VS070-1614MDR1 Integrated Machine Quick Start User Manual

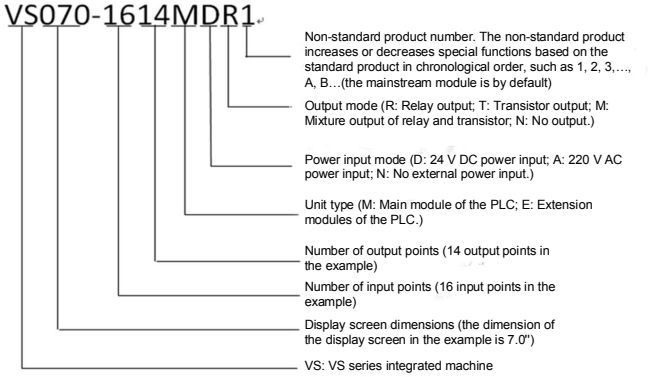
This quick start manual is to offer you a quick guide to the design, installation, connection, and maintenance of VS070-1614MDR1 integrated machine, convenient for on-site reference. Briefly introduced in this manual are the hardware specifications, features, and usage of VS070-1614MDR1 integrated machine, plus the optional parts and FAQ for your reference. For detailed product information, please refer to our *VS070-1614MDR1 Integrated Machine User Manual*, *Auto Station Programming Software User Manual,* and *IVC Series Micro-PLC Programming Manual*. For ordering the above user manuals, contact your supplier, or login in the website at http://www.invt-control.com to download the related technical information or feedback some problems of the PLCs.

Supporting software: HMITool6.0 or above, and Auto Station V1.40 or above.

1 Product introduction

1.1 Output description

The main module of the integrated machine is named based on the following figure.



To Customers:
Thanks you for choosing the product developed and produced by INVT Auto-Control Technology (Shenzhen) Co., Ltd. To know the product quality in use and provide better service for you, could you please fill in the sheet after the product has been operated for 1 month, and mail or fax it to our customer service center? We will send you an exquisite souvenir upon receiving the complete product quality feedback sheet. Furthermore, if you can give us some advices on improving the product and service quality, you will have a chance to be awarded a special gift.

INVT Auto-Control Technology (Shenzhen) Co., Ltd.

Customer service center

Product quality feedback sheet

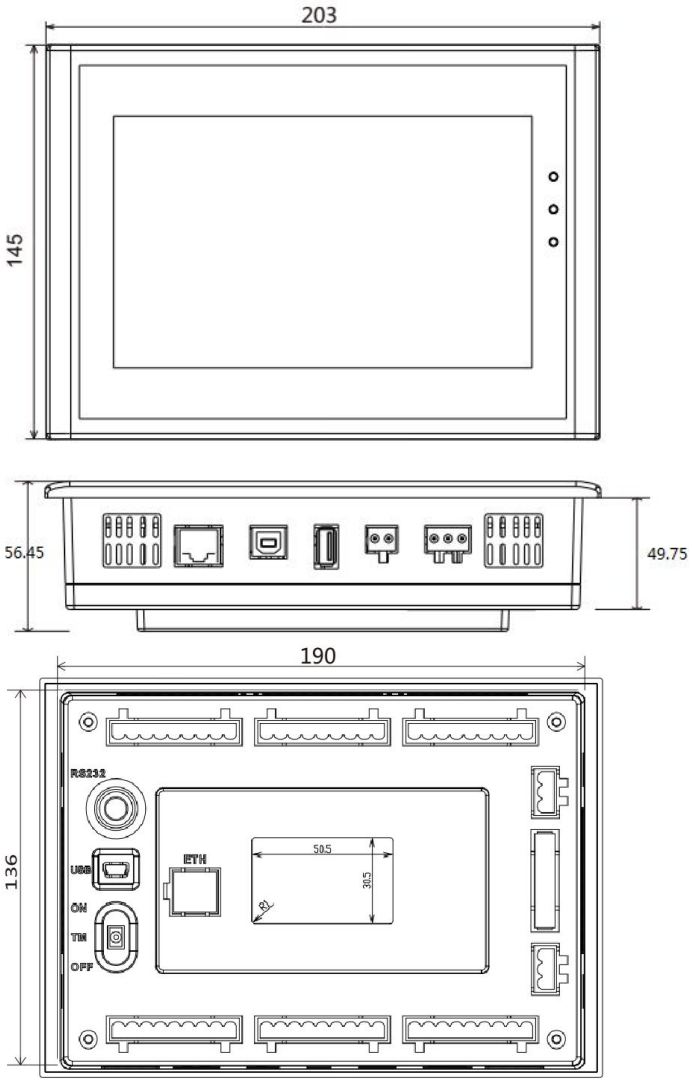
User name		Telephone	
User address		Postal code	
Product name and model		Installation date	
Machine No.			
Product appearance or structure			
Product performance			
Product package			
Product material			
Quality in use			
Improvement comments or suggestions			

