MITSUBISHI

Analog Input/Output Module Type A1S66ADA

User's Manual

(Hardware)

Thank you for buying the Mitsubishi general-purpose programmable controller MELSEC-A Series

Prior to use, please read both this manual and detailed manual thoroughly and familiarize yourself with the product.

MODEL	A1S66ADA-U-H-E
MODEL CODE	13JL42
IB (NA)-66820-J(1206) MEE	

● SAFETY PRECAUTIONS ●

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.
The instructions given in this manual are concerned with this product. Refer to the User's Manual of the CPU module in use for details on the safety instructions for the programmable controller system.
In this manual, the safety precautions are classified into two levels:
"⚠WARNING" and "⚠CAUTION".

⚠ 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 minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠CAUTION" may lead to serious consequences.
Observe the precautions of both levels because they are important for personal and system safety.
Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[DESIGN PRECAUTIONS]

⚠ WARNING

- In case of the external power supply failure or the programmable controller failure, set up a safety circuit outside the programmable controller so that the entire system can operate safely. The mis-output and malfunction may cause an accident.

⚠ CAUTION

- Use the programmable controller in an environment that meets the general specifications in the user's manual for the CPU module used. Using this programmable controller in an environment outside the range of the general specifications could result in electric shock, fires, malfunctions, and damage to or deterioration of the product.
- Do not bunch the control wires with the main circuit or power wires, or install them close to each other. They should be installed 100 mm (3.9 inch) or more from each other. Failure to do so may result in noise that would cause malfunctions.
- At power ON/OFF, voltage or current may instantaneously be output from the output terminal of this module. In such case, wait until the analog output becomes stable to start controlling the external device.

[INSTALLATION PRECAUTIONS]

⚠ CAUTION

- Insert the tabs at the bottom of the module into the mounting holes in the base unit. If the module is not properly installed, it may result in malfunctions, failure, or fallout.
- Do not directory touch the module's conductive parts. Doing so could cause malfunctions or failure in the module.

[WIRING PRECAUTIONS]

⚠ CAUTION

- Ground the AG and FG terminals to the protected grounding conductor when there are a lot of noise. Failure to ground these terminals may cause malfunctions.
- When wiring programmable controller, check the rated voltage and terminal layout of the wiring, and make sure the wiring is done correctly. Connecting a power supply that differs from the rated voltage or wiring it incorrectly may cause fires or failure.
- Tighten the terminal screws within the range of specified torque. If the terminal screws are loose, it may result in short circuits or malfunctions. Tightening the screws too far may cause damage to the screw, resulting in short circuits, or malfunctions.
- Be sure there are no foreign substances such as sawdust or wiring debris inside the module. Such debris could cause fires, failure, malfunctions.

[STARTING AND MAINTENANCE PRECAUTIONS]

⚠ CAUTION

- Do not touch the connector while the power is on. Doing so could cause malfunctions.
- Make sure to switch all phases of the external power supply off before cleaning or re-tightening terminal screws. If you do not switch off the external power supply, it will cause failure or malfunctions of the module.
- Do not disassemble or modify the modules. Doing so could cause failure, malfunctions, injury, or fires.
- Make sure to switch all phases of the external power supply off before mounting or removing the module. If you do not switch off the external power supply, it will cause failure or malfunctions of the module.
- Do not install/remove the terminal block more than 50 times after the first use of the product. (IEC 61131-2 compliant)
- Before handling the module, always touch grounded metal, etc. to discharge static electricity from the human body. Failure to do so can cause the module to fail or malfunction.

[OPERATING PRECAUTIONS]

⚠ CAUTION

- Do not output (turn ON) the "usage disable" signal as an output signal to special modules from the programmable controller CPU. Outputting the "usage disable" signal may cause programmable controller system malfunctions.

[DISPOSAL PRECAUTIONS]

⚠ CAUTION

- When disposing of this product, treat it as industrial waste.

