MITSUBISHI ELECTRIC

General-Purpose AC Servo

MITSUBISHI SERVO AMPLIFIERS & MOTORS

MELSERVO-J4

General-Purpose Interface/SSCNETⅢ/H Interface

MODEL

MR-J4-_A4(-RJ) MR-J4_B4(-RJ)

SERVO AMPLIFIER
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, Installation guide, and appended documents carefully. Do not use the equipment until you have a full knowledge of the equipment, safety information and instructions.
In this Instruction Manual, the safety instruction levels are classified into "WARNING" and "CAUTION".

⚠ WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight injury 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, when confirming whether the charge lamp is off or not, always confirm it from the front of the servo amplifier.
- Ground the servo amplifier and servo motor securely.
- 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 servo motor until they have been installed. Otherwise, it may cause an electric shock.
- Do not operate switches with wet hands. Otherwise, it may cause 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 and periodic inspection, do not remove the front cover of the servo amplifier even 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 ⏚) of the servo amplifier to the protective earth (PE) of the cabinet.
- When using an earth-leakage current breaker (RCD), select the 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, servo 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 (L1, L2, and L3) of the servo amplifier, in order to configure a circuit that shuts 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 using the regenerative resistor, switch power off with the alarm signal. Not doing so may cause a fire when a regenerative transistor malfunctions or the like may overheat the regenerative resistor.
- Provide adequate protection to prevent screws and other conductive matter, oil and other combustible matter from entering the servo amplifier and servo 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 cables to the correct terminals. Otherwise, a burst, damage, etc. may occur.
- ●Ensure that polarity (+/-) is correct. Otherwise, a burst, damage, etc. may occur.
- ●The servo amplifier heat sink, regenerative resistor, servo motor, etc. may be hot while power is on or for some time after power-off. Take safety measures, e.g. provide covers, to avoid accidentally touching the parts (cables, etc.) by hand.

4. Additional instructions

The following instructions should also be fully noted. Incorrect handling may cause a malfunction, 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 product packages is not allowed.
- ●Do not hold the front cover when transporting the servo amplifier. Otherwise, it may drop.
- ●Install the servo amplifier and the servo motor in a load-bearing place in accordance with the Instruction Manual.
- ●Do not get on or put heavy load on the equipment.
- ●The equipment must be installed in the specified direction.
- ●Leave specified clearances between the servo amplifier and the cabinet walls or other equipment.
- ●Do not install or operate the servo amplifier and servo motor which have been damaged or have any parts missing.
- ●Do not block the intake and exhaust areas of the servo amplifier. Otherwise, it may cause a malfunction.
- ●Do not drop or strike the servo amplifier and servo motor. Isolate them from all impact loads.
- ●When you keep or use the equipment, please fulfill the following environment.

Item		Environment
Ambient temperature	Operation	0 ˚C to 55 ˚C (non-freezing)
	Storage	-20 ˚C to 65 ˚C (non-freezing)
Ambient humidity	Operation	90 %RH or less (non-condensing)
	Storage	
Ambience		Indoors (no direct sunlight), free from corrosive gas, flammable gas, oil mist, dust, and dirt
Altitude		1000 m or less above sea level
Vibration resistance		5.9 m/s^2, at 10 Hz to 55 Hz (directions of X, Y and Z axes)

- ●When the product has been stored for an extended period of time, contact your local sales office.
- ●When handling the servo amplifier, be careful about the edged parts such as corners of the servo amplifier.
- ●The servo amplifier must be installed in a metal cabinet.

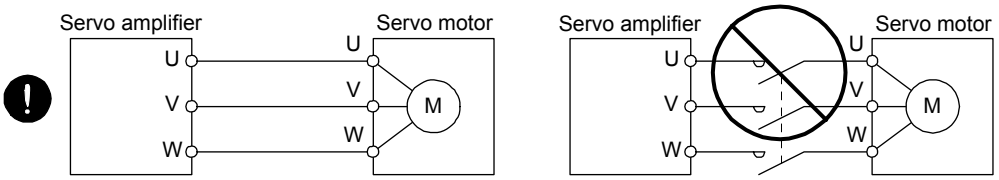
⚠ CAUTION

- When you disinfect or protect wooden packing from insects, take measures except by fumigation. Fumigating the servo amplifier or packing the servo amplifier with fumigated wooden packing can cause a malfunction of the servo amplifier due to halogen materials (such as fluorine, chlorine, bromine, and iodine) which are contained in fumigant.
- The servo amplifier must not be used with parts which contain halogen-series flame retardant materials (such as bromine) under coexisting conditions.

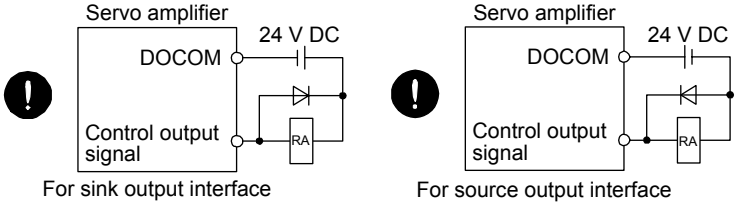
(2) Wiring

⚠ CAUTION

- Wire the equipment correctly and securely. Otherwise, the servo motor may operate unexpectedly.
- Do not install a power capacitor, surge killer, or radio noise filter (optional FR-BIF-H) on the servo amplifier output side.
- To avoid a malfunction, connect the wires to the correct phase terminals (U, V, and W) of the servo amplifier and servo motor.
- Connect the servo amplifier power output (U, V, and W) to the servo motor power input (U, V, and W) directly. Do not let a magnetic contactor, etc. intervene. Otherwise, it may cause a malfunction.



- The surge absorbing diode installed to 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, the cable or terminal block may generate heat because of the poor contact. Be sure to tighten the cable with specified torque.
- Connecting a servo motor of the wrong axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.

(3) Test run and adjustment

⚠ CAUTION

- Before operation, check the parameter settings. Improper settings may cause some machines to operate unexpectedly.
- Never make a drastic adjustment or change to the parameter values as doing so will make the operation unstable.
- Do not get close to moving parts in servo-on status.

(4) Usage

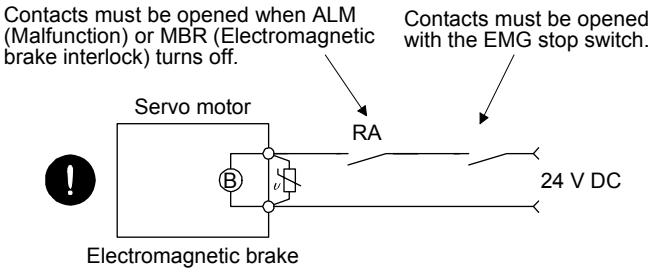
⚠ CAUTION

- When it is assumed that a hazardous condition may occur due to a power failure or product malfunction, use a servo motor with an external brake to prevent the condition.
- Do not disassemble, repair, or modify the equipment.
- Before resetting an alarm, make sure that the run signal of the servo amplifier is off in order to prevent a sudden restart. Otherwise, it may cause an accident.
- Use a noise filter, etc. to minimize the influence of electromagnetic interference. Electromagnetic interference may be given to the electronic equipment used near the servo amplifier.
- Burning or breaking a servo amplifier may cause a toxic gas. Do not burn or break it.
- Use the servo amplifier with the specified servo motor.
- The electromagnetic brake on the servo motor is designed to hold the motor shaft and should not be used for ordinary braking.
- For such reasons as service life and mechanical structure (e.g. where a ball screw and the servo motor are coupled via a timing belt), the electromagnetic brake may not hold the motor shaft. To ensure safety, install a stopper on the machine side.

(5) Corrective actions

⚠ CAUTION

- When it is assumed that a hazardous condition may occur due to a power failure or product malfunction, use a servo motor with an electromagnetic brake or external brake to prevent the condition.
- Configure an electromagnetic brake circuit so that it is activated also by an external EMG stop switch.



- When any alarm has occurred, eliminate its cause, ensure safety, and deactivate the alarm before restarting operation.
- Provide an adequate protection to prevent unexpected restart 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 malfunction, it is recommend that the electrolytic capacitor be replaced every 10 years when it is used in general environment. Please contact your local sales office.

(7) General instruction

●To illustrate details, the equipment in the diagrams of this 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 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 EEP-ROM, 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 malfunction when the EEP-ROM reaches the end of its useful life.

- Write to the EEP-ROM due to parameter setting changes
- Write to the EEP-ROM due to device changes

STO function of the servo amplifier

When using the STO function of the servo amplifier, refer to chapter 13 of "MR-J4-_A(-RJ) Servo Amplifier Instruction Manual" or "MR-J4-_B(-RJ) Servo Amplifier Instruction Manual".
For the MR-J3-D05 safety logic unit, refer to appendix 5 of "MR-J4-_A(-RJ) Servo Amplifier Instruction Manual" or "MR-J4-_B(-RJ) Servo Amplifier Instruction Manual".

Compliance with global standards

Refer to Appendix 1 for the compliance with global standard.

«About the manual»

You must have this Instruction Manual and the following manuals to use this servo. Ensure to prepare them to use the servo safely.

Relevant manuals

Manual name	Manual No.
MELSERVO-J4 Series Instructions and Cautions for Safe Use of AC Servos (packed with the servo amplifier)	IB(NA)0300197
MELSERVO-J4 Servo Amplifier Instruction Manual (Troubleshooting)	SH(NA)030109
MELSERVO Servo Motor Instruction Manual (Vol. 3) (Note 1)	SH(NA)030113
MELSERVO Linear Servo Motor Instruction Manual (Note 2)	SH(NA)030110
MELSERVO Linear Encoder Instruction Manual (Note 2, 3)	SH(NA)030111
EMC Installation Guidelines	IB(NA)67310

Note 1. It is necessary for using a rotary servo motor.
2. It is necessary for using a linear servo motor.
3. It is necessary for using a fully closed loop system.

This Instruction Manual does not describe the following items. These items are the same as those for MR-J4-_A(-RJ) or MR-J4-_B(-RJ) servo amplifier. For details of the items, refer to each chapter/section of the detailed explanation field.

Model	Item	Detailed explanation
MR-J4-_A4(-RJ)	Normal gain adjustment	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual chapter 6
	Special adjustment functions (except "Compliance with SEMI-F47 standard") (Note)	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual chapter 7
	Absolute position detection system	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual chapter 12
	Using STO function	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual chapter 13
	Communication function	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual chapter 14
MR-J4-_B4(-RJ)	Normal gain adjustment	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual chapter 6
	Special adjustment functions (except "Compliance with SEMI-F47 standard") (Note)	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual chapter 7
	Absolute position detection system	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual chapter 12
	Using STO function	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual chapter 13
	Using fully closed loop system	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual chapter 16

Note. For compliance with SEMI-F47 standard, refer to appendix 4.

«Cables used for wiring»

Wires mentioned in this Instruction Manual are selected based on the ambient temperature of 40 ˚C.

MEMO

CONTENTS

MEMO

1. FUNCTIONS AND CONFIGURATION

The items in the following table are the same as those for MR-J4-_A(-RJ) or MR-J4-_B(-RJ) servo amplifier. For details of the items, refer to each chapter/section of the detailed explanation field.

Model	Item	Detailed explanation
MR-J4-_A4(-RJ)	Summary	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 1.1
	Function list	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 1.5
	Removal and reinstallation of the front cover	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 1.7.2
MR-J4-_B4(-RJ)	Summary	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 1.1
	Function list	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 1.5
	Removal and reinstallation of the front cover	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 1.7.2

In MELSERVO-J4 series, servo amplifiers with CN2L connector are also available as MR-J4-_A4-RJ and MR-J4-_B4-RJ.
By using CN2L connector, an A/B/Z-phase differential output type external encoder can be connected to the servo amplifier. In a fully closed loop system, a four-wire type external encoder is connectable as well. The following table indicates the communication method of the external encoder compatible with MR-J4-_A4/MR-J4-_B4 and MR-J4-_A4-RJ/MR-J4-_B4-RJ servo amplifiers.

Table 1.1 Compatibility of communication methods

Operation mode	Linear encoder communication method	Connector on MR-J4-_A4/MR-J4-_B4	Connector on MR-J4-_A4-RJ/MR-J4-_B4-RJ
Linear servo motor system	Two-wire type	CN2	CN2L
	Four-wire type		
	A/B/Z-phase differential output type		
Fully closed loop system	Two-wire type	CN2	
	Four-wire type		
	A/B/Z-phase differential output type		

1. FUNCTIONS AND CONFIGURATION

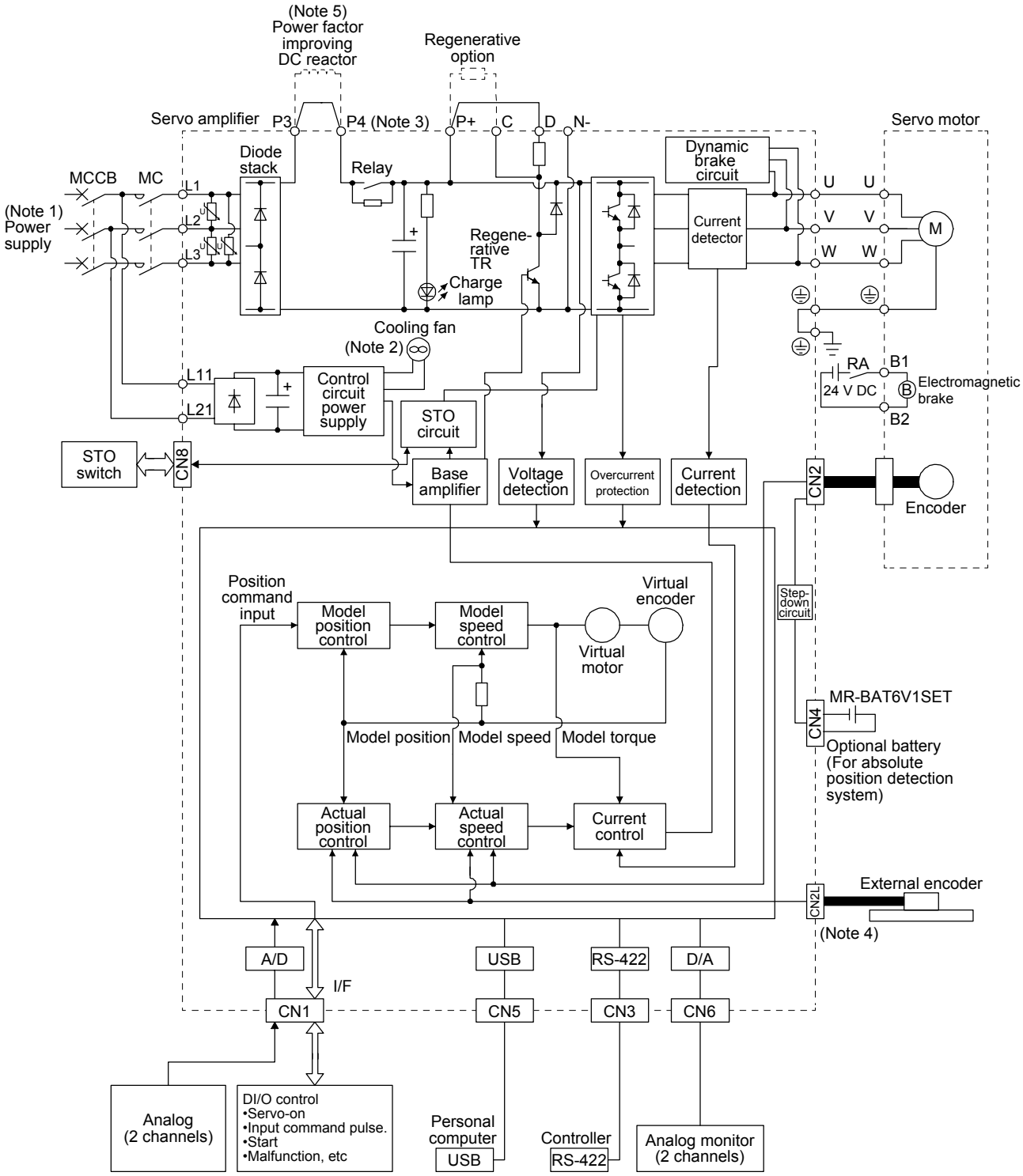
1.1 Function block diagram

The function block diagram of this servo is shown below.

1.1.1 For MR-J4-_A4(-RJ)

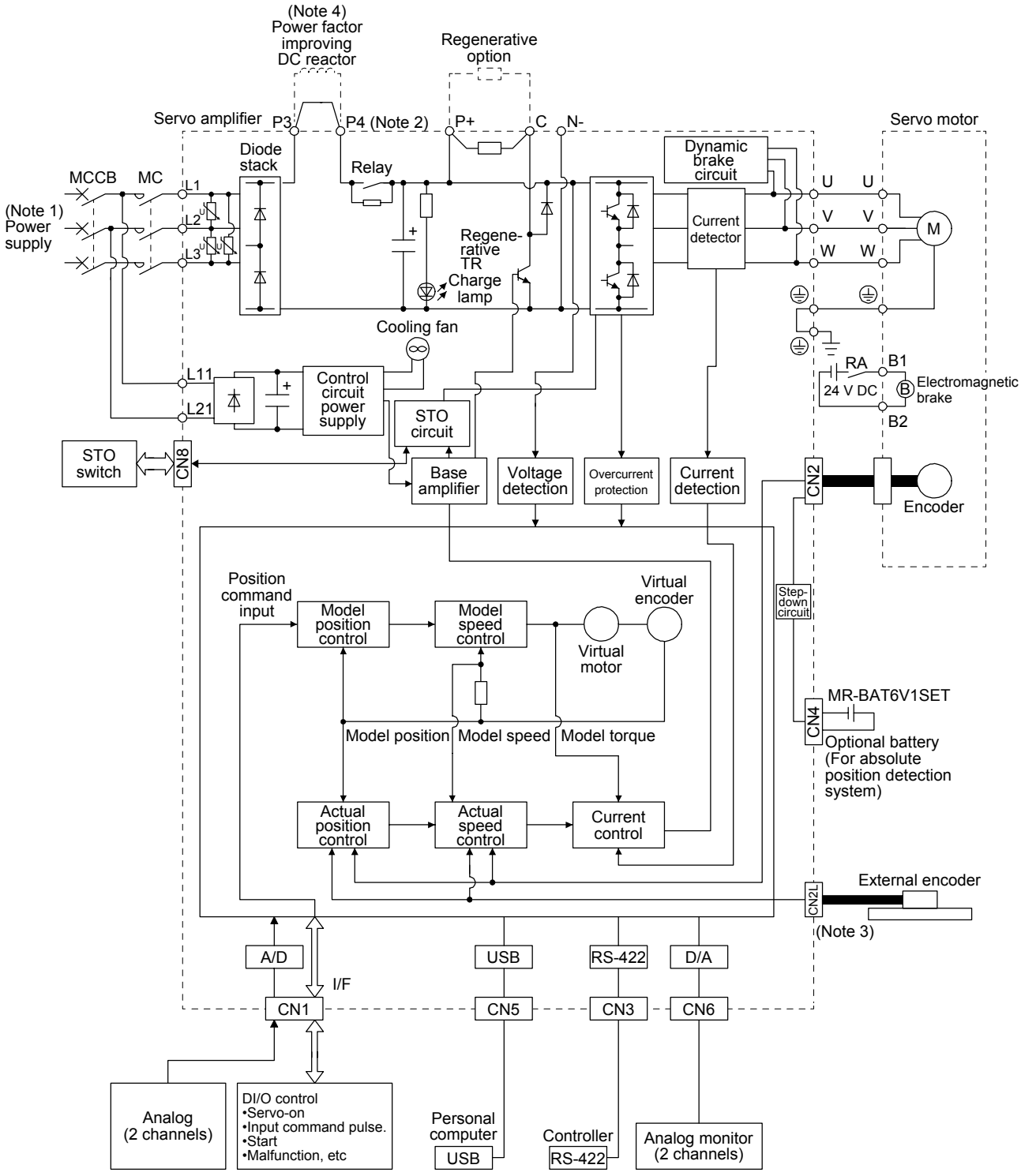
POINT
●The diagram shows for MR-J4-A4-RJ as an example. MR-J4-_A4 servo amplifier does not have CN2L connector.

(1) MR-J4-350A4(-RJ) or less



Note 1. Refer to section 1.2.1 for the power supply specification.
2. Servo amplifiers MR-J4-200A4(-RJ) or more have a cooling fan.
3. MR-J4 servo amplifier has P3 and P4 in the upstream of the inrush current suppression circuit. They are different from P1 and P2 of MR-J3 servo amplifiers.
4. This is for MR-J4-_A4-RJ servo amplifier. MR-J4-_A4 servo amplifier does not have CN2L connector.
5. 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 P3 and P4.

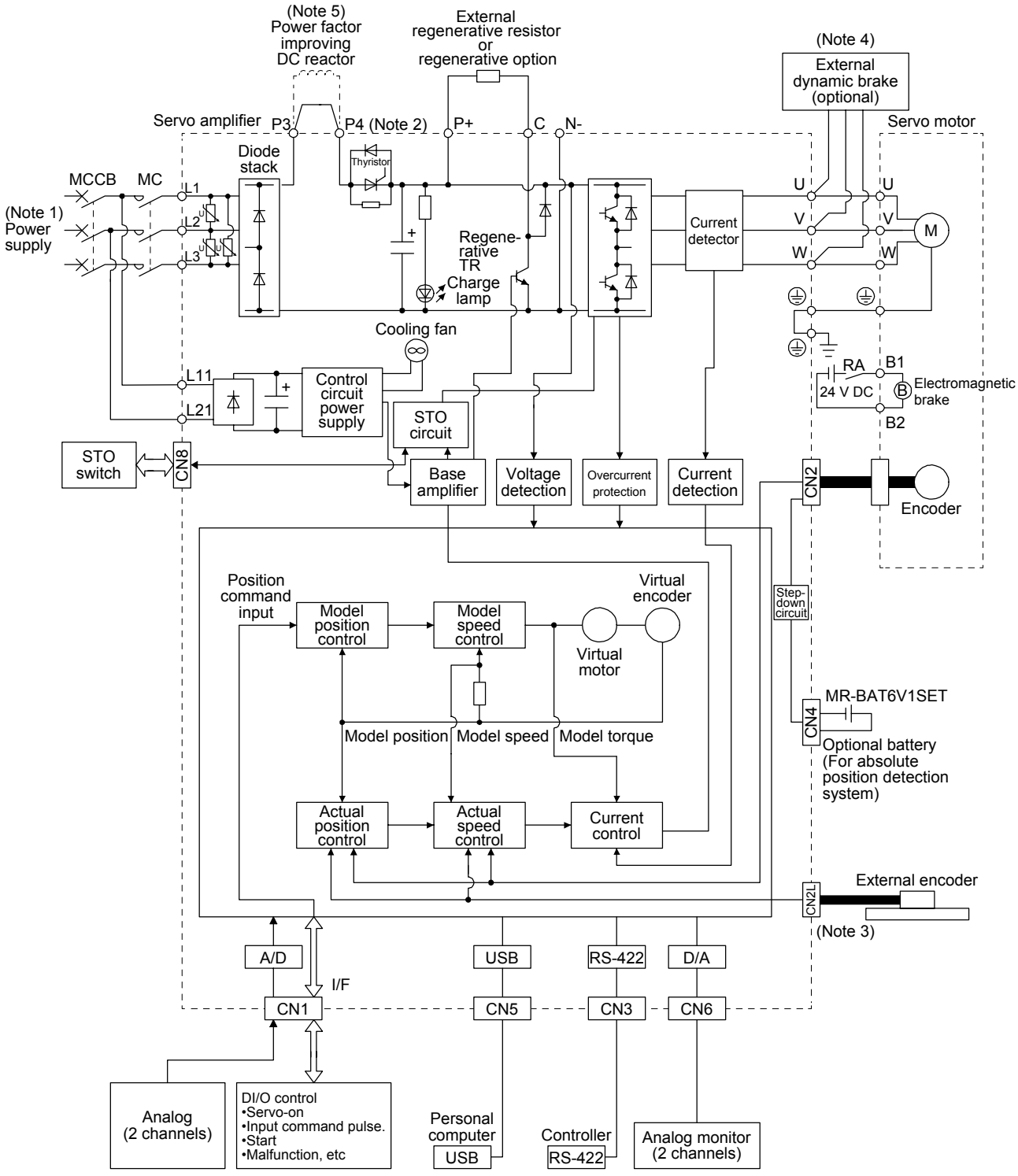
(2) MR-J4-500A4(-RJ)/MR-J4-700A4(-RJ)



Note 1. Refer to section 1.2.1 for the power supply specification.

2. MR-J4 servo amplifier has P3 and P4 in the upstream of the inrush current suppression circuit. They are different from P1 and P2 of MR-J3 servo amplifiers.
3. This is for MR-J4-_A4-RJ servo amplifier. MR-J4-_A4 servo amplifier does not have CN2L connector.
4. 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 P3 and P4.

(3) MR-J4-11KA4(-RJ)/MR-J4-15KA4(-RJ)/MR-J4-22KA4(-RJ)



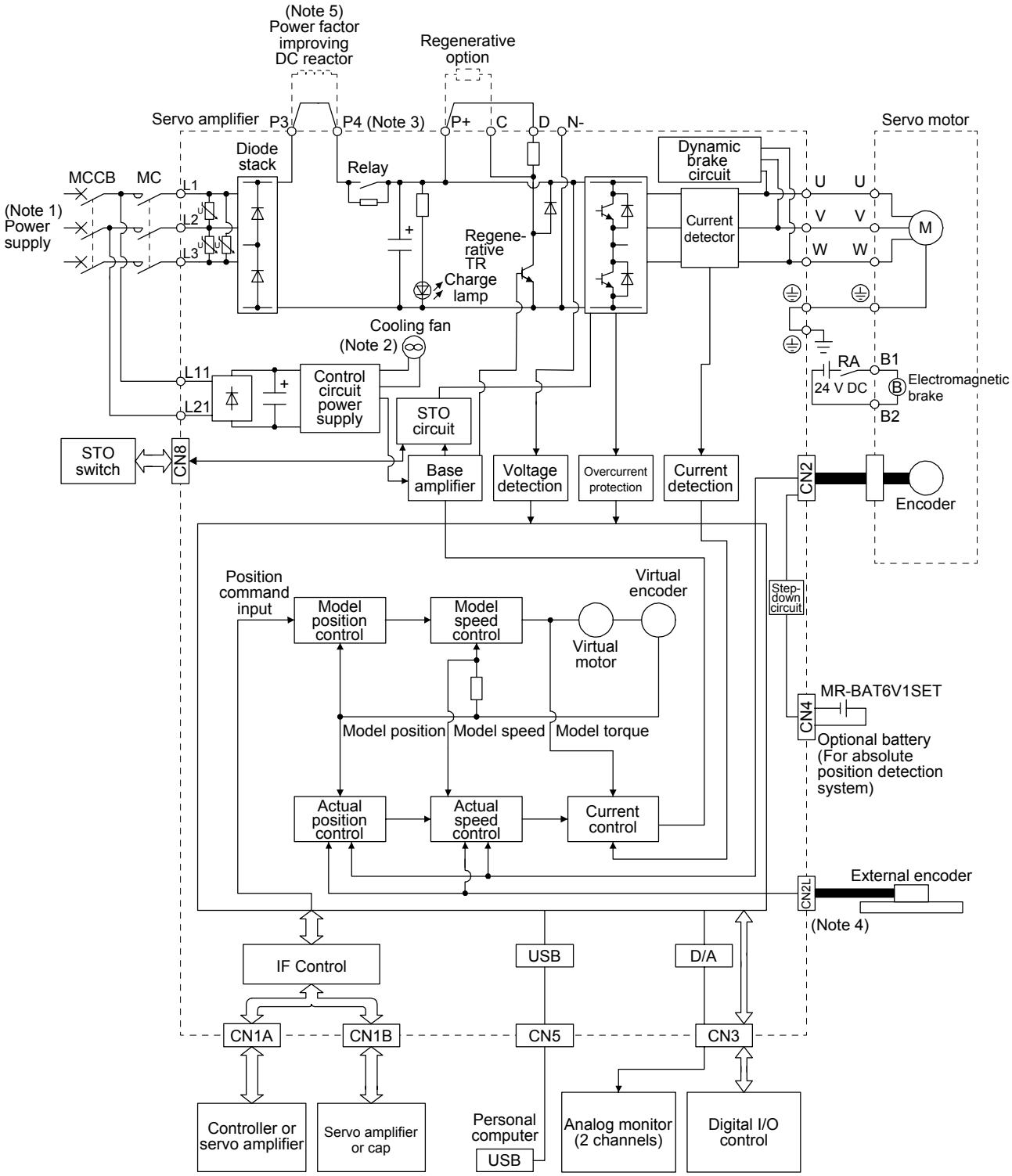
Note 1. Refer to section 1.2.1 for the power supply specification.

2. MR-J4 servo amplifier has P3 and P4 in the upstream of the inrush current suppression circuit. They are different from P1 and P2 of MR-J3 servo amplifiers.
3. This is for MR-J4-_A4-RJ servo amplifier. MR-J4-_A4 servo amplifier does not have CN2L connector.
4. Use an external dynamic brake for this servo amplifier. Failure to do so will cause an accident because the servo motor does not stop immediately but coasts at an alarm occurrence for which the servo motor does not decelerate to stop. Ensure the safety in the entire equipment. For alarms for which the servo motor does not decelerate to stop, refer to section 6.1.1.
5. 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 P3 and P4.

1.1.2 For MR-J4-_B4(-RJ)

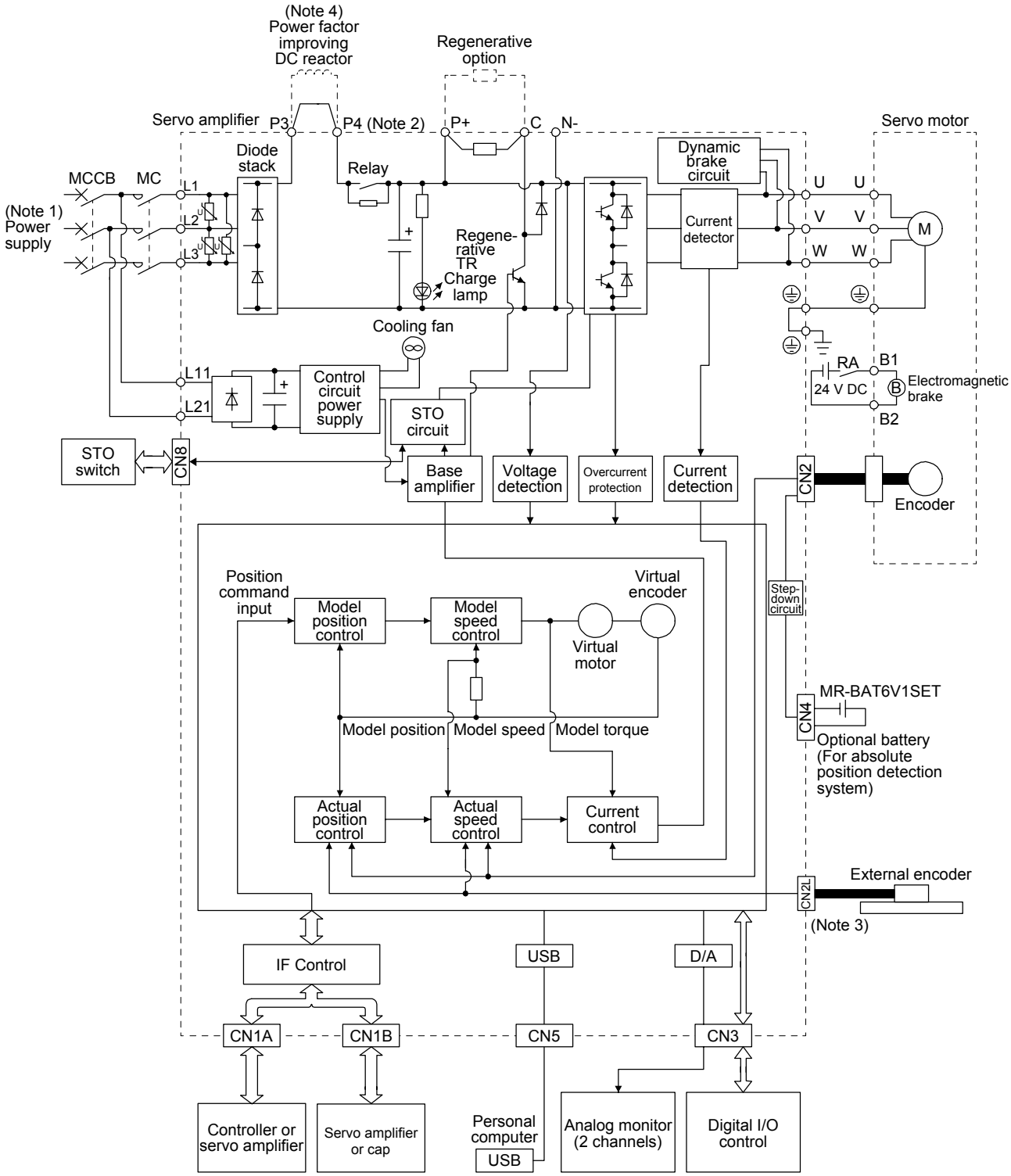
POINT
●The diagram shows for MR-J4-B4-RJ as an example. MR-J4-_B4 servo amplifier does not have CN2L connector.

(1) MR-J4-350B4(-RJ) or less



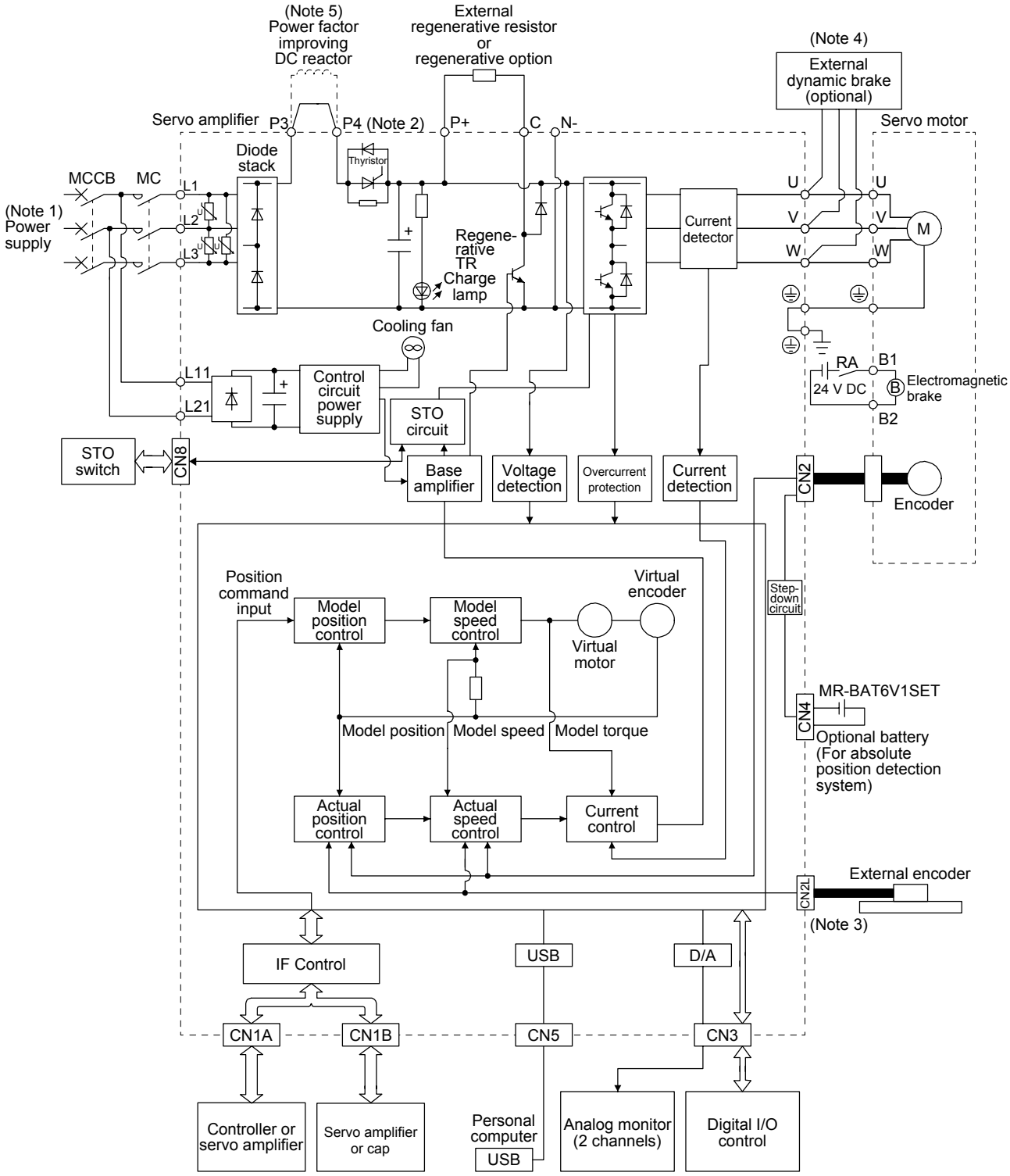
Note 1. Refer to section 1.2.2 for the power supply specification.
2. Servo amplifiers MR-J4-200B4(-RJ) or more have a cooling fan.
3. MR-J4 servo amplifier has P3 and P4 in the upstream of the inrush current suppression circuit. They are different from P1 and P2 of MR-J3 servo amplifiers.
4. This is for MR-J4-_B4-RJ servo amplifier. MR-J4-_B4 servo amplifier does not have CN2L connector.
5. 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 P3 and P4.

(2) MR-J4-500B4(-RJ)/MR-J4-700B4(-RJ)



Note 1. Refer to section 1.2.2 for the power supply specification.
2. MR-J4 servo amplifier has P3 and P4 in the upstream of the inrush current suppression circuit. They are different from P1 and P2 of MR-J3 servo amplifiers.
3. This is for MR-J4-_B4-RJ servo amplifier. MR-J4-_B4 servo amplifier does not have CN2L connector.
4. 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 P3 and P4.

(3) MR-J4-11KB4(-RJ)/MR-J4-15KB4(-RJ)/MR-J4-22KB4(-RJ)



Note 1. Refer to section 1.2.2 for the power supply specification.
2. MR-J4 servo amplifier has P3 and P4 in the upstream of the inrush current suppression circuit. They are different from P1 and P2 of MR-J3 servo amplifiers.
3. This is for MR-J4-_B4-RJ servo amplifier. MR-J4-_B4 servo amplifier does not have CN2L connector.
4. Use an external dynamic brake for this servo amplifier. Failure to do so will cause an accident because the servo motor does not stop immediately but coasts at an alarm occurrence for which the servo motor does not decelerate to stop. Ensure the safety in the entire equipment. For alarms for which the servo motor does not decelerate to stop, refer to section 6.2.1.
5. 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 P3 and P4.

1.2 Servo amplifier standard specifications

1.2.1 For MR-J4-_A4(-RJ)

Model: MR-J4-		60A4 (-RJ)	100A4 (-RJ)	200A4 (-RJ)	350A4 (-RJ)	500A4 (-RJ)	700A4 (-RJ)	11KA4 (-RJ)	15KA4 (-RJ)	22KA4 (-RJ)
Output	Rated voltage	3-phase 323 V AC								
	Rated current [A]	1.5	2.8	5.4	8.6	14.0	17.0	32.0	41.0	63.0
Main circuit power supply	Voltage/Frequency	3-phase 380 V AC to 480 V AC, 50 Hz/60 Hz								
	Rated current [A]	1.4	2.5	5.1	7.9	10.8	14.4	23.1	31.8	47.6
	Permissible voltage fluctuation	3-phase 323 V AC to 528 V AC								
	Permissible frequency fluctuation	Within ±5%								
	Power supply capacity [kVA]	Refer to section 8.2.								
	Inrush current [A]	Refer to section 8.4.								
Control circuit power supply	Voltage/Frequency	1-phase 380 V AC to 480 V AC, 50 Hz/60 Hz								
	Rated current [A]	0.1			0.2					
	Permissible voltage fluctuation	1-phase 323 V AC to 528 V AC								
	Permissible frequency fluctuation	Within ±5%								
	Power consumption [W]	30			45					
	Inrush current [A]	Refer to section 8.4.								
Interface power supply	Voltage	24 V DC ± 10%								
	Current capacity [A]	(Note 1) 0.5 (including CN8 connector signals)								
Control method		Sine-wave PWM control, current control method								
Dynamic brake		Built-in						External option (Note 6)		
Fully closed loop control		Corresponding								
Load-side encoder interface (Note 5)		Mitsubishi high-speed serial communication								
Communication function		USB: connection to a personal computer or others (MR Configurator2-compatible)								
		RS-422: 1 : n communication (up to 32 axes)								
Encoder output pulses		Compatible (A/B/Z-phase pulse)								
Analog monitor		Two channels								
Position control mode	Max. input pulse frequency	4 Mpps (for differential receiver) (Note 4), 200 kpps (for open collector)								
	Positioning feedback pulse	Encoder resolution (resolution per servo motor revolution): 22 bits								
	Command pulse multiplying factor	Electronic gear A:1 to 16777215, B:1 to 16777215, 1/10 < A/B < 4000								
	In-position range setting	0 pulse to ±65535 pulses (command pulse unit)								
	Error excessive	±3 revolutions								
	Torque limit	Set by parameter setting or external analog input (0 V DC to +10 V DC/maximum torque)								
Speed control mode	Speed control range	Analog speed command 1: 2000, internal speed command 1: 5000								
	Analog speed command input	0 to ±10 V DC/rated speed (The speed at 10 V is changeable with [Pr. PC12].)								
	Speed fluctuation ratio	±0.01% or less (load fluctuation 0 % to 100%), 0% (power fluctuation ±10%), ±0.2% or less (ambient temperature 25 ± 10 °C) when using analog speed command								
	Torque limit	Set by parameter setting or external analog input (0 V DC to +10 V DC/maximum torque)								
Torque control mode	Analog torque command input	0 V DC to ±8 V DC/maximum torque (input impedance 10 kΩ to 12 kΩ)								
	Speed limit	Set by parameter setting or external analog input (0 V DC to 10 V DC/rated speed)								
Protective functions		Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal), servo motor overheat protection, encoder error protection, regenerative error protection, undervoltage protection, instantaneous power failure protection, overspeed protection, error excessive protection, magnetic pole detection protection, and linear servo control fault protection								
Safety function		STO (IEC/EN 61800-5-2)								

Model: MR-J4-			60A4 (-RJ)	100A4 (-RJ)	200A4 (-RJ)	350A4 (-RJ)	500A4 (-RJ)	700A4 (-RJ)	11KA4 (-RJ)	15KA4 (-RJ)	22KA4 (-RJ)
Safety performance	Standards certified by CB		EN ISO 13849-1 category 3 PL d, EN 61508 SIL 2, EN 62061 SIL CL 2, and EN 61800-5-2 SIL 2								
	Response performance		8 ms or less (STO input off → energy shut off)								
	(Note 2) Test pulse input (STO)		Test pulse interval: 1 Hz to 25 Hz Test pulse off time: Up to 1 ms								
	Mean time to dangerous failure (MTTFd)		100 years or longer								
	Diagnosis coverage (DC)		Medium (90% to 99%)								
	Average probability of dangerous failures per hour (PFH)		1.68×10^{-10} [1/h]								
Compliance to standards	CE marking		LVD: EN 61800-5-1 EMC: EN 61800-3 MD: EN ISO 13849-1, EN 61800-5-2, EN 62061								
	UL standard		UL 508C								
Structure (IP rating)			Natural cooling, open (IP20)		Force cooling, open (IP20)		Force cooling, open (IP20) (Note 3)				
Close mounting			Impossible								
Environment	Ambient temperature	Operation	0 ˚C to 55 ˚C (non-freezing)								
		Storage	-20 ˚C to 65 ˚C (non-freezing)								
	Ambient humidity	Operation	90 %RH or less (non-condensing)								
		Storage									
	Ambience		Indoors (no direct sunlight), free from corrosive gas, flammable gas, oil mist, dust, and dirt								
	Altitude		1000 m or less above sea level								
	Vibration resistance		5.9 m/s^2, at 10 Hz to 55 Hz (directions of X, Y and Z axes)								
Mass		[kg]	1.7		2.1	3.6	4.3	6.5	13.4		18.2

Note 1. 0.5 A 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.

2. Test pulse is a signal which instantaneously turns off a signal to the servo amplifier at a constant period for external circuit to self-diagnose.

3. Except for the terminal block.

4. 1 Mpps or lower commands are supported in the initial setting. When inputting commands between 1 Mpps and 4 Mpps, change the setting in [Pr. PA13].

5. MR-J4-A4 servo amplifier is compatible only with two-wire type. MR-J4-A4-RJ servo amplifier is compatible with two-wire type, four-wire type, and A/B/Z-phase differential output type. Refer to table 1.1 for details.

6. Use an external dynamic brake for this servo amplifier. Failure to do so will cause an accident because the servo motor does not stop immediately but coasts at emergency stop. Ensure the safety in the entire equipment.

1.2.2 For MR-J4-_B4(-RJ)

Model: MR-J4-		60B4 (-RJ)	100B4 (-RJ)	200B4 (-RJ)	350B4 (-RJ)	500B4 (-RJ)	700B4 (-RJ)	11KB4 (-RJ)	15KB4 (-RJ)	22KB4 (-RJ)
Output	Rated voltage	3-phase 323 V AC								
	Rated current [A]	1.5	2.8	5.4	8.6	14.0	17.0	32.0	41.0	63.0
Main circuit power supply	Voltage/Frequency	3-phase 380 V AC to 480 V AC, 50 Hz/60 Hz								
	Rated current [A]	1.4	2.5	5.1	7.9	10.8	14.4	23.1	31.8	47.6
	Permissible voltage fluctuation	3-phase 323 V AC to 528 V AC								
	Permissible frequency fluctuation	Within ±5%								
	Power supply capacity [kVA]	Refer to section 8.2.								
	Inrush current [A]	Refer to section 8.4.								
Control circuit power supply	Voltage/Frequency	1-phase 380 V AC to 480 V AC, 50 Hz/60 Hz								
	Rated current [A]	0.1			0.2					
	Permissible voltage fluctuation	1-phase 323 V AC to 528 V AC								
	Permissible frequency fluctuation	Within ±5%								
	Power consumption [W]	30			45					
	Inrush current [A]	Refer to section 8.4.								
Interface power supply	Voltage	24 V DC ± 10%								
	Current capacity [A]	(Note 1) 0.3 (including CN8 connector signals)								
Control method		Sine-wave PWM control, current control method								
Dynamic brake		Built-in						External option (Note 6)		
SSCNET III/H communication cycle (Note 5)		0.222 ms, 0.444 ms, 0.888 ms								
Fully closed loop control		Corresponding								
Load-side encoder interface (Note 4)		Mitsubishi high-speed serial communication								
Communication function		USB: connection to a personal computer or others (MR Configurator2-compatible)								
Encoder output pulses		Compatible (A/B/Z-phase pulse)								
Analog monitor		Two channels								
Protective functions		Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal), servo motor overheat protection, encoder error protection, regenerative error protection, undervoltage protection, instantaneous power failure protection, overspeed protection, error excessive protection, magnetic pole detection protection, and linear servo control fault protection								
Safety function		STO (IEC/EN 61800-5-2)								
Safety performance	Standards certified by CB	EN ISO 13849-1 category 3 PL d, EN 61508 SIL 2, EN 62061 SIL CL 2, and EN 61800-5-2 SIL 2								
	Response performance	8 ms or less (STO input off → energy shut off)								
	(Note 2) Test pulse input (STO)	Test pulse interval: 1 Hz to 25 Hz Test pulse off time: Up to 1 ms								
	Mean time to dangerous failure (MTTFd)	100 years or longer								
	Diagnosis converge (DC)	Medium (90% to 99%)								
	Average probability of dangerous failures per hour (PFH)	1.68×10^{-10} [1/h]								
Compliance to standards	CE marking	LVD: EN 61800-5-1 EMC: EN 61800-3 MD: EN ISO 13849-1, EN 61800-5-2, EN 62061								
	UL standard	UL 508C								
Structure (IP rating)		Natural cooling, open (IP20)		Force cooling, open (IP20)		Force cooling, open (IP20) (Note 3)				
Close mounting		Impossible								

Model: MR-J4-			60B4 (-RJ)	100B4 (-RJ)	200B4 (-RJ)	350B4 (-RJ)	500B4 (-RJ)	700B4 (-RJ)	11KB4 (-RJ)	15KB4 (-RJ)	22KB4 (-RJ)
Environment	Ambient temperature	Operation	0 ˚C to 55 ˚C (non-freezing)								
		Storage	-20 ˚C to 65 ˚C (non-freezing)								
	Ambient humidity	Operation	90 %RH or less (non-condensing)								
		Storage									
	Ambience		Indoors (no direct sunlight), free from corrosive gas, flammable gas, oil mist, dust, and dirt								
	Altitude		1000 m or less above sea level								
	Vibration resistance		5.9 m/s^2, at 10 Hz to 55 Hz (directions of X, Y and Z axes)								
Mass [kg]			1.7		2.1	3.6	4.3	6.5	13.4		18.2

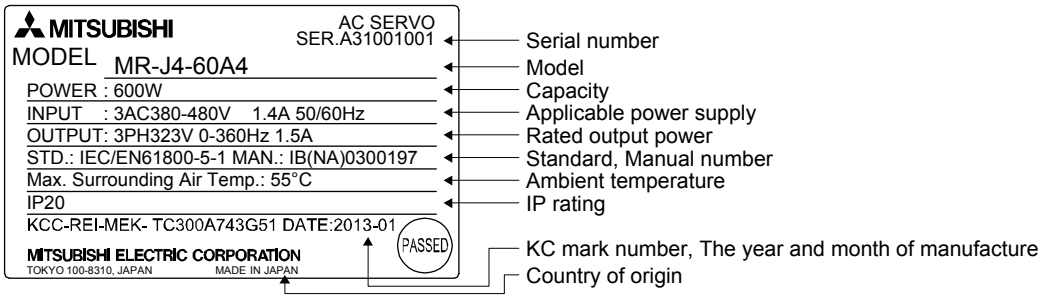
Note 1. 0.3 A is the value applicable when all I/O signals are used. The current capacity can be decreased by reducing the number of I/O points.
2. Test pulse is a signal which instantaneously turns off a signal to the servo amplifier at a constant period for external circuit to self-diagnose.
3. Except for the terminal block.
4. MR-J4-B4 servo amplifier is compatible only with two-wire type. MR-J4-B4-RJ servo amplifier is compatible with two-wire type, four-wire type, and A/B/Z-phase differential output type. Refer to table 1.1 for details.
5. The communication cycle depends on the controller specifications and the number of axes connected.
6. Use an external dynamic brake for this servo amplifier. Failure to do so will cause an accident because the servo motor does not stop immediately but coasts at emergency stop. Ensure the safety in the entire equipment.

1.3 Combinations of servo amplifiers and servo motors

Servo amplifier	Rotary servo motor			Linear servo motor (primary side)
	HG-SR	HG-JR	HG-JR (When the maximum torque is 400%)	
MR-J4-60_4(-RJ)	524	534		
MR-J4-100_4(-RJ)	1024	734, 1034	534	
MR-J4-200_4(-RJ)	1524, 2024	1534, 2034	734, 1034	
MR-J4-350_4(-RJ)	3524	3534	1534, 2034	
MR-J4-500_4(-RJ)	5024	5034	3534	
MR-J4-700_4(-RJ)	7024	7034	5034	
MR-J4-11K_4(-RJ)		9034, 11K1M4		
MR-J4-15K_4(-RJ)		15K1M4		
MR-J4-22K_4(-RJ)		22K1M4		LM-FP5H-60M-1SS0

1.4 Model designation

(1) Rating plate



(2) Model

The following describes what each block of a model name indicates.

MR－J4－60A4－RJ

Series

Special specifications

Symbol	Special specifications
None	Standard
-RJ	Fully closed loop control four-wire type/load-side encoder A/B/Z-phase input compatible
-PX	Without regenerative resistor (Note)
-RZ	MR-J4-_4-RJ without regenerative resistor (Note)

Power supply: 3-phase 380 V AC to 480 V AC

Corresponding

Symbol	Corresponding
A	General-purpose interface
B	SSCNET III/H

Rated output

Symbol	Rated output [kW]
60	0.6
100	1
200	2
350	3.5
500	5
700	7
11K	11
15K	15
22K	22

Note. Indicates a servo amplifier of 11 kW to 22 kW that does not use a regenerative resistor as standard accessory.

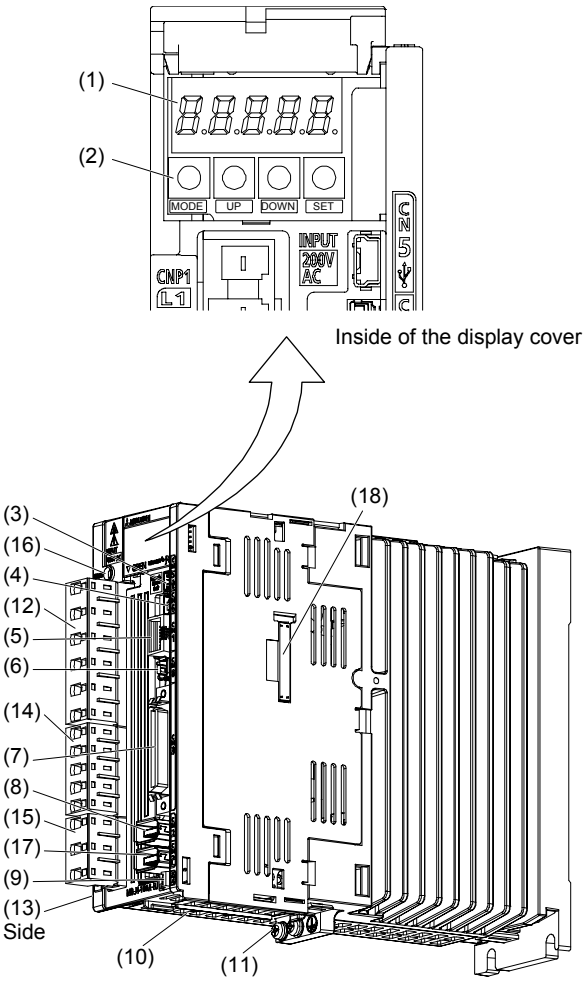
1.5 Structure

1.5.1 Parts identification

(1) For MR-J4-_A4(-RJ)

"MR-J4-_A" means "MR-J4-_A(-RJ) Servo Amplifier Instruction Manual".

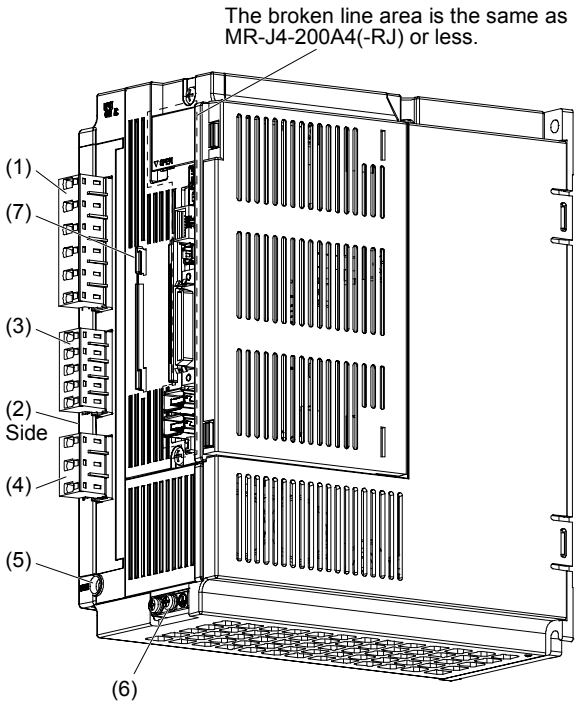
(a) For MR-J4-200A4(-RJ) or less
The diagram is for MR-J4-60A4-RJ.



No.	Name/Application	Detailed explanation
(1)	Display The 5-digit, seven-segment LED shows the servo status and the alarm number.	MR-J4-_A section 4.5
(2)	Operation section Used to perform status display, diagnostic, alarm, and parameter setting operations. Push the "MODE" and "SET" buttons at the same time for 3 s or more to switch to the one-touch tuning mode. MODE UP DOWN SET Used to set data. Push this button together with the "MODE" button for 3 s or more to switch to the one-touch tuning mode. Used to change the display or data in each mode. Used to change the mode. Push this button together wish the "SET" button for 3 s or more to switch to the one-touch tuning mode.	MR-J4-_A section 4.5
(3)	USB communication connector (CN5) Connect with the personal computer.	MR-J4-_A section 11.7
(4)	Analog monitor connector (CN6) Outputs the analog monitor.	MR-J4-_A section 3.2
(5)	RS-422 communication connector (CN3) Connect with the personal computer, etc.	MR-J4-_A chapter 14
(6)	STO input signal connector (CN8) Used to connect MR-J3-D05 safety logic unit and external safety relay.	MR-J4-_A chapter 13
(7)	I/O signal connector (CN1) Used to connect digital I/O signals.	MR-J4-_A section 3.2 Section 3.4
(8)	Encoder connector (CN2) Used to connect the servo motor encoder.	MR-J4-_A section 3.4
(9)	Battery connector (CN4) Used to connect the battery for absolute position data backup.	MR-J4-_A chapter 12
(10)	Battery holder Install the battery for absolute position data backup.	MR-J4-_A section 12.4
(11)	Protective earth (PE) terminal Grounding terminal	Section 3.1
(12)	Main circuit power supply connector (CNP1) Connect the input power supply.	
(13)	Rating plate	Section 1.4
(14)	Control circuit power supply connector (CNP2) Connect the control circuit power supply and regenerative option.	Section 3.1
(15)	Servo motor power output connector (CNP3) Connect the servo motor.	
(16)	Charge lamp When the main circuit is charged, this will light. While this lamp is lit, do not reconnect the cables.	
(17) (Note)	External encoder connector (CN2L) Used to connect the external encoder.	Linear Encoder Instruction Manual
(18)	Manufacturer setting connector (CN2L) This connector is attached on MR-J4-_A4-RJ servo amplifier, but not for use. MR-J4-_A4 servo amplifier does not have this connector.	

Note. This is for MR-J4-_A4-RJ servo amplifier. MR-J4-_A4 servo amplifier does not have CN2L connector.

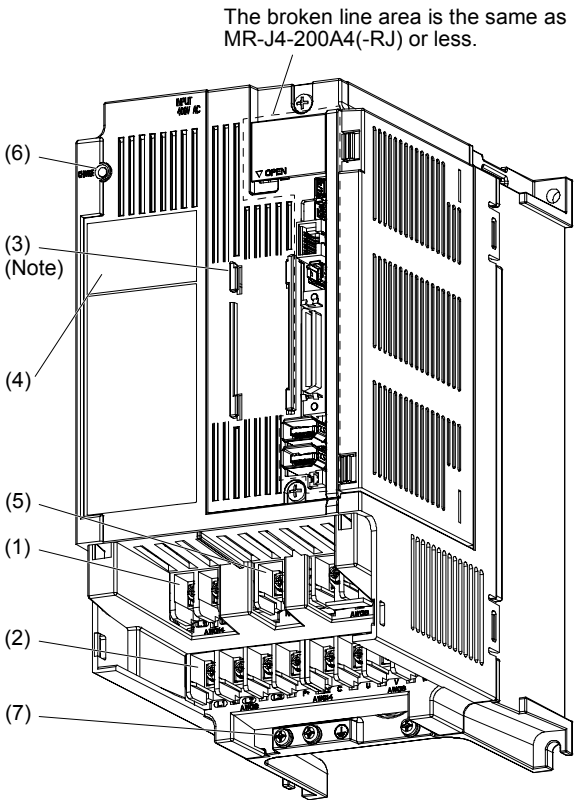
(b) MR-J4-350A4(-RJ)



No.	Name/Application	Detailed explanation
(1)	Main circuit power supply connector (CNP1) Connect the input power supply.	Section 3.1
(2)	Rating plate	Section 1.4
(3)	Control circuit power supply connector (CNP2) Connect the control circuit power supply and regenerative option.	Section 3.1
(4)	Servo motor power output connector (CNP3) Connect the servo motor.	
(5)	Charge lamp When the main circuit is charged, this will light. While this lamp is lit, do not reconnect the cables.	
(6)	Protective earth (PE) terminal Grounding terminal	Section 3.1
(7)	Battery holder Install the battery for absolute position data backup.	MR-J4-_A section 12.4

(c) MR-J4-500A4(-RJ)

POINT
●The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.7.2 of "MR-J4-_A(-RJ) Servo Amplifier Instruction Manual".

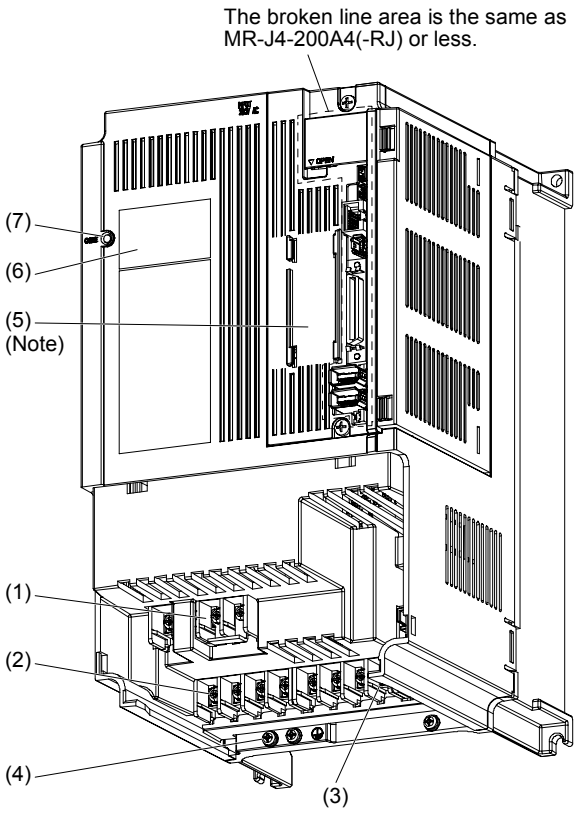


No.	Name/Application	Detailed explanation
(1)	Control circuit terminal block (TE2) Used to connect the control circuit power supply.	Section 3.1
(2)	Main circuit terminal block (TE1) Used to connect the input power supply and servo motor.	
(3)	Battery holder Install the battery for absolute position data backup.	MR-J4-_A section 12.4
(4)	Rating plate	Section 1.4
(5)	Regenerative option/power factor improving reactor terminal block (TE3) Used to connect a regenerative option and a power factor improving DC reactor.	Section 3.1
(6)	Charge lamp When the main circuit is charged, this will light. While this lamp is lit, do not reconnect the cables.	
(7)	Protective earth (PE) terminal Grounding terminal	Section 3.1

Note. Lines for slots around the battery holder are omitted from the illustration.

(d) MR-J4-700A4(-RJ)

POINT
●The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.7.2 of "MR-J4-_A(-RJ) Servo Amplifier Instruction Manual".



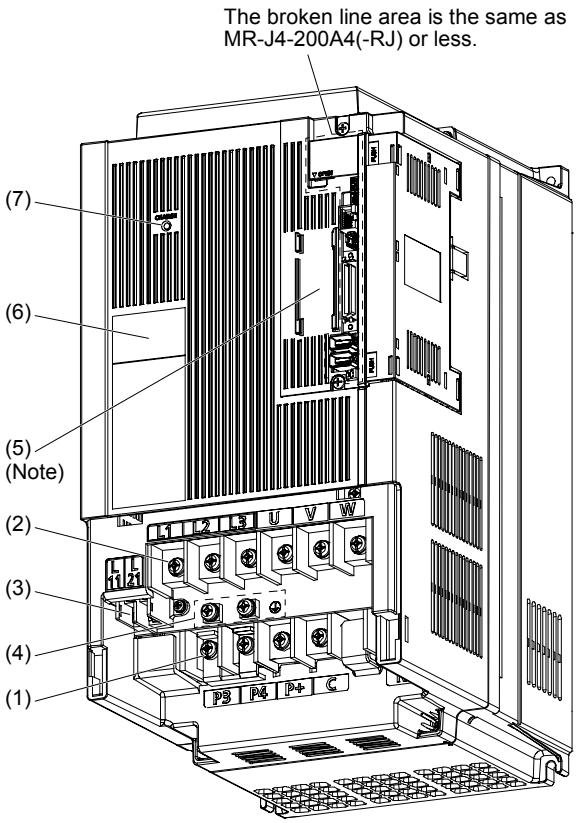
No.	Name/Application	Detailed explanation
(1)	Power factor improving reactor terminal block (TE3) Used to connect the DC reactor.	Section 3.1
(2)	Main circuit terminal block (TE1) Used to connect the input power supply, regenerative option, and servo motor.	
(3)	Control circuit terminal block (TE2) Used to connect the control circuit power supply.	
(4)	Protective earth (PE) terminal Grounding terminal	
(5)	Battery holder Install the battery for absolute position data backup.	MR-J4-_A section 12.4
(6)	Rating plate	Section 1.4
(7)	Charge lamp When the main circuit is charged, this will light. While this lamp is lit, do not reconnect the cables.	

Note. Lines for slots around the battery holder are omitted from the illustration.

(e) MR-J4-11KA4(-RJ)/MR-J4-15KA4(-RJ)

POINT

●The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.7.2 of "MR-J4-_A(-RJ) Servo Amplifier Instruction Manual".



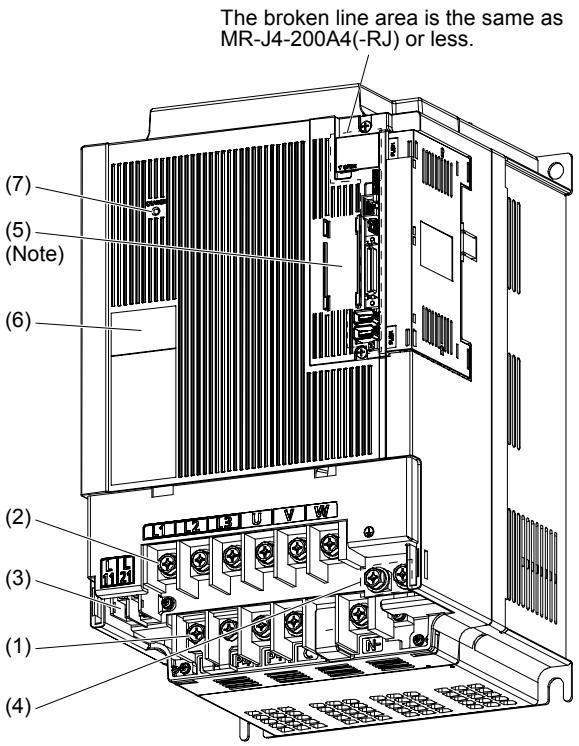
No.	Name/Application	Detailed explanation
(1)	Power factor improving reactor terminal block (TE1-2) Used to connect a power factor improving DC reactor and a regenerative option.	Section 3.1
(2)	Main circuit terminal block (TE1-1) Used to connect the input power supply and servo motor.	
(3)	Control circuit terminal block (TE2) Used to connect the control circuit power supply.	
(4)	Protective earth (PE) terminal Grounding terminal	
(5)	Battery holder Install the battery for absolute position data backup.	MR-J4-_A section 12.4
(6)	Rating plate	Section 1.4
(7)	Charge lamp When the main circuit is charged, this will light. While this lamp is lit, do not reconnect the cables.	

Note. Lines for slots around the battery holder are omitted from the illustration.

(f) MR-J4-22KA4(-RJ)

POINT

●The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.7.2 of "MR-J4-_A(-RJ) Servo Amplifier Instruction Manual".



No.	Name/Application	Detailed explanation
(1)	Power factor improving reactor terminal block (TE1-2) Used to connect a power factor improving DC reactor and a regenerative option.	Section 3.1
(2)	Main circuit terminal block (TE1-1) Used to connect the input power supply and servo motor.	
(3)	Control circuit terminal block (TE2) Used to connect the control circuit power supply.	
(4)	Protective earth (PE) terminal Grounding terminal	
(5)	Battery holder Install the battery for absolute position data backup.	MR-J4-_A section 12.4
(6)	Rating plate	Section 1.4
(7)	Charge lamp When the main circuit is charged, this will light. While this lamp is lit, do not reconnect the cables.	

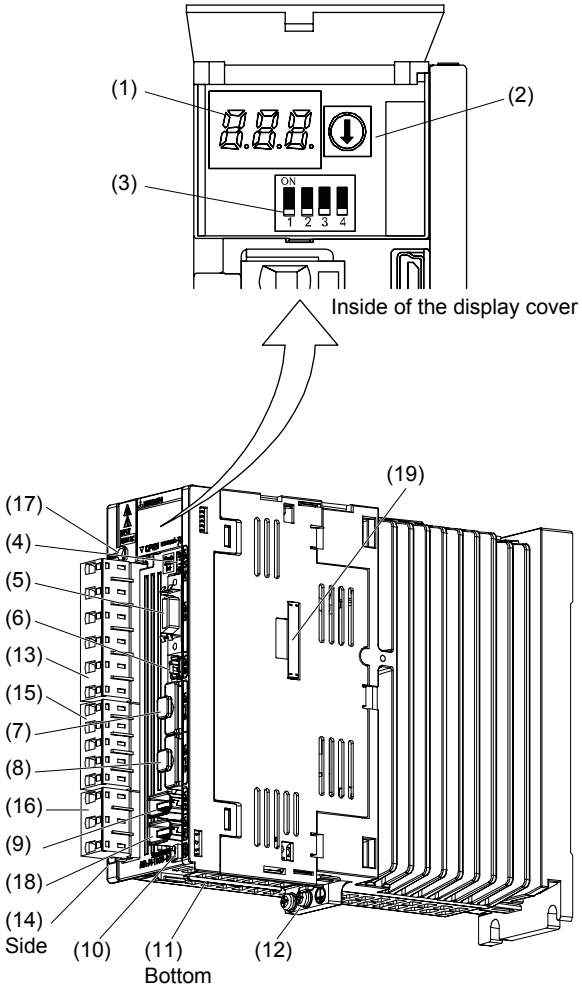
Note. Lines for slots around the battery holder are omitted from the illustration.

(2) For MR-J4-_B4(-RJ)

"MR-J4-_B" means "MR-J4-_B(-RJ) Servo Amplifier Instruction Manual".

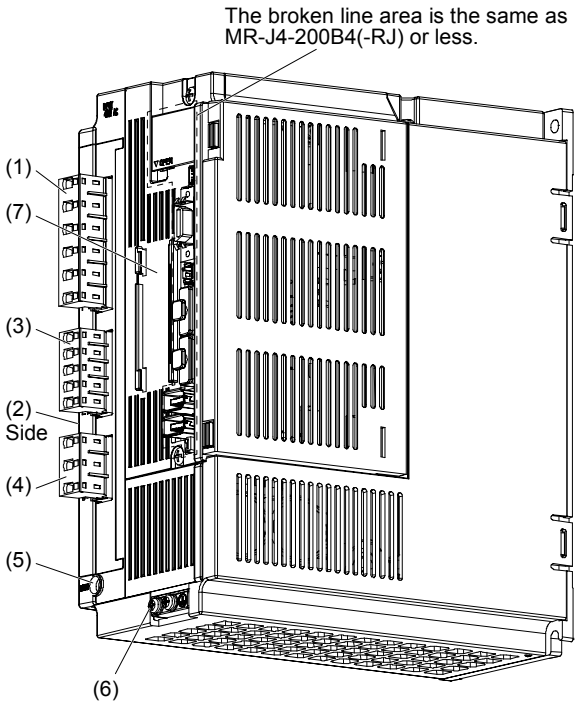
(a) MR-J4-200B4(-RJ) or less

The diagram is for MR-J4-60B4-RJ.



No.	Name/Application	Detailed explanation
(1)	Display The 3-digit, seven-segment LED shows the servo status and the alarm number.	MR-J4-_B section 4.3
(2)	Axis selection rotary switch (SW1) Used to set the axis No. of servo amplifier.	
(3)	Control axis setting switch (SW2) The test operation switch, the control axis deactivation setting switch, and the auxiliary axis number setting switch are available.	
(4)	USB communication connector (CN5) Connect with the personal computer.	MR-J4-_B section 11.7
(5)	I/O signal connector (CN3) Used to connect digital I/O signals.	MR-J4-_B section 3.2 Section 3.4
(6)	STO input signal connector (CN8) Used to connect MR-J3-D05 safety logic unit and external safety relay.	MR-J4-_B chapter 13 App. 1
(7)	SSCNET III cable connector (CN1A) Used to connect the servo system controller or the previous axis servo amplifier.	MR-J4-_B section 3.2 Section 3.4
(8)	SSCNET III cable connector (CN1B) Used to connect the next axis servo amplifier. For the final axis, put a cap.	
(9)	Encoder connector (CN2) Used to connect the servo motor encoder.	MR-J4-_B section 3.4
(10)	Battery connector (CN4) Used to connect the battery or the battery unit for absolute position data backup.	MR-J4-_B chapter 12
(11)	Battery holder Install the battery for absolute position data backup.	MR-J4-_B section 12.4
(12)	Protective earth (PE) terminal Grounding terminal	Section 3.2
(13)	Main circuit power supply connector (CNP1) Connect the input power supply.	
(14)	Rating plate	Section 1.4
(15)	Control circuit power supply connector (CNP2) Connect the control circuit power supply and regenerative option.	Section 3.2
(16)	Servo motor power output connector (CNP3) Connect the servo motor.	
(17)	Charge lamp When the main circuit is charged, this will light. While this lamp is lit, do not reconnect the cables.	
(18) (Note)	External encoder connector (CN2L) Used to connect the external encoder.	Linear Encoder Instruction Manual
(19)	Manufacturer setting connector (CN7) This connector is attached on MR-J4-_B4-RJ servo amplifier, but not for use. MR-J4-_B4 servo amplifier does not have this connector.	

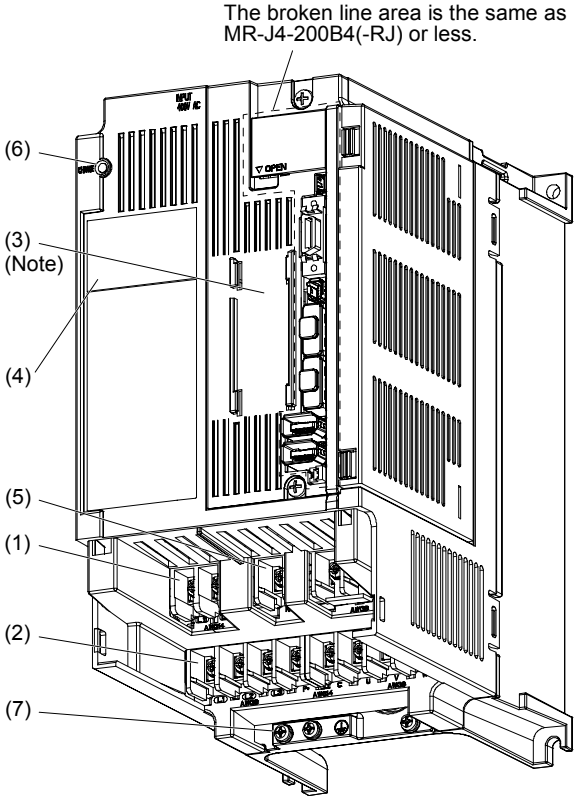
(b) MR-J4-350B4(-RJ)



No.	Name/Application	Detailed explanation
(1)	Main circuit power supply connector (CNP1) Connect the input power supply.	Section 3.2
(2)	Rating plate	Section 1.4
(3)	Control circuit power supply connector (CNP2) Connect the control circuit power supply and regenerative option.	Section 3.2
(4)	Servo motor power output connector (CNP3) Connect the servo motor.	
(5)	Charge lamp When the main circuit is charged, this will light. While this lamp is lit, do not reconnect the cables.	
(6)	Protective earth (PE) terminal Grounding terminal	Section 3.2
(7)	Battery holder Install the battery for absolute position data backup.	MR-J4-_B section 12.4

(c) MR-J4-500B4(-RJ)

POINT
●The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.7.2 of "MR-J4-_B(-RJ) Servo Amplifier Instruction Manual".

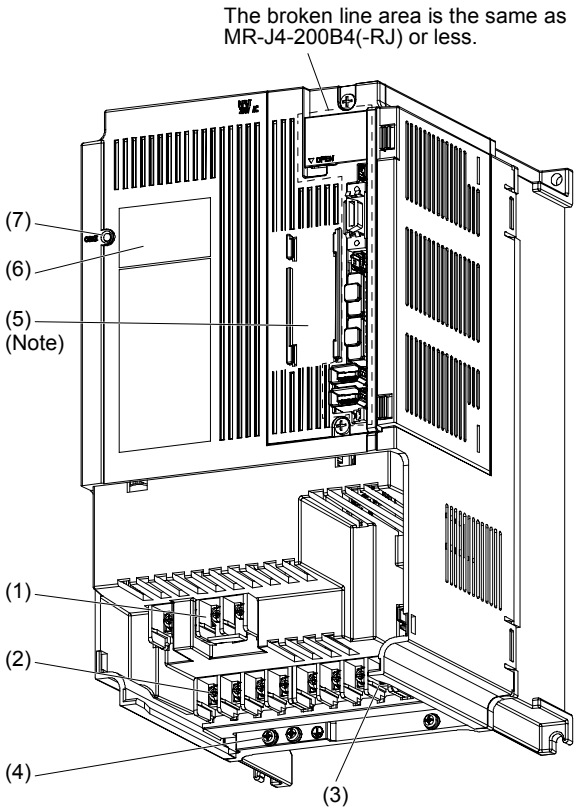


No.	Name/Application	Detailed explanation
(1)	Control circuit terminal block (TE2) Used to connect the control circuit power supply.	Section 3.2
(2)	Main circuit terminal block (TE1) Connect the input power supply.	
(3)	Battery holder Install the battery for absolute position data backup.	MR-J4-_B section 12.4
(4)	Rating plate	Section 1.4
(5)	Regenerative option/power factor improving reactor terminal block (TE3) Used to connect a regenerative option and a power factor improving DC reactor.	Section 3.2
(6)	Charge lamp When the main circuit is charged, this will light. While this lamp is lit, do not reconnect the cables.	
(7)	Protective earth (PE) terminal Grounding terminal	Section 3.2

Note. Lines for slots around the battery holder are omitted from the illustration.

(d) MR-J4-700B4(-RJ)

POINT
●The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.7.2 of "MR-J4-_B(-RJ) Servo Amplifier Instruction Manual".



