

FATEK

M Series

Programmable Controller

M Series PLC Expansion Module Specification Manual



NEXT Level SOLUTION

The contents of the manual will be revised as the version changes, and this version may not be the final version. Please go to <http://www.fatek.com> technical support area to download the latest version of the manual.

INDEX

Chapter 1	Expansion Modules	1-1
Chapter 2	Expansion of M Series PLC.....	2-1
2-1	I/O Expansion Specifications	2-2
2-2	Digital I/O Expansion and I/O Numbering	2-3
2-3	Numeric I/O Expansion and I/O Channel Mapping	2-5
2-4	Expansion Module Configuration Settings.....	2-8
2-5	Expansion Module Firmware Update	2-10
Chapter 3	Installation And Wiring	3-1
3-1	Environmental Specifications	3-2
3-2	Installation Precautions	3-3
Chapter 4	Power Module Wiring, Power Consumption Calculation, and Power Sequence Requirements.....	4-1
4-1	Specifications and Wiring of Power Module	4-2
4-2	Maximum Current Consumption of Expansion Module.....	4-5
4-3	Calculation Example of Power Capacity.....	4-8
4-4	Requirement of Power Sequence in CPU Module & Expansion Module	4-9
Chapter 5	Digital Input Circuit.....	5-1
5-1	Digital Input Circuit Specifications	5-2
5-2	24VDC Single-End Input Circuit and Wiring for SINK/SOURCE Input	5-3
Chapter 6	Digital Output Circuit.....	6-1
6-1	Digital Output Circuit Specifications	6-2
6-2	Single-End Output Circuit.....	6-3
6-3	Speed up the Single-End Transistor Output Circuit	6-6
6-4	Output Device Protection and Noise Suppression in DO Circuit.....	6-7
Chapter 7	Advanced Expansion & Power Modules Specifications	7-1
7-1	Power Module Specifications	7-2
Chapter 8	Plug-in Expansion Boards Specifications	8-1
8-1	Communication Plug-in Expansion Boards Specifications.....	8-2
8-2	High Speed Digital Input Plug-in Expansion Boards Specifications	8-6
8-3	High Speed Digital output Plug-in Expansion Boards Specifications	8-8
8-4	RTC Plug-in Expansion Boards Specifications	8-10
Chapter 9	High-Speed Expansion Modules Specifications.....	9-1
9-1	High Speed Communication Expansion Module Specifications.....	9-2
Chapter 10	Local I/O Expansion Modules Specifications	10-1
10-1	Digital Input Expansion Module Specifications	10-2
10-2	Digital Output Expansion Module Specifications	10-5
10-3	Digital Input /Output Combo Expansion Module Specifications	10-10
10-4	Analog Input Expansion Module Specifications.....	10-15
10-5	Analog Output Expansion Module Specifications	10-21

10-6	Analog Input/Output Combo Expansion Module Specifications	10-27
10-7	Temperature Expansion Module Specifications	10-31
10-8	Temperature Combo Expansion Module Specifications	10-37
10-9	Load Cell Expansion Module Specifications	10-40
10-10	Repeater Expansion Module Specifications	10-46
Chapter 11 Peripheral and Accessory		11-48
11-1	M PLC Dedicated Micro SD Card	11-49
11-2	High-Density DIO Cable	11-50
11-3	DIO Converter Module	11-53
11-4	European terminal	11-54
Chapter 12 Plug-in Expansion Boards application		12-1
12-1	Digital input Plug-in Module Specifications	12-2
12-2	Digital output Plug-in Module Specifications	12-3
12-3	High Speed Digital output Plug-in Module Specifications	12-4
12-4	High Speed Digital Input Plug-in Module Specifications	12-5
12-5	Communication Plug-in Module Specifications	12-6
12-6	RTC Plug-in Module Specifications	12-8
Chapter 13 Expansion modules application		13-1
13-1	Introduction to the digital input module	13-4
13-2	Introduction to the digital output module	13-4
13-3	Digital Input /Output Combo Specifications	13-5
13-4	Communication module	13-6
13-5	General analog input module	13-28
13-6	General analog output module	13-62
13-7	General analog input and output modules	13-79
13-8	Temperature control module	13-1
13-9	Weight Measuring Module	13-51
Chapter 14 Advanced Expansion & Power Modules Dimensions		14-1
14-1	Power Module Dimensions	14-2
Chapter 15 High Speed Expansion Modules Dimensions		15-1
15-1	High Speed Communication Expansion Module Dimensions	15-2
Chapter 16 Local I/O Expansion Modules Dimensions		16-1
16-1	Digital input Expansion Module Dimensions	16-2
16-2	Digital Output Expansion Module Dimensions	16-3
16-3	Digital Input/Output Combo Expansion Module Dimensions	16-5
16-4	Analog Input Expansion Module Dimensions	16-6
16-5	Analog Output Expansion Module Dimensions	16-8
16-6	Analog Input/Output Combo Expansion Module Dimensions	16-10
16-7	Temperature Expansion Module Dimensions	16-11
16-8	Temperature Combo Expansion Module Dimensions	16-14
16-9	Load Cell Expansion Module Dimensions	16-15
16-10	Repeater Expansion Module Dimensions	16-17
16-11	Terminal Cover Dimensions	16-18
Chapter 17 Peripheral and Accessory Dimensions		17-1
17-1	High-Density DIO Cable Dimensions	17-2
17-2	DIO Converter Module Dimensions	17-5

Chapter 18 Repairs and Maintenance.....18-1

18-1 Precautions..... 18-2

18-2 Daily Maintenance 18-3

18-3 Regular Maintenance 18-4

Precautions on using the product

Compliance with the application-related conditions

The user shall evaluate the suitability of FATEK product and shall install the product in the well-designed equipment or system.

The user needs to check if the system, machinery or device currently used is compatible with the FATEK product. If the user fails to confirm the compatibility or the suitability, then FATEK shall not be liable for the suitability of the product.

When required by the customer, FATEK shall provide correlated third party certification to define the value rating and the application restrictions that will be applicable for the product. However, the aforesaid certification message shall not be considered as sufficient to determine the suitability of the FATEK product, the final product, the machine, the system and other applications or relevant combinations. Described below are certain applications that should be cautiously treated by the user. In spite of this, the content described below shall neither be considered as having included all of the intended product purposes nor suggesting that all of the following purposes shall be entirely suitable for the product. For example, outdoors use, use in an area subjected to potential chemical contamination or electrical interference or used under conditions or functions not mentioned in this Manual or used with the system, machine and equipment that may create risks to life or properties.

Before working with the product, the user will be required to check if the entire system is marked with a hazard sign and shall select the design that can ensure the safety such as the backup design, etc. Otherwise, the user shall not be allowed to use the product in the application that will present personnel and the property safety concerns. In no event shall FATEK be liable for the specifications, statutory regulations or restrictions that will be used by the customer in the product combination or the product operations.

When using the product, FATEK shall not be liable for the programs edited by the user or the resulting consequences.

Disclaimers

Dimensions and weight

The dimensions and the weight specified in the manual are nominal values only. Even if provided with the tolerance, they cannot be used in the manufacturing purposes.

Performance data

The data specified in this Manual mean that the performance data obtained under FATEK' s test conditions are provided for the user to confirm its compliance only. Therefore, the user is also required to consider the actual application conditions. Therefore, actual performance shall be defined according to the content of the guarantee and the limit of responsibilities established by FATEK.

Errors and negligence

The content of this Manual is provided through careful checking process and is considered as correct. However, FATEK shall not be liable for the errors or the negligence that may be found in the text, printing content and proofreading.

Change of specifications

The product specifications and accessories may be subject to change along with the technical improvement or other reasons. In the event that the published specifications or performance need to be changed or where significant structural change is required, FATEK will change the model number of the product accordingly. If certain specifications of the product have changed, then FATEK will not give the notice under the following situation: when it is required to use a special model number or create particular specifications in order to support the customer' s application according to the instructions given by the customer. To confirm actual specifications of the product to be purchased, please contact the local FATEK distributor.

1

Expansion Modules

List of Expansion Modules

Category		Model	Specifications
Power Expansion	Power Supply Module	MPA024-24	Input: 100~240VAC(50/60Hz) · output: 24VDC 1A(Shared CPU dedicated power supply and external Sensor power supply) · Max. Power Consumption 24W.
		MPA048-24	Input: 100~240VAC(50/60Hz) · output: 24VDC 2A(Shared CPU dedicated power supply and external Sensor power supply) · Max. Power Consumption 48W.
High-Speed ¹ Expansion Modules	High Speed Communication Modules	MHCM22	2 ports RS232 communication module.
		MHCM55	2 ports RS485 communication module.
		MHCM25	1 port RS232 + 1 port RS485 communication module.
Local I/O Expansion Modules	DI Modules	M16X	16 points 24 VDC digital input · Push-in terminal blocks
	DO Modules	M16Y◇ ^{*2}	16 points transistor or relay output · Push-in terminal blocks
	DIO Combo Modules	M1616XY◇ ^{*2}	16 points 24 VDC digital input · 16 points transistor output · High density 40 pins header connector
	AI Modules	M04AD	4 channels,14-bit analog input module. (-10V~0V~+10V or -20mA~0mA~+20mA...) · Resolution:1/16383
		M04ADR	4 channels,18-bit analog input module. (-10V~0V~+10V or -20mA~0mA~+20mA...) · Resolution:1/160000
	AO Modules	M04DA	4 channels,14-bit analog output module. (-10V~0V~+10 or 0mA~+20mA...) · Resolution:1/16383
		M04DAR	4 channels,16-bit analog output module. (-10V~0V~+10 or 0mA~+20mA...) · Resolution:1/54000
	AIO Combo Modules	M0202AH	2 channels,14-bit analog input (-10V~0V~+10V or -20mA~0mA~+20mA...). And 2 channels,14-bit analog output. (-10V~0V~+10 or 0mA~+20mA...) · Resolution:1/16383
	Temperature measurement Modules	M04TC	4 channels · Thermocouple temperature input (K, J, T, E, R, B, N, S, mV) · Precision: ±0.5% (25°C±5°C)
		M04TCR	4 channels · Thermocouple temperature input (K, J, T, E, R, B, N, S, mV) · Precision: ±0.2% (25° C±5° C)
		M04RTD	4 channels RTD(Pt100/Pt1000, JPt100/JPt1000) · Precision: ±0.1% (25°C±5°C)
	Temperature Measurement Combo Modules	M0202TH	2 channels, RTD temperature input (Pt-100, Pt-1000, JPt-100, JPt-1000) · Resolution:0.1°C. And 2 channels, TC temperature input (K, J, T, E, R, B, N, S, mV) · Resolution: 0.1°C.
	Load Cell Modules	M02LC	2 channel, load cell measurement module with 24-bit resolution, Conversion precision ±0.5% (25° C±5° C)
		M02LCR	2 channel, load cell measurement module with 24-bit resolution, Conversion precision ±0.01% (25° C±5° C)
	End module	MRE	End module must be connected to the right side of the CPU module or the end of the entire row(rack).
Bus I/O	Repeater Module	MRPWE-AC	Expand 16 Local I/O modules per unit, with maximum of 3 modules

			added per CPU, achieving up to 64 expansion modules. Built-in AC power. Input: 100~240VAC(50/60Hz) · output: 24VDC 2A(Shared CPU dedicated power supply and external Sensor power supply) · Max. Power Consumption 48W.
	I/O Bus Extension Module(Head)	MRGH	The head module must be used with the MRGT (tail). Each row can expand up to 16 Local I/O expansion modules, with a maximum of 6 rows (6 sections, racks), for a total of 64 expansion modules.
	I/O Bus Extension Module(Tail)	MRGT	The tail module must be used with the MRGH (head). Each row can expand up to 16 Local I/O expansion modules, with a maximum of 6 rows (6 sections, racks), for a total of 64 expansion modules.
Plug-in Expansion Boards ^{*3}	Communication Plug-in Boards	MB-CB2	1 port RS232 communication Plug-in Board.
		MB-CB5	1 port RS485 communication Plug-in Board.
	DI Plug-in Boards	MB-2HSC	4 points 24VDC digital input · 2 channels 200KHz HSC · Push-in Terminal blocks.
	DO Plug-in Boards	MB-2PSO◇ ^{*2}	4 points transistor output · 2 channels 200KHz HSPO · Push-in terminal blocks
	RTC Plug-in Boards	MB-RTC	RTC Clock · Plug-in expansion Board.
Remote Expansion Modules	Coupler Unit	MC0EN	Remote I/O Coupler ((Modbus TCP and Ethernet/IP)
Peripheral and Accessory	High-density DIO connection Cable	MFW40I-50	High-density I/O extension cable · 40 pins Socket, 28AWG I/O cable · length 0.5M, Usually used with MFT40T.
		MFW40N-150	High-density I/O extension cable · 40 pins Socket, 28AWG I/O cable · length 1.5M(One end is a loose wire)
		MFW40NS-300	High-density I/O extension cable · 40 pins Socket, 22AWG I/O cable · length 3M (One end is a loose wire)
	DIO Converter Module	MFT40T	40 pins DIO Converter(Interface) Module · Connection method: Tool free & Push In.
	Dedicated Memory Card	MFM06	Industrial grade Micro-SD card · Data-log area: 6GB ^{*4}
	European terminal Block	MFT04C	4 Pins European terminal Block
		MFT05C	5 Pins European terminal Block
		MFT06C	6 Pins European terminal Block
		MFT18C	18 Pins European terminal Block

1. ME/MS/MA CPUs support high-speed expansion modules, while MQ CPUs and IO Couplers do not.

2. ◇: R-Relay output (CPU module and hybrid high-density DIO does not have); T-Transistor SINK(NPN) output; J-Transistor SOURCE(PNP) output.

3.A single CPU can support up to 6 high-speed expansion modules, which must be installed in the first 6 expansion slots on the right side of the CPU

(between the CPU and local I/O expansion).

4. MQ CPUs support Plug-in expansion boards, while ME/MS/MA CPUs do not.

5.The M series PLC only supports the MFM06 dedicated memory card

2

Expansion of M Series PLC

The expansion of M series PLC means when the resources provided by the M series CPU module are insufficient or the interface not provided by the CPU module. The number of I/O or interface types can be expanded by adding expansion modules. The expansion of M series PLC can be divided into many categories: Local I/O expansion, High-speed expansion, Plug In expansion, and Advanced expansion...etc.

2-1 I/O Expansion Specifications

The expansion of M Series PLC I/O consists of Digital I/O (DI/O, which status is represented by a single bit) and the Numeric I/O (NI/O, which status is represented by a 16-bit Word). Either the DI/O or the NI/O expansion is realized through expansion modules cascaded through the usage of the "I/O Output Expansion Connector" located at the right side of M Series PLC or expansion module.

The I/O points of M Series PLC are limited to 2048 points of DI/O (1024 points each for DI and DO), 512 words of NI/O (The sum of NI and NO does not exceed 512). Hardware limitations: ①. A maximum number of 64 modules can be used in the expansion. ②. The number of expansion modules that can be connected in series in each segment of the M series PLC is limited to 16 units, and repeater modules or branch modules must be used for extension between each segment.

Caution

1. If the I/O points of the application system exceed one of the limitations (1024 DI, 1024 DO, 256 NI, 256 NO), while startup the M Series PLC will treat this as an illegal I/O configuration, which in return will flag as an error situation by turn on the "ERR" LED. The corresponding error code will also be indicated in the CPU status register (DR35361).
2. The maximum number of expansion modules of M Series PLC is 64. Beyond this numbers will be treated as an invalid I/O configuration and the CPU Module will stop its operation, which in return will flag as an error situation by turn on the "ERR" LED. The corresponding error code will also be indicated in the CPU status register (DR35361).
3. The number of expansion modules that can be connected in series in each segment of the M series PLC is limited to 16 units, and expansion modules or branch modules must be used for extension between each segment.

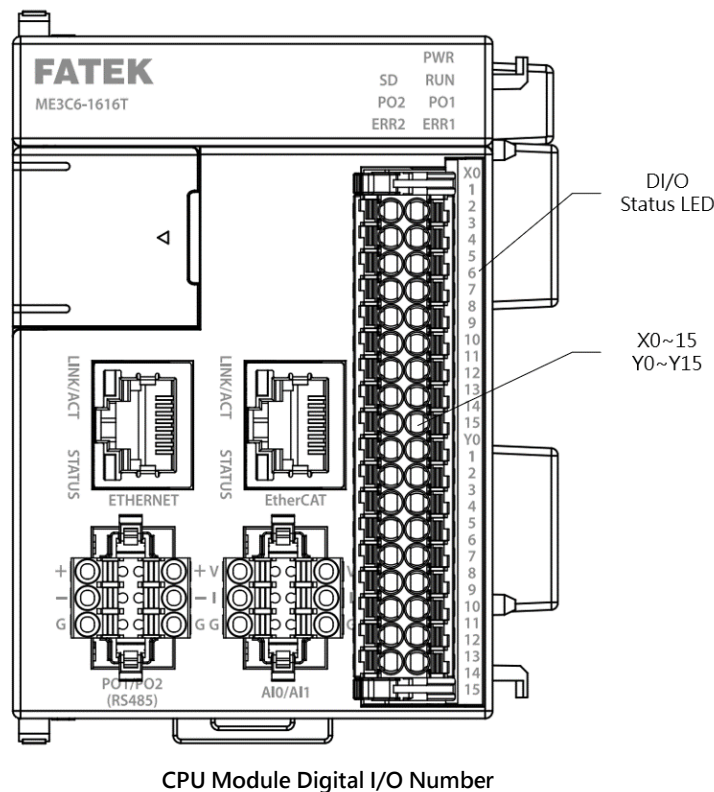
Warning

1. The maximum length of the I/O expansion cable for M Series PLC is 5 meters. Cables longer than that will cause incorrect I/O operation because of excess signal delay in hardware or noise pickup, resulting in damage to equipment or posing hazard to operating personnel. Since this kind of situation cannot be detected by the CPU Module, users are advised to take extra cautions and necessary measures.

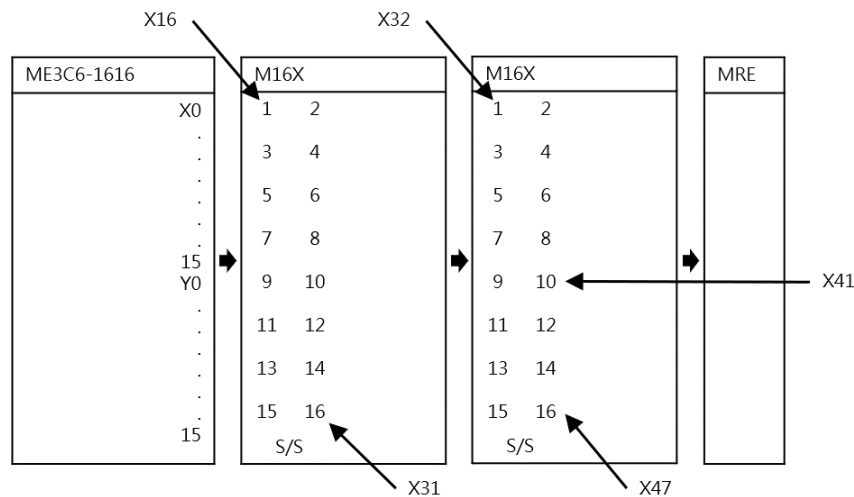
2-2 Digital I/O Expansion and I/O Numbering

Digital I/O means I/O with the discrete type of status, including digital input (with initial X in DI numbering) and digital output (with initial with Y in DO numbering). The DI and DO of M Series PLC can both be expanded up to 1024 points (numbered as X0~X1023 and Y0~Y1023, each with 1024 points).

The status of input contacts (X0~X1023) of PLC come from the input signal connected to the digital input terminal block on CPU Module or expansion module; while the status appears at digital output terminal block of CPU Module and expansion module reflects the digital output relay (Y0~Y1023) status inside PLC. On the M Series CPU Module, at the position right of the European terminal connector, there have labels indicate the corresponding signal name. They label each terminal with numbers representing the corresponding digital input contact Xn and digital output relay Yn. In the example of the CPU module in ME3C6-1616T, The labels of the digital input contacts on the left side of the European terminal connector are X0~15, S/S and the labels of the digital output contacts on the right side of the European terminal connector are Y0~15, COM. Users only need to locate the printed label for each terminal to find out its I/O number. The LED status display region also indicates the ON/OFF status for all DI(X0~X15) and DO(Y0~Y15) on the main unit. Users can easily find each terminal with its I/O number and LED status indication.



While the various expansion modules other than the CPU module have the same printed labels on the input/output terminals as the CPU module do, these labels are only relative I/O numbers, different from the absolute I/O numbers on CPU module. The number of a terminal only represents its order on the expansion module. For example, the first contact is 1, the second 2, etc. All numbers on the expansion module begin with 1. The actual number of digital input contact or digital output contact, however, is determined by summing the numbers on all previous expansion modules and the CPU module. See the following figure and its calculation.



Expansion Module Digital I/O Number

As shown in the above figure, digital input point 10 on the 2nd expansion module M16X. Because the top X numbers of the previous two units are 15 and 16, respectively, the number of input contact X10 on second expansion unit should be:

$$X (15 + 16 + 10) = X41$$

2-3 Numeric I/O Expansion and I/O Channel Mapping

The numeric I/O in M Series PLC treats 16 single-bit data as one 16-bit numeric data (Word) ranging from the 0~65535. Since all numeric data of M Series PLC are stored in the register inside PLC (16-bit width), therefore numeric I/O is also called register I/O. The Input Register (IR) has 256 Word (R34768 ~ R35023) for inputs from external numeric input (NI) module, and the Output Register (OR) also has 256 Word (R35024 ~ R35279) for outputs to external numeric output (NO) module.

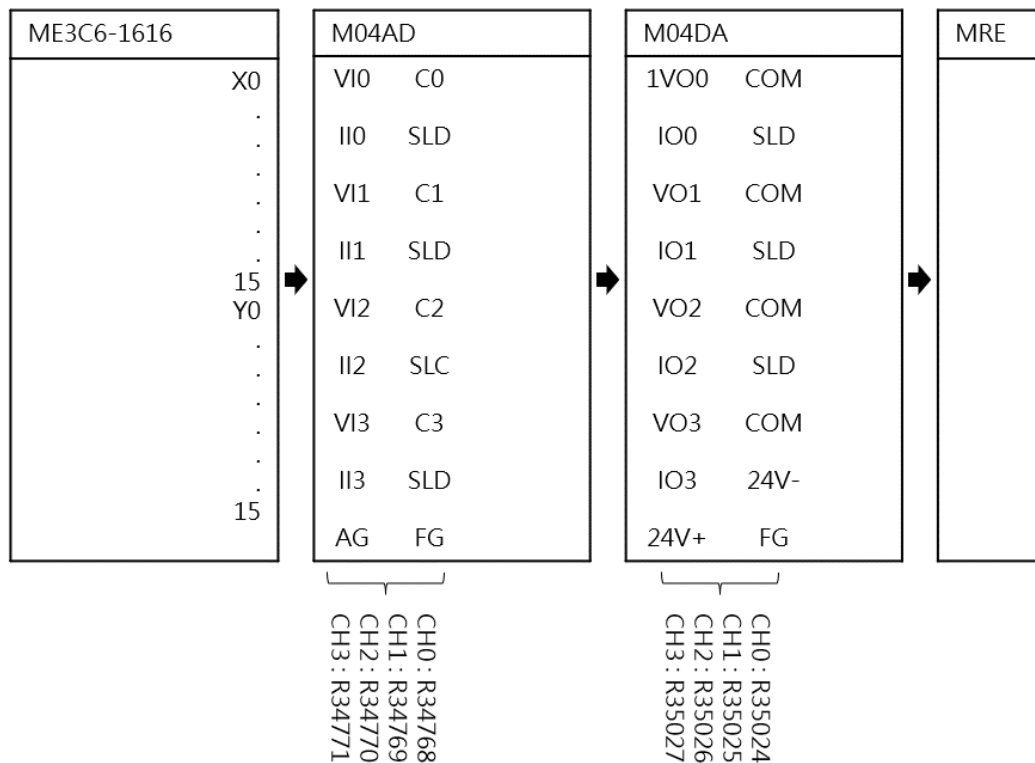
Analog Input Modules and Temperature Modules are Numeric input (NI) modules which use input register (IR) to convey the status. Analog Output Modules are Numeric output (NO) modules which output is directly from the Output register (OR). The Analog Input, Temperature Input, and Analog Output is of analog voltage or current. Either the magnitude of voltage or current is represented by the 16-bit value of the corresponding register. The corresponding current/voltage signal of any IR or on the NI/O module is named as a Channel (CH). The channels on the NI module are called numeric input channels (NI channels) and those on NO module numeric output channels (NO channels). The number of IR/OR used by NI and NO channels on each module varies depending on the module type or working mode. The following table lists the numbers of IR and OR used by NI and NO channels on each NI/O module:

Numeric I/O Expansion and I/O Channel Mapping

Module Name	NI Channel Label	NO Channel Label	Number of IR occupied (Word)	Number of OR occupied (Word)	Note
M04AD	CH0		2		The voltage and current inputs can't be used in the same channel at the same time. It only one (V or I) available.
	CH1		2		
	CH2		2		
	CH3		2		
M04ADR	CH0		1		The voltage and current inputs can't be used in the same channel at the same time. It only one (V or I) available.
	CH1		1		
	CH2		1		
	CH3		1		
M04DA		CH0		1	The voltage and current outputs can't be used in the same channel at the same time. It only one (V or I) available.
		CH1		1	
		CH2		1	
		CH3		1	
M04DAR		CH0		1	The voltage and current outputs can't be used in the same channel at the same time. It only one (V or I) available.
		CH1		1	
		CH2		1	
		CH3		1	
M0202AH	CH0		1		The voltage and current inputs can't be used in the same channel at the same time. It only one (V or I) available.
	CH1		1		
		CH0		1	The voltage and current outputs can't be used in the same channel at the same time. It only one (V or I) available.
		CH1		1	
M04TC	TC0		2		

	TC1		2		
	TC2		2		
	TC3		2		
M04TCR	TC0		2		
	TC1		2		
	TC2		2		
	TC3		2		
M04RTD	P0		2		
	P1		2		
	P2		2		
	P3		2		
M0202TH	TC0		2		
	TC1		2		
	RTD0		2		
	RTD1		2		
M02LC	CH0		4		
	CH1		4		
M02LCR	CH0		4		

The corresponding IR or number calculation of the NI/O module starts from the first expansion module. The first NI channel corresponds to the first IR register (R34768). Adding R34768 with the number of IR used by the first NI channel gives the IR number of the second NI channel. Adding the IR number of the second NI channel with the number of IR used by the second NI channel gives the IR number of the third NI channel. All other numbers can be obtained accordingly. Similarly, the first NO channel corresponds to the first OR (R35024). Adding R35024 with the number of OR used by the first NO channel gives the OR number of the second NO channel. (In the cumulative calculation of NI channels, care only for NI channels and disregard DI/O and NI. Similarly, in the case of NO channels, disregard DI/O and NI channels.) The following figure helps users find out the relation between NI/O channels and PLC's IR and OR.

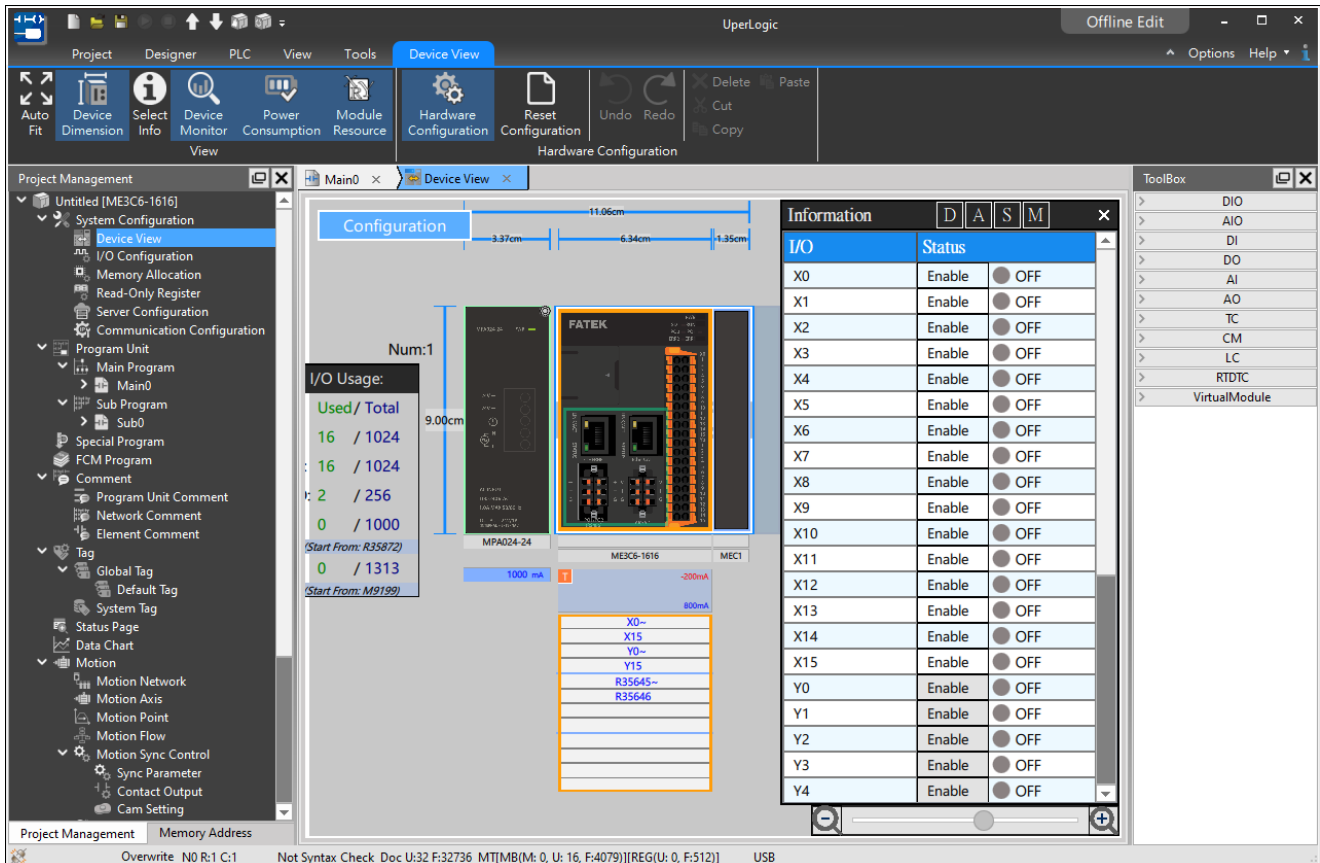


Analog expansion module IR, OR number

The M series PLC will automatically detect the expansion module when it is turned on, and then automatically set the IR and OR, the user does not need to make any settings.

2-4 Expansion Module Configuration Settings

The Expansion Module Configuration of the M-Series PLC is implemented in the “UperLogic→【Project】→【Device View】→Select a Expansion Module→【Configuration】. The Device View is designed to concurrently display the outline dimensions, Module Information (Module ID and Firmware Version), Power Consumption and Module Resources (occupying the register) of different expansion modules, as indicated below.



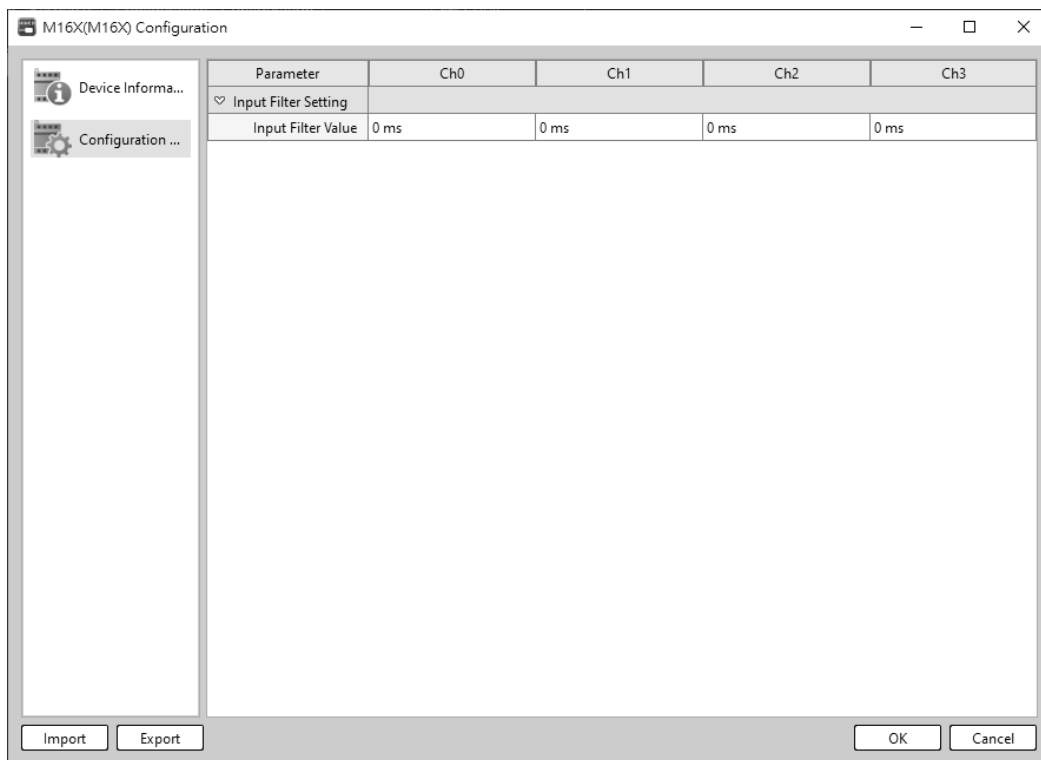
Device View

When being installed in different types of expansion modules, the Expansion Module Configuration of the M-Series PLC will display different types of configuration pages, as indicated below.

The Expansion Module Configuration of the M-Series PLC is saved in the expansion module directly. Even if the CPU module is damaged, such expansion module can still operate independently to show the corresponding processing action. In this way, it not only improves the system stability but also intensifies the system security.

⚠ Caution

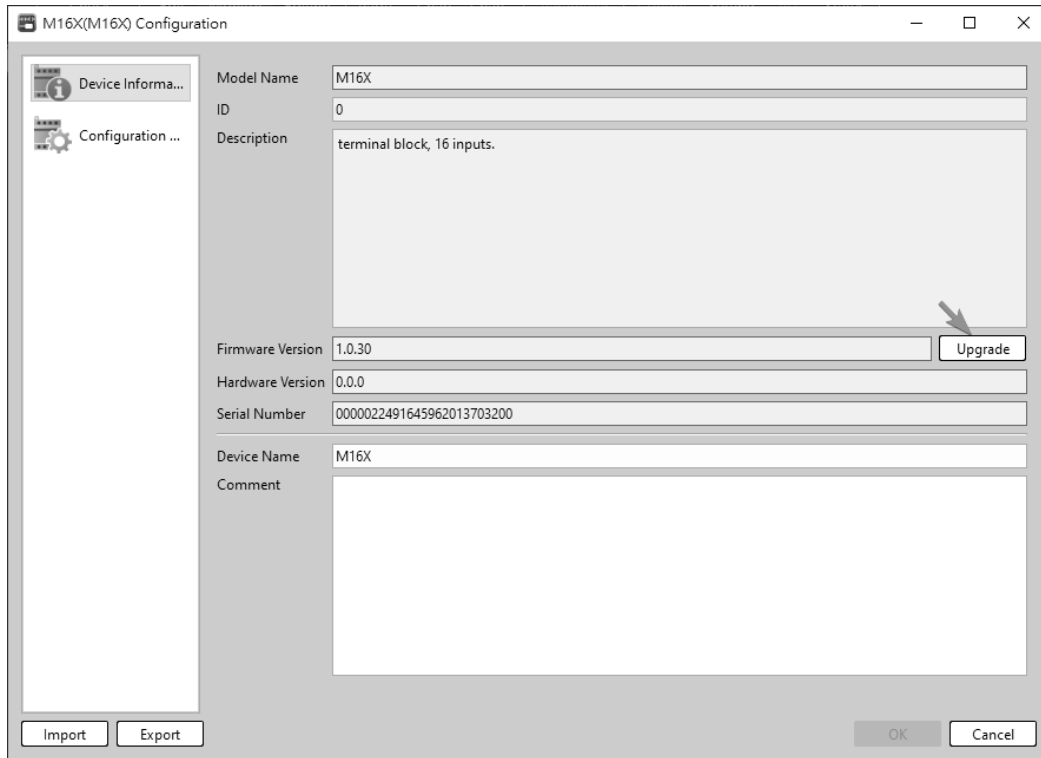
The expansion module configuration of M-Series PLC is saved in the project and the expansion module instead of being saved in the CPU module. Before replacing the expansion module, you need to set the expansion module configuration in the expansion module or save the project on the SD Card and then the CPU module will write the expansion module configuration being saved to the corresponding expansion module.



Configuration

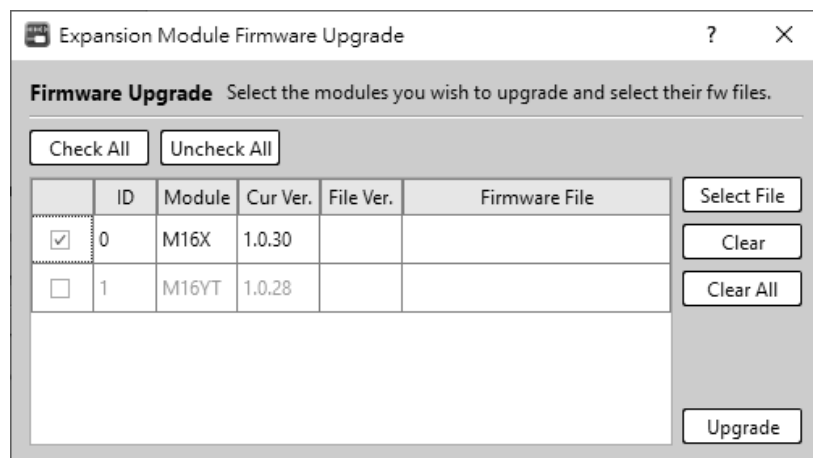
2-5 Expansion Module Firmware Update

The expansion module firmware of the M-Series PLC is updated in the “UperLogic→【Project】→【Device View】→Select a Expansion Module→【Device information】” profile. In this regard, the equipment information displays the module name, module ID, module description, module firmware version, module hardware version and module serial number of the expansion module, as indicated below:



Device Information

The expansion module firmware update of M series PLC can be updated individually or multiple expansion modules can be updated at the same time.



Firmware update

3

Installation And Wiring

⚠ Danger

1. Turn off all power before installation of M Series PLC or related equipments to prevent electric shock or damage to equipment.
2. During installation, never remove the dust cover sheet that were attached on the PLC before wiring is completed to avoid complications such as fire hazards, breakdown, or malfunction caused by drill dust or wire shreds falling inside PLC.
3. Upon completion of installation and wiring, remember to remove the dust cover sheet to avoid fire, breakdown or malfunction, caused by overheating.

3-1 Environmental Specifications

⚠ Caution

1. Environmental specifications of M Series PLC cannot exceed those listed in this manual. In addition, do not operate this equipment in environments with oil smoke, conductive dust, high temperatures, high humidity, corrosion gases, inflammable gases, rain or condensation, and high vibrations and shock.
2. Whether this product is used in a system or alone, it must be installed in an appropriate cabinet. The selection and installation of the cabinet must comply with local or national standards.

Environmental Specifications Table

Item	Specification	note
Operating Ambient Temperature	0~55°C	Permanent Installation
Storage Temperature	-25 ~ +70°C	
Relative Humidity (non-condensing)	20 ~ 90%	
Pollution Level	Degree II	
Altitude	≤2000m	
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)	
Shock	10G, 3 times each along the 3 axes	
Noise Suppression	1500Vp-p · Width 1us	
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)	

⚠ Warning

The listed environmental specifications are for M Series PLC under normal operation. Any operation in environment not conform to above conditions should be consulted with FATEK.

3-2 Installation Precautions

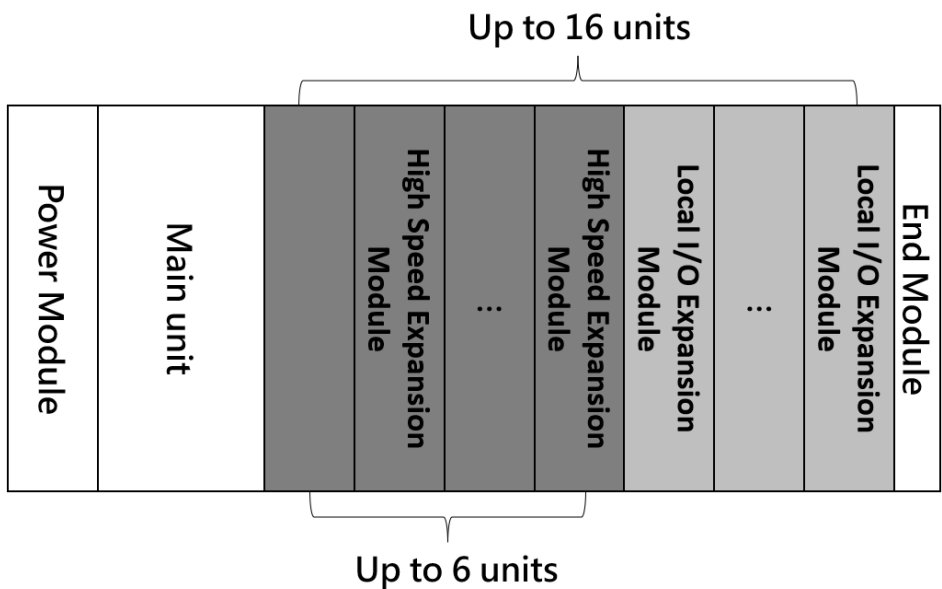
To avoid interference, the PLC should be installed to keep from noise sources such as high- voltage or high current and high-power switches. Other precautions are:

3-2-1 Placement of PLC

Fixation of M Series PLC, which can be fixed by DIN RAIL, should place vertically and start from the CPU module on the left to the expansion module on the right.

The high-speed expansion module requires two communication ports, so the high-speed expansion modules must be connected to the CPU module (Main unit) before the local I/O modules. A maximum of six high-speed modules can be connected, and without an I/O bus extension module, each CPU module can support up to 16 expansion modules. It should be noted that the number and types of modules that can be connected may vary slightly depending on the CPU model.

A typical figure of placement is shown below:

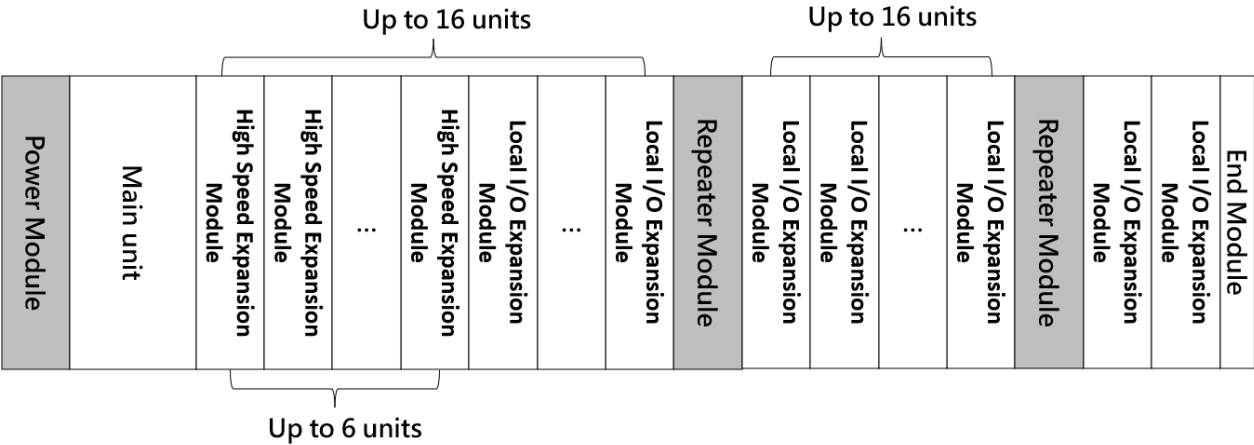


Placement of M series PLC installation

3-2-2 Placement of I/O Bus Extension Module(Repeater, MRPWE)

When the power module can't provide enough power for all the expansion modules, a "Repeater module" can be appropriately added to share the load of the power module. The repeater module is equivalent to the 48W power module. A maximum of 16 Local I/O expansion modules can be installed between a power module and a repeater module. A maximum of 16 Local I/O expansion modules can be installed between the repeater module and the next repeater module. A total of 64 expansion modules (Local I/O expansion plus High-speed expansion modules) can be installed.

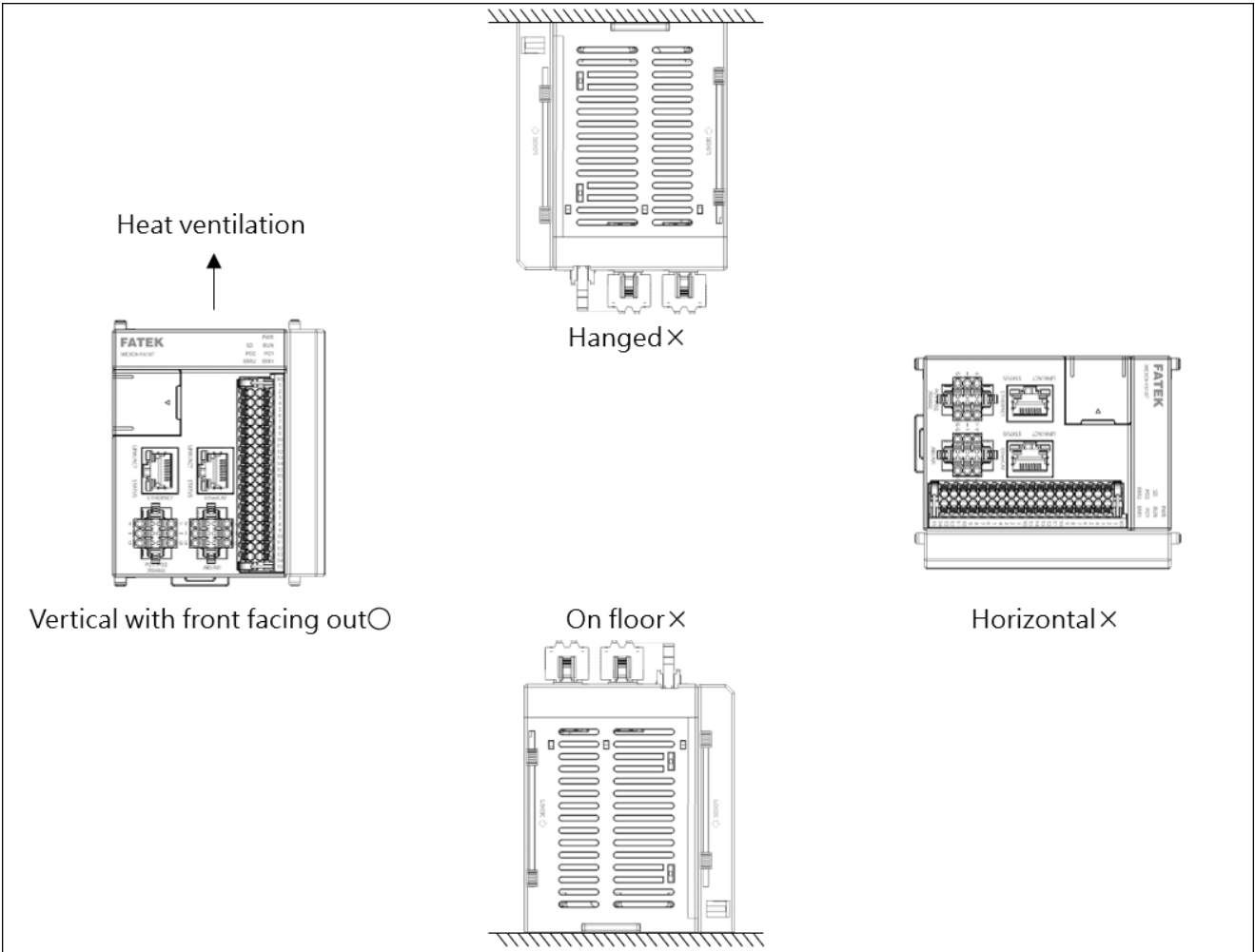
The following figure shows the placement of repeater modules:



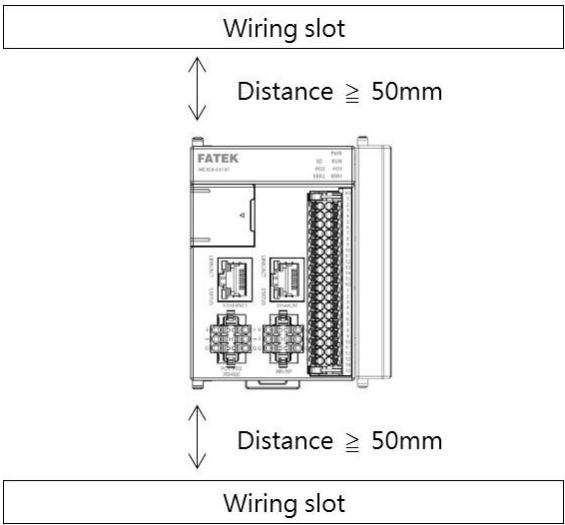
Placement of Repeater Module

3-2-3 Ventilation Space for Installation

The heat in M Series PLC is ventilated via air circulation. There should reserve more than 50mm space, both below and above PLC, and with vertical installation, for ventilation. as shown in the figure below :



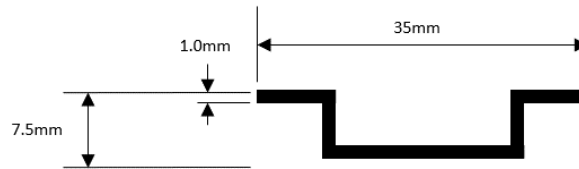
M Series PLC installation direction



M Series PLC ventilation space

3-2-4 Fixation by DIN RAIL

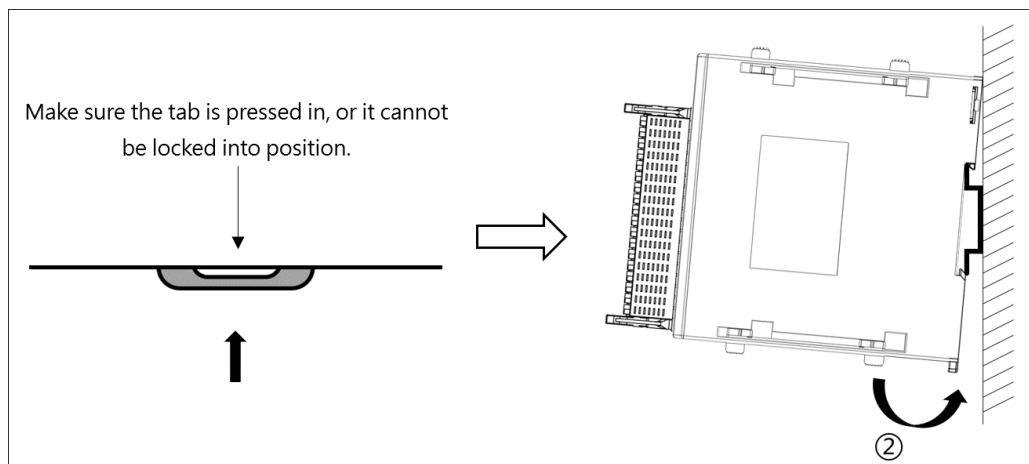
In an environment with slight vibration (less than 0.5G), this is the most convenient way of fixation and is easy for maintenance. Please use DIN EN50022 DIN RAIL, as shown in the figure below.



DIN RAIL SIZE

Mount

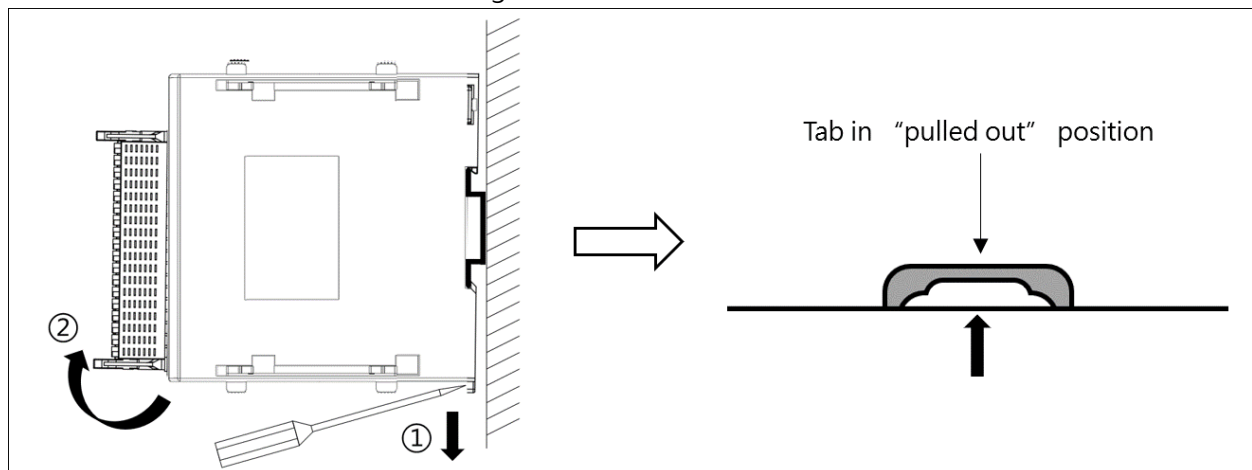
Hold PLC facing its front, press it down with a 15 degrees tilt onto the DIN RAIL. Swing it down until the upper edge of DIN RAIL groove on PLC back touches the upper tab of DIN RAIL. Then use this locked-in point as a pivot to press the PLC forward on the bottom and lock it in position. The procedure is illustrated below.



Mount DIN RAIL

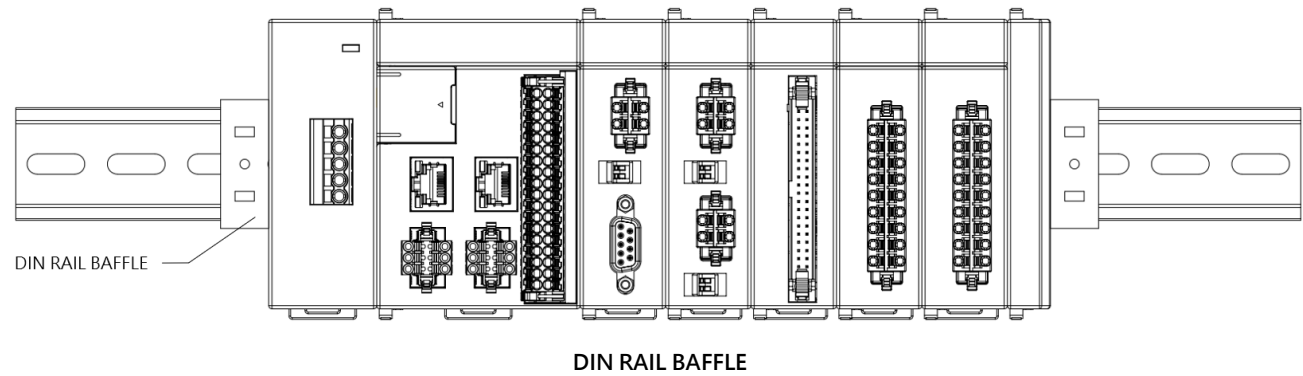
Dismount

Use a long screwdriver to reach in the hole on the DIN RAIL tab. Pull out the tab to "pulled out" position to remove PLC, as shown in the figure below.



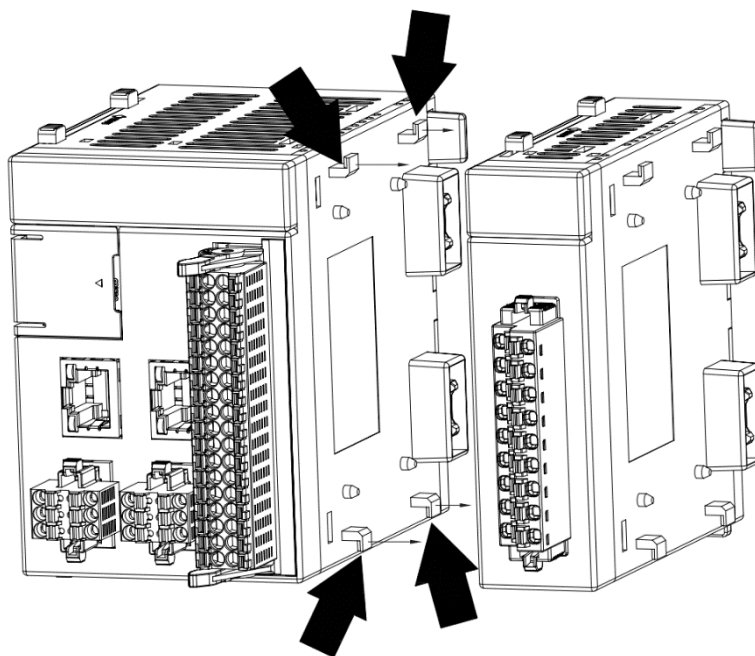
Dismount DIN RAIL

When used in the vibration source, it is recommended that a DIN RAIL damper should be installed on the leftmost and rightmost sides of the M-Series PLC, respectively. In this way, it can stabilize all the modules, including the CPU module and expansion module per the leftmost and rightmost DIN RAIL dampers indicated in the figure below.

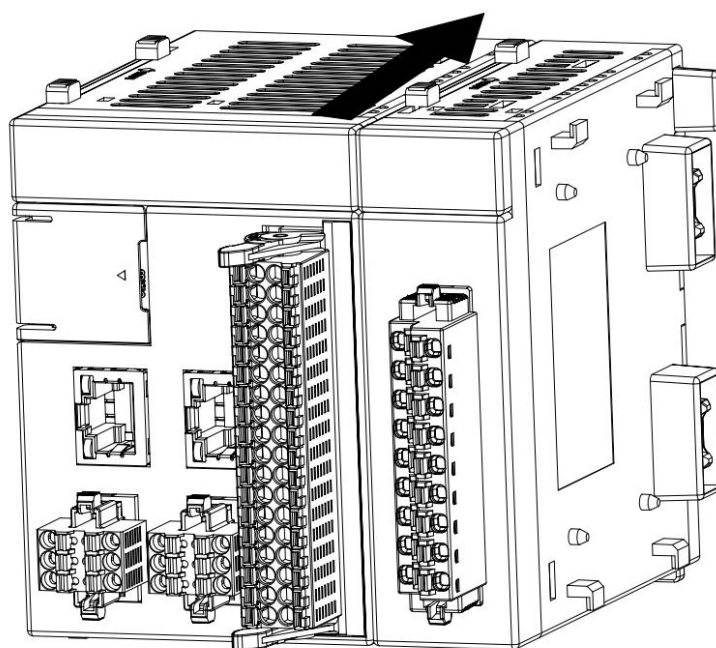


3-2-5 Installation of Expansion Modules

Expansion module installation method: after aligning the expansion module with the CPU Module slot or with the slot of the previous expansion module, insert the module and then push the latch-hook straight down to the base, as indicated in the figure below.



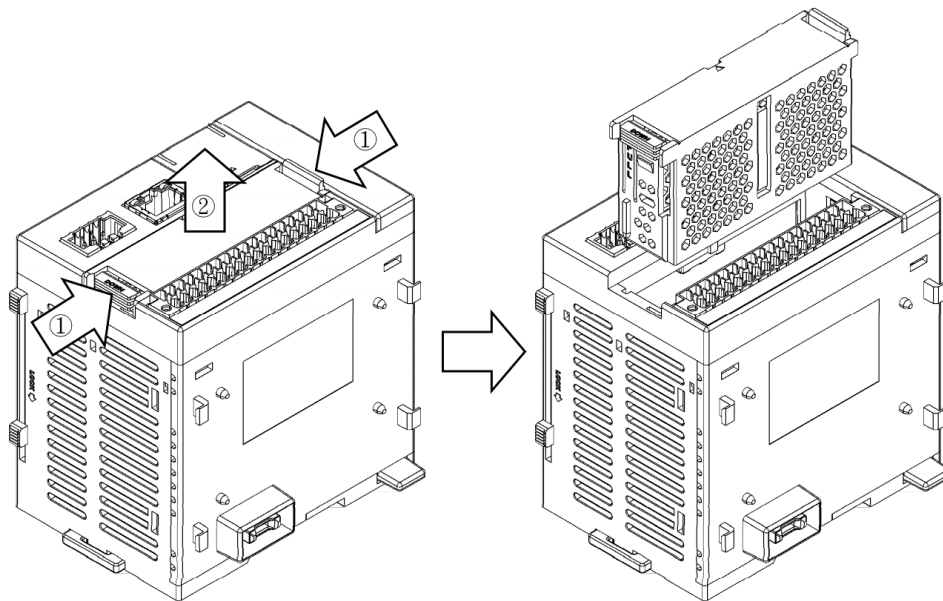
Install expansion module



Install the expansion module buckle

3-2-6 Installation and Remove of Plug-in Expansion Boards

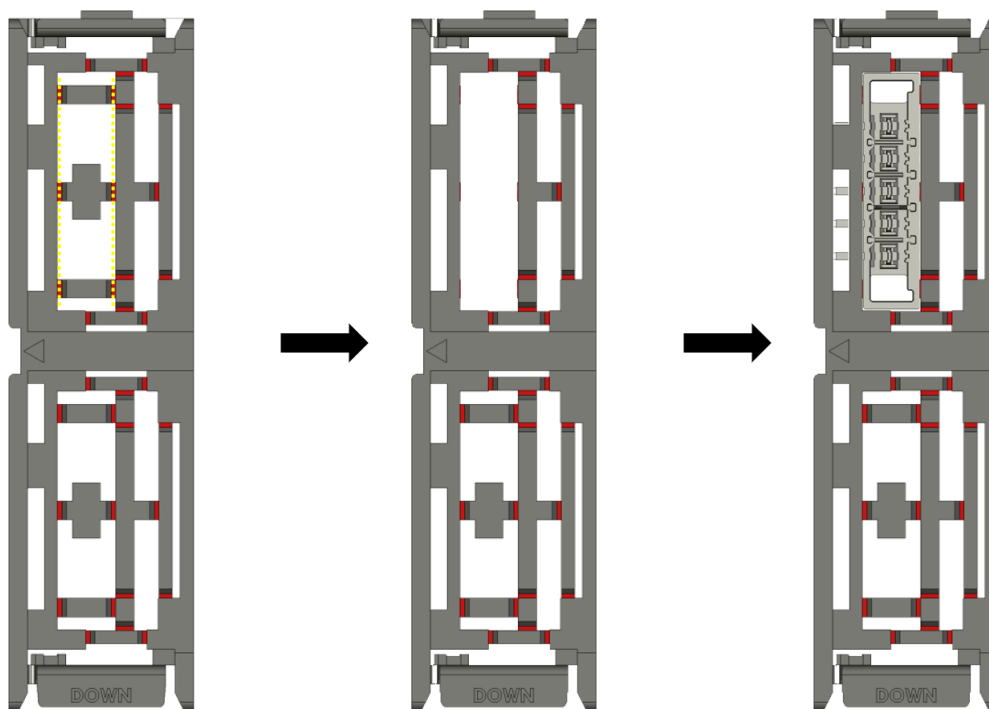
1. Press the top and bottom clips of the expansion case, then pull it upwards.



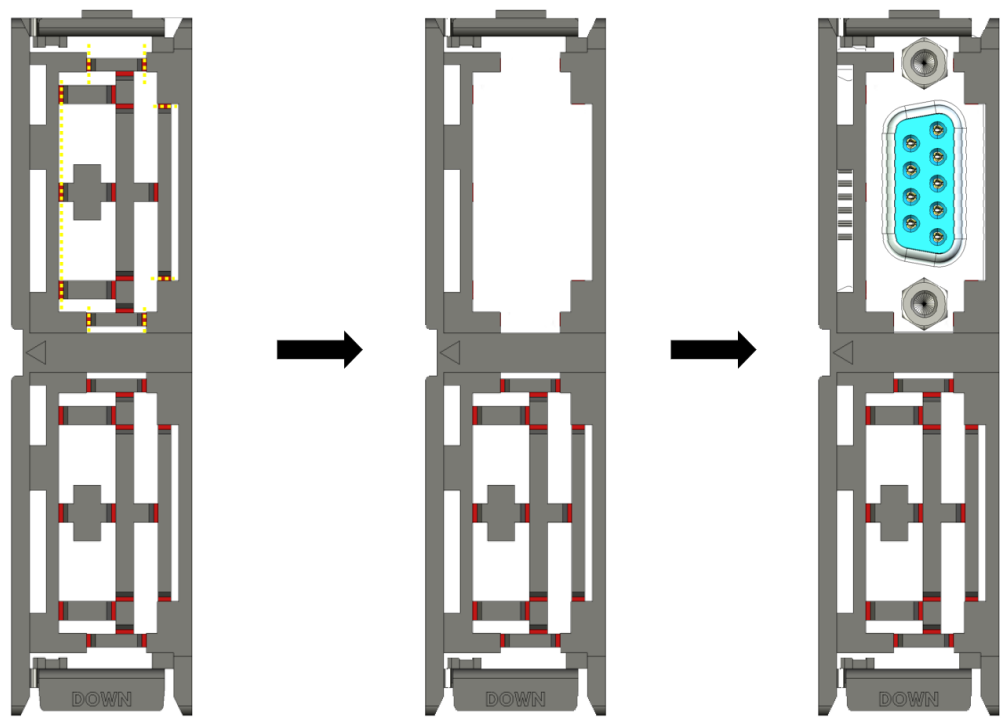
Remove expansion panel method

2. Cut off different support piece on the bracket(case) along the dotted line according to different plug-in expansion boards.

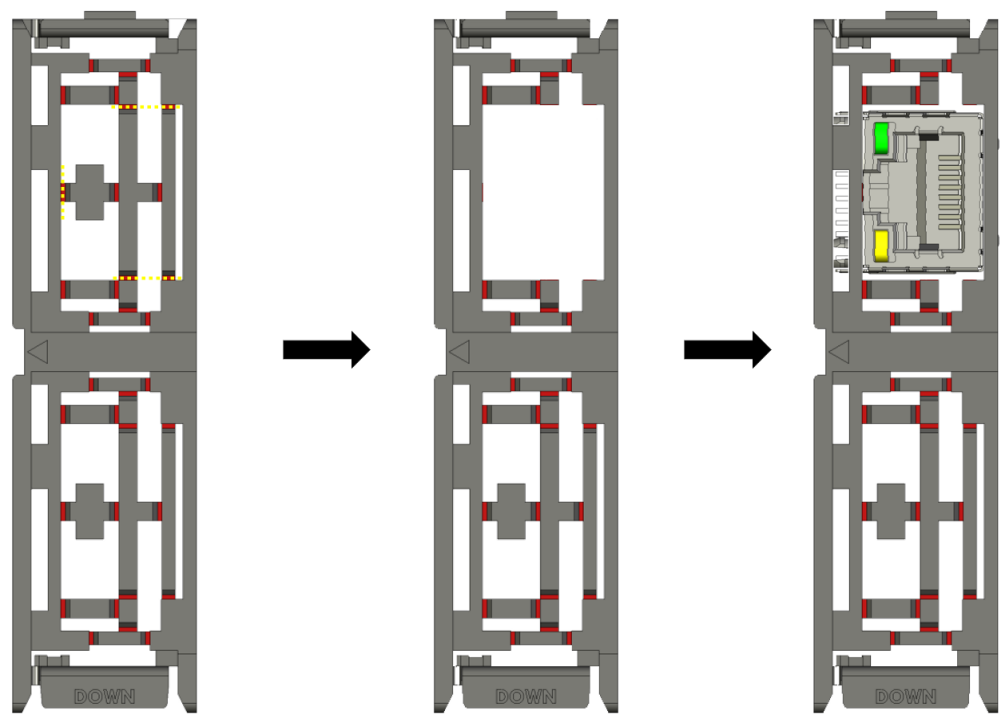
Plug-in expansion board: MB-CB5 · MB-2HSC · MB-4X · MB-2PSO◇ · MB-4Y◇



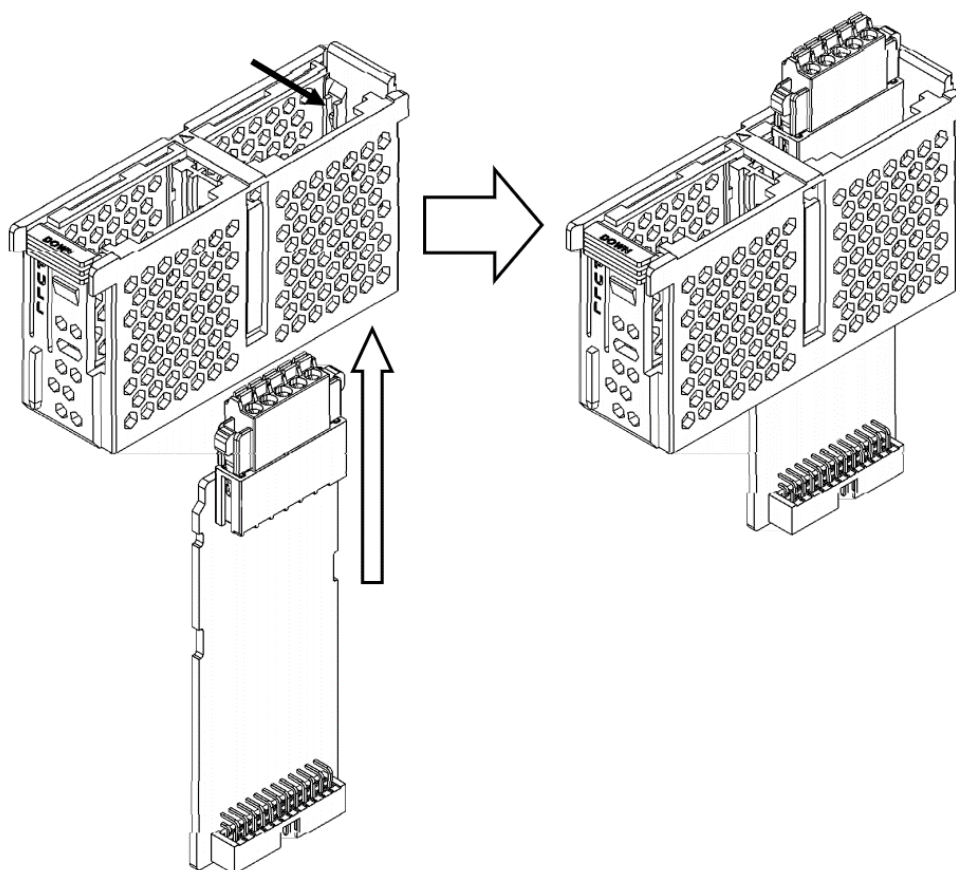
Plug-in expansion board: MB-CB2



Plug-in expansion board: MB-CBEIP

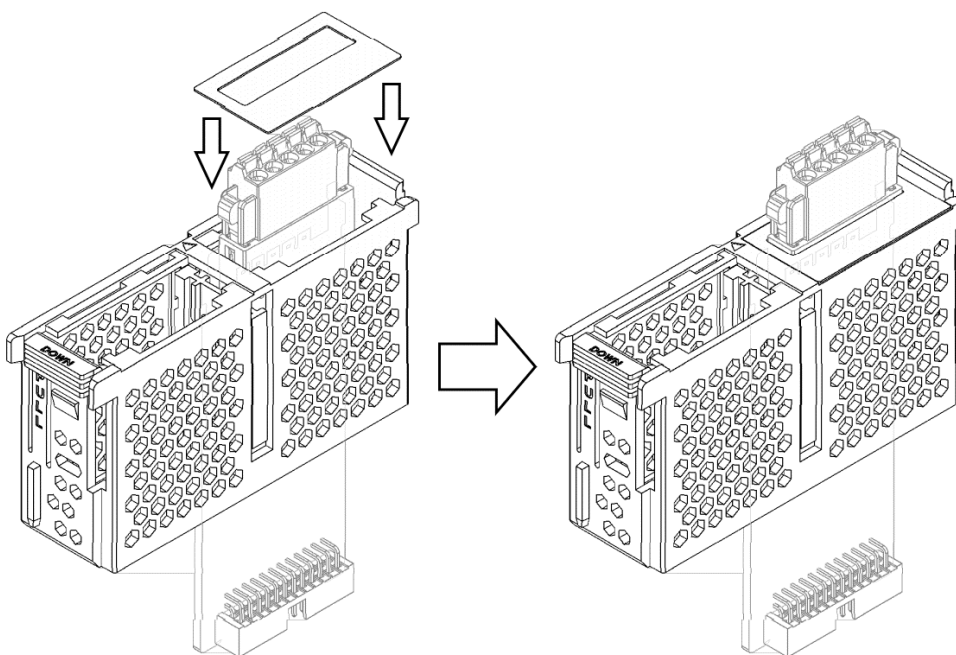


3. Insert the plug-in expansion board into the groove inside the bracket (by the black arrow).



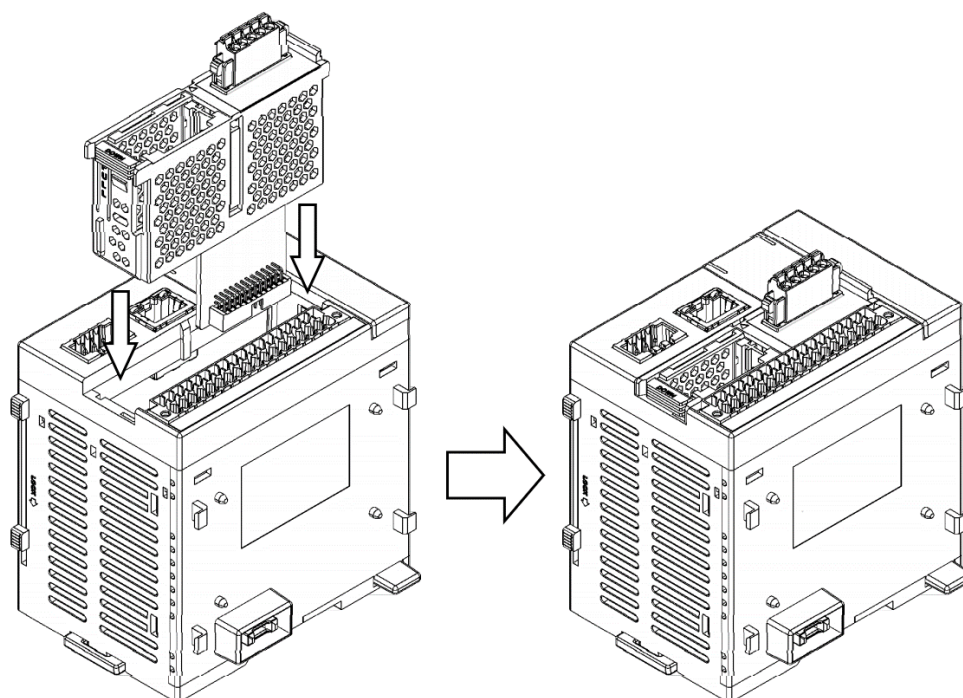
Insert the plug-in expansion board into the plug-in expansion board bracket method

4. Paste the nameplate that comes with the module °



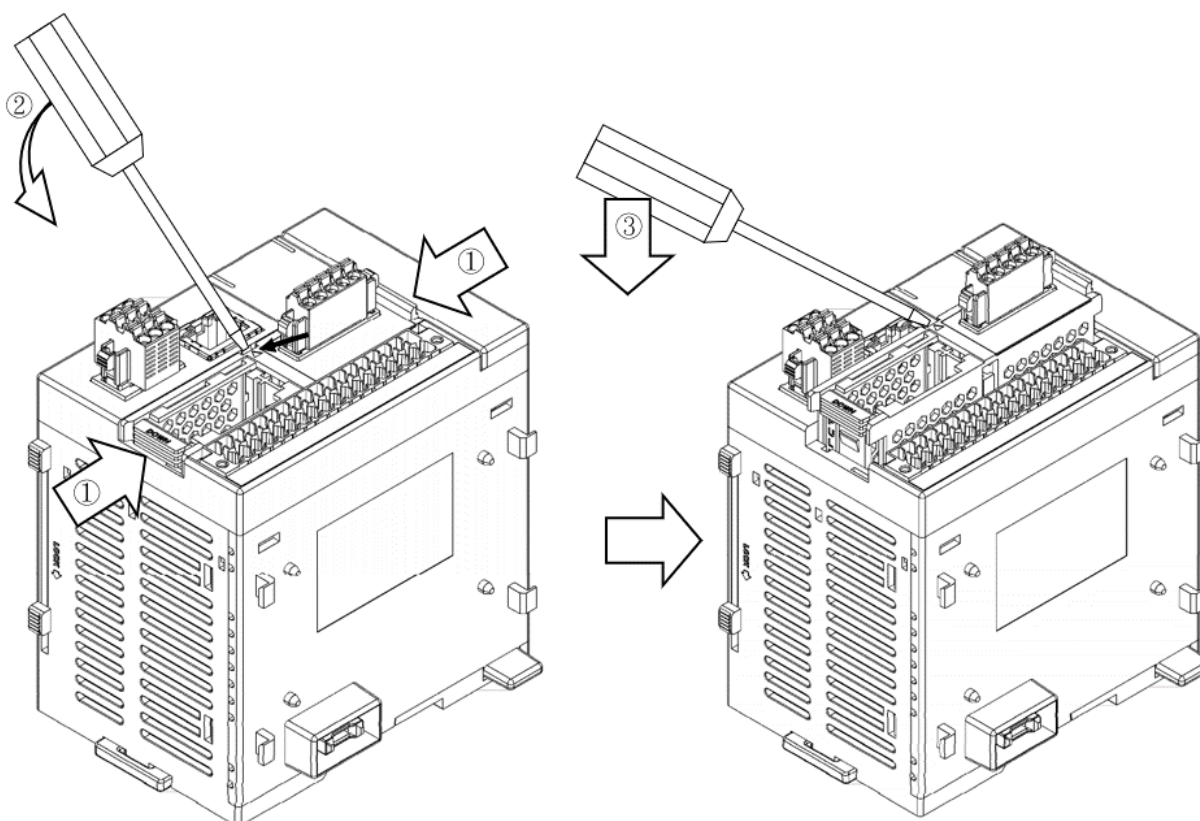
Paste the nameplate

5. Install the plug-in expansion board including the expansion bracket(case) to the MQ CPU. °



Install the plug-in Expansion Board to the MQ CPU.

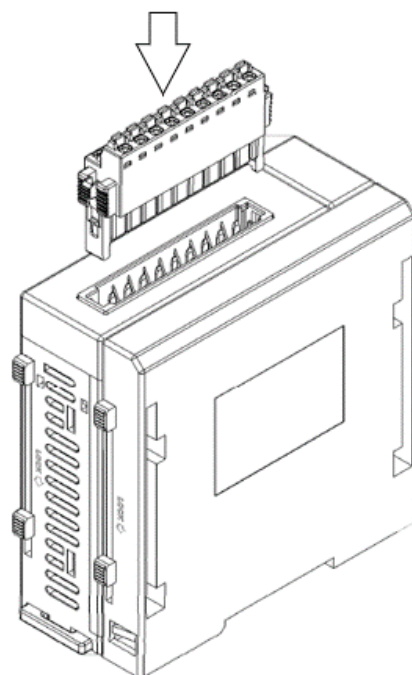
6. Press the clips on the top and bottom of the expansion bracket. and use a flat-blade screwdriver to lift the expansion bracket at the point by the black arrow.



Remove the Plug-in Expansion Board

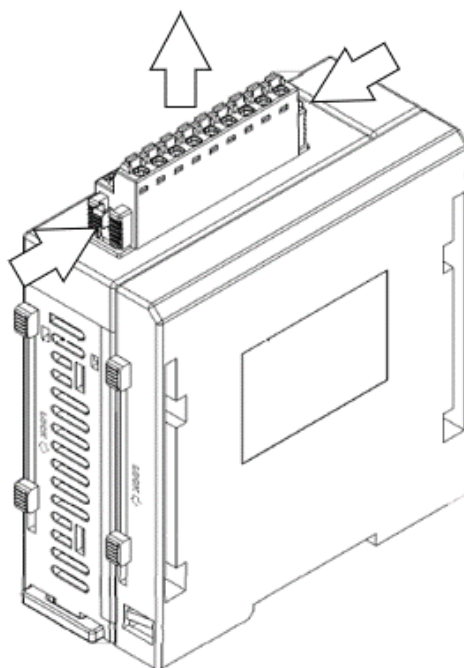
3-2-7 Mount European Terminal Block

- EU-standard terminal installation method: align the EU-standard terminal with the slot of the expansion module and then push it straight downward, as indicated in the figure below.



Mount European terminal Block

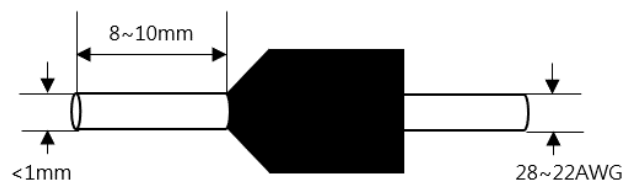
- EU-standard terminal removing method: push the fastener on both ends of the EU-standard terminal downward and then lift both of them upward and you can take out the terminal, as indicated in the figure below.



Dismount European terminal Block

3-2-8 DIO Converter Module and European terminal wiring

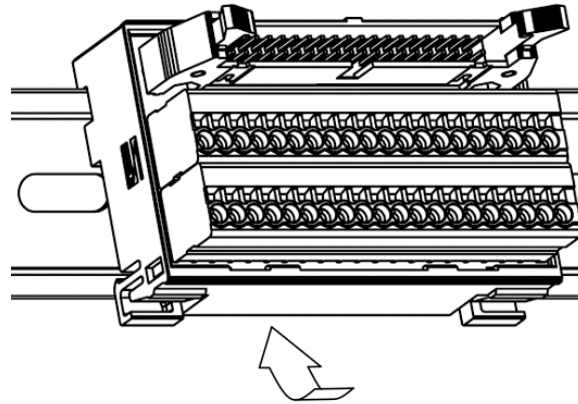
1. During the wiring of M Series PLC, please follow local national standards or regulations for installation.
2. The suitable I/O wiring diameter for M series PLC is AWG28~AWG22 · Please choose the wires with proper wire gauge for I/O wiring according to the current loads.
3. Shorter wires are preferred. It is advised that the length of I/O wiring does not exceed 100m (10m for high-speed input).
4. Input wiring should be separated from output or power wiring (at least 30~50mm apart). In case separation is not possible, adopt vertical crossing, no parallel wiring is allow.
5. The specifications of the crimp sleeve for the DIO Converter Module and the European terminal are as follows:



Crimp Sleeve Specifications

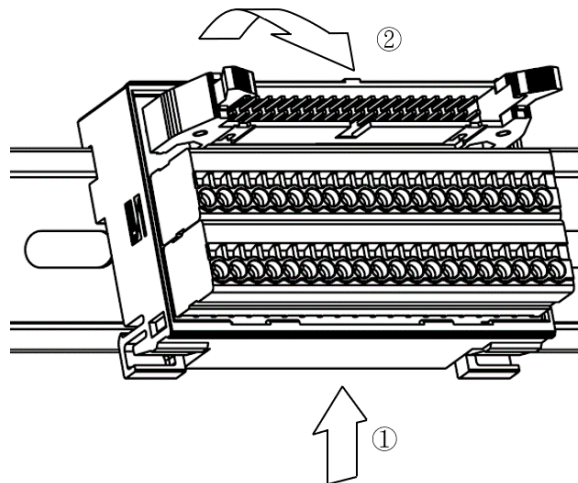
3-2-9 DIO Converter Module Installation

- First fix the upper clip, and then install the DIO Converter module into the DIN RAIL in the direction of the arrow.



Install DIO Converter Module

- Please push up in the direction of the No. 1 arrow first, and then pull out in the direction of the No. 2 arrow to disassemble.



Disassemble DIO Converter Module

4

Power Module Wiring, Power Consumption Calculation, and Power Sequence Requirements

There are two kinds of power for M series PLC power module. The 1st one is CPU dedicated power supply (To CPU & Expansion modules). The 2nd one is external Sensor power supply. The CPU module and the expansion module are also divided in 2 parts of circuits. The 1st one is 24VDC (Internal Circuit), the 2nd one is 24VDC (Output Sensor Circuit). The 24VDC (Internal Circuit) is supplied by the CPU dedicated power supply of the M series PLC power module. The 24VDC (Output Sensor Circuit) can be supplied by an external power supply or by the external Sensor power supply of the M series PLC power module. Neither the CPU module nor the expansion module has internal power supply, and both must consume the power of the power module to supply power.

⚠ Caution

In industrial environments, main power may irregularly experience a surge current or high voltage pulse caused by the start or shut down of high power equipment. Users are advised to take necessary measures (for example, the use of isolation transformer or other MOV suppression devices) for the protection of PLC and its peripherals.

4-1 Specifications and Wiring of Power Module

Power Module Specification Table

Specification \ Model		MPA024-24	MPA048-24	MRPWE-AC
input	Input Voltage	100~240VAC	100~240VAC	100~240VAC
	Input Frequency	50/60Hz	50/60Hz	50/60Hz
	Max. Input Current	1A max.	1A max.	1A max.
	Inrush Current (Cold Start)	22A/115Vac (44A/230Vac)	22A/115Vac (44A/230Vac)	22A/115Vac (44A/230Vac)
	Withstand voltage	3,000 VAC (Primary-secondary), 1,500 VAC (Primary-PE), 500 VAC (Secondary-PE)	3,000 VAC (Primary-secondary), 1,500 VAC (Primary-PE), 500 VAC (Secondary-PE)	3,000 VAC (Primary-secondary), 1,500 VAC (Primary-PE), 500 VAC (Secondary-PE)
	Insulation resistance	>100MΩ/500VDC	>100MΩ/500VDC	>100MΩ/500VDC
	Fuse Spec.	2A	2A	2A
	Hold-up time	>15ms/ 115VAC · >60ms/ 220VAC	>15ms/ 115VAC · >60ms/ 220VAC	>15ms/ 115VAC · >60ms/ 220VAC
	Isolation Type	Transformer/ Photocoupler Isolation · 1500VAC/1 minute	Transformer/ Photocoupler Isolation · 1500VAC/1 minute	Transformer/ Photocoupler Isolation · 1500VAC/1 minute
	Operation indication	LED (green)	LED (green)	LED (green)
output	Rated output power	24W (Shared CPU dedicated power supply and external Sensor power supply)	48W (Shared CPU dedicated power supply and external Sensor power supply)	48W (Shared CPU dedicated power supply and external Sensor power supply)
	Rated output current	1A (Shared CPU dedicated power supply and external	2A (Shared CPU dedicated power supply and external	2A (Shared CPU dedicated power supply and external

Chapter 4 Power Module Wiring, Power Consumption Calculation, and Power Sequence Requirements

		Sensor power supply)	Sensor power supply)	Sensor power supply)
	Output voltage range	24VDC±1%	24VDC±1%	24VDC±1%
	Conversion efficiency	86%/110VAC · 87%/220VAC	86%/110VAC · 87%/220VAC	86%/110VAC · 87%/220VAC
Protection	Overvoltage protection	Latching overvoltage protection, re-power on to recover 34V~36V	Latching overvoltage protection, re-power on to recover 34V~36V	Latching overvoltage protection, re-power on to recover 34V~36V
	Overcurrent protection	Method: Foldback overload protection, automatically recover when overload is removed 101%~133% rated output power	Method: Foldback overload protection, automatically recover when overload is removed 101%~133% rated output power	Method: Foldback overload protection, automatically recover when overload is removed 101%~133% rated output power
Environmental Specifications	Operating Ambient Temperature	0°C~55°C	0°C~55°C	0°C~55°C
	Relative Humidity	20 ~ 90% (non-condensing)	20 ~ 90% (non-condensing)	20 ~ 90% (non-condensing)
	Storage Temperature	-25 ~ +70°C	-25 ~ +70°C	-25 ~ +70°C
Certifications		CE	CE	CE
External dimensions		90mmX33.7mmX90mm	90mmX33.7mmX90mm	90mmX46.2mmX90mm

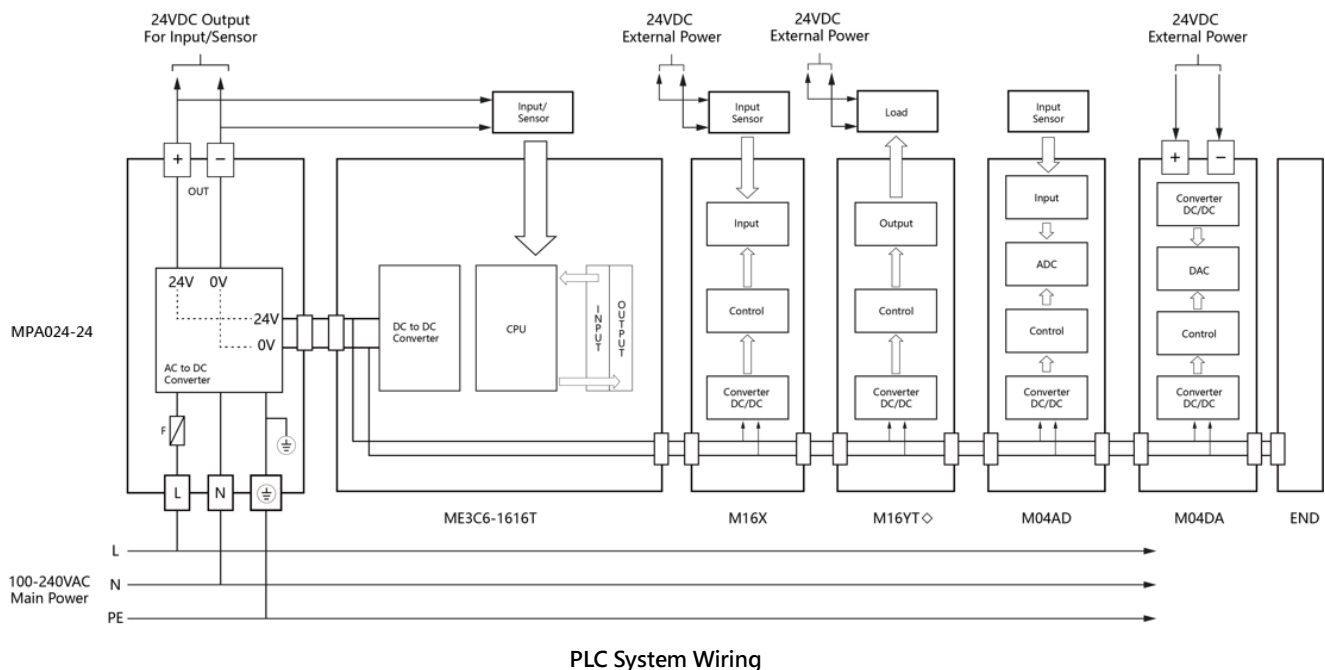
⚠ Caution

The wiring diagram of power module is shown below. Also be cautious about the following:

1. Please follow the wiring schemes regulated by local national standards to use single-pole switch (break hot wire “L”), or double-pole switch (break both “L” and “N”), to turn on or off the AC input power.
2. In wiring, live wire “L” must be connected to the L terminal on unit, while the Neutral wire “N” connected to the N terminal. Please use wires with diameters $1\text{mm}^2 \sim 2\text{mm}^2$.
3. All  terminals on CPU module or Power module have to be connected to the PE (Protective Earth) terminal of main power system as shown in the figure below, with wire diameters larger than 2mm^2 .

