 750 × 45	040J10
	120J10
	240J10



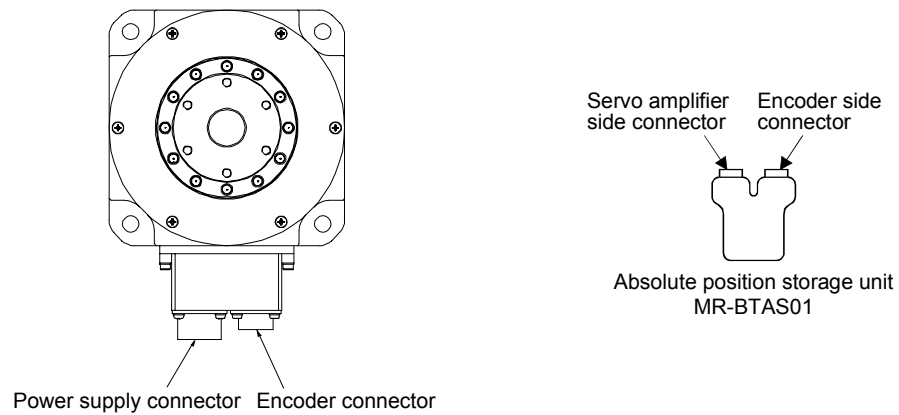
## 2. DIRECT DRIVE MOTOR

### 2.4 Connectors used for direct drive motor wiring

POINT
<ul style="list-style-type: none"> <li>The IP rating indicated is the connector's protection against ingress of dust and water when the connector is connected to a servo amplifier, direct drive motor and absolute position storage unit. If the IP rating of the connector, servo amplifier, direct drive motor and absolute position storage unit vary, the overall IP rating depends on the lowest IP rating of all components.</li> </ul>

#### 2.4.1 Selection of connectors

Use the connector configuration products given in the table as the connectors for connection with the direct drive motor. Refer to section 2.4.2 for the compatible connector configuration products.

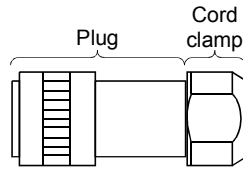


Direct drive motor	Wiring connector			
	For power supply	For encoder	Absolute position storage unit (Option) (Note)	
			Servo amplifier side	Encoder side
TM-RFM□C20	Connector configuration B	Connector configuration A	Connector configuration A	Connector configuration F
TM-RFM□E20				
TM-RFM□G20	Connector configuration D			
TM-RFM040J10				
TM-RFM120J10				
TM-RFM240J10	Connector configuration E			

Note. This absolute position storage unit is required for configuring absolute position detection system.

## 2. DIRECT DRIVE MOTOR

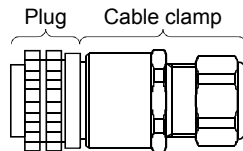
### 2.4.2 Wiring connectors (Connector configurations A · B · C · D · E · F)



Connector configuration	Feature	Plug (Hirose Electric)			Recommended cable (Bando Densen)		Direct drive motor encoder connector or absolute position storage unit connector (servo amplifier side) (Note 1)
		Type	Plug	Cord clamp	Model name	Overall diameter of cable [mm] (Reference)	
A	IP67	Straight	RM15WTPZK-12S	JR13WCCA-8(72)	20276 VSVPAWG#23×6P KB-0492 (Note 2)	8.2	RM15WTRZB-12P(72)

Note 1. The connector to be mated.

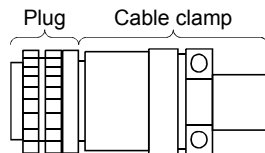
2. Purchase from Toa Electric Industry Co. Ltd., Nagoya Branch



Connector configuration	Feature	Plug (DDK)		Cable clamp		Direct drive motor power supply connector (Note 2)
		Type	Model name	Overall diameter of cable [mm] (Reference)	Model name	
B	IP67 EN compliant	Straight	CE05-6A14S-2SD-D Applicable wire size: AWG 22 to 16	4 to 8	ACS-08RL-MS14F (Nippon Flex)	CE05-2A14S-2PD-D
				8 to 12	ACS-12RL-MS14F (Nippon Flex)	
				5 to 8.3	YSO14-5 to 8 (Daiwa Dengyo)	
				8.3 to 11.3	YSO14-9 to 11 (Daiwa Dengyo)	
	General environment (Note 1)		D/MS3106B14S-2S Applicable wire size: AWG 22 to 16	7.9 or less (bushing ID)	D/MS3057-6A	

Note 1. Not comply with the EN.

2. The connector to be mated.

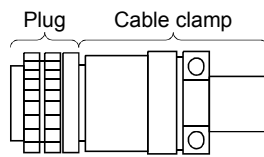


Connector configuration	Feature	Plug (DDK)		Cable clamp (DDK)		Direct drive motor power supply connector (Note 2)
		Type	Model name	Overall diameter of cable [mm] (Reference)	Model name	
C	IP67 EN compliant General environment (Note 1)	Straight	CE05-6A18-10SD-D-BSS Applicable wire size: AWG 14 to 12	8.5 to 11	CE3057-10A-2-D	CE05-2A18-10PD-D
				10.5 to 14.1	CE3057-10A-1-D	
				14.3 or less (bushing ID)	D/MS3057-10A	

Note 1. Not comply with the EN.

2. The connector to be mated.

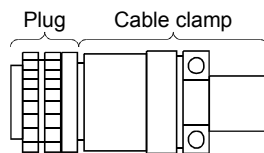
## 2. DIRECT DRIVE MOTOR



Connector configuration	Feature	Plug (DDK)		Cable clamp (DDK)		Direct drive motor power supply connector (Note 2)
		Type	Model name	Overall diameter of cable [mm] (Reference)	Model name	
D	IP67 EN compliant	Straight	CE05-6A22-22SD-D-BSS Applicable wire size: AWG 10 to 8	9.5 to 13	CE3057-12A-2-D	CE05-2A22-22PD-D
	General environment (Note 1)		D/MS3106B22-22S Applicable wire size: AWG 10 to 8	12.5 to 16	CE3057-12A-1-D	
				15.9 or less (bushing ID)	D/MS3057-12A	

Note 1. Not comply with the EN.

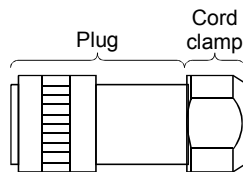
2. The connector to be mated.



Connector configuration	Feature	Plug (DDK)		Cable clamp (DDK)		Direct drive motor power connector (Note 2)
		Type	Model name	Overall diameter of cable [mm] (Reference)	Model name	
E	IP67 EN compliant	Straight	CE05-6A32-17SD-D-BSS Applicable wire size: AWG 6 to 4	22 to 23.8	CE3057-20A-1-D	CE05-2A32-17PD-D
	General environment (Note 1)		D/MS3106B32-17S Applicable wire size: AWG 6 to 4	23.8 or less (bushing ID)	D/MS3057-20A	

Note 1. Not comply with the EN.

2. The connector to be mated.



Connector configuration	Feature	Plug (Hirose Electric)			Recommended cable (Bando Densen)		Absolute position storage unit connector (encoder side) (Note 1)
		Type	Plug	Cord clamp	Model name	Overall diameter of cable [mm] (Reference)	
F	IP67	Straight	RM15WTPZ-12P(72)	JR13WCCA-8(72)	20276 VSVPAWG#23×6P KB-0492 (Note 2)	8.2	RM15WTRZB-12S(72)

Note 1. The connector to be mated.

2. Purchase from Toa Electric Industry Co. Ltd., Nagoya Branch

## 2. DIRECT DRIVE MOTOR

### 2.4.3 Connector outline drawings

The connector outline drawings for wiring the direct drive motor are shown below.

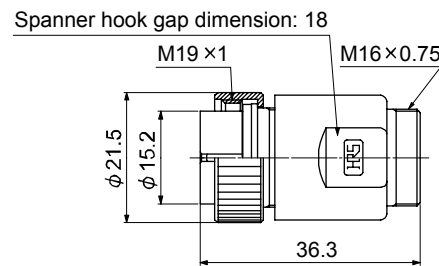
(1) Hirose Electric

- (a) RM15WTPZK-12S  
RM15WTPZ-12P(72)

Model	Connector configuration (Note)
RM15WTPZK-12S	A
RM15WTPZ-12P(72)	F

Note. For the connector configuration, refer to section 2.4.2.

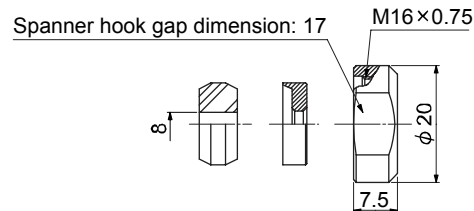
[Unit: mm]



(b) JR13WCCA-8(72)

For the connector configuration, refer to the connector configuration A and F of section 2.4.2.

[Unit: mm]

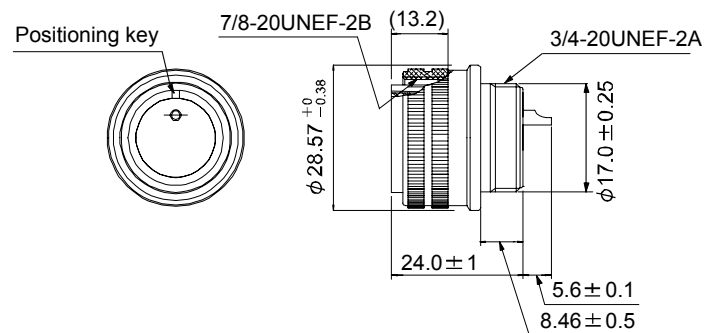


(2) DDK

- (a) CE05-6A14S-2SD-D

For the connector configuration, refer to the connector configuration B of section 2.4.2.

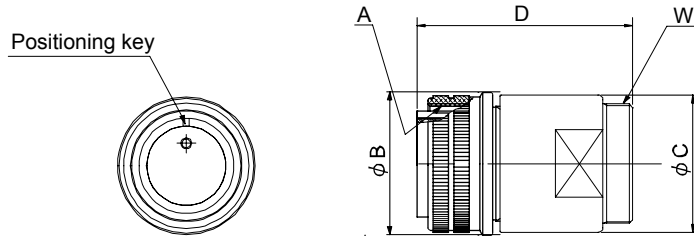
[Unit: mm]



## 2. DIRECT DRIVE MOTOR

- (b) CE05-6A18-10SD-D-BSS
- CE05-6A22-22SD-D-BSS
- CE05-6A32-17SD-D-BSS

[Unit: mm]

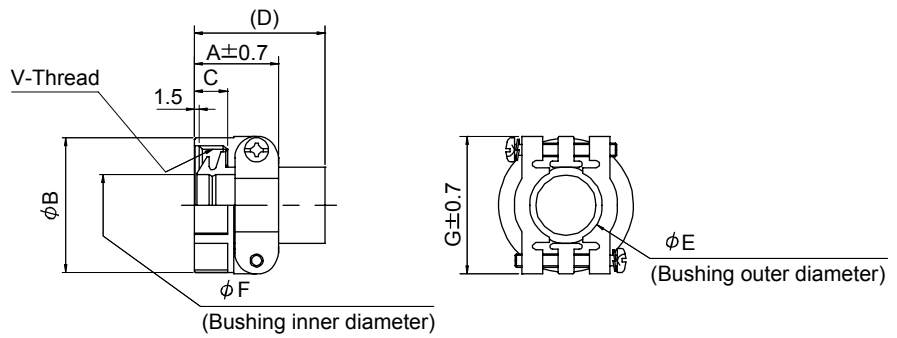


Model	A	$B_{-0.38}^{+0}$	$C \pm 0.8$	D or less	W	Connector configuration (Note)
CE05-6A18-10SD-D-BSS	1 1/8-18UNEF-2B	34.13	32.1	57	1-20UNEF-2A	C
CE05-6A22-22SD-D-BSS	1 3/8-18UNEF-2B	40.48	38.3	61	1 3/16-18UNEF-2A	D
CE05-6A32-17SD-D-BSS	2-18UNS-2B	56.33	54.2	79	1 3/4-18UNS-2A	E

Note. For the connector configuration, refer to section 2.4.2.

- (c) CE3057-10A-1-D
- CE3057-10A-2-D
- CE3057-12A-1-D
- CE3057-12A-2-D
- CE3057-20A-1-D

[Unit: mm]



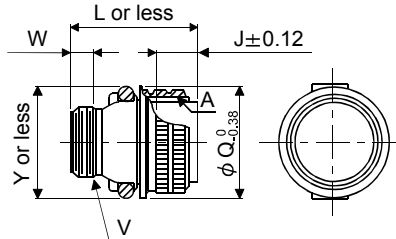
Model	Applicable shell size	A	B	C	(D)	E	F	G	V	Enclosed bushing type	Range of applicable cables (Reference)	Connector configuration (Note)
CE3057-10A-1-D	18	23.8	30.1	10.3	(41.3)	15.9	14.1	31.7	1-20UNEF-2B	CE3420-10-1	10.5 to 14.1	C
CE3057-10A-2-D							11.0			CE3420-10-2	8.5 to 11	
CE3057-12A-1-D	22	23.8	35	10.3	(41.3)	19	16.0	37.3	1 3/16-18UNEF-2B	CE3420-12-1	12.5 to 16	D
CE3057-12A-2-D							13.0			CE3420-12-2	9.5 to 13	
CE3057-20A-1-D	32	27.8	51.6	11.9	(43.0)	32.0	23.8	51.6	1 3/4-18UNS-2B	CE3420-20-1	22.0 to 23.8	E

Note. For the connector configuration, refer to section 2.4.2.

## 2. DIRECT DRIVE MOTOR

- (d) D/MS3106B14S-2S
- D/MS3106B18-10S
- D/MS3106B22-22S
- D/MS3106B32-17S

[Unit: mm]

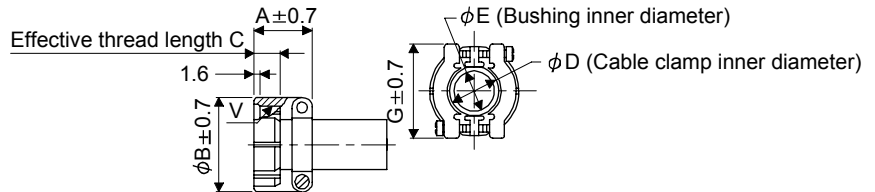


Model name	A	J	L	Q	V	W	Y	Connector configuration (Note)
D/MS3106B14S-2S	7/8-20UNEF	13.49	42.88	28.57	3/4-20UNEF	8.00	30	B
D/MS3106B18-10S	1 1/8-18UNEF	18.26	52.37	34.13	1-20UNEF	9.53	42	C
D/MS3106B22-22S	1 3/8-18UNEF	18.26	56.57	40.48	1 3/16-18UNEF	9.53	50	D
D/MS3106B32-17S	2-18UNS	18.26	61.92	56.33	1 3/4-18UNS	11.13	66	E

Note. For the connector configuration, refer to section 2.4.2.

- (e) D/MS3057-6A
- D/MS3057-10A
- D/MS3057-12A
- D/MS3057-20A

[Unit: mm]



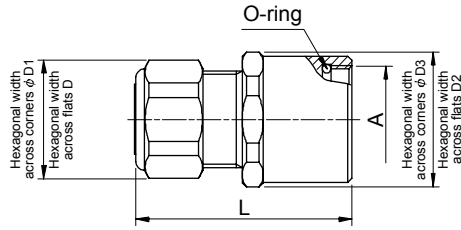
Model name	Shell size	A	B	C	D	E	G	V	Bushing	Connector configuration (Note)
D/MS3057-6A	14S	22.2	24.6	10.3	11.2	7.9	27.0	3/4-20UNEF	AN3420-6	B
D/MS3057-10A	18	23.8	30.1	10.3	15.9	14.3	31.7	1-20UNEF	AN3420-10	C
D/MS3057-12A	22	23.8	35.0	10.3	19.0	15.9	37.3	1 3/16-18UNEF-2A	AN3420-12	D
D/MS3057-20A	32	27.8	51.6	11.9	31.7	23.8	51.6	1 3/4-18UNS	AN3420-20	E

Note. For the connector configuration, refer to section 2.4.2.

## 2. DIRECT DRIVE MOTOR

### (3) Daiwa Dengyo

[Unit: mm]

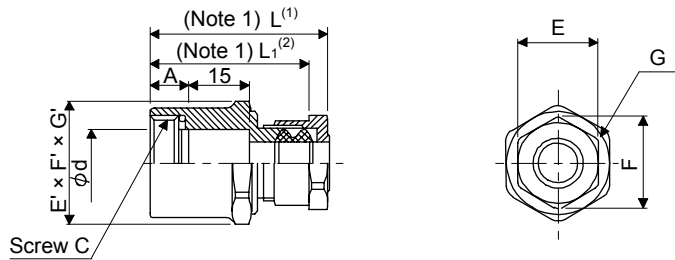


Model name	Applicable cable OD	A	Length before tightening L	Width across flats D	Width across corners D1	Width across flats D2	Width across corners D3	Connector configuration (Note)
YSO14-5 to 8	4 to 8.3	3/4-20UNEF-2B	44	23	25	26	28	B
YSO14-9 to 11	7 to 11.3							

Note. For the connector configuration, refer to the section 2.4.2.

### (4) Nippon Flex

[Unit: mm]



Model name	Screw C	Applicable cable OD	A	φd	Tightening nut			Nipple body			L	L <sub>1</sub>	Connector configuration (Note 2)
					E Two-face width	F Width across corners	G Number of corners	E' Two-face width	F' Width across corners	G' Number of corners			
ACS-08RL-MS14F	3/4-20UNEF-2B	4.0 to 8.0	7	15.0	20	22.0	6	22	24.2	6	46	41	B
ACS-12RL-MS14F	3/4-20UNEF-2B	8.0 to 12.0	7	15.0	24	26.4	6	36	28.6	6	46	41	

Note 1. (1) Indicates the reference dimension before assembling, and (2) indicates the reference dimension after assembling.

2. For the connector configuration, refer to section 2.4.2.

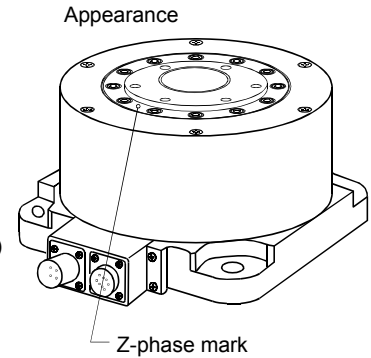
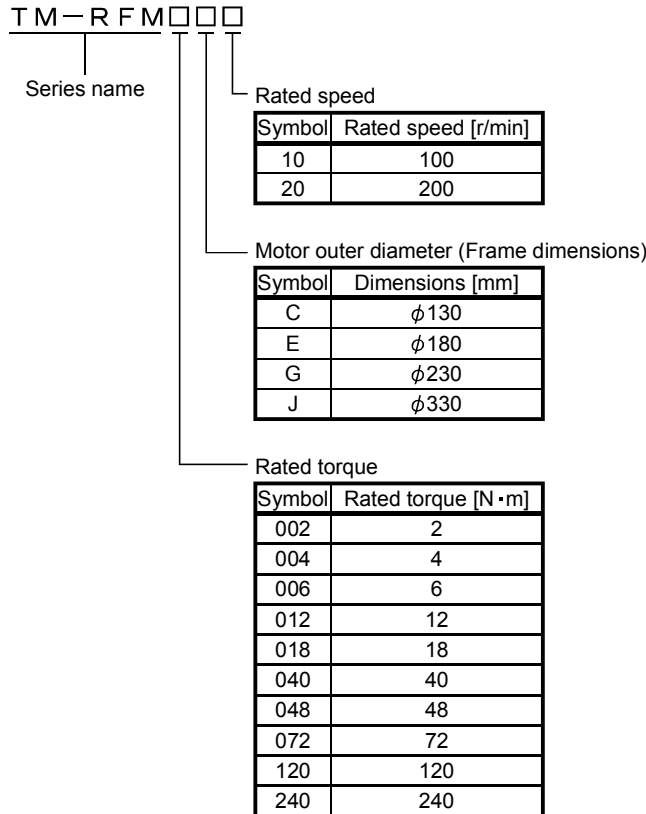
## 2. DIRECT DRIVE MOTOR

### 2.5 TM-RFM series direct drive motor

This section provides information on the specifications and characteristics of the direct drive motor. When using the TM-RFM series direct drive motor, always read the Safety Instructions in the beginning of this manual in addition to this section.

#### 2.5.1 Model code definition

The following describes what each block of a model name indicates. Note that not all the combinations of the symbols exist.





## 2. DIRECT DRIVE MOTOR

### 2.5.2 Specification list

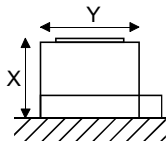
Direct drive motor			TM-RFM series								
			002C20	004C20	006C20	006E20	012E20	018E20			
Item											
Motor outer diameter (Frame dimensions) [mm]			φ 130			φ 180					
Compatible servo amplifier model MR-J3-□-RJ080W			20B	40B	60B	60B	70B	100B			
Continuous running duty (Note 1)	Rated output [W]		42	84	126	126	251	377			
	Rated torque	[N · m]	2	4	6	6	12	18			
		[oz · in]	283	566	850	850	1700	2550			
Rated speed (Note 1) [r/min]			200								
Maximum speed [r/min]			500								
Instantaneous permissible speed [r/min]			575								
Maximum torque			[N · m]	6	12	18	18	36	54		
			[oz · in]	850	1700	2550	2550	5100	7650		
Power rate at continuous rated torque [kW/s]			3.7	9.6	16.1	4.9	12.9	21.8			
Inertia moment			J [ $\times 10^{-4}$ kg · m <sup>2</sup> ]	10.9	16.6	22.4	74	111	149		
			WK <sup>2</sup> [oz · in <sup>2</sup> ]	59.6	90.8	122	405	607	815		
Recommended ratio of load inertia moment to direct drive motor rotor inertia moment (Note 2)			50 times or less								
Absolute accuracy [s]			± 15			± 12.5					
Power supply capacity (Note 3) [kVA]			0.25	0.38	0.53	0.46	0.81	1.3			
Rated current [A]			1.3	2.1	3.1	3.1	3.8	5.9			
Maximum current [A]			3.9	6.3	9.3	9.3	12	18			
Speed/position detector (Note 4)			Encoder common to absolute position and incremental detection systems (Resolution per direct drive motor 1 rotation: 1048576pulse/rev)								
Insulation class			Class F								
Structure			Totally enclosed, natural cooling (IP rating : IP42 (Note 5))								
Environmental conditions (Note 6)			Ambient temperature	Operation	[°C]	0 to 40 (non-freezing)					
					[°F]	32 to 104 (non-freezing)					
				Storage	[°C]	-15 to 70 (non-freezing)					
					[°F]	5 to 158 (non-freezing)					
			Ambient humidity	Operation		80%RH or less (non-condensing)					
				Storage		90%RH or less (non-condensing)					
			Ambience		Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust or splash of oil or water.						
			Altitude		Max.1000m above sea level						
Vibration resistance (Note 7) [m/s <sup>2</sup> ]			X: 49 Y: 49								
Vibration rank (Note 8)			V-10								
Permissible load for the rotor (Note 9)			Moment load	[N · m]	22.5			70			
				[oz · in]	3190			9910			
			Axial load		[N]	1100			3300		
Mass			[kg]	5.2	6.8	8.4	11	15	18		
			[lb]	12	15	19	25	33	40		

## 2. DIRECT DRIVE MOTOR

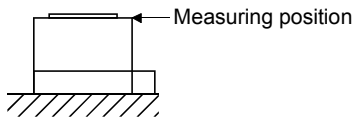
Direct drive motor				TM-RFM series												
				012G20		048G20		072G20		040J10		120J10		240J10		
Item																
Motor outer diameter (Frame dimensions) [mm]				$\phi 230$						$\phi 330$						
Compatible servo amplifier model MR-J3-□-RJ080W				70B		350B		350B		70B		350B		500B		
Continuous running duty (Note 1)	Rated output [W]			251		1005		1508		419		1257		2513		
	Rated torque	[N · m]			12		48		72		40		120		240	
		[oz · in]			1700		6800		10200		5660		17000		34000	
Rated speed (Note 1) [r/min]				200						100						
Maximum speed [r/min]				500						200						
Instantaneous permissible speed [r/min]				575						230						
Maximum torque	[N · m]			36		144		216		120		360		720		
	[oz · in]			5100		20400		30600		17000		51000		102000		
Power rate at continuous rated torque [kW/s]				6.0		37.5		59.3		9.4		40.9		91.4		
Inertia moment	J [ $\times 10^{-4}$ kg · m <sup>2</sup> ]			238		615		875		1694		3519		6303		
	WK <sup>2</sup> [oz · in <sup>2</sup> ]			1300		3360		4780		9260		19200		34500		
Recommended ratio of load inertia moment to direct drive motor rotor inertia moment (Note 2)				50 times or less												
Absolute accuracy [s]				$\pm 12.5$						$\pm 10$						
Power supply capacity (Note 3) [kVA]				0.71		2.7		3.8		1.2		3.4		6.6		
Rated current [A]				3.4		10.9		16		4.3		11		20		
Maximum current [A]				10		33		48		13		33		60		
Speed/position detector (Note 4)				Encoder common to absolute position and incremental detection systems (Resolution per direct drive motor 1 rotation: 1048576pulse/rev)												
Insulation class				Class F												
Structure				Totally enclosed, natural cooling (IP rating: IP42 (Note 5))												
Environmental conditions (Note 6)	Ambient temperature	Operation	[°C]	0 to 40 (non-freezing)												
			[°F]	32 to 104 (non-freezing)												
		Storage	[°C]	-15 to 70 (non-freezing)												
			[°F]	5 to 158 (non-freezing)												
	Ambient humidity	Operation		80%RH or less (non-condensing)												
		Storage		90%RH or less (non-condensing)												
	Ambience			Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust or splash of oil or water.												
	Altitude			Max.1000m above sea level												
Vibration resistance (Note 7) [m/s <sup>2</sup> ]			X: 49 Y: 49						X: 24.5 Y: 24.5							
Vibration rank (Note 8)				V-10												
Permissible load for the rotor (Note 9)	Moment load	[N · m]			93						350					
		[oz · in]			13200						49600					
	Axial load [N]			5500						16000						
Mass	[kg]			17		36		52		53		91		146		
	[lb]			38		80		115		120		205		325		

## 2. DIRECT DRIVE MOTOR

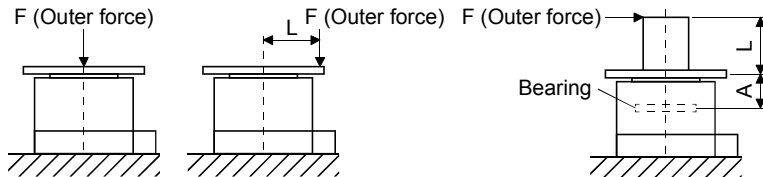
- Note 1. When the power supply voltage drops, the output and the rated speed cannot be guaranteed.
2. If the load inertia moment ratio exceeds the indicated value, please contact your local sales office.
3. Note that the power supply equipment capacity will vary according to the power supply impedance. This value assumes that the power factor improving AC reactor or the power factor improving DC reactor is not used.
4. Optional battery (MR-J3BAT) and absolute position storage unit (MR-BTAS01) are required for absolute position detection system.
5. Connectors and gap between rotor and stator are excluded.
6. In the environment where the direct drive motor is exposed to oil mist, oil and/or water, a standard specification direct drive motor may not be usable. Take dustproof and waterproof measures on the machine side.
7. The vibration direction is shown in the diagram. The numeric value indicates the maximum value of the component (commonly the bracket in the opposite direction of the direct drive motor rotor (output shaft)). Fretting of the bearing occurs easily when the motor stops, so maintain vibration to approximately one-half of the allowable value.



8. V-10 indicates that the amplitude of a single direct drive motor is  $10\mu\text{m}$  or less. The following figure shows the direct drive motor installation position for measurement and the measuring position.



9. The following is calculation examples of axial and moment loads to the rotor (output shaft). The axial and moment loads must be maintained equal to or below the permissible value.



Axial load  
 $= F + \text{load mass}$

Axial load  
 $= F + \text{load mass}$   
 Moment load  
 $= F \times L$

Axial load = load mass  
 Moment load =  $F \times (L + A)$

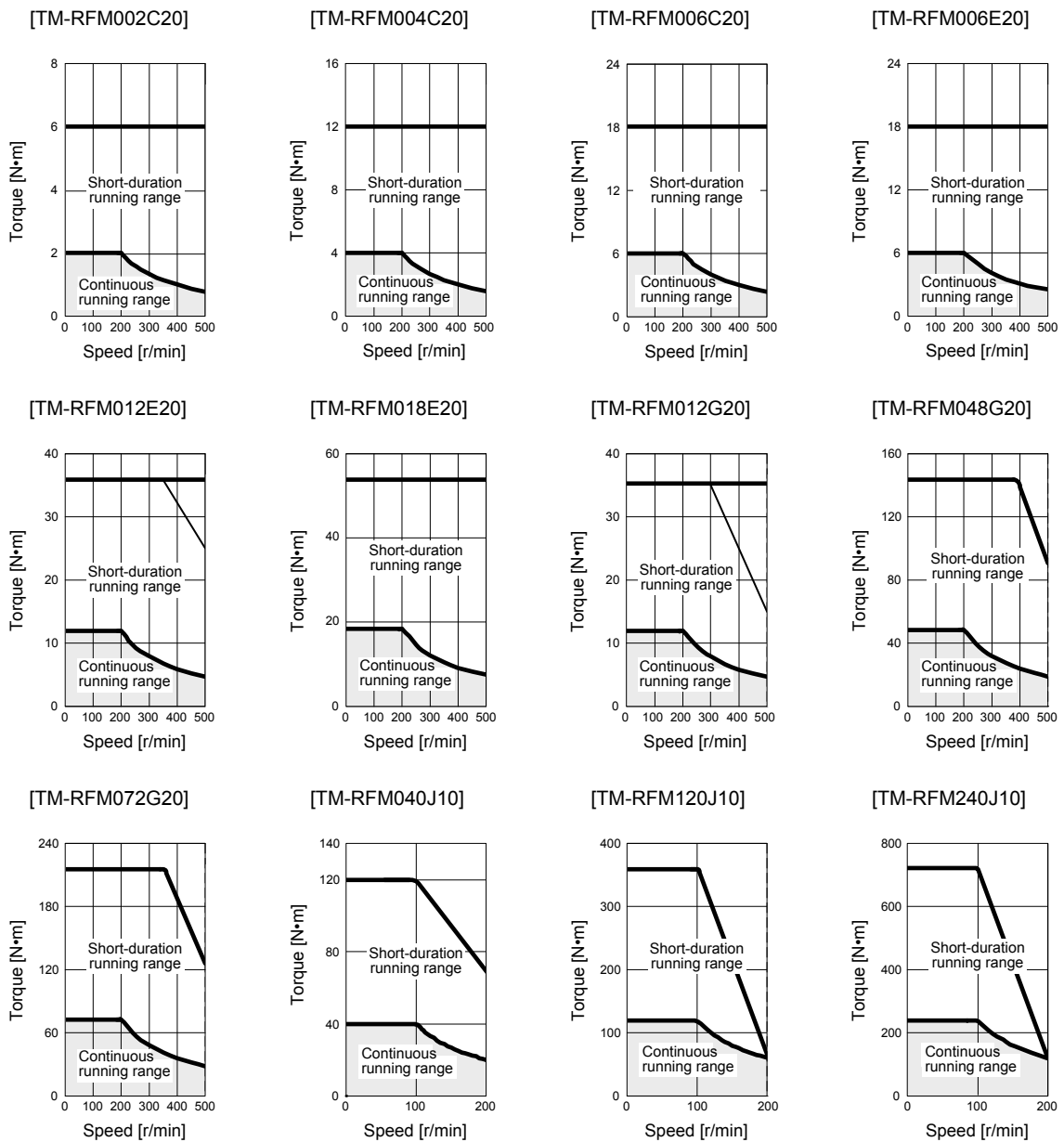
Direct drive motor	Motor outer diameter [mm] (Frame dimensions)	Dimension A [mm]
TM-RFM002C20 to 006C20	$\phi 130$	19.1
TM-RFM006E20 to 018E20	$\phi 180$	20.2
TM-RFM012G20 to 072G20	$\phi 230$	24.4
TM-RFM040J10 to 240J10	$\phi 330$	32.5

## 2. DIRECT DRIVE MOTOR

### 2.5.3 Torque characteristic

POINT
<ul style="list-style-type: none"> <li>When using a machine which generates unbalanced torque including a vertical axis, use an absolute position detection system (Refer to section 2.3.1 (4)). It is recommended that the unbalanced torque is 70% or less of the rated torque.</li> </ul>

When the power supply input of the servo amplifier are 3-phase 200VAC or 1-phase 230VAC, the torque characteristic is indicated by the heavy line. For the 1-phase 200VAC power supply, part of the torque characteristic is indicated by the thin line. The 1-phase power supply input is applicable to the TM-RFM002C20, TM-RFM004C20, TM-RFM006C20, TM-RFM006E20, TM-RFM012E20, TM-RFM012G20 and TM-RFM040J10.



