



AM500 Series Programmable Logic Controller User Guide



Industrial
Automation



New Energy
Vehicle



Intelligent
Elevator



Intelligent
Robot



Digital
Energy



Rail
Transit



Data code P500008837A07

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■ Waste Disposal

The storage, use, and disposal of this product (including optional accessories) must comply with local laws and regulations.

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The product/system described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel can identify the risks of the product/system and prevent possible dangers.

■ Proper Use of the Product

Proper transportation, storage, assembly, installation, commissioning, operation, and maintenance are required to ensure the safe operation of the product without any problems. The required ambient conditions must be met. All operations must follow the guidelines provided in this documentation.

Preface

■ Introduction

This product is a new generation of medium-sized programmable logic controller (PLC) independently developed by Inovance. It supports EtherCAT bus control and network switching over dual network ports. It allows process encapsulation and reuse through the Function Block (FB) and Function (FC) features, and supports multi-layer network communication through the RS485, Ethernet, and EtherCAT ports. This product can accommodate a maximum of 16 expansion modules. This product can also provide the RS485, RS232, CAN, digital input (DI), digital output (DO), analog input (AI), analog output (AO), real-time clock (RTC), and trans-flash (TF) card features through expansion cards.

This guide describes the product information, mechanical installation, electrical installation, communication connection, and operation and maintenance.

■ Compliance

The following table lists the certifications, directives, and standards applicable to this product. For certifications actually acquired for the product you purchased, see the certification marks on the product nameplate.

Certification	Directive		Standard
CE	EMC	2014/30/EU	24 VDC products: EN 61131-2 220 VAC products: EN 61131-2 EN 61000-3-2 EN 61000-3-3
	LVD	2014/35/EU	EN 61010-1 EN 61010-2-201
	RoHS	2011/65/EU amended by (EU) 2015/863	EN IEC 63000
UL/cUL	-		UL 61010-1 UL 61010-2-201 CAN/CSA-C22.2 No. 61010-1 CSA C22.2 NO. 61010-2-201
KCC	-		-
EAC	-		-
UKCA	Safety Regulations	Electrical Equipment (Safety) Regulations 2016	EN 61010-1 EN 61010-2-201
	EMC Regulations	Electromagnetic Compatibility Regulations 2016	24 VDC products: EN 61131-2 220 VAC products: EN 61131-2 EN 61000-3-2 EN 61000-3-3
	RoHS Regulations	Directive (RoHS) Regulations 2012	EN IEC 63000

■ More Data

Data Name	Data Code	Description
GE20 Series Expansion Cards User Guide	PS00006443	Describes the product information, mechanical installation, input connection, output connection, I/O connection, communication connection, and programming examples of the GE20 series expansion card.
Medium-Sized PLC Programming Software User Guide	PS00003145	Describes the basic functions, quick start, network settings, and programming basics of the medium-sized PLC programming software.
Medium-Sized PLC Programming Guide (Motion Control)	19012378	Describes the composition of the PLC motion control system, mechanism of the motion control program, motion control (MC) instructions, and simulation and commissioning related operations.
Medium-Sized PLC Instruction Guide	19012377	Describes basic instructions of the medium-sized PLC.
AM500 Series Programmable Logic Controller User Guide (this guide)	PS00008837	Describes the product information, mechanical installation, electrical installation, communication connection, and operation and maintenance.

■ Revision History

Date	Version	Description
January 2026	A07	Updated effect diagrams and the product code.
September 2025	A06	Updated effect diagrams.
May 2025	A05	Corrected minor errors.

Date	Version	Description
April 2025	A04	- Updated the Ethernet description in "2.3.1 General Specifications" on page 21 - Updated the software filter time description in "2.3.3 Input Specifications" on page 26 - Updated the uninstallation instruction in "3.5 Installation Method" on page 37 - Updated notes for input and output terminal wiring in "4.2 Terminal Wiring" on page 42
February 2024	A03	- Added the PNP model in "2.1 Model and Nameplate" on page 16 - Updated the descriptions of status indicators in "2.2 Components" on page 18 - Added the PNP specifications in the pulse input item in "2.3.1 General Specifications" on page 21 - Updated the power supply specifications in "2.3.2 Power Supply Specifications" on page 26 - Added the PNP specifications in the high-speed input (X0 to X7) item in "2.3.3 Input Specifications" on page 26 - Added the PNP specifications in the output type item in "2.3.4 Output Specifications" on page 27 - Added the PNP output terminal wiring in "4.2 Terminal Wiring" on page 42 - Added the AM52X programmable controller models and the GL20 expansion module models in "Appendix" on page 55
November 2023	A02	- Added the GE20-TF-RTC memory expansion card (with integrated RTC) in "Appendix" on page 55 - Added the support for the CAN free protocol in CAN specifications in "2.3.1 General Specifications" on page 21
September 2023	A01	- Added CAN specifications in "2.3.1 General Specifications" on page 21 - Added CAN communication descriptions in "5.1 Communication Networking" on page 47 - Added the GE20-CAN-485 expansion card in "Appendix" on page 55
June 2023	A00	Initial release.

■ Access to the Guide

This guide is not in the scope of delivery. If necessary, you can download the PDF file in the following ways:

- Visit <https://www.inovance.com/global> and choose Service&Support > Support > Documentation Download.
- Scan the QR code on the product with your smart phone to obtain the corresponding guide.
- Scan the QR code below to install My Inovance app, where you can search for and download user guides.



■ Warranty Disclaimer

If your product becomes defective under normal use conditions, we will offer guaranteed repair services within the warranty period. Maintenance will be charged after the warranty period expires.

Even in the warranty period, a maintenance fee will be charged for repair of the following damage:

- Damage caused by operations not following the instructions in the guide
- Damage caused by fire, flood, or abnormal voltage
- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product
- Damage or secondary damage caused by force majeure (such as natural disaster, earthquake, and lightning strike)

The maintenance fee will be charged according to our latest Price List if not otherwise agreed upon.

For details, see the Product Warranty Card.

1 Fundamental Safety Instructions

1.1 Fundamental Safety Instructions

■ Safety Disclaimer

- This chapter presents essential safety precautions for proper use of the product. Before use, read through the user guide and comprehend all the safety precautions. Failure to observe the safety instructions may result in equipment damage, physical injuries, or even death.
- "DANGER", "WARNING", and "CAUTION" items in this guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
- Use this product in an environment that complies with the design specifications. Malfunction or component damage caused by improper use is not covered by warranty.
- Inovance shall take no responsibility for any physical injuries or property damage caused by improper use.

■ Safety Levels and Definitions



DANGER indicates that failure to comply with the notice will result in severe physical injuries or even death.



WARNING indicates that failure to comply with the notice may result in severe physical injuries or even death.



CAUTION indicates that failure to comply with the notice may result in minor or moderate physical injuries or equipment damage.

