INVT IVIC1L-1616MAR-T Micro Programmable Logic Controller User Guide

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Contents

IVIC1L-1616MAR-T Micro Programmable Logic Controller

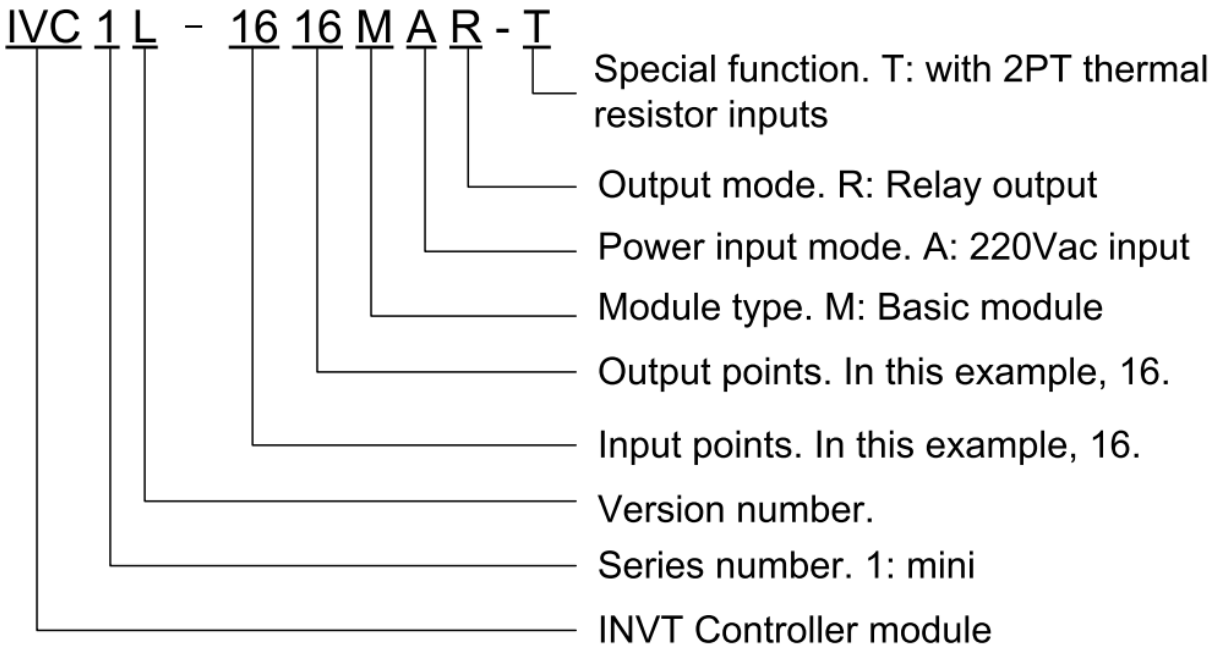
Quick Reference Manual of IVC1L-1616MAR-T with 2PT PLC

This quick start manual is to offer you a quick guide to the design, installation, connection and maintenance of IVC1L-1616MAR-T series PLC, convenient for on-site reference. Briefly introduced in this booklet are the hardware specs, features, and usage of IVC1L-1616MAR-T PLC, plus the optional parts and FAQ for your reference. For ordering the above user manuals, contact your INVT distributor or sales office. You can also visit http://www.invt-control.com to download PLC-related technical information or give feedback on PLC-related issues.

Introduction

1.1 Model Designation

The model designation is shown in the following figure.



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Shenzhen INVT Electric Co., Ltd.

Product Quality Feedback Form

Customer name		Phone	
Address	Postal	Code	
Model		Date of use	
Machine SN			
Appearance or structure			
Performance			
Package			
Material			
Quality problem during us age			
Suggestion about improv ement			

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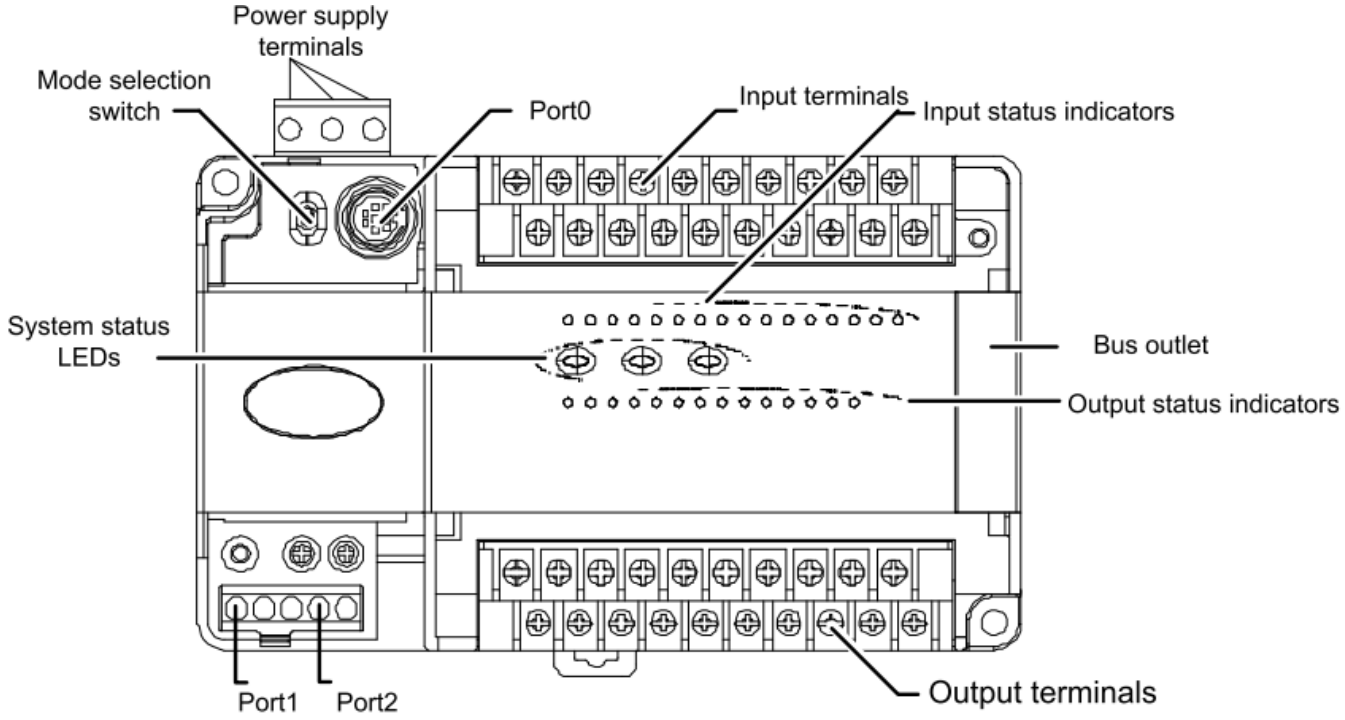
Tel: +86 23535967

1.2 Outline

The outline of the basic module is shown in the following figure by taking the example of IVC1L-1616MAR-T.



