MITSUBISHI

Analog input/ output module

User's Manual

(Hardware)

A1S63ADA

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

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

MODEL	A1S63ADA-U-(H/W)
MODEL CODE	13JG43
IB(NA)-68474-G(0609)MEE	

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● SAFETY PRECAUTIONS ●

(Always read these instructions before using this equipment.)

When using this equipment, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety and handle the equipment properly.
These precautions apply only to this equipment. Refer to the CPU module user's manual for a description of the PC system safety precautions.
These ●SAFETY PRECAUTIONS● classify the safety precautions into two categories: "DANGER" and "CAUTION".

⚠DANGER	Procedures which may lead to a dangerous condition and cause death or serious injury, if not carried out properly.
⚠CAUTION	Procedures which may lead to a dangerous condition and cause superficial to medium injury, or physical damage only, if not carried out properly.

Depending on circumstances, procedures indicated by **⚠CAUTION** may also be linked to serious results.
In any case, it is important to follow the directions for usage. Store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

[DESIGN PRECAUTIONS]

⚠DANGER

- Configure a safety circuit on the outside of the PC so that the entire system works to a safe side even when the external power failure occurs or PC main unit fails.
  An erroneous output or operation may result in an accident.

⚠CAUTION

- Use the PC in the environment given in the general specifications section of the applicable CPU module user's manual.
  Failure to do so may result in electric shock, fire, or erroneous operation or may damage or degrade the equipment.
- Do not bundle, or install, the control cables with, or near, the main circuit and power cables.
  Keep them at least 100 mm (3.9 inch) away from such cables.
  Noise may cause erroneous operation.
- 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 holes in the base module before installing the module. Be sure to install the module in the base module with screws tightened to the specified torque. Improper installation may cause erroneous operation, accident, or the module to fall out. ● Do not directly touch the module's conductive parts or electronic components. Doing so could cause malfunction or trouble in the module.

[WIRING PRECAUTIONS]

⚠CAUTION
● If noise generates frequently, ground the AG and FG terminals using the PC dedicated class-D ground (class-three ground) or higher. Failure to do so may result in erroneous operation. ● Confirm the rated voltage and terminal arrangement of the module before wiring it to the PC. If a power supply of different rating is connected or a wiring is performed erroneously, fire or accident may result. ● Tighten the terminal screws to the specified torque. Loose terminal screws may cause a short circuit or erroneous operation. If excessively tightened, the terminal screws may be damaged, and cause a short circuit or erroneous operation. ● Be sure that cuttings, wire chips, or other foreign matter do not enter the module. Foreign matter may start a fire or cause an accident or erroneous operation.

[STARTING AND MAINTENANCE PRECAUTIONS]

⚠CAUTION
● Do not touch live terminals. It may cause erroneous operation. ● 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. ● Do not disassemble or rebuild the module. It may cause accidents, erroneous operation, injury, 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 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 may cause the module to fail or malfunction.

[OPERATING PRECAUTIONS]

⚠CAUTION
● Do not output (ON) "Use Prohibited" signals from the PC CPU to the special module. Doing so could erroneously operate the PC system.

[DISPOSAL PRECAUTIONS]

⚠CAUTION
● When disposing of this equipment, handle it as industrial waste.

REVISIONS

* The manual number is given on the bottom right of the front cover.

Print Date	* Manual Number	Revision
Oct.,1994	IB (NA)-68474-A	First edition
Feb.,1999	IB (NA)-68474-B	Addition Safety precautions Partial Correction Section 3.1
Dec.,1999	IB (NA)-68474-C	Partial Correction Chapter 2
Nov.,2001	IB (NA)-68474-D	Partial Correction Contact ad dress (Back cover)
Oct.,2002	IB (NA)-68474-E	Partial Correction Chapter 2, Section 5.2
Sep.,2005	IB (NA)-68474-F	Addition Conformation to the EMC Directive and Low Voltage Instruction Partial Correction SAFETY PRECAUTIONS
Sep.,2006	IB (NA)-68474-G	Partial Correction SAFETY PRECAUTIONS

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CONTENTS

Safety Precautions.....A-1
Revision History.....A-4
Contents.....A-5
About the Manuals.....A-6
1. OVER VIEW 1
2. PERFORMANCE SPECIFICATIONS 1
3. NAMES AND SETTINGS OF EACH PART..... 3
  3.1 Names of each part..... 3
  3.2 Setting the offset and gain..... 6
4. HANDLING 9
  4.1 Precautions for handling..... 9
5. WIRING 10
  5.1 Precautions for wiring..... 10
  5.2 Example of module connection 10
6. OUTLINE DIMENSION DRAWINGS..... 12

About the Manuals

The following manuals are related to this product.
Order them if necessary.

Detailed manuals

Manual Name	Manual No. (Model code)
Analog input/output module type A1S63ADA User's Manual.	IB-66435 (13JE30)

Conformance to the EMC Directive/Low Voltage Directive

When incorporating the Mitsubishi PLC into other machinery or equipment and keeping compliance with the EMC and low voltage directives, refer to Chapter 3, "EMC Directives and Low Voltage Directives" of the User's Manual (Hardware) included with the CPU module or base unit used.
The CE logo is printed on the rating plate on the main body of the PLC that conforms to the EMC directive and low voltage instruction.
By making this product conform to the EMC directive and low voltage instruction, it is not necessary to make those steps individually.

