

**User Manual**



# **ADAM-6100EI Series**

**EtherNet/IP I/O Modules**

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If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return merchandise authorization) number from your dealer. This allows us to process your return more quickly.
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5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

# Declaration of Conformity

## CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from Advantech. Please contact your local supplier for ordering information.

## FCC Class A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

# Technical Support and Assistance

1. Visit the Advantech web site at [www.advantech.com/support](http://www.advantech.com/support) where you can find the latest information about the product.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
  - Product name and serial number
  - Description of your peripheral attachments
  - Description of your software (OS, version, application software, etc.)
  - A complete description of the problem
  - The exact wording of any error messages

# Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.

Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

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## Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:
  15. The power cord or plug is damaged.
  16. Liquid has penetrated into the equipment.
  17. The equipment has been exposed to moisture.
  18. The equipment does not work well, or you cannot get it to work according to the user's manual.
  19. The equipment has been dropped and damaged.
  20. The equipment has obvious signs of breakage.
21. **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -20° C (-4° F) OR ABOVE 60° C (140° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.**
22. **CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.**
23. The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

**DISCLAIMER:** This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

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# Chapter 1

Overview

## 1.1 Introduction

ADAM-6100EI is a series of EtherNet/IP remote I/O modules. EtherNet/IP protocol is very popular in industrial automation applications and all ADAM-6100EI series modules can comply with it. You can easily connect ADAM-6100EI modules to EtherNet/IP masters, like Allen-Bradley PLC, through EtherNet/IP protocol. ADAM-6100EI series module supports **Initial mode** and **Normal mode (EtherNet/IP mode)**, that you can set by the DIP switch on the side of ADAM module. Refer to Section 1.3.3 for how to configure it. When you configure the mode as **Initial mode**, you can configure ADAM-6100EI module's IP address and related setting by Advantech APAX/ADAM.Net utility. When you configure the mode as **Normal mode**, ADAM-6100EI modules are ready to communicate with EtherNet/IP master by EtherNet/IP protocol.

## 1.2 System Architecture

ADAM-6100EI series modules can be daisy-chained in an Ethernet network, making it easier to deploy, and helping improve scalability. You can refer to the figure below to see how a daisy-chain connection works in the network.



Figure 1.1 ADAM-6100EI Daisy Chain Connections



## 1.3 Features

### 1.3.1 Daisy Chain Connection

ADAM-6100EI module has built in Ethernet switches to allow daisy chain connections in an Ethernet network, making it easier to deploy, and helping improve scalability. The two Ethernet ports are fully compliant with IEEE 802.3u 10/100Mbps through standard RJ-45 connectors.



| Pin | Assignment | Description |
|-----|------------|-------------|
| 1   | TD +       | Transmit +  |
| 2   | TD -       | Transmit -  |
| 3   | RD +       | Receive +   |
| 4   | N/C        | not used    |
| 5   | N/C        | not used    |
| 6   | RD -       | Receive -   |
| 7   | N/C        | not used    |
| 8   | N/C        | not used    |

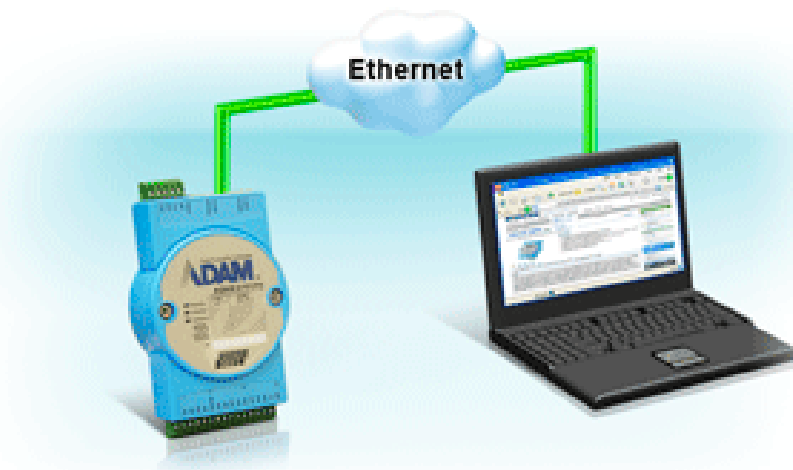
### 1.3.2 2,500V Isolation Protection

With triple isolation, including power supply, input/output, and Ethernet communication, ADAM-6100EI series ensures I/O data to be controlled correctly, and prevents devices from breaking down.