West Side, 6th Floor, Block B, INVT Guangming Technology Building, Songbai Road, Matian, Guangming District, Shenzhen

Postal code: 518106

1.2 Appearance and structure

The following figure shows the appearance and structure of VS070-1614MDR1 integrated machine.



The rounded port on the left side is a port for downloading. Elliptic port is the mode selection switch, providing three options: ON, TM, and OFF. For details about ports on the right side, see port description.

1.3 Basic parameters

Screen parameters

Specification	VS070-1614MDR1
Resolution (pixel)	800 × 480
Contrast	400:1
Brightness	450 cd/m^2
Touch panel	4-wire high precision touchpad
Display color	16.77 million
backlight module	LED

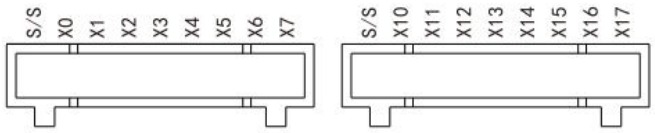
I/O points and terminal arrangements

Specification	VS070-1614MDR1
Total number of I/O points	30
Number of input points	16
Number of output points	14
Analog input	2
Analog output	1
RS485 (One for HMI, and one for PLC)	2

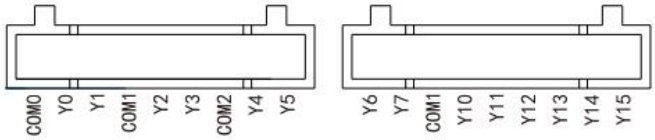
Specification	VS070-1614MDR1
RS232	1

Terminal arrangement of VS070-1614MDR1 machine

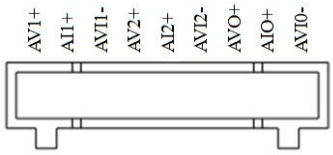
Input ports:



Output ports:

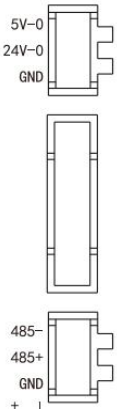


Analog input/output ports



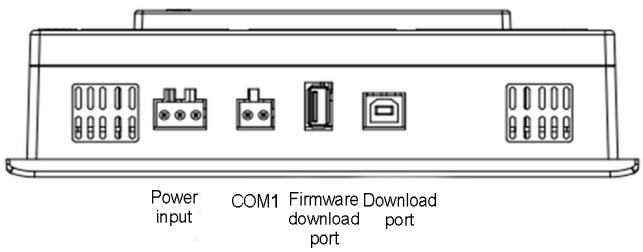
Right-side ports

From top from bottom, the ports on the top are power output ports, the medium is the bus socket for connecting extension modules, and the ports on the bottom are of 485 interfaces.



Ports on the shell:

The ports, from left to right, are power input interface, COM1, firmware download port (for firmware upgrade) and download port (conducting data exchange with HMI for downloading project).