1. Overview

This manual describes specifications, handling and wiring of an A1S63ADA Analog input/output module (hereinafter referred to as the A1S63ADA).

2 PREFORMANCE SPECIFICATIONS

The performance specifications of the A1S63ADA are shown below.

Item			Specifications							
A-D conversion	Analog input		Voltage:-10 to 0 to 10VDC(input resistance: 1MΩ) Current:-20 to 0 to 20mADC(input resistance: 250Ω)							
	Digital output		-4096 to 4095 (when resolution is set to 1/4000) -8192 to 8191 (when resolution is set to 1/8000) -12288 to 12287 (when resolution is set to 1/12000)							
	I/O characteristics *1		Analog input	Digital value output						
				1/4000	1/8000	1/12000				
			10V 5V or 20mA 0V or 4mA -5V or –20mA -10V	4000 2000 0 -2000 -4000	8000 4000 0 -4000 -8000	12000 6000 0 -6000 -12000				
	Max. resolution		Voltage Current	2.5mV 10μA	1.25mV 5μA	0.83mV 3.33μA				
	Conversion speed		———	1ms/ch	2ms/ch	3ms/ch				
	General accuracy*2		± 1%	± 40	± 80	± 120				
	Absolute max. input		Voltage: ± 15V Current: ± 30mA							
	Analog input points		2 channel							
D-A conversion	———		Voltage output				Current output			
	Digital input		-4000 to 4000 (when resolution is set to 1/4000) -8000 to 8000 (when resolution is set to 1/8000) -12000 to 12000 (when resolution is set to 1/12000)				0 to 4000 (when resolution is set to 1/4000) 0 to 8000 (when resolution is set to 1/8000) 0 to 12000 (when resolution is set to 1/12000)			
	Analog output		-10 to 0 to 10VDC(external load resistance:2kΩ to 1MΩ)				0 to 20mADC(external load resistance:0Ω to 600Ω)			
	I/O characteristics *3		1/4000	1/8000	1/12000	Analog output value	1/4000	1/8000	1/12000	Analog output value
			4000 2000 0 -2000 -4000	8000 4000 0 -4000 -8000	12000 6000 0 -6000 -12000	10V 5V 0V -5V -10V	4000 2000 0 — —	8000 4000 0 — —	12000 6000 0 — —	20mA 12mA 4mA — —
	Max. reso-lution	1/4000 1/8000 1/12000	2.5mV 1.25mV 0.83mV				5μA 2.5μA 1.7μA			

<table>
<tr><td colspan="2">Item</td><td colspan="2">Specifications</td></tr>
<tr><td rowspan="6">D-A conversion</td><td></td><td>Voltage output</td><td>Current output</td></tr>
<tr><td>Conversion speed*4</td><td colspan="2">1ms(1/4000) 2ms(1/8000) 3ms(1/12000)</td></tr>
<tr><td>General accuracy*5</td><td>± 1%(± 0.1V)</td><td>± 1%(± 0.2mA)</td></tr>
<tr><td>Solute max. output</td><td colspan="2">Voltage: ± 12V Current: + 28mA</td></tr>
<tr><td>Output shorting protection</td><td colspan="2">Provided</td></tr>
<tr><td>Analog output points</td><td colspan="2">1channel</td></tr>
<tr><td>Common to A-D and D-A conversions</td><td>Isolation specifications</td><td colspan="2"><table>
<tr><td>Specific isolated area</td><td>Isolation method</td><td>Dielectric withstand voltage</td><td>Insulation resistance</td></tr>
<tr><td>Between I/O terminal and PLC power supply</td><td>Photocoupler isolation</td><td>500V AC for 1 minute</td><td>5MΩ or more (measured with a 500V DC insulation resistance tester)</td></tr>
<tr><td>Between channels</td><td>Not isolated</td><td>-</td><td>-</td></tr>
</table></td></tr>
<tr><td colspan="2">Conversion speed in simple loop control*6</td><td colspan="2">4ms(1/4000) 7ms(1/8000) 9ms(1/12000)</td></tr>
<tr><td colspan="2">Number of occupying I/O points</td><td colspan="2">32 points</td></tr>
<tr><td colspan="2">Connection terminal block</td><td colspan="2">20-point terminal block (M3.5 (7 screw)</td></tr>
<tr><td colspan="2">Applicable wire size</td><td colspan="2">0.75 to1.5mm^2</td></tr>
<tr><td colspan="2">Applicable crimp terminal</td><td colspan="2">1.25-3.5 1.25-YS3A 2-3.5 2-YS3A
V1.25-M3 V1.25-YS3A V2-3.5 V2-YS3A</td></tr>
<tr><td colspan="2">Internal current consumption (5 VDC)</td><td colspan="2">0.8A</td></tr>
<tr><td colspan="2">Weight</td><td colspan="2">0.3kg</td></tr>
</table>

The offset and gain are set as shown below as the default setting.

