MITSUBISHI

Digital-Analog Conversion Module

User's Manual

(Hardware)

A1S68DAV/DAI

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	AJ68DAV-U-H/W-E
MODEL CODE	13J809
IB (NA)-66586-F(1112) 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 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 logic 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

- Provide a failsafe circuit to ensure that the system as whole can continue to function safely even if there is an external power supply fault or PLC failure.
  Otherwise there will be danger of accidents due to erroneous outputs or misoperation.
  (1) The status of analog output differs depending on the settings for the functions that control analog output. Make the settings with enough care. For details of the analog output status, refer to Section 3.4.4 of the detailed manual.
  (2) Normal output may not be obtained from output terminals or their internal circuits. Provide an external circuit to monitor output signals whose disruption could cause serious accidents.

⚠CAUTION

- Do not bundle the control wire and the communication cable with the main circuit or power line or keep them close to one another.
  Keep the control wire and the communication cable at least 100mm (3.94inch) away from the main circuit or power line.
  Otherwise, noise or malfunctions will occur.
- 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

- Use the PLC in an environment that meets the general specifications given in the User's Manual of the CPU module in use.
  Using it an environment which does not meet the general specifications could cause electric shock, fire or malfunctions, and damage or deterioration of the module.
- Install the module by engaging the module mounting projections on the lower part of the module in the mounting holes of the base unit.
  Incorrect installation could result in malfunctions, failure of detachment.

[WIRING PRECAUTIONS]

⚠CAUTION

- Ground the FG terminal using third class grounding or higher exclusively for the PLC.
  If you do not, the PLC will malfunction.
- Before connecting wires to the PLC, check the rated voltage and the terminal arrangement.
  Connecting power of a different voltage or wiring incorrectly will result in fire or failure.
- Tighten the terminal screws to the specified torque.
  Loose terminal screws will cause a short, fire or malfunctioning.
- Take all possible measures to prevent chips or wire scraps from entering the module.
  Entry of foreign material will cause fire, failure of malfunctions.

[STARTING AND MAINTENANCE PRECAUTIONS]

⚠WARNING

- Do not touch the terminals while they are live.
  This will cause malfunctions.
- Be sure to shut off all phases of the external power supply used by the system before cleaning or retightening the terminal screws.
  Not doing so can cause the module to fail or malfunction.

⚠CAUTION

- Do not disassemble or tamper will the module.
  This will cause failure, malfunctions, injuries or fire.
- Be sure to shut off all phases of the external power supply used by the system before mounting or removing the module.
  Not doing so may cause damage to the module.
- Do not mount/remove the module onto/from base unit more than 50 times (IEC61131-2-compliant), after the first use of the product.
- Before handling the module, always touch grounded metal, etc. to discharge static electricity from the human body.
  Failure to do so may cause the module to fail or malfunction.

[DISPOSAL PRECAUTIONS]

⚠CAUTION

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

● 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。
本手册中的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。
  (1) 模拟输出的状态会因控制模拟输出的各种功能的设置状态而异。设置时应充分注意。关于模拟输出状态的详细内容，请参照详细手册的3.4.4项。
  (2) 由于输出元件或其内部电路的故障，有时可能会无法正常输出或会异常输出。对于可能导致重大事故发生的输出信号，应在外部设置监视电路。

⚠注 意

- 请勿将控制线及通信电缆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。
- 电源接通/关闭时瞬间可能会有电压或电流从输出端子输出。
  请在模拟输出稳定后再开始控制。

【安装注意事项】

⚠注 意

- 应在所使用的CPU模块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可编程控制器，可能导致触电、火灾、误动作、产品损坏或性能劣化。
- 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，有可能造成误动作、故障或掉落。

【配线注意事项】

⚠注 意

- 必须将FG端子与可编程控制器的专用接地线连接（特别是噪声过多时）。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，有可能造成螺栓及模块破损从而导致掉落、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】

⚠警 告

- 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。

⚠注 意

- 请勿拆解或改造各模块。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。

【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。

● 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.