### 1.3.3 Ethernet-based Configuration Tool

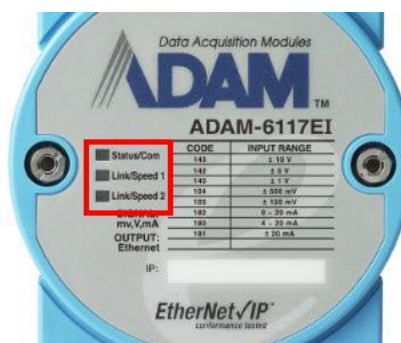
You can configure ADAM-6100EI module as Initial mode or Normal mode by the DIP switch in the side of each module. When ADAM-6100EI module is set as Initial mode, you can use ADAM.Net utility to configure and test the module via Ethernet connection between PC and the module. This can ensure the ADAM-6100EI module is set properly and is working correctly before connecting it to an EtherNet/IP network. When ADAM-6100EI module is set as Normal mode, it can directly communicate with EtherNet/IP master device such as Allen-Bradley PLC by EtherNet/IP protocol.





### 1.3.4 Status LED Indicator

There are 3 LED indicators on the front of the ADAM-6100 module-Status/COM, Link/Speed 1, and Link/Speed 2. The Status/COM LED indicates the status of the module. The Link/Speed LEDs indicate the network connections of Ethernet port 1 and port 2. After power on, if the module is not connected to any network, the Status LED and the COM LED will keep ON. Once the module is connected, the Status LED and COM LED will work according to the table below.



| Status of the module*          |                     |                                       |
|--------------------------------|---------------------|---------------------------------------|
| Mode                           | Status LED (Green)  | COM LED (Orange)                      |
| Init mode (Initial mode)       | ON/OFF flash        | ON during communication               |
| Normal mode (EtherNet/IP mode) | Keep ON             | ON during Communication               |
| Module Error                   | Keep OFF            | ON/OFF flash                          |
| Port Communication             |                     |                                       |
| Mode                           | Link LED (Green)    | Speed LED (Orange)                    |
| Port 1 connected               | Link 1 will keep ON | Speed 1 ON when network speed is 100M |
| Port 2 connected               | Link 2 will keep ON | Speed 2 ON when network speed is 100M |



# Chapter 2

## Product Specifications

## 2.1 Digital I/O Modules

### 2.1.1 Overview

The ADAM-6150EI, ADAM-6151EI and ADAM-6156EI are a series of isolated digital I/O modules which support the EtherNet/IP protocol. According to the channel number difference, you can choose the best digital I/O modules for your application.

- ADAM-6150EI: 8-ch isolated digital input and 7-ch isolated digital output module
- ADAM-6151EI: 16-ch isolated digital input module
- ADAM-6156EI: 16-ch isolated digital output module



Figure 2.1 ADAM-6150EI



Figure 2.2 ADAM-6151EI



Figure 2.3 ADAM-6156EI

### 2.1.2 Specifications

#### Digital Input

- Channels:
  - ADAM-6150EI: 8
  - ADAM-6151EI: 16
- Dry Contact (Switch: ON):
  - Logic level 0: Open
  - Logic level 1: Close to DGND
- Wet Contact (Switch: OFF):
  - Logic level 0:  $0 \sim 3 V_{DC}$  or  $0 \sim -3V_{DC}$
  - Logic level 1:  $10 \sim 30 V_{DC}$  or  $-10 \sim -30 V_{DC}$
- Input Impedance:  $10 k\Omega$
- Transition Time: 0.2 ms

#### Digital Output

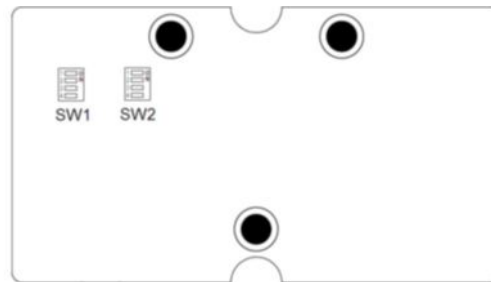
- Channels:
  - ADAM-6150EI: 7
  - ADAM-6156EI: 16
- Output Voltage Range:  $8 \sim 35 V_{DC}$
- Normal Output Current: 100 mA (per channel)
- FSV Safety Function