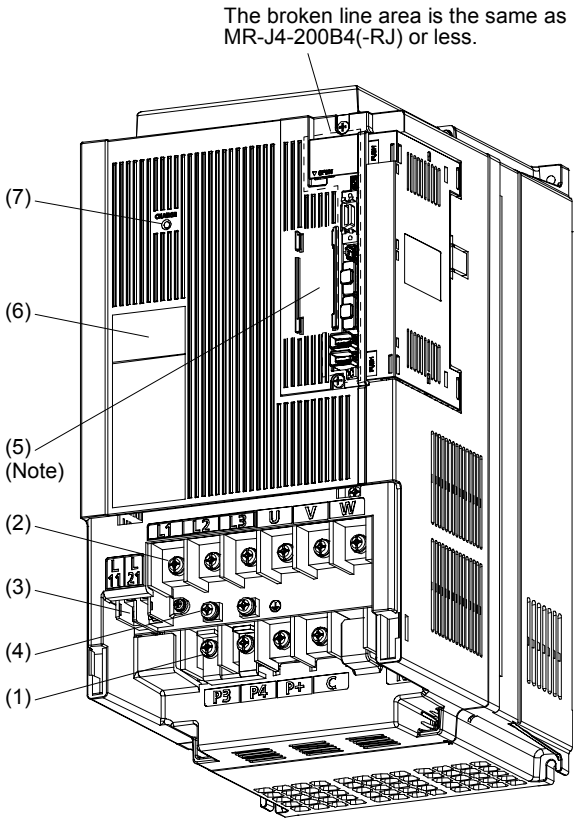
No.	Name/Application	Detailed explanation
(1)	Power factor improving reactor terminal block (TE3) Used to connect the DC reactor.	Section 3.2
(2)	Main circuit terminal block (TE1) Used to connect the input power supply, regenerative option, and servo motor.	
(3)	Control circuit terminal block (TE2) Used to connect the control circuit power supply.	
(4)	Protective earth (PE) terminal Grounding terminal	
(5)	Battery holder Install the battery for absolute position data backup.	MR-J4-_B section 12.4
(6)	Rating plate	Section 1.4
(7)	Charge lamp When the main circuit is charged, this will light. While this lamp is lit, do not reconnect the cables.	

Note. Lines for slots around the battery holder are omitted from the illustration.

(e) MR-J4-11KB4(-RJ)/MR-J4-15KB4(-RJ)

POINT

●The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.7.2 of "MR-J4-_B(-RJ) Servo Amplifier Instruction Manual".



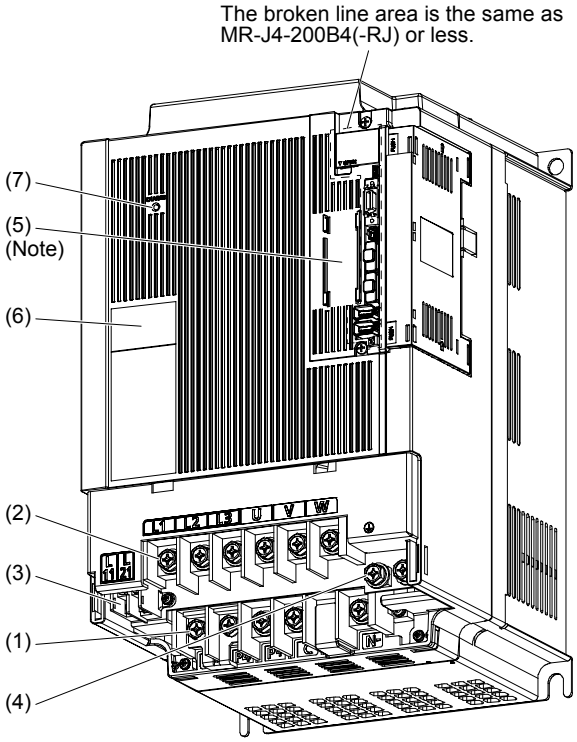
No.	Name/Application	Detailed explanation
(1)	Power factor improving reactor terminal block (TE1-2) Used to connect a power factor improving DC reactor and a regenerative option.	Section 3.2
(2)	Main circuit terminal block (TE1-1) Used to connect the input power supply and servo motor.	
(3)	Control circuit terminal block (TE2) Used to connect the control circuit power supply.	
(4)	Protective earth (PE) terminal Grounding terminal	
(5)	Battery holder Install the battery for absolute position data backup.	MR-J4-_B section 12.4
(6)	Rating plate	Section 1.4
(7)	Charge lamp When the main circuit is charged, this will light. While this lamp is lit, do not reconnect the cables.	

Note. Lines for slots around the battery holder are omitted from the illustration.

(f) MR-J4-22KB4(-RJ)

POINT

●The servo amplifier is shown without the front cover. For removal of the front cover, refer to section 1.7.2 of "MR-J4-_B(-RJ) Servo Amplifier Instruction Manual".



No.	Name/Application	Detailed explanation
(1)	Power factor improving reactor terminal block (TE1-2) Used to connect a power factor improving DC reactor and a regenerative option.	Section 3.2
(2)	Main circuit terminal block (TE1-1) Used to connect the input power supply and servo motor.	
(3)	Control circuit terminal block (TE2) Used to connect the control circuit power supply.	
(4)	Protective earth (PE) terminal Grounding terminal	
(5)	Battery holder Install the battery for absolute position data backup.	MR-J4-_B section 12.4
(6)	Rating plate	Section 1.4
(7)	Charge lamp When the main circuit is charged, this will light. While this lamp is lit, do not reconnect the cables.	

Note. Lines for slots around the battery holder are omitted from the illustration.

1.6 Configuration including peripheral equipment

⚠CAUTION ●Connecting a servo motor for different axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.

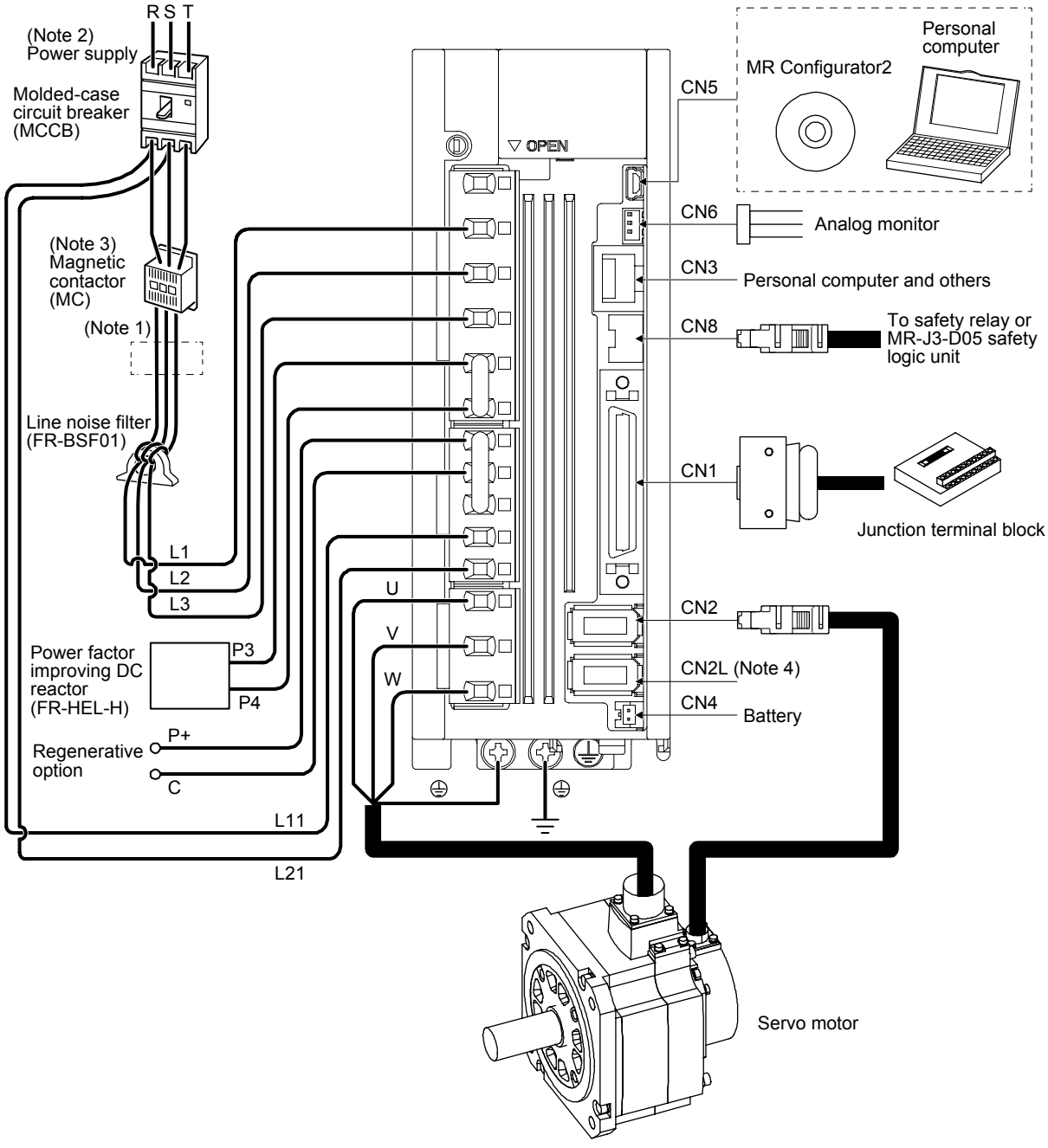
POINT

●Equipment other than the servo amplifier and servo motor are optional or recommended products.

1.6.1 For MR-J4-_A4(-RJ)

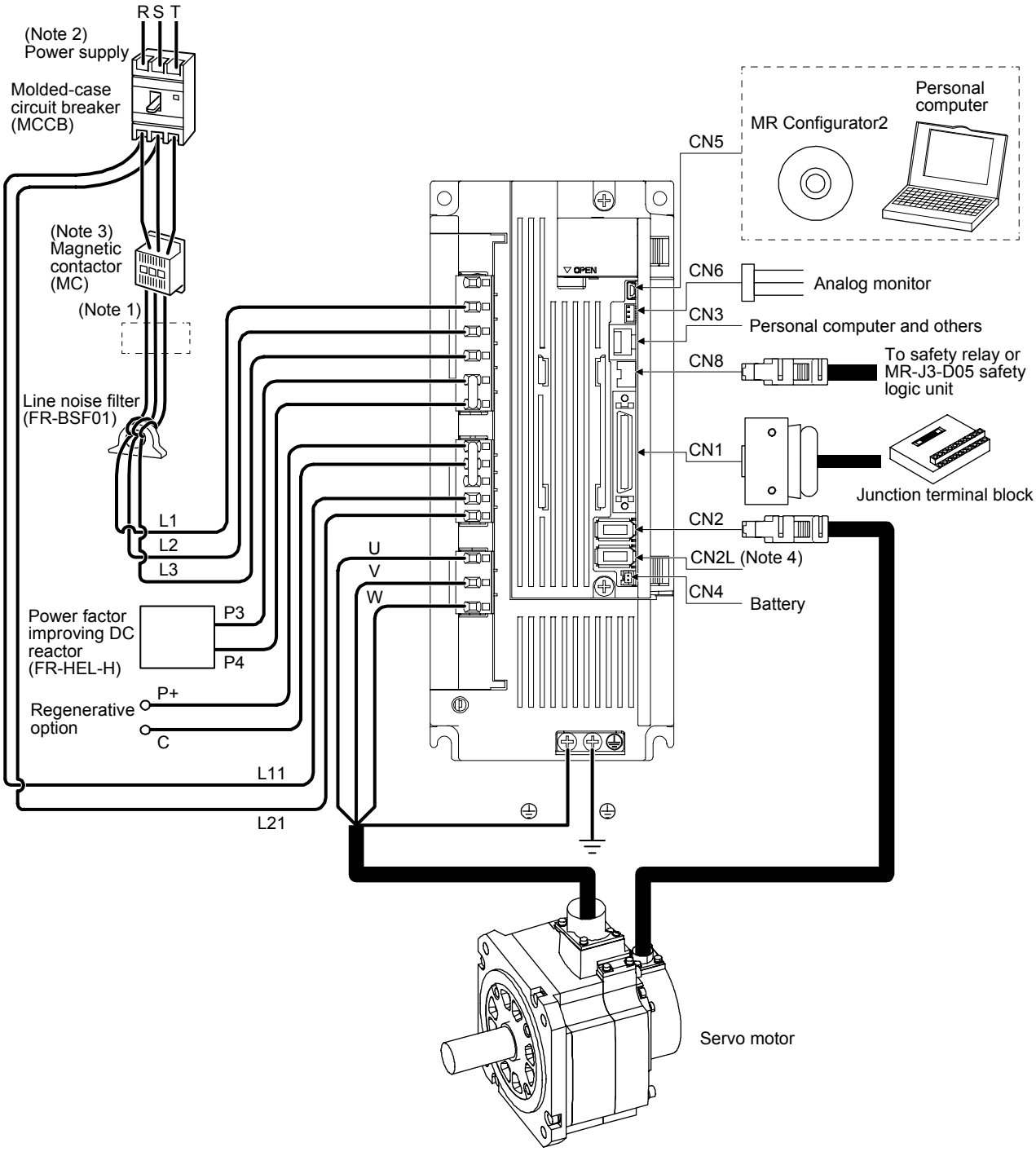
(1) MR-J4-200A4(-RJ) or less

The diagram is for MR-J4-60A4-RJ and MR-J4-100A4-RJ.



Note 1. 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 P3 and P4.
2. Refer to section 1.2.1 for the power supply specification.
3. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.
4. This is for MR-J4-_A4-RJ servo amplifier. MR-J4-_A4 servo amplifier does not have CN2L connector. When using MR-J4-_A4-RJ servo amplifier in the linear servo system or in the fully closed loop system, connect an external encoder to this connector. Refer to Table 1.1 and "Linear Encoder Instruction Manual" for the compatible external encoders.

(2) MR-J4-350A4(-RJ)



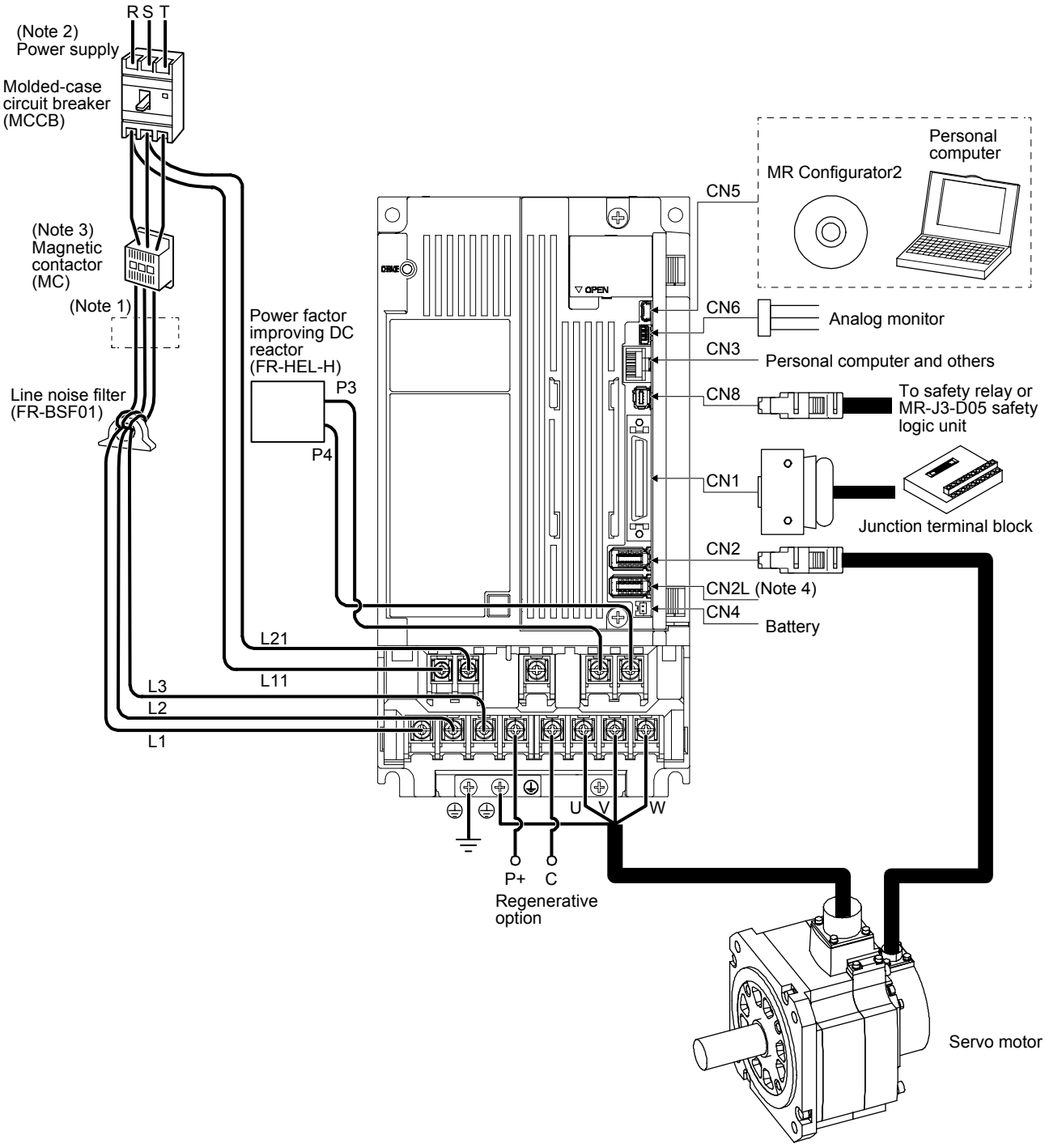
Note 1. The power factor improving AC reactor can also be used. In this case, the power factor improving DC reactor cannot be used. When not using the power factor improving DC reactor, short P3 and P4.

2. Refer to section 1.2.1 for the power supply specification.

3. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.

4. This is for MR-J4-_A4-RJ servo amplifier. MR-J4-_A4 servo amplifier does not have CN2L connector. When using MR-J4-_A4-RJ servo amplifier in the linear servo system or in the fully closed loop system, connect an external encoder to this connector. Refer to Table 1.1 and "Linear Encoder Instruction Manual" for the compatible external encoders.

(3) MR-J4-500A4(-RJ)



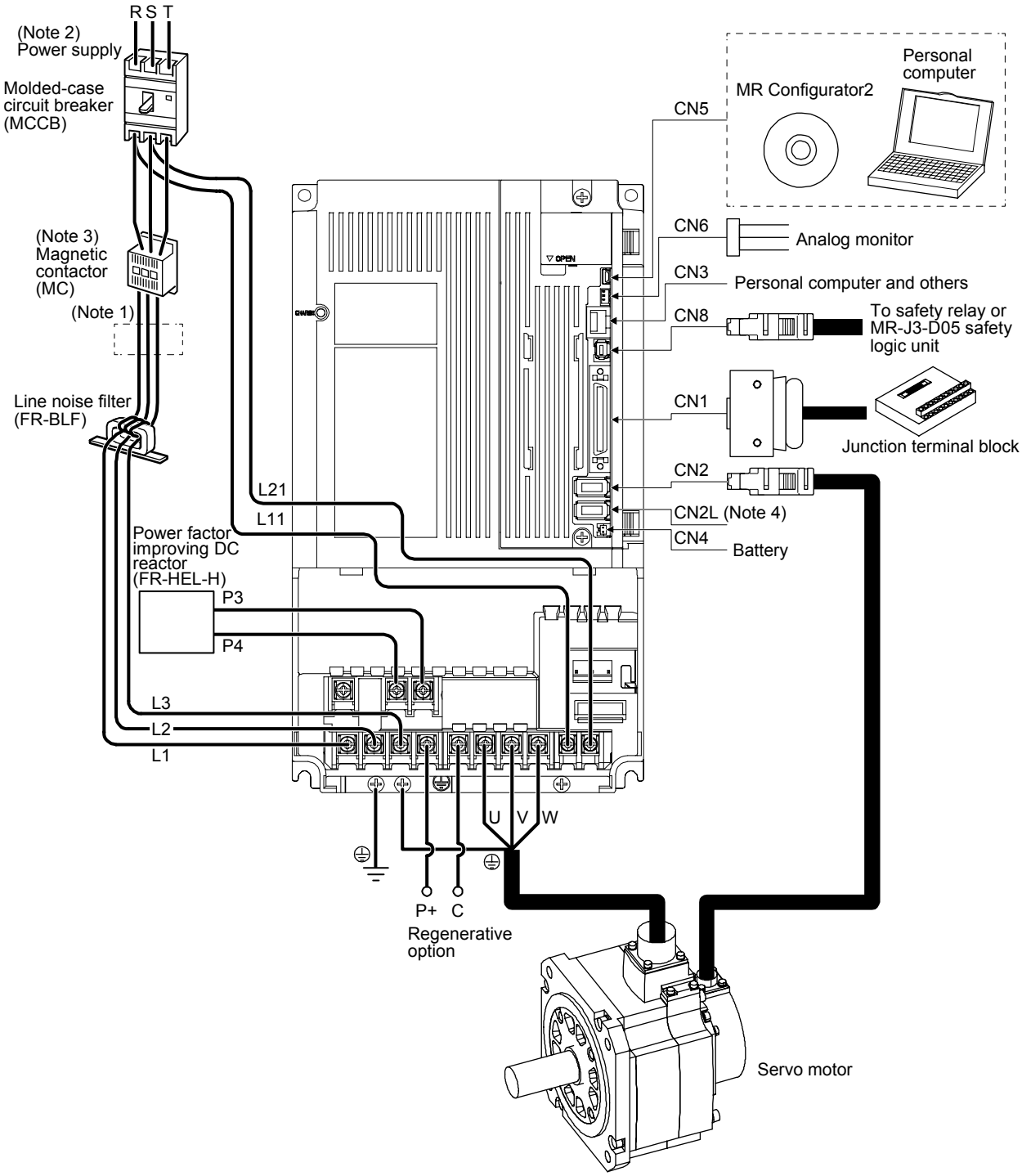
Note 1. The power factor improving AC reactor can also be used. In this case, the power factor improving DC reactor cannot be used. When not using the power factor improving DC reactor, short P3 and P4.

2. Refer to section 1.2.1 for the power supply specification.

3. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.

4. This is for MR-J4-_A4-RJ servo amplifier. MR-J4-_A4 servo amplifier does not have CN2L connector. When using MR-J4-_A4-RJ servo amplifier in the linear servo system or in the fully closed loop system, connect an external encoder to this connector. Refer to Table 1.1 and "Linear Encoder Instruction Manual" for the compatible external encoders.

(4) MR-J4-700A4(-RJ)



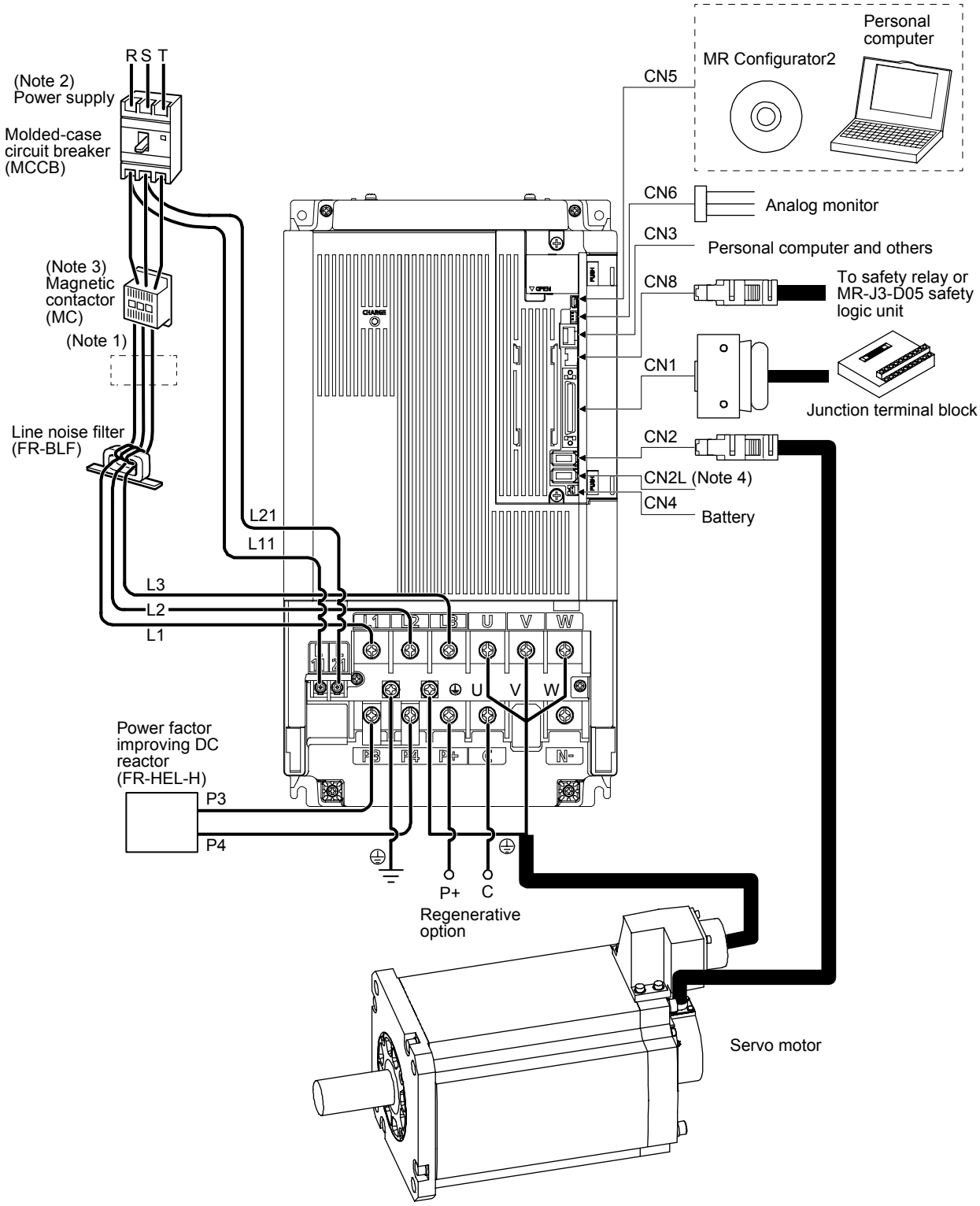
Note 1. The power factor improving AC reactor can also be used. In this case, the power factor improving DC reactor cannot be used. When not using the power factor improving DC reactor, short P3 and P4.

2. Refer to section 1.2.1 for the power supply specification.

3. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.

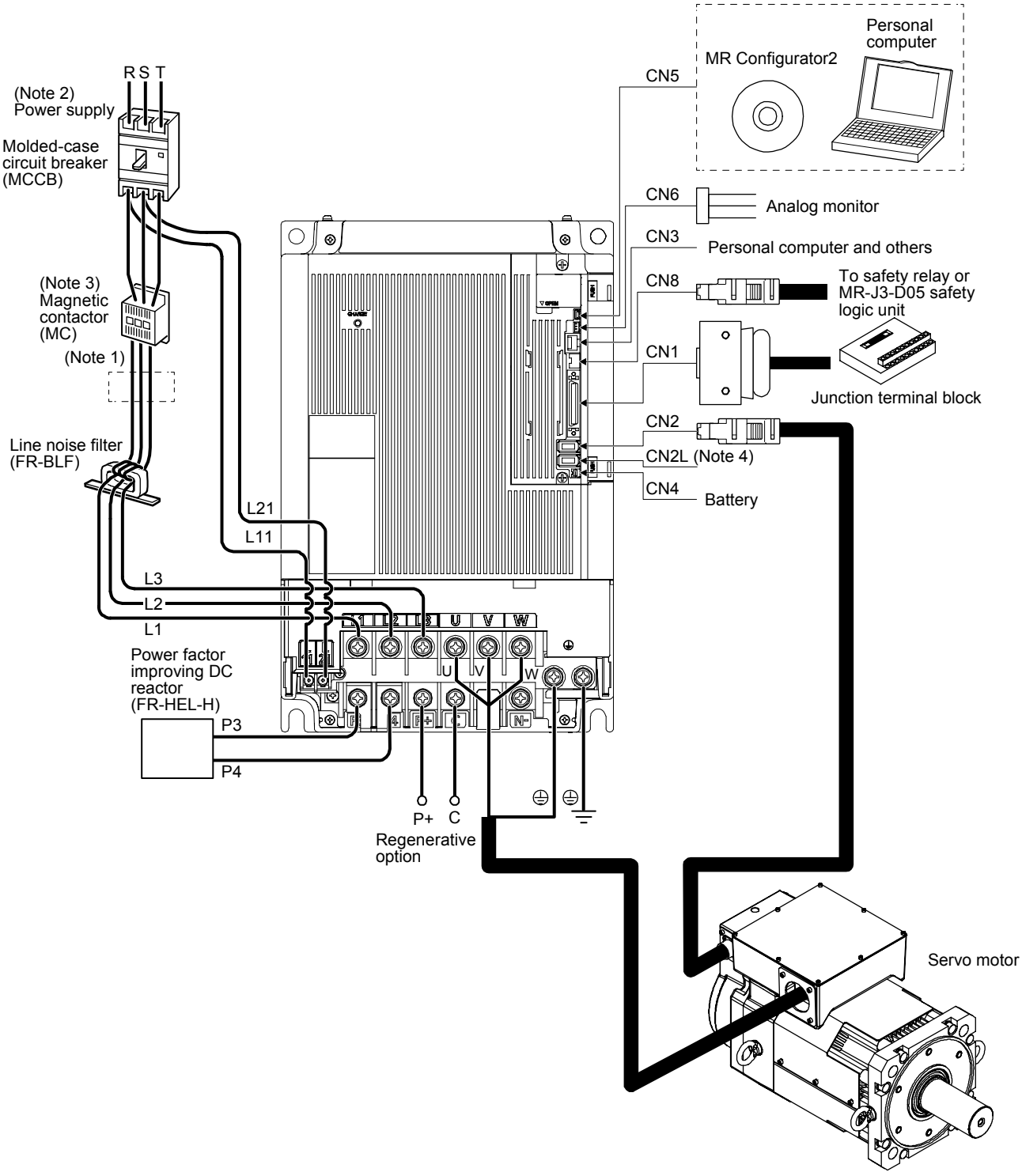
4. This is for MR-J4-_A4-RJ servo amplifier. MR-J4-_A4 servo amplifier does not have CN2L connector. When using MR-J4-_A4-RJ servo amplifier in the linear servo system or in the fully closed loop system, connect an external encoder to this connector. Refer to Table 1.1 and "Linear Encoder Instruction Manual" for the compatible external encoders.

(5) MR-J4-11KA4(-RJ)/MR-J4-15KA4(-RJ)



Note 1. 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 P3 and P4.
2. Refer to section 1.2.1 for the power supply specification.
3. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.
4. This is for MR-J4-_A4-RJ servo amplifier. MR-J4-_A4 servo amplifier does not have CN2L connector. When using MR-J4-_A4-RJ servo amplifier in the linear servo system or in the fully closed loop system, connect an external encoder to this connector. Refer to Table 1.1 and "Linear Encoder Instruction Manual" for the compatible external encoders.

(6) MR-J4-22KA4(-RJ)



Note 1. 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 P3 and P4.

2. Refer to section 1.2.1 for the power supply specification.

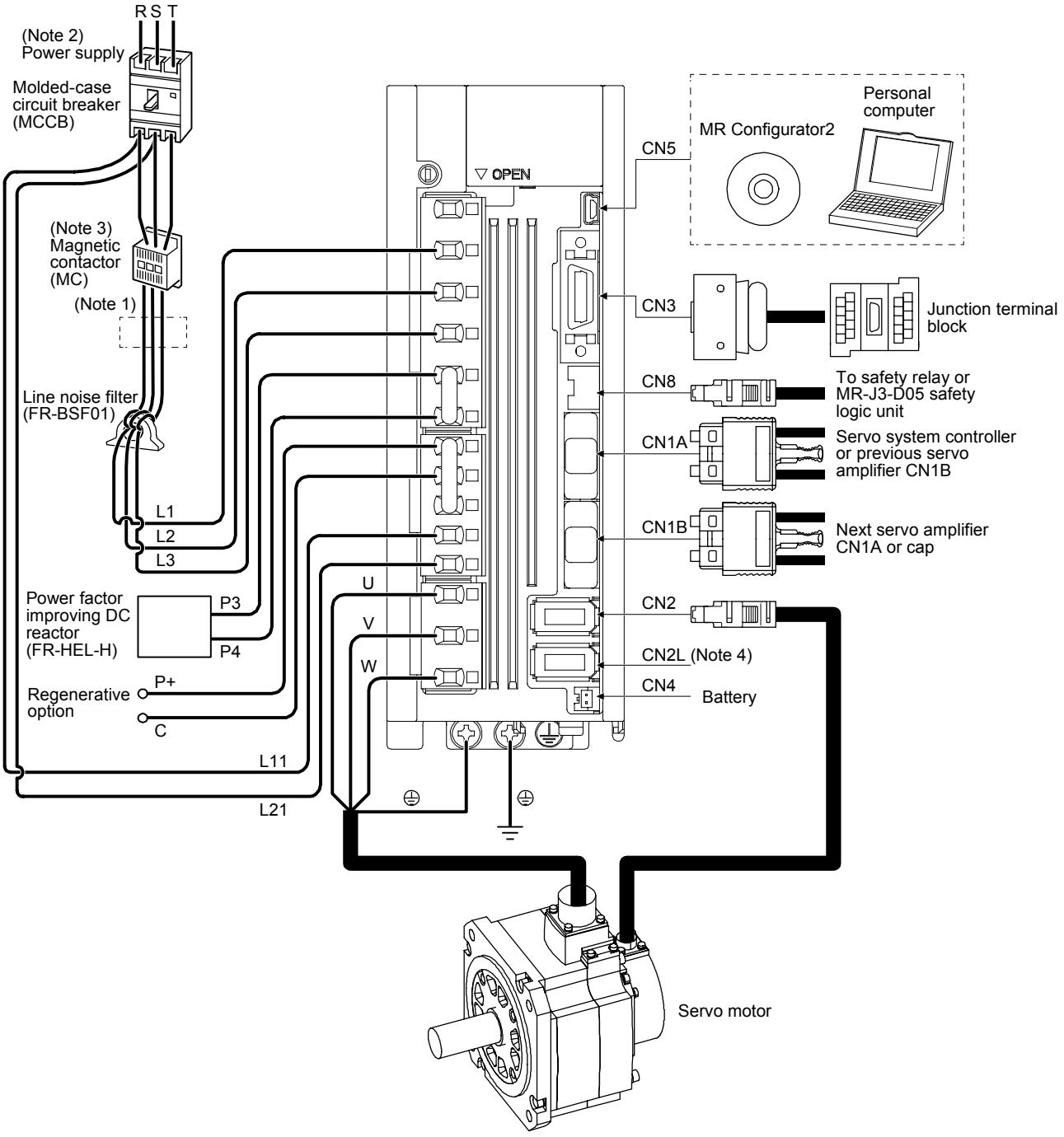
3. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.

4. This is for MR-J4-_A4-RJ servo amplifier. MR-J4-_A4 servo amplifier does not have CN2L connector. When using MR-J4-_A4-RJ servo amplifier in the linear servo system or in the fully closed loop system, connect an external encoder to this connector. Refer to Table 1.1 and "Linear Encoder Instruction Manual" for the compatible external encoders.

1.6.2 For MR-J4-_B4(-RJ)

(1) MR-J4-200B4(-RJ) or less

The diagram is for MR-J4-60B4-RJ and MR-J4-100B4-RJ.



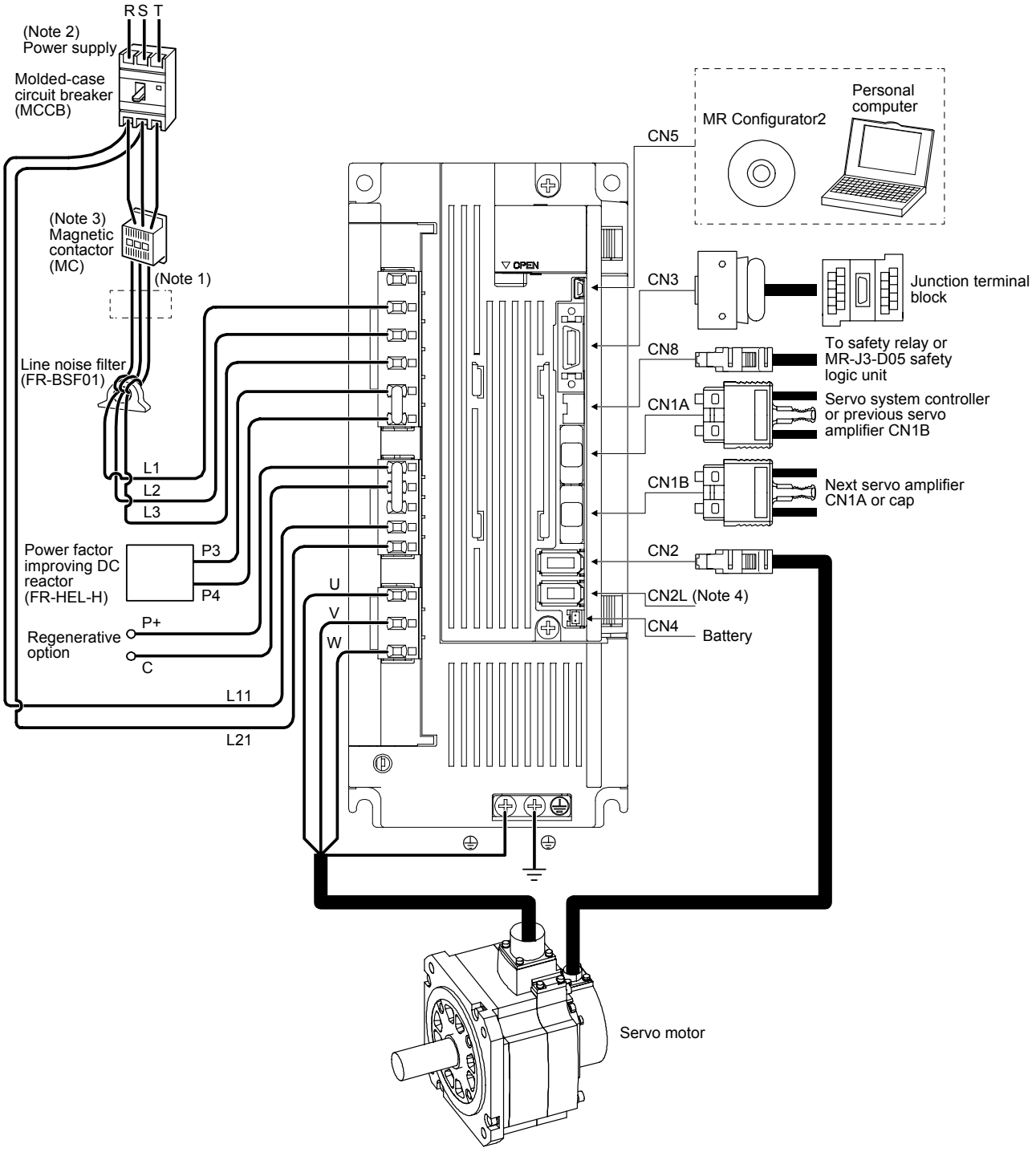
Note 1. The power factor improving AC reactor can also be used. In this case, the power factor improving DC reactor cannot be used. When not using the power factor improving DC reactor, short P3 and P4.

2. Refer to section 1.2.2 for the power supply specification.

3. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.

4. This is for MR-J4-_B4-RJ servo amplifier. MR-J4-_B4 servo amplifier does not have CN2L connector. When using MR-J4-_B4-RJ servo amplifier in the linear servo system or in the fully closed loop system, connect an external encoder to this connector. Refer to Table 1.1 and "Linear Encoder Instruction Manual" for the compatible external encoders.

(2) MR-J4-350B4(-RJ)



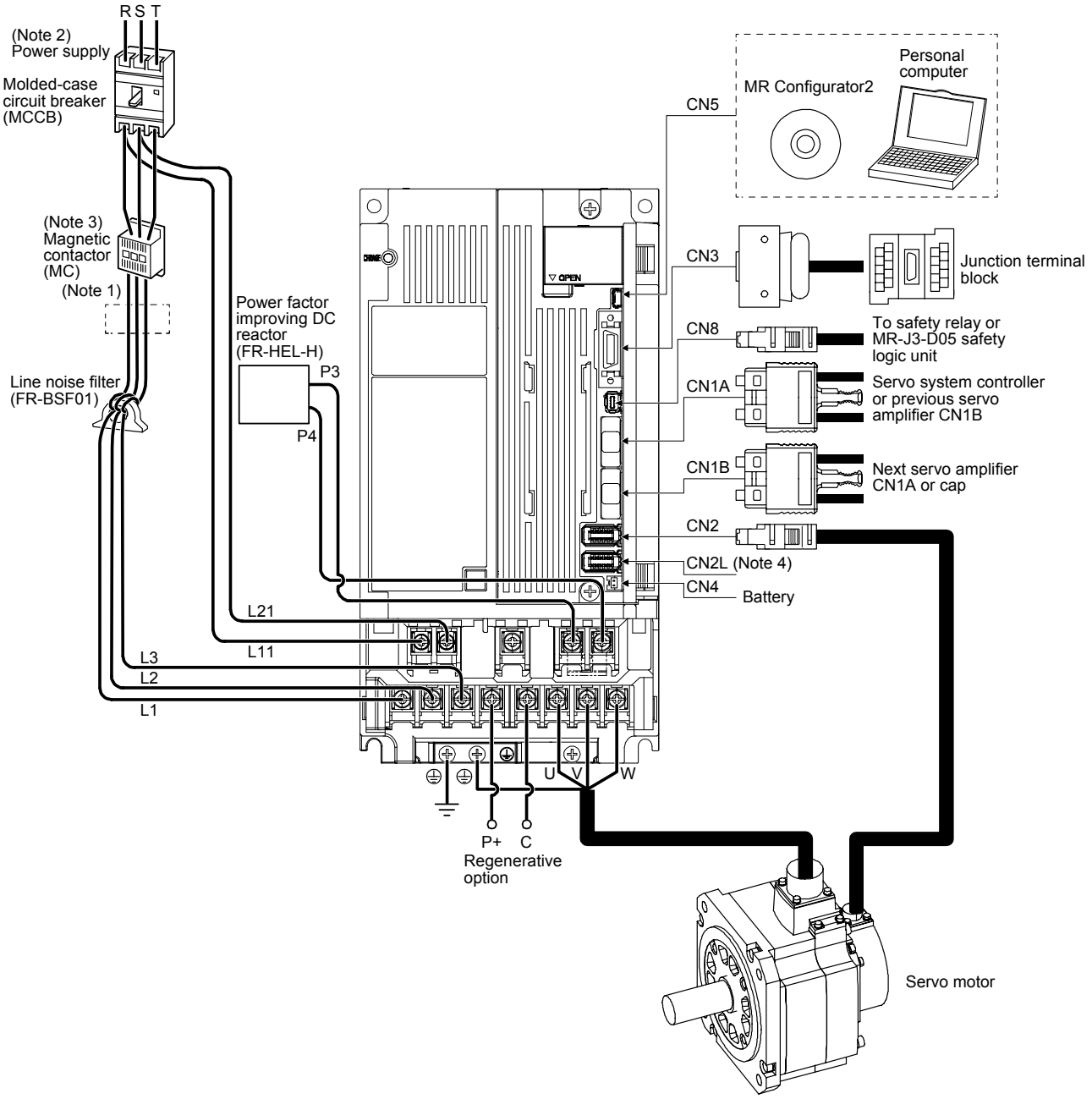
Note 1. The power factor improving AC reactor can also be used. In this case, the power factor improving DC reactor cannot be used. When not using the power factor improving DC reactor, short P3 and P4.

2. Refer to section 1.2.2 for the power supply specification.

3. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.

4. This is for MR-J4-_B4-RJ servo amplifier. MR-J4-_B4 servo amplifier does not have CN2L connector. When using MR-J4-_B4-RJ servo amplifier in the linear servo system or in the fully closed loop system, connect an external encoder to this connector. Refer to Table 1.1 and "Linear Encoder Instruction Manual" for the compatible external encoders.

(3) MR-J4-500B4(-RJ)



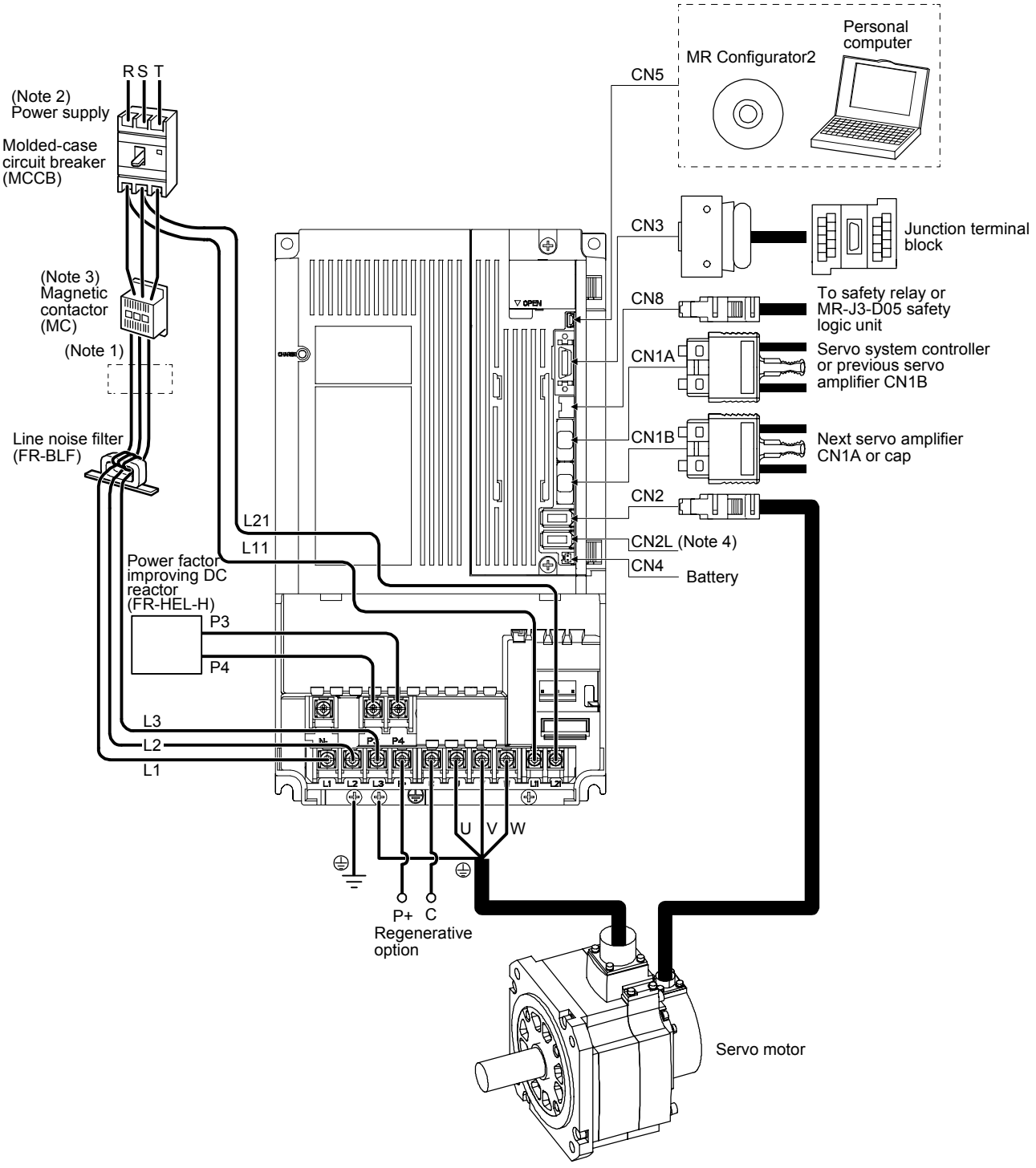
Note 1. The power factor improving AC reactor can also be used. In this case, the power factor improving DC reactor cannot be used. When not using the power factor improving DC reactor, short P3 and P4.

2. Refer to section 1.2.2 for the power supply specification.

3. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.

4. This is for MR-J4-_B4-RJ servo amplifier. MR-J4-_B4 servo amplifier does not have CN2L connector. When using MR-J4-_B4-RJ servo amplifier in the linear servo system or in the fully closed loop system, connect an external encoder to this connector. Refer to Table 1.1 and "Linear Encoder Instruction Manual" for the compatible external encoders.

(4) MR-J4-700B4(-RJ)



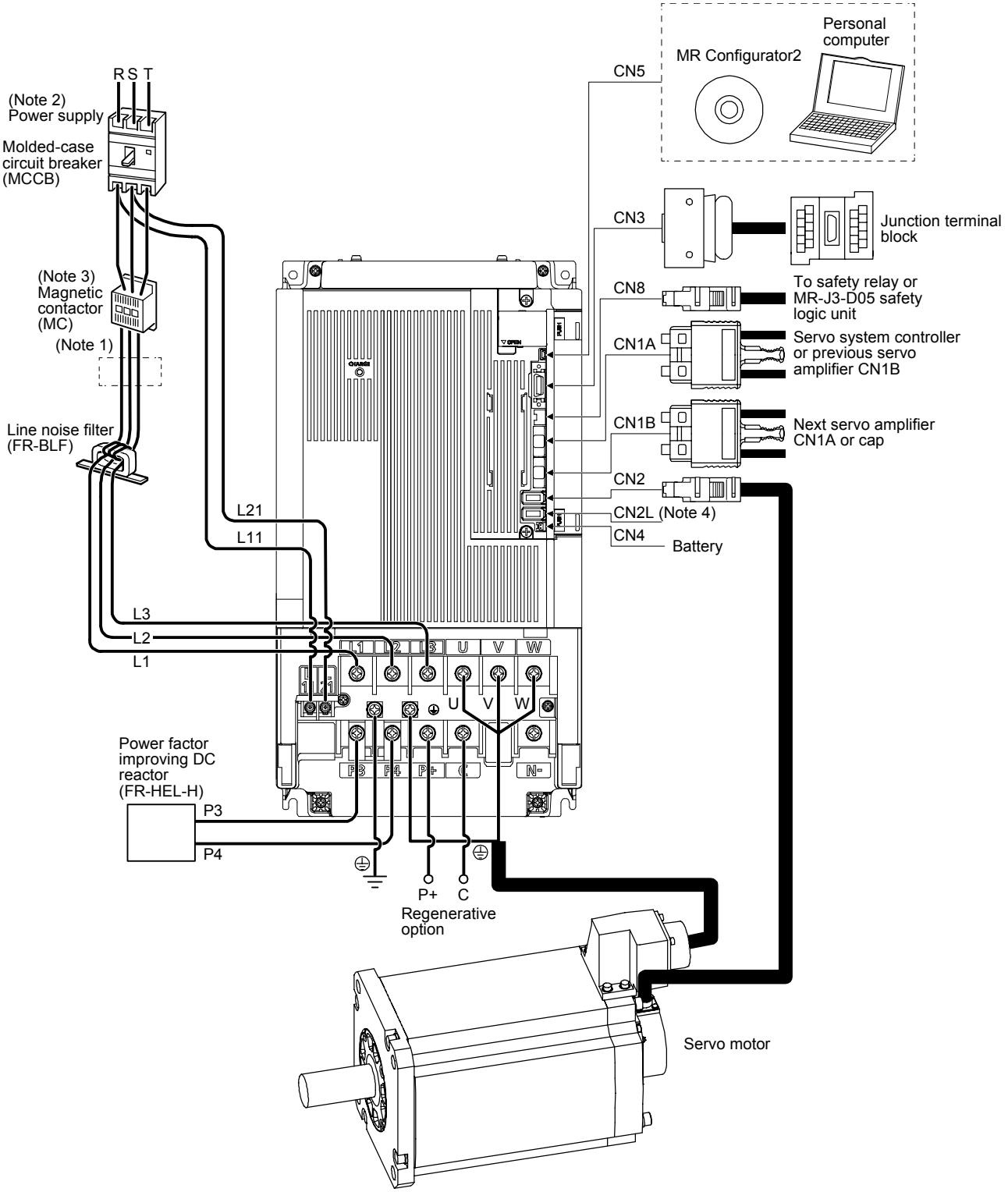
Note 1. The power factor improving AC reactor can also be used. In this case, the power factor improving DC reactor cannot be used. When not using the power factor improving DC reactor, short P3 and P4.

2. Refer to section 1.2.2 for the power supply specification.

3. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.

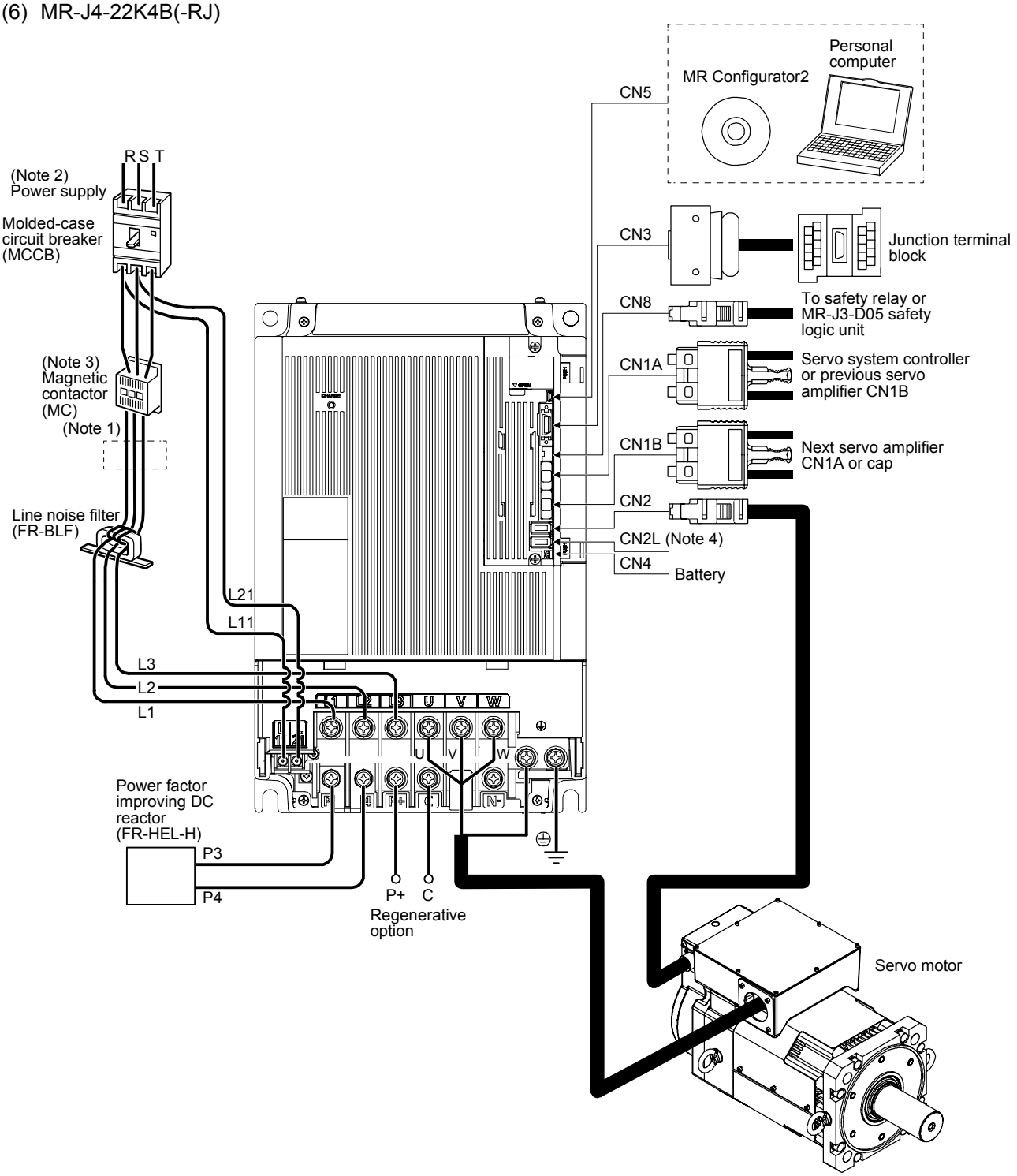
4. This is for MR-J4-_B4-RJ servo amplifier. MR-J4-_B4 servo amplifier does not have CN2L connector. When using MR-J4-_B4-RJ servo amplifier in the linear servo system or in the fully closed loop system, connect an external encoder to this connector. Refer to Table 1.1 and "Linear Encoder Instruction Manual" for the compatible external encoders.

(5) MR-J4-11K4B(-RJ)/MR-J4-15K4B(-RJ)



Note 1. 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 P3 and P4.
2. Refer to section 1.2.2 for the power supply specification.
3. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.
4. This is for MR-J4-_B4-RJ servo amplifier. MR-J4-_B4 servo amplifier does not have CN2L connector. When using MR-J4-_B4-RJ servo amplifier in the linear servo system or in the fully closed loop system, connect an external encoder to this connector. Refer to Table 1.1 and "Linear Encoder Instruction Manual" for the compatible external encoders.

(6) MR-J4-22K4B(-RJ)



Note 1. 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 P3 and P4.

2. Refer to section 1.2.2 for the power supply specification.

3. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.

4. This is for MR-J4-_B4-RJ servo amplifier. MR-J4-_B4 servo amplifier does not have CN2L connector. When using MR-J4-_B4-RJ servo amplifier in the linear servo system or in the fully closed loop system, connect an external encoder to this connector. Refer to Table 1.1 and "Linear Encoder Instruction Manual" for the compatible external encoders.

MEMO

2. INSTALLATION

⚠WARNING ●To prevent electric shock, ground each equipment securely.

⚠CAUTION

- ●Stacking in excess of the specified number of product packages is not allowed.
- ●Install the equipment on incombustible material. Installing them directly or close to combustibles will lead to a fire.
- ●Install the servo amplifier and the servo motor in a load-bearing place in accordance with the Instruction Manual.
- ●Do not get on or put heavy load on the equipment. Otherwise, it may cause injury.
- ●Use the equipment within the specified environment. For the environment, refer to section 1.2.
- ●Provide an adequate protection to prevent screws and other conductive matter, oil and other combustible matter from entering the servo amplifier.
- ●Do not block the intake and exhaust areas of the servo amplifier. Otherwise, it may cause a malfunction.
- ●Do not drop or strike the servo amplifier. Isolate it from all impact loads.
- ●Do not install or operate the servo amplifier which has been damaged or has any parts missing.
- ●When the product has been stored for an extended period of time, contact your local sales office.
- ●When handling the servo amplifier, be careful about the edged parts such as corners of the servo amplifier.
- ●The servo amplifier must be installed in a metal cabinet.
- ●When you disinfect or protect wooden packing from insects, take measures except by fumigation. Fumigating the servo amplifier or packing the servo amplifier with fumigated wooden packing can cause a malfunction of the servo amplifier due to halogen materials (such as fluorine, chlorine, bromine, and iodine) which are contained in fumigant.
- ●The servo amplifier must not be used with parts which contain halogen-series flame retardant materials (such as bromine) under coexisting conditions.

2. INSTALLATION

The items in the following table are the same as those for MR-J4-_A(-RJ) or MR-J4-_B(-RJ) servo amplifier. For details of the items, refer to each chapter/section of the detailed explanation field.

Model	Item	Detailed explanation
MR-J4-_A4(-RJ)	Keep out foreign materials	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 2.2
	Encoder cable stress	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 2.3
	Inspection items	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 2.4
	Parts having service lives	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 2.5
MR-J4-_B4(-RJ)	Keep out foreign materials	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 2.2
	Encoder cable stress	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 2.3
	SSCNET III cable laying	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 2.4
	Inspection items	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 2.5
	Parts having service lives	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 2.6

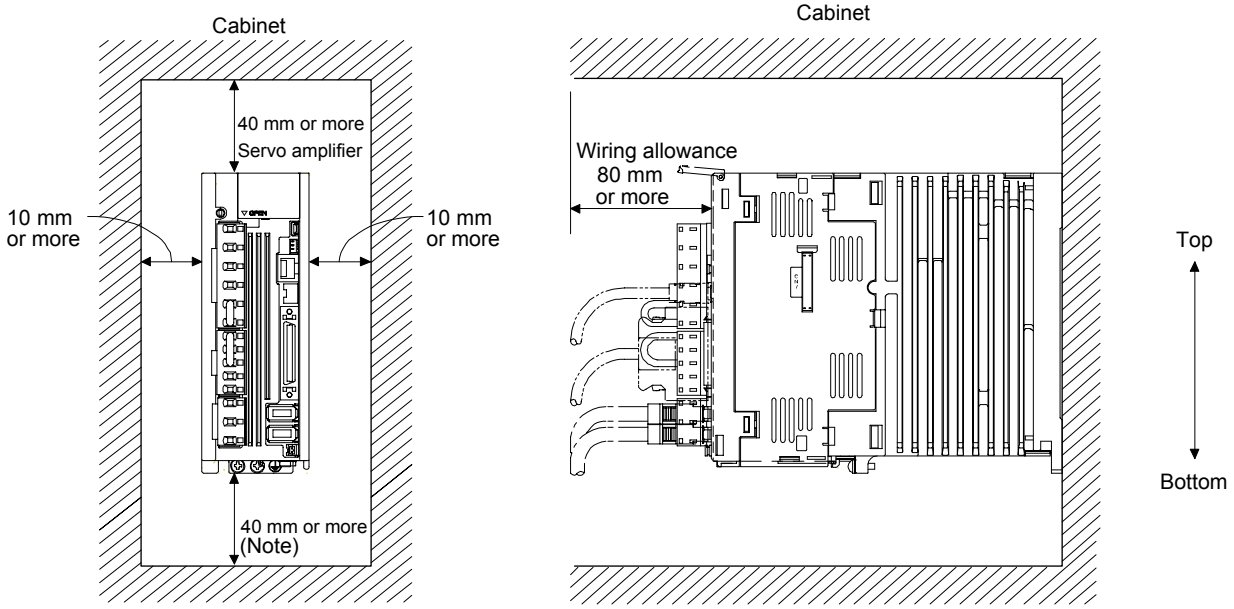
2.1 Installation direction and clearances

⚠CAUTION

- The equipment must be installed in the specified direction. Otherwise, it may cause a malfunction.
- Leave specified clearances between the servo amplifier and the cabinet walls or other equipment. Otherwise, it may cause a malfunction.

(1) Installation clearances of the servo amplifier

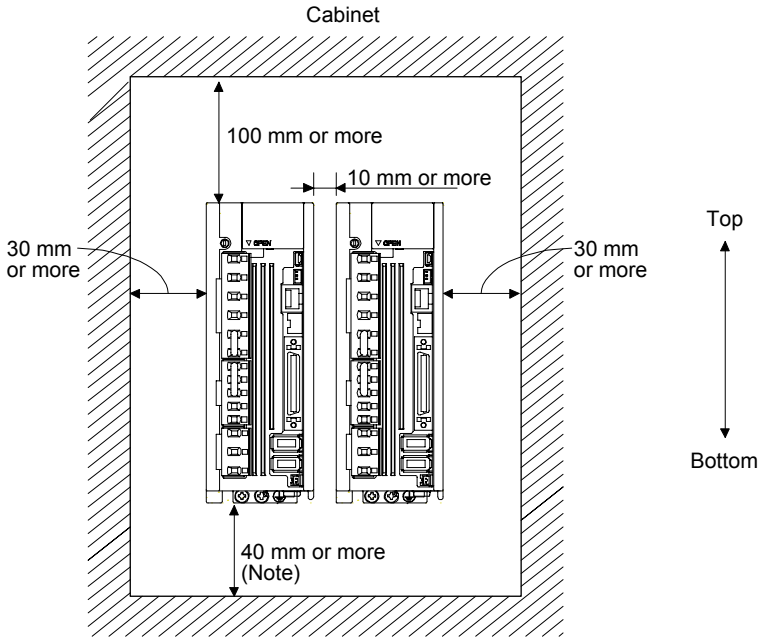
(a) Installation of one servo amplifier



Note. For 11 kW to 22 kW servo amplifiers, the clearance between the bottom and ground will be 120 mm or more.

(b) Installation of two or more servo amplifiers

Leave a large clearance between the top of the servo amplifier and the cabinet walls, and install a cooling fan to prevent the internal temperature of the cabinet from exceeding the environment.



Note. For 11 kW to 22 kW servo amplifiers, the clearance between the bottom and ground will be 120 mm or more.

(2) Others

When using heat generating equipment such as the regenerative option, install them with full consideration of heat generation so that the servo amplifier is not affected.

Install the servo amplifier on a perpendicular wall in the correct vertical direction.

MEMO

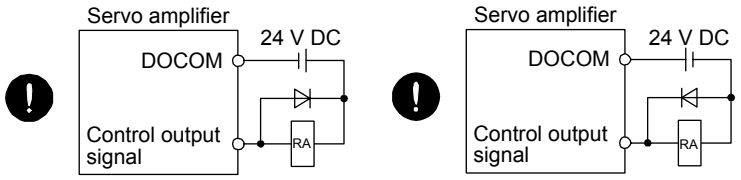
3. SIGNALS AND WIRING

⚠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, when confirming whether the charge lamp is off or not, always confirm it from the front of the servo amplifier.
- Ground the servo amplifier and servo motor securely.
- Do not attempt to wire the servo amplifier and servo motor until they have 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 connections of the power supply terminals.

⚠CAUTION

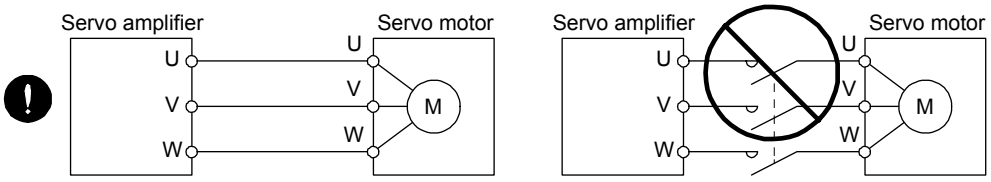
- Wire the equipment correctly and securely. Otherwise, the servo motor may operate unexpectedly, resulting in injury.
- Connect cables to the correct terminals. Otherwise, a burst, damage, etc. may occur.
- Ensure that polarity (+/-) is correct. Otherwise, a burst, damage, etc. may occur.
- The surge absorbing diode installed to the DC relay for control output should be fitted in the specified direction. Otherwise, the emergency stop and other protective circuits may not operate.



- Use a noise filter, etc. to minimize the influence of electromagnetic interference. Electromagnetic interference may be given to the electronic equipment used near the servo amplifier.
- Do not install a power capacitor, surge killer or radio noise filter (FR-BIF-H option) with the power line of the servo 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.
- Connecting a servo motor for different axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.

⚠CAUTION

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



POINT

●When you use a linear servo motor, replace the following left words to the right words.

Load to motor inertia ratio	→ Load mass
Torque	→ Thrust
(Servo motor) speed	→ (Linear servo motor) speed

The items in the following table are the same as those for MR-J4-_A(-RJ) or MR-J4-_B(-RJ) servo amplifier. For details of the items, refer to each chapter/section of the detailed explanation field.

Model	Item	Detailed explanation
MR-J4-_A4(-RJ)	I/O signal connection example	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.2
	Connector and pin assignment	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.4
	Signal (device) explanations	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.5
	Detailed explanation of signals	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.6
	Forced stop deceleration function	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.7
	Alarm occurrence timing chart	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.8
	Interface	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.9
	Servo motor with an electromagnetic brake	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.10
	Grounding	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.11
MR-J4-_B4(-RJ)	I/O signal connection example	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.2
	Connector and pin assignment	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.4
	Signal (device) explanations	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.5
	Forced stop deceleration function	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.6
	Alarm occurrence timing chart	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.7
	Interface	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.8
	SSCNET III cable connection	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.9
	Servo motor with an electromagnetic brake	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.10
	Grounding	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.11

3.1 MR-J4-_A4(-RJ)

3.1.1 Input power supply circuit

⚠CAUTION

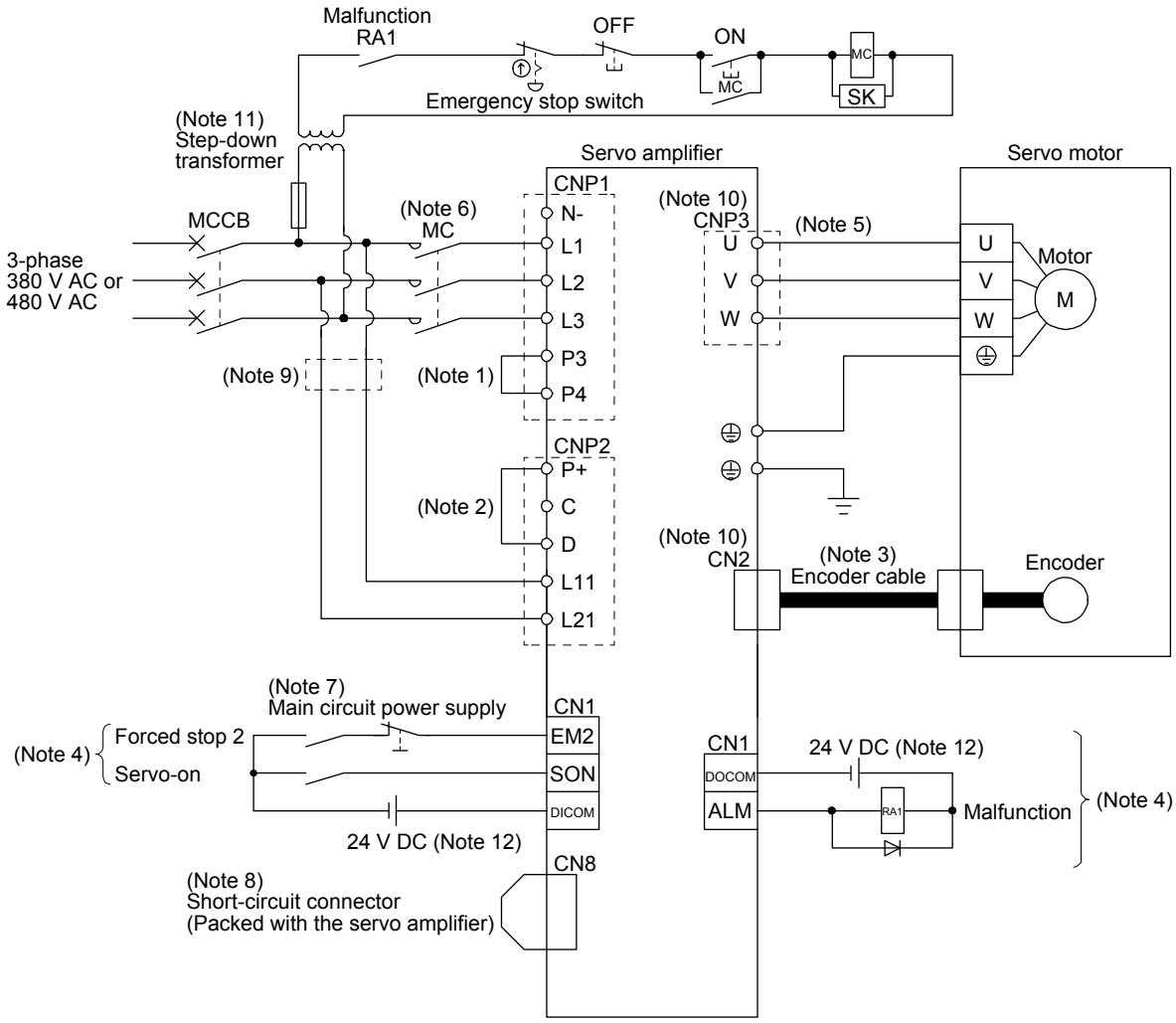
- Always connect a magnetic contactor between the power supply and the main circuit power supply (L1, L2, and L3) of the servo amplifier, in order to configure a circuit that shuts down the power supply on the side of the servo amplifier's power supply. If a magnetic contactor is not connected, continuous flow of a large current may cause a fire when the servo amplifier malfunctions.
- Use ALM (Malfunction) to switch main circuit power supply off. Not doing so may cause a fire when a regenerative transistor malfunctions or the like may overheat the regenerative resistor.
- Check the servo amplifier model, and then input proper voltage to the servo amplifier power supply. If input voltage exceeds the upper limit, the servo amplifier will break down.
- The servo amplifier has a built-in surge absorber (varistor) to reduce noise and to suppress lightning surge. The varistor can break down due to its aged deterioration. To prevent a fire, use a molded-case circuit breaker or fuse for input power supply.
- Connecting a servo motor for different axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.

POINT

- EM2 has the same function as EM1 in the torque control mode.

Configure the wirings so that the main circuit power supply is shut off and SON (Servo-on) is turned off after deceleration to a stop due to an alarm occurring, enabled servo forced stop, etc. A molded-case circuit breaker (MCCB) must be used with the input cables of the main circuit power supply.

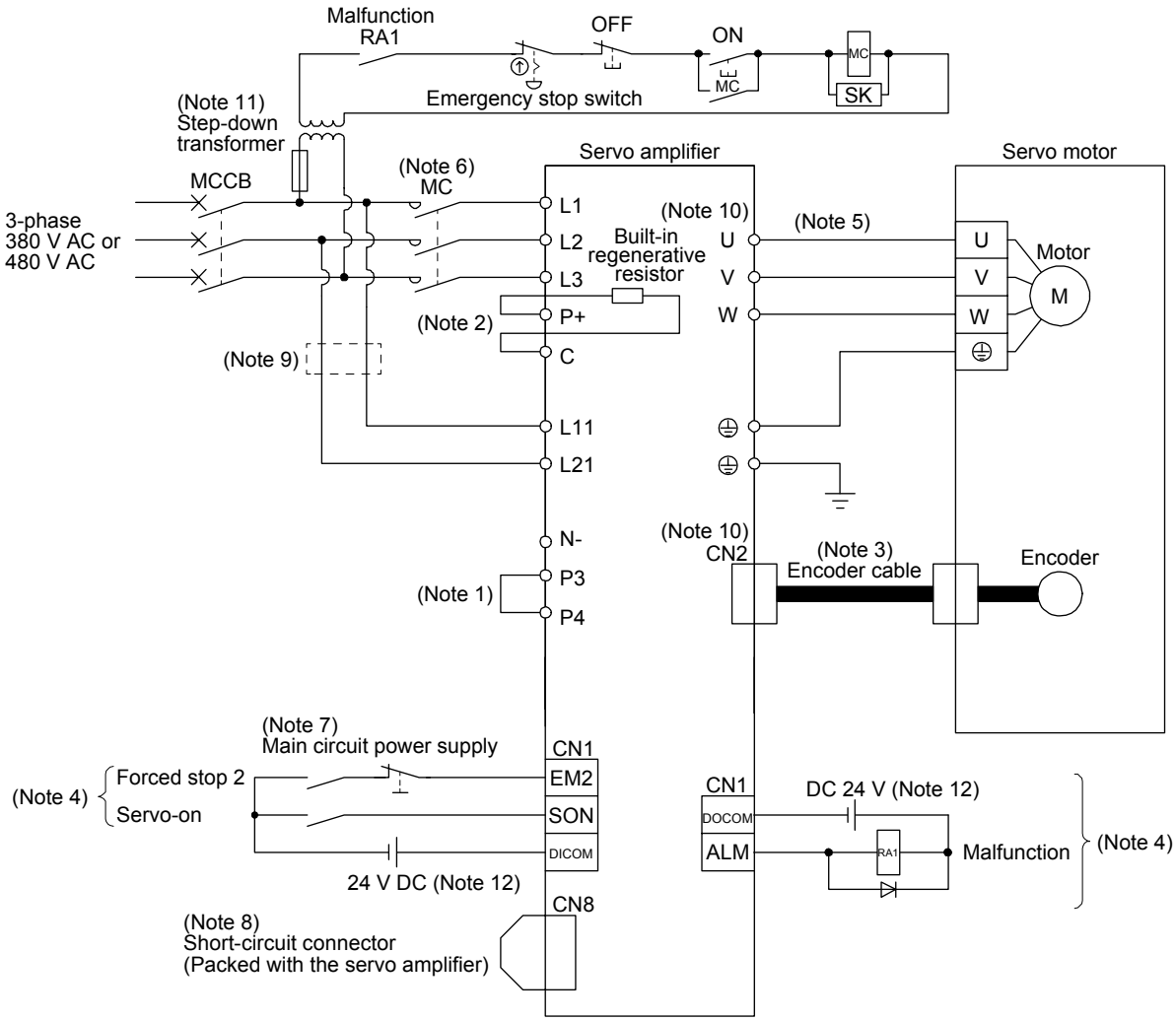
(1) MR-J4-60A4(-RJ) to MR-J4-350A4(-RJ)



Note 1. Always connect between P3 and P4 terminals. (factory-wired) When using the power factor improving DC reactor, refer to section 9.8. Use either the power factor improving DC reactor or the power factor improving AC reactor.

2. Always connect between P+ and D terminals. (factory-wired) When using the regenerative option, refer to section 9.2.
3. For the encoder cable, use of the option cable is recommended. For selecting cables, refer to "Servo Motor Instruction Manual (Vol. 3)".
4. This diagram is for sink I/O interface. For source I/O interface, refer to section 3.9.3 in MR-J4-_A(-RJ) Servo Amplifier Instruction Manual.
5. For connecting servo motor power wires, refer to "Servo Motor Instruction Manual (Vol. 3)".
6. Use a magnetic contactor with an operation delay time (interval between current being applied to the coil until closure of contacts) of 80 ms or less. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.
7. Configure a circuit to turn off EM2 when the main circuit power is turned off to prevent an unexpected restart of the servo amplifier.
8. When not using the STO function, attach the short-circuit connector came with a servo amplifier.
9. When wires used for L11 and L21 are thinner than wires used for L1, L2, and L3, use a molded-case circuit breaker. (Refer to section 9.7.)
10. Connecting a servo motor for different axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.
11. Stepdown transformer is required when the coil voltage of the magnetic contactor is 200 V class.
12. The illustration of the 24 V DC power supply is divided between input signal and output signal for convinence. However, they can be configured by one.

