Overrun Detection Enable Configuration

VM-4AD Module

Manual

Version V1.0
Archived Date 2023-03-07

VEICHI Electric Co., Ltd. provides customers with a full range of technical support, so users can reach the nearest VEICHI Electric Co., Ltd. office or customer service center, or the company headquarters directly.

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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:

- Log on to the official website of VEICHI Electric (www.VEICHI.com), see "Service and Support-Download", then type in keywords and download.
- Scan the QR code on the product body to get the manual with mobile phone.

■ Warranty Statement

If malfunctions or damage occur on the product under normal use, VEICHI Electric offers 18-month warranty (from the date of shipment from the factory, subject to the bar code on the body, and in accordance with the agreements between parties if there are some). Customers will be charged if it exceeds 18 months while damages caused by the following conditions will be charged if it is within 18 months.

- Product damage caused by wrong methods against this manual.
- Product damage caused by fire, flood, or abnormal voltage.
- Product damage caused for abnormal functions against this manual.
- Product damage caused for unspecified purposes against this manual.
- Secondary damage to the product caused by force majeure (natural disasters, earthquakes, lightning strikes) factors.

The relevant service costs are calculated according to the manufacturer's standards, and if there is a contract, the contract will be handled on a priority basis.

Please refer to the Product Warranty Card for detailed warranty description.

Safety Precaution

■ 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 Definition

: "DANGER" means death or serious bodily injuries if not operated in accordance with the regulations.

: "WARNING" means death or serious bodily injuries if not operated in accordance with the regulations.

: "CAUTION" means minor bodily injuries or damage to the equipment if not operated in accordance with the regulations.

Keep this guide in a safe place in case it is needed, and be sure to give this manual to the end user.

During Control System Design
 : ➢ Be sure to design safety circuits so that the control system will still work safely when the external power supply drops out or the programmable controller malfunctions; ➢ If the rated load current is exceeded or the load is short-circuited, etc., resulting in prolonged overcurrent, the module may smoke or is on fire, so safety devices such as fuses or circuit breakers shall be installed externally.
 : ➢ Be sure to 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 Description

VM – 4 AD

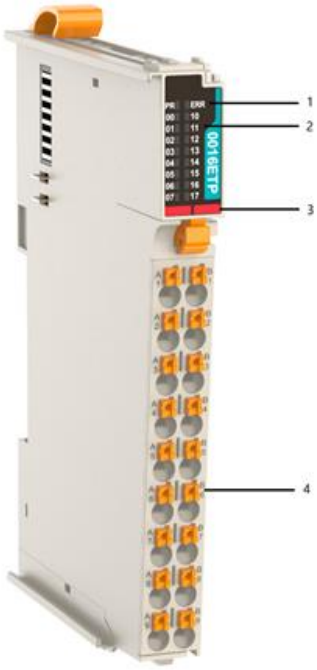
⓪ ① ②

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-4AD	VM series VM-4AD, 4-channel analog input module, with voltage/current input modes supported.		VM-series PLC, VM-series coupler

1.2 Component Description



No.	Interface	Function definition			
1	Signal indicator	PR (POWER+RUN)	Power and Run indicator	ON (green)	Module is working properly.
				OFF	Module is abnormal.
				Flashing (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 section for details.			

1.3 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	2A (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
Input type	Analog input
Input method	Voltage/current
Input channel	4
Resolution	16-bit
Conversion time	60μs/channel
Voltage input range	±10V, 0V~10V, ±5V, 0V~5V, 1V~5V
Voltage input impedance	1MΩ
Voltage input accuracy (25°C)	±0.1% (full scale)
Voltage input accuracy (full temperature range)	±0.1% (full scale)
Voltage input limit	±15V
Voltage input diagnosis	Support disconnection detection for 1V~5V configuration
Current input range	±20mA, 0mA~20mA, 4mA~20mA
Current sampling impedance	250 Ω
Current input accuracy (25°C)	±0.1% (full scale)
Current input accuracy (full temperature range)	±0.1% (full scale)
Current input limit	Instantaneous ±30mA, average ±24mA
Current input diagnosis	Support disconnection detection only when it is configured to 4mA~0mA
Isolated or not	Interface channels are not isolated from each other, power and interface isolated, interface and bus isolated
Input action display	None
Input derating	None

