VM-4DA Module

Manual

V1.0
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VEICHI Electric Co., Ltd. provides customers with all-round technical support. Please contact the nearest office or service center, or directly contact the company headquarters.

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Preface

■ Profile

The VM-4AD is a 4-channel analog input module that supports voltage and current input modes with resolutions up to 16 bits. It can be used with VM series master station and VM series VM-RTU-ECT or VM-RTU-PN interface modules. This manual describes the mechanical installation of the product, electrical installation, troubleshooting, module programming examples and version matching instructions.

■ Other Files

File	Content
VM-RTU-ECT	Introduction of product installation, wiring, use and other details
VM-RTU-PN	Introduction of product installation, wiring, use and other details
VM-4AD/4DA/4PT/4TC	Introduction of product installation, wiring, use and other details

■ Version Change Log

Revision date	Version	Content
2023-3	A1.1	Minor error correction
2022-11	A1.0	First release of the manual

■ Manual Access

This manual is not shipped with the product, so users can get its PDF version in the following way:

- Visit our official website (www.veichi.com), navigate to "Service and Support-Download", then enter keywords to download the manual.
- Scan the QR code on the product body to get the manual with mobile phone.

■ Warranty Description

VEICHI Electric provides an 18-month warranty for product malfunctions or damages during normal usage, starting from the production date (confirmed by the body's barcode or party agreements). Charges apply after 18 months or for damages within the warranty period resulting from the conditions listed below:

- Product damages caused by not following the operating instructions in the manual.
- Product damages caused by fire, flood, and abnormal voltage.
- Product damages caused caused by abnormal applications.
- Product damages caused by exceeding the specified scope of use of products.
- Product damages caused by force majeure (natural disasters, earthquakes and lightning strikes).

The relevant service fee shall be calculated by the unified standard of the manufacturer. If there is a contract, terms in it will be of the highest priority.

Please refer to "Product Warranty Card" for details.

Precautions

■ Safety Statement

- Read and follow these safety precautions before installing, operating, and maintaining the product.
- Follow all safety precautions stated on the product's labeling and in the manual when installing, operating, and maintaining the product for personal and equipment safety.
- The "CAUTION", "WARNING" and "DANGER" items in this manual do not mean all safety precautions to be observed, but are only supplementary to safety precautions.
- This product shall be used in an environment that complies with the design specifications, otherwise it may cause malfunction, and malfunction or damage to parts caused by failure to comply with the relevant regulations are not covered by the product warranty terms.
- VEICHI will not take on any legal responsibility for personal safety accidents, property damage caused by unauthorized operation of the product.

■ Safety Level

:"DANGER": Failure to observe the precautions will cause deaths and serious personal injuries.

:"WARNING": Failure to observe the precautions will cause deaths and serious personal injuries.

:"CAUTION": Failure to observe the precautions may cause slight personal injuries or product damages.

Keep this manual in a safe place for future reference, and ensure it’s handed to the end user.

Control System

:

- Design safety circuits to maintain safe control system operation in case of external power supply failure or programmable controller malfunctions.
- Install external safety devices like fuses or circuit breakers to prevent module smoking or fire in cases of sustained overcurrent, exceeding the rated load current, or load short-circuiting.

:

- Provide emergency brake circuits, protection circuits, interlock circuits for forward and reverse operation, and upper and lower position interlock switches to prevent damage to the machine in the external circuits of the programmable controller.
- Design external protection circuits and safety mechanisms for output signals related to major accidents for safe operation of the equipment.
- The programmable controller CPU may stop all output when it detects an abnormality in its own system; when some of the controller's circuits fail, output may turn uncontrolled. Please design suitable external control circuits in order to ensure normal operation;
- Damage to output units such as relays and transistors of programmable controllers will cause their output uncontrolled to the ON or OFF state;
- The programmable controller is designed to be used in indoor, overvoltage class II electrical environments, and its power supply system should be equipped with lightning protection to ensure that lightning overvoltage is not added to the programmable controller's power input or signal input, control output and others, so as to avoid damage to the equipment.

Installation

WARNING:

- Only maintenance professionals with adequate electrical knowledge and training related to electrical equipment should carry on installation work;
- For module removal and installation, the external supply power to the system must be fully disconnected in advance. Failure to fully disconnect may result in electric shock, module malfunction or misoperation;
- Do not use the programmable controller in the following places: places with dust, grease, conductive dust, corrosive gases, flammable gases; places exposed to high temperature, condensation, wind and rain; and places subject to vibration and shock. Electric shock, fire, and misuse can also cause damage and deterioration to the product;
- Programmable controllers are open type devices, please install them in control cabinets with door locks (protection of the control cabinet housing > IP20), and only operators who have been trained with sufficient electrical knowledge about equipments shall open the control cabinets.

CAUTION:

- Avoid metal shavings and wire ends falling into the ventilation holes of the controller during installation, which may cause fire, malfunction, and misoperation;
- Ensure that there is no foreign matter on its ventilation surface after installation, otherwise it may lead to poor heat dissipation, which may cause fire, malfunction, and misoperation;
- Connect the modules tightly to their respective connectors and lock the module connection hooks securely. Improper installation of the module may result in malfunction, malfunction and disconnection.

Wiring

DANGER:

- Wiring of this product should only be carried out by specialized maintenance personnel with adequate electrical knowledge and training related to electrical equipment;
- During wiring, the external supply power to the system must be fully disconnected in advance. Failure to do so may result in electric shock or equipment failure or malfunction;
- The cable terminals should be well insulated to ensure that the insulation distance between the cables is not reduced after the cables are installed in the terminal block. Failure to do so may result in electric shock or equipment damage.
- The cable terminals should be well insulated to ensure that the insulation distance between the cables is not reduced after the cables are installed in the terminal block. Failure to do so may result in electric shock or equipment damage.

CAUTION:

- To avoid electric shock, disconnect the power supply before connecting the power supply to this product;
- The input power supply of this product is DC24V, if the supplied power is not within ±20% of DC24V, this product will be seriously damaged. Therefore, please check whether the DC power supply provided by the switching power supply is stable or not regularly.

