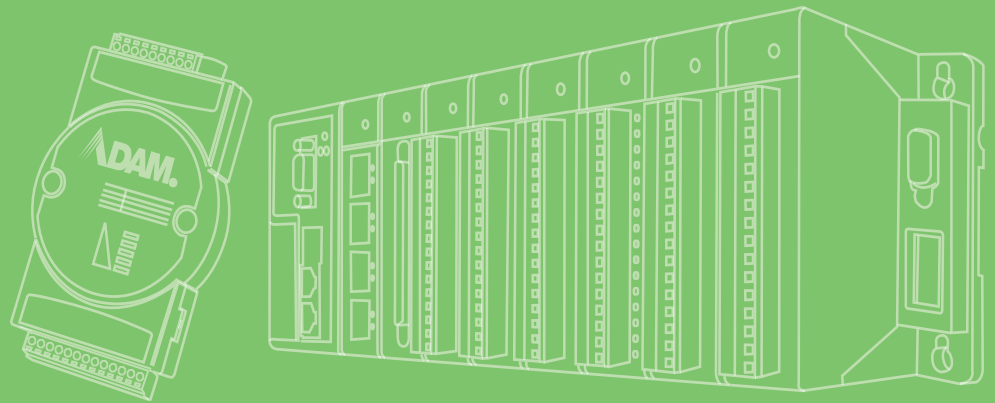# User Manual

AMAX-5000 Series

EtherCAT Slice I/O Modules

ADVANTECH

Enabling an Intelligent Planet

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Product Warranty (2 years)

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

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 merchandize authorization) number from your dealer. This allows us to process your return more quickly.

4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.

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 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.

Safety Instructions

1. Install the system only in area with restricted access.
2. Read these safety instructions carefully.
3. Keep this User Manual for later reference.
4. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
5. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
6. Keep this equipment away from humidity.
7. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
8. The openings on the enclosure are for air convection. Protect the equipment from overheating. DO NOT COVER THE OPENINGS.
9. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
10. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
11. All cautions and warnings on the equipment should be noted.
12. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
13. Never pour any liquid into an opening. This may cause fire or electrical shock.
14. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
15. If one of the following situations arises, get the equipment checked by service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated into the equipment.
    - The equipment has been exposed to moisture.
    - The equipment does not work well, or you cannot get it to work according to the user's manual.
    - The equipment has been dropped and damaged.
    - The equipment has obvious signs of breakage.
16. 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.
17. 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.
18. 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

Introduction

1.1 Introduction to AMAX-5000 slice I/O module

This manual will only introduce the AMAX-5000 series slice I/O modules. To know more about AMAX-5580 controller and AMAX-5400 series extension modules, please download AMAX-5580 user manual from our website.

Advantech provides different I/O modules for various applications. The following table outlines Advantech's supported I/O modules.

Table 1.1: Table 1.1: AMAX-5000 series extension modules		
Module	**Name**	**Specifications**
Power	AMAX-5001	Power Input Module - 24V$_{DC}$ power input for Slice IO* - Abnormal Voltage detection - 4DI / Wet Contact * This should be the first module to start the right hand-side slice IO after AMAX-5580. It can also be added between AMAX-50XX modules to provide extra power.
Analog I/O	AMAX-5015	4-Ch RTD Input module - 2 or 3 wire RTD sensor - Pt100, Pt1000, Balco500, Ni518 - 100Hz sample rate per channel
	AMAX-5017V	6-Ch Voltage Input Module - Voltage Input - 16-bit resolution - 100Hz sample rate per channel
	AMAX-5017C	6-Ch Current Input Module - Current Input - 16-bit resolution - 100Hz sample rate per channel - Support wire burn-out detection
	AMAX-5018	6-Ch Thermocouple Input Module - Support J/K/T/E/R/S/B type - 16-bit resolution - 100Hz sample rate per channel - Support wire burn-out detection
	AMAX-5024	4-Ch Analogue Output Module - Voltage and Current - 16-bit resolution - Fail-safe value output

Digital I/O	AMAX-5051	8-Ch Isolated Digital Input Module - DI Voltage: 10~30V$_{DC}$ - Filter : 3ms
	AMAX-5052	16-Ch Isolated Digital Input Module - DI Voltage: 10~30V$_{DC}$ - Filter: 3ms
	AMAX-5056	8-Ch Isolated Digital Output Module - Sink Type - DO Voltage: 10~30V$_{DC}$
	AMAX-5056SO	8-Ch Isolated Digital Output Module - Source Type - DO Voltage: 10~30V$_{DC}$
	AMAX-5057	16-Ch Isolated Digital Output Module - Sink Type - DO Voltage: 10 ~30V$_{DC}$
	AMAX-5057SO	16-Ch Isolated Digital Output Module - Source Type - DO Voltage: 10~30V$_{DC}$
Counter	AMAX-5080	2-Ch Counter/Encoder Input Module - Counter Range: 32-bit - Mode: Frequency, Counter - Counter Mode: up/down, bi-direction, A/B Phase
Extension/Coupler	AMAX-5074	EtherCAT Bus Coupler - 24V$_{DC}$ power input - 2xRJ45 - Abnormal Voltage detection *This module contains power input function, no need another AMAX-5001 to be the first power supply module
	AMAX-5079	EtherCAT Bus Extension - Extend EtherCAT by RJ45

Chapter 2

Hardware Installation

2.1 Install / Remove the module

AMAX-5000 series has easy-install design to help you install and maintain your modules easily.

2.1.1 Attach on the DIN-rail

Please follow below steps to secure AMAX-5000 modules on the DIN-rail:

1.   Unlock the latches at the bottom of AMAX-5000 module.
2.   Plug in the module each by each from the left to the right.
3.   Make sure the modules are attached on the DIN-rail.
4.   Lock on the latches.
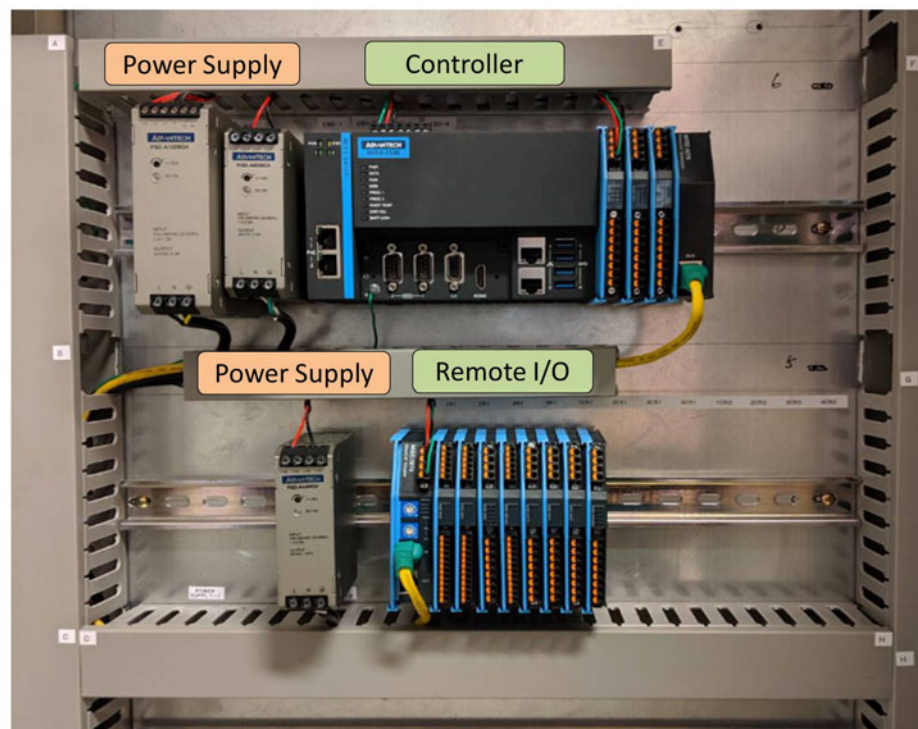
Figure 2.1 AMAX-5000 installed in control cabinet

2.1.2 Remove from the DIN-rail

You can easily detach the module by release the latch at the bottom of the module. Then you can draw out the module without any difficulty.

Figure 2.2 Release the latch to remove the module

Figure 2.3 AMAX-5000 module design

2.2 I/O Wiring

AMAX-5000 I/O modules leverage detachable clamp type terminal blocks. Comparing with traditional screw type terminal blocks, clamp type terminal blocks can save wiring time and provide better reliability for shock and vibration. Follow the procedures below for wiring your AMAX-5000 I/O module.

1. Use the screw driver to press the left notch on the terminal.
2. Insert the wire into the terminal.

Note! *Please use # 14 AWG ~ 28 AWG wire for terminal block.*

Chapter 3

Infrastructure

3.1 AMAX-5001 Smart Power Input Module with 4-ch DI

AMAX-5001 is a smart power input module. It supports dual power input for the external 24V$_{DC}$ power input, and supply maximum 2A current to the EtherCAT bus to empower the IO modules on the right side.

AMAX-5001 has smart diagnostic function to identify the power error on the external power supply and on internal bus. The status can be shown on the LED and on the process data.

Besides power input function, AMAX-5001 also equips 4-ch wet contact DI for user to connect to the system event.

Figure 3.1 AMAX-5001 Module

3.1.1 AMAX-5001 Application

The AMAX-5580 controller does not provide power to the right side EtherCAT bus, so AMAX-5001 must be the first module from the right side to provide independent power to the EtherCAT bus.

In configuration with large number of IO modules, it is possible to use another AMAX-5001 to provide extra 2A to the EtherCAT bus. It supply power to the modules following on the right side, and isolate from the power on the left side. Please refer to the following diagram for the detail.
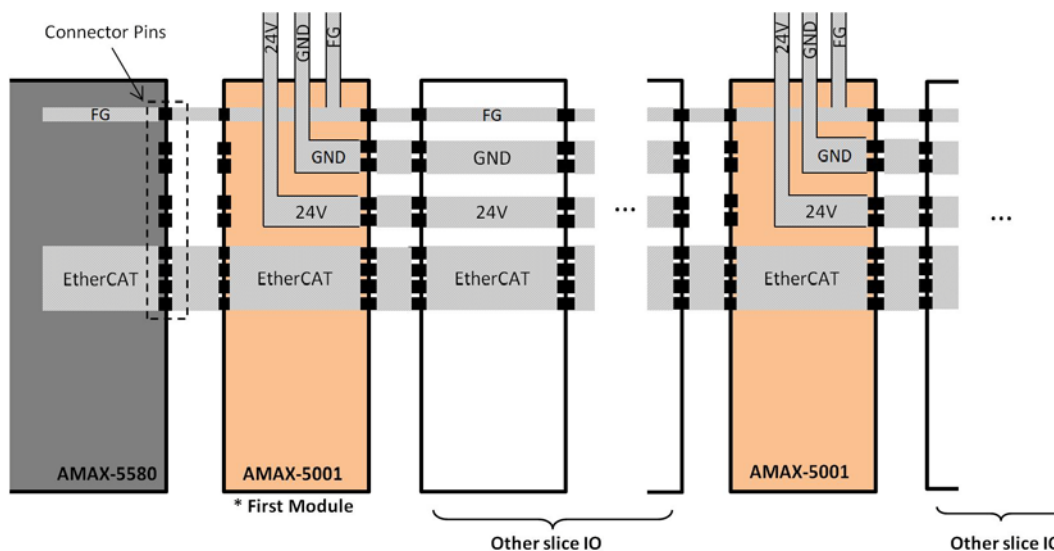
Figure 3.2 AMAX-5001 Application

3.1.2 AMAX-5001 Specification

3.1.2.1 General

- **Certification:** CE, FCC class A
- **Connector:** Pluggable 4P+8P push-in terminal (#24~16 AWG)
- **Enclosure:** PC
- **Power Consumption:** 2W @ 24V$_{DC}$
- **Protocol:** EtherCAT
- **Transmission Rate:** 100Mbps
- **Distributed Clock:** Default not supported
- **LED Indicator:** PWR, RUN, Power Diagnosis LED

3.1.2.2 Power Input

- **Rated Voltage:** 24V$_{DC}$ (±20%)
- **Dual Power Input:** Supported
- **Max Current on Bus:** 2A
- **Diagnosis Function:**
  - Over/under voltage for input 1&2
  - Over current output on bus

3.1.2.3 Digital Input

- **Channels:** 4
- **Digital Input:**
  – Wet Contact:
    Rated voltage: $24V_{DC}$
    Logic level 1: $10\sim30\ V_{DC}$ and $-10\sim-30V_{DC}$
    Logic level 0: $-3\sim3V_{DC}$
- **Input Delay:**
  – From logic 0 to 1: 4ms
  – From logic 1 to 0: 4ms
- **Digital Filter:** 3ms

3.1.2.4 Protection

Isolation Voltage: $2{,}000V_{DC}$

3.1.2.5 Environment

- **Operation Temperature:** -10~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

3.1.3 LED Indicator
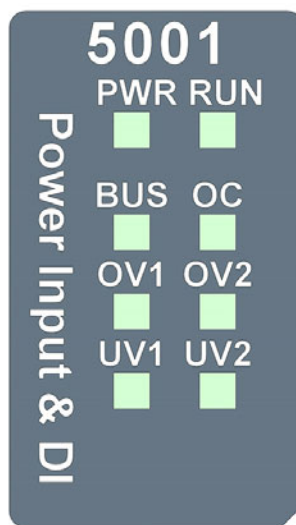
Figure 3.3 AMAX-5001 Module LED Indicator

LED	Color	Indication	Behavior
PWR	Green	ON	Power on
Run	Green	ON	EtherCAT connection
BUS	Green	ON	BUS power on
OC	RED	ON	BUS over current
OV1	RED	ON	Vin1 over voltage (30V)
OV2	RED	ON	Vin2 over voltage (30V)
UV1	RED	ON	Vin1 under voltage (10.7V)
UV2	RED	ON	Vin2 under voltage(10.7V)

Table 3.1: AMAX-5001 Module LED Indicator

3.1.4 Pin Definition
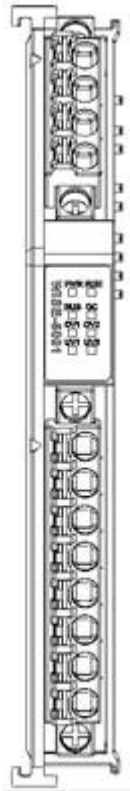
Figure 3.4 AMAX-5001 Module Front View
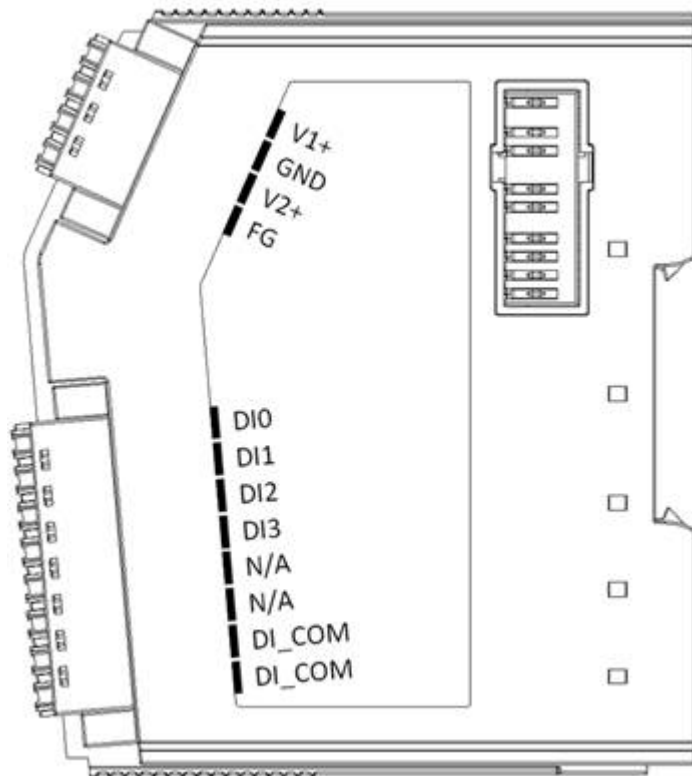
Figure 3.5 AMAX-5001 Module Side View