1.3.3 Software Specification

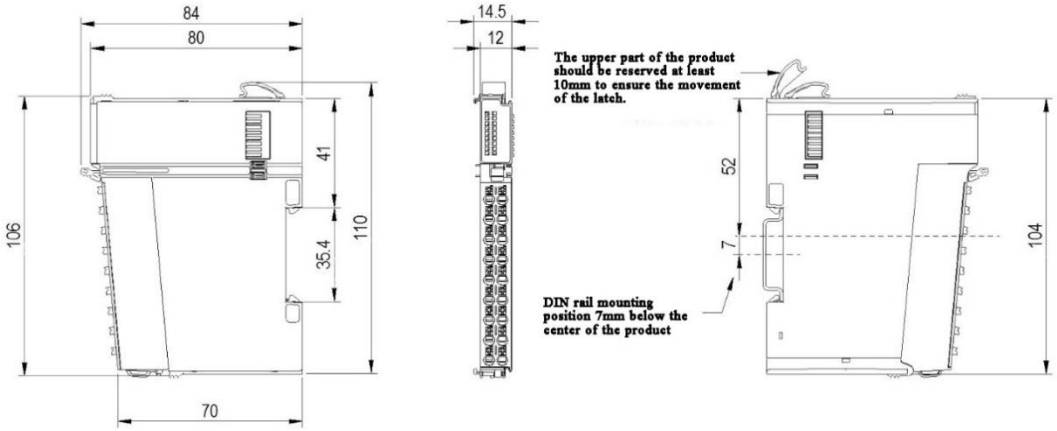
Item	Specification
Independent terminal configuration	Available
Diagnosis report configuration	Available
Diagnostic detection enable setting	Voltage detects short circuits, current detects disconnections, modes with output ranges containing 0 are not supported.
Conversion mode configuration	±10V, 0V~10V, ±5V, 0V~5V, 1V~5V, ±20mA, 0mA~20mA, 4mA~20mA
Filter parameter configuration	Range: 0~255, no unit
Over-limit detection enable configuration	Available
Peak holding enable configuration	Available
Conversion digital range configuration	-20000~20000, -32000~32000, -27648~27648
Sampling time	4-channel 250μs
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

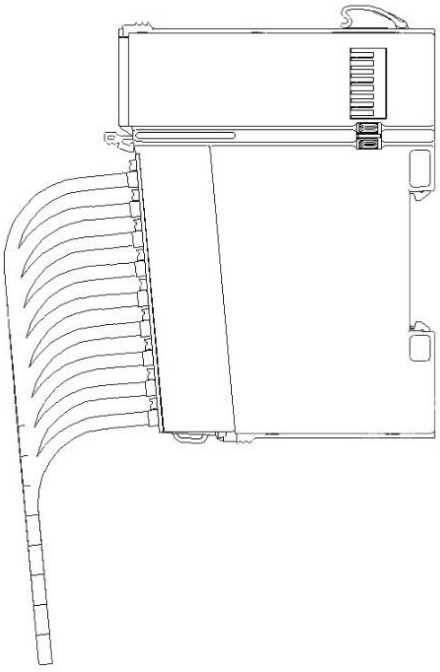
2.1 Mounting Dimensions

2.1.1 Module

Mounting dimension information is shown below in (mm).