PORTO and PORT1 PORT2 are communication terminals. PORTO uses RS232 mode with Mini DIN8 socket. PORT1 and PORT2 have double RS485. The busbar socket is for connecting the extension module. The mode selection switch has three positions: ON, TM and OFF.

1.3 Terminal Introduction

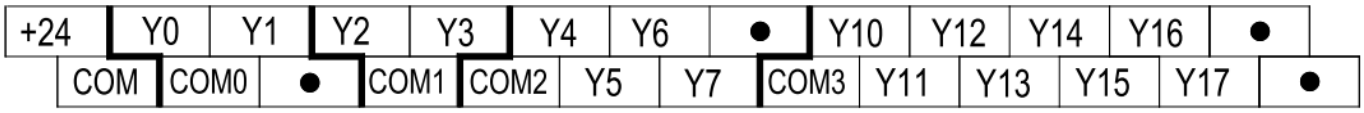
1. The layouts of terminals are shown as follows: Input terminals:

S/S	X0	X2	X4	X6	X10	X12	X14	X16	I1+	I1-	I2+	I2-
X1	X3	X5	X7	X11	X13	X15	X17	FG	R1+	R1-	R2+	R2-

Input terminal definition table

No.	Sign	Description	No.	Sign	Description
1	S/S	Input source/sink mode selection terminal	14	X1	Digital signal X1 input terminal
2	XO	Digital signal XO input terminal	1 c l”‘	n ‘	Digital signal X3 input terminal
3	X2	Digital signal X2 input terminal	16	c X’	Digital signal X5 input terminal
4	X4	Digital signal X4 input terminal	17 ‘ ‘	y7 ”	Digital signal X7 input terminal
5	X6	Digital signal X6 input terminal	18	X11	Digital signal X11 input terminal
6	X10	Digital signal X10 input terminal	19	X13	Digital signal X13 input terminal
7	X12	Digital signal X12 input terminal	20	X15	Digital signal X15 input terminal
8	X14	Digital signal X14 input terminal	21	X17	Digital signal X17 input terminal
9	X16	Digital signal X16 input terminal	22	FG	RTD cable shield ground
10	11	Positive RTD auxiliary current of CH1	23	R1+	Positive thermal-resistor sisnal iniut of CH1
11	11	Negative RTD auxiliary current of CH1	24	R1	Negative thermal-resistor sisnal ineut o f CH1
12	12+	Positive RTD auxiliary current of CH2	25	R2+	Positive thermal-resistor sisnal iniut of CH2
13	12—	Negative RTD auxiliary current of CH2	26	R2—	Negative thermal-resistor signal input of CH2

Output terminals:



No.	Sign	Description	No.	Sign	Description
1	+24	Positive pole of output power sup ply 24V	14	COM	Negative pole of output power s upply 24V
2	YO	Control output terminal	15	COMO	Control output common terminal
3	Y1	Control output terminal	16		Empty
4	Y2	Control output terminal	17	COM1	Common terminal of control out put terminal
5	Y3	Control output terminal	18	COM2	Common terminal of control out put terminal
6	Y4	Control output terminal	19	Y5	Control output terminal
7	Y6	Control output terminal	20	Y7	Control output terminal
8	•	Empty	21	COM3	Common terminal of control out put terminal
9	Y10	Control output terminal	22	Yll	Control output terminal
10	Y12	Control output terminal	23	Y13	Control output terminal
11	Y14	Control output terminal	24	Y15	Control output terminal
12	Y16	Control output terminal	25	Y17	Control output terminal
13	•	Empty	26	•	Empty

Power supply specifications

The specification of PLC built-in power and power for extension modules is listed in the following table.

Item		Unit	Min.	Typical value	Max.	Note
Power supply voltage		Vac	85	220	264	Normal startup and operation
Input current		A	/	/	2.	Input: 90Vac, 100% output
Rated outp ut current	5V/GND	mA	/	900	/	The total power of outputs 5V/G ND and 24V/GND 10.4W. Max. output power: 24.8W (su m of all branches)
	24V/GND	mA	/	300	/	
	+-15V/AGND	mA	/	200		
	24V/COM	mA	/	600	/	

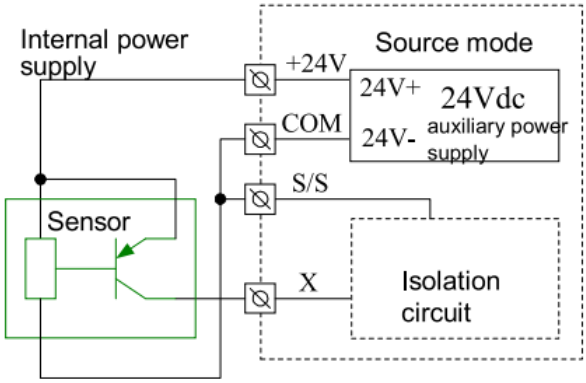
Digital Inputs & Outputs

3.1 Input Characteristic And Specification

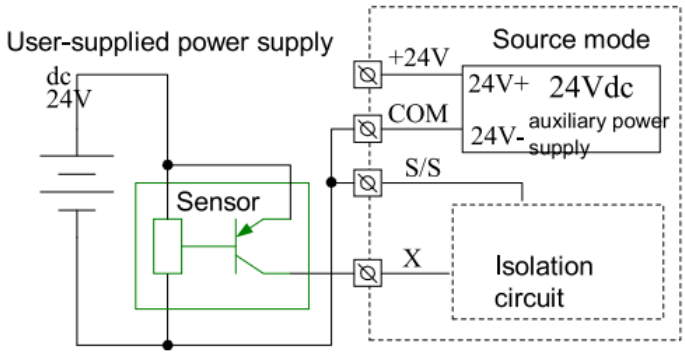
The input characteristic and specs are shown as follows:

Item		High-speed input terminals X0—X7	General input terminal
Input mode		Source mode or sink mode, set through s/s terminal	
Electric parameters	Input voltage	24Vdc	
	Input resistance	4k0	4.3k0
	Input ON	External circuit resistance < 4000	External circuit resistance < 4000
	Input OFF	External circuit resistance > 24k0	External circuit resistance > 24k0
Filtering function	Digital filter	X0—X7 have digital fi time: 0, 8, 16, 32 or 64ms programme)	tering function. Filtering (selected through user
	Hardware filter	Input terminals other than X0—X7 are of hardware filtering. Filtering time: about 10ms	
High-speed function		X0—X7: high-speed counting, interrupt, and pulse catching XO and X1: up to 50kHz counting frequency X2—X5: up to 10kHz counting frequency The sum of input frequency should be less than 60kHz	
Common terminal		Only one common terminal: COM	

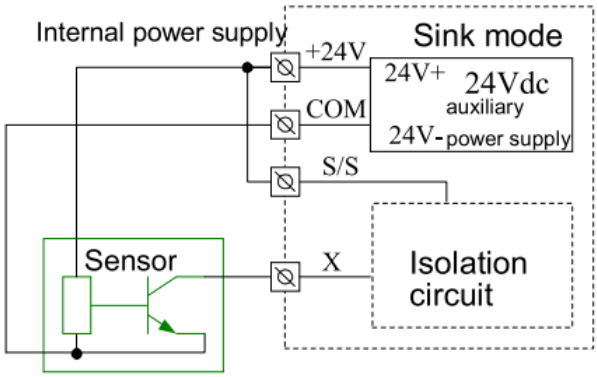
The input terminal act as a counter has a limit over the maximum frequency. Any frequency higher than that may result in incorrect counting or abnormal system operation. Make sure that the input terminal arrangement is reasonable and external sensors used are proper.
The PLC provides an S/S terminal for selecting signal input mode among source mode and sink mode. Connecting the S/S terminal to the +24 terminal, i.e. set the input mode to the sink mode, enables a connection with the NPN sensor.



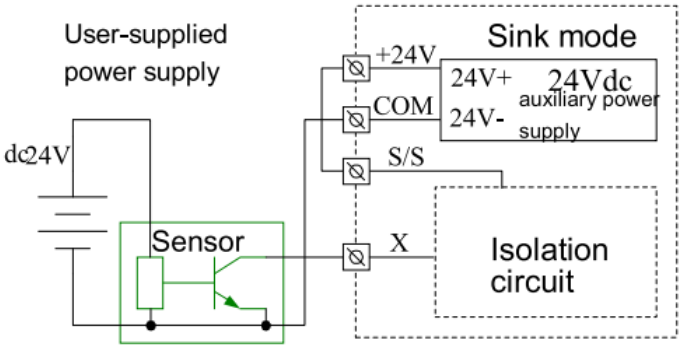
Source-type input wiring with internal power supply



Source-type input wiring with external auxiliary power supply



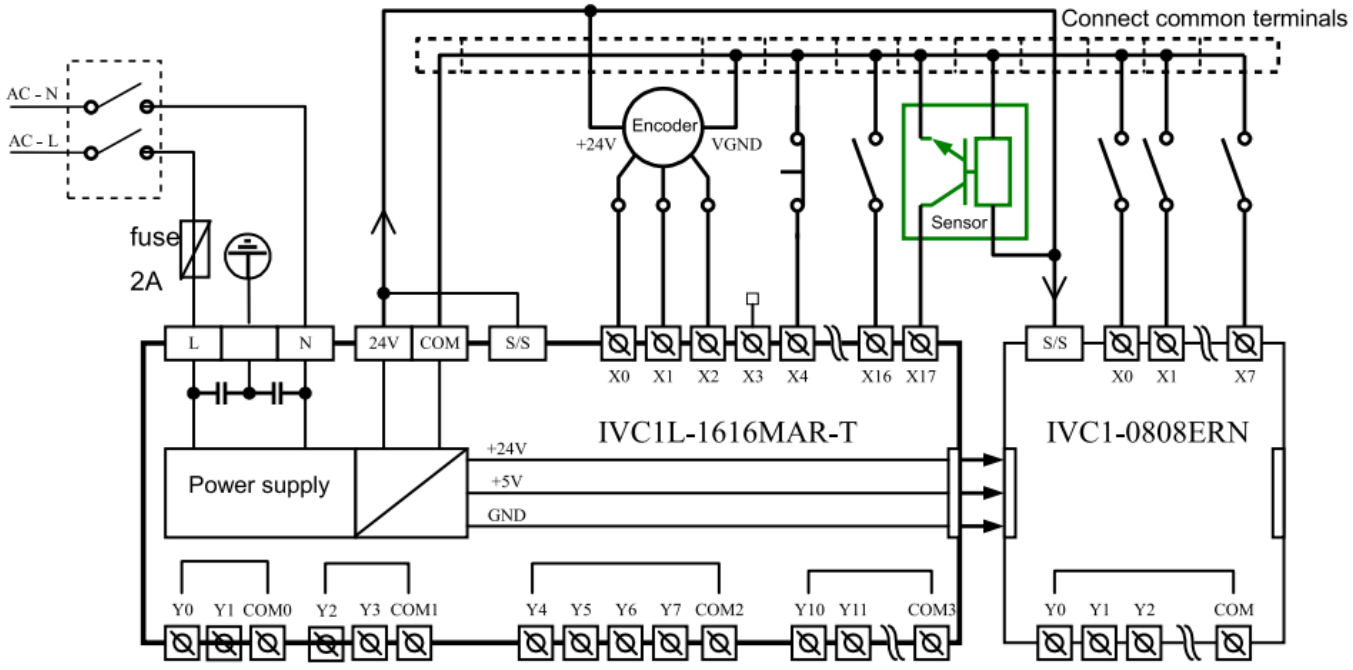
Sink-type input wiring with internal power supply



Sink-type input wiring with external auxiliary power supply

Input connection example

The following diagram shows an example of IVC1L-1616MAR-T in connection with an IVC1-0808ENR, which realizes simple positioning control. The positioning signals from the PG are input through high speed counting terminals XO 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.