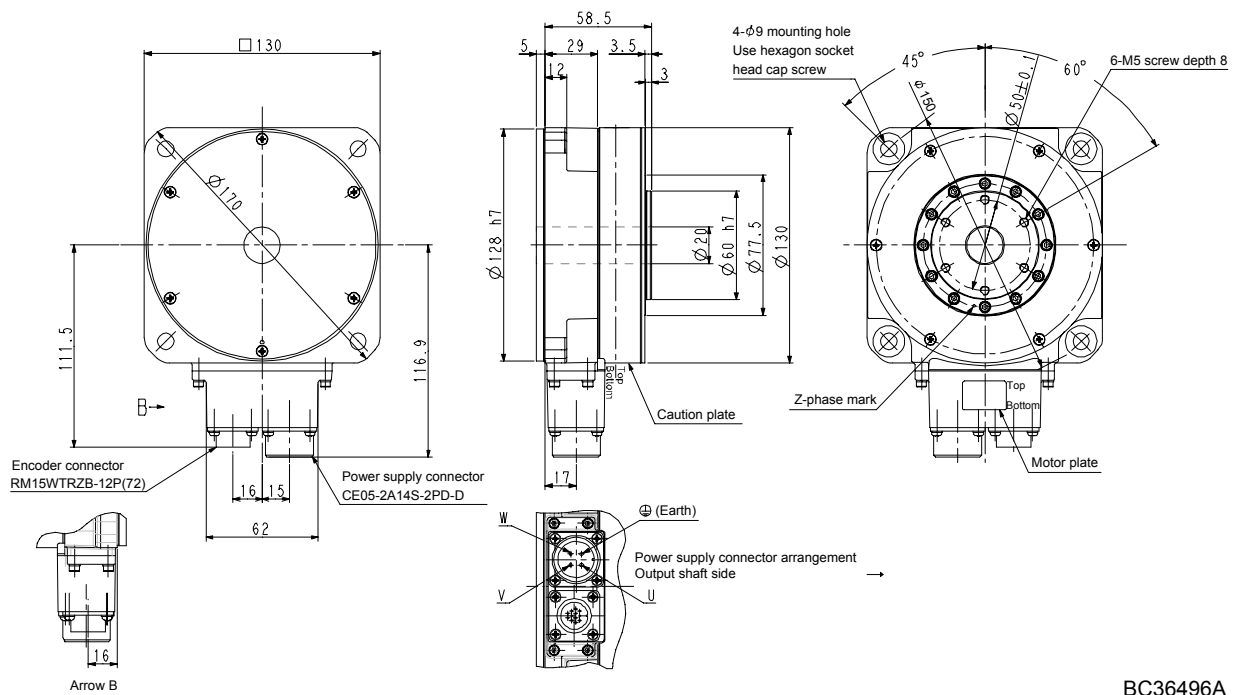
## 2. DIRECT DRIVE MOTOR

### 2.5.4 Outline dimension drawings

The actual dimensions may be 1mm to 3mm larger. Design the machine side with some allowances.  
Apply general tolerances for the dimensions without tolerances.

Model	Output [W]	Inertia moment $J [ \times 10^{-4} \text{kg} \cdot \text{m}^2 ]$ ( $\text{WK}^2 [\text{oz} \cdot \text{in}^2]$ )	Mass [kg] ([lb])
TM-RFM002C20	42	10.9 (59.6)	5.2 (12)

[Unit: mm]



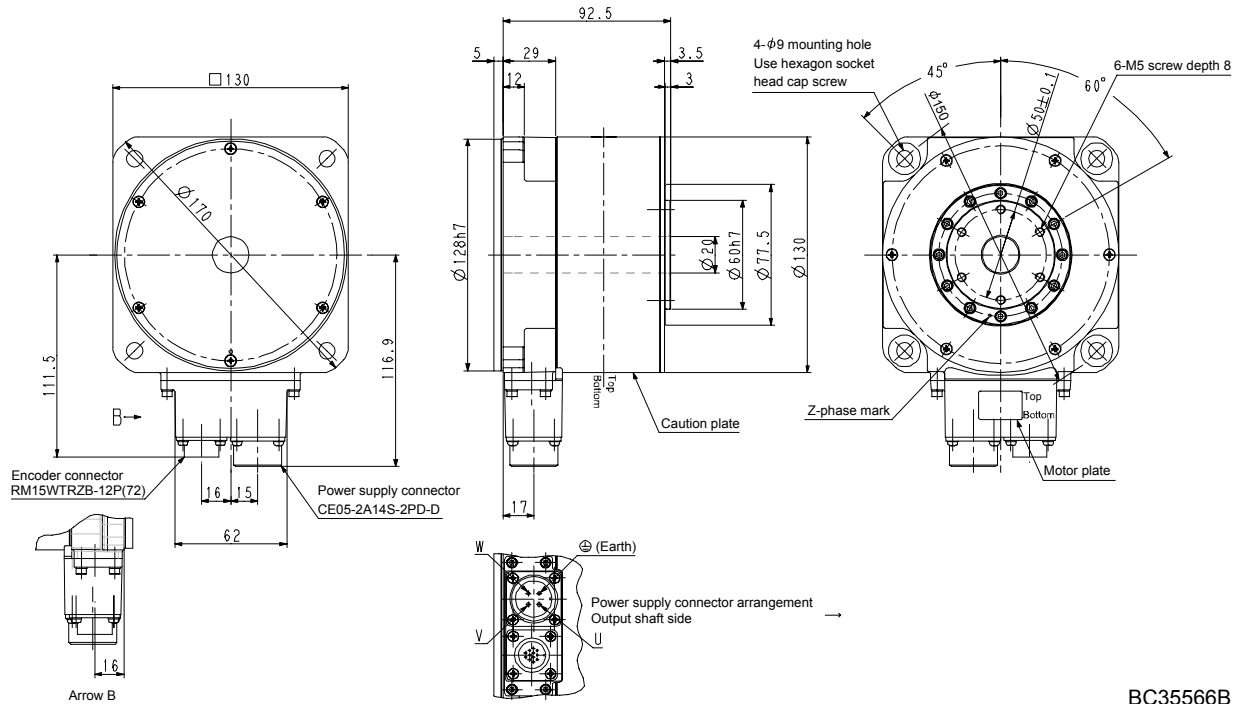
BC36496A



## 2. DIRECT DRIVE MOTOR

Model	Output [W]	Inertia moment J [ $\times 10^{-4} \text{kg} \cdot \text{m}^2$ ] (WK <sup>2</sup> [oz · in <sup>2</sup> ])	Mass [kg] ([lb])
TM-RFM006C20	126	22.4 (122)	8.4 (19)

[Unit: mm]



BC35566B



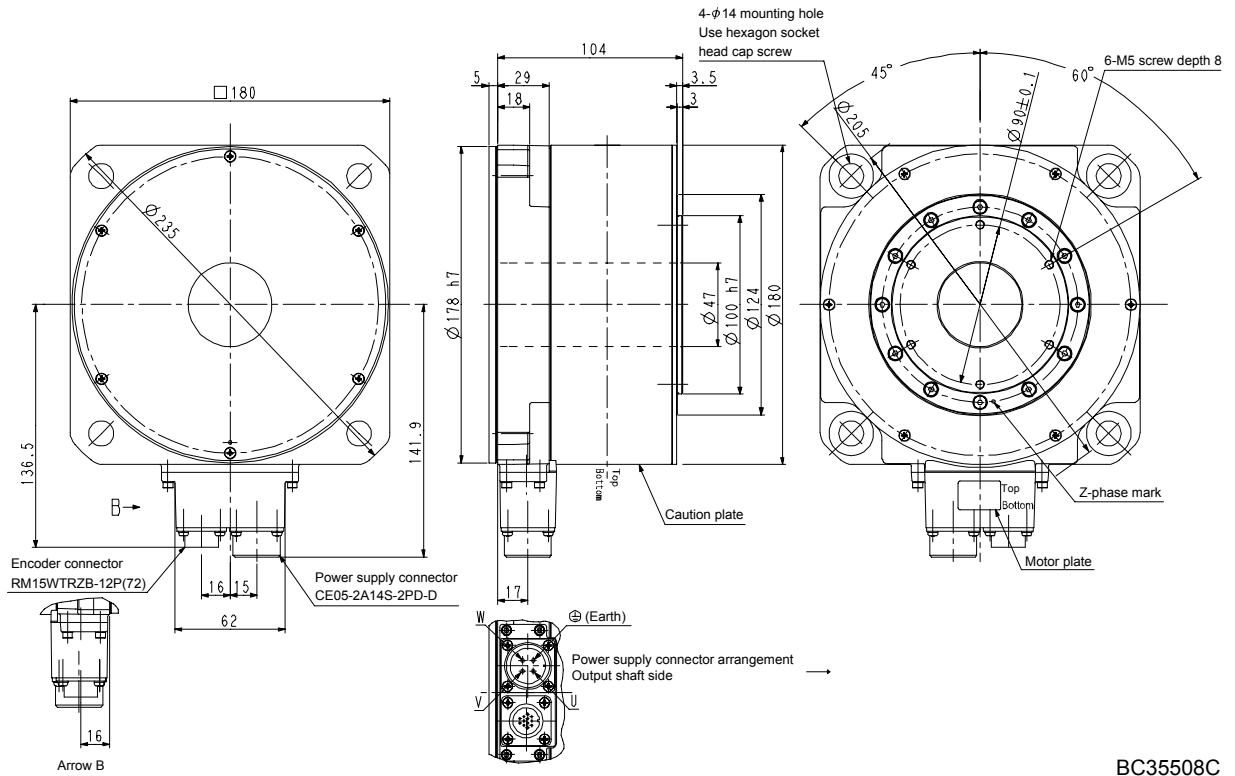




## 2. DIRECT DRIVE MOTOR

Model	Output [W]	Inertia moment J [ $\times 10^{-4}$ kg · m <sup>2</sup> ] (WK <sup>2</sup> [oz · in <sup>2</sup> ])	Mass [kg] ([lb])
TM-RFM018E20	377	149 (815)	18 (40)

[Unit: mm]



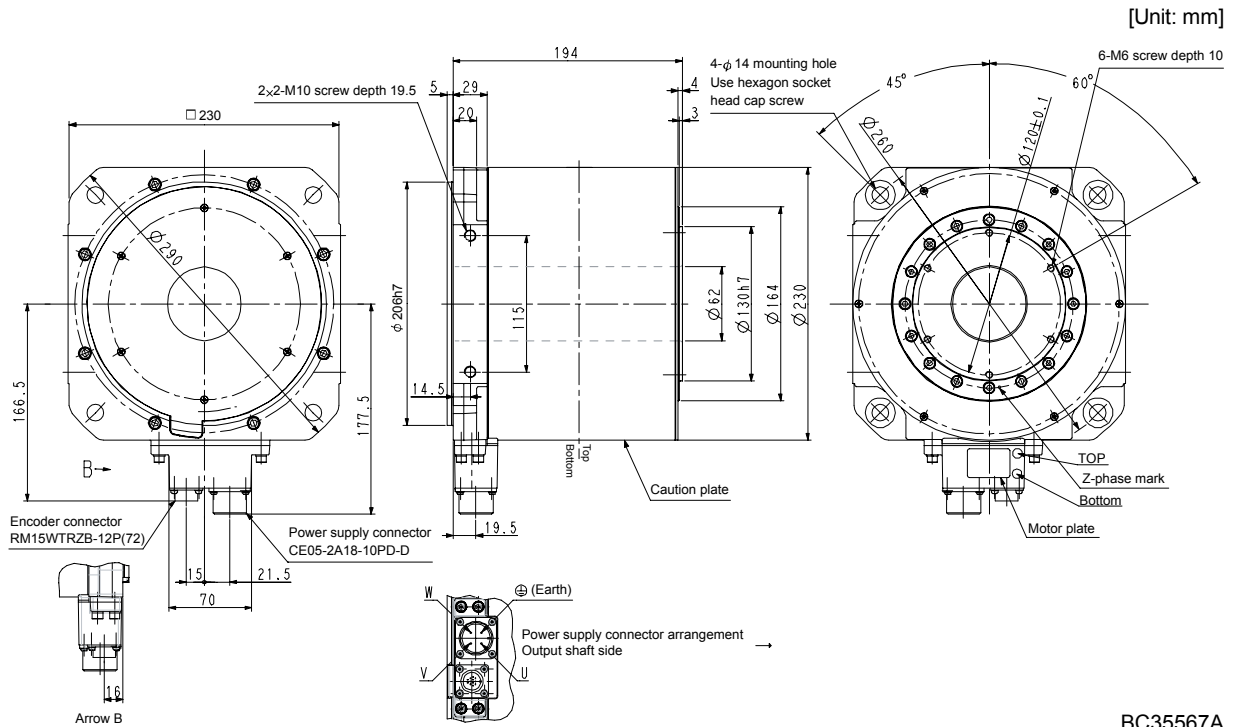
BC35508C





## 2. DIRECT DRIVE MOTOR

Model	Output [W]	Inertia moment J [ $\times 10^{-4}$ kg $\cdot$ m <sup>2</sup> ] (WK <sup>2</sup> [oz $\cdot$ in <sup>2</sup> ])	Mass [kg] ([lb])
TM-RFM072G20	1508	875 (4780)	52 (115)

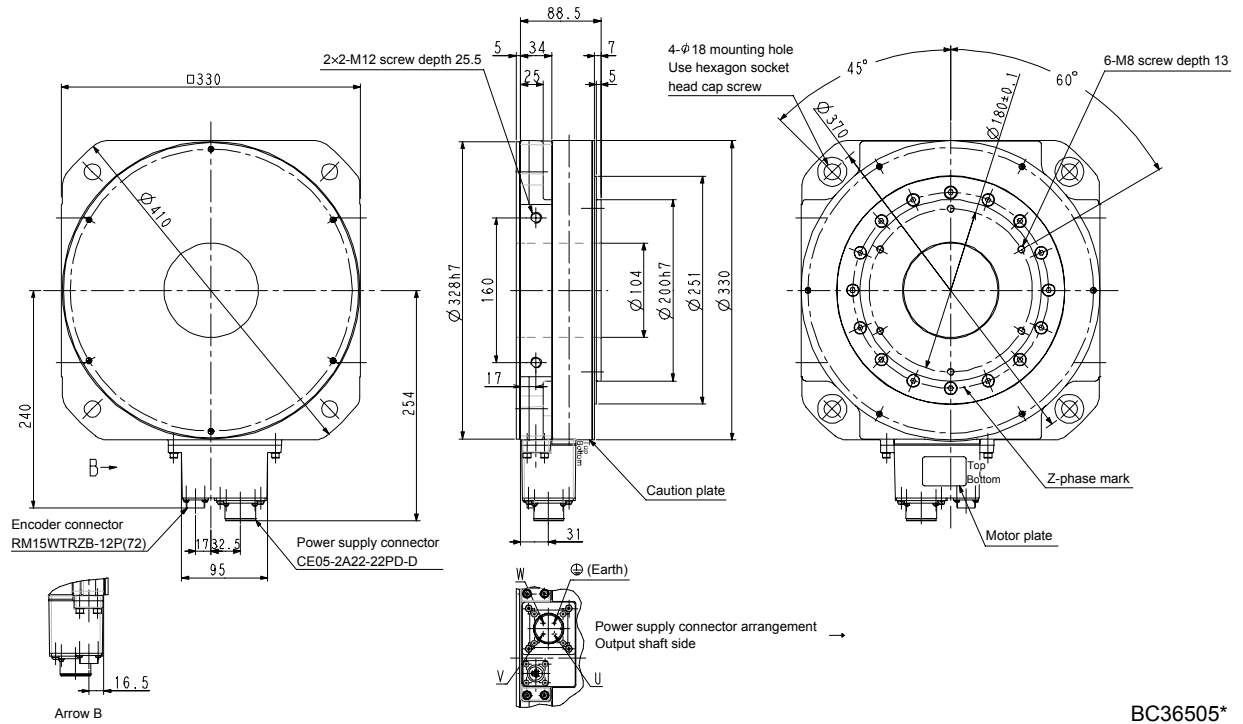


BC35567A

## 2. DIRECT DRIVE MOTOR

Model	Output [W]	Inertia moment J [ $\times 10^{-4}$ kg · m <sup>2</sup> ] (WK <sup>2</sup> [oz · in <sup>2</sup> ])	Mass [kg] ([lb])
TM-RFM040J10	838	1694 (9260)	53 (120)

[Unit: mm]

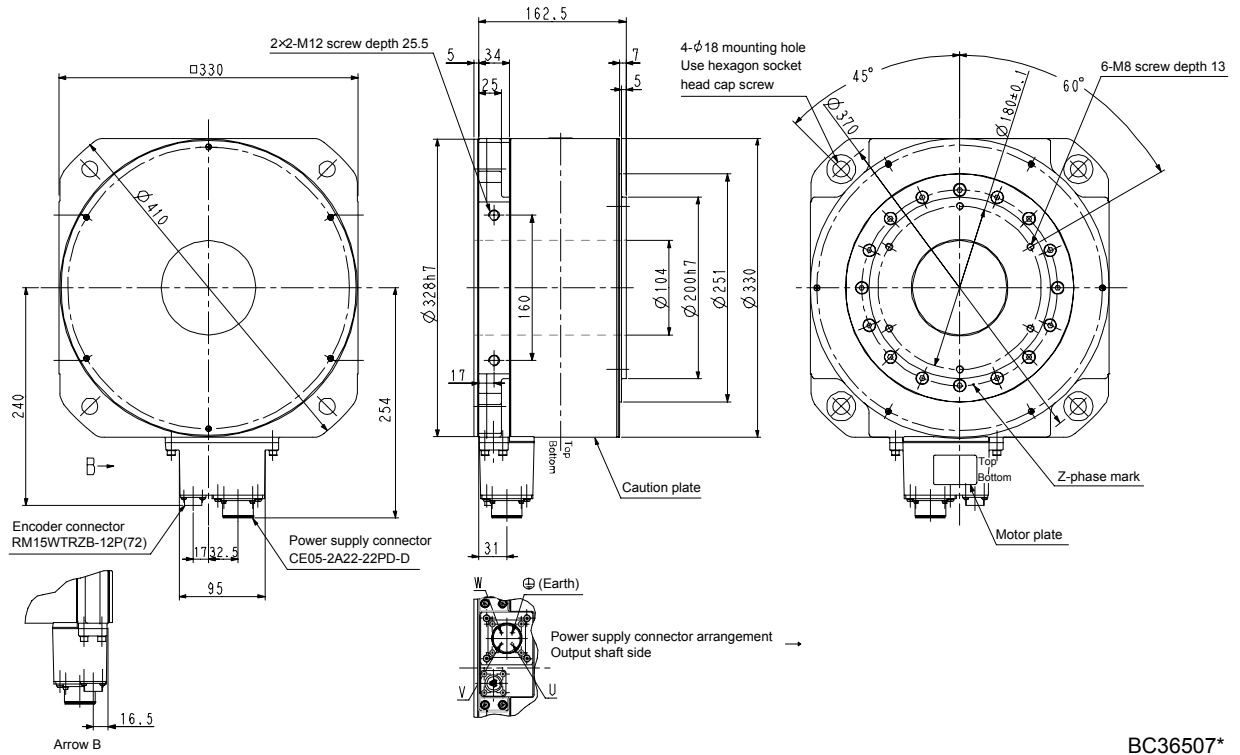


BC36505\*

## 2. DIRECT DRIVE MOTOR

Model	Output [W]	Inertia moment J [ $\times 10^{-4}$ kg · m <sup>2</sup> ] (WK <sup>2</sup> [oz · in <sup>2</sup> ])	Mass [kg] ([lb])
TM-RFM120J10	2513	3519 (19200)	91 (205)

[Unit: mm]



BC36507\*





## 2. DIRECT DRIVE MOTOR

### 2.5.5 Connection of servo amplifier and direct drive motor



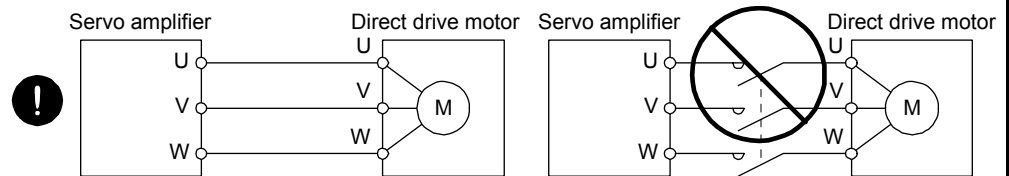
WARNING

- Any person who is involved in wiring should be fully competent to do the work.
- Ground the direct drive motor securely.
- Do not attempt to wire the direct drive motor until it has been installed. Otherwise, it may cause an electric shock.
- The cables should not be damaged, stressed, loaded, or pinched. Otherwise, it may cause an electric shock.
- To avoid an electric shock, insulate the connection areas of the power supply terminals.



CAUTION

- Wire the equipment correctly and securely. Otherwise, the direct drive motor may operate unexpectedly, resulting in injury.
- Connect cables to the correct terminals. Otherwise, a burst, damage, etc. may occur.
- Ensure that polarity (+/-) is correct. Otherwise, a burst, damage, etc. may occur.
- Do not install a power capacitor, surge killer, or radio noise filter (FR-BIF option) on the power line of the direct drive motor.
- Do not modify the equipment.
- Connect the servo amplifier power output (U, V, and W) to the direct drive motor power input (U, V, and W) directly. Do not let a magnetic contactor, etc. intervene. Otherwise, it may cause a malfunction.



## 2. DIRECT DRIVE MOTOR

### (1) Connection instructions



CAUTION

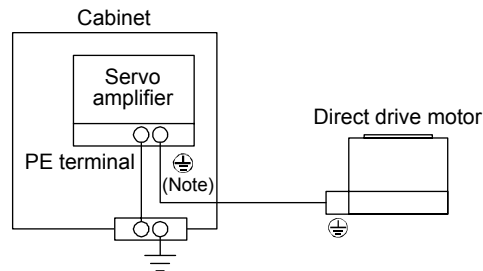
- To avoid a malfunction, connect the power supply phases (U, V, and W) of the servo amplifier and the direct drive motor correctly.
- Do not connect AC power supply directly to the direct drive motor. Otherwise, it may cause a malfunction.

#### POINT

- Refer to chapter 9 for the encoder cable.

This section explains the connection of the direct drive motor power (U, V, and W). Use of the optional connector is recommended for connection between the servo amplifier and direct drive motor. Refer to chapter 9 for details of the options.

For grounding, connect the grounding lead wire from the direct drive motor to the protective earth (PE) terminal of the servo amplifier, and then connect the wire from the servo amplifier to the ground via the protective earth of the cabinet. Do not connect the wire directly to the protective earth of the cabinet.

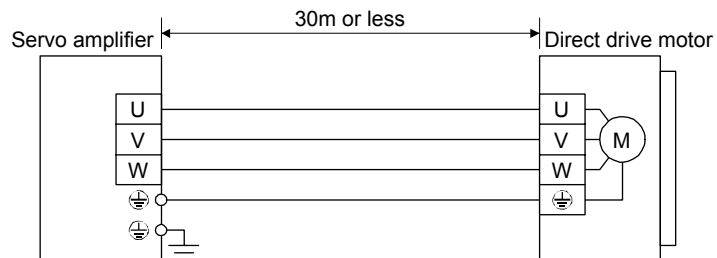


Note. The number of PE terminals of the servo amplifier differs depending on the amplifier type.

### (2) Direct drive motor power cable wiring diagram

Fabricate a cable as shown below.

Refer to section 3.2.1 for the wires used for the cable.





### 3. SIGNALS AND WIRING

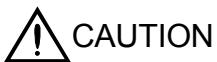
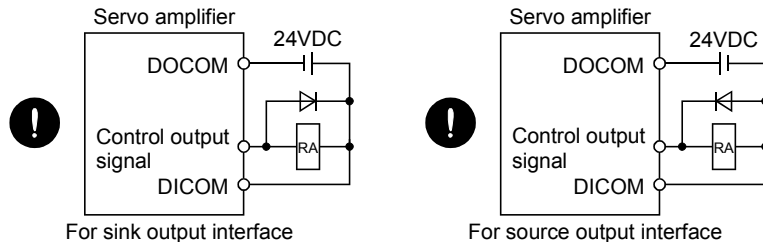
#### 3. SIGNALS AND WIRING



**WARNING**

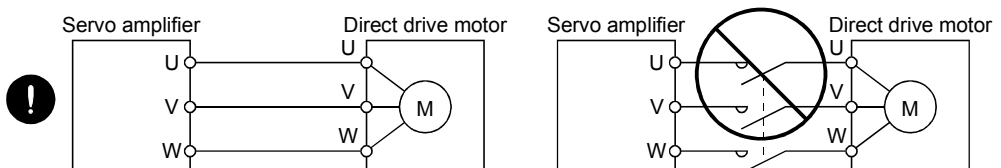
- Any person who is involved in wiring should be fully competent to do the work.
- Before wiring, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P(+) and N(−) is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, always confirm from the front of the servo amplifier whether the charge lamp is off or not.
- Ground the servo amplifier and the direct drive motor securely.
- Do not attempt to wire the servo amplifier and direct drive motor until they have been installed. Otherwise, it may cause an electric shock.
- The cables should not be damaged, stressed excessively, loaded heavily, or pinched. Otherwise, it may cause an electric shock.
- To avoid an electric shock, insulate the connections of the power supply terminals.

- Wire the equipment correctly and securely. Otherwise, the direct drive motor may operate unexpected, resulting in injury.
- Connect cables to correct terminals to prevent a burst, fault, etc.
- Ensure that polarity (+, −) is correct. Otherwise, a burst, damage, etc. may occur.
- The surge absorbing diode installed on the DC output signal relay must be wired in the specified direction. Otherwise, the forced stop (EM1) and other protective circuits may not operate.



**CAUTION**

- Electromagnetic interference may be given to electronic equipment used near the servo amplifier. Use a noise filter, etc. to minimize the influence of electromagnetic interference.
- Do not install a power capacitor, surge killer or radio noise filter (FR-BIF option) with the power line of the direct drive motor.
- When using the regenerative resistor, switch power off with the alarm signal. Otherwise, a transistor fault or the like may overheat the regenerative resistor, causing a fire.
- Do not modify the equipment.
- Connect the servo amplifier power supply output (U, V, and W) to the direct drive motor power supply input (U, V, and W) directly. Do not let a magnetic contactor, etc. intervene. Otherwise, it may cause a malfunction.



### 3. SIGNALS AND WIRING

#### 3.1 Precautions for this chapter

The following items are not described in this chapter. Since these descriptions are the same as those of MR-J3-□B Servo Amplifier, refer to the MR-J3-□B Servo Amplifier Instruction Manual.

Item	MR-J3-□B Servo Amplifier Instruction Manual
Explanation of power supply system	Section 3.3
Signal (device) explanations	Section 3.5
Alarm occurrence timing chart	Section 3.6
Interfaces	Section 3.7 (excluding the internal connection diagram)
Treatment of cable shield external conductor	Section 3.8
SSCNET III cable connection	Section 3.9
Grounding	Section 3.12
Control axis selection	Section 3.13

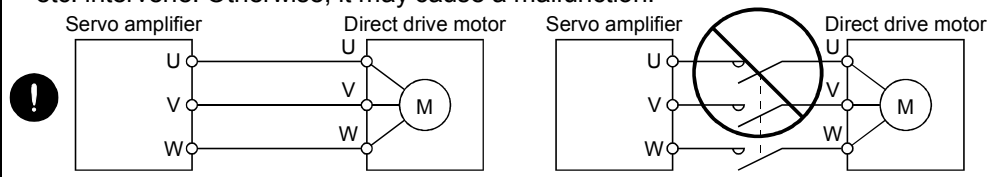
#### 3.2 Input power supply circuit



- Always connect a magnetic contactor between the power supply and the main circuit power supply (L<sub>1</sub>, L<sub>2</sub>, and L<sub>3</sub>) of the servo amplifier, and configure the wiring to be able to shut down the power supply on the side of the servo amplifier's power supply. If a magnetic contactor is not connected, continuous flow of a large current may cause a fire when the servo amplifier malfunctions.
- Use malfunction (ALM) to switch main circuit power supply off. Otherwise, a regenerative transistor fault or the like may overheat the regenerative resistor, causing a fire.
- Check the model and input the correct voltage for the power supply of the servo amplifier. When a voltage, which exceeds the maximum input voltage of the servo amplifier specifications, is input, the servo amplifier malfunctions.

#### POINT

- Even if alarm has occurred, do not switch off the control circuit power supply. When the control circuit power supply has been switched off, optical module does not operate, and optical transmission of SSCNET III communication is interrupted. Therefore, the servo amplifier on the rear axis displays "AA" at the indicator and turns into base circuit shut-off. The direct drive motor stops with starting dynamic brake.
- For details of each signal, refer to section 3.3 of the MR-J3-□B Servo Amplifier Instruction Manual.
- Connect the direct drive motor power terminal (U, V, and W) to the direct drive motor power input terminal (U, V, and W) directly. Do not let a magnetic contactor, etc. intervene. Otherwise, it may cause a malfunction.



Wire the power supply/main circuit as shown below so that power is shut off and the servo-on command turned off as soon as an alarm occurs, a servo forced stop is made valid, or a controller forced stop is made valid. A molded-case circuit breaker (MCCB) must be used with the input cables of the main circuit power supply.

### 3. SIGNALS AND WIRING

#### 3.2.1 Selection example of wires

POINT	<ul style="list-style-type: none"> <li>▪ Selection condition of wire size is as follows.</li> <li style="padding-left: 20px;">Construction condition: One wire is constructed in the air</li> <li style="padding-left: 20px;">Wire length: 30m or less</li> </ul>
-------	---

- (1) When using the 600V Grade heat-resistant polyvinyl chloride insulated wire (HIV wire)  
 Selection example of wire size when using HIV wires is indicated below.

Table 3.1 Wire size selection example 2 (HIV wire)

Servo amplifier	Wires [mm <sup>2</sup> ] (Note 1, 3)			
	L <sub>1</sub> · L <sub>2</sub> · L <sub>3</sub> · ⊕	L <sub>11</sub> · L <sub>21</sub>	U · V · W · ⊕	P · C
MR-J3-20B-RJ080W	2(AWG14)	1.25(AWG16)	1.25(AWG16)	2(AWG14)
MR-J3-40B-RJ080W				
MR-J3-60B-RJ080W				
MR-J3-70B-RJ080W				
MR-J3-100B-RJ080W	3.5(AWG12)		3.5(AWG12)	
MR-J3-350B-RJ080W				
MR-J3-500B-RJ080W (Note 2)	5.5(AWG10): a	1.25(AWG16): b	5.5(AWG10): a	2(AWG14): c

Note 1. Alphabets in the table indicate crimping tools. For crimping terminals and applicable tools, refer to (3) in this section.

2. When connecting to the terminal block, be sure to use the screws which are provided with the terminal block.

3. Wires are selected based on the highest rated current among combining direct drive motors.

- (2) Selection example of crimping terminals

Selection example of crimping terminals for the servo amplifier terminal box when using the wires mentioned in table 3.1 in this section is indicated below.