CH1 ... Offset: 0V/4mA, Gain: 5V/20mA
CH2 ... Offset: 0V/4mA, Gain: 5V/20mA
CH3 ... Offset: 0V/4mA, Gain: 10V/20mA

*1: For offset value: 0V/4mA, gain value: 5V/20mA

*2: This is the accuracy in respect to the maximum digital output value. The maximum digital output value is the maximum value at the selected resolution, and is the same for either a current input or voltage input.

*3: For offset value: 0V/4mA, gain value: 10V/20mA

*4: Depending on the timing of reading the digital value from the PLC CPU, the process may be carried out with a delay of up to one conversion processing time. The response time for the amplifier to output the D/A converted data to an external source is "maximum 1ms".

*5: This is the accuracy in respect to the maximum analog output value.

*6: The response time for the amplifier to output the D/A converted data to an external source is "1ms". For the general specifications, refer to the User's Manual for the PLC CPU in use.

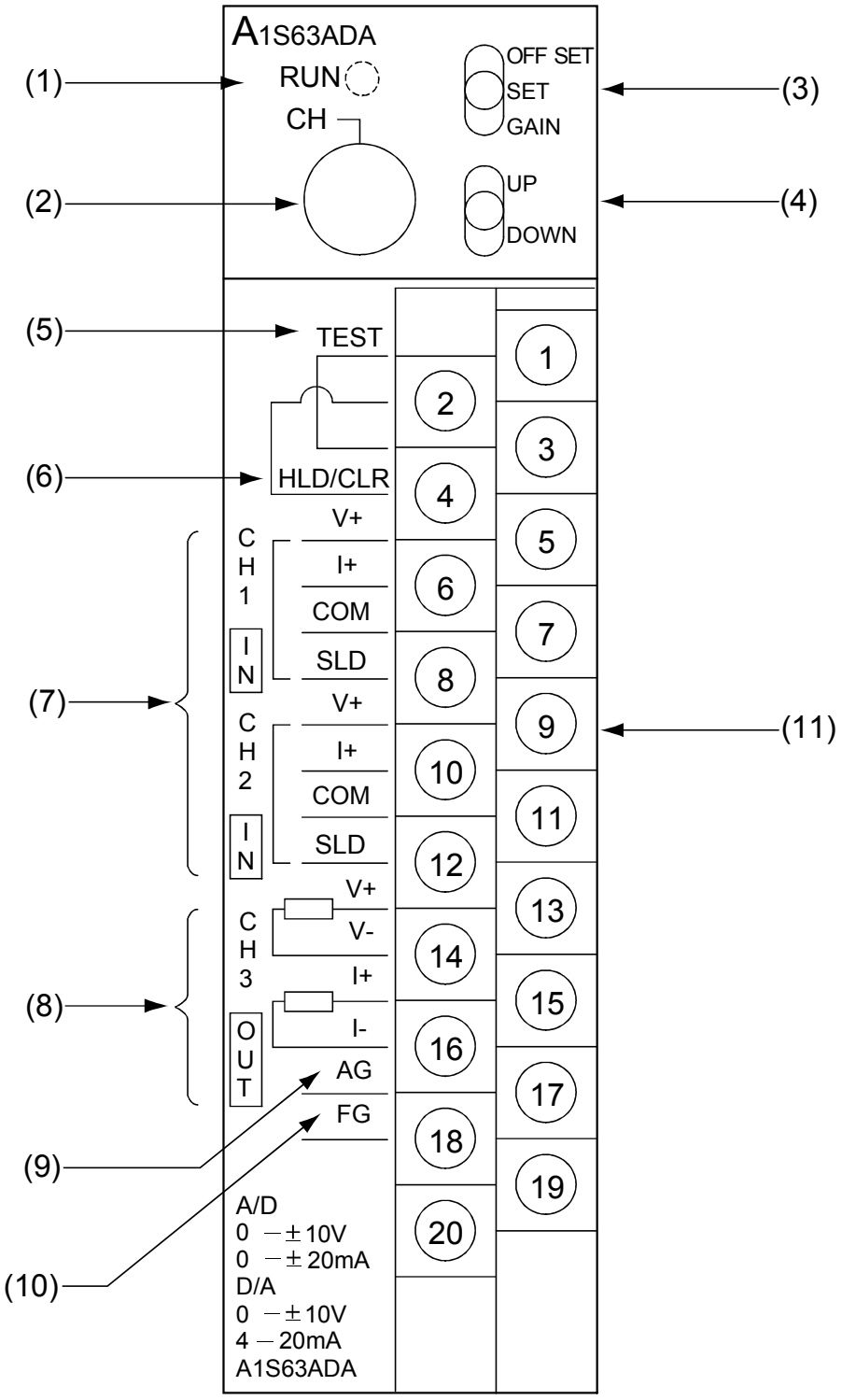
POINT

For approx. 30 minutes after the power is turned ON, the A/D conversion value will fluctuate due to the effect of the self-generated heat.
If this fluctuation is a problem, start control after warming up for approx. 30 minutes. In the same manner, wait approx. 30 minutes to warm up before adjusting the offset/gain value (user-set).

