Smarter. Greener. Together.

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AH Motion - Hardware Manual

AH Motion - Hardware Manual

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AH Motion - Hardware Manual

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Chapter 4 Installation and Wiring

P

Preface

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P.1 Introduction

Thank you for purchasing the AH series Motion CPU with our advanced motion control system.

This manual introduces the hardware structures, specifications, and the installation of AH motion system products based on AH motion CPUs. Please ensure that you understand the configuration and operations of the AH series motion control system, and use the AH series motion CPU correctly.

To obtain required information for different system configurations, you can navigate between different manuals of AH Motion series manuals and other related manuals.

P.1.1 Applicable Products

This manual relates to the following products

- AHxxEMC-5A (AH08EMC-5A/AH10EMC-5A/AH20EMC-5A)
- AH500 series modules

P.1.2 Related Manuals

The related manuals of the AH Motion series motion controllers are composed of the following.

1. **AH Motion - Hardware Manual**
   It introduces function specifications, electrical specifications, appearances, dimensions, and etc.

2. **ISPSoft User Manual**
   It introduces the use of ISPSoft, the programming languages (ladder diagrams, instruction lists, sequential function charts, function block diagrams, and structured texts), the concept of POUs, the concept of tasks, and the operation of motion control programming.

3. **AH Motion - Standard Instructions Manual**
   It introduces the elements for standard programming including devices, symbols and standard instructions.

4. **AH Motion - Operation Manual**
   It introduces basic knowledge of motion control structure, software/hardware setup, quick start of Software operations, devices to be used, motion control operations and troubleshooting.

5. **AH Motion - Motion Control Instructions Manual**
   It introduces the elements for motion control programming including axis parameters, symbols and single axis/multi-axes motion instructions.

6. **AH Motion - Communication Manual**
   It introduces the concept of communication protocols (e.g. EtherCAT) and the configuration of AH Motion products based on the protocols.

7. **AH500 Motion Control Module Manual**
   It introduces the specifications for the AH500 series motion control modules, the wiring, the instructions, and the functions.

8. **AH500 Module Manual**
   It introduces the use of special I/O modules of AH500 series PLCs. For example, network modules, analog I/O modules, temperature measurement modules, and etc.

P.2 Navigation between Manuals

Before using the products, there are three manuals that should be utilized as fundamental information: ***AH Motion - Hardware Manual***, ***ISPSoft User Manual***, and ***AH Motion - Standard Instructions Manual.***

With the fundamental manuals, you can understand the basic information of hardware configuration, operation procedures of the software, and the basic instructions for using the system.

To obtain required information for different system configurations and applications, refer to other manuals as indicated in the table below. Reading all manuals related to your system configuration helps you make the most use of the AH series motion control system.

Related manuals / General operation procedures		AH Motion series manuals							
		Fundamental							
		AH Motion – Hardware Manual	ISPSoft User Manual	AH Motion – Standard Instructions Manual	AH Motion – Operation Manual	AH Motion – Motion Control Instructions Manual	AH Motion – Communication Manual	AH500 Motion Control Module Manual	AH500 Module Manual
1. Overview of AH Motion series products		V							
2. Setting up hardware configuration for the system		V							
	for motion control applications				V				
	for communication (e.g. EtherCAT)						V		
	for additional motion control modules							V	
	for I/O extension using AH500 series modules								V
3. Getting started with the software			V						
	for motion control applications				V				
	for communication (e.g. EtherCAT)						V		
	for additional motion control modules							V	
	for I/O extension using AH500 series modules								V
4. Programming			V	V					
	for motion control applications				V	V			
	for communication (e.g. EtherCAT)						V		

Related manuals / General operation procedures		AH Motion series manuals							
		Fundamental							
		AH Motion – Hardware Manual	ISPSoft User Manual	AH Motion – Standard Instructions Manual	AH Motion – Operation Manual	AH Motion – Motion Control Instructions Manual	AH Motion – Communication Manual	AH500 Motion Control Module Manual	AH500 Module Manual
	for additional motion control modules							V	
	for I/O extension using AH500 series modules								V
5. Testing and troubleshooting			V		V				
	for motion control applications					V*			
	for communication (e.g. EtherCAT)						V		
	for additional motion control modules			V*				V	
	for I/O extension using AH500 series modules			V*					V
6. Maintenance and Inspection		V							

Note:** Information regarding Error codes and Indicators and the associated troubleshooting information are attached as Appendices for a quick reference. For the complete troubleshooting of the system, refer to ***AH Motion – Operation Manual**.**

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Chapter 1 Product Introduction

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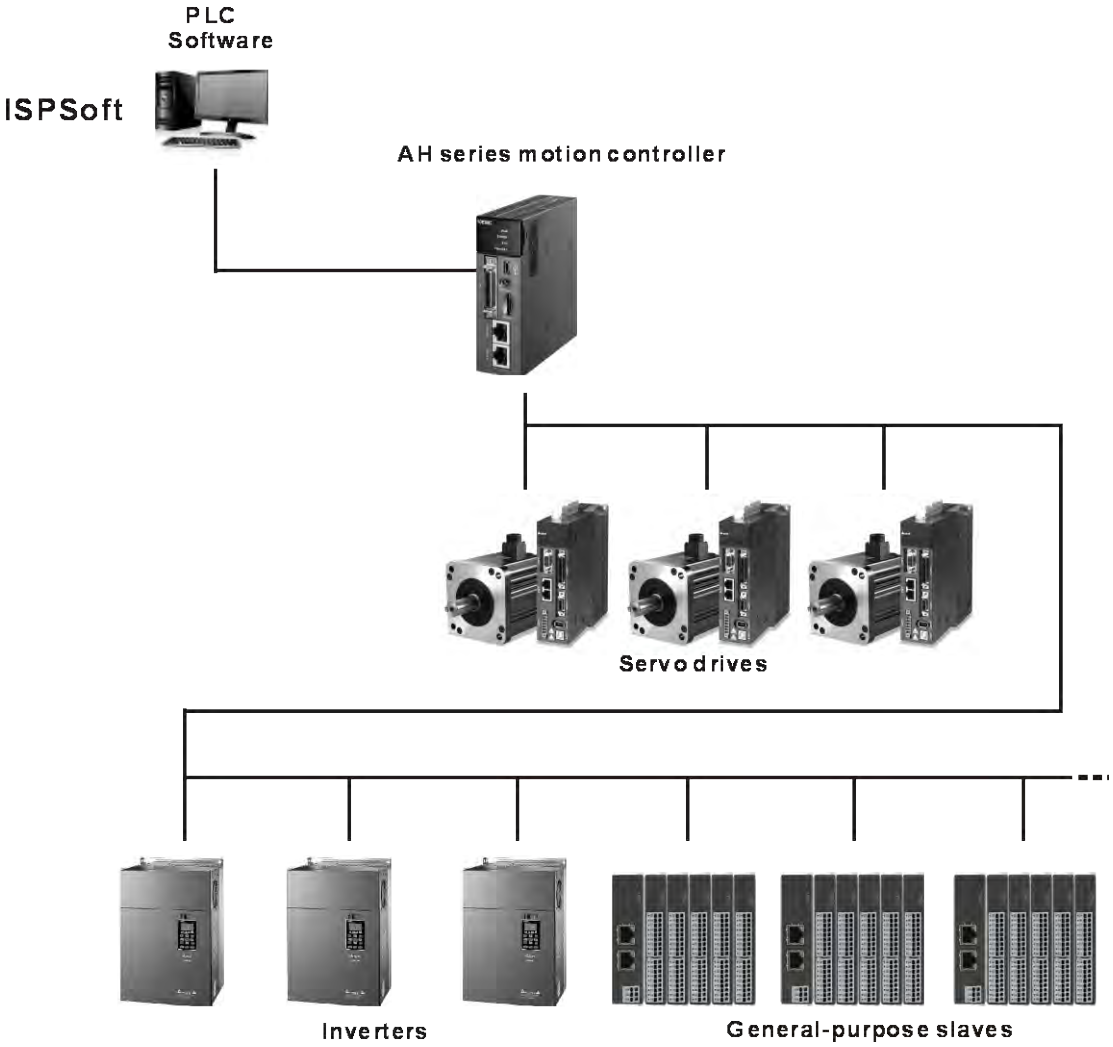
1.1 The AH Series Motion Controller

The AH series motion controllers are the new generation motion controllers that provide high-speed performance through high speed interface, e.g. EtherCAT, and abundant functionality by the various functional modules. In machine automation applications, they provide accessibility, maintainability and reliability which are demanded in machine automation controllers.

The AH series motion controllers support the functionality of AH500 series PLCs, and are fully comply with PLCopen motion control function blocks that are required for motion control. The built-in high-speed motion network interface is capable of synchronizing I/O devices quickly and can be used in motion control devices, machine vision equipment, I/O devices, and more. With these products, you can build up a machine automation system easily through ISPSoft software to achieve maximum functionality and user-friendly operation.

With the machine automation system that is built from Delta products, you can connect devices easily and apply the system as a complete solution with functionality and usability.



1.1.1. Product Features

Hardware Features

1. High performance motion control

- AHxxEMC-5A features EtherCAT motion control interface and is capable of controlling up to 32 axes. Maximum 6 axes synchronous linear interpolation and 3 axes synchronous circular interpolation.
- Supports PLCopen motion control standard function blocks.

2. High efficiency

- The AH Motion CPU adopts a 32-bit high-speed processor. The instructions are executed at a speed of 0.3 milliseconds per 1k steps. (50% of the instructions are ladder instructions, and 50% of the instructions are other standard instructions.)

3. Multiple I/O modules

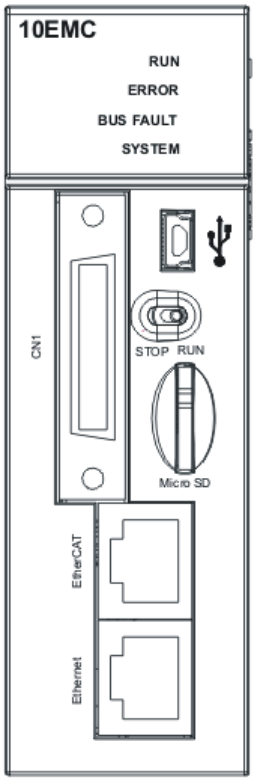
- The I/O modules supported by the AH Motion CPU are digital input/output modules, analog input/output modules, temperature measurement modules, network modules, and motion control modules.

Module	Description
Digital input/output module	Digital input/output AH16AM10N-5A, AH16AM30N-5A, AH16AN01P-5A, AH16AN01R-5A, AH16AN01S-5A, AH16AN01T-5A, AH16AP11P-5A, AH16AP11R-5A, AH16AP11T-5A, AH32AM10N-5A, AH32AM10N-5B, AH32AM10N-5C, AH32AN02P-5A, AH32AN02P-5B, AH32AN02P-5C, AH32AN02T-5A, AH32AN02T-5B, AH32AN02T-5C, AH64AM10N-5C, AH64AN02P-5C and AH64AN02T-5C
Analog input/output module	Analog input/output AH04AD-5A, AH04DA-5A, AH06XA-5A, AH08AD-5A, AH08AD-5B, AH08AD-5C, AH08DA-5A, AH08DA-5B, and AH08DA-5C
Temperature measurement module	Measuring the temperature AH04PT-5A, AH04TC-5A, AH08TC-5A, and AH08PTG-5A
Motion control module	Controlling the motion AH02HC-5A, AH04HC-5A, AH05PM-5A, AH10PM-5A, AH15PM-5A, AH20MC-5A
Network module	Additional communication interface AH10SCM-5A and AH10COPM-5A

4. Larger program capacity and memory

- The program capacity of the AH Motion CPU can be up to 256k steps. Users do not need to change to a more advanced CPU if the user program grows bigger.
- The AH Motion CPU offers 128k words of data registers; 64k words of D devices and 64k words of L devices.

5. Serial control interface with multiple functions



- AHxxEMC-5A provides one serial interface through USB: COM1.
- AHBP05M2-5A (AH motion backplane) provides one serial interface through terminal block: COM2.
- You can use the USB serial interface (COM1) as RS-232 and terminal block serial interface (COM2) as RS-485 according to the application. The data transfer rate can be increased from 9600 bps to 115200bps.
- ISPSoft,can perform automatic data exchange simply by filling the data exchange form in the software. Users do not need to write any program for this purpose and can save time and efforts. For details of data exchange between devices, refer to ***ISPSoft User Manual***.

6. Memory card

- The memory card has the following functions.

  System backup: for user program, CPU parameters, module tables, and setting values in devices.

  System recovery: for user program, CPU parameters, module tables, and setting values in devices.

  Parameter storage: The values in the devices

  Log storage: The system error log and the system status log

7. Hot swap

- The AH motion series I/O modules support the on-line uninterruptible hot swapping. When the system runs, users can replace the module with error without stopping the system or setting the module to offline state. After the module is replaced, the new module will resume normal operation automatically.

Software Features

1. Complying with IEC 61131-3

- The AH Motion CPU complies with IEC 61131-3 editing environment which supports various programming languages, multiple function blocks, tasks, and symbol tables.
- The programming languages which are supported are, structured texts (ST), ladder diagrams (LD), sequential function charts (SFC), and Continuous Function Chart (CFC).
- You can select a programming language according to your preference and the convenience. The programming languages support one another so that the programs written by different users are related.

2. Various function blocks*

- In addition to standard IEC61131-3 function blocks (including PLCopen motion control function blocks), we also offer various convenient function blocks (DFB). You can write the program frequently executed in a function block so that the program becomes more structured and can be executed more conveniently.
- The encryption function supported by ISPSoft provides the secrecy of function blocks for special businesses. The program inside a function block cannot be learned, and the patent of a business will not be infringed.

***Note**: A function block is a program element equipped with the operation function. It is similar to a subroutine, and is a type of POU (Program Organization Unit). It cannot operate by itself, and has to be called through the program POU. After the related parameters are transmitted, the function defined by a function block is executed. Besides, the final operation result can be sent to the device or variable used in the superior POU after the execution of the function block is complete.

3. Task

- The user program supports 283 tasks at most: 32 cyclic tasks, 32 I/O interrupt tasks, 212 external interrupt tasks, 1 24V LV detection, 4 timed interrupt tasks, and 2 communication interrupt tasks.
- Users can enable and disable a task during the execution of a program by means of TKON and TKOFF.

4. On-line debugging mode

- After a single instruction step has been complete, or after a breakpoint is specified, users can easily find the bug in the program by means of the on-line debugging mode supported by the AH Motion CPU.
- Note: Structured Text (ST) do not support on-line debugging mode, and sequential function charts (SFC) programming support the debugging mode during the action and the transition.

5. On-line editing mode

- When the system runs, users can make use of the on-line editing mode to update the program without affecting the operation of the system.

1.1.2. Overview of the System Configurations

The two categories of system configurations of AH Motion series motion control CPU are as follows.

● Basic System Configurations

The AH Motion series CPU basic configurations include the **AH Motion CPU Network Configuration**, **AH500 Series Module Configuration**, and **Supported Software**.

AH Motion Network Configuration

- AHxxEMC-5A

You can use the EtherCAT master port built in on the CPU interface to connect to slave devices such as analog and digital I/O, servo drives, AC motor drives and encoder input devices. With EtherCAT network configuration, you can design a system capable of performing very accurate sequence and motion control in a fixed cycle.

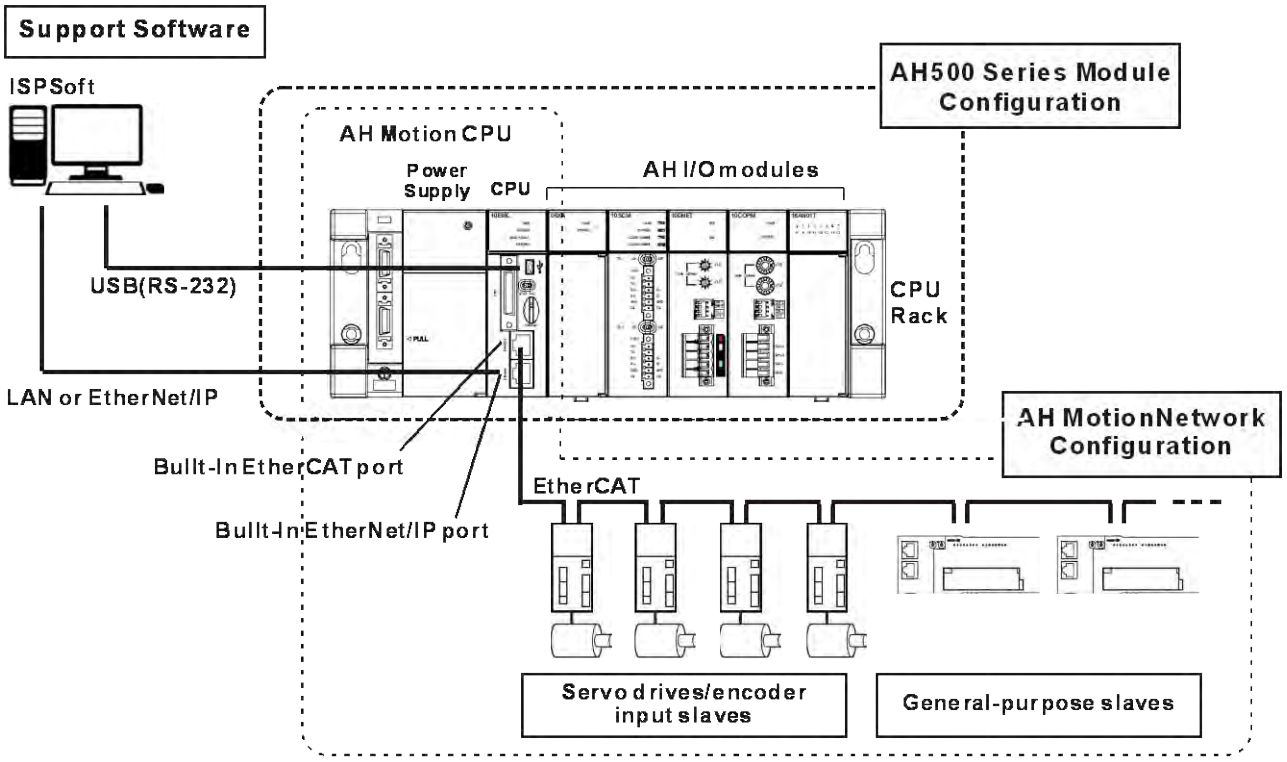
AH500 Series Module Configuration

With the motion backplane, you can also add AH500 series I/O modules* in addition to the EtherCAT network. AH500 series modules can be installed directly to the motion backplane where the CPU module is mounted.

*Note: a few of AH500 series I/O modules are not supported by the motion backplane. Refer to **Ch2 System Configuration** for the list of supported products.

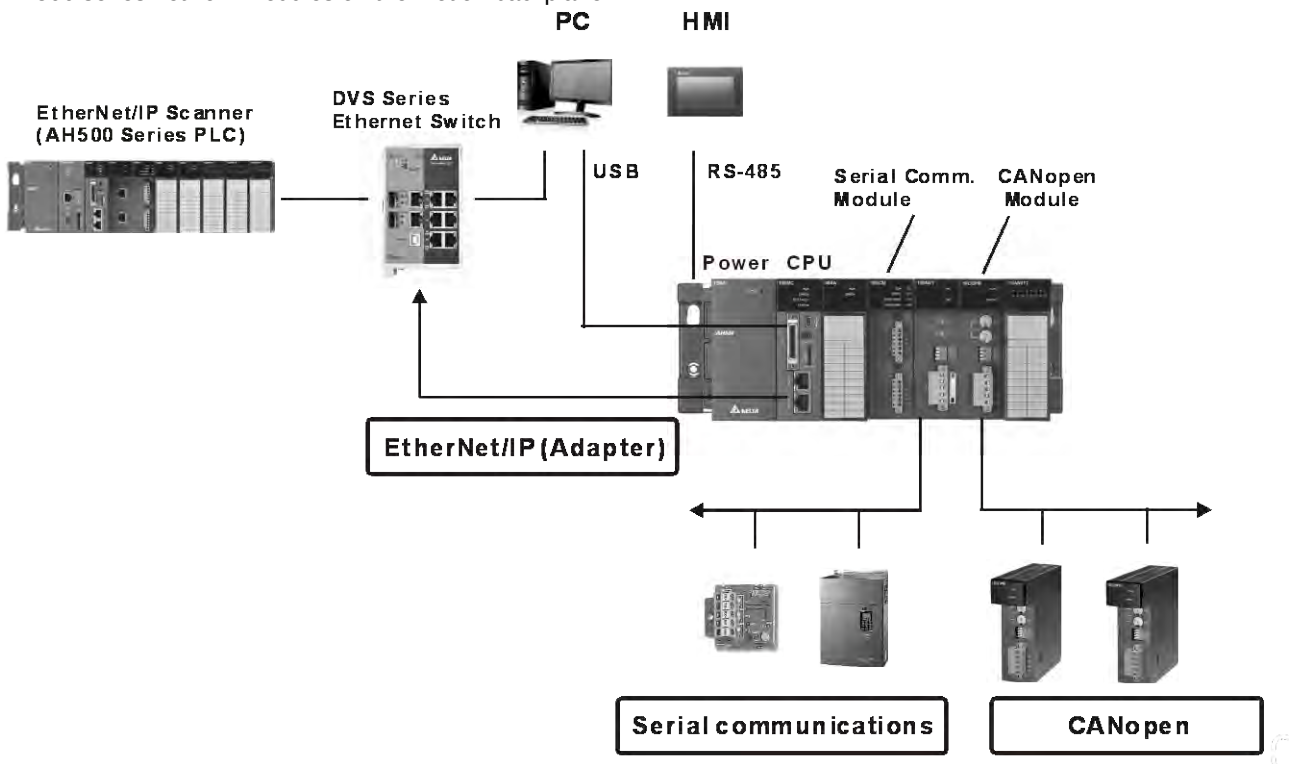
Supported Software

ISPSoft is the major programming software that you use for an AH Motion series motion controller. You can connect the software on the computer to the USB interface on the CPU module through a commercially available USB cable. You can also connect ISPSoft to the Ethernet port on the CPU module with an Ethernet cable or to the built-in RS-485 port on the Motion backplane with a RS-485 cable and a converting device, e.g. IFD6500 USB/RS-485 converter. In addition to ISPSoft, you can also use other software for configuring various applications based on different networks.



● Other Network Configurations

Through the network interfaces on the AH motion CPU and the motion backplane, you can connect host computers, Human Machine Interfaces (HMI) and other AH series PLCs with RS-232(USB), RS-485, and EtherNet/IP networks. In addition, you can also create CANopen network and additional serial communication network (RS-485) by mounting AH500 series network modules on the motion backplane.



Supported Software

ISPSoft is the major programming software that you use for an AH Motion series motion controller. You can use ISPSoft to set up the controller configurations, parameters, and to develop the program. Debugging and simulate operation.

Required software

- **ISPSoft**: Programming and hardware configuration
- **COMMGR**: Communication management
- **EtherCAT Builder**: EtherCAT network configurator (for AHxxEMC-5A)

Optional software

- **EtherNet/IP Builder**: EtherNet/IP network configurator
- **CANopen Builder**: CANopen network configurator

1.2 AH Motion CPU Specifications

1.2.1 Environmental Specifications

Environmental Specifications	
Operating temperature	-20~60°C
Storage temperature	-40~70°C
Operating humidity	5~95% No condensation
Storage humidity	5~95% No condensation
Vibration/Shock resistance	International standards IEC 61131-2, IEC 68-2-6 (TEST Fc)/ IEC 61131-2 & IEC 68-2-27 (TEST Ea)
Operating environment	No corrosive gas exists.
Installation location	In a control box
Pollution degree	2

1.2.2 General Specifications

General Specifications		
AHxxEMC-5A		**Remark**
Execution	The program is executed cyclically.	
Input/Output control	Cyclically refreshed inputs/outputs Direct inputs/outputs	The inputs and outputs can be controlled through the direct inputs (DX device) and direct outputs (DY device).
Programming language	IEC 61131-3	
	Ladder diagram (LD), continuous function chart (CFC), structured text (ST), and sequential function chart (SFC).	
Instruction execution speed	0.3 ms/K steps	
Constant scan cycle (ms)	1-32000 (The scan cycle can be increased by one millisecond.)	The scan cycle time can be specified by parameters.
Program capacity (step)	256K steps	
Installation	DIN rails or screws	
Installation of modules	Modules are installed directly on a backplane.	
Number of modules	Five input/output modules at most can be installed on a motion backplane.	
Number of tasks	283 tasks (32 cyclic tasks, 32 I/O interrupt tasks, 212 external interrupt tasks, 1 24V LV detection, 4 timed interrupt tasks, and 2 communication interrupt tasks).	

General Specifications		
AHxxEMC-5A		**Remark**
Number of input/output devices	X/Y devices (bit): 8192 (X0.0~X511.15/Y0.0~Y511.15) X/Y devices (word): 512 (X0~X511/Y0~Y511)	Number of devices which can be used in a program
Number of inputs/outputs	338 inputs/ 324 outputs (AHBP05M2-5A)	Number of inputs/outputs accessible to an CPU
Input relay [X]	8192 (X0.0~X511.15)	
Output relay [Y]	8192 (Y0.0~Y511.15)	
Auxiliary relay [M]	8192 (M0~M8191)	
Timer [T]	2048 (T0~T2047)	
Counter [C]	2048 (C0~C2047)	
32-bit counter [HC/AC]	HC: 64 (HC0~HC63) AC: 56 (AC0~ AC55)	
Data register [D]	D device (bit): 1048576 (D0.0~D65535.15) D device (word): 65536 (D0~D65535)	
Stepping relay [S]	2048 (bit) (S0~S2047)	
Index register [E]	32 (word) (E0~E31)	
Special auxiliary relay [SM /AM/AR]	SM(bit): 2048 (SM0~SM2047) AM(bit): 16384 (AM0~AM16383) AR(bit):1048576 (AR0.15~AR65535.15)	
Special data register [SR/AR]	SR(word): 2048 (SR0~SR2047) AR(word): 65536 (AR0~AR65535)	
Serial communication port	One RS-232(USB), One RS-485 communication port	
Ethernet port	10/100 M	
USB port	Mini USB	
Memory card slot	Supports Micro SD card (SD 2.0)	
Real-time clock	Years, months, days, hours, minutes, seconds, and weeks	The function is available when the CPU is used together with the motion backplane

2

Chapter 2 System Configuration

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2.1 Basic System Configuration

An AH Motion series CPU provides two types of configurations as follows.

1. Basic Configurations

The basic configurations explained in this section include the CPU network configuration and the configuration of the I/O modules which are controlled by the CPU.

- AH Motion CPU network configuration
- AH500 Series Module Configuration

2. Other Network Configurations

In addition to the main CPU network configuration, you can also set up other network configurations which are connected to the CPU's built-in EtherNet/IP port and other network modules.

AH Motion CPU Network Configuration

- AHxxEMC

The AH Motion CPU provides EtherCAT network as a basic motion system.

With the EtherCAT network system, you can obtain execution results of both sequence and motion control operation in the high speed communications period of EtherCAT network. This feature enables precise sequence control and motion control with a constant cycle time and steady operational results.

For more information on EtherCAT system, refer to ***AH Motion - Communication Manual.***

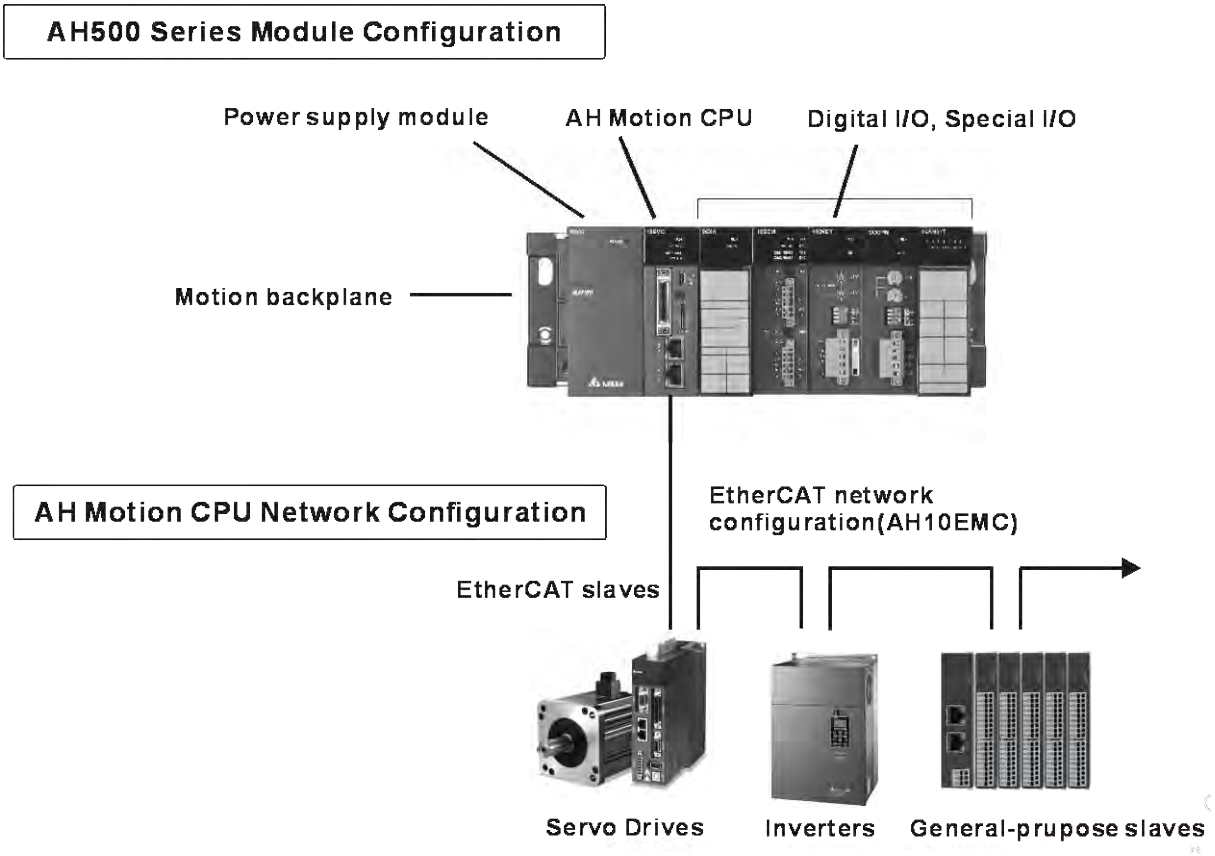
AH500 Series Module Configuration

CPU Rack

The CPU Rack consists of products as follows.

- AH Motion series CPU
- AH Motion series backplane
- AH500 series power supply module
- AH500 series motion control modules
- AH500 series network modules*
- AH500 series digital I/O modules and special I/O modules.

*__Note__: Some AH500 series network modules are not supported by AH Motion CPU. Refer to **2.1.2 AH500 Series Module Configuration** for the supported models.



2.1.1. AH Motion CPU Network Configuration

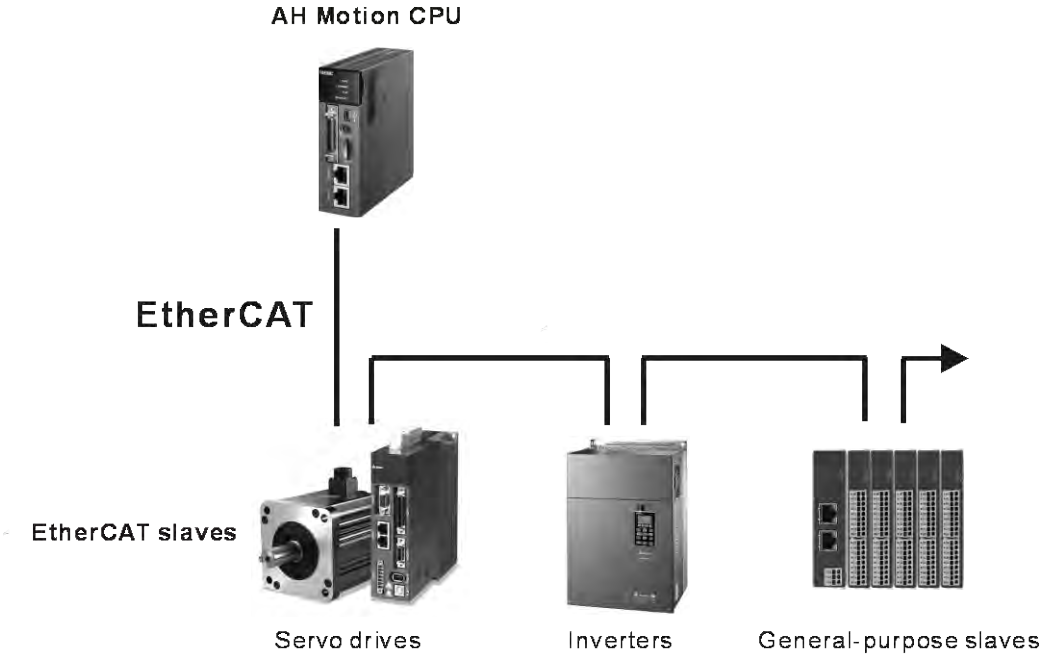
AHxxEMC – EtherCAT

The EtherCAT network configuration includes AHxxEMC which is the core motion CPU, an AH motion backplane*, and an AH500 series power supply module. You can connect the built-in EtherCAT master port to the EtherCAT slave devces.

For more information about EtherCAT network, refer to ***AH Motion – Communicatoin Manual***.

The AHxxEMC can also be used as a motion control module in an AH500 series PLC configuration. You can install it onto the AH500 series main backplane to perform motion control function.
For more information about this application, refer to ***AH500 Motion Control Module Manual***.

***Note**: The AH motion backplane must be used together with AHxxEMC when you use AHxxEMC as a motion CPU.

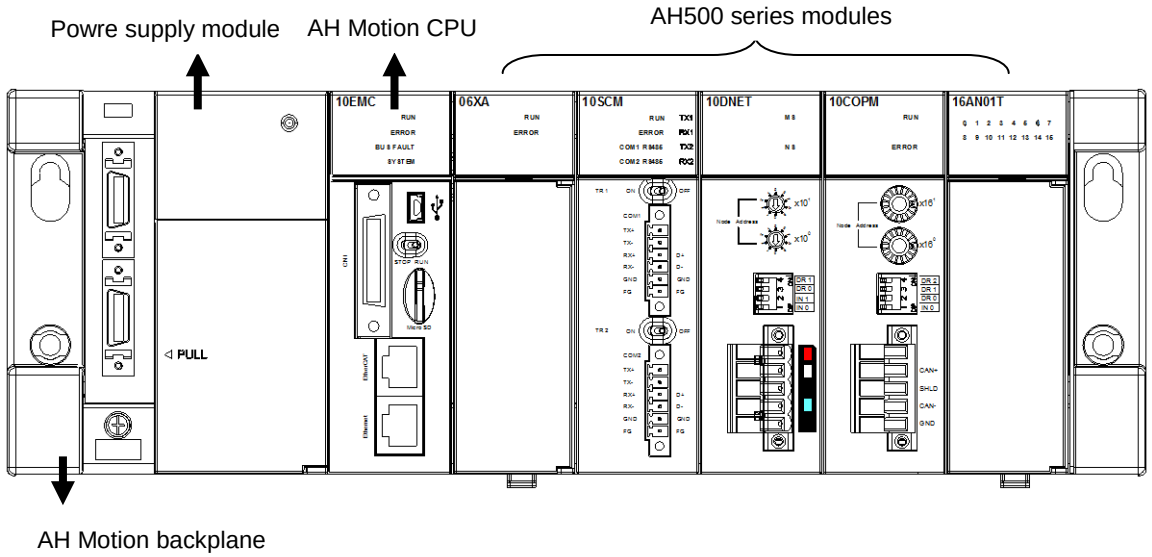


2.1.2. AH500 Series Module Configuration

The AH Motion CPU rack consists of a motion backplane with a power supply module and a motion CPU. You can mount additional AH500 series moudles to the right for different applications. The available modules include digital input/output modules, analog input/output modules, network modules, and motion control modules.

- **AH Motion CPU Rack**

A CPU module, a power supply module, and I/O modules are installed on a motion backplane.



- **Components**

Component	Model Name	Description
Power supply module	AHPS05-5A	100~240 VAC 50/60 Hz
	AHPS15-5A	24 VDC
AH Motion CPU	AHxxEMC-5A	AH08EMC-5A: 8 axes; AH10EMC-5A: 16 axes; AH20EMC-5A: 32 axes One EtherCAT port One EtherNet/IP port (adapter) One built-in USB port (RS-232) One built-in micro SD interface
Motion backplane	AHBP05M2-5A	Five slots available for additional AH500 series modules.
Digital input/output module	AH16AM10N-5A	24 VDC 5 mA 16 inputs Terminal block
	AH32AM10N-5A	24 VDC 5 mA 32 inputs Terminal block
	AH32AM10N-5B	24 VDC 5 mA 32 inputs DB37 connector
	AH32AM10N-5C	24 VDC 5 mA 32 inputs MIL connector
	AH64AM10N-5C	24 VDC 3.2 mA 64 inputs MIL connector
	AH16AM30N-5A	100~240 VAC 4.5 mA~9 mA (100 V, 50 Hz) 16 inputs Terminal block
	AH16AN01R-5A	240 VAC/24 VDC 2 A 16 outputs Relay Terminal block
	AH16AN01T-5A	12~24 VDC 0.5 A 16 outputs

Component	Model Name	Description
		Sinking output Terminal block
	AH16AN01P-5A	12~24 VDC 0.5 A 16 outputs Sourcing output Terminal block
	AH32AN02T-5A	12~24 VDC 0.1 A 32 outputs Sinking output Terminal block
	AH32AN02T-5B	12~24 VDC 0.1 A 32 outputs Sinking output DB37 connector
	AH32AN02T-5C	12~24 VDC 0.1 A 32 outputs Sinking output MIL connector
	AH32AN02P-5A	12~24 VDC 0.1 A 32 outputs Sourcing output Terminal block
	AH32AN02P-5B	12~24 VDC 0.1 A 32 outputs Sourcing output DB37 connector
	AH32AN02P-5C	12~24 VDC 0.1 A 32 outputs Sourcing output MIL connector
	AH64AN02T-5C	12~24 VDC 0.1 A 64 outputs Sinking output MIL connector
	AH64AN02P-5C	12~24 VDC 0.1 A

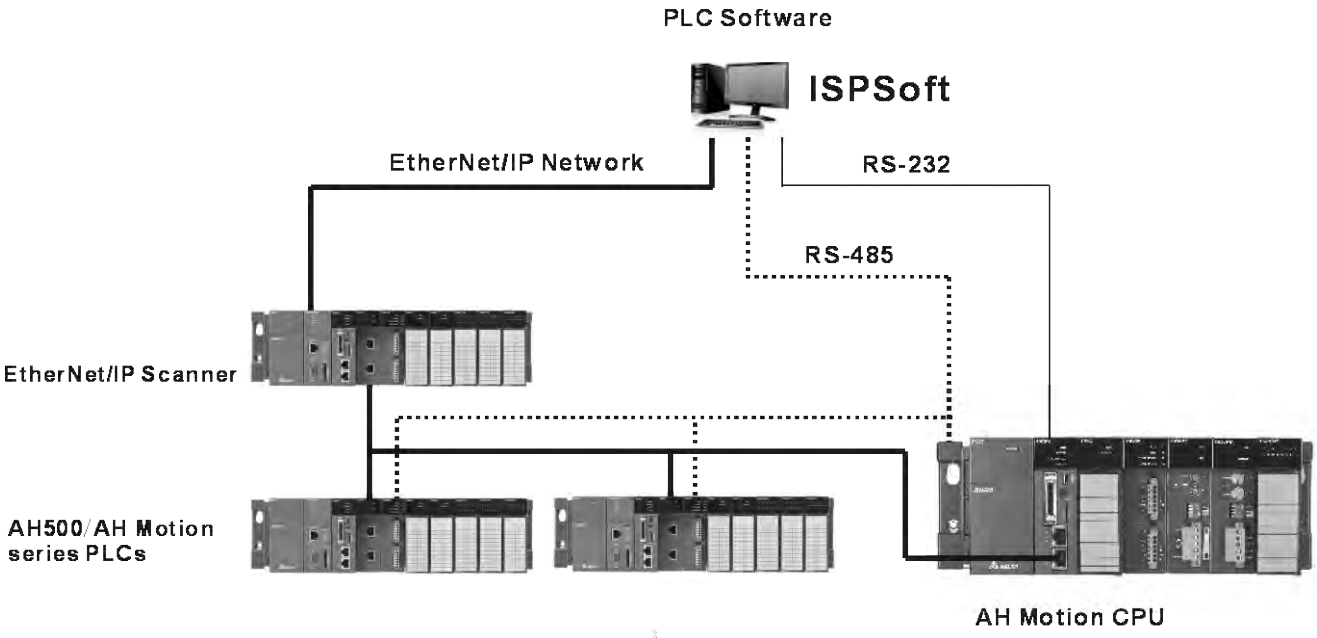
Component	Model Name	Description
		64 outputs Sourcing output MIL connector
	AH16AN01S-5A	100~240 VAC 0.5 A 16 outputs TRIAC Terminal block
Analog input/output module	AH04AD-5A	Four-channel analog input module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, 0/4 mA~20 mA, and -20 mA~20 mA Conversion time: 150 us/channel
	AH08AD-5A	Eight-channel analog input module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, 0/4 mA~20 mA, and -20 mA~20 mA Conversion time: 150 us/channel
	AH08AD-5B	Eight-channel analog input module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, and -10 V~10 V Conversion time: 150 us/channel
	AH08AD-5C	Eight-channel analog input module Hardware resolution: 16 bits 0/4 mA~20 mA, and -20 mA~20 mA Conversion time: 150 us/channel
	AH04DA-5A	Four-channel analog output module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, and 0/4 mA~20 mA Conversion time: 150 us/channel
	AH08DA-5A	Eight -channel analog output module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, and 0/4 mA~20 mA Conversion time: 150 us/channel
	AH08DA-5B	Eight-channel analog output module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, and -10 V~10 V Conversion time: 150 us/channel
	AH08DA-5C	Eight-channel analog output module Hardware resolution: 16 bits 0/4 mA~20 mA Conversion time: 150 us/channel
	AH06XA-5A	Four-channel analog input module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, 0/4 mA~20 mA, and -20 mA~20 mA Conversion time: 150 us/channel Two-channel analog output module

Component	Model Name	Description
		Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, and 0/4 mA~20 mA Conversion time: 150 us/channel
Temperature measurement module	AH04PT-5A	Four-channel four-wire/three-wire RTD Sensor type: Pt100/Pt1000/Ni100/Ni1000 sensor, and 0~300 Ω input impedance Resolution: 0.1°C/0.1°F (16 bits) Four-wire conversion time: 150 ms/channel Three-wire conversion time: 300 ms/channel
	AH08PTG-5A	Eight-channel four-wire/three-wire/two-wire RTD Sensor type: Pt100/Pt1000/Ni100/Ni1000, and 0~300 Ω input impedance Resolution: 0.1°C/0.1°F (16 bits) Conversion time: 20 ms/4 channels and 200 ms/8 channels
	AH04TC-5A	Four-channel thermocouple Sensor type: J, K, R, S, T, E, N, and -150~+150 mV Resolution: 0.1°C/0.1°F Conversion time: 200 ms/channel
	AH08TC-5A	Eight-channel thermocouple Sensor type: J, K, R, S, T, E, N, and -150~+150 mV Resolution: 0.1°C/0.1°F Conversion time: 200 ms/channel
Motion control module	AH02HC-5A	Two-channel high-speed counter module (200 kHz)
	AH04HC-5A	Four-channel high-speed counter module (200 kHz)
	AH05PM-5A	Two-axis pulse train motion control module (1 MHz)
	AH10PM-5A	Six-axis pulse train motion control module (Four axes: 1 MHz; Two axes: 200 kHz)
	AH15PM-5A	Four-axis pulse train motion control module (1 MHz)
	AH20MC-5A	Twelve-axis DMCNET (Delta Motion Control Network) motion control module (10 Mbps)
Network module	AH10COPM-5A	It is a CANopen communication module. It can function as a master or a slave.
	AH10SCM-5A	It is a serial communication module with two RS-485/RS-422 ports, and supports Modbus and UD Link protocols. One part of communication is isolated from the other part of the communication, and one part of power is isolated from the other part of the power.
I/O extension cable	DVPACAB7A10	1.0 meter I/O extension cable (MIL connector) for AH32AM10N-5C and AH64AM10N-5C
	DVPACAB7B10	1.0 meter I/O extension cable (MIL connector) for AH32AN02T-5C, AH32AN02P-5C, AH64AN02T-5C and AH64AN02P-5C
	DVPACAB7C10	1.0 meter I/O extension cable (DB37 connector) for AH32AM10N-5B, AH32AN02T-5B, and AH32AN02P-5B
	DVPACAB7D10	1.0 meter I/O extension cable for AH04HC-5A and AH20MC-5A
	DVPACAB7E10	1.0 meter I/O extension cable for AH10PM-5A and AH15PM-5A

Component	Model Name	Description
External terminal module	DVPAETB-ID32A	I/O external terminal module for AH32AM10N-5C and AH64AM10N-5C 32 inputs
	DVPAETB-OR16A	I/O external terminal module for AH32AN02T-5C and AH64AN02T-5C 16 relay outputs
	DVPAETB-OR16B	I/O external terminal module for AH32AN02P-5C and AH64AN02P-5C 16 relay outputs
	DVPAETB-ID32B	I/O external terminal module for AH32AM10N-5B 32 inputs
	DVPAETB-OR32A	I/O external terminal module for AH32AN02T-5B 32 relay outputs
	DVPAETB-OR32B	I/O external terminal module for AH32AN02P-5B 32 relay outputs
	DVPAETB-OT32A	I/O external terminal module for AH32AN02T-5C, AH32AN02P-5C, AH64AN02T-5C, and AH64AN02P-5C 32 transistor outputs
	DVPAETB-OT32B	I/O external terminal module for AH32AN02T-5B and AH32AN02P-5B 32 transistor outputs
	DVPAETB-IO16C	I/O external terminal module for AH04HC-5A and AH20MC-5A
	DVPAETB-IO24C	I/O external terminal module for AH10PM-5A
	DVPAETB-IO24C	I/O external terminal module for AH10PM-5A
Dummy module	AHASP01-5A	Dummy module used for an empty I/O slot

2.2 Software Connection

Through the network interfaces on the AH motion CPU and the motion backplane, you can connect the CPU to the host computer with RS-232(USB), RS-485, and Ethernet networks. In this configuration, you can also connect ISPSoft with AH500 series PLCs. Refer to ***ISPSoft User Manual*** for information on the procedures of the connections between the AH Motion system and the ISPSoft.

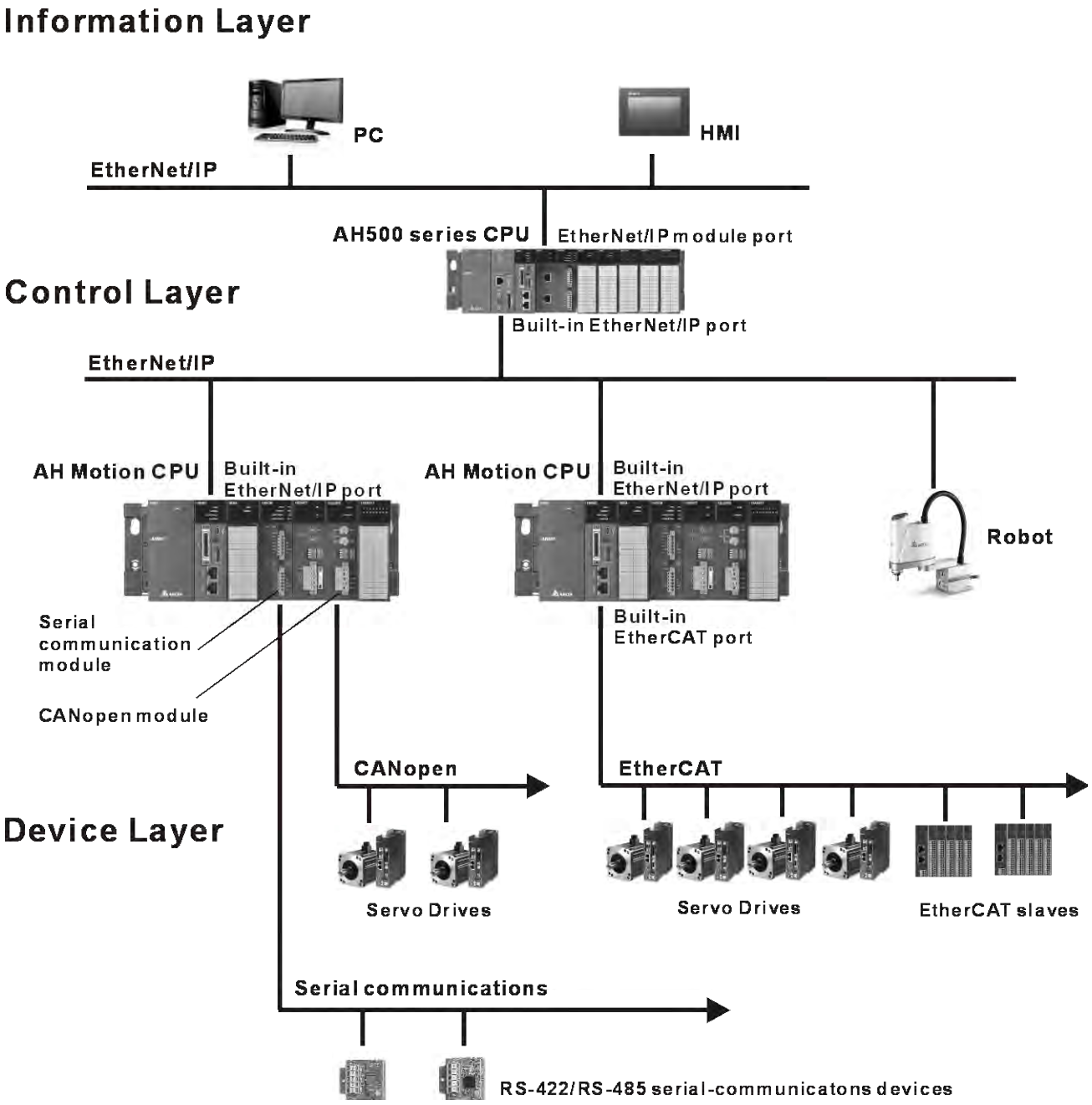


2.3 Overall Network Configuration

- **AHxxEMC**

In addition to the AH Motion CPU network, e.g. EtherCAT, you can expand AH Motion system with additional networks such as CANopen network and serial communication networks. The diagram below shows the overall network configuration of different layers.

For operation procedures on connecting different communication networks, refer to ***ISPSoft User Manual***.



Layer	Function	Network type	Protocols	Devices
Information Layer	Message communications (CIP) with host personal computer	EtherNet/IP	CIP message communications	Built-in EtherNet/IP port
Control Layer	Automatic data exchange between controllers (no programming required)	EtherNet/IP MODBUS TCP Serial communications	EtherNet/IP MODBUS TCP MODBUS RS-422/RS-485	Delta controllers
Device Layer - field networks	Communication between PLC and devices with serial interface.	Serial communications	MODBUS RS-422/RS-485	Serial communication module
	High-speed, high accuracy communications with servo drives and slaves(32 axes)	EtherCAT	EtherCAT protocol	Built-in EtherCAT port
	High-speed, high accuracy communications with servo drives and slaves (16 axes)	CANopen	CANopen protocol	CANopen module

3

Chapter 3 Product Specifications

Table of Contents

3.1 Environmental Specifications

Environmental Specifications	
Operating temperature	-20~60°C
Storage temperature	-40~70°C
Operating humidity	5~95% No condensation
Storage humidity	5~95% No condensation
Vibration/Shock resistance	International standards IEC 61131-2, IEC 68-2-6 (TEST Fc)/ IEC 61131-2 & IEC 68-2-27 (TEST Ea)
Operating environment	No corrosive gas exists.
Installation location	In a control box
Pollution degree	2

3.2 AH Motion CPU

3.2.1 General Specifications

- **AHxxEMC-5A**

General Specifications		
AHxxEMC-5A		**Remark**
Execution	The program is executed cyclically.	
Input/Output control	Cyclically refreshed inputs/outputs Direct inputs/outputs	The inputs and outputs can be controlled through the direct inputs (DX device) and direct outputs (DY device).
Programming language	IEC 61131-3	
	Ladder diagram (LD), continuous function chart (CFC), structured text (ST), and sequential function chart (SFC).	
Instruction execution speed	0.3 ms/K steps	
Constant scan cycle (ms)	1-32000 (The scan cycle can be increased by one millisecond.)	The scan cycle time can be specified by parameters.
Program capacity (step)	256K steps	
Installation	DIN rails or screws	
Installation of modules	Modules are installed directly on a backplane.	
Number of modules	Five input/output modules at most can be installed on a motion backplane.	
Number of tasks	283 tasks (32 cyclic tasks, 32 I/O interrupt tasks, 212 external interrupt tasks, 1 24V LV detection, 4 timed interrupt tasks, and 2 communication interrupt tasks).	

General Specifications		
AHxxEMC-5A		**Remark**
Number of input/output devices	X/Y devices (bit): 8192 (X0.0~X511.15/Y0.0~Y511.15) X/Y devices (word): 512 (X0~X511/Y0~Y511)	Number of devices which can be used in a program
Number of inputs/outputs	328 inputs/ 324 outputs (AHxxEMC)	Number of inputs/outputs accessible to an CPU
Input relay [X]	8192 (X0.0~X511.15)	
Output relay [Y]	8192 (Y0.0~Y511.15)	
Auxiliary relay [M]	8192 (M0~M8191)	
Timer [T]	2048 (T0~T2047)	
Counter [C]	2048 (C0~C2047)	
32-bit counter [HC/AC]	HC: 64 (HC0~HC63) AC: 56 (AC0~ AC55) (AHxxEMC)	
Data register [D]	D device (bit): 1048576 (D0.0~D65535.15) D device (word): 65536 (D0~D65535)	
Stepping relay [S]	2048 (S0~S2047)	
Index register [E]	32 (E0~E31)	
Special auxiliary relay [SM /AM/AR]	SM: 2048 (SM0~SM2047) AM: 16384 (AM0~AM16383) (AHxxEMC) AR:1048576 (AR0.15~AR65535.15) (AHxxEMC)	
Special data register [SR/AR]	SR: 2048 (SR0~SR2047) AR: 65536 (AR0~AR65535) (AHxxEMC)	
Serial communication port	One RS-232(USB), One RS-485 communication port	
Ethernet port	10/100 M	
USB port	Mini USB	
Memory card slot	Supports Micro SD card (SD 2.0)	
Real-time clock	Years, months, days, hours, minutes, seconds, and weeks	The function is available when the CPU is used together with the motion backplane

Description of the terminals

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
X0.0+, X0.0-, X0.1+, X0.1-	1. Differential input terminals. 2. The functions of the terminals: ● High-speed count: ◆ The terminals are the RESET input terminals for counter 0~counter 1. ◆ X0.0+ and X0.0- are for counter 0. X0.1+ and X0.1- are for counter 1. ◆ High-speed capture: The terminals can	1MHz	+/-5mA	+/-5V

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
	function as trigger signals for high-speed captures.			
X0.2, X0.3, X1.4, X1.5	1. Common input terminals. 2. The functions of the terminals: ● High-speed count: ◆ The terminals are the RESET input terminals for counter 2~counter 5. ◆ X0.2 is for counter 2. X0.3 is for counter 3. X1.4 is for counter 4 X1.5 is for counter 5 ● High-speed capture: X0.2 and X0.3 can function as trigger signals for high-speed captures.	100kHz(*1)	5mA	24V
X0.8+, X0.8-, X0.9+, X0.9-	1. Differential input terminals. 2. The functions of the terminals: ● Motion control: The terminals are for a manual pulse generator. ● High-speed count: ◆ The terminals are for counter 0. ◆ X0.8+ and X0.8- are the A-phase inputs for counter 0. X0.9+ and X0.9- are the B-phase inputs for counter 0. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs	1MHz	+/-5mA	+/-5V
X0.10+, X0.10-, X0.11+, X0.11-	1. Differential input terminals. 2. The functions of the terminals: ● High-speed count: ◆ The terminals are for counter 1. ◆ X0.10+ and X0.10- are the A-phase inputs for counter 1. X0.11+ and X0.11- are the B-phase inputs for counter 1. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs	1MHz	+/-5mA	+/-5V
X0.12, X0.13, X0.14, X0.15, X1.0, X1.1, X1.2, X1.3	1. Common input terminals. 2. The functions of the terminals: ● High-speed count: ◆ The terminals are for counter 2~counter 5. ◆ X0.12 and X0.13 are for counter 2. X0.14 and X0.15 are for counter 3. X1.0 and X1.1 are for counter 4. X1.2 and X1.3 are for counter 5. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs: X0.12, X0.13, X0.14 and X0.15 can function as interrupt inputs.	100 kHz(*1)	5mA	24 V
Y0.8, Y0.9,	1. Pulse output temrinals (open collector). 2. The function of the terminals:	200 kHz	15 mA	24 V

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
Y0.10, Y0.11	● High-speed comparison: The terminals can function as high-speed comparison outputs.			

*1. If the frequency of input signals received by an input terminal must be 200 kHz, the input terminal must be connected to a 1 kΩ (2 W) resistor in parallel

3.2.2 Motion Control Function Specifications

● **AHxxEMC-5A**

Specifications	AHxxEMC-5A
Number of substantial axes supported	AH08EMC-5A: 8 axes; AH10EMC-5A: 16 axes; AH20EMC-5A: 32 axes (Axis 1~axis 32)
Storage	The capacity of the built-in storage is 256K steps.
Unit	Motor unit, mechanical unit
Motor control	High-speed motion control system EtherCAT The response time is 100Mbps.
Maximum speed	EtherCAT: 100M bps Diffirential input: 1MHz Open collector input : 200KHz Open collector output:200KHz

Specifications		AHxxEMC-5A
Input signal	**Operating switch**	RUN-STOP switch
	Input terminal	X0.0+, X0.0-, X0.1+, X0.1-, X0.8+, X0.8-, X0.9+, X0.9-, X0.10+, X0.10-, X0.11+, X0.11-, X0.2, X0.3, X0.12, X0.13, X0.14, X0.15, X1.0,X1.1, X1.2, X1.3, X1.4, X1.5,
Output signal	**Output terminal**	Y0.8, Y0.9, Y0.10, and Y0.11
	External communication port	Mini USB port Ethernet port EtherCAT port
Memory card slot		Supports Micro SD card The maximum capacity is 32 GB.
M-code		M00~M01, M03~M101, and M103~M65535: The execution of a program pauses. (WAIT) You can use them freely.
G-code		G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G18 (ZX plane selection), G19 (YZ plane selection), G90 (absolute programming), and G91 (incremental programming)
Number of counters		6

Specifications	AHxxEMC-5A
Number of high-speed capture/comparison	6
Number of interrupt devices	216

3.2.3 Communication Ports

- **AHxxEMC-5A**

AHxxEMC is equipped with a mini USB port and an Ethernet port and an EtherCAT port.

Mini USB: A mini USB port can function as a slave station. You can download or upload a program through a mini USB port. The communication protocols supported by the mini USB port are MODBUS ASCII and MODBUS RTU (RS-232).

Ethernet: The Ethernet port supports communication protocol MODBUS TCP and EtherNet/IP adapter.

MODBUS TCP

The Ethernet port on AH Motion CPU can exchange data with a device with Ethernet interface, e.g. AH500 series PLCs, through a common Ethernet cable.

- Can be connected to ISPSoft. A program can be uploaded/downloaded and monitored.
- Can also function as a standard MODBUS TCP slave.

EtherNet/IP adapter

The Ethernet port on AH Motion CPU can be connected by an EtherNet/IP scanner and perform data exchange through a common Ethernet cable.

- Can be connected to EtherNet/IP scanner through I/O connection.
- Can be connected to EtherNet/IP scanner through CIP Message.

Specifications	
Electrical isolation	500 VDC
Connector	RJ45
Transmission cable	CAT-5, CAT-5e, CAT-6

EtherCAT: An EtherCAT port can be used to perform motion control function based on EtherCAT communications

Specifications	
Electrical isolation	500 VDC
Connector	RJ45
Transmission cable	Delta Cable UC-EMCXXX-XXA

Communication specifications:

Interface / Specifications	Mini USB
Serial transmission rate	9,600~57,600 bps
Number of data bits	7 bits~8 bits
Parity bit	Even parity bit/Odd parity bit/None
Number of stop bits	1 data bit~2 data bits

ASCII mode	Slave stations are supported.	
RTU mode	Slave stations are supported.	
Number of data read/written (ASCII mode)	100 registers	
Number of data read/written (RTU mode)	100 registers	
Interface / Specifications	**Ethernet**	
	MODBUS TCP	**EtherNet/IP**
Transmission rate	10/100 Mbps	10/100 Mbps
Communication protocol	MODBUS TCP	EtherNet/IP
Number of data read/written	100 registers	250 registers
Maximum transmission distance	100 meters	100 meters
Interface / Specifications	**EtherCAT**	
Serial transmission rate	100 Mbps	
Communication protocol	EtherCAT packet format	
Number of axes supported	AH08EMC-5A: 8 axes; AH10EMC-5A: 16 axes; AH20EMC-5A: 32 axes	

3.2.4 I/O Addressing of AH Motion CPU

The I/O addressing between AH Motion CPUs and AH500 I/O modules installed on the motion backplane is a part of the CPU specifications. The range of I/O addressing of AH Motion CPUs is explained in this section.

- **Software-defined address**

  Every AH motion CPU supports software-defined addresses between AH Motion CPU and its I/O modules. As a default setting, a starting address is given by the software and I/O addresses are automatically allocated according to the starting address. For example, AH16AM10N-5A, digital input module with 16 inputs, takes the **input device range** of 16 bits, starting from X**n**.0 (X**n**.0~X**n**.15).

- **User-defined address**

  If you want to define the I/O addresses according to actual needs, you can assign a starting address to an input/output module by software. You can benefit from the user-defined addresses that allow you to obtain a flexible and customized program. The available user-defined addresses for each I/O module will be listed later.

■ Software-defined Addresses

Digital Input/Output Modules

Input/Output devices are automatically assigned to a digital input/output module through HWCONFIG in ISPSoft according to the number of inputs/outputs which the digital input/output module has. The default start addresses are shown below.

Note:

1. The below diagram only shows the list of the modules and is not an actual configuration.
2. AH16AR10N-5A(16AR) is not supported.

16AM	16 inputs. The **input device range** occupies 16 bits. (X**n**.0~X**n**.15)
16AN	16 outputs. The **output device range** occupies 16 bits. (Y**n**.0~Y**n**.15)
16AP	8 inputs and 8 outputs. The **input device range** occupies 16 bits, and the **output device range** occupies 16 bits. (X**n**.0~X**n**.15, and Y**n**.0~Y**n**.15)
32AM	32 inputs. The **input device range** occupies 32 bits. (X**n**.0~X**n+1**.15)
32AN	32 outputs. The **output device range** occupies 32 bits. (Y**n**.0~Y**n+1**.15)
64AM	64 inputs. The **input device range** occupies 64 bits. (X**n**.0~X**n+3**.15)
64AN	64 inputs. The **output device range** occupies 64 bits. (Y**n**.0~Y**n+3**.15)

Information: Rack 1

Slot No.	Label	Firmware Version	Description	Input Device Range	Output Device Range
-	AHPS05-5A	-	AH Power Supply Module	None	None
-	AHCPU530-EN	1.00	Basic CPU module building with	None	None
0	AH16AM10N-5A	-	16 x DI, 24 VDC	X0.0 ~ X0.15	
1	AH16AN01R-5A	-	16 x DO, Relay 240 VAC/24 VDC		Y0.0 ~ Y0.15
2	AH16AP11R-5A	-	8 x DI VDC, 8 x DO VAC/VDC	X1.0 ~ X1.15	Y1.0 ~ Y1.15
3	AH16AR10N-5A	1.00	16 x DI, 24 VDC	X2.0 ~ X2.15	
4	AH32AM10N-5A	-	32 x DI, 24 VDC	X3.0 ~ X4.15	
5	AH32AN02T-5A	-	32 x DO, NPN 12 to 24 VDC		Y2.0 ~ Y3.15
6	AH64AM10N-5C	-	64 x DI, 24 VDC	X5.0 ~ X8.15	
7	AH64AN02P-5C	-	64 x DO, PNP 12 to 24 VDC		Y4.0 ~ Y7.15

Analog Input/Output Modules

Input/Output data registers are automatically assigned to an analog input/output module through HWCONFIG in ISPSoft according to the number of registers which is defined for the analog input/output module. A channel occupies two words.

Note: The below diagram only shows the list of the modules and is not an actual configuration.

04AD	4 input channels. The **input device range** occupies 8 data registers.
08AD	8 input channels. The **input device range** occupies 16 data registers
06XA	4 input channels, and 2 output channels. The **input device range** occupies 8 data registers, and the **output device range** occupies 4 data registers.
04DA	4 output channels. The **output device range** occupies 8 data registers
08DA	8 output channels. The **output device range** occupies 16 data registers.

Slot No.	Label	Firmware Version	Descrption	Input Device Range	Output Device Range	Comment
-	AHPS05-5A	-	AH Power Supply Module	None	None	
-	AHCPU530-EN	1.00	Basic CPU module building with Ethernet	None	None	
0	AH04AD-5A	1.00	4 x AI 16bit	D0 ~ D7		
1	AH08AD-5B	1.00	8 x AI 16bit	D8 ~ D23		
2	AH06XA-5A	1.00	4 x 16bit AI, 2 x 16bit AO	D24 ~ D31	D32 ~ D35	
3	AH04DA-5A	1.00	4 x AO 16bit		D36 ~ D43	
4	AH08DA-5B	1.00	4 x AO 16bit		D44 ~ D59	
5						
6						
7						

Temperature Measurement Modules

Input data registers are automatically assigned to a temperature measurement module through HWCONFIG in ISPSoft according to the number of registers which is defined for the temperature measurement module. A channel occupies two words.

Note: The below diagram only shows the list of the modules and is not an actual configuration.

04PT	4 input channels. The **input device range** occupies 8 data registers.
08PTG	8 input channels. The **input device range** occupies 16 data registers
04TC	4 input channels. The **input device range** occupies 8 data registers.
08TC	8 input channels. The **input device range** occupies 16 data registers

Information: Rack 1

Slot No.	Label	Firmware Version	Description	Input Device Range	Output Device Range
-	AHPS05-5A	-	AH Power Supply Module	None	None
-	AHCPU530-EN	1.00	Basic CPU module building with	None	None
0	AH04PT-5A	1.00	4 x 3/4 wires RTD input 0.1 degr	D0 ~ D7	
1	AH08PTG-5A	1.00	8 x 3/4 wires RTD input 0.1 degr	D8 ~ D23	
2	AH04TC-5A	1.00	4 x 24 bit TC input 0.1 degree Ce	D24 ~ D31	
3	AH08TC-5A	1.00	8 x 24 bit TC input 0.1 degree Ce	D32 ~ D47	

Motion Control Modules

Input/Output data registers are automatically assigned to a motion control module through HWCONFIG in ISPSoft according to the number of registers which is defined for the motion control module.

Note: The below diagram only shows the list of the modules and is not an actual configuration.

02HC	2 input channels. The **input device range** occupies 14 data registers, and the **output device range** occupies 2 data registers.
04HC	4 input channels. The **input device range** occupies 28 data registers, and the **output device range** occupies 4 data registers.
05PM	No input registers and no output registers are assigned to it. Please refer to AH500 Motion Control Module Manual for more information about the parameter setting.
10PM	No input registers and no output registers are assigned to it. Please refer to AH500 Motion Control Module Manual for more information about the parameter setting.
15PM	No input registers and no output registers are assigned to it. Please refer to AH500 Motion Control Module Manual for more information about the parameter setting.
20MC	No input registers and no output registers are assigned to it. Please refer to AH500 Motion Control Module Manual for more information about the parameter setting.

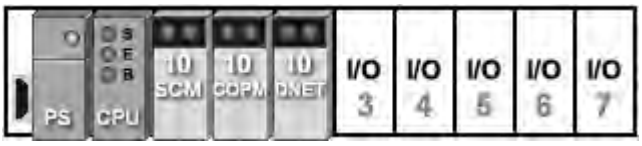
Information: Rack 1

Slot No.	Label	Firmware Version	Descrption	Input Device Range	Output Device Range
-	AHPS05-5A	-	AH Power Supply Modu	None	None
-	AHCPU530-EN	1.00	Basic CPU module buildi	None	None
0	AH02HC-5A	1.00	High speed counter, 2 ch	D0 ~ D13	D14 ~ D15
1	AH02HC-5A	1.00	High speed counter, 2 ch	D16 ~ D29	D30 ~ D31
2	AH05PM-5A	1.00	2-axis pulse-train MC	None	None
3	AH10PM-5A	1.00	6-axis pulse-train MC	None	None
4	AH15PM-5A	1.00	4-axis pulse-train MC	None	None
5	AH20MC-5A	1.00	12-axis DMCNET MC	None	None

Network Modules

Input/Output data registers are automatically assigned to a network module through HWCONFIG in ISPSoft according to the number of registers which is defined for the network module.

Note: The below diagram only shows the list of the modules and is not an actual configuration.



10SCM	The **input device range** occupies 18 data registers.
10COPM	The input device range occupies 2 data registers.
10DNET (not supported yet)	No input registers and no output registers are assigned to it.

Information: Rack 1

Slot No.	Label	Firmware Version	Descrption	Input Device Range	Output Device Range
-	AHPS05-5A	-	AH Power Supply Module	None	None
-	AHCPU530-EN	1.00	Basic CPU module building with Et	None	None
0	AH10SCM-5A	1.00	Serial communication module	D0 ~ D17	
1	AH10COPM-5A	1.00	CANopen communication module	D18 ~ D19	
2	AH10DNET-5A	1.00	DeviceNet scanner	None	None

■ User-defined Addresses

Digital Input/Output Modules

You can assign input devices and output devices to a digital input/output module through HWCONFIG in ISPSoft. The **input devices** should be within the range between **X0.0 and X511.15**, and the **output devices** should be within the range between **Y0.0 and Y511.15**. Take AH16AP11R-5A for example. The default input devices are X0.0~X0.15, and the default output devices are Y0.0~Y0.15. You can change the input device range from X0.0~X0.15 to X10.0~X10.15, and change the output device range from Y0.0~Y0.15 to Y20.0~Y20.15.

- The **default** input/output device range: X0.0~X0.15, and Y0.0~Y0.15

Slot No.	Label	Firmware Version	Descrption	Input Device Range	Output Device Range	Comment
-	AHPS05-5A	-	AH Power Supply Module	None	None	
-	AHCPU530-EN	1.00	Basic CPU module building with Ethernet	None	None	
0	AH16AP11R-5A	-	8 x DI VDC, 8 x DO VAC/VDC	X0.0 ~ X0.15	Y0.0 ~ Y0.15	
1						
2						
3						
4						
5						
6						
7						

- The **user-defined** input/output device range: X10.0~X10.15, and Y20.0~Y20.15

Slot No.	Label	Firmware Version	Descrption	Input Device Range	Output Device Range	Comment
-	AHPS05-5A	-	AH Power Supply Module	None	None	
-	AHCPU530-EN	1.00	Basic CPU module building with Ethernet	None	None	
0	AH16AP11R-5A	-	8 x DI VDC, 8 x DO VAC/VDC	X10.0 ~ X10.15	Y20.0 ~ Y20.15	
1						
2						
3						
4						
5						
6						
7						

Analog Input/Output Modules

You can assign input registers and output registers to an analog input/output module through HWCONFIG in ISPSoft. The **input registers** and the **output registers** should be within the range between **D0 and D65535**. Take AH06XA-5A for example. The original input registers are D0~D7, and the original output registers are D8~D11. You can change the input device range from D0~D7 to D50~D57, and change the output device range from D8~D11 to D100~D103.

- The **default** input/output device range: D0~D7, and D8~D11

Slot No.	Label	Firmware Version	Descrption	Input Device Range	Output Device Range	Comment
-	AHPS05-5A	-	AH Power Supply Module	None	None	
-	AHCPU530-EN	1.00	Basic CPU module building with Ethernet	None	None	
0	AH06XA-5A	1.00	4 x 16bit AI, 2 x 16bit AO	D0 ~ D7	D8 ~ D11	
1						
2						
3						
4						
5						
6						
7						

- The **user-defined** input/output device range: D50~D57, and D100~D103

Slot No.	Label	Firmware Version	Descrption	Input Device Range	Output Device Range	Comment
-	AHPS05-5A	-	AH Power Supply Module	None	None	
-	AHCPU530-EN	1.00	Basic CPU module building with Ethernet	None	None	
0	AH06XA-5A	1.00	4 x 16bit AI, 2 x 16bit AO	D50 ~ D57	D100 ~ D103	
1						
2						
3						
4						
5						
6						
7						

Temperature Measurement Modules

You can assign input registers to a temperature measurement module through HWCONFIG in ISPSoft. The **input registers** should be within the range between **D0 and D65535**. Take AH08TC-5A for example. The original input registers are D0~D15. You can change the input device range from D0~D15 to D60~D75.

- The **default** input device range: D0~D151

Slot No.	Label	Firmware Versi...	Descrption	Input Device Range	Output Device Range	Comment
-	AHPS05-5A	-	AH Power Supply	None	None	
-	AHCPU530-EN	1.00	Basic CPU modul	None	None	
0	AH08TC-5A	1.00	8 x 24bit TC input	D0 ~ D15		
1						
2						
3						
4						
5						
6						
7						

- The **user-defined** input device range: D60~D75

Slot No.	Label	Firmware Versi...	Descrption	Input Device Range	Output Device Range	Comment
-	AHPS05-5A	-	AH Power Supply	None	None	
-	AHCPU530-EN	1.00	Basic CPU modul	None	None	
0	AH08TC-5A	1.00	8 x 24bit TC input	D60 ~ D75		
1						
2						
3						
4						
5						
6						
7						

Motion Control Modules

You can assign input registers and output registers to a motion control module through HWCONFIG in ISPSoft. The **input registers** should be within the range between **D0 and D65535**, and the **output registers** should be within the range between **D0 and D65535**. Take AH04HC-5A for example. The original input registers are D0~D27. You can change the **input device range** from D0~D27 to D200~D227.

- The **default** input device range: D0~D27

Slot No.	Label	Firmware Version	Descrption	Input Device Range	Output Device Range	Comment
-	AHPS05-5A	-	AH Power Supply Module	None	None	
-	AHCPU530-EN	1.00	Basic CPU module building with Ethernet	None	None	
0	AH04HC-5A	1.00	High speed counter, 4 channels	D0 ~ D27	D28 ~ D31	
1						
2						
3						
4						

- The **user-defined** input device range: D200~D227

Slot No.	Label	Firmware Version	Description	Input Device Range	Output Device Range	Comment
-	AHPS05-5A	-	AH Power Supply Module	None	None	
-	AHCPU530-EN	1.00	Basic CPU module building with Ethernet	None	None	
0	AH04HC-5A	1.00	High speed counter, 4 channels	D200 ~ D227	D28 ~ D31	
1						
2						
3						
4						

Network Modules

You can assign input registers and output registers to a network module through HWCONFIG in ISPSoft. The **input registers** should be within the range between **D0 and D65535**, and the **output registers** should be within the range between **D0 and D65535**. Take AH10EN-5A* for example. The original input registers are D0~D19. You can change the **input device range** from D0~D19 to D150~D169.

***Note**: AH10EN-5A is not supported by AHxxEMC-5A The diagram below is only a demonstration on changing input device range.

- The **default** input device range: D0~D19

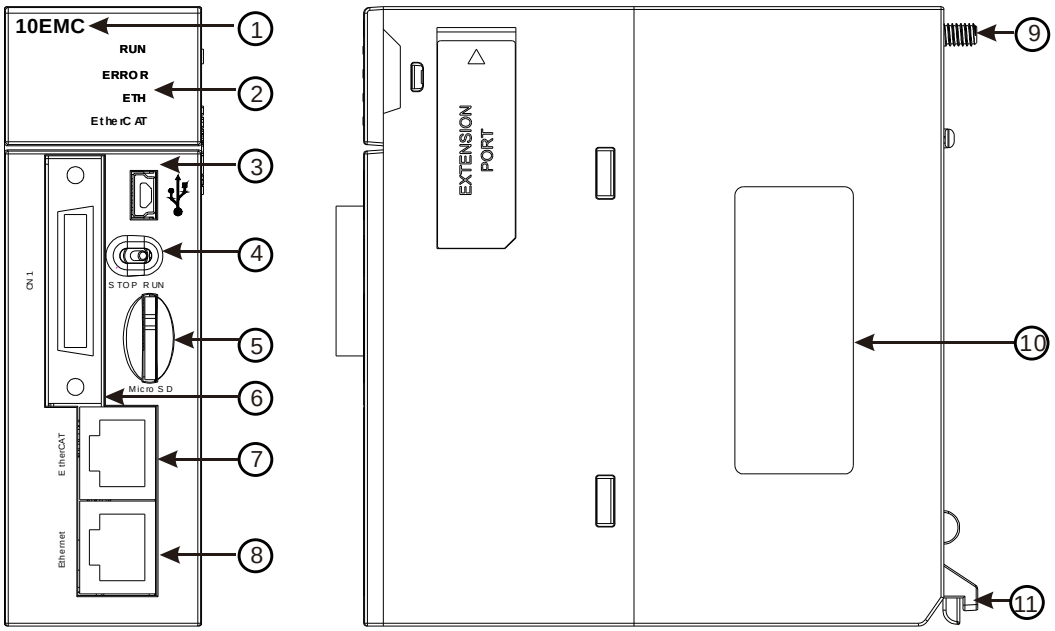
Slot No.	Label	Firmware Version	Description	Input Device Range	Output Device Range	Comment
-	AHPS05-5A	-	AH Power Supply Module	None	None	
-	AHCPU530-EN	1.00	Basic CPU module building with Ethernet	None	None	
0	AH10EN-5A	1.00	Ethernet master module	D0 ~ D19	D20 ~ D39	
1						
2						
3						
4						

- The **user-defined** input device range: D150~D169

Slot No.	Label	Firmware Version	Description	Input Device Range	Output Device Range	Comment
-	AHPS05-5A	-	AH Power Supply Module	None	None	
-	AHCPU530-EN	1.00	Basic CPU module building with Ethernet	None	None	
0	AH10EN-5A	1.00	Ethernet master module	D150 ~ D169	D20 ~ D39	
1						
2						
3						
4						

3.2.5 Profiles and Dimensions

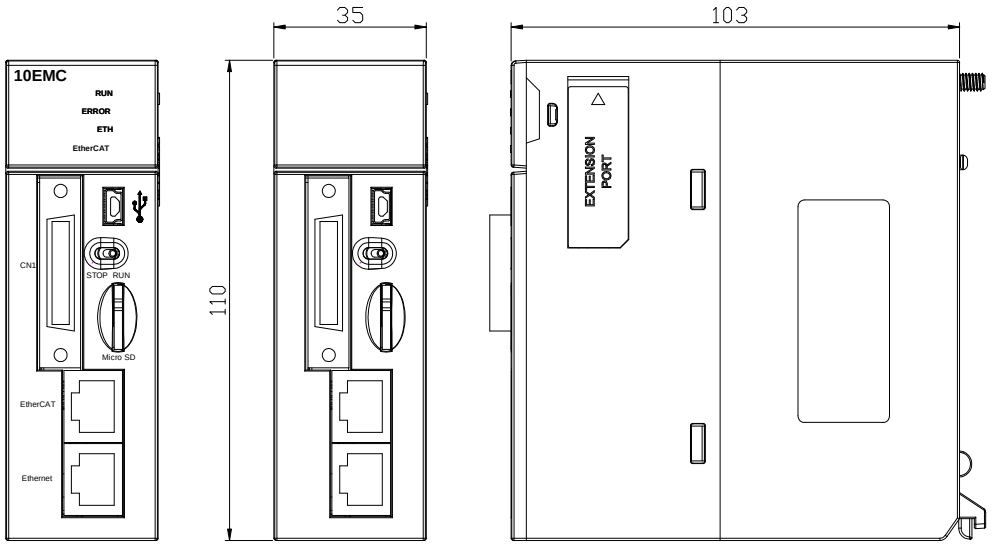
- **AHxxEMC-5A**



Number	Name	Description
1	Model name	Model name of the CPU module
2	RUN LED indicator	Operating status of the CPU module ON: The user program is being executed. OFF: The execution of the user program stops. Blink: The user program is in a debugging mode.
	ERROR LED indicator	Error status of the CPU module ON: A serious error occurs in the system. OFF: The system is normal. Blink: A slight error occurs in the system.
	BUS FAULT LED indicator	Error status of the I/O bus ON: A serious error occurs in the I/O bus. OFF: The I/O bus is normal. Blink: A slight error occurs in the I/O bus.
	SYSTEM LED indicator	System status of the CPU module ON: The external input/output is forced ON/OFF. OFF: The system is in a default status. Blink: The CPU module is being reset / The value in the device is being cleared.
3	Mini USB port	Providing the RS-232 communication interface
4	RUN/STOP switch	RUN: The user program is executed. STOP: The execution of the user program stops.
5	SD slot	Micro SD interface
6	Connector	Connecting the module and an I/O extension cable.
7	EtherCAT port	Providing the EtherCAT communication interface

Number	Name	Description
8	Ethernet port	Providing the Ethernet communication interface
9	Set screw	Fixing the module
10	Label	Nameplate
11	Hook	Connecting the module and a backplane.

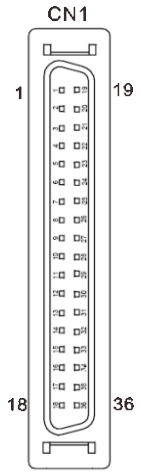
Dimensions:



Dimensions are in mm.