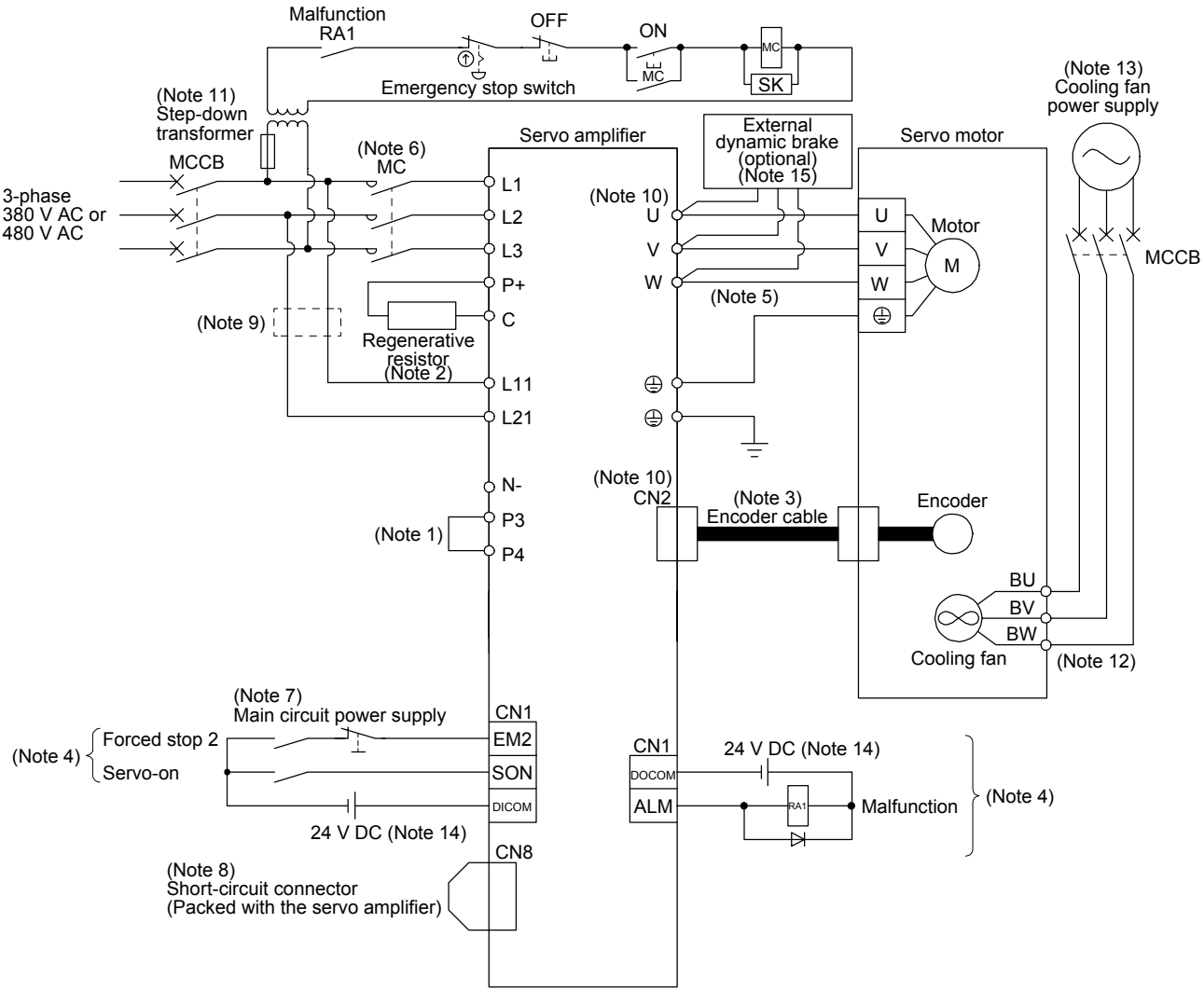
(2) MR-J4-500A4(-RJ)/MR-J4-700A4(-RJ)



Note 1. Always connect between P3 and P4 terminals. (factory-wired) When using the power factor improving DC reactor, refer to section 9.8. Use either the power factor improving DC reactor or the power factor improving AC reactor.

2. When using the regenerative option, refer to section 9.2.
3. For the encoder cable, use of the option cable is recommended. For selecting cables, refer to "Servo Motor Instruction Manual (Vol. 3)".
4. This diagram is for sink I/O interface. For source I/O interface, refer to section 3.9.3 in MR-J4-_A(-RJ) Servo Amplifier Instruction Manual.
5. For connecting servo motor power wires, refer to "Servo Motor Instruction Manual (Vol. 3)".
6. Use a magnetic contactor with an operation delay time (interval between current being applied to the coil until closure of contacts) of 80 ms or less. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.
7. Configure a circuit to turn off EM2 when the main circuit power is turned off to prevent an unexpected restart of the servo amplifier.
8. When not using the STO function, attach the short-circuit connector came with a servo amplifier.
9. When wires used for L11 and L21 are thinner than wires used for L1, L2, and L3, use a molded-case circuit breaker. (Refer to section 9.7.)
10. Connecting a servo motor for different axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.
11. Stepdown transformer is required when the coil voltage of the magnetic contactor is 200 V class.
12. The illustration of the 24 V DC power supply is divided between input signal and output signal for convinence. However, they can be configured by one.

(3) MR-J4-11KA4(-RJ) to MR-J4-22KA4(-RJ)



Note 1. Always connect between P3 and P4 terminals. (factory-wired) When using the power factor improving DC reactor, refer to section 9.8. Use either the power factor improving DC reactor or the power factor improving AC reactor.
2. When using the regenerative resistor, refer to section 9.2.
3. For the encoder cable, use of the option cable is recommended. For selecting cables, refer to "Servo Motor Instruction Manual (Vol. 3)".
4. This diagram is for sink I/O interface. For source I/O interface, refer to section 3.9.3 in MR-J4-_A(-RJ) Servo Amplifier Instruction Manual.
5. For connecting servo motor power wires, refer to "Servo Motor Instruction Manual (Vol. 3)".
6. Use a magnetic contactor with an operation delay time (interval between current being applied to the coil until closure of contacts) of 80 ms or less. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.
7. Configure a circuit to turn off EM2 when the main circuit power is turned off to prevent an unexpected restart of the servo amplifier.
8. When not using the STO function, attach the short-circuit connector came with a servo amplifier.
9. When wires used for L11 and L21 are thinner than wires used for L1, L2, and L3, use a molded-case circuit breaker. (Refer to section 9.7.)
10. Connecting a servo motor for different axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.
11. Stepdown transformer is required when the coil voltage of the magnetic contactor is 200 V class.
12. Only HG-JR22K1M4 servo motor is equipped with a cooling fan.
13. For the cooling fan power supply, refer to "Servo Motor Instruction Manual (Vol. 3)".
14. The illustration of the 24 V DC power supply is divided between input signal and output signal for convinence. However, they can be configured by one.
15. Use an external dynamic brake for this servo amplifier. Failure to do so will cause an accident because the servo motor does not stop immediately but coasts at an alarm occurrence for which the servo motor does not decelerate to stop. Ensure the safety in the entire equipment. For alarms for which the servo motor does not decelerate to stop, refer to section 6.1.1.

3.1.2 Explanation of power supply system

(1) Signal explanations

POINT
●For the layout of connector and terminal block, refer to chapter 7 DIMENSIONS.

<table>
<tr><th>Symbol</th><th>Connection target (application)</th><th>Description</th></tr>
<tr><td>L1/L2/L3</td><td>Main circuit power supply</td><td>Supply the following power to L1, L2, and L3.
<table><tr><th>Servo amplifier
Power</th><th>MR-J4-60A4(-RJ) to MR-J4-22KA4(-RJ)</th></tr><tr><td>3-phase 380 V AC to 480 V AC, 50 Hz/60 Hz</td><td>L1/L2/L3</td></tr></table></td></tr>
<tr><td>P3/P4</td><td>Power factor improving DC reactor</td><td>When not using the power factor improving DC reactor, connect P3 and P4. (factory-wired)
When using the power factor improving DC reactor, disconnect P3 and P4, and connect the power factor improving DC reactor to P3 and P4.
Refer to section 9.8 for details.</td></tr>
<tr><td>P+/C/D</td><td>Regenerative option</td><td>1) MR-J4-350A4(-RJ) or less
When using a servo amplifier built-in regenerative resistor, connect P+ and D. (factory-wired)
When using a regenerative option, disconnect P+ and D, and connect the regenerative option to P+ and C.
2) MR-J4-500A4(-RJ) to MR-J4-22KA4(-RJ)
MR-J4-500A4(-RJ) to MR-J4-22KA4(-RJ) do not have D.
When using a servo amplifier built-in regenerative resistor, connect P+ and C. (factory-wired)
When using a regenerative option, disconnect wires of P+ and C for the built-in regenerative resistor. And then connect wires of the regenerative option to P+ and C.
Refer to section 9.2 to 9.5 for details.</td></tr>
<tr><td>L11/L21</td><td>Control circuit power supply</td><td>Supply the following power to L11 and L21.
<table><tr><th>Servo amplifier
Power</th><th>MR-J4-60A4(-RJ) to MR-J4-22KA4(-RJ)</th></tr><tr><td>1-phase 380 V AC to 480 V AC</td><td>L11/L21</td></tr></table></td></tr>
<tr><td>U/V/W</td><td>Servo motor power output</td><td>Connect them to the servo motor power supply (U, V, and W). Connect the servo amplifier power output (U, V, and W) to the servo motor power input (U, V, and W) directly. Do not let a magnetic contactor, etc. intervene. Otherwise, it may cause a malfunction.</td></tr>
<tr><td>N-</td><td>Power regenerative converter
Power regenerative common converter
Brake unit</td><td>This terminal is used for a power regenerative converter, power regenerative common converter, and brake unit.
Refer to section 9.3 to 9.5 for details.</td></tr>
<tr><td>⏚</td><td>Protective earth (PE)</td><td>Connect it to the grounding terminal of the servo motor and to the protective earth (PE) of the cabinet for grounding.</td></tr>
</table>

(2) Power-on sequence

POINT
●A voltage, output signal, etc. of analog monitor output may be irregular at power-on.

(a) Power-on procedure

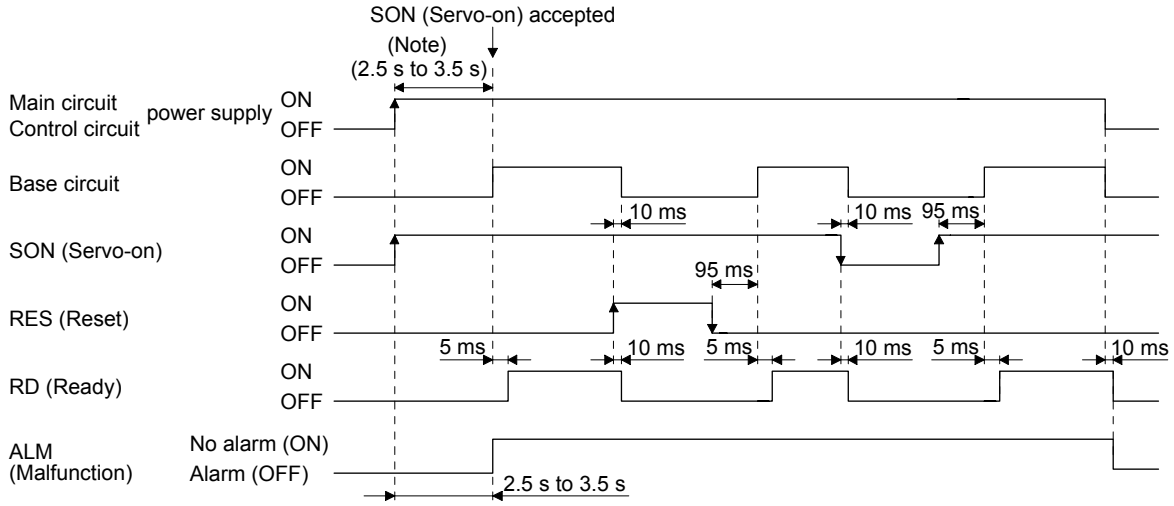
1) Always wire the power supply as shown in above section 3.1 using the magnetic contactor with the main circuit power supply (3-phase: L1, L2, and L3). Configure up an external sequence to switch off the magnetic contactor as soon as an alarm occurs.

2) Switch on the control circuit power supply (L11 and L21) simultaneously with the main circuit power supply or before switching on the main circuit power supply. If the main circuit power supply is not on, the display shows the corresponding warning. However, by switching on the main circuit power supply, the warning disappears and the servo amplifier will operate properly.

3) The servo amplifier receives the SON (Servo-on) 2.5 s to 3.5 s after the main circuit power supply is switched on. Therefore, when SON (Servo-on) is switched on simultaneously with the main circuit power supply, the base circuit will switch on in about 2.5 s to 3.5 s, and the RD (Ready) will switch on in further about 5 ms, making the servo amplifier ready to operate. (Refer to (b) in this section.)

4) When RES (Reset) is switched on, the base circuit is shut off and the servo motor shaft coasts.

(b) Timing chart



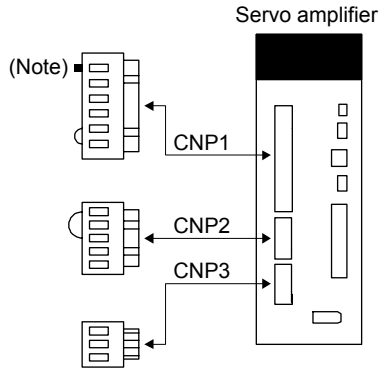
Note. This time period is longer when detecting magnetic pole for the linear servo motor.

(3) Wiring CNP1, CNP2, and CNP3

POINT
●For the wire sizes used for wiring, refer to section 9.6. ●MR-J4-500A4(-RJ) or more do not have these connectors.

Use the servo amplifier power supply connector for wiring CNP1, CNP2, and CNP3.

(a) Connector



Note. A pin for preventing improper connection is inserted to N- of CNP1 connector.

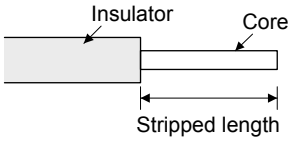
Table 3.1 Connector and applicable wire

Connector	Receptacle assembly	Applicable wire		Stripped length [mm]	Open tool	Manufacturer
		Size	Insulator OD			
CNP1	06JFAT-SAXGDK-HT10.5	AWG 16 to 14	3.9 mm or shorter	10	J-FAT-OT-XL	JST
CNP2	05JFAT-SAXGDK-HT7.5					
CNP3	03JFAT-SAXGDK-HT10.5					

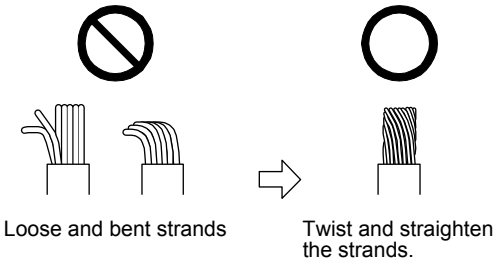
(b) Cable connection procedure

1) Fabrication on cable insulator

Refer to table 3.1 for stripped length of cable insulator. The appropriate stripped length of cables depends on their type, etc. Set the length considering their status.



Twist strands lightly and straighten them as follows.



You can also use a ferrule to connect with the connectors. The following shows references to select ferrules according to wire sizes.

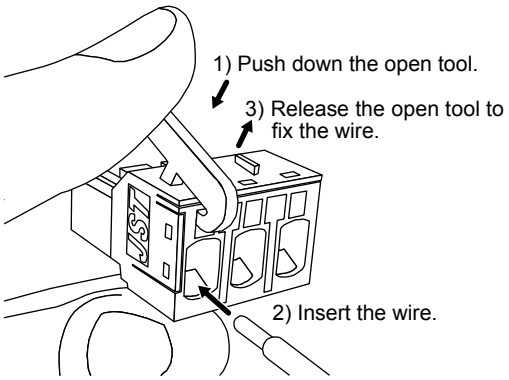
Servo amplifier	Wire size	Ferrule model (Phoenix Contact)		Crimp terminal (Phoenix Contact)
		For 1 cable	For 2 cables	
MR-J4-60A4(-RJ) to MR-J4-350A4(-RJ)	AWG 16	AI1.5-10BK	AI-TWIN2×1.5-10BK	CRIMPFOX-ZA3
	AWG 14	AI2.5-10BU		

2) Inserting wire

Insert the open tool as follows and push down it to open the spring. While the open tool is pushed down, insert the stripped wire into the wire insertion hole. Check the insertion depth so that the cable insulator does not get caught by the spring.

Release the open tool to fix the wire. Pull the wire lightly to confirm that the wire is surely connected.

The following shows a connection example of the CNP3 connector for 3.5 kW.



3.2 MR-J4-_B4(-RJ)

3.2.1 Input power supply circuit

⚠CAUTION

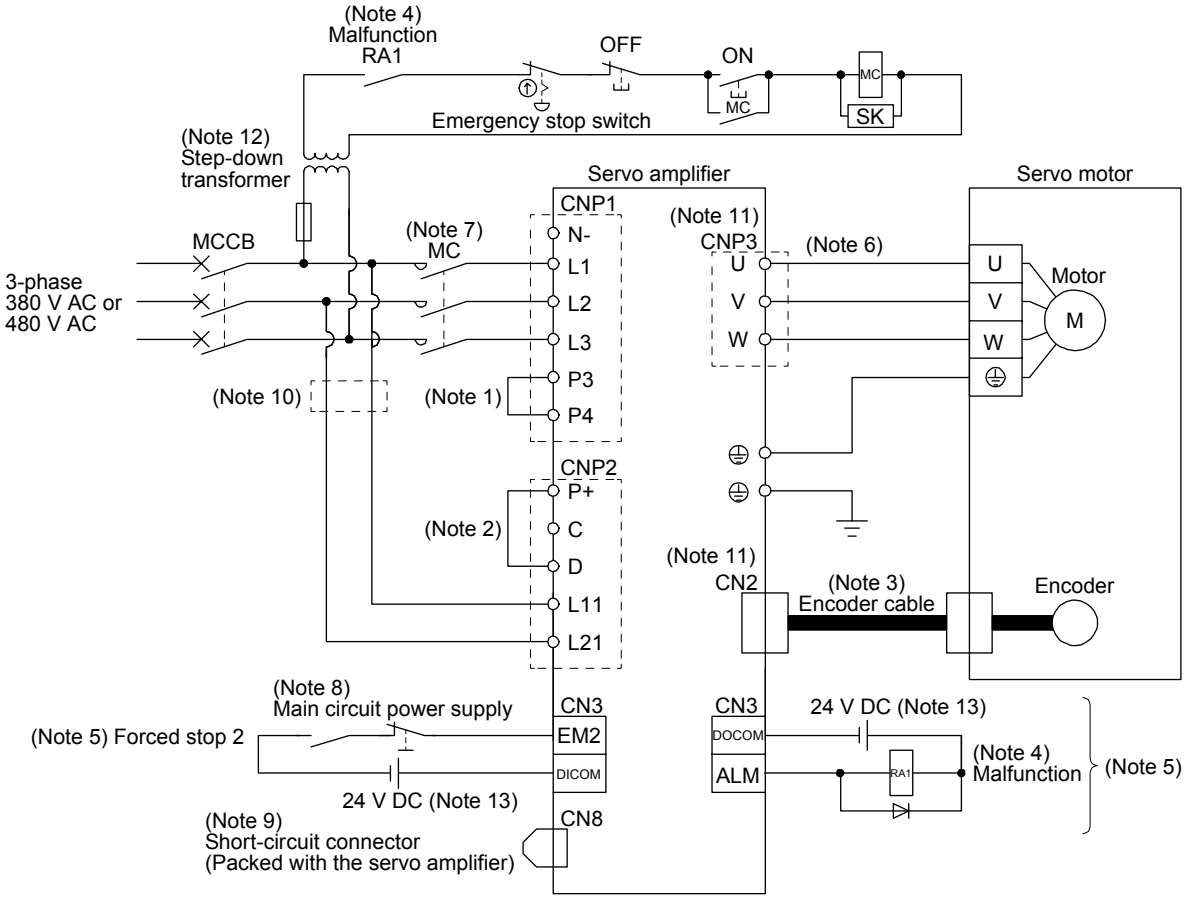
- Always connect a magnetic contactor between the power supply and the main circuit power supply (L1, L2, and L3) of the servo amplifier, in order to configure a circuit that shuts down the power supply on the side of the servo amplifier's power supply. If a magnetic contactor is not connected, continuous flow of a large current may cause a fire when the servo amplifier malfunctions.
- Use ALM (Malfunction) to switch main circuit power supply off. Not doing so may cause a fire when a regenerative transistor malfunctions or the like may overheat the regenerative resistor.
- Check the servo amplifier model, and then input proper voltage to the servo amplifier power supply. If input voltage exceeds the upper limit, the servo amplifier will break down.
- The servo amplifier has a built-in surge absorber (varistor) to reduce noise and to suppress lightning surge. The varistor can break down due to its aged deterioration. To prevent a fire, use a molded-case circuit breaker or fuse for input power supply.
- Connecting a servo motor for different axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.

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/H communication is interrupted. Therefore, the next axis servo amplifier displays "AA" at the indicator and turns into base circuit shut-off. The servo motor stops with starting dynamic brake.
- EM2 has the same function as EM1 in the torque control mode.

Configure the wiring so that the main circuit power supply is shut off and the servo-on command turned off after deceleration to a stop due to an alarm occurring, an enabled servo forced stop, or an enabled controller forced stop. A molded-case circuit breaker (MCCB) must be used with the input cables of the main circuit power supply.

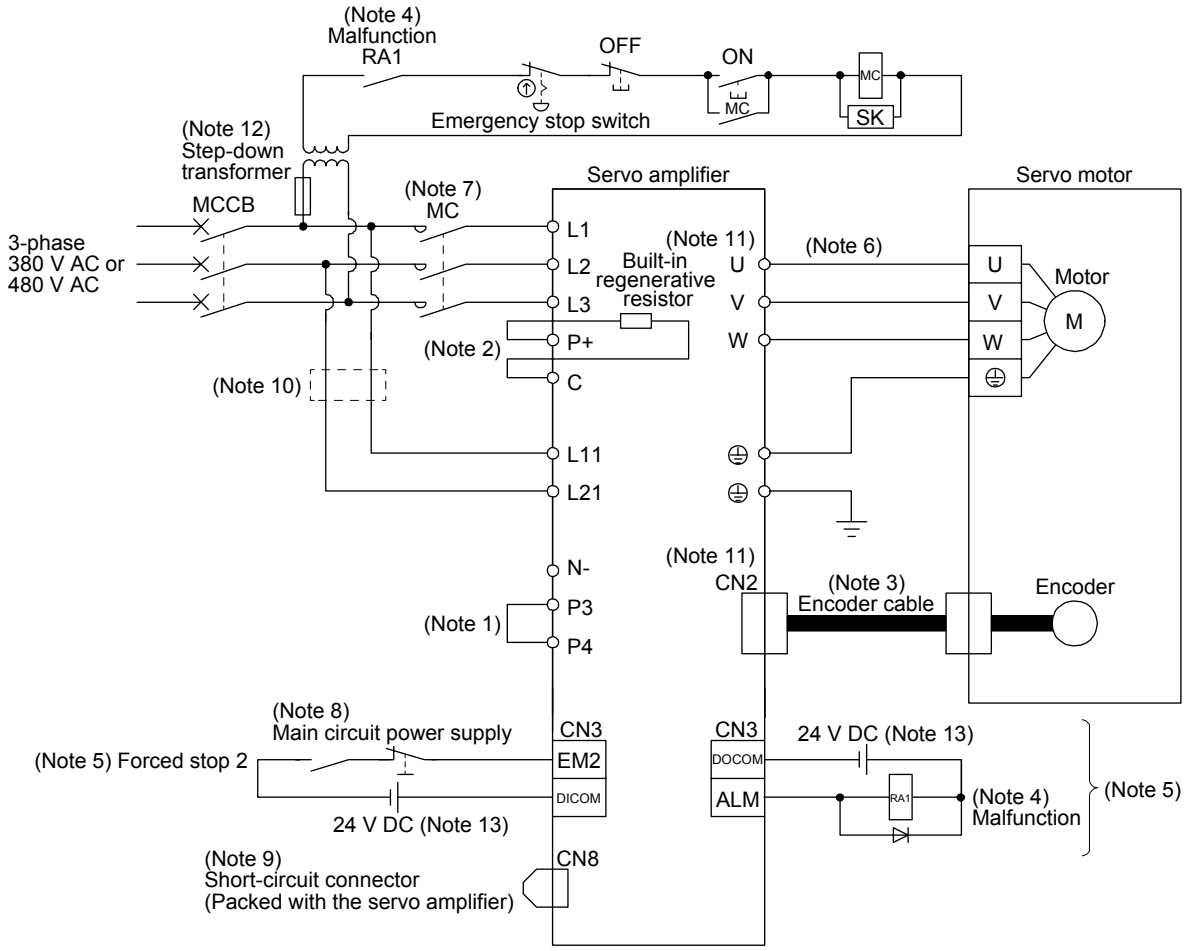
(1) MR-J4-60B4(-RJ) to MR-J4-350B4(-RJ)



Note 1. Always connect between P3 and P4 terminals. (factory-wired) When using the power factor improving DC reactor, refer to section 9.8. Use either the power factor improving DC reactor or the power factor improving AC reactor.

2. Always connect between P+ and D terminals. (factory-wired) When using the regenerative option, refer to section 9.2.
3. For the encoder cable, use of the option cable is recommended. For selecting cables, refer to "Servo Motor Instruction Manual (Vol. 3)".
4. If disabling ALM (Malfunction) output with the parameter, configure up the power supply circuit which switches off the magnetic contactor after detection of alarm occurrence on the controller side.
5. This diagram is for sink I/O interface. For source I/O interface, refer to section 3.8.3 in MR-J4-_B(-RJ) Servo Amplifier Instruction Manual.
6. For connecting servo motor power wires, refer to "Servo Motor Instruction Manual (Vol. 3)".
7. Use a magnetic contactor with an operation delay time (interval between current being applied to the coil until closure of contacts) of 80 ms or less. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.
8. Configure a circuit to turn off EM2 when the main circuit power is turned off to prevent an unexpected restart of the servo amplifier.
9. When not using the STO function, attach the short-circuit connector came with a servo amplifier.
10. When wires used for L11 and L21 are thinner than wires used for L1, L2, and L3, use a molded-case circuit breaker. (Refer to section 9.7.)
11. Connecting a servo motor for different axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.
12. Stepdown transformer is required when the coil voltage of the magnetic contactor is 200 V class.
13. The illustration of the 24 V DC power supply is divided between input signal and output signal for convinence. However, they can be configured by one.

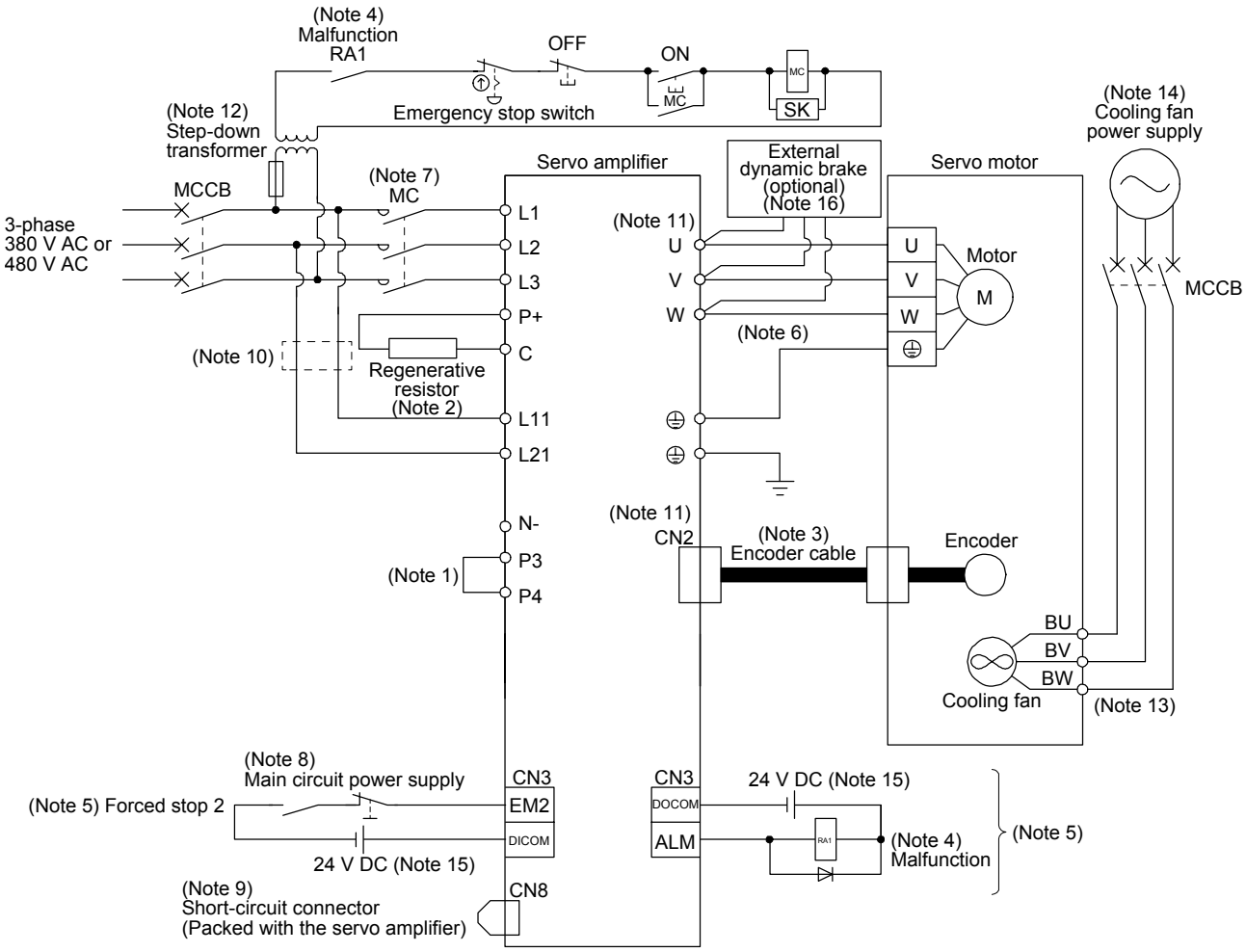
(2) MR-J4-500B4(-RJ)/MR-J4-700B4(-RJ)



Note 1. Always connect between P3 and P4 terminals. (factory-wired) When using the power factor improving DC reactor, refer to section 9.8. Use either the power factor improving DC reactor or the power factor improving AC reactor.

2. When using the regenerative option, refer to section 9.2.
3. For the encoder cable, use of the option cable is recommended. For selecting cables, refer to "Servo Motor Instruction Manual (Vol. 3)".
4. If disabling ALM (Malfunction) output with the parameter, configure up the power supply circuit which switches off the magnetic contactor after detection of alarm occurrence on the controller side.
5. This diagram is for sink I/O interface. For source I/O interface, refer to section 3.8.3 in MR-J4-_B(-RJ) Servo Amplifier Instruction Manual.
6. For connecting servo motor power wires, refer to "Servo Motor Instruction Manual (Vol. 3)".
7. Use a magnetic contactor with an operation delay time (interval between current being applied to the coil until closure of contacts) of 80 ms or less. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.
8. Configure a circuit to turn off EM2 when the main circuit power is turned off to prevent an unexpected restart of the servo amplifier.
9. When not using the STO function, attach the short-circuit connector came with a servo amplifier.
10. When wires used for L11 and L21 are thinner than wires used for L1, L2, and L3, use a molded-case circuit breaker. (Refer to section 9.7.)
11. Connecting a servo motor for different axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.
12. Stepdown transformer is required when the coil voltage of the magnetic contactor is 200 V class.
13. The illustration of the 24 V DC power supply is divided between input signal and output signal for convinence. However, they can be configured by one.

(3) MR-J4-11KB4(-RJ) to MR-J4-22KB4(-RJ)



Note
1. Always connect between P3 and P4 terminals. (factory-wired) When using the power factor improving DC reactor, refer to section 9.8. Use either the power factor improving DC reactor or the power factor improving AC reactor.
2. When using the regenerative resistor, refer to section 9.2.
3. For the encoder cable, use of the option cable is recommended. For selecting cables, refer to "Servo Motor Instruction Manual (Vol. 3)".
4. If disabling ALM (Malfunction) output with the parameter, configure up the power supply circuit which switches off the magnetic contactor after detection of alarm occurrence on the controller side.
5. This diagram is for sink I/O interface. For source I/O interface, refer to section 3.8.3 in MR-J4-_B(-RJ) Servo Amplifier Instruction Manual.
6. For connecting servo motor power wires, refer to "Servo Motor Instruction Manual (Vol. 3)".
7. Use a magnetic contactor with an operation delay time (interval between current being applied to the coil until closure of contacts) of 80 ms or less. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.
8. Configure a circuit to turn off EM2 when the main circuit power is turned off to prevent an unexpected restart of the servo amplifier.
9. When not using the STO function, attach the short-circuit connector came with a servo amplifier.
10. When wires used for L11 and L21 are thinner than wires used for L1, L2, and L3, use a molded-case circuit breaker. (Refer to section 9.7.)
11. Connecting a servo motor for different axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.
12. Stepdown transformer is required for coil voltage of magnetic contactor more than 200 V class servo amplifiers.
13. Only HG-JR22K1M4 servo motor is equipped with a cooling fan.
14. For the cooling fan power supply, refer to "Servo Motor Instruction Manual (Vol. 3)".
15. The illustration of the 24 V DC power supply is divided between input signal and output signal for convinence. However, they can be configured by one.
16. Use an external dynamic brake for this servo amplifier. Failure to do so will cause an accident because the servo motor does not stop immediately but coasts at an alarm occurrence for which the servo motor does not decelerate to stop. Ensure the safety in the entire equipment. For alarms for which the servo motor does not decelerate to stop, refer to section 6.2.1.

3.2.2 Explanation of power supply system

(1) Signal explanations

POINT
●For the layout of connector and terminal block, refer to chapter 7 DIMENSIONS.

Symbol	Connection target (application)	Description
L1/L2/L3	Main circuit power supply	Supply the following power to L1, L2, and L3. Power \ Servo amplifier: MR-J4-60B4(-RJ) to MR-J4-22KB4(-RJ) 3-phase 380 V AC to 480 V AC, 50 Hz/60 Hz: L1/L2/L3
P3/P4	Power factor improving DC reactor	When not using the power factor improving DC reactor, connect P3 and P4. (factory-wired) When using the power factor improving DC reactor, disconnect P3 and P4, and connect the power factor improving DC reactor to P3 and P4. Refer to section 9.8 for details.
P+/C/D	Regenerative option	1) MR-J4-350B4(-RJ) or less When using a servo amplifier built-in regenerative resistor, connect P+ and D. (factory-wired) When using a regenerative option, disconnect P+ and D, and connect the regenerative option to P+ and C. 2) MR-J4-500B4(-RJ) to MR-J4-22KB4(-RJ) MR-J4-500B4(-RJ) to MR-J4-22KB4(-RJ) do not have D. When using a servo amplifier built-in regenerative resistor, connect P+ and C. (factory-wired) When using a regenerative option, disconnect wires of P+ and C for the built-in regenerative resistor. And then connect wires of the regenerative option to P+ and C. Refer to section 9.2 to 9.5 for details.
L11/L21	Control circuit power supply	Supply the following power to L11 and L21. Power \ Servo amplifier: MR-J4-60B4(-RJ) to MR-J4-22KB4(-RJ) 1-phase 380 V AC to 480 V AC: L11/L21
U/V/W	Servo motor power output	Connect them to the servo motor power supply (U, V, and W). Connect the servo amplifier power output (U, V, and W) to the servo motor power input (U, V, and W) directly. Do not let a magnetic contactor, etc. intervene. Otherwise, it may cause a malfunction.
N-	Power regenerative converter Power regenerative common converter Brake unit	This terminal is used for a power regenerative converter, power regenerative common converter, and brake unit. Refer to section 9.3 to 9.5 for details.
⏚	Protective earth (PE)	Connect it to the grounding terminal of the servo motor and to the protective earth (PE) of the cabinet for grounding.

(2) Power-on sequence

POINT
●A voltage, output signal, etc. of analog monitor output may be irregular at power-on.

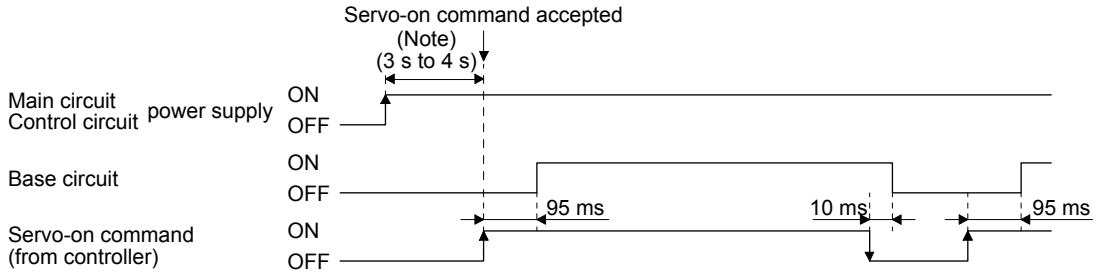
(a) Power-on procedure

1) Always wire the power supply as shown in above section 3.1 using the magnetic contactor with the main circuit power supply (3-phase: L1, L2, and L3). Configure up an external sequence to switch off the magnetic contactor as soon as an alarm occurs.

2) Switch on the control circuit power supply (L11 and L21) simultaneously with the main circuit power supply or before switching on the main circuit power supply. If the control circuit power supply is turned on with the main circuit power supply off, and then the servo-on command is transmitted, [AL. E9 Main circuit off warning] will occur. Turning on the main circuit power supply stops the warning and starts the normal operation.

3) The servo amplifier receives the servo-on command within 3 s to 4 s after the main circuit power supply is switched on.
(Refer to (2) of this section.)

(b) Timing chart



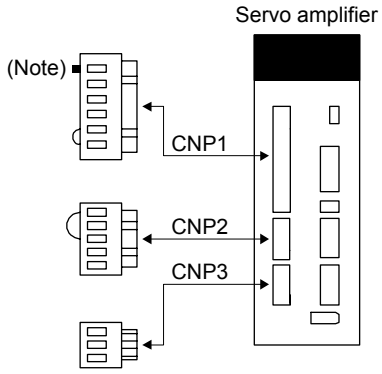
Note. This time period is longer when detecting magnetic pole for the linear servo motor.

(3) Wiring CNP1, CNP2, and CNP3

POINT
●For the wire sizes used for wiring, refer to section 9.6. ●MR-J4-500B4(-RJ) or more do not have these connectors.

Use the servo amplifier power supply connector for wiring CNP1, CNP2, and CNP3.

(a) Connector



Note. A pin for preventing improper connection is inserted to N- of CNP1 connector.

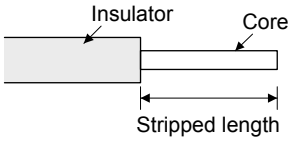
Table 3.2 Connector and applicable wire

Connector	Receptacle assembly	Applicable wire		Stripped length [mm]	Open tool	Manufacturer
		Size	Insulator OD			
CNP1	06JFAT-SAXGDK-HT10.5	AWG 16 to 14	3.9 mm or shorter	10	J-FAT-OT-XL	JST
CNP2	05JFAT-SAXGDK-HT7.5					
CNP3	03JFAT-SAXGDK-HT10.5					

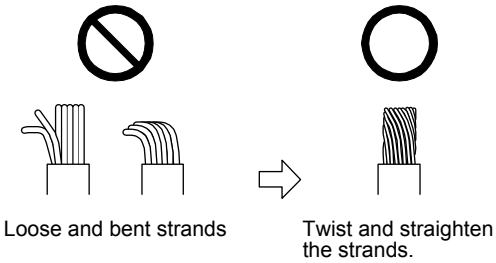
(b) Cable connection procedure

1) Fabrication on cable insulator

Refer to table 3.2 for stripped length of cable insulator. The appropriate stripped length of cables depends on their type, etc. Set the length considering their status.



Twist strands lightly and straighten them as follows.



You can also use a ferrule to connect with the connectors. The following shows references to select ferrules according to wire sizes.

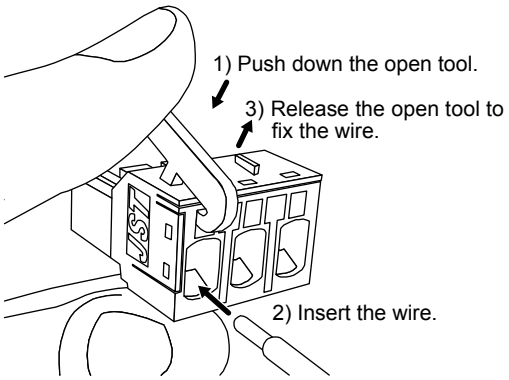
Servo amplifier	Wire size	Ferrule model (Phoenix Contact)		Crimping tool (Phoenix Contact)
		For 1 cable	For 2 cables	
MR-J4-60B4(-RJ) to MR-J4-350B4(-RJ)	AWG 16	AI1.5-10BK	AI-TWIN2×1.5-10BK	CRIMPFOX-ZA3
	AWG 14	AI2.5-10BU		

2) Inserting wire

Insert the open tool as follows and push down it to open the spring. While the open tool is pushed down, insert the stripped wire into the wire insertion hole. Check the insertion depth so that the cable insulator does not get caught by the spring.

Release the open tool to fix the wire. Pull the wire lightly to confirm that the wire is surely connected.

The following shows a connection example of the CNP3 connector for 3.5 kW.



4. STARTUP (WIRING CHECK)

⚠WARNING

- Do not operate the switches with wet hands. Otherwise, it may cause an electric shock.

⚠CAUTION

- Before starting operation, check the parameters. Improper settings may cause some machines to operate unexpectedly.
- The servo amplifier heat sink, regenerative resistor, servo motor, etc. may be hot while power is on or for some time after power-off. Take safety measures, e.g. provide covers, to avoid accidentally touching the parts (cables, etc.) by hand.
- During operation, never touch the rotor of the servo motor. Otherwise, it may cause injury.

The items in the following table are the same as those for MR-J4-_A(-RJ) or MR-J4-_B(-RJ) servo amplifier. For details of the items, refer to each chapter/section of the detailed explanation field.

Model	Item	Detailed explanation
MR-J4-_A4(-RJ)	Switching power on for the first time (expect wiring check)	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 4.1
	Startup in position control mode	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 4.2
	Startup in speed control mode	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 4.3
	Startup in torque control mode	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 4.4
	Display and operation sections	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 4.5
MR-J4-_B4(-RJ)	Switching power on for the first time (expect wiring check)	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 4.1
	Startup	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 4.2
	Switch setting and display of the servo amplifier	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 4.3
	Test operation	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 4.4
	Test operation mode	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 4.5

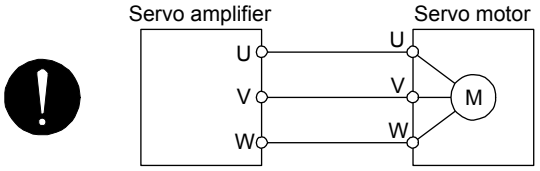
4. STARTUP (WIRING CHECK)

4.1 Power supply system wiring

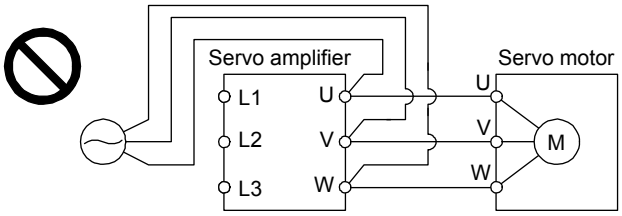
Before switching on the main circuit and control circuit power supplies, check the following items.

(1) Power supply system wiring
The power supplied to the power input terminals (L1, L2, L3, L11, and L21) of the servo amplifier should satisfy the defined specifications. (Refer to section 1.2.)

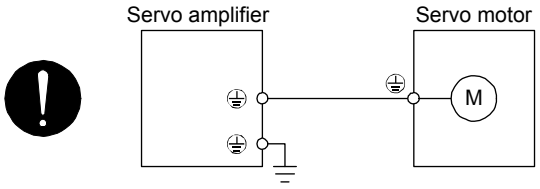
(2) Connection of servo amplifier and servo motor
(a) The servo amplifier power output (U, V, and W) should match in phase with the servo motor power input terminals (U, V, and W).



(b) The power supplied to the servo amplifier should not be connected to the power outputs (U, V, and W). Doing so will fail the connected servo amplifier and servo motor.

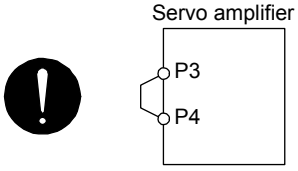


(c) The grounding terminal of the servo motor is connected to the PE terminal of the servo amplifier.



(d) The CN2 connector of the servo amplifier should be connected to the encoder of the servo motor securely using the encoder cable.

(e) Between P3 and P4 should be connected.



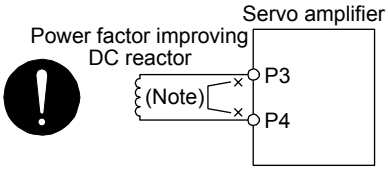
(3) When you use an option and peripheral equipment
(a) When you use a regenerative option for 3.5 kW or less servo amplifiers
- The lead wire between P+ terminal and D terminal should not be connected.
- The regenerative option should be connected to P+ terminal and C terminal.
- A twisted cable should be used. (Refer to section 9.2.4.)

(b) When you use a regenerative option for 5 kW or more servo amplifiers
- The lead wire of built-in regenerative resistor connected to P+ terminal and C terminal should not be connected.
- The regenerative option should be connected to P+ terminal and C terminal.
- A twisted cable should be used when wiring is over 5 m and under 10 m. (Refer to section 9.2.4.)

(c) When you use a brake unit and power regenerative converter for 5 kW or more servo amplifiers
- The lead wire of built-in regenerative resistor connected to P+ terminal and C terminal should not be connected.
- Brake unit, power regenerative converter should be connected to P+ terminal and N- terminal. (Refer to section 9.3 to 9.4.)

(d) When you use a power regenerative common converter for 11 kW or more servo amplifiers
- Power regenerative common converter should be connected to P4 terminal and N- terminal. (Refer to section 9.5.)

(e) The power factor improving DC reactor should be connected between P3 and P4. (Refer to section 9.8.)



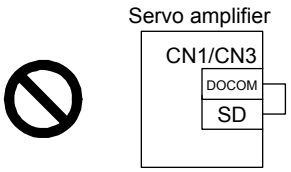
Note. Always disconnect between P3 and P4.

4.2 I/O signal wiring

(1) The I/O signals should be connected correctly.
Use DO forced output to forcibly turn on/off the pins of the CN1/CN3 connector. This function can be used to perform a wiring check. In this case, switch on the control circuit power supply only.
Refer to "MR-J4-_A(-RJ) Servo Amplifier Instruction Manual" or "MR-J4-_B(-RJ) Servo Amplifier Instruction Manual" for details of I/O signal connection.

(2) A voltage exceeding 24 V DC is not applied to the pins of the CN1/CN3 connector.

(3) SD and DOCOM of the CN1/CN3 connector is not shorted.



MEMO

5. PARAMETERS

⚠CAUTION	●Never make a drastic adjustment or change to the parameter values as doing so will make the operation unstable. ●If fixed values are written in the digits of a parameter, do not change these values. ●Do not change parameters for manufacturer setting. ●Do not set values other than described values to each parameter.

5.1 MR-J4-_A4(-RJ)

5.1.1 Parameter list

POINT
●To enable a parameter whose symbol is preceded by *, cycle the power after setting it. ●The symbols in the control mode column mean as follows. P: Position control mode S: Speed control mode T: Torque control mode

Read the MR-J4-_A(-RJ) Servo Amplifier Instruction Manual for the parameters with "MR-J4-_A" in the detailed explanation field.

(1) Basic setting parameters ([Pr. PA_ _])

No.	Symbol	Name	Initial value	Unit	Operation mode			Control mode			Detailed explanation
					Standard	Full.	Lin.	P	S	T	
PA01	*STY	Operation mode	1000h		○	○	○	○	○	○	Section 5.1.2
PA02	*REG	Regenerative option	0000h		○	○	○	○	○	○	
PA03	*ABS	Absolute position detection system	0000h		○	○	○	○			MR-J4-_A
PA04	*AOP1	Function selection A-1	2000h		○	○	○	○	○		
PA05	*FBP	Number of command input pulses per revolution	10000		○	○		○			
PA06	CMX	Electronic gear numerator (command pulse multiplication numerator)	1		○	○	○	○			
PA07	CDV	Electronic gear denominator (command pulse multiplication denominator)	1		○	○	○	○			
PA08	ATU	Auto tuning mode	0001h		○	○	○	○	○		
PA09	RSP	Auto tuning response	16		○	○	○	○	○		
PA10	INP	In-position range	100	[pulse]	○	○	○	○			
PA11	TLP	Forward rotation torque limit/positive direction thrust limit	100.0	[%]	○	○	○	○	○	○	
PA12	TLN	Reverse rotation torque limit/negative direction thrust limit	100.0	[%]	○	○	○	○	○	○	
PA13	*PLSS	Command pulse input form	0100h		○	○	○	○			
PA14	*POL	Rotation direction selection/travel direction selection	0		○	○	○	○			
PA15	*ENR	Encoder output pulses	4000	[pulse/rev]	○	○	○	○	○	○	
PA16	*ENR2	Encoder output pulses 2	1		○	○	○	○	○	○	
PA17	*MSR	Servo motor series setting	0000h				○	○	○	○	Section 5.1.2
PA18	*MTY	Servo motor type setting	0000h				○	○	○	○	
PA19	*BLK	Parameter writing inhibit	00AAh		○	○	○	○	○	○	MR-J4-_A
PA20	*TDS	Tough drive setting	0000h		○	○	○	○	○	○	
PA21	*AOP3	Function selection A-3	0001h		○	○	○	○	○		
PA22		For manufacturer setting	0000h								
PA23	DRAT	Drive recorder arbitrary alarm trigger setting	0000h		○	○	○	○	○	○	MR-J4-_A
PA24	AOP4	Function selection A-4	0000h		○	○	○	○	○		

No.	Symbol	Name	Initial value	Unit	Operation mode			Control mode			Detailed explanation
					Standard	Full.	Lin.	P	S	T	
PA25	OTHOV	One-touch tuning - Overshoot permissible level	0	[%]	○	○	○	○	○		MR-J4-_A
PA26	*AOP5	Function selection A-5	0000h		○	○	○	○	○		
PA27		For manufacturer setting	0000h								
PA28			0000h								
PA29			0000h								
PA30			0000h								
PA31			0000h								
PA32			0000h								

(2) Gain/filter setting parameters ([Pr. PB_ _])

No.	Symbol	Name	Initial value	Unit	Operation mode			Control mode			Detailed explanation
					Standard	Full.	Lin.	P	S	T	
PB01	FILT	Adaptive tuning mode (adaptive filter II)	0000h		○	○	○	○	○	○	MR-J4-_A
PB02	VRFT	Vibration suppression control tuning mode (advanced vibration suppression control II)	0000h		○	○	○	○			
PB03	PST	Position command acceleration/deceleration time constant (position smoothing)	0	[ms]	○	○	○	○			
PB04	FFC	Feed forward gain	0	[%]	○	○	○	○			
PB05		For manufacturer setting	500								
PB06	GD2	Load to motor inertia ratio/load to motor mass ratio	7.00	[Multiplier]	○	○	○	○	○		MR-J4-_A
PB07	PG1	Model loop gain	15.0	[rad/s]	○	○	○	○	○		
PB08	PG2	Position loop gain	37.0	[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	OVA	Overshoot amount compensation	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	NHF	Shaft resonance suppression filter	0000h		○	○	○	○	○	○	
PB18	LPF	Low-pass filter setting	3141	[rad/s]	○	○	○	○	○		
PB19	VRF11	Vibration suppression control 1 - Vibration frequency	100.0	[Hz]	○	○	○	○			
PB20	VRF12	Vibration suppression control 1 - Resonance frequency	100.0	[Hz]	○	○	○	○			
PB21	VRF13	Vibration suppression control 1 - Vibration frequency damping	0.00		○	○	○	○			
PB22	VRF14	Vibration suppression control 1 - Resonance frequency damping	0.00		○	○	○	○			
PB23	VFBF	Low-pass filter selection	0000h		○	○	○	○	○	○	
PB24	*MVS	Slight vibration suppression control	0000h		○	○	○	○			
PB25	*BOP1	Function selection B-1	0000h		○	○	○	○			
PB26	*CDP	Gain switching function	0000h		○	○	○	○	○		
PB27	CDL	Gain switching condition	10	[kpps]/ [pulse]/ [r/min]	○	○	○	○	○		
PB28	CDT	Gain switching time constant	1	[ms]	○	○	○	○	○		
PB29	GD2B	Load to motor inertia ratio/load to motor mass ratio after gain switching	7.00	[Multiplier]	○	○	○	○	○		
PB30	PG2B	Position loop gain after gain switching	0.0	[rad/s]	○	○	○	○			
PB31	VG2B	Speed loop gain after gain switching	0	[rad/s]	○	○	○	○	○		
PB32	VICB	Speed integral compensation after gain switching	0.0	[ms]	○	○	○	○	○		
PB33	VRF1B	Vibration suppression control 1 - Vibration frequency after gain switching	0.0	[Hz]	○	○	○	○			

No.	Symbol	Name	Initial value	Unit	Operation mode			Control mode			Detailed explanation
					Standard	Full.	Lin.	P	S	T	
PB34	VRF2B	Vibration suppression control 1 - Resonance frequency after gain switching	0.0	[Hz]	○	○	○	○			MR-J4-_A
PB35	VRF3B	Vibration suppression control 1 - Vibration frequency damping after gain switching	0.00		○	○	○	○			
PB36	VRF4B	Vibration suppression control 1 - Resonance frequency damping after gain switching	0.00		○	○	○	○			
PB37		For manufacturer setting	1600								
PB38			0.00								
PB39			0.00								
PB40			0.00								
PB41			0000h								
PB42			0000h								
PB43			0000h								
PB44			0.00								
PB45	CNHF	Command notch filter	0000h		○	○	○	○			MR-J4-_A
PB46	NH3	Machine resonance suppression filter 3	4500	[Hz]	○	○	○	○	○	○	
PB47	NHQ3	Notch shape selection 3	0000h		○	○	○	○	○	○	
PB48	NH4	Machine resonance suppression filter 4	4500	[Hz]	○	○	○	○	○	○	
PB49	NHQ4	Notch shape selection 4	0000h		○	○	○	○	○	○	
PB50	NH5	Machine resonance suppression filter 5	4500	[Hz]	○	○	○	○	○	○	
PB51	NHQ5	Notch shape selection 5	0000h		○	○	○	○	○	○	
PB52	VRF21	Vibration suppression control 2 - Vibration frequency	100.0	[Hz]	○	○	○	○			
PB53	VRF22	Vibration suppression control 2 - Resonance frequency	100.0	[Hz]	○	○	○	○			
PB54	VRF23	Vibration suppression control 2 - Vibration frequency damping	0.00		○	○	○	○			
PB55	VRF24	Vibration suppression control 2 - Resonance frequency damping	0.00		○	○	○	○			
PB56	VRF21B	Vibration suppression control 2 - Vibration frequency after gain switching	0.0	[Hz]	○	○	○	○			
PB57	VRF22B	Vibration suppression control 2 - Resonance frequency after gain switching	0.0	[Hz]	○	○	○	○			
PB58	VRF23B	Vibration suppression control 2 - Vibration frequency damping after gain switching	0.00		○	○	○	○			
PB59	VRF24B	Vibration suppression control 2 - Resonance frequency damping after gain switching	0.00		○	○	○	○			
PB60	PG1B	Model loop gain after gain switching	0.0	[rad/s]	○	○	○	○	○		
PB61		For manufacturer setting	0.0								
PB62			0000h								
PB63			0000h								
PB64			0000h								

(3) Extension setting parameters ([Pr. PC_ _])

No.	Symbol	Name	Initial value	Unit	Operation mode			Control mode			Detailed explanation
					Standard	Full.	Lin.	P	S	T	
PC01	STA	Acceleration time constant	0	[ms]	○		○		○	○	MR-J4-_A
PC02	STB	Deceleration time constant	0	[ms]	○		○		○	○	
PC03	STC	S-pattern acceleration/deceleration time constant	0	[ms]	○		○		○	○	
PC04	TQC	Torque command time constant/thrust command time constant	0	[ms]	○		○			○	
PC05	SC1	Internal speed command 1	100	[r/min]/ [mm/s]	○		○		○		
		Internal speed limit 1			○		○			○	
PC06	SC2	Internal speed command 2	500	[r/min]/ [mm/s]	○		○		○		
		Internal speed limit 2			○		○			○	
PC07	SC3	Internal speed command 3	1000	[r/min]/ [mm/s]	○		○		○		
		Internal speed limit 3			○		○			○	
PC08	SC4	Internal speed command 4	200	[r/min]/ [mm/s]	○		○		○		
		Internal speed limit 4			○		○			○	

No.	Symbol	Name	Initial value	Unit	Operation mode			Control mode			Detailed explanation
					Standard	Full.	Lin.	P	S	T	
PC09	SC5	Internal speed command 5	300	[r/min]/ [mm/s]	○		○		○		MR-J4-_A
		Internal speed limit 5			○		○			○	
PC10	SC6	Internal speed command 6	500	[r/min]/ [mm/s]	○		○		○		
		Internal speed limit 6			○		○			○	
PC11	SC7	Internal speed command 7	800	[r/min]/ [mm/s]	○		○		○		
		Internal speed limit 7			○		○			○	
PC12	VCM	Analog speed command - Maximum speed	0	[r/min]/ [mm/s]	○		○		○		
		Analog speed limit - Maximum speed			○		○			○	
PC13	TLC	Analog torque/thrust command maximum output	100.0	[%]	○		○			○	
		Analog torque/thrust limit maximum output			○		○			○	
PC14	MOD1	Analog monitor 1 output	0000h		○	○	○	○	○	○	Section 5.1.2
PC15	MOD2	Analog monitor 2 output	0001h		○	○	○	○	○	○	
PC16	MBR	Electromagnetic brake sequence output	0	[ms]	○	○	○	○	○	○	MR-J4-_A
PC17	ZSP	Zero speed	50	[r/min]/ [mm/s]	○	○	○	○	○	○	
PC18	*BPS	Alarm history clear	0000h		○	○	○	○	○	○	
PC19	*ENRS	Encoder output pulse selection	0000h		○	○	○	○	○	○	
PC20	*SNO	Station No. setting	0	[station]	○	○	○	○	○	○	
PC21	*SOP	RS-422 communication function selection	0000h		○	○	○	○	○	○	
PC22	*COP1	Function selection C-1	0000h		○	○	○	○	○	○	
PC23	*COP2	Function selection C-2	0000h		○		○		○	○	
PC24	*COP3	Function selection C-3	0000h		○	○	○	○			
PC25		For manufacturer setting	0000h								
PC26	*COP5	Function selection C-5	0000h		○	○	○	○	○		MR-J4-_A
PC27	*COP6	Function selection C-6	0000h		○	○	○	○	○	○	
PC28		For manufacturer setting	0000h								
PC29			0000h								
PC30	STA2	Acceleration time constant 2	0	[ms]	○		○		○	○	MR-J4-_A
PC31	STB2	Deceleration time constant 2	0	[ms]	○		○		○	○	
PC32	CMX2	Command input pulse multiplication numerator 2	1		○	○	○	○			
PC33	CMX3	Command input pulse multiplication numerator 3	1		○	○	○	○			
PC34	CMX4	Command input pulse multiplication numerator 4	1		○	○	○	○			
PC35	TL2	Internal torque limit 2/internal thrust limit 2	100.0	[%]	○	○	○	○	○	○	
PC36	*DMD	Status display selection	0000h		○	○	○	○	○	○	
PC37	VCO	Analog speed command offset	0	[mV]	○		○		○		
		Analog speed limit offset			○		○			○	
PC38	TPO	Analog torque command offset	0	[mV]	○		○			○	
		Analog torque limit offset			○	○	○		○		
PC39	MO1	Analog monitor 1 offset	0	[mV]	○	○	○	○	○	○	
PC40	MO2	Analog monitor 2 offset	0	[mV]	○	○	○	○	○	○	
PC41		For manufacturer setting	0								
PC42			0								
PC43	ERZ	Error excessive alarm detection level	0	[rev]/[mm]	○	○	○	○			MR-J4-_A
PC44	*COP9	Function selection C-9	0000h			○		○			
PC45	*COPA	Function selection C-A	0000h			○	○	○	○	○	
PC46		For manufacturer setting	0								
PC47			0								
PC48			0								
PC49			0								
PC50			0000h								
PC51	RSBR	Forced stop deceleration time constant	100	[ms]	○	○	○	○	○		MR-J4-_A
PC52		For manufacturer setting	0								
PC53			0								
PC54	RSUP1	Vertical axis freefall prevention compensation amount	0	[0.0001rev] /[0.01mm]	○	○	○	○			MR-J4-_A

No.	Symbol	Name	Initial value	Unit	Operation mode			Control mode			Detailed explanation
					Standard	Full.	Lin.	P	S	T	
PC55		For manufacturer setting	0								
PC56			100								
PC57			0000h								
PC58			0								
PC59			0000h								
PC60	*COPD	Function selection C-D	0000h		○			○	○	○	MR-J4-_A
PC61		For manufacturer setting	0000h								
PC62			0000h								
PC63			0000h								
PC64			0000h								
PC65			0000h								
PC66			0000h								
PC67			0000h								
PC68			0000h								
PC69			0000h								
PC70			0000h								
PC71			0000h								
PC72			0000h								
PC73			0000h								
PC74			0000h								
PC75			0000h								
PC76			0000h								
PC77			0000h								
PC78			0000h								
PC79			0000h								
PC80			0000h								

(4) I/O setting parameters ([Pr. PD_ _])

No.	Symbol	Name	Initial value	Unit	Operation mode			Control mode			Detailed explanation
					Standard	Full.	Lin.	P	S	T	
PD01	*DIA1	Input signal automatic on selection 1	0000h		○	○	○	○	○	○	MR-J4-_A
PD02		For manufacturer setting	0000h								
PD03	*DI1L	Input device selection 1L	0202h		○	○	○	○	○		MR-J4-_A
PD04	*DI1H	Input device selection 1H	0002h		○		○			○	
PD05	*DI2L	Input device selection 2L	2100h		○	○	○	○	○		
PD06	*DI2H	Input device selection 2H	0021h		○		○			○	
PD07	*DI3L	Input device selection 3L	0704h		○	○	○	○	○		
PD08	*DI3H	Input device selection 3H	0007h		○		○			○	
PD09	*DI4L	Input device selection 4L	0805h		○	○	○	○	○		
PD10	*DI4H	Input device selection 4H	0008h		○		○			○	
PD11	*DI5L	Input device selection 5L	0303h		○	○	○	○	○		
PD12	*DI5H	Input device selection 5H	0003h		○		○			○	
PD13	*DI6L	Input device selection 6L	2006h		○	○	○	○	○		
PD14	*DI6H	Input device selection 6H	0020h		○		○			○	
PD15		For manufacturer setting	0000h								
PD16			0000h								
PD17	*DI8L	Input device selection 8L	0A0Ah		○	○	○	○	○		MR-J4-_A
PD18	*DI8H	Input device selection 8H	0000h		○		○			○	
PD19	*DI9L	Input device selection 9L	0B0Bh		○	○	○	○	○		
PD20	*DI9H	Input device selection 9H	0000h		○		○			○	
PD21	*DI10L	Input device selection 10L	2323h		○	○	○	○	○		
PD22	*DI10H	Input device selection 10H	0023h		○		○			○	
PD23	*DO1	Output device selection 1	0004h		○	○	○	○	○	○	

No.	Symbol	Name	Initial value	Unit	Operation mode			Control mode			Detailed explanation
					Standard	Full.	Lin.	P	S	T	
PD24	*DO2	Output device selection 2	000Ch		○	○	○	○	○	○	MR-J4-_A
PD25	*DO3	Output device selection 3	0004h		○	○	○	○	○	○	
PD26	*DO4	Output device selection 4	0007h		○	○	○	○	○	○	
PD27		For manufacturer setting	0003h								
PD28	*DO6	Output device selection 6	0002h		○	○	○	○	○	○	MR-J4-_A
PD29	*DIF	Input filter setting	0004h		○	○	○	○	○	○	
PD30	*DOP1	Function selection D-1	0000h		○	○	○	○	○	○	
PD31		For manufacturer setting	0000h								
PD32	*DOP3	Function selection D-3	0000h		○	○	○	○			MR-J4-_A
PD33		For manufacturer setting	0000h								
PD34	DOP5	Function selection D-5	0000h		○	○	○	○	○	○	MR-J4-_A
PD35		For manufacturer setting	0000h								
PD36			0000h								
PD37			0000h								
PD38			0								
PD39			0								
PD40			0								
PD41			0000h								
PD42			0000h								
PD43			0000h								
PD44			0000h								
PD45			0000h								
PD46			0000h								
PD47			0000h								
PD48			0000h								

(5) Extension setting 2 parameters ([Pr. PE_ _])

No.	Symbol	Name	Initial value	Unit	Operation mode			Control mode			Detailed explanation
					Standard	Full.	Lin.	P	S	T	
PE01	*FCT1	Fully closed loop function selection	0000h			○		○			MR-J4-_A
PE02		For manufacturer setting	0000h								
PE03	*FCT2	Fully closed loop function selection 2	0003h			○		○			
PE04	*FBN	Fully closed loop control - Feedback pulse electronic gear 1 - Numerator	1			○		○			
PE05	*FBD	Fully closed loop control - Feedback pulse electronic gear 1 - Denominator	1			○		○			
PE06	BC1	Fully closed loop control - Speed deviation error detection level	400	[r/min]		○		○			
PE07	BC2	Fully closed loop control - Position deviation error detection level	100	[kpulse]		○		○			
PE08	DUF	Fully closed loop dual feedback filter	10	[rad/s]		○		○			
PE09		For manufacturer setting	0000h								
PE10	FCT3	Fully closed loop function selection 3	0000h			○		○			
PE11		For manufacturer setting	0000h								
PE12			0000h								
PE13			0000h								
PE14			0111h								
PE15			20								
PE16			0000h								
PE17			0000h								
PE18			0000h								
PE19			0000h								
PE20			0000h								
PE21			0000h								
PE22			0000h								

No.	Symbol	Name	Initial value	Unit	Operation mode			Control mode			Detailed explanation
					Standard	Full.	Lin.	P	S	T	
PE23		For manufacturer setting	0000h								
PE24			0000h								
PE25			0000h								
PE26			0000h								
PE27			0000h								
PE28			0000h								
PE29			0000h								
PE30			0000h								
PE31			0000h								
PE32			0000h								
PE33			0000h								
PE34	*FBN2	Fully closed loop control - Feedback pulse electronic gear 2 - Numerator	1			○		○			MR-J4-_A
PE35	*FBD2	Fully closed loop control - Feedback pulse electronic gear 2 - Denominator	1			○		○			
PE36		For manufacturer setting	0.0								
PE37			0.00								
PE38			0.00								
PE39			20								
PE40			0000h								
PE41	EOP3	Function selection E-3	0000h		○	○	○	○	○	○	MR-J4-_A
PE42		For manufacturer setting	0								
PE43			0.0								
PE44			0000h								
PE45			0000h								
PE46			0000h								
PE47			0000h								
PE48			0000h								
PE49			0000h								
PE50			0000h								
PE51			0000h								
PE52			0000h								
PE53			0000h								
PE54			0000h								
PE55			0000h								
PE56			0000h								
PE57			0000h								
PE58			0000h								
PE59			0000h								
PE60			0000h								
PE61			0.00								
PE62			0.00								
PE63			0.00								
PE64			0.00								

(6) Extension setting 3 parameters ([Pr. PF_ _])

No.	Symbol	Name	Initial value	Unit	Operation mode			Control mode			Detailed explanation
					Standard	Full.	Lin.	P	S	T	
PF01		For manufacturer setting	0000h								
PF02			0000h								
PF03			0000h								
PF04			0								
PF05			0								
PF06			0000h								
PF07			1								
PF08			1								
PF09	*FOP5	Function selection F-5	0000h		○	○		○	○	○	MR-J4-_A
PF10		For manufacturer setting	0000h								
PF11			0000h								
PF12			10000								
PF13			100								
PF14			100								
PF15	DBT	Electronic dynamic brake operating time	2000	[ms]	○	○		○	○	○	MR-J4-_A
PF16		For manufacturer setting	0000h								
PF17			10								
PF18			0000h								
PF19			0000h								
PF20			0000h								
PF21	DRT	Drive recorder switching time setting	0	[s]	○	○	○	○	○	○	MR-J4-_A
PF22		For manufacturer setting	200								
PF23	OSCL1	Vibration tough drive - Oscillation detection level	50	[%]	○	○	○	○	○		MR-J4-_A
PF24	*OSCL2	Vibration tough drive function selection	0000h		○	○	○	○	○		
PF25	CVAT	SEMI-F47 function - Instantaneous power failure detection time (instantaneous power failure tough drive - detection time)	200	[ms]	○	○	○	○	○	○	
PF26		For manufacturer setting	0								
PF27			0								
PF28			0								
PF29			0000h								
PF30			0								
PF31	FRIC	Machine diagnosis function - Friction judgement speed	0	[r/min]/ [mm/s]	○	○	○	○	○	○	MR-J4-_A
PF32		For manufacturer setting	50								
PF33			0000h								
PF34			0000h								
PF35			0000h								
PF36			0000h								
PF37			0000h								
PF38			0000h								
PF39			0000h								
PF40			0000h								
PF41			0000h								
PF42			0000h								
PF43			0000h								
PF44			0000h								
PF45			0000h								
PF46			0000h								
PF47			0000h								
PF48			0000h								

(7) Linear servo motor/DD motor setting parameters ([Pr. PL_ _])

No.	Symbol	Name	Initial value	Unit	Operation mode			Control mode			Detailed explanation
					Standard	Full.	Lin.	P	S	T	
PL01	*LIT1	Linear servo motor function selection 1	0301h				○	○	○	○	MR-J4-_A
PL02	*LIM	Linear encoder resolution - Numerator	1000	[μm]			○	○	○	○	
PL03	*LID	Linear encoder resolution - Denominator	1000	[μm]			○	○	○	○	
PL04	*LIT2	Linear servo motor function selection 2	0003h				○	○	○	○	
PL05	LB1	Position deviation error detection level	0	[mm]			○	○			
PL06	LB2	Speed deviation error detection level	0	[mm/s]			○	○	○		
PL07	LB3	Thrust deviation error detection level	100	[%]			○	○	○	○	
PL08	*LIT3	Linear servo motor function selection 3	0010h				○	○	○	○	
PL09	LPWM	Magnetic pole detection voltage level	30	[%]			○	○	○	○	
PL10		For manufacturer setting	5								
PL11			100								
PL12			500								
PL13			0000h								
PL14			0000h								
PL15			20								
PL16			0								
PL17	LTSTS	Magnetic pole detection - Minute position detection method - Function selection	0000h				○	○	○	○	MR-J4-_A
PL18	IDLV	Magnetic pole detection - Minute position detection method - Identification signal amplitude	0	[%]			○	○	○	○	
PL19		For manufacturer setting	0								
PL20			0								
PL21			0								
PL22			0								
PL23			0000h								
PL24			0								
PL25			0000h								
PL26			0000h								
PL27			0000h								
PL28			0000h								
PL29			0000h								
PL30			0000h								
PL31			0000h								
PL32			0000h								
PL33			0000h								
PL34			0000h								
PL35			0000h								
PL36			0000h								
PL37			0000h								
PL38			0000h								
PL39			0000h								
PL40			0000h								
PL41			0000h								
PL42			0000h								
PL43			0000h								
PL44			0000h								
PL45			0000h								
PL46			0000h								
PL47			0000h								
PL48			0000h								

5.1.2 Detailed list of parameters

POINT

●"x" in the "Setting digit" columns means which digit to set a value.

(1) Basic setting parameters ([Pr. PA_ _])

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode P	S	T
PA01 *STY Operation mode	_ _ _ x	Control mode selection Select a control mode. 0: Position control mode 1: Position control mode and speed control mode 2: Speed control mode 3: Speed control mode and torque control mode 4: Torque control mode 5: Torque control mode and position control mode	0h	○	○	○
	_ _ x _	Operation mode selection 0: Standard control mode 1: Fully closed loop control mode 4. Linear servo motor control mode Setting other than above will result in [AL. 37 Parameter error].	0h	○	○	○
	_ x _ _	For manufacturer setting	0h			
	x _ _ _		1h			
PA02 *REG Regenerative option	_ _ x x	Regenerative option Used to select the regenerative option. Incorrect setting may cause the regenerative option to burn. If a selected regenerative option is not for use with the servo amplifier, [AL. 37 Parameter error] occurs. 00: Regenerative option is not used. ・For servo amplifier of 0.6 kW to 7 kW, built-in regenerative resistor is used. ・Supplied regenerative resistors or regenerative option is used with the servo amplifier of 11 kW to 22 kW. 01: FR-RC-H/FR-CV-H/FR-BU2-H When you use FR-RC-H, FR-CV-H, or FR-BU2-H, select "Mode 2 (_ _ _ 1)" of "Undervoltage alarm detection mode selection" in [Pr. PC27]. 80: MR-RB1H-4 81: MR-RB3M-4 (Cooling fan is required.) 82: MR-RB3G-4 (Cooling fan is required.) 83: MR-RB5G-4 (Cooling fan is required.) 84: MR-RB34-4 (Cooling fan is required.) 85: MR-RB54-4 (Cooling fan is required.) 91: MR-RB3U-4 (Cooling fan is required.) 92: MR-RB5U-4 (Cooling fan is required.) FA: When the supplied regenerative resistors or the regenerative option is cooled by the cooling fan to increase the ability with the servo amplifier of 11 kW to 22 kW.	00h	○	○	○
	_ x _ _	For manufacturer setting	0h			
	x _ _ _		0h			
PA17 *MSR Servo motor series setting		When you use a linear servo motor, select its model from [Pr. PA17] and [Pr. PA18]. Set this and [Pr. PA18] at a time. Refer to the following table for settings. Linear servo motor series / Servo motor model (primary side) / Parameter [Pr. PA17] setting / [Pr. PA18] setting LM-F / LM-FP5H-60M-1SS0 / 00B2h / 5801h	0000h	○	○	○

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode		
				P	S	T
PA18 *MTY Servo motor type setting		When you use a linear servo motor, select its model from [Pr. PA17] and [Pr. PA18]. Set this and [Pr. PA17] at a time. Refer to the table of [Pr. PA17] for settings.	0000h	○	○	○

(2) Extension setting parameters ([Pr. PC_ _])

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode P	S	T
PC14 MOD1 Analog monitor 1 output	_ _ x x	Analog monitor 1 output selection Select a signal to output to MO1 (Analog monitor 1). Refer to appendix 3.1 (3) for detection point of output selection. Refer to table 5.1 for settings.	00h	○	○	○
	_ x _ _	For manufacturer setting	0h			
	x _ _ _		0h			

Table 5.1 Analog monitor setting value

Setting value	Item	Operation mode (Note 1) Standard	Full.	Lin.
00	(Linear) servo motor speed (±8 V/max. speed)	○	○	○
01	Torque or thrust (±8 V/max. torque or max. thrust) (Note 3)	○	○	○
02	(Linear) servo motor speed (+8V/max. speed)	○	○	○
03	Torque or thrust (+8 V/max. torque or max. thrust) (Note 3)	○	○	○
04	Current command (±8 V/max. current command)	○	○	○
05	Command pulse frequency (±10 V/±4 Mpps)	○	○	○
06	Servo motor-side droop pulses (±10 V/100 pulses) (Note 2)	○	○	○
07	Servo motor-side droop pulses (±10 V/1000 pulses) (Note 2)	○	○	○
08	Servo motor-side droop pulses (±10 V/10000 pulses) (Note 2)	○	○	○
09	Servo motor-side droop pulses (±10 V/100000 pulses) (Note 2)	○	○	○
0A	Feedback position (±10 V/1 Mpulses) (Note 2)	○		
0B	Feedback position (±10 V/10 Mpulses) (Note 2)	○		
0C	Feedback position (±10 V/100 Mpulses) (Note 2)	○		
0D	Bus voltage (+8 V/800 V)	○	○	○
0E	Speed command 2 (±8 V/max. speed)	○	○	○
10	Load-side droop pulses (±10 V/100 pulses) (Note 2)		○	
11	Load-side droop pulses (±10 V/1000 pulses) (Note 2)		○	
12	Load-side droop pulses (±10 V/10000 pulses) (Note 2)		○	
13	Load-side droop pulses (±10 V/100000 pulses) (Note 2)		○	
14	Load-side droop pulses (±10 V/1 Mpulses) (Note 2)		○	
15	Servo motor-side/load-side position deviation (±10 V/100000 pulses)		○	
16	Servo motor-side/load-side speed deviation (±8 V/max. speed)		○	
17	Encoder inside temperature (±10 V/±128 °C)	○	○	

Note 1. Items with ○ are available for each operation mode.
Standard: Standard (semi closed loop system) use of the rotary servo motor
Full.: Fully closed loop system use of the rotary servo motor
Lin.: Linear servo motor use
2. Encoder pulse unit
3. 8 V is outputted at the maximum torque. However, when [Pr. PA11] and [Pr. PA12] are set to limit torque, 8 V is outputted at the torque highly limited.

No./symbol/ name	Setting digit	Function	Initial value [unit]	Control mode		
				P	S	T
PC15 MOD2 Analog monitor 2 output	_ _ x x	Analog monitor 2 output selection Select a signal to output to MO2 (Analog monitor 2). Refer to appendix 3.1 (3) for detection point of output selection. Refer to [Pr. PC14] for settings.	01h	○	○	○
	_ x _ _	For manufacturer setting	0h			
	x _ _ _		0h			

5.2 MR-J4-_B4(-RJ)

5.2.1 Parameter list

POINT

- When you connect the amplifier to a servo system controller, servo parameter values of the servo system controller will be written to each parameter.
- Setting may not be made to some parameters and their ranges depending on the servo system controller model, servo amplifier software version, and MR Configurator2 software version. For details, refer to the servo system controller user's manual.
- The parameter whose symbol is preceded by * is enabled with the following conditions:
  *: After setting the parameter, cycle the power or reset the controller.
  **: After setting the parameter, cycle the power.
- Abbreviations of operation modes indicate the followings.
  Standard: Standard (semi closed loop system) use of the rotary servo motor
  Full.: Fully closed loop system use of the rotary servo motor
  Lin.: Linear servo motor use

Read the MR-J4-_B(-RJ) Servo Amplifier Instruction Manual for the parameters with "MR-J4-_B" in the detailed explanation field.

