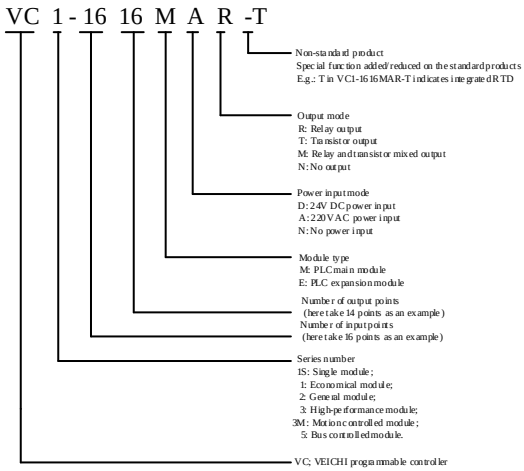
VC1-1616MAR-T PLC Quick Reference Manual

This manual provides a quick on-site access for users to the information of the design, installation, connection and maintenance of the VC1-1616MAR-T series PLC. It briefly describes the hardware specifications, features and usage of the VC1-1616MAR-T Series PLC. There are also brief descriptions of associated accessories, answers to frequently asked questions, and other information for easy reference. For more detailed product information, please refer to the "VC Series Programmable Controller Manual" and "AutoStudio Programming Software Manual" issued by VEICHI. Please consult with the supplier if needed. Users can also download PLC related technical information or give feedback on PLC related questions on https://www.veichi.com.

1 Production Introduction

1.1 Module Description

Module description is shown below:



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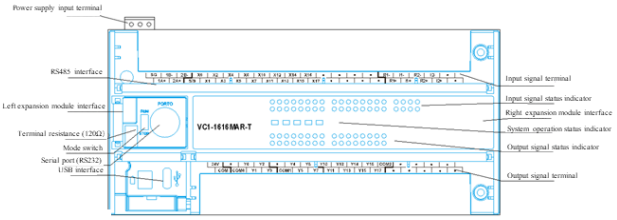
Customer Service Center, Suzhou VEICHI Electric Technology Co., Ltd.

Product Feedback Form

User name		Tel	
Address		Postal code	
Product name & model		Installation date	
Machine code			
Appearance or structure			
Performance			
Package			
Materials			
Quality in use			
Comments or suggestions			

1.2 Appearance and Structure

The appearance and structure of the main module VC1-1616MAR-T is shown below:

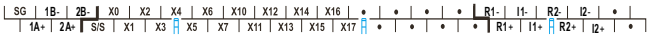


It adopts RS232 and Mini DIN8 socket, 1 channel of RS485 and Type-C USB interface. The right expansion module interface is used to connect the expansion module, the left one is used to connect the expansion communication module. There are two options for the mode switch, ON/OFF, and one RS485 terminal resistor with a resistance of 120 Ω.

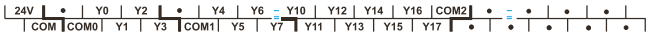
1.3 Terminal Introduction

Terminal Arrangement

Input terminal:



Output terminal:



2 Power Supply Specification

The specifications of the built-in power supply of the main module and those that the main module can supply to expansion modules are shown as below.

- AC power supply specification:

Item		Unit	Min.	Typ.	Max.	Description
Input voltage range		Vac	85	220	264	Voltage range for proper start and operation
Input current		A	/	/	1.5	90Vac input, full-load output
Rated output current	5V/GND	mA	/	1500	/	The sum power of 5V/GND and 24V/GND shall not exceed 30W.
	24V/GND	mA	/	900	/	
	24V/COM	mA	/		/	

3 Switch Input and Output Characteristics

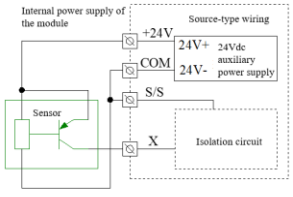
3.1 Input Characteristics and Signal Specifications

Input characteristics and signal specifications are show in the following table.