3.2.6 Arrangement of Terminals

- **AHxxEMC-5A**



Pin	Terminal	Function		Pin	Terminal	Function	
		Pulse	Count			Pulse	Count
1	COM		COM	19	Y0.11		Out3
2	COM		COM	20	Y0.10		Out2
3	COM		COM	21	Y0.9		Out1
4	COM		COM	22	Y0.8		Out0
5	S/S		COM	23	X1.3		CntA5
6	X1.5		Rst5	24	X1.2		CntA5
7	S/S		S/S	25	X1.1		CntA4
8	X1.4		Rst4	26	X1.0		CntA4
9	S/S		S/S	27	X0.15	DOG3	CntA3
10	X0.3		Rst3	28	X0.14	DOG2	CntA3
11	S/S		S/S	29	X0.13	DOG1	CntB2
12	X0.2		Rst2	30	X0.12	DOG0	CntA2
13	X0.1-		Rst1-	31	X0.1+		Rst1+
14	X0.11-	DOG5-	CntB1-	32	X0.11+	DOG5+	CntB1+

15	X0.10-	DOG4-	CntA1-	33	X0.10+	DOG4+	CntA1+
16	X0.0-		Rst0-	34	X0.0+		Rst0+
17	X0.9-	MPGB-	CntB0-	35	X0.9+	MPGA-	CntB0+
18	X0.8-	MPGB+	CntA0-	36	X0.8+	MPGA+	CntA0+

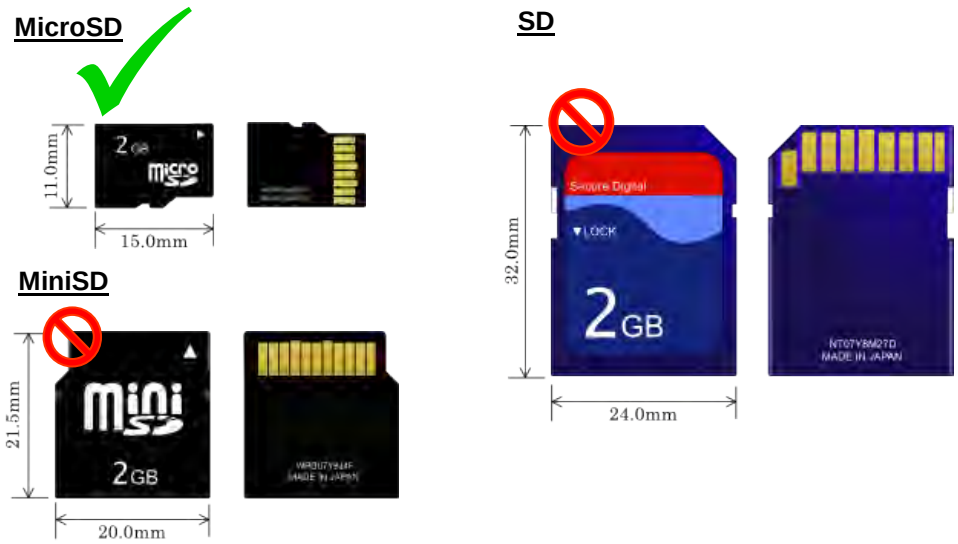
3.2.7 Memory Card Slot

- **AHxxEMC-5A**

The AH Motion series CPU modules support micro SD cards. You can purchase products which meet the specifications supported by the memory card slot on the AH Motion CPU.

SD Cards

SD cards have three size types: SD cards, miniSD cards, and microSD cards. The AH Motion CPU supports Micro SDHC cards.



Specifications for Memory Cards

The specifications of SD cards can also be classified into three types according to capacity: SD cards, SDHC cards, and SDXC cards. The AH Motion CPU supports MicroSDHC in FAT32 file system as below. Be sure to purchase products which meet the specifications.

- **SD card families**

Type	SD	**SDHC**			SDXC	
Capacity	2 GB Max.	**32 GB max.**			32 GB~2 TB	
File system	FAT/FAT32	**FAT16/FAT32**			exFAT	
Size	SD	SDHC	MiniSDHC	**MicroSDHC**	SDXC	MicroSDXC
Speed class rating	N/A	**Class 2 (Min. 2 MB/sec.)** **Class 4 (Min. 4 MB/sec.)** **Class 6 (Min. 6 MB/sec.)** **Class 10 (Min. 10 MB/sec.)**			Class 2 (Min. 2 MB/sec.) Class 4 (Min. 4 MB/sec.) Class 6 (Min. 6 MB/sec.) Class 10 (Min. 10 MB/sec.)	

3.3 AH Motion Backplane

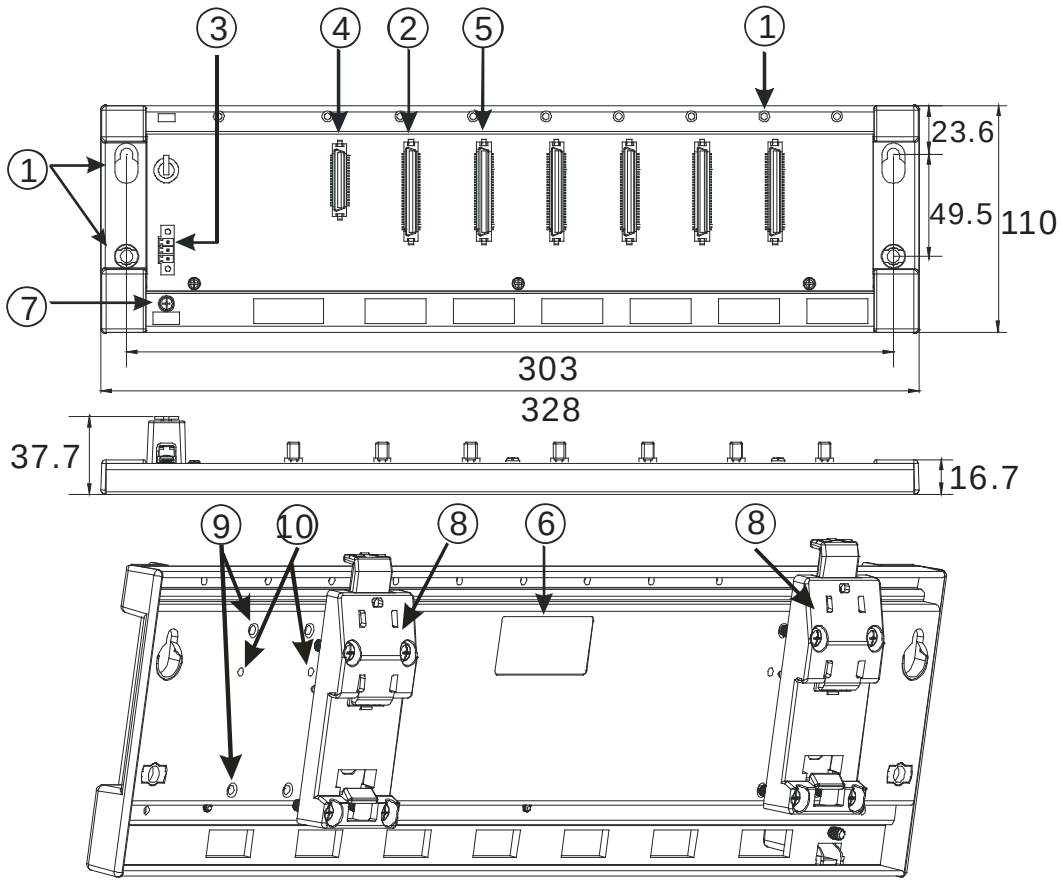
3.3.1 General Specifications

- **The specifications for the motion backplane**

Specifications \ Model	AHBP05M2-5A
Number of I/O slots	5
Applicable power supply module	AHPS05-5A, AHPS15-5A
Applicable input/output module	The AH500 series input/output modules can be installed.

3.3.2 Profile and Dimensions

- **Motion backplane:** AHBP05M2-5A

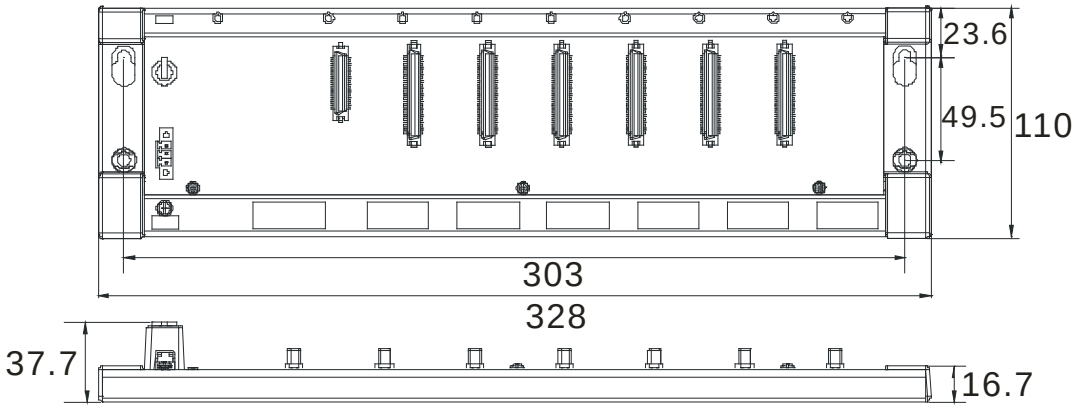


Number	Name	Description
1	Mounting hole	Fixing the backplane
2	Connector	Connecting the backplane and a motion CPU module
3	Communication port	RS-485 communication port.
4	Connector	Connecting the backplane and a power supply module.
5	Connector	Connecting the backplane and an input/output module.
6	Label	Model name and serial number
7	Screw hole for grounding	Screw hole for grounding

Number	Name	Description
8	Mounting clips	Fixing a backplane on a DIN rail
9	Fixing holes	Screws holes for fixing mounting clips
10	Locating hole	Aligning the mounting clips with the backplane

Dimensions:

- **Main backplane:** AHBP05M2-5A



Dimensions are in mm.

3.4 Power Supply Module

3.4.1 General Specifications

- **AHPS05-5A**

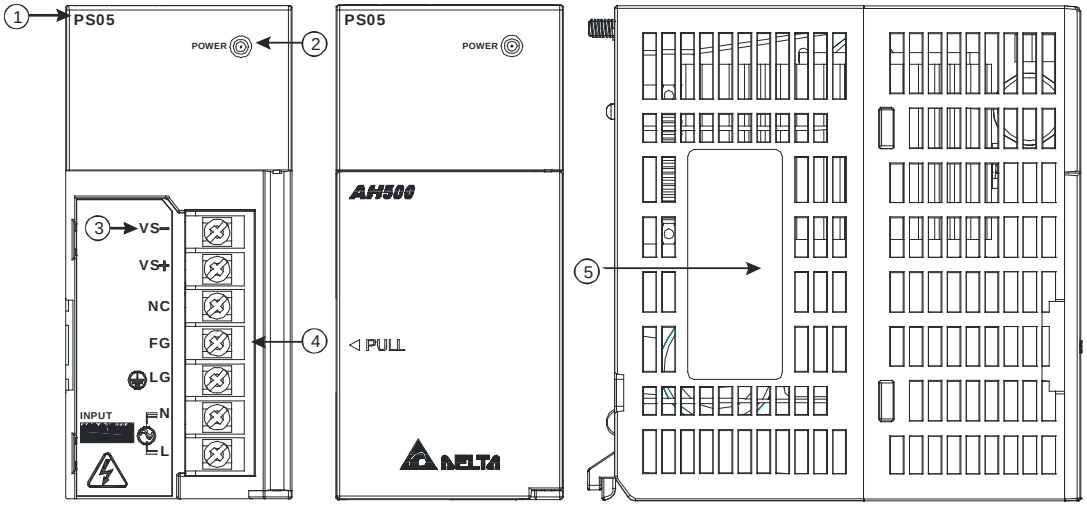
	Specifications
Supply voltage	100~240 VAC (-15%~10%), 50/60 Hz±5%
Action specifications	If the input power supply is larger than 85 VAC, the power supply module can function normally.
Allowable instantaneous power failure time	If the instantaneous power failure time is within ten milliseconds, the power supply module keeps running.
Fuse	4 A/250 VAC
Inrush current	45 A within 1 millisecond at 115 VAC
24 VDC output	The maximum current is 2.5 A. It is only for a backplane.
Power protection	The 24 VDC output is equipped with the short circuit protection and the overcurrent protection.
Surge voltage withstand level	1,500 VAC (Primary-secondary), 1,500 VAC (Primary-PE), 500 VAC (Secondary-PE)
Insulation voltage	Above 5 MΩ (The voltage between all inputs/outputs and the ground is 500 VDC.)
Ground	The diameter of the ground should not be less than the diameters of the cables connected to the terminals L and N.

- **AHPS15-5A**

	Specifications
Supply voltage	24 VDC (-35%, +30%)
Allowable instantaneous power failure time	10 milliseconds
Fuse	6.3 A/250 VAC
Inrush current	30 A within 100 milliseconds
24 VDC output	1.5 A
Maximum output power	36 W
Power protection	The 24 VDC output is equipped with the short circuit protection, the overcurrent protection, and the overvoltage protection.
Surge voltage withstand level	500 VAC
Ground	The diameter of the ground should be greater than 1.6 mm^2.

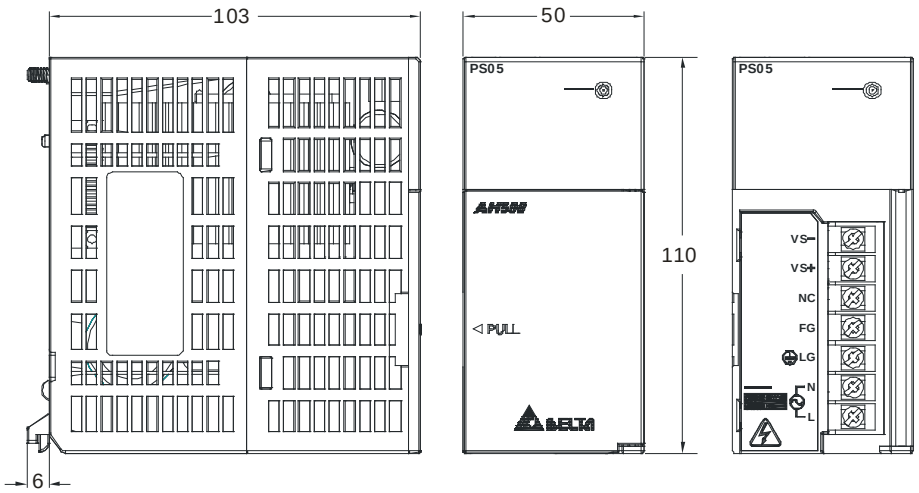
3.4.2 Profile and Dimensions

- **AHPS05-5A**



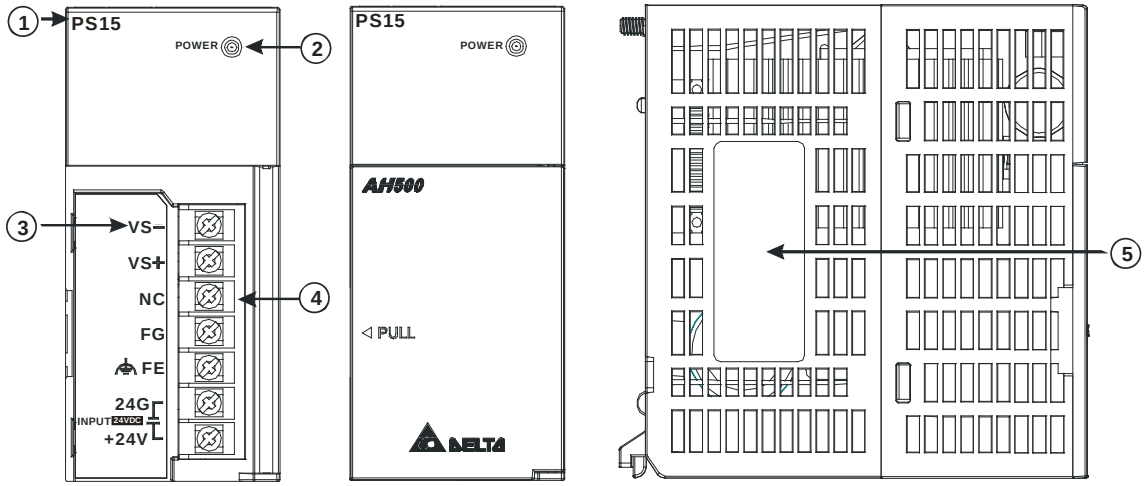
Number	Name	Description
1	Model name	Model name of the power supply module
2	POWER LED indicator (green)	Indicating the status of the power supply
3	Arrangement of the terminals	VS-: It is connected to the negative 24 VDC power supply. VS+: It is connected to the positive 24 VDC power supply. NC: No connection FG: Functional ground LG: Line ground L/N: AC power input
4	Terminal	Terminal for wiring
5	Label	Nameplate

Dimensions:



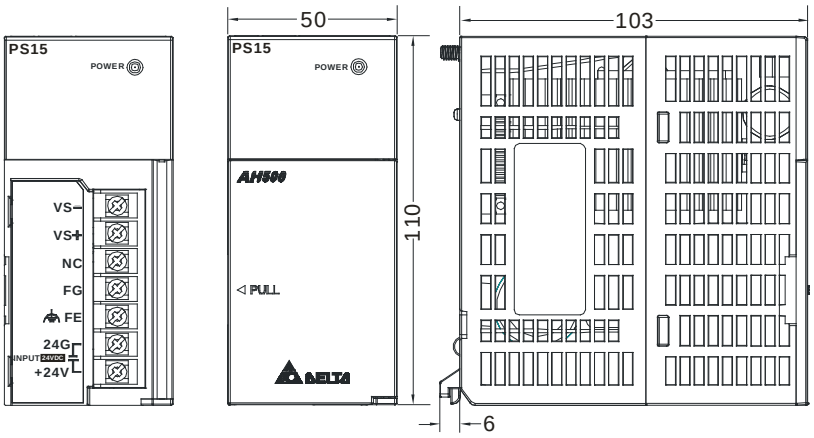
Dimensions are in mm.

- **AHPS15-5A**



Number	Name	Description
1	Model name	Model name of the power supply module
2	POWER LED indicator (green)	Indicating the status of the power supply
3	Arrangement of the terminals	VS-: It is connected to the negative 24 VDC power supply. VS+: It is connected to the positive 24 VDC power supply. NC: No connection FG: Functional ground FE: Line ground 24G/+24V: DC power input
4	Terminal	Terminal for wiring
5	Label	Nameplate

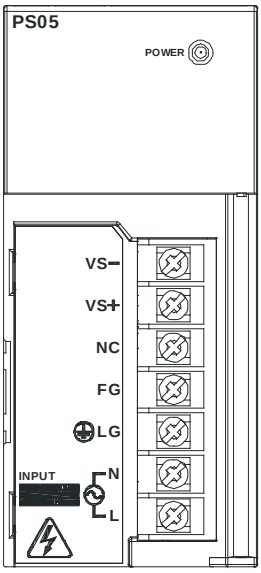
Dimensions:



Dimensions are in mm.

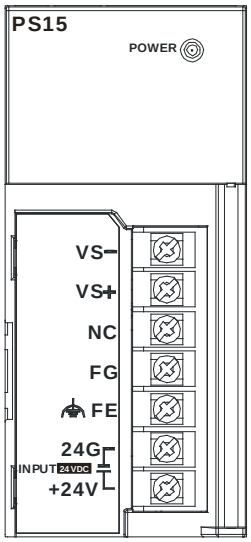
3.4.3 Arrangement of Terminals

- **AHPS05-5A**



- VS-: It is connected to the negative 24 VDC power supply, and used to detect the external power supply.
- VS+: It is connected to the positive 24 VDC power supply, and used to detect the external power supply.
- NC: No connection
- FG: Functional ground
- LG: Line ground
- L/N: AC power input

- **AHPS15-5A**



- VS-: It is connected to the negative 24 VDC power supply, and used to detect the external power supply.
- VS+: It is connected to the positive 24 VDC power supply, and used to detect the external power supply.
- NC: No connection
- FG: Functional ground
- FE: Line ground
- 24G/+24V: DC power input

3.5 Motion Control Modules

3.5.1 General Specifications

- **AH02HC-5A**

Specifications		
Number of channels		2 channels
Input signal	**Input (differential input)**	CH0: X0.8+, X0.8-, X0.9+, and X0.9- CH1: X0.10+, X0.10-, X0.11+, and X0.11-
	Pulse format	Pulse/Direction (one phase and one input) Counting up/Counting down (one phase and two inputs) One time the frequency of A/B-phase inputs (two phases and two inputs) Four times the frequency of A/B-phase inputs (two phases and two inputs)
	Signal level	5~24 VDC
Specifications	**Maximum frequency of counting**	The maximum frequency is 200 kHz.
	Range	The number of sampled pulses is in the range of -200000 to 200000. The number of accumulated pulses is in the range of -999999999 to 999999999. The number of input pulses is in the range of -2147483648 to 2147483648.
	Type	General count Circular count
RESET input	**Input (differential input)**	CH0: X0.0+ and X0.0- CH1: X0.1+ and X0.1-
	Signal level	5~24 VDC
	Maximum current	15 mA
Comparison output	**Output type**	CH0: The high-speed pulse output Y0.8 is a transistor whose collector is an open collector. CH1: The high-speed pulse output Y0.9 is a transistor whose collector is an open collector.
	Signal level	24 VDC
	Maximum current	15 mA

- **AH04HC-5A**

Specifications		
Number of channels		4 channels
Input signal	**Input (differential input)**	CH0: X0.8+, X0.8-, X0.9+, and X0.9- CH1: X0.10+, X0.10-, X0.11+, and X0.11- CH2: X0.12+, X0.12-, X0.13+, and X0.13- CH3: X0.14+, X0.14-, X0.15+, and X0.15-
	Pulse format	Pulse/Direction (one phase and one input) Counting up/Counting up (one phase and two inputs) One time the frequency of A/B-phase inputs (two phases and two inputs)

Specifications		
		Four times the frequency of A/B-phase inputs (two phases and two inputs)
	Signal level	5~24 VDC
Specifications	**Maximum frequency of counting**	The maximum frequency is 200 kHz.
	Range	The number of sampled pulses is in the range of -200000 to 200000. The number of accumulated pulses is in the range of -999999999 to 999999999. The number of input pulses is in the range of -2147483648 to 2147483648.
	Type	Linear count Circular count
RESET input	**Input (differential input)**	CH0: X0.0+ and X0.0- CH1: X0.1+ and X0.1- CH2: X0.2+ and X0.2- CH3: X0.3+ and X0.3-
	Signal level	5~24 VDC
	Maximum current	15 mA
Comparison output	**Output type**	CH0: The high-speed pulse output Y0.8 is a transistor whose collector is an open collector. CH1: The high-speed pulse output Y0.9 is a transistor whose collector is an open collector. CH2: The high-speed pulse output Y0.10 is a transistor whose collector is an open collector. CH3: The high-speed pulse output Y0.11 is a transistor whose collector is an open collector.
	Signal level	24 VDC
	Maximum current	15 mA

- **AH05PM-5A**

Specifications				
Number of actual axes		2 axes		
Storage		The capacity of the built-in storage is 64K steps.		
Unit		Motor unit	Compound unit	Mechanical unit
Connection with a CPU module		You can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.		
Motor control		There are three types of pulse output modes. These modes adopt the differential output. 1. Pulse/Direction 2. Counting up/Counting down 3. A/B-phase output		
Maximum speed		Single axis: 1M PPS Multi-axis interpolation: 1M PPS		
Input signal	**Detector**	X0.0, X0.1, X0.8, X0.9, X0.12, and X0.13		

Specifications		
Output signal	**Servo output signal**	Y0.0+, Y0.0-, Y0.2+, Y0.2-, Y0.1+, Y0.1-, Y0.3+, Y0.3-, Y0.8, and Y0.9
External communication port		Mini USB port
Number of basic instructions		27
Number of applied instructions		130
M-code		1. OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END)) 2. M00~M01, M03~M101, and M103~M65535: The execution of the program pauses. (WAIT) You can use them freely.
G-code		G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G90 (absolute programming), and G91 (incremental programming)

Description of the terminals

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
X0.0, X0.1, X0.8, X0.9, X0.12, and X0.13	1. Single/A/B-phase input terminals. 2. The functions of the terminals: ● Motion control: ◆ X0.0 is the PG input for axis 1, and X0.1 is the PG input for axis 2. ◆ X0.12 is the DOG input for axis 1, and X0.13 is the DOG input for axis 2. ◆ X0.8 and X0.9 are for a manual pulse generator. ● High-speed count: ◆ X0.0 is the RESET input for counter 0. ◆ X0.8 is the A-phase input for counter 0, and X0.9 is the B-phase input for counter 0. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs: X0.8, X0.9, X0.12, X0.13	100 kHz (*1)	5 mA	24 V
Y0.8 and Y0.9	1. The high-speed pulse output terminals are transistors whose collectors are open collectors. 2. The functions of the terminals: ● Motion control: Y0.8 is the CLEAR output for axis 1, and Y0.9 is the CLEAR output for axis 2. ● High-speed comparison: The high-speed comparison output teminals provide the PWM function.	200 kHz	15 mA	24 V
Y0.0+, Y0.0-, Y0.1+, Y0.1-, Y0.2+, Y0.2-, Y0.3+, and Y0.3-	1. Differential output terminals. 2. The function of the terminals: ● Motion control: ◆ Y0.0+ and Y0.0- are the A-phase output terminals for axis 1. Y0.2+ and Y0.2- are	1 MHz	5 mA	5 V

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
	◆ the A-phase output temrinals for axis 2. Y0.1+ and Y0.1- are the B-phase output terminals for axis 1. Y0.3+ and Y0.3- are the B-phase output terminals for axis 2.			

*1. If the frequency of input signals received by an input terminal must be 200 kHz, the input terminal must be connected to a 1 kΩ (2 W) resistor in parallel.

- **AH10PM-5A**

Specifications				
Number of actual axes		6 axes		
Storage		The capacity of the built-in storage is 64K steps.		
Unit		Motor unit	Compound unit	Mechanical unit
Connection with a CPU module		You can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.		
Motor control		There are three types of pulse output modes. These modes adopt the differential output. 1. Pulse/Direction 2. Counting up/Counting down 3. A/B-phase output		
Maximum speed		Single axis: 1M PPS Multi-axis interpolation: 1M PPS		
Input signal	**Operating switch**	STOP/RUN (automatic/manual switch)		
	Detector	X0.8, X0.9, X0.10, X0.11, X0.12, X0.13, X0.14, X0.15, X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-		
Output signal	**Servo output signal**	Y0.0+, Y0.0-, Y0.2+, Y0.2-, Y0.4+, Y0.4-, Y0.6+, Y0.6-, Y0.1+, Y0.1-, Y0.3+, Y0.3-, Y0.5+, Y0.5-, Y0.7+, Y0.7-, Y0.8, Y0.9, Y0.10, and Y0.11		
External communication port		Mini USB port Ethernet port		
Memory Card Slot		Micro SD card The maximum capacity is 32 GB.		
Number of basic instructions		27		
Number of applied instructions		130		
M-code		1. OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END)) 2. M00~M01, M03~M101, and M103~M65535: The execution of the program pauses. (WAIT) You can use them freely.		

Specifications	
G-code	G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G18 (ZX plane selection), G19 (YZ plane selection), G90 (absolute programming), and G91 (incremental programming)

Description of the terminals

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-	1. Differential input temrinalss. 2. The functions of the terminals: ● Motion control: They are the PG input terminals for axis 1~axis 4. ● High-speed counter: X0.0+ and X0.0- are the RESET input terminals for counter 0. X0.1+ and X0.1- are the RESET input terminals for counter 1. X0.2+ and X0.2- are the RESET input terminals for counter 2 and counter 4. X0.3+ and X0.3- are the RESET input temrinals for counter 3 and counter 5. ● High-speed capture: The terminals can function as trigger signals for high-speed captures.	200 kHz	5 mA	5~24 V
X0.8 and X0.9	1. Single/A/B-phase input terminals. 2. The functions of the terminals: ● Motion control: The terminals are for a manual pulse generator. ● High-speed count: ◆ The terminals are for counter 0. ◆ X0.8 is the A-phase input for counter 0, and X0.9 is the B-phase input for counter 0. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs	100 kHz (*1)	5 mA	24 V
X0.10, X0.11, X0.12, X0.13, X0.14, and X0.15	1. Single/A/B-phase input terminals. 2. The functions of the terminals: ● Motion control: They are the DOG input terminals for axis 1~axis 6. ● High-speed counter: ◆ The terminals are for counter 1~counter 5. ◆ X0.10 is the A-phase input for counter 1, X0.12 is the A-phase input for counter 2 and counter 4, and X0.14 is the A-phase input for counter 3 and counter 5. ◆ X0.11 is the B-phase input for counter 1, X0.13 is the B-phase input for counter 2 and counter 4, and X0.15 is the B-phase input for counter 3 and counter 5. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs	100 kHz (*1)	5 mA	24 V

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
Y0.8, Y0.9, Y0.10, and Y0.11	1. The high-speed pulse output terminals are transistors whose collectors are open collectors. 2. The functions of the terminals: ● Motion control: ◆ The terminals are the CLEAR output terminals for axis 1~axis 4, and provide the PWM function. ◆ Y0.8 and Y0.9 are for axis 5. Y0.10 and Y0.11 are for axis 6. Y0.8 is the A-phase output for axis 5, and Y0.10 is the A-phase output for axis 6. Y0.9 is the B-phase output for axis 5, and Y0.11 is the B-phase output for axis 6. ● High-speed comparison: The terminals can function as high-speed comparison output terminals.	200 kHz	15 mA	24 V
Y0.0+, Y0.0-, Y0.1+, Y0.1-, Y0.2+, Y0.2-, Y0.3+, Y0.3-, Y0.4+, Y0.4-, Y0.5+, Y0.5-, Y0.6+, Y0.6-, Y0.7+, and Y0.7-	1. Differential output terminals. 2. The function of the terminals: ● Motion control: ◆ The terminals are for axis 1~axis 4. ◆ Y0.0+ and Y0.0- are the A-phase output terminals for axis 1. Y0.2+ and Y0.2- are the A-phase output terminals for axis 2. Y0.4+ and Y0.4- are the A-phase output terminals for axis 3. Y0.6+ and Y0.6- are the A-phase output terminals for axis 4. ◆ Y0.1+ and Y0.1- are the B-phase output terminals for axis 1. Y0.3+ and Y0.3- are the B-phase output terminals for axis 2. Y0.5+ and Y0.5- are the B-phase output terminals for axis 3. Y0.7+ and Y0.7- are the B-phase output terminals for axis 4. ◆ Y0.0+ and Y0.0- are the CLEAR output terminals for axis 5. Y0.1+ and Y0.1- are the CLEAR output terminals for axis 6.	1 MHz	5 mA	5 V

*1. If the frequency of input signals received by an input terminal must achieve 200 kHz, the input terminal must be connected to a 1 kΩ (2 W) resistor in parallel.

- **AH15PM-5A**

	AH15PM-5A		
Number of actual axes	4 axes		
Storage	The capacity of the built-in storage is 64K steps.		
Unit	Motor unit	Compound unit	Mechanical unit
Connection with a CPU module	You can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.		
Motor control	There are three types of pulse output modes. These modes adopt the differential output. 1. Pulse/Direction		

		AH15PM-5A
		2. Counting up/Counting down 3. A/B-phase output
Maximum speed		Single axis: 1M PPS Multi-axis interpolation: 1M PPS
Input signal	**Operating switch**	STOP/RUN (automatic/manual switch)
	Detector	X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, X0.3-, X0.4, X0.5, X0.6, X0.7, X0.10, X0.11, X0.12, X0.13, X0.14, X0.15, X1.0, X1.1, X1.2, X1.3, X1.4, X1.5
Output signal	**Servo output signal**	Y0.0+, Y0.0-, Y0.2+, Y0.2-, Y0.4+, Y0.4-, Y0.6+, Y0.6-, Y0.1+, Y0.1-, Y0.3+, Y0.3-, Y0.5+, Y0.5-, Y0.7+, Y0.7-, Y0.8, Y0.9, Y0.10, Y0.11
External communication port		Mini USB port Ethernet port
Memory card slot		Supports Micro SD card The maximum capacity is 32 GB.
Number of basic instructions		27
Number of applied instructions		130
M-code		1. OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END)) 2. M00~M01, M03~M101, and M103~M65535: The execution of the program pauses. (WAIT) You can use them freely.
G-code		G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G18 (ZX plane selection), G19 (YZ plane selection), G90 (absolute programming), and G91 (incremental programming)

Description of the terminals

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-	1. Differential input terminals. 2. The functions of the terminals: ● Motion control: They are the PG input terminals for axis 1~axis 4. ● High-speed counter: X0.0+ and X0.0- are the RESET input terminals for counter 0. X0.1+ and X0.1- are the RESET input terminals for counter 1. X0.2+ and X0.2- are the RESET input terminals for counter 2 and counter 4. X0.3+ and X0.3- are the RESET input terminals for counter 3 and counter 5. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs	200 kHz	5 mA	5~24 V
X0.4, X0.5, X0.6, and X0.7	1 Single/A/B-phase input terminals. 2 The functions of the terminals: ● Motion control: They are the DOG input terminals for axis 1~axis 4.	100 kHz (*1)	5 mA	24 V

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
X0.8+, X0.8-, X0.9+, and X0.9-	1. Differential input temrinals. 2. The functions of the terminals: ● Motion control: The terminals are for a manual pulse generator. ● High-speed count: ◆ The terminals are for counter 0. ◆ X0.8+ and X0.8- are the A-phase input terminals for counter 0, and X0.9+ and X0.9- are the B-phase input terminals for counter 0. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs	200 kHz	5 mA	5~24 V
X0.10, X0.11, X0.12, X0.13, X0.14, X0.15 X1.0, and X1.1	1 Single/A/B-phase input terminals. 2 The functions of the terminals: ● Motion control: X0.10 is LSP0, X0.11 is LSN0, X0.12 is LSP1, X0.13 is LSN1, X0.14 is LSP2, X0.15 is LSN2, X1.0 is LSP3, and X1.1 is LSN3.	100 kHz (*1)	5 mA	24 V
X0.10, X0.11, X0.12, X0.13, X0.14, and X0.15,	● High-speed count: ◆ The terminals are for counter 1~counter 5. ◆ X0.10 is the A-phase input for counter 1. X0.12 is the A-phase input for counter 2 and counter 4. X0.14 is the A-phase input for counter 3 and counter 5. ◆ X0.11is the B-phase input for counter 1. X0.13 is the B-phase input for counter 2 and counter 4. X0.15 is the B-phase input for counter 3 and counter 5. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs: X0.10~X0.15	100 kHz (*1)	5 mA	24 V
X1.2, X1.3, X1.4, and X1.5	1. Single/A/B-phase input terminals.	100 kHz (*1)	5 mA	24 V
Y0.8, Y0.9, Y0.10, and Y0.11	1. The high-speed pulse output terminals are transistors whose collectors are open collector. 2. The function of the terminals: ● Motion control: The terminals are the CLEAR output terminals for axis 1~axis 4. ● High-speed comparison: The terminals can function as high-speed comparison output terminals.	200 kHz	15 mA	24 V
Y0.0+, Y0.0-, Y0.1+, Y0.1-, Y0.2+, Y0.2-, Y0.3+, Y0.3-, Y0.4+, Y0.4-, Y0.5+, Y0.5-, Y0.6+, Y0.6-, Y0.7+, and Y0.7-	1. Differential output terminals. 2. The function of the terminals: ● Motion control: ◆ The terminals are for axis 1~axis 4. ◆ Y0.0+ and Y0.0- are the A-phase output terminals for axis 1. Y0.2+ and Y0.2- are the A-phase the output terminals for axis 2. Y0.4+ and Y0.4- are the A-phase output terminals for axis 3. Y0.6+ and Y0.6- are the A-phase output terminals for axis 4. ◆ Y0.1+ and Y0.1- are the B-phase output	1 MHz	5 mA	5 V

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
	terminals for axis 1. Y0.3+ and Y0.3- are the B-phase output terminals for axis 2. Y0.5+ and Y0.5- are the B-phase output terminals for axis 3. Y0.7+ and Y0.7- are the B-phase output terminals for axis 4. ◆ Y0.0+ and Y0.0- are the CLEAR output terminals for axis 5. Y0.1+ and Y0.1- are the CLEAR output temrinals for axis 6.			

*1. If the frequency of input signals received by an input terminal must be 200 kHz, the input terminal must be connected to a 1 kΩ (2 W) resistor in parallel.

- **AH20MC-5A**

		Specifications		
		AH20MC-5A		
Number of actual axes		12 axes		
Storage		The capacity of the built-in storage is 64K steps.		
Unit		Motor unit	Compound unit	Mechanical unit
Connection with a CPU module		You can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.		
Motor control		Delta high-speed motion control system DMCNET (Delta Motion Control Network) The response time is one millisecond.		
Maximum speed		Single axis: 1M PPS Two-axis interpolation: 1M PPS		
Input signal	**Operating switch**	STOP/RUN (automatic/manual switch)		
	Detector	X0.10+, X0.10-, X0.11+, X0.11-, X0.12+, X0.12-, X0.13+, X0.13-, X0.14+, X0.14-, X0.15+, X0.15, X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, X0.3-, X0.8+, X0.8-, X0.9+, X0.9-		
Output signal	**Servo output signal**	Y0.8, Y0.9, Y0.10, Y0.11		
External communication port		Mini USB port Ethernet port DMCNET port		
Memory card slot		Supports Micro SD card The maximum capacity is 32 GB.		
Number of basic instructions		27		
Number of applied instructions		130		
M-code		● OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END)) ● M00~M01, M03~M101, and M103~M65535: The execution of the program pauses. (WAIT)		

	Specifications
	AH20MC-5A
	You can use them freely.
G-code	G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G18 (ZX plane selection), G19 (YZ plane selection), G90 (absolute programming), and G91 (incremental programming)

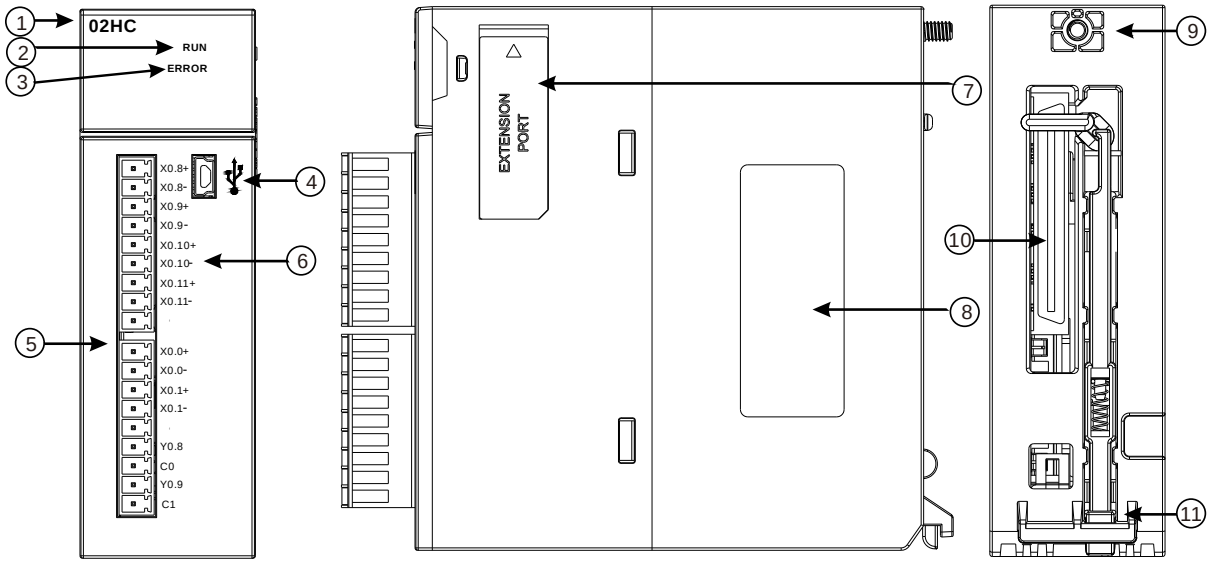
Description of the terminals

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-	1. Differential input terminals. 2. The functions of the terminals: ● High-speed count: ◆ The terminals are the RESET input terminals for counter 0~counter 5. ◆ X0.0+ and X0.0- are for counter 0. X0.1+ and X0.1- are for counter 1. X0.2+ and X0.2- are for counter 2 and counter 4. X0.3+ and X0.3- are for counter 3 and counter 5. ● High-speed comparison and capture: The terminals can function as trigger signals for high-speed captures.	200 kHz	5 mA	5~24 V
X0.8+, X0.8-, X0.9+, and X0.9-	1. Differential input terminals. 2. The functions of the terminals: ● Motion control: The terminals are for a manual pulse generator. ● High-speed count: ◆ The terminals are for counter 0. ◆ X0.8+ and X0.8- are the A-phase input terminals for counter 0. X0.9+ and X0.9- are the B-phase input terminals for counter 0. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt input terminals	200 kHz	5 mA	5~24 V
X0.10+, X0.10-, X0.11+, X0.11-, X0.12+, X0.12-, X0.13+, X0.13, X0.14+, X0.14-, X0.15+, and X0.15-	1. They are differential input terminals. 2. The functions of the terminals: ● Motion control: supports DOG signal input for axis 1 to axis 6. The function is applicable for inserting single axis one-speed/two-speed motion. ● High-speed count: ◆ The terminals are for counter 1~counter 5. ◆ AB-phsae pulse input: A-phase: X0.10+ and X0.10- are the input terminals for counter 1. X0.12+ and X0.12- are the input temrinals for counter 2 and counter 4. X0.14+ and X0.14- are the input terminals for counter 3 and counter 5. B-phase: X0.11+ and X0.11- are the input terminals for counter 1. X0.13+ and X0.13- are the input terminals for counter 2 and counter 4. X0.15+ and X0.15- are the input	200 kHz	5 mA	5~24 V

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
	terminals for counter 3 and counter 5. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs			
Y0.8, Y0.9, Y0.10, and Y0.11	1. The high-speed pulse output temrinals are transistors whose collectors are open collectors. 2. The function of the terminals: ● High-speed comparison: The terminals can function as high-speed comparison output temrinals.	200 kHz	15 mA	24 V

3.5.2 Profiles and Dimensions

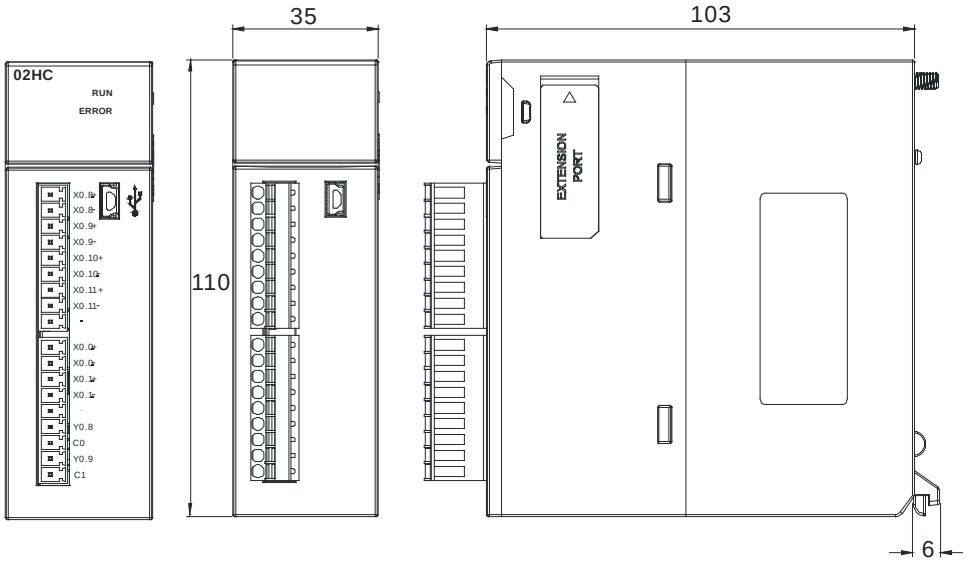
- **AH02HC-5A**



Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
3	ERROR LED indicator (red)	Error status of the module Blinking: The module is abnormal.
4	USB port	Providing the mini USB communication interface
5	Terminals	Input/Output terminals
6	Arrangement of the input/output terminals	Arrangement of the terminals
7	Extension port	Updating the firmware
8	Label	Nameplate
9	Set screw	Fixing the module

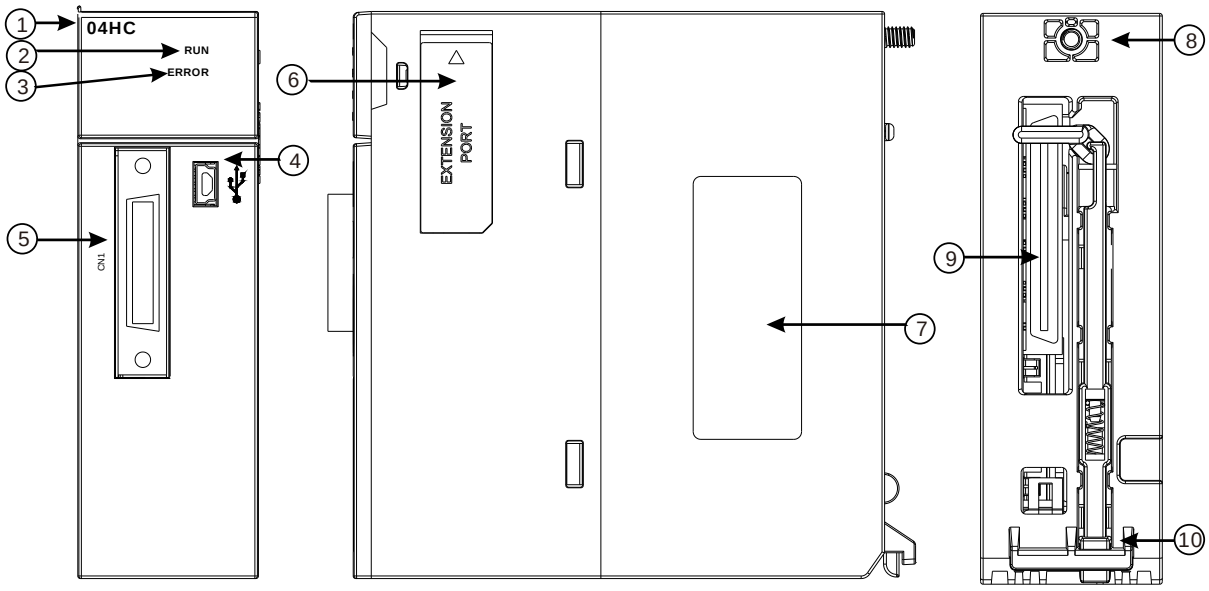
Number	Name	Description
10	Connector	Connecting the module and a backplane
11	Projection	Fixing the module

Dimensions:



Dimensions are in mm.

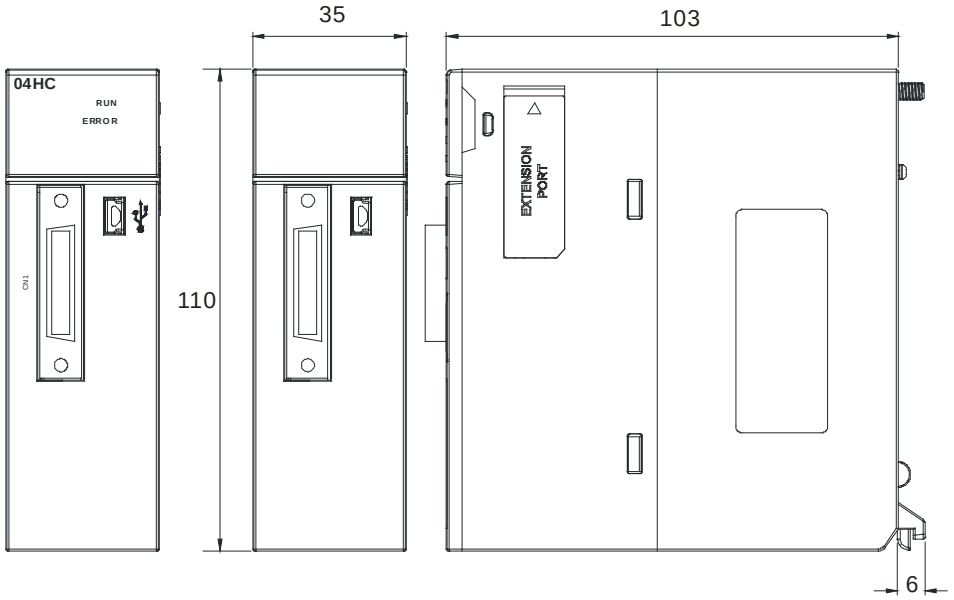
- **AH04HC-5A**



Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
3	ERROR LED indicator (red)	Error status of the module Blinking: The module is abnormal.

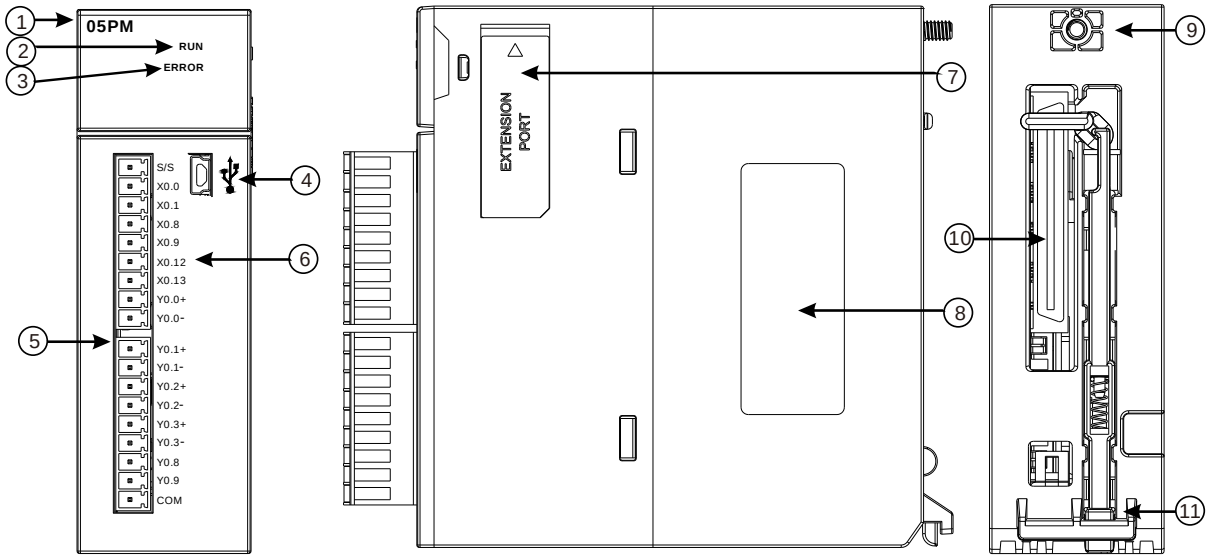
Number	Name	Description
4	USB port	Providing the mini USB communication interface
5	Connector	Connecting the module and an I/O extension cable
6	Extension port	Updating the firmware
7	Label	Nameplate
8	Set screw	Fixing the module
9	Connector	Connecting the module and a backplane
10	Projection	Fixing the module

Dimensions:



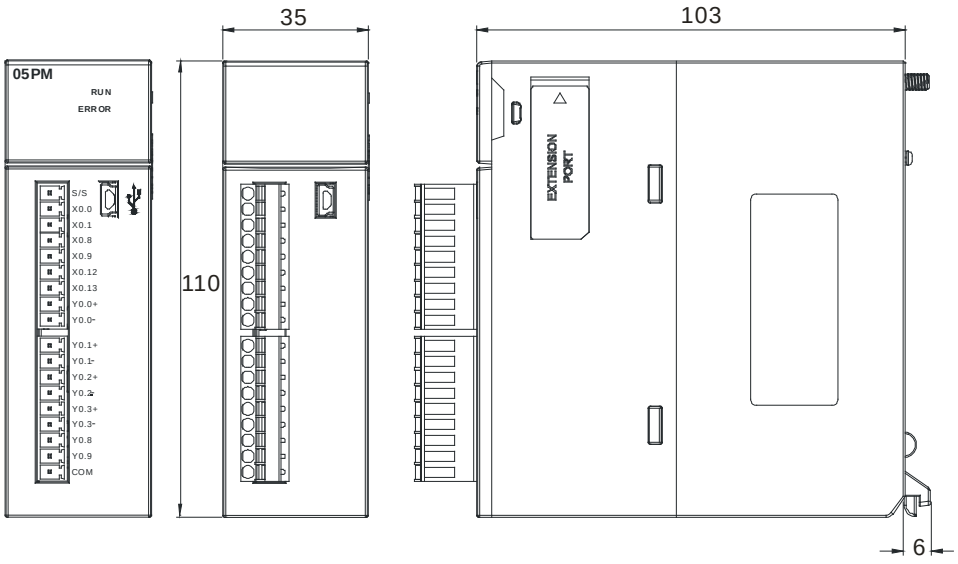
Dimensions are in mm.

- **AH05PM-5A**



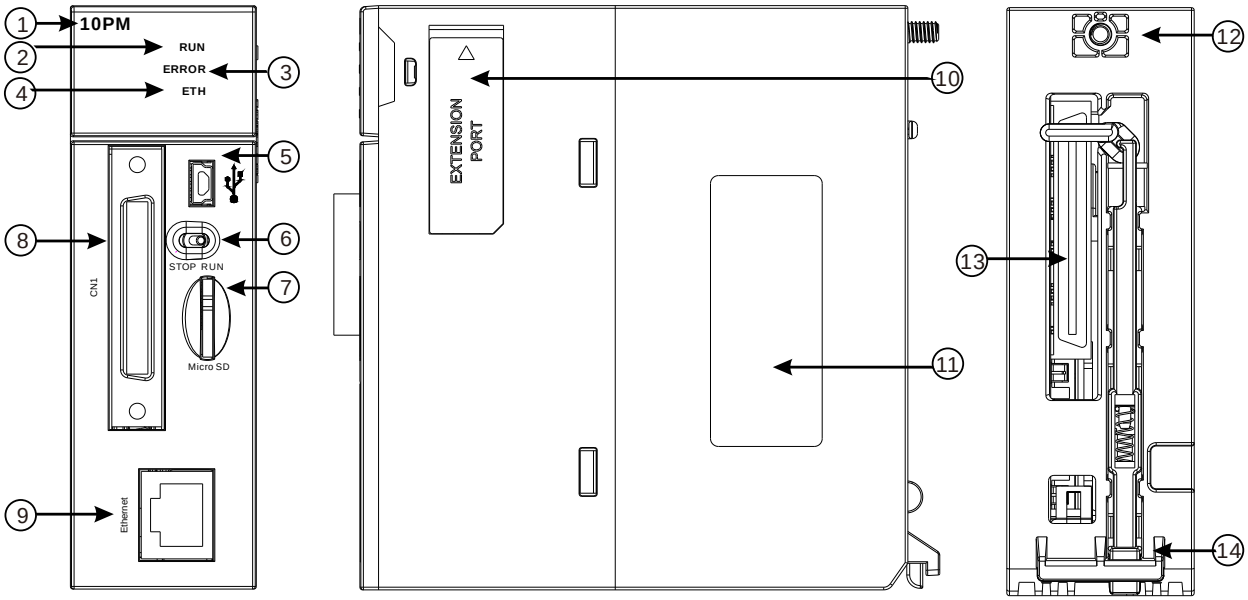
Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
3	ERROR LED indicator (red)	Error status of the module Blinking: The module is abnormal.
4	USB port	Providing the mini USB communication interface
5	Terminals	Input/Output terminals
6	Arrangement of the input/output terminals	Arrangement of the terminals
7	Extension port	Updating the firmware
8	Label	Nameplate
9	Set screw	Fixing the module
10	Connector	Connecting the module and a backplane
11	Projection	Fixing the module

Dimensions:



Dimensions are in mm.

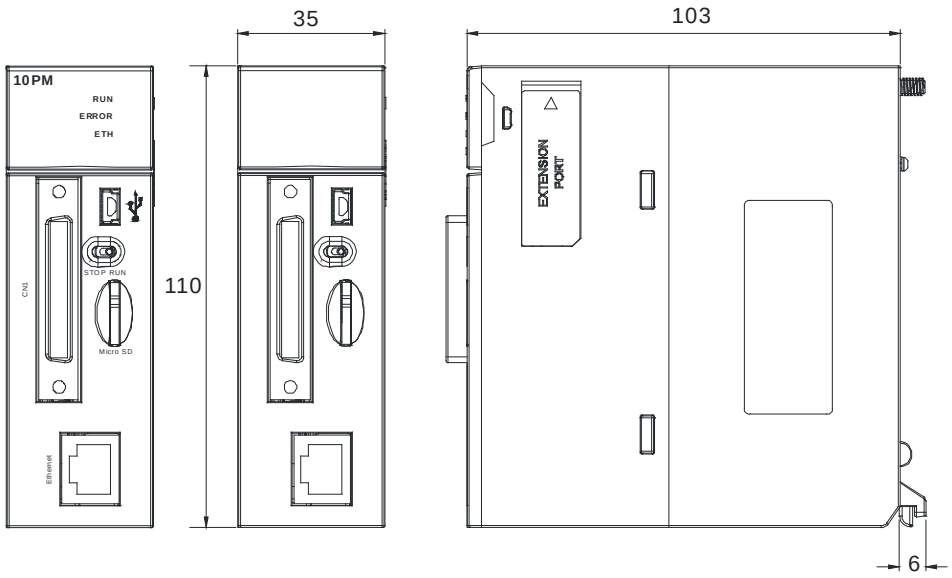
- **AH10PM-5A**



Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
3	ERROR LED indicator (red)	Error status of the module Blinking: The module is abnormal.
4	Ethernet connection LED indicator (green)	Status of the Ethernet connection ON: The Ethernet connection is being connected. OFF: The Ethernet connection is disconnected.
5	USB port	Providing the mini USB communication interface
6	RUN/STOP switch	RUN: The user program is executed.

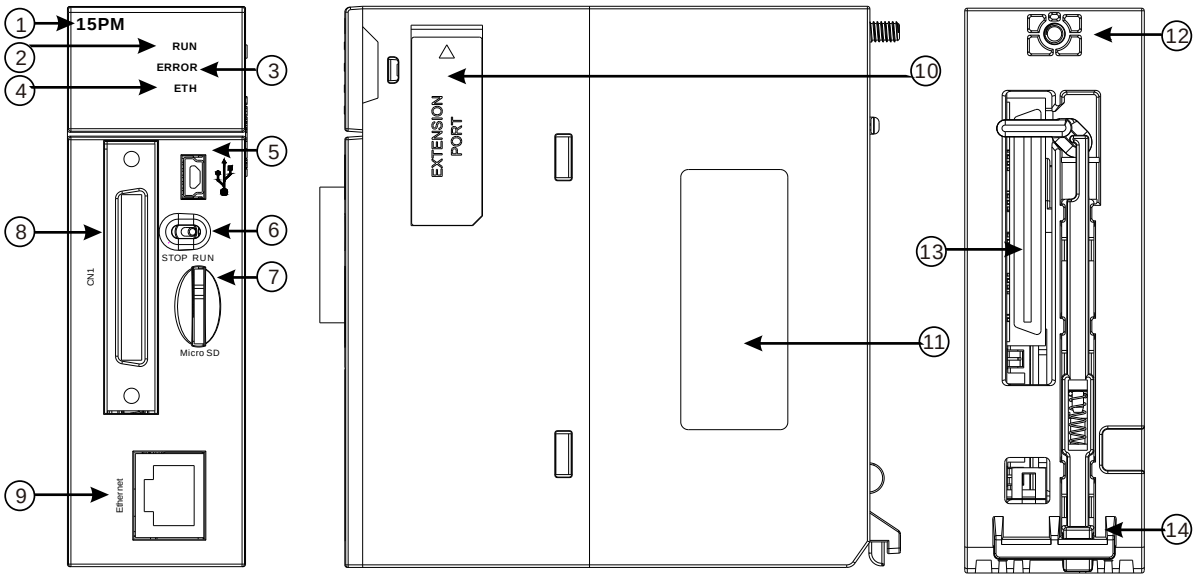
Number	Name	Description
		STOP: The execution of the user program stops.
7	SD slot	Providing the SD interface
8	Connector	Connecting the module and an I/O extension cable
9	Ethernet port	Providing the Ethernet communication interface
10	Extension port	Updating the firmware
11	Label	Nameplate
12	Set screw	Fixing the module
13	Connector	Connecting the module and a backplane
14	Projection	Fixing the module

Dimensions:



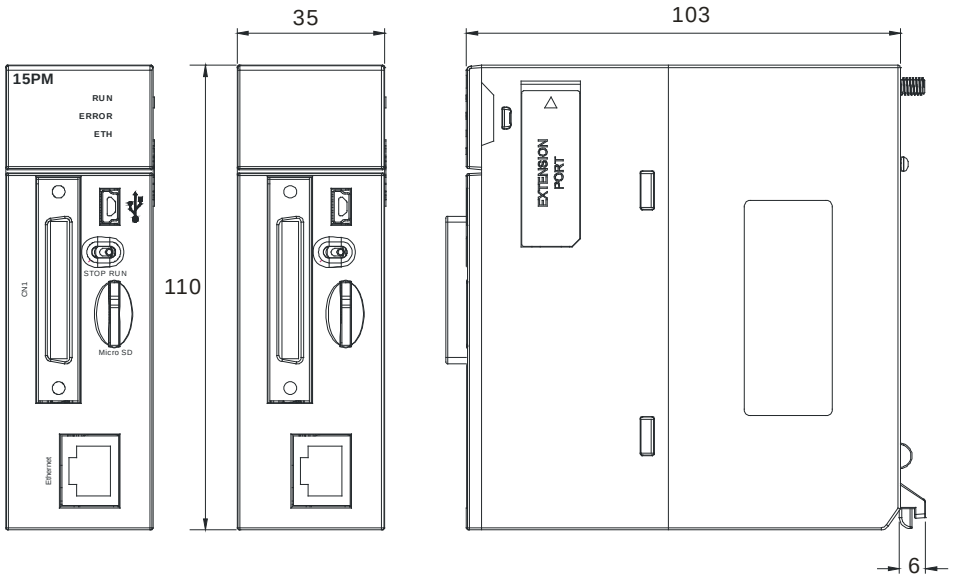
Dimensions are in mm.

- **AH15PM-5A**



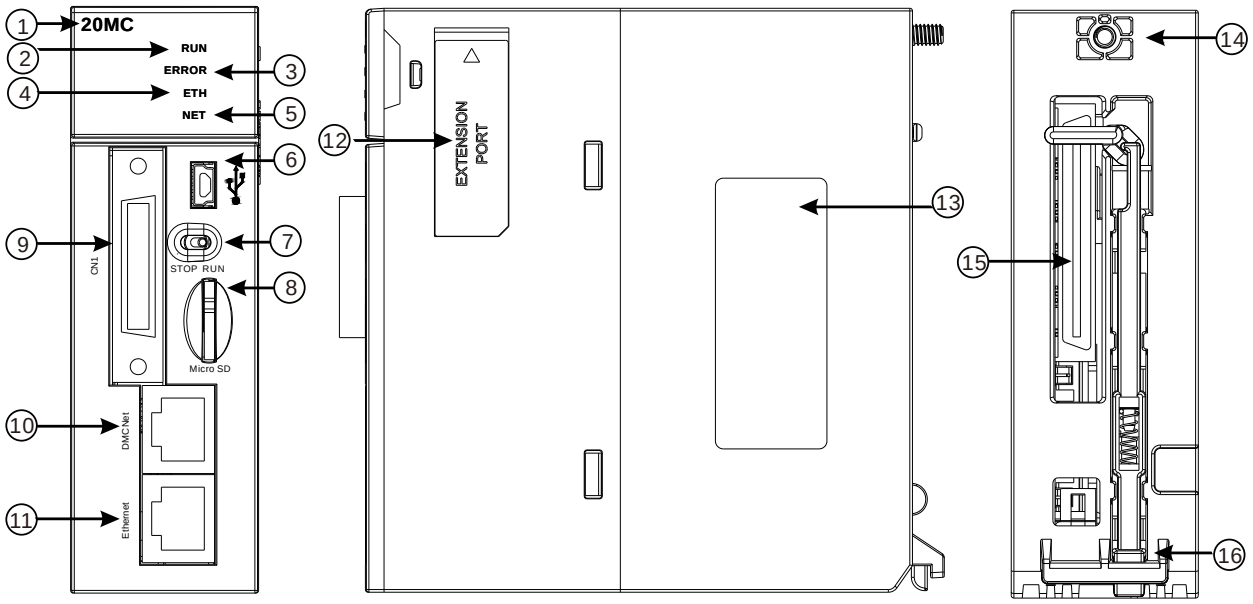
Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
3	ERROR LED indicator (red)	Error status of the module Blinking: The module is abnormal.
4	Ethernet connection LED indicator (green)	Status of the Ethernet connection ON: The Ethernet connection is being connected. OFF: The Ethernet connection is disconnected.
5	USB port	Providing the mini USB communication interface
6	RUN/STOP switch	RUN: The user program is executed. STOP: The execution of the user program stops.
7	SD slot	Providing the SD interface
8	Connector	Connecting the module and an I/O extension cable
9	Ethernet port	Providing the Ethernet communication interface
10	Extension port	Updating the firmware
11	Label	Nameplate
12	Set screw	Fixing the module
13	Connector	Connecting the module and a backplane
14	Projection	Fixing the module

Dimensions:



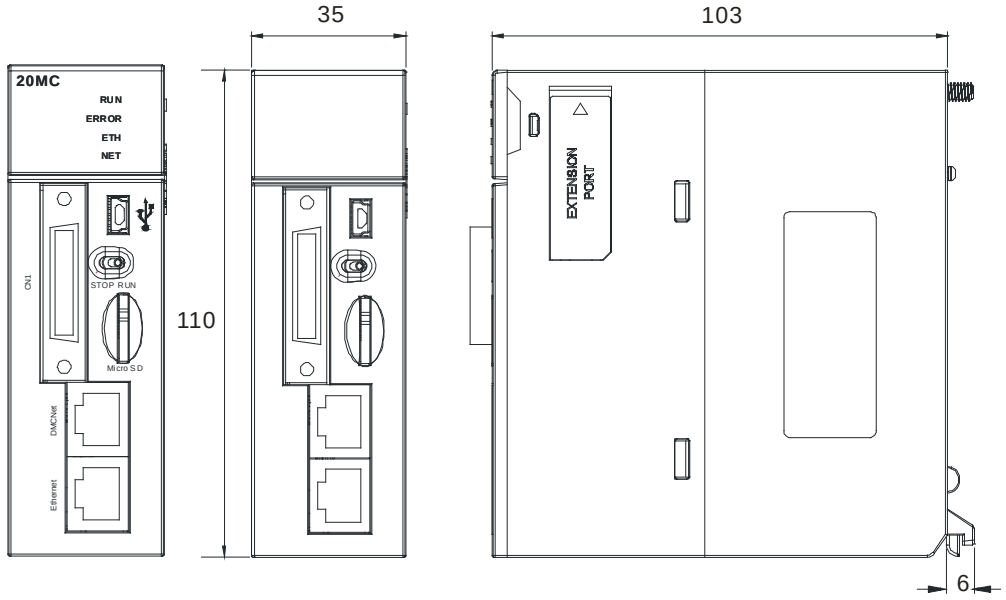
Dimensions are in mm.

- **AH20MC-5A**



Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
3	ERROR LED indicator (red)	Error status of the module Blinking: The module is abnormal.
4	Ethernet connection LED indicator (green)	Status of the Ethernet connection ON: The Ethernet connection is being connected. OFF: The Ethernet connection is disconnected.
5	DMCNET connection LED indicator (green)	Status of the DMCNET connection ON: The DMCNET connection is being connected. OFF: The DMCNET connection is disconnected.
6	USB port	Providing the mini USB communication interface
7	RUN/STOP switch	RUN: The user program is executed. STOP: The execution of the user program stops.
8	SD slot	Providing the SD interface
9	Connector	Connecting the module and an I/O extension cable.
10	DMCNET port	Providing the DMCNET communication interface
11	Ethernet port	Providing the Ethernet communication interface
12	Extension port	For updating the firmware
13	Label	Nameplate
14	Set screw	Fixing the module
15	Connector	Connecting the module and a backplane
16	Projection	Fixing the module

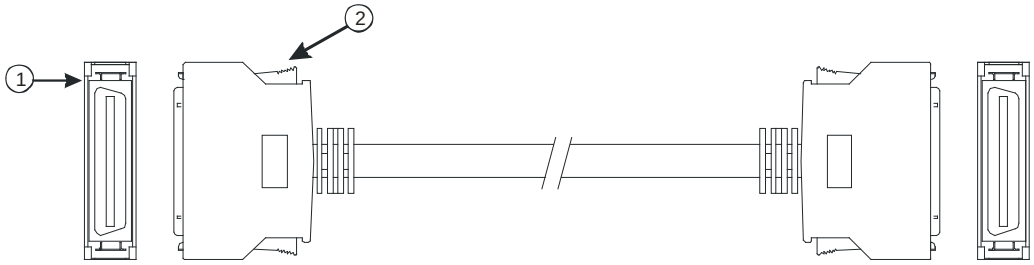
Dimensions:



Dimensions are in mm.

- **I/O extension cable and external terminal module**

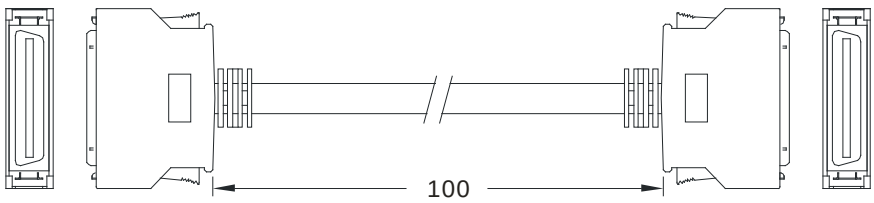
1. I/O extension cable UC-ET010-13B(DVPACAB7D10), UC-ET010-15B(DVPACAB7E10)



Number	Name	Description
1	Connector	Connecting a motion control module and an external terminal module UC-ET010-13B(DVPACAB7D10): 36-pin I/O extension cable for AH04HC-5A, AH20MC-5A and AHxxEMC-5A. UC-ET010-15B(DVPACAB7E10): 50-pin I/O extension cable for AH10PM-5A and AH15PM-5A.
2	Clip	Fixing the connector

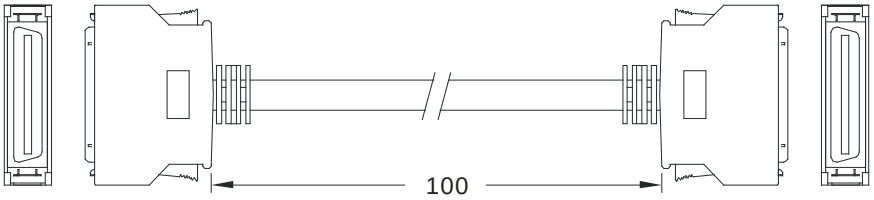
Dimensions:

UC-ET010-13B(DVPACAB7D10): 36-pin I/O extension cable for AH04HC-5A, AH20MC-5A and AHxxEMC-5A



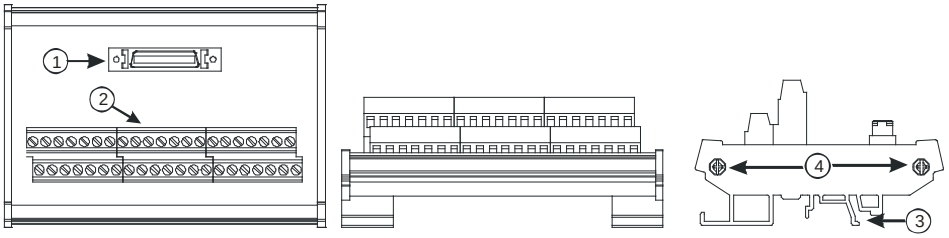
Dimensions are in cm.

UC-ET010-15B(DVPACAB7E10): 50-pin I/O extension cable for AH10PM-5A and AH15PM-5A



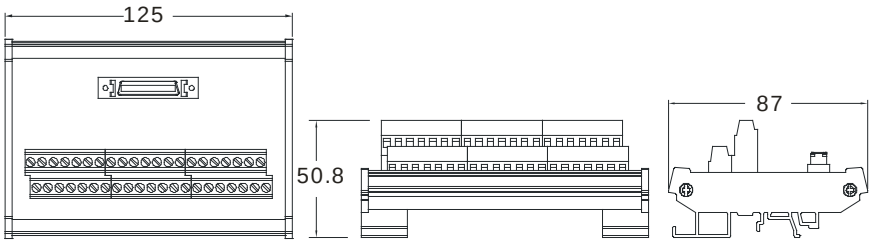
Dimensions are in cm.

2. External terminal module for AH04HC-5A and AH20MC-5A: UB-10-IO16C(DVPAETB-IO16C)



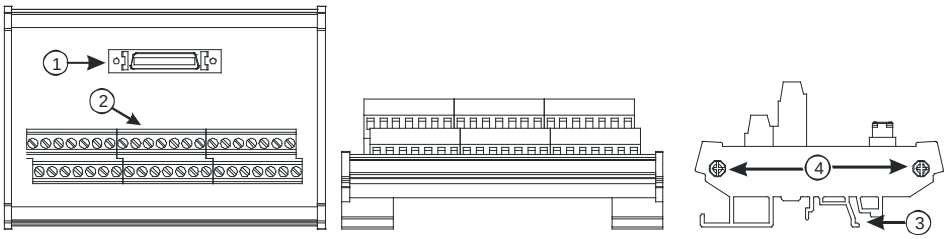
Number	Name	Description
1	Connector	Connecting the external terminal module and a motion control module
2	Terminals	Input/Output terminals for wiring
3	Clip	Hanging the external terminal module on a DIN rail
4	Set screw	Fixing the base

Dimensions:



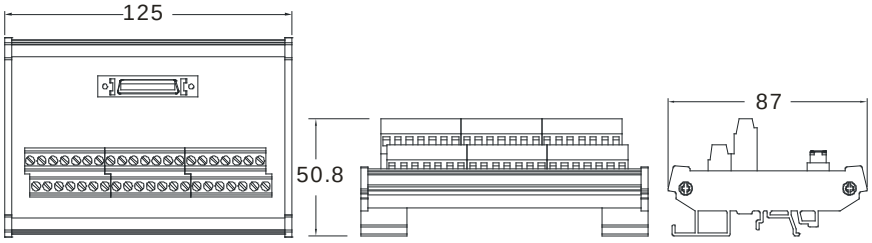
Dimensions are in mm.

3. External terminal module for AHxxEMC-5A: UB-10-IO22C(DVPAETB-IO22C)



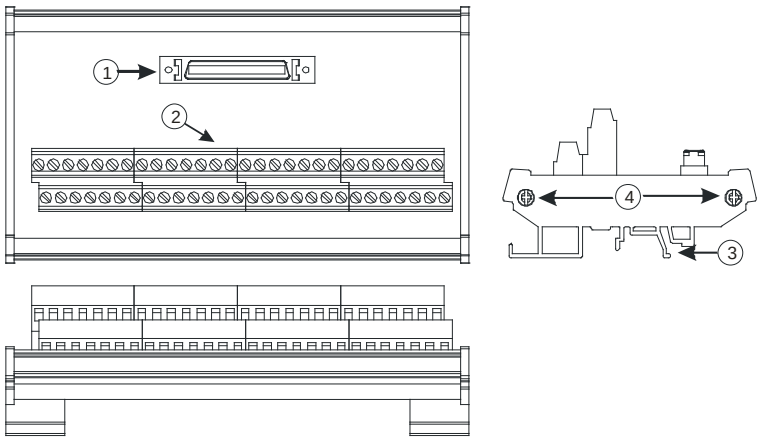
Number	Name	Description
1	Connector	Connecting the external terminal module and a motion control module
2	Terminals	Input/Output terminals for wiring
3	Clip	Hanging the external terminal module on a DIN rail
4	Set screw	Fixing the base

Dimensions:



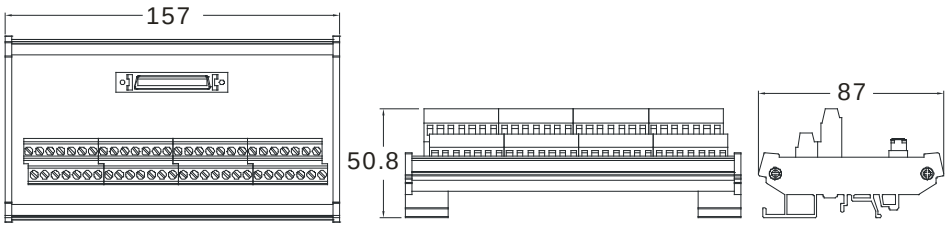
Dimensions are in mm.

4. External terminal module for AH10PM-5A: UB-10-IO24C(DVPAETB-IO24C)



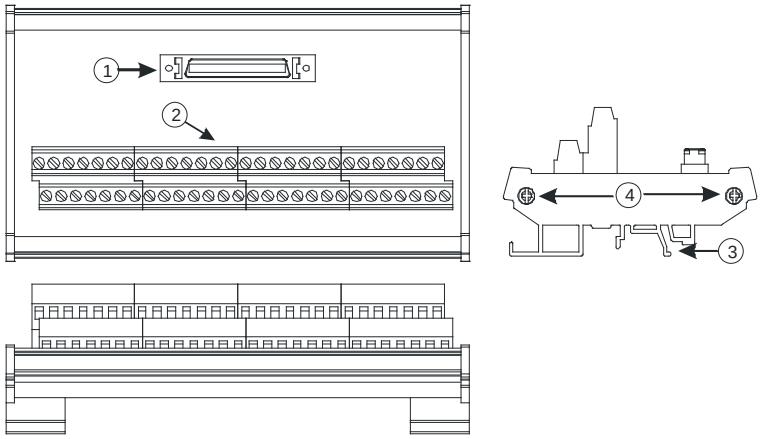
Number	Name	Description
1	Connector	Connecting the external terminal module and a motion control module
2	Terminals	Input/Output terminals for wiring
3	Clip	Hanging the external terminal module on a DIN rail
4	Set screw	Fixing the base

Dimensions:



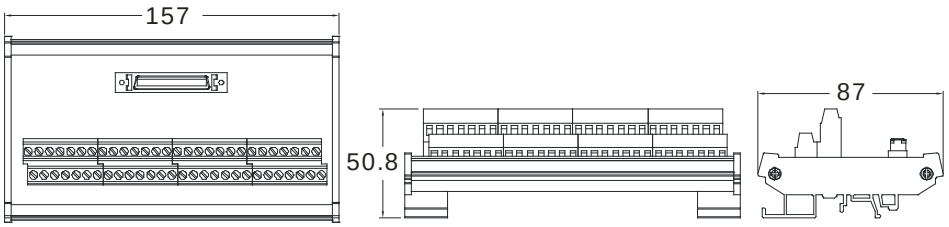
Dimensions are in mm.