Maintenance

CAUTION:

- Only specialized maintenance personnel with adequate electrical knowledge and training related to electrical equipment shall carry out the operational maintenance of the product;

- When cleaning the module or re-tightening the bolts on the terminal strip or connectors, the external power supply to the system must be completely disconnected. Failure to do so may result in electric shock;
- When disassembling a module or making connections to or removing communication cables, the external supply power to the system must first be completely disconnected. Failure to fully disconnect may result in electric shock or malfunction.

Safety Recommendations

- Please consider the manual installation or other spare methods that are separate from PLC to stop or start the system when there are mechanical parts that will be touched directly by operators like position of loading/unloading tools or parts with auto running function.
- If it is necessary to modify the programs while the system is in operation, please consider to add locks or other safeguards to ensure that only authorized personnel can make the necessary modifications.

Scrapping

:

- Dispose of this product as industrial waste, and the batteries should be handled separately in accordance with local laws and regulations;
- Dispose of equipment and products in accordance with industrial waste disposal standards to avoid environmental pollution.

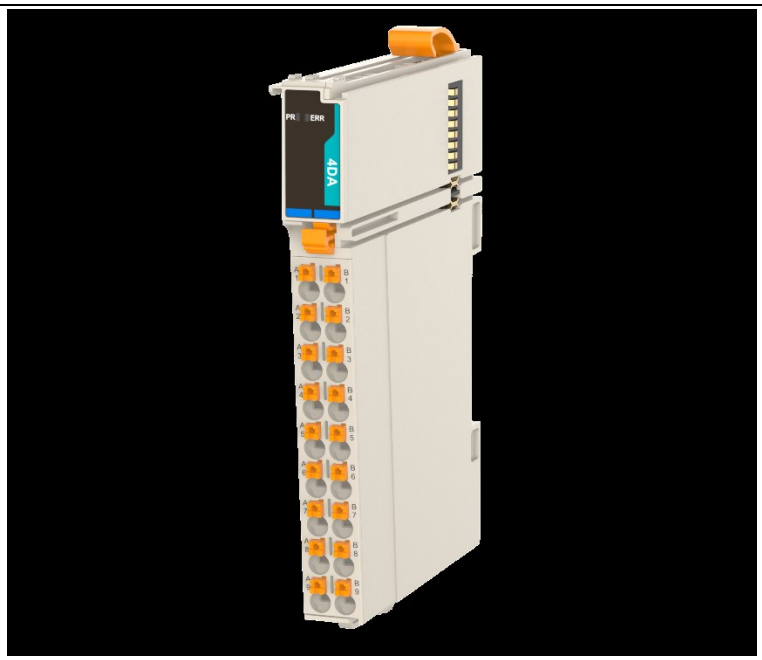
1 Product Information

1.1 Naming Rules and Nameplate

VM – 4 DA

⓪ ① ②

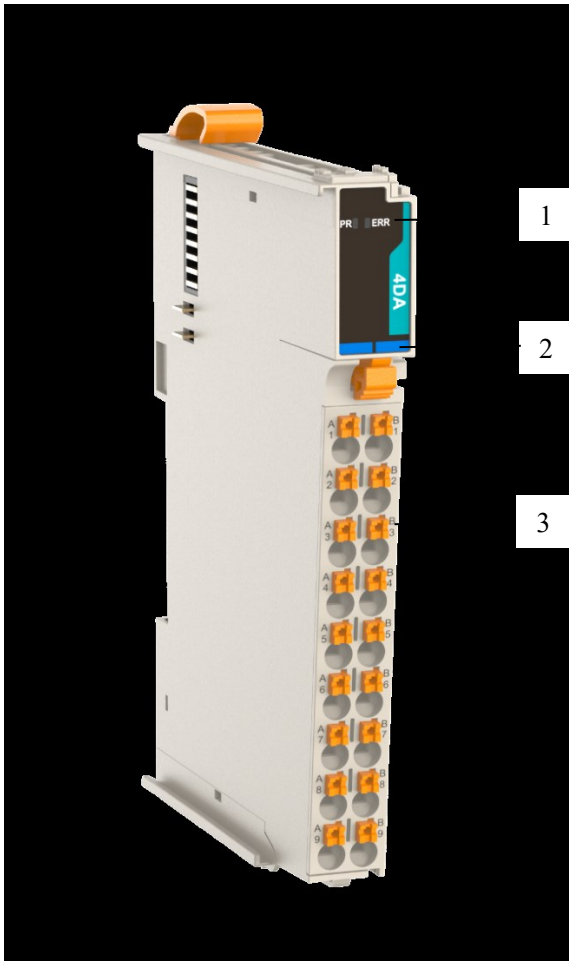
⓪ Product Information VM: VEICHI Flexible Series IO Module
① IO input channel 4: Channel 8: Channel
② Module type AD: Analog input DA: Analog output PT: RTD temperature detection TC: Thermocouple temperature detection



The relevant ordering data for this product is shown in the table below based on the above naming rules and nameplate information:

Model	Description	Machine code	Application
VM-4DA	VM series VM-4DA, with 4-channel AI module, supports voltage/current output mode.		VM-series PLC, VM-series coupler

1.2 Component Description



No.	Interface	Definition			
1	Signal indicator	PR (POWER+RUN)	Power and Run indicator	ON (green)	Module is working properly.
				OFF	Module is abnormal.
				Flash (green)	Module is in ready or stop state.
		ERR	Error indicator	ON (red)	Module is in error state.
2	Color	Yellow: IO input		Red: IO output	
		Green: analog input		Blue: analog output	
		Orange: temperature measurement input			
3	User terminal	See the terminal definition for details.			

