FATEK

M Series

Programmable Controller

M Series PLC
Expansion Module Specification Manual

NEXT Level SOLUTION

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FATEK AUTOMATION CORP

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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.

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Chapter 1 List of Expansion Modules

List of Expansion Modules

Module Name			Specifications
Left Side Expansion Modules	Power Modules	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.
Right Side Expansion Modules	High Speed Communication Modules	MHCM25	1 port RS232 + 1 port RS485 communication module.
		MHCM55	2 ports RS485 communication module.
	DI Modules	M16X	16 points 24VDC digital input
	DO Modules	M16Y◇	16 points relay or transistor output
	DIO Combo Modules	M1616XY◇	16 points high-density 24VDC digital input，16 point high-density transistor output，hybrid 40 pin I/O extension cable.
	AI Modules	M04AD	4 channels, 14-bit analog input module (-10V~0V~+10V or -20mA~0mA~+20mA...)
		M04ADR	4 channels,18-bit analog input module (-10V~0V~+10V or -20mA~0mA~+20mA...)
	AO Modules	M04DA	4 channels,14-bit analog output module (-10V~0V~+10 or 0mA~+20mA...)
		M04DAR	4 channels,16-bit analog output module (-10V~0V~+10 or 0mA~+20mA...)
	AIO Combo Modules	M0202AH	4 channels, 14-bit analog input module (-10V~0V~+10V or -20mA~0mA~+20mA...) 4 channels,14-bit analog output module (-10V~0V~+10 or 0mA~+20mA...)
	Temperature measurement Modules	M04TC	4 channels, TC temperature input module with (K, J, T, E, R, B, N, S, mV)，0.1℃ resolution.
		M04TCR	4 channels, TC temperature input module with (K, J, T, E, R, B, N, S, mV)，0.1℃ resolution.
	Temperature Measurement Combo Modules	M0202TH	2 channels, TC temperature input module with (K, J, T, E, R, B, N, S, mV)，0.1℃ resolution. 2 channels, RTD temperature input module with(Pt-100, Pt-1000, JPt-100, JPt-1000)，0.1℃ resolution.
	Load Cell Module	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，This must be connected to the rightmost side of the CPU module or the entire string of modules.
Remote Expansion Modules	communication connector	MC0MN	Remote I/O Coupler (Modbus/ TCP)

Peripheral and Accessory	High Density DIO Cable	MFW40I-50	High-density I/O extension cable · 40 pin Socket, 28AWG I/O cable · length 50cm
	External terminal module	MFT40T	40 pin External terminal module
	European terminal Block	MFT18C	18 Pin European terminal Block
		MFT06C	6 Pin European terminal Block
		MFT04C	4 Pin European terminal Block

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

2. Right side expansion modules are divided into standard type and high-speed type. High-speed type can only accept up to 6 units. And it must be installed in the first 6 positions on the right side of the CPU module.

2

Chapter 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 two categories: I/O expansion and communication port expansion.

2-1I/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 thru 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 (256 points each for NI and NO). Hardware limitations: ①. A maximum number of 64 modules can be used in the expansion. ②The 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.

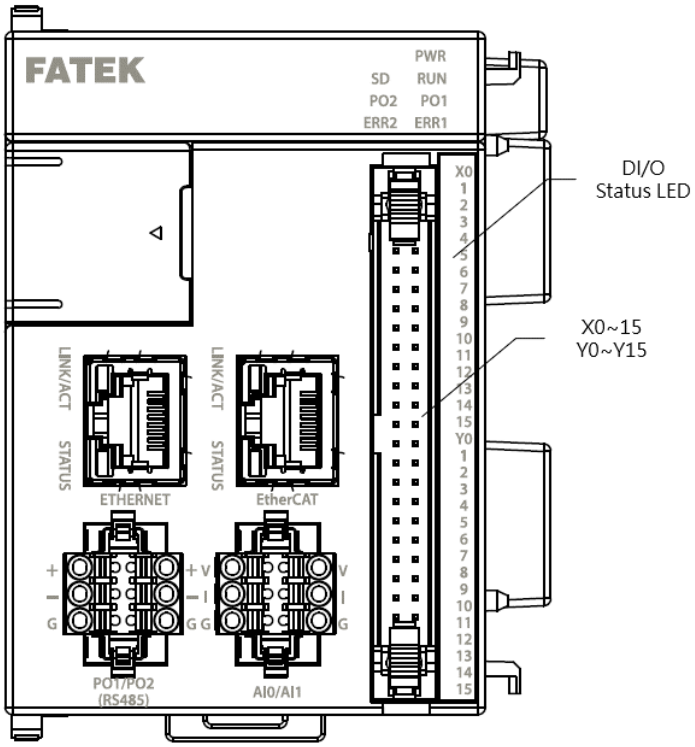
⚠ Caution
1. If the I/O points of the application system exceed one of the limitations (1024 DI,1024 DO,256 NI, 256 NO), while startup the M Series PLC will treat this as an illegal I/O configuration, which in return will flag as an error situation by turn on the "ERR" LED . The corresponding error code 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.

Digital I/O Expansion and I/O Numbering

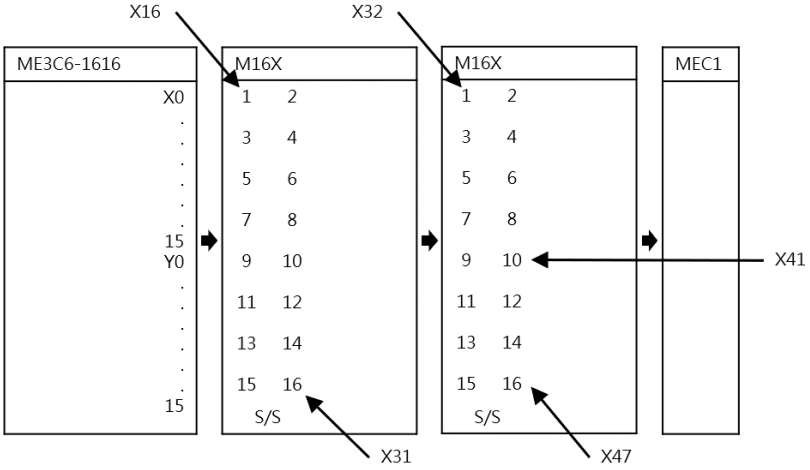
Digital I/O means I/O with the discrete type status, including digital input (with initial X in DI numbering) and digital output (with initial with Y in DO numbering). The DI and DO of M Series PLC can both be expanded up to 1024 points (numbered as X0~X1023 and Y0~Y1023, each with 1024 points).

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 M Series CPU Module, at the position right of the external 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 external terminal connector are X0~15,S/S and the labels of the digital input contacts on the right side of the external 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.



CPU Module Digital I/O Number

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 the output replay, 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,10 output points 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 X41 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 treat 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.

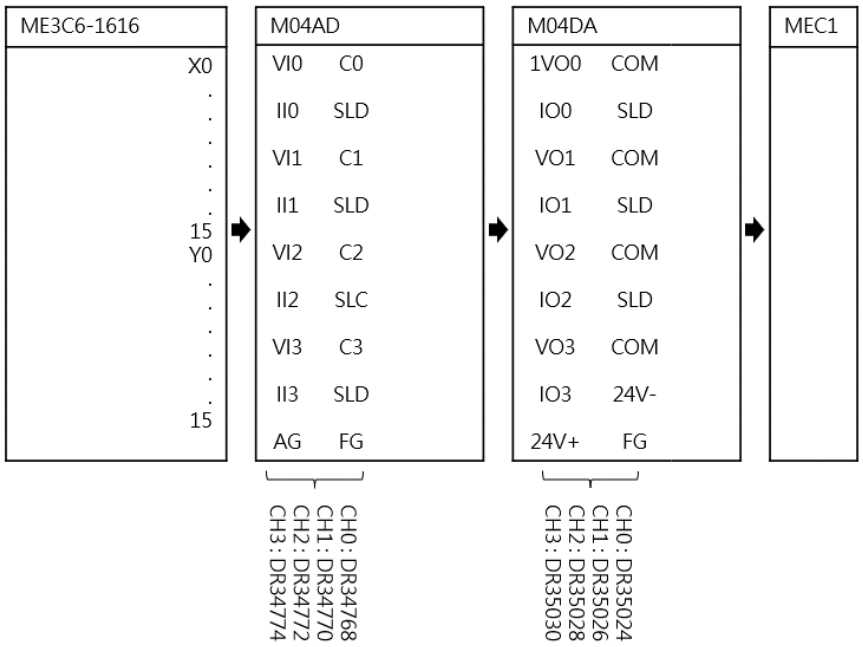
Analog Input Modules and Temperature Modules are of Numeric input (NI) modules which use input register (IR) to convey the status. Analog Output Modules are of Numeric output (NO) modules which output is directly from the Output register (OR). The Analog Input, Temperature Input, and Analog Output is 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 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		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		
M04ADR	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		
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		2	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		2	
		CH2		2	
		CH3		2	
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	

Module Name	NI Channel Label	NO Channel Label	Number of IR occupied (Word)	Number of OR occupied (Word)	Note
M04TC	TC0		2		
	TC1		2		
	TC2		2		
	TC3		2		
M04TCR	TC0		2		
	TC1		2		
	TC2		2		
	TC3		2		
M0202TH	TC0		@2		
	TC1		@2		
	RTD0		@2		
	RTD1		@2		
M02LC	CH0		4		
	CH1		4		
M02LCR	CH0		4		

The corresponding IR or 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.

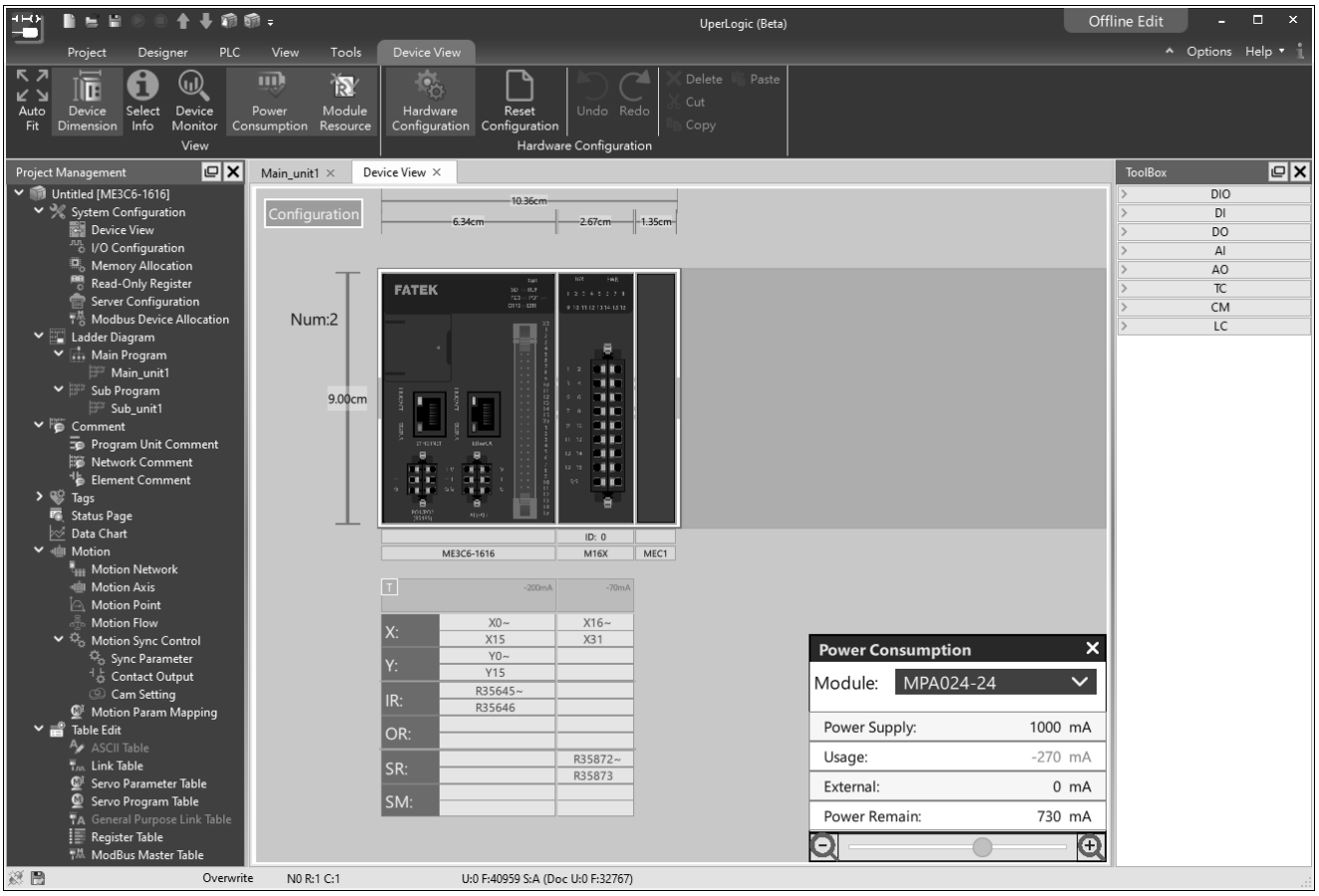


Analog expansion module IR, OR number

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】→【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.

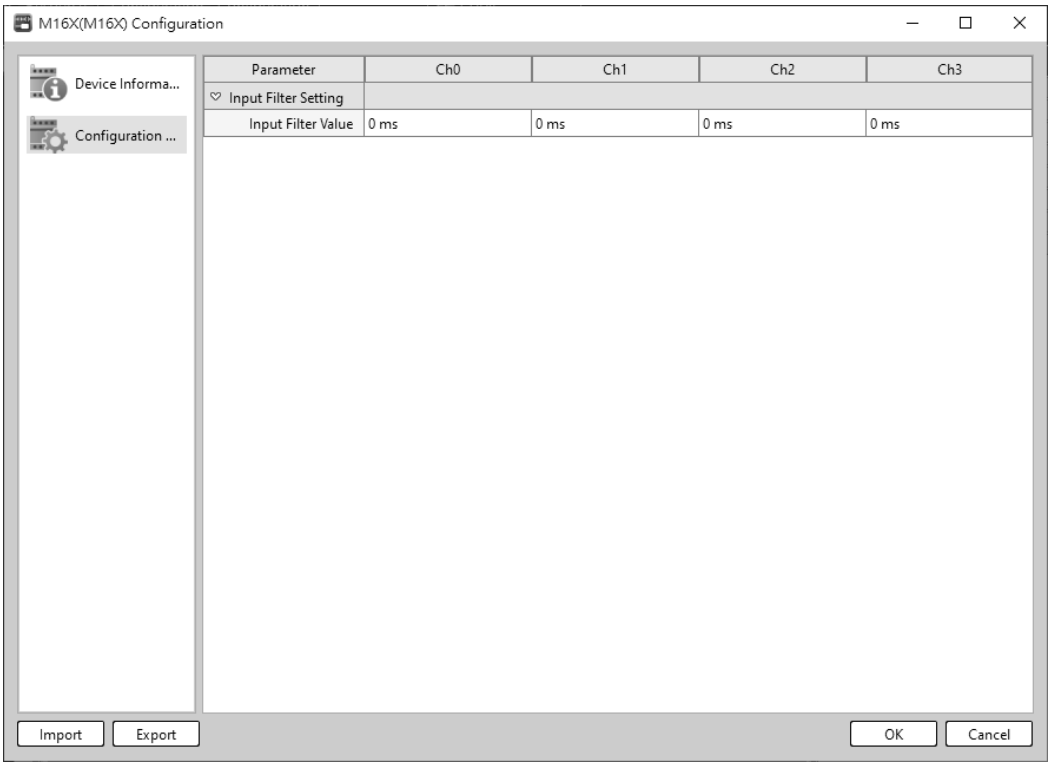


Device View

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.

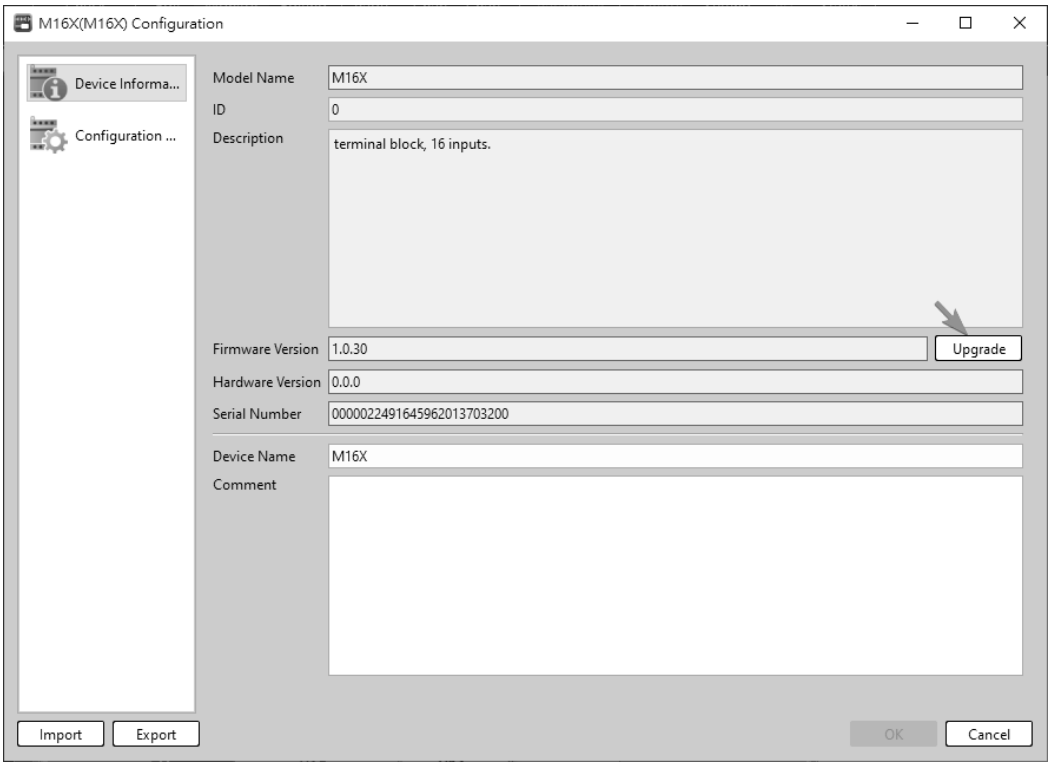
⚠ Caution
The expansion module configuration of M-Series PLC is saved in the project and the expansion module instead of being saved in the CPU module. Before replacing the expansion module, you need to set the expansion module configuration in the expansion module or save the project on the SD Card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



Configuration

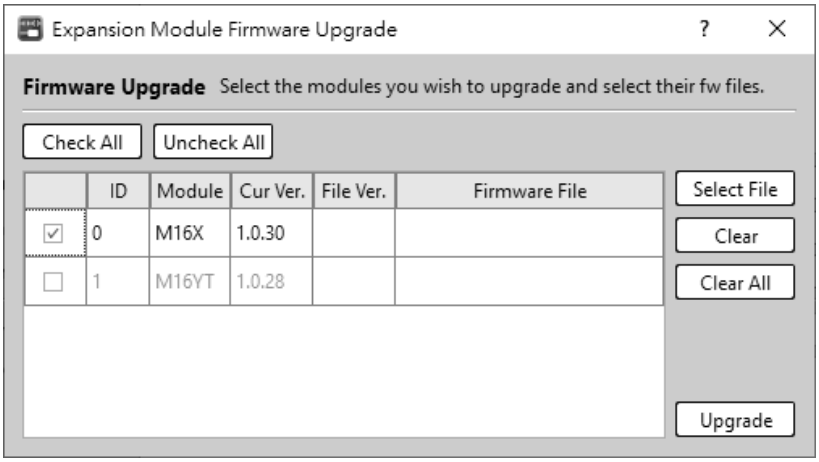
2-5 Expansion Module Firmware Update

The expansion module firmware of the M-Series PLC is updated in the "UperLogic→【Project】→【Device View】→【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

Chapter 3 Installation And Wiring

⚠ Danger
1. Turn off all power during 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 surrounded 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. This product has to be housed appropriately whether it's used in a system or standalone. The choice and installation of housing must comply with local national standards.

Environmental Specifications Table

Item	Specification	note
Operating Ambient Temperature	0~55℃	Permanent Installation
Storage Temperature	-25 ~ +70℃	
Relative Humidity (non-condensing, RH-2)	5 ~ 95%	
Pollution Level	Dergree Ⅱ	
Altitude	≦2000m	
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5 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

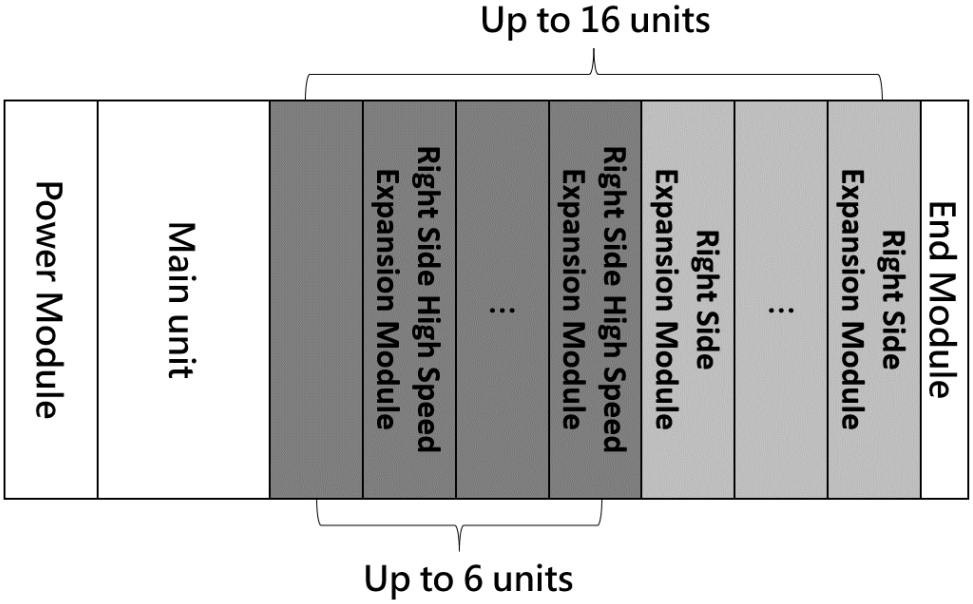
To avoid interference, the PLC should be installed to keep from noise sources such as high- voltage or high-currentlines and high power switches. Other precautions are:

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 right side high-speed module needs to use 2 communication ports, so the right side high-speed module needs to be connected to the PLC host in front of the right module first. Up to 6 right high-speed modules can be connected.

A typical figure of placement is shown below:

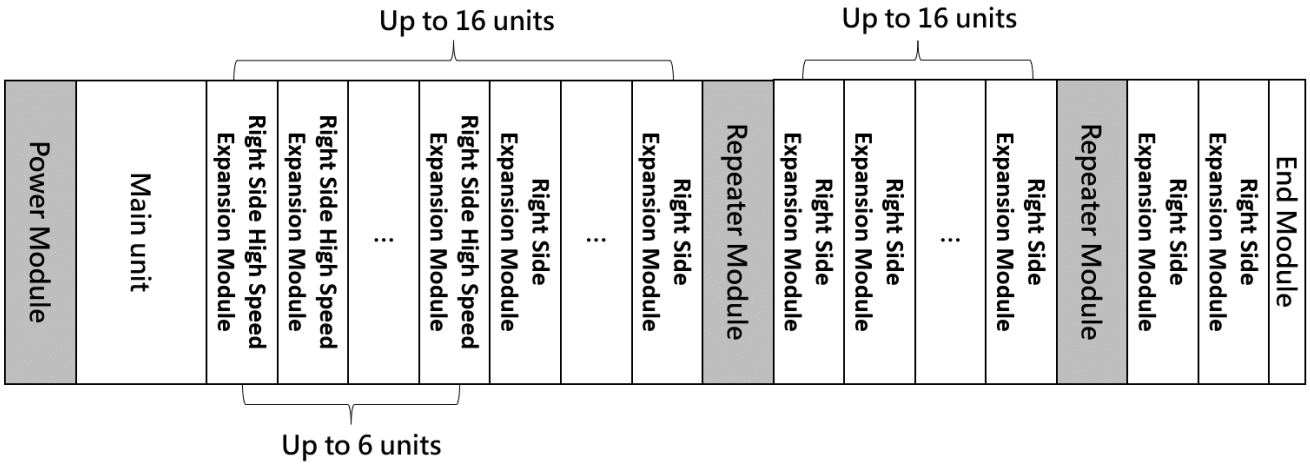


Placement of M series PLC installation

3-2-2 Placement of Repeater Module

When the power module cannot bear the power of the right expansion group, a relay module can be appropriately added to share the load of the power module. The relay module is equivalent to the 48W power module. A maximum of 16 expansion modules can be installed between the power module and the relay module. A maximum of 16 expansion modules can be installed between the relay module and the right side of the relay module. Expansion modules.

The following figure shows the placement of its repeater module:



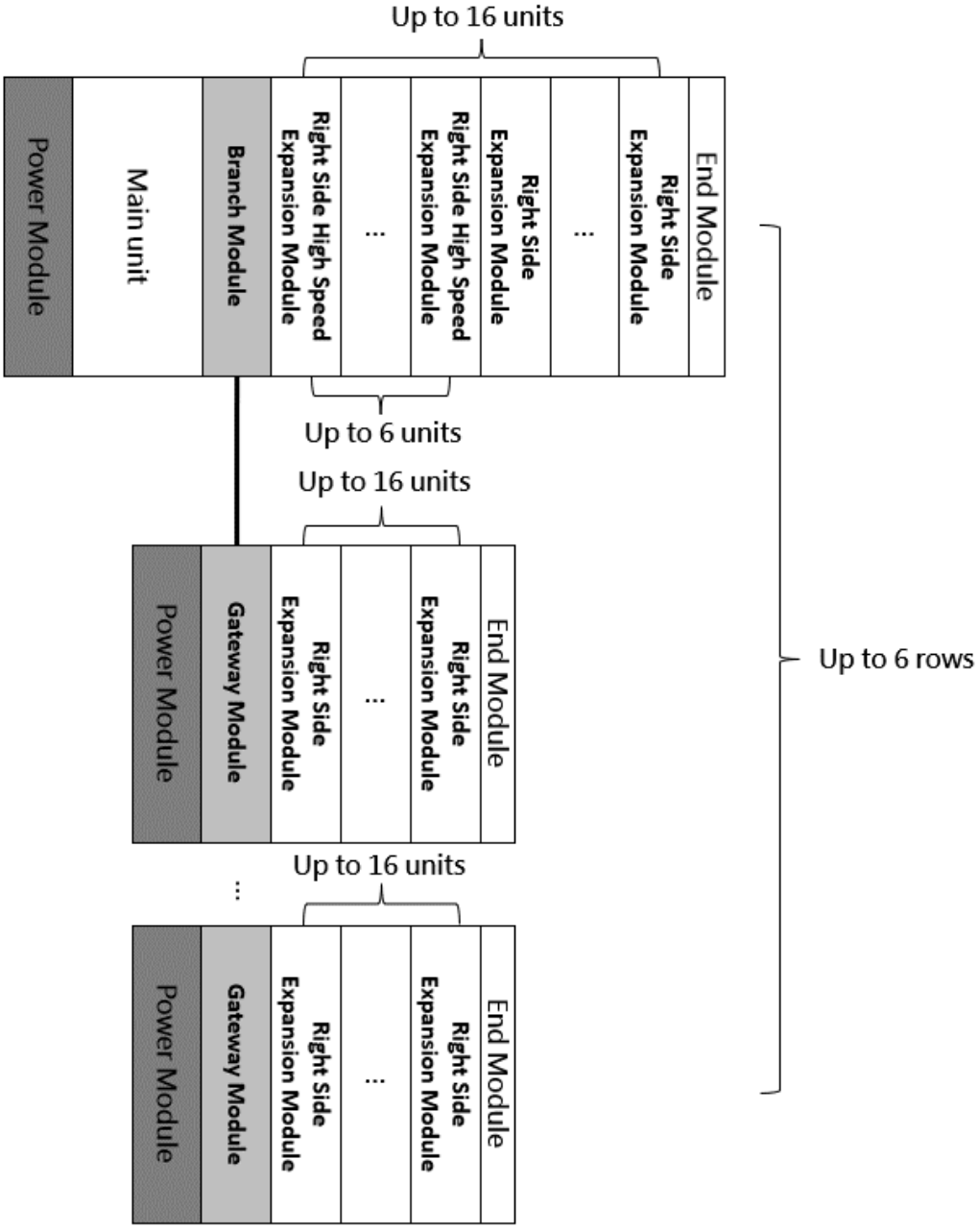
Placement of Repeater Module installation

3-2-3 Placement of Branch/Gateway Module

When the control box is not wide enough to accommodate the right expansion module, a branch/gateway module can be installed to extend the right expansion module to the next row. Only a maximum of 16 right-side expansion modules can be installed behind the branch/gateway module, with a maximum of 5 rows of gateway modules in a total of 6 rows.