Table 3.2: Upper 4 Pin Connector	
Pin Number	Pin Definition
1	V1+
2	GND
3	V2+
4	FG

Table 3.3: Lower 8 Pin Connector	
Pin Number	Pin Definition
1	DI0
2	DI1
3	DI2
4	DI3
5	N/A
6	N/A
7	DI_COM
8	DI_COM

3.1.5 Application Wiring
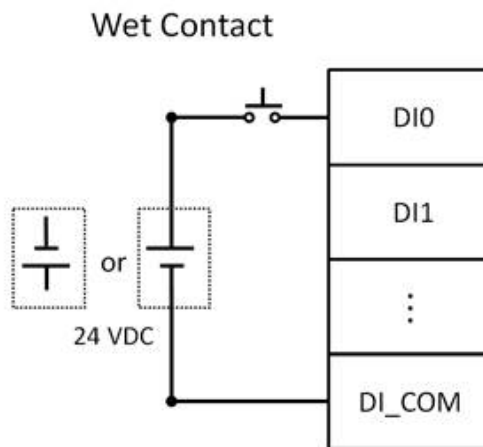
Figure 3.6 Wiring for AMAX-5001 Digital Input
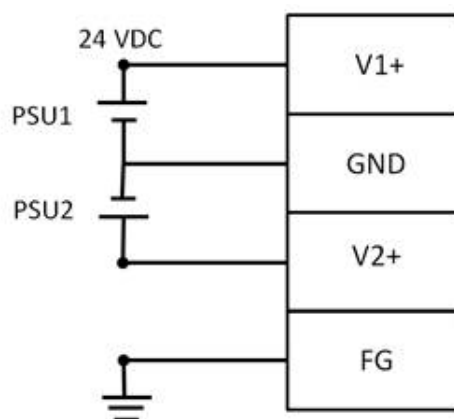
Figure 3.7 Wiring for AMAX-5001 Power Input

3.1.6 Object Description and Parameterization

3.1.6.1 Status of Power Supply (0x6000-0x6FFF)

Table 3.4: Status of Power Supply (0x6000-0x6FFF)					
Index (hex)	Name	Meaning	Data type	Flags	Default value
6000:01	Over_Voltage_1	Voltage 1 > 28.8V (24*1.2)	UINT	RO	0x00
6000:02	Under_Voltage_1	Voltage 1 < 19.2V (24*0.8)	UINT	RO	0x00
6000:03	Over_Voltage_2	Voltage 2 > 28.8V (24*1.2)	UINT	RO	0x00
6000:04	Under_Voltage_2	Voltage 2 < 19.2V (24*0.8)	UINT	RO	0x00
6000:05	Over_Current	Current > 2A	UINT	RO	0x00
6000:06	DI0	The digital input channel 0	UINT	RO	0x00
6000:07	DI1	The digital input channel 1	UINT	RO	0x00
6000:08	DI2	The digital input channel 2	UINT	RO	0x00
6000:09	DI3	The digital input channel 3	UINT	RO	0x00
6000:11	Voltage_1	The value of the Voltage 1	REAL	RO	0x00
6000:12	Voltage_2	The value of the Voltage 2	REAL	RO	0x00
6000:13	Current	The value of the Current	REAL	RO	0x00

3.2 AMAX-5074 EtherCAT Coupler with ID Switch

The AMAX-5074 is an EtherCAT coupler that connects remote EtherCAT slave IO modules to the EtherCAT fieldbus through RJ-45 LAN port, it supports three main topologies: Ring, Line, and Star.

It is also the power input module supporting 24 VDC dual input for maximum 2A current, provides power for the modules which are connected next to the AMAX-5074.

Figure 3.8 AMAX-5074 Module

3.2.1 AMAX-5074 Specification

3.2.1.1 General

- **Certification:** CE, FCC class A
- **Connector':** Pluggable 4P push-in terminal (#24~16 AWG) and 2x RJ45
- **Enclosure:** PC
- **Power Consumption:** 2.5W @ 24V_{DC}
- **Protocol:** EtherCAT
- **Transmission Rate:** 100Mbps
- **Distributed Clock:** Default not supported
- **LED Indicator:** PWR, RUN, Power Diagnosis LED

3.2.1.2 Power Input

- **Rated Voltage:** 24VDC (±20%)
- **Dual Power Input:** Supported
- **Max Current on Bus:** 2A
- **Diagnosis Function:**
  - Over/under voltage for input 1&2
  - Over current output on bus
- **Over Voltage LED Alarm:** Around 28.8V
- **Over Voltage Shutdown:** Around 36V
- **Under Voltage LED Alarm:** Around 19.2V
- **Under Voltage Shutdown:** Around 9V

3.2.1.3 EtherCAT Coupler

- **Function:** Coupling EtherCAT IO modules to 100BASETX EtherCAT network
- **Cable:** Ethernet/EtherCAT cable (min. Cat. 5), shielded
- **Distance between stations:** Max. 100 m (100BASETX)
- **Number of configurable IDs:** 256 (2 x 16-bit ID switch)
- **Bus Interface:** 2 x RJ45 (1 x Input, 1 x Output)

3.2.1.4 Environment

- **Operation Temperature:** -10~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

3.2.2 LED Indicator

Figure 3.9 AMAX-5074 Module LED Indicator

Table 3.5: AMAX-5074 Module LED Indicator			
LED	**Color**	**Indication**	**Behavior**
PW	Green	ON	Power on
Run	Green	ON	EtherCAT connection
BUS	Green	ON	BUS power on
OC	RED	ON	BUS over current 2A
OV1	RED	ON	Vin1 over voltage (28.8V)
OV2	RED	ON	Vin2 over voltage(28.8V)
UV1	RED	ON	Vin1 under voltage (19.2V)
UV2	RED	ON	Vin2 under voltage(19.2V)

3.2.3 ID Switch
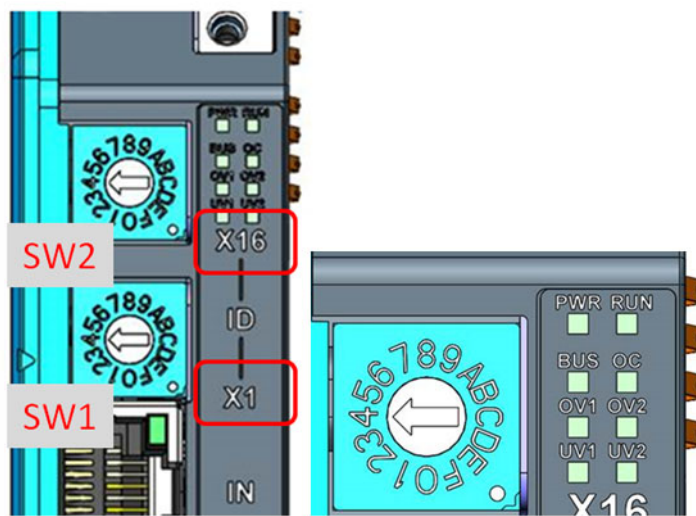
Figure 3.10 AMAX-5074 ID Switch

Table 3.6: AMAX-5074 ID Switch		
Switch Number	**Multiple**	**Range (HEX)**
SW1	X1	0~F
SW2	X16	0~F
Example	(SW2, SW1) = (4, C), then ID = 4 x16 + C x1 = 76	

3.2.4   Pin Definition
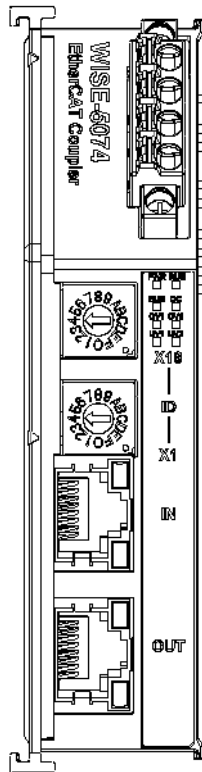
Figure 3.11 AMAX-5074 Module Front View
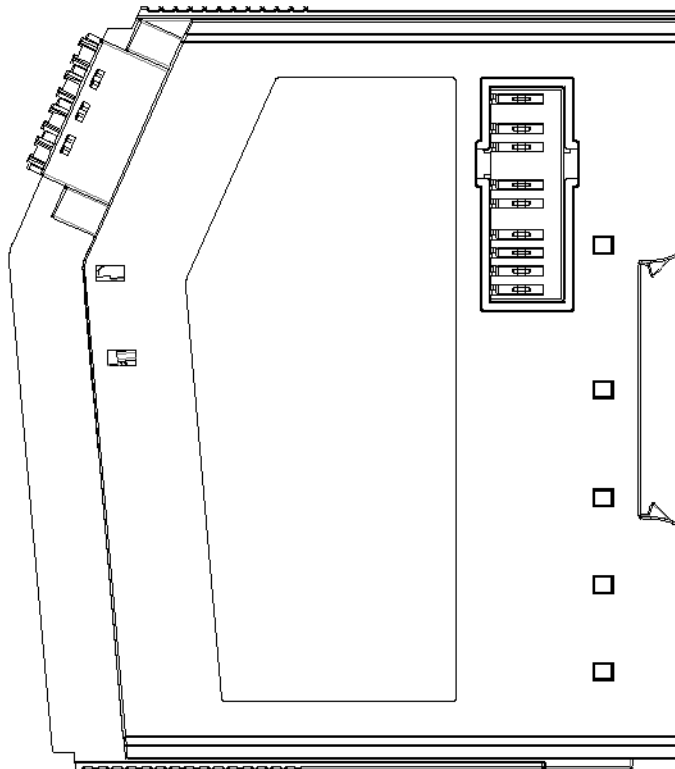
Figure 3.12 AMAX-5074 Module Side View

Table 3.7: Upper 4 Pin Connector

Pin Number	Pin Definition
1	V1+
2	GND
3	V2+
4	FG

Table 3.8: Lower 2 LAN Port

LAN Number	LAN Definition
1	EtherCAT signal input
2	EtherCAT signal output

3.2.5 Application Wiring
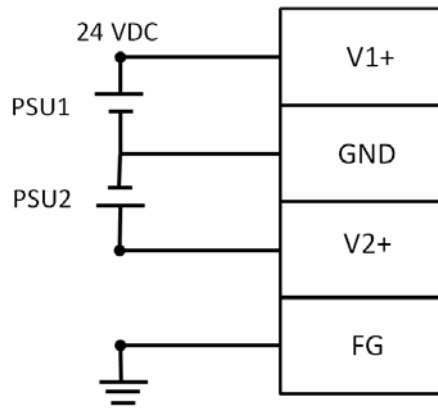
Figure 3.13 Wiring for AMAX-5074 Power Input

3.2.6 Object Description and Parameterization

Status of Power Supply (0x6000-0x6FFF)

Table 3.9: Status of Power Supply (0x6000-0x6FFF)

Index (hex)	Name	Meaning	Data type	Flags	Default value
6000:01	Over_Voltage_1	Voltage 1 > 28.8V (24*1.2)	UINT	RO	0x00
6000:02	Under_Voltage_1	Voltage 1 < 19.2V (24*0.8)	UINT	RO	0x00
6000:03	Over_Voltage_2	Voltage 2 > 28.8V (24*1.2)	UINT	RO	0x00
6000:04	Under_Voltage_2	Voltage 2 < 19.2V (24*0.8)	UINT	RO	0x00
6000:05	Over_Current	Current > 2A	UINT	RO	0x00
6000:06	Device_ID	ID Switch	UINT	RO	0x00
6000:11	Voltage_1	The value of the Voltage 1	FLOAT	RO	0x00
6000:12	Voltage_2	The value of the Voltage 2	FLOAT	RO	0x00
6000:13	Current	The value of the Current	FLOAT	RO	0x00

3.3 AMAX-5079 EtherCAT Extension

The AMAX-5079 is an extension module converting EtherCAT bus to 100BASE-TX Ethernet through RJ-45 LAN port which can be connected to AMAX-5074 EtherCAT coupler or any EtherCAT devices to extend EtherCAT network. AMAX-5079 should be installed at the end of the EtherCAT terminal and the maximum extension distance is 100m.

Figure 3.14 AMAX-5079 Module

3.3.1 AMAX-5079 Specification

3.3.1.1 General:

- ■ **Certification:** CE, FCC class A
- ■ **Connector':** 1 x RJ45
- ■ **Enclosure:** PC
- ■ **Power Consumption:** N/A
- ■ **Protocol:** EtherCAT
- ■ **Transmission Rate:** 100Mbps
- ■ **LED Indicator:** N/A

3.3.1.2 EtherCAT Extension

- **Function:** Conversion of EtherCAT to 100BASE-TX Ethernet for extension of the EtherCAT network
- **Cable:** Ethernet/EtherCAT cable (min. Cat. 5), shielded
- **Distance between stations:** Max. 100 m (100BASETX)
- **Bus Interface:** 1 x RJ45
- **Power from bus:** N/A

3.3.1.3 Environment

- **Operation Temperature:** -10~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

3.3.2 Pin Definition
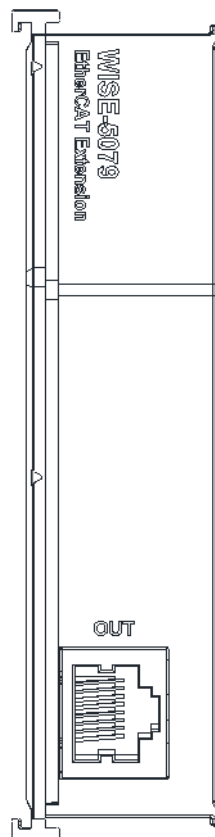
Figure 3.15 AMAX-5079 Module Front View
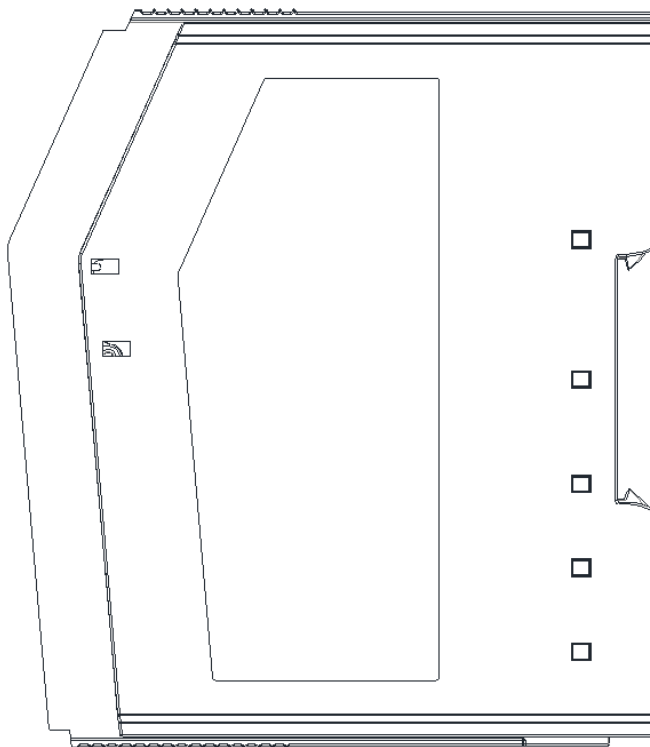
Figure 3.16 AMAX-5079 Module Side View

Table 3.10: LAN Port	
LAN Number	**LAN Definition**
1	EtherCAT signal output

Chapter 4

Analog Input/Output Modules

4.1 AMAX-5015 4-ch RTD Input Module

The AMAX-5015 is a 16-bit, 4-channel RTD input module that features programmable input ranges on all channels. This module is an extremely cost-effective solution for industrial measurement and monitoring applications. Its opto-isolated inputs provide 2,000 VDC of isolation between the analog input and the module, protecting the module and peripherals from damage due to high input line voltage.