⚠ Warning

24VDC Output power for Sensor circuit cannot be connected in parallel with other powers, in which the conflict between two sets of power will decrease their lifetime or cause immediate damage. This will induce unexpected malfunction of PLC and cause serious or even deadly damage to people or equipment.



4-2 Maximum Current Consumption of Expansion Module

The CPU module and expansion modules themselves have no power supply and must be supplied by the M series PLC power module. The following table shows the maximum current consumption of each expansion module.

⚠ Warning				
Any output of M series PLC power module, the total amount of current cannot exceed the value listed in the below table. Any violation will cause a voltage drop by overloading the power supply, or intermittent powered with the supply in protection mode, either of which will result in unexpected action of PLC and cause harm to people or damage to equipment.				

Maximum Current Consumption of Expansion Module Table

Model/ Current Consumption			24VDC (Internal Circuit)	24VDC (Output Sensor Circuit)
Advanced and power Expansion Modules	Power Modules	MPA024-24	-	-
		MPA048-24	-	-
Plug-in Expansion Boards	Communication Plug-in Expansion Boards	MB-CB2	Approaches 0 mA	
		MB-CB5	Approaches 0 mA	
	DI Plug-in Expansion Boards	MB-2HSC	Approaches 0 mA	
	DO Plug-in Expansion Boards	MB-2PSO◇	Approaches 0 mA	
	RTC Plug-in Expansion Boards	MB-RTC	Approaches 0 mA	
High Speed Expansion Modules	High Speed Communication Modules	MHCM22	40mA	
		MHCM55	40mA	
		MHCM25	40mA	
Local I/O Expansion	DI Modules	M16X	70mA	7.5mA/ Point
	DO Modules	M16YT	150mA	Max.0.5A/ Point
		M16YJ	163mA	Max.0.5A/ Point

Chapter 4 Power Module Wiring, Power Consumption Calculation, and Power Sequence Requirements

		M16YR	90mA	Max.2A/ Point
	DIO Combo Modules	M1616XYT	202mA	X :7.5mA Y:0.5A/ Point
		M1616XYJ	202mA	X :7.5mA Y:0.5A/Point
	AI Modules	M04AD	78.2mA	-
		M04ADR	78.2mA	-
	AO Modules	M04DA	14.2mA	107mA
		M04DAR	14.2mA	107mA
	AIO Combo Modules	M0202AH	22.58mA	39.85mA
	Temperature measurement Modules	M04TC	30.7mA	-
		M04TCR	30.7mA	-
		M04RTD	30mA	
	Temperature Measurement Combo Modules	M0202TH	30mA	-
	Load Cell Modules	M02LC	40.64mA	-
		M02LCR	56.1mA	-
	End module	MRE	-	-
I/O Bus Extension modules	Repeater Modules	MRPWE-AC	-	-
	I/O Bus Extension module(Head)	MRGH	-	-
	I/O Bus Extension module(Tail)	MRGT	-	-
Remote Expansion Modules	Remote I/O Coupler	MC0EN	80mA	-

Maximum Current Consumption of CPU Module Table

Model		Current	24VDC (Internal Circuit)	24VDC (Output Sensor Circuit)
CPU Modules	Compact CPU Modules	MQ2M3-1616T	150mA	DI : 7.5mA/Point DO : Max.0.1A/Point
	Advanced CPU Modules	MA1N1-1616◇	150mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		MA1N2-1616◇	150mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		MA1N3-1616◇	150mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		MA1I4-1616◇	150mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		MA1M3-1616◇	150mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		MA2M3-1616◇	150mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		MA3M3-1616◇	150mA	DI : 7.5mA/Point DO : Max.0.1A/Point
	General Motion Control CPU Module	MS1C1-1616◇	200mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		MS1C2-1616◇	200mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		MS2C3-1616◇	200mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		MS2C4-1616◇	200mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		MS2C5-1616◇	200mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		MS3C6-1616◇	200mA	DI : 7.5mA/Point DO : Max.0.1A/Point
	Advanced Motion Control CPU Module	ME1C1-1616◇	200mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		ME2C3-1616◇	200mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		ME2C4-1616◇	200mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		ME2C5-1616◇	200mA	DI : 7.5mA/Point DO : Max.0.1A/Point
		ME3C6-1616◇	200mA	DI : 7.5mA/Point DO : Max.0.1A/Point

4-3 Calculation Example of Power Capacity

Power module selection is depending on the sum of current consumption of all modules. Therefore, user must know the current consumption of each module. Please refer to the maximum current consumption of expansion module table, which has the maximum current consumption of each expansion module.

User must consider the match between power and expansion modules cannot cause output power of any one group of overload use.

Example 1: The below diagram is a System Modules, try to calculate the power supply used of the system.

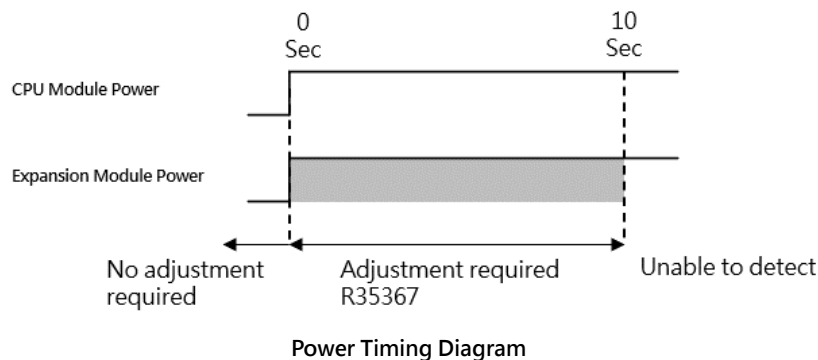
Type	Power Module	CPU Module	Expansion Module	Expansion Module	Expansion Module	Expansion Module	END Module	Extra Capacity
Module Name	MPA024-24	MS2C2-1616	M16X	M16YT	M04AD	M04TC	MRE	
24VDC (Output Circuit)	+1000mA	-200mA	-70mA	-150mA	-78.2mA	-30.7mA	-	231.1mA
24VDC (Input Circuit)		-7.5mA*16 Point	-7.5mA*16 Point	-	-	-	-	

➤ **CPU Module - 24VDC (output Circuit) - 24VDC (input Circuit)**

$$\text{【1000mA】} - \text{【200mA+70mA+150mA+78.2mA+30.7mA】} - \text{【(7.5mA*16)+(7.5mA*16)】} = 231.1\text{mA}$$

4-4 Requirement of Power Sequence in CPU Module & Expansion Module

When the power is on, the M Series PLC first detects the type and number of expansion module attached to it and then gets the actual I/O configuration. Therefore, while the CPU module performs detection, the power in expansion module should be already turned ON and stable, otherwise, the detected I/O configuration will be incorrect. Namely, the power of expansion module should be ON simultaneously or even earlier. There will be no time sequence error when CPU module/expansion module are connected to one power. If the expansion module and CPU module powered by different powers (or the same power but different switches), or external power supply is used for expansion modules, time sequence of both powers should be considered. To solve the problem of the expansion module power does not get ready before CPU module power does, M Series PLC provides a special R35367 register which can delay the detection time of I/O configuration. The time base of R35367 is 0.01sec with a default value of 0, which can be set from 0~1000 (0~10sec), as shown in the figure below. If the expansion module power cannot be stable within 1sec after CPU module power is ON, the R35367 time needs to be set longer to delay the detection by CPU. It cannot exceed 10sec, however, otherwise the configuration of expansion interface cannot be detected.



5

Digital Input Circuit

M Series PLC provides the single end 24VDC inputs which use the common terminal to save terminals. The response speeds of single-end common input circuits are available in high, medium-low. The single-end input circuit can be set to SINK or SOURCE type by varying the wiring of the common terminal S/S inside PLC and external common wire of input circuits.

5-1 Digital Input Circuit Specifications

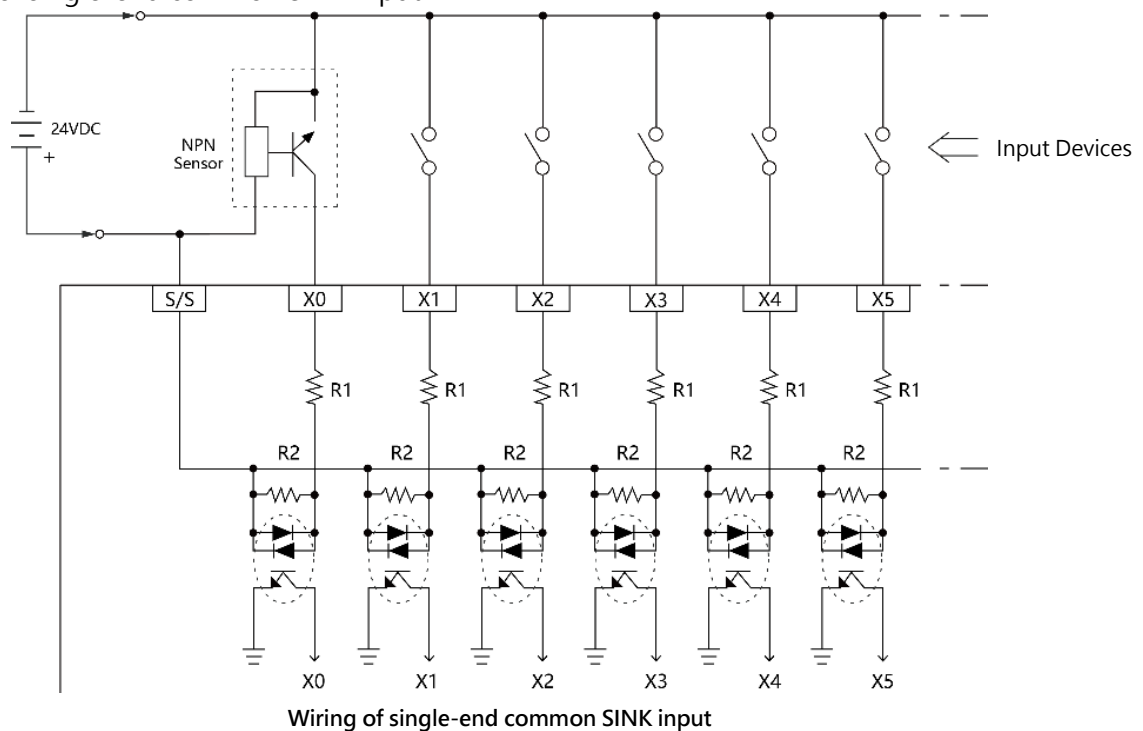
Digital Input Circuit Specifications

Item		24VDC Single-end input		Note
		High Speed (HSC)	Medium-Low Speed	
Specifications				
Maximum input frequency		200KHz	1kHz	
Input Signal Voltage		24VDC $\pm$ 10%		
Input Current Threshold	ON Current	> 8mA	> 4mA	
	OFF Current	< 2mA	< 1.5mA	
Maximum Input Current		7.6mA	10.5mA	
Input Resistance		3.3k Ω	5.6k Ω	
Input Status Indication		Displayed by LED: Lit when "ON" , dark when "OFF"		
Isolation Type		Transformer/ Photo-coupler Isolation · 1500VAC/1 minute		
SINK /SOURCE Wiring		Via variation of internal common terminal S/S and external common wiring		
CPU Modules	MQ2M3-1616T◇	X0~X7	X8~X15	
	MA1N1-1616◇	X0~X15	-	
	MA1N2-1616◇	X0~X15	-	
	MA1N3-1616◇	X0~X15	-	
	MA1I4-1616◇	X0~X15	-	
	MA1M3-1616◇	X0~X15	-	
	MA2M3-1616◇	X0~X15	-	
	MA3M3-1616◇	X0~X15	-	
	MS1C1-1616◇	X0~X15	-	
	MS1C2-1616◇	X0~X15	-	
	MS2C3-1616◇	X0~X15	-	
	MS2C4-1616◇	X0~X15	-	
	MS2C5-1616◇	X0~X15	-	
	MS3C6-1616◇	X0~X15	-	
	ME1C1-1616◇	X0~X15	-	
	ME2C3-1616◇	X0~X15	-	
	ME2C4-1616◇	X0~X15	-	
	ME2C5-1616◇	X0~X15	-	
	ME3C6-1616◇	X0~X15	-	
Expansion Modules	M16X	-	X1~X16	
	M1616XY	-	X1~X16	
Noise Filtering Time Constant		DHF(0 ~ 15ms) + AHF(0.47 μ s)	DHF(0 ~ 70ms) + AHF(0.47ms)	DHF : Digital Hardware Filter AHF : Analog Hardware Filter

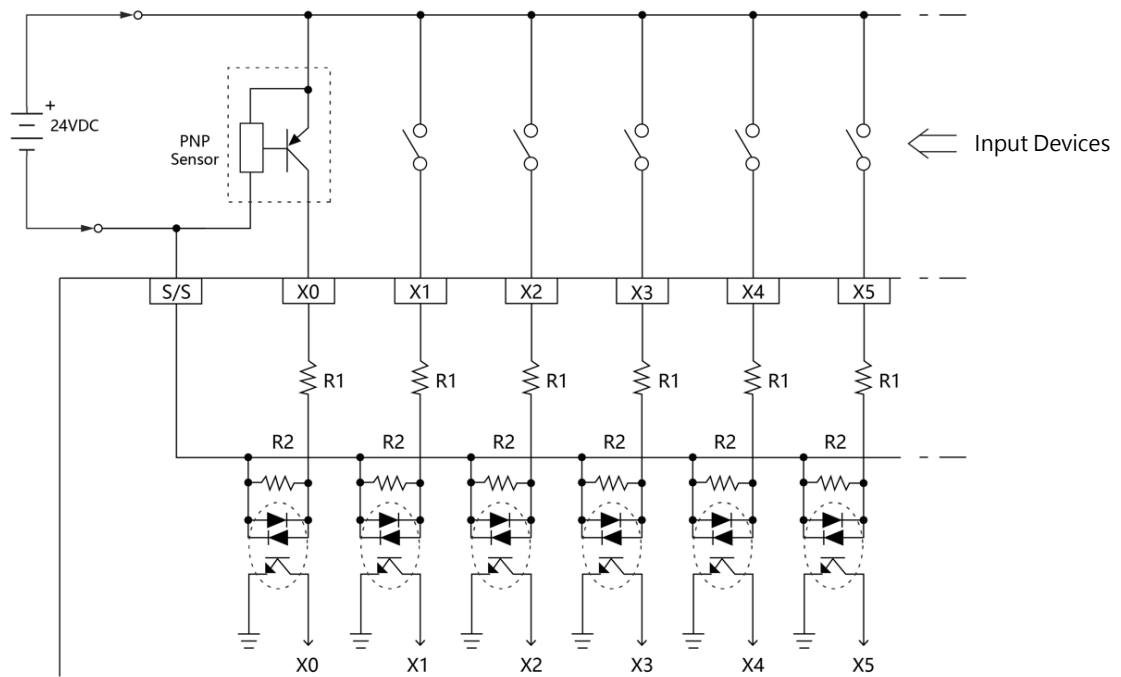
5-2 24VDC Single-End Input Circuit and Wiring for SINK/SOURCE Input

The 24VDC single-end digital input circuits of M Series PLC are available for high and medium-low speed. They all have similar circuit structures but with different response speeds. To save input terminals, the circuit of single-end input is implemented by connecting one end of all input points (photo coupler) inside the PLC to the same internal common point labeled as S/S. The other end of each input circuit is connected to corresponding terminals such as X0, X1, X2, etc. The S/S common terminal and N single-end inputs comprise of N digital inputs (i.e., only N+1 terminals are used for N terminals). Therefore, we call this type of input structure the single-end input. The user also needs to do the same thing when making the connection of external digital input devices. Namely, one end of all input devices (e.g., buttons, switches) are connected together and called the external common wire, while the other ends of input circuits are connected to the input terminals X0, X1, X2, etc., of PLC. Then finish it by connecting the external common wiring and internal common terminal S/S to the positive/negative terminals of the 24VDC power. When connect the internal common terminal S/S to 24V+(positive) and the external common wire to 24V - (negative), then the circuit serve as SINK input. On the contrary, while exchange the wiring of the above internal and external common will serve as a SOURCE input. The above wiring schemes can illustrate below

➤ Wiring of single-end common SINK input



➤ Wiring of single-end common SOURCE input



Wiring of single-end common SOURCE input

6

Digital Output Circuit

6-1 Digital Output Circuit Specifications

Digital Output Circuit Specifications

Specification \ Item		Single-End Transistor Output		Single-End Relay Output
		High Speed	Medium Speed	
Maximum output frequency		200KHz	1kHz	For ON/OFF use, not for frequently switching
Working Voltage		5~30VDC		<250VAC,30VDC
Maximum Load Current	Resistive	0.1A/single · 0.4A/common	0.5A/single · 4A/common	2A/single · 8A/common
	Inductive			80VA(AC)/24VA(DC)
Maximum Voltage Drop/conducting resistance		0.6V	2.2V	0.06V(initial)
Minimum Load		-	-	2mA/DC power
Leakage Current		< 0.1mA/30VDC		-
Maximum Output Delay Time	ON > OFF	< 2μS	< 10μS	10ms
	OFF > ON		< 40μS	
Output Status Indication		Displayed by LED: Lit when “ON” , dark when “OFF”		
Over Current Protection		N/A		
Isolation Type		Photocoupler Isolation, 500VAC, 1 minute		Electromagnetic Isolation, 1500VAC, 1 minute
SINK /SOURCE Type		Choose SINK/SOURCE by models and non-exchangeable		Bilateral device, can be arbitrarily set to SINK/SOURCE output
CPU Modules	MQ2M3-1616◇	Y0~Y7	Y8~Y15	-
	MA1N1-1616◇	Y0~Y15	-	
	MA1N2-1616◇	Y0~Y15	-	-
	MA1N3-1616◇	Y0~Y15	-	-
	MA1I4-1616◇	Y0~Y15*	-	-
	MA1M3-1616◇	Y0~Y15	-	-
	MA2M3-1616◇	Y0~Y15	-	-
	MA3M3-1616◇	Y0~Y15	-	-
	MS1C1-1616◇	Y0~Y15	-	-
	MS1C2-1616◇	Y0~Y15	-	-
	MS2C3-1616◇	Y0~Y15		
	MS2C4-1616◇	Y0~Y15	-	-
	MS2C5-1616◇	Y0~Y15	-	-
	MS3C6-1616◇	Y0~Y15	-	-
	ME1C1-1616◇	Y0~Y15	-	-
	ME2C3-1616◇	Y0~Y15	-	-
	ME2C4-1616◇	Y0~Y15	-	-
	ME2C5-1616◇	Y0~Y15	-	-
	ME3C6-1616◇	Y0~Y15	-	-
	Expansion Modules	M16YT	-	Y1~Y16
M16YJ		-	Y1~Y16	-
M16YR		-	-	Y1~Y16
M1616XYT		-	Y1~Y16	-
M1616XYJ		-	Y1~Y16	

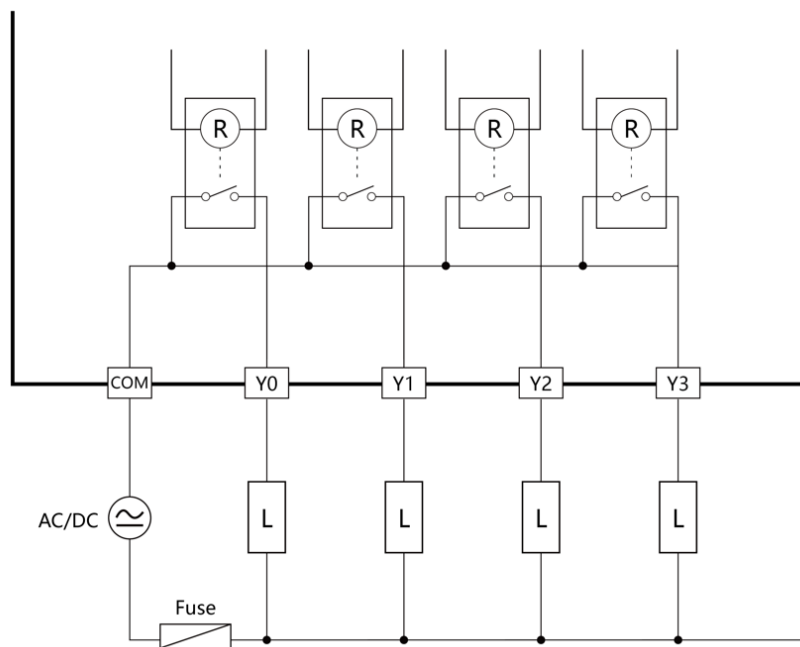
6-2 Single-End Output Circuit

M Series PLC output circuits such as relays, transistors or TRIAC are single-end output structure. A single-end output in each digital output (DO) takes up only one terminal. But since any output device has two ends, the one end of several output devices has to be connected together to one common point (called output common) for single-end output. Then each output point can output via this common point. The more output devices share the same common point, the more terminals are saved, while relatively increasing the current running through the common point. Common point is shown as COM. The various single-end common output circuits are described below :

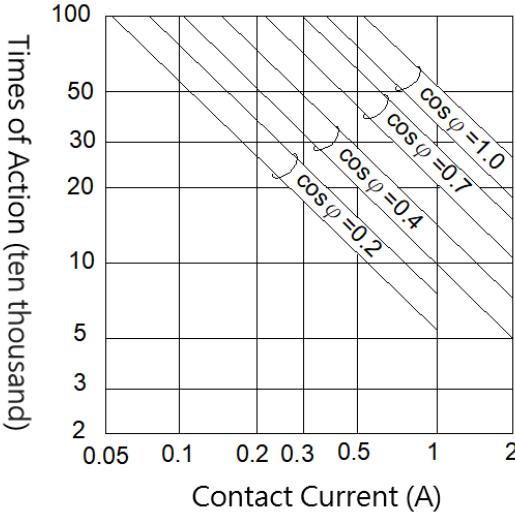
6-2-1 Structure and Wiring of Single-End Relay Output Circuit

Because relay contacts have no polarity, it can be applied for AC or DC load power. Each relay can provide current up to 2A. The maximum rated current in all output commons of M Series PLC is 8A. Its mechanical lifetime can reach up to 2 million times, while the contacts have a shorter lifetime. The lifetime also varies depending on working voltage, load type (power factor $\cos \phi$) and contact current. The relation between them is plotted in the figure below. In the case of pure resistive load ($\cos \phi = 1.0$) at 120VAC and 2A, the lifetime of contacts is about 250 thousand times. While for high inductive or capacitive load with $\cos \phi$ up to 0.2 and current within 1A, the lifetime decreases rapidly to about 50 thousand times (AC200V) or 80 thousand times (AC120V).

➤ Single-End Relay Output Circuit



Single-End Relay Output Circuit

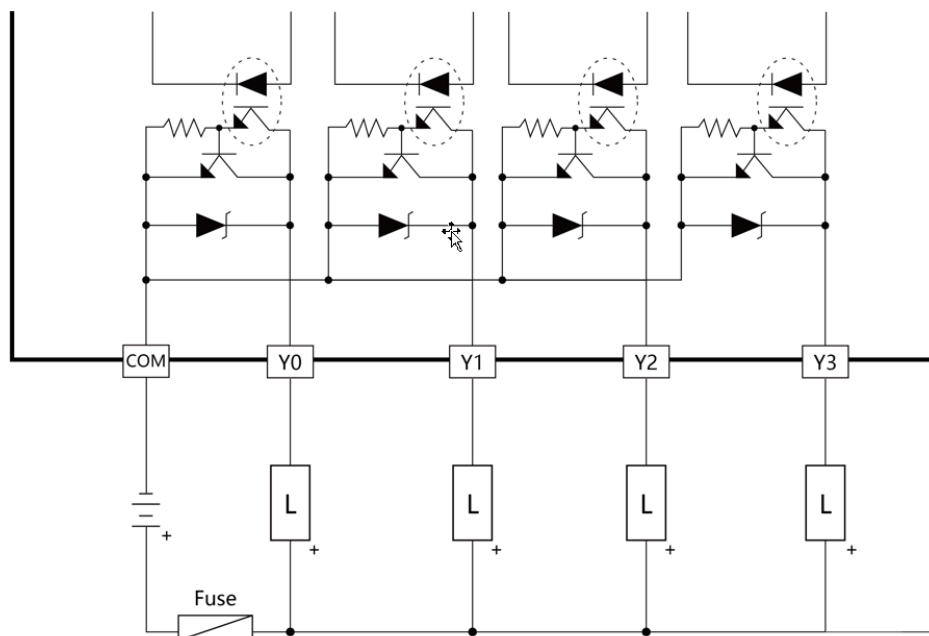


Relay life at different currents and phases

6-2-2 Structure and Wiring of Single-End Transistor SINK/SOURCE Output Circuit

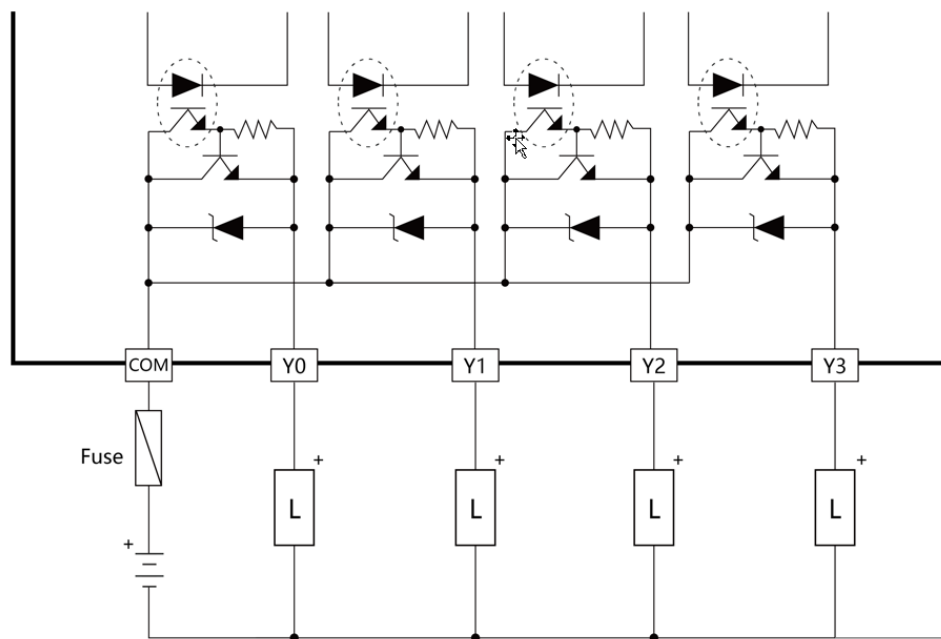
The transistor contacts are divided into SINK and SOURCE output circuit. Each transistor contact can provide a max current of 0.5A. The max current limit of the output common point of the transistor can be divided into 2A current or 4A current according to different models.

➤ Transistor Single-End SINK Output



Transistor Single-End SINK Output

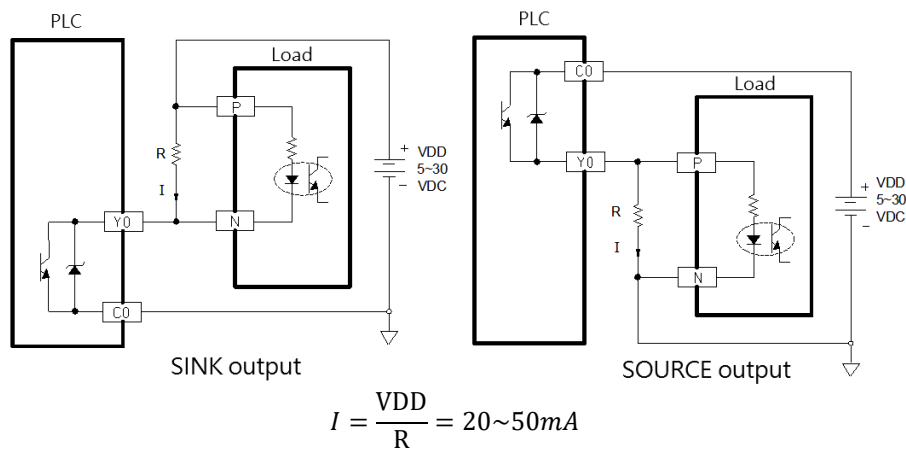
➤ Transistor Single-End SOURCE Output



Transistor Single-End SOURCE Output

6-3 Speed up the Single-End Transistor Output Circuit

Either with the SINK or SOURCE structure in single-end output transistor circuit, when the transistor switches from ON to OFF, the junction capacitor between transistor CE electrodes should be charged to near the load voltage VDD before it can stop the current running through the photocoupler inside the load, which increase the OFF time and decrease the response speed. This problem can be solved by adding a Dummy load to accelerate charging rate and speed up the working frequency of transistor output. For the transistor output in M-PLC, Dummy load that are added to the high- and medium-speed transistor output and generate a load current of 20~50mA is adequate. For low-speed transistor where its driving capability (0.5A) but speed is concerned, adding a Dummy load only decreases its driving capability without any significant improvement and hence is not recommended. The following diagram shows how to add a Dummy load to SINK and SOURCE transistor output. (only applicable to high and medium-speed)



Speed up the Single-End Transistor Output Circuit

6-4 Output Device Protection and Noise Suppression in DO Circuit

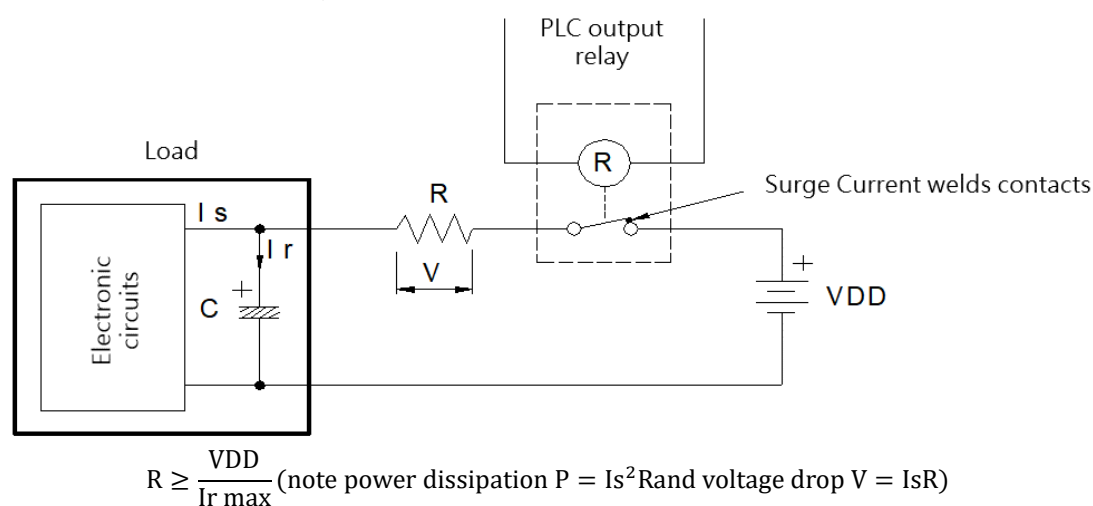
Since the digital output circuits are mainly used for the ON/OFF switching operation, the output components such as relays, transistors and TRIAC can be deemed as kinds of switch components. Normally, surge currents or counter-electromotive force voltages are generated during the ON/OFF operation of these switch components. The effect of surge currents or counter-electromotive force voltages is particularly serious when heavy capacitive or inductive loads are incorporated, which may cause damage to the output components or generate noises in other electronic circuits and equipment. Among those three M-PLC output components, where TRIAC require no special treatment because of their features of smaller rated current, zero cross in ON/OFF, and built-in protection circuits, special consideration should be given to relays and transistors when they are used in high power applications or connected with capacitive or inductive loads and are described in the following:

6-4-1 Protection of Relay Contacts and Noise Suppression

Because the relay contacts are used to contact switch components having extremely low resistance, the surge current I_r generated instantly upon turning on the relay is normally pretty strong (even if the steady load current is very small). Under such strong surge, the contact tends to melt and stick due to extreme temperature in such a way that the relay cannot trip when it is disconnected. In addition, when the relay connections are OFF, large di/dt is generated because of the instantaneous change from low resistance to open circuit (∞) soon after following the tripping of contact. As a result, an extremely strong counter-electromotive force voltage is induced, which creates sparks between the electrodes of two relay contacts and results in poor contact due to carbon deposits. Among those three output components, either in ON or OFF state, very serious interference can be caused by the surge current or the counter-electromotive of the relay. The solutions to this problem are listed as follows:

Suppression of Surge Current

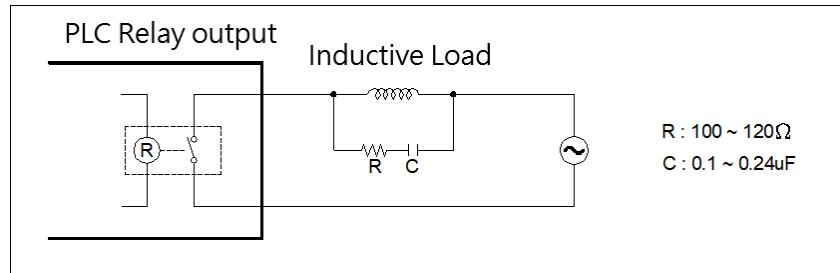
Connect a small resistor R in series to lower the surge current, but note that too large R will affect the driving capability or cause too much voltage drop.



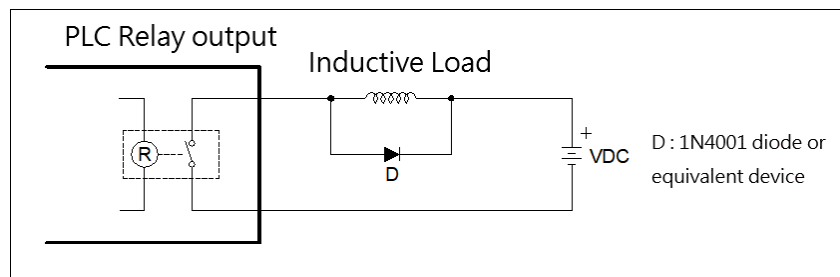
I_r max of relay in M Series PLC = 2A

Suppression of Counter-Electromotive Force

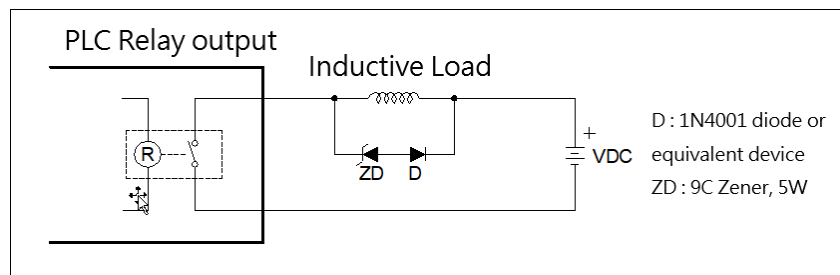
For the inductive load, whether in AC or DC power, suppression devices must be connected in parallel to both its ends to protect the relay contacts and lower noise interference. The schematic diagrams for AC and DC powers are shown below, respectively:



Scheme of AC power load



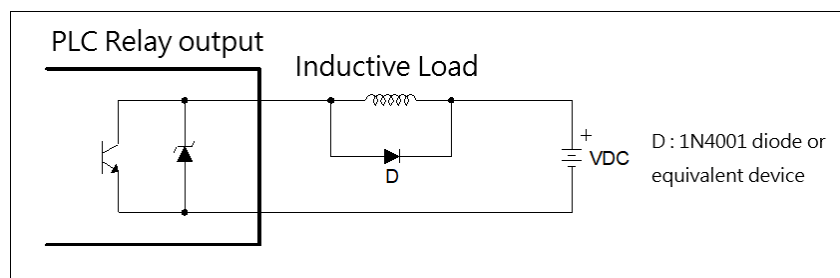
Suppress by a diode in DC power load (for low power)



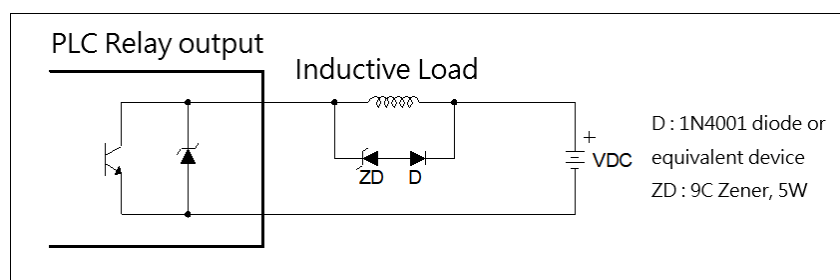
Suppress by a diode + Zener in DC power load (for high power and frequent ON/OFF)

6-4-2 Protection of Transistor Output and Noise Suppression

The transistor output in M Series PLC already includes Zener diode for counter-electromotive force, which is sufficient for low power inductive load and medium frequency of ON/OFF application. In conditions of high power or frequent ON/OFF, please construct another suppression circuit to lower noise interference and prevent voltage from exceeding the limit or overheating that may damage the transistor output circuit.



Suppress by a diode (for low power)



Suppress by a diode + Zener (high power and frequent ON/OFF)

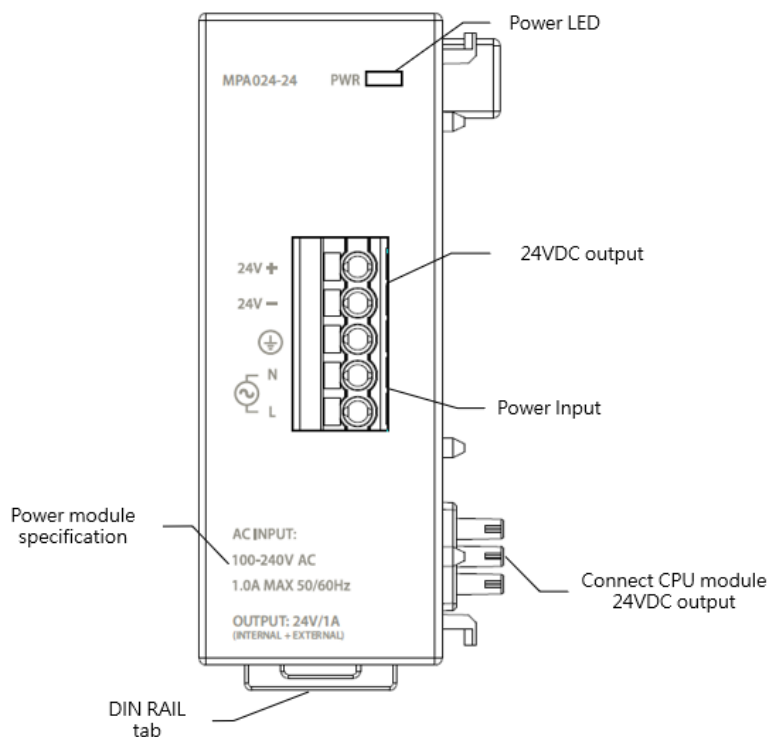


Advanced Expansion & Power Modules Specifications

7-1 Power Module Specifications

7-1-1 MPA024-24 Specification

Appearance and Function



MPA024-24 部位名稱

Technical Specifications

MPA024-24 Technical Specifications Table

Item		Technical Specifications
Model		MPA024-24
Input	Input voltage	100~240VAC
	Input frequency	50/60Hz
	Maximum input current	1A max.
	Inrush current (cold start)	22A/115Vac (44A/230Vac)
	Withstand voltage	3,000 VAC (Primary-secondary), 1,500 VAC (Primary-PE), 500 VAC (Secondary-PE)
	Insulation resistance	>100MΩ/500VDC
	Fuse	2A
	Hold-up time	>15ms/ 115VAC · >60ms/ 220VAC
	Isolation Type	Transformer/ Photocoupler Isolation · 1500VAC/1 minute
	Power indication	LED (green)
output	Rated output power	24W (Shared CPU dedicated power supply and external Sensor power supply)
	Rated output current	1A (Shared CPU dedicated power supply and external Sensor power supply)
	Output voltage range	24VDC±1%
	Conversion efficiency	86%/110VAC · 87%/220VAC
Protection	Overvoltage protection	Latching overvoltage protection, re-power on to recover 34V~36V

Chapter 7 Advanced Expansion & Power Modules Module Specifications

	Overcurrent protection	Method: Foldback overload protection, automatically recover when overload is removed 101%~133% rated output power
Operating Ambient Temperature		0~55°C
Relative Humidity		20 ~ 90% (non-condensing)
Altitude		≤2000m
Vibration (Fixed by DIN RAIL)		5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock		10G, 3 times each along the 3 axes
Noise Suppression		1500Vp-p · Width 1us
Withstand Voltage		1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)
Certification		CE

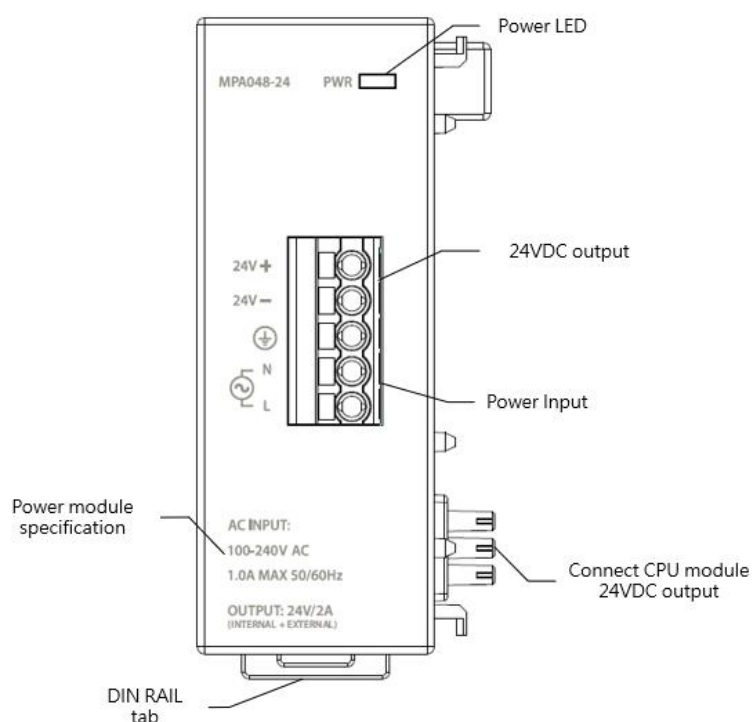
Status Indicator

MPA024-24 Status Indicator Table

Name	instruction
PWR LED	Power ON: green light Power OFF: no light

7-1-2 MPA048-24 Specification

Appearance and Function



MPA048-24 Appearance

Technical Specifications

MPA048-24 Technical Specifications Table

Item		Technical Specifications
Model		MPA048-24
Input	Input voltage	100~240VAC
	Input frequency	50/60Hz
	Maximum input current	1A max.
	Inrush current (cold start)	22A/115Vac (44A/230Vac)
	Withstand voltage	3,000 VAC (Primary-secondary), 1,500 VAC (Primary-PE), 500 VAC (Secondary-PE)
	Insulation resistance	>100MΩ/500VDC
	Fuse	2A
	Hold-up time	>15ms/ 115VAC · >60ms/ 220VAC
	Isolation Type	Transformer/ Photocoupler Isolation · 1500VAC/1 minute
	Power indication	LED (green)
output	Rated output power	48W (Shared CPU dedicated power supply and external Sensor power supply)
	Rated output current	2A (Shared CPU dedicated power supply and external Sensor power supply)
	Output voltage range	24VDC±1%
	Conversion efficiency	86%/110VAC · 87%/220VAC
Protection	Overvoltage protection	Latching overvoltage protection, re-power on to recover 34V~36V
	Overcurrent protection	Method: Foldback overload protection, automatically recover when overload is removed

Chapter 7 Advanced Expansion & Power Modules Module Specifications

		101%~133% rated output power
Operating Ambient Temperature		0~55°C
Relative Humidity		20 ~ 90% (non-condensing)
Altitude		≤2000m
Vibration (Fixed by DIN RAIL)		5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock		10G, 3 times each along the 3 axes
Noise Suppression		1500Vp-p · Width 1us
Withstand Voltage		1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)
Certification		CE

Status Indicator

MPA048-24 Status Indicator Table

Name	instruction
PWR LED	Power ON: green light Power OFF: no light



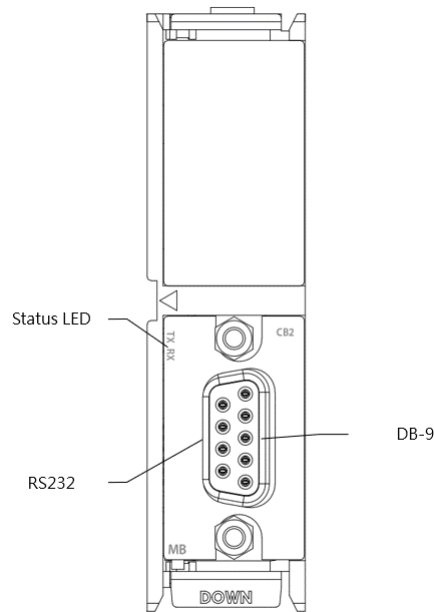
Plug-in Expansion Boards Specifications

8-1 Communication Plug-in Expansion Boards Specifications

If the communication Port of the M Series CPU module is not enough for a specific application, then can expand it with the additional plug-in Expansion Boards.

8-1-1 MB-CB2 Specifications

Appearance and Function



MB-CB2 Appearance

Technical Specifications

MB-CB2 Technical Specifications Table

Item	Technical Specifications
Model	MB-CB2
connection interface	1 Port RS232
Maximum number of connections	1 Slave
Connector type	D-Sub 9-Pins
Transmission rate	Max 115200
Maximum cable length	15M*

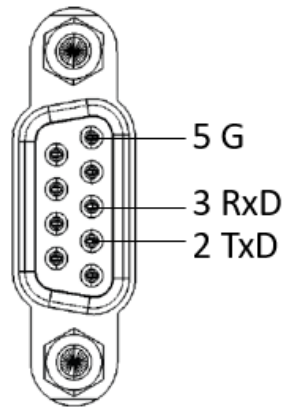
* It varies based on cable material, communication speed and usage environment.

Status Indicator

MB-CB2 Status Indicator Table

Name	instruction
RX Port Indicator	Port is receiving: yellow-green light
TX Port Indicator	Port is transmitting: orange light

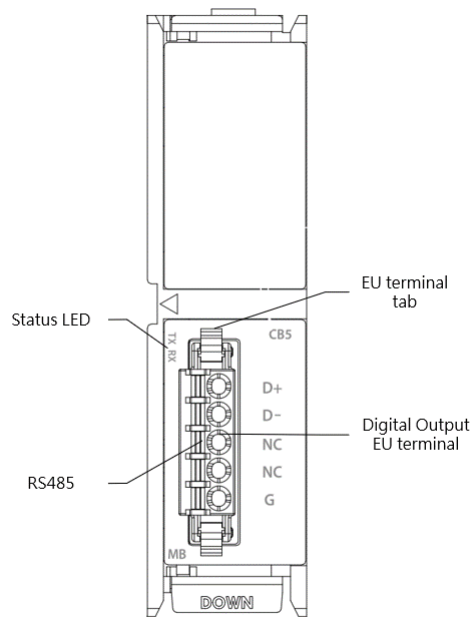
Pin assignment of the connector



MB-CB2 Pins

8-1-2 MB-CB5 Specifications

Appearance and Function



MB-CB5 Appearance

Technical Specifications

MB-CB5 Technical Specifications Table

Item	Technical Specifications
Model	MB-CB5
connection interface	1 Port RS485
Maximum number of connections	32 Slaves
Connector type	5 pins spring terminal
Transmission rate	Max 230400
Maximum cable length	1200M*

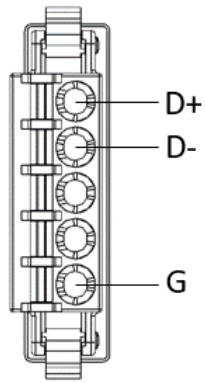
* It varies based on cable material, communication speed and usage environment.

Status Indicator

MB-CB5 Status Indicator Table

Name	instruction
RX Port Indicator	Port is receiving: yellow-green light
TX Port Indicator	Port is transmitting: orange light

Pin assignment of the connector



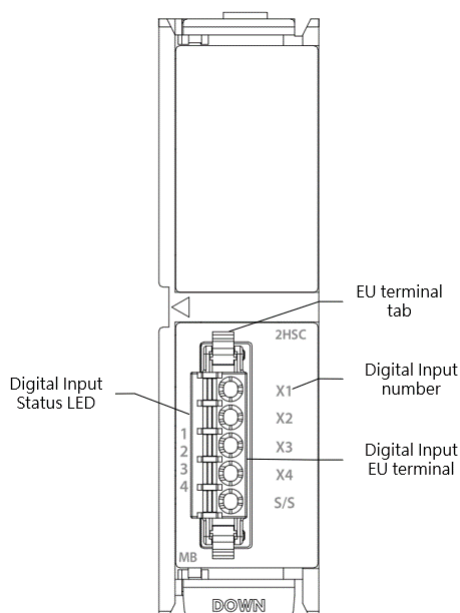
MB-CB5 Pins

8-2 High Speed Digital Input Plug-in Expansion Boards Specifications

If the input point of the M Series CPU module is not enough for a specific application, then can expand it with the additional plug-in expansion boards.

8-2-1 MB-2HSC Specifications

Appearance and Function



MB-2HSC Appearance

Technical Specifications

MB-2HSC Technical Specifications Table

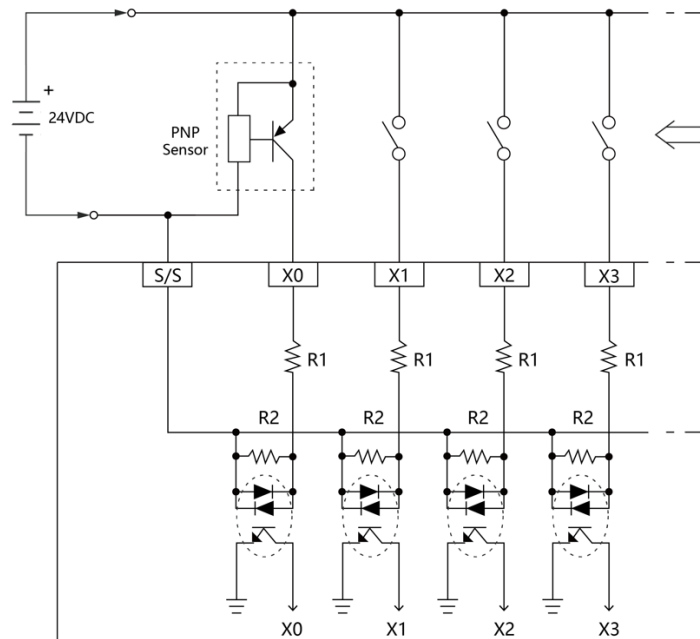
Item		Technical Specifications
Model		MB-2HSC
Input Points		4
Input Points Type		24VDC Single-end input
Maximum input frequency		High Speed Counter · 200kHz
Input Signal Voltage		24VDC±10%
Input Current Threshold	ON Current	> 4mA
	OFF Current	< 2mA
Maximum Input Current		6mA
Input Resistance		3.3kΩ
Isolation Type		Transformer/ Photocoupler Isolation · 1500VAC/1 minute
SINK /SOURCE Wiring		Via variation of internal common terminal S/S and external common wiring
Noise Filtering Time Constant		DHF(0 ~ 15ms) + AHF(0.47μs)

Status Indicator**MB-2HSC Status Indicator Table**

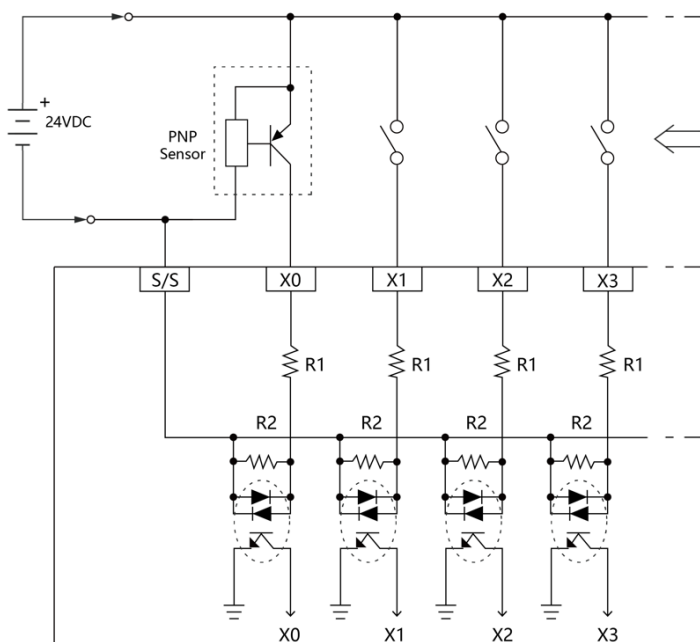
Indicator	instruction
1~4 Input Indicator	ON: green light OFF: no light

Wiring

- Wiring of single-end common SINK input

**Wiring of single-end common SINK input**

- Wiring of single-end common SOURCE input

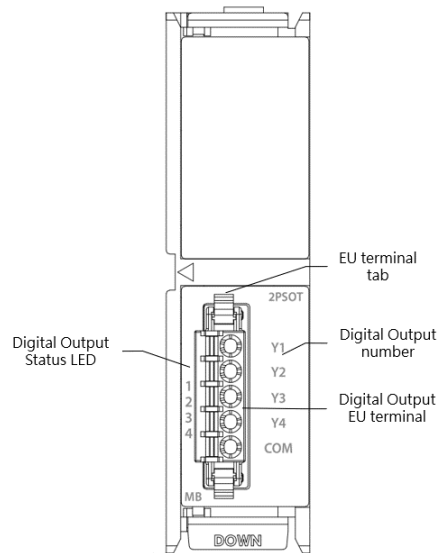
**Wiring of single-end common SOURCE input**

8-3 High Speed Digital output Plug-in Expansion Boards Specifications

If the output point of the M Series CPU module is not enough for a specific application, then can expand it with the additional plug-in Expansion Boards.

8-3-1 MB-2PSOT/MB-2PSOJ Specifications

Appearance and Function



MB-2PSOT Appearance

Technical Specifications

MB-2PSOT/MB-2PSOJ Technical Specifications Table

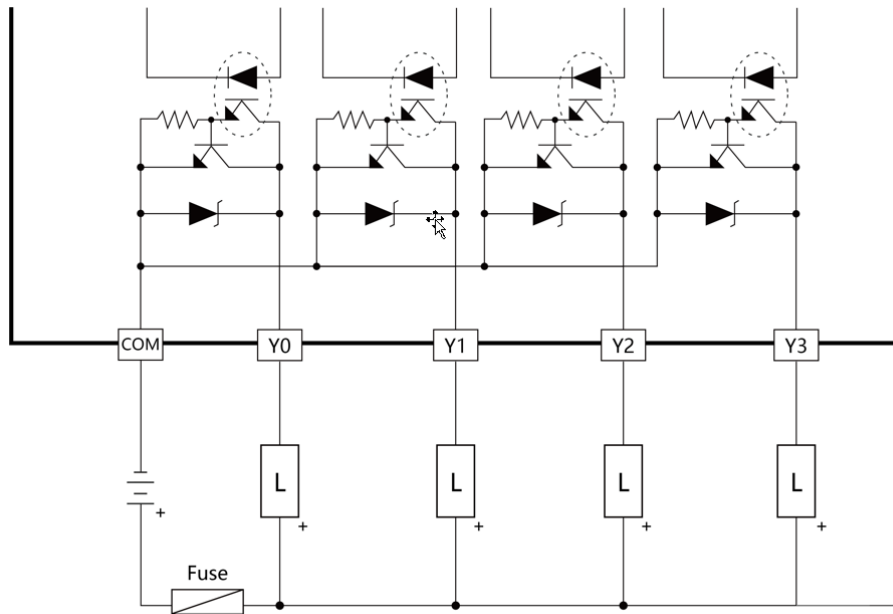
Item		Technical Specifications
model		MB-2PSOT/MB-2PSOJ
Output Points		4
Output Points Type		Single-End Transistor Output; T-Transistor SINK(NPN) output; J-Transistor SOURCE(PNP) output
Maximum output frequency		High Speed Pulses Output · 200kHz
Working Voltage		5~30VDC
Maximum Load Current	Resistive	0.1A/Single
	Inductive	0.4A/COM
Maximum Voltage Drop/conducting resistance		0.6V
Minimum Load		-
Leakage Current		< 0.1mA/30VDC
Maximum Output Delay Time	ON > OFF	< 2μS
	OFF > ON	< 2μS
Over Current Protection		N/A
Isolation Type		Photocoupler Isolation, 500VAC, 1 minute
SINK /SOURCE Type		Choose SINK/SOURCE by models and non-exchangeable

Status Indicator**MB-2PSOT/MB-2PSOJ Status Indicator Table**

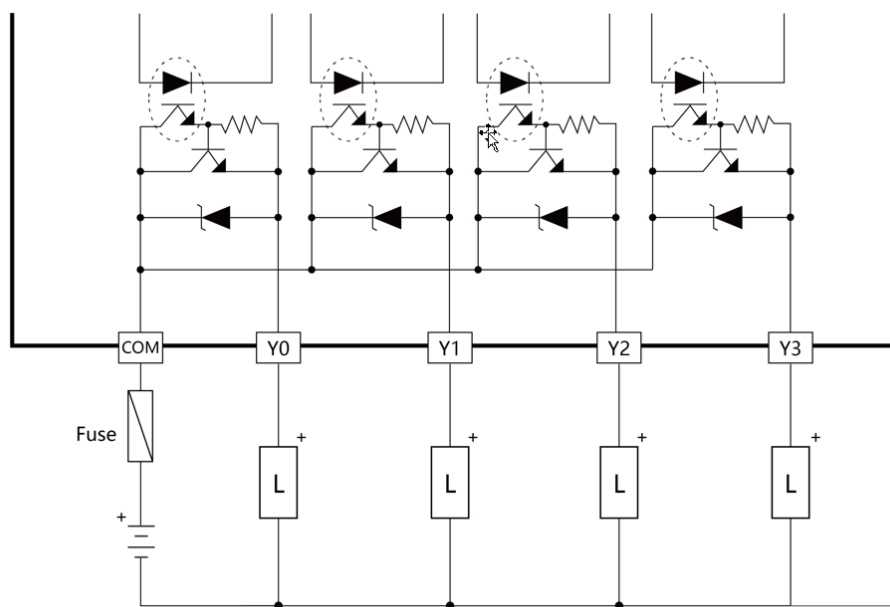
Indicator	instruction
1~4 Output Indicator	ON: green light OFF: no light

Wiring

➤ Transistor Single-End SINK Output

**Transistor Single-End SINK Output**

➤ Transistor Single-End SOURCE Output

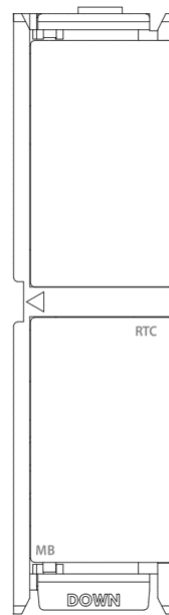
**Transistor Single-End SOURCE Output**

8-4 RTC Plug-in Expansion Boards Specifications

If the MQ series CPU module requires RTC function, then can expand it with the RTC plug-in expansion boards.

8-4-1 MB-RTC Specifications

Appearance and Function



MB-RTC Appearance

Technical Specifications

MB-RTC Technical Specifications Table

Item	Technical Specifications
Model	MB-RTC
Function	Real Time Clock The RTC can keep time correctly regardless of whether the PLC is powered on or off. Provides 7 types of time including week, year, month, day, hour, minute, second...etc.
battery model	CR2450 size non-charge battery
Battery Life	10 years*

* It varies based on usage, environment, temperature or other conditions.

9



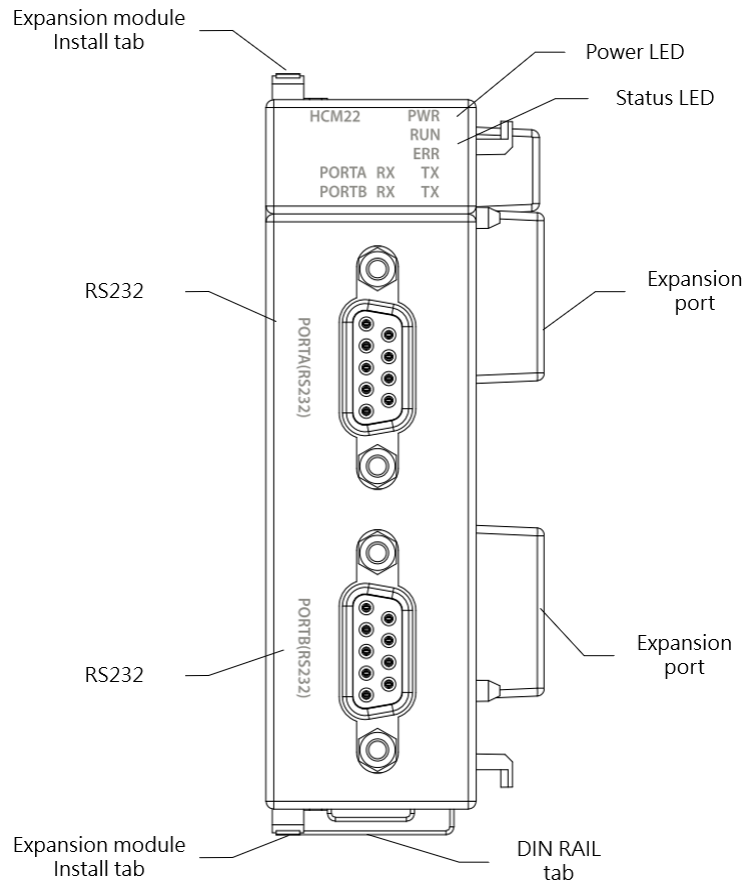
High-Speed Expansion Modules Specifications

9-1 High Speed Communication Expansion Module Specifications

If the communication Port of the M Series CPU module is not enough for a specific application, then can expand it with the additional expansion modules.

9-1-1 MHCM22 Specifications

Appearance and Function



MHCM22 Appearance

Technical Specifications

MHCM22 Technical Specifications Table

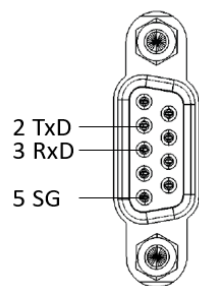
Item	Technical Specifications
Model	MHCM22
connection interface	2 Port RS232
Maximum number of connections	1 Slave/Port
Connector type	D-Sub 9-Pins
Transmission rate	Max 115200
Maximum cable length	15M
isolation method	Internal power isolation

Status Indicator

MHCM22 Status Indicator Table

Name	instruction
PWR Indicator	Power ON: green light Power OFF: no light
RUN Indicator	Running: green light
ERR Indicator	In ERROR: red light
Port A RX Indicator	Port A is receiving: orange light
Port A TX Indicator	Port A is transmitting: orange light
Port B RX Indicator	Port B is receiving: orange light
Port B TX Indicator	Port B is transmitting: orange light

Pin assignment of the connector

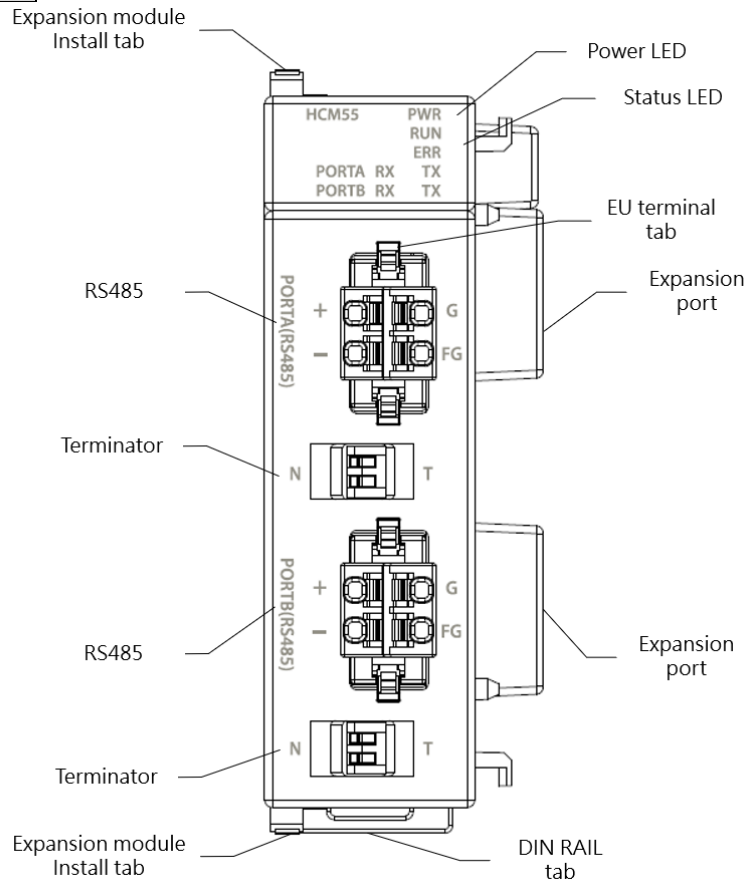


RS232

MHCM22 Pins

9-1-2 MHCM55 Specifications

Appearance and Function



MHCM55 Appearance

Technical Specifications

MHCM55 Technical Specifications Table

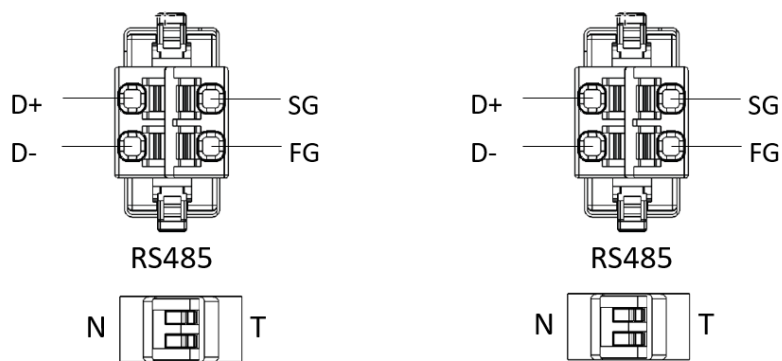
Item	Technical Specifications
Model	MHCM55
connection interface	2 Port RS485
Maximum number of connections	32 Slaves/Port
Connector type	4 pins spring terminal
Transmission rate	Max 230400
Maximum cable length	1200M
isolation method	Internal power isolation

Status Indicator

MHCM55 Status Indicator Table

Name	instruction
PWR Indicator	Power ON: green light Power OFF: no light
RUN Indicator	Running: green light
ERR Indicator	In ERROR: red light
Port A RX Indicator	Port A is receiving: orange light
Port A TX Indicator	Port A is transmitting: orange light
Port B RX Indicator	Port B is receiving: orange light
Port B TX Indicator	Port B is transmitting: orange light

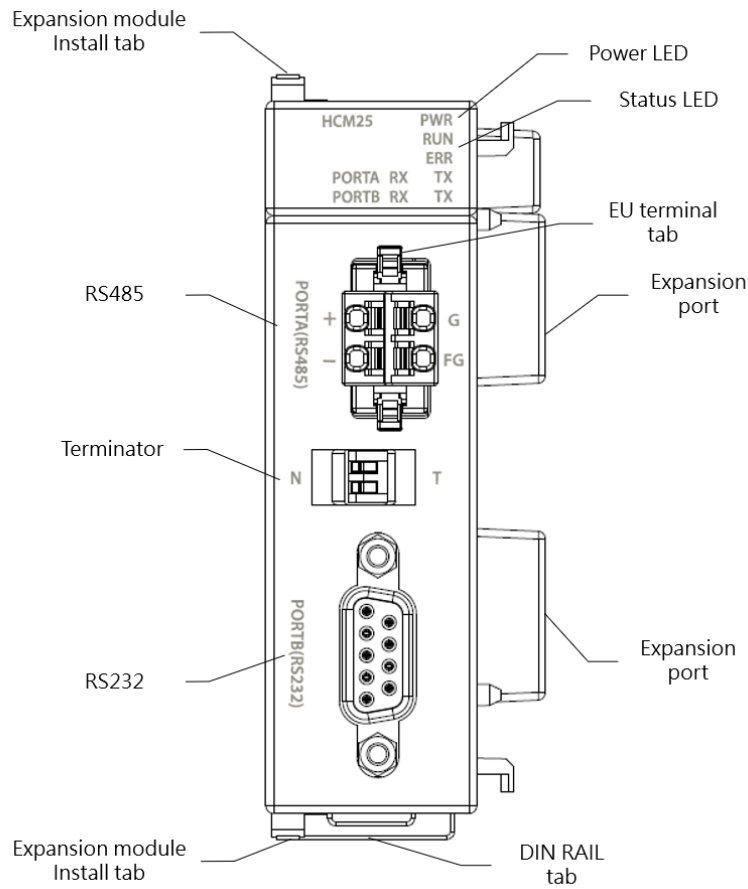
Pin assignment of the connector



MHCM55 Pins

9-1-3 MHCM25 Specifications

Appearance and Function



MHCM25 Appearance

Technical Specifications

MHCM25 Technical Specifications Table

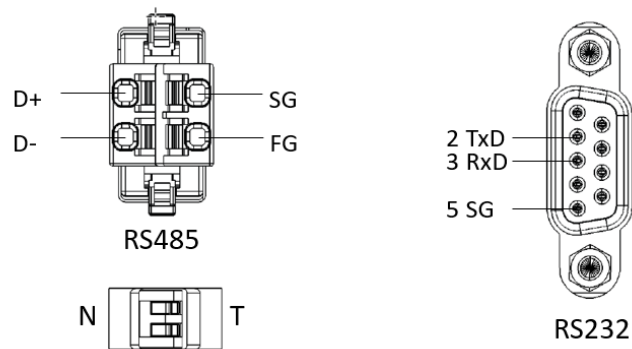
Item	Technical Specifications
Model	MHCM25
connection interface	1 Port RS232 + 1 Port RS485
Maximum number of connections	RS232: 1 Slave RS485: 32 Slaves
Connector type	RS232: D-Sub 9-Pins RS485: 4 pins spring terminal
Transmission rate	RS232: Max 115200 RS485: Max 230400
Maximum cable length	RS232: 15M RS485: 1200M
isolation method	Internal power isolation

Status Indicator

MHCM25 Status Indicator Table

Name	instruction
PWR Indicator	Power ON: green light Power OFF: no light
RUN Indicator	Running: green light
ERR Indicator	In ERROR: red light
Port A RX Indicator	Port A is receiving: orange light
Port A TX Indicator	Port A is transmitting: orange light
Port B RX Indicator	Port B is receiving: orange light
Port B TX Indicator	Port B is transmitting: orange light

Pin assignment of the connector



MHCM25 Pins

10

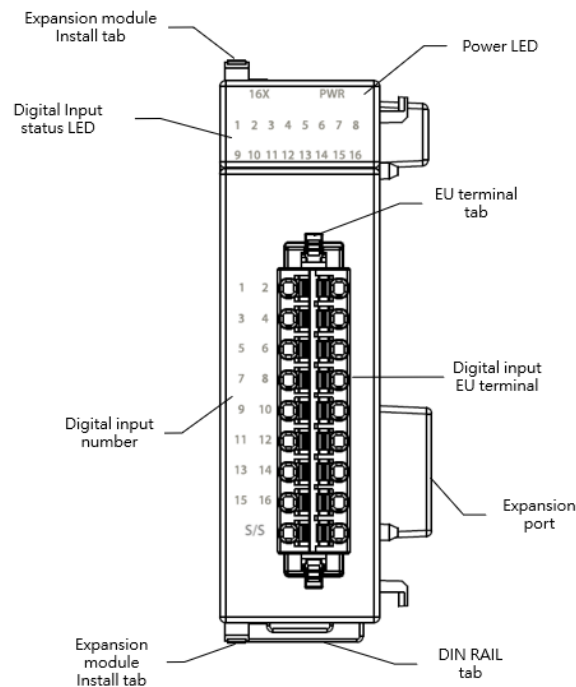
Local I/O Expansion Modules Specifications

10-1 Digital Input Expansion Module Specifications

If the input point of the M Series CPU module is not enough for a specific application, then can expand it with the additional expansion modules.

10-1-1 M16X Specifications

Appearance and Function



M16X Appearance

Technical Specifications

M16X Technical Specifications Table

Item		Technical Specifications
Model		M16X
Input Points		16
Input Points Type		24VDC Single-end input
Maximum input frequency		Medium-Low Speed · 1kHz
Input Signal Voltage		24VDC±10%
Input Current Threshold	ON Current	> 4mA
	OFF Current	< 1.5mA
Maximum Input Current		7.6mA
Input Resistance		5.6kΩ
Isolation Type		Transformer/ Photocoupler Isolation · 1500VAC/1 minute
SINK /SOURCE Wiring		Via variation of internal common terminal S/S and external common wiring
Noise Filtering Time Constant		DHF(0 ~ 70ms) + AHF(0.47ms)
Operating Ambient Temperature		0~55°C
Relative Humidity		20 ~ 90% (non-condensing)
Altitude		≤2000m
Vibration		5~8.4Hz Amplitude: 3.5mm

(Fixed by DIN RAIL)	8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock	10G, 3 times each along the 3 axes
Noise Suppression	1500Vp-p · Width 1us
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)

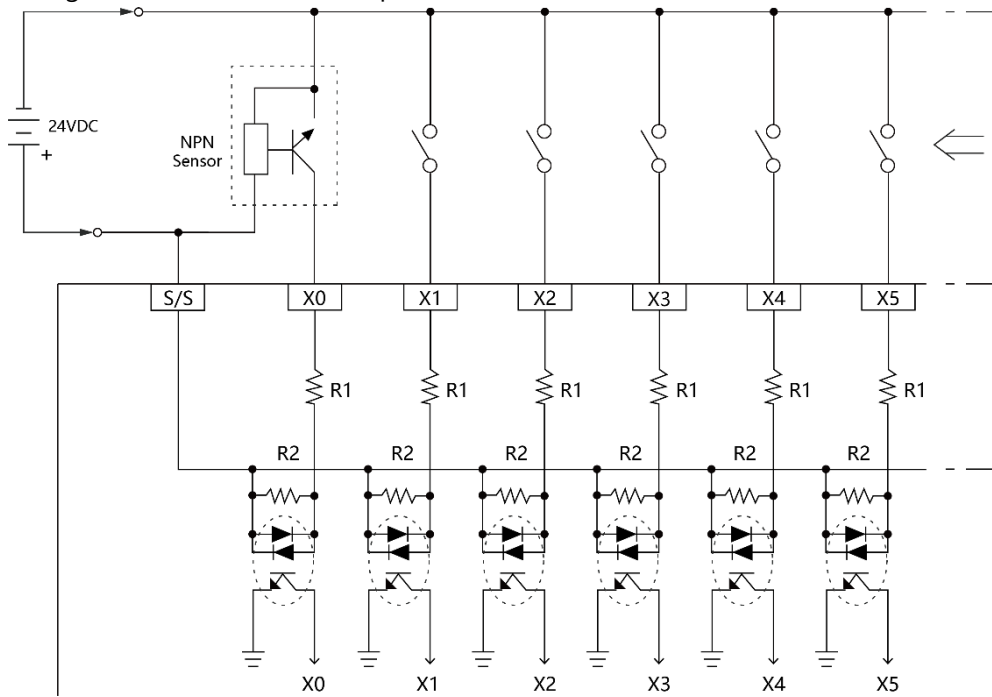
Status Indicator

M16X Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: green light Power OFF: no light
X1~X16 Input Indicator	ON: green light OFF: no light

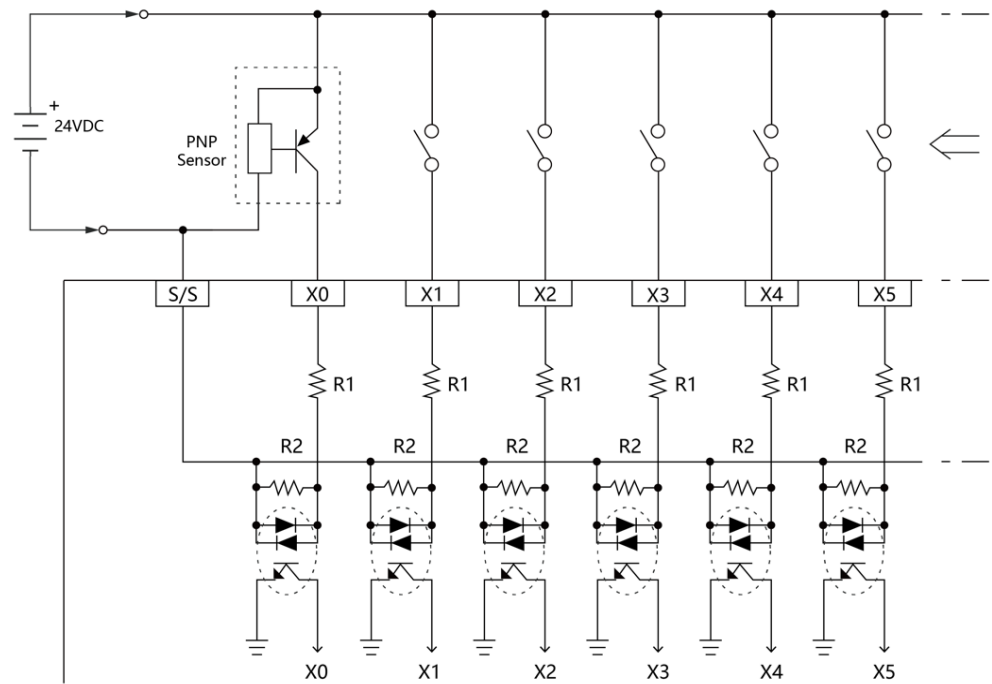
Wiring

➤ Wiring of single-end common SINK input



Wiring of single-end common SINK input

➤ Wiring of single-end common SOURCE input



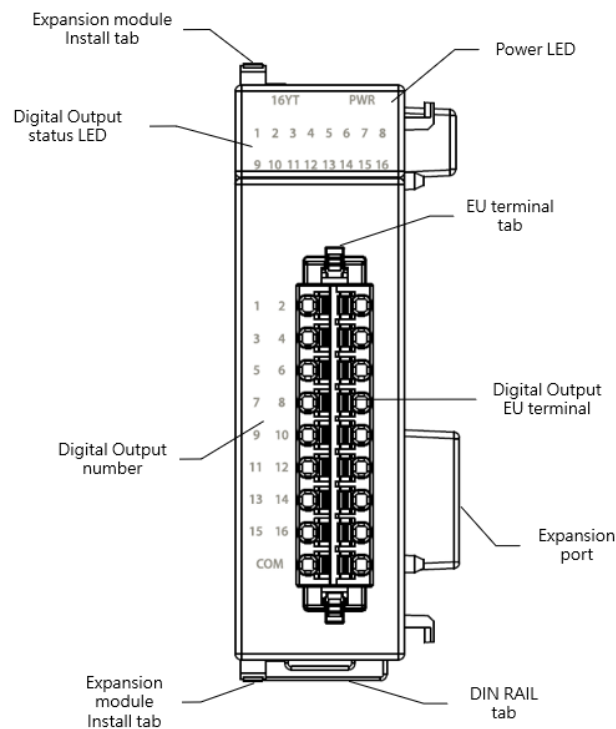
Wiring of single-end common SOURCE input

10-2 Digital Output Expansion Module Specifications

If the output point of the M Series CPU module is not enough for a specific application, then can expand it with the additional expansion modules.