## General

- Communication: 10/100 Base-T Ethernet
- Supported Protocol: EtherNet/IP
- Power Input: Unregulated 10 ~ 30 V<sub>DC</sub>
- Power Consumption: 2.4 W @ 24 V<sub>DC</sub>
- Power Reversal Protection (30V Max.)
- Operating Humidity: 20 ~ 95% RH (non-condensing)
- Storage Humidity: 0 ~ 95% RH (non-condensing)
- Operating Temperature: -10 ~ 70°C
- Storage Temperature: -20 ~ 80°C

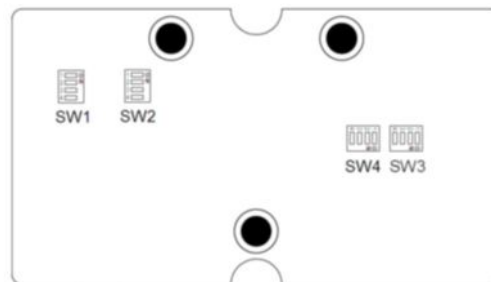
### 2.1.3 Switch Settings

ADAM-6150EI:



| Switch     | SW1                   |     |     |     | SW2 |     |     |     |
|------------|-----------------------|-----|-----|-----|-----|-----|-----|-----|
| Position   | 1                     | 2   | 3   | 4   | 1   | 2   | 3   | 4   |
| DI Channel | Ch3                   | Ch2 | Ch1 | Ch0 | Ch7 | Ch6 | Ch5 | Ch4 |
| ON         | Dry Contact (Default) |     |     |     |     |     |     |     |
| OFF        | Wet contact           |     |     |     |     |     |     |     |

ADAM-6151EI:

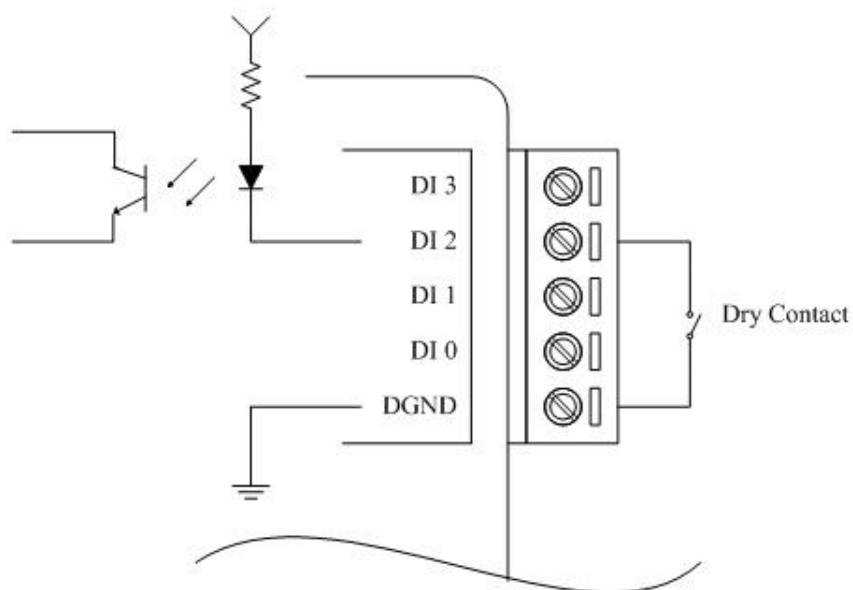


| Switch     | SW1                   |      |     |     | SW2  |      |      |      |
|------------|-----------------------|------|-----|-----|------|------|------|------|
| Position   | 1                     | 2    | 3   | 4   | 1    | 2    | 3    | 4    |
| DI Channel | Ch3                   | Ch2  | Ch1 | Ch0 | Ch7  | Ch6  | Ch5  | Ch4  |
| Switch     | SW3                   |      |     |     | SW4  |      |      |      |
| Position   | 1                     | 2    | 3   | 4   | 1    | 2    | 3    | 4    |
| DI Channel | Ch11                  | Ch10 | Ch9 | Ch8 | Ch15 | Ch14 | Ch13 | Ch12 |
| ON         | Dry Contact (Default) |      |     |     |      |      |      |      |
| OFF        | Wet contact           |      |     |     |      |      |      |      |