Figure 4.1 AMAX-5015 Module

4.1.1 AMAX-5015 Specification

4.1.1.1 General

- **Certification:** CE, FCC class A
- **Connector:** Pluggable 4P+8P push-in terminal (#24~16 AWG)
- **Enclosure:** PC
- **Power Consumption:** 2W @ 24VDC
- **Protocol:** EtherCAT
- **Transmission Rate:** 100Mbps
- **Distributed Clock:** Default not supported
- **LED Indicator:** PWR, RUN

4.1.1.2 Analog Output

- **Channel:** 4
- **Input Connection:** 2 or 3 wire
- **Temperature Range:**
    - **Pt 100 RTD:**
        Pt -50°C to 150°C
        Pt 0°C to 100°C
        Pt 0°C to 200°C
        Pt 0°C to 400°C
        Pt -200°C to 200°C IEC RTD 100 ohms
        (a = 0.00385)
        JIS RTD 100 ohms
        (a = 0.00392)
    - **Pt 1000 RTD:**
        Pt -40°C to 160°C
    - **Balco 500 RTD:**
        -30°C to 120°C
        Ni 518 RTD:
        -80°C to 100°C
        0°C to 100°C
- **Resolution:** 16 bit with ±0.1% FSR accuracy
- **Sample Rate:** 100 sample/s (per channel)
- **Burn-out detection:** Yes

4.1.1.3 Protection

- **Isolation Voltage:** 2000V$_{DC}$

4.1.1.4 Environment

- **Operation Temperature:** -10~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

4.1.2 LED Indicator
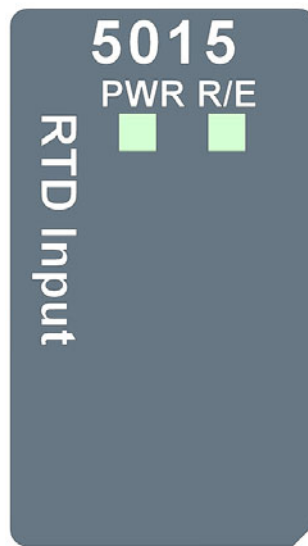
Figure 4.2 AMAX-5015 Module LED Indicator

Table 4.1: AMAX-5015 Module LED Indicator			
LED	**Color**	**Indication**	**Behavior**
Power	Green	ON	Power on
	Yellow	ON	Locating Module
Run/Error	Green	ON	EtherCAT Connected
		Blink	EtherCAT Connecting
		OFF	EtherCAT Abnormal
	RED	ON/Blink	System Abnormal
		OFF	No Error

4.1.3 Pin Definition
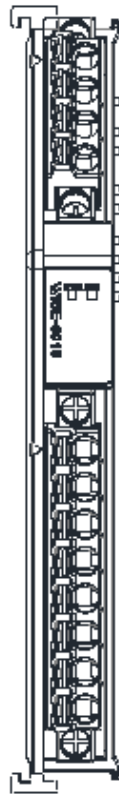
Figure 4.3 AMAX-5015 Module Front View
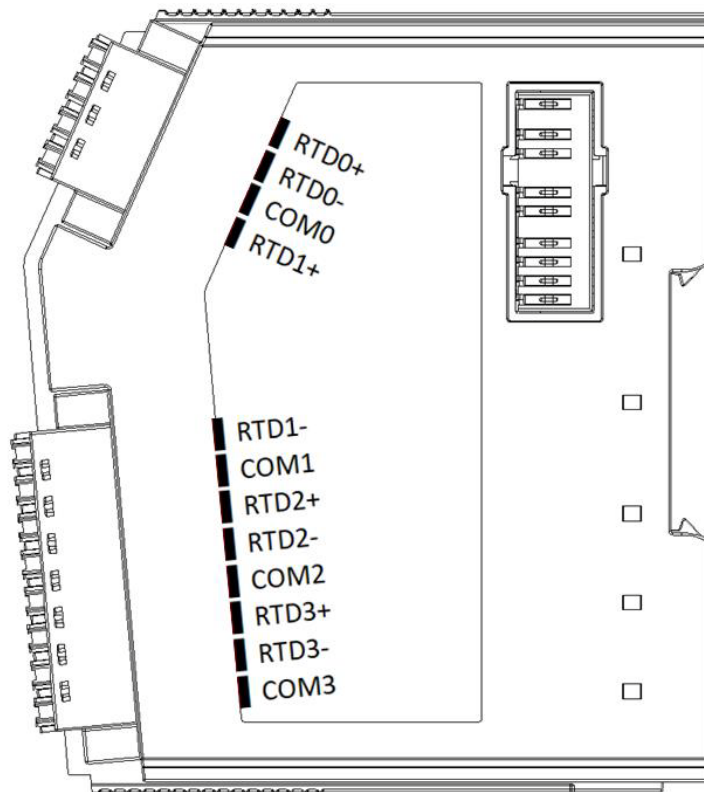
Figure 4.4 AMAX-5015 Module Side View

Table 4.2: Upper 4 Pin Connector	
Pin Number	**Pin Definition**
1	RTD0+
2	RTD0-
3	COM0
4	RTD1+

Table 4.3: Lower 8 Pin Connector	
Pin Number	**Pin Definition**
1	RTD1-
2	COM1
3	RTD2+
4	RTD2-
5	COM2
6	RTD3+
7	RTD3-
8	COM3

4.1.4 Application Wiring

Figure 4.5 Wiring for AMAX-5015

4.1.5 Object Description and Parameterization

4.1.5.1 Input Data of the Module (0x6000 - 0x6FFF)

Index (hex)	Name	Meaning	Data type	Flags	Default value
Table 4.4: Input Data of the Module (0x6000 - 0x6FFF)					
60n0:01	AIn_BurnOut	Detect whether the input circuit open	BOOL	RO	0x00
60n0:02	AIn_OverRange	Detect whether the input Ohm is under	BOOL	RO	0x00
60n0:03	AIn_UnderRange	Detect whether the input Ohm is over	BOOL	RO	0x00
60n0:17	AIn_Raw	Analog input value (raw data)	UINT	RO	0x00
60n0:19	AIn_Scale	Analog input value (RTD data) (round off to the 1st decimal place) (decimal point not display)	DINT	RO	0x00

(n=0 for Ch0 to n=3 for Ch3)

4.1.5.2 Configuration Data of the Module (0x8000 - 0x8FFF)

Index (hex)	Name	Meaning	Data type	Flags	Default value
Table 4.5: Configuration Data of the Module (0x8000 - 0x8FFF)					
80n0:01	AIn_EnBurnOut	Enable burn out for ch#n	BOOL	RW	1
80n0:17	AIn_Range	Type of ch#n	DT0800EN16 (16 bits)	RW	932 (Pt100(385) - 50~150 'C)
80n0:20	AIn_BurnOutValue	Enable burn out for ch#n	DT0802EN16 (16 bits)	RW	1 (up scale)

4.1.5.3 Enums (0x0800 - 0xFFF)

Table 4.6: Range (DT0800EN16) Enums

Index (hex)	Name	Item Name	Default value
0x0800	DT0800EN16(Range)	Pt-100 (385) -50~150 °C	932
		Pt-100 (385) 0~100 °C	933
		Pt-100 (385) 0~200 °C	934
		Pt-100 (385) 0~400 °C	935
		Pt-100 (385) -200~200 °C	930
		Pt-100 (392) -50~150 °C	964
		Pt-100 (392) 0~100 °C	965
		Pt-100 (392) 0~200 °C	966
		Pt-100 (392) 0~400 °C	967
		Pt-100 (392) -200~200 °C	962
		Pt-1000 (385) -40~160 °C	994
		Balco (500) -30~120 °C	768
		Ni (518) -80~100 °C	800
		Ni (518) 0~100 °C	801

Table 4.7: Range (DT0802EN16) Enums

Index (hex)	Name	Item Name	Default value
0x0802	DT0802EN16 (Burn Out Value)	Down scale	0
		Up scale	1

4.1.5.4 Configuration of the Module (0xF600 - 0xFFFF)

Table 4.8: Configuration of the Module (0xF600 - 0xFFFF)

Index (hex)	Name	Meaning	Data type	Flags	Default value
F600:01	LocateModule	Turn on/off Locate LED	BOOL	RW	0
F600:17	AI_SamplingRate	The sampling rate of the module (total channel)	DT0801EN16	RW	0 (10Hz)

4.1.5.5 Enums (0x0800 - 0xFFF)

Table 4.9: Burn Out Value (DT0802EN16) Enums

Index (hex)	Name	Item Name	Default value
0x0801	DT0802EN16 (Burn Out Value)	10Hz	0
		400Hz	1

4.2   AMAX-5017C 6-ch Current Input Module

The AMAX-5017C is a 16-bit, 6-channel differential current input module that provides programmable input ranges on all channels, and different channels can be configured using different ranges. You can also use CODESYS to configure range type for each channel. This module is an extremely cost-effective solution for industrial measurement and monitoring applications. The module provides $2000V_{DC}$ optical isolation between channels. If any high voltage or current damage the channels, the whole system (other modules and control unit) won't be affected cause it is already isolated.

Figure 4.6 AMAX-5017C Module

4.2.1 AMAX-5017C Specification

4.2.1.1 General
- **Certification:** CE, FCC class A
- **Protocol:** EtherCAT
- **Baud Rate:** 100M bps

4.2.1.2 Analog Output
- **Channel:** 6 (Differential)
- **Input Impedance:** Current: 120 Ω
- **Input Type:** mA
- **Voltage/Current Range:** ±20 mA, 0 ~ 20 mA, 4 ~ 20 mA
- **Accuracy:** ±0.2% or better of Full Scale Range(Current)
- **Span Drift:** 6 ppm/°C
- **Resolution:** 16-bit
- **Sampling Rate:** 100 sample/s (per channel)

4.2.1.3 Protection
- **Isolation Voltage:** 2000V$_{DC}$

4.2.1.4 Environment
- **Operation Temperature:** -10~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Operating Humidity:** 20 ~ 95% RH (non-condense)
- **Storage Humidity:** 0 ~ 95% RH (non-condense)

4.2.2 LED Indicator
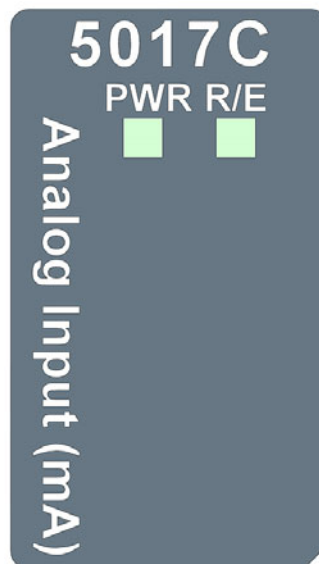
Figure 4.7 AMAX-5017C Module LED Indicator

Table 4.10: AMAX-5017C Module LED Indicator			
LED	**Color**	**Indication**	**Behavior**
Power	Green	ON	Power on
	Yellow	ON	Locating Module
Run/Error	Green	ON	EtherCAT Connected
		Blink	EtherCAT Connecting
		OFF	EtherCAT Abnormal
	RED	ON/Blink	System Abnormal
		OFF	No Error

4.2.3 Pin Definition
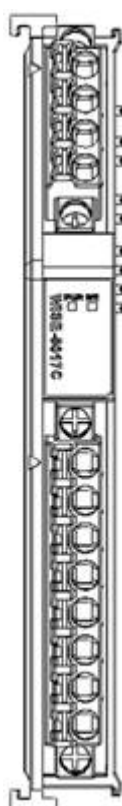
Figure 4.8 AMAX-5017C Module Front View
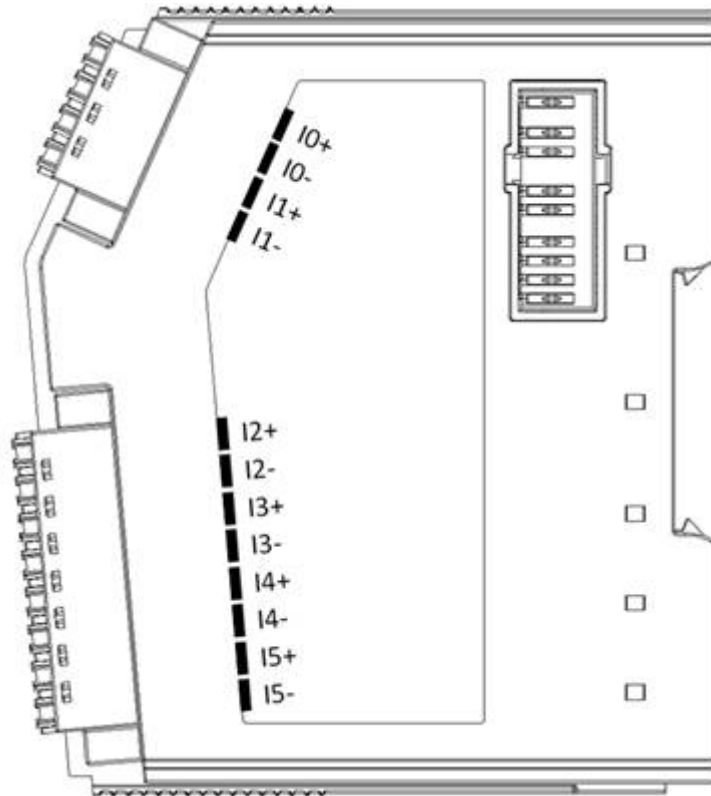
Figure 4.9 AMAX-5017C Module Side View

Table 4.11: Upper 4 Pin Connector	
Pin Number	**Pin Definition**
1	I0+
2	I0-
3	I1+
4	I1-

Table 4.12: Lower 8 Pin Connector	
Pin Number	**Pin Definition**
1	I2+
2	I2-
3	I3+
4	I3-
5	I4+
6	I4-
7	I5+
8	I5-

4.2.4 Application Wiring
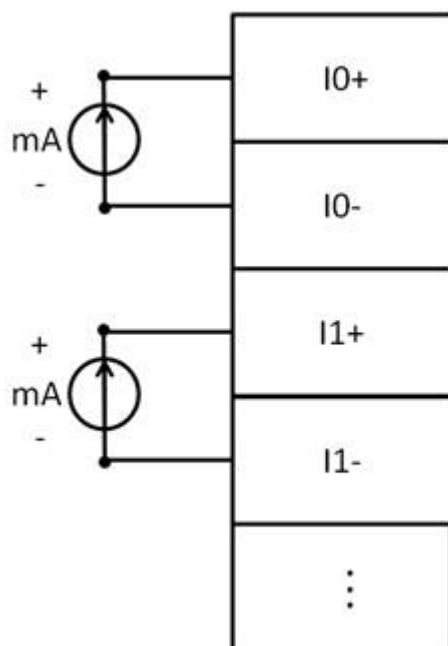
Figure 4.10 Wiring for AMAX-5017C

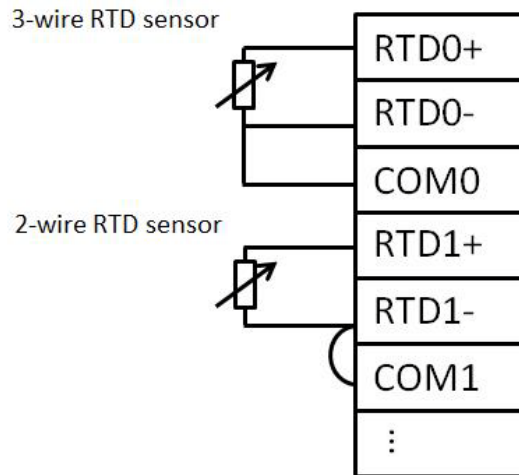## 4.2.5 Object Description and Parameterization

4.2.5.1 Input Data of the Module (0x6000 - 0x6FFF)

Table 4.13: Input Data of the Module (0x6000 - 0x6FFF)					
Index (hex)	**Name**	**Meaning**	**Data type**	**Flags**	**Default value**
60n0:01	AIn_BurnOut	Detect whether the input circuit open	BOOL	RO	0x00
60n0:02	AIn_OverRange	Detect whether the input Ohm is under	BOOL	RO	0x00
60n0:03	AIn_UnderRange	Detect whether the input Ohm is over	BOOL	RO	0x00
60n0:17	AIn	Analog input value (raw data)	UINT	RO	0x00

