

MITSUBISHI ELECTRIC
General-Purpose AC Servo
MELSERVO- J2-Super Series

MR-J2S-10□□to 700□
MR-J2S-10□1 to 40□1
Instructions and Cautions for
Safe Use of AC Servos

If this is the first time for you to use the MELSERVO-J2-Super Series, the optionally available MR-J2S-□ Servo Amplifier Instruction Manual and MELSERVO Servo Motor Instruction Manual are required. Always purchase them and use the MELSERVO-J2-Super Series safely.

Country/Region	Sales office	Tel/Fax
USA	Mitsubishi Electric Automation Inc. 500 Corporate Woods Parkway, Vernon Hills, IL 60061, USA	Tel : +1-847-478-2100 Fax : +1-847-478-0327
Germany	Mitsubishi Electric Europe B.V. German Branch Gothaer Strasse 8, D-40880 Ratingen, Germany	Tel : +49-2102-486-0 Fax : +49-2102-486-1120
Italy	Mitsubishi Electric Europe B.V. Italian Branch Viale Colleoni 7 I-20041 Agrate Brianza (Milano), Italy	Tel : +39-39-60531 Fax : +39-39-605312
China	Mitsubishi Electric Automation (China) Ltd. 4F Zhi Fu Plaza, No. 80 Xin Chang Road Shanghai 200003, China	Tel : +86-21-6120-0808 Fax : +86-21-6121-2444
Taiwan	Setsuyo Enterprise Co., Ltd. 6F, No. 105 Wu-Kung 3rd Rd, Wu-Ku Hsiang, Taipei Hsine, Taiwan	Tel : +886-2-2299-2499 Fax : +886-2-2299-2509
Korea	Mitsubishi Electric Automation Korea Co., Ltd. 3F, 1480-6, Gayang-dong, Gangseo-gu, Seoul 157-200, Korea	Tel : +82-2-3660-9552 Fax : +82-2-3664-8372
Singapore	Mitsubishi Electric Asia Pte. Ltd. 307 Alexandra Road #05-01/02, Mitsubishi Electric Building Singapore 159943	Tel : +65-6470-2460 Fax : +65-6476-7439

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BLDG MARUNOUCHI TOKYO 100-8310

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● Safety Instructions ●

Please read the instructions carefully before using the equipment.

Install, and peruse all this guide and attached documents before the drive and maintenance and the check. After that, use these correctly. Use it after it is skilled of the knowledge of the equipment, information on safety, and all of notes.
In this guide, the safety instruction levels are classified into "WARNING" and "CAUTION".



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



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

Note that the CAUTION level may lead to a serious consequence according to conditions. Please follow the instructions of both levels because they are important to personnel safety. What must not be done and what must be done are indicated by the following diagrammatic symbols.



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



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

In this guide, instructions at a lower level than the above, instructions for other functions, and so on are classified into "POINT".
After reading this guide, always keep it accessible to the operator.

1. To prevent electric shock, note the following



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

2. To prevent fire, note the following



- 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 main circuit power supply and L₁, L₂, and L₃ of the servo amplifier, and configure the wiring to be able to shut down the power supply on the side of the servo amplifier's power supply. If a magnetic contactor is not connected, continuous flow of a large current may cause a fire when the servo amplifier malfunctions.
- When a regenerative resistor is used, use an alarm signal to switch main power off. Otherwise, a regenerative transistor fault or the like may overheat the regenerative resistor, causing a fire.
- Provide adequate protection to prevent screws and other conductive matter, oil and other combustible matter from entering the servo amplifier and servo motor.
- Always connect a molded case circuit breaker to the power supply of the servo amplifier.

3. To prevent injury, note the following



- Only the voltage specified in the instruction manual should be applied to each terminal. Otherwise, a burst, damage, etc. may occur.
- Connect the terminals correctly to prevent a burst, damage, etc.
- Ensure that polarity (+, -) is correct. Otherwise, a burst, damage, etc. may occur.
- During power-on or for some time after power-off, do not touch or close a parts (cable etc.) to the servo amplifier fins, regenerative resistor, servo motor, etc. Their temperatures may be high and you may get burnt or a parts may be damaged.
- During operation, never touch the rotating parts of the servo motor. Otherwise, it may cause injury.