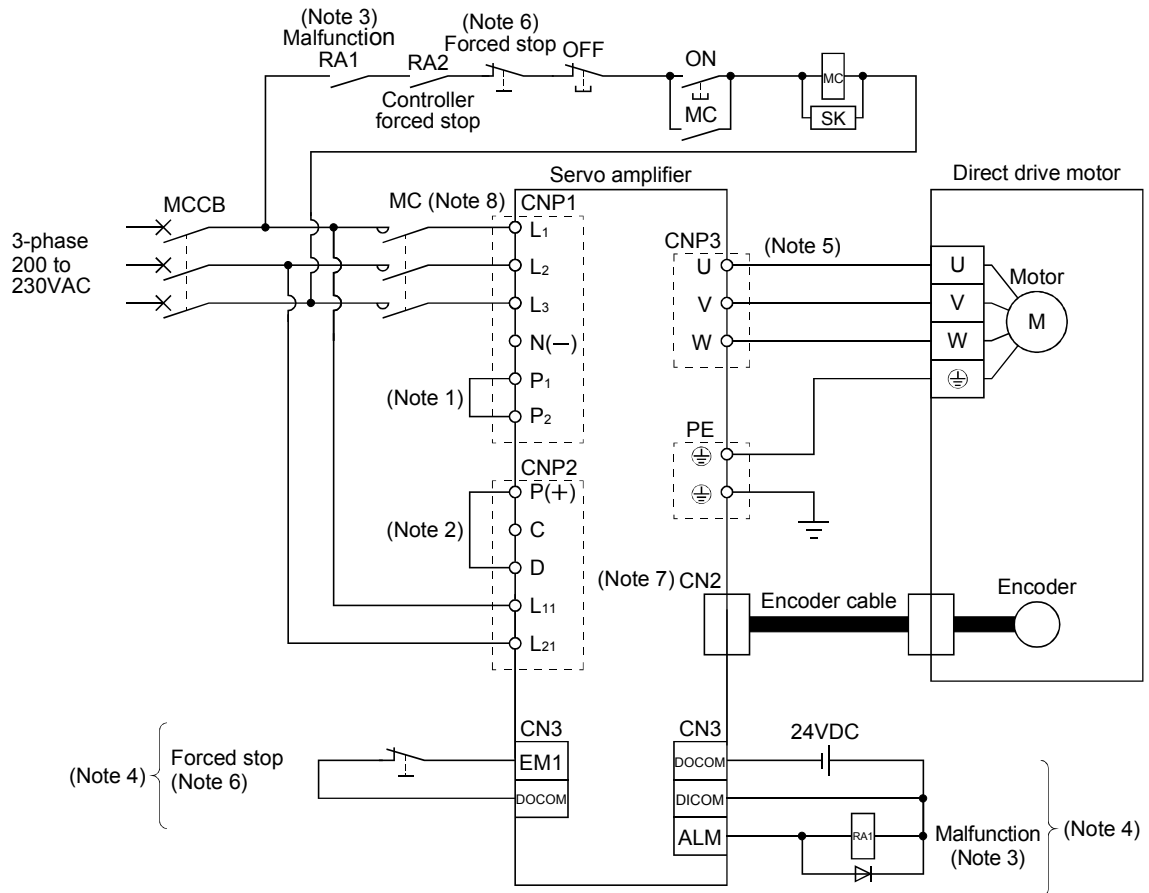
Symbol	Servo amplifier side crimping terminals		
	(Note) Crimping terminal	Applicable tool	Manufacturer
		Body	
a	FVD5.5-4	YNT-1210S	Japan Solderless Terminals
b	FVD2-M3	YNT-1614	
c	FVD2-4		

Note. Some crimping terminals may not be mounted depending on the size. Make sure to use the recommended ones or equivalent ones.

### 3. SIGNALS AND WIRING

#### 3.2.2 Connection example

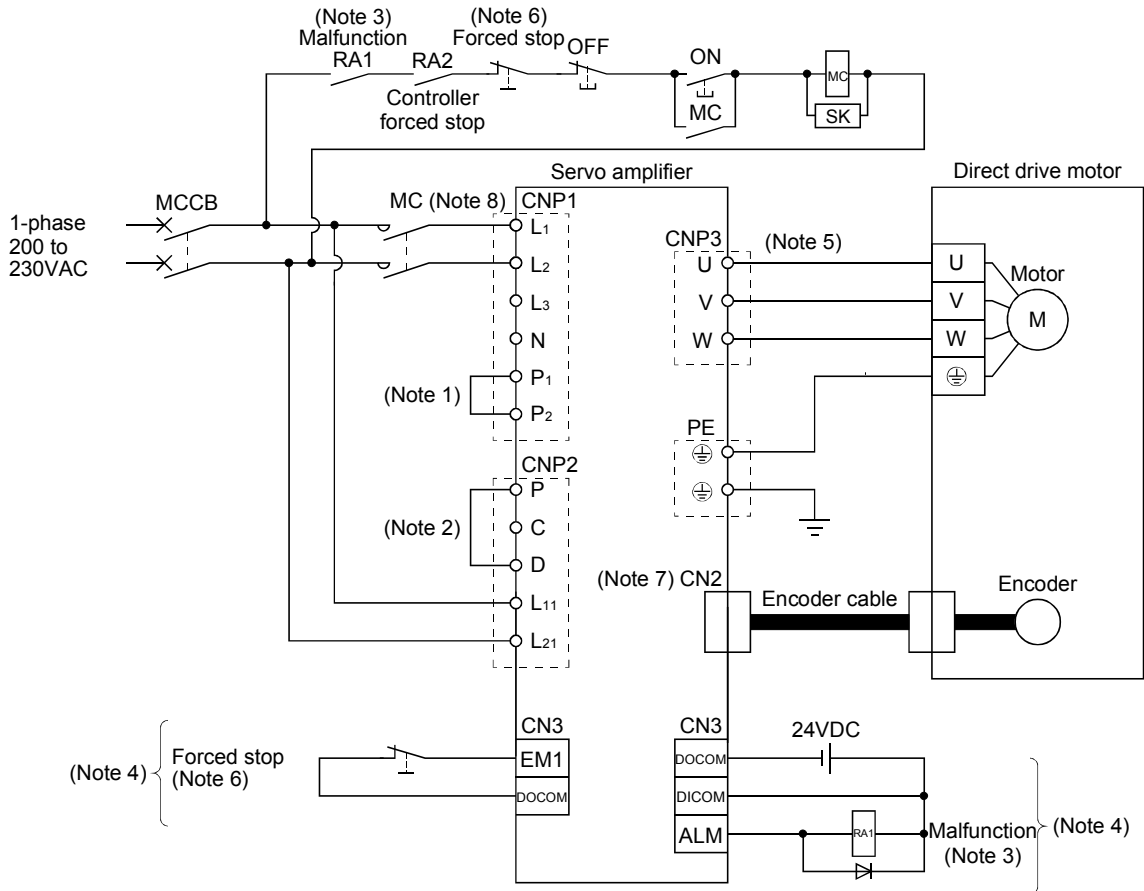
- (1) For 3-phase 200 to 230VAC power supply to MR-J3-20B-RJ080W to MR-J3-100B-RJ080W · MR-J3-350B-RJ080W



- Note 1. Always connect P<sub>1</sub> and P<sub>2</sub>. (Factory-wired.) When using the power factor improving DC reactor, refer to chapter 11 of the MR-J3-□B Servo Amplifier Instruction Manual. Use either the power factor improving DC reactor or the power factor improving AC reactor.
- Note 2. Always connect P(+) and D. (Factory-wired.) When using the regenerative option, refer to chapter 11 of the MR-J3-□B Servo Amplifier Instruction Manual.
- Note 3. If deactivating output of malfunction (ALM) with parameter change, configure up the power supply circuit which switches off the magnetic contactor after detection of alarm occurrence on the controller side.
- Note 4. For sink I/O interface. For source I/O interface, refer to section 3.7.3 of the MR-J3-□B Servo Amplifier Instruction Manual.
- Note 5. For details of connection of the servo amplifier and direct drive motor, refer to section 2.5.5.
- Note 6. Configure the circuit to shut down the main circuit power supply simultaneously with the turn off of forced stop (EM1) using the external sequence.
- Note 7. This connector detects speed, position and temperature of the direct drive motor. (Refer to chapter 9.)
- Note 8. Be sure to use a magnetic contactor with an operation delay time of 80ms or less. The operation delay time is the time interval between current being applied to the magnetic coil until closure of contacts.

### 3. SIGNALS AND WIRING

(2) For 1-phase 200 to 230VAC power supply to MR-J3-20B-RJ080W to MR-J3-70B-RJ080W

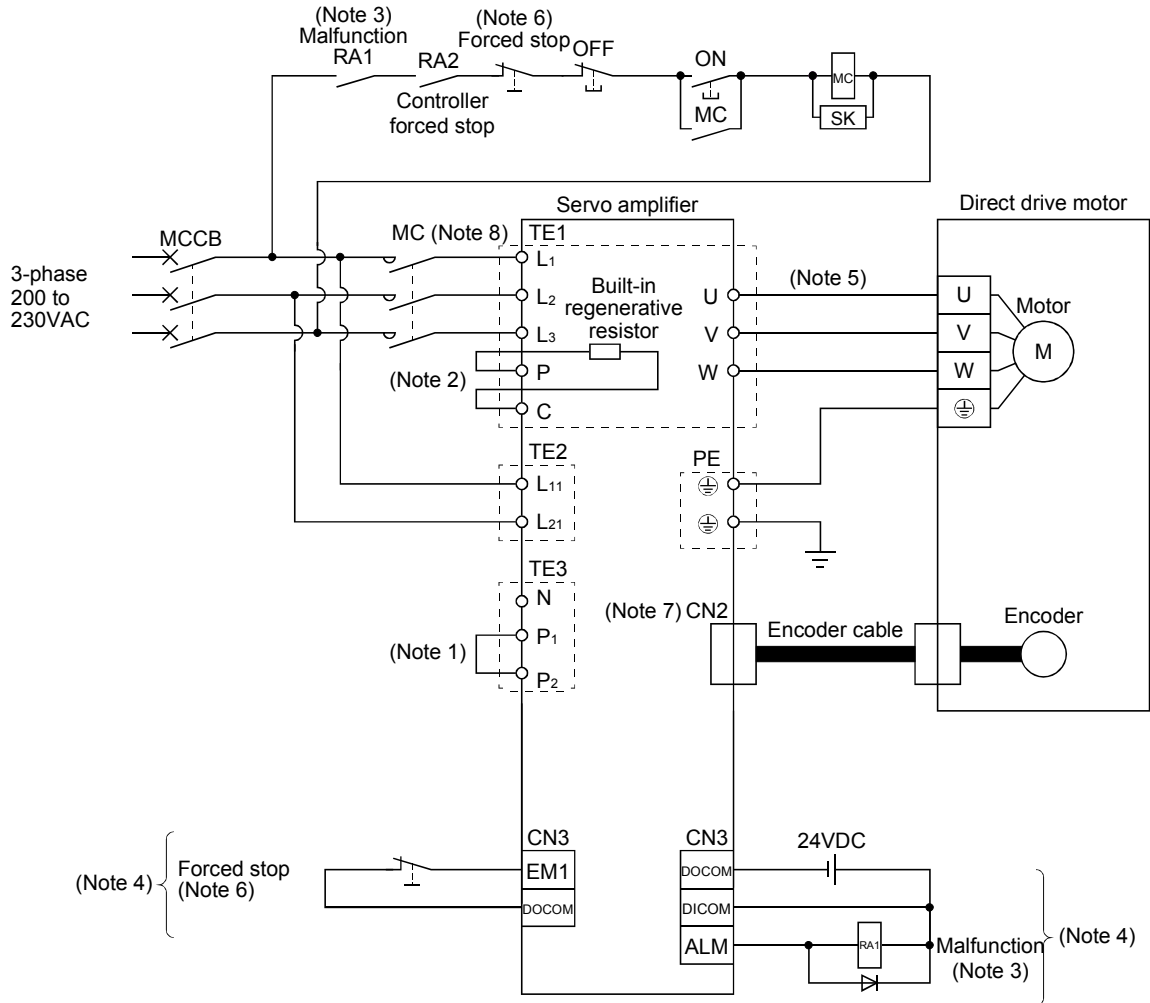


- Note 1. Always connect P<sub>1</sub> and P<sub>2</sub>. (Factory-wired.) When using the power factor improving DC reactor, refer to chapter 11 of the MR-J3-□B Servo Amplifier Instruction Manual. Use either the power factor improving DC reactor or the power factor improving AC reactor.
- Note 2. Always connect P and D. (Factory-wired.) When using the regenerative option, refer to chapter 11 of the MR-J3-□B Servo Amplifier Instruction Manual.
- Note 3. If deactivating output of malfunction (ALM) with parameter change, configure up the power supply circuit which switches off the magnetic contactor after detection of alarm occurrence on the controller side.
- Note 4. For sink I/O interface. For source I/O interface, refer to section 3.7.3 of the MR-J3-□B Servo Amplifier Instruction Manual.
- Note 5. For details of connection of the servo amplifier and direct drive motor, refer to section 2.5.5.
- Note 6. Configure the circuit to shut down the main circuit power supply simultaneously with the turn off of forced stop (EM1) using the external sequence.
- Note 7. This connector detects speed, position and temperature of the direct drive motor. (Refer to chapter 9.)
- Note 8. Be sure to use a magnetic contactor with an operation delay time of 80ms or less. The operation delay time is the time interval between current being applied to the magnetic coil until closure of contacts.



### 3. SIGNALS AND WIRING

#### (3) MR-J3-500B-RJ080W



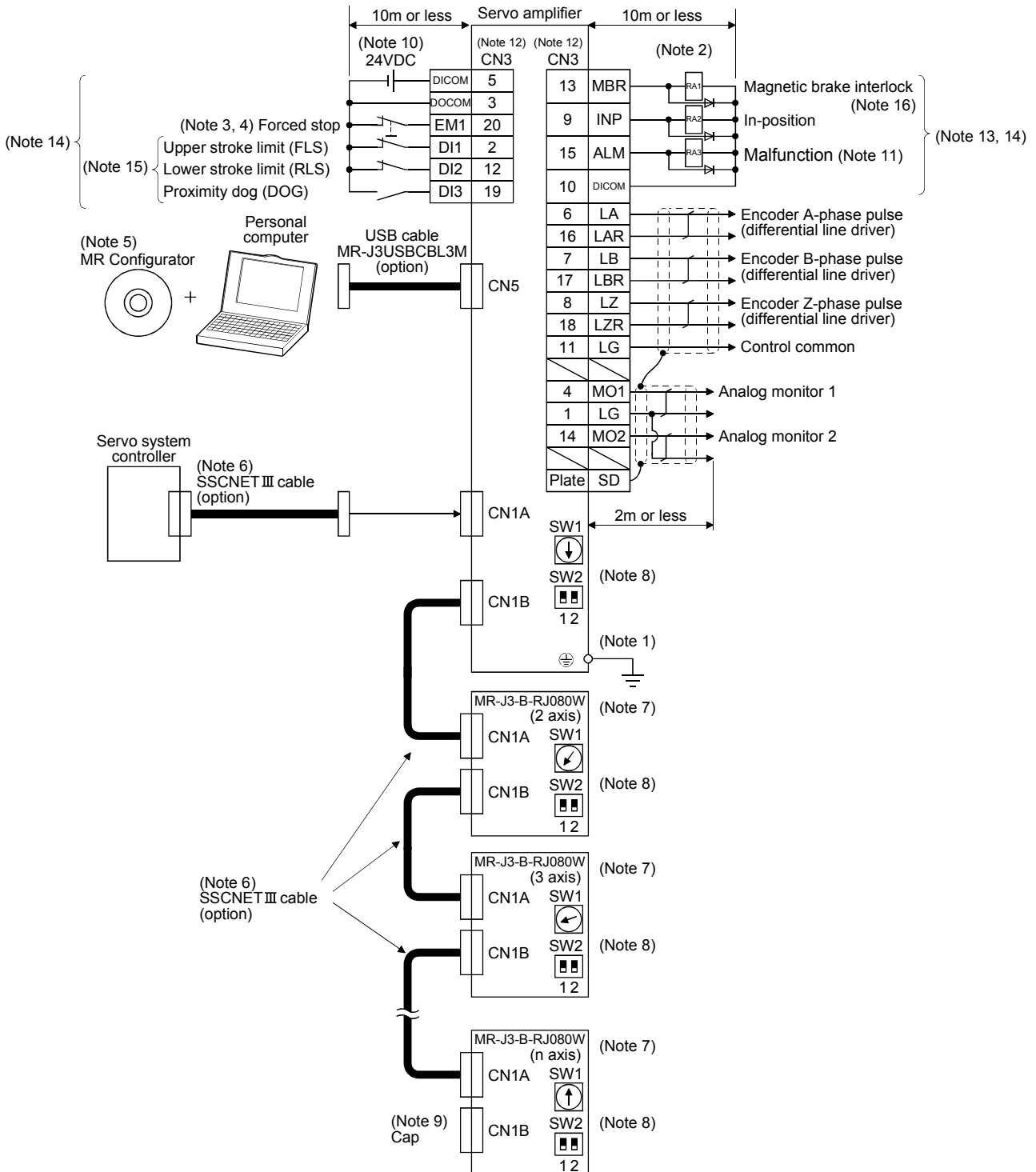
- Note 1. Always connect P<sub>1</sub> and P<sub>2</sub>. (Factory-wired.) When using the power factor improving DC reactor, refer to chapter 11 of the MR-J3-□B Servo Amplifier Instruction Manual. Use either the power factor improving DC reactor or the power factor improving AC reactor.
- Note 2. When using the regenerative option, refer to chapter 11 of the MR-J3-□B Servo Amplifier Instruction Manual.
- Note 3. If deactivating output of malfunction (ALM) with parameter change, configure up the power supply circuit which switches off the magnetic contactor after detection of alarm occurrence on the controller side.
- Note 4. For sink I/O interface. For source I/O interface, refer to section 3.7.3 of the MR-J3-□B Servo Amplifier Instruction Manual.
- Note 5. For details of connection of the servo amplifier and direct drive motor, refer to section 2.5.5.
- Note 6. Configure the circuit to shut down the main circuit power supply simultaneously with the turn off of forced stop (EM1) using the external sequence.
- Note 7. This connector detects speed, position and temperature of the direct drive motor. (Refer to chapter 9.)
- Note 8. Be sure to use a magnetic contactor with an operation delay time of 80ms or less. The operation delay time is the time interval between current being applied to the magnetic coil until closure of contacts.

### 3. SIGNALS AND WIRING

#### 3.3 I/O signal connection example

**POINT**

- For details of each signal, refer to chapter 3 of the MR-J3-□B Servo Amplifier Instruction Manual.



### 3. SIGNALS AND WIRING

Note 1 To prevent an electric shock, always connect the protective earth (PE) terminal (⊕) of the servo amplifier to the protective earth (PE) of the cabinet.

2. Connect the diode in the correct direction. If it is connected reversely, the servo amplifier will be faulty and will not output signals, disabling the forced stop (EM1) and other protective circuits.
3. If the controller does not have an forced stop (EM1) function, always install a forced stop switch (Normally closed contact).
4. When starting operation, always turn on the forced stop (EM1). (Normally closed contact) By setting "□1□□" in the parameter No.PA04 of the servo amplifier, the forced stop (EM1) can be made invalid.
5. Use MRZJW3-SETUP 221E (Software version is C2 or later). (Refer to section 11.8 of the MR-J3-□B Servo Amplifier Instruction Manual)
6. Use SSCNETIII cables listed in the following table.

Cable	Cable model name	Cable length
Standard cord inside panel	MR-J3BUS□M	0.15m to 3m
Standard cable outside panel	MR-J3BUS□M-A	5m to 20m
Long-distance cable	MR-J3BUS□M-B	30m to 50m

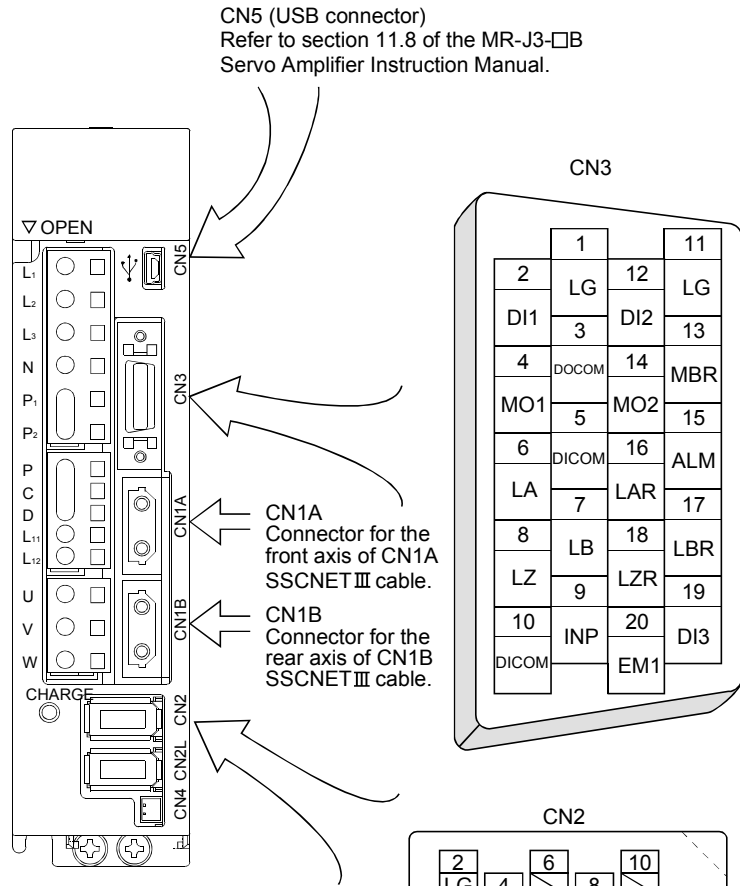
7. The wiring of the second and subsequent axis is omitted.
8. Up to 16 axes may be connected. Refer to section 3.13 of the MR-J3-□B Servo Amplifier Instruction Manual for setting of axis selection.
9. Make sure to put a cap on the unused CN1A \* CN1B.
10. Supply 24VDC±10% 150mA current for interfaces from the outside. 150mA is the value applicable when all I/O signals are used. The current capacity can be decreased by reducing the number of I/O points. Refer to section 3.7.2 (1) of the MR-J3-□B Servo Amplifier Instruction Manual that gives the current value necessary for the interface.
11. Malfunction (ALM) turns on in normal alarm-free condition (Normally closed contacts).
12. The pins with the same signal name are connected in the servo amplifier.
13. The signal can be changed by parameter No.PD07, PD08, PD09.
14. For sink I/O interface. For source I/O interface, refer to section 3.7.3 of the MR-J3-□B Servo Amplifier Instruction Manual.
15. Devices can be assigned for DI1 \* DI2 \* DI3 with controller setting. For devices that can be assigned, refer to the controller instruction manual. The assigned devices are for the Q173DCPU, Q172DCPU, Q170MCP, LD77MH□, QD74MH□ and QD75MH□.
16. Electromagnetic brake interlock (MBR) is useful when setting up an external brake system.

### 3. SIGNALS AND WIRING

#### 3.4 Connector and signal arrangements

POINT	
	<ul style="list-style-type: none"> <li>The pin configurations of the connectors are as viewed from the cable connector wiring section.</li> </ul>

The servo amplifier front view shown is for MR-J3-20B-RJ080W or less. For the appearances and connector layouts of other servo amplifiers, refer to chapter 7 SERVO AMPLIFIER OUTLINE DRAWINGS.



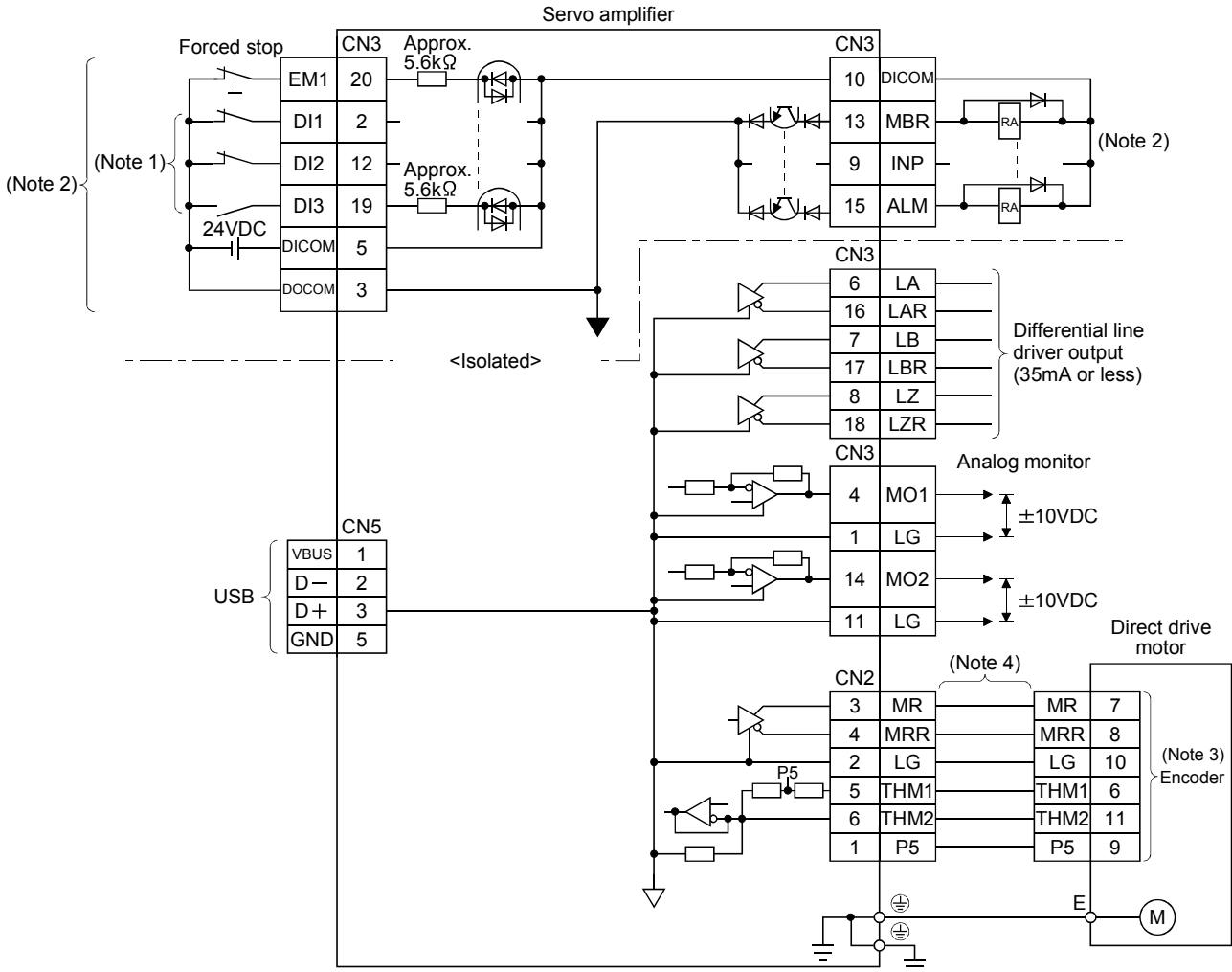
The frames of the CN2 and CN3 connectors are connected to the PE (earth) terminal in the servo amplifier.

The figures of connectors manufactured by 3M are shown above. When using any other connector, refer to section 9.1.2.

### 3. SIGNALS AND WIRING

#### 3.5 Internal connection diagram

##### 3.5.1 Incremental system



Note 1. Signal can be assigned for these pins with controller setting.

For contents of signals, refer to the instruction manual of controller.

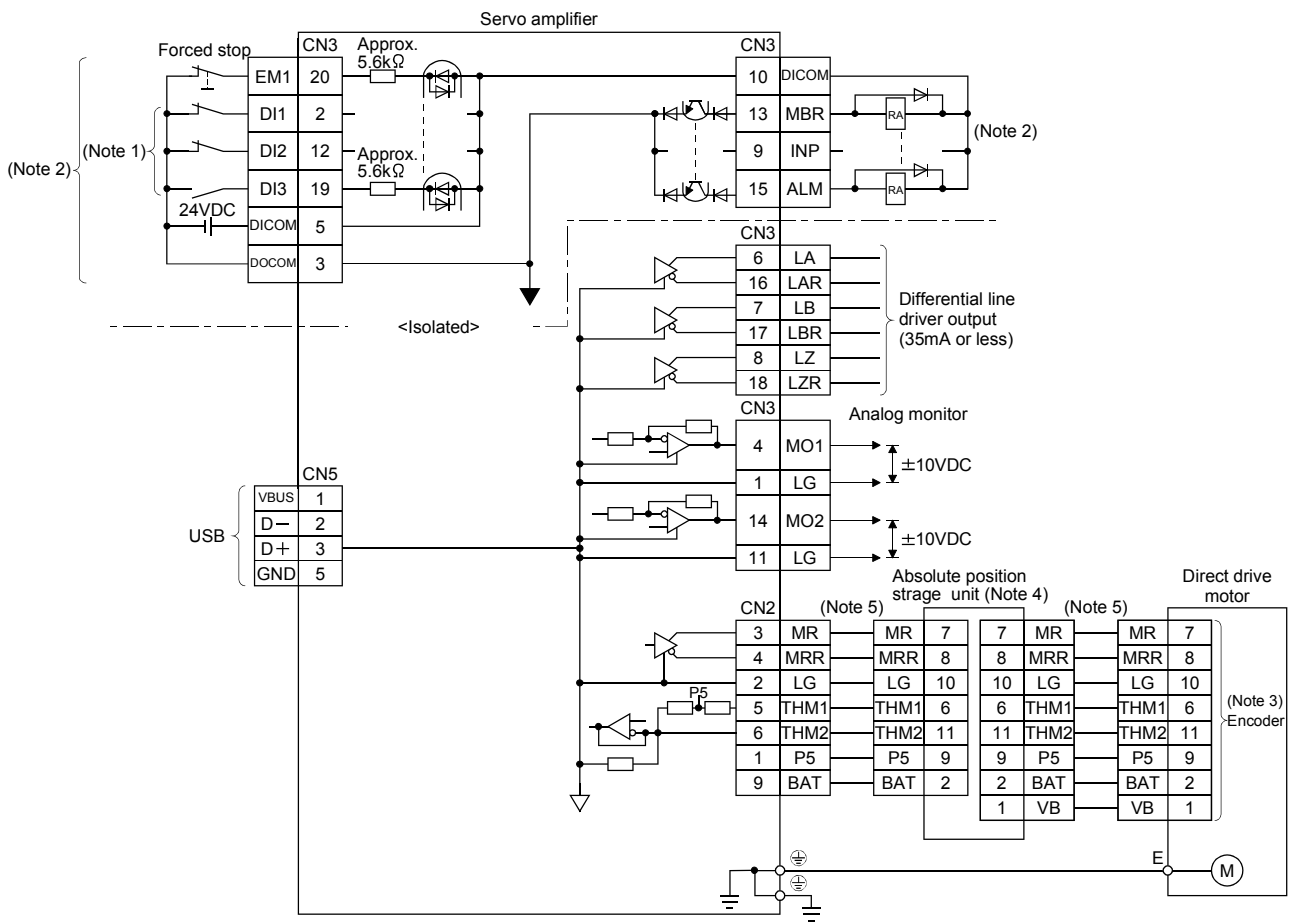
2. For sink I/O interface. For source I/O interface, refer to section 3.7.3 of the MR-J3-□B Servo Amplifier Instruction Manual.

3. Speed, position and temperature of the direct drive motor are detected.

4. Fabrication of the encoder cable is required at user side. (Refer to section 9.1.2.)

### 3. SIGNALS AND WIRING

#### 3.5.2 Absolute position detection system



Note 1. Signal can be assigned for these pins with controller setting.

For contents of signals, refer to the instruction manual of controller.

2. For sink I/O interface. For source I/O interface, refer to section 3.7.3 of the MR-J3-□B Servo Amplifier Instruction Manual.

3. Speed, position and temperature of the direct drive motor are detected.

4. To configure the absolute position detection system, always connect this by combining with the MR-J3BAT battery. (Refer to section 9.2.)