***The branch gateway module itself does not include the power module function and only connects the upper and lower rows of communications, so the power module must be installed at the front.**

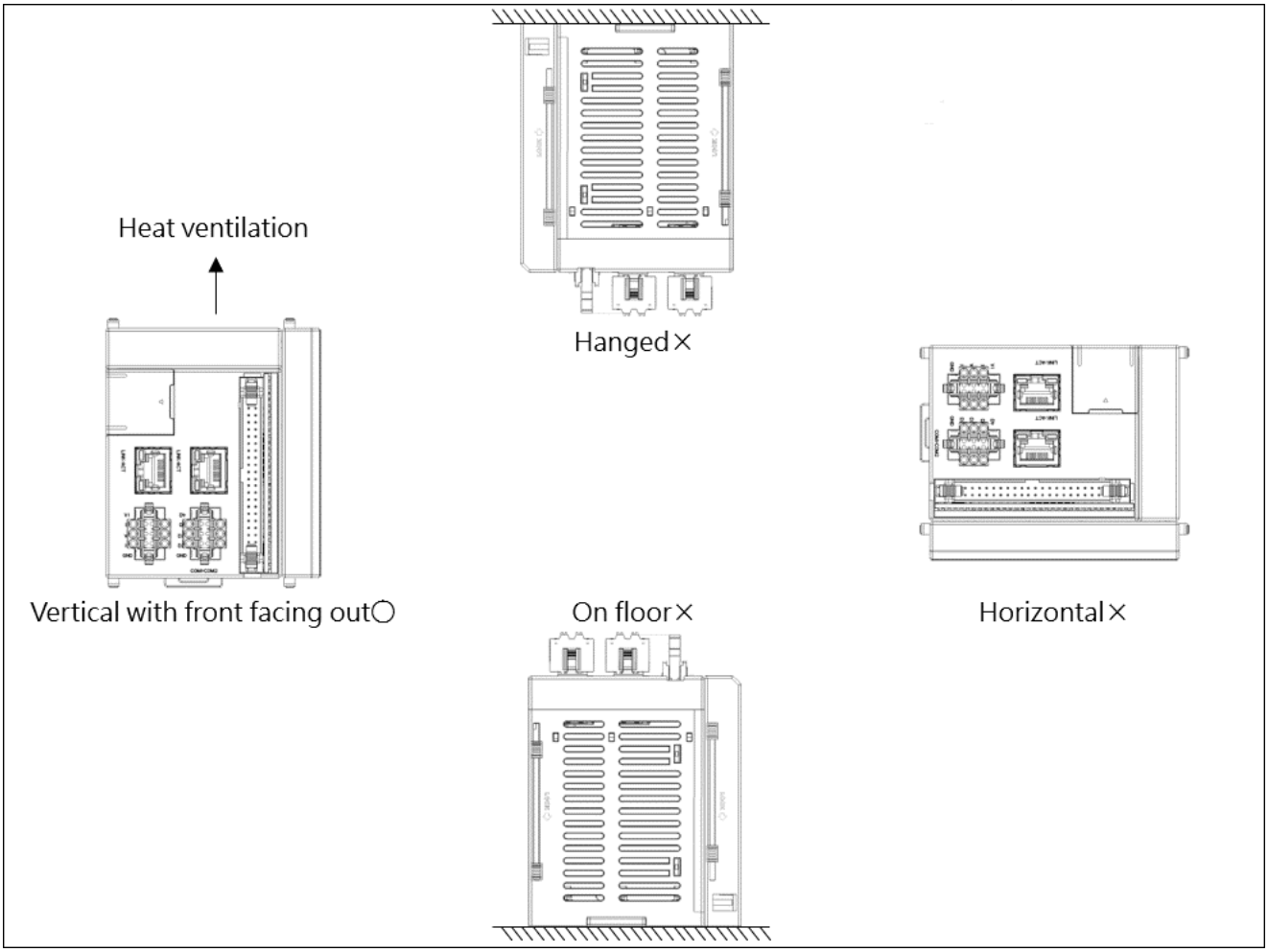
The following figure shows the placement of its Branch/Gateway modules:



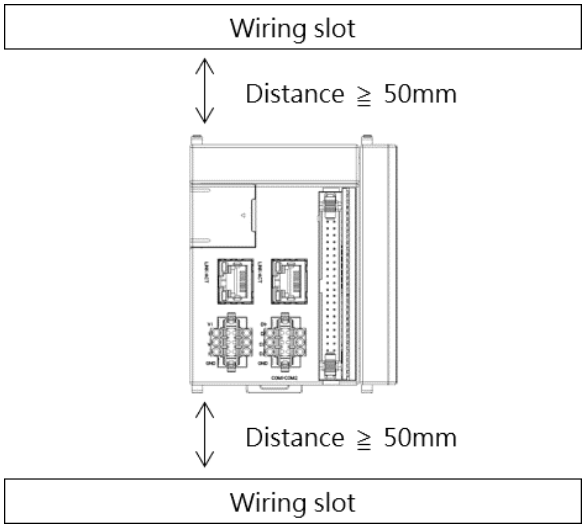
Placement of Branch/Gateway Module installation

3-2-4 Ventilation Space for Installation

The heat in M Series PLC is ventilated via air circulation. There should reserve more than 20mm space, both below and above PLC, and with vertical installation, for ventilation. as shown in the figure below :



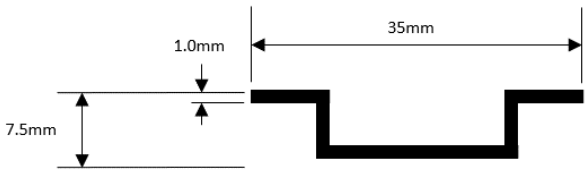
M Series PLC installation direction



M Series PLC ventilation space

3-2-5 Fixation by DIN RAIL

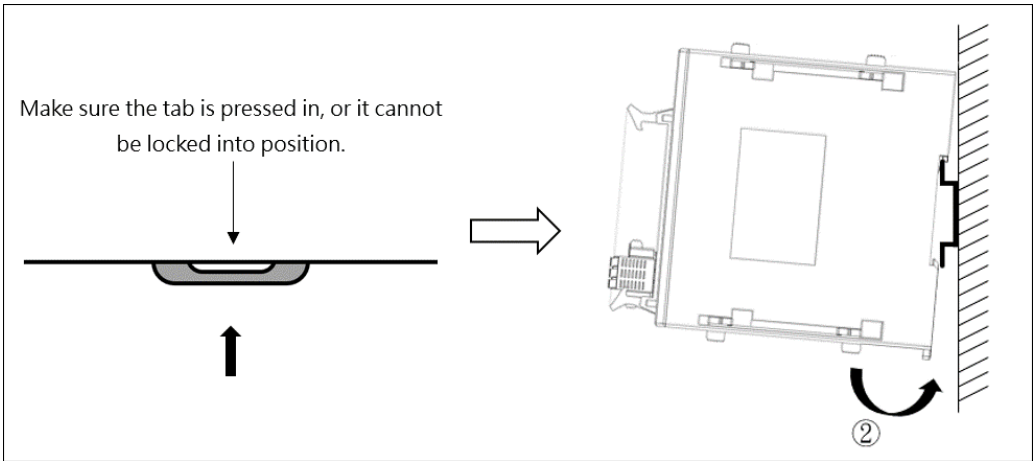
In an environment with slight vibration (less than 0.5G), this is the most convenient way of fixation and is easy for maintenance. Please use DIN EN50022 DIN RAIL, as shown in the figure below.



DIN RAIL SIZE

Mount

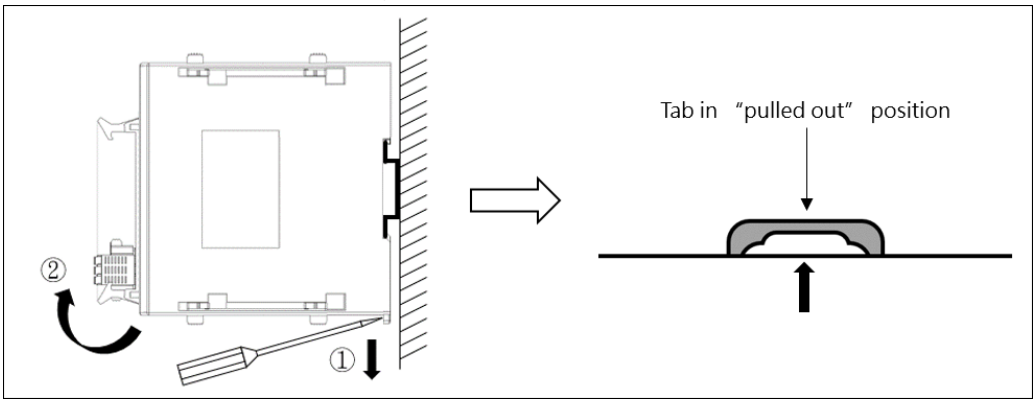
Hold PLC facing its front, press it down with a 15 degree tilt onto the DIN RAIL. Swing it down until the upper edge of DIN RAIL groove on PLC back touches the upper tab of DIN RAIL. Then use this locked-in point as a pivot to press the PLC forward on the bottom and lock it in position. The procedure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



Mount DIN RAIL

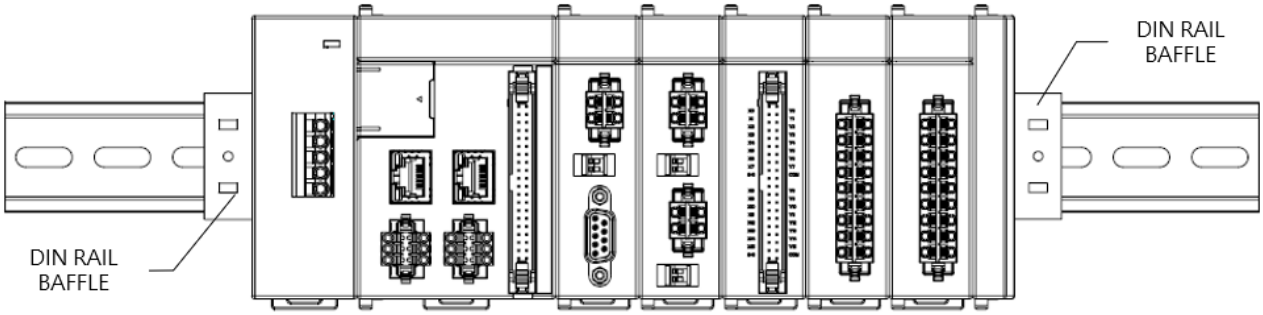
Dismount

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

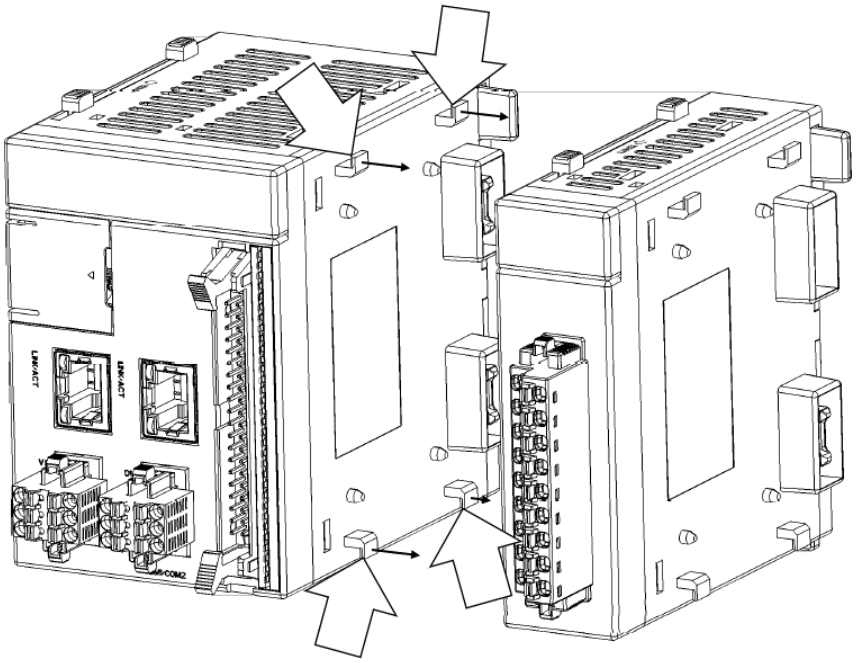
When used in the vibration source, it is recommended that a DIN RAIL damper should be installed on the leftmost and rightmost sides of the M-Series PLC, respectively. In this way, it can stabilize all of the modules, including the CPU module and expansion module per the leftmost and rightmost DIN RAIL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



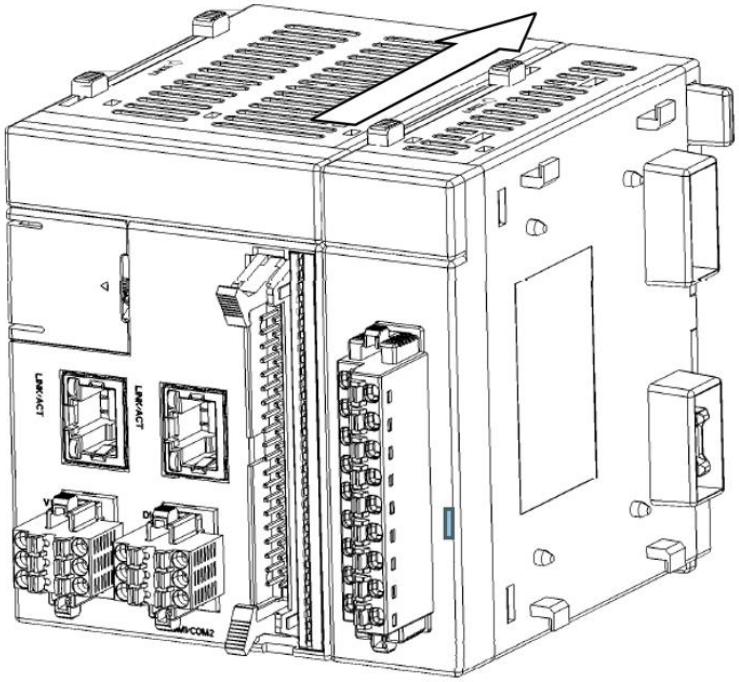
DIN RAIL BAFFLE

3-2-6 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.



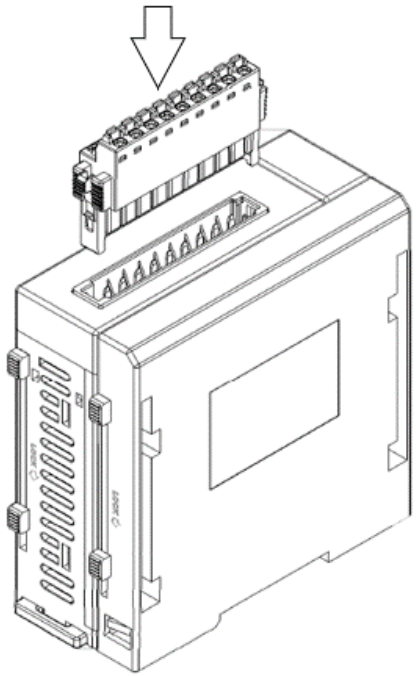
Install expansion module



Install the expansion module buckle

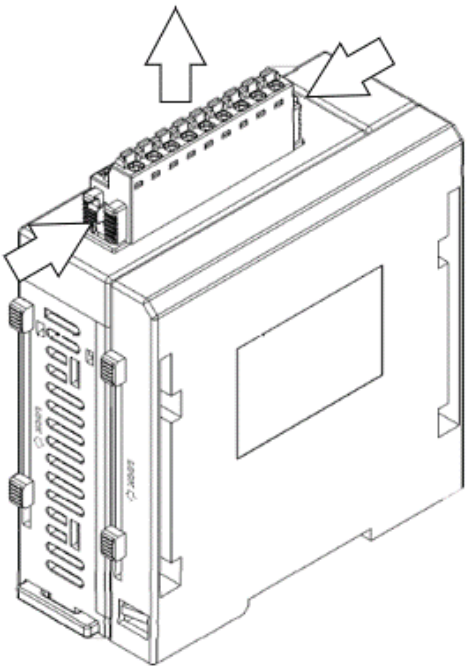
3-2-7 Mount European Terminal Block

- 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

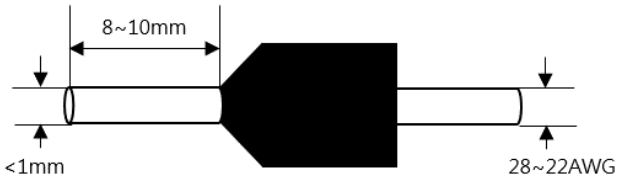
- EU-standard terminal removing method: push the fastener on both ends of the EU-standard terminal downward and then lift both of them upward and you can take out the terminal, as indicated in the figure below.



Dismount European terminal Block

3-2-8 External terminal module and European terminal wiring

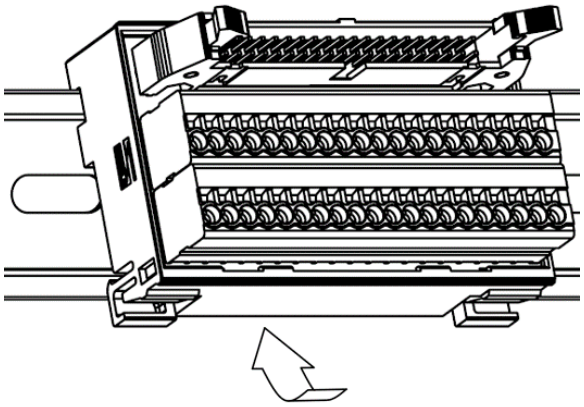
1. During the wiring of M Series PLC, please follow local national standards or regulations for installation.
2. The suitable I/O wiring diameter for M series PLC is AWG28~AWG22 · Please choose the wires with proper wire gauge for I/O wiring according to the current loads.
3. Shorter wires are preferred. 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 External terminal module and the European terminal are as follows:



Crimp Sleeve Specifications

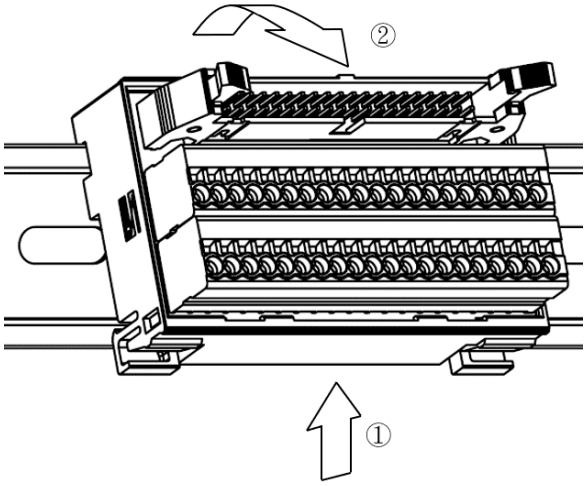
3-2-9 External terminal module installation

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



Install External terminal 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 External terminal module

4

Chapter 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. The 2nd one is external Sensor power supply. The CPU module and the extension module are also divided in 2 parts of circuits. The 1st one is 24VDC (Output Circuit), the 2nd one is 24VDC (Input Circuit). The 24VDC (Output Circuit) is supplied by the CPU dedicated power supply of the M series PLC power module. The 24VDC (Output 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 extension module has a 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

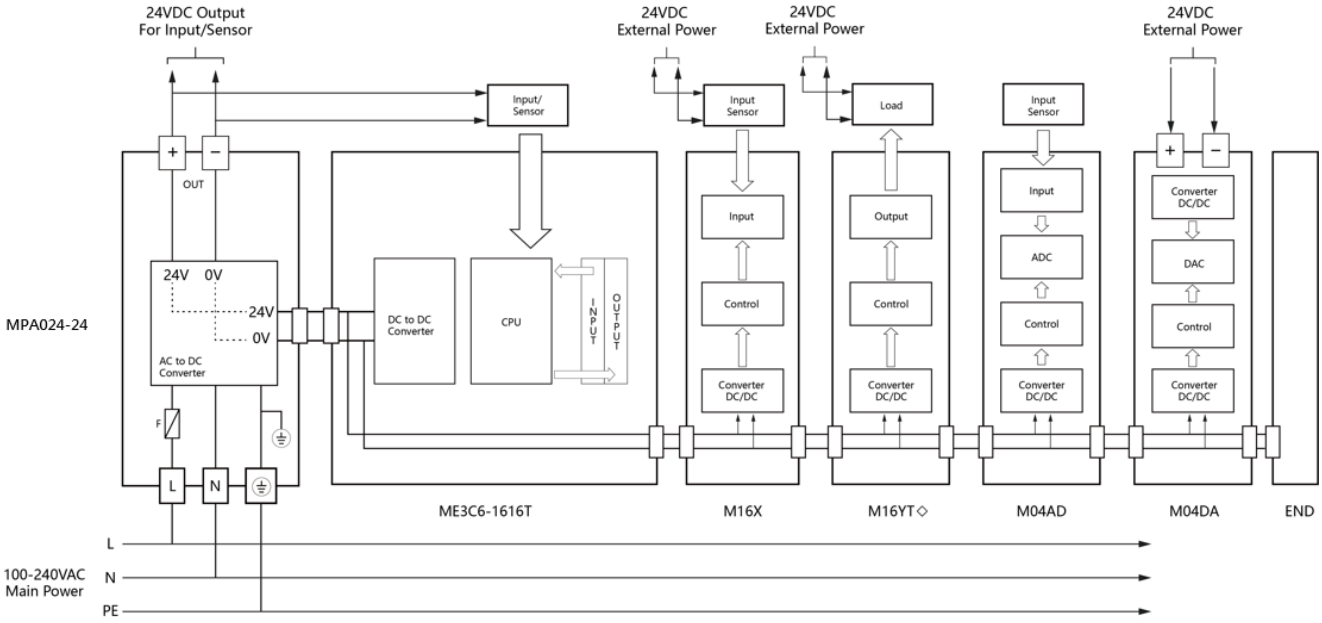
Power Module Specification Table

Specification / Model		MPA024-24	MPA048-24
input	Input Voltage	100~240VAC	100~240VAC
	Input Frequency	50/60Hz	50/60Hz
	Max. Input Current	1A max.	1A max.
	Inrush Current (Cold Start)	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)
	Insulation resistance	>100MΩ/500VDC	>100MΩ/500VDC
	Fuse Spec.	2A	2A
	Hold-up time	>15ms/ 115VAC · >60ms/ 220VAC	>15ms/ 115VAC · >60ms/ 220VAC
	Isolation Type	Transformer/ Photocoupler Isolation · 1500VAC/1 minute	Transformer/ Photocoupler Isolation · 1500VAC/1 minute
	Operation indication	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)
	Rated output current	1A (Shared CPU dedicated power supply and external Sensor power supply)	2A (Shared CPU dedicated power supply and external Sensor power supply)
	Output voltage range	24VDC±1%	24VDC±1%
	Conversion efficiency	86%/110VAC · 87%/220VAC	86%/110VAC · 87%/220VAC
Protection	Overvoltage	Latching overvoltage protection, re-power	Latching overvoltage protection, re-power

	protection	on to recover 34V~36V	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
Environmental Specifications	Operating Ambient Temperature	0℃~55℃	0℃~55℃
	Relative Humidity	20 ~ 90% (non-condensing)	20 ~ 90% (non-condensing)
	Storage Temperature	-25 ~ +70℃	-25 ~ +70℃
Certifications		CE	CE
External dimensions		90mmX33.7mmX90mm	90mmX33.7mmX90mm

⚠ Caution
The schematic 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, hot wire〝L〞must be connected to the L terminal on unit, while the ground line〝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 EG (Earth Ground) terminal of main power system as shown in the figure below, with wire diameters larger than 2mm^2.

⚠ Warning
Output of 24VDC power for input 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.



PLC System Wiring

4-2 Maximum Current Consumption of Expansion Module

CPU Modules and Expansion Modules do not have a built-in power supply and must be supplied by the M-Series PLC power module. The table below shows the maximum current consumption for each expansion module.

⚠ Warning
Any output of M series PLC power module, the total amount of current cannot exceed the value listed in the above 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			24VDC (Output Circuit)	24VDC (Input Circuit)
Left Side Expansion Modules	Power Modules	MPA024-24	-	-
		MPA048-24	-	-
CPU Modules	Basic 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
	Basic 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
		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
Right Side Expansion Modules	High Speed Communication Modules	MHCM25	30mA	-
		MHCM55	35mA	-
	DI Modules	M16X	70mA	7.5mA/ Point
	DO Modules	M16YT	150mA	Max.0.5A/ Point
		M16YJ	163mA	Max.0.5A/ Point
		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	-
	Temperature Measurement Combo Modules	M0202TH	@	-
	Load Cell Modules	M02LC	40.64mA	-
		M02LCR	56.1mA	-
	End module	MRE	-	-
Remote Side Expansion Modules	communication connector	MC0MN	@	

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.

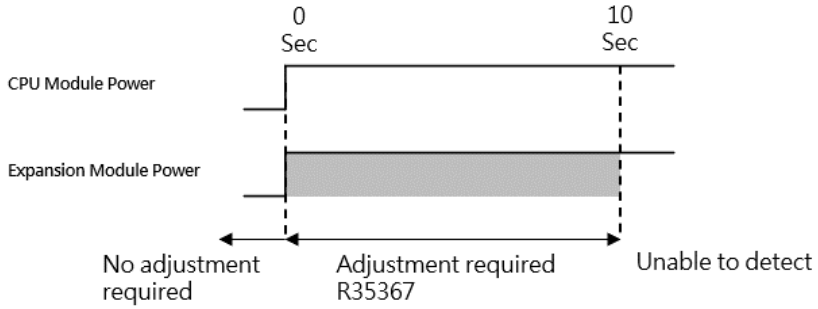
Type	Power Module	CPU Module	Expansion Module	Expansion Module	Expansion Module	Expansion Module	END Module	Extra Capacity
Module Name	MPA024-24	MS2C2-1616	M16X	M16YT	M04AD	M04TC	MRE	
24VDC (Output Circuit)	+1000mA	-200mA	-70mA	-150mA	-78.2mA	-30.7mA	-	231.1mA
24VDC (Input Circuit)		-7.5mA*16 Point	-7.5mA*16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

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

  【1000mA】–【200mA+70mA+150mA+78.2mA+30.7mA】-【(7.5mA*16)+(7.5mA*16)】=231.1mA

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 its expansion interface and get the actual I/O configuration. Therefore, while the CPU module performs detection, the power in expansion module should be already UP, otherwise, the detected I/O configuration will not correct. 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 together 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 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 (0~10c), as shown in the figure below. If the expansion module power cannot be UP within 1sec after main unit 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.