4.2.5.2 Configuration Data of the Module (0x8000 - 0x8FFF)

Table 4.14: Configuration Data of the Module (0x8000 - 0x8FFF)					
Index (hex)	**Name**	**Meaning**	**Data type**	**Flags**	**Default value**
80n0:01	AIn_EnBurnOut	Enable burn out for ch#n	BOOL	RW	1
80n0:17	AIn_Range	Type of ch#n	DT0800EN16 (16 bits)	RW	0x180 (4~20 mA)
80n0:20	AIn_BurnOutValue	Enable burn out for ch#n	DT0802EN16 (16 bits)	RW	1 (up scale)

4.2.5.3 Enums (0x0800 - 0xFFF)

Table 4.15: Range (DT0800EN16) Enums

Index (hex)	Name	Item Name	Default value
0x0800	DT0800EN16 (Range)	4~20 mA	0x180
		+/-20 mA	0x181
		0~20 mA	0x182

Table 4.16: Sampling Rate (DT0801EN16) Enums

Index (hex)	Name	Item Name	Default value
0x0801	DT0801EN16 (Sampling Rate)	10Hz	0
		600Hz	1

Table 4.17: Burn Out Value (DT0802EN16) Enums

Index (hex)	Name	Item Name	Default value
0x0802	DT0802EN16 (Burn Out Value)	Down scale	0
		Up scale	1

4.2.5.4 Configuration of the Module (0xF600 - 0xFFFF)

Table 4.18: Configuration of the Module (0xF600 - 0xFFFF)

Index (hex)	Name	Meaning	Data type	Flags	Default value
F600:01	LocateModule	Turn on/off Locate LED	BOOL	RW	0
F600:17	AI_SamplingRate	The sampling rate of the module (total channel)	DT0801EN16	RW	0 (10Hz)

4.3 AMAX-5017V 6-ch Voltage Input Module

The AMAX-5017V is a 16-bit, 6-channel differential voltage input module that provides programmable input ranges on all channels, and different channels can be configured using different ranges. You can also use CODESYS to configure range type for each channel. This module is an extremely cost-effective solution for industrial measurement and monitoring applications. The module provides 2000 V_{DC} optical isolation between channels. If any high voltage or current damage the channels, the whole system (other modules and control unit) won't be affected cause it is already isolated.

Figure 4.11 AMAX-5017V Module

4.3.1 AMAX-5017V Specification

4.3.1.1 General
- **Certification:** CE, FCC class A
- **Protocol:** EtherCAT
- **Baud Rate:** 100M bps

4.3.1.2 Analog Output
- **Channel:** 6 (Differential)
- **Input Impedance:** Voltage: >10M Ω
- **Input Type:** V, mV
- **Voltage/Current Range:** ±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V
- **Accuracy:** ±0.1% or better of Full Scale Range (Voltage)
- **Span Drift:** 6 ppm/°C
- **Resolution:** 16-bit
- **Sampling Rate:** 100 sample/s (per channel)

4.3.1.3 Protection
- **Isolation Voltage:** 2000 V_{DC}

4.3.1.4 Environment
- **Operation Temperature:** -10~70°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Operating Humidity:** 20 ~ 95% RH (non-condensing)
- **Storage Humidity:** 0 ~ 95% RH (non-condensing)

4.3.2 LED Indicator
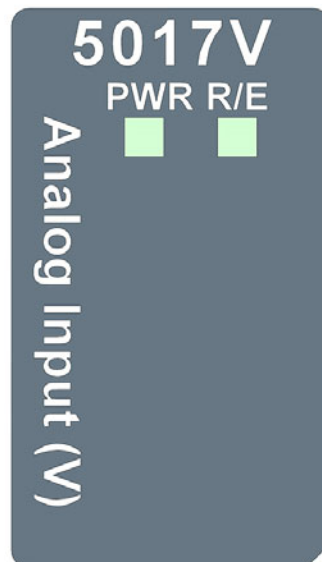
Figure 4.12 AMAX-5017V Module LED Indicator

Table 4.19: AMAX-5017V Module LED Indicator

LED	Color	Indication	Behavior
Power	Green	ON	Power on
	Yellow	ON	Locating Module
Run/Error	Green	ON	EtherCAT Connected
		Blink	EtherCAT Connecting
		OFF	EtherCAT Abnormal
	RED	ON/Blink	System Abnormal
		OFF	No Error

4.3.3 Pin Definition
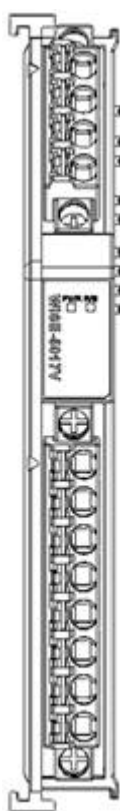
Figure 4.13 AMAX-5017V Module Front View
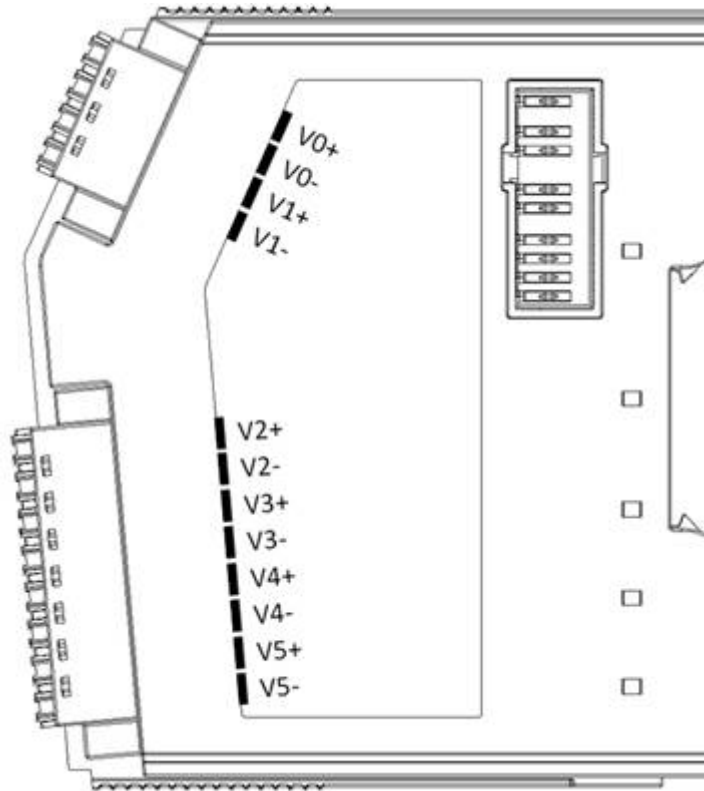
Figure 4.14 AMAX-5017V Module Side View

Table 4.20: Upper 4 Pin Connector	
Pin Number	**Pin Definition**
1	V0+
2	V0-
3	V1+
4	V1-

Table 4.21: Lower 8 Pin Connector	
Pin Number	**Pin Definition**
1	V2+
2	V2-
3	V3+
4	V3-
5	V4+
6	V4-
7	V5+
8	V5-

4.3.4   Application Wiring

Figure 4.15 Wiring for AMAX-5017V

4.3.5   Object Description and Parameterization

4.3.5.1   Input Data of the Module (0x6000 - 0x6FFF)

Table 4.22: Input Data of the Module (0x6000 - 0x6FFF)					
Index (hex)	**Name**	**Meaning**	**Data type**	**Flags**	**Default value**
60n0:17	AIn	Analog input value (raw data)	UINT	RO	0x00

4.3.5.2   Configuration Data of the Module (0x8000 - 0x8FFF)

Table 4.23: Configuration Data of the Module (0x8000 - 0x8FFF)					
Index (hex)	**Name**	**Meaning**	**Data type**	**Flags**	**Default value**
80n0:17	AIn_Range	Type of ch#n	DT0800EN16 (16 bits)	RW	0x143 (-10~10V)

4.3.5.3 Enums (0x0800 - 0xFFF)

Table 4.24: Range (DT0800EN16) Enums			
Index (hex)	**Name**	**Item Name**	**Default value**
0x0800	DT0800EN16 (Range)	+/-150 mV	0x103
		+/-500 mV	0x104
		+/-1 V	0x140
		+/-5 V	0x142
		+/-10 V	0x143
		0~150 mV	0x105
		0~ 500 mV	0x106
		0~1 V	0x145
		0~5 V	0x147
		0~10 V	0x148

4.3.5.4 Configuration of the Module (0xF600 - 0xFFFF)

Table 4.25: Configuration of the Module (0xF600 - 0xFFFF)					
Index (hex)	**Name**	**Meaning**	**Data type**	**Flags**	**Default value**
F600:01	LocateModule	Turn on/off Locate LED	BOOL	RW	0
F600:17	AI_SamplingRate	The sampling rate of the module (total channel)	DT0801EN16	RW	0 (10Hz)

4.3.5.5 Enums (0x0800 - 0xFFF)

Table 4.26: Sampling Rate (DT0801EN16) Enums			
Index (hex)	**Name**	**Item Name**	**Default value**
0x0801	DT0801EN16 (Sampling Rate)	10Hz	0
		600Hz	1

4.4 AMAX-5018 6-ch Thermocouple Module

The AMAX-5018 is a 16-bits 6-channel thermocouple module, which supports: J, K, T, E, R, S, B type thermocouple and multi-range voltage input (±50 mV, ±100 mV, ±500 mV, ±1 V, ±2.5 V), each channel supports open load detection. The module provides 2000 VDC optical isolation, if any surge voltage or current input the channel, the whole system (other modules or control unit) will not be damaged.

Figure 4.16 AMAX-5018 Module

4.4.1 AMAX-5018 Specification

4.4.1.1 General
- **Certification:** CE, FCC class A
- **Connector:** Pluggable 4P+8P push-in terminal (#24~16 AWG)
- **Enclosure:** PC
- **Power Consumption:** 2W @ 24VDC
- **Protocol:** EtherCAT
- **Transmission Rate:** 100Mbps
- **Distributed Clock:** Default not supported
- **LED Indicator:** PWR, RUN

4.4.1.2 Thermocouple Input
- **Channel:** 6 (Differential)
- **Input Impedance:** Voltage: >2M Ω
- **Voltage Input:** ±50 mV, ±100 mV, ±500 mV, ±1 V, ±2.5 V
- **Sensor Type:**
  Type J (0 ~ 760°C)
  Type K (0 ~ 1370°C)
  Type T (-100 ~ 400°C)
  Type E (0 ~ 1000°C)
  Type R (500 ~ 1750°C)
  Type S (500 ~ 1750°C)
  Type B (500 ~ 1800°C)
- **Resolution:** 16 bit with ±0.1% FSR accuracy
- **Sample Rate:** 100 sample/s (per channel)
- **Burn-out detection:** Yes

4.4.1.3 Protection
- **Isolation Voltage:** 2000 V_{DC}

4.4.1.4 Environment
- **Operation Temperature:** -25~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Operating Humidity:** 20 ~ 95% RH (non-condensing)
- **Storage Humidity:** 0 ~ 95% RH (non-condensing)

4.4.2 LED Indicator
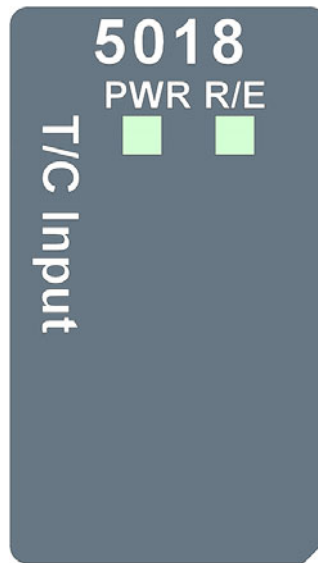
Figure 4.17 AMAX-5018 Module LED Indicator

Table 4.27: AMAX-5018 Module LED Indicator			
LED	Color	Indication	Behavior
Power	Green	ON	Power on
	Yellow	ON	Locating Module
Run/Error	Green	ON	EtherCAT Connected
		Blink	EtherCAT Connecting
		OFF	EtherCAT Abnormal
	RED	ON/Blink	System Abnormal
		OFF	No Error

4.4.3 Pin Definition
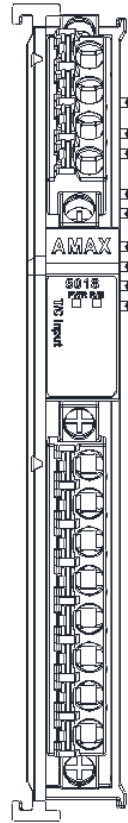
Figure 4.18 AMAX-5018 Module Front View
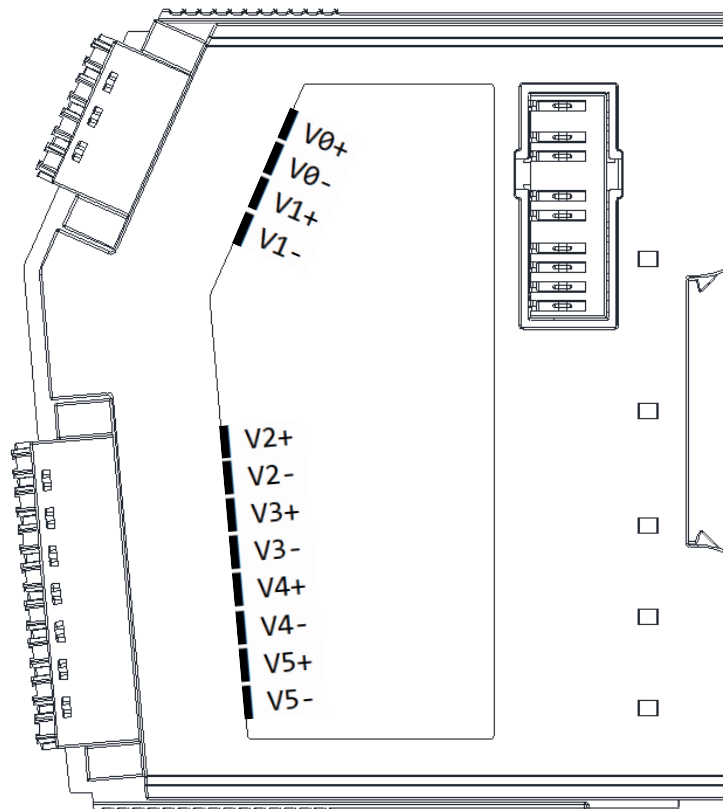
Figure 4.19 AMAX-5018 Module Side View

Table 4.28: Upper 4 Pin Connector	
Pin Number	**Pin Definition**
1	V0+
2	V0-
3	V1+
4	V1-

Table 4.29: Lower 8 Pin Connector	
Pin Number	**Pin Definition**
1	V2+
2	V2-
3	V3+
4	V3-
5	V4+
6	V4-
7	V5+
8	V5-

4.4.4 Application Wiring
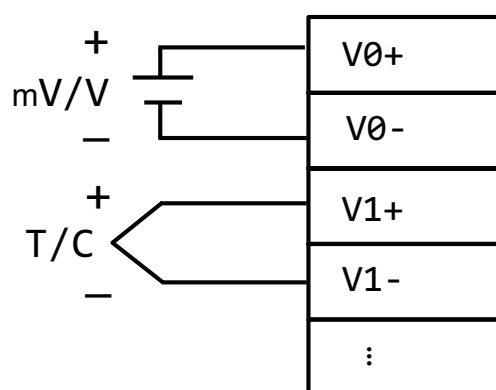
Figure 4.20 Wiring for AMAX-5018

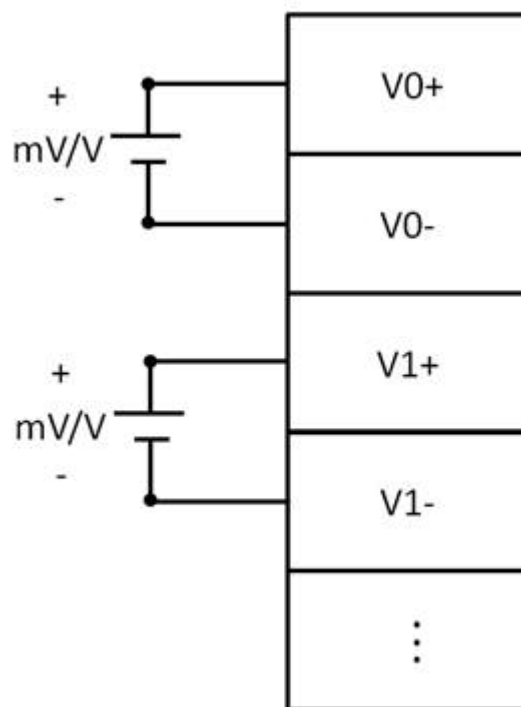## 4.4.5 Object Description and Parameterization

4.4.5.1 Input Data of the Module (0x6000 - 0x6FFF)

Table 4.30: Input Data of the Module (0x6000 - 0x6FFF)					
Index (hex)	Name	Meaning	Data type	Flags	Default value
60n0:17	AIn	Analog input value (raw data)	UINT	RO	0x00

4.4.5.2 Configuration Data of the Module (0x8000 - 0x8FFF)

Table 4.31: Configuration Data of the Module (0x8000 - 0x8FFF)					
Index (hex)	Name	Meaning	Data type	Flags	Default value
60n0:01	AIn_BurnOut	Detect whether the thermo-couple input wire burnout	BOOL	RO	0x00
60n0:02	AIn_OverRange	Detect whether the thermo-couple input is over range	BOOL	RO	0x00
60n0:03	AIn_UnderRange	Detect whether the thermo-couple input is under range	BOOL	RO	0x00
60n0:17	AIn_Raw	Analog input value (raw data)	UINT	RO	0x00
60n0:19	AIn_Scale	Analog input value (scale data)	DINT	RO	0x00

If voltage input, actual AI scaling value = Ain_Scale/10000.