■ Safety Precautions

- Some drawings in this guide show the equipment without covers or protective guards to display more details. Remember to install the covers and protective guards before using the equipment and operate it in accordance with the instructions.

- Drawings in the user guide are for illustration only and may be different from the equipment you purchased.
- Operators must take mechanical precautions to protect personal safety and wear protective equipment, such as anti-smashing shoes, safety clothing, safety glasses, protective gloves, and protective sleeves.

Unpacking



WARNING

- Do not install the product when you find that the product and its accessories have any damage or corrosion or they have been used.
- Do not install the product when there is water inside the product or any of its parts is missing or damaged.
- Do not install the product when the product name is inconsistent with that in the packing list.



CAUTION

- Before unpacking, check the package for any damage, water seepage, dampness, or deformation.
- Unpack the product layer by layer. Do not strike the package violently.
- Check the surfaces of the equipment and accessories for any damage, rust, and scratches.
- Check the equipment, accessories, and materials in the package against the packing list.

Storage and Transportation



CAUTION

- Handle the equipment with care during transportation and mind your steps to prevent physical injuries or equipment damage.
- When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in personal injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply may result in equipment damage.
- Store and transport the product in environments free from water splashes, rain exposure, direct sunlight, strong electric and magnetic fields, and excessive vibration.
- Avoid storing the product for more than 3 months. When the product needs to be stored for an extended period, take more strict protection and necessary inspection.
- Package the product strictly before transporting it, and use an enclosed container for long-distance transportation.
- Never transport the product with other equipment or materials that may harm or have negative impacts on the product.

Installation



DANGER

- Installation must be carried out by technicians who have received relevant training on electrical equipment and have sufficient electrical expertise. Non-professionals are not allowed to operate the equipment.



WARNING

- Read through the user guide and safety precautions before installation.
- Do not install the equipment in places with strong electric or magnetic fields.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in an electric shock.
- When installing the equipment in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or fire accidents.
- Do not modify the product.
- When installing the product in a cabinet or final assembly, make sure that the enclosure of the cabinet or final assembly provides adequate fire prevention, electrical protection, and mechanical protection conforming to relevant IEC standards and local laws and regulations.
- Before installing devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.
- Install the product on an incombustible object, such as metal, and do not touch or attach the product to combustibles. Failure to comply may result in fire accidents.



CAUTION

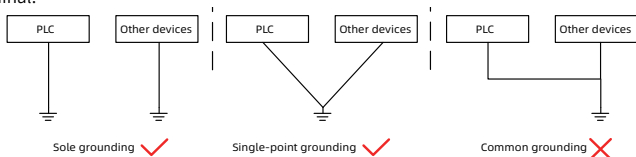
- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal shavings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper on top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes.
- Resonance may occur when the equipment operating at a constant speed executes variable speed operations. In this case, install the vibration-proof rubber under the motor frame or use the vibration suppression function to reduce resonance.

Wiring



DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Before wiring, cut off all the power supplies of the equipment. Wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. Measure the DC voltage of the main circuit and make sure that it is below the safety voltage. Failure to comply will result in an electric shock.
- Do not perform wiring, remove the equipment cover, or touch the circuit board with power on. Failure to comply will result in an electric shock.
- Make sure that the device is reliably grounded. Failure to comply will result in an electric shock. Ground the equipment separately or to a single point, rather than to a shared terminal.



WARNING

- Do not connect the input power supply to the output end of the equipment. Failure to comply can result in equipment damage or even fire.
- When connecting a drive to a motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Cables used for wiring must meet cross sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- After wiring is done, check that all cables are connected properly and no screws, washers or exposed cables are left inside the equipment. Failure to comply may result in an electric shock or equipment damage.



CAUTION

- During wiring, follow the proper electrostatic discharge (ESD) procedures, and wear an antistatic wrist strap. Failure to comply will result in damage to internal equipment circuits.
- Use shielded twisted pairs for the control circuit. Connect the shield to the grounding terminal of the equipment for grounding purpose. Failure to comply will result in equipment malfunction.

Power-on



DANGER

- Before power-on, check that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Before power-on, make sure that the power supply meets equipment requirements to prevent equipment damage or fire.
- Do not open the cabinet door or protective cover of the product, touch any wiring terminal of the product, or remove any part of the product with power on. Failure to comply can result in an electric shock.



WARNING

- Perform a trial run after wiring and parameter setting to ensure the equipment operates safely. Failure to comply may result in physical injuries or equipment damage.
- Before power-on, check that the rated voltage of the equipment is consistent with that of the power supply. Failure to comply may result in fire accidents.
- Before power-on, check that no one is near the equipment, motor, or machine. Failure to comply may result in physical injuries or even death.

Operation



DANGER

- The equipment must be operated only by professionals. Failure to comply will result in physical injuries or even death.
- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply can result in an electric shock.



WARNING

- Do not touch the equipment casing, fan, or resistor with bare hands to feel the temperature. Failure to comply may result in personal injuries.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in fire accidents or equipment damage.

Maintenance



DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Do not maintain the equipment with power on. Failure to comply will result in an electric shock.
- Before maintenance, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- When a permanent magnet motor is used, do not touch the motor terminals immediately after power-off because the motor terminals can generate induced voltage during rotation even after the equipment power supply is off. Failure to comply can result in an electric shock.



WARNING

- Carry out daily and periodic inspection and maintenance on the equipment according to maintenance requirements and retain a maintenance record.

Repair



DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Do not repair the equipment with power on. Failure to comply can result in an electric shock.
- Before inspection and repair, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.



- Submit the repair request according to the warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply may result in death, personal injury or equipment damage.
- When the equipment is faulty or damaged, require professionals to perform troubleshooting and repair by following repair instructions and keep a repair record.
- Replace quick-wear parts of the equipment in according with the replacement instructions.
- Do not perform operations on damaged equipment. Failure to comply may result in death, physical injuries, or severe equipment damage.
- After the equipment is replaced, check the wiring and set parameters again.

Disposal



- Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in property damage, physical injuries, or even death.
- Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

■ Safety Labels

For safe equipment operation and maintenance, comply with the safety labels on the equipment. Do not damage or remove the safety labels. The following table describes the safety labels.

Safety Label	Description
	Read through the safety instructions and user guide before operating the equipment. Failure to comply may result in equipment damage, physical injuries, or even death.

1.2 Industrial Information Security

This product provides an interface to connect to the network and transmit data through the network interface. To protect factories, systems, machines, and networks

from cyber attacks, appropriate industrial information security protection mechanisms need to be implemented to ensure the safe operation of factories, systems, machines, and networks.

The customer is responsible for providing and continuously ensuring a secure connection between the product and the customer's network or any other network, to prevent unauthorized access to their factory, systems, machines, and networks. The system or machine may only be connected to the corporate network or the Internet when a secure connection is established and proper security measures are in place (for example, using antivirus software and installing firewalls).