5. Fabrication of the encoder cable is required at user side. (Refer to section 9.1.2.)

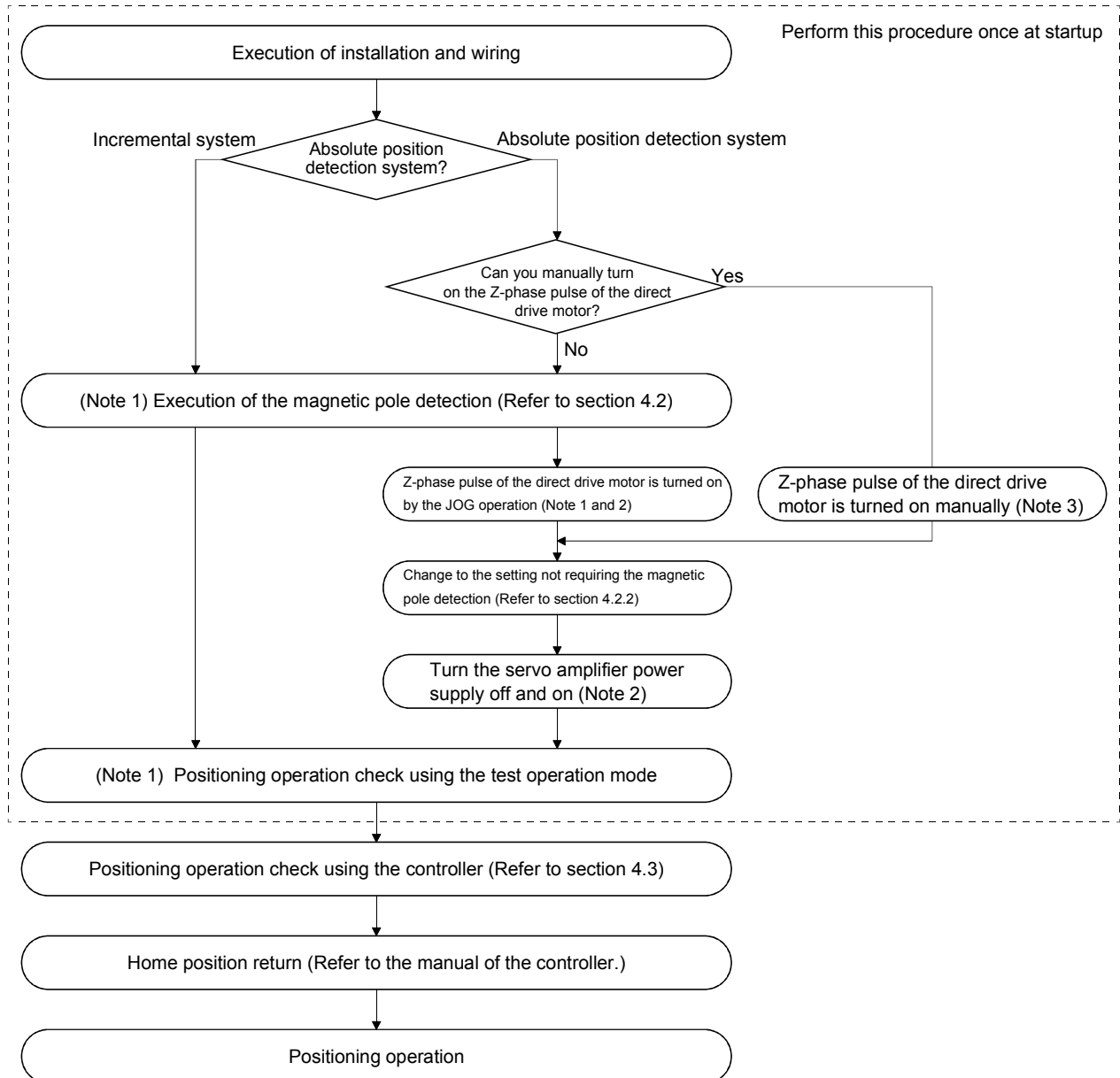


# 4. OPERATION AND FUNCTIONS

## 4. OPERATION AND FUNCTIONS

### 4.1 Startup

Start up the direct drive servo referring to the following procedure.



Note 1. MR Configurator is used.

2. Under the absolute position detection system, always turn on the Z-phase pulse of the direct drive motor while the servo amplifier power supply is on, then turn the servo amplifier power supply off and on. By turning off and on the power supply, the absolute position becomes confirmed. Without this operation, the absolute position cannot be regained properly, and a warning will occur at the controller side.
3. If the Z-phase pulse of the direct drive motor can be turned on manually, it does not have to be turned on by the magnetic pole detection or the JOG operation.  
For this operation, always connect the direct drive motor encoder and the servo amplifier and turn on only the control circuit power supply of the servo amplifier (L<sub>11</sub>, L<sub>21</sub>) (turn off the main circuit power supply L<sub>1</sub>, L<sub>2</sub>, and L<sub>3</sub>). Perform this operation by considering the safety.



## 4. OPERATION AND FUNCTIONS

### 4.2 Magnetic pole detection

POINT
<ul style="list-style-type: none"><li>▪ Magnetic pole detection is not required for the configured absolute position detection system where the Z-phase pulse can be turned on manually. For this operation, always connect the direct drive motor encoder and the servo amplifier and turn on the control circuit power supply of the servo amplifier. Perform this operation by considering the safety.</li></ul>

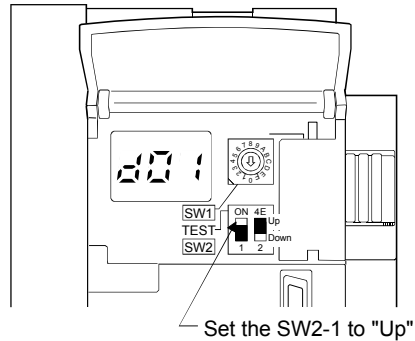
Make sure to perform the magnetic pole detection before starting the positioning operation in order to match the positional relationship between the direct drive motor and the encoder.

Before starting up the equipment, always perform the test operation (positioning operation) of MR Configurator.

#### 4.2.1 Preparation for the magnetic pole detection

POINT
<ul style="list-style-type: none"><li>▪ When the test operation mode is set with the test operation select switch (SW2-1), the SSCNET III communication of the servo amplifiers following the servo amplifier with the test operation mode is disconnected.</li></ul>

For the magnetic pole detection, the test operation mode (positioning operation) of MR Configurator is used. Turn the power of servo amplifier off and set the test operation select switch (SW2-1) as shown below. By turning the power on, it switches to the test operation mode.



## 4. OPERATION AND FUNCTIONS

---

### 4.2.2 Driving when magnetic pole is detected



#### WARNING

- Note that the magnetic pole detection is automatically started simultaneously with turning on the servo-on command.



#### CAUTION

- If the magnetic pole detection is not executed properly, the direct drive motor may run unexpectedly.

#### POINT

- Establish the machine configuration using the stroke limits (FLS and RLS). If the stroke limits (FLS and RLS) do not exist, it may cause the machine damage by a collision.
- At the magnetic pole detection, it is not predictable whether it moves to the forward rotation or reverse rotation.
- Setting the parameter No.PS09 (Magnetic pole detection voltage level) may cause the occurrence of overload, overcurrent, magnetic pole detection alarm, etc.
- When performing the positioning operation from the controller, set the sequence which confirms the normal completion of magnetic pole detection and the servo-on status, then outputs the positioning command. If outputting the positioning command before the Ready (RD) turns on, the command may not be accepted or the servo alarm may occur.
- After the magnetic pole detection, check the accuracy of position with the test operation (positioning operation) of MR Configurator.
- The accuracy of magnetic pole detection will be improved by being operated in the no-load condition.

For the following cases, the magnetic pole detection is required.

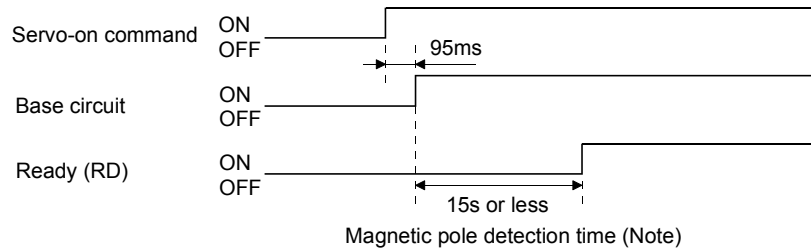
- (a) When using the incremental system (Refer to (1) in this section)
- (b) When using the absolute position detection system and matching with the cases indicated below (Refer to (2) in this section)
  - At the system setup (at the first startup of equipment)
  - When the direct drive motor is replaced
  - When the Z-phase pulse of the direct drive motor cannot be turned on manually
  - When the absolute position erase (25) alarm has occurred

## 4. OPERATION AND FUNCTIONS

### (1) For the incremental system

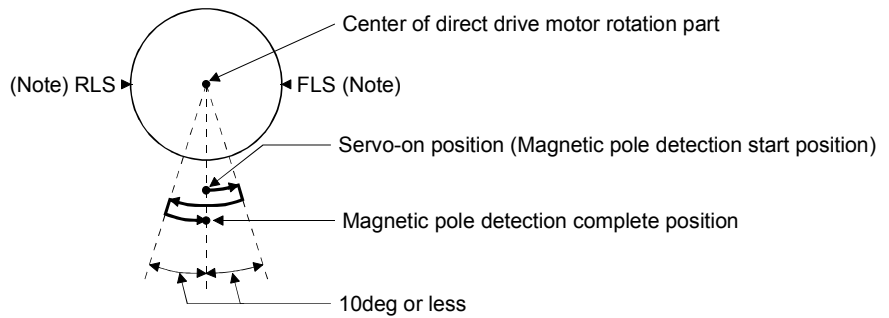
For the incremental system, the magnetic pole detection is required every time the power is turned on. By turning on the servo-on command from the controller after the power-on, the magnetic pole detection is automatically carried out. Therefore, there is no need to set the parameters (first digit of parameter No. PS01) for executing the magnetic pole detection.

#### (a) Timing chart



Note. The magnetic pole detection time indicates the operation time when the stroke limits (FLS and RLS) is on.

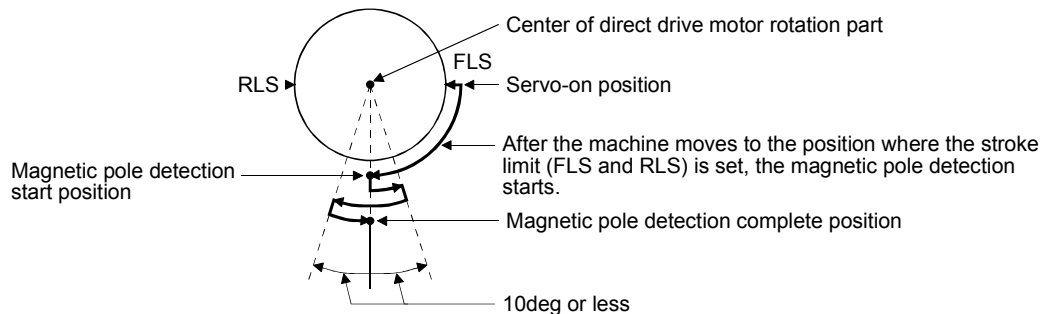
#### (b) Direct drive motor movement (when FLS and RLS are on)



Note. When the stroke limit (FLS and RLS) turns off during the magnetic pole detection, the operation of magnetic pole detection is carried on to the opposite direction. When both FLS and RLS are off, the magnetic pole detection error (27) occurs.

#### (c) Direct drive motor movement (when FLS and RLS is off)

When the FLS and RLS are off at the servo-on, the magnetic pole detection is carried out as follows.



## 4. OPERATION AND FUNCTIONS

---

(2) For the absolute position detection system

POINT	
• Be sure to turn on the Z-phase pulse in JOG operation after the magnetic pole detection.	

Carry out the magnetic pole detection referring the following procedure.

(a) Set the parameter No.PS01 (Special function selection 1) to "□□□1 (Magnetic pole detection always valid)".

Parameter No.PS01

□	□	□	1
---	---	---	---

└ Magnetic pole detection always valid (initial value)

(b) Execute the magnetic pole detection. (Refer to (1) (a) and (b) in this section)

(c) Change the parameter No.PS01 to "□□□0 (Magnetic pole detection not valid)" after the normal completion of magnetic pole detection.

Parameter No.PS01

□	□	□	0
---	---	---	---

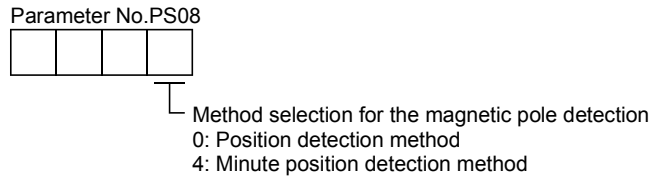
└ Magnetic pole detection invalid

By turning on the Z-phase pulse in JOG operation and by making the magnetic pole detection function invalid with the parameter No.PS01 after the magnetic pole detection, the magnetic pole detection for each power-on will be unnecessary.

## 4. OPERATION AND FUNCTIONS

### 4.2.3 Magnetic pole detection method setting

Set a magnetic pole detection method to the 1st digit (method selection for the magnetic pole detection) of parameter No.PS08.



### 4.2.4 Setting the magnetic pole detection voltage level of the position detection method

Set the voltage level in parameter No.PS09 (Magnetic pole detection voltage level) to perform magnetic pole detection with the position detection method. Voltage level setting is not required when detecting magnetic poles by the minute position detection method.

#### (1) Guideline of parameter settings

Set the parameters referring to the following table.

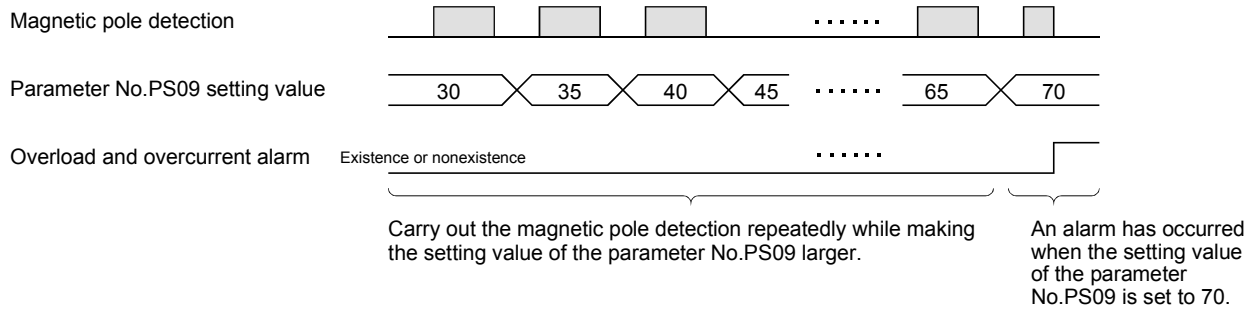
Parameter No.PS09 setting value (Indication)	Small ← Middle → Large (Less than 10 (Initial value) More than 50)	
Servo status		
Torque at operation	Small	Large
Overload, overcurrent alarm	Not frequently occurred	Frequently occurred
Magnetic pole detection alarm	Frequently occurred	Not frequently occurred
Magnetic pole detection accuracy	Low	High

#### (2) Setting procedure

- (a) By carrying out the magnetic pole operation, make the setting of parameter No.PS09 (magnetic pole detection voltage level) larger until the overload 1 (50), overload 2 (51), overload warning 1 (E1) and overload warning 2 (EC) occur. To get a rough idea, make it larger in "5". When these alarms and warnings occur during the magnetic pole detection by MR Configurator, the test operation of MR Configurator is automatically completed and the servo-off status is established.
- (b) Set the final setting value to approximately 70% of the value which is set at the occurrence of the overload 1 (50), overload 2 (51), overload warning 1 (E1) and overload warning 2 (EC). However, in the case where the initial magnetic pole detection error (27) occurs with this setting value, set the final setting value to the value intermediate between the setting value at the occurrence of the overload 1 (50), overload 2 (51), overload warning 1 (E1), overload warning 2 (EC) and the setting value at the occurrence of the magnetic pole detection alarm.
- (c) Carry out the magnetic pole detection again with the final setting value.

## 4. OPERATION AND FUNCTIONS

### (3) Setting example



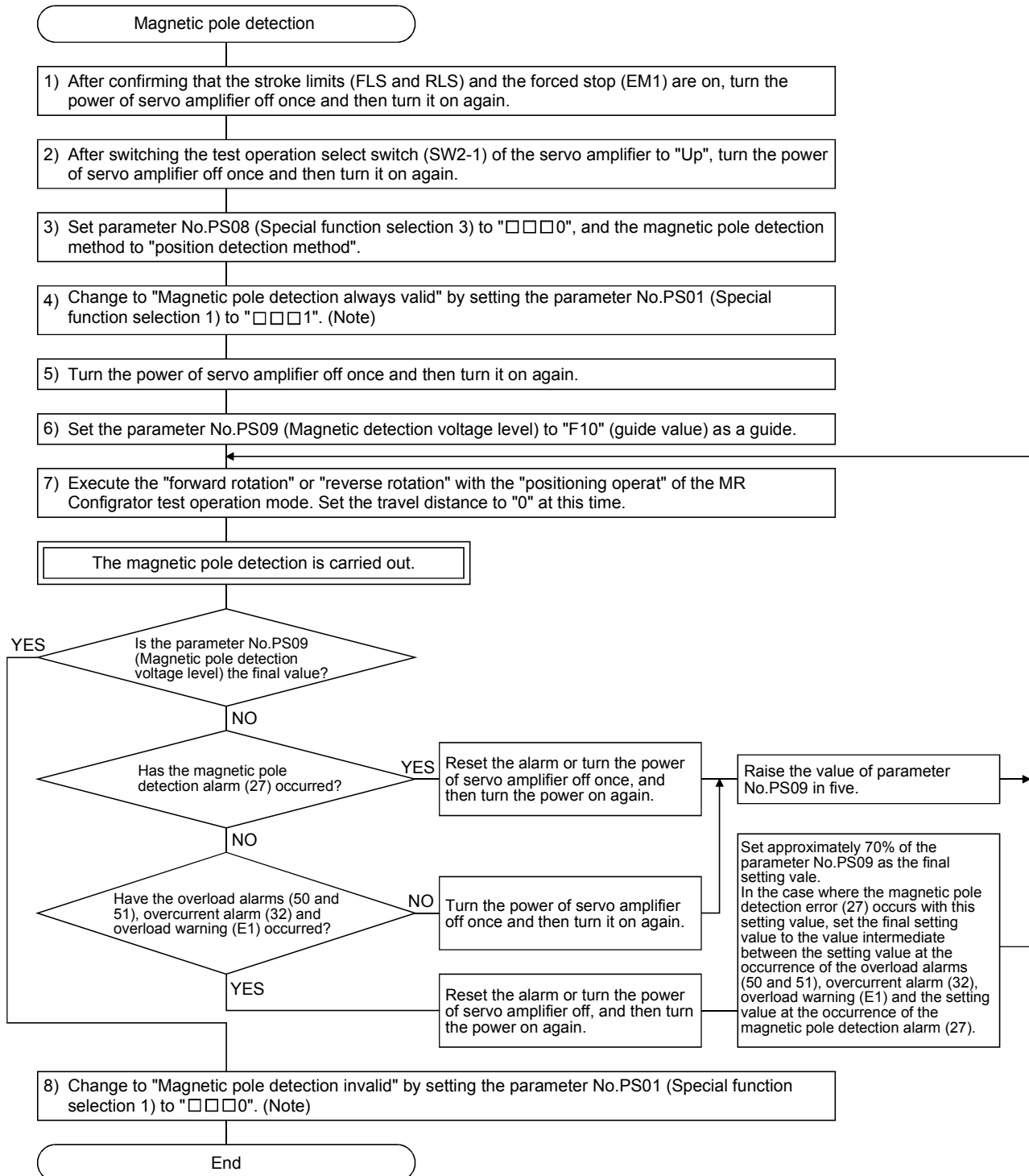
Here, the final setting value of the parameter No.PS09 is set to 49 (the setting value at the occurrence of the overload and overcurrent alarm =  $70 \times 0.7$ ).

## 4. OPERATION AND FUNCTIONS

### 4.2.5 Magnetic pole detection method using MR Configurator

The following shows the procedure of the magnetic pole detection using MR Configurator.

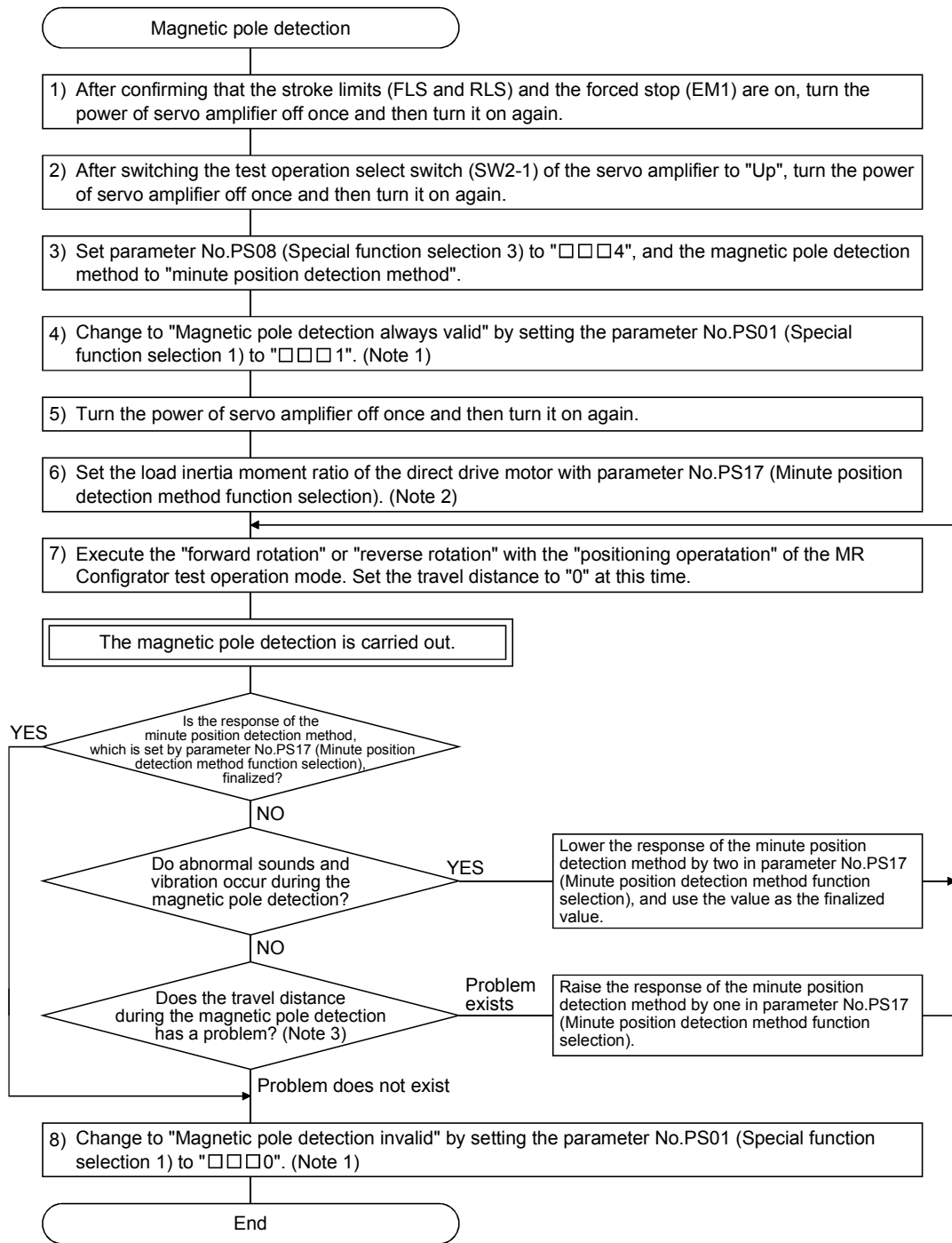
#### (1) Magnetic pole detection using position detection method



Note. Parameter No.PS01 setting is unnecessary for an incremental system.

## 4. OPERATION AND FUNCTIONS

### (2) Magnetic pole detection using minute position detection method



Note 1. Parameter No.PS01 setting is unnecessary for an incremental system.

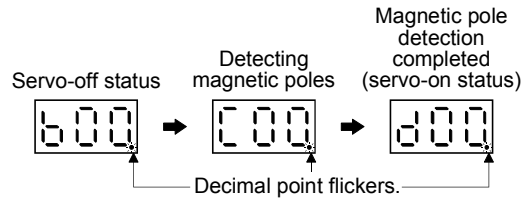
2. When the load inertia moment ratio of the direct drive motor is unknown, detect magnetic poles with the position detection method, perform auto tuning, and set an estimated value.

3. When detecting magnetic poles with the minute position detection method, the maximum travel distance of 5 degrees or less during the magnetic pole detection is acceptable. To shorten the travel distance, increase the response of the minute position detection method in parameter No.PS17 (Minute position detection method function selection).



## 4. OPERATION AND FUNCTIONS

- (3) Transition of the servo amplifier display (3-digit 7-segment LED) when detecting magnetic poles  
 The servo amplifier display (3-digit 7-segment LED) shifts as shown below when the magnetic poles are detected properly using MR Configurator.



### 4.3 Operation from the controller

When establishing the absolute position detection system, battery (MR-J3BAT) and the absolute position storage unit is required.

The direct drive servo can be used in combination with the following controllers.

Servo system controller	Model		Software version (Note)
Motion controller	Q17□DCPU	SV13/SV22	00H or later
		SV43	00B or later
	Q170MCPU	SV13/SV22	00G or later
		SV43	
Positioning module	LD77MH□		
	QD74MH□		110220000000000-B or later
	QD75MH□		101120000000000-B or later

Note. Refer to the manual of the each servo system controller for the software version and other details.

#### 4.3.1 Operation method

The positioning operation from the controller is basically the same as that of MR-J3-□B.

For the system, using the incremental system, however, the magnetic pole detection is automatically performed at the first servo-on after turning the power on. For this reason, when performing the positioning operation, configure the sequence which surely confirms the servo-on status as the inter lock condition of the positioning command.

Also, some parameter settings and home position return varies depending on types of controllers.

## 4. OPERATION AND FUNCTIONS

### 4.3.2 Servo system controller setting

#### (1) Setting instructions

When using the direct drive servo, set it as described in this section. For other servo parameters and positioning control parameters, set them in the same method as that of MR-J3-□B servo amplifier.

The following servo parameters will be valid by turning the power of servo amplifier off once and then turning it on again after writing to the servo amplifier from the controller.

Setting Item				Setting description	
				Motion controller Q17□DCPU/Q170MCPU	(Note 3) Positioning module LD77MH□/QD74MH□/ QD75MH□
Servo parameters	Amplifier setting			MR-J3-B DD	MR-J3-DD (Note 4)
	Motor setting			Automatic setting	
	No.	(Note 1) Symbol	Name	Initial value	Set as necessary.  When using QD74MH□ or QD75MH□, set it with sequence program. It is necessary to set the initial values of these parameters at the startup of direct drive servo. Refer to (2) and (3) in this section. When using LD77MH□, set it with GX Configurator-QP (SW2D5C-QD75P-E) as necessary.
	PA01		For manufacturer setting (Note 2)	0060h	
	PC01	*ERZ	Error excessive alarm level	3	
	PC03	*ENRS	Encoder output pulses selection	0000h	
	PD03		For manufacturer setting (Note 2)	0020h	
	PD04			0021h	
	PS01	**LIT1	Special function selection 1	0001h	
	PS04	*LIT2	Special function selection 2	0003h	
	PS05	LB1	Servo control position deviation error detection level	9	
	PS06	LB2	Servo control speed deviation error detection level	100	
	PS07	LB3	Servo control torque deviation error detection level	100	
	PS08	*LIT3	Special function selection 3	0010h	
	PS09	LPWM	Magnetic pole detection voltage level	30	
	PS10		For manufacturer setting (Note 2)	0005h	
	PS11			0064h	
	PS12			01F4h	
PS17	LTSTS	Minute position detection method function selection	0000h		
PS18	IDLV	Minute position detection method identification signal amplitude	0		

Note 1. The parameters having \* before the symbol will be valid in the following conditions.

\* : Turn the power of servo amplifier off once after the setting and then turn it on again, or execute the controller reset.

\*\* : Turn the power of servo amplifier off once after the setting, and then turn it on again.

2. For the LD77MH□/QD74MH□/QD75MH□, make sure to set the initial value.

3. Pay attention on the followings.

- If the parameter (servo parameter) of servo amplifier has been changed, it automatically reads the servo parameter and stores in the buffer memory of LD77MH□/QD74MH□/QD75MH□. However, it does not reflect to the flash ROM.
- When turning off, resetting the power of LD77MH□/QD74MH□/QD75MH□ or turning off the control circuit power supply of servo amplifier right after changing the servo parameter, the servo parameter may not reflect to the buffer memory of LD77MH□/QD74MH□/QD75MH□. In such a case, change it again.

4. Set QD74MH□ and QD75MH□ with sequence program. (Refer to (2) of this section.)

## 4. OPERATION AND FUNCTIONS

---

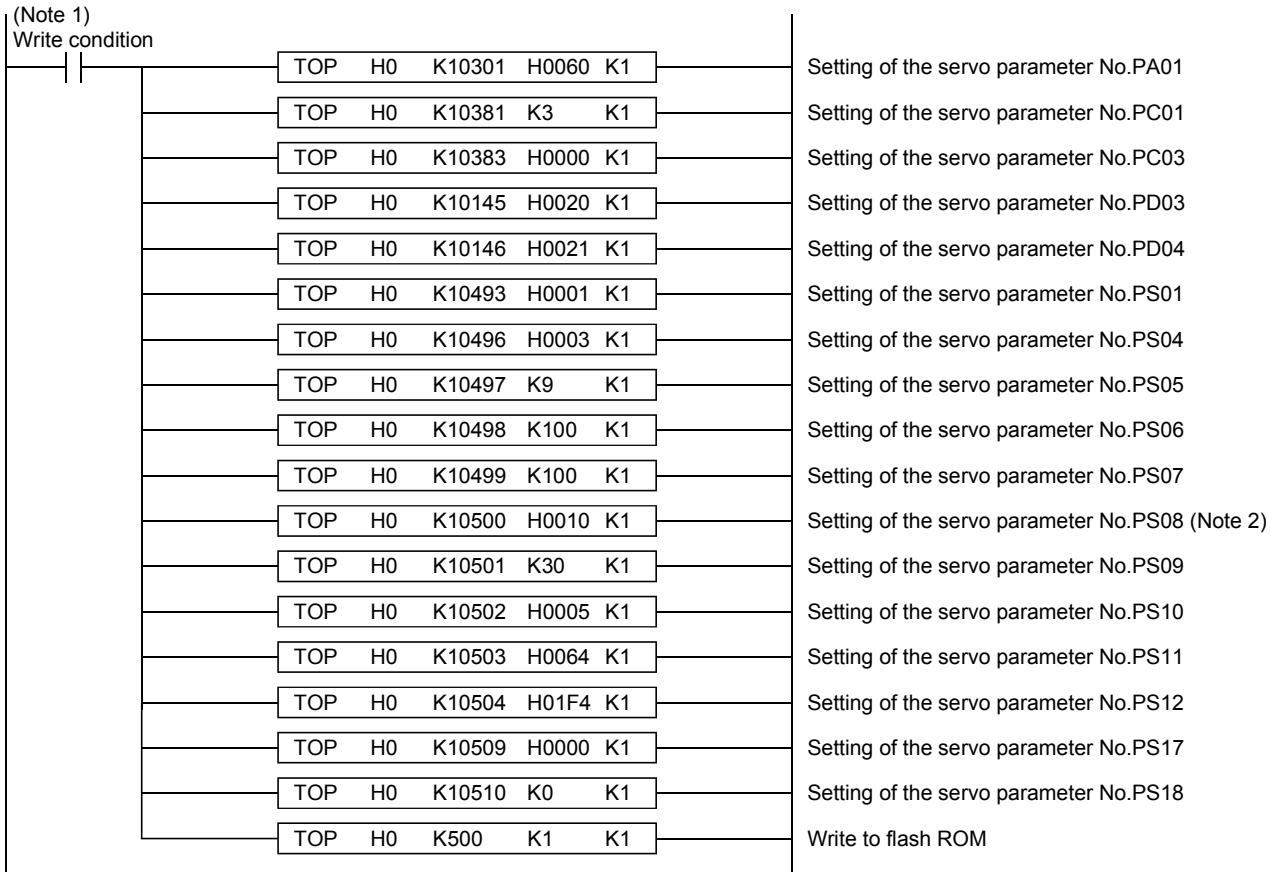
(2) Sequence program example of servo parameters on the positioning module

POINT
<ul style="list-style-type: none"><li>▪ For QD74MH□/QD75MH□, the parameter error (37) will occur if servo parameters are not initialized.</li><li>▪ The number of write time to the flash ROM is limited to 100,000. For this reason, try to write to the flash ROM only when changing the servo parameter instead of writing with every sequence program. When controlling multiple axes, write the servo parameters to all axes.</li><li>▪ Once the initial values are written to the flash ROM at startup, servo parameters are not required to be written at next power on or later. If the module write with GX Configurator-QP has been performed from QD75MH□, however, initialize the servo parameters again.</li></ul>

## 4. OPERATION AND FUNCTIONS

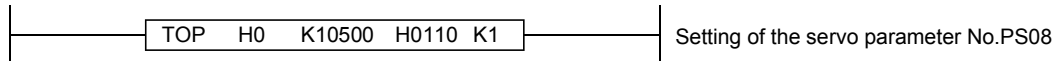
(a) Sequence program example when QD74MH□ is used

The following shows the example of writing the axis No.1 servo parameter to the flash ROM. After changing the servo parameter, turn on the power of QD74MH□ again or reset the CPU, then send the setting value to the servo amplifier. Refer to the Type QD74MH Positioning Module User's Manual (Details) (IB(NA)0300147) for the buffer memory address of the special setting parameters (No.PS□) of the 2nd to 16th axis servo parameters.