Power Timing Diagram

5

Chapter 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 and 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

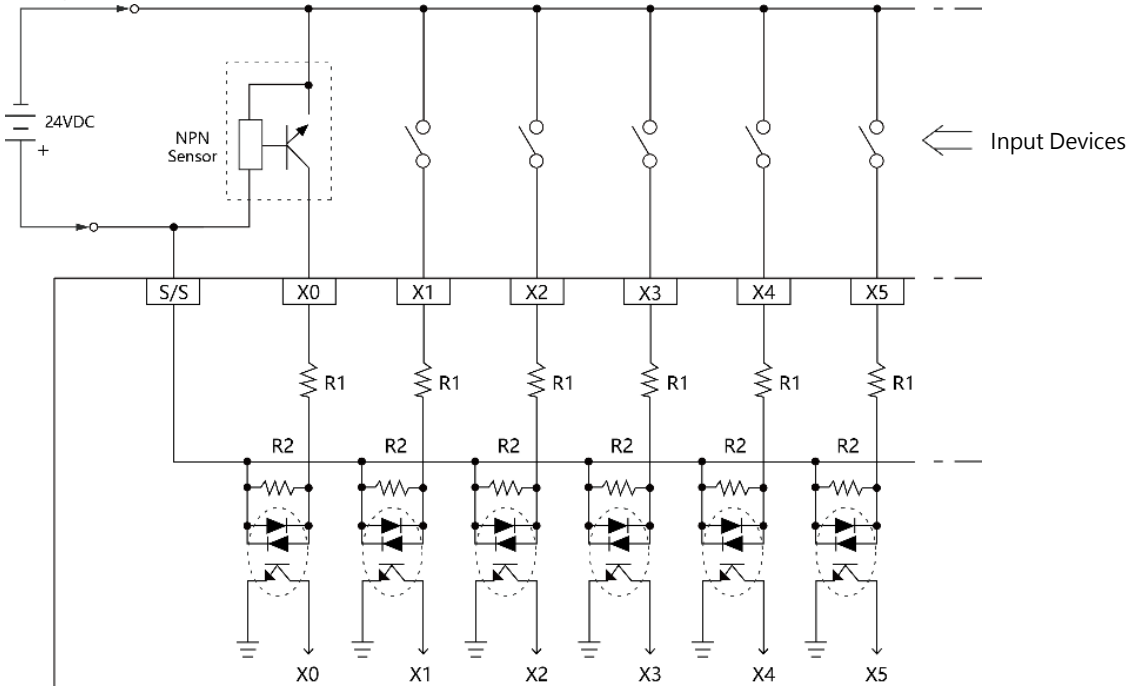
Digital Input Circuit Specifications

Item / Specifications		24VDC Single-end input		Note
		High Speed(HSC)	Medium Speed	
Maximum input frequency		200KHz	1kHz	
Input Signal Voltage		24VDC±10%		
Input Current Threshold	ON Current	> 8mA	> 4mA	
	OFF Current	< 2mA	< 1.5mA	
Maximum Input Current		10.5mA	7.6mA	
Input Resistance		5.6kΩ	3.3kΩ	
Input Status Indication		Displayed by LED: Lit when "ON", dark when "OFF"		
Isolation Type		Transformer/ Photocoupler Isolation · 1500VAC/1 minute		
SINK /SOURCE Wiring		Via variation of internal common terminal S/S and external common wiring		
CPU Modules	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	-	
	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(0.47μs)	DHF(0 ~ 70ms) + AHF(0.47μs)	DHF：Digital Hardware Filter AHF：Analog Hardware Filter

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

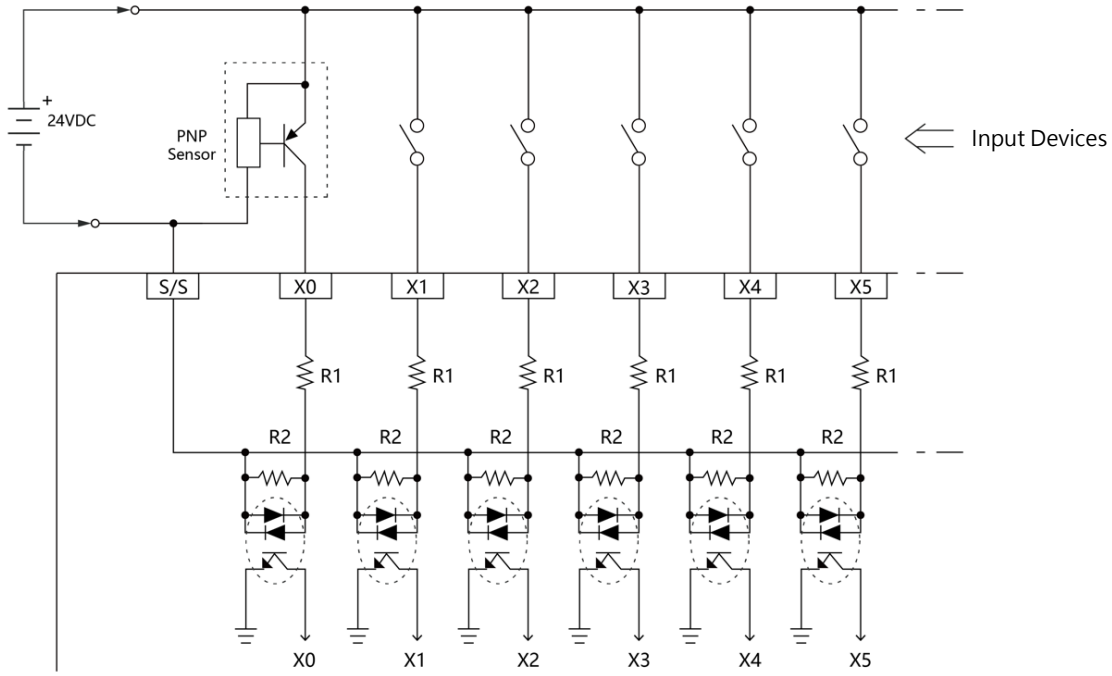
The 24VDC single-end digital input circuits of M Series PLC are available for high, medium and low speed. They all have the similar circuit structures but with different response speeds. To save input terminals, the circuit of single-end input is implemented by connecting one end of all input points (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, the 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 SINK input

- Wiring of single-end common SOURCE input



Wiring of single-end common SOURCE input

6

Chapter 6 Digital Output Circuit

6-1 Digital Output Circuit Specifications

Digital Output Circuit Specifications

Item / Specification			Single-End Transistor Output		Single-End Relay Output
			High Speed (HSC)	Medium Speed	
Maximum output frequency			200KHz	1kHz	For ON/OFF · not for frequent exchange
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/conducing 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	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	-	-
	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	

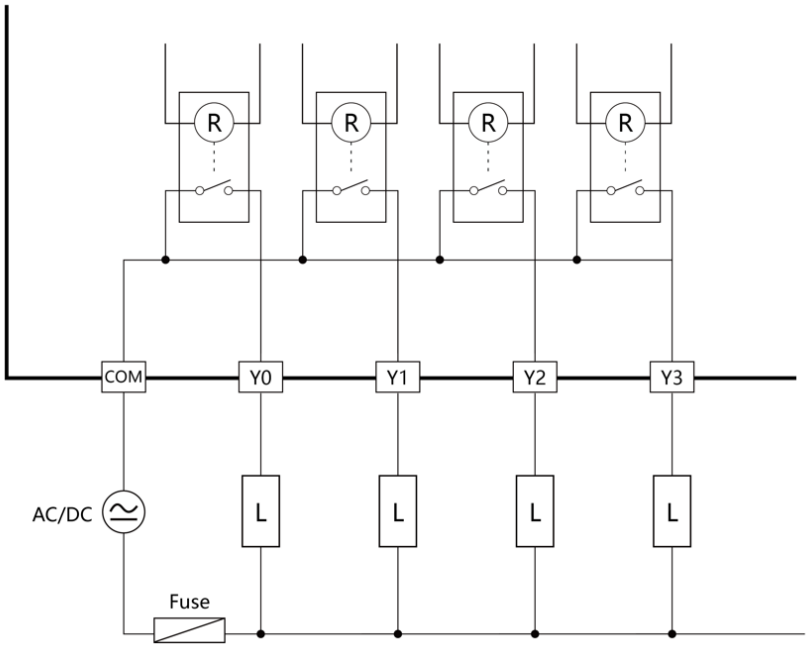
6-2 Single-End Output Circuit

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 device share a same common points, the more terminals are saved, while relatively increasing the current running through the common point. Combination of any output common with its individual single-end outputs are called a Common Output Block. The various single-end common output circuits are described below：

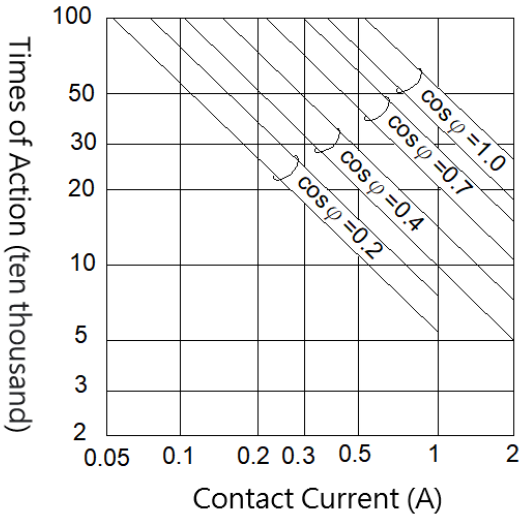
6-2-1 Structure and Wiring of Single-End Relay Output Circuit

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

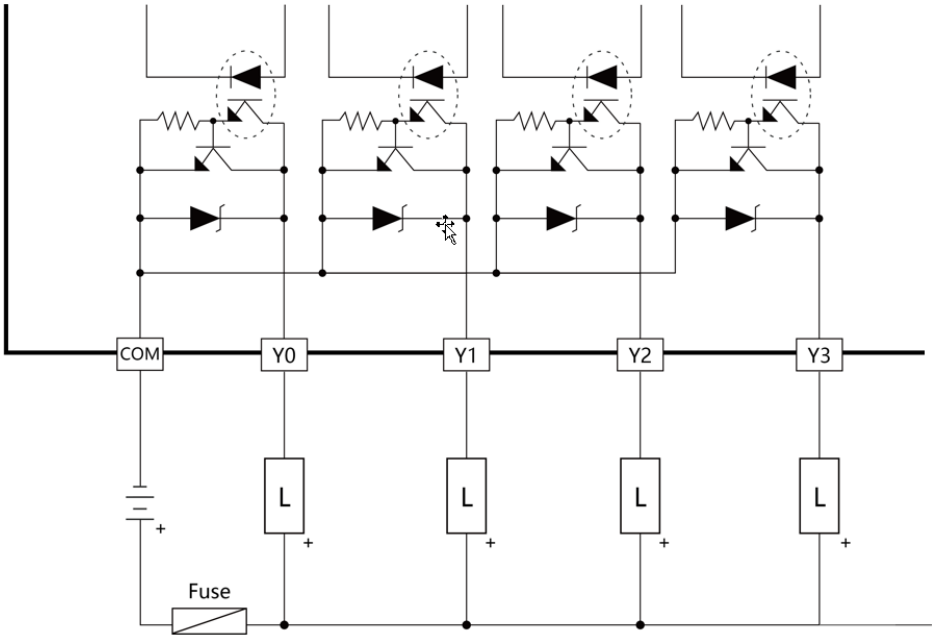


Relay life at different currents and phases

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

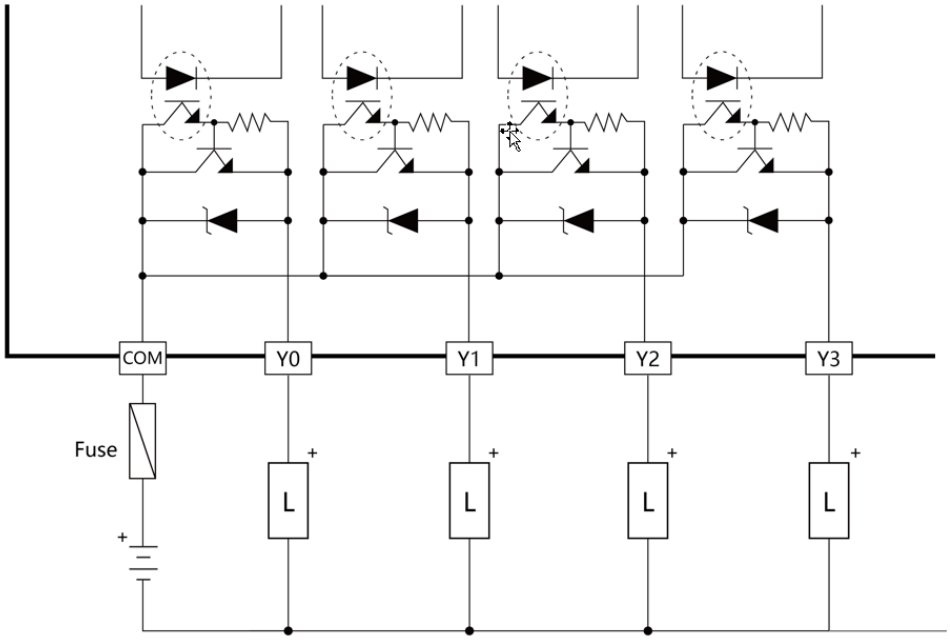
The transistor contacts are divided into SINK and SOURCE output circuit. Each transistor contact can provide a max current of 0.5A. The max current limit of the output common point of the transistor can be divided into 2A current or 4A current according to different models.

- Transistor Single-End SINK Output



Transistor Single-End SINK Output

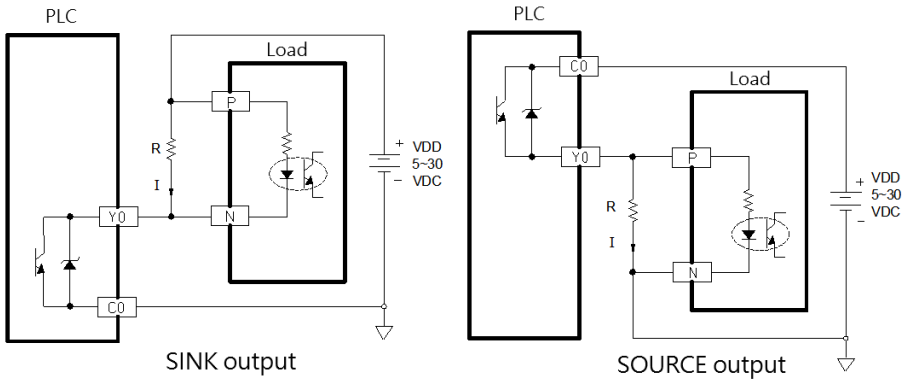
- Transistor Single-End SOURCE Output



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)



$$I = \frac{\mathrm{VDD}}{\mathrm{R}} = 20\sim50mA$$

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:

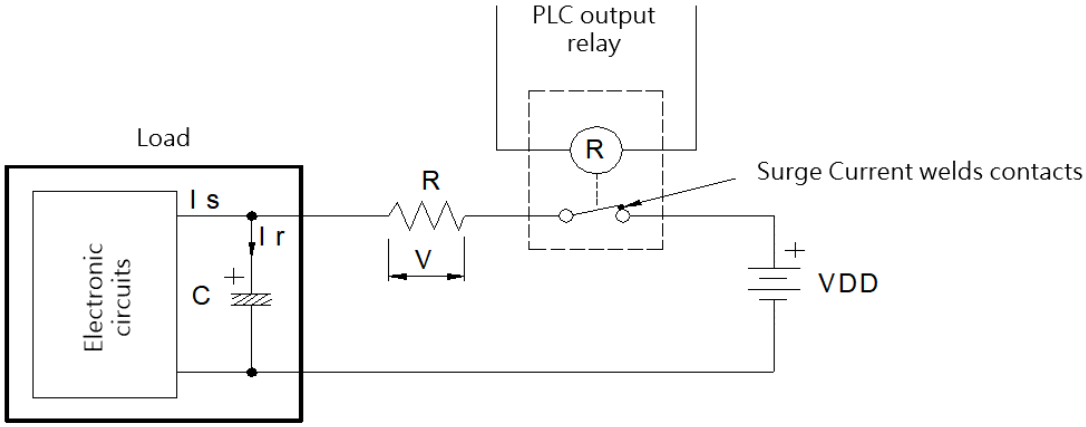
6-4-1 Protection of Relay Contacts and Noise Suppression

Because the relay contacts are used to contact switch components having extremely low resistance, the surge current IR 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.

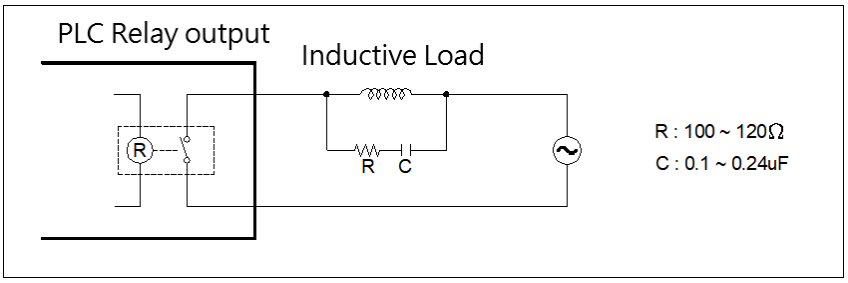


$$R \geq \frac{VDD}{Ir\ max} (\text{note power dissipation } P = Is^2 R \text{ and voltage drop } V = IsR)$$

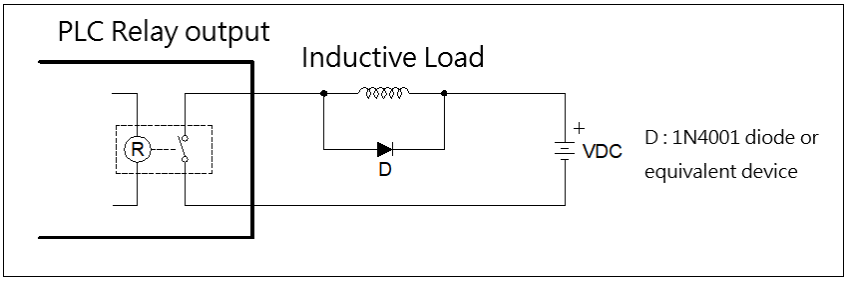
Ir max of relay in M Series PLC = 2A

Suppression of Counter-Electromotive Force

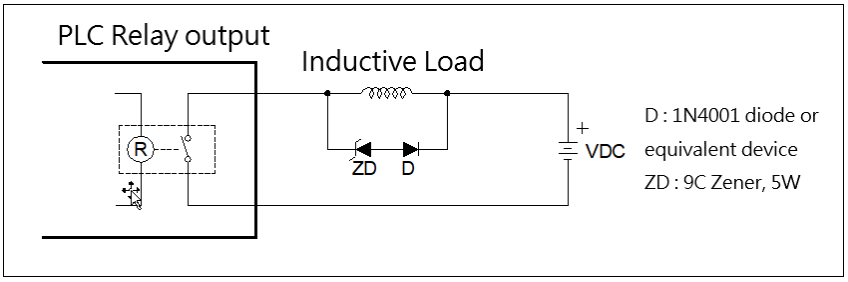
For the inductive load, whether in AC or DC power, suppression devices must be connected in parallel to both its ends to protect the relay contacts and lower noise interference. The schematic diagrams for AC and DC powers are shown below, respectively:



Scheme of AC power load



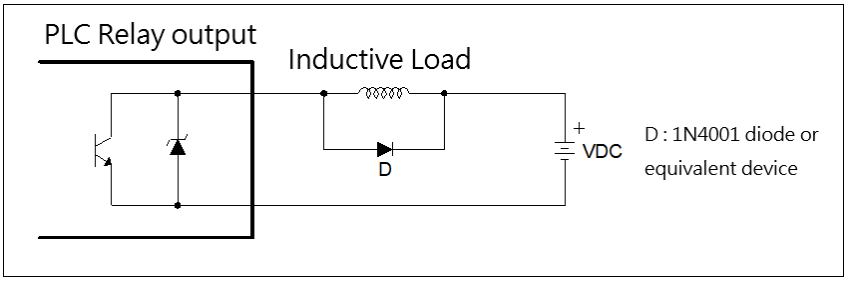
Suppress by a diode in DC power load (for low power)



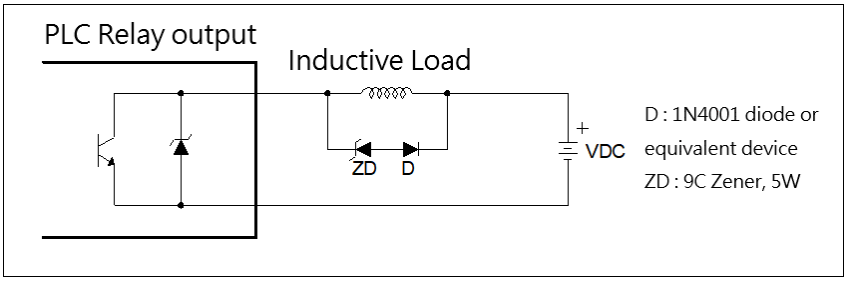
Suppress by a diode + Zener in DC power load (for high power and frequent ON/OFF)

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)

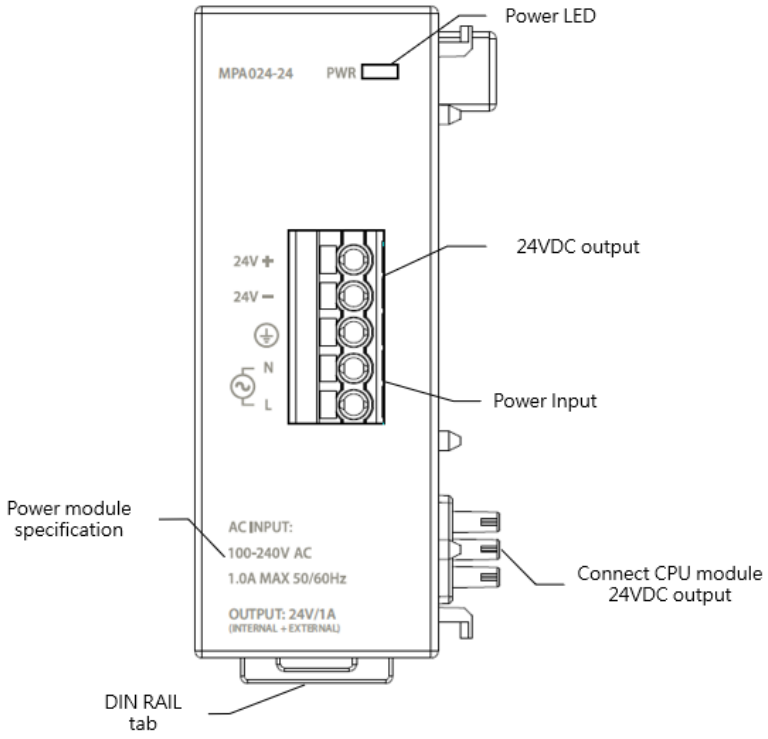
7

Chapter 7 Left Side Expansion Module Specifications

7-1 Power Module Specifications

7-1-1 MPA024-24 Specification

Appearance and Function



MPA024-24 Appearance

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

	Overcurrent protection	Method: Foldback overload protection, automatically recover when overload is removed 101%~133% rated output power
Operating Ambient Temperature		0~55℃
Relative Humidity		20 ~ 90% (non-condensing)
Altitude		≦2000m
Vibration (Fixed by DIN RAIL)		5~8.4Hz Amplitude: 3.5 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

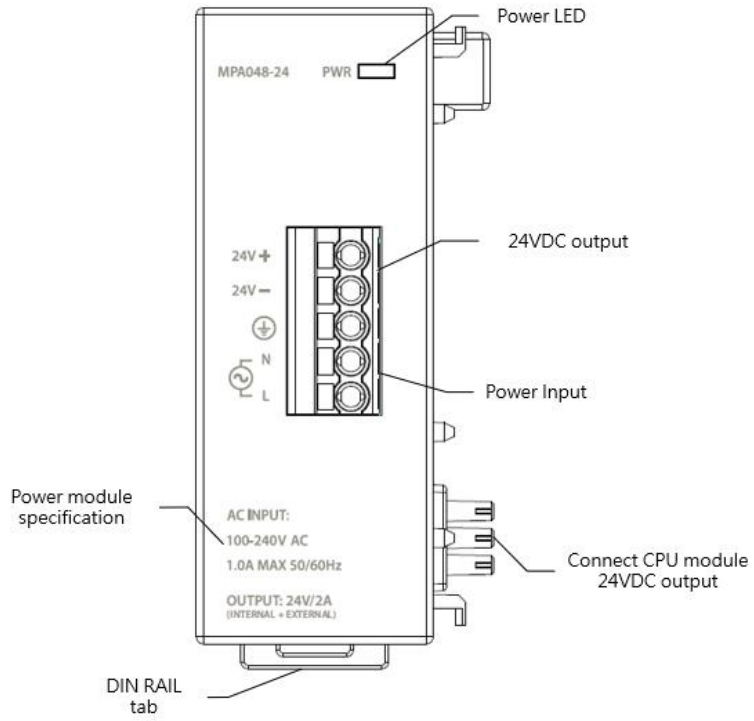
Status Indicator

MPA024-24 Status Indicator Table

Name	instruction
PWR LED	Power ON: Green Light Power OFF: NO Lights

7-1-2 MPA048-24 Specifiication

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

	101%~133% rated output power
Operating Ambient Temperature	0~55℃
Relative Humidity	20 ~ 90% (non-condensing)
Altitude	≦2000m
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5 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 Lights

8

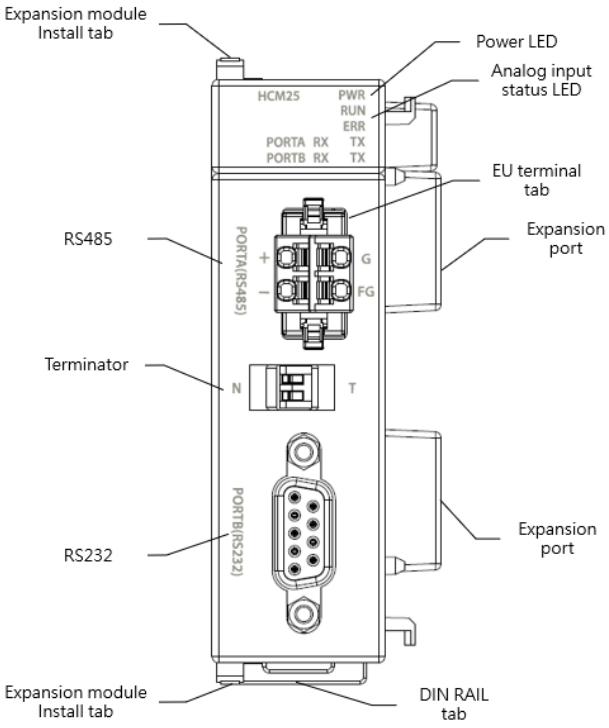
Chapter 8 Right Side High-Speed Expansion Module Specifications

8-1 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.

8-1-1 MHCM25 Specifications

Appearance and Function



MHCM25 Appearance

Technical Specifications

MHCM25 Technical Specifications Table

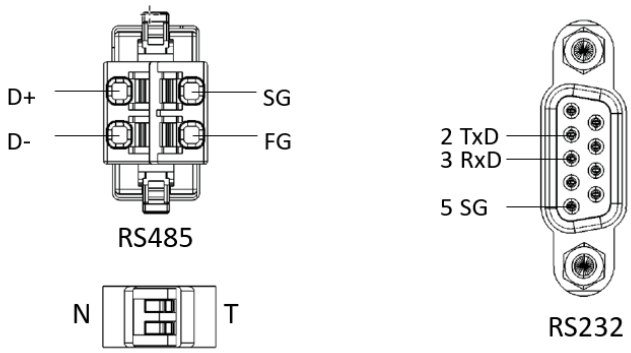
item	Technical Specifications
Model	MHCM25
connection interface	1 Port RS232 + 1 Port RS485
Maximum number of connections	RS232: 1 Slave RS485: 32 Slaves
Connector type	RS232: D-Sub 9-Pin RS485: 4 pin spring terminal
Transmission rate	RS232: Max 115200 RS485: Max 230400
Maximum cable length	RS232: 15M 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

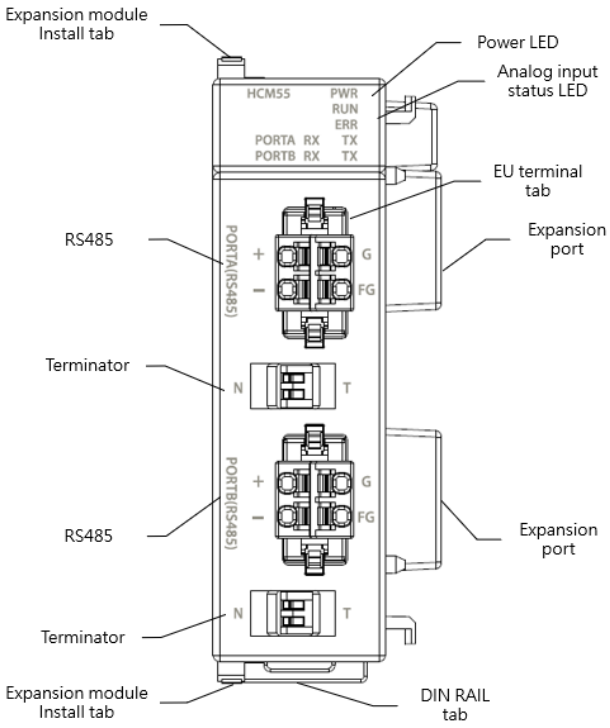
Pin assignment of the connector



MHCM25 Pin

8-1-2 MHCM55 Specifications

Appearance and Function



MHCM55 Appearance

Technical Specifications

MHCM55 Technical Specifications Table

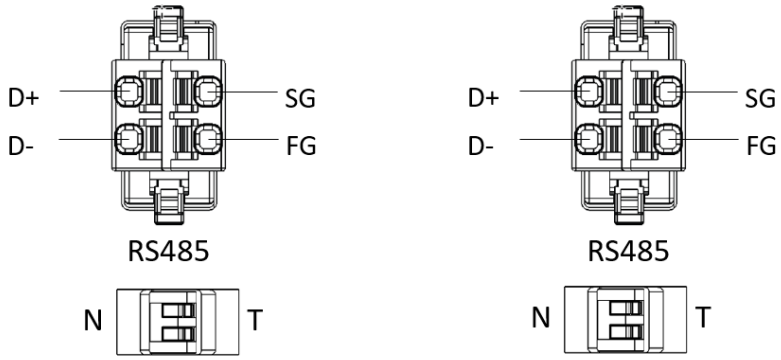
item	Technical Specifications
Model	MHCM55
connection interface	2 Port RS485
Maximum number of connections	RS485: 32 Slaves
Connector type	RS485: 4 pin spring terminal
Transmission rate	RS485: Max 230400
Maximum cable length	RS485: 1200M
isolation method	Internal power isolation

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 Pin

9

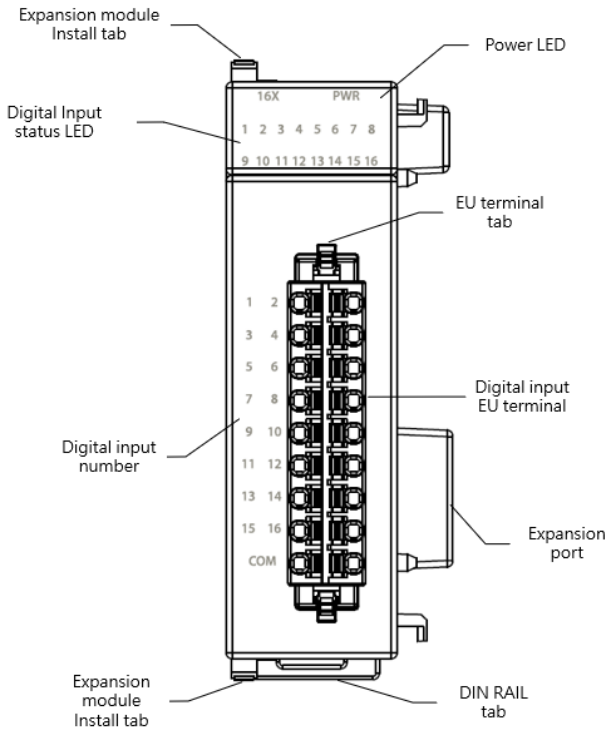
Chapter 9 Right Side Expansion Module Specifications

9-1 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.