About the Manuals

The following product are available for this equipment.
Refer to the table given below to choose suitable manuals.

Detailed Manual

Manual name	Manual No. (Model code)
D/A converter module type A1S68DAV/DAI User's Manual	IB-66587

COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES

(1) Method of ensuring compliance
To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.
- User's manual for the CPU module used
- User's manual (hardware) for the CPU module or base unit used

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

(2) Additional measures
No additional measures are necessary for the compliance of this product with EMC and Low Voltage Directives.

1. General Description

This manual gives the specifications and handling instructions for the A1S68DAV digital to analog converter module (hereafter called the “A1S68DAV”) and the A1S68DAI digital to analog current converter module (hereafter called the “A1S68DAI”), which are used in combination with a MELSEC A series compact building block type PLC CPU (hereafter called the “PLC CPU”)

A1S68DAV is used to convert incoming digital values (16-bit signed binary data) which are set with the PLC CPU to analog values (voltage outputs ranging from -10V to 10V).

A1S68DAI is used to convert incoming digital values (16-bit signed binary data) which are set with the PLC CPU to analog values (voltage output ranging from 4mA to 20mA).

A1S68DAV and A1S68DAI are referred to as “A1S68DAV/DAI” or “module” in this manual.

1.1 Related manuals

The following manuals given the specifications, handling, and programming method for the A1S68DAV/DAI.
A1S68DAV/DAI User’s Manual (IB-66587)

2. Performance Specifications

The performance specifications of the A1S68DAV/DAI are tabled below.
For the general specifications, refer to the user's manual for the PLC CPU are using.

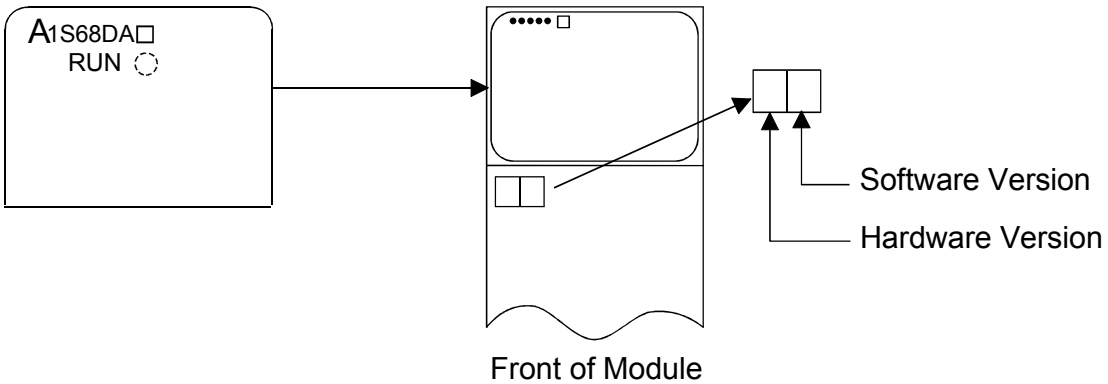
Item	Specification			
	A1S68DAV		A1S68DAI	
Digital input value	-2048 to 2047		0 to 4095	
Analog output	-10 to 0 to 10 VDC (External load resistance: 2KΩ to 1MΩ)		4 to 20mADC (External load resistance: 0 to 600Ω)	
I/O characteristics	Digital input value	Analog output value	Digital input value	Analog output value
	2000	10V	4000	20mA
	1000	5V	2000	12mA
	0	0V	0	4mA
	-1000	-5V		
	-2000	-10V		
Maximum resolution of analog value	5mA		4μA	
Overall accuracy (accuracy to maximum value)	±1% (±100mV)		±1% (±200μA)	
Maximum conversion time	Maximum 4ms *1/8 channels			
Output short protection	Provided			
Analog output points	8 channels/module			
Insulation method	Photocoupler insulation between output terminals and PLC power.			
Offset/gain adjustment	Not provided			
Number of I/O points	Special, 32			
Connection terminal	20 point terminal block (M3.5 × 7screws)			
Applicable wire size	0.75 to 1.5mm^2			
Applicable solderless terminal	R1.25-3, 1.25-YS3A, RAV1.25-3, V1.25-YS3A			
Internal current consumption (5VDC)	0.65A		0.85A	
Weight	0.22kg *2			

