MITSUBISHI ELECTRIC

General-Purpose AC Servo

MITSUBISHI SERVO AMPLIFIERS & MOTORS

MELSERVO-JE

MR-JE Servo amplifier
Model
MR-JE-10_ to MR-JE-300_

Instructions and Cautions for Safe Use of AC Servos

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Specifications are subject to change without notice.
Compliance with the indicated global standards and regulations is current as of the release date of this installation guide.
The original instructions for Europe are in English.

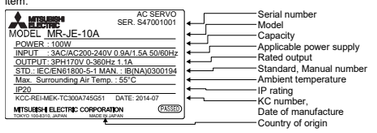
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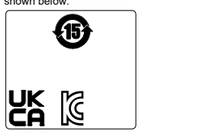
Contents of the package
Unpack the product and check the rating plate to see if the servo amplifier is as you ordered.

Contents	Quantity
Servo amplifier	1
MR-JE Servo amplifier Instructions and Cautions for Safe Use of AC Servos (This guide)	1

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



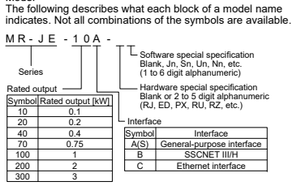
Standard marking
An example of standard marking is shown below.



Warning plate
The following shows an example of warning plate.



Model
The following describes what each block of a model name indicates. Not all combinations of the symbols are available.



1. About the manuals

To use the MELSERVO-JE series safely, read each instruction manual carefully.

1.1 MELSERVO-JE relevant manuals

This installation guide explains how to mount MR-JE servo amplifiers.
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.

1.2 Purpose of this guide

This installation guide explains the safe operation of MR-JE servo amplifiers for engineers of machinery manufacturers and machine operators. For detailed information of the products, refer to each servo amplifier instruction manual.

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-JE servo amplifiers.
Here, professional engineers should meet all the conditions below.

(1) Persons who took a proper training of related work of electrical equipment or persons who can avoid risk based on past experience.

(2) Persons who have read and familiarized himself/herself with this installation guide and operating manuals for the protective devices (e.g. light curtain) connected to the safety control system.

2.2 Applications of the devices

MR-JE servo amplifiers are used to drive servo motors, and comply with the standards shown below.
IEC/EN 61800-5-1/GB 12668.501, IEC/EN 61800-3/GB 12668.3/KN 61800-3 (KS C 9800-3)

2.3 Correct use

Use the MR-JE servo amplifiers within specifications. Refer to each instruction manual for specifications such as voltage, temperature, etc. 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
- If you need to get close to the moving parts of the machine for inspection or others, ensure safety by confirming the power off, etc. Otherwise, it may cause an accident.
- It takes 15 minutes maximum 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. 274.

(1) Local wiring
The following table shows the stranded wire sizes [AWG] symbols rated at 75 °C/60 °C.

Table. Recommended wires

Servo amplifier (Note 3)	75 °C/60 °C stranded wire [AWG]		
	L1/L2/L3/⏚ (Note 2)	P+/C	U/V/W/⏚ (Note 1,2)
MR-JE-10_/MR-JE-20_/MR-JE-40_/MR-JE-70_/MR-JE-100_ (T)/ MR-JE-200_/MR-JE-300_	14/14	14/14	14/14
MR-JE-200_ (S)	12/12		

Note 1. Optional cables provided by Mitsubishi Electric and Mitsubishi Electric System Service Co., Ltd. are available. 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.
2. The following shows the PE terminal specifications of the servo amplifier.
Screw size: M4
Tightening torque: 1.2 [N•m]
Recommended crimp terminals: R2-4 (Manufactured by JST)
Crimping tool: YPT-60-21 (Manufactured by JST)
3. "(S)" means 1-phase 200 V AC power input and "(T)" means 3-phase 200 V AC power input in the table.