9-1-1 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 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(0.47μs)
Operating Ambient Temperature		0~55℃
Relative Humidity		5 ~ 90% (non-condensing)
Altitude		≦2000m

Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5 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)

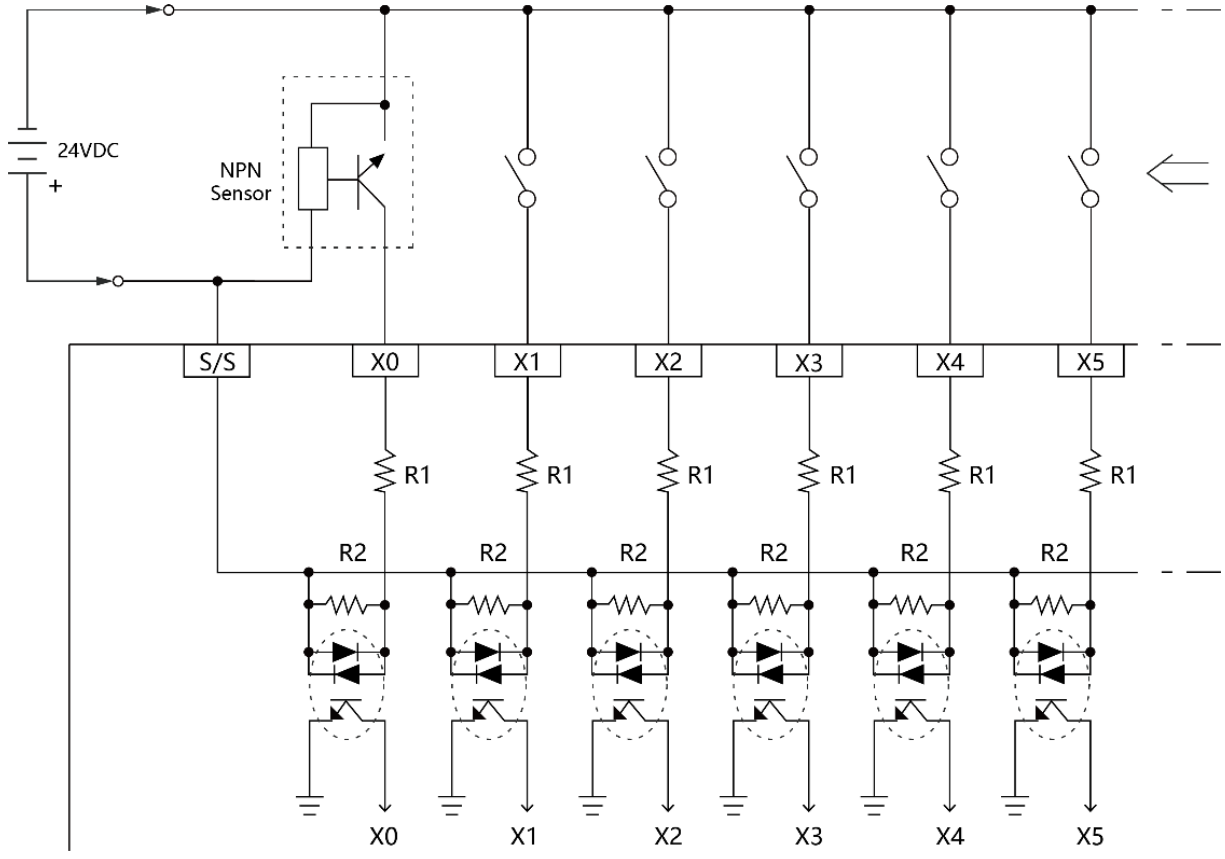
Status Indicator

M16X Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: Green Light Power OFF: No Light
1~16 Input Indicator	ON: Green Light OFF: No Light

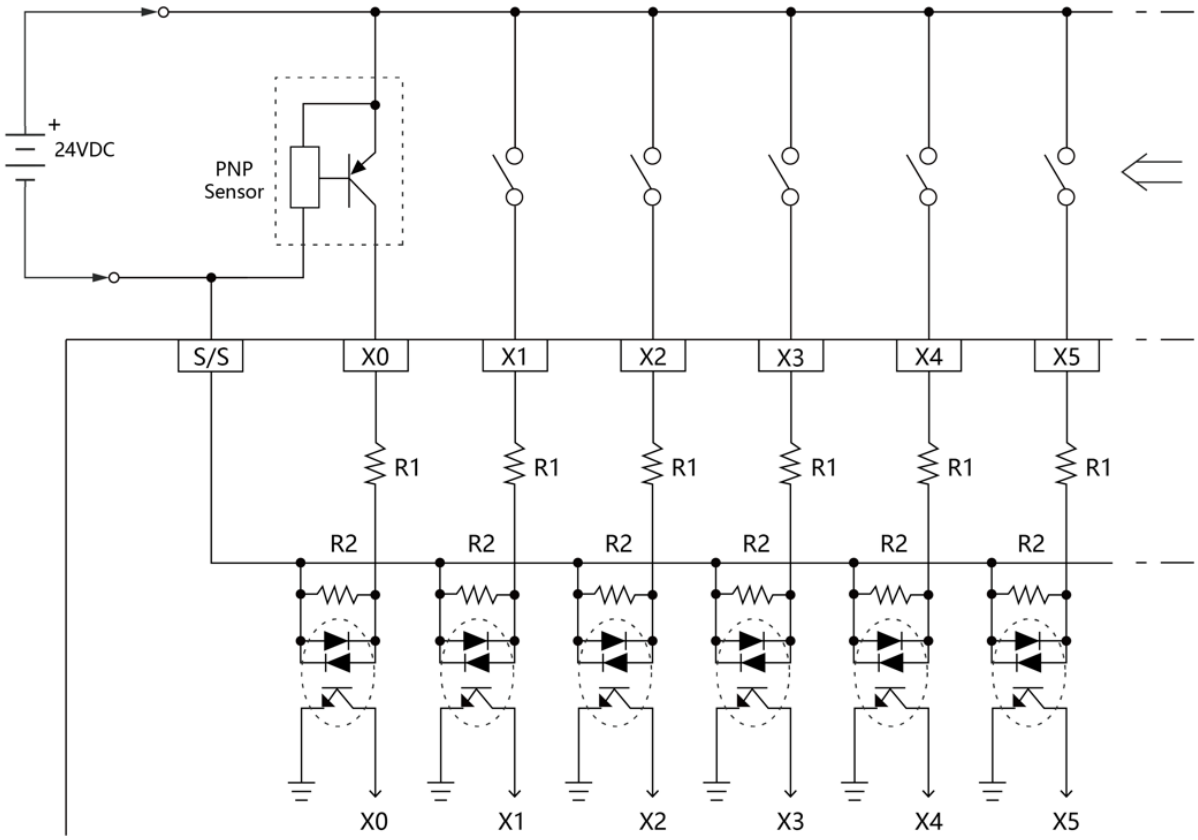
Wiring

- Wiring of single-end common SINK input



Wiring of single-end common SINK input

- Wiring of single-end common SOURCE input



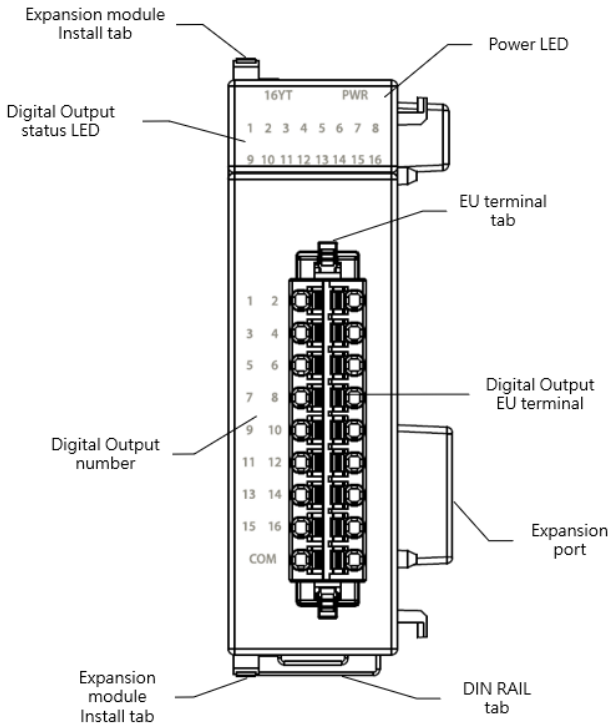
Wiring of single-end common SOURCE input

9-2 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.

9-2-1 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 ，1kHz
Working Voltage		5~30VDC
Maximum Load Current	Resistive	0.5A
	Inductive	
Maximum Voltage Drop/conducing 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℃
Relative Humidity		5 ~ 90% (non-condensing)
Altitude		≦2000m
Vibration (Fixed by DIN RAIL)		5~8.4Hz Amplitude: 3.5 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)

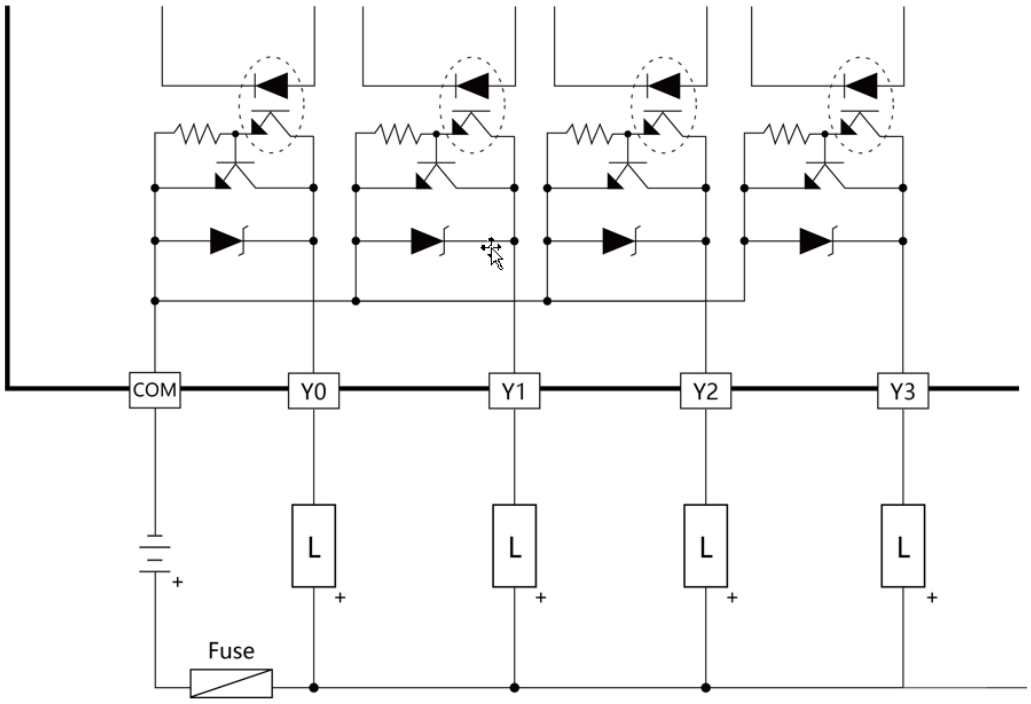
Status Indicator

M16YT / M16YJ Status Indicator Table

Indicator	instruction
PWR LED	Power ON: Green Light Power OFF: No Light
1~16 Output Indicator	ON: Green Light OFF: No Light

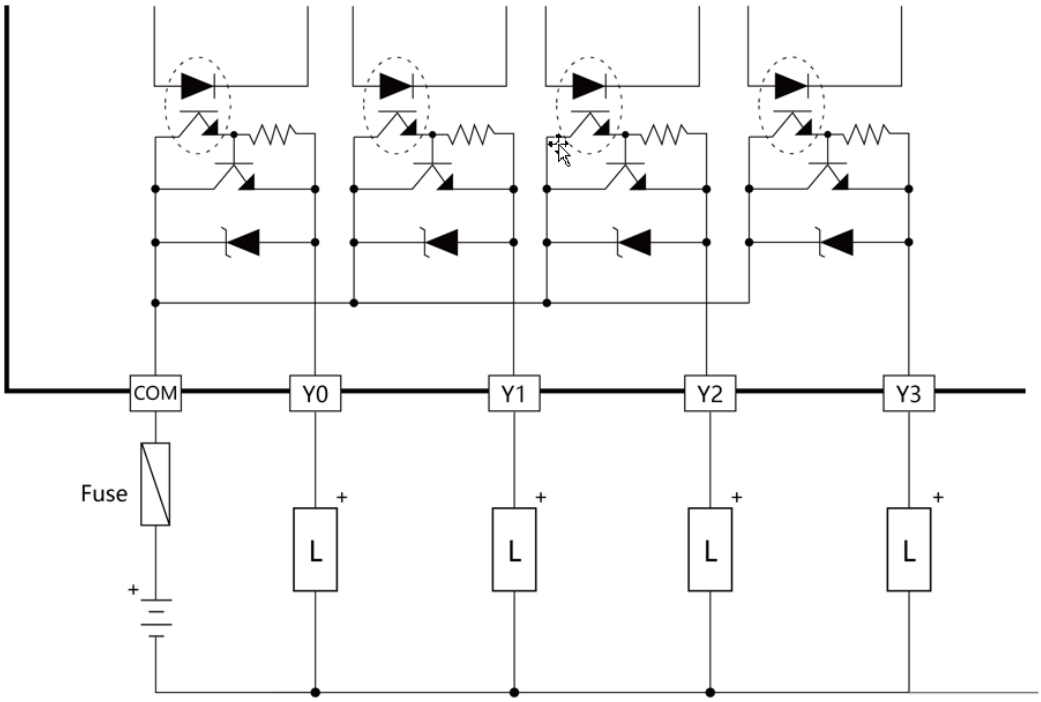
Wiring

- Transistor Single-End SINK Output



Transistor Single-End SINK Output

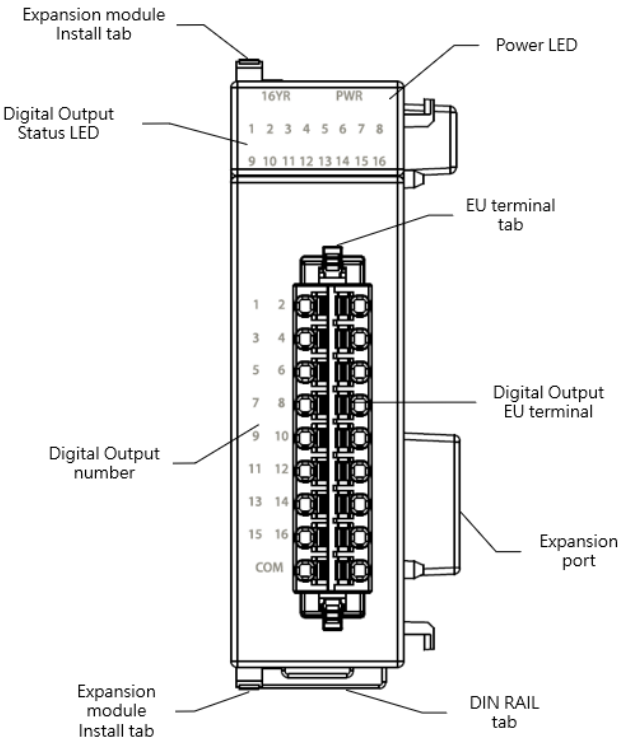
- Transistor Single-End SOURCE Output



Transistor Single-End SOURCE Output

9-2-2 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 frequent exchange
Working Voltage		<250VAC,30VDC
Maximum Load Current	Resistive	2A/single · 8A/common
	Inductive	80VA(AC)/24VA(DC)
Maximum Voltage Drop/conducing 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, 1500VAC, 1 minute
SINK /SOURCE Type		Bilateral device, can be arbitrarily set to SINK/SOURCE output

Operating Ambient Temperature	0~55℃
Relative Humidity	5 ~ 90% (non-condensing)
Altitude	≦2000m
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5 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)

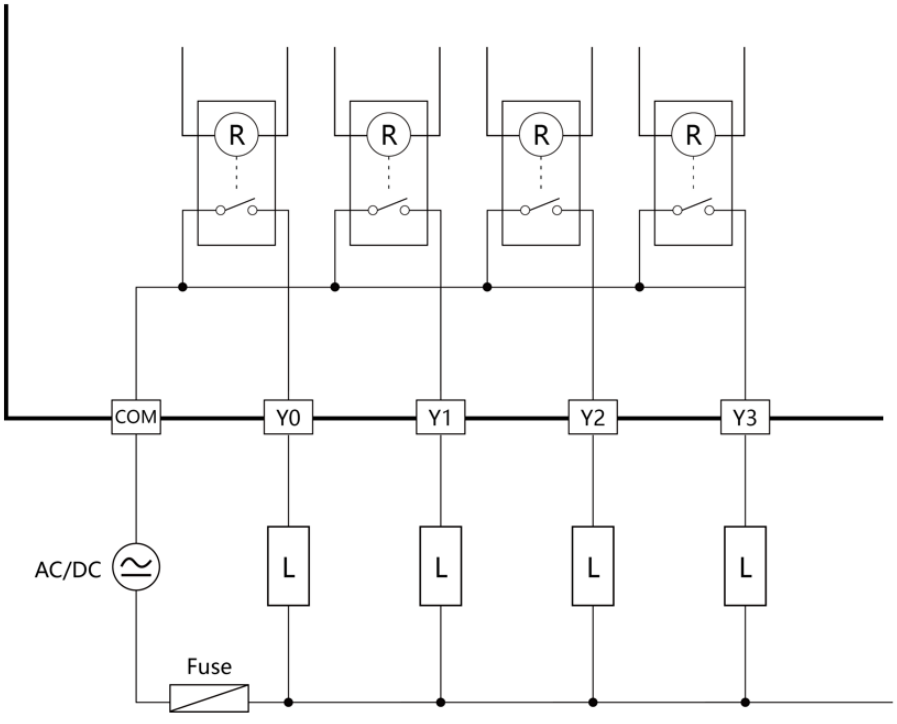
Status Indicator

M16YR Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: Green Light Power OFF: No Light
1~16 Output Indicator	ON: Green Light OFF: No Light

Wiring

- Single-End Relay Output Circuit



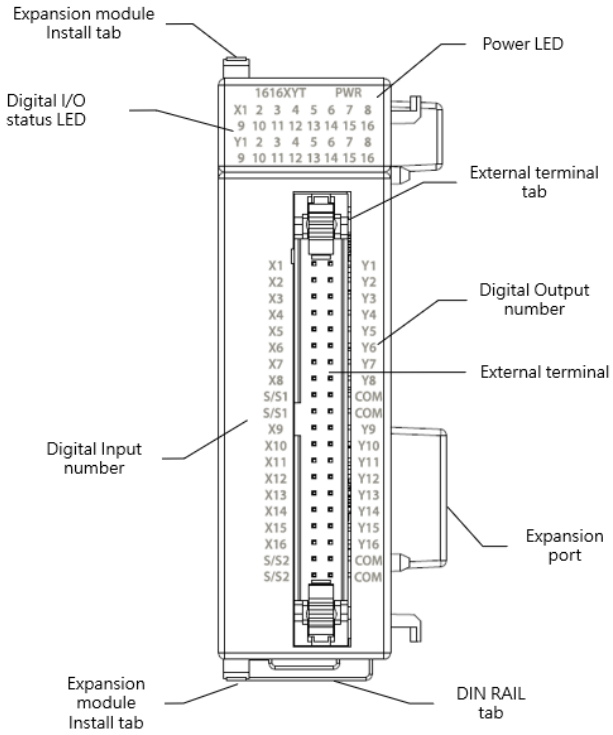
Single-End Relay Output Circuit

9-3 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.

9-3-1 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 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(0.47μs)
Operating Ambient Temperature		0~55℃
Relative Humidity		5 ~ 90% (non-condensing)
Altitude		≦2000m

Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5 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 · 1kHz
Working Voltage		5~30VDC
Maximum Load Current	Resistive	0.5A
	Inductive	
Maximum Voltage Drop/conducing 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℃
Relative Humidity		5 ~ 90% (non-condensing)
Altitude		≦2000m
Vibration (Fixed by DIN RAIL)		5~8.4Hz Amplitude: 3.5 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)

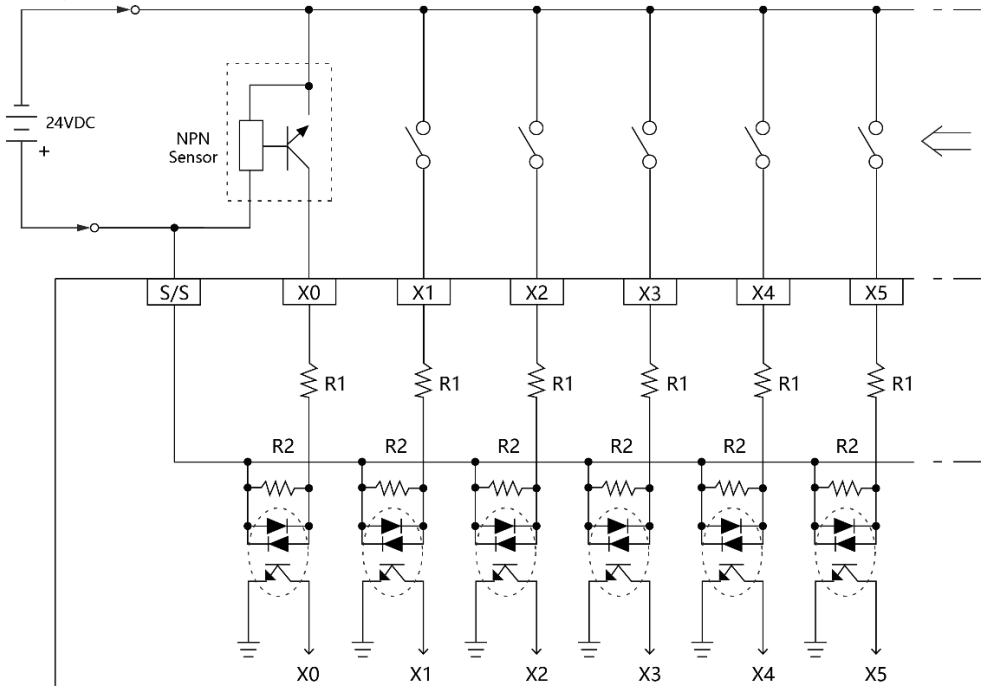
Status Indicator

M16X Status Indicator Table

Indicator	instruction
PWR Indicator	Power ON: Green Light Power OFF: No Light
1~16 Input Indicator	ON: Green Light OFF: No Light
1~16 output Indicator	ON: Green Light OFF: No Light

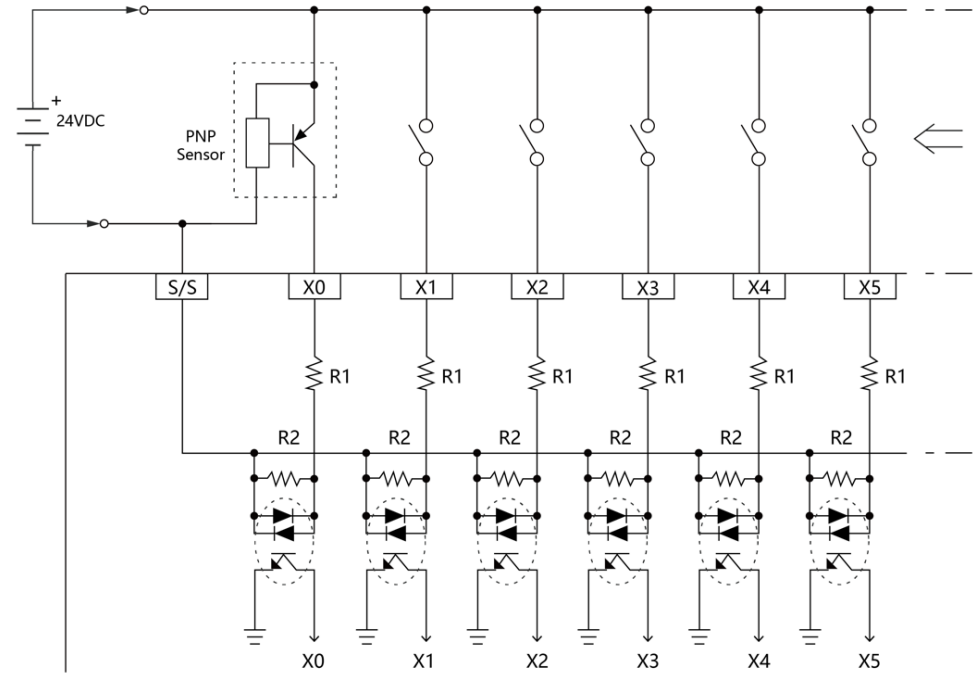
Wiring

- Wiring of single-end common SINK input



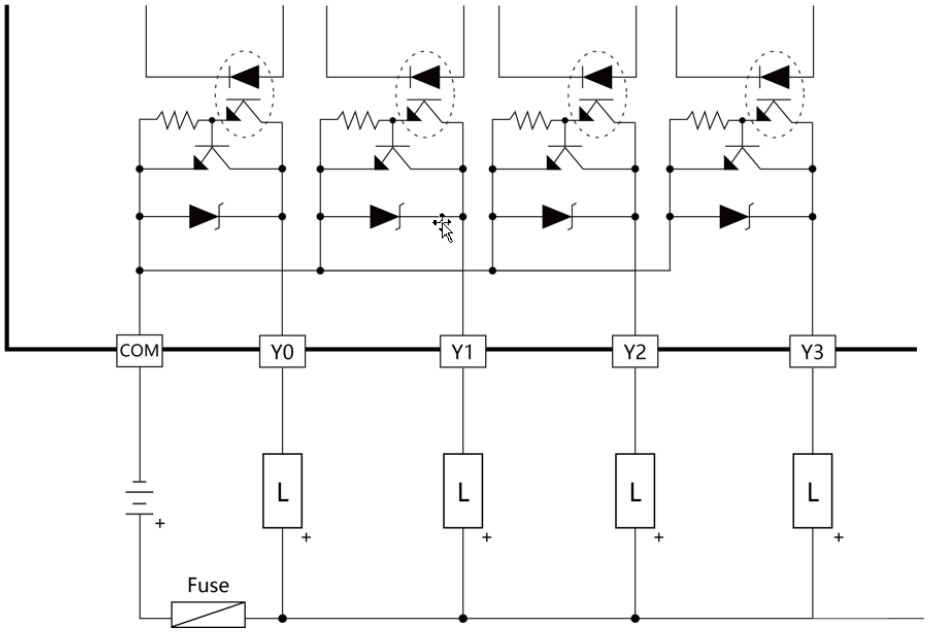
Wiring of single-end common SINK input

- Wiring of single-end common SOURCE input



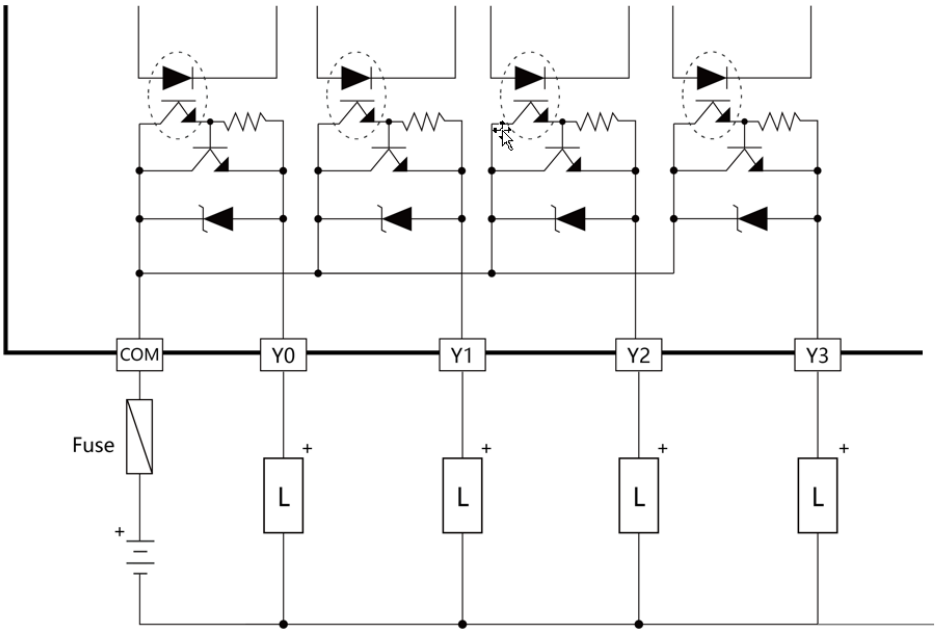
Wiring of single-end common SOURCE input

- Transistor Single-End SINK Output



Transistor Single-End SINK Output

- Transistor Single-End SOURCE Output



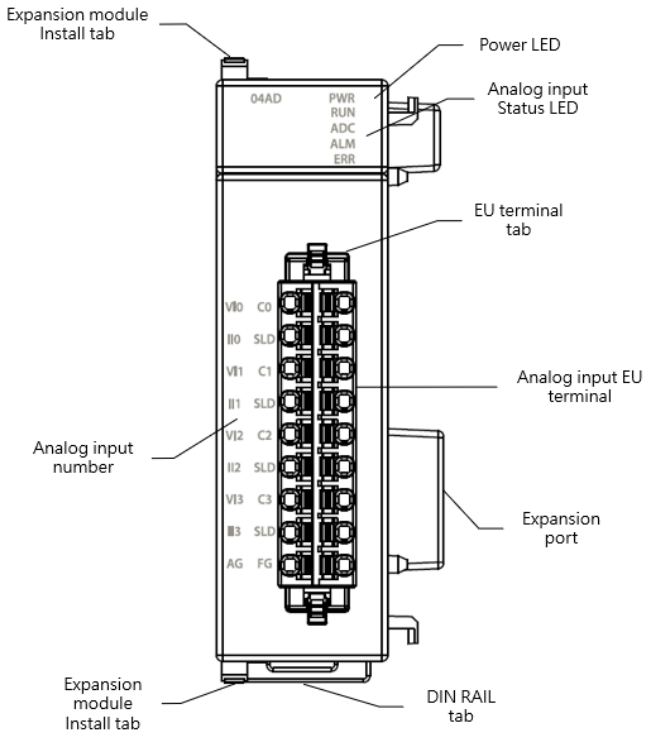
Transistor Single-End SOURCE Output

9-4 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.