*1: If the frequency of access from the PLC CPU using FROM/TO instructions is high (e.g.scan time of 5ms or less with access every scan), this can be extended up to about 6ms.

*2: The weight in hardware version "F" or earlier is 0.28kg.

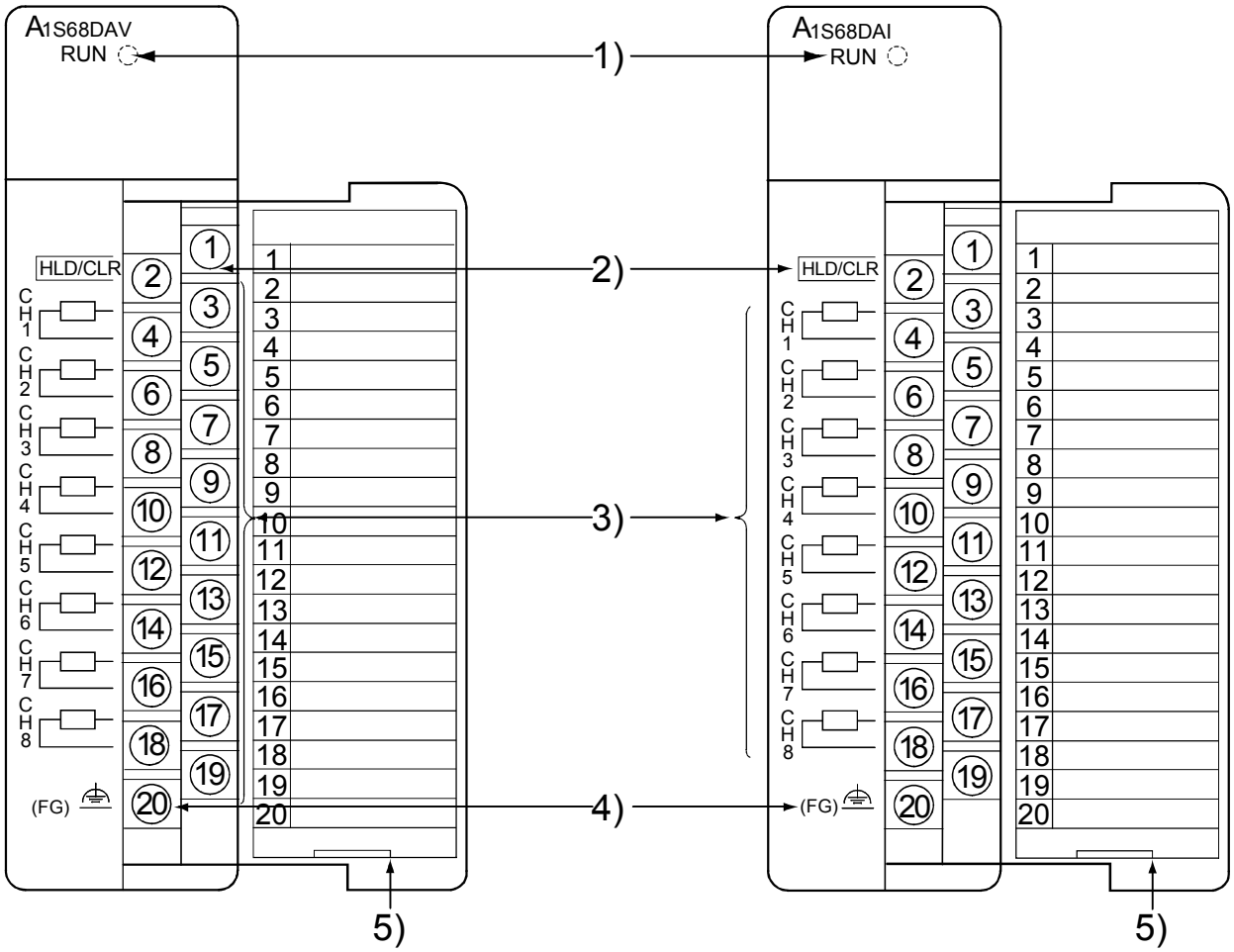
How to check the hardware version

The hardware version for the A1S68DAV/DAI can be checked on the label on the front of the module.



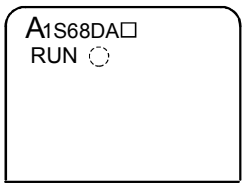
3. Nomenclature and Settings

The name of each part of the A1S68DAV/DAI is indicated below.

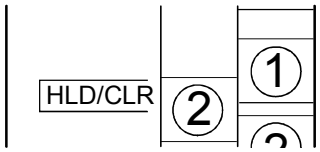
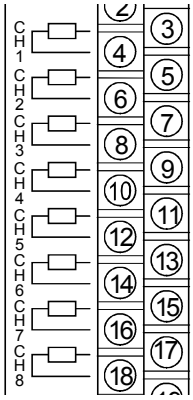
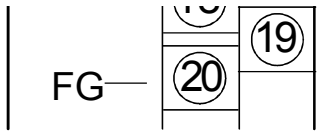


Remark

In hardware version “F” or earlier, the RUN LED is positioned 6mm left from the one of hardware version “G” or later.



Hardware version
“F” or earlier

<table>
<tr><th>No</th><th>Name and appearance</th><th>Description</th></tr>
<tr><td>1)</td><td>“RUN” LED
  </td><td>LED that indicates the operating status of the A1S68DAV/DAI.
On :Normal operation.
Off :5VDC power supply cut, watchdog timer error, or PLC CPU error.
Flash :Write data error.</td></tr>
<tr><td>2)</td><td>Analog output hold/clear setting terminals (terminal No.1,2)