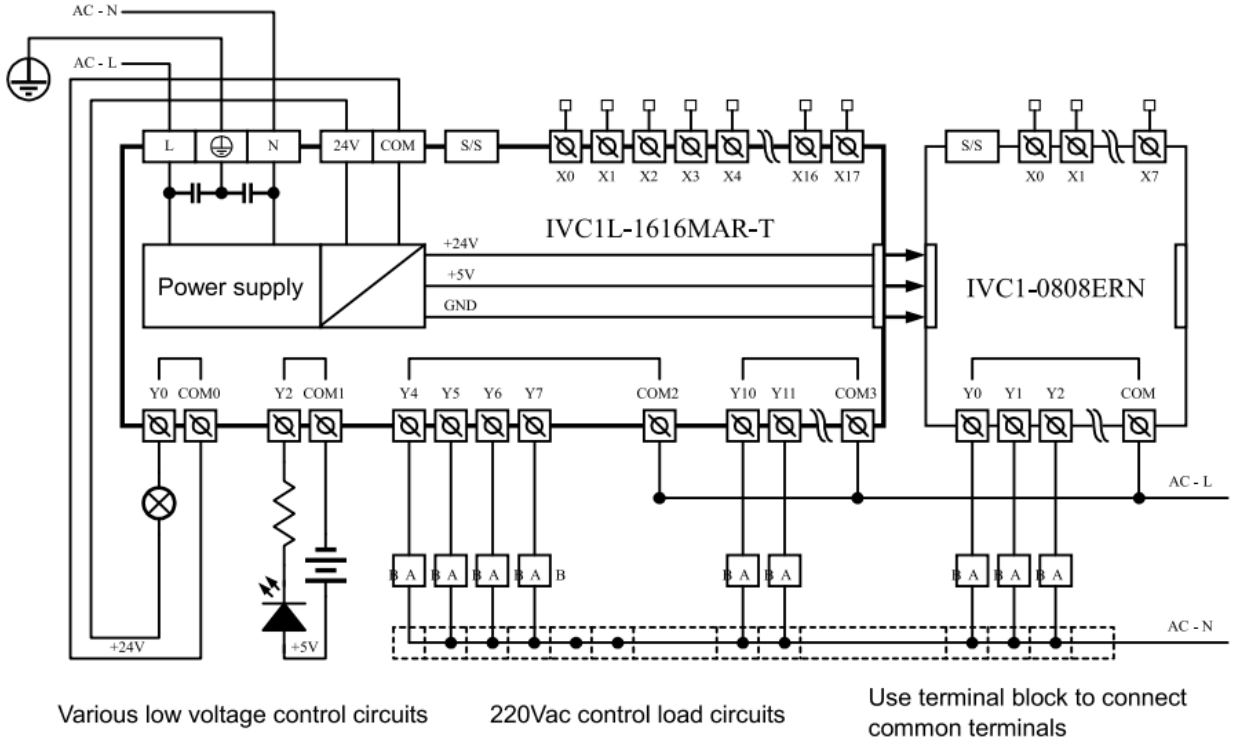
3.2 Output Characteristic And Specification

The electric specs of outputs is shown in the following table.

Item		Relay output
Switched voltage		Below 250Vac, 30Vdc
Circuit isolation		By Relay
Operation indication		Relay output contacts closed, LED on
Leakage current of open circuit		/
Minimum load		2mA/5Vdc
Max. output current	Resistive load	2A/1 point; 8A/4 points, using a COM 8A/8 points, using a COM
	Inductive load	220Vac, 80VA
	Illumination load	220Vac, 100W
Response time	OFF—›ON	20ms Max
	ON—*OFF	20ms Max
Y0, Y1 max. output frequency		/
Y2, Y3 max. output frequency		/
Output common terminal		YO/ Y1-COMO; Y2/Y3-COM1. After Y4, Max 8 terminals use one isolated common terminal
Fuse protection		None

Output connection example

The following diagram shows an example of IVC1L-1616MAR-T in connection with an IVC1-0808ENR. Some (like Y0-COMO) are connected to the 24Vdc circuit powered by local 24V-COM, some (like Y2-COM1) are connected to the 5Vdc low voltage signal circuit, and others (like Y4—Y7) are connected to the 220Vac voltage signal circuit. Different output groups can be connected to different signal circuits with different voltages.