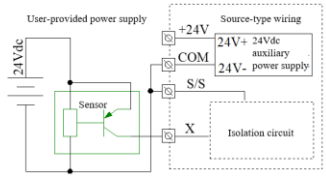
Item		High-speed input terminal X0~X7	General input terminal
Signal input method		Source/sink mode, selectable via "S/S" terminals	
Electrical parameters	Detection voltage	24Vdc	
	Input impedance	1K	4kΩ
	Input ON	External circuit resistance < 400Ω	External circuit resistance < 400Ω
	Input OFF	External circuit resistance > 24kΩ	External circuit resistance > 24kΩ
Filter function	Digital filter	X0 to X7 are of digital filter function. Filtering time can be programmed in 0~60ms.	
	Hardware filter	Input terminals (other than X0~X7) are of hardware filter mode. Filtering time: about 10ms.	
High speed function		X0~X7: high-speed counting, interruption, and pulse catching X0 and X1: up to 50kHz counting frequency X2~X7: up to 10kHz counting frequency The sum of input frequency should be less than 60kHz	
Common terminal		Only one: S/S	

The input terminal of the counter should correspondingly abide by its upper frequency limit. Any frequency higher than that may result in incorrect counting or abnormal system operation. Make sure that the input terminal arrangement is reasonable and choose the proper external sensors.

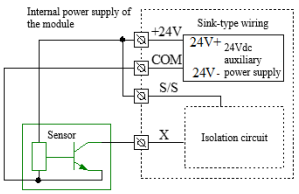
The PLC provides the “S/S” port for selecting the signal input mode, which can be set as source-type or sink-type mode. Connecting “S/S” to “+24V” means users select the sink-type mode, and then an NPN-type sensor can be connected.



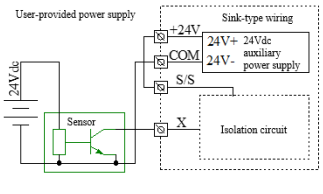
Wiring of source-type input using module internal power



Wiring of source-type input using external auxiliary power



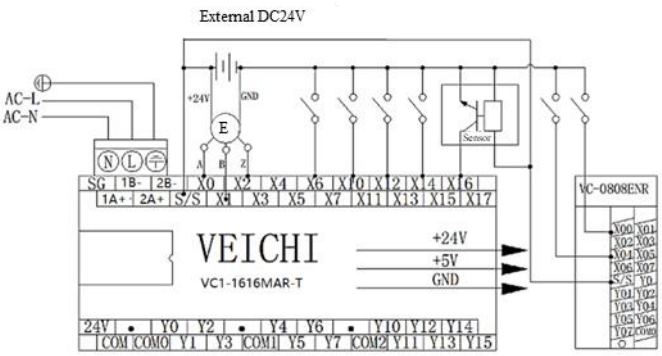
Wiring of sink-type input using module internal power



Wiring of sink-type input using module internal power

Input connection instance

The following diagram shows an example of VC1-1614MAR-T in connection with an VC-0808ENR, which realizes simple positioning control. The positioning signals from the encoder are detected through high-speed counting terminals X0 and X1, the limit switch signals that require high-speed response can be input through high-speed terminals X2~X7. Other user signals can be input through any other input terminals.



3.2 Output Characteristics and Signal Specifications

The comparison of relay and transistor output types is shown below.

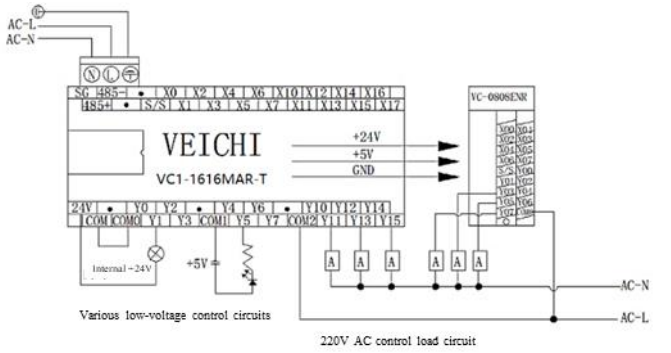
Item	Relay	Transistor
Mode	The output is connected when the its status is ON; and it's disconnected when the status is OFF.	
Common terminal	Several groups are there with a common terminal COMn in each group, adapting to control circuits in different potentials. All common terminals are isolated from each other.	
Voltage	220Vac, 24Vdc, no polarity requirements	24Vdc with polarity requirements
Current	In accordance with the output electrical codes	
Characteristics	High drive voltage and high current	Low drive current, high frequency, long service life
Application	Loads with low operating frequency of intermediate relay, contactor coil, indicator light, etc.	Scenarios with high operating frequency and long service life of control servo amplifier, frequently operated electromagnet, etc.

The output electrical codes are as below.