  </td><td>Terminals that set the analog output status when the PLC CPU is in the STOP status.
The hold or clear status is set by shorting/opening the connection between terminals 1 and 2.
When shorted (HOLD) : At a PLC CPU STOP, the analog value before the STOP is output.
When open (CLEAR) : At a PLC CPU STOP, the analog value shown below is output.
• A1S68DAV.....0V
• A1S68DAI .....4mA</td></tr>
<tr><td>3)</td><td>Analog output terminals (terminal No.3 to 18)
  </td><td>Terminal that output the digital to analog converted values to external destinations in each channel.
<table>
<tr><th>Channel</th><th>Terminal No.</th><th>Channel</th><th>Terminal No.</th></tr>
<tr><td>1</td><td>3, 4</td><td>5</td><td>11, 12</td></tr>
<tr><td>2</td><td>5, 6</td><td>6</td><td>13, 14</td></tr>
<tr><td>3</td><td>7, 8</td><td>7</td><td>15, 16</td></tr>
<tr><td>4</td><td>9, 10</td><td>8</td><td>17, 18</td></tr>
</table></td></tr>
<tr><td>4)</td><td>FG terminal (Terminal No.20)
  </td><td>Frame ground terminal</td></tr>
<tr><td>5)</td><td>Code sheet</td><td>Filled out to indicate the application of each terminal</td></tr>
</table>

4. Handling

4.1 Caution on handling

(1) The case module of the A1S68DAV/DAI is made of resin: do not drop is or subject it to strong impact.