9-4-1 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

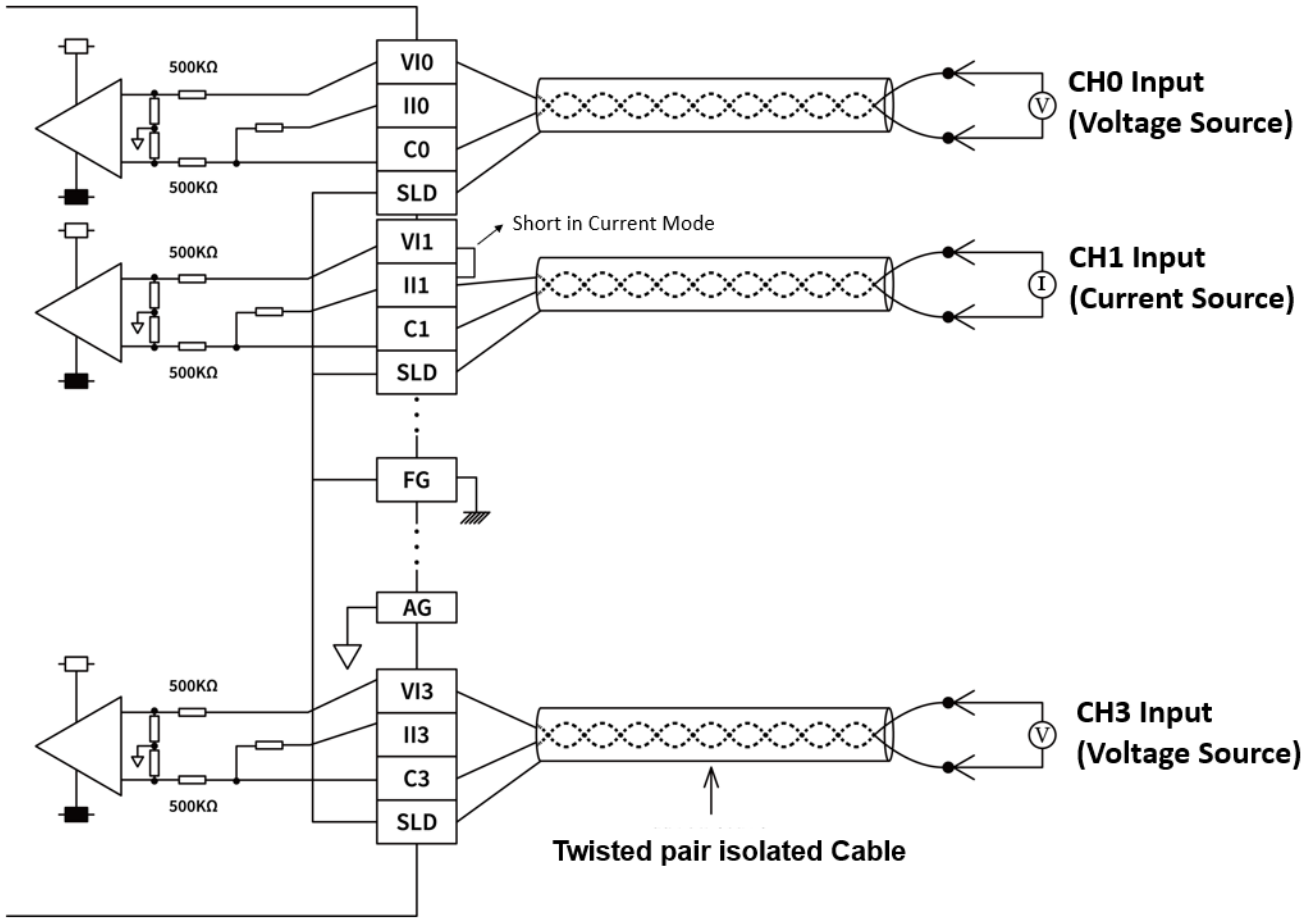
Conversion precision	Voltage	±0.1% (25°C±5℃) ±0.2% (0～55℃)
	Current	±0.2% (25°C±5℃) ±0.4% (0～55℃)
AD Converter	24-Bit	
Input Resistance	Voltage：1MΩ Current：250Ω	
Hardware maximum input	Voltage：－15V～＋15V Current：-30mA~+30mA	
Insulation	Between analog input and CPU：insulated（Digital isolators, transformers） Between analog input channels：non-insulated	
Operating Ambient Temperature	0~55℃	
Relative Humidity	5 ~ 90% (non-condensing)	
Altitude	≦2000m	
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5 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

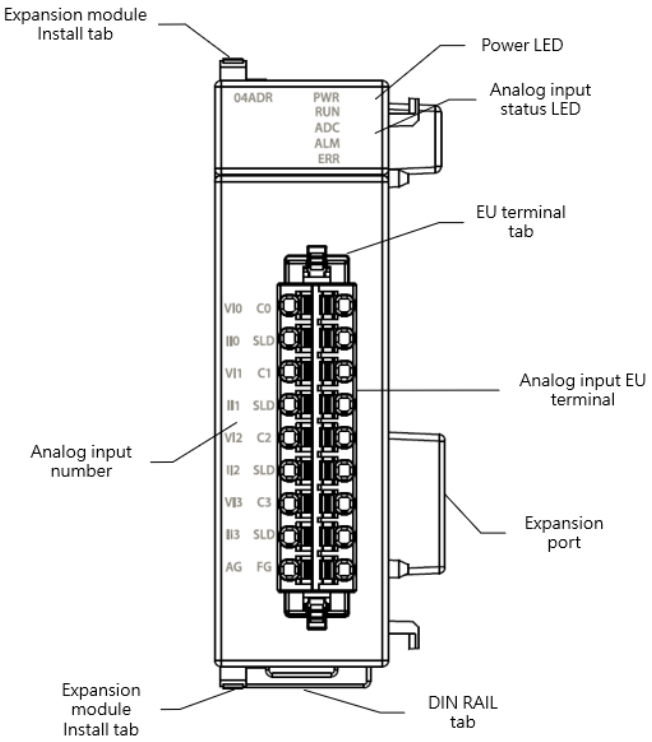
Wiring



M04AD Wiring

9-4-2 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	Resolution
	Voltage	-10~+10V	-80000~80000	0.125mV
		-5~+5V	-80000~80000	0.0625mV
		0~10V	0~80000	0.125mV
		0~5V	0~80000	0.0625mV
		1~5V	0~80000	0.05mV
	Current	-20mA~+20mA	-80000~80000	0.25uA
		0~20mA	0~80000	0.25uA
		4~20mA	0~80000	0.2uA
Conversion precision	Voltage	±0.1% (25°C±5°C) ±0.2% (0 ~ 55°C)		
	Current	±0.1% (25°C±5°C) ±0.2% (0 ~ 55°C)		

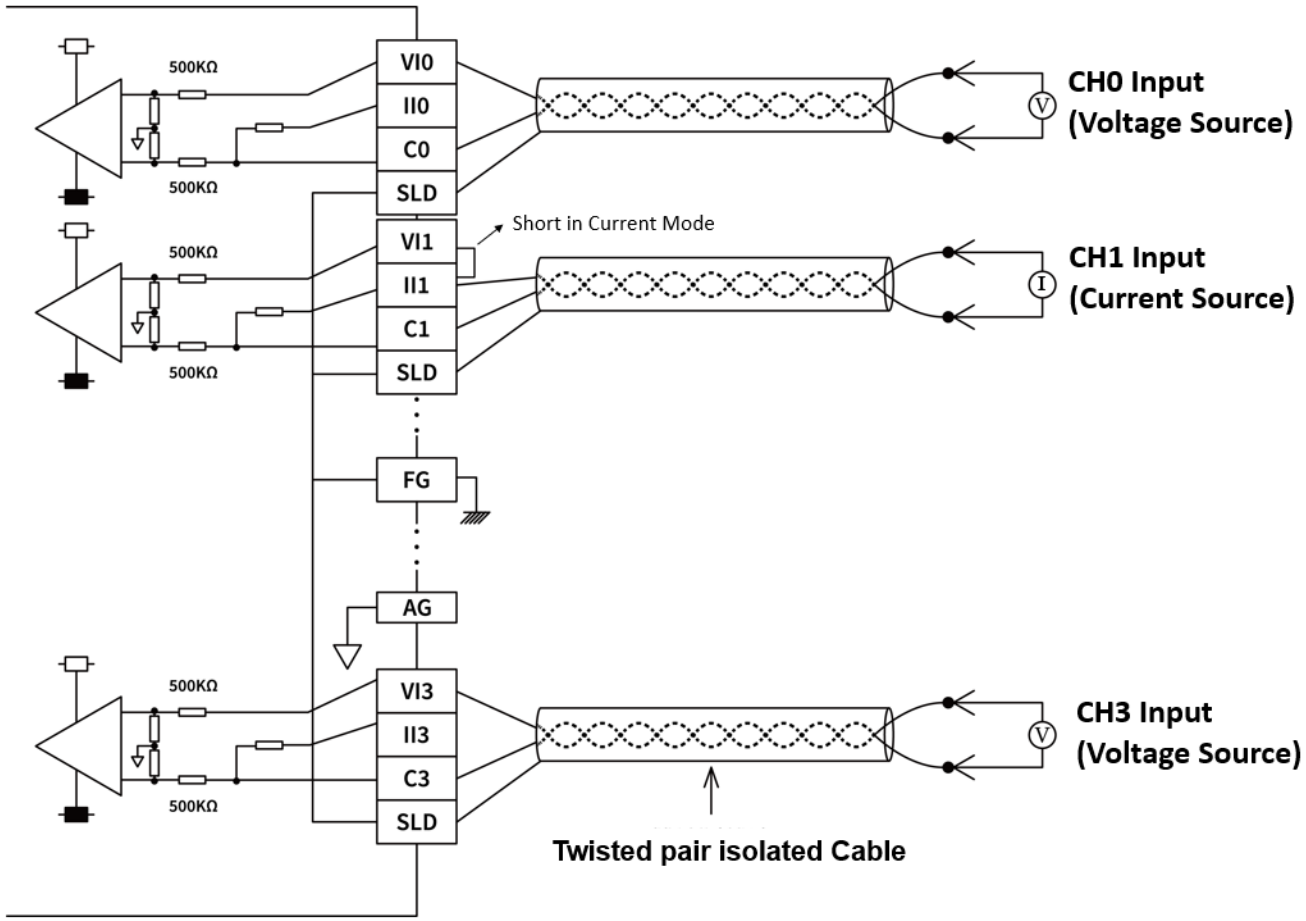
AD Converter	24-Bit
Input Resistance	Voltage：1MΩ Current：250Ω
Hardware maximum input	Voltage： - 15V ~ + 15V Current：-30mA~+30mA
Insulation	Between analog input and CPU：insulated（Digital isolators, transformers） Between analog input channels：non-insulated
Operating Ambient Temperature	0~55℃
Relative Humidity	5 ~ 90% (non-condensing)
Altitude	≦2000m
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5 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

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



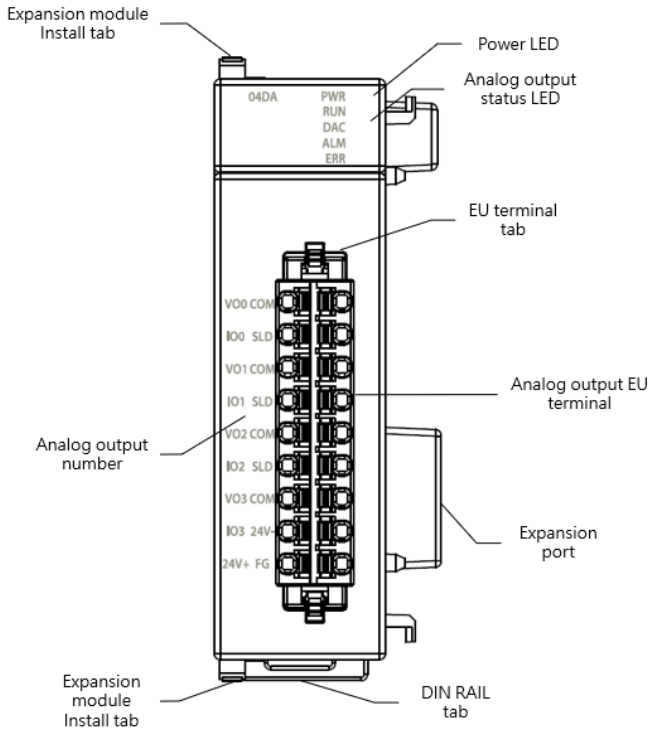
M04ADR Wiring

9-5 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.

9-5-1 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℃±5℃) ±0.5% (0~55℃)		

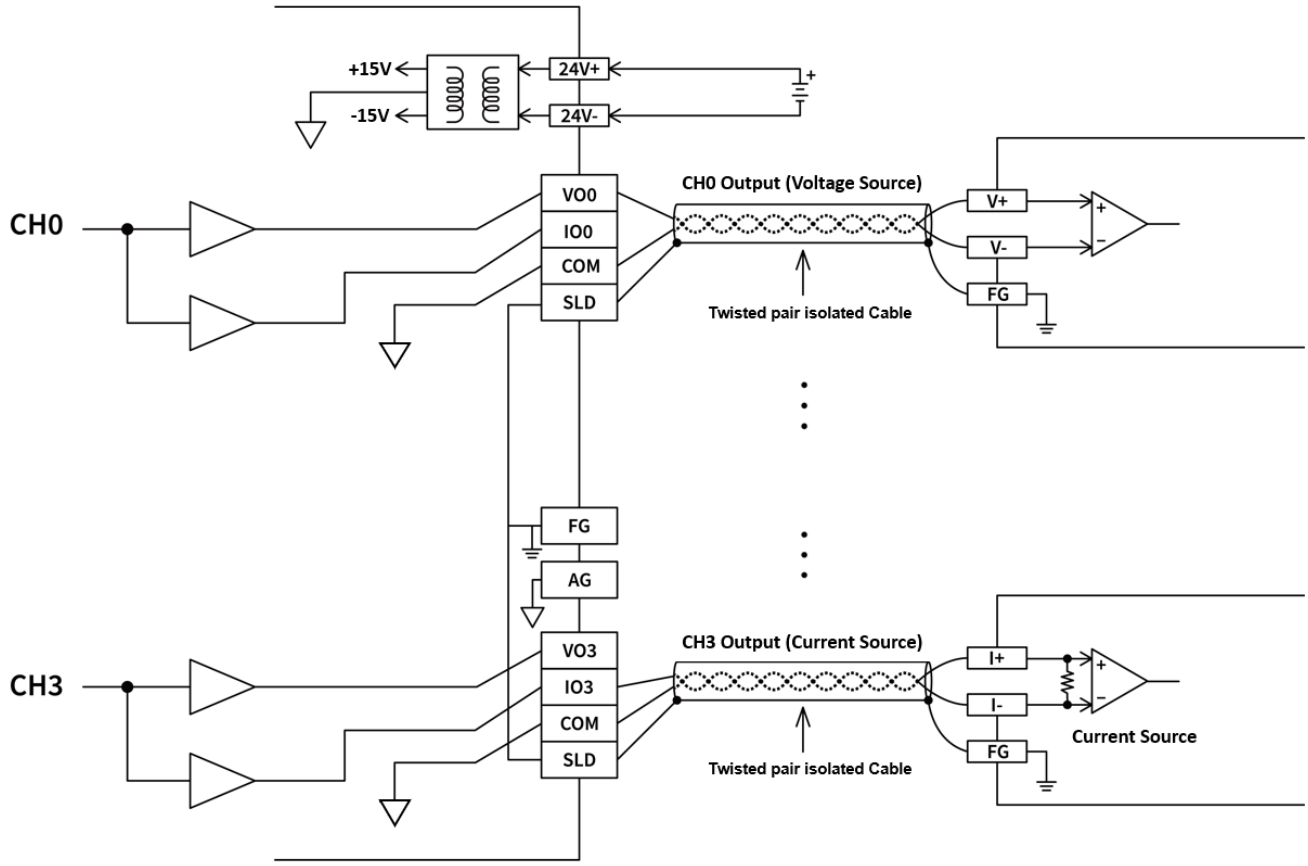
	Current	±0.2% (25℃±5℃) ±0.5% (0~55℃)
DA Converter	24-Bit	
Minimum load impedance	Voltage：1kΩ	
Maximum load impedance	Current：500Ω	
hardware output	Voltage	-10.2~+10.2V -5.1~+5.1V -0.2~10.2V -0.1~5.1V 0.9~5.1V
	Current	0~20.2mA 4~20.2mA
Insulation	Between analog input and CPU：insulated（Digital isolators, transformers） Between analog input channels：non-insulated	
Operating Ambient Temperature	0~55℃	
Relative Humidity	5 ~ 90% (non-condensing)	
Altitude	≦2000m	
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5 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

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

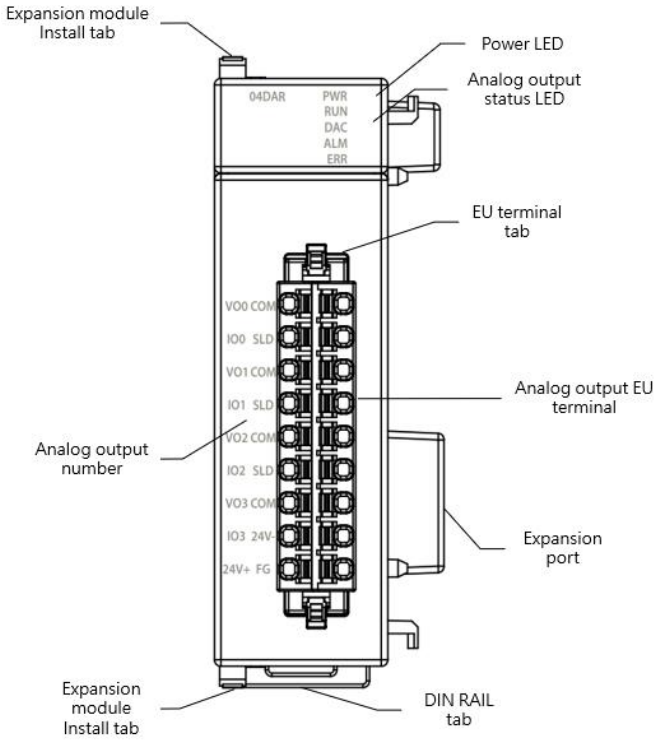
Wiring



M04DA Wiring

9-5-2 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℃±5℃) ±0.3% (0~55℃)		
	Current	±0.05% (25℃±5℃) ±0.3% (0~55℃)		
DA Converter	24-Bit			
Minimum load impedance	Voltage：1kΩ			
Maximum load impedance	Current：500Ω			
hardware output	Voltage	-10.2~+10.2V -5.1~+5.1V		

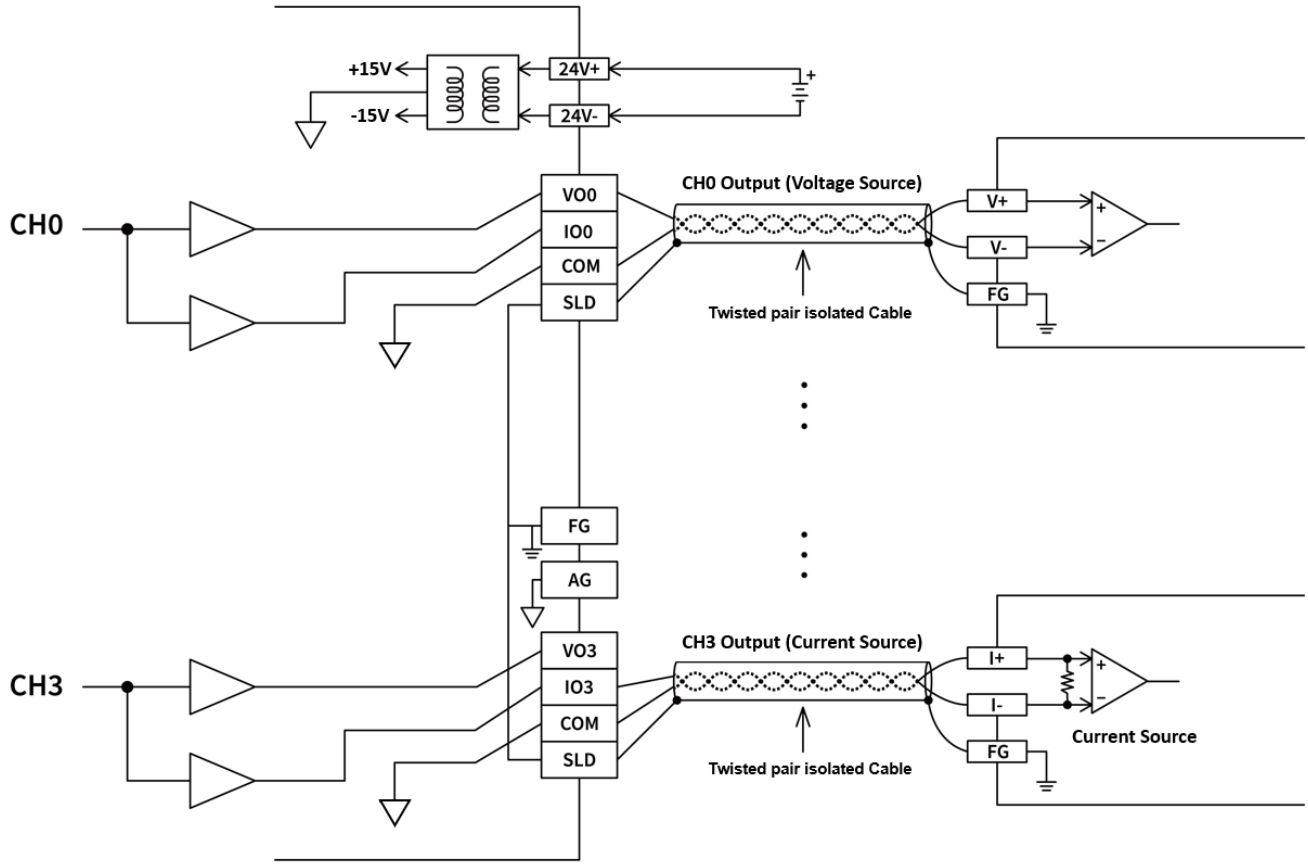
		-0.2~10.2V -0.1~5.1V 0.9~5.1V
	Current	0~20.2mA 4~20.2mA
Insulation	Between analog input and CPU：insulated（Digital isolators, transformers） Between analog input channels：non-insulated	
Operating Ambient Temperature	0~55℃	
Relative Humidity	5 ~ 90% (non-condensing)	
Altitude	≦2000m	
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5 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



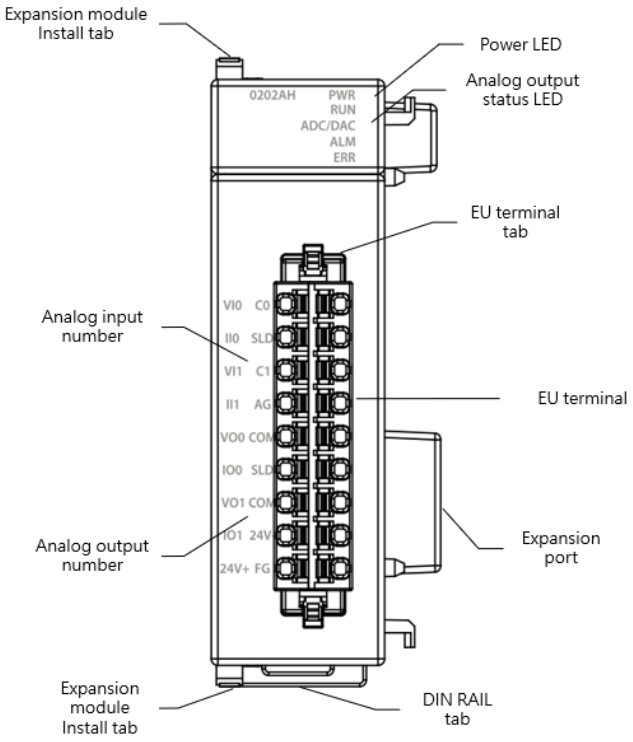
M04DAR Wiring

9-6 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.

9-6-1 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

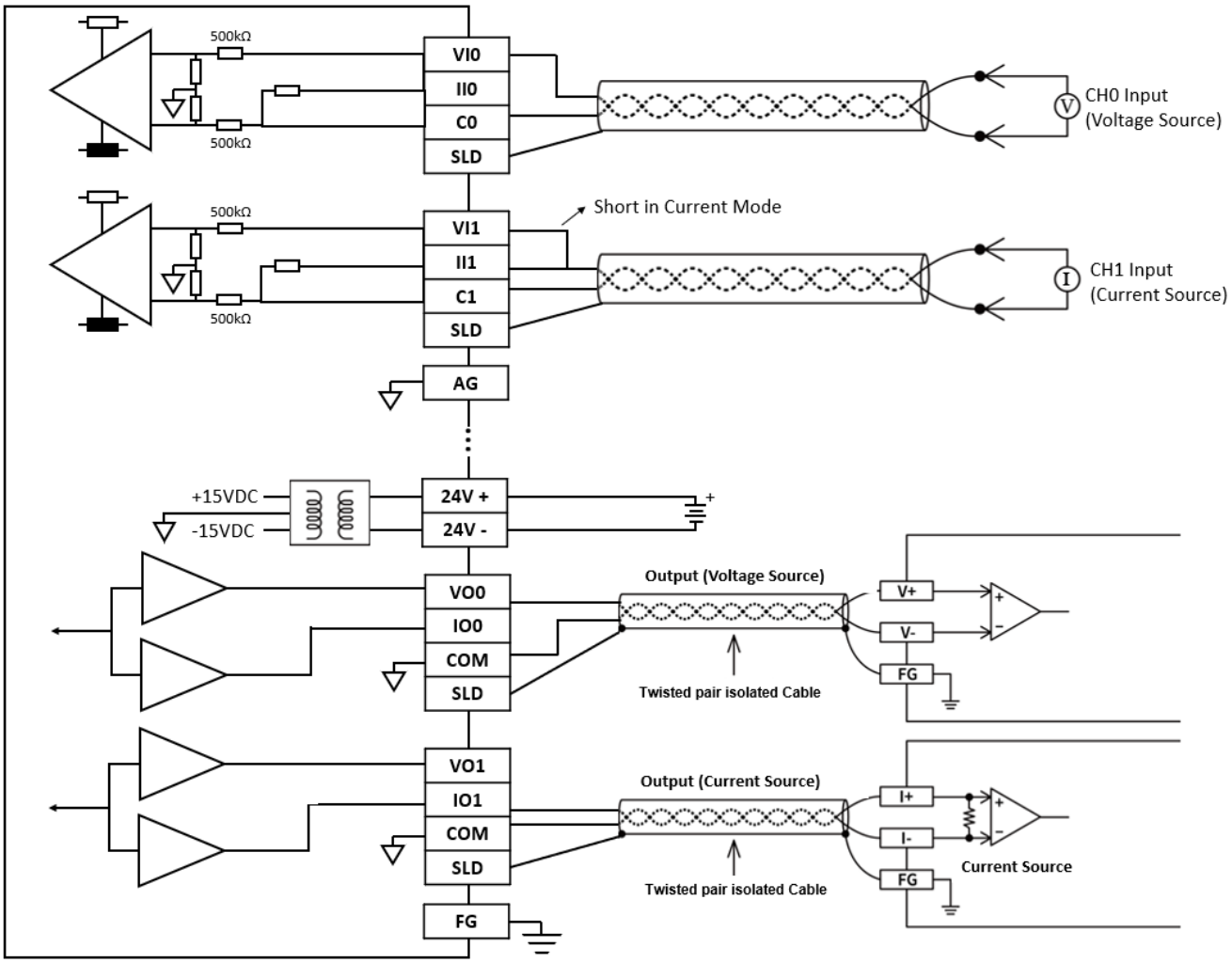
		4~20mA	0~16383	0.976uA
Conversion precision	Voltage	±0.1% (25℃±5℃) ±0.2% (0～55℃)		
	Current	±0.2% (25℃±5℃) ±0.4% (0～55℃)		
AD Converter	24-Bit			
Input Resistance	Voltage：1MΩ Current：250Ω			
Hardware maximum input	Voltage： -15V～+15V Current：-30mA~+30mA			
Output Specifications				
Output Point	2			
Conversion 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℃±5℃) ±0.5% (0~55℃)		
	Current	±0.2% (25℃±5℃) ±0.5% (0~55℃)		
DA Converter	24-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		
Common Specifications				
Insulation	Between analog input and CPU：insulated（Digital isolators, transformers） Between analog input channels：non-insulated			
Operating Ambient Temperature	0~55℃			
Relative Humidity	5 ~ 90% (non-condensing)			
Altitude	≦2000m			
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5 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



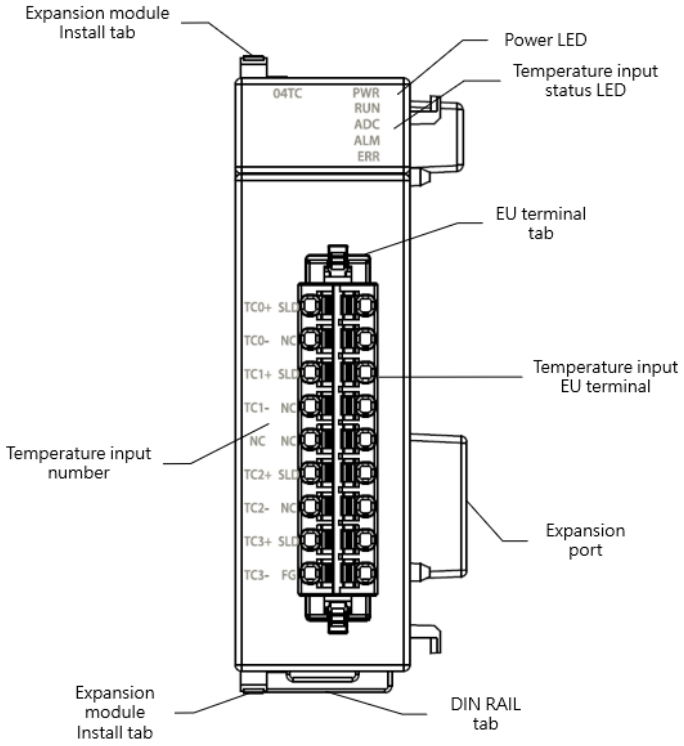
M0202AH Wiring

9-7 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.