Item		Relay
Circuit power supply voltage		Below 250Vac, 30Vdc
Circuit insulation		Mechanical insulation
Operation indication		The relay output contact is connected and the indicator light is on
Leakage current in open circuit		/
Min. load		2mA/5Vdc
Max. output current	Resistive load	2A/1-point 8A/4-point group of COM 8A/6-point group of COM 8A/8-point group of COM
	Inductive load	220Vac, 80VA
	Lamp load	220Vac, 100W
Response time	OFF→ON	20ms Max
	ON→OFF	20ms Max
Y0,Y1,Y2 max. output frequency		/
Output common terminal		Y0/Y1/Y2/Y3—COM0. Y4/Y5/Y6/Y7—COM1. One COM can be shared by a maximum of 8 terminals after Y10, all common terminals are isolated from each other
Fuse protection		None

Output connection instance

The following diagram shows the connection between VC1-1616MAR-T (adopt 24V power supply if it's DC main module) and VC-0808ENR expansion module. Different output groups can be connected to different signal circuits with different voltages. Some (like Y1-COM0) are connected to the 24Vdc circuit powered by the 24V COM of this controller. Some (like Y5-COM1) are connected to the 5Vdc low-voltage signal circuit. Others (like Y11, Y13, Y15) are connected to the 220Vac voltage signal circuit. That is, different output groups can operate in circuits with different voltage levels.

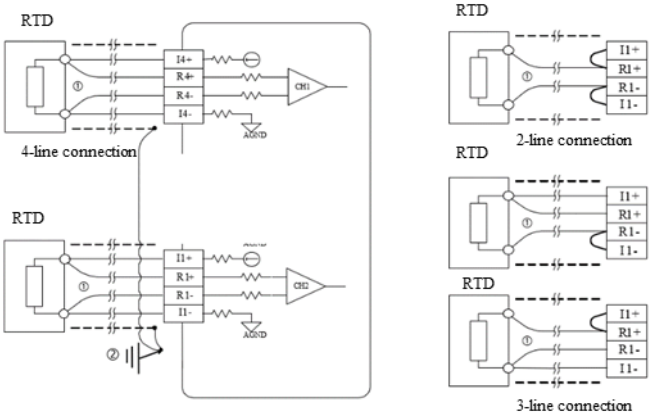


RTD performance indicator

Table 2-2 Performance indicator

Item	Description			
	Celsius (°C)		Fahrenheit (°F)	
Input signal	RTD type: Pt100, Cu100, Cu50; Number of channels: 2			
Conversion speed	(15±2%) ms × 2 channels (unused channels are not converted)			
Rated temperature range	Pt100	-150°C~+600°C	Pt100	-238°F~+1112°F
	Cu100	-30°C~+120°C	Cu100	-22°F~+248°F
	Cu50	-30°C~+120°C	Cu50	-22°F~+248°F
Digital output	16-bit A/D conversion; temperature values stored in 16-bit two's complement			
	Pt100	-1500~+6000	Pt100	-2380~+11120
	Cu100	-300~+1200	Cu100	-220~+2480
	Cu50	-300~+1200	Cu50	-220~+2480
Minimum resolution	Pt100	0.2°C	Pt100	0.36°F
	Cu100	0.2°C	Cu100	0.36°F
	Cu50	0.2°C	Cu50	0.36°F
Accuracy	±0.5% of the full scale			
Isolation	The analog and digital circuits are isolated by optocouplers. The analog circuit is internally isolated from the 24Vdc power supply for module charging. Analog channels are not isolated from each other.			

RTD connection instance



In the figure, ① to ⑤ refers to the 5 notes for wiring.

1) The RTD signal is connected via a shielded cable. Lines should be routed away from power cables or other wires that may cause electrical disturbance. The lines to be connected to the RTD are described as follows.

2) RTD sensors (type: Pt100, Cu100, Cu50) can be wired via 2, 3 or 4-line connection, with 4-line connection being the most accurate, 3-line connection being the second and 2-line connection the lowest ranked. When the line length is greater than 10m, it is recommended to use 4-line connection to eliminate the line resistance error.

3) In order to reduce and avoid the measurement error and noise interference, it is recommended to use a connection cable at the length of less than 100m. The measurement error is caused by the impedance of the connection cable and may vary according to different channels in the same module, so it is necessary to adjust the characteristics of each channel. For details, see steps in "Characteristic Setting".

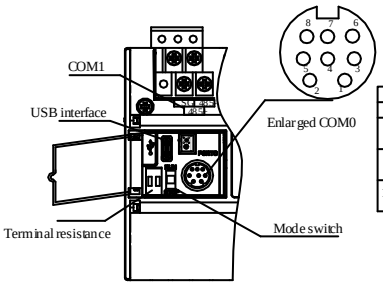
4) If there are too many electrical disturbances, connect the shielding ground to the ground terminal.

5) Avoid shorting the positive and negative terminals of the channel to prevent false data being detected on this channel.