(2) Do not remove the printed circuit board from the case.
This could cause failure.

(3) Make sure that no wire offcuts or other debris enters the top of the module during wiring.
If anything does enter the module, remove it.

(4) Tighten the module mounting and the terminal screws as specified below.

Screw	Tightening torque range (N • cm)
Module mounting screw (M4 screw)	78 to 118
Terminal block terminal screw (M3.5 screw)	59 to 88
Terminal block mounting screw (M4 screw)	78 to 118

5. Wiring

The precautions and wiring method for making connection to external devices are as given below.

5.1 Wiring instructions

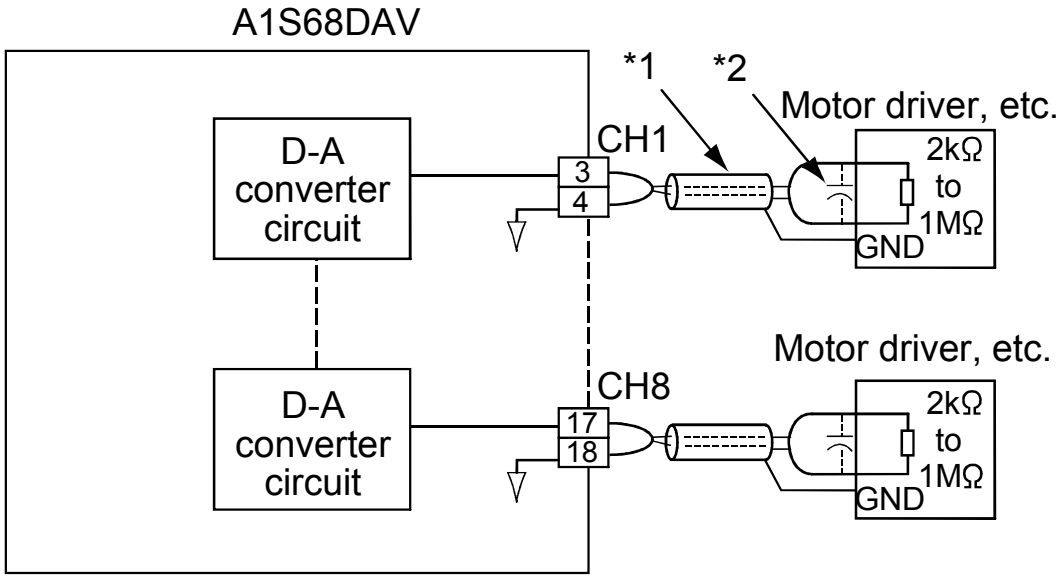
Inorder for the A1S68DAV/DAI to realize its optimum performance, and to ensure reliable system operation, the external wiring must have minimum susceptibility to noise.
The following cautions therefore apply when configuring the external wiring of the A1S68DAV/DAI.

(1) Do not bundle the external wiring together with main circuit or high-voltage lines, or load-bearing wires other than those of the PLC.
This will increase susceptibility to noise and the effects of surges and induction.

(2) Ground the shielding of shielded wires and shielded cables at one point.