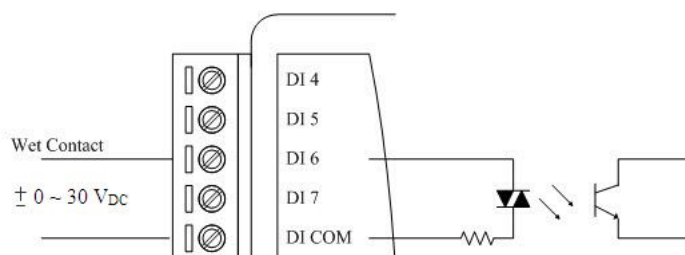


## 2.1.4 Application Wiring

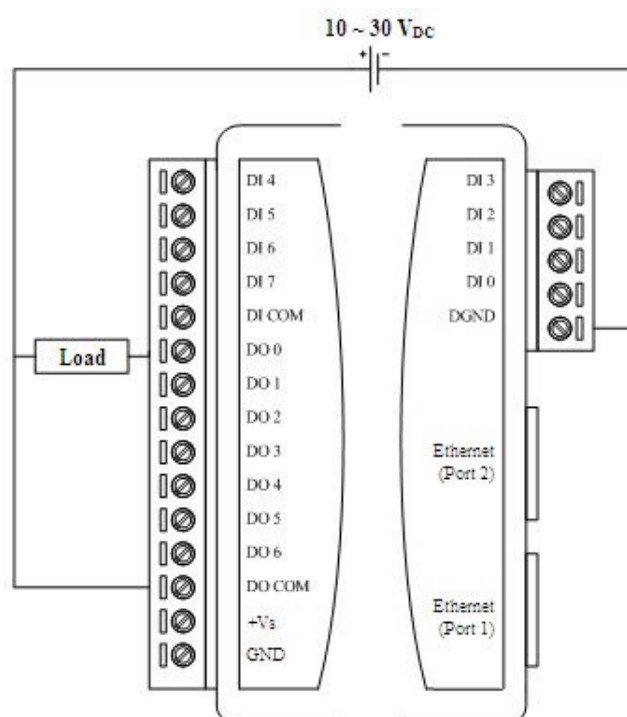
### Isolated Digital Input - Dry Contact



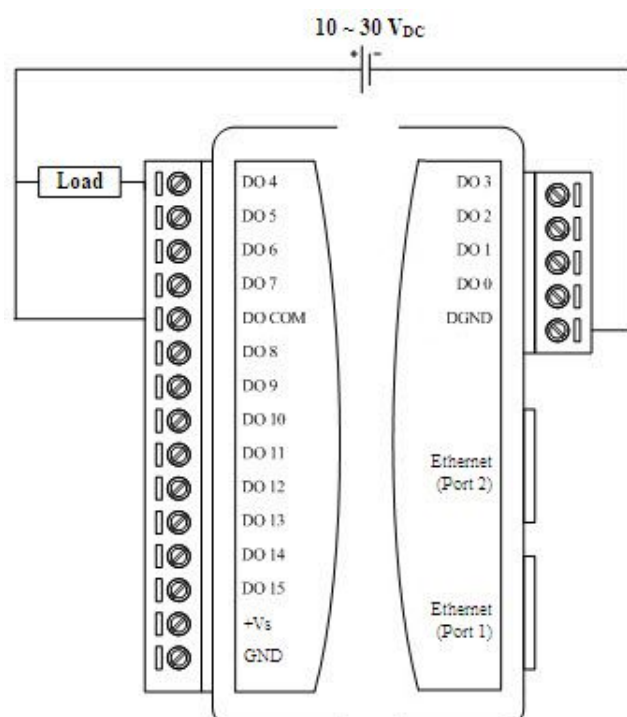
### Isolated Digital Input - Wet Contact



## Isolated Digital Output (ADAM-6150EI)



## Isolated Digital Output (ADAM-6156EI)



## 2.2 Relay Modules

### 2.2.1 Overview

The ADAM-6160EI is a relay module which supports EtherNet/IP protocol. It provides 5 Form C and 1 Form A/B (selectable) relay channels and is excellent for ON/OFF control or low-power switching applications in an EtherNet/IP system.