5. External terminal module for AH15PM-5A: UB-10-IO34C(DVPAETB-IO34C)



Number	Name	Description
1	Connector	Connecting the external terminal module and a motion control module
2	Terminals	Input/Output terminals for wiring
3	Clip	Hanging the external terminal module on a DIN rail
4	Set screw	Fixing the base

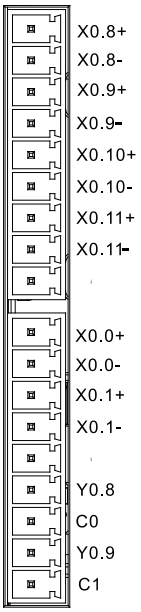
Dimensions:



Dimensions are in mm

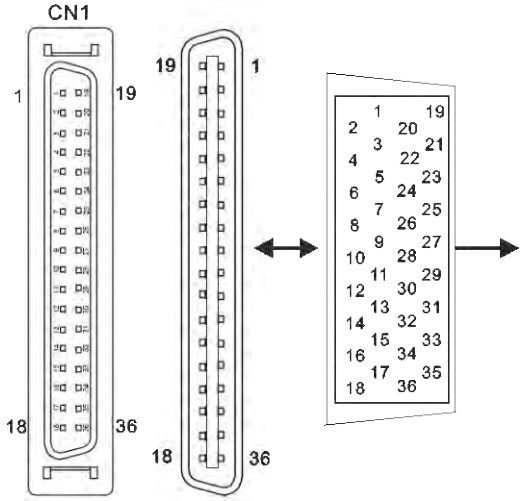
3.5.3 Arrangement of Input/Output Terminals

- **AH02HC-5A**



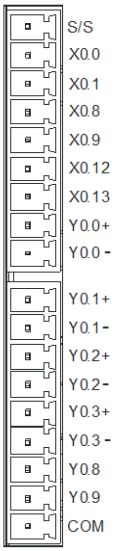
Terminal	Function Count	Terminal	Function Count
X0.8+	CntA0+	X0.0+	Rst0+
X0.8-	CntA0-	X0.0-	Rst0-
X0.9+	CntB0+	X0.1+	Rst1+
X0.9-	CntB0-	X0.1-	Rst1-
X0.10+	CntA1+	Y0.8	Out0
X0.10-	CntA1-	C0	COM0
X0.11+	CntB1+	Y0.9	Out1
X0.11-	CntB1-	C1	COM1

- **AH04HC-5A**



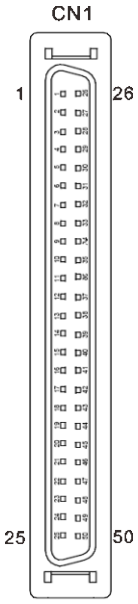
Pin	Terminal	Function Count	Pin	Terminal	Function Count
1	C3	COM3	19	Y0.11	Out3
2	C2	COM2	20	Y0.10	Out2
3	C1	COM1	21	Y0.9	Out1
4	C0	COM0	22	Y0.8	Out0
5	-	-	23	-	-
6	-	-	24	-	-
7	X0.3-	Rst3-	25	X0.3+	Rst3+
8	X0.15-	CntB3-	26	X0.15+	CntB3+
9	X0.14-	CntA3-	27	X0.14+	CntA3+
10	X0.2-	Rst2-	28	X0.2+	Rst2+
11	X0.13-	CntB2-	29	X0.13+	CntB2+
12	X0.12-	CntA2-	30	X0.12+	CntA2+
13	X0.1-	Rst1-	31	X0.1+	Rst1+
14	X0.11-	CntB1-	32	X0.11+	CntB1+
15	X0.10-	CntA1-	33	X0.10+	CntA1+
16	X0.0-	Rst0-	34	X0.0+	Rst0+
17	X0.9-	CntB0-	35	X0.9+	CntB0+
18	X0.8-	CntA0-	36	X0.8+	CntA0+

- **AH05PM-5A**



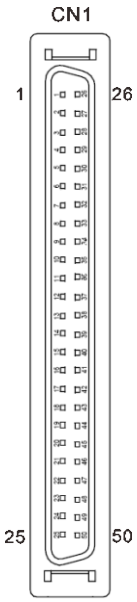
Terminal	Function Pulse	Function Count	Terminal	Function Pulse	Function Count
S/S	S/S	S/S	Y0.1+	B0+	-
X0.0	PG0	Rst0	Y0.1-	B0-	-
X0.1	PG1	-	Y0.2+	A1+	-
X0.8	MPGA	CntA0	Y0.2-	A1-	-
X0.9	MPGB	CntB0	Y0.3+	B1+	-
X0.12	DOG0	-	Y0.3-	B1-	-
X0.13	DOG1	-	Y0.8	CLR0	-
Y0.0+	A0+	-	Y0.9	CLR1	-
Y0.0-	A0-	-	COM	-	-

- **AH10PM-5A**



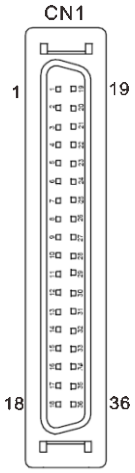
Pin	Terminal	Function		Pin	Terminal	Function	
		Pulse	Count			Pulse	Count
1	C3	COM3	-	26	Y0.11	CLR3/B5	-
2	C2	COM2	-	27	Y0.10	CLR2/A5	-
3	C1	COM1	-	28	Y0.9	CLR1/B4	-
4	C0	COM0	-	29	Y0.8	CLR0/A4	-
5	NC	-	. -	30	NC	-	-
6	Y0.7-	B3-	-	31	Y0.7+	B3+	-
7	Y0.6-	A3-	-	32	Y0.6+	A3+	-
8	Y0.5-	B2-	-	33	Y0.5+	B2+	-
9	Y0.4-	A2-	-	34	Y0.4+	A2+	-
10	Y0.3-	B1-	-	35	Y0.3+	B1+	-
11	Y0.2-	A1-	-	36	Y0.2+	A1+	-
12	Y0.1-	B0-/CLR5-	-	37	Y0.1+	B0+/CLR5+	-
13	Y0.0-	A0-/CLR4-	-	38	Y0.0+	A0+/CLR4+	-
14	NC	-	-	39	NC	-	-
15	NC	-	-	40	S/S	S/S	S/S
16	X0.15	DOG3	CntB3/CntB5	41	X0.14	DOG2	CntB3/CntA5
17	X0.13	DOG1	CntB2/CntB4	42	X0.12	DOG0	CntA2/CntA4
18	X0.11	DOG5	CntB1	43	X0.10	DOG4	CntA1
19	X0.9	MPGB	CntB0	44	X0.8	MPGA	CntA0
20	NC	-	-	45	NC	-	-
21	NC	-	-	46	NC	-	-
22	X0.3-	Pg3-	Rst3-/Rst5-	47	X0.3+	Pg3+	Rst3+/Rst5+
23	X0.2-	Pg2-	Rst2-/Rst4-	48	X0.2+	Pg2+	Rst2+/Rst4+
24	X0.1-	Pg1-	Rst1-	49	X0.1+	Pg1+	Rst1+
25	X0.0-	Pg0-	Rst0-	50	X0.0+	Pg0+	Rst0+

- **AH15PM-5A**



Pin	Terminal	Function		Pin	Terminal	Function	
		Pulse	Count			Pulse	Count
1	Y0.11	CLR3	-	26	Y0.10	CLR2	-
2	Y0.9	CLR1	-	27	Y0.8	CLR0	
3	COM	COM	-	28	Y0.7+	B3+	-
4	Y0.7-	B3-	-	29	Y0.6+	A3+	-
5	Y0.6-	A3-	. -	30	Y0.5+	B2+	-
6	Y0.5-	B2-	-	31	Y0.4+	A2+	-
7	Y0.4-	A2-	-	32	Y0.3+	B1+	-
8	Y0.3-	B1-	-	33	Y0.2+	A1+	-
9	Y0.2-	A1-	-	34	Y0.1+	B0+	-
10	Y0.1-	B0-	-	35	Y0.0+	A0+	-
11	Y0.0-	A0-	-	36	S/S	S/S	S/S
12	X1.5	CHG3	-	37	X1.4	CHG2	-
13	X1.3	CHG1	-	38	X1.2	CHG0	-
14	X1.1	LSN3	-	39	X1.0	LSP3	-
15	X0.15	LSN2	CntB3/CntB5	40	X0.14	LSP2	CntB3/CntA5
16	X0.13	LSN1	CntB2/CntB4	41	X0.12	LSP1	CntA2/CntA4
17	X0.11	LSN0	CntB1	42	X0.10	LSP0	CntA1
18	X0.9-	MPGB-	CntB0-	43	X0.9+	MPGB+	CntB0+
19	X0.8-	MPGA-	CntA0-	44	X0.8+	MPGA+	CntA0+
20	X0.7	DOG3	-	45	X0.6	DOG2	-
21	X0.5	DOG1	-	46	X0.4	DOG0	-
22	X0.3-	Pg3-	Rst3-/Rst5-	47	X0.3+	Pg3+	Rst3+/Rst5+
23	X0.2-	Pg2-	Rst2-/ Rst4-	48	X0.2+	Pg2+	Rst2+/Rst4+
24	X0.1-	Pg1-	Rst1-	49	X0.1+	Pg1+	Rst1+
25	X0.0-	Pg0-	Rst0-	50	X0.0+	Pg0+	Rst0+

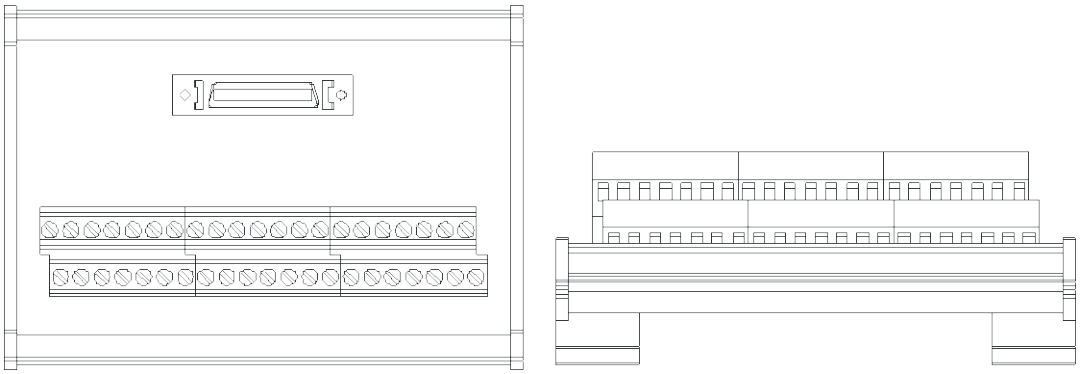
- **AH20MC-5A**



Pin	Terminal	Function		Pin	Terminal	Function	
		Pulse	Count			Pulse	Count
1	C3	-	COM3	19	Y0.11	-	Out3
2	C2	-	COM2	20	Y0.10	-	Out2
3	C1	-	COM1	21	Y0.9	-	Out1
4	C0	-	COM0	22	Y0.8	-	Out0
5	NC	-	-	23	NC	-	-
6	NC	-	-	24	NC	-	-
7	X0.3-	-	Rst3-/Rst5-	25	X0.3+	-	Rst3+/Rst5+
8	X0.15-	DOG3-	CntB3-/CntB5+	26	X0.15+	DOG3+	CntB3+/CntB5+
9	X0.14-	DOG2-	CntA3-/CntA5+	27	X0.14+	DOG2+	CntA3+/CntA5+
10	X0.2-	-	Rst2-/Rst4-	28	X0.2+	-	Rst2+/Rst4+
11	X0.13-	DOG1-	CntB2-/CntB4-	29	X0.13+	DOG1+	CntB2+/CntB4+
12	X0.12-	DOG0-	CntA2-/CntA4-	30	X0.12+	DOG0+	CntA2+/CntA4+
13	X0.1-	-	Rst1-	31	X0.1+	-	Rst1+
14	X0.11-	DOG5-	CntB1-	32	X0.11+	DOG5+	CntB1+
15	X0.10-	DOG4-	CntA1-	33	X0.10+	DOG4+	CntA1+
16	X0.0-	-	Rst0-	34	X0.0+	-	Rst0+
17	X0.9-	MPGB-	CntB0-	35	X0.9+	MPGB+	CntB0+
18	X0.8-	MPGA-	CntA0-	36	X0.8+	MPGA+	CntA0+

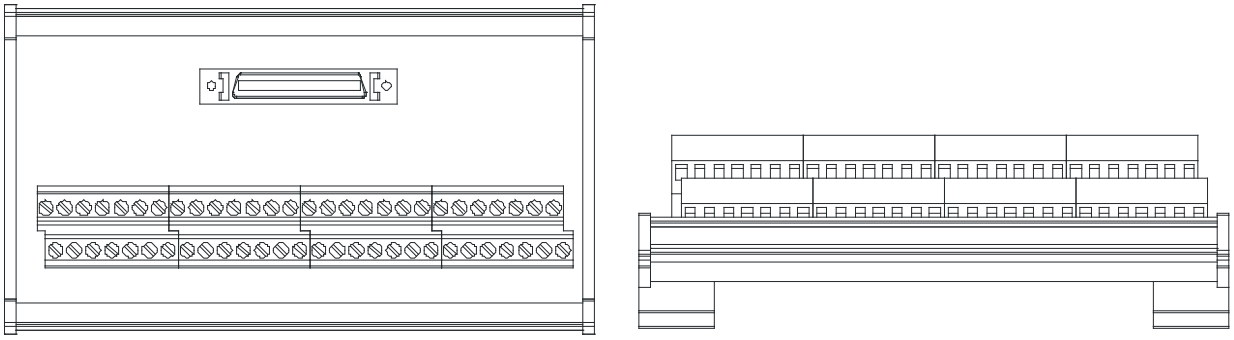
- **External terminal module**

1. External terminal module for AH04HC-5A: UB-10-IO16C(DVPAETB-IO16C)



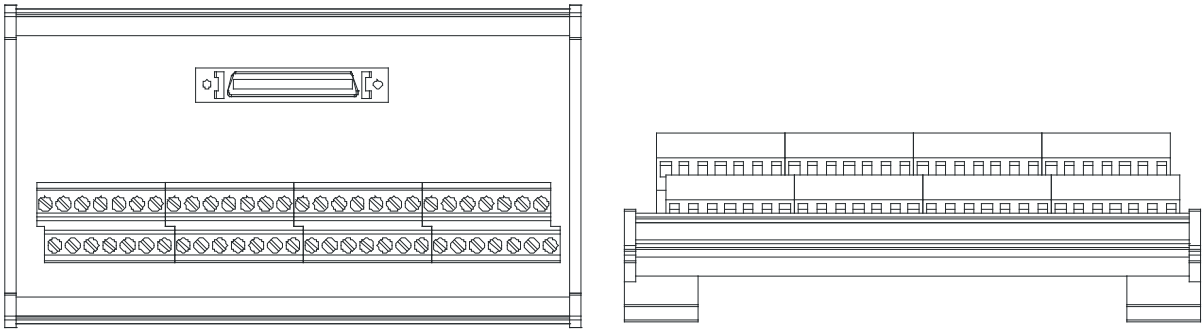
C3	C2	C1	C0	N/C	N/C	X0.3-	X0.15-	X0.14-	X0.2-	X0.13-	X0.12-	X0.1-	X0.11-	X0.10-	X0.0-	X0.9-	X0.8-	24G	24G	FE
Y0.11	Y0.10	Y0.9	Y0.8	N/C	N/C	X0.3+	X0.15+	X0.14+	X0.2+	X0.13+	X0.12+	X0.1+	X0.11+	X0.10+	X0.0+	X0.9+	X0.8+	N/C	24V	24V

2. External terminal module for AH10PM-5A: UB-10-IO22C(DVPAETB-IO24C)



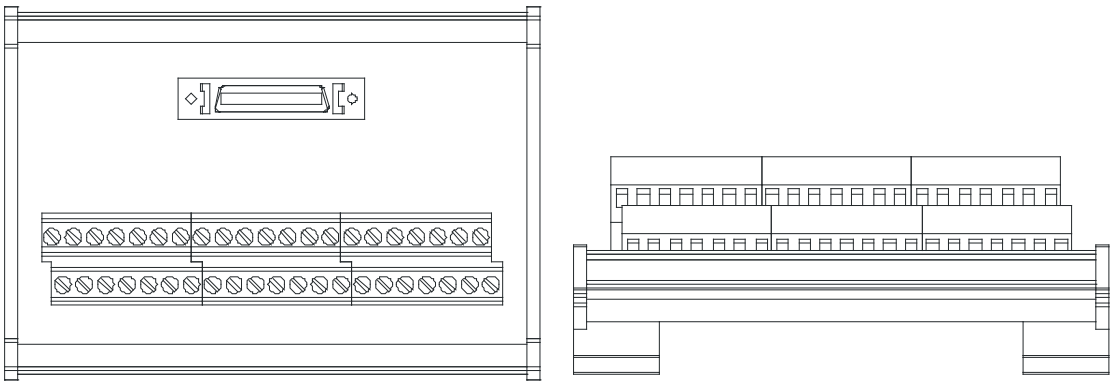
1st from the upper left	C3	C2	C1	C0	N/C	Y0.7-	Y0.6-	Y0.5-	Y0.4-	Y0.3-	Y0.2-	Y0.1-	Y0.0-	N/C
15th from the upper left	N/C	X0.15	X0.13	X0.11	X0.9	N/C	N/C	X0.3-	X0.2-	X0.1-	X0.0-	24G	24G	FE
1st from the lower left	Y0.11	Y0.10	Y0.9	Y0.8	N/C	Y0.7+	Y0.6+	Y0.5+	Y0.4+	Y0.3+	Y0.2+	Y0.1+	Y0.0+	N/C
15th from the lower left	S/S	X0.14	X0.12	X0.10	X0.8	N/C	N/C	X0.3+	X0.2+	X0.1+	X0.0+	N/C	24V	24V

3. External terminal module for AH15PM-5A: UB-10-IO24C(DVPAETB-IO34C)



1st from the upper left	Y0.11	Y0.9	COM	Y0.7-	Y0.6-	Y0.5-	Y0.4-	Y0.3-	Y0.2-	Y0.1-	Y0.0-	X1.5	X1.3	X1.1
15th from the upper left	X0.15	X0.13	X0.11	X0.9-	X0.8-	X0.7	X0.5	X0.3-	X0.2-	X0.1-	X0.0-	24G	24G	FE
1st from the lower left	Y0.10	Y0.8	Y0.7+	Y0.6+	Y0.5+	Y0.4+	Y0.3+	Y0.2+	Y0.1+	Y0.0+	S/S	X1.4	X1.2	X1.0
15th from the lower left	X0.14	X0.12	X0.10	X0.9+	X0.8+	X0.6	X0.4	X0.3+	X0.2+	X0.1+	X0.0+	N/C	24V	24V

4. External terminal module for AHxxEMC-5A: UB-10-IO34C(DVPAETB-IO22C)



COM	COM	COM	COM	S/S	X1.5	S/S	X1.4	S/S	X0.3	S/S	X0.2	X0.1-	X0.11-	X0.10-	X0.0-	X0.9-	X0.8-	24G	24G	FE
Y0.11	Y0.10	Y0.9	Y0.8	X1.3	X1.2	X1.1	X1.0	X0.15	X0.14	X0.13	X0.12	X0.1+	X0.11+	X0.10+	X0.0+	X0.9+	X0.8+	N/C	24V	24V

3.6 Digital Input/Output Modules

3.6.1 General Specifications

- **Digital input specifications: 24 VDC**

Specifications \ Model		AH16AM 10N-5A	AH32AM 10N-5A	AH32AM 10N-5B	AH32AM 10N-5C	AH64AM 10N-5C	AH16AP 11R-5A	AH16AP 11T-5A	AH16AP 11P-5A
Number of inputs		16	32	32	32	64	8	8	8
Connector type		Removable terminal block		DB37 connector	MIL connector		Removable terminal block		
Input type		Digital input							
Input form		Direct current (sinking or sourcing)							
Input current		24 VDC 5 mA				24 VDC 3.2 mA	24 VDC 5 mA		
Action level	**OFF→ON**	>15 VDC							
	ON→OFF	<5 VDC							
Response time	**OFF→ON**	10 ms±10%							
	ON→OFF	15 ms±10%							
Max. input frequency		50 Hz							
Input impedance		4.7 kΩ				7.5 kΩ	4.7 kΩ		
Input signal		Voltage input Sinking: The inputs are NPN transistors whose collectors are open collectors. Sourcing: The inputs are PNP transistors whose collectors are open collectors.							
Electrical isolation		Optocoupler							
Input display		When the optocoupler is driven, the input LED indicator is ON.							

- **Digital input specifications: 120 ~ 240 VAC**

Specifications \ Model		AH16AM30N-5A
Number of inputs		16
Connector type		Removable terminal block
Input type		Digital input
Input form		Alternating current
Input current		120 VAC and 4.5 mA; 240 VAC and 9 mA
Action level	**OFF→ON**	>79 VAC
	ON→OFF	<40 VAC
Response time	**OFF→ON**	15 ms
	ON→OFF	30 ms
Electrical isolation		Optocoupler
Input display		When the optocoupler is driven, the input LED indicator is ON.

- **Digital output specifications**

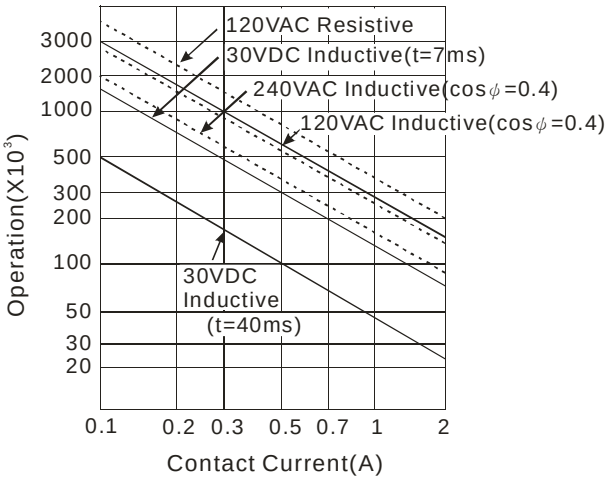
Specifications \ Model		AH16AN 01R-5A	AH16AP 11R-5A	AH16AN 01T-5A	AH16AP 11T-5A	AH16AN 01P-5A	AH16AP 11P-5A	AH16AN 01S-5A
Number of outputs		16	8	16	8	16	8	16
Connector type		Removable terminal block						
Output type		Realy-R		Transistor-T (sinking)		Transistor-P (sourcing)		TRIAC-S
Voltage specifications		250 VAC, and below 30 VDC		12~30 VDC[*2]		12~30 VDC[*2]		120/240 VAC
Max. load	**Resistance**	2 A/output (5 A/COM)		0.5 A/output (4 A/COM)		0.5 A/output (4 A/COM)		0.5 A/output (2 A/COM)
	Inductance	Life cycle curve[*3]		12 W (24 VDC)		12 W (24 VDC)		Not applicable
	Bulb	20 W (24 VDC) 100 W (230 VAC)		2 W (24 VDC)		2 W (24 VDC)		60 WAC
Max. output frequency[*1]	**Resistance**	1 Hz		100 Hz		100 Hz		10 Hz
	Inductance	0.5 Hz		0.5 Hz		0.5 Hz		-
	Bulb	1 Hz		10 Hz		10 Hz		10 Hz
Max. Response time	**OFF→ON**	10 ms		0.5 ms		0.5 ms		1 ms+0.5 AC cycles
	ON→OFF							

Specifications \ Model		AH32AN 02T-5A	AH32AN 02P-5A	AH32AN 02T-5B	AH32AN 02P-5B	AH32AN 02T-5C	AH32AN 02P-5C	AH64AN 02T-5C	AH64AN 02P-5C
Number of outputs		32	32	32	32	32	32	64	64
Connector type		Removable terminal block		DB37 connector		MIL connector			
Output type		Transistor–T (sinking) Transistor-P (sourcing)							
Voltage specifications		12~30 VDC*2							
Max. load	**Resistance**	0.1 A/output (1 A/COM)							
	Inductance	Not applicable							
	Bulb	Not applicable							
Max. output frequency*1	**Resistance**	100 Hz							
	Inductance	-							
	Bulb	-							
Max. Response time	**OFF→ON**	0.5 ms							
	ON→OFF								

*1: The scan cycle affects the frequency.

*2: The terminals UP and ZP needs to be connected to the 24 VDC auxiliary power supply (-15%~+20%), and the rated current consumption is 1 mA/output.

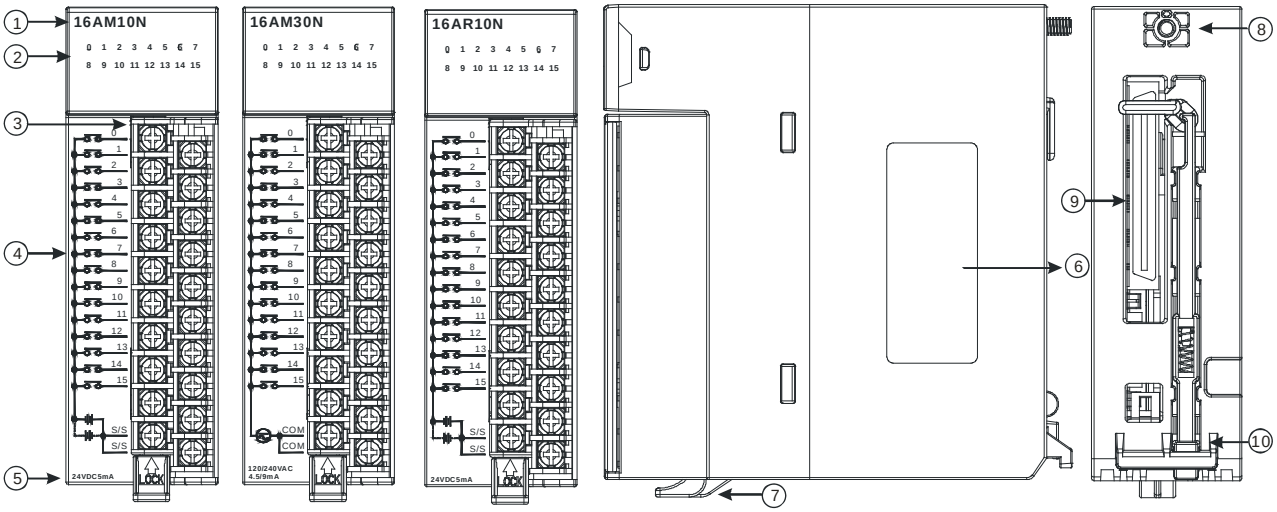
*3: The life cycle curve is as follows.

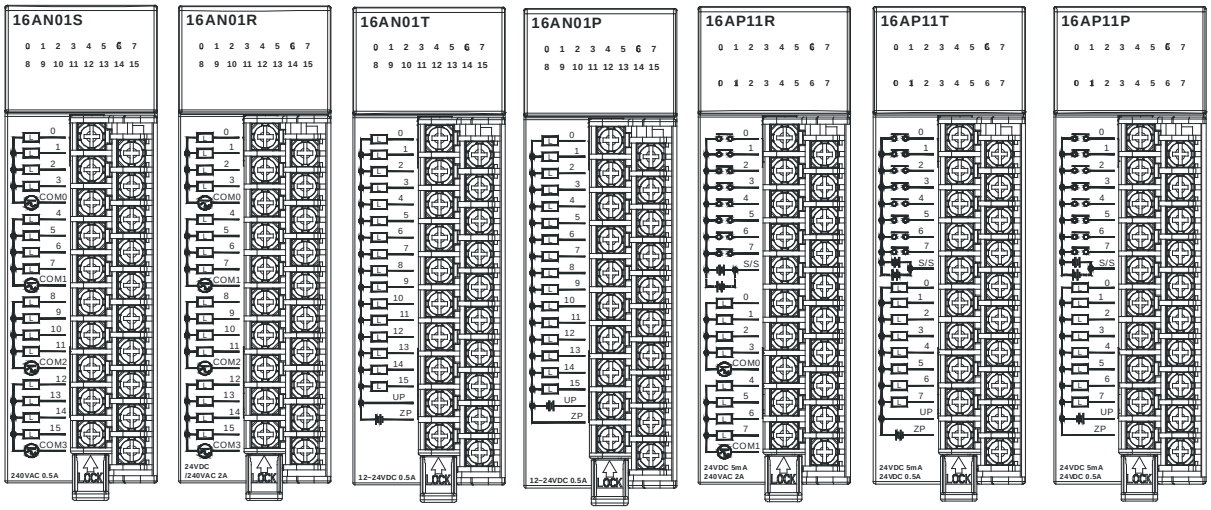


3.6.2 Profile and Dimensions

- **Digital I/O module, 16 DI/DO, JIS removable terminal block**

AH16AM10N-5A, AH16AM30N-5A, AH16AR10N-5A(not supported), AH16AN01S-5A, AH16AN01R-5A, AH16AN01T-5A, AH16AN01P-5A, AH16AP11R-5A, AH16AP11T-5A, AH16AP11P-5A

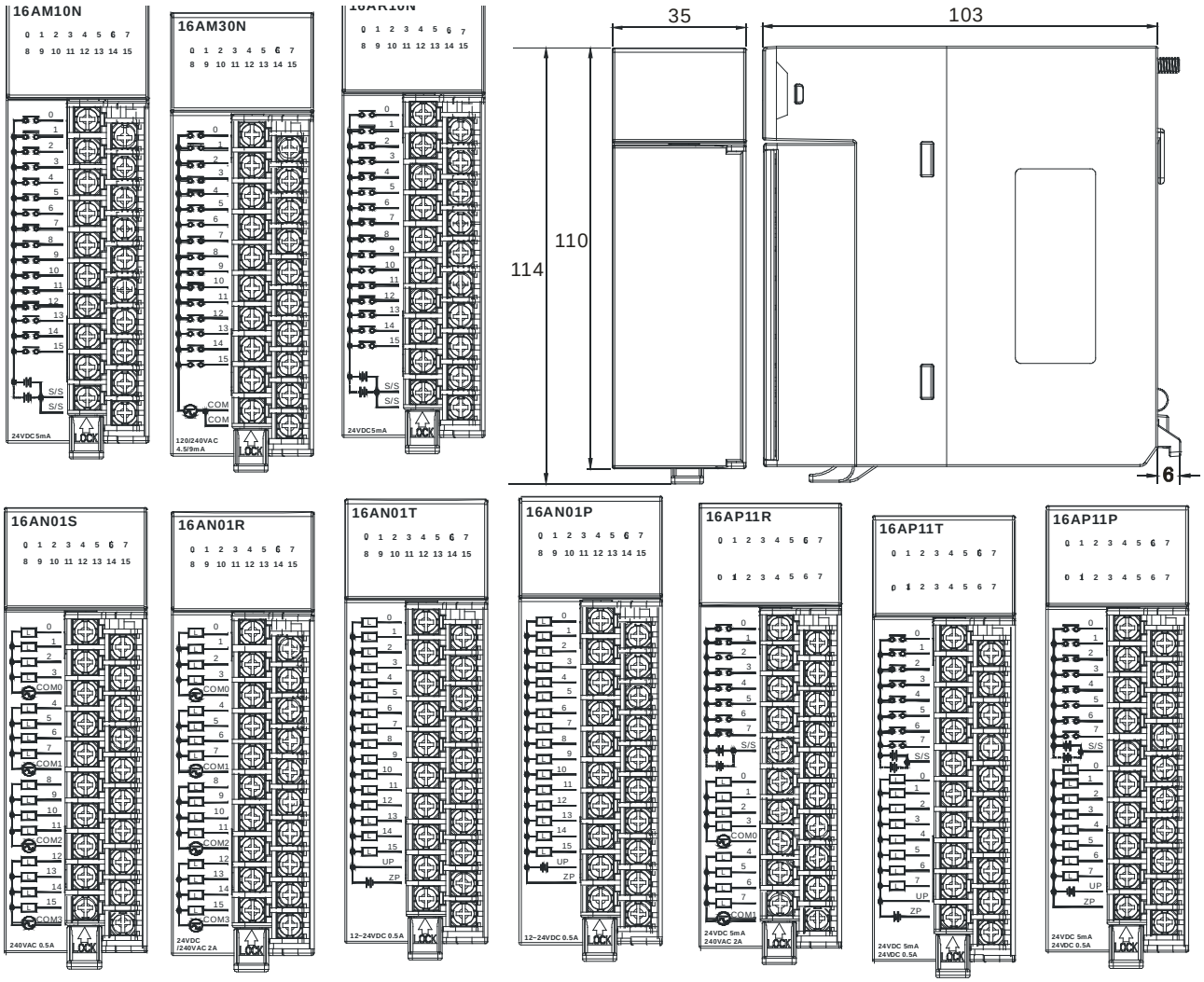




Number	Name	Description
1	Model name	Model name of the module
2	Input/Output LED indicator	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.
3	Removable terminal block	The inputs are connected to a switch or a sensor. The outputs are connected to a load which will be driven, e.g. a contact, or a solenoid valve.
4	Arrangement of the input/output terminals	Arrangement of the terminals
5	Description of the inputs/outputs	Number of inputs/outputs and specifications
6	Label	Nameplate

Number	Name	Description
7	Clip	Fixing the removable terminal block
8	Set screw	Fixing the module
9	Connector	Connecting the module and a backplane
10	Projection	Fixing the module

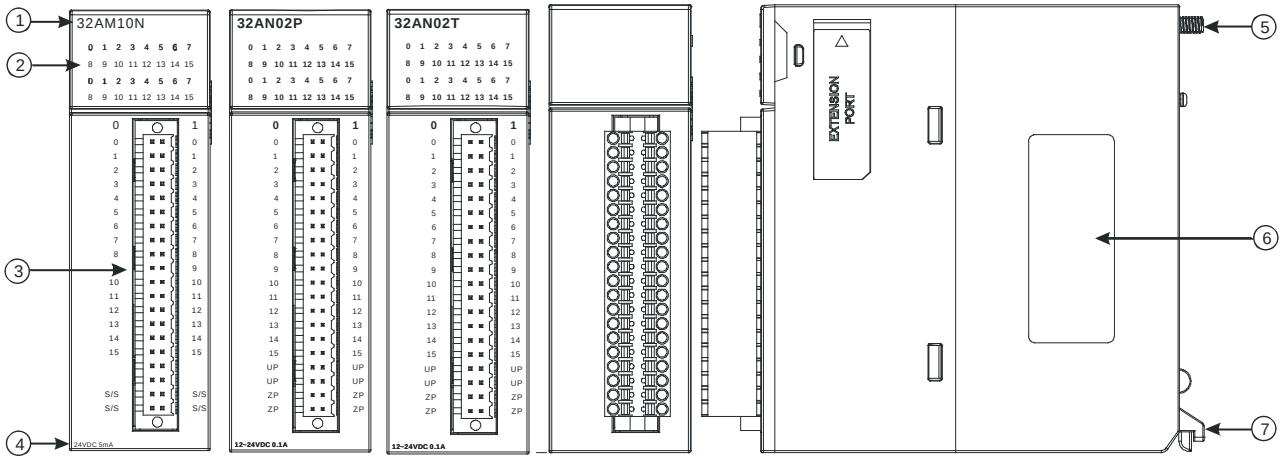
Dimensions:



Dimensions are in mm.

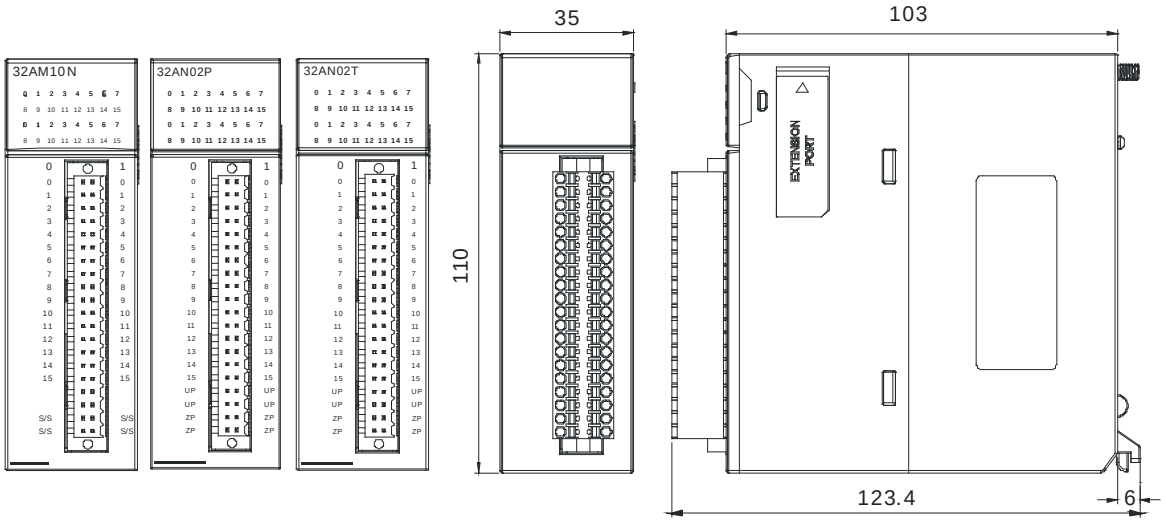
- **Digital I/O module, 32 DI/DO, EU removable terminal block**

  AH32AM10N-5A, AH32AN02P-5A, AH32AN02T-5A



Number	Name	Description
1	Model name	Model name of the module
2	Input/Output LED indicator	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.
3	Removable terminal block	The inputs are connected to a switch or a sensor. The outputs are connected to a load which will be driven, e.g. a contact, or a solenoid valve.
4	Description of the inputs/outputs	Number of inputs/outputs and specifications
5	Set screw	Fixing the module
6	Label	Nameplate
7	Projection	Fixing the module

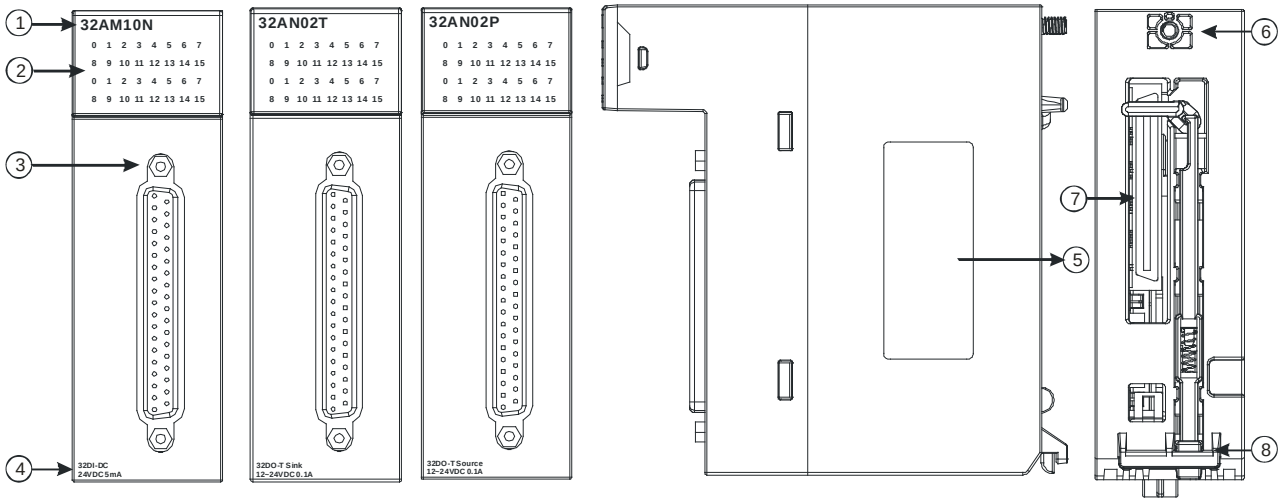
Dimensions:



Dimensions are in mm.

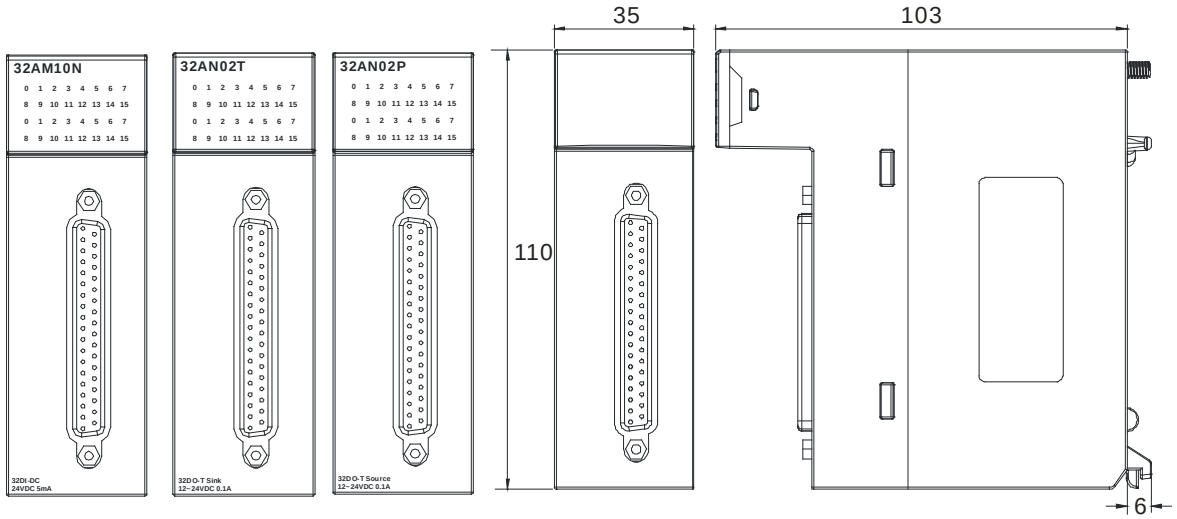
- **Digital I/O module, 32 DI/DO, DB37**

  AH32AM10N-5B, AH32AN02T-5B, AH32AN02P-5B



Number	Name	Description
1	Model name	Model name of the module
2	Input/Output LED indicator	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.
3	DB37 connector	It is connected to the I/O extension cable UC-ET010-33B (DVPACAB7C10).
4	Description of the inputs/outputs	Number of inputs/outputs and specifications
5	Label	Nameplate
6	Set screw	Fixing the module
7	Connector	Connecting the module and a backplane
8	Projection	Fixing the module

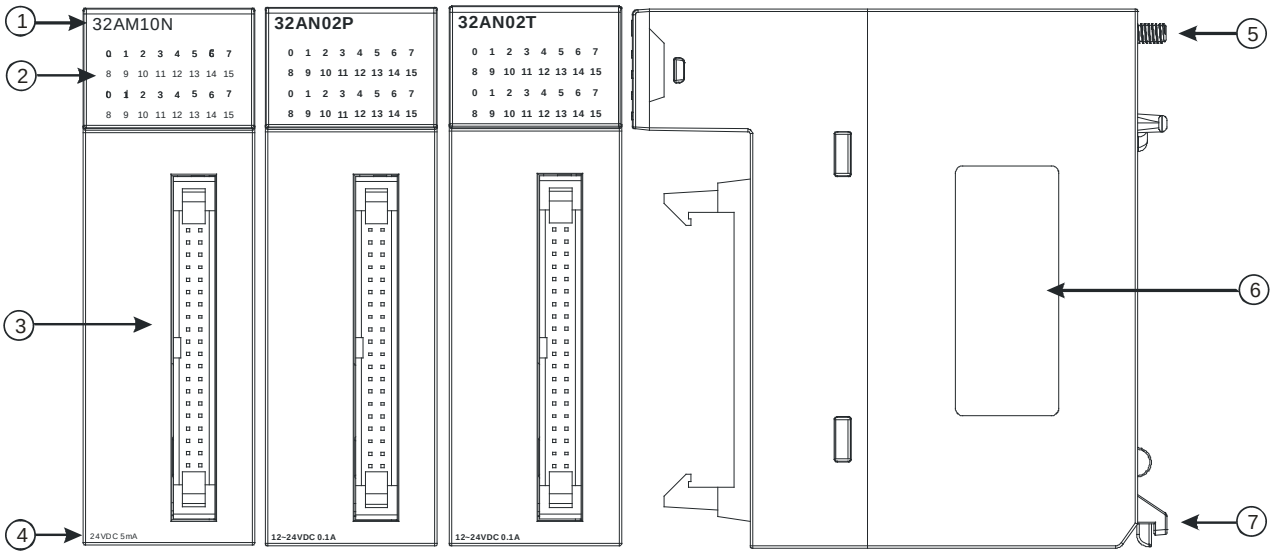
Dimensions:



Dimensions are in mm.

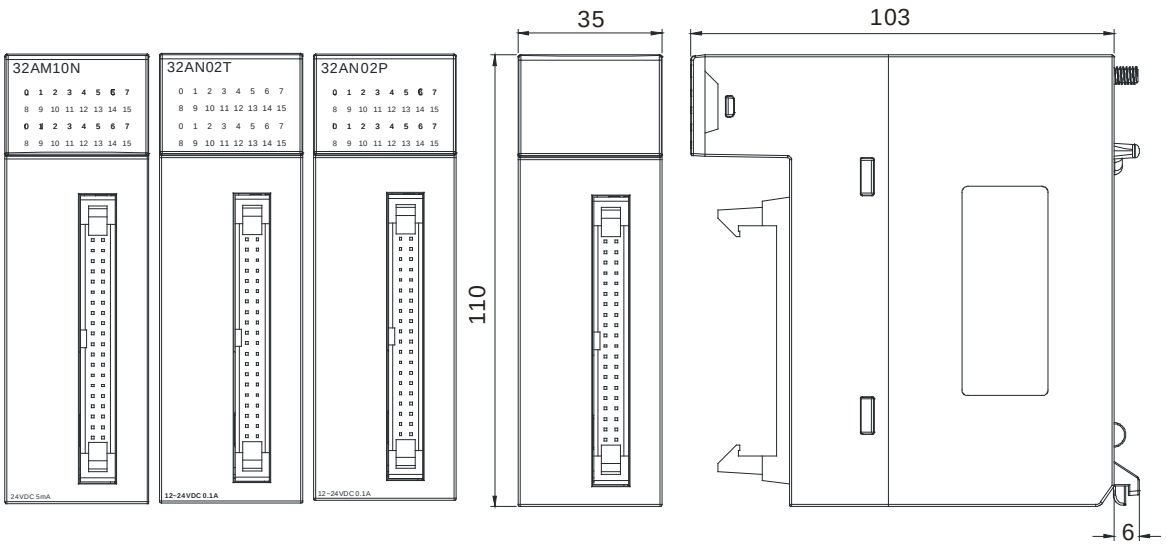
- **Digital I/O module, 32 DI/DO, MIL connector**

  AH32AM10N-5C, AH32AN02T-5C, AH32AN02P-5C



Number	Name	Description
1	Model name	Model name of the module
2	Input/Output LED indicator	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.
3	MIL connector	It is connected to the I/O extension cable UC-ET010-24A (DVPACAB7A10) / UC-ET010-24C(DVPACAB7B10).
4	Description of the inputs/outputs	Number of inputs/outputs and specifications
5	Set screw	Fixing the module
6	Label	Nameplate
7	Projection	Fixing the module

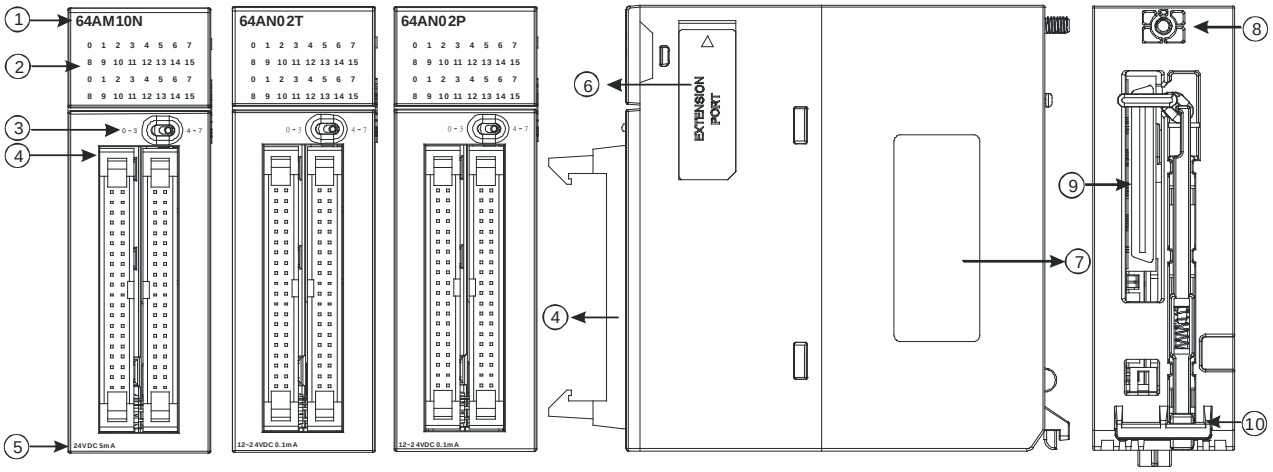
Dimensions:



Dimensions are in mm.

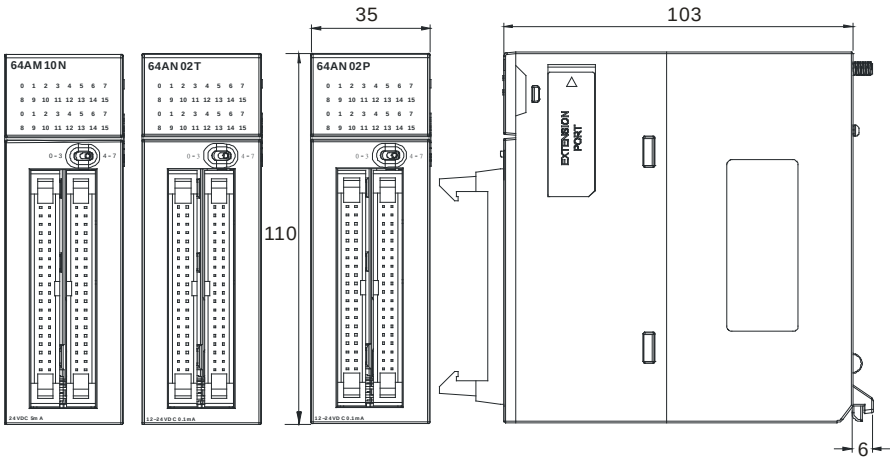
- **Digital I/O module, 64 DI/DO, MILconnector**

AH64AM10N-5C/AH64AN02T-5C/AH64AN02P-5C



Number	Name	Description
1	Model name	Model name of the module
2	Input/Output LED indicator	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.
3	LED indicator switch	Left: High 32 bits Right: Low 32 bits
4	MIL connector	It is connected to the I/O extension cable UC-ET010-24A(DVPACAB7A10) / UC-ET010-24C(DVPACAB7B10).
5	Description of the inputs/outputs	Number of inputs/outputs and specifications
6	Extension port	Updating the firmware
7	Label	Nameplate
8	Set screw	Fixing the module
9	Connector	It connects the module and a backplane.
10	Projection	Fixing the module

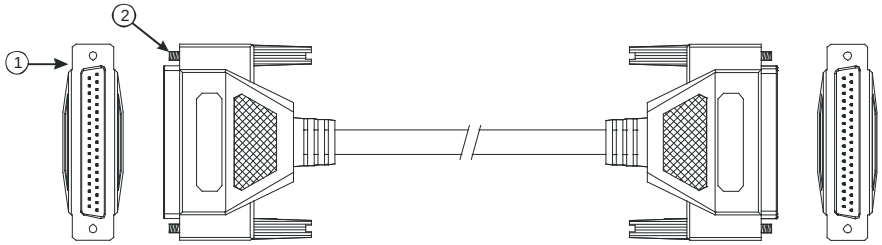
Dimensions:



Dimensions are in mm.

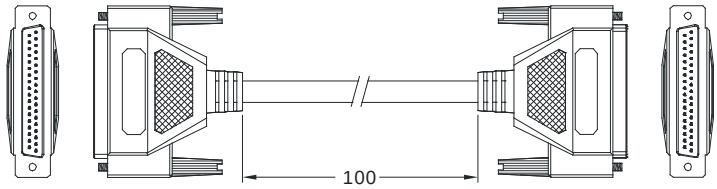
- **DB37 connector, I/O extension cable, and external terminal module**

  - **I/O extension cable: UC-ET010-33B (DVPACAB7C10)**



Number	Name	Description
1	DB37 connector	Connecting a digital input/output module and an external terminal module.
2	Set screw	Fixing the connector

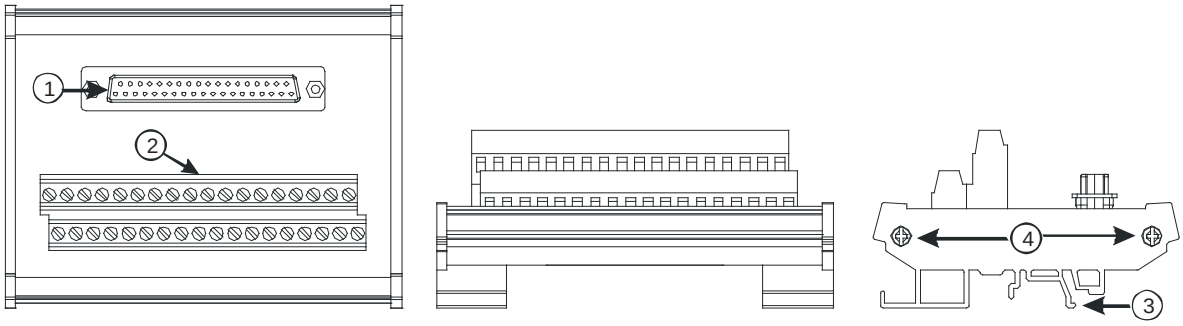
Dimensions:



Dimensions are in cm

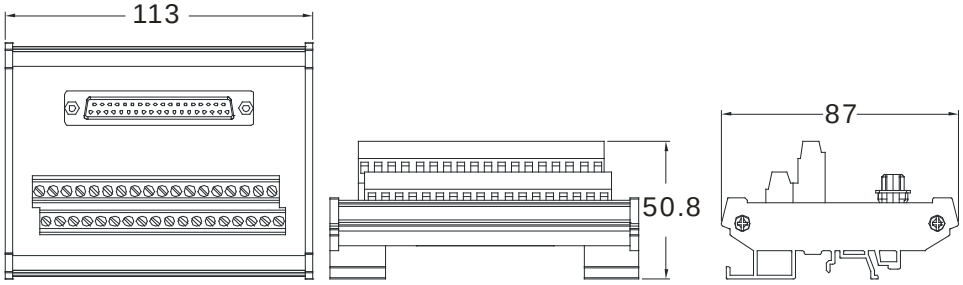
  - **External terminal module for AH32AM10N-5B:**

    - **UB-10-ID32B(DVPAETB-ID32B)**



Number	Name	Description
1	DB37 connector	Connecting the external terminal module and a digital input/output module
2	Terminals	Input/Output terminals for wiring
3	Clip	Hanging the external terminal module on a DIN rail
4	Set screw	Fixing the base

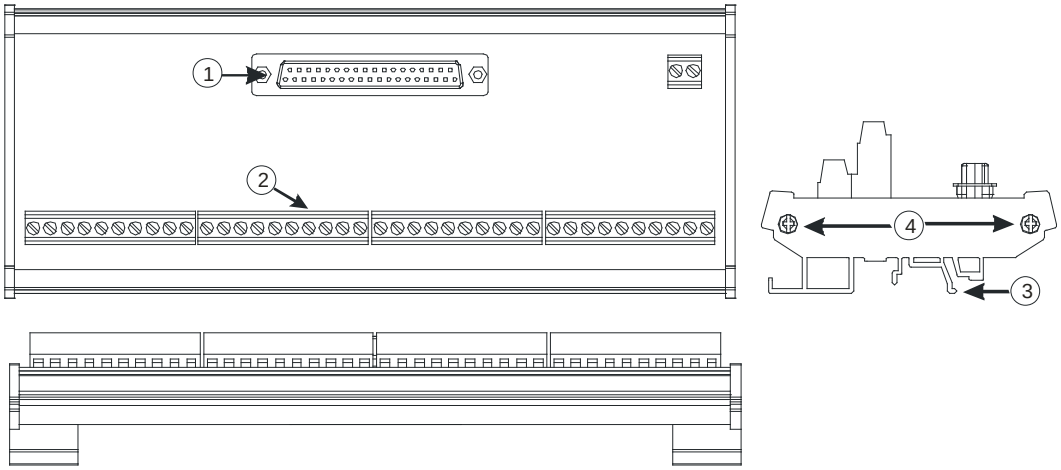
Dimensions:



Dimensions are in mm.

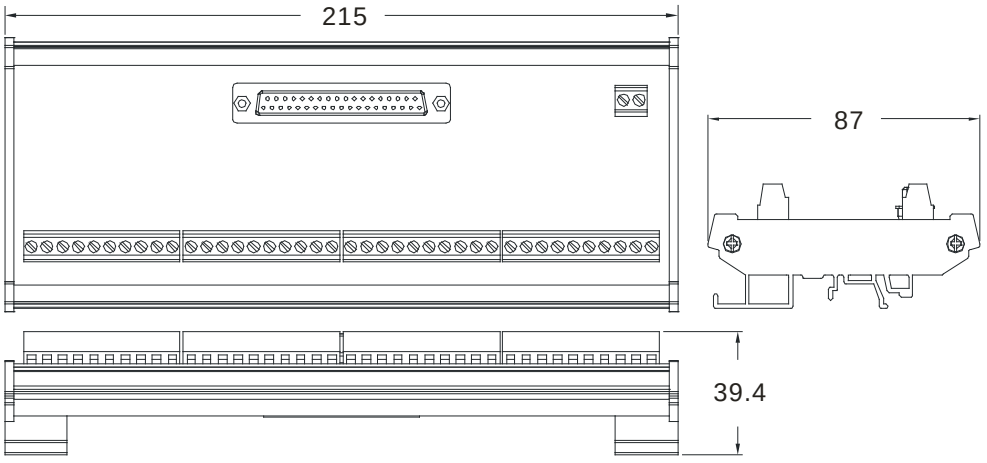
- **External terminal modules for AH32AN02T-5B:**

  ■ **UB-10-OR32A(DVPAETB-OR32A)**



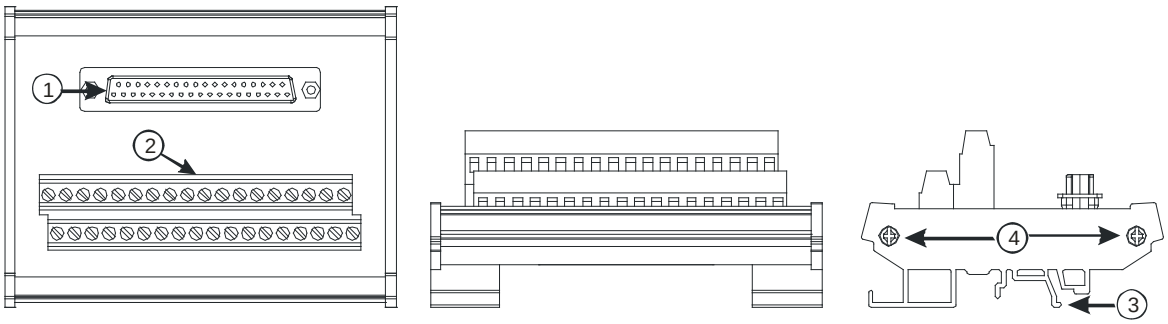
Number	Name	Description
1	DB37 connector	Connecting the external terminal module and a digital input/output module
2	Terminals	Input/Output terminals for wiring
3	Clip	Hanging the external terminal module on a DIN rail
4	Set screw	Fixing the base

Dimensions:



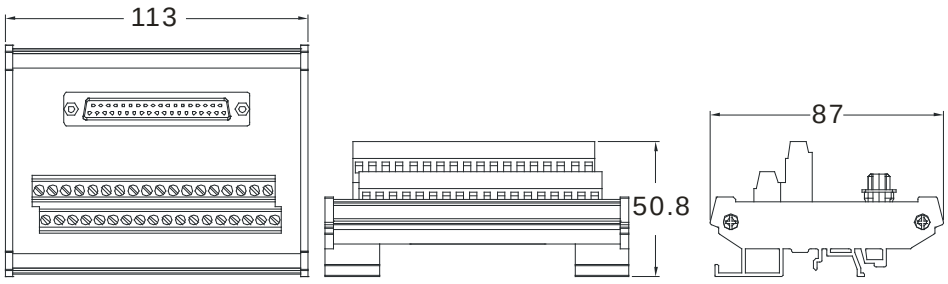
Dimensions are in mm.

■ **UB-10-OT32B(DVPAETB-OT32B)**



Number	Name	Description
1	DB37 connector	Connecting the external terminal module and a digital input/output module
2	Terminals	Input/Output terminals for wiring
3	Clip	Hanging the external terminal module on a DIN rail
4	Set screw	Fixing the base

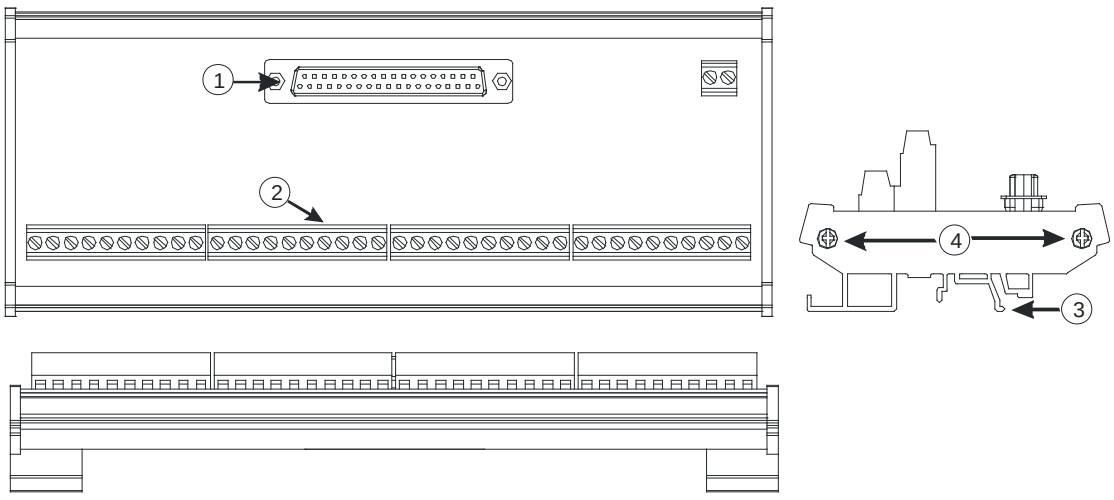
Dimensions:



Dimensions are in mm.

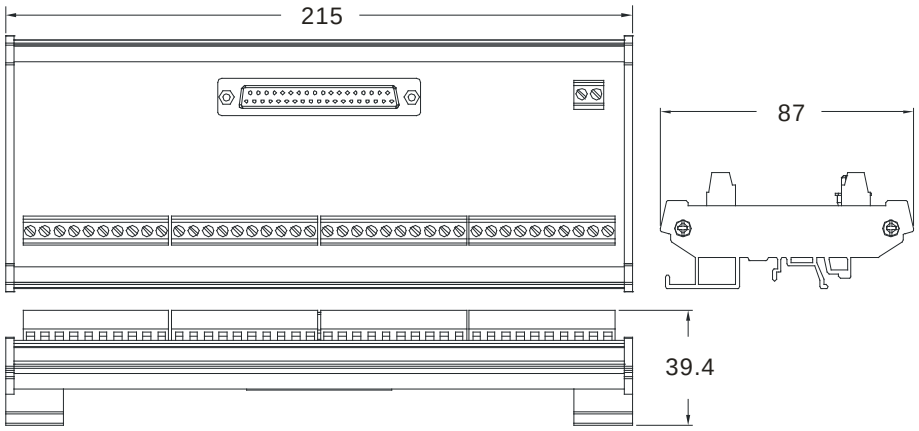
- **External terminal modules for AH32AN02P-5B**

■ **UB-10-OR32B(DVPAETB-OR32B)**



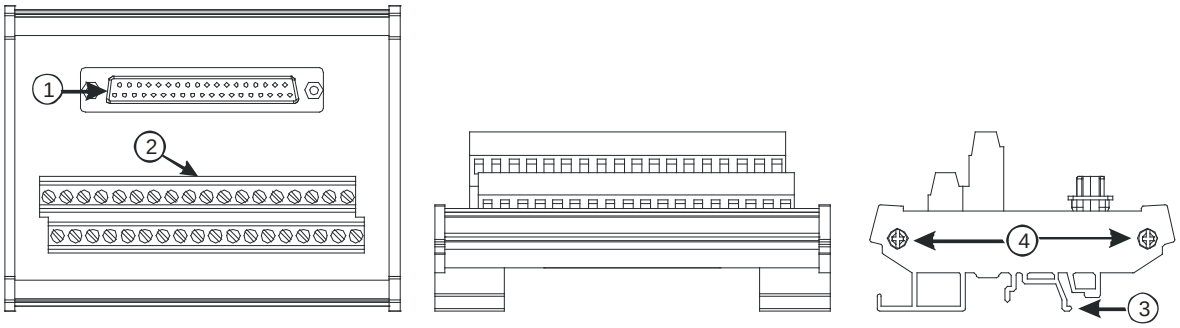
Number	Name	Description
1	DB37 connector	Connecting the external terminal module and a digital input/output module
2	Terminals	Input/Output terminals for wiring
3	Clip	Hanging the external terminal module on a DIN rail
4	Set screw	Fixing the base

Dimensions:



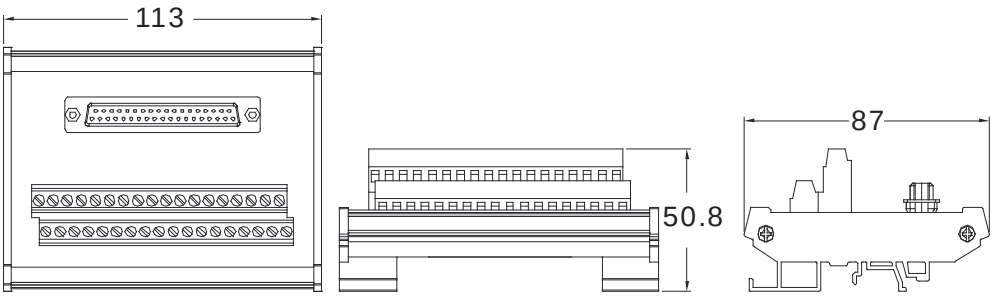
Dimensions are in mm.

■ **UB-10-OT32B(DVPAETB-OT32B)**



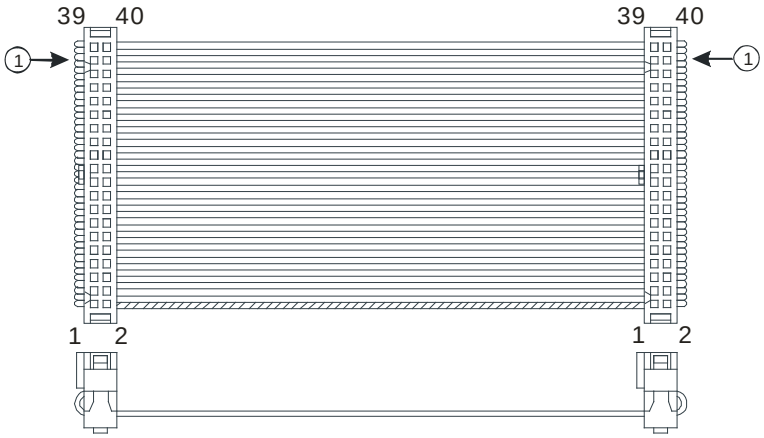
Number	Name	Description
1	DB37 connector	Connecting the external terminal module and a digital input/output module
2	Terminals	Input/Output terminals for wiring
3	Clip	Hanging the external terminal module on a DIN rail
4	Set screw	Fixing the base

Dimensions:



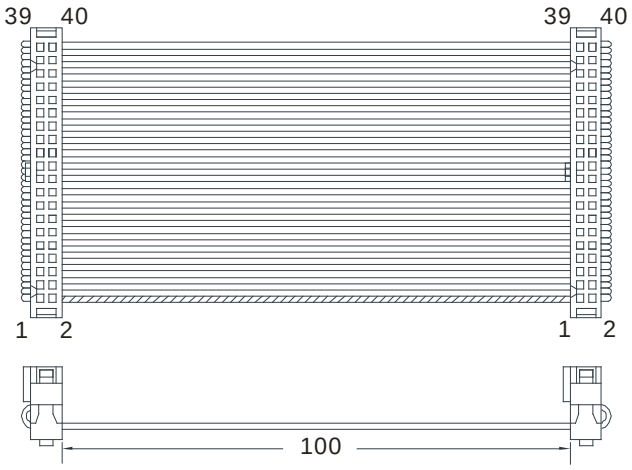
Dimensions are in mm.

- **MIL connector, I/O extension cable, and external terminal module**
  - **I/O extension cable:** UC-ET010-24A(DVPACAB7A10)



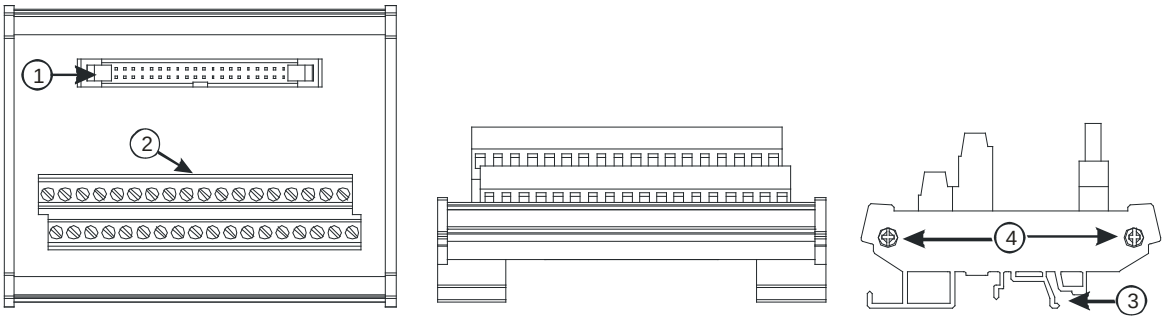
Number	Name	Description
1	40-pin IDC connector	Connecting a digital input/output module and the external terminal module UB-10-ID32A(DVPAETB-ID32A).

Dimensions:



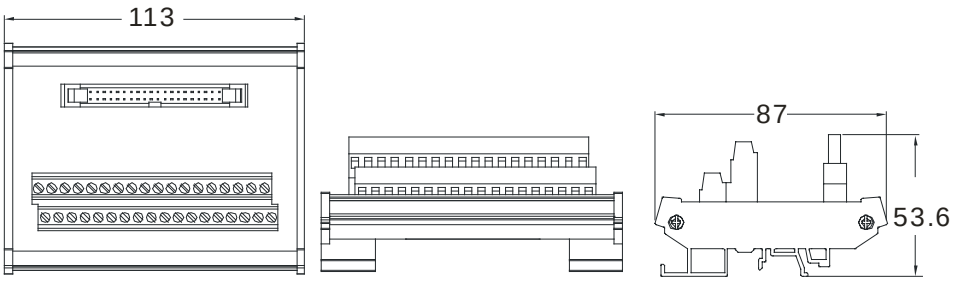
Dimensions are in cm.

- **External terminal module for AH32AM10N-5C/AH64AM10N-5C:** UB-10-ID32A(DVPAETB-ID32A)



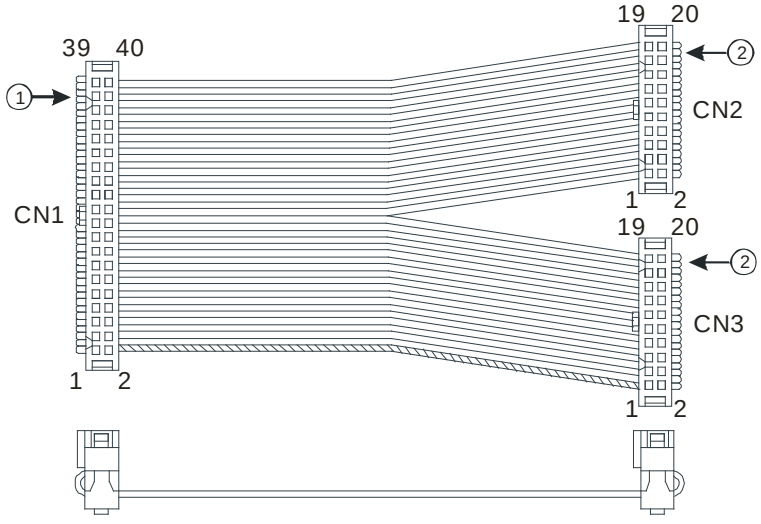
Number	Name	Description
1	40-pin MIL connector	Connecting the external terminal module and a digital input/output module
2	Terminals	Input/Output terminals for wiring
3	Clip □	Hanging the external terminal module on a DIN rail
4	Set screw	Fixing the base

Dimensions:



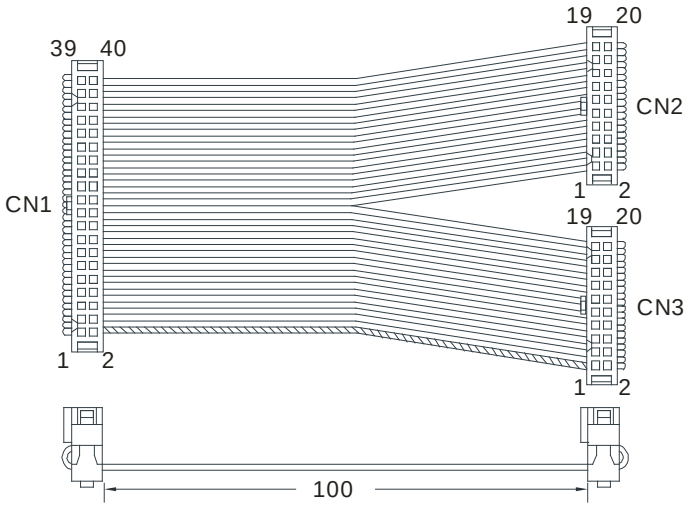
Dimensions are in mm.

I/O extension cable: UC-ET010-24C (DVPACAB7B10)



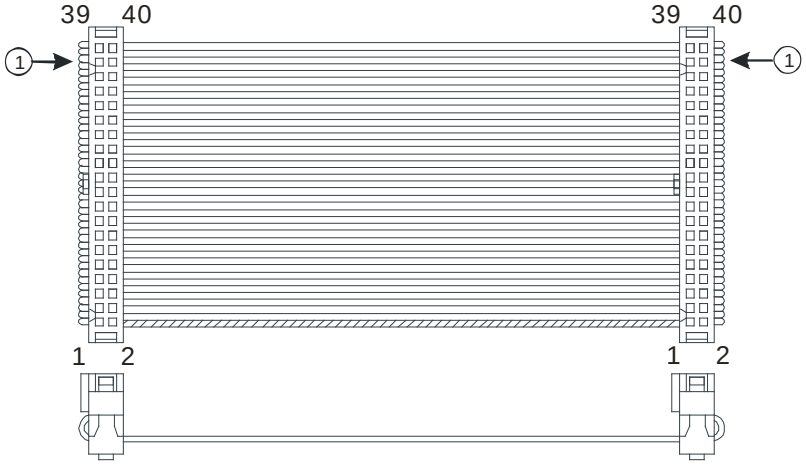
Number	Name	Description
1	40-pin IDC connector	Connecting a digital input/output module and an external terminal module
2	20-pin IDC connector	Connecting a digital input/output module and the external terminal module DVPAETB-OR16A or DVPAETB-OR16B

Dimensions:



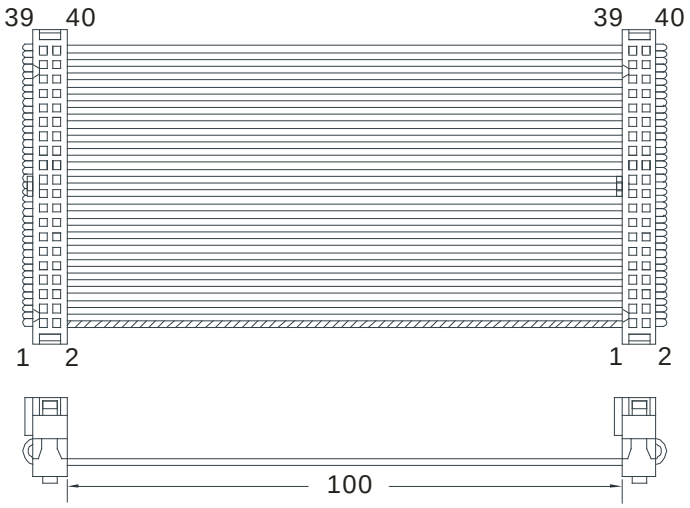
Dimensions are in cm.

- **I/O extension cable:** UC-ET010-24A (DVPACAB7A10)



Number	Name	Description
1	40-pin IDC connector	Connecting a digital input/output module and the external terminal module UB-10-OT32A(DVPAETB-OT32A)

Dimensions:

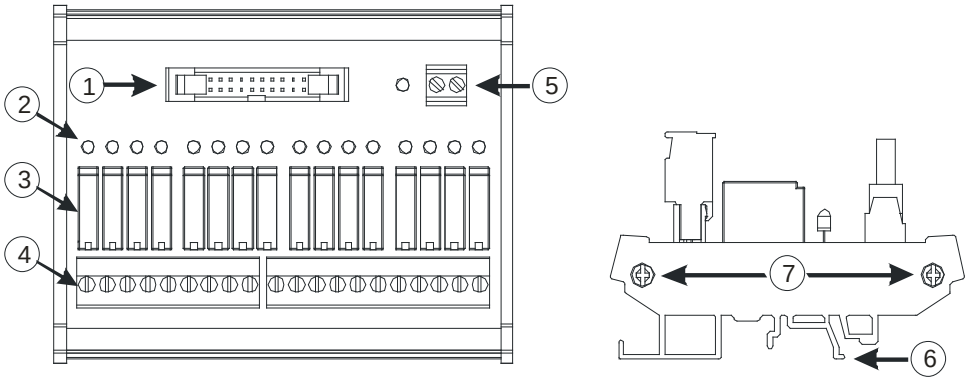


Dimensions are in cm.

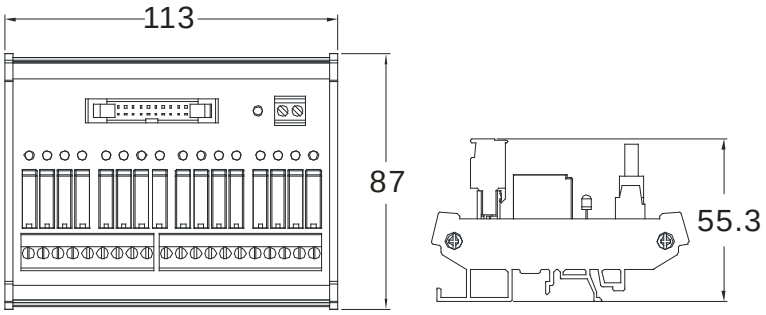
- **External terminal modules for AH32AN02T-5C/AH64AN02T-5C**

Number	Name	Description
1	20-pin MIL connector	Connecting the external terminal module and a digital input/output module
2	Output LED indicator	If there is an output signal, the output LED indicator is ON.
3	Output relay	Output relay
4	Output terminal	Output terminal for wiring
5	Power input terminal	Power input terminal for wiring
6	Clip □	Hanging the external terminal module on a DIN rail
7	Set screw	Fixing the base

UB-10-OR16A(DVPAETB-OR16A)

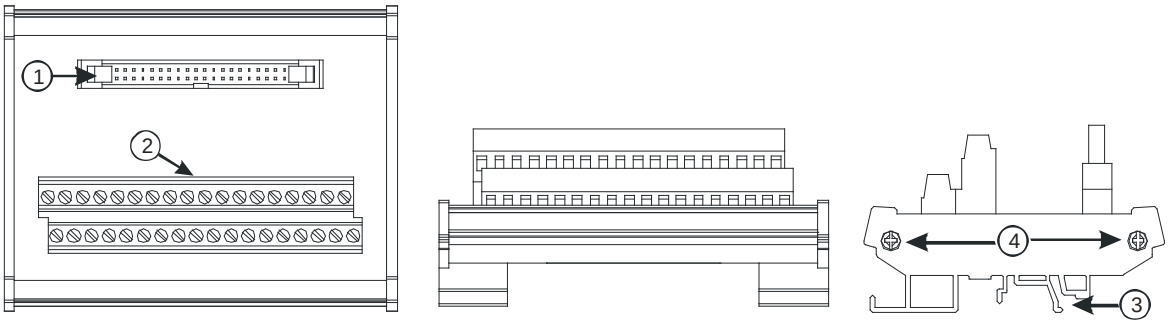


Dimensions:

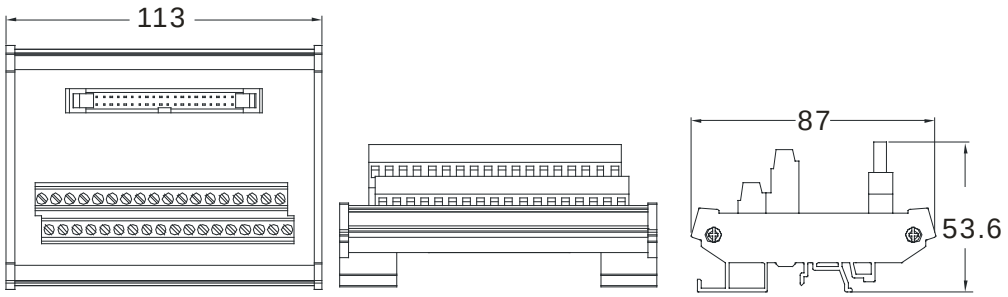


Dimensions are in mm.

UB-10-OT32A(DVPAETB-OT32A)



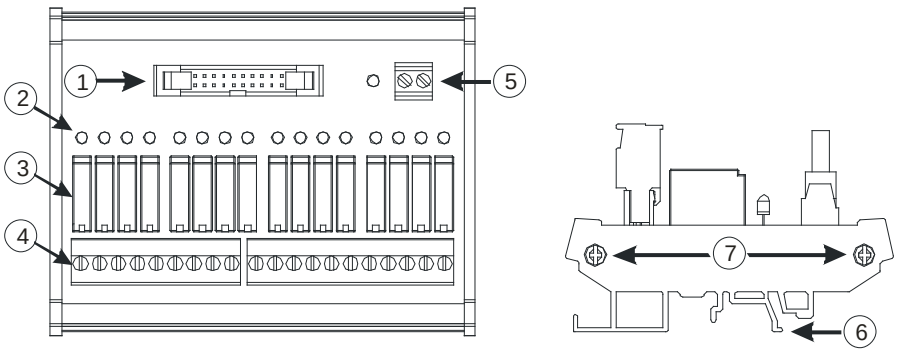
Dimensions:



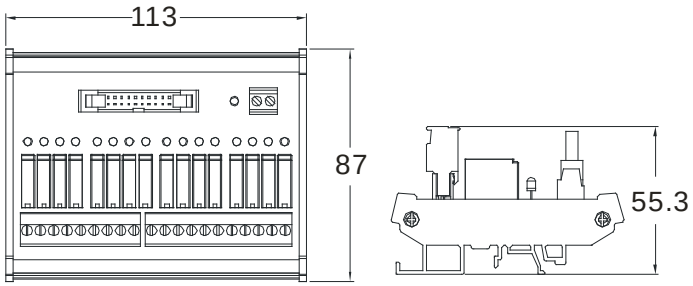
Dimensions are in mm.

External terminal module for AH32AN02P-5C/AH64AN02P-5C

UB-10-OR16B(DVPAETB-OR16B)

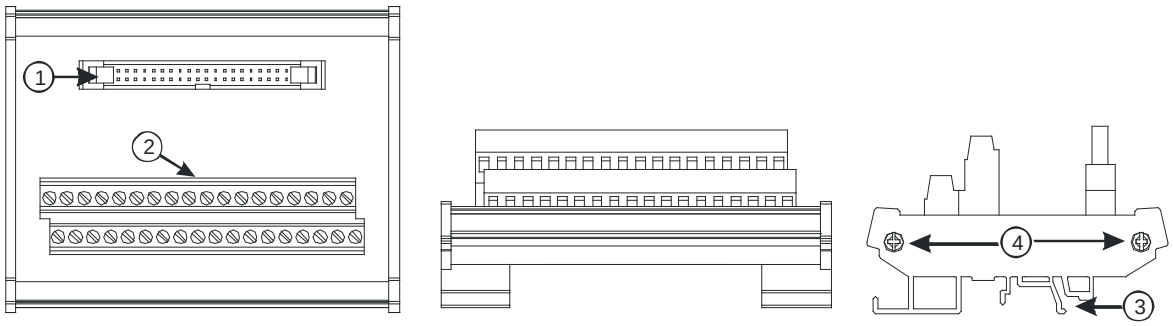


Dimensions:

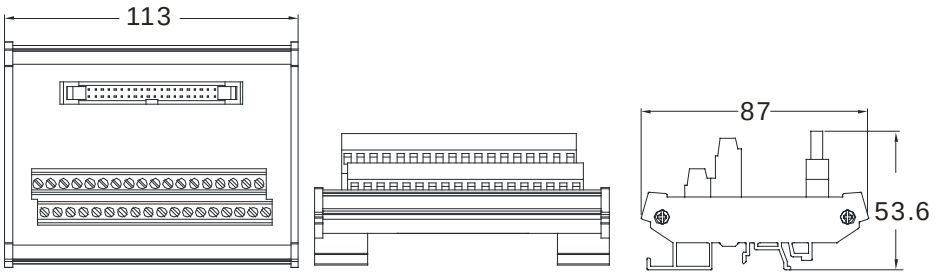


Dimensions are in mm.