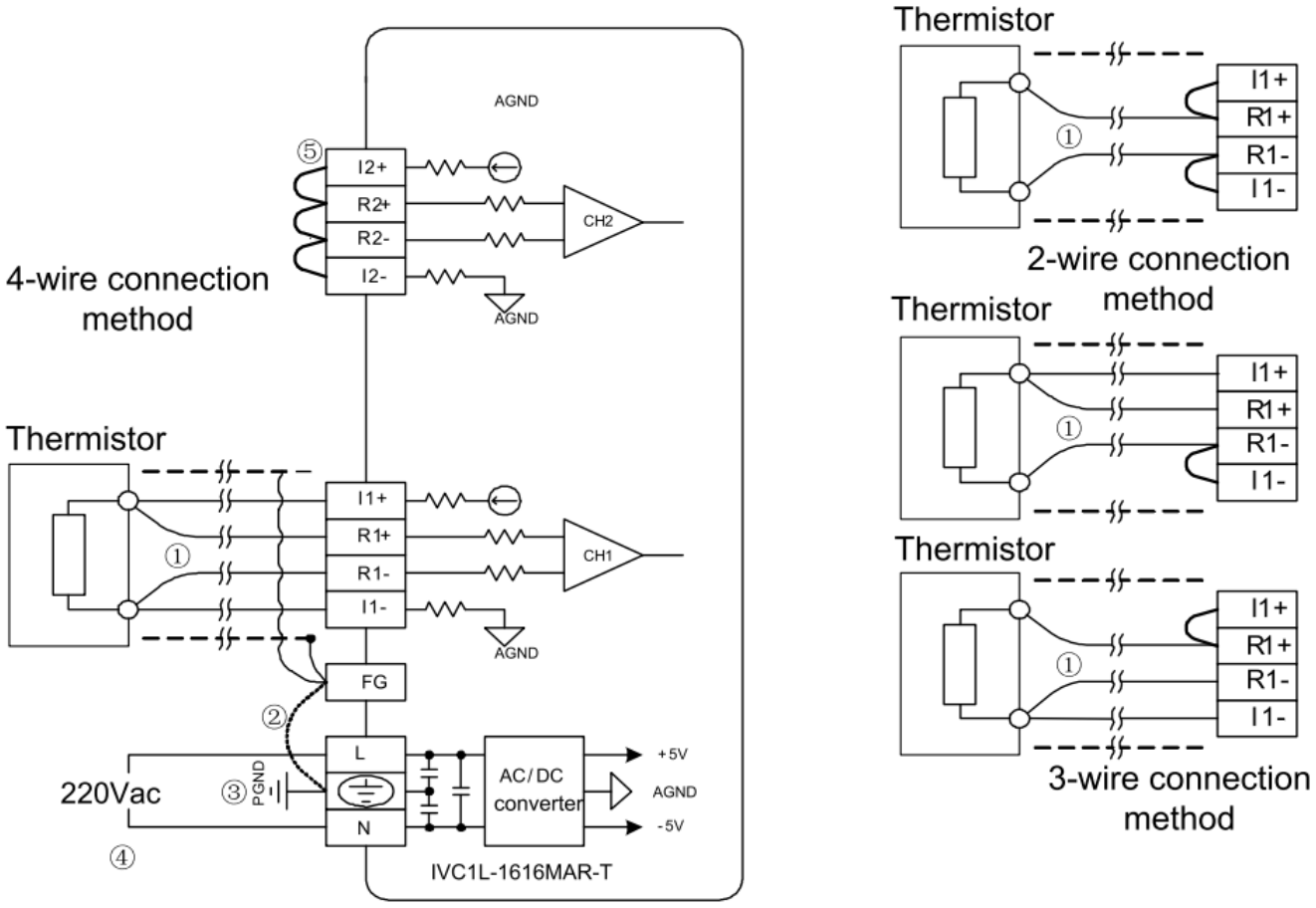


3.3 Thermistor Characteristic And Specification
Performance Specification

Item	Specification			
	Degrees Celsius (°C)		I Degrees Fahrenheit (°F) ‘	
Input signal.	Termistor type: Pt100, Cu100, Cu50 Number of channels: 2			
Converting speed	(15±2%) ms x 4 channels (The conversion is not performed for unused channels.)			
Rated temperature r ange	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	The temperature value is stored in 16-bit binary complement code.			
	Pt100	—1500—+6000	Pt100	—2380—+11120
	Cu100	—300—+1200	Cu100	—220—+2480
	Cu50	—300—+1200	Cu50	—220—+2480

Item	Specification			
	Degrees Celsius (°C)		Degrees Fahrenheit (°F)	
Lowest 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
Precision	±1% of the full range			
Isolation	Analog circuits are isolated from digital circuits by using photoelectric couplers. Analog channels are not isolated from each other.			

The following figure shows the terminal wiring:



Terminal wiring

The labels 0 to 0 in the above figure indicate the connection that you need to pay special attention to.

1. It is recommended that you connect the thermistor signals by using a shielded twisted-pair cable, and keep the cable away from power cables or other cables that may cause electrical interference. The connection of a thermistor is described as follows:

   For thermistor sensors of the Pt100, Cu100, and Cu50 types, you can use the 2-wire, 3-wire, and 4-wire connection methods. Among them, the precision of the 4-wire connection method is the highest, that of the 3-wire connection method is the second highest, and that of the 2-wire connection method is the lowest. If the length of the wire is longer than 10 m, it is recommended that you use the 4-wire connection method to eliminate the resistance error caused by the wire.

   To reduce measurement errors and prevent noise interference, it is recommended that you use connection cables that are shorter than 100 m.
2. If too much electrical interference is caused, connect the shielding ground to the ground terminal PG of the module.
3. Ground the ground terminal PG of the module properly.
4. Use 220Vac power supply. O. Short-circuit the positive and negative terminals that do not use a channel to prevent the detection of error data on the channel.