● CONDITIONS OF USE FOR THE PRODUCT ●

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.
(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.
MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.
("Prohibited Application")
Prohibited Applications include, but not limited to, the use of the PRODUCT in;
- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTs are required. For details, please contact the Mitsubishi representative in your region.

●安全注意事项●

（使用之前请务必阅读）

在使用本产品之前，应仔细阅读本手册以及本手册中所介绍的相关手册，同时在充分注意安全的前提下正确操作。
本注意事项仅记载与本产品有关的内容。关于可编程控制器系统方面的安全注意事项，请参阅所使用的 CPU 模块的用户手册。
在“安全注意事项”中，安全注意事项被分为“⚠警告”和“⚠注意”两个等级。

⚠ 警告	表示错误操作可能造成危险后果，导致死亡或重伤事故。
⚠ 注意	表示错误操作可能造成危险后果，导致中度伤害、轻伤或财产损失。

此外，根据情况不同，即使标注为“⚠注意”的事项也有可能会引发严重后果。
这两个等级的注意事项记载的均为重要内容，请务必遵守。
请妥善保管本手册以备需要时取阅，并将本手册交给最终用户。

【设计注意事项】

⚠警告

● 应在可编程控制器外部设置一个安全电路，以保证整个系统在外部电源异常或可编程控制器本体故障时也能安全运行。否则可能由于误输出、误动作而导致事故发生。

⚠注意

● 应在所使用的CPU模块的用户手册记载的一般规格环境下使用可编程控制器。
如果在一般规格范围以外的环境中使用模块，可能导致触电、火灾、误动作、产品损坏或性能劣化。
● 请勿将控制线与主电路及动力线等捆扎在一起或相互靠得太近。
应相距大约 100mm 以上距离。因为噪声有可能导致误动作。
● 电源 ON/OFF 时输出端子可能会瞬间输出电压或电流，请在模拟输出稳定后再开始进行控制。

【安装注意事项】

⚠注意

● 请将模块下部的模块固定用凸起部切实插入基板的固定孔后，以规定的扭矩拧紧模块安装螺栓。
如果模块未正确安装并以螺栓固定，有可能造成模块误动作、故障或掉落。
● 请勿直接触碰模块的导电部分。否则可能导致模块误动作、故障。

【配线注意事项】

⚠注意

● 噪声过多时，必须将 AG 端子及 FG 端子与可编程控制器的专用接地线连接。否则有可能导致误动作。
● 进行可编程控制器配线作业时，应在确认产品的额定电压及端子排列的基础上正确进行操作。
如果连接了与额定值不符的电源或配线错误，可能导致火灾或故障。
● 应在规定的扭矩范围内拧紧端子螺栓。
如果端子螺栓拧得过松，有可能导致短路或误动作。
如果端子螺栓拧得过紧，有可能造成螺栓损坏从而导致短路或误动作。
● 应注意防止切屑及配线头等异物掉入模块内。
否则有可能导致火灾、故障或误动作。

【启动 / 维护注意事项】

⚠注意

● 在通电状态下请勿触摸端子，否则可能导致误动作。
● 在清洁模块或重新紧固端子螺栓时，必须将系统使用的外部供应电源全部断开后再进行操作。如果未全部断开，有可能导致模块故障或误动作。
● 请勿拆开或改造模块。否则可能导致故障、误动作、人身伤害或火灾。
● 在拆装模块时，必须将系统使用的外部供应电源全部断开后再进行操作。
如果未全部断开，有可能导致模块故障或误动作。
● 产品投入使用后，端子排的拆装次数不应超过 50 次。（根据 IEC61131-2 规范）
● 在触碰模块之前，必须先触碰已接地的金属等，释放掉人体等所携带的静电。如果不释放掉静电，有可能导致模块故障或误动作。

【运行注意事项】

⚠注意

● 在从可编程控制器 CPU 至特殊功能模块的输出信号中，请勿输出“禁止使用”的信号（或使之 ON）。
如果对“禁止使用”的信号进行输出，有可能导致可编程控制器系统发生误动作。

【报废处理注意事项】

⚠注意

● 本产品报废时，应当作工业废物处理。

About This Manual

The following product manuals are available.