4. Additional instructions

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

(1) Transportation and installation

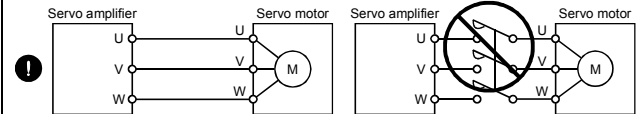


- Transport the products correctly according to their mass.
- Stacking in excess of the specified number of products is not allowed.
- Do not carry the servo motor by holding the cables, shaft, encoder or connector.
- Do not hold the front cover to transport the servo amplifier. The servo amplifier may drop.
- Install the servo amplifier in a load-bearing place in accordance with the instruction manual.
- Do not get on or put heavy load on the equipment.
- The servo amplifier and servo motor must be installed in the specified direction.
- Leave specified clearances between the servo amplifier and control enclosure walls or other equipment.
- Do not install or operate the servo amplifier and servo motor which has been damaged or has any parts missing.
- Do not block the intake and exhaust areas of the servo amplifier and servo motor with a cooling fan. Otherwise, it may cause a malfunction.
- Do not drop or strike servo amplifier or servo motor. Isolate from all impact loads.
- When storing or using the servo amplifier and servo motor, comply with the environmental conditions given in the Servo Amplifier Instruction Manual and Servo Motor Instruction Manual.
- Securely attach the servo motor to the machine. If attach insecurely, the servo motor may come off during operation.
- The servo motor with reduction gear must be installed in the specified direction to prevent oil leakage.
- Take safety measures, e.g. provide covers, to prevent accidental access to the rotating parts of the servo motor during operation.
- Never hit the servo motor or shaft, especially when coupling the servo motor to the machine. Otherwise, the encoder may malfunction.
- Do not subject the servo motor shaft to more than the permissible load. Otherwise, the shaft may break.
- When the equipment has been stored for an extended period of time, contact your local sales office.
- When treating the servo amplifier be careful about the edged parts such as the corners of the servo amplifier.
- The servo amplifier must be installed in the metal cabinet.

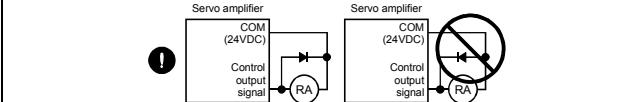
(2) Wiring



- 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 (FR-BIF option) between the servo motor and servo amplifier.
- Connect the wires to the correct phase terminals (U, V, W) of the servo amplifier and servo motor. Not doing so may cause unexpected operation.
- Connect the servo motor power terminal (U, V, W) to the servo motor power input terminal (U, V, W) directly. Do not let a magnetic contactor, etc. intervene. Otherwise, it may cause a malfunction.



- Do not connect AC power directly to the servo motor. 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 (connector), the cable or terminal block (connector) may generate heat because of the poor contact. Be sure to tighten the cable with specified torque.

(3) Test run adjustment



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

(4) Usage



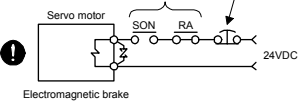
- Provide an external emergency stop circuit to ensure that operation can be stopped and power switched off immediately.
- Any person who is involved in disassembly and repair should be fully competent to do the work.
- Before resetting an alarm, make sure that the run signal of the servo amplifier is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

(5) Corrective actions



- When it is assumed that a hazardous condition may take place at the occur due to a power failure or a product fault, use a servo motor with electromagnetic brake or an external brake mechanism for the purpose of prevention.
- Configure a circuit so that the electromagnetic brake activates with the external emergency stop switch at the same time.

Contacts must be opened when the servo-on (SON) signal, the malfunction (ALM) signal, or the electromagnetic brake interlock (MBR) signal turns off. Circuit must be opened during external emergency stop switch.



- When any alarm has occurred, eliminate its cause, ensure safety, and deactivate the alarm before restarting operation.
- Design the machine in order to avoid sudden restarting in case of after an instantaneous power failure.

(6) Maintenance, inspection and parts replacement



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

(7) General instruction

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

● DISPOSAL OF WASTE ●

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

BATTERY transportation

MR-BAT and A6BAT are lithium metal batteries. MR-BAT and A6BAT are not subject to the dangerous goods (Class 9) of the UN Recommendations.
To transport lithium metal batteries and lithium metal batteries contained in equipment by means of transport subject to the UN Recommendations, take actions to comply with the following regulations: the United Nations Recommendations on the Transport of Dangerous Goods, the Technical Instruction (ICAO-TI) by the International Civil Aviation Organization (ICAO), and the International Maritime Dangerous Goods Code (IMDG Code) by the International Maritime Organization (IMO).
To transport the batteries, check the latest standards or the laws of the destination country and take actions.
For more information, contact your local sales office. (As of May 2013)

1. INTRODUCTION

1.1 Introduction to the manuals

If this is the first time for you to use the MELSERVO-J2-Super Series, the optionally available MR-J2S-□ Servo Amplifier Instruction Manual (see the list below) and MELSERVO Servo Motor Instruction Manual (SH(NA)3181) are required. Please read them all carefully to use the MELSERVO-J2-Super safely.

