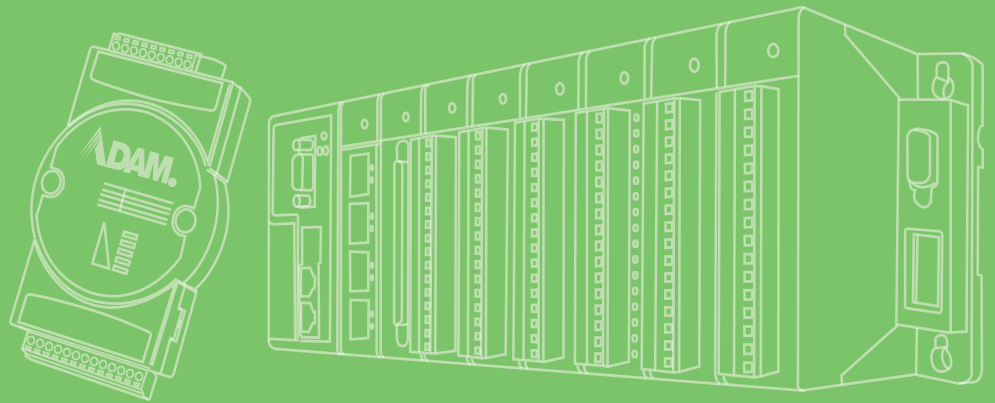


User Manual



AMAX-5000 Series

EtherCAT Slice I/O Modules

ADVANTECH

Enabling an Intelligent Planet

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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 AMAX-5000 series slice I/O modules. To know more about the 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: AMAX-5000 series extension modules

Module	Name	Specifications
Infrastructure	AMAX-5001	Power input module - 24V _{DC} power input for Slice IOs* - Abnormal voltage detection - 4DI / wet contact * This should be the first module of the right side IO modules following to the AMAX-5580. It can also be added between AMAX-5000 modules to provide extra power.
	AMAX-5074	EtherCAT coupler - 24V _{DC} power input - 2xRJ45 (in*1, out*1) - Abnormal Voltage Detection *This module contains power input feature, so no need to add another AMAX-5001 to be the power input module
	AMAX-5079	EtherCAT Extension - Extend EtherCAT by RJ45 (out*1)
Analog Input/Output Modules	AMAX-5015	4-ch RTD input module - 2 or 3 wire RTD sensor - Pt100, Pt1000, Balco500, Ni518 - 100Hz sample rate per channel
	AMAX-5017C	6-ch current input module - Current Input - 16-bit resolution - 100Hz sample rate per channel - Supports wire burn-out detection
	AMAX-5017V	6-ch Voltage input module - Voltage Input - 16-bit resolution - 100Hz sample rate per channel
	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 Module	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 input module - Sink Type - DO Voltage: 10~30V _{DC}
	AMAX-5056SO	8-ch Isolated digital input module - Source Type - DO Voltage: 10~30V _{DC}
	AMAX-5057	16-ch Isolated digital input module - Sink Type - DO Voltage: 10 ~30V _{DC}
	AMAX-5057SO	16-ch Isolated digital input module - Source Type - DO Voltage: 10~30V _{DC}
Counter/Encoder Module	AMAX-5080	2-ch Counter/encoder input module - Counter Range: 32-bit - Mode: Encoder mode, bi-direction mode
Digital I/O Module with Timestamp	AMAX-5051T	8-ch Digital input module (w/ 2-ch timestamp) - DI Voltage: 11~30V _{DC} - timestamp resolution: 1ns - Input delay: < 0.5us
	AMAX-5056T	2-ch Timestamp digital output module - DO voltage: 10~30V _{DC} - timestamp resolution: 1ns - Output delay: < 0.5us

Chapter 2

Hardware Installation

2.1 Install / Remove the Module

AMAX-5000 series is an easy-install design to help you maintain your modules easily.

2.1.1 Attach on the DIN-rail

Follow these steps to secure AMAX-5000 modules on the DIN-rail:

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

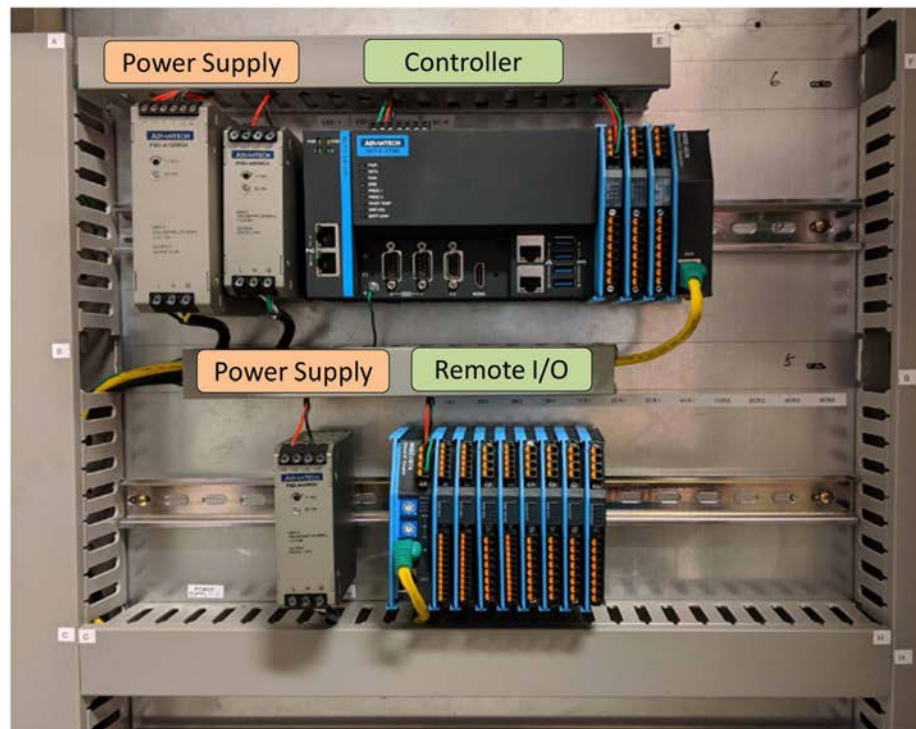


Figure 2.1 AMAX-5000 installed in control cabinet

2.1.2 Remove from the DIN-rail

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



Figure 2.2 Unlock the latch to remove the module



Figure 2.3 AMAX-5000 module design

2.2 I/O Wiring

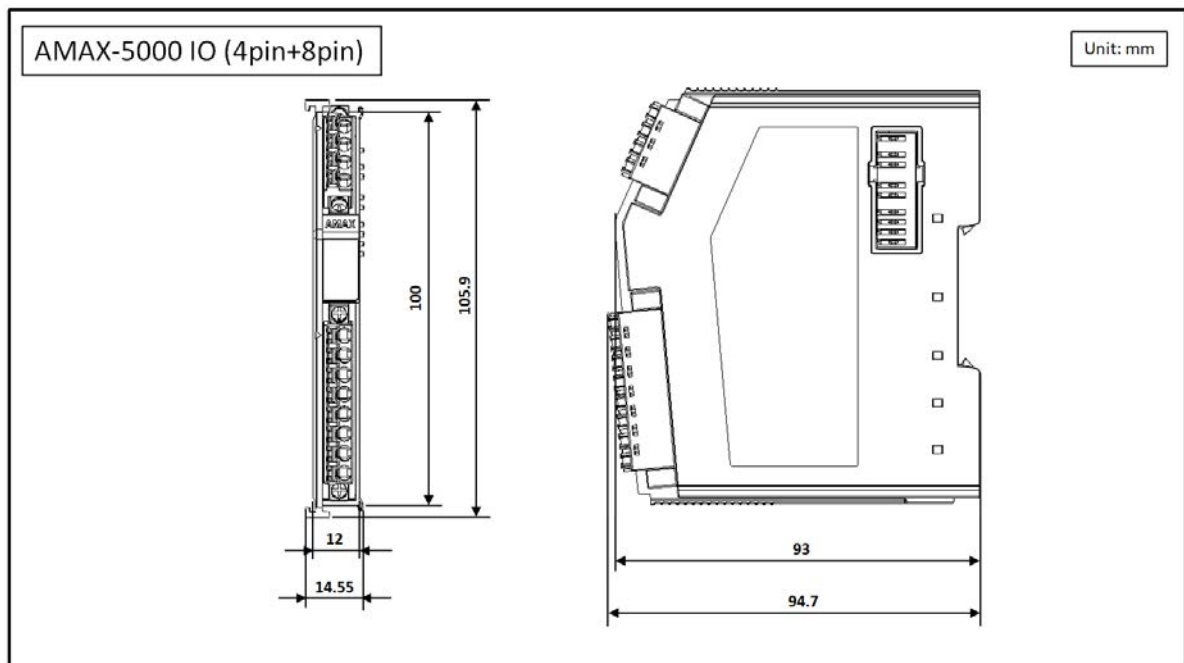
AMAX-5000 I/O modules leverage detachable clamp type terminal blocks. Comparing with traditional screw type terminal blocks, clamp type terminal blocks can save wiring time and provide better reliability for shock and vibration. Follow the procedures below for wiring your AMAX-5000 I/O module.

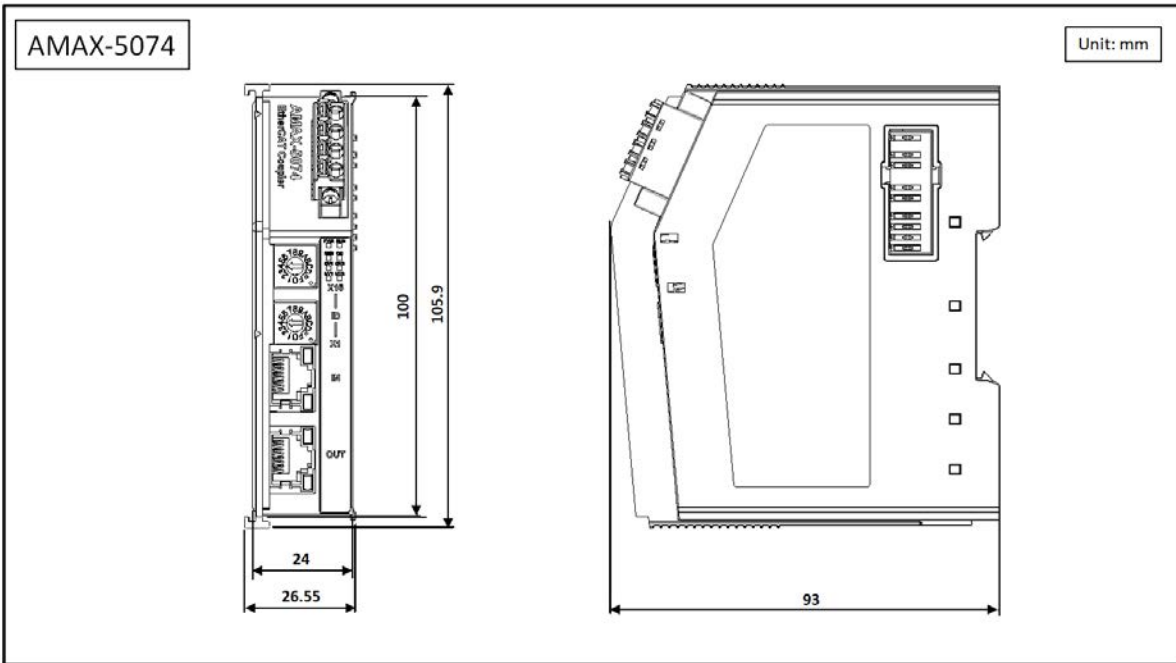
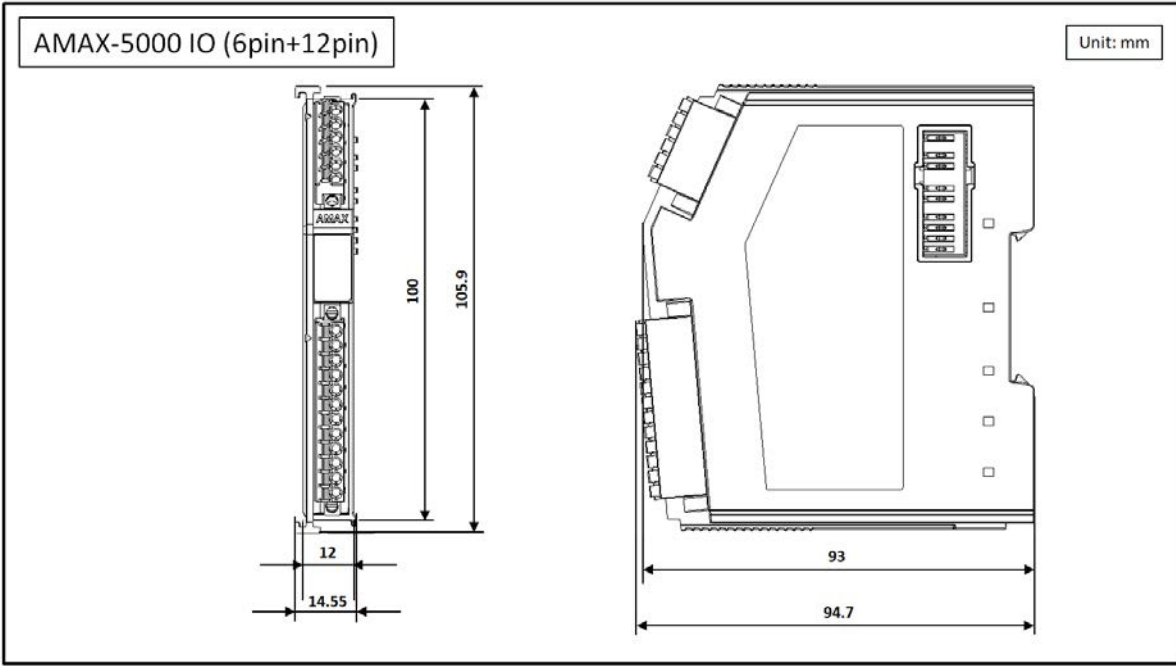
1. Use the screw driver to press the left notch on the terminal.
2. Insert the wire into the terminal.

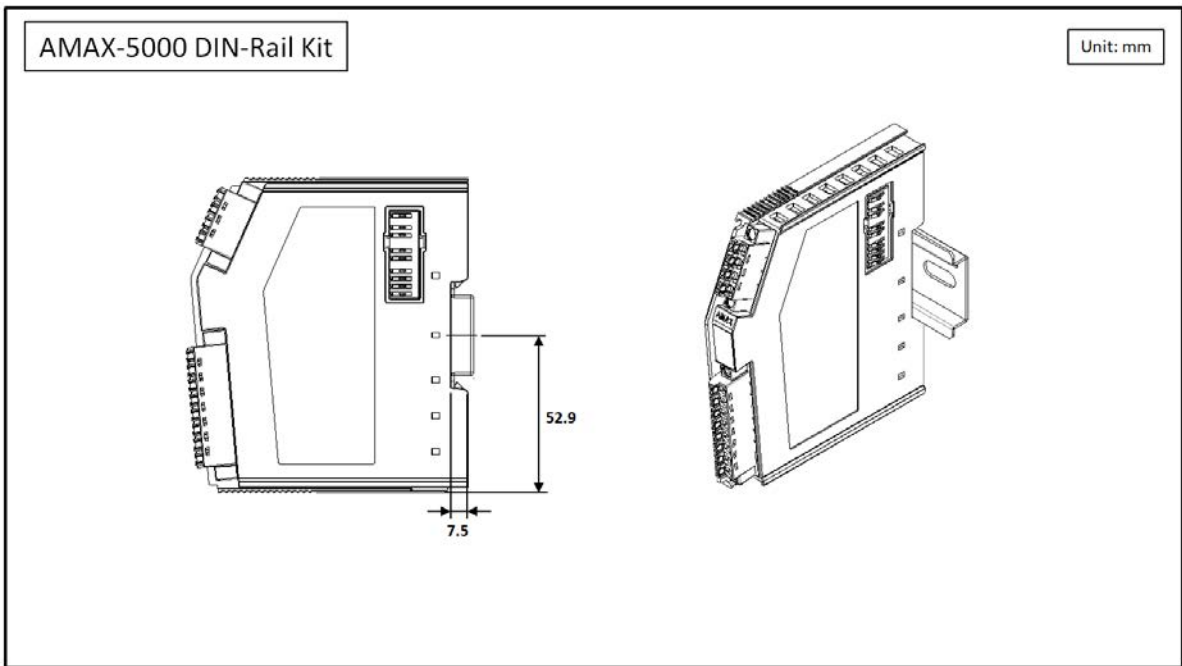
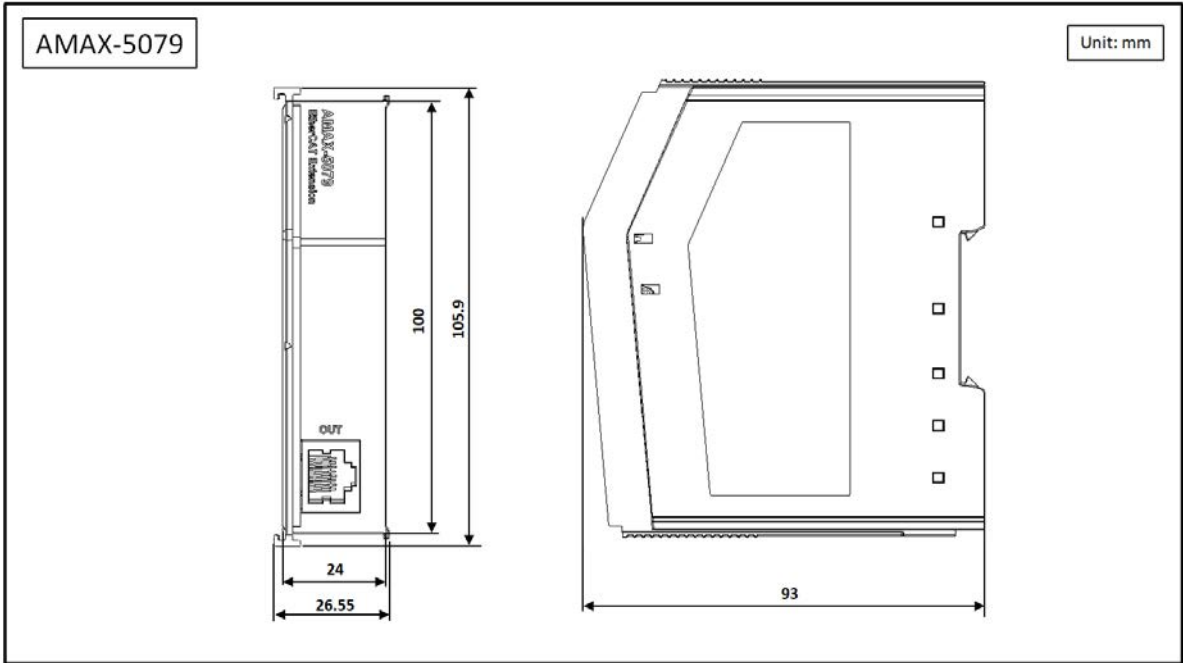
Note! Please use # 14 AWG ~ 28 AWG wire for terminal block.