INOVANCE continuously develops and improves its products and solutions to enhance safety. It is strongly recommended that you update your products promptly and always use the latest product versions.



Caution

Malware (such as viruses, Trojans, and worms) can bring the device into an unsafe operating state, resulting in death, serious injury, and property damage. Observe the following precautions strictly:

- Always use the latest software version. If the product version is no longer supported or the latest program version is not applied, customers are at increased risk of cyberattacks.
 - Implement and maintain appropriate security measures (including but not limited to deploying anti-virus software, firewall, WAF, IPS/IDS, situational awareness system, ID verification, and data encryption) to prevent files in the removable storage device from being damaged by malware and to protect products, networks, systems, and interfaces from unauthorized access, disruption, intrusion, data leakage, or information theft.
 - Check all safety-related interfaces and settings after commissioning.
-

2 Product Information

2.1 Model and Nameplate

■ Model description

AM 52X - 0808 TX
① ② ③ ④

① Product series AM: AM series programmable logic controller	③ Number of inputs/outputs 08: 8 inputs 08: 8 outputs
② Model code 5: 500 series platform 2: 2 Ethernet ports X: Number of EtherCAT axes, 1 indicating 8 axes, 2 indicating 16 axes	④ Output type X: N or P TN: Sink-type transistor TP: Source-type transistor

■ Nameplate description

The nameplate is identical for the entire AM52X series, except for the model and SN. This section uses the AM521 model as an example for illustration.

AM521-0808TN



INOVANCE

AM521-0808TN
Programmable Logic Controller

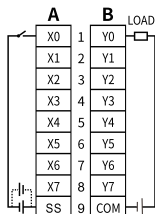


POWER INPUT: DC24V 1A
OUTPUT: DC24V/0.5A RES LOAD

SN:0123456789123456



Certification
mark



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AM521-0808TP



INOVANCE

AM521-0808TP
Programmable Logic Controller

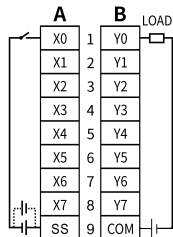


POWER INPUT: DC24V 1A
OUTPUT: DC24V/0.5A RES LOAD

SN:0123456789123456



Certification
mark



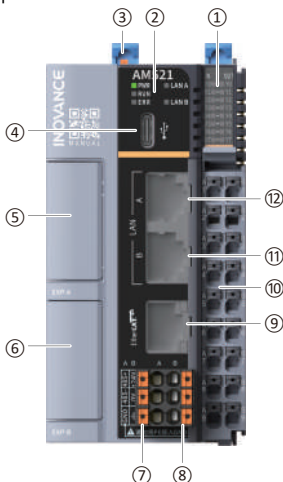
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Model	Description	Code
AM521-0808TN-INT	AM500 series 8-input 8-output 8-axis programmable controller	01441183
AM522-0808TN-INT	AM500 series 8-input 8-output 16-axis programmable controller	01441169
AM521-0808TP-INT	AM500 series 8-input 8-output 8-axis programmable controller	01441190
AM522-0808TP-INT	AM500 series 8-input 8-output 16-axis programmable controller	01441226

2.2 Components

Components are identical for the entire AM52X series. This section uses the AM521-0808TN model as an example for illustration.



No.	Type	Mark	Definition	Indicator Color	Description
①	I/O indicator	IN/OUT	I/O status	Yellow-green	- Steady ON: Input or output active - OFF: Input or output inactive
②	Operation status indicator	PWR	Power supply	Yellow-green	- Steady ON: Power supply normal - OFF: Power supply off or abnormal
		RUN	Normal running	Yellow-green	- Steady ON: User program running - OFF: User program stopped
		ERR	Running error	Red	- OFF: No major error - Blinking^[1]: Major error occurred
		LAN A	LAN A state	Yellow-green	- Steady ON: Connected - Blinking: Communication in progress - OFF: Disconnected
		LAN B	LAN B state	Yellow-green	- Steady ON: Connected - Blinking: Communication in progress - OFF: Disconnected
③	DIP switch	RUN/STOP	Run/Stop control	-	-
④	Type-C port		Communication with PC	-	-
⑤/- ⑥	Expansion card slot	01/02	Expansion card slots, used to expand features	-	Expansion card options are available in " Appendix " on page 55

No.	Type	Mark	Definition	Indicator Color	Description
⑦	RS485	485+	Positive of RS485 communication signal	-	-
		485-	Negative of RS485 communication signal	-	-
		GND	RS485 communication ground	-	-
⑧	Power supply port	+24V	24 VDC power supply positive	-	-
		0V	24 VDC power supply negative	-	-
			Function grounding (FE)	-	-
⑨	EtherCAT port	EtherCAT	EtherCAT communication	-	-
⑩	I/O terminal	-	8-channel input and 8-channel output	-	For details, see "4.1 Terminal Layout" on page 41
⑪/- ⑫	Ethernet port	LAN B/LAN A	RJ45 ports used for Ethernet communication	-	-



Caution

[1]: If the product malfunctions and needs to be powered off and restarted, be sure to turn off the power and wait for at least 10 seconds after the power indicator is off before proceeding with the power-on and startup operation.

2.3 Product Specifications

2.3.1 General Specifications

■ General Specifications

Item	Specification
Program capacity	10 MB
Data capacity	20 MB, of which 512 kB is retentive at power failure
Bit instruction operation	44 ns
Integer operation	41 ns
Floating point operation (double precision)	55 ns
EtherCAT	● AM521: 8 axes ● AM522: 16 axes
Axis control performance	4-axis synchronization within 1 ms cycle (time calculated based on motion control)
Electronic cam, interpolation	Supported
Local expansion	Expansion module: Supports up to 16 GL20 series local expansion modules.
	Expansion card: Supports 10 types of expansion cards. Up to 2 expansion cards can be installed simultaneously. For the type of expansion card, see " Appendix " on page 55
Programming platform	InoProShop (CODESYS)
Programming language	IEC 61131-3 programming language (LD, ST, SFC, CFC)

Item		Specification
User program upload and download	Ethernet	PLC monitoring and user program uploading or downloading through Ethernet
	TF card	User program downloading by using the GE20 series storage expansion card
	Type-C	PLC monitoring and user program uploading or downloading through the Type-C port
Firmware flashing	SD card	Firmware flashing through the GE20 series storage expansion card
	Type-C	Firmware flashing by connecting to a PC through the Type-C port
Firmware upgrade	Ethernet	Firmware upgrade through Ethernet
Dimensions and weight	Dimensions (W x H x D)	53 mm x 100 mm x 80 mm
	Weight	Approx. 197 g
IP rating		IP20