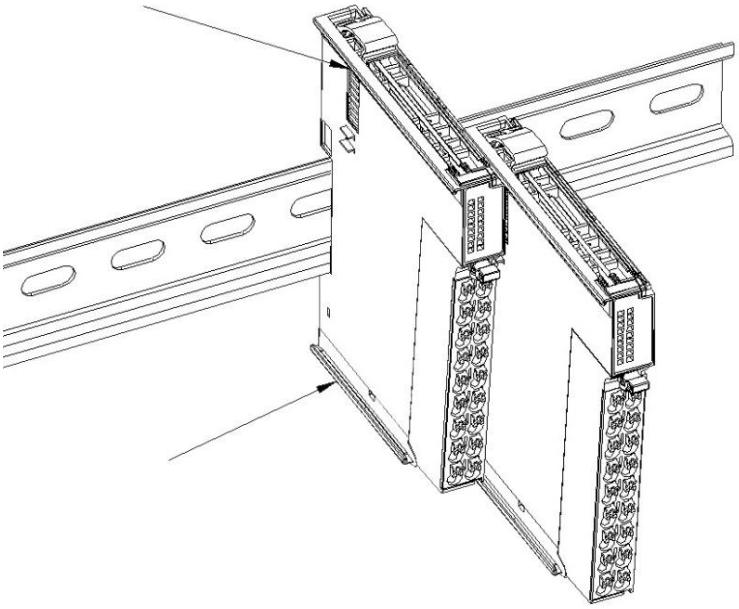
2.1.2 Connection Cables



2.2 Installation

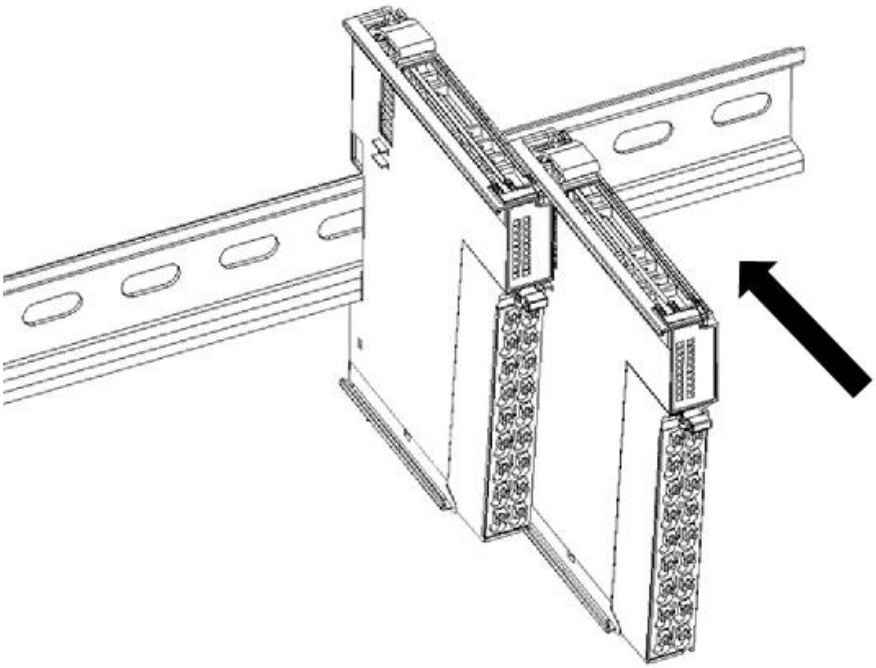
2.2.1 Inter-module Installation

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:

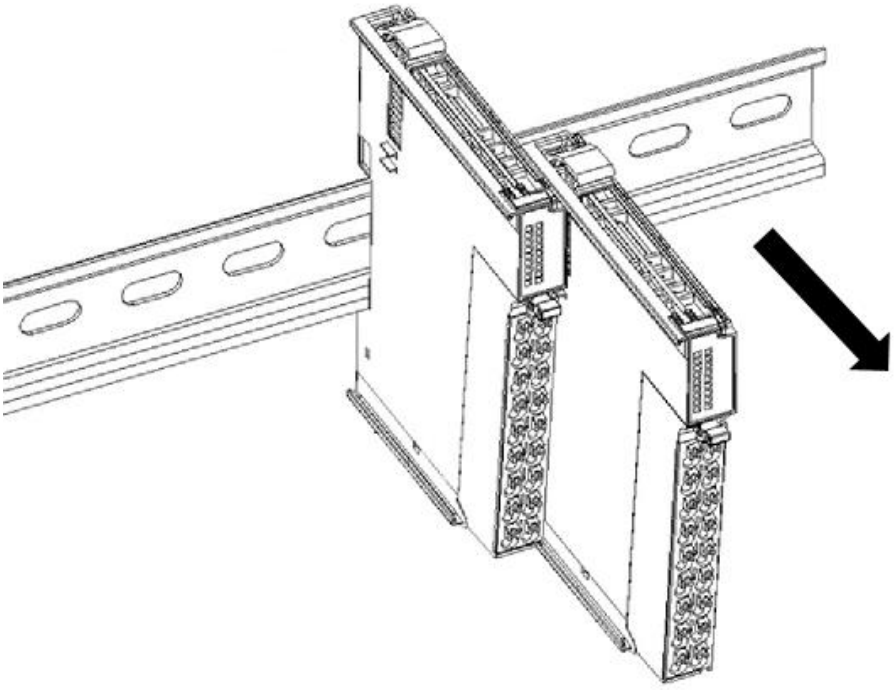


Note: Push the rail snaps first to open state, place the module onto the DIN rail, press down the top of the snaps with your hand until it is in place. Install a DIN rail clamp on each end of the main unit or module. During installation, hook the bottom of the rail clamp to the bottom of the rail and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



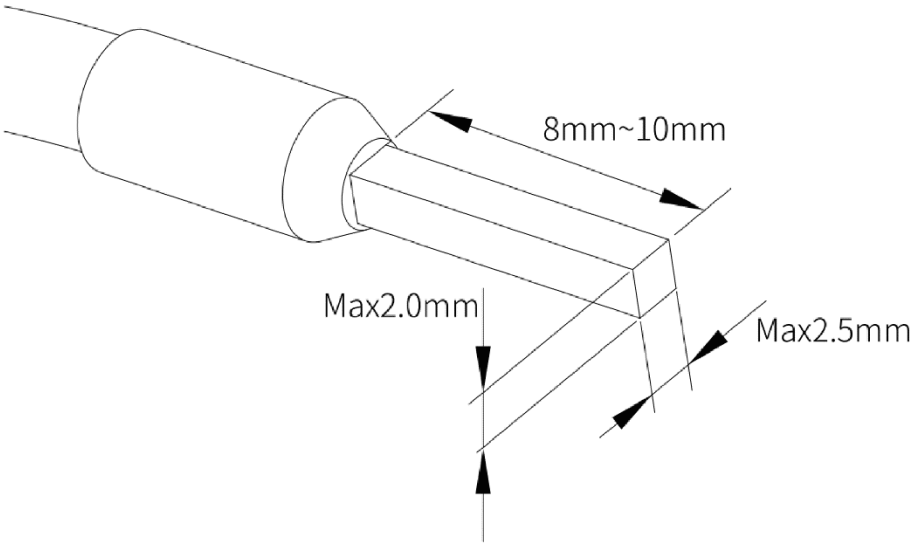
3 Electrical Installation

3.1 Cable Selection

The wire lug diameters in the following table are for reference only, and can be adjusted according to reasonable calculations based on practical use.