(1) Basic setting parameters ([Pr. PA_ _])

No.	Symbol	Name	Initial value	Unit	Operation mode			Detailed explanation
					Standard	Full.	Lin.	
PA01	**STY	Operation mode	1000h		○	○	○	Section 5.2.2
PA02	**REG	Regenerative option	0000h		○	○	○	
PA03	*ABS	Absolute position detection system	0000h		○	○	○	MR-J4-_B
PA04	*AOP1	Function selection A-1	2000h		○	○	○	
PA05		For manufacturer setting	10000					
PA06			1					
PA07			1					
PA08	ATU	Auto tuning mode	0001h		○	○	○	MR-J4-_B
PA09	RSP	Auto tuning response	16		○	○	○	
PA10	INP	In-position range	1600	[pulse]	○	○	○	
PA11		For manufacturer setting	1000.0					
PA12			1000.0					
PA13			0000h					
PA14	*POL	Rotation direction selection/travel direction selection	0		○	○	○	MR-J4-_B
PA15	*ENR	Encoder output pulses	4000	[pulse/rev]	○	○	○	
PA16	*ENR2	Encoder output pulses 2	1		○	○	○	
PA17	**MSR	Servo motor series setting	0000h				○	Section 5.2.2
PA18	**MTY	Servo motor type setting	0000h				○	
PA19	*BLK	Parameter writing inhibit	00ABh		○	○	○	MR-J4-_B
PA20	*TDS	Tough drive setting	0000h		○	○	○	
PA21	*AOP3	Function selection A-3	0001h		○	○	○	
PA22	**PCS	Position control composition selection	0000h		○			
PA23	DRAT	Drive recorder arbitrary alarm trigger setting	0000h		○	○	○	

No.	Symbol	Name	Initial value	Unit	Operation mode			Detailed explanation
					Standard	Full.	Lin.	
PA24	AOP4	Function selection A-4	0000h		○	○	○	MR-J4-_B
PA25	OTHOV	One-touch tuning - Overshoot permissible level	0	[%]	○	○	○	
PA26	*AOP5	Function selection A-5	0000h		○	○	○	
PA27		For manufacturer setting	0000h					
PA28			0000h					
PA29			0000h					
PA30			0000h					
PA31			0000h					
PA32			0000h					

(2) Gain/filter setting parameters ([Pr. PB_ _])

No.	Symbol	Name	Initial value	Unit	Operation mode			Detailed explanation
					Standard	Full.	Lin.	
PB01	FILT	Adaptive tuning mode (adaptive filter II)	0000h		○	○	○	MR-J4-_B
PB02	VRFT	Vibration suppression control tuning mode (advanced vibration suppression control II)	0000h		○	○	○	
PB03	TFBGN	Torque feedback loop gain	18000	[rad/s]	○	○	○	
PB04	FFC	Feed forward gain	0	[%]	○	○	○	
PB05		For manufacturer setting	500					
PB06	GD2	Load to motor inertia ratio/load to motor mass ratio	7.00	[Multiplier]	○	○	○	MR-J4-_B
PB07	PG1	Model loop gain	15.0	[rad/s]	○	○	○	
PB08	PG2	Position loop gain	37.0	[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	OVA	Overshoot amount compensation	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	NHF	Shaft resonance suppression filter	0000h		○	○	○	
PB18	LPF	Low-pass filter setting	3141	[rad/s]	○	○	○	
PB19	VRF11	Vibration suppression control 1 - Vibration frequency	100.0	[Hz]	○	○	○	
PB20	VRF12	Vibration suppression control 1 - Resonance frequency	100.0	[Hz]	○	○	○	
PB21	VRF13	Vibration suppression control 1 - Vibration frequency damping	0.00		○	○	○	
PB22	VRF14	Vibration suppression control 1 - Resonance frequency damping	0.00		○	○	○	
PB23	VFBF	Low-pass filter selection	0000h		○	○	○	
PB24	*MVS	Slight vibration suppression control	0000h		○	○	○	
PB25		For manufacturer setting	0000h					
PB26	*CDP	Gain switching function	0000h		○	○	○	MR-J4-_B
PB27	CDL	Gain switching condition	10	[kpps]/ [pulse]/ [r/min]	○	○	○	
PB28	CDT	Gain switching time constant	1	[ms]	○	○	○	
PB29	GD2B	Load to motor inertia ratio/load to motor mass ratio after gain switching	7.00	[Multiplier]	○	○	○	
PB30	PG2B	Position loop gain after gain switching	0.0	[rad/s]	○	○	○	

No.	Symbol	Name	Initial value	Unit	Operation mode			Detailed explanation
					Standard	Full.	Lin.	
PB31	VG2B	Speed loop gain after gain switching	0	[rad/s]	○	○	○	MR-J4-_B
PB32	VICB	Speed integral compensation after gain switching	0.0	[ms]	○	○	○	
PB33	VRF11B	Vibration suppression control 1 - Vibration frequency after gain switching	0.0	[Hz]	○	○	○	
PB34	VRF12B	Vibration suppression control 1 - Resonance frequency after gain switching	0.0	[Hz]	○	○	○	
PB35	VRF13B	Vibration suppression control 1 - Vibration frequency damping after gain switching	0.00		○	○	○	
PB36	VRF14B	Vibration suppression control 1 - Resonance frequency damping after gain switching	0.00		○	○	○	
PB37		For manufacturer setting	1600					
PB38			0.00					
PB39			0.00					
PB40			0.00					
PB41			0					
PB42			0					
PB43			0000h					
PB44			0.00					
PB45	CNHF	Command notch filter	0000h		○	○	○	Section 5.2.2
PB46	NH3	Machine resonance suppression filter 3	4500	[Hz]	○	○	○	MR-J4-_B
PB47	NHQ3	Notch shape selection 3	0000h		○	○	○	
PB48	NH4	Machine resonance suppression filter 4	4500	[Hz]	○	○	○	
PB49	NHQ4	Notch shape selection 4	0000h		○	○	○	
PB50	NH5	Machine resonance suppression filter 5	4500	[Hz]	○	○	○	
PB51	NHQ5	Notch shape selection 5	0000h		○	○	○	
PB52	VRF21	Vibration suppression control 2 - Vibration frequency	100.0	[Hz]	○	○	○	
PB53	VRF22	Vibration suppression control 2 - Resonance frequency	100.0	[Hz]	○	○	○	
PB54	VRF23	Vibration suppression control 2 - Vibration frequency damping	0.00		○	○	○	
PB55	VRF24	Vibration suppression control 2 - Resonance frequency damping	0.00		○	○	○	
PB56	VRF21B	Vibration suppression control 2 - Vibration frequency after gain switching	0.0	[Hz]	○	○	○	
PB57	VRF22B	Vibration suppression control 2 - Resonance frequency after gain switching	0.0	[Hz]	○	○	○	
PB58	VRF23B	Vibration suppression control 2 - Vibration frequency damping after gain switching	0.00		○	○	○	
PB59	VRF24B	Vibration suppression control 2 - Resonance frequency damping after gain switching	0.00		○	○	○	
PB60	PG1B	Model loop gain after gain switching	0.0	[rad/s]	○	○	○	
PB61		For manufacturer setting	0.0					
PB62			0000h					
PB63			0000h					
PB64			0000h					

(3) Extension setting parameters ([Pr. PC_ _])

No.	Symbol	Name	Initial value	Unit	Operation mode			Detailed explanation
					Standard	Full.	Lin.	
PC01	ERZ	Error excessive alarm level	0	[rev]/ [mm]	○	○	○	MR-J4-_B
PC02	MBR	Electromagnetic brake sequence output	0	[ms]	○	○	○	
PC03	*ENRS	Encoder output pulse selection	0000h		○	○	○	
PC04	**COP1	Function selection C-1	0000h		○	○	○	
PC05	**COP2	Function selection C-2	0000h		○			
PC06	*COP3	Function selection C-3	0000h		○	○	○	
PC07	ZSP	Zero speed	50	[r/min]/ [mm/s]	○	○	○	
PC08	OSL	Overspeed alarm detection level	0	[r/min]/ [mm/s]	○	○	○	
PC09	MOD1	Analog monitor 1 output	0000h		○	○	○	Section 5.2.2
PC10	MOD2	Analog monitor 2 output	0001h		○	○	○	
PC11	MO1	Analog monitor 1 offset	0	[mV]	○	○	○	MR-J4-_B
PC12	MO2	Analog monitor 2 offset	0	[mV]	○	○	○	
PC13	MOSDL	Analog monitor - Feedback position output standard data - Low	0	[pulse]	○	○	○	
PC14	MOSDH	Analog monitor - Feedback position output standard data - High	0	[10000pulses]	○	○	○	
PC15		For manufacturer setting	0					
PC16			0000h					
PC17	**COP4	Function selection C-4	0000h		○	○	○	MR-J4-_B
PC18	*COP5	Function selection C-5	0000h		○	○	○	
PC19		For manufacturer setting	0000h					
PC20	*COP7	Function selection C-7	0000h		○	○	○	MR-J4-_B
PC21	*BPS	Alarm history clear	0000h		○	○	○	
PC22		For manufacturer setting	0					
PC23			0000h					
PC24	RSBR	Forced stop deceleration time constant	100	[ms]	○	○	○	MR-J4-_B
PC25		For manufacturer setting	0					
PC26	**COP8	Function selection C-8	0000h		○	○	○	MR-J4-_B
PC27	**COP9	Function selection C-9	0000h			○	○	
PC28		For manufacturer setting	0000h					
PC29	*COPB	Function selection C-B	0000h		○		○	MR-J4-_B
PC30		For manufacturer setting	0					
PC31	RSUP1	Vertical axis freefall prevention compensation amount	0	[0.0001rev]/ [0.01mm]	○	○	○	MR-J4-_B
PC32		For manufacturer setting	0000h					
PC33			0					
PC34			100					
PC35			0000h					
PC36			0000h					
PC37			0000h					
PC38			0000h					
PC39			0000h					
PC40			0000h					
PC41			0000h					
PC42			0000h					
PC43			0000h					
PC44			0000h					
PC45			0000h					
PC46			0000h					

No.	Symbol	Name	Initial value	Unit	Operation mode			Detailed explanation
					Standard	Full.	Lin.	
PC47		For manufacturer setting	0000h					
PC48			0000h					
PC49			0000h					
PC50			0000h					
PC51			0000h					
PC52			0000h					
PC53			0000h					
PC54			0000h					
PC55			0000h					
PC56			0000h					
PC57			0000h					
PC58			0000h					
PC59			0000h					
PC60			0000h					
PC61			0000h					
PC62			0000h					
PC63			0000h					
PC64			0000h					

(4) I/O setting parameters ([Pr. PD_ _])

No.	Symbol	Name	Initial value	Unit	Operation mode			Detailed explanation
					Standard	Full.	Lin.	
PD01		For manufacturer setting	0000h					
PD02	*DIA2	Input signal automatic on selection 2	0000h		○	○	○	MR-J4-_B
PD03		For manufacturer setting	0020h					
PD04			0021h					
PD05			0022h					
PD06			0000h					
PD07	*DO1	Output device selection 1	0005h		○	○	○	MR-J4-_B
PD08	*DO2	Output device selection 2	0004h		○	○	○	
PD09	*DO3	Output device selection 3	0003h		○	○	○	
PD10		For manufacturer setting	0000h					
PD11			0004h					
PD12	*DOP1	Function selection D-1	0000h		○	○	○	MR-J4-_B
PD13		For manufacturer setting	0000h					
PD14	*DOP3	Function selection D-3	0000h		○	○	○	MR-J4-_B
PD15		For manufacturer setting	0000h					
PD16			0000h					
PD17			0000h					
PD18			0000h					
PD19			0000h					
PD20			0					
PD21			0					
PD22			0					
PD23			0					
PD24			0000h					
PD25			0000h					
PD26			0000h					

No.	Symbol	Name	Initial value	Unit	Operation mode			Detailed explanation
					Standard	Full.	Lin.	
PD27		For manufacturer setting	0000h					
PD28			0000h					
PD29			0000h					
PD30			0					
PD31			0					
PD32			0					
PD33			0000h					
PD34			0000h					
PD35			0000h					
PD36			0000h					
PD37			0000h					
PD38			0000h					
PD39			0000h					
PD40			0000h					
PD41			0000h					
PD42			0000h					
PD43			0000h					
PD44			0000h					
PD45			0000h					
PD46			0000h					
PD47			0000h					
PD48			0000h					

(5) Extension setting 2 parameters ([Pr. PE_ _])

No.	Symbol	Name	Initial value	Unit	Operation mode			Detailed explanation
					Standard	Full.	Lin.	
PE01	**FCT1	Fully closed loop function selection 1	0000h			○		MR-J4-_B
PE02		For manufacturer setting	0000h					
PE03	*FCT2	Fully closed loop function selection 2	0003h			○		MR-J4-_B
PE04	**FBN	Fully closed loop control - Feedback pulse electronic gear 1 - Numerator	1			○		
PE05	**FBD	Fully closed loop control - Feedback pulse electronic gear 1 - Denominator	1			○		
PE06	BC1	Fully closed loop control - Speed deviation error detection level	400	[r/min]		○		
PE07	BC2	Fully closed loop control - Position deviation error detection level	100	[kpulse]		○		
PE08	DUF	Fully closed loop dual feedback filter	10	[rad/s]		○		
PE09		For manufacturer setting	0000h					
PE10	FCT3	Fully closed loop function selection 3	0000h			○		MR-J4-_B
PE11		For manufacturer setting	0000h					
PE12			0000h					
PE13			0000h					
PE14			0111h					
PE15			20					
PE16			0000h					
PE17			0000h					
PE18			0000h					
PE19			0000h					
PE20			0000h					

No.	Symbol	Name	Initial value	Unit	Operation mode			Detailed explanation
					Standard	Full.	Lin.	
PE21		For manufacturer setting	0000h					
PE22			0000h					
PE23			0000h					
PE24			0000h					
PE25			0000h					
PE26			0000h					
PE27			0000h					
PE28			0000h					
PE29			0000h					
PE30			0000h					
PE31			0000h					
PE32			0000h					
PE33			0000h					
PE34	**FBN2	Fully closed loop control - Feedback pulse electronic gear 2 - Numerator	1			○		MR-J4-_B
PE35	**FBD2	Fully closed loop control - Feedback pulse electronic gear 2 - Denominator	1			○		
PE36		For manufacturer setting	0.0					
PE37			0.00					
PE38			0.00					
PE39			20					
PE40			0000h					
PE41	EOP3	Function selection E-3	0000h		○	○	○	MR-J4-_B
PE42		For manufacturer setting	0					
PE43			0.0					
PE44			0000h					
PE45			0000h					
PE46			0000h					
PE47			0000h					
PE48			0000h					
PE49			0000h					
PE50			0000h					
PE51			0000h					
PE52			0000h					
PE53			0000h					
PE54			0000h					
PE55			0000h					
PE56			0000h					
PE57			0000h					
PE58			0000h					
PE59			0000h					
PE60			0000h					
PE61			0.00					
PE62			0.00					
PE63			0.00					
PE64			0.00					

(6) Extension setting 3 parameters ([Pr. PF_ _])

No.	Symbol	Name	Initial value	Unit	Operation mode			Detailed explanation
					Standard	Full.	Lin.	
PF01		For manufacturer setting	0000h					
PF02			0000h					
PF03			0000h					
PF04			0					
PF05			0000h					
PF06	*FOP5	Function selection F-5	0000h		○	○	○	MR-J4-_B
PF07		For manufacturer setting	0000h					
PF08			0000h					
PF09			0					
PF10			0					
PF11			0					
PF12	DBT	Electronic dynamic brake operating time	2000	[ms]	○	○	○	MR-J4-_B
PF13		For manufacturer setting	0000h					
PF14			10					
PF15			0000h					
PF16			0000h					
PF17			0000h					
PF18			0000h					
PF19			0000h					
PF20			0000h					
PF21	DRT	Drive recorder switching time setting	0	[s]	○	○	○	MR-J4-_B
PF22		For manufacturer setting	200					
PF23	OSCL1	Vibration tough drive - Oscillation detection level	50	[%]	○	○	○	MR-J4-_B
PF24	*OSCL2	Vibration tough drive function selection	0000h		○	○	○	
PF25	CVAT	SEMI-F47 function - Instantaneous power failure detection time (instantaneous power failure tough drive - detection time)	200	[ms]	○	○	○	
PF26		For manufacturer setting	0					
PF27			0					
PF28			0					
PF29			0000h					
PF30			0					
PF31	FRIC	Machine diagnosis function - Friction judgement speed	0	[r/min]/ [mm/s]	○	○	○	MR-J4-_B
PF32		For manufacturer setting	50					
PF33			0000h					
PF34			0000h					
PF35			0000h					
PF36			0000h					
PF37			0000h					
PF38			0000h					
PF39			0000h					
PF40			0000h					
PF41			0000h					
PF42			0000h					
PF43			0000h					
PF44			0000h					
PF45			0000h					
PF46			0000h					
PF47			0000h					
PF48			0000h					

(7) Linear servo motor/DD motor setting parameters ([Pr. PL_ _])

No.	Symbol	Name	Initial value	Unit	Operation mode			Detailed explanation
					Standard	Full.	Lin.	
PL01	**LIT1	Linear servo motor function selection 1	0301h				○	MR-J4-_B
PL02	**LIM	Linear encoder resolution - Numerator	1000	[μm]			○	
PL03	**LID	Linear encoder resolution - Denominator	1000	[μm]			○	
PL04	*LIT2	Linear servo motor function selection 2	0003h				○	
PL05	LB1	Position deviation error detection level	0	[mm]			○	
PL06	LB2	Speed deviation error detection level	0	[mm/s]			○	
PL07	LB3	Thrust deviation error detection level	100	[%]			○	
PL08	*LIT3	Linear servo motor function selection 3	0010h				○	
PL09	LPWM	Magnetic pole detection voltage level	30	[%]			○	
PL10		For manufacturer setting	5					
PL11			100					
PL12			500					
PL13			0000h					
PL14			0					
PL15			20					
PL16			0					
PL17	LTSTS	Magnetic pole detection - Minute position detection method - Function selection	0000h				○	MR-J4-_B
PL18	IDLV	Magnetic pole detection - Minute position detection method - Identification signal amplitude	0	[%]			○	
PL19		For manufacturer setting	0					
PL20			0					
PL21			0					
PL22			0					
PL23			0000h					
PL24			0					
PL25			0000h					
PL26			0000h					
PL27			0000h					
PL28			0000h					
PL29			0000h					
PL30			0000h					
PL31			0000h					
PL32			0000h					
PL33			0000h					
PL34			0000h					
PL35			0000h					
PL36			0000h					
PL37			0000h					
PL38			0000h					
PL39			0000h					
PL40			0000h					
PL41			0000h					
PL42			0000h					
PL43			0000h					
PL44			0000h					
PL45			0000h					
PL46			0000h					
PL47			0000h					
PL48			0000h					

5.2.2 Detailed list of parameters

POINT

●"x" in the "Setting digit" columns means which digit to set a value.

(1) Basic setting parameters ([Pr. PA_ _])

<table>
<tr><th>No.</th><th>Symbol</th><th>Name and function</th><th>Initial value [unit]</th><th>Setting range</th></tr>
<tr><td>PA01</td><td>**STY</td><td>Operation mode
Select a operation mode.
<table><tr><th>Setting digit</th><th>Explanation</th><th>Initial value</th></tr><tr><td>_ _ _ x</td><td>For manufacturer setting</td><td>0h</td></tr><tr><td>_ _ x _</td><td>Operation mode selection
0: Standard control mode
1: Fully closed loop control mode
4. Linear servo motor control mode
Setting other than above will result in [AL. 37 Parameter error].</td><td>0h</td></tr><tr><td>_ x _ _</td><td>For manufacturer setting</td><td>0h</td></tr><tr><td>x _ _ _</td><td>Operation mode selection
To change this digit, use an application software "MR-J4(W)-B mode selection". When you change it without the application, [AL. 3E Operation mode error] will occur.
0: J3 compatibility mode
1: J4 mode</td><td>1h</td></tr></table></td><td colspan="2">Refer to Name and function column.</td></tr>
</table>

<table>
<tr><th>No.</th><th>Symbol</th><th>Name and function</th><th>Initial value [unit]</th><th>Setting range</th></tr>
<tr><td>PA02</td><td>**REG</td><td>Regenerative option
Used to select the regenerative option.
Incorrect setting may cause the regenerative option to burn.
If a selected regenerative option is not for use with the servo amplifier, [AL. 37 Parameter error] occurs.
<table><tr><th>Setting digit</th><th>Explanation</th><th>Initial value</th></tr><tr><td>_ _ x x</td><td>Regenerative option selection
00: Regenerative option is not used.
・For servo amplifier of 0.6 kW to 7 kW, built-in regenerative resistor is used.
・Supplied regenerative resistors or regenerative option is used with the servo amplifier of 11 kW to 22 kW.
01: FR-RC-H/FR-CV-H/FR-BU2-H
When you use FR-RC-H, FR-CV-H, or FR-BU2-H, select "Mode 2 (_ _ _ 1)" of "Undervoltage alarm detection mode selection" in [Pr. PC20].
80: MR-RB1H-4
81: MR-RB3M-4 (Cooling fan is required.)
82: MR-RB3G-4 (Cooling fan is required.)
83: MR-RB5G-4 (Cooling fan is required.)
84: MR-RB34-4 (Cooling fan is required.)
85: MR-RB54-4 (Cooling fan is required.)
91: MR-RB3U-4 (Cooling fan is required.)
92: MR-RB5U-4 (Cooling fan is required.)
FA: When the supplied regenerative resistors or the regenerative option is cooled by the cooling fan to increase the ability with the servo amplifier of 11 kW to 22 kW.</td><td>00h</td></tr><tr><td>_ x _ _</td><td>For manufacturer setting</td><td>0h</td></tr><tr><td>x _ _ _</td><td></td><td>0h</td></tr></table></td><td>Refer to Name and function column.</td><td></td></tr>
<tr><td>PA17</td><td>**MSR</td><td>Servo motor series setting
When you use a linear servo motor, select its model from [Pr. PA17] and [Pr. PA18]. Set this and [Pr. PA18] at a time.
Refer to the following table for settings.
<table><tr><th rowspan="2">Linear servo motor series</th><th rowspan="2">Servo motor model (primary side)</th><th colspan="2">Parameter</th></tr><tr><th>[Pr. PA17] setting</th><th>[Pr. PA18] setting</th></tr><tr><td>LM-F</td><td>LM-FP5H-60M-1SS0</td><td>00B2h</td><td>5801h</td></tr></table></td><td>0000h</td><td>Refer to Name and function column.</td></tr>
<tr><td>PA18</td><td>**MTY</td><td>Servo motor type setting
When you use a linear servo motor, select its model from [Pr. PA17] and [Pr. PA18]. Set this and [Pr. PA17] at a time.
Refer to the table of [Pr. PA17] for settings.</td><td>0000h</td><td>Refer to Name and function column of [Pr. PA17].</td></tr>
</table>

(2) Extension setting parameters ([Pr. PC_ _])

<table>
<tr><th>No.</th><th>Symbol</th><th>Name and function</th><th>Initial value [unit]</th><th>Setting range</th></tr>
<tr><td>PC09</td><td>MOD1</td><td>Analog monitor 1 output
Select a signal to output to MO1 (Analog monitor 1). Refer to appendix 3.2 (3) for detection point of output selection.

<table>
<tr><th>Setting digit</th><th>Explanation</th><th>Initial value</th></tr>
<tr><td>_ _ x x</td><td>Analog monitor 1 output selection
Refer to table 5.2 for settings.</td><td>00h</td></tr>
<tr><td>_ x _ _</td><td rowspan="2">For manufacturer setting</td><td>0h</td></tr>
<tr><td>x _ _ _</td><td>0h</td></tr>
</table>

Table 5.2 Analog monitor setting value
<table>
<tr><th rowspan="2">Setting value</th><th rowspan="2">Item</th><th colspan="3">Operation mode (Note 1)</th></tr>
<tr><th>Standard</th><th>Full.</th><th>Lin.</th></tr>
<tr><td>00</td><td>(Linear) servo motor speed (±8 V/max. speed)</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>01</td><td>Torque or thrust (±8 V/max. torque or max. thrust)</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>02</td><td>(Linear) servo motor speed (+8V/max. speed)</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>03</td><td>Torque or thrust (+8 V/max. torque or max. thrust)</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>04</td><td>Current command (±8 V/max. current command)</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>05</td><td>Speed command (±8 V/max. speed)</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>06</td><td>Servo motor-side droop pulses (±10 V/100 pulses) (Note 2)</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>07</td><td>Servo motor-side droop pulses (±10 V/1000 pulses) (Note 2)</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>08</td><td>Servo motor-side droop pulses (±10 V/10000 pulses) (Note 2)</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>09</td><td>Servo motor-side droop pulses (±10 V/100000 pulses) (Note 2)</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>0A</td><td>Feedback position (±10 V/1 Mpulses) (Note 2)</td><td>○</td><td></td><td></td></tr>
<tr><td>0B</td><td>Feedback position (±10 V/10 Mpulses) (Note 2)</td><td>○</td><td></td><td></td></tr>
<tr><td>0C</td><td>Feedback position (±10 V/100 Mpulses) (Note 2)</td><td>○</td><td></td><td></td></tr>
<tr><td>0D</td><td>Bus voltage (+8 V/800 V)</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>0E</td><td>Speed command 2 (±8 V/max. speed)</td><td>○</td><td>○</td><td>○</td></tr>
<tr><td>10</td><td>Load-side droop pulses (±10 V/100 pulses) (Note 2)</td><td></td><td>○</td><td></td></tr>
<tr><td>11</td><td>Load-side droop pulses (±10 V/1000 pulses) (Note 2)</td><td></td><td>○</td><td></td></tr>
<tr><td>12</td><td>Load-side droop pulses (±10 V/10000 pulses) (Note 2)</td><td></td><td>○</td><td></td></tr>
<tr><td>13</td><td>Load-side droop pulses (±10 V/100000 pulses) (Note 2)</td><td></td><td>○</td><td></td></tr>
<tr><td>14</td><td>Load-side droop pulses (±10 V/1 Mpulses) (Note 2)</td><td></td><td>○</td><td></td></tr>
<tr><td>15</td><td>Servo motor-side/load-side position deviation (±10 V/100000 pulses)</td><td></td><td>○</td><td></td></tr>
<tr><td>16</td><td>Servo motor-side/load-side speed deviation (±8 V/max. speed)</td><td></td><td>○</td><td></td></tr>
<tr><td>17</td><td>Encoder inside temperature (±10 V/±128 ˚C)</td><td>○</td><td>○</td><td></td></tr>
</table>
Note 1. Items with ○ are available for each operation mode.
Standard: Standard (semi closed loop system) use of the rotary servo motor
Full.: Fully closed loop system use of the rotary servo motor
Lin.: Linear servo motor use
2. Encoder pulse unit</td><td>Refer to Name and function column.</td><td></td></tr>
</table>

<table>
<tr><th>No.</th><th>Symbol</th><th>Name and function</th><th>Initial value [unit]</th><th>Setting range</th></tr>
<tr><td>PC10</td><td>MOD2</td><td>Analog monitor 2 output
Select a signal to output to MO2 (Analog monitor 2). Refer to appendix 3.2 (3) for detection point of output selection.
<table><tr><th>Setting digit</th><th>Explanation</th><th>Initial value</th></tr><tr><td>_ _ x x</td><td>Analog monitor 2 output selection
Refer to [Pr. PC09] for settings.</td><td>01h</td></tr><tr><td>_ x _ _</td><td rowspan="2">For manufacturer setting</td><td>0h</td></tr><tr><td>x _ _ _</td><td>0h</td></tr></table></td><td colspan="2">Refer to Name and function column.</td></tr>
</table>

6. TROUBLESHOOTING

POINT

●Refer to "MELSERVO-J4 Servo Amplifier Instruction Manual (Troubleshooting)" for details of alarms and warnings.

●As soon as an alarm occurs, turn SON (Servo-on) off and interrupt the power.

6.1 MR-J4-_A4(-RJ)

6.1.1 Alarm and warning list

When an error occurs during operation, the corresponding alarm or warning is displayed. When the alarm or the warning occurs, refer to "MELSERVO-J4 Servo Amplifier Instruction Manual (Troubleshooting)" to remove the failure. When an alarm occurs, ALM will turn off.
To output alarm codes, set [Pr. PD34] to "_ _ _ 1". Alarm codes are outputted by on/off of bit 0 to bit 2. Warnings ([AL. 91] to [AL. F3]) do not have alarm codes. The alarm codes in the following table will be outputted when they occur. The alarm codes will not be outputted in normal condition.
After its cause has been removed, the alarm can be deactivated in any of the methods marked ○ in the alarm deactivation column. Warnings are automatically canceled after the cause of occurrence is removed.
For the alarms and warnings in which "SD" is written in the stop method column, the axis stops with the dynamic brake after forced stop deceleration. For the alarms and warnings in which "DB" or "EDB" is written in the stop method column, the servo motor stops with the dynamic brake without forced stop deceleration.

	No.	Alarm code			Name	Detail display	Detail name	Stop method (Note 2, 3)	Alarm deactivation			Operation mode		
		CN1 22 (Bit 2)	CN1 23 (Bit 1)	CN1 24 (Bit 0)					Alarm reset (RES)	Press the "SET" button on the current alarm screen.	Power off → on	Standard	Full.	Lin.
Alarm	10	0	1	0	Undervoltage	10.1	Voltage drop in the control circuit power	EDB	○	○	○	○	○	○
						10.2	Voltage drop in the main circuit power	SD	○	○	○	○	○	○
	12	0	0	0	Memory error 1 (RAM)	12.1	RAM error 1	DB			○	○	○	○
						12.2	RAM error 2	DB			○	○	○	○
						12.4	RAM error 4	DB			○	○	○	○
						12.5	RAM error 5	DB			○	○	○	○
	13	0	0	0	Clock error	13.1	Clock error 1	DB			○	○	○	○
						13.2	Clock error 2	DB			○	○	○	○
	14	0	0	0	Control process error	14.1	Control process error 1	DB			○	○	○	○
						14.2	Control process error 2	DB			○	○	○	○
						14.3	Control process error 3	DB			○	○	○	○
						14.4	Control process error 4	DB			○	○	○	○
						14.5	Control process error 5	DB			○	○	○	○
						14.6	Control process error 6	DB			○	○	○	○
						14.7	Control process error 7	DB			○	○	○	○
						14.8	Control process error 8	DB			○	○	○	○
						14.9	Control process error 9	DB			○	○	○	○
						14.A	Control process error 10	DB			○	○	○	○
	15	0	0	0	Memory error 2 (EEP-ROM)	15.1	EEP-ROM error at power on	DB			○	○	○	○
						15.2	EEP-ROM error during operation	DB			○	○	○	○

	No.	Alarm code			Name	Detail display	Detail name	Stop method (Note 2, 3)	Alarm deactivation			Operation mode		
		CN1 22 (Bit 2)	CN1 23 (Bit 1)	CN1 24 (Bit 0)					Alarm reset (RES)	Press the "SET" button on the current alarm screen.	Power off → on	Standard	Full.	Lin.
Alarm	16	1	1	0	Encoder initial communication error 1	161 or less	Encoder initial communication - Receive data error 1	DB			○	○	○	○
						16.2	Encoder initial communication - Receive data error 2	DB			○	○	○	○
						16.3	Encoder initial communication - Receive data error 3	DB			○	○	○	○
						16.5	Encoder initial communication - Transmission data error 1	DB			○	○	○	○
						16.6	Encoder initial communication - Transmission data error 2	DB			○	○	○	○
						16.7	Encoder initial communication - Transmission data error 3	DB			○	○	○	○
						16.A	Encoder initial communication - Process error 1	DB			○	○	○	
						16.B	Encoder initial communication - Process error 2	DB			○	○	○	
						16.C	Encoder initial communication - Process error 3	DB			○	○	○	
						16.D	Encoder initial communication - Process error 4	DB			○	○	○	
						16.E	Encoder initial communication - Process error 5	DB			○	○	○	
						16.F	Encoder initial communication - Process error 6	DB			○	○	○	
	17	0	0	0	Board error	17.1	Board error 1	DB			○	○	○	○
						17.3	Board error 2	DB			○	○	○	○
						17.4	Board error 3	DB			○	○	○	○
	19	0	0	0	Memory error 3 (FLASH-ROM)	19.1	FLASH-ROM error 1	DB			○	○	○	○
						19.2	FLASH-ROM error 2	DB			○	○	○	○
	1A	1	1	0	Servo motor combination error	1A.1	Servo motor combination error	DB			○	○	○	○
						1A.2	Servo motor control mode combination error	DB			○	○	○	○
	1E	1	1	0	Encoder initial communication error 2	1E.1	Encoder malfunction	DB			○	○	○	
						1E.2	Load-side encoder malfunction	DB			○		○	
	1F	1	1	0	Encoder initial communication error 3	1F.1	Incompatible encoder	DB			○	○	○	○
						1F.2	Incompatible load-side encoder	DB			○		○	
	20	1	1	0	Encoder normal communication error 1	20.1	Encoder normal communication - Receive data error 1	EDB			○	○	○	○
						20.2	Encoder normal communication - Receive data error 2	EDB			○	○	○	○
						20.3	Encoder normal communication - Receive data error 3	EDB			○	○	○	○
						20.5	Encoder normal communication - Transmission data error 1	EDB			○	○	○	○
						20.6	Encoder normal communication - Transmission data error 2	EDB			○	○	○	○
						20.7	Encoder normal communication - Transmission data error 3	EDB			○	○	○	○
						20.9	Encoder normal communication - Receive data error 4	EDB			○	○	○	○
						20.A	Encoder normal communication - Receive data error 5	EDB			○	○	○	○
	21	1	1	0	Encoder normal communication error 2	21.1	Encoder data error 1	EDB			○	○	○	
						21.2	Encoder data update error	EDB			○	○	○	
						21.3	Encoder data waveform error	EDB			○	○	○	
						21.4	Encoder non-signal error	EDB			○		○	○
						21.5	Encoder hardware error 1	EDB			○	○		
						21.6	Encoder hardware error 2	EDB			○	○		
						21.9	Encoder data error 2	EDB			○	○	○	

	No.	Alarm code			Name	Detail display	Detail name	Stop method (Note 2, 3)	Alarm deactivation			Operation mode		
		CN1 22 (Bit 2)	CN1 23 (Bit 1)	CN1 24 (Bit 0)					Alarm reset (RES)	Press the "SET" button on the current alarm screen.	Power off → on	Standard	Full.	Lin.
Alarm	24	1	0	0	Main circuit error	24.1	Ground fault detected by hardware detection circuit	DB			○	○	○	○
						24.2	Ground fault detected by software detection function	DB	○	○	○	○	○	○
	25	1	1	0	Absolute position erased	25.1	Servo motor encoder - Absolute position erased	DB			○	○	○	
	27	1	1	0	Initial magnetic pole detection error	27.1	Initial magnetic pole detection - Abnormal termination	DB	○	○	○			○
						27.2	Initial magnetic pole detection - Time out error	DB	○	○	○			○
						27.3	Initial magnetic pole detection - Limit switch error	DB	○	○	○			○
						27.4	Initial magnetic pole detection - Estimated error	DB	○	○	○			○
						27.5	Initial magnetic pole detection - Position deviation error	DB	○	○	○			○
						27.6	Initial magnetic pole detection - Speed deviation error	DB	○	○	○			○
						27.7	Initial magnetic pole detection - Current error	DB	○	○	○			○
	28	1	1	0	Linear encoder error 2	28.1	Linear encoder - Environment error 2	EDB			○		○	○
	2A	1	1	0	Linear encoder error 1	2A.1	Linear encoder error 1-1	EDB			○		○	○
						2A.2	Linear encoder error 1-2	EDB			○		○	○
						2A.3	Linear encoder error 1-3	EDB			○		○	○
						2A.4	Linear encoder error 1-4	EDB			○		○	○
						2A.5	Linear encoder error 1-5	EDB			○		○	○
						2A.6	Linear encoder error 1-6	EDB			○		○	○
						2A.7	Linear encoder error 1-7	EDB			○		○	○
						2A.8	Linear encoder error 1-8	EDB			○		○	○
	2B	1	1	0	Encoder counter error	2B.1	Encoder counter error 1	EDB			○			
						2B.2	Encoder counter error 2	EDB			○			
	30	0	0	1	Regenerative error (Note 1)	30.1	Regeneration heat error	DB	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
						30.2	Regeneration signal error	DB	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
						30.3	Regeneration feedback signal error	DB	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
	31	1	0	1	Overspeed	31.1	Abnormal motor speed	SD	○	○	○	○	○	○
	32	1	0	0	Overcurrent	32.1	Overcurrent detected at hardware detection circuit (during operation)	DB			○	○	○	○
						32.2	Overcurrent detected at software detection function (during operation)	DB	○	○	○	○	○	○
						32.3	Overcurrent detected at hardware detection circuit (during a stop)	DB			○	○	○	○
						32.4	Overcurrent detected at software detection function (during a stop)	DB	○	○	○	○	○	○
	33	0	0	1	Overvoltage	33.1	Main circuit voltage error	EDB	○	○	○	○	○	○
	35	1	0	1	Command frequency error	35.1	Command frequency error	SD	○	○	○	○	○	○
	37	0	0	0	Parameter error	37.1	Parameter setting range error	DB			○	○	○	○
						37.2	Parameter combination error	DB			○	○	○	○
	3A	0	0	0	Inrush current suppression circuit error	3A.1	Inrush current suppression circuit error	EDB			○	○	○	○

	No.	Alarm code			Name	Detail display	Detail name	Stop method (Note 2, 3)	Alarm deactivation			Operation mode		
		CN1 22 (Bit 2)	CN1 23 (Bit 1)	CN1 24 (Bit 0)					Alarm reset (RES)	Press the "SET" button on the current alarm screen.	Power off → on	Standard	Full.	Lin.
Alarm	42	1	1	0	Servo control error	42.1	Servo control error by position deviation	EDB	△ (Note 4)	△ (Note 4)	○			○
						42.2	Servo control error by speed deviation	EDB	△ (Note 4)	△ (Note 4)	○			○
						42.3	Servo control error by torque/thrust deviation	EDB	△ (Note 4)	△ (Note 4)	○			○
					Fully closed loop control error	42.8	Fully closed loop control error by position deviation	EDB	△ (Note 4)	△ (Note 4)	○		○	
						42.9	Fully closed loop control error by speed deviation	EDB	△ (Note 4)	△ (Note 4)	○		○	
						42.A	Fully closed loop control error by position deviation during command stop	EDB	△ (Note 4)	△ (Note 4)	○		○	
	45	0	1	1	Main circuit device overheat (Note 1)	45.1	Main circuit device overheat error	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
	46	0	1	1	Servo motor overheat (Note 1)	46.1	Abnormal temperature of servo motor 1	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	
						46.2	Abnormal temperature of servo motor 2	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)		○	○
						46.3	Thermistor disconnected	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
						46.5	Abnormal temperature of servo motor 3	DB	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	
						46.6	Abnormal temperature of servo motor 4	DB	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	
	47	0	1	1	Cooling fan error	47.1	Cooling fan stop error	SD			○	○	○	○
						47.2	Cooling fan speed reduction error	SD			○	○	○	○
	50	0	1	1	Overload 1 (Note 1)	50.1	Thermal overload error 1 during operation	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
						50.2	Thermal overload error 2 during operation	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
						50.3	Thermal overload error 4 during operation	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
						50.4	Thermal overload error 1 during a stop	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
						50.5	Thermal overload error 2 during a stop	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
						50.6	Thermal overload error 4 during a stop	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
	51	0	1	1	Overload 2 (Note 1)	51.1	Thermal overload error 3 during operation	DB	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
						51.2	Thermal overload error 3 during a stop	DB	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
	52	1	0	1	Error excessive	52.1	Excess droop pulse 1	SD	○	○	○	○	○	○
						52.3	Excess droop pulse 2	SD	○	○	○	○	○	○
						52.4	Error excessive during 0 torque limit	SD	○	○	○	○	○	○
						52.5	Excess droop pulse 3	EDB	○	○	○	○	○	○
	54	0	1	1	Oscillation detection	54.1	Oscillation detection error	EDB	○	○	○	○	○	○
	56	1	1	0	Forced stop error	56.2	Over speed during forced stop	EDB	○	○	○	○	○	○
						56.3	Estimated distance over during forced stop	EDB	○	○	○	○	○	○
	63	1	1	0	STO timing error	63.1	STO1 off	DB	○	○	○	○	○	○
						63.2	STO2 off	DB	○	○	○	○	○	○

	No.	Alarm code			Name	Detail display	Detail name	Stop method (Note 2, 3)	Alarm deactivation			Operation mode		
		CN1 22 (Bit 2)	CN1 23 (Bit 1)	CN1 24 (Bit 0)					Alarm reset (RES)	Press the "SET" button on the current alarm screen.	Power off → on	Standard	Full.	Lin.
Alarm	70	1	1	0	Load-side encoder initial communication error 1	70.1	Load-side encoder initial communication - Receive data error 1	DB			○		○	
						70.2	Load-side encoder initial communication - Receive data error 2	DB			○		○	
						70.3	Load-side encoder initial communication - Receive data error 3	DB			○		○	
						70.5	Load-side encoder initial communication - Transmission data error 1	DB			○		○	
						70.6	Load-side encoder initial communication - Transmission data error 2	DB			○		○	
						70.7	Load-side encoder initial communication - Transmission data error 3	DB			○		○	
						70.A	Load-side encoder initial communication - Process error 1	DB			○		○	
						70.B	Load-side encoder initial communication - Process error 2	DB			○		○	
						70.C	Load-side encoder initial communication - Process error 3	DB			○		○	
						70.D	Load-side encoder initial communication - Process error 4	DB			○		○	
						70.E	Load-side encoder initial communication - Process error 5	DB			○		○	
						70.F	Load-side encoder initial communication - Process error 6	DB			○		○	
	71	1	1	0	Load-side encoder normal communication error 1	71.1	Load-side encoder communication - Receive data error 1	EDB			○		○	
						71.2	Load-side encoder communication - Receive data error 2	EDB			○		○	
						71.3	Load-side encoder communication - Receive data error 3	EDB			○		○	
						71.5	Load-side encoder communication - Transmission data error 1	EDB			○		○	
						71.6	Load-side encoder communication - Transmission data error 2	EDB			○		○	
						71.7	Load-side encoder communication - Transmission data error 3	EDB			○		○	
						71.9	Load-side encoder communication - Transmission data error 4	EDB			○		○	
						71.A	Load-side encoder communication - Transmission data error 5	EDB			○		○	
	72	1	1	0	Load-side encoder normal communication error 2	72.1	Load-side encoder data error 1	EDB			○		○	
						72.2	Load-side encoder data update error	EDB			○		○	
						72.3	Load-side encoder data waveform error	EDB			○		○	
						72.4	Load-side encoder non-signal error	EDB			○		○	
						72.5	Load-side encoder hardware error 1	EDB			○		○	
						72.6	Load-side encoder hardware error 2	EDB			○		○	
						72.9	Load-side encoder data error 2	EDB			○		○	
	8A	0	0	0	USB communication time-out error/serial communication time-out error	8A.1	USB communication time-out error/serial communication time-out error	SD	○	○	○	○	○	○

	No.	Alarm code			Name	Detail display	Detail name	Stop method (Note 2, 3)	Alarm deactivation			Operation mode		
		CN1 22 (Bit 2)	CN1 23 (Bit 1)	CN1 24 (Bit 0)					Alarm reset (RES)	Press the "SET" button on the current alarm screen.	Power off → on	Standard	Full.	Lin.
Alarm	8E	0	0	0	USB communication error/serial communication error	8E.1	USB communication receive error/serial communication receive error	SD	○	○	○	○	○	○
						8E.2	USB communication checksum error/serial communication checksum error	SD	○	○	○	○	○	○
						8E.3	USB communication character error/serial communication character error	SD	○	○	○	○	○	○
						8E.4	USB communication command error/serial communication command error	SD	○	○	○	○	○	○
						8E.5	USB communication data number error/serial communication data number error	SD	○	○	○	○	○	○
	88888				Watchdog	8888._	Watchdog	SD			○	○	○	○

Note 1. Leave for about 30 minutes of cooling time after removing the cause of occurrence.

2. Stop method indicates as follows:
   - DB: Stops with dynamic brake. (Coasts for the servo amplifier without dynamic brake.)
   - EDB: Stops with electronic dynamic brake for 600 W or less servo amplifiers
     Stops with dynamic brake for 700 W or more servo amplifiers
   - SD: Forced stop deceleration

3. This is applicable when [Pr. PA04] is set to the initial value. The stop system of SD can be changed to DB using [Pr. PA04].

4. Reset enable or disable can be selected using [Pr. PE03].

	No.	Name	Detail display	Detail name	Stop method (Note 2, 3)	Operation mode		
						Standard	Full.	Lin.
Warning	91	Servo amplifier overheat warning (Note 1)	91.1	Main circuit device overheat warning		○	○	○
	92	Battery cable disconnection warning	92.1	Encoder battery cable disconnection warning		○		
			92.3	Battery degradation		○		
	93	ABS data transfer warning	93.1	ABS data transfer requirement warning during magnetic pole detection				○
	95	STO warning	95.1	STO1 off detection	DB	○	○	○
			95.2	STO2 off detection	DB	○	○	○
	96	Home position setting warning	96.1	In-position warning at home positioning		○	○	○
			96.2	Command input warning at home positioning		○	○	○
			96.3	Servo off warning at home positioning		○	○	○
	99	Stroke limit warning	99.1	Forward rotation stroke end off	(Note 4)	○		
			99.2	Reverse rotation stroke end off	(Note 4)	○		
	9F	Battery warning	9F.1	Low battery		○	○	○
	E0	Excessive regeneration warning	E0.1	Excessive regeneration warning		○	○	○
	E1	Overload warning 1	E1.1	Thermal overload warning 1 during operation		○	○	○
			E1.2	Thermal overload warning 2 during operation		○	○	○
			E1.3	Thermal overload warning 3 during operation		○	○	○
			E1.4	Thermal overload warning 4 during operation		○	○	○
			E1.5	Thermal overload error 1 during a stop		○	○	○
			E1.6	Thermal overload error 2 during a stop		○	○	○
			E1.7	Thermal overload error 3 during a stop		○	○	○
			E1.8	Thermal overload error 4 during a stop		○	○	○
	E2	Servo motor overheat warning	E2.1	Servo motor temperature warning		○	○	○
	E3	Absolute position counter warning	E3.1	Multi-revolution counter travel distance excess warning		○		
			E3.2	Encoder absolute positioning counter warning		○	○	
			E3.5	Absolute position counter warning		○		
	E5	ABS time-out warning	E5.1	Time-out during ABS data transfer		○		
			E5.2	ABSM off during ABS data transfer		○		
			E5.3	SON off during ABS data transfer		○		
	E6	Servo forced stop warning	E6.1	Forced stop warning	SD	○	○	○
	E8	Cooling fan speed reduction warning	E8.1	Decreased cooling fan speed warning		○	○	○
			E8.2	Cooling fan stop		○	○	○
	E9	Main circuit off warning	E9.1	Servo-on signal on during main circuit off	DB	○	○	○
			E9.2	Bus voltage drop during low speed operation	DB	○	○	○
	EA	ABS servo-on warning	EA.1	ABS servo-on warning		○		
	EC	Overload warning 2	EC.1	Overload warning 2		○	○	○

	No.	Name	Detail display	Detail name	Stop method (Note 2, 3)	Operation mode		
						Standard	Full.	Lin.
Warning	ED	Output watt excess warning	ED.1	Output watt excess warning		○	○	○
	F0	Tough drive warning	F0.1	Instantaneous power failure tough drive warning		○	○	○
			F0.3	Vibration tough drive warning		○	○	○
	F2	Drive recorder - Miswriting warning	F2.1	Drive recorder - Area writing time-out warning		○	○	○
			F2.2	Drive recorder - Data miswriting warning		○	○	○
	F3	Oscillation detection warning	F3.1	Oscillation detection warning		○	○	○

Note 1. Leave for about 30 minutes of cooling time after removing the cause of occurrence.

2. Stop method indicates as follows:
   - DB: Stops with dynamic brake. (Coasts for the servo amplifier without dynamic brake.)
   - SD: Forced stop deceleration

3. This is applicable when [Pr. PA04] is set to the initial value. The stop system of SD can be changed to DB using [Pr. PA04].

4. Quick stop or slow stop can be selected using [Pr. PD30].

6.2 MR-J4-_B4(-RJ)

6.2.1 Alarm and warning list

When an error occurs during operation, the corresponding alarm or warning is displayed. When the alarm or the warning occurs, refer to "MELSERVO-J4 Servo Amplifier Instruction Manual (Troubleshooting)" to remove the failure. When an alarm occurs, ALM will turn off.
After its cause has been removed, the alarm can be deactivated in any of the methods marked ○ in the alarm deactivation column in the following table. Warnings are automatically canceled after the cause of occurrence is removed.
For the alarms and warnings in which "SD" is written in the stop method column, the axis stops with the dynamic brake after forced stop deceleration. For the alarms and warnings in which "DB" or "EDB" is written in the stop method column, the servo motor stops with the dynamic brake without forced stop deceleration.

	No.	Name	Detail display	Detail name	Stop method (Note 4, 5)	Alarm reset			Operation mode		
						Error reset	CPU reset	Power off → on	Standard	Full.	Lin.
Alarm	10	Undervoltage	10.1	Voltage drop in the control circuit power	EDB	○	○	○	○	○	○
			10.2	Voltage drop in the main circuit power	SD	○	○	○	○	○	○
	12	Memory error 1 (RAM)	12.1	RAM error 1	DB			○	○	○	○
			12.2	RAM error 2	DB			○	○	○	○
			12.3	RAM error 3	DB			○	○	○	○
			12.4	RAM error 4	DB			○	○	○	○
			12.5	RAM error 5	DB			○	○	○	○
	13	Clock error	13.1	Clock error 1	DB			○	○	○	○
			13.2	Clock error 2	DB			○	○	○	○
	14	Control process error	14.1	Control process error 1	DB			○	○	○	○
			14.2	Control process error 2	DB			○	○	○	○
			14.3	Control process error 3	DB			○	○	○	○
			14.4	Control process error 4	DB			○	○	○	○
			14.5	Control process error 5	DB			○	○	○	○
			14.6	Control process error 6	DB			○	○	○	○
			14.7	Control process error 7	DB			○	○	○	○
			14.8	Control process error 8	DB			○	○	○	○
			14.9	Control process error 9	DB			○	○	○	○
			14.A	Control process error 10	DB			○	○	○	○
	15	Memory error 2 (EEP-ROM)	15.1	EEP-ROM error at power on	DB			○	○	○	○
			15.2	EEP-ROM error during operation	DB			○	○	○	○
	16	Encoder initial communication error 1	16.1	Encoder initial communication - Receive data error 1	DB			○	○	○	○
			16.2	Encoder initial communication - Receive data error 2	DB			○	○	○	○
			16.3	Encoder initial communication - Receive data error 3	DB			○	○	○	○
			16.5	Encoder initial communication - Transmission data error 1	DB			○	○	○	○
			16.6	Encoder initial communication - Transmission data error 2	DB			○	○	○	○
			16.7	Encoder initial communication - Transmission data error 3	DB			○	○	○	○
			16.A	Encoder initial communication - Process error 1	DB			○	○	○	
			16.B	Encoder initial communication - Process error 2	DB			○	○	○	
			16.C	Encoder initial communication - Process error 3	DB			○	○	○	
			16.D	Encoder initial communication - Process error 4	DB			○	○	○	
			16.E	Encoder initial communication - Process error 5	DB			○	○	○	
			16.F	Encoder initial communication - Process error 6	DB			○	○	○	

	No.	Name	Detail display	Detail name	Stop method (Note 4, 5)	Alarm reset			Operation mode		
						Error reset	CPU reset	Power off → on	Standard	Full.	Lin.
Alarm	17	Board error	17.1	Board error 1	DB			○	○	○	○
			17.3	Board error 2	DB			○	○	○	○
			17.4	Board error 3	DB			○	○	○	○
			17.5	Board error 4	DB			○	○	○	○
			17.6	Board error 5	DB			○	○	○	○
			17.8	Board error 6 (Note 6)	EDB			○	○	○	○
	19	Memory error 3 (FLASH-ROM)	19.1	FLASH-ROM error 1	DB			○	○	○	○
			19.2	FLASH-ROM error 2	DB			○	○	○	○
	1A	Servo motor combination error	1A.1	Servo motor combination error	DB			○	○	○	○
			1A.2	Servo motor control mode combination error	DB			○	○	○	○
	1E	Encoder initial communication error 2	1E.1	Encoder malfunction	DB			○	○	○	
			1E.2	Load-side encoder malfunction	DB			○		○	
	1F	Encoder initial communication error 3	1F.1	Incompatible encoder	DB			○	○	○	○
			1F.2	Incompatible load-side encoder	DB			○		○	
	20	Encoder normal communication error 1	20.1	Encoder normal communication - Receive data error 1	EDB			○	○	○	○
			20.2	Encoder normal communication - Receive data error 2	EDB			○	○	○	○
			20.3	Encoder normal communication - Receive data error 3	EDB			○	○	○	○
			20.5	Encoder normal communication - Transmission data error 1	EDB			○	○	○	○
			20.6	Encoder normal communication - Transmission data error 2	EDB			○	○	○	○
			20.7	Encoder normal communication - Transmission data error 3	EDB			○	○	○	○
			20.9	Encoder normal communication - Receive data error 4	EDB			○	○	○	○
			20.A	Encoder normal communication - Receive data error 5	EDB			○	○	○	○
	21	Encoder normal communication error 2	21.1	Encoder data error 1	EDB			○	○	○	
			21.2	Encoder data update error	EDB			○	○	○	
			21.3	Encoder data waveform error	EDB			○	○	○	
			21.4	Encoder non-signal error	EDB			○		○	○
			21.5	Encoder hardware error 1	EDB			○	○		
			21.6	Encoder hardware error 2	EDB			○	○		
			21.9	Encoder data error 2	EDB			○	○	○	
	24	Main circuit error	24.1	Ground fault detected by hardware detection circuit	DB			○	○	○	○
			24.2	Ground fault detected by software detection function	DB	○	○	○	○	○	○
	25	Absolute position erased	25.1	Servo motor encoder - Absolute position erased	DB			○	○	○	
	27	Initial magnetic pole detection error	27.1	Magnetic pole detection - Abnormal termination	DB			○			○
			27.2	Magnetic pole detection - Time out error	DB			○			○
			27.3	Magnetic pole detection - Limit switch error	DB			○			○
			27.4	Magnetic pole detection - Estimated error	DB			○			○
			27.5	Magnetic pole detection - Position deviation error	DB			○			○
			27.6	Magnetic pole detection - Speed deviation error	DB			○			○
			27.7	Magnetic pole detection - Current error	DB			○			○
	28	Linear encoder error 2	28.1	Linear encoder - Environment error	EDB			○		○	○
	2A	Linear encoder error 1	2A.1	Linear encoder error 1-1	EDB			○		○	○
			2A.2	Linear encoder error 1-2	EDB			○		○	○
			2A.3	Linear encoder error 1-3	EDB			○		○	○
			2A.4	Linear encoder error 1-4	EDB			○		○	○
			2A.5	Linear encoder error 1-5	EDB			○		○	○
			2A.6	Linear encoder error 1-6	EDB			○		○	○
			2A.7	Linear encoder error 1-7	EDB			○		○	○
			2A.8	Linear encoder error 1-8	EDB			○		○	○
	2B	Encoder counter error	2B.1	Encoder counter error 1	EDB			○			
			2B.2	Encoder counter error 2	EDB			○			

	No.	Name	Detail display	Detail name	Stop method (Note 4, 5)	Alarm reset			Operation mode		
						Error reset	CPU reset	Power off → on	Standard	Full.	Lin.
Alarm	30	Regenerative error (Note 1)	30.1	Regeneration heat error	DB	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
			30.2	Regeneration signal error	DB	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
			30.3	Regeneration feedback signal error	DB	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
	31	Overspeed	31.1	Abnormal motor speed	SD	○	○	○	○	○	○
	32	Overcurrent	32.1	Overcurrent detected at hardware detection circuit (during operation)	DB			○	○	○	○
			32.2	Overcurrent detected at software detection function (during operation)	DB	○	○	○	○	○	○
			32.3	Overcurrent detected at hardware detection circuit (during a stop)	DB			○	○	○	○
			32.4	Overcurrent detected at software detection function (during a stop)	DB	○	○	○	○	○	○
	33	Overvoltage	33.1	Main circuit voltage error	EDB	○	○	○	○	○	○
	34	SSCNET receive error 1	34.1	SSCNET receive data error	SD	○	○ (Note 2)	○	○	○	○
			34.2	SSCNET connector connection error	SD	○	○	○	○	○	○
			34.3	SSCNET communication data error	SD	○	○	○	○	○	○
			34.4	Hardware error signal detection	SD	○	○	○	○	○	○
	35	Command frequency error	35.1	Command frequency error	SD	○	○	○	○	○	○
	36	SSCNET receive error 2	36.1	Continuous communication data error	SD	○	○	○	○	○	○
	37	Parameter error	37.1	Parameter setting range error	DB		○	○	○	○	○
			37.2	Parameter combination error	DB		○	○	○	○	○
	3A	Inrush current suppression circuit error	3A.1	Inrush current suppression circuit error	EDB			○	○	○	○
	3E	Operation mode error	3E.1	Operation mode error	DB			○	○	○	○
	42	Servo control error (linear servo motor)	42.1	Servo control error by position deviation	EDB	○ (Note 3)	○ (Note 3)	○			○
			42.2	Servo control error by speed deviation	EDB	○ (Note 3)	○ (Note 3)	○			○
			42.3	Servo control error by thrust deviation	EDB	○ (Note 3)	○ (Note 3)	○			○
		Fully closed loop control error (during fully closed loop control)	42.8	Fully closed loop control error by position deviation	EDB	○ (Note 3)	○ (Note 3)	○		○	
			42.9	Fully closed loop control error by speed deviation	EDB	○ (Note 3)	○ (Note 3)	○		○	
			42.A	Fully closed loop control error by position deviation during command stop	EDB	○ (Note 3)	○ (Note 3)	○		○	
	45	Main circuit device overheat (Note 1)	45.1	Main circuit device overheat error	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
	46	Servo motor overheat (Note 1)	46.1	Abnormal temperature of servo motor 1	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	
			46.2	Abnormal temperature of servo motor 2	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)		○	○
			46.3	Thermistor disconnected	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
			46.5	Abnormal temperature of servo motor 3	DB	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	
			46.6	Abnormal temperature of servo motor 4	DB	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	
	47	Cooling fan error	47.1	Cooling fan stop error	SD			○	○	○	○
			47.2	Cooling fan speed reduction error	SD			○	○	○	○

	No.	Name	Detail display	Detail name	Stop method (Note 4, 5)	Alarm reset			Operation mode		
						Error reset	CPU reset	Power off → on	Standard	Full.	Lin.
Alarm	50	Overload 1 (Note 1)	50.1	Thermal overload error 1 during operation	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
			50.2	Thermal overload error 2 during operation	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
			50.3	Thermal overload error 4 during operation	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
			50.4	Thermal overload error 1 during a stop	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
			50.5	Thermal overload error 2 during a stop	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
			50.6	Thermal overload error 4 during a stop	SD	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
	51	Overload 2 (Note 1)	51.1	Thermal overload error 3 during operation	DB	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
			51.2	Thermal overload error 3 during a stop	DB	○ (Note 1)	○ (Note 1)	○ (Note 1)	○	○	○
	52	Error excessive	52.1	Excess droop pulse 1	SD	○	○	○	○	○	○
			52.3	Excess droop pulse 2	SD	○	○	○	○	○	○
			52.4	Error excessive during 0 torque limit	SD	○	○	○	○	○	○
			52.5	Excess droop pulse 3	EDB	○	○	○	○	○	○
	54	Oscillation detection	54.1	Oscillation detection error	EDB	○	○	○	○	○	○
	56	Forced stop error	56.2	Over speed during forced stop	EDB	○	○	○	○	○	○
			56.3	Estimated distance over during forced stop	EDB	○	○	○	○	○	○
	63	STO timing error	63.1	STO1 off	DB	○	○	○	○	○	○
			63.2	STO2 off	DB	○	○	○	○	○	○
	70	Load-side encoder initial communication error 1	70.1	Load-side encoder initial communication - Receive data error 1	DB			○		○	
			70.2	Load-side encoder initial communication - Receive data error 2	DB			○		○	
			70.3	Load-side encoder initial communication - Receive data error 3	DB			○		○	
			70.5	Load-side encoder initial communication - Transmission data error 1	DB			○		○	
			70.6	Load-side encoder initial communication - Transmission data error 2	DB			○		○	
			70.7	Load-side encoder initial communication - Transmission data error 3	DB			○		○	
			70.A	Load-side encoder initial communication - Process error 1	DB			○		○	
			70.B	Load-side encoder initial communication - Process error 2	DB			○		○	
			70.C	Load-side encoder initial communication - Process error 3	DB			○		○	
			70.D	Load-side encoder initial communication - Process error 4	DB			○		○	
			70.E	Load-side encoder initial communication - Process error 5	DB			○		○	
			70.F	Load-side encoder initial communication - Process error 6	DB			○		○	

	No.	Name	Detail display	Detail name	Stop method (Note 4, 5)	Alarm reset			Operation mode		
						Error reset	CPU reset	Power off → on	Standard	Full.	Lin.
Alarm	71	Load-side encoder normal communication error 1	71.1	Load-side encoder communication - Receive data error 1	EDB			○		○	
			71.2	Load-side encoder communication - Receive data error 2	EDB			○		○	
			71.3	Load-side encoder communication - Receive data error 3	EDB			○		○	
			71.5	Load-side encoder communication - Transmission data error 1	EDB			○		○	
			71.6	Load-side encoder communication - Transmission data error 2	EDB			○		○	
			71.7	Load-side encoder communication - Transmission data error 3	EDB			○		○	
			71.9	Load-side encoder communication - Transmission data error 4	EDB			○		○	
			71.A	Load-side encoder communication - Transmission data error 5	EDB			○		○	
	72	Load-side encoder normal communication error 2	72.1	Load-side encoder data error 1	EDB			○		○	
			72.2	Load-side encoder data update error	EDB			○		○	
			72.3	Load-side encoder data waveform error	EDB			○		○	
			72.4	Load-side encoder non-signal error	EDB			○		○	
			72.5	Load-side encoder hardware error 1	EDB			○		○	
			72.6	Load-side encoder hardware error 2	EDB			○		○	
			72.9	Load-side encoder data error 2	EDB			○		○	
	8A	USB communication time-out error	8A.1	USB communication time-out error	SD	○	○	○	○	○	○
	8E	USB communication error	8E.1	USB communication receive error	SD	○	○	○	○	○	○
			8E.2	USB communication checksum error	SD	○	○	○	○	○	○
			8E.3	USB communication character error	SD	○	○	○	○	○	○
			8E.4	USB communication command error	SD	○	○	○	○	○	○
			8E.5	USB communication data number error	SD	○	○	○	○	○	○
	888	Watchdog	88._	Watchdog	DB			○	○	○	○

Note 1. Leave for 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. The alarm can be canceled by setting as follows:
   - For the fully closed loop control: set [Pr. PE03] to "1 _ _ _".
   - For the linear servo motor: set [Pr. PL04] to "1 _ _ _".
4. Stop method indicates as follows:
   - DB: Stops with dynamic brake. (Coasts for the servo amplifier without dynamic brake.)
   - EDB: Stops with electronic dynamic brake for 600 W or less servo amplifiers
     Stops with dynamic brake for 700 W or more servo amplifiers
   - SD: Forced stop deceleration
5. This is applicable when [Pr. PA04] is set to the initial value. The stop system of SD can be changed to DB using [Pr. PA04].
6. This alarm occurs only in the J3 compatibility mode.

	No.	Name	Detail display	Detail name	Stop method (Note 2, 3)	Operation mode		
						Standard	Full.	Lin.
Warning	91	Servo amplifier overheat warning (Note 1)	91.1	Main circuit device overheat warning		○	○	○
	92	Battery cable disconnection warning	92.1	Encoder battery cable disconnection warning		○		
			92.3	Battery degradation		○		
	95	STO warning	95.1	STO1 off detection	DB	○	○	○
			95.2	STO2 off detection	DB	○	○	○
	96	Home position setting warning	96.1	In-position warning at home positioning		○	○	○
			96.2	Command input warning at home positioning		○	○	○
	9F	Battery warning	9F.1	Low battery		○	○	○
	E0	Excessive regeneration warning (Note 1)	E0.1	Excessive regeneration warning		○	○	○
	E1	Overload warning 1 (Note 1)	E1.1	Thermal overload warning 1 during operation		○	○	○
			E1.2	Thermal overload warning 2 during operation		○	○	○
			E1.3	Thermal overload warning 3 during operation		○	○	○
			E1.4	Thermal overload warning 4 during operation		○	○	○
			E1.5	Thermal overload error 1 during a stop		○	○	○
			E1.6	Thermal overload error 2 during a stop		○	○	○
			E1.7	Thermal overload error 3 during a stop		○	○	○
			E1.8	Thermal overload error 4 during a stop		○	○	○
	E2	Servo motor overheat warning	E2.1	Servo motor temperature warning		○	○	○
	E3	Absolute position counter warning	E3.2	Encoder absolute positioning counter warning		○	○	
			E3.5	Absolute position counter warning		○		
	E4	Parameter warning	E4.1	Parameter setting range error warning		○	○	○
	E6	Servo forced stop warning	E6.1	Forced stop warning	SD	○	○	○
	E7	Controller forced stop warning	E7.1	Controller forced stop warning	SD	○	○	○
	E8	Cooling fan speed reduction warning	E8.1	Decreased cooling fan speed warning		○	○	○
			E8.2	Cooling fan stop		○	○	○
	E9	Main circuit off warning	E9.1	Servo-on signal on during main circuit off	DB	○	○	○
			E9.2	Bus voltage drop during low speed operation	DB	○	○	○
			E9.3	Ready-on signal on during main circuit off	DB	○	○	○
	EC	Overload warning 2 (Note 1)	EC.1	Overload warning 2		○	○	○
	ED	Output watt excess warning	ED.1	Output watt excess warning		○	○	○
	F0	Tough drive warning	F0.1	Instantaneous power failure tough drive warning		○	○	○
			F0.3	Vibration tough drive warning		○	○	○
	F2	Drive recorder - Miswriting warning	F2.1	Drive recorder - Area writing time-out warning		○	○	○
			F2.2	Drive recorder - Data miswriting warning		○	○	○
	F3	Oscillation detection warning	F3.1	Oscillation detection warning		○	○	○

Note 1. Leave for about 30 minutes of cooling time after removing the cause of occurrence.

2. Stop method indicates as follows:
   - DB: Stops with dynamic brake. (Coasts for the servo amplifier without dynamic brake.)
   - SD: Decelerates to a stop

3. This is applicable when [Pr. PA04] is set to the initial value. The stop system of SD can be changed to DB using [Pr. PA04].

6.2.2 Troubleshooting at power on

When the servo system does not boot and system error occurs at power on of the servo system controller, improper boot of the servo amplifier might be the cause. Check the display of the servo amplifier, and take actions according to this section.

Display	Description	Cause	Checkpoint	Action
AA	Communication with the servo system controller has disconnected.	The power of the servo system controller was turned off.	Check the power of the servo system controller.	Switch on the power of the servo system controller.
		A SSCNET III cable was disconnected.	"AA" is displayed in the corresponding axis and following axes.	Replace the SSCNET III cable of the corresponding axis.
			Check if the connectors (CNIA, CNIB) are unplugged.	Connect it correctly.
		The power of the servo amplifier was turned off.	"AA" is displayed in the corresponding axis and following axes.	Check the power of the servo amplifier.
				Replace the servo amplifier of the corresponding axis.
Ab	Initialization communication with the servo system controller has not completed.	The control axis is disabled.	Check if the disabling control axis switch (SW2-2) is on.	Turn off the disabling control axis switch (SW2-2).
		The setting of the axis No. is incorrect.	Check that the other servo amplifier is not assigned to the same axis No.	Set it correctly.
		Axis No. does not match with the axis No. set to the servo system controller.	Check the setting and axis No. of the servo system controller.	Set it correctly.
		Information about the servo series has not set in the simple motion module.	Check the value set in Servo series (Pr.100) in the simple motion module.	Set it correctly.
		Communication cycle does not match.	Check the communication cycle at the servo system controller side. When using 8 axes or less: 0.222 ms When using 16 axes or less: 0.444 ms When using 32 axes or less: 0.888 ms	Set it correctly.
		A SSCNET III cable was disconnected.	"Ab" is displayed in the corresponding axis and following axes.	Replace the SSCNET III cable of the corresponding axis.
			Check if the connectors (CNIA, CNIB) are unplugged.	Connect it correctly.
		The power of the servo amplifier was turned off.	"Ab" is displayed in an axis and the following axes.	Check the power of the servo amplifier.
		The servo amplifier is malfunctioning.	"Ab" is displayed in an axis and the following axes.	Replace the servo amplifier of the corresponding axis.
b##. (Note)	The system has been in the test operation mode.	Test operation mode has been enabled.	Test operation setting switch (SW2-1) is turned on.	Turn off the test operation setting switch (SW2-1).
off	Operation mode for manufacturer setting is set.	Operation mode for manufacturer setting is enabled.	Check if all of the control axis setting switches (SW2) are on.	Set the control axis setting switches (SW2) correctly.

Note. ## indicates axis No.

MEMO

7. DIMENSIONS

POINT

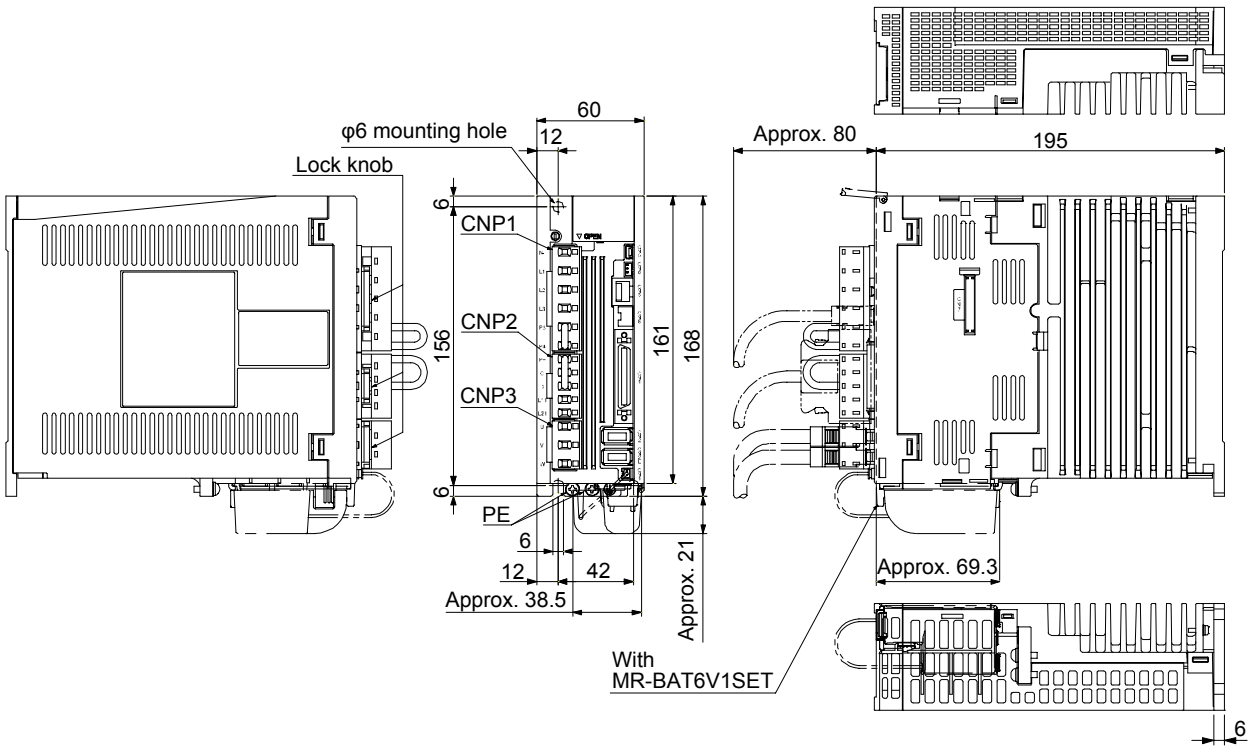
●The dimensions shown are for MR-J4-_A4-RJ and MR-J4-_B4-RJ. MR-J4-_A4 and MR-J4-_B4 servo amplifiers do not have CN2L and CN7 connectors. The dimensions for MR-J4-_A4 and MR-J4-_B4 servo amplifiers are the same as those for MR-J4-_A4-RJ and MR-J4-_B4-RJ servo amplifiers except these connectors.

