



MR-J4 Servo amplifier
MR-J4-10 to MR-J4-22K
MR-J4-60 4 to MR-J4-22K 4

Instructions and Cautions for Safe Use of AC Servos

Table with columns: Country/Region, Sales office, Tel/Fax, and address information for USA, Germany, China, and Korea.

ISO/IEC 13849-1 Category 3 PL e, IEC/EN 62061 SIL CL 3, IEC/EN 61800-5-2 SIL 3 (STO) (Except for MR-J4-03A6 and MR-J4W2-0303B6)
In addition, MR-J4 servo amplifiers can be used with the MR-D30 functional safety unit, MR-J3-D05 safety logic unit, or safety PLCs.

Always use the MR-J4 servo amplifiers within specifications (voltage, temperature, etc. Refer to each instruction manual 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.

2.3.1 Peripheral device and power wiring
The followings are selected based on IEC/EN 61800-5-1, UL 508C, and CSA C22.2 No.14.
(1) Power Wiring (local wiring and crimping tool)
Use only copper wires or copper bus bars for wiring. The following table shows the stranded wire sizes [AWG] and the crimp terminal symbols called as "C" or "C'".

Table 2. Recommended wires. Table 2. Recommended crimp terminals. Tables showing wire specifications and crimp terminal recommendations for various servo amplifier models.

1. To connect these models to a terminal block, be sure to use the screws that come with the terminal block.
2. Alphabetical order indicates crimping tools. Refer to table 2 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.
4. Use the crimp terminals "C" for the terminal of the servo amplifier.
5. This value is of 240V/50Hz for MR-J4-03A6 and MR-J4W2-0303B6.
6. This value is of U/V/W/E for MR-J4-03A6 and MR-J4W2-0303B6.
7. "S1" means 1-phase 200 V AC power input and "T1" means 3-phase 200 V AC power input in the table.

(2) Selection example of MCCB and fuse
Use T class fuses or molded-case circuit breaker (UL 489 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 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 each servo amplifier instruction manual.

Table showing MCCB and fuse selection examples for various servo amplifier models and power ratings.

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(3) Power supply
This servo amplifier can be supplied from star-connected supply with grounded neutral point of overvoltage category II (overvoltage category II) for MR-J4-03A6 and MR-J4W2-0303B6 set forth in IEC/EN 60664-1. However, when you use the neutral point for single phase supply, a reinforced insulating transformer is required in the power input section. For the interface power supply, use an external 24 V DC power supply with reinforced insulation on I/O terminals.

(4) Grounding
To prevent an electric shock, always connect the protective earth (PE) terminal (marked with a lightning bolt symbol) 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 at a time.

2.3.2 EMC 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).

(1) 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 the metal cabinet. Additionally, mount the servo amplifier in the cabinet with the protective earth based on the standard of IEC/EN 60204-1 is correctly connected. For environment, the units should be used in open type (UL 50) and overvoltage category shown in table in section 8.1. The servo amplifier needs to be installed at or below of pollution degree 2.

(2) Short-circuit protection (SCCR)
Suitable For Use On A Circuit Capable Of Delivering Not More Than 100 kA rms Symmetrical Amperes, 500 Volts Maximum (Not More Than 5 kA rms Symmetrical Amperes, 48 Volts Maximum for MR-J4-03A6 and MR-J4W2-0303B6).

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

(4) Over-temperature protection for motor
Motor Over temperature sensing is not provided by the drive. Integral thermal protection(s) is necessary for motor and refer to chapter 4 for the proper connection.

(5) 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 Canadian Electrical Code and any applicable provincial codes.

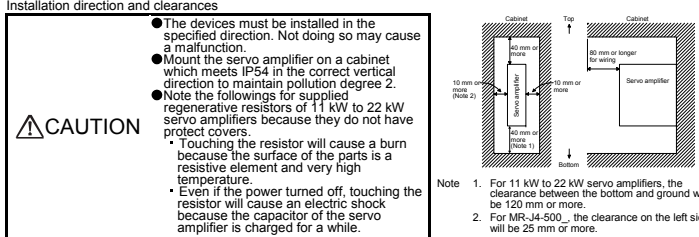
2.3.3 USA/Canada compliance
This servo amplifier is designed in compliance with UL 508C and CSA C22.2 No.14.
(1) Installation
The minimum cabinet size is 150% of each MR-J4 servo amplifier's volume. Also, design the cabinet so that the ambient temperature in the cabinet is 55 °C or less. The servo amplifier must be installed in the metal cabinet. Additionally, mount the servo amplifier in the cabinet with the protective earth based on the standard of IEC/EN 60204-1 is correctly connected. For environment, the units should be used in open type (UL 50) and overvoltage category shown in table in section 8.1. The servo amplifier needs to be installed at or below of pollution degree 2.

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 observation 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.

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)
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).

3. Mounting/dismounting
Installation direction and clearances
The devices must be installed in the specified direction. Not doing so may cause a malfunction.