UB-10-OT32A(DVPAETB-OT32A)



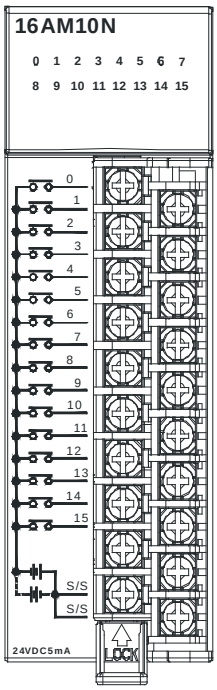
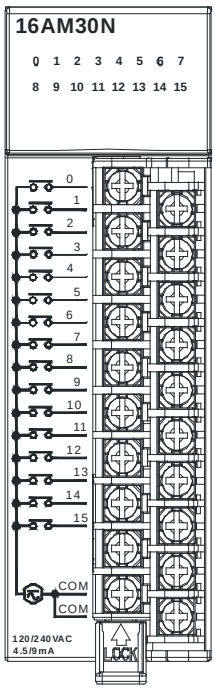
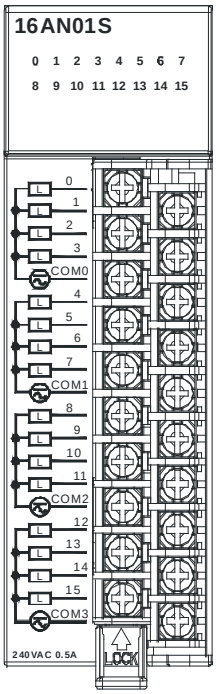
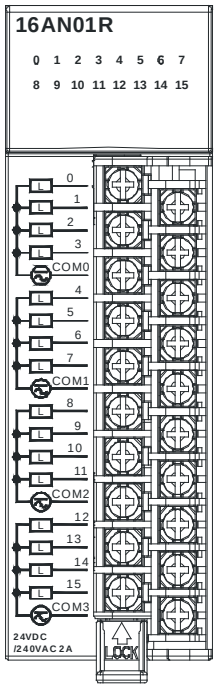
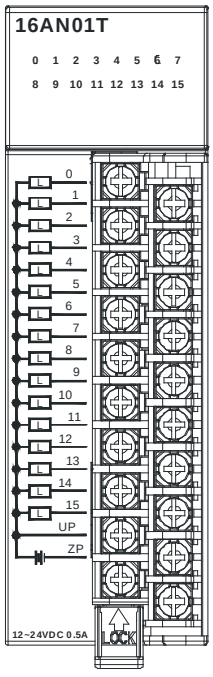
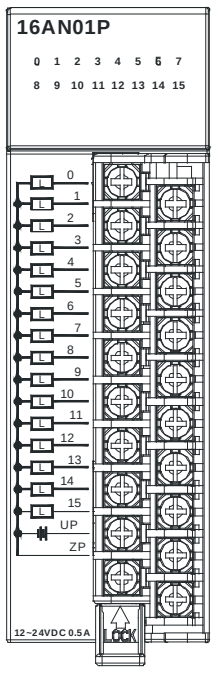
Dimensions:

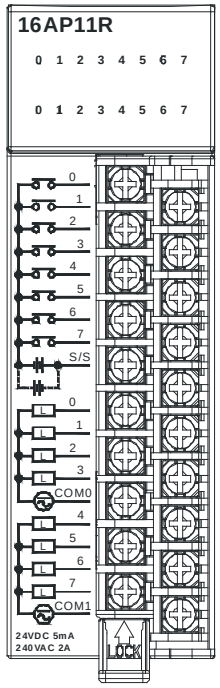
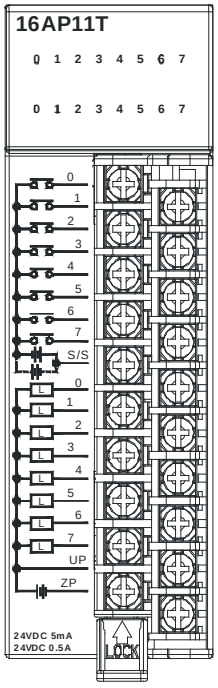
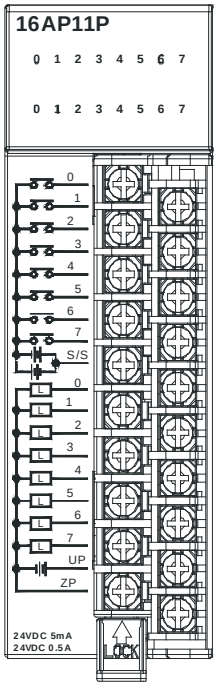


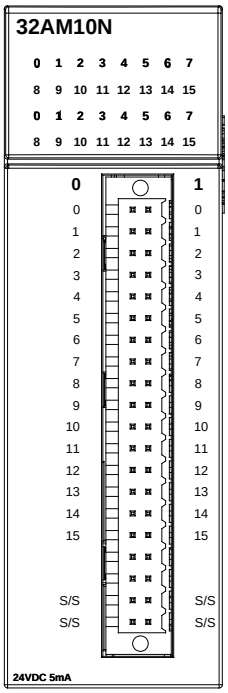
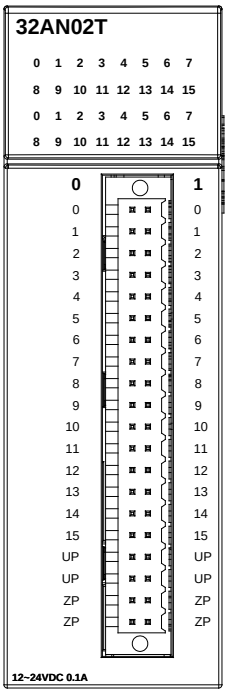
Dimensions are in mm.

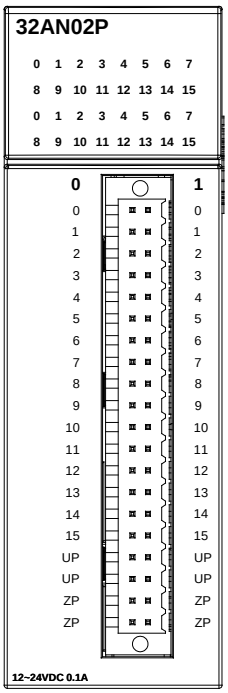
3.6.3 Arrangement of Input/Output Terminals

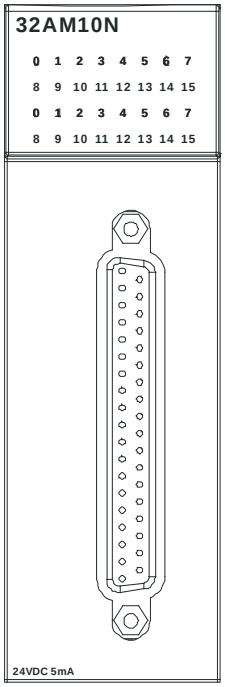
- **Digital input/output modules**

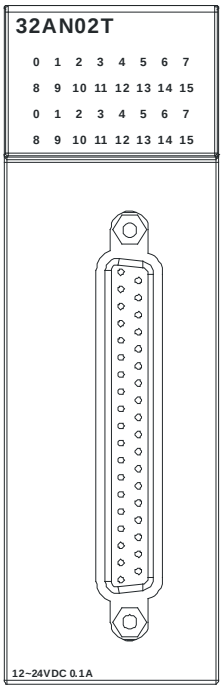
AH16AM10N-5A	AH16AM30N-5A	AH16AN01S-5A
		
AH16AN01R-5A	**AH16AN01T-5A**	**AH16AN01P-5A**
		

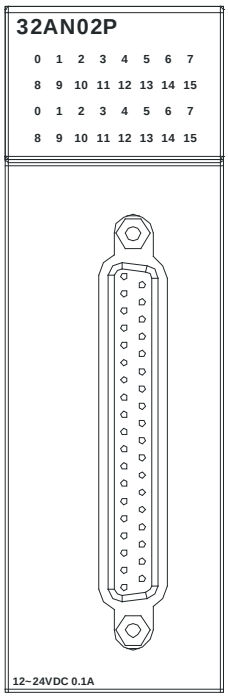
AH16AP11R-5A	AH16AP11T-5A	AH16AP11P-5A
		

AH32AM10N-5A			AH32AN02T-5A		
	0.0	1.0		0.0	1.0
	0.1	1.1		0.1	1.1
	0.2	1.2		0.2	1.2
	0.3	1.3		0.3	1.3
	0.4	1.4		0.4	1.4
	0.5	1.5		0.5	1.5
	0.6	1.6		0.6	1.6
	0.7	1.7		0.7	1.7
	0.8	1.8		0.8	1.8
	0.9	1.9		0.9	1.9
	0.10	1.10		0.10	1.10
	0.11	1.11		0.11	1.11
	0.12	1.12		0.12	1.12
	0.13	1.13		0.13	1.13
	0.14	1.14		0.14	1.14
	0.15	1.15		0.15	1.15
	-	-		UP	UP
	-	-		UP	UP
	S/S	S/S		ZP	ZP
	S/S	S/S		ZP	ZP

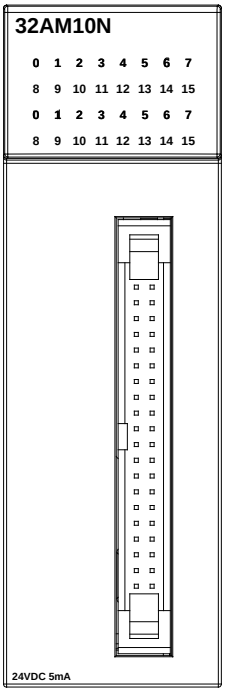
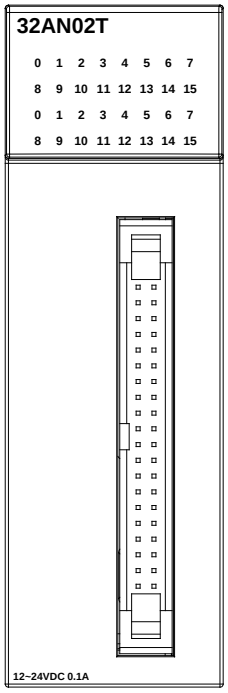
AH32AN02P-5A		
	0.0	1.0
	0.1	1.1
	0.2	1.2
	0.3	1.3
	0.4	1.4
	0.5	1.5
	0.6	1.6
	0.7	1.7
	0.8	1.8
	0.9	1.9
	0.10	1.10
	0.11	1.11
	0.12	1.12
	0.13	1.13
	0.14	1.14
	0.15	1.15
	UP	UP
	UP	UP
	ZP	ZP
	ZP	ZP

AH32AM10N-5B		
	0.0	0.1
	0.2	0.3
	0.4	0.5
	0.6	0.7
	0.8	0.9
	0.10	0.11
	0.12	0.13
	0.14	0.15
	S/S	S/S
	NC	1.0
	1.1	1.2
	1.3	1.4
	1.5	1.6
	1.7	1.8
	1.9	1.10
	1.11	1.12
	1.13	1.14
	1.15	S/S
	S/S	

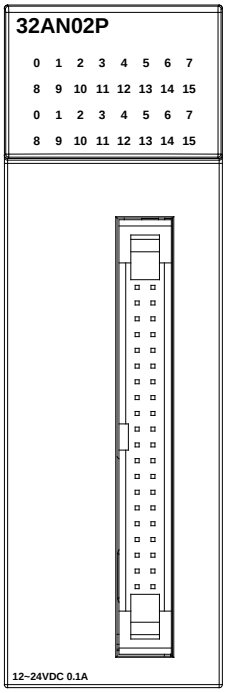
AH32AN02T-5B		
	0.0	0.1
	0.2	0.3
	0.4	0.5
	0.6	0.7
	0.8	0.9
	0.10	0.11
	0.12	0.13
	0.14	0.15
	ZP	ZP
	UP	1.0
	1.1	1.2
	1.3	1.4
	1.5	1.6
	1.7	1.8
	1.9	1.10
	1.11	1.12

AH32AN02P-5B		
	0.0	0.1
	0.2	0.3
	0.4	0.5
	0.6	0.7
	0.8	0.9
	0.10	0.11
	0.12	0.13
	0.14	0.15
	ZP	UP
	UP	1.0
	1.1	1.2
	1.3	1.4
	1.5	1.6
	1.7	1.8
	1.9	1.10
	1.11	1.12

	1.13	1.14		1.13	1.14
	1.15	ZP		1.15	ZP
	UP			UP	

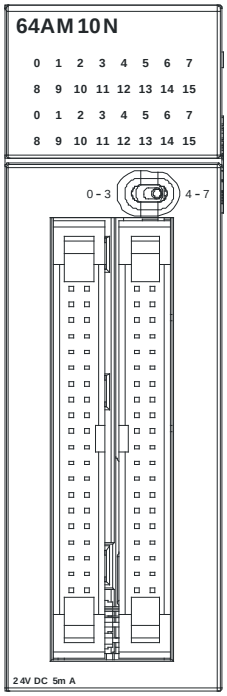
AH32AM10N-5C			AH32AN02T-5C		
	0.0	0.1		0.0	0.1
	0.2	0.3		0.2	0.3
	0.4	0.5		0.4	0.5
	0.6	0.7		0.6	0.7
	0.8	0.9		0.8	0.9
	0.10	0.11		0.10	0.11
	0.12	0.13		0.12	0.13
	0.14	0.15		0.14	0.15
	S/S	S/S		ZP	ZP
				UP	UP
	1.0	1.1		1.0	1.1
	1.2	1.3		1.2	1.3
	1.4	1.5		1.4	1.5
	1.6	1.7		1.6	1.7
	1.8	1.9		1.8	1.9
	1.10	1.11		1.10	1.11
	1.12	1.13		1.12	1.13
	1.14	1.15		1.14	1.15
	S/S	S/S		ZP	ZP
				UP	UP

AH32AN02P-5C



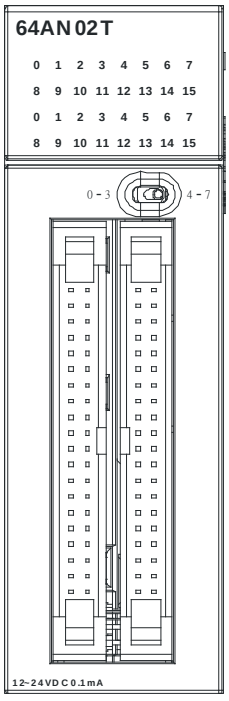
0.0	0.1
0.2	0.3
0.4	0.5
0.6	0.7
0.8	0.9
0.10	0.11
0.12	0.13
0.14	0.15
ZP	ZP
UP	UP
1.0	1.1
1.2	1.3
1.4	1.5
1.6	1.7
1.8	1.9
1.10	1.11
1.12	1.13
1.14	1.15
ZP	ZP
UP	UP

AH64AM10N-5C



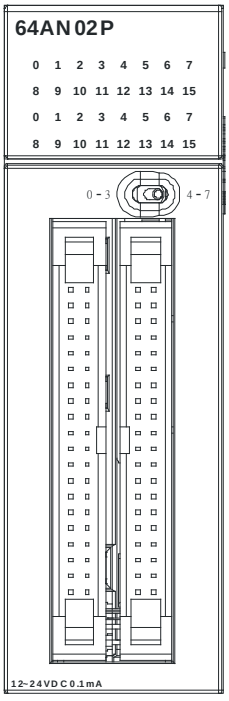
NC	NC	NC	NC
S/S	S/S	2.0	2.1
1.15	1.14	2.2	2.3
1.13	1.12	2.4	2.5
1.11	1.10	2.6	2.7
1.9	1.8	2.8	2.9
1.7	1.6	2.10	2.11
1.5	1.4	2.12	2.13
1.3	1.2	2.14	2.15
1.1	1.0	S/S	S/S
NC	NC	NC	NC
S/S	S/S	3.0	3.1
0.15	0.14	3.2	3.3
0.13	0.12	3.4	3.5
0.11	0.10	3.6	3.7
0.9	0.8	3.8	3.9
0.7	0.6	3.10	3.11
0.5	0.4	3.12	3.13
0.3	0.2	3.14	3.15
0.1	0.0	S/S	S/S

AH64AN02T-5C



UP	UP	2.0	2.1
ZP	ZP	2.2	2.3
1.15	1.14	2.4	2.5
1.13	1.12	2.6	2.7
1.11	1.10	2.8	2.9
1.9	1.8	2.10	2.11
1.7	1.6	2.12	2.13
1.5	1.4	2.14	2.15
1.3	1.2	ZP	ZP
1.1	1.0	UP	UP
UP	UP	3.0	3.1
ZP	ZP	3.2	3.3
0.15	0.14	3.4	3.5
0.13	0.12	3.6	3.7
0.11	0.10	3.8	3.9

AH64AN02P-5C

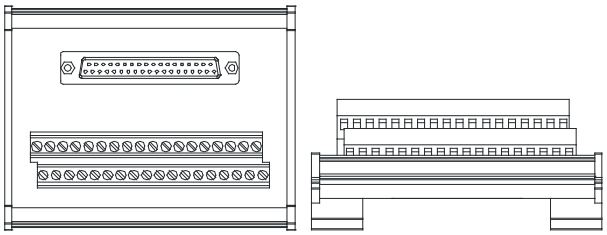


UP	UP	2.0	2.1
ZP	ZP	2.2	2.3
1.15	1.14	2.4	2.5
1.13	1.12	2.6	2.7
1.11	1.10	2.8	2.9
1.9	1.8	2.10	2.11
1.7	1.6	2.12	2.13
1.5	1.4	2.14	2.15
1.3	1.2	ZP	ZP
1.1	1.0	UP	UP
UP	UP	3.0	3.1
ZP	ZP	3.2	3.3
0.15	0.14	3.4	3.5
0.13	0.12	3.6	3.7
0.11	0.10	3.8	3.9

	0.9	0.8	3.10	3.11		0.9	0.8	3.10	3.11
	0.7	0.6	3.12	3.13		0.7	0.6	3.12	3.13
	0.5	0.4	3.14	3.15		0.5	0.4	3.14	3.15
	0.3	0.2	ZP	ZP		0.3	0.2	ZP	ZP
	0.1	0.0	UP	UP		0.1	0.0	UP	UP

- **DB37 connector and the external terminal module**

1. External terminal module for AH32AM10N-5B: UB-10-ID32B(DVPAETB-ID32B)



Terminals:

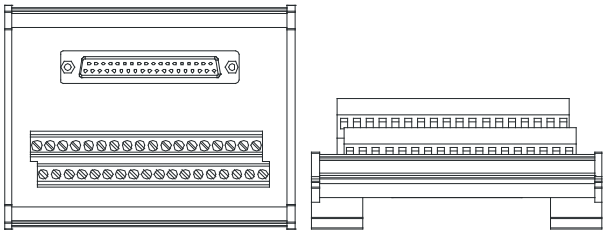
Upper row	X0	X2	X4	X6	X10	X12	X14	X16	X20	X22	X24	X26	X30	X32	X34	X36	S/S	S/S
Lower row	X1	X3	X5	X7	X11	X13	X15	X17	X21	X23	X25	X27	X31	X33	X35	X37	S/S	S/S

AH series terminals:

Upper row	X0.0	X0.2	X0.4	X0.6	X0.8	X0.10	X0.12	X0.14	X1.0	X1.2	X1.4	X1.6	X1.8	X1.10	X1.12	X1.14	S/S	S/S
Lower row	X0.1	X0.3	X0.5	X0.7	X0.9	X0.11	X0.13	X0.15	X1.1	X1.3	X1.5	X1.7	X1.9	X1.11	X1.13	X1.15	S/S	S/S

2. External terminal modules for AH32AN02T-5B

◆ UB-10-OT32B(DVPAETB-OT32B)



Terminals:

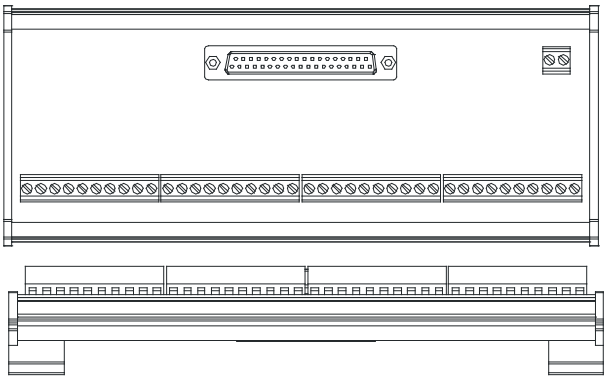
Upper row	Y0	Y2	Y4	Y6	Y10	Y12	Y14	Y16	Y20	Y22	Y24	Y26	Y30	Y32	Y34	Y36	UP	UP
Lower row	Y1	Y3	Y5	Y7	Y11	Y13	Y15	Y17	Y21	Y23	Y25	Y27	Y31	Y33	Y35	Y37	ZP	ZP

AH series terminals:

Upper	Y0.0	Y0.2	Y0.4	Y0.6	Y0.8	Y0.10	Y0.12	Y0.14	Y1.0	Y1.2	Y1.4	Y1.6	Y1.8	Y1.10	Y1.12	Y1.14	UP	UP

row																		
Lower row	Y0.1	Y0.3	Y0.5	Y0.7	Y0.9	Y0.11	Y0.13	Y0.15	Y1.1	Y1.3	Y1.5	Y1.7	Y1.9	Y1.11	Y1.13	Y1.15	ZP	ZP

◆ UB-10-OR32A(DVPAETB-OR32A)



Terminals:

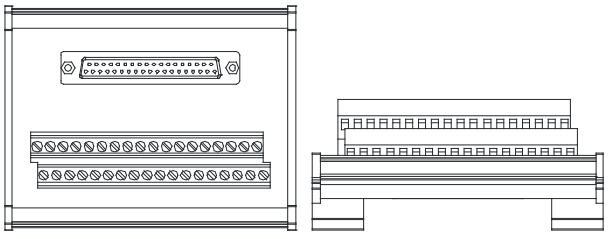
																		GND	+24V
1st from the left	C0	Y0	Y1	Y2	Y3	C1	Y4	Y5	Y6	Y7	C2	Y10	Y11	Y12	Y13	C3	Y14	Y15	Y16	Y17
21st from the left	C4	Y20	Y21	Y22	Y23	C5	Y24	Y25	Y26	Y27	C6	Y30	Y31	Y32	Y33	C7	Y34	Y35	Y36	Y37

AH series terminals:

																		GND	+24V
1st from the left	C0	Y0.0	Y0.1	Y0.2	Y0.3	C1	Y0.4	Y0.5	Y0.6	Y0.7	C2	Y0.8	Y0.9	Y0.10	Y0.11	C3	Y0.12	Y0.13	Y0.14	Y0.15
21st from the left	C4	Y1.0	Y1.1	Y1.2	Y1.3	C5	Y1.4	Y1.5	Y1.6	Y1.7	C6	Y1.8	Y1.9	Y1.10	Y1.11	C7	Y1.12	Y1.13	Y1.14	Y1.15

3. External terminal modules for AH32AN02P-5B

◆ DVPAETB-OT32B



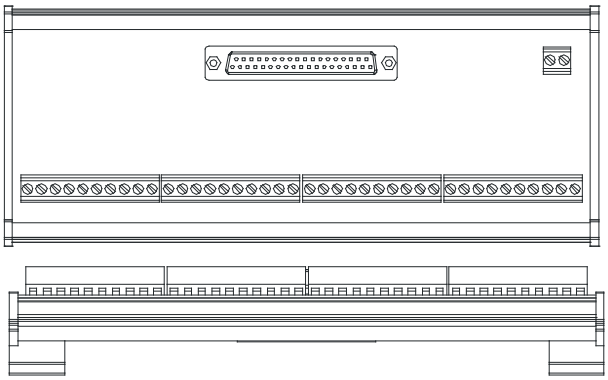
Terminals:

Upper row	Y0	Y2	Y4	Y6	Y10	Y12	Y14	Y16	Y20	Y22	Y24	Y26	Y30	Y32	Y34	Y36	UP	UP
Lower row	Y1	Y3	Y5	Y7	Y11	Y13	Y15	Y17	Y21	Y23	Y25	Y27	Y31	Y33	Y35	Y37	ZP	ZP

AH series terminals:

Upper row	Y0.0	Y0.2	Y0.4	Y0.6	Y0.8	Y0.10	Y0.12	Y0.14	Y1.0	Y1.2	Y1.4	Y1.6	Y1.8	Y1.10	Y1.12	Y1.14	UP	UP
Lower row	Y0.1	Y0.3	Y0.5	Y0.7	Y0.9	Y0.11	Y0.13	Y0.15	Y1.1	Y1.3	Y1.5	Y1.7	Y1.9	Y1.11	Y1.13	Y1.15	ZP	ZP

◆ UB-10-OR32B(DVPAETB-OR32B)



Terminals:

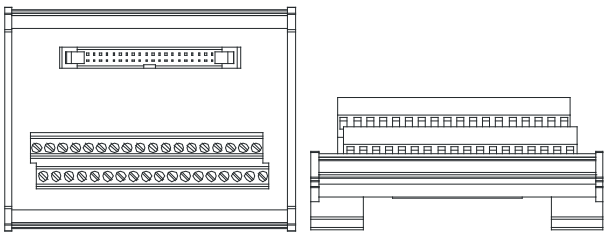
																			GND	+24V
1st from the left	C0	Y0	Y1	Y2	Y3	C1	Y4	Y5	Y6	Y7	C2	Y10	Y11	Y12	Y13	C3	Y14	Y15	Y16	Y17
21st from the left	C4	Y20	Y21	Y22	Y23	C5	Y24	Y25	Y26	Y27	C6	Y30	Y31	Y32	Y33	C7	Y34	Y35	Y36	Y37

AH series terminals:

																			GND	+24V
1st from the left	C0	Y0.0	Y0.1	Y0.2	Y0.3	C1	Y0.4	Y0.5	Y0.6	Y0.7	C2	Y0.8	Y0.9	Y0.10	Y0.11	C3	Y0.12	Y0.13	Y0.14	Y0.15
21st from the left	C4	Y1.0	Y1.1	Y1.2	Y1.3	C5	Y1.4	Y1.5	Y1.6	Y1.7	C6	Y1.8	Y1.9	Y1.10	Y1.11	C7	Y1.12	Y1.13	Y1.14	Y1.15

- **MIL connector and the external terminal module**

1. External terminal module for AH64AM10N-5C: UB-10-ID32A(DVPAETB-ID32A)



Terminals:

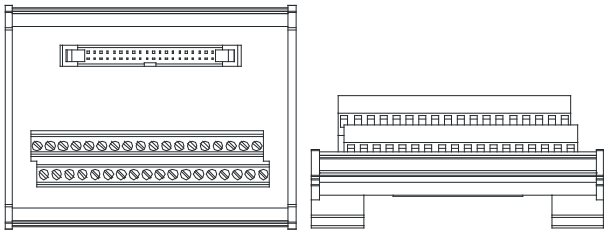
Upper row	S/S	S/S	X0	X2	X4	X6	X10	X12	X14	X16	X20	X22	X24	X26	X30	X32	X34	X36
Lower row	S/S	S/S	X1	X3	X5	X7	X11	X13	X15	X17	X21	X23	X25	X27	X31	X33	X35	X37

AH series terminals:

Upper row	X0.0	X0.2	X0.4	X0.6	X0.8	X0.10	X0.12	X0.14	X1.0	X1.2	X1.4	X1.6	X1.8	X1.10	X1.12	X1.14	S/S	S/S
Lower row	X0.1	X0.3	X0.5	X0.7	X0.9	X0.11	X0.13	X0.15	X1.1	X1.3	X1.5	X1.7	X1.9	X1.11	X1.13	X1.15	S/S	S/S

2. External terminal modules for AH32AN02T-5C/AH64AN02T-5C:

◆ UB-10-OT32A(DVPAETB-OT32A)



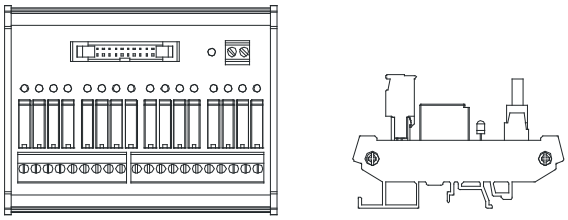
Terminals:

Upper row	Y0	Y2	Y4	Y6	Y10	Y12	Y14	Y16	Y20	Y22	Y24	Y26	Y30	Y32	Y34	Y36	+24V	+24V
Lower row	Y1	Y3	Y5	Y7	Y11	Y13	Y15	Y17	Y21	Y23	Y25	Y27	Y31	Y33	Y35	Y37	GND	GND

AH series terminals:

Upper row	Y0.0	Y0.2	Y0.4	Y0.6	Y0.8	Y0.10	Y0.12	Y0.14	Y1.0	Y1.2	Y1.4	Y1.6	Y1.8	Y1.10	Y1.12	Y1.14	+24V	+24V
Lower row	Y0.1	Y0.3	Y0.5	Y0.7	Y0.9	Y0.11	Y0.13	Y0.15	Y1.1	Y1.3	Y1.5	Y1.7	Y1.9	Y1.11	Y1.13	Y1.15	GND	GND

◆ UB-10-OR16A(DVPAETB-OR16A)



Terminals:

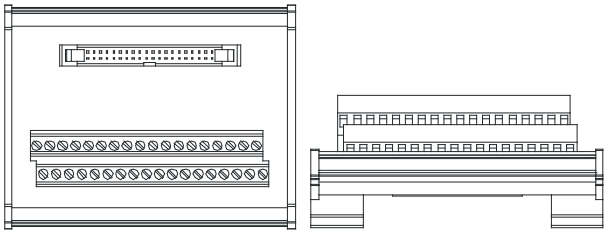
																	GND	+24V
C0	Y0	Y1	Y2	Y3	C1	Y4	Y5	Y6	Y7	C2	Y10	Y11	Y12	Y13	C3	Y14	Y15	Y16	Y17

AH series terminals:

																		GND	+24V
C0	Y0.0	Y0.1	Y0.2	Y0.3	C1	Y0.4	Y0.5	Y0.6	Y0.7	C2	Y0.8	Y0.9	Y0.10	Y0.11	C3	Y0.12	Y0.13	Y0.14	Y0.15

3. External terminal module for AH32AN02P-5C/AH64AN02P-5C:

◆ UB-10-OT32A(DVPAETB-OT32A)



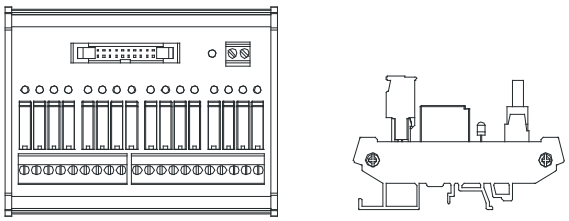
Terminals:

Upper row	Y0	Y2	Y4	Y6	Y10	Y12	Y14	Y16	Y20	Y22	Y24	Y26	Y30	Y32	Y34	Y36	+24V	+24V
Lower row	Y1	Y3	Y5	Y7	Y11	Y13	Y15	Y17	Y21	Y23	Y25	Y27	Y31	Y33	Y35	Y37	GND	GND

AH series terminals:

Upper row	Y0.0	Y0.2	Y0.4	Y0.6	Y0.8	Y0.10	Y0.12	Y0.14	Y1.0	Y1.2	Y1.4	Y1.6	Y1.8	Y1.10	Y1.12	Y1.14	+24V	+24V
Lower row	Y0.1	Y0.3	Y0.5	Y0.7	Y0.9	Y0.11	Y0.13	Y0.15	Y1.1	Y1.3	Y1.5	Y1.7	Y1.9	Y1.11	Y1.13	Y1.15	GND	GND

◆ UB-10-OR16B(DVPAETB-OR16B)



Terminals:

																	GND	+24V
C0	Y0	Y1	Y2	Y3	C1	Y4	Y5	Y6	Y7	C2	Y10	Y11	Y12	Y13	C3	Y14	Y15	Y16	Y17

AH series terminals:

																		GND	+24V
C0	Y0.0	Y0.1	Y0.2	Y0.3	C1	Y0.4	Y0.5	Y0.6	Y0.7	C2	Y0.8	Y0.9	Y0.10	Y0.11	C3	Y0.12	Y0.13	Y0.14	Y0.15

3.7 Analog Input/Output Modules

3.7.1 General Specifications

- **AH04AD-5A/AH08AD-5A/AH08AD-5B/AH08AD-5C**

Electrical specifications

Module name	AH04AD-5A	AH08AD-5A	AH08AD-5B	AH08AD-5C
Number of inputs	4	8	8	8
Analog-to-digital conversion	Voltage input/Current input	Voltage input/Current input	Voltage input	Current input
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)			
Connector type	Removable terminal block			
Conversion time	150 μs/channel			
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC			

Functional specifications

Analog-to-digital conversion	Voltage input				
Rated input range	-10 V~10 V	0 V~10 V	±5 V	0 V~5 V	1 V~5 V
Hardware input range	-10.1 V~10.1 V	-0.1 V~10.1 V	-5.05 V~5.05 V	-0.05 V~5.05 V	0.95 V~5.05 V
Operating error (Room temperature) (The number of input voltages which are averaged is 100.)	±0.1%				
Operating error (Full temperature range) (The number of input voltages which are averaged is 100.)	±0.45%				
Linearity error (Room temperature)	±0.07%				
Linearity error (Full temperature range)	±0.12%				
Hardware resolution	16 bits				
Input impedance	>200 kΩ				
Absolute input range	±15 V				
Analog-to-digital conversion	Current input				
Rated input range	±20 mA		0 mA~20 mA		4 mA~20 mA

Analog-to-digital conversion	Voltage input		
Hardware input range	-20.2 mA~20.2 mA	-0.2 mA~20.2 mA	3.8 mA~20.2 mA
Operating error (Room temperature) (The number of input currents which are averaged is 100.)	±0.1%		
Operating error (Full temperature range) (The number of input currents which are averaged is 100.)	±0.2%		
Linearity error (Room temperature) (Full temperature range)	±0.05%		
Linearity error	±0.23%		
Hardware resolution	16 bits		
Input impedance	250 Ω		
Absolute input range	±32 mA		

- **AH04DA-5A/AH08DA-5A/AH08DA-5B/AH08DA-5C**

Electrical specifications

Module name	AH04DA-5A	AH08DA-5A	AH08DA-5B	AH08DA-5C
Number of outputs	4	8	8	8
Analog-to-digital conversion	Voltage output/ Current output	Voltage output/ Current output	Voltage output	Current output
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)			
Connector type	Removable terminal block			
Conversion time	150 μs/channel			
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC			

Functional specifications

Digital-to-analog conversion	Voltage output				
Rated output range	±10 V	0 V~10 V	±5 V	0 V~5 V	1 V~5 V
Hardware output range	-10.1 V~10.1 V	-0.1 V~10.1 V	-5.05 V~5.05 V	-0.05 V~5.05 V	0.95 V~5.05 V
Operating error (Room temperature) (The number of	±0.02%				

Digital-to-analog conversion	Voltage output
output voltages which are averaged is 100.)	
Operating error (Full temperature range) (The number of output voltages which are averaged is 100.)	±0.04%
Linearity error (Room temperature)	±0.004%
Linearity error (Full temperature range)	±0.004%
Hardware resolution	16 bits
Permissible load impedance	1 kΩ~2 MΩ: ±10 V and 0 V~10 V ≧500 Ω: 1 V~5 V

Digital-to-analog conversion	Current output	
Rated output range	0 mA~20 mA	4 mA~20 mA
Hardware output range	-0.2 mA~20.2 mA	3.8 mA~20.2 mA
Operating error (Room temperature) (The number of output currents which are averaged is 100.)	±0.06%	
Operating error (Full temperature range) (The number of output currents which are averaged is 100.)	±0.07%	
Linearity error (Room temperature)	±0.01%	
Linearity error (Full temperature range)	±0.01%	
Hardware resolution	16 bits	
Permissible load impedance	≦550 Ω	

- **AH06XA-5A**

Electrical specifications

Module name	AH06XA-5A

Module name	AH06XA-5A
Number of inputs	4
Number of outputs	2
Analog-to-digital conversion	Voltage input/Current input/Voltage output/Current output
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)
Connector type	Removable terminal block
Conversion time	150 us/channel
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC

Functional specifications for the analog-to-digital conversion

Analog-to-digital conversion	Voltage input				
Rated input range	-10 V~10 V	0 V~10 V	±5 V	0 V~5 V	1 V~5 V
Hardware input range	-10.1 V~10.1 V	-0.1 V~10.1 V	-5.05 V~5.05 V	-0.05 V~5.05 V	0.95 V~5.05 V
Operating error (Room temperature) (The number of input voltages which are averaged is 100.)	±0.1%				
Operating error (Full temperature range) (The number of input voltages which are averaged is 100.)	±0.45%				
Linearity error (Room temperature)	±0.07%				
Linearity error (Full temperature range)	±0.12%				
Hardware resolution	16 bits				
Input impedance	>200 kΩ				
Absolute input range	±15 V				
Analog-to-digital conversion	Current input				
Rated input range	±20 mA		0 mA~20 mA		4 mA~20 mA

Hardware input range	-20.2 mA~20.2 mA	-0.2 mA~20.2 mA	3.8 mA~20.2 mA
Operating error (Room temperature) (The number of input currents which are averaged is 100.)	±0.1%		
Operating error (Full temperature range) (The number of input currents which are averaged is 100.)	±0.2%		
Linearity error (Room temperature)	±0.05%		
Linearity error (Full temperature range)	±0.23%		
Hardware resolution	16 bits		
Input impedance	250 Ω		
Absolute input range	±32 mA		

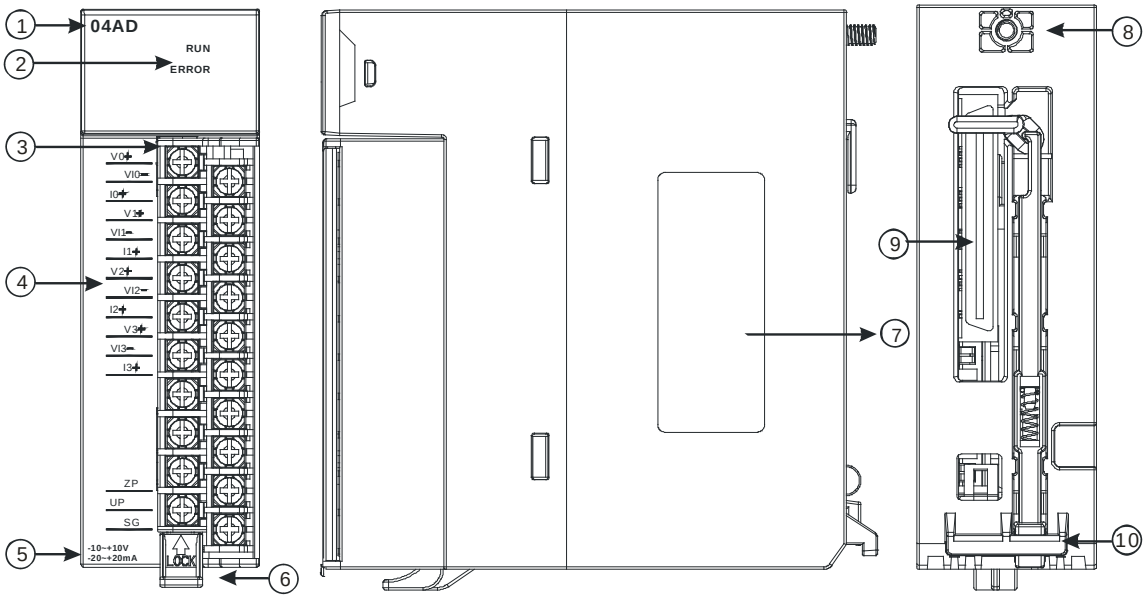
Functional specifications for the digital-to-analog conversion

Digital-to-analog conversion	**Voltage output**				
Rated output range	±10 V	0 V~10 V	±5 V	0 V~5 V	1 V~5 V
Hardware output range	-10.1 V~10.1 V	-0.1 V~10.1 V	-5.05 V~5.05 V	-0.05 V~5.05 V	0.95 V~5.05 V
Operating error (Room temperature) (The number of output voltages which are averaged is 100.)	±0.02%				
Operating error (Full temperature range) (The number of output voltages which are averaged is 100.)	±0.04%				
Linearity error (Room temperature)	±0.004%				
Linearity error (Full temperature range)	±0.004%				
Hardware resolution	16 bits				

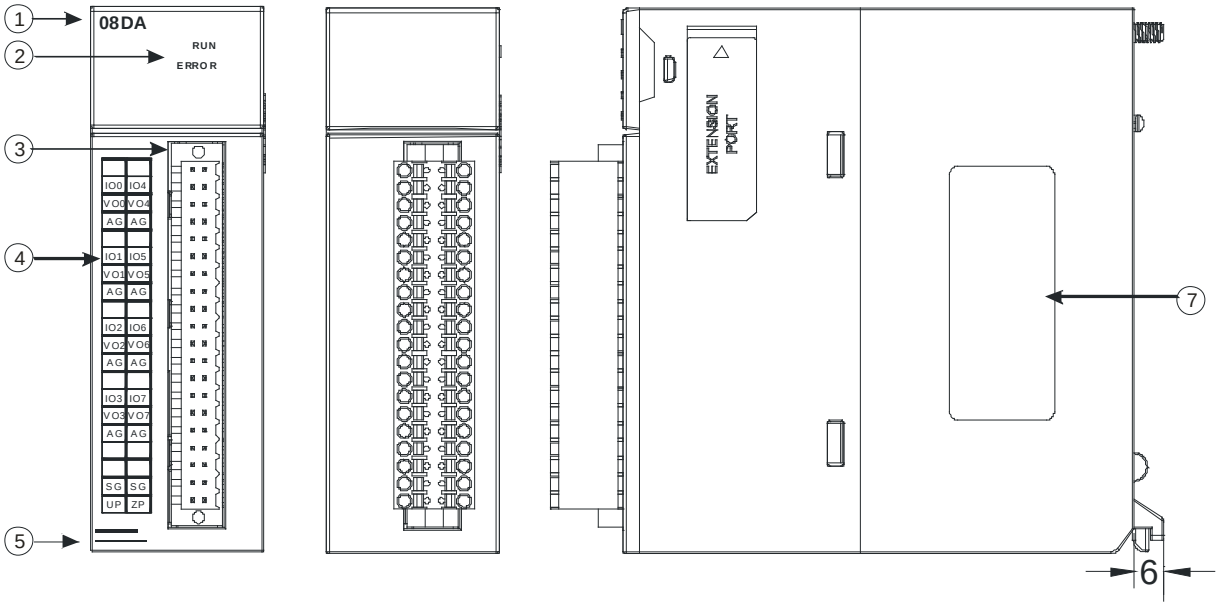
Permissible load impedance	1 kΩ~2 MΩ: ±10 V and 0 V~10 V ≧500 Ω: 1 V~5 V	
Digital-to-analog conversion	**Current output**	
Rated output range	0 mA~20 mA	4 mA~20 mA
Hardware output range	-0.2 mA~20.2 mA	3.8 mA~20.2 mA
Operating error (Room temperature) (The number of output currents which are averaged is 100.)	±0.06%	
Operating error (Full temperature range) (The number of output currents which are averaged is 100.)	±0.07%	
Linearity error (Room temperature)	±0.01%	
Linearity error (Full temperature range)	±0.01%	
Hardware resolution	16 bits	
Permissible load impedance	≦550 Ω	

3.7.2 Profiles and Dimensions

- **AH04AD-5A/AH08AD-5B/AH08AD-5C/AH04DA-5A/AH08DA-5B/AH08DA-5C/AH06XA-5A**



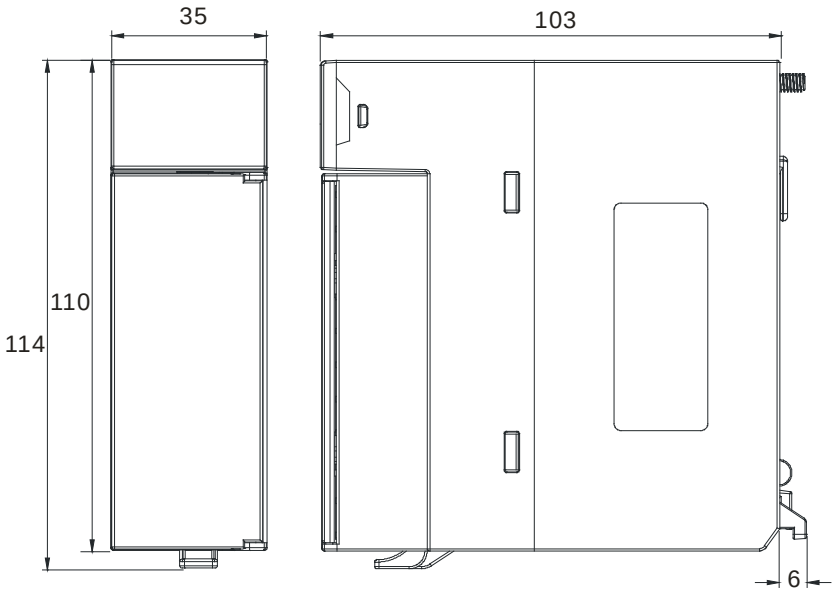
- **AH08AD-5A/AH08DA-5A**



Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator	Operating status of the module ON: The module is running. OFF: The module stops running.
	ERROR LED indicator	Error status of the module ON: A serious error occurs in the module. OFF: The module is normal. Blink: A slight error occurs in the module.
3	Removable terminal block	The inputs are connected to sensors. The outputs are connected to loads which will be driven.
4	Arrangement of the input/output terminals	Arrangement of the terminals
5	Description of the inputs/outputs	Simple specifications for the module
6	Clip	Removing the terminal block
7	Label	Nameplate
8	Set screw	Fixing the module
9	Connector	Connecting the module and a backplane
10	Projection	Fixing the module

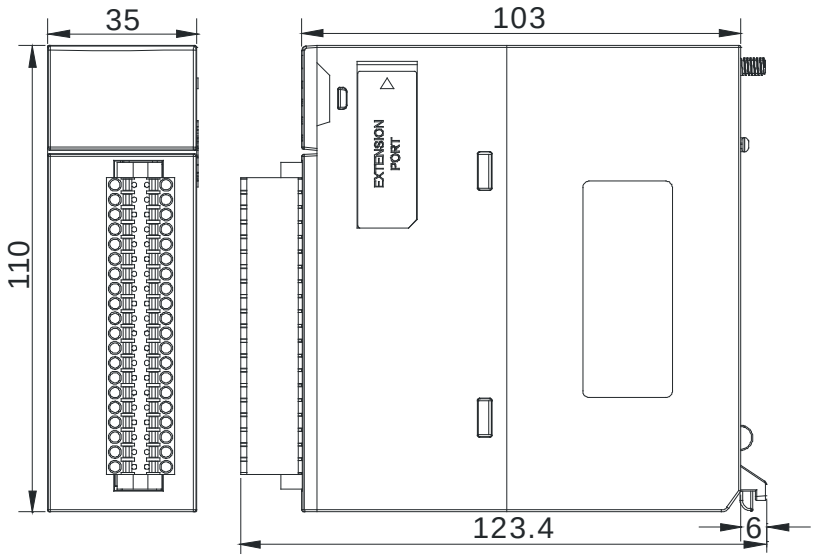
Dimensions:

AH04AD-5A/AH08AD-5B/AH08AD-5C/AH04DA-5A/AH08DA-5B/AH08DA-5C/AH06XA-5A



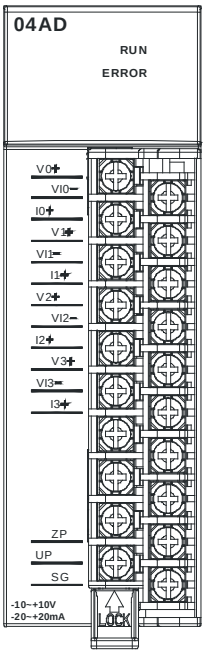
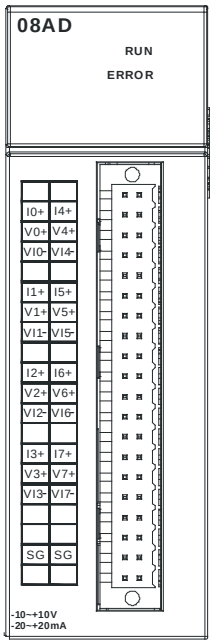
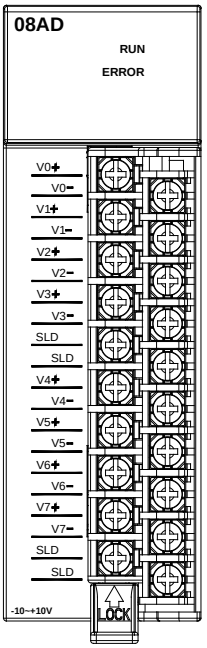
Dimensions are in mm.

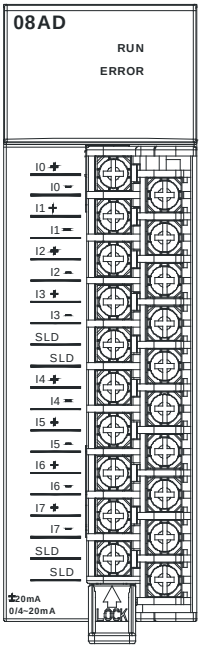
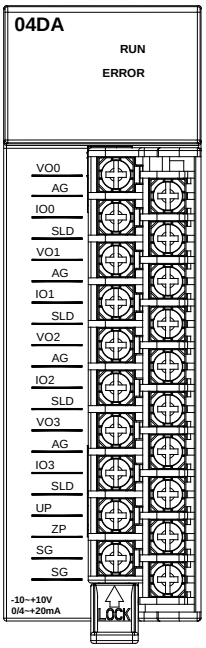
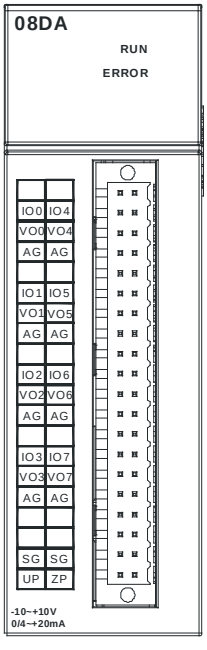
- **AH08AD-5A/AH08DA-5A**

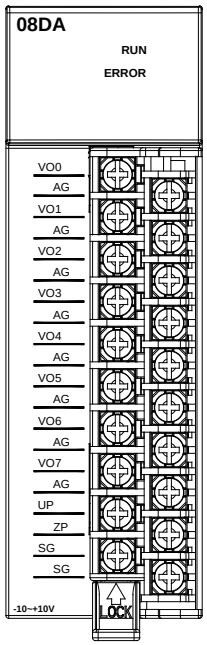
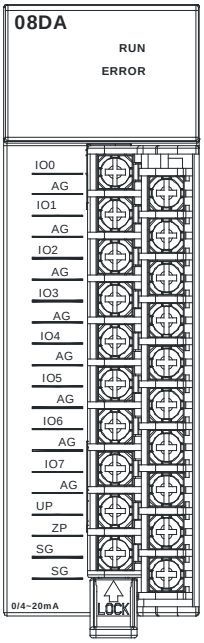
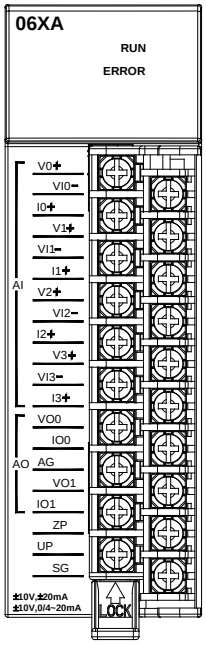


Dimensions are in mm.

3.7.3 Arrangement of Input/Output Terminals

AH04AD-5A	AH08AD-5A	AH08AD-5B
		

AH08AD-5C	AH04DA-5A	AH08DA-5A
		

AH08DA-5B	AH08DA-5C	AH06XA-5A
		

3.8 Temperature Measurement Modules

3.8.1 General Specifications

- **AH04PT-5A**

Electrical specifications

Number of analog inputs	4
Applicable sensor	Three-wire configuration: Pt100/Ni100/Pt1000/Ni1000 sensor, and 0~300 Ω input impedance Two-wire/Four-wire configuration: Pt100/Ni100/Pt1000/Ni1000 sensor, and 0~300 Ω input impedance Pt100: DIN 43760-1980 JIS C1604-1989; 100 Ω 3850 PPM/°C Pt1000: DIN EN60751; 1 kΩ 3850 PPM/°C Ni100/Ni1000: DIN 43760
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)
Connector type	Removable terminal block
Overall accuracy	25°C/77°F: The error is ±0.5% of the input within the range -20~60°C/-4~140°F: The error is ±1% of the input within the range
Conversion time	Two-wire/Four-wire configuration: 150 ms/channel Three-wire configuration: 300 ms/channel
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, and the analog channels are isolated from one another by optocouplers. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC

Functional specifications

Analog-to-digital conversion	Centigrade (°C)	Fahrenheit (°F)	Input impedance
Rated input range	Pt100: -180°C~800°C Ni100: -80°C~170°C Pt1000: -180°C~800°C Ni1000: -80°C~170°C	Pt100: -292°F~1,472°F Ni100: -112°F~338°F Pt1000: -292°F~1,472°F Ni1000: -112°F~338°F	0~300 Ω
Average function	Range: 1~100		
Self-diagnosis	Disconnection detection		

- **AH08PTG-5A**

Electrical specifications

Number of analog inputs	8
Applicable sensor	Three-wire configuration: Pt100/Ni100/Pt1000/Ni1000 sensor, and 0~300 Ω input impedance Two-wire/Four-wire configuration: Pt100/Ni100/Pt1000/Ni1000 sensor, and 0~300 Ω input

	impedance Pt100: DIN 43760-1980 JIS C1604-1989; 100 Ω 3850 PPM/°C Pt1000: DIN EN60751; 1 kΩ 3850 PPM/°C Ni100/Ni1000: DIN 43760
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)
Connector type	Removable terminal block
Overall accuracy	The error is ±1°C of a Pt100/Pt1000/Ni100/Ni1000 sensor's temperature. The error is ±0.1% of a resistance in the range of 0 Ω to 300 Ω.
Conversion time	● Quick mode: Four-wire/Two-wire configuration: 20 ms/channel Three-wire configuration: 200 ms/channel ● General mode: A conversion time will be gotten after the conversion time of the two channels in a group is added up. Four-wire/Two-wire configuration: 200 ms/channel Three-wire configuration: 400 ms/channel
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit, and the analog channels are isolated from one another by optocouplers. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between two group circuits: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC

3

Functional specifications

Analog-to-digital conversion	Centigrade (°C)	Fahrenheit (°F)	Input impedance
Rated input range	Pt100: -180°C~800°C Ni100: -80°C~170°C Pt1000: -180°C~800°C Ni1000: -80°C~170°C	Pt100: -292°F~1,472°F Ni100: -112°F~338°F Pt1000: -292°F~1,472°F Ni1000: -112°F~338°F	0~300 Ω
Average function	Range: 1~100		
Self-diagnosis	Disconnection detection		

- **AH04TC-5A/AH08TC-5A**

Electrical specifications

Module name	AH04TC-5A	AH08TC-5A
Number of analog inputs	4	8
Applicable sensor	Type J, type K, type R, type S, type T, type E, and type N thermocouples ±150 mV voltage inputs	
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)	
Connector type	Removable terminal block	
Overall accuracy	25°C/77°F: The error is ±0.5% of the input within the range -20~60°C/-4~140°F: The error is ±1% of the input within the range	

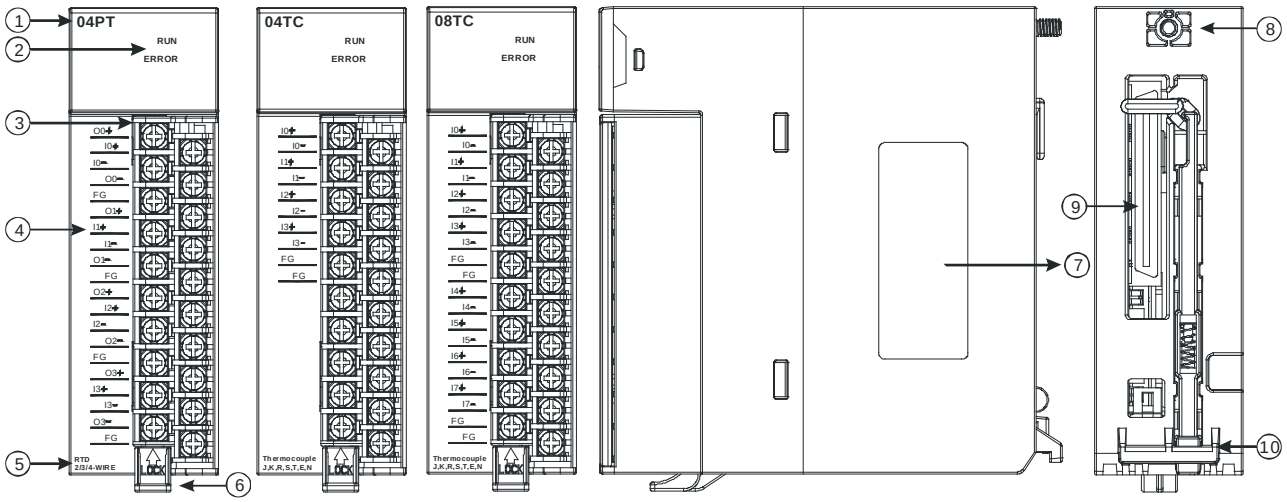
Conversion time	200 ms/channel
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, and the analog channels are isolated from one another by optocouplers. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC Isolation between analog channels: 120 VAC

Functional specifications

Analog-to-digital conversion	Centigrade (°C)	Fahrenheit (°F)	Voltage input
Rated input range	Type J: -100°C~1,150°C Type K: -100°C~1,350°C Type R: 0°C~1,750°C Type S: 0°C~1,750°C Type T: -150°C~390°C Type E: -150°C~980°C Type N: -150°C~1,280°C	Type J: -148°F~2,102°F Type K: -148°F~2,462°F Type R: 32°F~3,182°F Type S: 32°F~3,182°F Type T: -238°F~734°F Type E: -238°F~1,796°F Type N: -238°F~2,336°F	±150 mV
Average function	Range: 1~100		
Self-diagnosis	Disconnection detection		

3.8.2 Profiles and Dimensions

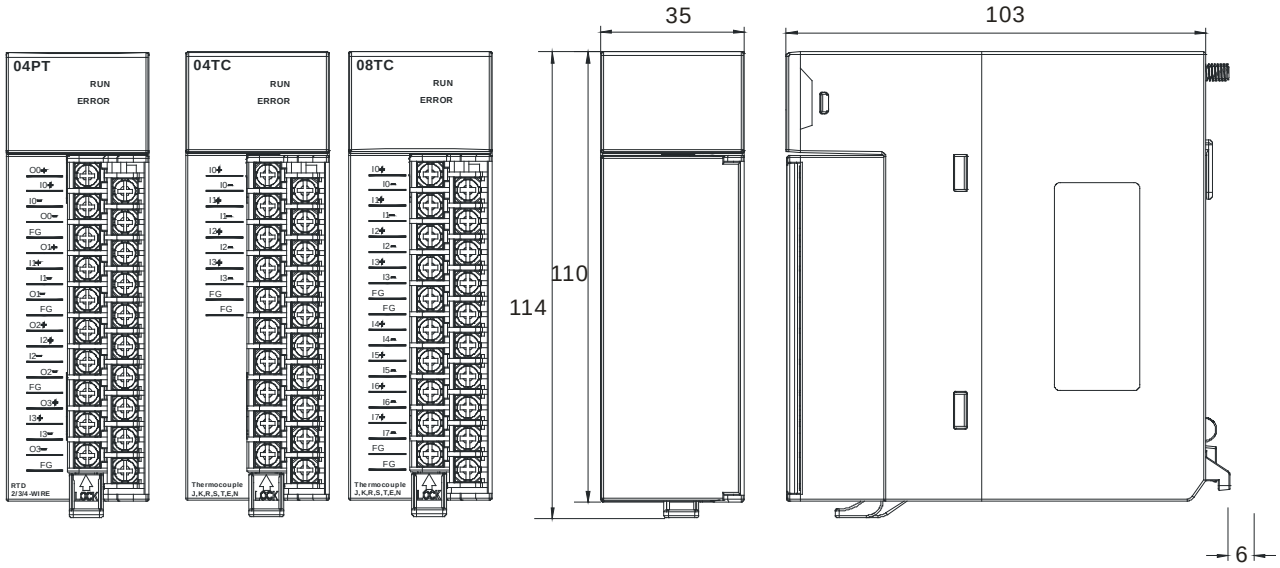
- **AH04PT-5A/AH04TC-5A/AH08TC-5A**



Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator	Operating status of the module ON: The module is running. OFF: The module stops running.

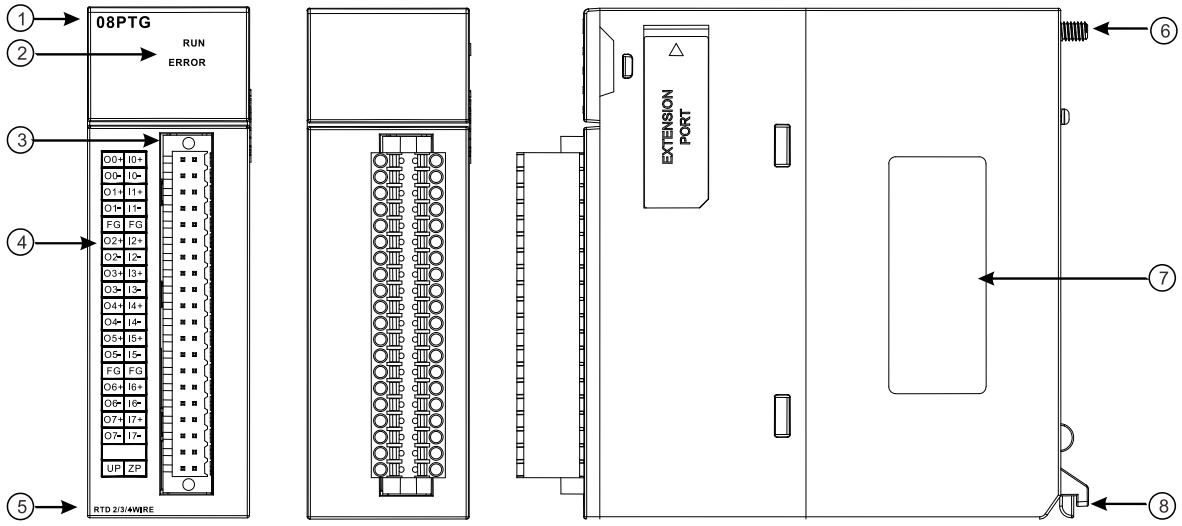
Number	Name	Description
2	ERROR LED indicator	Error status of the module ON: A serious error occurs in the module. OFF: The module is normal. Blink: A slight error occurs in the module.
3	Removable terminal block	The inputs are connected to a sensor.
4	Arrangement of the input terminals	Arrangement of the terminals
5	Description of the inputs	Simple specifications for the module
6	Clip	Removing the terminal block
7	Label	Nameplate
8	Set screw	Fixing the module
9	Connector	Connecting the module and a backplane
10	Projection	Fixing the module

Dimensions:



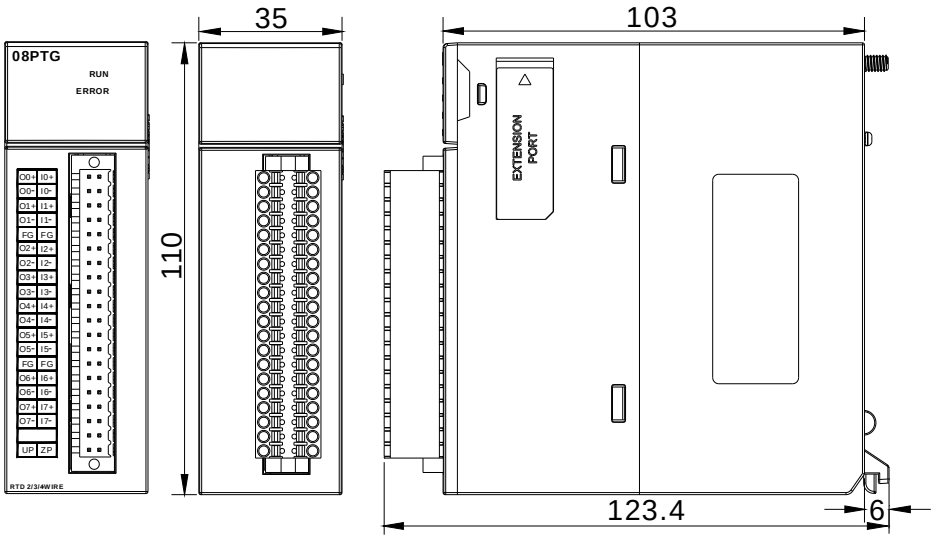
Dimensions are in mm.

- **AH08PTG-5A**



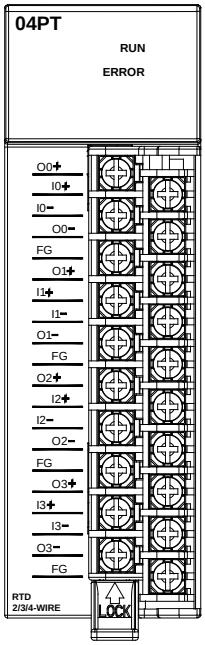
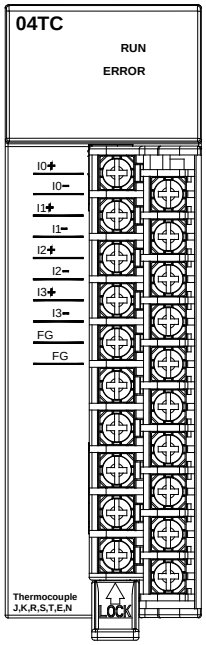
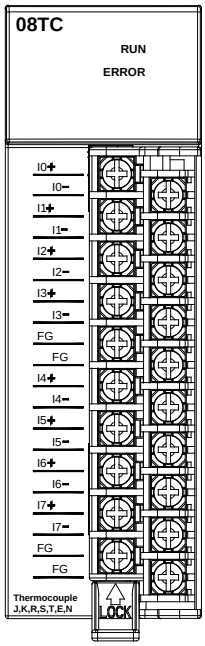
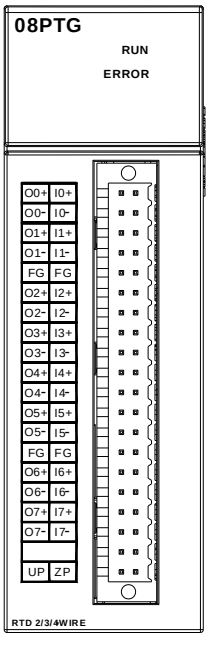
Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator	Operating status of the module ON: The module is running. OFF: The module stops running.
	ERROR LED indicator	Error status of the module ON: A serious error occurs in the module. OFF: The module is normal. Blinking: A slight error occurs in the module.
3	Removable terminal block	The inputs are connected to a sensor.
4	Arrangement of the input terminals	Arrangement of the terminals
5	Description of the inputs	Simple specifications for the module
6	Set screw	Fixing the module
7	Label	Nameplate
8	Projection	Fixing the module

Dimensions:



Dimensions are in mm.

3.8.3 Arrangement of Input/Output Terminals

AH04PT-5A	AH04TC-5A
	
AH08TC-5A	**AH08PTG-5A**
	

3.9 Network Modules

3.9.1 General Specifications

- **AH10SCM-5A**

RS-485/RS-422 communication interface

	Specifications
Connector type	European-style terminal block
Transmission speed	1,200, 2,400, 4,800, 9,600, 19,200, 38,400, 57,600, 76,800, 115,200, 230,400, and 460,800 bps
Communication format	Stop bit: 1 stop bit or 2 stop bits Parity bit: none, an odd parity bit, or an even parity bit Data bit: 7 data bits or 8 data bits
Communication protocol	MODBUS ASCII/RTU UD Link BACnet MS/TP slave stations

Electrical specifications

	Specifications
Supply voltage	5 VDC
Electric energy consumption	1.5 W
Insulation voltage	2,500 VDC
Weight	Approximately 131 g

- **AH10COPM-5A**

CANopen interface

	Specifications
Transmission method	CAN
Electrical isolation	500 VDC
Connector	Removable connector (5.08 mm)
Communication cable	It is suggested that you use the Delta standard cables TAP-CB01 and TAP-CB02. The communication cable used should be away from the power cable used, and the shielded cables used should be connected to the ground.

CANopen communication

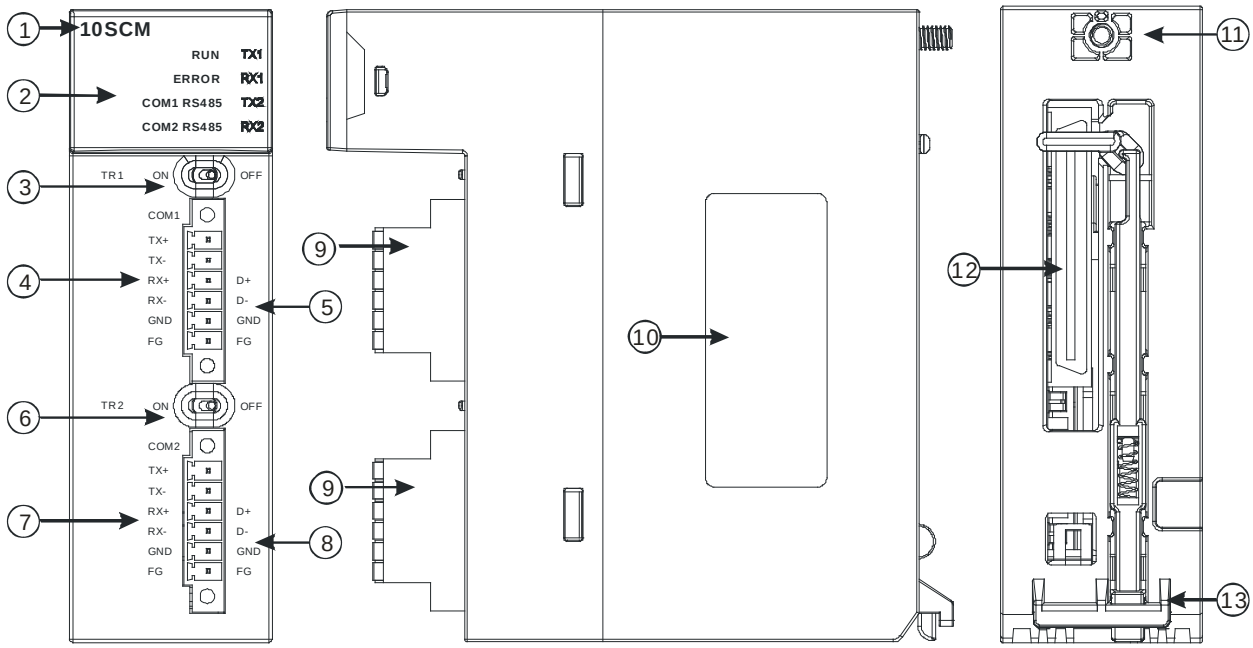
	Specifications
Message type	PDO, SDO, SYNC, EMCY, NMT
Transmission speed	10 kbps, 20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps, 1 Mbps

Electrical specifications

	Specifications
Supply voltage	A CPU module supplies 24 VDC (-15%~20%) power through an internal bus.
Electric energy consumption	1.7 W
Insulation voltage	500 V

3.9.2 Profiles and Dimensions

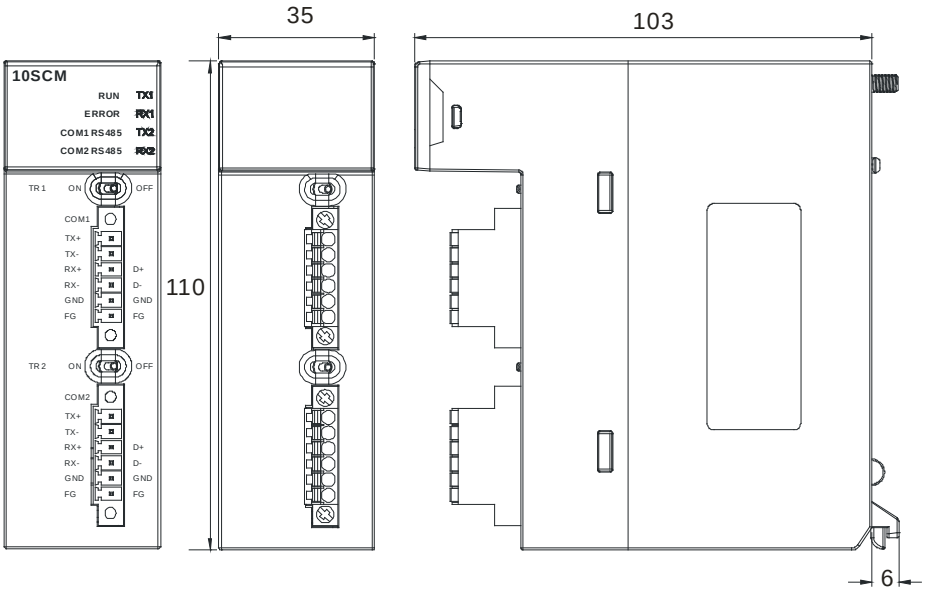
- **AH10SCM-5A**



Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
	ERROR LED indicator (red)	Error status of the module ON: There is a hardware error. OFF: The module is normal. Blinking: 1. The setting of the module is incorrect, or there is a communication error. 2. Restoring the module to the default factory value
	COM1 (RS-485) LED indicator (green)	ON: RS-485 mode OFF: RS-422 mode
	COM2 (RS-485) LED indicator (green)	ON: RS-485 mode OFF: RS-422 mode
	TX1/TX2 LED indicator (orange)	Blinking: The data is being transmitted through the RS-485/RS422 port. OFF: The data is not being transmitted through the RS-485/RS422

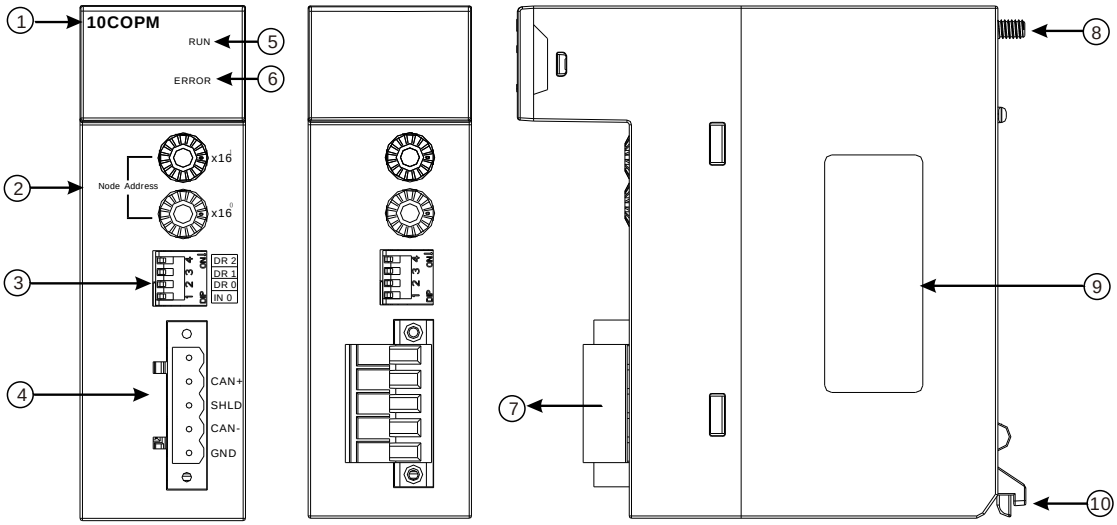
Number	Name	Description
		port.
	RX1/RX2 LED indicator (orange)	Blinking: The data is being reveived through the RS-485/RS422 port. OFF: The data is not being reveived through the RS-485/RS422 port.
3	Switch of terminal resistor 1	Switching terminal resistor 1 ON/OFF
4	Terminals	Terminals for COM1 (RS-422)
5	Terminals	Terminals for COM1 (RS-485)
6	Switch of terminal resistor 2	Switching terminal resistor 2 ON/OFF
7	Terminals	Terminals for COM2 (RS-422)
8	Terminals	Terminals for COM2 (RS-485)
9	European-style terminal block	Terminals for wiring
10	Label	Nameplate
11	Set screw	Fixing the module
12	Connector	Connecting the module and a backplane
13	Projection	Fixing the module

Dimensions:



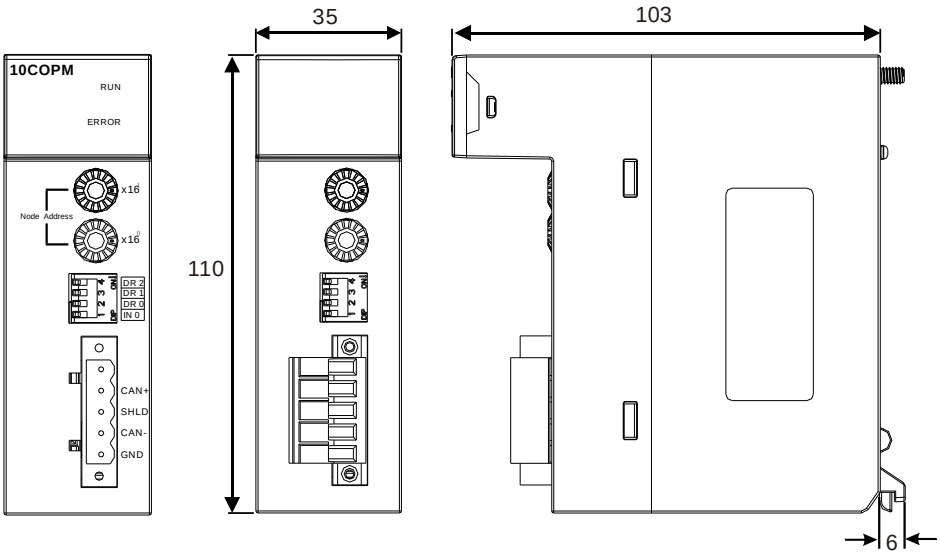
Dimensions are in mm.

- **AH10COPM-5A**



Number	Name	Description
1	Model name	Model name of the module
2	Address knobs	For setting an address
3	Function switch	For setting a function
4	CANopen connector	For a CANopen connection
5	RUN LED indicator	Operating status of the module
6	ERROR LED indicator	Error status of the module
7	Removable terminal block	Terminals
8	Set screw	Fixing the module
9	Label	Nameplate
10	Projection	Fixing the module

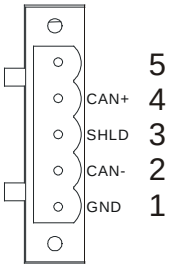
Dimensions:



■ **CANopen communication connector**

A CANopen connector is connected to a CANopen network. Please wire AH10COPM-5A by using the connector attached to AH10COPM-5A.

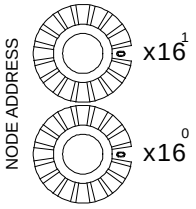
Pin	Signal	Description
5	-	Reserved
4	CAN+	CAN_H
3	SHLD	Shielded cable
2	CAN-	CAN_L
1	GND	0 VDC



■ **Address knobs**

The address knobs on AH10COPM-5A are used to set the node address of AH10COPM-5A on a CANopen network. Setting range: 1~7F (0 and 80~FF can not be used.)

Setting	Description
1~7F	Valid CANopen node address
0, 80~FF	Invalid CANopen node address



Example: If the station address of AH10COPM-5A is 16#26, you have to turn the knob corresponding to $x16^1$ to position 2, and turn the knob corresponding to $x16^0$ to position 6.

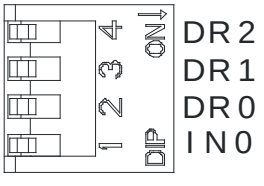
Points for attention:

1. After the station address of AH10COPM-5A is changed, you have to power AH10COPM-5A again, otherwise the change will not take effect.
2. To prevent the address knobs on AH10COPM-5A from being scratched, please carefully use a slotted screwdriver to rotate the address knobs on AH10COPM-5A.

■ **Function switch**

The function switch on AH10COPM-5A is used to set the communication speed at which AH10COPM-5A is connected to a CANopen network. There is a limit on the maximum communication distance to which a communication speed corresponds.