Related Manual

Manual Name	Manual No. (Type code)
Analog Input/Output Module Type A1S66ADA User's Manual	IB-66819 (13JL41)

Please read A1S66ADA Module User's Manual before using this module.

1. Overview

This manual describes the handling and specifications of the A1S66ADA type Analog I/O Module (hereafter referred to as A1S66ADA), which is utilized in combination with the MELSEC-A series CPU module (hereafter referred to as programmable controller CPU).

(1) Product in the same package
After unpacking, please confirm that the following product is contained.

Product Name	No. of Items
Analog Input/output Module type A1S66ADA	1

2. Performance Specifications

The performance specifications of the A1S66ADA are described below:
Refer to the user's manual of the programmable controller CPU for the general specifications.

Item		Performance Specifications							
D/A conversion	-	Voltage output					Current outpu		
	Digital input	0 to 4000 (12-bit binary value)							
	Analog output	-10 to 10VDC (External load resistance : 2kΩ to 1MΩ)					0 to 20mADC (External load resistance : 0Ω to 600Ω)		
	I/O characteristics	Digital input	Analog output				Digital input	Analog output	
			0 to 10V range	0 to 5V range	1 to 5V range	-10 to 10V range		0 to 20mA range	4 to 20mA range
		0	0V	0V	1V	-10V	0	0mA	4mA
		1000	2.5V	1.25V	2V	-5V	1000	5mA	8mA
		2000	5V	2.5V	3V	0V	2000	10mA	12mA
		3000	7.5V	3.75V	4V	5V	3000	15mA	16mA
		4000	10V	5V	5V	10V	4000	20mA	20mA
	Maximum resolution		2.5mV	1.25mV	1.0mV	5.0mV		5μA	4μA
	Conversion speed	240μs/2 channels or less (Sampling : 80μs/1 channel)							
	Absolute maximum output	Voltage : ±12V Current : +28mA							
	Output short protection	Present							
	Analog output points	2 channels							
	Offset/gain adjustment	Adjust the two channels simultaneously with the control knob on the front side of the module. The adjustment should be done on-line.							
A/D conversion	Analog input	Voltage : -10 to 0 to 10VDC (Input resistance: 1MΩ) Current: 0 to 20mADC (Input resistance: 250Ω)							
	Digital output	0 to 4095 (12-bit binary value)							
	I/O characteristics	Analog input (voltage)					Analog input (current)		Digital output
		0 to 10V range	0 to 5V range	1 to 5V range	-10 to10V range		0 to 20mA range	4 to 20mA range	
		0V	0V	1V	-10V		0mA	4mA	0
		2.5V	1.25V	2V	-5V		5mA	8mA	1000
		5V	2.5V	3V	0V		10mA	12mA	2000
		7.5V	3.75V	4V	5V		15mA	16mA	3000
		10V	5V	5V	10V		20mA	20mA	4000
	Maximum resolution	2.5mV	1.25mV	1.0mV	5.0mV		5μA	4μA	
	Conversion speed	400μs/4 channels or less (Sampling : 80μs/1 channel)							
	Absolute maximum input	Voltage : ±15V Current : ±30mA*1							
	Analog input points	4 channels							
	Offset/gain adjustment	Adjust the four channels simultaneously with the control knob on the front side of the module. Check the digital output value on-line while making the adjustments.							
Overall accuracy		D/A conversion (accuracy against the maximum value)		Voltage output (All ranges)		Current output (All ranges)			
				±1.0 % (±100 mV)		±1.0 % (±200 μA)			
		A/D conversion (accuracy against the full scale)		±1.0 % (±40)					
Insulation method		Between the output terminal and programmable controller power supply: Photocoupler isolation Between channels: Not isolated							
Number of occupying I/O points		64 points (Input 64 points, output 64 points)							
Connecting terminal base		20-point terminal base (M3.5 × 7 screws)							
Applicable wire size		0.75 to 1.25mm^2							
Applicable solderless terminal		R1.25 - 3 1.25 - YS3 2 - 3.5 2 - YS3A V1.25 - M3 V1.25 -YS3A V2 - S3 V2 - YS3A							
Internal current consumption (5VDC)		0.21A							
External power supply	Voltage	21.6VDC to 26.4VDC							
	Current consumption	0.16A							
Weight		0.33kg							