If thermocouple input, actual AI scaling value = Ain_Scale/10.

(n=0~5 for Ch0~Ch5)

Wire burnout detection

If burn out detection of any channel is enabled, the all channels' range type should be all thermocouple.

(Supported only when the channel's range type is thermocouple.)

When burn out enabled, conversion time per channel = 7.8ms. (21.4Hz per channel)

Under and over range

If thermocouple input < Range_Min without wire burnout, AI# shows Range_Min

If thermocouple input > Range_Max without wire burnout, AI# shows Range_Max

(Supported only when the channel's range type is thermocouple.)

Table 4.32: Thermocouple Range Boundaries				
Range Type	Range_Min	Range_Max	Under_Temp	Over_Temp
J	0	760	-80	840
K	0	1370	-100	1370
T	-100	400	-140	400
E	0	1000	-100	1000
R	500	1750	320	1760
S	500	1750	320	1760
B	500	1800	320	1820

4.4.5.3 Configuration Data of the Module (0x8000 - 0x8FFF)

Table 4.33: Configuration Data of the Module (0x8000 - 0x8FFF)					
Index (hex)	Name	Meaning	Data type	Flags	Default value
80n0:01	AIn_EnBurnOut	Enable burt out for ch#n	BOOL	RW	0
80n0:17	AIn_Range	Type of ch#n	DT0800EN16 (16 bits)	RW	421 (K 0~1370 °C)
80n0:18	AIn_BurnOutValue	burn out value for ch#n	DT0802EN16 (16 bits)	RW	1 (up scale)

(n=0~5 for Ch0~Ch5)

4.4.5.4 Enums (0x0800 - 0xFFF)

Table 4.34: Range (DT0800EN16) Enums			
Index (hex)	Name	Item Name	Default
0x0800	DT0800EN16 +/-50 mV (Range)	+/-50 mV	0x101
		+/-100 mV	0x102
		+/-500 mV	0x104
		+/-1 V	0x140
		+/-2.5 V	0x141
		K 0~1370°C	0x420
		J 0~760°C	0x400
		E 0~1000°C	0x460
		T -100~400°C	0x440
		R 500~1750°C	0x480
		S 500~1750°C	0x4A0
		B 500~1800°C	0x4C0

4.4.5.5 Configuration of the Module (0xF600 - 0xFFFF)

Table 4.35: Configuration of the Module (0xF600 - 0xFFFF)					
Index (hex)	Name	Meaning	Data type	Flags	Default value
F600:01	LocateModule	Turn on/off Locate LED	BOOL	RW	0
F600:03	UnderWindFlow	Set if module is under wind flow	BOOL	RW	0
F600:17	AI_SamplingRate	The sampling rate of the module (total channel)	DT0801EN16	RW	0 (10Hz)

4.4.5.6 Enums (0x0800 - 0xFFF)

Table 4.36: Sampling Rate (DT0801EN16) Enums			
Index (hex)	Name	Item Name	Default value
0x0801	DT0801EN16 (Sampling Rate)	10Hz	0
		600Hz	1

Index (hex)	Name	Meaning	Data type	Flags	Default value
F600:01	LocateModule	Turn on/off Locate LED	BOOL	RW	0
F600:17	AI_SamplingRate	The sampling rate of the module (total channel)	DT0801EN16	RW	0 (10Hz)
F600:19	CJC_Offset	The CJC offset of the module CJC offset = CJC_Offset/10	DINT	RW	0

4.4.5.7 Enums (0x0800 - 0xFFF)

Table 4.37: Sampling Rate (DT0801EN16) Enums			
Index (hex)	Name	Item Name	Default value
0x0801	DT0801EN16 (Sampling Rate)	10Hz	0
		600Hz	1

4.5   AMAX-5024 4-ch Analog Output Module

The AMAX-5024 is a 16-bit, 4-channel analog output module that provides program-mable output ranges on every channel, and different channels can be configured using different ranges. The module provides 2000 VDC optical isolation, if any high voltage or current damage the channels, the whole system (other modules or control unit) will not be damaged.

Figure 4.21 AMAX-5024 Module

4.5.1 AMAX-5024 Specification

4.5.1.1 General
- **Certification:** CE, FCC class A
- **Protocol:** EtherCAT
- **Baud Rate:** 100M bps

4.5.1.2 Analog Output
- **Channel:** 4
- **Output Range:** V, mV, mA
- **Output Type:** 0~5 V,0 ~10 V, ±5V, ±10V, 4 ~ 20 mA, 0 ~ 20 mA
- **Accuracy:** ±0.01% of FSR @ 25C
- **Drift:** ± 50 ppm/°C
- **Resolution:** 16-bit
- **Current Load Resistor:** Max. 500 Ω
- **Voltage Load Resistor:** Min. 1K Ω

4.5.1.3 Protection
- **Isolation Voltage:** 2000 V_{DC}

4.5.1.4 Environment
- **Operation Temperature:** -20~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Operating Humidity:** 20 ~ 95% RH (non-condensing)
- **Storage Humidity:** 0 ~ 95% RH (non-condensing)

4.5.2 LED Indicator
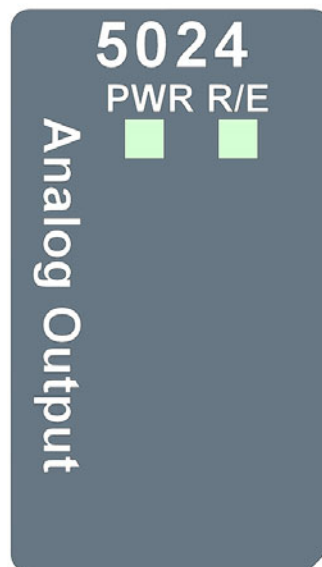
Figure 4.22 AMAX-5024 Module LED Indicator

Table 4.38: AMAX-5024 Module LED Indicator			
LED	**Color**	**Indication**	**Behavior**
Power	Green	ON	Power on
	Yellow	ON	Locating Module
Run/Error	Green	ON	EtherCAT Connected
		Blink	EtherCAT Connecting
		OFF	EtherCAT Abnormal
	RED	ON/Blink	System Abnormal
		OFF	No Error

4.5.3 Pin Definition
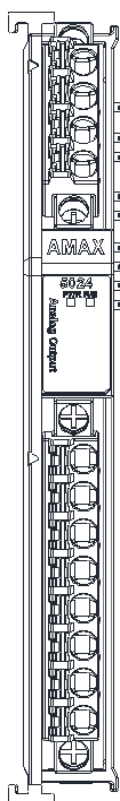
Figure 4.23 AMAX-5024 Module Front View
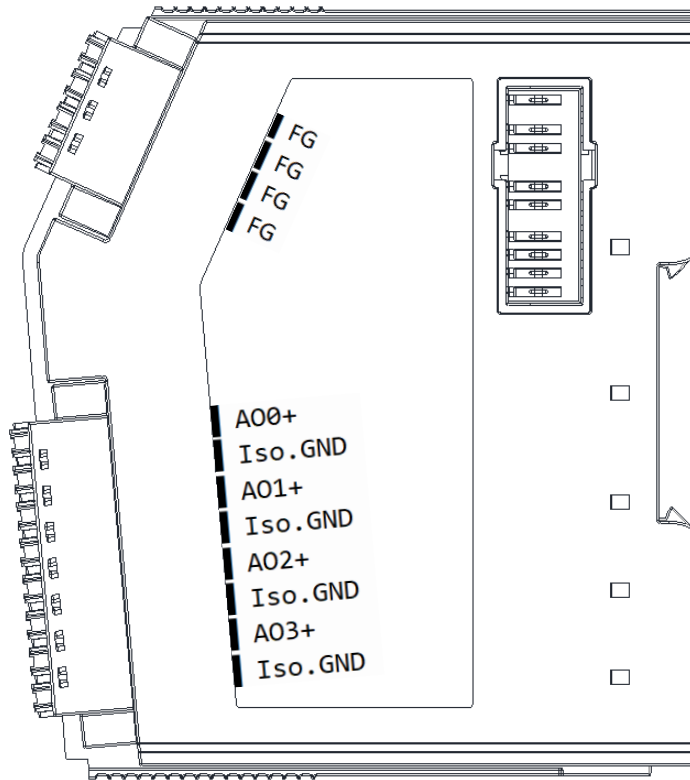
Figure 4.24 AMAX-5024 Module Side View

Table 4.39: Upper 4 Pin Connector	
Pin Number	**Pin Definition**
1	FG
2	FG
3	FG
4	FG

Table 4.40: Lower 8 Pin Connector	
Pin Number	**Pin Definition**
1	AO0+
2	Iso. GND
3	AO1+
4	Iso. GND
5	AO2+
6	Iso. GND
7	AO3+
8	Iso. GND

4.5.4 Application Wiring
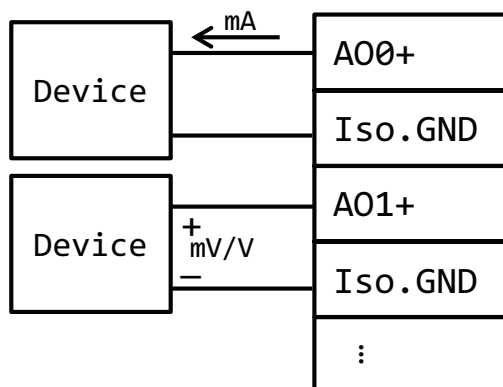
Figure 4.25 Wiring for AMAX-5024

4.5.5 Object Description and Parameterization

4.5.5.1 Input Data of the Module (0x6000 - 0x6FFF)

Table 4.41: Input Data of the Module (0x6000 - 0x6FFF)					
Index (hex)	Name	Meaning	Data type	Flags	Default value
60n0:01	AOn_BurnOut	Detect whether the input circuit open	BOOL	RO	0x00
60n0:17	AOn	Read analog output value	UINT	RO	0x00

(n=0~3 for Ch0~3)

4.5.5.2 Output Data of the Module (0x7000 - 0x7FFF)

Table 4.42: Output Data of the Module (0x7000 - 0x7FFF)					
Index (hex)	Name	Meaning	Data type	Flags	Default value
70n0:17	AOn	Analog output value (raw data)	UINT	RO	0x00

(n=0~3 for Ch0~3)

4.5.5.3 Configuration Data of the Module (0x8000 - 0x8FFF)

Table 4.43: Configuration Data of the Module (0x8000 - 0x8FFF)					
Index (hex)	Name	Meaning	Data type	Flags	Default value
80n0:02	AOn_EnSlewRate	Enable slew rate function	BOOL	RW	0
80n0:17	AOn_Range	Type of ch#n	DT0800EN16 (16 bits)	RW	0x180 (4~20 mA)
80n0:21	AOn_SlewRate	Slew rate setting	DT801EN16	RW	0x00

(n=0~3 for Ch0~3)

4.5.5.4 Enums (0x0800 - 0xFFF)

Table 4.44: Range (DT0800EN16) Enums			
Index (hex)	**Name**	**Item Name**	**Default**
0x0800 (Range)	DT0800EN16	0~5 V	0x147
		0~10 V	0x148
		+/-5 V	0x142
		+/-10 V	0x143
		4~20 mA	0x180
		0~20 mA	0x182

4.5.5.5 Enums (0x0800 - 0xFFF)

Table 4.45: Slew clock rate (DT0801EN16) Enums			
Index (hex)	**Name**	**Item Name**	**Default**
0x0801	DT0801EN16 (Slew clock rate)	+/-1 V(mA) /s	0x01
		+/-2 V(mA) /s	0x02
		+/-4 V(mA) /s	0x04
		+/-8 V(mA) /s	0x08
		+/-16 V(mA) /s	0x10
		+/-32 V(mA) /s	0x20
		+/-64 V(mA) /s	0x40

4.5.5.6 Configuration Data of the Module (0x8000 - 0x8FFF)

Table 4.46: Configuration Data of the Module (0x8000 - 0x8FFF)					
Index (hex)	**Name**	**Meaning**	**Data type**	**Flags**	**Default value**
F600:01	LocateModule	Turn on/off Locate LED	BOOL	RW	0
F600:18	AO_SafetyValue	Set AO safety value	DT802EN16	RW	0 (zero)

4.5.5.7 Enums (0x0800 - 0xFFF)

Table 4.47: Safety Value (DT0802EN16) Enums			
Index (hex)	**Name**	**Item Name**	**Default value**
0x0802	DT0802EN16 (Safety Value)	Zero	0
		Last Value	1

Chapter 5

Digital Module

5.1 AMAX-5051 8-ch Digital Input Module

The AMAX-5051 features 8 digital input (sink/source) channels. The digital input channels offer LED to indicate digital status. The module provides 2,000 V_{DC} optical isolation between channels. If any high voltage or current damage the channels, the whole system (other modules, and control unit) won't be affected because it is already isolated.