10-2-1 M16YT / M16YJ Specifications

Appearance and Function



M16Y Appearance

Technical Specifications

M16YT / M16YJ Technical Specifications Table

Item		Technical Specifications
model		M16YT / M16YJ
Output Points		16
Output Points Type		Single-End Transistor Output; T-Transistor SINK(NPN) output ; J-Transistor SOURCE(PNP) output
Maximum output frequency		Medium speed · 1kHz
Working Voltage		5~30VDC
Maximum Load Current	Resistive	0.5A/Single 4A/COM
	Inductive	
Maximum Voltage Drop/conducting resistance		2.2V
Minimum Load		-
Leakage Current		< 0.1mA/30VDC
Maximum Output	ON > OFF	< 10μS
	OFF > ON	< 40μS

Delay Time		
Over Current Protection		N/A
Isolation Type		Photocoupler Isolation, 500VAC, 1 minute
SINK /SOURCE Type		Choose SINK/SOURCE by models and non-exchangeable
Operating Ambient Temperature		0~55°C
Relative Humidity		20 ~ 90% (non-condensing)
Altitude		≤2000m
Vibration (Fixed by DIN RAIL)		5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock		10G, 3 times each along the 3 axes
Noise Suppression		1500Vp-p · Width 1us
Withstand Voltage		1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)

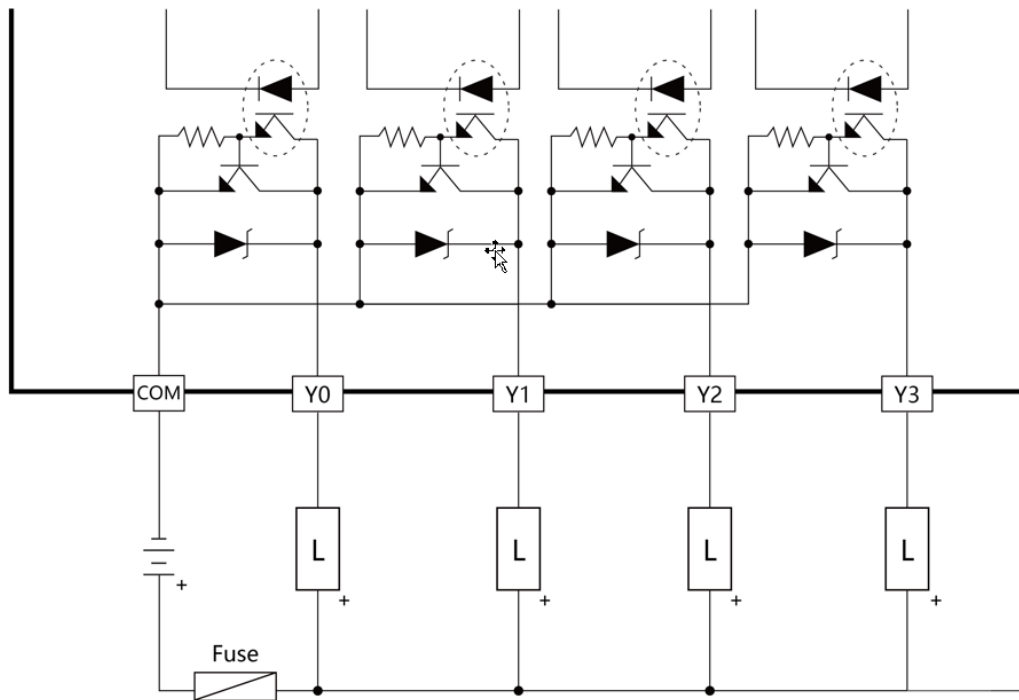
Status Indicator

M16YT / M16YJ Status Indicator Table

Indicator	instruction
PWR LED	Power ON: green light Power OFF: no light
Y1~Y16 Output Indicator	ON: green light OFF: no light

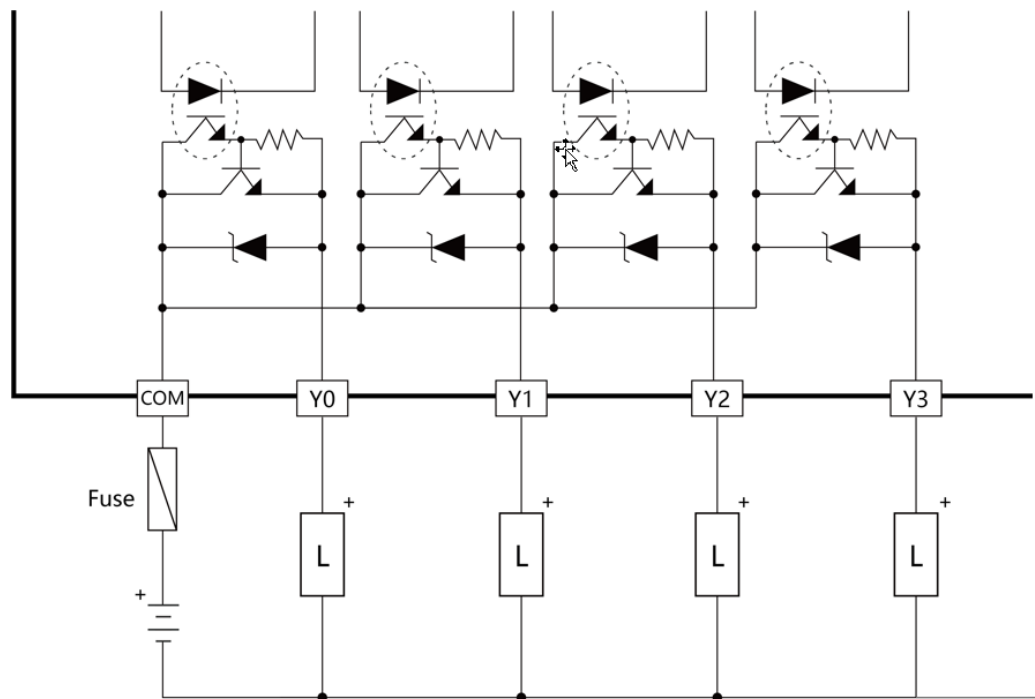
Wiring

➤ Transistor Single-End SINK Output



Transistor Single-End SINK Output

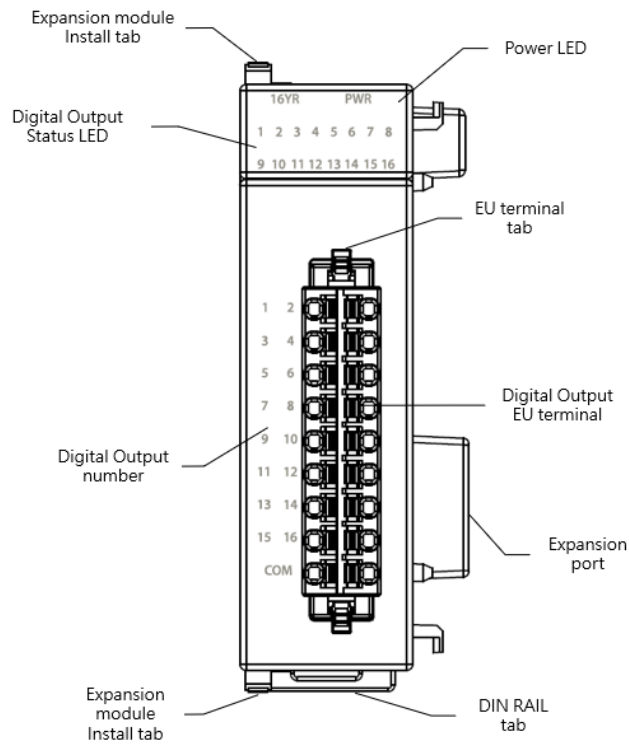
➤ Transistor Single-End SOURCE Output



Transistor Single-End SOURCE Output

10-2-2 M16YR Specifications

Appearance and Function



M M16R Appearance

Technical Specification

M16YR Technical Specification Table

Item		Technical Specifications
Model		M16YR
Output Points		16
Output Points Type		Single-End Relay Output
Maximum output frequency		For ON/OFF, not for frequently switching
Working Voltage		<250VAC,30VDC
Maximum Load Current	Resistive	2A/single 8A/common
	Inductive	80VA(AC)/24VA(DC)
Maximum Voltage Drop/conducting resistance		0.06V(Initial)
Minimum Load		2mA/DC Power
Leakage Current		-
Maximum Output Delay Time	ON > OFF	10ms
	OFF > ON	
Over Current Protection		N/A
Isolation Type		Electromagnetic Isolation, 500VAC, 1 minute
SINK /SOURCE Type		Bilateral device, can be arbitrarily set to SINK/SOURCE output

Operating Ambient Temperature	0~55℃
Relative Humidity	20 ~ 90% (non-condensing)
Altitude	≤2000m
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock	10G, 3 times each along the 3 axes
Noise Suppression	1500Vp-p · Width 1us
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)

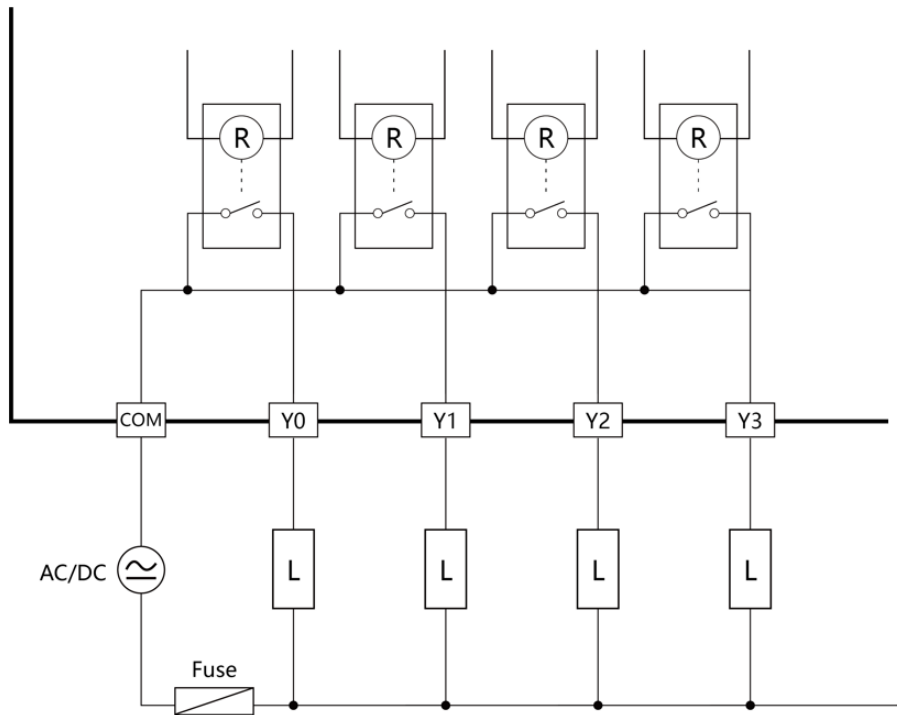
Status Indicator

M16YR Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: green light Power OFF: no light
Y1~Y16 Output Indicator	ON: green light OFF: no light

Wiring

➤ Single-End Relay Output Circuit



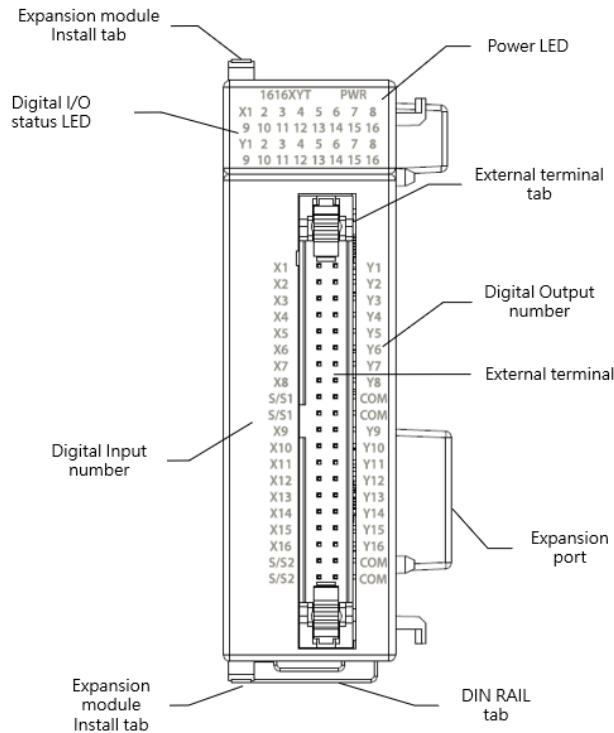
Single-End Relay Output Circuit

10-3 Digital Input /Output Combo Expansion Module Specifications

If the I/O point of the M Series CPU module is not enough for a specific application, then can expand it with the additional expansion modules.

10-3-1 M1616XYT / M1616XTJ Specification

Appearance and Function



M1616XYT / M1616XYJ Appearance

Technical Specifications

M1616XYT / M1616XYJ Input Technical Specifications Table

Item		Technical Specifications
Model		M1616XYT / M1616XYJ
Input Points		16
Input Points Type		24VDC Single-end input
Maximum input frequency		Medium-Low Speed · 1kHz
Input Signal Voltage		24VDC±10%
Input Current Threshold	ON Current	> 4mA
	OFF Current	< 1.5mA
Maximum Input Current		7.6mA
Input Resistance		5.6kΩ
Isolation Type		Transformer/ Photocoupler Isolation · 500VAC/1 minute
SINK /SOURCE Wiring		Via variation of internal common terminal S/S and external common wiring
Noise Filtering Time Constant		DHF(0 ~ 70ms) + AHF(0.47ms)
Operating Ambient Temperature		0~55°C
Relative Humidity		20 ~ 90% (non-condensing)
Altitude		≤2000m

Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock	10G, 3 times each along the 3 axes
Noise Suppression	1500Vp-p · Width 1us
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)

M1616XYT / M1616XYJ Output Technical Specifications Table

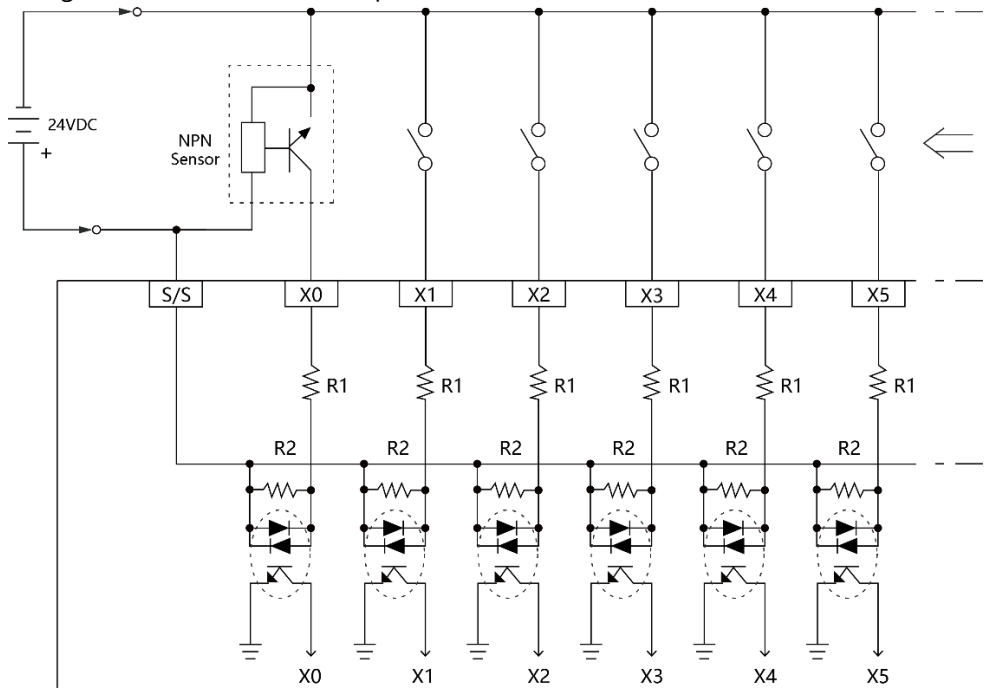
Item		Technical Specifications
model		M1616XYT / M1616XYJ
Output Points		16
Output Points Type		Single-End Transistor Output; T-Transistor SINK(NPN) output ; J-Transistor SOURCE(PNP) output
Maximum output frequency		Medium Speed · 1kHz
Working Voltage		5~30VDC
Maximum Load Current	Resistive	0.5A
	Inductive	
Maximum Voltage Drop/conducting resistance		2.2V
Minimum Load		-
Leakage Current		< 0.1mA/30VDC
Maximum Output Delay Time	ON > OFF	< 10μS
	OFF > ON	< 40μS
Over Current Protection		N/A
Isolation Type		Photocoupler Isolation, 500VAC, 1 minute
SINK /SOURCE Type		Choose SINK/SOURCE by models and non-exchangeable
Operating Ambient Temperature		0~55°C
Relative Humidity		20 ~ 90% (non-condensing)
Altitude		≤2000m
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)	
Shock	10G, 3 times each along the 3 axes	
Noise Suppression	1500Vp-p · Width 1us	
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)	

Status Indicator**M16X Status Indicator Table**

Indicator	instruction
PWR Indicator	Power ON: green light Power OFF: no light
X1~X16 Input Indicator	ON: green light OFF: no light
Y1~Y16 output Indicator	ON: green light OFF: no light

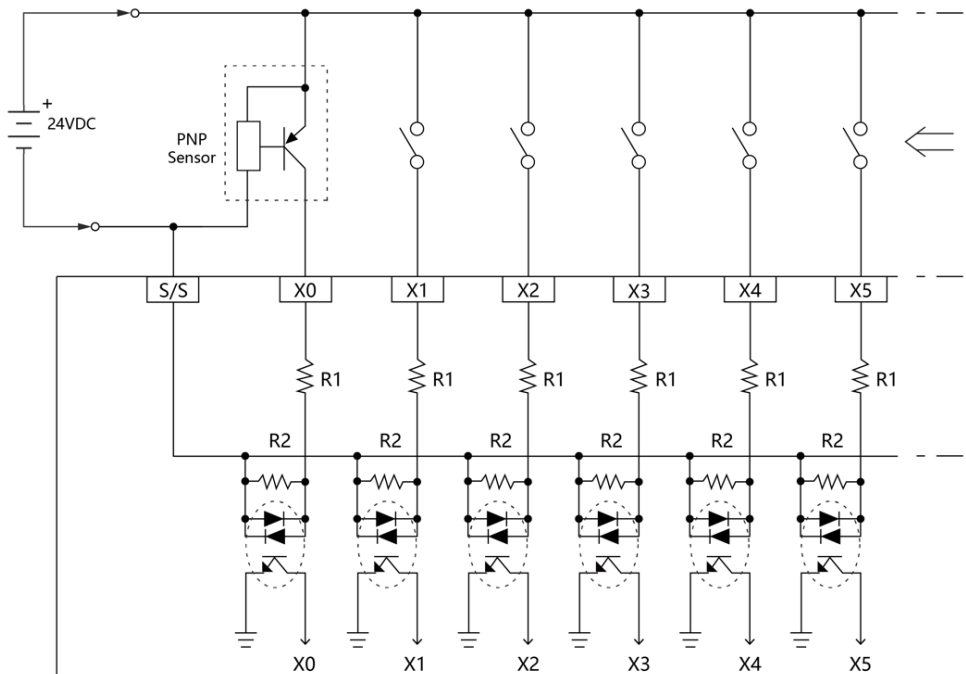
Wiring

➤ Wiring of single-end common SINK input



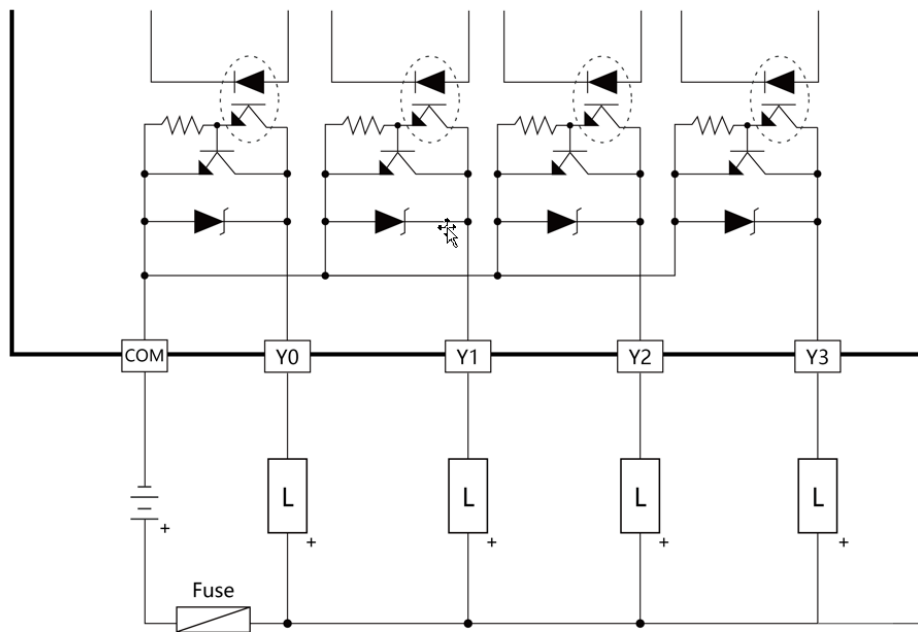
Wiring of single-end common SINK input

➤ Wiring of single-end common SOURCE input



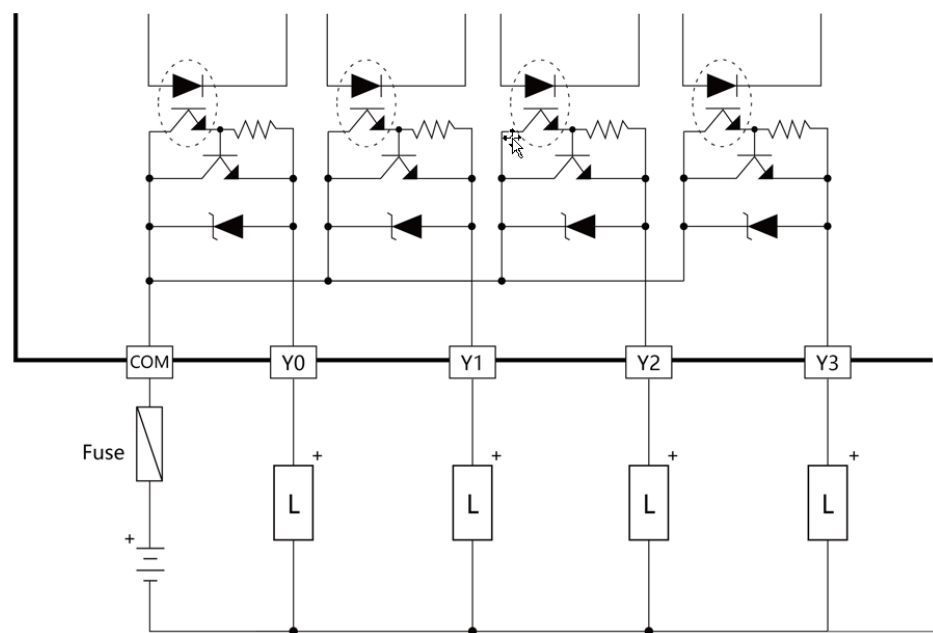
Wiring of single-end common SOURCE input

➤ Transistor Single-End SINK Output



Transistor Single-End SINK Output

➤ Transistor Single-End SOURCE Output



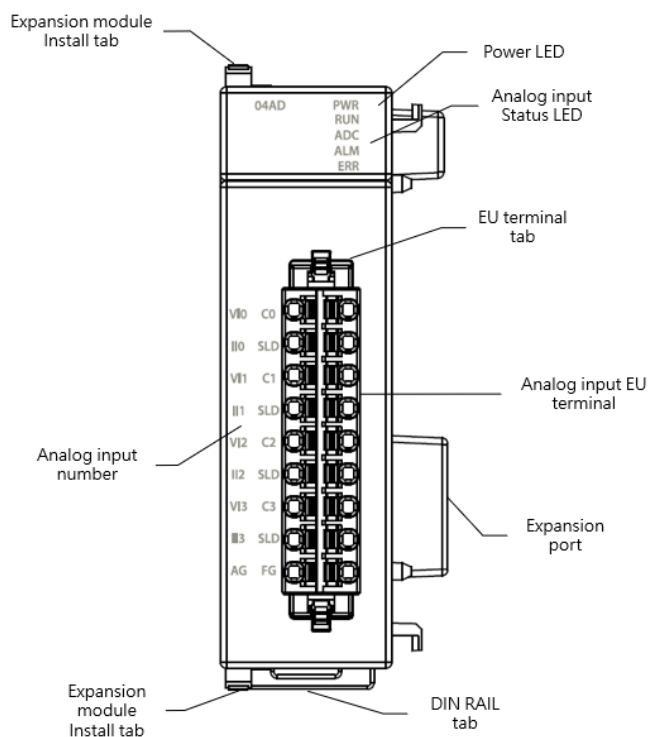
Transistor Single-End SOURCE Output

10-4 Analog Input Expansion Module Specifications

If the Analog input point of the M Series CPU module is not enough for a specific application, then can expand it with the additional expansion modules.

10-4-1 M04AD Specification

Appearance and Function



M04AD Appearance

Technical Specification

M04AD Technical Specification Table

Item	Technical Specification			
Model	M04AD			
Input Point	4			
Conversion speed	High Speed: 300us/Ch Medium Speed: 500us/Ch Low Speed: 1ms/Ch 50Hz filter: 80ms/Ch 60Hz filter: 68ms/Ch			
Analog Input Characteristics and Resolution	Analog input range		Data	Resolution
	Voltage	-10~+10V	-8192~8191	1.22mV
		-5~+5V	-8192~8191	0.61mV
		0~10V	0~16383	0.61mV
		0~5V	0~16383	0.305mV
		1~5V	0~16383	0.244mV
	Current	-20mA~+20mA	-8192~8191	2.44uA
		0~20mA	0~16383	1.22uA
		4~20mA	0~16383	0.976uA

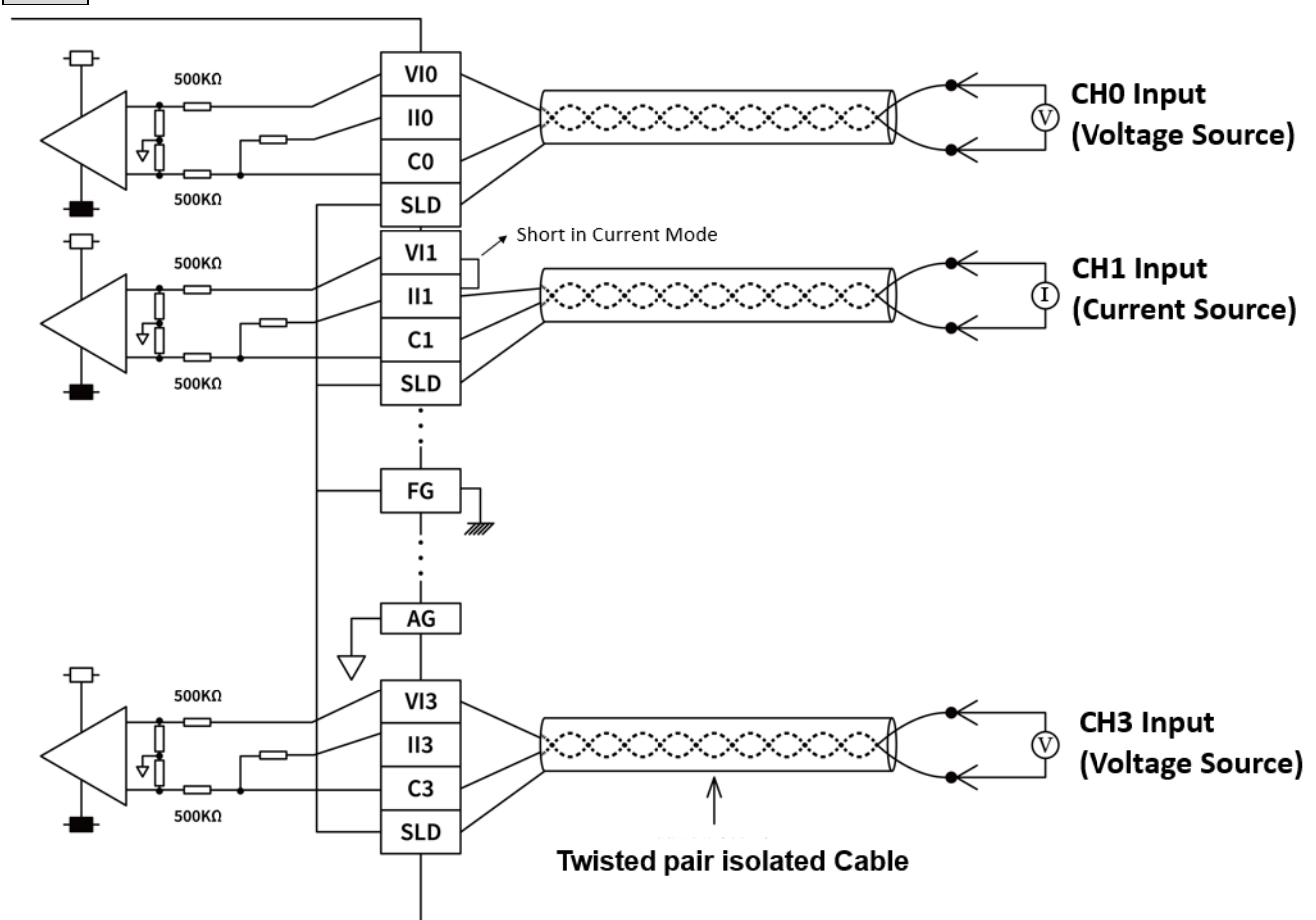
Conversion precision	Voltage	±0.1% (25°C±5°C) ±0.2% (0 ~ 55°C)
	Current	±0.2% (25°C±5°C) ±0.4% (0 ~ 55°C)
AD Converter	24-Bit	
Input Resistance	Voltage : 1MΩ Current : 250Ω	
Hardware maximum input	Voltage : - 15V ~ + 15V Current : -30mA~+30mA	
Insulation	Between analog input and CPU : insulated (Digital isolators, transformers) Between analog input channels : non-insulated	
Operating Ambient Temperature	0~55°C	
Relative Humidity	20 ~ 90% (non-condensing)	
Altitude	≤2000m	
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)	
Shock	10G, 3 times each along the 3 axes	
Noise Suppression	1500Vp-p · Width 1us	
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)	

Status Indicator

M04AD Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: green light Power OFF: no light
RUN Indicator	Running: green light
ADC Indicator	ADC Converting: yellow light
ALM Indicator	On Alert: red light
ERR Indicator	In ERROR: red light

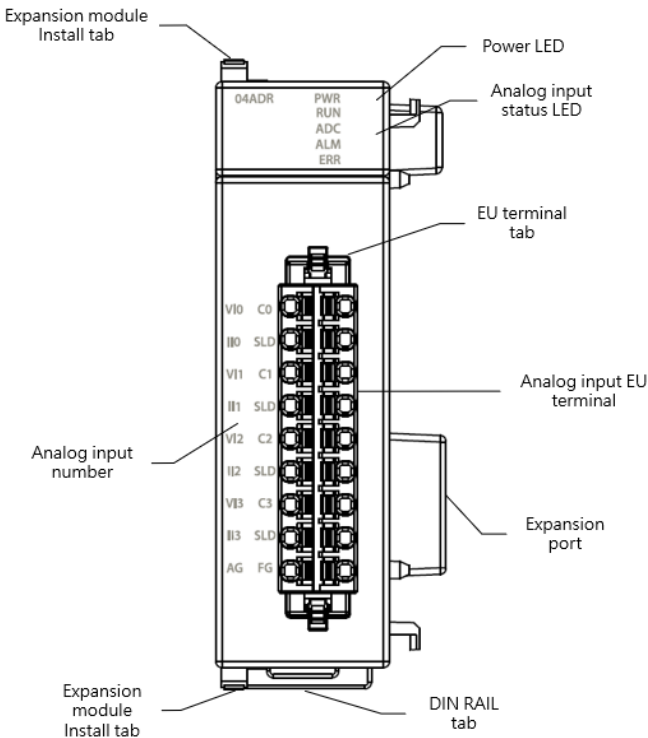
Wiring



M04AD Wiring

10-4-2 M04ADR Specification

Appearance and Function



M04ADR Appearance

Technical Specification

M04ADR Technical Specification

Item	Technical Specification		
Model	M04ADR		
Input Points	4		
Conversion speed	High Speed: 1.5ms/Ch. Medium Speed: 4ms/Ch. Low Speed: 15ms/Ch. 50Hz Filter: 80ms/Ch. 60Hz Filter: 68ms/Ch.		
Analog Input Characteristics and Resolution	Analog input range		Data
	Voltage	-10~+10V	-80000~80000
		-5~+5V	-80000~80000
		0~10V	0~80000
		0~5V	0~80000
		1~5V	0~80000
	Current	-20mA~+20mA	-80000~80000
		0~20mA	0~80000
		4~20mA	0~80000
Conversion precision	Voltage	$\pm 0.1\%$ (25°C $\pm 5^\circ\text{C}$) $\pm 0.2\%$ (0 ~ 55°C)	
	Current	$\pm 0.1\%$ (25°C $\pm 5^\circ\text{C}$) $\pm 0.2\%$ (0 ~ 55°C)	

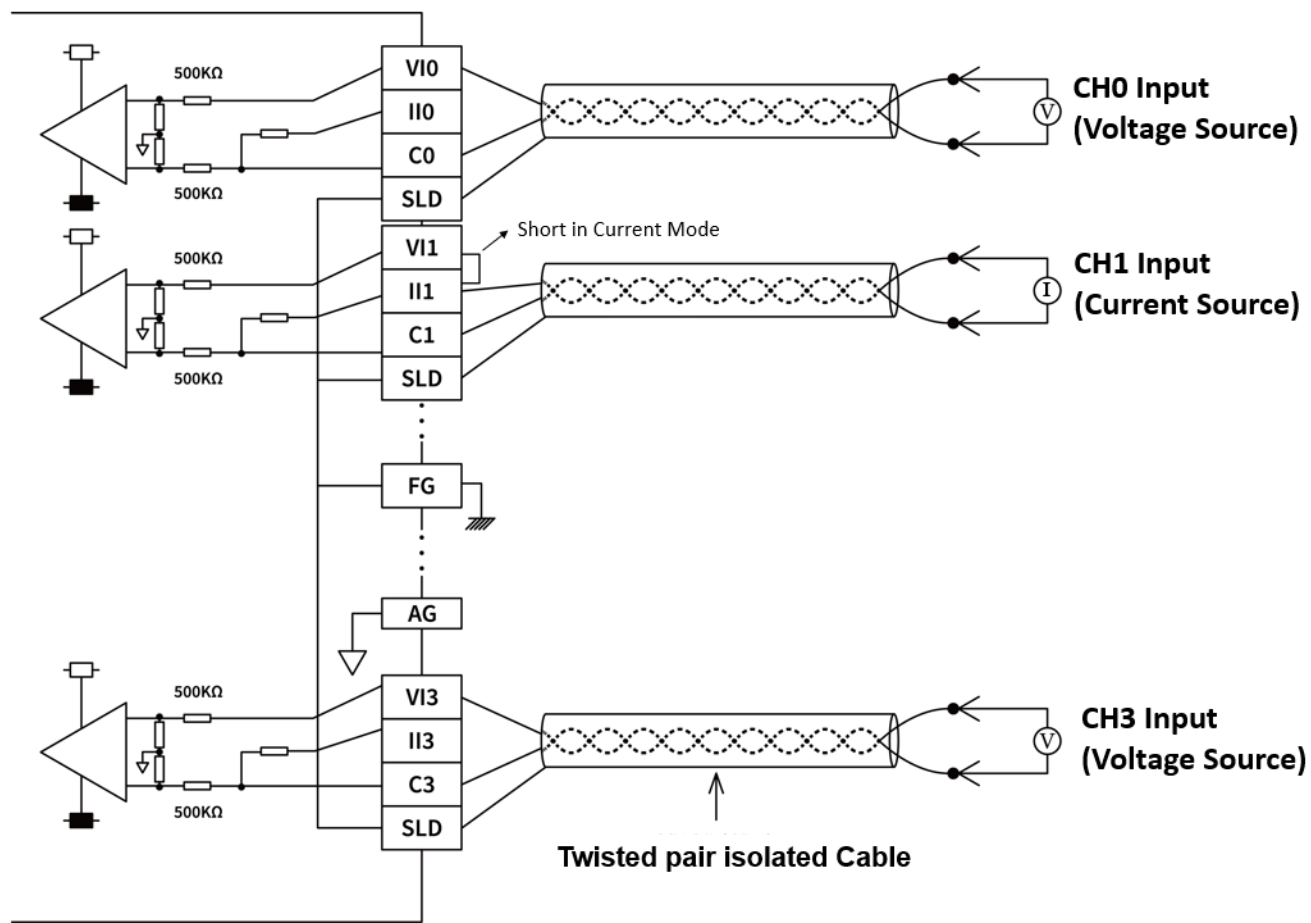
AD Converter	24-Bit
Input Resistance	Voltage : 1M Ω Current : 250 Ω
Hardware maximum input	Voltage : - 15V ~ + 15V Current : -30mA~+30mA
Insulation	Between analog input and CPU : insulated (Digital isolators, transformers) Between analog input channels : non-insulated
Operating Ambient Temperature	0~55°C
Relative Humidity	20 ~ 90% (non-condensing)
Altitude	$\leq$ 2000m
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock	10G, 3 times each along the 3 axes
Noise Suppression	1500Vp-p · Width 1 μ s
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)

Status Indicator

M04ADR Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: green light Power OFF: no light
RUN Indicator	Running: green light
ADC Indicator	ADC Converting: yellow light
ALM Indicator	On Alert: red light
ERR Indicator	In ERROR: red light

Wiring



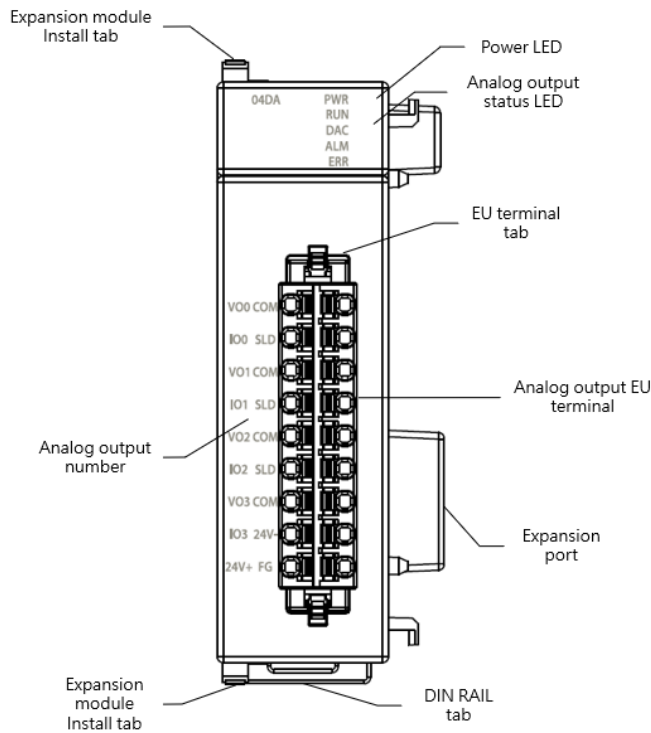
M04ADR Wiring

10-5 Analog Output Expansion Module Specifications

If the Analog output point of the M Series CPU module is not enough for a specific application, then can expand it with the additional expansion modules.

10-5-1 M04DA Specification

Appearance and Function



M04DA Appearance

Technical Specification

M04DA Technical Specification

Item	Technical Specification			
model	M04DA			
Output Point	4			
Conversion speed	1ms/channel			
Analog output characteristics and resolution	Analog output range		Data	Resolution
	Voltage	-10~+10V	-8192~8191	1.22mV
		-5~+5V	-8192~8191	0.61mV
		0~10V	0~16383	0.61mV
		0~5V	0~16383	0.305mV
		1~5V	0~16383	0.244mV
	Current	0~20mA	0~16383	1.22μA
		4~20mA	0~16383	0.976μA
Conversion precision	Voltage	±0.2% (25°C±5°C) ±0.5% (0~55°C)		
	Current	±0.2% (25°C±5°C) ±0.5% (0~55°C)		
DA Converter	16-Bit			

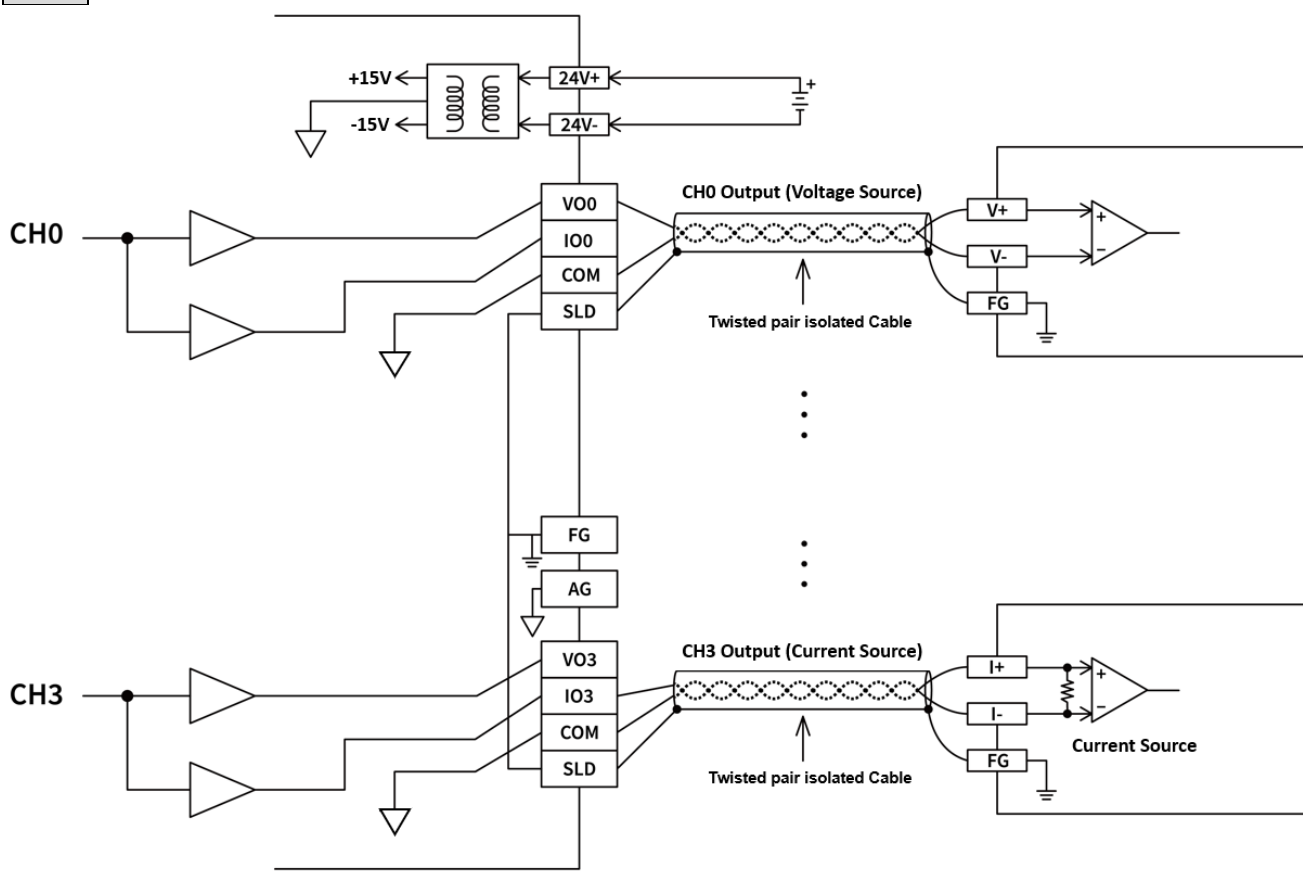
Minimum load impedance	Voltage : 1k Ω	
Maximum load impedance	Current : 500 Ω	
Hardware maximum output	Voltage	-10.2~+10.2V -5.1~+5.1V -0.2~10.2V -0.1~5.1V 0.9~5.1V
	Current	0~20.2mA 4~20.2mA
Insulation	Between analog output and CPU : insulated (Digital isolators, transformers) Between analog output channels : non-insulated	
Operating Ambient Temperature	0~55°C	
Relative Humidity	20 ~ 90% (non-condensing)	
Altitude	$\leq$ 2000m	
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)	
Shock	10G, 3 times each along the 3 axes	
Noise Suppression	1500Vp-p · Width 1 μ s	
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)	

Status Indicator

M04DA Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: green light Power OFF: no light
RUN Indicator	Running: green light
DAC Indicator	DAC Converting: yellow light
ALM Indicator	On Alert: red light
ERR Indicator	In ERROR: red light

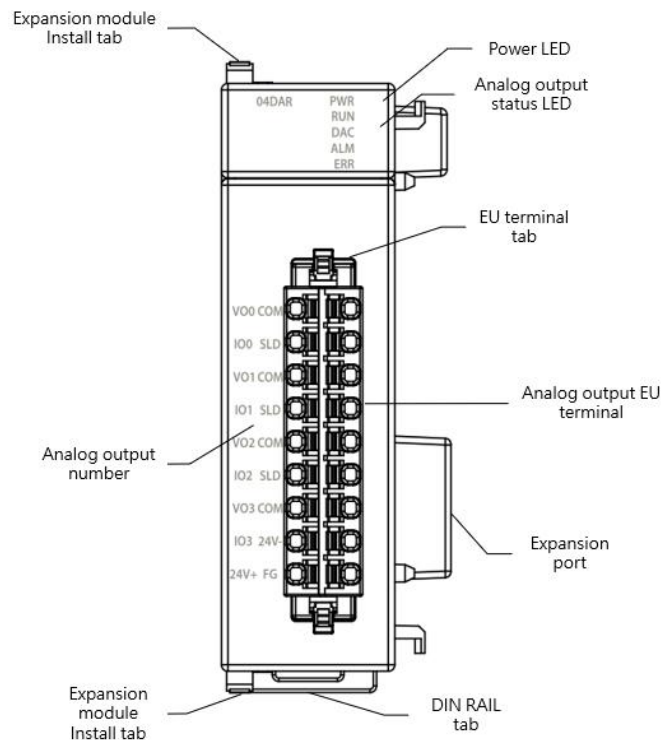
Wiring



M04DA Wiring

10-5-2 M04DAR Specification

Appearance and Function



M04DAR Appearance

Technical Specification

M04DAR Technical Specification

Item	Technical Specification			
model	M04DAR			
Output Point	4			
Conversion speed	0.5ms/channel			
Analog output characteristics and resolution	Analog output range		Data	Resolution
	Voltage	-10~+10V	-27000~27000	0.37mV
		-5~+5V	-27000~27000	0.185mV
		0~10V	0~27000	0.37mV
		0~5V	0~27000	0.185mV
		1~5V	0~27000	0.48mV
	Current	0~20mA	0~27000	0.74μA
		4~20mA	0~27000	0.592μA
Conversion precision	Voltage	±0.05% (25°C±5°C) ±0.3% (0~55°C)		
	Current	±0.05% (25°C±5°C) ±0.3% (0~55°C)		
DA Converter	16-Bit			
Minimum load impedance	Voltage : 1kΩ			
Maximum load impedance	Current : 500Ω			
hardware output	Voltage	-10.2~+10.2V		
		-5.1~+5.1V		

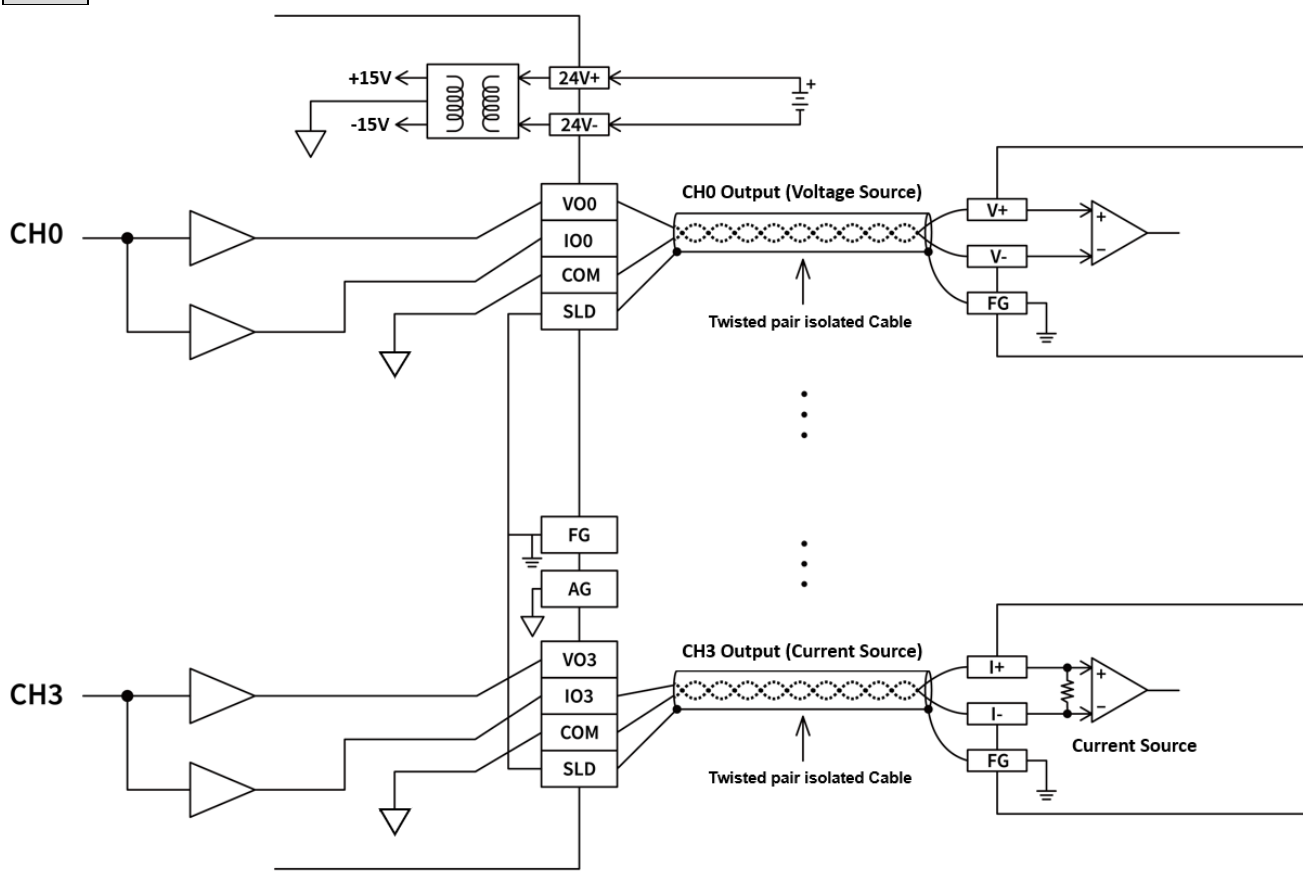
		-0.2~10.2V -0.1~5.1V 0.9~5.1V
	Current	0~20.2mA 4~20.2mA
Insulation	Between analog output and CPU : insulated (Digital isolators, transformers) Between analog output channels : non-insulated	
Operating Ambient Temperature	0~55°C	
Relative Humidity	20 ~ 90% (non-condensing)	
Altitude	≤2000m	
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)	
Shock	10G, 3 times each along the 3 axes	
Noise Suppression	1500Vp-p · Width 1us	
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)	

Status Indicator

M04DAR Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: green light Power OFF: no light
RUN Indicator	Running: green light
DAC Indicator	DAC Converting: yellow light
ALM Indicator	On Alert: red light
ERR Indicator	In ERROR: red light

Wiring



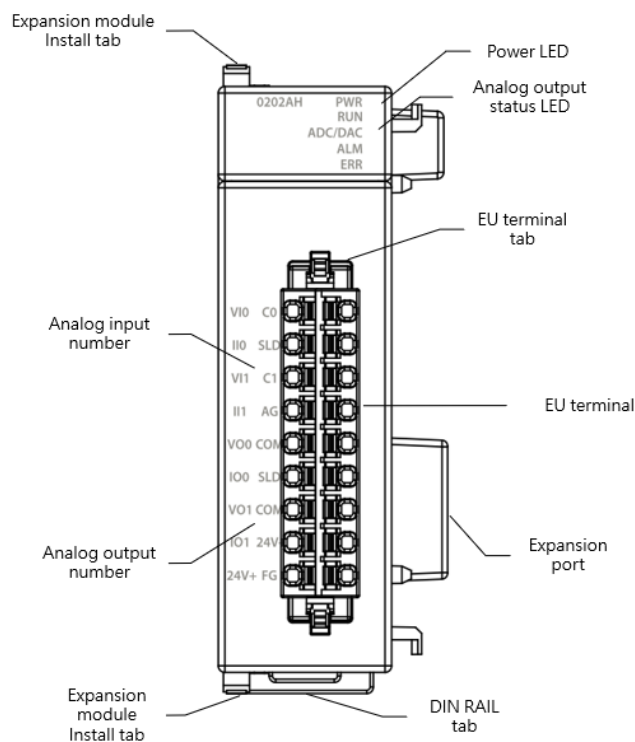
M04DAR Wiring

10-6 Analog Input/Output Combo Expansion Module Specifications

If the Analog input/output point of the M Series CPU module is not enough for a specific application, then can expand it with the additional expansion modules.

10-6-1 M0202AH Specifications

Appearance and Function



M0202AH Appearance

Technical Specification

M0202AH Technical Specification

Item	Technical Specification			
Model	M0202AH			
Input Specifications				
Input Point	2			
Conversion speed	High Speed: 300us/Ch Medium Speed: 500us/Ch Low Speed: 1ms/Ch 50Hz filter: 80ms/Ch 60Hz filter: 68ms/Ch			
Analog Input Characteristics and Resolution	Analog input range		Data	Resolution
	Voltage	-10~+10V	-8192~8191	1.22mV
		-5~+5V	-8192~8191	0.61mV
		0~10V	0~16383	0.61mV
		0~5V	0~16383	0.305mV
		1~5V	0~16383	0.244mV
	Current	-20mA~+20mA	-8192~8191	2.44uA
		0~20mA	0~16383	1.22uA

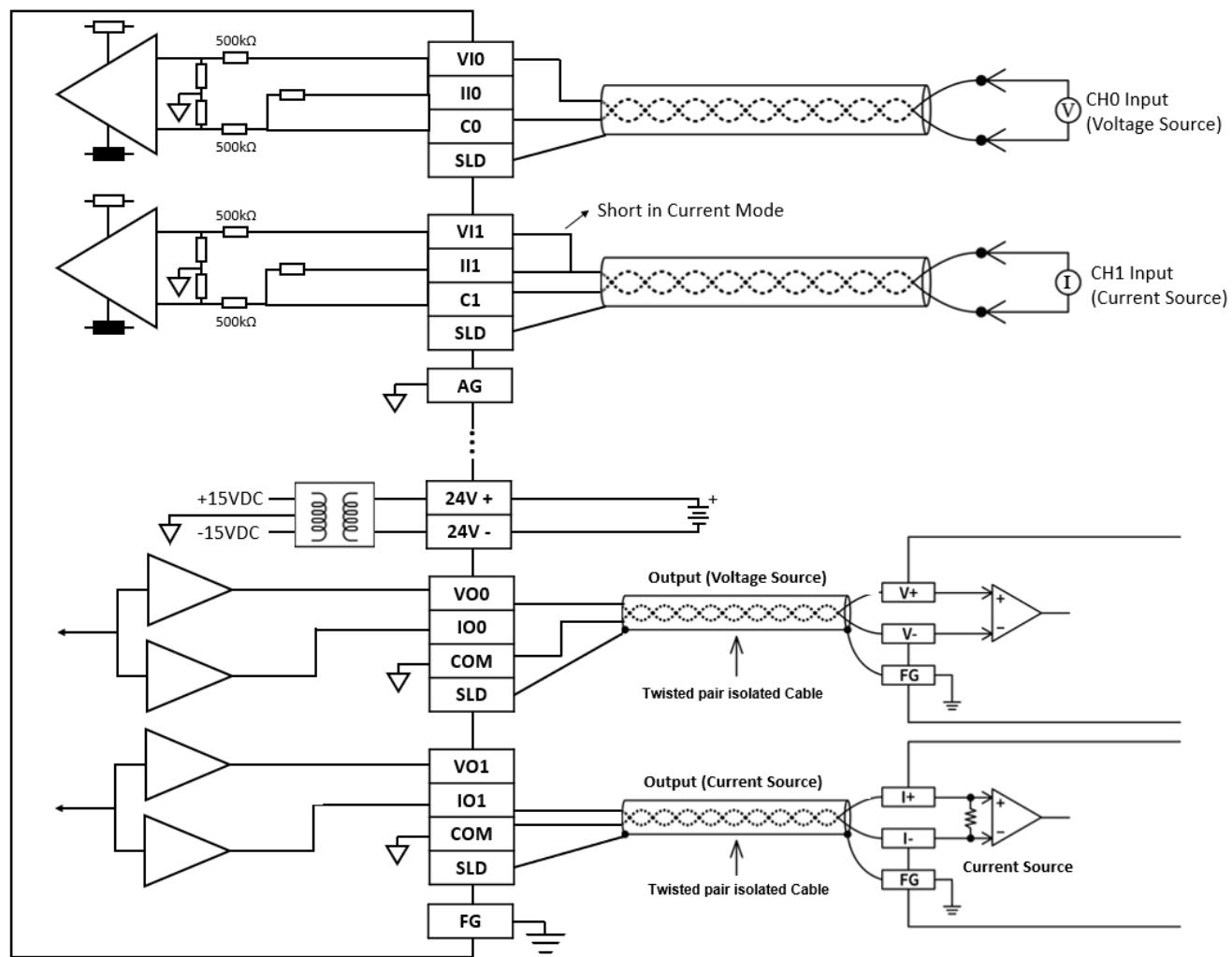
		4~20mA	0~16383	0.976uA
Conversion precision	Voltage	±0.1% (25°C±5°C) ±0.2% (0 ~ 55°C)		
	Current	±0.2% (25°C±5°C) ±0.4% (0 ~ 55°C)		
AD Converter	24-Bit			
Input Resistance	Voltage : 1MΩ Current : 250Ω			
Hardware maximum input	Voltage : - 15V ~ + 15V Current : -30mA~+30mA			
Output Specifications				
Output Point	2			
Conversion speed	1ms/channel			
Analog output characteristics and resolution	Analog output range		Data	Resolution
	Voltage	-10~+10V	-8192~8191	1.22mV
		-5~+5V	-8192~8191	0.61mV
		0~10V	0~16383	0.61mV
		0~5V	0~16383	0.305mV
		1~5V	0~16383	0.244mV
	Current	0~20mA	0~16383	1.22μA
		4~20mA	0~16383	0.976μA
Conversion precision	Voltage	±0.2% (25°C±5°C) ±0.5% (0~55°C)		
	Current	±0.2% (25°C±5°C) ±0.5% (0~55°C)		
DA Converter	24-Bit			
Minimum load impedance	Voltage : 1kΩ			
Maximum load impedance	Current : 500Ω			
Hardware Maximum output	Voltage	-10.2~+10.2V -5.1~+5.1V -0.2~10.2V -0.1~5.1V 0.9~5.1V		
	Current	0~20.2mA 4~20.2mA		
Common Specifications				
Insulation	Between analog input/output and CPU : insulated (Digital isolators, transformers) Between analog input/output channels : non-insulated			
Operating Ambient Temperature	0~55°C			
Relative Humidity	20 ~ 90% (non-condensing)			
Altitude	≤2000m			
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s^2(2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)			
Shock	10G, 3 times each along the 3 axes			
Noise Suppression	1500Vp-p · Width 1us			
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)			

Status Indicator

M0202AH Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: green light Power OFF: no light
RUN Indicator	Running: green light
ADC/DAC Indicator	ADC/DAC Converting: yellow light
ALM Indicator	On Alert: red light
ERR Indicator	In ERROR: red light

Wiring



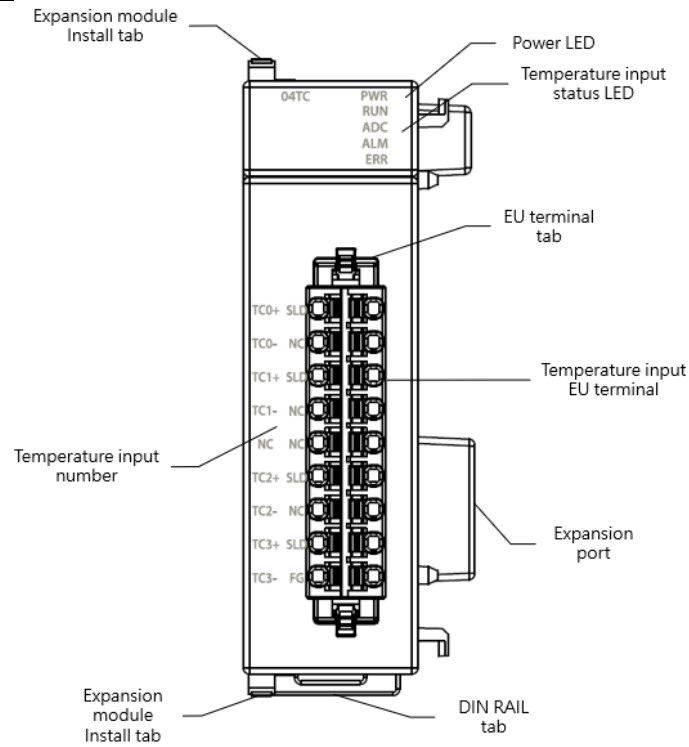
M0202AH Wiring

10-7 Temperature Expansion Module Specifications

If the temperature input point of the M Series CPU module is not enough for a specific application, then can expand it with the additional expansion modules.

10-7-1 M04TC Specification

Appearance and Function



M04TC Appearance

Technical Specification

M04TC Technical Specifications Table

Item	Technical Specification
Model	M04TC
Input Points	4
Resolution	0.1°C
Sampling cycle	High Speed:200ms/ch Standard:400ms/ch
Temperature sensor type	K, J, E, T, R, B, N, S, mV
Conversion precision	±0.5% (25°C±5°C) ±1% (0 ~ 55°C)
AD Converter	24-Bit
Operating mode	PID Control ON/OFF Control
Control cycle	0.1~30 Second+ 1 Scan time
Tuning	PID Auto Tuning
Insulation	Between analog input and CPU : insulated (Digital isolators) Between analog input channels : insulated (optocoupler isolator)
Operating Ambient	0~55°C

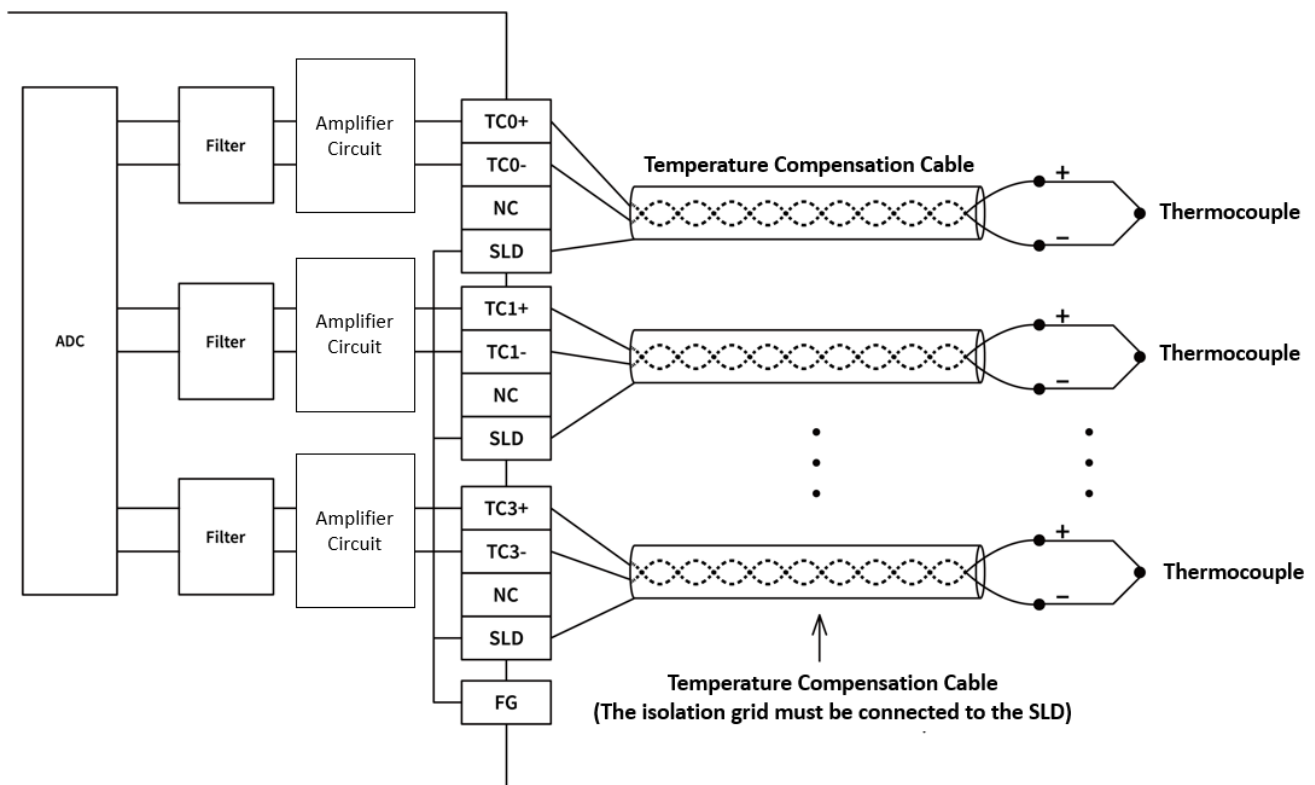
Temperature	
Relative Humidity	20 ~ 90% (non-condensing)
Altitude	≤2000m
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock	10G, 3 times each along the 3 axes
Noise Suppression	1500Vp-p · Width 1us
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)

Status Indicator

M04TC Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: green light Power OFF: no light
RUN Indicator	Running: green light
ADC Indicator	ADC Converting: yellow light
ALM Indicator	On Alert: red light
ERR Indicator	In ERROR: red light

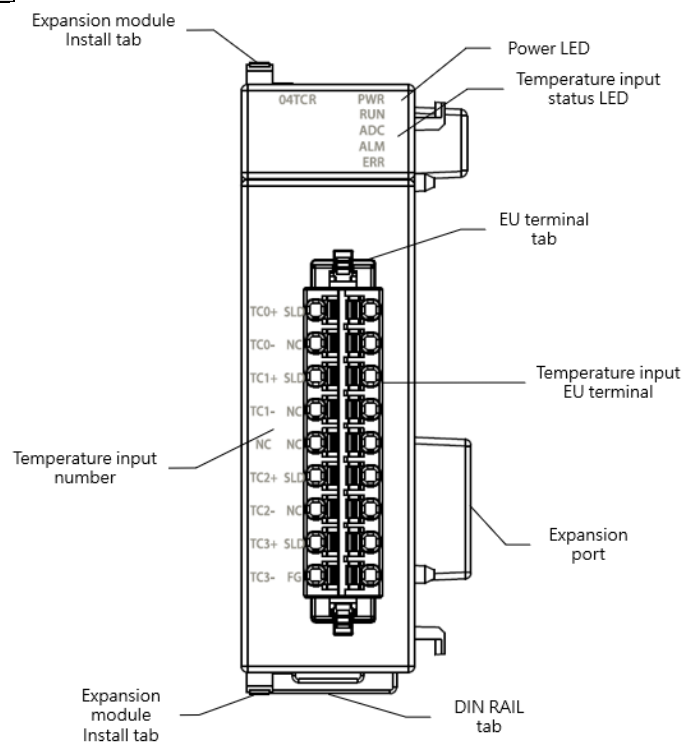
Wiring



M04TC Wiring

10-7-2 M04TCR Specification

Appearance and Function



M04TCR Appearance

Technical Specification

M04TCR Technical Specifications Table

Item	Technical Specification
Model	M04TCR
Input Points	4
Resolution	0.1°C
Sampling cycle	High Speed:100ms/ch Standard:200ms/ch
Temperature sensor type	K, J, E, T, R, B, N, S, mV
Conversion precision	±0.2% (25°C±5°C) ±0.4% (0 ~ 55°C)
AD Converter	24-Bit
Operating mode	PID Control ON/OFF Control
Control cycle	0.1~30 Second+ 1 Scan time
Tuning	PID Auto Tuning
Insulation	Between analog input and CPU : insulated (Digital isolators) Between analog input channels : insulated (optocoupler isolator)
Operating Ambient Temperature	0~55°C
Relative Humidity	20 ~ 90% (non-condensing)
Altitude	≤2000m
Vibration	5~8.4Hz Amplitude: 3.5mm

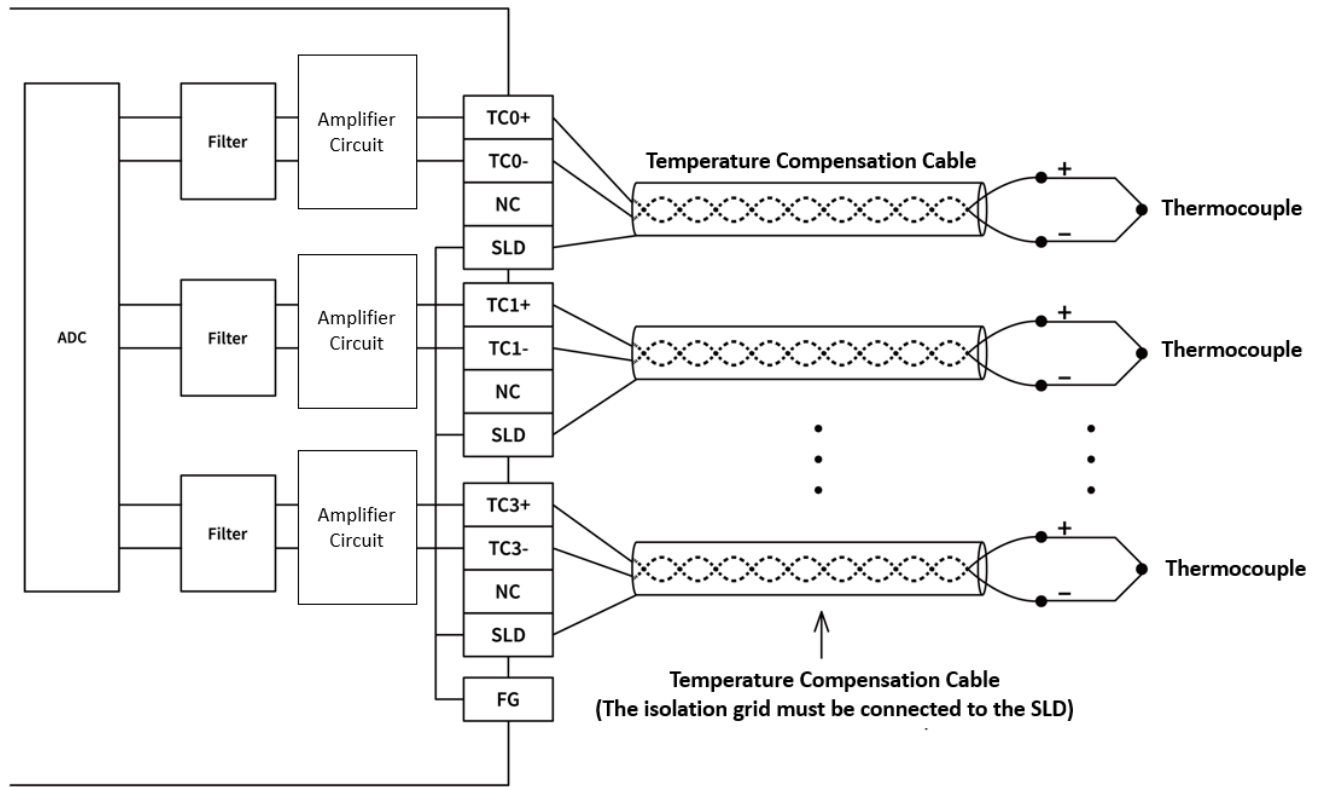
(Fixed by DIN RAIL)	8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock	10G, 3 times each along the 3 axes
Noise Suppression	1500Vp-p · Width 1us
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)

Status Indicator

M04TCR Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: green light Power OFF: no light
RUN Indicator	Running: green light
ADC Indicator	ADC Converting: yellow light
ALM Indicator	On Alert: red light
ERR Indicator	In ERROR: red light

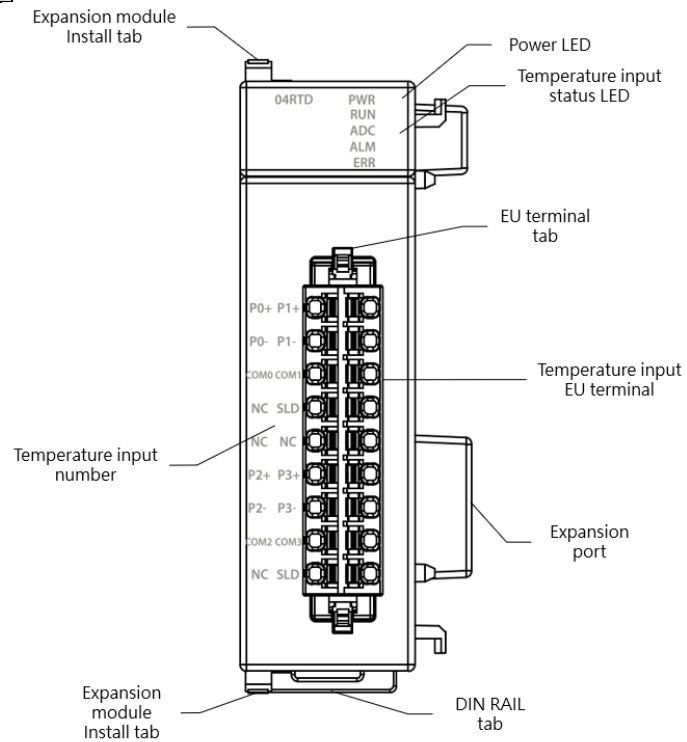
Wiring



M04TCR Wiring

10-7-3 M04RTD Specification

Appearance and Function



M04RTD Appearance

Technical Specification

M04RTD Technical Specifications Table

Item	Technical Specification
Model	M04RTD
Input Points	4
Resolution	0.1°C
Sampling cycle	100ms/ch
Temperature sensor type	Pt100 / Pt1000: (-200~850°C) JPt100 / JPt1000: (-200~600°C) PT100(1000) - DIN EN 60751 JPT100(1000) - JIS C 1609-1981
Conversion precision	±0.1% (25°C±5°C) ±0.5% (0 ~ 55°C)
AD Converter	24-Bit
Operating mode	PID Control ON/OFF Control
Control cycle	0.1~30 Second+ 1 Scan time
Tuning	PID Auto Tuning
Insulation	Between analog input and CPU : insulated (Digital isolators) Between analog input channels : insulated (optocoupler isolator)
Operating Ambient Temperature	0~55°C
Relative Humidity	20 ~ 90% (non-condensing)

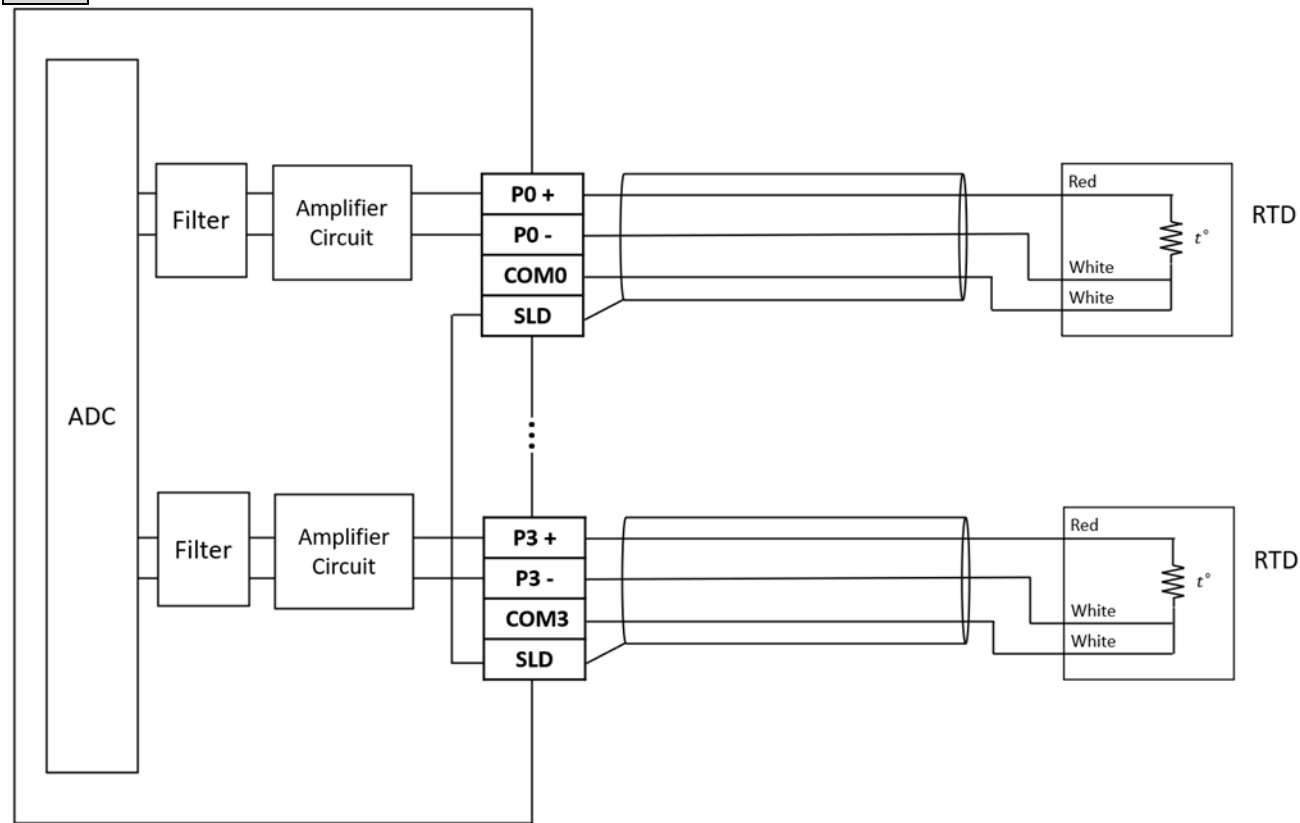
Altitude	≤2000m
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock	10G, 3 times each along the 3 axes
Noise Suppression	1500Vp-p · Width 1us
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)

Status Indicator

M04RTD Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: green light Power OFF: no light
RUN Indicator	Running: green light
ADC Indicator	ADC Converting: yellow light
ALM Indicator	On Alert: red light
ERR Indicator	In ERROR: red light

Wiring



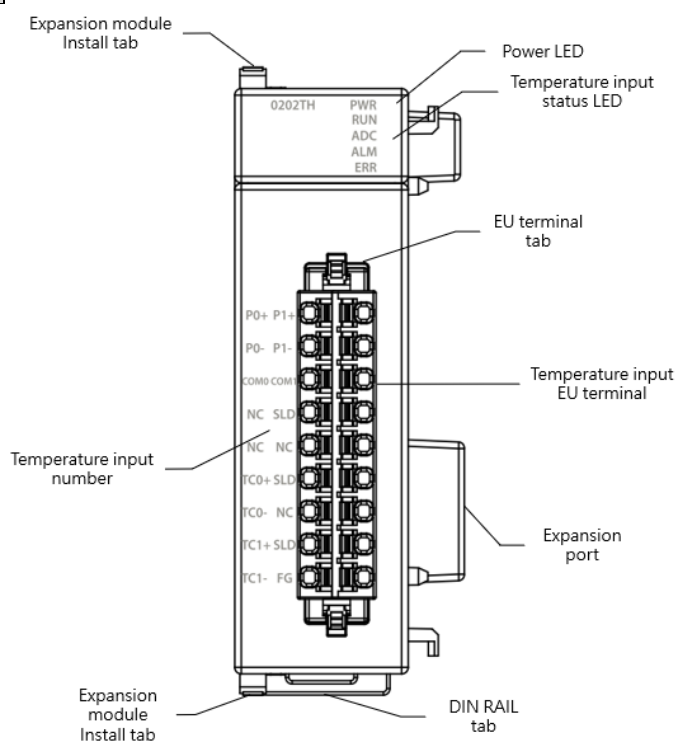
M04RTD Wiring

10-8 Temperature Combo Expansion Module Specifications

If the temperature input point of the M Series CPU module is not enough for a specific application, then can expand it with the additional expansion modules.

10-8-1 M0202TH Specification

Appearance and Function



M0202TH Appearance

Technical Specification

M0202TH Technical Specifications Table

Item	Technical Specification
Model	M0202TH
TC Specifications	
Input Points	2
Resolution	0.1°C
Sampling cycle	High Speed:200ms/ch Standard:400ms/ch
Temperature sensor type	K, J, E, T, R, B, N, S, mV
Conversion precision	±0.5% (25°C±5°C) ±1% (0~55°C)
AD Converter	24-Bit
RTD Specifications	
Input Points	2
Resolution	0.1°C
Sampling cycle	100ms/ch
Temperature sensor type	Pt-100, Pt-1000 (-200~850°C) JPt-100, JPt-1000 (-200~600°C)

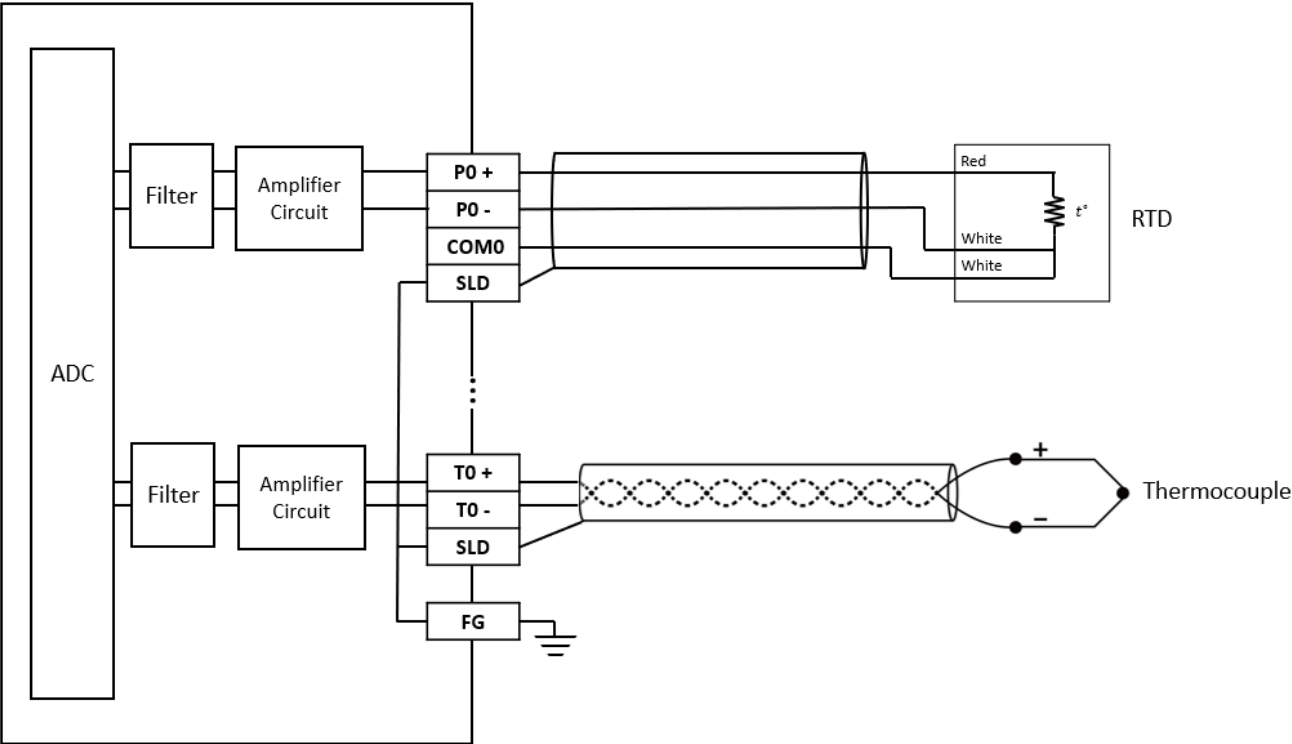
Conversion precision	±0.1% (25°C±5°C) ±0.5% (0 ~ 55°C)
AD Converter	24-Bit
Common Specifications	
Operating mode	PID Control ON/OFF Control
Control cycle	0.1~30 Second
Tuning	PID Auto Tuning
Insulation	Between analog input and CPU : insulated (Digital isolators) Between analog input channels : insulated (optocoupler isolator)
Operating Ambient Temperature	0~55°C
Relative Humidity	20 ~ 90% (non-condensing)
Altitude	≤2000m
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock	10G, 3 times each along the 3 axes
Noise Suppression	1500Vp-p · Width 1us
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)

Status Indicator

M0202TH Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: green light Power OFF: no light
RUN Indicator	Running: green light
ADC Indicator	ADC Converting: yellow light
ALM Indicator	On Alert: red light
ERR Indicator	In ERROR: red light

Wiring



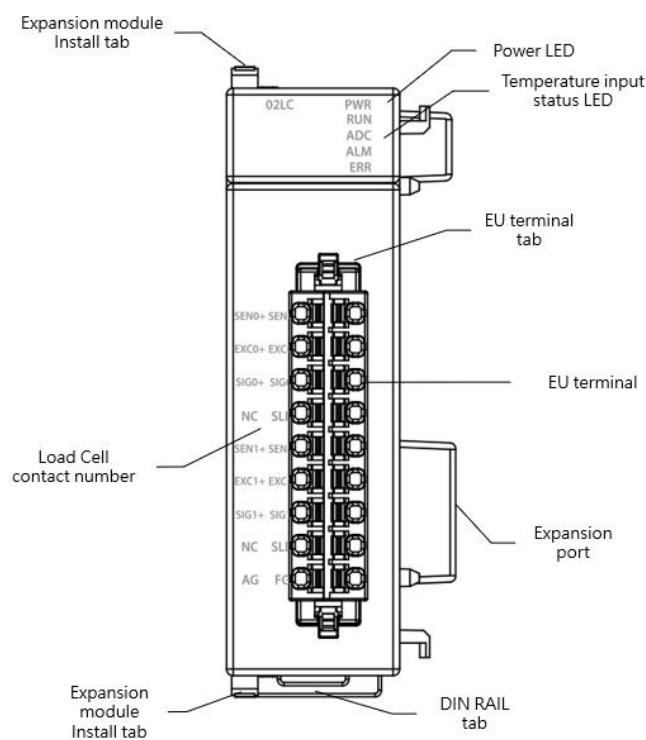
M0202TH Wiring

10-9 Load Cell Expansion Module Specifications

If the Load Cell input point of the M Series CPU module is not enough for a specific application, then can expand it with the additional expansion modules.

10-9-1 M02LC Specifications

Appearance and Function



M02LC Appearance

Technical Specification

M02LC Technical Specifications Table

Item	Technical Specification
Model	M02LC
Input Points	2
Excitation Voltage	5VDC $\pm$ 5%, 60mA
Sensor Type	4-wire or 6-wire Load Cell
Number of Sensor Connection	4 * 350 Ω Sensor
Sensitivity	$\pm$ 1.0mV/V $\pm$ 2.0mV/V $\pm$ 3.0mV/V $\pm$ 4.0mV/V
AD Converter Resolution	24-Bit
Conversion precision	$\pm$ 0.5% (25 $^{\circ}$ C $\pm$ 5 $^{\circ}$ C) $\pm$ 1% (0 ~ 55 $^{\circ}$ C)
Zero Drift	0.2uV/ $^{\circ}$ C
Gain Drift	$\pm$ 10ppm/ $^{\circ}$ C
Sampling cycle	High Speed :2ms/ch. (only Use Single Point) Standard:10ms/ch

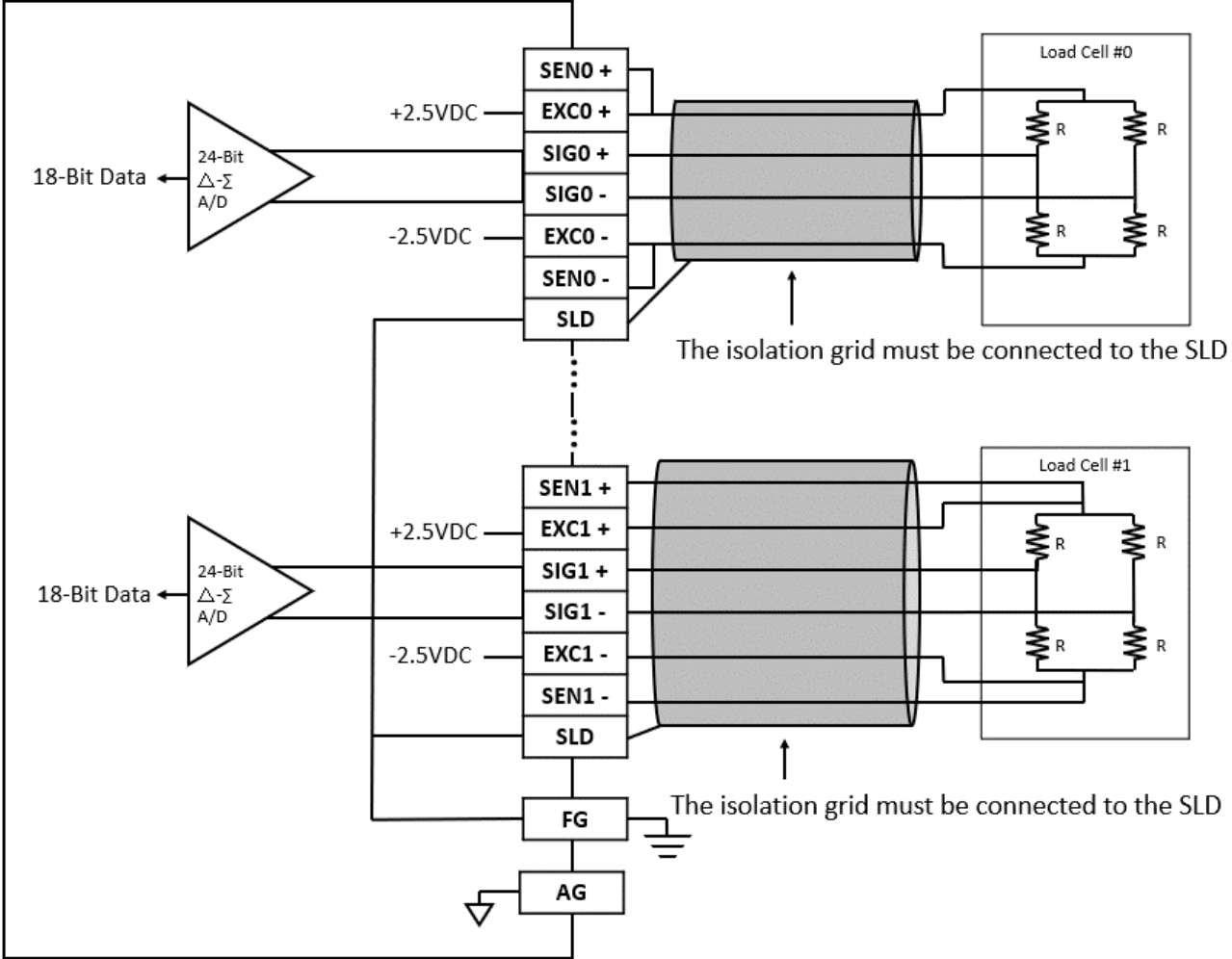
Insulation	Between analog input and CPU : insulated (Digital isolators) Between analog input channels : insulated (optocoupler isolator)
Operating Ambient Temperature	0~55°C
Relative Humidity	20 ~ 90% (non-condensing)
Altitude	≤2000m
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock	10G, 3 times each along the 3 axes
Noise Suppression	1500Vp-p · Width 1us
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)

Status Indicator

M02LC Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: green light Power OFF: no light
RUN Indicator	Running: green light
ADC Indicator	ADC Converting: yellow light
ALM Indicator	On Alert: red light
ERR Indicator	In ERROR: red light

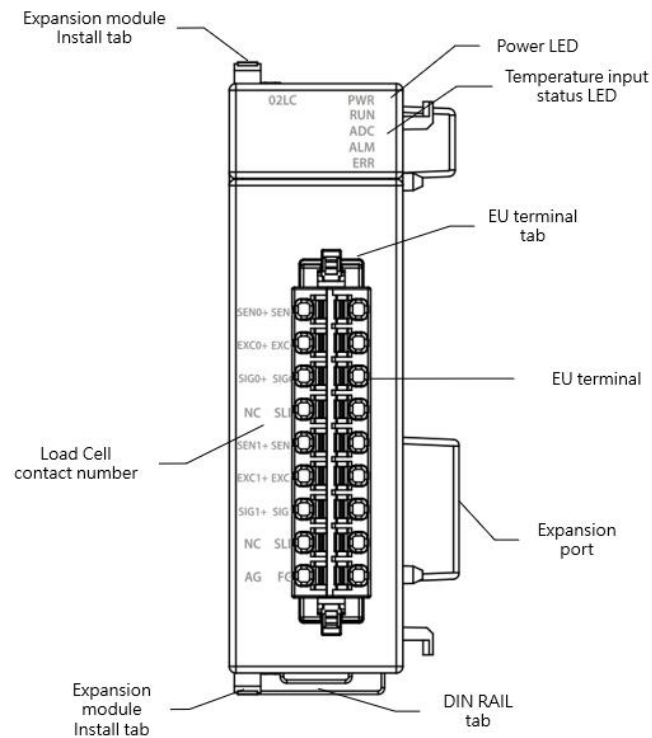
Wiring



M02LC Wiring

10-9-2 M02LCR Specifications

Appearance and Function



M02LC Appearance

Technical Specification

M02LCR Technical Specifications Table

Item	Technical Specification
Model	M02LCR
Input Points	2
Excitation Voltage	5VDC $\pm$ 5%, 60mA
Sensor Type	4-wire or 6-wire Load Cell
Number of Sensor Connection	4 * 350 Ω Sensor
Sensitivity	$\pm$ 1.0mV/V $\pm$ 2.0mV/V $\pm$ 3.0mV/V $\pm$ 4.0mV/V
AD Converter Resolution	24-Bit
Conversion precision	$\pm$ 0.01% (25°C $\pm$ 5°C) $\pm$ 0.4% (0~50°C)
Zero Drift	0.2uV/°C
Gain Drift	$\pm$ 10ppm/°C
Sampling cycle	Standard:10ms/ch
Insulation	Between analog input and CPU : insulated (Digital isolators, Transformer) Between analog input channels : insulated (optocoupler isolator)
Operating Ambient Temperature	0~55°C
Relative Humidity	20 ~ 90% (non-condensing)

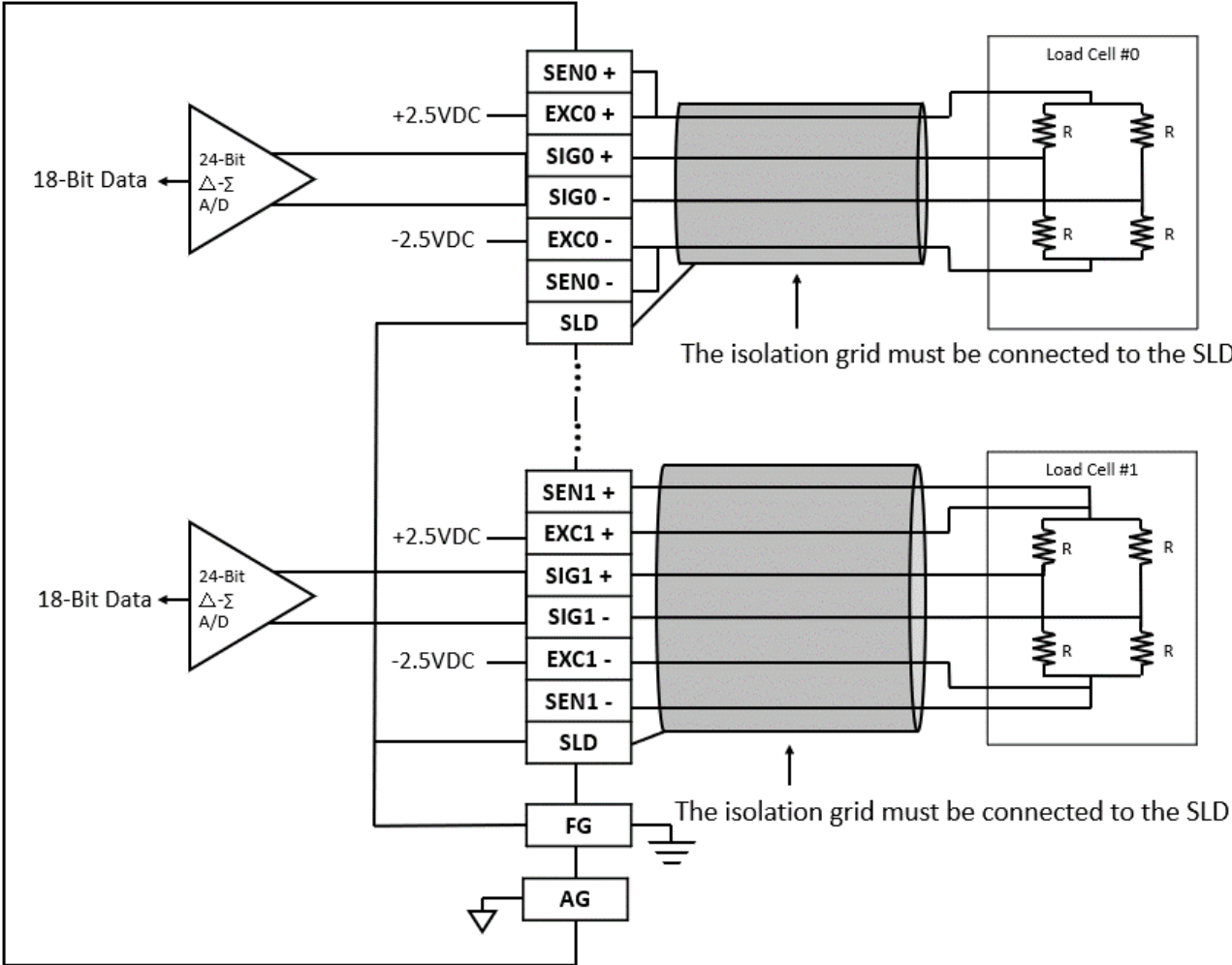
Altitude	≤2000m
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration: 19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock	10G, 3 times each along the 3 axes
Noise Suppression	1500Vp-p · Width 1us
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)

Status Indicator

M02LCR Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: green light Power OFF: no light
RUN Indicator	Running: green light
ADC Indicator	ADC Converting: yellow light
ALM Indicator	On Alert: red light
ERR Indicator	In ERROR: red light

Wiring



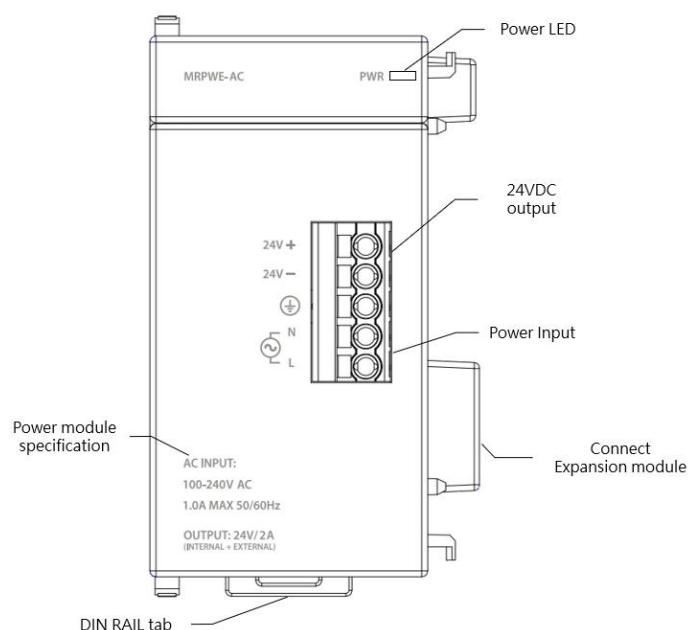
M02LCR Wiring

10-10 Repeater Expansion Module Specifications

If the power of the Power module is not enough for expansion module, then can expand it with the additional repeater Expansion module.