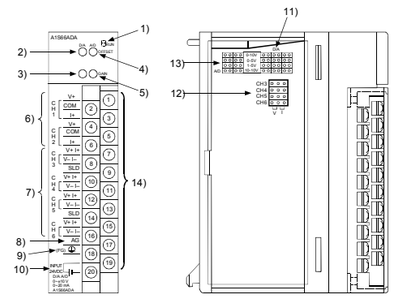
*1 Current value indicates value of instant input current that does not break module inner electrical resistance.

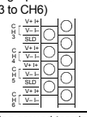
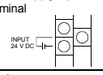
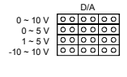
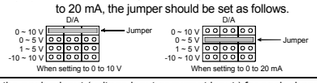
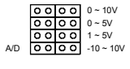
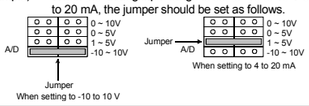
Point

When utilizing the peripheral device to assign the I/O numbers, set it as a 64-point output module.

3. Part Identification and Settings

3.1 Part Identification



NO.	Name	Description
1)	RUN LED RUN	Indicates the operating conditions of the A1S66ADA On: Power is ON Off: Power is OFF
2)	D/A conversion offset control knob D/A OFFSET	Used when making a fine adjustment of the D/A conversion offset. The offset value is increased by turning the control knob to the right. The offset value is decreased by turning the control knob to the left.
3)	D/A conversion gain control knob D/A GAIN	Used when making a fine adjustment of the D/A conversion gain. The gain value is increased by turning the control knob to the right. The gain value is decreased by turning the control knob to the left.
4)	A/D conversion offset control knob A/D OFFSET	Used when making a fine adjustment of the A/D conversion offset. The offset value is increased by turning the control knob to the right. The offset value is decreased by turning the control knob to the left.
5)	A/D conversion gain control knob A/D GAIN	Used when making a fine adjustment of the A/D conversion gain. The gain value is increased by turning the control knob to the right. The gain value is decreased by turning the control knob to the left.
6)	Analog output terminal (CH1, CH2) 	Outputs the analog values (voltage/current) of CH1 to CH2. Refer to Section 5.2 on the wiring method.
7)	Analog input terminal (CH3 to CH6) 	Inputs the analog values (voltage/current) of CH3 to CH6. Refer to Section 5.2 on the wiring method.
8)	Analog ground terminal	The ground terminal of the analog signal (Refer to Section 5.2 on the wiring method.)
9)	Frame ground terminal	The ground terminal of the shielded cable (Refer to Section 5.2 on the wiring method.)
10)	Power supply input terminal 	Connect 24VDC at the input terminal of the power supply.
11)	Analog-output range switching setting pin 	Set the analog output range. CH1, CH2 common. When setting the current output range, set as follows: When switching to 0 to 20 mA → Set a jumper at a position between 0 V and 5 V. When switching to 4 to 20 mA → Set a jumper at a position between 1 V and 5 V. Set the jumper as it always makes a line. (Set it with the jumper) (Setting at shipment : 0 to 10V range) (Example) When the analog output range is set to 0 to 10 V or 0 to 20 mA, the jumper should be set as follows. 
12)	Analog-input voltage/current switching setting pin 	Set the analog input (voltage input or current input) for each channel (CH3 to CH6). (Set it with the jumper) (Setting at shipment : V) For voltage input setting : V For current input setting : I
13)	Analog-input range switching setting pin 	Set the analog output range. CH3 to CH6 common. When setting the current output range, set as follows: When switching to 0 to 20 mA → Set a jumper at a position between 0 V and 5 V. When switching to 4 to 20 mA → Set a jumper at a position between 1 V and 5 V. (Setting at shipment : 0 to 10V range) (Set it with the jumper) (Example) When the analog input range is set to -10 to 10 V or 4 to 20 mA, the jumper should be set as follows. 
14)	Terminal block	Numbers in a graphic indicate terminal numbers.