2 Power supply specifications

The following table shows the power supply specifications.

Item		Unit	Min. value	Typical value	Max. value	Remarks
Input voltage range		V DC	18	24	30	Voltage range for proper start and operation Relay output, and digital input power can use the input voltage
Current		A		0.3	1.5	
Rated output current	5 V/ GND	mA	/	/	1000	Used in the system
Rated output current	3.3 V/GND	mA	/	/	300	Used in the system

In which

- Adopting non-isolated power and power input nominal voltage 24 V DC.
- The power circuit is required to be configured with a function for detecting upon power failure. When the PLC is powered off, 3.3 V should be kept at least 200 ms for data backup.

3 Digital input/output characteristics

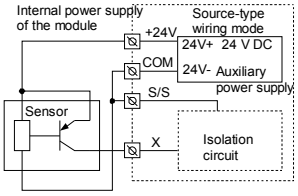
3.1 Input characteristics and signal specifications

The following table describes the input characteristics and signal specifications.

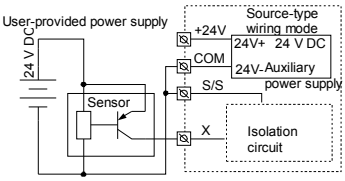
Item		High-speed input terminals X0 to X7	Common input terminal
Signal input mode		Source-type or sink-type mode. You can select the mode through the "S/S" terminal.	
Electrical parameters	Detection voltage	24 V DC	
	Input impedance	0.8 kΩ	4 kΩ
	Input switched on	The resistance of the external circuit is lower than 400 Ω.	The resistance of the external circuit is lower than 400 Ω.
	Input switched off	The resistance of the external circuit is higher than 24 kΩ.	The resistance of the external circuit is higher than 24 kΩ.
Filtering function	Digital filtering	X0–X7 have digital filtering function. Filtering time: 0, 8, 16, 32, and 64 ms (selected through user programming).	
	Hardware filtering	Hardware filtering is adopted for ports except X0 to X7, and the filtering time is about 10 ms.	
High-speed function		Ports X0 to X7 can implement multiple functions including high-speed counting, interrupting, and pulse capture. The maximum couting frequency of X0 and X1 is 50 kHz. The maximum couting frequency of X2 and X5 is 10 kHz. The sum of input frequency shall be less than 60 kHz.	
Common wiring terminal		Only one common treminal: COM	

The maximum frequency of the count input port is limited. If the input frequency exceeds the limit, the counting may be incorrect or the system fails to run properly. You need to arrange the input ports properly and select a proper external sensor.

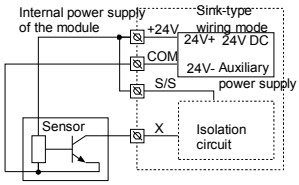
The PLC provides the "S/S" port for selecting the signal input mode. You can select the source-type or sink-type mode. Connecting "S/S" to "+24V" indicates that you select the sink-type input mode, and then an NPN-type sensor can be connected.



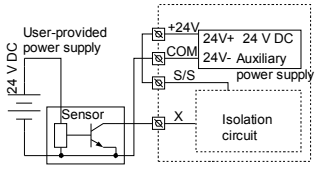
Wiring diagram of source-type input mode based on the internal power supply of the module



Wiring diagram of source-type input mode based on an external auxiliary power supply



Wiring diagram of sink-type input mode based on the internal power supply of the module



Wiring diagram of sink-type input mode based on an external auxiliary power supply