5.2 Module connection example

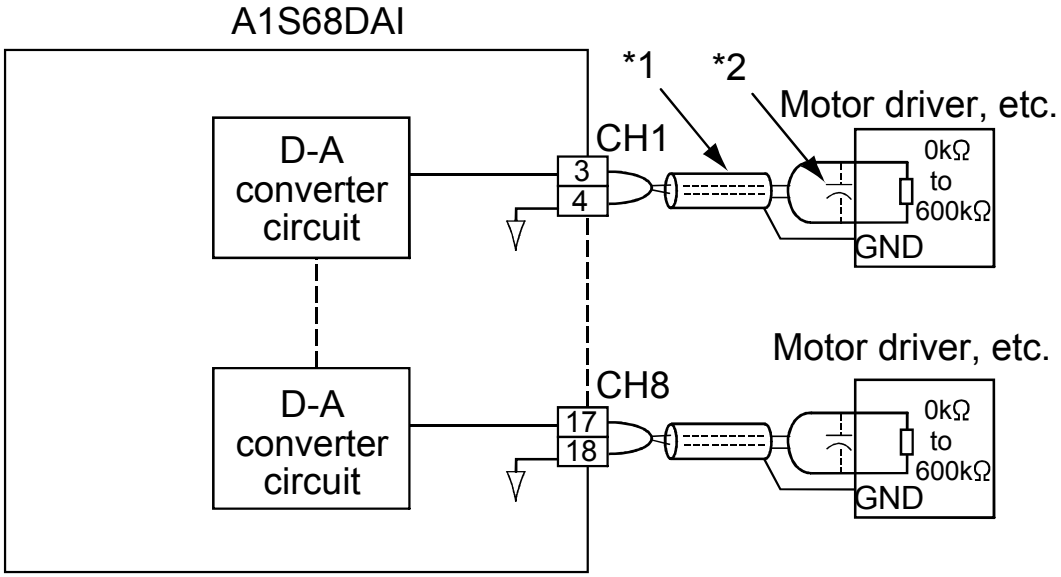
(1) An example of the wiring to external devices in the case of an A1S68DAV is shown below.



*1: Use two-core shielded wiring (twisted).

*2: If noise or ripple is generated by the external wiring, connect a 0.1 to 0.47μF (25V or more voltage resistance parts) capacitor to the input terminal of the external device.

(2) An example of the wiring to external devices in the case of an A1S68DAI is shown below.

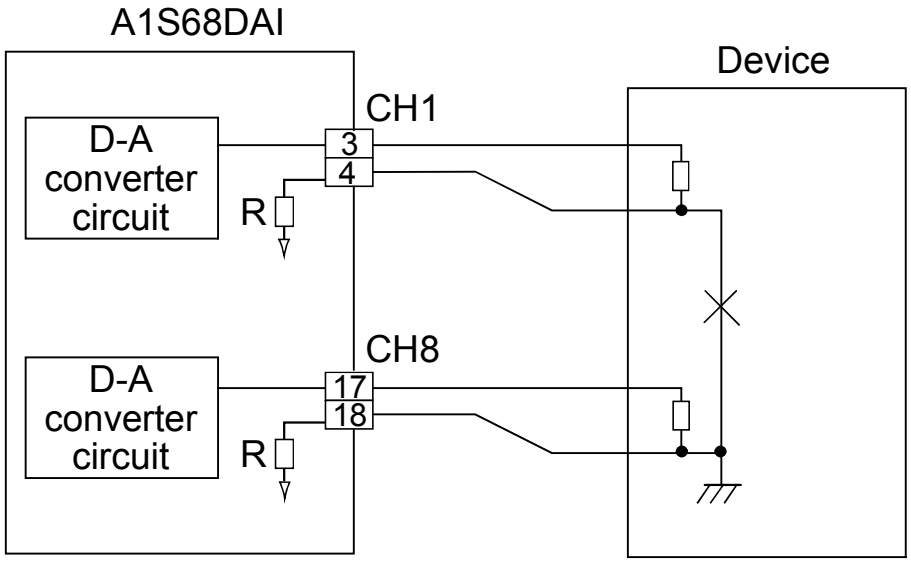


*1: Use two-core shielded wiring (twisted).

*2: If noise or ripple is generated by the external wiring, connect a 0.1 to 0.47μF (25V or more voltage resistance parts) capacitor to the input terminal of the external device.