3. NAMES AND SETTINGS OF EACH PART

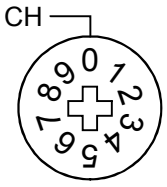
3.1 Names of each part

The names of each part are explained in this section.

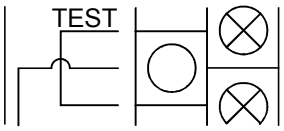
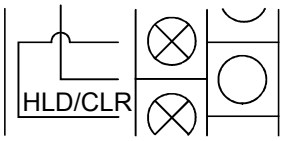
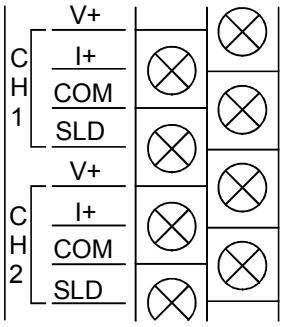
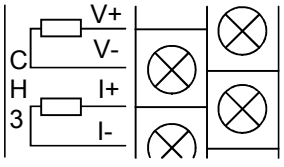


<table>
<tr><th>No.</th><th>Name</th><th>Details</th></tr>
<tr><td>(1)</td><td>RUN LED

RUN</td><td>This indicates the A1S63ADA operation state.
• Normal mode
LED ON: In normal operation
Flickering: Setting data error
LED OFF: 5V power OFF or watch dog timer error
• Test mode
Flickering: The LED flickers at a 0.25 second interval when the offset/gain select switch is set to "OFFSET" or "GAIN". If the CH3 setting value is set above the setting range with the UP/DOWN switch, the LED will flicker at a fast 0.1 second interval.
LED OFF: The offset/gain select switch is set to "SET".</td></tr>
<tr><td>(2)</td><td>Channel, resolution select switch