DR 2	DR 1	DR 0	Communication speed	Maximum communication distance
OFF	OFF	OFF	10 kbps	5000 m
OFF	OFF	ON	20 kbps	2500 m
OFF	ON	OFF	50 kbps	1000 m
OFF	ON	ON	125 kbps	500 m
ON	OFF	OFF	250 kbps	250 m
ON	OFF	ON	500 kbps	100 m
ON	ON	OFF	800 kbps	50 m
ON	ON	ON	1 Mbps	25 m

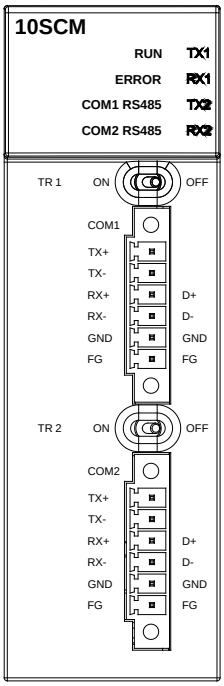
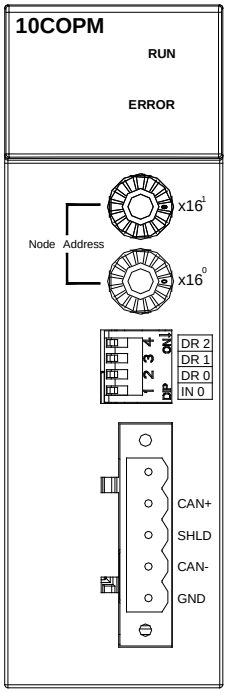


IN 0	Reserved	

Points for attention:

1. After you change the communication speed at which AH10COPM-5A is connected to a CANopen network, you have to power AH10COPM-5A again, otherwise the change will not take effect.
2. To prevent the DIP switch on AH10COPM-5A from being scratched, please carefully use a slotted screwdriver to rotate the DIP switch on AH10COPM-5A.

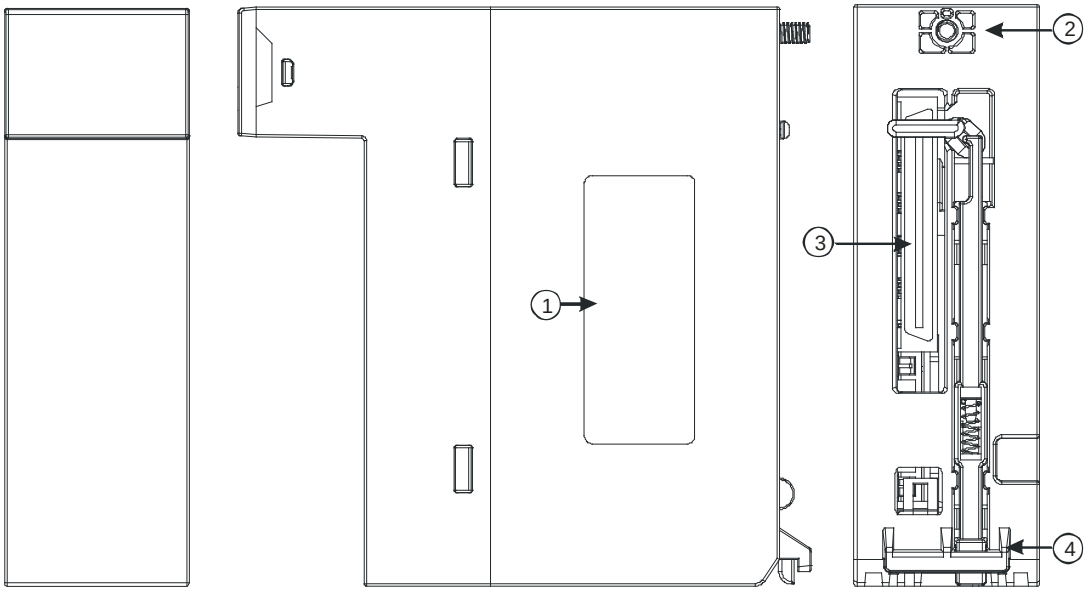
3.9.3 Arrangement of Input/Output Terminals

AH10SCM-5A	AH10COPM-5A
	

3.10 Dummy Module

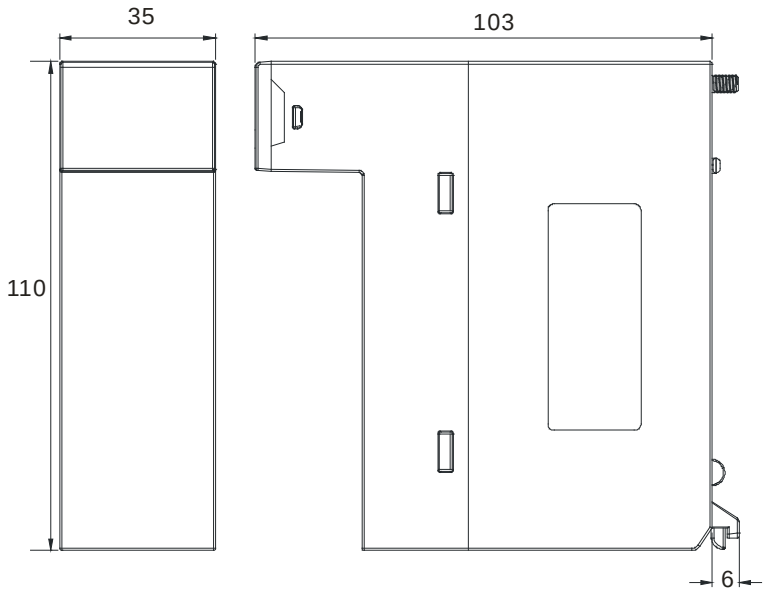
3.10.1 Profiles and Dimensions

- **Dummy module AHASP01-5A**



Number	Name	Description
1	Label	Nameplate
2	Set screw	Fixing the module
3	Connector	Connecting the module and a backplane
4	Projection	Fixing the module

Dimensions:



Dimensions are in mm.

4

Chapter 4 Installation and Wiring

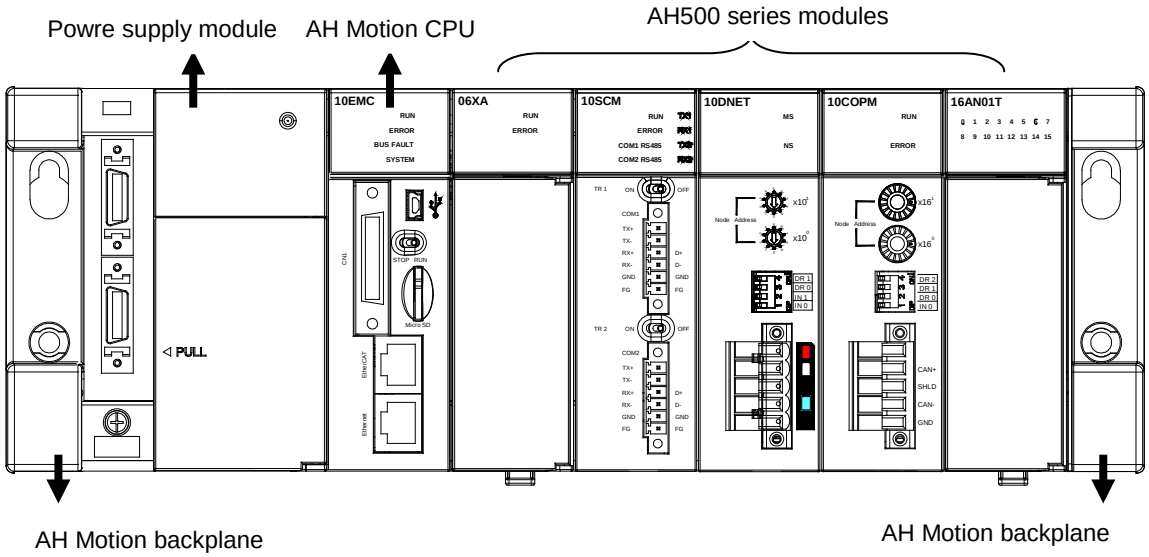
Table of Contents

4.1 Quick Review before Installation

Before you start the installation and wiring of AH Motion system, we suggest that you review your actual application and have a clear idea of the required components in your system. This section will give you a quick overview of the components in AH Motion CPU rack configuration. You can also refer to **CH2 System Configuration** for planning the system or **CH3 Product Specifications** for choosing proper products for your system.

4.1.1 AH Motion Hardware Components

A complete AH Motion CPU rack consists of a Motion backplane, a power supply module, a Motion CPU module, and additional AH500 series I/O modules as below.



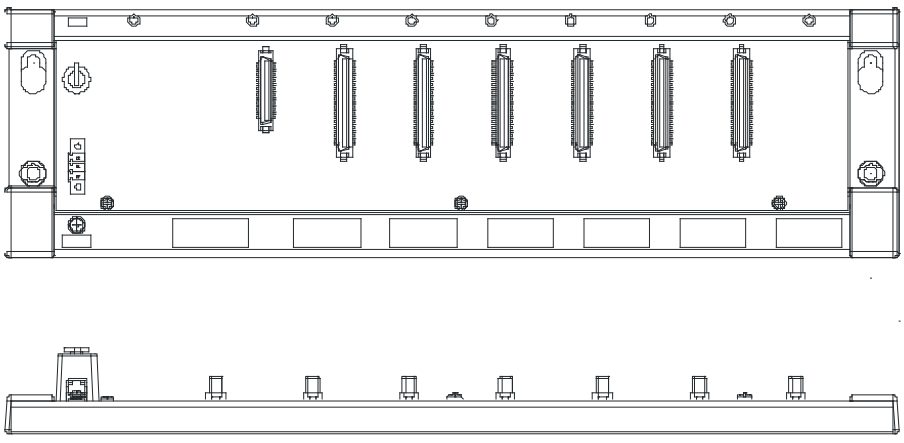
- **Basic Components**

  An AH Motion CPU rack consists of the following four basic components.

  - **Motion backplane**

    A Motion CPU module and other modules are installed on a Motion backplane which functions as the communication interface between CPU and modules. The Motion backplane also provides an additional COM port (RS-485).

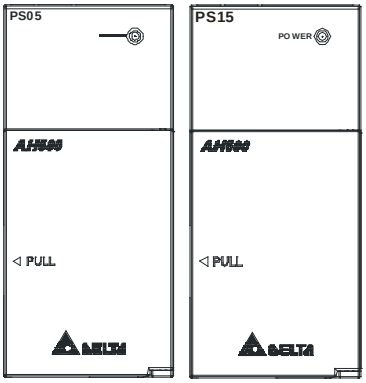
    AHBP05M2-5A: supporting up to 5 additional I/O modules



- **Power supply modules**

  A power supply module functions to convert alternating current to direct current, or directly provides direct current. It provides power for the modules installed on it. A Motion backplane must `be assigned a power supply module. A power supply module has to be installed on the left-most side of a backplane.

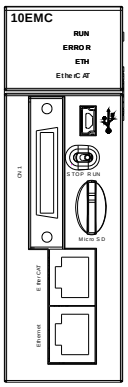
  AHPS05-5A **AHPS15-5A**



- **Motion CPU module**

  A Motion CPU module is the core of a complete AH Motion system. It is responsible for controlling and managing the whole system, and is installed in the second slot from the left on the Motion backplane.

  AHxxEMC-5A



- **Communication cables**

  Several communication interfaces are built in a Motion CPU module. You can select a suitable communication cable according to the required application.

  Refer to the following table for information about the communication interfaces and the main applications.

Interface	Connector	Application
EtherCAT	RJ45	Industrial network connecting EtherCAT slaves
EtherNet	RJ45	Computer/HMI communication/remote control/data exchange/industrial network
RS-232	Mini USB	Programming
RS-485	Terminal block	Programming

- **Additional Modules**

  In addition to the basic components, you can also expand the function by attaching I/O modules or function modules. The following are the applicable modules for an AH Motion CPU rack. You can select the proper products according to your needs.

  - **Motion control modules:**

AH02HC-5A	Two-channel high-speed counter module (200 kHz)
AH04HC-5A	Four-channel high-speed counter module (200 kHz)
AH05PM-5A	Two-axis pulse train motion control module (1 MHz)
AH10PM-5A	Six-axis pulse train motion control module (Four axes: 1 MHz; Two axes: 200 kHz)
AH15PM-5A	Four-axis pulse train motion control module (1 MHz)
AH20MC-5A	Twelve-axis DMCNET (Delta Motion Control Network) motion control module (10 Mbps)

  - **Digital input/output modules:**

AH16AM10N-5A	24 VDC, 5 mA, 16 inputs, Terminal block
AH32AM10N-5A	24 VDC, 5 mA, 32 inputs, Terminal block
AH32AM10N-5B	24 VDC, 5 mA, 32 inputs, DB37 connector
AH32AM10N-5C	24 VDC, 5 mA, 32 inputs, MIL connector
AH64AM10N-5C	24 VDC, 3.2 mA, 64 inputs, MIL connector
AH16AM30N-5A	100~240 VAC, 4.5 mA/9 mA (100 V, 50 Hz), 16 inputs, Terminal block
AH16AN01R-5A	240 VAC/24 VDC, 2 A, 16 outputs, Relay, Terminal block
AH16AN01T-5A	12~24 VDC, 0.5 A ,16 outputs, Sinking output(NPN), Terminal block
AH16AN01P-5A	12~24 VDC, 0.5 A, 16 outputs, Sourcing output(PNP), Terminal block
AH16AN01S-5A	110/220 VAC, 0.5 A, 16 outputs, TRIAC, Terminal block
AH32AN02T-5A	12~24 VDC, 0.1 A, 32 outputs, Sinking output(NPN), Terminal block
AH32AN02T-5B	12~24 VDC, 0.1 A, 32 outputs, Sinking output(NPN), DB37 connector
AH32AN02T-5C	12~24 VDC, 0.1 A, 32 outputs, Sinking output(NPN), MIL connector
AH32AN02P-5A	12~24 VDC, 0.1 A, 32 outputs, Sourcing output(PNP), Terminal block
AH32AN02P-5B	12~24 VDC, 0.1 A, 32 outputs, Sourcing output(PNP), DB37 connector
AH32AN02P-5C	12~24 VDC, 0.1 A, 32 outputs, Sourcing output(PNP), MIL connector
AH64AN02T-5C	12~24 VDC, 0.1 A, 64 outputs, Sinking output(NPN), MIL connector
AH64AN02P-5C	12~24 VDC, 0.1 A, 64 outputs, Sourcing output(PNP), MIL connector
AH16AP11R-5A	24 VDC, 5 mA, 8 inputs ,240 VAC/24 VDC, 2 A, 8 outputs, Relay ,Terminal block
AH16AP11T-5A	24 VDC, 5 mA, 8 inputs, 12~24 VDC, 0.5 A, 8 output, Sinking output(NPN), Terminal block
AH16AP11P-5A	24 VDC, 5 mA, 8 inputs, 12~24 VDC, 0.5 A, 8 outputs, Sourcing output(PNP), Terminal block

  - **Analog input/output modules:**

AH04AD-5A	Four-channel analog input module 16-bit resolution

	-10~+10 V, 0~10 V, -5~+5 V, 0/1~5 V, 0/4~20 mA, or -20~+20 mA
AH08AD-5A	Eight-channel analog input module 16-bit resolution -10~+10 V, 0~10 V, -5~+5 V, 0/1~5 V, 0/4~20 mA, or -20~+20 mA
AH08AD-5B	Eight-channel analog input module 16-bit resolution -10~+10 V, 0~10 V, -5~+5 V, 0/1~5 V
AH08AD-5C	Eight-channel analog input module 16-bit resolution 0/4~20 mA or -20~+20 mA
AH04DA-5A	Four-channel analog output module 16-bit resolution -10~+10 V, 0~10 V, -5~+5 V, 0/1~5 V, or 0/4~20 mA
AH08DA-5A	Eight-channel analog output module 16-bit resolution -10~+10 V, 0~10 V, -5~+5 V, 0/1~5 V, or 0/4~20 mA
AH08DA-5B	Eight-channel analog output module 16-bit resolution -10~+10 V, 0~10 V, -5~+5 V, or 0/1~5 V
AH08DA-5C	Eight-channel analog output module 16-bit resolution 0/4~20 mA
AH06XA-5A	Four-channel analog input and two-channel analog output module 16-bit resolution Analog input: -10~+10 V, 0~10 V, -5~+5 V, 0/1~5 V, 0/4~20 mA, or -20~+20 mA Analog output: -10~+10 V, 0~10 V, -5~+5 V, 0/1~5 V, or 0/4~20 mA

- **Temperature measurement modules:**

AH04PT-5A	Four-channel four-wire/three-wire RTD Sensor type: Pt100, Pt1000, Ni100, Ni1000, or 0~300 Ω input impedance
AH08PTG-5A	Eight-channel four-wire/three-wire/two-wire RTD Sensor type: Pt100, Pt1000, Ni100, Ni1000, or 0~300 Ω input impedance
AH04TC-5A	Four-channel thermocouple Sensor type: J, K, R, S, T, E, N, or -150~+150 mV
AH08TC-5A	Eight-channel thermocouple Sensor type: J, K, R, S, T, E, N, or -150~+150 mV

- **Network modules:**

AH10SCM-5A	Serial communication module with two RS-485/RS-422 ports, and supports MODBUS and UD Link protocols. One part of communication is isolated from the other part of the communication, and one part of power is isolated from the other part of the power.
AH10COPM-5A	CANopen communication module. It can function as a master or a slave.

- **Dummy module:**

AHASP01-5A	Dummy module used for an empty I/O slot

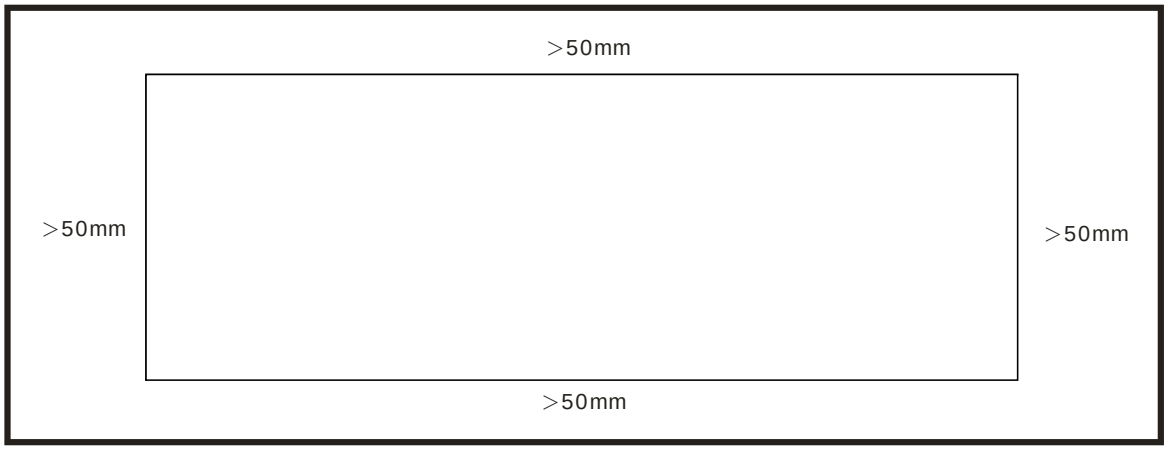
4.2 Points to Note on Installation

- An AH Motion system only supports the horizontal installation, and a power supply module has to be installed on the left-most side of a backplane.
- Product dimensions (modules, backplanes, cables and more) should be confirmed when making an installation layout. To obtain sufficient installation space, you should also save proper wiring space for connectors, cables and other instruments.
- Make sure that the work environment conforms to the specifications for the products. It is necessary to take account of the basic temperature/humidity control and the dust/corrosion prevention.
- The electromagnetic interference will result in the wrong action of the whole system. Therefore, you have to do EMC design carefully. Refer to **Appendices** in this manual for more information related to EMC standards.
- If the specifications for the components such as screws and washers are noted specifically in the manual, use the components conforming to the specifications.
- If a cable is connected to a communication port, make sure that the connector of the cable is joined to the port on the module properly.
- A backplane has to be mounted on a plane stably instead of being just set on the plane. After it is installed, make sure that it is fixed on the plane.

4.3 Installation

4.3.1 CPU Rack Installation in a Control Panel

The motion controller has to be installed in a closed control box. In order to ensure that the PLC disapates heat properly, the space between the motion controller and the control box has to be larger than 50 millimeters.



- Keep the motion controller away from high-voltage equipment, high-voltage wires, and high-voltage motors.
- In order to prevent the temperature of a motion controller from rising, do not install the motion controller vertically on the bottom/top in the control box.
- Install a motion controller horizontally in the control box, as shown above.
- If you intend to increase the number of modules, you have to leave some space for installing the modules in the control box.

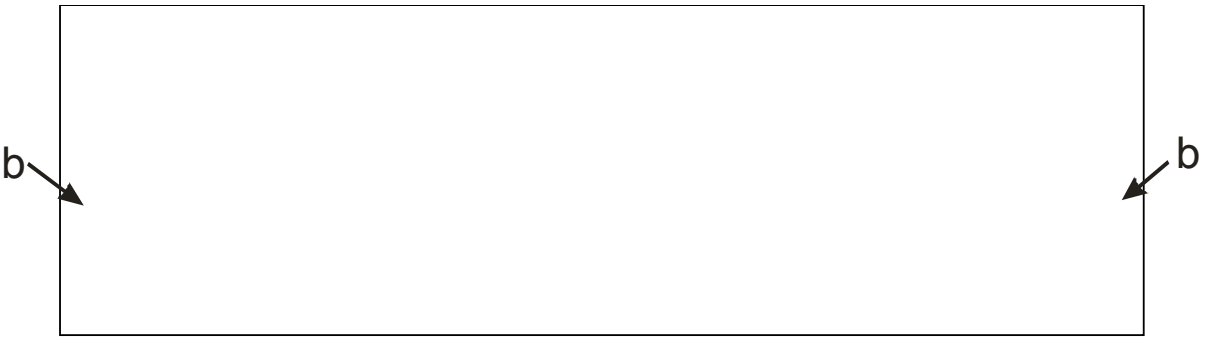
4.3.2 Mounting a Backplane

- **Fixing a backplane by screws**

Mount the backplane on a plane by means of M5 screws, as illustrated below. To fix the backplane, you need to evaluate the length of a screw, the size of a thread, and whether to use a nut according to the actual condition of the plane unless there are specific specifications for a screw which are indicated in the pictures below.

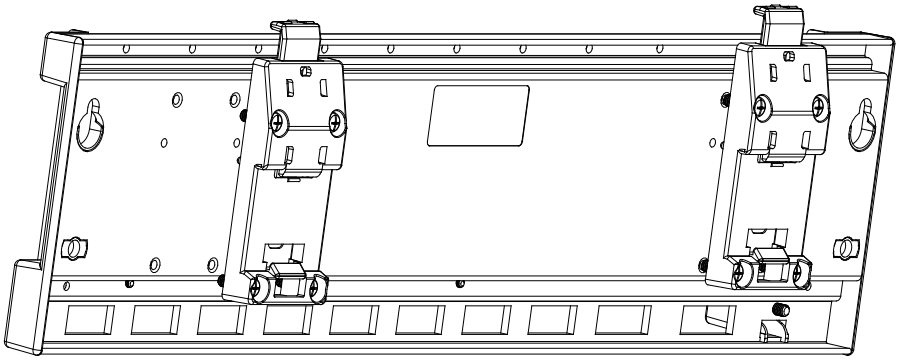
1. Tighten the M5 screws in the holes indicated by **a**.

2. Tighten the two screws in the holes indicated by **b**.



- **Installing a DIN rail**

1. The installation is applicable to a 35 millimeter DIN rail.
2. Install the mounting clips on a backplane.

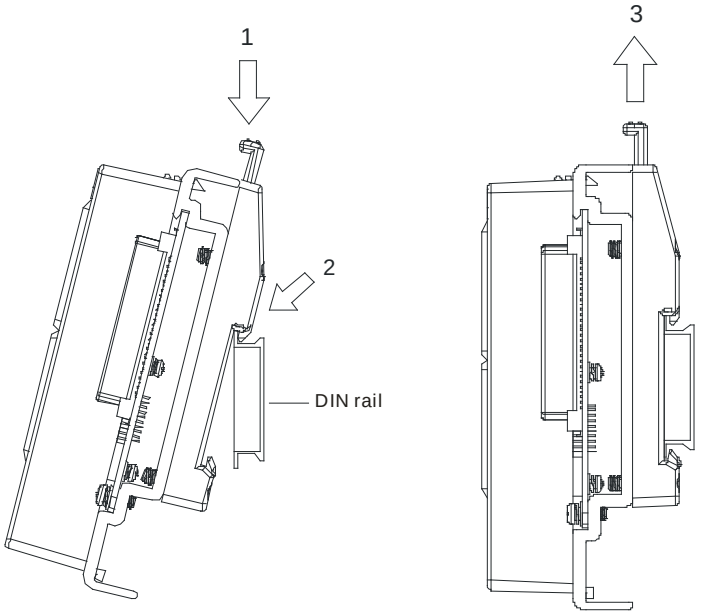


3. Install the backplane on a DIN rail.

   Step 1: Press the hook in the direction indicated by the arrow.

   Step 2: Mount the DIN rail clips onto a DIN rail.

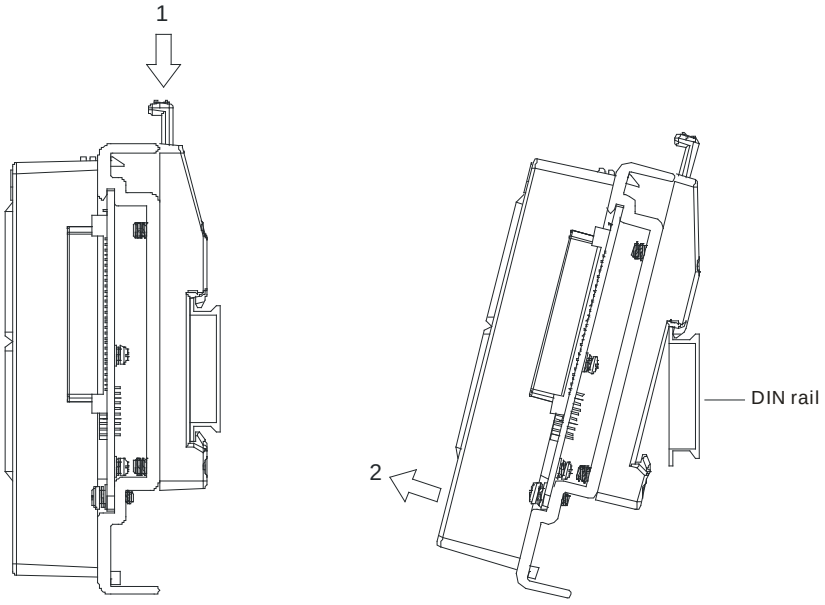
   Step 3: Pull the hook to fix the clips and the DIN rail.



- **Removing a DIN rail**

  Step 1: Press the hook in the direction indicated by the arrow.

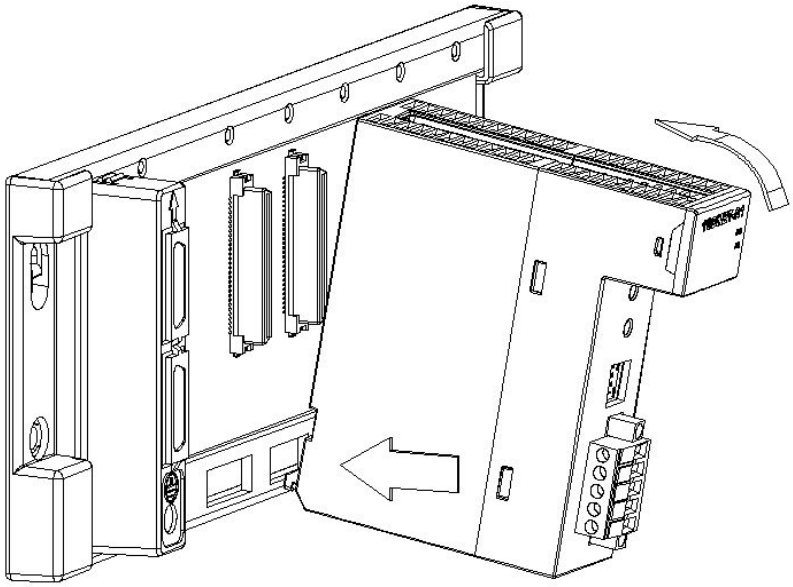
  Step 2: Remove the backplane.



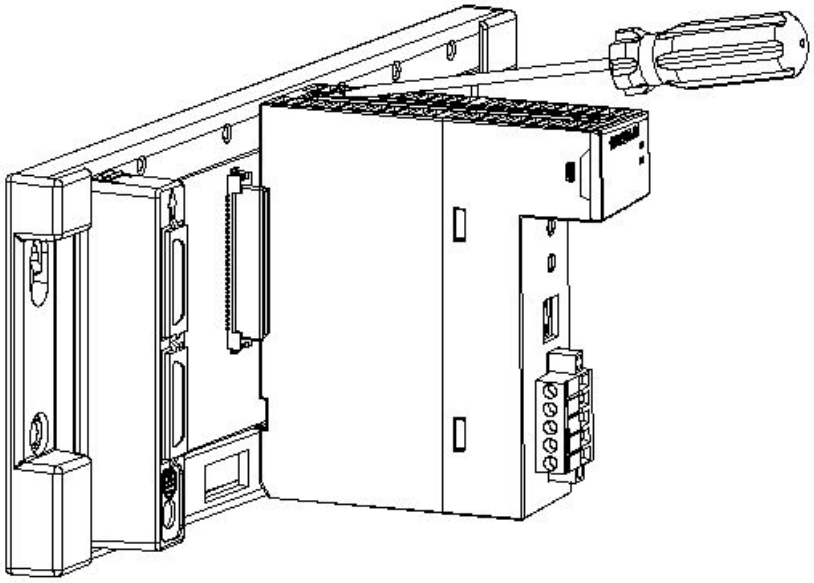
4.3.3 Installing a Module

Insert a module into a slot, make sure that the module is installed on the backplane properly, and tighen the the screw, as illustrated below.

1. Insert the hook under the module into the hole in the backplane.
2. Push the module in the direction indicated by the arrow until it clicks.



3. Tighten the screw on the module.

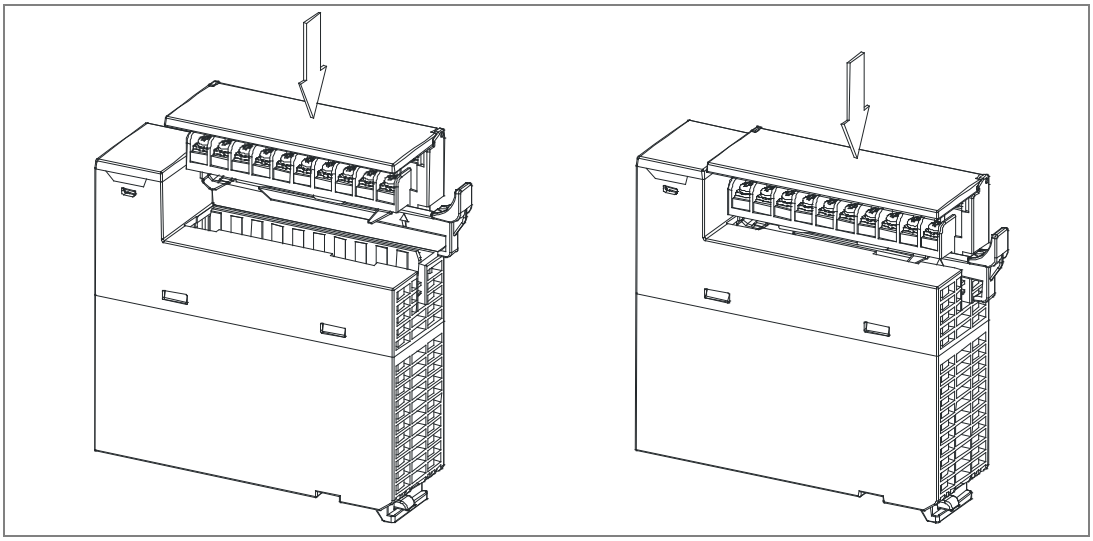


4.3.4 Installing a Removable Terminal Block

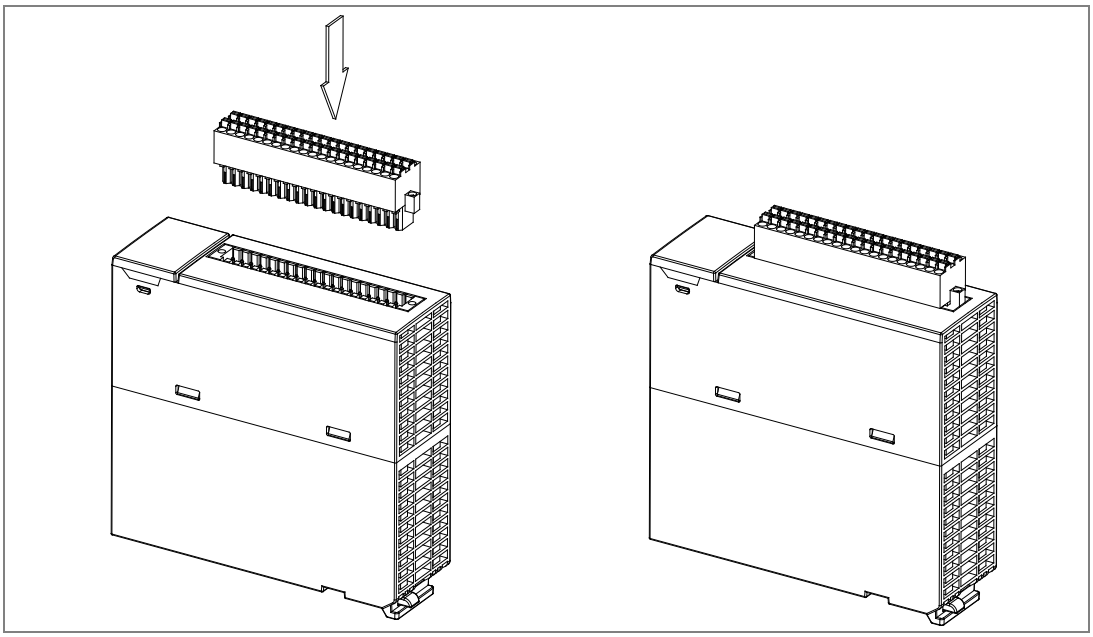
- **Installation**

1. Align a terminal block with the printed circuit board, and press it into the module.

Type 1

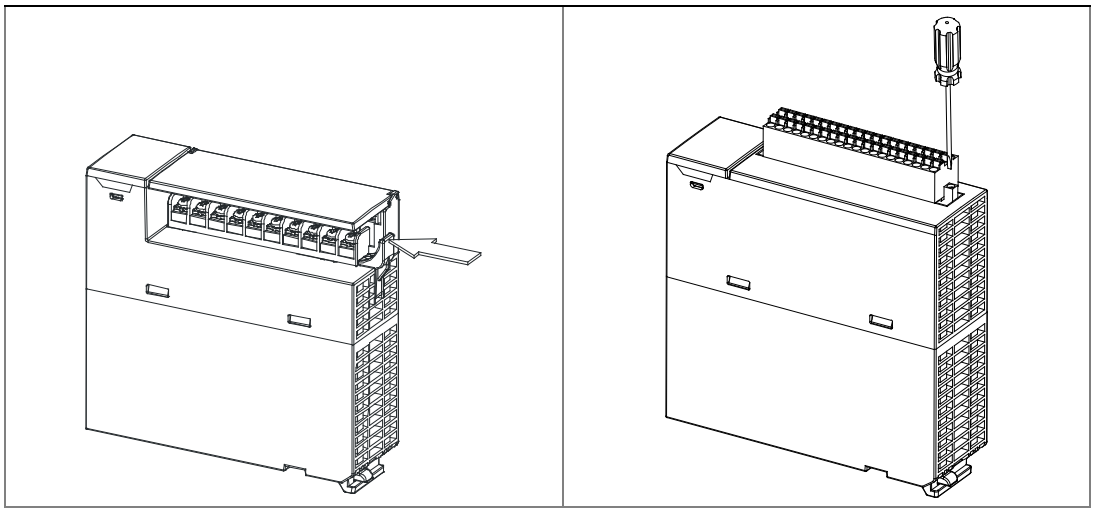


Type 2



2. Press the clip in the direction indicated by the arrow. For high-definition terminals(Type 2), a flat head screw driver is required to fasten the screws on both ends.

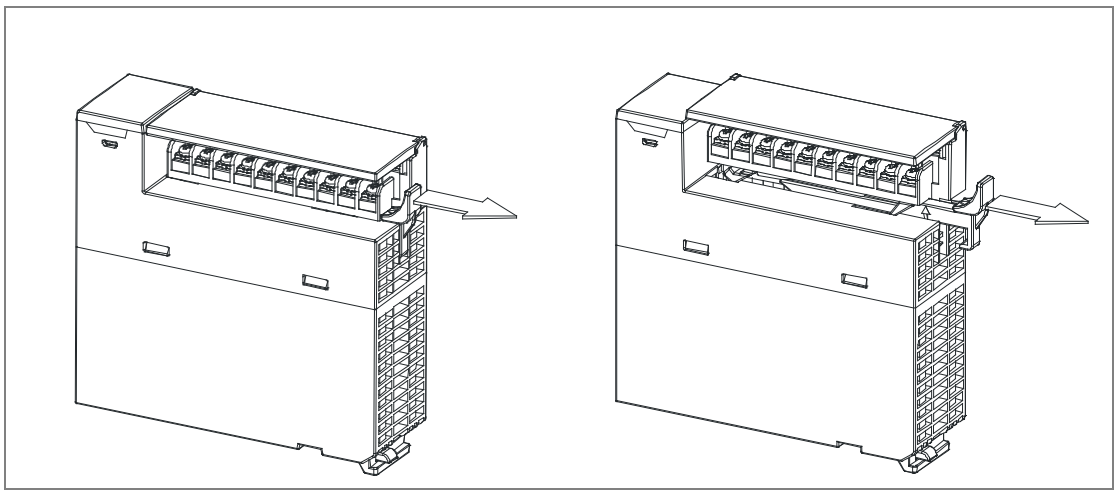
Type 1 **Type 2**



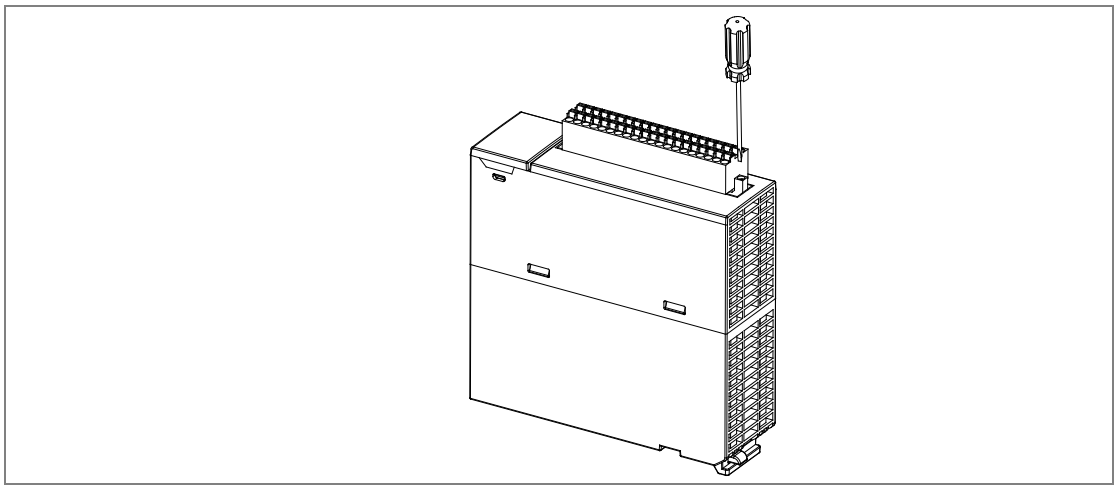
- **Removal**

1. Pull the clip in the direction indicated by the arrow. For high-definition terminals(Type 2), a flat head screw driver is required to loose the screws on both ends.

Type 1

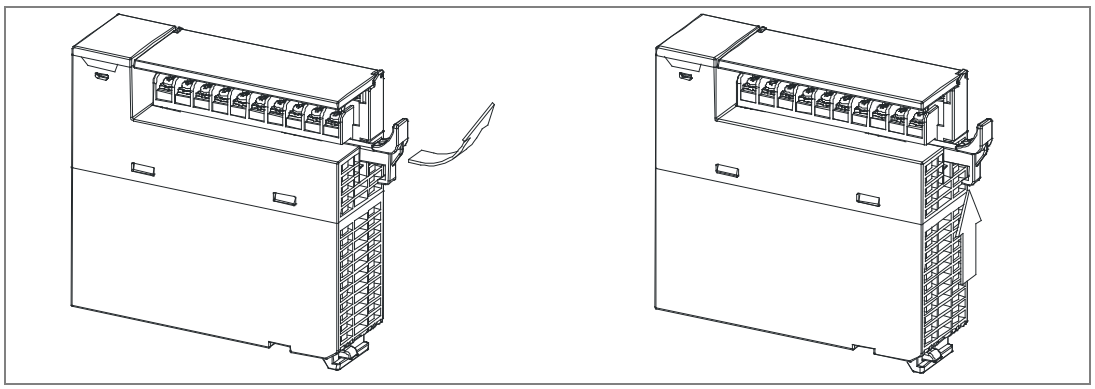


Type 2

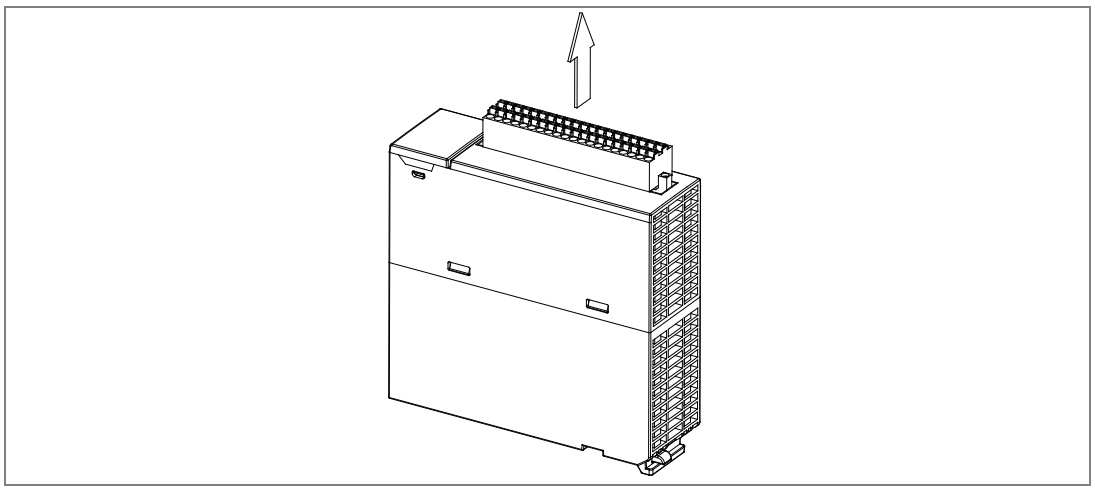


2. Pull up the clip. High-definition terminals(Type 2) can be pull out directly.

Type 1

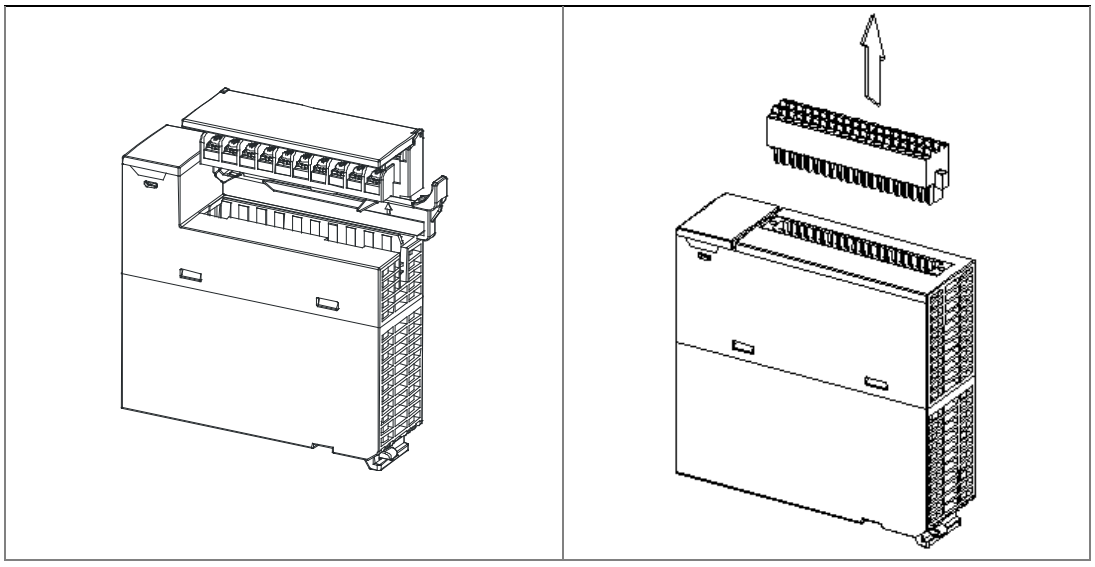


Type 2



3. The terminal block is removed.

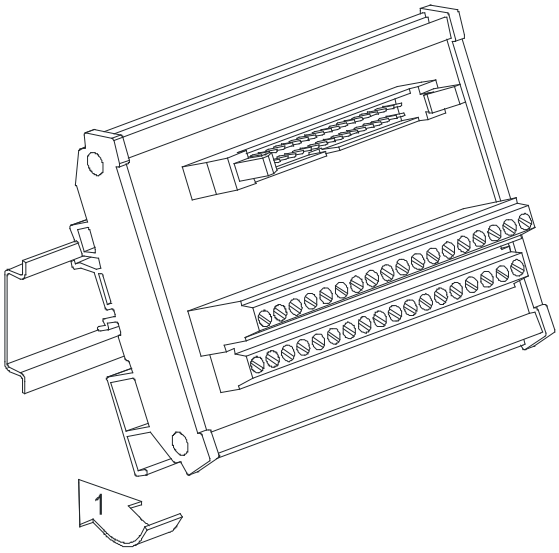
Type 1 **Type 2**



4.3.5 Installing an External Terminal Module

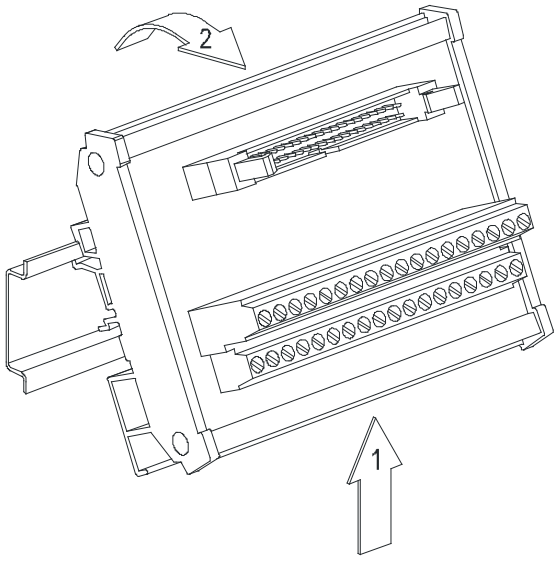
- **Installation**

  1. One side of an external terminal module has to be fixed first.
  2. Press the terminal module in the direction indicated by arrow 1, and make sure that the groove is combined with the DIN rail.



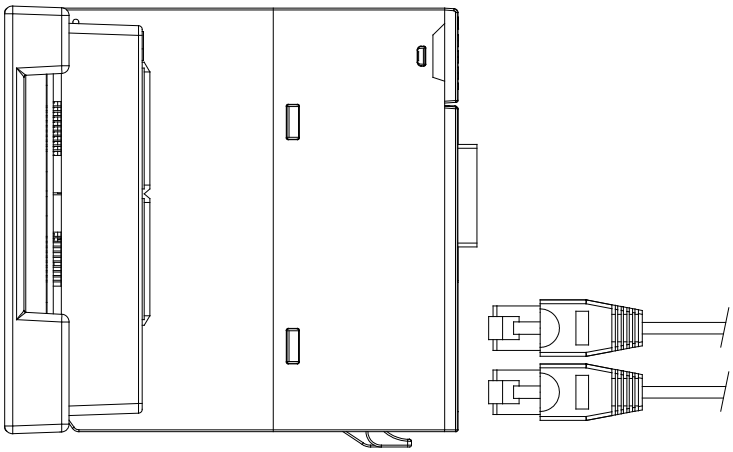
- **Removal**

  1. Push the terminal module in the direction indicated by arrow 1.
  2. Pull the terminal module in the direction indicated by arrow 2.



4.3.6 Connecting Communication Cables

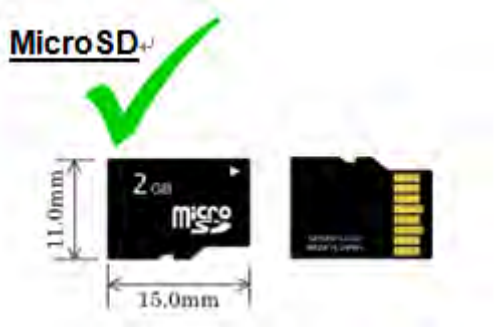
Plug a communication cable in the port on a Motion CPU module, and make sure that the connector of the cable is joined to the port properly. RS-232 (USB), RS-485 (terminals on the backplane), CN1 and RJ45 cables could be used.



4.3.7 Installing and Removing a Memory Card

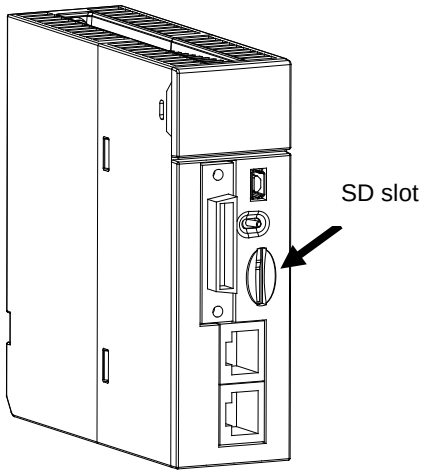
- **Formatting of a Memory Card**

  A memory card needs to be formatted before the first use on an AH Motion CPU module. Make sure the file system you use on formatting the SD card is FAT32.



- **SD Slot on a Motion CPU**

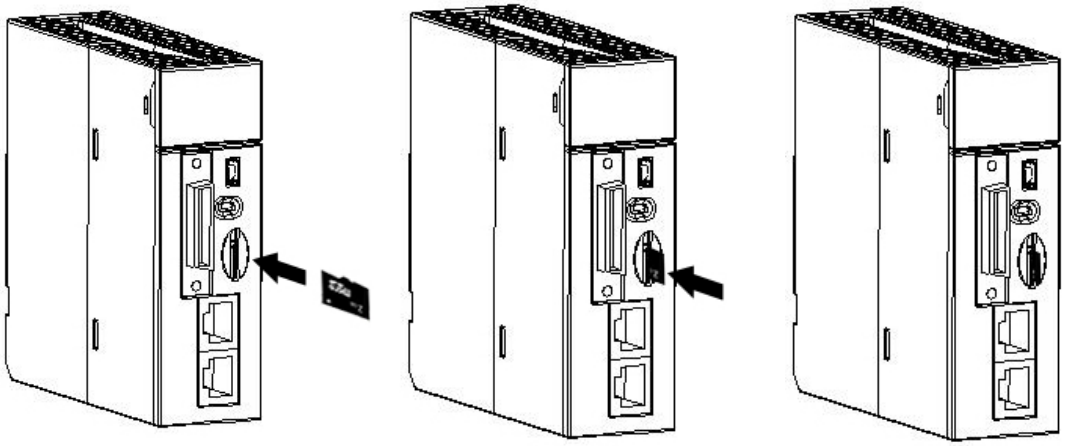
  As shown below, the SD slot is in the middle of the front of a Motion CPU module.



- **Installing a Memory Card**

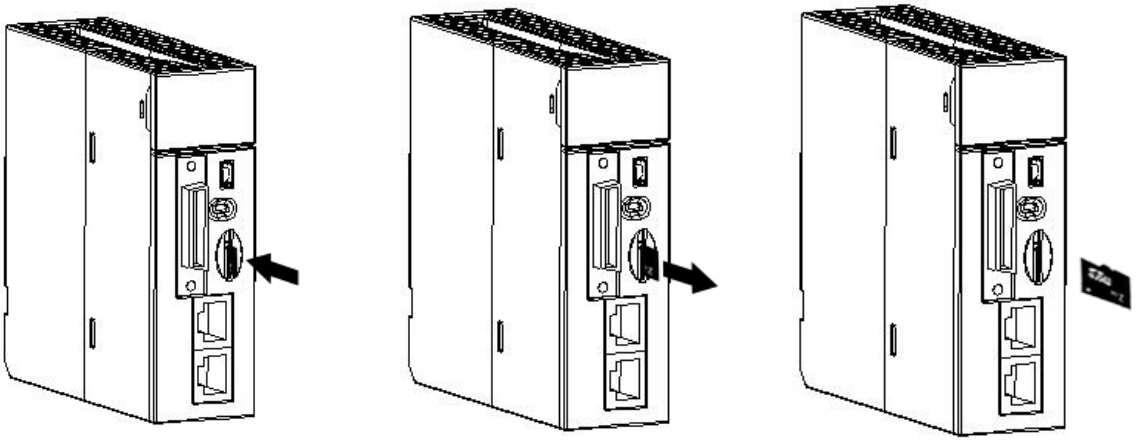
  Insert a memory card into the SD slot in a Motion CPU module, and push it downward until it clicks. After the memory card is installed, it is fixed firmly in the slot. If the memory card is loose, it is not installed correctly. Besides, the

memory card has mistake-proofing design. If it is inserted in the wrong direction, it can not be pushed downward. This is to prevent the CPU module from being damaged. The correct way to insert the memory card is shown below.



- **Removing a Memory Card**

After a memory card is pushed downward, it springs from the slot, and you can take it out.



4.4 Points to Note about Wiring

- **Points for attention**

DANGER	● Before installing or wiring a module, you need to make sure that the external power supply is turned off. If the power supply is not turned off, you may get an electric shock, or the product may be damaged. ● If the installation of the module or the wiring of the module is complete, you need to make sure that a terminal block cover is installed on the module before you turn on the power supply or operate the module. If the terminal block cover is not installed properly, you may get an electric shock, or the module may not operate normally.
WARNING	● Be sure to connect the terminals FG and LG with protective grounding conductors. Otherwise, users may get an electric shock, or the module may not operate normally. ● To ensure that a PLC is wired correctly, users need to check the rated voltage of the product, and the arrangement of the terminals. If the PLC is connected to the power supply which does not conform to the rated voltage, or the product is not wired correctly, a fire accident will occur, or the product will be damaged. ● The external connections should be crimped or press-welded by specific tools, or soldered correctly.

	The improper connections will result in a short circuit, a fire accident, or erroneous operation. ● Tighten the terminal screws with the specified torque. If the terminal screws are loose, a short circuit, a fire accident, or erroneous operation will occur. Tightening the terminal screws too far, may cause damage to the terminal screws and the module, resulting in a short circuit or a malfunction. ● Make sure that there are no foreign substances such as iron filings or wiring debris inside the module. Theses foreign substances may result in a fire accident, damage, or erroneous operation.

- **Wiring an I/O module**

(1) Definition of 2/3/4-wire connection:

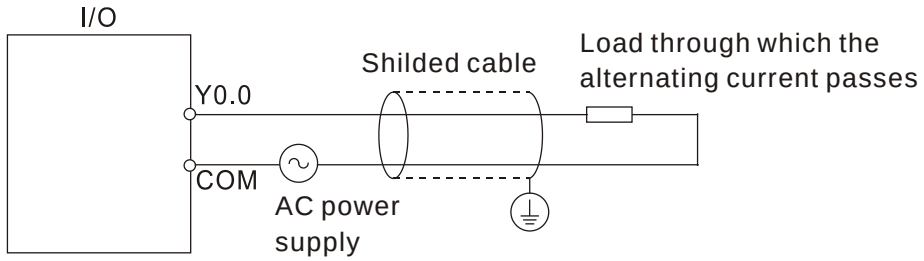
- 2/3-wire connection(passive sensors): share the power circuit with the system
- 4-wire connection(active sensors): independently powered. Not recommended to share the same power circuit with the system

(2) Terminals with insulation sleeves can not be arranged as a terminal block. It is recommended that the terminals be covered with insulation tubes.

(3) Please use single-core cables or twin-core cables. The diameters of the cables used should be in the range of 12 AWG to 22 AWG. The torques applied to the screw terminals should be in the range of 5 kg-cm (4.3 lb-in) to 8 kg-cm (6.9 lb-in). Please use copper conducting wires. The temperature of the copper conducting wires should be 60/75°C.

(4) Please keep the input cables, the output cables, and the power cable separate form one another.

(5) If the main circuit and the power cable can not be separated from each other, please use a shielded cable, and ground it at the side of the I/O module. In some cases, the shielded cable is grounded at the opposite side.



(6) If you wire a module by means of piping, you need to ground the piping correctly.

(7) Please keep 24 VDC input cables separate from 110 VAC input cables and 220VDC input cables.

(8) If the wiring length is more than 200 meters (686.67 inches), the leakage current will result from parasitic capacitance, and the system will break down.

- **Grounding a cable**

Please ground a cable according to the steps below.

(1) Please ground a cable correctly.

(2) The area of the cross-section of the cable which is grounded should be 2 mm^2 or larger than 2 mm^2.

(3) The ground point should be near the PLC. Ground the cable properly.

Note

(1) The 110 V/220 V power cable and the 24 VDC power cable should be thick cables. (The area of the cross-section of the cable is 2 mm^2, and the diameter of the cable is 14 AWG.) Be sure to twist the power cables at terminal screws. To prevent the short circuit which results from loose screws, you need to use solderless terminals with insulation sleeves.

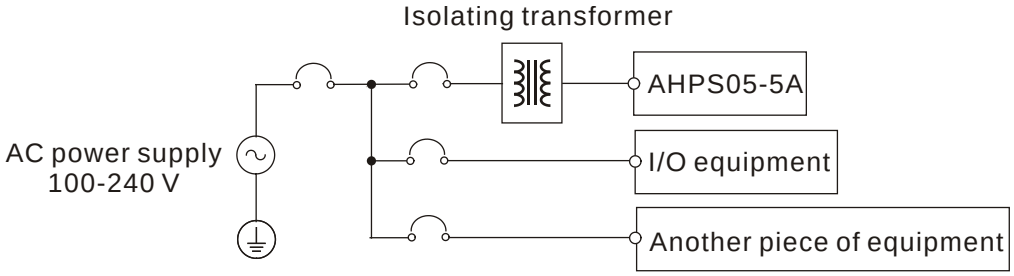
(2) If cables are connected to the terminals LG and FG, the cables need to be grounded. Do not connect LG and FG to any devices. If LG and FG are not grounded, the PLC will be susceptible to noise. Since LG have potential, you will get an electric shock if you touch metal parts.

4.5 Wiring Power Supply Modules

4.5.1 Precautions

- **Connecting AC power cables**

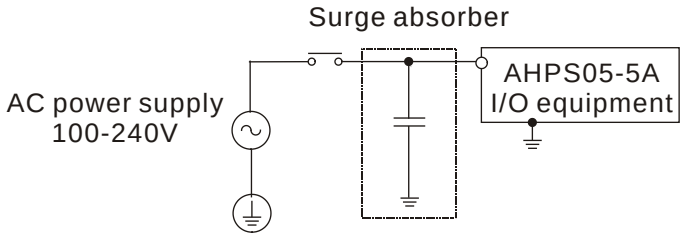
(1) Please separate the power cable of AHPS05-5A from the power cables for I/O devices and other devices. If there is much noise, connect an isolating transformer.



(2) The 110 VAC cable, the 220 VAC cable, and the 24 VDC cable should be twisted, and connected to a module within a short distance.

(3) Do not bundle 110 VAC cable, the 220 VAC cable, the 24 VDC cable, the (high-voltage high-current) main circuit, and the I/O signal cable together. Besides, it is recommended that the distance between adjacent cables should be more than 100 millimeters.

(4) To prevent the surge resulting from lightning, please install a surge absorber in the way shown below.

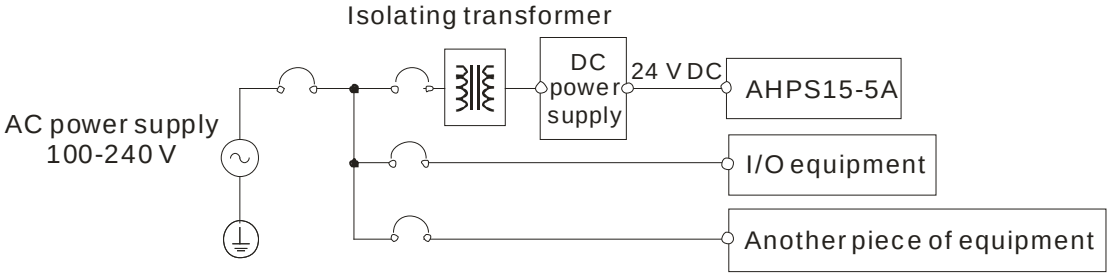


Points for attention:

1. The surge absorber and the PLC system should be grounded separately.
2. Please select the surge absorber whose working voltage is not less than the maximum allowable input voltage.

- **Connecting DC power cables**

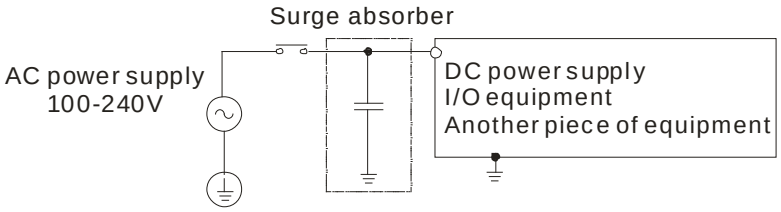
(1) AHPS15-5A is independently supplied with power by a DC power supply. Please separate the power cable of the DC power supply from the power cables for I/O devices and other devices. If there is much noise, connect an isolating transformer.



(2) The 110 VAC cable, the 220 VAC cable, and the 24 VDC cable should be twisted, and connected to a module within a short distance.

(3) Do not bundle 110 VAC cable, the 220 VAC cable, the 24 VDC cable, the (high-voltage high-current) main circuit, and the I/O signal cable together. Besides, it is recommended that the distance between adjacent cables should be more than 100 millimeters.

(4) To prevent the surge resulting from lightning, please install a surge absorber in the way shown below.

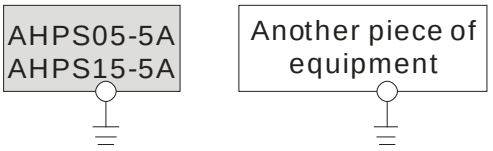


Points for attention:

1. The surge absorber and the PLC system should be grounded separately.
2. Please select the surge absorber whose working voltage is not less than the maximum allowable input voltage.

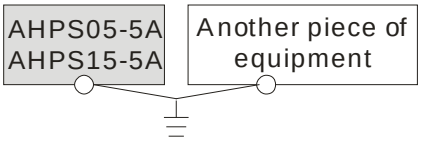
4.5.2 Ground

- The diameter of the ground should not be less than the diameters of the cables connected to the terminals L and N.
- If much equipment is used, please use single-point ground.



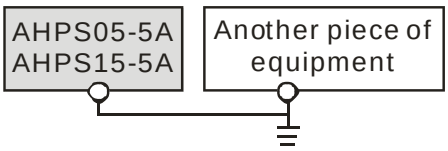
The single-point ground is better.

- If single-point ground can not be used, please use common-point ground.



The common-point ground is permitted.

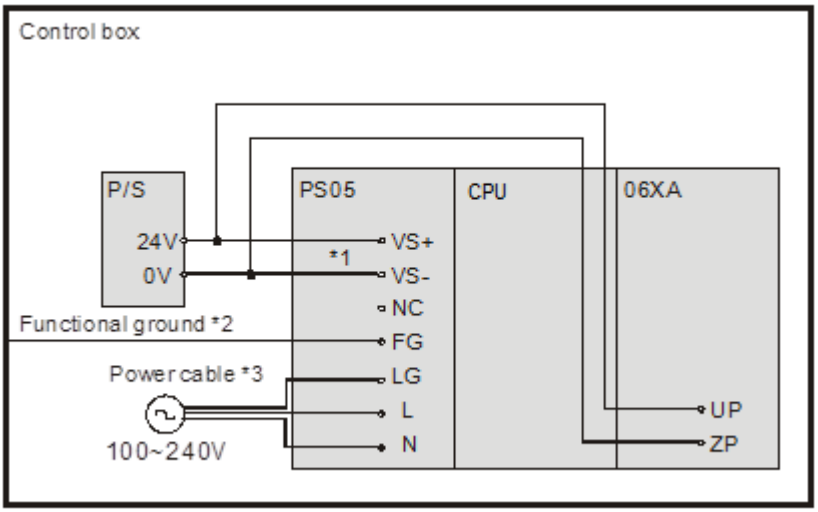
- you can not ground equipment in the way shown on the right.



The equipment can not be grounded in this way.

4.5.3 Wiring Power Supply Modules

- Connecting an AC power cable



*1. 24V on the external power supply is connected to VS+ and VS- on the power supply module. VS+ and VS- can be used to detect whether the voltage of the external power supply is stable.

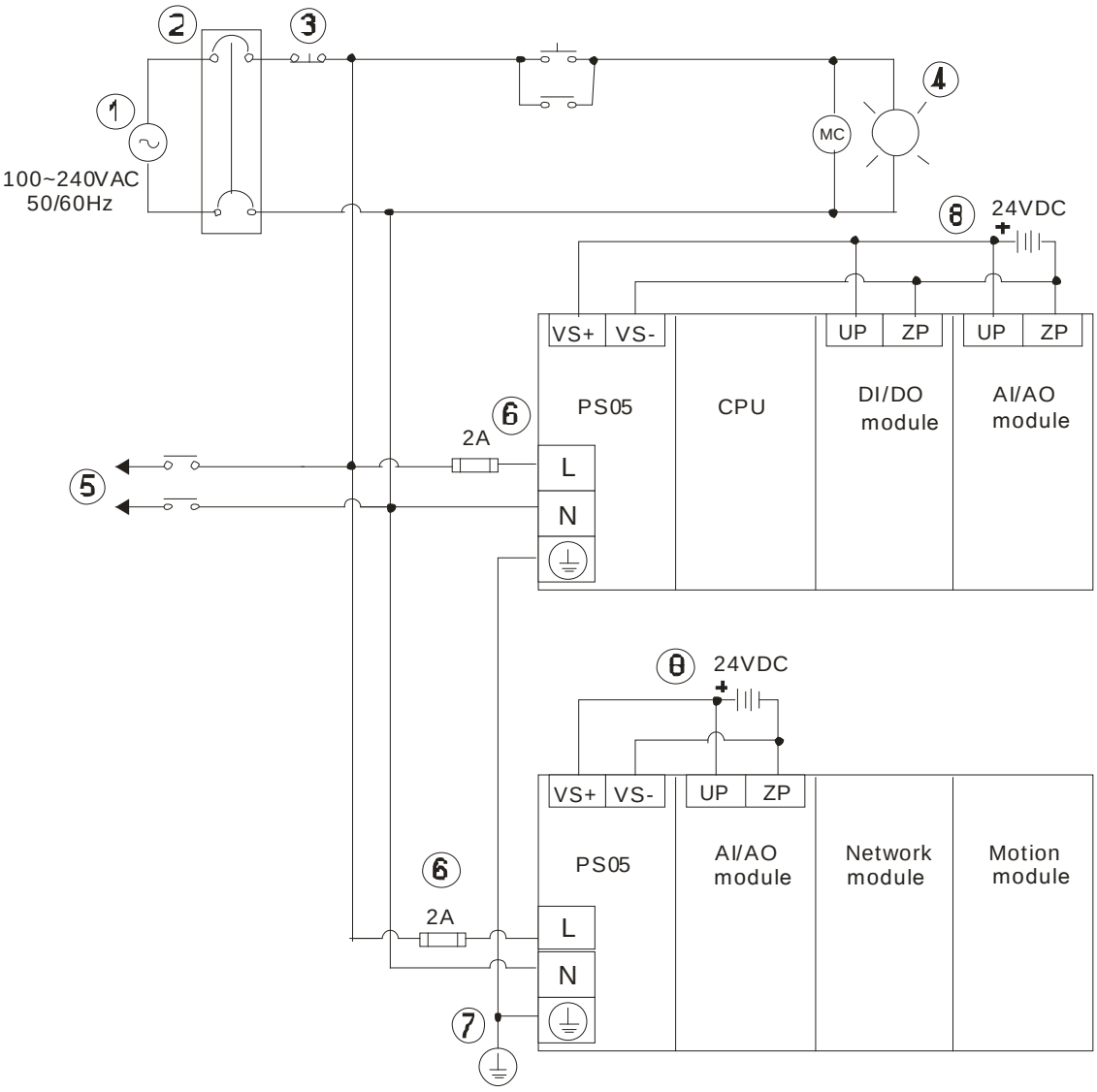
*2. FG on the power supply module is connected to the control box as the functional ground.

*3. The live wire and the neutral wire in the AC power cable are connected to L and N on the power supply module respectively. To prevent the system from becoming abnormal, the ground in the AC power cable has to be connected to LG on the power supply module.

The power input of AHPS05-5A is the AC input. You have to pay attention to the following points when you use AHPS05-5A.

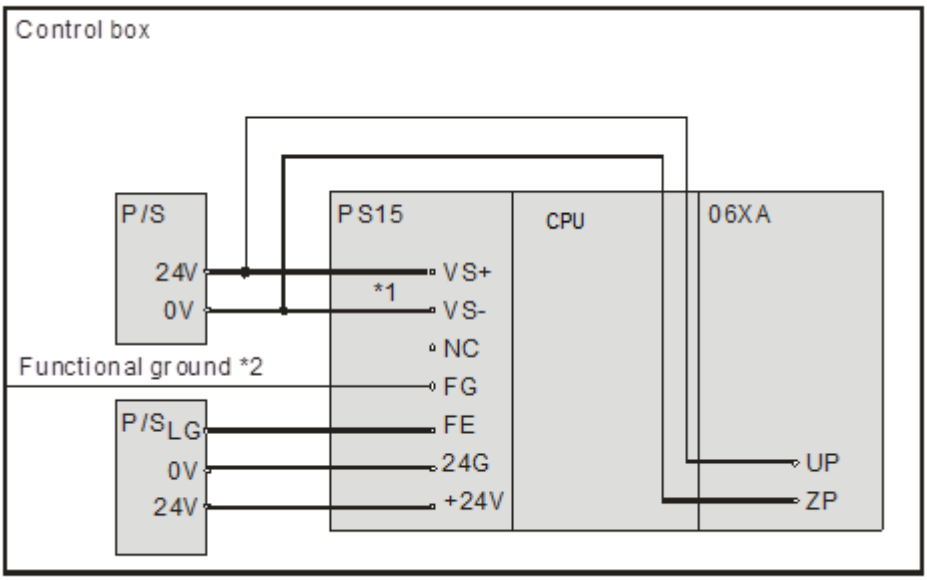
- The alternating-current input voltage is in the range of 100 VAC to 240 VAC. Please connect the power supply to the terminals L and N. If the 110 VAC or the 220 VAC power supply is connected to the input terminals VS+ and VS-, the PLC will be damaged.
- In order to ensure that the external power supply stably provides24 VDC power, the external power supply can be connected to VS+ and VS-. If the PLC detects that the voltage of the external power supply is lower than the working voltage, you can write a protective program.
- The length of the cable connecting with the ground should be more than 1.6 millimeters.
- If the power cut lasts for less than 10 milliseconds, the PLC keeps running without being affected. If the power cut lasts for long, or if the voltage of the power supply decreases, the PLC stops running, and there is no output. When the power supply returns to normal, the PLC resumes. (You have to notice that there are latched auxiliary relays and registers in the PLC when you write the program.)
- Please use single-core cables or multicore cables. The diameters of the cables used should be in the range of 12 AWG to 22 AWG. The torque applied to the terminal screws should be 9.50 kg-cm (8.25 lb-in). Please use copper conducting wires. The temperature of the copper conductive cables should be 60/75°C.

- Safety wiring: The PLC controls many devices, and the activity of any device affects the activity of other devices. If any device breaks down, the whole automatic control system goes out of control, and the danger occurs. The protection circuit is shown below.



①	Alternating-current power supply: 100~240 VAC, and 50/60 Hz
②	Circuit breaker
③	Emergency stop: The emergency stop button can be used to cut off the power when an emergency occurs.
④	Power indicator
⑤	Load through which the alternating current passes
⑥	2 A fuse
⑦	The ground impedance is less than 100 Ω.
⑧	Direct-current power supply: 24 VDC

- Connecting a DC power cable



*1. 24V on the external power supply is connected to VS+ and VS- on the power supply module. VS+ and VS- can be used to detect whether the voltage of the external power supply is stable.

*2. FG on the power supply module is connected to the control box as the functional ground.

*3. +24V and 24G on the power supply module are connected to 24V and 0V on the DC power supply. To prevent the system from becoming abnormal, the ground of the DC power supply has to be connected to FE on the power supply module.

The power input of AHPS15-5A is the DC input. You have to pay attention to the following points when you use AHPS15-5A.

- In order to ensure that the external power supply stably provides 24 VDC power, the external power supply can be connected to VS+ and VS-. If the PLC detects that the voltage of the external power supply is lower than the working voltage, you can write a protective program.
- The length of the cable connecting with the ground should be more than 1.6 millimeters.
- If the power cut lasts for less than 10 milliseconds, the PLC keeps running without being affected. If the power cut lasts for long, or if the voltage of the power supply decreases, the PLC stops running, and there is no output. When the power supply returns to normal, the PLC resumes. (You have to notice that there are latched auxiliary relays and registers in the PLC when you write the program.)
- Please use single-core cables or multicore cables. The diameters of the cables used should be in the range of 12 AWG to 22 AWG. The torque applied to the terminal screws should be 9.50 kg-cm (8.25 lb-in). Please use copper conducting wires. The temperature of the copper conductive cables should be 60/75°C.

4.5.4 Power Consumption

Products	Model name	Internal power consumption	External power consumption
AH Motion CPU	AHxxEMC-5A	4 W	-
Motion backplane	AHBP05M2-5A	1.2 W	-

Products	Model name	Internal power consumption	External power consumption
Motion control module	AH02HC-5A	2.4 W	-
	AH04HC-5A	2.4 W	-
	AH05PM-5A	2.7 W	-
	AH10PM-5A	2.7 W	-
	AH15PM-5A	2.7 W	-
	AH20MC-5A	3 W	-
Digital I/O module	AH16AM10N-5A	0.1 W	1.9 W
	AH16AM30N-5A	0.1 W	-
	AH16AN01P-5A	0.2 W	0.4 W
	AH16AN01R-5A	2.1 W	-
	AH16AN01S-5A	0.6 W	-
	AH16AN01T-5A	0.2 W	0.4 W
	AH16AP11P-5A	0.2 W	0.2 W
	AH16AP11R-5A	1.1 W	-
	AH16AP11T-5A	0.2 W	0.2 W
	AH32AM10N-5A	0.2 W	3.8 W
	AH32AM10N-5B	0.2 W	3.8 W
	AH32AM10N-5C	0.2 W	3.8 W
	AH32AN02P-5A	0.4 W	0.8 W
	AH32AN02P-5B	0.4 W	0.8 W
	AH32AN02P-5C	0.4 W	0.8 W
	AH32AN02T-5A	0.4 W	0.8 W
	AH32AN02T-5B	0.4 W	0.8 W
	AH32AN02T-5C	0.4 W	0.8 W
	AH64AM10N-5C	0.2 W	4.9 W
	AH64AN02P-5C	0.6 W	1.5 W
	AH64AN02T-5C	0.6 W	1.5 W
Analog I/O module	AH04AD-5A	0.35 W	1 W
	AH04DA-5A	0.34 W	2.6 W
	AH06XA-5A	0.34 W	1.4 W
	AH08AD-5A	1.1W	-
	AH08DA-5A	0.36W	4.55W
	AH08AD-5B	1.9 W	-
	AH08DA-5B	0.25 W	2.2 W
	AH08AD-5C	1.6 W	-
	AH08DA-5C	0.25 W	3.7 W
Temperature	AH04PT-5A	2 W	-

Products	Model name	Internal power consumption	External power consumption
measurement module	AH08PTG-5A	0.7W	4W
	AH04TC-5A	1.5 W	-
	AH08TC-5A	1.5 W	-
Network module	AH10SCM-5A	1.2 W	-
	AH10COPM-5A	0.8 W	-

4.6 Wiring AH Motion CPU Modules

4.6.1 Specifications of Inputs and Outputs

- **AHxxEMC-5A**

General Specifications		
AHxxEMC-5A		**Remark**
Execution	The program is executed cyclically.	
Input/Output control	Cyclically refreshed inputs/outputs Direct inputs/outputs	The inputs and outputs can be controlled through the direct inputs (DX device) and direct outputs (DY device).
Programming language	IEC 61131-3	
	Ladder diagram (LD), continuous function chart (CFC), structured text (ST), and sequential function chart (SFC).	
Instruction execution speed	0.3 ms/K steps	
Constant scan cycle (ms)	1-32000 (The scan cycle can be increased by one millisecond.)	The scan cycle time can be specified by parameters.
Program capacity (step)	256K steps	
Installation	DIN rails or screws	
Installation of modules	Modules are installed directly on a backplane.	
Number of modules	Five input/output modules at most can be installed on a motion backplane.	
Number of tasks	283 tasks (32 cyclic tasks; 32 I/O interrupts; 212 external interrupts; 1 24V LV detection)	
Number of input/output devices	X/Y devices (bit): 8192 (X0.0~X511.15/Y0.0~Y511.15) X/Y devices (word): 512 (X0~X511/Y0~Y511)	Number of devices which can be used in a program
Number of inputs/outputs	328 inputs/ 324 outputs (AH10EMC)	Number of inputs/outputs accessible to an CPU
Input relay [X]	8192 (X0.0~X511.15)	
Output relay [Y]	8192 (Y0.0~Y511.15)	
Auxiliary relay [M]	8192 (M0~M8191)	

General Specifications		
AHxxEMC-5A		**Remark**
Timer [T]	2048 (T0~T2047)	
Counter [C]	2048 (C0~C2047)	
32-bit counter [HC/AC]	HC: 64 (HC0~HC63) AC: 56 (AC0~ AC55) (AHxxEMC)	
Data register [D]	D device (bit): 1048576 (D0.0~D65535.15) D device (word): 65536 (D0~D65535)	
Stepping relay [S]	2048 (S0~S2047)	
Index register [E]	32 (E0~E31)	
Special auxiliary relay [SM /AM/AR_b]	SM: 2048 (SM0~SM2047) AM: 16384 (AM0~AM16383) (AHxxEMC) AR_b:1048576 (AR0.15~AR65535.15) (AHxxEMC)	
Special data register [SR/AR]	SR: 2048 (SR0~SR2047) AR: 65536 (AR0~AR65535) (AHxxEMC)	
Serial communication port	One RS-232(USB), One RS-485 communication port	
Ethernet port	10/100 M	
USB port	Mini USB	
Memory card slot	Supports Micro SD card (SD 2.0)	
Real-time clock	Years, months, days, hours, minutes, seconds, and weeks	The function is available when the CPU is used together with the motion backplane

Description of the terminals

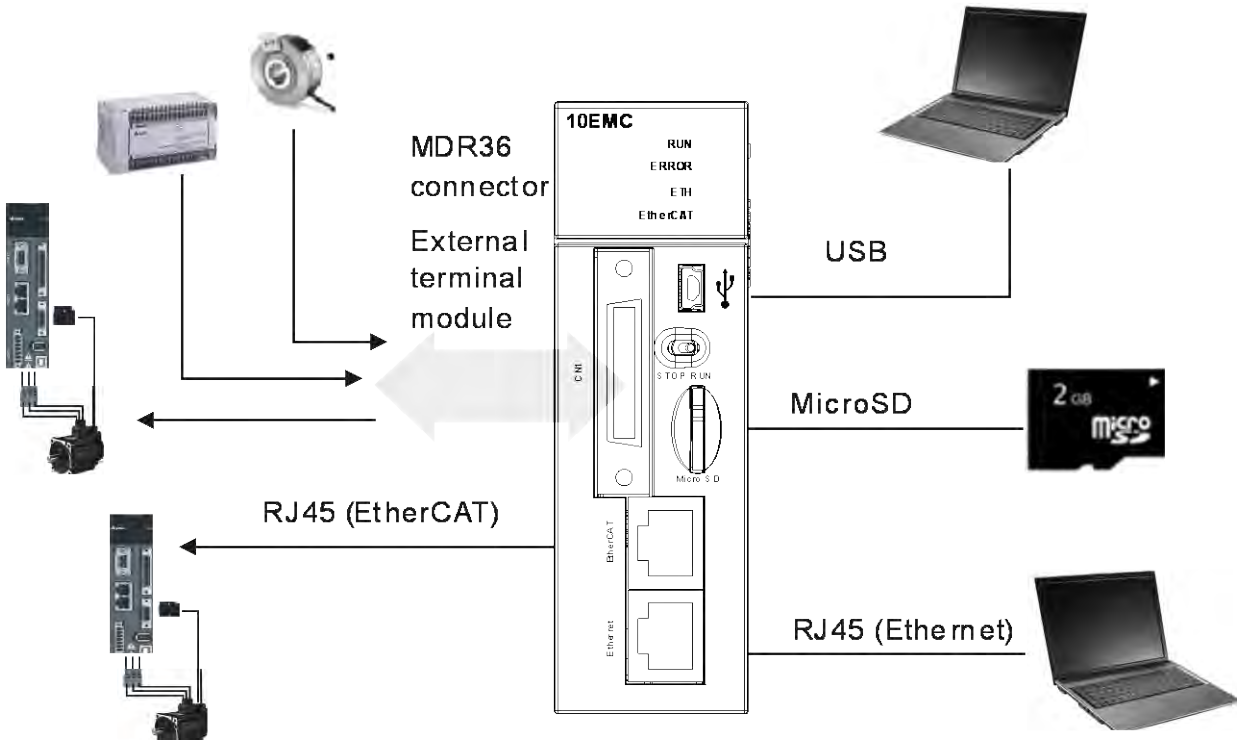
Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
X0.0+, X0.0-, X0.1+, X0.1-	1. Differential input terminals. 2. The functions of the terminals: ● High-speed count: ◆ The terminals are the RESET input terminals for counter 0~counter 1. ◆ X0.0+ and X0.0- are for counter 0. X0.1+ and X0.1- are for counter 1. ◆ High-speed capture: The terminals can function as trigger signals for high-speed captures.	1MHz	+/-5mA	+/-5V
X0.2, X0.3, X1.4, X1.5	1. Common input terminals. 2. The functions of the terminals: ● High-speed count: ◆ The terminals are the RESET input terminals for counter 2~counter 5. ◆ X0.2 is for counter 2. X0.3 is for counter 3. X1.4 is for counter 4 X1.5 is for counter 5	100kHz(*1)	5mA	24V

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
	● High-speed capture: The terminals can function as trigger signals for high-speed captures.			
X0.8+, X0.8-, X0.9+, X0.9-	1. Differential input terminals. 2. The functions of the terminals: ● Motion control: The terminals are for a manual pulse generator. ● High-speed count: ◆ The terminals are for counter 0. ◆ X0.8+ and X0.8- are the A-phase inputs for counter 0. X0.9+ and X0.9- are the B-phase inputs for counter 0. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs	1MHz	+/-5mA	+/-5V
X0.10+, X0.10-, X0.11+, X0.11-	1. Differential input terminals. 2. The functions of the terminals: ● High-speed count: ◆ The terminals are for counter 1. ◆ X0.10+ and X0.10- are the A-phase inputs for counter 1. X0.11+ and X0.11- are the B-phase inputs for counter 1. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs	1MHz	+/-5mA	+/-5V
X0.12, X0.13, X0.14, X0.15, X1.0, X1.1, X1.2, X1.3	1. Common input terminals. 2. The functions of the terminals: ● High-speed count: ◆ The terminals are for counter 2~counter 5. ◆ X0.12 and X0.13 are for counter 2. X0.14 and X0.15 are for counter 3. X1.0 and X1.1 are for counter 4. X1.2 and X1.3 are for counter 5. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs: X0.12, X0.13, X0.14 and X0.15 can function as interrupt inputs.	100kHz(*1)	5mA	24 V
Y0.8, Y0.9, Y0.10, Y0.11	1. Pulse output temrinals (open collector). 2. The function of the terminals: ● High-speed comparison: The terminals can function as high-speed comparison outputs.	200 kHz	15 mA	24 V

*1. If the frequency of input signals received by an input terminal must be 200 kHz, the input terminal must be connected to a 1 kΩ (2 W) resistor in parallel.