■ Communication specifications

Item		Specification
EtherCAT		• Supports up to 127 EtherCAT slaves, with a minimum synchronization cycle of 1 ms • Supports disabling and scanning of slaves
Ethernet	Network port	• Two Ethernet ports share one IP address, network switching function supported • 100M adaptive RJ45 Ethernet port
	Ethernet/IP master and slave	• Functions as a master and supports up to 16 slaves. • Functions as a slave and supports up to 16 masters.
	Modbus TCP master and slave	• Functions as a master and supports up to 63 slaves. • Functions as a slave and supports up to 16 masters.
	OPC UA server	16 clients
	TCP/UDP free protocol	16 connections
FINS TCP/UDP communication		2 channels (up to 32 connections for each channel)
MELSEC communication		2 channels (up to 32 connections for each channel)

Item		Specification
OPC UA	User verification	Anonymous
	Server port	4840
	Session timeout	5s to 600,000s
	Sampling interval	100 ms, 300 ms, 500 ms, 1000 ms, 2500 ms, or 5000 ms
	Publish interval	200 ms to 20,000,000 ms
	Maximum number of sessions	50
	Maximum number of subscriptions of the server	200
	Maximum number of monitored nodes of the server	20,000
	Maximum number of subscriptions per session	50
	Maximum number of monitored nodes per subscription	10,000
	Maximum number of nodes read/written per frame	1000

Item		Specification
RS485	Number of channels	11 • 3 channels supported by the PLC (1 channel for the main unit and 2 channels for expansion cards) • 8 channels for expansion (2 channels for each of 4 GL20-2S485 modules)
	Hardware port	2 x 3-pin terminal (shared with the power supply)
	Isolation mode	No isolation
	Termination resistor	No (The PLC can be used as the master or slave.)
	Number of slaves	Up to 31 Modbus RTU slaves
	Baud rate	9600 bit/s, 19,200 bit/s, 38,400 bit/s, 57,600 bit/s, or 115,200 bit/s
	Short circuit protection	Protection against incorrect connection to the 24 V terminal
	Free protocol on serial port	Supported
CAN		• CANopen master: Support for one CANopen master and up to 63 slaves through expansion cards • CAN free protocol supported
USB	Number of channels	1
	USB cable length	1.5 m
	USB communication version	USB 2.0, full speed
	USB port	Type-C
	Master/slave	The PLC can only act as a slave but not a master.
	Power supply	The USB port can be used to power the PLC and download user programs (but cannot be used to drive local modules).

2.3.2 Power Supply Specifications

Item	Specification
Rated voltage of terminal input power	24 VDC $\pm$ 10% (21.6 VDC to 26.4 VDC)
Rated current of terminal input power	1 A (maximum value at 24 VDC)
Rated voltage of bus output power	5.2 VDC (4.9 VDC to 5.5 VDC)
Rated current of bus output power ^[1]	2 A (maximum value at 5 V)
24 V input power protection	Protection against short circuit and reverse connection
Hot swapping	Not supported

Note

[1]: Expansion modules are powered by the AM500 series programmable logic controller. Therefore, the sum of the rated current values of the bus input power for expansion modules must not be greater than the current value specified in the table (≤ 2 A). For example, the rated current of the bus input power for the GL20-3232ETN-M expansion module is 250 mA, so at most eight such modules can be connected to the AM500 programmable logic controller ($2 \text{ A}/250 \text{ mA} = 8$).

2.3.3 Input Specifications

Item	Specification
Input type	Digital input
Number of input channels	8
Input mode	Sink/Source
Input voltage class	24 VDC $\pm$ 10% (21.6 VDC to 26.4 VDC)

Item		Specification
High-speed pulse input (X0 to X7)	Number of hardware input channels	8
	Input current when input is ON	- AM52X-0808TN: > 4 mA - AM52X-0808TP: > 2.5 mA
	Input current when input is OFF	- AM52X-0808TN: < 2.5 mA - AM52X-0808TP: < 1.5 mA
	Hardware response time	2 μ s (RC time)
	Maximum input frequency	- AM52X-0808TN: 200 kHz - AM52X-0808TP: 100 kHz
	Input impedance	- AM52X-0808TN: 3.4 kΩ - AM52X-0808TP: 5.7 kΩ
	Number of encoder axes	Max. 4
	A/B phase, pulse/direction, CW/CCW, single-phase pulse signal	Supported
ON voltage		$\geq$ 15 VDC
OFF voltage		$\leq$ 5 VDC
Software filter time		- Low-speed: 2 ms to 1000 ms - High-speed: 200 ns to 100 μs
Isolation mode		Capacitive isolation for integrated chip
Common terminal mode		8-point/common terminal (positive/negative polarity of input power being changeable)

2.3.4 Output Specifications

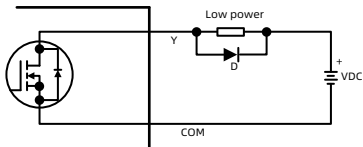
Item	Specification
Output type	- TN: NPN transistor output - TP: PNP transistor output
Number of output channels	8
Output voltage class	24 VDC $\pm$ 10% (21.6 VDC to 26.4 VDC)

Item		Specification
High-speed pulse output (Y0 to Y7)	Number of hardware output channels	8
	Resistive output load	0.5 A/point; 2 A/8-point
	Inductive output load	7.2 W/point; 24 W/8-point
	Lamp output load	5 W/point, 18 W/8-point
	Hardware response time (ON/OFF)	< 1 μ s (OFF→ON); < 2 μ s (ON→OFF)
	Load current requirements	Load current $\geq$ 12 mA when used with outputs greater than 10 kHz
	Maximum output frequency	200 kHz for resistive load; 0.5 Hz for inductive load; 10 Hz for lamp load
	Number of pulse axes	Supports up to 4 pulse axes, which share motion control instructions with the bus axis
	A/B phase, pulse/direction, CW/CCW, single-phase pulse signal	Supported
PWM function		Supported (5 Hz to 200 kHz)
PWM output		Maximum frequency 200 kHz, minimum pulse width 2.5 μ s, minimum resolution 2.5 μ s, adjustable duty cycle 0.01% to 99.99%
Leakage current upon OFF		< 30 μ A at rated 24 V
Maximum residual voltage during ON		< 0.5 VDC
Isolation mode		Digital isolator
Common terminal mode		8-point/common terminal (polarity of output power supply being negative)
Short circuit protection		Protection against short circuit of each channel, recovered after power-off
External inductive load protection		Flywheel diode ^[1] is required when an external inductive load is connected.
Output action display		The output indicator lights up (controlled by software) when the output is in drive state.

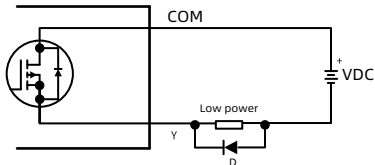
Note

[1]: Use 1N4001 (50 V/1 A) or a similar diode, as marked by D in the following figures.