1.3 Technical Specification

1.3.1 Power Specification

Item	Specification
Rated voltage of terminal input voltage	24V DC (20.4V DC~ 28.8V DC)
Rated current of terminal input power	100mA (typical at 24V)
Rated voltage of bus input power	5V DC (4.75V DC~5.25V DC)
Rated current of bus input power	85mA (typical at 5V)
Power isolation	Relative isolation between 24V and 5V
Rated voltage of terminal output power	None
Rated current of terminal output power	None
Module hot-swap function	Not available

1.3.2 Output Specification

Item	Specification
Output type	Analog Output
Output mode	Voltage/current
Output channel	4
Resolution	12-bit
Conversion time	1ms/channel
Voltage output range	±10V, 0V~10V, ±5V, 0V~5V, 1V~5V
Voltage output impedance	1KΩ
Voltage output accuracy (25°c)	±1% (full scale)
Voltage output accuracy (full temperature range)	±1% (full scale)
Current output range	0mA~20mA, 4mA~20mA
Current output impedance	0Ω~600Ω
Current output accuracy (25°c)	±1% (full scale)
Current output accuracy (full temperature range)	±1% (full scale)
Isolated or not	Not isolated: interface channels; Isolated: power and interface, interface and bus.
Output display	None
Output derating	None

1.3.3 Software Specification

Item	Specification
Independent terminal configuration	YES
Diagnosis report configuration	YES

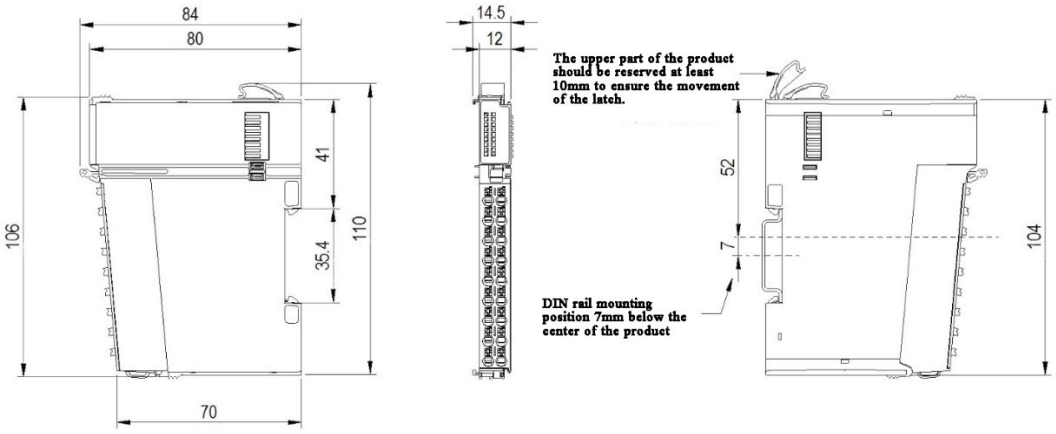
Conversion mode configuration	±10V, 0V~10V, ±5V, 0V~5V, 1V~5V, 0mA~20mA, 4mA~20mA
Filter parameter configuration	Range: 0~255, no unit
Peak holding enable configuration	YES
Conversion digital range configuration	-20,000~20,000, -32,000~32,000, -27648~27648
Sampling time	4-channel 1ms
Sampling refresh	Asynchronous refresh according to sampling time, synchronous refresh according to bus cycle not required
Stop mode	Keep the current value and no more refresh

2 Mechanical Installation

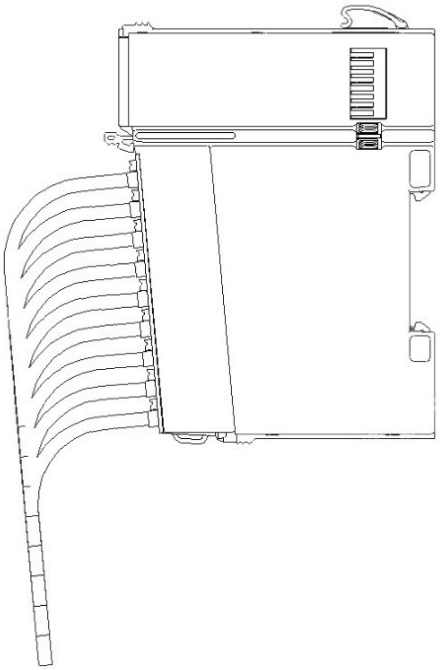
2.1 Mounting Dimensions

2.1.1 Module

Mounting dimension information is shown below in (mm).