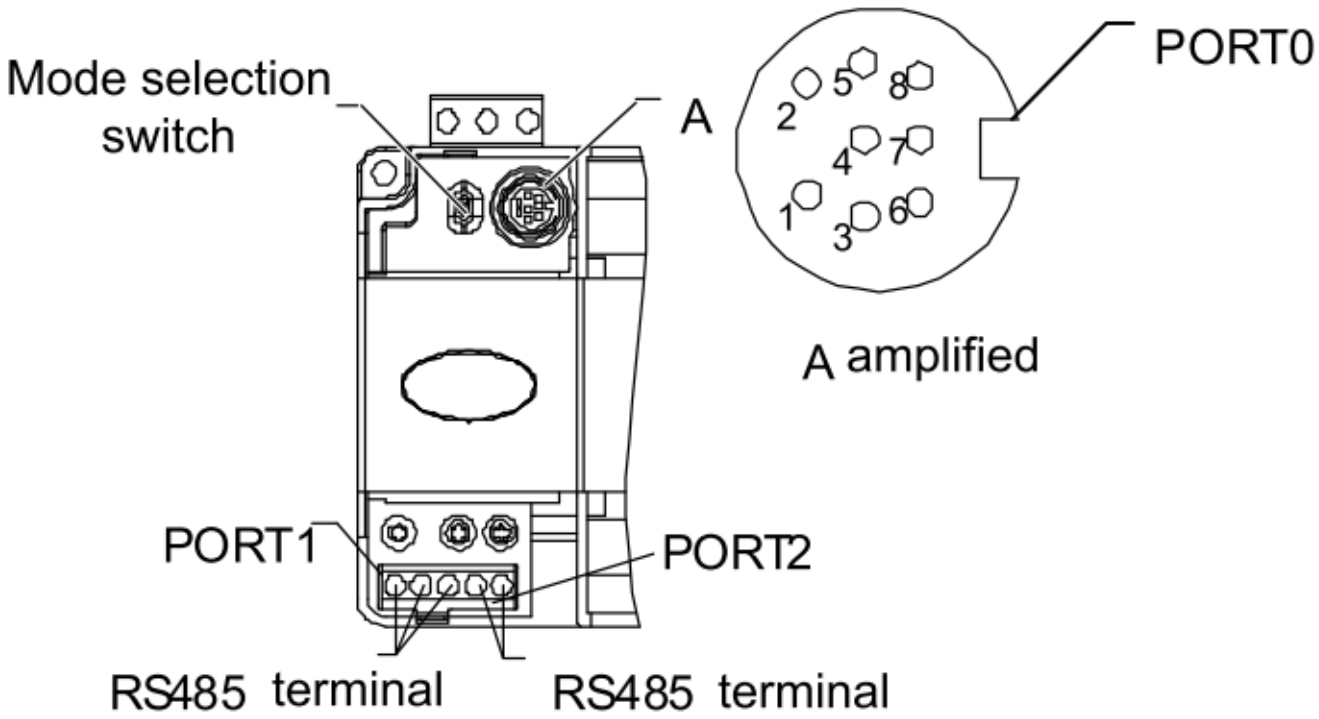
SD unit configuration

Address No.	Name	RIW attribute	Note
SD172	Sampling average of CH1	R	Default value: 0
SD173	Sampling times of CH1	RW	1-1000, Default value: 8
SD174	Sampling average of CH2	R	Default value: 0
SD175	Sampling times of CH2	RW	1-1000, Default value: 8
SD178	Mode selection for CH1 (8 LSBs) Mode selection for CH2 (8 MSBs)	RW	0: Disable 1:PT100 (-1500-6000, degrees Celsius) 2:PT100 (-2380-11120, degrees Fahrenheit) 3:Cu100 (-300-1200, degrees Celsius) 4:Cu100 (-220-2480, degrees Fahrenheit) 5:Cu50 (-300-1200, degrees Celsius) 6:Cu50 (-220-2480, degrees Fahrenheit)

Setting example:
In order to configure the PT100 for both CH1 and CH2, output the value in degrees Celsius, and set the points of average value to 4, you need to set the 8 leaset significant bits(LSBs) of SD178 to Ox01 and the 8 most significant bits(MSBs) of SD178 to Ox01, i.e. set the SD178 to Ox0101(hexadecimal). Then set the SD173 and SD175 to 4. The values of SD172 and SD174 are the average temperatures in Celsius degree of the four samplings detected by the CH1 PT100 and CH2 PT100, respectively.

Communication Port

IVC1L-1616MAR-T basic module has three serial asynchronous communication ports: PORTO, PORT1, and PORT2. Supported baud rates: 115200, 57600, 38400, 19200, 9600, 4800, 2400, 1200bps. The mode selection switch determines the communication protocol of PORTO.



Pin No.	Name	Description
3	GND	Ground
4	RXD	Serial data receiving pin (from RS232 to PLC)
5	TX D	Serial data transmitting pin (from PLC to RS 232)
1, 2, 6, 7,8	Reserves	Undefined pin, leave it suspended

As a terminal dedicated to user programming, PORTO can be converted to programming protocol through the mode selection switch. The relationship between PLC operation status and the protocol used by PORTO is shown in the following table.

Mode selection switch position	Status	PORTO operation protocol
ON-	Run	Programming protocol, or Modbus protocol,or free-port protocol, or N: N network protocol, as determined by user program and system configuration
ON→TM	Running	Converted to programming protocol
OFF →TM	Stop	
OFF	Stop	If the system configuration of user program is free-port protocol, it converts to programming protocol automatically after stop; or system protocol keeps unchanged

PORT1. PORT2 are ideal for connection with equipment that can communicate (such as inverters). With Modbus protocol or RS485 terminal free protocol, it can control multiple devices through the network. Its terminals are

fixed with screws. You can use a shielded twisted-pair as the signal cable to connect communication ports by yourself.

Installation

PLC is applicable to Installation category II, Pollution degree 2.

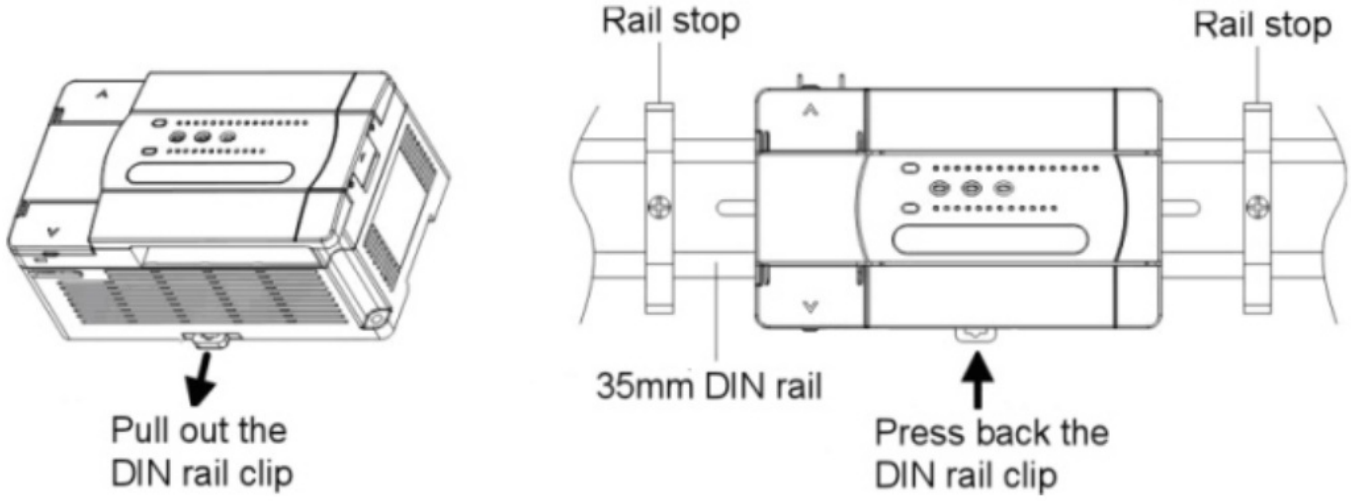
5.1 Installation Dimensions

Model	Length	Width	Height	Net weight
IVCAL-1616MAR-T	182mm	90mm	71.2mm	750g

5.2 Installation Method

DIN rail installation

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



The detailed procedure is as follows:

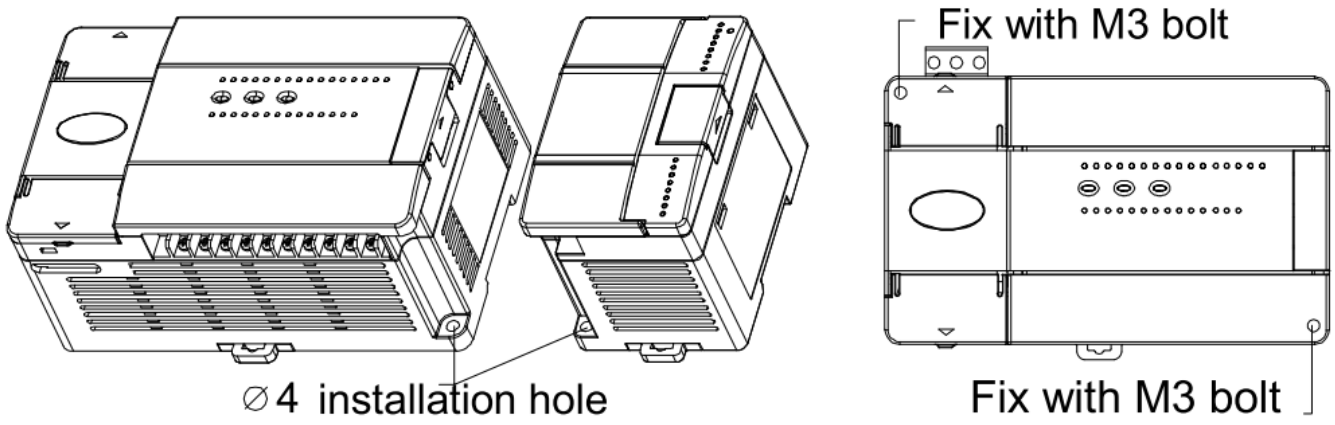
1. Fix the DIN rail onto the installation backplane;
2. Pull out the DIN rail clip from the bottom of the module;
3. Mount the module to the DIN.
4. Press back the DIN rail clip to lock the module.
5. Fix the two ends of the module with the rail stops to avoid sliding.

This procedure can be used to install the DIN rail for all other IVC1L-1616MAR-T PLCs.

Screw fixing

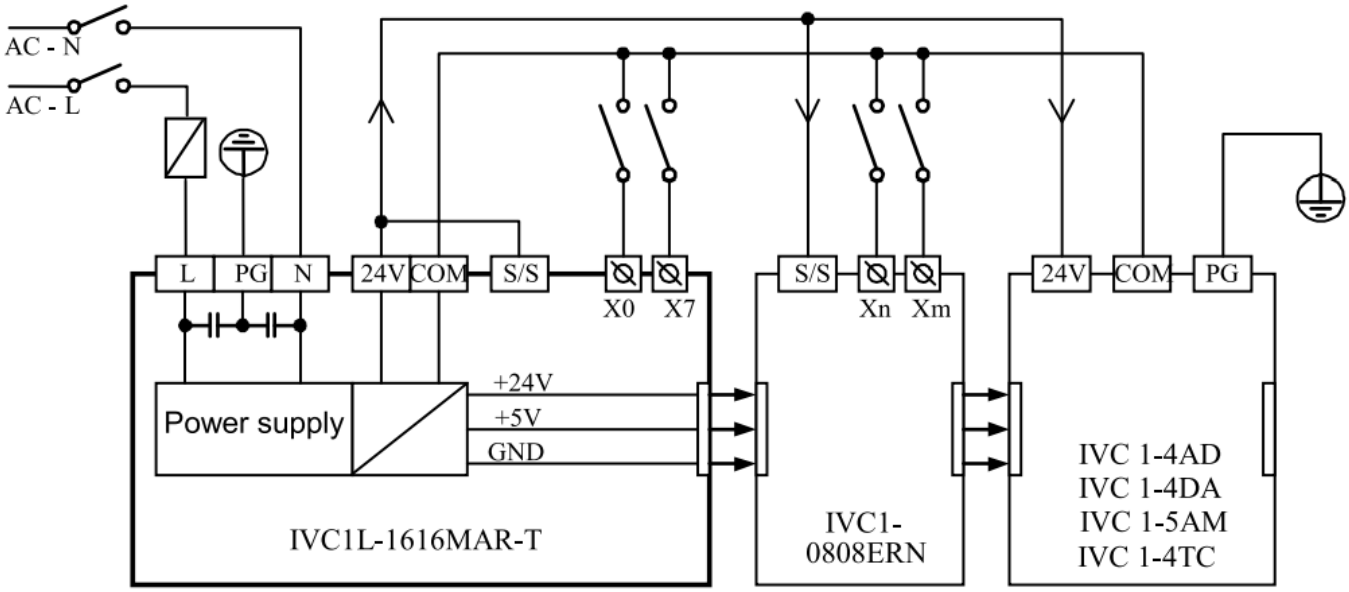
Fixing the PLC with screws can stand greater shock than DIN rail mounting.

Use M3 screws through the mounting holes on PLC enclosure to fix the PLC onto the backboard of the electric cabinet, as shown in the following figure.

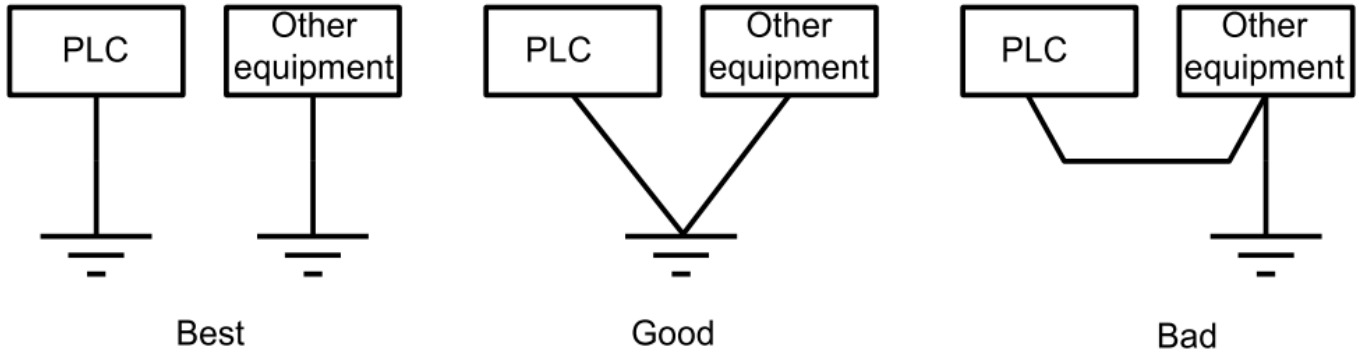


5.3 Cable Connection and Specification

Connect power cable and grounding cable. We suggest you wire a protection circuit at the power supply input terminal. The following figure shows shows the connection of the AC and auxiliary power supplies.