Servo amplifier	Manual name	Manual No.
MR-J2S-A	MR-J2S-□A Servo Amplifier Instruction Manual	SH(NA)030006
MR-J2S-B	MR-J2S-□B Servo Amplifier Instruction Manual	SH(NA)030007
MR-J2S-CP	MR-J2S-□CP Servo Amplifier Instruction Manual	SH(NA)030017
MR-J2S-CP-S084	MR-J2S-□CP-S084 Servo Amplifier Instruction Manual	SH(NA)030036
MR-J2S-CL	MR-J2S-□CL Servo Amplifier Instruction Manual	SH(NA)030034

1.2 Contents of the packing

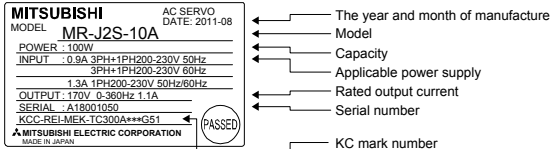
After unpacking, check the rating plate to confirm that the servo amplifier you received is as you ordered.

Contents	Quantity
Servo amplifier	1
(Note) Control circuit terminal block connector	1
MELSERVO-J2-Super Series Instructions and Cautions for Safe Use of AC Servos (This guide)	1

Note: Not provided for the servo amplifier of MR-J2S-200□ or more.

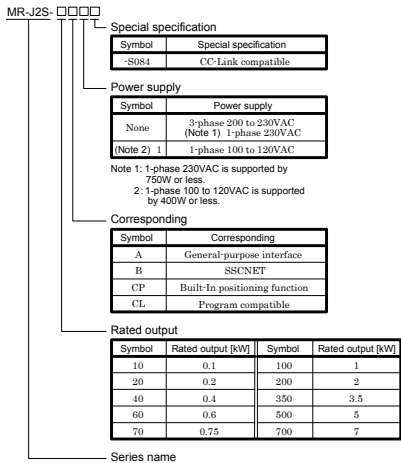
1.3 Model code definition

(1) Rating plate



(2) Model code

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



2. COMPLIANCE WITH THE CE MARKING

2.1 What is CE marking?

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

(1) EMC directive

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

(2) Low voltage directive

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

(3) Machinery directive

Servo amplifier is a main component in a machine configuration. Do not allow using the machine until the machine in which these servo amplifiers are mounted is declared to comply with the machinery directive.

2.2 For compliance

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

(1) Servo amplifiers and servo motors used

Use the servo amplifiers and servo motors which standard product.

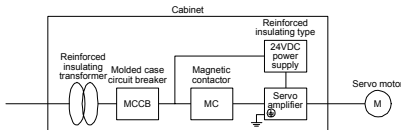
Servo amplifier : MR-J2S-10□ to MR-J2S-700□

MR-J2S-10□ to MR-J2S-40□1

Servo motor : HC-KFS□, HC-MFS□, HC-SFS□, HC-RFS□

HC-UFS□, HA-LFS□, HC-LFS□

(2) Structure



(3) Environment

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

(4) Power supply

(a) Operate the servo amplifier to meet the requirements of the overvoltage category II set forth in IEC/EN 60664-1. For this purpose, a reinforced insulating transformer conforming to the EN should be used in the power input section.

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

(5) Grounding

(a) To prevent an electric shock, the protective earth (PE) terminal (marked ⊕) of the servo amplifier must be connected to the protective earth (PE) of the cabinet.

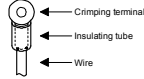
(b) Do not connect two ground cables to the same protective earth (PE) terminal. Always connect cables to the terminals one-to-one.



- (c) If a leakage current breaker is used to prevent an electric shock, the protective earth (PE) terminals of the servo amplifier must be connected to the corresponding earth terminals.