7. DIMENSIONS

7.1 MR-J4-_A4(-RJ)

(a) MR-J4-60A4(-RJ)/MR-J4-100A4(-RJ)

[Unit: mm]



Mass: 1.7 [kg]

Terminal

CNP1
N-
L1
L2
L3
P3
P4

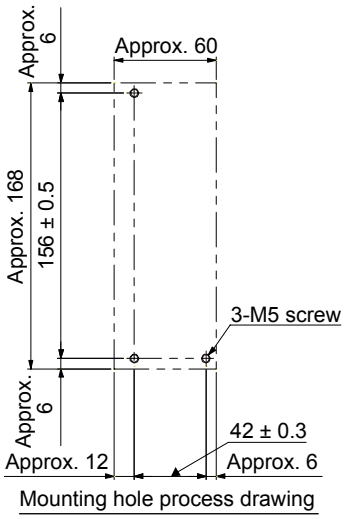
CNP2
P+
C
D
L11
L21

CNP3
U
V
W

PE

Screw size: M4
Tightening torque: 1.2 [N•m]

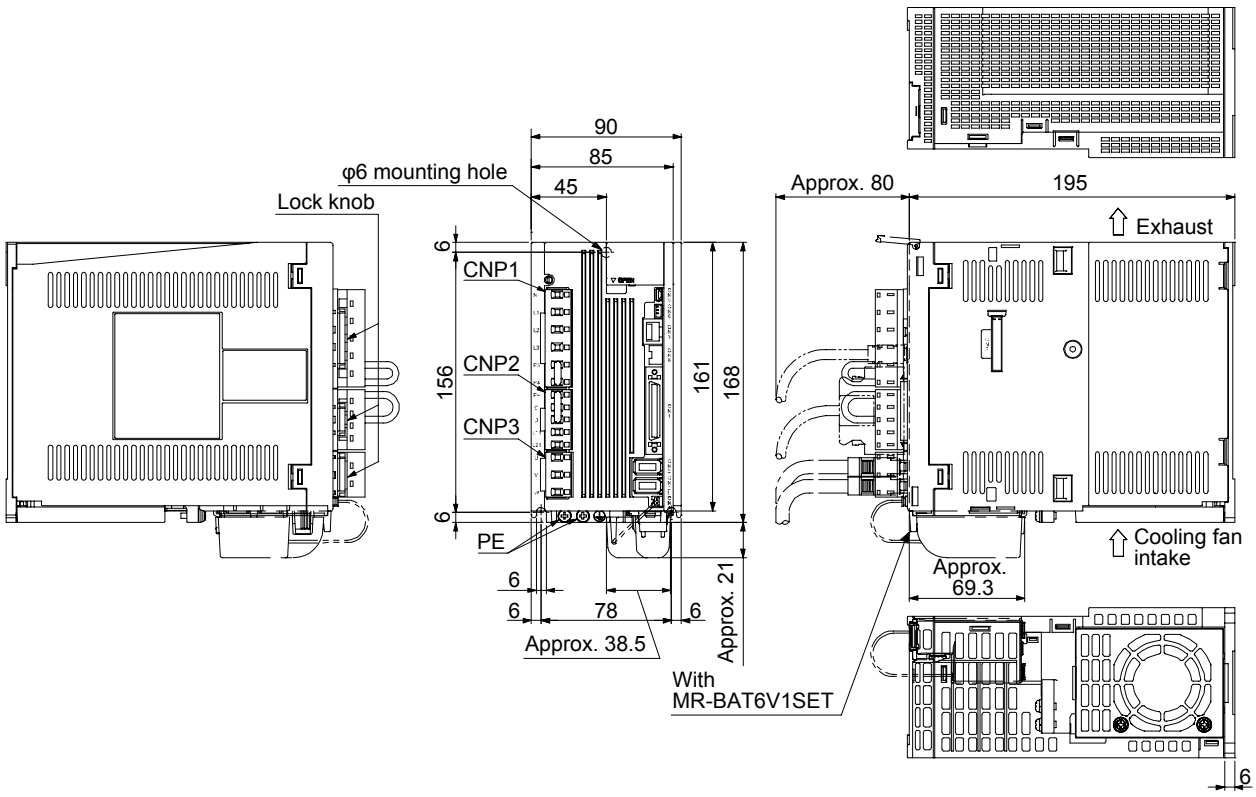
Mounting screw
Screw size: M5
Tightening torque: 3.24 [N•m]



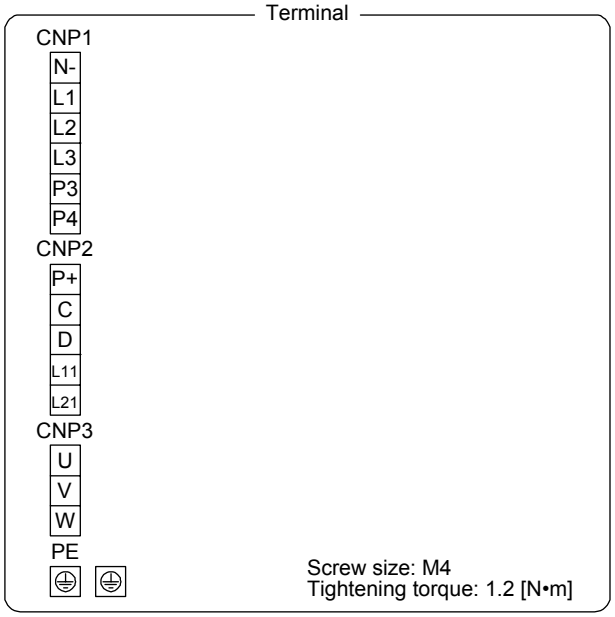
Mounting hole process drawing

(b) MR-J4-200A4(-RJ)

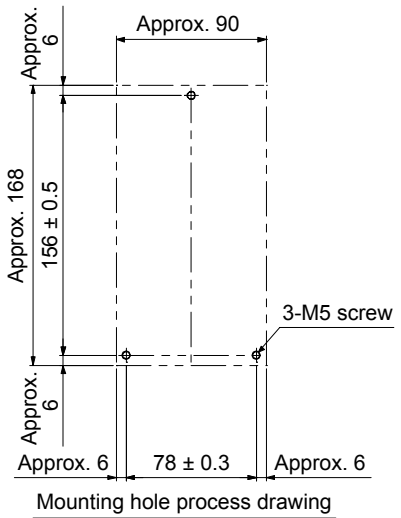
[Unit: mm]



Mass: 2.1 [kg]



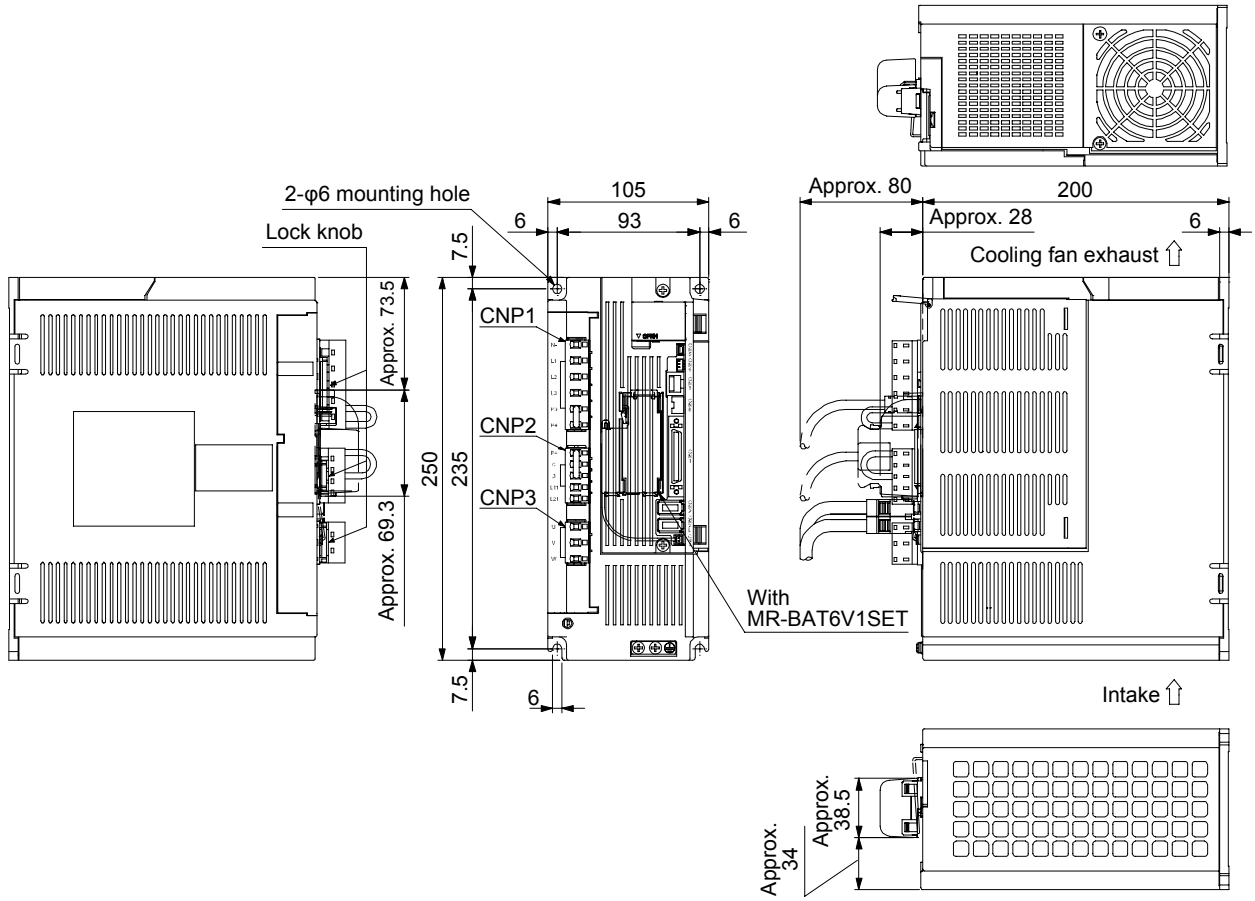
Mounting screw
Screw size: M5
Tightening torque: 3.24 [N•m]



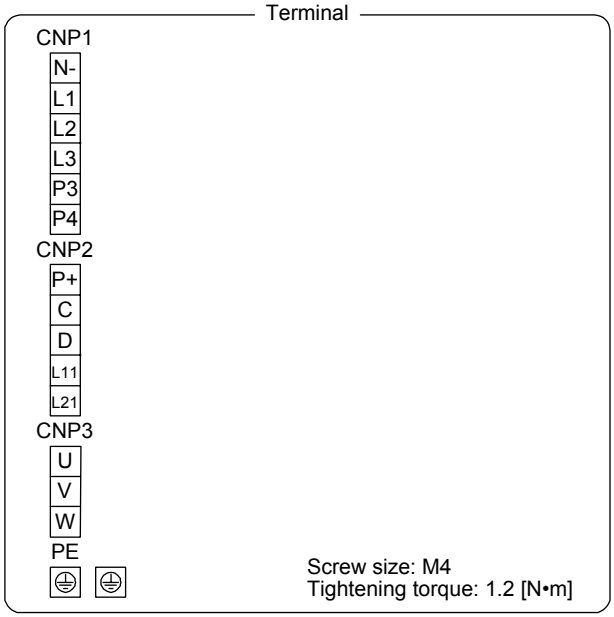
Mounting hole process drawing

(c) MR-J4-350A4(-RJ)

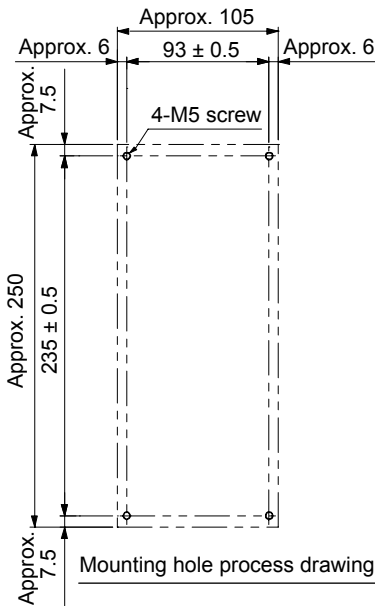
[Unit: mm]



Mass: 3.6 [kg]

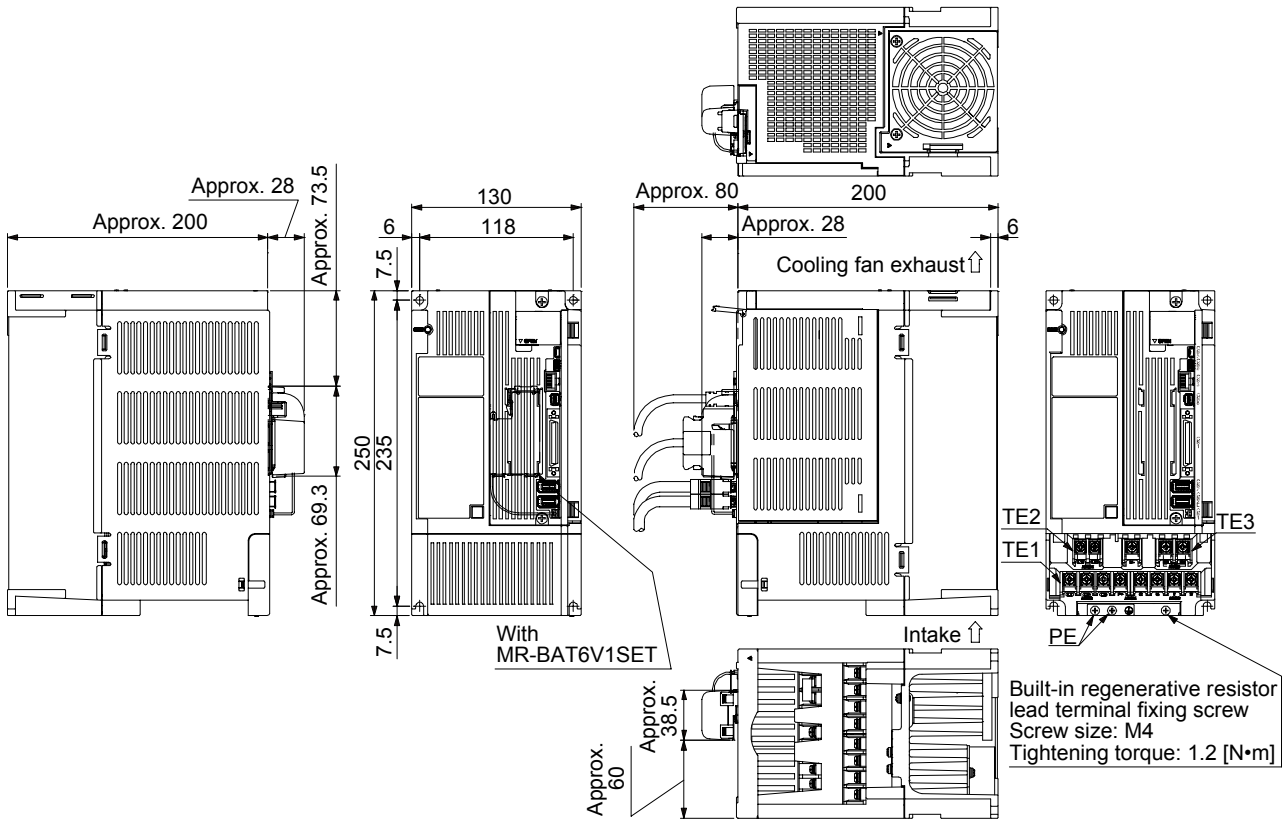


Mounting screw
Screw size: M5
Tightening torque: 3.24 [N•m]



(d) MR-J4-500A4(-RJ)

[Unit: mm]



Mass: 4.3 [kg]

Terminal

TE2 L11 L21 TE3 N- P3 P4

TE1 L1 L2 L3 P+ C U V W

PE

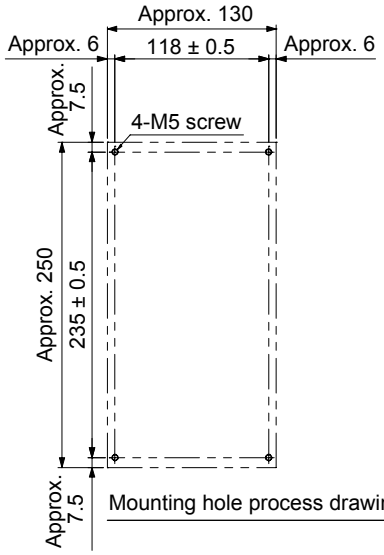
TE2 Terminal screw: M3.5
Tightening torque: 0.8 [N•m]

TE3 Terminal screw: M4
Tightening torque: 1.2 [N•m]

TE1 Terminal screw: M4
Tightening torque: 1.2 [N•m]

PE Screw size: M4
Tightening torque: 1.2 [N•m]

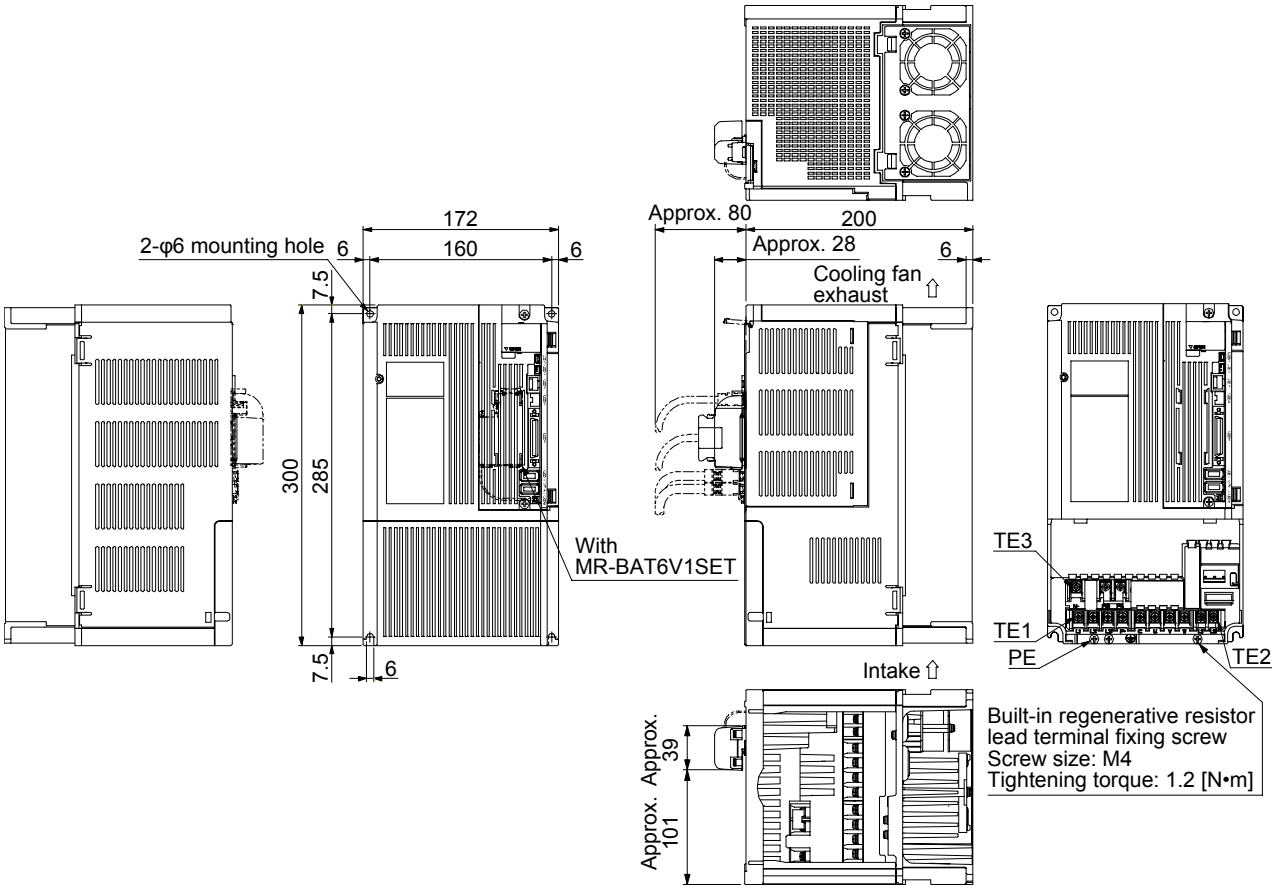
Mounting screw
Screw size: M5
Tightening torque: 3.24 [N•m]



Mounting hole process drawing

(e) MR-J4-700A4(-RJ)

[Unit: mm]



Mass: 6.5 [kg]

Terminal

TE3 N- P3 P4

TE1 L1 L2 L3 P+ C U V W TE2 L11 L21

PE

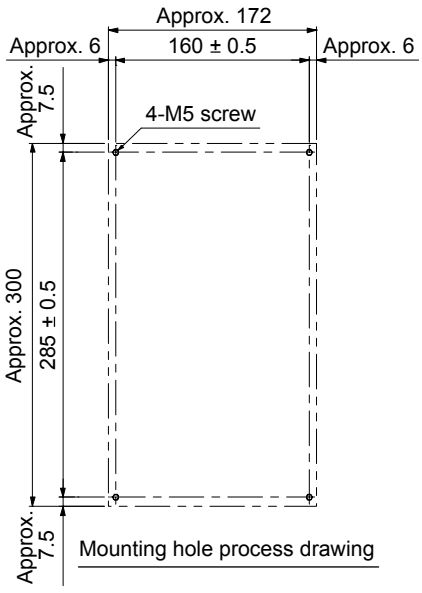
TE3 Screw size: M4
Tightening torque: 1.2 [N•m]

TE1 Screw size: M4
Tightening torque: 1.2 [N•m]

TE2 Screw size: M3.5
Tightening torque: 0.8 [N•m]

PE Screw size: M4
Tightening torque: 1.2 [N•m]

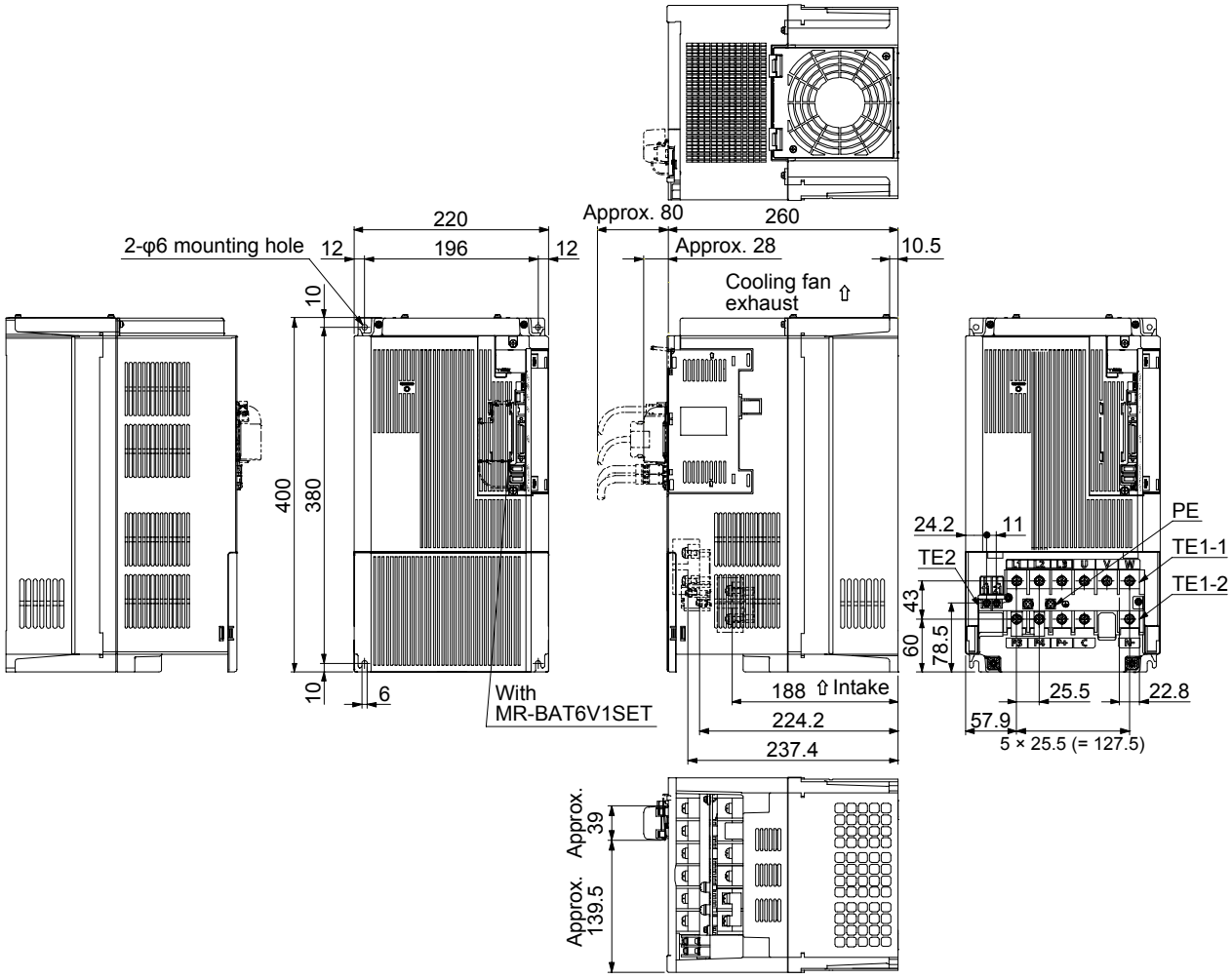
Mounting screw
Screw size: M5
Tightening torque: 3.24 [N•m]



Mounting hole process drawing

(f) MR-J4-11KA4(-RJ)/MR-J4-15KA4(-RJ)

[Unit: mm]



Mass: 13.4 [kg]

Terminal

TE1-1 L1 L2 L3 U V W

TE1-2 P3 P4 P+ C ⏥ N-

TE2 L11 L21

PE ⏚ ⏚

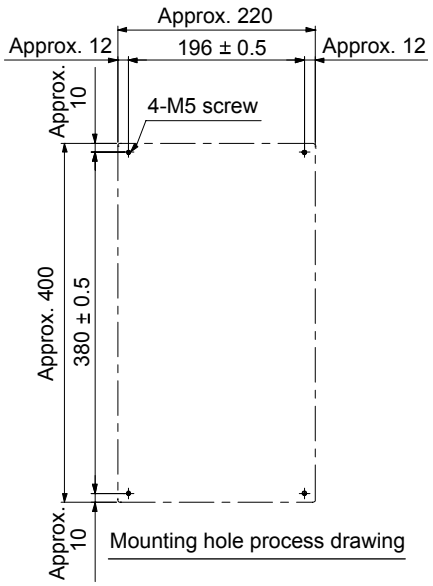
TE1-1 Screw size: M6
Tightening torque: 3.0 [N•m]

TE1-2 Screw size: M6
Tightening torque: 3.0 [N•m]

TE2 Screw size: M4
Tightening torque: 1.2 [N•m]

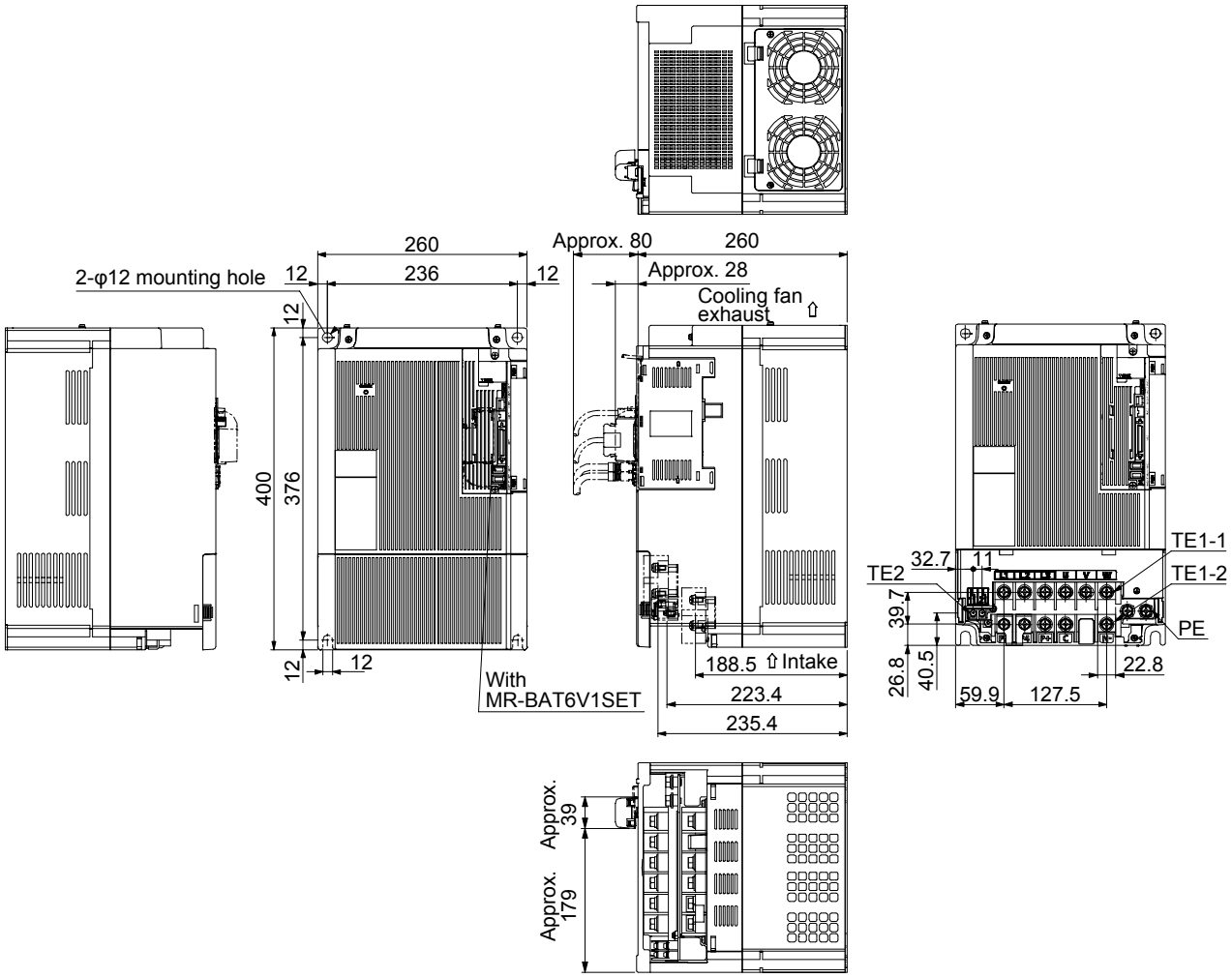
PE Screw size: M6
Tightening torque: 3.0 [N•m]

Mounting screw
Screw size: M5
Tightening torque: 3.24 [N•m]



(g) MR-J4-22KA4(-RJ)

[Unit: mm]



Mass: 18.2 [kg]

Terminal

TE1-1 L1 L2 L3 U V W

TE1-2 P3 P4 P+ C ⁄ N-

PE ⏚ ⏚ TE2 L11 L21

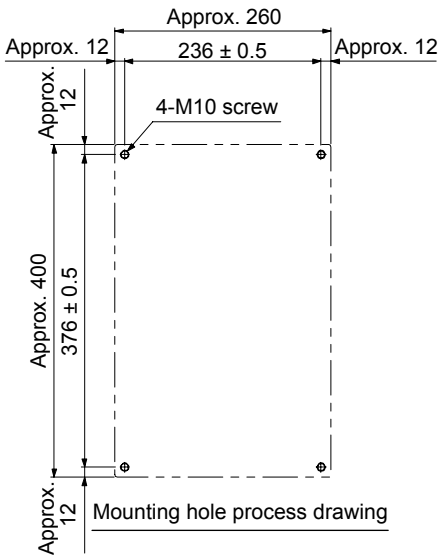
TE1-1 Screw size: M8
Tightening torque: 6.0 [N•m]

TE1-2 Screw size: M8
Tightening torque: 6.0 [N•m]

TE2 Screw size: M4
Tightening torque: 1.2 [N•m]

PE Screw size: M8
Tightening torque: 6.0 [N•m]

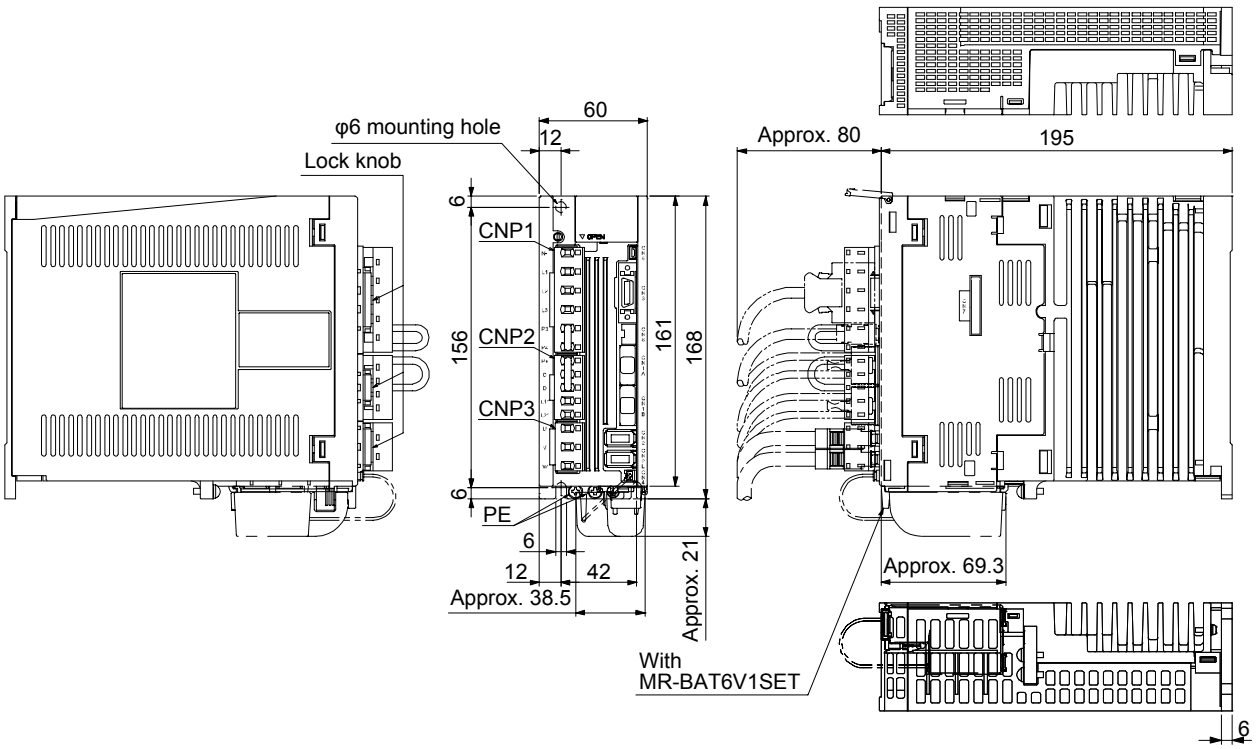
Mounting screw
Screw size: M10
Tightening torque: 3.24 [N•m]



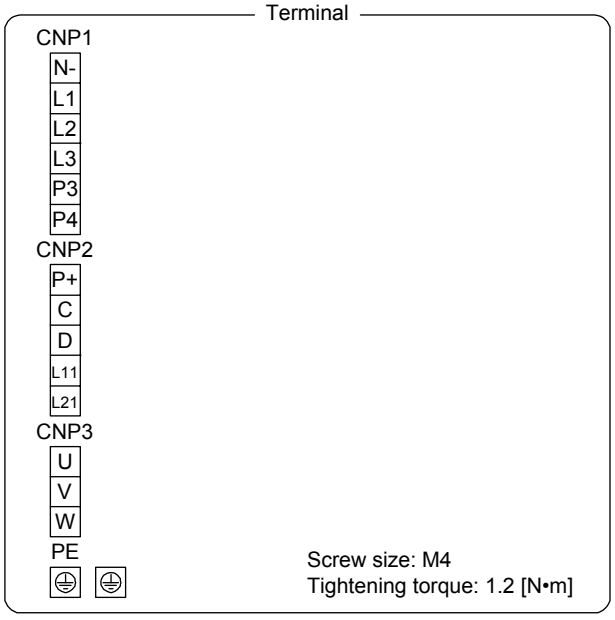
7.2 MR-J4-_B4(-RJ)

(a) MR-J4-60B4(-RJ)/MR-J4-100B4(-RJ)

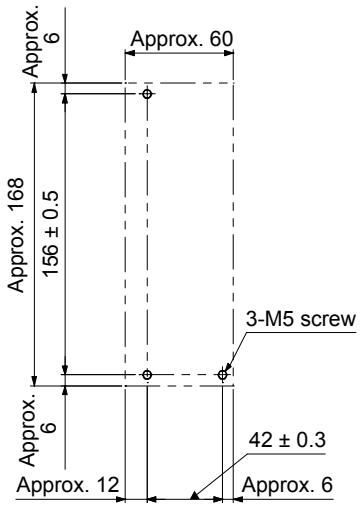
[Unit: mm]



Mass: 1.7 [kg]



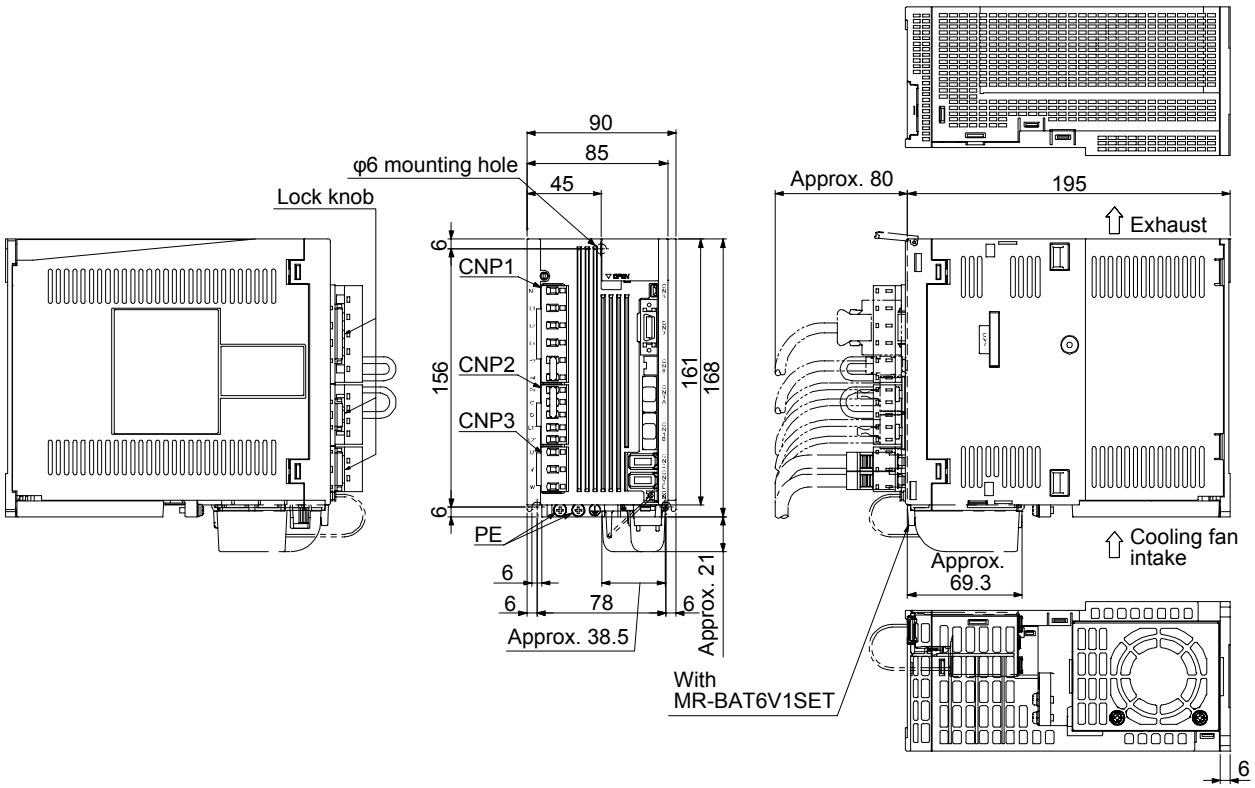
Mounting screw
Screw size: M5
Tightening torque: 3.24 [N•m]



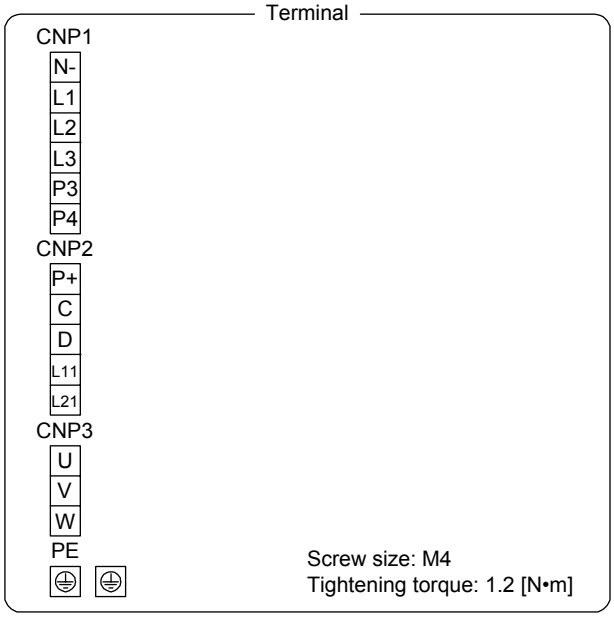
Mounting hole process drawing

(b) MR-J4-200B4(-RJ)

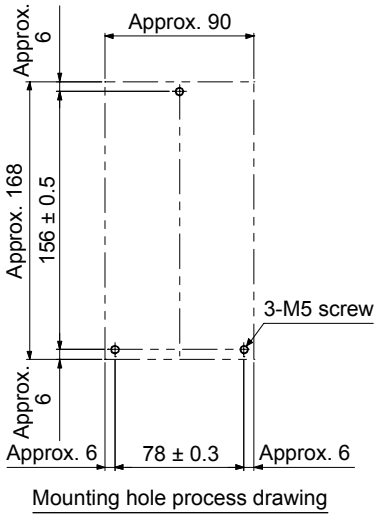
[Unit: mm]



Mass: 2.1 [kg]



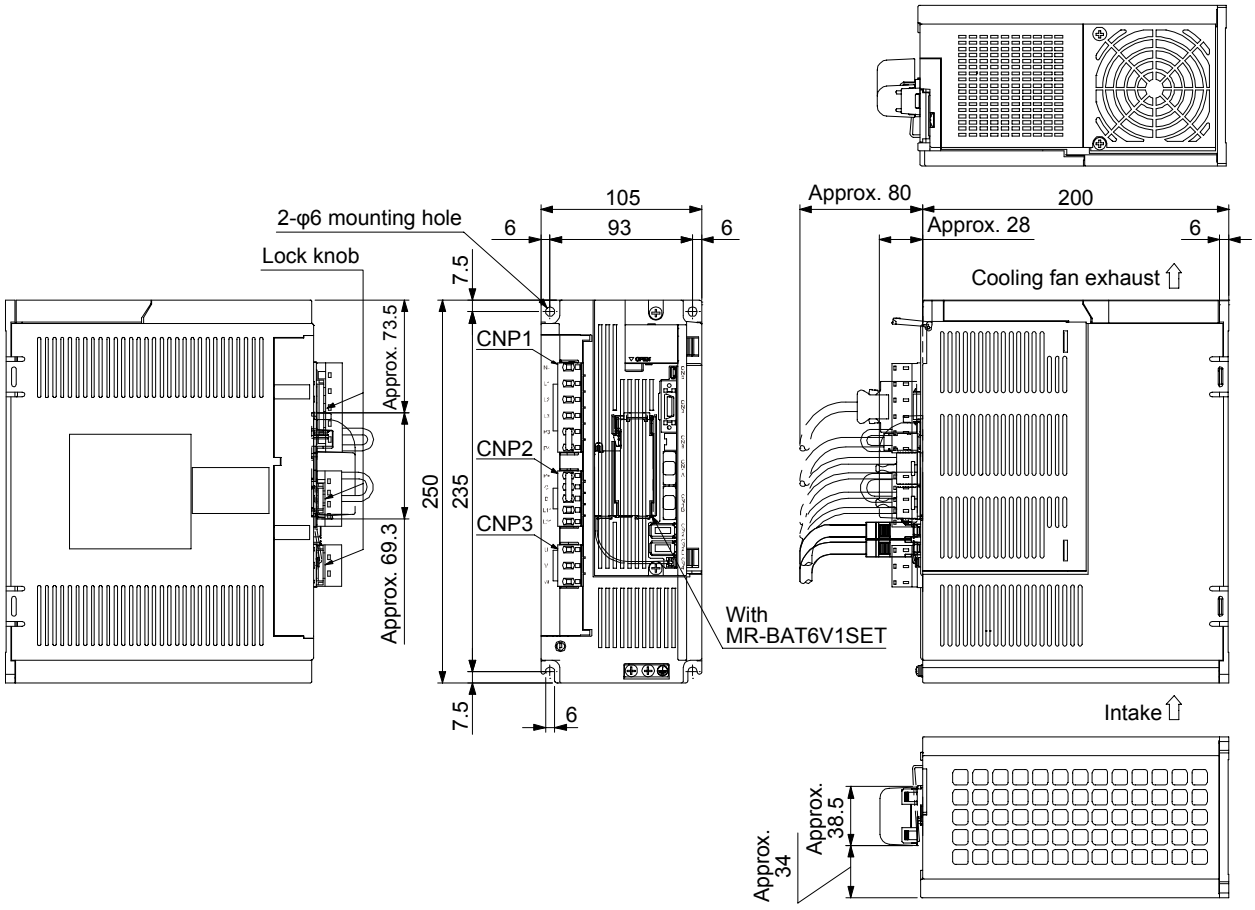
Mounting screw
Screw size: M5
Tightening torque: 3.24 [N•m]



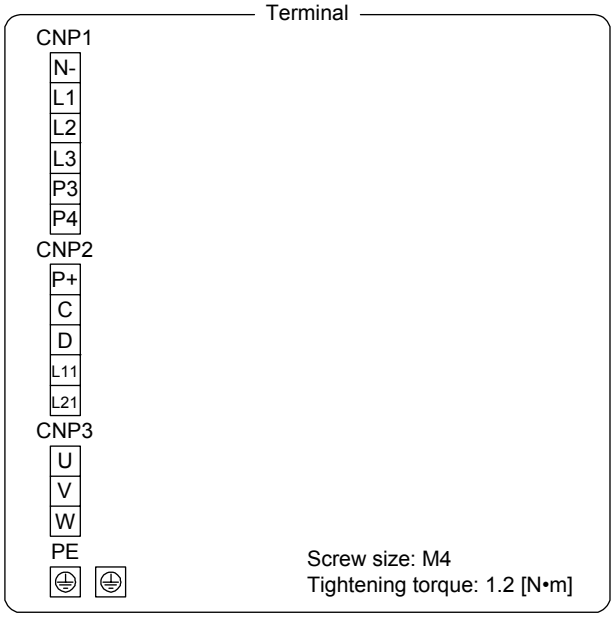
Mounting hole process drawing

(c) MR-J4-350B4(-RJ)

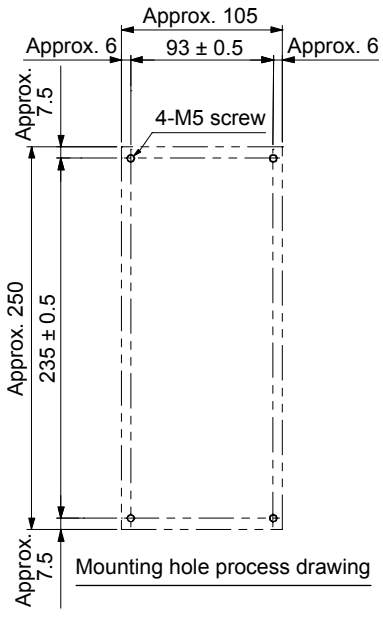
[Unit: mm]



Mass: 3.6 [kg]

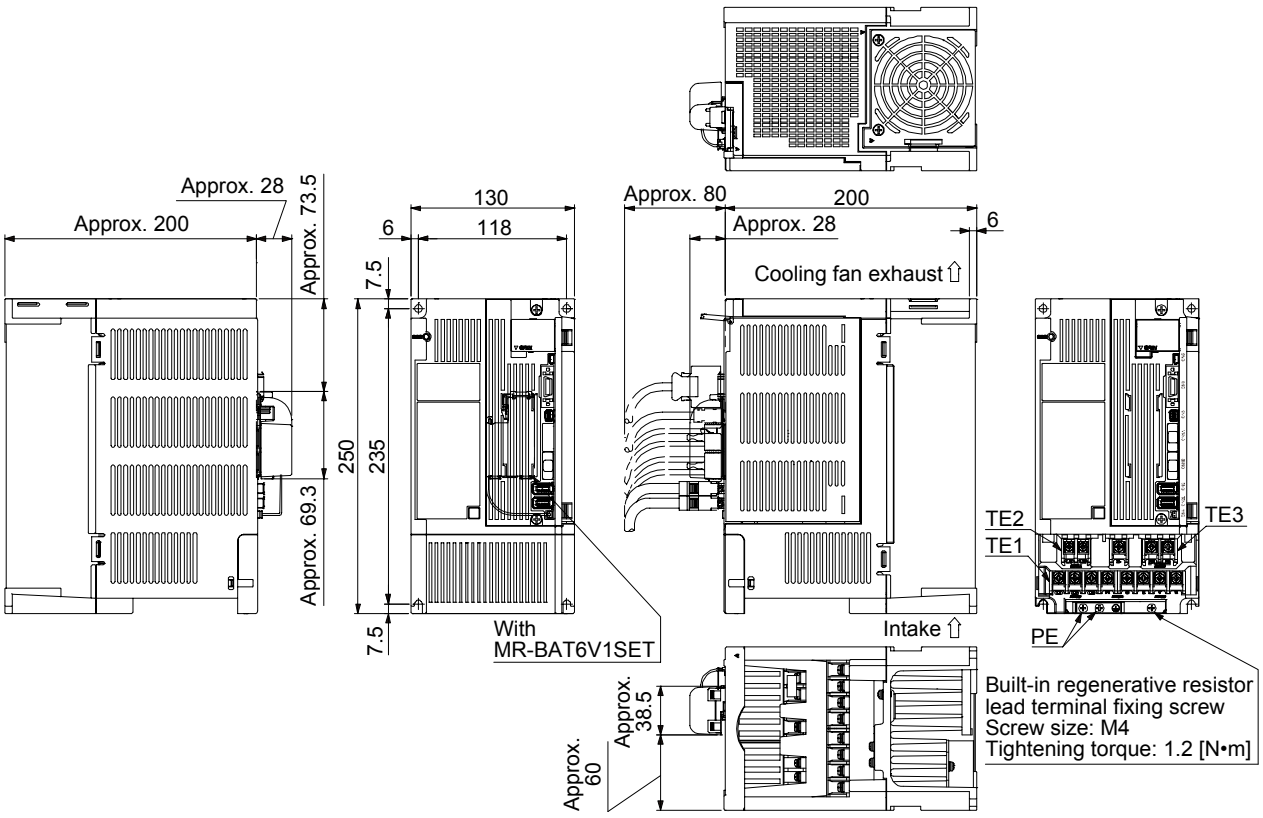


Mounting screw
Screw size: M5
Tightening torque: 3.24 [N•m]



(d) MR-J4-500B4(-RJ)

[Unit: mm]



Mass: 4.3 [kg]

Terminal

TE2 L11 L21 TE3 N- P3 P4

TE1 L1 L2 L3 P+ C U V W

PE

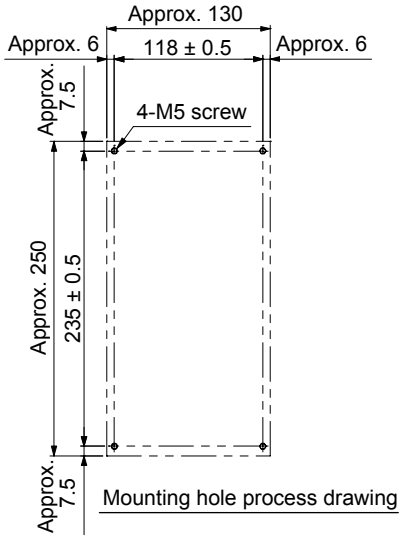
TE2 Terminal screw: M3.5
Tightening torque: 0.8 [N•m]

TE3 Terminal screw: M4
Tightening torque: 1.2 [N•m]

TE1 Terminal screw: M4
Tightening torque: 1.2 [N•m]

PE Screw size: M4
Tightening torque: 1.2 [N•m]

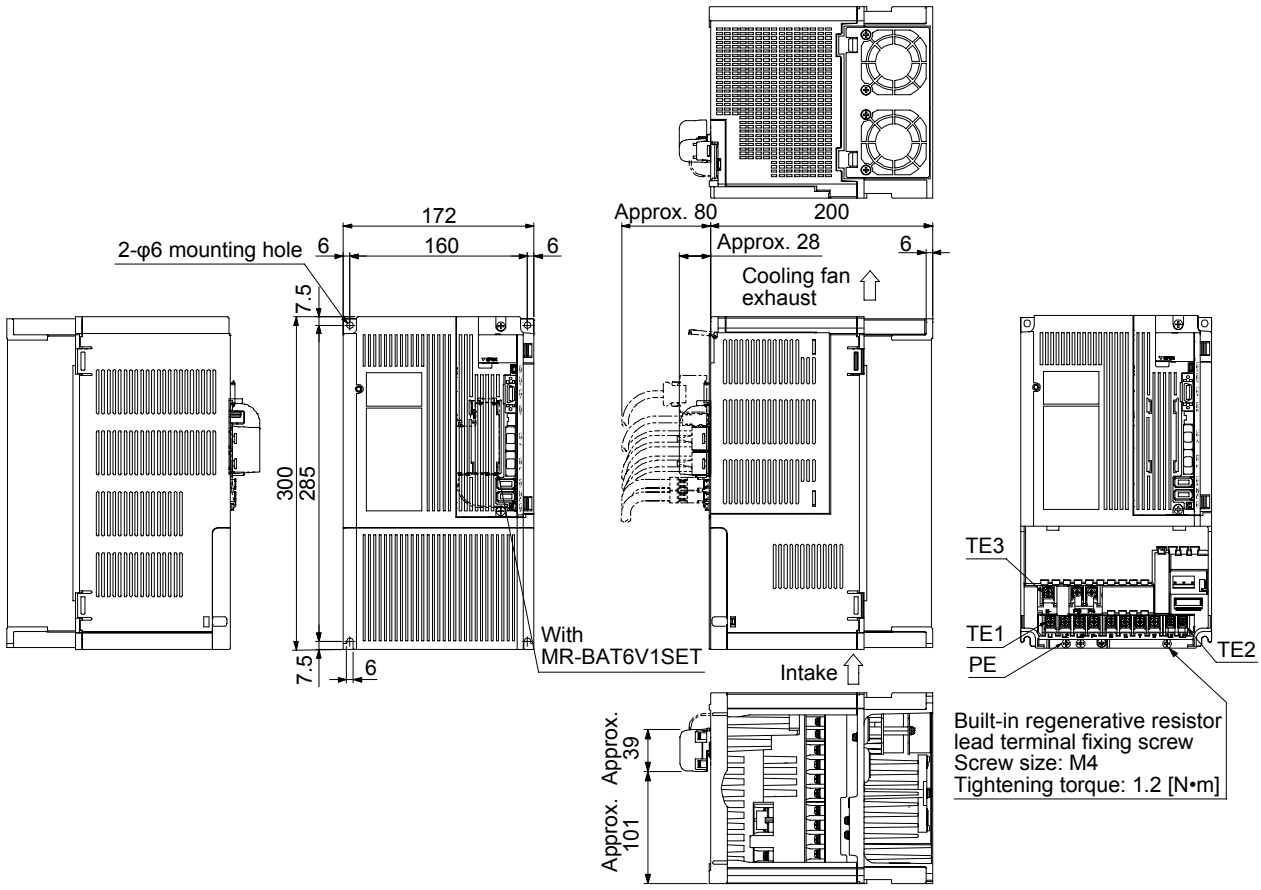
Mounting screw
Screw size: M5
Tightening torque: 3.24 [N•m]



Mounting hole process drawing

(e) MR-J4-700B4(-RJ)

[Unit: mm]



Mass: 6.5 [kg]

Terminal

TE3 N- P3 P4

TE1 L1 L2 L3 P+ C U V W TE2 L11 L21

PE ⏚ ⏚

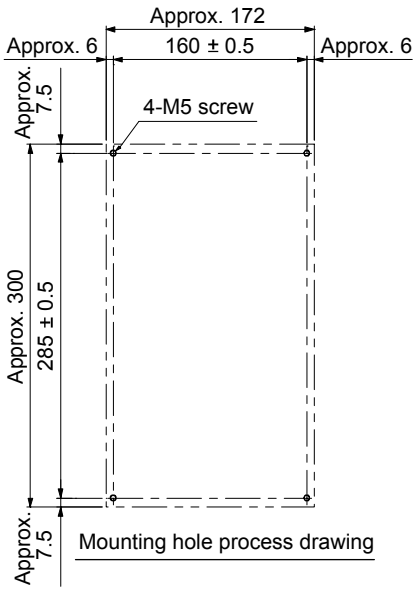
TE3 Screw size: M4
Tightening torque: 1.2 [N•m]

TE1 Screw size: M4
Tightening torque: 1.2 [N•m]

TE2 Screw size: M3.5
Tightening torque: 0.8 [N•m]

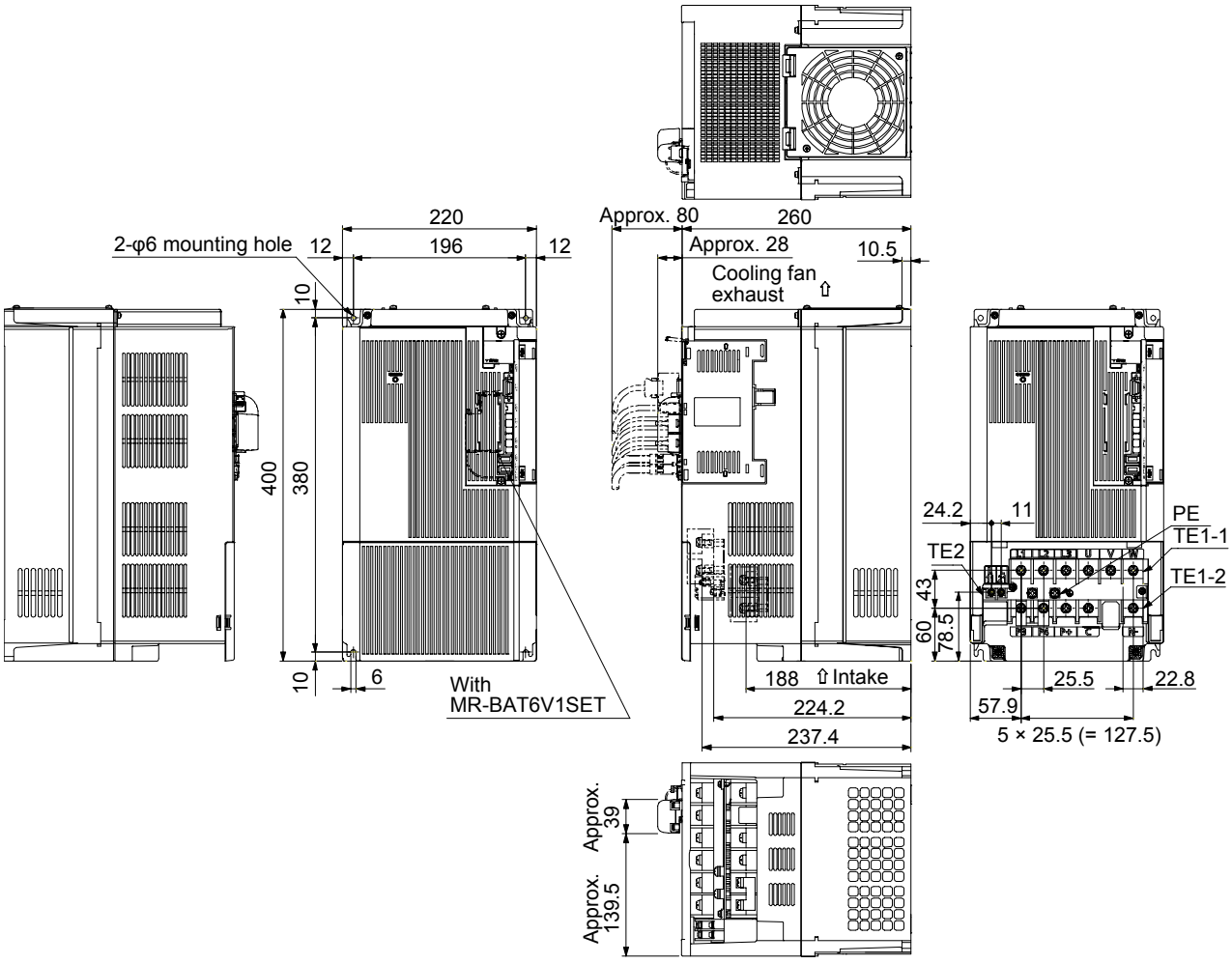
PE Screw size: M4
Tightening torque: 1.2 [N•m]

Mounting screw
Screw size: M5
Tightening torque: 3.24 [N•m]



(f) MR-J4-11KB4(-RJ)/MR-J4-15KB4(-RJ)

[Unit: mm]



Mass: 13.4 [kg]

Terminal

TE1-1 L1 L2 L3 U V W

TE1-2 P3 P4 P+ C ⁄ N-

TE2 L11 L21

PE ⏚ ⏚

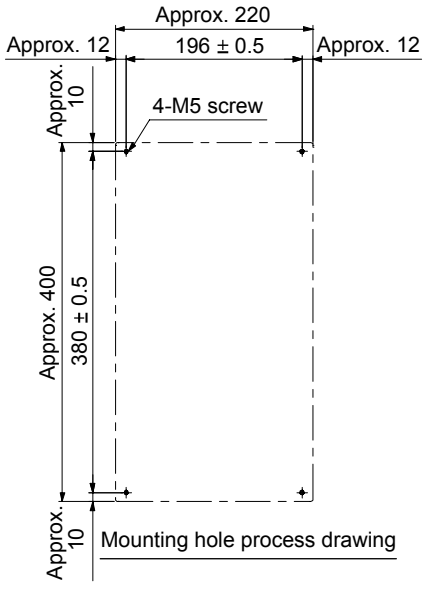
TE1-1 Screw size: M6
Tightening torque: 3.0 [N•m]

TE1-2 Screw size: M6
Tightening torque: 3.0 [N•m]

TE2 Screw size: M4
Tightening torque: 1.2 [N•m]

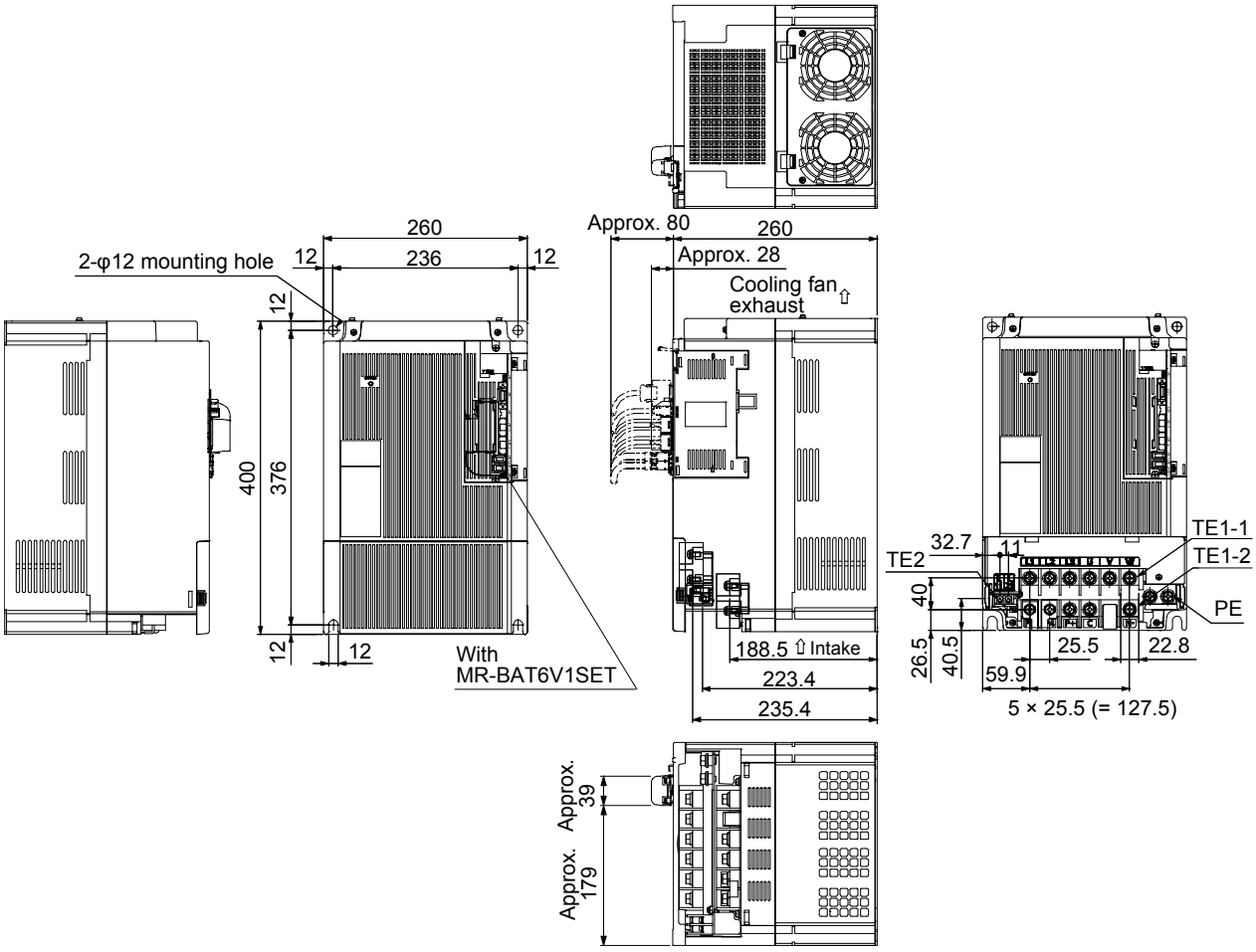
PE Screw size: M6
Tightening torque: 3.0 [N•m]

Mounting screw
Screw size: M5
Tightening torque: 3.24 [N•m]



(g) MR-J4-22KB4(-RJ)

[Unit: mm]



Mass: 18.2 [kg]

Terminal

TE1-1 L1 L2 L3 U V W

TE1-2 P3 P4 P+ C ⁄ N-

PE ⏚ ⏚ TE2 L11 L21

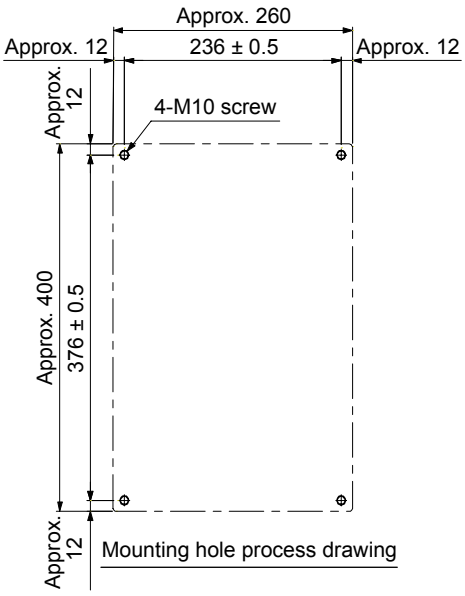
TE1-1 Screw size: M8
Tightening torque: 6.0 [N•m]

TE1-2 Screw size: M8
Tightening torque: 6.0 [N•m]

TE2 Screw size: M4
Tightening torque: 1.2 [N•m]

PE Screw size: M8
Tightening torque: 6.0 [N•m]

Mounting screw
Screw size: M10
Tightening torque: 26.5 [N•m]



MEMO

8. CHARACTERISTICS

The items in the following table are the same as those for MR-J4-_A(-RJ) or MR-J4-_B(-RJ) servo amplifier. For details of the items, refer to each chapter/section of the detailed explanation field.

Model	Item	Detailed explanation
MR-J4-_A4(-RJ)	Cable bending life	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 10.4
MR-J4-_B4(-RJ)	Cable bending life	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 10.4

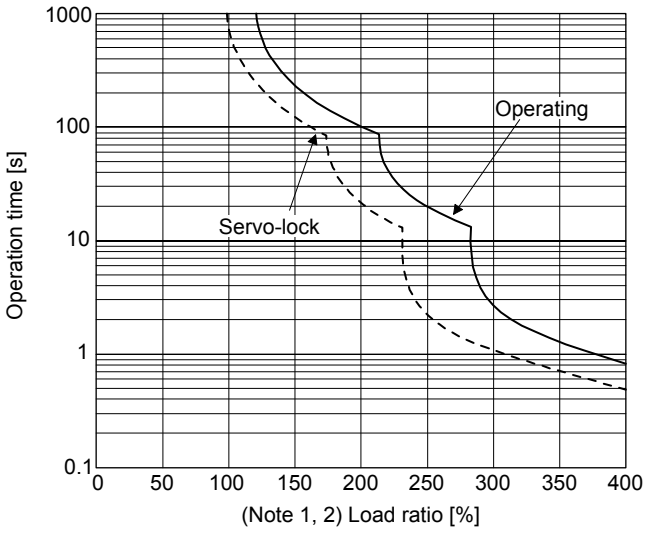
8.1 Overload protection characteristics

An electronic thermal is built in the servo amplifier to protect the servo motor, servo amplifier and servo motor power wires from overloads.
[AL. 50 Overload 1] occurs if overload operation performed is above the electronic thermal protection curve shown in fig. 8.1. [AL. 51 Overload 2] occurs if the maximum current is applied continuously for several seconds due to machine collision, etc. Use the equipment on the left-side area of the continuous or broken line in the graph.
For the system where the unbalanced torque occurs, such as a vertical axis system, it is recommended that the unbalanced torque of the machine be kept at 70% or less of the motor's rated torque.
This servo amplifier has servo motor overload protective function. (The servo motor overload current (full load current) is set on the basis of 120% rated current of the servo amplifier.)

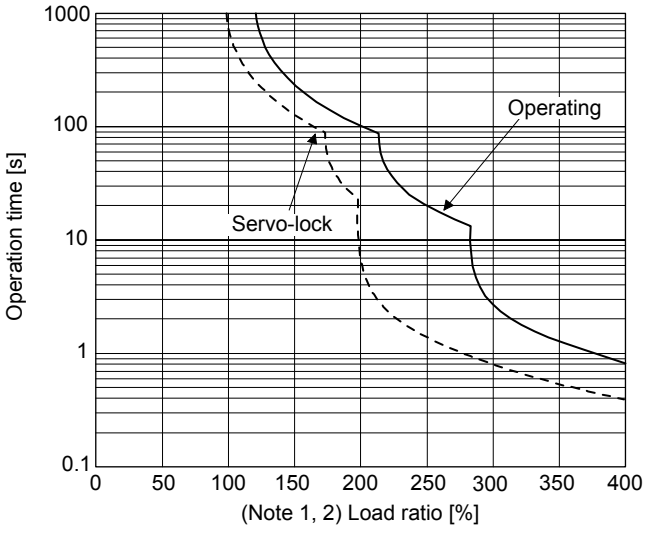
The following table shows the combination of each servo motor and overload protective characteristics.

Rotary servo motor			Graph of overload protection characteristics
HG-SR	HG-JR (standard)	HG-JR (When the maximum torque is 400%)	
524 1024	534 734 1034	534	Characteristics a
1524 2024 3524	1534 2034 3534	734 1034 1534 2034	Characteristics b
5024 7024	5034 7034	3534 5034	Characteristics c
	9034 11K1M4 15K1M4 22K1M4		Characteristics d

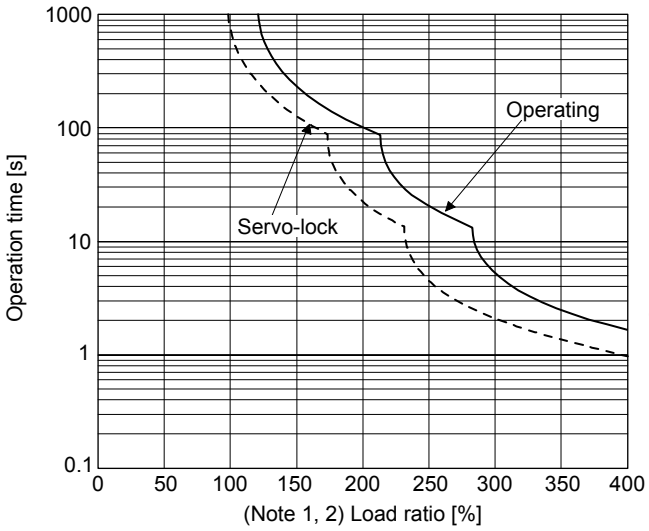
The following graphs show overload protection characteristics.



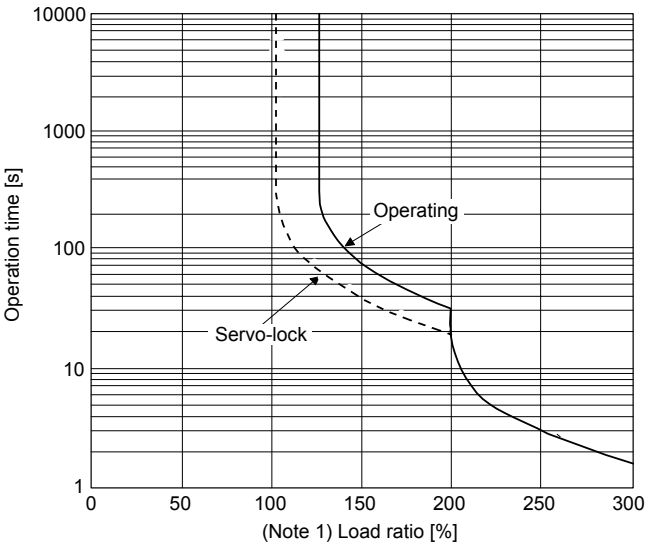
Characteristics a



Characteristics b



Characteristics c



Characteristics d

Note 1. If operation that generates torque more than 100% of the rating is performed with an abnormally high frequency in a servo motor stop status (servo-lock status) or in a 30 r/min or less low-speed operation status, the servo amplifier may malfunction regardless of the electronic thermal protection.

2. The operation time at the load ratio of 300% to 400% applies when the maximum torque of HG-JR servo motor is increased to 400%.

Fig. 8.1 Electronic thermal protection characteristics

8.2 Power supply capacity and generated loss

(1) Amount of heat generated by the servo amplifier

Table 8.1 indicates servo amplifiers' power supply capacities and losses generated under rated load. For thermal design of an enclosed type cabinet, use the values in the table in consideration for the worst operating conditions. The actual amount of generated heat will be intermediate between values at rated torque and servo-off according to the duty used during operation. When the servo motor is run at less than the rated speed, the power supply capacity will be smaller than the value in the table, but the servo amplifier's generated heat will not change.

Table 8.1 Power supply capacity and generated loss per servo motor at rated output

Servo amplifier	Servo motor	(Note 1) Power supply capacity [kVA]	(Note 2) Servo amplifier-generated heat [W]			Area required for heat dissipation [m^2]
			At rated output	At rated output [Generated heat in the cabinet when dissipating heat outside the cabinet] (Note 3)	With servo-off	
MR-J4-60_4(-RJ)	HG-SR524	1.0	40		18	0.8
	HG-JR534	1.0	40		18	0.8
MR-J4-100_4(-RJ)	HG-SR1024	1.7	60		18	1.2
	HG-JR734	1.3	60		18	1.2
	HG-JR1034	1.7	60		18	1.2
MR-J4-200_4(-RJ)	HG-SR1524	2.5	90		20	1.8
	HG-SR2024	3.5	90		20	1.8
	HG-JR1534	2.5	90		20	1.8
	HG-JR2034	3.5	90		20	1.8
MR-J4-350_4(-RJ)	HG-SR3524	5.5	130		20	2.6
	HG-JR3534	5.5	160		20	2.7
MR-J4-500_4(-RJ)	HG-SR5024	7.5	195		25	3.9
	HG-JR5034	7.5	195		25	3.9
MR-J4-700_4(-RJ)	HG-SR7024	10	300		25	6.0
	HG-JR7034	10	300		25	6.0
MR-J4-11K_4(-RJ)	HG-JR9034	13	435	130	45	8.7
	HG-JR11K1M4	16	530	160	45	11.0
MR-J4-15K_4(-RJ)	HG-JR15K1M4	22	640	195	45	13.0
MR-J4-22K_4(-RJ)	HG-JR22K1M4	33	850	260	55	17.0

Note 1. Note that the power supply capacity will vary according to the power supply impedance. This value is applicable when the power factor improving AC reactor or power factor improving DC reactor are not used.

2. Heat generated during regeneration is not included in the servo amplifier-generated heat. To calculate heat generated by the regenerative option, refer to section 9.2.

3. This value is applicable when the servo amplifier is cooled by using the heat sink outside mounting attachment.

(2) Heat dissipation area for an enclosed type cabinet

The enclosed type cabinet (hereafter called the cabinet) which will contain the servo amplifier should be designed to ensure that its temperature rise is within +10 ˚C at the ambient temperature of 40 ˚C. (With an approximately 5 ˚C safety margin, the system should operate within a maximum 55 ˚C limit.) The necessary cabinet heat dissipation area can be calculated by equation 8.1.

$$A = \frac{P}{K \cdot \Delta T} \quad \cdots\cdots (8.1)$$

A: Heat dissipation area [m^2]
P: Loss generated in the cabinet [W]
ΔT: Difference between internal and ambient temperatures [˚C]
K: Heat dissipation coefficient [5 to 6]

When calculating the heat dissipation area with equation 8.1, assume that P is the sum of all losses generated in the cabinet. Refer to table 8.1 for heat generated by the servo amplifier. "A" indicates the effective area for heat dissipation, but if the cabinet is directly installed on an insulated wall, that extra amount must be added to the cabinet's surface area. The required heat dissipation area will vary with the conditions in the cabinet. If convection in the cabinet is poor and heat builds up, effective heat dissipation will not be possible. Therefore, arrangement of the equipment in the cabinet and the use of a cooling fan should be considered. Table 8.1 lists the cabinet dissipation area for each servo amplifier (guideline) when the servo amplifier is operated at the ambient temperature of 40 ˚C under rated load.

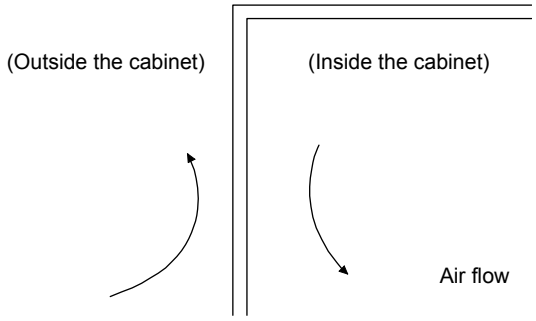


Fig. 8.2 Temperature distribution in an enclosed type cabinet

When air flows along the outer wall of the cabinet, effective heat exchange will be possible, because the temperature slope inside and outside the cabinet will be steeper.

8.3 Dynamic brake characteristics

POINT

- Do not use dynamic brake to stop in a normal operation as it is the function to stop in emergency.
- 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.
- Be sure to enable EM1 (Forced stop 1) after servo motor stops when using EM1 (Forced stop 1) frequently in other than emergency.
- Servo motors for MR-J4 may have the different coasting distance from that of the previous model.
- The electronic dynamic brake operates in the initial state for the HG series servo motors of 600 W or smaller capacity. The time constant "τ" for the electronic dynamic brake will be shorter than that of normal dynamic brake. Therefore, coasting distance will be longer than that of normal dynamic brake. For how to set the electronic dynamic brake, refer to [Pr. PF09] and [Pr. PF15] (MR-J4-_A4) or [Pr. PF06] and [Pr. PF12] (MR-J4-_B4).

8.3.1 Dynamic brake operation

(1) Calculation of coasting distance

Fig. 8.3 shows the pattern in which the servo motor comes to a stop when the dynamic brake is operated. Use equation 8.2 to calculate an approximate coasting distance to a stop. The dynamic brake time constant τ varies with the servo motor and machine operation speeds. (Refer to (2) of this section.) A working part generally has a friction force. Therefore, actual coasting distance will be shorter than a maximum coasting distance calculated with the following equation.

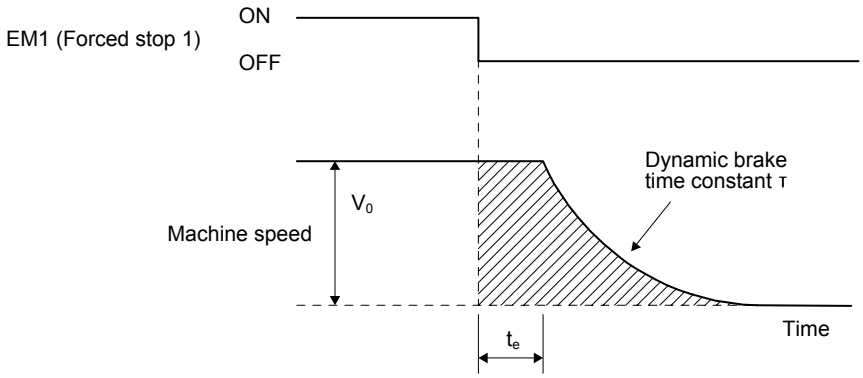
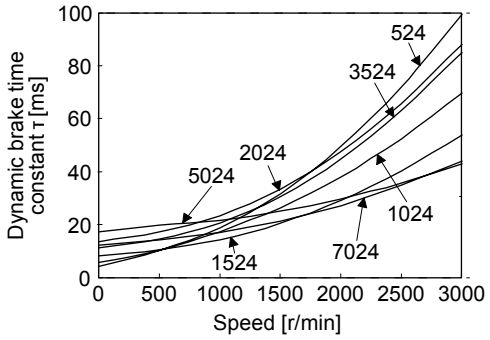


Fig. 8.3 Dynamic brake operation diagram

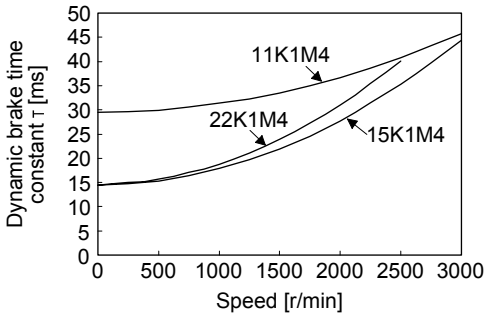
$$L_{max} = \frac{V_0}{60} \cdot \left\{ t_e + \tau \left(1 + \frac{J_L}{J_M} \right) \right\} \quad \cdots\cdots (8.2)$$

L_{max}: Maximum coasting distance [mm]
V_0: Machine's fast feed speed [mm/min]
J_M: Moment of inertia of the servo motor [× 10^{-4} kg•m^2]
J_L: Load moment of inertia converted into equivalent value on servo motor shaft [× 10^{-4} kg•m^2]
τ: Dynamic brake time constant ····· [s]
t_e: Delay time of control section ····· [s]
For 7 kW or lower servo, there is internal relay delay time of about 10 ms. For 11 kW to 22 kW servo, there is delay caused by magnetic contactor built into the external dynamic brake (about 50 ms) and delay caused by the external relay.

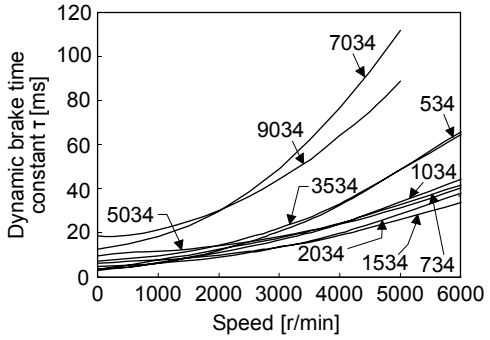
(2) Dynamic brake time constant
The following shows necessary dynamic brake time constant τ for equation 8.2.



HG-SR series



HG-JR1500r/min series



HG-SR3000r/min series

8.3.2 Permissible load to motor inertia when the dynamic brake is used

Use the dynamic brake under the load to motor inertia ratio indicated in the following table. If the ratio is higher than this value, the dynamic brake may burn. If there is a possibility that the ratio may exceed the value, contact your local sales office.
The values of the permissible load to motor inertia ratio in the table are the values at the maximum rotation speed of the servo motor. The value in the parenthesis shows the value at the rated speed.

Servo motor	Permissible load to motor inertia ratio [multiplier (×1)]
HG-SR524	5 (15)
HG-SR1024	5 (17)
HG-SR1524	
HG-SR2024	5 (15)
HG-SR3524	
HG-SR5024	
HG-SR7024	

Servo motor	Permissible load to motor inertia ratio [multiplier (×1)]
HG-JR534	30 (30)
HG-JR734	
HG-JR1034	
HG-JR1534	
HG-JR2034	
HG-JR3534	20 (30) (Note)
HG-JR5034	15 (30)
HG-JR7034	11 (30)
HG-JR9034	18 (30)
HG-JR11K1M4	10 (30)
HG-JR15K1M4	
HG-JR22K1M4	20 (30)

Note. When the maximum torque is increased to 400%, the permissible load to motor inertia ratio at the maximum speed of the servo motor is 25 times.

8.4 Inrush currents at power-on of main circuit and control circuit

The following table indicates the inrush currents (reference data) that will flow when 480 V AC is applied at the power supply capacity of 2500 kVA and the wiring length of 1 m.