4 Communication

The VC1-1616MAR-T series PLC main module provides 3 asynchronous serial communication ports, namely COM0, COM1 and COM2 which support the baud rates of 115200, 57600, 38400, 19200, 9600, 4800, 2400, and 1200 bps.

The communication protocol for COM0 is determined by the mode switch as below.



Pin	Name	Description
3	GND	Grounding pin
4	RXD	Serial data receiving pin (from RS232 to the PLC)
5	TXD	Serial data transmitting pin (from the PLC to RS232)
1,2, 6, 7, 8	Reserved	Serial data receiving pin (from RS232 to the PLC)

As a dedicated interface for user programming, COM0 can be forcefully switched to the programming protocol via the mode switch. The relationship between PLC operation status and COM0 usage protocol is shown in the table below.

Mode switch position	Status	COM0 operating protocol
ON	RUN	It can be programming protocol, or Modbus protocol as determined by user program and system configuration.
OFF	STOP	If the system configuration of user program is Modbus protocol, it converts to programming protocol automatically after stop. Otherwise, the system protocol keeps unchanged.

COM1 and COM2 are ideal for connection with communication-supported production equipments (such as drives). With Modbus protocol or RS485 free protocol, a drive can control multiple devices through the network. Its terminals are fixed with screws. Communication signal cables are at users' discretion. It is recommended to use a twisted shielded pair as the signal cable to connect communication ports.

The USB is Type-C interface. The supported functions include upload, download, online upgrade firmware and monitoring.

5 Installation

The PLC is applicable to Installation Category II, Pollution degree 2.

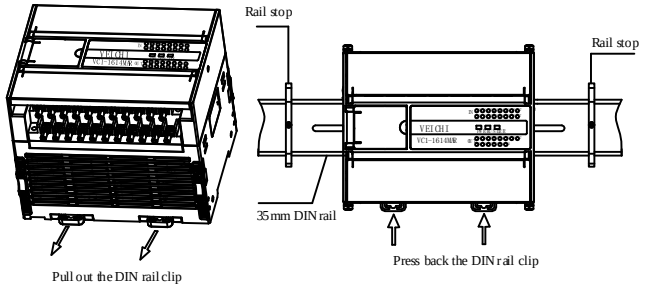
5.1 Dimensions

Model	Length	Width	Height	Net weight
VC1-1616MAR-T	192mm	90mm	92.7mm	596g

5.2 Installation instruction

Use DIN rail

Generally, the PLC can be mounted onto a 35mm-wide rail (DIN), as shown in the following figure.



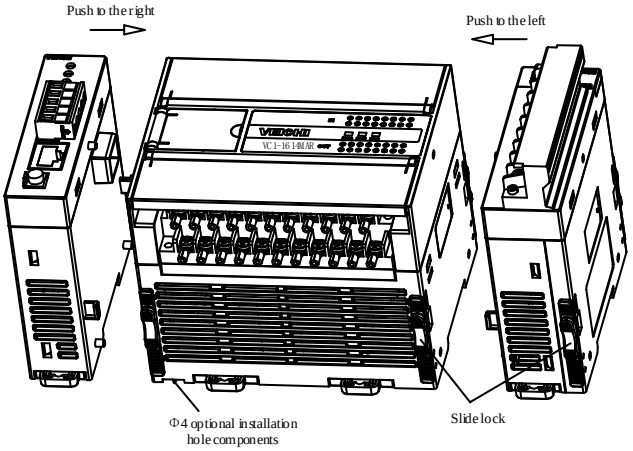
The specific installation steps are as follows:

1) Fix the DIN rail horizontally on the mounting backplane.
2) Pull out the DIN rail buckle under the bottom of the module.
3) Hang the module on the DIN.
4) Press the buckle back to its original position to lock the module.
5) Finally, fixed both ends of the module with DIN rail clips to avoid sliding.

Other VC1-1616MAR-T series PLCs can be mounted on DIN rail according to the above steps.

Use screws

For applications with large oscillations, the main module can be installed with screws. When installing the expansion module, first pull the slide lock up to the top, align it and push it toward the main module. After that, pull it down to the end to complete the fixation. This is shown in the figure below. (Note: The main module requires optional accessories for screw installation, and the expansion module does not support screw installation.)

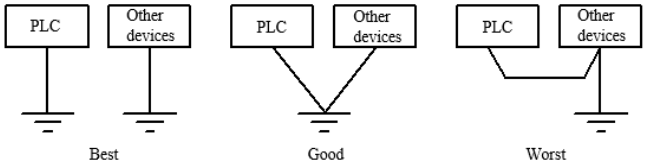


5.3 Cable Connection and Specification

For power and grounding cable connection, it is recommended to add an air switch and fuses to the PLC power input to protect the circuit.