2.3 Dimensions







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 - external $24V_{DC}$ power input, and a maximum 2A current to the EtherCAT bus to power the IO modules on the right side.

AMAX-5001 has a smart diagnostic function to identify power errors on the external power supply and on the internal bus. Status on the process data is shown on the LED.

AMAX-5001 is also equipped with 4-ch wet contact DI for users to connect to system events.



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 on 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 the extra 2A to the EtherCAT bus. It should supply power to the modules following on the right side, and isolate them from the power on the left side. Please refer to the following diagram for the details.

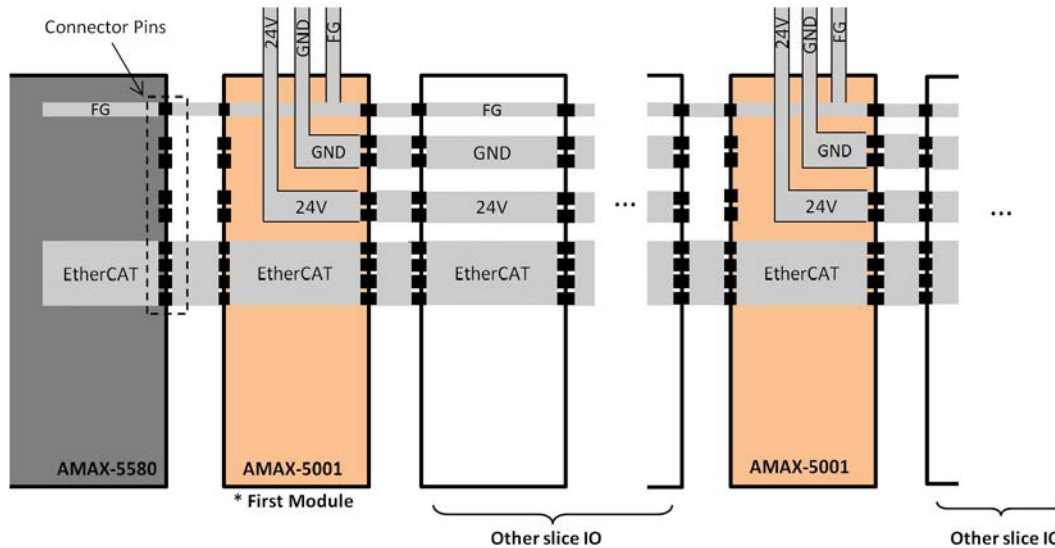


Figure 3.2 AMAX-5001 Application

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
- **Weight:** Approx. 80g

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:** $-25\sim60^{\circ}C$ (vertical mounted)
- **Storage Temperature:** $-40\sim85^{\circ}C$
- **Relative Humidity:** 5~95% (non-condense)

3.1.3 LED Indicator

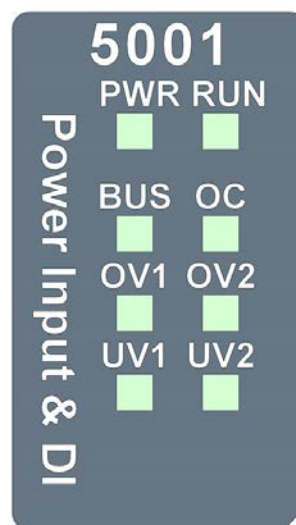


Figure 3.3 AMAX-5001 Module LED Indicator

Table 3.1: 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)

3.1.4 Pin Definition



Figure 3.4 AMAX-5001 Module Front View

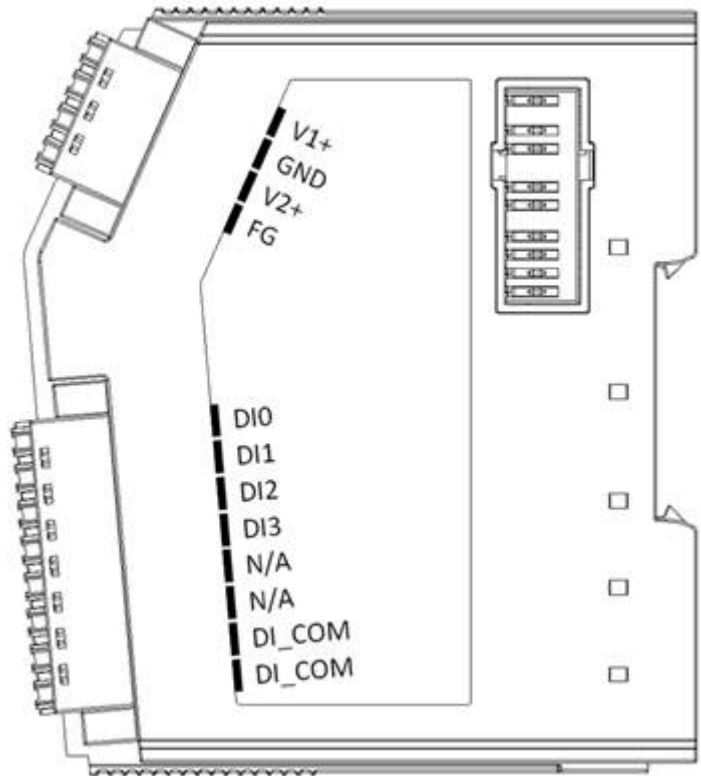


Figure 3.5 AMAX-5001 Module Side View

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

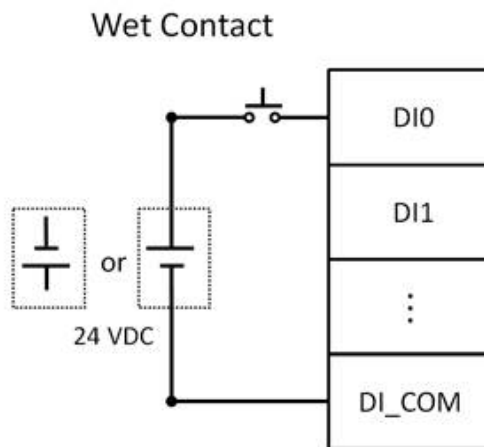


Figure 3.6 Wiring for AMAX-5001 Digital Input

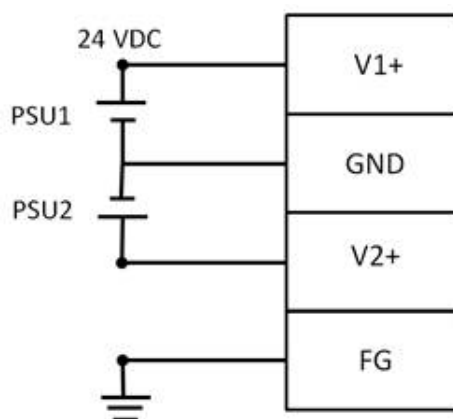


Figure 3.7 Wiring for AMAX-5001 Power Input

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
- **Weight:** Approx. 97g

3.2.1.2 Power Input

- **Rated Voltage:** 24VDC ($\pm 20\%$)
- **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:** -25~60°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

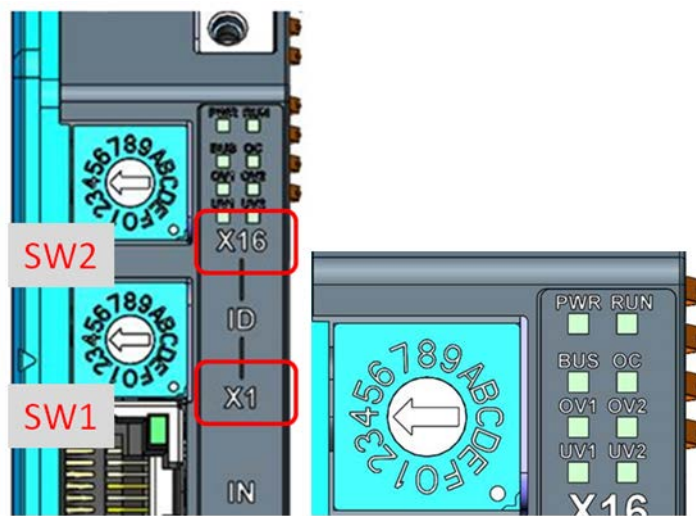


Figure 3.10 AMAX-5074 ID Switch

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	

Note! Function Reserved, hot connection is currently not supported in CODE-SYS.



3.2.4 Pin Definition

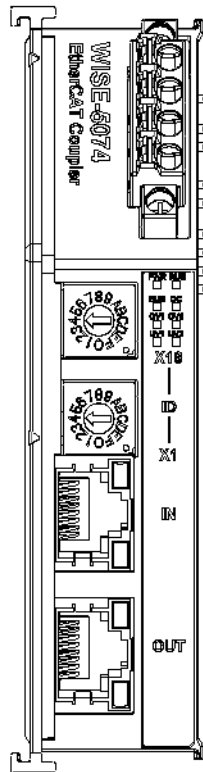


Figure 3.11 AMAX-5074 Module Front View

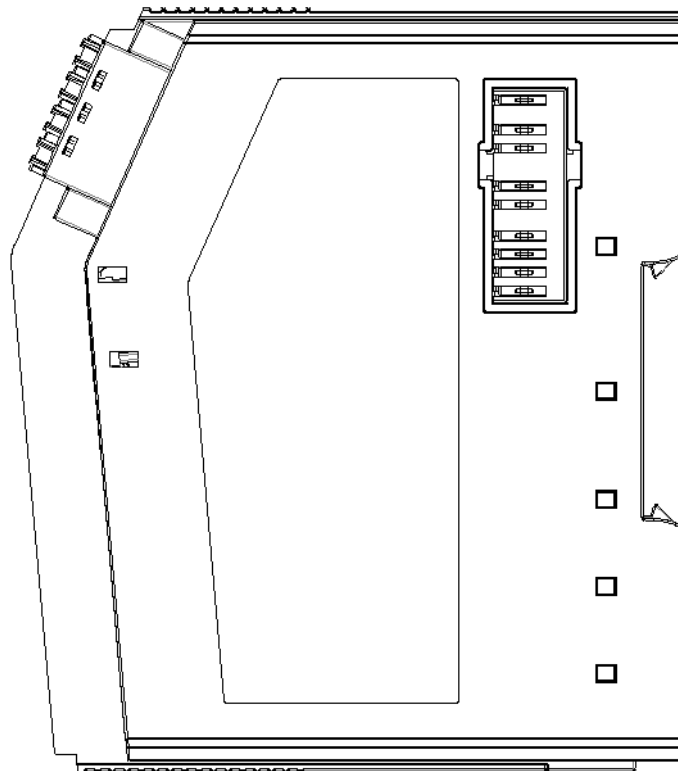


Figure 3.12 AMAX-5074 Module Side View

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

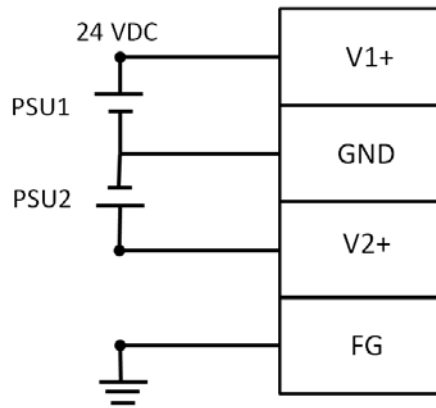


Figure 3.13 Wiring for AMAX-5074 Power Input

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 the 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
- **Weight:** Approx. 71g

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 (100BASE-TX)
- **Bus Interface:** 1 x RJ45
- **Power from bus:** N/A

3.3.1.3 Environment

- **Operation Temperature:** -25~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

3.3.2 Pin Definition

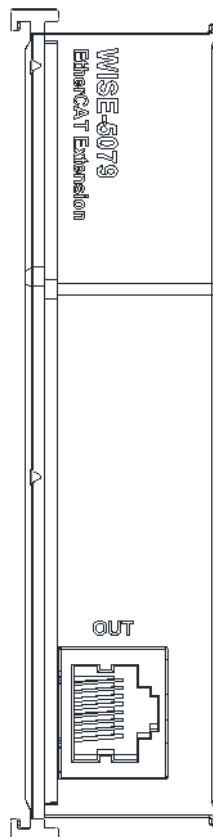


Figure 3.15 AMAX-5079 Module Front View

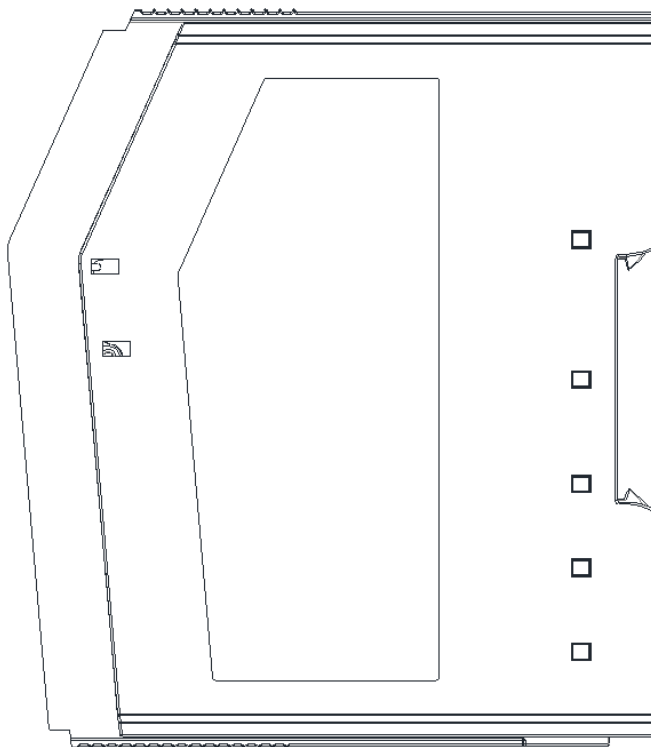


Figure 3.16 AMAX-5079 Module Side View

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
- **Weight:** Approx. 80g

4.1.1.2 Analog Input

- **Channel:** 4
- **Input Connection:** 2 or 3 wire
- **Input Impedance:** >10M Ω
- **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 $\pm 0.1\%$ FSR accuracy @25°C
- **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:** -25~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

4.1.2 LED Indicator

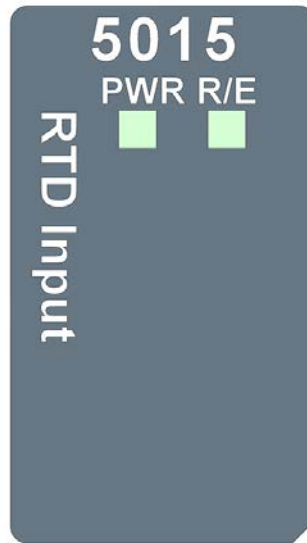


Figure 4.2 AMAX-5015 Module LED Indicator

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
	RED	OFF	EtherCAT Abnormal
		ON/Blink	System Abnormal
	OFF	No Error	

4.1.3 Pin Definition

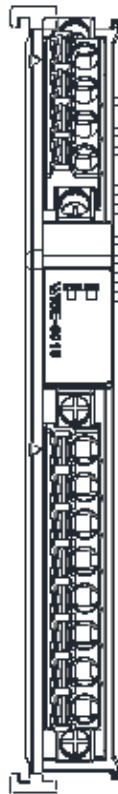


Figure 4.3 AMAX-5015 Module Front View

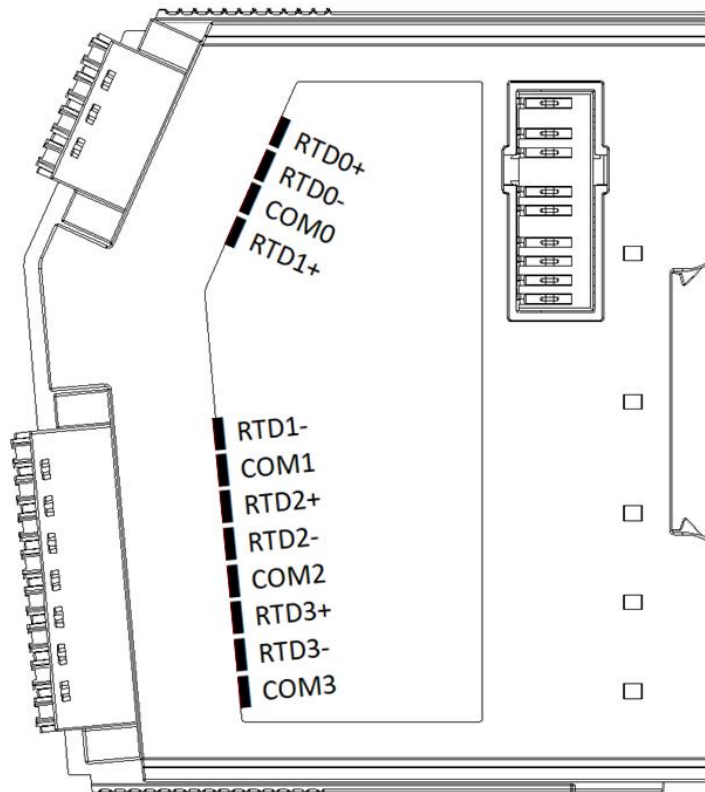


Figure 4.4 AMAX-5015 Module Side View

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

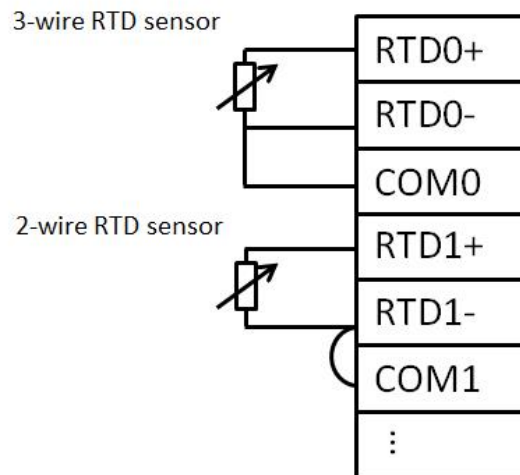


Figure 4.5 Wiring for AMAX-5015

4.1.5 Object Description and Parameterization

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

Table 4.4: 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_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)

Table 4.5: 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	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 - 0xFFFF)

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)	DT0801E N16	RW	0 (10Hz)

4.1.5.5 Enums (0x0800 - 0xFFFF)

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 because 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
- **Weight:** Approx. 80g

4.2.1.2 Analog Input

- **Channel:** 6 (Differential)
- **Input Impedance:** 120 Ω
- **Input Type:** mA
- **Voltage/Current Range:** ± 20 mA, 0 ~ 20 mA, 4 ~ 20 mA
- **Span Drift:** 6 ppm/ $^{\circ}$ C
- **Resolution:** 16 bit with $\pm 0.2\%$ FSR accuracy @25 $^{\circ}$ C
- **Sampling Rate:** 100 sample/s (per channel)