- ADAM-6160EI: 6-ch Relay Module



Figure 2.4 ADAM-6160EI

### 2.2.2 Specifications

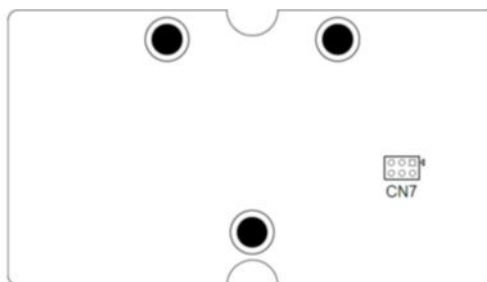
#### Relay

- Channels: 5 Form C and 1 Form A/B (selected by jumper)
- Contact Rating:
  - AC: 250 V @ 5 A
  - DC: 30 V @ 5 A
- Breakdown Voltage:
  - 500 VAC (50/60 Hz)
- Mechanism: 20,000,000 operations
- Relay on time: 7 ms
- Relay off time: 3 ms
- Contact Resistance: 30 mΩ (max.)
- Insulation Resistance: 1 GΩ at 500 V<sub>DC</sub>
- FSV Safety Function

## General

- Communication: 10/100 Base-T Ethernet
- Supported Protocol: EtherNet/IP
- Power Input: Unregulated 10 ~ 30 V<sub>DC</sub>
- Power Consumption: 3.5 W @ 24 V<sub>DC</sub>
- Power Reversal Protection (30V Max.)
- Operating Humidity: 20 ~ 95% RH (non-condensing)
- Storage Humidity: 0 ~ 95% RH (non-condensing)
- Operating Temperature: -10 ~ 70°C
- Storage Temperature: -20 ~ 80°C

### 2.2.3 Jumper Settings



| CN7 | Relay Ch0 Configuration |
|-----|-------------------------|
|     | Normally Open (Default) |
|     | Normally Closed         |

**Note!** Users need to separate two PC boards to set the jumpers of the ADAM-6160EI.



## 2.3 Analog I/O Modules

### 2.3.1 ADAM-6117EI: 8-ch Isolated Analog Input Module

#### 2.3.1.1 Overview

The ADAM-6117EI is a 16-bit, 8-channel isolated analog input module. It accepts millivoltage inputs ( $\pm 150$  mV,  $\pm 500$  mV), voltage inputs ( $\pm 1$  V,  $\pm 5$  V and  $\pm 10$  V) and current input ( $\pm 20$  mA, 0~20 mA, 4~20 mA). Each analog channel can be configured to an individual range for a variety of applications.



Figure 2.5 ADAM-6117EI

#### 2.3.1.2 Specifications

##### Analog Input:

- Channels: 8 (Differential)
- Input Impedance:
  - Voltage:  $>10$  M $\Omega$
  - Current: 120  $\Omega$
- Input Type: V, mV, mA
- Input Range:  $\pm 150$  mV,  $\pm 500$  mV,  $\pm 1$  V,  $\pm 5$  V,  $\pm 10$  V,  $\pm 20$  mA, 0~20 mA, 4~20 mA (different range can be configured for each channel in the utility)
- Accuracy:
  - Voltage:  $\pm 0.1\%$  or better at 25°C
  - Current:  $\pm 0.2\%$  or better at 25°C
- Resolution:

| Voltage      |            | Current     |            |
|--------------|------------|-------------|------------|
| Range        | Resolution | Range       | Resolution |
| $\pm 150$ mV | 16 bit     | $\pm 20$ mA | 15 bit     |
| $\pm 500$ mV | 16 bit     | 0~20 mA     | 14 bit     |
| $\pm 1$ V    | 16 bit     | 4~20 mA     | 14 bit     |
| $\pm 5$ V    | 16 bit     |             |            |
| $\pm 10$ V   | 16 bit     |             |            |