10-10-1 MRPWE-AC Specifications

Appearance and Function



MRPWE-AC Appearance

Technical Specifications

MRPWE-AC Technical Specifications Table

Item		Technical Specifications
Model		MRPWE-AC
Input	Input voltage	100~240VAC
	Input frequency	50/60Hz
	Maximum input current	1A max.
	Inrush current (cold start)	22A/115Vac (44A/230Vac)
	Withstand voltage	3,000 VAC (Primary-secondary), 1,500 VAC (Primary-PE), 500 VAC (Secondary-PE)
	Insulation resistance	>100MΩ/500VDC
	Fuse	2A
	Hold-up time	>15ms/ 115VAC · >60ms/ 220VAC
	Isolation Type	Transformer/ Photocoupler Isolation · 1500VAC/1 minute
	Power indication	LED (green)
output	Rated output power	48W (Shared CPU dedicated power supply and external Sensor power supply)
	Rated output current	2A (Shared CPU dedicated power supply and external Sensor power supply)
	Output voltage range	24VDC±1%
	Conversion efficiency	86%/110VAC · 87%/220VAC
Protection	Overvoltage protection	Latching overvoltage protection, re-power on to recover 34V~36V

	Overcurrent protection	Method: Foldback overload protection, automatically recover when overload is removed 101%~133% rated output power
Operating Ambient Temperature		0~55°C
Relative Humidity		20 ~ 90% (non-condensing)
Altitude		≤2000m
Vibration (Fixed by DIN RAIL)		5~8.4Hz Amplitude: 3.5mm 8.4~150Hz Constant acceleration:19.6m/s ² (2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock		10G, 3 times each along the 3 axes
Noise Suppression		1500Vp-p · Width 1us
Withstand Voltage		1500 VAC 1 minute (Between power terminals and input/output terminals, and between all external terminals and the housing)
Certification		CE

Status Indicator

MRPWE Status Indicator Table

Name	instruction
PWR LED	Power ON: green light Power OFF: no light

Peripheral and Accessory



11-1 M PLC Dedicated Micro SD Card

11-1-1 MFM06 Specifications

Appearance and Function



MFM06

Technical Specification

MFM06 Specifications Table

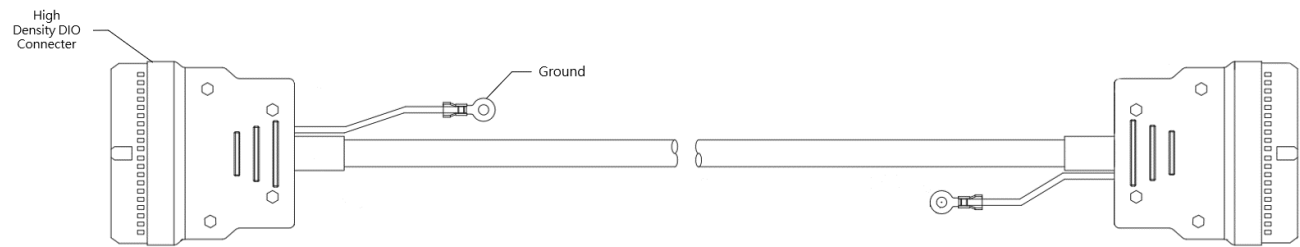
Item	Technical Specification
Model	MFM06
Memory card capacity	2G System + 6GB Data-log
Function	OS Upgrade System Backup (Register /Project) Project Update 6GB Data-log Area*
Operate and storage temperatures	-40°C to 85°C
Dimensions	11 mm x 15 mm x 1 mm

* The number of Data-log depends on CPU model.

11-2 High-Density DIO Cable

11-2-1 MFW40I-50 Specifications

Appearance and Function



MFW40I-50 Appearance

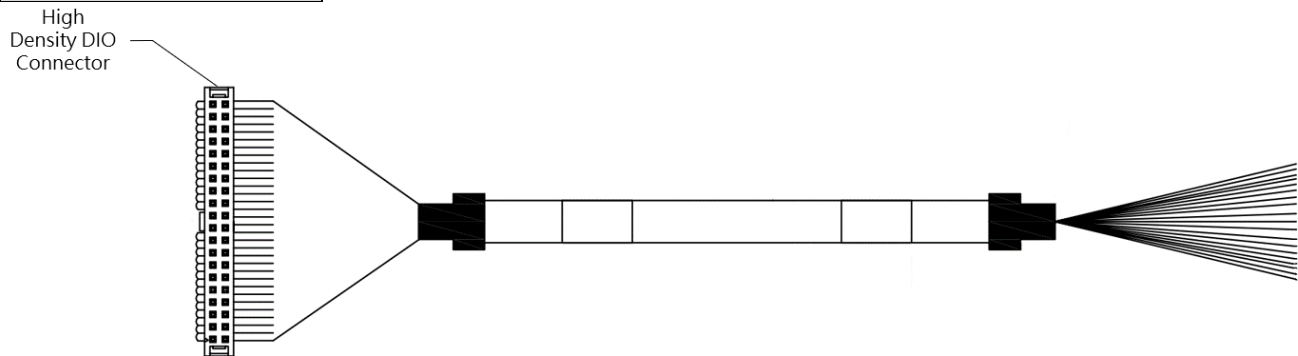
Technical Specification

MFW40I-50 Specifications Table

Item	Technical Specification
Model	MFW40I-50
Length	0.5M
Wire Sizes	AWG28
Function	Connect Expansions Module's 40pin High-Density DIO Connector to DIO Converter Module (MFT40T)
Matching module	MFT40T(DIO Converter Module)
Isolation Method	Aluminum foil + Aluminum Magnesium

11-2-2 MFW40N-150 Specifications

Appearance and Function



MFW40N-150 Appearance

Technical Specification

MFW40N-150 Specifications Table

Item	Technical Specification
Model	MFW40N-150
Length	1.5M
Wire Sizes	AWG28
Function	One end is connected to the 40pin High-Density DIO Connector of the expansion module, and the other end is a loose wire that can be processed by the customer.
Matching module	MFT40T(DIO Converter Module)
Isolation Method	With isolation, No ground wire

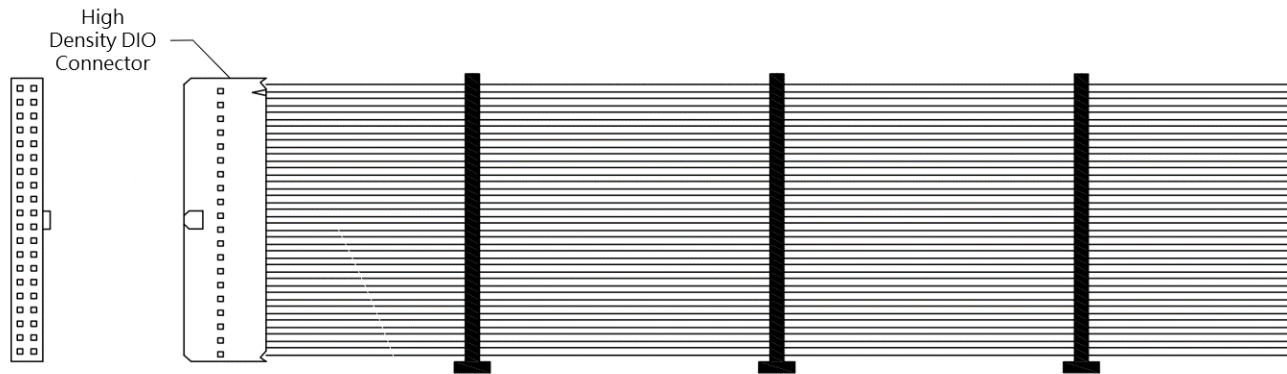
Pin

MFW40N-150					
X0	Brown	1	21	Brown and black	Y0
X1	Brown and white	2	22	Red	Y1
X2	Red and black	3	23	Red and white	Y2
X3	Orange	4	24	Orange and black	Y3
X4	Orange and white	5	25	Orange and green	Y4
X5	Yellow	6	26	Yellow and black	Y5
X6	Yellow and red	7	27	Green	Y6
X7	Green and black	8	28	Green and white	Y7
S/S0	Light green	9	29	Light green and black	COM
S/S0	Light green and red	10	30	Light green and green	COM
X8	Blue	11	31	Blue and black	Y8
X9	Blue and white	12	32	Light blue	Y9
X10	Light blue and black	13	33	Light blue and red	Y10
X11	Purple	14	34	Purple and black	Y11
X12	Purple and red	15	35	Purple and white	Y12
X13	Gray	16	36	Gray and black	Y13
X14	Gray and red	17	37	Gray and green	Y14
X15	White	18	38	Black and white	Y15
S/S1	Pink	19	39	Pink and black	COM
S/S1	Pink and red	20	40	Black	COM

MFW40N-150 Pins

11-2-3 MFW40NS-300 Specifications

Appearance and Function



MFW40NS-300 Appearance

Technical Specification

MFW40NS-3000 Specifications Table

Item	Technical Specification
Model	MFW40NS-300
Length	3M
Wire Sizes	AWG22
Function	One end is connected to the 40pin High-Density DIO Connector of the expansion module, and the other end is a loose wire that can be processed by the customer.
Isolation Method	No isolation, N ground wire

Pin

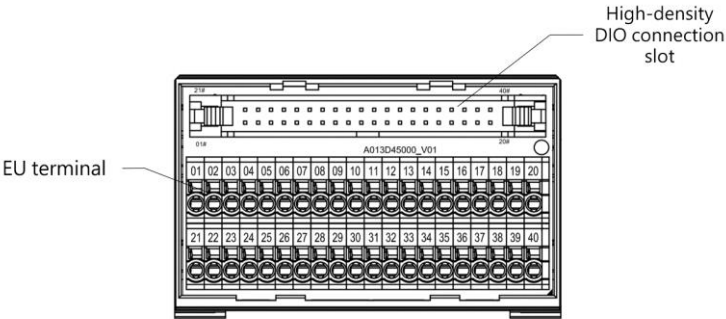
MFW40NS-300					
X0	Brown	1	21	Red	Y0
X1	Orange	2	22	Yellow	Y1
X2	Green	3	23	Blue	Y2
X3	Purple	4	24	Gray	Y3
X4	White	5	25	Black	Y4
X5	Brown	1	21	Red	Y5
X6	Orange	2	22	Yellow	Y6
X7	Green	3	23	Blue	Y7
S/S0	Purple	4	24	Gray	COM
S/S0	White	5	25	Black	COM
X8	Brown	1	21	Red	Y8
X9	Orange	2	22	Yellow	Y9
X10	Green	3	23	Blue	Y10
X11	Purple	4	24	Gray	Y11
X12	White	5	25	Black	Y12
X13	Brown	1	21	Red	Y13
X14	Orange	2	22	Yellow	Y14
X15	Green	3	23	Blue	Y15
S/S1	Purple	4	24	Gray	COM
S/S1	White	5	25	Black	COM

MFW40NS-300 Pins

11-3 DIO Converter Module

11-3-1 MFT40T Specifications

Appearance and Function



MFT40T Appearance

Technical Specification

MFT40T Specifications Table

Item	Technical Specification
Model	MFT40T
Function	I/O Module for wiring (40 pins DIO Converter Module)
對應轉接模組	MFW40I-50 (High-Density DIO Cable)

Pin

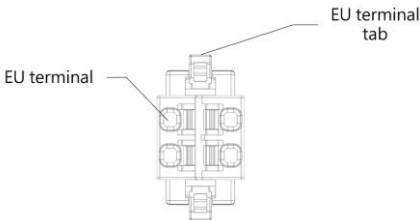
MFT40T			
X0	1	21	Y0
X1	2	22	Y1
X2	3	23	Y2
X3	4	24	Y3
X4	5	25	Y4
X5	6	26	Y5
X6	7	27	Y6
X7	8	28	Y7
S/S0	9	29	COM
S/S0	10	30	COM
X8	11	31	Y8
X9	12	32	Y9
X10	13	33	Y10
X11	14	34	Y11
X12	15	35	Y12
X13	16	36	Y13
X14	17	37	Y14
X15	18	38	Y15
S/S1	19	39	COM
S/S1	20	40	COM

MFT40T Pins

11-4 European terminal

11-4-1 MFT04C Specifications

Appearance and Function



MFT04C Appearance

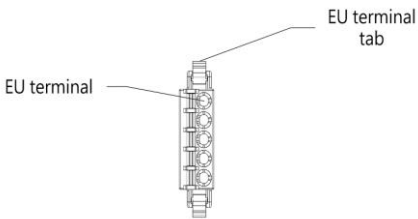
Technical Specification

MFT04C Specifications Table

Item	Technical Specification
Model	MFT04C
Pin	2X2pins Crimp type European terminal
Function	2X2pins Crimp type European terminal for High-Speed Communication Module

11-4-2 MFT05C Specifications

Appearance and Function



MFT05C Appearance

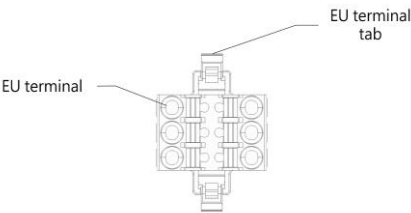
Technical Specification

MFT05C Specifications Table

Item	Technical Specification
Model	MFT05C
Pin	1X5pins Crimp type European terminal
Function	1X5pin2X2pins Crimp type European terminal for MQ Plug-in Expansion Boards

11-4-3 MFT06C Specifications

Appearance and Function



MFT06C Appearance

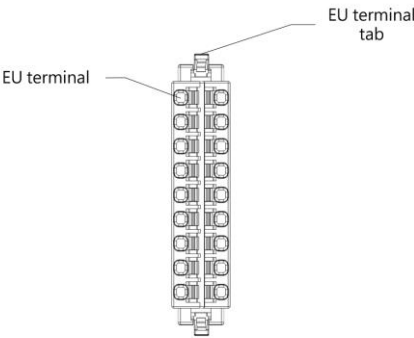
Technical Specification

MFT06C Specifications Table

Item	Technical Specification
Model	MFT06C
Pin	2X3pins Crimp type European terminal
Function	2X3pins Crimp type European terminal for CPU Module

11-4-4 MFT18C Specifications

Appearance and Function



MFT18C Appearance

Technical Specification

MFT18C Specifications Table

Item	Technical Specification
Model	MFT18C
Pin	2X9pins Crimp type European terminal
Function	2X9pin Crimp type European terminal for local I/O expansion module

12

Plug-in Expansion Boards application

12-1 Digital input Plug-in Module Specifications

12-1-1 MB-4X

This is a digital input plug-in module for the MQ model. It can be expanded to two at most. The upper one is fixed to X16-X19, and the lower one is fixed to X20-X23. Its specifications and usage are the same as the M16X module. For details, please refer to [M16X](#).

12-2 Digital output Plug-in Module Specifications

12-2-1 MB-4YT/MB-4YJ

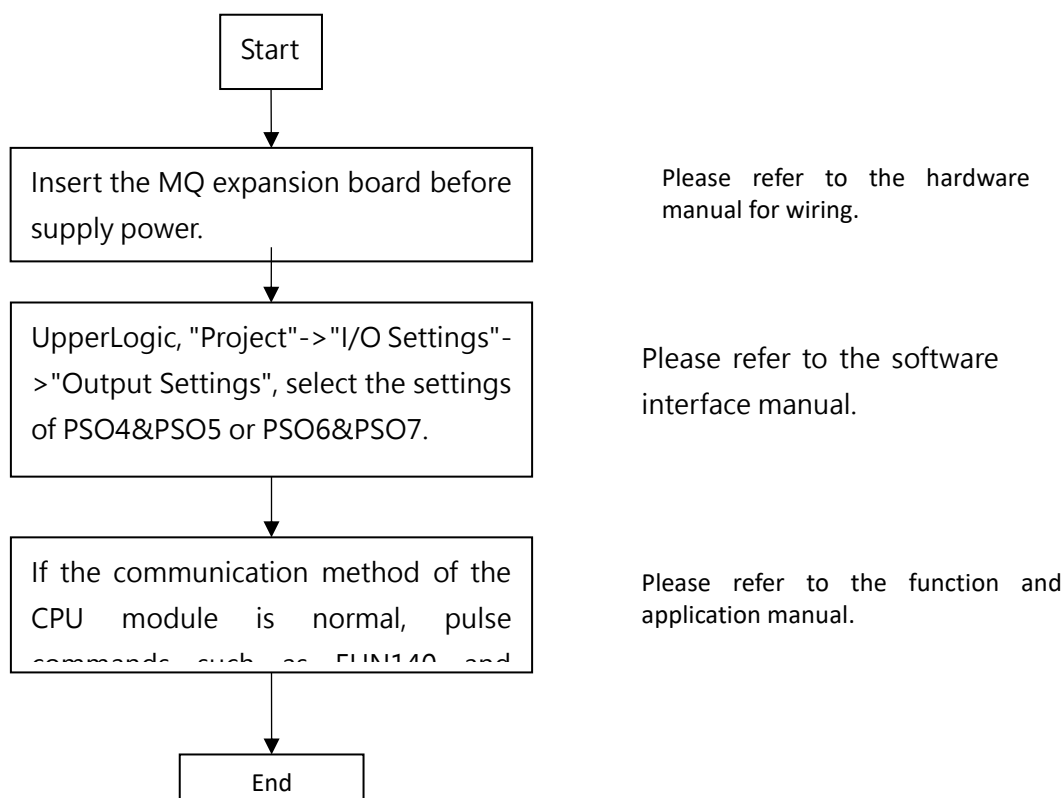
This is a digital output plug-in module for the MQ model. It can be expanded to two at most. The upper one is fixed to Y16-Y19, and the lower one is fixed to Y20-Y23. Its specifications and usage are the same as the M16Y module. For details, please refer to [M16YT/M16YJ](#).

12-3 High Speed Digital output Plug-in Module Specifications

12-3-1 MB-2PSOT

This is the pulse output plug-in module for the MQ model. It can be expanded to two at most. The upper one is fixed to PSO4 and PSO5; the lower one is fixed to PSO6 and PSO7.

Usage steps:



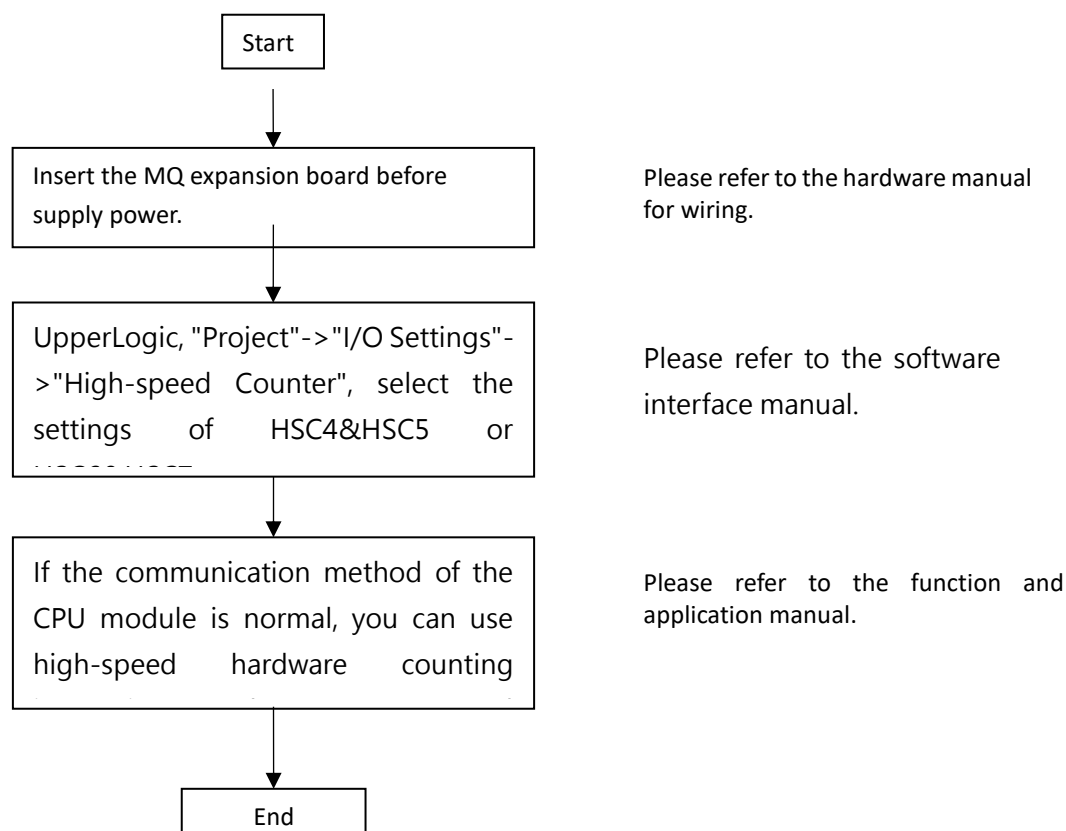
The software and instructions are used like the built-in HPSO output on the PLC host. Please refer to Chapter 9 Pulse Output and NC Positioning Control in the Function and Application Manual.

12-4 High Speed Digital Input Plug-in Module Specifications

12-4-1 MB-2HSC

This is a high-speed counting plug-in module for the MQ model. It can be expanded to two at most. The upper ones are fixed to HSC4 and HSC5; the lower ones are fixed to HSC6 and HSC7.

Usage steps:



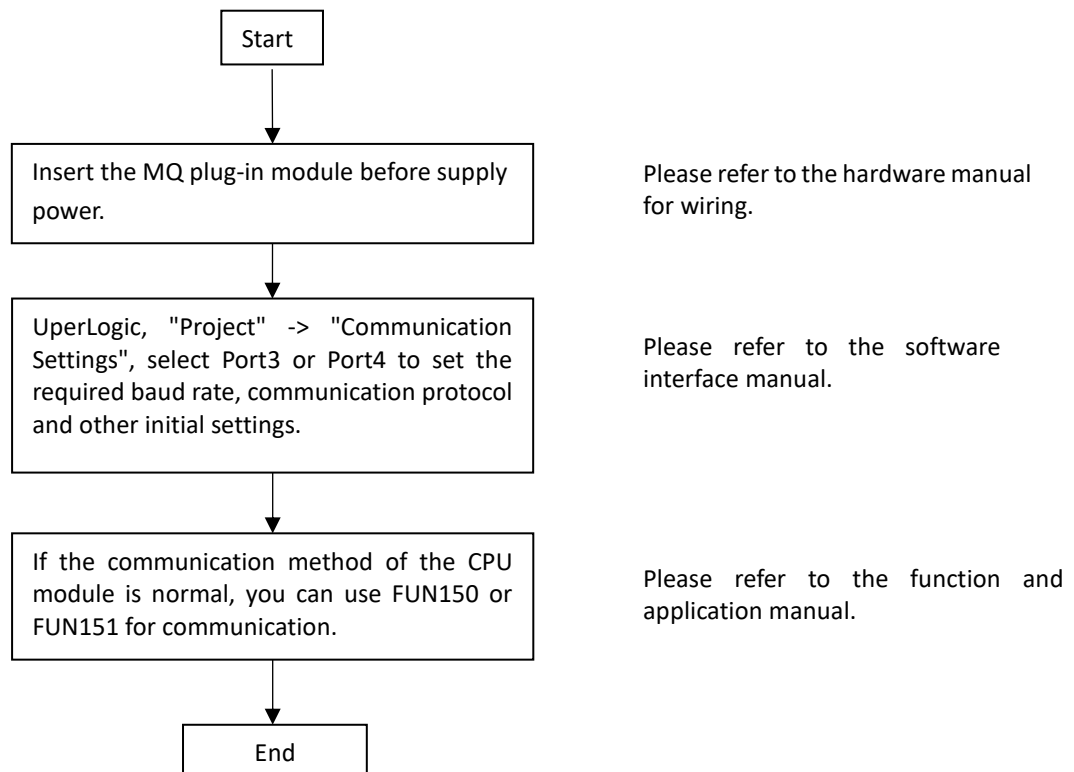
The software and instructions are used like the built-in HSC high-speed counter on the PLC host. Please refer to Chapter 8 High-speed Counter and Timer in the Function and Application Manual, Chapter 8-1 High-speed Counter.

12-5 Communication Plug-in Module Specifications

12-5-1 MB-CB2

This is an RS232 plug-in module for the MQ model. It can be expanded to two at most. The upper one is fixed to PORT3; the lower one is fixed to PORT4.

Usage steps:

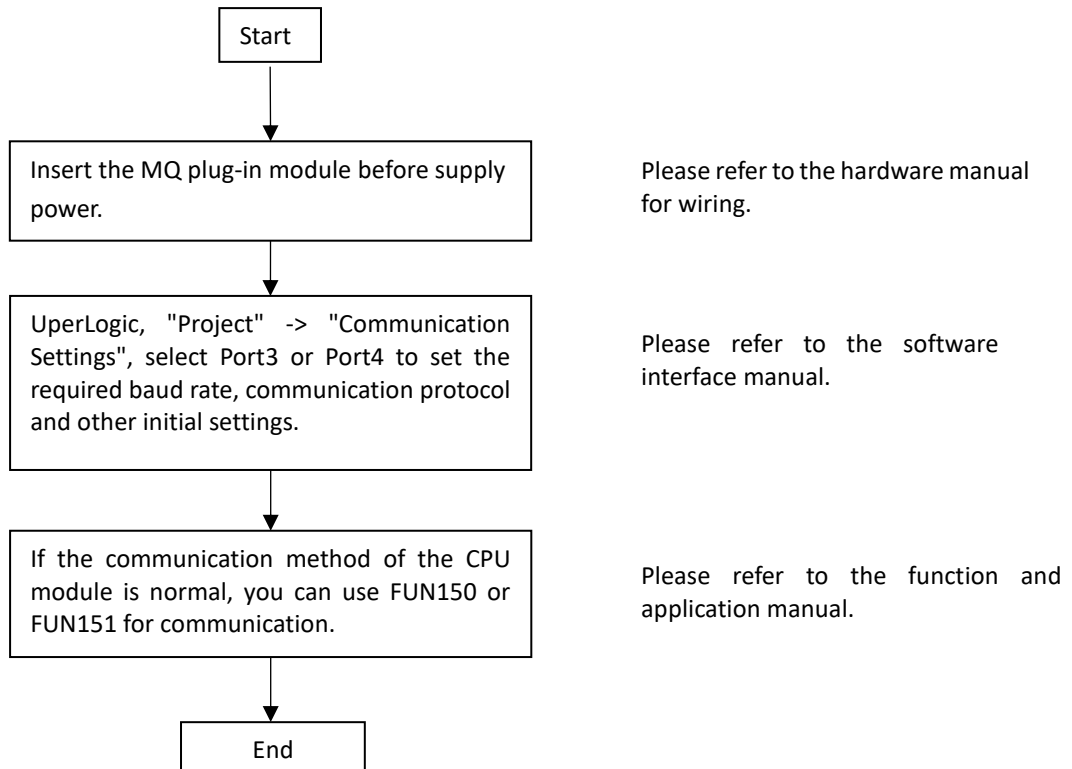


The software and instructions are used like the two RS485 built-in on the PLC host. Please refer to Chapter 10 Serial Communication in the Function and Application Manual.

12-5-2 MB-CB5

This is an RS485 plug-in module for the MQ model. It can be expanded to two at most. The upper one is fixed to PORT3; the lower one is fixed to PORT4.

Usage steps:



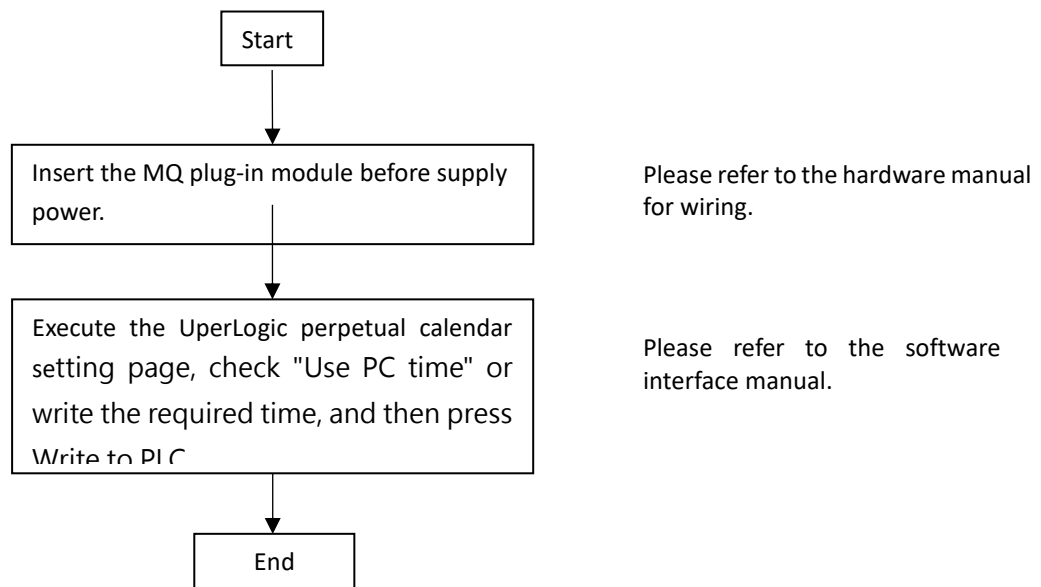
The software and instructions are used like the two RS485 built-in on the PLC host. Please refer to Chapter 10 Serial Communication in the Function and Application Manual.

12-6 RTC Plug-in Module Specifications

12-6-1 MB-RTC

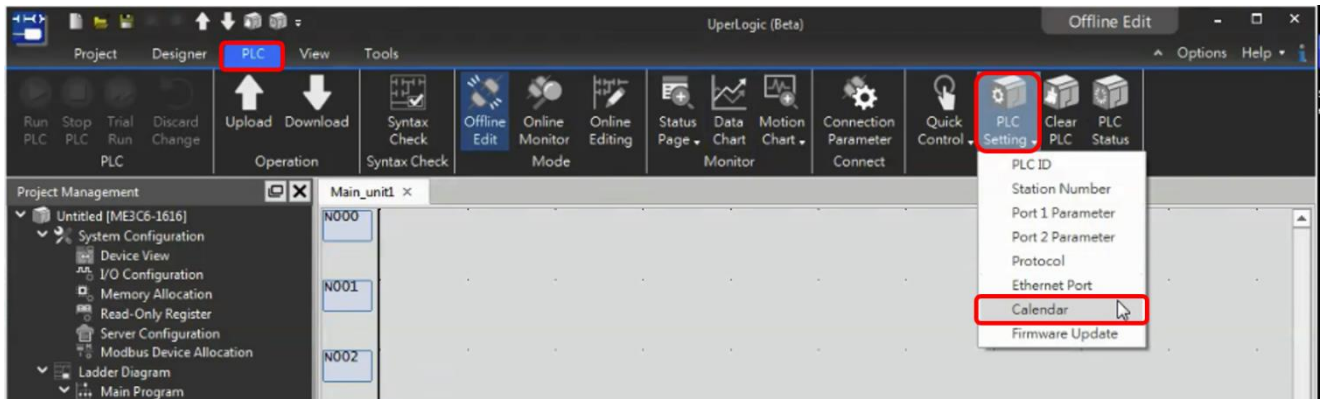
This is an RTC perpetual calendar plug-in module for the MQ model. The host does not have a built-in perpetual calendar, and can be expanded to one at most.

Usage steps:



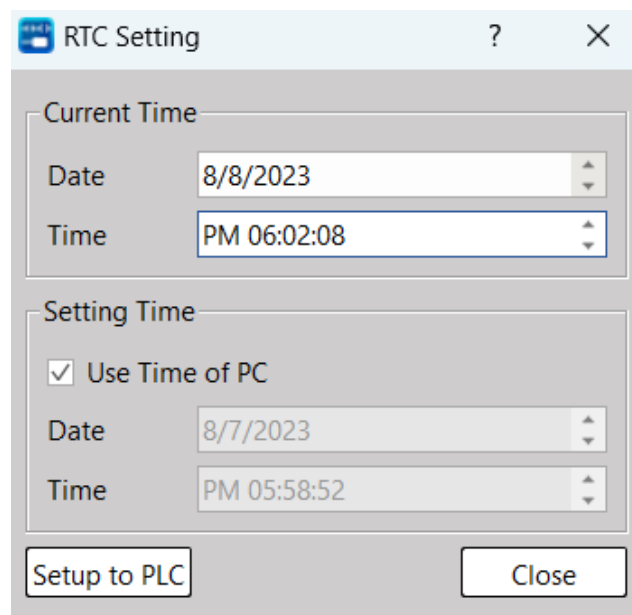
By setting with the software UperLogic, it allows users to set up the calendar time(RTC) without the need of using special M9179 relay and Ladder control function. The steps described below are the corresponding setting and operation methods:

1. Open the UperLogic and then connect it to the PLC that will be set.
2. In the upper left tool bar, click PLC-> PLC set -> RTC.



1. Figure 2 Selections of RTC Settings

3. After being selected, the following page will be exported.



2. Figure 3 Window of RTC Settings

4. Adjust the time that will be set and then click the "Set to PLC" option.

Instructions and notice for the RTC setting window:

- "Current Time" column: The current time retrieved from PLC under online status.
- "Set Time" column: Tick "Use PC Time" and the PC time will be displayed in the lower-side column. Next, press the "Set to PLC" button and "Current Time" will be changed to current PC time.
- When cancelling the ticking of "Use PC Time", you may change the "Date" and "Time" in the lower-side column as required. Next, press the "Set to PLC" button again and "Current PLC Time" will be changed to the time being set currently.
- When the PLC stops running, you cannot set the RTC and the picture below will appear.

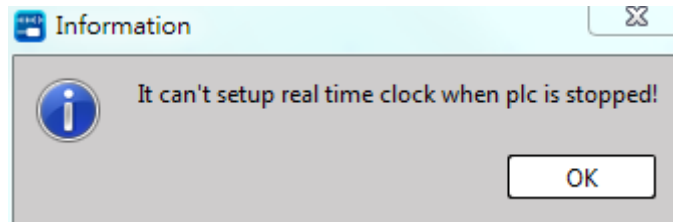


Figure 4 RTC setting is not available when the PLC stops running.

13

Expansion modules application

I/O Address of Analog Input/Output Modules

The input point numbers of the analog I/O modules are calculated from the module closest to the CPU unit, and the channel values of each module correspond to the I/O registers IR (starting at R34768) and OR (starting at R35024) inside the PLC, but the total number of IR/OR varies with different models, please refer to the system specifications and model descriptions. In order to facilitate the user's use and save the effort of calculation, the software UperLogic will automatically detect and allocate them after connecting with the PLC. In addition, the data size will be different depending on the model of the module, therefore, it may occupy 16-bit or 32-bit of value space.

Module ID

Each module connected to the PLC will get a unique identification code ID, the number starts from 0. This number will be used for the ID item in the related command to control the specified module, and the user can obtain this information from the DeviceView of UperLogic.

Module Types

There are three types of connections between modules and PLCs: Advanced, Local I/O, High speed and Plug-in. The High speed is used for large amounts of data or high-speed data exchange needs. It can only connect up to six units and must be directly connected. Continuously connected to the right side of PLC. The current module related information is as follows.

Connection Types	Modules
Local I/O expansion	M16X/M16Y/M1616XY M04AD/M04ADR M04DA/M04DAR M0202AH M04TC/M04TCR M0202TH M02LC/M02LCR
High speed expansion	MHCM22/MHCM25/MHCM55
Advanced expansion	-
Plug-in expansion ※only MQ type support	MB-4X MB-4YT/MB-4YJ MB-2PSOT MB-2HSC MB-CB2 MB-RTC

System-Related Register

The system provides two special register information for modules: heartbeat detection and current points. Each bit of the heartbeat register corresponds to a module, and when it is 1, it means that the communication is alive within a designated period of time; the system will automatically detect the heartbeat status of all modules, will alarm when it is abnormal, and will be put into STOP mode even after it has been recovered.

Register	Register No.
Heartbeat Detection (ID: 0 ~ 15)	R35374
Heartbeat Detection (ID: 16 ~ 31)	R35375
Heartbeat Detection (ID: 32 ~ 47)	R35376
Heartbeat Detection (ID: 48 ~ 63)	R35377
Expanded Analog Input points	R35378
Expanded Analog Output points	R35379
Expanded Digital Input points	R35380
Expanded Digital Output points	R35381

13-1 Introduction to the digital input module

13-1-1 M16X

The digital input module provides 16bits input points, the module will convert the input signal into digital status 0 or 1.

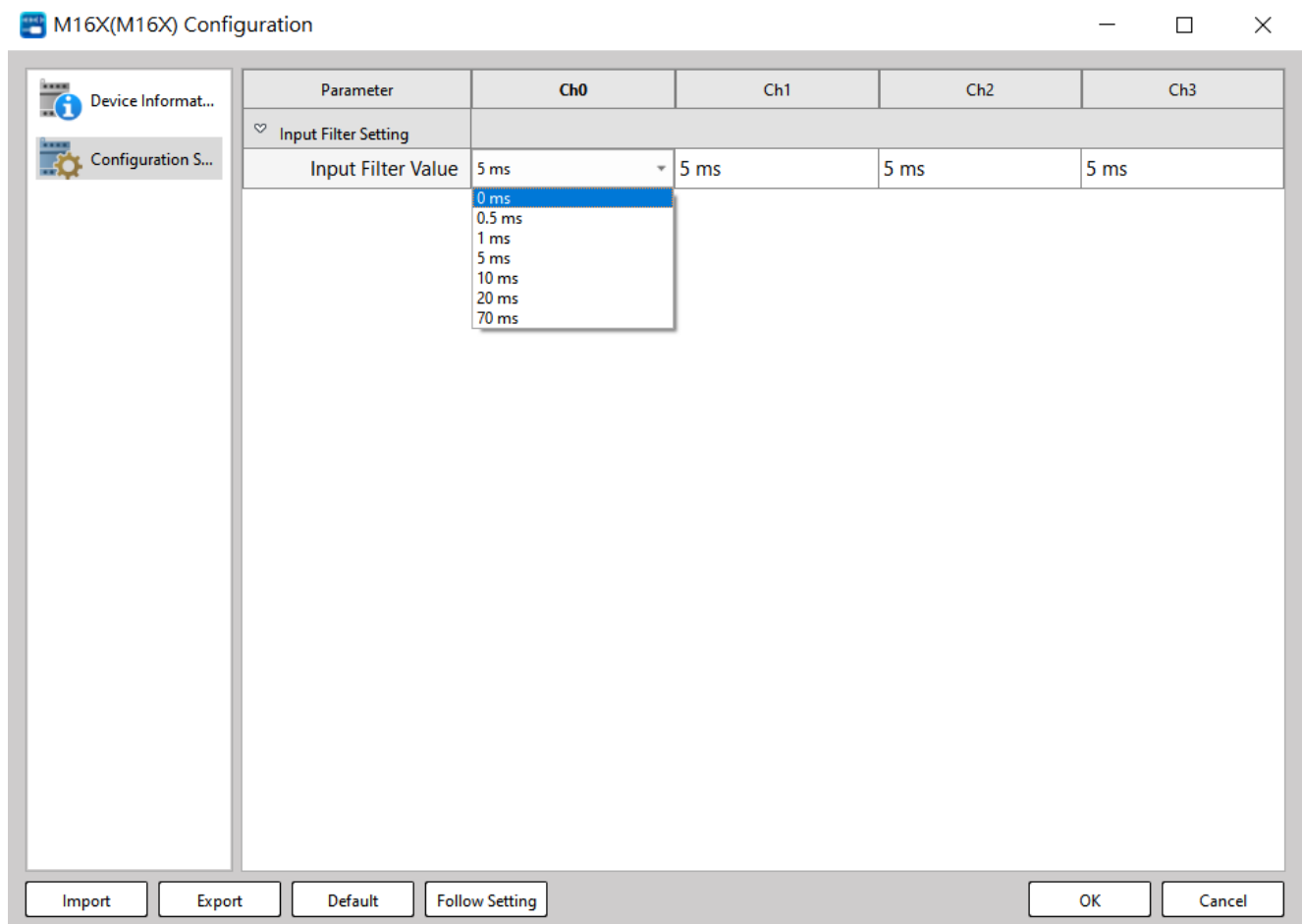
13-1-2 M16X features

The M16X modules provide 4 channels of filter, the channel 0 works on bit 1-4, channel 1 works on bit 5-8, and so on.

Filter function support following 7 different settings: [0 ms · 0.5 ms · 1 ms · 5 ms · 10 ms · 20 ms · 70 ms].

Take 5ms setting for example, when the input signal sustains unchanged within 5ms, it then is considered a legit input. Otherwise, the status remains the same and this change will be filtered out.

The default value setting is 5ms. When value setting is 0ms, which means the filter function is disabled.



13-2 Introduction to the digital output module

13-2-1 M16YT / M16YJ

Digital output module provides 16bits for output, the module will convert the digital status 0 and 1 into a physical output signal.

13-2-2 M16YT / M16YJ function

Digital output module does not require further configuration.

13-3 Digital Input /Output Combo Specifications

13-3-1 M1616XYT / M1616XYJ

Digital hybrid module provides 32bits, with 16 input bits and 16 output bits. Input bits convert the input signal into digital status 0 or 1, whereas the digital status 0 and 1 is converted into the output signal.

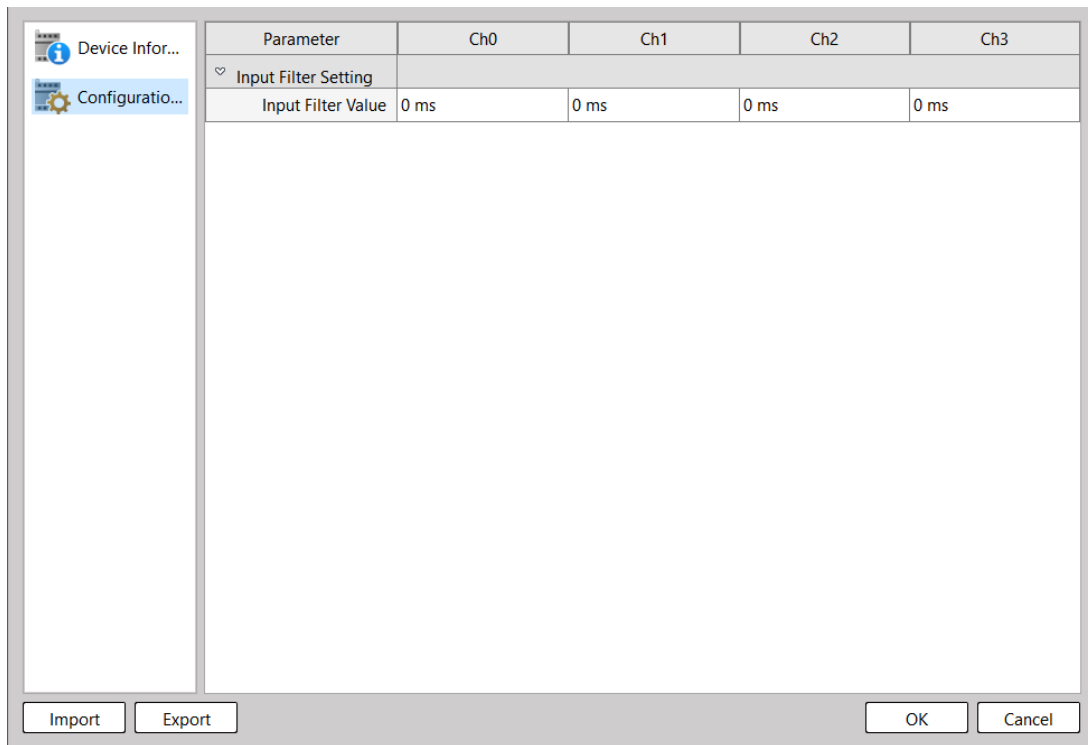
13-3-2 M1616XYT / M1616XYJ function

The 1616XYT/M1616XYJ modules provide 4 channels of filter, the channel 0 works on point 1-4, channel 1 works on point 5-8, and so on.

Filter function support following 7 different settings: [0 ms · 0.5 ms · 1 ms · 5 ms · 10 ms · 20 ms · 70 ms].

Take 5ms setting for example, when the input signal sustains unchanged within 5ms, it then is considered a legit input. Otherwise, the status remains the same and this change will be filtered out.

The default value setting is 5ms. When value setting is 0ms, which means the filter function is disabled.



13-4 Communication module

The M-series CPU unit has two built-in RS-485 serial ports. Besides that, for MA/MS/ME-series PLC, you can add MHCM modules to increase the number of communication ports up to total 14 of them; For MQ-series, you can add additional communication boards up to total 4 of them.

MHCM is only supported in MA/MS/ME-series PLC, where each MHCM22/25/55 module provides two ports: MHCM22 has two RS232 interfaces, MHCM25 has RS232 and RS485 interfaces, and MHCM55 has two RS485 interfaces. Each port can either be master or slave, supporting Modbus ASCII/RTU and user-defined communication protocols, which can be configured through software UperLogic. If you configure it as a Modbus master, you need to use the communication instruction FUN156 CMCTL; if you configure it as a Modbus slave, it shares the Modbus map of the PLC CPU module; if the configuration is a user-defined protocol, you need to use the communication instruction FUN156 CMCTL, and it is necessary to set the communication protocol in alignment with individual device. Each communication protocol can be set to three types of communication, including send, receive, and send & receive. The packet can be defined by the user, and can be defined as constants, check codes, PLC registers, etc. The user-defined protocol enables PLC to freely expand and communicate with different devices. The naming method of the communication module is as mentioned above. The 2 of MHCM represents the RS-232 interface, and the 5 represents the RS-485 interface. The specifications and appearance are as follows.

Upon delivery, the communication parameters will be preset as below:

Communication setting	Preset value
Baud rate	9600bps

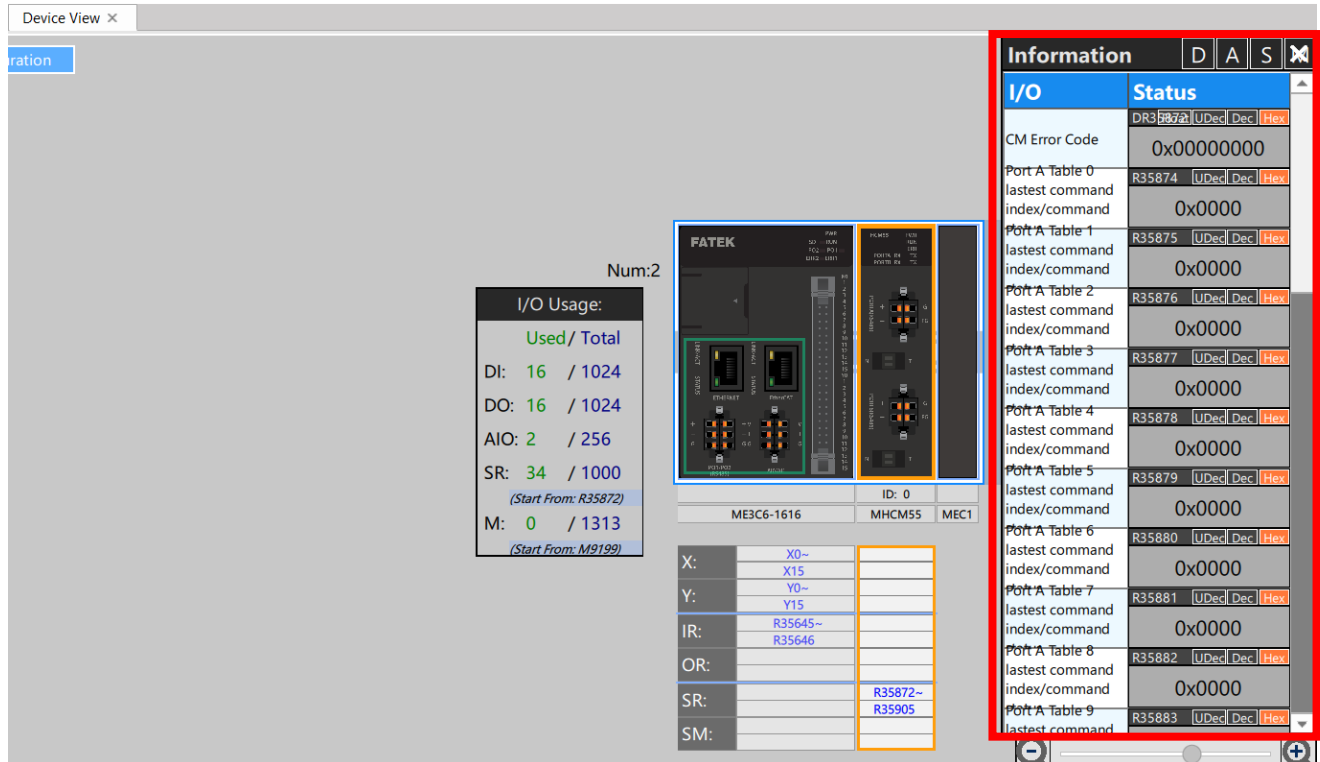
Data bit number	8 Bits
Parity checking	Even
Stopping bit number	1 Bit

Table 28 Preset value of the communication setting

13-4-1 I/O Status

Find the information of the MHCM module from the device monitor.

Click [Project] → [Device Window] → [Device Monitor] in the execution function bar. The device monitoring window on the right will be shown as in the figure below.



Device Monitoring

I/O Status shows the communication connection status of each table for each port. High byte defines the index of the command, and low byte defines the status code as follows.

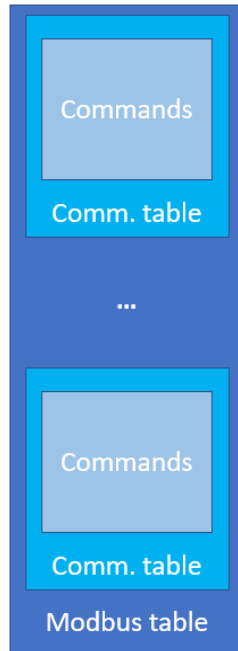
Status Code	Description
0	Normal operation
1	Receive overtime
2	Packet error
Other	Reserved

13-4-2 Communication mode

The MHCM module can be configured with Modbus or user-defined communication protocols for different ports, and different communication protocols and communication parameters can be set between ports. In the Modbus protocol, it distinguishes the master station and the servant station for users to choose.

13-4-3 Modbus Communication Protoacal(Master)

The Modbus communication protocol supports RTU/ASCII mode. When serving as a master, communication commands should be configured by order in the corresponding tables. Based on the configured setting, the MHCM module will transmit commands to the slave sequentially and then wait for reply. The Modbus table supports at most 16 sets of communication tables, which defines the order by which commands will be transmitted.



The illustration of Modbus Master Table

When executing according to Modbus table, the MHCM module will check the status of Communication Table #0 to Communication Table #15 sequentially and then execute the corresponding action. After executing the communication table, the MHCM module will start from Communication Table #0 again. The status of communication table can be controlled through PLC commands and such control can be set as "Run Once" , "Run Cycling" , and "Stop" .

Control Status	Action
Run Once(0)	Execute "Run once" and appoint the target communication tables, where all of the commands in the table will be transmitted once sequentially.
Run Cycling(1)	Execute "Run Cycling" and appoint the target communication tables, where all of the commands in the table will be transmitted continuously and sequentially.
Stop(2)	Stop the execution. When restarting, it will start executing the table again.

Control Status of Modbus Master Table

When using the MHCM module as a master, the following time-related parameters are provided to change the behavior.

Time-related parameter	Unit	Behavior
Send delay time	ms	After executing a command, the master waits for the elapsing of "Send delay time" before executing the next one.
Receive timeout interval	ms	If the master does not receive the packet within "Send timeout interval" , then it will be judged as receiving timeout.
Send retry interval	ms	When receiving timeout occurs, the master waits for the elapsing of "Send retry interval" for "Send retry count" times before executing the next one.
Send retry count	Count	

Modbus Master Time-related Parameter Table

The Modbus table supports at most 16 sets of communication tables and each communication table contains commands that will be transmitted. In each communication table, the maximum number of commands is 256. When configuring the Modbus table, you need to set up communication table #0–#15 sequentially. In the communication table, each command shall define the ON/OFF, read/write, PLC type, and Modbus register type, etc. After being configured, you need to save the Modbus table in the module and the module will execute according to the communication table and the sequence of the commands. For detailed setting of order, please refer to the table below.

COM0 Master Table

Master Table

AddDelete

No.	Description
0	

Master Table 0 Setting

ClearMove UpMove DownAddDelete

No.	Description	Enable	Slave Station Number	Read/Write	Register Type	Register Address	R/W Direction	PLC Member	PLC Address	Data
0		☒	1	Read	Coil (0x)	1	->	X	0	1

Order parameter	Description
Enable	Enable/disable of the command
Read/write	Read/Write operations of PLC data.
Slave Station Number	The station no. as a slave.
Register Type	The type of the Modbus device memory.
Register Address	The address of the Modbus device memory.
PLC Member	The type of the PLC device memory.
PLC Address	The address of the PLC device memory.
Data length	The size of the data that will be written or read.
Enable	Enable/disable of the command

Communication parameters of a Modbus master

13-4-4 Modbus Communication Protocol (Slave)

Modbus station table diagram:

The Modbus communication protocol supports RTU/ASCII mode. When used as a slave, it shares the same Modbus map configured in the PLC. When used as a slave, the MHCM module allows the configuration of the following time-related parameter.

Time-related Parameter	Unit	Behavior
Reply delay time	ms	After executing the command and receiving the response, the MHCM needs to wait for "Reply delay time" before reply.

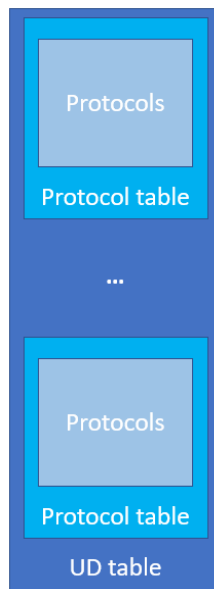
Modbus Slave Time-related Parameter

13-4-5 User-defined communication protocols

When setting as user-defined communication protocol (UD protocol), it should be configured with user defined table (UD table). The communication protocol table, communication setup table, user defined packet and user defined table shall support maximum 16 sets of communication protocol tables, with each communication protocol table containing several communication protocols that should be transmitted. Each communication protocol provides 3 different types of communication packets, including transmitted packet, received packet and transmitted & received packet.

The packet pool can support 32 sets of different packet format. The packet format can be defined by the user for classifying them into constant, check code and PLC register, etc. Through user-defined packets, the PLC will be allowed to communicate with other devices.

Based on the communication type, each communication protocol shall be allowed to select the outgoing packet and incoming packet from the packet pool. When executing the communication protocol, the module will transmit specific command to the external device or receive the command from such device according to the outgoing packet or the incoming packet.



The illustration of User-defined Table

When running the user-defined table, the MHCM module will check the status of communication protocol Table #0 to Table #15 sequentially in order to execute the corresponding behavior. After completing the desired table, the MHCM module will start from communication protocol Table #0 again. The status of communication protocol table can be controlled through the PLC command and the control method can be set as "Run Once" , "Run Cycling" or "Stop" .

Control Status	Action
Run Once(0)	Execute "Run once" and appoint the target communication tables, where all of the commands in the table will be transmitted once sequentially.
Run Cycling(1)	Execute "Run Cycling" and appoint the target communication tables, where all of the commands in the table will be transmitted continuously and sequentially.
Stop(2)	Stop the execution. When restarting, it will start executing the table again.

User-defined Status Table

When using the user-defined protocol as a master, the MHCM module will be allowed to set up the following time-related parameters.

Time-related parameter	Unit	Behavior
Send delay time	ms	After executing a command, the master waits for the elapsing of "Send delay time" before executing the next one.
Receive timeout interval	ms	If the master does not receive the packet within "Send timeout interval" , then it will be judged as receiving timeout.
Send retry interval	ms	When receiving timeout occurs, the master waits for the elapsing of "Send retry interval" for "Send retry count" times before executing the next one.
Send retry count	Count	

User-defined Time-related Parameters

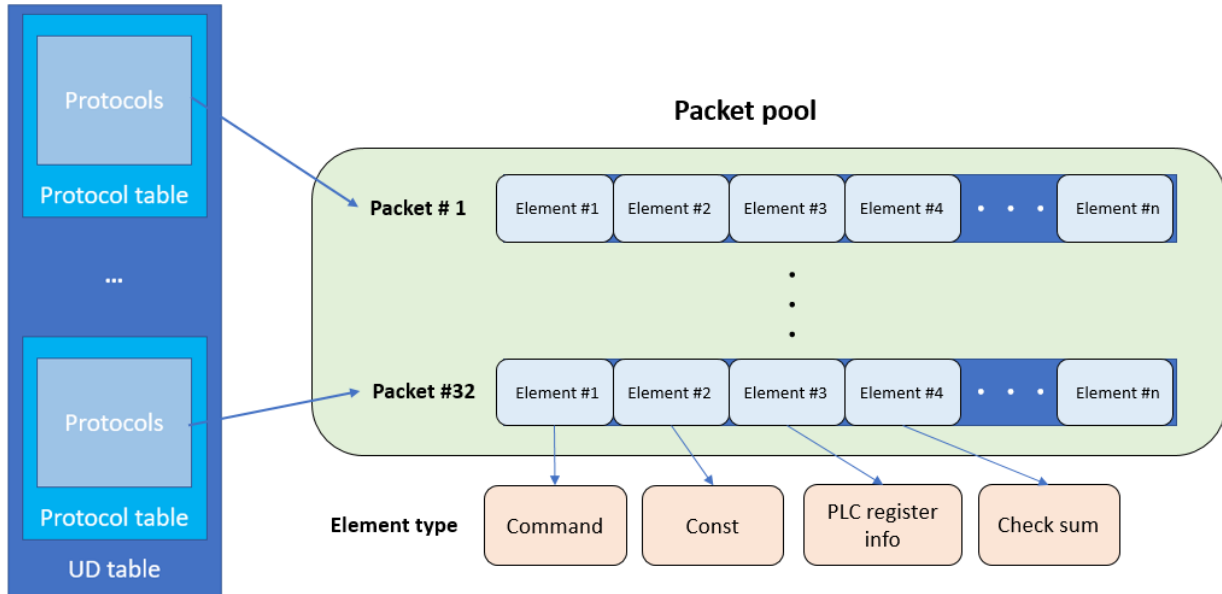
The user-defined table supports at most 16 sets of communication protocol tables and each communication protocol table contains protocols that will be transmitted. In each communication protocol table, the maximum number of protocols is 256.

When configuring the user defined table, you need to set up communication protocol Table #1–#16 according to sequential order. In the communication protocol table, each communication protocol shall be defined with Enable/Disable, Send/Receive/Send & Receive, Tx packet and Rx packet, etc., respectively. After being configured, save the user defined table to the module and the module will run the protocols according to the Communication Protocol Table and the sequence of communication protocols. For detailed setting of communication protocol, please refer to the table below.

Communication protocol parameter	Description
Enable	Enable/Disable the communication protocol.
Packet Mode	Send, receive or send & receive
TX Packet	If the packet mode is send/send & receive mode, the selected packet from the UD Packet pool will be sent.
RX Packet	If the packet mode is receive/send & receive mode, the selected packet format from the UD Packet pool will be used for parsing received data.

Setting the User-defined Table

The UD Packet pool supports at most 32 sets of packets for selecting Tx packet or Rx packet when setting the communication protocol. Being composed of a variety of components, the packet allows the user to execute the setting flexibly as required so that the PLC will be expanded to support more communication devices.



In the packet pool, the maximum number of Elements in a packet is 512.
The Element Type can be defined as Command, Const, Checksum or Register.

- Const

Set the appointed component as the fixed constant.

- Command

Set the appointed component as control characters.

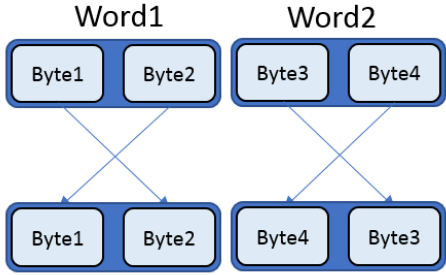
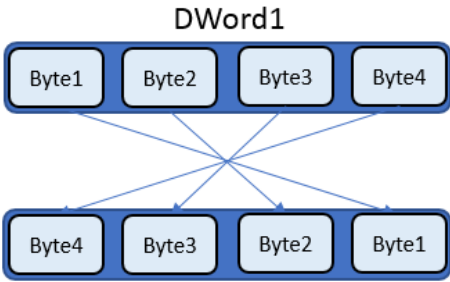
Control Character	HEX
SOH	0x1
STX	0x2
ETX	0x3
EOT	0x4
ENQ	0x5
ACK	0x6
LF	0xA
CR	0xD
NAK	0x15
SYN	0x16
ETB	0x17
ESC	0x1B

Control Character table

Register

Based on the binding type of Tx packet and Rx packet in the communication protocol, the software will determine whether to read from or write in the PLC data.

If the packet is set as Tx packet, the software will read the PLC data according to the register action mode and then update it to the appointed component. If the packet is set as Rx packet, then the software will write the component data in the PLC register according to the register action mode. For detailed PLC register information setting, please refer to the table below.

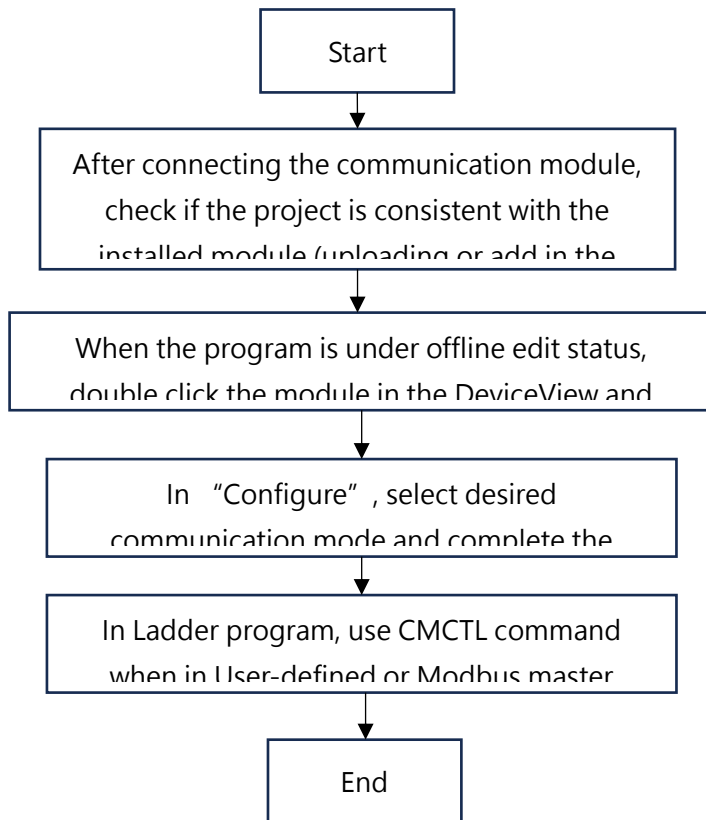
Component	Description
PLC register type	The type of PLC register
PLC address	The Address of the PLC register.
Data length	The size of the data.
Register action	- None - Byte Swap The data required for PLC reading and writing shall be Word or DWord (based on the register type). Byte swap by word:  Byte swap by DWord: 

Checksum

Set the appointed component as checksum and it is required to appoint the type, the start position and the length of the checksum. Based on the content of the packet, the MHCM Module will calculate the checksum and then update it to the appointed component.

Component check code	Description
Checksum Type	CRC, TOTAL_BYTE, TOTAL_WORD, XOR, AND, OR, LRC, TOTAL_COMPLEMENT, and TOTAL_INVERSE.
Checksum Start Index	The starting position of the checksum that will be calculated.
Checksum Length	The length of the checksum that will be calculated.

Parameter table of check codes

13-4-6 Serial communication module control instruction (CMCTL)

Please refer to the instruction user manual for the details of information.

CMCTL Directive:

FUN156P CMCTL	CMCTL	FUN156P CMCTL
Instruction Description		
EN PAU 156. CMCTL ID : Pt : Ts : MD : WR : ERR ID: Module number used Pt: Appointed COMA/COMB (A= 0; B=1) Ts: Communication table mask Bit 1: Table 1 Bit 2: Table 2 Bit 15: Table 15 Bit 16–Bit 31: Retained. Do not use. MD: Setting the mode 0: RUN ONCE 1: RUN CYCLING 2: STOP WR: Storage working status Bit0–Bit1: Table 0 state Bit2–Bit3: Table 1 state Bit30–Bit31: Table 15 state (= 0: RUN_ONCE = 1: RUN_CYCLING = 2: STOP)		

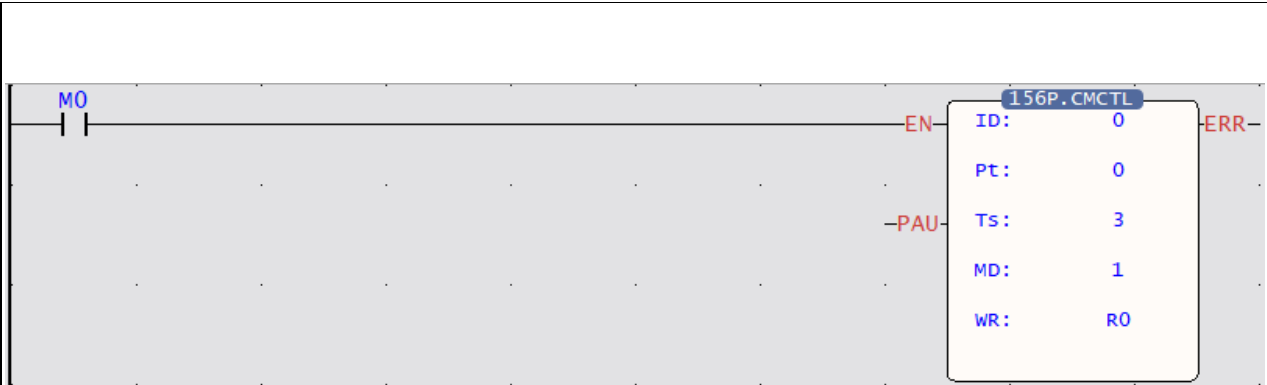
FUN156P CMCTL	CMCTL						FUN156P CMCTL																																																												
<table><tr><th rowspan="3">Operator range</th><th>LD</th><th>OP</th><th>SD</th><th>POD</th><th>DP</th><th>K</th></tr><tr><td>R0</td><td>R35024</td><td>R35280</td><td>R43224</td><td>D0</td><td></td></tr><tr><td> </td><td> </td><td> </td><td> </td><td> </td><td></td></tr><tr><td></td><td>R34767</td><td>R35151</td><td>R43323</td><td>R47319</td><td>D7999</td><td></td></tr><tr><td>ID</td><td></td><td></td><td></td><td></td><td></td><td>0~127</td></tr><tr><td>Pt</td><td></td><td></td><td></td><td></td><td></td><td>0~23</td></tr><tr><td>Ts</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>0~63</td></tr><tr><td>MD</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>0~63</td></tr><tr><td>WR</td><td>○</td><td></td><td></td><td>○</td><td>○</td><td>5word</td></tr></table>							Operator range	LD	OP	SD	POD	DP	K	R0	R35024	R35280	R43224	D0									R34767	R35151	R43323	R47319	D7999		ID						0~127	Pt						0~23	Ts	○	○	○	○	○	0~63	MD	○	○	○	○	○	0~63	WR	○			○	○	5word
Operator range	LD	OP	SD	POD	DP	K																																																													
	R0	R35024	R35280	R43224	D0																																																														
	R34767	R35151	R43323	R47319	D7999																																																														
ID						0~127																																																													
Pt						0~23																																																													
Ts	○	○	○	○	○	0~63																																																													
MD	○	○	○	○	○	0~63																																																													
WR	○			○	○	5word																																																													
Feature description	This command is used with the communication modules HCM25 and HCM55, and the relevant settings need to be configured by the software before use																																																																		

- When EN OFF->ON, communication control will be carried out for the specified port, and when ON->OFF, it will stop.
- PAU is not yet supported
- The communication status code for each form is updated in the assigned status register, and the address can be checked using the device view

FUN156: Explanation of WR

Bit0	Table0 status	Table0 = 0(00): RUN_ONCE
		= 1(01): RUN_CYCLING
Bit1		= 2(10): STOP
Bit2	Table1 status	Table1 = 0(00): RUN_ONCE
		= 1(01): RUN_CYCLING
Bit3		= 2(10): STOP
Bit4	Table2 status	Table2 = 0(00): RUN_ONCE
		= 1(01): RUN_CYCLING
Bit5		= 2(10): STOP
Bit6	Table3 status	Table3 = 0(00): RUN_ONCE
		= 1(01): RUN_CYCLING
Bit7		= 2(10): STOP
Bit30	Table15 status	Table15 = 0(00): RUN_ONCE
		= 1(01): RUN_CYCLING
Bit31		= 2(10): STOP

Example of a
program



For example, when M0 is 1, Port 0 of the first module will be turned on, and Table 1 and Table 2 will be controlled to communicate (0001b+0010b=0011b is equal to 3(10)), MD selects RUN CYCLING mode to indicate continuous communication, and R0 stores the current mode of each table.

13-4-7 Error Code

HCM SR Code				
	MODBUS Mater	MODBUS Slave	UD Send	UD Receive
0x00	inerrancy	inerrancy	inerrancy	inerrancy
0x01	There was no response from the servant (time-out)		There was no response from the servant (time-out)	
0x02	Abnormal communication (Received Wrong Format)	Abnormal communication (Received Wrong Format)	Abnormal communication (Received Wrong Format)	Abnormal communication (Received Wrong Format)
0x03			Abnormal communication (Error length received)	Abnormal communication (Error length received)
0x04	Launch the non-existent form		Launch the non-existent form	Enabled non-existent forms/enabled existential forms
0x05	Successful Transaction (One-Time Mode)		Successful Transaction (One-Time Mode)	
0xA1	Modbus16 0x01 Unsupported feature codes	Unsupported feature codes		
0xA2	Modbus17 0x02 Unsupported addresses	Unsupported addresses		
0xA3	Modbus16 0x03 Invalid values	Invalid values		
0xA4	Modbus17 0x04 The equipment of Park Station is abnormal			
0xA5	Modbus(s) modbus 0x05			
0xA6	Modbus17 0x06			
0xA7	Modbus(s) modbus 0x07			
0xA8	Modbus16 0x08			
0xA9	Modbus16 0x09			

9				
0xA A	Modbus Error code 0x0A			
0xA B	Modbus Error code 0x0B			
0xA F	Unsupport Modbus Error code			
Internal Identifiers				
0xF 0	No response from the PLC	No response from the PLC	No response from the PLC	No response from the PLC

[MODBUS Master]

- 0: No errors
- 1 : slave not reply(time-out)
- 2: Communication Abnormality (Received to Wrong Format)
- 3 :
- 4: Start the non-existent form
- 5: Transaction Successful (One-time Mode)
- A0~AF : slave reply MODBUS Error code

[MODBUS Slave]

- 0: No errors
- 1 :
- 2: Communication Abnormality (Received to Wrong Format)
- 3 :
- A0~AF:reply MODBUS Error code

[UD Send]

- 0: No errors
- 1 : Slave not reply(time-out)
- 2: Communication Abnormality (Received to Wrong Format)
- 3: Communication Exception (Error Length Received)
- 4: Start the non-existent form
- 5: Transaction Successful (One-time Mode)

[UD Receive]

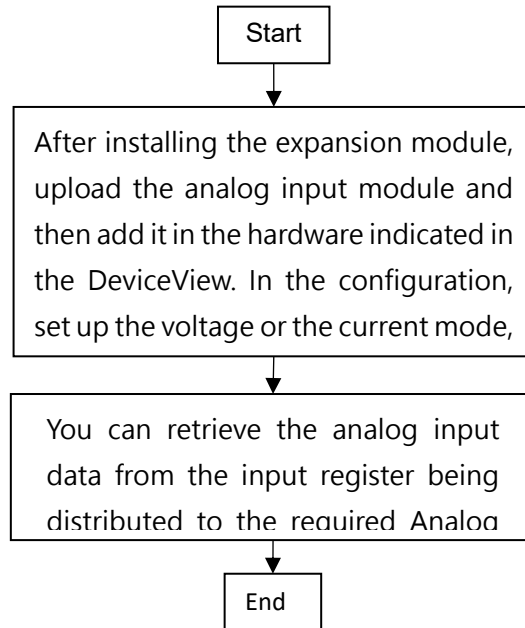
- 0: No errors
- 1 :
- 2: Communication Abnormality (Received to Wrong Format)
- 3: Communication Exception (Error Length Received)
- 4: Start the non-existent form

13-5 General analog input module

13-5-1 M04AD/M04ADR

The analog input module is configured with the following two kinds of different resolutions and they are AI and AIH type of modules. The resolution of AI is rated at 14 bits, whereas that of AIH is rated at 18 bits. The difference between them is the conversion speed and resolution. For details, please refer to "Inputting signal scope" section and "Setting conversion time" section.

Operating Steps to use the analog input module:



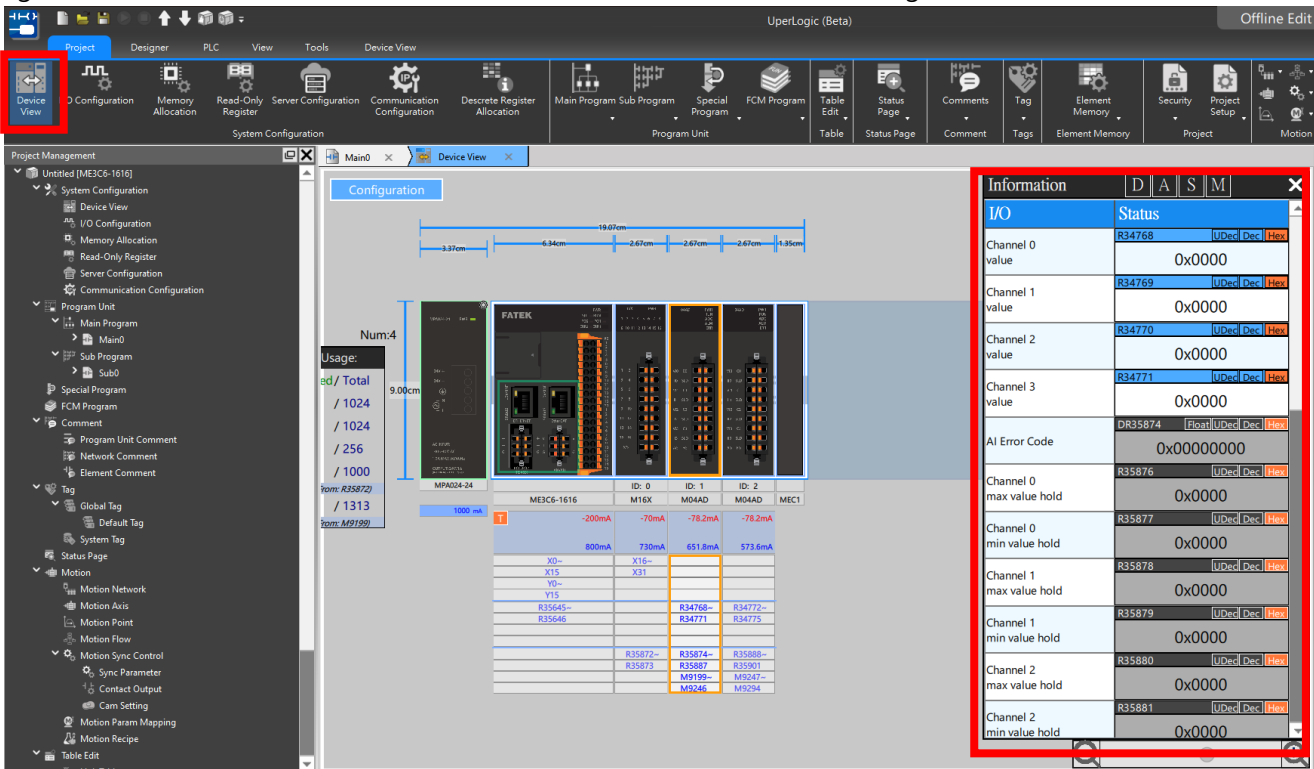
13-5-2 Description of analog input format planning

In terms of analog reading value processing, FATEK provides three commonly used data representation methods and multiple averaging of reading values that can be set to minimize the drifting of reading value caused by interference or unstable input signals in the field.

UperLogic provides a very simple operation interface to plan the data format, effective bits, and average times of analog input readings and other related settings.

Searching for the data of the analog input modules from the machine monitoring:

In function bar, click “Project” → “Device View” → “Device Monitor” and the picture will show the right-side device monitoring window:



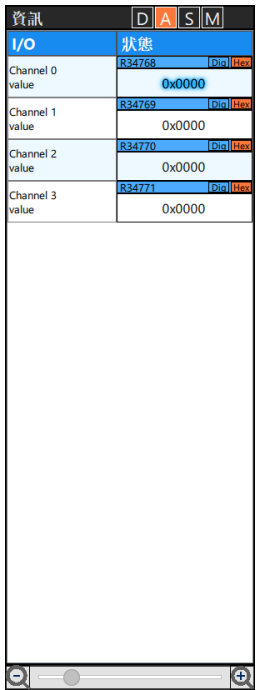
Device Monitor

In the information, you may select the resources to be displayed such as “Digital data” , “Logic data” , “Status data” and “Relay” .

- Logic Data (Analog read value data)

In analog modules (AI, AO, TC), the logic data refer to the values retrieved from the channel.

When clicking the “Logic data” at the upper side “Device monitor”, the Module List will display the logic data only. Place the mouse on the desired value and when the data is lit in blue as per the figure below, you may revise the value of such register. Through the “Dec” and “Hex” on right-hand side of the register, you may also revise the value display pattern instantly.

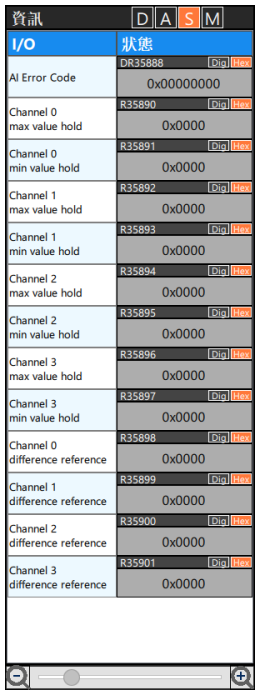


資訊		D	A	S	M
I/O	狀態				
Channel 0 value	R34768	0x0000	Hex		
Channel 1 value	R34769	0x0000	Hex		
Channel 2 value	R34770	0x0000	Hex		
Channel 3 value	R34771	0x0000	Hex		

Logic data in device monitor

● Status Data

When clicking the “Status data” at the upper side “Device monitor” , the Module List will display the status data only. When the data is lit in gray as per figure below, you cannot revise the value of such register; for the “Dec” and “Hex” on right-hand side of the register, however, you will be allowed to revise the value display pattern instantly.



資訊		D	A	S	M
I/O	狀態				
AI Error Code	DR35888	0x00000000	Hex		
Channel 0 max value hold	R35890	0x0000	Hex		
Channel 0 min value hold	R35891	0x0000	Hex		
Channel 1 max value hold	R35892	0x0000	Hex		
Channel 1 min value hold	R35893	0x0000	Hex		
Channel 2 max value hold	R35894	0x0000	Hex		
Channel 2 min value hold	R35895	0x0000	Hex		
Channel 3 max value hold	R35896	0x0000	Hex		
Channel 3 min value hold	R35897	0x0000	Hex		
Channel 0 difference reference	R35898	0x0000	Hex		
Channel 1 difference reference	R35899	0x0000	Hex		
Channel 2 difference reference	R35900	0x0000	Hex		
Channel 3 difference reference	R35901	0x0000	Hex		

Status data in logic monitor

- Relays

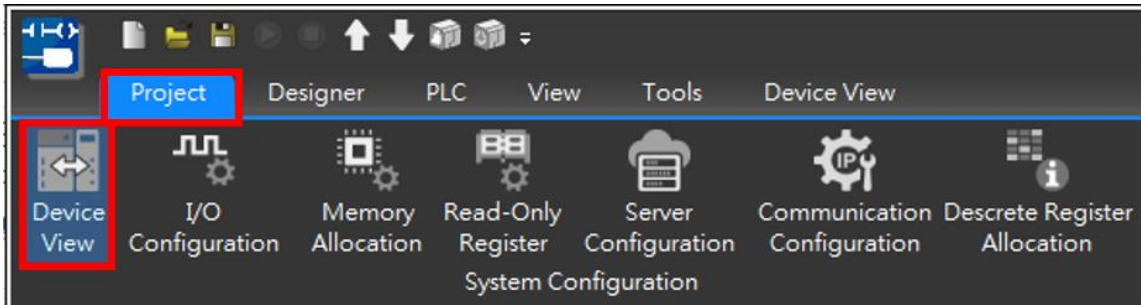
When clicking the “Relay” at upper side of “Device monitor” , the Module List will display the status data only. When placing the mouse on the value and if the data is lit in blue as per the figure below, you will be allowed to revise the value of such register. If the register position is lit in gray, then you will not be able to revise the value display pattern.