Servo amplifier	Inrush currents (A_{0-P})	
	Main circuit power supply (L1, L2, and L3)	Control circuit power supply (L11 and L21)
MR-J4-60_4(-RJ) MR-J4-100_4(-RJ)	65 A (attenuated to approx. 5 A in 10 ms)	40 A to 50 A (Attenuated to approx. 0 A in 2 ms)
MR-J4-200_4(-RJ)	80 A (attenuated to approx. 5 A in 10 ms)	
MR-J4-350_4(-RJ)	100 A (attenuated to approx. 20 A in 10 ms)	
MR-J4-500_4(-RJ)	65 A (attenuated to approx. 9 A in 20 ms)	41 A (attenuated to approx. 0 A in 3 ms)
MR-J4-700_4(-RJ)	68 A (attenuated to approx. 34 A in 20 ms)	
MR-J4-11K_4(-RJ)	339 A (attenuated to approx. 10 A in 30 ms)	38 A (attenuated to approx. 1 A in 30 ms)
MR-J4-15K_4(-RJ)	339 A (attenuated to approx. 15 A in 30 ms)	
MR-J4-22K_4(-RJ)	339 A (attenuated to approx. 20 A in 30 ms)	

Since large inrush currents flow in the power supplies, always use molded-case circuit breakers and magnetic contactors.
(Refer to section 9.7.)
When circuit protectors are used, it is recommended that the inertia delay type, which is not tripped by an inrush current, be used.

MEMO

9. OPTIONS AND PERIPHERAL EQUIPMENT

⚠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, when confirming whether the charge lamp is off or not, always confirm it from the front of the servo amplifier.

⚠CAUTION

●Use the specified peripheral equipment and options to prevent a malfunction or a fire.

POINT

●We recommend using HIV wires to wire the servo amplifiers, options, and peripheral equipment. Therefore, the recommended wire sizes may differ from those used for the previous servo amplifiers.

The items in the following table are the same as those for MR-J4-_A(-RJ) or MR-J4-_B(-RJ) servo amplifier. For details of the items, refer to each chapter/section of the detailed explanation field.

Model	Item	Detailed explanation
MR-J4-_A4(-RJ)	MR-D05UDL3M-B STO cable	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 11.1.2
	Junction terminal block MR-TB50	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 11.6
	MR Configurator2	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 11.7
	Battery	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 11.8
	Relay (recommended)	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 11.13
	External dynamic brake	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 11.17
	Heat sink outside mounting attachment (MR-J4ACN15K/MR-J3ACN)	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 11.18
MR-J4-_B4(-RJ)	MR-D05UDL3M-B STO cable	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 11.1.2
	SSCNET III cable	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 11.1.3
	Junction terminal block PS7DW-20V14B-F (recommended)	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 11.6
	MR Configurator2	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 11.7
	Battery	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 11.8
	Relay (recommended)	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 11.13
	External dynamic brake	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 11.17
	Heat sink outside mounting attachment (MR-J4ACN15K/MR-J3ACN)	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 11.18

9.1 Cable/connector sets

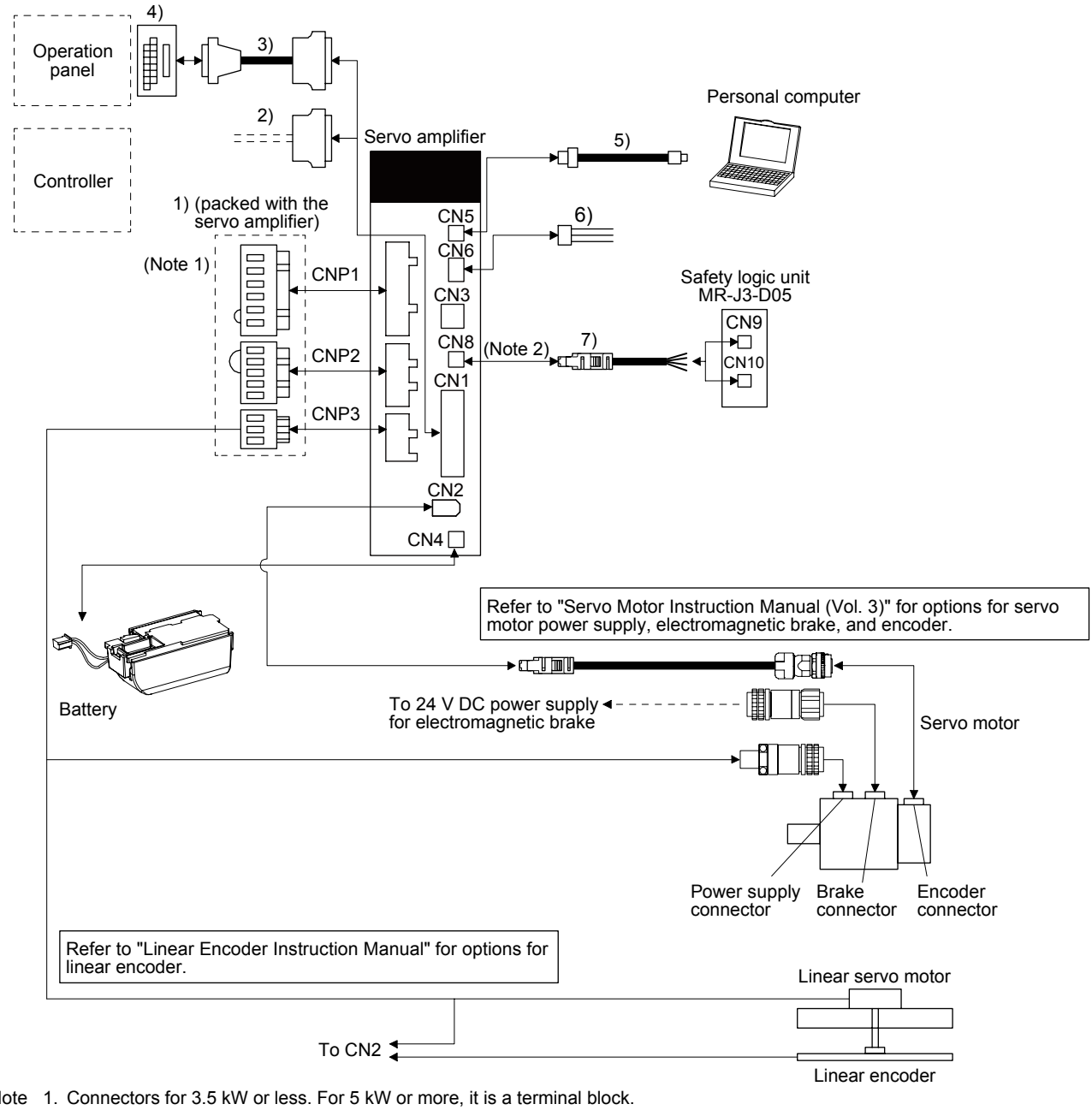
POINT

●The IP rating indicated for cables and connectors is their protection against ingress of dust and raindrops when they are connected to a servo amplifier or servo motor. If the IP rating of the cable, connector, servo amplifier and servo motor vary, the overall IP rating depends on the lowest IP rating of all components.

Please purchase the cable and connector options indicated in this section.

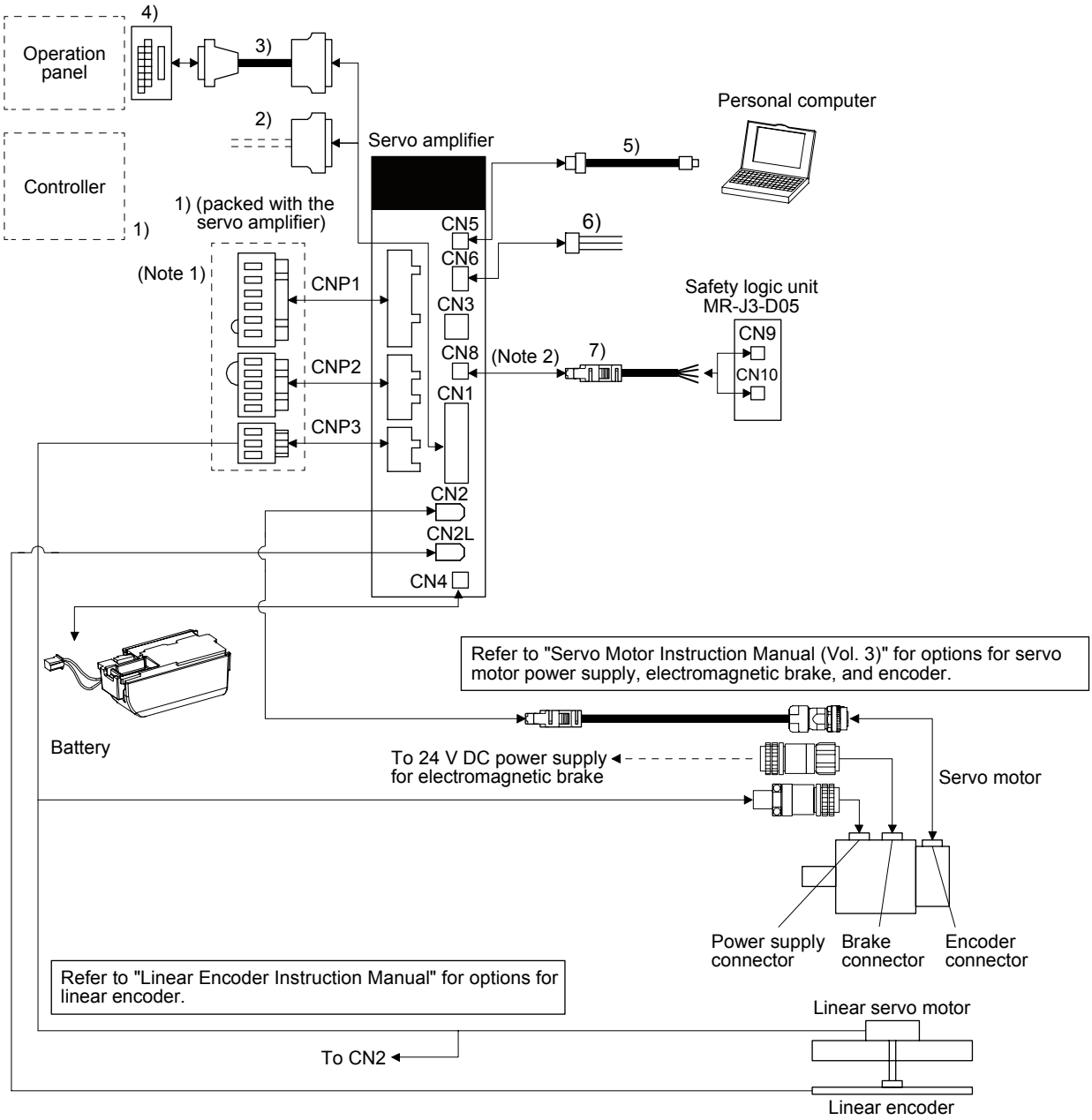
9.1.1 Combinations of cable/connector sets

For MR-J4-_A4 servo amplifier

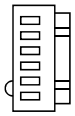
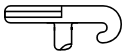
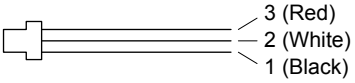


Note 1. Connectors for 3.5 kW or less. For 5 kW or more, it is a terminal block.
2. When not using the STO function, attach the short-circuit connector (8)) came with a servo amplifier.

For MR-J4-_A4-RJ servo amplifier

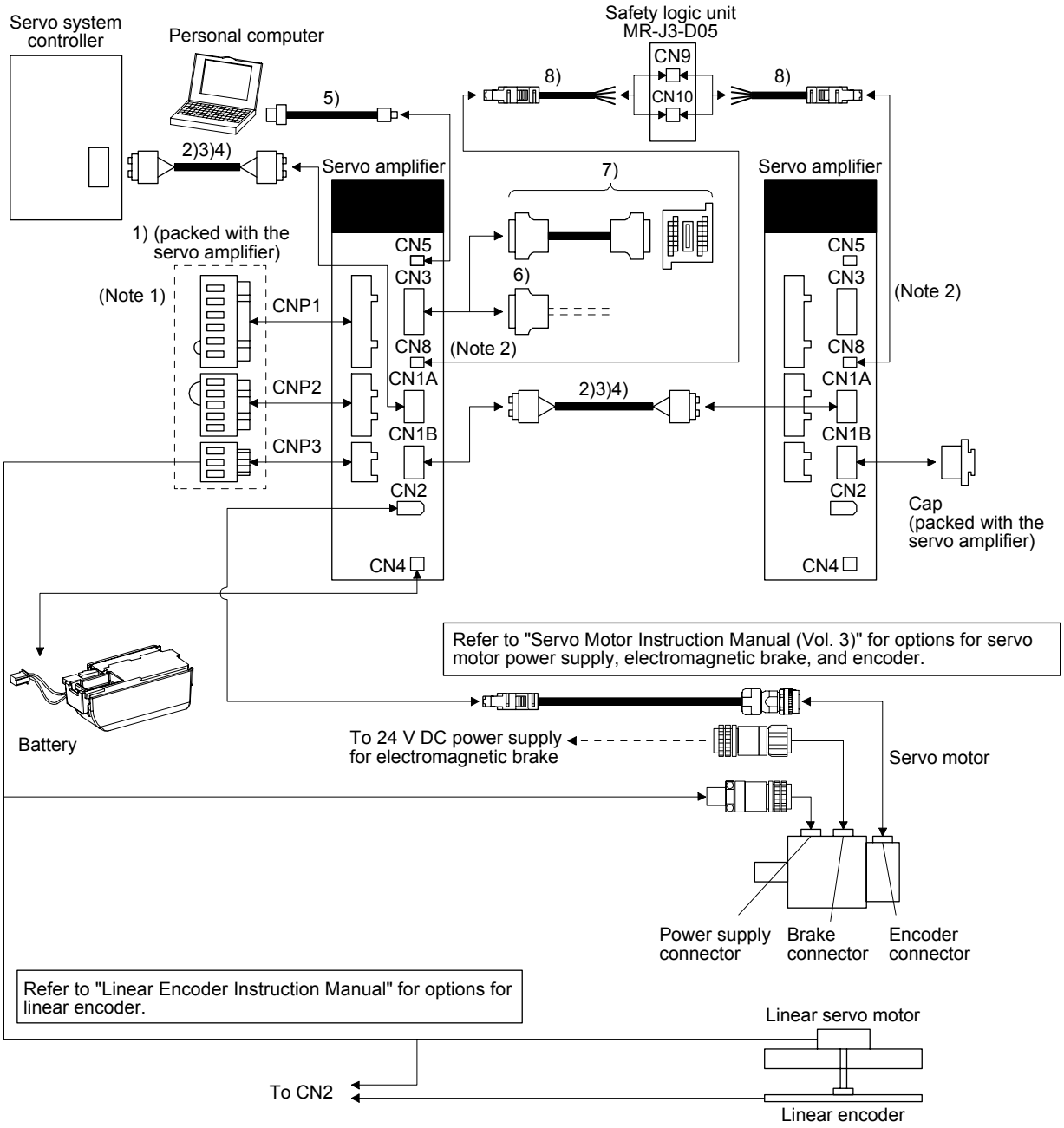


Note 1. Connectors for 3.5 kW or less. For 5 kW or more, it is a terminal block.
2. When not using the STO function, attach the short-circuit connector (8)) came with a servo amplifier.

No.	Product name	Model	Description	Application
1)	Servo amplifier power connector set		   CNP1 connector: 06JFAT-SAXGDK-HT10.5 (JST) CNP2 connector: 05JFAT-SAXGDK-HT7.5 (JST) CNP3 connector: 03JFAT-SAXGDK-HT10.5 (JST) Applicable wire size: 1.25 mm^2 to 2.1 mm^2 (AWG 16 to 14) Insulator OD: to 3.9 mm  Open tool J-FAT-OT-XL (JST)	Supplied with servo amplifiers of 3.5 kW or less
2)	Junction terminal block cable	MR-J2M-CN1TBL_M Cable length: 0.5 m, 1 m (Refer to section 11.6.)	Junction terminal block connector Connector: D7950-B500FL (3M) CN1 connector Connector: 10150-6000EL Shell kit: 10350-3210-000 (3M or equivalent) 	For junction terminal block connection
3)	CN1 connector set	MR-J3CN1	Connector: 10150-3000PE Shell kit: 10350-52F0-008 (3M or equivalent) 	
4)	Junction terminal block	MR-TB50	Refer to section 11.6.	
5)	USB cable	MR-J3USBCBL3M Cable length: 3 m	CN5 connector mini-B connector (5 pins) Personal computer connector A connector 	For connection with PC-AT compatible personal computer
6)	Monitor cable	MR-J3CN6CBL1M Cable length: 1 m	 3 (Red) 2 (White) 1 (Black) CN6 connector Housing: 151004-0300 Terminal: 50011-8100 (Molex)	
7)	STO cable	MR-D05UDL3M-B	Connector set: 2069250-1 (TE Connectivity) 	Connection cable for the CN8 connector
8)	Short-circuit connector			Supplied with servo amplifier

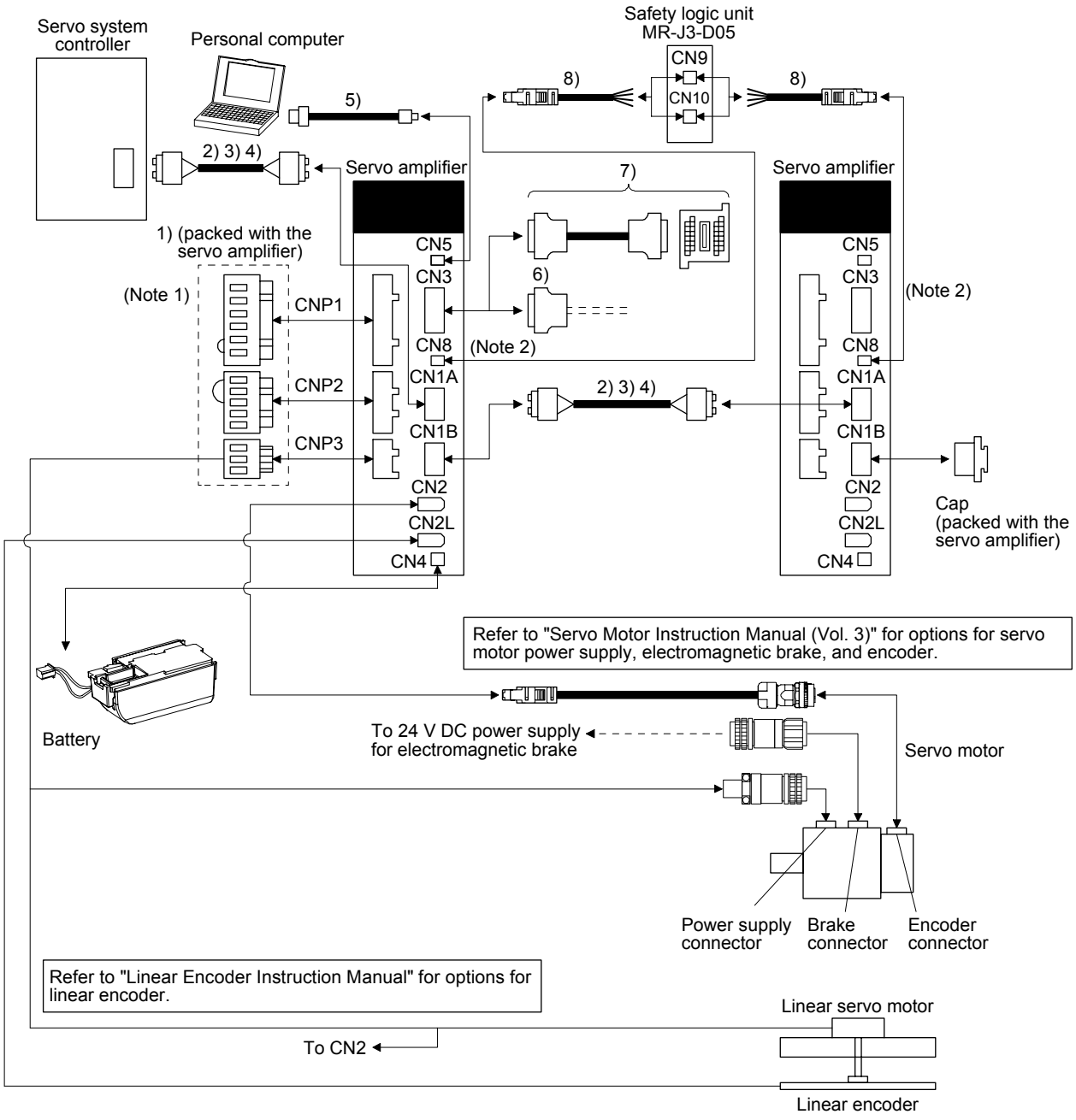
9.1.2 Combinations of cable/connector sets

For MR-J4-_B4 servo amplifier



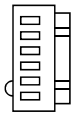
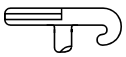
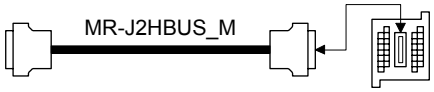
Note 1. Connectors for 3.5 kW or less. For 5 kW or more, it is a terminal block.
2. When not using the STO function, attach the short-circuit connector (9)) came with a servo amplifier.

For MR-J4-_B4-RJ servo amplifier



Note 1. Connectors for 3.5 kW or less. For 5 kW or more, it is a terminal block.

2. When not using the STO function, attach the short-circuit connector (9)) came with a servo amplifier.

No.	Product name	Model	Description	Application
1)	Servo amplifier power connector set		 CNP1 connector: 06JFAT-SAXGDK-HT10.5 (JST)  CNP2 connector 05JFAT-SAXGDK-HT7.5 (JST)  CNP3 connector: 03JFAT-SAXGDK-HT10.5 (JST) Applicable wire size: 1.25 mm^2 to 2.1 mm^2 (AWG 16 to 14) Insulator OD: to 3.9 mm  Open tool J-FAT-OT-XL (JST)	Supplied with servo amplifiers of 3.5 kW or less
2)	SSCNET III cable	MR-J3BUS_M Cable length: 0.15 m to 3 m (Refer to section 11.1.3.)	Connector: PF-2D103 (JAE) Connector: PF-2D103 (JAE) 	Standard cord inside cabinet
3)	SSCNET III cable	MR-J3BUS_M-A Cable length: 5 m to 20 m (Refer to section 11.1.3.)		Standard cable outside cabinet
4)	SSCNET III cable	MR-J3BUS_M-B Cable length: 30 m to 50 m (Refer to section 11.1.3.)	Connector: CF-2D103-S (JAE) Connector: CF-2D103-S (JAE) 	Long-distance cable
5)	USB cable	MR-J3USBCBL3M Cable length: 3 m	CN5 connector mini-B connector (5 pins) Personal computer connector A connector 	For connection with PC-AT compatible personal computer
6)	Connector set	MR-CCN1	 Connector: 10120-3000PE Shell kit: 10320-52F0-008 (3M or equivalent)	
7)	Junction terminal block (recommended)		PS7DW-20V14B-F (Yoshida Electric Industry)  MR-J2HBUS_M Junction terminal block PS7DW-20V14B-F is not option. For using the junction terminal block, option MR-J2HBUS_M is necessary. Refer to section 11.6 for details.	
8)	STO cable	MR-D05UDL3M-B	Connector set: 2069250-1 (TE Connectivity) 	Connection cable for the CN8 connector
9)	Short-circuit connector			Supplied with servo amplifier

9.2 Regenerative option

> **⚠CAUTION**
>
> ●Do not use servo amplifiers with regenerative options other than the combinations specified below.
> Otherwise, it may cause a fire.

9.2.1 Combination and regenerative power

The power values in the table are resistor-generated powers and not rated powers.

Servo amplifier	Regenerative power [W]								
	Built-in regenerative resistor	MR-RB1H-4 [82 Ω]	(Note 1) MR-RB3M-4 [120 Ω]	(Note 1) MR-RB3G-4 [47 Ω]	(Note 1) MR-RB5G-4 [47 Ω]	(Note 1) MR-RB34-4 [26 Ω]	(Note 1) MR-RB54-4 [26 Ω]	(Note 1) MR-RB3U-4 [22 Ω]	(Note 1) MR-RB5U-4 [22 Ω]
MR-J4-60_4(-RJ)	15	100	300						
MR-J4-100_4(-RJ)	15	100	300						
MR-J4-200_4(-RJ)	100			300	500				
MR-J4-350_4(-RJ)	100			300	500				
MR-J4-500_4(-RJ)	130					300	500		
MR-J4-700_4(-RJ)	170							300	500

Servo amplifier	(Note 2) Regenerative power [W]		
	External regenerative resistor (accessory)	MR-RB5K-4 [10 Ω]	MR-RB6K-4 [10 Ω]
MR-J4-11K_4(-RJ)	500 (800)	500 (800)	
MR-J4-15K_4(-RJ)	850 (1300)		850 (1300)
MR-J4-22K_4(-RJ)	850 (1300)		850 (1300)

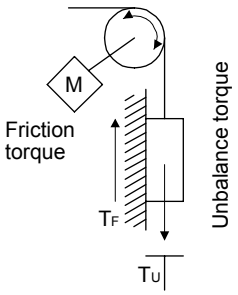
Note 1. Always install a cooling fan.
2. Values in parentheses assume the installation of a cooling fan.

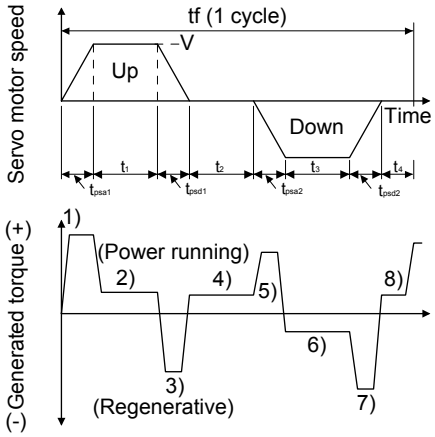
9.2.2 Selection of regenerative option

(1) For rotary servo motor

Use the following method when regeneration occurs continuously in vertical motion applications or when it is desired to make an in-depth selection of the regenerative option.

(a) Regenerative energy calculation





Formulas for calculating torque and energy in operation

Regenerative power	Torque applied to servo motor [N•m]	Energy E [J]
1)	$T_1 = \frac{(J_L/\eta + J_M) \cdot V}{9.55 \cdot 10^4} \cdot \frac{1}{t_{psa1}} + T_U + T_F$	$E_1 = \frac{0.1047}{2} \cdot V \cdot T_1 \cdot t_{psa1}$
2)	$T_2 = T_U + T_F$	$E_2 = 0.1047 \cdot V \cdot T_2 \cdot t_1$
3)	$T_3 = \frac{-(J_L \cdot \eta + J_M) \cdot V}{9.55 \cdot 10^4} \cdot \frac{1}{t_{psa2}} + T_U + T_F$	$E_3 = \frac{0.1047}{2} \cdot V \cdot T_3 \cdot t_{psa2}$
4), 8)	$T_4, T_8 = T_U$	$E_4, E_8 \geq 0$ (No regeneration)
5)	$T_5 = \frac{(J_L/\eta + J_M) \cdot V}{9.55 \cdot 10^4} \cdot \frac{1}{t_{psd2}} - T_U + T_F$	$E_5 = \frac{0.1047}{2} \cdot V \cdot T_5 \cdot t_{psd2}$
6)	$T_6 = -T_U + T_F$	$E_6 = 0.1047 \cdot V \cdot T_6 \cdot t_3$
7)	$T_7 = \frac{-(J_L \cdot \eta + J_M) \cdot V}{9.55 \cdot 10^4} \cdot \frac{1}{t_{psd2}} - T_U + T_F$	$E_7 = \frac{0.1047}{2} \cdot V \cdot T_7 \cdot t_{psd2}$

From the calculation results in 1) to 8), find the absolute value (Es) of the sum total of negative energies.

(b) Losses of servo motor and servo amplifier in regenerative mode

The following table lists the efficiencies and other data of the servo motor and servo amplifier in the regenerative mode.

Servo amplifier	Inverse efficiency [%]	Capacitor charging [J]
MR-J4-60_4(-RJ)	85	12
MR-J4-100_4(-RJ)	85	12
MR-J4-200_4(-RJ)	85	25
MR-J4-350_4(-RJ)	85	43
MR-J4-500_4(-RJ)	90	45

Servo amplifier	Inverse efficiency [%]	Capacitor charging [J]
MR-J4-700_4(-RJ)	90	70
MR-J4-11K_4(-RJ)	90	120
MR-J4-15K_4(-RJ)	90	170
MR-J4-22K_4(-RJ)	90	250

Inverse efficiency (η): Efficiency including some efficiencies of the servo motor and servo amplifier when rated (regenerative) torque is generated at rated speed. Since the efficiency varies with the speed and generated torque, allow for about 10%.

Capacitor charging (Ec): Energy charged into the electrolytic capacitor in the servo amplifier

Subtract the capacitor charging from the result of multiplying the sum total of regenerative energies by the inverse efficiency to calculate the energy consumed by the regenerative option.

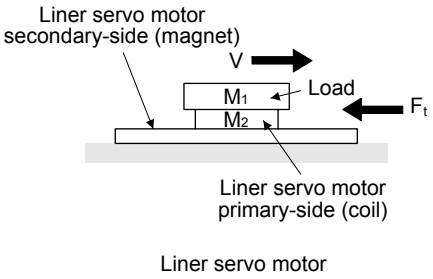
$ER\ [J] = \eta \cdot Es - Ec$

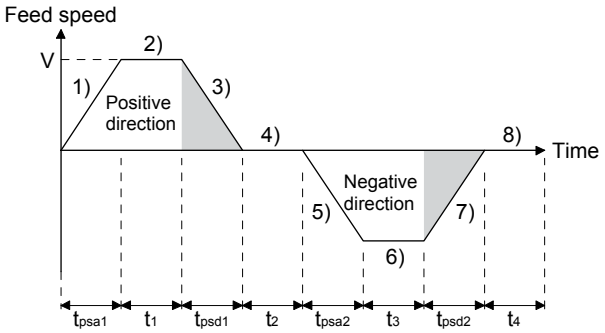
Calculate the power consumption of the regenerative option on the basis of single-cycle operation period tf [s] to select the necessary regenerative option.

$PR\ [W] = ER/tf$

(2) For linear servo motor

(a) Calculation of thrust and energy





The following shows equations of the linear servo motor thrust and energy at the driving pattern above.

Section	Travel direction of linear servo motor	Energy E [J]
1)	$F_1 = (M_1 + M_2) \cdot V/t_{psa1} + F_t$	$E_1 = V/2 \cdot F_1 \cdot t_{psa1}$
2)	$F_2 = F_1$	$E_2 = V \cdot F_2 \cdot t_1$
3)	$F_3 = -(M_1 + M_2) \cdot V/t_{psd1} + F_t$	$E_3 = V/2 \cdot F_3 \cdot t_{psd1}$
4), 8)	$F_4, F_8 = 0$	$E_4, E_8 = 0$ (No regeneration)
5)	$F_5 = (M_1 + M_2) \cdot V/t_{psa2} + F_t$	$E_5 = V/2 \cdot F_5 \cdot t_{psa2}$
6)	$F_6 = F_t$	$E_6 = V \cdot F_6 \cdot t_3$
7)	$F_7 = -(M_1 + M_2) \cdot V/t_{psd2} + F_t$	$E_7 = V/2 \cdot F_7 \cdot t_{psd2}$

From the calculation results in 1) to 8), find the absolute value (Es) of the sum total of negative energies.

(b) Losses of servo motor and servo amplifier in regenerative mode
Refer to this section (1) (b) for inverse efficiency and Capacitor charging.

(c) generative energy calculation
Subtract the capacitor charging from the result of multiplying the sum total of regenerative energies by the inverse efficiency to calculate the energy consumed by the regenerative resistor.

$ER [J] = \eta \cdot Es - Ec$

From the total of ER's whose subtraction results are positive and a 1-cycle period, the power consumption of the regenerative option can be calculated with the following expression.

Power consumption PR [W] total of positive ER's/1-cycle operation period (tf)

Select the regenerative option from the PR value. Regenerative option is not required when the energy consumption is equal to or less than the built-in regenerative energy.

9.2.3 Parameter setting

Set [Pr. PA02] according to the option to be used.

[Pr. PA02]

0	0		

Selection of regenerative option
00: Regenerative option is not used.
- For servo amplifier of 0.6 kW to 7 kW, built-in regenerative resistor is used.
- Supplied regenerative resistors or regenerative option is used with the servo amplifier of 11 kW to 22 kW.

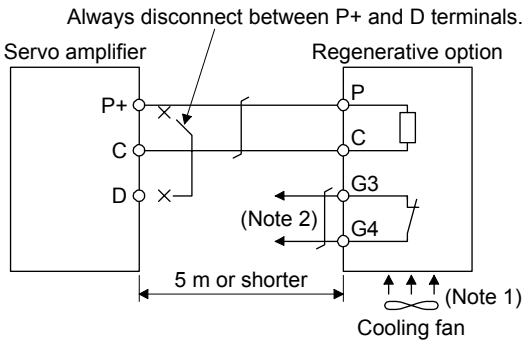
01: FR-BU2-H/FR-RC-H/FR-CV-H
80: MR-RB1H-4
81: MR-RB3M-4 (Cooling fan is required.)
82: MR-RB3G-4 (Cooling fan is required.)
83: MR-RB5G-4 (Cooling fan is required.)
84: MR-RB34-4 (Cooling fan is required.)
85: MR-RB54-4 (Cooling fan is required.)
91: MR-RB3U-4 (Cooling fan is required.)
92: MR-RB5U-4 (Cooling fan is required.)
FA: When the supplied regenerative resistors or the regenerative option is cooled by the cooling fan to increase the ability with the servo amplifier of 11 kW to 22 kW.

9.2.4 Selection of regenerative option

POINT
●MR-RB3M-4, MR-RB3G-4, MR-RB5G-4, MR-RB34-4, MR-RB54-4, MR-RB5K-4, or MR-RB6K-4 is used, a cooling fan is required to cool it. The cooling fan should be prepared by the customer. ●For the wire sizes used for wiring, refer to section 9.6.

The regenerative option generates heat of 100 ˚C higher than the ambient temperature. Fully consider heat dissipation, installation position, wires used, etc. before installing the option. For wiring, use flame-resistant wires or make the wires flame-resistant and keep them away from the regenerative option. Always use twisted cables of max. 5 m length for connection with the servo amplifier.

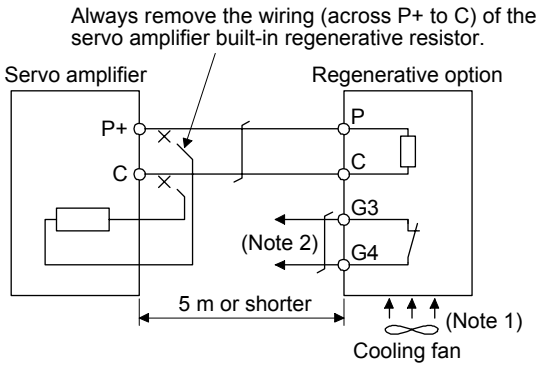
(1) MR-J4-350A4(-RJ) or less/MR-J4-350B4(-RJ) or less
Always remove the wiring from across P+ to D and fit the regenerative option across P+ to C. G3 and G4 are thermal sensor's terminals. Between G3 and G4 is opened when the regenerative option overheats abnormally.



Note 1. When using the MR-RB3M-4, MR-RB3G-4, or MR-RB5G-4, forcibly cool it with a cooling fan (92 × 92, minimum air flow: 1.0 m^3).
2. Make up a sequence which will switch off the magnetic contactor when abnormal heating occurs.
G3-G4 contact specifications
Maximum voltage: 120 V AC/DC
Maximum current: 0.5 A/4.8 V DC
Maximum capacity: 2.4 VA

(2) MR-J4-500A4(-RJ)/MR-J4-700A4(-RJ)/MR-J4-500B4(-RJ)/MR-J4-700B4(-RJ)

Always remove the wiring (across P+ to C) of the servo amplifier built-in regenerative resistor and fit the regenerative option across P+ to C. G3 and G4 are thermal sensor's terminals. Between G3 and G4 is opened when the regenerative option overheats abnormally.



Note 1. When using the MR-RB34-4, MR-RB54-4, MR-RB3U-4, or MR-RB5U-4, forcibly cool it with a cooling fan (92 × 92, minimum air flow: 1.0 m^3).

2. Make up a sequence which will switch off the magnetic contactor when abnormal heating occurs.

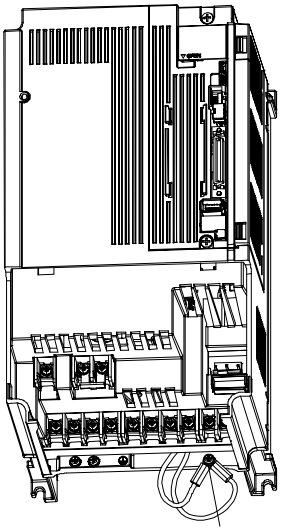
G3-G4 contact specifications

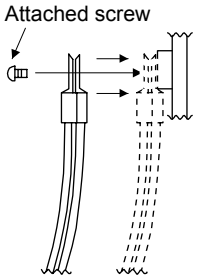
Maximum voltage: 120 V AC/DC

Maximum current: 0.5 A/4.8 V DC

Maximum capacity: 2.4 VA

When using the regenerative option, remove the servo amplifier's built-in regenerative resistor wires (across P+ to C), fit them back to back, and secure them to the frame with the accessory screw as shown below.

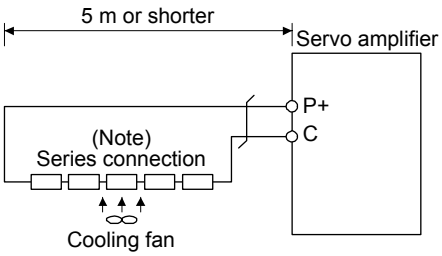




(3) MR-J4-11KA4(-RJ)/MR-J4-15KA4(-RJ)/MR-J4-22KA4(-RJ)/MR-J4-11KB4(-RJ)/MR-J4-15KB4(-RJ)/MR-J4-22KB4(-RJ) (when using the supplied regenerative resistor)

When using the regenerative resistors supplied to the servo amplifier, the specified number of resistors (4 or 5 resistors) must be connected in series. If they are connected in parallel or in less than the specified number, the servo amplifier may become faulty and/or the regenerative resistors burn.

Install the resistors at intervals of about 70 mm. Cooling the resistors with two cooling fans (1.0 m^3/min or more, 92 mm × 92 mm) improves the regeneration capability. In this case, set "_ _ F A" in [Pr. PA02].



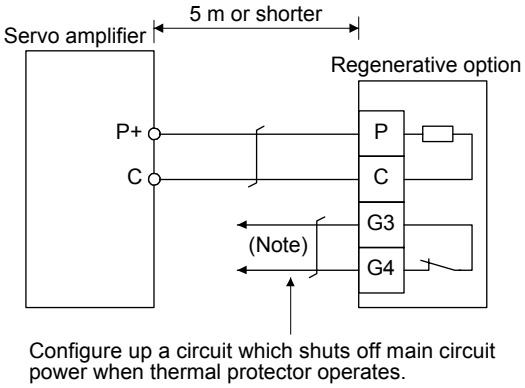
Note. The number of resistors connected in series depends on the resistor type. The thermal sensor is not mounted on the attached regenerative resistor. An abnormal heating of resistor may be generated at a regenerative circuit failure. Install a thermal sensor near the resistor and establish a protective circuit to shut off the main circuit power supply when abnormal heating occurs. The detection level of the thermal sensor varies according to the settings of the resistor. Set the thermal sensor in the most appropriate position on your design basis, or use the thermal sensor built-in regenerative option. (MR-RB5E, 5R, 9P, 9F, 5K-4, 6B-4, 60-4, or 6K-4)

Servo amplifier	Regenerative resistor	Regenerative power [W]		Resultant resistance [Ω]	Number of resistors
		Normal	Cooling		
MR-J4-11KA4(-RJ) MR-J4-11KB4(-RJ)	GRZG400-2.5Ω	500	800	10	4
MR-J4-15KA4(-RJ) MR-J4-22KA4(-RJ) MR-J4-15KB4(-RJ) MR-J4-22KB4(-RJ)	GRZG400-2Ω	850	1300	10	5

(4) MR-J4-11K_4-PX to MR-J4-22K_4-PX, and MR-J4-11K_4-RZ to MR-J4-22K_4-RZ (when using the regenerative option)

The MR-J4-11KA4-PX to MR-J4-22KA4-PX, MR-J4-11KB4-PX to MR-J4-22KB4-PX, MR-J4-11KA4-RZ to MR-J4-22KA4-RZ, and MR-J4-11KB4-RZ to MR-J4-22KB4-RZ servo amplifiers are not supplied with regenerative resistors. When using any of these servo amplifiers, always use the MR-RB5K-4 or MR-RB6K-4 regenerative option.

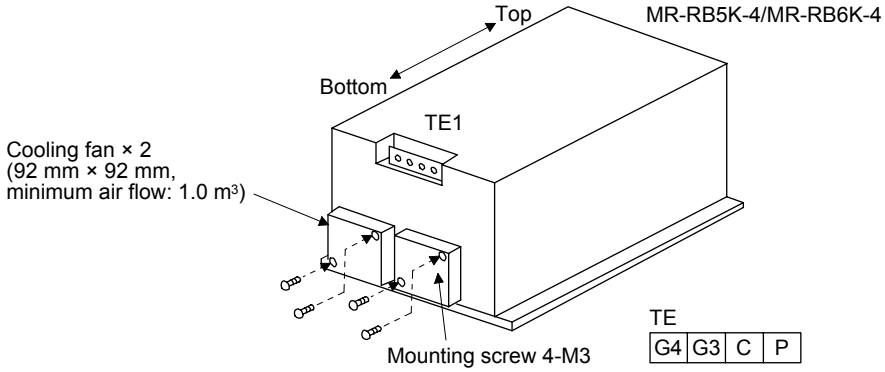
Cooling the regenerative option with cooling fans improves regenerative capability. G3 and G4 are thermal sensor's terminals. Between G3 and G4 is opened when the regenerative option overheats abnormally.



Note. G3-G4 contact specifications
Maximum voltage: 120 V AC/DC
Maximum current: 0.5 A/4.8 V DC
Maximum capacity: 2.4 VA

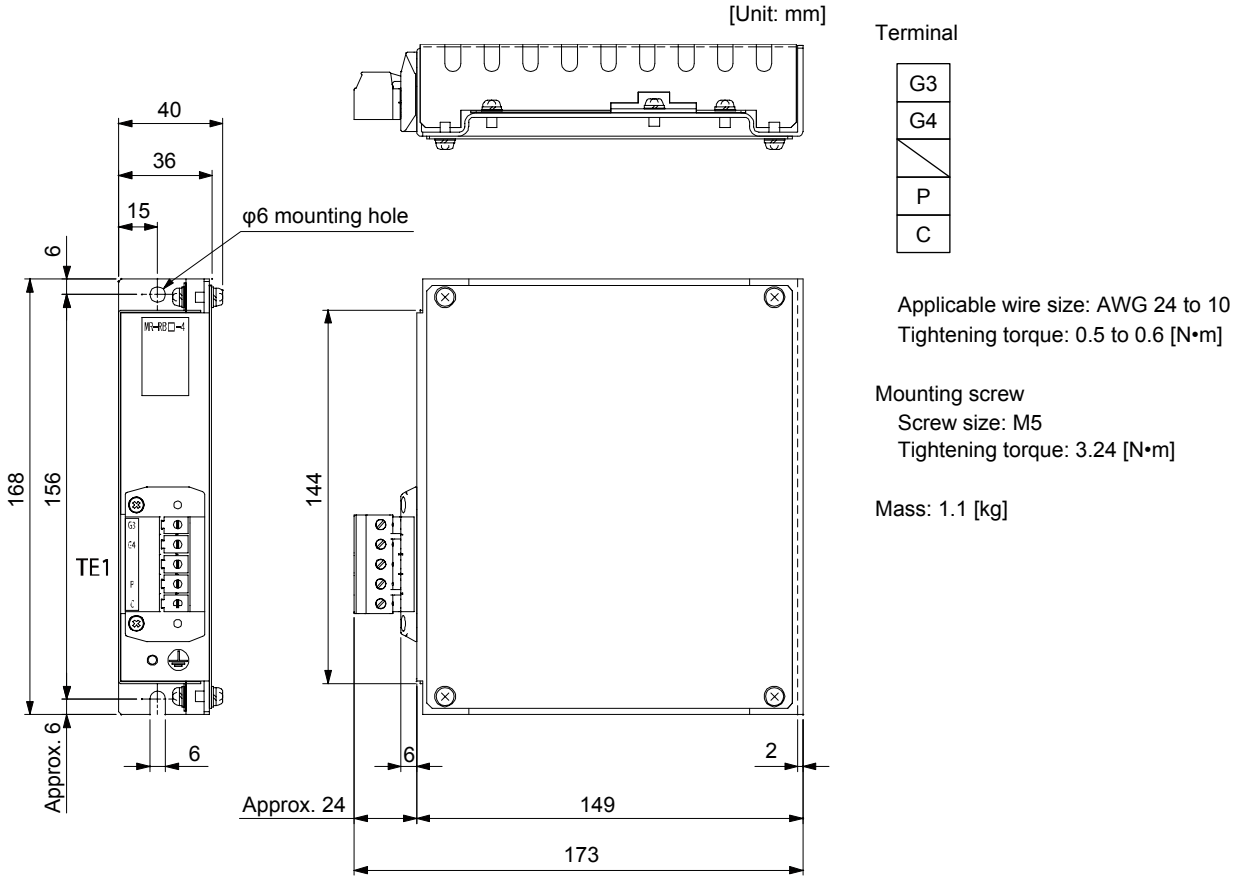
Servo amplifier	Regenerative option	Resistance [Ω]	Regenerative power [W]	
			Without cooling fans	With cooling fans
MR-J4-11KA4-PX MR-J4-11KB4-PX MR-J4-11KA4-RZ MR-J4-11KB4-RZ	MR-RB5K-4	10	500	800
MR-J4-15KA4-PX MR-J4-15KB4-PX MR-J4-15KA4-RZ MR-J4-15KB4-RZ MR-J4-22KA4-PX MR-J4-22KB4-PX MR-J4-22KA4-RZ MR-J4-22KB4-RZ	MR-RB6K-4	10	850	1300

When using cooling fans, install them using the mounting holes provided in the bottom of the regenerative option.



9.2.5 Dimensions

(1) MR-RB1H-4



Terminal

G3
G4
P
C

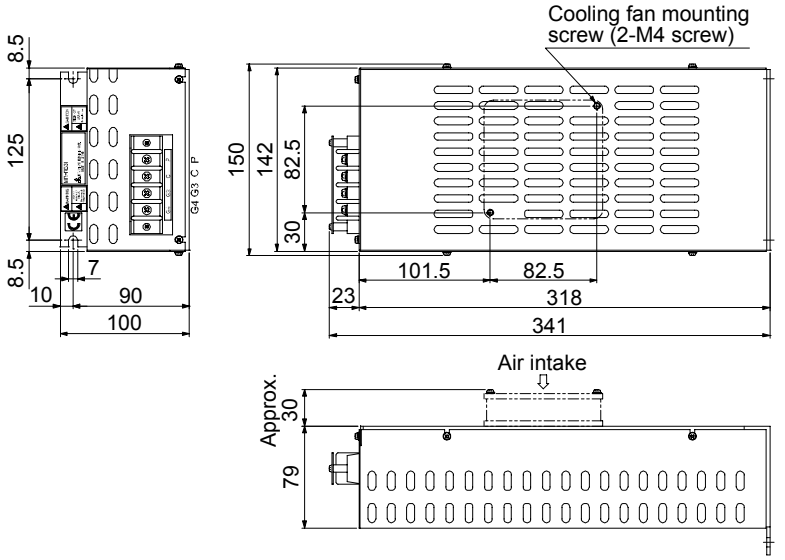
Applicable wire size: AWG 24 to 10
Tightening torque: 0.5 to 0.6 [N•m]

Mounting screw
Screw size: M5
Tightening torque: 3.24 [N•m]

Mass: 1.1 [kg]

(2) MR-RB34-4/MR-RB3M-4/MR-RB3G-4/MR-RB3U-4

[Unit: mm]



Terminal block

P
C
G3
G4

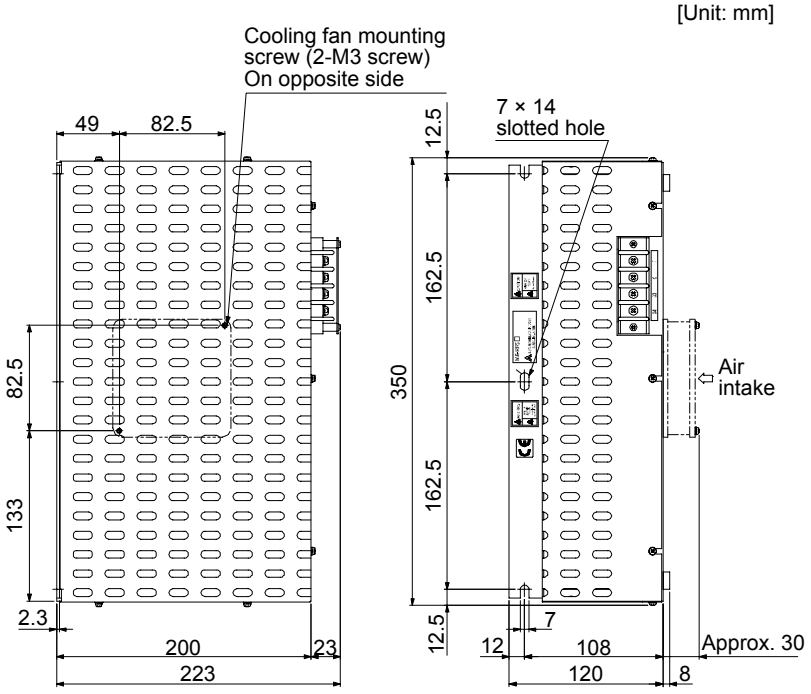
Terminal screw size: M4
Tightening torque: 1.2 [N•m]

Mounting screw
Screw size: M6
Tightening torque: 5.4 [N•m]

Mass: 2.9 [kg]

(3) MR-RB54-4/MR-RB5G-4/MR-RB5U-4

[Unit: mm]



Terminal block

P
C
G3
G4

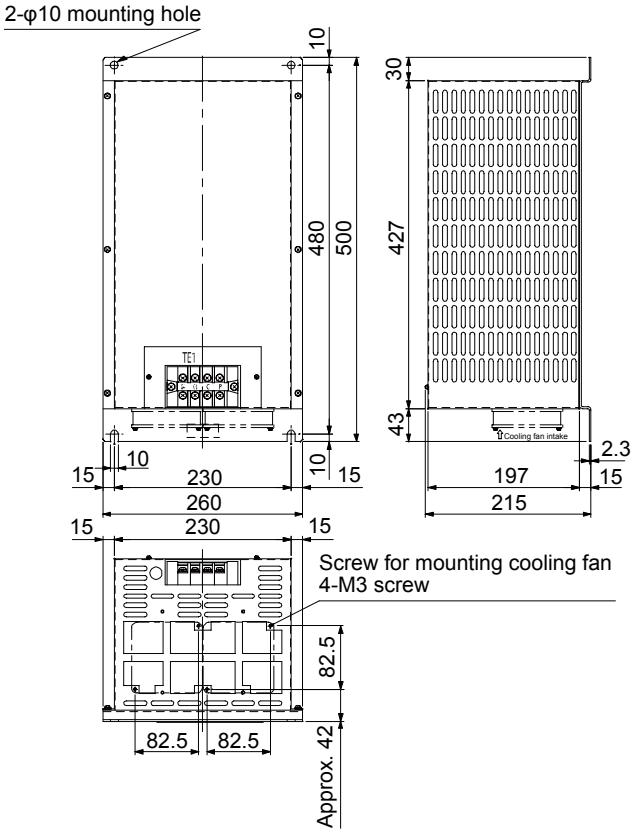
Terminal screw size: M4
Tightening torque: 1.2 [N•m]

Mounting screw
Screw size: M6
Tightening torque: 5.4 [N•m]

Mass: 5.6 [kg]

(4) MR-RB5K-4/MR-RB6K-4

[Unit: mm]



- Terminal

G4	G3	C	P

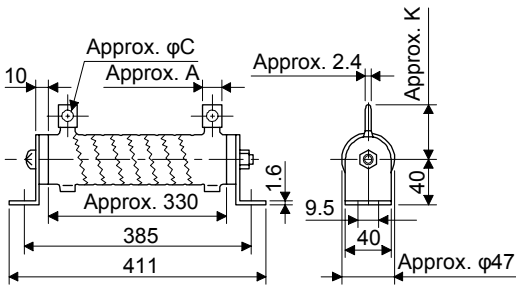
Terminal screw size: M5
Tightening torque: 2.0 [N•m]

- Mounting screw
Screw size: M8
Tightening torque: 13.2 [N•m]

Regenerative option	Mass [kg]
MR-RB5K-4	10
MR-RB6K-4	11

(5) GRZG400-2.5Ω/GRZG400-2.0Ω (standard accessories)

[Unit: mm]



Regenerative resistor	Variable dimensions			Mounting screw size	Tightening torque [N•m]	Mass [kg]
	A	C	K			
GRZG400-2.5Ω	10	5.5	39	M8	13.2	0.8
GRZG400-2.0Ω						

9.3 FR-BU2-H brake unit

POINT

- When a brake unit and a resistor unit are installed horizontally or diagonally, the heat dissipation effect diminishes. Install them on a flat surface vertically.
- The temperature of the resistor unit case will be higher than the ambient temperature by 100 ˚C or over. Keep cables and flammable materials away from the case.
- Ambient temperature condition of the brake unit is between -10 ˚C and 50 ˚C. Note that the condition is different from the ambient temperature condition of the servo amplifier (between 0 ˚C and 55 ˚C).
- Configure the circuit to shut down the power-supply with the alarm output of the brake unit and the resistor unit under abnormal condition.
- Use the brake unit with a combination indicated in section 9.3.1.
- For executing a continuous regenerative operation, use FR-RC-H power regenerative converter or FR-CV-H power regenerative common converter.
- Brake unit and regenerative options (Regenerative resistor) cannot be used simultaneously.

Connect the brake unit to the bus of the servo amplifier. As compared to the MR-RB regenerative option, the brake unit can return larger power. Use the brake unit when the regenerative option cannot provide sufficient regenerative capability.
When using the brake unit, set [Pr. PA02] to "_ _ 0 1".
When using the brake unit, always refer to the FR-BU2 Brake Unit Instruction Manual.

9.3.1 Selection

Use a combination of servo amplifier, brake unit and resistor unit listed below.

Brake unit		Resistor unit	Number of connected units	Permissible continuous power [kW]	Resultant resistance [Ω]	Applicable servo amplifier (Note 2)
400 V class	FR-BU2-H30K	FR-BR-H30K	1	1.99	16	MR-J4-500_4(-RJ) MR-J4-700_4(-RJ) MR-J4-11K_4(-RJ) (Note 1)
	FR-BU2-H55K	FR-BR-H55K	1	3.91	8	MR-J4-11K_4(-RJ) MR-J4-15K_4(-RJ) MR-J4-22K_4(-RJ)
	FR-BU2-H75K	MT-BR5-H75K	1	7.5	6.5	MR-J4-22K_4(-RJ)

Note 1. When HG-JR11K1M4 servo motor is used, limit the torque during power running to 180% or less, or the servo motor speed to 1800 r/min or less.

2. When the brake unit is selected by using the capacity selection software, a brake unit other than the combinations listed may be shown. Refer to the combinations displayed on the capacity selection software for detailed combinations.

9.3.2 Brake unit parameter setting

Whether a parameter can be changed or not is listed below.

Parameter		Change possible/ impossible	Remarks
No.	Name		
0	Brake mode switchover	Impossible	Do not change the parameter.
1	Monitor display data selection	Possible	Refer to the FR-BU2 Brake Unit Instruction Manual.
2	Input terminal function selection 1	Impossible	Do not change the parameter.
3	Input terminal function selection 2		
77	Parameter write selection		
78	Cumulative energization time carrying-over times		
CLr	Parameter clear		
ECL	Alarm history clear		
C1	For manufacturer setting		

9.3.3 Connection example

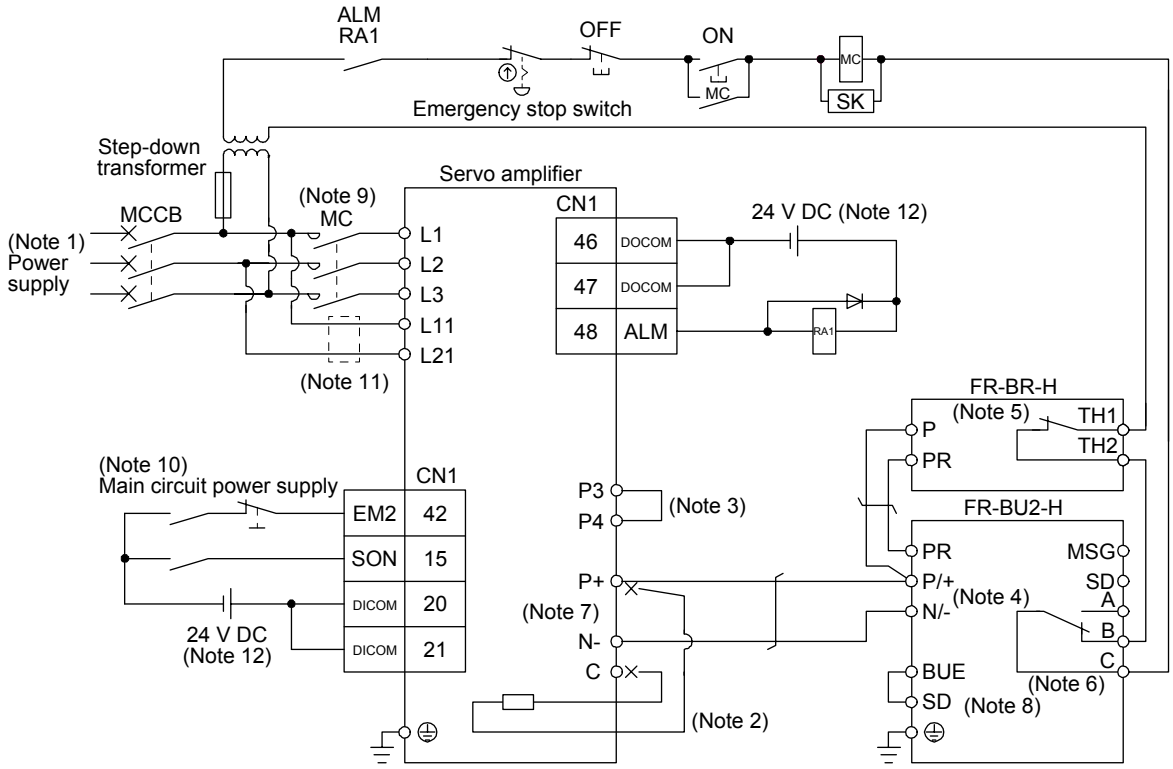
POINT

●EM2 has the same function as EM1 in the torque control mode.

●Connecting PR terminal of the brake unit to P+ terminal of the servo amplifier results in brake unit malfunction. Always connect the PR terminal of the brake unit to the PR terminal of the resistor unit.

(1) Combination of FR-BU2-H brake unit and FR-BR-H resistor unit

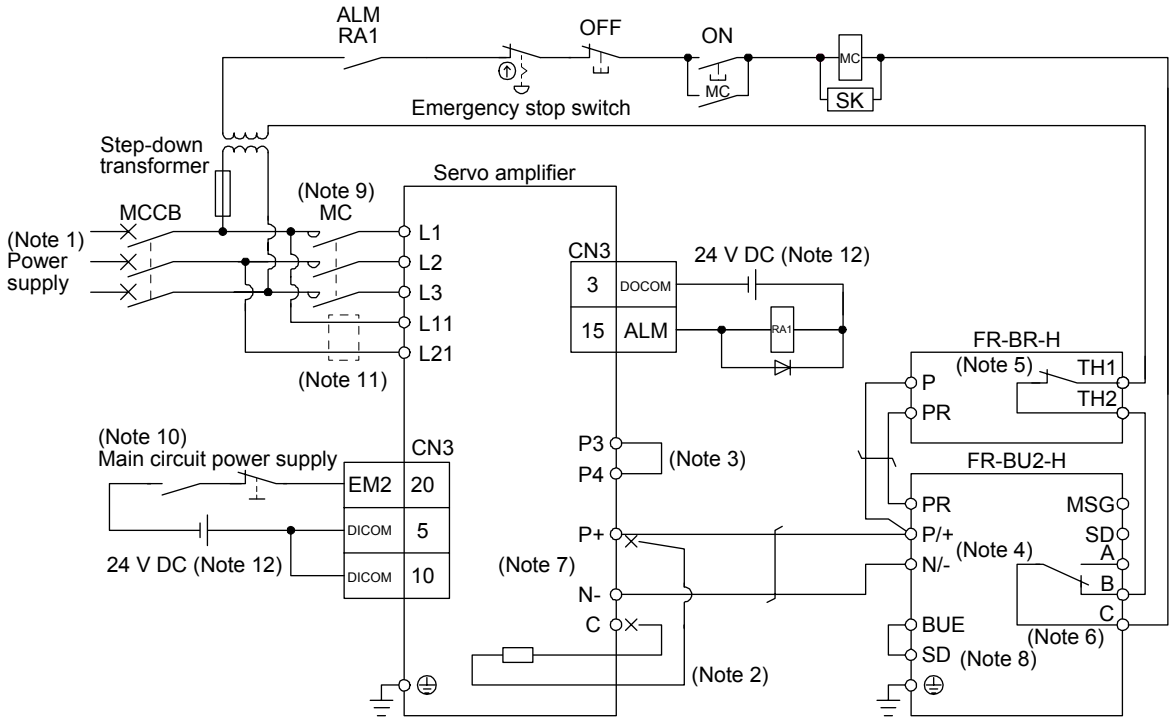
(a) For MR-J4-_A4(-RJ)



Note 1. For the power supply specifications, refer to section 1.2.1.

2. For the servo amplifier of 5 kW and 7 kW, always disconnect the lead wire of built-in regenerative resistor, which is connected to P+ and C terminals. For the servo amplifier of 11 kW to 22 kW, do not connect a supplied regenerative resistor to the P+ and C terminals.
3. Always connect between P3 and P4 terminals. (factory-wired) Use either the power factor improving DC reactor or the power factor improving AC reactor. When using the power factor improving DC reactor, refer to section 9.8.
4. Connect P/+ and N/- terminals of the brake unit to a correct destination. Incorrect connection destination results in servo amplifier and brake unit malfunction.
5. Contact rating: 1b contact, 110 V AC, 5 A/220 V AC, 3 A
   Normal condition: TH1-TH2 is conducting. Abnormal condition: TH1-TH2 is not conducting.
6. Contact rating: 230 V AC, 0.3 A/30 V DC, 0.3 A
   Normal condition: B-C is conducting./A-C is not conducting. Abnormal condition: B-C is not conducting./A-C is conducting.
7. Do not connect more than one cable to each P+ to N- terminals of the servo amplifier.
8. Always connect BUE and SD terminals. (factory-wired)
9. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.
10. Configure a circuit to turn off EM2 when the main circuit power is turned off to prevent an unexpected restart of the servo amplifier.
11. When wires used for L11 and L21 are thinner than wires used for L1, L2, and L3, use a molded-case circuit breaker.
12. The illustration of the 24 V DC power supply is divided between input signal and output signal for convinence. However, they can be configured by one.

(b) For MR-J4-_B4(-RJ)

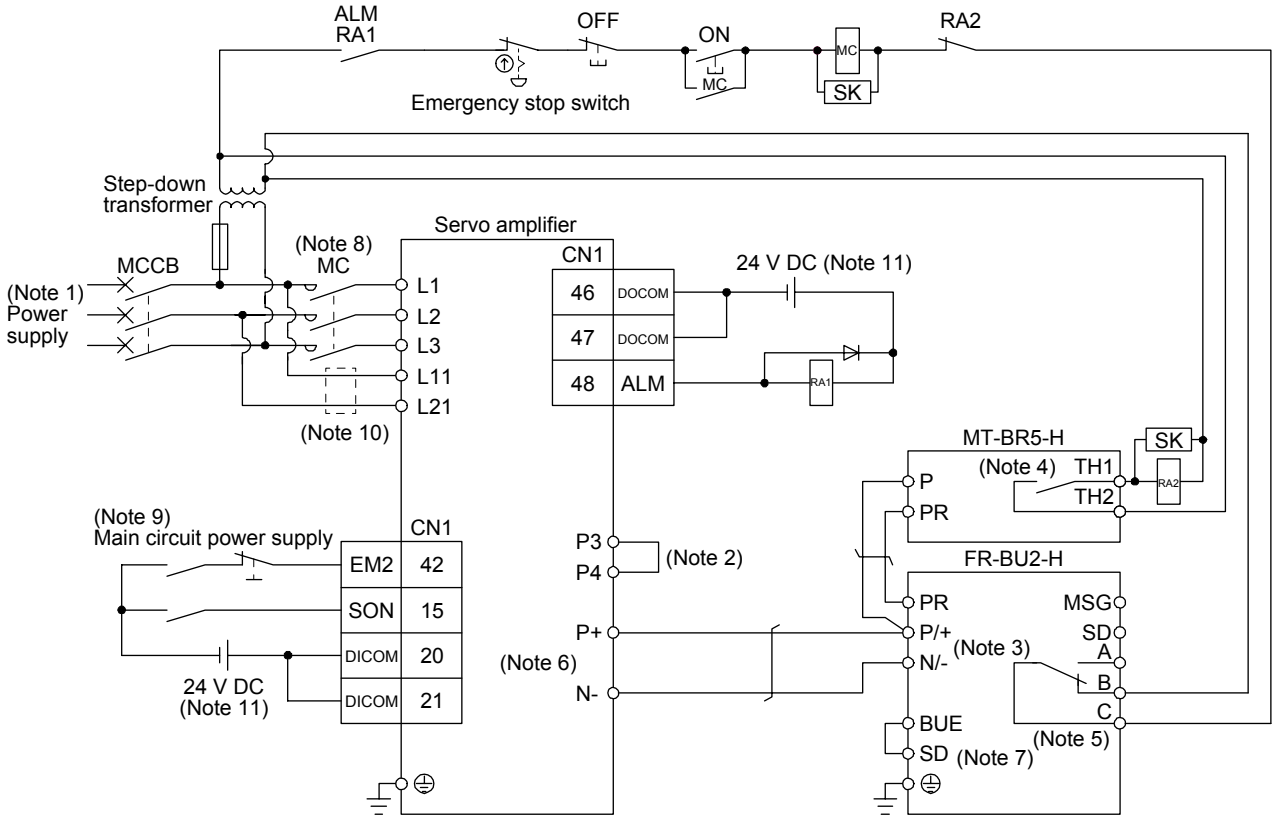


Note 1. For the power supply specifications, refer to section 1.2.2.

2. For the servo amplifier of 5 kW and 7 kW, always disconnect the lead wire of built-in regenerative resistor, which is connected to P+ and C terminals. For the servo amplifier of 11 kW to 22 kW, do not connect a supplied regenerative resistor to the P+ and C terminals.
3. Always connect between P3 and P4 terminals. (factory-wired) Use either the power factor improving DC reactor or the power factor improving AC reactor. When using the power factor improving DC reactor, refer to section 9.8.
4. Connect P/+ and N/- terminals of the brake unit to a correct destination. Incorrect connection destination results in servo amplifier and brake unit malfunction.
5. Contact rating: 1b contact, 110 V AC, 5 A/220 V AC, 3 A
   Normal condition: TH1-TH2 is conducting. Abnormal condition: TH1-TH2 is not conducting.
6. Contact rating: 230 V AC, 0.3 A/30 V DC, 0.3 A
   Normal condition: B-C is conducting./A-C is not conducting. Abnormal condition: B-C is not conducting./A-C is conducting.
7. Do not connect more than one cable to each P+ to N- terminals of the servo amplifier.
8. Always connect BUE and SD terminals. (factory-wired)
9. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.
10. Configure a circuit to turn off EM2 when the main circuit power is turned off to prevent an unexpected restart of the servo amplifier.
11. When wires used for L11 and L21 are thinner than wires used for L1, L2, and L3, use a molded-case circuit breaker.
12. The illustration of the 24 V DC power supply is divided between input signal and output signal for convinence. However, they can be configured by one.

(2) Combination of FR-BU2-H brake unit and MT-BR5-H resistor unit

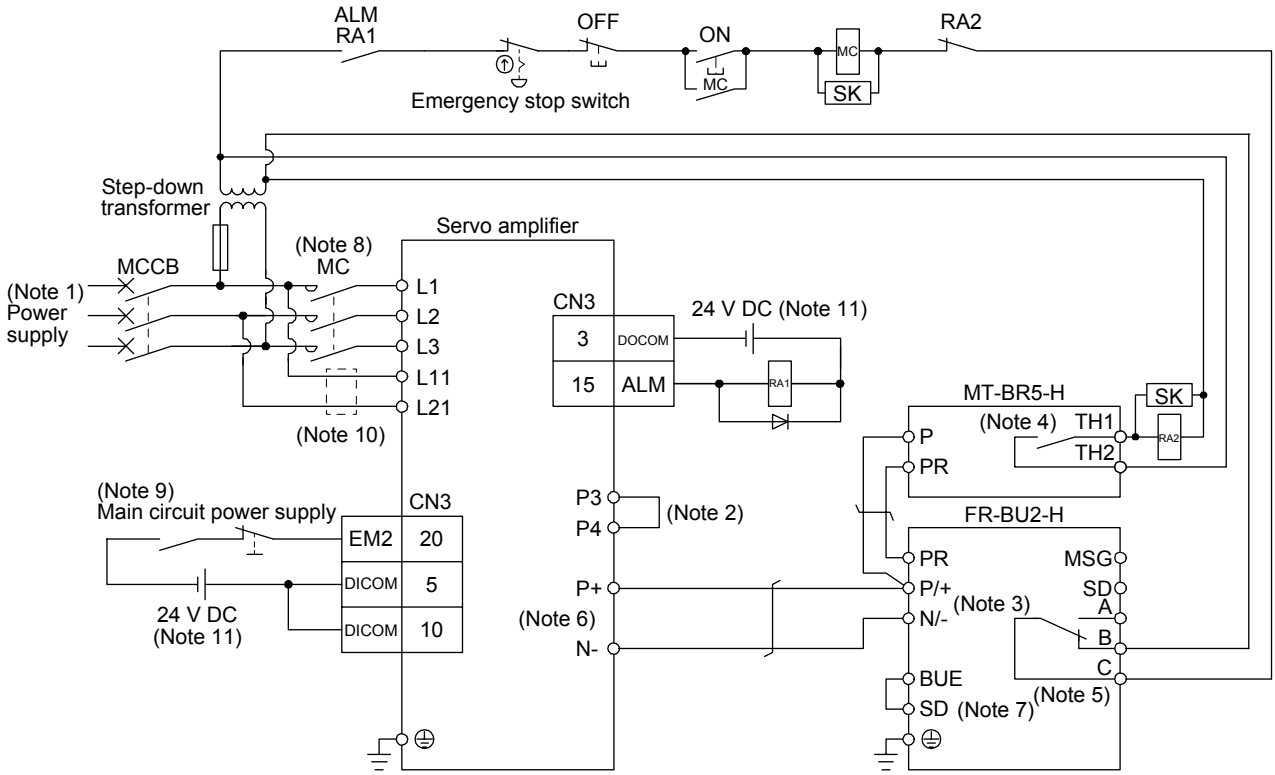
(a) For MR-J4-_A4(-RJ)



Note 1. For power supply specifications, refer to section 1.2.1.

2. Always connect between P3 and P4. (factory-wired) Use either the power factor improving DC reactor or the power factor improving AC reactor. When using the power factor improving DC reactor, refer to section 9.8.
3. Connect P/+ and N/- terminals of the brake unit to a correct destination. Incorrect connection destination results in servo amplifier and brake unit malfunction.
4. Contact rating: 1a contact, 110 V AC, 5 A/220 V AC, 3 A
   Normal condition: TH1-TH2 is not conducting. Abnormal condition: TH1-TH2 is conducting.
5. Contact rating: 230 V AC, 0.3 A/30 V DC, 0.3 A
   Normal condition: B-C is conducting./A-C is not conducting. Abnormal condition: B-C is not conducting./A-C is conducting.
6. Do not connect more than one cable to each P+ to N- terminals of the servo amplifier.
7. Always connect BUE and SD terminals. (factory-wired)
8. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.
9. Configure a circuit to turn off EM2 when the main circuit power is turned off to prevent an unexpected restart of the servo amplifier.
10. When wires used for L11 and L21 are thinner than wires used for L1, L2, and L3, use a molded-case circuit breaker.
11. The illustration of the 24 V DC power supply is divided between input signal and output signal for convenience. However, they can be configured by one.

(b) For MR-J4-_B4(-RJ)

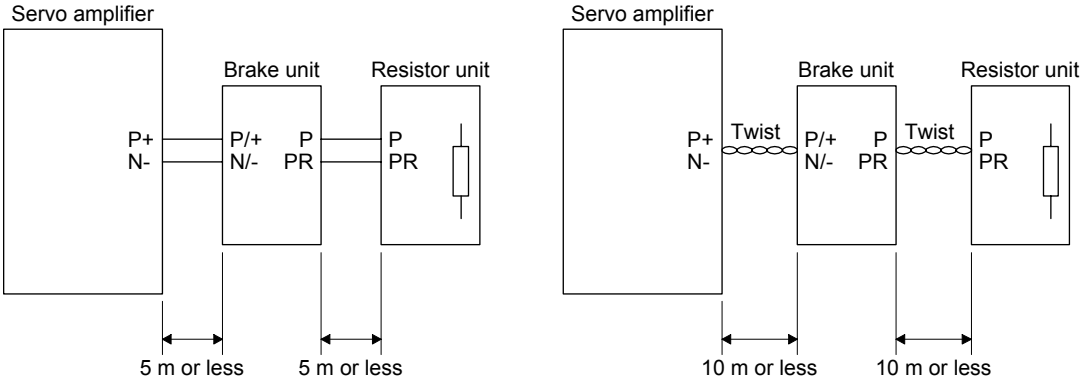


Note 1. For power supply specifications, refer to section 1.2.2.

2. Always connect between P3 and P4. (factory-wired) Use either the power factor improving DC reactor or the power factor improving AC reactor. When using the power factor improving DC reactor, refer to section 9.8.
3. Connect P/+ and N/- terminals of the brake unit to a correct destination. Incorrect connection destination results in servo amplifier and brake unit malfunction.
4. Contact rating: 1a contact, 110 V AC, 5 A/220 V AC, 3 A
   Normal condition: TH1-TH2 is not conducting. Abnormal condition: TH1-TH2 is conducting.
5. Contact rating: 230 V AC, 0.3 A/30 V DC, 0.3 A
   Normal condition: B-C is conducting./A-C is not conducting. Abnormal condition: B-C is not conducting./A-C is conducting.
6. Do not connect more than one cable to each P+ to N- terminals of the servo amplifier.
7. Always connect BUE and SD terminals. (factory-wired)
8. Depending on the main circuit voltage and operation pattern, bus voltage decreases, and that may cause the forced stop deceleration to shift to the dynamic brake deceleration. When dynamic brake deceleration is not required, slow the time to turn off the magnetic contactor.
9. Configure a circuit to turn off EM2 when the main circuit power is turned off to prevent an unexpected restart of the servo amplifier.
10. When wires used for L11 and L21 are thinner than wires used for L1, L2, and L3, use a molded-case circuit breaker.
11. The illustration of the 24 V DC power supply is divided between input signal and output signal for convenience. However, they can be configured by one.

(3) Connection instructions

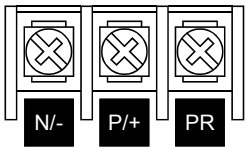
The cables between the servo amplifier and the brake unit, and between the resistor unit and the brake unit should be as short as possible. Always twist the cable longer than 5 m (twist five times or more per one meter). Even when the cable is twisted, the cable should be less than 10 m. Using cables longer than 5 m without twisting or twisted cables longer than 10 m may result in the brake unit malfunction.



(4) Wires

For the brake unit, HIV wire (600 V Grade heat-resistant polyvinyl chloride insulated wire) is recommended.

1) Main circuit terminal

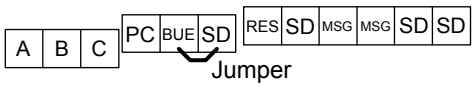


Terminal block

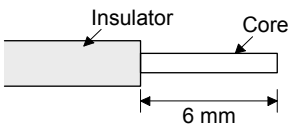
Brake unit		Main circuit terminal screw size	Crimp terminal N/-, P/+, PR, ⏚	Tightening torque [N•m]	Wire size N/-, P/+, PR, ⏚ HIV wire [mm²]	Wire size N/-, P/+, PR, ⏚ AWG
400 V class	FR-BU2-H30K	M4	5.5-4	1.5	3.5	12
	FR-BU2-H55K	M5	5.5-5	2.5	5.5	10
	FR-BU2-H75K	M6	14-6	4.4	14	6

2) Control circuit terminal

> POINT
>
> ●Under tightening can cause a cable disconnection or malfunction. Over tightening can cause a short circuit or malfunction due to damage to the screw or the brake unit.



Terminal block



Wire the stripped cable after twisting to prevent the cable from becoming loose. In addition, do not solder it.
Screw size: M3
Tightening torque: 0.5 to 0.6 [N•m]
Wire size: 0.3 mm^2 to 0.75 mm^2
Screw driver: Small flat-blade screwdriver
(Tip thickness: 0.4 mm/Tip width 2.5 mm)

(5) Crimp terminals for P+ and N- terminals of servo amplifier

(a) Recommended crimp terminals

POINT

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

Servo amplifier		Brake unit	Number of connected units	Crimp terminal (Manufacturer)	(Note 1) Applicable tool
400 V class	MR-J4-500_4(-RJ)	FR-BU2-H30K	1	FVD5.5-S4 (JST)	b
	MR-J4-700_4(-RJ)	FR-BU2-H30K	1	FVD5.5-S4 (JST)	b
	MR-J4-11K_4(-RJ)	FR-BU2-H30K	1	FVD5.5-6 (JST)	b
		FR-BU2-H55K	1	FVD5.5-6 (JST)	b
	MR-J4-15K_4(-RJ)	FR-BU2-H55K	1	FVD5.5-6 (JST)	b
	MR-J4-22K_4(-RJ)	FR-BU2-H55K	1	FVD5.5-8 (JST)	b
		FR-BU2-H75K	1	FVD14-8 (JST)	a

Note 1. Symbols in the applicable tool field indicate applicable tools in (4)(b) of this section.