4.2.1.3 Protection

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

4.2.1.4 Environment

- **Operation Temperature:** -25~60 $^{\circ}$ C (vertical mounted)
- **Storage Temperature:** -40~85 $^{\circ}$ C
- **Operating Humidity:** 20 ~ 95% RH (non-condense)
- **Storage Humidity:** 0 ~ 95% RH (non-condense)

4.2.2 LED Indicator

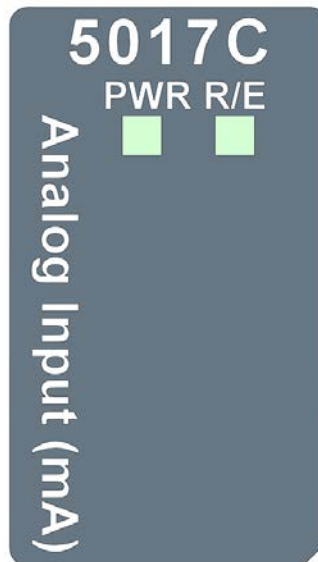


Figure 4.7 AMAX-5017C Module LED Indicator

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

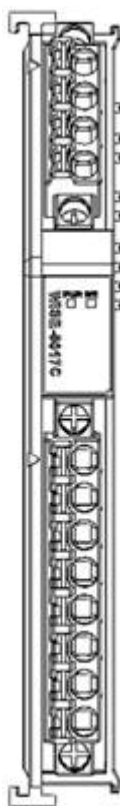


Figure 4.8 AMAX-5017C Module Front View

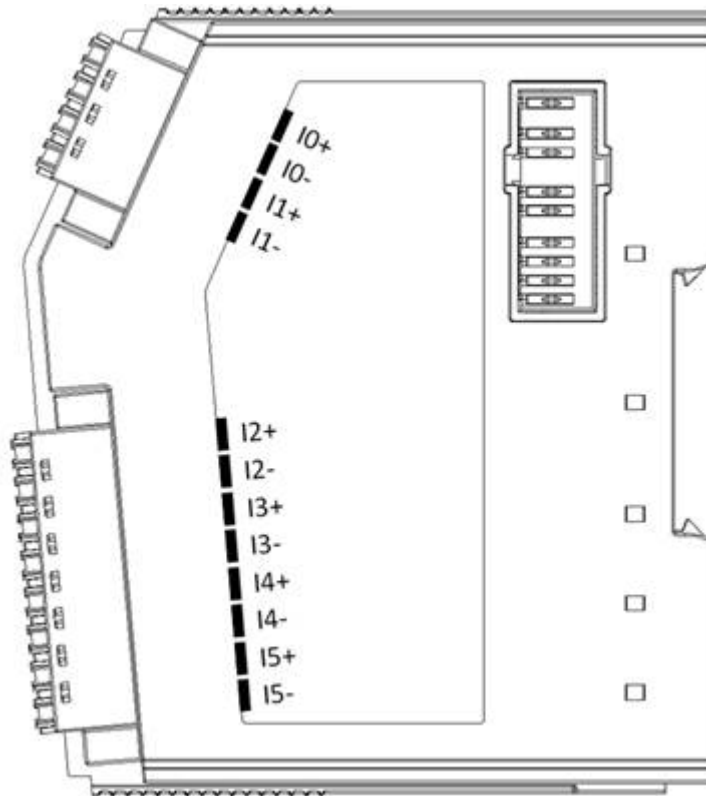


Figure 4.9 AMAX-5017C Module Side View

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

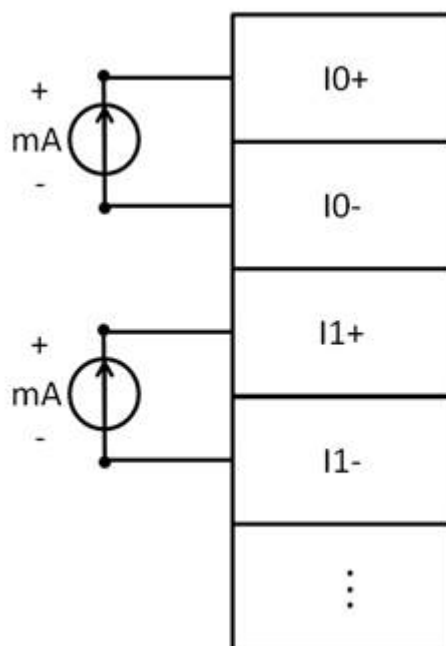


Figure 4.10 Wiring for AMAX-5017C

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 - 0xFFFF)

Table 4.15: Range (DT0800EN16) Enums			
Enums (0x0800 - 0xFFFF)			
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)	DT0801E N16	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
- **Weight:** Approx. 80g

4.3.1.2 Analog Input

- **Channel:** 6 (Differential)
- **Input Impedance:** >1M Ω
- **Input Type:** V, mV
- **Voltage/Current Range:** ± 150 mV, ± 500 mV, ± 1 V, ± 5 V, ± 10 V
- **Span Drift:** 6 ppm/ $^{\circ}$ C
- **Resolution:** 16-bit with $\pm 0.1\%$ FSR accuracy @25 $^{\circ}$ C
- **Sampling Rate:** 100 sample/s (per channel)

4.3.1.3 Protection

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

4.3.1.4 Environment

- **Operation Temperature:** -25~70 $^{\circ}$ C (vertical mounted)
- **Storage Temperature:** -40~85 $^{\circ}$ C
- **Operating Humidity:** 20 ~ 95% RH (non-condensing)
- **Storage Humidity:** 0 ~ 95% RH (non-condensing)

4.3.2 LED Indicator

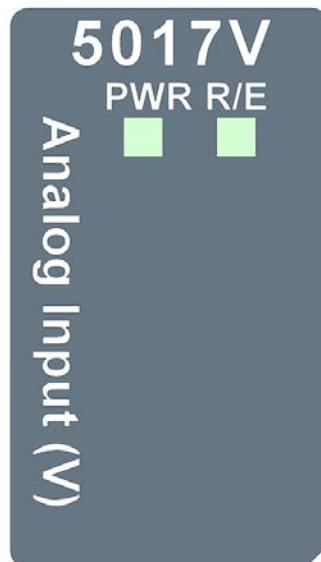


Figure 4.12 AMAX-5017V Module LED Indicator

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

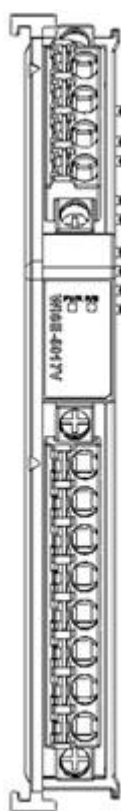


Figure 4.13 AMAX-5017V Module Front View

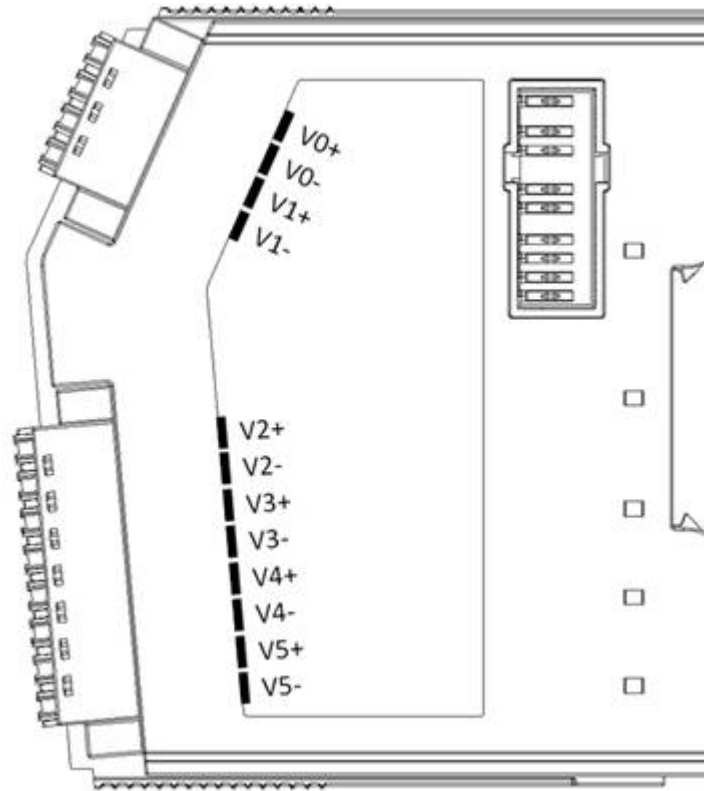


Figure 4.14 AMAX-5017V Module Side View

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

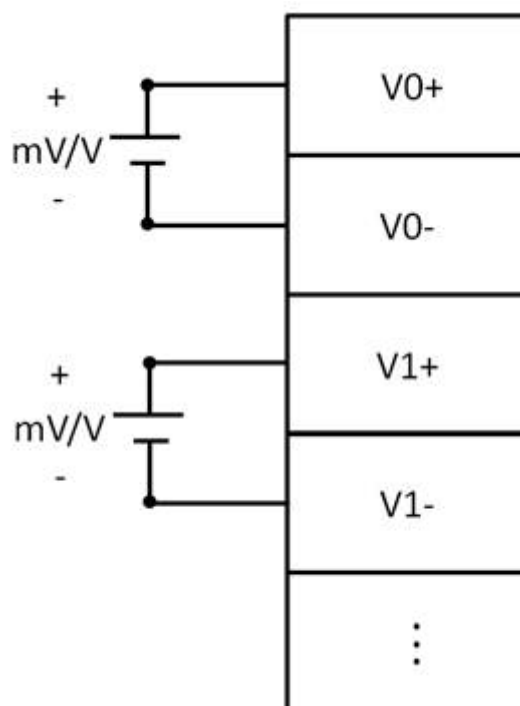


Figure 4.15 Wiring for AMAX-5017V

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 - 0xFFFF)

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)	DT0801E N16	RW	0 (10Hz)

4.3.5.5 Enums (0x0800 - 0xFFFF)

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 inputs 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
- **Weight:** Approx. 80g

4.4.1.2 Thermocouple Input

- **Channel:** 6 (Differential)
- **Input Impedance:** >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 $\pm 0.1\%$ FSR accuracy @25°C
- **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

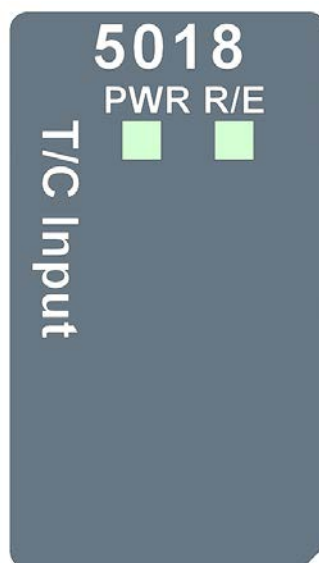


Figure 4.17 AMAX-5018 Module LED Indicator

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

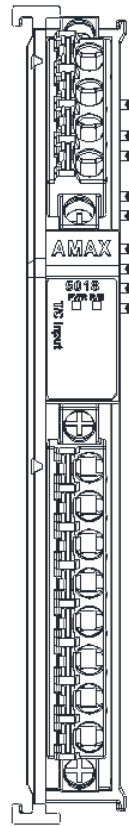


Figure 4.18 AMAX-5018 Module Front View

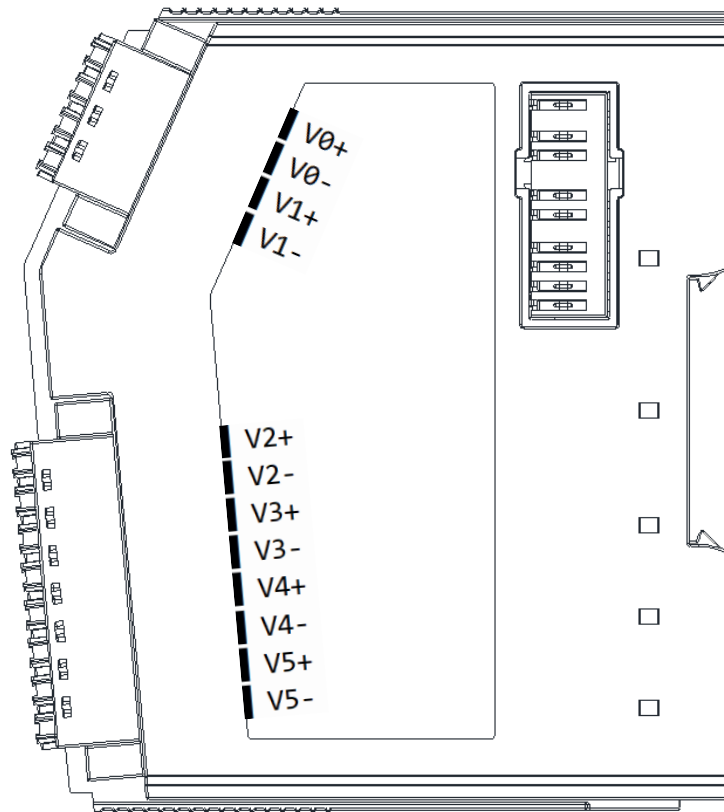


Figure 4.19 AMAX-5018 Module Side View

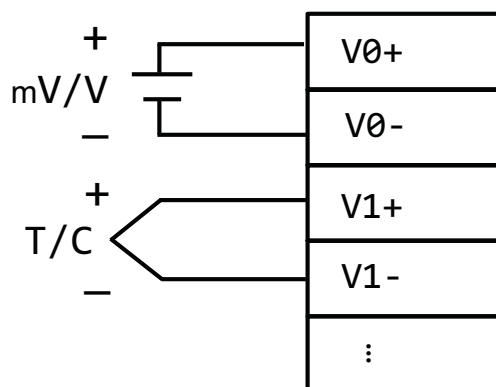
Table 4.28: Upper 4 Pin Connector

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 thermocouple input wire burnout	BOOL	RO	0x00
60n0:02	AIn_Over-Range	Detect whether the thermocouple input is over range	BOOL	RO	0x00
60n0:03	AIn_Under-Range	Detect whether the thermocouple 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 is 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_BurnOut-Value	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 - 0xFFFF)

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 - 0xFFFF)

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 - 0xFFFF)

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 programmable 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
- **Weight:** Approx. 80g

4.5.1.2 Analog Output

- **Channel:** 4
- **Output Range:** V, mA
- **Output Type:** 0~5 V, 0 ~10 V, $\pm 5V$, $\pm 10V$, 4 ~ 20 mA, 0 ~ 20 mA
- **Drift:** ± 50 ppm/ $^{\circ}C$
- **Resolution:** 16-bit with $\pm 0.01\%$ of FSR accuracy @25 $^{\circ}C$
- **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:** -25~60 $^{\circ}C$ (vertical mounted)
- **Storage Temperature:** -40~85 $^{\circ}C$
- **Operating Humidity:** 20 ~ 95% RH (non-condensing)
- **Storage Humidity:** 0 ~ 95% RH (non-condensing)

4.5.2 LED Indicator

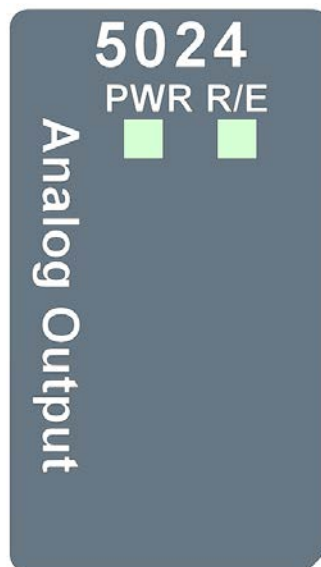


Figure 4.22 AMAX-5024 Module LED Indicator

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

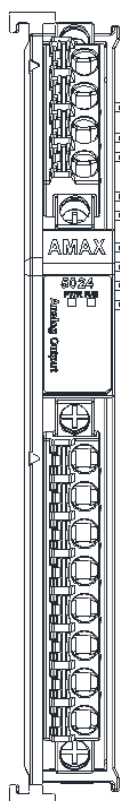


Figure 4.23 AMAX-5024 Module Front View

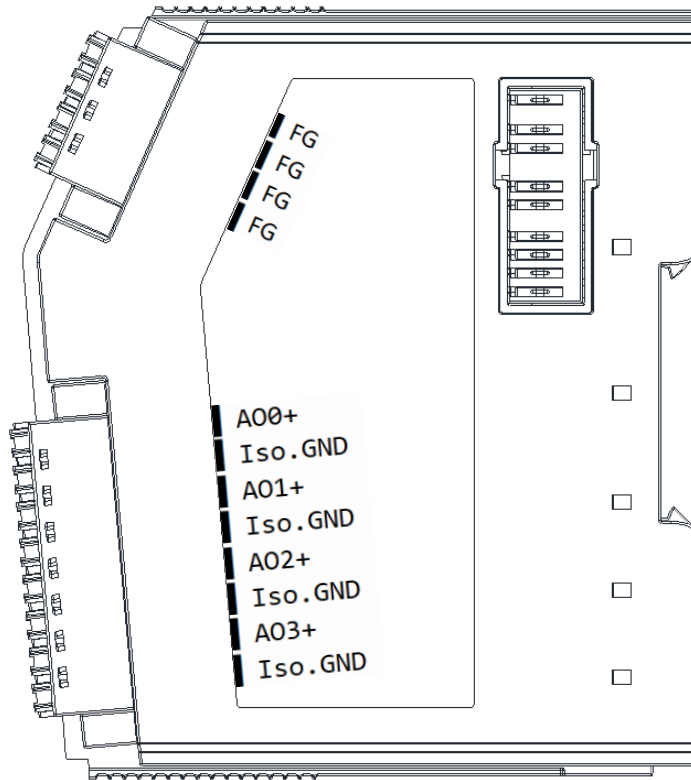


Figure 4.24 AMAX-5024 Module Side View

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

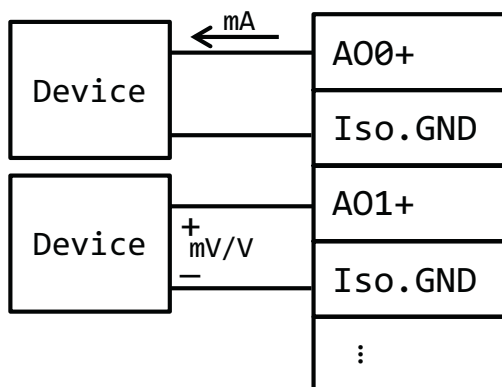


Figure 4.25 Wiring for AMAX-5024

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	AO _n _BurnOut	Detect whether the input circuit open	BOOL	RO	0x00
60n0:17	AO _n	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	AO _n	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	AO _n _EnSlewRate	Enable slew rate function	BOOL	RW	0
80n0:17	AO _n _Range	Type of ch#n	DT0800EN16 (16 bits)	RW	0x180 (4~20 mA)
80n0:21	AO _n _SlewRate	Slew rate setting	DT801EN16	RW	0x00