Reliable grounding cables can enhance equipment safety and improve the PLC's electromagnetic immunity. Please connect the power supply ⏚ end of the PLC to the earthing conductor during installation. It is recommended to use connection wires of AWG12 to AWG16 and shorten the wires as much as possible.

An independent grounding device is also recommended to set. Keep the grounding cables away from those of other devices (especially the devices cause strong disturbance), as shown below.



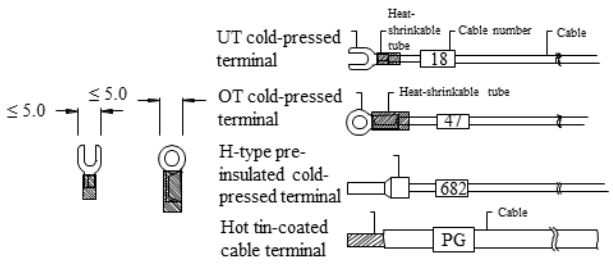
Cable specification

For the wiring of the PLC, it is recommended to use multi-strand copper wire and ready-made insulated terminals to ensure the wiring quality. The recommended cross-sectional areas and models of the cable are shown in the following table.

Cable	Cross-sectional area	Recommendation	Compatible wiring terminal and heat-shrinkable tube
AC power cable (L, N)	1.0~2.0mm²	AWG12, 18	H1.5/14 pre-insulated tube-like terminal, or hot tin-coated cable terminal
Grounding cable (⏚)	2.0mm²	AWG12	H2.0/14 pre-insulated tube-like terminal, or hot tin-coated cable terminal
Input signal cable (X)	0.8~1.0mm²	AWG18, 20	UT1-3 or OT1-3 cold-pressed terminal Φ3 or Φ4 heat-shrinkable tube
Output signal cable (Y)	0.8~1.0mm²	AWG18, 20	

Fix the processed cable terminals onto the wiring terminals of PLC by screws. Pay attention to the positions of the screws. The tightening torque for the screws is 0.5 to 0.8 Nm, which ensures complete reliable connection without damaging the screws.

The recommended cable processing-method is shown in the following figure.



6 Power-on, Operation, and Routine Maintenance

6.1 Power-on and Operation

After the wiring is complete, check all the connections. Ensure that no foreign matters have dropped inside the housing and heat dissipation is in good conditions.

1. Power on the PLC. The PWR indicator of the PLC is on.

2. Start the AutoStation software on the PC and download the compiled user program to the PLC.

3. After the program is downloaded and verified, set the mode switch to ON. The RUN indicator is on. If the ERR indicator is on, it indicates that errors occur on the user program or the system. In this case, rectify the errors by referring to the instructions in the VC Series Small-sized PLC Programming Manual.

4. Power on the PLC external system to perform commissioning on the system.

6.2 Routine maintenance

Pay attention to the following notes for routine maintenance and inspection:

1. Ensure that the PLC operates in a clean environment, preventing foreign matters or dust from dropping into the machine.

2. Keep the PLC in good ventilation and heat dissipation conditions.

3. Ensure that the wiring is properly performed and all the wiring terminals are well fastened.

Warning

1. Never connect the transistor output to an AC circuit (like 220VAC). The design of the output circuit must abide by the requirements of electric parameters, and no overvoltage or overcurrent is allowed.

2. Use the relay contacts only when necessary, because the use life of relay contacts depends largely on its action times.

3. The relay contacts can support loads smaller than 2A. To support larger loads, use external contacts or mid-relay.

4. The relay may fail to connect when the current of its contact is smaller than 5mA.

User Notice

1. The warranty covers only the PLC machine.

2. The warranty period is eighteen months. VEICHI provides free-of-charge maintenance for the product if it is faulty or damaged in normal use within the warranty period.

3. The warranty period starts from the factory date of the product. The machine code is the only basis for determining whether the product is in the warranty period. An equipment without the machine code is deemed as out of warranty.

4. Maintenance and repair services are charged in the following scenarios even the product is within the warranty period:

- Faults are caused by not complying with the user manual;
- The damage caused by fire, flood, or voltage anomalies;
- The PLC is damaged by the unsupported functions.

5. The service charge will be calculated based on actual cost, and if there is a contract, the provisions stated in the contract prevail.

6. Please make sure that you keep this card and present it to the service unit at the time of warranty.

Please contact the agent or VEICHI directly if there's any questions.

Suzhou VEICHI Electric Technology Co., Ltd.

China Customer Service Center

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Version V1.0 Archived 2022-06-02