- **AM52X-0808TN**



- **AM52X-0808TP**



3 Mechanical Installation

3.1 Installation Environment

When installing the PLC on the guide rail, take the operability, maintainability, and environment adaptation into account.

Item	Specification
Installation/ Operating environment	Free from conductive dust, conductive fibers, explosive dust, flammable gases, water mist/greasy dirt, corrosive dusts/gases, strong vibration, and repetitive shock
Altitude	≤ 2000 m
IP rating	IP20
Pollution degree	PD2
Noise immunity	±2 kV on power cable (IEC 61000-4-4)
Overvoltage category	I
EMC immunity level	Zone B, IEC 61131-2
Grounding mode	Connect to a termination resistor of 100 Ω or lower.
Anti-static rating	Contact discharge +/-6 kV and air discharge +/-8 kV
Vibration resistance	● Application scenario: Tested according to IEC 60068-2-6; 3.5 mm amplitude at 5 Hz to 8.4 Hz; 1 g acceleration at 8.4 Hz to 200 Hz; in ten cycles/axes. ● Transportation scenario: Tested according to IEC 60068-2-64; power spectral density of 0.011 g²/Hz at 5 Hz to 100 Hz and of 0.001 g²/Hz at 200 Hz; G_{rms} of 1.14 g
Shock resistance	Application/Transportation scenario: Tested according to IEC 60068-2-27; 15 g peak acceleration, 11 ms pulse width, 18 times in X/Y/Z-axis directions
Operating temperature and humidity	● Temperature: -20°C to +55°C (for horizontal installation), -20°C to +45°C (for non-horizontal installation) ● Humidity: < 95% RH (30°C), non-condensing Note: When the ambient temperature exceeds the upper limit, a cooling fan or air conditioner must be installed along the heat dissipation hole direction.

Item	Specification
Storage temperature and humidity	● Temperature: -20°C to +60°C ● Humidity: < 95% RH (30°C), non-condensing
Transportation temperature and humidity	● Temperature: -40°C to +70°C ● Humidity: < 95% RH (40°C), non-condensing

Installation position and limit	Installation position	The module can be installed in four modes. For details, see "3.2 Installation Position" on page 34
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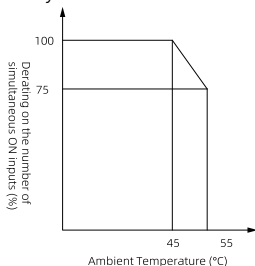
Installation position and limit

Installation limit

Horizontal installation

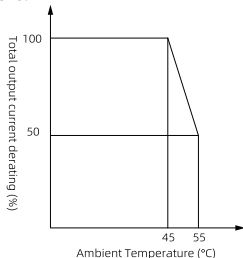
• Input derating

The PLC can operate with full load at ambient temperature of 45°C. Derate the number of ON input points to 75% (lower than or equal to six ON input points) at an ambient temperature of 55°C. Derate the number of ON input points by 2.5% for every additional 1°C above 45°C.



• Output derating

The PLC can operate with full load (total current of eight output points not exceeding 2 A) at an ambient temperature of 45°C. Derate the total output current of ON output points to 50% (total current of eight output points not exceeding 1 A) at an ambient temperature of 55°C. Derate the total output current of ON output points by 5% for every additional 1°C above 45°C.



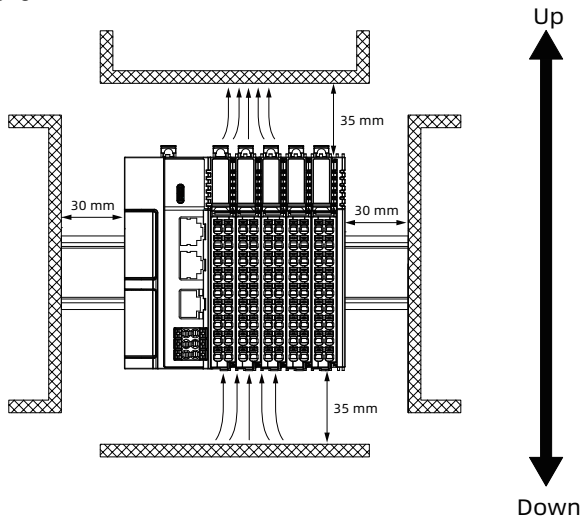
Installation position and limit	Installation limit	Non-horizontal installation	At the same time, the maximum number of input points should not exceed 6, the maximum output current should not exceed 1 A, and the number of modules should not exceed 6.
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3.2 Installation Position

This product can be installed in four positions (modes): horizontal (recommended), vertical, cabinet top, and cabinet bottom. Different modes have different ambient temperature requirements. For details, see ["3.1 Installation Environment" on page 30](#).

■ Optimal installation position

The optimal installation mode is horizontal, adopting natural convection for heat dissipation. To ensure normal ventilation and heat dissipation and sufficient wiring space, sufficient clearance must be reserved around the module, as shown in the following figure. The unit is mm.



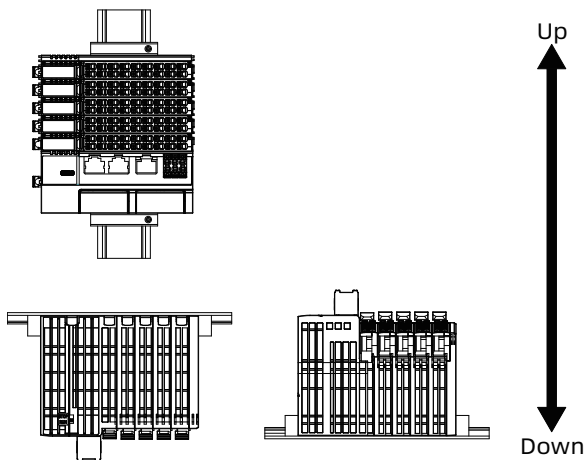


Caution

If there is a high-temperature heat source (heater, transformer, large resistor, etc.) in vicinity of the product, keep the product away from the heat source by at least 100 mm.

■ Other installation positions

For other installation positions, the same clearance requirements as the optimal installation position apply. Other installation positions are shown in the following figure.





Caution

In case of vertical installation:

- PLC must be installed below all I/O modules.
 - Hold the cables with a cable duct to prevent the weight of cables being applied to the lower end plate, which may result loose of the PLC from the DIN rail.
-

3.3 Installation Precautions

- Before you install and uninstall the PLC and modules, ensure that they are powered off.
-



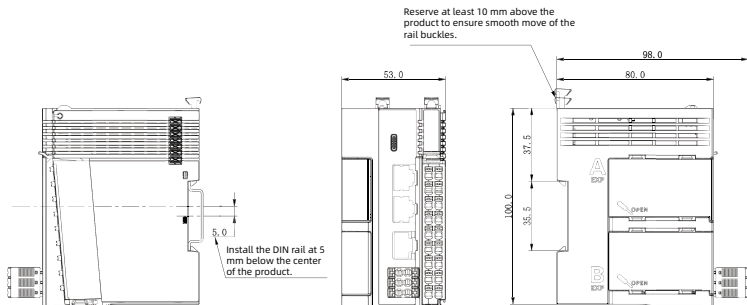
Caution

Do not connect/disconnect the module with power ON. This may lead to master restart or user data loss or damage.