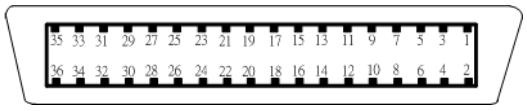
4.6.2 Wiring AHxxEMC-5A

- External devices for AHxxEMC-5A



- MDR36 connector

Pin	Function	Pin	Function
1	COM	19	Y0.11
2	COM	20	Y0.10
3	COM	21	Y0.9
4	COM	22	Y0.8
5	S/S	23	X1.3
6	X1.5	24	X1.2
7	S/S	25	X1.1
8	X1.4	26	X1.0
9	S/S	27	X0.15
10	X0.3	28	X0.14
11	S/S	29	X0.13
12	X0.2	30	X0.12
13	X0.1-	31	X0.1+
14	X0.11-	32	X0.11+
15	X0.10-	33	X0.10+
16	X0.0-	34	X0.0+
17	X0.9-	35	X0.9+

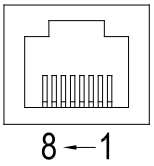


18	X0.8-	36	X0.8+	

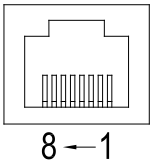
- USB port

Pin	Function	
1	VBUS (4.4–5.25 V)	 Mini-B
2	D−	
3	D+	
4	Ground	
5	Ground	

- EtherNet/IP port

Pin	Signal	Description	
1	TX+	Transmitting data (positive pole)	
2	TX-	Transmitting data (negative pole)	
3	RX+	Receiving data (positive pole)	
4	--	N/C	
5	--	N/C	
6	RX-	Receiving data (negative pole)	
7	--	N/C	
8	--	N/C	

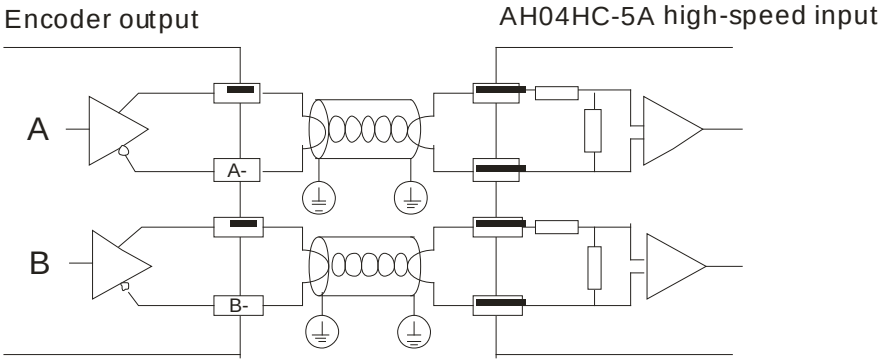
- EtherCAT port

Pin	Signal	Description	
1	TX+	Transmitting data (positive pole)	
2	TX-	Transmitting data (negative pole)	
3	RX+	Receiving data (positive pole)	
4	--	N/C	
5	--	N/C	
6	RX-	Receiving data (negative pole)	
7	--	N/C	
8	--	N/C	

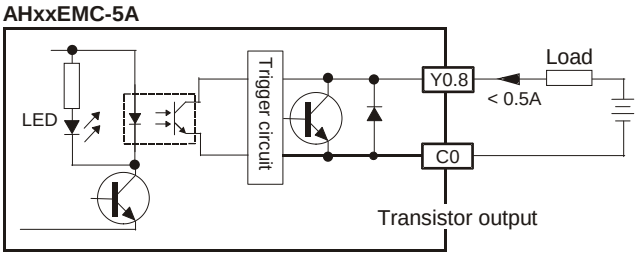
Wiring the Differential Input Terminals

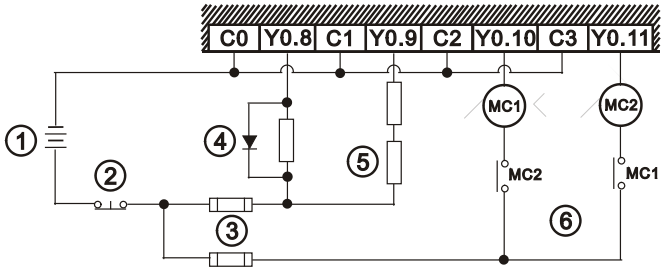
The direct-current signals in voltage 5 V can pass through the high-speed input terminals X0.0+~X0.1+, X0.0-~X0.1-, X0.8+~X0.11+, and X0.8-~X0.11- on AHxxEMC-5A. The frequency of input signals can be up to 1 MHz. These high-speed input terminals are connected to a differential (two-wire) line driver.

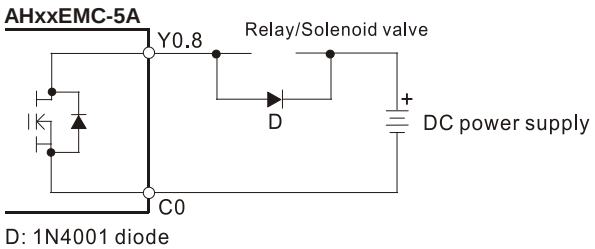
- Wiring differential input terminals (The wiring below is used for high speed and high noise.)

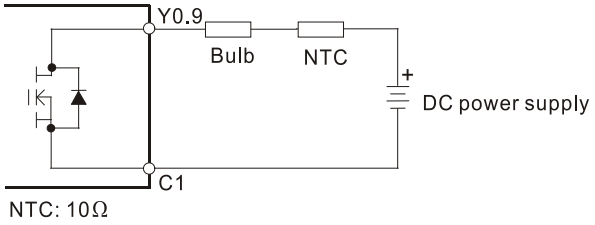
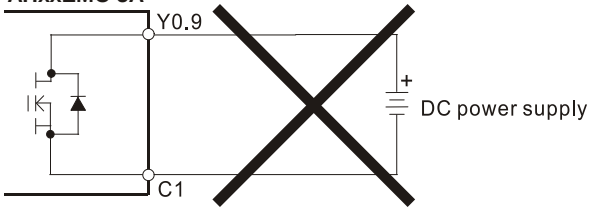


Transistor Output Circuit





①	Direct-current power supply	②	Emergency stop	③	Fuse
④	The output terminals of a transistor module are open-collector output terminals. If Y0.8 is a pulse train output terminal of a transistor module, the output current passing through its output pull-up resistor must be greater than 0.1 A to ensure that the transistor module operates normally. A relay or a solenoid valve is used as a DC load. A diode is connected in parallel to absorb the surge voltage which occurs when the load is OFF.  				

⑤	A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON. **AHxxEMC-5A**  NTC: 10Ω Y0.9 can not be connected to a power supply directly. It must be connected to a load. **AHxxEMC-5A** 
⑥	Mutually exclusive output: For example, Y0.10 controls the clockwise rotation of the motor, and Y0.11 controls the counterclockwise rotation of the motor. The interlock circuit which is formed, and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

4.7 Wiring Motion Control Modules

4.7.1 Specifications of Inputs and Outputs

- **AH02HC-5A**

Specifications		
Number of channels		2 channels
Input signal	**Input (differential input)**	CH0: X0.8+, X0.8-, X0.9+, and X0.9- CH1: X0.10+, X0.10-, X0.11+, and X0.11-
	Pulse format	Pulse/Direction (one phase and one input) Counting up/Counting down (one phase and two inputs) One time the frequency of A/B-phase inputs (two phases and two inputs) Four times the frequency of A/B-phase inputs (two phases and two inputs)
	Signal level	5~24 VDC
Specifications	**Maximum frequency of counting**	The maximum frequency is 200 kHz.
	Range	The number of sampled pulses is in the range of -200000 to 200000. The number of accumulated pulses is in the range of -999999999 to 999999999. The number of input pulses is in the range of -2147483648 to 2147483648.
	Type	General count Circular count
RESET input	**Input (differential input)**	CH0: X0.0+ and X0.0- CH1: X0.1+ and X0.1-
	Signal level	5~24 VDC
	Maximum current	15 mA
Comparison output	**Output type**	CH0: The high-speed pulse output Y0.8 is a transistor whose collector is an open collector. CH1: The high-speed pulse output Y0.9 is a transistor whose collector is an open collector.
	Signal level	24 VDC
	Maximum current	15 mA

- **AH04HC-5A**

Specifications		
Number of channels		4 channels
Input signal	**Input (differential input)**	CH0: X0.8+, X0.8-, X0.9+, and X0.9- CH1: X0.10+, X0.10-, X0.11+, and X0.11- CH2: X0.12+, X0.12-, X0.13+, and X0.13- CH3: X0.14+, X0.14-, X0.15+, and X0.15-
	Pulse format	Pulse/Direction (one phase and one input) Counting up/Counting up (one phase and two inputs) One time the frequency of A/B-phase inputs (two phases and two inputs)

Specifications		
		Four times the frequency of A/B-phase inputs (two phases and two inputs)
	Signal level	5~24 VDC
Specifications	**Maximum frequency of counting**	The maximum frequency is 200 kHz.
	Range	The number of sampled pulses is in the range of -200000 to 200000. The number of accumulated pulses is in the range of -999999999 to 999999999. The number of input pulses is in the range of -2147483648 to 2147483648.
	Type	Linear count Circular count
RESET input	**Input (differential input)**	CH0: X0.0+ and X0.0- CH1: X0.1+ and X0.1- CH2: X0.2+ and X0.2- CH3: X0.3+ and X0.3-
	Signal level	5~24 VDC
	Maximum current	15 mA
Comparison output	**Output type**	CH0: The high-speed pulse output Y0.8 is a transistor whose collector is an open collector. CH1: The high-speed pulse output Y0.9 is a transistor whose collector is an open collector. CH2: The high-speed pulse output Y0.10 is a transistor whose collector is an open collector. CH3: The high-speed pulse output Y0.11 is a transistor whose collector is an open collector.
	Signal level	24 VDC
	Maximum current	15 mA

- **AH05PM-5A**

Specifications				
Number of actual axes		2 axes		
Storage		The capacity of the built-in storage is 64K steps.		
Unit		Motor unit	Compound unit	Mechanical unit
Connection with a CPU module		You can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.		
Motor control		There are three types of pulse output modes. These modes adopt the differential output. 1. Pulse/Direction 2. Counting up/Counting down 3. A/B-phase output		
Maximum speed		Single axis: 1M PPS Multi-axis interpolation: 1M PPS		
Input signal	**Detector**	X0.0, X0.1, X0.8, X0.9, X0.12, and X0.13		

Specifications		
Output signal	**Servo output signal**	Y0.0+, Y0.0-, Y0.2+, Y0.2-, Y0.1+, Y0.1-, Y0.3+, Y0.3-, Y0.8, and Y0.9
External communication port		Mini USB port
Number of basic instructions		27
Number of applied instructions		130
M-code		1. OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END)) 2. M00~M01, M03~M101, and M103~M65535: The execution of the program pauses. (WAIT) You can use them freely.
G-code		G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G90 (absolute programming), and G91 (incremental programming)

Description of the terminals

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
X0.0, X0.1, X0.8, X0.9, X0.12, and X0.13	1. Single/A/B-phase input terminals. 2. The functions of the terminals: ● Motion control: ◆ X0.0 is the PG input for axis 1, and X0.1 is the PG input for axis 2. ◆ X0.12 is the DOG input for axis 1, and X0.13 is the DOG input for axis 2. ◆ X0.8 and X0.9 are for a manual pulse generator. ● High-speed count: ◆ X0.0 is the RESET input for counter 0. ◆ X0.8 is the A-phase input for counter 0, and X0.9 is the B-phase input for counter 0. ● High-speed capture: The terminals can function as trigger signals for high-speed capture. ● Interrupt input s: X0.8, X0.9, X0.12, X0.13	100 kHz (*1)	5 mA	24 V
Y0.8 and Y0.9	1. The high-speed pulse output terminals are transistors whose collectors are open collectors. 2. The functions of the terminals: ● Motion control: Y0.8 is the CLEAR output for axis 1, and Y0.9 is the CLEAR output for axis 2. ● High-speed comparison: The high-speed comparison output teminals provide the PWM function.	200 kHz	15 mA	24 V
Y0.0+, Y0.0-, Y0.1+, Y0.1-, Y0.2+, Y0.2-, Y0.3+, and Y0.3-	1. Differential output terminals. 2. The function of the terminals: ● Motion control: ◆ Y0.0+ and Y0.0- are the A-phase output terminals for axis 1. Y0.2+ and Y0.2- are	1 MHz	5 mA	5 V

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
	◆ the A-phase output temrinals for axis 2. Y0.1+ and Y0.1- are the B-phase output terminals for axis 1. Y0.3+ and Y0.3- are the B-phase output terminals for axis 2.			

*1. If the frequency of input signals received by an input terminal must be 200 kHz, the input terminal must be connected to a 1 kΩ (2 W) resistor in parallel.

- **AH10PM-5A**

Specifications				
Number of actual axes		6 axes		
Storage		The capacity of the built-in storage is 64K steps.		
Unit		Motor unit	Compound unit	Mechanical unit
Connection with a CPU module		You can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.		
Motor control		There are three types of pulse output modes. These modes adopt the differential output. 1. Pulse/Direction 2. Counting up/Counting down 3. A/B-phase output		
Maximum speed		Single axis: 1M PPS Multi-axis interpolation: 1M PPS		
Input signal	**Operating switch**	STOP/RUN (automatic/manual switch)		
	Detector	X0.8, X0.9, X0.10, X0.11, X0.12, X0.13, X0.14, X0.15, X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-		
Output signal	**Servo output signal**	Y0.0+, Y0.0-, Y0.2+, Y0.2-, Y0.4+, Y0.4-, Y0.6+, Y0.6-, Y0.1+, Y0.1-, Y0.3+, Y0.3-, Y0.5+, Y0.5-, Y0.7+, Y0.7-, Y0.8, Y0.9, Y0.10, and Y0.11		
External communication port		Mini USB port Ethernet port		
Memory Card Slot		Micro SD card The maximum capacity is 32 GB.		
Number of basic instructions		27		
Number of applied instructions		130		
M-code		1. OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END)) 2. M00~M01, M03~M101, and M103~M65535: The execution of the program pauses. (WAIT) You can use them freely.		
G-code		G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G18 (ZX plane selection), G19 (YZ plane selection), G90 (absolute programming), and G91 (incremental programming)		

Description of the terminals

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-	1. Differential input temrinals. 2. The functions of the terminals: ● Motion control: They are the PG input terminals for axis 1~axis 4. ● High-speed counter: X0.0+ and X0.0- are the RESET input terminals for counter 0. X0.1+ and X0.1- are the RESET input terminals for counter 1. X0.2+ and X0.2- are the RESET input terminals for counter 2 and counter 4. X0.3+ and X0.3- are the RESET input temrinals for counter 3 and counter 5. ● High-speed capture: The terminals can function as trigger signals for high-speed captures.	200 kHz	5 mA	5~24 V
X0.8 and X0.9	1. Single/A/B-phase input terminals. 2. The functions of the terminals: ● Motion control: The terminals are for a manual pulse generator. ● High-speed count: ◆ The terminals are for counter 0. ◆ X0.8 is the A-phase input for counter 0, and X0.9 is the B-phase input for counter 0. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs	100 kHz (*1)	5 mA	24 V
X0.10, X0.11, X0.12, X0.13, X0.14, and X0.15	1. Single/A/B-phase input terminals. 2. The functions of the terminals: ● Motion control: They are the DOG input terminals for axis 1~axis 6. ● High-speed counter: ◆ The terminals are for counter 1~counter 5. ◆ X0.10 is the A-phase input for counter 1, X0.12 is the A-phase input for counter 2 and counter 4, and X0.14 is the A-phase input for counter 3 and counter 5. ◆ X0.11 is the B-phase input for counter 1, X0.13 is the B-phase input for counter 2 and counter 4, and X0.15 is the B-phase input for counter 3 and counter 5. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs	100 kHz (*1)	5 mA	24 V
Y0.8, Y0.9, Y0.10, and Y0.11	1. The high-speed pulse output terminals are transistors whose collectors are open collectors. 2. The functions of the terminals: ● Motion control: ◆ The terminals are the CLEAR output terminals for axis 1~axis 4, and provide the PWM function. ◆ Y0.8 and Y0.9 are for axis 5. Y0.10 and Y0.11 are for axis 6. Y0.8 is the A-phase	200 kHz	15 mA	24 V

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
	output for axis 5, and Y0.10 is the A-phase output for axis 6. Y0.9 is the B-phase output for axis 5, and Y0.11 is the B-phase output for axis 6. ● High-speed compariso: The terminals can function as high-speed comparison output terminals.			
Y0.0+, Y0.0-, Y0.1+, Y0.1-, Y0.2+, Y0.2-, Y0.3+, Y0.3-, Y0.4+, Y0.4-, Y0.5+, Y0.5-, Y0.6+, Y0.6-, Y0.7+, and Y0.7-	1. Differential output terminals. 2. The function of the terminals: ● Motion control: ◆ The terminals are for axis 1~axis 4. ◆ Y0.0+ and Y0.0- are the A-phase output terminals for axis 1. Y0.2+ and Y0.2- are the A-phase output terminals for axis 2. Y0.4+ and Y0.4- are the A-phase output terminals for axis 3. Y0.6+ and Y0.6- are the A-phase output terminals for axis 4. ◆ Y0.1+ and Y0.1- are the B-phase output terminals for axis 1. Y0.3+ and Y0.3- are the B-phase output terminals for axis 2. Y0.5+ and Y0.5- are the B-phase output terminals for axis 3. Y0.7+ and Y0.7- are the B-phase output terminals for axis 4. ◆ Y0.0+ and Y0.0- are the CLEAR output terminals for axis 5. Y0.1+ and Y0.1- are the CLEAR output terminals for axis 6.	1 MHz	5 mA	5 V

*1. If the frequency of input signals received by an input terminal must achieve 200 kHz, the input terminal must be connected to a 1 kΩ (2 W) resistor in parallel.

- **AH15PM-5A**

		AH15PM-5A		
Number of actual axes		4 axes		
Storage		The capacity of the built-in storage is 64K steps.		
Unit		Motor unit	Compound unit	Mechanical unit
Connection with a CPU module		You can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.		
Motor control		There are three types of pulse output modes. These modes adopt the differential output. 1. Pulse/Direction 2. Counting up/Counting down 3. A/B-phase output		
Maximum speed		Single axis: 1M PPS Multi-axis interpolation: 1M PPS		
Input signal	**Operating switch**	STOP/RUN (automatic/manual switch)		
	Detector	X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, X0.3-, X0.4, X0.5, X0.6, X0.7,		

		AH15PM-5A
		X0.10, X0.11, X0.12, X0.13, X0.14, X0.15, X1.0, X1.1, X1.2, X1.3, X1.4, X1.5
Output signal	**Servo output signal**	Y0.0+, Y0.0-, Y0.2+, Y0.2-, Y0.4+, Y0.4-, Y0.6+, Y0.6-, Y0.1+, Y0.1-, Y0.3+, Y0.3-, Y0.5+, Y0.5-, Y0.7+, Y0.7-, Y0.8, Y0.9, Y0.10, Y0.11
External communication port		Mini USB port Ethernet port
Memory card slot		Supports Micro SD card The maximum capacity is 32 GB.
Number of basic instructions		27
Number of applied instructions		130
M-code		1. OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END)) 2. M00~M01, M03~M101, and M103~M65535: The execution of the program pauses. (WAIT) You can use them freely.
G-code		G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G18 (ZX plane selection), G19 (YZ plane selection), G90 (absolute programming), and G91 (incremental programming)

Description of the terminals

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-	1. Differential input terminals. 2. The functions of the terminals: ● Motion control: They are the PG input terminals for axis 1~axis 4. ● High-speed counter: X0.0+ and X0.0- are the RESET input terminals for counter 0. X0.1+ and X0.1- are the RESET input terminals for counter 1. X0.2+ and X0.2- are the RESET input terminals for counter 2 and counter 4. X0.3+ and X0.3- are the RESET input terminals for counter 3 and counter 5. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs	200 kHz	5 mA	5~24 V
X0.4, X0.5, X0.6, and X0.7	1 Single/A/B-phase input terminals. 2 The functions of the terminals: ● Motion control: They are the DOG input terminals for axis 1~axis 4.	100 kHz (*1)	5 mA	24 V
X0.8+, X0.8-, X0.9+, and X0.9-	1. Differential input temrinals. 2. The functions of the terminals: ● Motion control: The terminals are for a manual pulse generator. ● High-speed count: ◆ The terminals are for counter 0. ◆ X0.8+ and X0.8- are the A-phase input terminals for counter 0, and X0.9+ and X0.9-	200 kHz	5 mA	5~24 V

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
	are the B-phase input terminals for counter 0. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs			
X0.10, X0.11, X0.12, X0.13, X0.14, X0.15, X1.0, and X1.1	1 Differential input temrinals. 2 The functions of the terminals: ● Motion control: X0.10 is LSP0, X0.11 is LSN0, X0.12 is LSP1, X0.13 is LSN1, X0.14 is LSP2, X0.15 is LSN2, X1.0 is LSP3, and X1.1 is LSN3. ● High-speed count: ◆ The terminals are for counter 1~counter 5. ◆ X0.10 is the A-phase input for counter 1. X0.12 is the A-phase input for counter 2 and counter 4. X0.14 is the A-phase input for counter 3 and counter 5. ◆ X0.11is the B-phase input for counter 1. X0.13 is the B-phase input for counter 2 and counter 4. X0.15 is the B-phase input for counter 3 and counter 5. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt input terminals: X0.10~X0.15	100 kHz (*1)	5 mA	24 V
X1.2, X1.3, X1.4, and X1.5	1. Single/A/B-phase input terminals.	100 kHz (*1)	5 mA	24 V
Y0.8, Y0.9, Y0.10, and Y0.11	1. The high-speed pulse output terminals are transistors whose collectors are open collector. 2. The function of the terminals: ● Motion control: The terminals are the CLEAR output terminals for axis 1~axis 4. ● High-speed comparison: The terminals can function as high-speed comparison output terminals.	200 kHz	15 mA	24 V
Y0.0+, Y0.0-, Y0.1+, Y0.1-, Y0.2+, Y0.2-, Y0.3+, Y0.3-, Y0.4+, Y0.4-, Y0.5+, Y0.5-, Y0.6+, Y0.6-, Y0.7+, and Y0.7-	1. Differential output terminals. 2. The function of the terminals: ● Motion control: ◆ The terminals are for axis 1~axis 4. ◆ Y0.0+ and Y0.0- are the A-phase output terminals for axis 1. Y0.2+ and Y0.2- are the A-phase the output terminals for axis 2. Y0.4+ and Y0.4- are the A-phase output terminals for axis 3. Y0.6+ and Y0.6- are the A-phase output terminals for axis 4. ◆ Y0.1+ and Y0.1- are the B-phase output terminals for axis 1. Y0.3+ and Y0.3- are the B-phase output terminals for axis 2. Y0.5+ and Y0.5- are the B-phase output terminals for axis 3. Y0.7+ and Y0.7- are the B-phase output terminals for axis 4. ◆ Y0.0+ and Y0.0- are the CLEAR output terminals for axis 5. Y0.1+ and Y0.1- are the CLEAR output temrinals for axis 6.	1 MHz	5 mA	5 V

*1. If the frequency of input signals received by an input terminal must be 200 kHz, the input terminal must be connected to a 1 kΩ (2 W) resistor in parallel.

- **AH20MC-5A**

		Specifications		
		AH20MC-5A		
Number of actual axes		12 axes		
Storage		The capacity of the built-in storage is 64K steps.		
Unit		Motor unit	Compound unit	Mechanical unit
Connection with a CPU module		You can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.		
Motor control		Delta high-speed motion control system DMCNET (Delta Motion Control Network) The response time is one millisecond.		
Maximum speed		Single axis: 1M PPS Two-axis interpolation: 1M PPS		
Input signal	**Operating switch**	STOP/RUN (automatic/manual switch)		
	Detector	X0.10+, X0.10-, X0.11+, X0.11-, X0.12+, X0.12-, X0.13+, X0.13-, X0.14+, X0.14-, X0.15+, X0.15, X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, X0.3-, X0.8+, X0.8-, X0.9+, X0.9-		
Output signal	**Servo output signal**	Y0.8, Y0.9, Y0.10, Y0.11		
External communication port		Mini USB port Ethernet port DMCNET port		
Memory card slot		Supports Micro SD card The maximum capacity is 32 GB.		
Number of basic instructions		27		
Number of applied instructions		130		
M-code		• OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END)) • M00~M01, M03~M101, and M103~M65535: The execution of the program pauses. (WAIT) You can use them freely.		
G-code		G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G18 (ZX plane selection), G19 (YZ plane selection), G90 (absolute programming), and G91 (incremental programming)		

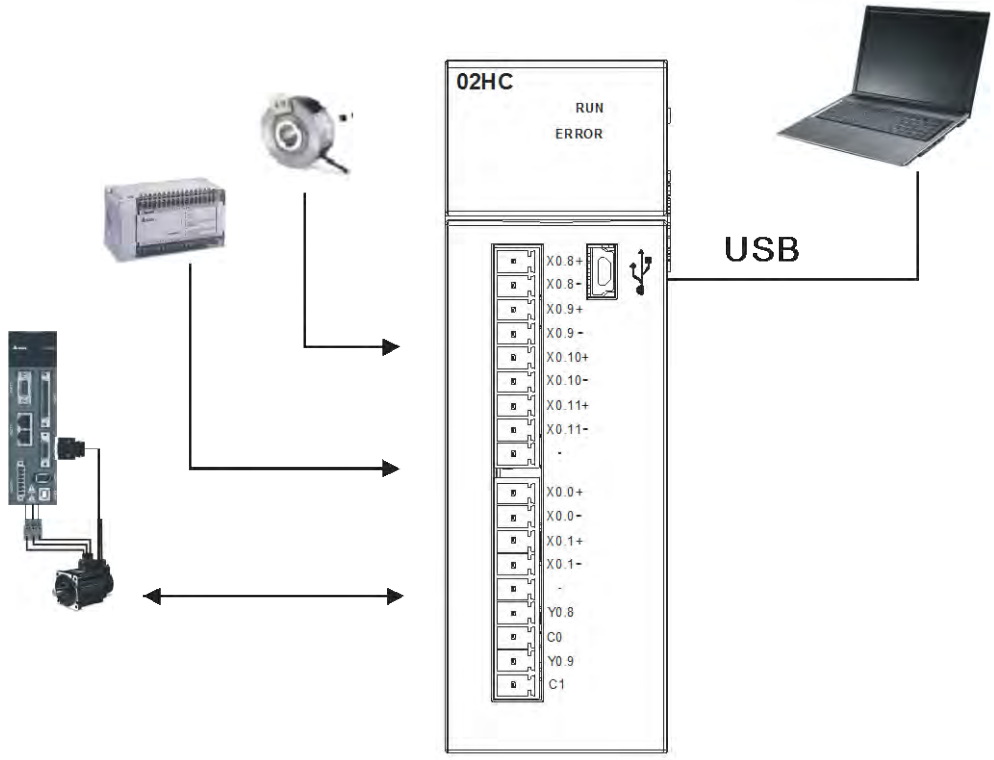
Description of the terminals

Terminal	Description	Response characteristic	Rated input	
			Current	Voltage

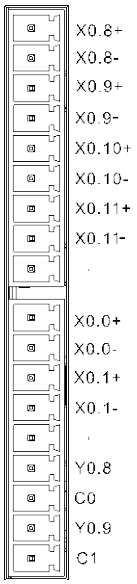
Terminal	Description	Response characteristic	Rated input	
			Current	Voltage
X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-	1. Differential input terminals. 2. The functions of the terminals: ● High-speed count: ◆ The terminals are the RESET input terminals for counter 0~counter 5. ◆ X0.0+ and X0.0- are for counter 0. X0.1+ and X0.1- are for counter 1. X0.2+ and X0.2- are for counter 2 and counter 4. X0.3+ and X0.3- are for counter 3 and counter 5. ● High-speed capture: The terminals can function as trigger signals for high-speed captures.	200 kHz	5 mA	5~24 V
X0.8+, X0.8-, X0.9+, and X0.9-	1. Differential input terminals. 2. The functions of the terminals: ● Motion control: The terminals are for a manual pulse generator. ● High-speed count: ◆ The terminals are for counter 0. ◆ X0.8+ and X0.8- are the A-phase input terminals for counter 0. X0.9+ and X0.9- are the B-phase input terminals for counter 0. ● High-speed capture: The terminals can function as trigger signals for high-speed capture s. ● Interrupt inputs	200 kHz	5 mA	5~24 V
X0.10+, X0.10-, X0.11+, X0.11-, X0.12+, X0.12-, X0.13+, X0.13, X0.14+, X0.14-, X0.15+, and X0.15-	1. They are differential input terminals. 2. The functions of the terminals: ● Motion control: supports DOG signal input for axis 1 to axis 6. The function is applicable for inserting single axis one-speed/two-speed motion. ● High-speed count: ◆ The terminals are for counter 1~counter 5. ◆ AB-phsae pulse input: A-phase: X0.10+ and X0.10- are the input terminals for counter 1. X0.12+ and X0.12- are the input temrinals for counter 2 and counter 4. X0.14+ and X0.14- are the input terminals for counter 3 and counter 5. B-phase: X0.11+ and X0.11- are the input terminals for counter 1. X0.13+ and X0.13- are the input terminals for counter 2 and counter 4. X0.15+ and X0.15- are the input terminals for counter 3 and counter 5. ● High-speed capture: The terminals can function as trigger signals for high-speed captures. ● Interrupt inputs	200 kHz	5 mA	5~24 V
Y0.8, Y0.9, Y0.10, and Y0.11	1. The high-speed pulse output temrinals are transistors whose collectors are open collectors. 2. The function of the terminals: ● High-speed comparison: The terminals can function as high-speed comparison output temrinals.	200 kHz	15 mA	24 V

4.7.2 Wiring AH02HC-5A and AH04HC-5A

- External devices for AH02HC-5A

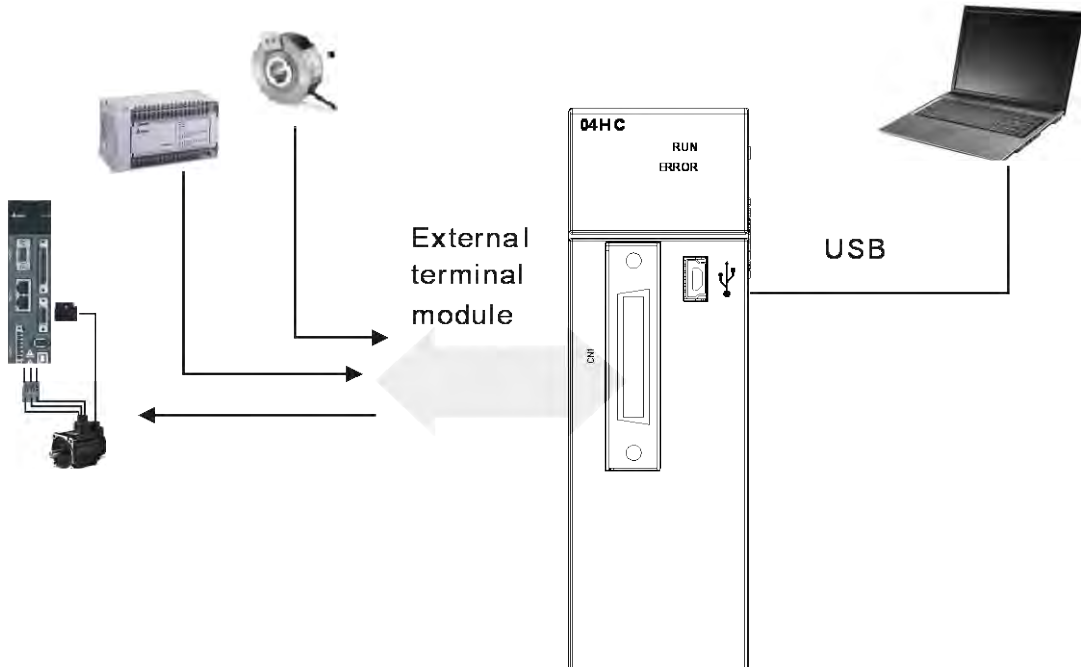


- Terminals on AH02HC-5A

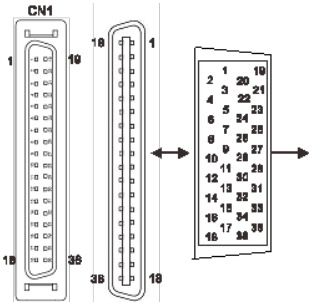


Terminal	Function Count	Terminal	Function Count
X0.8+	CntA0+	X0.0+	Rst0+
X0.8-	CntA0-	X0.0-	Rst0-
X0.9+	CntB0+	X0.1+	Rst1+
X0.9-	CntB0-	X0.1-	Rst1-
X0.10+	CntA1+	Y0.8	Out0
X0.10-	CntA1-	C0	COM0
X0.11+	CntB1+	Y0.9	Out1
X0.11-	CntB1-	C1	COM1

- External devices for AH04HC-5A



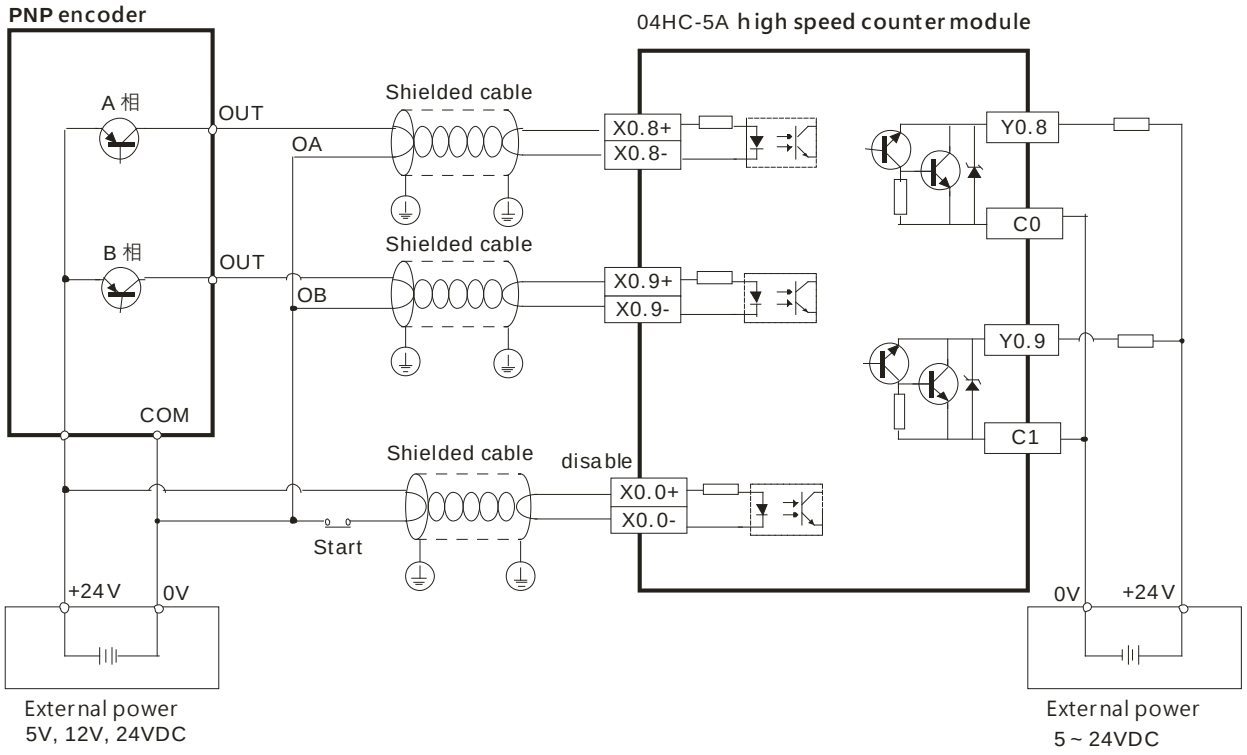
- Connector on AH04HC-5A



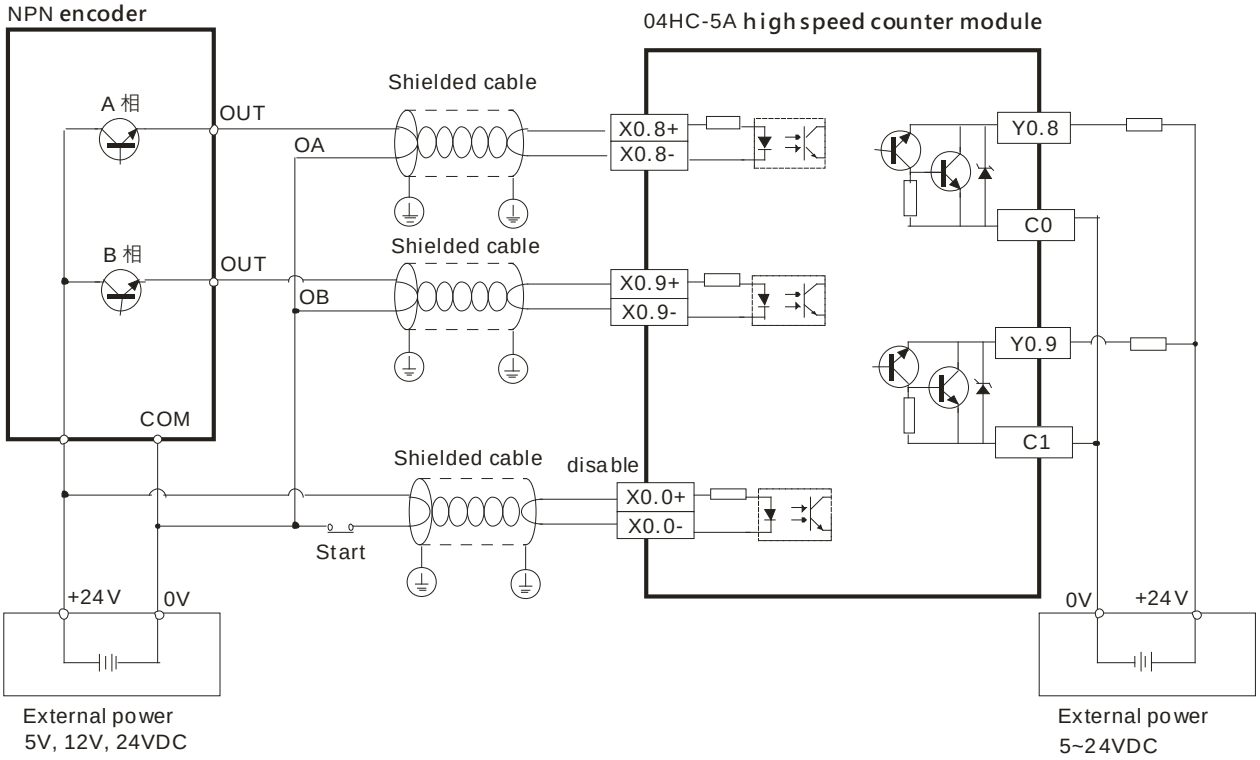
Pin	Terminal	Function Count	Pin	Terminal	Function Count
1	C3	COM3	19	Y0.11	Out3
2	C2	COM2	20	Y0.10	Out2
3	C1	COM1	21	Y0.9	Out1
4	C0	COM0	22	Y0.8	Out0
5	-	-	23	-	-
6	-	-	24	-	-
7	X0.3-	Rst3-	25	X0.3+	Rst3+
8	X0.15-	CntB3-	26	X0.15+	CntB3+
9	X0.14-	CntA3-	27	X0.14+	CntA3+
10	X0.2-	Rst2-	28	X0.2+	Rst2+
11	X0.13-	CntB2-	29	X0.13+	CntB2+
12	X0.12-	CntA2-	30	X0.12+	CntA2+
13	X0.1-	Rst1-	31	X0.1+	Rst1+
14	X0.11-	CntB1-	32	X0.11+	CntB1+
15	X0.10-	CntA1-	33	X0.10+	CntA1+
16	X0.0-	Rst0-	34	X0.0+	Rst0+
17	X0.9-	CntB0-	35	X0.9+	CntB0+
18	X0.8-	CntA0-	36	X0.8+	CntA0+

External Wiring

1. A PNP encoder is used.



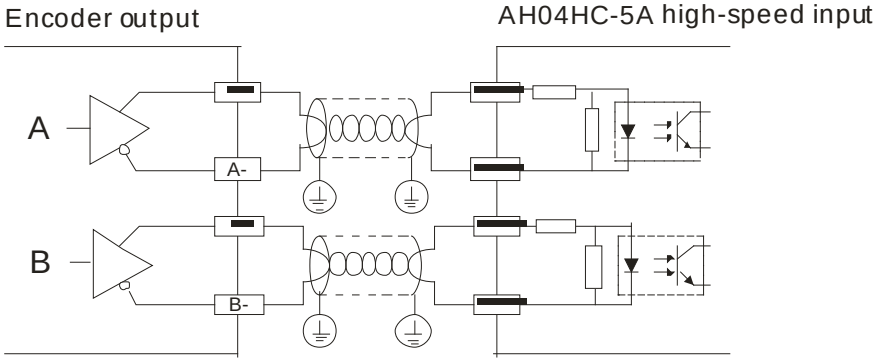
2. An NPN encoder is used.



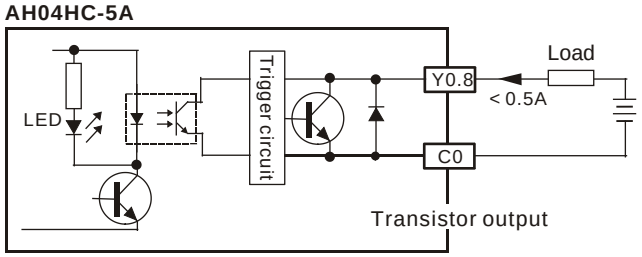
Wiring the Differential Input Terminals

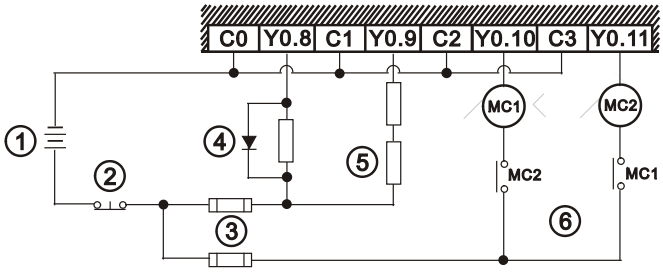
The direct-current signals ranging in voltage from 5 V to 24 V can pass through the high-speed input terminals X0.0+~X0.1+, X0.0-~X0.1-, X0.8+~X0.11+, and X0.8-~X0.11- on AH02HC-5A, and the high-speed input terminals X0.0+~X0.3+, X0.0-~X0.3-, X0.8+~X0.15+, and X0.8-~X0.15- on AH04HC-5A. The frequency of input signals can be up to 200 kHz. These high-speed input terminals are connected to a differential (two-wire) line driver.

- Wiring differential input terminals (The wiring below is used for high speed and high noise.)



Transistor Output Circuit



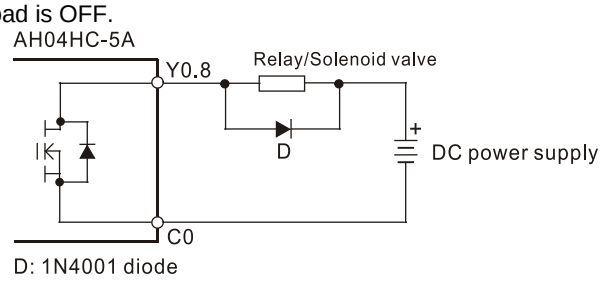


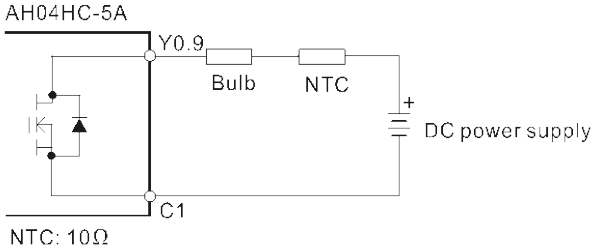
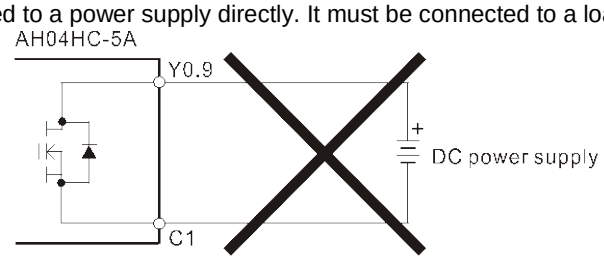
①	Direct-current power supply	②	Emergency stop	③	Fuse

④

The output terminals of a transistor module are open-collector output terminals. If Y0.8 is a pulse train output terminal of a transistor module, the output current passing through its output pull-up resistor must be greater than 0.1 A to ensure that the transistor module operates normally.

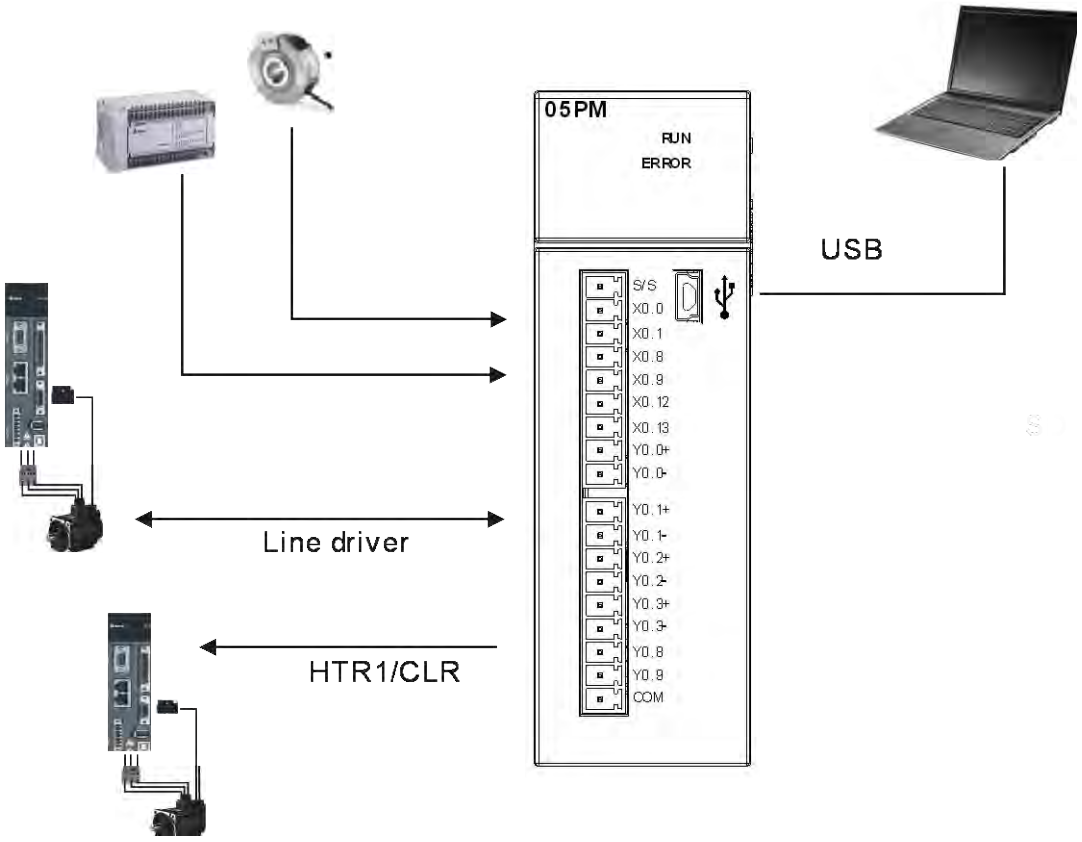
A relay or a solenoid valve is used as a DC load. A diode is connected in parallel to absorb the surge voltage which occurs when the load is OFF.



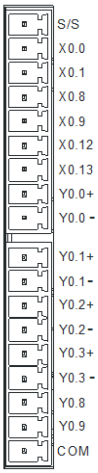
⑤	A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON.  Y0.9 can not be connected to a power supply directly. It must be connected to a load. 
⑥	Mutually exclusive output: For example, Y0.10 controls the clockwise rotation of the motor, and Y0.11 controls the counterclockwise rotation of the motor. The interlock circuit which is formed, and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

4.7.3 Wiring AH05PM-5A, AH10PM-5A, and AH15PM-5A

- External devices for AH05PM-5A

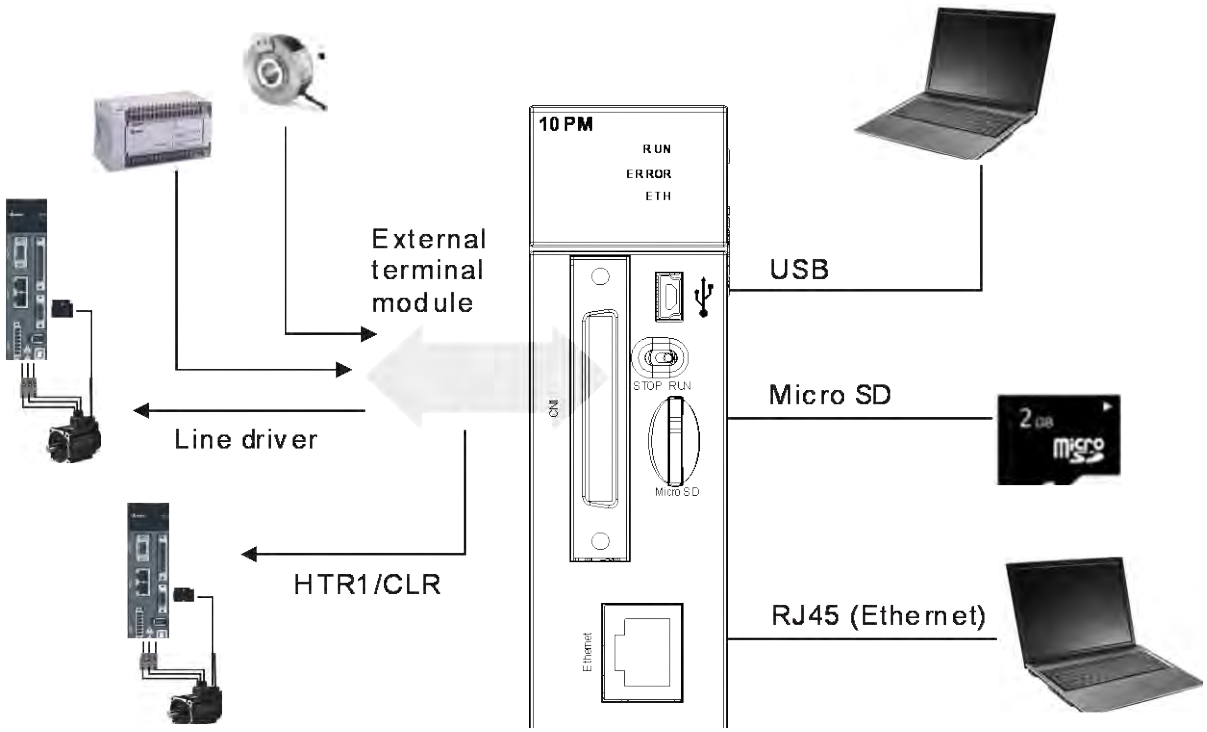


- Terminals on AH05PM-5A

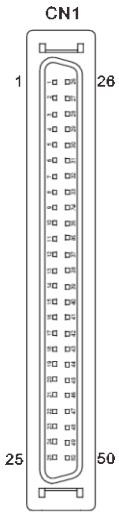


Terminal	Function		Terminal	Function	
	Pulse	Count		Pulse	Count
S/S	S/S	S/S	Y0.1+	B0+	-
X0.0	PG0	Rst0	Y0.1-	B0-	-
X0.1	PG1	-	Y0.2+	A1+	-
X0.8	MPGA	CntA0	Y0.2-	A1-	-
X0.9	MPGB	CntB0	Y0.3+	B1+	-
X0.12	DOG0	-	Y0.3-	B1-	-
X0.13	DOG1	-	Y0.8	CLR0	-
Y0.0+	A0+	-	Y0.9	CLR1	-
Y0.0-	A0-	-	COM	-	-

- External devices for AH10PM-5A

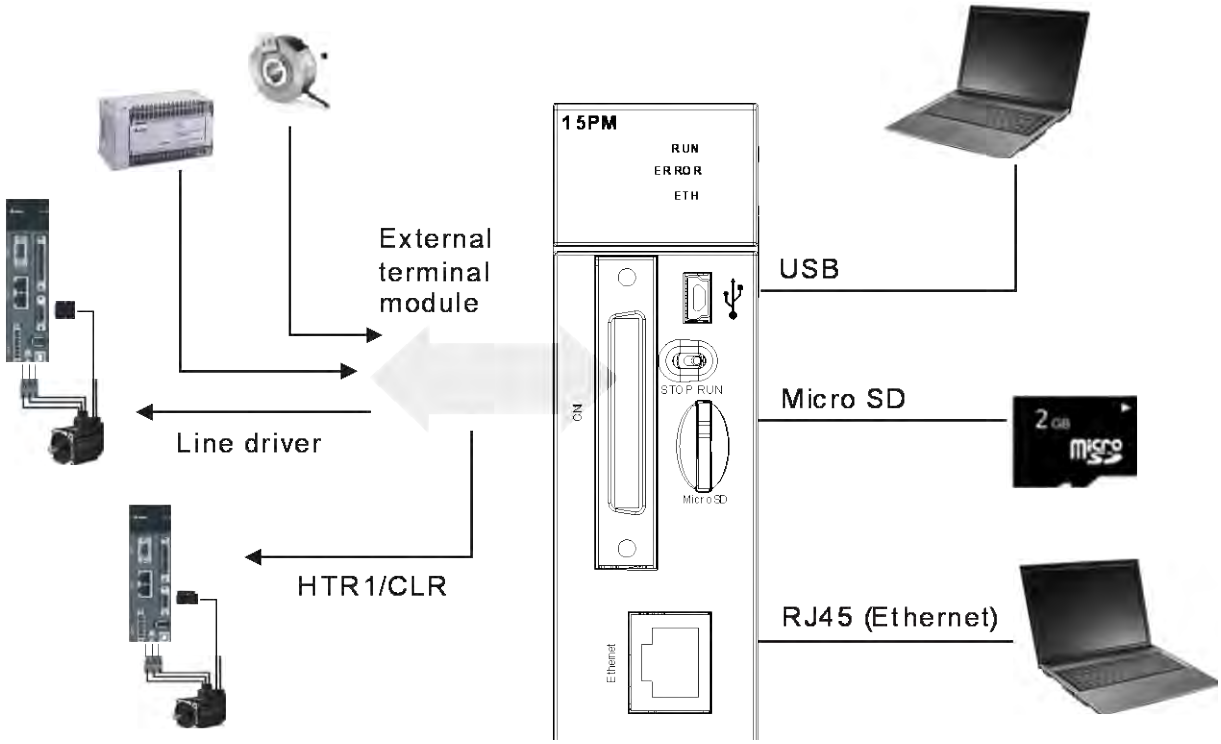


- Connector on AH10PM-5A

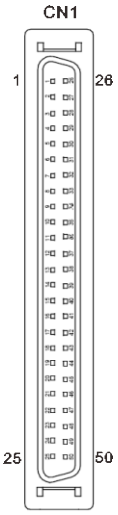


Pin	Terminal	Function		Pin	Terminal	Function	
		Pulse	Count			Pulse	Count
1	C3	COM3	-	26	Y0.11	CLR3/B5	-
2	C2	COM2	-	27	Y0.10	CLR2/A5	-
3	C1	COM1	-	28	Y0.9	CLR1/B4	-
4	C0	COM0	-	29	Y0.8	CLR0/A4	-
5	NC	-	. -	30	NC	-	-
6	Y0.7-	B3-	-	31	Y0.7+	B3+	-
7	Y0.6-	A3-	-	32	Y0.6+	A3+	-
8	Y0.5-	B2-	-	33	Y0.5+	B2+	-
9	Y0.4-	A2-	-	34	Y0.4+	A2+	-
10	Y0.3-	B1-	-	35	Y0.3+	B1+	-
11	Y0.2-	A1-	-	36	Y0.2+	A1+	-
12	Y0.1-	B0-/CLR5-	-	37	Y0.1+	B0+/CLR5+	-
13	Y0.0-	A0-/CLR4-	-	38	Y0.0+	A0+/CLR4+	-
14	NC	-	-	39	NC	-	-
15	NC	-	-	40	S/S	S/S	S/S
16	X0.15	DOG3	CntB3/CntB5	41	X0.14	DOG2	CntB3/CntA5
17	X0.13	DOG1	CntB2/CntB4	42	X0.12	DOG0	CntA2/CntA4
18	X0.11	DOG5	CntB1	43	X0.10	DOG4	CntA1
19	X0.9	MPGB	CntB0	44	X0.8	MPGA	CntA0
20	NC	-	-	45	NC	-	-
21	NC	-	-	46	NC	-	-
22	X0.3-	Pg3-	Rst3-/Rst5-	47	X0.3+	Pg3+	Rst3+/Rst5+
23	X0.2-	Pg2-	Rst2-/Rst4-	48	X0.2+	Pg2+	Rst2+/Rst4+
24	X0.1-	Pg1-	Rst1-	49	X0.1+	Pg1+	Rst1+
25	X0.0-	Pg0-	Rst0-	50	X0.0+	Pg0+	Rst0+

- External devices for AH15PM-5A



- Connector on AH15PM-5A



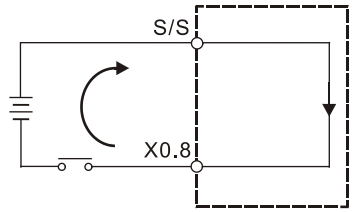
Pin	Terminal	Function		Pin	Terminal	Function	
		Pulse	Count			Pulse	Count
1	Y0.11	CLR3	-	26	Y0.10	CLR2	-
2	Y0.9	CLR1	-	27	Y0.8	CLR0	-
3	COM	COM	-	28	Y0.7+	B3+	-
4	Y0.7-	B3-	-	29	Y0.6+	A3+	-
5	Y0.6-	A3-	-	30	Y0.5+	B2+	-
6	Y0.5-	B2-	-	31	Y0.4+	A2+	-
7	Y0.4-	A2-	-	32	Y0.3+	B1+	-
8	Y0.3-	B1-	-	33	Y0.2+	A1+	-
9	Y0.2-	A1-	-	34	Y0.1+	B0+	-
10	Y0.1-	B0-	-	35	Y0.0+	A0+	-
11	Y0.0-	A0-	-	36	S/S	S/S	S/S
12	X1.5	CHG3	-	37	X1.4	CHG2	-
13	X1.3	CHG1	-	38	X1.2	CHG0	-
14	X1.1	LSN3	-	39	X1.0	LSP3	-
15	X0.15	LSN2	CntB3/CntB5	40	X0.14	LSP2	CntB3/CntA5
16	X0.13	LSN1	CntB2/CntB4	41	X0.12	LSP1	CntA2/CntA4
17	X0.11	LSN0	CntB1	42	X0.10	LSP0	CntA1
18	X0.9-	MPGB-	CntB0-	43	X0.9+	MPGB+	CntB0+
19	X0.8-	MPGA-	CntA0-	44	X0.8+	MPGA+	CntA0+
20	X0.7	DOG3	-	45	X0.6	DOG2	-
21	X0.5	DOG1	-	46	X0.4	DOG0	-
22	X0.3-	Pg3-	Rst3-/Rst5-	47	X0.3+	Pg3+	Rst3+/Rst5+
23	X0.2-	Pg2-	Rst2-/Rst4-	48	X0.2+	Pg2+	Rst2+/Rst4+
24	X0.1-	Pg1-	Rst1-	49	X0.1+	Pg1+	Rst1+
25	X0.0-	Pg0-	Rst0-	50	X0.0+	Pg0+	Rst0+

Wiring Input Terminals

The input signal is the direct-current power input. Sinking and sourcing are the current driving capability of a circuit. They are defined below.

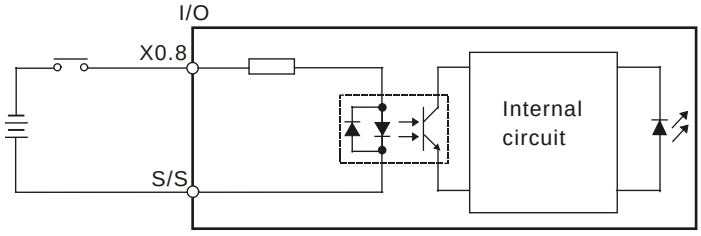
- **NPN(Sink)**

Direct current



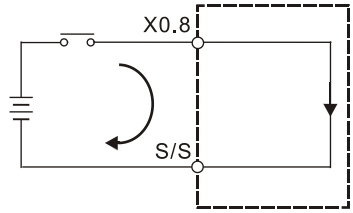
The current flows into the common terminal S/S.

Equivalent circuit of the input circuit



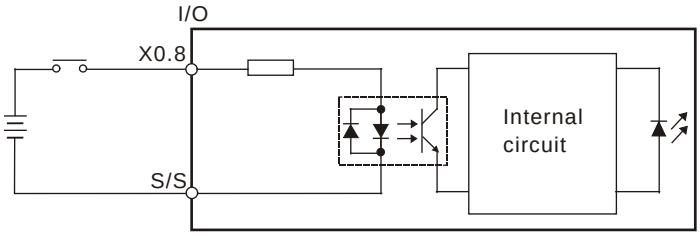
- **PNP(Source)**

Direct current



The current flows from the common terminal S/S.

Equivalent circuit of the input circuit

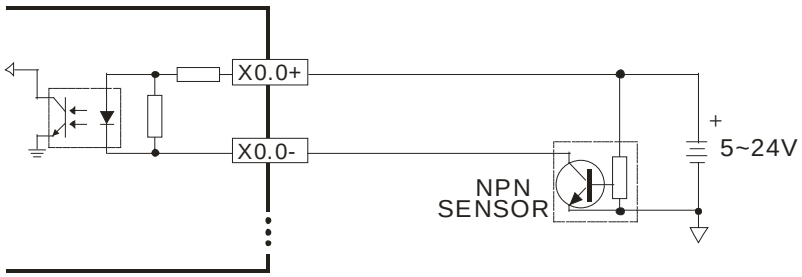


- **Wiring the differential input terminals**

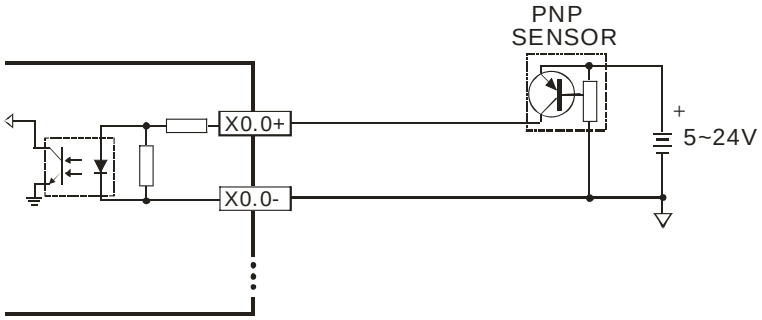
The direct-current signals ranging in voltage from 5-24 VDC can pass through the high-speed input terminals X0.0+~X0.3+ and X0.0-~X0.3- on AH10PM-5A, and X0.0+~X0.3+, X0.0-~X0.3-, X0.8+~X0.9+, and X0.8-~X0.9- on AH15PM-5A. (Only 24 VDC signals can pass through the other input terminals on AH10PM-5A and AH15PM-5A.) The frequency of input signals can be up to 200 kHz.

If the frequency of input signals is less than 50 kHz and there is not much noise, these high-speed input terminals can be connected to the direct-current power supply whose voltage is in the range of 5 V to 24 V. The wiring diagrams for AH10PM-5A are shown below.

NPN(Sink):

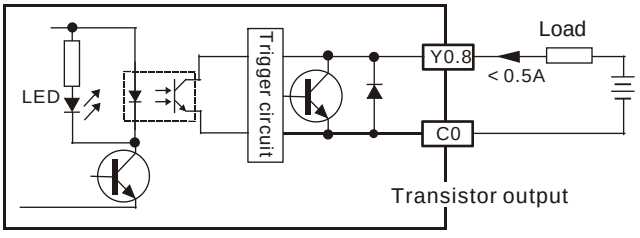


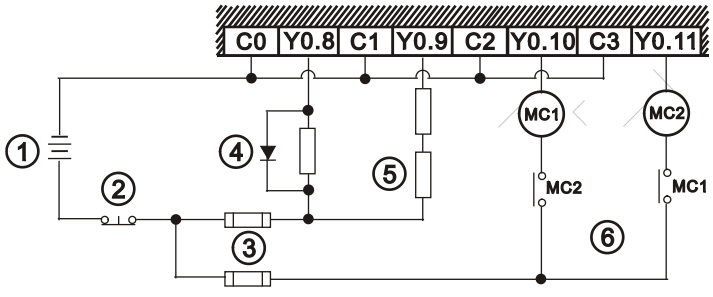
PNP(Source):



Wiring the Output Terminals

1. Transistor output circuit



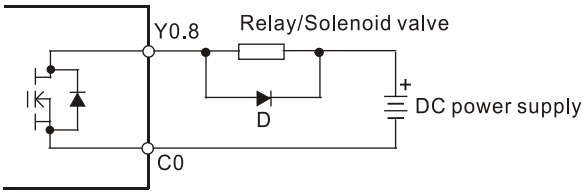


①	Direct-current power supply	②	Emergency stop	③	Fuse

④

The output terminals of a transistor module are open-collector output terminals. If Y0.8 is a pulse train output terminal of a transistor module, the output current passing through its output pull-up resistor must be greater than 0.1 A to ensure that the transistor module operates normally.

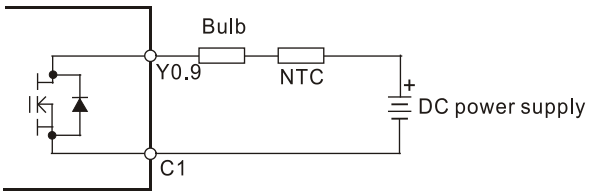
A relay or a solenoid valve is used as a DC load. A diode is connected in parallel to absorb the surge voltage which occurs when the load is OFF.



D: 1N4001 diode

⑤

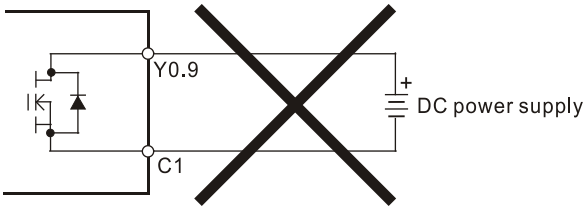
A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON.



NTC: 10Ω

⑤

Y0.9 can not be connected to a power supply directly. It must be connected to a load.

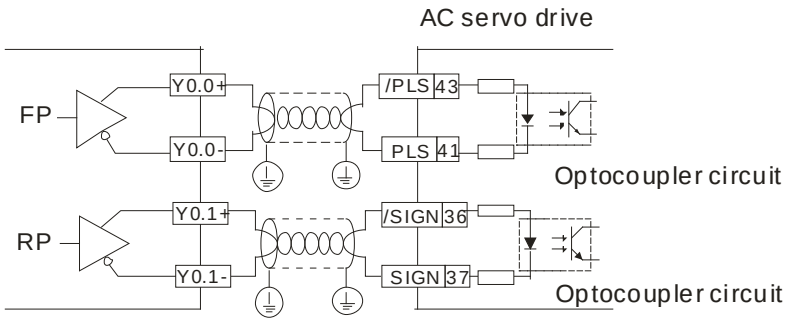


⑥

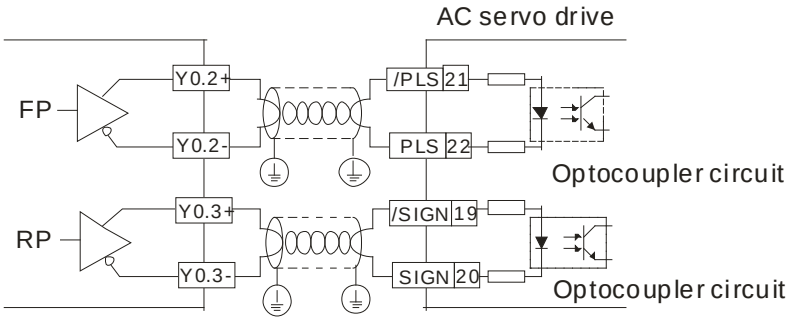
Mutually exclusive output: For example, Y0.10 controls the clockwise rotation of the motor, and Y0.11 controls the counterclockwise rotation of the motor. The interlock circuit which is formed, and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

2. Wiring diagrams for the differential output terminals

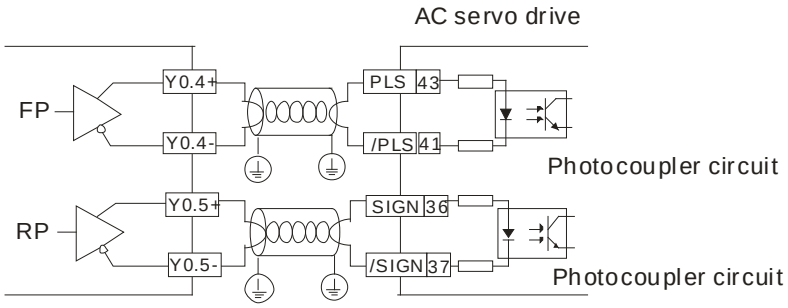
- Wiring differential output terminals on AH05PM-5A / AH10PM-5A / AH15PM-5A, and an ASDA-A / ASDA-A+ / ASDA-A2 series AC servo drive



- Wiring differential output terminals on AH05PM-5A / AH10PM-5A / AH15PM-5A, and an ASDA-B series AC servo drive

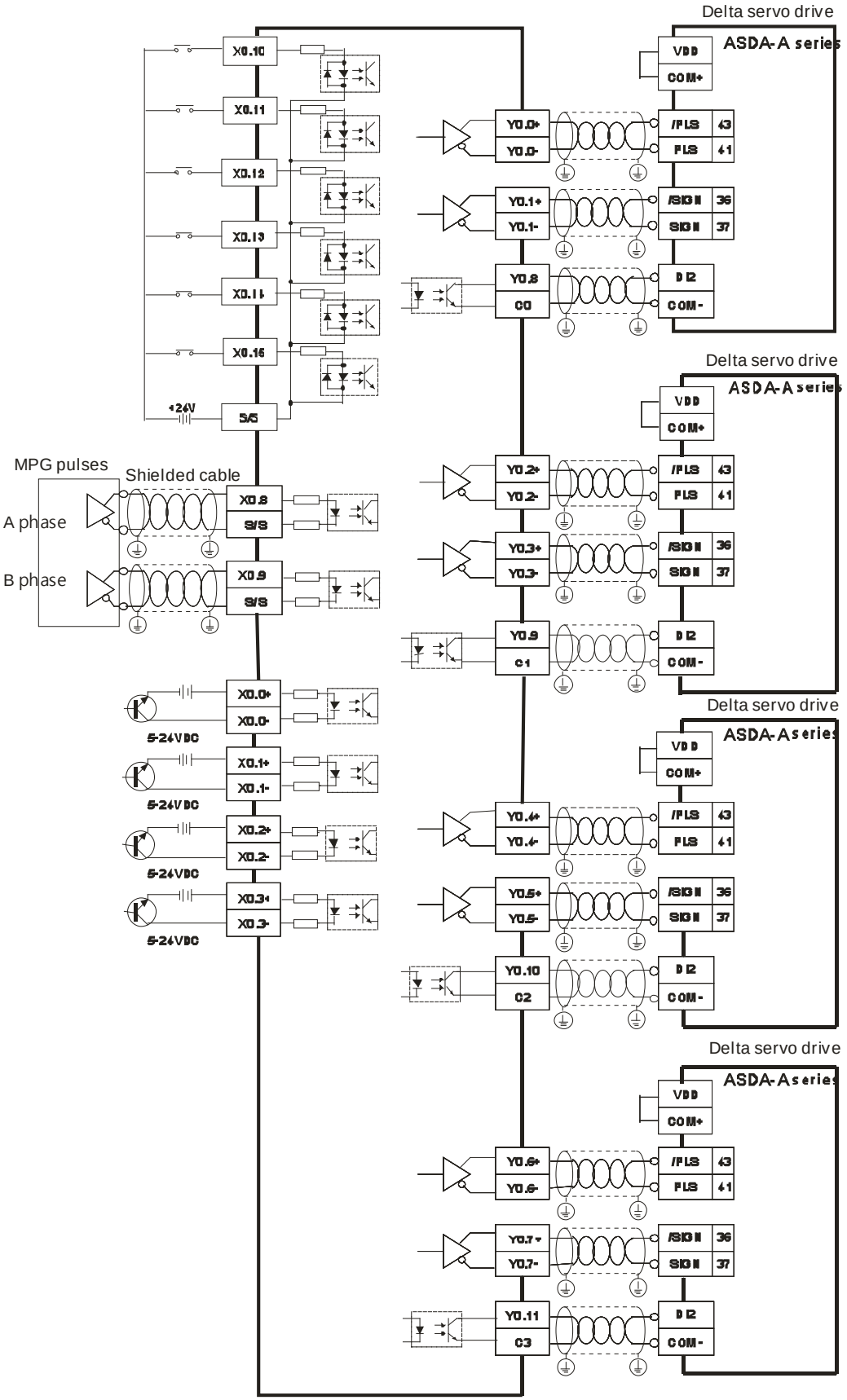


- Wiring differential output terminals on AH05PM-5A / AH10PM-5A / AH15PM-5A, and an ASDA-AB series AC servo drive

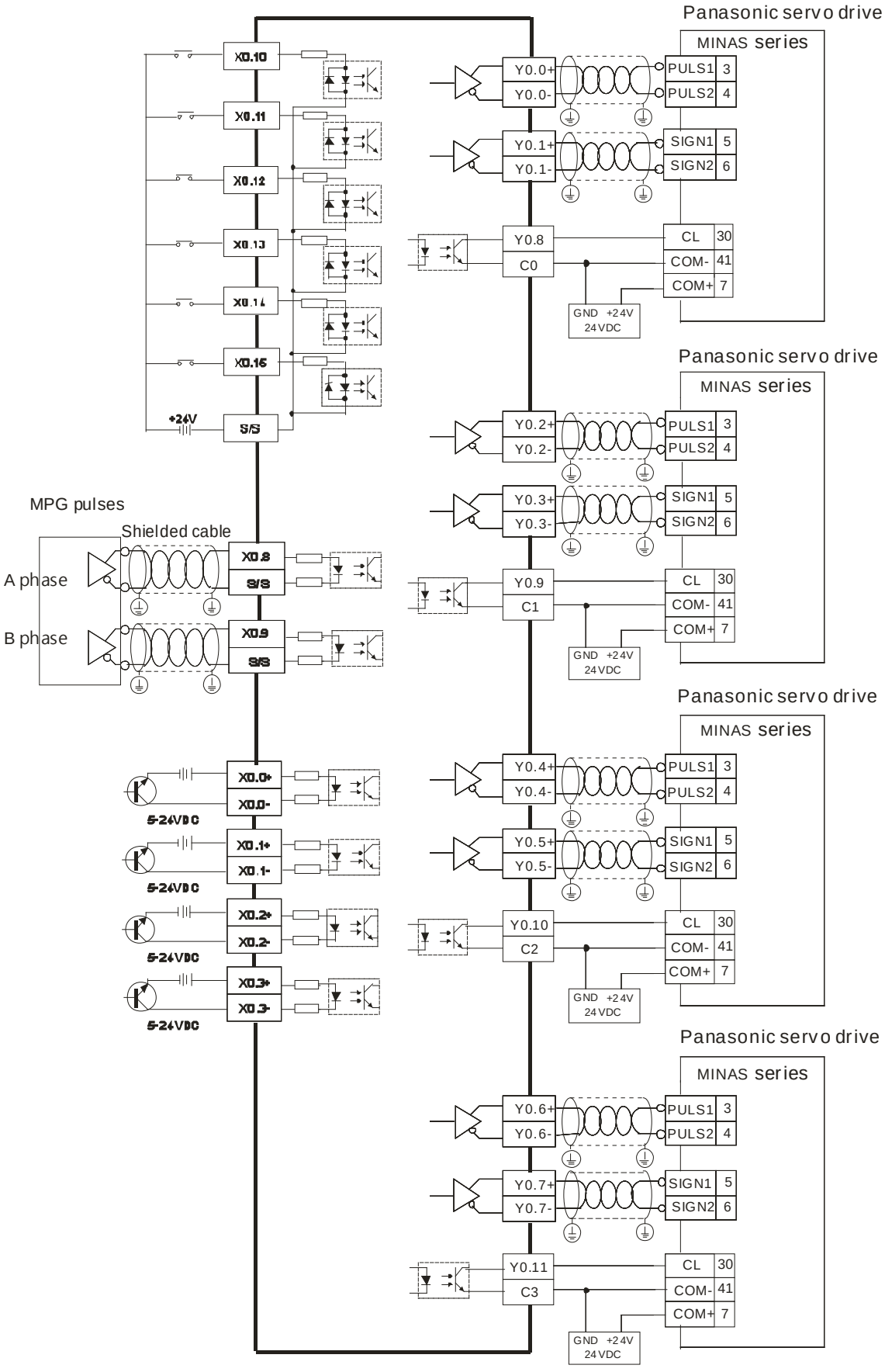


Wiring AH10PM-5A and an Inferior Servo Drive

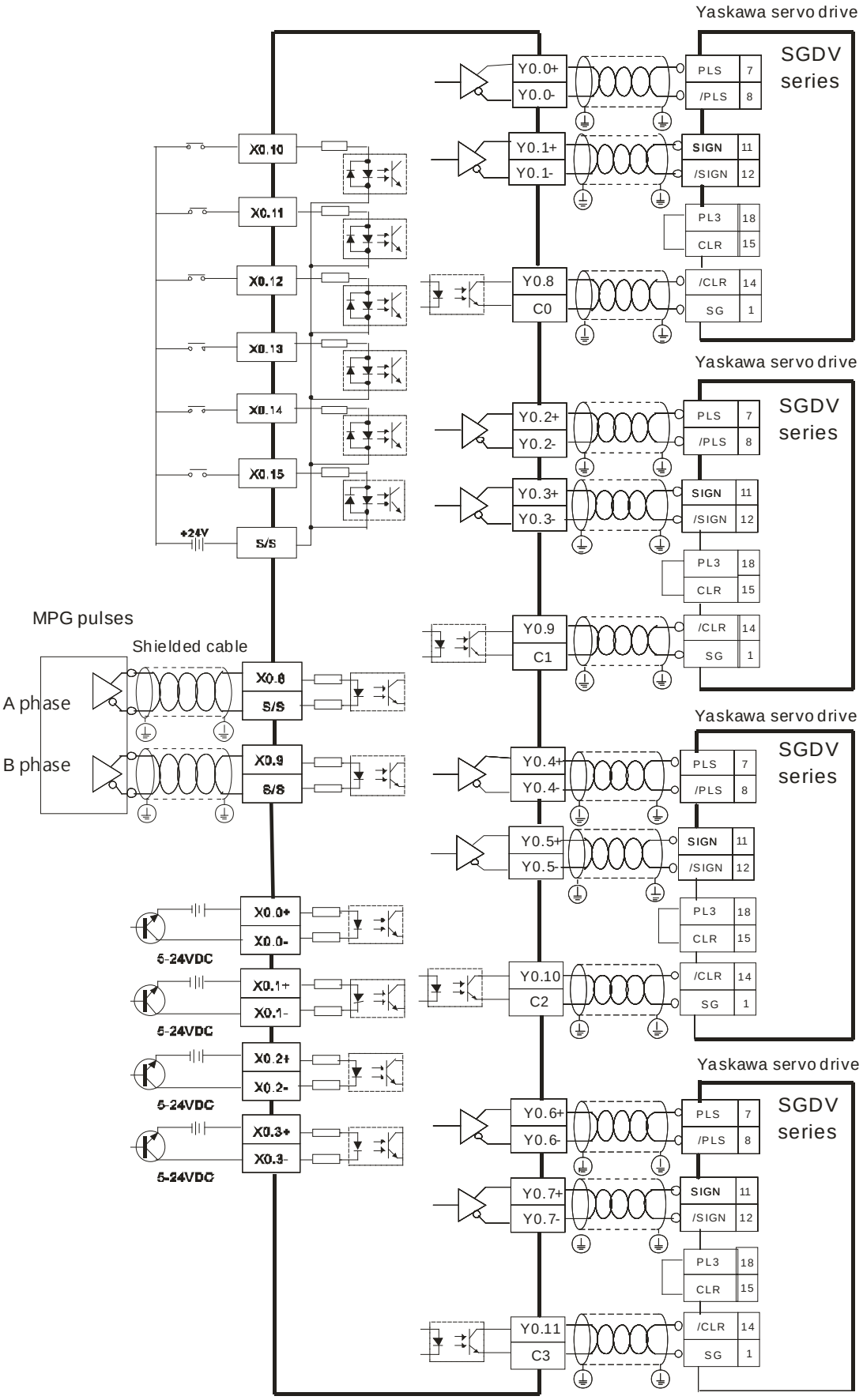
- Wiring AH10PM-5A and a Delta ASDA-A series AC servo drive