Material name	Wire diameter	
	PRC standard /mm2	American standard (US) /AWG
Tube lug	0.3	22
	0.5	20
	0.75	18
	1.0	18
	1.5	16

If other tube lugs are used, crimp them to the stranded wire, shape and size are required as shown below.



3.2 Terminal Definition

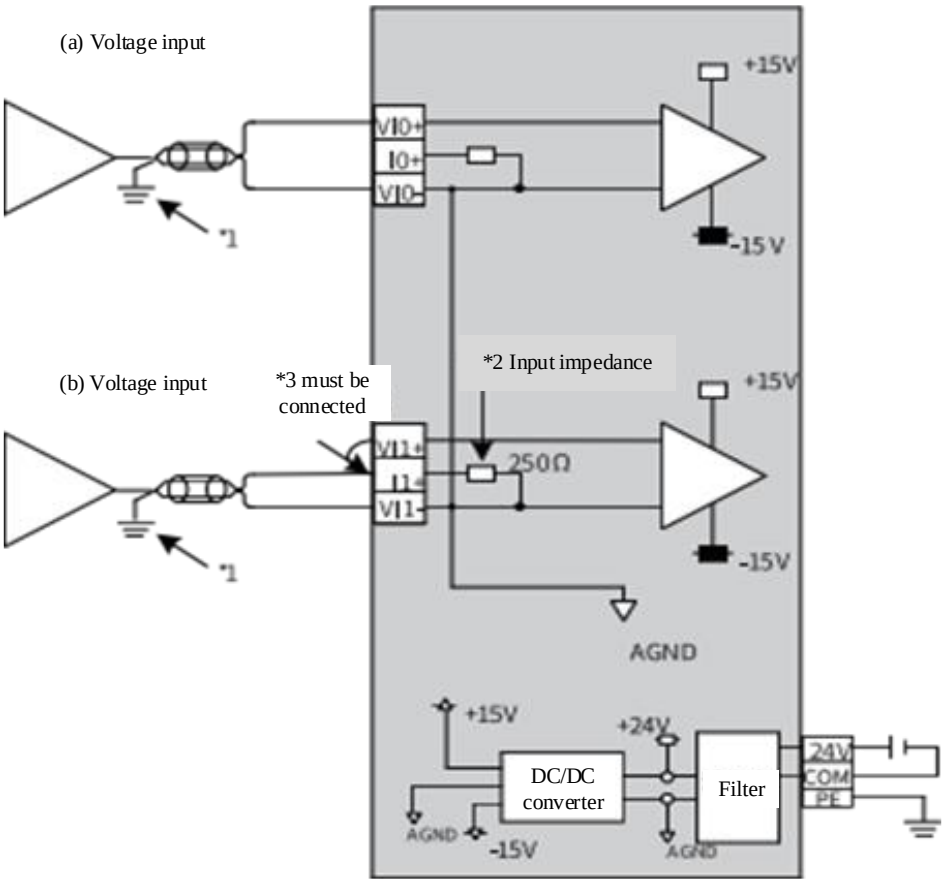
Left signal	Left terminal	Right terminal	Right signal
VI0+	A1	B1	VI1+
I0+	A2	B2	I1+
VI0-	A3	B3	VI1-
VI2+	A4	B4	VI3+
I2+	A5	B5	I3+
VI2-	A6	B6	VI3-
-	A7	B7	-
PE	A8	B8	PE
24V	A9	B9	COM

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.

3.3.1 Output Terminal Wiring



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

*2 It indicates the input impedance of the 4AD.

*3 If current is input, the (V+) and (I+) terminals must be connected.

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.

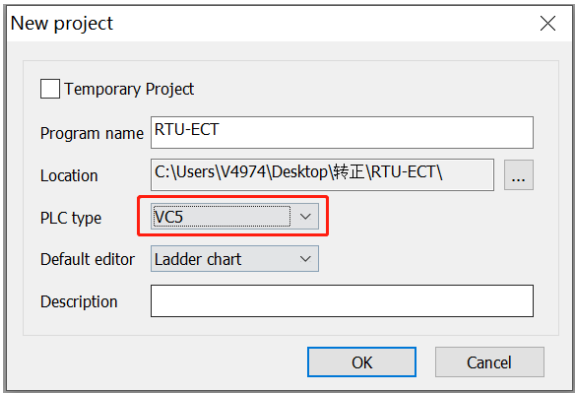
4.2 Module Channel Fault Code

Fault code	Description	Solution
0x6001	Disconnection	With disconnection enabled, check whether the input current or voltage is greater than the minimum value in the current (4mA~20mA) mode or voltage (1V~5V) mode.
0x6002	Short circuit	None.
0x6003	Data over upper limit	With overrun enabled, the input voltage or current is greater than the rated value.
0x6004	Data under lower limit	With overrun enabled, the input voltage or current is less than the rated value.
0x6005	Data overflow	With out-of-range function enabled, the input voltage or current is greater than the limit.
0x6006	Data underflow	With out-of-range function enabled the input voltage or current is less than the limit.