Note 1. Configure a sequence program where the servo parameters are written to the flash ROM only when a servo parameter is changed.

2. Change the sequence program of the servo parameter No.PS08 to the following sequence program for the magnetic pole detection without the stroke limit (FLS and RLS).

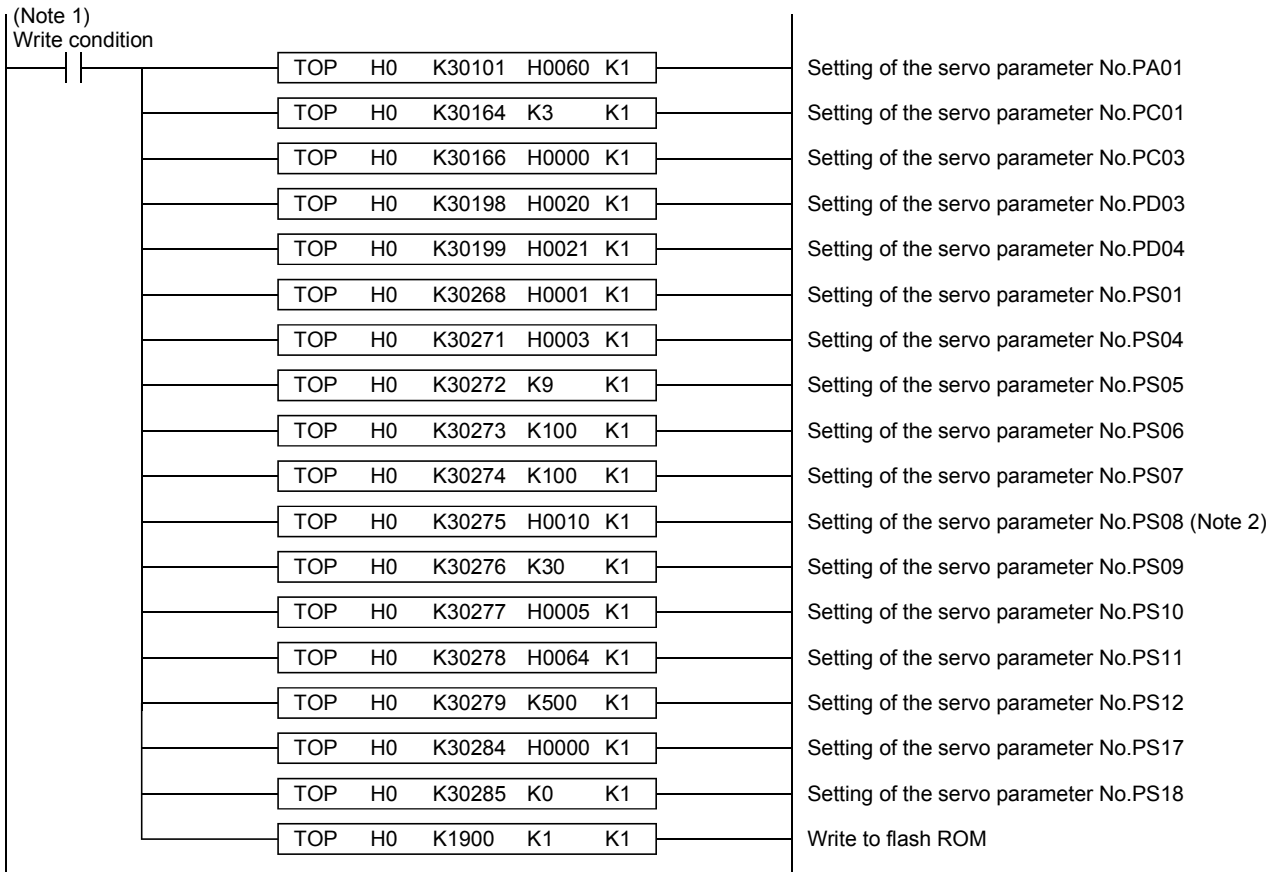


## 4. OPERATION AND FUNCTIONS

### (b) Sequence program example when QD75MH□ is used

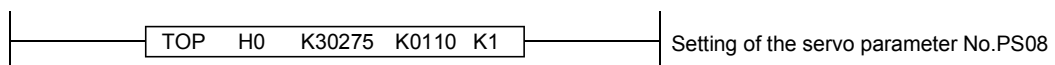
The following shows the example of writing the axis No.1 servo parameter to the flash ROM.

After changing the servo parameter, turn on the power of QD75MH□ again or reset the CPU, then send the setting value to the servo amplifier. Refer to (3) in this section for the special setting parameter (No. PS□) address of servo parameter.



Note 1. Configure a sequence program where the servo parameters are written to the flash ROM only when a servo parameter is changed.

- Change the sequence program of the servo parameter No.PS08 to the following sequence program for the magnetic pole detection without the stroke limit (FLS and RLS).



However, do not change to this sequence program if using the stroke limit (FLS and RLS) at the QD75MH□ side.

### (c) Initialization of the servo parameter at the startup of direct drive servo

- Before turning the power of servo amplifier on, write the servo parameter initial value, which is unique to the direct drive servo, to the flash ROM of QD74MH□/QD75MH□ referring to the sequence program example shown in (2) in this section.
- After completion of writing to the flash ROM, turn the power of servo amplifier on.

## 4. OPERATION AND FUNCTIONS

### (3) QD75MH□ buffer memory address of special setting parameter (No.PS□□)

Description			Initial value	Unit	Buffer memory address			
No.	Symbol (Note)	Name			Axis 1	Axis 2	Axis 3	Axis 4
PS01	**LIT1	Special function selection 1	0001h		30268	30468	30668	30868
PS02		For manufacturer setting	0000h		30269	30469	30669	30869
PS03			0000h		30270	30470	30670	30870
PS04	*LIT2	Special function selection 2	0003h		30271	30471	30671	30871
PS05	LB1	Servo control position deviation error detection level	9	0.01rev	30272	30472	30672	30872
PS06	LB2	Servo control speed deviation error detection level	100	r/min	30273	30473	30673	30873
PS07	LB3	Servo control torque deviation error detection level	100	%	30274	30474	30674	30874
PS08	*LIT3	Special function selection 3	0010h		30275	30475	30675	30875
PS09	LPWM	Magnetic pole detection voltage level	30	%	30276	30476	30676	30876
PS10		For manufacturer setting	0005h		30277	30477	30677	30877
PS11			0064h		30278	30478	30678	30878
PS12			01F4h		30279	30479	30679	30879
PS13			0000h		30280	30480	30680	30880
PS14			0000h		30281	30481	30681	30881
PS15			0000h		30282	30482	30682	30882
PS16			0000h		30283	30483	30683	30883
PS17	LTSTS	Minute position detection method function selection	0000h		30284	30484	30684	30884
PS18	IDLV	Minute position detection method identification signal amplitude	0	%	30285	30485	30685	30885
PS19		For manufacturer setting	0000h		30286	30486	30686	30886
PS20			0000h		30287	30487	30687	30887
PS21			0000h		30288	30488	30688	30888
PS22			0000h		30289	30489	30689	30889
PS23			0000h		30290	30490	30690	30890
PS24			0000h		30291	30491	30691	30891
PS25			0000h		30292	30492	30692	30892
PS26			0000h		30293	30493	30693	30893
PS27			0000h		30294	30494	30694	30894
PS28			0000h		30295	30495	30695	30895
PS29			0000h		30296	30496	30696	30896
PS30			0000h		30297	30497	30697	30897
PS31			0000h		30298	30498	30698	30898
PS32			0000h		30299	30499	30699	30899

Note. Parameter whose symbol is preceded by \* is made valid with the following conditions.

\* : Set the parameter value, switch power off once after setting, and then switch it on again, or perform the controller reset.

\*\* : Set the parameter value, switch power off once, and then switch it on again.

## 4. OPERATION AND FUNCTIONS

### 4.4 Servo control error detection function

POINT
<ul style="list-style-type: none"> <li>For the servo control error detection function, the position and speed deviation error detections are enabled as factory-set. (Parameter No.PS04: <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/>3)</li> </ul>

If the servo control gets unstable for some reasons, the direct drive motor may not operate properly. The protective function for detecting this before happens and stopping the operation is the servo control error detection function.

As the servo control error detection function, there are three types of detection methods: position deviation, speed deviation and torque deviation. An error is detected when each error detection function is enabled with the setting of the parameter No.PS04 (Special function selection 2). The detection level can be changed with the parameter Nos. PS05, PS06 and PS07.

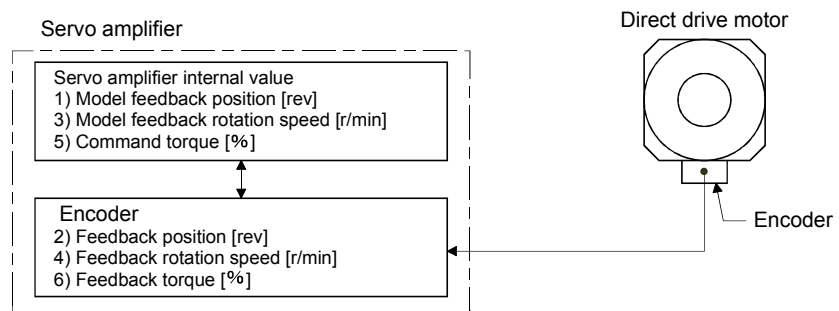
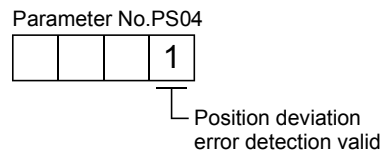


Figure 4.1 Outline of servo control error detection function

#### (1) Position deviation error detection

Set the parameter No.PS04 to "1" to make the position deviation error detection enabled.

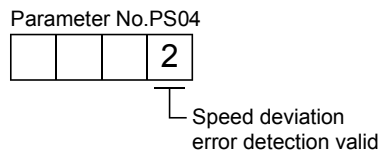


If there is a deviation larger than the setting value (1 to 1000rev) of the parameter No.PS05 (Servo control position deviation error detection level) after comparing the model feedback position 1) and the feedback position 2) in Figure 4.1, the alarm (Servo control error 42) occurs, and the direct drive motor stops. The initial value of parameter No.PS05 is 0.09rev (About 30degree in the mechanical radian). Change the setting value as necessary.

## 4. OPERATION AND FUNCTIONS

### (2) Speed deviation error detection

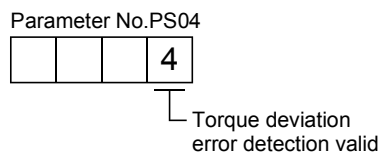
Set the parameter No.PS04 to "□□□2" to make the speed deviation error detection enabled.



If there is a deviation larger than the setting value (1 to 2000r/min) of the parameter No.PS06 (Servo control speed deviation error detection level) after comparing the model feedback speed 3) and the feedback speed 4) in Figure 4.1, the alarm (Servo control error 42) occurs, and the direct drive motor stops. The initial value of parameter No.PS06 is 100r/min. Change the setting value as necessary.

### (3) Torque deviation error detection

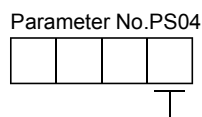
Set the parameter No.PS04 to "□□□4" to make the torque deviation error detection enabled.



If there is a deviation larger than the setting value (1 to 1,000%) of the parameter No.PS07 (Servo control torque deviation error detection level) after comparing the command torque 5) and the feedback torque 6) in Figure 4.1, the alarm (Servo control error 42) occurs, and the direct drive motor stops. The initial value of parameter No.PS05 is 100%. Change the setting value as necessary.

### (4) Detecting multiple deviation errors

Setting the parameter No.PS04 as shown below allows the direct drive motor to detect multiple deviation errors. For the error detection methods, refer to (1) to (3) in this section.



Setting value	Position deviation error detection	Speed deviation error detection	Torque deviation error detection
1	○	○	○
2	○	○	○
3	○	○	○
4	○	○	○
5	○	○	○
6	○	○	○
7	○	○	○





## 5. PARAMETERS

### 5. PARAMETERS



#### CAUTION

- Never adjust or change the parameter values extremely as it will make operation instable.
- If fixed values are written in the digits of a parameter, do not change these values.

#### POINT

- When the servo amplifier is connected with the servo system controller, the parameters are set to the values of the servo system controller. Cycling the power disables the values set in MR Configurator and enables the values set in servo system controller.
- Setting may not be made to some parameters and ranges depending on the model or software version of the servo system controller. For details, refer to the servo system controller user's manual.

In this servo amplifier, the parameters are classified into the following groups on a function basis.

Parameter group	Main description
Basic setting parameters (No.PA□□)	Make basic setting with these parameters.
Gain/filter parameters (No.PB□□)	Use these parameters when making gain adjustment manually.
Extension setting parameters (No.PC□□)	When changing settings such as analog monitor output signal, use these parameters.
I/O setting parameters (No.PD□□)	Use these parameters when changing the I/O signals of the servo amplifier.
Special setting parameters (No.PS□□)	Use these parameters when setting specially for the direct drive servo.

#### 5.1 Parameter write inhibit (Parameter No.PA19)

#### POINT

- This parameter is made valid when power is switched off, then on after setting, or when the controller reset has been performed.

In the factory setting, this servo amplifier allows changes to the all parameters, settings. With the setting of parameter No.PA19, write can be disabled to prevent accidental changes.

The next table indicates the parameters which are enabled for reference and write by the setting of parameter No.PA19. Operation can be performed for the parameters marked ○.

Parameter No.PA19 setting	Setting operation	Basic setting parameters No.PA□□	Gain/filter parameters No.PB□□	Extension setting parameters No.PC□□	I/O setting parameters No.PD□□	Special setting parameters No.PS□□
0000h	Reference	○	<del>○</del>	<del>○</del>	<del>○</del>	<del>○</del>
	Write	○	<del>○</del>	<del>○</del>	<del>○</del>	<del>○</del>
000Bh	Reference	○	○	○	<del>○</del>	<del>○</del>
	Write	○	○	○	<del>○</del>	<del>○</del>
000Ch	Reference	○	○	○	○	<del>○</del>
	Write	○	○	○	○	<del>○</del>

## 5. PARAMETERS

Parameter No.PA19 setting	Setting operation	Basic setting parameters No.PA□□	Gain/filter parameters No.PB□□	Extension setting parameters No.PC□□	I/O setting parameters No.PD□□	Special setting parameters No.PS□□
000Dh (initial value)	Reference	○	○	○	○	○
	Write	○	○	○	○	○
100Bh	Reference	○	/	/	/	/
	Write	Parameter No.PA19 only	/	/	/	/
100Dh	Reference	○	○	○	○	○
	Write	Parameter No.PA19 only	/	/	/	/

### 5.2 Basic setting parameters (No.PA□□)

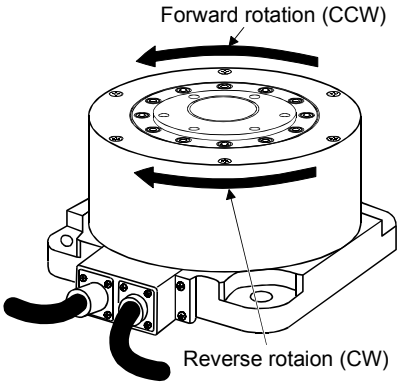
#### 5.2.1 Parameter list

POINT
<ul style="list-style-type: none"> <li>▪ For details of the parameters in which columns MR-J3-□B is written, refer to the MR-J3-□B Servo Amplifier Instruction Manual section 5.1.</li> <li>▪ The parameter whose symbol preceded by * can be validated with the following conditions. <ul style="list-style-type: none"> <li>* : Turn off the power and then on again, or reset the controller after setting the parameter.</li> <li>** : Turn off the power and then on again after setting the parameter.</li> </ul> </li> <li>▪ Never change the parameters for the manufacturer setting.</li> </ul>

No.	Symbol	Name	Initial value	Unit	Reference
PA01	/	For manufacturer setting	0060h	/	/
PA02	**REG	Regenerative option	0000h	/	MR-J3-□B
PA03	*ABS	Absolute position detection system	0000h	/	Section 5.2.2
PA04	*AOP1	Function selection A-1	0000h	/	MR-J3-□B
PA05	/	For manufacturer setting	0	/	/
PA06	/		1		
PA07	/		1		
PA08	ATU	Auto tuning	0001h	/	MR-J3-□B
PA09	RSP	Auto tuning response	12	/	
PA10	INP	In-position range	100	pulse	
PA11	/	For manufacturer setting	1000.0	/	/
PA12	/		1000.0		
PA13	/		0000h		
PA14	*POL	Rotation direction selection	0	/	Section 5.2.2
PA15	*ENR	Encoder output pulses	4000	pulse/ rev	MR-J3-□B
PA16	/	For manufacturer setting	0	/	/
PA17	/		0000h		
PA18	/		0000h		
PA19	*BLK	Parameter write inhibit	000Dh	/	Section 5.2.2

## 5. PARAMETERS

### 5.2.2 List of details

Classification	No.	Symbol	Name and function	Initial value	Unit	Setting range											
Basic setting parameter	PA01		For manufacturer setting Do not change this value by any means.	0060h													
	PA03	*ABS	Absolute position detection system Set this parameter when using the absolute position detection system in the position control mode. <div style="border: 1px solid black; padding: 5px; display: inline-block; margin: 5px 0;"> <table border="1" style="border-collapse: collapse;"> <tr> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;">0</td> <td style="width: 20px; text-align: center;"> </td> </tr> </table> </div> Selection of absolute position detection system (Refer to MR-J3-□B Servo Amplifier Instruction Manual chapter 12) 0: Used in incremental system 1: Used in absolute position detection system If the absolute position detection system is enabled when the incremental system is being used, parameter error (37) occurs.	0	0	0		0000h		Refer to the name and function column							
	0	0	0														
<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;">POINT</div> <ul style="list-style-type: none"> <li>▪ This parameter cannot be used in the speed control mode.</li> </ul>																	
	PA14	*POL	Rotation direction selection Select direct drive motor rotation direction relative. <table border="1" style="border-collapse: collapse; margin: 10px auto; width: 80%;"> <thead> <tr> <th rowspan="2">Setting</th> <th colspan="2">Direct drive motor rotation direction</th> </tr> <tr> <th>When positioning address increases</th> <th>When positioning address decreases</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">CCW</td> <td style="text-align: center;">CW</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">CW</td> <td style="text-align: center;">CCW</td> </tr> </tbody> </table> <div style="text-align: center;">  </div> <div style="border: 1px solid black; padding: 5px; display: inline-block; margin: 5px 0;">           POINT         </div> <ul style="list-style-type: none"> <li>▪ This parameter cannot be used in the speed control mode.</li> </ul>	Setting	Direct drive motor rotation direction		When positioning address increases	When positioning address decreases	0	CCW	CW	1	CW	CCW	0		0 1
Setting	Direct drive motor rotation direction																
	When positioning address increases	When positioning address decreases															
0	CCW	CW															
1	CW	CCW															

## 5. PARAMETERS

Classification	No.	Symbol	Name and function	Initial value	Unit	Setting range						
Basic setting parameter	PA19	*BLK	Parameter write inhibit	000Dh		Refer to the name and function column						
							Applicable parameters					
			Setting				Operation	No.PA□□	No.PB□□	No.PC□□	No.PD□□	No.PS□□
			0000h				Reference	○	/	/	/	/
							Write	○	/	/	/	/
			000Bh				Reference	○	○	○	/	/
							Write	○	○	○	/	/
			000Ch				Reference	○	○	○	○	/
							Write	○	○	○	○	/
			000Dh				Reference	○	○	○	○	○
							Write	○	○	○	○	○
			100Bh				Reference	○	/	/	/	/
							Write	Parameter No.PA19 only	/	/	/	/
			100Dh				Reference	○	○	○	○	○
Write	Parameter No.PA19 only	/		/	/	/						

## 5. PARAMETERS

### 5.3 Gain/Filter parameters (No.PB□□)

#### 5.3.1 Parameter list

POINT
<ul style="list-style-type: none"> <li>▪ For details of the parameters in which columns MR-J3-□B is written, refer to the MR-J3-□B Servo Amplifier Instruction Manual section 5.2.</li> <li>▪ The parameter whose symbol preceded by * can be validated with the following conditions.</li> <li style="padding-left: 20px;">* : Turn off the power and then on again, or reset the controller after setting the parameter.</li> <li>▪ Never change the parameters for the manufacturer setting.</li> </ul>

No.	Symbol	Name	Initial value	Unit	Reference
PB01	FILT	Adaptive tuning mode(adaptive filter II)	0000h		MR-J3-□B
PB02	VRFT	Vibration suppression control tuning mode(advanced vibration suppression control)	0000h		
PB03		For manufacturer setting	0		
PB04	FFC	Feed forward gain	0	%	MR-J3-□B
PB05		For manufacturer setting	500		
PB06	GD2	Ratio of load inertia moment to direct drive motor inertia moment	7.0	Multiplier (× 1)	MR-J3-□B
PB07	PG1	Model loop gain	24	rad/s	
PB08	PG2	Position loop gain	37	rad/s	
PB09	VG2	Speed loop gain	823	rad/s	
PB10	VIC	Speed integral compensation	33.7	ms	
PB11	VDC	Speed differential compensation	980		
PB12		For manufacturer setting	0		
PB13	NH1	Machine resonance suppression filter 1	4500	Hz	
PB14	NHQ1	Notch shape selection 1	0000h		
PB15	NH2	Machine resonance suppression filter 2	4500	Hz	
PB16	NHQ2	Notch shape selection 2	0000h		
PB17		Automatic setting parameter			
PB18	LPF	Low-pass filter setting	3141	rad/s	
PB19	VRF1	Vibration suppression control vibration frequency setting	100.0	Hz	
PB20	VRF2	Vibration suppression control resonance frequency setting	100.0	Hz	
PB21		For manufacturer setting	0.00		
PB22			0.00		
PB23	VFBF	Low-pass filter selection	0000h		MR-J3-□B
PB24	*MVS	Slight vibration suppression control selection	0000h		
PB25		For manufacturer setting	0000h		
PB26	*CDP	Gain changing selection	0000h		MR-J3-□B
PB27	CDL	Gain changing condition	10		
PB28	CDT	Gain changing time constant	1	ms	
PB29	GD2B	Gain changing ratio of load inertia moment to direct drive motor inertia moment	7.0	Multiplier (× 1)	
PB30	PG2B	Gain changing position loop gain	37	rad/s	
PB31	VG2B	Gain changing speed loop gain	823	rad/s	
PB32	VICB	Gain changing speed integral compensation	33.7	ms	
PB33	VRF1B	Gain changing vibration suppression control vibration frequency setting	100.0	Hz	
PB34	VRF2B	Gain changing vibration suppression control resonance frequency setting	100.0	Hz	

## 5. PARAMETERS

### 5.4 Extension setting parameters (No.PC□□)

#### 5.4.1 Parameter list

POINT
<ul style="list-style-type: none"> <li>▪ For details of the parameters in which columns MR-J3-□B is written, refer to the MR-J3-□B Servo Amplifier Instruction Manual section 5.3.</li> <li>▪ The parameter whose symbol preceded by * can be validated with the following conditions.               <ul style="list-style-type: none"> <li>* : Turn off the power and then on again, or reset the controller after setting the parameter.</li> </ul> </li> <li>▪ Never change the parameters for the manufacturer setting.</li> </ul>

No.	Symbol	Name	Initial value	Unit	Reference
PC01	*ERZ	Error excessive alarm level	3	rev	MR-J3-□B
PC02	MBR	Electromagnetic brake sequence output	0	ms	
PC03	*ENRS	Encoder output pulses selection	0000h		
PC04		For manufacturer setting	0000h		
PC05			0000h		
PC06			0000h		
PC07	ZSP	Zero speed	50	r/min	MR-J3-□B
PC08		For manufacturer setting	0		
PC09	MOD1	Analog monitor 1 output	0000h		MR-J3-□B
PC10	MOD2	Analog monitor 2 output	0001h		
PC11	MO1	Analog monitor 1 offset	0	mV	
PC12	MO2	Analog monitor 2 offset	0	mV	
PC13		For manufacturer setting	0		
PC14			0		
PC15			0		
PC16			0000h		
PC17		For manufacturer setting (Note)	0000h		
PC18		For manufacturer setting	0000h		
PC19			0000h		
PC20	*COP7	Function selection C-7	0000h		MR-J3-□B
PC21	*BPS	Alarm history clear	0000h		
PC22		For manufacturer setting	0000h		
PC23			0000h		
PC24			0000h		
PC25			0000h		
PC26			0100h		
PC27			0000h		
PC28			0000h		
PC29			0000h		
PC30			0000h		
PC31			0000h		
PC32			0000h		

Note. This parameter is "Function selection C-4" for the MR-J3-□B servo amplifier, however the parameter is not available for the MR-J3-□B-RJ080W servo amplifier. If the setting is changed, a parameter error (37) occurs.

## 5. PARAMETERS

### 5.5 I/O setting parameters (No.PD□□)

#### 5.5.1 Parameter list

POINT
<ul style="list-style-type: none"> <li>▪ For details of the parameters in which columns MR-J3-□B is written, refer to the MR-J3-□B Servo Amplifier Instruction Manual section 5.4.</li> <li>▪ The parameter whose symbol preceded by * can be validated with the following conditions.                             <ul style="list-style-type: none"> <li>* : Turn off the power and then on again, or reset the controller after setting the parameter.</li> </ul> </li> <li>▪ Never change the parameters for the manufacturer setting.</li> </ul>

No.	Symbol	Name	Initial value	Unit	Reference
PD01		For manufacturer setting	0000h		
PD02			0000h		
PD03			0020h		
PD04			0021h		
PD05			0000h		
PD06			0000h		
PD07	*D01	Output signal device selection 1(CN3-13)	0005h		MR-J3-□B
PD08	*D02	Output signal device selection 2(CN3-9)	0004h		
PD09	*D03	Output signal device selection 3(CN3-15)	0003h		
PD10		For manufacturer setting	0000h		
PD11			0004h		
PD12			0000h		
PD13			0000h		
PD14	*DOP3	Function selection D-3	0000h		MR-J3-□B
PD15		For manufacturer setting	0000h		
PD16			0000h		
PD17			0000h		
PD18			0000h		
PD19			0000h		
PD20			0000h		
PD21			0000h		
PD22			0000h		
PD23			0000h		
PD24			0000h		
PD25			0000h		
PD26			0000h		
PD27			0000h		
PD28			0000h		
PD29			0000h		
PD30			0000h		
PD31			0000h		
PD32			0000h		



## 5. PARAMETERS

### 5.6 Special setting parameters (No.PS□□)

#### 5.6.1 Parameter list

POINT
<ul style="list-style-type: none"> <li>▪ The parameter whose symbol preceded by * can be validated with the following conditions.</li> <li>  * : Turn off the power and then on again, or reset the controller after setting the parameter.</li> <li>  ** : Turn off the power and then on again after setting the parameter.</li> <li>▪ Never change the parameters for the manufacturer setting.</li> </ul>

No.	Symbol	Name	Initial value	Unit	Reference
PS01	**LIT1	Special function selection 1	0001h		Section 5.6.2
PS02		For manufacturer setting	0000h		
PS03			0000h		
PS04	*LIT2	Special function selection 2	0003h		Section 5.6.2
PS05	LB1	Servo control position deviation error detection level	9	0.01 rev	
PS06	LB2	Servo control speed deviation error detection level	100	r/min	
PS07	LB3	Servo control torque deviation error detection level	100	%	
PS08	*LIT3	Special function selection 3	0010h		
PS09	LPWM	Magnetic pole detection voltage level	30	%	
PS10		For manufacturer setting	0005h		
PS11			0064h		
PS12			01F4h		
PS13			0000h		
PS14			0000h		
PS15			0000h		
PS16			0000h		
PS17	LTSTS	Minute position detection method function selection	0000h		Section 5.6.2
PS18	IDLV	Minute position detection method identification signal amplitude	0	%	
PS19		For manufacturer setting	0000h		
PS20			0000h		
PS21			0000h		
PS22			0000h		
PS23			0000h		
PS24			0000h		
PS25			0000h		
PS26			0000h		
PS27			0000h		
PS28			0000h		
PS29			0000h		
PS30			0000h		
PS31			0000h		
PS32			0000h		

## 5. PARAMETERS

### 5.6.2 List of details

Classification	No.	Symbol	Name and function	Initial value	Unit	Setting range				
Special setting parameters	PS01	*LIT1	<p>Special function selection 1</p> <p>The magnetic pole detection setting, the valid/invalid setting of the direct drive motor thermistor can be selected. (Refer to section 4.2)</p> <p>Direct drive motor magnetic pole detection setting is unnecessary for an incremental system.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20px; height: 20px;"> </td> <td style="width: 20px; height: 20px;">0</td> <td style="width: 20px; height: 20px;">0</td> <td style="width: 20px; height: 20px;"> </td> </tr> </table> </div> <p style="margin-left: 40px;">Direct drive motor magnetic pole detection setting 0: Magnetic pole detection invalid 1: Magnetic pole always valid</p> <p style="margin-left: 40px;">Direct drive motor thermistor valid/invalid setting 0: Thermistor error detection valid 1: Thermistor error detection invalid</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center; margin: 0;"><b>POINT</b></p> <ul style="list-style-type: none"> <li>▪ To protect the direct drive motor from overheating, usually fabricate a cable that includes a thermistor wire. Set the thermistor error detection to be valid with this parameter.</li> </ul> </div>		0	0		0001h		Refer to the name and function column
		0	0							
	PS02		For manufacturer setting	0000h						
	PS03		Do not change this value by any means.	0000h						
	PS04	*LIT2	<p>Special function selection 2</p> <p>Servo control error detection function and servo control error reset can be selected.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20px; height: 20px;"> </td> <td style="width: 20px; height: 20px;">0</td> <td style="width: 20px; height: 20px;">0</td> <td style="width: 20px; height: 20px;"> </td> </tr> </table> </div> <p style="margin-left: 40px;">Servo control error detection function selection (Refer to section 4.4) 0: Invalid 1: Position deviation error detection valid 2: Speed deviation error detection valid 3: Position/speed deviation error detection valid 4: Torque deviation error detection valid 5: Position/torque deviation error detection valid 6: Speed/torque deviation error detection valid 7: Position/speed/torque deviation error detection valid</p> <p style="margin-left: 40px;">Servo control error detection reset selection Set the controller reset condition of the servo control error detection (42). 0: Reset impossible (Reset by switching off is possible.) 1: Reset possible</p>		0	0		0003h		Refer to the name and function column
	0	0								
PS05	LBI	<p>Servo control position deviation error detection level</p> <p>Used to set the position deviation error detection level of the servo control error detection. When the difference between the model feedback position and the feedback position is bigger than this setting value, the servo control error is detected (42). When the initial value is (9), the mechanical radian is approximately 30 deg. (Refer to section 4.4)</p>	9	0.01 rev	1 to 1000					