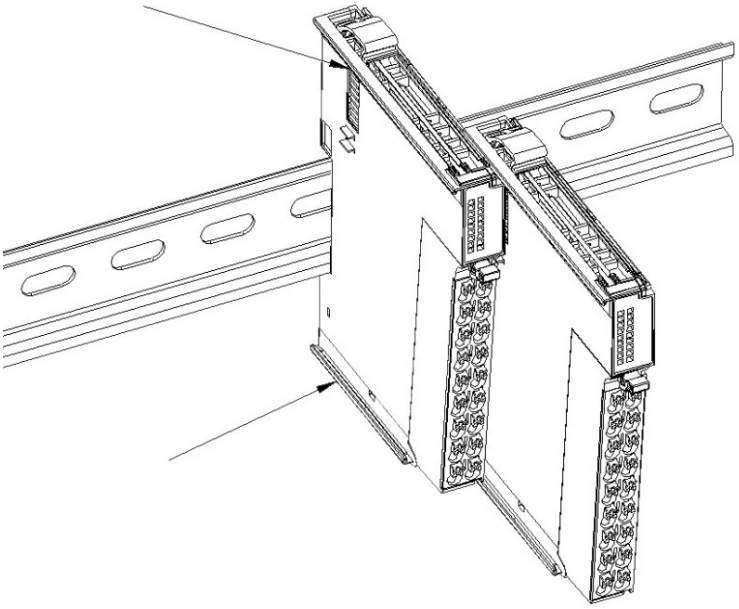
2.1.2 Connection Cable



2.2 Installation

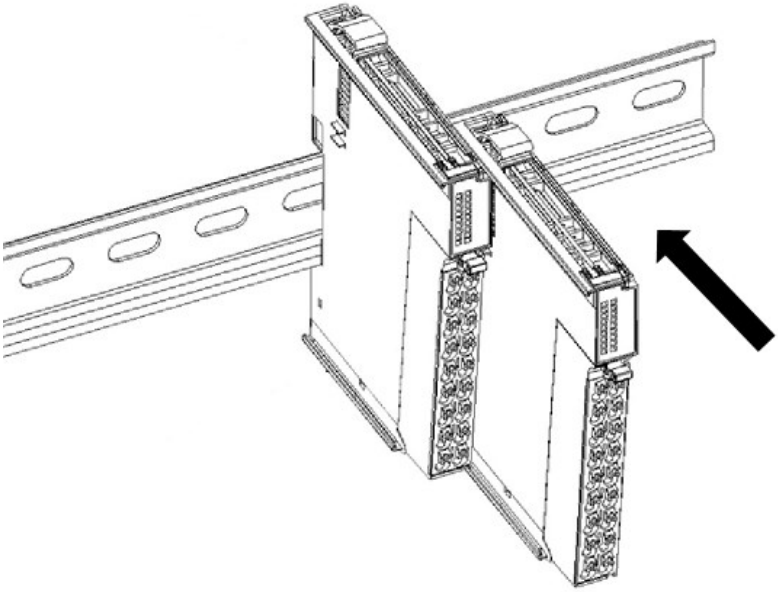
2.2.1 Inter-module Installation

Inter-module assemblies are slide-mounted via the top and bottom rails.



2.2.2 Rail Installation

DIN rail mounting is adopted here. When installing, align the module with the DIN rail and press the snap until there is a clear click sound. As shown in the figure below:

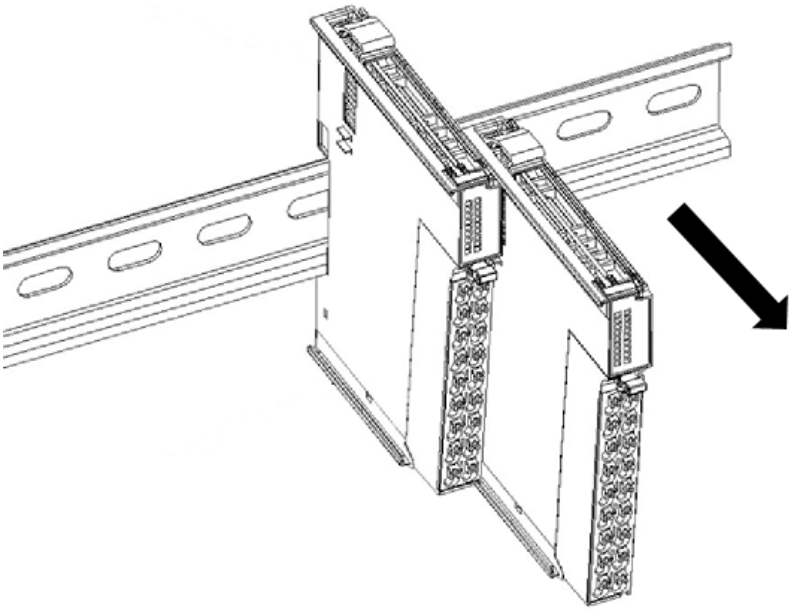


Note: Push the rail snaps first to open state, place the module onto the DIN rail, press down the top of the snaps with your hand until it is in place. Install a DIN rail clamp on each end of the main unit or module. During installation, hook the bottom of the rail clamp to the bottom of the rail and then rotate the rail clamp

so that the top end of the rail clamp is hooked to the top end of the rail, and finally tighten the screws to lock the rail clamp.

2.2.3 Disassembly

Push the rail snap with your finger and pull the module out in the direction away from the DIN rail.