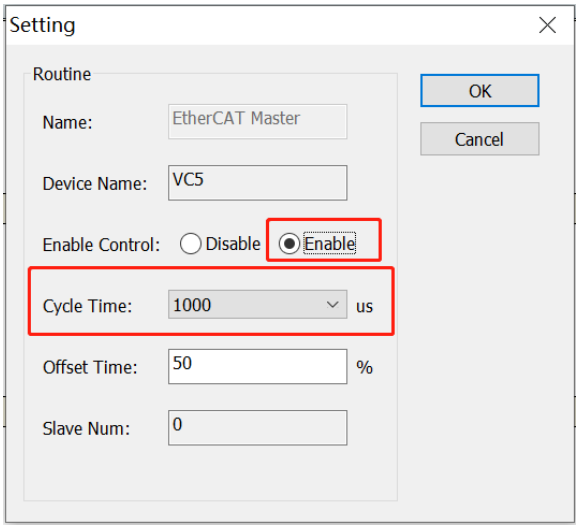
5 Module Programming Example

5.1 VEICHI Auto Studio with VC5

5.1.1 Create A New Project

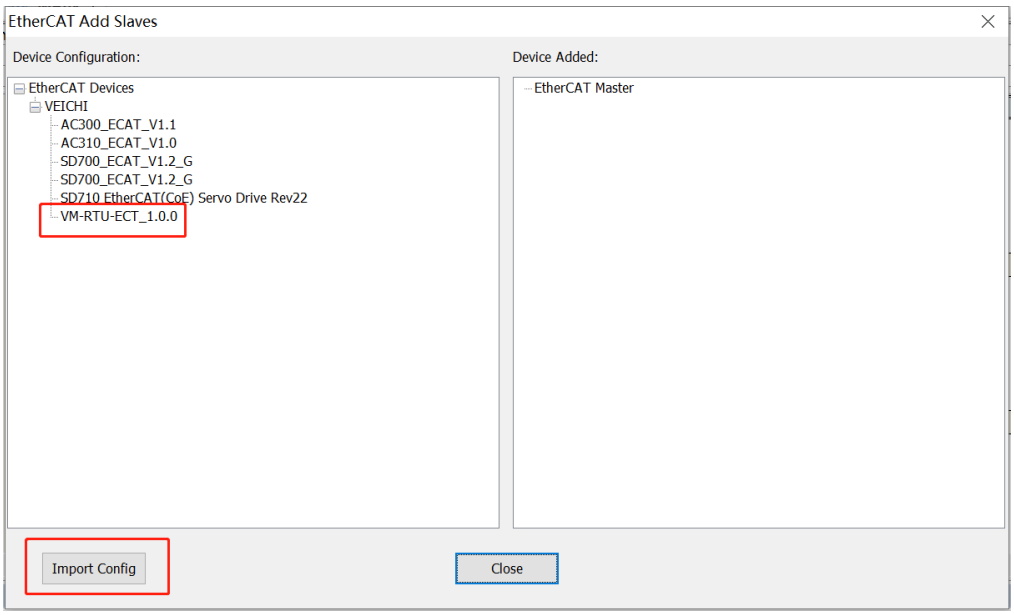


5.1.2 Configure EtherCAT Task



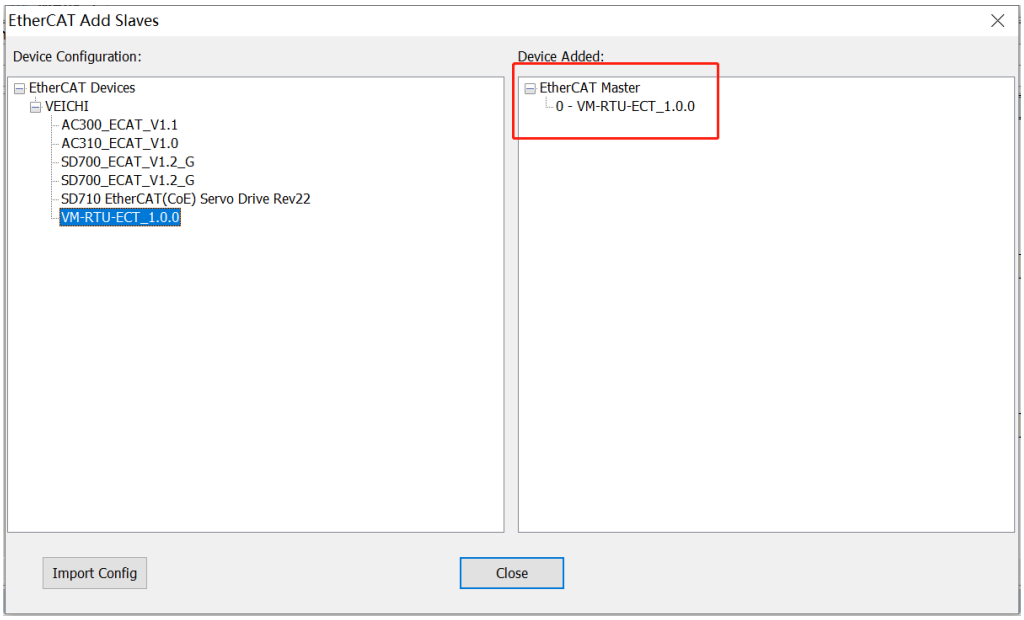
5.1.3 Import the xml File

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



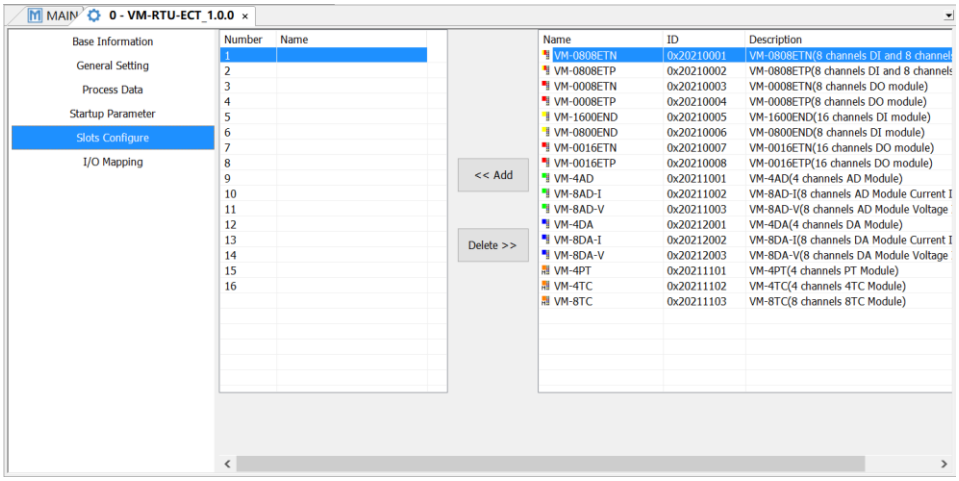
5.1.4 Scanning the Slave