4. Loading and Installation

4.1 Handling Precautions

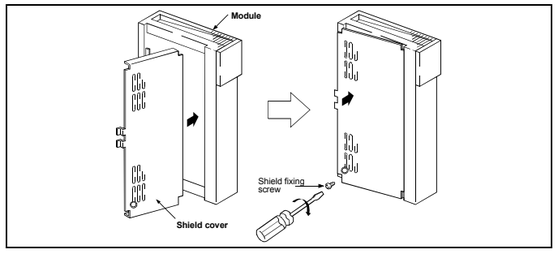
(1) Do not drop or put a great impact on the module case and the terminal block because they are made of resin.
(2) Do not take the printed circuit board of the module out of the case. It may result in a failure.
(3) Be careful not to let foreign matter such as filings or wire chips get inside the module while wiring. Remove all foreign matters if any get inside.
(4) Tighten the module installation screws and terminal screws within the range as follows:

Screw Area	Tightening Torque Range
Module fixing screws (M4 screw)	78 to 118N·cm
Terminal block terminal screws (M3.5 screw)	59 to 88N·cm
Terminal block installation screws (M4 screw)	78 to 118N·cm

4.2 Installation and Removal of the Shield Cover

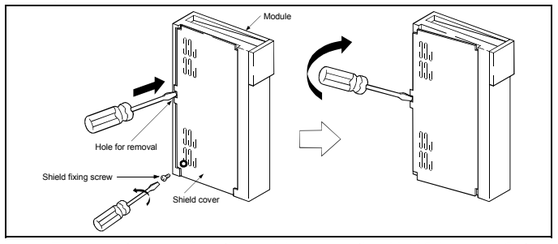
It is necessary to install the shield cover when using Procedures for installing and removing the shield cover are described below.

(1) Installation



To install the shield cover to the module, install the cover to the terminal side first as shown in the figure, then it will be completed by pushing the cover to the module and tightening the shield fixing screw.

(2) Removal



To remove the cover from the module, remove the shield fixing screw first and insert the tip of a flat-tip screwdriver into the removal hole as shown in the figure, then move the screwdriver towards the rear of the module to separate the clip from the removal hole and remove the cover.

4.3 Installation Environment

Never install the A series in the following environments:
(1) Locations where the ambient temperature is outside the range of 0 to 55°C.
(2) Locations where the ambient humidity is outside the range of 10 to 90% RH.
(3) Locations where dew condensation takes place due to sudden temperature changes.
(4) Locations where there are corrosive and/or combustible gasses.
(5) Locations where there is a high level of conductive powder (such as dust and iron filings, oil mist, salt, and organic solvents).
(6) Locations exposed to the direct rays of the sun.
(7) Locations where strong power and magnetic fields are generated.
(8) Locations where vibration and shock are directly transmitted to the main module.

5. Wiring

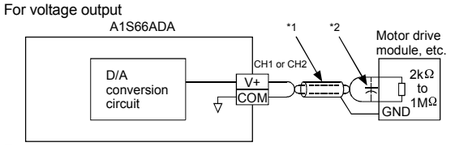
The following describes the precautionary items on wiring as well as wiring to the external devices.