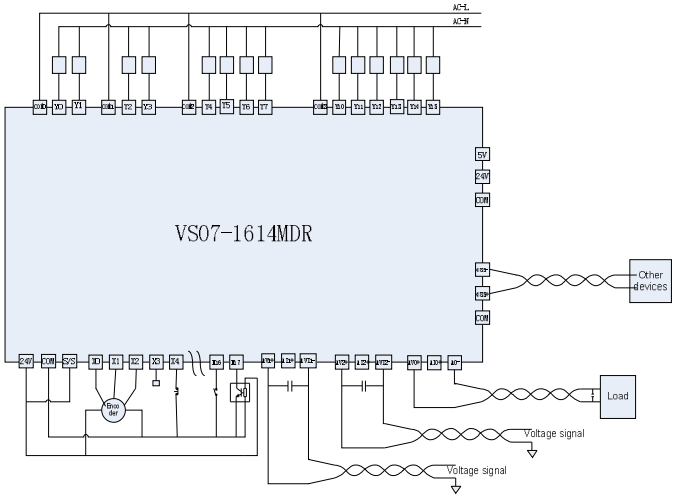
3.2 Output electrical specifications

Item		Relay-type output
Circuit power supply voltage		Below 250 V AC, 30 V DC
Circuit insulation		Relay mechanical insulation
Action indication		The indicator is on when the relay output contact is closed.
Open-circuit leakage current		/
Min. load		2 mA/5 V DC
Max. output current	Resistive load	2 A/1-point Common terminal of the 8 A/4-point group Common terminal of the 8 A/8-point group
	Inductive load	220 V AC, 80 VA
	Lamp load	220 V AC, 100 W
Response time	OFF→ON	Maximum time: 20 ms
	ON→OFF	Maximum time: 20 ms
Common output terminal		Y0/ Y1–COM0. Y2/ Y3–COM1. After Y4, every 8 terminals use one isolated common terminal, and all the common terminals are isolated from each other.
Fuse protection		No

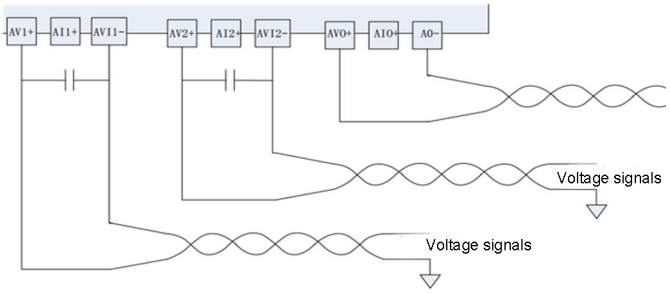
Input/output connection instances

The following figure shows the connection of VS070-1614MDR1 integrated machine, which is an instance of implementing simple positioning control. Input group: The position signals obtained by the encoder can be detected by the X0 and X1 high-speed counting terminals. The position switch signals that require quick response can be connected to the high-speed terminals X2 to X7. Other user signals can be distributed among the input terminals.

Output group (like Y0–Y17) can be connected to 24 V DC circuit powered by local 24V-COM, or connected to 220 V AC voltage signal circuit.

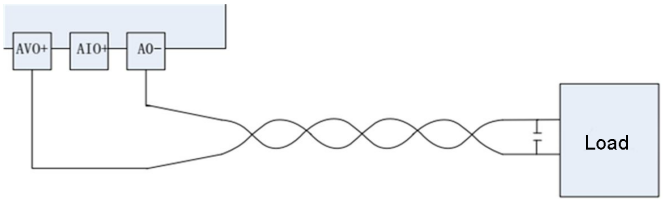


Input connection instance of analog signal



1. For analog input, it is recommended to use shielded twisted-pair cables. The cable should be kept away from the power wire or other wires that may cause electrical interference.
2. If there is fluctuation in input signals or electrical interference during the external wiring, a smoothing capacitor (0.1μF–0.47μF/25 V) is recommended.
3. If the current channel uses the power input, the voltage and current input ports should be shorted.
4. Analog power supply not only can use 24 V DC power supply output by the main module, but can use other power supplies that meet the requirements.
5. Do not use the unconnected pin on the user terminals.

