MITSUBISHI ELECTRIC

AC Servo System

MITSUBISHI ELECTRIC SERVO SYSTEM

MELSERVO

PWB open type multi-axis Servo drive

Model

MR-MD333G_

Safety Instructions and Precautions for AC Servos

D

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Germany	Mitsubishi Electric Europe B.V. German Branch Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany	Tel : +49-2102-486-0
China	Mitsubishi Electric Automation (China) Ltd. Mitsubishi Electric Automation Center, No.1386 Hongqiao Road, Shanghai, China	Tel : +86-21-2322-3030
Korea	Mitsubishi Electric Automation Korea Co., Ltd. 7F to 9F, Gangseo Hangang Xi-tower A, 401, Yangcheon-ro, Gangseo-Gu, Seoul, Korea	Tel : +82-2-6103-9474
Japan	Mitsubishi Electric Corporation Tokyo Building, 2-7-3, Marunouchi, Chiyoda-ku, Tokyo 100-8310, Japan	Tel : +81-3-3218-2111

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HEAD OFFICE: TOKYO BLDG., 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

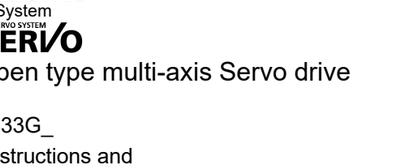
IB(NA)0300570-D(2606)MEE

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.

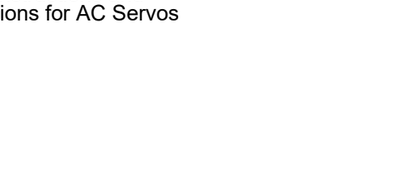
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Rating plate

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



Model code



1. About the manuals

To use the MR-MD series safely, read specifications carefully.

1.1 MR-MD relevant manuals

This installation guide explains how to mount MR-MD.
If you have any questions about the operation and 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-MD for engineers of machinery manufacturers and machine operators. This installation guide does not explain how to operate machines in which safe servo system is, or will be integrated. For detailed information of the products, refer to specifications.

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, cautionary items such as precautions that may lead to property damages, and instructions for other functions are classified as "POINT".

2.1 Professional engineer

Only professional engineers should mount MR-MD.
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.

2.2 Correct use

Use the MELSERVO MR-MD within specifications. Refer to the chapter "Technical data" of this manual.
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.

2.2.1 Selection of peripheral device and wiring

(1) Power supply
The main circuit power supply, control circuit power supply, and interface power supply must be the reinforced insulating type.

(2) Grounding
The MR-MD has a frame ground (FG). Connect all of FG to the protective earth (PE) of the cabinet.

2.2.2 Europe/UK compliance

CE/UKCA markings indicate that the servo drives are in compliance with the essential requirements of the EU directives, the UK regulations, etc. Machines and equipment that contain servo drives are also subject to the marks.

(1) EMC requirement
MR-MD comply with EN/BS EN IEC 61800-3. As for I/O wires (max. length 10 m) and encoder/motor cables (max. length 30 m), use shielded wires and ground the shields. Install the surge protector on the primary side of AC/DC power supply. The recommended products are as follows:
Surge protector: Okaya Electric Industries RAV-781BYZ-2, RAV-781BXZ-4
MR-MD 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. 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.

(2) WEEE directive compliance
The AC servos comply with Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU. This mark (shown on the right) indicates that the product bearing the mark should be disposed of separately from household waste in any country. For the United Kingdom, regulations equivalent to this directive are applicable.

(3) For Declaration of Conformity (DoC)
We declare that MR-MD is in compliance with EMC directive (2014/30/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.

2.2.3 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.)

2.2.4 China compliance

(1) China RoHS
The following is stated in Chinese according to the national standard for the restriction of the use of hazardous substances in electrical and electronic products.