9-7-1 M04TC Specification

Appearance and Function



M04TC Appearance

Technical Specification

M04TC Technical Specifications Table

item	Technical Specification
Model	M04TC
Input Points	4
Resolution	0.1℃
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℃) ±1% (0～55℃)
AD Converter	24-Bit
Operating mode	PID Control ON/OFF Control
Control cycle	1~100 Second
Tuning	PID Auto Tuning
Insulation	Between analog input and CPU：insulated（Digital isolators） Between analog input channels：insulated（optocoupler isolator）
Operating Ambient	0~55℃

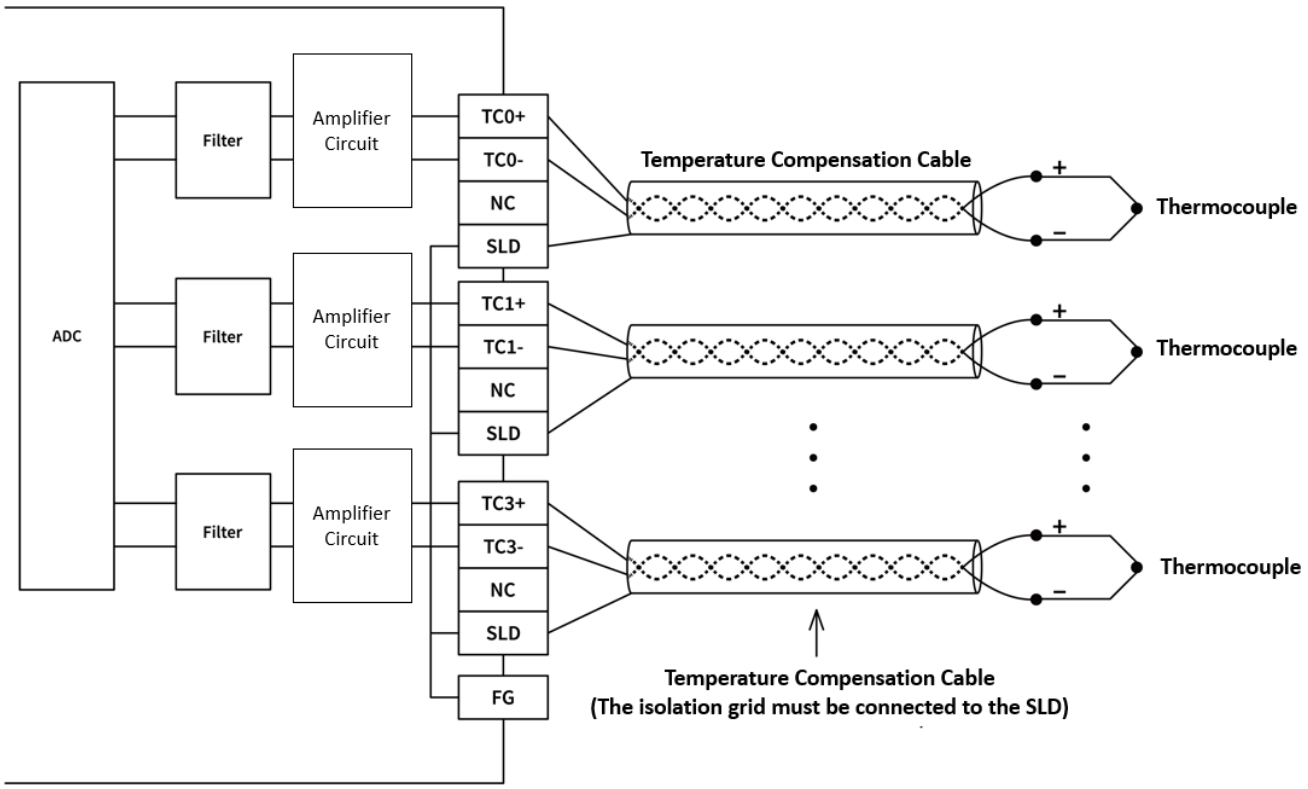
Temperature	
Relative Humidity	5 ~ 90% (non-condensing)
Altitude	≦2000m
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5 8.4~150Hz Constant acceleration:19.6m/s^2(2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock	10G, 3 times each along the 3 axes
Noise Suppression	1500Vp-p · Width 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

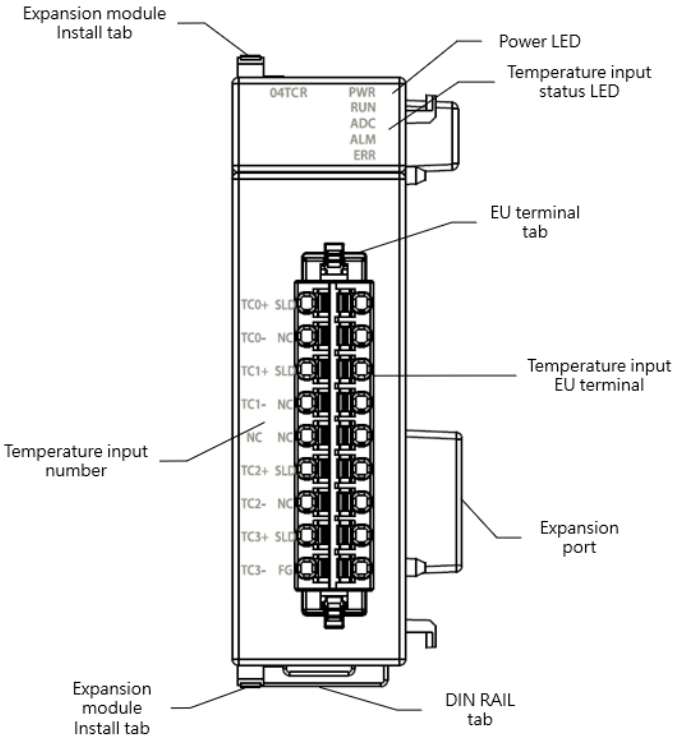
Wiring



M04TC Wiring

9-7-2 M04TCR Specification

Appearance and Function



M04TCR Appearance

Technical Specification

M04TCR Technical Specifications Table

item	Technical Specification
Model	M04TCR
Input Points	4
Resolution	0.1℃
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℃) ±0.4% (0 ~ 55℃)
AD Converter	24-Bit
Operating mode	PID Control ON/OFF Control
Control cycle	1~100 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℃
Relative Humidity	5 ~ 90% (non-condensing)
Altitude	≦2000m
Vibration	5~8.4Hz Amplitude: 3.5

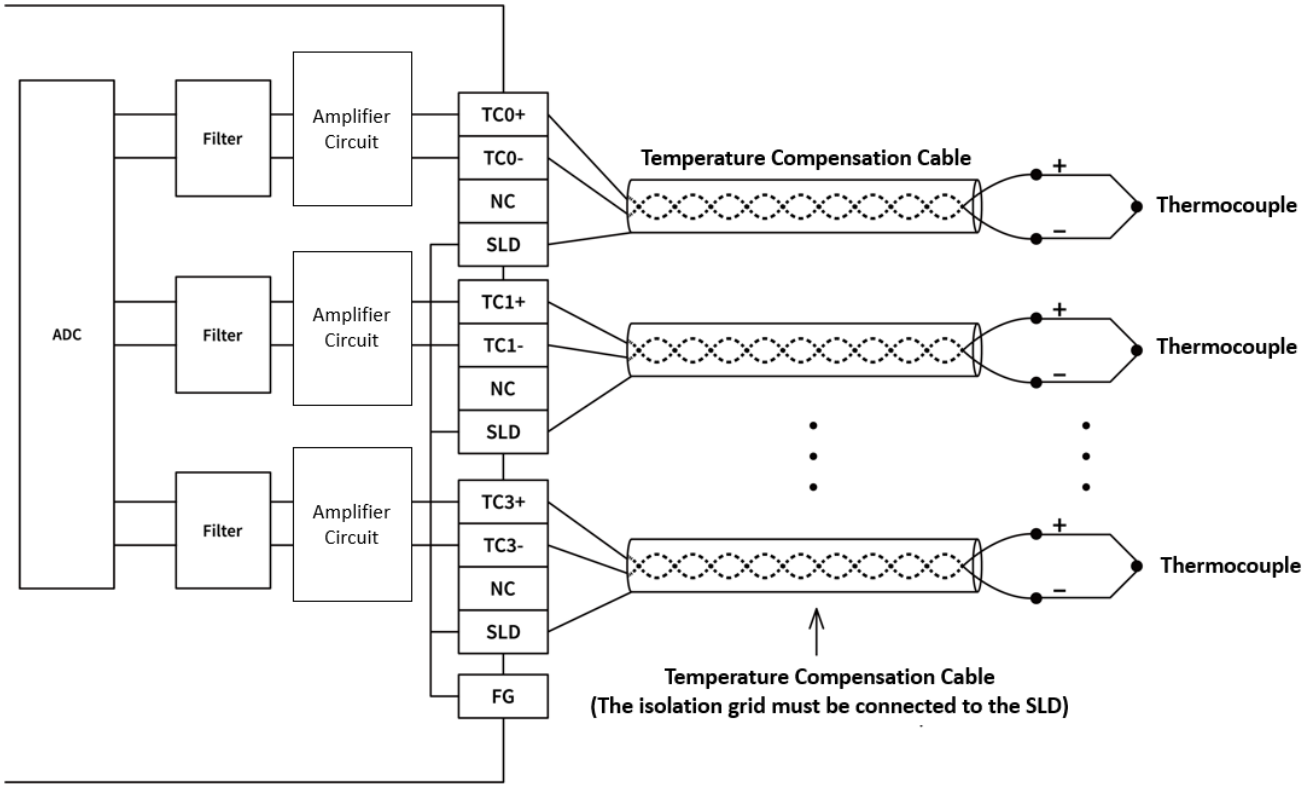
(Fixed by DIN RAIL)	8.4~150Hz Constant acceleration:19.6m/s^2(2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock	10G, 3 times each along the 3 axes
Noise Suppression	1500Vp-p · Width 1us
Withstand Voltage	1500 VAC 1 minute (Between power terminals and input/output terminals, and between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



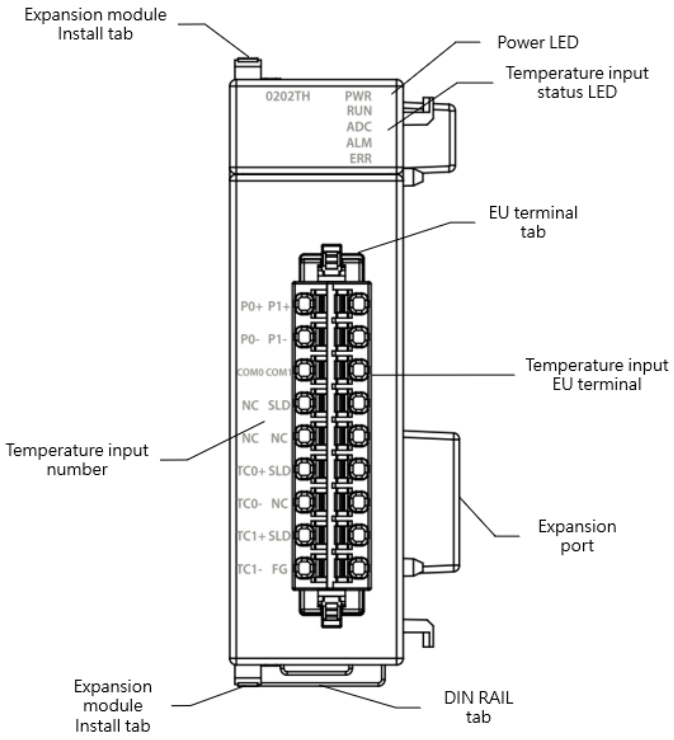
M04TCR Wiring

9-8 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.

9-8-1 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℃
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℃) ±1% (0～55℃)
AD Converter	24-Bit
RTD Specifications	
Input Points	2
Resolution	0.1℃
Sampling cycle	100ms/ch
Temperature sensor type	Pt-100, Pt-1000, JPt-100, JPt-1000
Conversion precision	±0.1% (25°C±5℃)

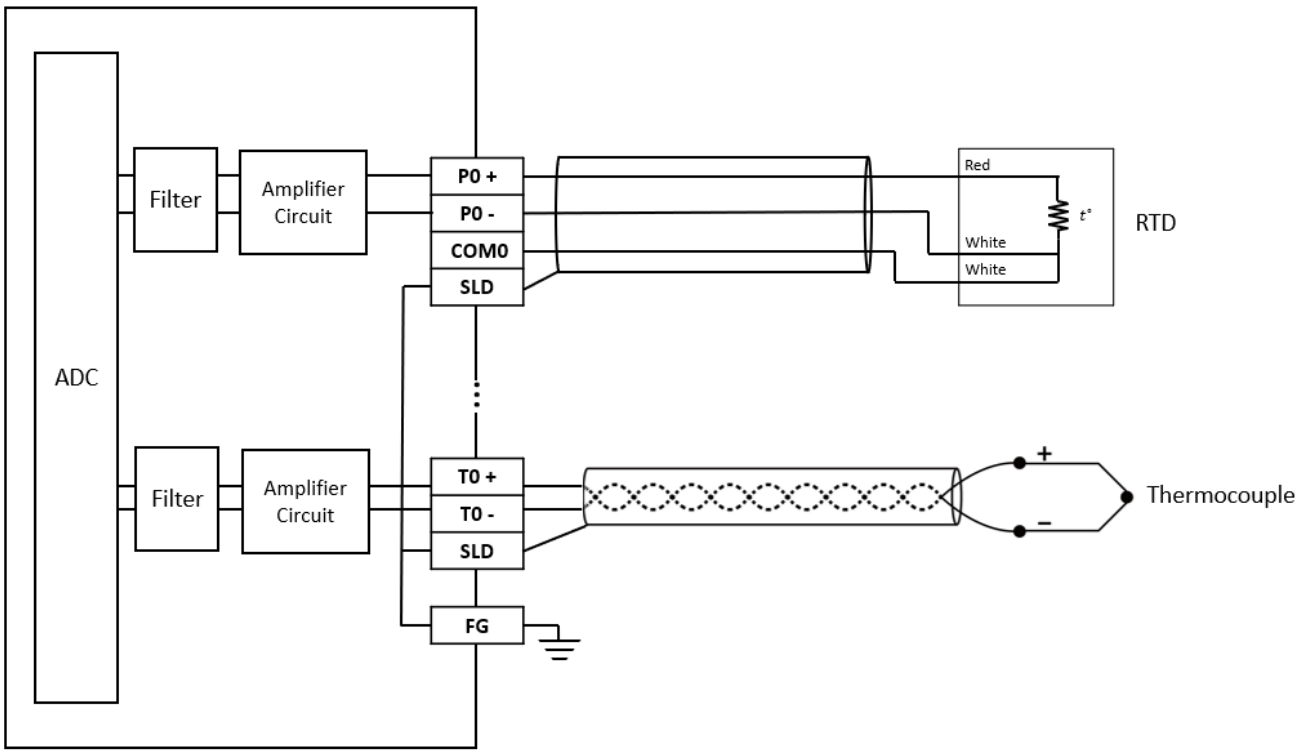
	±0.5% (0 ~ 55℃)
AD Converter	24-Bit
Common Specifications	
Operating mode	PID Control ON/OFF Control
Control cycle	1~100 Second
Tuning	PID Auto Tuning
Insulation	Between analog input and CPU：insulated（Digital isolators） Between analog input channels：insulated（optocoupler isolator）
Operating Ambient Temperature	0~55℃
Relative Humidity	5 ~ 90% (non-condensing)
Altitude	≦2000m
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5 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



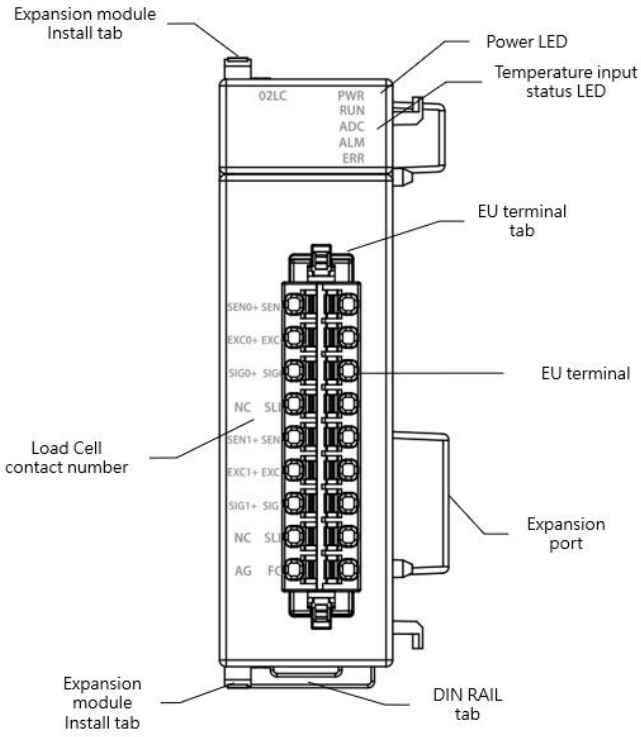
M0202TH Wiring

9-9 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.

9-9-1 M02LC Specifications

Appearance and Function



M02LC Appearance

Technical Specification

M02LC Technical Specifications Table

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

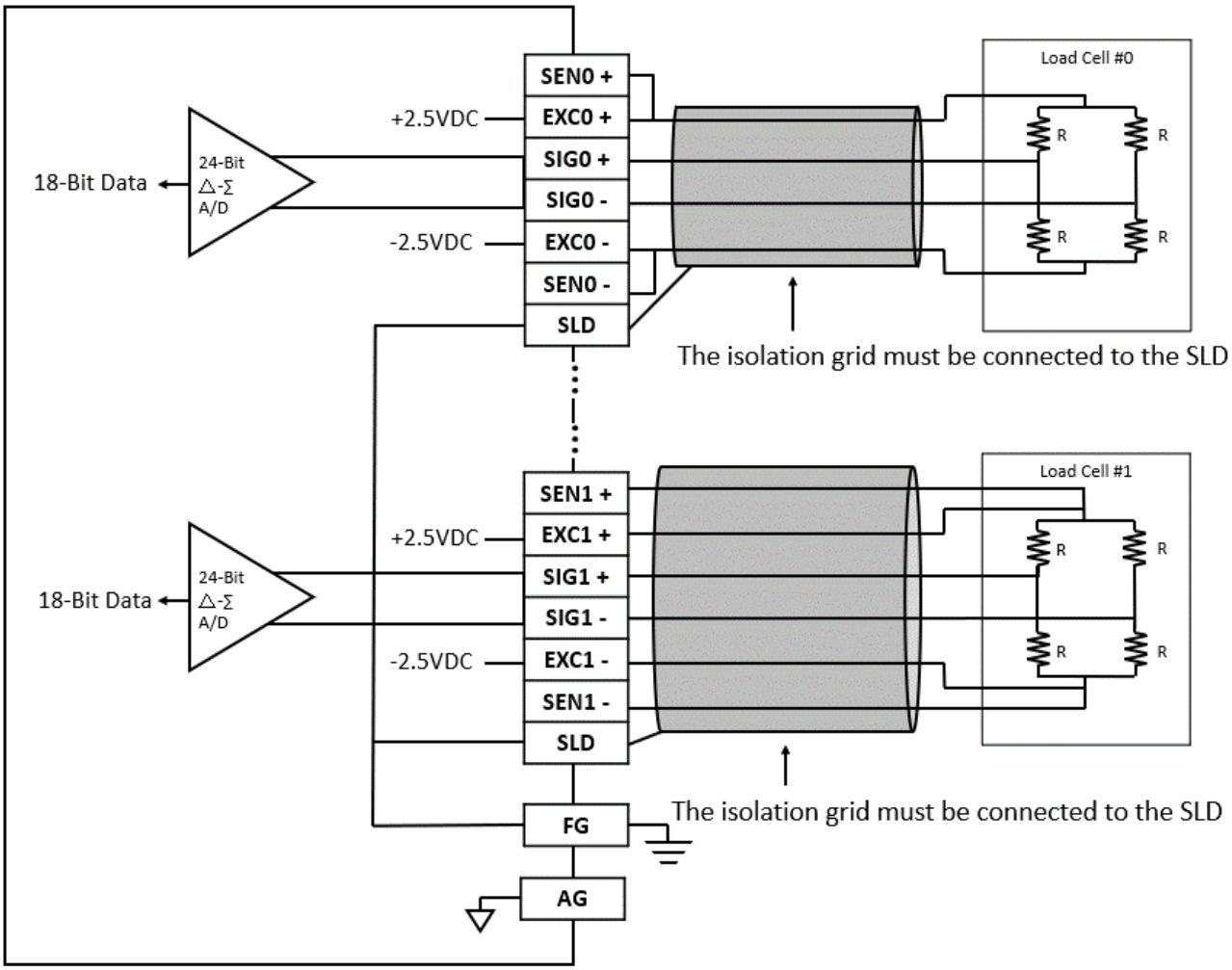
Insulation	Between analog input and CPU：insulated（Digital isolators） Between analog input channels：insulated（optocoupler isolator）
Operating Ambient Temperature	0~55℃
Relative Humidity	5 ~ 90% (non-condensing)
Altitude	≦2000m
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5 8.4~150Hz Constant acceleration:19.6m/s^2(2G) 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

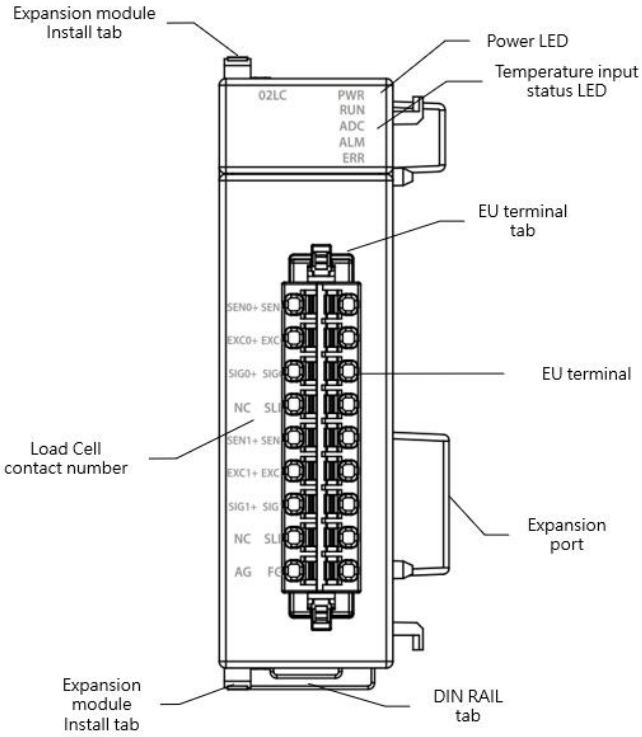
Wiring



M02LC Wiring

9-9-2 M02LCR Specifications

Appearance and Function



M02LC Appearance

Technical Specification

M02LCR Technical Specifications Table

item	Technical Specification
Model	M02LCR
Input Points	2
Excitation Voltage	5VDC±5%, 60mA
Sensor Type	4-wire or 6-wire Load Cell
Number of Sensor Connection	4 * 350Ω Sensor
Sensitivity	±1.0mV/V ±2.0mV/V ±3.0mV/V ±4.0mV/V
AD Converter Resolution	24-Bit
Conversion precision	±0.01% (25°C±5°C)
Zero Drift	0.2uV/°C
Gain Drift	±10ppm/°C
Sampling cycle	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	5 ~ 90% (non-condensing)
Altitude	≦2000m

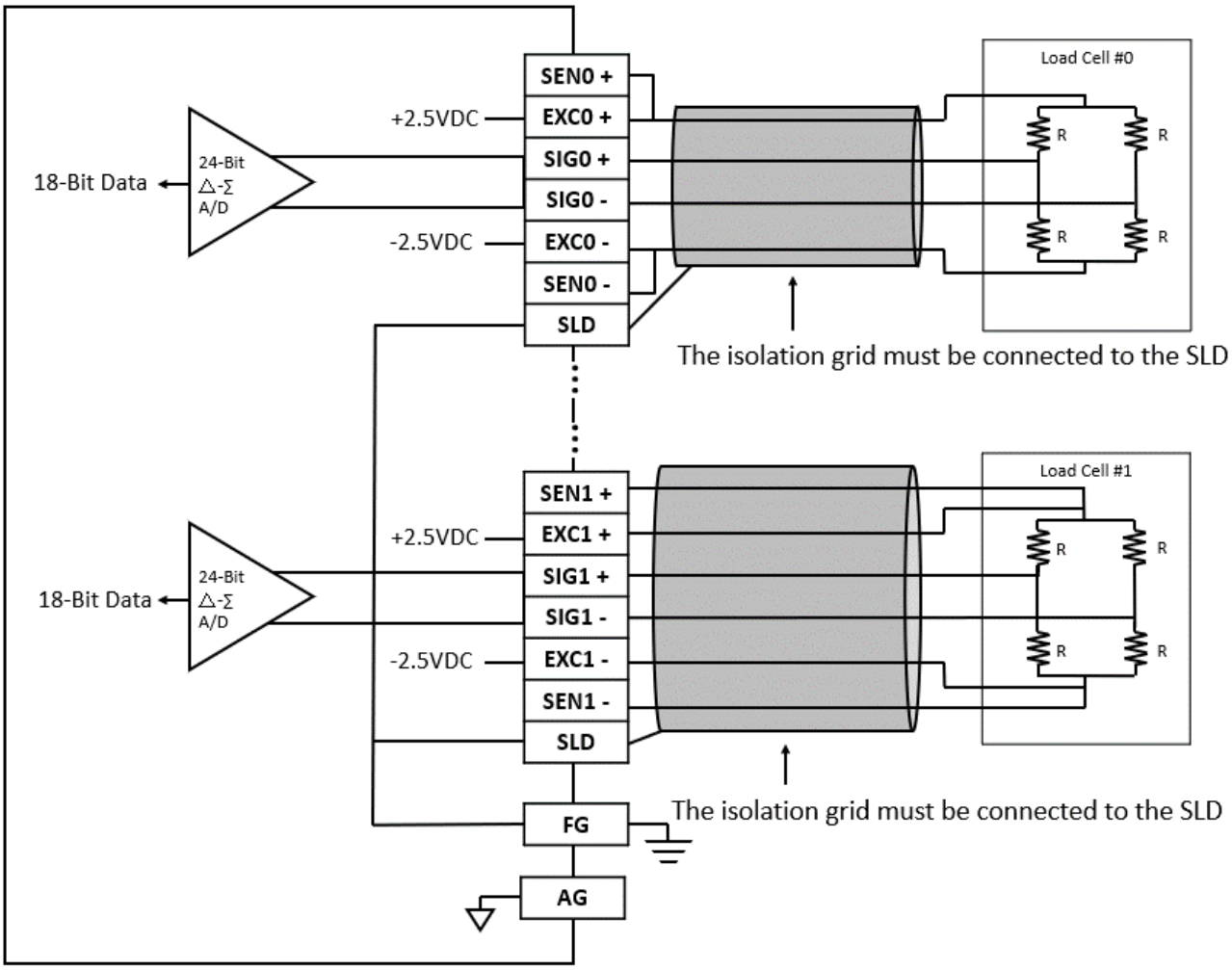
Vibration (Fixed by DIN RAIL)	5~8.4Hz Amplitude: 3.5 8.4~150Hz Constant acceleration:19.6m/s^2(2G) 10G, 10 times each along the 3 axes (IEC61131-2 Standard)
Shock	10G, 3 times each along the 3 axes
Noise Suppression	1500Vp-p · Width 1us
Withstand Voltage	1500 VAC 1 minute (Between power terminals and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



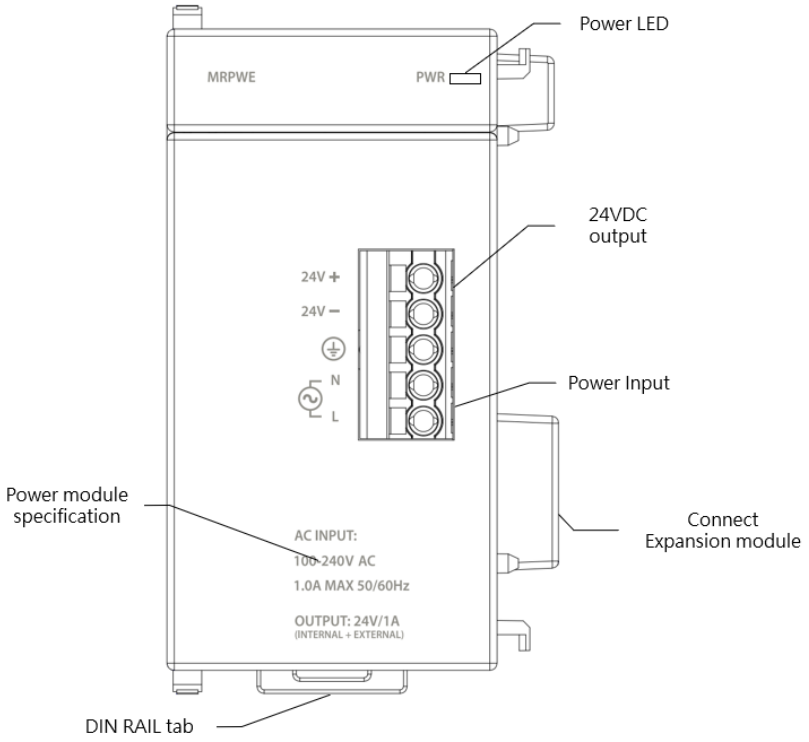
M02LCR Wiring

9-10 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.