Output connection instance of analog signal



1. For analog output, it is recommended to use shielded twisted-pair cables. The cable should be kept away from the power wire or other wires that may cause electrical interference.
2. Using single-point grounding on the load end of the output cable
3. If there is electrical noise or voltage fluctuation during outputting, a smoothing capacitor (0.1 μF–0.47 μF/25 V) is recommended.
4. If voltage output short circuit occurs or the current load is connected to the voltage output end, VS070-1614MDR1 integrated machine I may be damaged.
5. Analog power supply not only can use 24 V DC power supply output by the main module, but can use other power supplies that meet the requirements.

6. Do not use the unconnected pin on the user terminals.

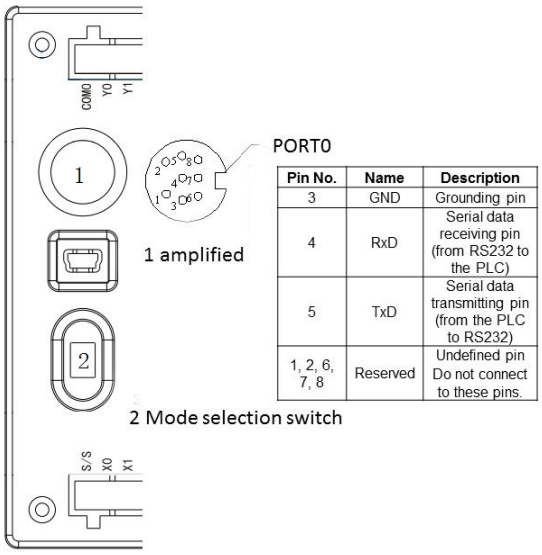
The analog signal input/output specification is listed in the following table.

The analog quantity is non-isolated

	Parameter
Analog input range	0–10 V DC, 0–20 mA
Analog output range	0–10 V DC, 0–20 mA
Total precision	±1% of the full scale
Resolution	5 mV, 10 μA
Concersion speed	2 ms/channel

4 Communication ports

VS070-1614MDR1 integrated machine provides three asynchronous serial communication ports, namely COM1, PORT0, and PORT1. They support the baud rates of 115200, 57600, 38400, 19200, 9600, 4800, 2400, and 1200 bps. The communication protocol of PORT0 is determined by the mode selection switch as shown in the following figure.



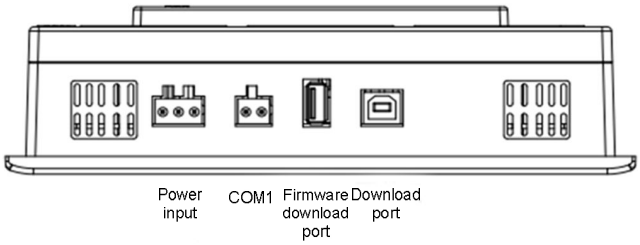
PORT0

Pin No.	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	Undefined pin Do not connect to these pins.

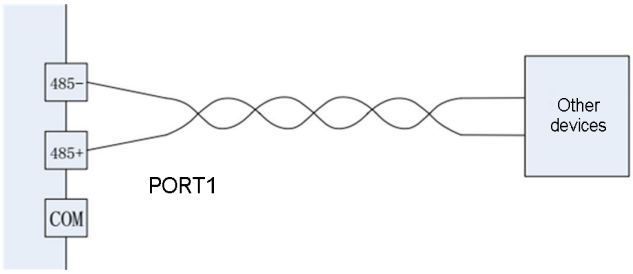
As a specialized interface for user programming, PORT0 can be forcibly switched to the programming port protocol through the mode selection switch. The following table describes the mapping between PLC running states and PORT0 running protocols.

Mode selection switch setting	State	PORT0 running protocol
ON	Running	Depend on the user program and its system configuration. It can be the programming port, Modbus, free-port, or N:N network protocol.
TM (ON→TM)	Running	Forcibly switched to the programming port protocol.
TM (OFF→TM)	Stopped	
OFF	Stopped	If the free-port protocol is used in the system configuration of the user program, PORT0 is automatically switched to the programming port protocol after the PLC is stopped. Otherwise, the protocol set in the system is not switched.