(n=0~3 for Ch0~3)

4.5.5.4 Enums (0x0800 - 0xFFFF)

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 - 0xFFFF)

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 - 0xFFFF)

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 show 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
- **Weight:** Approx. 80g

5.1.1.2 Digital Input:

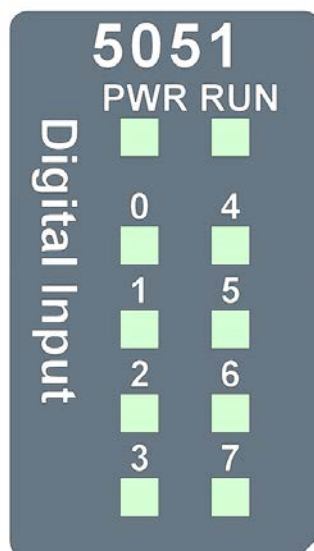
- **Channels:** 8
- **Digital Input:**
 - Dry Contact:
 - Logic level 1: close to Iso.GND
 - Logic level 0: open
 - Wet Contact:
 - Rated voltage: 24V_{DC}
 - Logic level 1: 10~30 V_{DC} and -10~-30V_{DC}
 - Logic level 0: -3~3V_{DC}
- **Input Delay:**
 - From logic 0 to 1: 4ms
 - From logic 1 to 0: 4ms
- **Digital Filter:** 3ms
- **Typical Input Current:** Logic level 1: 1.3mA~4.3mA (10V~30V)

5.1.1.3 Protection

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

5.1.1.4 Environment

- **Operation Temperature:** -25~60°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

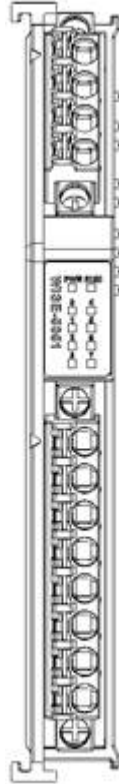


Figure 5.3 AMAX-5051 Module Front View

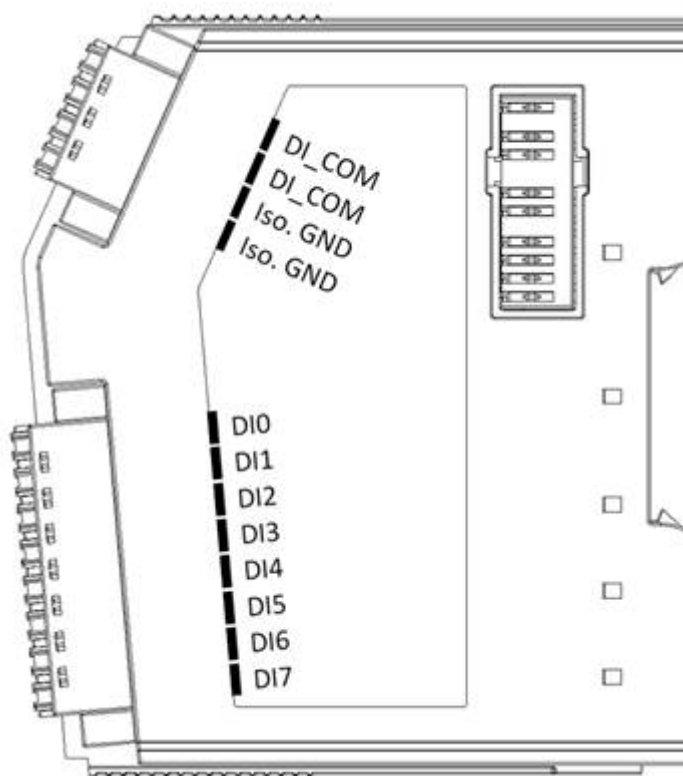


Figure 5.4 AMAX-5051 Module Side View

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

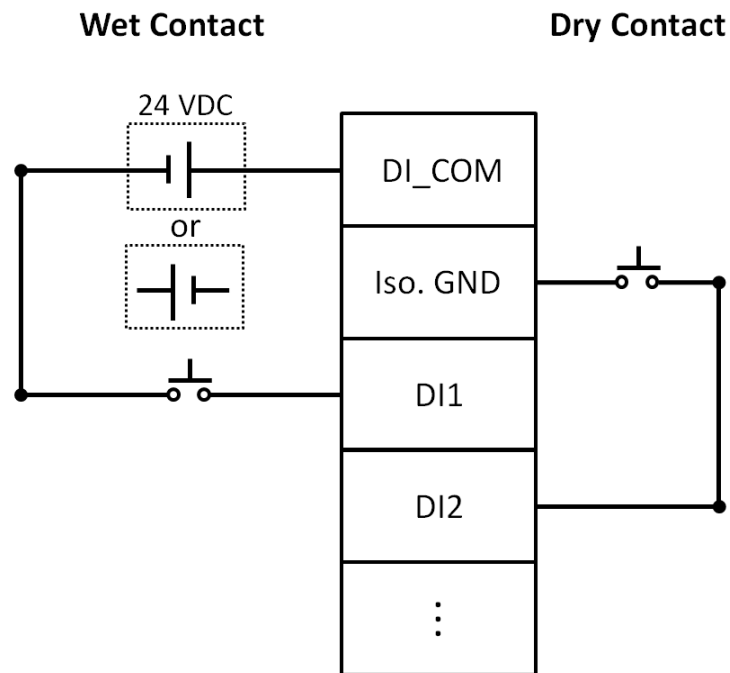


Figure 5.5 Wiring for AMAX-5051

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
- **Weight:** Approx. 80g

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: 10~30 V_{DC} and -10~-30V_{DC}
 - Logic level 0: -3~3V_{DC}
- **Input Delay:**
 - From logic 0 to 1: 4ms
 - From logic 1 to 0: 4ms
- **Digital Filter:** 3ms
- **Typical Input Current:** Logic level 1: 1.3mA~4.3mA (10V~30V)

5.2.1.3 Protection

- Isolation Voltage: 2,000V_{DC}

5.2.1.4 Environment

- **Operation Temperature:** -25~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

5.2.2 LED Indicator

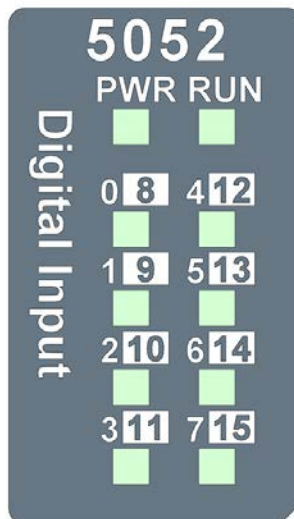


Figure 5.7 AMAX-5052 Module LED Indicator

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

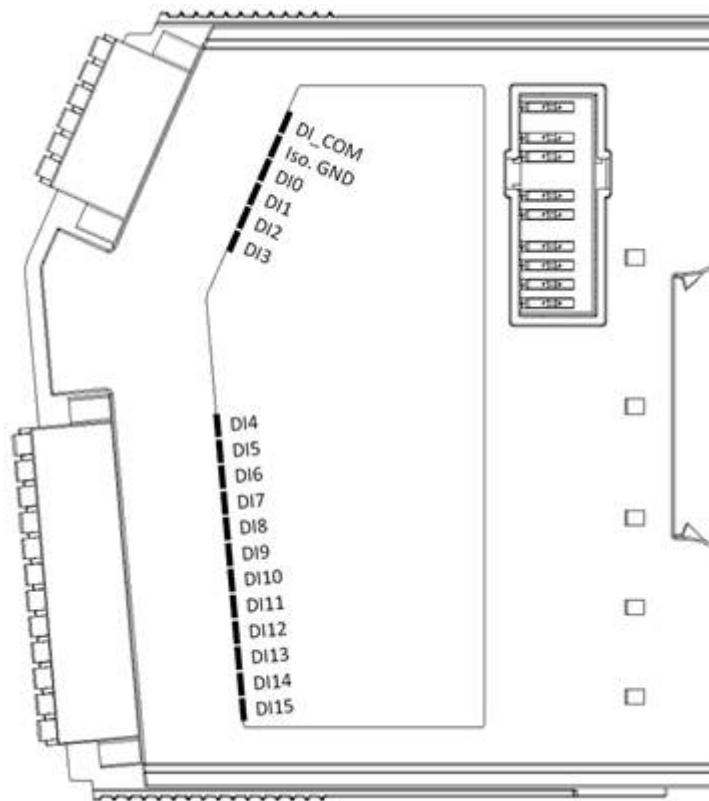


Figure 5.9 AMAX-5052 Module Side View

Table 5.5: Upper 6 Pin Connector

Pin Number	Pin Definition
1	DI_COM
2	Iso. GND
3	DI0
4	DI1
5	DI2
6	DI3

Table 5.6: Lower 12 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

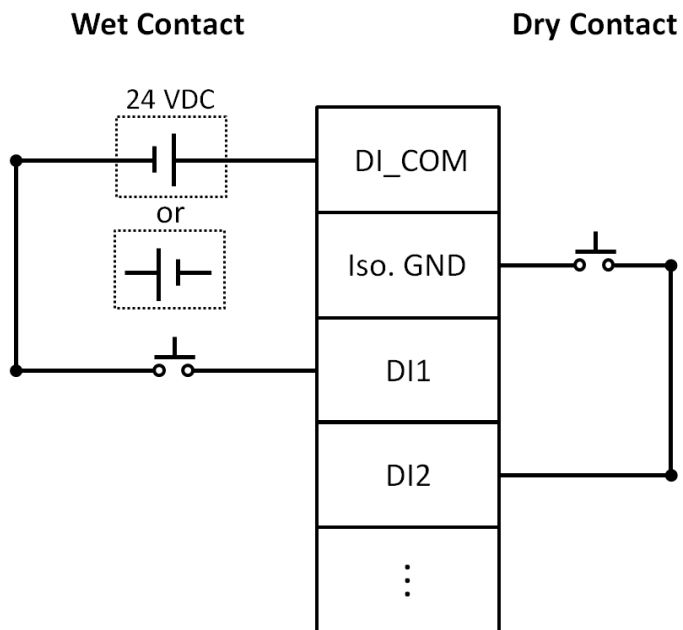


Figure 5.10 Wiring for AMAX-5052

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
- **Weight:** Approx. 80g

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:** -25~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

5.3.2 LED Indicator

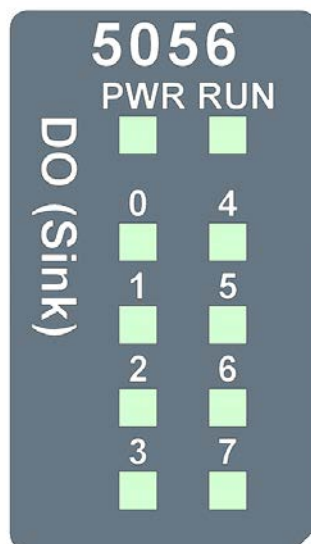


Figure 5.12 AMAX-5056 Module LED Indicator

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

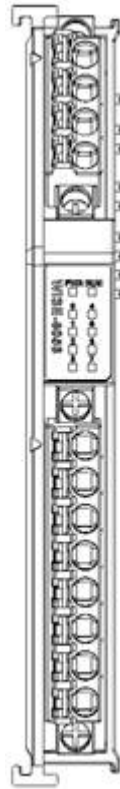


Figure 5.13 AMAX-5056 Module Front View

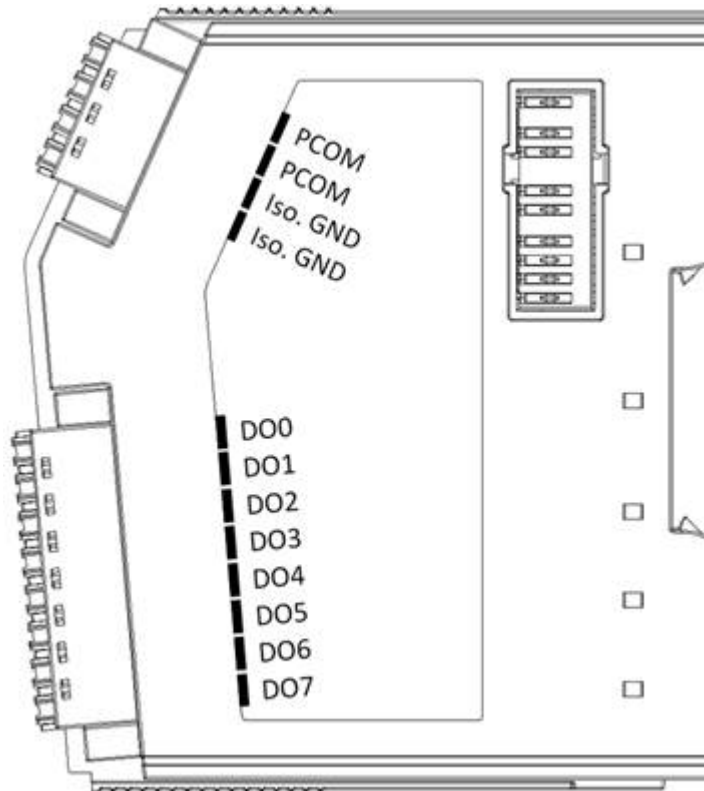


Figure 5.14 AMAX-5056 Module Side View

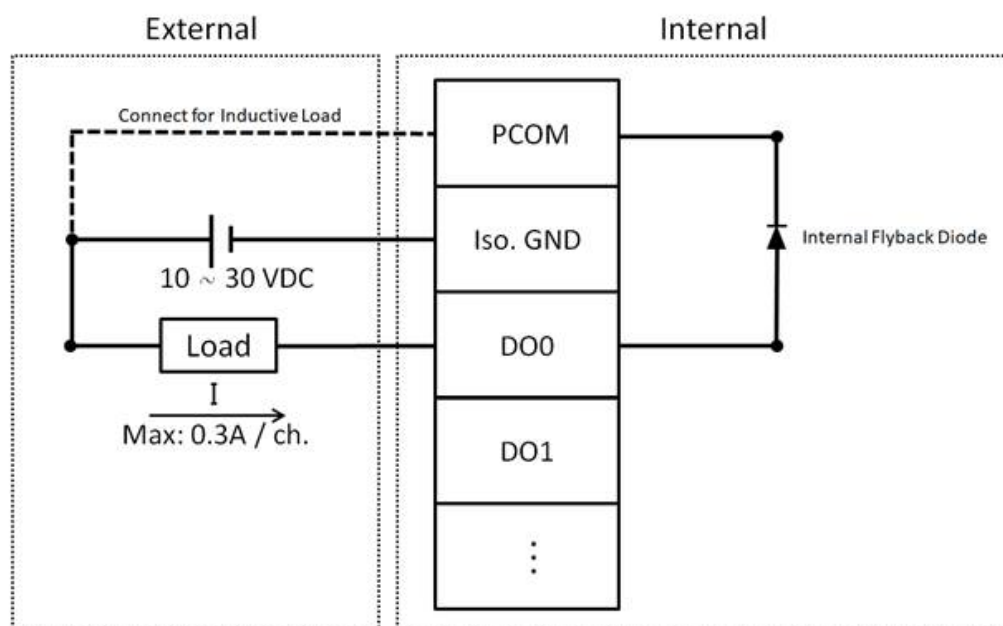
Table 5.8: Upper 4 Pin Connector

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 an 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
- **Weight:** Approx. 80g

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:** -25~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

5.4.2 LED Indicator

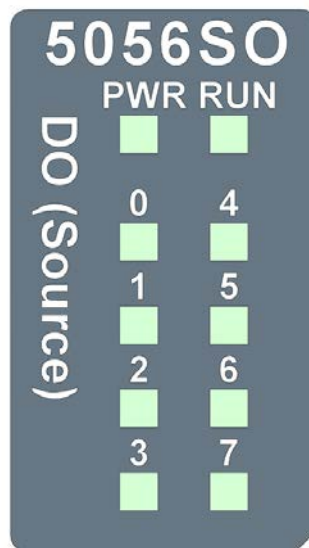


Figure 5.17 AMAX-5056SO Module LED Indicator

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

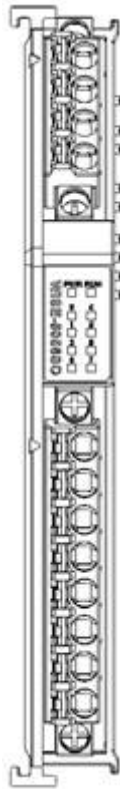


Figure 5.18 AMAX-5056SO Module Front View

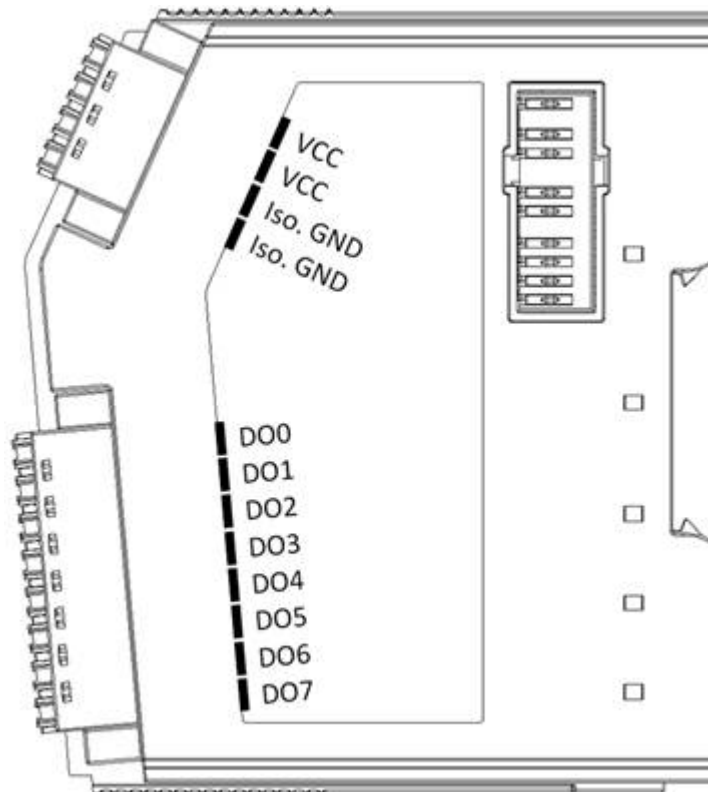


Figure 5.19 AMAX-5056SO Module Side View

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

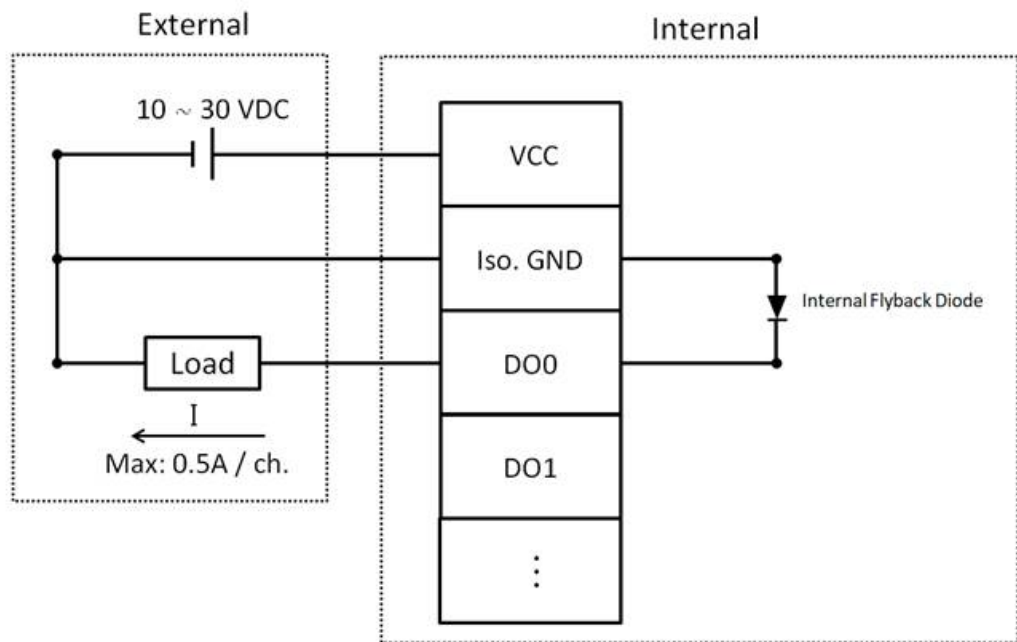


Figure 5.20 Wiring for AMAX-5056SO

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
- **Weight:** Approx. 80g

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:** -25~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