## 5. PARAMETERS

Classification	No.	Symbol	Name and function	Initial value	Unit	Setting range
Special setting parameters	PS06	LB2	Servo control speed deviation error detection level Used to set the speed deviation error detection level of the servo control error detection. When the difference between the model feedback speed and the feedback speed is bigger than this setting value, the servo control error is detected (42). (Refer to section 4.4)	100	r/min	1 to 2000
	PS07	LB3	Servo control to torque deviation error detection level Used to set the torque deviation error detection level of the servo control error detection. When the difference between the command torque and the feedback torque is bigger than this setting value, the servo control error is detected (42). (Refer to section 4.4)	100	%	1 to 1000
	PS08	*LIT3	Special function selection 3 Select the valid/invalid setting of the stroke limit and the magnetic pole detection method for the magnetic pole detection. (Refer to section 4.2.3) When the stroke limit (FLS and RLS) of the servo amplifier is not used, invalidate the stroke limit for the magnetic pole detection.  <div style="display: flex; align-items: center; margin-bottom: 5px;"> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 5px;"></div> </div> <div style="margin-left: 20px;"> <p>└─ Method selection for the magnetic pole detection 0: Position detection method 4: Minute position detection method</p> <p>└─ Valid/invalid setting of the stroke limit (FLS and RLS) for the magnetic pole detection 0: Valid 1: Invalid</p> </div>	0010h		Refer to the name and function column
	PS09	LPWM	Magnetic pole detection voltage level Used to set the direct current exciting voltage level during the magnetic pole detection. When the overload alarm (50 and 51) or overcurrent alarm (32) occurs, set the smaller value. When the initial magnetic pole detection error occurs during the magnetic pole detection, set the bigger value. (Refer to section 4.2.4)	30	%	0 to 100
	PS10		For manufacturer setting	0005h		
	PS11		Do not change these values by any means.	0064h		
	PS12			01F4h		
PS13			0000h			
PS14			0000h			
PS15			0000h			
PS16			0000h			

## 5. PARAMETERS

Classification	No.	Symbol	Name and function	Initial value	Unit	Setting range																																																																		
Special setting parameters	PS17	LTSTS	<p>Minute position detection method function selection</p> <p>Used to set the response and the load to motor inertia moment ratio of the minute position detection method.</p> <p>To make the parameter valid, set parameter No.PS08 (Special function selection 3) to "□□□4" (minute position detection method). (Refer to section 4.2.5)</p> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 5px;"> </div> <div style="border: 1px solid black; padding: 2px 5px;"> </div> </div> <p style="margin-left: 40px;">└─ Response of the minute position detection method</p> <table border="1" style="margin-left: 40px; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Setting</th> <th>Response</th> <th>Setting</th> <th>Response</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Low response</td> <td>8</td> <td>Middle response</td> </tr> <tr> <td>1</td> <td rowspan="2">↑</td> <td>9</td> <td rowspan="2">↑</td> </tr> <tr> <td>2</td> <td>A</td> </tr> <tr> <td>3</td> <td rowspan="2">↓</td> <td>B</td> <td rowspan="2">↓</td> </tr> <tr> <td>4</td> <td>C</td> </tr> <tr> <td>5</td> <td rowspan="2">↓</td> <td>D</td> <td rowspan="2">↓</td> </tr> <tr> <td>6</td> <td>E</td> </tr> <tr> <td>7</td> <td>Middle response</td> <td>F</td> <td>High response</td> </tr> </tbody> </table> <p style="margin-left: 40px;">└─ Selecting the load inertia moment ratio at the direct drive motor, which decides the response of the minute position detection method</p> <table border="1" style="margin-left: 40px; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Setting</th> <th>Load inertia moment ratio</th> <th>Setting</th> <th>Load inertia moment ratio</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Less than 10 times</td> <td>8</td> <td>80 times</td> </tr> <tr> <td>1</td> <td>10 times</td> <td>9</td> <td>90 times</td> </tr> <tr> <td>2</td> <td>20 times</td> <td>A</td> <td>100 times</td> </tr> <tr> <td>3</td> <td>30 times</td> <td>B</td> <td>110 times</td> </tr> <tr> <td>4</td> <td>40 times</td> <td>C</td> <td>120 times</td> </tr> <tr> <td>5</td> <td>50 times</td> <td>D</td> <td>130 times</td> </tr> <tr> <td>6</td> <td>60 times</td> <td>E</td> <td>140 times</td> </tr> <tr> <td>7</td> <td>70 times</td> <td>F</td> <td>150 times or more</td> </tr> </tbody> </table>	Setting	Response	Setting	Response	0	Low response	8	Middle response	1	↑	9	↑	2	A	3	↓	B	↓	4	C	5	↓	D	↓	6	E	7	Middle response	F	High response	Setting	Load inertia moment ratio	Setting	Load inertia moment ratio	0	Less than 10 times	8	80 times	1	10 times	9	90 times	2	20 times	A	100 times	3	30 times	B	110 times	4	40 times	C	120 times	5	50 times	D	130 times	6	60 times	E	140 times	7	70 times	F	150 times or more	0000h		Refer to the name and function column
	Setting	Response	Setting	Response																																																																				
	0	Low response	8	Middle response																																																																				
1	↑	9	↑																																																																					
2		A																																																																						
3	↓	B	↓																																																																					
4		C																																																																						
5	↓	D	↓																																																																					
6		E																																																																						
7	Middle response	F	High response																																																																					
Setting	Load inertia moment ratio	Setting	Load inertia moment ratio																																																																					
0	Less than 10 times	8	80 times																																																																					
1	10 times	9	90 times																																																																					
2	20 times	A	100 times																																																																					
3	30 times	B	110 times																																																																					
4	40 times	C	120 times																																																																					
5	50 times	D	130 times																																																																					
6	60 times	E	140 times																																																																					
7	70 times	F	150 times or more																																																																					
	PS18	IDLV	<p>Minute position detection method identification signal amplitude</p> <p>Used to set the identification signal amplitude for the minute position detection method. To make the parameter valid, set parameter No.PS08 (Special function selection 3) to "□□□4".</p> <p>Identification signal is "100%" when "0000h" is set. (Refer to section 4.2.5)</p>	0	%	0 to 100																																																																		
	PS19		For manufacturer setting	0000h																																																																				
	PS20		Do not change these values by any means.	0000h																																																																				
	PS21			0000h																																																																				
	PS22			0000h																																																																				
	PS23			0000h																																																																				
	PS24			0000h																																																																				
	PS25			0000h																																																																				
	PS26			0000h																																																																				
	PS27			0000h																																																																				
	PS28			0000h																																																																				
	PS29			0000h																																																																				
	PS30			0000h																																																																				
	PS31			0000h																																																																				
	PS32			0000h																																																																				



## 6. TROUBLESHOOTING

### 6. TROUBLESHOOTING

POINT
<ul style="list-style-type: none"> <li>Alarms and warnings are basically the same as those of MR-J3-□B servo amplifier. This chapter describes the contents different from those of MR-J3-□B servo amplifier.</li> <li>As soon as an alarm occurs, make the servo-off status and interrupt the main circuit power.</li> </ul>

If an alarm has occurred, refer to this chapter and remove its cause.

#### 6.1 Alarms and warning list

When a fault occurs during operation, the corresponding alarm or warning is displayed. Refer to section 6.2 of this manual and section 8.2 of the MR-J3-□B Servo Amplifier Instruction Manual at an alarm occurrence and section 6.3 of this manual and section 8.3 of the MR-J3-□B Servo Amplifier Instruction Manual at a warning occurrence, and then take the appropriate action. When an alarm occurs, the ALM turns off.

After its cause has been removed, the alarm can be deactivated in any of the methods marked ○ in the alarm deactivation column. The alarm is automatically canceled after removing the cause of occurrence.

	Display	Name	Alarm deactivation		
			Power off → on	Error reset	CPU reset
Alarms	10	Undervoltage	○	○	○
	12	Memory error 1 (RAM)	○	○	○
	13	Clock error	○	○	○
	15	Memory error 2 (EEP-ROM)	○	○	○
	16	Encoder error 1	○	○	○
	17	Board error	○	○	○
	19	Memory error 3 (Flash-ROM)	○	○	○
	1A	Motor combination error	○	○	○
	1F	Encoder combination error	○	○	○
	20	Encoder error 2	○	○	○
	21	Encoder error 3	○	○	○
	24	Main circuit error	○	○	○
	25	Absolute position erase	○	○	○
	27	Initial magnetic pole detection error	○	○	○
	2B	Encoder counter error	○	○	○
	30	Regenerative error	(Note 1)○	(Note 1)○	(Note 1)○
	31	Overspeed	○	○	○
	32	Overcurrent	○	○	○
	33	Overvoltage	○	○	○
	34	Receive error 1	○	(Note 2)○	○
	35	Command frequency alarm	○	○	○
	36	Receive error 2	○	○	○
	37	Parameter error	○	○	○
	42	Servo control error	○	(Note 3)○	(Note 3)○
	45	Main circuit device overheat	(Note 1)○	(Note 1)○	(Note 1)○
46	Direct drive motor overheat	(Note 1)○	(Note 1)○	(Note 1)○	
47	Cooling fan alarm	○	○	○	
50	Overload 1	(Note 1)○	(Note 1)○	(Note 1)○	
51	Overload 2	(Note 1)○	(Note 1)○	(Note 1)○	
52	Error excessive	○	○	○	
8A	USB communication time-out error	○	○	○	
8E	USB communication error	○	○	○	
888	Watchdog	○	○	○	
Warnings	92	Battery cable disconnection warning			
	96	Home position setting error			
	9F	Battery warning			
	E0	Excessive regeneration warning			
	E1	Overload warning 1			
	E2	Direct drive motor overheat warning			
	E3	Absolute position counter warning			
	E4	Parameter warning			
	E6	Servo forced stop warning			
	E7	Controller forced stop warning			
E8	Cooling fan speed reduction warning				
E9	Main circuit off warning				
EC	Overload warning 2				
ED	Output watt excess warning				

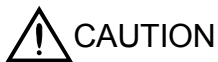
Note 1. Deactivate the alarm about 30 minutes of cooling time after removing the cause of occurrence.

2. In some controller communication status, the alarm factor may not be removed.

3. Set parameter No.PS04 to "1□□□" to deactivate.

## 6. TROUBLESHOOTING

### 6.2 Remedies for alarms



- When any alarm has occurred, eliminate its cause, ensure safety, then reset the alarm, and restart operation. Otherwise, injury may occur.
- If an absolute position erase (25) occurred, always make home position setting again. Otherwise, it may cause an unexpected operation.
- As soon as an alarm occurs, make servo-off and power off the main circuit and control circuit.

#### POINT

- When any of the following alarms has occurred, do not deactivate the alarm and resume operation repeatedly. To do so will cause the servo amplifier/direct drive motor to fail. Remove the cause of occurrence, and leave a cooling time of more than 30 minutes before resuming operation. To protect the main circuit elements, any of these servo alarms cannot be deactivated from the servo system controller until the specified time elapses after its occurrence. Judging the load changing condition until the alarm occurs, the servo amplifier calculates this specified time automatically.
- Regenerative error (30)
- Main circuit device overheat (45)
- Direct drive motor overheat (46)
- Overload 1 (50)
- Overload 2 (51)
- The alarm can be deactivated by switching power off, then on or by the error reset command • CPU reset from the servo system controller. For details, refer to section 6.1.

When an alarm occurs, the malfunction (ALM) switches off and the dynamic brake is operated to stop the direct drive motor. At this time, the display indicates the alarm No.

The direct drive motor comes to a stop. Remove the cause of the alarm in accordance with this section. Use MR Configurator to refer to a factor of alarm occurrence.

Display	Name	Definition	Cause	Action
10	Undervoltage	Refer to chapter 8 of the MR-J3-□B Servo Amplifier Instruction Manual.		
12	Memory error 1 (RAM)			
13	Clock error			
15	Memory error 2 (EEP-ROM)			
16	Encoder error 1	Communication error occurred between encoder and servo amplifier.	1. Encoder connector (CN2) disconnected. 2. Encoder fault 3. Encoder cable faulty (Wire breakage or shorted)	Connect correctly. Replace the direct drive motor. Repair or replace the cable.
17	Board error 2	Refer to chapter 8 of the MR-J3-□B Servo Amplifier Instruction Manual.		
19	Memory error 3 (Flash ROM)			
1A	Motor combination error			

## 6. TROUBLESHOOTING

Display	Name	Definition	Cause	Action
1F	Encoder combination error	Wrong combination of servo amplifier and encoder.	Wrong combination of servo amplifier and encoder.	Use correct combination.
20	Encoder error 2	Refer to chapter 8 of the MR-J3-□B Servo Amplifier Instruction Manual.		
21	Encoder error 3			
24	Main circuit error			
25	Absolute position erase	Absolute position data in error	1. Voltage drop in encoder (Battery disconnected.)	Connect the battery. According to the startup procedure (Refer to section 4.1.1), start up the direct drive servo again, and set the home position.
			2. Battery voltage low	Replace the battery.
			3. Battery cable or battery is faulty.	According to the startup procedure (Refer to section 4.1.1), start up the direct drive servo again, and set the home position.
			4. Absolute position storage unit faulty.	Replace the absolute position storage unit. According to the startup procedure (Refer to section 4.1.1), start up the direct drive servo again, and set the home position.
			5. The encoder cable is disconnected or broken.	Check the encoder cable. According to the startup procedure (Refer to section 4.1.1), start up the direct drive servo again, and set the home position.
		Power was switched on for the first time in the absolute position detection system.	Home position not set.	Connect the battery. According to the startup procedure (Refer to section 4.1.1), start up the direct drive servo again, and set the home position.
27	Initial magnetic pole detection error	Initial magnetic pole detection did not operate normally	1. Machine struck.	Perform the magnetic pole detection in order not to strike the machine.
			2. Accuracy at initial magnetic pole detection is low.	Check the parameter No.PS09 setting (magnetic pole detection voltage level).
			3. Poor wiring of U, V and W.	Correct the wiring.
			4. Magnetic pole detection limit switch is not on.	Connect the magnetic detection limit switch correctly. When not connecting the limit switch to the servo amplifier, check the setting of parameter No.PS08 (special function selection 3).
2B	Encoder counter error	Data created by the encoder has errors.	1. Noise entered the encoder.	Shut off the power supply once, then turn on the power supply again. According to the startup procedure (Refer to section 4.1.1), start up the direct drive servo again, and set the home position.
			2. Encoder fault.	Replace the direct drive motor.
			3. Encoder cable faulty.	Check if the shield of the encoder cable is treated correctly. (Refer to section 9.1.2(3)) After confirming its treatment, start the direct drive servo again by referring to the startup procedure (in section 4.1.1) and set the home position.



## 6. TROUBLESHOOTING

Display	Name	Definition	Cause	Action
30	Regenerative error	Refer to chapter 8 of the MR-J3-□B Servo Amplifier Instruction Manual.		
31	Overspeed			
32	Overcurrent			
33	Overvoltage			
34	Receive error 1			
35	Command frequency alarm			
36	Receive error 2			
37	Parameter error			
42	Servo control error	Servo control error occurred.	1. Initial magnetic pole detection has not been performed.	Perform initial magnetic pole detection.
			2. The position deviation exceeded the detection level.	Check the operation condition. Check the setting of parameter No.PS05 (Servo control position deviation error detection level) as required.
			3. The speed deviation exceeded the detection level.	Check the operation condition. Check the setting of parameter No.PS06 (Servo control speed deviation error detection level) as required.
			4. Torque deviation exceeded the detection level.	Check the operation condition. Check the parameter No.PS07 setting (Servo control torque deviation error detection level) as necessary.
			5. Wrong connection of direct drive motor. Servo amplifier's power supply output (U, V, and W) do not match with direct drive motor's power supply input (U, V, and W).	Connect correctly.
45	Main circuit device overheat	Refer to chapter 8 of the MR-J3-□B Servo Amplifier Instruction Manual.		
46	Direct drive motor overheat	Direct drive motor temperature rose. (Detected by thermistor)	1. Ambient temperature of direct drive motor is over 40°C (104°F).	Check environment so that ambient temperature is 0 to 40°C (32 to 104°F).
			2. Direct drive motor is overloaded.	1. Reduce load. 2. Check operation pattern. 3. Replace direct drive motor that provides larger output.
			3. Thermistor in direct drive motor is faulty.	Replace the direct drive motor.
			4. Thermistor wire faulty. (Breakage or short-circuit)	Repair or replace the encoder cable.
47	Cooling fan alarm	Refer to chapter 8 of the MR-J3-□B Servo Amplifier Instruction Manual.		

## 6. TROUBLESHOOTING

Display	Name	Definition	Cause	Action
50	Overload1	Load exceeded overload protection characteristic of servo amplifier.	1. Servo amplifier is used in excess of its continuous output current.	1. Reduce load. 2. Check operation pattern. 3. Replace direct drive motor that provides larger output.
			2. Servo system is instable and hunting.	1. Repeat acceleration/ deceleration to execute auto tuning. 2. Change auto tuning response setting. 3. Set auto tuning to off and make gain adjustment manually.
			3. Machine struck something.	1. Check operation pattern. 2. Install limit switches.
			4. Wrong connection of direct drive motor. Servo amplifier's power supply output (U, V, and W) do not match direct drive motor's power supply input (U, V, and W).	Connect correctly.
			5. Encoder faulty.  <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: center;">Checking method</p> <p>When the direct drive motor rotor is rotated with the servo-off, the cumulative feedback pulses do not vary in proportional to the turning angle in the rotor, and the indication skips or returns midway.</p> </div>	Replace the direct drive motor.
			6. Initial magnetic pole detection has not been performed.	Perform initial magnetic pole detection.
			7. After Overload 2 (51) occurred, turn off/on the power supply to clear the alarm. Then the overload operation is repeated.	1. Reduce load. 2. Check operation pattern. 3. Replace direct drive motor that provides larger output.
51	Overload2	Machine collision or the like caused max. output current to flow successively for several seconds. For the time of the alarm occurrence, refer to the section 8.1.	1. Machine struck something.	1. Check operation pattern. 2. Install limit switches.
			2. Wrong connection of direct drive motor. Servo amplifier's power supply output (U, V, and W) do not match direct drive motor's power supply input (U, V, and W).	Connect correctly.
			3. Servo system is instable and hunting.	1. Repeat acceleration/deceleration to execute auto tuning. 2. Change auto tuning response setting. 3. Set auto tuning to off and make gain adjustment manually.
			4. Encoder faulty.  <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: center;">Checking method</p> <p>When the direct drive motor rotor is rotated with the servo-off, the cumulative feedback pulses do not vary in proportional to the turning angle in the rotor, and the indication skips or returns midway.</p> </div>	Replace the direct drive motor.
			5. Initial magnetic pole detection has not been performed.	Perform initial magnetic pole detection.

## 6. TROUBLESHOOTING

Display	Name	Definition	Cause	Action
52	Error excessive	Refer to chapter 8 of the MR-J3-□B Servo Amplifier Instruction Manual.		
8A	USB communication time-out error			
8E	USB communication error			
888	Watchdog			

### 6.3 Remedies for warnings



#### CAUTION

- If an absolute position counter warning (E3) occurred, always make home position setting again. Otherwise, it may cause an unexpected operation.

#### POINT

- When any of the following alarms has occurred, do not resume operation by switching power of the servo amplifier off/on repeatedly. The servo amplifier and direct drive motor may become faulty. If the power of the servo amplifier is switched off/on during the alarms, allow more than 30 minutes for cooling before resuming operation.
- Excessive regenerative warning (E0)
- Overload warning 1 (E1)
- Direct drive motor overheat (E2)

If E6, E7 or E9 occurs, the servo-off status is established. If any other warning occurs, operation can be continued but an alarm may take place or proper operation may not be performed.

Remove the cause of warning according to this section. Use MR Configurator to refer to a factor of warning occurrence.

Display	Name	Definition	Cause	Action
92	Battery cable disconnection warning	Absolute position detection system battery voltage is low.	1. Battery cable is open.	Repair the cable or replace the battery.
			2. Battery voltage supplied from the servo amplifier to the encoder fell to about 3V or less. (Detected with the encoder)	Replace the battery.
			3. An absolute position storage unit is not connected.	Connect the absolute position storage unit.
96	Home position setting warning	Refer to chapter 8 of the MR-J3-□B Servo Amplifier Instruction Manual.		
9F	Battery warning	Voltage of battery for absolute position detection system reduced.	1. Battery voltage fell to 3.2V or less. (Detected with the servo amplifier)	Replace the battery.
			2. Battery deteriorated and its voltage fell. (Detected with the encoder)	
			3. An absolute position storage unit is not connected.	Connect the absolute position storage unit.

## 6. TROUBLESHOOTING

Display	Name	Definition	Cause	Action
E0	Excessive regeneration warning	Refer to chapter 8 of the MR-J3-□B Servo Amplifier Instruction Manual.		
E1	Overload warning 1			
E2	Direct drive motor overheat warning	Direct drive motor temperature rose and exceeded 85% of the alarm occurrence level.	1. Ambient temperature of direct drive motor is over 40°C (104°F).	Check environment so that ambient temperature is 0 to 40°C (32 to 104°F).
			2. Direct drive motor is overloaded.	1. Reduce load. 2. Check operation pattern. 3. Replace direct drive motor that provides larger output.
			3. Thermistor in direct drive motor is faulty.	Replace the direct drive motor.
E3	Absolute position counter warning	Refer to chapter 8 of the MR-J3-□B Servo Amplifier Instruction Manual.		
E4	Parameter warning			
E6	Servo forced stop warning			
E7	Controller forced stop warning			
E8	Cooling fan speed reduction warning			
E9	Main circuit off warning			
EC	Overload warning 2			
ED	Output watt excess warning			



# 7. SERVO AMPLIFIER OUTLINE DRAWINGS

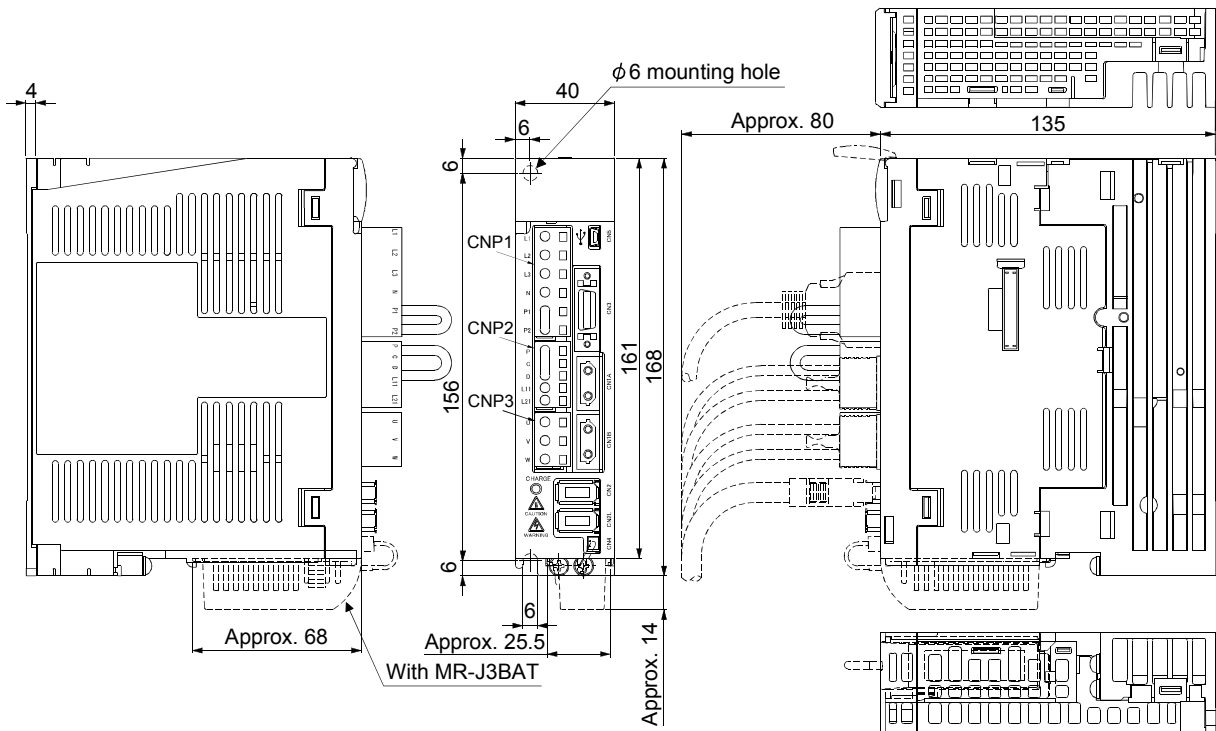
## 7. SERVO AMPLIFIER OUTLINE DRAWINGS

**POINT**

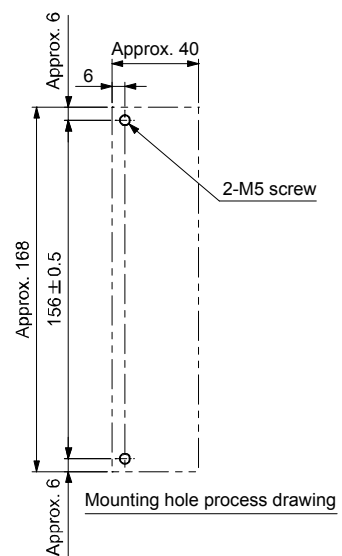
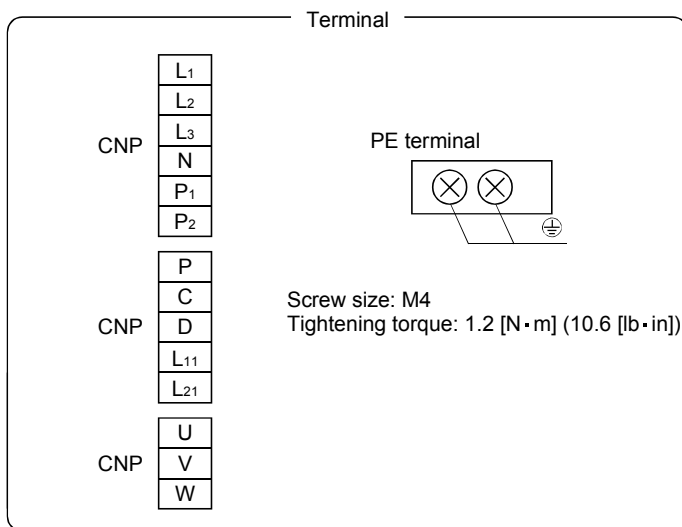
- For the outline drawings of connectors, refer to section 9.2 of the MR-J3-□B Servo Amplifier Instruction Manual.

(1) MR-J3-20B-RJ080W

[Unit: mm]



Mass: 0.8 [kg] (1.76 [lb])



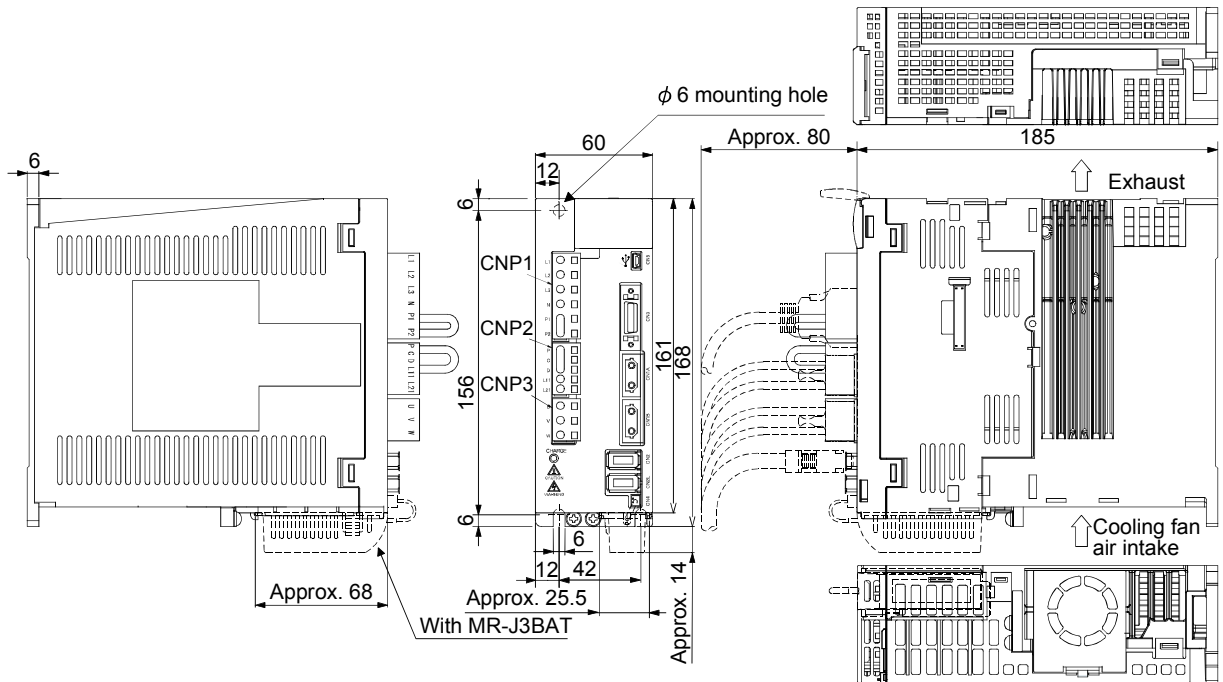
Mounting screw  
Screw size: M5  
Tightening torque: 3.24 [N·m] (28.7 [lb·in])



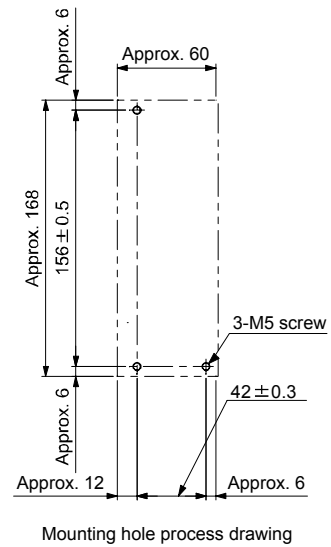
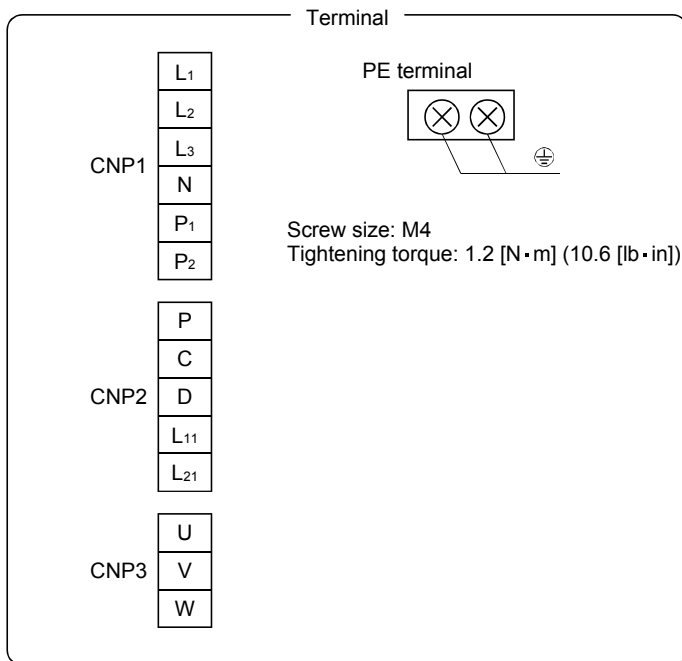
# 7. SERVO AMPLIFIER OUTLINE DRAWINGS

(3) MR-J3-70B-RJ080W • MR-J3-100B-RJ080W

[Unit: mm]



Mass: 1.4 [kg] (3.09 [lb])