資訊		D A S M	
I/O	狀態		
min. clear request relay	Ch 0 M9256	●	OFF
	Ch 1 M9257	●	OFF
	Ch 2 M9258	●	OFF
	Ch 3 M9259	●	OFF
difference operation trigger relay	Ch 0 M9260	●	OFF
	Ch 1 M9261	●	OFF
	Ch 2 M9262	●	OFF
	Ch 3 M9263	●	OFF
data buffer request relay	Ch 0 M9264	●	OFF
	Ch 1 M9265	●	OFF
	Ch 2 M9266	●	OFF
	Ch 3 M9267	●	OFF
data buffer trigger relay	Ch 0 M9268	●	OFF
	Ch 1 M9269	●	OFF
	Ch 2 M9270	●	OFF
	Ch 3 M9271	●	OFF
alarm clear request relay	Ch 0 M9272	●	OFF
	Ch 1 M9273	●	OFF
	Ch 2 M9274	●	OFF
	Ch 3 M9275	●	OFF
underflow alarm	Ch 0 M9276	●	OFF
	Ch 1 M9277	●	OFF
	Ch 2 M9278	●	OFF
	Ch 3 M9279	●	OFF
overflow alarm	Ch 0 M9280	●	OFF
	Ch 1 M9281	●	OFF
	Ch 2 M9282	●	OFF
	Ch 3 M9283	●	OFF
	Ch 0 M9284	●	OFF

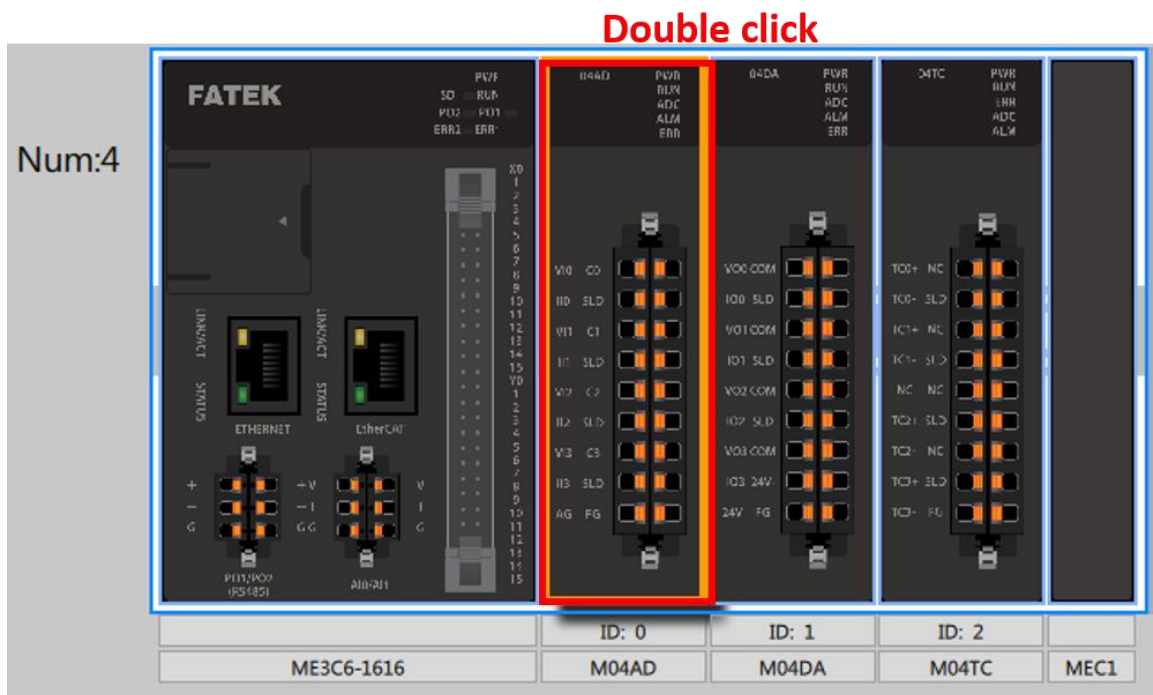
Status data in logic monitor

M04AD/M04ADR function:

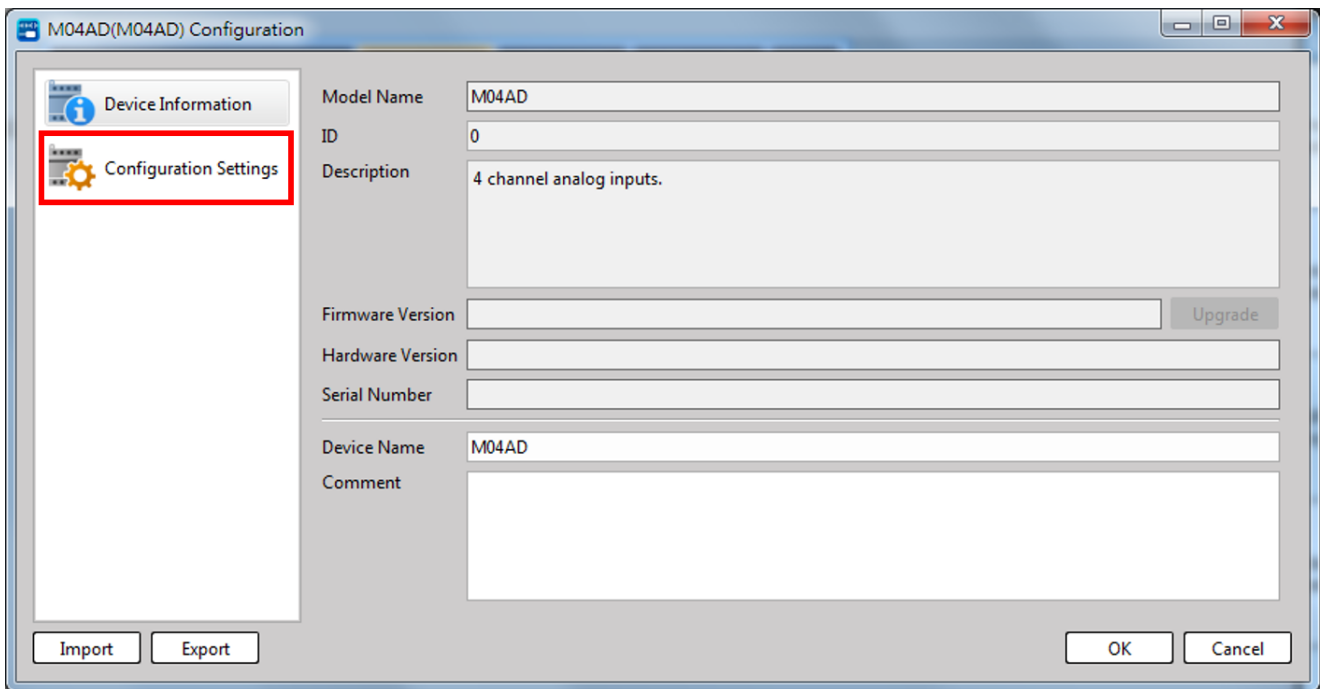
The Analog In (AI) Module is designed with lots of functions for use by the user such as data buffering, value scaling and alarm setting, etc. To use these functions, double click the required module on "Project->DeviceView" and then click "Configure" and you can find out the position of AI setting functions, as per the figure below. Same as the Ladder editing, these functions can be set only under offline editing status.



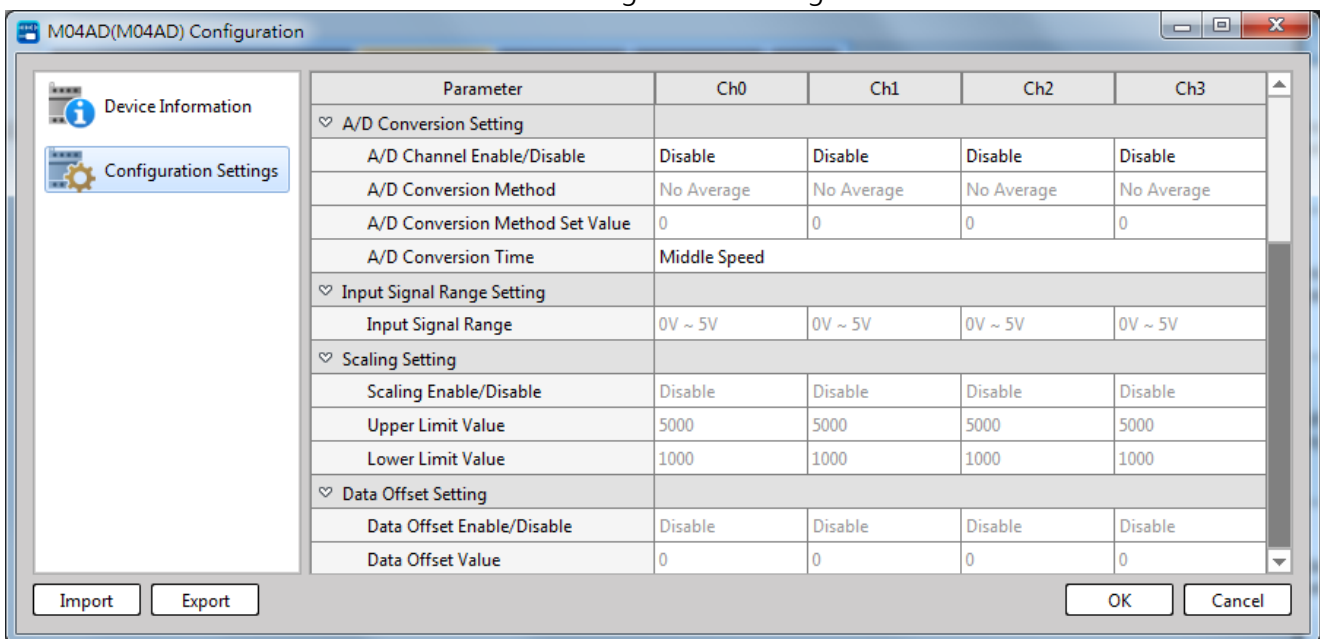
Location of Device View



Find and click the module



Click "Configuration Settings"



Setting window of M04AD/M04ADR modules

For other modules, same way should be used to access the function setting page; however, the function may vary according to the module selected.

The functions of AI module will be introduced in this section.

Channel On/Off :

This function is designed for setting the Enable or Disable for the respective A/D conversion channel. When enabling the A/D conversion channel, such channel will execute the A/D conversion. When closing the A/D conversion channel, such channel will not execute the A/D conversion. Such function also reduces the conversion cycle time for all of the channels.

Directions for use and instructions

Conversion cycle time = (A/D configuring time + A/D conversion time) x Number of opened A/D channel

Where:

A/D configuring time = MUX input time + PGA configuring time

A/D conversion time >= A/D data reading time + A/D data processing time

Example:

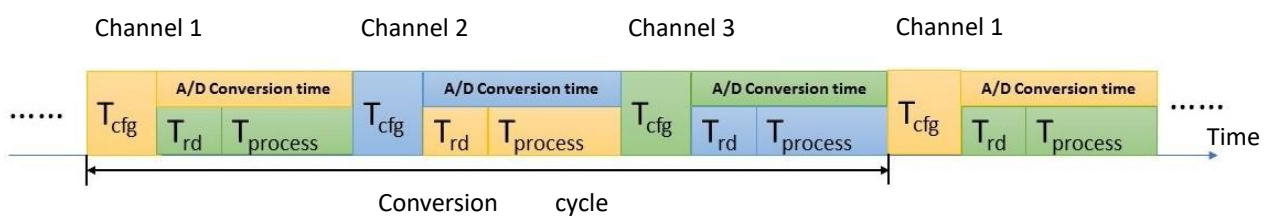
Number of opened A/D channel = 3

Conversion cycle time = (A/D configuring time + A/D conversion time) x 3

T_{cfg} = A/D configuring time for current-flowing channel

T_{rd} = A/D data reading time for last channel

$T_{process}$ = A/D data processing time for last channel



The diagram of conversion cycle time

Setting and Preset value

If the channel Enable/Disable is not being set, then it will be preset as Disable.

Function	M04AD	M04ADR	Preset setting
Channel Enable/Disable	Enable	Enable	Disable
	Disable	Disable	

Channel Enable / Disable of M04AD/M04ADR

M04AD/M04ADR Input Calibration Function

Each channel is input corrected, and each channel stores the offset and gain corresponding to each gear for calibration.

The default value is factory corrected and stored in the module and is not modified, and can be used to restore the factory to its original state.

Application method and instructions

Execute the offset calibration first and then the gain calibration.

Input 0V or interrupt the channel and then compute the internal offset value. Next, input the max. voltage for each bay (5V, 10V or 20mA) and then compute the internal gain value. Finally, save the offset value together with the gain value in the module.

Final output = (A/D output – offset value) * Gain value

The calibration comprises the following two modes:

User Calibration Mode:

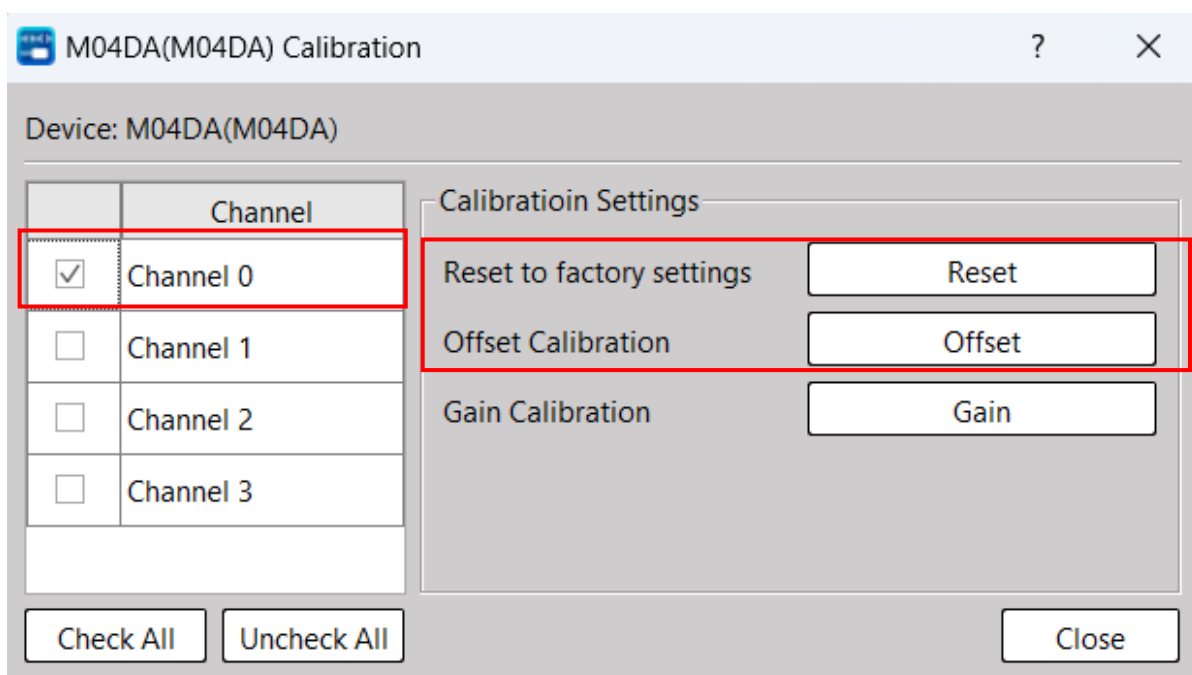
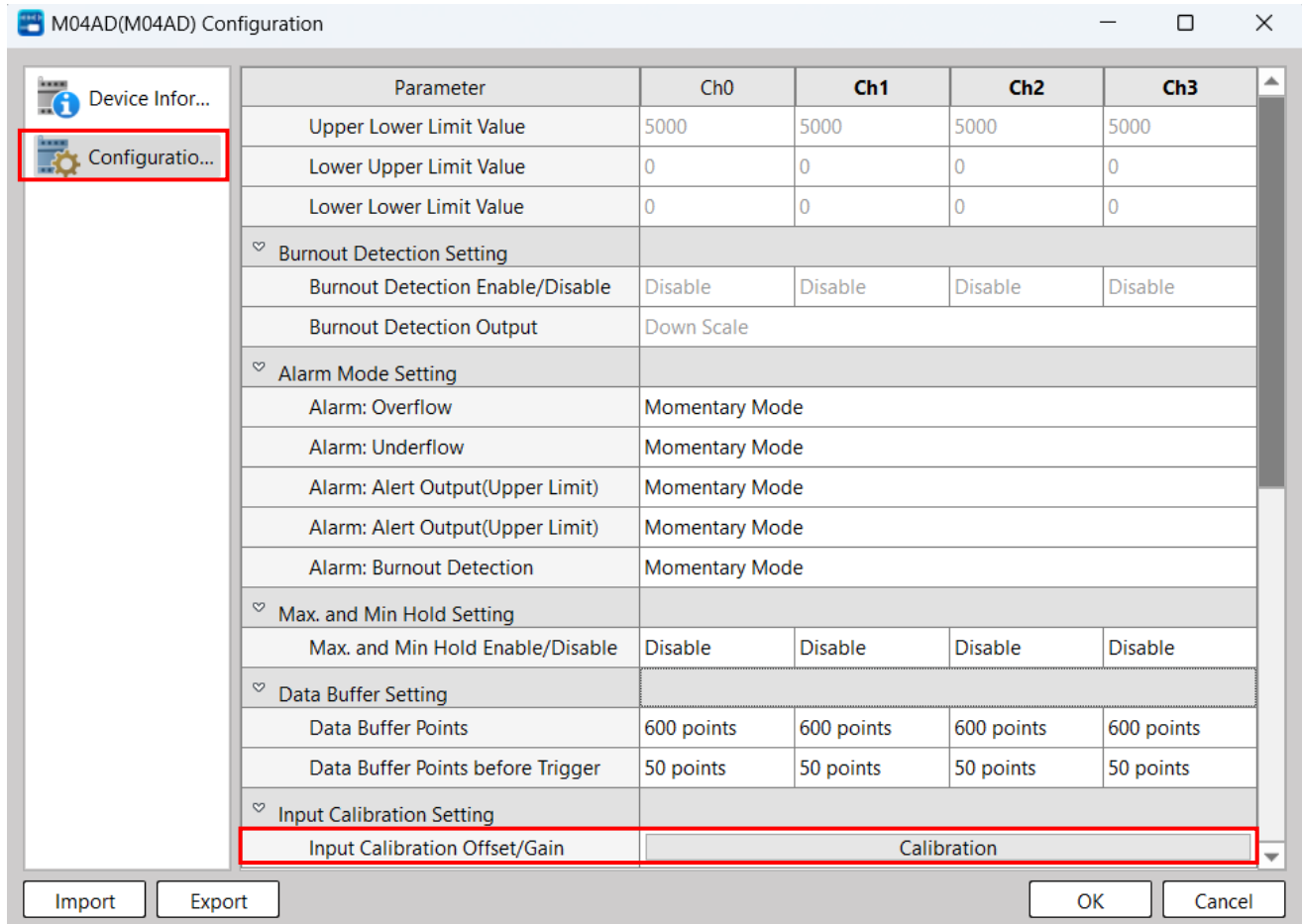
- If the user has special needs or there is a large error in the value due to the large difference between the current ambient temperature and the general room temperature, you can use the user calibration mode to correct the error.

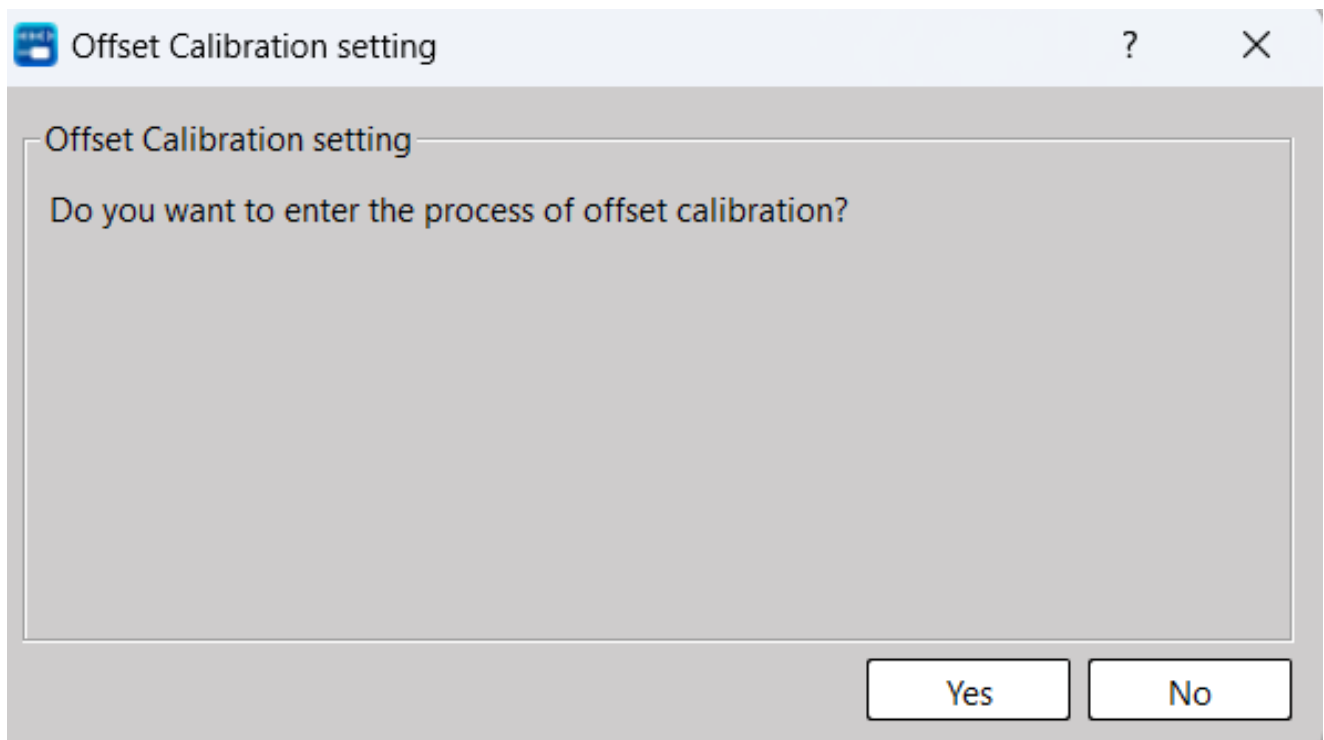
Restoring Factory Calibration Mode:

- When delivered from the factory, all channels will be calibrated. In the meantime, each channel will save the offset value and the gain value of 0–5V, 0–10V and 0–20mA in the module.

User Calibration Steps:

Make the PLC stop running, and in the “Online Monitor Mode”, double-click the module to be recalled in the “Device View”, and find “Calibration” in the “Configuration Settings”, select the channel to be calibrated and find “Offset/Gain Calibration”, press “Offset/Gain” to input the specified voltage according to the software prompt (if it is a general analog output module, adjust the meter to the corresponding gear) to complete the offset/gain Calibration °

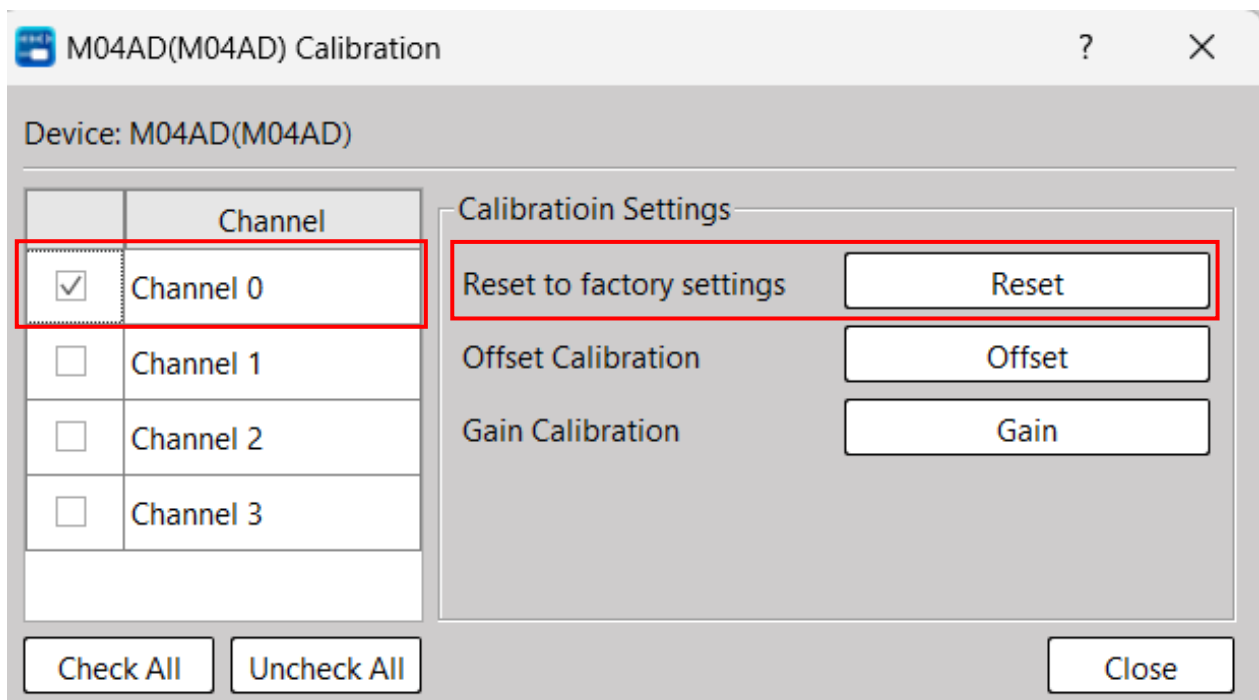
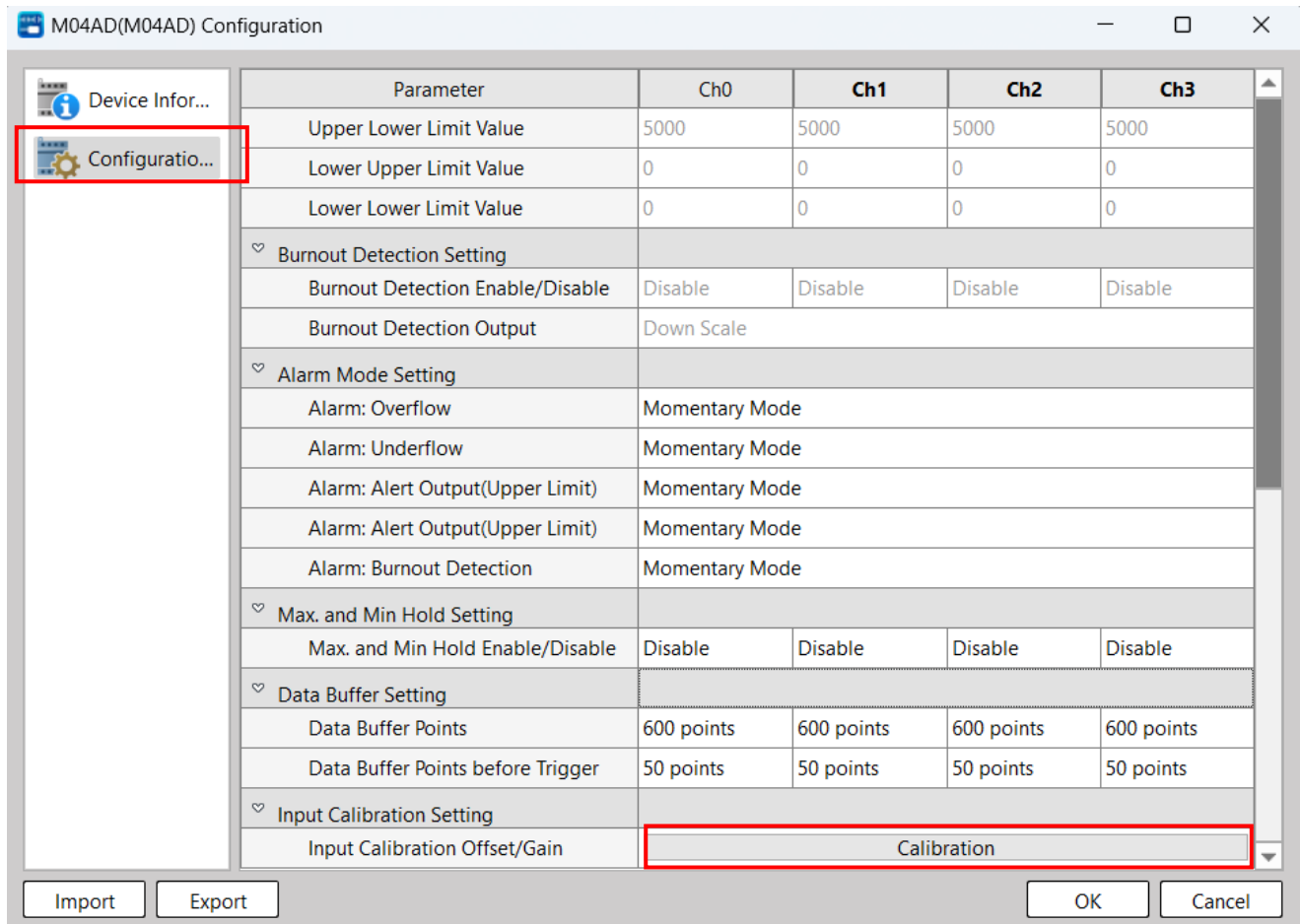




M04AD/M04ADR user calibration process

Restore factory settings steps:

Make the PLC stop running, and in the “Online Monitor Mode”, double-click the module to be recalled in the “Device View”, and find “Calibration” in the “Configuration Settings”, and find "Restore Factory Settings" after entering and press "Restore".



M04AD/M04AD restore factory setting process

Setting and preset value

Each channel is designed with 5V offset, 10V offset and 20mA offset as well as 5V gain, 10V gain and 20mA gain values. The preset value serves as the factory calibration value and will be saved in the module.

Input setting	calibration	Preset value
Offset value	Factory value	calibration value
Gain value	Factory value	calibration value

M04AD/M04ADR calibration preset value

A/D Conversion Mode

When setting the average value of each channel, it will be set as follows: No Average Mode, Frequency Average Mode, Time Average Mode and Move Average Mode.

Application method and instructions

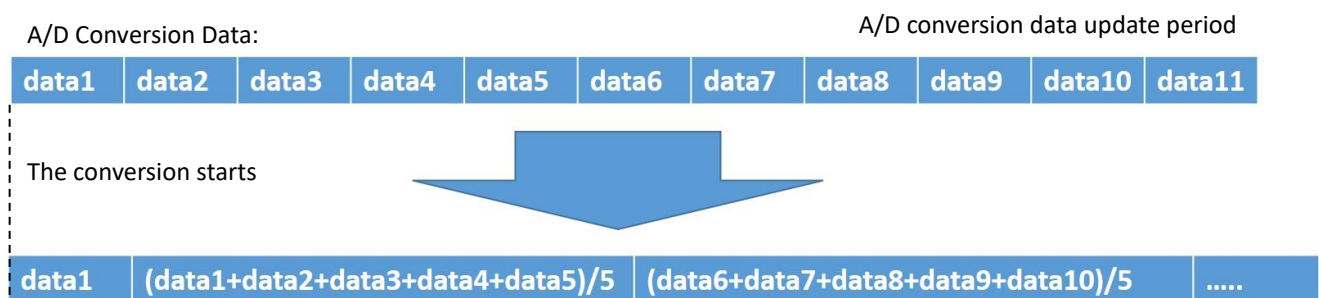
No Average Mode: The mean value processing will not be executed after completing the A/D conversion. The processing time will be equivalent to the conversion cycle time.

Frequency Average Mode: The system will execute the A/D conversion according to the established frequency and then execute the average process for the converted value. The Frequency Average Mode shall be effective when the set value is bigger than "2".

The required processing time will be equivalent to the result acquired by multiplying the average value with the conversion cycle.

Example:

If the module converts 11 pieces of data and sets the average number of times to 5, the returned results are as follows:



A/D Conversion Result:

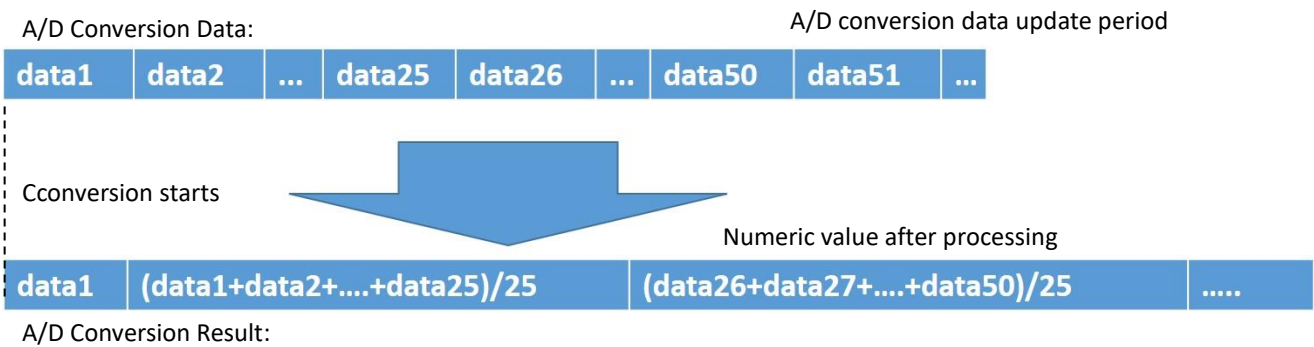
Time Average Mode: The system will execute the A/D conversion according to the set time and will execute the mean value processing for the values being converted within such period of time. The averaging will become processed when the set time is over 2 times of the conversion cycle.

The processing time will be equivalent to the setting time.

Example:

Numbers of channel used: 8ch. The action required for setting the average processing time as 4ms. Number

of A/D conversion data undergoing average processing = 100ms, then the average number of A/D conversion data processed = $100\text{ms} \div 4\text{ms} = 25$



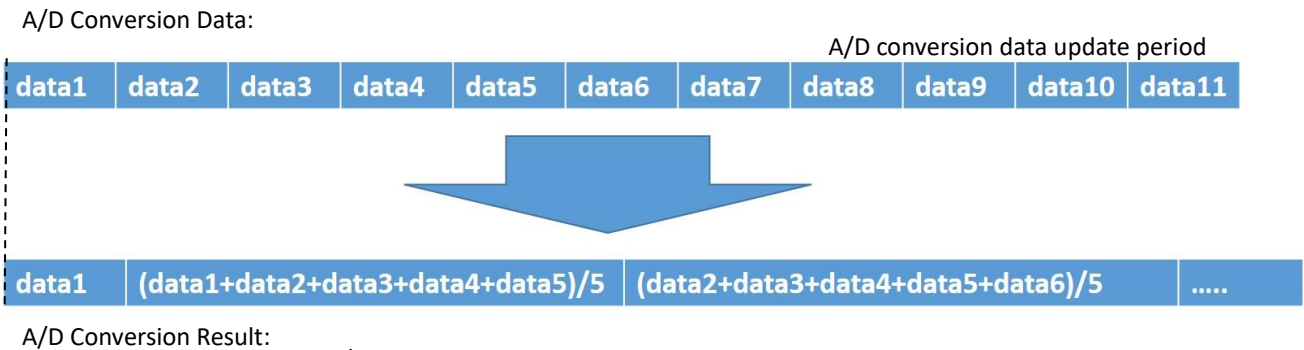
Schematic diagram of M04AD/M04ADR module times average mode processing time

Move Average Mode: Set the average number. During each conversion cycle, the system will execute the mean value processing for the latest A/D conversion data according to established frequency. The system will execute the move averaging when the value is bigger than "2" .

The processing time will be equivalent to the conversion cycle.

Example:

Action when average move frequency is set at 5 times.



A/D Conversion Result:

AVG1= data1

AVG2=(date1+date2+date3+date4+date5)/5

AVG 3=(date2+date3+date4+date5+date6)/5

AVG 4=(date3+date4+date5+date6+date7)/5

AVG 5=(date4+date5+date6+date7+date8)/5

AVG 6=(date5+date6+date7+date8+date9)/5

AVG 7=(date6+date7+date8+date9+date10)/5

Setting and Preset value

If A/D conversion mode is not established for the channel, then the preset mode shall be regarded as No Average Mode. In this case, each averaged unit can accommodate up to 1000 individuals of converted values.

A/D Conversion Mode	AI setting scope	AIH setting scope	Preset value
No Average Mode	None	None	None
Frequency Average Mode	2 to 1000 (times)	2 to 1000 (times)	2
Move Average Mode	2 to 1000 (times)	2 to 1000 (times)	2
Time Average Mode	1 to 1604000 (ms)	1 to 1604000 (ms)	1

M04AD/M04ADR setting value ranges for each average mode

Input Signal Scope**Application method and instructions**

1–5V: Same as the resolution of 0–5V, which is the scaling result through 0–5V.

4mA–20mA: Same as the resolution of 0–20mA, which is the scaling result through 0–20mA.

Setting and Preset value

If the input signal scope is not being set for the channel, then it will be preset as 0V–10V.

Input signal scope		Digital output scope
Voltage	0V – 10V	0 – 16383
	-10V – 10V	-8192 – 8191
	0V – 5V	0 – 16383
	-5V – 5V	-8192 – 8191
	1V – 5V	0 – 16383
Current	0 mA – 20 mA	0 – 16383
	-20 mA ~ 20 mA	-8192 ~ 8191
	4 mA ~ 20 mA	0 ~ 16383

M04AD setting input signal range

Input signal scope		Digital output scope
Voltage	0V – 10V	Voltage
	-10V – 10V	-80000 ~ 80000
	0V – 5V	0 ~ 80000
	-5V – 5V	-80000 ~ 80000
	1V – 5V	0 ~ 80000
Current	0 mA – 20 mA	Current
	-20 mA – 20 mA	-80000 ~ 80000
	4 mA – 20 mA	0 ~ 80000

M04AR setting input signal range

Overflow and underflow

Each channel shall be set in either Enable or Disable status. When enabled, you need to check if the channel is under overflow or underflow status. In the meantime, it is also required to determine the alarm relay behavior according to the alarm module selected. Such detection will not be required when the channel is closed.

Application method and instructions

Based on the input signal scope set for each channel, you need to check if the detected digital output is exceeding the overflow limit or is lower than the underflow limit value. When detecting the overflow or underflow status, the system will output the alarm and the corresponding relay will shift from OFF to ON.

Input signal scope		Digital output scope	Overflow Limit Value	Underflow Limit Value
Voltage	0V ~ 10 V	0 ~ 16383	16383	0
	-10V ~ 10V	-8192 ~ 8191	8191	-8192
	0V ~ 5V	0 ~ 16383	16383	0
	-5V ~ 5V	-8192 ~ 8191	8191	-8192
	1V ~ 5V	0 ~ 16383	16383	0
Current	0mA ~ 20mA	0 ~ 16383	16383	0
	-20mA ~ 20mA	-8192 ~ 8191	8191	-8192
	4 ~ 20 mA	0 ~ 16383	16383	0

M04AD overflow and underflow range

Input signal scope		Digital output scope	Overflow Limit Value	Underflow Limit Value
Voltage	0V ~ 10 V	0 ~ 80000	96000	-16000
	-10V ~ 10V	-80000 ~ 80000	96000	-96000
	0V ~ 5V	0 ~ 80000	96000	-16000
	-5V ~ 5V	-80000 ~ 80000	96000	-96000
	1V ~ 5V	0 ~ 80000	88000	-8000
Current	0mA ~ 20mA	0 ~ 80000	96000	-16000
	-20mA ~ 20mA	-80000 ~ 80000	96000	-96000
	4 ~ 20 mA	0 ~ 80000	88000	-8000

M04AR overflow and underflow range

Example:

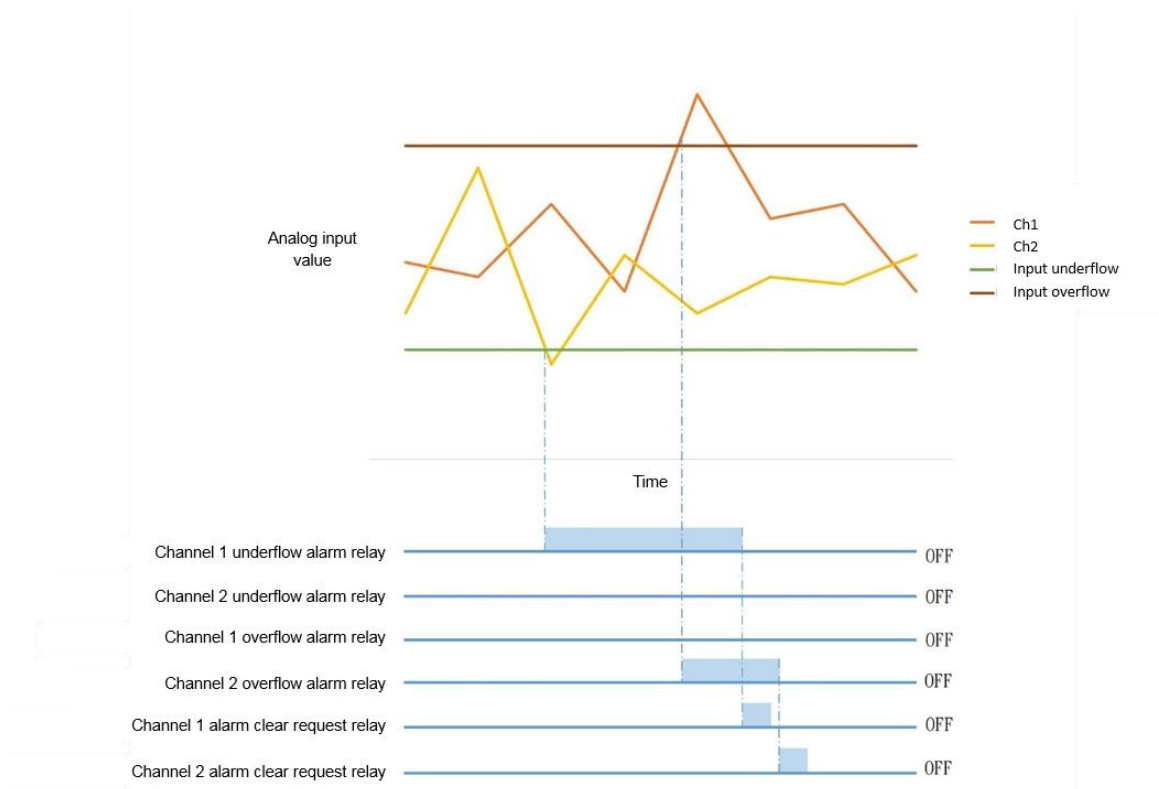


Diagram of Overflow and underflow alarm output

Setting and Preset value

If the channel is not set with downflow and underflow limit, then it will be preset as closing.

Function	M04AD	M04ADR	Preset
Overflow and underflow	Enable	Enable	Disable
	Disable	Disable	

M04AD/M04ADR overflow and underflow Enable/Disable settings

Run-time relay control



For detailed relay and alarm mode setting, please refer to alarm section.

Setting Conversion Time

Due to different resolutions, the AI and AIH modules are designed with the respective conversion time "S". Such conversion time can be used for setting the A/D conversion speed as High (high speed), Middle (medium speed) and Low (low speed) as well as 50Hz or 60Hz. The conversion speed shall be set for all channels and cannot be changed for certain channels individually.

Setting and Preset value

If the conversion time is not being set, then it will be preset as "Middle".

Note: Conversion time = (A/D setup time + A/D conversion time)

Conversion time setup	M04AD conversion time	M04ADR conversion time
High	0.3ms/ch	1.5ms/ch
Middle	0.5ms/ch	4ms/ch
Low	1ms/ch	15ms/ch
50Hz	80ms/ch	80ms/ch
60Hz	67ms/ ch	67ms/ ch

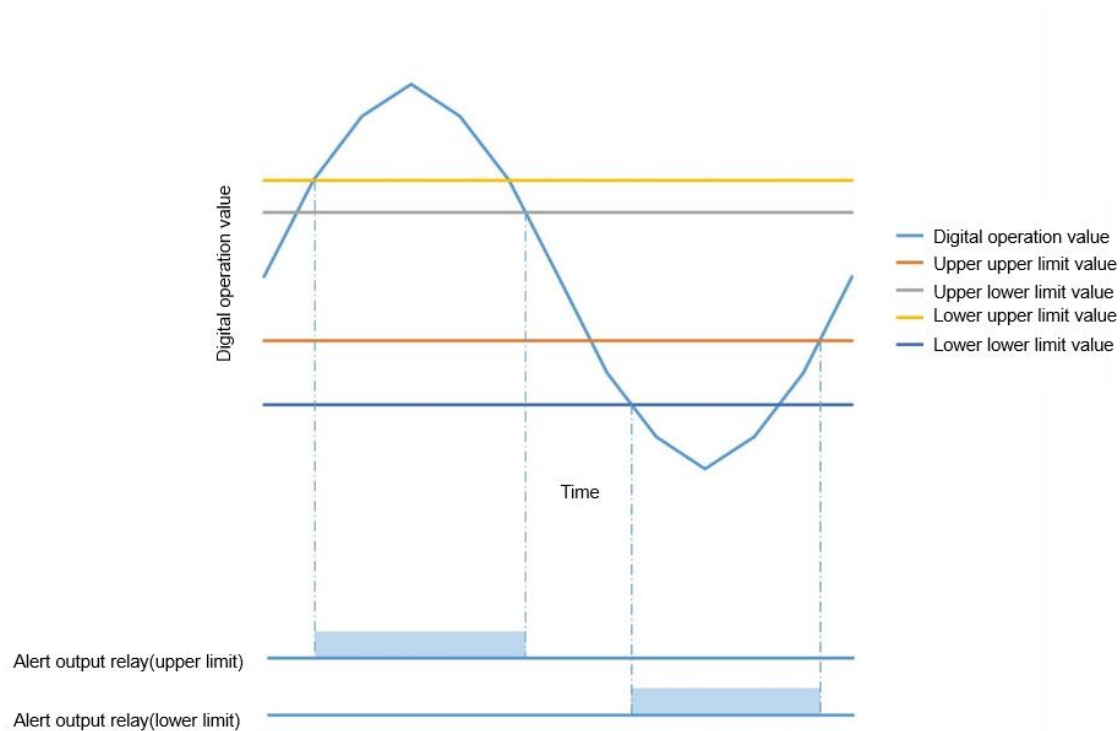
M04AD/M04ADR time conversion setting

Alert Output

Each channel shall be set as Enable or Disable status. When enabled, you need to set the alarm output scope and then start the channel detection. Based on the alert mode, you are also required to determine the alert relay behavior, but the detection will not be required when the channel is closed.

Alert triggering conditions and behavior

When detecting that the digital output value exceeds the alert output scope, the system will output the alert and the corresponding relay will shift from OFF to ON status.



Schematic diagram of alert output



Setting and Preset value

Conditions required for the alert output scope:

Upper limit value of upper limit $\geq$ Lower limit value of upper limit $>$ Upper limit value of lower limit $\geq$ Lower limit value of lower limit

If the channel has not been set with the alert output, then it will be preset as closing.

Setting	M04AD	M04ADR	Preset
Alert output	Enable	Enable	Disable
	Disable	Disable	
Upper limit value of upper limit	Restricted in digital output scope	-82000~82000	5000
Lower limit value of upper limit		-82000~82000	5000
Upper limit value of lower limit		-82000~82000	0
Lower limit value of lower limit		-82000~82000	0

Setting of alert output

Run-time relay control

For detailed alarm relay and alarm mode setting method, please refer to alarm section.

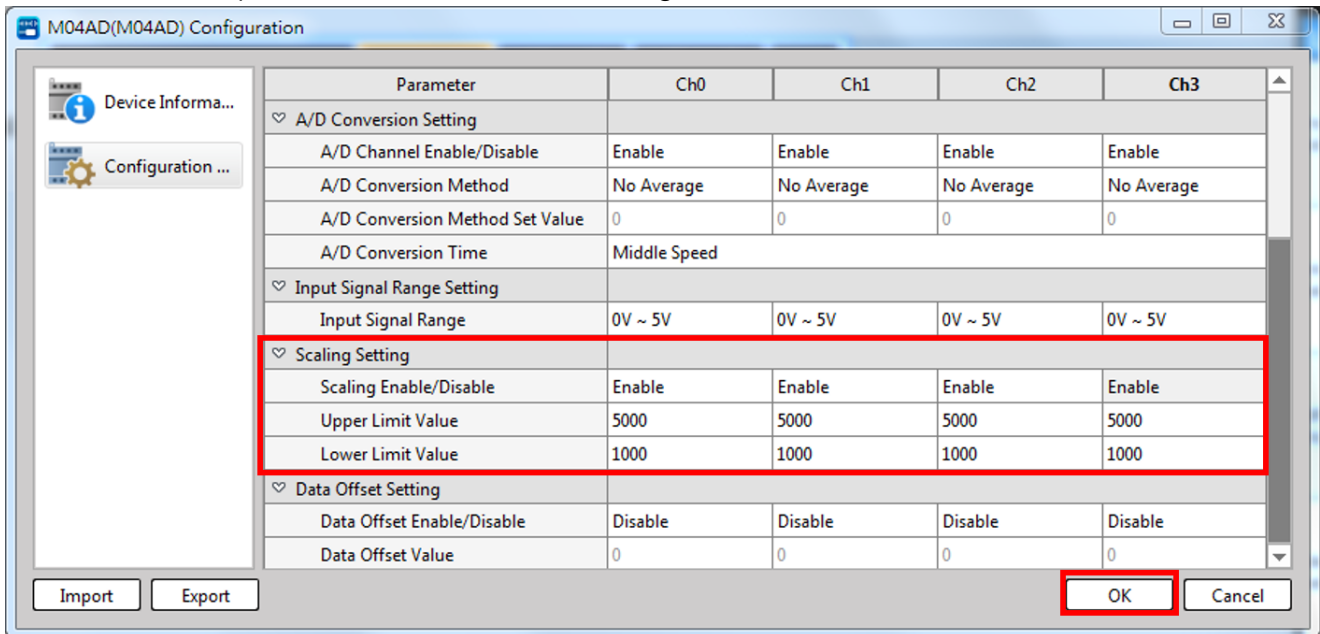
Value Scaling Function

Each channel shall be set as Enable or Disable status. When enabled, you need to set the scaling scope and then start converting the digital output scope to the set scaling scope; but the conversion will not be required when the channel is closed.



Application method and instructions

Select "Device view" and click M04AD/M04ADR module you want to use, and click "Configuration Settings", after enabling the A/D channel you want to enable, find "Scaling Setting" (as shown in the figure below), and enable the desired A/D channel. Fill in the upper limit value and lower limit value for the channel using this function, then press OK and download the setting data of the module.



Converts the digital output range to a preset scale range.

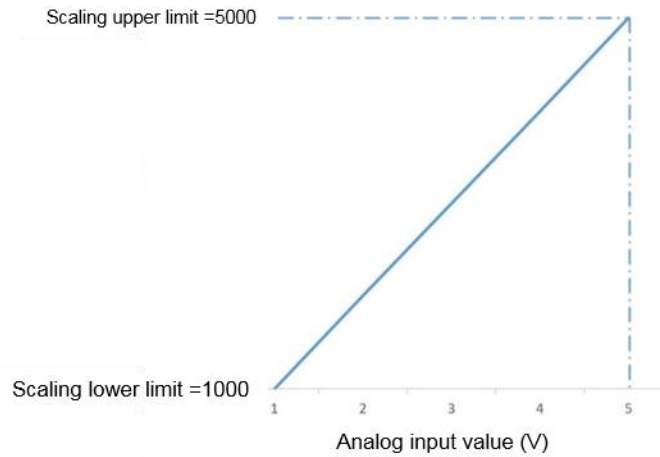
Example:

When selecting 1V–5V mode for M04AD/M04ADR:

Actual analog input scope = "1V–5V"

Scaling setup scope = "1000–5000"

Digital output scope = "0–16383"



Schematic diagram of M04AD/M04ADR scaling scope

Analog input	Digital output value	Digital computation value (scaling value)
1V	0	1000
2V	4096	2000
3V	8192	3000
4V	12288	4000
5V	16383	5000

Comparison table of M04AD/M04ADR digital scaling value and analog input to digital output

Setting and Preset value

The scaling scope setting shall meet following conditions:

Scaling upper limit value > Scaling lower limit value

If the channel is not designed with scaling function, then it will be preset as closing.

Function	AI setting	AIH setting	Preset
Scaling function	Enable	Enable	Disable
	Disable	Disable	
Scale the upper limit value	Restricted in digital output scope	-131072~131071	Disable
Scaling upper limit value		-131072~131071	Disable

Scaling function setting

Max. value/Min. value recording function

Each channel shall be set as Enable or Disable status. When enabled, you need to save the maximum value and the minimum value of the channel in the corresponding register, but the value saving will not be required when the channel is closed.

Application method and instructions

Save the maximum value and the minimum value of the respective channel in the corresponding register.

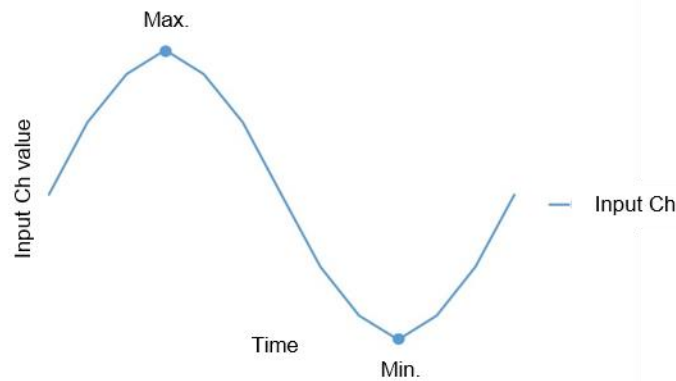


Diagram of Max. value/ Min. value recording function

Settings and Defaults

If the channel is not set with max. value and min. value, then it will be preset as closing.

Function	M04AD	M04ADR	Preset
Maintain max. value and min. value	Enable	Enable	Disable
	Disable	Disable	

Setting maintenance of max. value and min. value

To update the max. value and the min. value, confirm that the max. value and the min. value function has been opened in the configuration setting. Next, distribute such module to the corresponding SM and then operate according to the procedure indicated below in order to complete the updating.

Run-time relay control

Run-time relay control	Description	Setting
Max. value clearing request relay	Clear max. channel value	Off->On: Rest max. channel value On->Off: Triggering done
Min. value clearing request relay	Clear min. channel value	Off->On: Rest min. channel value On->Off: Triggering done

Use the relay to control the max. value and the min. value to maintain the setting

Burn-out Detection Function

You may set the Enable or Disable for specific bay (1V–5V and 4mA–20mA). When enabled, you need to set up the burn-out detection function and start detecting the burn-out condition of the channel. Next, determine the alarm relay behavior according to the alarm mode, but such detection will not be required if the channel is closed.

Application method and instructions

The burn-out detection function can be used to detect 1V–5V or 4mA–20mA bay only.

If the burn-out threshold conditions are established, the system will output the burn-out alarm and the corresponding relay will shift from Off to On.

When detecting the burn-out, the system will determine the digital value to be transmitted whether the control output is high-level or low-level.

Burn-out detection of M04AD:

Analog input		Digital output	M04AD Burn-out Threshold
Voltage	1V ~ 5V	0~16383	Digital value < -32767
current	4 mA ~ 20 mA	0~16383	Digital value < -32767

M04AD burn-out detection threshold

When detecting the burn-out, the system will determine the digital value to be transmitted whether the control output is high-level or low-level.

Burn-out detection setting	When detecting burn-out
Low-level	Digital value = 0
High-level	Digital value = 0x7FFF

M04AD low-level and high-level settings for burn-out

Burn-out detection of M04ADR:

Analog input		Digital output	M04ADR Burn-out Threshold
Voltage	1V ~ 5V	0~8000	Digital value < -16000
Current	4 mA ~ 20 mA	0~8000	Digital value < -16000

M04ADR burn-out detection threshold

When detecting the burn-out, the system will determine the digital value to be transmitted whether the control output is high-level or low-level.

Burn-out detection setting	When detecting burn-out
Low-level	Digital value = 0
High-level	Digital value = 0x1FFFF

M04ADR low-level and high-level settings for burn-out

Setting and Preset value

If the channel is not set with burn-out detection function, it will be preset as closing.

If the channel is set with burn-out detection function, it will be preset as low-level.

Function	M04AD	M04ADR	Preset
Burn-out detection	Enable	Enable	Disable
	Disable	Disable	
Burn-out detection setting	High-level	High-level	Low-level
	Low-level	Low-level	

Burn-out setting of M04AD/M04ADR

Run-time relay control

For detailed alert relay and alarm mode setting, please refer to alarm section.

Digital Clipping Setting (only M04ADR supports such function at current stage)

Only M04ADR module can be set to enable the digital clipping function. Each channel shall be set with Enable or Disable function. When enabled, M04ADR will restrict the digital output value in the digital output scope, but M04ADR will not execute the digital clipping if the channel is closed.

Application method and instructions

When enabling the digital clipping function and when the input voltage/current is beyond the input signal scope, the system will restrict the digital output value in the digital output scope. When closing the digital clipping function, the signal may exceed the digital output scope.

Input signal scope	Digital output scope	Digital output limit	Digital computation value	
			Enable digital clipping	Disable digital clipping
0V ~ 10 V	0 ~ 80000	-20000 ~ 100000	0 ~ 80000	-20000 ~ 100000
-10V ~ 10V	-80000 ~ 80000	-100000 ~ 100000	-80000 ~ 80000	-100000 ~ 100000
0V ~ 5V	0 ~ 80000	-20000 ~ 100000	0 ~ 80000	-20000 ~ 100000
-5V ~ 5V	-80000 ~ 80000	-100000 ~ 100000	-80000 ~ 80000	-100000 ~ 100000
1V ~ 5V	0 ~ 80000	-20000 ~ 100000	0 ~ 80000	-20000 ~ 100000
0 mA ~ 20 mA	0 ~ 80000	-20000 ~ 100000	0 ~ 80000	-20000 ~ 100000
-20 mA ~ 20 mA	-80000 ~ 80000	-100000 ~ 100000	-80000 ~ 80000	-100000 ~ 100000
4 mA ~ 20 mA	0 ~ 80000	-20000 ~ 100000	0 ~ 80000	-20000 ~ 100000

Setting and Preset value

If the channel has no digital clipping, it is set to off by default.

*Note: This function is not available for the M04AD module.

function	M04ADR setting	Default settings
Digital clipping	Open	Shut down
	Shut down	

Digital clipping function setting

Deviation Running Function

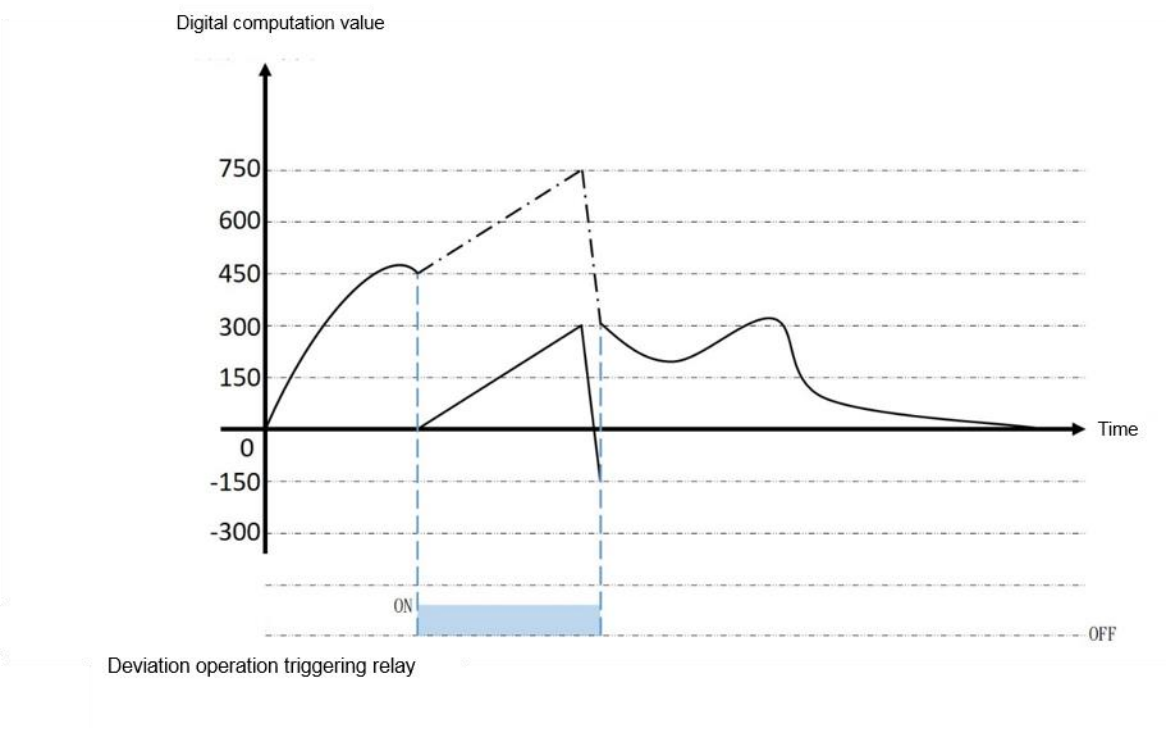
Through the channel, you may control the starting and stopping of the corresponding relay. When setting the relay from Off to On, you may execute the deviation running and then update the value used for triggering the deviation running to the register. When the relay is shifted from On to Off, the system will cancel the deviation running function.

Application method and instructions

When the relay "Off -> On" is triggered by the deviation running function, you may use the digital value being exported at that time as the reference value and then update it as "0". During the deviation running period with the relay being set at "On" status, the system will deduct the deviation reference value from digital output value.

Digital computation value = Digital output value = Deviation reference value.

Example:



Schematic diagram of deviation operation function

Deviation operation triggering relay: When the relay is under “Off -> On” status, the system will save the digital output value (0) as the deviation reference value and then update the digital computation value as “0”. When the relay is under “On->Off” status, it will take the calibrated datum point as the datum point.

Run-time relay control

Run-time relay control	Description	Setting
Deviation operation triggering relay	Trigger the deviation operating	Off->On: Run the deviation operating On->Off: Cancel the function

Deviation operation function for relay control

Data Offset Setting Function

Each channel can be set as Enable or Disable. When enabled, you need to set up the data offsetting function in order to correct the data through data translation.

Application method and instructions

The digital output value should be added with the set offset value for executing the data calibration.

Digital computation value = Digital output value + Data offset value

Example:

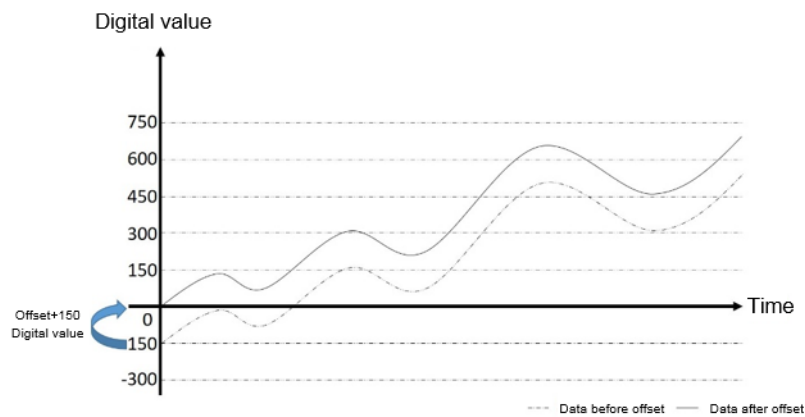


Diagram of data offset

Settings and Defaults

If the channel is not designed with data offsetting function, then it will be preset as closing.

Setup	M04AD	M04ADR	Preset
Set data offset setting	Enable	Enable	Disable
	Disable	Disable	
Data offset value	-16383~16383	-82000~82000	0

Setting of data offset

Data Buffering Function

Through the relay-controlled data buffering function, you may save the digital computation value in the data buffering field in order to observe the change of the digital computation value.

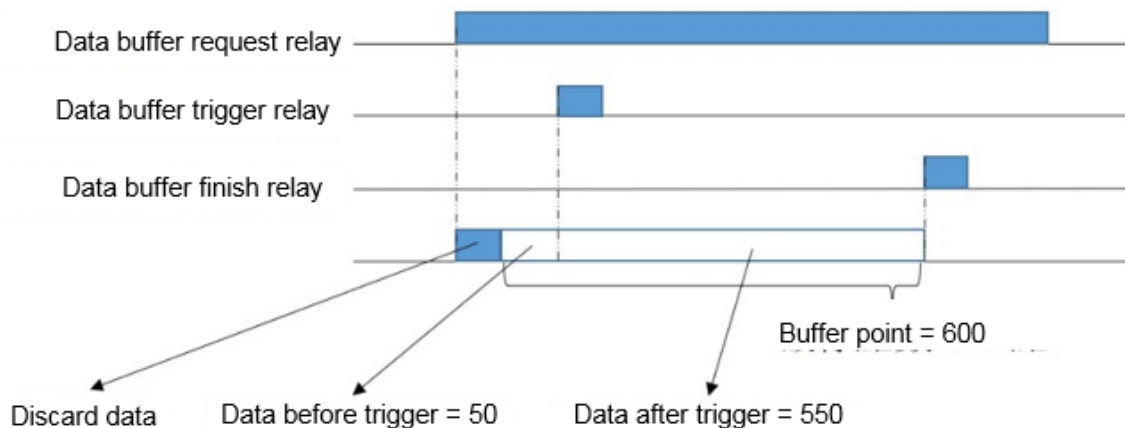
Application method and instructions

Based on the processing time required for the A/D conversion mode, each buffering point will be allowed to save the digital computation value in the data buffering field.

Each channel will be allowed for saving up to 600 points/ch.

Example:

When the number of data points is set as 50, you may set the number of buffering points as 600.



Example diagram of data buffering function

Setting and Preset value

If the channel is not designed with digital amplitude limiting function, then it will be preset as closing.

Setup	M04AD setting scope	M04ADR setting scope	Preset value
Number of buffer points before triggering	0–599	0–599	200
Number of buffer points	1–600	1–600	600

Setting of data buffering function

Described below is the data buffering function application method:

Run-time relay control

Data buffer relay	Description	Setting
Data buffer request relay	Request for buffering	Off->On: Start buffer On->Off: Stop buffer
Data buffer trigger relay	Triggering	Off->On: Trigger data buffer request relay
Data buffer complete status relay	Data being buffered	Off->On: Instruct the software to read the buffer by reading the relay when completing the required number of buffer points. On->Off: Instruct the software to read the buffer by reading the relay after reading the required number of buffer points. Data buffer trigger relay: On->Off->On. When triggered again, it will shift to Off and then change to Off->On after reading the required number of buffer points.

Steps of applying data buffering function

After completing the data buffering, you may use Fun115 DBUF to read the buffer data from the module to the PLC.

M04AD/M04ADR Alarm

- Alarm mode

Alarm mode setup	Description of mode
Transient Mode (preset)	When analog input is restored to normal scope, the alarm will be cleared (On->Off) automatically.
Latch Mode	Even if the analog input resumes normal scope, the alarm relay will maintain the status continuously. The clear alarm relay will order the relay to shift from Off to On by clearing the trigger alarm.

Setting of alarm mode

- Types of alarm

The alarm relay will perform the action according to the alarm mode.

Alarm relay	Description of function
CH* Underflow Alarm Relay	Off->On: Underflow detected in CH*. Off: Channel is in normal scope.
CH* Overflow Alarm Relay	Off->On: Overflow detected in CH*. Off: Channel is in normal scope.
CH* Alarm Output Relay (upper limit)	Off->On: Alarm output detected in CH* (upper limit). Off: Channel is in normal scope.

CH* Alarm Output Relay (lower limit)	Off->On: Alarm output detected in CH* (lower limit). Off: Channel is in normal scope.
CH* Burn-out Alarm	Off->On: Burn-out detected in CH*. Off: Channel is in normal scope.

All types of alarms and actions of M04AD/M04ADR

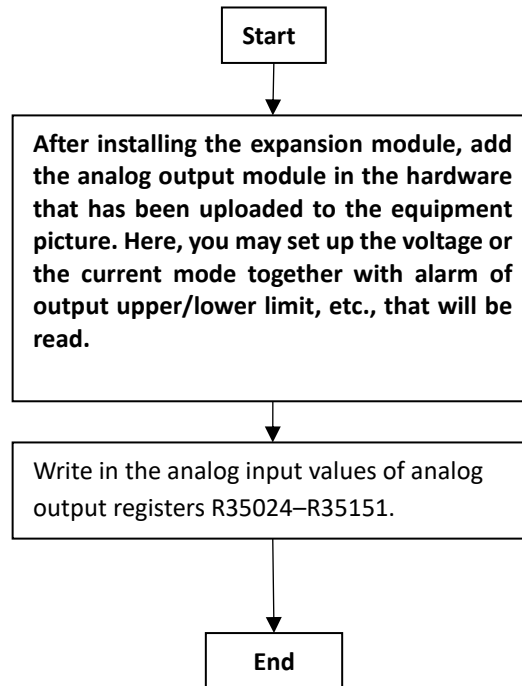
* Means the number of the channel.

If the alarm mode is set as latch mode, you may clear all of the alarms in CH* by setting alarm clear request relay from Off to On.

13-6 General analog output module

13-6-1 M04DA/M04DAR

The analog input module is configured with the following two kinds of different resolutions and they are AIO and AOH type of modules. The resolution of AO is rated at 14 bits, which is the same as 14 effect bit mode designed for M Series-4DA and that of AOH is rated at 16 bits. The difference between them is the graduation mark being defined according to the resolution. For details, please refer to the "Outputting signal scope" section.



Search M04DA/M04DAR data in Device Monitor

Click "Project" → "Device View" → "Device Monitor", the device monitoring window will be shown as below on the right side:

The screenshot displays the Device Monitor interface. On the left, the 'I/O Usage' panel shows: DI: 16 / 1024, DO: 16 / 1024, AIO: 6 / 256, SR: 2 / 1000, and M: 13 / 1313. The central rack diagram shows a FATEK PLC with an M04DA expansion module. The 'Information' panel on the right is highlighted with a red box and contains the following data:

I/O	Status
Channel 0 value	R35024 UDec Dec Hex 0x0000
Channel 1 value	R35025 UDec Dec Hex 0x0000
Channel 2 value	R35026 UDec Dec Hex 0x0000
Channel 3 value	R35027 UDec Dec Hex 0x0000
AO Error Code	DR35028 UDec Dec Hex 0x00000000
DAC power alarm	M9211 ON
alarm clear request relay	Ch 0 M9199 OFF Ch 1 M9200 OFF Ch 2 M9201 OFF Ch 3 M9202 OFF
short-circuit alarm	Ch 0 M9203 OFF Ch 1 M9204 OFF Ch 2 M9205 OFF Ch 3 M9206 OFF
	Ch 0 M9207 OFF Ch 1 M9208 OFF

Device monitor

In the information, you can choose the resources to be displayed, such as "Digital Data", "Logic Data", "Status Data", and "Relay".

- Logic data (temperature data)
- Logic data refers to the value obtained or output by the channel. Click "Logic Data" on the top information of "Device Monitor", only logical data will be displayed in the module list. Put the mouse over the value, and when the data is blue as shown in the figure below, the value of the register can be modified; or modify the value display mode through "Dec" and "Hex" on the right of the register.

Information		D	A	S
I/O	Status			
Channel 0 value	R35024	UDec	Dec	Hex
	0x0000			
Channel 1 value	R35025	UDec	Dec	Hex
	0x0000			
Channel 2 value	R35026	UDec	Dec	Hex
	0x0000			
Channel 3 value	R35027	UDec	Dec	Hex
	0x0000			

Logic data in “Device Monitor”

- Status Data

Click “Status Data” on the top of “Device Monitor”, and only the status data will be displayed in the module list. When the data is grayed out as shown in the figure below, the value of the register cannot be modified. However, it is still possible to quickly modify the value display mode through “Dec” and “Hex” on the right side of the register.

DAC power alarm	M9211		ON
alarm clear request relay	Ch 0 M9199		OFF
	Ch 1 M9200		OFF
	Ch 2 M9201		OFF
	Ch 3 M9202		OFF
short-circuit alarm	Ch 0 M9203		OFF
	Ch 1 M9204		OFF
	Ch 2 M9205		OFF
	Ch 3 M9206		OFF
open-circuit alarm	Ch 0 M9207		OFF
	Ch 1 M9208		OFF
	Ch 2 M9209		OFF
	Ch 3 M9210		OFF

Status data in “Device Monitor”

AO Error Code	DR3	572	UDec	Dec	Hex
	0x00000000				

Error code in “Device Monitor”

- Relays
- Click “Relay” on the top of “Device Monitor”, and only the status information will be displayed in the module list. Put the mouse over the value, when the data is blue as shown in the figure below, the value of the register can be modified, otherwise, if the register position is gray, it cannot be modified.

data buffer request relay	Ch 0	M9199		OFF
	Ch 1	M9200		OFF
	Ch 2	M9201		OFF
	Ch 3	M9202		OFF
data buffer trigger relay	Ch 0	M9203		OFF
	Ch 1	M9204		OFF
	Ch 2	M9205		OFF
	Ch 3	M9206		OFF
alarm clear request relay	Ch 0	M9207		OFF
	Ch 1	M9208		OFF
	Ch 2	M9209		OFF
	Ch 3	M9210		OFF

Status data in “Device Monitor”

13-6-2 M04DA/M04DAR function:

The AO (Analog Output) Module is designed with lots of functions for use by the user such as slew rate setting, scaling and alarm setting. The use these functions, access "Project->Device View" and double click the desired module and you will find out the position required for setting the M04DA/M04DAR function in "Configuration Settings". For details. It is the same as the Ladder editing except that these settings can only be executed under offline editing status.

Channel Enable/Disable

Each channel is designed with D/A conversion channel Enable or Disable function. When D/A conversion channel is under Enable status, the channel will execute D/A conversion. When D/A conversion channel is under closing status, the channel will not execute D/A conversion and it can also reduce the conversion cycle of all channels.

Application method and instructions

Conversion cycle time = (D/A conversion time) x (Number of opened D/A channels)

Example:

Number of opened channels= 3

Conversion cycle time = (D/A conversion time) x 3

Setting and Preset value

If the channel is not designed with channel Enable/Disable function, it will be preset as closing.

Setup	M04AD setting	M04ADR setting	Preset Value
Channel Enable/Disable	Enable	Enable	Disable
	Disable	Disable	

Setting of channel Enable/Disable

Output Calibration Function

Each channel will execute the output calibration for the respective bay. Each channel will store the offset value and the gain value of each bay to carry out the required calibration.

The preset value is the factory calibration value and is saved in the module and it cannot be changed. The preset value can be used to restore to the factory status.

- Application method and instructions

Execute the offset calibration and then the gain calibration.

Upon delivery, the factory will calibrate the respective bay of each channel. To make the calibration, the user may calibrate the bay being set for the channel that will be calibrated.

Set the offset until the external measuring DAC outputs "0". Save the offset value and then set the gain until the external measuring DAC outputs the voltage (5V, 10V) or current (20mA) for the respective bay. After being confirmed, the user may save the internal gain value in the module.

DAC input = Data input * gain value/65535 + offset value

The calibration comprises the following two types:

User Calibration Mode

- Based on the set bay, perform the calibration for the target channel.

Factory Restoration Mode

- All channels will be calibrated before leaving the factory, and the parameters will be stored in the module. If the user needs to return the factory calibration value in the future, he can use UperLogic to recall it.

For the calibration steps of M04DA/M04DAR, please refer M04DA/M04DAR Input Calibration Function.

Setting and Preset value

Each channel is designed with offset value and gain value. The present value is the factory calibration value and it is saved in the module.

Input Calibration Setting	M04DA	M04DAR	Preset Value
Offset Value	-16383 ~ 16383	-32000~32000	Factory calibration value
Gain Value	-100000 ~ 100000	-100000~100000	Factory calibration value

Setting of Input Calibration function

M04DA/M04DAR output range:

The M04DA/M04DAR module has its own output signal range due to different resolutions, and this function is used to set the output signal range of each channel, set the analog voltage/current output, and switch the range.

Settings and Defaults

If the channel has no set output signal range, the default is 0V ~ 10V.

M04DA output signal range		Digital input range
voltage	-10 to +10 V	-8192 to 8191
	-5 to +5 V	-8192 to 8191
	0 to +10 V	0 to 16383
	0 to +5 V	0 to 16383
	1 to +5 V	0 to 16383
current	0 to 20 mA	0 to 16383
	4 to 20 mA	0 to 16383

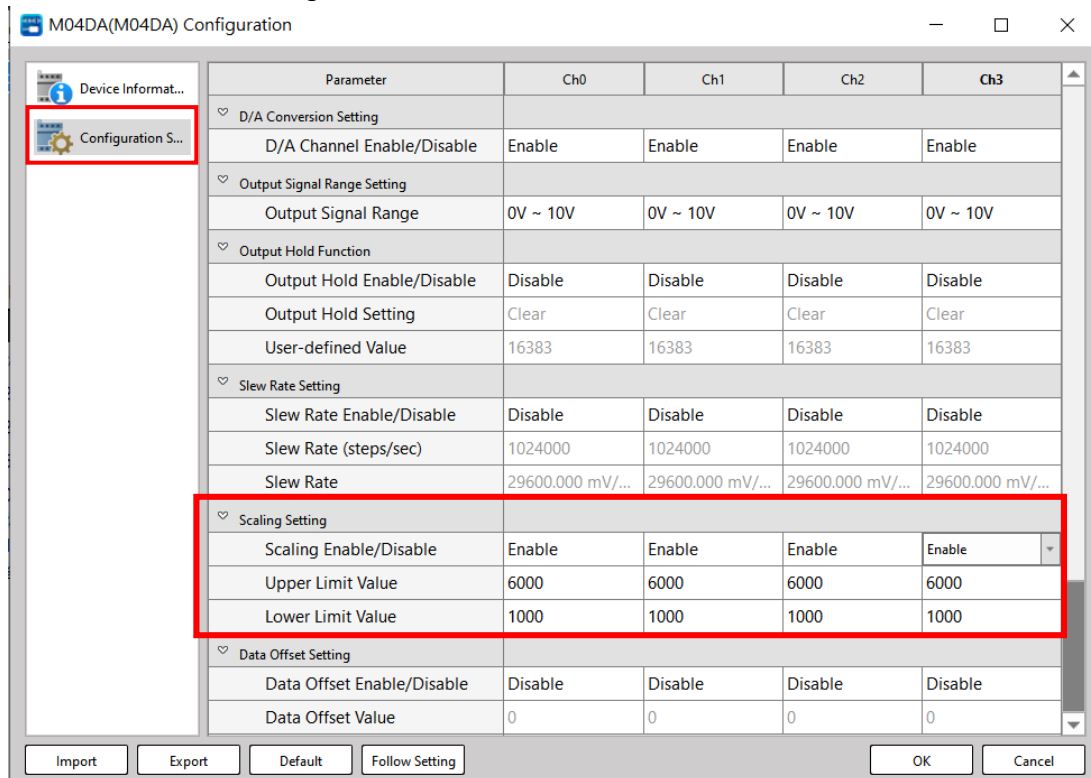
M04DAR output signal range		Digital input range
voltage	-10 to +10 V	-27000 to 27000
	-5 to +5 V	-27000 to 27000
	0 to +10 V	0 to 27000
	0 to +5 V	0 to 27000
	1 to +5 V	0 to 27000
current	0 to 20 mA	0 to 27000
	4 to 20 mA	0 to 27000

Value Scaling Function:

Set the zoom function on or off for each channel. When it is enabled, you need to set the zoom range first. Converts the digital input range to a scale range, allowing the user to decide the scale of the digital input. When turned off, it does not convert.

Directions for use and instructions

You can go to the device view and click on the M04DA/M04DAR module you want to use, and click "Configure Settings", after enabling the D/A channel you want to enable, find "Zoom Start/Off" (as shown below). And start the channel you want to use this function, fill in the upper and lower limit values, and then press OK, and download the setting data of the module.



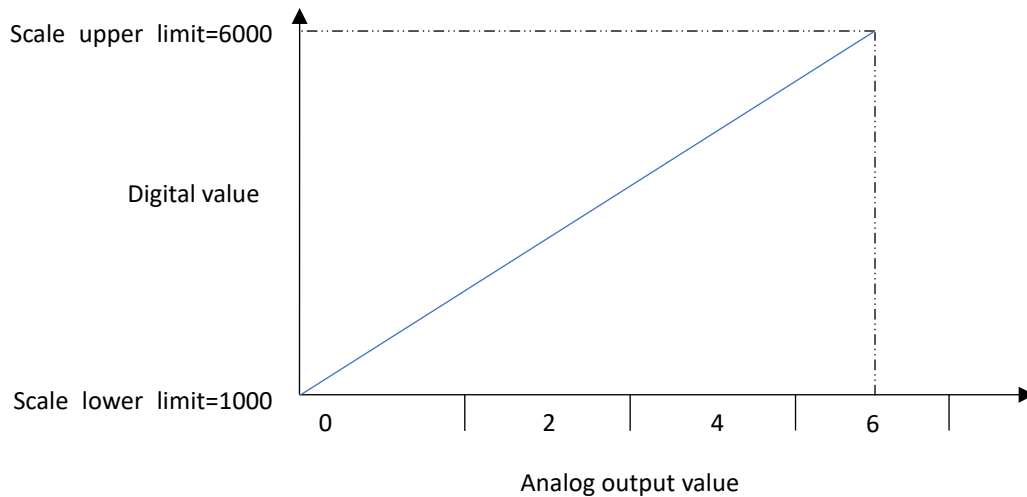
Note: If the number input entered by the user is outside the zoom range, the boundary value of the zoom range will be limited.

Example:

Analog output range = "0V ~ 10V"

Digital input range = "0 ~ 27000"

Zoom setting range = "1000~6000"



The user enters a value	Numeric input value	Output Voltage (V)
1000	0	0 V
2000	5400	2 V
3000	10800	4 V
4000	16200	6 V
5000	21600	8 V
6000	27000	10 V

Settings and Defaults

The zoom range setting must meet the following criteria:

Upper Limit Value > Lower Limit Value

Set up	M04DA setting	M04DAR settings	Default value
zoom	Open Shut down	Open Shut down	Shut down
Upper Limit Value	-2147483648 to 2147483647	-2147483648 to 2147483647	Shut down
Lower Limit Value	-2147483648 to 2147483647	-2147483648 to 2147483647	Shut down

Output Hold Function:

When the channel on/off is on, the output hold function of each channel can be set to be turned on or off. When it is turned on, it is necessary to set the output hold setting, and when the PLC stops or due to an error stop, the output is controlled according to the output hold setting, and when it is turned off, the output is not controlled.

Directions for use and instructions

There are three types of output hold settings:

Clear Mode: Outputs an offset value when the PLC stops or occurs due to an error stop.

Hold Mode: Maintains the output before the PLC stops or stops due to an error when the PLC stops or stops due to an error.

User-defined values: When the PLC stops or occurs due to an error stop, the user-defined value is output.

	When the channel is open			When the channel is closed
	Clear mode	Hold mode	User-defined values	Independent
CPU Status: Executed	D/A value	D/A value	D/A value	0 V/mA
CPU Status: Stopped	Offset value	The value before stopping	User-defined values	0 V/mA
CPU Status: Stopped by error	Offset value	The value before stopping	User-defined values	0 V/mA

*If the M04DA/M04DAR uses clear mode when the CPU is stopped/stopped due to an error, the channel will output an offset value (the voltage/current output by the offset value will be equivalent to the voltage/current output when the digital value of 0 is input (when the CPU is normal and the same gear and data offset are used))

Settings and Defaults

If the channel does not have an output hold function, the default setting is off.

If the channel is not set, the output remains set, and the default setting is clear.

If the user-defined value is not specifically set by the user, it is set to the maximum output value of the gear by default.

Set up	M04DA setting	M04DAR setting	default
Output Hold Function	enable Disable	enable Disable	Disable
Output Hold Setting	Clear Hold User-defined values	Clear Hold User-defined values	Clear

Slew Rate Control Setting:

The rotation rate control of each channel is set to be on or off, when the rotation rate control is set to on, the rotation rate needs to be set to avoid the instantaneous increase of voltage/current output, and if the gear output changes greatly when it is closed, it will directly respond to the output.

Settings and Defaults

If the channel does not have a slew rate control setting, the default setting is off.

Set up	M04DA setting	M04DAR setting	default
Slew Rate setting	Enable Disable	Enable Disable	Disable
Rotation rate	64 steps/100ms 125 steps/100ms 250 steps/100ms 500 steps/100ms 1000 steps/100ms 2000 steps/100ms 4000 steps/100ms 8000 steps/100ms 16000 steps/100ms 32000 steps/100ms 64000 steps/100ms 128000 steps/100ms 256000 steps/100ms 512000 steps/100ms 1024000 steps/100ms	64 steps/100ms 125 steps/100ms 250 steps/100ms 500 steps/100ms 1000 steps/100ms 2000 steps/100ms 4000 steps/100ms 8000 steps/100ms 16000 steps/100ms 32000 steps/100ms 64000 steps/100ms 128000 steps/100ms 256000 steps/100ms 512000 steps/100ms 1024000 steps/100ms	1024000 steps/100ms

Data Offset Function:

Set the data offset function to be on or off for each channel, when it is turned on, the data offset function needs to be set to correct the data offset, and when it is turned off, the data offset is not performed.

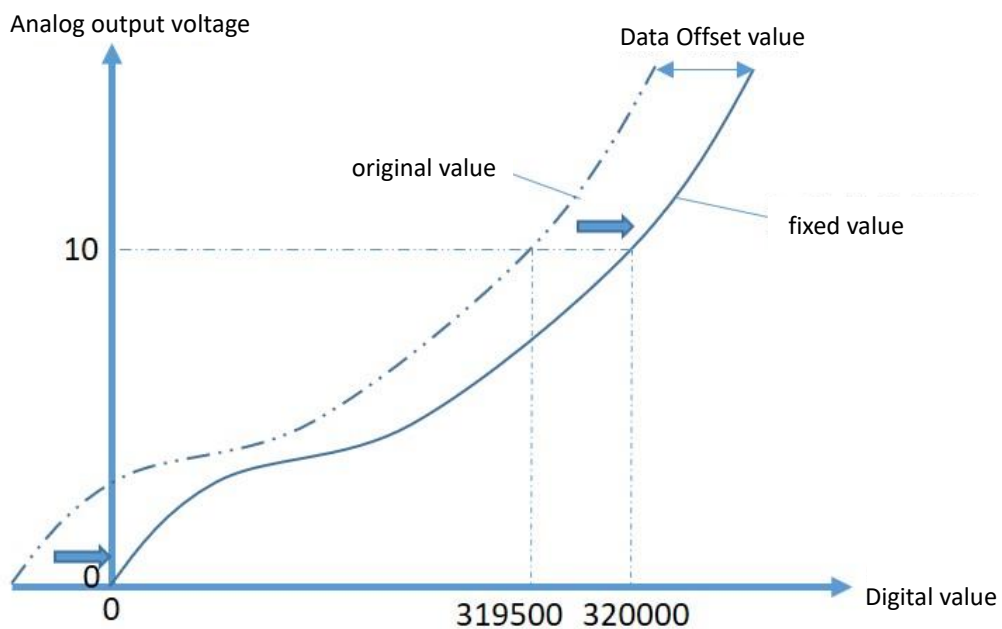
Directions for use and instructions

Add a set data offset to the digital input value to correct the data.

Number operation value = digital input value + data offset value.

Example: Analog output range: 0 ~ 10 V, data offset value is +50

Numeric input value	Numeric values	Analog Output Voltage(V)
-50	0	0
31950	32000	10V



Settings and Defaults

If the channel does not have a set data offset function, it is set to off by default.

Set up	M04DA setting	M04DAR setting	default
Data offset function	Open Shut down	Open Shut down	Shut down
Data offset value	-16383 ~ 16383	-64000 ~ 64000	0

Short Circuit Detection:

It automatically detects whether a short circuit has occurred and determines the behavior of the alarm relay according to the alarm pattern.

Short circuit detection is used to detect the voltage level and determine whether a short circuit has occurred.

- Directions for use and instructions

When a channel short circuit is detected, an alarm will be output, causing the corresponding relay to change from Off -> On.

Settings and Defaults

If there is no short-circuit detection set on the channel, it is set to off by default.

Set up	M04DA setting	M04DAR setting	default
Short Circuit Detection	Open Shut down	Open Shut down	Shut down

Run-time relay control

Please refer to the alarm relay and alarm mode setting Chapter.

Open Circuit Detection:

Automatically detects if an open circuit has occurred and determines the behavior of the alarm relay based on the alarm pattern.

Open circuit detection is used to detect the current level and determine whether an open circuit has occurred.

Directions for use and instructions

When the detection channel is open, an alarm will be output, causing the corresponding relay to change from Off -> On.

Settings and Defaults

If the channel is not set for open circuit detection, it is set to off by default.

Set up	M04DA setting	M04DAR setting	default
Open Circuit Detection	Open Shut down	Open Shut down	Shut down

M04DA/M04DAR Open Circuit Detection Setting

- Run-time relay control

Please refer to the alarm relay and alarm mode.

M04DA/M04DAR Alarm :

- Alarm mode

M04DA/M04DAR Alarm mode configuration	Alert behavior
Instantaneous mode (default).	When the analog input returns to the normal range, the alarm is automatically cleared (On->Off).
Latch mode	Even if the analog input returns to the normal range, the alarm relay will remain in place. Alarm elimination (Off->On) is eliminated by triggering an alarm elimination requirement relay

- All types of alerts

Alarm relay behavior is determined based on the alarm pattern

M04DA/M04DAR Alarm relay	Feature description
CH* short detect alarm relay	Off->On : CH* detect short circuit ° Off : Within the normal range of the channel.
CH* open detect alarm relay	Off->On : CH* detect open circuit ° Off : Within the normal range of the channel.
CH* Alarm Clearance Requirement Relay	If the alarm mode is latching mode, the alarm clearing requirement relay will operate. Off->On: clear CH* all alarm °

* Represents the number of the channel.

13-7 General analog input and output modules

13-7-1 M0202AH

The M0202AH module is an economic solution for the first two channels for analog input and two channels for analog output. The functional aspect is actually a hybrid application of M 04AD and M04DA, so the use case is the same.

Analog Input Section:

Please refer to this manual [for the general analog input module](#).