The anti-electromagnetic interference capability of the PLCs can be improved by configuring reliable grounding cables. When installing a PLC, connect the power supply terminal ⏚ to the ground. It is recommended that you use connection wires of AWG12 to AWG16 and try to shorten the wires, and that you configure independent grounding and keep the grounding cables away from those of other devices (especially those generating strong interference), as shown in the following figure.

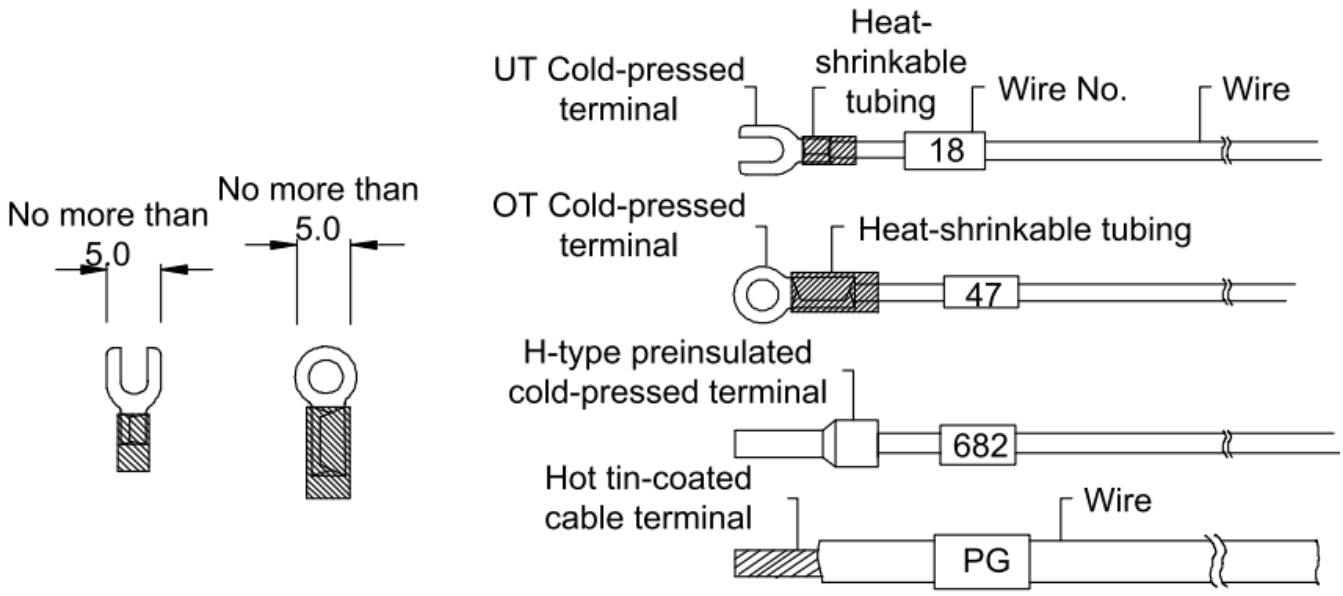


Cable specification

When wiring a PLC, use multi-strand copper wire and ready-made insulated terminals to ensure the quality. The recommended model and the cross-sectional area of the cable are shown in the following table.

Cable	Cross-sectional area	Recommended model	Cable lug and heat-shrink tube
AC power cable (L, N)	1.0-2.0mm2	AWG12, 18	H1.5/14 round insulated lug, or tin ned cable lug
Earth cable (e)	2.0mm2	AWG12	H2.0114 round insulated lug, or tin ned cable lug
Input signal cable (X)	0.8-1.0mm2	AWG18, 20	UT1-3 or OT1-3 solderless lug 1)3 or c1314 heat shrinkable tube
Output signal cable (Y)	0.8-1.0mm2	AWG18, 20	

Fix the prepared cable head onto the PLC terminals with screws. Fastening torque: 0.5-0.8Nm.
The recommended cable processing-method is shown in the following figure.



Power-on Operation And Maintenance

6.1 Startup

Check the cable connection carefully. Make sure that the PLC is clear of alien objects and the heat dissipation channel is clear.

1. Power on the PLC, the PLC POWER indicator should be on.
2. Start the AutoStation software on the host and download the compiled user program to the PLC.
3. After checking the download program, switch the mode selection switch to the ON position, the RUN indicator should be on. If the ERR indicator is on, the user program or the system is faulty. Loop up in the IVC series PLC Programming Manual and remove the fault.
4. Power on the PLC external system to start system debugging.

6.2 Routine Maintenance

Do the following:

1. Ensure the PLC a clean environment. Protect it from aliens and dust.
2. Keep the ventilation and heat dissipation of PLC in good condition.

3. Ensure that the cable connections are reliable and in good condition.

Warning

1. Use the relay contacts only when necessary, because the life span of

Notice

1. The warranty range is confined to the PLC only.
2. Warranty period is 18 months, within which period INVT conducts free maintenance and repairing to the PLC that has any fault or damage under the normal operation conditions.
3. The start time of warranty period is the delivery date of the product, of which the product SN is the sole basis of judgment. PLC without a product SN shall be regarded as out of warranty.
4. Even within 18 months, maintenance will also be charged in the following situations:
   Damages incurred to the PLC due to mis-operations, which are not in compliance with the User Manual;
   Damages incurred to the PLC due to fire, flood, abnormal voltage, etc;
   Damages incurred to the PLC due to the improper use of PLC functions.
5. The service fee will be charged according to the actual costs. If there is any contract, the contract prevails.
6. Please keep this paper and show this paper to the maintenance unit when the product needs to be repaired.
7. If you have any question, please contact the distributor or our company directly.

Shenzhen INVT Electric Co., Ltd.
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Guangming District, Shenzhen, China
Website: www.invt.com

Documents / Resources

	INVT IVIC1L-1616MAR-T Micro Programmable Logic Controller [pdf] User Guide IVIC1L-1616MAR-T Micro Programmable Logic Controller, IVIC1L-1616MAR-T, Micro Programmable Logic Controller, Programmable Logic Controller, Logic Controller