Both COM1 and PORT1 are RS485 ports that can be connected to devices with communication functions, such as inverters. These ports can be used to control multiple devices in networking mode through the RS485 terminal free protocol. They are terminals fastened with screws. You can make the communication signal cables by yourself. It is recommended that you use shielded twisted pairs (STPs) to connect the ports, as shown in the following figure.



HMI



PLC

5 Installation

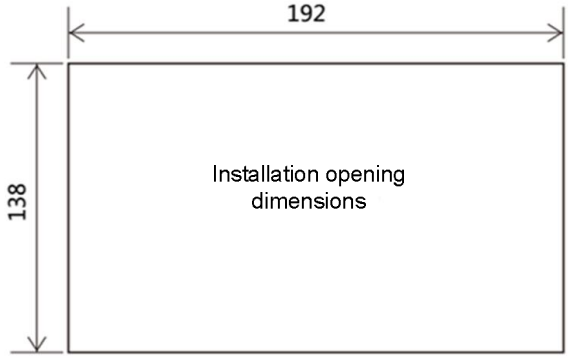
VS070-1614MDR1 integrated machine are applicable to scenarios with installation environments of standard II and pollution level of 2.

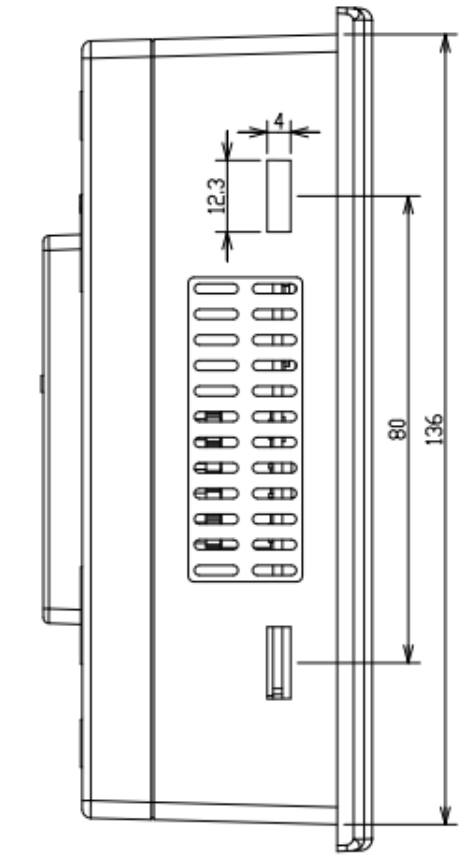
5.1 Dimensions and specifications

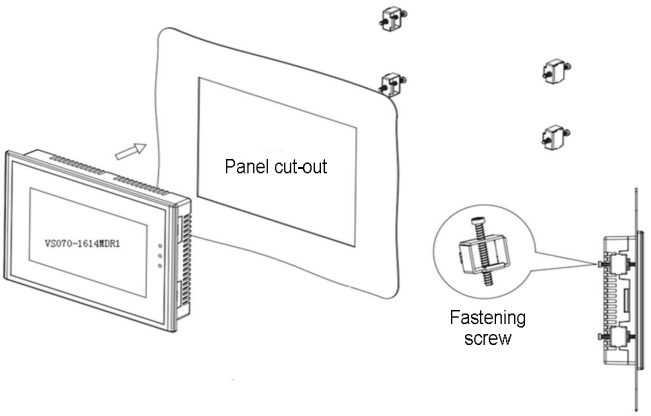
Model	Length	Width	Height	Net weight
VS070-1614MDR1	203 mm	145 mm	56.45 mm	780 g

5.2 Installation modes

Ensure that the power wire, PLC output module, contactor, starter, relay, and other types of electrical interface devices keep a certain distance from the VS series products when installing devices behind the product. What calls for special attention is that a longer distance should be kept between the variable frequency klystron and the switching power supply. Besides, input and output of this kind of device must adopt shielded cables, and connect the shielded net to the star-shaped ground of the system.