5.5.2 LED Indicator

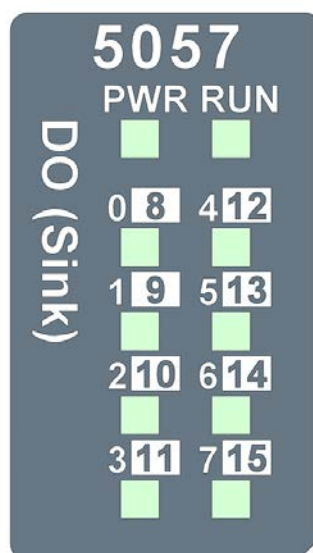


Figure 5.22 AMAX-5057 Module LED Indicator

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

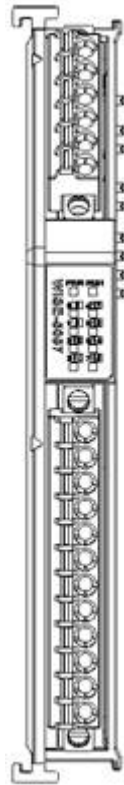


Figure 5.23 AMAX-5057 Module Front View

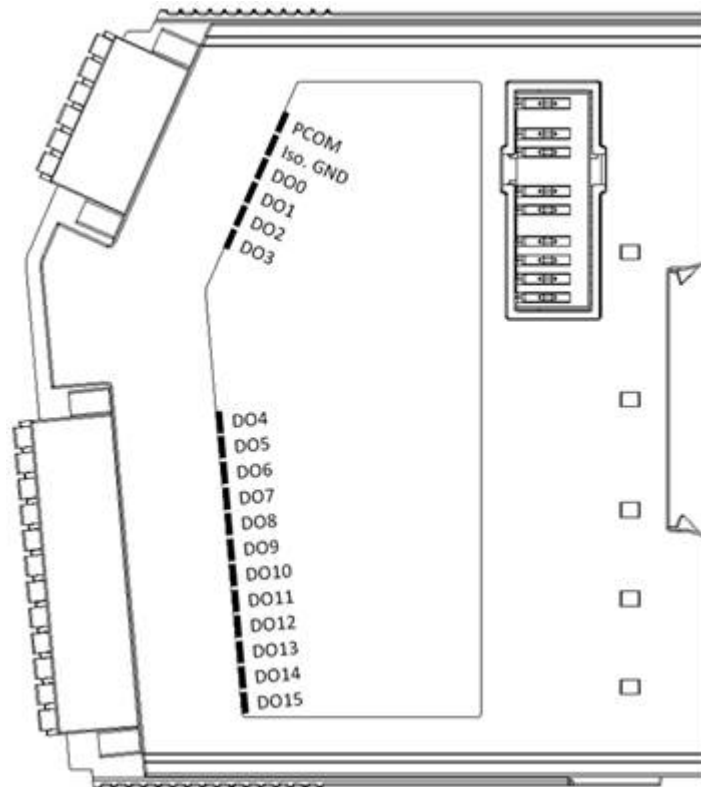


Figure 5.24 AMAX-5057 Module Side View

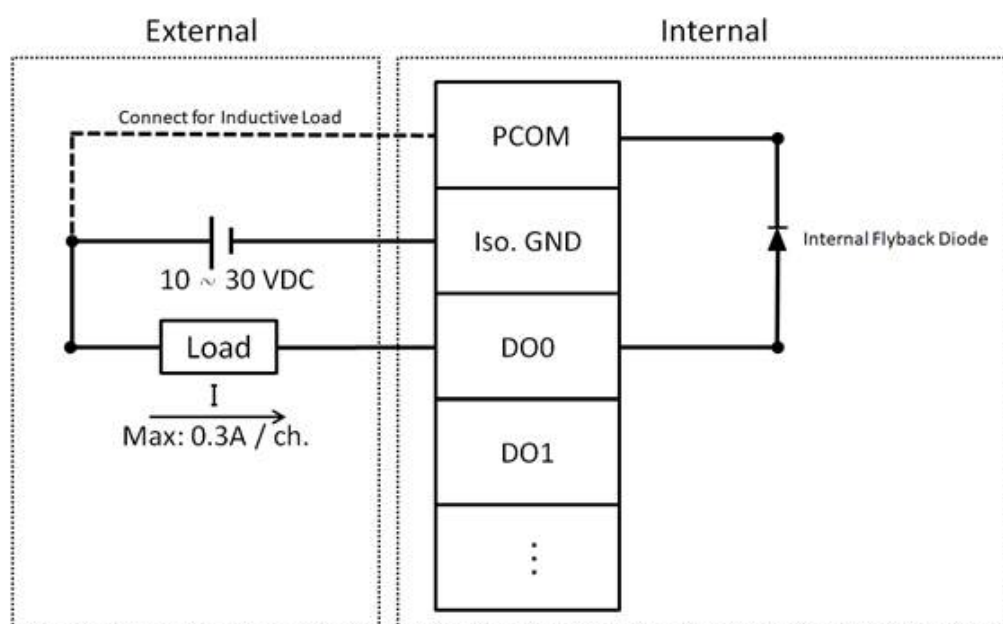
Table 5.14: Upper 6 Pin Connector

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 an 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
- **Weight:** Approx. 80g

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:** -25~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

5.6.2 LED Indicator

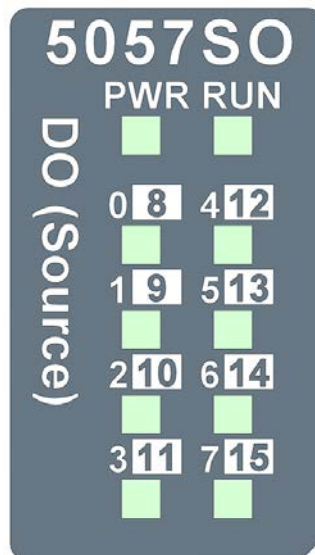


Figure 5.27 AMAX-5057SO Module LED Indicator

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

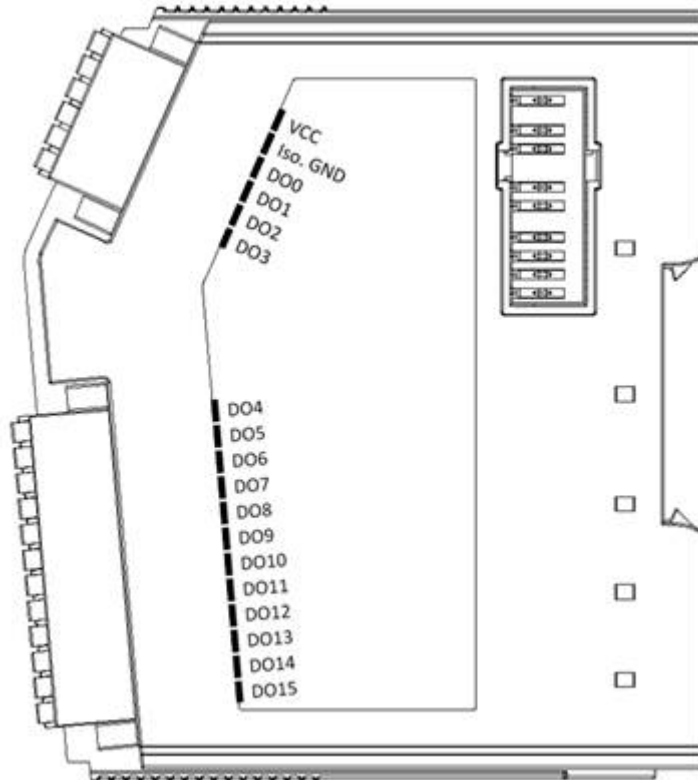


Figure 5.29 AMAX-5057SO Module Side View

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

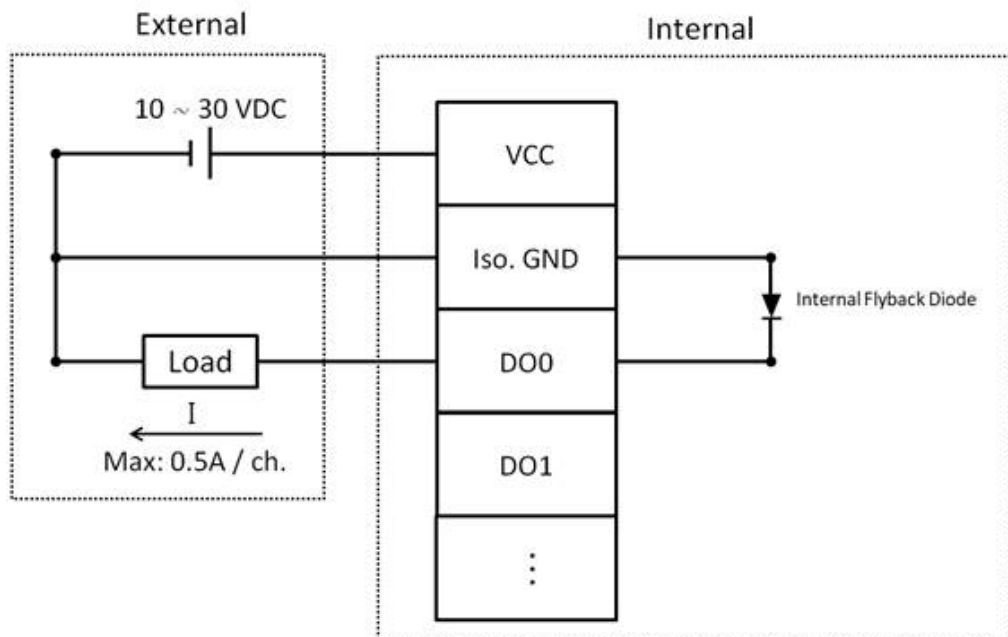


Figure 5.30 Wiring for AMAX-5057SO

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

Chapter 6

Counter/Encoder
Module

6.1 AMAX-5080 2-ch Counter/ Encoder 32-bit

The AMAX-5080 is a 32-bit 2-ch counter/encoder module which supports Encoder Mode and Bi-direction Mode. It supports single-ended input with up to 1MHz input frequency. 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 6.1 AMAX-5080 Module

6.1.1 AMAX-5051T Specification

6.1.1.1 General

- **Certification:** CE, FCC class A
- **Connector:** Pluggable 6P+12P 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, A/B/Z/L status
- **Weight:** Approx. 80g

6.1.1.2 Counter Input

- **Channels:** 2
- **Counter Range:** 32 bit
- **Modes:** Counter (up/down, bi-direction, up, A/B/Z Phase, DI latch)
Frequency:
- **Signal Input:**
Single-ended
"0" signal: -3...+5 V (EN 61131-2, type 1/3)
"1" signal: 11...30 V (EN 61131-2, type 3)
- **Input Frequency:** 1 MHz max.

6.1.1.3 Protection

Isolation Voltage: 2,000V_{DC}

6.1.1.4 Environment

- **Operation Temperature:** -25~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

6.1.2 LED Indicator

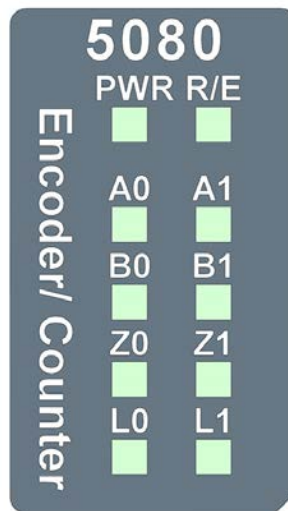


Figure 6.2 AMAX-5080 Module LED Indicator

Table 6.1: 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
A0	Green	ON	Signal Input
A1	Green	ON	Signal Input
B0	Green	ON	Signal Input
B1	Green	ON	Signal Input
Z0	Green	ON	Signal Input
Z1	Green	ON	Signal Input
L0	Green	ON	Signal Input
L1	Green	ON	Signal Input

6.1.3 Pin Definition

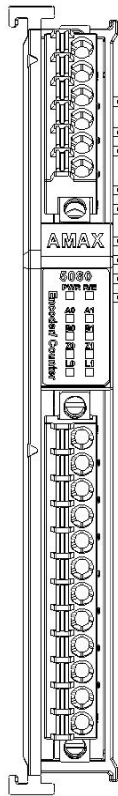


Figure 6.3 AMAX-5080 Module Front View

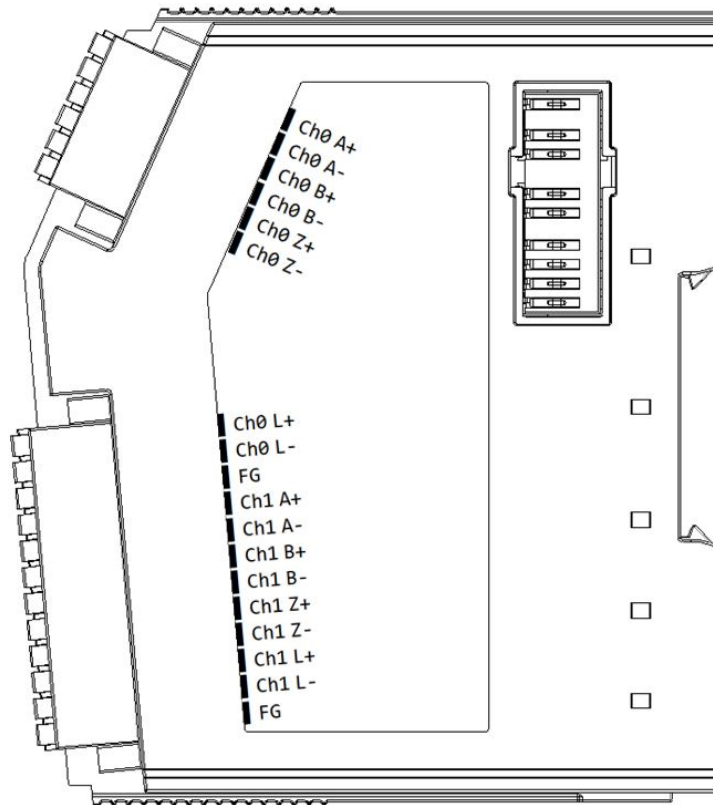


Figure 6.4 AMAX-5080 Module Side View

Table 6.2: Upper 6 Pin Connector

Pin Number	Pin Definition
1	Ch0 A+
2	Ch0 A-
3	Ch0 B+
4	Ch0 B-
5	Ch0 Z+
6	Ch0 Z-

Table 6.3: Lower 12 Pin Connector

Pin Number	Pin Definition
1	Ch0 L+
2	Ch0 L-
3	FG
4	Ch1 A+
5	Ch1 A-
6	Ch1 B+
7	Ch1 B-
8	Ch1 Z+
9	Ch1 Z-
10	Ch1 L+
11	Ch1 L-
12	FG

6.1.4 Application Wiring

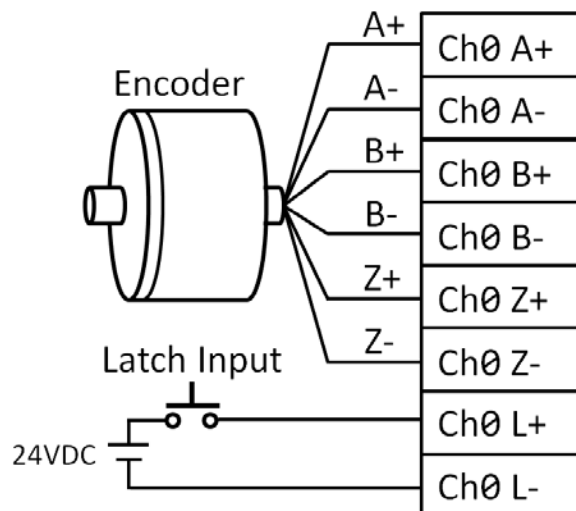


Figure 6.5 Wiring for AMAX-5080

6.1.5 AMAX-5080 Counter Mode

The AMAX-5080 supports two counter modes, the counter mode can be set by the Cn_Mode_Select (0x80n0:01) value “0” (Encoder Mode) or “1” (Bi-Direction Mode).

- Encoder Mode
- Bi-Direction Mode

Both mode supports following features:

- Overflow/underflow detection and reload counter
- Latch counter value
- Reset counter value
- Set counter value
- Counter frequency measurement
- Input Filter

6.1.5.1 Encoder Mode

The Behavior of A/B Phase 4X Quadrant Counter

The figure below shows Encoder Mode counter behavior. Ch0_A and Ch0_B are single-ended signals from the incremental encoder, if the “A” pulse is rising 90° ahead of the “B” pulse, the counter value increases; if the “B” pulse is rising ahead of the “A”, the counter value decreases.