2. Coat the crimping part with an insulation tube.

(b) Applicable tool

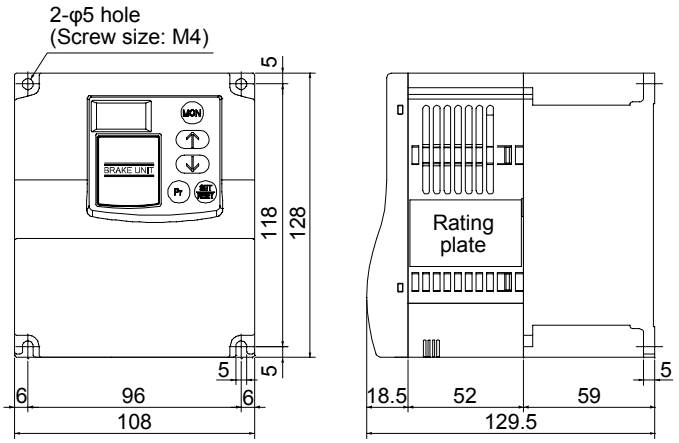
Symbol	Servo amplifier-side crimp terminals				
	Crimp terminal	Applicable tool			Manufacturer
		Body	Head	Dice	
a	FVD14-8	YF-1/E-4	YNE-38	DH-112/DH-122	JST
b	FDV5.5-S4 FDV5.5-6	YNT-1210S			

9.3.4 Dimensions

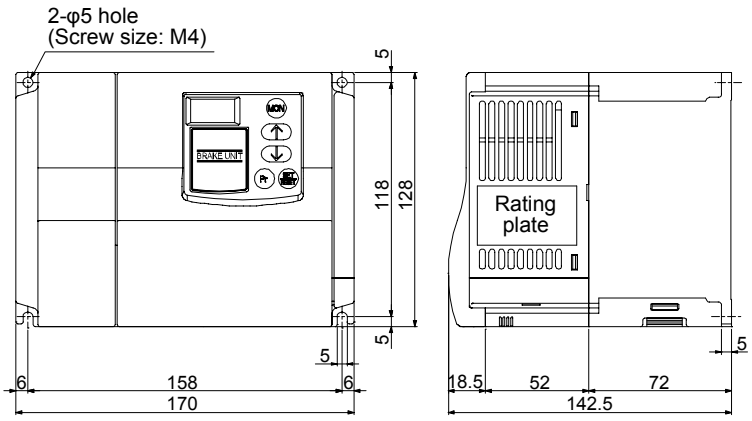
(1) FR-BU2-H brake unit

[Unit: mm]

FR-BU2-H30K

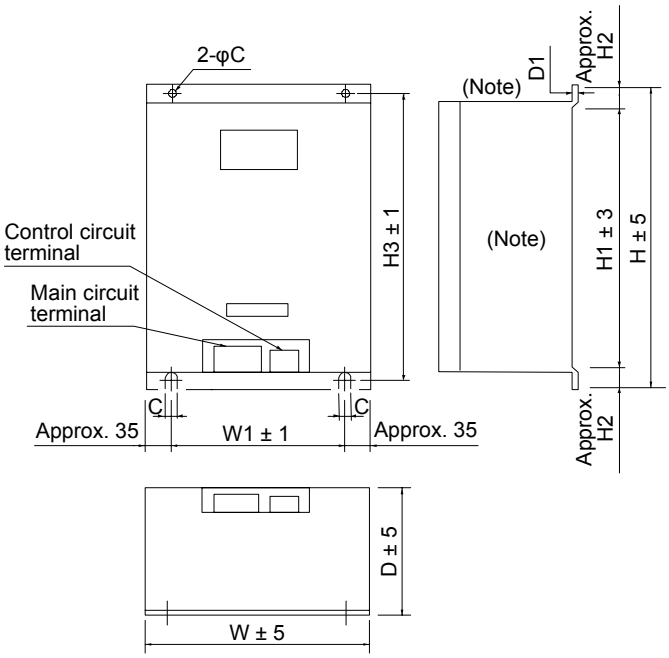


FR-BU2-H55K, FR-BU2-H75K



(2) FR-BR-H resistor unit

[Unit: mm]

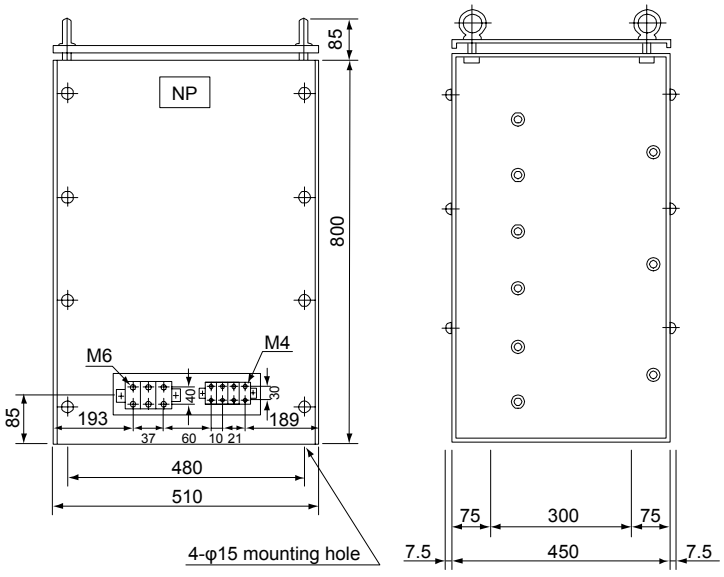


Note. Ventilation ports are provided on both sides and the top. The bottom is open.

	Resistor unit	W	W1	H	H1	H2	H3	D	D1	C	Approximate mass [kg]
400 V class	FR-BR-H30K	340	270	600	560	20	582	220	4	10	30
	FR-BR-H55K	480	410	700	620	40	670	450	3.2	12	70

(3) MT-BR5-H resistor unit

[Unit' mm]



Resistor unit		Resistance	Approximate mass [kg]
400 V class	MT-BR5-H75K	6.5 Ω	70

9.4 FR-RC-H power regenerative converter

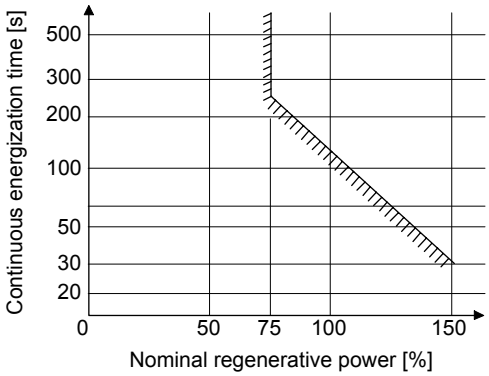
POINT
●When using FR-RC-H, set [Pr. PA04] to "0 0 _ _" to enable EM1 (Forced stop 1).

When using FR-RC-H with MR-J4-_A4(-RJ), set [Pr. PA02] to "_ _ 0 1" and set [Pr. PC27] to "_ _ _ 1". When using it with MR-J4-_B4(-RJ), set [Pr. PA02] to "_ _ 0 1" and set [Pr. PC20] to "_ _ _ 1".

(1) Selection

The converters can continuously return 75% of the nominal regenerative power. They are applied to the servo amplifiers of the 5 kW to 22 kW.

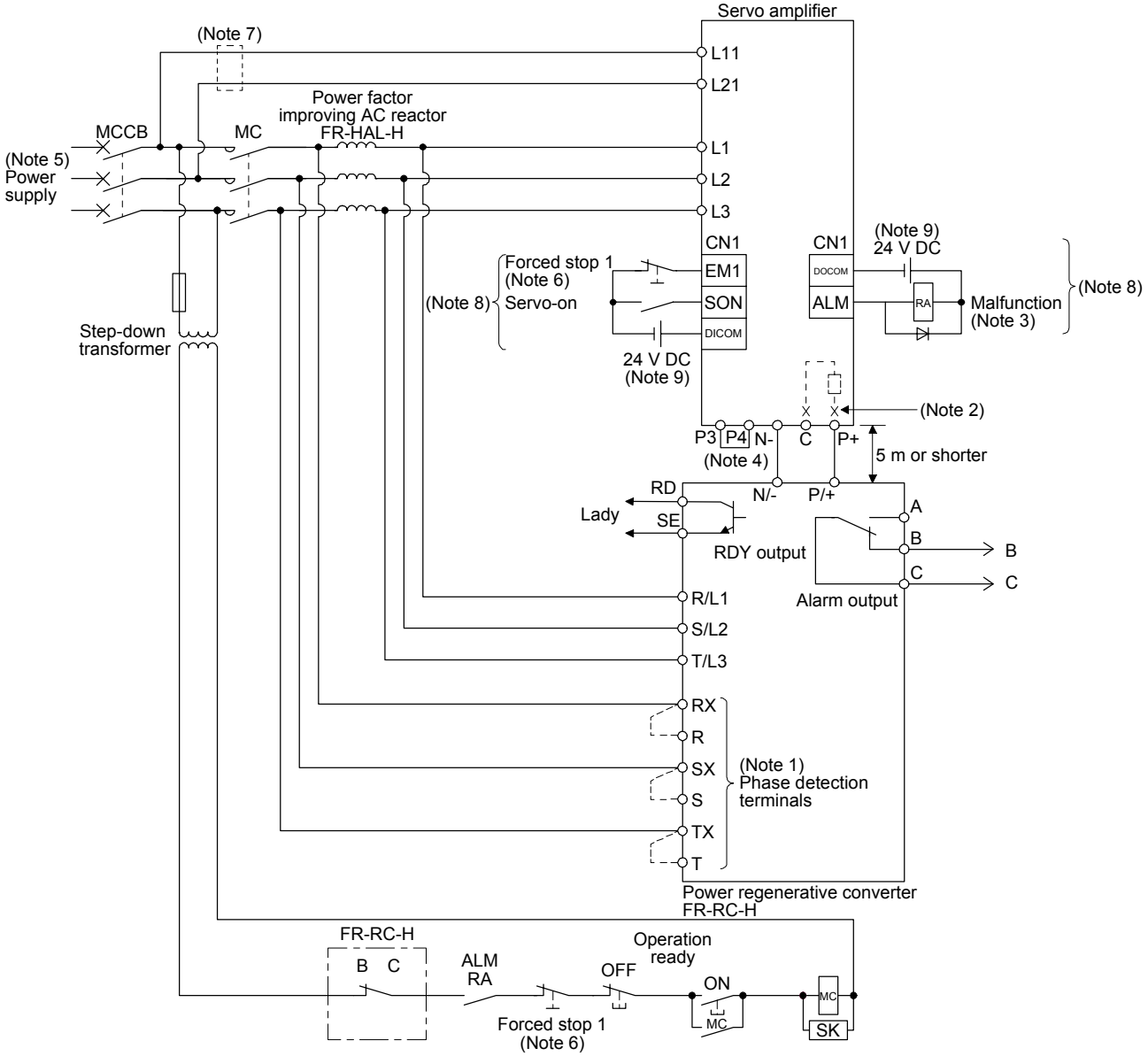
Power regenerative converter	Nominal regenerative power [kW]	Servo amplifier
FR-RC-H15K	15	MR-J4-500_4(-RJ) MR-J4-700_4(-RJ)
FR-RC-H30K	30	MR-J4-11K_4(-RJ) MR-J4-15K_4(-RJ)
FR-RC-H55K	55	MR-J4-22K_4(-RJ)



(2) Connection example

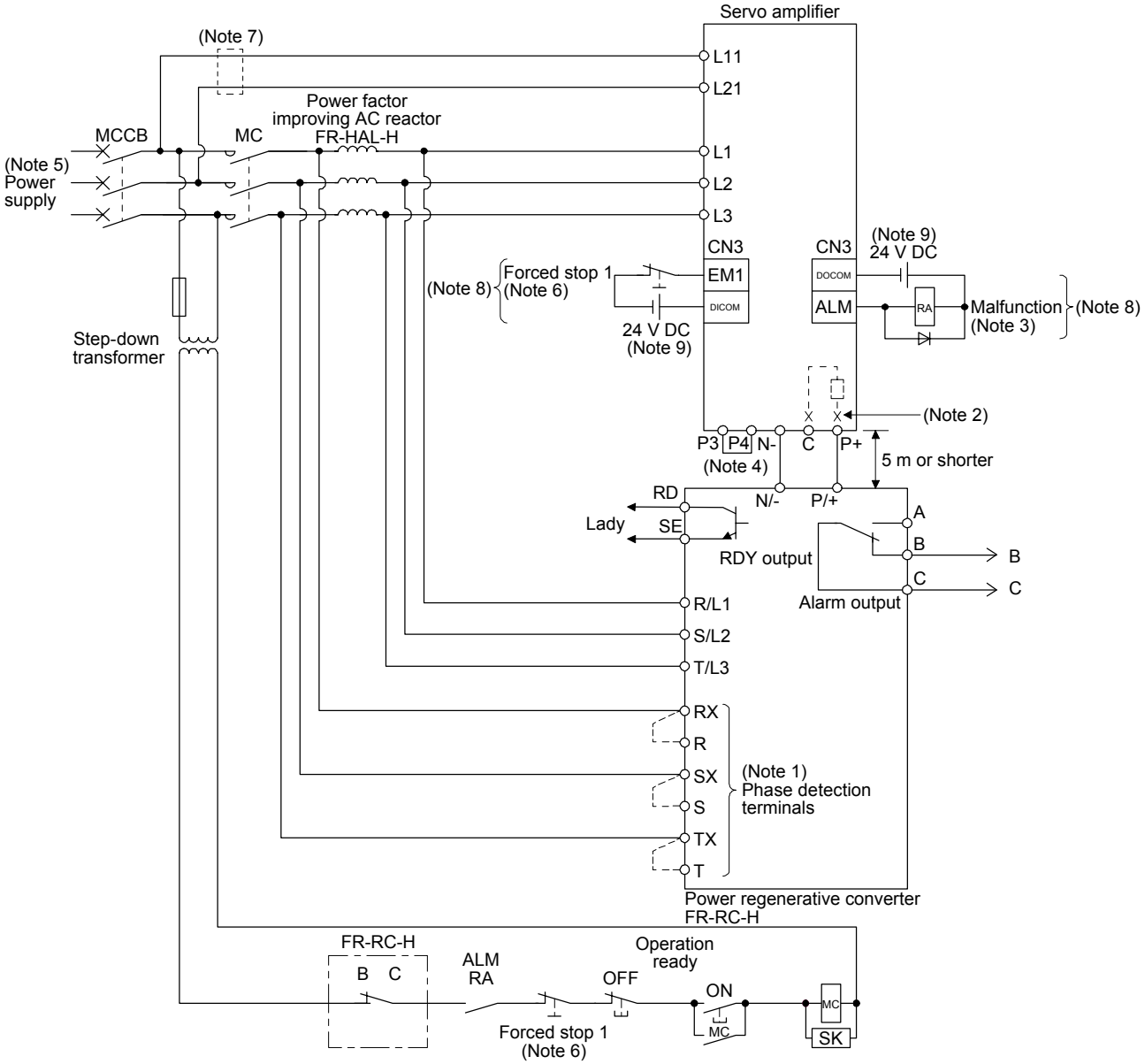
POINT
●In this configuration, only the STO function is supported. The forced stop deceleration function is not available.

(a) For MR-J4-_A4(-RJ)



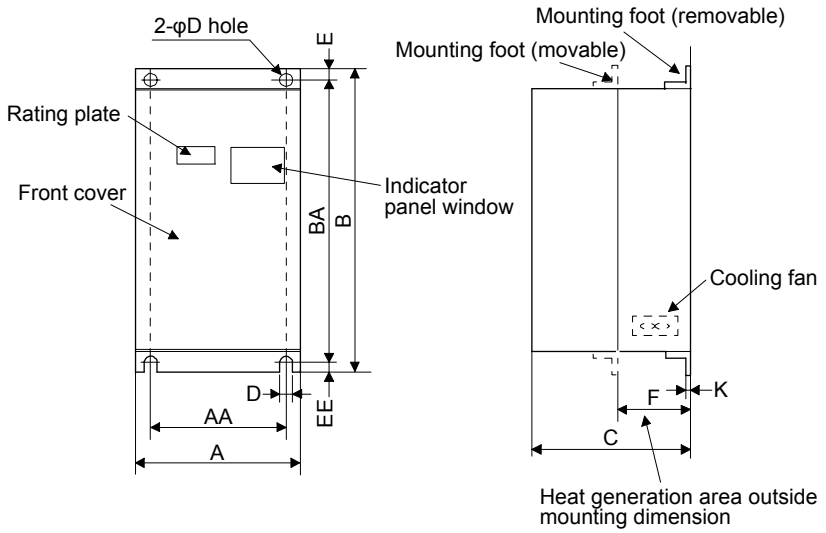
Note 1. When not using the phase detection terminals, fit the jumpers across RX-R, SX-S and TX-T. If the jumpers remain removed, the FR-RC-H will not operate.
2. For the servo amplifier of 5 kW and 7 kW, always disconnect the lead wire of built-in regenerative resistor, which is connected to P+ and C terminals. For the servo amplifier of 11 kW to 22 kW, do not connect a supplied regenerative resistor to the P+ and C terminals.
3. If disabling ALM (Malfunction) output with the parameter, configure up the power supply circuit which switches off the magnetic contactor after detection of alarm occurrence on the controller side.
4. Always connect between P3 and P4 terminals. (factory-wired) Use either the power factor improving DC reactor or the power factor improving AC reactor. When using the power factor improving DC reactor, refer to section 9.8.
5. For the power supply specifications, refer to section 1.2.1.
6. Set [Pr. PA04] to "0 0 _ _" to enable EM1 (Forced stop 1). Configure up the circuit which shuts off main circuit power with external circuit at EM1 (Forced stop 1) off.
7. When wires used for L11 and L21 are thinner than wires used for L1, L2, and L3, use a molded-case circuit breaker.
8. This diagram is for sink I/O interface. For source I/O interface, refer to section 3.9.3 in MR-J4-_A(-RJ) Servo Amplifier Instruction Manual.
9. The illustration of the 24 V DC power supply is divided between input signal and output signal for convinence. However, they can be configured by one.

(b) For MR-J4-_B4(-RJ)



Note 1. When not using the phase detection terminals, fit the jumpers across RX-R, SX-S and TX-T. If the jumpers remain removed, the FR-RC-H will not operate.
2. For the servo amplifier of 5 kW and 7 kW, always disconnect the lead wire of built-in regenerative resistor, which is connected to P+ and C terminals. For the servo amplifier of 11 kW to 22 kW, do not connect a supplied regenerative resistor to the P+ and C terminals.
3. If disabling ALM (Malfunction) output with the parameter, configure up the power supply circuit which switches off the magnetic contactor after detection of alarm occurrence on the controller side.
4. Always connect between P3 and P4 terminals. (factory-wired) Use either the power factor improving DC reactor or the power factor improving AC reactor. When using the power factor improving DC reactor, refer to section 9.8.
5. For the power supply specifications, refer to section 1.2.2.
6. Set [Pr. PA04] to "0 0 _ _" to enable EM1 (Forced stop 1). Configure up the circuit which shuts off main circuit power with external circuit at EM1 (Forced stop 1) off.
7. When wires used for L11 and L21 are thinner than wires used for L1, L2, and L3, use a molded-case circuit breaker.
8. This diagram is for sink I/O interface. For source I/O interface, refer to section 3.8.3 in MR-J4-_B(-RJ) Servo Amplifier Instruction Manual.
9. The illustration of the 24 V DC power supply is divided between input signal and output signal for convinence. However, they can be configured by one.

(3) Dimensions

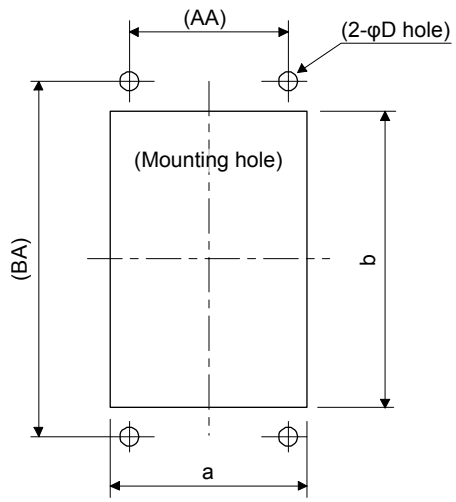


[Unit: mm]

Power regenerative converter	A	AA	B	BA	C	D	E	EE	K	F	Approximate mass [kg]
FR-RC-H15K	340	270	600	582	195	10	10	8	3.2	90	31
FR-RC-H30K											
FR-RC-H55K	480	410	700	670	250	12	15	15	3.2	135	55

(4) Mounting hole machining dimensions

When the power regenerative converter is installed to an enclosed type cabinet, mount the heat generating area of the converter outside the box to provide heat generation measures. At this time, the mounting hole having the following dimensions is machined in the box.



[Unit: mm]

Power regenerative converter	a	b	D	AA	BA
FR-RC-H15K	330	562	10	270	582
FR-RC-H30K					
FR-RC-H55K	470	642	12	410	670

9.5 FR-CV-H power regenerative common converter

POINT

- For details of the power regenerative common converter FR-CV-H, refer to the FR-CV Installation Guide (IB(NA)0600075).
- Do not supply power to the main circuit power supply terminals (L1, L2, and L3) of the servo amplifier. Doing so will fail the servo amplifier and FR-CV-H.
- Connect the DC power supply between the FR-CV-H and servo amplifier with correct polarity. Connection with incorrect polarity will fail the FR-CV-H and servo amplifier.
- Two or more FR-CV-H's cannot be installed to improve regeneration capability. Two or more FR-CV-H's cannot be connected to the same DC power supply line.
- When using FR-CV-H, set [Pr. PA04] to "0 0 _ _" to enable EM1 (Forced stop 1).

When using FR-CV-H with MR-J4-_A4(-RJ), set [Pr. PA02] to "_ _ 0 1" and set [Pr. PC27] to "_ _ _ 1". When using it with MR-J4-_B4(-RJ), set [Pr. PA02] to "_ _ 0 1" and set [Pr. PC20] to "_ _ _ 1".

(1) Model

F R − C V − H 2 2 K

Capacity

Symbol	Capacity [kW]
22K	22
30K	30
37K	37
55K	55

Symbol	Voltage class
H	400 V class

(2) Selection

FR-CV-H power regenerative common converter can be used for the servo amplifier of 11 kW to 22 kW. The following shows the restrictions on using the FR-CV-H.

(a) Up to two servo amplifiers can be connected to one FR-CV-H.

(b) FR-CV-H capacity [W] ≥ Total of rated capacities [W] × 2 of servo amplifiers connected to FR-CV-H.

(c) The total of used servo motor rated currents should be equal to or less than the applicable current [A] of the FR-CV-H.

(d) Among the servo amplifiers connected to the FR-CV-H, the servo amplifier of the maximum capacity should be equal to or less than the maximum connectable capacity [W].

The following table lists the restrictions.

Item	FR-CV-H_			
	22K	30K	37K	55K
Maximum number of connected servo amplifiers	1			2
Total of connectable servo amplifier capacities [kW]	11	15	18.5	27.5
Total of connectable servo motor rated currents [A]	43	57	71	110
Maximum servo amplifier capacity [kW]	11	15	15	22

When using the FR-CV-H, always install the dedicated stand-alone reactor (FR-CVL-H).

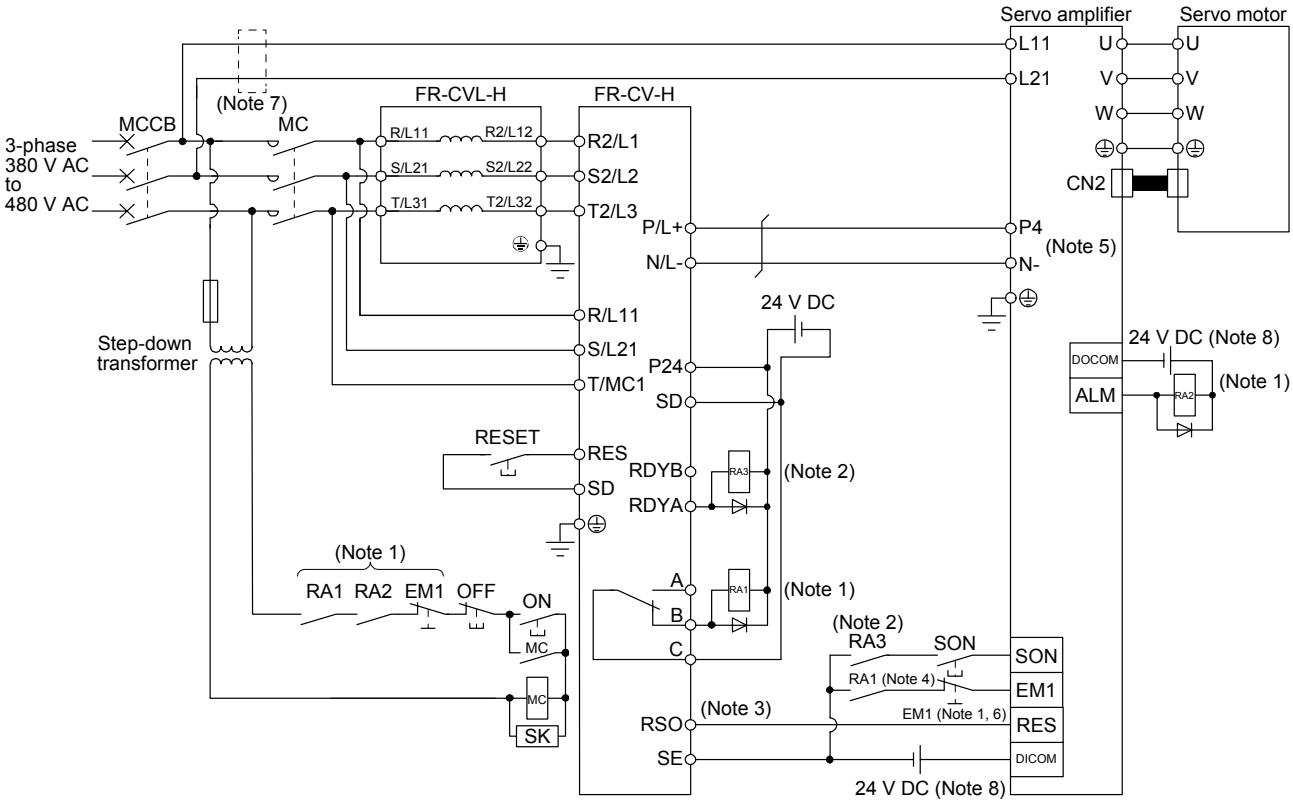
Power regenerative common converter	Dedicated stand-alone reactor
FR-CV-H22K(-AT)	FR-CVL-H22K
FR-CV-H30K(-AT)	FR-CVL-H30K
FR-CV-H37K	FR-CVL-H37K
FR-CV-H55K	FR-CVL-H55K

(3) Connection diagram

POINT

●In this configuration, only the STO function is supported. The forced stop deceleration function is not available.

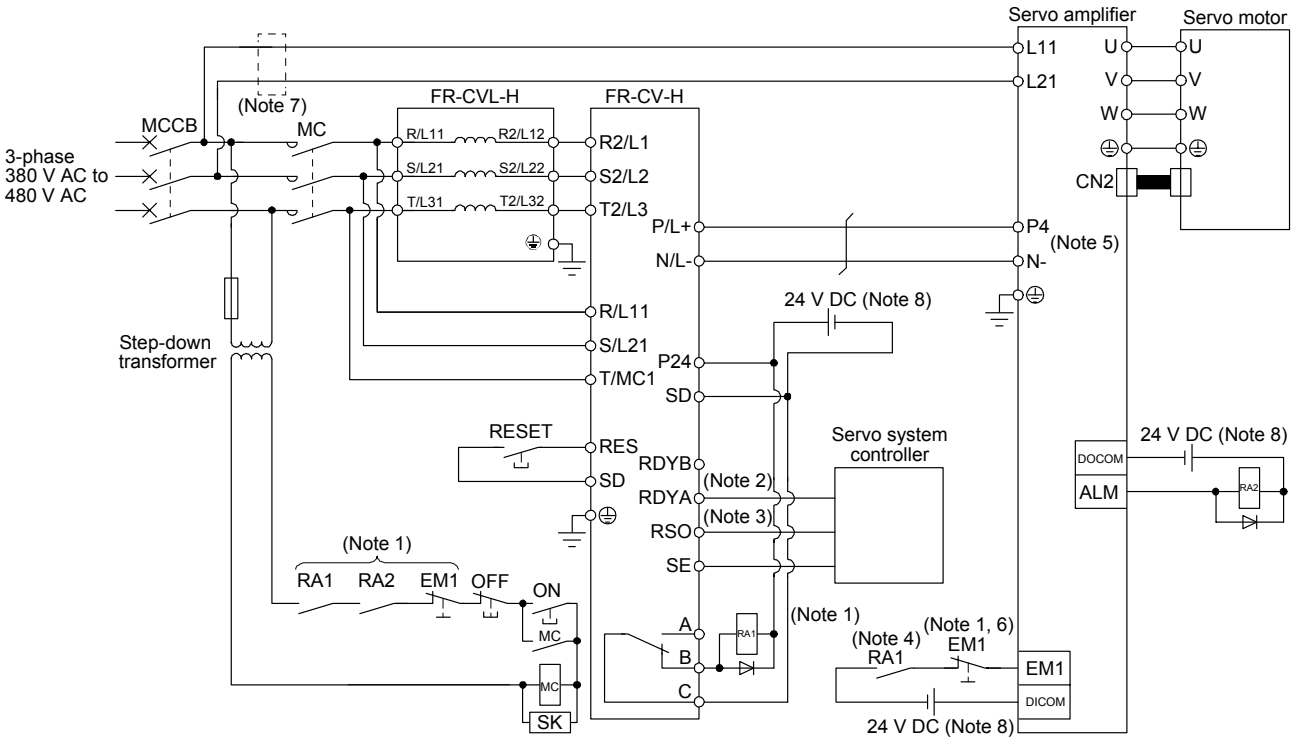
(a) For MR-J4-_A4(-RJ)



Note 1. Configure a sequence that will shut off main circuit power in the following.
- An alarm occurred at FR-CV-H or servo amplifier.
- EM1 (Forced stop 1) is enabled.

2. For the servo amplifier, configure a sequence that will switch the servo-on after the FR-CV-H is ready.
3. For the FR-CV-H, the RSO signal turns off when it is put in a ready-to-operate status where the reset signal is input. Configure a sequence that will make the servo inoperative when the RSO signal is on.
4. Configure a sequence that will make a stop with the forced stop input of the servo amplifier if an alarm occurs in the FR-CV-H.
5. When using FR-CV-H, always disconnect wiring between P3 and P4 terminals.
6. Set [Pr. PA04] to "0 0 _ _" to enable EM1 (Forced stop 1).
7. When wires used for L11 and L21 are thinner than wires used for L1, L2, and L3, use a molded-case circuit breaker.
8. The illustration of the 24 V DC power supply is divided between input signal and output signal for convinence. However, they can be configured by one.

(b) For MR-J4-_B4(-RJ)



Note 1. Configure a sequence that will shut off main circuit power in the following.
- An alarm occurred at FR-CV-H or servo amplifier.
- EM1 (Forced stop 1) is enabled.

2. For the servo amplifier, configure a sequence that will switch the servo-on after the FR-CV-H is ready.
3. For the FR-CV-H, the RSO signal turns off when it is put in a ready-to-operate status where the reset signal is input. Configure a sequence that will make the servo inoperative when the RSO signal is on.
4. Configure a sequence that will make a stop with the emergency stop input of the servo system controller if an alarm occurs in the FR-CV-H. When the servo system controller does not have an emergency stop input, use the forced stop input of the servo amplifier to make a stop as shown in the diagram.
5. When using FR-CV-H, always disconnect wiring between P3 and P4 terminals.
6. Set [Pr. PA04] to "0 0 _ _" to enable EM1 (Forced stop 1).
7. When wires used for L11 and L21 are thinner than wires used for L1, L2, and L3, use a molded-case circuit breaker.
8. The illustration of the 24 V DC power supply is divided between input signal and output signal for convinence. However, they can be configured by one.

(4) Selection example of wires used for wiring

POINT

●Selection conditions of wire size is as follows.
Wire type: HIV wire (600 V grade heat-resistant polyvinyl chloride insulated wire)
Construction condition: One wire is constructed in the air.

(a) Wire size

1) Between P and P4, and between N and N-

The following table indicates the connection wire sizes of the DC power supply (P4, N- terminals) between the FR-CV-H and servo amplifier.

Total of servo amplifier capacities [kW]	Wire [mm^2]
11	8 (AWG 8)
15	8 (AWG 8)
22	14 (AWG 6)

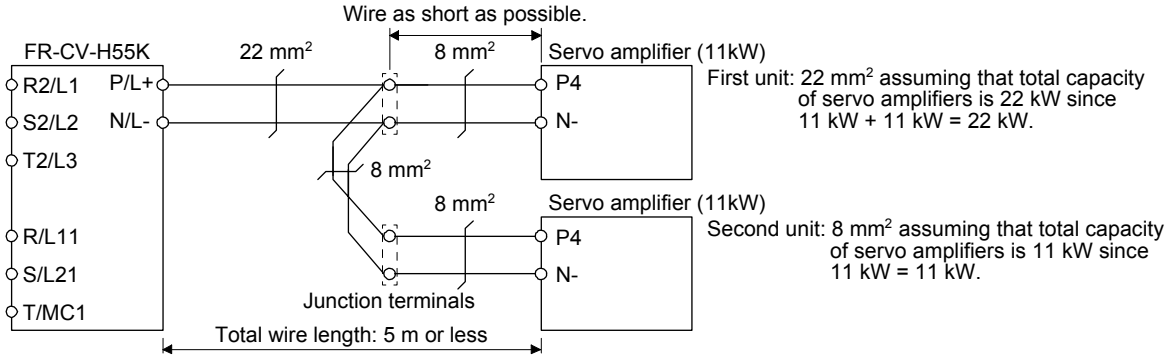
2) Grounding

For grounding, use the wire of the size equal to or greater than that indicated in the following table, and make it as short as possible.

Power regenerative common converter	Grounding wire size [mm^2]
FR-CV-H22K/FR-CV-H30K	8 (AWG 8)
FR-CV-H37K/FR-CV-H55K	14 (AWG 6)

(b) Example of selecting the wire sizes

When connecting two servo amplifiers of 11 kW, always use junction terminals for wiring the servo amplifier terminals P4, N-.



(5) Other precautions

(a) Always use the dedicated stand-alone reactor (FR-CVL-H) as the power factor improving reactor. Do not use the power factor improving AC reactor (FR-HAL-H) or power factor improving DC reactor (FR-HEL-H).

(b) The inputs/outputs (main circuits) of the FR-CV-H and servo amplifiers include high-frequency components and may provide electromagnetic wave interference to communication equipment (such as AM radios) used near them. In this case, interference can be reduced by installing the radio noise filter (FR-BIF-H) or line noise filter (FR-BSF01, FR-BLF).

(c) The overall wiring length for connection of the DC power supply between the FR-CV-H and servo amplifiers should be 5 m or less, and the wiring must be twisted.

(6) Specifications

Item \ Power regenerative common converter FR-CV-H_			22K	30K	37K	55K
Total of connectable servo amplifier capacities [kW]			11	15	185	27.5
Maximum servo amplifier capacity [kW]			11	15	15	22
Output	Total of connectable servo motor rated currents [A]		43	57	71	110
	Regenerative braking torque	Short-time rating	Total capacity of applicable servo motors, 300% torque, 60 s (Note 1)			
		Continuous rating	100% torque			
Power supply	Rated input AC voltage/frequency		3-phase 380 V AC to 480 V AC, 50 Hz/60 Hz			
	Permissible AC voltage fluctuation		3-phase 323 V AC to 528 V AC, 50 Hz/60 Hz			
	Permissible frequency fluctuation		±5%			
	Power supply capacity (Note 2) [kVA]		41	52	66	100
IP rating (JEM 1030), cooling method			Open type (IP00), forced cooling			
Environment	Ambient temperature		-10 ˚C to 50 ˚C (non-freezing)			
	Ambient humidity		90 %RH or less (non-condensing)			
	Ambience		Indoors (no direct sunlight), free from corrosive gas, flammable gas, oil mist, dust, and dirt			
Altitude, vibration resistance			1000 m or less above sea level, 5.9 m/s^2			
Molded-case circuit breaker or earth-leakage current breaker			50AF 50A	60AF 60A	100AF 75A	100AF 100A
Magnetic contactor			S-N25	S-N35	S-N50	S-N65

Note 1. This is the time when the protective function of the FR-CV is activated. The protective function of the servo amplifier is activated in the time indicated in section 8.1.

2. The specified value is the power supply capacity of FR-CV-H. The total power supply capacities of the connected servo amplifiers are actually required.

9.6 Selection example of wires

POINT

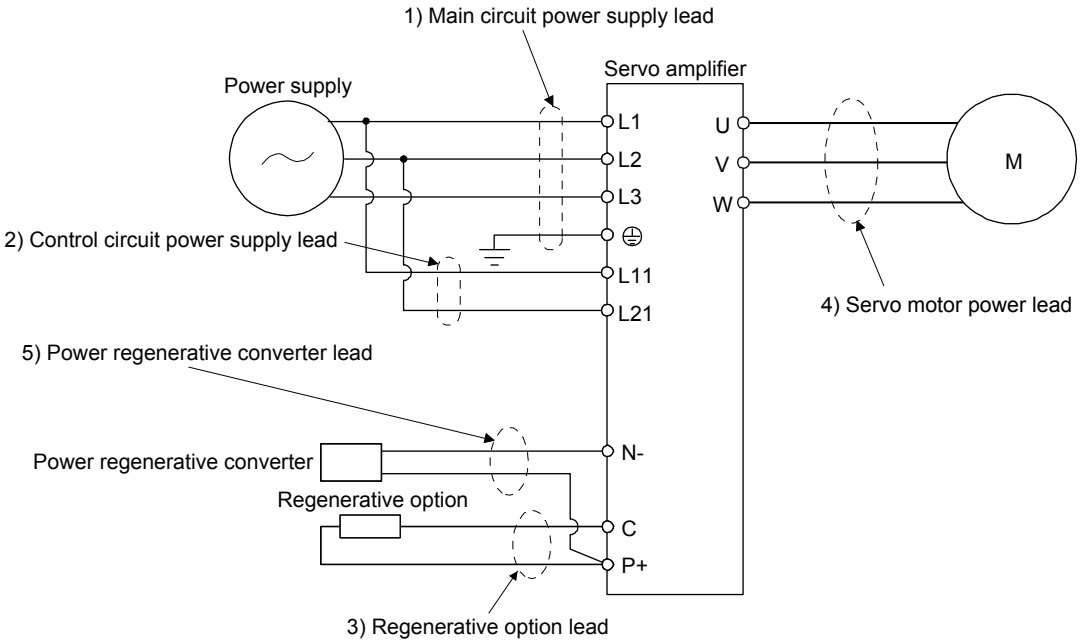
●To comply with the UL/CSA standard, use the wires shown in appendix 1 for wiring. To comply with other standards, use a wire that is complied with each standard.

●Selection conditions of wire size is as follows.

Construction condition: One wire is constructed in the air.

Wire length: 30 m or less

The following diagram shows the wires used for wiring. Use the wires given in this section or equivalent.



(1) When using the 600 V Grade heat-resistant polyvinyl chloride insulated wire (HIV wire)
Wire size selection examples for HIV wires are indicated below.

Table 9.1 Wire size selection example (HIV wire)

Servo amplifier	Wires [mm^2] (Note 1)			
	1) L1/L2/L3/⏚	2) L11/L21	3) P+/C	4) U/V/W/⏚ (Note 3)
MR-J4-60_4(-RJ)/ MR-J4-100_4(-RJ)	2 (AWG 14)	1.25 to 2 (AWG 16 to 14) (Note 4)	2 (AWG14)	AWG 16 to 14
MR-J4-200_4(-RJ)				
MR-J4-350_4(-RJ)				
MR-J4-500_4(-RJ) (Note 2)	2 (AWG 14): b	1.25 (AWG 16): a 2 (AWG 14): c (Note 4)	2 (AWG14): b	3.5 (AWG 12): a
MR-J4-700_4(-RJ) (Note 2)	3.5 (AWG 12): a			5.5 (AWG 10): a
MR-J4-11K_4(-RJ) (Note 2)	5.5 (AWG 10): d	1.25 (AWG 16): b 2 (AWG 14): b (Note 4)	2 (AWG14): f	8 (AWG 8): g
MR-J4-15K_4(-RJ) (Note 2)	8 (AWG 8): g		3.5 (AWG 12): d	
MR-J4-22K_4(-RJ) (Note 2)	14 (AWG 6): i		3.5 (AWG 12): e	5.5 (AWG 10): e (Note 5) 8 (AWG 8):h (Note 6) 14 (AWG 6): i

Note 1. Alphabets in the table indicate crimping tools. For crimp terminals and applicable tools, refer to (2) in this section.
2. To connect these models to a terminal block, be sure to use the screws that come with the terminal block.
3. The wire size shows applicable size of the servo amplifier connector and terminal block. For wires connecting to the servo motor, refer to each servo amplifier instruction manual.
4. Be sure to use the size of 2 mm^2 when corresponding to UL/CSA standard.
5. This is for connecting to the linear servo motor with natural cooling method.
6. This is for connecting to the linear servo motor with liquid cooling method.

Use wires (5)) of the following sizes with the power regenerative converter (FR-RC-H).

Model	Wire [mm^2]
FR-RC-H15K	14 (AWG6)
FR-RC- H30K	
FR-RC- H55K	

(2) Selection example of crimp terminals
Crimp terminal selection examples for the servo amplifier terminal blocks are indicated below.

Symbol	Servo amplifier-side crimp terminals				Manufacturer
	Crimp terminal (Note)	Applicable tool			
		Body	Head	Dice	
a	FVD5.5-4	YNT-1210S			JST
b	FVD2-4	YNT-1614			
c	FVD2-M3				
d	FVD5.5-6	YNT-1210S			
e	FVD5.5-8	YNT-1210S			
f	FVD2-6	YNT-1614			
g	FVD8-6	YF-1	YNE-38	DH-121/DH-111	
h	FVD8-8				
i	FVD14-8			DH-122/DH-112	

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

9.7 Molded-case circuit breakers, fuses, magnetic contactors (recommended)

(1) For main circuit power supply

Always use one molded-case circuit breaker and one magnetic contactor with one servo amplifier. When using a fuse instead of the molded-case circuit breaker, use the one having the specifications given in this section.

Servo amplifier	Molded-case circuit breaker (Note 1)		Fuse			Magnetic contactor (Note 2)
	Frame, rated current	Voltage AC [V]	Class	Current [A]	Voltage AC [V]	
MR-J4-60_4(-RJ)	30 A frame 5 A	480	T	10	600	S-N10
MR-J4-100_4(-RJ)	30 A frame 10 A			15		
MR-J4-200_4(-RJ)	30 A frame 15 A			25		
MR-J4-350_4(-RJ)	30 A frame 20 A			35		S-N18
MR-J4-500_4(-RJ)	30 A frame 20 A			50		
MR-J4-700_4(-RJ)	30 A frame 30 A			65		S-N20
MR-J4-11K_4(-RJ)	50 A frame 50 A			100		S-N25
MR-J4-15K_4(-RJ)	60 A frame 60 A			150		S-N35
MR-J4-22K_4(-RJ)	100 A frame 100 A			175		S-N50

Note 1. When having the servo amplifier comply with the UL/CSA standard, refer to appendix 1.
2. Use a magnetic contactor with an operation delay time (interval between current being applied to the coil until closure of contacts) of 80 ms or less.

(2) For control circuit power supply

When the wiring for the control circuit power supply (L11, L21) is thinner than that for the main circuit power supply (L1, L2, L3), install an overcurrent protection device (molded-case circuit breaker or fuse) to protect the branch circuit.

Servo amplifier	Molded-case circuit breaker (Note)		Fuse (Class T)		Fuse (Class K5)	
	Frame, rated current	Voltage AC [V]	Current [A]	Voltage AC [V]	Current [A]	Voltage AC [V]
MR-J4-60_4(-RJ)	30 A frame 5 A	480	1	600	1	600
MR-J4-100_4(-RJ)						
MR-J4-200_4(-RJ)						
MR-J4-350_4(-RJ)						
MR-J4-500_4(-RJ)						
MR-J4-700_4(-RJ)						
MR-J4-11K_4(-RJ)						
MR-J4-15K_4(-RJ)						
MR-J4-22K_4(-RJ)						

Note. When having the servo amplifier comply with the UL/CSA standard, refer to appendix 1.

9.8 Power factor improving DC reactor

The following shows the advantages of using power factor improving DC reactor.

- It improves the power factor by increasing the form factor of the servo amplifier's input current.
- It decreases the power supply capacity.
- The input power factor is improved to about 85%.
- As compared to the power factor improving AC reactor (FR-HAL-H), it decreases the loss.

When connecting the power factor improving DC reactor to the servo amplifier, always disconnect P3 and P4. If it remains connected, the effect of the power factor improving DC reactor is not produced.
When used, the power factor improving DC reactor generates heat. To release heat, therefore, leave a 10 cm or more clearance at each of the top and bottom, and a 5 cm or more clearance on each side.

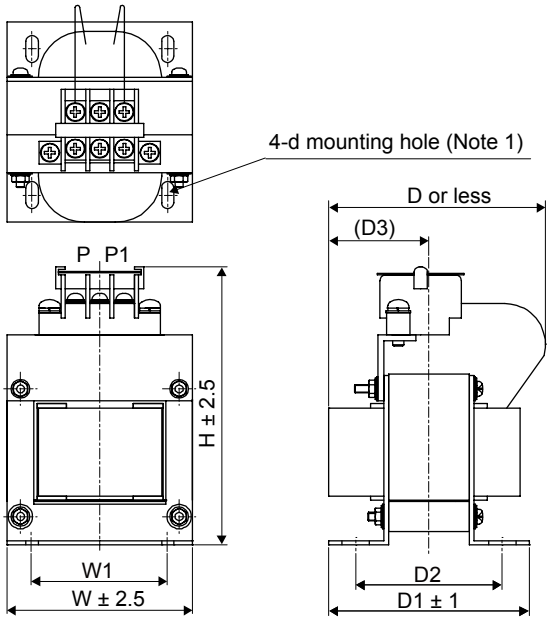


Fig. 9.1

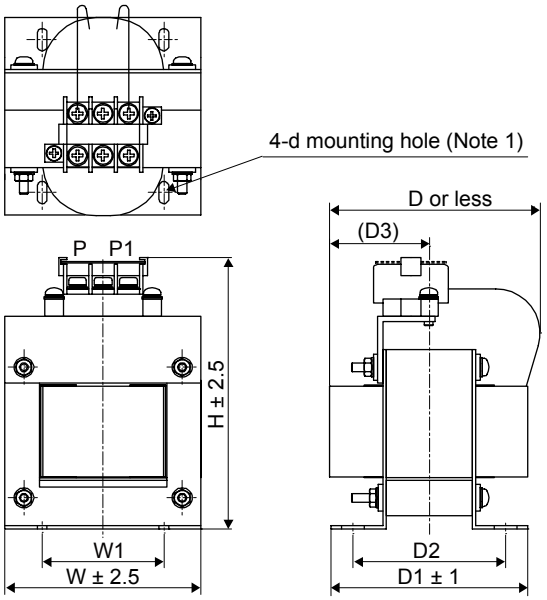


Fig. 9.2

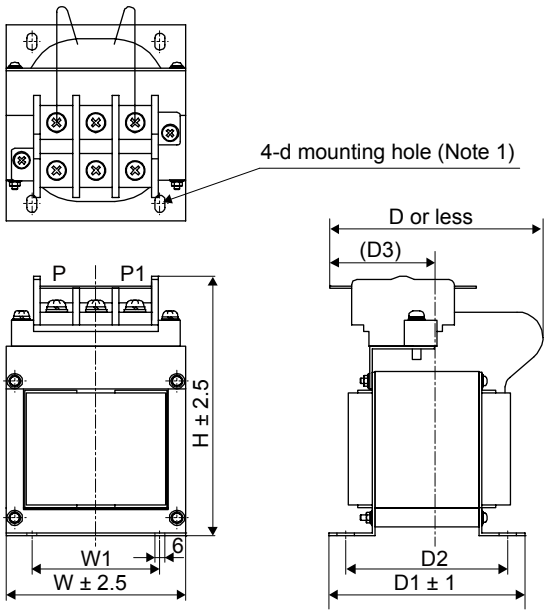
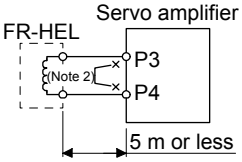


Fig. 9.3



Note 1. Use this for grounding.

2. When using the power factor improving DC reactor, remove the short bar across P3 and P4.

Servo amplifier	Power factor improving DC reactor	Dimensions	Dimensions [mm]								Terminal size	Mass [kg]	Wire [mm^2] (Note)
			W	W1	H	D	D1	D2	D3	d			
MR-J4-60_4(-RJ)	FR-HEL-H1.5K	Fig. 9.1	66	50	100	80	74	54	37	M4	M3.5	1.0	2 (AWG 14)
MR-J4-100_4(-RJ)	FR-HEL-H2.2K		76	50	110	80	74	54	37	M4	M3.5	1.3	2 (AWG 14)
MR-J4-200_4(-RJ)	FR-HEL-H3.7K	Fig. 9.2	86	55	120	95	89	69	45	M4	M4	2.3	2 (AWG 14)
MR-J4-350_4(-RJ)	FR-HEL-H7.5K		96	60	128	105	100	80	50	M5	M4	3.5	2 (AWG 14)
MR-J4-500_4(-RJ)	FR-HEL-H11K		105	75	137	110	105	85	53	M5	M5	4.5	3.5 (AWG 12)
MR-J4-700_4(-RJ)	FR-HEL-H15K	Fig. 9.3	105	75	152	125	115	95	62	M5	M6	5.0	5.5 (AWG 10)
MR-J4-11K_4(-RJ)													8 (AWG 8)
MR-J4-15K_4(-RJ)	FR-HEL-H22K		133	90	178	120	95	75	53	M5	M6	6.0	8 (AWG 8)
MR-J4-22K_4(-RJ)	FR-HEL-H30K		133	90	178	120	100	80	56	M5	M6	6.5	14 (AWG 6)

Note. Selection conditions of wire size is as follows.

Wire type: 600 V grade heat-resistant polyvinyl chloride insulated wire (HIV wire)

Construction condition: One wire is constructed in the air.

9.9 Power factor improving AC reactor

The following shows the advantages of using power factor improving AC reactor.

- It improves the power factor by increasing the form factor of the servo amplifier's input current.
- It decreases the power supply capacity.
- The input power factor is improved to about 80%.

When using power factor improving reactors for two servo amplifiers or more, be sure to connect a power factor improving reactor to each servo amplifier. If using only one power factor improving reactor, enough improvement effect of phase factor cannot be obtained unless all servo amplifiers are operated.

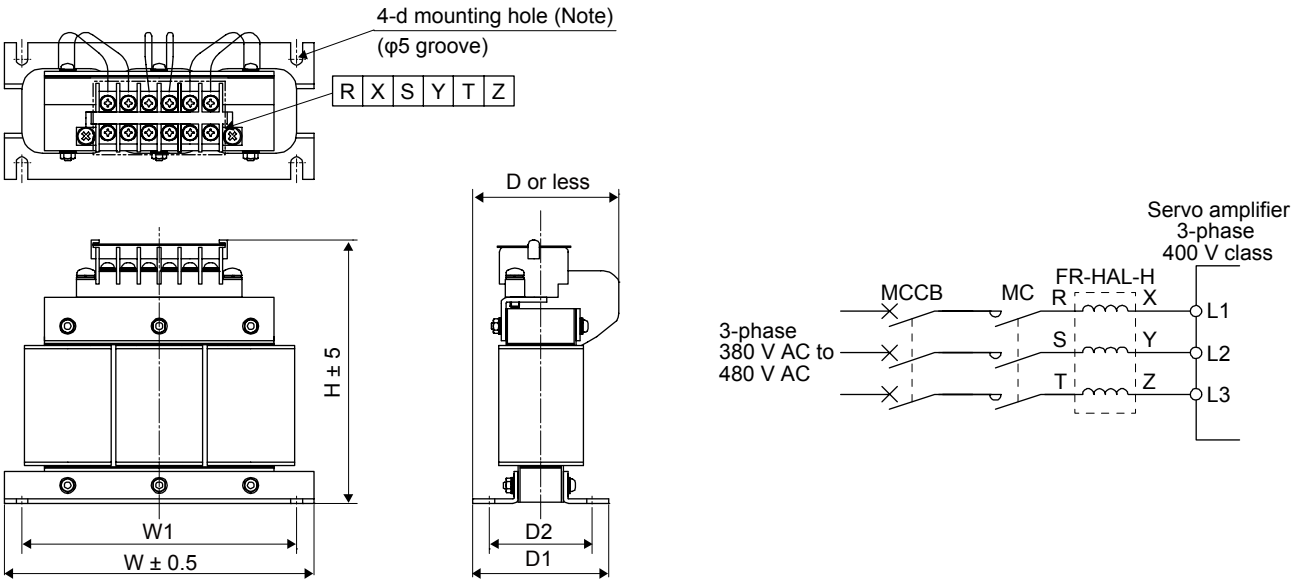


Fig. 9.4

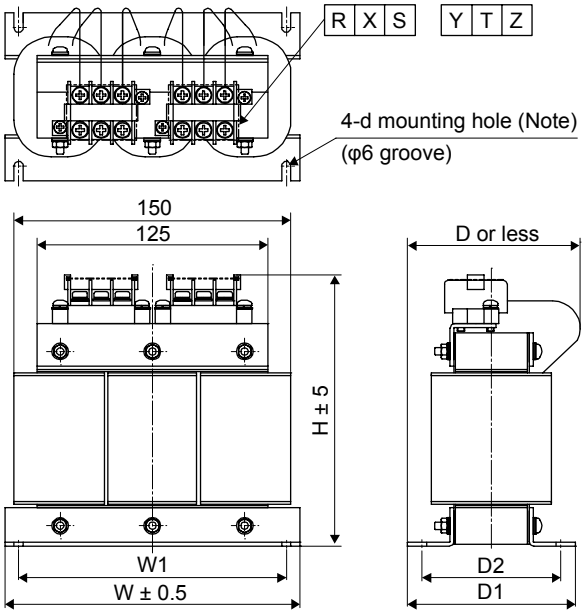


Fig. 9.5

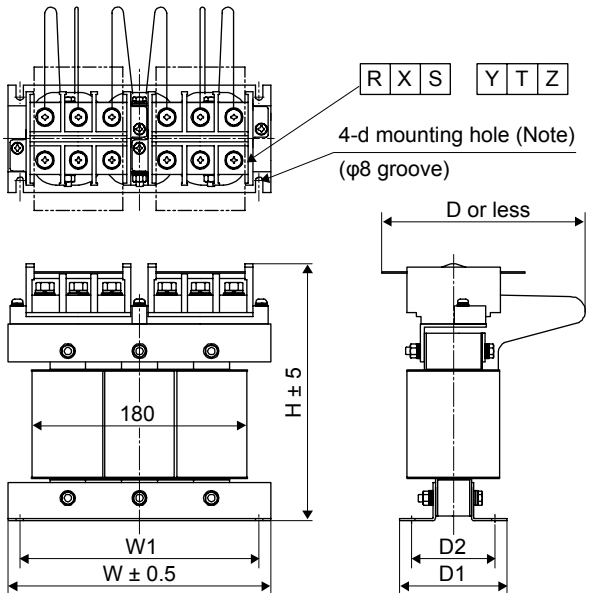


Fig. 9.6

Note. Use this for grounding.

Servo amplifier	Power factor improving AC reactor	Dimensions	Dimensions [mm]							Terminal size	Mass [kg]
			W	W1	H	D (Note)	D1	D2	d		
MR-J4-60_4(-RJ)	FR-HAL-H1.5K	Fig. 9.4	135	120	115	59	59.6	45	M4	M3.5	1.5
MR-J4-100_4(-RJ)	FR-HAL-H2.2K		135	120	115	59	59.6	45	M4	M3.5	1.5
MR-J4-200_4(-RJ)	FR-HAL-H3.7K		135	120	115	69	70.6	57	M4	M3.5	2.5
MR-J4-350_4(-RJ)	FR-HAL-H7.5K	Fig. 9.5	160	145	142	91	91	75	M4	M4	5.0
MR-J4-500_4(-RJ)	FR-HAL-H11K		160	145	146	91	91	75	M4	M5	6.0
MR-J4-700_4(-RJ)/ MR-J4-11K_4(-RJ)	FR-HAL-H15K		220	200	195	105	90	70	M5	M5	9.0
MR-J4-15K_4(-RJ)	FR-HAL-H22K	Fig. 9.6	220	200	215	170	90	70	M5	M8	9.5
MR-J4-22K_4(-RJ)	FR-HAL-H30K		220	200	215	170	96	75	M5	M8	11

Note. Maximum dimensions. The dimension varies depending on the input/output lines.

9.10 Noise reduction techniques

Noises are classified into external noises which enter the servo amplifier to cause it to malfunction and those radiated by the servo amplifier to cause peripheral equipment to malfunction. Since the servo amplifier is an electronic device which handles small signals, the following general noise reduction techniques are required. Also, the servo amplifier can be a source of noise as its outputs are chopped by high carrier frequencies. If peripheral equipment malfunction due to noises produced by the servo amplifier, noise suppression measures must be taken. The measures will vary slightly with the routes of noise transmission.

(1) Noise reduction techniques

(a) General reduction techniques

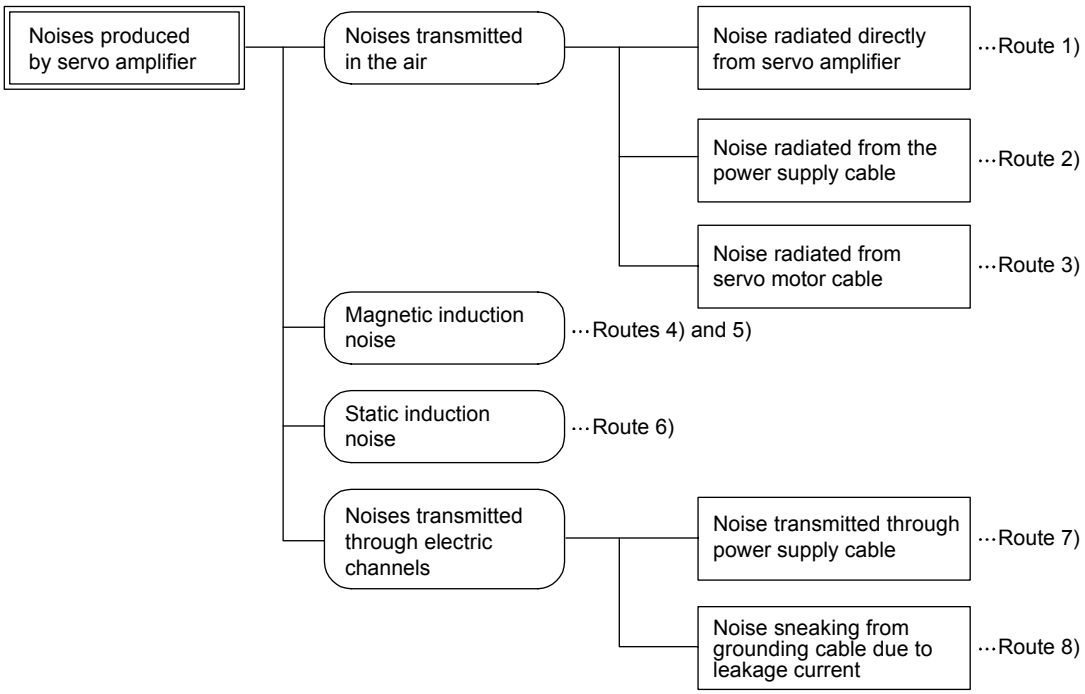
- Avoid bundling power lines (input/output) and signal cables together or running them in parallel to each other. Separate the power lines from the signal cables.
- Use a shielded twisted pair cable for connection with the encoder and for control signal transmission, and connect the external conductor of the cable to the SD terminal.
- Ground the servo amplifier, servo motor, etc. together at one point. (Refer to section 3.11 of "MR-J4-_A(-RJ) Servo Amplifier Instruction Manual" or "MR-J4-_B(-RJ) Servo Amplifier Instruction Manual".)

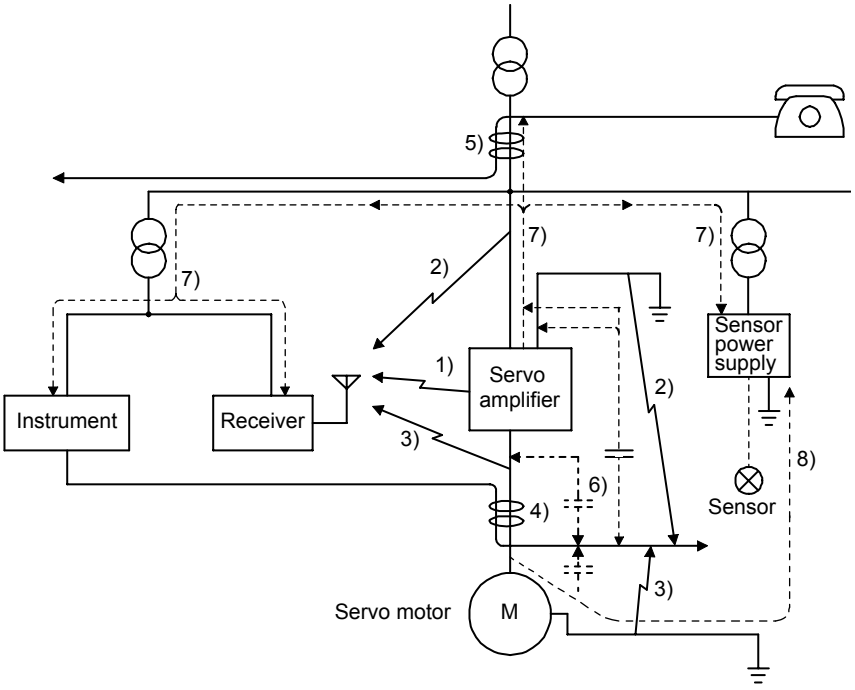
(b) Reduction techniques for external noises that cause the servo amplifier to malfunction

If there are noise sources (such as a magnetic contactor, an electromagnetic brake, and many relays which make a large amount of noise) near the servo amplifier and the servo amplifier may malfunction, the following countermeasures are required.

- Provide surge absorbers on the noise sources to suppress noises.
- Attach data line filters to the signal cables.
- Ground the shields of the encoder connecting cable and the control signal cables with cable clamp fittings.
- Although a surge absorber is built into the servo amplifier, to protect the servo amplifier and other equipment against large exogenous noise and lightning surge, attaching a varistor to the power input section of the equipment is recommended.

(c) Techniques for noises radiated by the servo amplifier that cause peripheral equipment to malfunction
Noises produced by the servo amplifier are classified into those radiated from the cables connected to the servo amplifier and its main circuits (input and output circuits), those induced electromagnetically or statically by the signal cables of the peripheral equipment located near the main circuit cables, and those transmitted through the power supply cables.





Noise transmission route	Suppression techniques
1) 2) 3)	When measuring instruments, receivers, sensors, etc. which handle weak signals and may malfunction due to noise and/or their signal cables are contained in a cabinet together with the servo amplifier or run near the servo amplifier, such devices may malfunction due to noises transmitted through the air. The following techniques are required. 1. Provide maximum clearance between easily affected devices and the servo amplifier. 2. Provide maximum clearance between easily affected signal cables and the I/O cables of the servo amplifier. 3. Avoid wiring the power lines (input/output lines of the servo amplifier) and signal lines side by side or bundling them together. 4. Insert a line noise filter to the I/O cables or a radio noise filter on the input line. 5. Use shielded wires for the signal and power lines, or put the lines in separate metal conduits.
4) 5) 6)	When the power lines and the signal lines are laid side by side or bundled together, magnetic induction noise and static induction noise will be transmitted through the signal cables and malfunction may occur. The following techniques are required. 1. Provide maximum clearance between easily affected devices and the servo amplifier. 2. Provide maximum clearance between easily affected signal cables and the I/O cables of the servo amplifier. 3. Avoid wiring the power lines (input/output lines of the servo amplifier) and signal lines side by side or bundling them together. 4. Use shielded wires for the signal and power lines, or put the lines in separate metal conduits.
7)	When the power supply of peripheral equipment is connected to the power supply of the servo amplifier system, noises produced by the servo amplifier may be transmitted back through the power supply cable and the devices may malfunction.The following techniques are required. 1. Install the radio noise filter (FR-BIF-H) on the power lines (Input lines) of the servo amplifier. 2. Install the line noise filter (FR-BSF01/FR-BLF) on the power lines of the servo amplifier.
8)	When the cables of peripheral equipment are connected to the servo amplifier to make a closed loop circuit, leakage current may flow to malfunction the peripheral equipment. If so, malfunction may be prevented by disconnecting the grounding cable of the peripheral device.

(2) Noise reduction techniques

(a) Data line filter (recommended)

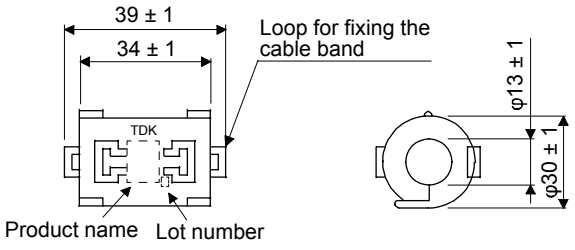
Noise can be prevented by installing a data line filter onto the encoder cable, etc.

For example, ZCAT3035-1330 by TDK, ESD-SR-250 by NEC TOKIN, and GRFC-13 by Kitagawa Industries are available as data line filters.

As a reference example, the impedance specifications of the ZCAT3035-1330 (TDK) are indicated below. This impedances are reference values and not guaranteed values.

Impedance [Ω]	
10 MHz to 100 MHz	100 MHz to 500 MHz
80	150

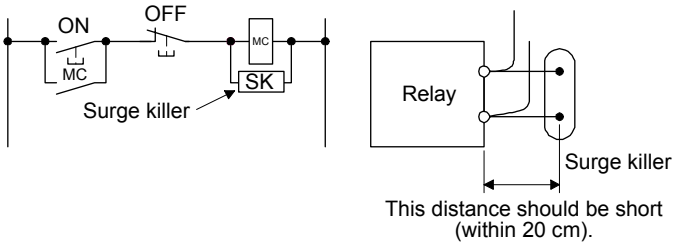
[Unit: mm]



Outline drawing (ZCAT3035-1330)

(b) Surge killer (recommended)

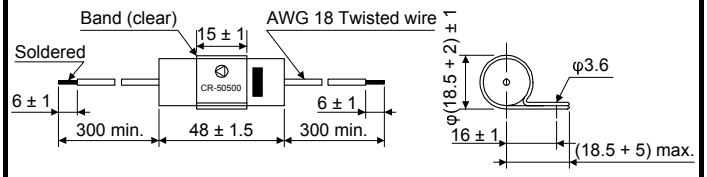
Use of a surge killer is recommended for AC relay, magnetic contactor or the like near the servo amplifier. Use the following surge killer or equivalent.



(Ex.) CR-50500 Okaya Electric Industries)

Rated voltage AC [V]	C [μF ± 20%]	R [Ω ± 30%]	Test voltage
250	0.5	50 (1/2 W)	Between terminals: 625 V AC, 50 Hz/60 Hz 60 s Between terminal and case: 2000 V AC 50 Hz/60 Hz 60 s

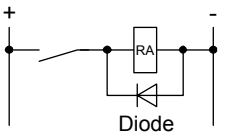
Dimensions [Unit: mm]



Note that a diode should be installed to a DC relay or the like.

Maximum voltage: Not less than four times the drive voltage of the relay or the like.

Maximum current: Not less than twice the drive current of the relay or the like.



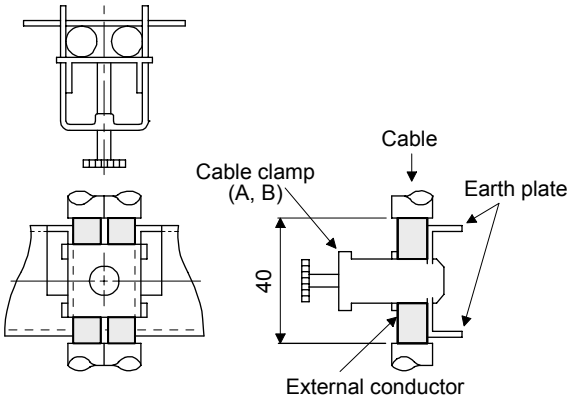
(c) Cable clamp fitting AERSBAN-_SET

Generally, the grounding of the shielded wire may only be connected to the connector's SD terminal. However, the effect can be increased by directly connecting the cable to an grounding plate as shown below.

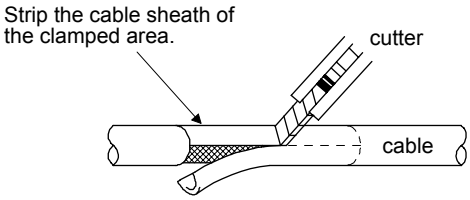
Install the grounding plate near the servo amplifier for the encoder cable. Peel part of the cable sheath to expose the external conductor, and press that part against the grounding plate with the cable clamp. If the cable is thin, clamp several cables in a bunch.

The cable clamp comes as a set with the grounding plate.

[Unit: mm]



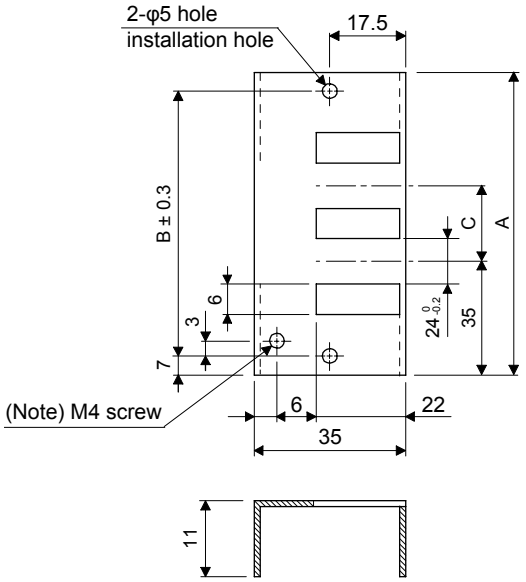
Clamp section diagram



・Dimensions

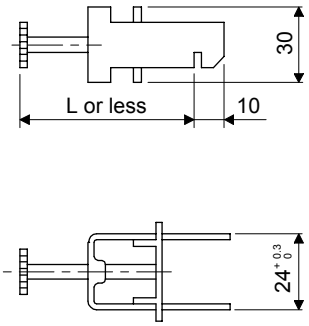
[Unit: mm]

Earth plate



[Unit: mm]

Clamp section diagram



Note. Screw hole for grounding. Connect it to the grounding plate of the cabinet.

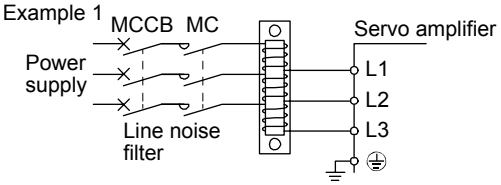
Model	A	B	C	Accessory fittings
AERSBAN-DSET	100	86	30	Clamp A: 2pcs.
AERSBAN-ESET	70	56		Clamp B: 1pc.

Clamp fitting	L
A	70
B	45

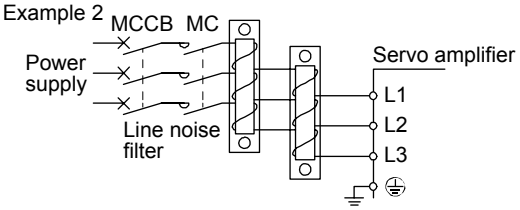
(d) Line noise filter (FR-BSF01/FR-BLF)

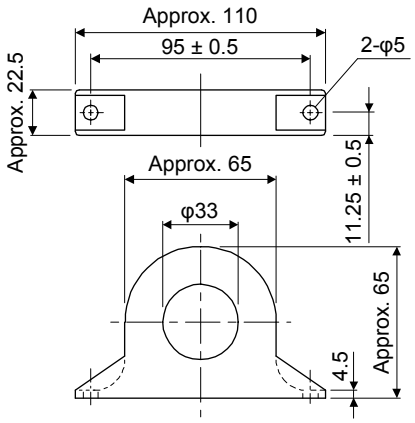
This filter is effective in suppressing noises radiated from the power supply side and output side of the servo amplifier and also in suppressing high-frequency leakage current (0-phase current). It especially affects the noises between 0.5 MHz and 5 MHz band.

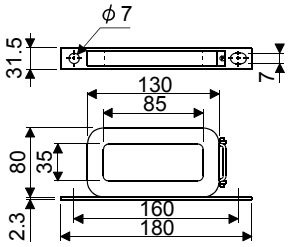
<table>
<tr><th>Connection diagram</th><th>Dimensions [Unit: mm]</th></tr>
<tr><td>Use the line noise filters for lines of the main power supply (L1, L2, and L3) and of the servo motor power (U, V, and W). Pass each of the wires through the line noise filter an equal number of times in the same direction. For the main power supply, the effect of the filter rises as the number of passes increases, but generally four passes would be appropriate. For the servo motor power lines, passes must be four times or less. Do not pass the grounding wire through the filter. or the effect of the filter will drop.
Wind the wires by passing through the filter to satisfy the required number of passes as shown in Example 1. If the wires are too thick to wind, use two or more filters to have the required number of passes as shown in Example 2.
Place the line noise filters as close to the servo amplifier as possible for their best performance.

Example 1
 

(Number of turns: 4)

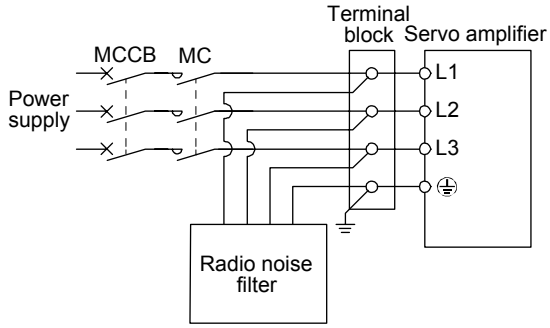
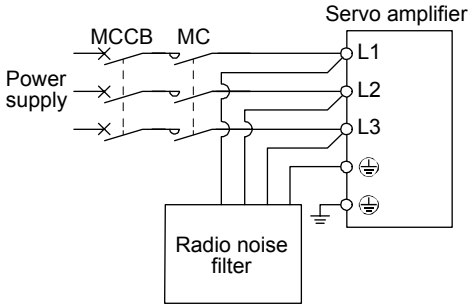
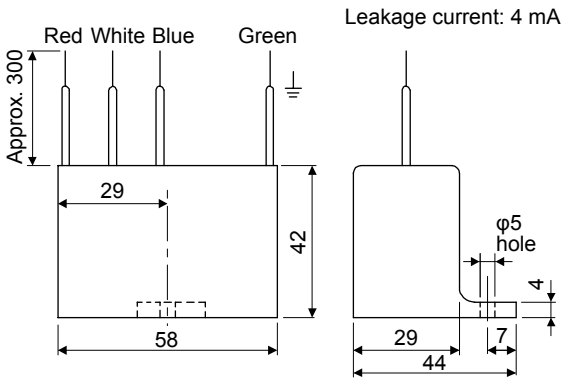
Example 2
 

Two filters are used
(Total number of turns: 4)</td><td>FR-BSF01 (for wire size 3.5 mm^2 (AWG 12) or less)
 

FR-BLF (for wire size 5.5 mm^2 (AWG 10) or more))
 
</td></tr>
</table>

(e) Radio noise filter (FR-BIF-H)

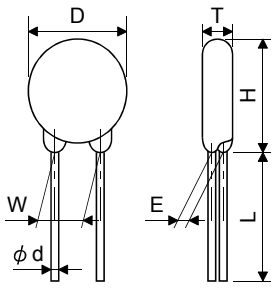
This filter is effective in suppressing noises radiated from the power supply side of the servo amplifier especially in 10 MHz and lower radio frequency bands. The FR-BIF-H is designed for the input only.

Connection diagram	Dimensions [Unit: mm]
Make the connection cables as short as possible. Grounding is always required. • MR-J4-350_4(-RJ) or less  • MR-J4-500_4(-RJ) or more 	

(f) Varistor for input power supply (recommended)

Varistors are effective to prevent exogenous noise and lightning surge from entering the servo amplifier. When using a varistor, connect it between each phase of the input power supply of the equipment. For varistors, the TND20V-102K, manufactured by NIPPON CHEMI-CON, are recommended. For detailed specification and usage of the varistors, refer to the manufacturer catalog.

Power supply voltage	Varistor	Maximum rating					Maximum limit voltage		Static capacity (reference value)	Varistor voltage rating (range) V1 mA
		Permissible circuit voltage		Surge current immunity	Energy immunity	Rated pulse power	[A]	[V]		
		AC [Vrms]	DC [V]	8/20 μs [A]	2 ms [J]	[W]			[pF]	[V]
400 V class	TND20V-102K	625	825	7500/1 time 6500/2 times	400	1.0	100	1650	560	1000 (900 to 1100)



[Unit: mm]

Model	D Max.	H Max.	T Max.	E ±1.0	(Note) L min.	φd ±0.05	W ±1.0
TND20V-102K	22.5	25.5	9.5	6.4	20	0.8	10.0

Note. For special purpose items for lead length (L), contact the manufacturer.

9.11 Earth-leakage current breaker

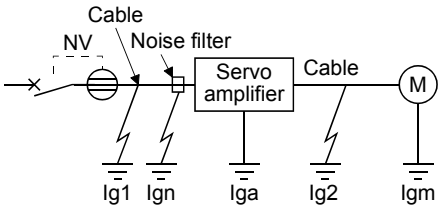
(1) Selection method

High-frequency chopper currents controlled by pulse width modulation flow in the AC servo circuits. Leakage currents containing harmonic contents are larger than those of the motor which is run with a commercial power supply.

Select an earth-leakage current breaker according to the following formula, and ground the servo amplifier, servo motor, etc. securely.

To minimize leakage currents, make the input and output cables as short as possible, and make the grounding cable longer than 30 cm.

Rated sensitivity current ≥ 10 • {Ig1 + Ign + Iga + K • (Ig2 + Igm)} [mA]····· (9.1)



Earth-leakage current breaker		K
Type	Mitsubishi products	
Models provided with harmonic and surge reduction techniques	NV-SP NV-SW NV-CP NV-CW NV-HW	1
General models	BV-C1 NFB NV-L	3

Ig1: Leakage current on the electric channel from the earth-leakage current breaker to the input terminals of the servo amplifier (Found from Fig. 9.7.)

Ig2: Leakage current on the electric channel from the output terminals of the servo amplifier to the servo motor (Found from Fig. 9.7.)

Ign: Leakage current when a filter is connected to the input side (4.4 mA per one FR-BIF-H)

Iga: Leakage current of the servo amplifier (Found from table 9.3.)

Igm: Leakage current of the servo motor (Found from table 9.2.)