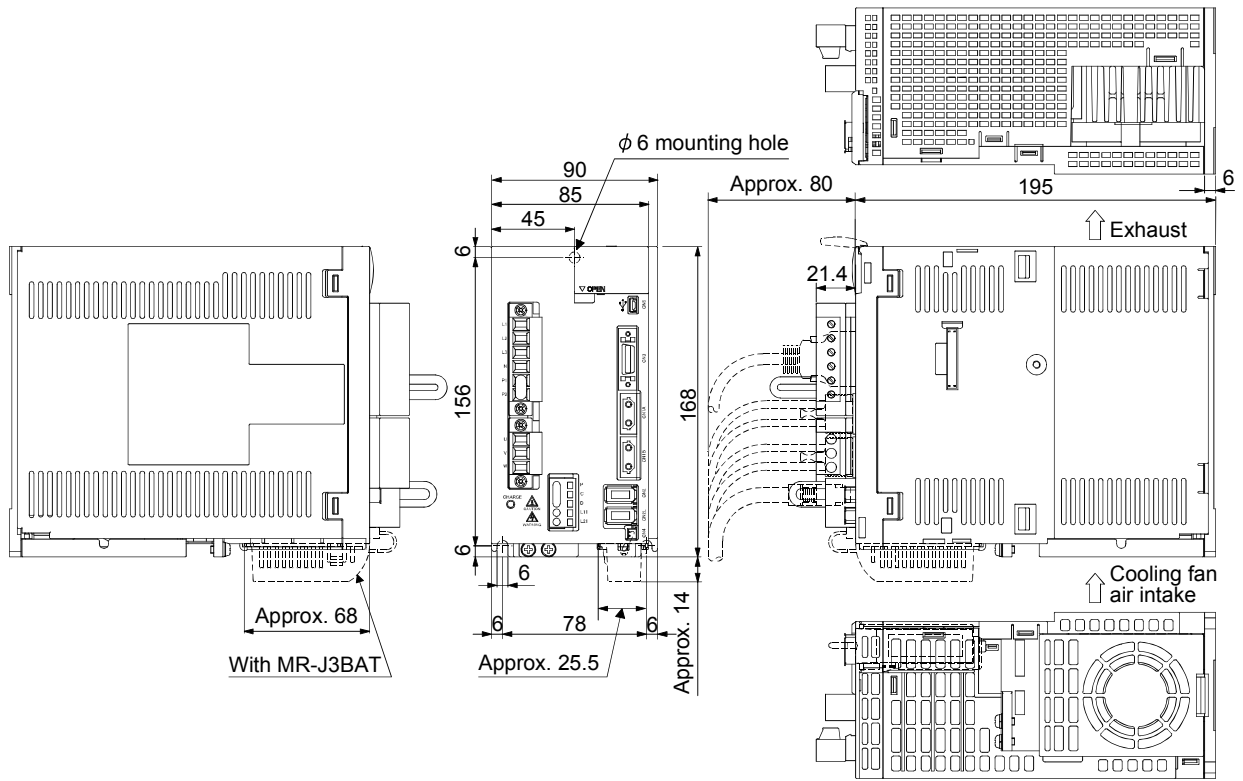
Mounting screw  
 Screw size: M5  
 Tightening torque: 3.24 [N·m] (28.7 [lb·in])



# 7. SERVO AMPLIFIER OUTLINE DRAWINGS

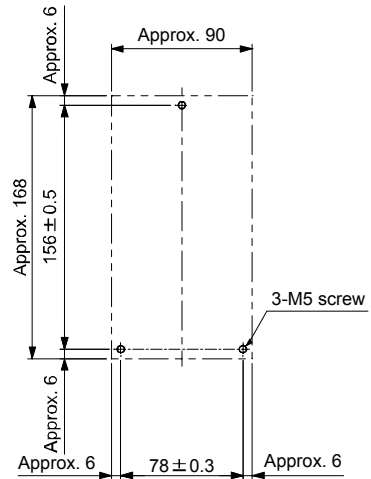
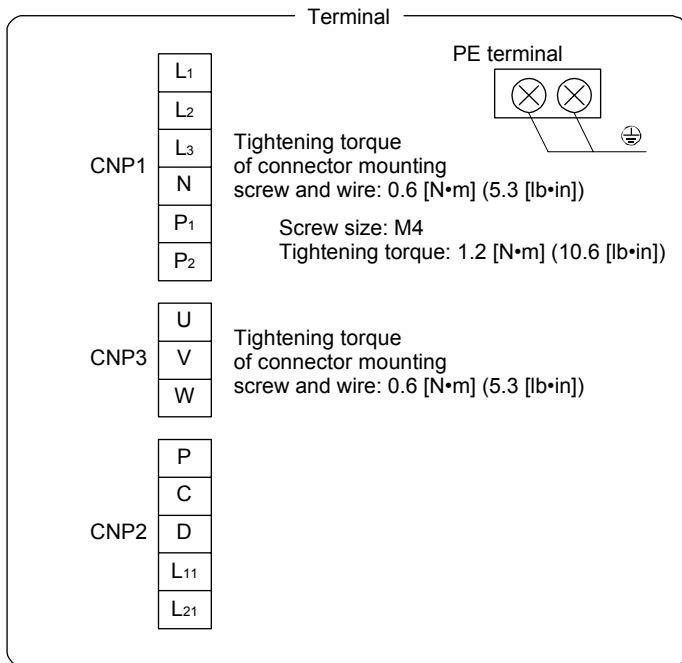
## (4) MR-J3-350B-RJ080W

[Unit: mm]



With MR-J3BAT

Mass: 2.3 [kg] (5.1 [lb])



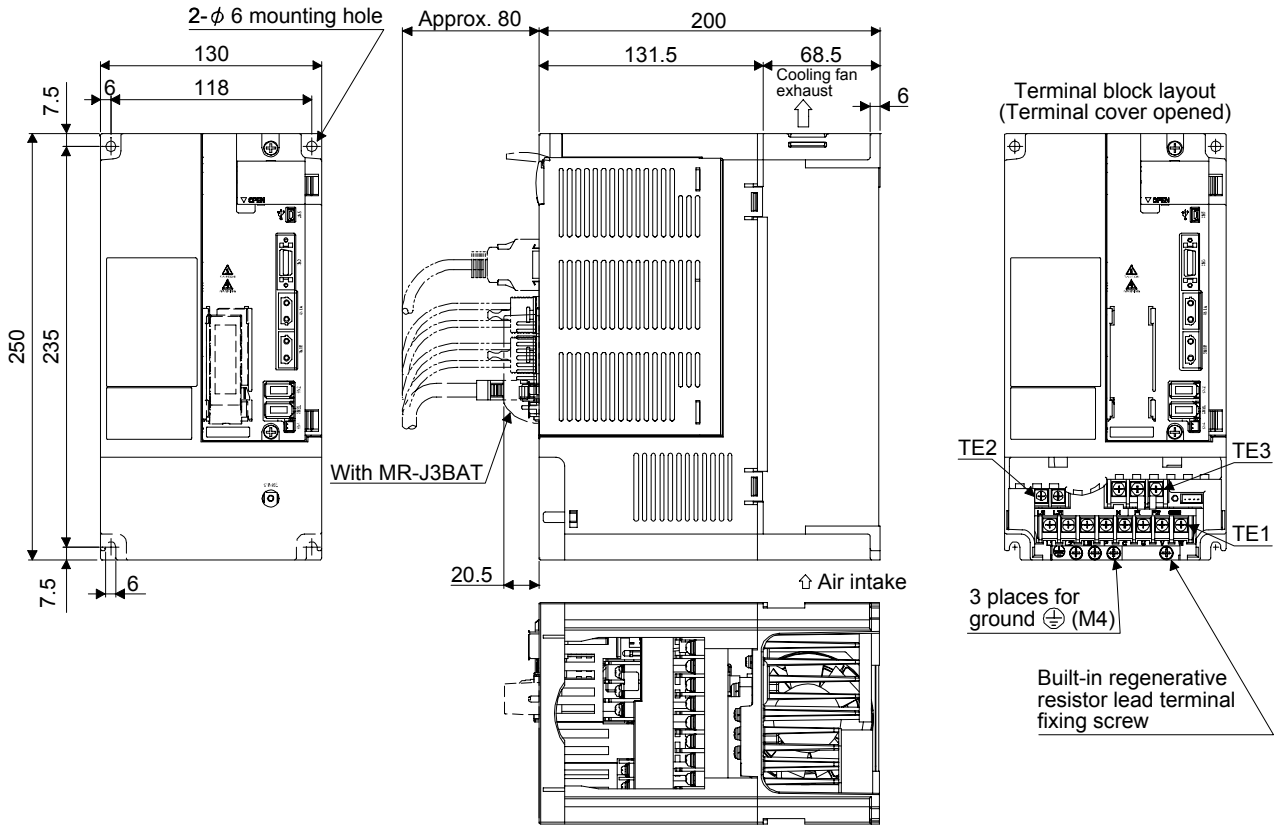
Mounting hole process drawing

Mounting screw  
Screw size: M5  
Tightening torque: 3.24 [N · m] (28.7 [lb · in])

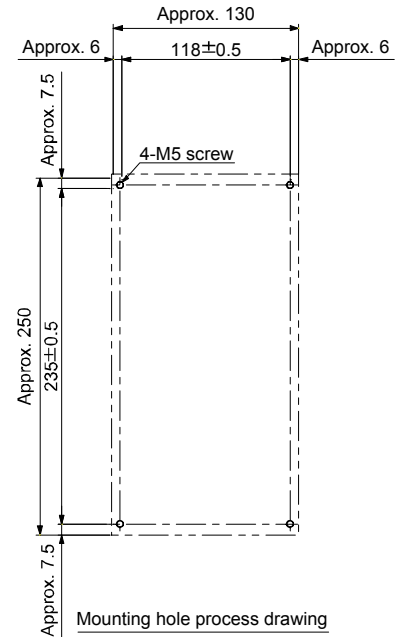
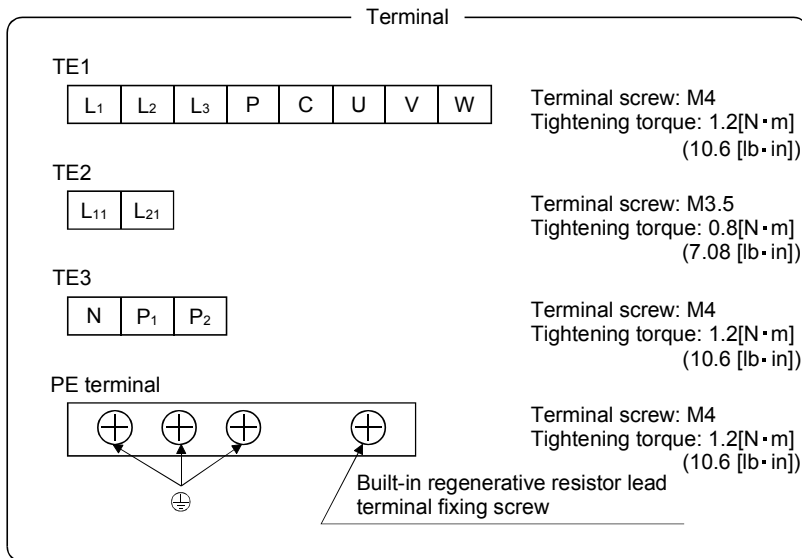
# 7. SERVO AMPLIFIER OUTLINE DRAWINGS

## (5) MR-J3-500B-RJ080W

[Unit: mm]



Mass: 4.6 [kg] (10.1 [lb])



Mounting screw  
Screw size: M5  
Tightening torque: 3.24 [N·m] (28.7 [lb·in])



## 8. CHARACTERISTICS

---

### 8. CHARACTERISTICS

#### 8.1 Overload protection characteristics

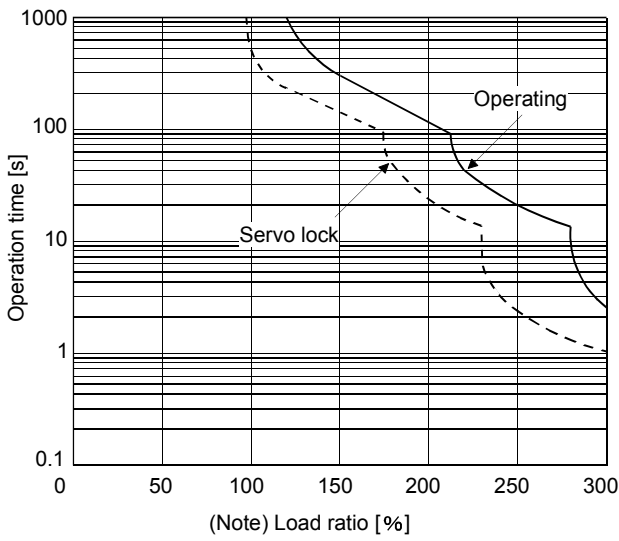
An electronic thermal relay is built in the servo amplifier to protect the direct drive motor, servo amplifier and direct drive motor power line from overloads. Overload 1 alarm (50) occurs if overload operation performed is above the electronic thermal relay protection curve shown in any of Figs 8.1. Overload 2 alarm (51) occurs if the maximum current flew continuously for several seconds due to machine collision, etc. Use the equipment on the left-hand side area of the continuous or broken line in the graph.

In a machine like the one for vertical lift application where unbalanced torque will be produced, it is recommended to use the machine so that the unbalanced torque is 70% or less of the rated torque.

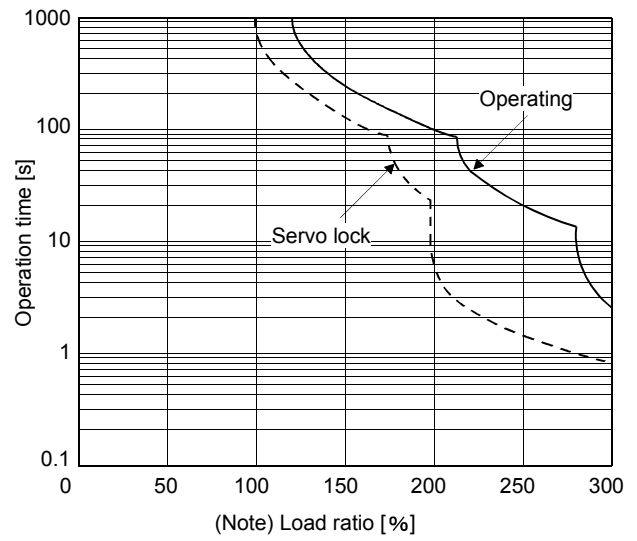
When you carry out close mounting of the servo amplifier, make circumference temperature into 0 to 45°C, or use it at 75% or smaller effective load ratio.

Servo amplifier MR-J3-□B-RJ080W has solid-state direct drive motor overload protection. (The motor full load current is 115% rated current.)

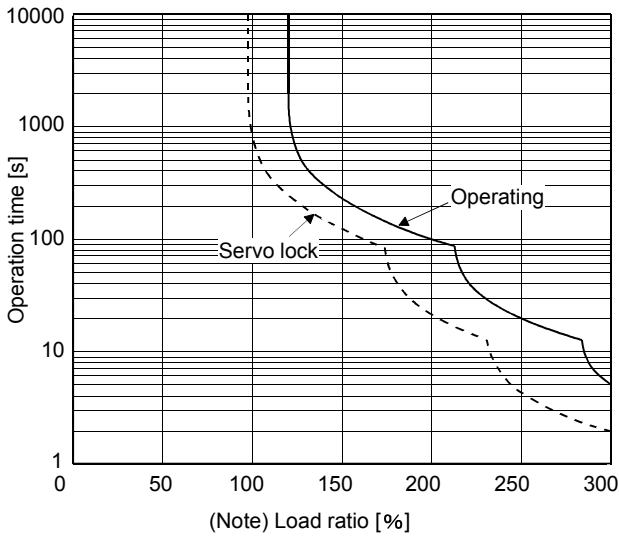
## 8. CHARACTERISTICS



MR-J3-20B-RJ080W to MR-J3-100B-RJ080W



MR-J3-350B-RJ080W



MR-J3-500B-RJ080W

Note. If operation that generates torque more than 100% of the rating is performed with an abnormally high frequency in a direct drive motor stop status (servo lock status) or in a 30r/min or less low-speed operation status, the servo amplifier may fail even when the electronic thermal relay protection is not activated.

Fig 8.1 Electronic thermal relay protection characteristics

## 8. CHARACTERISTICS

### 8.2 Dynamic brake characteristics

POINT
<ul style="list-style-type: none"> <li>▪ Dynamic brake operates at occurrence of alarm, servo forced stop warning (E6), and controller forced stop warning (E7), and when power is turned off. Do not use dynamic brake to stop in a normal operation as it is the function to stop in emergency.</li> <li>▪ For a machine operating at the recommended load to motor inertia ratio or less, the estimated number of usage times of the dynamic brake is 1000 times while the machine decelerates from the rated speed to a stop once in 10 minutes.</li> <li>▪ Be sure to make forced stop (EM1) valid after direct drive motor stops when using forced stop (EM1) frequently in other than emergency.</li> </ul>

#### 8.2.1 Dynamic brake operation

##### (1) Calculation of coasting distance

Fig. 8.2 shows the pattern in which the direct drive motor comes to a stop when the dynamic brake is operated. Use equation 8.1 to calculate an approximate coasting distance to a stop. The dynamic brake time constant  $\tau$  varies with the direct drive motor and machine operation speeds. (Refer to (2) of this section.)

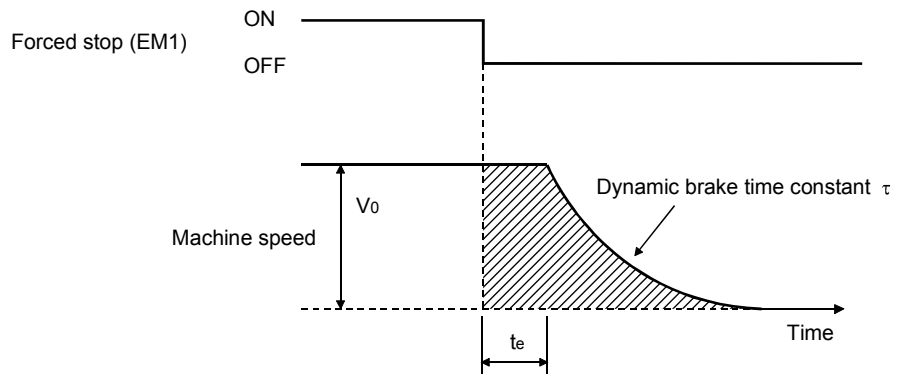


Fig. 8.2 Dynamic brake operation diagram

$$L_{\max} = \frac{V_0}{60} \cdot \left\{ t_e + \tau \left( 1 + \frac{J_L}{J_M} \right) \right\} \dots \dots \dots (8.1)$$

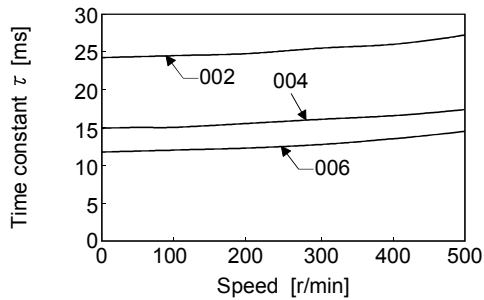
- $L_{\max}$  : Maximum coasting distance ..... [mm][in]
- $V_0$  : Machine rapid feed rate ..... [mm/min][in/min]
- $J_M$  : Direct drive motor inertial moment ..... [ $\times 10^{-4}$  kg  $\cdot$  m<sup>2</sup>][oz  $\cdot$  in<sup>2</sup>]
- $J_L$  : Load inertia moment converted into equivalent value on direct drive motor rotor ..... [ $\times 10^{-4}$  kg  $\cdot$  m<sup>2</sup>][oz  $\cdot$  in<sup>2</sup>]
- $\tau$  : Dynamic brake time constant ..... [s]
- $t_e$  : Delay time of control section ..... [s]

There is internal relay delay time of about 10ms.

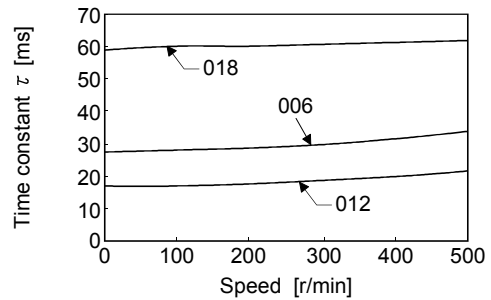
## 8. CHARACTERISTICS

### (2) Dynamic brake time constant

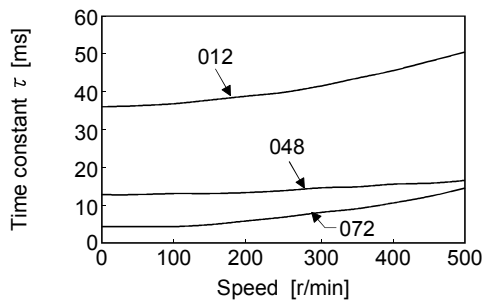
The following shows necessary dynamic brake time constant  $\tau$  for the equation (8.1).



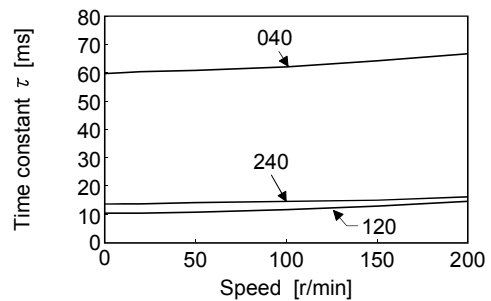
TM-RFM□C20



TM-RFM□E20



TM-RFM□G20



TM-RFM□J10

### 8.2.2 The dynamic brake at the load inertia moment ratio

Use the dynamic brake under the load inertia moment ratio indicated in the following table. If the load inertia moment is higher than this value, the dynamic brake may burn. If there is a possibility that the load inertia moment may exceed the value, contact your local sales office.

The values of the load inertia moment ratio in the table are the values at the maximum rotation speed of the direct drive motor.

The value in the parenthesis shows the value at the rated speed of the direct drive motor.

Servo amplifier	Direct drive motor			
	TM-RFM□C20	TM-RFM□E20	TM-RFM□G20	TM-RFM□J10
MR-J3-20B-RJ080W	100(300)	/	/	/
MR-J3-40B-RJ080W	100(300)			
MR-J3-60B-RJ080W	100(300)			
MR-J3-70B-RJ080W	/	100(300)	50(300)	50(200)
MR-J3-100B-RJ080W		100(300)	/	/
MR-J3-350B-RJ080W	/	/	50(300)	50(200)
MR-J3-500B-RJ080W			50(200)	

## 9. OPTIONS FOR DIRECT DRIVE SERVO

---

### 9. OPTIONS FOR DIRECT DRIVE SERVO



#### WARNING

- Before connecting any option or peripheral equipment, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P(+) and N(−) is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, always confirm from the front of the servo amplifier whether the charge lamp is off or not.



#### CAUTION

- Use the specified auxiliary equipment and options. Otherwise, it may cause a malfunction or a fire.

#### 9.1 Cable/connector sets

POINT
-------

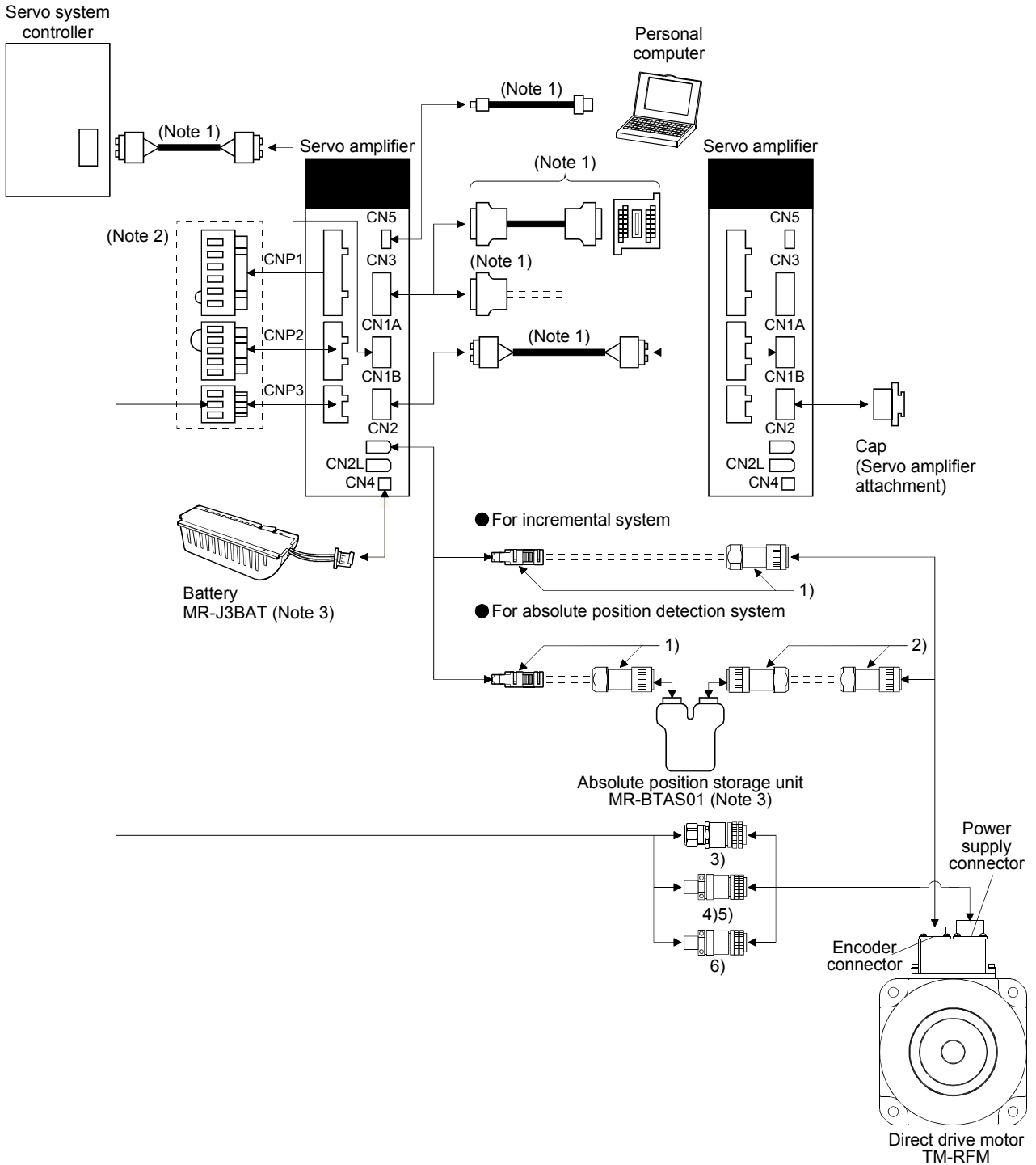
- |  |
|--|
| <ul style="list-style-type: none"><li>▪ The IP rating indicated is the cable's or connector's protection against ingress of dust and water when the cable or connector is connected to a servo amplifier, direct drive motor and absolute position storage unit. If the IP rating of the cable, connector, servo amplifier, direct drive motor and absolute position storage unit vary, the overall IP rating depends on the lowest IP rating of all components.</li></ul> |
|--|

As the cables and connectors used with this servo, purchase the options indicated in this section.









# 9. OPTIONS FOR DIRECT DRIVE SERVO

## 9.1.1 Combinations of cable and connector set



- Note 1. Refer to section 11.1 of the MR-J3-□B Servo Amplifier Instruction Manual.  
 2. Connectors for 3.5kW or less. For 5kW or more, terminal blocks.  
 3. Always connect for using in an absolute position detection system. (Refer to section 9.2.)

## 9. OPTIONS FOR DIRECT DRIVE SERVO

No.	Product	Model	Description	Application
1)	Encoder connector set	MR-J3DDCNS	 <p>For connection between servo amplifier and direct drive motor. For connection between servo amplifier and absolute position storage unit. Refer to section 9.1.2 for details.</p>	IP67
2)	Encoder connector set	MR-J3DDSPS	 <p>For connection between absolute position storage unit and direct drive motor. Refer to section 9.1.2 for details.</p>	IP67
3)	Power supply connector set	MR-PWCNF	<p>Plug: CE05-6A14S-2SD-D (DDK)</p> <p>Cable clamp: YSO14-9 to 11 (Daiwa Dengyo)</p> <p>Applicable cable</p> <p>Applicable wire size: 0.3mm<sup>2</sup> (AWG22) to 1.25mm<sup>2</sup> (AWG16)</p> <p>Overall diameter of cable 8.3 to 11.3mm</p>  <p>For TM-RFM□C20 For TM-RFM□E20</p>	IP67 Corresponding to EN
4)	Power supply connector set	MR-PWCNS4	<p>Plug: CE05-6A18-10SD-D-BSS</p> <p>Cable clamp: CE3057-10A-1-D (DDK)</p> <p>Applicable cable</p> <p>Applicable wire size: 2mm<sup>2</sup> (AWG14) to 3.5mm<sup>2</sup> (AWG12)</p> <p>Overall diameter of cable 10.5 to 14.1mm</p>  <p>For TM-RFM□G20</p>	IP67 Corresponding to EN
5)	Power supply connector set	MR-PWCNS5	<p>Plug: CE05-6A22-22SD-D-BSS</p> <p>Cable clamp: CE3057-12A-1-D (DDK)</p> <p>Applicable cable</p> <p>Applicable wire size: 5.5mm<sup>2</sup> (AWG10) to 8mm<sup>2</sup> (AWG8)</p> <p>Overall diameter of cable 12.5 to 16mm</p>  <p>For TM-RFM040J10 For TM-RFM120J10</p>	IP67 Corresponding to EN
6)	Power supply connector set	MR-PWCNS3	<p>Plug: CE05-6A32-17SD-D-BSS</p> <p>Cable clamp: CE3057-20A-1-D (DDK)</p> <p>Applicable cable</p> <p>Applicable wire size: 14mm<sup>2</sup> (AWG6) to 22mm<sup>2</sup> (AWG4)</p> <p>Overall diameter of cable 22 to 23.8mm</p>  <p>For TM-RFM240J10</p>	IP67 Corresponding to EN



## 9. OPTIONS FOR DIRECT DRIVE SERVO

### 9.1.2 Encoder connector set

POINT	
	<ul style="list-style-type: none"> <li>▪ Fabrication of the encoder cable is required at user side. Prepare the parts shown in (1) and (2), and fabricate as the wiring diagram shown in (3). For the connector set specification, refer to section 2.4.2.</li> <li>▪ Fabricate the encoder cable to be 50m or shorter between the servo amplifier and the direct drive motor.</li> <li>▪ Always connect the following items to configure the absolute position detection system with the direct drive servo.               <ul style="list-style-type: none"> <li>Battery (MR-J3BAT)</li> <li>Absolute position storage unit (MR-BTAS01)</li> </ul> </li> <li>▪ For absolute position detection system, refer to chapter 12 of the MR-J3-□B Servo Amplifier Instruction Manual.</li> <li>▪ Replace the battery (MR-J3BAT) while the control circuit power supply is on. If the battery is replaced while the control circuit power supply is off, the absolute position erase alarm (25) will occur. Battery replacement using the cable for connecting battery (MR-J3BTCBL03M) cannot be performed for the MR-J3-□B-RJ080W servo amplifier.</li> </ul>



#### (1) MR-J3DDCNS

This connector set is used to fabricate the encoder cable for the incremental system or the absolute position detection system (between the servo amplifier and the absolute position storage unit).