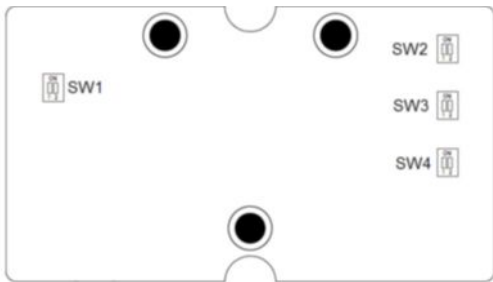
- Sampling Rate: 12 samples/second (total)
- CMR @ 50/60 Hz: 92 dB
- NMR @ 50/60 Hz: 60 dB
- Span Drift:  $\pm 30$  ppm/ $^{\circ}\text{C}$
- Zero Drift:  $\pm 6$   $\mu\text{V}/^{\circ}\text{C}$
- Isolation Voltage: 2,500  $V_{\text{DC}}$
- High Common Mode: up to 200  $V_{\text{DC}}$

**General:**

- Communication: 10/100 Base-T Ethernet
- Supported Protocol: EtherNet/IP
- Power Input: Unregulated 10 ~ 30  $V_{\text{DC}}$
- Power Consumption: 3 W max. @ 24  $V_{\text{DC}}$
- Power Reversal Protection (30V max.)
- Operating Humidity: 20 ~ 95% RH (non-condensing)
- Storage Humidity: 0 ~ 95% RH (non-condensing)
- Operating Temperature:  $-10 \sim 70^{\circ}\text{C}$
- Storage Temperature:  $-20 \sim 80^{\circ}\text{C}$

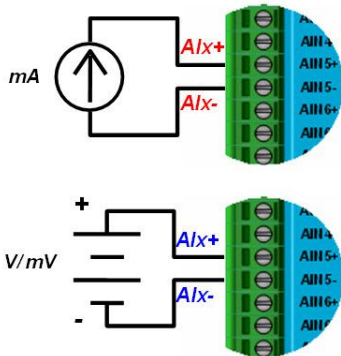
**2.3.1.3 Switch Settings**

SW1~SW4: Set input mode of each AI channel



| Switch   | SW1                    |     | SW2 |     | SW3 |     | SW4 |     |
|----------|------------------------|-----|-----|-----|-----|-----|-----|-----|
| Position | 1                      | 2   | 1   | 2   | 1   | 2   | 1   | 2   |
| Channel  | Ch1                    | Ch0 | Ch3 | Ch2 | Ch5 | Ch4 | Ch7 | Ch6 |
| ON       | Current Mode           |     |     |     |     |     |     |     |
| OFF      | Voltage Mode (Default) |     |     |     |     |     |     |     |

**2.3.1.4 Application Wiring**



## 2.3.2 ADAM-6118EI: 7-ch Thermocouple Input Module

### 2.3.2.1 Overview

The ADAM-6118EI is a 16-bit, 7-channel thermocouple input module that provides programmable input ranges on all channels. It accepts various thermocouple inputs (Types J, K, T, E, R, S, B). It is designed for temperature measurement of several industrial control applications.



Figure 2.6 ADAM-6118EI

### 2.3.2.2 Specifications

#### Analog Input:

- Channels: 7 (Differential)
- Input Impedance:
  - Voltage:  $>10\text{ M}\Omega$
  - Current:  $120\text{ }\Omega$
- Input Type: V, mV, mA, thermocouple
- Temperature Range: Type: J (-210 ~ 1,200°C), Type K (-270 ~ 1,372°C), Type T (-270 ~ 400°C), Type E (-270 ~ 1,000°C), Type R (0 ~ 1,768°C), Type S (0 ~ 1,768°C), Type B (200 ~ 1,820°C)
- Voltage/Current Range:  $\pm 150\text{ mV}$ ,  $\pm 500\text{ mV}$ ,  $\pm 1\text{ V}$ ,  $\pm 5\text{ V}$ ,  $\pm 10\text{ V}$ ,  $\pm 20\text{ mA}$ ,  $0\sim 20\text{ mA}$ ,  $4\sim 20\text{ mA}$  (different ranges can be configured for each channel in the utility)
- Accuracy:
  - Temperature:  $\pm 0.2\%$  or better at 25°C
  - Voltage:  $\pm 0.1\%$  or better at 25°C
  - Current:  $\pm 0.2\%$  or better at 25°C