Analog Output Section :

Please refer to this manual [for general analog output modules](#).

13-8 Temperature control module

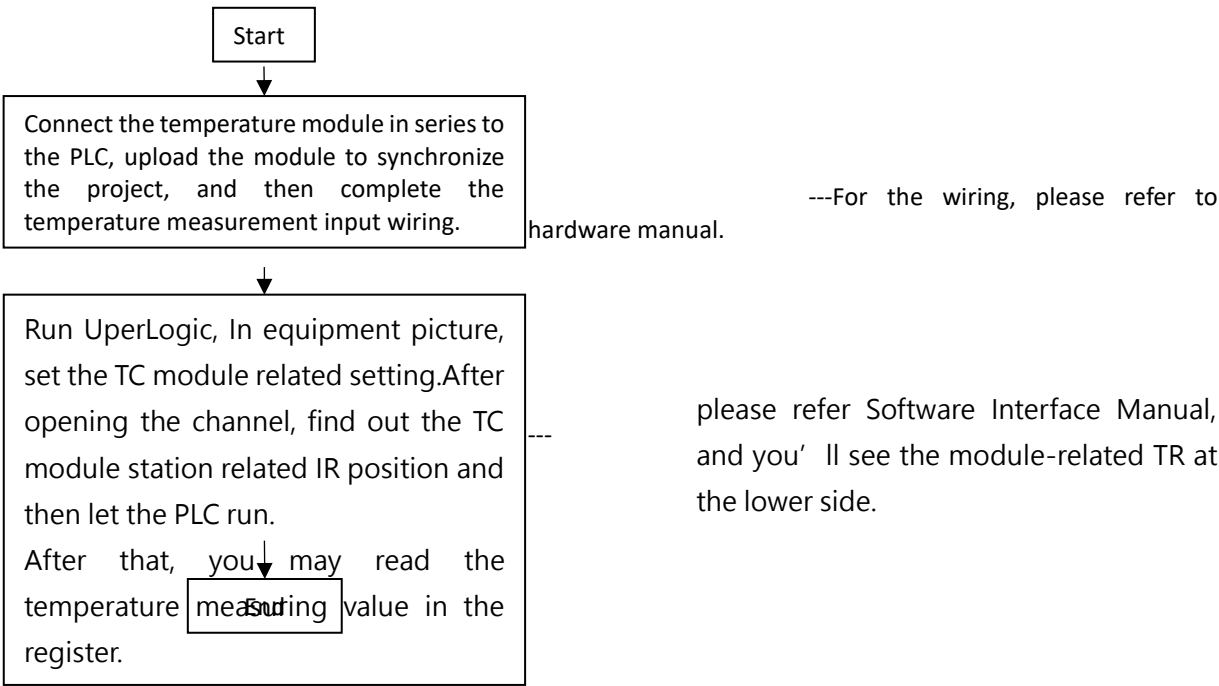
In response to the vast temperature control application market, M SERIES PLC provides thermocouples (M04TC) and platinum resistors (M04RTD), as well as hybrid modules (M0202TH) that combine the two; among them, M04TC and other temperature modules can be used as 4-point For temperature measurement of thermocouple input, there are 9 thermocouple types to choose from: J, K, T, E, N, B, R, S, ± 100 millivolts, etc.; each temperature module occupies the actual I/O address The numerical input depends on the model and resolution. The update rate of the temperature measurement of the TC module can be selected as normal (update time is 0.4 seconds, resolution is 0.1°) or fast (update time is 0.2 seconds, resolution is 0.1°). 1°) two modes; the update rate of the temperature measurement of the TCR module can be selected from normal (update time is 0.2 seconds, resolution is 0.1°) or fast (update time is 0.1 seconds, resolution is 1°) a pattern.

When using the above-mentioned temperature modules for temperature measurement, UperLogic provides an extremely simple form-filling method to plan the temperature module and temperature sensor types, and specify the corresponding register to store the temperature readings. As for PID temperature control, there is a dedicated convenience instruction (FUN99) to perform PID operation control, and the operation results are output through the appropriate output interface.

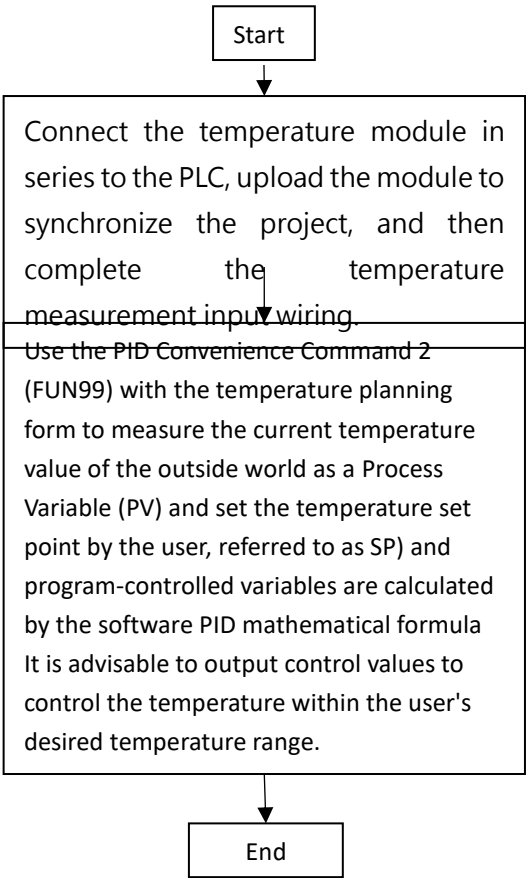
13-8-1 M04TC/M04TCR

Steps to use the temperature module:

Temperature measurement



Closed circuit temperature PID control



For the wiring, please refer to hardware manual.

Please refer to the command description and program example of FUN99.

Searching M04TC/M04TCR data in Device Monitor:

Click “Project” → “Device View” → “Device Monitor” , the device monitoring window will be shown as below on the right side:

Num:2

I/O Usage:

Used/ Total

DI: 16 / 1024

DO: 16 / 1024

AIO: 10 / 256

SR: 2 / 1000

(Start From: R35872)

M: 44 / 1313

(Start From: M9199)

FATEK

DI16

DO16

AI5

AQ2

RS485

ETHERNET

USB

SD

PC1

PC2

PC3

PC4

PC5

PC6

PC7

PC8

PC9

PC10

PC11

PC12

PC13

PC14

PC15

PC16

PC17

PC18

PC19

PC20

PC21

PC22

PC23

PC24

PC25

PC26

PC27

PC28

PC29

PC30

PC31

PC32

PC33

PC34

PC35

PC36

PC37

PC38

PC39

PC40

PC41

PC42

PC43

PC44

PC45

PC46

PC47

PC48

PC49

PC50

PC51

PC52

PC53

PC54

PC55

PC56

PC57

PC58

PC59

PC60

PC61

PC62

PC63

PC64

PC65

PC66

PC67

PC68

PC69

PC70

PC71

PC72

PC73

PC74

PC75

PC76

PC77

PC78

PC79

PC80

PC81

PC82

PC83

PC84

PC85

PC86

PC87

PC88

PC89

PC90

PC91

PC92

PC93

PC94

PC95

PC96

PC97

PC98

PC99

PC100

PC101

PC102

PC103

PC104

PC105

PC106

PC107

PC108

PC109

PC110

PC111

PC112

PC113

PC114

PC115

PC116

PC117

PC118

PC119

PC120

PC121

PC122

PC123

PC124

PC125

PC126

PC127

PC128

PC129

PC130

PC131

PC132

PC133

PC134

PC135

PC136

PC137

PC138

PC139

PC140

PC141

PC142

PC143

PC144

PC145

PC146

PC147

PC148

PC149

PC150

PC151

PC152

PC153

PC154

PC155

PC156

PC157

PC158

PC159

PC160

PC161

PC162

PC163

PC164

PC165

PC166

PC167

PC168

PC169

PC170

PC171

PC172

PC173

PC174

PC175

PC176

PC177

PC178

PC179

PC180

PC181

PC182

PC183

PC184

PC185

PC186

PC187

PC188

PC189

PC190

PC191

PC192

PC193

PC194

PC195

PC196

PC197

PC198

PC199

PC200

PC201

PC202

PC203

PC204

PC205

PC206

PC207

PC208

PC209

PC210

PC211

PC212

PC213

PC214

PC215

PC216

PC217

PC218

PC219

PC220

PC221

PC222

PC223

PC224

PC225

PC226

PC227

PC228

PC229

PC230

PC231

PC232

PC233

PC234

PC235

PC236

PC237

PC238

PC239

PC240

PC241

PC242

PC243

PC244

PC245

PC246

PC247

PC248

PC249

PC250

PC251

PC252

PC253

PC254

PC255

PC256

PC257

PC258

PC259

PC260

PC261

PC262

PC263

PC264

PC265

PC266

PC267

PC268

PC269

PC270

PC271

PC272

PC273

PC274

PC275

PC276

PC277

PC278

PC279

PC280

PC281

PC282

PC283

PC284

PC285

PC286

PC287

PC288

PC289

PC290

PC291

PC292

PC293

PC294

PC295

PC296

PC297

PC298

PC299

PC300

PC301

PC302

PC303

PC304

PC305

PC306

PC307

PC308

PC309

PC310

PC311

PC312

PC313

PC314

PC315

PC316

PC317

PC318

PC319

PC320

PC321

PC322

PC323

PC324

PC325

PC326

PC327

PC328

PC329

PC330

PC331

PC332

PC333

PC334

PC335

PC336

PC337

PC338

PC339

PC340

PC341

PC342

PC343

PC344

PC345

PC346

PC347

PC348

PC349

PC350

PC351

PC352

PC353

PC354

PC355

PC356

PC357

PC358

PC359

PC360

PC361

PC362

PC363

PC364

PC365

PC366

PC367

PC368

PC369

PC370

PC371

PC372

PC373

PC374

PC375

PC376

PC377

PC378

PC379

PC380

PC381

PC382

PC383

PC384

PC385

PC386

PC387

PC388

PC389

PC390

PC391

PC392

PC393

PC394

PC395

PC396

PC397

PC398

PC399

PC400

PC401

PC402

PC403

PC404

PC405

PC406

PC407

PC408

PC409

PC410

PC411

PC412

PC413

PC414

PC415

PC416

PC417

PC418

PC419

PC420

PC421

PC422

PC423

PC424

PC425

PC426

PC427

PC428

PC429

PC430

PC431

PC432

PC433

PC434

PC435

PC436

PC437

PC438

PC439

PC440

PC441

PC442

PC443

PC444

PC445

PC446

PC447

PC448

PC449

PC450

PC451

PC452

PC453

PC454

PC455

PC456

PC457

PC458

PC459

PC460

PC461

PC462

PC463

PC464

PC465

PC466

PC467

PC468

PC469

PC470

PC471

PC472

PC473

PC474

PC475

PC476

PC477

PC478

PC479

PC480

PC481

PC482

PC483

PC484

PC485

PC486

PC487

PC488

PC489

PC490

PC491

PC492

PC493

PC494

PC495

PC496

PC497

PC498

PC499

PC500

PC501

PC502

PC503

PC504

PC505

PC506

PC507

PC508

PC509

PC510

PC511

PC512

PC513

PC514

PC515

PC516

PC517

PC518

PC519

PC520

PC521

PC522

PC523

PC524

PC525

PC526

PC527

PC528

PC529

PC530

PC531

PC532

PC533

PC534

PC535

PC536

PC537

PC538

PC539

PC540

PC541

PC542

PC543

PC544

PC545

PC546

PC547

PC548

PC549

PC550

PC551

PC552

PC553

PC554

PC555

PC556

PC557

PC558

PC559

PC560

PC561

PC562

PC563

PC564

PC565

PC566

PC567

PC568

PC569

PC570

PC571

PC572

PC573

PC574

PC575

PC576

PC577

PC578

PC579

PC580

PC581

PC582

PC583

PC584

PC585

PC586

PC587

PC588

PC589

PC590

PC591

PC592

PC593

PC594

PC595

PC596

PC597

PC598

PC599

PC600

PC601

PC602

PC603

PC604

PC605

PC606

PC607

PC608

PC609

PC610

PC611

PC612

PC613

PC614

PC615

PC616

PC617

PC618

PC619

PC620

PC621

PC622

PC623

PC624

PC625

PC626

PC627

PC628

PC629

PC630

PC631

PC632

PC633

PC634

PC635

PC636

PC637

PC638

PC639

PC640

PC641

PC642

PC643

PC644

PC645

PC646

PC647

PC648

PC649

PC650

PC651

PC652

PC653

PC654

PC655

PC656

PC657

PC658

PC659

PC660

PC661

PC662

PC663

PC664

PC665

PC666

PC667

PC668

PC669

PC670

PC671

PC672

PC673

PC674

PC675

PC676

PC677

PC678

PC679

PC680

PC681

PC682

PC683

PC684

PC685

PC686

PC687

PC688

PC689

PC690

PC691

PC692

PC693

PC694

PC695

PC696

PC697

PC698

PC699

PC700

PC701

PC702

PC703

PC704

PC705

PC706

PC707

PC708

PC709

PC710

PC711

PC712

PC713

PC714

PC715

PC716

PC717

PC718

PC719

PC720

PC721

PC722

PC723

PC724

PC725

PC726

PC727

PC728

PC729

PC730

PC731

PC732

PC733

PC734

PC735

PC736

PC737

PC738

PC739

PC740

PC741

PC742

PC743

PC744

PC745

PC746

PC747

PC748

PC749

PC750

PC751

PC752

PC753

PC754

PC755

PC756

PC757

PC758

PC759

PC760

PC761

PC762

PC763

PC764

PC765

PC766

PC767

PC768

PC769

PC770

PC771

PC772

PC773

PC774

PC775

PC776

PC777

PC778

PC779

PC780

PC781

PC782

PC783

PC784

PC785

PC786

PC787

PC788

PC789

PC790

PC791

PC792

PC793

PC794

PC795

PC796

PC797

PC798

PC799

PC800

PC801

PC802

PC803

PC804

PC805

PC806

PC807

PC808

PC809

PC810

PC811

PC812

PC813

PC814

PC815

PC816

PC817

PC818

PC819

PC820

PC821

PC822

PC823

PC824

PC825

PC826

PC827

PC828

PC829

PC830

PC831

PC832

PC833

PC834

PC835

PC836

PC837

PC838

PC839

PC840

PC841

PC842

PC843

PC844

PC845

PC846

PC847

PC848

PC849

PC850

PC851

PC852

PC853

PC854

PC855

PC856

PC857

PC858

PC859

PC860

PC861

PC862

PC863

PC864

PC865

PC866

PC867

PC868

PC869

PC870

PC871

PC872

PC873

PC874

PC875

PC876

PC877

PC878

PC879

PC880

PC881

PC882

PC883

PC884

PC885

PC886

PC887

PC888

PC889

PC890

PC891

PC892

PC893

PC894

PC895

PC896

PC897

PC898

PC899

PC900

PC901

PC902

PC903

PC904

PC905

PC906

PC907

PC908

PC909

PC910

PC911

PC912

PC913

PC914

PC915

PC916

PC917

PC918

PC919

PC920

PC921

PC922

PC923

PC924

PC925

PC926

PC927

PC928

PC929

PC930

PC931

PC932

PC933

PC934

PC935

PC936

PC937

PC938

PC939

PC940

PC941

PC942

PC943

PC944

PC945

PC946

PC947

PC948

PC949

PC950

PC951

PC952

PC953

PC954

PC955

PC956

PC957

PC958

PC959

PC960

PC961

PC962

PC963

PC964

PC965

PC966

PC967

PC968

PC969

PC970

PC971

PC972

PC973

PC974

PC975

PC976

PC977

PC978

PC979

PC980

PC981

PC982

PC983

PC984

PC985

PC986

PC987

PC988

PC989

PC990

PC991

PC992

PC993

PC994

PC995

PC996

PC997

PC998

PC999

PC1000

PC1001

PC1002

PC1003

PC1004

PC1005

PC1006

PC1007

PC1008

PC1009

PC1010

PC1011

PC1012

PC1013

PC1014

PC1015

PC1016

PC1017

PC1018

PC1019

PC1020

PC1021

PC1022

PC1023

PC1024

PC1025

PC1026

PC1027

PC1028

PC1029

PC1030

PC1031

PC1032

PC1033

PC1034

PC1035

PC1036

PC1037

PC1038

PC1039

PC1040

PC1041

PC1042

PC1043

PC1044

PC1045

PC1046

PC1047

PC1048

PC1049

PC1050

PC1051

PC1052

PC1053

PC1054

PC1055

PC1056

PC1057

PC1058

PC1059

PC1060

PC1061

PC1062

PC1063

PC1064

PC1065

PC1066

PC1067

PC1068

PC1069

PC1070

PC1071

PC1072

PC1073

PC1074

PC1075

PC1076

PC1077

PC1078

PC1079

PC1080

PC1081

PC1082

PC1083

PC1084

PC1085

PC1086

PC1087

PC1088

PC1089

PC1090

PC1091

PC1092

PC1093

PC1094

PC1095

PC1096

PC1097

PC1098

PC1099

PC1100

PC1101

PC1102

PC1103

PC1104

PC1105

PC1106

PC1107

PC1108

PC1109

PC1110

PC1111

PC1112

PC1113

PC1114

PC1115

PC1116

PC1117

PC1118

PC1119

PC1120

PC1121

PC1122

PC1123

PC1124

PC1125

PC1126

PC1127

PC1128

PC1129

PC1130

PC1131

PC1132

PC1133

PC1134

PC1135

PC1136

PC1137

PC1138

PC1139

PC1140

PC1141

PC1142

PC1143

PC1144

PC1145

PC1146

PC1147

PC1148

PC1149

PC1150

PC1151

PC1152

PC1153

PC1154

PC1155

PC1156

PC1157

PC1158

PC1159

PC1160

PC1161

PC1162

PC1163

PC1164

PC1165

PC1166

PC1167

PC1168

PC1169

PC1170

PC1171

PC1172

PC1173

PC1174

PC1175

PC1176

PC1177

PC1178

PC1179

PC1180

PC1181

PC1182

PC1183

PC1184

PC1185

PC1186

PC1187

PC1188

PC1189

PC1190

PC1191

PC1192

PC1193

PC1194

PC1195

PC1196

PC1197

PC1198

PC1199

PC1200

PC1201

PC1202

PC1203

PC1204

PC1205

PC1206

PC1207

PC1208

PC1209

PC1210

PC1211

PC1212

PC1213

PC1214

PC1215

PC1216

PC1217

PC1218

PC1219

PC1220

PC1221

PC1222

PC1223

PC1224

PC1225

PC1226

PC1227

PC1228

PC1229

PC1230

PC1231

PC1232

PC1233

PC1234

PC1235

PC1236

PC1237

PC1238

PC1239

PC1240

PC1241

PC1242

PC1243

PC1244

PC1245

PC1246

PC1247

PC1248

PC1249

PC1250

PC1251

PC1252

PC1253

PC1254

PC1255

PC1256

PC1257

PC1258

PC1259

PC1260

PC1261

PC1262

PC1263

PC1264

PC1265

PC1266

PC1267

PC1268

PC1269

PC1270

PC1271

PC1272

PC1273

PC1274

PC1275

PC1276

PC1277

PC1278

PC1279

PC1280

PC1281

PC1282

PC1283

PC1284

PC1285

PC1286

PC1287

PC1288

PC1289

PC1290

PC1291

PC1292

PC1293

PC1294

PC1295

PC1296

PC1297

PC1298

PC1299

PC1300

PC1301

PC1302

PC1303

PC1304

PC1305

PC1306

PC1307

PC1308

PC1309

PC1310

- Logic data (temperature data)

Logic data refers to the value obtained or output by the channel. Click "Logic Data" on the top information of "Device Monitor", only logical data will be displayed in the module list. Put the mouse over the value, and when the data is blue as shown in the figure below, the value of the register can be modified; or modify the value display mode through "Dec" and "Hex" on the right of the register.

Information		D				A		S		M	
I/O	Status										
Channel 0 value	DR34776		Float	UDec	Dec	Hex					
	0x00000000										
Channel 1 value	DR34778		Float	UDec	Dec	Hex					
	0x00000000										
Channel 2 value	DR34780		Float	UDec	Dec	Hex					
	0x00000000										
Channel 3 value	DR34782		Float	UDec	Dec	Hex					
	0x00000000										

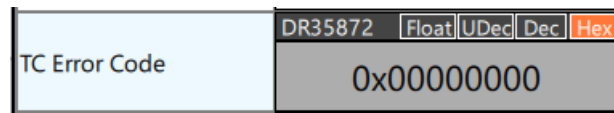
Logic data in "Device Monitor"

- Status information

If you click [Status Data] at the top of "Device Monitoring", only the status data will be displayed in the module list. When the data is grayed out as shown in the image below, the value of the scratchpad cannot be modified. However, it is still possible to quickly modify the display of values by using [Dec] and [Hex] on the right side of the register.

upper input limit	Ch 0 M9211	OFF	loop disconnection detection	Ch 0 M9231	OFF
	Ch 1 M9212	OFF		Ch 1 M9232	OFF
	Ch 2 M9213	OFF		Ch 2 M9233	OFF
	Ch 3 M9214	OFF		Ch 3 M9234	OFF
lower input limit	Ch 0 M9215	OFF	data buffer finish relay	Ch 0 M9235	OFF
	Ch 1 M9216	OFF		Ch 1 M9236	OFF
	Ch 2 M9217	OFF		Ch 2 M9237	OFF
	Ch 3 M9218	OFF		Ch 3 M9238	OFF
upper deviation limit	Ch 0 M9219	OFF	burnout detection	Ch 0 M9239	OFF
	Ch 1 M9220	OFF		Ch 1 M9240	OFF
	Ch 2 M9221	OFF		Ch 2 M9241	OFF
	Ch 3 M9222	OFF		Ch 3 M9242	OFF
lower deviation limit	Ch 0 M9223	OFF			
	Ch 1 M9224	OFF			
	Ch 2 M9225	OFF			
	Ch 3 M9226	OFF			
upper lower deviation limit	Ch 0 M9227	OFF			
	Ch 1 M9228	OFF			
	Ch 2 M9229	OFF			
	Ch 3 M9230	OFF			

Status data in "Device Monitor"



Error code in "Device Monitor"

- Relays

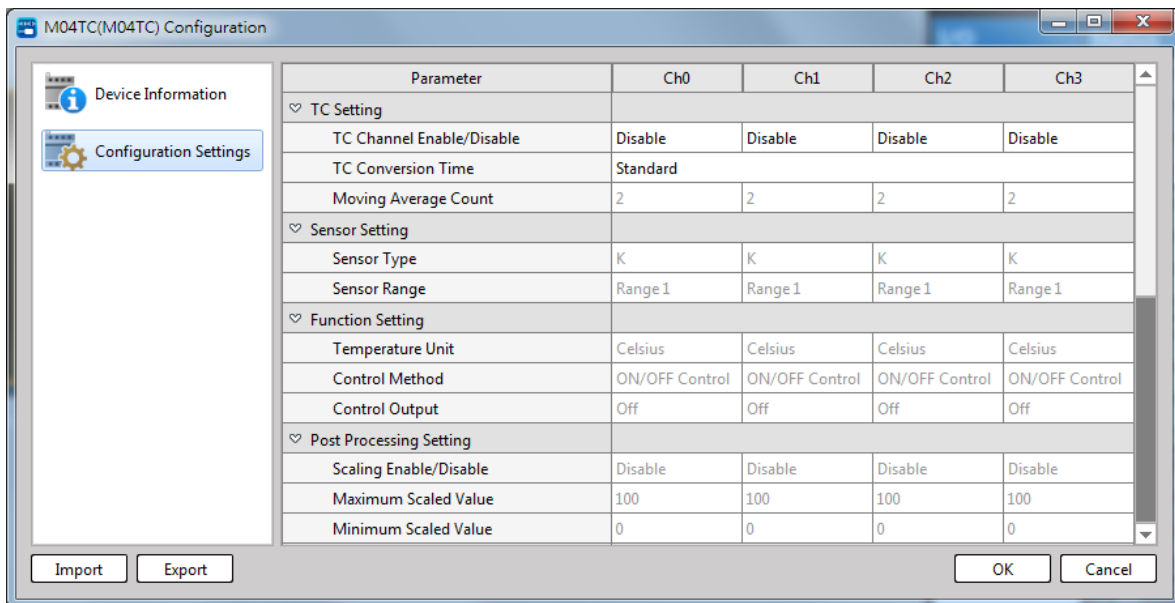
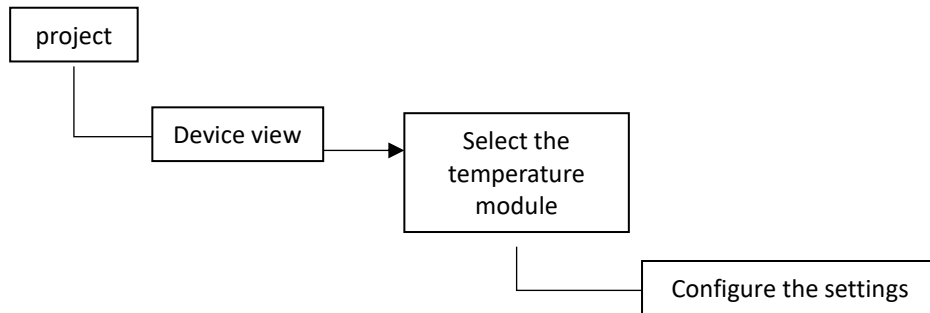
Click "Relay" on the top of "Device Monitor", and only the status information will be displayed in the module list. Put the mouse over the value, when the data is blue as shown in the figure below, the value of the register can be modified, otherwise, if the register position is gray, it cannot be modified.

data buffer request relay	Ch 0	M9199		OFF
	Ch 1	M9200		OFF
	Ch 2	M9201		OFF
	Ch 3	M9202		OFF
data buffer trigger relay	Ch 0	M9203		OFF
	Ch 1	M9204		OFF
	Ch 2	M9205		OFF
	Ch 3	M9206		OFF
alarm clear request relay	Ch 0	M9207		OFF
	Ch 1	M9208		OFF
	Ch 2	M9209		OFF
	Ch 3	M9210		OFF

Status data in "Device Monitor"

Temperature module related function and setting:

After connecting M04TC module with CPU module, click “Device View-> Configuration Settings” to start the setting in the Project window.



M04TC Channel Opening/Closing:

In each channel, the A/D conversion channel is designed with opening or closing function. When A/D conversion channel is opened, the channel will execute the A/D conversion. When A/D conversion channel is closed, the channel will not execute the A/D conversion and will reduce the conversion cycle for all of the channels

Setup: Opening/closing (preset)

M04TC Conversion Time :

It comprises standard and fast speed for changing the temperature and the conversion speed of the channel and selecting the temperature updating speed. The faster the conversion speed, the poorer the conversion speed accuracy; otherwise, it is more accurate. Such kind of setting is not available for the closed channel.

Set value: (conversion speed-ms)

Set value: (conversion speed-ms)

Average Move Frequency :

The average move frequency can be applied in the temperature control value (PV) of each channel. Assume noise is presented in the environment, the noise interference encountered by the control value can be reduced through such function. The setting scope is 2–10.

Setting: (frequency)

Preset value: 2

Sensor Type :

The system is equipped with a variety of thermocouple temperature sensors to meet the diversified applications. It is also designed with voltage bays to work with special type of thermocouple temperature sensor. You may select the temperature sensor that suits the channel the most. Listed below the supported sensor type and the related input scope:

Sensor type	Input scope(°C)
B	200~1800
E	-200~1000
J	-100~1200
K	-200~1350
N	-150~1300
R	0~1750

Sensor type	Input scope(°C)
S	0~1750
T	-200~400

Table 84 Supported ranges for various sensors

Temperature Units :

Based on the country, you may select local temperature unit (either in °C or °F). The temperature unit selected for each channel can be accurate till to the first place following the decimal point.

°C (preset value)

°F

Control Method:

Set the temperature control method for each channel.

Switch control: Compare with the set SV value to control the output for conversion between ON (max. output value) and OFF (min. output value).

PID control: By combing the proportional (P), integral action (I) and derivative action (D), it allows the system to achieve more efficient temperature control and its fluctuating ratio is also better then that of switch control.

Set value: Select the mode (preset, switch control)

Start running: Temperature control command

Shifting set: Stop temperature control and then set in "Equipment picture -> Configure" .

Control Output :

When M04TC module/CPU is faulty or when CPU is shut down, set the output value required for controlling each channel at Open (max. output value), Close (min. output value) or Hold (hold output value).

Setting:

Open/Close (preset)/Hold

Scaling:

By mapping the input scope to the new scope set by the user, you may enlarge or shrink the process control value; for example, applying -100°C–500°C to the newly created 0–10000 scope.

Setting:

Open/Close (preset value)

Max. scaling value (100)

Min. scaling value (0)

Scope: -32000–32000

Note: The system will output the error alarm if the min. value is greater than or equal to the max. value.

Circuit Disconnection Detection:

If the output value is the output max. limit value or output min. limit value, you may monitor the temperature measuring value (PV) at each time point. As long as the rising or the dropping does not exceed 2°C, the system will output the circuit disconnection detection alarm. Each channel will be allowed for setting:

Set judgment time: (s)

Scope: 0–7200(s). Such function remains inactive if set as "0" .

Burn-out Detection:

During the burn-out detection, it is not required to execute any setting and the M04TC module will keep checking to see if any burn-out occurs. If the burn-out phenomenon is detected at the input end, the system will report error warning; in this case, the system will display the bit required for the burn-out detection.

Setting Data Buffer:

Based on the sampling cycle, you may save the temperature control value (PV). The maximum number that can be saved in each channel shall be up to 600 individuals. After setting the desired observation point, you will be allowed to check the change of the number of the observation point before and after the observation. By using with DBUF FUN115 command, you will be allowed to save the massive data captured by the TC module in the PLC.

Setting:

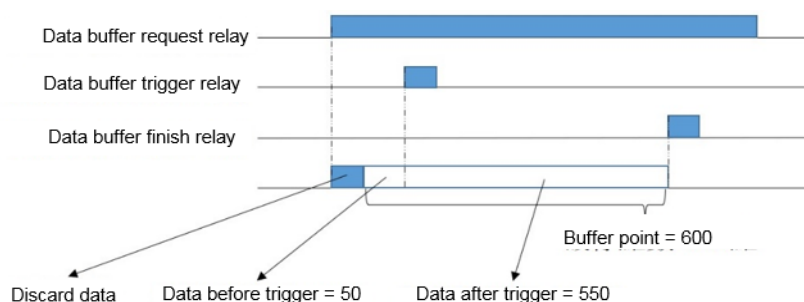
Number of buffer point before triggering (data number before the triggering point: 0–600)

Number of data buffer point (1–600)

Before triggering, the number of buffer point shall be less than or equal to that of the data buffer point.

Running method:

1. Data Buffer Request Relay starts/stops the saving (upper edge triggering).
2. Data Buffer Trigger Relay starts data collection (upper edge triggering).
3. After that, the module will continue the relay reporting through the data buffer function.
4. The user may load back the data in the PLC through DBUF FUN115 command



Sequence diagram of data buffering process

Assume that the user triggers the Data Buffer Trigger Relay before filling up the data retrieved from the

buffer points before the triggering, the system will ignore the remaining data and then start saving the data after the triggering. If the relay is under "On" status when completing the data buffer, the ignored data will not be included in the data that are transmitted back to the PLC by the user. For example, when setting the number of buffer point before the triggering as 200, the system will trigger the Data Buffer Request Relay to start data saving. If the Data Buffer Trigger Relay is triggered when the quantity of the data saved by the buffer is accumulated to 150 points, the system will ignore the remaining 50 points and then start collecting the data after the triggering. As a result, the quantity of the data being loaded back to the PLC will become the value obtained by deducting 50 individuals of data from that of the total buffer points.

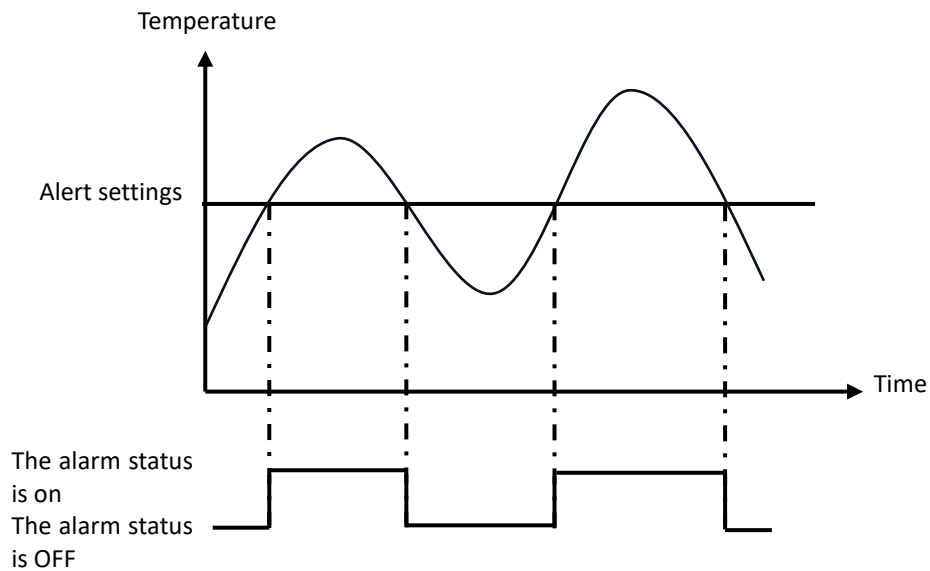
Before the triggering, the system will ignore the buffer points being existed during the period after completing the data buffer points and before the relay is activated following the data buffering.

The application method shall be the same as M04AD/M04ADR module. For details, please refer to "[General Analog Input Module](#)".

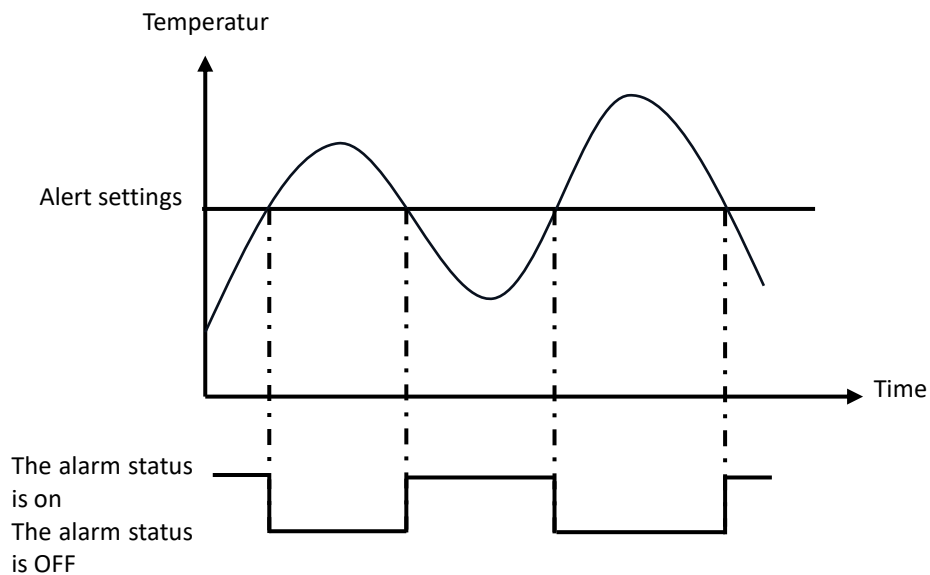
Alert:

When process control value (PV) or deviation value (E) reaches the set alert value, the system will enter alert status.

Input alert:

**Input upper limit alert**

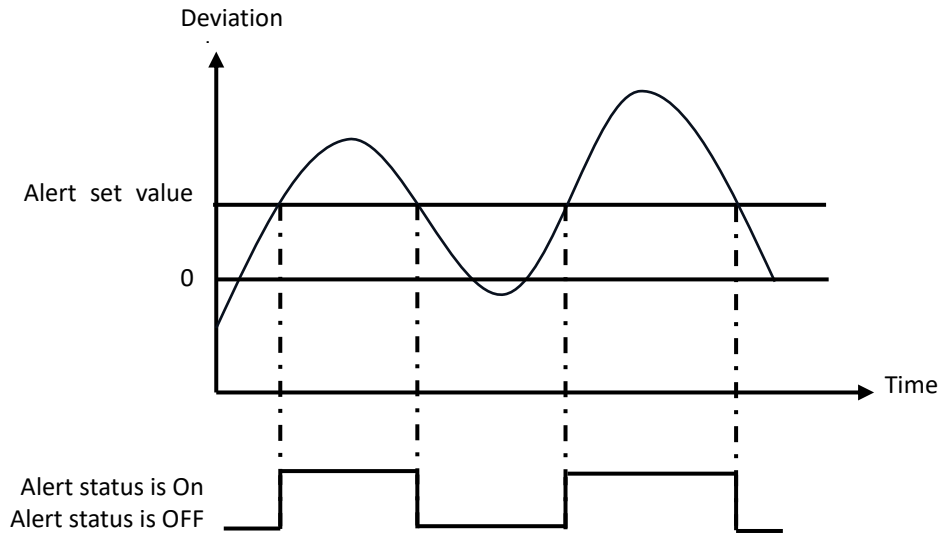
When the programmable value (PV) exceeds or equals to the alert set value, an alert will be issued.

**Input lower limit alert**

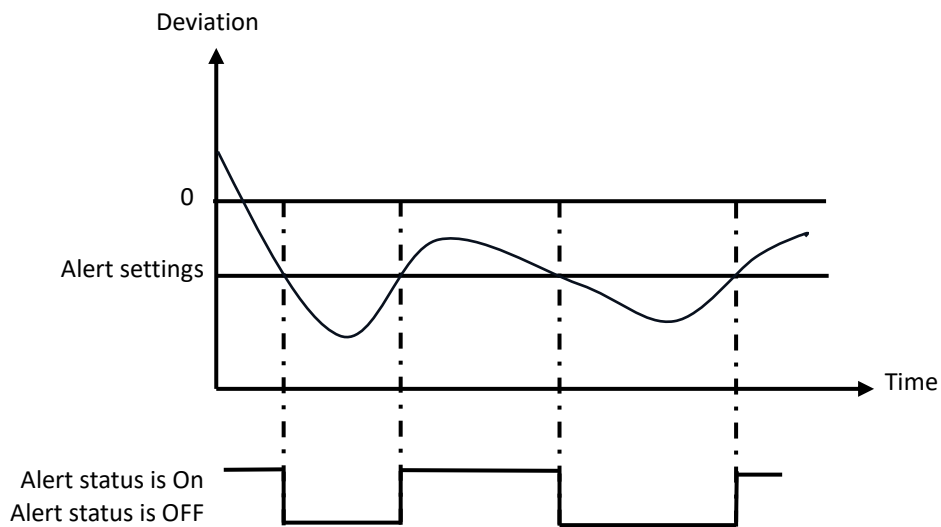
When the programmable value (PV) exceeds or equals to the alert set value, an alert will be issued.

Deviation Alarm (E)

Upper deviation limit alert. The system outputs the alert when deviation (E) is greater than or equal to the alert set value

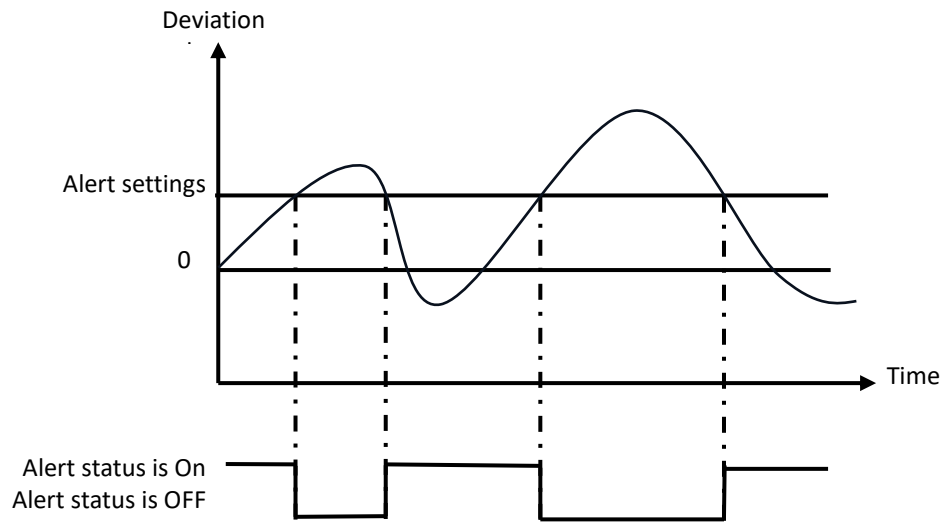


Deviation upper limit alert set value is greater than zero

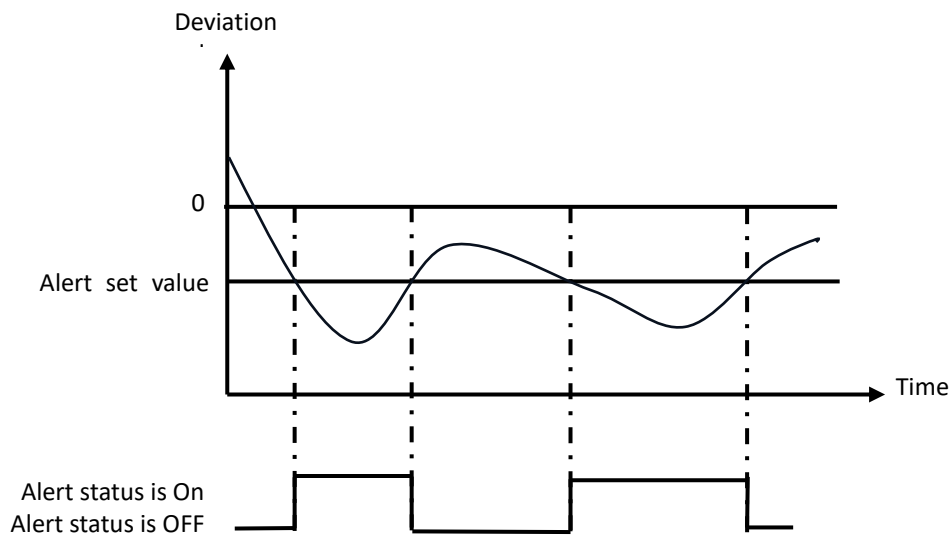


Deviation upper limit alert set value is less than zero

Lower deviation limit alert. The system outputs the alert when deviation (E) is less than or equal to the alert set value.

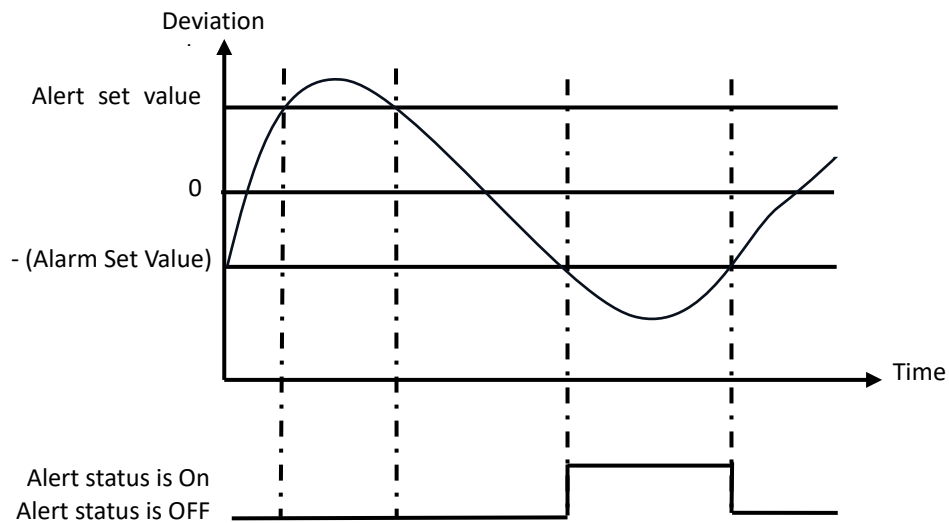


Deviation lower limit alert set value is greater than zero



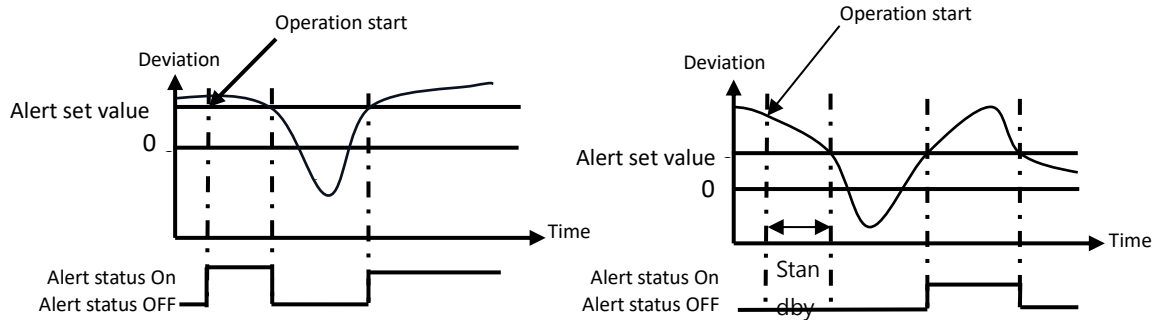
Deviation lower limit alert set value is less than zero

Upper/lower deviation limit alert: The system will enter alert status when satisfying the following conditions.

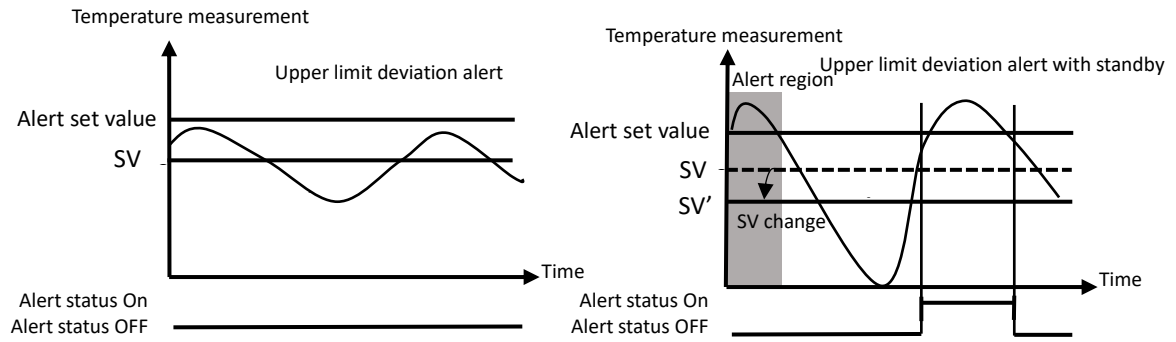


$$\text{Deviation (E)} \geq \text{Alert set value} \text{ or } \text{Deviation (E)} \leq -\text{Alert set value}$$

The alert standby mode ON or OFF status. It is configured as standby mode. If changing the set value (SV) or the error value before starting the temperature control, the system will enter the warning mode. When running under standby mode, the system will not output the alert (ON) before setting the alert as OFF even if the temperature process control value (PV) or the deviation value (E) has reached the alert status ON scope.



When starting the temperature control, the system will not output the alarm when reaching the first round of alarm OFF scope.



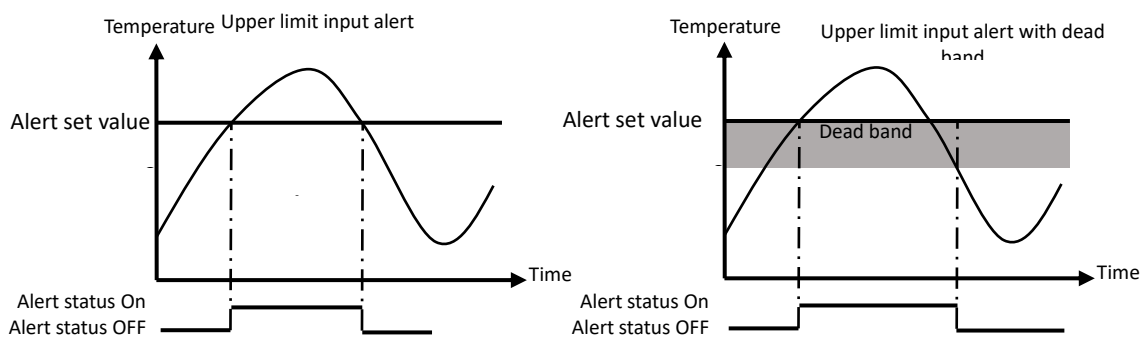
Assuming that the temperature programmed value (PV) is in the safe range, when the set value (SV) changes, the PV may fall within the alert region, so as to avoid alerts in standby mode

Setting alert mode and alert value

- Type of setting
- Setting alarm value
- The alarm value set by the input alarm will be regarded as the input scope.
- The alarm value set by the deviation alarm will be ranging between “-full scale–full scale” .

Note:

1. Full scale: The max. and the min. temperature scope of such type of sensor. Taking “K” for example, the max. value is 1350 and the min. value is -200. Therefore, the full scale will be set as 1550.
- When setting, check if the standby mode should be enabled (ON/OFF).
 - It is required to set the dead band alert and the value of each channel. The input scope will be 0–10.0% of the full scale.



Schematic diagram of dead band alert mode

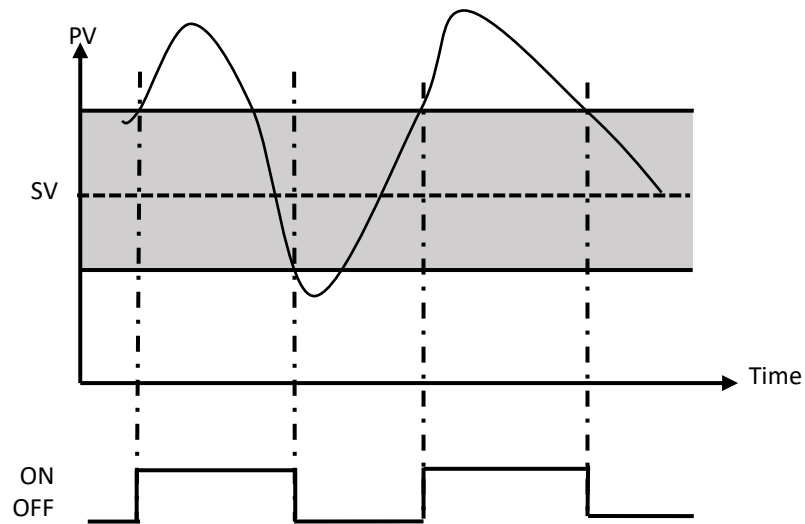
- Set the alarm delay frequency. If it is judged as the alert status, then the system will accumulate the frequency when entering the alarm status each time. The system will output the alert if the accumulated frequency is bigger than the set value. The scope is ranging between 0–255.

Dead Band :

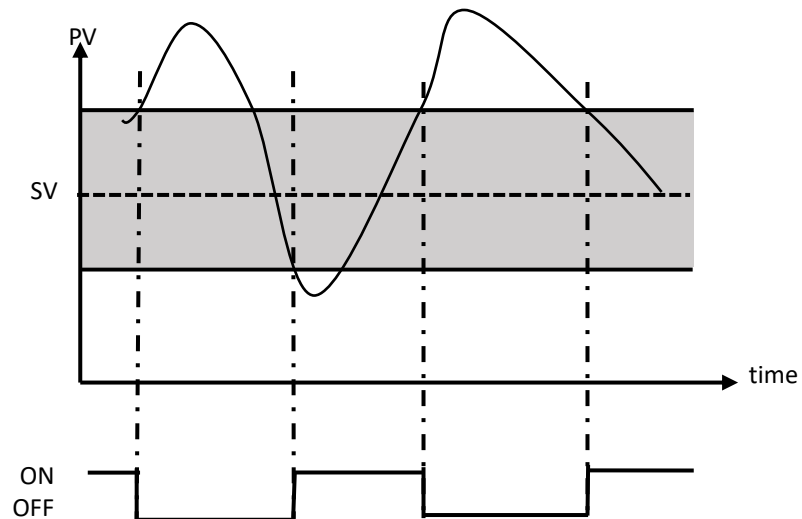
You need to set the response difference that will be exported when the channel temperature control mode is under "ON/OFF" status, and such setting is also applicable for the PID temperature control. For details, please refer to Section 13.2.12 "PID Control" .

Set value: (dead band) temperature, ranging between 0–10.0% (input scope).

- Taking "K" for example, the scale of dead band will be as below: $(1350 - (-200)) * 0.1 = 155^{\circ}\text{C}$



ON/OFF control & heat action

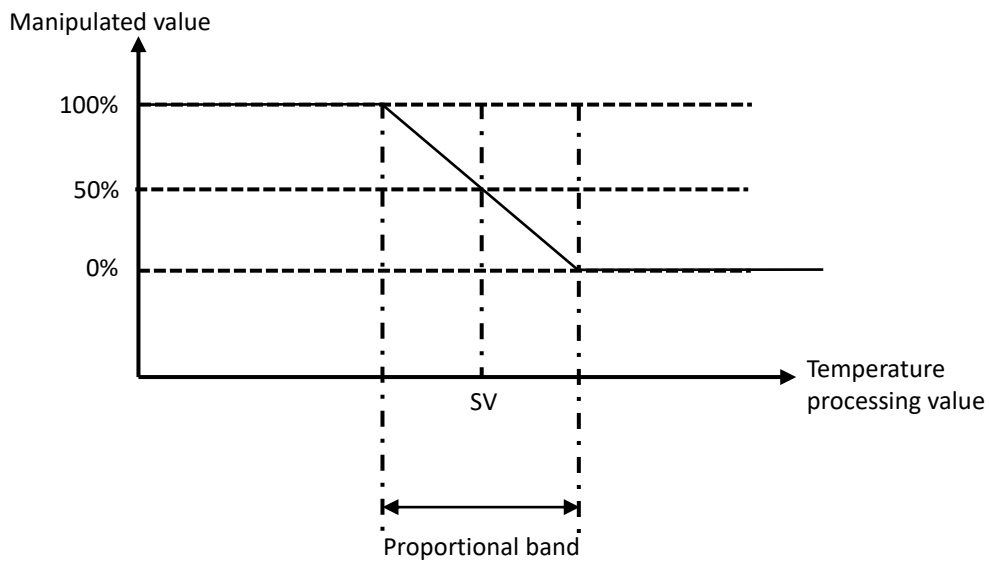


ON/OFF control & cool action

PID Control

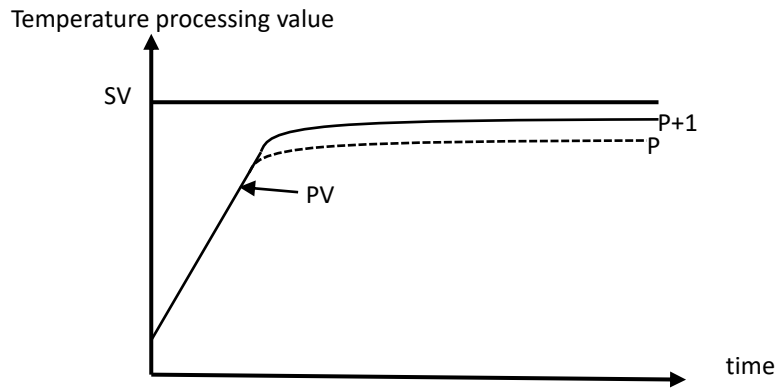
Each channel can run the respective PID computation, and the Temperature Control Mode shall be set as the PID control. By using proportional (P), integral action (I) and derivative action (D), the system will be allowed to execute the temperature more efficiently in order to execute the P, PI, PD and PID control according to actual operation need.

Proportional: Specific output proportion will be created according to the scale of output quantity (MV) along with the error (E) between the measured value (PV) and the set value (SV). The smaller the proportional value, the stronger the fluctuation; otherwise, smaller fluctuation will result.



Proportional control layout

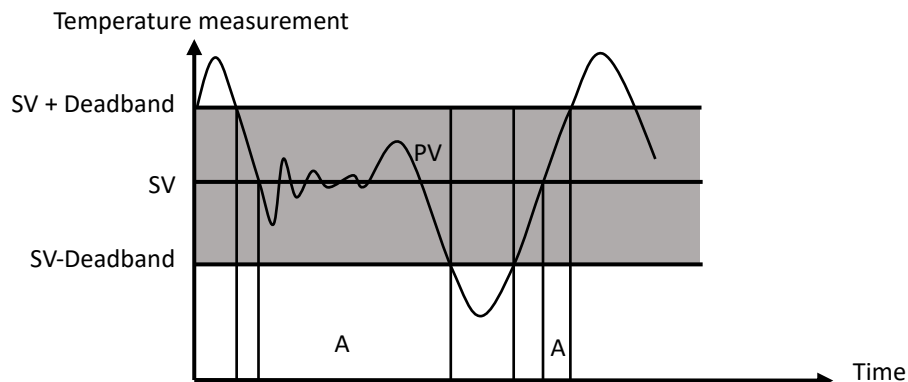
Integral Time: The output quantity will be increased and decreased according to the error (E) between the measured value (PV) and the set value (SV) in order to minimize the error that will be created by the P action. The smaller the integral time, the stronger the fluctuation and the quicker the rising; otherwise, it will become smaller and slower. The scope is ranging between 0–3600s. If the integral time is set as “0” , then the system will not execute the integral control.



Integral control layout

Derivative Time: The output quantity will be increased and decreased according to the change rate between the measured value (PV) and the set value (SV). Even though abrupt change is created due to the noise, the system will be restored to stabilized status within a short period of time through the derivative action. The smaller the derivative time, the weaker the fluctuation and the slower the response; otherwise, it will become bigger and quicker. The scope is ranging between 0–3600s. If the derivative time is set as “0” , then the system will not execute the derivative control.

PID Dead Band: The setting scope is ranging between 0–10.0% (input scope). During the PID control, the system will regard such zone as a deviation (E) inactive area. When the temperature process control value (PV) enters the dead band, the system will keep the PID computation until riding through the set value (SV). At this time, “E” will be resolved in the computation formula when expressed as “0” and then the system will resume normal PID computation after riding through the dead band. As shown in the figure below, “E” in Zone-A is expressed as “0” .



Derivative control layout

PID Manual Mode: After being enabled, the output quantity (MV) will be changed to manual control mode instead of using the PID computation result as the output data.

Output scope limit. Such function is used to set the PID output scale. Based on the operating status, it is used to set the upper output limit, limited max. output value, lower output limit and limited min. output value. If the lower output limit is greater than or equal to upper output limit, then the system will output error alarm.

Biase: The output biase value. It allows the user to increase or decrease the output value. In spite of this, it will be limited by the created output scope.

Manual Output: Set the manual output quantity and its scope will be ranging between "lower output limit – upper output limit" .

Set value:

1. Channel No. (channel number)
2. PID parameters (proportional (P), integral time (I), derivative time (D))
3. PID manual mode: ON/OFF (preset)
4. Biase: Output biase (real)
5. Manual output: Lower output limit – upper output limit
6. Upper output limit: To be bigger than lower output limit.
7. Lower output limit: To be smaller than upper output limit.
8. Dead band setting: 0.0–10.0%

Selecting Heating/Cooling Control

Such function is used to set the heating control or the cooling control when executing the temperature control for the respective channel.

Setting type: Temperature control command

Heat/cool: Forward/Reverse (preset)

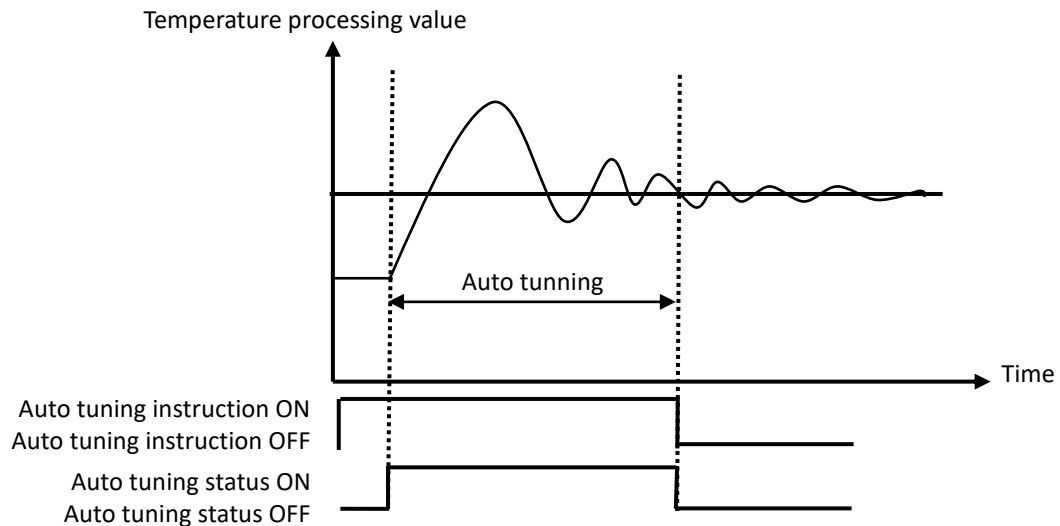
When executing the ON/OFF control, the method will vary according to the selected action.

Heat/cool	Description
Heating control	If the measured value is smaller than the set value, the output increase action will be regarded as the set value for the heating process.
Cooling control	If the measured value is bigger than the set value, the output increase action will be regarded as the set value for the cooling process.

Heat/cool control behavior relationship

Auto tuning

Based on the control system operating environment, such function can be used to calculate appropriate PID parameters required for the proportional (P), integral time (I) and derivative time (D). You will be allowed to use the aforesaid parameters after executing the temperature control under PID Control Mode. In this case, it provides several waveforms through ON/OFF control for the temporary in order to obtain the optimal PID parameters. After that, the system will log the parameters in the PID-related memory where they will be converted to PID control mode in order to execute the temperature control.



Auto tuning layout

During the auto tuning period, the system will use the upper output limit and the lower output limit as the reference for executing the output. To execute the auto tuning, you need to set the output cycle as the value other than "0" .

If the SV setting exceeds the temperature scope value, then the system will not execute the auto tuning function. If the cycle still remains after the auto tuning process, then the system will output auto tuning overdue error alarm.

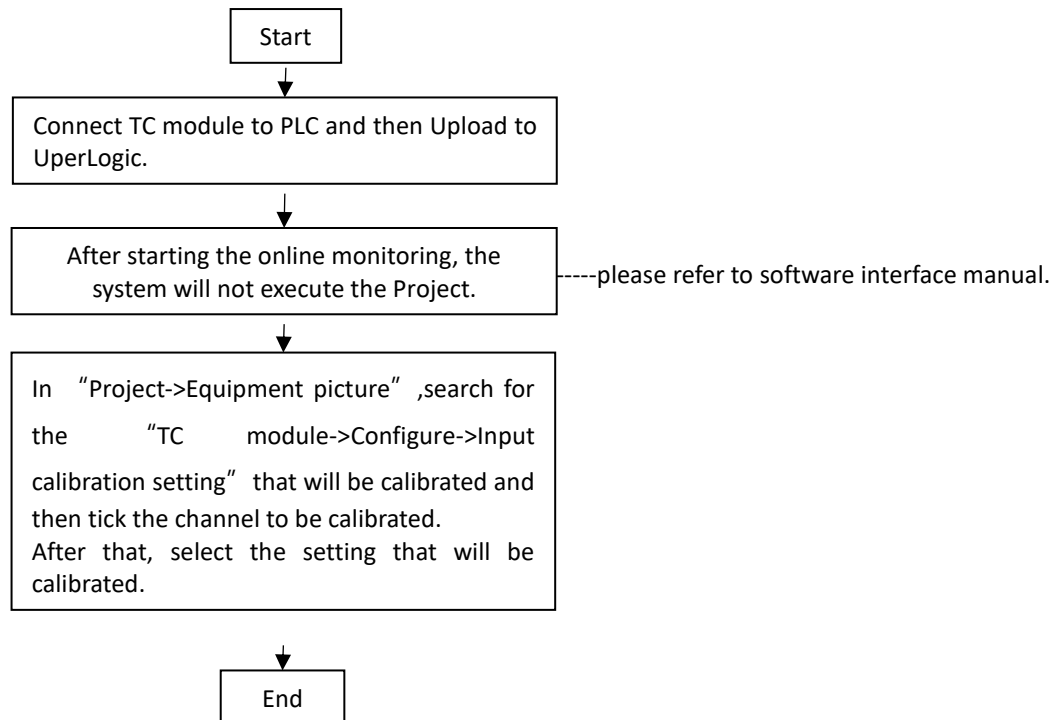
The auto tuning function cannot be executed for the channel that has been set as closed conversion. If you change the value set for the SV, dead band, sensor calibration, output limit, output cycle, control mode and channel closing, then the system will stop executing the auto tuning function and will trigger the error alarm (ON).

Execution method: Through temperature control commands.

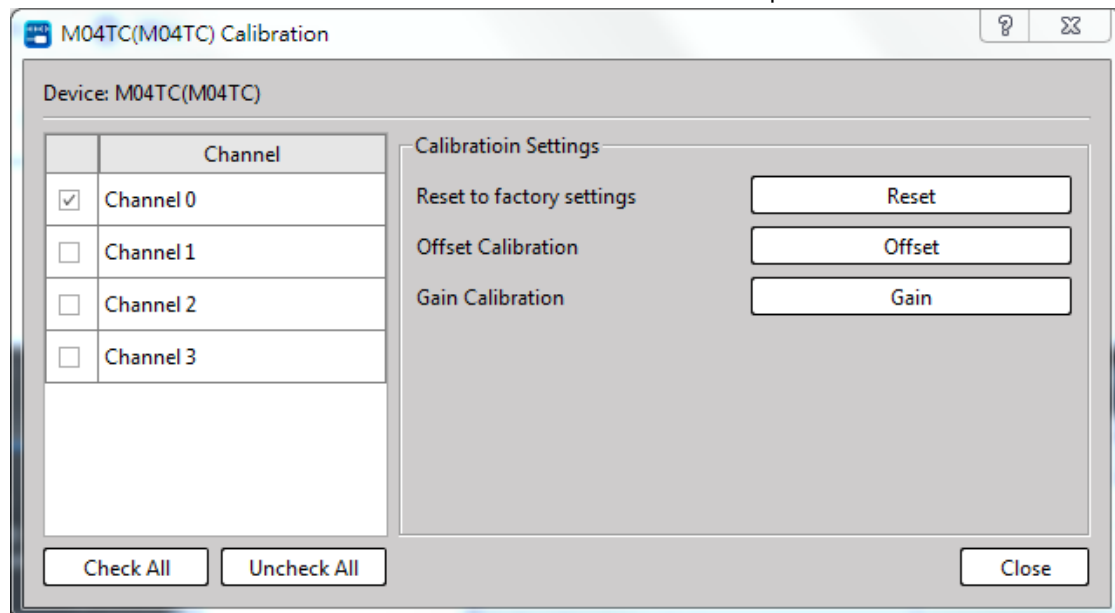
Ending method: Auto tuning finish report (the Auto tuning status set by the TPCTL will be shown as "3").

M04TC Calibration Steps

If the user considers that certain errors may exist in the value during the running process, then the calibration function can be used to calibrate the values of TC module according to the steps provided below:



M04TC module user calibration steps



M04TC module calibration window

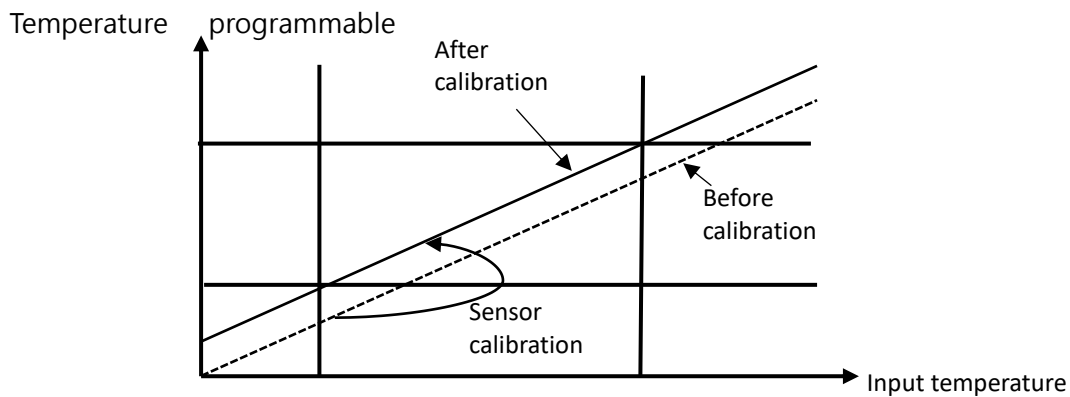
Restore Factory Calibration Value

Upon delivery, the system will calibrate the TC module once and then save the calibrated value in TC module. To restore such value to the factory calibration value, you may find out the "Restore factory setting" in the picture above and then select "Reset" in order to restore the offset value and the gain value to the factory setting.

User Calibration

If the calibration value set by the factory presents certain errors during the operating process, then these errors can be corrected by the user. To correct, click the offset value/gain value to be corrected and then input corresponding values according to steps described in the wording hint.

Calibration of the process control value of the respective channel. If the imported temperature value is different from actual one, you may use the temperature measuring value (PV) obtained through the Offset value and Gain value calibration and then save it in the M04TC module



Data figure layout before and after sensor calibration

Setting type: When executing the calibration, please refer to user calibration and the formula will be as follows: $\text{Gain value}/1000 + \text{Data offset}$

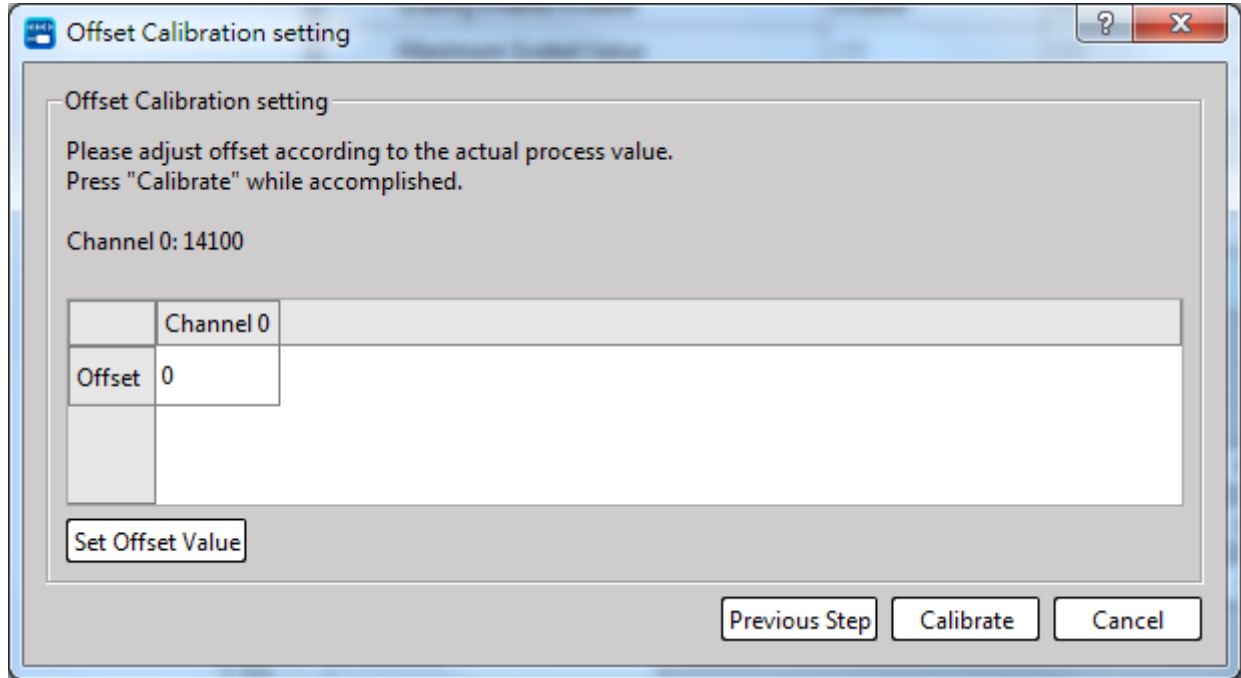
Setting:

1. Channel number
2. Gain scope: -32000–32000
3. Offset scope: -32000–32000
4. Save in M04TC module

- Offset calibration

Calibration path is indicated as below:

In "Project->Device View" , find the "M04TC module->Configuration Settings->Input calibration setting" that will be calibrated and then tick the channel to be calibrated. Next, select the "Offset" option.



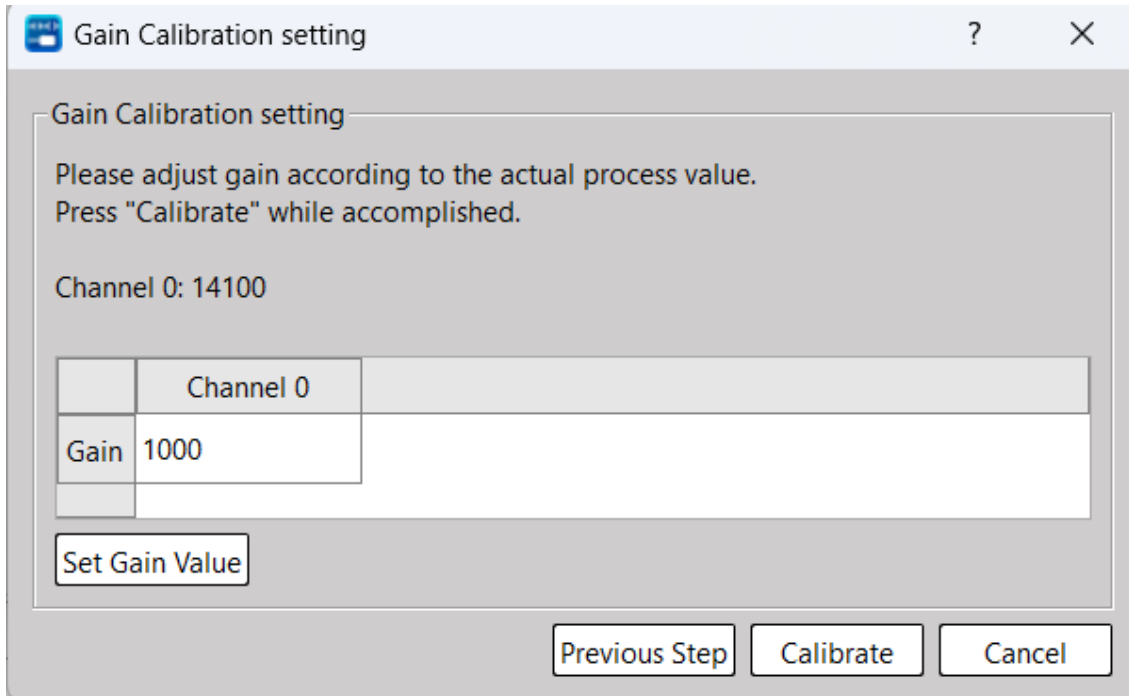
M04TC module offset calibration window

Based on the wording hint, input the value of the corresponding mode to complete the calibration.

- Gain calibration

Calibration path is indicated as below:

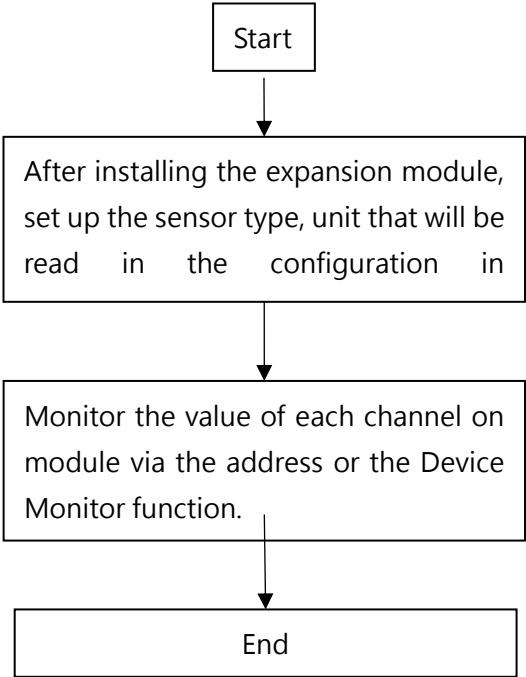
In “Project->Device View”, find the “M04TC module->Configuration Settings->Input calibration setting” that will be calibrated and then tick the channel to be calibrated. Next, select the “Gain” option.



M04TC module gain calibration window

Based on the wording hint, input the value of the corresponding mode to complete the calibration.

13-8-2 M0202TH

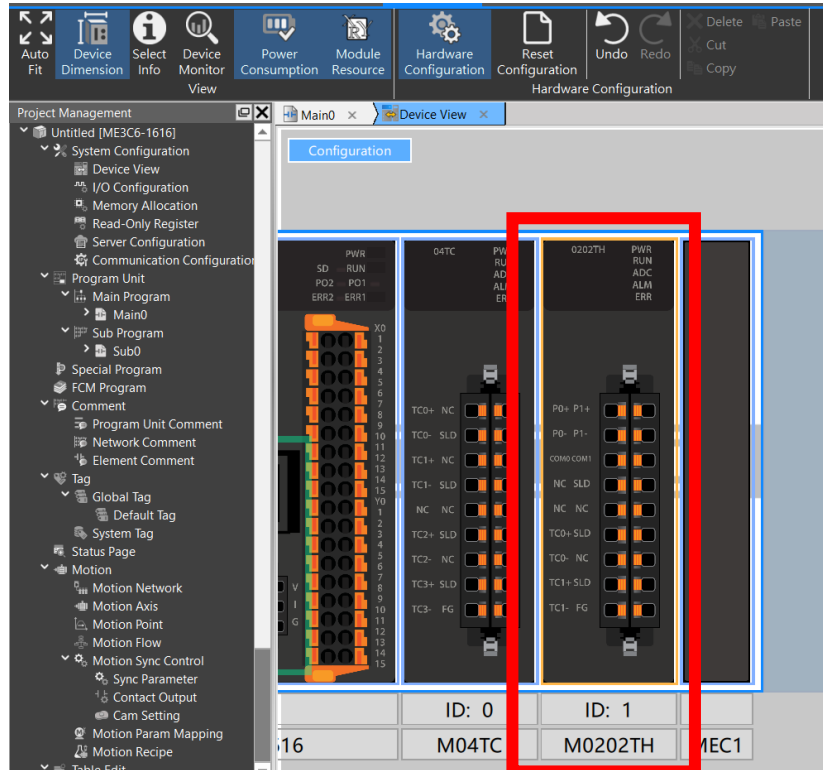


For detailed Management and configuration, please refer to Interface Manual.

Refer to the Mapping table to check the address of each channel on the module.

Searching M0202TH data in Device Monitor

Click “Management” → “Device Monitor” , the device monitoring window will be shown as below on the right side:



In the information, you can choose the resources to be displayed, such as “Digital Data” , “Logic Data” , “Status Data” .

(1) Logic Data(temperature data)

The logic data refer to the values retrieved from the channel.
When clicking the “Logic data” at the upper side “Device monitor” , the Module List will display the logic data only. Place the mouse on the desired value and when the data is lit in blue as per the figure below, you may revise the value of such register. Through the “Dec” and “Hex” on right-hand side of the register, you may also revise the value display pattern instantly.

Information		D	A	S	X
I/O	Status				
		Float	UDec	Dec	Hex
Channel 0 value	0x00000101				
Channel 1 value	0x00000113				
Channel 2 value	0x00000107				
Channel 3 value	0x00003714				

Logic data in “Device Monitor”

(2) Status Data

Click “Status Data” on the top of “Device Monitor” , and only the status data will be displayed in the module list. When the data is grayed out as shown in the figure below, the value of the register cannot be modified. However, it is still possible to quickly modify the value display mode through “Dec” and “Hex” on the right side of the register.

	Float	UDec	Dec	Hex
M0202TH Error Code	0x00000000			

Error code in “Device Monitor”

Temperature module related function and setting

After connecting M0202TH module with M PLC click “Management-> Configuration Settings” to start the setting in the Project window.

M0202TH(M0202TH) Configuration

Device Information
Configuration Settings

Parameter	Ch0	Ch1	Parameter	Ch2	Ch3
RTD Setting			TC Setting		
RTD Channel Enable/Disable	Disable	Disable	TC Channel Enable/Disable	Disable	Disable
Moving Average Count	2	2	TC Conversion Time	Standard	
Sensor Setting			Moving Average Count		
Sensor Type	Pt100	Pt100	2		
Sensor Range	Range 1	Range 1	Sensor Setting		
Function Setting			Sensor Type		
Temperature Unit	Celsius	Celsius	K		
Control Method	ON/OFF Contr...	ON/OFF Contr...	Sensor Range		
Control Output	Off	Off	Range 1		
Post Processing Setting			Function Setting		
Scaling Enable/Disable	Disable	Disable	Temperature Unit		
Maximum Scaled Value	100	100	Celsius		
Minimum Scaled Value	0	0	Control Method		
Data Buffer Setting			ON/OFF Contr...		
Data Buffer Points	600 points	600 points	Control Output		
Data Buffer Points before Trigger	200 points	200 points	Off		
Alert Setting			Post Processing Setting		
RTD Alert Standby Mode Enable/Disable	Disable	Disable	Scaling Enable/Disable		
Upper Limit Input Value	800.0°C	800.0°C	Disable		
Lower Limit Input Value	-100.0°C	-100.0°C	Maximum Scaled Value		
Upper Limit Deviation Value	1000.0°C	1000.0°C	100		
Lower Limit Deviation Value	-1000.0°C	-1000.0°C	Minimum Scaled Value		
Upper Lower Limit Deviation Value	1000.0°C	1000.0°C	0		
Dead Band Alert	0.0 %	0.0 %	Data Buffer Setting		
Number of Alert Delay	0	0	Data Buffer Points		
Loop Disconnection Detection	0 sec	0 sec	600 points		
Loop Disconnection Dead Band	0.0°C	0.0°C	Data Buffer Points before Trigger		
			200 points		
			Alert Setting		
			TC Alert Standby Mode Enable/Disable		
			Disable		
			Upper Limit Input Value		
			1350.0°C		
			Lower Limit Input Value		
			-100.0°C		
			Upper Limit Deviation Value		
			1450.0°C		
			Lower Limit Deviation Value		
			-1450.0°C		
			Upper Lower Limit Deviation Value		
			1450.0°C		
			Dead Band Alert		
			0.0 %		
			Number of Alert Delay		
			0		
			Loop Disconnection Detection		
			0 sec		

Import
Export
Default
Follow Setting
OK
Cancel

M0202TH Module configuration setting

M0202TH channel enable/disable

In each channel, the A/D conversion channel is designed with enable or disable function. When A/D conversion channel is enabled, the channel will execute the A/D conversion. When A/D conversion channel is disable, the channel will not execute the A/D conversion and will reduce the conversion cycle for all of the channels

Setup: enable/disable (preset)

M0202TH conversion time

The TC part divide to standard and fast speed for changing the temperature and the conversion speed of the channel and selecting the temperature updating speed. The faster the conversion speed, the poorer the conversion speed accuracy; otherwise, it is more accurate.

The RTD is fixed, such kind of setting is not available for the disable channel.

Set value: (conversion speed-ms)

Moving average count

The Moving average count can be applied in the temperature control value (PV) of each channel. Assume noise is presented in the environment, the noise interference encountered by the control value can be reduced through such function. The setting scope is 2–10.

Set as 1 means no average.

Setting: (frequency)

Preset value: 2

Sensor Type

The system is equipped with a variety of thermocouple temperature sensors to meet the diversified applications. It is also designed with voltage bays to work with special type of thermocouple temperature sensor. You may select the temperature sensor that suits the channel the most. Listed below the supported sensor type and the related input scope.

Sensor type	Input scope(°C)
TC	
B	200~1800
E	-200~1000
J	-100~1200
K(default)	-200~1350

Sensor type	Input scope(°C)
TC	
N	-150~1300
R	0~1750
S	0~1750
T	-200~400
RTD	
Pt100(default)	-200~850
JPt100	-200~600
Pt1000	-200~850
JPt1000	-200~600

Supported ranges for various sensors

Temperature Unit

Based on the country, you may select local temperature unit (either in °C or °F). The temperature unit selected for each channel can be accurate till to the first place following the decimal point.

Setting:

°C (preset value)

°F

Scaling

By mapping the input scope to the new scope set by the user, you may enlarge or shrink the process control value; for example, applying -100°C–500°C to the newly created 0–10000 scope.

Setting:

Open/Close (preset value)

Max. scaling value (100)

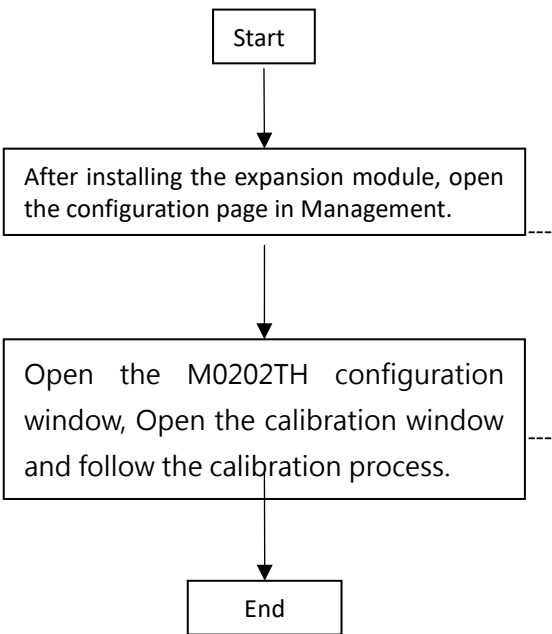
Min. scaling value (0)

Scope: -32000–32000

Note: The system will output the error alarm if the min. value is greater than or equal to the max. value.

M0202TH calibration steps

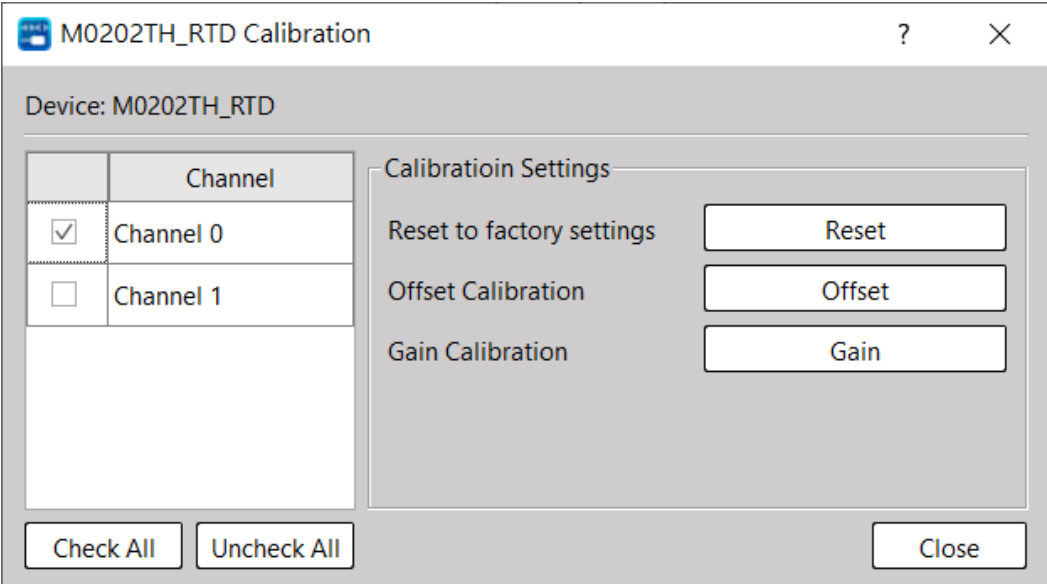
If the user considers that certain errors may exist in the value during the running process, then the calibration function can be used to calibrate the RTD/TC values of M0202TH module according to the steps provided below:

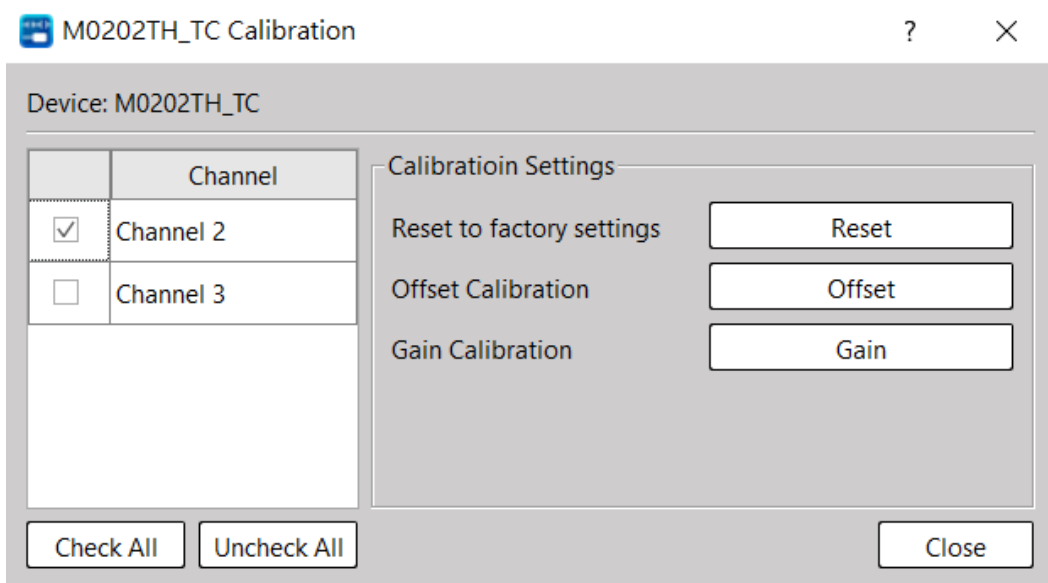


For detailed Management and configuration, please refer to Interface Manual.