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.



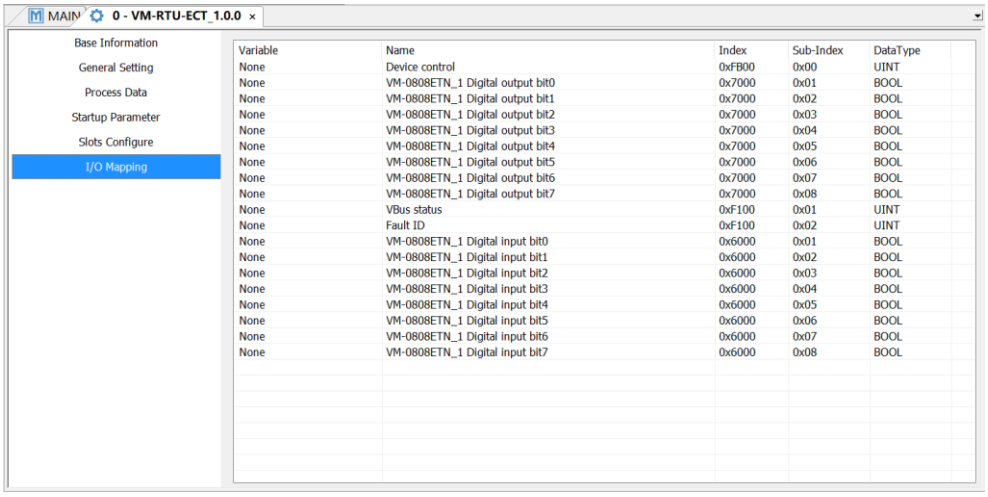
5.1.5 Slot Configuration

VC5 requires to configure the slot of the device first. 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.



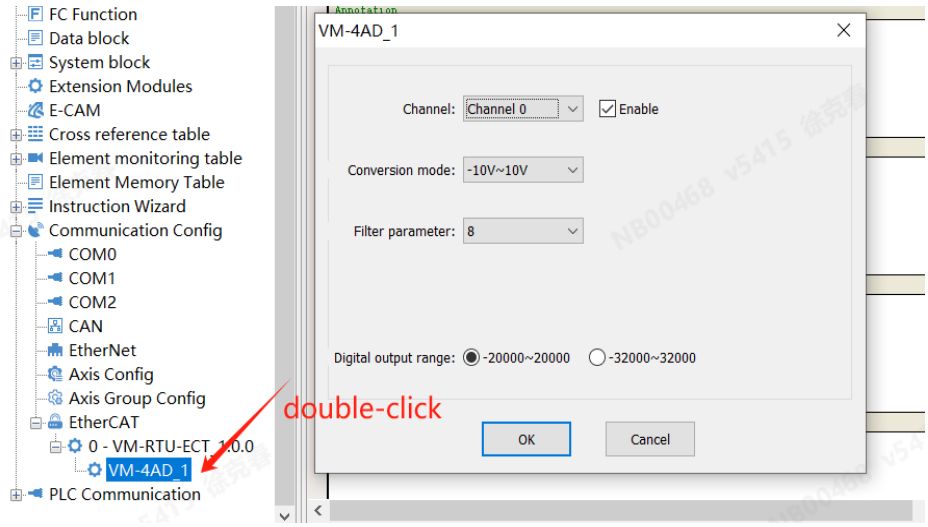
5.1.6 IO Mapping

VC5 default setting is no mapping, 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.