5.1 Precautions when Wiring

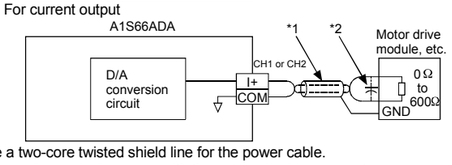
To obtain the maximum performance from the functions of A1S66ADA and improve the system reliability, a wiring with the high durability against the noise is required. The external wiring precautions described below make more improvement in the wiring not to be affected by the noise.
(1) Use separate cables for the AC and the analog input to the A1S66ADA, in order not to be affected by the AC side surge or conductivity.
(2) Do not bundle or place the cable close to the main circuit line, high voltage line or load carrying wires from other than the programmable controller. It is influenced more easily by the noise, surge, or conductivity.
(3) Place a one-point grounding on the programmable controller side for the shield line or shield cable. However, depending on the external noise conditions, it may be better to have a grounding externally.

5.2 Wiring Between the A1S66ADA and the External Devices

The following shows the wiring method for the A1S66ADA.
(1) CH1 and CH2
(a) For voltage output



(b) For current output



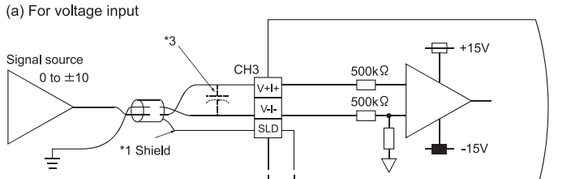
*1 Use a two-core twisted shield line for the power cable.
*2 When noise or ripple occurs with the external cable, connect a condenser with 0.1 to 0.47μFWV to the input terminal of the external device.

Important

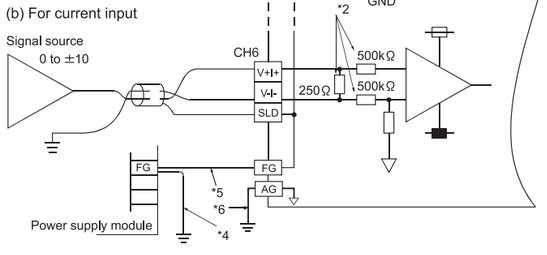
The voltage and current output can not be used simultaneously on the same channel.
In the event it is used, the internal elements are destroyed; therefore always open unused terminals.

(2) CH3 to CH6

(a) For voltage input



(b) For current input

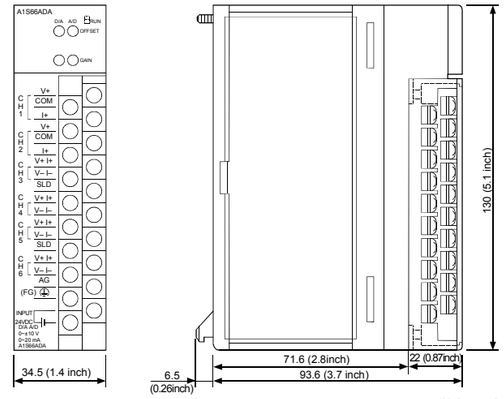


*1 Use a two-core twisted shield line for the power cable.
*2 Indicates the A1S66ADA input resistance.
*3 When noise or ripple occurs with the external cable, connect a condenser with about 0.1 to 0.47μF (25V or more voltage resistance parts) between the terminal V+I+ and V-I-.
*4 The FG terminal of the power supply module should always be grounded.
*5 Make sure to connect between the FG of the power supply module and the FG of A1S66ADA.
*6 Due to noise in the environment, AG terminal may attain better accuracy when grounded.

Point

The FG terminal of A1S66ADA and the FG terminal of the programmable controller power supply module are not connected.

6. External Dimensions Diagram



(Unit : mm)

WARRANTY

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; machine damage or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

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