Install according to NEMA-4 standard

VS series products can be installed in the machine cabinet whose depth is more than 56.5 mm. It is recommended to install on the front panel of the cabinet. For convenience, please keep a space distance of at least 22 mm around the VS series product so as to open the front panel of the cabinet and connect power supply and communication cables normally.

Put the product into the mounting hole made on the panel, insert the mounting screws into the four fixing holes around the product shell from the back of the panel, and fasten the mounting screws one by one until the product is firmly fixed on the panel.

To ensure that NEMA-4 sealing standard is complied, the mounting screws delivered with the product must be used, and the bending of the mounting panel cannot exceed 0.010".

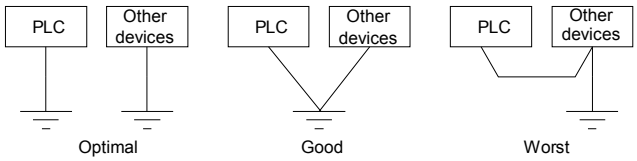
Note: Do not tighten the mount screws too hard to prevent from damaging the touch screen.

5.3 Cable connection and specifications

It is recommended that you add an air switch on the power side of the PLC and fuse protection circuit in PLC power input when connecting power and grounding cables.

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.

It is recommended 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.



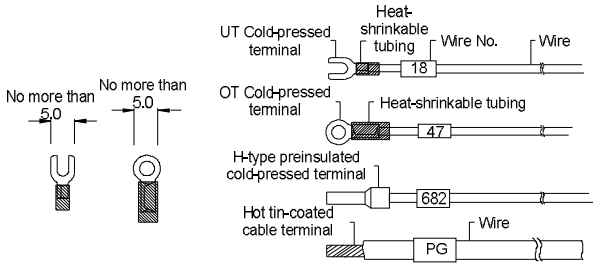
Cable specifications

For the wiring of the PLC, it is recommended that you use multi-stranded copper wire and prepare insulated terminals to ensure the wiring quality. The following table describes the recommended wire cross-sectional areas and models.

Cable	Coss-sectional area of wire	Wire model	Compatible wiring terminals and heat-shrinkable tubing
Power cable	1.0–2.0mm²	AWG12, 18	H1.5/14 preinsulated tube-like terminal, or hot tin-coated cable terminal
Grounding cable (⏚)	2.0mm²	AWG12	H2.0/14 preinsulated 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 tubing
Output signal cable (Y)	0.8–1.0mm²	AWG18, 20	

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

The following figure shows the recommended cable preparation mode.



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 POWER indicator of the PLC is on.

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

3. After the program is downloaded and verified, set the mode selection 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 *IVC Series Micro-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 aspects when performing 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. Strictly follow the electrical parameters to design the output circuits. Ensure that no overvoltage or overcurrent occurs.

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

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

4. Note that the relay contact may fail to close when the current is smaller than 5 mA.

User notice

1. The warranty covers only the PLC machine.

2. **The warranty period is 18 months**. We provide free-of-charge maintenance and repairs for the product if it is faulty or damaged during proper operation within the warranty period.

3. **The warranty period starts from the ex-factory date of the product**. The machine No. is the only basis for determining whether the machine is within the warranty period. A device without the machine No. is deemed out-of-warranty.

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

Faults are caused due to misoperations. Operations are not performed following the instructions provided in the manual.

The machine is damaged due to causes such as fire, flood, or voltage exceptions.

The machine is damaged due to improper use. You use the machine to perform some unsupported functions.

5. The service fees are calculated based on the actual fees. If there is a contract, the provisions stated in the contract prevail.

6. Keep this warranty card. Show it to the maintenance unit when you seek maintenance services.

7. Contact the local dealer or directly contact our company if you have any questions.

Customer Service Center (China)

INVT Auto-Control Technology (Shenzhen) Co., Ltd.

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Postal code: 518106

Company website: http://www.invt-control.com/en/index.html

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