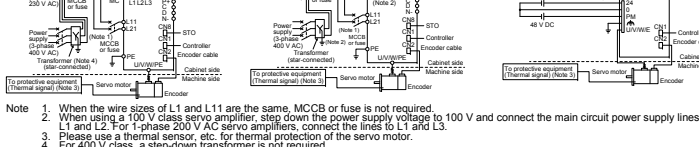


To adapt your machine using MR-J4-03A6 or MR-J4W2-0303B6 to IEC/EN 60950-1, either supply the amplifier with a power supply complying with the requirement of 2.5 stated in IEC/EN 60950-1 (Limited Power Source), or cover the amplifier and motors connected to the outputs with a fire enclosure.

4. Electrical Installation and configuration diagram
The installation complies with IEC/EN 60204-1. The voltage supply to machines must be 20 ms or more of immunity to instantaneous power failures as specified in IEC/EN 60204-1.

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

The following shows representative configuration examples to conform to the IEC/EN/UL/CSA standards.
(1) 3-phase input for MR-J4 1-axis (2) 1-phase input for MR-J4 1-axis (3) Main circuit 48 V DC input for MR-J4 1-axis servo amplifier



The 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/HCH/A series servo motors (Mfg.: Mitsubishi Electric)
(2) Using a servo motor complied with IEC 60034-1 and Mitsubishi Electric encoder (OBA, OSA)

5. Signals
The following shows MR-J4-10B signals as a typical example. For other servo amplifiers, refer to each servo amplifier instruction manual.

Table showing I/O signals for the servo amplifier, including STO, STOCOM, STOT, STOZ, TOFCOM, TOFB1, and TOFB2.

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.

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. (Except for MR-J4-03A6 and MR-J4W2-0303B6)

Table showing inspection items for the servo amplifier, including tightening torque, number of power-on cycles, and battery life.

6.2 Parts having service lives
Service lives of the following parts are listed below. However, the service lives vary depending on operation 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.

Table showing service lives for various parts: Smoothing capacitor, Relay, Cooling fan, and Battery life.

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.

Table showing environmental requirements for the servo amplifier, including ambient temperature, humidity, vibration, and IP rating.

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE: TOKYO BLDG MARUNOUCHI TOKYO 100-8310

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Contents of the package
Unpack the product and check the rating plate to see if the servo motor is as you ordered.

Table showing contents of the package: Servo amplifier, MELSERVO-J4 Series instructions and cautions for safe use of AC servos, and a rating plate.

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

Table showing an example of a rating plate with technical specifications for a servo amplifier.

Warning plate
The following shows an example of warning plate. The following describes what each block of a model name indicates. Not all combinations of the symbols are available.

1. About the manuals
1.1 MELSERVO MR-J4 relevant manuals
This installation guide explains how to mount MR-J4 servo amplifiers. You can also check it with our website for free.
http://www.mitsubishielectric.com/fa/
If you have any questions about the operation or programming of the equipment described in this guide, contact your local sales office.
In addition, when you mount a protective device, specific technical skills which are not detailed in the guide will be required.

2. About safety
This chapter explains safety of users and machine operators. Please read the chapter carefully before mounting the equipment. In this installation guide, the specific warnings and cautions levels are classified as follows.

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.

2.1 Professional engineer
Only professional engineers should mount MR-J4 servo amplifiers. Here, professional engineers should meet the all conditions below.
(1) Persons who took a proper engineering training or qualified persons who are engaged in electrical equipment
Check if applicable technical training is available at your local Mitsubishi Electric office. Contact your local sales office for schedules and locations.
(2) Persons who can access operating manuals for the protective devices (e.g. light curtain) connected to the safety control system. Persons who have read and familiarized himself/herself with the manuals.

2.2 Applications of the devices
MR-J4 servo amplifiers comply with the following standards.
• IEC/EN 61800-5-1, IEC/EN 61800-3, IEC/EN 60204-1

Table showing environmental requirements: Altitude (Max. 2000 m above sea level), Transportation (Max. 10000 m above sea level).

8. Technical data
8.1 MR-J4 servo amplifier

Table showing technical data for MR-J4 servo amplifiers, including power supply, control circuit, interface, and protection class.

Note: For the use in US/Canada, constitute a branch circuit including the power supply which endures SCCR of 5 kA minimum in the industrial cabinet.

8.2 Servo amplifier dimensions
Table showing servo amplifier dimensions (W, H, D, Mass) for various models.

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8.3 Mounting hole
Table showing mounting hole dimensions (a, a1, b, c, d, d1, e, e1, f) for various servo amplifier models.

Table showing mounting hole dimensions (a, a1, b, c, d, d1, e, e1, f) for various servo amplifier models.

9. Check list for user documentation
Mitsubishi Electric logo and title: 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 following 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 (protective 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.

[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 with 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.

[Limitations]
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 repaired (or 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 warranty work.

(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 the required applicable laws and has an action 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 causes, 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 loss 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 will not result in a serious damage even if any failure or malfunction occurs in General-Purpose AC Servo. Please ask your local FA Center for details.
(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, medical treatment, railway signal control and fuel systems, and also such require a special safety 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 treatment, railway signal control and fuel systems, and also such require a special safety system, including 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.