



MR-J4 Servo amplifier
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 Mitsubishi Electric Automation, Inc. contact information for various countries including USA, Brazil, Germany, UK, Italy, Spain, France, Czech Republic, Poland, Russia, South Africa, China, Taiwan, Korea, Singapore, Thailand, Indonesia, India, and Australia.

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BLDG MARUNOUCHI TOKYO 100-8310

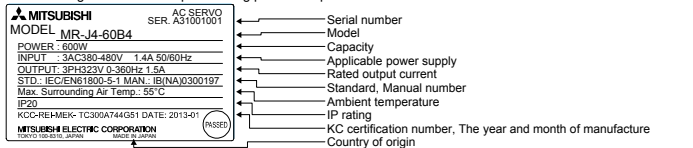
IB(NA)0300197-H(1311)MEE Printed in Japan This guide uses recycled paper. Specifications are subject to change without notice.

Copyright©2012 Mitsubishi Electric Corporation All Right Reserved.

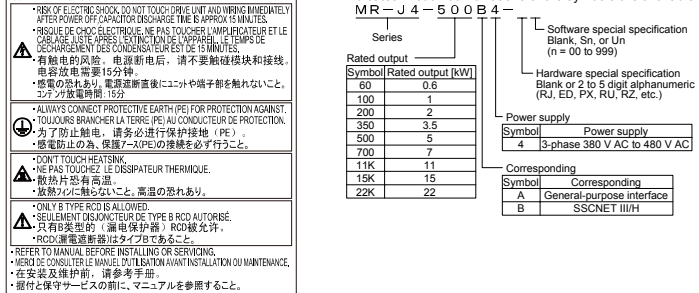
Contents of the package
Unpack the product and check the rating plate to see if the servo motor is as you ordered.

Table with columns: Servo amplifier, Quantity. Shows MELSERVO-J4 Series Instructions and Cautions for Safe Use of AC Servos (This guide) with quantity 1.

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



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.

1.2 Purpose of this guide

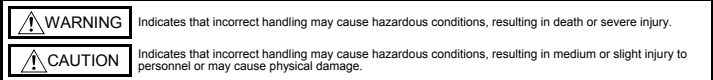
This installation guide explains the safe operation of MR-J4 servo amplifiers for engineers of machinery manufacturers and machine operators.

1.3 Terms related to safety

1.3.1 IEC 61800-5-2 Stop function
STO function (Refer to IEC 61800-5-2:2007 4.2.2.2 STO). The 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.

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.



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 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.

2.3 Correct use

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: 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 for wiring. The following table shows the wire sizes [AWG] and the crimp terminal symbols rated at 75 °C/60 °C.

Table showing wire sizes [AWG] and crimp terminal symbols for Servo amplifier. Columns include L1/L2/L3, L1/L1L2, P+V, and U/V/W/PE (Note 3).

Note: 1. To connect these models to a terminal block, be sure to use the screws that come with the terminal block. 2. Alphabetical 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

Table: Recommended crimp terminals. Columns: Symbol, Crimp terminal (Note), Servo amplifier-side crimp terminals (Body, Head, Dice), and Manufacturer (JST).

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

(2) 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 voltage 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 each servo amplifier instruction manual.

Table: Selection example of MCCB and fuse. Columns: Servo amplifier, Molded-case circuit breaker (480 V AC), Fuse (600 V).

(3) Power supply

This servo amplifier can be used on the condition 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.

(4) Grounding
To prevent an electric shock, always connect the protective earth (PE) terminal (marked with a ground 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) terminals. Always connect the terminals one-to-one. Always use a shielded cable to connect the terminals. If using a leakage circuit breaker, always ground the protective earth (PE) terminal of the servo amplifier to prevent an electric shock. Only an RCD (earth-leakage current breaker) type B can be used for the power supply side of the product.

2.3.2 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).

- (1) EMC requirement
MR-J4 servo amplifiers comply with category C3 in accordance with 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.
(2) 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.

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. For environment, the units should be used in open type (UL 50) and overvoltage category III or lower. The servo amplifier needs to be installed at or below of pollution degree 2. For connection, use copper wires.
(2) 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.
(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
Motor Over temperature sensing is not provided by the drive.
(5) Capacitor discharge
It takes 15 minutes for capacitor discharging. Do not touch the unit and terminals immediately after power off.
(6) 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.

2.3.4 South Korea compliance
This product complies with the Radio Wave Law (KC mark). However, some applications are being processed. For the situation of compliance, contact your local sales office. Please note the following to use the product.
이 기기는 업무용 (A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바랍니다. 가정외의 지역에서 사용하는 것을 목적으로 합니다.
(The product is for business use (Class A) and meets the electromagnetic compatibility requirements. The seller and user must note the above point, and use the product in a place except for home. In addition, use an EMC filter, surge protector, ferrite core, and line noise filter on the primary side for inputs. Use a ferrite core and line noise filter for outputs. Use a distance greater than 30 m between the product and third party sensitive radio communications for an MR-J4-22K_4.)

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.