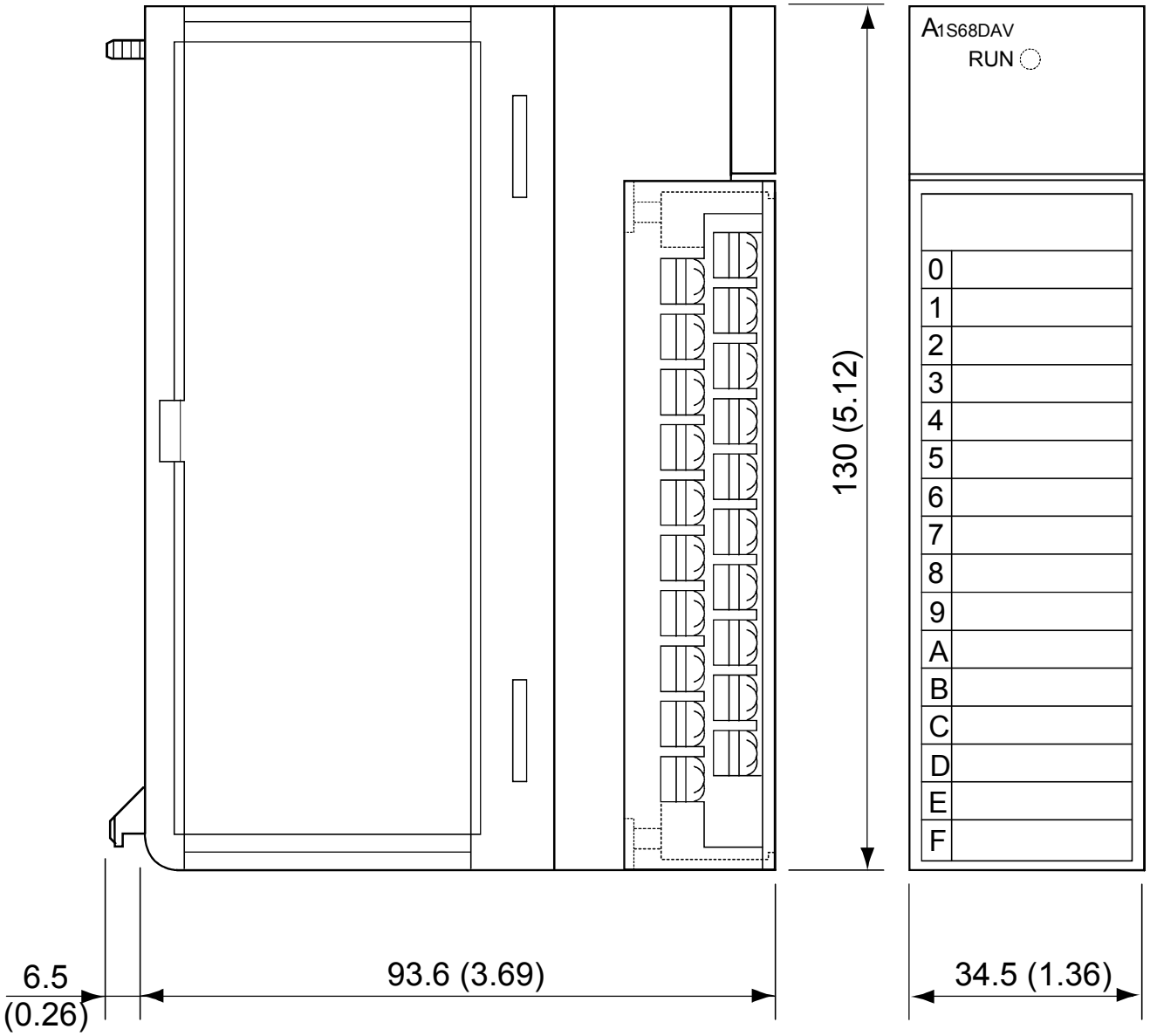
Important

A device with a shared current common line cannot be connected to an A1S68DAI.
If such a devices is connected, normal output will not be possible