- To avoid damage to the PLC and modules, prevent the enclosure and terminals of them from falling-off or being impacted.

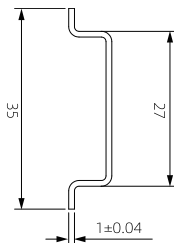
3.4 Installation Dimensions

The installation dimensions (in mm) are shown in the figure below.



3.5 Installation Method

The DIN rail in compliance with IEC 60715 is used to install the PLC. The following figure shows the dimensions (width of 35 mm and thickness of 1 mm) of the rail.

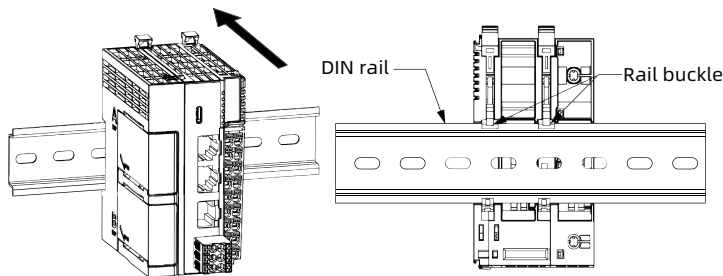


Caution

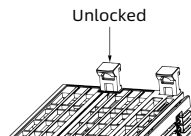
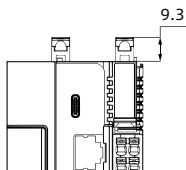
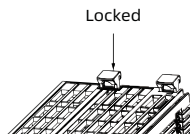
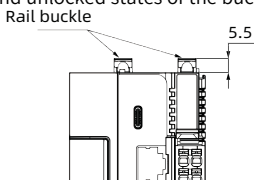
When installed on a DIN rail other than the recommended one (especially the one whose thickness is not 1.0 mm), the product will not fit in place as the mounting hook does not work.

■ Installing the PLC

1. Align the PLC with the DIN rail and push the PLC towards the direction marked by the arrow until you hear a click sound, as shown in the following figure.



2. Confirm that the DIN rail buckles of the PLC are locked. The following figures show the locked and unlocked states of the buckles.



- The buckles are locked when pressed down.
- The buckles are unlocked when lifted up.

Pressing the buckles locks them.

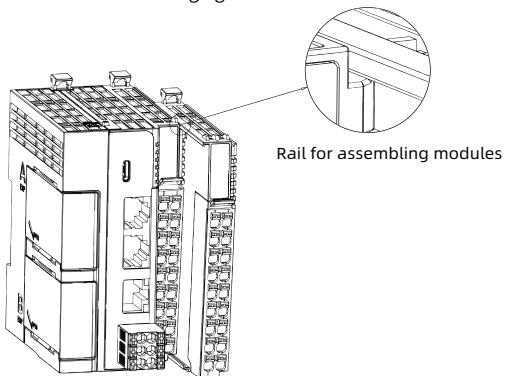


Caution

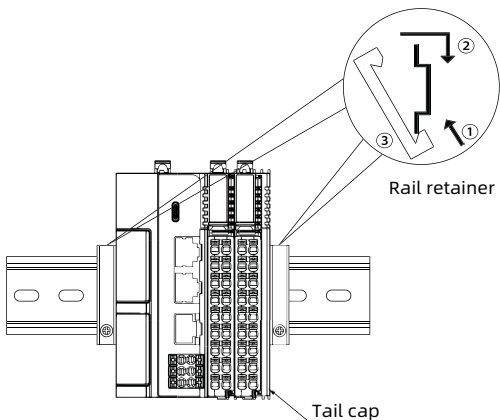
When the PLC is not installed on the rail, keep the mounting hook in the locked state. Keeping the mounting hook unlocked for a prolonged time may cause the hook to fail.

■ Inserting modules to the PLC

1. Modules are slid onto the PLC through the rails on the top and bottom of the modules, as shown in the following figure.

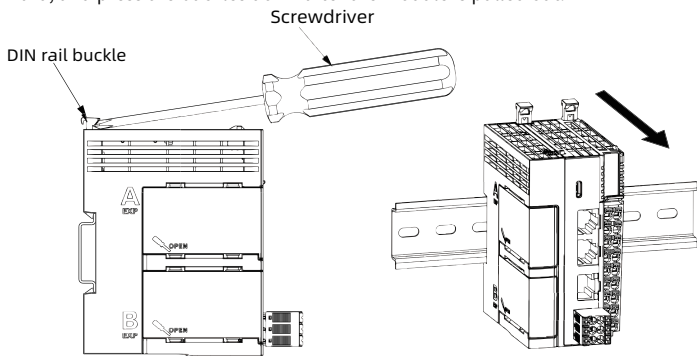


2. Mount an end plate on a side of the PLC or expansion module. When you install a rail retainer, hook the bottom of the retainer to the bottom of the rail, rotate the retainer to make its top hook the top of the rail, and then tighten the screw to fasten the rail retainer, as shown in the figure below.



■ Removal

Use a straight screwdriver or similar tool to pry up the rail buckles, pull the module forward, and press the buckles down after the module is pulled out.



4 Electrical Installation

4.1 Terminal Layout



Left Signal	Left Terminal Mark	Right Terminal Mark	Right Signal
X0 input	A1	B1	Y0 output
X1 input	A2	B2	Y1 output
X2 input	A3	B3	Y2 output
X3 input	A4	B4	Y3 output
X4 input	A5	B5	Y4 output
X5 input	A6	B6	Y5 output
X6 input	A7	B7	Y6 output
X7 input	A8	B8	Y7 output
Input common terminal SS	A9	B9	Output common terminal COM



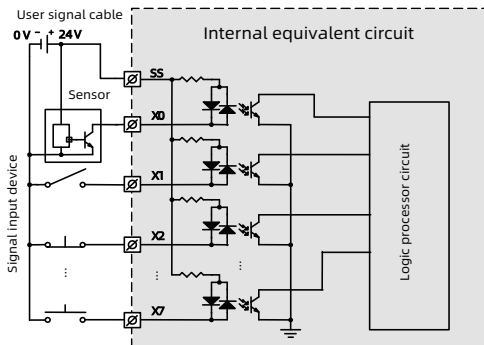
Caution

- The length of a high-speed I/O interface extension cable must be within 3.0 m.
- To prevent interference, route the I/O interface extension cable and the power cable (high-voltage/high-current cables) through different non-parallel routes.