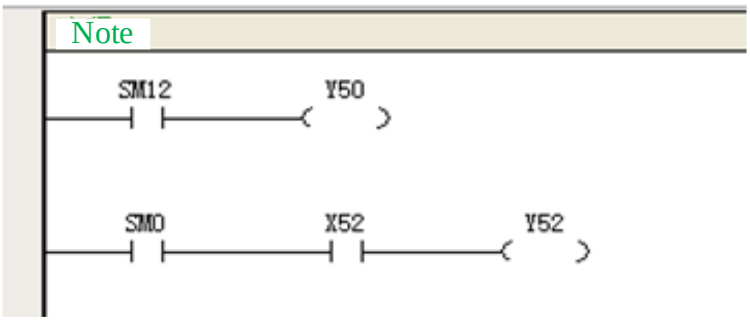


5.1.7 Set Parameters

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



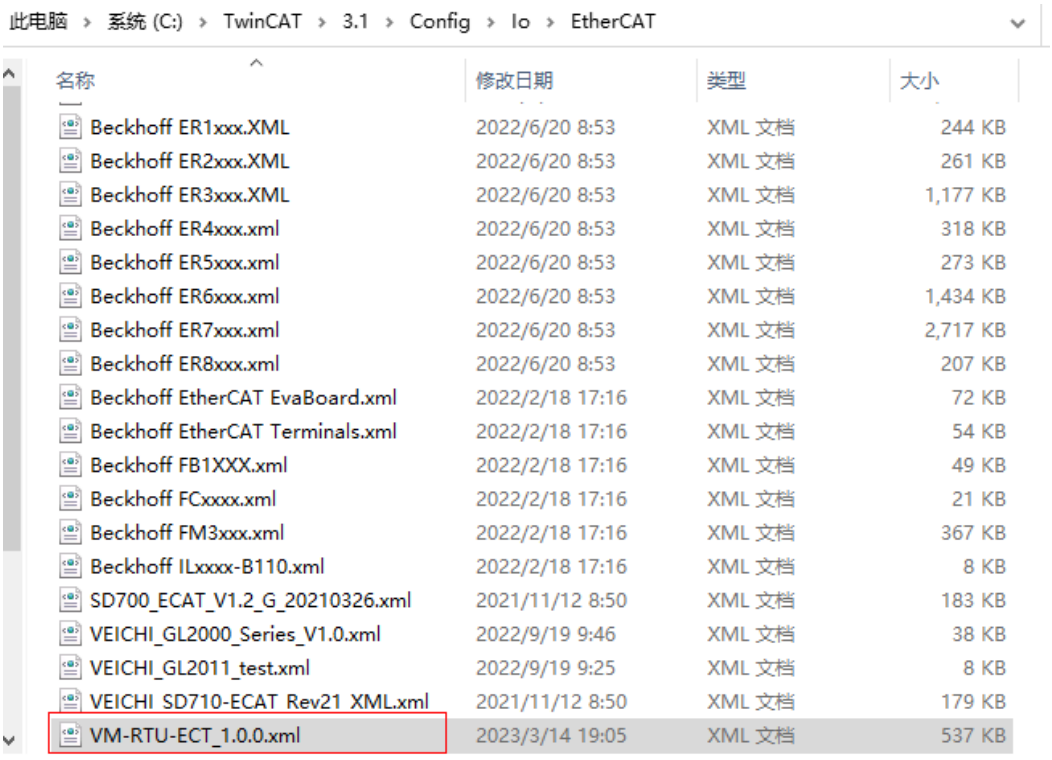
5.1.9 Compile, Download and Run

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

5.2 Simple commissioning with Beckhoff TwinCAT

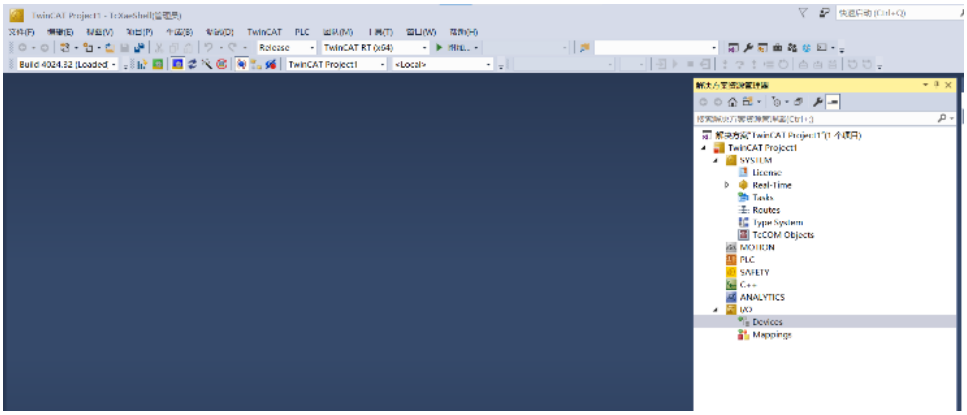
5.2.1 Import the xml File

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.