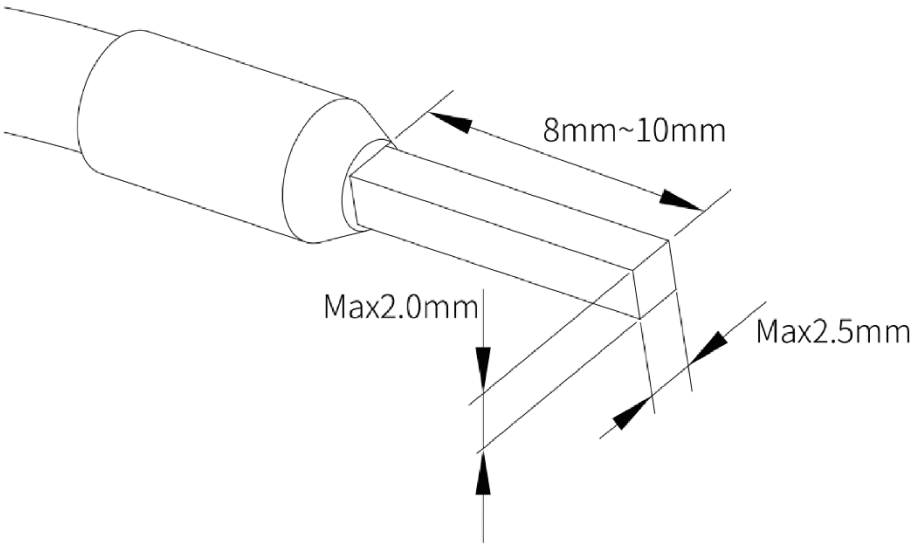
3 Electrical Installation

3.1 Cable Selection

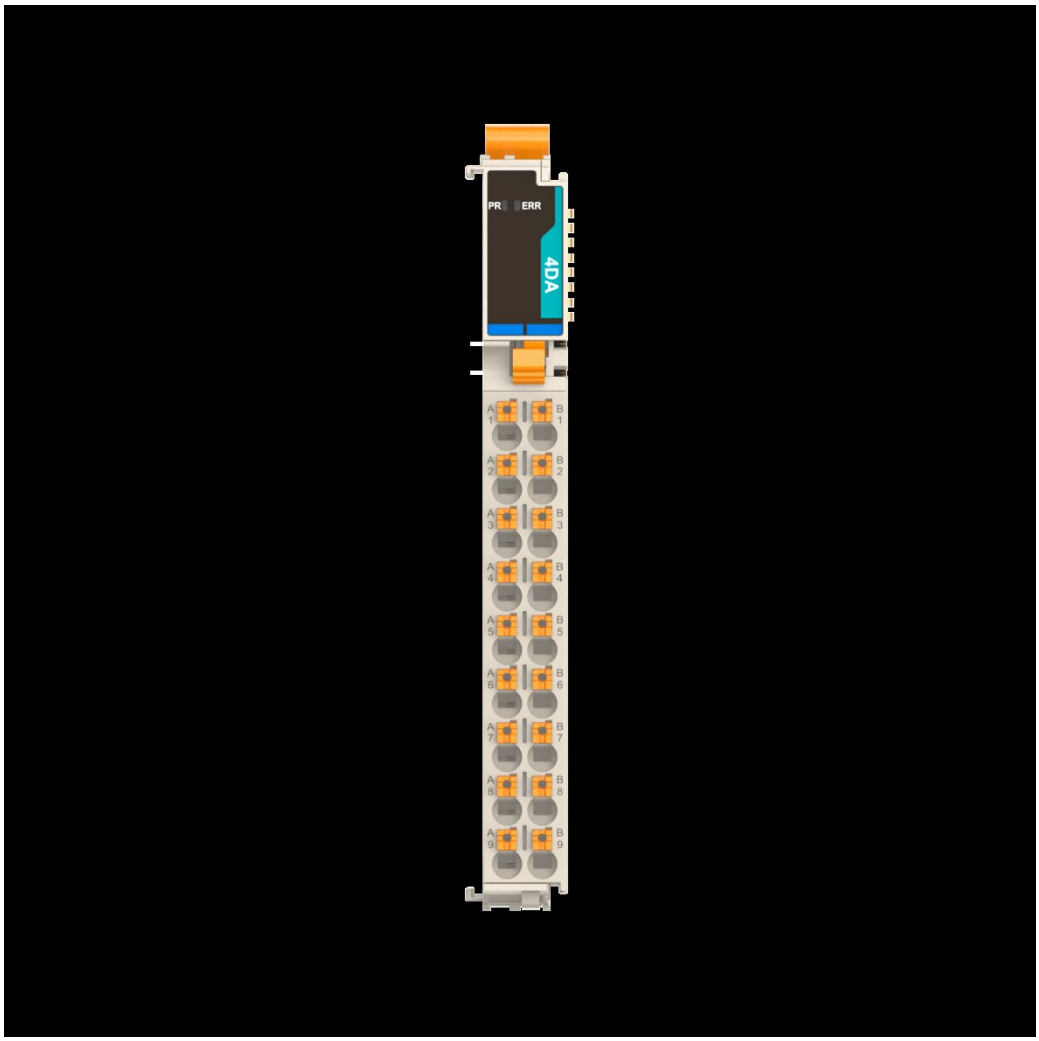
In the following table, the lug diameter is for reference only, which can be calculated reasonably according to actual use and adjusted separately.

Material name	Wire diameter	
	GB/mm^2	ANSI/AWG
Tubular lug	0.3	22
	0.5	20
	0.75	18
	1.0	18
	1.5	16

If other tubular lugs are used, press them to the twisted cables. The shape and size requirements are as shown in the following figure.



3.2 Terminal Definition



Left signal	Left terminal	Right terminal	Right signal
V0+	A1	B1	V1+
I0+	A2	B2	I1+
V0-	A3	B3	V1-
V2+	A4	B4	V3+
I2+	A5	B5	I3+
V2-	A6	B6	V3-
-	A7	B7	-
PE	A8	B8	PE
24V	A9	B9	COM

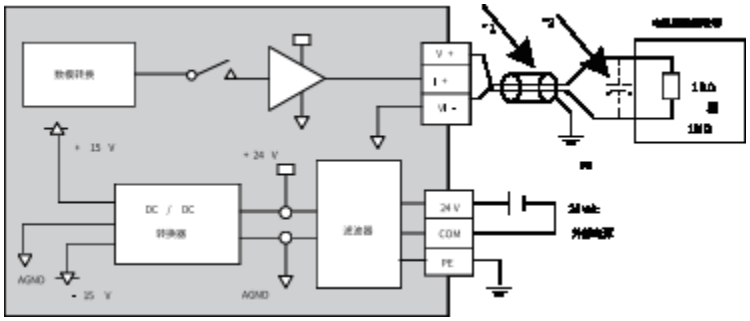
3.3 Terminal Wiring

3.3.1 Wiring Precautions

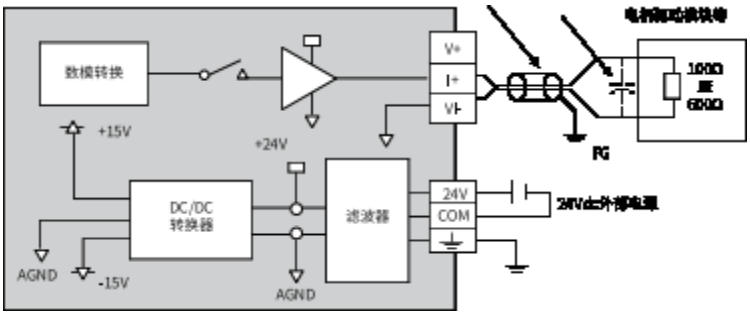
For extension cable wiring, prevent power lines (high voltage, high current) and other bundled cables which transmit strong interfering signals, from surge and inductive influences. Please separate the wires and avoid parallel wiring. Otherwise there may be additional noise. Use the recommended cables and adapter boards to connect, and the expansion cable is recommended to use shielded cables to improve anti-interference capability. A single-point soldering should be applied to the shielding layer of the shielded wire.

3.3.2 Output Terminal Wiring

Voltage output:



Current output:



Note:

*1 Two-core twisted shielded wire is used for analog signal lines.

*2 If external wiring has noise or ripple, connect a 0.1uF to 0.47uF/25V capacitor between the V+/I+ terminals and VI-.

4 Troubleshooting

When the module ERR indicator is lit, the module is in malfunction. If there is a fault code reported by the module at this time, the fault code can be obtained through the diagnostic data object dictionary value in the “Online CoE” interface as shown in the figure below, and the definition of the object dictionary is shown in the table below.