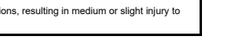
(2) Selection example of MCCB and fuse
Use T class fuses or molded-case circuit breaker (UL 489 Listed MCCB) as the following table. The T class fuses and molded-case circuit breakers in the table are selection examples based on rated I/O of the servo amplifiers and are suitable for output servo motor conductor protection. The maximum rating of the servo motor branch short-circuit/ground-fault protective device can be selected based on the rated input current of the servo amplifier. 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 and selecting a Type E Combination motor controller, refer to each servo amplifier instruction manual.

Servo amplifier (Note)	Molded-case circuit breaker (240 V AC)	Fuse (300 V)
MR-JE-10_/MR-JE-20_/MR-JE-40_/MR-JE-70_ (T)	NF50-SVFU-5A (50 A frame 5 A)	10 A
MR-JE-70_ (S)/MR-JE-100_ (T)	NF50-SVFU-10A (50 A frame 10 A)	15 A
MR-JE-200_ (T)/MR-JE-300_	NF50-SVFU-15A (50 A frame 15 A)	30 A
MR-JE-100_ (S)	NF50-SVFU-15A (50 A frame 15 A)	30 A
MR-JE-200_ (S)	NF50-SVFU-20A (50 A frame 20 A)	40 A

Note. "(S)" means 1-phase 200 V AC power input and "(T)" means 3-phase 200 V AC power input in the table.

(3) Power supply
This servo amplifier can be supplied from star-connected supply with grounded neutral point of overvoltage category III (overvoltage category II for 1-phase servo amplifiers) 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 ⏚) 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.
This product can cause a DC current in the protective earthing conductor. To protect direct/indirect contact using an earth-leakage current breaker (RCD), only an RCD of type B can be used for the power supply side of the product.



(5) Motor overload and Over temperature protection
The overload protection of the servo motor does not include a thermal memory function, and is not speed sensitive. The servo amplifier cannot detect overheating of the servo motor. The servo motors are protected by the servo motor overheat protection function of the servo amplifiers (a protection characteristic based on 120 % of the rated current). To provide the servo motor with overheat protection, use a magnetic contactor (electromagnetic switch) with a thermal relay. Alternatively, install a thermal sensor or equivalent equipment near the rating plate of the servo motor to check that the servo motor temperature is under 105 °C with sensing device. (Refer to Chapter 4)

2.3.2 Europe/UK compliance

The CE/UKCA marking proves the compliance of the servo product with the essential requirements specified in the relevant EU Directives and UK Regulations, and this marking also applies to machines and equipment incorporating servos.

(1) EMC requirement
MR-JE servo amplifiers comply with EN/BS EN IEC 61800-3. Install an EMC filter and surge protector on the primary side of the servo amplifier. As for I/O signal wires (max. length 10 m) and encoder cables (max. length 50 m), use shielded wires and ground the shields. However, when the encoder cable length is longer than 30 m for MR-JE-70_ and MR-JE-100_, set a radio noise filter (FR-BIF) to the input power supply side of the servo amplifier.
The following shows recommended products.
EMC filter: Soshin Electric HF3000A-UN series
Surge protector: Okaya Electric Industries RSPD series
Radio noise filter: Mitsubishi Electric FR-BIF
MR-JE Series are not intended to be used on a low-voltage network which supplies domestic premises; electromagnetic interference is expected if used on such a network. The installer shall provide a guide for installation and use, including recommended mitigation devices. To avoid the risk of crosstalk to signal cables, the installation instructions shall either recommend that the power interface cable be segregated from signal cables. Install the DC power supply for I/O signals of the servo amplifiers in the same cabinet. Do not connect the other electric devices to the DC power supply.

(2) For Declaration of Conformity (DoC)
We declare that the servo amplifiers are in compliance with EC directives (EMC directive (2014/30/EU), Low voltage directive (2014/35/EU), and RoHS directive (2011/65/EU, (EU) 2015/863)) and applicable regulations of the UK. 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. 274.

(1) Installation
The minimum cabinet size is 150% of MR-JE 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 on a cabinet that 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 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. For SCCR when using a Type E Combination motor controller, refer to each servo amplifier instruction manual.

(3) 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.

2.3.4 South Korea compliance

Products that bear the KC mark comply with the Radio Wave Law. Please note the following to use the product.
이 기기는 업무용 (A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 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.)