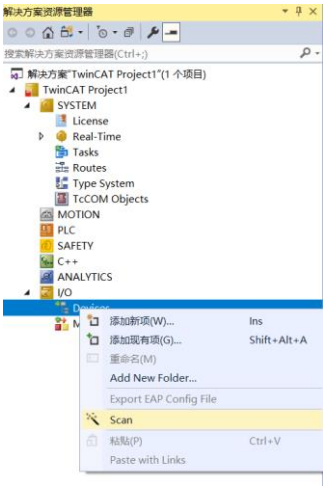
5.2.2 Create A New TwinCAT Project

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

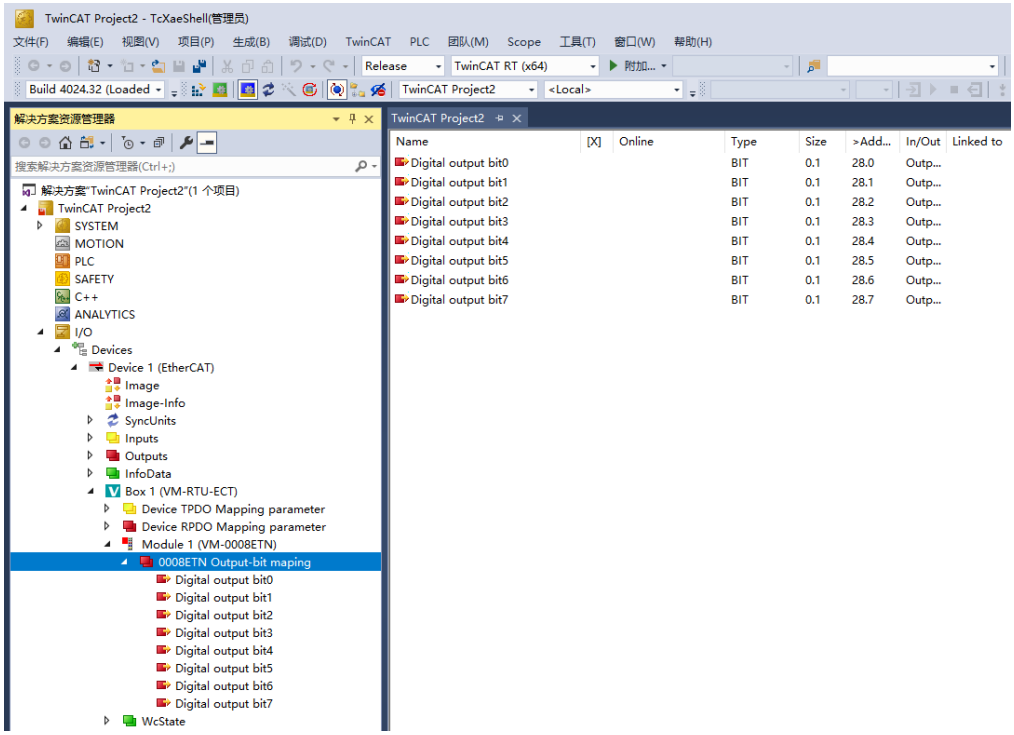
Ensure that the VM-RTU-ECT and VM-0016ETP are connected for device scanning, and follow the pop-up confirmation to make it run to OP.



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.


TwinCAT Project2 - TcXaeShell(管理员)
文件(F) 编辑(E) 视图(V) 项目(P) 生成(B) 调试(D) TwinCAT PLC 团队(M) Scope 工具(T) 窗口(W) 帮助(H)
Release
TwinCAT RT (x64)
附加...
Build 4024.32 (Loaded
TwinCAT Project2
<Local>
解决方案资源管理器
搜索解决方案资源管理器(Ctrl+;)
解决方案"TwinCAT Project2"(1 个项目)
TwinCAT Project2
SYSTEM
MOTION
PLC
SAFETY
C++
ANALYTICS
I/O
Devices
Device 1 (EtherCAT)
Image
Image-Info
SyncUnits
Inputs
Outputs
InfoData
Box 1 (VM-RTU-ECT)
Device TPDO Mapping parameter
Device RPDO Mapping parameter
Module 1 (VM-0008ETN)
0008ETN Output-bit maping
Digital output bit0
Digital output bit1
Digital output bit2
Digital output bit3
Digital output bit4
Digital output bit5
Digital output bit6
Digital output bit7
WcState
TwinCAT Project2
Name [X] Online Type Size >Add... In/Out Linked to
Digital output bit0 BIT 0.1 28.0 Outp...
Digital output bit1 BIT 0.1 28.1 Outp...
Digital output bit2 BIT 0.1 28.2 Outp...
Digital output bit3 BIT 0.1 28.3 Outp...
Digital output bit4 BIT 0.1 28.4 Outp...
Digital output bit5 BIT 0.1 28.5 Outp...
Digital output bit6 BIT 0.1 28.6 Outp...
Digital output bit7 BIT 0.1 28.7 Outp...