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)

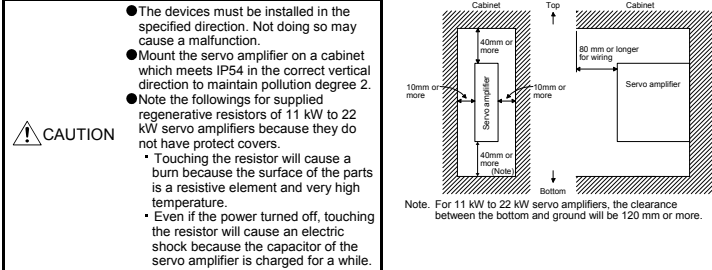
- (5) Separate the wiring for safety function from other signal wirings. (ISO 13849-1 Table F.1 No.1)
(6) Protect the cables with appropriate ways (routing them in a cabinet, using a cable guard, etc.).
(7) Keep the required clearance/creepage distance depending on voltage you use.

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). The battery options (MR-BAT6V1SET and MR-BAT6V1) are assembled batteries from two batteries (lithium metal battery CR17335A) which are not subject to the dangerous goods (Class 9) of the UN Recommendations.

3. Mounting/dismounting

Installation direction and clearances

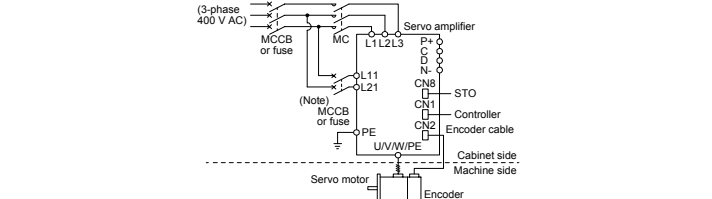


4. Electrical installation and configuration diagram

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 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.



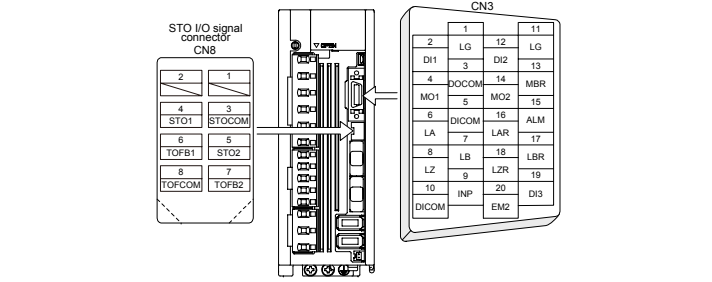
Note: When the wire sizes of L1 and L11 are the same, MCCB or fuse is not required.
The control circuit connectors described by rectangles are safely separated from the main circuits described by circles. The connected motors will be limited as follows.

- (1) HG/HF/HCA series servo motors (Mfg.: Mitsubishi Electric)
(2) Using a servo motor complied with IEC60034-1 and Mitsubishi Electric encoder (OBA, OSA)

5. Signals

5.1 Signal

The following shows MR-J4-60B4 signals as a typical example. For other servo amplifiers, refer to each servo amplifier instruction manual.



5.2 I/O device

Table: I/O device connections. Columns: Device, Connector, Pin No. Includes entries for Em2, STO COM, STO1, STO2, TOFCOM, TOF81, TOF82.

Table: Output device connections. Columns: Symbol, Device, Connector, Pin No. Includes entries for TOFCOM, TOF81, TOF82.

Table: Power supply connections. Columns: Symbol, Device, Connector, Pin No. Includes entries for DICOM, DOCOM, SD.

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.

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.

Table: Servo amplifier inspection items. Columns: Servo amplifier, Tightening torque (N·m), L1, L2, L3, N-, P3, P4, P+, C, L11, L21, U, V, W, PE. Includes entries for MR-J4-60, MR-J4-500, MR-J4-700, MR-J4-11K, MR-J4-22K_4.

- (2) 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.

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: Parts having service lives. Columns: Part name, Life guideline. Includes entries for Smoothing capacitor, Relay, Cooling fan, (Note 1) Rotary servo motor battery backup time, (Note 2) Battery life.

- 1. The data-holding time by the battery using MR-BAT6V1SET. 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. For other batteries, refer to each servo amplifier instruction manual.
2. The 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 (20 °C surrounding air temperature or less).
4. The power-on time ratio 25% is equivalent to 8 hours power on for a weekday and off for a weekend.

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 the option battery's transportation and handling refer to the instruction manual.

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

Table: Environmental requirements for the servo amplifier. Columns: Item, Operation, Storage, and Environment. Includes entries for Ambient temperature, Ambient humidity, Vibration load, Pollution degree, IP rating, and Altitude.

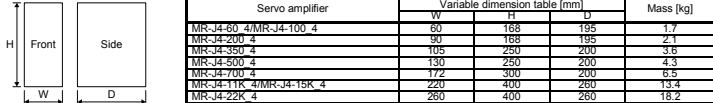
Note: In regular transport packaging

8. Technical data

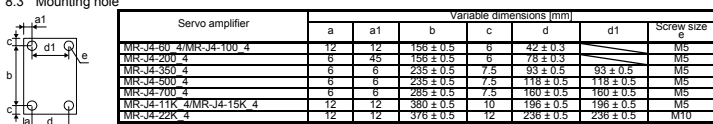
8.1 MR-J4 servo amplifier

Table: Technical data for MR-J4 servo amplifier. Columns: Item, Value. Includes entries for Power supply, Control method, Control method, Safety function (STO), Average probability of dangerous failures per hour, Mission time, Response performance, Pollution degree, Overvoltage category, Protection class, and Short-circuit current rating (ISCCR).

8.2 Servo amplifier dimensions



8.3 Mounting hole



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.

[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 for the Product and the caution label 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 caused 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. General-Purpose AC Servo, and a back-up 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 governments 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.