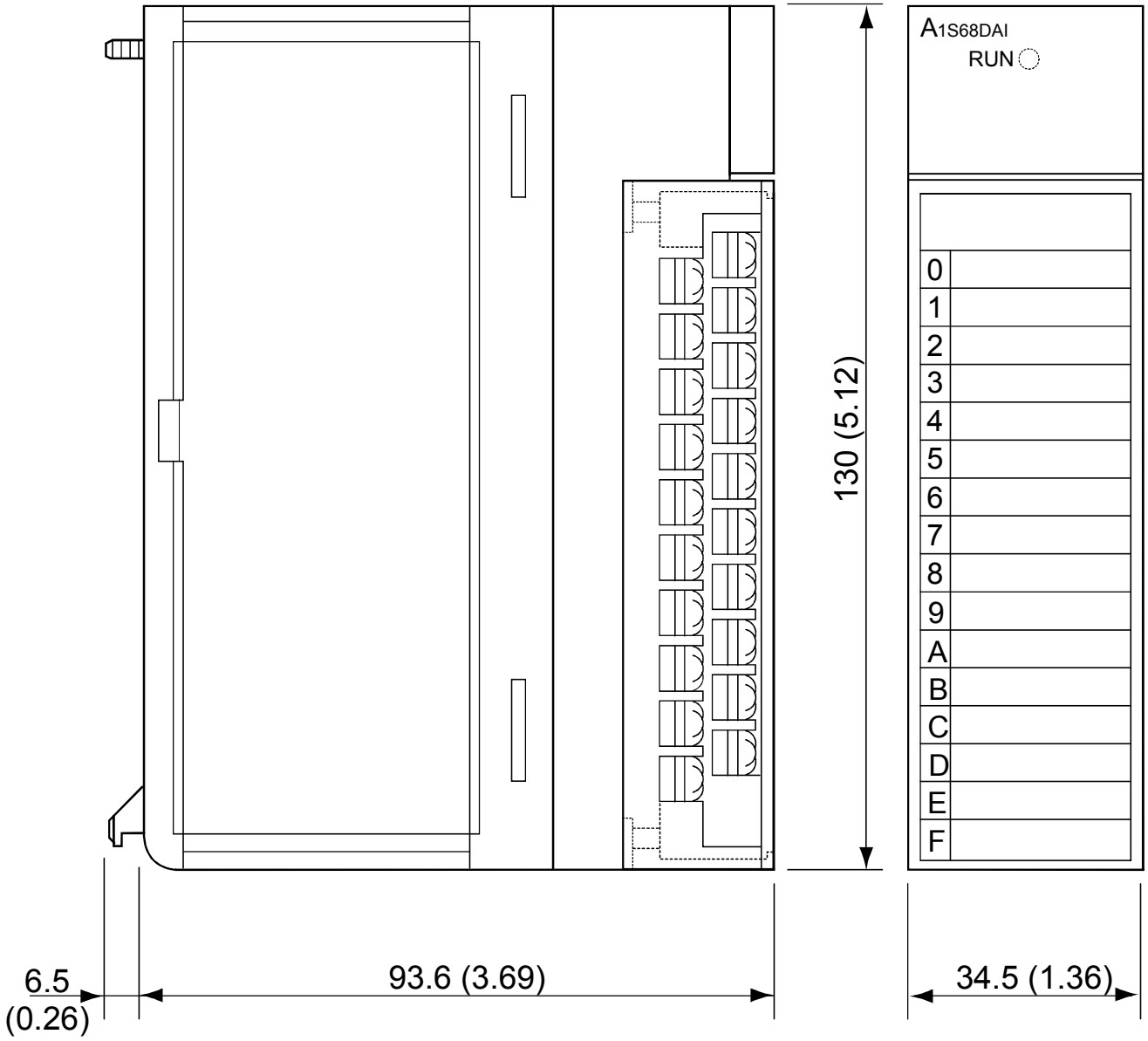
6. Outside Dimensions

(1) A1S68DAV



Unit:mm(inch)

(2) A1S68DAI



Unit:mm(inch)

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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