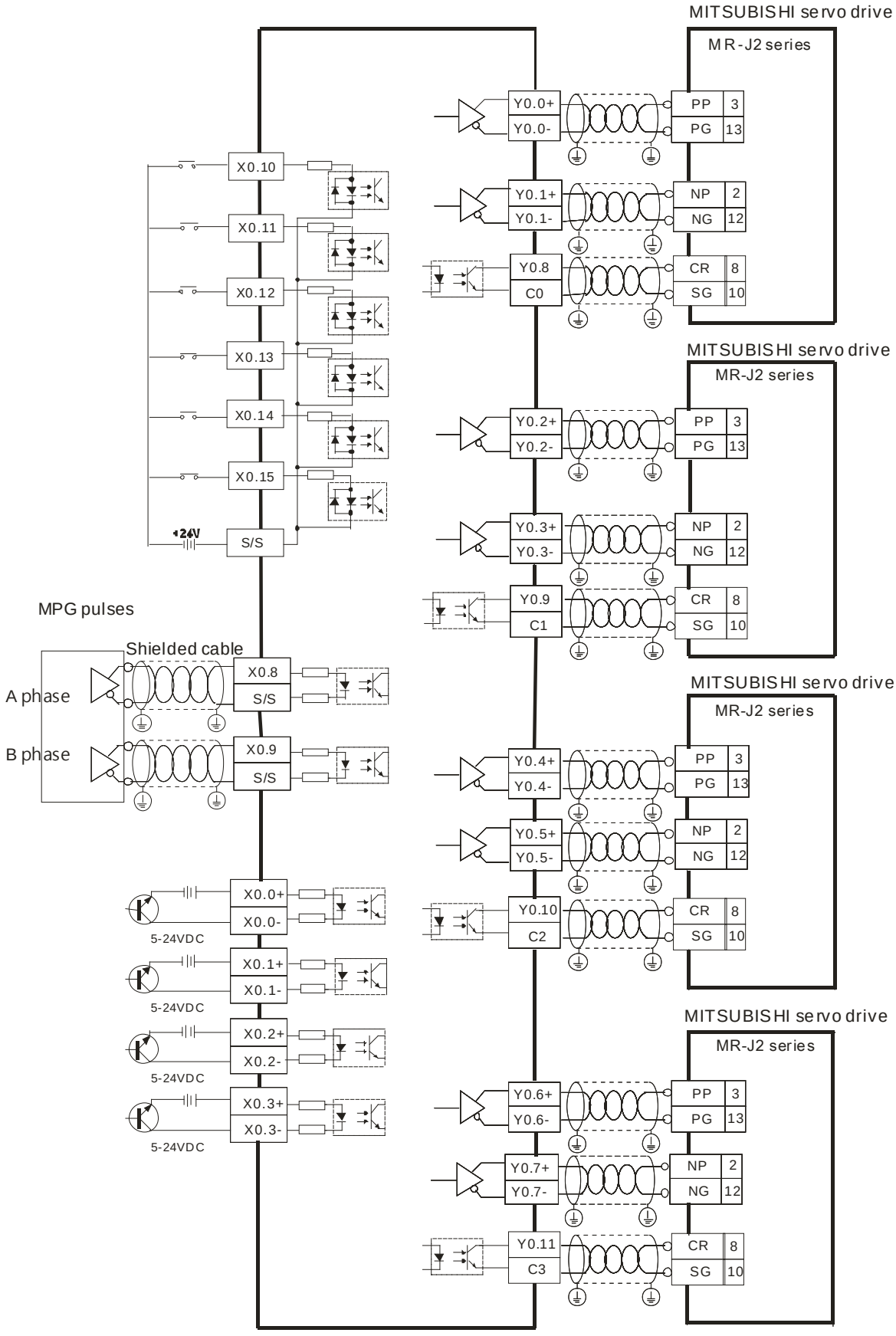
- Wiring AH10PM-5A and a Panasonic MINAS series servo drive



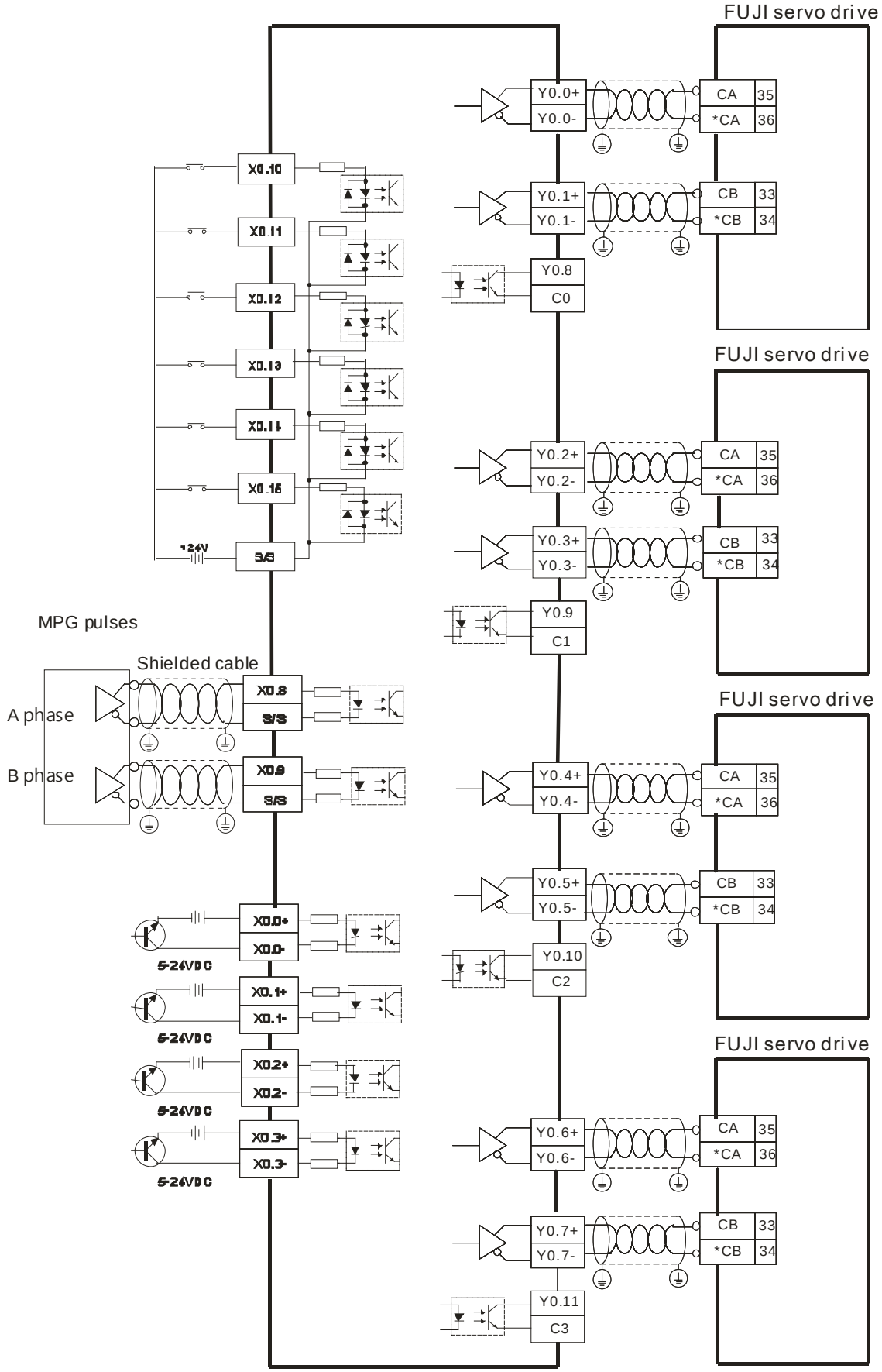
- Wiring AH10PM-5A and an Yaskawa servo drive



- Wiring AH10PM-5A and a Mitsubishi MJR2 series servo drive

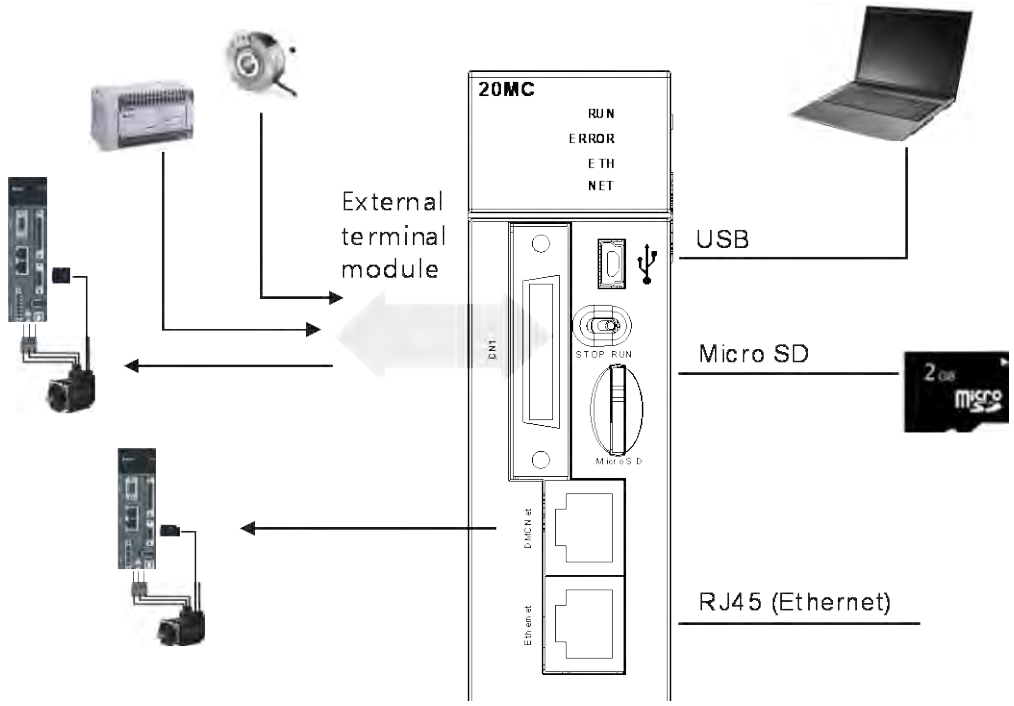


- Wiring AH10PM-5A and a Fuji servo drive

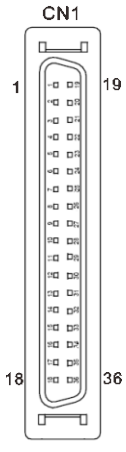


4.7.4 Wiring AH20MC-5A

- External devices for AH20MC-5A



- Connector on AH20MC-5A

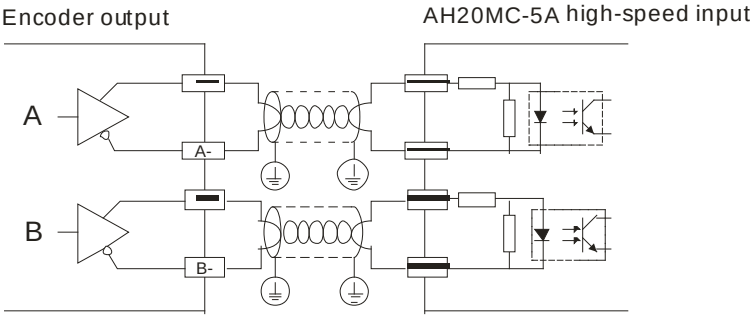


Pin	Terminal	Function		Pin	Terminal	Function	
		Pulse	Count			Pulse	Count
1	C3	-	COM3	19	Y0.11	-	Out3
2	C2	-	COM2	20	Y0.10	-	Out2
3	C1	-	COM1	21	Y0.9	-	Out1
4	C0	-	COM0	22	Y0.8	-	Out0
5	NC	-	-	23	NC	-	-
6	NC	-	-	24	NC	-	-
7	X0.3-	-	Rst3-/Rst5-	25	X0.3+	-	Rst3+/Rst5+
8	X0.15-	DOG3-	CntB3-/CntB5+	26	X0.15+	DOG3+	CntB3+/CntB5+
9	X0.14-	DOG2-	CntA3-/CntA5+	27	X0.14+	DOG2+	CntA3+/CntA5+
10	X0.2-	-	Rst2-/Rst4-	28	X0.2+	-	Rst2+/Rst4+
11	X0.13-	DOG1-	CntB2-/CntB4-	29	X0.13+	DOG1+	CntB2+/CntB4+
12	X0.12-	DOG0-	CntA2-/CntA4-	30	X0.12+	DOG0+	CntA2+/CntA4+
13	X0.1-	-	Rst1-	31	X0.1+	-	Rst1+
14	X0.11-	DOG5-	CntB1-	32	X0.11+	DOG5+	CntB1+
15	X0.10-	DOG4-	CntA1-	33	X0.10+	DOG4+	CntA1+
16	X0.0-	-	Rst0-	34	X0.0+	-	Rst0+
17	X0.9-	MPGB-	CntB0-	35	X0.9+	MPGB+	CntB0+
18	X0.8-	MPGA-	CntA0-	36	X0.8+	MPGA+	CntA0+

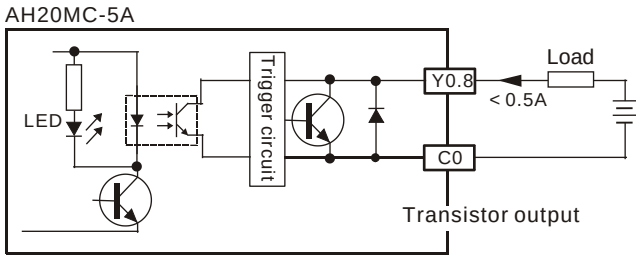
Wiring the Differential Input Terminals

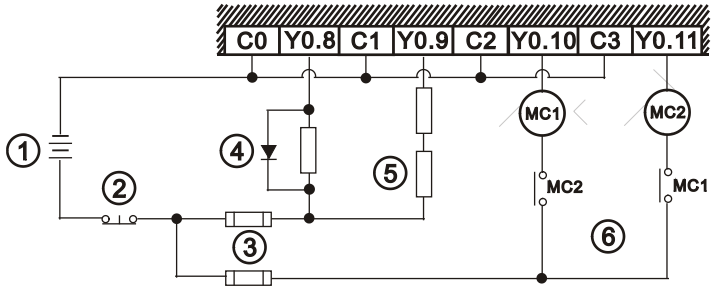
The direct-current signals ranging in voltage from 5-24 VDC can pass through the high-speed input terminals X0.0+~X0.3+, X0.0-~X0.3-, X0.8+~X0.15+, and X0.8-~X0.15- on AH20MC-5A. The frequency of input signals can be up to 200 kHz. These high-speed input terminals are connected to a differential (two-wire) line driver.

- Wiring differential input terminals (The wiring below is used for high speed and high noise.)



Transistor Output Circuit





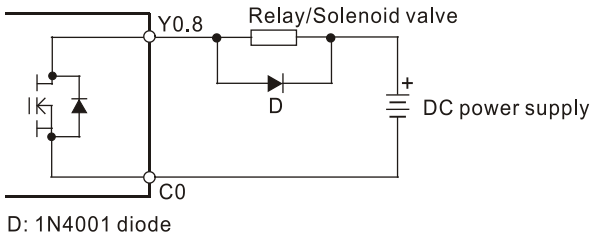
①	Direct-current power supply	②	Emergency stop	③	Fuse

④

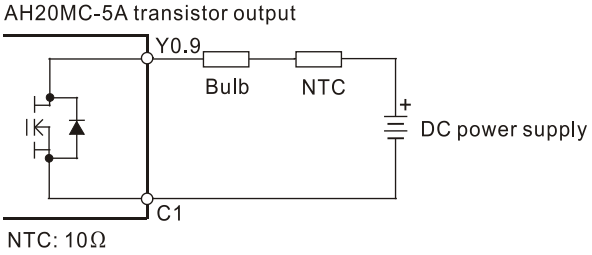
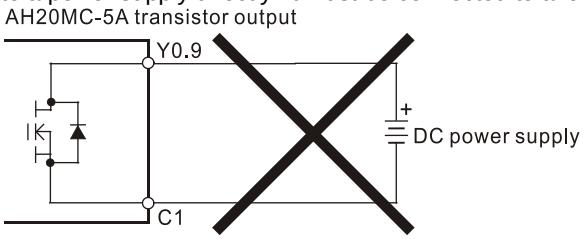
The output terminals of a transistor module are open-collector output terminals. If Y0.8 is a pulse train output terminal of a transistor module, the output current passing through its output pull-up resistor must be greater than 0.1 A to ensure that the transistor module operates normally.

A relay or a solenoid valve is used as a DC load. A diode is connected in parallel to absorb the surge voltage which occurs when the load is OFF.

AH20MC-5A transistor output



D: 1N4001 diode

⑤	A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON.  Y0.9 can not be connected to a power supply directly. It must be connected to a load. 
⑥	Mutually exclusive output: For example, Y0.10 controls the clockwise rotation of the motor, and Y0.11 controls the counterclockwise rotation of the motor. The interlock circuit which is formed, and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

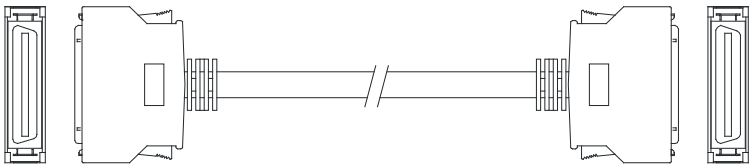
4.7.5 I/O Extension Cables and External Terminal Modules

A connector for a motion control module connects an I/O extension cable to an external terminal module. You can install wires on the input and output terminal blocks in the external terminal module.

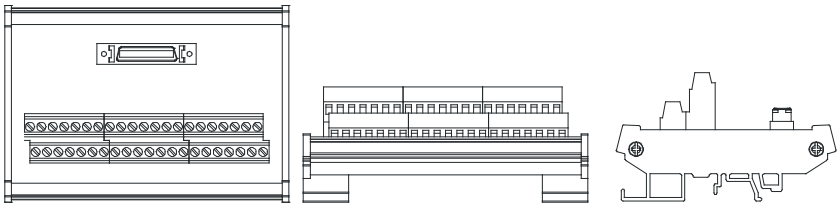
1. I/O extension cable UC-ET010-13B(DVPACAB7D10)/ UC-ET010-15B (DVPACAB7E10)

   UC-ET010-13B is a 36-pin I/O extension cable for AH04HC-5A, AH20MC-5A and AHxxEMC-5A.

   UC-ET010-15B is a 50-pin I/O extension cable for AH10PM-5A and AH15PM-5A.

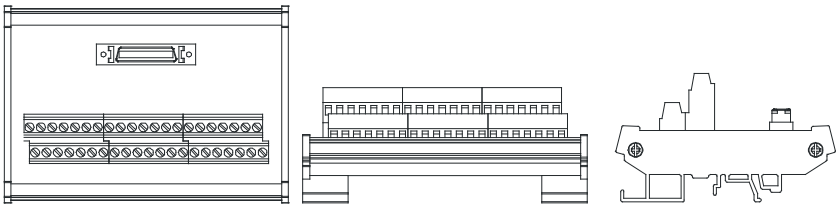


2. External terminal module for AH04HC-5A, AH20MC-5A : UB-10-IO16C or DVPAETB-IO16C



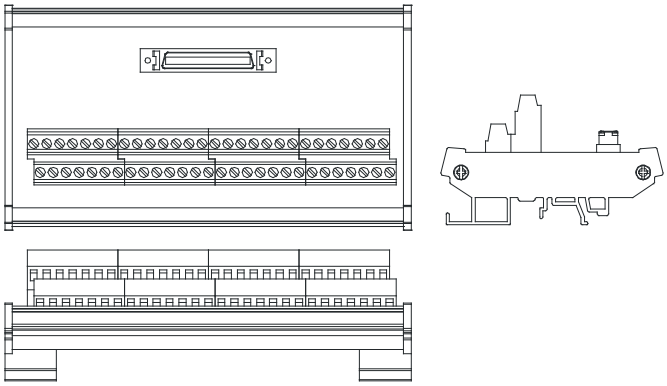
C3	C2	C1	C0	N/C	N/C	X0.3-	X0.15-	X0.14-	X0.2-	X0.13-	X0.12-	X0.1-	X0.11-	X0.10-	X0.0-	X0.9-	X0.8-	24G	24G	FE
Y0.11	Y0.10	Y0.9	Y0.8	N/C	N/C	X0.3+	X0.15+	X0.14+	X0.2+	X0.13+	X0.12+	X0.1+	X0.11+	X0.10+	X0.0+	X0.9+	X0.8+	N/C	24V	24V

3. External terminal module for AHxxEMC-5A: UB-10-IO22C or DVPAETB-IO22C



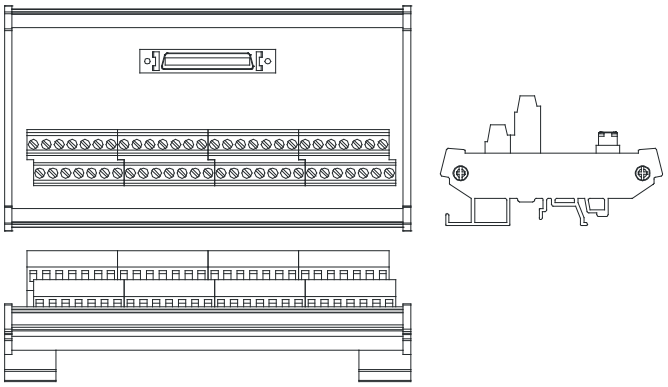
COM	COM	COM	COM	S/S	X1.5	S/S	X1.4	S/S	X0.3	S/S	X0.2	X0.1-	X0.11-	X0.10-	X0.0-	X0.9-	X0.8-	24G	24G	FE
Y0.11	Y0.10	Y0.9	Y0.8	X1.3	X1.2	X1.1	X1.0	X0.15	X0.14	X0.13	X0.12	X0.1+	X0.11+	X0.10+	X0.0+	X0.9+	X0.8+	N/C	24V	24V

4. External terminal module for AH10PM-5A: UB-10-IO24C or DVPAETB-IO24C



1st from the upper left	C3	C2	C1	C0	N/C	Y0.7-	Y0.6-	Y0.5-	Y0.4-	Y0.3-	Y0.2-	Y0.1-	Y0.0-	N/C
15th from the upper left	N/C	X0.15	X0.13	X0.11	X0.9	N/C	N/C	X0.3-	X0.2-	X0.1-	X0.0-	24G	24G	FE
1st from the lower left	Y0.11	Y0.10	Y0.9	Y0.8	N/C	Y0.7+	Y0.6+	Y0.5+	Y0.4+	Y0.3+	Y0.2+	Y0.1+	Y0.0+	N/C
15th from the lower left	S/S	X0.14	X0.12	X0.10	X0.8	N/C	N/C	X0.3+	X0.2+	X0.1+	X0.0+	N/C	24V	24V

5. External terminal module for AH15PM-5A: UB-10-IO34C or DVPAETB-IO34C



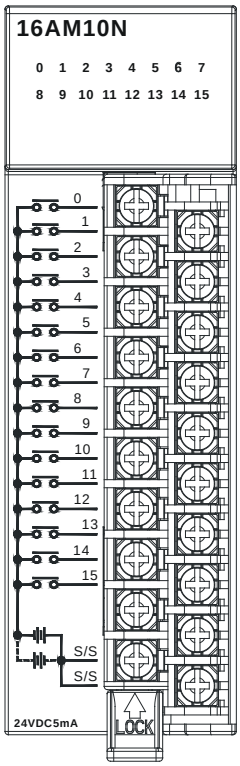
1st from the upper left	Y0.11	Y0.9	COM	Y0.7-	Y0.6-	Y0.5-	Y0.4-	Y0.3-	Y0.2-	Y0.1-	Y0.0-	X1.5	X1.3	X1.1
15th from the upper left	X0.15	X0.13	X0.11	X0.9-	X0.8-	X0.7	X0.5	X0.3-	X0.2-	X0.1-	X0.0-	24G	24G	FE
1st from the lower left	Y0.10	Y0.8	Y0.7+	Y0.6+	Y0.5+	Y0.4+	Y0.3+	Y0.2+	Y0.1+	Y0.0+	S/S	Y1.4	Y1.2	Y1.0
15th from the lower left	X0.14	X0.12	X0.10	X0.9+	X0.8+	X0.6	X0.4	X0.3+	X0.2+	X0.1+	X0.0+	N/C	24V	24V

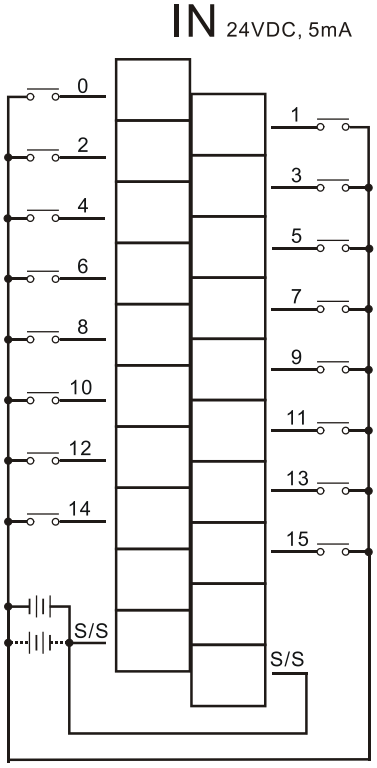
4.8 Wiring Digital Input/Output Modules

The wiring of digital input/output modules is illustrated simply in this section. The simplistic wiring diagrams below also illustrate how the power supplies are connected to S/S, UP, ZP and COM. If you want to get more information about the wiring of digital input/output terminals, you can refer to section 4.9 in this manual.

4.8.1 Wiring AH16AM10N-5A

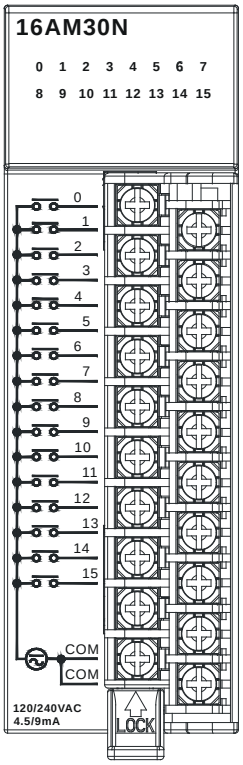
Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA

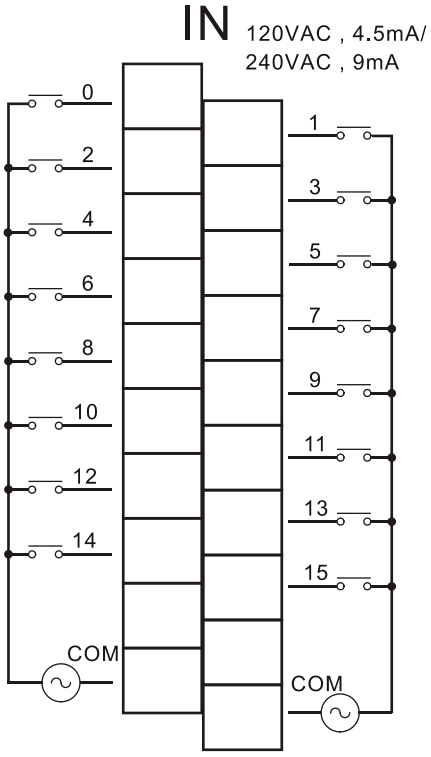




4.8.2 Wiring AH16AM30N-5A

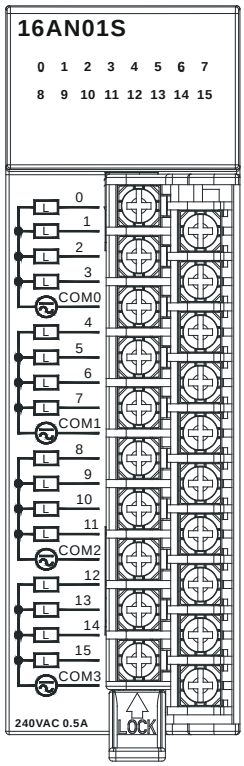
Input form	Alternating current
Input current	120 VAC, 4.5 mA; 240 VAC, 9 mA

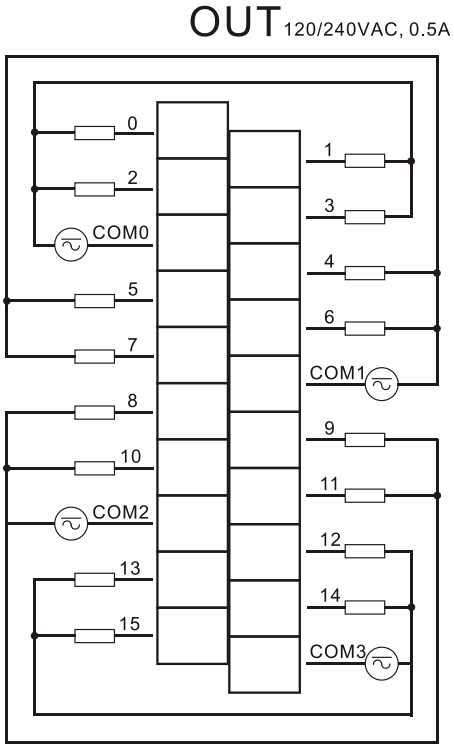




4.8.3 Wiring AH16AN01S-5A

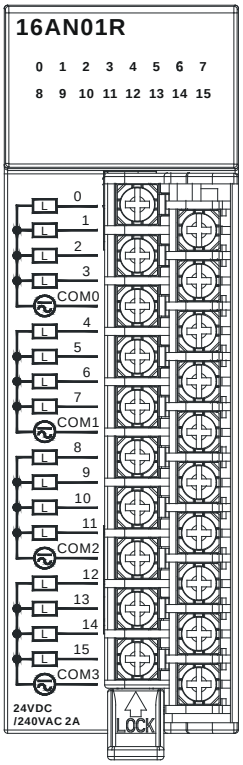
Output type	TRIAC-S
Voltage specifications	120/240 VAC, 0.5 A

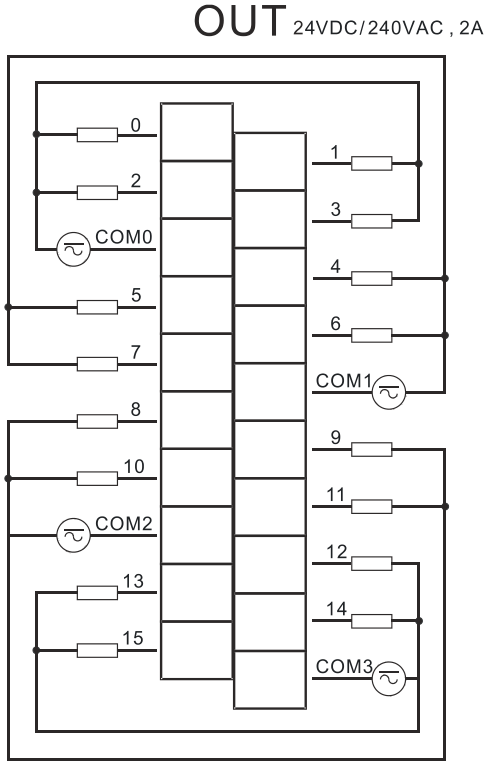




4.8.4 Wiring AH16AN01R-5A

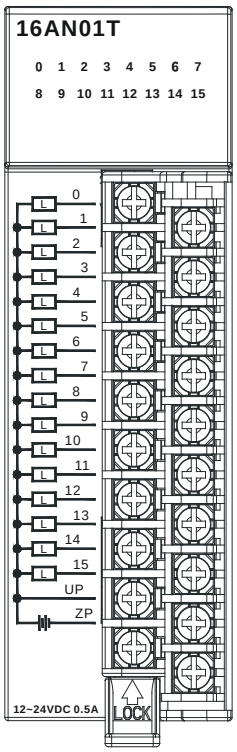
Output type	Relay-R
Voltage specifications	24 VDC, 240 VAC, 2 A

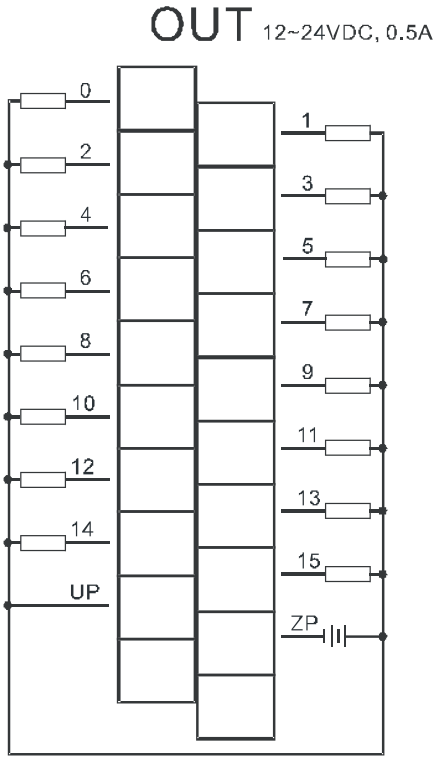




4.8.5 Wiring AH16AN01T-5A

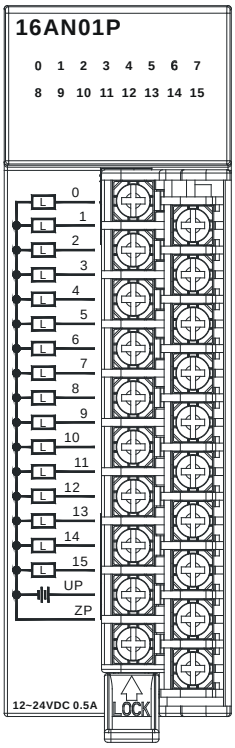
Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.5 A

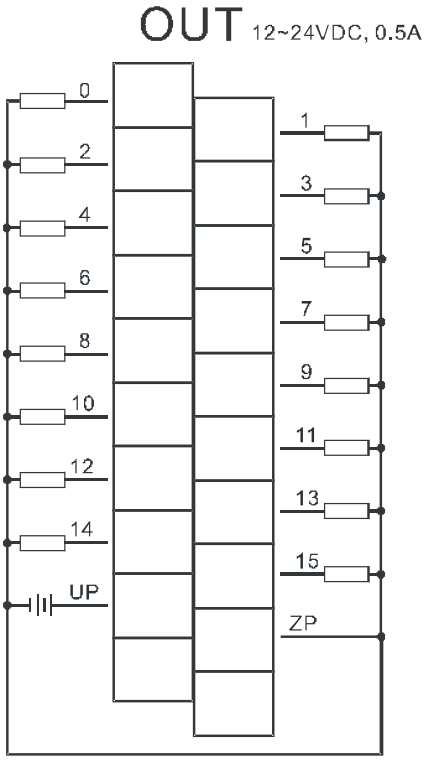




4.8.6 Wiring AH16AN01P-5A

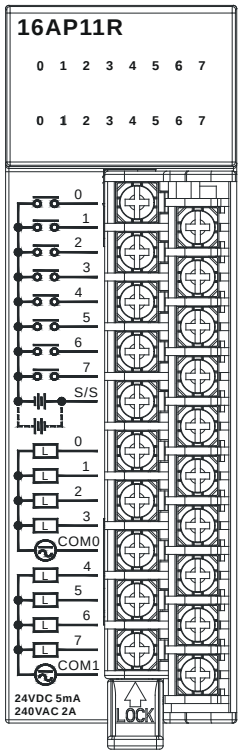
Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.5 A

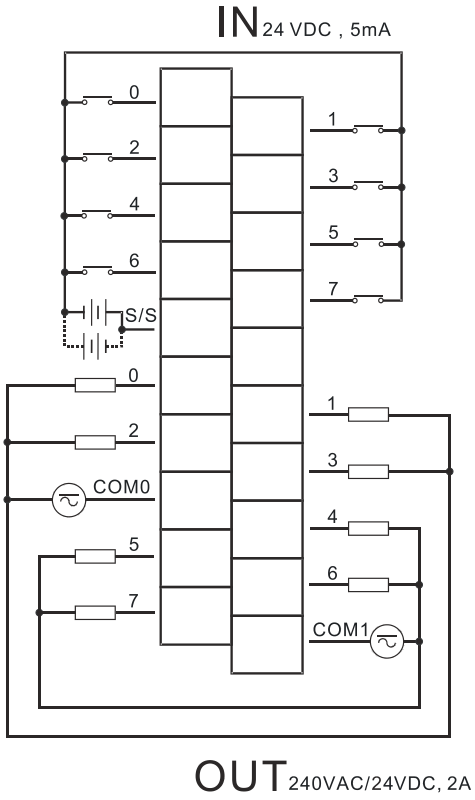




4.8.7 Wiring AH16AP11R-5A

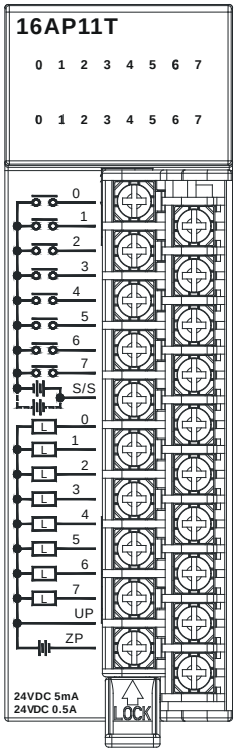
Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA
Output type	Relay-R
Voltage specifications	24 VDC, 240 VAC, 2 A

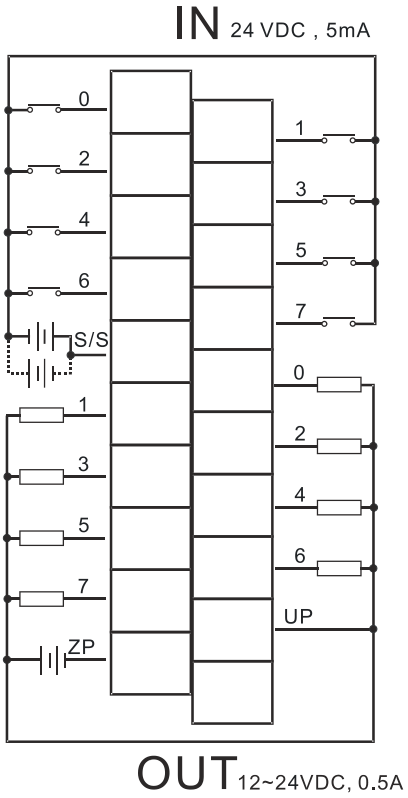




4.8.8 Wiring AH16AP11T-5A

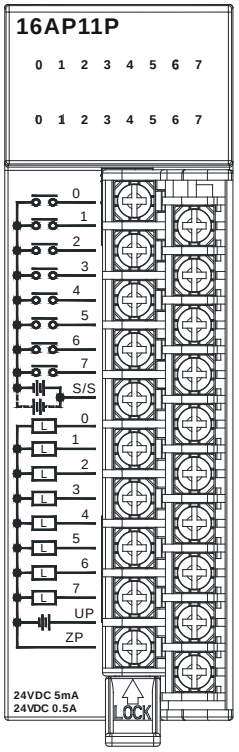
Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA
Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.5 A

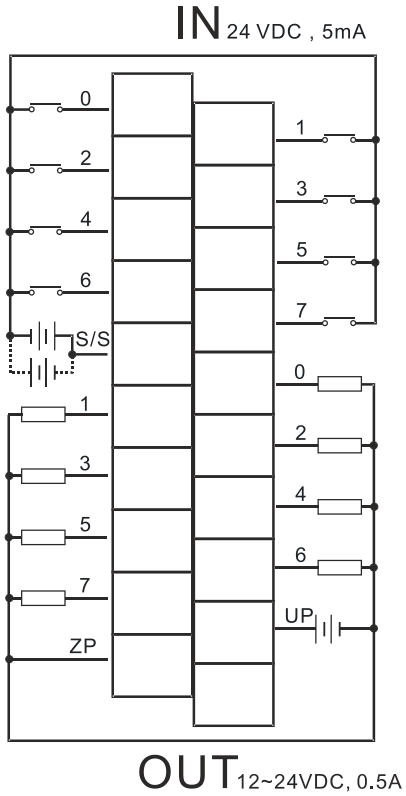




4.8.9 Wiring AH16AP11P-5A

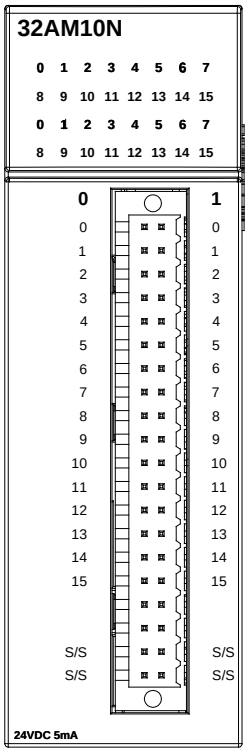
Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA
Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.5 A

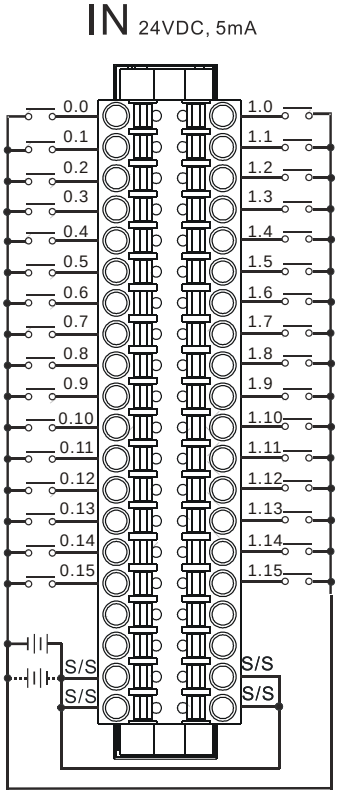




4.8.10 Wiring AH32AM10N-5A

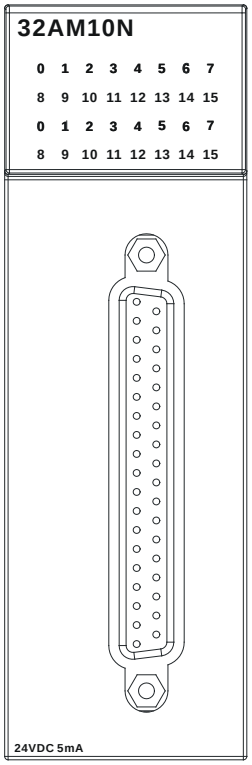
Input form	Direct current (sinking or sourcing)
Input current	240VDC, 5 mA

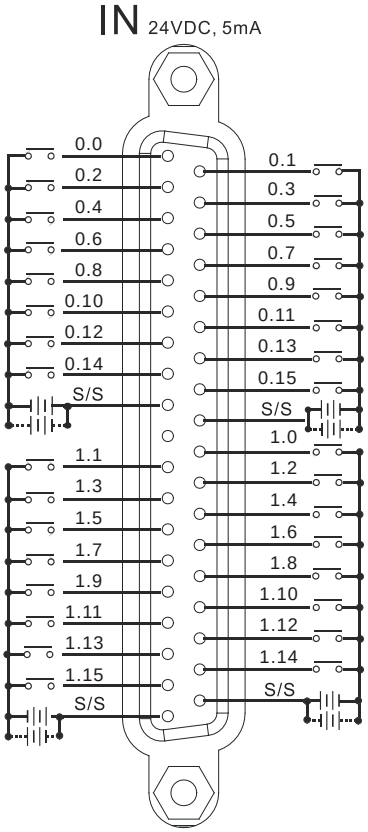




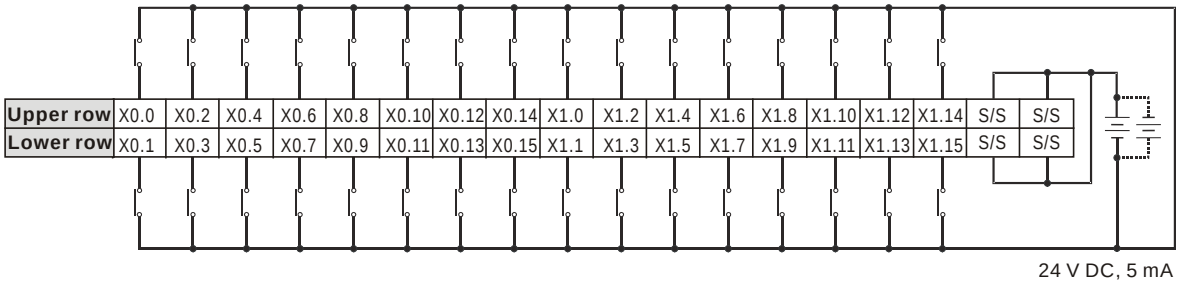
4.8.11 Wiring AH32AM10N-5B

Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA



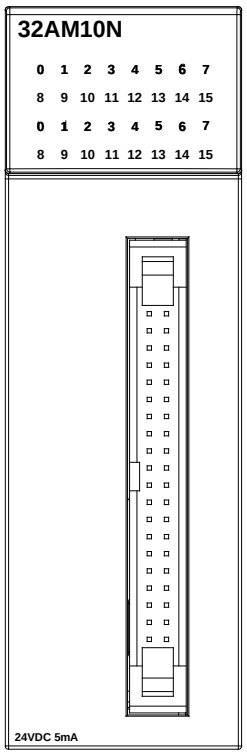


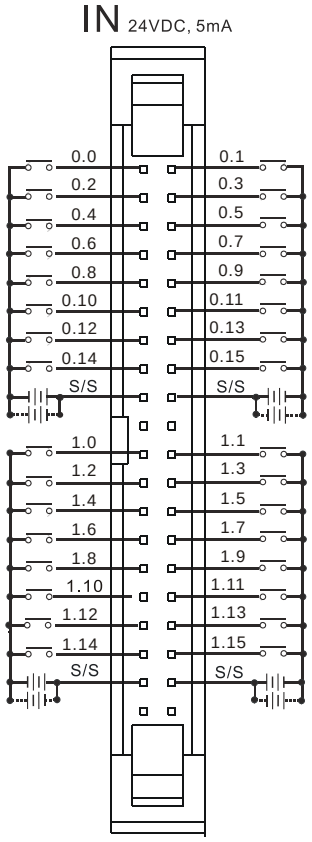
Wiring the external terminal module UB-10-ID32B:



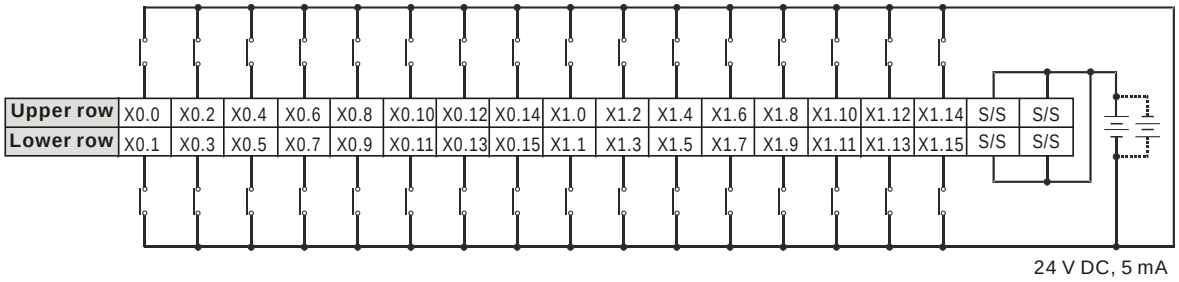
4.8.12 Wiring AH32AM10N-5C

Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA



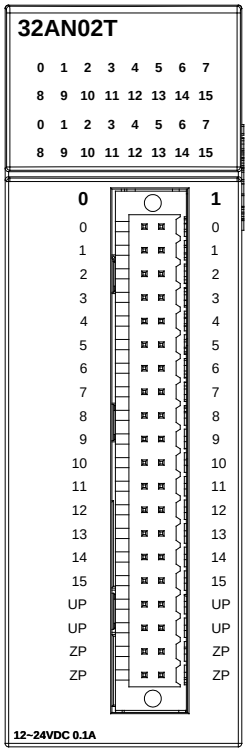


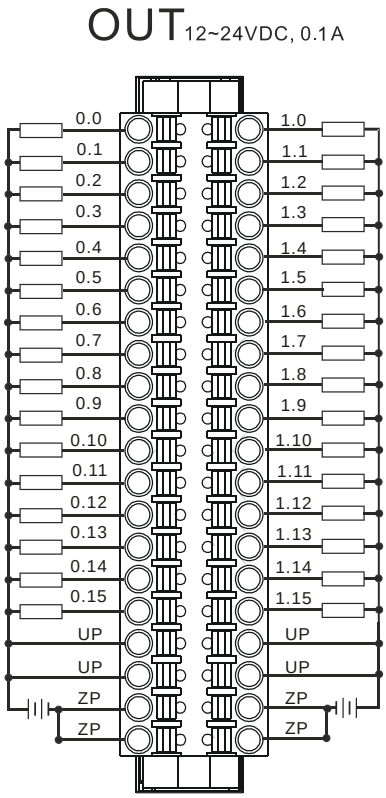
Wiring the external terminal module UB-10-ID32A:



4.8.13 Wiring AH32AN02T-5A

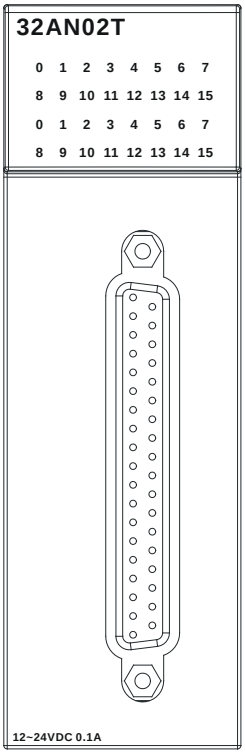
Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.1 A

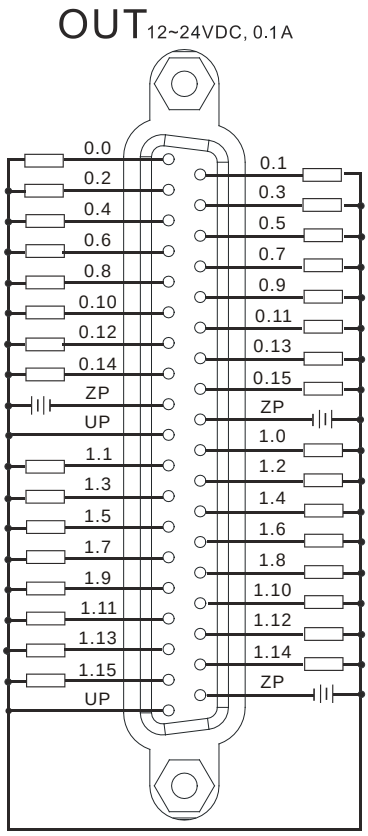




4.8.14 Wiring AH32AN02T-5B

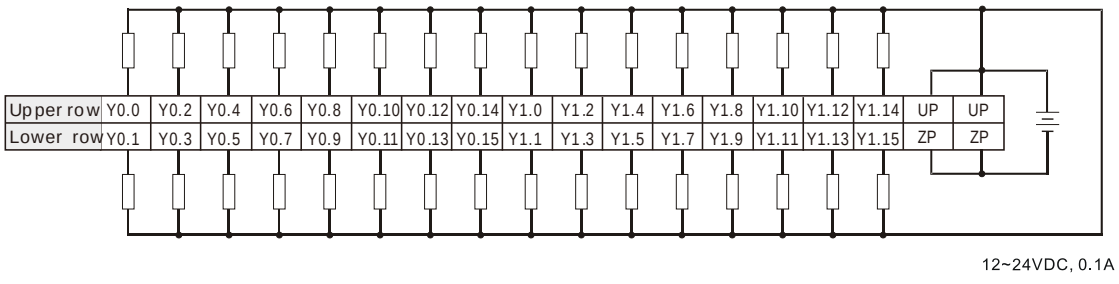
Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.1 A





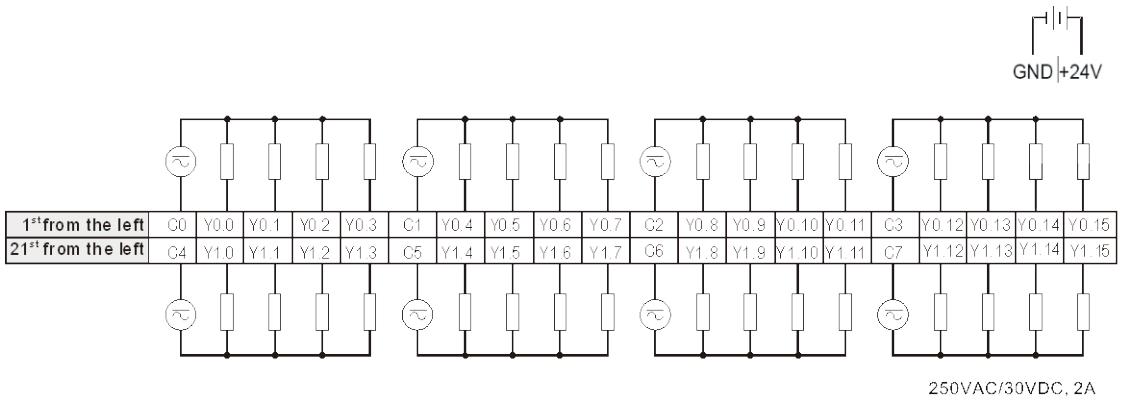
Wiring the external terminal module UB-10-OT32B:

Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.1 A



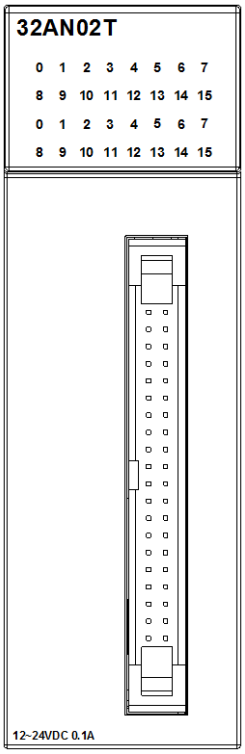
Wiring the external terminal module UB-10-OR32A:

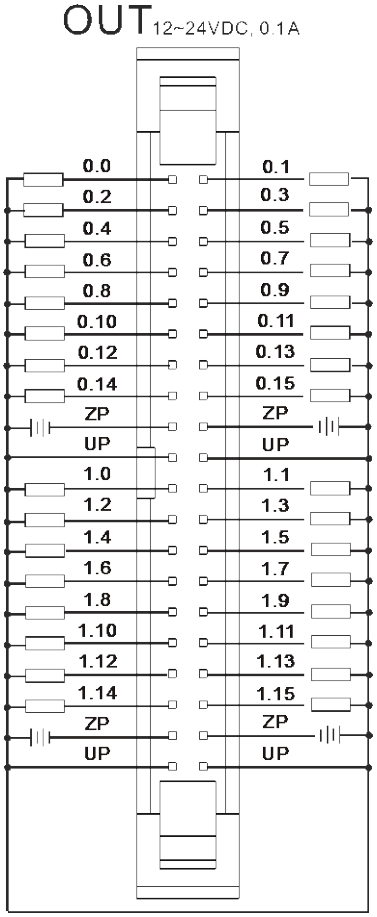
Output type	Relay-R
Voltage specifications	250 VAC, below 30VDC



4.8.15 Wiring AH32AN02T-5C

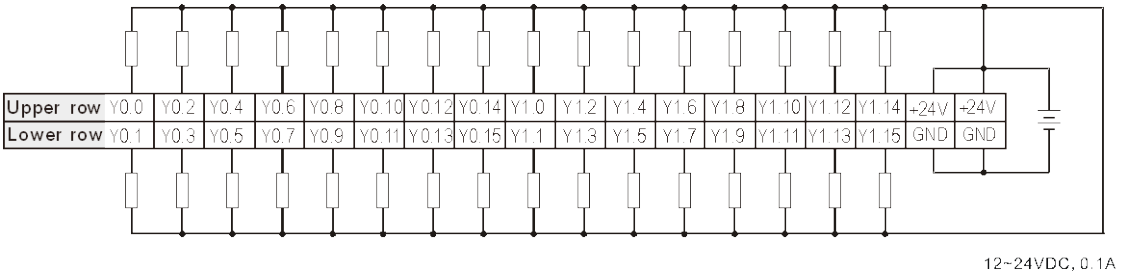
Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.1 A





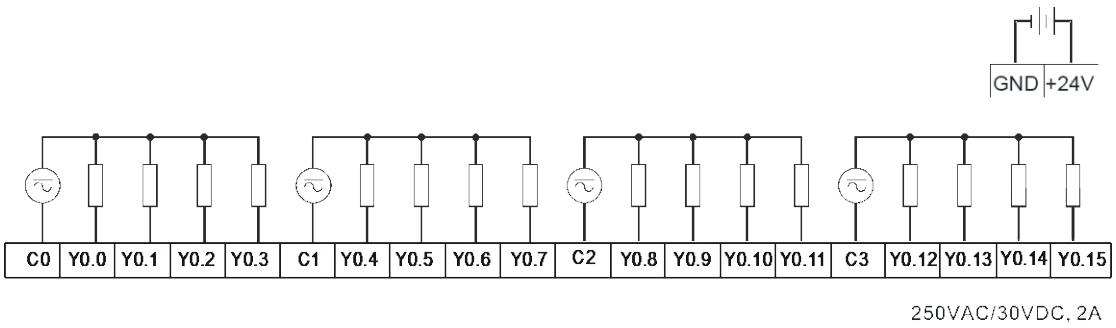
Wiring the external terminal module UB-10-OT32A:

Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.1 A



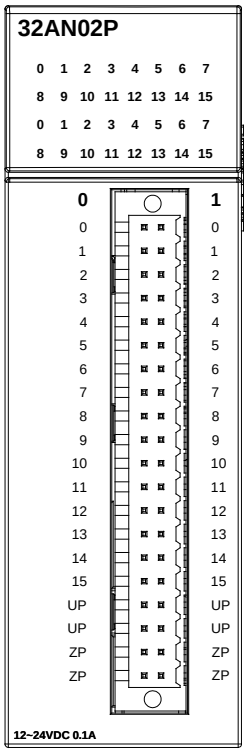
Wiring the external terminal module UB-10-OR16A:

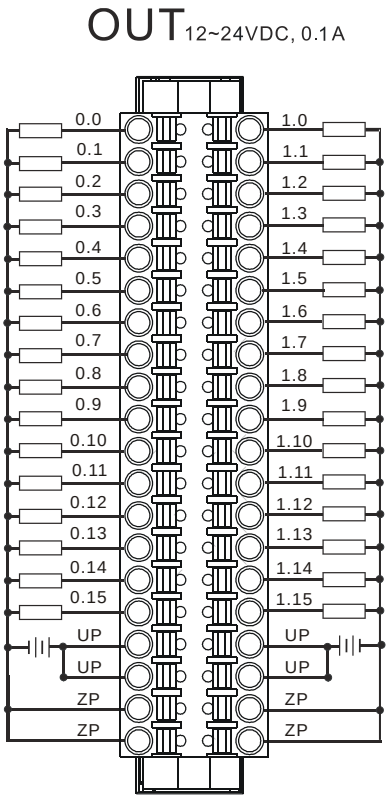
Output type	Relay-R
Voltage specifications	250 VAC, below 30VDC



4.8.16 Wiring AH32AN02P-5A

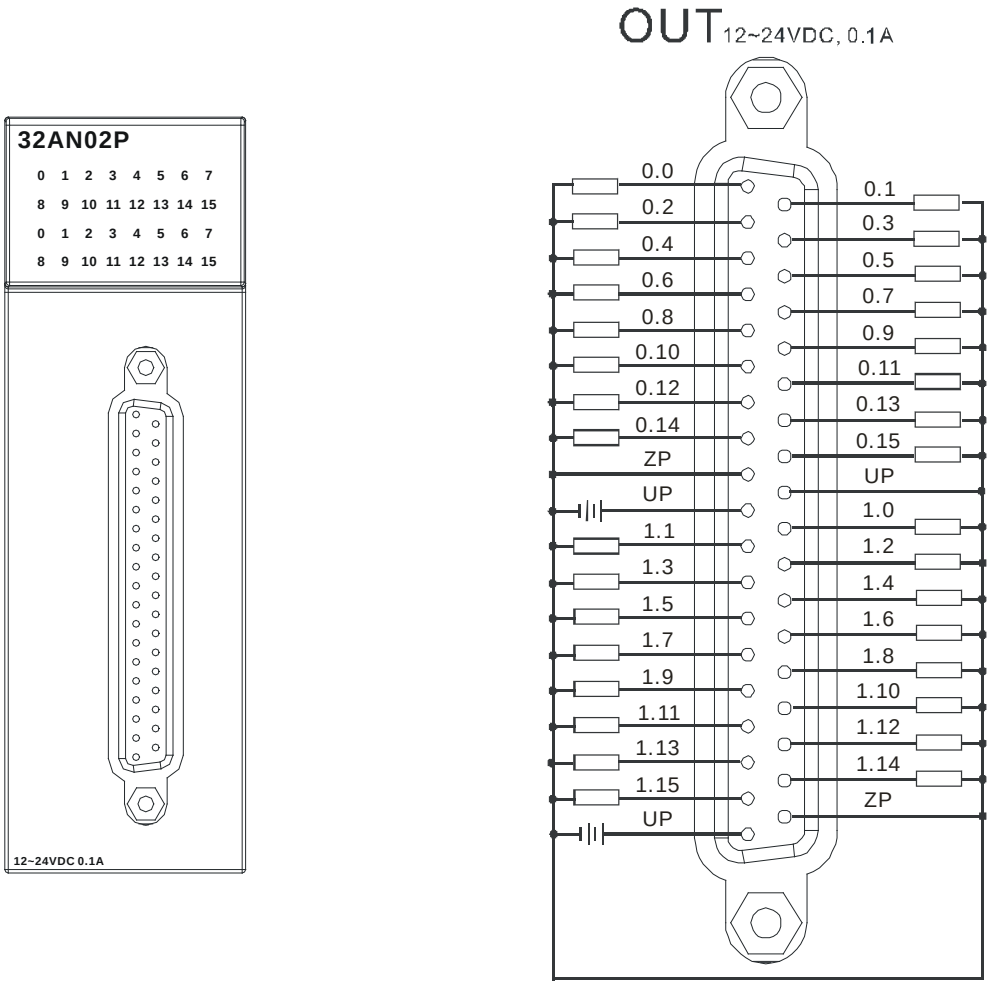
Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.1 A





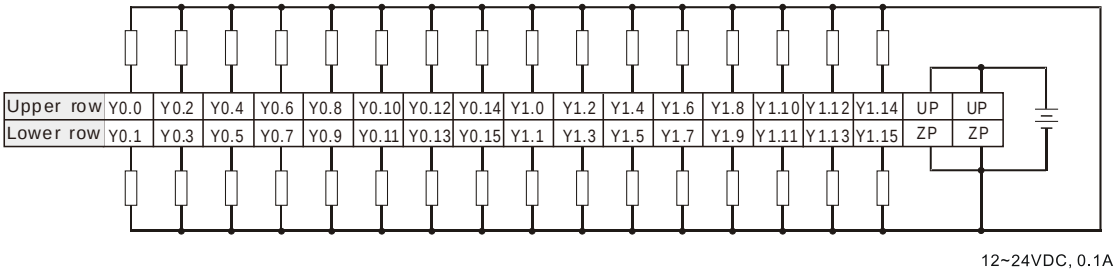
4.8.17 Wiring AH32AN02P-5B

Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.1 A



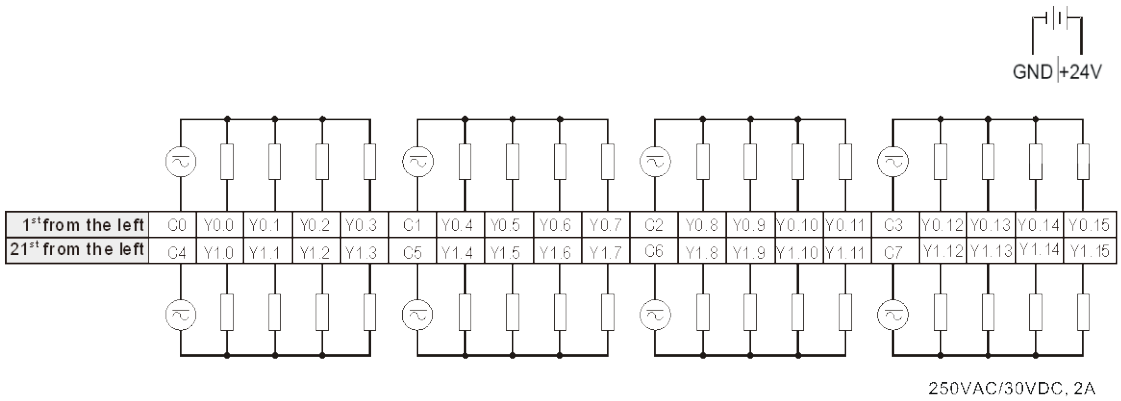
Wiring the external terminal module UB-10-OT32B:

Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.1 A



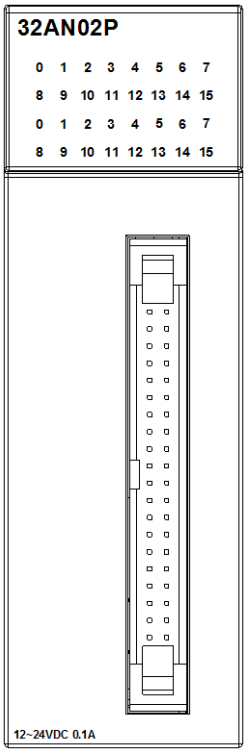
Wiring the external terminal module UB-10-OR32B:

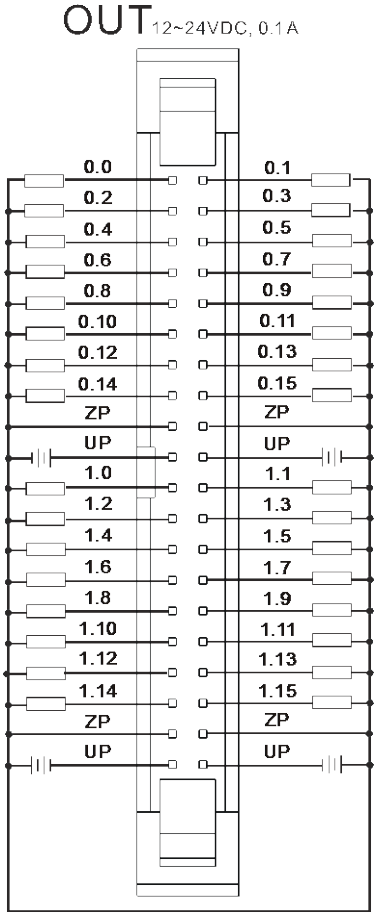
Output type	Relay-R
Voltage specifications	250 VAC, below 30VDC



4.8.18 Wiring AH32AN02P-5C

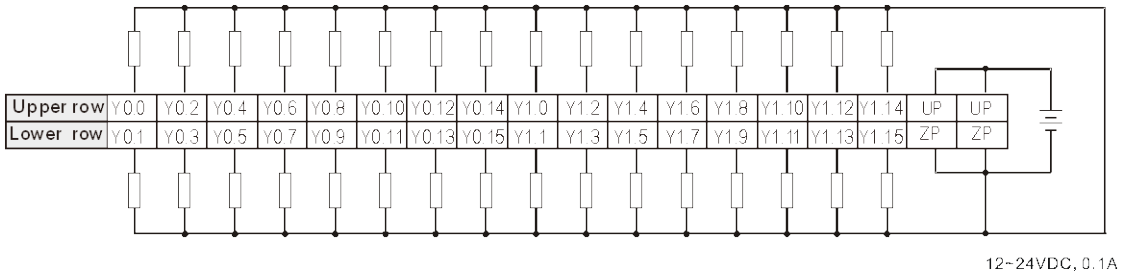
Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.1 A





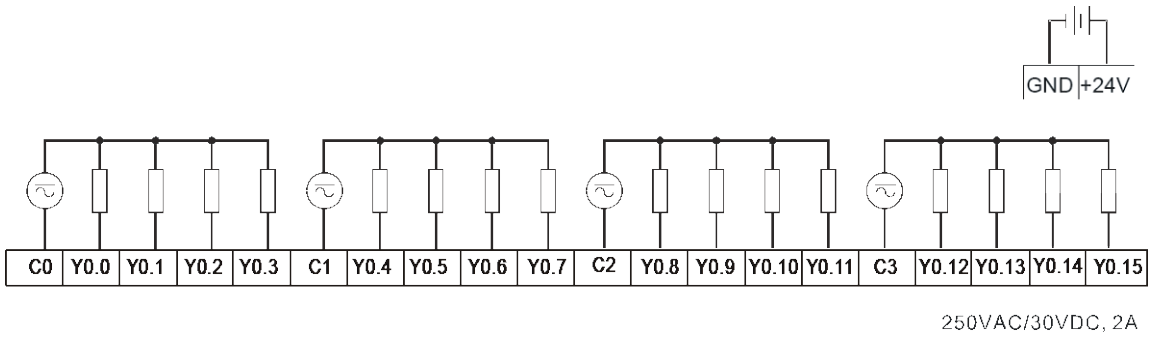
Wiring the external terminal module UB-10-OT32A:

Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.1 A



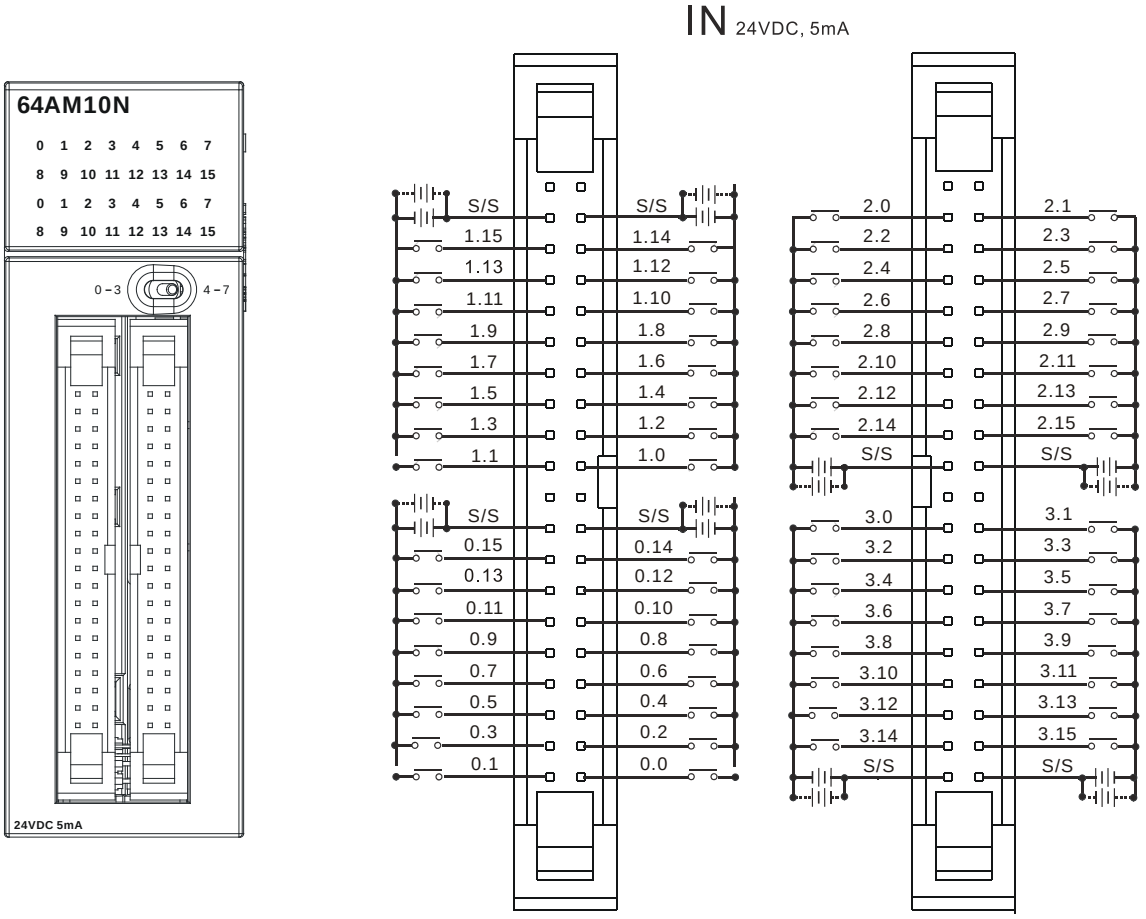
Wiring the external terminal module UB-10-OR16B:

Output type	Relay-R
Voltage specifications	250 VAC, below 30VDC



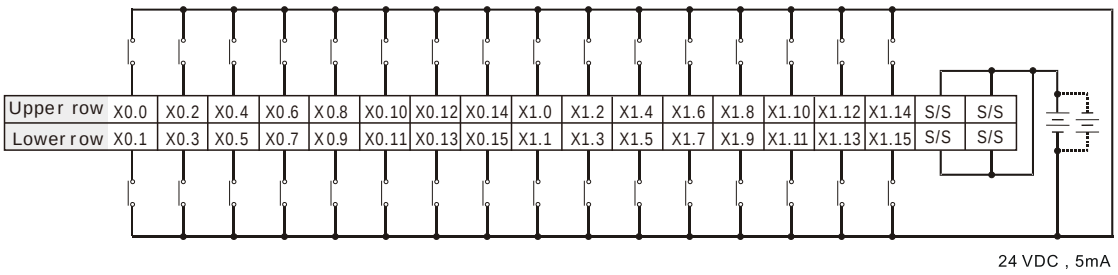
4.8.19 Wiring AH64AM10N-5C

Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA



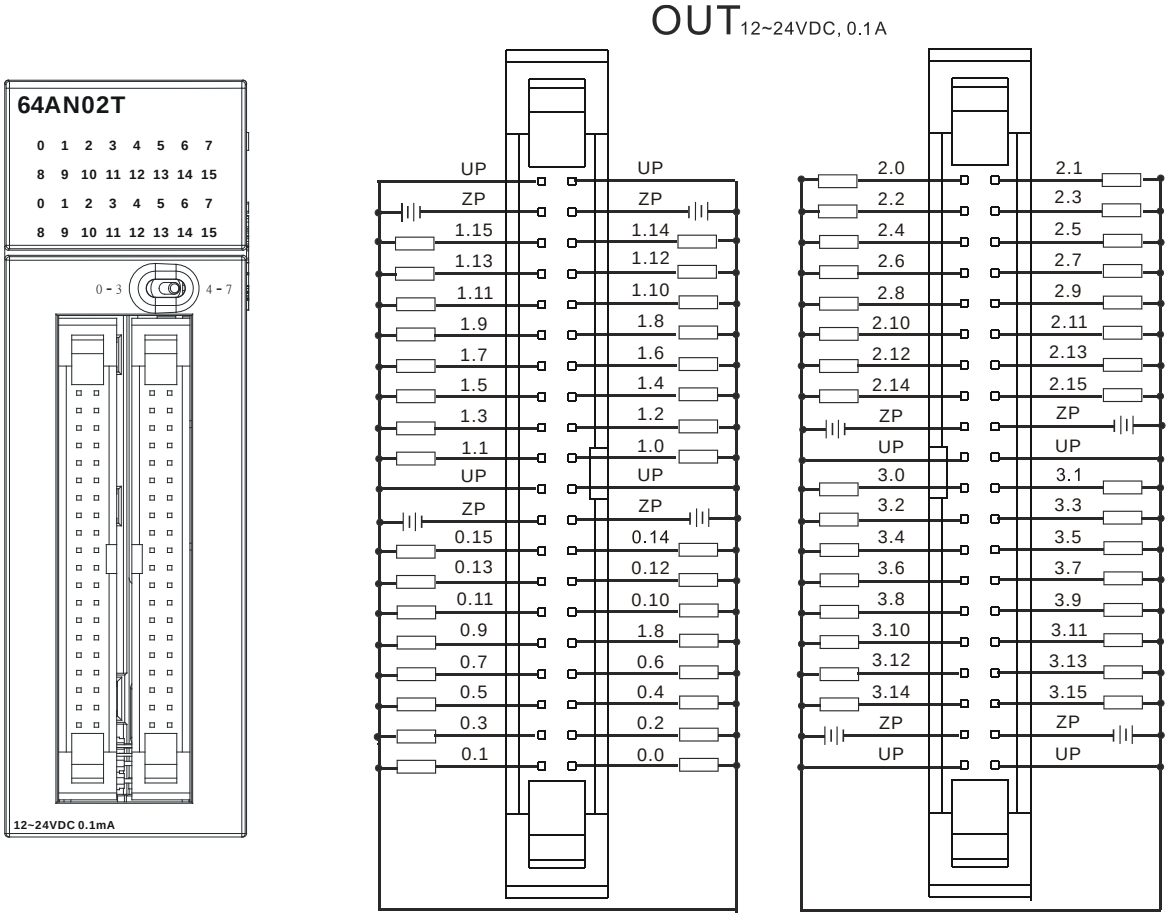
Wiring the external terminal module UB-10-ID32A:

Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA



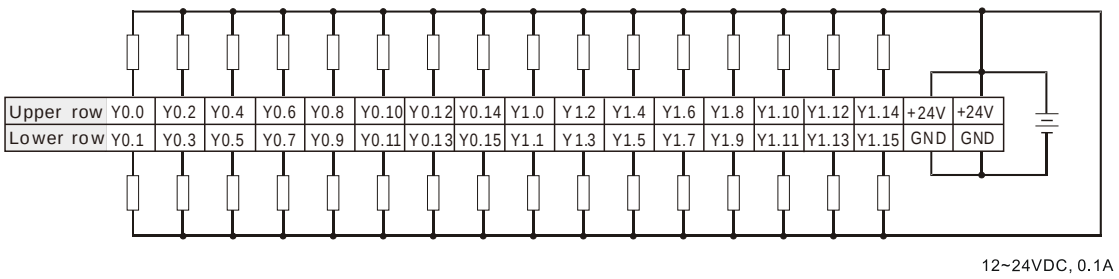
4.8.20 Wiring AH64AN02T-5C

Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.1 A



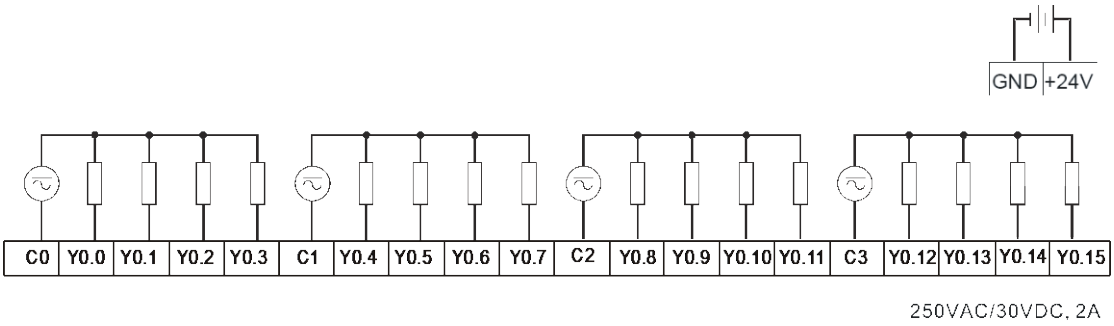
Wiring the external terminal module UB-10-OT32A:

Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.1 A



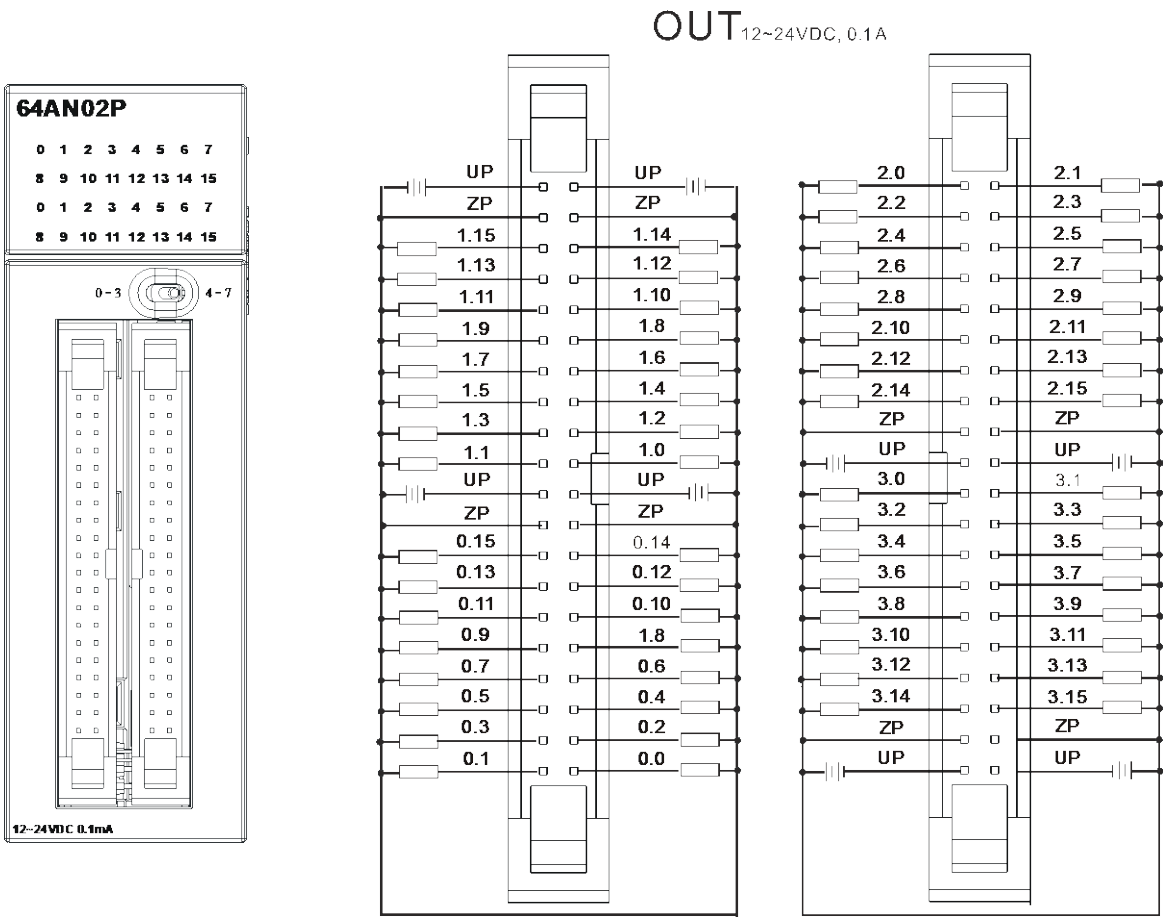
Wiring the external terminal module UB-10-OR16A:

Output type	Relay-R
Voltage specifications	250 VAC, below 30VDC



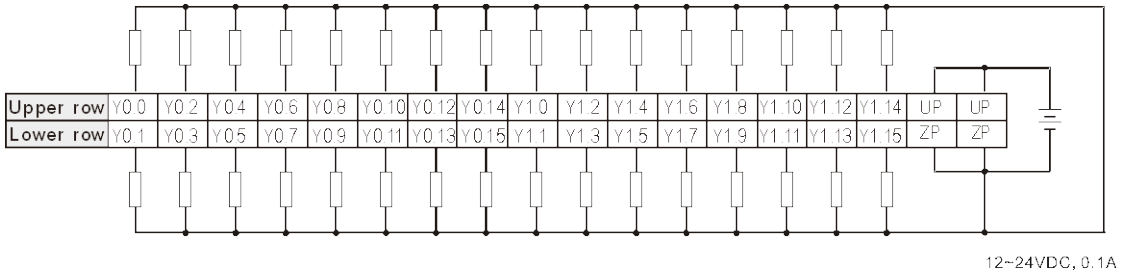
4.8.21 Wiring AH64AN02P-5C

Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.1 A



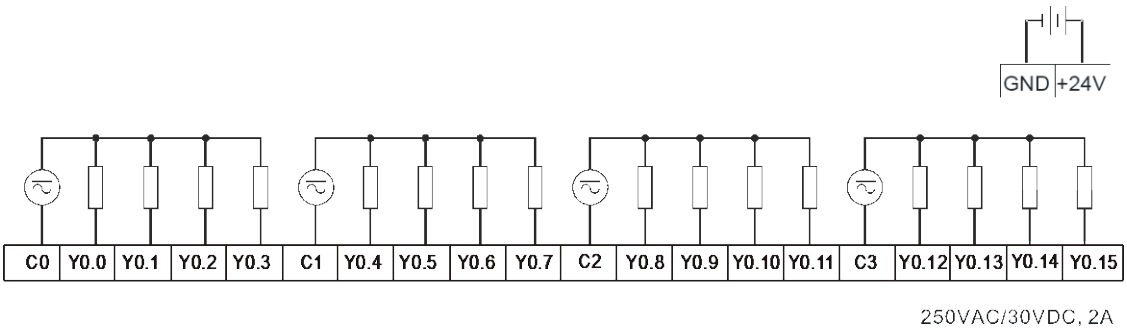
Wiring the external terminal module UB-10-OT32A:

Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.1 A



Wiring the external terminal module UB-10-OR16B:

Output type	Relay-R
Voltage specifications	250 VAC, below 30VDC



4.9 Wiring Digital Input/Output Terminals

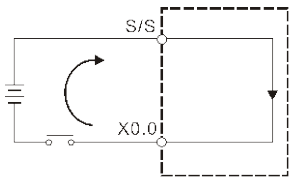
4.9.1 Wiring Digital Input Terminals

NPN(Sink) and PNP(Source)

The input signal is the 24 VDC power input. Sinking and sourcing are current driving capabilities of a circuit. They are defined as follows.