Refer to the Mapping table to check the address of each channel on the module.

M0202TH module user calibration steps





M0202TH module calibration screen

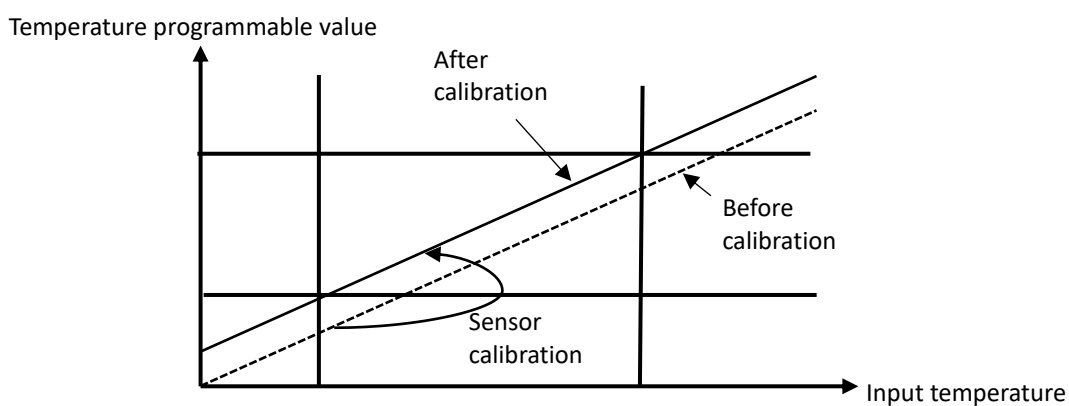
Restore Factory Calibration Value

Upon delivery, the system will calibrate the TC module once and then save the calibrated value in TC module. To restore such value to the factory calibration value, you may find out the "Restore factory setting" in the picture above and then select "Reset" in order to restore the offset value and the gain value to the factory setting.

User Calibration

If the calibration value set by the factory presents certain errors during the operating process, then these errors can be corrected by the user. To correct, click the offset value/gain value to be corrected and then input corresponding values according to steps described in the software wizards.

Calibration of the process control value of the respective channel. If the imported temperature value is different from actual one, you may use the temperature measuring value (PV) obtained through the Offset value and Gain value calibration and then save it in the M0202TH module



Data figure layout before and after sensor calibration

Setting type: When executing the calibration, please refer to user calibration and the formula will be as follows: $\text{Gain value}/1000 + \text{Data offset}$

Setting:

1. Channel number
2. Gain scope: -32000–32000
3. Offset scope: -32000–32000
4. Save in M0202TH module

- Offset calibration

Calibration path is indicated as below:

In "Management", find the "M0202TH module->Configuration Settings->Input calibration setting" that will be calibrated and then tick the channel to be calibrated. Next, select the "Offset" option.

Offset Calibration setting

Please adjust offset according to the actual process value.
Press "Calibrate" while accomplished.

Channel 0: 255

	Channel 0	
Offset	0	

Set Offset Value

Previous Step Calibrate Cancel

M0202TH module offset calibration window

Based on the software wizards, input the value of the corresponding mode to complete the calibration.

- Gain calibration

Calibration path is indicated as below:

In "management", find the "M0202TH module->Configuration Settings->Input calibration setting" that will be calibrated and then tick the channel to be calibrated. Next, select the "Gain" option.

Gain Calibration setting

Please adjust gain according to the actual process value.
Press "Calibrate" while accomplished.

Channel 0: 251

	Channel 0	
Gain	1000	

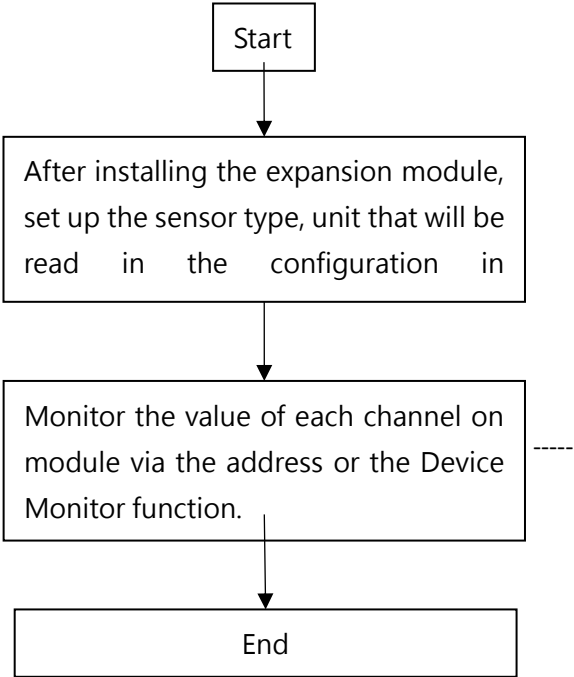
Set Gain Value

Previous Step Calibrate Cancel

M0202TH module gain calibration window

Based on the software wizards, input the value of the corresponding mode to complete the calibration.

13-8-3 M04RTD

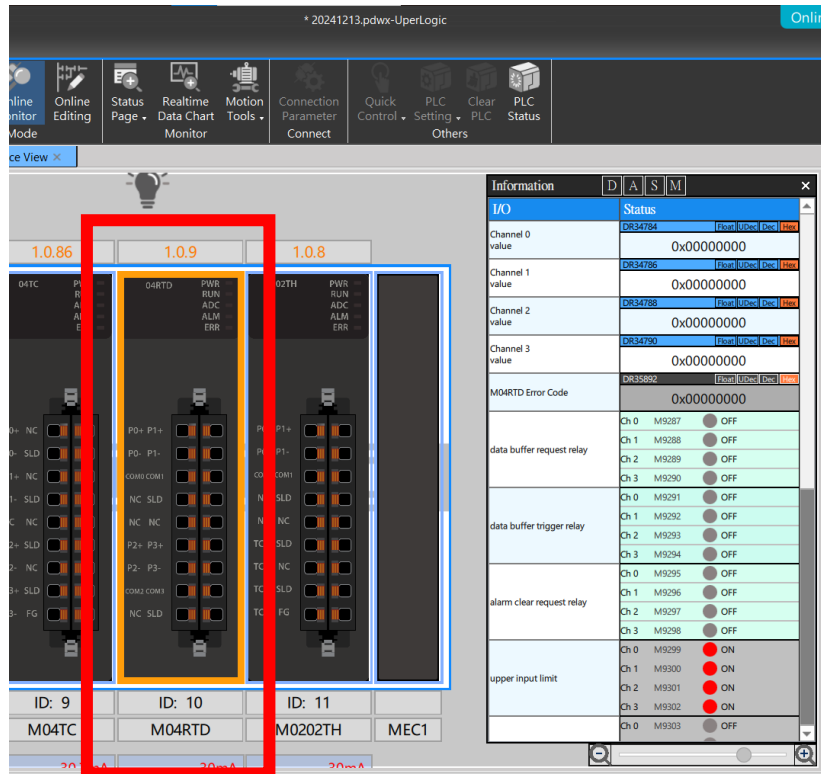


For detailed Management and configuration, please refer to Interface Manual.

Refer to the Mapping table to check the address of each channel on the module.

Searching M04RTD data in Device Monitor

Click “Management” → “Device Monitor” , the device monitoring window will be shown as below on the right side:



In the information, you can choose the resources to be displayed, such as “Digital Data” , “Logic Data” , “Status Data” .

(3) Logic Data(temperature data)

The logic data refer to the values retrieved from the channel.
When clicking the “Logic data” at the upper side “Device monitor” , the Module List will display the logic data only. Place the mouse on the desired value and when the data is lit in blue as per the figure below, you may revise the value of such register. Through the “Dec” and “Hex” on right-hand side of the register, you may also revise the value display pattern instantly.

Information		D	A	S	X
I/O	Status				
		Float	UDec	Dec	Hex
Channel 0 value	0x00000101				
Channel 1 value	0x00000113				
Channel 2 value	0x00000107				
Channel 3 value	0x00003714				

Logic data in “Device Monitor”

(4) Status Data

Click “Status Data” on the top of “Device Monitor” , and only the status data will be displayed in the module list. When the data is grayed out as shown in the figure below, the value of the register cannot be modified. However, it is still possible to quickly modify the value display mode through “Dec” and “Hex” on the right side of the register.

M04RTD Error Code	DR35892	Float	UDec	Dec	Hex
	0x00000000				

Error code in “Device Monitor”

Temperature module related function and setting

After connecting M04RTD module with M PLC click “Management-> Configuration Settings” to start the setting in the Project window.

M04RTD Configuration

Device Infor...

Configuratio...

Register Sett...

Parameter	Ch0	Ch1	Ch2	Ch3
RTD Setting				
RTD Channel Enable/Disable	Disable	Disable	Disable	Disable
Moving Average Count	2	2	2	2
Sensor Setting				
Sensor Type	Pt100	Pt100	Pt100	Pt100
Sensor Range	Range 1	Range 1	Range 1	Range 1
Function Setting				
Temperature Unit	Celsius	Celsius	Celsius	Celsius
Control Method	ON/OFF Control	ON/OFF Control	ON/OFF Control	ON/OFF Control
Control Output	Off	Off	Off	Off
Post Processing Setting				
Scaling Enable/Disable	Disable	Disable	Disable	Disable
Maximum Scaled Value	100	100	100	100
Minimum Scaled Value	0	0	0	0
Data Buffer Setting				
Data Buffer Points	600 points	600 points	600 points	600 points
Data Buffer Points before Trigger	200 points	200 points	200 points	200 points
Alert Setting				
Alert Standby Mode Enable/Disable	Disable	Disable	Disable	Disable
Upper Limit Input Value	800.0°C	800.0°C	800.0°C	800.0°C
Lower Limit Input Value	-100.0°C	-100.0°C	-100.0°C	-100.0°C
Upper Limit Deviation Value	1000.0°C	1000.0°C	1000.0°C	1000.0°C
Lower Limit Deviation Value	-1000.0°C	-1000.0°C	-1000.0°C	-1000.0°C
Upper Lower Limit Deviation Value	1000.0°C	1000.0°C	1000.0°C	1000.0°C
Dead Band Alert	0.0 %	0.0 %	0.0 %	0.0 %
Number of Alert Delay	0	0	0	0
Loop Disconnection Detection	0 sec	0 sec	0 sec	0 sec
Loop Disconnection Dead Band	0.0°C	0.0°C	0.0°C	0.0°C
Input Calibration Setting				
Input Calibration Offset/Gain	Calibration			

Import

Export

Default

Follow Setting

Register

OK

Cancel

M04RTD Module configuration setting

M04RTD channel enable/disable

In each channel, the A/D conversion channel is designed with enable or disable function. When A/D conversion channel is enabled, the channel will execute the A/D conversion. When A/D conversion channel is disable, the channel will not execute the A/D conversion and will reduce the conversion cycle for all of the channels

Setup: enable/disable (preset)

Moving average count

The Moving average count can be applied in the temperature control value (PV) of each channel. Assume noise is presented in the environment, the noise interference encountered by the control value can be reduced through such function. The setting scope is 2–10.

Set as 1 means no average.

Setting: (frequency)

Preset value: 2

Sensor Type

The system is equipped with a variety of thermocouple temperature sensors to meet the diversified applications. It is also designed with voltage bays to work with special type of thermocouple temperature sensor. You may select the temperature sensor that suits the channel the most. Listed below the supported sensor type and the related input scope.

Sensor type	Input scope(°C)
RTD	
Pt100(default)	-200~850
JPt100	-200~600
Pt1000	-200~850
JPt1000	-200~600

Supported ranges for various sensors

Temperature Unit

Based on the country, you may select local temperature unit (either in °C or °F). The temperature unit selected for each channel can be accurate till to the first place following the decimal point.

Setting:

°C (preset value)

°F

Scaling

By mapping the input scope to the new scope set by the user, you may enlarge or shrink the process control value; for example, applying -100°C–500°C to the newly created 0–10000 scope.

Setting:

Open/Close (preset value)

Max. scaling value (100)

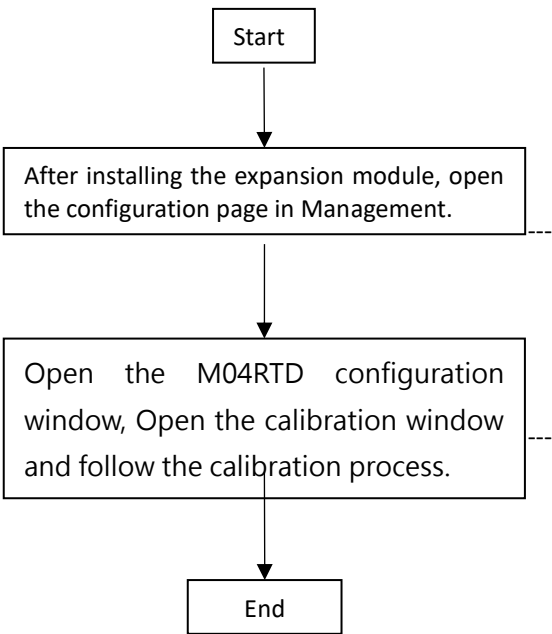
Min. scaling value (0)

Scope: -32000–32000

Note: The system will output the error alarm if the min. value is greater than or equal to the max. value.

M04RTD calibration steps

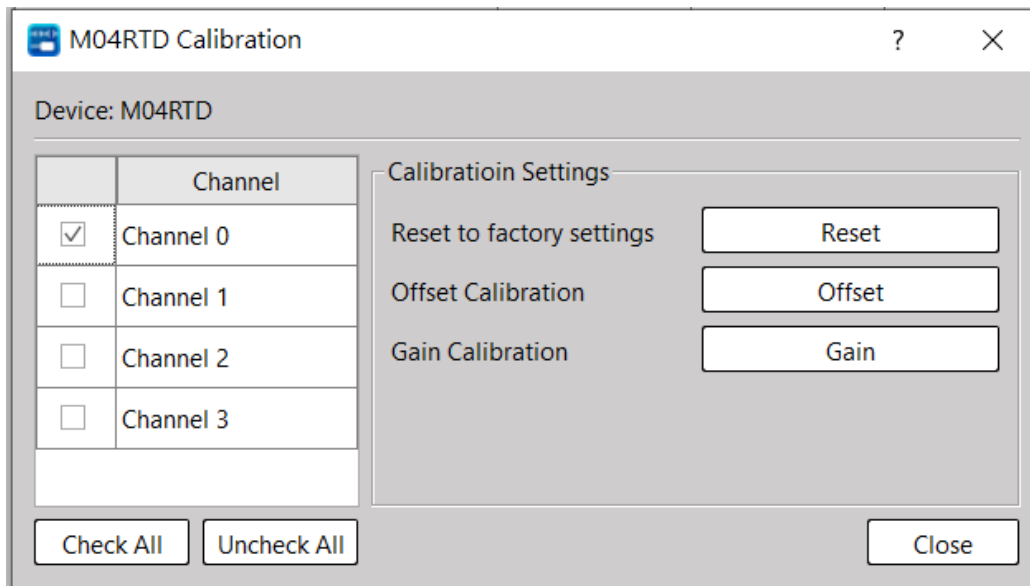
If the user considers that certain errors may exist in the value during the running process, then the calibration function can be used to calibrate the RTD values of M04RTD module according to the steps provided below:



For detailed Management and configuration, please refer to Interface Manual.

Refer to the Mapping table to check the address of each channel on the module.

M04RTD module user calibration steps



M04RTD module calibration screen

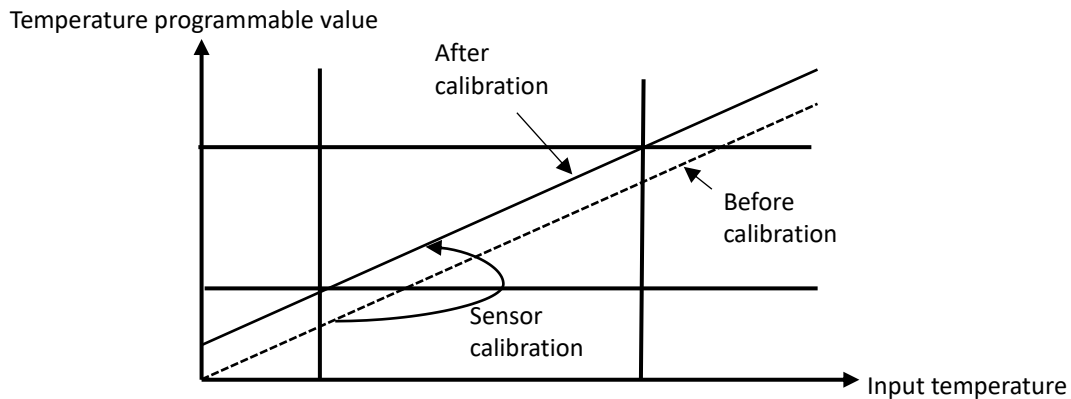
Restore Factory Calibration Value

Upon delivery, the system will calibrate the RTD module once and then save the calibrated value in RTD module. To restore such value to the factory calibration value, you may find out the "Reset factory setting" in the picture above and then select "Reset" in order to restore the offset value and the gain value to the factory setting.

User Calibration

If the calibration value set by the factory presents certain errors during the operating process, then these errors can be corrected by the user. To correct, click the offset value/gain value to be corrected and then input corresponding values according to steps described in the software wizards.

Calibration of the process control value of the respective channel. If the imported temperature value is different from actual one, you may use the temperature measuring value (PV) obtained through the Offset value and Gain value calibration and then save it in the M04RTD module



Data figure layout before and after sensor calibration

Setting type: When executing the calibration, please refer to user calibration and the formula will be as follows: $\text{Gain value}/1000 + \text{Data offset}$

Setting:

5. Channel number
6. Gain scope: -32000–32000
7. Offset scope: -32000–32000
8. Save in M04RTD module

- Offset calibration

Calibration path is indicated as below:

In "Management" , find the "M04RTD module->Configuration Settings->Input calibration setting" that will be calibrated and then tick the channel to be calibrated. Next, select the "Offset" option.

Offset Calibration setting

Please adjust offset according to the actual process value.
Press "Calibrate" while accomplished.

Channel 0: 255

	Channel 0	
Offset	0	

Set Offset Value

Previous Step Calibrate Cancel

M04RTD module offset calibration window

Based on the software wizards, input the value of the corresponding mode to complete the calibration.

- Gain calibration

Calibration path is indicated as below:

In "management" , find the "M04RTD module->Configuration Settings->Input calibration setting" that will be calibrated and then tick the channel to be calibrated. Next, select the "Gain" option.

Gain Calibration setting

Please adjust gain according to the actual process value.
Press "Calibrate" while accomplished.

Channel 0: 251

	Channel 0	
Gain	1000	

Set Gain Value

Previous Step Calibrate Cancel

M04RTD module gain calibration window

Based on the software wizards, input the value of the corresponding mode to complete the calibration.

13-9 Weight Measuring Module

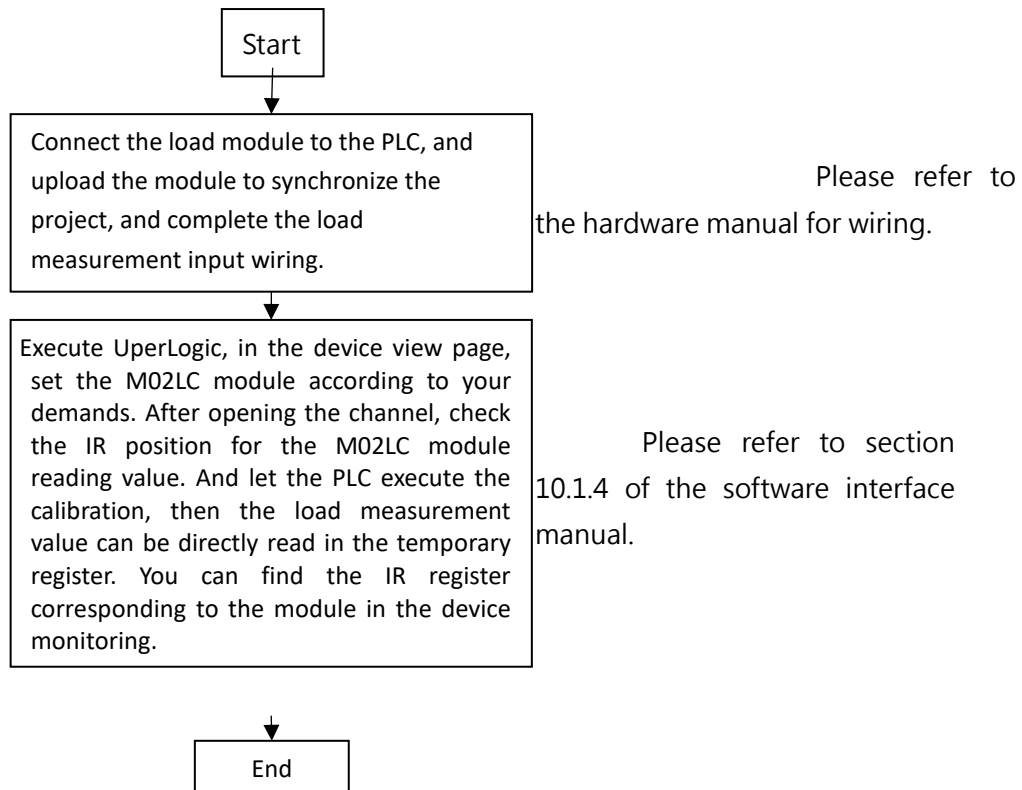
13-9-1 MU2LC/MU2LCR

Steps to use Load Cell Module

Load

Cell

Measurement



Module Introduction

Load cell module provides two different resolutions, namely the M02LCR and M02LCR module. It can be used to measure weak signals generated by load cells, and turn it into weight value.

The hardware resolution capability of this module is 24 bits. The range of weight readings is elastically changed according to the setting of the load cell. The range of digital readings is fixed at 0~10000.

In order to filter out the on-site noise accompanying the signal, this module also provides the functions of sampling signal averaging and automatic zero-point compensation.

The difference between the two modules in the conversion speed and resolution. The resolution of M02LR is 14 bits, and the resolution of M02LCR is 18 bits. For details, please refer to the input "Signal Scope" chapter and "Conversion Time Setting".

The ambient temperature and the connecting distance will affect the accuracy of the load cell. If the environmental parameters changes, it will affect the accuracy of the load cell after calibration. The user must re-calibrate to ensure the correctness of the weight reading.

M02LCR Sampling Time

100 sample/second

M02LC Sampling Time

4800 sample/second.

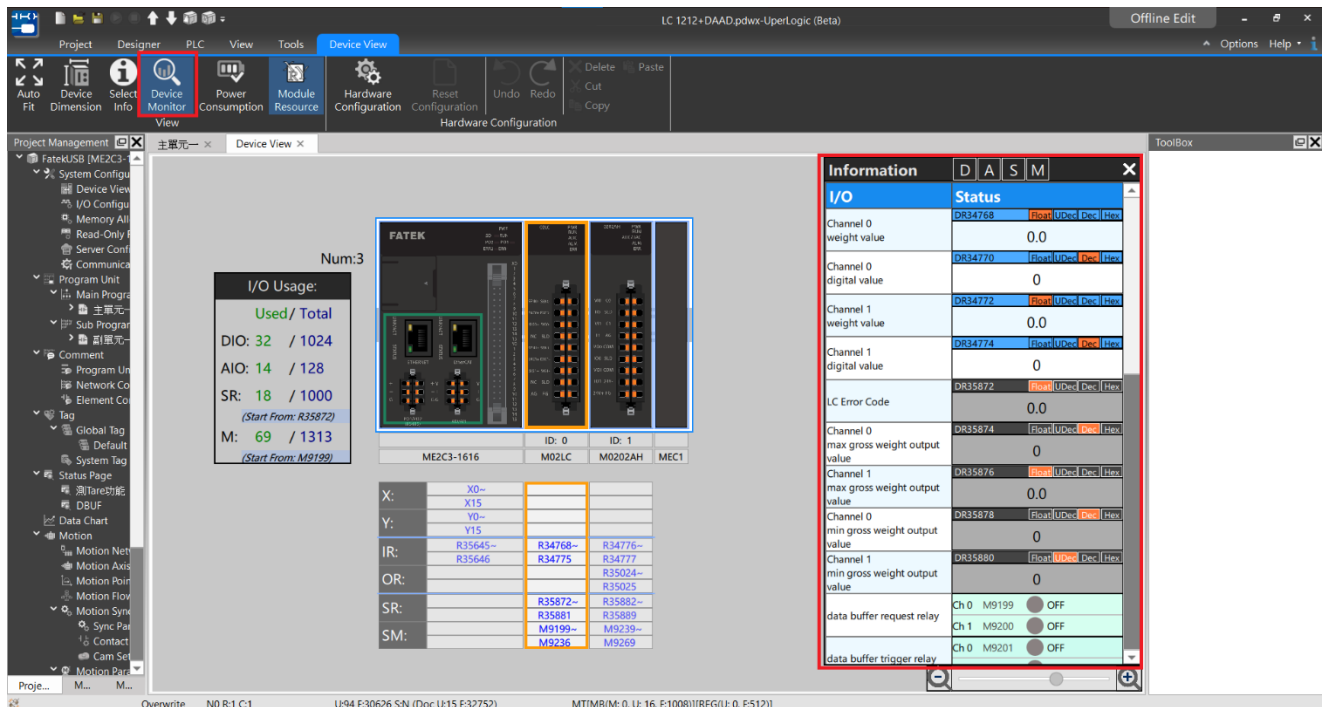
Planning Description of Input Format

In terms of analog reading value processing, FATEK provides three commonly used data representation methods, and the reading value can be set to be averaged multiple times, so as to improve the field that is more easily affected. Interference, or reading drift caused by unstable input signal.

UperLogic provides an extremely simple operation interface for planning the data format, effective bits, and average times of the load reading and other related settings.

Monitoring Load Cell Module Value

Click [Project] → [Device View] → [Device Monitor] in the execution function bar, and the device monitoring window on the right will appear:



Device Monitoring

In the information, you can choose the resources to be displayed, such as [Digital Data], [Logic Data], [Status Data] and [Relay].

- Logical data

In the load cell module (M02LCR), logic data refers to the value obtained or output by the channel.

Click [Logic Data] on the top information of [Device Monitor], then only the logical data will be displayed in the module list. If you put the mouse over the value, and when the data is blue as shown in the figure below, the value of the register can be modified. You can also quickly modify the value display mode through [Float], [Dec] and [Hex] on the right side of the register.

The default value of the LC module is displayed as a 32-bit floating-point number. If the user needs to convert it to decimal, it can be achieved with the relevant instructions for converting floating-point numbers to integers.

Information		D	A	S	M	X	
I/O	Status						
Channel 0 weight value	DR34768	Float	UDec	Dec	Hex		
	0.0						
Channel 0 digital value	DR34770	Float	UDec	Dec	Hex		
	0						
Channel 1 weight value	DR34772	Float	UDec	Dec	Hex		
	0.0						
Channel 1 digital value	DR34774	Float	UDec	Dec	Hex		
	0						
LC Error Code	DR35872	Float	UDec	Dec	Hex		
	0.0						
Channel 0 max gross weight output value	DR35874	Float	UDec	Dec	Hex		
	0						
Channel 1 max gross weight output value	DR35876	Float	UDec	Dec	Hex		
	0.0						
Channel 0 min gross weight output value	DR35878	Float	UDec	Dec	Hex		
	0						
Channel 1 min gross weight output value	DR35880	Float	UDec	Dec	Hex		
	0						
data buffer request relay	Ch 0 M9199	☐ OFF					
	Ch 1 M9200	☐ OFF					
data buffer trigger relay	Ch 0 M9201	☐ OFF					

Logic data for device monitoring

- Status Data

Click [Status Data] on the top of [Device Monitor], and only the status data will be displayed in the module list. When the data is grayed out as shown in the figure below, the value of the register cannot be modified. However, it is still possible to quickly modify the value display mode through [Dec] and [Hex] on the right side of the register.

Information		D	A	S	M	X	
I/O	Status						
Channel 0 weight value	DR34768	Float	UDec	Dec	Hex		
	0.0						
Channel 0 digital value	DR34770	Float	UDec	Dec	Hex		
	0						
Channel 1 weight value	DR34772	Float	UDec	Dec	Hex		
	0.0						
Channel 1 digital value	DR34774	Float	UDec	Dec	Hex		
	0						
LC Error Code	DR35872	Float	UDec	Dec	Hex		
	0.0						
Channel 0 max gross weight output value	DR35874	Float	UDec	Dec	Hex		
	0						
Channel 1 max gross weight output value	DR35876	Float	UDec	Dec	Hex		
	0.0						
Channel 0 min gross weight output value	DR35878	Float	UDec	Dec	Hex		
	0						
Channel 1 min gross weight output value	DR35880	Float	UDec	Dec	Hex		
	0						
data buffer request relay	Ch 0 M9199	☐ OFF					
	Ch 1 M9200	☐ OFF					
data buffer trigger relay	Ch 0 M9201	☐ OFF					

Status data of device monitoring

Channel Weight Value

Engineering weight reading value confirm by user will be affected by the user's calibration and will change the scale of the weight reading value.

Channel Digit Value

Original reading value of voltage signal conversion, and the range is 0~10000.

For example:

1 mv/V load cell with a range of 100 kg.

When the actual load of the load cell is 100 kg, the reading value of this channel should be 10000, which means that the module receives the full-scale voltage of the 1 mv/V load cell.

LC Error Code

Error indicators used during program debugging.

Currently, the function is reserved.

Channel Maximum Total Weight Output Value

After being energized, the maximum & minimum gross weight read by the LC module will be stored and placed in the appropriate register.

The maximum gross weight will be stored in this register.

Channel Minimum Total Weight Output Value

After being energized, the maximum & minimum gross weight read by the LC module will be stored and placed in the appropriate register.

The minimum gross weight will be stored in this register.

- Relays

Click [Relay] on the top information of [Device Monitoring], and only the status information will be displayed in the module list. Put the mouse over the value, when the data is blue as shown in the figure below, the value of the register can be modified, otherwise, if it is the register position with a gray background, it cannot be modified.

Category	Channel	Register Address	Status
min. clear request relay	Ch 0	M9256	OFF
	Ch 1	M9257	OFF
	Ch 2	M9258	OFF
	Ch 3	M9259	OFF
difference operation trigger relay	Ch 0	M9260	OFF
	Ch 1	M9261	OFF
	Ch 2	M9262	OFF
	Ch 3	M9263	OFF
data buffer request relay	Ch 0	M9264	OFF
	Ch 1	M9265	OFF
	Ch 2	M9266	OFF
	Ch 3	M9267	OFF
data buffer trigger relay	Ch 0	M9268	OFF
	Ch 1	M9269	OFF
	Ch 2	M9270	OFF
	Ch 3	M9271	OFF
alarm clear request relay	Ch 0	M9272	OFF
	Ch 1	M9273	OFF
	Ch 2	M9274	OFF
	Ch 3	M9275	OFF
underflow alarm	Ch 0	M9276	OFF
	Ch 1	M9277	OFF
	Ch 2	M9278	OFF
	Ch 3	M9279	OFF
overflow alarm	Ch 0	M9280	OFF
	Ch 1	M9281	OFF
	Ch 2	M9282	OFF
	Ch 3	M9283	OFF
	Ch 0	M9284	OFF

Status data of device monitoring

Data Buffer Request Relay

When the relay is ON, the data buffer request is started.

For detailed steps, please refer to the data buffer setting chapter.

Data Buffer Trigger Relay

When the relay is ON, start the data buffer trigger.

For detailed steps, please refer to the data buffer setting chapter.

Alarm Clear Request Relay

After alarm happened, the Alarms can be cleared by using this relay.

Error Clear Request Relay

After error occurred, the alarms can be cleared by using this relay.

Zero-point Set Request Relay

Set the current weight reading to zero.

Zero-point Return Request Relay

Restore the current weight reading to the preset zero-point after calibration.

Stable Output

When is in stable state, the relay is ON.

When is not a stable state, the relay is OFF.

Center Point Detection Output

When entering the center point state, the relay is ON.

When leaving the center point state, the relay is OFF.

Zero-point Detection Output

When entering the zero state, the relay is ON.

When leaving the zero state, the relay is OFF.

Zero-point Setting Completed Output

When the zero-point setting completed, the relay will stay in ON state for one scan period.

Zero-point Restoration Completed Output

When the zero-point setting completed, the relay will stay in ON state for one scan period.

Input Signal Error Detection

When the "weight reading value" is greater than $(\text{maximum weight capacity}) + (\text{maximum weight capacity} \times \text{input signal error percentage})$, a warning signal will be issued, and the relay will be ON.

Conditions for Triggering Signal Error : $\text{weight reading} > \text{maximum weight capacity} + \text{maximum weight capacity} \times \text{input signal error percentage}$.

※ This function will only be detected when "input signal error" is enabled in the software settings.

Excess Weight Capacity

When the load exceeds the "weight capacity overlocking" alarm setting value, a warning signal will be issued, then relay will be ON.

Conditions for Triggering an Overweight Alarm:

$\text{weight reading} > \text{maximum weight capacity} + \text{current minimum scale} \times 9$.

※ This function will only be detected when "input signal error" is enabled in the software setting.

Out of Zero-point range

When using a special relay **to set the zero-point**, the system can check the zero-point position, if it exceeds the reasonable zero-point range, the warning relay will ON.

※This function will only be detected when " input signal error " is enabled in the software settings.

Conversion Excess

When the load input signal voltage exceeds the maximum upper limit, the warning relay will ON .

For example:

The sensitivity of the load cell is 1 mv/v.

If the input signal is greater than 5 mv (the maximum range of the load cell), the warning relay will ON .

※ This function will only be detected when " input signal error " is enabled in the software settings.

Total Weight Upper Limit Alarm

When the total weight exceeds the set upper limit, the warning relay will ON.

Total Weight Lower Limit Alarm

When the total weight is lower than the set lower limit, the warning relay will ON.

Data Buffer Done Relay

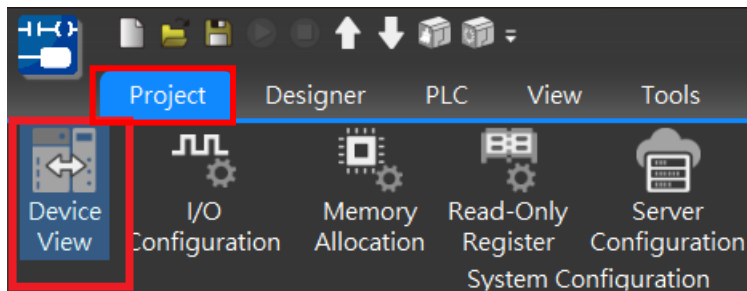
When data buffering is completed, the relay will ON.

Error Flag

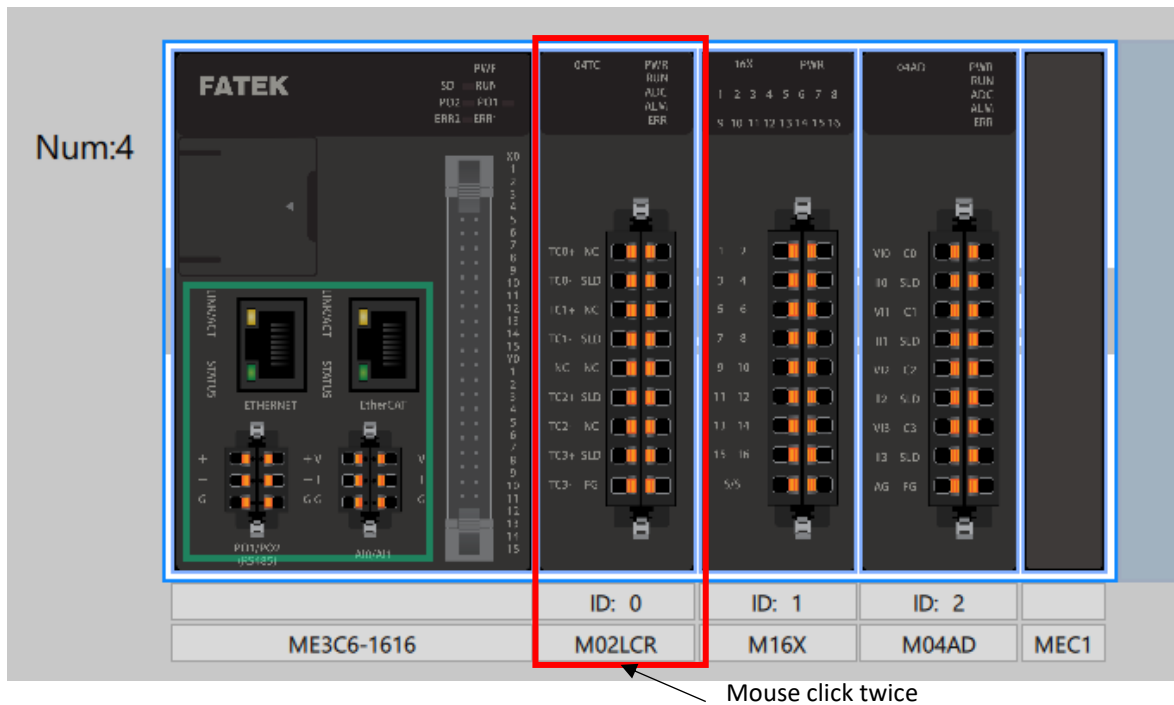
The warning relay is ON when conversion excess or weight capacity overlocking occurs.

Load application function

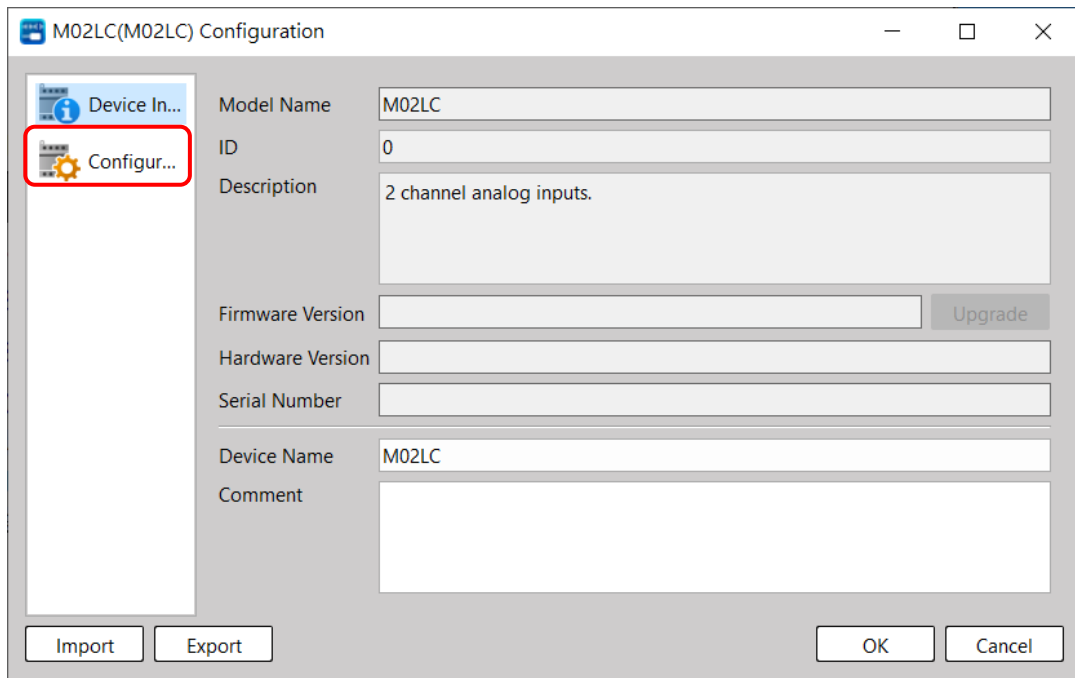
The M02LCR module provides a lot of functions for users to use, such as data buffering, value scaling, alarm setting and other functions. These functions can be accessed from “Project- >Device view->click the desired module twice-> Configuration Settings” to find the position of M02LCR function settings, as shown in the figure below, and it is the same as ladder diagram editing, these settings can only be set in the offline editing state.



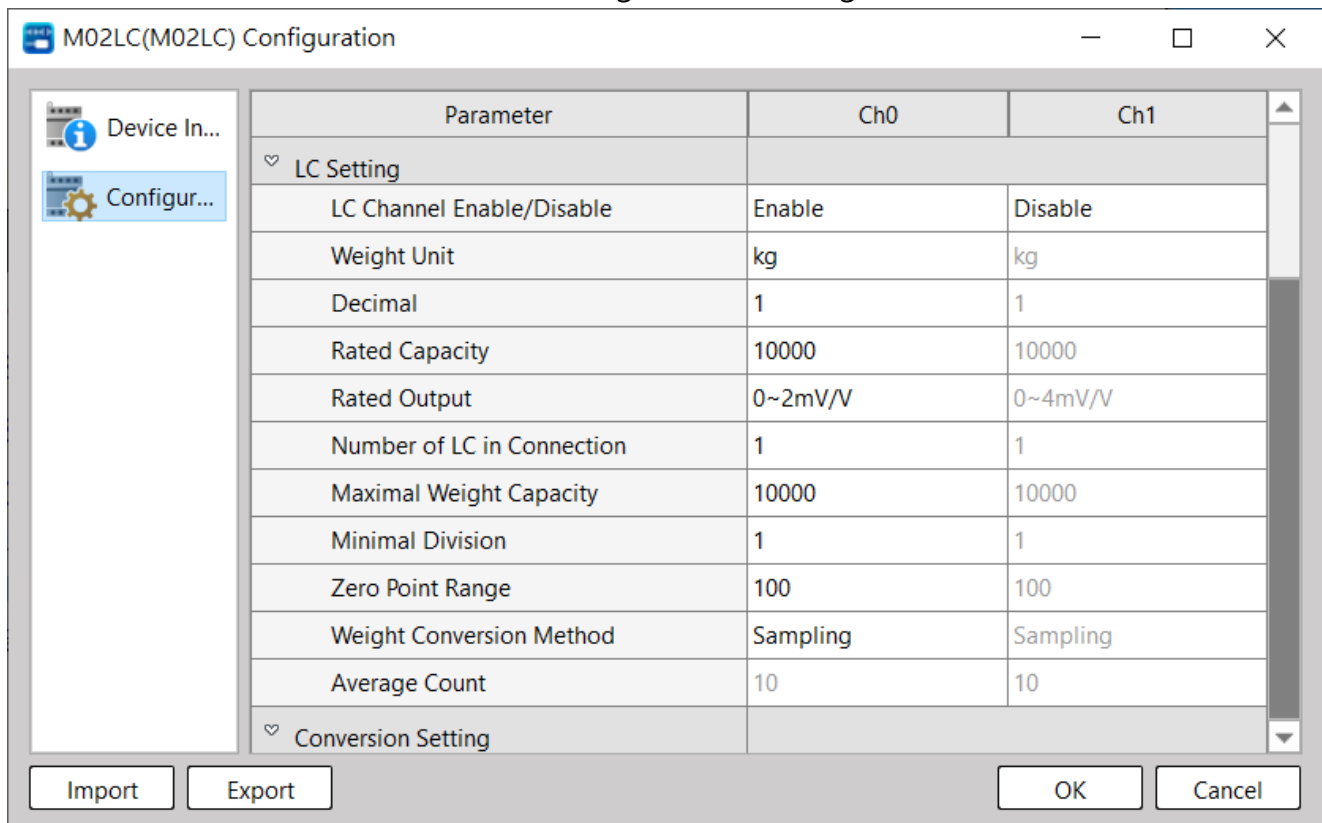
Position of device view



Find and click on the module



Click Configuration Settings



Setting page of M02LCR module

Channel Opening/Closing

Each channel can be set to ON or OFF.

When the channel is turned on, the channel takes a load reading.

When a conversion channel is turned off, the channel is not read and reduces the total channel conversion time.

Conversion time description

M02LCR sampling time: 100 time/second

When the single/dual channel is turned on, the sampling cycle period is 10ms.

M02LC sampling time: 4800 time/second

When single channel is turned on, the sampling period is 0.2ms

When dual channels are turned on, the sampling period is 0.4ms

Settings and Preset value

If the channel is not set to on/off, the default setting is off.

Load Cell Parameter setting

Before using the LC module, it is necessary to set the sensitivity, weight unit, decimal point, etc. according to the usage situation. The parameters must be set as follows:

How to use and instructions

Set the weight unit, number of decimal places, rated capacity, rated output, etc. and then set user calibration to make the measurement range match to the user's needs.

Weight unit selection

Kg (Default)/G/T

Weight decimal point selection

10^0 (Default)/ 10^{-1} / 10^{-2} / 10^{-3}

Rated capacity setting

For load cells with different capacities, different rated capacities can be set to correspond to the maximum range of the load cell

Rated capacity: the maximum range of a single Load cell

Range: 0~999999

Default: 50000

Rated output setting

For load cells with different sensitivities, the channel can be set, the range is as follows

Rated output range	
Rated output	1mv/V
	2mv/V

	3mv/V
	4mv/V

Setting input signal range of M02LCR & M02LC

Maximum weight capacity setting

For the load cells in each channel, the entire load system can be set according to the number of load cells.

Range: 0~maximum rated capacity

※The setting range cannot exceed the rated capacity, and must be less than or equal to the (maximum capacity of the load cell)*(Number of load cell connections)

※ The setting range shall not exceed the rated capacity, and must be less than or equal to the maximum range of the load element * the number of load element connections.

Number of connections setting

The number of load cells used by the channel at the same time

Range: 1~4

Default: 1

Minimum division setting

Users can set the load reading minimum division value.

Minimum scale: 1/2/5/10/20/50

Zero-point range setting

In the case of no load, the output gross weight of the scale may not be reset to zero due to some reasons .

About this situation, it can be corrected with "zero-point setting"

and "zero-point tracking time" and "zero-point tracking range" , with the parameters setting, LC module could automatically correct the zero-point and reset the gross weight reading to zero .

If the weight value is higher that the setting range, then will not be automatically zero corrected

Settable range: 0.0~10.0% (Maximum weight capacity capacity)

Default: 10.0%

Weight conversion settings

For the average processing of each channel, users could set to three modes: no average mode/time average mode/moving average.

How to use and instructions

Sampling (No Averaging Mode):

When the LC module is reading value, no averaging processing is performed.

The processing time is equal to the conversion cycle time.

Counting average mode:

A/D conversion is performed according to the set number of times, and the conversion value is averaged. The counting average needs to be set above 4 to be effective.

The required processing time is equal to the set average multiplied by the conversion period.

Example:

For example, if the module converts 11 data and sets the average number of times to 5, the returned results are as follows:

A/D Converted Data:

data1	data2	data3	data4	data5	data6	data7	data8	data9	data10	data11



Average Result:

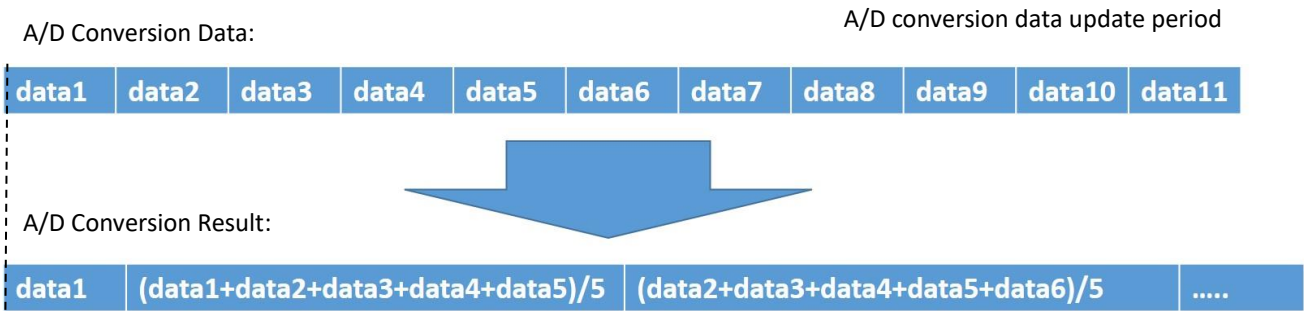
data1	$(data1+data2+data3+data4+data5)/5$	$(data6+data7+data8+data9+data10)/5$	

Schematic diagram of M02LCR module times average mode processing time

Moving average mode:

Set the number of averages. During each conversion cycle, the weight reading data will be averaged according to the set times. The moving average needs to be set above 2 to be effective. The required processing time is equal to the set average multiplied by the conversion period example:

If the number of moving averages is set to 5 times, the conversion diagram is as follows.



A/D Conversion Result:
1st = data1
2nd=(date1+date2+date3+date4+date5)/5
3rd=(date2+date3+date4+date5+date6)/5
4th=(date3+date4+date5+date6+date7)/5
5th=(date4+date5+date6+date7+date8)/5
6th=(date5+date6+date7+date8+date9)/5
7th=(date6+date7+date8+date9+date10)/5

Schematic diagram of the processing time of the moving average mode of the load cell module

Settings and Defaults

If the channel has no A/D conversion mode set, the default mode is "no averaging mode"

A/D conversion mode	M02LCR Setting range	Defaults
Sampling (No averaging mode)	none	none
Counting average mode	4 to 255 (times)	4
Moving average mode	2 to 255 (times)	2

Load cell average mode setting value range

Calibration Function

After setting the unit, input calibration can be performed on each channel, and each channel stores the corresponding calibration value.

The default is the factory calibration value and is permanently stored in the module and will not be modified. The default value can be used to restore to the factory state.

Directions for use and instructions

There are two types of calibration:

User Calibration Mode:

- If the user has special needs or there is a large error in the value due to the large difference between the current ambient temperature and the general room temperature, the user calibration mode can be used to correct the error.

Restore Factory Settings:

- When the factory leaves the factory, all channels will be calibrated and the parameters will be placed in the module. If the user needs to return the factory calibration value in the future, he can use UperLogic to recall it.

Register Calibration:

- Calibration can be performed through use of registers, suitable for situation where only HMIs are present and calibration is required at the site.

User Calibration Steps:

Let the PLC stop running, and in the “Online Monitor Mode”, double-click the module to be recalled in the “Device View”, and find “Calibration” in the “Configuration Settings”.

After selecting the channel to be calibrated, follow the software prompts to complete the calibration.

The image shows two windows from the M02LC(M02LC) software interface.

M02LC(M02LC) Configuration Window:

On the left is a sidebar with "Device In..." and "Configur...". The main area is a table with columns "Parameter", "Ch0", and "Ch1".

Parameter	Ch0	Ch1
Stable Status Setting		
Stable Status Range	100	100
Stable Status Time	100	100
Zero Point Detection Setting		
Zero Point Detection Enable/Disable	Enable	Enable
Zero Point Detection Maximum	200	200
Zero Point Detection Minimum	-100	-100
Data Buffer Setting		
Data Type	Gross Weight	Digital Value
Data Buffer Points	20 points	600 points
Data Buffer Points before Trigger	5 points	20 points
Tare Subtraction Setting		
Tare Subtraction Mode	One Touch	One Touch

Buttons at the bottom: Import, Export, OK, Cancel.

M02LC(M02LC) Calibration Window:

Device: M02LC(M02LC)

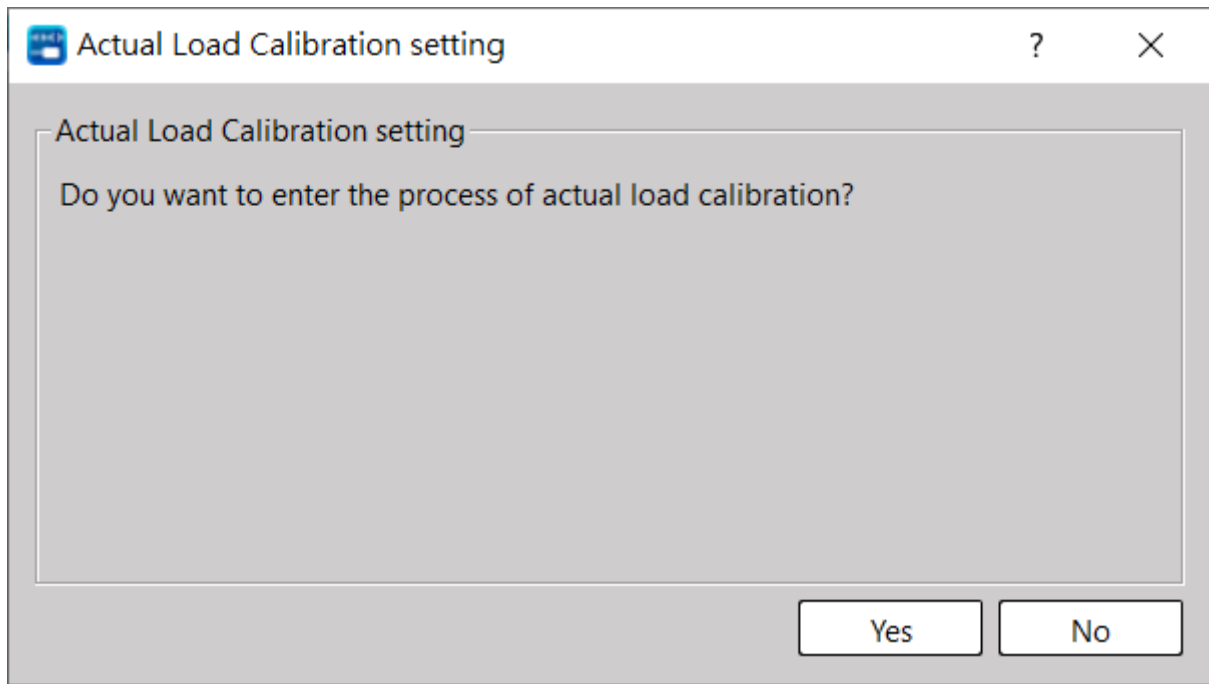
On the left is a table to select channels for calibration:

	Channel
☒	Channel 0
☐	Channel 1

On the right is the "Calibration Settings" section with three rows of settings and buttons:

Reset to factory settings	Reset
Actual Load Calibration	Actual Load
Scale Calibration	Scale

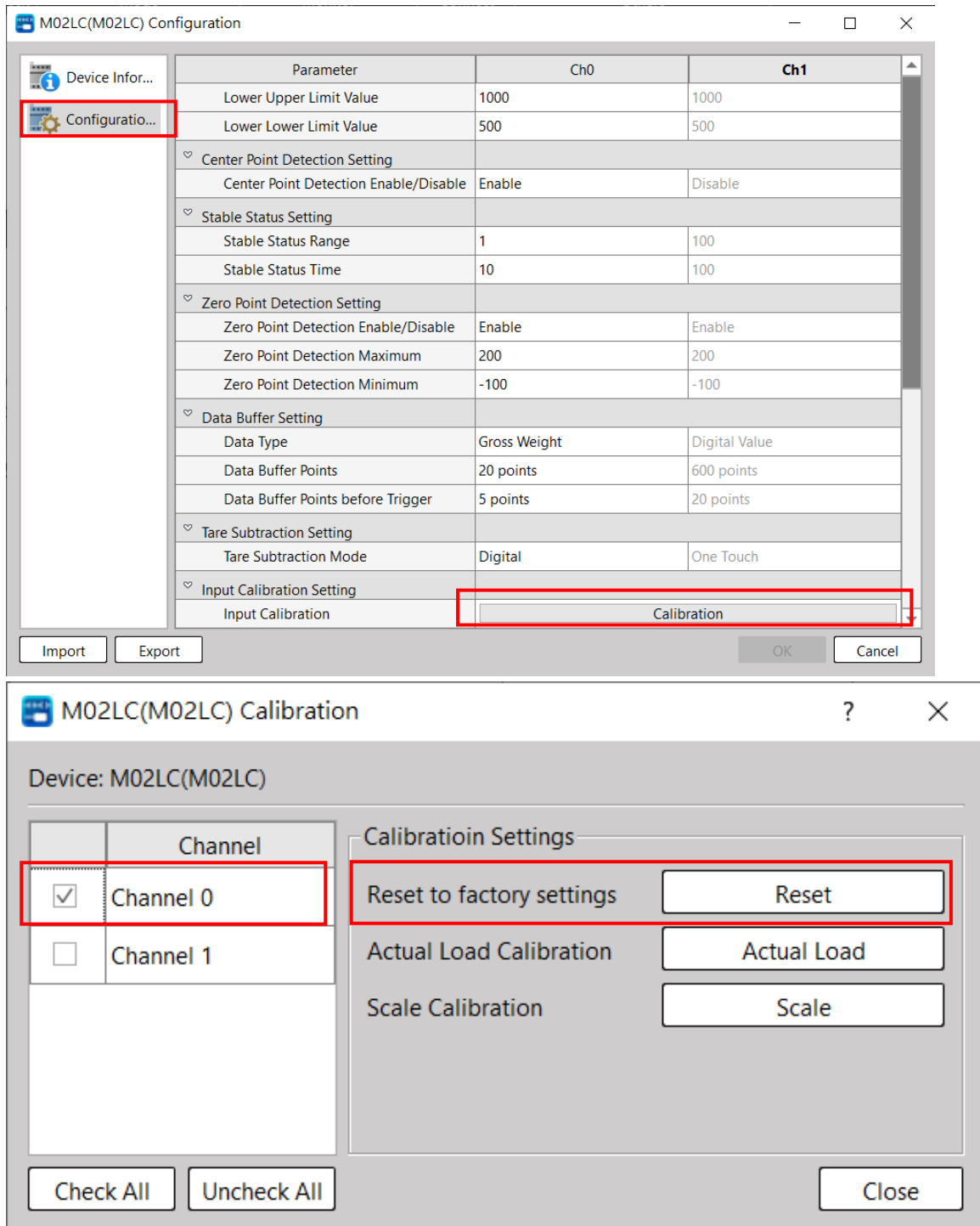
Buttons at the bottom: Check All, Uncheck All, Close.



M02LCR user calibration process

Reset factory settings steps:

Let the PLC stop running, and in the “Online Monitor Mode”, click twice on the module to be recalled in the “Device View”, and find “Calibration” in the “Configuration Settings”, and find “Reset to factory settings” after entering press “Reset”.



M02LCR reset factory settings process

Register Calibration:

Supports the use of registers to calibrate LC modules. When used, one module can be calibrated at a time. The register address and description are as follows:

BASE REGISTER - R35822

Name	Address	Data Type	Description	Details
Activation	R35822	16BIT UNSIGNED	=ON(0x4F4E), Enable Calibration =Others, No operations	
Module ID	R35823	16BIT UNSIGNED	Module Index	0~63
Channel ID	R35824	16BIT UNSIGNED	Channel Index	0~N · N is module-dependent.
Status Code	R35825	16BIT UNSIGNED	Status of Operation	=0x0, No operations =0x5201, Operating =0x5202, Success =0x5203, Invalid module index =0x5204, The designated module index does not support calibration. =0x5205, Invalid channel index =0x5206, Time-out =0x5207, Other errors
Control Word	R35826	16BIT UNSIGNED	=0x8A01 · Actual load calibration =0x8A02 · Zero calibration =0x8A03 · Span calibration =0x8B01 · Scale calibration =0x8B02 · Scale calibration test =0x8B03 · Scale calibration sync =0x8C01 · Reset to factory =0x8D01 · Obtain input value =0x8D02 · Cancel current operation =Others · No	- Actual load calibration(0x8A01 ~ 0x8A03) : - Set 'span standard weight' - Set 0x8A01 to start actual load calibration - Make sure the weight load is zero and then set 0x8A02 - Make sure the weight load is as 'span standard weight' and then set 0x8A03 - Scale calibration(0x8B01 ~ 0x8B03) : - Set 0x8B01 to start scale calibration and obtain 'zero value' and 'span value' - Modify 'zero value' and 'span value' as intended and set 0x8D01 to observe the 'input value' - Set 0x8B03 to complete the process when the input

			operations	value is good
Zero Value	R35827	32BIT FLOAT	Calibration reference value(A/D)	Used for display or modification in different calibration modes.
Span Value	R35829	32BIT FLOAT	Calibration reference value(A/D)	Used for display or modification in different calibration modes.
Input Value	R35831	32BIT FLOAT	Weight value(g, kg, etc.)	Store input value
Span Standard Weight	R35833	32BIT FLOAT	Weight value(g, kg, etc.)	Configuration decides the unit. This should be set during Actual load calibration.

Settings and Defaults

Each channel has a default value that is factory corrected and stored in the module.

Enter Calibration Settings	Defaults
Offset value	Factory calibration value
Gain value	Factory calibration value

M02LCR Calibration Preset Value Table

Conversion settings

Users can set the conversion method according to their needs.

Mode 1-Automatic stop:

When set to automatic stop, if the load exceeds the "weight capacity over frequency" alarm set value, the reading will be stopped.

And at this time, the output value is all 0, and the warnings of other functions will not be activated until the user triggers "error clear", then the value will be changed and all detection errors will start.

In this mode, all warnings need to be cleared by the user. Errors and warnings need to be cleared through special registers.

※It can be monitored from the device to confirm the location of "error clear register"

Information		D	A	S	M	X
I/O	Status					
value	0.0					
Channel 0	DR35878	Float	UDec	Dec	Hex	
min gross weight output value	-1492					
Channel 1	DR35880	Float	UDec	Dec	Hex	
min gross weight output value	2147483647					
data buffer request relay	Ch 0 M9199	☐ OFF				
	Ch 1 M9200	☐ OFF				
data buffer trigger relay	Ch 0 M9201	☐ OFF				
	Ch 1 M9202	☐ OFF				
alarm clear request relay	Ch 0 M9203	☐ OFF				
	Ch 1 M9204	☐ OFF				
error clear request relay	Ch 0 M9205	☐ OFF				
	Ch 1 M9206	☐ OFF				
zero set request relay	Ch 0 M9207	☐ OFF				
	Ch 1 M9208	☐ OFF				
zero reset request relay	Ch 0 M9209	☐ OFF				
	Ch 1 M9210	☐ OFF				

Mode 2 - Automatic Recovery:

Set to automatic recovery, if the load exceeds the "weight capacity overclocking" alarm set value, it will continue to turn the value.

At this time, the output value and all warnings are fixed.

If the turn value returns to the normal range, the warning will be cleared automatically.

※The system will automatically confirm the status of "input signal error" and "out of zero point range". Whether the alarm is cleared depends on the current status and is not affected by the aforementioned conversion settings.

Gravity Acceleration settings

This function calibrates the weight error caused by different gravitational acceleration.

Users can correct the corresponding value according to the location.

※ The value of acceleration of gravity when leaving the factory is stored by default.

Weight value = gross weight output value * calibration position value / installation position value

Setting range: 9.7000~9.9999

※When the installation position = calibration position, this calibration is not enabled.

Zero Point tracking settings

When the gross weight is not zero, the zero-point will be adjusted automatically. When the scale is not loaded, the output gross weight may not be reset to zero due to some reasons.

At this time, it can be combined with "Zero Point Tracking Time" and "Zero Point Tracking Range" to automatically correct the zero-point and output the weight as 0.

After enabling this function, as shown in the timing diagram below, during the time of zero-point tracking, it will check whether the reading value is within the range of zero-point tracking. If it is within the range, the zero-point will be automatically corrected and the weight reading will be set to 0.

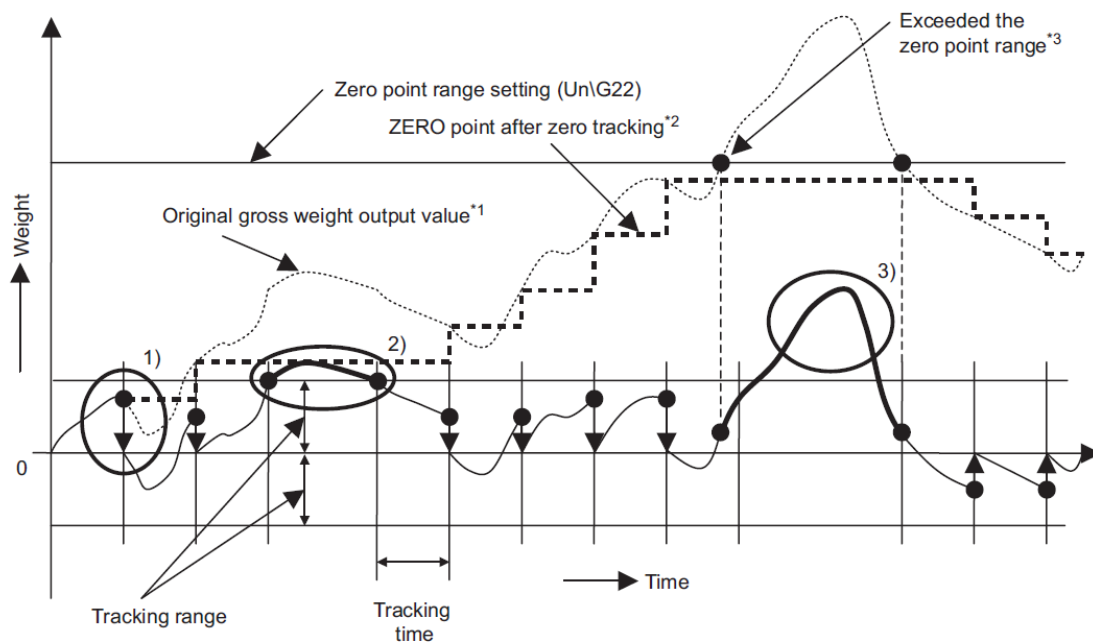
If it is outside the range, zero-point calibration will not be performed.

If it exceeds the zero-point range, the zero-point tracking function will not be performed.

Zero-point tracking range: $0 \sim 100 \times (1/4 \text{ minimum scale})$

Zero-point tracking time: $0 \sim 100 \times (100\text{ms})$

Default value: range & time are both 0



Zero tracking timing diagram

Input signal error settings

This function will detect whether the input signal meets the conditions set by the warning.

When the "input signal error" is activated, the following three error & alarm functions will be detected.

Input signal error:

1. The user can customize an input **signal error percentage** value. If the weight reading value is greater than the condition, a warning will be issued.
2. Conditions for triggering signal error: $\text{weight reading} > \text{maximum weight capacity} + \text{maximum weight capacity} * \text{input signal error percentage}$
3. Set value range 0.0~25.0%

Overweight alarm setting:

1. When the load exceeds the set value of "overweight alarm", a warning signal will be issued.
2. Conditions for triggering overweight alarm: $\text{weight reading} > \text{maximum weight capacity} + (\text{current minimum scale} * 9)$

When the zero-point range is exceeded:

When using a special relay **to set the zero-point**, the system will check the zero-point position, if it exceeds the reasonable zero-point range, the warning relay will be ON

※ Zero-point range = $\text{maximum weight capacity} * \text{zero-point range} [\%]$

Gross weight setting (warning setting)

Turn on the "warning output" and set the upper and lower limit warnings, and whenever the weight reading exceeds the set range, a warning message will be sent

Conditions for warning

1. When the weight reading value $>$ the upper limit value, a warning will be issued
2. When the weight reading value $<$ lower limit value, a warning will be issued

Conditions for clearing warnings

1. When the weight reading value $<$ the upper and lower limit values, a warning will be issued
2. When the weight reading value $>$ the lower upper limit value, a warning will be issued.

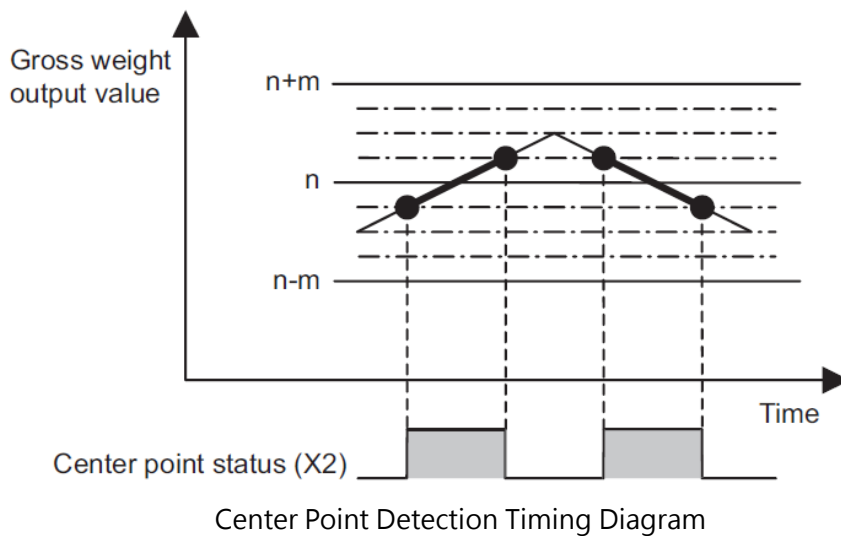
Center point detection setting

It is convenient for users to find the center point.

If this function is turned on, it will automatically find the center point of the weight value.

The range of the center point is plus or minus 1/4 of the smallest scale of the weight reading.

If the weight value is within this range, it will be detected. For the detailed timing diagram, please refer to the following figure:

**Steady state setting**

Check whether the weight value is in a stable state. If the change degree is lower than the stable state range within the stable state time, it will enter a stable state.

※ If the steady state time is set to 0, it means that the steady state detection will not be performed.

Available range:

Steady state range: 0~100 (minimum scale)

Steady state time: 0~100 (100ms)

Zero-point detection settings

This function can know whether the load has been removed from the scale.

If the load has been removed, the load cell should be in a stable state at this time. If it is not in a stable state, no detection will be performed.

Data buffer settings

Data buffer function can be controlled through the relay, and the digital operation value can be stored in the data buffer area to observe the change of the digital operation value.

For detailed usage and instructions, please refer to the instruction description section below.

Settings and Defaults

If the channel is not set, the default setting is off.

Setup	M02LC setting range	M02LCR setting range	Defaults
Buffer points before trigger	0 - 599	0 - 599	200
Buffer points	1 - 600	1 - 600	600

Setting of data buffering function

For more information about use of related instructions, please refer to the MODCONF OP:TARESUB and MODCONF OP:TAREZROFFSET in the instruction manual.

Tare Weight Deduction Mode:

When using the tare deduction instruction, there are two modes for the user to choose from

Light touch mode:

Reset the current gross weight as the tare weight, and deduct the tare weightFor

example, if the weighing platform has been erected, the load element can only measure the weight of the weighing platform, and then the tare weight deduction will be triggered, and the weight reading can be reset to zero, and the net weight

measurement must be started ※ At this time, it must be in a stable state. Failure to do so may result in an incorrect

pattern of deductions: subtract

any number from the gross weight (weight reading) in multiples of the minimum scale.

When the tare weight deduction is triggered, the gross weight is subtracted from the set value.

When you cancel the tare weight deduction, the value that was deducted from the gross weight is restored

Setting value range: 0~50000 (0~maximum rated capacity)

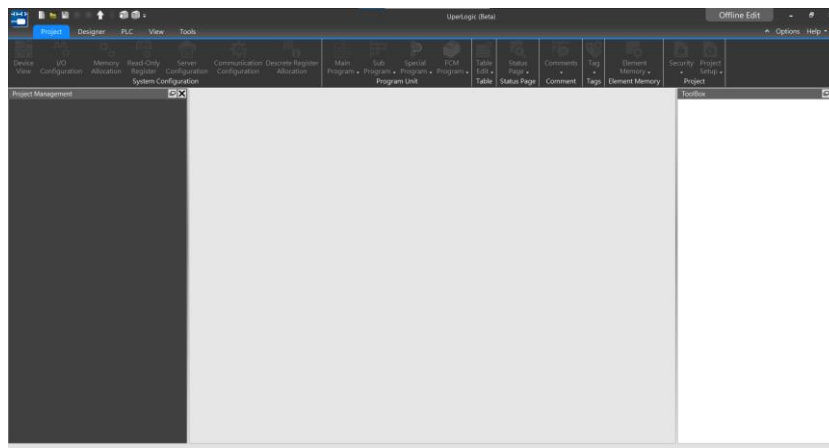
calibration

The load module provides two Calibration methods, namely Actual Load Calibration and Scale Calibration, and its function can be summarized as the former is to use the actual weight to plot the function of weight and numerical value, and the latter is to directly provide the zero point (origin) and the distance (slope) to draw the required function.

Actual Load Calibration can meet most of the calibration needs, but if there are still some errors, you can use Scale Calibration to make more detailed Calibrations after doing Actual Load Calibration. At this time, Scale Calibration will use the parameters of the Actual Load Calibration results as preset. The setting value is brought into Scale Calibration, and the user only needs to make fine adjustments according to its parameters.

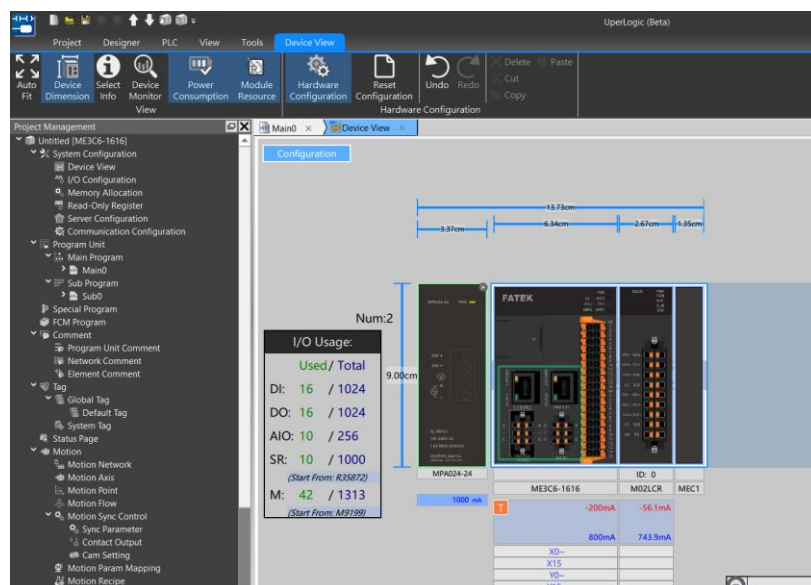
You can also use Scale Calibration directly to make Calibrations, the default values will be 0 and 1, and users need to fill in the parameters for calibration.

First, enter the user interface of U perLogic, as shown in the figure below



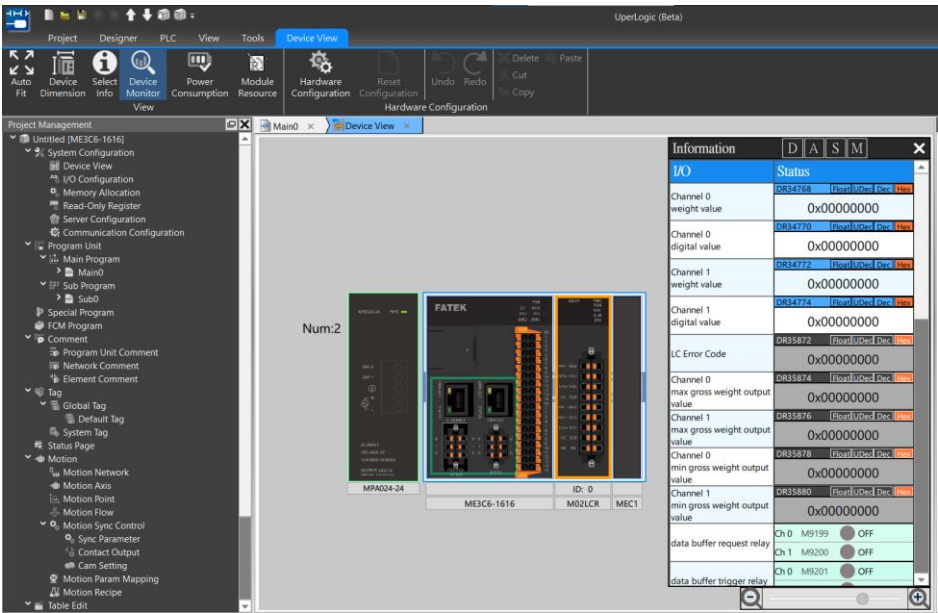
Click on PLC/Upload and select Ethernet (or USB) in the Connection Parameters interface

Through the project/equipment to try to confirm that the Load Cell module is indeed connected to the PLC, the following figure shows the interface after successful upload



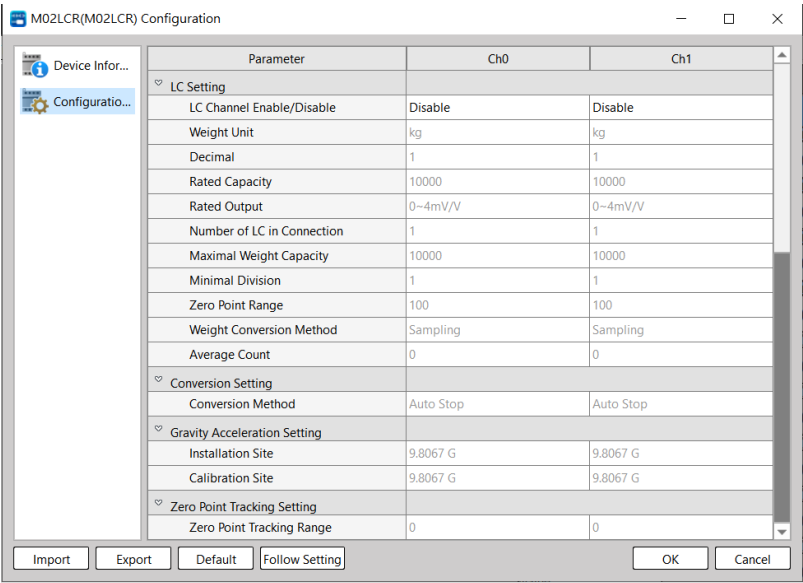
Click on PLC/Online Monitoring and select Ethernet (or USB) in the connection parameter interface, then click on Device Attempt/Equipment Monitoring so that you can see the weight value measured by the Load Cell module in the information field.

The following diagram shows the device monitoring for the device view:



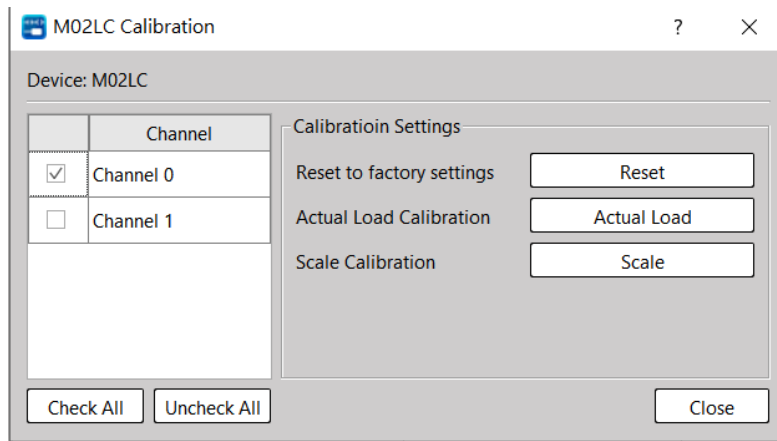
If you need to set the weight correction, double-click on the Load Cell module to see the module setting window, and the parameter settings in this window (e.g., weight unit, number of decimal places, rated output...) is based on the module configuration, and the user can use this window as a reference.

The following figure shows the Load Cell setting window



Scroll down the configuration setting window and click "Calibration" in the calibration field, and you can check the channel you want to correct and select the calibration method in the calibration interface.

The picture below shows the Load Cell calibration window.

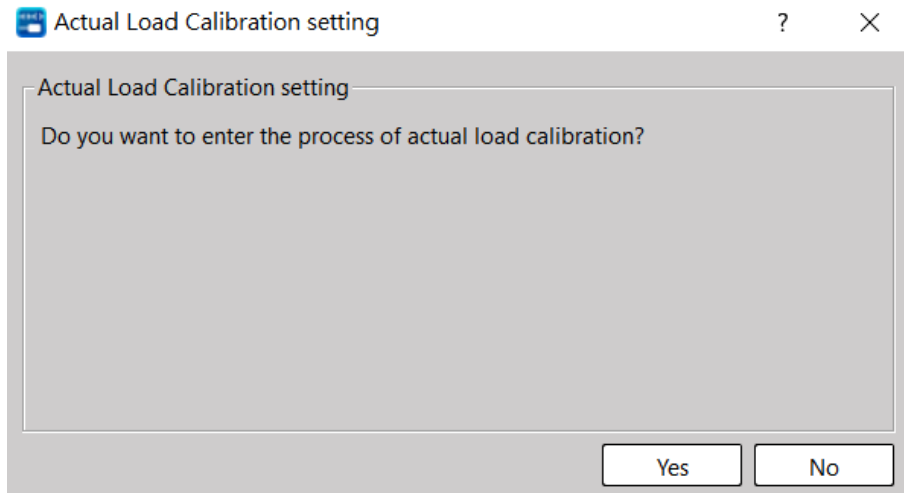


Method 1 Actual Load Calibration

This method requires an item of known weight, this weight is regarded as the standard weight, and the parameters will be corrected according to the standard weight during the calibration process, and the calibration work will be carried out according to the window prompts after clicking "Actual Load".

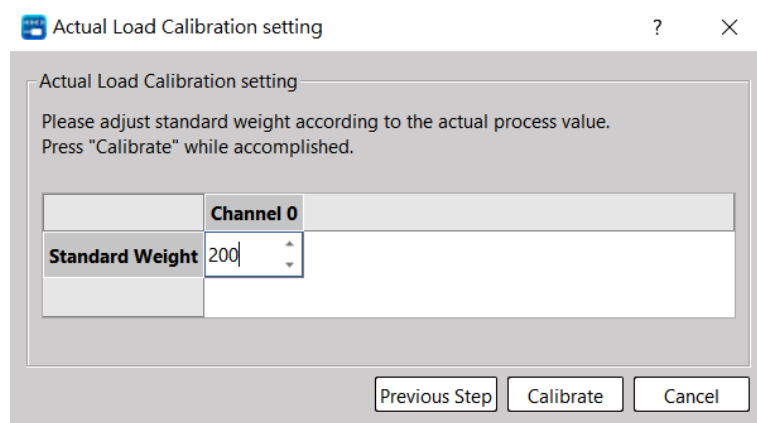
When you see the confirmation window, click "Yes" to proceed with Actual Load Calibration.

The picture below shows entering the Actual Load Calibration confirmation window.

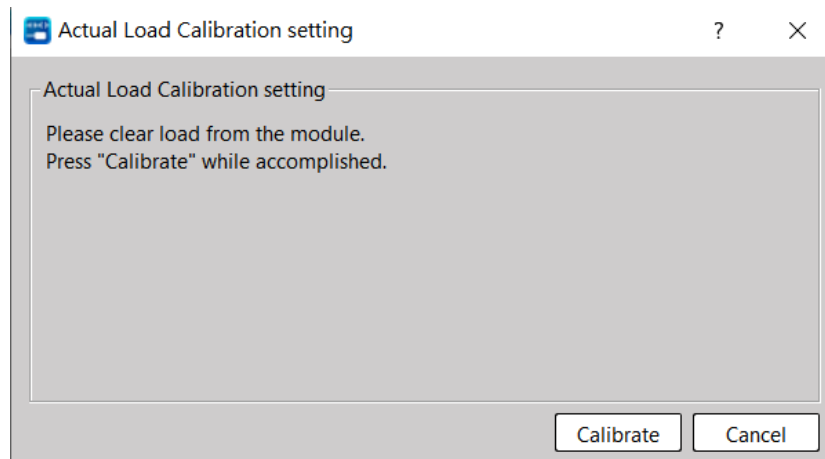


For the channel to be corrected, fill in the known weight in the standard weight, determine the weight value, and click "Correct".

The figure below shows the standard weight value set by Actual Load Calibration.

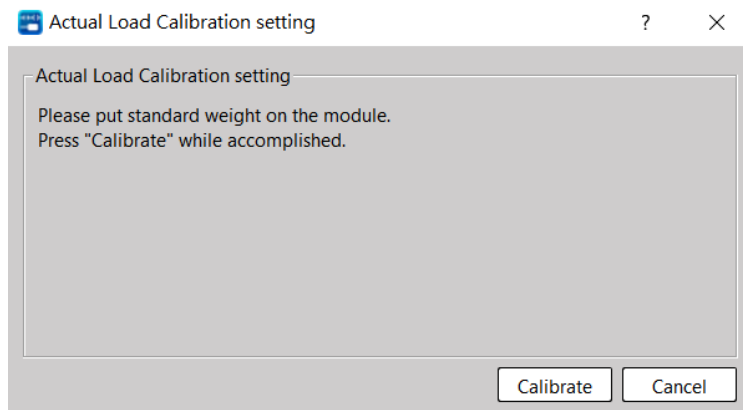


In this step, you need to empty the load on the module, and click "Calibration" after emptying the load. The picture below shows the confirmation window for clearing the load of the Actual Load Calibration module.

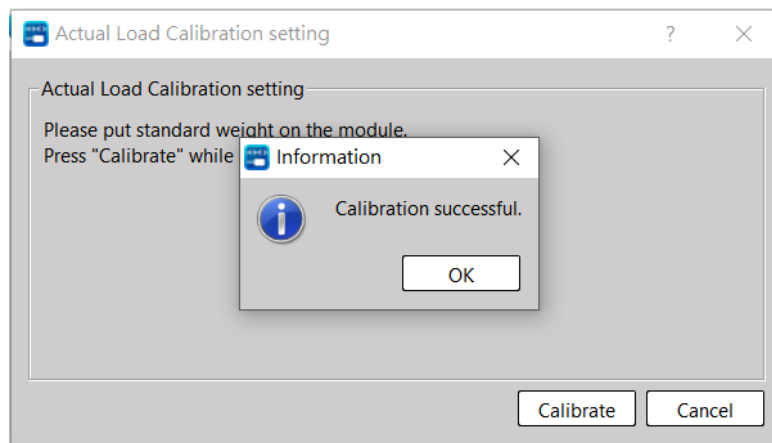


Place the standard-weight item above the module and click "Correct" after placing it.

The picture below shows the confirmation window for placing standard weight in Actual Load Calibration.



The calibration success window appears and the calibration work of Actual Load Calibration is completed. The picture below shows the Actual Load Calibration calibration success window.

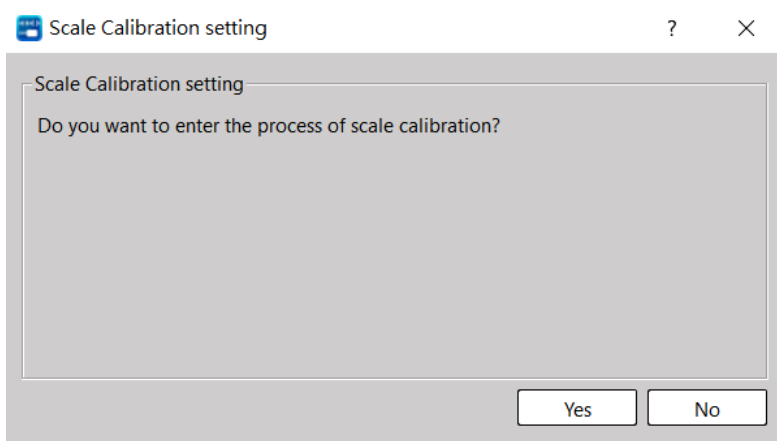


Method 2 Scale Calibration

Another method is to set the zero point zero and span by yourself. The two parameters determine the conversion behavior between the digital value and the weight value. Click "Scale Calibration" to perform the Scale Calibration correction.