9-10-1 MRPWE Specifications

Appearance and Function



MRPWE Appearance

Technical Specifications

MRPWE Technical Specifications Table

Item		Technical Specifications
Model		MRPWE
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℃
Relative Humidity		20 ~ 90% (non-condensing)
Altitude		≦2000m
Vibration (Fixed by DIN RAIL)		5~8.4Hz Amplitude: 3.5 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

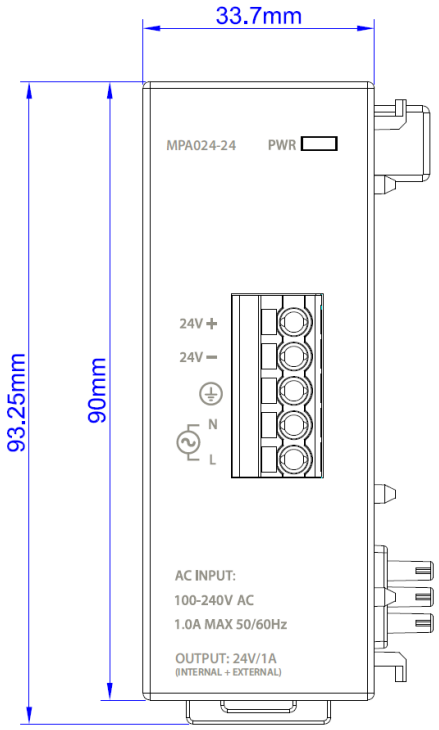
Name	instruction
PWR LED	Power ON: Green Light Power OFF: NO Lights

10

Chapter 10 Left Side Expansion Dimensions

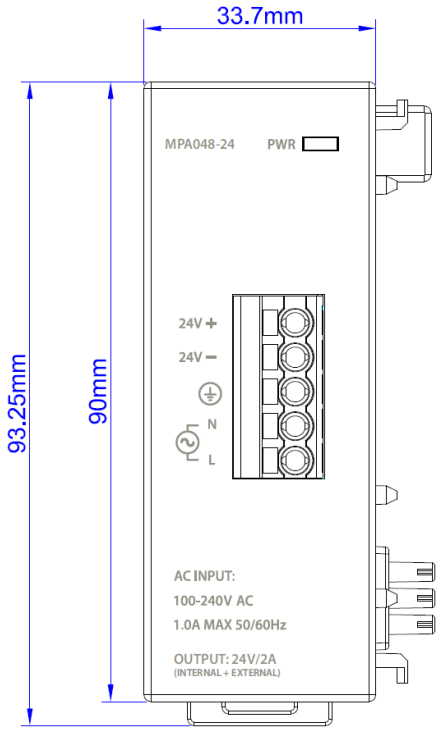
10-1 Power Module Dimensions

10-1-1 MPA024-24 Dimensions



MPA024-24 Dimensions

10-1-2 MPA048-24 Dimensions



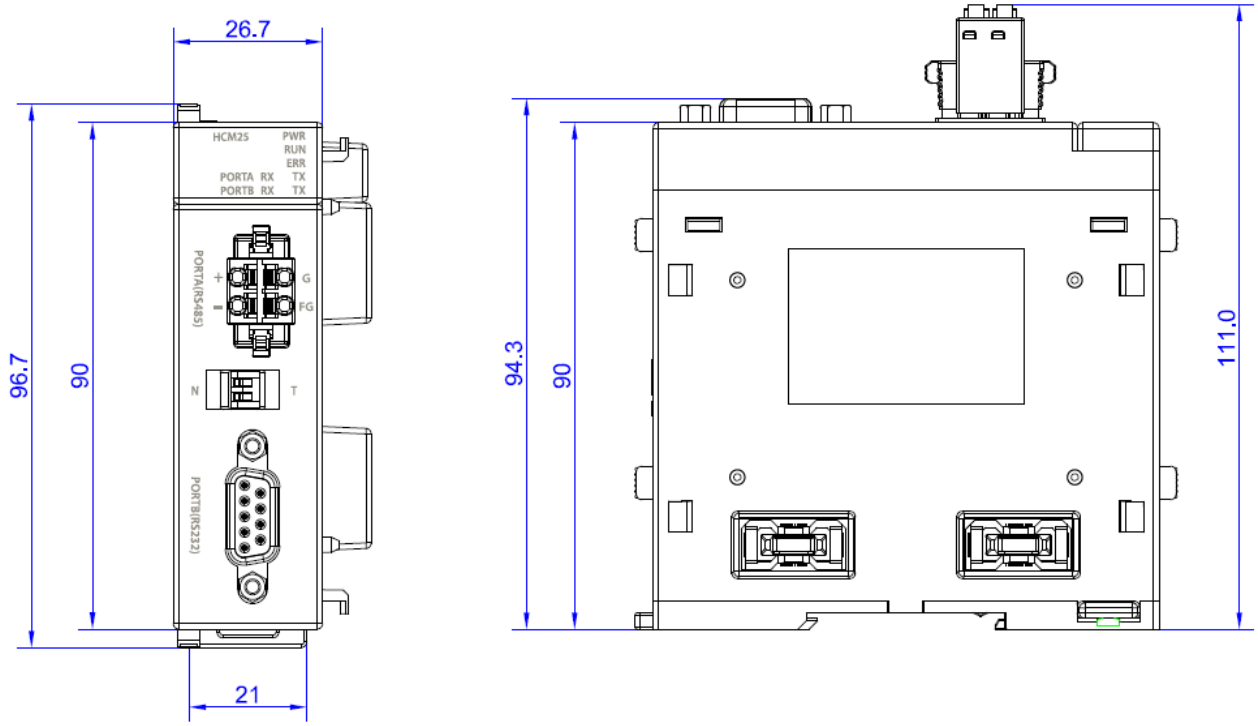
MPA048-24 Dimensions

11

Chapter 11 Right Side High-Speed Expansion Dimensions

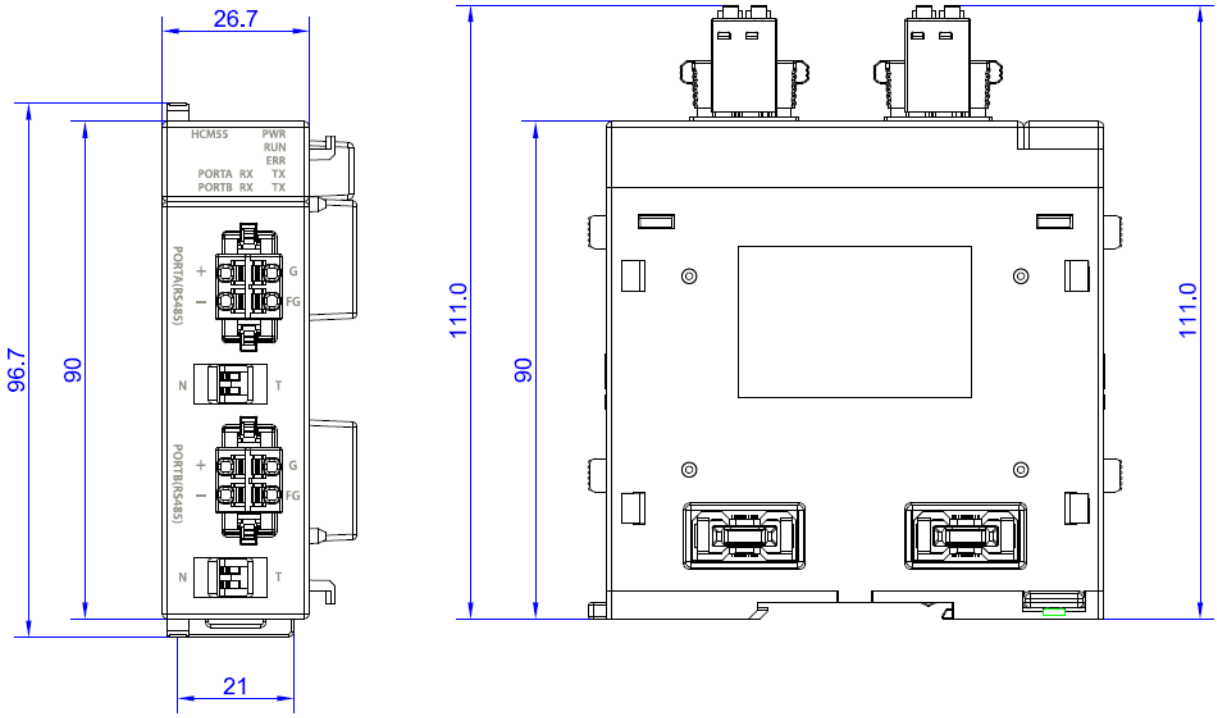
11-1 High Speed Communication Expansion Module Dimensions

11-1-1 MHCM25 Dimensions



MHCM25 Dimensions

11-1-2 MHCM55 Dimensions



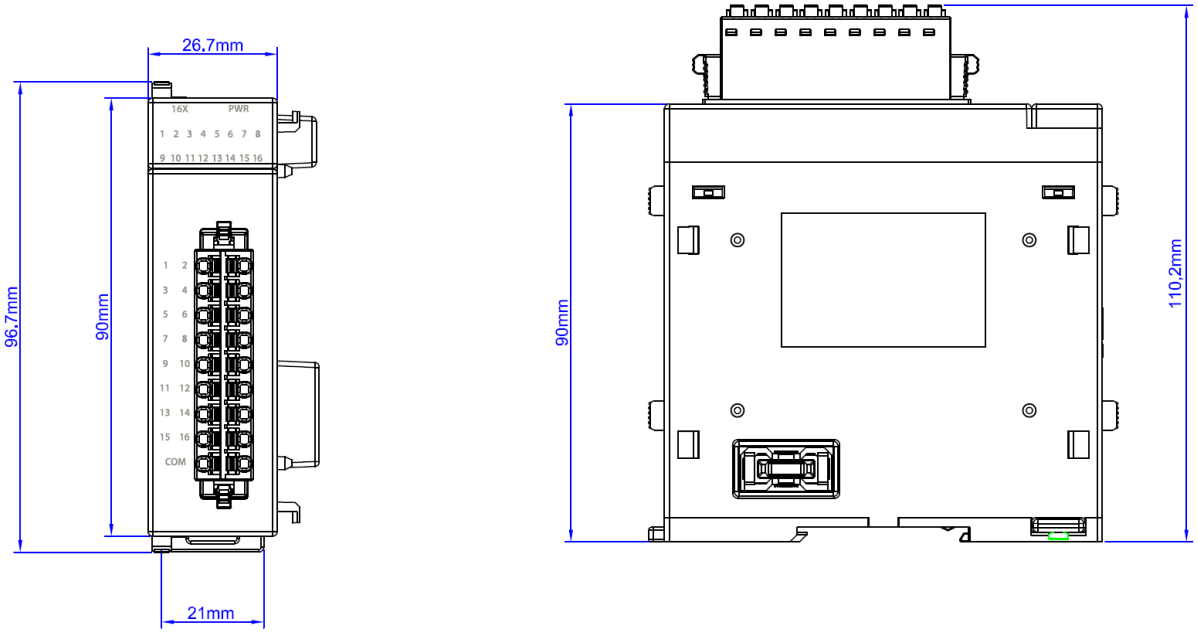
MHCM55 Dimensions

12

Chapter 12 Right Side Expansion Dimensions

12-1 Digital input Expansion Module Dimensions

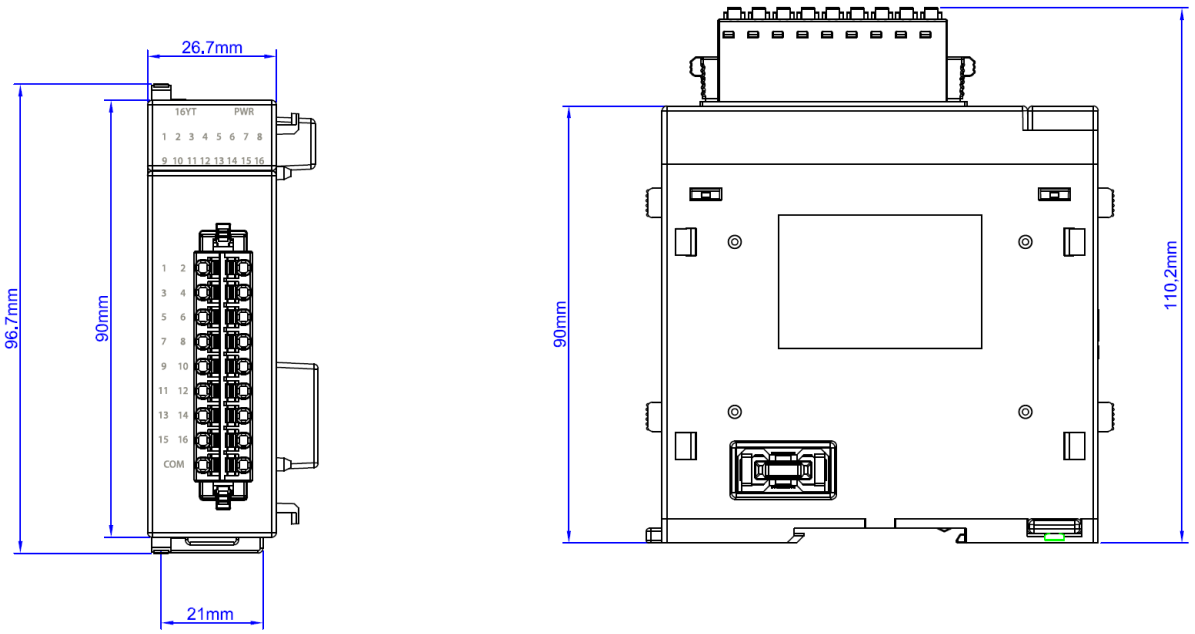
12-1-1 M16X Dimensions



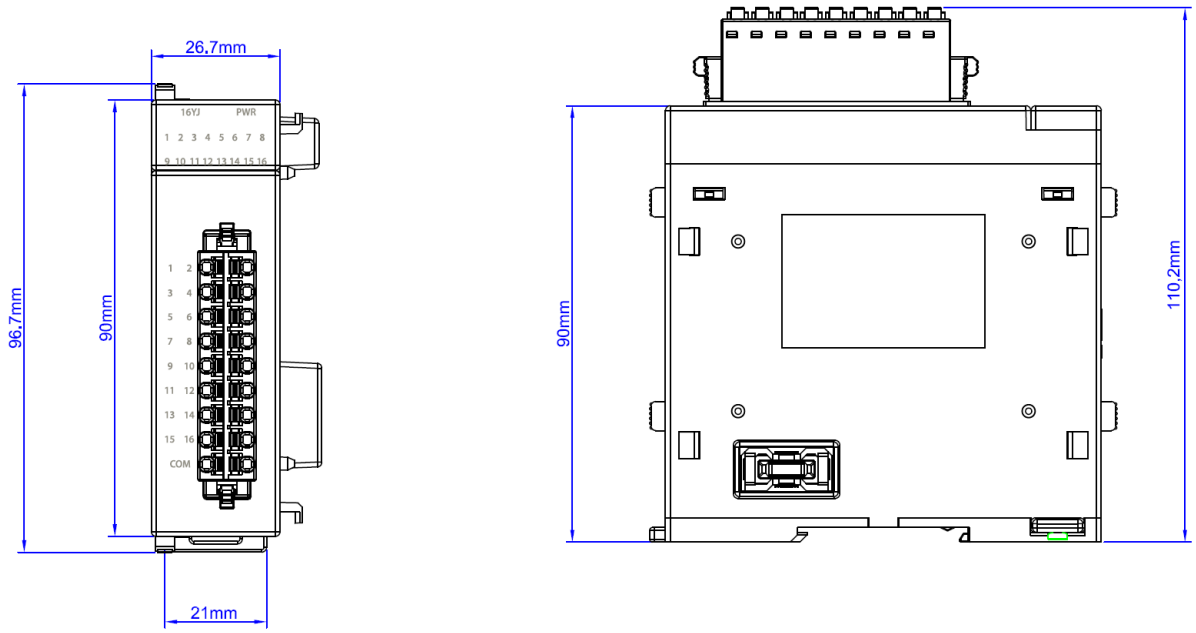
M16X Dimensions

12-2 Digital Output Expansion Module Dimensions

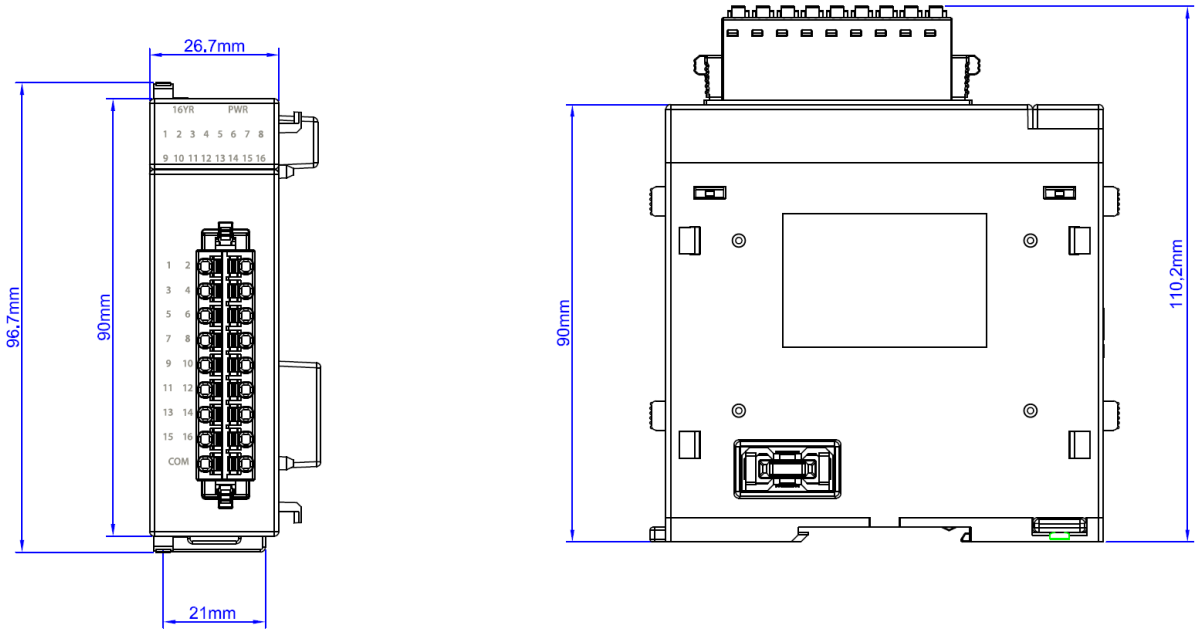
12-2-1 M16YT / M16YJ /M16YR Dimensions



M16YT Dimensions



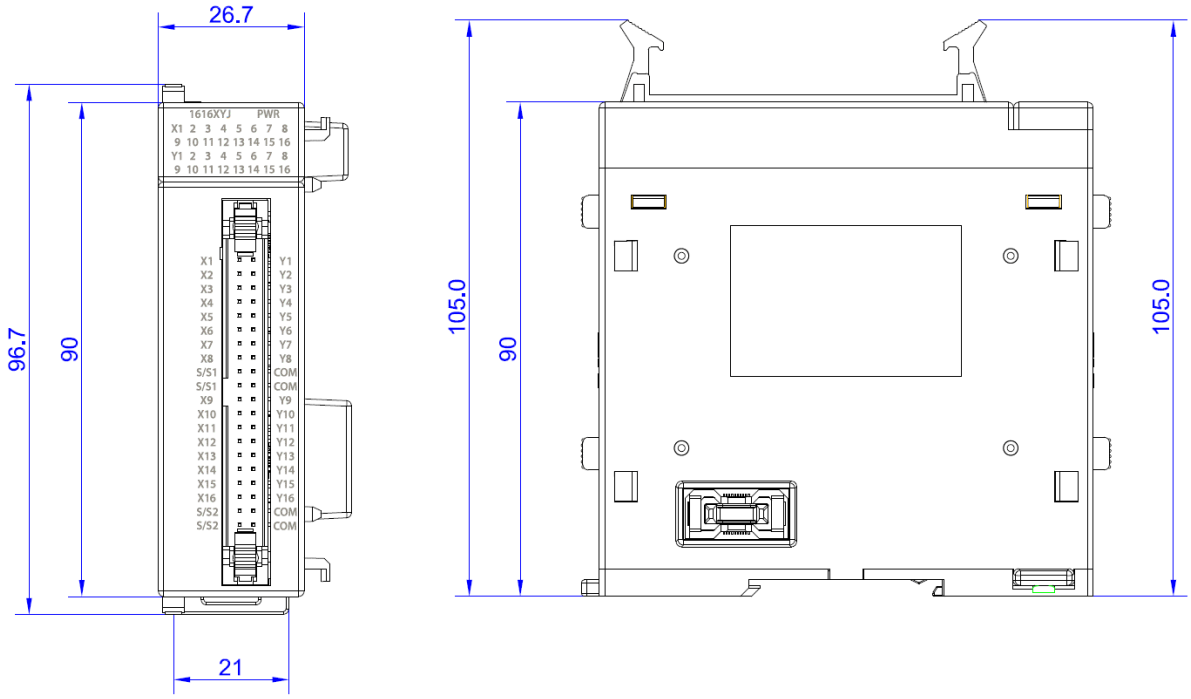
M16YJ Dimensions



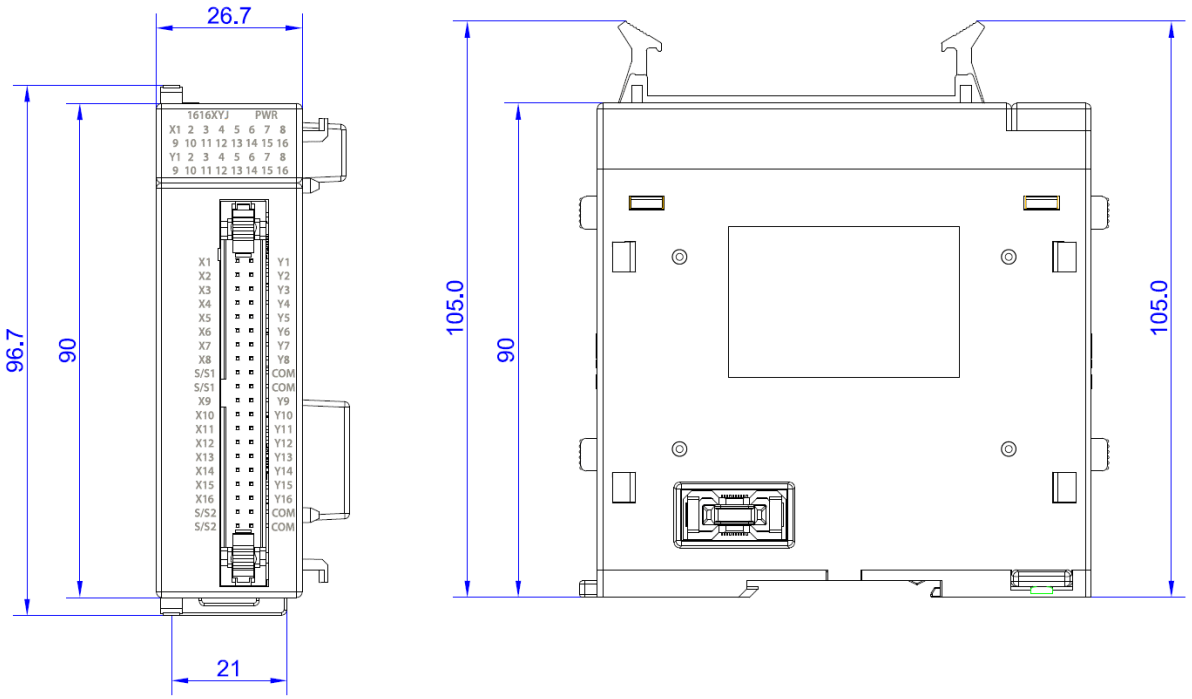
M16YR Dimensions

12-3 Digital Input/Output Combo Expansion Module Dimensions

12-3-1 M1616XYT / M161616XYJ Dimensions



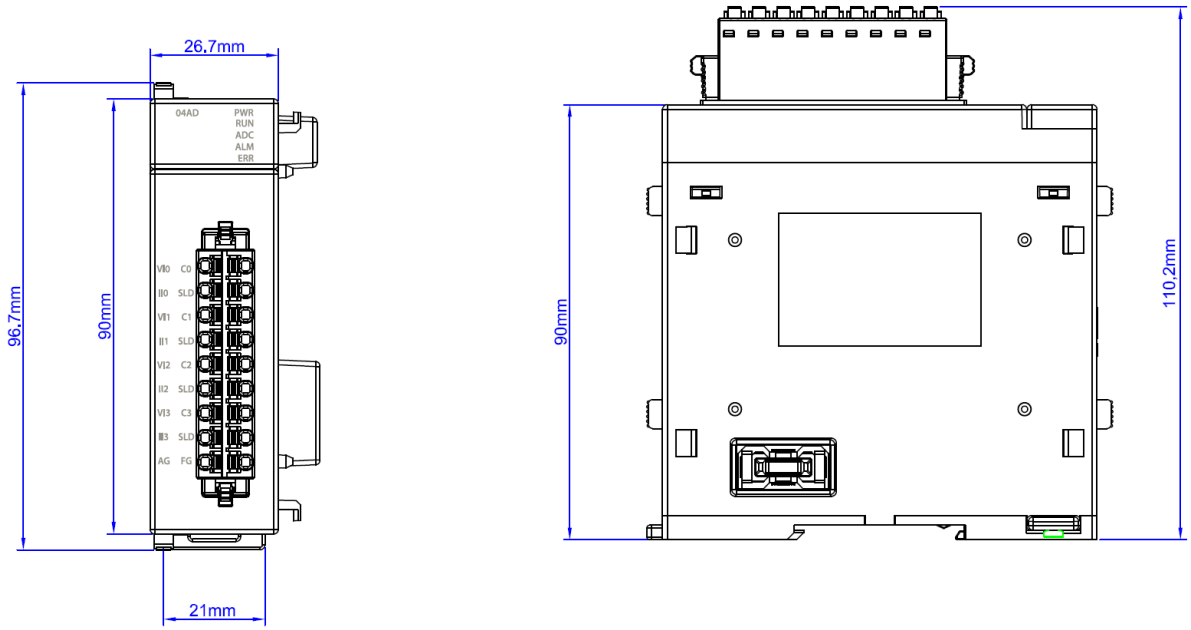
M1616XYT Dimensions



M1616XYJ Dimensions

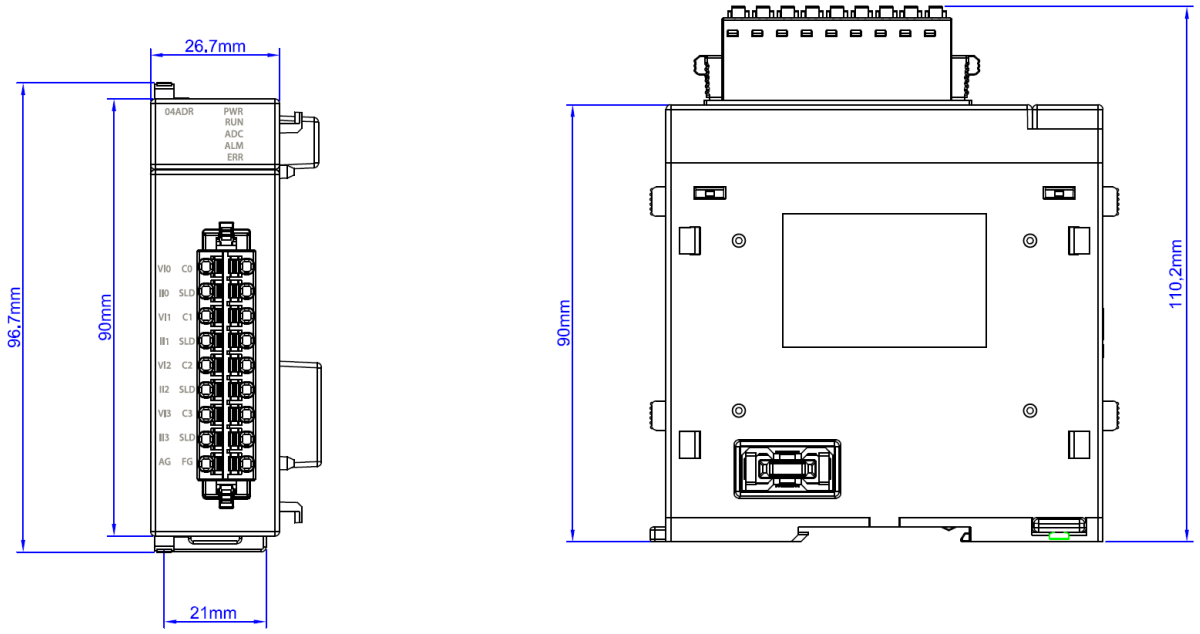
12-4 Analog Input Expansion Module Dimensions