Figure 5.1 AMAX-5051 Module

5.1.1 AMAX-5051 Specification

5.1.1.1 General

- **Certification:** CE, FCC class A
- **Connector:** Pluggable 4P+8P push-in terminal (#24~16 AWG)
- **Enclosure:** PC
- **Power Consumption:** 2W @ 24V_{DC}
- **Protocol:** EtherCAT
- **Transmission Rate:** 100Mbps
- **Distributed Clock:** Default not supported
- **LED Indicator:** PWR, RUN, DI status

5.1.1.2 Digital Input:

- **Channels:** 8
- **Digital Input:**
  - Dry Contact:
    Logic level 1: close to Iso.GND
    Logic level 0: open
  - Wet Contact:
    Rated voltage: $24V_{DC}$
    Logic level 1: $10{\sim}30\ V_{DC}$ and $-10{\sim}-30V_{DC}$
    Logic level 0: $-3{\sim}3V_{DC}$
- **Input Delay:**
  - From logic 0 to 1: 4ms
  - From logic 1 to 0: 4ms
- **Digital Filter:** 3ms

5.1.1.3 Protection

- **Isolation Voltage:** $2,000V_{DC}$

5.1.1.4 Environment

- **Operation Temperature:** -10~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

5.1.2 LED Indicator
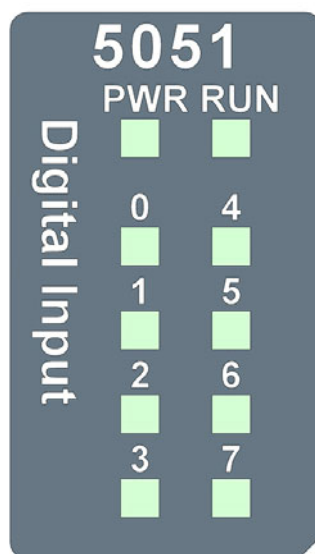
Figure 5.2 AMAX-5051 Module LED Indicator

Table 5.1: AMAX-5051 Module LED Indicator			
LED	**Color**	**Indication**	**Behavior**
Power	Green	ON	Power on
Run	Green	ON	EtherCAT connection
	Green	Blink	When TX/RX data in transmission
DI0~7	Green	ON	Dry/Wet Logic "1"
		OFF	Dry/Wet Logic "0"

5.1.3 Pin Definition
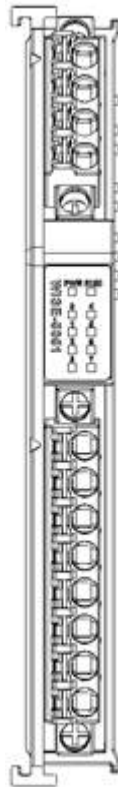
Figure 5.3 AMAX-5051 Module Front View
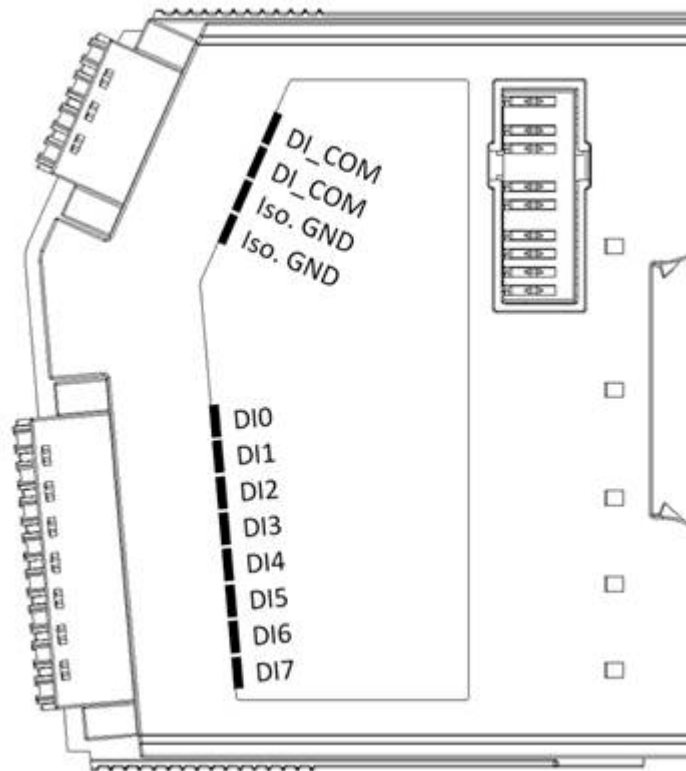
Figure 5.4 AMAX-5051 Module Side View

Table 5.2: Upper 4 Pin Connector	
Pin Number	Pin Definition
1	DI_COM
2	DI_COM
3	Iso. GND
4	Iso. GND

Table 5.3: Lower 8 Pin Connector	
Pin Number	Pin Definition
1	DI0
2	DI1
3	DI2
4	DI3
5	DI4
6	DI5
7	DI6
8	DI7

5.1.4 Application Wiring
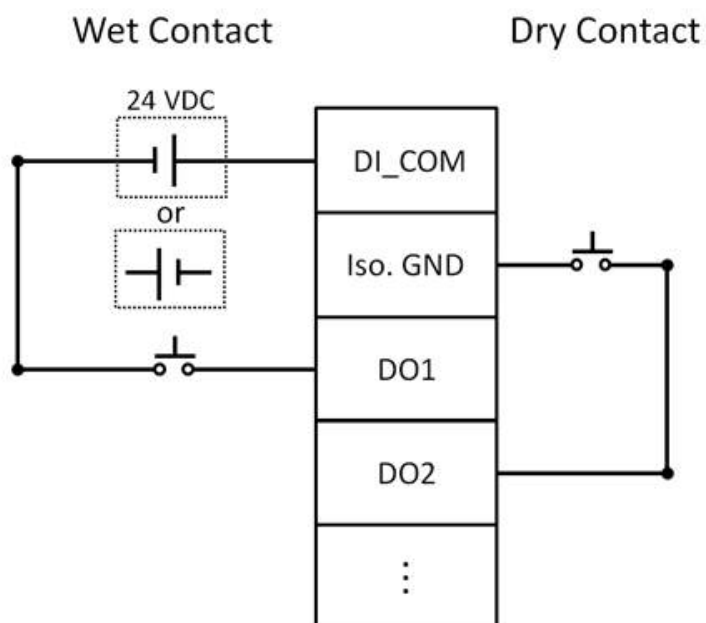
Figure 5.5 Wiring for AMAX-5051

5.1.5 Object Description and Parameterization

5.1.5.1 Input Data of the Module (0x3001)

Index (hex)	Name	Meaning	Data type	Flags	Default value
3001:01	DI0	Digital Input Channel 0	BOOLEAN	RO	0x00
3001:02	DI1	Digital Input Channel 1	BOOLEAN	RO	0x00
3001:03	DI2	Digital Input Channel 2	BOOLEAN	RO	0x00
3001:04	DI3	Digital Input Channel 3	BOOLEAN	RO	0x00
3001:05	DI4	Digital Input Channel 4	BOOLEAN	RO	0x00
3001:06	DI5	Digital Input Channel 5	BOOLEAN	RO	0x00
3001:07	DI6	Digital Input Channel 6	BOOLEAN	RO	0x00
3001:08	DI7	Digital Input Channel 7	BOOLEAN	RO	0x00

5.2   AMAX-5052 16-ch Digital Input Module

The AMAX-5052 features 16 digital input (sink/source) channels. The digital input channels offer LED to indicate digital status. The module provides 2,000 V_{DC} optical isolation between channels. If any high voltage or current damage the channels, the whole system (other modules, and control unit) won't be affected because it is already isolated.

Figure 5.6 AMAX-5052 Module

5.2.1   AMAX-5052 Specification

5.2.1.1   General

- ■ **Certification:** CE, FCC class A
- ■ **Connector:** Pluggable 6P+12P push-in terminal (#28~16 AWG)
- ■ **Enclosure:** PC
- ■ **Power Consumption:** 2W @ 24V_{DC}
- ■ **Protocol:** EtherCAT
- ■ **Transmission Rate:** 100Mbps
- ■ **Distributed Clock:** Default not supported
- ■ **LED Indicator:** PWR, RUN

5.2.1.2 Digital Input

- **Channels:** 16
- **Digital Input:**
  - Dry Contact:
    Logic level 1: close to Iso.GND
    Logic level 0: open
  - Wet Contact:
    Rated voltage: $24V_{DC}$
    Logic level 1: $10\text{\textasciitilde}30\ V_{DC}$ and $-10\text{\textasciitilde}-30V_{DC}$
    Logic level 0: $-3\text{\textasciitilde}3V_{DC}$
- **Input Delay:**
  - From logic 0 to 1: 4ms
  - From logic 1 to 0: 4ms
- **Digital Filter:** 3ms

5.2.1.3 Protection

- Isolation Voltage: $2,000V_{DC}$

5.2.1.4 Environment

- **Operation Temperature:** -10~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

5.2.2 LED Indicator
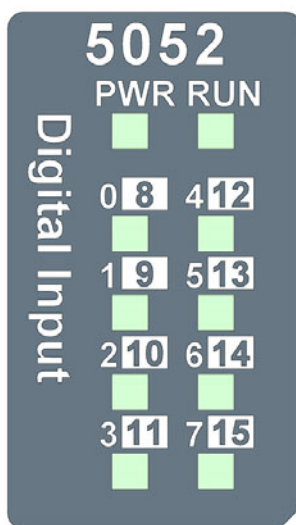
Figure 5.7 AMAX-5052 Module LED Indicator

Table 5.4: AMAX-5052Module LED Indicator			
LED	**Color**	**Indication**	**Behavior**
Power	Green	ON	Power on
Run	Green	ON	EtherCAT connection
	Green	Blink	When TX/RX data in transmission
DI0~7	Green	ON	Dry/Wet Logic "1"
		OFF	Dry/Wet Logic "0"
DI8~15	Yellow	ON	Dry/Wet Logic "1"
		OFF	Dry/Wet Logic "0"

5.2.3 Pin Definition
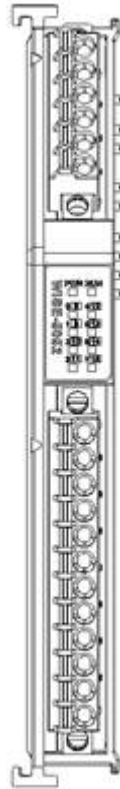
Figure 5.8 AMAX-5052 Module Front View
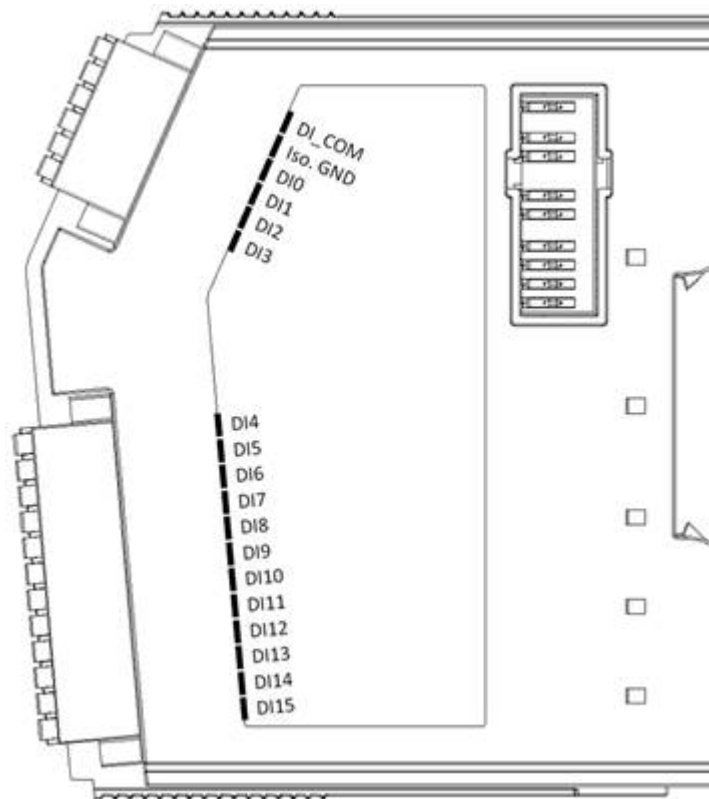
Figure 5.9 AMAX-5052 Module Side View

Table 5.5: Upper 6Pin Connector	
Pin Number	**Pin Definition**
1	DI_COM
2	Iso. GND
3	DI0
4	DI1
5	DI2
6	DI3

Table 5.6: Lower 8 Pin Connector	
Pin Number	**Pin Definition**
1	DI4
2	DI5
3	DI6
4	DI7
5	DI8
6	DI9
7	DI10
8	DI11
9	DI12
10	DI13
11	DI14
12	DI15

5.2.4 Application Wiring
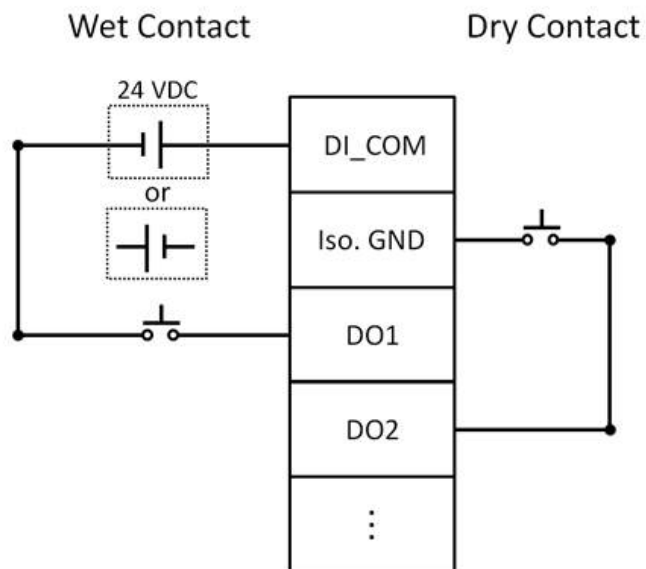
Figure 5.10 Wiring for AMAX-5052

5.2.5   Object Description and Parameterization

5.2.5.1   Input Data of the Module (0x3001)

Index (hex)	Name	Meaning	Data type	Flags	Default value
3001:01	DI0	Digital Input Channel 0	BOOLEAN	RO	0x00
3001:02	DI1	Digital Input Channel 1	BOOLEAN	RO	0x00
3001:03	DI2	Digital Input Channel 2	BOOLEAN	RO	0x00
3001:04	DI3	Digital Input Channel 3	BOOLEAN	RO	0x00
3001:05	DI4	Digital Input Channel 4	BOOLEAN	RO	0x00
3001:06	DI5	Digital Input Channel 5	BOOLEAN	RO	0x00
3001:07	DI6	Digital Input Channel 6	BOOLEAN	RO	0x00
3001:08	DI7	Digital Input Channel 7	BOOLEAN	RO	0x00
3002:01	DI8	Digital Input Channel 8	BOOLEAN	RO	0x00
3002:02	DI9	Digital Input Channel 9	BOOLEAN	RO	0x00
3002:03	DI10	Digital Input Channel 10	BOOLEAN	RO	0x00
3002:04	DI11	Digital Input Channel 11	BOOLEAN	RO	0x00
3002:05	DI12	Digital Input Channel 12	BOOLEAN	RO	0x00
3002:06	DI13	Digital Input Channel 13	BOOLEAN	RO	0x00
3002:07	DI14	Digital Input Channel 14	BOOLEAN	RO	0x00
3002:08	DI15	Digital Input Channel 15	BOOLEAN	RO	0x00

5.3 AMAX-5056 8-ch Sink-type Digital Output Module

The AMAX-5056 module features 8 digital output (sink) channels. The digital output channels offer LED to indicate digital status. The module provides 2,000 V_{DC} optical isolation between channels. If any high voltage or current damage the channels, the whole system (other modules, and control unit) won't be affected because it is already isolated.