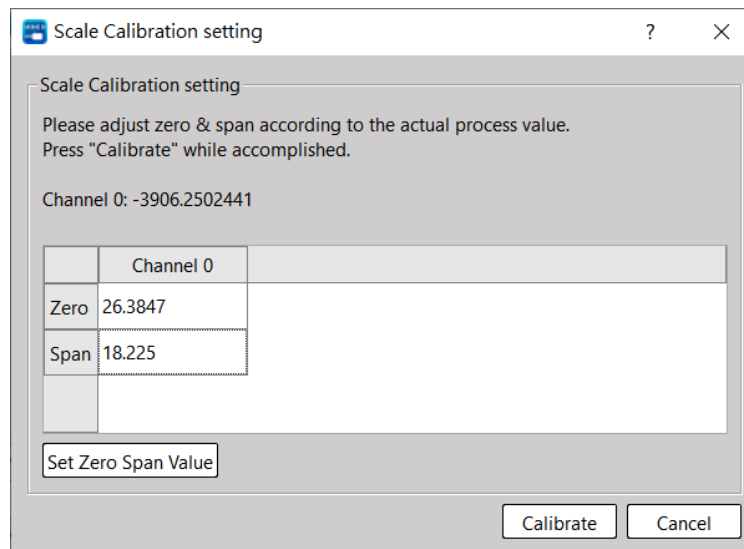
When you see the OK window, click "Yes" to correct Scale Calibration.

The picture below shows entering the Scale Calibration confirmation window.



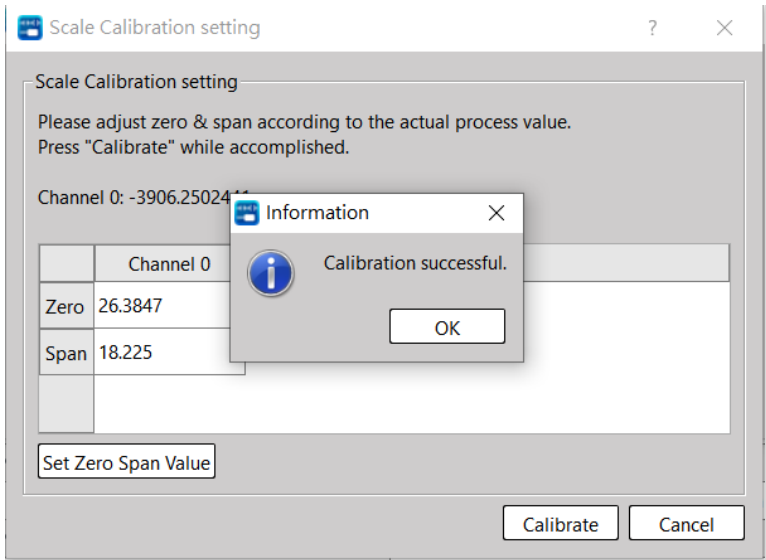
In the parameter setting window, you can see the weight value of the channel to be corrected, this value is displayed in real time when setting the parameters can be referenced, for the zero point and the measurement distance two parameters of the channel to be corrected, please click "set the zero point measurement distance value" (click this button to update the two parameters), click "Calibration" after the setting is completed

The picture below shows the Scale Calibration parameter setting window.



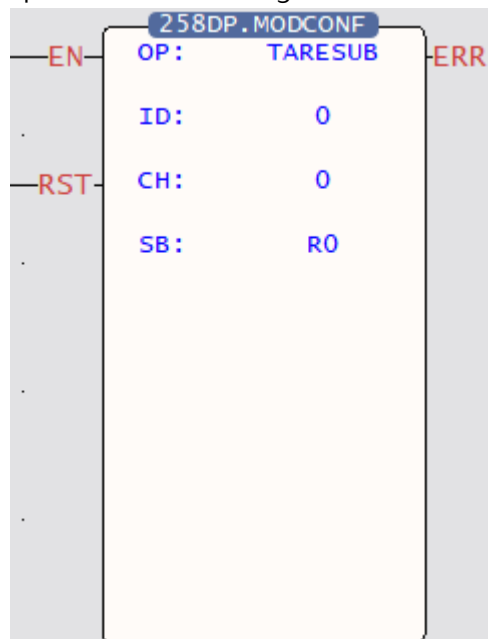
The calibration success window appears and the Scale Calibration is completed.

The picture below shows the Scale Calibration success window.



FUN258P MODCONF	Tare Weight Deduction Command								FUN258P MODCONF																																																						
Instruction Description																																																															
Ladder Symbol 258DP.MODCONF OP TARESUB ID CH SB Operation Control — EN Reset — RST ERR — Error					OP: TARESUB ID: Expansion module ID number (0~N) CH: The channel position to be deducted (0~N) SB: The 32BIT value of the tare weight to be deducted																																																										
<table><tr><th>Operand \ Range</th><th>HR</th><th>IR</th><th>OR</th><th>SR</th><th>ROR</th><th>DR</th><th>K</th><th>XR</th></tr><tr><td></td><td>R0 R34767</td><td>R34768 R34895</td><td>R35024 R35151</td><td>R35280 R43223</td><td>R43224 R47319</td><td>D0 D11999</td><td></td><td>V、Z P0~P9</td></tr><tr><td>FUN</td><td></td><td></td><td></td><td></td><td></td><td></td><td>1、2</td><td>○</td></tr><tr><td>ID</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○*</td><td>○*</td><td>0~63</td><td>○</td></tr><tr><td>CH</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr><tr><td>SUB</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr></table>					Operand \ Range	HR	IR	OR	SR	ROR	DR	K	XR		R0 R34767	R34768 R34895	R35024 R35151	R35280 R43223	R43224 R47319	D0 D11999		V、Z P0~P9	FUN							1、2	○	ID	○	○	○	○	○*	○*	0~63	○	CH	○	○	○	○	○	○	○	○	SUB	○	○	○	○	○	○	○	○					
Operand \ Range	HR	IR	OR	SR	ROR	DR	K	XR																																																							
	R0 R34767	R34768 R34895	R35024 R35151	R35280 R43223	R43224 R47319	D0 D11999		V、Z P0~P9																																																							
FUN							1、2	○																																																							
ID	○	○	○	○	○*	○*	0~63	○																																																							
CH	○	○	○	○	○	○	○	○																																																							
SUB	○	○	○	○	○	○	○	○																																																							
Feature description	● To subtract the custom tare weight, you must change the config setting to “digital mode” . In the “light touch mode” , the current gross weight will be regarded as the tare weight directly deducted. ● Removing the fixed tare weight and recalibrating it may benefit from improved accuracy. ● When the Tare weight deduction command is enabled, if it is "light touch mode," it is the automatic parameter setting mode subtracting the current scale reading value. ● When the command of tare weight deducting is enabled, if the command mode is set to "digital", it is the manual parameter setting mode. At this time, the user can																																																														

The following is an example of the input in the ladder diagram:



OP: Tare Weight Deduction

Mode ID: Expansion Module ID Number

CH: To deduct the channel position

SB: The tare weight to be subtracted, occupy two registers※

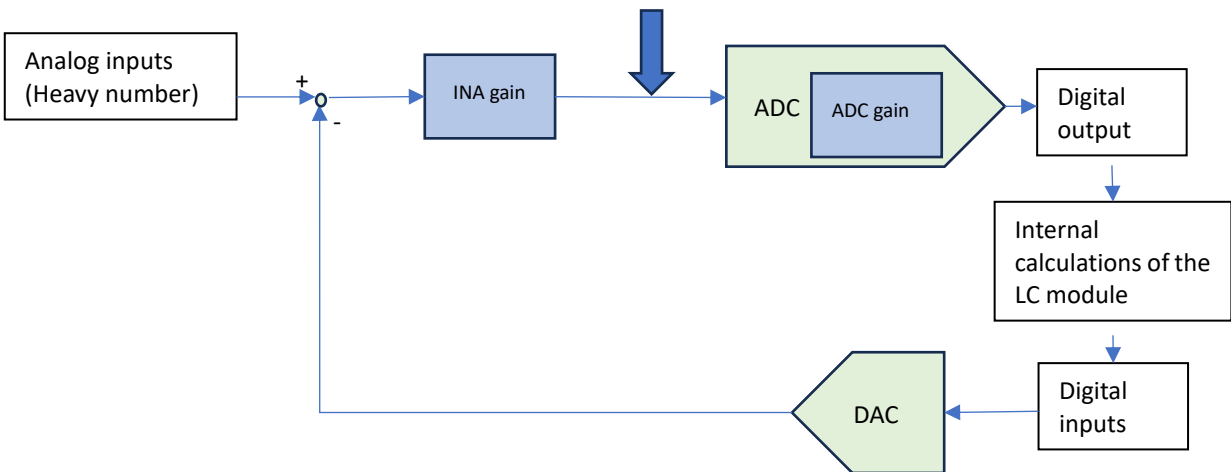
To subtract the custom tare weight, change the config setting of the LC module in the device view - Tare Weight Deduction Mode to "numeric mode", so that the value set by the user is subtracted when the command is triggered. If it is in "light touch mode", when this command is triggered, the current gross weight will be regarded as the tare weight, and the current gross weight will be directly deducted.

Tare Weight Offset Command:

FUN258P MODCONF	Tare Weight Offset Command		FUN258P MODCONF																																																					
Instruction Description																																																								
Ladder Symbol 258DP.MODCONF OP TARESUB ID CH SB Operation — EN Control Reset — RST ERR — Error OP: TAREZROFFSET ID: Expansion module ID number (0~N) CH: The channel position to be deducted (0~N) WR: Starting register for offset command setting																																																								
<table><tr><th rowspan="2">Operand \ Range</th><th>HR</th><th>IR</th><th>OR</th><th>SR</th><th>ROR</th><th>DR</th><th>K</th><th>XR</th></tr><tr><td>R0 R34767</td><td>R34768 R34895</td><td>R35024 R35151</td><td>R35280 R43223</td><td>R43224 R47319</td><td>D0 D11999</td><td></td><td>V、Z P0~P9</td></tr><tr><td>OP</td><td></td><td></td><td></td><td></td><td></td><td></td><td>TAREZROFFSET</td><td>○</td></tr><tr><td>ID</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○*</td><td>○*</td><td>0~63</td><td>○</td></tr><tr><td>CH</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr><tr><td>SB</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr></table>				Operand \ Range	HR	IR	OR	SR	ROR	DR	K	XR	R0 R34767	R34768 R34895	R35024 R35151	R35280 R43223	R43224 R47319	D0 D11999		V、Z P0~P9	OP							TAREZROFFSET	○	ID	○	○	○	○	○*	○*	0~63	○	CH	○	○	○	○	○	○	○	○	SB	○	○	○	○	○	○	○	○
Operand \ Range	HR	IR	OR		SR	ROR	DR	K	XR																																															
	R0 R34767	R34768 R34895	R35024 R35151	R35280 R43223	R43224 R47319	D0 D11999		V、Z P0~P9																																																
OP							TAREZROFFSET	○																																																
ID	○	○	○	○	○*	○*	0~63	○																																																
CH	○	○	○	○	○	○	○	○																																																
SB	○	○	○	○	○	○	○	○																																																
Feature description																																																								
Form WR: <table><tr><td>WR+0</td><td>INA gain</td></tr><tr><td>WR+1</td><td>ADC gain</td></tr><tr><td>WR+2</td><td rowspan="2">digital value, 32 bits</td></tr><tr><td>WR+3</td></tr></table> ● Remove the fixed tare weight. By setting the Instrumentation amplifier gain and ADC gain, it is possible to improve ADC conversion accuracy. ● Automatically parameter setting mode set the command mode to 0 and send the command to enable the tare zero function. The module will automatically calculate the appropriate Instrumentation amplifier gain, ADC gain, and Digital value and send it back to the PLC.				WR+0	INA gain	WR+1	ADC gain	WR+2	digital value, 32 bits	WR+3																																														
WR+0	INA gain																																																							
WR+1	ADC gain																																																							
WR+2	digital value, 32 bits																																																							
WR+3																																																								

FUN258P MODCONF	Tare Shift Instruction	FUN258P MODCONF
Feature description		

The input needs to be 0, i.e. analog input = DAC output, to achieve the tare deduction.



- User manual setting mode, MD=1, send a command to enable the tare zero function, and the command will be accompanied by the Instrumentation amplifier gain, ADC gain and Digital value set by the user. The Instrumentation amplifier gain is 433.92, 216.96 and 108.48, the ADC gain is 1, 2, 4, 8 and 16, and the Digital value setting range is 1~ 56874 (2.1696 V).

Like below table:

WR+0	INA gain
WR+1	ADC gain
WR+2	Digital 32bits
WR+3	

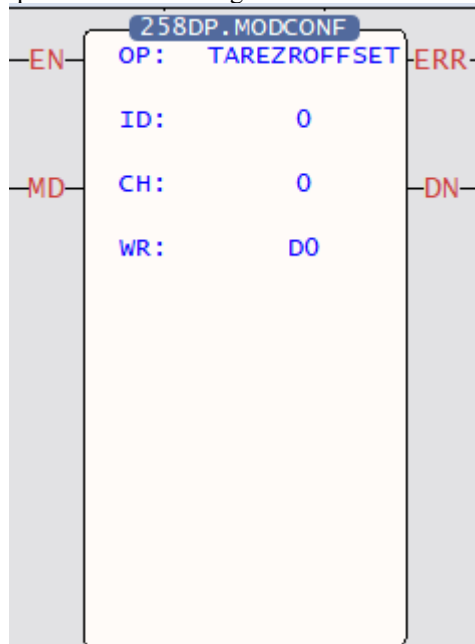
WR form

index	0	1	2
INA gain	433.92	216.96	108.48

INA gain table, if you need to fill in 433.92, you only need to fill in 0 to WR+0; If 216.96 is required, add 1....And so on.

FUN258P MODCONF	Tare Shift Instruction	FUN258P MODCONF
Feature description	● DACvalue count Fixed weight · $\text{Fixed tare weight} = \left(\text{DAC digital value} \times \frac{2.5}{65535} \right) \times \frac{\text{Rated capacity} \times \text{number of LC sensor}}{\text{INA gain} \times \text{Excitation voltage} \times \text{Rated output}}$ In manual mode: (1) Excitation voltage is 5V · (2) Rated output · unit is V · for example: if choose rated output be 2mV/V · rated output= 0.002V · If user calibration is enabled, the Fixed Weight must also be corrected by user calibration. ● ADC/INA Gain setting suggestion formula: $\frac{\text{Max weighting capacity}}{\text{Rated capacity} \times \text{number of LC sensor}} \times \text{INA gain} \times \text{ADC gain} \leq 500$ The maximum weight capacity is the actual measurement range used, which does not exceed the rated capacity of the LC sensor specification. Select the appropriate INA gain and ADC gain so that the numerical result on the left side of the equation is as close to 500 as possible. * The tare weight offset command is only supported by the LCR module, not by the LC.	

The following is an example of the input in the ladder diagram:



OP: TAREZROFFSET

ID: Expansion module ID number (0~N)

CH: The channel position to be deducted (0~N)

WR: Starting register for offset command setting

WR+0:INA GAIN

WR+1:ADC GAIN

WR+2~+3:Digital Value

Data caching commands:

How to use and instruction:

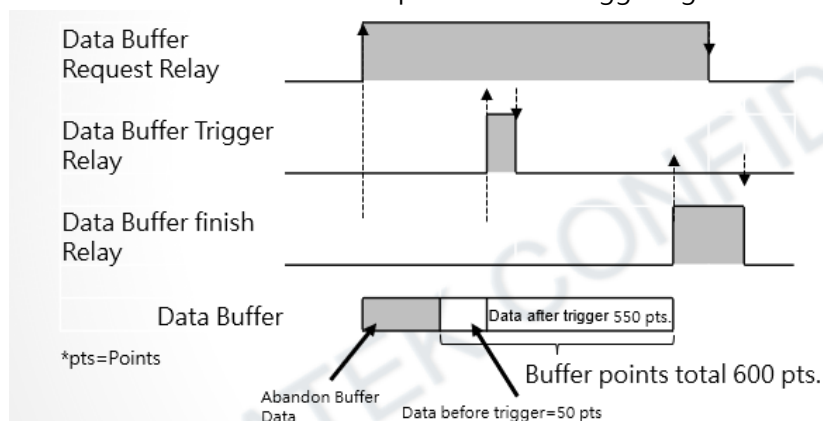
Through the data buffer relay and the data trigger relay, a continuous load cell reading value can be recorded, and the stored reading can be moved to the PLC register through the data buffer command to observe the change of the analog value.

According to the processing time of the load cell reading value conversion mode, the digital operation value of each buffer point is updated to the data buffer area.

Each channel can store up to 600 points.

Example:

When the buffer points are set to 600 and the data points before triggering are set to 50



Example diagram of the data buffering function

Settings and Defaults

If the channel is not set, the default setting is off.

Setup	M02LCR setting range	M02LCRR setting range	Defaults
Buffer points before trigger	0-599	0-599	200
Buffer points	1-600	1-600	600

Setting of data buffering function

The following table shows how to use the data buffering function

Run-time relay control

Data Buffer Relay	Description	Setup
Data Buffer Request Relay	Buffer Request	Off- >On: Start caching. On- >Off: Disable caching.
Data Buffer Trigger Relay	Trigger	Off->On: Trigger the data buffer relay.
Data Buffer Completion Status Relay	Buffer Completion Data	Off- >On: specified buffer points are completed, the buffer can be read through command 115 (DBUF function). On- >Off: Data buffer request relay: On -> Off, Off when the buffer is turned off. Data buffer trigger relay: On->Off->On, then Off when retriggering, until Off->On after the buffer points are completed.

Steps to use the data buffer function

After the data buffer is completed, you can use Fun 115 DBUF to read the buffered data stored in the module to the PLC.

【Device Information Description】:

Channel weight value:

Engineering weight reading value confirm by user will be affected by the user's calibration and will change the scale of the weight reading value.

Channel Numeric Values :

Original reading value of voltage signal conversion, and the range is 0~10000.

For example:

1 mv/V load cell with a range of 100 kg.

When the actual load of the load cell is 100 kg, the reading value of this channel should be 10000, which means that the module receives the full-scale voltage of the 1 mv/V load cell.

LC Error Code :

Error indicators used during program debugging.

Currently, the function is reserved.

Channel Maximum Total Weight Output Value:

After being energized, the maximum & minimum gross weight read by the LC module will be stored and placed in the appropriate register.

The maximum gross weight will be stored in this register.

Channel Minimum Total Weight Output Value:

After being energized, the maximum & minimum gross weight read by the LC module will be stored and placed in the appropriate register.

The minimum gross weight will be stored in this register.

Data Buffer Request Relay:

When the relay is ON, the data buffer request is started.

For detailed steps, please refer to the [data buffer setting](#) chapter.

Data Buffer Trigger Relay:

For details on how to use

the relay ON to start data cache triggering, [refer to the Data Cache Settings](#) section

Alarm Clear Request Relay:

After alarm happened, the Alarms can be cleared by using this relay.

Error Clear Request Relay :

After error occurred, the alarms can be cleared by using this relay.

Zero-point Set Request Relay:

Set the current weight reading to zero.

Zero-point Return Request Relay:

Restore the current weight reading to the preset zero-point after calibration.

Stable Output:

When is in stable state, the relay is ON.

When is not a stable state, the relay is OFF.

Center Point Detection Output:

When entering the center point state, the relay is ON.

When leaving the center point state, the relay is OFF.

Zero-point Detection Output:

When entering the zero state, the relay is ON.

When leaving the zero state, the relay is OFF.

Zero-point Setting Completed Output:

When the zero-point setting completed, the relay will stay in ON state for one scan period.

Zero-point Restoration Completed Output:

When the zero-point setting completed, the relay will stay in ON state for one scan period.

Input Signal Error Detection :

When the "weight reading value" is greater than "(maximum weight capacity) + (maximum weight capacity * input signal error percentage)", a warning signal will be issued, and the relay will be ON.

Conditions for Triggering Signal Error : $\text{weight reading} > \text{maximum weight capacity} + \text{maximum weight capacity} * \text{input signal error percentage}$.

Note: This function will only be detected when "input signal error" is enabled in the software settings.

Excess Weight Capacity:

When the load exceeds the "weight capacity overlocking" alarm setting value, a warning signal will be issued, then relay will be ON.

Conditions for Triggering an Overweight Alarm: $\text{weight reading} > \text{maximum weight capacity} + \text{current minimum scale} * 9$.

Note: This function will only be detected when "input signal error" is enabled in the software setting.

Out of Zero-point range:

When using a special relay **to set the zero-point**, the system can check the zero-point position, if it exceeds the reasonable zero-point range, the warning relay will ON.

※This function will only be detected when "input signal error" is enabled in the software settings.

Conversion Excess:

When the load input signal voltage exceeds the maximum upper limit, the warning relay will ON .

For example:

The sensitivity of the load cell is 1 mv/v.

If the input signal is greater than 5 mv (the maximum range of the load cell), the warning relay will ON .

※ This function will only be detected when " input signal error " is enabled in the software settings.

Total Weight Upper Limit Alarm:

When the total weight exceeds the set upper limit, the warning relay will ON.

Total Weight Lower Limit Alarm:

When the total weight is lower than the set lower limit, the warning relay will ON.

Data Buffer Done Relay:

The relay is ON when the data caching is complete.

Error Flag :

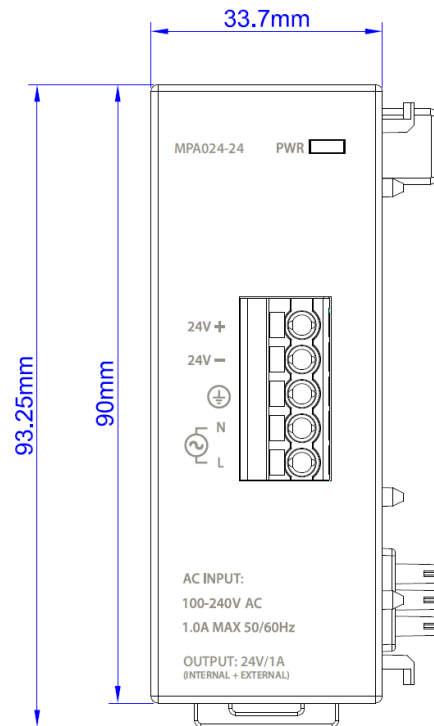
The warning relay is ON when conversion excess or weight capacity overclocking occurs.

14

Advanced Expansion & Power Modules Dimensions

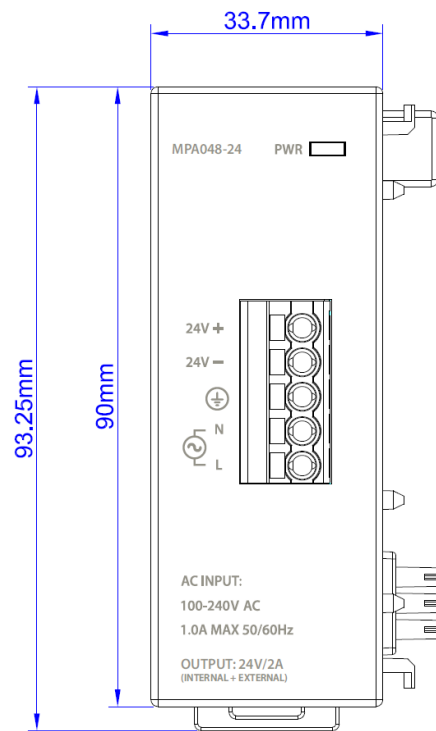
14-1 Power Module Dimensions

14-1-1 MPA024-24 Dimensions



MPA024-24 Dimensions

14-1-2 MPA048-24 Dimensions



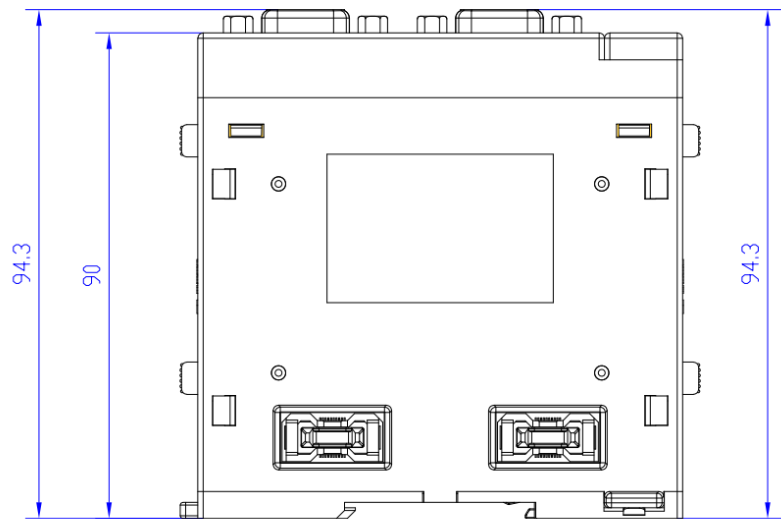
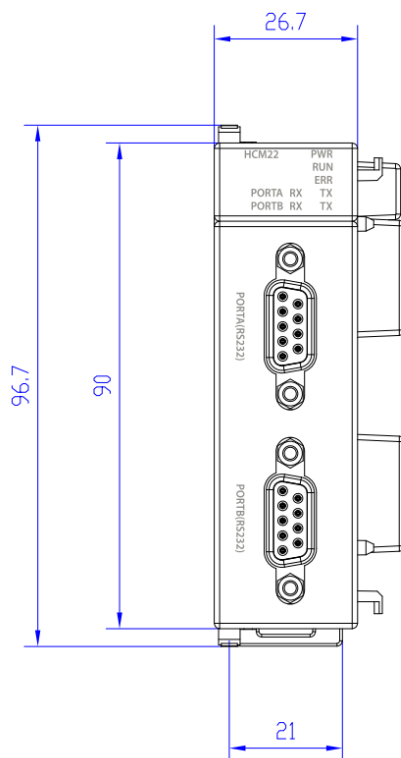
MPA048-24 Dimensions

15

High Speed Expansion Modules Dimensions

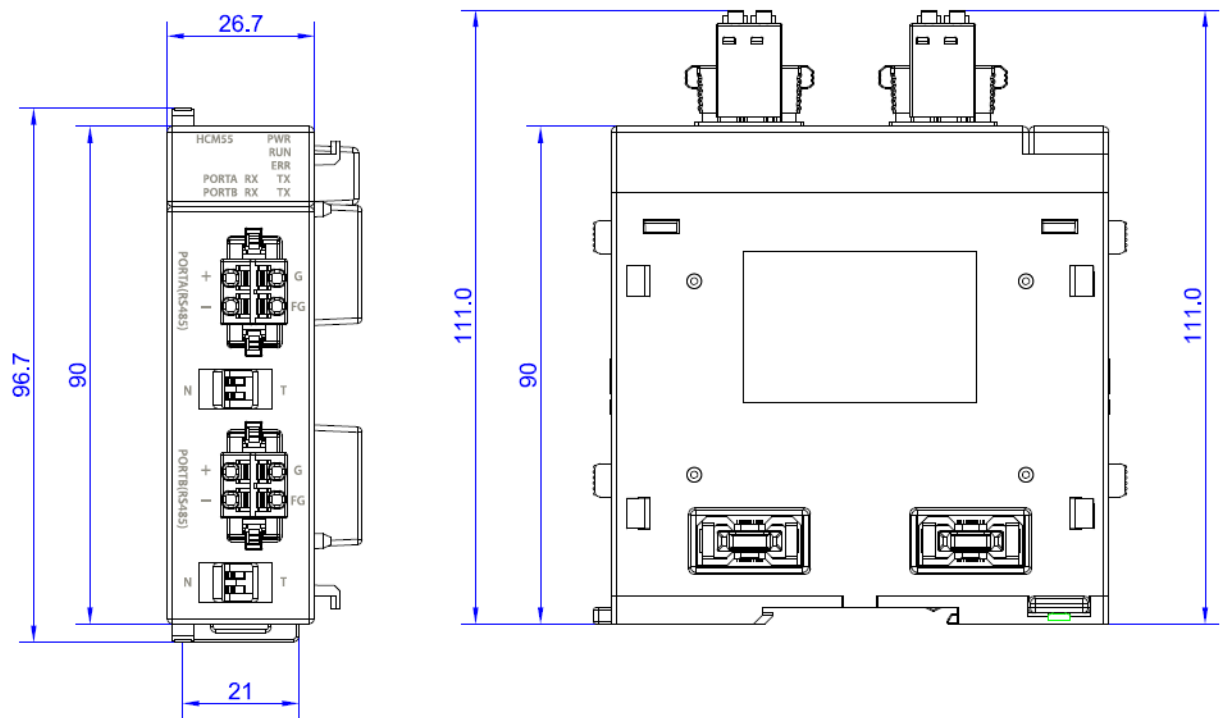
15-1 High Speed Communication Expansion Module Dimensions

15-1-1 MHCM22 Dimensions



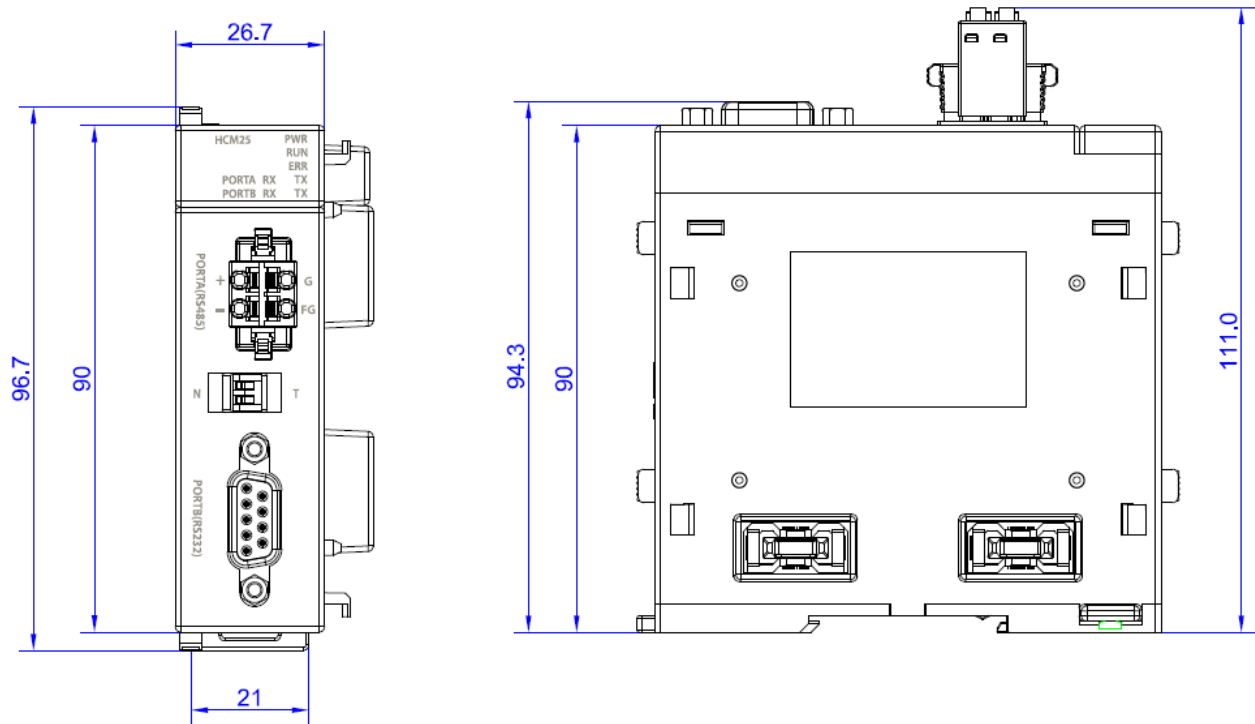
MHCM22 Dimensions

15-1-2 MHCM55 Dimensions



MHCM55 Dimensions

15-1-3 MHCM25 Dimensions



MHCM25 Dimensions

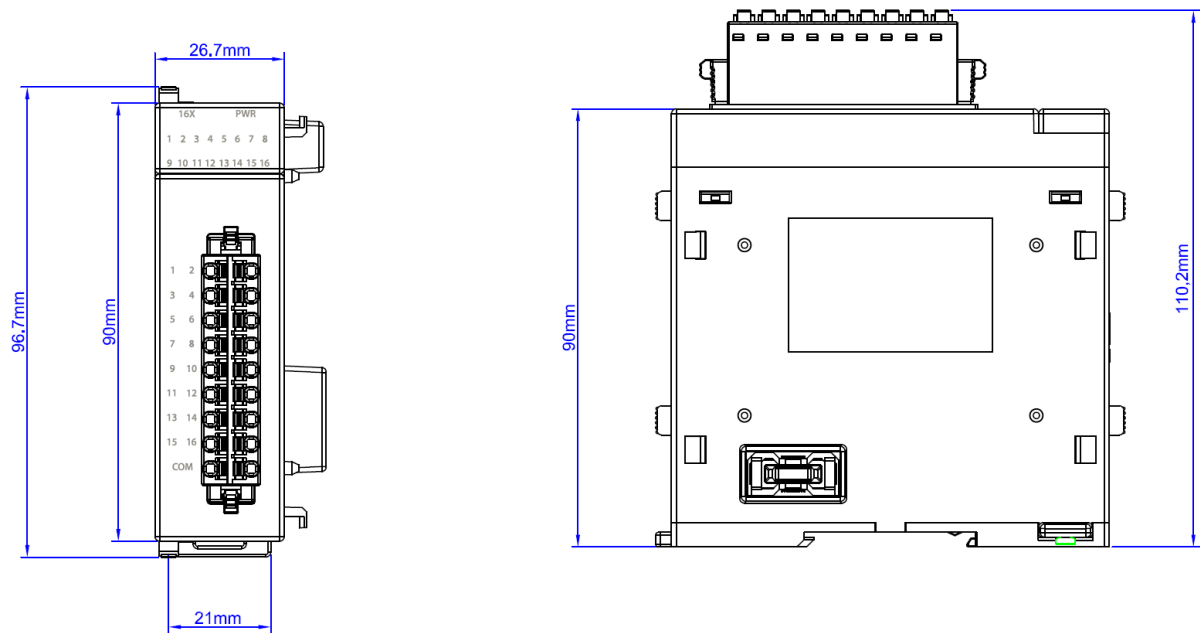
16

Local I/O Expansion Modules

Dimensions

16-1 Digital input Expansion Module Dimensions

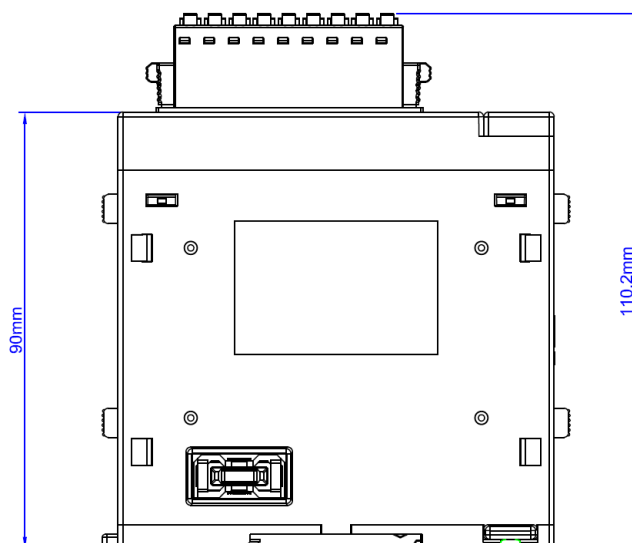
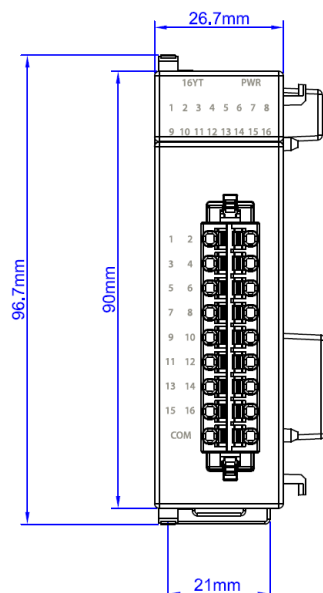
16-1-1 M16X Dimensions



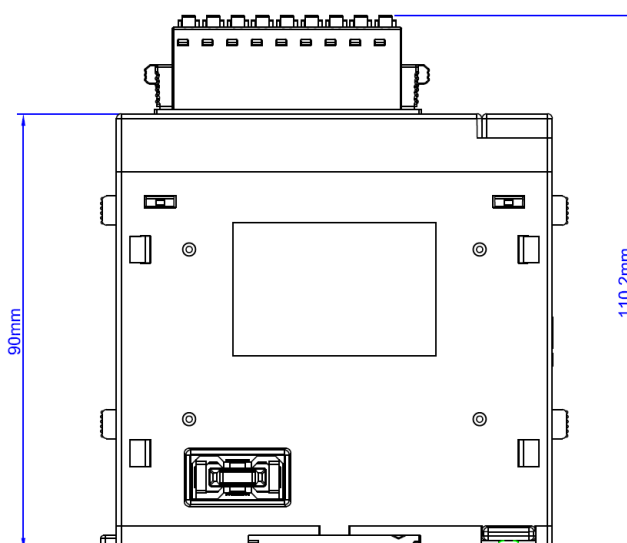
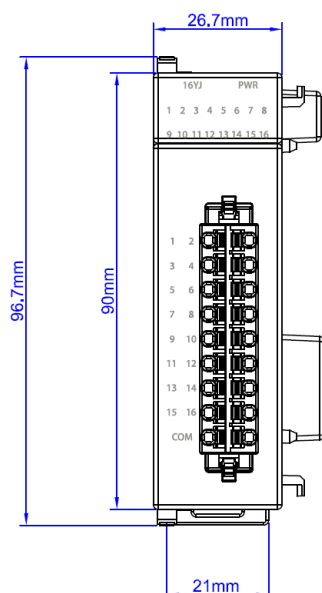
M16X Dimensions

16-2 Digital Output Expansion Module Dimensions

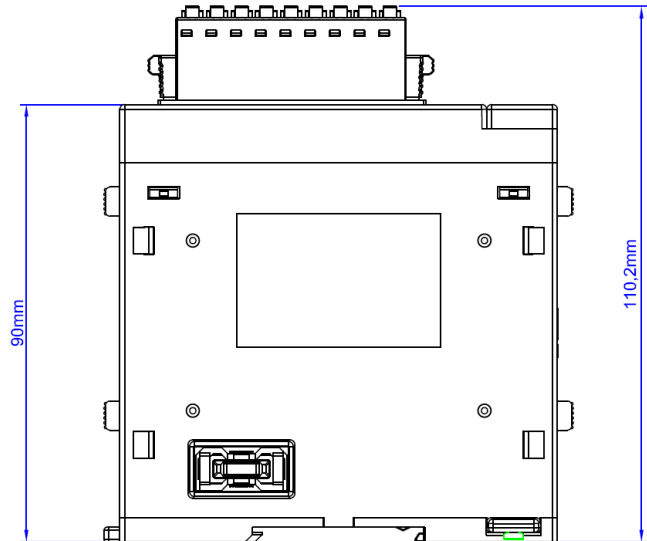
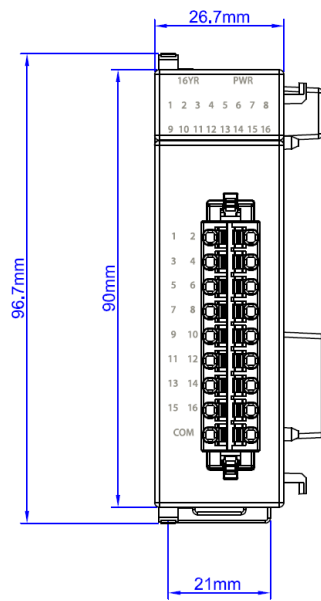
16-2-1 M16YT / M16YJ /M16YR Dimensions



M16YT Dimensions



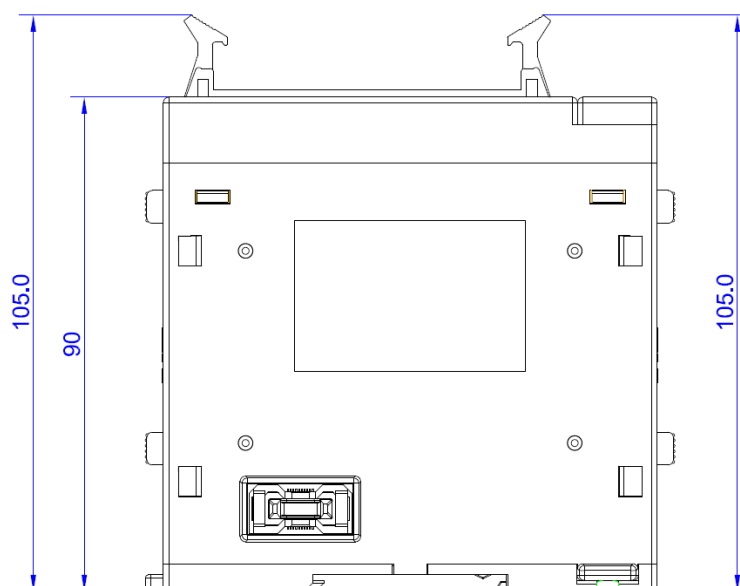
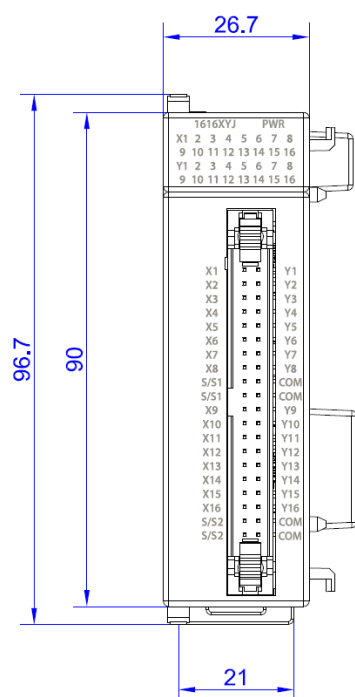
M16YJ Dimensions



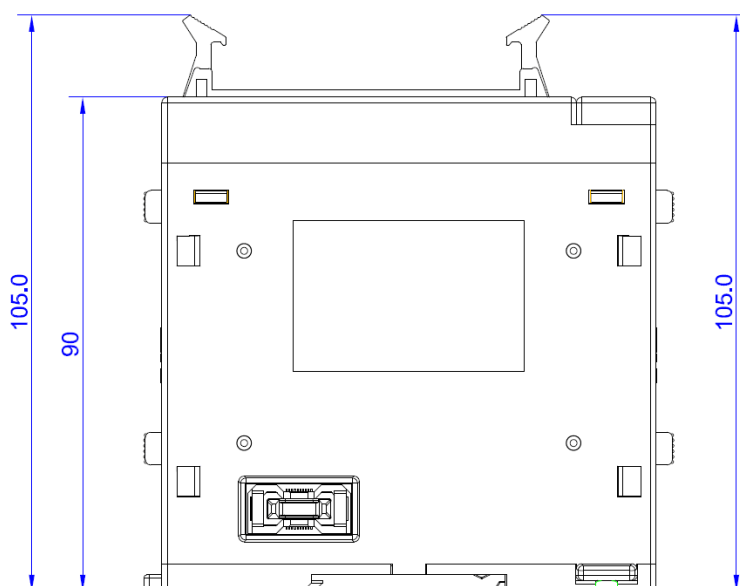
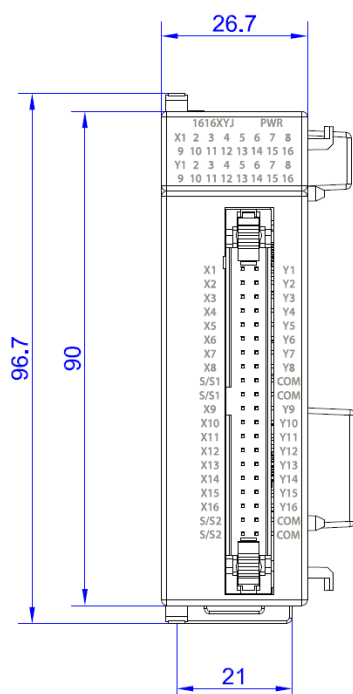
M16YR Dimensions

16-3 Digital Input/Output Combo Expansion Module Dimensions

16-3-1 M1616XYT / M161616XYJ Dimensions



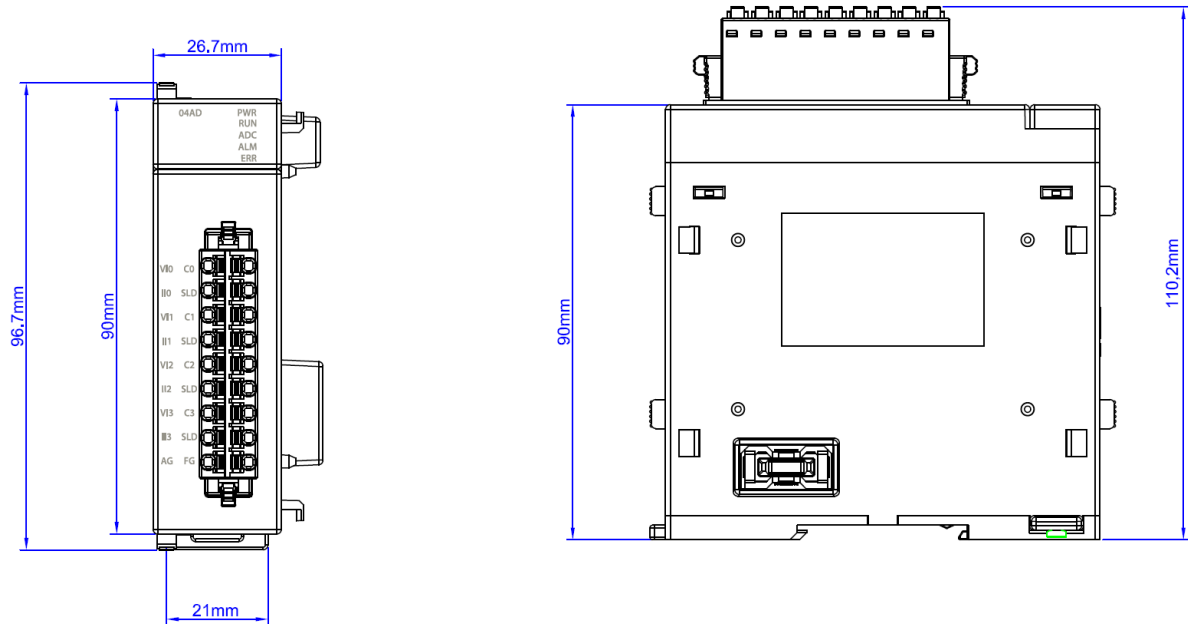
M1616XYT Dimensions



M1616XYJ Dimensions

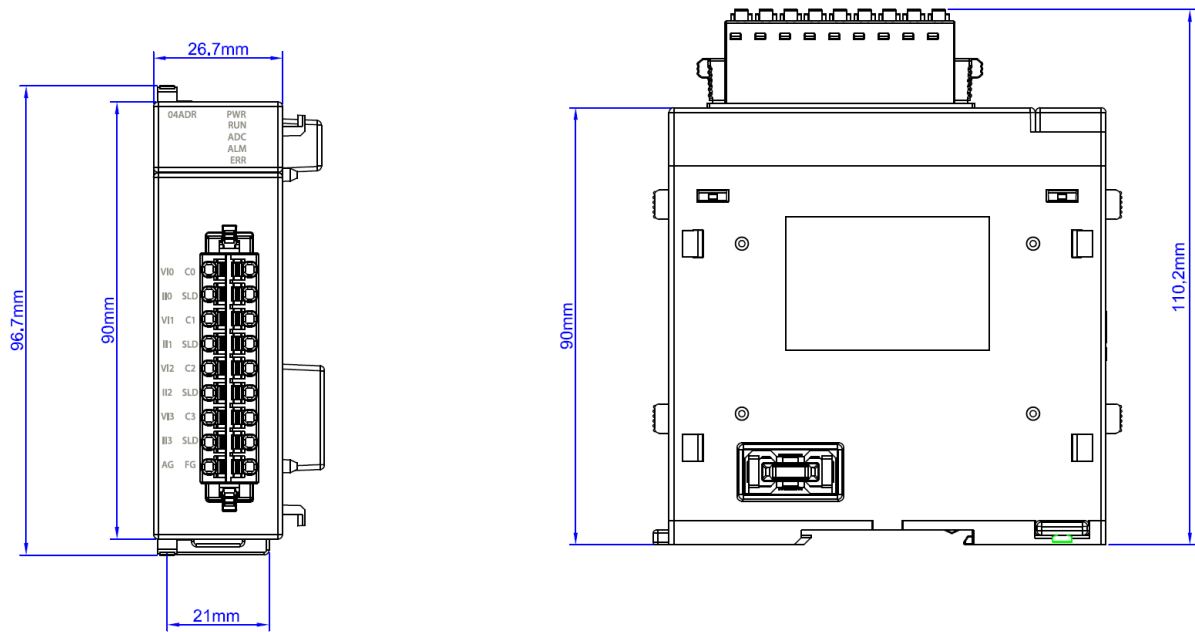
16-4 Analog Input Expansion Module Dimensions

16-4-1 M04AD Dimensions



M04AD Dimensions

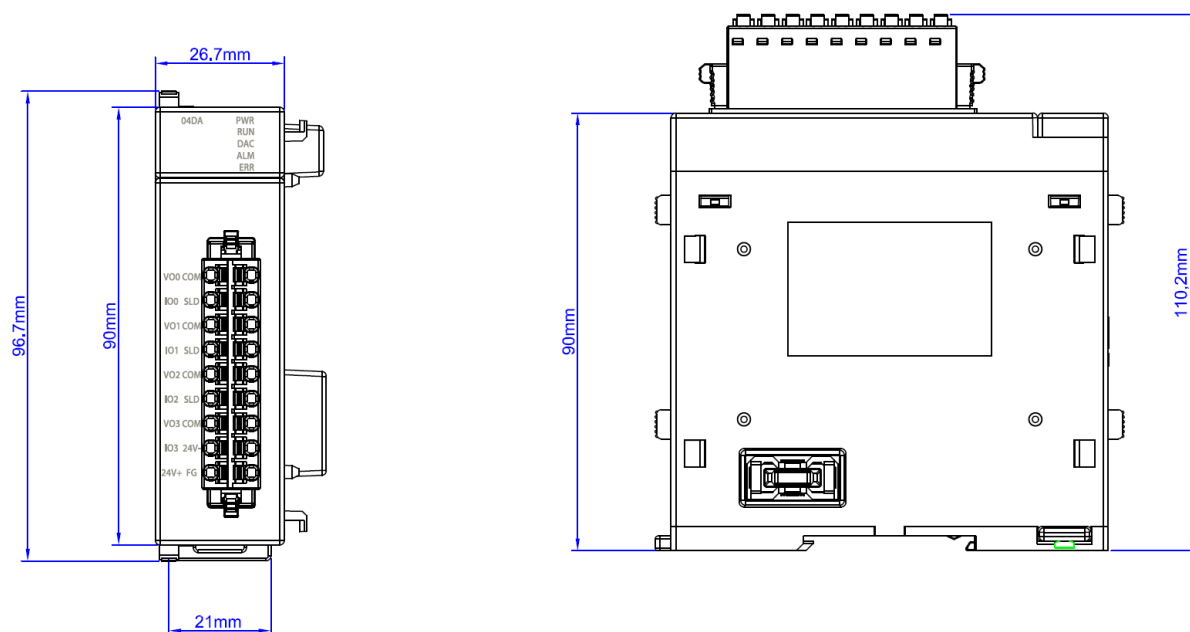
16-4-2 M04ADR Dimensions



M04ADR Dimensions

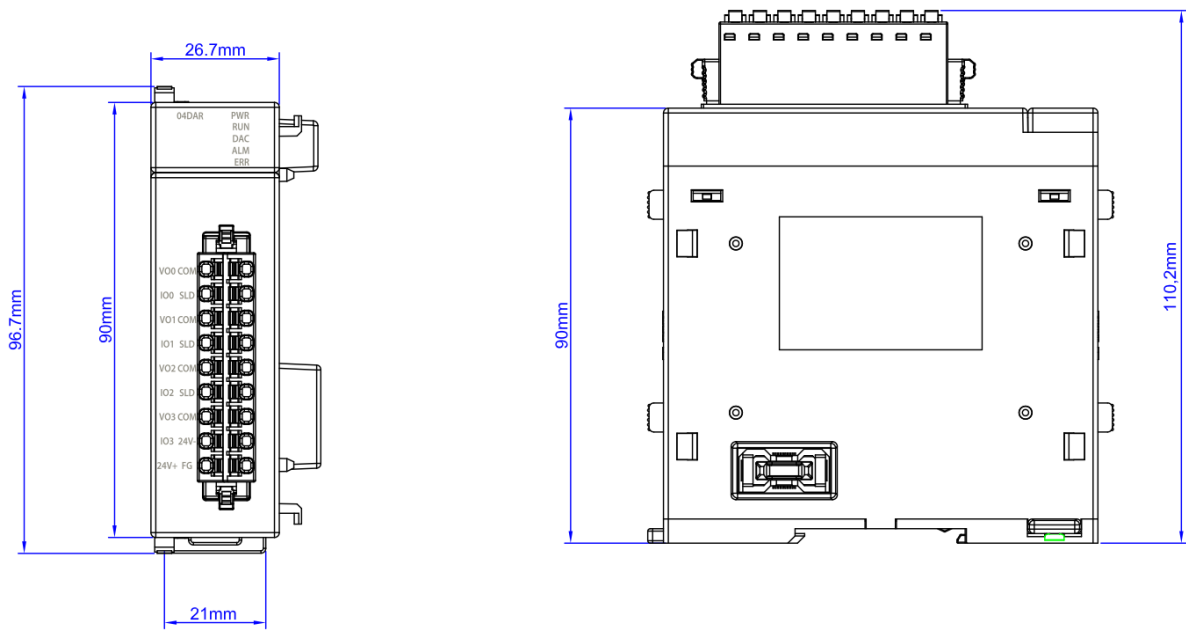
16-5 Analog Output Expansion Module Dimensions

16-5-1 M04DA Dimensions



M04DA Dimensions

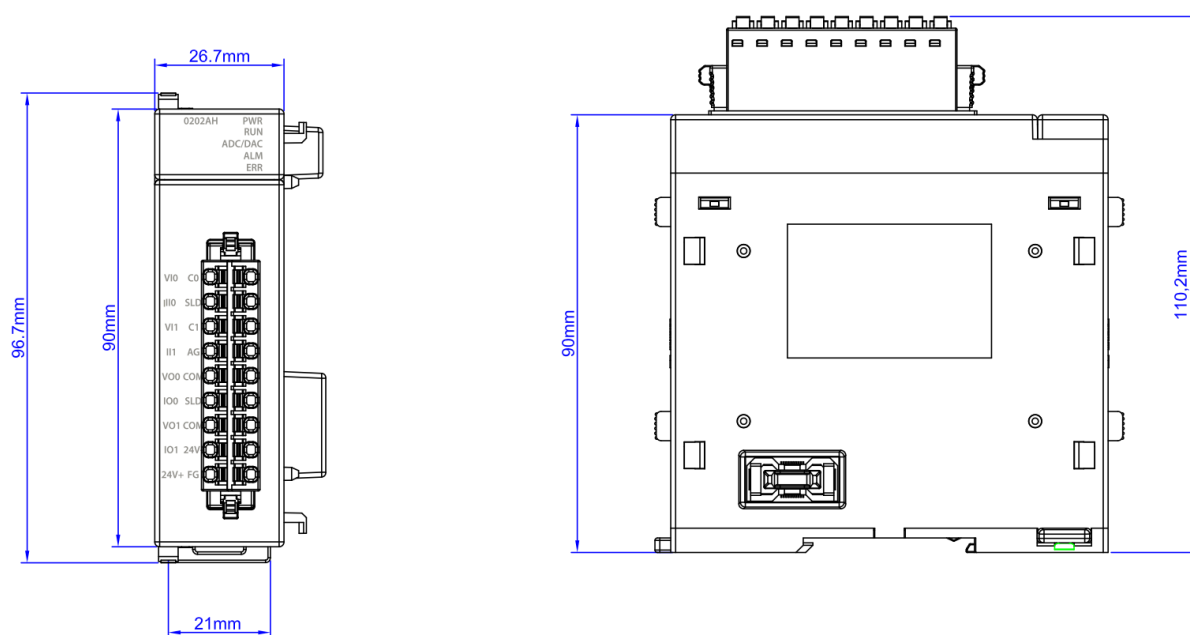
16-5-2 M04DAR Dimensions



M04DAR Dimensions

16-6 Analog Input/Output Combo Expansion Module Dimensions

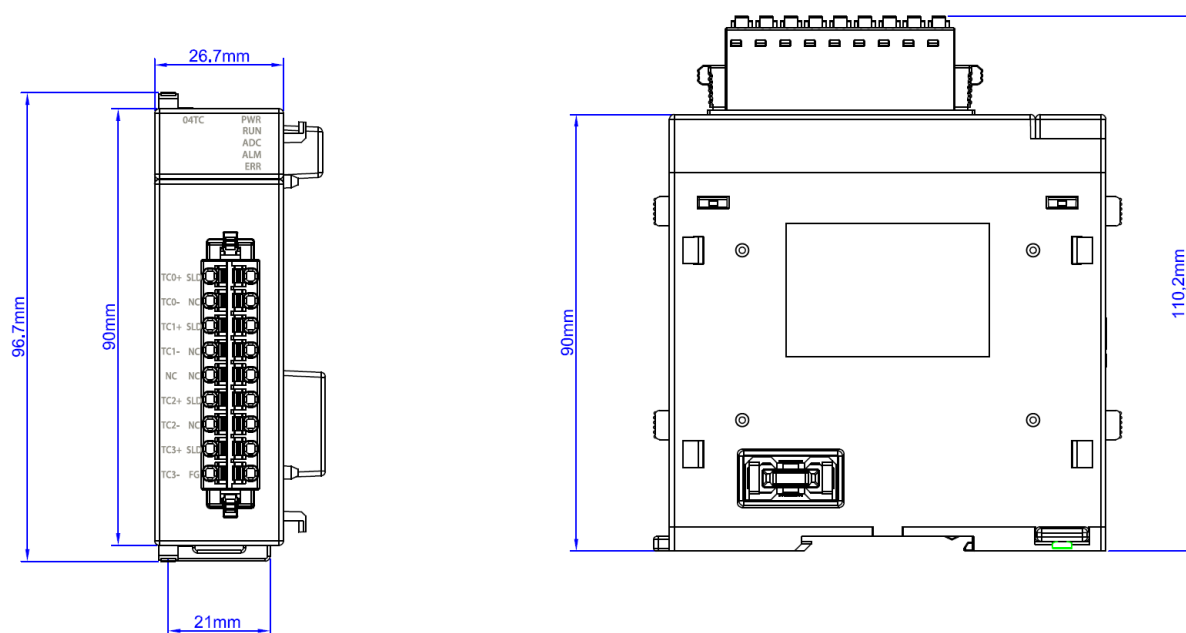
16-6-1 M0202AH Dimensions



M0202AH Dimensions

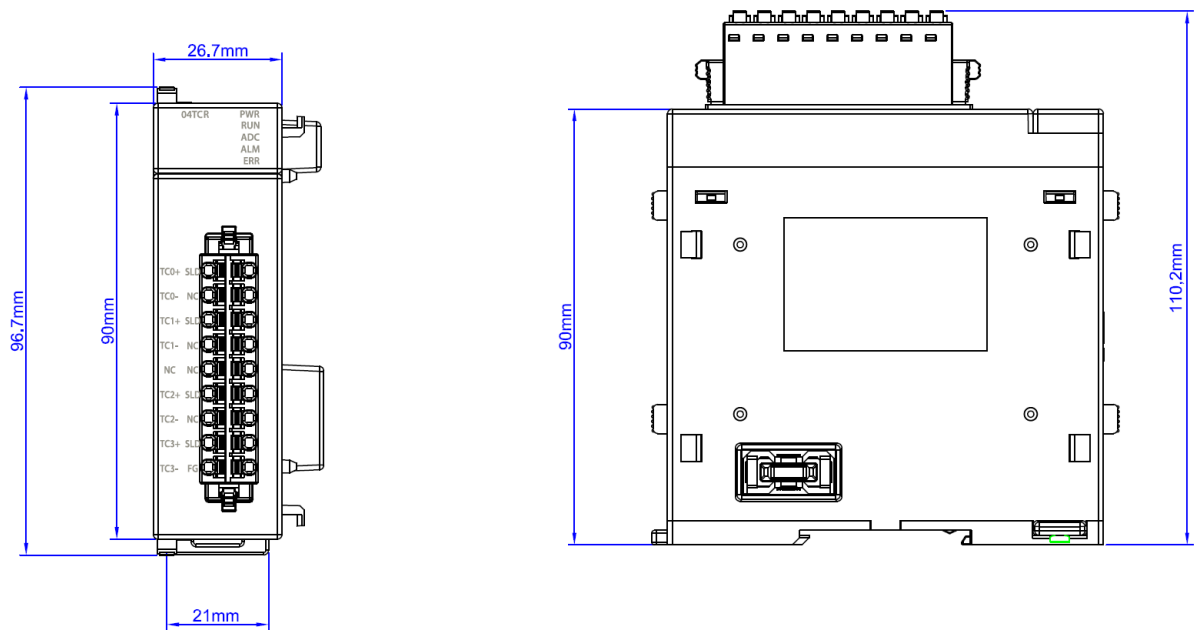
16-7 Temperature Expansion Module Dimensions

16-7-1 M04TC Dimensions

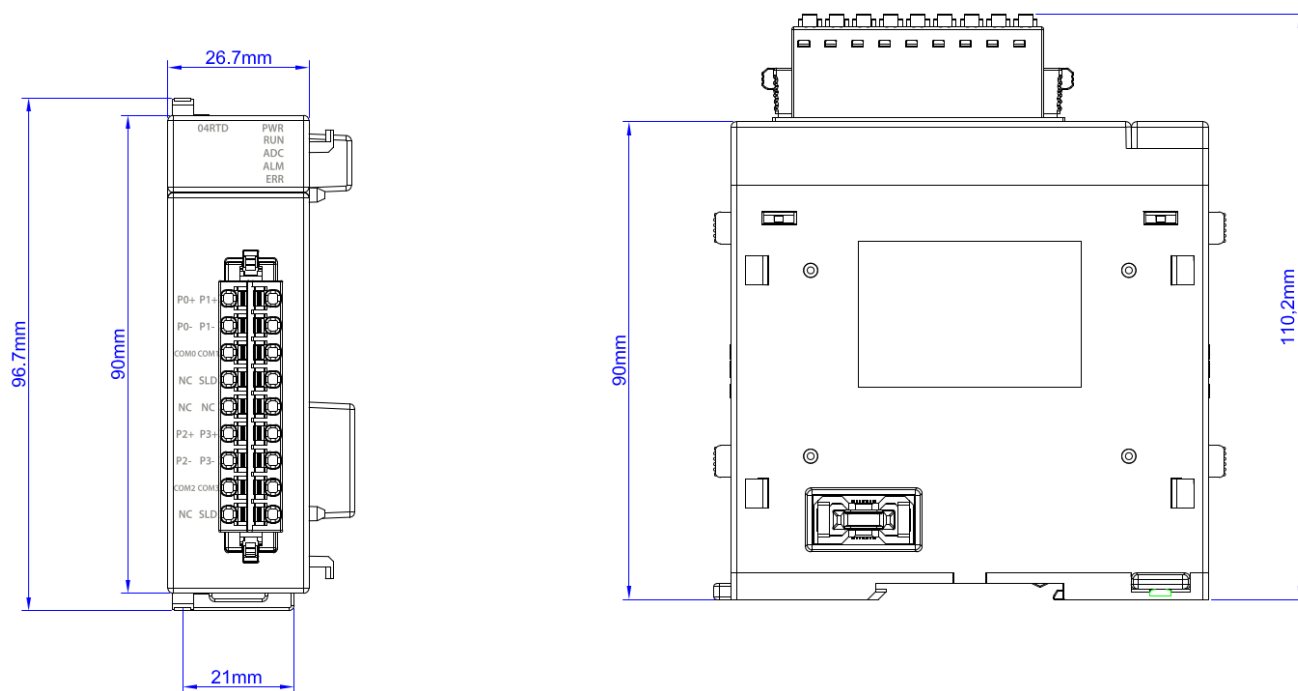


M04TC Dimensions

16-7-2 M04TCR Dimensions



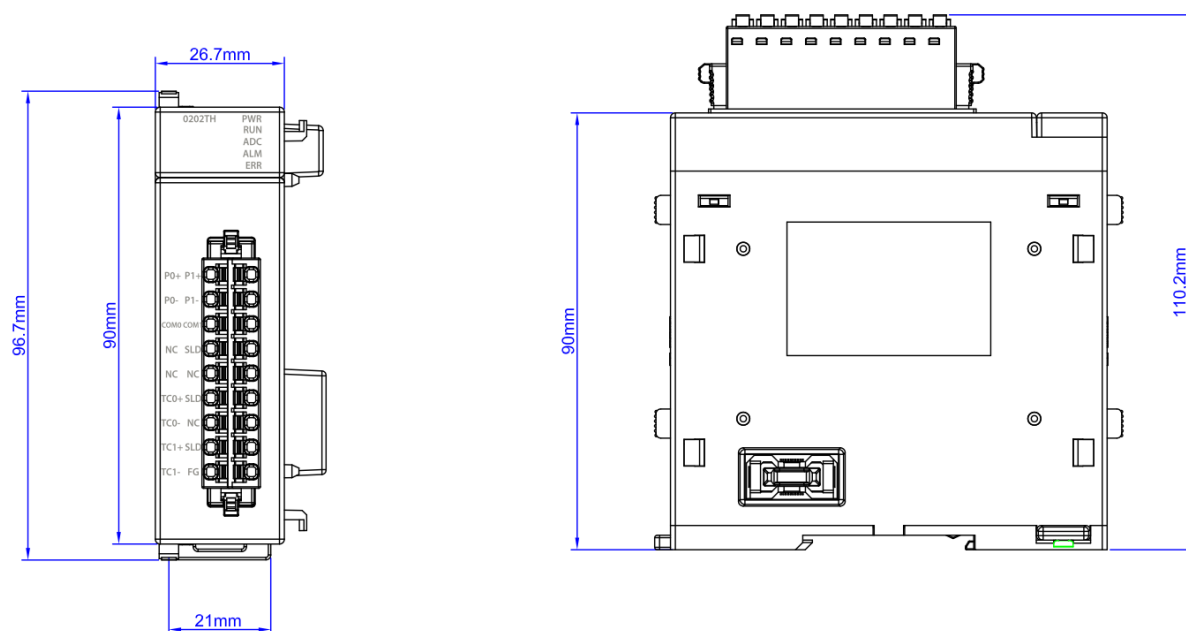
M04TCR Dimensions

16-7-3 M04RTD Dimensions

M04RTD Dimensions

16-8 Temperature Combo Expansion Module Dimensions

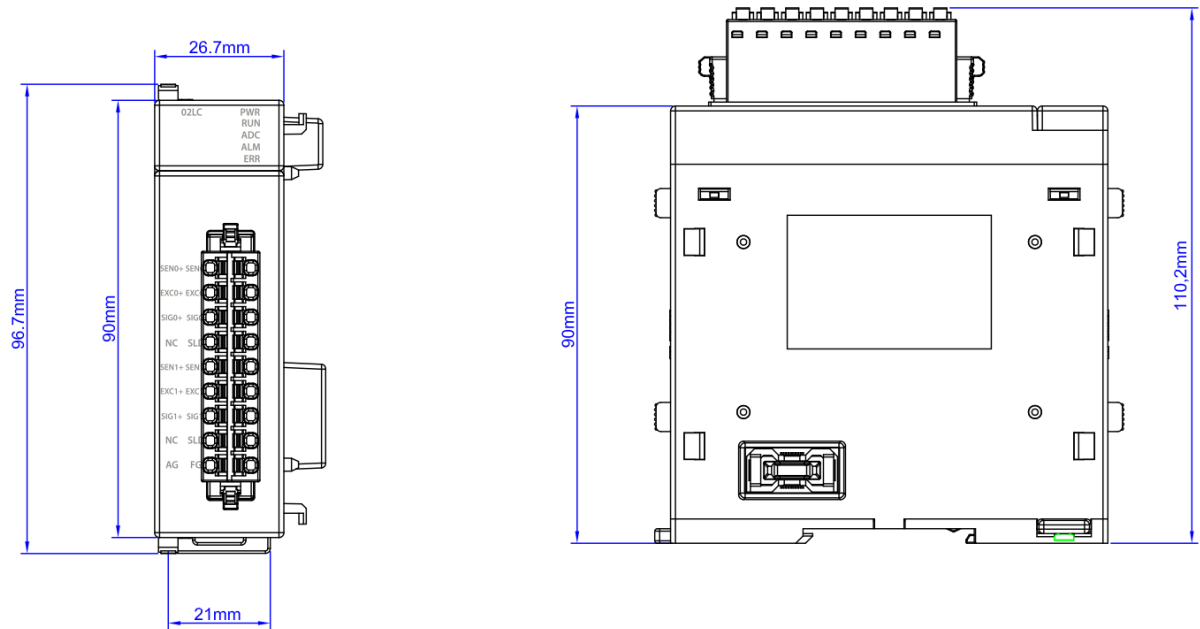
16-8-1 M0202TH Dimensions



M0202TH Dimensions

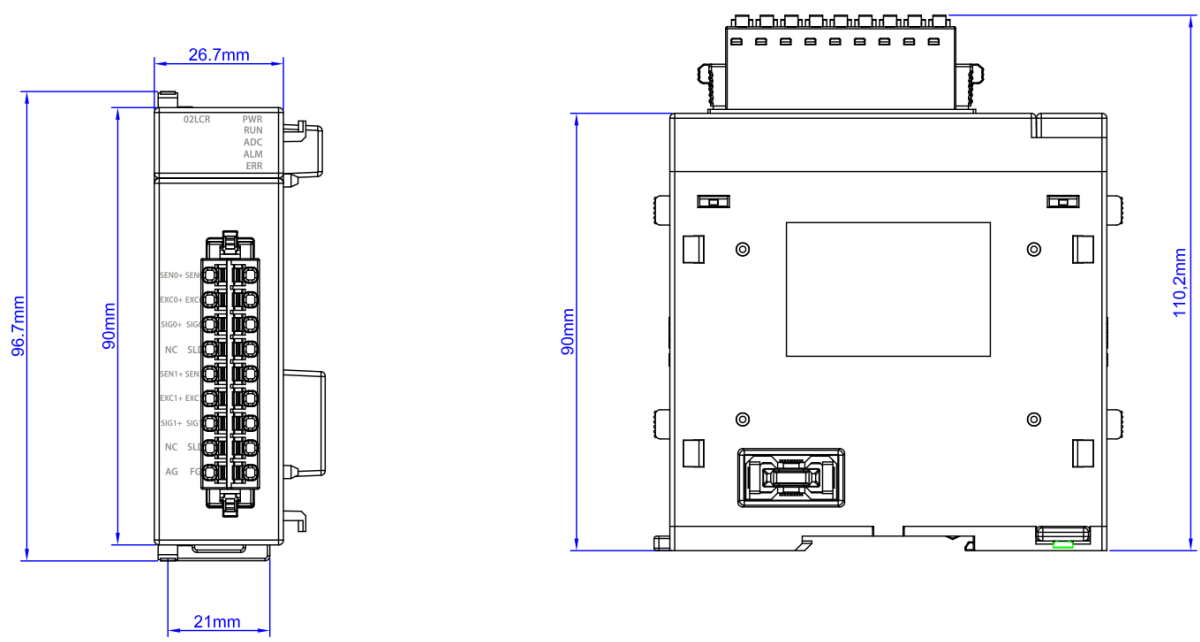
16-9 Load Cell Expansion Module Dimensions

16-9-1 M02LC Dimensions



M02LC Dimensions

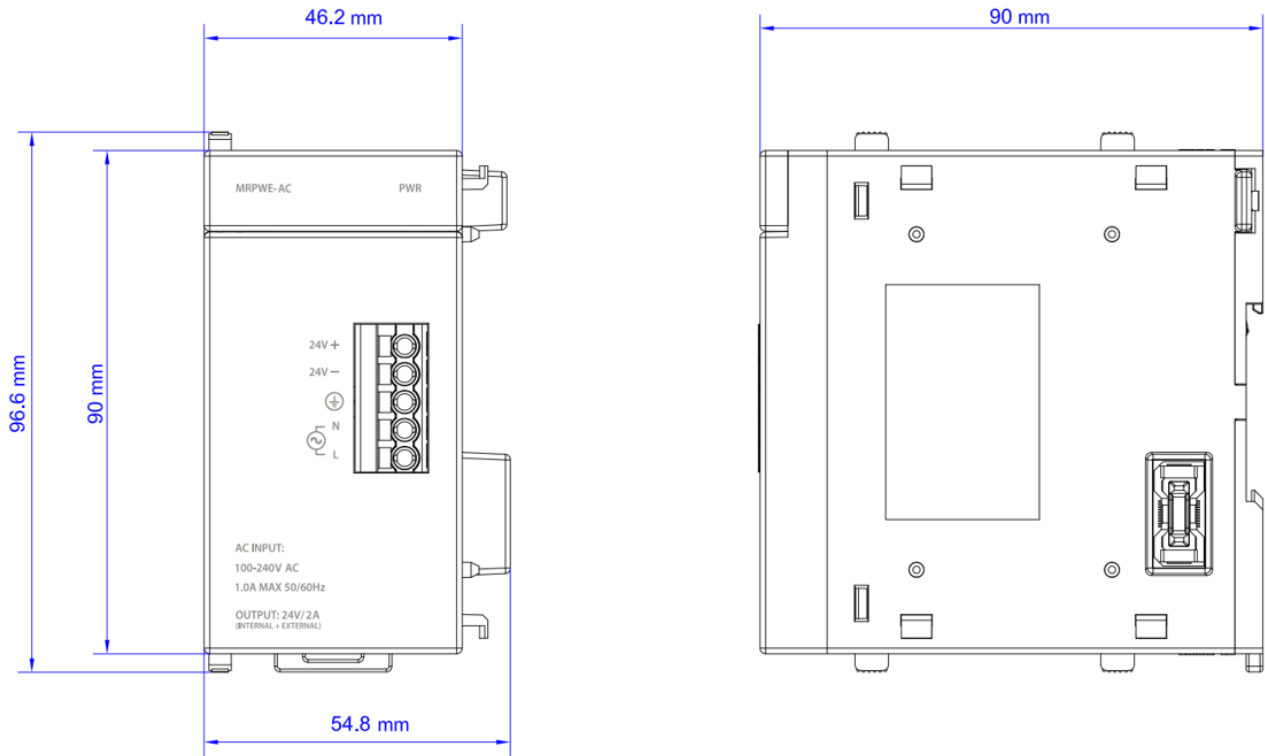
16-9-2 M02LCR Dimensions



M02LCR Dimensions

16-10 Repeater Expansion Module Dimensions

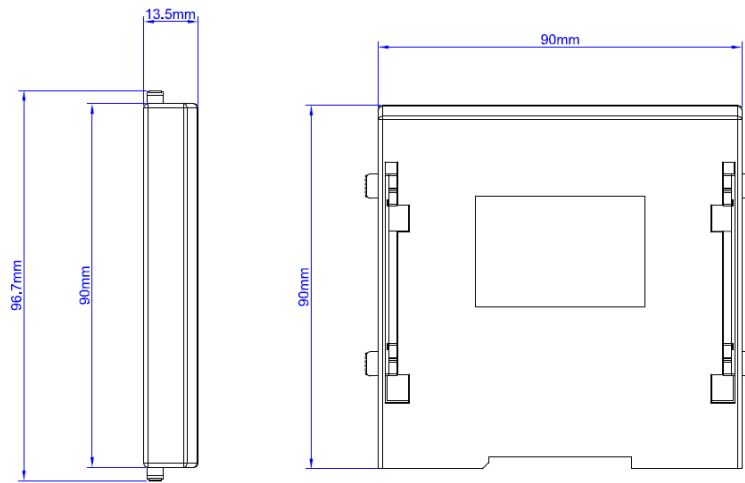
16-10-1 MRPWE-AC Dimensions



MRPWE-AC Dimensions

16-11 Terminal Cover Dimensions

16-11-1 MRE Dimensions



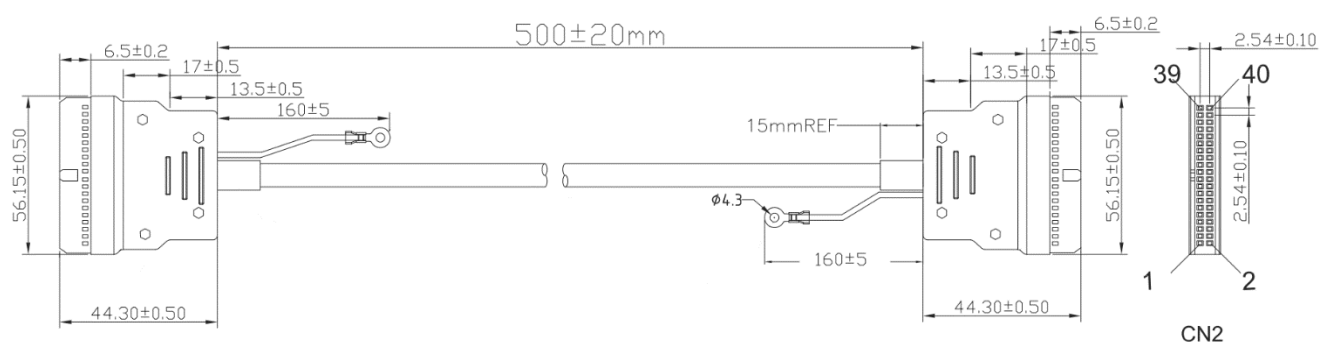
MRE Dimensions

17

Peripheral and Accessory Dimensions

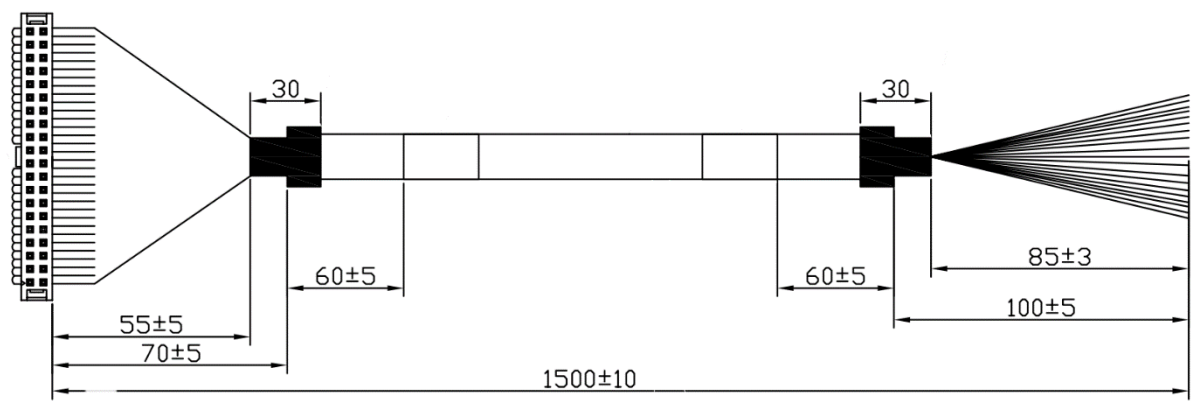
17-1 High-Density DIO Cable Dimensions

17-1-1 MFW40I-50 Dimensions



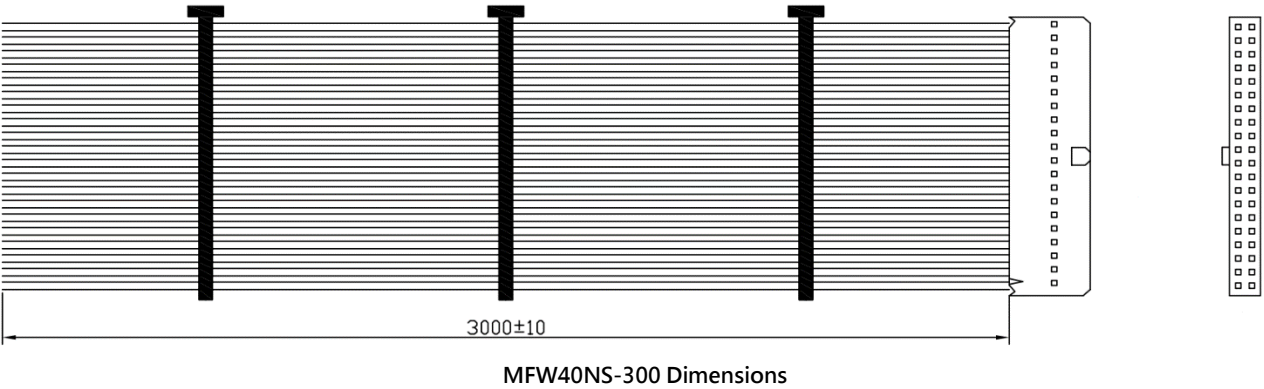
MFW40I-50 Dimensions

17-1-2 MFW40N-150 Dimensions



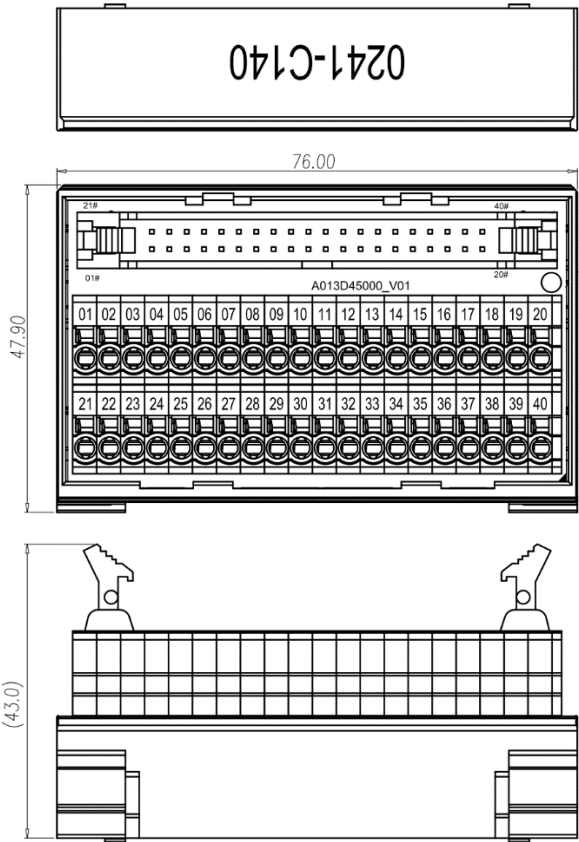
MFW40N-150 Dimensions

17-1-3 MFW40NS-300 Dimensions



17-2 DIO Converter Module Dimensions

17-2-1 MFT40T Dimensions



MFT40T Dimensions

18

Repairs and Maintenance

18-1 Precautions

When performing the required servicing and maintenance, please watch the following requirements because incorrect or careless operations may result in personal injury and equipment damage.

- ⚠ Please confirm that the ambient environment is not exposed to corrosive substances (*e.g.*, chlorides and sulfide gas) and combustible substances (*e.g.*, oil mist and cutting powder) or dusty area to prevent PLC System from failure or causing a fire.
- ⚠ Do not contact the terminal to prevent the terminal from getting oxidized or personnel from electrocution.
- ⚠ Shut down the external power and then dismantle the terminal or the screws to avoid personnel electrocution.
- ⚠ Do not apply heavy force on the cables or drag or clip the cable too hard to prevent cable from damage or terminal from loosening while avoiding electrocution.
- ⚠ Confirm that the input voltage is within the rating scope.
- ⚠ Do not attempt to disassemble or modify the module or repair the module privately; otherwise, it may lead to product failure, fire or personnel injury.
- After replacing the CPU module, confirm that all programs and parameters are being created in the new CPU module and are duly set. Following that, you may start the PLC System to prevent the controlled component from executing a false action.
- Please read the manuals carefully in order to get familiar with the required operation mechanisms when the PLC is running such as procedure change, forced output and RUN/STOP, etc. The purpose is to prevent incorrect output or equipment damage as may be caused by inaccurate operations.
- Before touching the module, please touch the grounding metal first or wear an anti-static bracelet in order to discharge the electrostatic from the human body to prevent it from damaging the module.
- When using a mobile phone or communication device, please keep appropriate distance to prevent from interfering with the system as to cause the false action.
- Do not install the PLC Control System in an environment exposed to direct sunlight or humidity.
- Please confirm that appropriate distance has been maintained between the PLC Control System and the heat source such as coil, heater and resistor, etc. to prevent the component from being exposed to higher temperature.
- Please install an emergency power shutdown system and an over-current protection device as required in order to protect the PLC Control System.
- During the operations and maintenance process, please check the installation stability in order to avoid unexpected vibrations as to damage the PLC Control System and the controlled component.

18-2 Daily Maintenance

The connection terminal may present loosening signs after running the PLC System for a longer time. To maintain the PLC System at normal operating status, the inspection should be executed according to daily maintenance items after confirming that the ambient environment meets the environmental specifications that are specified in Chapter 3. When discovering any abnormal signs, please make improvements immediately according to the specified troubleshooting method.

18-2-1 Maintenance Tools

- Screwdriver
- Stain removing alcohol
- Cleaning cotton rag
- Swab

18-2-2 Daily Maintenance Items

Daily maintenance items

No.	Inspection Item		Job Content	Judgment Standard	Action
1	Appearance cleanliness		Visual inspection	If there are any stains.	Wipe off the stains.
2	Appearance completeness		Visual inspection	If there is any damage.	Wipe off the stains.
3	Back board and DIN Rail installation status		If the back board and the DIN rail are securely installed.	The back board and the DIN rail must be securely installed.	Check if the back board and the rail are properly installed.
4	Locking status of module connection area		If the locking of module connection area is detaching or loosening.	The locking device of the module connection area must be located at the locking position.	Move the locking device of the module connection area back to the locking position.
5	Appearance of wiring cable		If the wiring cable is damaged.	The wiring cable shall be intact without any damage.	Replace the wiring cable.
6	Connection status of each terminal		If the terminal is loosening.	The terminal cannot present any loosening sign.	Connect the terminal properly.
7	Power module	PWR lamp	If the PWR lamp is ON.	The PWR lamp must be ON.	For detailed troubleshooting, please refer to "Expansion Module Troubleshooting" section.
8	Expansion module	PWR lamp	If the PWR lamp is ON.	The PWR lamp must be ON.	
		RUN lamp	If the RUN lamp is ON.	The RUN lamp must be ON.	
		ERR lamp	If the ERR lamp is OFF.	The ERR lamp must be OFF.	
		ALM lamp	If the ALM lamp is OFF.	The ALM lamp must be OFF.	

* Remove the expansion module and then use a swab to wipe off the dust and stains present in inaccessible corners.

18-3 Regular Maintenance

When the routine daily maintenance is required, the module should be serviced cyclically according to the actual operating environment. The inspection should be executed according to daily maintenance items after confirming that the ambient environment meets the environmental specifications that are specified in Chapter 3. When discovering any abnormal signs, please make improvement immediately according to the specified troubleshooting method.

18-3-1 Maintenance Tools

- Screwdriver
- Stain removing alcohol
- Cleaning cotton rag
- Swab
- Multimeter
- Temperature gauge
- Hygrometer

18-3-2 Regular Maintenance Items

Regular maintenance items table.

No.	Inspection Item	Job Content	Judgment Standard	Action
1	Environmental temperature and humidity	Measure with temperature gauge and hygrometer.	Must meet the environmental specifications established for the respective module.	Confirm the reasons causing the environmental change and then remove the problem.
2	Air	Measure the corrosive gas	Corrosive gas should not be detected.	
3	Power voltage	Measured the supplied AC power.	Must meet the power module specifications.	Confirm the power supply system.
4	Dust/stain attaching status	Check the appearance	If any dust and stain.	Wipe off the dust and the stains.
5	Module installation status	Check if the module is securely installed.	The module must be securely installed.	For correct installation method, please refer to "Installation and Wiring" section.
6	Locking status of connection area between modules	If the locking of module connection area is detaching or loosening.	The locking device of the module connection area must be located at the locking position.	Move the locking device of the module connection area back to the locking position.
7	Terminal connection status	Check by plugging and unplugging the connection port.	The terminal cannot present any loosening signs.	Connect the terminal properly.
8	Appearance of wiring cable	If the wiring cable is presenting any damage signs.	The wiring cable should be intact without any damage.	Replace the wiring cable.
9	PLC System diagnosis	Check the error record.	Caused by careless error.	For detailed troubleshooting, please refer to "Expansion Module Troubleshooting" section.

10	Max. scanning time	Check the status value of R35371 through the monitoring page.	The maximum scanning time must be without the scope allowed by the system specifications.	Check the reasons causing the extension of scanning time.

* Remove the expansion module and then use a swab to wipe off the dust and stains present in inaccessible corners.

Amendment record

Version	Date	Description
V1.0	2024/12/20	Draft
V1.1	2024/12/20	Plug-in Expansion Boards & Expansion modules application