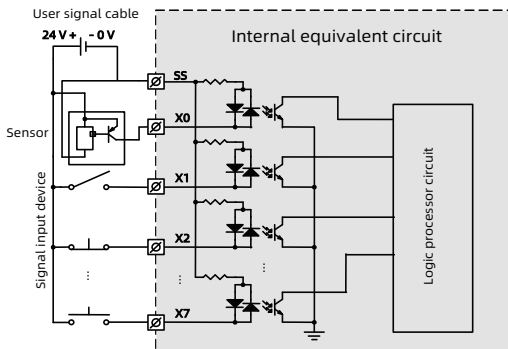
4.2 Terminal Wiring

■ Input terminal circuit diagram

● Sink input

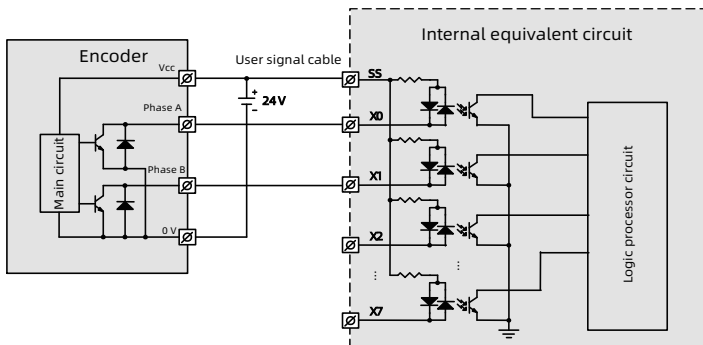


● Source input



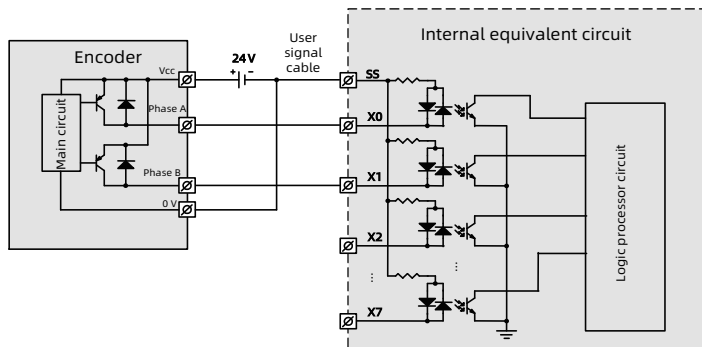
● Phase A/B encoder sink input

The following section uses a group of inputs X0 (phase A) and X1 (phase B) as an example. The PLC supports a total of four groups of inputs: X0 (phase A) and X1 (phase B), X2 (phase A) and X3 (phase B), X4 (phase A) and X5 (phase B), and X6 (phase A) and X7 (phase B).



● Phase A/B encoder source input

The following section uses a group of inputs X0 (phase A) and X1 (phase B) as an example. The PLC supports a total of four groups of inputs: X0 (phase A) and X1 (phase B), X2 (phase A) and X3 (phase B), X4 (phase A) and X5 (phase B), and X6 (phase A) and X7 (phase B).

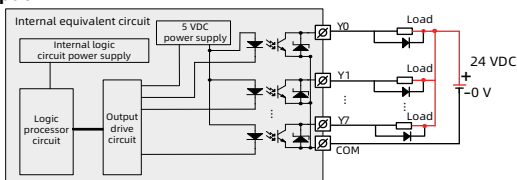


Note

The phase A/B pulse can be set to operate in frequency multiplication by 1, 2, or 4.

■ Output terminal circuit diagram

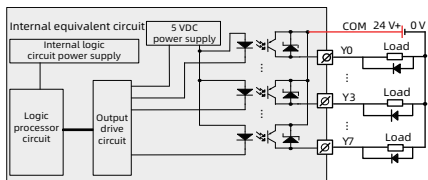
● Sink output



Note

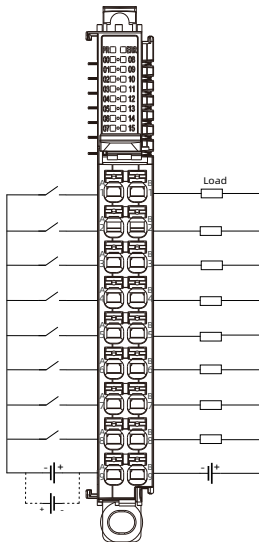
An external flywheel diode is required when an inductive load is connected. In this case, use a 1N4001 or similar diode.

● Source output

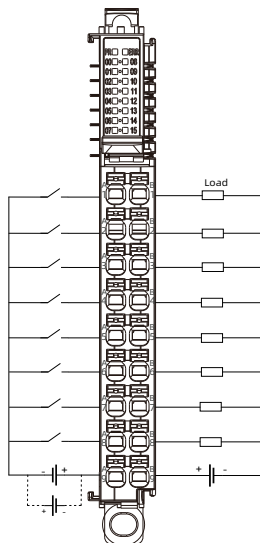


■ Input and output terminal wiring

● Sink input and output



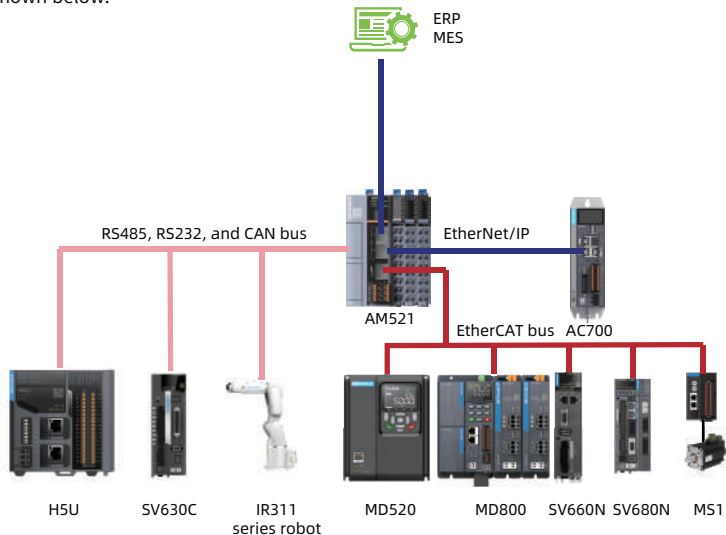
● Source input and output



5 Communication Connection

5.1 Communication Networking

This PLC can be connected to other sites, ERP, MES and other systems through Ethernet interface, or connected to other slaves (such as MD520, MD800, SV630N and SV660N drives) or other modules with EtherCAT function through EtherCAT interface. With GE20 series extension cards, this PLC can also be connected to H5U, SV630C, and IR311 series industrial robots through RS485, RS232, or CAN communication, as shown below.