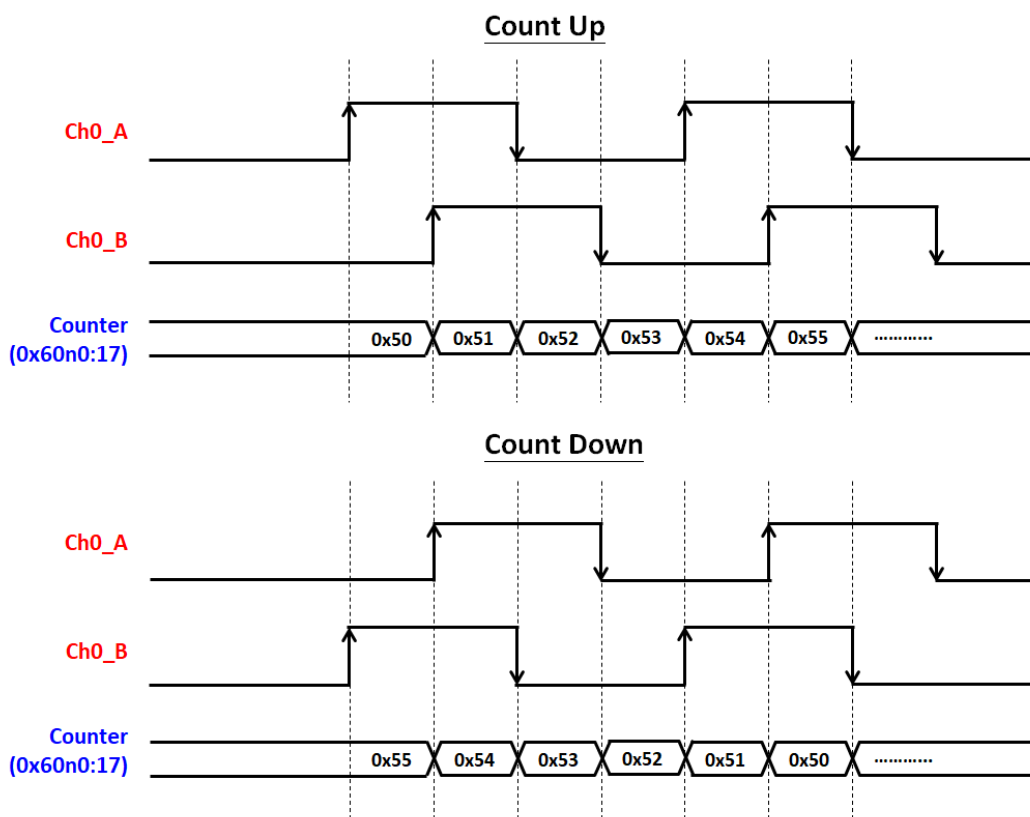


Figure 6.6 Encoder Mode – A/B Phase 4X

Blue are 0x6000, 0x7000, 0x8000 parameters.

Red are external signals.

n=0~1 for Ch0~1

The counter value and A, B phase status can be read at below Index:

Table 6.4: Encoder Mode parameter index

Name	Index
CIn_Counter_Value	0x60n0:17
CIn_Status_of_Input_A	0x60n0:09
CIn_Status_of_Input_B	0x60n0:10

6.1.5.2 Bi-Direction Mode

The Behavior of Pulse Direction Counter

Below figure shows Bi-Direction Mode counter behavior, Ch0_A is a single-ended pulse from encoder or any pulse generator. Ch0_B is a digital input which indicates the counter direction. When Ch0_B is high, the counter value counts up with the Ch0_A input pulse (Rising Edge-Triggered); when Ch0_B is low, the counter value counts down with the Ch0_A input pulse.

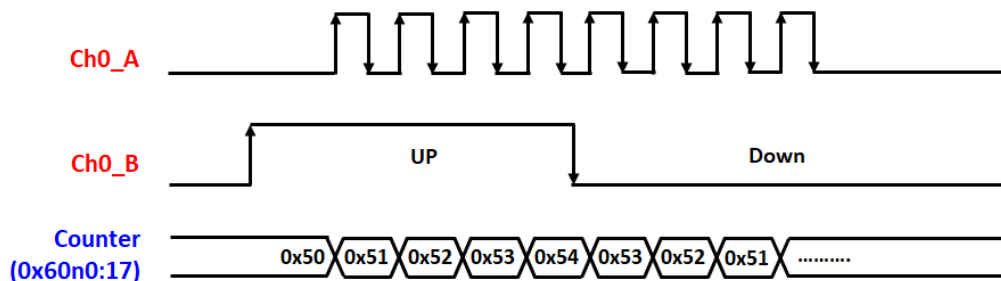


Figure 6.7 Bi-Direction Mode – Pulse Direction

Blue are 0x6000, 0x7000, 0x8000 parameters.

Red are external signals.

n=0~1 for Ch0~1

The counter value and A, B signal input status can be read at below Index:

Table 6.5: Bi-Direction Mode parameter index

Name	Index
CIn_Counter_Value	0x60n0:17
CIn_Status_of_Input_A	0x60n0:09
CIn_Status_of_Input_B	0x60n0:10

6.1.6 Counter Features

Below features are all applied for either Encoder Mode or Bi-Direction Mode. The PDO index is listed on 6.1.7 Object description and parameterization.

6.1.6.1 Overflow/Underflow Detection and Reload Counter

Overflow and Underflow

When counter value exceed the counter boundaries, the CIn_Over_Flow (0x60n0:04) or CIn_Under_Flow (0x60n0:05) will be set to "1" correspondingly. The boundaries can be 0x00/0xFFFFFFFF or 0x00/Cn_Reload_Counter_Values (when the reload counter is set).

The figure below shows an example of overflow/underflow behavior under Bi-direction Mode, the same behavior also applies for Encoder Mode.

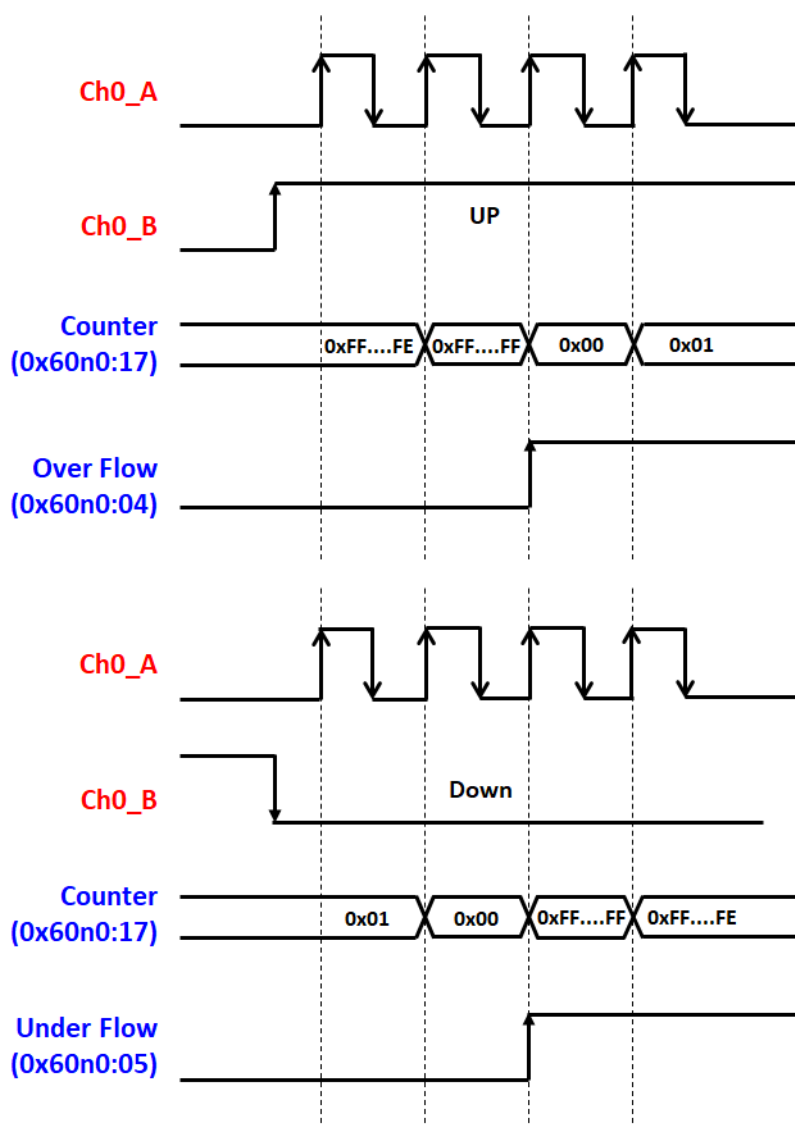


Figure 6.8 Counter Overflow and Underflow

Blue are 0x6000, 0x7000, 0x8000 parameters.

Red are external signals.

n=0~1 for Ch0~1

Reset Underflow and Overflow flag

CIn_Over_Flow will be clear to “0” automatically once the counter value over 1/3 of the 0xFFFFFFFF or Cn_Reload_Counter_Values (when the reload counter is set) after overflow flag is triggered.

CIn_Under_Flow will be clear to “0” automatically once the counter value under 2/3 of the 0xFFFFFFFF or Cn_Reload_Counter_Values (when the reload counter is set) after underflow flag is triggered.

Reload Counter Value

Users can set the Cn_Reload_Counter_Values (0x80n0:07) to adjust the counter boundaries when Cn_Enable_Register_Reload (0x80n0:06) is enabled. The process of boundaries setting and the underflow/overflow status reset count can refer to below example.

Example: Set Reload Counter Value to 0x00003000

Step1: Set C0_Reload_Counter_Values to 0x00003000

Step2: Set C0_Enable_Register_Reload to Enable

Step3: Counter range will become 0 ~ 0x00003000

Table 6.6: Reload Counter Definitions

Reload Register	Reload Value	Counter Boundary	Overflow Status Reset	Underflow Status Reset
Enable	0x00003000	0 to 0x00003000	0x00001000	0x00002000
Disable (default)	NA	0 to 0xFFFFFFFF	0x55555555	0xAAAAAAAA

6.1.6.2 Latch Counter Value

The counter values can be latched by external signals. Both L or Z pin can be configured independently as an latch signal input pin, the latched counter value can be read at CIO_Latch_Values(0x6000:18). The active polarity (Rising or Falling Edge-triggered) of latch input signal can also be configured. All related configurable parameters and the status of Z and L pin are listed below:

Table 6.7: Latch Counter Parameters

	Z pin	L pin
Enable Latch	COn_Enable_Latch_Z (0x70n0:02)	COn_Enable_Latch_External (0x70n0:03)
Enable Latch Valid	CIn_Latch_Z_Valid (0x60n0:02)	CIn_Latch_External_Valid (0x60n0:03)
Active Polarity	Cn_Z_Pulse_Active_Polarity (0x80n0:03)	Cn_External_Latch_Active_Polarity (0x80n0:05)
Status	CIn_Status_of_Input_Z (0x60n0:12)	CIn_Status_of_Input_External_Latch (0x60n0:12)

* Active Polarity: 0: Rising Edge, 1: Falling Edge
n=0~1 for Ch0~1

The example below shows how to latch the counter value by an external signal at rising edge on Ch0 Z pin under Bi-Direction Mode:

Step 0: Set Rising Edge-Triggered at C0_Z_Pulse_Active_Polarity (0x8000:05)

Step 1: Enable CO0_Enable_Latch_Z (0x7000:02)

Step 2: Check CI0_Latch_Z_Valid (0x6000:02) frequently, if the bit is high, the counter value is successfully latched by an external signal.

Step 3: Read latch values at CI0_Latch_Values (0x6000:18)

Step 4: Before next latch signal coming, the CO0_Enable_Latch_Z (0x7000:02) should be toggled once to clear the CI0_Latch_Z_Valid (0x6000:02) status.

Step5: Once the CI0_Latch_Z_Valid (0x6000:02) bit is low, the module is ready for the next latching signal.

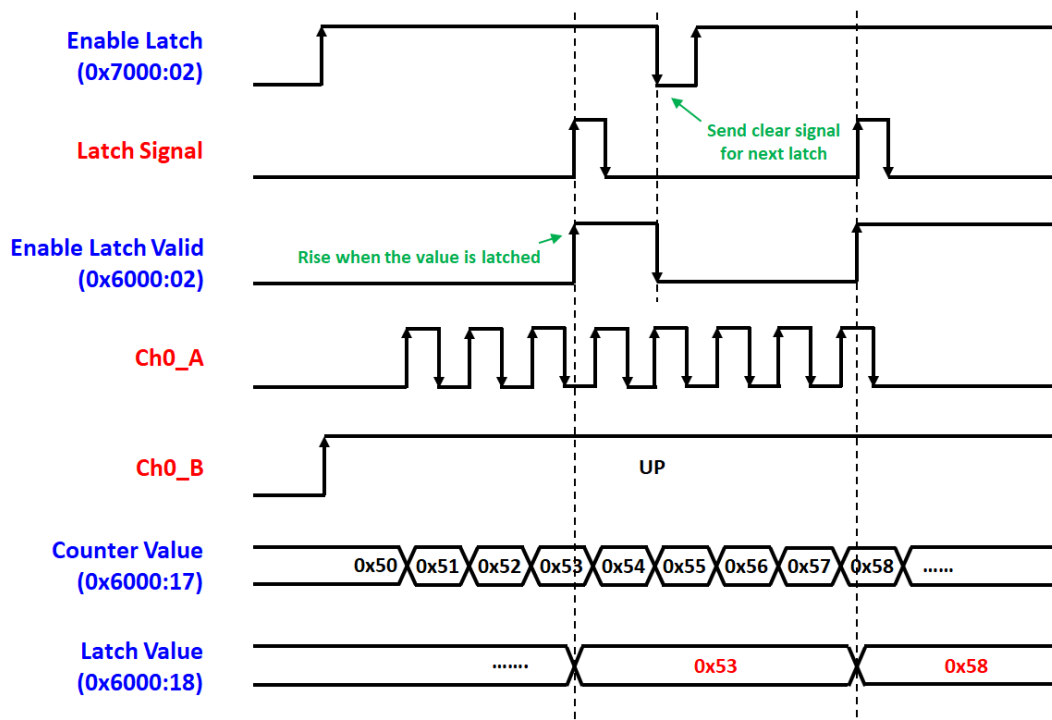


Figure 6.9 Latch Counter by Z pin

Blue are 0x6000, 0x7000, 0x8000 parameters.

Red are external signals.

Note! *CI0_Latch_Values(0x6000:18) can be overwritten by both Z and L pin if those pins are configured correctly.*



6.1.6.3 Reset Counter Value

The counter values can also be reset by external signals.

Both L and Z pin can be configured independently as an reset signal input pin. Once the configured rest pin is triggered, the Cln_Counter_Value (0x60n0:17) and the Cln_Latch_Values (0x60n0:18) will both reset to "0".

If the Z or L pin is configured as a reset pin, the latch function of that pin will become invalid automatically.

The index of Enable Rest and the Status of Z and L pin are listed below:

Table 6.8: Reset Counter Parameters

	Z pin	L pin
Enable Reset	Cn_Enable_Z_Pulse_Reset (0x80n0:02)	Cn_Enable_External_Reset (0x80n0:04)
Status	Cln_Status_of_Input_Z (0x60n0:12)	Cln_Status_of_Input_External_Latch (0x60n0:12)

* Enable Reset: 0: Disable, 1: Enable

n=0~1 for Ch0~1

The example below shows how to reset the counter value by an external signal on Ch0 Z pin in Bi-Direction Mode (Ch0 L pin as a Latch input):

Example: Reset Counter Value and Latch Counter Value

Step1: Set C0_Enable_Z_Pulse_Reset (0x8000:02) to "1".

Step2: An external reset signal (Rising edge-triggered) will clear both Cln_Counter_Value (0x6000:17) and Cln_Latch_Values (0x600n0:18)

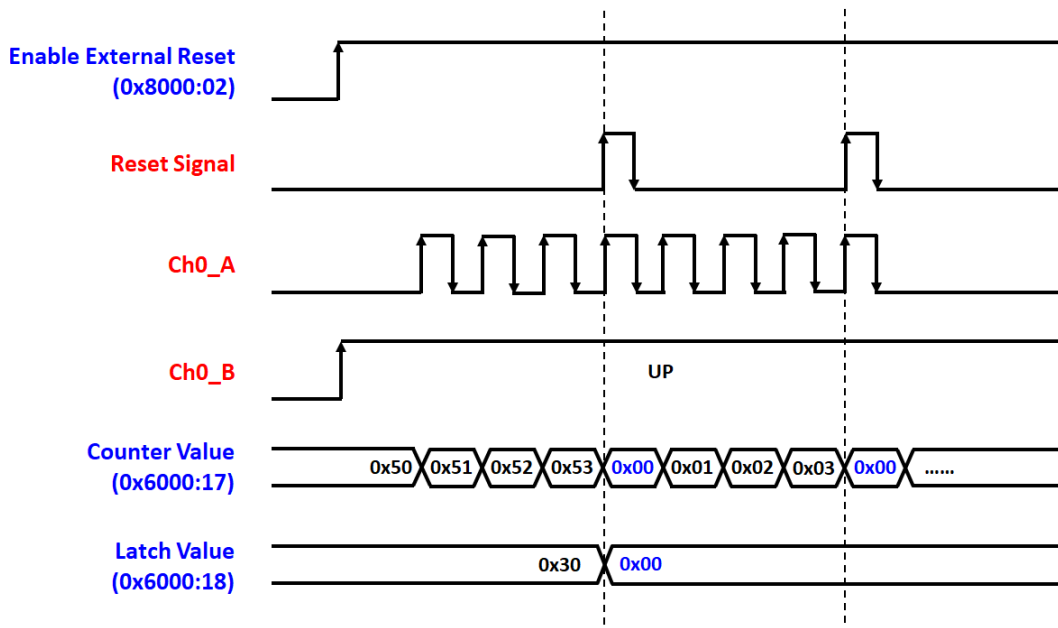


Figure 6.10 Reset Counter by Z pin

Blue are 0x6000, 0x7000, 0x8000 parameters.

Red are external signals.

6.1.6.4 Set Counter Value

The counter value can be overwrite to a desired number by setting at address CO_n_Set_Counter_Value (0x70n0:17) and CO_n_Set_Counter (0x70n0:01) no matter if the counter is counting or not. This feature is usually used for restoring the last incremental encoder value after system reboot. Once the counter value is set, the CIn_Set_Counter_Done (0x60n0:01) will be changed to “1”.