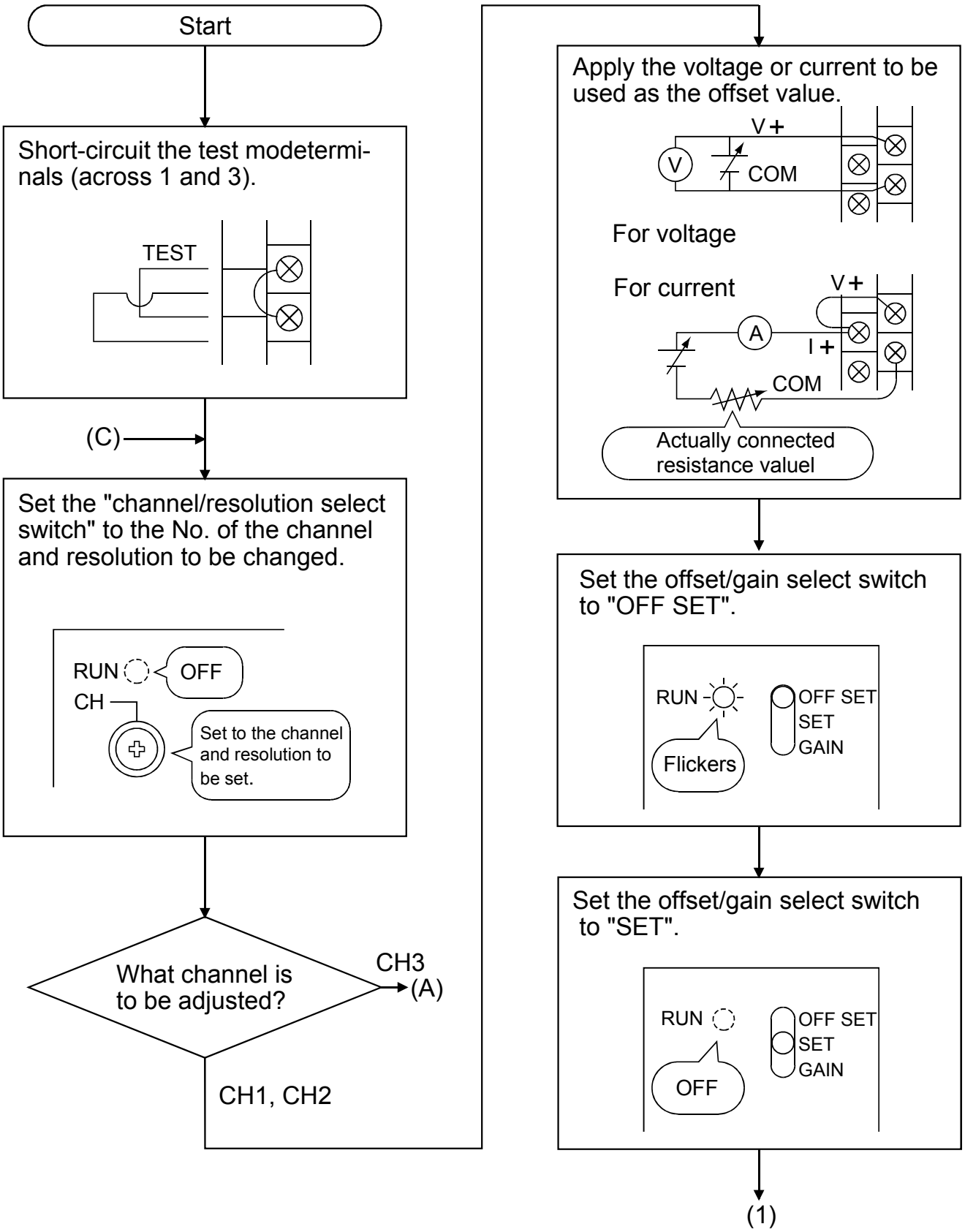
 
</td><td>This sets the channel for adjusting the offset/gain value and the resolution.
• Normal mode: Invalid
• Test mode : Valid
(Factly setting: 0)
<table>
<tr><th>Setting value</th><th>Offset/gain adjustment channel</th><th>Resolution</th></tr>
<tr><td>1</td><td>CH1</td><td rowspan="3">1/14000</td></tr>
<tr><td>2</td><td>CH2</td></tr>
<tr><td>3</td><td>CH3</td></tr>
<tr><td>4</td><td>CH4</td><td rowspan="3">1/8000</td></tr>
<tr><td>5</td><td>CH5</td></tr>
<tr><td>6</td><td>CH6</td></tr>
<tr><td>7</td><td>CH7</td><td rowspan="3">1/12000</td></tr>
<tr><td>8</td><td>CH8</td></tr>
<tr><td>9</td><td>CH9</td></tr>
</table></td></tr>
<tr><td>(3)</td><td>Offset/gain select switch

</td><td>OFFSET position: The offset value is adjusted.
SET position : When moved from OFFSET to SET, the offset value is registered. When moned from GAIN to SET, the gain value is registered.
GAIN position : The gain value is adjusted.</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name</th><th>Details</th></tr>
<tr><td>(4)</td><td>UP/DOWN switch
</td><td>This increments or decrements the CH3 offset value or gain value.
<table>
<tr><th>Time at UP/DOWN position</th><th>Increment/decrement width</th></tr>
<tr><td>Less than 1.5s</td><td>Voltage: approx. 2.5mV
Current: approx. 5μA</td></tr>
<tr><td>1.5s or more</td><td>Voltage: approx. 50mV
Current: approx. 5μA</td></tr>
</table></td></tr>
<tr><td>(5)</td><td>Test mode terminal
 
</td><td>This is used to adjust the offset/gain value and to set the resolution.
• Short-circuit across terminals 1 and 3 ... Test mode
• Open across terminals 1 and 3 ... Normal mode</td></tr>
<tr><td>(6)</td><td>Output hold/clear setting terminal
 
</td><td>This sets the CH3 analog output state when the PLC CPU is stopped.
Open across terminals 2 and 4: The offset value is output when the CPU is stopped (clear)
Short-circuit across terminals 2 and 4: The analog value is output when the CPU is stopped (hold)</td></tr>
<tr><td>(7)</td><td>Analog input terminal(CH1, CH2)
 
</td><td>The CH1 and CH2 analog values (voltage/current) are input.</td></tr>
<tr><td>(8)</td><td>Analog output terminal(CH3)
 
</td><td>The CH3 analog values (voltage/current) is output.</td></tr>
<tr><td>(9)</td><td>Analog ground terminal</td><td>This is the ground terminal for the analog signal.</td></tr>
<tr><td>(10)</td><td>Frame ground terminal</td><td>This is the module's ground terminal.</td></tr>
<tr><td>(11)</td><td>Terminal block</td><td>The numbers in the drawing indicate the terminal No.</td></tr>
</table>

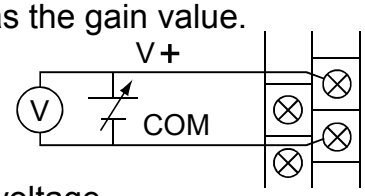
3.2 Setting the offset and gain

Use the following procedure to change the input/output conversion characteristics.



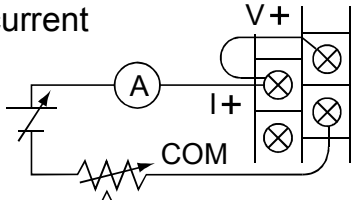
(1)

Apply the voltage or current to be used as the gain value.



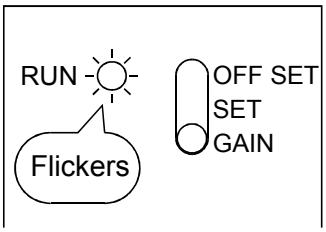
For voltage

For current

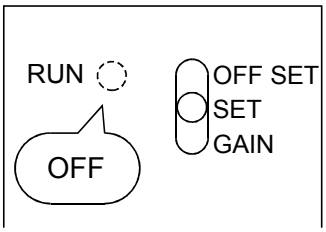


Actually connected resistance value

Set the offset/gain select switch to "GAIN".



Set the offset/gain select switch to "SET".



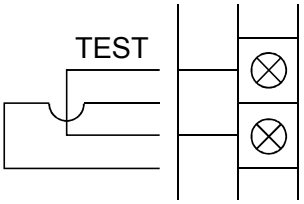
(B)

Adjust other channels?

YES → (C)

NO

Open the test mode terminals (across 1 and 3).



End *

* The state of the RUN LED after the adjustment is shown below.