- Resolution:

| Temperature |            | Voltage |            | Current |            |
|-------------|------------|---------|------------|---------|------------|
| Range       | Resolution | Range   | Resolution | Range   | Resolution |
| Type J      | 14 bit     | ±150 mV | 16 bit     | ±20 mA  | 15 bit     |
| Type K      | 14 bit     | ±500 mV | 16 bit     | 0~20 mA | 14 bit     |
| Type T      | 14 bit     | ±1 V    | 16 bit     | 4~20 mA | 14 bit     |
| Type E      | 14 bit     | ±5 V    | 16 bit     |         |            |
| Type R      | 14 bit     | ±10 V   | 16 bit     |         |            |
| Type S      | 14 bit     |         | 16 bit     |         |            |
| Type B      | 14 bit     |         | 16 bit     |         |            |

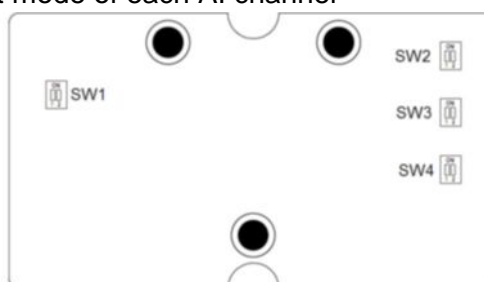
- Sampling Rate: 12 samples/second (total)
- CMR @ 50/60 Hz: 92 dB
- NMR @ 50/60 Hz: 60 dB
- Span Drift: ±25 ppm/°C
- Zero Drift: ±6 µV/°C
- Isolation Voltage: 2,500 V<sub>DC</sub>
- High Common Mode: up to 200 V<sub>DC</sub>

#### General:

- Communication: 10/100 Base-T Ethernet
- Supported Protocol: Ethernet/IP
- Power Input: Unregulated 10 ~ 30 V<sub>DC</sub>
- Power Consumption: 3 W (max.) @ 24 V<sub>DC</sub>
- Power Reversal Protection (30V max.)
- Operating Humidity: 20 ~ 95% RH (non-condensing)
- Storage Humidity: 0 ~ 95% RH (non-condensing)
- Operating Temperature: -10 ~ 70°C
- Storage Temperature: -20 ~ 80°C

### 2.3.2.3 Switch Settings

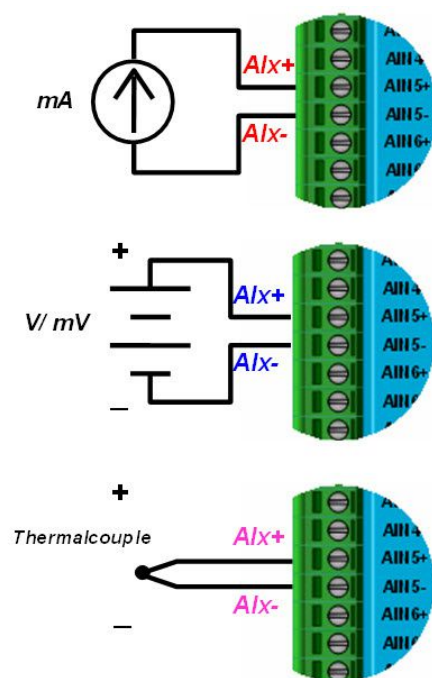
SW1~SW4: Set input mode of each AI channel



| Switch   | SW1                                      |     | SW2 |     | SW3 |     | SW4 |     |
|----------|--|-----|-----|-----|-----|-----|-----|-----|
| Position | 1  | 2   | 1   | 2   | 1   | 2   | 1   | 2   |
| Channel  | Ch1                                      | Ch0 | Ch3 | Ch2 | Ch5 | Ch4 | Ch7 | Ch6 |
| ON       | Current Mode                             |     |     |     |     |     |     |     |
| OFF      | Voltage Mode/Thermocouple Mode (Default) |     |     |     |     |     |     |     |



### 2.3.2.4 Application Wiring





**General:**

- Communication: 10/100 Base-T Ethernet
- Supported Protocol: Ethernet/IP
- Power Input: Unregulated 10 ~ 30 V<sub>DC</sub>
- Power Consumption: 3 W (max.) @ 24 V<sub>DC</sub>
- Power Reversal Protection (30V max.)
- Operating Humidity: 20 ~ 95% RH (non-condensing)
- Storage Humidity: 0 ~ 95% RH (non-condensing)
- Operating Temperature: -10 ~ 70°C
- Storage Temperature: -20 ~ 80°C