Take Ch0 for example, the start counter value can be overwritten by following steps:

Step1: Set CO0_Set_Counter_Value (0x7000:17) to 0x00

Step2: Enable CO0_Set_Counter (0x7000:01)

Step3: When the CIO_Set_Counter_Done (0x6000:01) is true, the counter value is changed

Step4: CO0_Set_Counter (0x7000:01) should be set to “0” before the next change

Step5: CIO_Set_Counter_Done (0x6000:01) will set to False along with CO0_Set_Counter

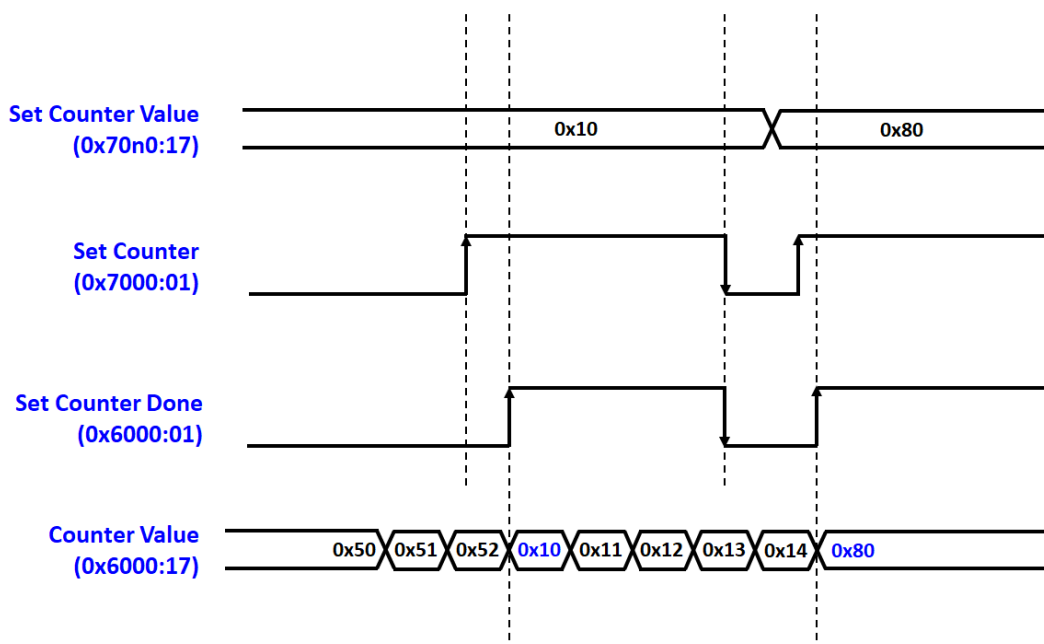


Figure 6.11 Set Counter Value

Note! The counter value should not be set over Reload Counter Value.



6.1.6.5 Counter Frequency Measurement

The increment (or decrement) frequency of counter value can be read by CIn_Frequency_Value (0x60n0:19), the value will be updated every second. This feature is often used to determine velocity.

6.1.6.6 Input Filter

AMAX-5080 supports input filter for A/B/Z/L input signal. The selectable filter for Cn_Input_Filter_Time (0x80n0:08) are listed as below:

Table 6.9: Input Filter Level

Filter Num.	Time	Frequency
0	Disable Filter	
1	0.3us	1.32MHz
2	0.6us	654KHz
3	1.2us	370KHz
4	2.4us	197KHz
5	3.6us	134KHz
6	4.8us	101KHz
7	7.2us	68KHz
8	9.6us	51KHz
9	14.4us	34KHz
10	19.2us	26.1KHz
11	28.8us	17.4KHz
12	38.4us	13.1KHz

6.1.7 Object description and parameterization

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

Table 6.10: Input Data of the Module (0x6000 - 0x6FFF)

Index (hex)	Name	Meaning	Data type	Flags	Default
0x60n0:01	CIn_Set_Counter_Done	The counter was set.	BOOLEAN	RO	0x00
0x60n0:02	CIn_Latch_Z_Valid	The counter is latched by Z input.	BOOLEAN	RO	0x00
0x60n0:03	CIn_Latch_External_Valid	The counter is latched by L input.	BOOLEAN	RO	0x00
0x60n0:04	CIn_Over_Flow	Counter Over flow	BOOLEAN	RO	0x00
0x60n0:05	CIn_Under_Flow	Counter under flow	BOOLEAN	RO	0x00
0x60n0:09	CIn_Status_of_Input_A	Status of input A	BOOLEAN	RO	0x00
0x60n0:10	CIn_Status_of_Input_B	Status of input B	BOOLEAN	RO	0x00
0x60n0:11	CIn_Status_of_Input_Z	Status of input Z	BOOLEAN	RO	0x00
0x60n0:12	CIn_Status_of_Input_External_Latch	Status of input Z	BOOLEAN	RO	0x00
0x60n0:17	CIn_Counter_Value	Counter Value	UINT32	RO	0x00
0x60n0:18	CIn_Latch_Value	Latch Value	UINT32	RO	0x00
0x60n0:19	CIn_Frequency_Value	Update Frequency every second	UINT32	RO	0x00

(n=0~1 for Ch0~1)

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

Table 6.11: Output Data of the Module (0x7000 - 0x7FFF)

Index (hex)	Name	Meaning	Data type	Flags	Default
0x70n0:01	COn_Set_Counter	Set Counter	BOOLEAN	RW	0x00
0x70n0:02	COn_Enable_Latch_Z	Enable Z pin counter latching	BOOLEAN	RW	0x00
0x70n0:03	COn_En- able_Latch_External	Enable L pin counter latching	BOOLEAN	RW	0x00
0x70n0:17	COn_Set_Counter_Val ue	Set Counter Value	UINT32	RW	0x00

(n=0~1 for Ch0~1)

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

Table 6.12: Configuration Data of the Module (0x8000 - 0x8FFF)

Index (hex)	Name	Meaning	Data type	Flags	Default
0x80n0:01	Cn_Mode_Select	Select Encoder mode 0: Encoder mode 1: Bi-Direction Mode	INT16	RW	0x00
0x80n0:02	Cn_Enable_Z_ Pulse_Reset	A counter reset is trig- gered via the Z pulse input. 0:Disable 1:Enable	INT16	RW	0x00
0x80n0:03	Cn_Z_Pulse_Ac- tive_Polarity	0:Rising Edge 1:Falling Edge	INT16	RW	0x00
0x80n0:04	Cn_Enable_Ext- ernal_Reset	A counter reset is trig- gered via the external latch input. 0:Disable 1:Enable	INT16	RW	0x00
0x80n0:05	Cn_Ext- ernal_Latch_Ac- tive_Polarity	0:Rising Edge 1:Falling Edge	INT16	RW	0x00
0x80n0:06	Cn_Enable_Regis- ter_Reload	0:Disable 1:Enable	INT16	RW	0x00
0x80n0:07	Cn_Re- load_Counter_Val- ues	The counter counts exceed the Reload_Counter_Values will reset to zero.	UINT32	RW	0xFFFF FFF

Table 6.12: Configuration Data of the Module (0x8000 - 0x8FFF)

		0:Disable
		1: 0.3us (1.32MHz)
		2: 0.6us (654KHz)
		3: 1.2us (370KHz)
		4: 2.4us (197KHz)
		5: 3.6us (134KHz)
0x80n0:08	Cn_Input_Filter_ Time	6: 4.8us (101KHz)
		7: 7.2us (68KHz)
		8: 9.6us (51KHz)
		9: 14.4us (34KHz)
		10: 19.2us (26.1KHz)
		11: 28.8us (17.4KHz)
		12: 38.4us (13.1KHz)

(n=0~1 for Ch0~1)

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

Table 6.13: Configuration of the Module (0xF600 - 0xFFFF)

Index (hex)	Name	Meaning	Data type	Flags	Default
0xF600:01	LocateModule	Control LED 0: Disable 1: Enable	BOOLEAN	RW	0x00
0xF600:09	Encoder Firm- ware Version	Encoder MCU Firmware Ver- sion	BIT8	RO	0x00
0xF600:0A	Alarm Status	Alarm status: 0x00: Normal 0x01: Encoder MCU is not ready, and encoder MCU FW version is 255(Dec). 0x02: Encoder MCU is ready, but Firmware version is not between 100 ~ 254(Dec.) 0x03: Encoder MCU is in boot mode, please upgrade firmware.	BIT8	RO	0x00

Chapter 7

Digital I/O Module with
Timestamp

7.1 The Benefit of Time-stamping Digital I/O

7.1.1 The EtherCAT data transfer in cycle base

For the standard EtherCAT digital IO module, the PDO data is transferred cyclically, and the digital signal state is detected or set at a specific time of the cycle, which means the response of the IO is restricted by the EtherCAT cycle time. There will be some limitations for both digital input and digital output in some application cases.

Take digital input as an example, if an external sensors response time is shorter than the EtherCAT cycle time, the input signal may not be detected. As shown below, if the EtherCAT cycle time is 1ms, and the sensor's input signal is 200 μ s for example, the sensors state change may be lost in this application (first pulse in the figure). Only the digital status at the moment of PDO data transfer can be detected (second pulse in the figure).

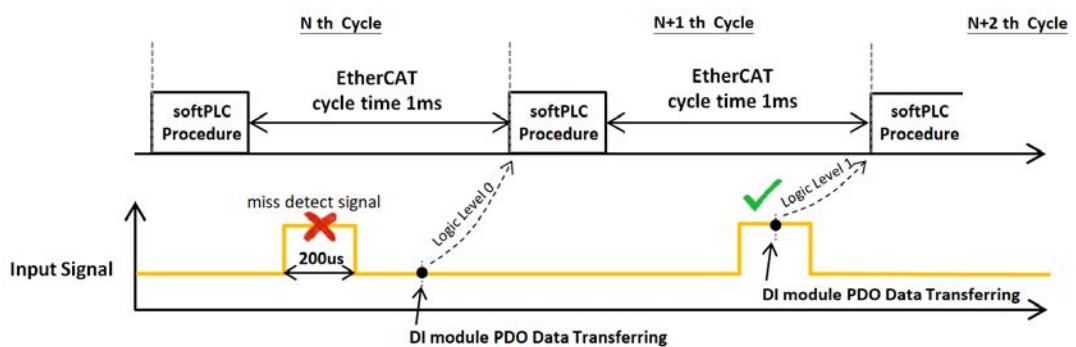


Figure 7.1 Standard Digital Input Module Signal Acquisition

Take digital output as another example, if two digital output modules are distributed to two different stations, when the master sets an output signal to both modules, the actual output will have little time difference between two modules as shown in the figure below. Even though the time difference is smaller than a cycle time, it can be critical especially on the application which needs synchronized signal output.

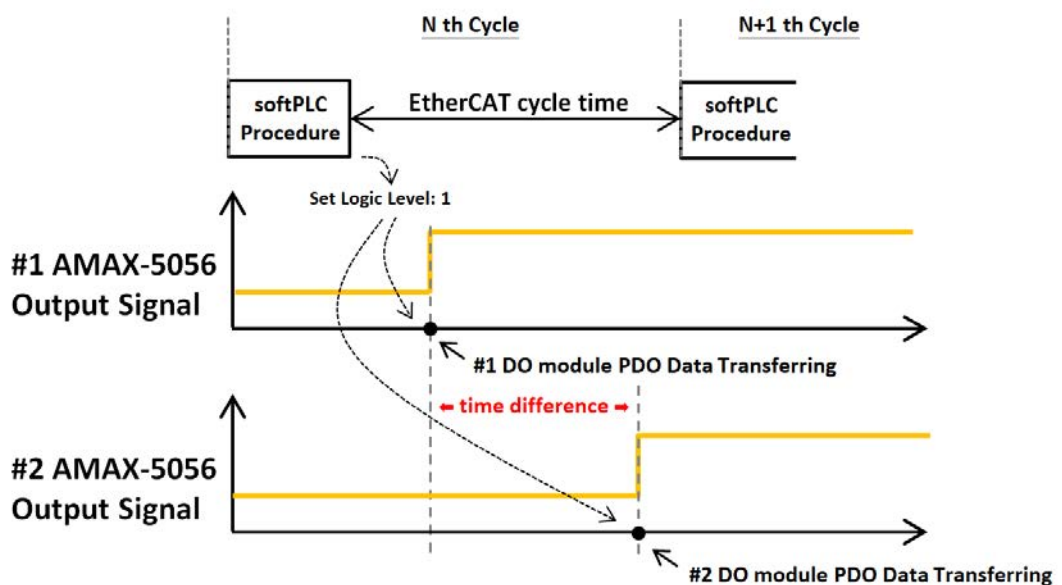


Figure 7.2 Standard Digital Output Module (SM mode)

Thus, shortening the EtherCAT cycle time is required for both scenarios. But most of the time, the limitation of the EtherCAT cycle time is restricted by the number of slave devices and the total data length of the PDOs, and also, the minimum cycle times of the EtherCAT protocol which is about $100\mu\text{s}$. Furthermore, shortening the EtherCAT cycle time will also increase the load of the master controller since the data acquisition frequency is increased; the system resource will be occupied by the data acquisition tasks.

Therefore, a time-stamping function for digital IO modules has been designed for these advance applications.

7.1.2 The EtherCAT data transfer in time base

Benefiting from the EtherCAT distributed clock mechanism, all EtherCAT slave devices are able to synchronize to master controller's system time in a 64-bits time-stamp value with a resolution of 1ns. (The timestamp format is starting from 1.1.2000 00:00)

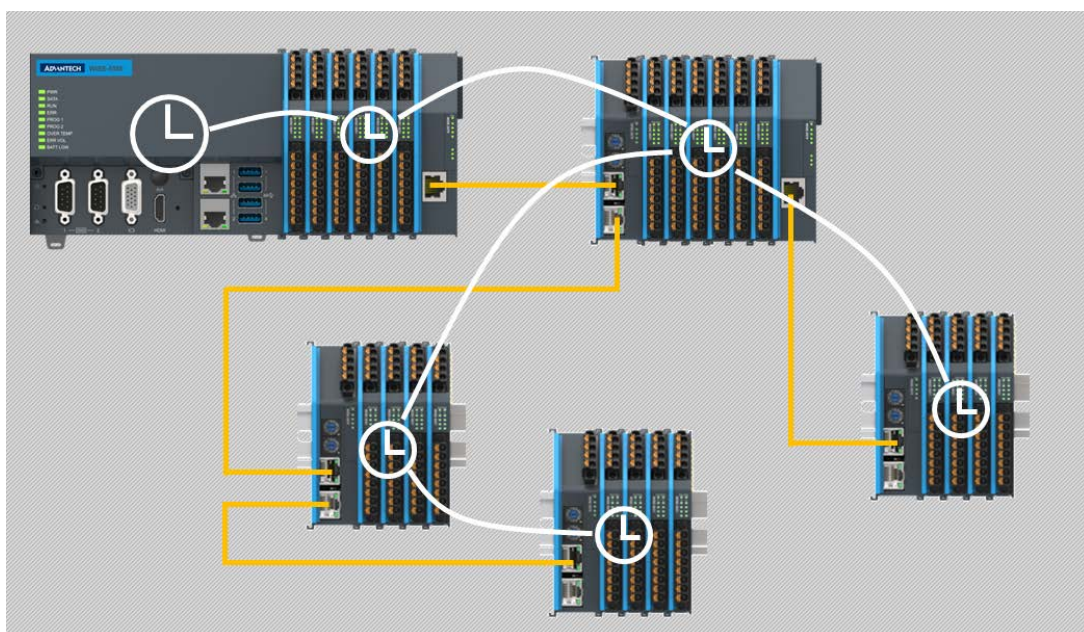


Figure 7.3 EtherCAT Distributed Clock

Thus, a time-stamped digital input/output signal can transfer to the EtherCAT bus, which makes the data exchange more precise and be able to release from the PLC cycle.

Digital Input with Timestamp

In order to latch the input signal, the digital input module contains a set of parameters to record the precise timestamp for each rising-edge (t_h) and falling-edge (t_l).

One thing to be noticed, is that there is only one set of timestamp can be stored in the module, so the user should select the latching mode: Single Event or Continuous (default).

The Single Event mode only latches the first rising-edge and falling-edge timestamp and ignores any state change afterward. The Continuous mode will continuously update the latest timestamp of state change.

Each rising-edge (t_h) and falling-edge (t_l) can be set to Single Event mode or Continuous mode independently.

Single Event Mode

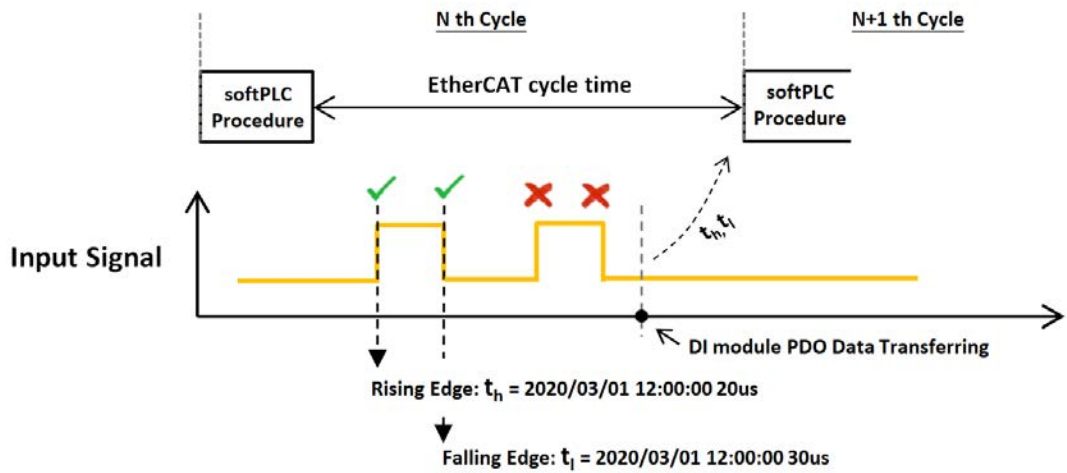


Figure 7.4 Digital Input with Timestamp - Single Event Mode

Continuous Mode

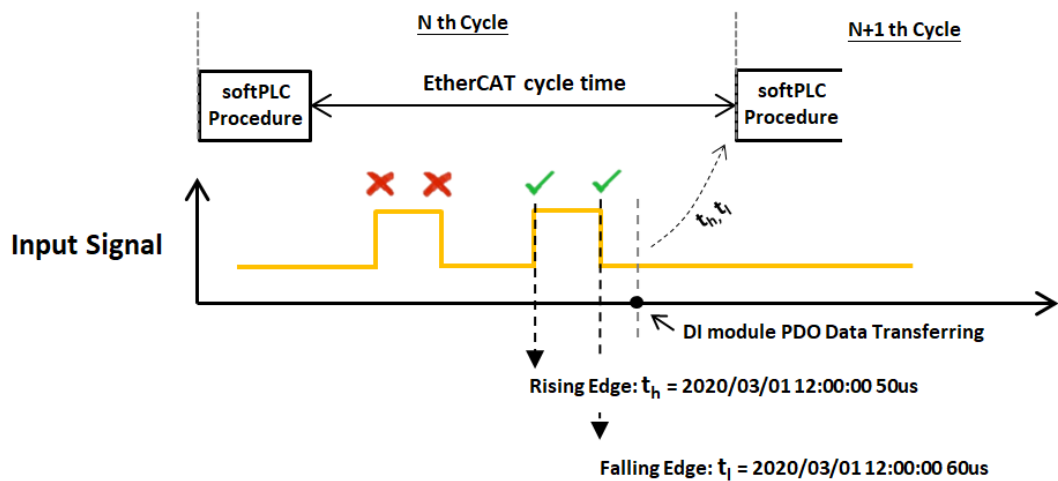


Figure 7.5 Digital Input with Timestamp - Continuous Mode

Digital Output with Timestamp

By setting Start Time and Activation to the time-stamping digital output module, the preset logic level will be activated at any specific time of the cycle as figure below. With this characteristic, the possibility of synchronizing multiple output signals can be realized.