含有有害十物质的名称，含有量，含有部品

关于本公司产品的十种有害物质的含有状况和环境保护使用期限标识的内容，如下表所示。

产品中有害物质的名称及含有的信息表												
部件名称		有害物质 (物质名称/阈值/基准) *1										环境保护使用期限标识 *2
		铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	PBB	PBDE	DEHP	DBP	BBP	DIBP	
		阈值：镉：0.01 wt% (100 ppm)、铅以外：0.1 wt% (1000 ppm)										
伺服放大器	电路板组件	×	○	○	○	○	○	○	○	○	○	15

*1 ○：表示该有害物质在该部件所有均质材料中的含量均不超出电器电子产品有害物质限制使用国家标准要求。
×：表示该有害物质至少在该部件的某一均质材料中的含量超出电器电子产品有害物质限制使用国家标准要求。
*2 15 在中国制造/销售的产品中含有特定有害物质的标志。只要能遵守本产品在安全和使用方面的注意事项，从生产日算起的年限以内，不会对环境污染，人体，财产产生深刻的影响。

2.2.5 Compliance with Standards

The MR-MD complies with the following standard.
EN/BS EN/IEC 61800-3/GB 12668.3/KN 61800-3 (KS C 9800-3)

2.3 General cautions for safety protection and protective measures

Observe the following items to ensure proper use of the MR-MD.

(1) Only qualified personnel and professional engineers should perform the installation of safety components and systems.

(2) When mounting, installing, and using the MR-MD, always observe the standards and directives applicable in the respective countries.

2.4 Disposal

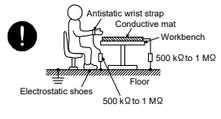
Disposal of unusable or irreparable devices should always occur in accordance with the applicable country-specific waste disposal regulations.

2.5 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-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.

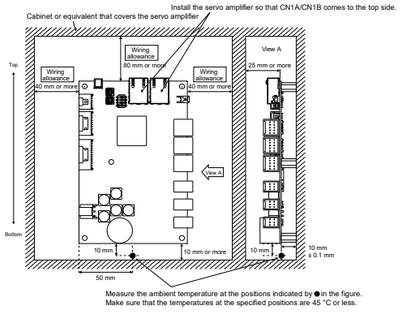
3. Mounting/Dismantling

The equipment must be installed in the specified direction. Otherwise, a fault may occur.
Install the servo drive on a perpendicular wall in the correct vertical direction and at least IP54 in order to maintain pollution degree 2.
To mount MR-MD, use M4 screws, studs, or equivalent to secure all the five mounting holes. Ground the four FG holes among the five mounting holes using metal studs or equivalent. (Tightening torque: 1.5 ± 0.2 N•m)
Printed wiring boards inside the unit are exposed. Incorrect handling could result in destruction of the unit by static electricity. Pay attention to the followings when handling the unit.
• Be sure to ground the body and the workbench (grounding resistance: 500 kΩ to 1 MΩ). Do not handle the unit without grounding.

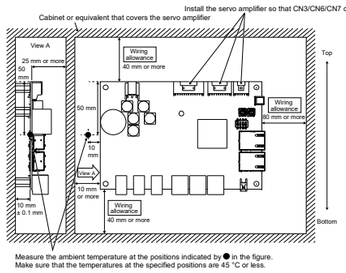


• Take out the unit from the bag carefully so that the static electricity is not generated.
• Do not touch the mounted components or patterns of printed wiring boards of the unit.

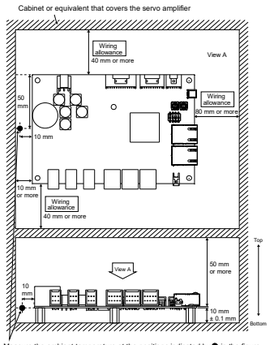
(1) Vertical placement



(2) Vertical, horizontal placement



(3) Horizontal placement

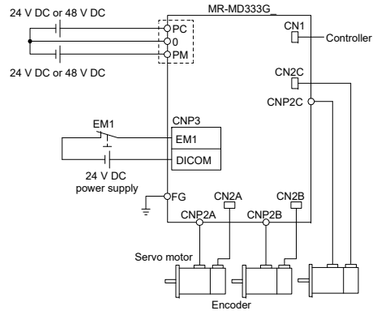


4. Electrical Installation and Configuration diagram

POINT

- The voltage supply to machines must be 20 ms or more of tolerance against instantaneous power failure as specified in IEC/EN 60204-1.
- To prevent unexpected movement of the servo motor, securely connect the wire with the specified method and torque.