2.4 General cautions for safety protection and protective measures

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

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

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

2.5 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)

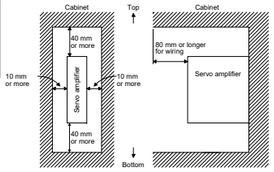
2.6 Lithium battery transportation

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 batteries (MR-BAT6V1SET-A 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

⚠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.



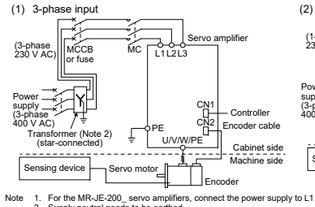
4. Electrical Installation and configuration diagram

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

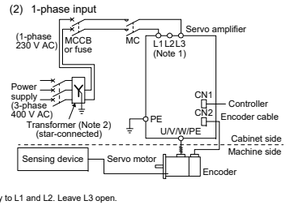
⚠CAUTION
- Connecting a servo motor for different axis to U, V, W, or CN2 of the servo amplifier may cause a malfunction.
- Securely connect the cables in the specified method and tighten them with the specified torque. Otherwise, the servo motor may operate unexpectedly.

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

(1) 3-phase input



(2) 1-phase input



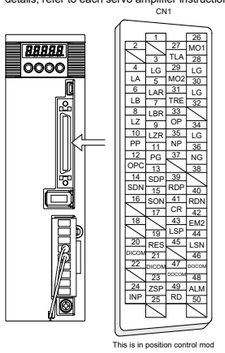
Note 1. For the MR-JE-200_ servo amplifiers, connect the power supply to L1 and L2. Leave L3 open.
2. Supply neutral needs to be earthed.

The connectors described by rectangles are safely separated from the main circuits described by circles.
Use MR-JE servo amplifiers in combination with HG series or HJ series servo motors.

5. Signals

5.1 Signal

The following shows CN1 connector signals of MR-JE-10A as a typical example. For the other connector details, refer to each servo amplifier instruction manual.



5.2 I/O device

The following shows typical I/O devices of MR-JE-_A. For the other devices, refer to each servo amplifier instruction manual.

Input device

Symbol	Device	Connector	Pin No.
SON	Servo-on	CN1	15
RES	Reset		19
CR	Clear		41
EM2	Forced stop 2		42
LSP	Forward rotation stroke end		43
LSN	Reverse rotation stroke end		44

Output device

Symbol	Device	Connector	Pin No.
ZSP	Zero speed detection	CN1	23
INP	In-position		24
ALM	Malfunction		48
RD	Ready		49

Power supply

Symbol	Device	Connector	Pin No.
DICOM	Digital I/F power supply input	CN1	20, 21
DOCOM	Digital I/F common		46, 47
SD	Shield		Plate

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 screws on the protective earth (PE) terminal. Retighten any loose screws. (tightening torque: 1.2 N•m)

(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.

(9) Make sure that the emergency stop circuit operates properly such that an operation can be stopped immediately and a power is shut off by the emergency stop switch.

6.2 Parts having service life

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

Part name	Life guideline
Smoothing capacitor	10 years (Note 3)
Relay	Number of power-on, forced stop, and controller forced stop times: 100,000 times
Cooling fan	50,000 hours to 70,000 hours (7 years to 8 years)
Battery backup time (Note 1)	Approximately 20,000 hours (equipment power supply: off, ambient temperature: 20 °C)
Battery life (Note 2)	5 years from date of manufacture

Note 1. The time is for using MR-BAT6V1SET-A. For details and other battery backup time, refer to each servo amplifier instruction manual.
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. If a 3-phase power supply is used, the service life of the capacitor is 10 years under continuous operation in air-conditioned environments (ambient temperatures of 40 °C or less at altitudes of up to 1000 m and 30 °C or less at altitudes of over 1000 m and up to 2000 m). The characteristic of smoothing capacitor is deteriorated due to ripple currents, etc. The service life of the capacitor greatly varies depending on ambient temperatures and operating conditions.