12-4-1 M04AD Dimensions



M04AD Dimensions

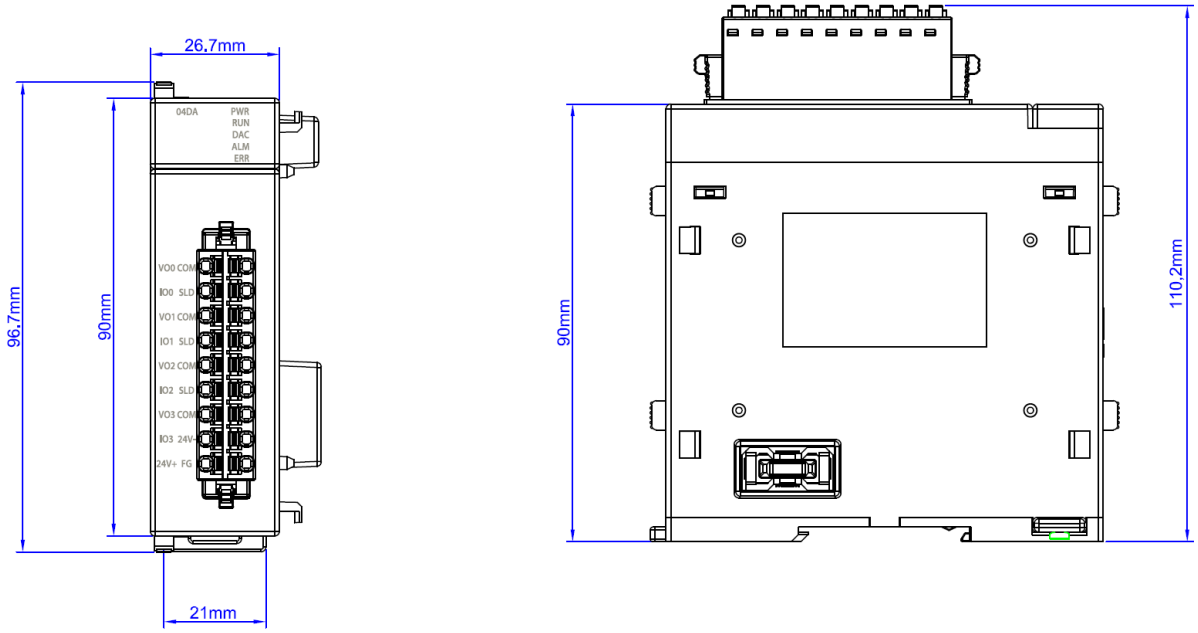
12-4-2 M04ADR Dimensions



M04ADR Dimensions

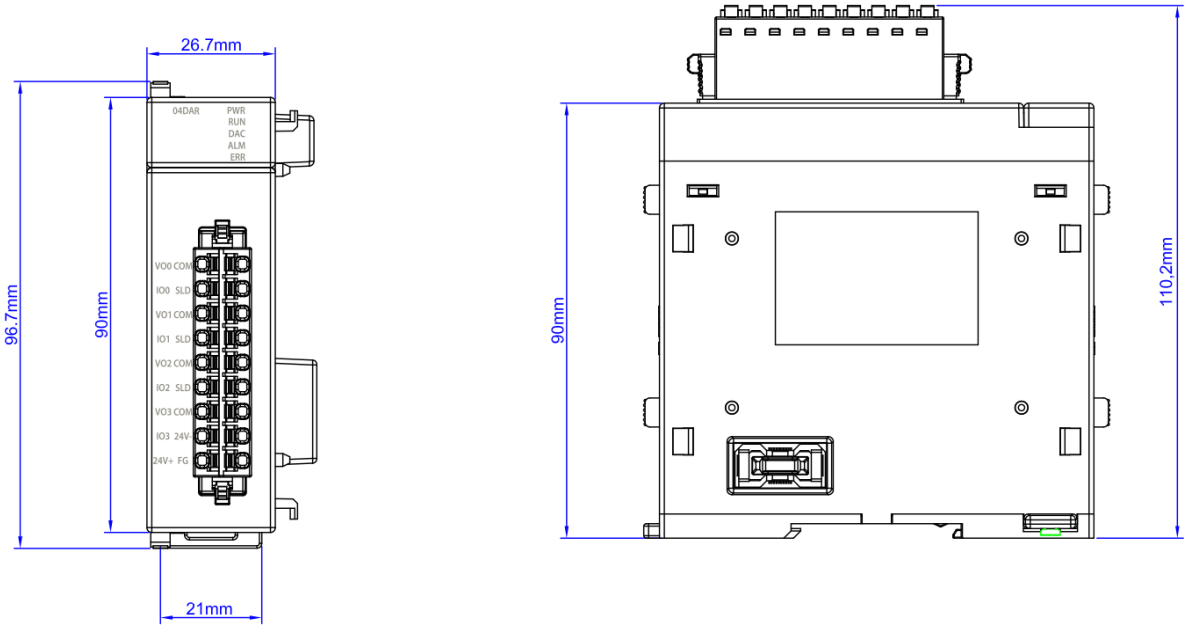
12-5 Analog Output Expansion Module Dimensions

12-5-1 M04DA Dimensions



M04DA Dimensions

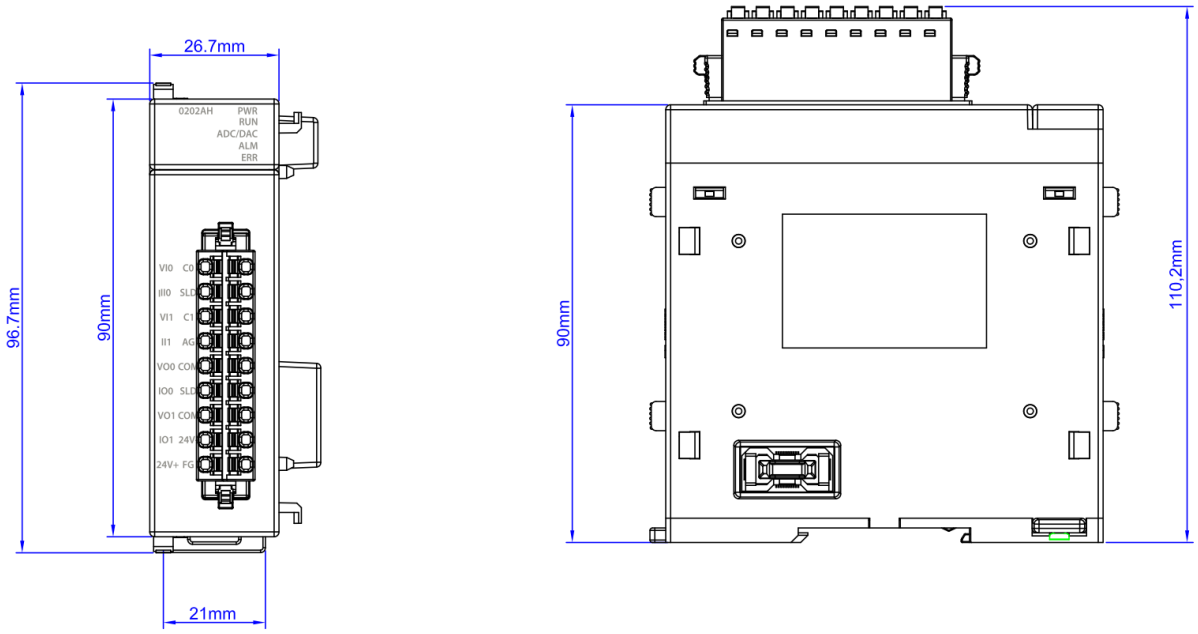
12-5-2 M04DAR Dimensions



M04DAR Dimensions

12-6 Analog Input/Output Combo Expansion Module Dimensions

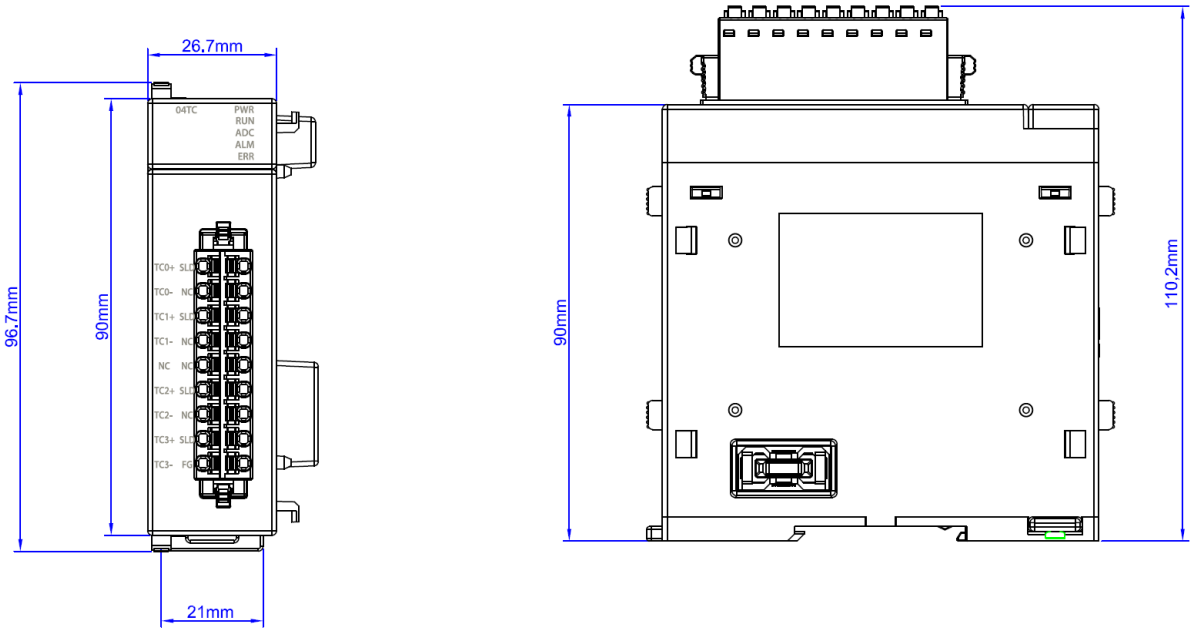
12-6-1 M0202AH Dimensions



M0202AH Dimensions

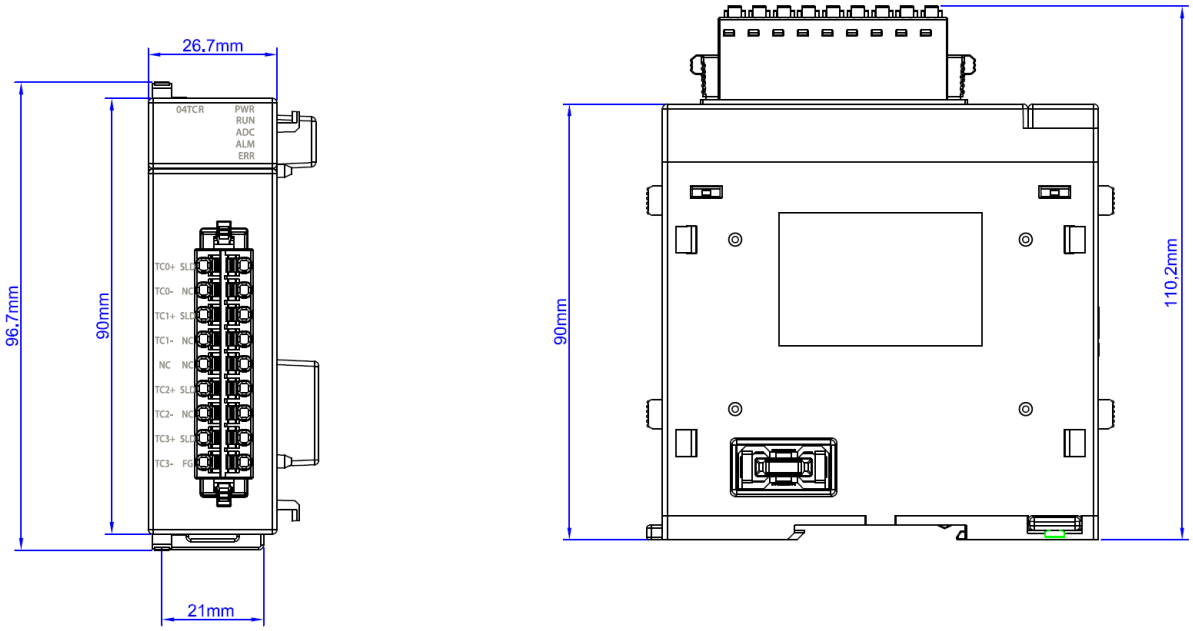
12-7 Temperature Expansion Module Dimensions

12-7-1 M04TC Dimensions



M04TC Dimensions

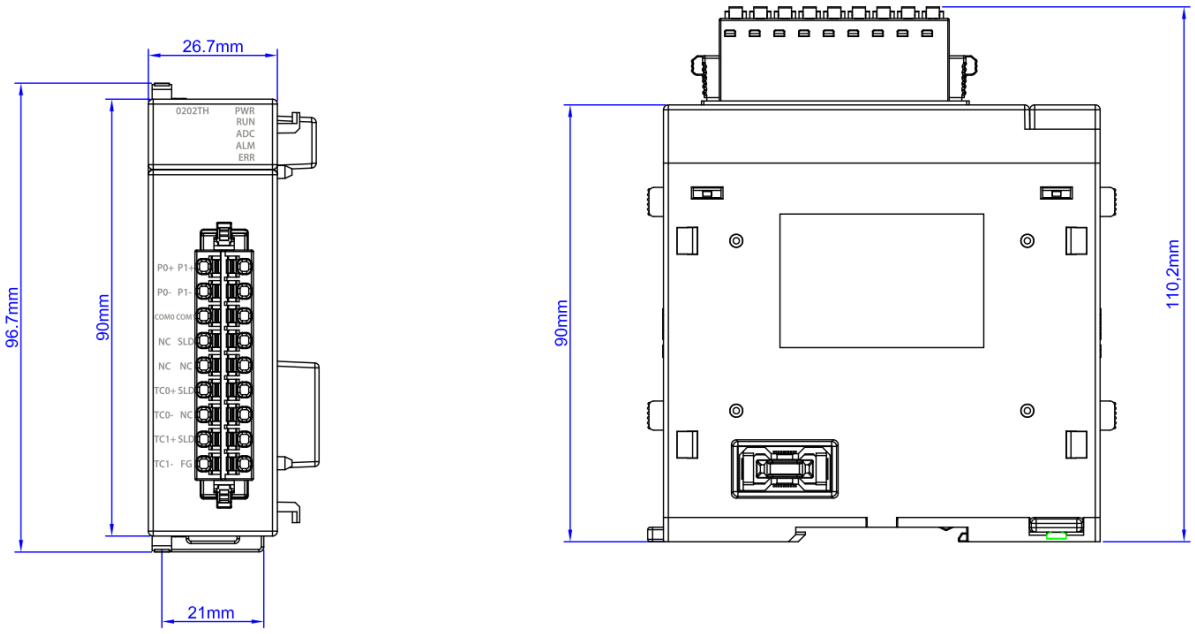
12-7-2 M04TCR Dimensions



M04TCR Dimensions

12-8 Temperature Combo Expansion Module Dimensions

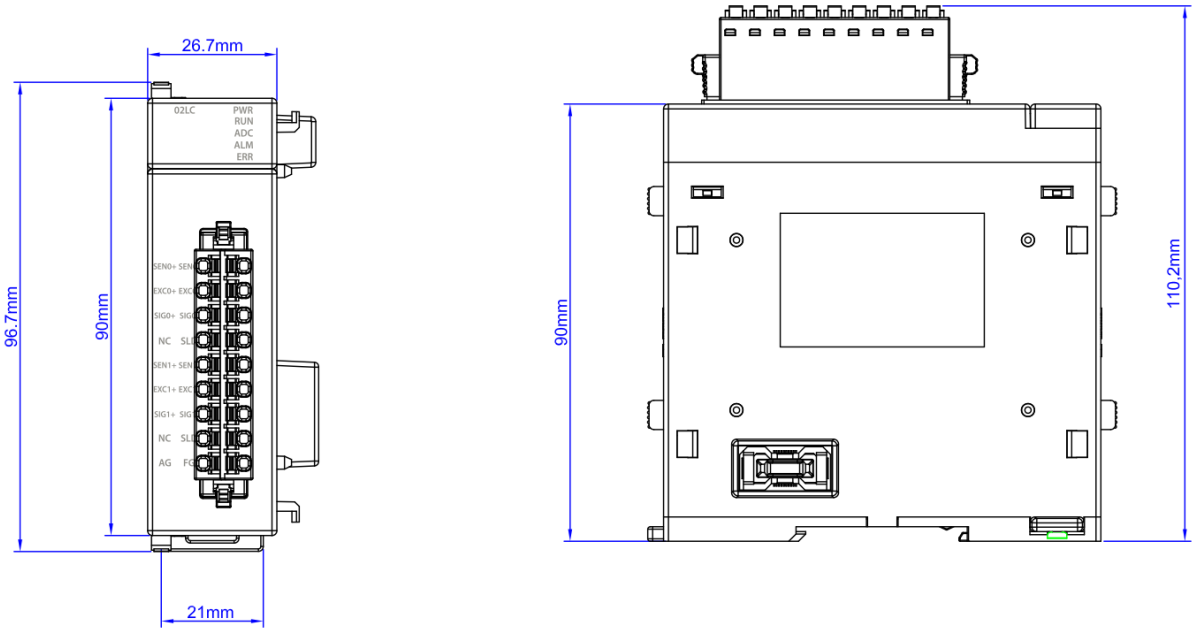
12-8-1 M0202TH Dimensions



M0202TH Dimensions

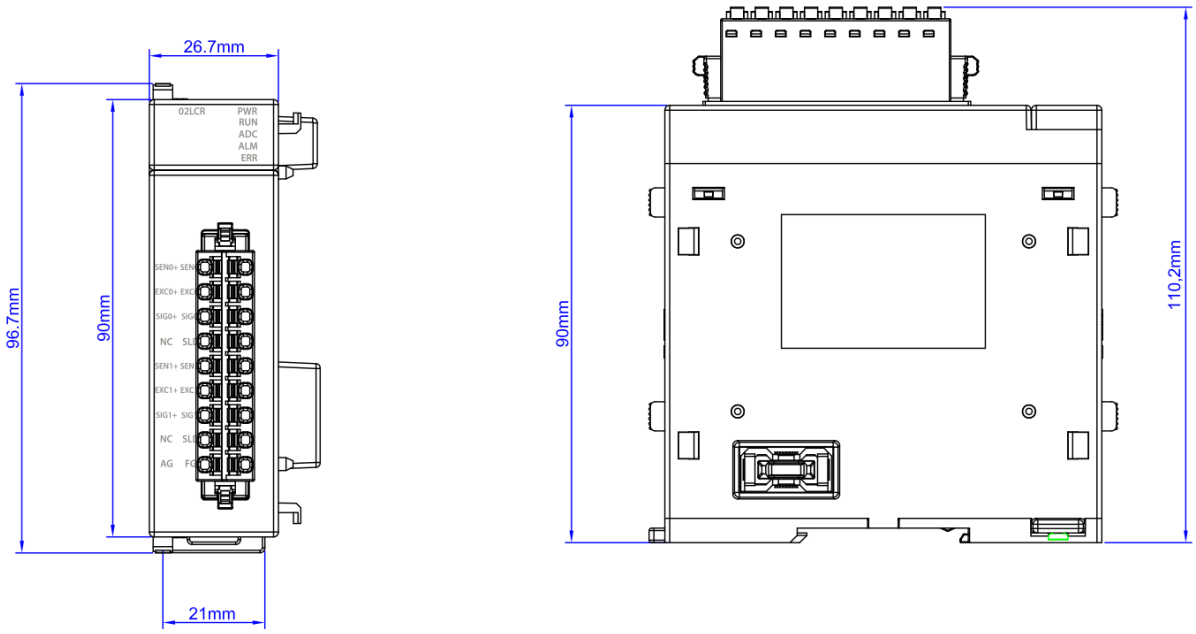
12-9 Load Cell Expansion Module Dimensions

12-9-1 M02LC Dimensions



M02LC Dimensions

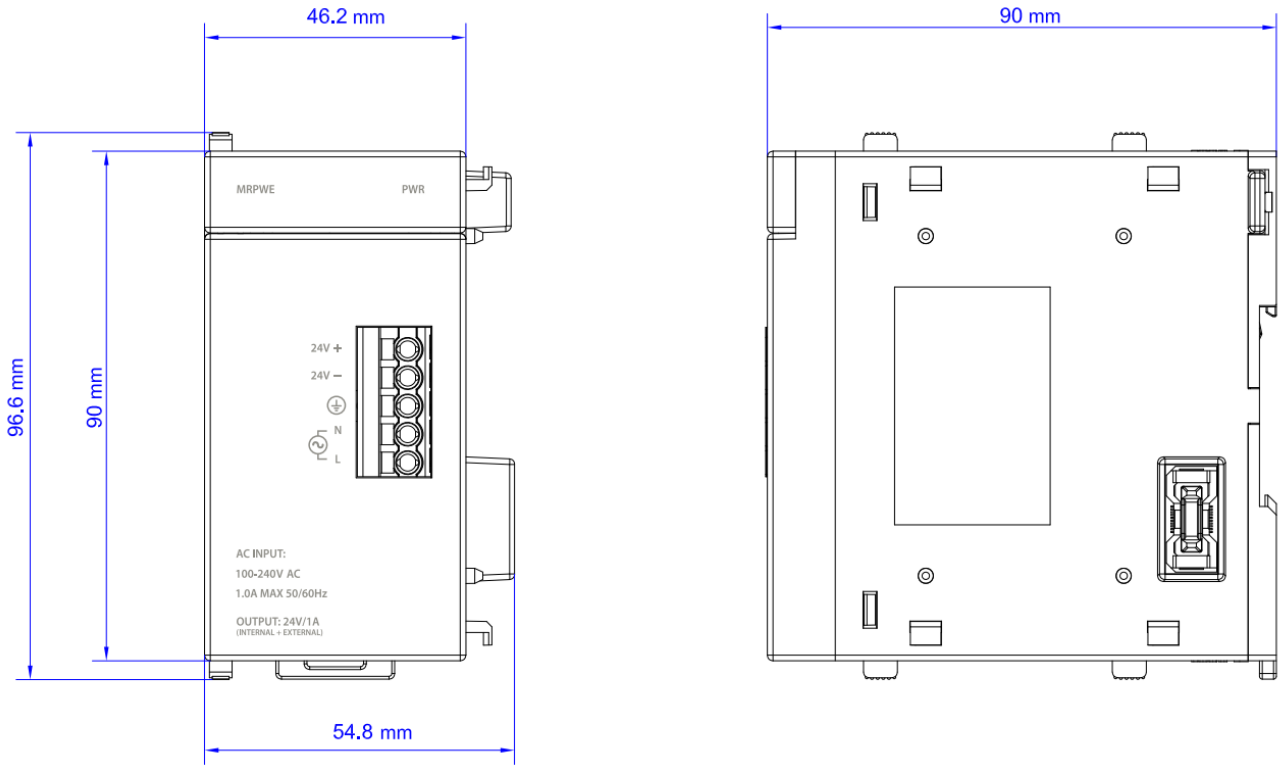
12-9-2 M02LCR Dimensions



M02LCR Dimensions

12-10 Repeater Expansion Module Dimensions#

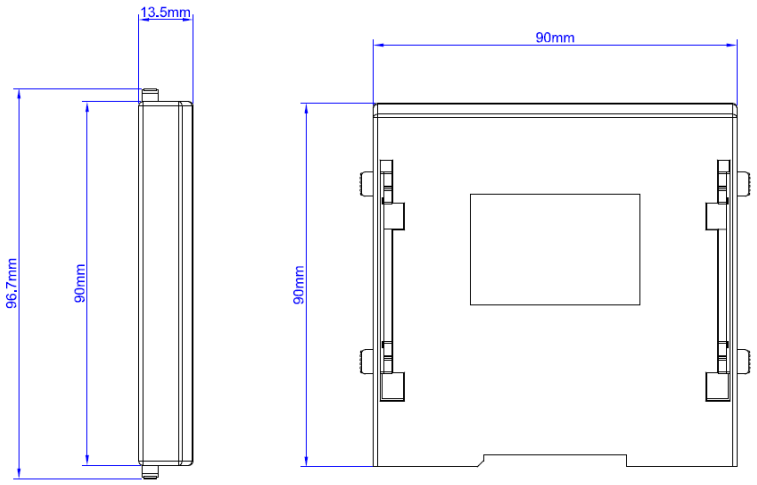
12-10-1 MRPWE Dimensions



MRE Dimensions

12-11 Terminal Cover Dimensions

12-11-1 MRE Dimensions



MRE Dimensions

13

Chapter 13 Expansion Module Troubleshooting

13-1 Digital Input Expansion Module Troubleshooting

Digital Input Expansion Module Troubleshooting Table

Error Code	Error State	ERR LED	Module behavior	Note

13-2 Digital Output Expansion Module Troubleshooting

Digital output Expansion Module Troubleshooting Table

Error Code	Error State	ERR LED	Module behavior	Note

13-3 Analog Input Expansion Module Troubleshooting

Analog Input Expansion Module Troubleshooting Table

Error Code	Error State	ERR LED	Module behavior	Note

13-4 Analog Output Expansion Module Troubleshooting

Analog Output Expansion Module Troubleshooting Table

Error Code	Error State	ERR LED	Module behavior	Note

13-5 Temperature Input Expansion Module Troubleshooting

Temperature Input Expansion Module Troubleshooting Table

Error Code	Error State	ERR LED	Module behavior	Note

14

Chapter 14 Repairs and Maintenance

14-1 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.

14-2 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.

14-2-1 Maintenance Tools

- Screwdriver
- Stain removing alcohol
- Cleaning cotton rag
- Swab

14-2-2 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.

14-3 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.

14-3-1 Maintenance Tools

- Screwdriver
- Stain removing alcohol
- Cleaning cotton rag
- Swab
- Multimeter
- Temperature gauge
- Hygrometer

14-3-2 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	Author
V1.0	2022/05/31	Draft	Albert