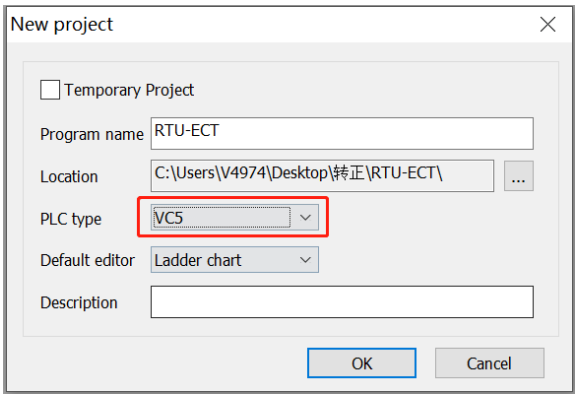
4.1 Module Fault Code

Fault code	Description	Solution
0x5003	24V external power supply dropout	Check the module's isolated power supply.

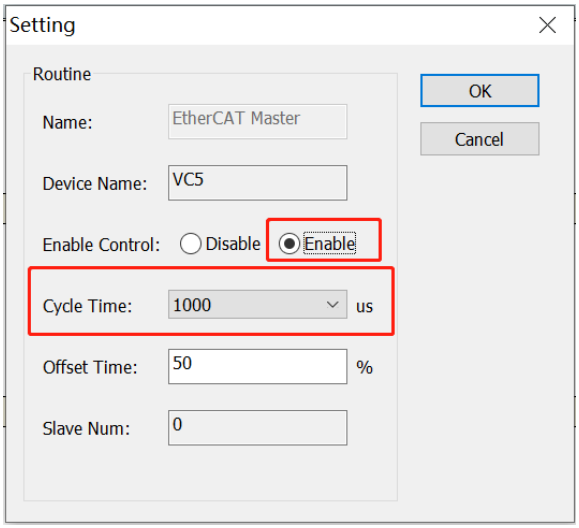
5 Module Programming Example

5.1 VEICHI Auto Studio with VC5

5.1.1 Create A New Project

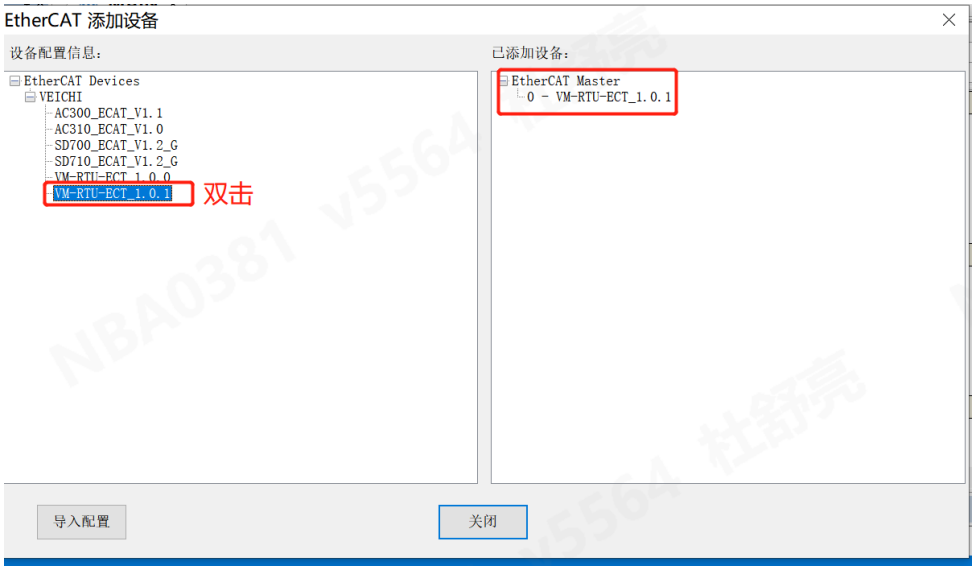


5.1.2 Configure EtherCAT Task



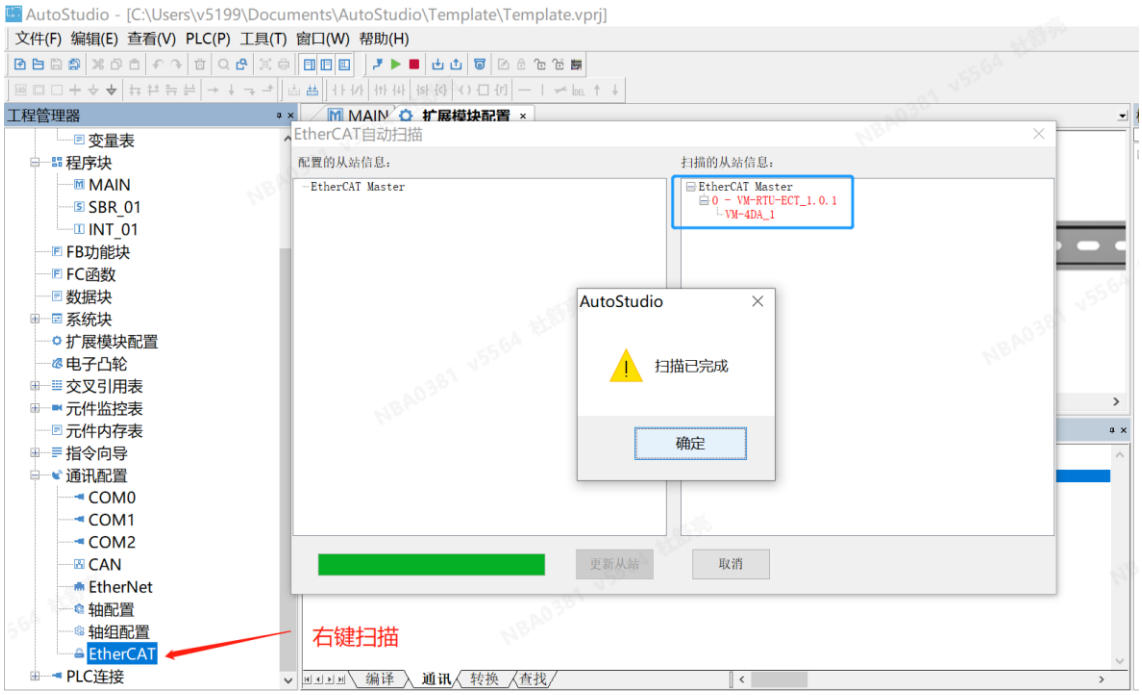
5.1.3 Import the xml File

Import the current latest version of VM-RTU-ECT_1.0.1.xml description file and double click to add it to the device:



5.1.4 Scan the Slave

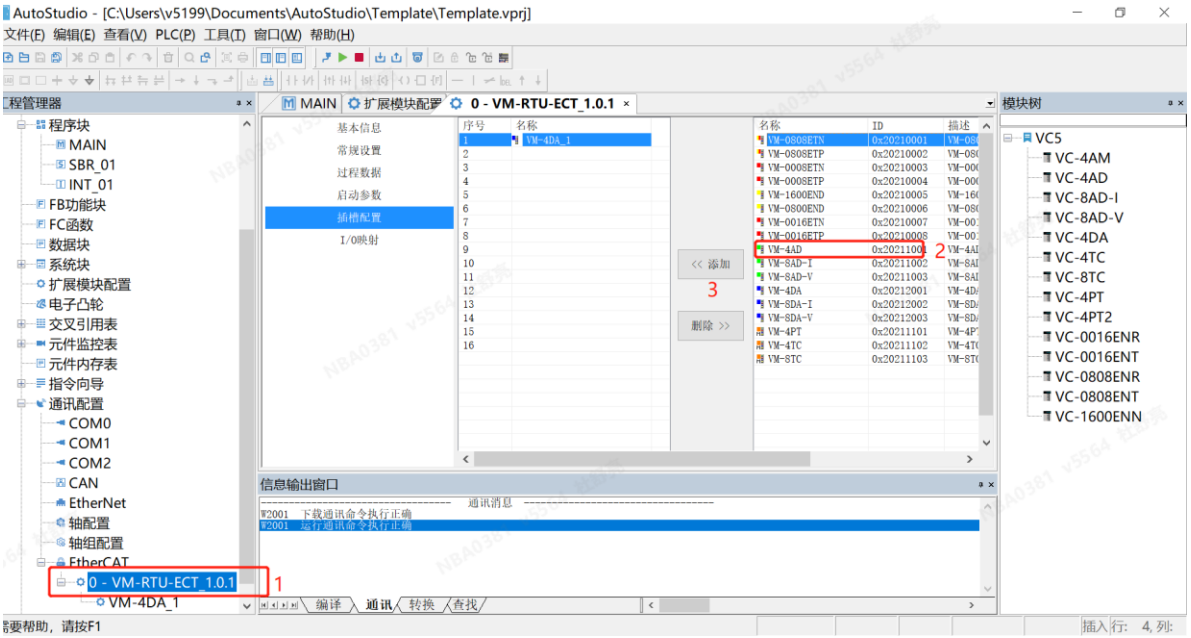
Currently, the latest version of VM-RTU-ECT_1.0.1 supports EtherCAT auto-scanning device. Right-click on EtherCAT and select auto-scanning, and the scanned modules and order are consistent with the real object.



5.1.5 Configure the Slot

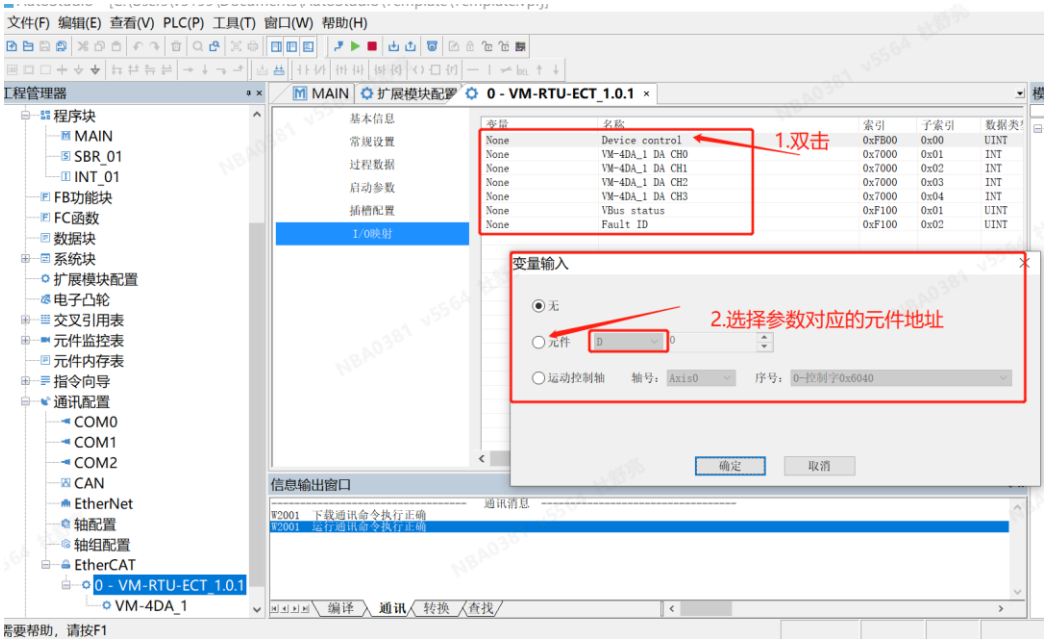
If EtherCAT auto-scanning in VC5 triggered by right-click doesn't find devices, please manually configure the device slots in VC5. The configuration of the expansion modules and the order must be

consistent with the real object, otherwise an alarm will pop up to indicate that the configuration does not match what is connected.