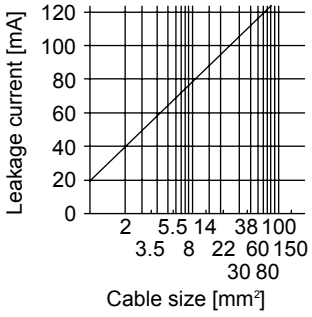


Fig. 9.7 Example of leakage current per km (Ig1, Ig2) for CV cable run in metal conduit

Table 9.2 Servo motor leakage current example (Igm)

Servo motor power [kW]	Leakage current [mA]
0.5 to 1	0.1
1.5 to 2	0.2
3.5	0.3
5	0.5
7	0.7
9 to 11	1.0
15	13
22	2.3

Table 9.3 Servo amplifier leakage current example (Iga)

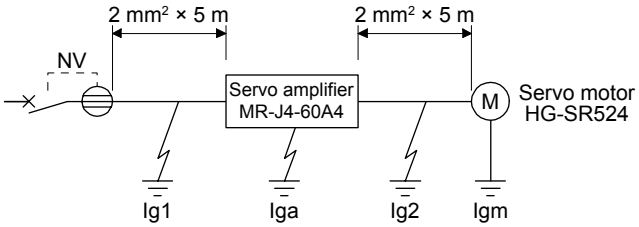
Servo amplifier capacity [kW]	Leakage current [mA]
0.6	0.1
0.75 to 3.5	0.15
5/7	2
11/15	5.5
22	2.3

Table 9.4 Earth-leakage current breaker selection example

Servo amplifier	Rated sensitivity current of earth-leakage current breaker [mA]
MR-J4-60_4(-RJ) to MR-J4-350_4(-RJ)	15
MR-J4-500_4(-RJ)	30
MR-J4-700_4(-RJ)	50
MR-J4-11K_4(-RJ) to MR-J4-22K_4(-RJ)	100

(2) Selection example

Indicated below is an example of selecting an earth-leakage current breaker under the following conditions.



Use an earth-leakage current breaker designed for suppressing harmonics/surges.
Find the terms of equation (9.1) from the diagram.

$$Ig1 = 20 \cdot \frac{5}{1000} = 0.1 \text{ [mA]}$$

$$Ig2 = 20 \cdot \frac{5}{1000} = 0.1 \text{ [mA]}$$

Ign = 0 (not used)

Iga = 0.1 [mA]

Igm = 0.1 [mA]

Insert these values in equation (9.1).

$$Ig \geq 10 \cdot \{0.1 + 0 + 0.1 + 1 \cdot (0.1 + 0.1)\}$$
$$\geq 4 \text{ [mA]}$$

According to the result of calculation, use an earth-leakage current breaker having the rated sensitivity current (Ig) of 4.0 mA or more.
An earth-leakage current breaker having Ig of 15 mA is used with the NV-SP/SW/CP/CW/HW series.

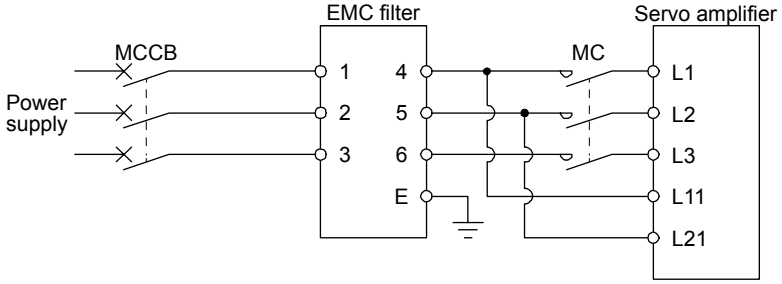
9.12 EMC filter (recommended)

It is recommended that one of the following filters be used to comply with EN EMC directive. Some EMC filters have large in leakage current.

(1) Combination with the servo amplifier

Servo amplifier	Recommended filter (Soshin Electric)				Mass [kg]
	Model	Rated current [A]	Rated voltage [V AC]	Leakage current [mA]	
MR-J4-60_4(-RJ)/ MR-J4-100_4(-RJ)	TF3005C-TX	5	500	5.5	6
MR-J4-200_4(-RJ) to MR-J4-700_4(-RJ)	TF3020C-TX	20			
MR-J4-11K_4(-RJ)	TF3030C-TX	30			7.5
MR-J4-15K_4(-RJ)	TF3040C-TX	40			12.5
MR-J4-22K_4(-RJ)	TF3060C-TX	60			

(2) Connection example

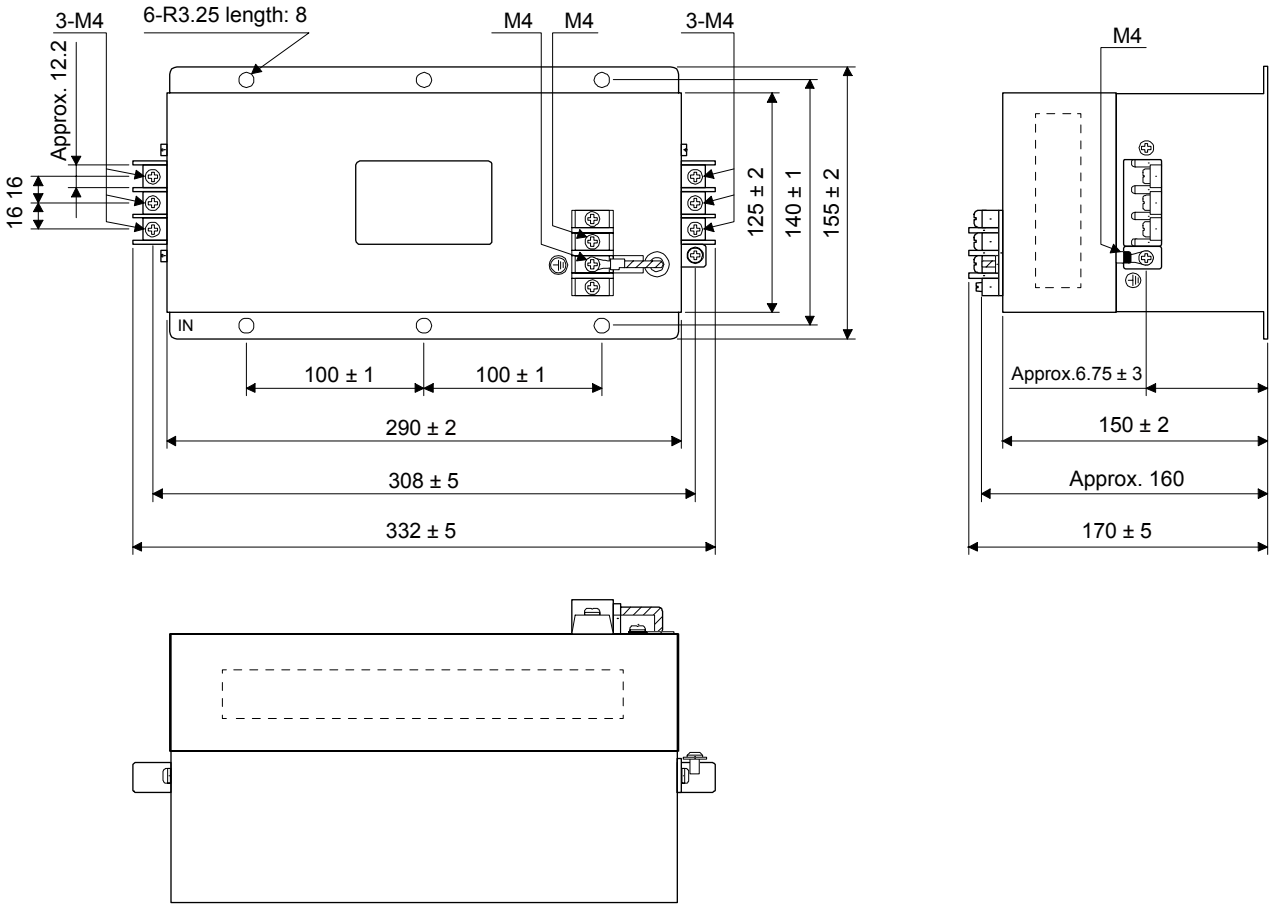


(3) Dimensions

(a) EMC filter

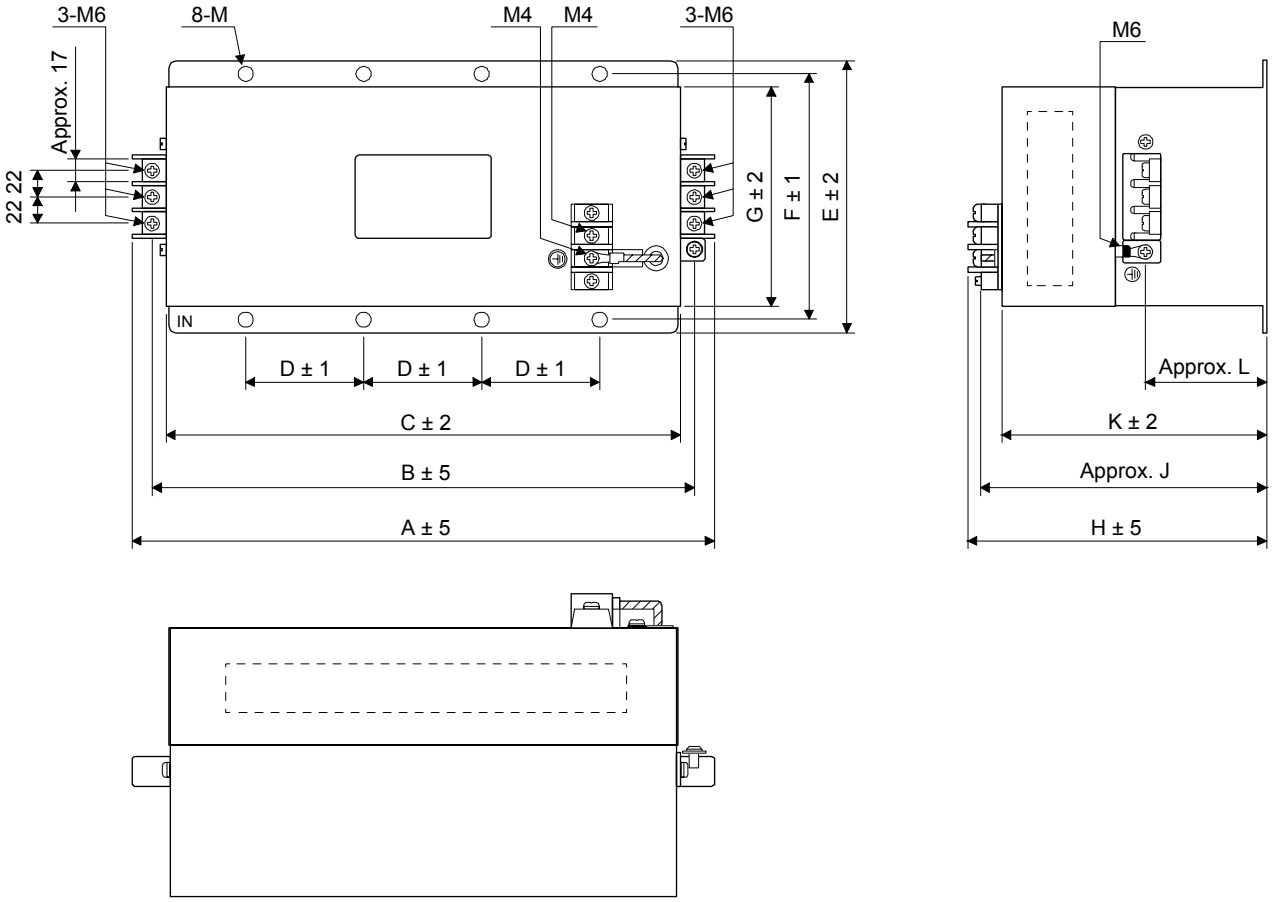
TF3005C-TX/TX3020C-TX/TF3030C-TX

[Unit: mm]



TF3040C-TX/TF3060C-TX

[Unit: mm]



Model	Dimensions [mm]											
	A	B	C	D	E	F	G	H	J	K	L	M
TF3040C-TX TF3060C-TX	438	412	390	100	175	160	145	200	(190)	180	(91.5)	R3.25 Length 8 (for M6)

10. USING A LINEAR SERVO MOTOR

⚠WARNING ●When using the linear servo motor, read "Linear Servo Motor Instruction Manual" and "Linear Encoder Instruction Manual".

The items in the following table are the same as those for MR-J4-_A(-RJ) or MR-J4-_B(-RJ) servo amplifier. For details of the items, refer to each chapter/section of the detailed explanation field.

Model	Item	Detailed explanation
MR-J4-_A4(-RJ)	Functions and configuration	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 15.1
	Operation and functions	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 15.3
	How to replace servo amplifier without magnetic pole detection	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual app. 10
MR-J4-_B4(-RJ)	Functions and configuration	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 14.1
	Operation and functions	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 14.3
	How to replace servo amplifier without magnetic pole detection	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual app. 8

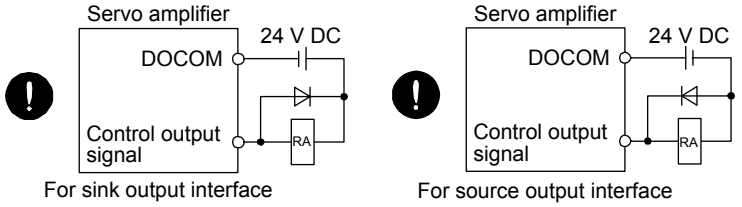
Refer to [Pr. PA17 Servo motor series setting] and [Pr. PA18 Servo motor type setting] for setting the linear servo motor.

10.1 Signals and wiring

⚠WARNING

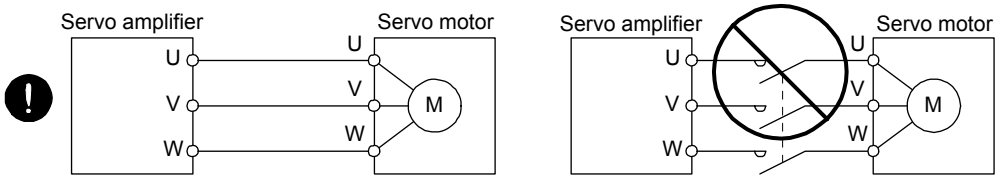
- Any person who is involved in wiring should be fully competent to do the work.
- Before wiring, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P+ and N- is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, when confirming whether the charge lamp is off or not, always confirm it from the front of the servo amplifier.
- Ground the servo amplifier and the linear servo motor securely.
- Do not attempt to wire the servo amplifier and the linear servo motor until they have 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 connections of the power supply terminals.

- Wire the equipment correctly and securely. Otherwise, the linear servo 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.
- The surge absorbing diode installed to the DC relay for control output should be fitted in the specified direction. Otherwise, the emergency stop and other protective circuits may not operate.



⚠CAUTION

- Use a noise filter, etc. to minimize the influence of electromagnetic interference. Electromagnetic interference may be given to the electronic equipment used near the servo amplifier.
- Do not install a power capacitor, surge killer or radio noise filter (FR-BIF-H option) with the power wire of the linear servo 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.
- Connect the servo amplifier power output (U, V, and W) to the linear servo motor power input (U, V, and W) directly. Do not let a magnetic contactor, etc. intervene. Otherwise, it may cause a malfunction.



10. USING A LINEAR SERVO MOTOR

⚠CAUTION
- Connecting a linear servo motor of the wrong axis to the U, V, W, or CN2 may cause a malfunction.
- Do not modify the equipment.
- The cables such as power wires deriving from the primary side cannot stand the long-term bending action. Avoid the bending action by fixing the cables to the moving part, etc. Also, use the cable that stands the long-term bending action for the wiring to the servo amplifier.

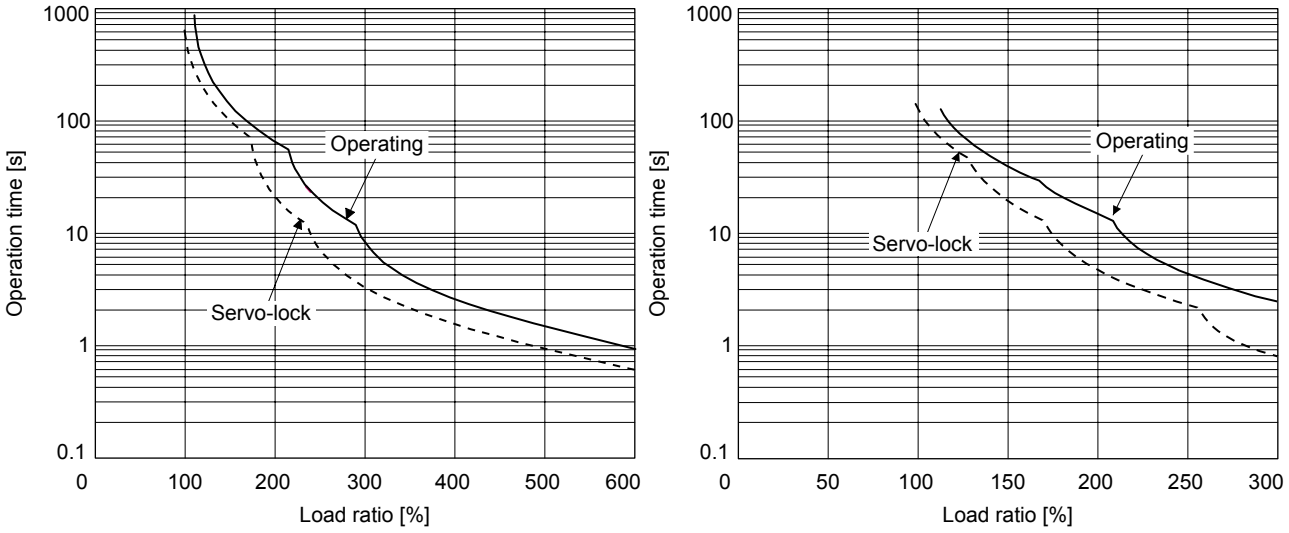
This section does not describe the following items. For details of the items, refer to each section of the detailed description field.

Model	Item	Detailed explanation
MR-J4-_A4 (-RJ)	Input power supply circuit	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.1
	Explanation of power supply system	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.3
	Signal (device) explanations	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.5
	Alarm occurrence timing chart	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.8
	Interface	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.9
	Grounding	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 3.11
	Display and operation sections	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual section 4.5
MR-J4-_B4 (-RJ)	Input power supply circuit	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.1
	Explanation of power supply system	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.3
	Signal (device) explanations	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.5
	Alarm occurrence timing chart	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.7
	Interface	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.8
	SSCNET III cable connection	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.9
	Grounding	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 3.11
	Switch setting and display of the servo amplifier	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual section 4.3

10.2 Characteristics

10.2.1 Overload protection characteristics

An electronic thermal is built in the servo amplifier to protect the linear servo motor, servo amplifier and linear servo motor power wires from overloads.
[AL. 50 Overload 1] occurs if overload operation performed is above the electronic thermal protection curve shown in fig. 10.1. [AL. 51 Overload 2] occurs if the maximum current is applied continuously for several seconds due to machine collision, etc. Use the equipment on the left-side area of the continuous or broken line in the graph.
This servo amplifier has solid-state linear servo motor overload protection. (The servo motor overload current (full load current) is set on the basis of 120% rated current of the servo amplifier.)



a. LM-F (natural cooling)

b. LM-F (liquid cooling)

Fig. 10.1 Electronic thermal protection characteristics

10.2.2 Power supply capacity and generated loss

Table 10.1 indicates servo amplifiers' power supply capacities and losses generated under rated load. For thermal design of an enclosed type cabinet, use the values in the table in consideration for the worst operating conditions. The actual amount of generated heat will be intermediate between values at rated torque and servo-off according to the duty used during operation. When the linear servo motor is run at less than the rated speed, the power supply capacity will be smaller than the value in the table, but the servo amplifier's generated heat will not change.
Mounting a heat sink outside of the cabinet enables to reduce heat in the cabinet and design a compact enclosed type cabinet.

Table 10.1 Power supply capacity and generated loss per linear servo motor at rated output

Linear servo motor	Servo amplifier	Power supply capacity [kVA] (Note 1)	Servo amplifier-generated heat [W] (Note 2)		Area required for heat dissipation [m2]
			At rated output	With servo-off	
LM-FP5H-60M-1SS0	MR-J4-22KB4(-RJ) MR-J4-22KA4(-RJ)	22	640	45	12.8

Note 1. Note that the power supply capacity will vary according to the power supply impedance. This value is applicable when the power factor improving AC reactor or power factor improving DC reactor are not used.
2. Heat generated during regeneration is not included in the servo amplifier-generated heat. To calculate heat generated by the regenerative option, refer to section 9.2.

10.2.3 Dynamic brake characteristics

POINT

- Do not use dynamic brake to stop in a normal operation as it is the function to stop in emergency.
- For a machine operating at the recommended load to motor mass 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.
- Be sure to enable EM1 (Forced stop 1) after the linear servo motor stops when using EM1 (Forced stop 1) frequently in other than emergency.

The approximate coasting distance from when the dynamic break is activated until when the linear servo motor stops can be calculated with the equation below.

$$Lmax = V_0 \cdot (0.03 + M \cdot (A + B \cdot V_0^2))$$

Lmax: Coasting distance of the machine [m]
V_0: Speed when the brake is activated [m/s]
M: Full mass of the moving part [kg]
A: Coefficient (Refer to the following tables.)
B: Coefficient (Refer to the following tables.)

Linear servo motor	Coefficient A	Coefficient B
LM-FP5H-60M-1SS0	1.95×10^{-4}	4.00×10^{-5}

⚠CAUTION

- The coasting distance is a theoretically calculated value which ignores the running load such as friction. The calculated value is considered to be longer than the actual distance. However, if an enough breaking distance is not obtained, the linear servo motor may crash into the stroke end, which is very dangerous. Install the anti-crash mechanism such as an air brake or an electric/mechanical stopper such as a shock absorber to reduce the shock of moving parts. No linear servo motor with an electromagnetic brake is available.

10.2.4 Permissible load to motor mass ratio when the dynamic brake is used

Use the dynamic brake under the load to motor mass ratio indicated in the following table. If the ratio is higher than this value, the dynamic brake may burn. If there is a possibility that the ratio may exceed the value, contact your local sales office.
The values of the permissible load to motor mass ratio in the table are the values when the linear servo motor is used at the maximum speed.

Linear servo motor	Permissible load to motor mass ratio [Multiplier]
LM-F series	100

When actual speed does not reach the maximum speed of the servo motor, calculate the permissible load to motor mass ratio at the time of using the dynamic brake by the following equation. (The upper limit is 300 times.)

Permissible load to motor mass ratio of the dynamic brake = Value in the table × (Servo motor maximum speed^2/Actual using speed^2)

When an actual using speed is 2 m/s, the equation will be as follows.
Permissible load to motor mass ratio of dynamic brake = 100 × $2^2/2^2$ = 100 [times]

MEMO

APPENDIX

This appendix does not describe the following items. For details of the items, refer to each section of the detailed description field.

Model	Item	Detailed explanation
MR-J4-_A4(-RJ)	Peripheral equipment manufacturer (for reference)	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual app. 1
	Handling of AC servo amplifier batteries for the United Nations Recommendations on the Transport of Dangerous Goods	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual app. 2
	Symbol for the new EU Battery Directive	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual app. 3
	MR-J3-D05 Safety logic unit	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual app. 5
	EC declaration of conformity	MR-J4-_A(-RJ) Servo Amplifier Instruction Manual app. 6
MR-J4-_B4(-RJ)	Peripheral equipment manufacturer (for reference)	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual app. 1
	Handling of AC servo amplifier batteries for the United Nations Recommendations on the Transport of Dangerous Goods	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual app. 2
	Symbol for the new EU Battery Directive	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual app. 3
	MR-J3-D05 Safety logic unit	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual app. 5
	EC declaration of conformity	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual app. 6
	SSCNET III cable (SC-J3BUS_M-C) manufactured by Mitsubishi Electric System & Service	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual app. 10
	J3 compatibility mode	MR-J4-_B(-RJ) Servo Amplifier Instruction Manual app. 12

App. 1 Compliance with global standards

App. 1.1 Terms related to safety (IEC/EN 61800-5-2 Stop function)

STO function (Refer to IEC/EN 61800-5-2: 2007 4.2.2.2 STO.)
MR-J4 servo amplifiers have the STO function. The STO function shuts down energy to servo motors, thus removing torque. This function electronically cuts off power supply in the servo amplifier.

App. 1.2 About safety

This section explains safety of users and machine operators. Please read the section carefully before mounting the equipment.

App. 1.2.1 Professional engineer

Only professional engineers should mount MR-J4 servo amplifiers.
Here, professional engineers should meet the all conditions below.

(1) A person who took a proper engineering training
Please note if you can take proper engineering training at your local Mitsubishi Electric office. Contact your local sales office for schedules and locations.

(2) A person who can access to operating manuals for the protective devices (e.g. light curtain) connected to the safety control system.
A person who have read and familiarized himself/herself with the manuals.

App. 1.2.2 Applications of the devices

MR-J4 servo amplifiers comply with the following safety standards.
ISO/EN ISO 13849-1 Category 3 PL d, IEC/EN 62061 SIL CL 2, IEC/EN 61800-5-2 SIL 2 (STO), IEC/EN 61800-5-1, IEC/EN 61800-3, IEC/EN 60204-1
In addition, MR-J4 servo amplifiers can be used with the MR-J3-D05 safety logic unit or safety PLCs.

App. 1.2.3 Correct use

Always use the MR-J4 servo amplifiers within specifications (voltage, temperature, etc. Refer to section 1.2 for details.). Mitsubishi Electric Co. accepts no claims for liability if the equipment is used in any other way or if modifications are made to the device, even in the context of mounting and installation.

⚠WARNING ●It takes 15 minutes for capacitor discharging. Do not touch the unit and terminals immediately after power off.

(1) Peripheral device and power wiring

(a) Local wiring and crimping tool

Use only copper wires rated at 60 ˚C/75 ˚C for wiring. The following table shows the wire sizes [AWG] and the crimp terminal symbols rated at 75 ˚C.

Servo amplifier	Wire [AWG] (Note 2)			
	L1/L2/L3 ⏚	L11/L21	P+/C	U/V/W/⏚ (Note 3)
MR-J4-60_4/MR-J4-100_4	14	14	14	14
MR-J4-200_4				
MR-J4-350_4				
MR-J4-500_4 (Note 1)	14: b	14: b	14: b	12: a
MR-J4-700_4 (Note 1)	12: a			10: a
MR-J4-11K_4 (Note 1)	10: d		14: e	8: f
MR-J4-15K_4 (Note 1)	8: f		12: d	6: c
MR-J4-22K_4 (Note 1)	6: g		12: h	4: i

Note 1. To connect these models to a terminal block, be sure to use the screws that come with the terminal block.
2. Alphabets in the table indicate crimping tools. Refer to the following table for the crimp terminals and crimping tools.
3. Select wire sizes depending on the rated output of the servo motors. The values in the table are sizes based on rated output of the servo amplifiers.

Table: Recommended crimp terminals

Symbol	Servo amplifier-side crimp terminals				Manufacturer
	Crimp terminal (Note)	Applicable tool			
		Body	Head	Dice	
a	FVD5.5-4	YNT-1210S			JST
b	FVD2-4	YNT-1614			
c	FVD14-6	YF-1	YNE-38	DH-122 DH-112	
d	FVD5.5-6	YNT-1210S			
e	FVD2-6	YNT-1614			
f	FVD8-6	YF-1	YNE-38	DH-121 DH-111	
g	FVD14-8	YF-1	YNE-38	DH-122 DH-112	
h	FVD5.5-8	YNT-1210S			
i	FVD22-8	YF-1	YNE-38	DH-123 DH-113	

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

(b) Selection example of MCCB and fuse

When a servo amplifier is protected by T class fuses or circuit breaker having an interrupting rating not less than 10 kA effective value and 480 V maximum, use T class fuses or molded-case circuit breaker (UL489 Listed MCCB) as the following table. The T class fuses and molded-case circuit breakers in the table are selected examples based on rated I/O of the servo amplifiers. When you select a smaller capacity servo motor to connect it to the servo amplifier, you can also use smaller capacity T class fuses or molded-case circuit breaker than ones in the table. For selecting ones other than Class T fuses and molded-case circuit breakers below, refer to section 9.7.

Servo amplifier	Molded-case circuit breaker (480 V AC)	Fuse (600 V)
MR-J4-60_4	NF100-HRU-5A (100 A frame 5 A)	10 A
MR-J4-100_4	NF100-HRU-5A (100 A frame 5 A)	10 A
MR-J4-200_4	NF100-HRU-10A (100 A frame 10 A)	15 A
MR-J4-350_4	NF100-HRU-10A (100 A frame 10 A)	20 A
MR-J4-500_4	NF100-HRU-15A (100 A frame 15 A)	30 A
MR-J4-700_4	NF100-HRU-20A (100 A frame 20 A)	40 A
MR-J4-11K_4	NF100-HRU-30A (100 A frame 30 A)	60 A
MR-J4-15K_4	NF100-HRU-40A (100 A frame 40 A)	80 A
MR-J4-22K_4	NF100-HRU-60A (100 A frame 60 A)	125 A

(c) Power supply

This servo amplifier can be used under the conditions of overvoltage category III set forth in IEC/EN 60664-1. For the interface power supply, use an external 24 V DC power supply with reinforced insulation on I/O terminals.

(d) Grounding

To prevent an electric shock, always connect the protective earth (PE) terminal (marked ⏚) of the servo amplifier to the protective earth (PE) of the cabinet. Do not connect two grounding cables to the same protective earth (PE) terminal. Always connect cables to the terminals one-to-one.

If using an earth-leakage current breaker, always ground the protective earth (PE) terminal of the servo amplifier to prevent an electric shock. Only an RCD (earth-leakage current breaker) of type B can be used for the power supply side of the product.

(2) EU compliance

The MR-J4 servo amplifiers are designed to comply with the following directions to meet requirements for mounting, using, and periodic technical inspections: Machinery directive (2006/42/EC), EMC directive (2004/108/EC), and Low-voltage directive (2006/95/EC).

(a) EMC requirement

MR-J4 servo amplifiers comply with category C3 in accordance with IEC/EN 61800-3. As for I/O wires (max. length 10 m. However, 3 m for STO cable for CN8.) and encoder cables (max. length 50 m), connect them to a shielded grounding.

Use an EMC filter and surge protector on the primary side for inputs. In addition, use a line noise filter for outputs of the 11 kW and 15 kW servo amplifiers. The following shows recommended products.

EMC filter: Soshin Electric HF3000A-UN series

Surge protector: Okaya Electric Industries RSPD-250-U4 series

Line noise filter: Mitsubishi Electric FR-BLF

- MR-J4 Series are not intended to be used on a low-voltage public network which supplies domestic premises;
- radio frequency interference is expected if used on such a network.
  The installer shall provide a guide for Installation and use, including recommended mitigation devices.

(b) For Declaration of Conformity (DoC)

Hereby, MITSUBISHI ELECTRIC EUROPE B.V., declares that the servo amplifiers are in compliance with the necessary requirements and standards (2006/42/EC, 2004/108/EC and 2006/95/EC). For the copy of Declaration of Conformity, contact your local sales office.

(3) USA/Canada compliance

This servo amplifier is designed in compliance with UL 508C and CSA C22.2 No.14 standards. Refer to MR-J4 Servo Amplifier Instruction Manuals for details of UL/CSA standards.

(a) Installation

The minimum cabinet size is 150% of each MR-J4 servo amplifier's volume. Also, design the cabinet so that the ambient temperature in the cabinet is 55 ˚C or less. The servo amplifier must be installed in a metal cabinet. Environment is open type (UL 50) and overvoltage category III. The servo amplifier needs to be installed at or below of pollution degree 2. Use copper conductors only.

(b) Short-circuit current rating (SCCR)
Suitable For Use On A Circuit Capable Of Delivering Not More Than 100 kA rms Symmetrical Amperes, 500 Volts Maximum.

(c) Overload protection characteristics
The MR-J4 servo amplifiers have servo motor overload protective function. (It is set on the basis (full load current) of 120% rated current of the servo amplifier.)

(d) Over-temperature protection for motor
Motor Over temperature sensing is not provided by the drive.

(e) Capacitor discharge
It takes 15 minutes for capacitor discharging. Do not touch the unit and terminals immediately after power off.

(f) Branch circuit protection
For installation in United States, branch circuit protection must be provided, in accordance with the National Electrical Code and any applicable local codes.
For installation in Canada, branch circuit protection must be provided, in accordance with the Canada Electrical Code and any applicable provincial codes.

(4) South Korea compliance
This product complies with the Radio Wave Law (KC mark). Please note the following to use the product.
이 기기는 업무용 (A급) 전자파적합기기로서 판 매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으 로 합니다.
(The product is for business use (Class A) and meets the electromagnetic compatibility requirements. The seller and the user must note the above point, and use the product in a place except for home. In addition, use an EMC filter, surge protector, and line noise filter on the primary side for inputs. Use a line noise filter for outputs.)

App. 1.2.4 General cautions for safety protection and protective measures

Observe the following items to ensure proper use of the MELSERVO MR-J4 servo amplifiers.

(1) For safety components and installing systems, only qualified personnel and professional engineers should perform.

(2) When mounting, installing, and using the MELSERVO MR-J4 servo amplifier, always observe standards and directives applicable in the country.

(3) The item about noises of the test notices in the manuals should be observed.

(4) The MR-J4 servo amplifiers fulfill the requirements to conducted emissions at the main connections in the frequency range from 150 kHz to 30 MHz. (Bases for the evaluation: Product standard IEC/EN 61800, adjustable speed electrical power drive systems, Part 3: EMC)

App. 1.2.5 Residual risk

(1) Be sure that all safety related switches, relays, sensors, etc., meet the required safety standards.

(2) Perform all risk assessments and safety level certification to the machine or the system as a whole.

(3) If the upper and lower power module in the servo amplifier are shorted and damaged simultaneously, the servo motor may make a half revolution at a maximum.

(4) Only qualified personnel are authorized to install, start-up, repair or service the machines in which these components are installed. Only trained engineers should install and operate the equipment. (ISO 13849-1 Table F.1 No.5)

(5) Separate the wiring for safety function from other signal wirings. (ISO 13849-1 Table F.1 No.1)

(6) Protect the cables with appropriate ways (routing them in a cabinet, using a cable guard, etc.).

(7) Keep the required clearance/creepage distance depending on voltage you use.

App. 1.2.6 Disposal

Disposal of unusable or irreparable devices should always occur in accordance with the applicable country-specific waste disposal regulations.
(Example: European Waste 16 02 14)

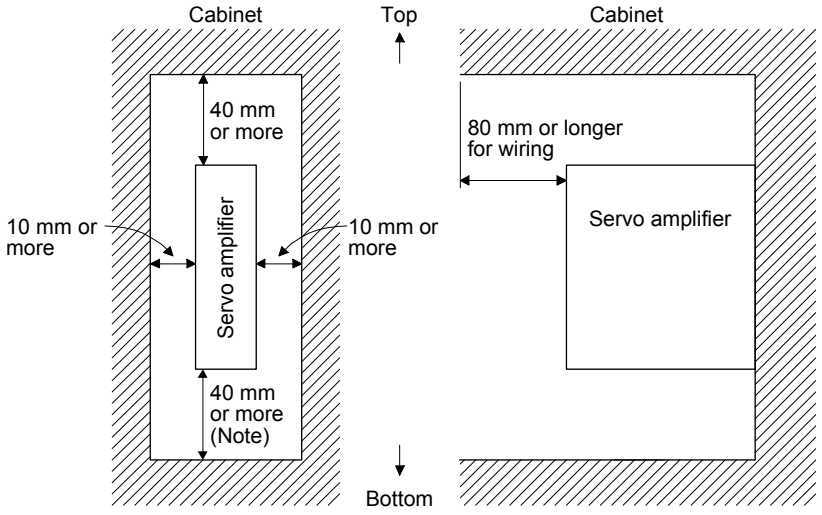
App. 1.2.7 Lithium battery transportation

To transport lithium batteries, take actions to comply with the instructions and regulations such as the United Nations (UN), the International Civil Aviation Organization (ICAO), and the International Maritime Organization (IMO).
The battery options (MR-BAT6V1SET and MR-BAT6V1) are assembled batteries from lithium metal battery CR17335A which are not subject to the dangerous goods (Class 9) of the UN Recommendations.

App. 1.3 Mounting/dismounting

Installation direction and clearances

⚠CAUTION	●The devices must be installed in the specified direction. Not doing so may cause a malfunction. ●Mount the servo amplifier on a cabinet which meets IP54 in the correct vertical direction to maintain pollution degree 2.



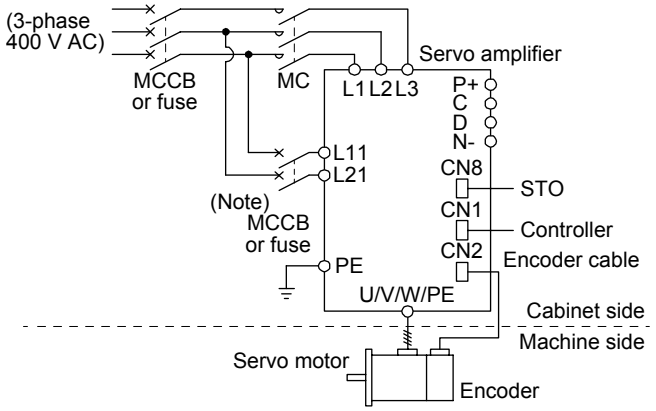
Note. For 11 kW to 22 kW servo amplifiers, the clearance between the bottom and ground will be 120 mm or more.

App. 1.4 Electrical Installation and configuration diagram

⚠WARNING ●Turn off the molded-case circuit breaker (MCCB) to avoid electrical shocks or damages to the product before starting the installation or wiring.

⚠CAUTION
- ●The installation complies with IEC/EN 60204-1. The voltage supply to machines must be 20 ms of immunity to instantaneous power failures as specified in IEC/EN 60204-1.
- ●Connecting a servo motor of the wrong axis to U, V, W, or CN2_ of the servo amplifier may cause a malfunction.

The following shows representative configuration diagram examples to conform to the IEC/EN/UL/CSA standards.



Note. When the wire sizes of L1 and L11 are the same, MCCB or fuse is not required.

The control circuit connectors described by rectangles are safely separated from the main circuits described by circles.
The connected motors will be limited as follows.

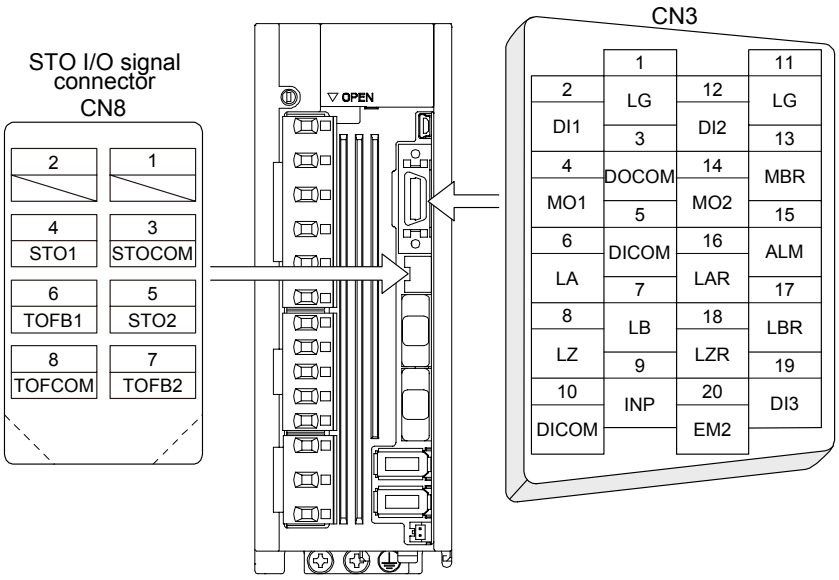
(1) HG/HF/HC/HA series servo motors (Mfg.: Mitsubishi Electric)

(2) Using a servo motor complied with IEC60034-1 and Mitsubishi Electric encoder (OBA, OSA)

App. 1.5 Signal

App. 1.5.1 Signal

The following shows MR-J4-60B4 signals as a typical example. Refer to section 3.4 of "MR-J4-_A(-RJ) Servo Amplifier Instruction Manual" or "MR-J4-_B(-RJ) Servo Amplifier Instruction Manual" for other servo amplifiers.



App. 1.5.2 Input device

Input device

Symbol	Device	Connector	Pin No.
EM2	Forced stop 2	CN3	20
STOCOM	Common terminal for input signals STO1/STO2	CN8	3
STO1	STO1 state input		4
STO2	STO2 state input		5

Output device

Symbol	Device	Connector	Pin No.
TOFCOM	Common terminal for monitor output signal in STO state	CN8	8
TOFB1	Monitor output signal in STO1 state		6
TOFB2	Monitor output signal in STO2 state		7

Power supply

Symbol	Device	Connector	Pin No.
DICOM	Digital I/F power supply input	CN3	5, 10
DOCOM	Digital I/F common		3
SD	Shield		Plate

App. 1.6 Maintenance and service

⚠WARNING ●To avoid an electric shock, only qualified personnel should attempt inspections. For repair and parts replacement, contact your local sales office.

⚠CAUTION ●Do not perform insulation resistance test on the servo amplifier. Otherwise, it may cause a malfunction.
●Do not disassemble and/or repair the equipment on customer side.

App. 1.6.1 Inspection items

It is recommended that the following points periodically be checked.

(1) Check for loose terminal block screws. Retighten any loose screws.

Servo amplifier	Tightening torque [N•m]													
	L1	L2	L3	N-	P3	P4	P+	C	L11	L21	U	V	W	PE
MR-J4-60_4/MR-J4-100_4/ MR-J4-200_4/MR-J4-350_4														1.2
MR-J4-500_4	1.2								0.8		1.2			
MR-J4-700_4	1.2								0.8		1.2			
MR-J4-11K_4/MR-J4-15K_4	3.0								1.2		3.0			
MR-J4-22K_4	6.0								1.2		6.0			

(2) Check servo motor bearings, brake section, etc. for unusual noise.

(3) Check the cables and the like for scratches or cracks. Perform periodic inspection according to operating conditions.

(4) Check that the connectors are securely connected to the servo motor.

(5) Check that the wires are not coming out from the connector.

(6) Check for dust accumulation on the servo amplifier.

(7) Check for unusual noise generated from the servo amplifier.

(8) Check the servo motor shaft and coupling for connection.

App. 1.6.2 Parts having service lives

Service lives of the following parts are listed below. However, the service life vary depending or operating methods and environment. If any fault is found in the parts, they must be replaced immediately regardless of their service lives. For parts replacement, please contact your local sales office.

Part name	Life guideline
Smoothing capacitor	(Note 3) 10 years
Relay	Number of power-on, forced stop and controller forced stop times: 100 000 times Number of on and off for STO: 1,000,000 times
Cooling fan	10,000 hours to 30,000 hours (2 years to 3 years)
Rotary servo motor battery backup time (Note 1)	Approximately 20,000 hours (equipment power supply: off, ambient temperature: 20 ˚C)
(Note 2) Battery life	5 years from date of manufacture

Note 1. The data-holding time using a battery of MR-BAT6V1SET on condition that the power supply of the servo amplifier is off. Replace the batteries within three years since the operation start whether the power supply of the servo amplifier is on/off. If the battery is used out of specification, [AL. 25 Absolute position erased] may occur.

2. Quality of the batteries degrades by the storage condition. The battery life is 5 years from the production date regardless of the connection status.

3. The characteristic of smoothing capacitor is deteriorated due to ripple currents, etc. The life of the capacitor greatly depends on ambient temperature and operating conditions. The capacitor will reach the end of its life in 10 years of continuous operation in normal air-conditioned environment (40 ˚C surrounding air temperature or less).

App. 1.7 Transportation and storage

⚠CAUTION

- Transport the products correctly according to their mass.
- Stacking in excess of the limited number of product packages is not allowed.
- Do not hold the front cover to transport the servo amplifier. Otherwise, it may drop.
- Install the servo amplifier and servo motor in a load-bearing place in accordance with the Instruction Manual.
- Do not get on or put heavy load on the equipment.
- For detailed information on transportation and handling of the optional battery, refer to app. 2 of "MR-J4-_A(-RJ) Servo Amplifier Instruction Manual" or "MR-J4-_B(-RJ) Servo Amplifier Instruction".

When you keep or use it, please fulfill the following environment.

Item		Environment
Ambient temperature	Operation [°C]	0 to 55 Class 3K3 (IEC/EN 60721-3-3)
	Transportation (Note) [°C]	-20 to 65 Class 2K4 (IEC/EN 60721-3-2)
	Storage (Note) [°C]	-20 to 65 Class 1K4 (IEC/EN 60721-3-1)
Ambient humidity	Operation, transportation, storage	5% to 90 %RH
Vibration load	Test values	10 Hz to 57 Hz with constant deviation of 0.075 mm 57 Hz to 150 Hz with constant acceleration of 9.8 m/s^2 (1 g) to IEC/EN 61800-5-1 (Test Fc of IEC 60068-2-6)
	Operation	5.9 m/s^2 (0.6 g)
	Transportation (Note)	Class 2M3 (IEC/EN 60721-3-2)
	Storage	Class 1M2 (IEC/EN 60721-3-2)
Pollution degree		2
IP rating		Except terminal block IP20 (IEC/EN 60529) and fan finger guard
		Open type (UL 50)
Altitude	Operation, storage	1000 m or less above sea level
	Transportation	10000 m or less above sea level

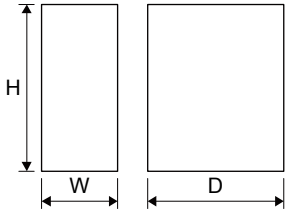
Note. In regular transport packaging

App. 1.8 Technical data

App. 1.8.1 MR-J4 servo amplifier

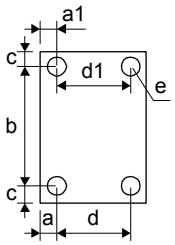
Item		MR-J4-60_4/MR-J4-100_4/MR-J4-200_4/MR-J4-350_4/MR-J4-500_4/ MR-J4-700_4/MR-J4-11K_4/MR-J4-15K_4/MR-J4-22K_4
Power supply	Main circuit (line voltage)	3-phase 380 V AC to 480 V AC, 50 Hz/60 Hz
	Control circuit (line voltage)	1-phase 380 V AC to 480 V AC, 50 Hz/60 Hz
	Interface (SELV)	24 V DC, (required current capacity: MR-J4-_A4, 500 mA; MR-J4-_B4, 300 mA)
Control method		Sine-wave PWM control, current control method
Safety function (STO) IEC/EN 61800-5-2		EN ISO 13849-1 category 3 PL d, EN 61508 SIL 2, EN 62061 SIL CL 2, and EN 61800-5-2 SIL 2
Mean time to dangerous failure		MTTFd ≥ 100 [years]
Effectiveness of fault monitoring of a system or subsystem		DC = 90 [%]
Average probability of dangerous failures per hour		PFH = 1.68×10^{-10} [1/h]
Mission time		TM = 20 [years]
Response performance		8 ms or less (STO input off → energy shut off)
Pollution degree		2 (IEC/EN 60664-1)
Overvoltage category		III (IEC/EN 60664-1)
Protection class		I (IEC/EN 61800-5-1)
Short-circuit current rating (SCCR)		100 kA

App. 1.8.2 Servo amplifier dimensions



Servo amplifier	Variable dimension table [mm]			Mass [kg]
	W	H	D	
MR-J4-60_4/MR-J4-100_4	60	168	195	1.7
MR-J4-200_4	90	168	195	2.1
MR-J4-350_4	105	250	200	3.6
MR-J4-500_4	130	250	200	4.3
MR-J4-700_4	172	300	200	6.5
MR-J4-11K_4/MR-J4-15K_4	220	400	260	13.4
MR-J4-22K_4	260	400	260	18.2

App. 1.8.3 Mounting hole



Servo amplifier	Variable dimensions [mm]						Screw size
	a	a1	b	c	d	d1	e
MR-J4-60_4/MR-J4-100_4	12	12	156 ± 0.5	6	42 ± 0.3		M5
MR-J4-200_4	6	45	156 ± 0.5	6	78 ± 0.3		M5
MR-J4-350_4	6	6	235 ± 0.5	7.5	93 ± 0.3	93 ± 0.3	M5
MR-J4-500_4	6	6	235 ± 0.5	7.5	118 ± 0.5	118 ± 0.5	M5
MR-J4-700_4	6	6	285 ± 0.5	7.5	160 ± 0.5	160 ± 0.5	M5
MR-J4-11K_4/MR-J4-15K_4	12	12	380 ± 0.5	10	196 ± 0.5	196 ± 0.5	M5
MR-J4-22K_4	12	12	376 ± 0.5	12	236 ± 0.5	236 ± 0.5	M10

App. 1.9 Check list for user documentation

MITSUBISHI ELECTRIC

MR-J4 installation checklist for manufacturer/installer

The following items must be satisfied by the initial test operation at least. The manufacturer/installer must be responsible for checking the standards in the items.
Maintain and keep this checklist with related documents of machines to use this for periodic inspection.

1. Is it based on directive/standard applied to the machine? Yes [ ], No [ ]
2. Is directive/standard contained in Declaration of Conformity (DoC)? Yes [ ], No [ ]
3. Does the protection instrument conform to the category required? Yes [ ], No [ ]
4. Are electric shock protective measures (protection class) effective? Yes [ ], No [ ]
5. Is the STO function checked (test of all the shut-off wiring)? Yes [ ], No [ ]

Checking the items will not be instead of the first test operation or periodic inspection by professional engineers.

App. 2 Analog monitor

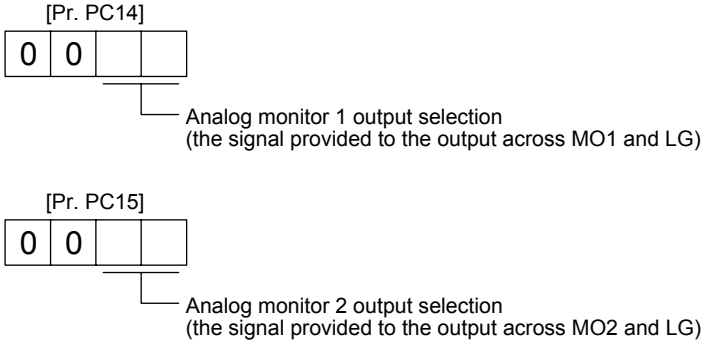
POINT
●A voltage of analog monitor output may be irregular at power-on.

The servo status can be output to two channels in terms of voltage.

App. 2.1 For MR-J4-_A4(-RJ)

(1) Setting

Change the following digits of [Pr. PC14] and [Pr. PC15].



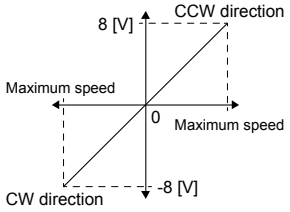
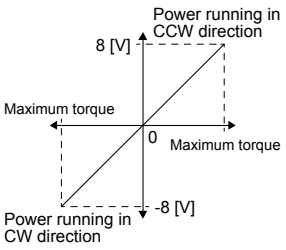
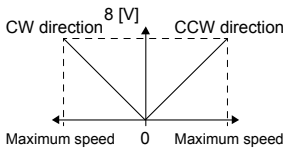
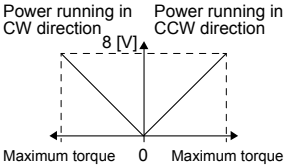
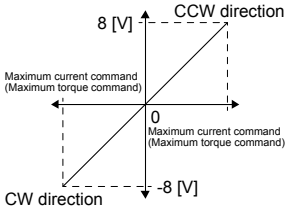
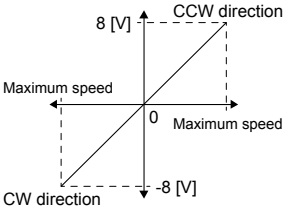
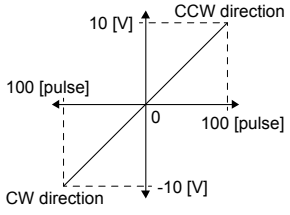
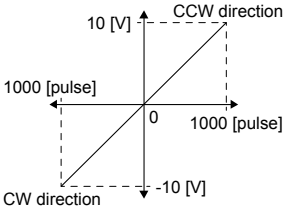
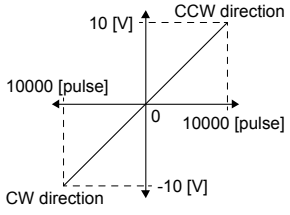
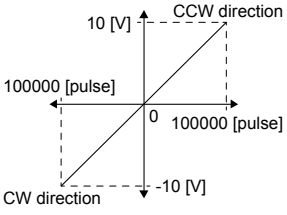
[Pr. PC39] and [Pr. PC40] can be used to set the offset voltages to the analog output voltages. Setting value is -9999 mV to 9999 mV.

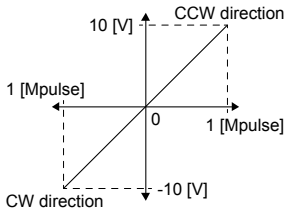
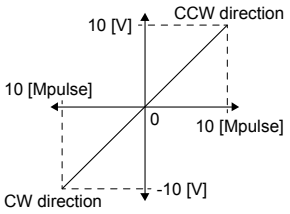
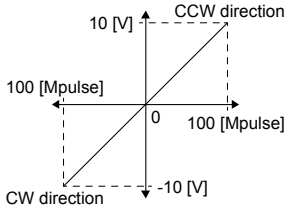
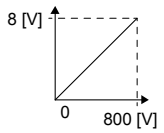
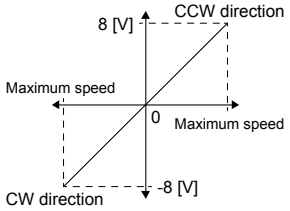
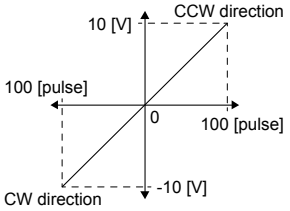
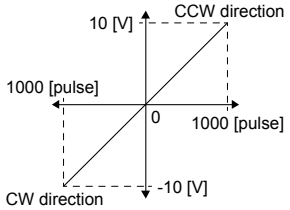
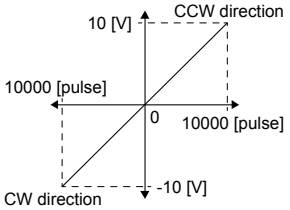
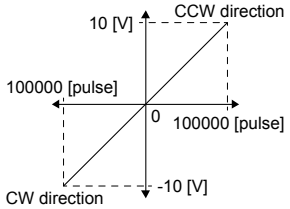
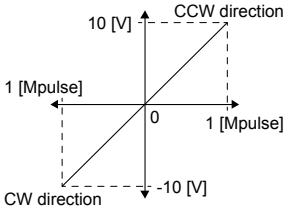
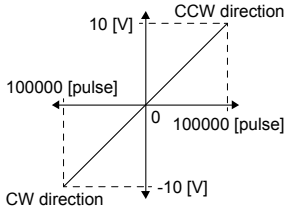
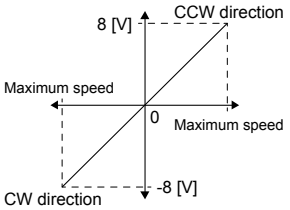
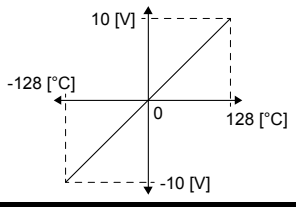
Parameter	Description	Setting range [mV]
PC39	This is used to set the offset voltage of MO1 (Analog monitor 1).	-9999 to 9999
PC40	This is used to set the offset voltage of MO2 (Analog monitor 2).	

(2) Setting

POINT
●When you use a linear servo motor, replace the following left words to the right words. (servo motor) speed [r/min] →(linear servo motor) speed [mm/s] CCW direction →Positive direction CW direction →Negative direction Torque [N•m] →Thrust[N]

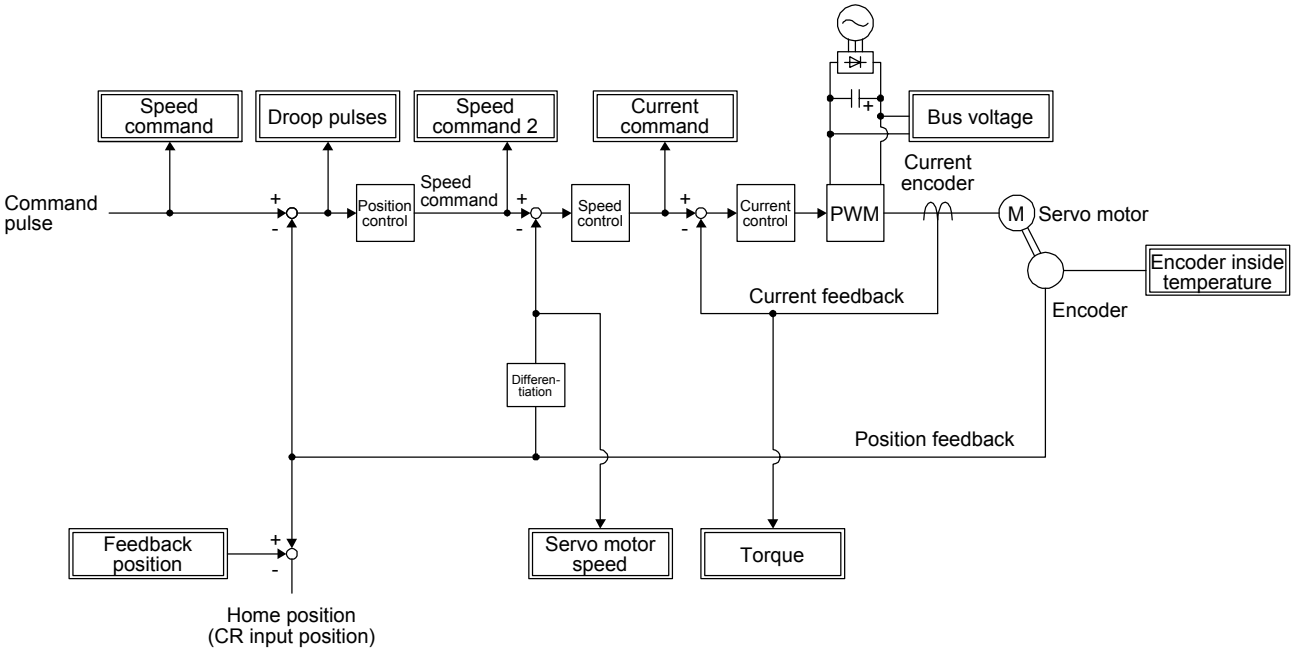
The servo amplifier is factory-set to output the servo motor speed to MO1 (Analog monitor 1) and the torque to MO2 (Analog monitor 2). The setting can be changed by setting in [Pr. PC09] and [Pr. PC10] as follows.
Refer to (3) for the detection point.

Setting value	Output item	Description	Setting value	Output item	Description
00	Servo motor speed		01	Torque	
02	Servo motor speed		03	Torque	
04	Current command		05	Command pulse frequency (±10 V/±4 Mpps)	
06	Servo motor-side droop pulses (Note 1, 3, 5, 6) (±10 V/100 pulses)		07	Servo motor-side droop pulses (Note 1, 3, 5, 6) (±10 V/1000 pulses)	
08	Servo motor-side droop pulses (Note 1, 3, 5, 6) (±10 V/10000 pulses)		09	Servo motor-side droop pulses (Note 1, 3, 5, 6) (±10 V/100000 pulses)	

Setting value	Output item	Description	Setting value	Output item	Description
0A	Feedback position (Note 1, 2, 3) (±10 V/1 Mpulses)		0B	Feedback position (Note 1, 2, 3) (±10 V/10 Mpulses)	
0C	Feedback position (Note 1, 2, 3) (±10 V/100 Mpulses)		0D	Bus voltage	
0E	Speed command 2 (Note 3)		10	Load-side droop pulses (Note 3, 4, 5, 6) (±10 V/100 pulses)	
11	Load-side droop pulses (Note 3, 4, 5, 6) (±10 V/1000 pulses)		12	Load-side droop pulses (Note 3, 4, 5, 6) (±10 V/10000 pulses)	
13	Load-side droop pulses (Note 3, 4, 5, 6) (±10 V/100000 pulses)		14	Load-side droop pulses (Note 3, 4, 5, 6) (±10 V/1 Mpulses)	
15	Motor-side/load-side position deviation (Note 3, 5, 6) (±10 V/100000 pulses)		16	Servo motor-side/load-side speed deviation	
17	Encoder inside temperature (±10 V/±128 °C)				

Note 1. Encoder pulse unit
2. Available in position control mode
3. This cannot be used in the torque control mode.
4. This can be used with MR Configurator2 with software version 1.19V or later.
5. This cannot be used in the speed control mode.
6. Output in the load-side encoder unit for the fully closed loop control. Output in the servo motor encoder unit for the semi closed loop control.

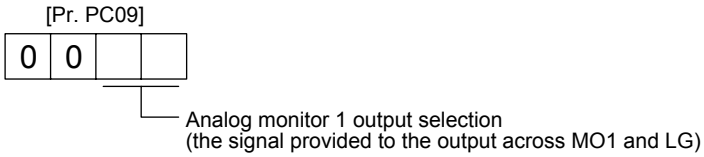
(3) Analog monitor block diagram

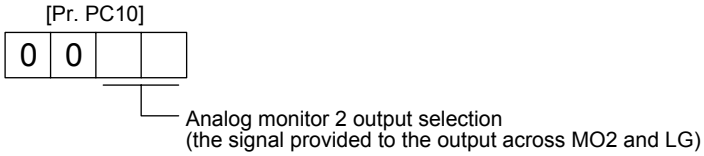


App. 2.2 For MR-J4-_B4(-RJ)

(1) Setting

Change the following digits of [Pr. PC09] and [Pr. PC10].





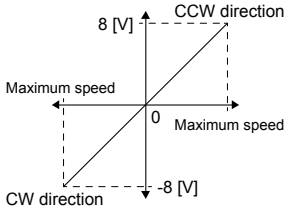
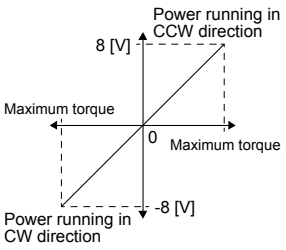
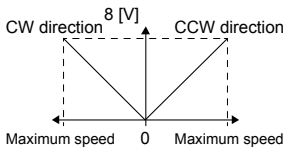
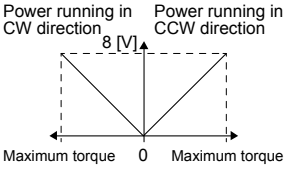
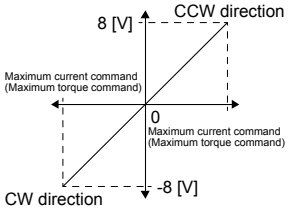
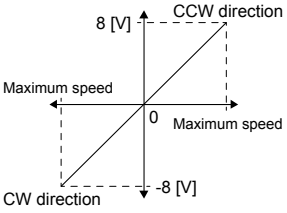
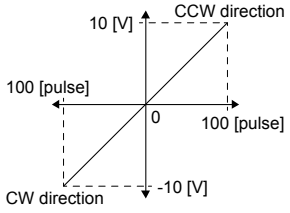
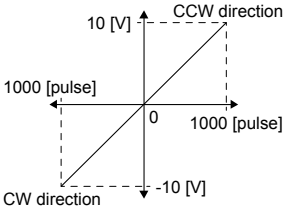
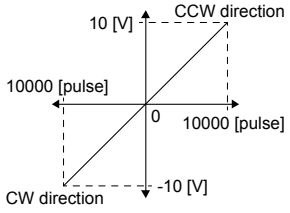
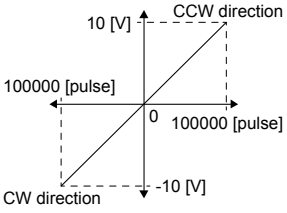
[Pr. PC11] and [Pr. PC12] can be used to set the offset voltages to the analog output voltages. Setting value is -999 mV to 999 mV.

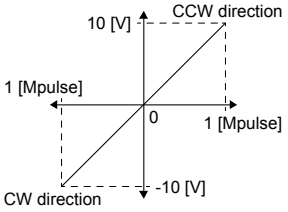
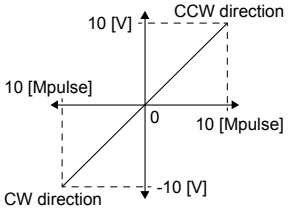
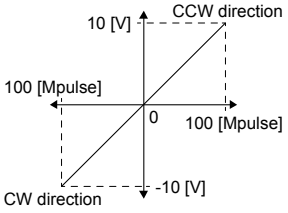
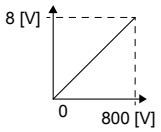
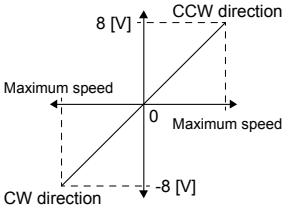
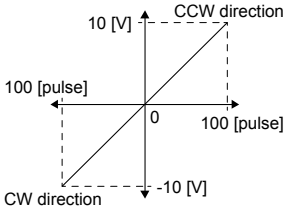
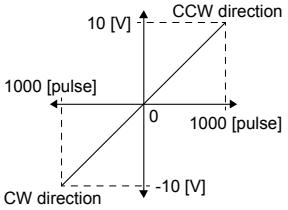
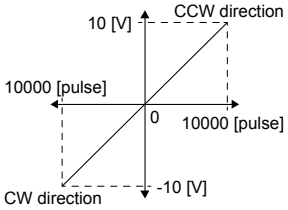
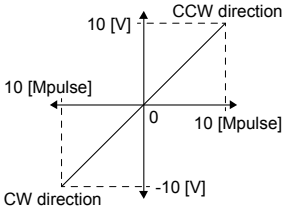
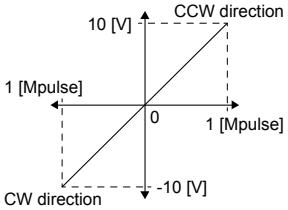
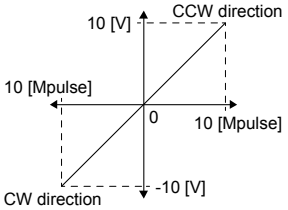
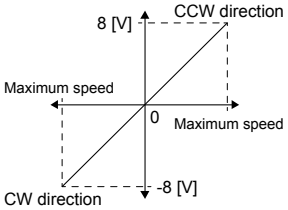
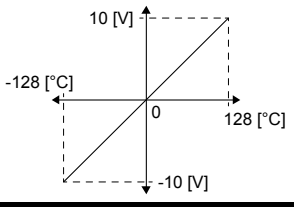
Parameter	Description	Setting range [mV]
PC11	This is used to set the offset voltage of MO1 (Analog monitor 1).	-999 to 999
PC12	This is used to set the offset voltage of MO2 (Analog monitor 2).	

(2) Setting

POINT
●When you use a linear servo motor, replace the following left words to the right words. (servo motor) speed [r/min] →(linear servo motor) speed [mm/s] CCW direction →Positive direction CW direction →Negative direction Torque [N•m] →Thrust[N]

The servo amplifier is factory-set to output the servo motor speed to MO1 (Analog monitor 1) and the torque to MO2 (Analog monitor 2). The setting can be changed by setting in [Pr. PC09] and [Pr. PC10] as follows.
Refer to (3) for the detection point.

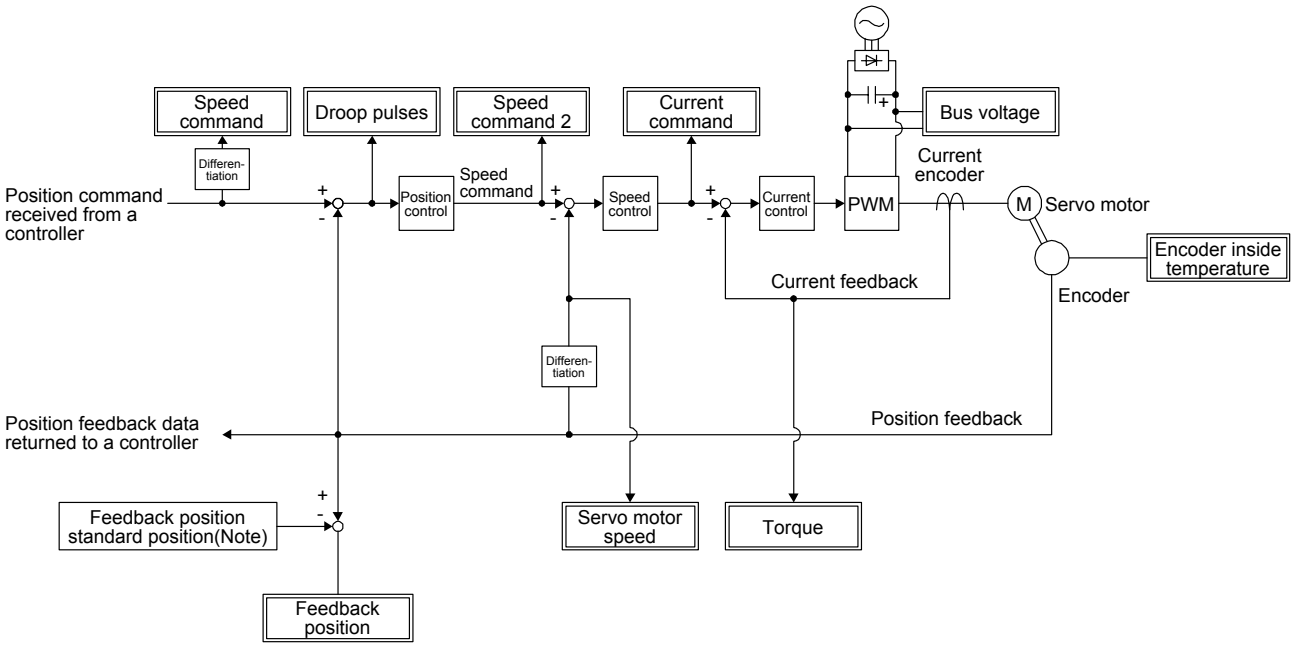
Setting value	Output item	Description	Setting value	Output item	Description
00	Servo motor speed		01	Torque	
02	Servo motor speed		03	Torque	
04	Current command		05	Speed command	
06	Servo motor-side droop pulses (Note 1, 3, 5, 6) (±10 V/100 pulses)		07	Servo motor-side droop pulses (Note 1, 3, 5, 6) (±10 V/1000 pulses)	
08	Servo motor-side droop pulses (Note 1, 3, 5, 6) (±10 V/10000 pulses)		09	Servo motor-side droop pulses (Note 1, 3, 5, 6) (±10 V/100000 pulses)	

Setting value	Output item	Description	Setting value	Output item	Description
0A	Feedback position (Note 1, 2, 3) (±10 V/1 Mpulses)		0B	Feedback position (Note 1, 2, 3) (±10 V/10 Mpulses)	
0C	Feedback position (Note 1, 2, 3) (±10 V/100 Mpulses)		0D	Bus voltage	
0E	Speed command 2 (Note 3)		10	Load-side droop pulses (Note 3, 4, 5, 6) (±10 V/100 pulses)	
11	Load-side droop pulses (Note 3, 4, 5, 6) (±10 V/1000 pulses)		12	Load-side droop pulses (Note 3, 4, 5, 6) (±10 V/10000 pulses)	
13	Load-side droop pulses (Note 3, 4, 5, 6) (±10 V/10 Mpulses)		14	Load-side droop pulses (Note 3, 4, 5, 6) (±10 V/1 Mpulses)	
15	Motor-side/load-side position deviation (Note 3, 5, 6) (±10 V/10 Mpulses)		16	Servo motor-side/load-side speed deviation	
17	Encoder inside temperature (±10 V/±128 °C)				

Note 1. Encoder pulse unit
2. Available in position control mode
3. This cannot be used in the torque control mode.
4. This can be used with MR Configurator2 with software version 1.19V or later.
5. This cannot be used in the speed control mode.
6. Output in the load-side encoder unit for the fully closed loop control. Output in the servo motor encoder unit for the semi closed loop control.

(3) Analog monitor block diagram

(a) Semi closed loop control

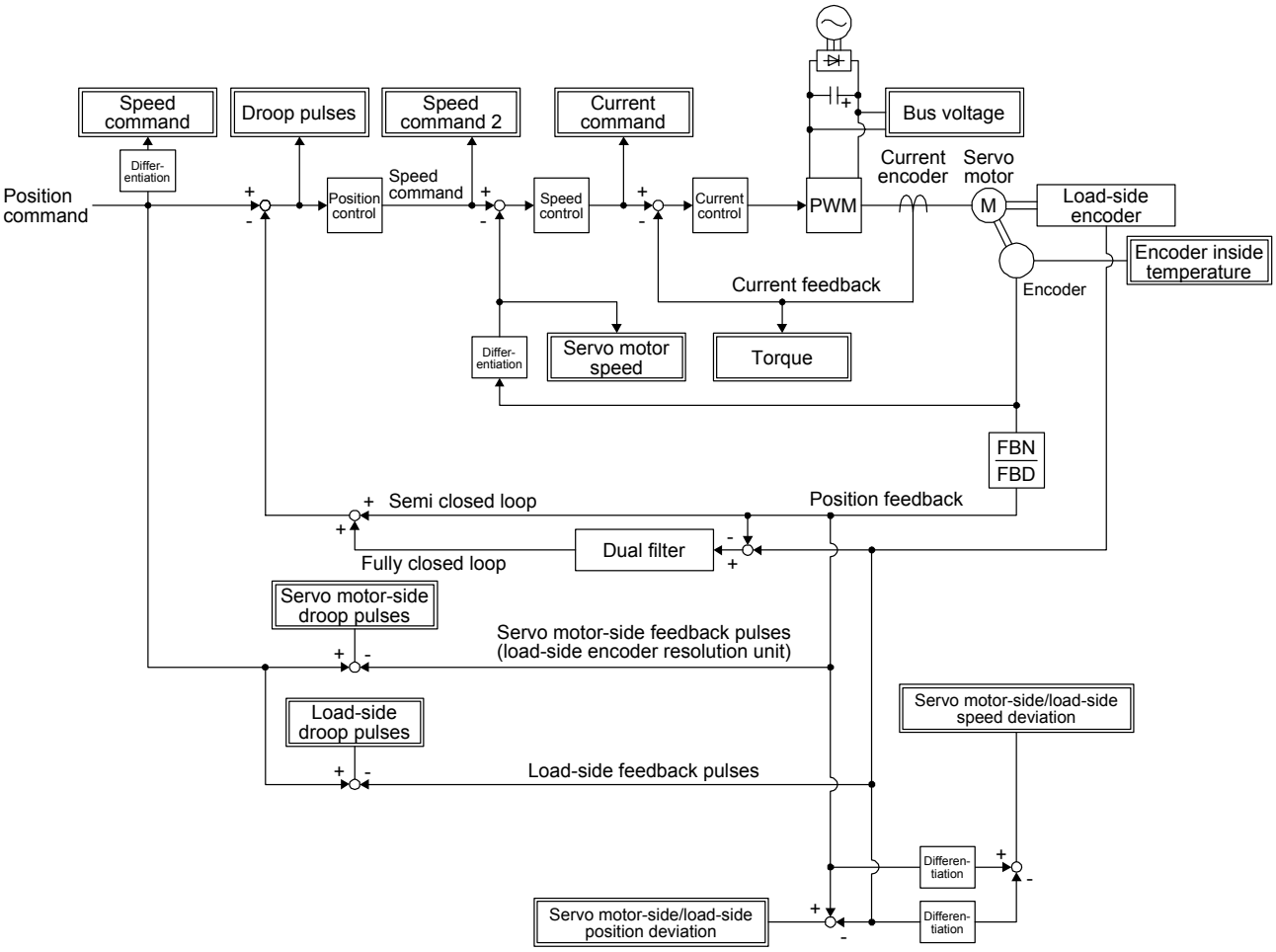


Note. The feedback position is output based on the position data passed between servo system controller and servo amplifier. [Pr. PC13] and [Pr. PC14] can set up the standard position of feedback position that is output to analog monitor in order to adjust the output range of feedback position. The setting range is between -9999 pulses and 9999 pulses.

Standard position of feedback position = [Pr. PC14] setting value × 10000 + [Pr. PC13] setting value

Parameter	Description	Setting range
PC13	Sets the lower-order four digits of the standard position of feedback position	-9999 to 9999 [pulse]
PC14	Sets the higher-order four digits of the standard position of feedback position	-9999 to 9999 [10000 pulses]

(b) Fully closed loop control



App. 3 Compliance with SEMI-F47 standard

POINT

- The control circuit power supply of the servo amplifier can be possible to comply with SEMI-F47. However, a back-up capacitor may be necessary for instantaneous power failure in the main circuit power supply depending on the power supply impedance and operating situation. Be sure to check them by testing the entire equipment using actual machines.
- Use a 3-phase for the input power supply of the servo amplifier.

The following explains the compliance with "SEMI-F47 semiconductor process equipment voltage sag immunity test" of MR-J4 series.

(1) Parameter setting
Setting [Pr. PA20] and [Pr. PF25] as follows will enable SEMI-F47.

Parameter	Setting value	Description
PA20	_ 1 _ _	SEMI-F47 selection
PF25	200	Set the time [ms] of the [AL. 10.1 Voltage drop in the control circuit power] occurrence.

Enabling SEMI-F47 will change operation as follows.

(a) The voltage will drop in the control circuit power with "Rated voltage × 50% or less". 200 ms later, [AL. 10.1 Voltage drop in the control circuit power] will occur.

(b) [AL. 10.2 Voltage drop in the main circuit power] will occur when bus voltage is as follows.

Servo amplifier	Bus voltage which triggers alarm
MR-J4-60_4(-RJ) to MR-J4-22K_4(-RJ)	380 V DC

(c) MBR (Electromagnetic brake interlock) will turn off when [AL. 10.1 Voltage drop in the control circuit power] occurs.

(2) Requirements and recommended conditions of SEMI-F47 standard
Table app. 1 shows the permissible time of instantaneous power failure for instantaneous power failure of SEMI-F47 standard.

Table App. 1 Requirements and recommended conditions of SEMI-F47 standard

Instantaneous power failure voltage	Permissible time of instantaneous power failure [s]	
	Requirement	Recommended condition
Rated voltage × 90%		10 to 100
Rated voltage × 80%	0.5 to 1	0.5 to 10
Rated voltage × 70%	0.2 to 0.5	0.2 to 0.5
Rated voltage × 50%	0.05 to 0.2	0.02 to 0.2
Rated voltage × 0%		to 0.02

REVISIONS

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

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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-J4-A4 MR-J4-B4 INSTRUCTIONMANUAL
MODEL CODE	1CW812

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : TOKYO BLDG MARUNOUCHI TOKYO 100-8310

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Specifications subject to change without notice.