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.
- For detailed information on the battery's transportation and handing refer to each servo amplifier instruction manual.
- Install the product in a load-bearing place of servo amplifier and servo motor in accordance with instruction manual.
- Do not put excessive load on the machine.
- Do not hold the lead of the built-in regenerative resistor, cables, or connectors when carrying the servo amplifier. Otherwise, it may drop.

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 2K12 (IEC/EN 60721-3-2)
	Storage (Note)	[°C]	-20 to 65 Class 1K4 (IEC/EN 60721-3-1)
Ambient humidity	Operation, transportation, storage		5 %RH to 90 %RH
Vibration resistance	Test condition		10 Hz to 57 Hz with constant amplitude of 0.075 mm 57 Hz to 150 Hz with constant acceleration of 9.8 m/s² to IEC/EN 61800-5-1 (Test Fc of IEC 60068-2-6)
	Operation		5.9 m/s²
	Transportation (Note)		Class 2M3 (IEC/EN 60721-3-2)
	Storage		Class 1M2 (IEC/EN 60721-3-2)
Pollution degree			2
IP rating			IP20 (IEC/EN 60529)
			Open type (UL 50)
Altitude	Operation, storage		Max. 2000 m above sea level (MR-JE-_AS: Max. 1000 m above sea level)
	Transportation		Max. 10000 m above sea level

Note. In regular transport packaging

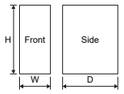
8.Technical data

8.1 MR-JE servo amplifier

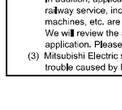
Item		MR-JE-10_/MR-JE-20_/MR-JE-40_/MR-JE-70_(T)/MR-JE-100_/MR-JE-200_	MR-JE-300_
Power supply	Line voltage	3-phase or 1-phase 200 V AC to 240 V AC, 50 Hz /60 Hz	3-phase 200 V AC to 240 V AC, 50 Hz/60 Hz
	Interface (SELV)	24 V DC, (required current capacity: MR-JE-_A(S), 300 mA; MR-JE-_B, 300 mA; MR-JE-_C, 300 mA) (Note)	
Control method		Sine-wave PWM control, current control method	
Pollution degree		2 (IEC/EN 60664-1)	
Overvoltage category		1-phase 200 V AC: II (IEC/EN 60664-1), 3-phase 200 V AC: III (IEC/EN 60664-1)	
Protective class		I (IEC/EN 61800-5-1)	
Short-circuit current rating (SCCR)		100 kA	

Note. This will be 100 mA for the MR-JE-_B servo amplifiers manufactured in April 2016 or before (May 2016 or before for amplifiers manufactured in China).

8.2 Dimensions/mounting hole process drawing



Servo amplifier	Variable dimensions [mm]				Mass [kg]
	W	H	D		
MR-JE-10_/MR-JE-20_/MR-JE-40_	50	168	135		0.8
MR-JE-70_/MR-JE-100_	70	168	185		1.5
MR-JE-200_/MR-JE-300_	90	168	195		2.1



Servo amplifier	Variable dimensions [mm]					Screw size
	a	a1	b	c	d	e
MR-JE-10_/MR-JE-20_/MR-JE-40_	6	6	156 ± 0.5	6		M5
MR-JE-70_/MR-JE-100_	22	22	156 ± 0.5	6	42 ± 0.3	M5
MR-JE-200_/MR-JE-300_	6	45	156 ± 0.5	6	78 ± 0.3	M5

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]
For terms of warranty, please contact your original place of purchase.
[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;
1. a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
2. a failure caused by any alteration, etc. to the Product made on your side without our approval
3. 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
4. a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
5. any replacement of consumable parts (battery, fan, smoothing capacitor, etc.)
6. 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
7. 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
8. 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 loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:
(1) Damages caused by any cause found not to be the responsibility of Mitsubishi.
(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.
(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.
(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

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 AC Servo, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in AC Servo, and a backup or fail-safe function should operate on an external system to AC Servo when any failure or malfunction occurs.
(2) Our 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.
(3) Mitsubishi Electric shall have no responsibility or liability for any problems involving programmable controller trouble and system trouble caused by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.