(6) Wiring

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



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

(7) Peripheral devices, options

- (a) Use the molded case circuit breaker and magnetic contactor models which are EN compliant products given in the MR-J2S-□ Servo Amplifier Instruction Manual.
- (b) The sizes of the wires given in the MR-J2S-□ Servo Amplifier Instruction Manual meet the following conditions. For use in any other conditions, follow Table 6 and Annex D IEC/EN 60204-1.
- Ambient temperature : 40°C (104°F)
 - Sheath : PVC (polyvinyl chloride)
 - Installation on wall surface or open cable tray
- (c) Use the EMC filter for noise reduction.

(8) Performing EMC tests

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

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

3. CONFORMANCE WITH UL/cUL STANDARD

This servo amplifier complies with UL 508C and CSA C22.2 No.14 standard. Refer to section 1.3 (2) for the servo amplifier model names described in the tables and figures.

(1) Servo amplifier and servo motor used

Use standard servo amplifiers and servo motors.

Servo amplifier	Servo motor				
	HC-KFS	HC-MFS	HC-SFS		HC-RFS
			1000r/min	2000r/min	3000r/min
MR-J2S-10□(□)	053・13	053・13			
MR-J2S-20□(□)	23	23			
MR-J2S-40□(□)	43	43			
MR-J2S-60□				52	53
MR-J2S-70□	73	73			
MR-J2S-100□			81	102	103
MR-J2S-200□			121・201	152・202	153・203
MR-J2S-350□			301	352	353
MR-J2S-500□				502	503・503
MR-J2S-700□				702	

Servo amplifier	Servo motor					
	HC-UFS		HA-LFS			HC-LFS
	2000r/min	3000r/min	1000r/min	1500r/min	2000r/min	
MR-J2S-10□(□)		13				
MR-J2S-20□(□)		23				
MR-J2S-40□(□)		43				
MR-J2S-60□						52
MR-J2S-70□	72	73				
MR-J2S-100□						102
MR-J2S-200□	152					152
MR-J2S-350□	202					202
MR-J2S-500□	352・502					302
MR-J2S-700□			601	701M		

(2) Installation

The MR-J2S series have been approved as the products which have been installed in the electrical enclosure.

The minimum enclosure size is based on 150% of each MR-J2S combination.

And also, design the enclosure so that the ambient temperature in the enclosure is 55°C (131°F) or less.

The servo amplifier must be installed in the metal cabinet.

(3) Short circuit rating (SCCR: Short Circuit Current Rating)

Suitable For Use On A Circuit Capable Of Delivering Not More Than 100 kA rms Symmetrical Amperes, 500 V Maximum.

(4) Flange

Mount the servo motor on a flange which has the following size or produces an equivalent or higher heat dissipation effect.

Flange size [mm(in)]	Servo motor						
	HC-KFS	HC-MFS	HC-SFS	HC-RFS	HC-UFS	HA-LFS	HC-LFS
150×150×6 (5.91×5.91×0.24)	053・13	053・13			13		
250×250×6 (9.84×9.84×0.24)	23	23			23		
250×250×12 (9.84×9.84×0.47)	43	43	81 52 to 152 53 to 153	103 to 203	43		52・102 ・152
300×300×12 (11.81×11.81×0.47)	73	73			73		202・302
300×300×20 (11.81×11.81×0.79)			121・201 ・202 352・203 ・353				
550×550×30 (21.65×21.65×1.18)				353・503	72・152		
650×650×35 (25.59×25.59×1.38)			301・502 ・702		202 to 502	601・701M 502・702	

(5) About wiring 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.

(6) Capacitor discharge time

The capacitor discharge time is as follows. To ensure safety, do not touch the charging section for 15 minutes after power-off.

Servo amplifier	Discharge time (min)	Servo amplifier	Discharge time (min)
MR-J2S-10□(□)・20□(□)	1	MR-J2S-70□ to 350□	3
MR-J2S-40□(□)・60□	2	MR-J2S-500□・700□	5

(7) Options, peripheral devices

Use the UL/cUL Standard-compliant products.

Use the molded case circuit breaker (UL489 Listed MCCB) or a Class K5 fuse indicated in the table below.