Representative configuration example to conform to the IEC/EN standard is shown below.



The motor that connects it is limited as follows.

(1) Servo motors manufactured by Mitsubishi Electric (HK/HG series)

(2) Other servo motors complying with IEC 60034-1 which are used with a Mitsubishi Electric serial interface-compatible encoder

5. Maintenance and Service

To prevent a malfunction, do not perform an insulation resistance test (megger test) on the MR-MD.
Do not disassemble, repair, or modify the product.

5.1 Inspection items

It is recommended that the following points periodically be checked.

(1) Servo motor bearings, brake section, etc. for unusual noise.

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

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

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

(5) Check for dust accumulation on the servo drive.

(6) Check for unusual noise generated from the servo drive.

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

(8) 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.

5.2 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 *1
Battery backup time	Approximately 30,000 hours/3 axes (equipment power supply: off, ambient temperature: 20 °C) Approximately 38,000 hours/3 axes (power-on time ratio: 25 %, ambient temperature: 20 °C)

*1 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). 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.

6. Environment

Transport the products correctly according to their mass.
Stacking in excess of the limited number of product packages is not allowed.
Install the product in a load-bearing place of servo motor in accordance with the specifications.
Do not put excessive load on the machine.
Do not hold the cables or connectors when carrying the MR-MD. Otherwise, it may drop.
When you keep or use it, please fulfill the following environment.

	Operation	Transportation	Storage
Ambient temperature	0 °C to 45 °C (non-freezing) Class 3K3 (IEC 60721-3-3)	-25 °C to 70 °C (non-freezing) Class 2K12 (IEC 60721-3-2)	-25 °C to 70 °C (non-freezing) Class 1K4 (IEC 60721-3-1)
Ambient humidity	5 %RH to 95 %RH (non-condensing)	5 %RH to 95 %RH (non-condensing)	5 %RH to 95 %RH (non-condensing)
Ambience	Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist or dust		
Altitude/ atmospheric pressure	Altitude: Max. 1000 m	Transportation conditions: Overland/sea transportation, or transporting by an airplane whose cargo compartment is pressurized at 700 hPa or higher	Atmospheric pressure: 700 hPa to 1060 hPa (Equivalent to altitudes from -400 m to 3000 m)
Vibration resistance	Each of the X-, Y-, and Z-directions 10 Hz to 55 Hz, acceleration amplitude 5.9 m/s²	2 Hz to 9 Hz, displacement amplitude (single amplitude) 7.5 mm 9 Hz to 200 Hz, acceleration amplitude 20 m/s² Class 2M3 (IEC 60721-3-2)	2 Hz to 9 Hz, displacement amplitude (single amplitude) 1.5 mm 9 Hz to 200 Hz, acceleration amplitude 5 m/s² Class 1M2 (IEC 60721-3-1)

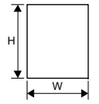
7. Technical Data

7.1 MR-MD

Item		MR-MD333G_
Power supply	Main circuit	24 V DC or 48 V DC
	Control circuit	24 V DC or 48 V DC
	Interface (SELV)	24 V DC ± 10 %, (required current capacity: 500 mA)
Control system		Sine-wave PWM control/current control system
Pollution degree		2 acc. to IEC/EN 60664-1 *1
Overvoltage category		II acc. to IEC/EN 60664-1 *1
Protective class		III

*1 When the main circuit is powered by 24 V DC, the control circuit should not be powered by 48 V DC.

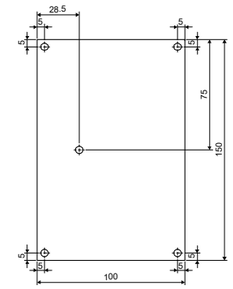
7.2 Dimensions



Servo drive	W [mm]	H [mm]
MR-MD333G_	150	100

7.3 Mounting hole

[Unit: mm]



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.