Figure 5.11 AMAX-5056 Module

5.3.1 AMAX-5056 Specification

5.3.1.1 General

- **Certification:** CE, FCC class A
- **Connector:** Pluggable 4P+8P push-in terminal (#24~16 AWG)
- **Enclosure:** PC
- **Power Consumption:** 2W @ 24V_{DC}
- **Protocol:** EtherCAT
- **Transmission Rate:** 100Mbps
- **Distributed Clock:** Default not supported
- **LED Indicator:** PWR, RUN, DO status

5.3.1.2 Digital Output:

- **Channels:** 8 (Sink Type)
- **Voltage Rating:** 10~30V_{DC}
- **Rated Current Output:** 0.3A per channel at signal "1"
- **Leakage Current:** 25uA per channel at signal "0"
- **Output Delay:** From logic level 0 to 1: 10us
  From logic level 1 to 0: 100us

5.3.1.3 Protection

- **Isolation Voltage:** 2,000V_{DC}
- Internal Flyback diode for inductive load

5.3.1.4 Environment

- **Operation Temperature:** -10~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

5.3.2 LED Indicator
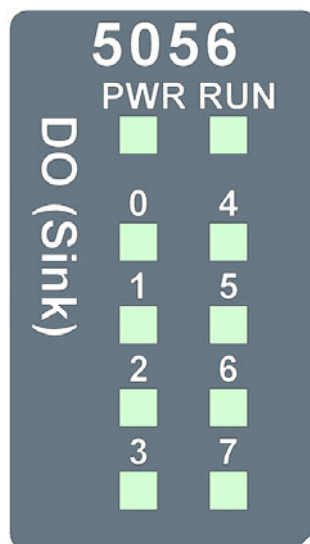
Figure 5.12 AMAX-5056 Module LED Indicator

Table 5.7: AMAX-5056 Module LED Indicator			
LED	**Color**	**Indication**	**Behavior**
Power	Green	ON	Power on
Run	Green	ON	EtherCAT connection
	Green	Blink	When TX/RX data in transmission
DI0~7	Green	ON	DO turn on
		OFF	DO turn off

5.3.3 Pin Definition
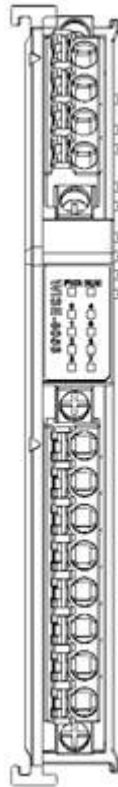
Figure 5.13 AMAX-5056 Module Front View
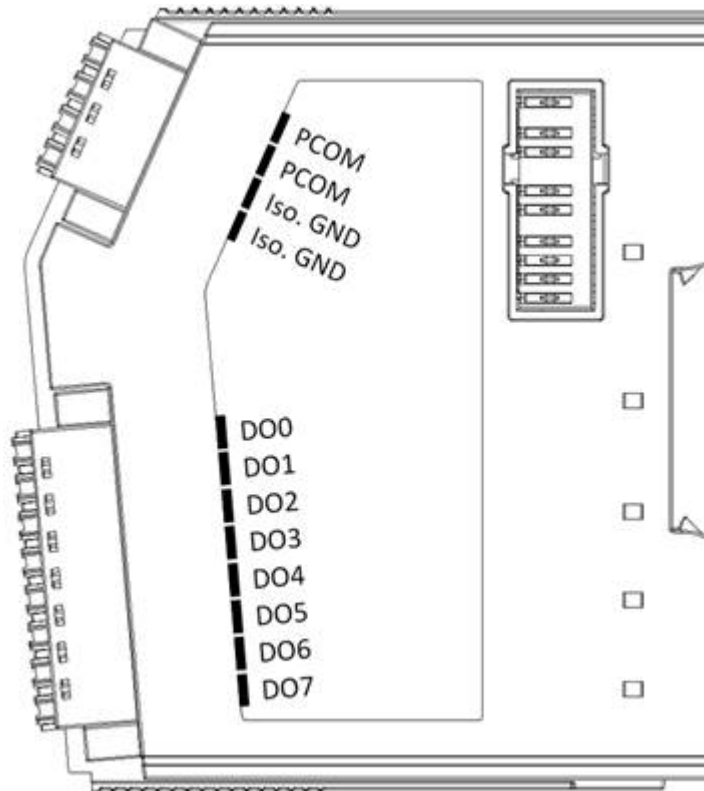
Figure 5.14 AMAX-5056 Module Side View

Table 5.8: Upper 4 Pin Connector

Pin Number	Pin Definition
1	PCOM
2	PCOM
3	Iso. GND
4	Iso. GND

Table 5.9: Lower 8 Pin Connector

Pin Number	Pin Definition
1	DO0
2	DO1
3	DO2
4	DO3
5	DO4
6	DO5
7	DO6
8	DO7

5.3.4 Application Wiring
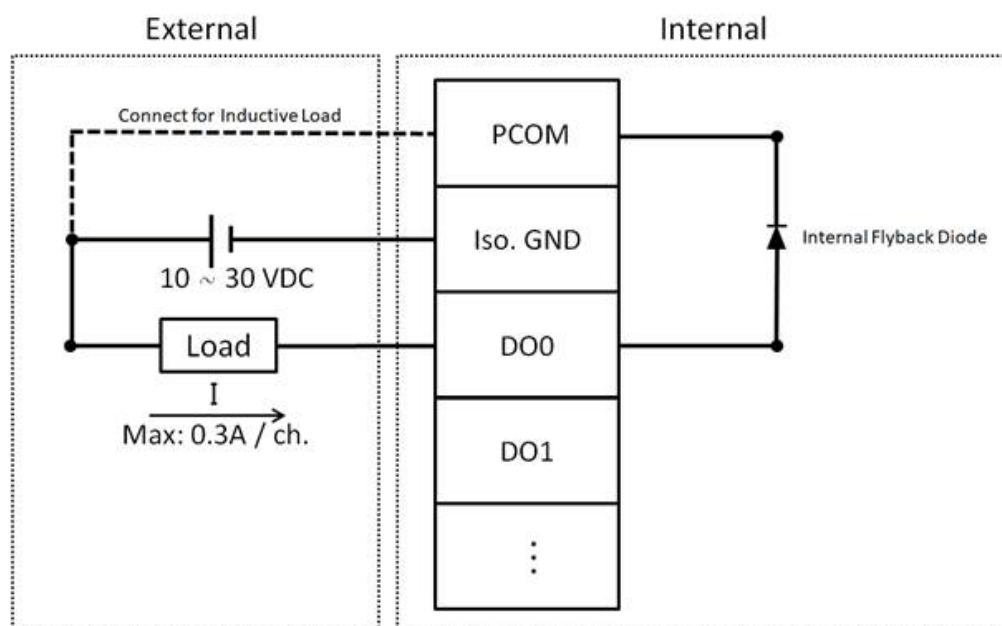
Figure 5.15 Wiring for AMAX-5056

5.3.5 Object Description and Parameterization

5.3.5.1 Output Data of the Module (0x3101)

Index (hex)	Name	Meaning	Data type	Flags	Default value
3101:01	DO0	Digital Output Channel 0	BOOLEAN	RO	0x00
3101:02	DO1	Digital Output Channel 1	BOOLEAN	RO	0x00
3101:03	DO2	Digital Output Channel 2	BOOLEAN	RO	0x00
3101:04	DO3	Digital Output Channel 3	BOOLEAN	RO	0x00
3101:05	DO4	Digital Output Channel 4	BOOLEAN	RO	0x00
3101:06	DO5	Digital Output Channel 5	BOOLEAN	RO	0x00
3101:07	DO6	Digital Output Channel 6	BOOLEAN	RO	0x00
3101:08	DO7	Digital Output Channel 7	BOOLEAN	RO	0x00

5.4 AMAX-5056SO 8-ch Source-type Digital Output Module

The AMAX-5056SO module features 8 digital output (source) channels. The digital output channels offer and LED to indicate digital status. The module provides 2,000 V_{DC} optical isolation between channels. If any high voltage or current damage the channels, the whole system (other modules, and control unit) won't be affected because it is already isolated.

Figure 5.16 AMAX-5056SO Module

5.4.1 AMAX-5056SO Specification

5.4.1.1 General

- **Certification:** CE, FCC class A
- **Connector:** Pluggable 4P+8P push-in terminal (#24~16 AWG)
- **Enclosure:** PC
- **Power Consumption:** 2W @ 24V_{DC}
- **Protocol:** EtherCAT
- **Transmission Rate:** 100Mbps
- **Distributed Clock:** Default not supported
- **LED Indicator:** PWR, RUN, DO status

5.4.1.2 Digital Output:

- **Channels:** 8 (Source Type)
- **Voltage Rating:** 10~30V_{DC}
- **Rated Current Output:** 0.5A per channel at signal "1"
- **Leakage Current:** 10uA per channel at signal "0"
- **Output Delay:** From logic level 0 to 1: 150us
  From logic level 1 to 0: 2ms

5.4.1.3 Protection

- **Isolation Voltage:** 2,000V_{DC}
- Internal Flyback diode for inductive load

5.4.1.4 Environment

- **Operation Temperature:** -10~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

5.4.2 LED Indicator
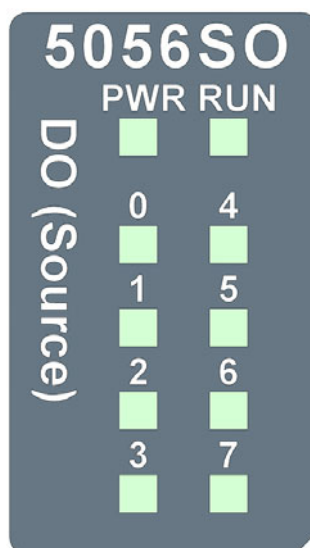
Figure 5.17 AMAX-5056SO Module LED Indicator

Table 5.10: AMAX-5056SO Module LED Indicator			
LED	**Color**	**Indication**	**Behavior**
Power	Green	ON	Power on
Run	Green	ON	EtherCAT connection
	Green	Blink	When TX/RX data in transmission
DI0~7	Green	ON	DO turn on
		OFF	DO turn off

5.4.3 Pin Definition
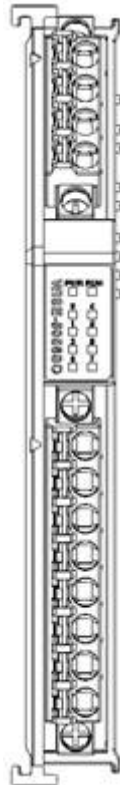
Figure 5.18 AMAX-5056SO Module Front View
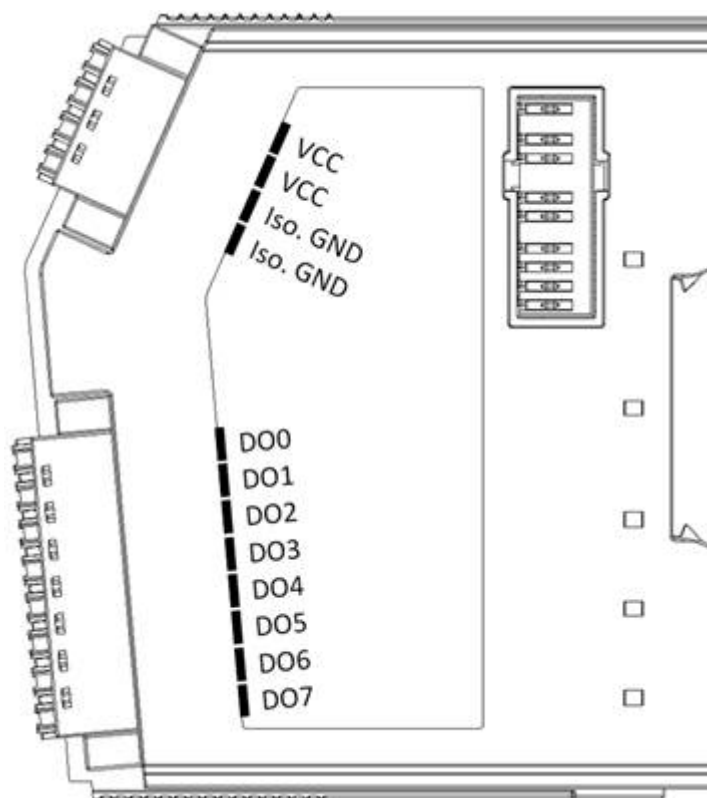
Figure 5.19 AMAX-5056SO Module Side View

Table 5.11: Upper 4 Pin Connector	
Pin Number	**Pin Definition**
1	VCC
2	VCC
3	Iso. GND
4	Iso. GND

Table 5.12: Lower 8 Pin Connector	
Pin Number	**Pin Definition**
1	DO0
2	DO1
3	DO2
4	DO3
5	DO4
6	DO5
7	DO6
8	DO7

5.4.4 Application Wiring
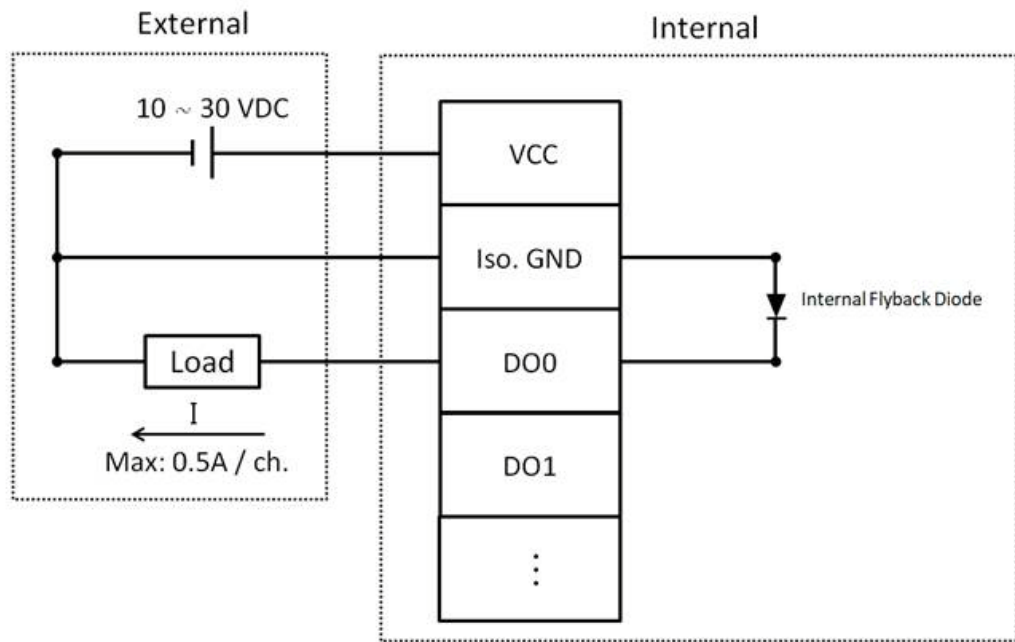
Figure 5.20 Wiring for AMAX-5056SO

5.4.5 Object Description and Parameterization

5.4.5.1 Output Data of the Module (0x3101)

Index (hex)	Name	Meaning	Data type	Flags	Default value
3101:01	DO0	Digital Output Channel 0	BOOLEAN	RO	0x00
3101:02	DO1	Digital Output Channel 1	BOOLEAN	RO	0x00
3101:03	DO2	Digital Output Channel 2	BOOLEAN	RO	0x00
3101:04	DO3	Digital Output Channel 3	BOOLEAN	RO	0x00
3101:05	DO4	Digital Output Channel 4	BOOLEAN	RO	0x00
3101:06	DO5	Digital Output Channel 5	BOOLEAN	RO	0x00
3101:07	DO6	Digital Output Channel 6	BOOLEAN	RO	0x00
3101:08	DO7	Digital Output Channel 7	BOOLEAN	RO	0x00

5.5 AMAX-5057 16-ch Sink-type Digital Output Module

The AMAX-5057 module features 16 digital output (sink) channels. The digital output channels offer LED to indicate digital status. The module provides 2,000 V_{DC} optical isolation between channels. If any high voltage or current damage the channels, the whole system (other modules, and control unit) won't be affected because it is already isolated.