RUN LED state

ON ... Adjustment was completed normally.

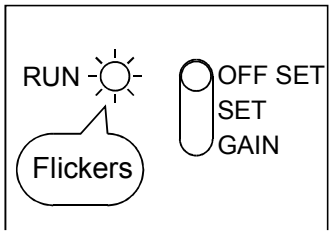
Flicker ... The resolution is not the same for all channels.

↓

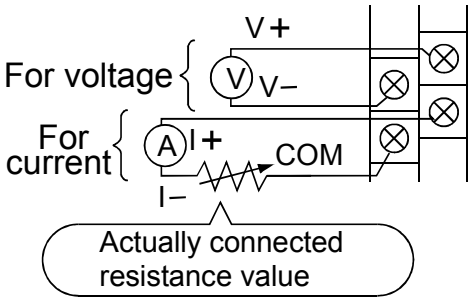
Adjust again.

(A)

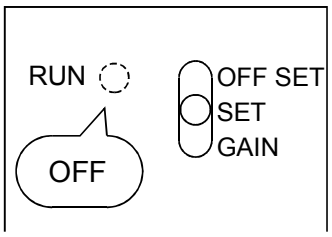
Set the offset/gain select switch to "OFF SET".



Using the "UP/DOWN switch", set the voltage or current to be used as the offset value.



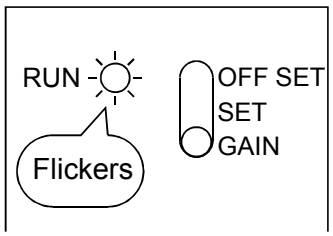
Set the offset/gain select switch to "SET".



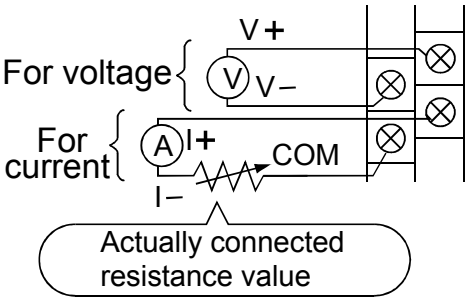
(2)

(2)

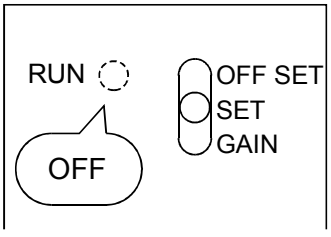
Set the offset/gain select switch to "GAIN"



Using the "UP/DOWN switch", set the voltage or current to be used as the gain value.



Set the offset/gain select switch to "SET".



(B)

Remark

The offset value and gain values are set as follows.

(1) A/D conversion section
  (a) The offset value is the analog input value (voltage or current) at which the digital output value is "0".
  (b) The gain value is the analog input value (voltage or current) at which the digital output value is one of the following.
    1. 2000 (resolution 1/4000)
    2. 4000 (resolution 1/8000)
    3. 6000 (resolution 1/12000)

(2) D/A conversion section
  (a) The offset value is the analog value (voltage or current) output from the A1S63ADA when the digital value is "0".
  (b) The gain value is the analog value (voltage or current) output from the A1S63ADA when the digital value is one of the following.
    1. 4000 (resolution 1/4000)
    2. 8000 (resolution 1/8000)
    3. 12000 (resolution 1/12000)

4. HANDLING

4.1 Precautions for handling

(1) As the body case and terminal block are made of resin, do not drop these or apply strong impacts.
(2) Do not remove the module's PCB from the case. Failure to observe this could lead to faults.
(3) Make sure that foreign matter such as wire scraps do not enter the module from the top while wiring. If any foreign matter enters, remove it.
(4) Tighten the module tightening screws and terminal screws, etc., within the following range.

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

5. WIRING

The precautions for wiring and examples of connecting the module are given in this section.

5.1 Precautions for wiring

One condition for creating a highly reliable system and using the A1S63ADA functions to the fullest is to carry out wiring that is not easily "affected by noise".

Precautions for wiring are given below.

(1) Use separate cables for the alternating current and A1S63ADA analog input, and make sure that the alternating current side is not affected by surge or induction.
(2) Do not wire near or with the main circuit wires, high-voltage wires or load wire other than from the PLC. If laid close together, the wires will be affected by noise, surge and induction.
(3) Ground the shield wire or the shield of the shield cable at one point on the PLC side.
Note that depending on the state of noise from the external source, these should be grounded on the external side.