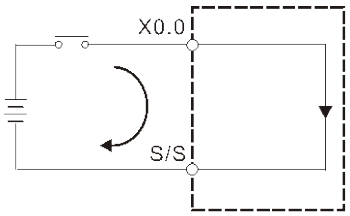
- NPN(Sink)

  Sinking=The current flows into the common terminal S/S.



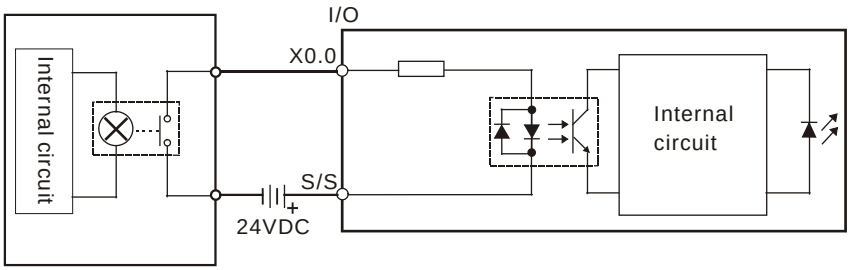
- PNP(Source)

  Souring=The current flows from the common terminal S/S.

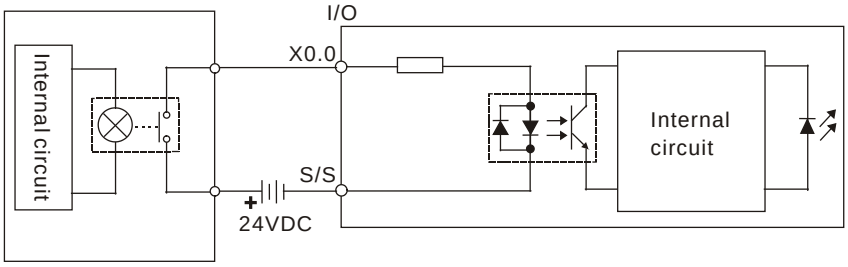


Relay Type

- NPN(Sink)

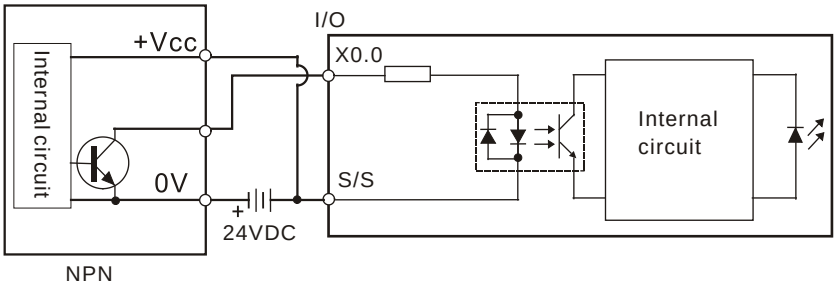


- PNP(Source)

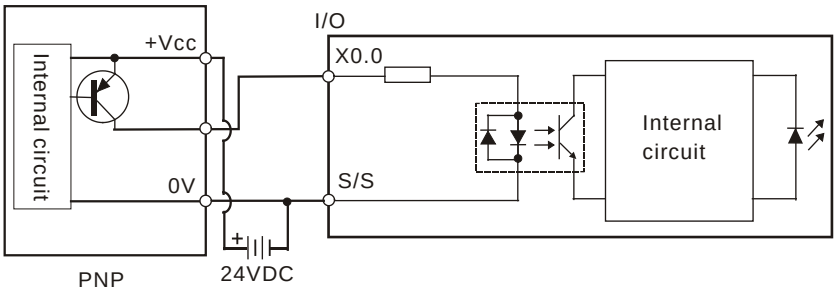


Open-collector Input Type

- Sinking (NPN transistor whose collector is open)



- Sourcing (PNP transistor whose collector is open)

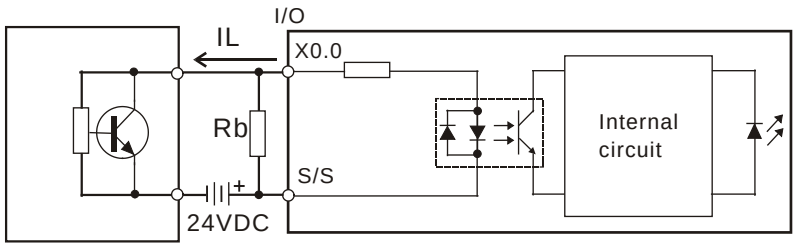


Two-wire Proximity Switch

Please use the two-wire proximity switch whose leakage current I_L is less than 1.5 mA when the switch is OFF. If the leakage current is larger than 1.5 mA, please connect the divider resistance Rb gotten from the formula below.

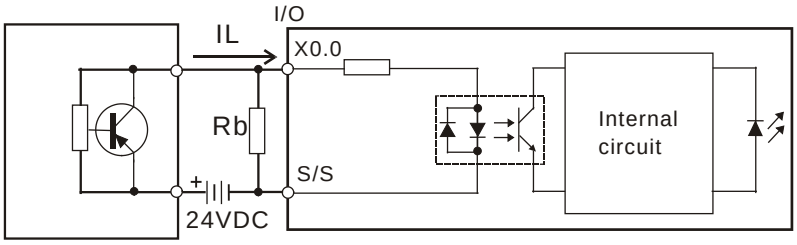
$$Rb \leq \frac{6}{IL - 1.5} \text{ (k Ω)}$$

- NPN(Sink)



Two-wire proximity switch

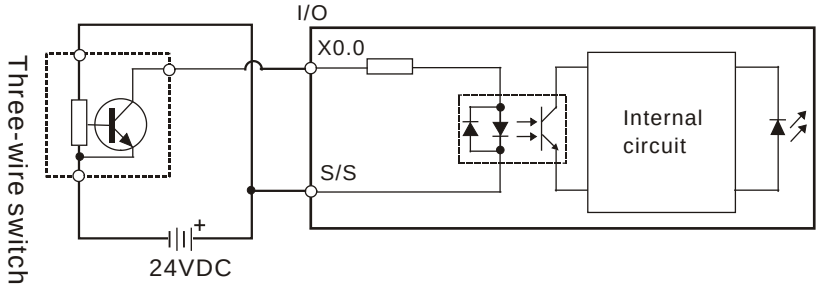
- PNP(Source)



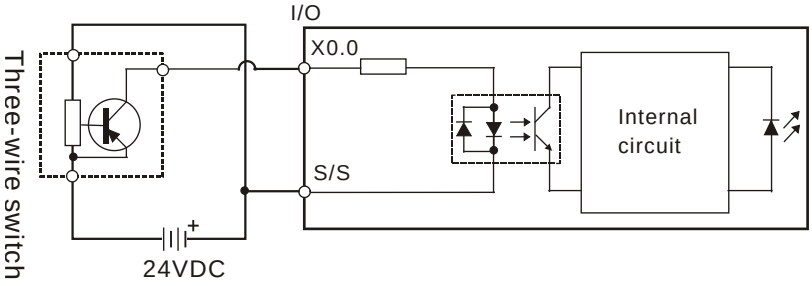
Two-wire proximity switch

Three-wire Switch

- NPN(Sink)

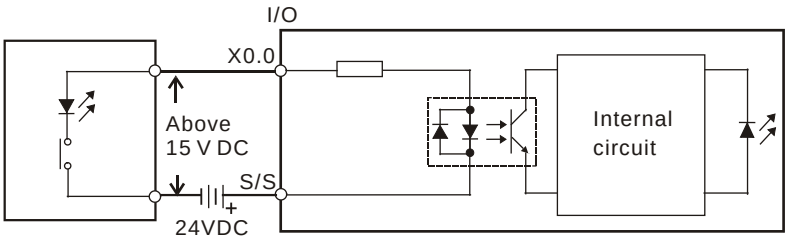


- PNP(Source)



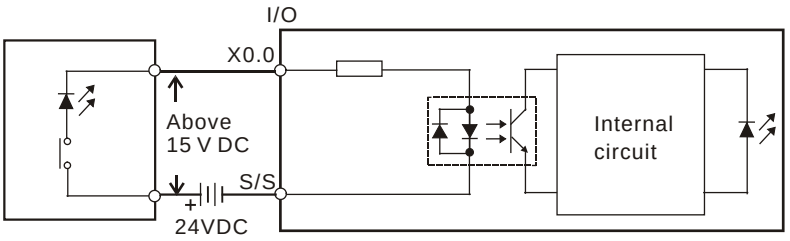
Optoelectronic Switch

- NPN(Sink)



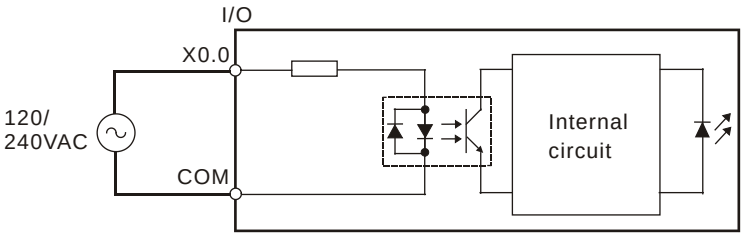
Optoelectronic switch

- PNP(Source)



Optoelectronic switch

Voltage Input (120~240 VAC)

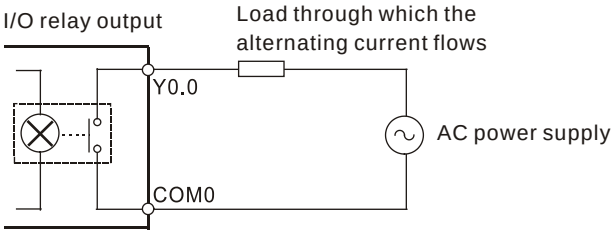


4.9.2 Wiring Digital Output Terminals

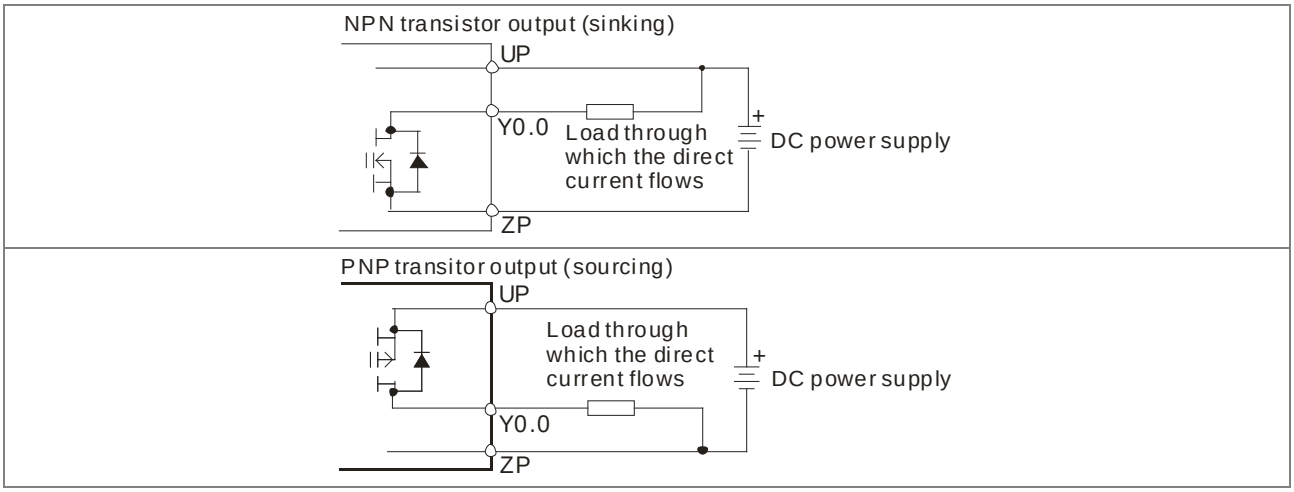
Output Circuits

There are three types of output units. They are relay outputs, transistor outputs, and TRIAC outputs.

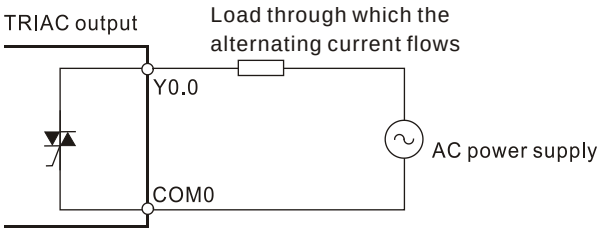
1. Relay output



2. Transistor output

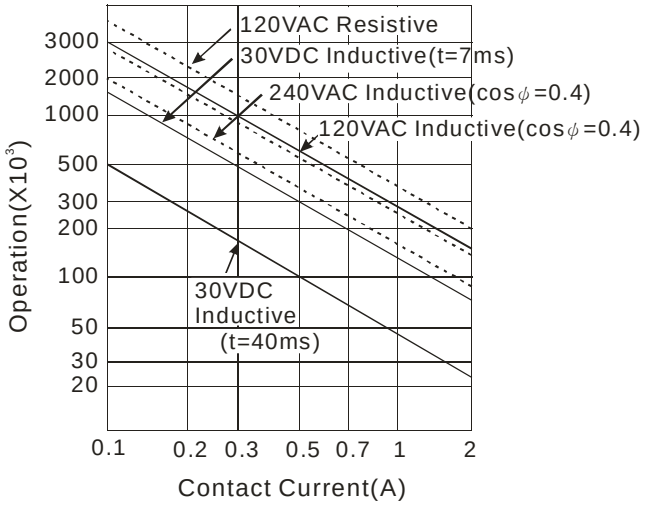


3. TRIAC output

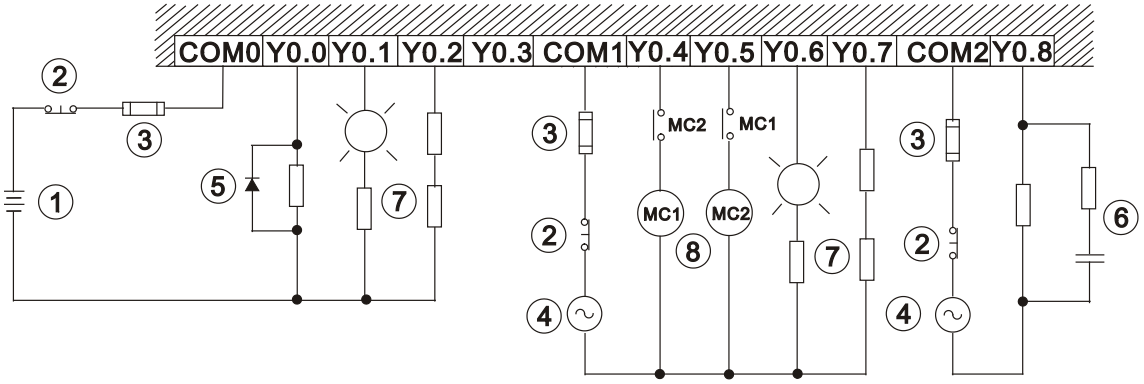


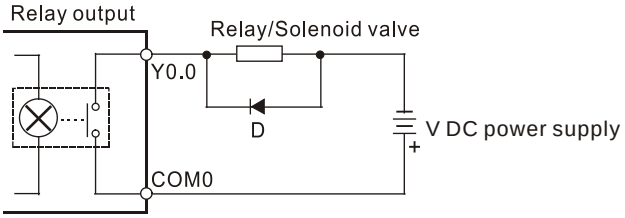
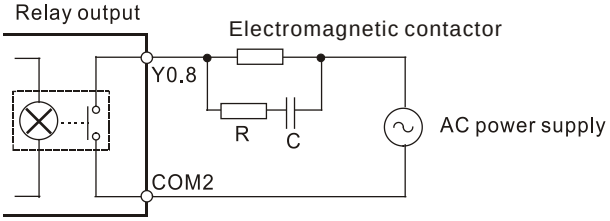
Relay Output Circuit

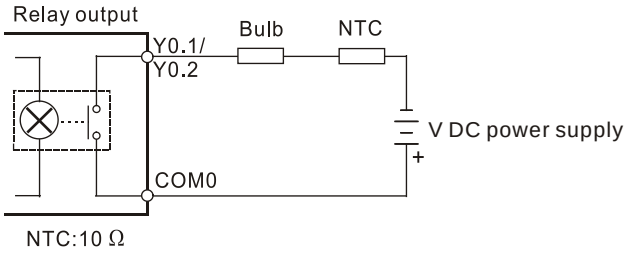
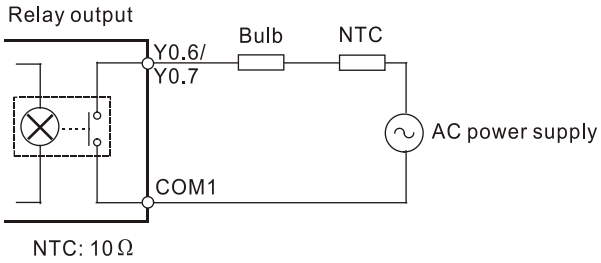
Relay terminals have no polarity. They can be applied to alternating current which passes through a load, or direct current which passes through a load. The maximum current which can passes through every relay terminal is 2 A, and the maximum current which can passes through every common terminal is 5 A. The lifetime of a relay terminal varies with the working voltage, the load type (the power factor cos ϕ), and the current passing through the terminal. The relation is shown in the life cycle curve below.



- **Relay output circuit**



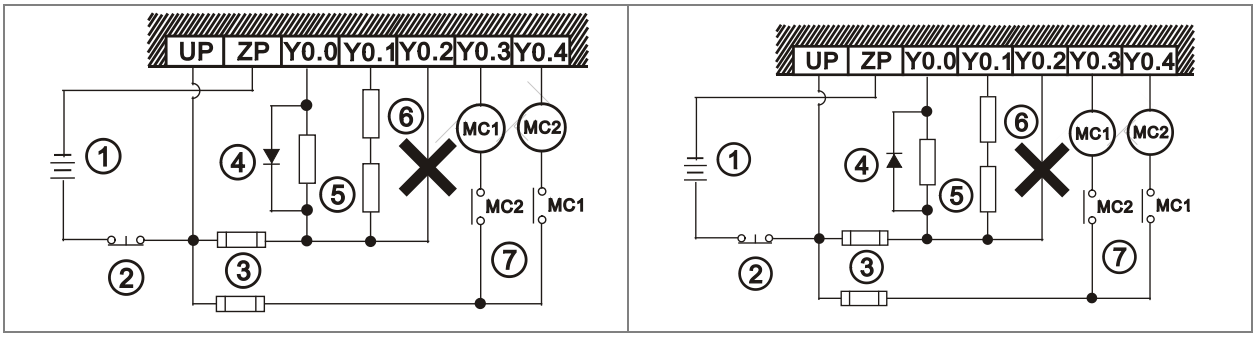
①	Direct-current power supply
②	Emergency stop: An external switch is used.
③	Fuse: To protect the output circuit, a fuse having a breaking capacity in the range of 5 A to 10 A is connected to the common terminal.
④	Alternating-current power supply
⑤	A relay or a solenoid valve is used as a DC load. A diode is connected in parallel to absorb the surge voltage which occurs when the load is OFF.  D: 1N4001 diode
⑥	An electromagnetic contactor is used as an AC load. A resistor and a capacitor are connected in parallel to absorb the surge voltage which occurs when the load is OFF.  R: 100~120 Ω C: 0.1~0.24 uF

⑦	A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON.  A bulb (neon lamp) is used as an AC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON. 
⑧	Mutually exclusive output: For example, Y0.4 controls the clockwise rotation of the motor, and Y0.5 controls the counterclockwise rotation of the motor. The interlock circuit which is formed, and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

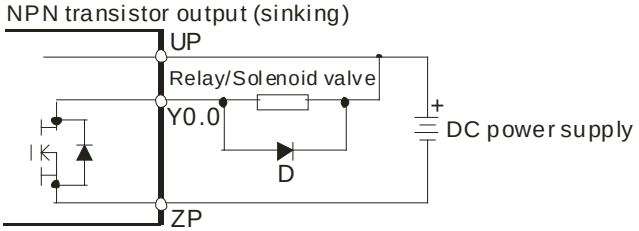
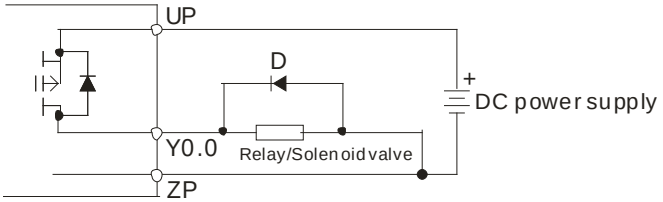
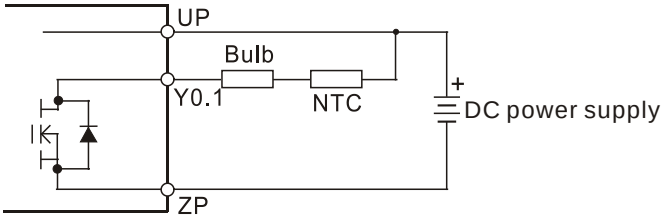
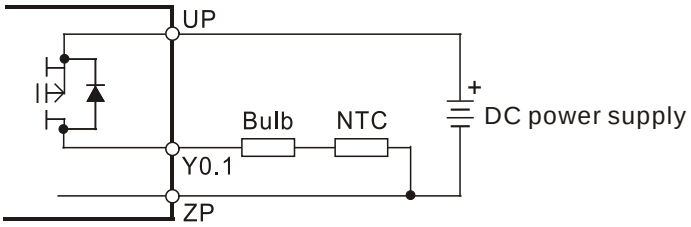
Transistor Output Circuit

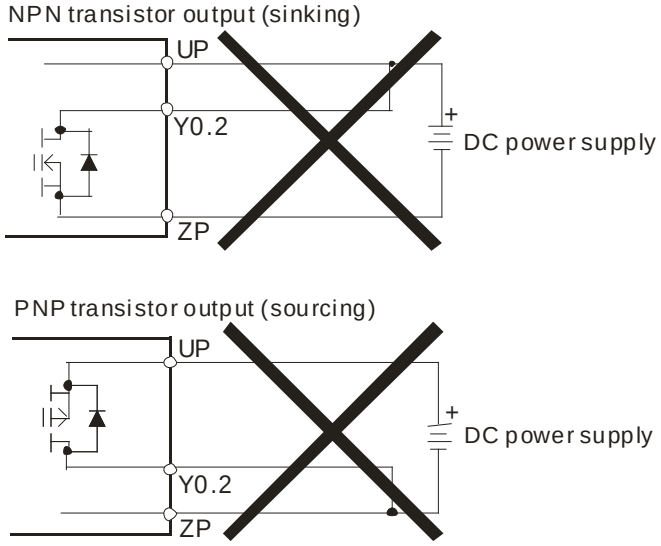
The AH series transistor outputs are equipped with the diodes which provide the counter-electromotive force protection. They can be used if they are not turned ON/OFF frequently and there are low-power inductive loads. If they are turned ON/OFF frequently and there are high-power inductive loads, they must be connected to noise suppression circuits to reduce the noise and prevent the overvoltage or the overheating from damaging the transistor output circuit.

- **NPN/PNP transistor output circuit**



①	Direct-current power supply
②	Emergency stop
③	Fuse

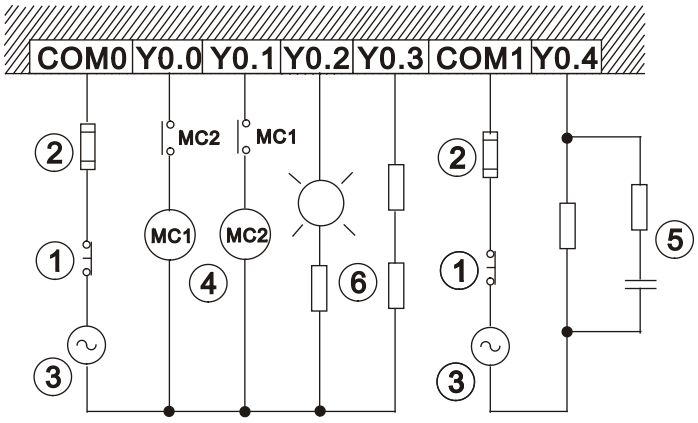
④	The output terminals of a transistor module are open-collector output terminals. If Y0.0/Y0.1 is a pulse train output terminal of a transistor module, the output current passing through its output pull-up resistor must be greater than 0.1 A to ensure that the transistor module operates normally. A relay or a solenoid valve is used as a DC load. A diode is connected in parallel to absorb the surge voltage which occurs when the load is OFF. NPN transistor output (sinking)  D: 1N4001 diode PNP transistor output (sourcing)  D: 1N4001 diode
⑤	A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON. NPN transistor output (sinking)  NTC: 10 Ω PNP transistor output (sourcing)  NTC: 10 Ω

⑥	Y0.2 can not be connected to a power supply directly. It must be connected to a load. 
⑦	Mutually exclusive output: For example, Y0.3 controls the clockwise rotation of the motor, and Y0.4 controls the counterclockwise rotation of the motor. The interlock circuit which is formed, and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

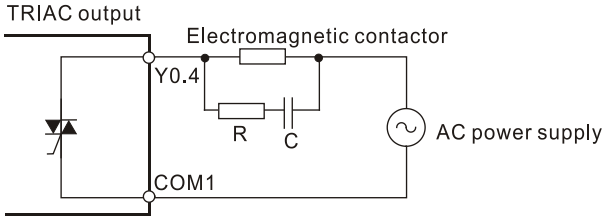
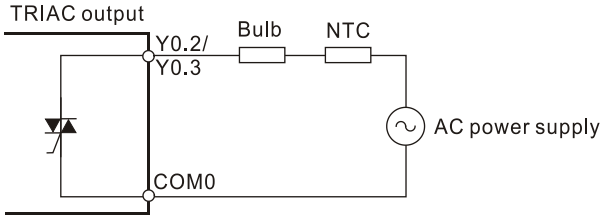
TRIAC Output Circuit

TRIAC terminals only can be applied to alternating current which passes through a load. The maximum current which can passes through every TRIAC terminal is 0.5 A, and the maximum current which can passes through every common terminal is 2 A.

- **TRIAC output circuit**



①	Emergency stop: An external switch is used.
②	Fuse: To protect the output circuit, a fuse having a breaking capacity in the range of 5 A to 10 A is connected to the common terminal.
③	Alternating-current power supply.
④	Mutually exclusive output: For example, Y0.0 controls the clockwise rotation of the motor, and Y0.1 controls the counterclockwise rotation of the motor. The interlock circuit which is formed, and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

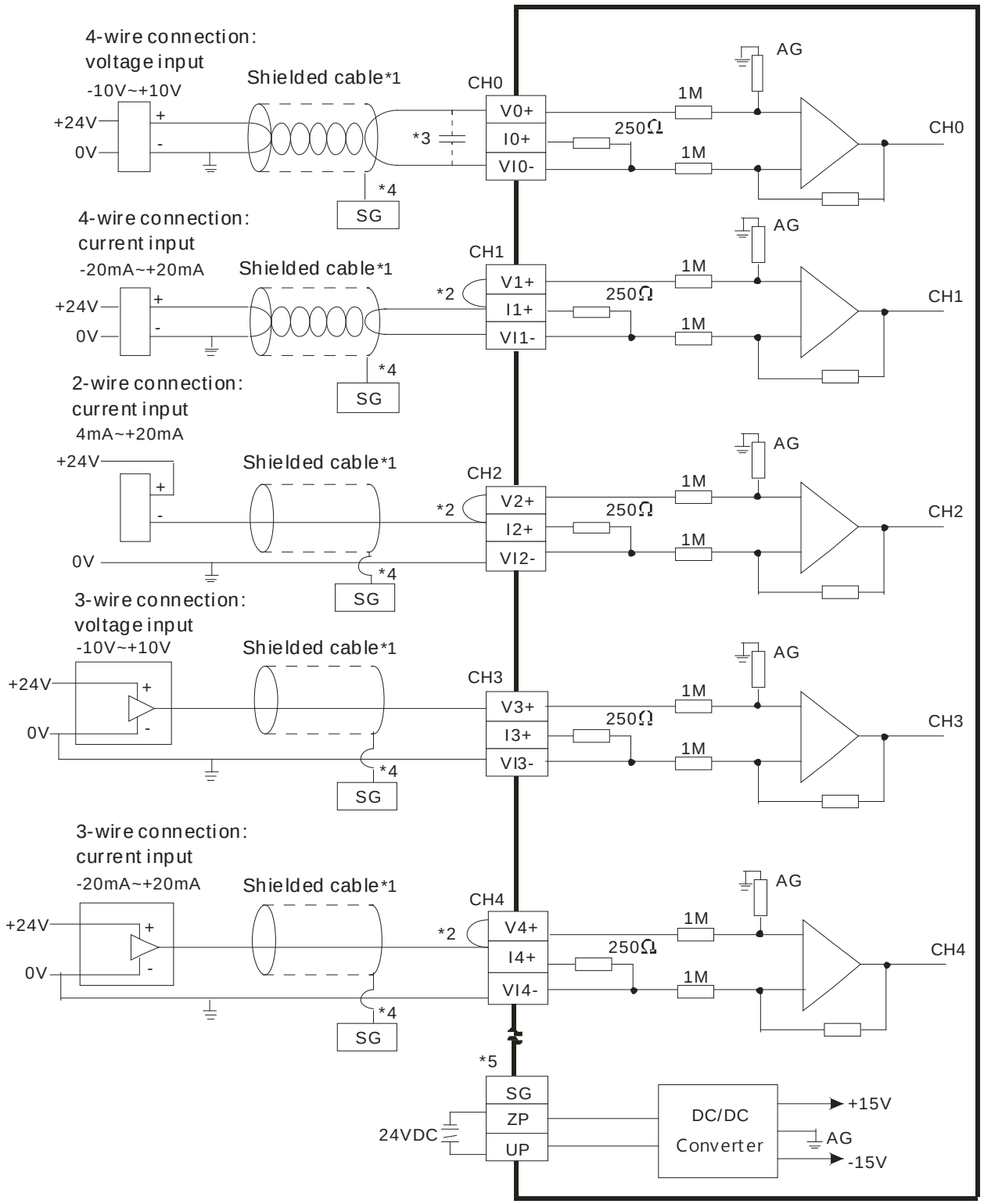
⑤	An electromagnetic contactor is used as an AC load. A resistor and a capacitor are connected in parallel to absorb the surge voltage which occurs when the load is OFF.  R: 100~120 Ω C: 0.1~0.24uF
⑥	A bulb (neon lamp) is used as an AC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON.  NTC:10 Ω

4.10 Wiring Analog Input/Output Modules

Definition of 2/3/4-wire connection:

- 2/3-wire connection(passive sensors): share the power circuit with the system
- 4-wire connection(active sensors): independently powered. Not recommended to share the same power circuit with the system

4.10.1 Wiring AH04AD-5A/AH08AD-5A



*1. Please use a shielded cable as an analog input cable, and isolate the shielded cable from other power cables.

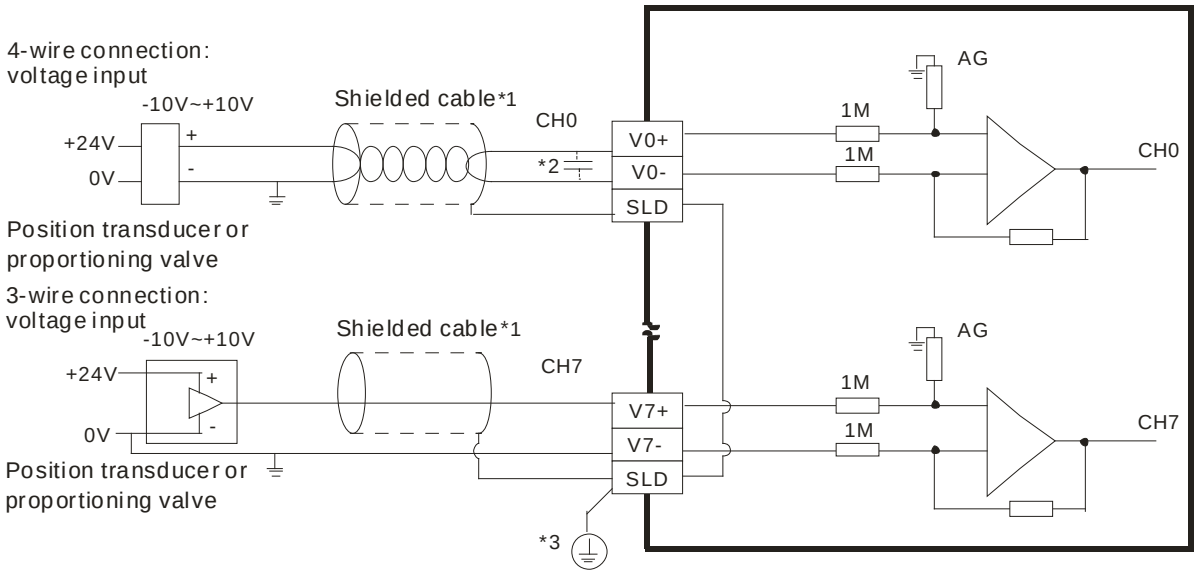
*2. If current is connected, the connection between Vn+ and In+ needs to be a short circuit. (n= 0 ~7.)

*3. If ripple voltage results in interference with the wiring, please connect a 0.1~0.47 μF and 25 V capacitor.

*4. Please connect the ground in the shielded cable to the terminal SG.

*5. Once the module is installed on a backplane, the module's terminal SG and the backplane's terminal ⏚ will be a short circuit. In this case, please connect the backplane's terminal ⏚ to the ground terminal ⏚.

4.10.2 Wiring AH08AD-5B

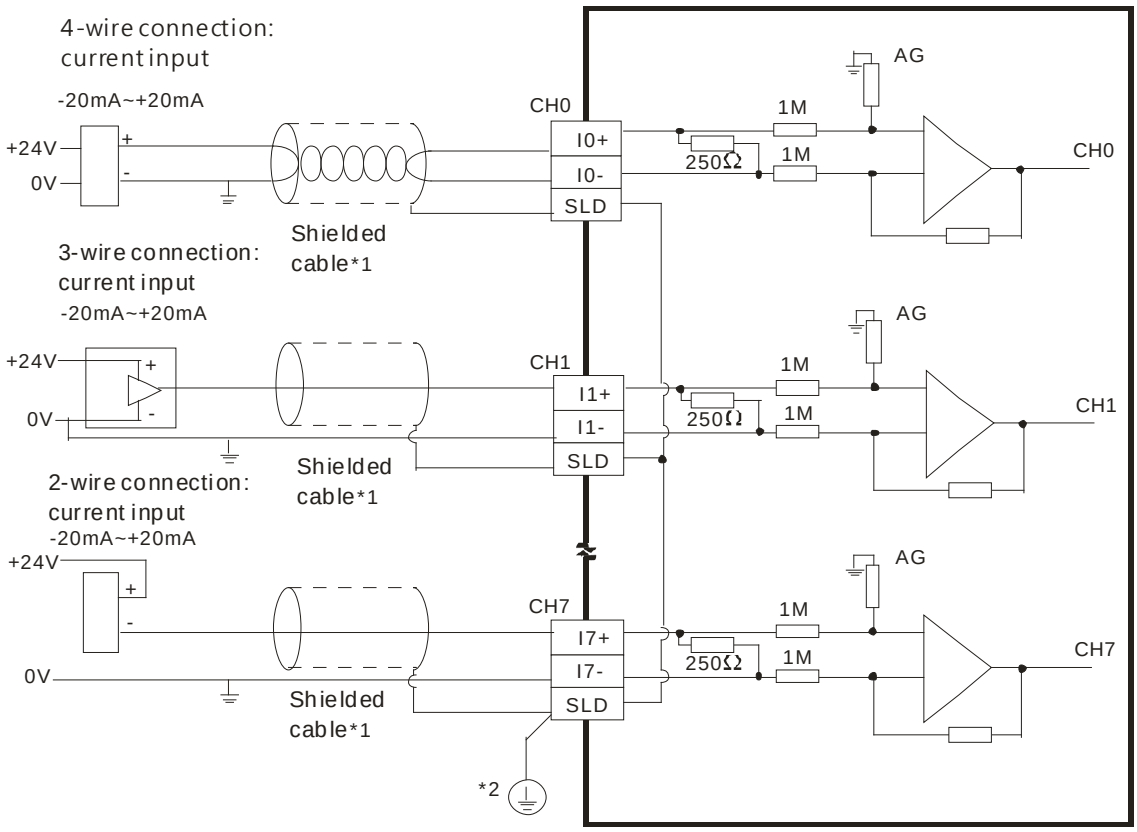


*1. Please use a shielded cable as an analog input cable, and isolate the shielded cable from other power cables.

*2. If ripple voltage results in interference with the wiring, please connect a 0.1~0.47 μF and 25 V capacitor.

*3. Please connect the terminal SLD to the ground terminal ⏚.

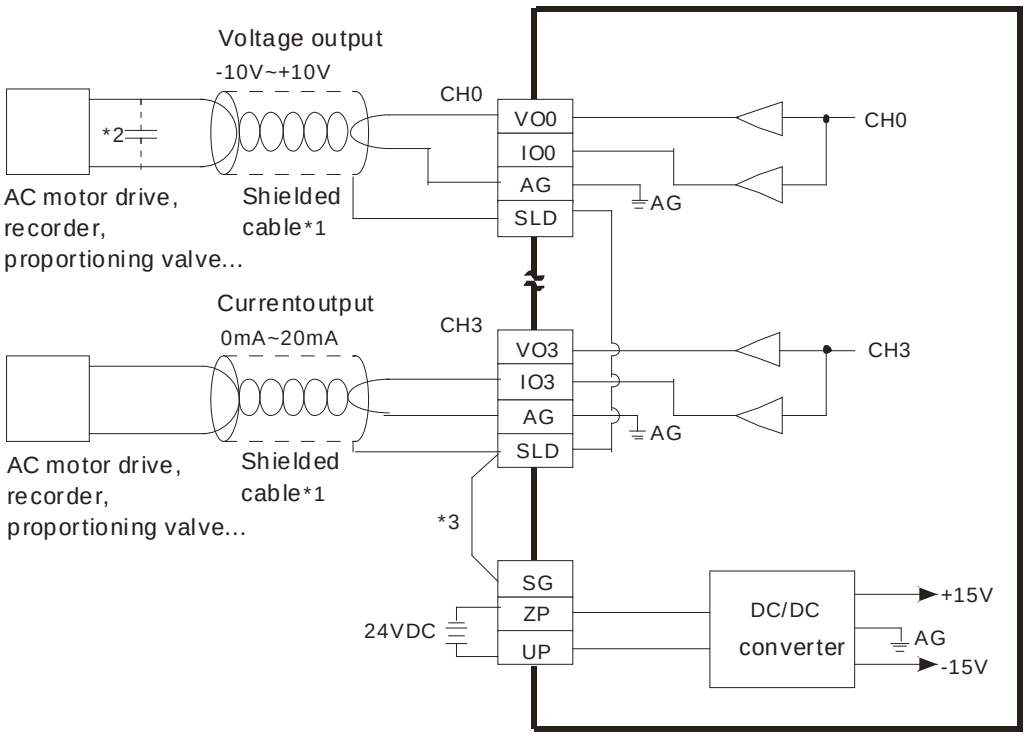
4.10.3 Wiring AH08AD-5C



*1. Please use a shielded cable as an analog input cable, and isolate the shielded cable from other power cables.

*2. Please connect the terminal SLD to the ground terminal ⏚.

4.10.4 Wiring AH04DA-5A/AH08DA-5A

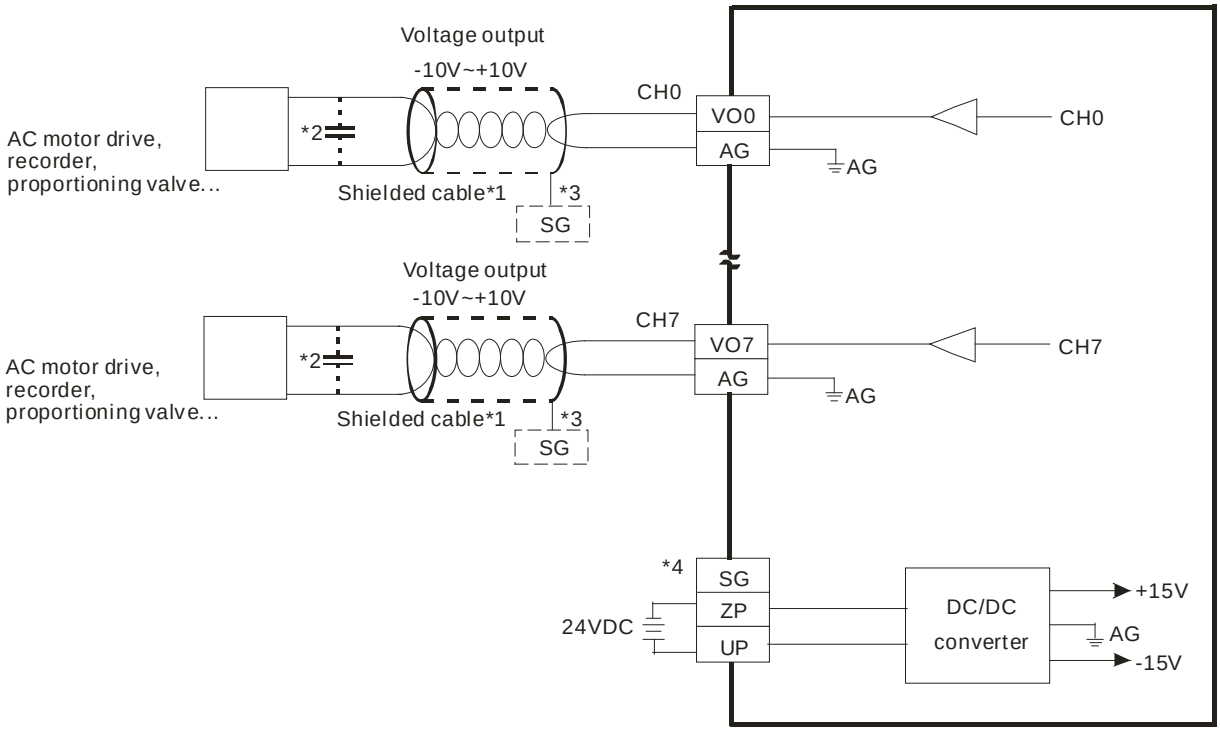


*1. Please use a shielded cable as an analog output cable, and isolate the shielded cable from other power cables.

*2. If the ripple voltage of the input terminal of the load connected is large, and results in interference with the wiring, please connect a 0.1~0.47 μF and 25 V capacitor.

*3. Please connect the terminal SLD to the terminal SG. Once the module is installed on a backplane, the module's terminal SG and the backplane's terminal ⏚ will be a short circuit. In this case, please connect the backplane's terminal ⏚ to the ground terminal ⏚.

4.10.5 Wiring AH08DA-5B



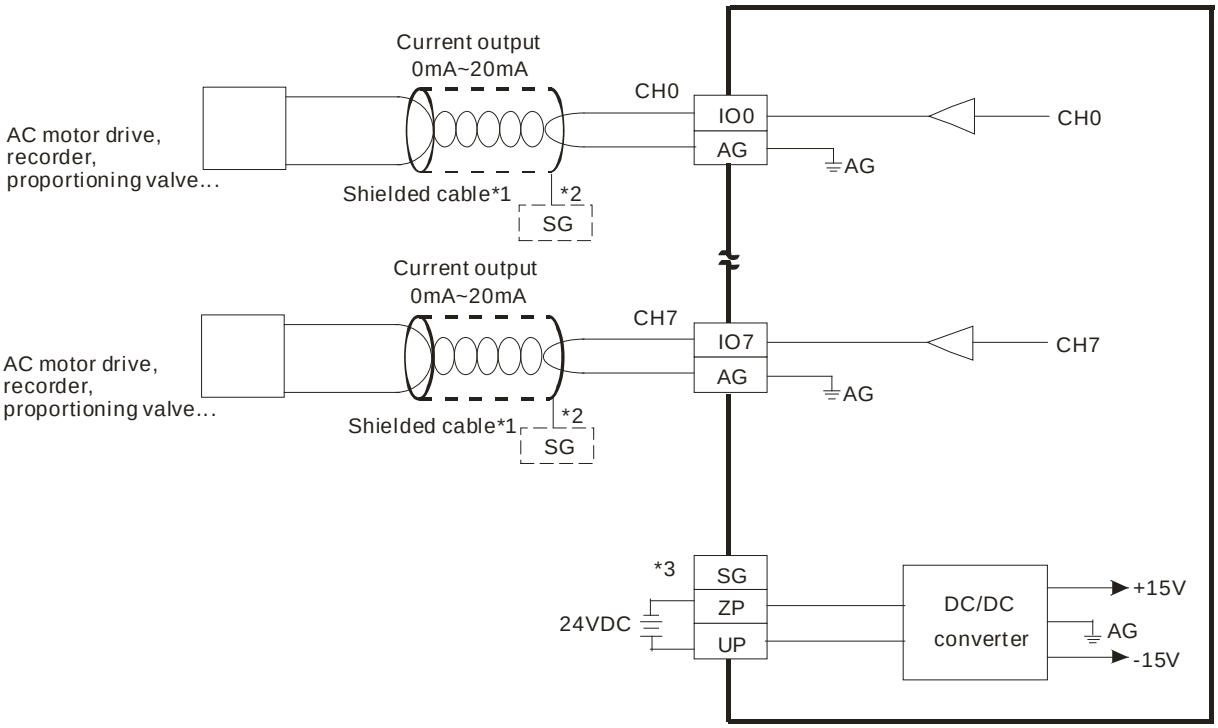
1. Please use a shielded cable as an analog output cable, and isolate the shielded cable from other power cables.

*2. If the ripple voltage of the input terminal of the load connected is large, and results in interference with the wiring, please connect a 0.1~0.47 μF and 25 V capacitor.

*3. Please connect the ground in the shielded cable to the terminal SG.

*4. Once the module is installed on a backplane, the module's terminal SG and the backplane's terminal ⏚ will be a short circuit. In this case, please connect the backplane's terminal ⏚ to the ground terminal ⏚.

4.10.6 Wiring AH08DA-5C

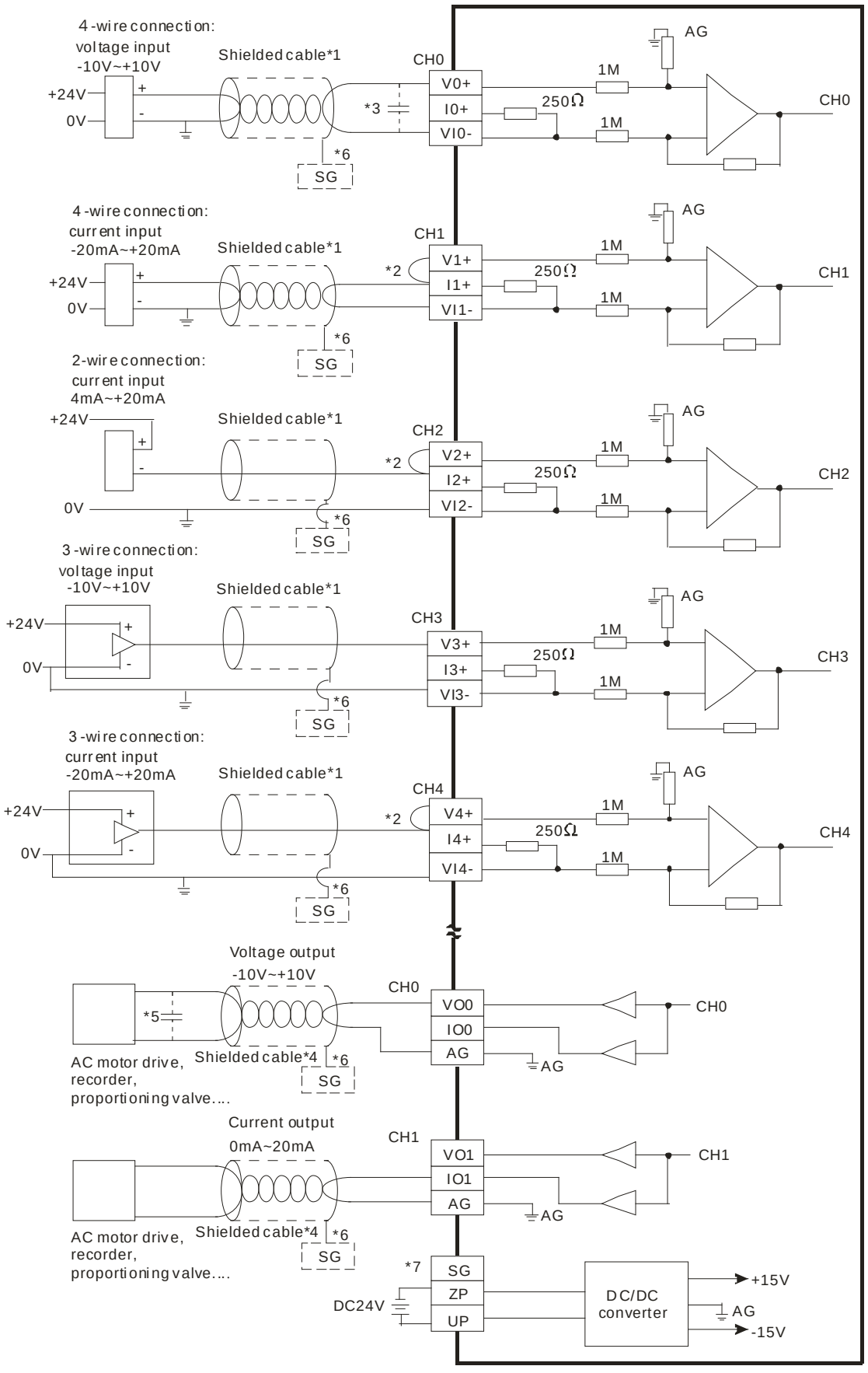


*1. Please use a shielded cable as an analog output cable, and isolate the shielded cable from other power cables.

*2. Please connect the ground in the shielded cable to the terminal SG.

*3. Once the module is installed on a backplane, the module's terminal SG and the backplane's terminal ⏚ will be a short circuit. In this case, please connect the backplane's terminal ⏚ to the ground terminal ⏚.

4.10.7 Wiring AH06XA-5A



*1. Please use a shielded cable as an analog input cable, and isolate the shielded cable from other power cables.

*2. If current is connected, the connection between Vn+ and In+ (n=0~7) needs to be a short circuit.

*3. If ripple voltage results in interference with the wiring, please connect a 0.1~0.47 μF and 25 V capacitor.

*4. Please isolate the analog output cable from other power cables.

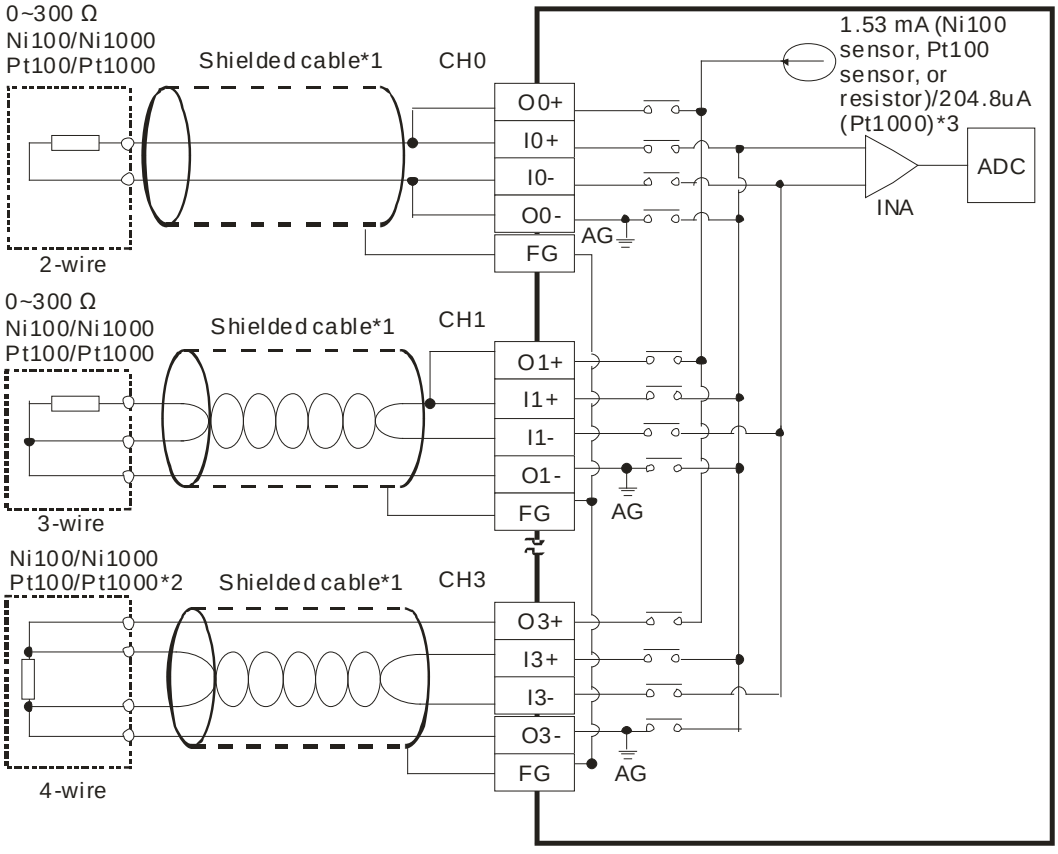
*5. If the ripple voltage of the input terminal of the load connected is large, and results in interference with the wiring, please connect a 0.1~0.47 μF and 25 V capacitor.

*6. Please connect the ground wire in the shielded cable to the terminal SG.

*7. Once the module is installed on a backplane, the module's terminal SG and the backplane's terminal ⏚ will be a short circuit. In this case, please connect the backplane's terminal ⏚ to the ground terminal ⏚.

4.11 Wiring Temperature Measurement Modules

4.11.1 Wiring AH04PT-5A

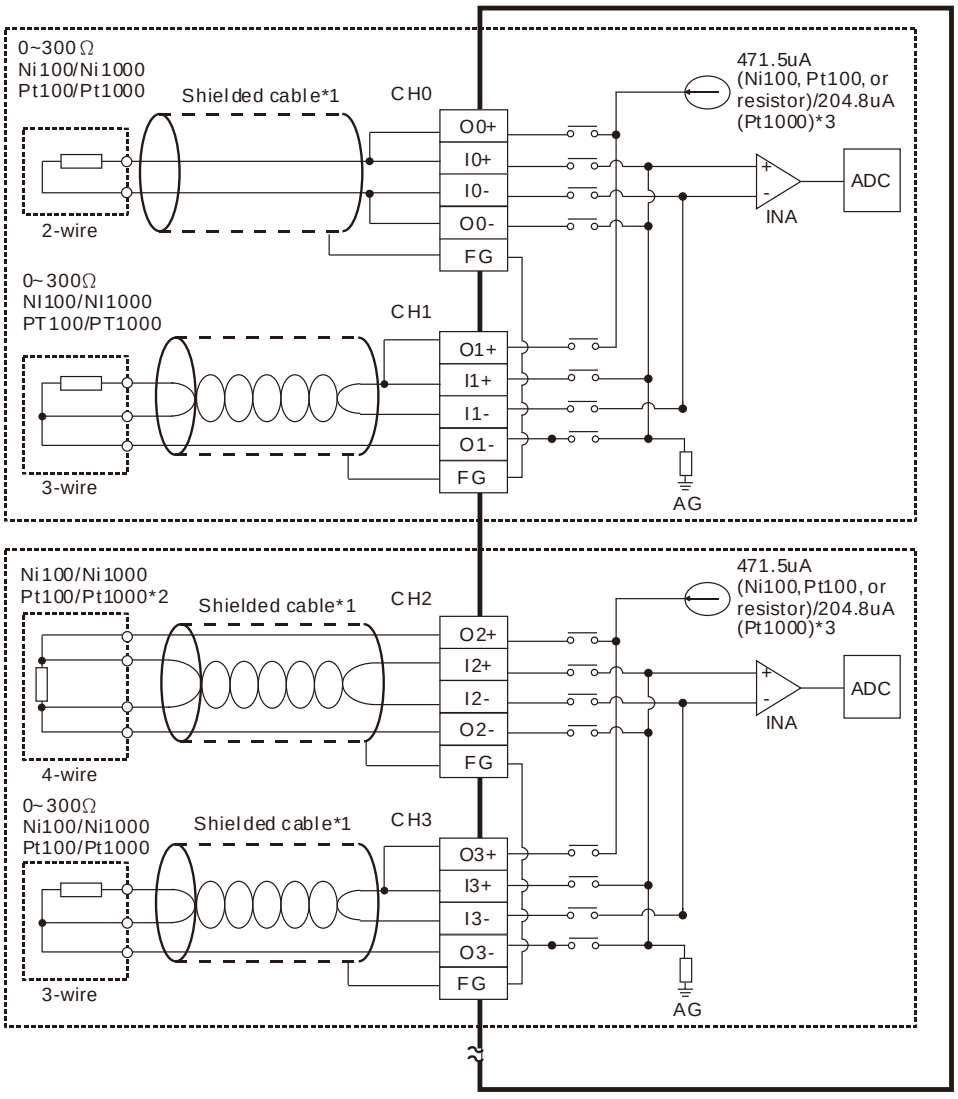


*1. The cable connected to the input terminal should be the cable or the shielded twisted pair cable which can be connected to an Ni100/Ni1000/Pt100/Pt1000 sensor, and should be kept separate from other power cables and cables which generate noise. Please use a three-wire temperature sensor. If you want to use a two-wire temperature sensor, O**n**+ and I**n**+ must be short-circuited, and O**n**- and I**n**- must be short-circuited. (**n** is in the range of 0 to 3.)

*2. If you want to measure resistance in the range of 0 Ω to 300 Ω, you can use a two-wire or three-wire sensor instead of a four-wire sensor.

*3. You need to select an appropriate sensor. If an Ni100 temperature sensor, a Pt100 temperature sensor, or a resistance sensor is used, the internal excitation current is 1.53 mA. If an Ni1000 temperature sensor, or a Pt1000 temperature sensor is used, the internal excitation current is 204.8 μA.

4.11.2 Wiring AH08PTG-5A

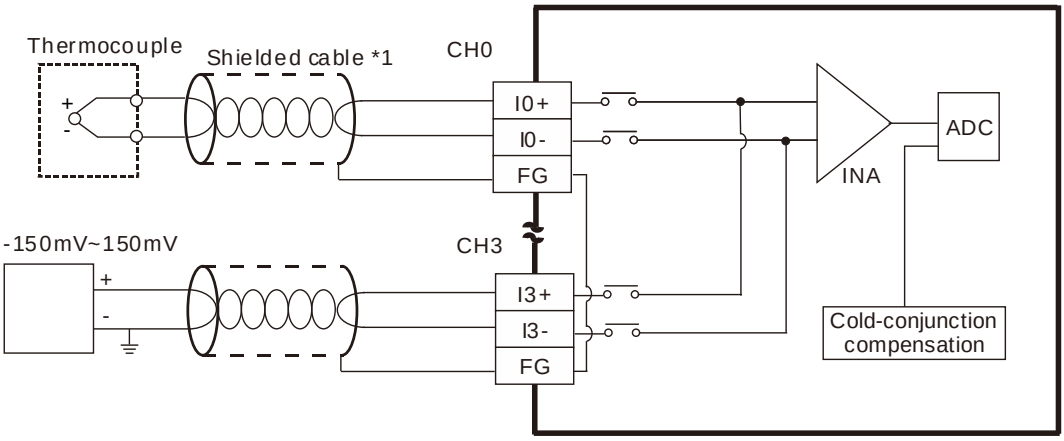


*1. The cable connected to the input terminal should be the cable or the shielded twisted pair cable which can be connected to an Ni100/Ni1000/Pt100/Pt1000 sensor, and should be kept separate from other power cables and cables which generate noise. Please use a three-wire temperature sensor. If users want to use a two-wire temperature sensor, O**n**+ and I**n**+ must be short-circuited, and O**n**- and I**n**- must be short-circuited. (**n** is in the range of 0 to 7.)

*2. If users want to measure resistance in the range of 0 Ω to 300 Ω, they can use a two-wire or three-wire sensor instead of a four-wire sensor.

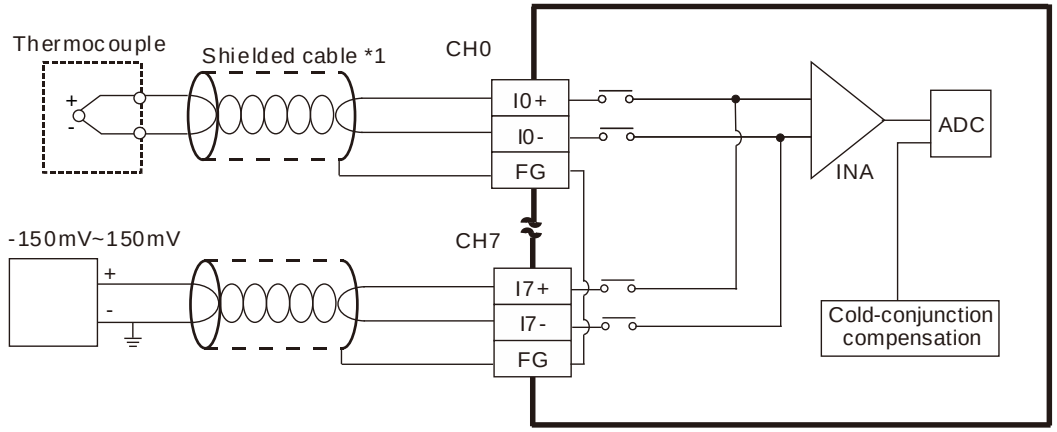
*3. User need to select an appropriate sensor. If an Ni100 temperature sensor, a Pt100 temperature sensor, or a resistance sensor is used, the internal excitation current is 471.5 μA. If an Ni1000 temperature sensor, or a Pt1000 temperature sensor is used, the internal excitation current is 204.8 μA.

4.11.3 Wiring AH04TC-5A



*1. The cable connected to the input terminal should be the cable or the shielded twisted pair cable which can be connected to a type J, type K, type R, type S, type T, type E, or type N thermocouple, and should be kept separate from other power cables and cables which generate noise.

4.11.4 Wiring AH08TC-5A



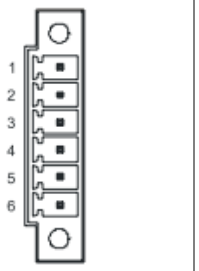
*1. The cable connected to the input terminal should be the cable or the shielded twisted pair cable which can be connected to type J, type K, type R, type S, type T, type E, or type N thermocouple, and should be kept separate from other power cables and cables which generate noise.

4.12 Wiring Network Modules

4.12.1 Wiring AH10SCM-5A

- RS-485/RS-422 communication port

Pin	RS-485	RS-422
1	N/C	TX+
2	N/C	TX-
3	D+	RX+
4	D-	RX-
5	SG	SG
6	N/C	SG

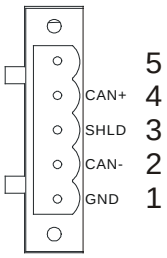


4.12.2 Wiring AH10COPM-5A

CANopen Communication Connector

A CANopen connector is connected to a CANopen network. Please wire AH10COPM-5A by using the connector attached to AH10COPM-5A.

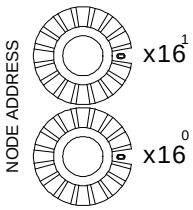
Pin	Signal	Description
5	-	Reserved
4	CAN+	CAN_H
3	SHLD	Shielded cable
2	CAN-	CAN_L
1	GND	0VDC



Address Knobs

The address knobs on AH10COPM-5A are used to set the node address of AH10COPM-5A on a CANopen network. Setting range: 1~7F (0 and 80~FF can not be used.)

Setting	Description
1~7F	Valid CANopen node address
0, 80 ~ FF	Invalid CANopen node address



Example: If the station address of AH10COPM-5A is 16#26, you have to turn the knob corresponding to $x16^1$ to position 2, and turn the knob corresponding to $x16^0$ to position 6.

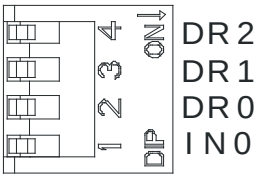
Points for attention:

- After the station address of AH10COPM-5A is changed, you have to power AH10COPM-5A again, otherwise the change will not take effect.
- To prevent the address knobs on AH10COPM-5A from being scratched, please carefully use a slotted screwdriver to rotate the address knobs on AH10COPM-5A.

Function Switch

The function switch on AH10COPM-5A is used to set the communication speed at which AH10COPM-5A is connected to a CANopen network. There is a limit on the maximum communication distance to which a communication speed corresponds.

DR 2	DR 1	DR 0	Communication speed	Maximum communication distance
OFF	OFF	OFF	10 kbps	5000 m
OFF	OFF	ON	20 kbps	2500 m
OFF	ON	OFF	50 kbps	1000 m
OFF	ON	ON	125 kbps	500 m
ON	OFF	OFF	250 kbps	250 m
ON	OFF	ON	500 kbps	100 m
ON	ON	OFF	800 kbps	50 m
ON	ON	ON	1 Mbps	25 m
IN 0				Reserved



Points for attention:

- After you change the communication speed at which AH10COPM-5A is connected to a CANopen network, you have to power AH10COPM-5A again, otherwise the change will not take effect.
- To prevent the DIP switch on AH10COPM-5A from being scratched, please carefully use a slotted screwdriver to rotate the DIP switch on AH10COPM-5A.

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Chapter 5 Maintenance and Inpection

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5.1 Cautions

Before users undertake the maintenance and the inspection, they have to pay attention to the following items. **The incorrect or careless operation will lead to damage to the staff and the equipment.**

- To prevent a breakdown of an AH Motion system or a fire accident, please make sure that the ambient environment is not exposed to corrosive substances such as chloride gas and sulfide gas, flammable substances such as oil mist and cutting powder, or dirt.
- To prevent the connectors from oxidizing, or to prevent the staff from getting an electric shock, please do not touch the connectors.
- To prevent the staff from getting an electric shock, please turn off the power before pulling the connectors or loosening the screws.
- To prevent the cables from being damaged, or to prevent the connectors from being loosened, please do not impose weight on the cable, or pull them violently.
- Please make sure that the input voltage is within the rated range.
- Please do not disassemble or alter the modules. Otherwise, the products will break down, a fire accident will occur, or the staff will be injured.
- To prevent a controlled element from malfunctioning, please make sure that the program and the parameters are written into a new CPU module which replaces an old one before restarting the AH Motion system.
- To prevent the improper operation which results in the incorrect output or the damage to the equipment, please refer to the related manuals for more information about operating the modules.
- To prevent the damage to the modules, please touch metal which is grounded or wear an antistatic wrist strap to release the static electricity from the body.
- To prevent the noise from resulting in the breakdown of the system, please keep a proper distance from the system when using a cell phone or a communication apparatus.
- Please avoid installing an AH Motion system under the sun or in a humid environment.
- To prevent the temperature of an element from being high, please make sure that the AH Motion system keeps a proper distance from heat sources such as coils, heating apparatuses, and resistors.
- To protect an AH Motion system, please install an emergency stop switch and an overcurrent protection according to the actual needs.
- Inserting and pulling a module several times may lead to the loose contact between the module and the backplane.
- To prevent an unexpected shock from resulting in the damage to an AH Motion system and a controlled element, please make sure that the modules are installed firmly.

5.2 Daily Maintenance

To keep an AH Motion system operating normally, make sure that the ambient environment and the AH Motion system conform to the cautions listed in section 5.1. Users then can undertake the daily inspection described below. If any abnormal situation occurs, please follow the remedy and carry out the maintenance.

5.2.1 Tools Required for Inspection

- A screwdriver
- Industrial alcohol
- A clean cotton cloth

5.2.2 Daily Inspection

No.	Item		Inspection	Criterion	Corrective Action
1	Appearance		Visual inspection	Dirt must not be present.	Remove the dirt.
2	Installation of a backplane		Check whether the set screws are loose.	The backplane must be installed firmly.	Further tighten the screws.
			Check whether the backplane is installed on the DIN rail properly.		Install the backplane on the DIN rail properly.
3	Installation of a module		Check whether the module is loose, the projection is inserted into the hole on the backplane, and the screw is tightened.	The hook under the module must be inserted into the hole in the backplane, and the screw must be tightened.	Install the module firmly.
4	Connection		Check whether the removable terminal block is loose.	The removable terminal block should be tight.	Install the terminal block firmly.
			Check whether the connector is loose.	The connector should be tight.	Further tighten the screws on the connector.
5	Power supply module	POWER LED indicator	Check whether the POWER LED indicator is ON.	The POWER LED indicator must be ON.	Please refer to ***AH Motion – Operation Manual*** for more information regarding troubleshooting and error logs.
	CPU module	RUN LED indicator	When the CPU module is running, check whether the RUN LED is ON.	The RUN LED indicator must be ON.	
		ERROR LED indicator	Check whether the ERROR LED indicator is OFF.	The ERROR LED indicator must be OFF.	
		BUS FAULT LED indicator	Check whether the BUS FAULT LED indicator is OFF.	The BUS FAULT LED indicator must be OFF.	
		SYSTEM LED indicator	Check whether the SYSTEM LED indicator is OFF.	The SYSTEM LED indicator must be OFF.	
	LED indicators on an extension module		Check whether the LED indicators on the extension module are ON.	If the LED indicators are ON, the module operates normally.	

* Please refer to ***AH500 Module Manual*** for more information related to the LED indicators on the extension modules.

5.3 Periodic Maintenance

Under the condition that the daily inspection is undertaken, users are suggested that they should carry out the periodic maintenance according to the actual operating environment. After making sure that the ambient environment and the AH Motion system conform to the cautions listed in section 5.1, users then can undertake the periodic inspection described below. If any abnormal situation occurs, please follow the suggested actions and carry out the maintenance.

5.3.1 Tools Required for Inspection

- A screwdriver
- Industrial alcohol
- A clean cotton cloth
- A multimeter
- A thermometer
- A hygrometer

5.3.2 Periodic Inspection

No.	Item		Inspection	Criterion	Action
1	Ambient environment	Ambient temperature/humidity	The ambient temperature and the ambient humidity are measured by a thermometer and a hygrometer.	The ambient temperature and the ambient humidity must conform to the specifications for the modules or the backplane. If the specifications are different, the strictest specifications have high priority.	To ensure that the system operates in a stable environment, check the reason why the environment varies, and correct it.
		Atmosphere	Measure corrosive gas.	Corrosive gas must not be present.	
2	Supply voltage		Measure the AC power supply.	The power supply should meet the specifications for the power supply module.	Check the power supply.
3	Installation	Looseness	Check whether the module is loose.	The module must be installed firmly.	Please refer to chapter 4 for more information about installing the module.
		Adhesion of dirt	Check the appearance.	Dirt must not be present.	Remove the dirt.
4	Connection	Looseness of terminal screws	Tighten the screws with a screwdriver.	The screws must not be loose.	Further tighten the screws.
		Looseness of connectors	Pull the connectors.	The connectors must not be loose.	Further tighten the screws on the connectors.
5	PLC system diagnosis		Check the error logs.	No new error occurs.	Please refer to ***AH Motion – Operation Manual*** for more information regarding troubleshooting and error logs.

No.	Item	Inspection	Criterion	Action
6	Maximum scan time	Check the state of SR413 and that of SR414 through the device monitoring table in ISPSoft.	The maximum scan cycle must be within the range specified in the system specifications.	Check the reason why the scan time is too long.

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Appendices

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A.1 EMC Standards for an AH Motion System

A.1.1 EMC Standards Applicable to an AH Motion System

The EMC standards which are applicable to an AH Motion system are listed below.

- **EMI**

Port	Frequency range	Level (Normative)	Reference standard
Enclosure port (radiated) (measured at a distance of 10 meters)	30-230 MHz	40 dB (μV/m) quasi-peak	IEC 61000-6-4
	230-1000 MHz	47 dB (μV/m) quasi-peak	
AC power port (conducted)	0.15-0.5 MHz	79 dB (μV) quasi-peak	IEC 61000-6-4
		66 dB (μV) average	
	0.5-30 MHz	73 dB (μV) quasi-peak	
		60 dB (μV) average	

- **EMS**

Environmental phenomenon	Reference standard	Test		Test level
Electrostatic discharge	IEC 61000-4-2	Contact		± 4 kV
		Air		± 8 kV
Radio frequency electromagnetic field Amplitude modulated	IEC 61000-4-3	80% AM, 1 kHz sinusoidal	2.0-2.7 GHz	1 V/m
			1.4-2.0 GHz	3 V/m
			80-1000 MHz	10 V/m
Power frequency magnetic field	IEC 61000-4-8	60 Hz		30 A/m
		50 Hz		30 A/m

- **Conducted immunity test**

Environmental phenomenon		Fast transient burst	High energy surge	Radio frequency interference
Reference standard		IEC 61000-4-4	IEC 61000-4-5	IEC 61000-4-6
Interface/Port	Specific interface/port	Test level	Test level	Test level
Data communication	Shielded cable	1 kV	1 kV CM	10V
	Unshielded cable	1 kV	1 kV CM	10V
Digital and analog I/O	AC I/O (unshielded)	2 kV	2 kV CM 1 kV DM	10V
	Analog or DC I/O (unshielded)	1 kV	1 kV CM	10V
	All shielded lines (to the earth)	1 kV	1 kV CM	10V
Equipment power	AC power	2 kV	2 kV CM 1 kV DM	10V
	DC power	2 kV	0.5 kV CM 0.5 kV DM	10V
I/O power and auxiliary power output	AC I/O and AC auxiliary power	2 kV	2 kV CM 1 kV DM	10V
	DC I/O and DC auxiliary power	2 kV	0.5 kV CM 0.5 kV DM	10V

A.1.2 Installation Instructions for the EMC Standards

A PLC must be installed in a control box. The control box protects the PLC, and shields off the electromagnetic interference generated by the PLC.

- **Control box**

  - Use a conductive control box.
  - To ensure that an inner plate contacts the control box well, users have to mask the paint on the bolts of the plate.
  - To ensure that the control box is grounded well even if there is high-frequency noise, users have to connect the control box with a thick wire.

- The diameter of a hole in the control box must be less than 10 millimeters, i.e. 3.94 inches. If the diameter of the hole is larger than 10 millimeters, the radio frequency noise may be emitted.

- To prevent the radio waves from leaking through the interval between the door of the control box and the PLC, the interval needs to be reduced. Besides, users can prevent the radio waves from leaking by putting an EMI gasket on the painted surface.

- **Connecting a power cable and a ground**

  The power cable of the PLC system and the ground are connected in a way described below.

  - Provide a ground point near the power supply module. Use thick and short wires to connect the terminals LG and FG with the ground. (The length of the wire should be less than 30 centimeters, i.e. 11.18 inches.) LG and FG function to pass the noise generated by the PLC system to the ground. Therefore, the impedance should be as low as possible. Besides, the wires are used to relieve the noise. They themselves carry a lot of noise. Using the short wires can prevent the wires from acting as antennas.

  - Twist the ground and the power cable. After the ground and the power cable are twisted, the noise flowing through the power cable is passed to the ground. If a filter is installed on the power cable, the ground and the power cable do not need to be twisted.

A.1.3 Cables

Grounding a shielded cable

Cables drawn from the control box carry high-frequency noise. When they are outside the control box, they are like antennas emitting noise. To prevent the emission of noise, the cables connected to digital input/output modules, analog input/output modules, temperature measurement modules, network modules, and motion control modules should be shielded cables.

The use of shielded cables also increases the resistance to noise. If the signal cables connected to digital input/output modules, analog input/output modules, temperature measurement modules, network modules, and motion control modules are shielded cables, and are grounded properly, the resistance to noise is improved. However, the resistance to noise will not meet the specified requirement if users do not use shielded cables or the shielded cables are not grounded correctly. If the shield of a cable is connected with the control box, users have to make sure that the shield contacts the control box. If the control box is painted, users have to scrape the paint. All fastening must be metal, and the shield must contact the surface of the control box. If the surface is not even, users need to use washers to correct the unevenness, or use an abrasive to level the surface.

If the shield of a shielded cable is grounded, it needs to be as close to a module as possible. Users have to make sure that there is no electromagnetic induction between the cable which is grounded and other cable which is grounded. Besides, users have to take appropriate measures so that the shield of a cable contacts the control box.