Servo amplifier	Molded case circuit breaker		Fuse		Servo amplifier	Molded case circuit breaker		Fuse		
	Current	Voltage AC[V]	Current [A]	Voltage AC[V]		Current	Voltage AC[V]	Current [A]	Voltage AC[V]	
MR-J2S-10□(□) ・20□	50A frame 5A	240	10	250	MR-J2S-200□	50A frame 20A	240	40	250	
MR-J2S-40□・ 20□	50A frame 10A		15		MR-J2S-350□	50A frame 30A		70		
MR-J2S-60□・ 70□・40□	50A frame 15A		20		MR-J2S-500□	50A frame 50A		125		
MR-J2S-100□			25		MR-J2S-700□	100A frame 75A		150		

(8) Selection example of wires

To comply with the UL/cUL Standard, use UL-approved copper wires rated at 60/75°C (140/167°F) for wiring.

Servo amplifier	(Note 1) Wires (mm ²)				
	L ⁺ ・L ⁻ ・L ⁰ ・Φ	L ¹¹ ・L ¹²	U・V・W・Φ	P・C	B1・B2
MR-J2S-10□(1) to 40□(1)・60□・70□	2(AWG14)-a	1.25(AWG16)	1.25(AWG16)-a	2(AWG14)-a	1.25(AWG16)
MR-J2S-100□			2(AWG14)-a		
MR-J2S-200□	3.5(AWG12)-b		3.5(AWG12)-b		
MR-J2S-350□	5.5(AWG10)-b		(Note 2)		
MR-J2S-500□			5.5(AWG10)-b	5.5(AWG10)-b	
MR-J2S-700□			5.5(AWG10)-b	5.5(AWG10)-b	
	8(AWG8)-c	8(AWG8)-c	3.5(AWG12)-b		

Note 1. Alphabets in the table indicate crimping tools. Refer to the following table for the crimping terminals and crimping tools.

2. 3.5mm² for use of the HC-RFS203 servo motor.

Use the wires of the following sizes with the brake unit (FR-BU) and power return converter (FR-RC).

Model	Wires [mm ²]	Model	Wires [mm ²]
FR-BU-15K	3.5(AWG12)	FR-BU-55K	14(AWG6)
FR-BU-30K	5.5(AWG10)	FR-RC-15K	14(AWG6)

Table: Recommended crimping terminals

Symbol	Servo amplifier side crimping terminals		
	Crimping terminal	Applicable tool	Manufacturer name
a	32959	47387	TE Connectivity
b	FVD5.5-4	YNT-1210S	
c	FVD8-5	Body YF-1・E-4 Head YNE-38 Dies DH-111・DH-121	

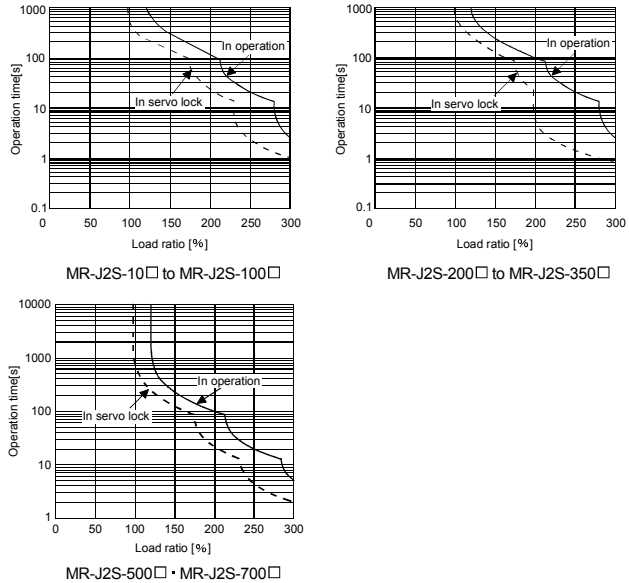
(9) Terminal tightening torque

Servo amplifier	Tightening torque [N・m]												
	L ₁	L ₂	L ₃	N	P	C	D	L ₁₁	L ₁₂	U	V	W	PE
MR-J2S-10□(□) to 40□(□)・ 60□ to 100□	1.2							1.2		1.2			
MR-J2S-200□・MR-J2S-350□ MR-J2S-500□・MR-J2S-700□	1.2							0.8		1.2			

(10) Overload Protection Characteristics

An electronic thermal relay is built in the servo amplifier to protect the servo motor, servo amplifier and servo motor power line from overloads. The operation characteristics of the electronic thermal relay are shown below. It is recommended to use an unbalanced torque-generated machine, such as a vertical motion shaft, so that unbalanced torque is not more than 70% of the rated torque.

Servo amplifier MR-J2S series have servo motor overload protection. (The motor full load current is 115% rated current.)