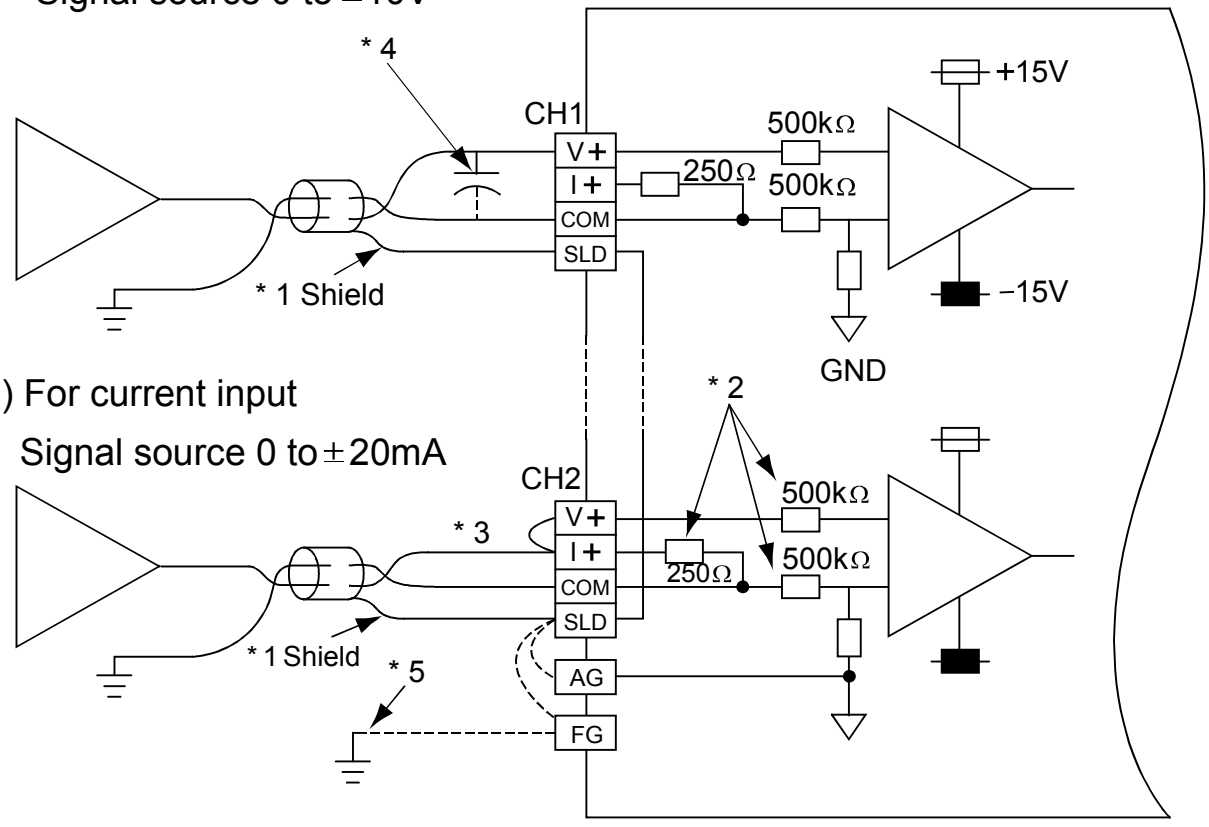
5.2 Example of module connection

The method for wiring the A1S63ADA is shown below.

(1) CH1 and CH2

(a) For voltage input

Signal source 0 to ±10V



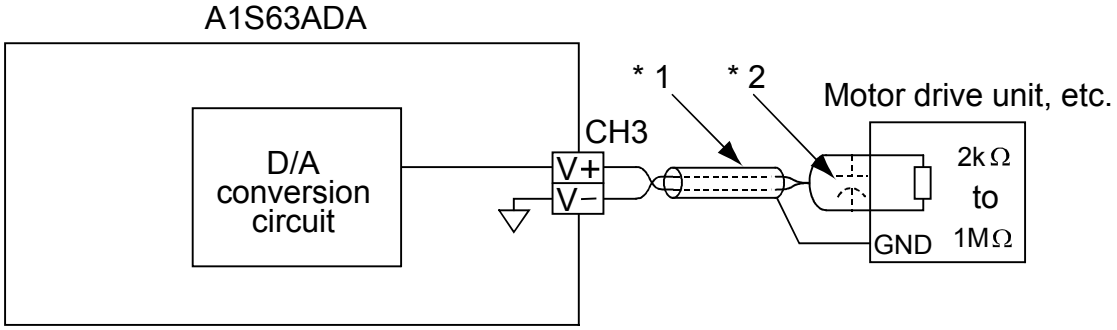
(b) For current input

Signal source 0 to ±20mA

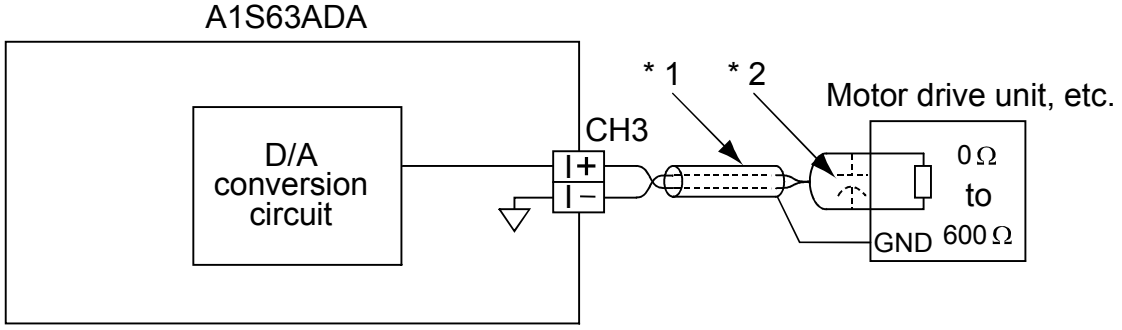
*1: Use a 2-core twisted shield wire for the wire.
*2: This indicates the A1S63ADA input resistance.
*3: When inputting the current, always connect the (V+) and (I+) terminals.
*4: If noise or ripple is generated in the external wire, connect an approx. 0.1 to 0.47μF25WV capacitor between terminal V and COM.
*5: If there are high levels of noise, always ground. There may be cases where the power supply unit FG or main module FG should also be grounded.
If the grounding wire is changed (connected or disconnected) after setting the offset value and gain value, set the offset value and gain value again.