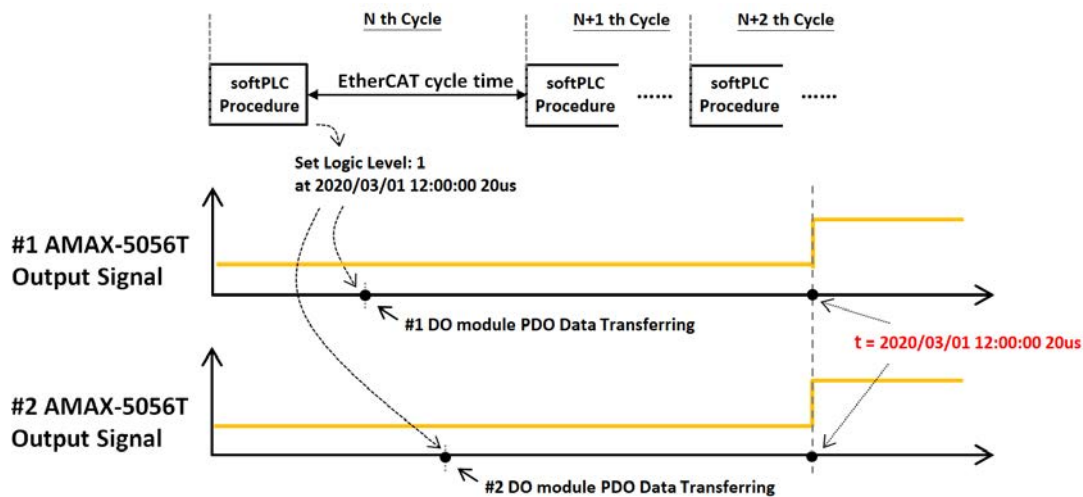


Figure 7.6 Digital Output with Timestamp

To sum up, these are the major benefits of using time-stamp technology on EtherCAT IO modules:

- Enabling the precise and deterministic IO responses.
- Releasing the data process from cycle base to time base, increasing the flexibility of cycle time of whole system.
- Reduces processor loading by reducing the data acquisition frequency.

7.2 AMAX-5051T 8-ch Digital Input Module (w/ 2-ch timestamp)

The AMAX-5051T is an 8-ch digital input module (including 2-ch timestamp DI). The timestamp enables a precise and deterministic DI latching at a resolution of 1ns. The digital input channels offer LED to indicate digital status. The module provides 2,000 VDC 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 7.7 AMAX-5051T Module

7.2.1 AMAX-5051T Specification

7.2.1.1 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
- **LED Indicator:** PWR, RUN, DI status
- **Weight:** Approx. 80g

7.2.1.2 Digital Input (w/ timestamp)

- **Channels:** 2 (DI0_TS~DI1_TS)
- **Digital Input:**
 - Wet Contact (only):
 - Logic level 1: 11~30 V_{DC}
 - Logic level 0: -3~5 V_{DC}
 - (similar to EN 61131-2, type 3)
- **Input Delay:** < 0.5 us
- **DI Latch:** First Edge & Last Edge DI Latch
- **Resolution Timestamp:** 1ns
- **Typical Input Current:** Logic level 1: 1.4mA~4.3mA (11V~30V)

7.2.1.3 Digital Input (w/o timestamp):

- **Channels:** 6 (DI2~DI7)
- **Digital Input:**
 - Dry Contact:
 - Logic level 1: close to Iso.GND
 - Logic level 0: open
 - Wet Contact:
 - Logic level 1: 11~30 V_{DC}
 - Logic level 0: -3~5 V_{DC}
 - (similar to EN 61131-2, type 3)
- **Input Delay:** < 10us
- **Typical Input Current:** Logic level 1: 1.4mA~4.3mA (11V~30V)

7.2.1.4 Protection

Isolation Voltage: 2,000V_{DC}

7.2.1.5 Environment

- **Operation Temperature:** -25~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

7.2.2 LED Indicator

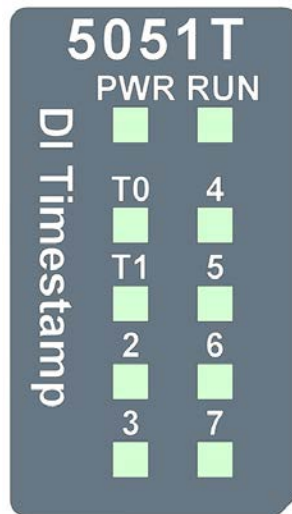


Figure 7.8 AMAX-5051T Module LED Indicator

Table 7.1: AMAX-5051T Module LED Indicator			
LED	Color	Indication	Behavior
Power	Green	ON	Power on
Run/Error	Green	ON	EtherCAT connection
	Green	Blink	When TX/RX data in transmission
T0~1 (timestamp)	Green	ON	Wet Logic "1"
		OFF	Wet Logic "0"
DI2~7	Green	ON	Dry/Wet Logic "1"
		OFF	Dry/Wet Logic "0"

7.2.3 Pin Definition

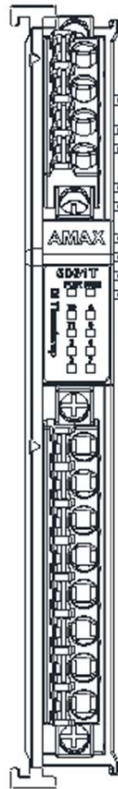


Figure 7.9 AMAX-5051T Module Front View

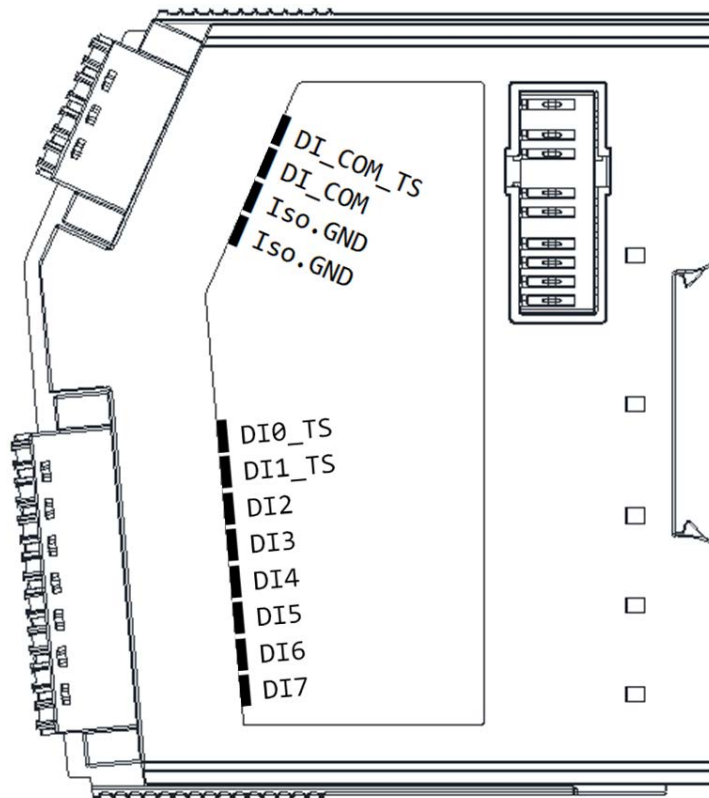


Figure 7.10 AMAX-5051T Module Side View

Table 7.2: Upper 4 Pin Connector

Pin Number	Pin Definition
1	DI_COM_TS
2	DI_COM
3	Iso.GND
4	Iso.GND

Table 7.3: Lower 8 Pin Connector

Pin Number	Pin Definition
1	DI0_TS
2	DI1_TS
3	DI2
4	DI3
5	DI4
6	DI5
7	DI6
8	DI7

7.2.4 Application Wiring

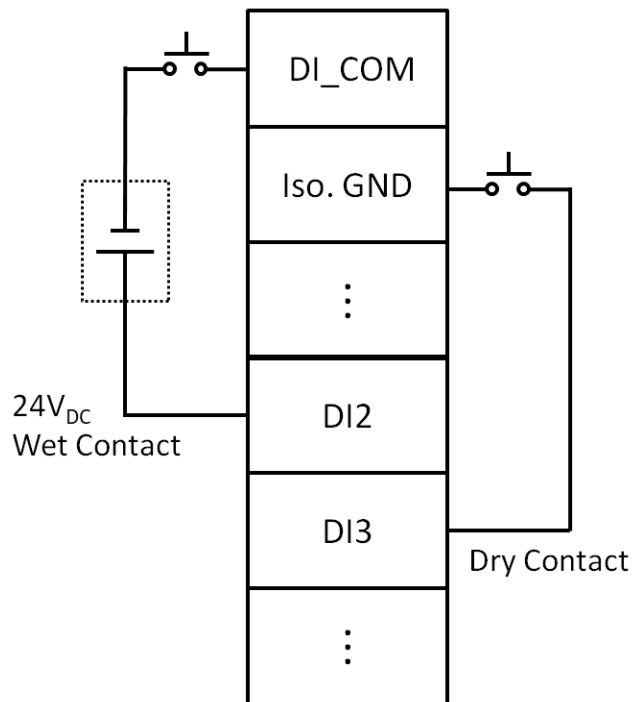


Figure 7.11 Wiring for AMAX-5051T standard DI

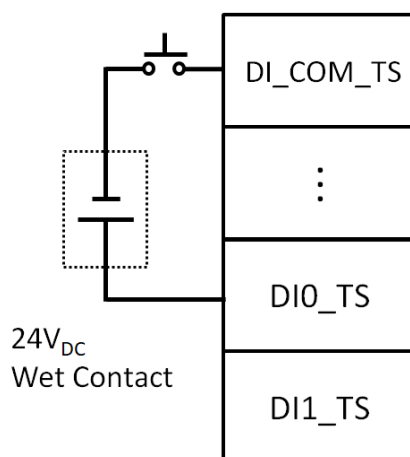


Figure 7.12 Wiring for AMAX-5051T timestamp DI

7.2.5 Object Description and Parameterization

7.2.5.1 SM0, PDO assignment 0x1C10 (not changeable)

Table 7.4: SM0, PDO assignment 0x1C10 (not changeable)

Index	Size (byte.bit)	Name	PDO content
0x1A00 (default)	0.1	Channel 0	Input 0
0x1A01 (default)	0.1	Channel 1	Input 1
0x1A02 (default)	0.1	Channel 2	Input 2
0x1A03 (default)	0.1	Channel 3	Input 3
0x1A04 (default)	0.1	Channel 4	Input 4
0x1A05 (default)	0.1	Channel 5	Input 5
0x1A06 (default)	0.1	Channel 6	Input 6
0x1A07 (default)	0.1	Channel 7	Input 7

7.2.5.2 SM01, PDO assignment 0x1C11 (PDOs are mutually exclusive)

Table 7.5: SM01, PDO assignment 0x1C11 (PDOs are mutually exclusive)

Index	Size (byte.bit)	Name	PDO content
0x1A10	2.0	Latch	Status0; Status1
0x1A11	6.0	Latch	Status0; LatchPos0
0x1A12	18.0	Latch	Status0; LatchPos0; LatchNeg0
0x1A13(default)	34.0	Latch	Status0/ Status1; LatchPos0/ LatchPos1; LatchNeg0/ LatchNeg1

7.2.5.3 SM2, PDO assignment 0x1C12 (PDOs are mutually exclusive)

Table 7.6: SM2, PDO assignment 0x1C12 (PDOs are mutually exclusive)

Index	Size (byte.bit)	Name	PDO content
0x1A14	4.0	SysTime	32 bit representation
0x1A15	8.0	SysTime	64 bit representation

7.3 AMAX-5056T 2-ch Timestamp Digital Output Module

The AMAX-5056T is a 2-ch timestamp digital output module. The timestamp enables a precise DO sync. at a resolution of 1ns. The digital output channels offer LED to indicate digital status. The module provides 2,000 VDC 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 7.13 AMAX-5056T Module

7.3.1 AMAX-5056T Specification

7.3.1.1 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
- **LED Indicator:** PWR, RUN, DO status
- **Weight:** Approx. 80g

7.3.1.2 Timestamp Digital Output

- **Channels:** 2
- **Digital Output:**
 - Rated Voltage: 10~30 VDC
 - Rated Current Output:
 - Logic level 1: 0.3A per channel
 - Logic level 0: 25 μ A per channel (leakage current)
- **Output Delay:** < 0.5 μ s
- **Resolution Timestamp:** 1ns

7.3.1.3 Protection

Isolation Voltage: 2,000V_{DC}

7.3.1.4 Environment

- **Operation Temperature:** -25~60°C (vertical mounted)
- **Storage Temperature:** -40~85°C
- **Relative Humidity:** 5~95% (non-condense)

7.3.2 LED Indicator

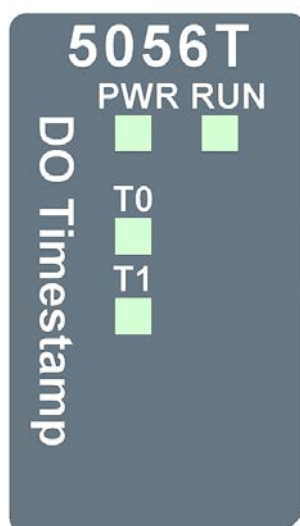


Figure 7.14 AMAX-5056T Module LED Indicator

Table 7.7: AMAX-5056T Module LED Indicator

LED	Color	Indication	Behavior
Power	Green	ON	Power on
Run/Error	Green	ON	EtherCAT connection
	Green	Blink	When TX/RX data in transmission
T0~1 (timestamp)	Green	ON	Wet Logic "1"
		OFF	Wet Logic "0"

7.3.3 Pin Definition

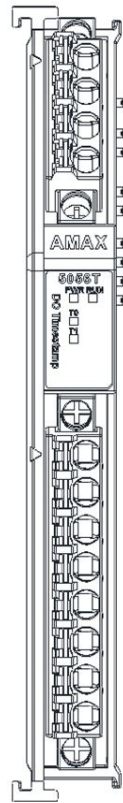


Figure 7.15 AMAX-5056T Module Front View

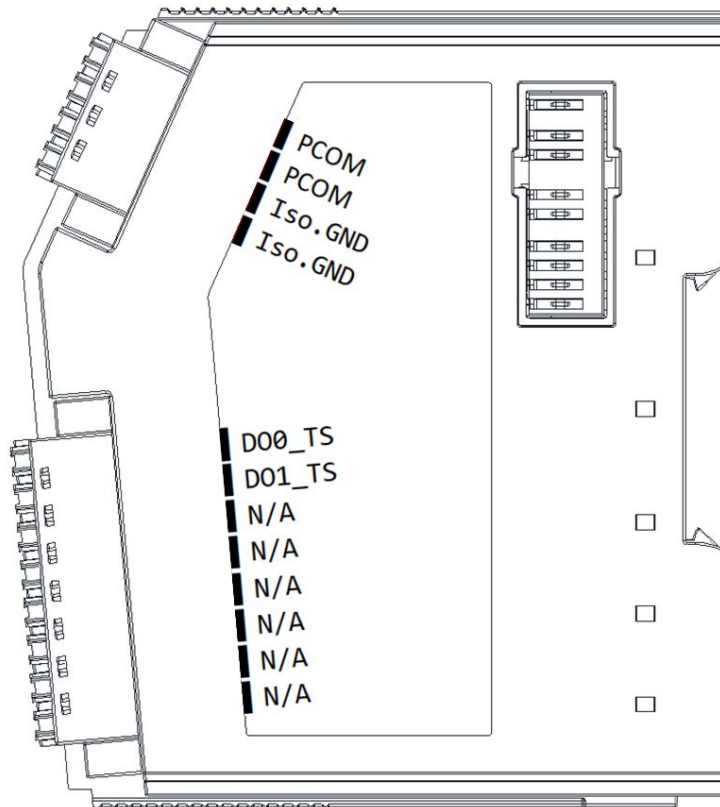


Figure 7.16 AMAX-5056T Module Side View

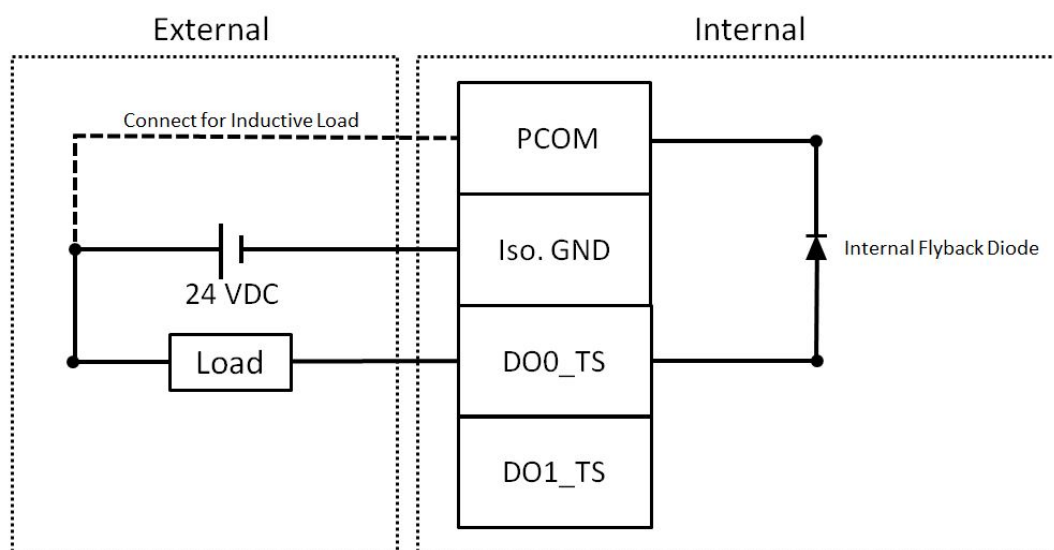
Table 7.8: Upper 4 Pin Connector

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

Table 7.9: Lower 8 Pin Connector

Pin Number	Pin Definition
1	DO0_TS
2	DO1_TS
3	N/A
4	N/A
5	N/A
6	N/A
7	N/A
8	N/A

7.3.4 Application Wiring

**Figure 7.17 Wiring for AMAX-5056T timestamp DI**

7.3.5 Object Description and Parameterization

7.3.5.1 SM00, PDO assignment 0x1C10

Table 7.10: SM00, PDO assignment 0x1C10

Index	Size (byte.bit)	Name	Description
0x1610(default)	1.0	DC Sync Activate	This byte activates a new start time in the terminal through the transition 0 --> 3

7.3.5.2 SM01 PDO assignment 0x1C11

Table 7.11: SM01 PDO assignment 0x1C11

Index	Size (byte.bit)	Name	Description
0x1611(default)	10.0	DC Sync Start	64-bit value of the next desired switching event

7.3.5.3 SM02, PDO assignment 0x1C12

Table 7.12: SM02, PDO assignment 0x1C12

Index	Size (byte.bit)	Name	Description
0x1600 (default)	0.1	Channel 0	Output 0 V/24 V of channel 0
0x1601 (default)	0.1	Channel 1	Output 0 V/24 V of channel 1

7.3.5.4 SM03, PDO assignment 0x1C13

Table 7.13: SM03, PDO assignment 0x1C13

Index	Size (byte.bit)	Name	Description
0x1A00	8.0	SysTime	64 bit Time stamp

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