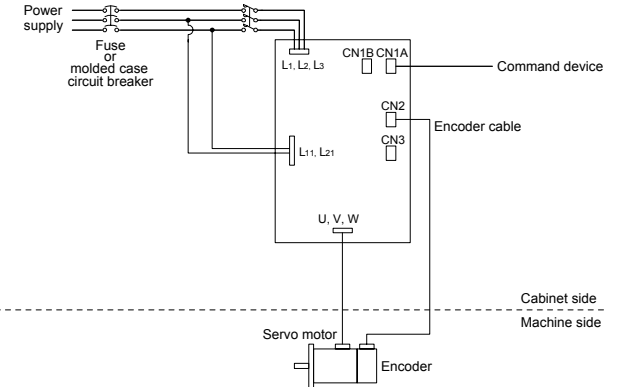


(11) Over-temperature protection for motor

Motor Over temperature sensing is not provided by the drive.

(12) Figure configuration

Representative configuration example to conform to the UL/cUL standard is shown below. The earth wiring is excluded from the figure configuration.



4. INSPECTION

WARNING

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

CAUTION

- Do not perform insulation resistance test on the servo amplifier as damage may result.
- Do not disassemble and/or repair the equipment on customer side.

(1) Inspection

It is recommended to make the following checks periodically.

- (a) Check for loose terminal block screws. Retighten any loose screws.
- (b) Check the cables and the like for scratches and cracks. Perform periodic inspection according to operating conditions.
- (c) Check that the connector is securely connected to the servo amplifier.
- (d) Check that the wires are not coming out from the connector.
- (e) Check for dust accumulation on the servo amplifier.
- (f) Check for unusual noise generated from the servo amplifier.

(2) Life

The following parts must be changed periodically as listed below. If any part is found faulty, it must be changed immediately even when it has not yet reached the end of its life, which depends on the operating method and environmental conditions.

For use in the atmosphere having much oil mist, dust, etc., clean and inspect every three months.

For parts replacement, please contact your sales representative.

Servo amplifier	Part name	Standard life
	Smoothing capacitor	10 years
	Relay	Number of power-on and number of emergency stop times ^a 100,000 times
	Cooling fan	10,000 to 30,000 hours (2 to 3 years) ^a
	Absolute position battery	Refer to the MR-J2S-□ Servo Amplifier Instruction Manual.

(a) Smoothing capacitor

Affected by ripple currents, etc. and deteriorates in characteristic. 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 (Surrounding air temperature of 40°C (104°F) or less.).

(b) Relays

Their contacts will wear due to switching currents and contact faults occur. Relays reach the end of their life when the cumulative number of power-on and emergency stop times is 100,000, which depends on the power supply capacity

(c) Servo amplifier cooling fan

The cooling fan bearings reach the end of their life in 10,000 to 30,000 hours. Normally, therefore, the fan must be changed in a few years of continuous operation as a guideline.

It must also be changed if unusual noise or vibration is found during inspection.

5. ALARMS AND WARNINGS

5.1 Alarms

Indication	Name	Indication	Name	Indication	Name
10	Under voltage	33	Over voltage	63	Home position return incomplete
12	Memory error 1	34	CRC error	64	Home position setting Error
13	Clock error	35	Command pulse frequency error	72	Option unit communication error
15	Memory error 2	36	Transfer error	76	Option unit ID error
16	Encoder error 1	37	Parameter error	8A	Serial communication time-out error
17	Board error	39	Program error	8D	CC-Link alarm
19	Memory error 3	45	Main circuit device Overheat	8E	Serial communication error
1A	Motor combination error	46	Servo motor overheat	88	Watchdog
20	Encoder error 2	50	Overload 1		
24	Main circuit error	51	Overload 2		
25	Absolute position erase	52	Error excessive		
30	Regenerative error	61	Home operation alarm		
31	Over speed				
32	Over current				

5.2 Warnings

Indication	Name	Indication	Name	Indication	Name
90	Zeroing incomplete	9E	CC-Link warning 2	E6	Servo emergency stop warning
92	Battery cable disconnection warning	9F	Battery warning	E7	Controller emergency stop warning
96	Home position setting warning	E0	Excessive regenerative warning	E9	Main circuit off warning
97	Program operation disable	E1	Overload warning	EA	ABS servon warning
98	Software limit warning	E3	Absolute position counter warning	EE	SSCNET error warning
9D	CC-Link warning 1	E4	Parameter warning		
		E5	ABS time-out warning		

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.