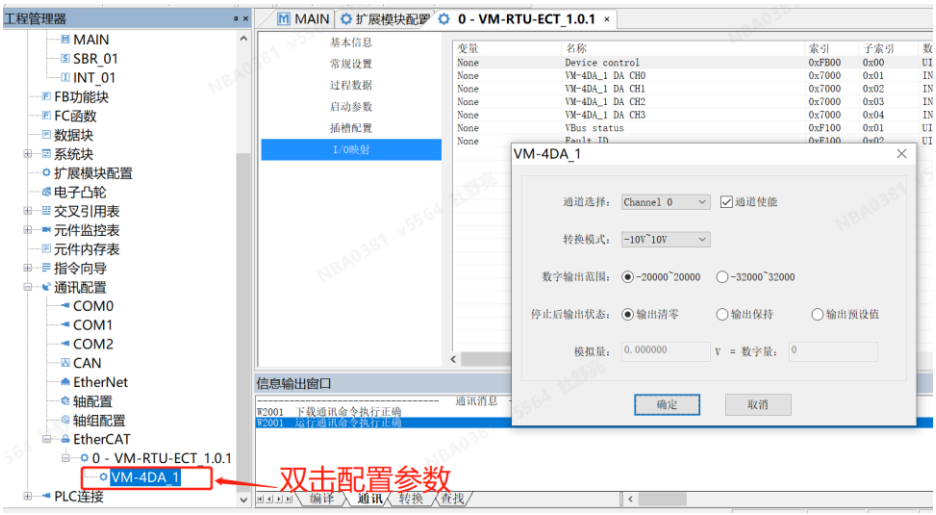
5.1.6 IO Mapping

VC5 is set to “no mapping” by default, so it is necessary to map the registers that will be controlled and monitored to the soft components before actual use, otherwise users cannot operate on them.

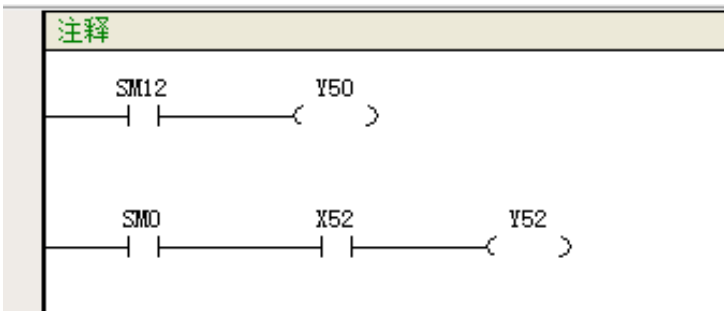


5.1.7 Set Parameters

1. Double-click the VM-4AD module and see the pop-up the parameter configuration. Enable the channel, then modify the channel and conversion mode as needed, and set the sampling time as well as the filtering parameters.



5.1.8 Write User Programs



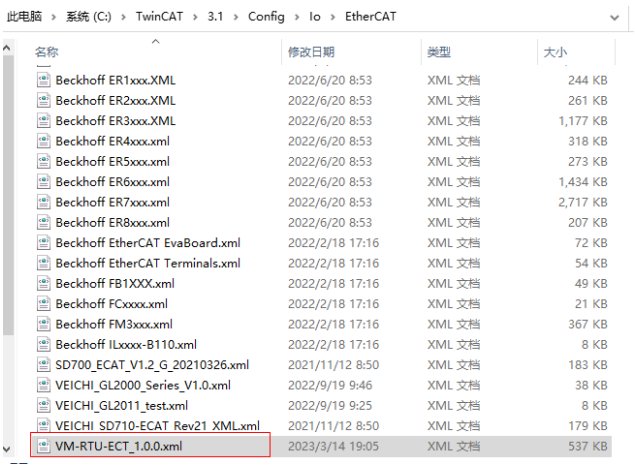
5.1.9 Compile, Download and Run

If there are no errors during compiling, download and run it.

5.2 Simple Commission with Beckhoff TwinCAT

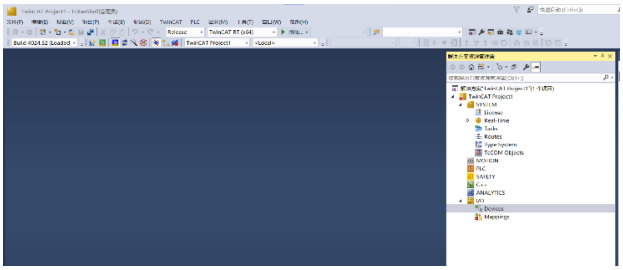
5.2.1 Import the xml File

Copy the current latest version of the description file VM-RTU-ECT_1.0.0.xml to the TwinCAT installation directory under TwinCAT\3.1\Config\Io\EtherCAT.



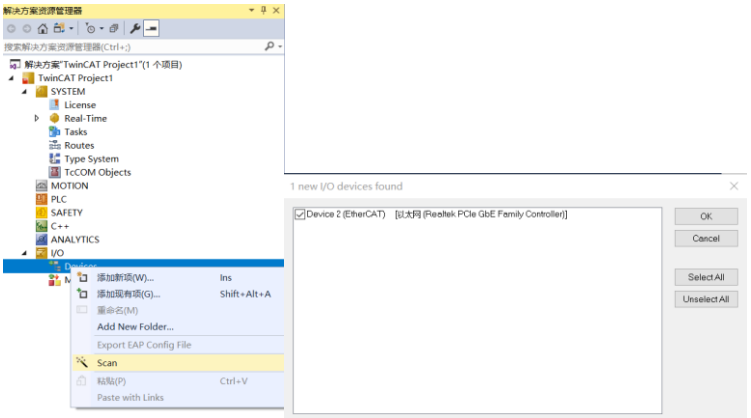
5.2.2 Create A New TwinCAT Project

Open the TwinCAT software to create a new TwinCAT project, connect the VM-RTU-ECT to the VM-0016ETP and power up and connect it to the Ethernet interface of the PC.



5.2.3 Scan the Devices

Ensure that the VM-RTU-ECT and VM-0016ETP are connected for device scanning, and follow the pop-up confirmation to make it run to OP.



Note: A new installation of TwinCAT software requires the installation of the real-time NIC driver before this step.

5.2.4 IO Monitoring and Commissioning

As shown in the figure below, scan to a 0016ETP expansion module under the device VM-RTU-ECT coupler for IO monitoring and debugging its input and output.