Figure 5.21 AMAX-5057 Module

5.5.1 AMAX-5056 Specification

5.5.1.1 General

- **Certification:** CE, FCC class A
- **Connector:** Pluggable 6P+12P push-in terminal (#28~16 AWG)
- **Enclosure:** PC
- **Power Consumption:** 2.5W @ 24V_{DC}
- **Protocol:** EtherCAT
- **Transmission Rate:** 100Mbps
- **Distributed Clock:** Default not supported
- **LED Indicator:** PWR, RUN

5.5.1.2 Digital Output:
- **Channels:** 16 (Sink Type)
- **Voltage Rating:** 10~30V$_{DC}$
- **Rated Current Output:** 0.3A per channel at signal "1"
- **Leakage Current:** 25uA per channel at signal "0"
- **Output Delay:** From logic level 0 to 1: 10us
  From logic level 1 to 0: 100us

5.5.1.3 Protection
- **Isolation Voltage:** 2,000V$_{DC}$
- Internal Flyback diode for inductive load

5.5.1.4 Environment
- **Operation Temperature:** -10~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

5.5.2 LED Indicator
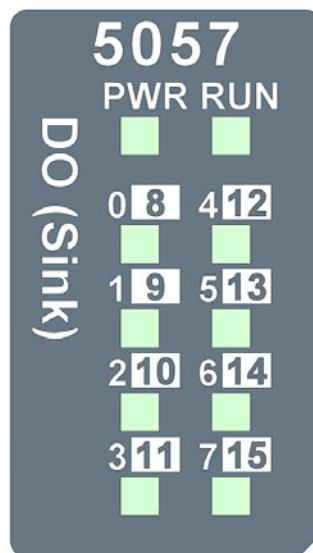
Figure 5.22 AMAX-5057 Module LED Indicator

Table 5.13: AMAX-5057 Module LED Indicator			
LED	**Color**	**Indication**	**Behavior**
Power	Green	ON	Power on
Run	Green	ON	EtherCAT connection
	Green	Blink	When TX/RX data in transmission
DI0~7	Green	ON	DO turn on
		OFF	DO turn off
DI8~15	Yellow	ON	DO turn on
		OFF	DO turn off

5.5.3 Pin Definition

Figure 5.23 AMAX-5057 Module Front View
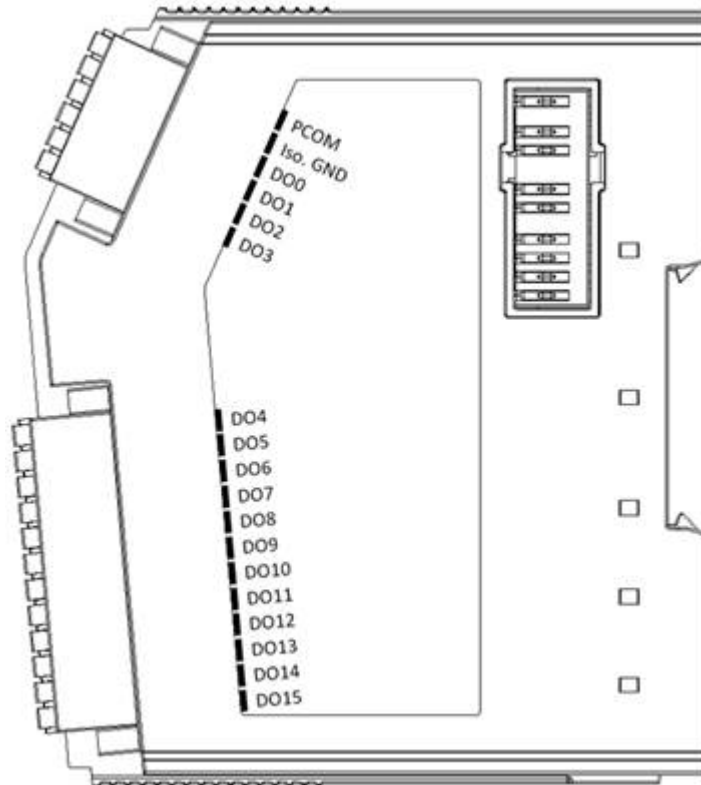
Figure 5.24 AMAX-5057 Module Side View

Table 5.14: Upper 6 Pin Connector

Pin Number	Pin Definition
1	PCOM
2	Iso. GND
3	DO1
4	DO2
5	DO3
6	DO4

Table 5.15: Lower 12 Pin Connector

Pin Number	Pin Definition
1	DO4
2	DO5
3	DO6
4	DO7
5	DO8
6	DO9
7	DO10
8	DO11
9	DO12
10	DO13
11	DO14
12	DO15

5.5.4 Application Wiring

Figure 5.25 Wiring for AMAX-5057

5.5.5 Object Description and Parameterization

5.5.5.1 Output Data of the Module (0x3101)
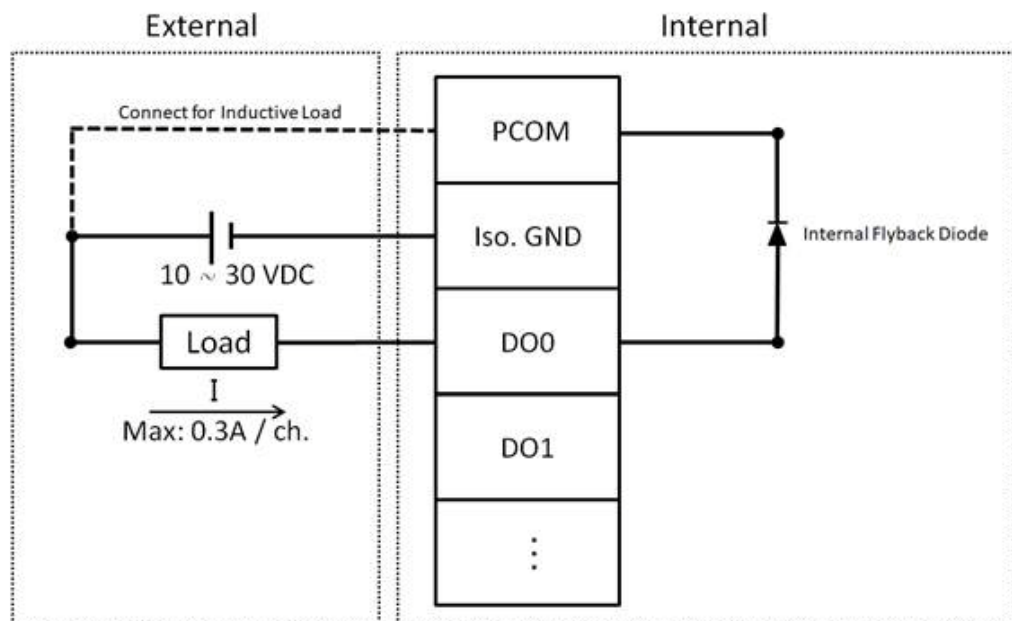
Index (hex)	Name	Meaning	Data type	Flags	Default value
3101:01	DO0	Digital Output Channel 0	BOOLEAN	RO	0x00
3101:02	DO1	Digital Output Channel 1	BOOLEAN	RO	0x00
3101:03	DO2	Digital Output Channel 2	BOOLEAN	RO	0x00
3101:04	DO3	Digital Output Channel 3	BOOLEAN	RO	0x00
3101:05	DO4	Digital Output Channel 4	BOOLEAN	RO	0x00
3101:06	DO5	Digital Output Channel 5	BOOLEAN	RO	0x00
3101:07	DO6	Digital Output Channel 6	BOOLEAN	RO	0x00
3101:08	DO7	Digital Output Channel 7	BOOLEAN	RO	0x00
3102:01	DO8	Digital Output Channel 8	BOOLEAN	RO	0x00
3102:02	DO9	Digital Output Channel 9	BOOLEAN	RO	0x00
3102:03	DO10	Digital Output Channel 10	BOOLEAN	RO	0x00
3102:04	DO11	Digital Output Channel 11	BOOLEAN	RO	0x00
3102:05	DO12	Digital Output Channel 12	BOOLEAN	RO	0x00
3102:06	DO13	Digital Output Channel 13	BOOLEAN	RO	0x00
3102:07	DO14	Digital Output Channel 14	BOOLEAN	RO	0x00
3102:08	DO15	Digital Output Channel 15	BOOLEAN	RO	0x00

5.6 AMAX-5057SO 16-ch Source-type Digital Output Module

The AMAX-5057SO module features 16 digital output (source) channels. The digital output channels offer and LED to indicate digital status. The module provides 2,000 V_{DC} optical isolation between channels. If any high voltage or current damage the channels, the whole system (other modules, and control unit) won't be affected because it is already isolated.

Figure 5.26 AMAX-5057SO Module

5.6.1 AMAX-5057SO Specification

5.6.1.1 General

- **Certification:** CE, FCC class A
- **Connector:** Pluggable 6P+12P push-in terminal (#28~16 AWG)
- **Enclosure:** PC
- **Power Consumption:** 2.5W @ 24V_{DC}
- **Protocol:** EtherCAT
- **Transmission Rate:** 100Mbps
- **Distributed Clock:** Default not supported
- **LED Indicator:** PWR, RUN

5.6.1.2 Digital Output

- ■ **Channels:** 16 (Source Type)
- ■ **Voltage Rating:** 10~30V$_{DC}$
- ■ **Rated Current Output:** 0.5A per channel at signal "1"
- ■ **Leakage Current:** 10uA per channel at signal "0"
- ■ **Output Delay:** From logic level 0 to 1: 150us
    From logic level 1 to 0: 2ms

5.6.1.3 Protection

- ■ **Isolation Voltage:** 2,000V$_{DC}$
- ■ Internal Flyback diode for inductive load

5.6.1.4 Environment

- ■ **Operation Temperature:** -10~60°C (vertical mounted)
- ■ **Storage Temperature:** -40~85°C
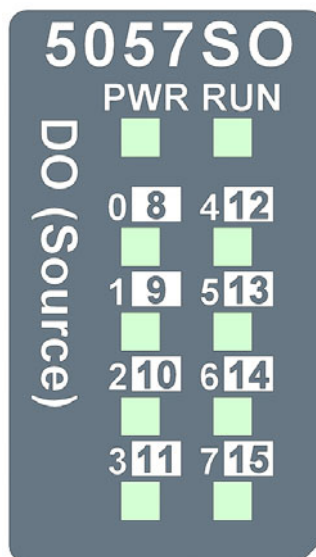- ■ **Relative Humidity:** 5~95% (non-condense)

5.6.2 LED Indicator

Figure 5.27 AMAX-5057SO Module LED Indicator

Table 5.16: AMAX-5057SO Module LED Indicator			
LED	**Color**	**Indication**	**Behavior**
Power	Green	ON	Power on
Run	Green	ON	EtherCAT connection
	Green	Blink	When TX/RX data in transmission
DI0~7	Green	ON	DO turn on
		OFF	DO turn off
DI8~15	Yellow	ON	DO turn on
		OFF	DO turn off

5.6.3 Pin Definition and Wiring

Figure 5.28 AMAX-5057SO Module Front View
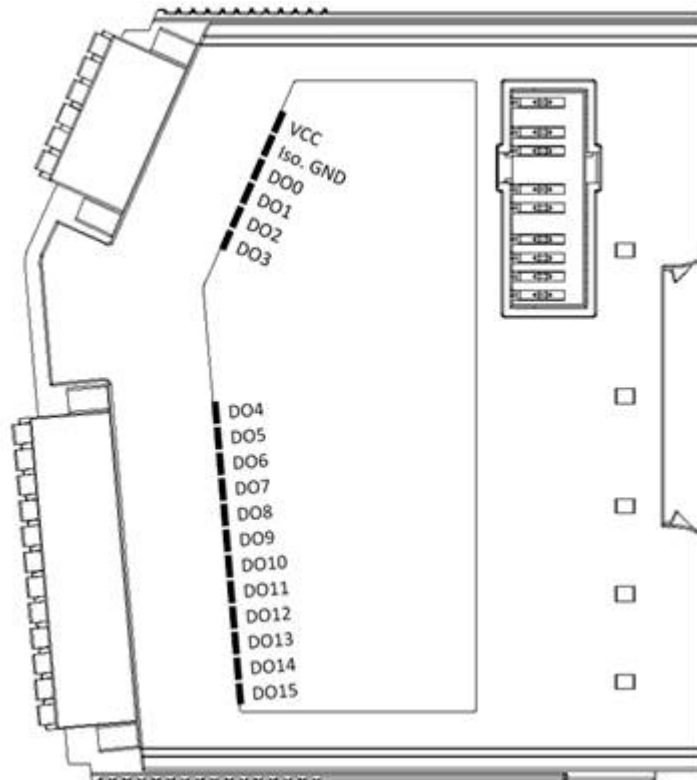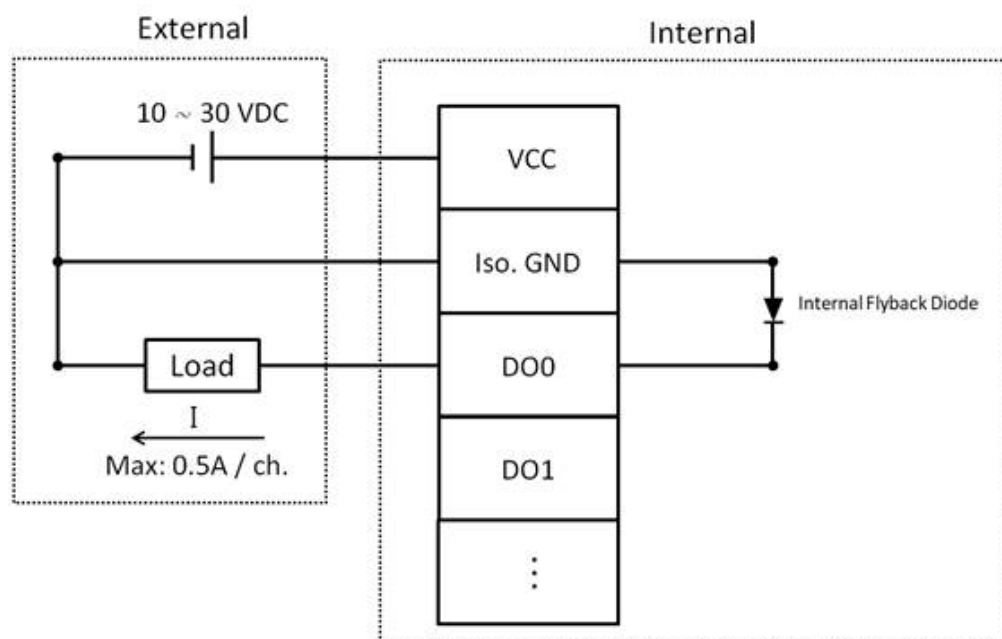

Figure 5.29 AMAX-5057SO Module Side View

Table 5.17: Upper 6 Pin Connector

Pin Number	Pin Definition
1	VCC
2	Iso. GND
3	DO1
4	DO2
5	DO3
6	DO4

Table 5.18: Lower 12 Pin Connector

Pin Number	Pin Definition
1	DO4
2	DO5
3	DO6
4	DO7
5	DO8
6	DO9
7	DO10
8	DO11
9	DO12
10	DO13
11	DO14
12	DO15

5.6.4 Application Wiring

Figure 5.30 Wiring for AMAX-5057SO

5.6.5 Object Description and Parameterization

5.6.5.1 Output Data of the Module (0x3101)

Index (hex)	Name	Meaning	Data type	Flags	Default value
3101:01	DO0	Digital Output Channel 0	BOOLEAN	RO	0x00
3101:02	DO1	Digital Output Channel 1	BOOLEAN	RO	0x00
3101:03	DO2	Digital Output Channel 2	BOOLEAN	RO	0x00
3101:04	DO3	Digital Output Channel 3	BOOLEAN	RO	0x00
3101:05	DO4	Digital Output Channel 4	BOOLEAN	RO	0x00
3101:06	DO5	Digital Output Channel 5	BOOLEAN	RO	0x00
3101:07	DO6	Digital Output Channel 6	BOOLEAN	RO	0x00
3101:08	DO7	Digital Output Channel 7	BOOLEAN	RO	0x00
3102:01	DO8	Digital Output Channel 8	BOOLEAN	RO	0x00
3102:02	DO9	Digital Output Channel 9	BOOLEAN	RO	0x00
3102:03	DO10	Digital Output Channel 10	BOOLEAN	RO	0x00
3102:04	DO11	Digital Output Channel 11	BOOLEAN	RO	0x00
3102:05	DO12	Digital Output Channel 12	BOOLEAN	RO	0x00
3102:06	DO13	Digital Output Channel 13	BOOLEAN	RO	0x00
3102:07	DO14	Digital Output Channel 14	BOOLEAN	RO	0x00
3102:08	DO15	Digital Output Channel 15	BOOLEAN	RO	0x00

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