Parts	Description
Connector set	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Connector at the servo amplifier side Receptacle: 36210-0100PL Shell kit: 36310-3200-008 (3M) or Connector set: 54599-1019 (Molex) Applicable wire size: 0.25mm<sup>2</sup> (AWG23) to 0.5mm<sup>2</sup> (AWG20)</p> </div> <div style="text-align: center;">  <p>Connector at the encoder side or at the absolute position storage unit side (connected from the servo amplifier) Plug: RM15WTPZK-12S Cord clamp: JR13WCCA-8(72) (Hirose Electric)</p> </div> </div>

#### (2) MR-J3DDSPS

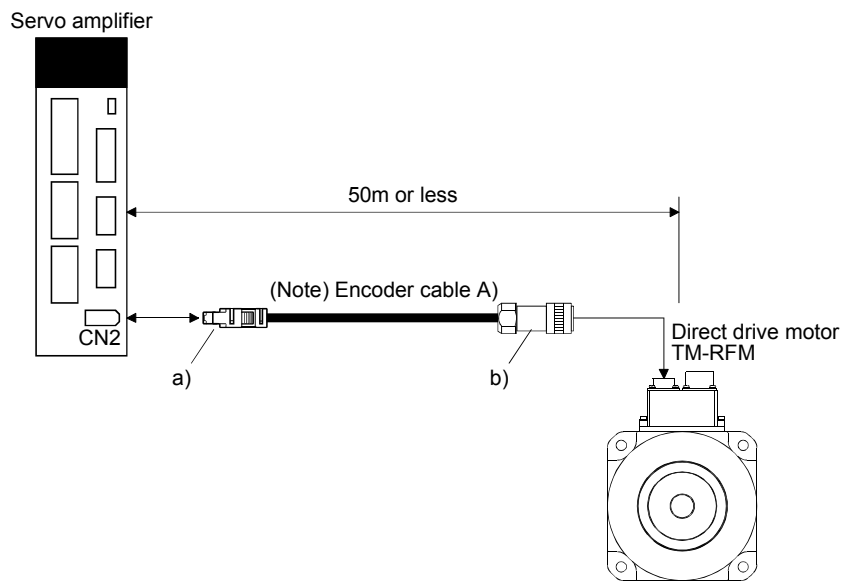
This connector set is used to fabricate the encoder cable (between the absolute position storage unit and the direct drive motor) for the absolute position detection system.

Parts	Description
Connector set	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Connector at the absolute position storage unit side Plug: RM15WTPZ-12P(72) Cord clamp: JR13WCCA-8(72) (Hirose Electric) Applicable wire size: 0.25mm<sup>2</sup> (AWG23) to 0.5mm<sup>2</sup> (AWG20)</p> </div> <div style="text-align: center;">  <p>Connector at the encoder side Plug: RM15WTPZK-12S Cord clamp: JR13WCCA-8(72) (Hirose Electric)</p> </div> </div>

## 9. OPTIONS FOR DIRECT DRIVE SERVO

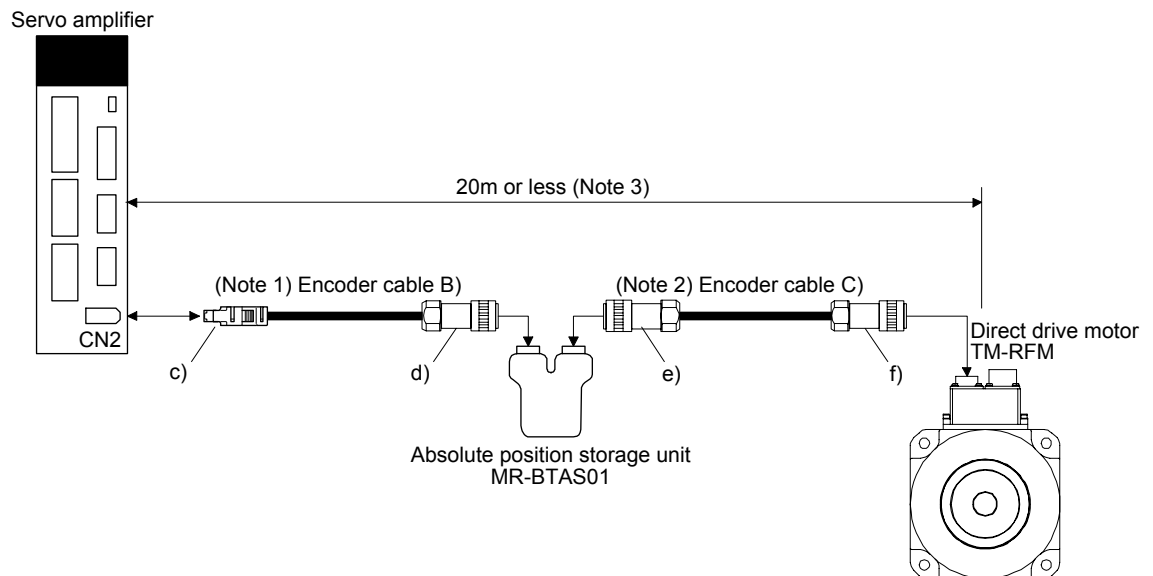
### (3) Combinations for the encoder cable

#### 1) For incremental system



Note. Refer to (3)(a) of this section for details.

#### 2) For absolute position detection system



Note 1. Refer to (3)(b) of this section for details.

Note 2. Refer to (3)(c) of this section for details.

Note 3. For cable of 20m or more, contact your local sales office.

## 9. OPTIONS FOR DIRECT DRIVE SERVO

### (a) Encoder cable A)

#### 1) Connector details

a) For CN2 connector		b) For encoder connector
Receptacle: 36210-0100PL Shell kit: 36310-3200-008 (3M)	Connector set: 54599-1019 (Molex)	Straight plug: RM15WTPZK-12S Cord clamp: JR13WCCA-8(72) (Hirose Electric)
<p>View seen from wiring side. (Note 1)</p>	or	Recommended cable: 20276 VSVP AWG#23×6P KB-0492 (Note 3) (Bando Densen)
<p>View seen from wiring side. (Note 1)</p>		<p>View seen from the wiring side. (Note 2)</p>

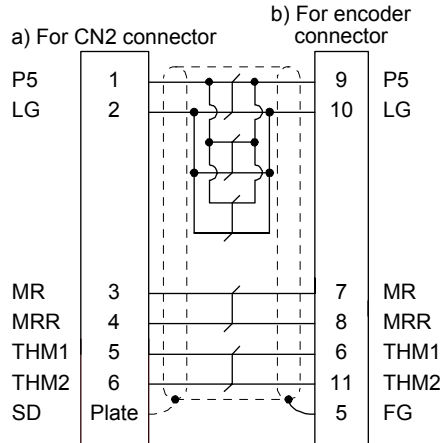
Note 1. Keep open the pins shown with . Especially, pin 10 is for manufacturer adjustment. If it is connected with any other pin, the servo amplifier cannot operate normally.

2. Keep open the pins shown with .

3. Purchase from Toa Electric Industry Co. Ltd., Nagoya Branch

# 9. OPTIONS FOR DIRECT DRIVE SERVO

## 2) Internal wiring diagram



Refer to the following table for the required wires to fabricate the encoder cable.

Core size [mm <sup>2</sup> ]	Conductor resistance of one core [Ω/km]	Cable OD [mm]
0.25	63.6 or less	8.2

### (b) Encoder cable B)

#### 1) Connector details

c) For CN2 connector		d) For absolute position storage unit connector
Receptacle: 36210-0100PL Shell kit: 36310-3200-008 (3M)	Connector set: 54599-1019 (Molex)	Straight plug: RM15WTPZK-12S Cord clamp: JR13WCCA-8(72) (Hirose Electric)
<p>View seen from wiring side. (Note 1)</p>	<p>View seen from wiring side. (Note 1)</p>	Recommended cable: 20276 VSVPAWG#23×6P KB-0492 (Note 3) (Bando Densen)
		<p>View seen from the wiring side. (Note 2)</p>

Note 1. Keep open the pins shown with . Especially, pin 10 is provided for manufacturer adjustment. If it is connected with any other pin, the servo amplifier cannot operate normally.

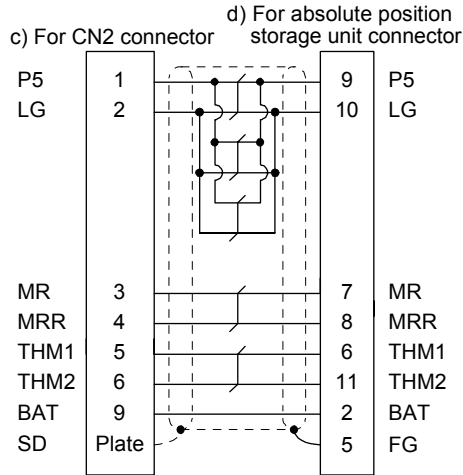
2. Keep open the pin shown with .

3. Purchase from Toa Electric Industry Co. Ltd., Nagoya Branch

# 9. OPTIONS FOR DIRECT DRIVE SERVO

## 2) Internal wiring diagram

When the distance between the servo amplifier and the direct drive motor is within 20m (Note)



Note. For the cable of 20m or longer, contact your local sales office.

Refer to the following table for the required wires to fabricate the encoder cable.

Core size [mm <sup>2</sup> ]	Conductor resistance of one core [Ω/km]	Cable OD [mm]
0.25	63.6 or less	8.2

### (c) Encoder cable C)

#### 1) Connector details

e) For absolute position storage unit connector	f) For encoder connector
Straight plug: RM15WTPZ-12P(72) Cord clamp: JR13WCCA-8(72) (Hirose Electric)	Straight plug: RM15WTPZK-12S Cord clamp: JR13WCCA-8(72) (Hirose Electric)
Recommended cable: 20276 VSVP AWG#23×6P KB-0492 (Note 2) (Bando Densen)	Recommended cable: 20276 VSVP AWG#23×6P KB-0492 (Note 2) (Bando Densen)
View seen from the wiring side. (Note 1)	View seen from the wiring side. (Note 1)

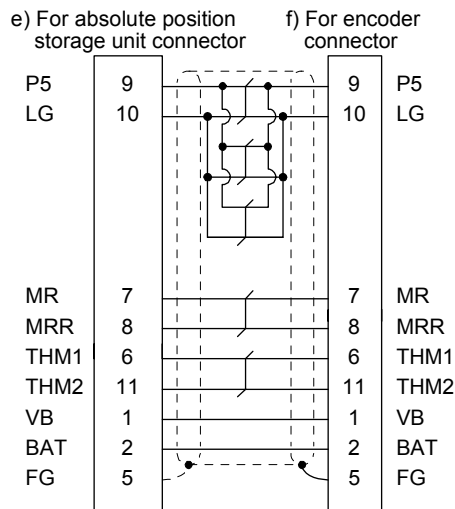
Note 1. Keep open the pin shown with

2. Purchase from Toa Electric Industry Co. Ltd., Nagoya Branch

## 9. OPTIONS FOR DIRECT DRIVE SERVO

### 2) Internal wiring diagram

When the distance between the servo amplifier and the direct drive motor is within 20m (Note)



Note. For the cable of 20m or longer, contact your local sales office.

Refer to the following table for the required wires to fabricate the encoder cable.

Core size [mm <sup>2</sup> ]	Conductor resistance of one core [Ω/km]	Cable OD [mm]
0.25	63.6 or less	8.2



## 9. OPTIONS FOR DIRECT DRIVE SERVO

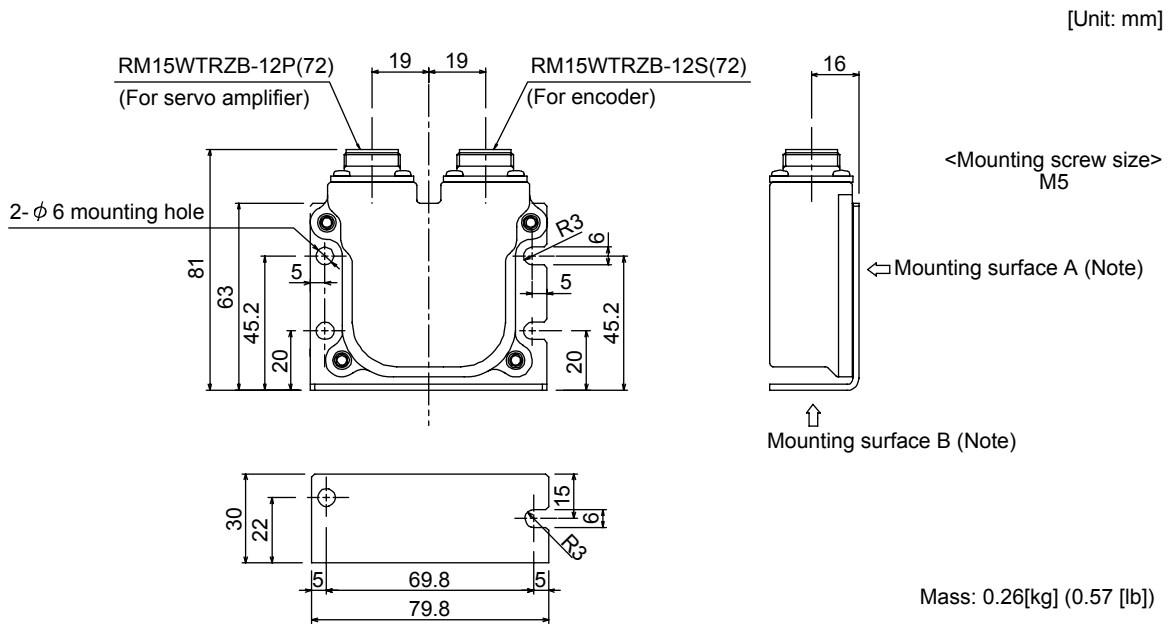
### 9.2 Absolute position storage unit MR-BTAS01

POINT
<ul style="list-style-type: none"> <li>▪ Replacing the MR-BTAS01 absolute position storage unit will erase the absolute position. Start up the direct drive servo again and perform home positioning according to the section 4.1.1.</li> <li>▪ Replace the battery (MR-J3BAT) while the control circuit power supply is on. If the battery is replaced while the control circuit power supply is off, the absolute position erase (25) will occur. Battery replacement using the cable for connecting battery (MR-J3BTCBL03M) cannot be performed for the MR-J3-□B-RJ080W servo amplifier.</li> <li>▪ Absolute position erase (25) will occur if the encoder cable is disconnected.</li> </ul>

The MR-BTAS01 absolute position storage unit is required to configure the absolute position detection system with the direct drive servo.

(1) Connection method with the encoder cable  
Refer to (3)(b) of section 9.1.2.

(2) Outline drawings



Note. When mounting the unit outside the cabinet, fix the mounting surface A with four screws.  
When mounting the unit inside the cabinet, you can also choose the mounting surface B to fix it with two screws.

## 9. OPTIONS FOR DIRECT DRIVE SERVO

---

### (3) Environment

The following table shows the environment for the absolute position storage unit.

Item		Environment
Ambient temperature	Operation	[°C] 0 to 55 (non-freezing)
		[°F] 32 to 131 (non-freezing)
	Storage	[°C] -20 to 65 (non-freezing)
		[°F] -4 to 149 (non-freezing)
Ambient humidity	Operation	90%RH or less (non-condensing)
	Storage	
Ambient		Indoors (no direct sunlight), no corrosive gas, flammable gas, oil mist, dust or splash of oil or water.
Altitude		Max. 1000m above sea level
Vibration resistance		When the mounting surface A is fixed: 49m/s <sup>2</sup> (directions of X, Y and Z axes) When the mounting surface B is fixed: 5.9m/s <sup>2</sup> (directions of X, Y and Z axes)



# APPENDIX

## App. 1 Parameter list

POINT
<ul style="list-style-type: none"> <li>The parameter whose symbol preceded by * can be validated with the following conditions:               <ul style="list-style-type: none"> <li>* : Turn off the power and then on again, or reset the controller after setting the parameter.</li> <li>** : Turn off the power and then on again after setting the parameter.</li> </ul> </li> </ul>

Basic setting parameters (PA□□)		
No.	Symbol	Name
PA01		For manufacturer setting
PA02	**REG	Regenerative option
PA03	*ABS	Absolute position detection system
PA04	*AOP1	Function selection A-1
PA05 to PA07		For manufacturer setting
PA08	ATU	Auto tuning mode
PA09	RSP	Auto tuning response
PA10	INP	In-position range
PA11 to PA13		For manufacturer setting
PA14	*POL	Rotation direction selection
PA15	*ENR	Encoder output pulses
PA16 to PA18		For manufacturer setting
PA19	*BLK	Parameter write inhibit

Gain/filter parameters (PB□□)		
No.	Symbol	Name
PB01	FILT	Adaptive tuning mode (adaptive filter II)
PB02	VRFT	Vibration suppression control tuning mode (advanced vibration suppression control)
PB03		For manufacturer setting
PB04	FFC	Feed forward gain
PB05		For manufacturer setting
PB06	GD2	Ratio of load inertia moment to direct drive motor inertia moment
PB07	PG1	Model loop gain
PB08	PG2	Position loop gain
PB09	VG2	Speed loop gain
PB10	VIC	Speed integral compensation
PB11	VDC	Speed differential compensation
PB12		For manufacturer setting
PB13	NH1	Machine resonance suppression filter 1
PB14	NHQ1	Notch shape selection 1
PB15	NH2	Machine resonance suppression filter 2
PB16	NHQ2	Notch shape selection 2
PB17		Automatic setting parameter
PB18	LPF	Low-pass filter setting
PB19	VRF1	Vibration suppression control vibration frequency setting
PB20	VRF2	Vibration suppression control resonance frequency setting
PB21		For manufacturer setting
PB22		
PB23	VFBF	Low-pass filter selection
PB24	*MVS	Slight vibration suppression control selection
PB25		For manufacturer setting
PB26	*CDP	Gain changing selection
PB27	CDL	Gain changing condition
PB28	CDT	Gain changing time constant
PB29	GD2B	Gain changing ratio of load inertia moment to direct drive motor inertia moment
PB30	PG2B	Gain changing position loop gain
PB31	VG2B	Gain changing speed loop gain
PB32	VICB	Gain changing speed integral compensation
PB33	VRF1B	Gain changing vibration suppression control vibration frequency setting
PB34	VRF2B	Gain changing vibration suppression control resonance frequency setting
PB35 to PB45		For manufacturer setting

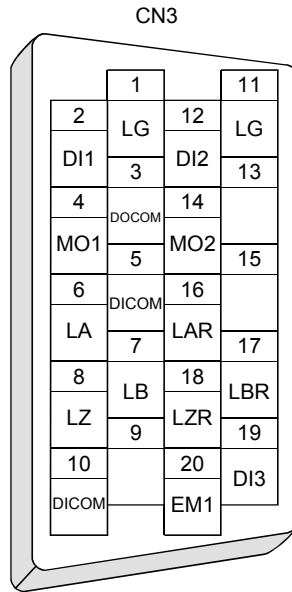
# APPENDIX

Extension setting parameters (PC□□)		
No.	Symbol	Name
PC01	*ERZ	Error excessive alarm level
PC02	MBR	Electromagnetic brake sequence output
PC03	*ENRS	Encoder output pulses selection
PC04 to PC06		For manufacturer setting
PC07	ZSP	Zero speed
PC08		For manufacturer setting
PC09	MOD1	Analog monitor 1 output
PC10	MOD2	Analog monitor 2 output
PC11	MO1	Analog monitor 1 offset
PC12	MO2	Analog monitor 2 offset
PC13 to PC19		For manufacturer setting
PC20	*COP7	Function selection C-7
PC21	*BPS	Alarm history clear
PC22 to PC32		For manufacturer setting

I/O setting parameters (PD□□)		
No.	Symbol	Name
PD01 to PD06		For manufacturer setting
PD07	*D01	Output signal device selection 1 (CN3-13)
PD08	*D02	Output signal device selection 2 (CN3-9)
PD09	*D03	Output signal device selection 3 (CN3-15)
PD10 to PD13		For manufacturer setting
PD14	*DOP3	Function selection D-3
PD15 to PD32		For manufacturer setting

Special setting parameters (PS□□)		
No.	Symbol	Name
PS01	**LIT1	Special function selection 1
PS02 PS03		For manufacturer setting
PS04	*LIT2	Special function selection 2
PS05	LB1	Servo control position deviation error detection level
PS06	LB2	Servo control speed deviation error detection level
PS07	LB3	Servo control torque deviation error detection level
PS08	*LIT3	Special function selection 3
PS09	LPWM	Magnetic pole detection voltage level
PS10 to PS16		For manufacturer setting
PS17	LTSTS	Minute position detection method function selection
PS18	IDLV	Minute position detection method identification signal amplitude
PS19 to PS32		For manufacturer setting

App. 2 Signal layout recording paper



App. 3 Handling of AC servo amplifier batteries for the United Nations Recommendations on the Transport of Dangerous Goods

United Nations Recommendations on the Transport of Dangerous Goods Rev. 15 (hereinafter Recommendations of the United Nations) has been issued. To reflect this, transport regulations for lithium metal batteries are partially revised in 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).

To comply the instruction and code, we have modified the indication on the package for general-purpose AC servo batteries.

(1) Target model

(a) Battery (cell)

Model	Option model
ER6	MR-J3BAT
ER17330	MR-BAT, A6BAT

(b) Battery unit (assembled)

Model	Option model
ER17330	MR-J2M-BT
CR17335A	MR-BAT6V1
	MR-BAT6V1SET

## APPENDIX

---

(2) Purpose

Safer transportation of lithium metal batteries.

(3) Change in regulations

The following points are changed for lithium metal batteries transportation by sea or air due to Recommendations of the United Nations Rev. 15 and ICAO-TI 2009-2010 edition. For lithium metal batteries, cells are classified as UN3090, and batteries contained in or packed with equipment are classified as UN3091.

- (a) A package containing 24 cells or 12 batteries or less that are not contained in equipment are no longer exempt from the following: attachment of a handling label, submission of the Shipper's Declaration for Dangerous Goods, and a 1.2m drop test.
- (b) A battery handling label (size: 120 × 110mm) is required. Emergency telephone number must be filled out in the additional handling information of the Shipper's Declaration for Dangerous Goods.
- (c) New handling label design containing battery illustration (Figure) must be used.



Figure. Example of Mitsubishi Label with Battery Illustration

(4) Action taken by Mitsubishi

The following caution will be added to the packages of the target batteries.

"Containing lithium metal battery. Regulations apply for transportation."

(5) Transportation precaution for customers

For sea or air transportation, the handling label (Figure) is required for the package of a Mitsubishi cell or battery and the outer package containing several packages of Mitsubishi cells or batteries. Documentations like the handling label in the specified design and the Shipper's Declaration for Dangerous Goods are required. Please attach the documentations to the packages. The above change will not affect the function and performance of the product.

### App. 4 Symbol for the new EU Battery Directive

Symbol for the new EU Battery Directive (2006/66/EC) that is plastered to general-purpose AC servo battery is explained here.



Note. This symbol mark is for EU countries only.

This symbol mark is according to the directive 2006/66/EC Article 20 Information for end-users and Annex II.

Your MITSUBISHI ELECTRIC product is 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 your household waste.

If a chemical symbol is printed beneath the symbol shown above, this chemical symbol means that the battery or accumulator contains a heavy metal at a certain concentration. 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.

Please, dispose of batteries and accumulators correctly at your local community waste collection/recycling centre.

Please, help us to conserve the environment we live in!



### App. 5 Compliance with the CE marking

#### App. 5.1 What are CE marking?

The CE marking is mandatory and must be affixed to specific products placed on the European Union. When a product conforms to the requirements, the CE marking must be affixed to the product. The CE marking also applies to machines and equipment incorporating servos.

##### (1) EMC directive

The EMC directive applies to the servo units alone. This servo is designed to comply with the EMC directive. The EMC directive also applies the servo-incorporated machines and equipment. This requires the EMC filters to be used with the servo-incorporated machines and equipment to comply with the EMC directive. For specific EMC directive conforming methods, refer to the EMC Installation Guidelines (IB(NA)67310).

##### (2) Low voltage directive

The low voltage directive applies also to servo units alone. This servo is designed to comply with the low voltage directive.

#### App. 5.2 For compliance

Be sure to perform an appearance inspection of every unit before installation. In addition, have a final performance inspection on the entire machine/system, and keep the inspection record.

##### (1) Servo amplifiers and direct drive motors used

Use the servo amplifiers and direct drive motors which standard product.

Servo amplifier : MR-J3-20B-RJ080W to MR-J3-100B-RJ080W • MR-J3-500B-RJ080W

Direct drive motor : TM-RFM□C20 (Note)

TM-RFM□E20 (Note)

TM-RFM□G20 (Note)

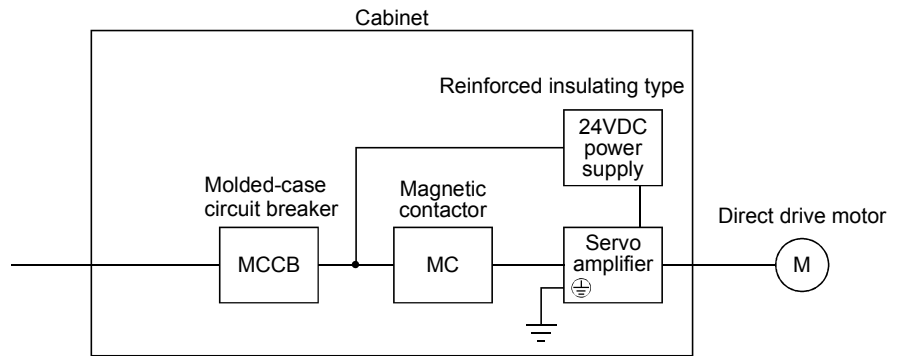
TM-RFM□J10 (Note)

Note. For the latest information, contact your local sales office.

# APPENDIX

## (2) Structure

The control circuit provide safe separation to the main circuit in the servo amplifier.



## (3) Environment

(a) Operate the servo amplifier at pollution degree 2 or 1 set forth in EN 60664-1. For this purpose, install the servo amplifier in a cabinet which is protected against water, oil, carbon, dust, dirt, etc. (IP54).

(b) Environment

Item		Environment	
(Note 1) Ambient temperature	Operation	[°C]	(Note 2) 0 to 55
		[°F]	32 to 131
	Storage, Transportation	[°C]	− 20 to 65
		[°F]	− 4 to 149
Ambient humidity	Operation, Storage, Transportation	90% RH or less	
Maximum altitude	Operation, Storage	1000m or less	
	Transportation	10000m or less	

Note 1. Ambient temperature is the internal temperature of the cabinet.

2. The servo amplifier 200V 3.5kW or less can be mounted closely. In this case, keep the ambient temperature within 0 to 45°C (32 to 113°F) or use the servo amplifier with 75% or less of the effective load ratio.

## (4) Power supply

(a) This servo amplifier can be supplied from star-connected supply with earthed neutral point of overvoltage category III set forth in EN 60664-1. However, when using the neutral point of 400V system for 1-phase supply, a reinforced insulating transformer is required in the power input section.

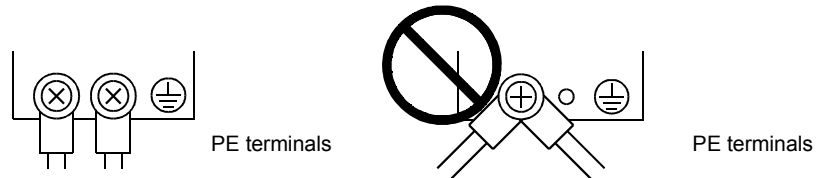
(b) For the interface power supply, use a 24VDC power supply with reinforced insulation on I/O terminals.

## APPENDIX

---

### (5) Grounding

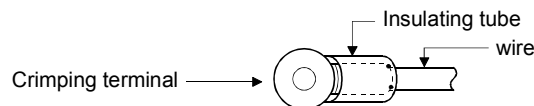
- (a) To prevent an electric shock, the protective earth (PE) terminal (marked  $\oplus$ ) of the servo amplifier must be connected to the protective earth (PE) of the cabinet.
- (b) Do not connect two ground cables to the same protective earth (PE) terminal. Always connect cables to the terminals one-to-one.



- (c) If an earth leakage circuit breaker is used, always earth the protective earth (PE) terminal of the servo amplifier to prevent an electric shock.

### (6) Wiring

- (a) The wires to be connected to the terminal block of the servo amplifier must have crimping terminals provided with insulating tubes to prevent contact with adjacent terminals.



- (b) Use the direct drive motor side power supply connector which complies with the EN. The EN compliant power supply connector sets are available as options.
- (c) The servo amplifier must be installed in the metal cabinet.

### (7) Peripheral devices, options

- (a) Use the molded-case circuit breaker and magnetic contactor models which are EN compliant products given in the MR-J3-□B Servo Amplifier Instruction Manual section 11.12. Use a type B earth-leakage current breaker (RCD). When it is not used, provide insulation between the servo amplifier and other device by double insulation or reinforced insulation, or install a transformer between the main power supply and servo amplifier.
- (b) The sizes of the wires given in the MR-J3-□B Servo Amplifier Instruction Manual meet the following conditions. For use in any other conditions, follow Table 6 and Annex D of EN 60204-1.
  - Ambient temperature: 40°C (104°F)
  - Sheath : PVC (polyvinyl chloride)
  - Installation on wall surface or open cable tray
- (c) Use the EMC filter for noise reduction.

### (8) Performing EMC tests

When EMC tests are run on a machine/device into which the servo amplifier has been installed, it must conform to the electromagnetic compatibility (immunity/emission) standards after it has satisfied the operating environment/electrical equipment specifications.

For the other EMC directive guidelines on the servo amplifier, refer to the EMC Installation Guidelines(IB(NA)67310).

# REVISIONS

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

Print Data	*Manual Number	Revision
Nov. 2012	SH(NA)030079-A	First edition

This manual confers no industrial property rights or any rights of any other kind, nor does it confer any patent licenses. Mitsubishi Electric Corporation cannot be held responsible for any problems involving industrial property rights which may occur as a result of using the contents noted in this manual.

Country/Region	Sales office	Tel/Fax
USA	Mitsubishi Electric Automation Inc. 500 Corporate Woods Parkway, Vernon Hills, IL 60061, USA	Tel : +1-847-478-2100 Fax : +1-847-478-0327
Germany	Mitsubishi Electric Europe B.V. German Branch Gothaer Strasse 8, D-40880 Ratingen, Germany	Tel : +49-2102-486-0 Fax : +49-2102-486-1120
Italy	Mitsubishi Electric Europe B.V. Italian Branch Viale Colleoni 7 1-20041 Agrate Brianza (Milano), Italy	Tel : +39-39-60531 Fax : +39-39-6053312
China	Mitsubishi Electric Automation (China) Ltd. 4F Zhi Fu Plazz, No. 80 Xin Chang Road Shanghai 200003, China	Tel : +86-21-6120-0808 Fax : +86-21-6121-2444
Taiwan	Setsuyo Enterprise Co., Ltd. 6F, No.105 Wu-Kung 3rd Rd, Wu-Ku Hsiang, Taipei Hsine, Taiwan	Tel : +886-2-2299-2499 Fax : +886-2-2299-2509
Korea	Mitsubishi Electric Automation Korea Co., Ltd. 3F, 1480-6, Gayang-dong, Gangseo-gu, Seoul 157-200, Korea	Tel : +82-2-3660-9552 Fax : +82-2-3664-8372
Singapore	Mitsubishi Electric Asia Pte, Ltd. 307 Alexandra Road #05-01/02, Mitsubishi Electric Building Singapore 159943	Tel : +65-6470-2460 Fax : +65-6476-7439

## 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]

The term of warranty for Product is twelve (12) months after your purchase or delivery of the Product to a place designated by you or eighteen (18) months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

### [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:
  - (i) a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
  - (ii) a failure caused by any alteration, etc. to the Product made on your side without our approval
  - (iii) 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
  - (iv) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
  - (v) any replacement of consumable parts (battery, fan, smoothing capacitor, etc.)
  - (vi) 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
  - (vii) 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
  - (viii) 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 responsibility for compensation against loss of opportunity, secondary loss, etc.

Whether under or after the term of warranty, we assume no responsibility for any damages arisen from causes for which we are not responsible, any losses of opportunity and/or profit incurred by you due to a failure of the Product, any damages, secondary damages or compensation for accidents arisen under a specific circumstance that are foreseen or unforeseen by our company, any damages to products other than the Product, and also compensation for any replacement work, readjustment, start-up test run of local machines and the Product and any other operations conducted by you.

### 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 General-Purpose AC Servo, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in General-Purpose AC Servo, and a backup or fail-safe function should operate on an external system to General-Purpose AC Servo when any failure or malfunction occurs.
- (2) Our General-Purpose 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.



MODEL	MR-J3-B-RJ080 INSTRUCTION MANUAL
MODEL CODE	1CW601

# MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : TOKYO BLDG MARUNOUCHI TOKYO 100-8310