(2) CH3

(a) For voltage output



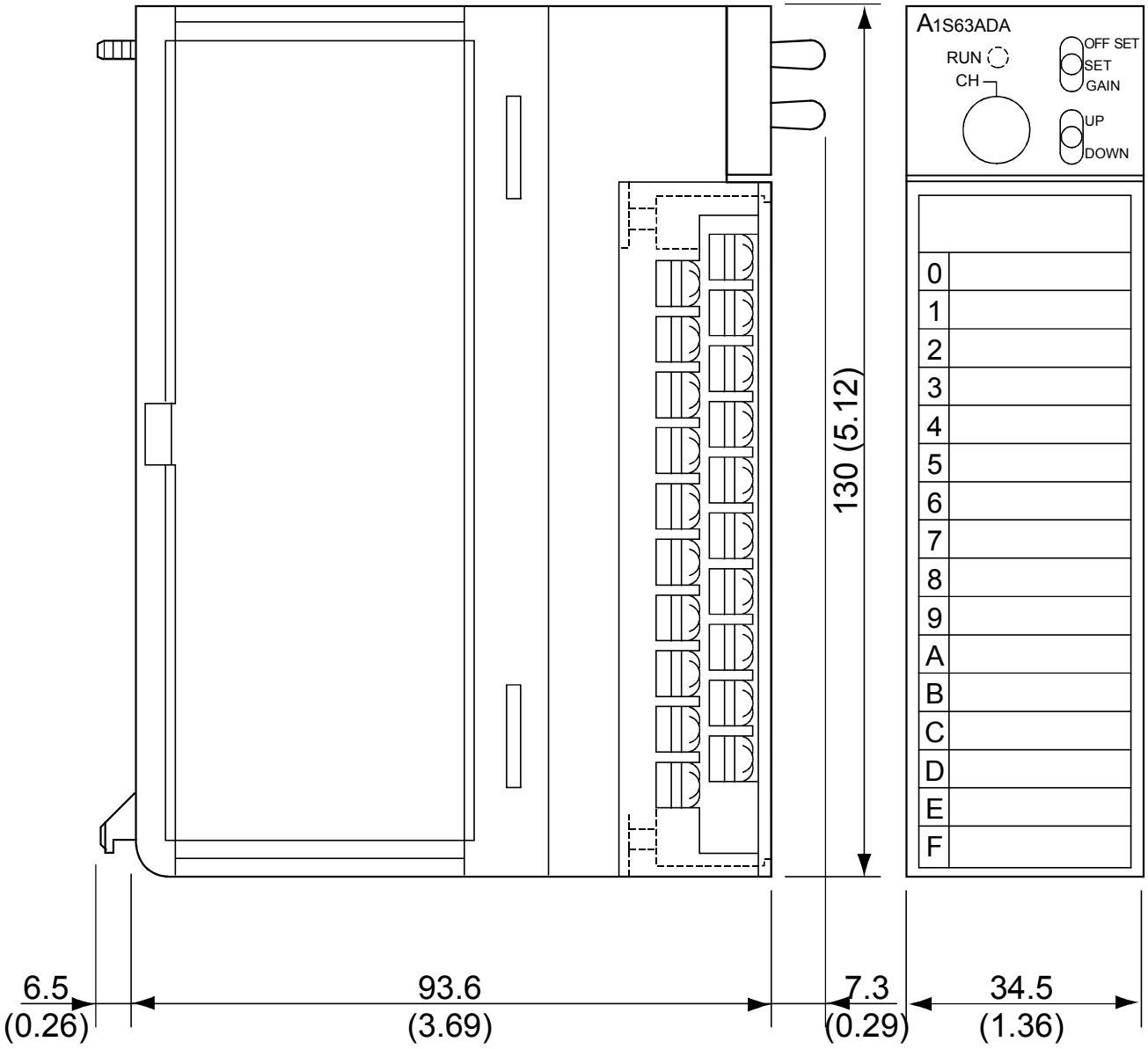
(b) For current output



*1: Use a 2-core twisted shield wire for the wire.
*2: If noise or ripple is generated in the external wiring, connect a 0.1 to 0.47μF capacitor (approximate 25V or more withstand voltage) between the terminal V and COM.

IMPORTANT
The voltage and current output of the same channel cannot be used simultaneously. The internal element will be damaged if used together, so always open the terminals that are not in use.

6. EXTERNAL DIMENSIONS DIAGRAM



Unit: mm(inch)

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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.

⚠For safe use

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi.
- This product has been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

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