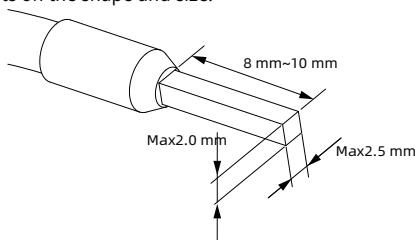


5.2 Cable Selection

The cable lugs and cable sizes in the following table are for reference only. Select proper cables based on actual situations.

Material Name	Applicable Cable Size	
	mm ²	AWG
Tubular lug	0.3	22
	0.5	20
	0.75	18
	1.0	18
	1.5	16

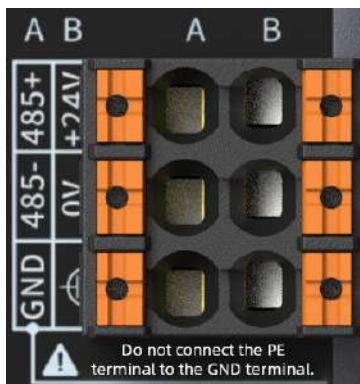
If other tubular lugs are used, crimp them to twisted cables. The following figure shows requirements on the shape and size.



5.3 Cable Connection

■ RS485 communication

The RS485 communication port and the 24 V power supply port are located on the left and right of the same terminal block, respectively.



● Terminal definition

Signal	Left Terminal	Right Terminal	Signal
RS485 differential pair positive signal	485+	+24V	24 VDC power supply positive
RS485 differential pair negative signal	485–	0V	24 VDC power supply negative
RS485 communication ground	GND		PE

● Wiring

Select proper tube cables according to ["5.2 Cable Selection" on page 47](#) and insert the cables to the corresponding communication ports.

■ Ethernet communication

For reliable communication, use Cat 5 shielded twisted pair cables with injection molded, iron-shelled connectors as Ethernet cables.

- Insert the registered jack on the cable into the Ethernet port (RJ45 port) until a click is heard.
- To remove the RJ45 network cable, press and hold the tail of the registered jack, and then pull it out along the direction parallel with the PLC.

5.4 EtherCAT Communication

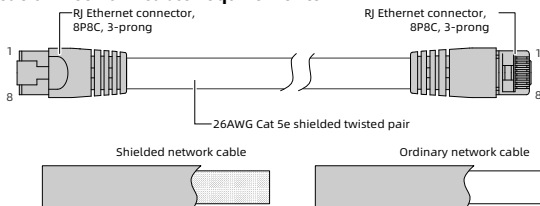
■ EtherCAT specifications

Item	Description
Communication protocol	EtherCAT protocol
Service supported	CoE (PDO and SDO)
Synchronization mode	Distributed clock (DC) for the servo and input/output synchronization for I/O
Physical layer	100BASE-TX
Baud rate	100 Mbit/s (100Base-TX)
Duplex mode	Full duplex
Topology	Linear topology
Transmission medium	Network cable (For details, see "Wiring".)
Transmission distance	Less than 100 m between two nodes
Number of slaves	Up to 127 EtherCAT slaves
EtherCAT frame length	44 bytes to 1498 bytes
Process data	Up to 1486 bytes per Ethernet frame

■ Wiring

The PLC provides a CN3 port for EtherCAT bus communication. The communication cable must meet the following requirements:

Communication network cable requirements



Signal pin assignment

Pin	Signal	Direction	Description
1	TD+	Output	Data transmission positive
2	TD—	Output	Data transmission negative
3	RD+	Input	Data receiving positive
4	-	-	Not used
5	-	-	Not used
6	RD—	Input	Data receiving negative
7	-	-	Not used
8	-	-	Not used

Length requirements

The cable between devices must not exceed 100 m when the EtherCAT bus is used. Exceeding this length will attenuate signals and affect normal communication.

Technical requirements

100% continuity test without short circuit, open circuit, misalignment, or poor contact. Cables meeting the following requirements are recommended.

Item	Specification
Cable type	Flexible crossover cable, S-FTP, Cat 5e
Standard	EIA/TIA 568A, EN 50173, ISO/IEC 11801 EIA/TIA Bulletin TSB EIA/TIA SB40-A&TSB36
Conductor size	AWG26
Conductor type	Twisted pair
Number of pairs	4

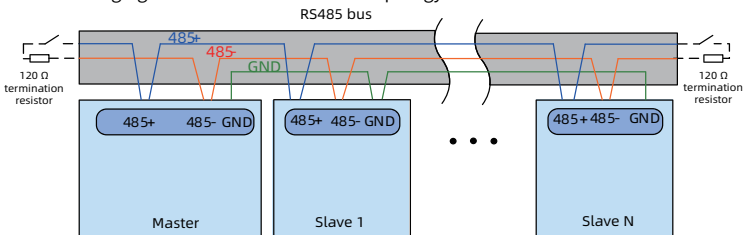
5.5 RS485 Communication

Pay attention to the following points during RS485 wiring:

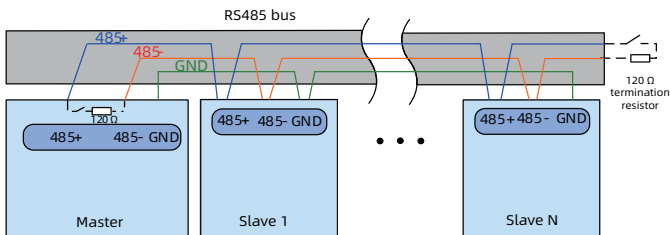
- It is recommended to use a shielded twisted pair cable to connect the 485+ and 485— ports of the RS485 bus.

- Connect a 120 Ω termination resistor at each end of the bus to prevent signal reflection.
- Connect the reference grounds of RS485 signals of all the nodes together.
- Up to 31 nodes can be connected to the RS485 bus and the cable length of any node branch must be less than 3 m.

The following figures show the RS485 bus topology.



Local RS485 communication of AM300/500 series hosts



RS485 communication of GE20 series extension cards

To avoid interference, do not bundle the cable together with an AC power cable or high voltage cable.

6 Operation and Maintenance

6.1 Start and Stop

After programs are written into the PLC, perform the following steps to run and stop the PLC:

To run the PLC:

1. Set the system to RUN.
2. Confirm that the RUN indicator is steady ON in yellow-green.
3. Set the system to the "STOP" state, or stop the PLC in the background by using the host controller.

6.2 User Program Download with a TF Card

Prerequisites

- A TF (Micro SD) card with a capacity of 32 GB or less and a FAT32 file system is prepared.
- The product is powered off.

Procedure

1. Use the software tool InoProShop to generate the "Application.userprg" file. For details, see Section 9.5.2 "Upgrade Using an SD Card" in the *Medium-Sized PLC Programming Software User Guide*.
2. Create the "PLCProgram" directory in the root directory of the Micro SD card and copy the "Application.userprg" file to the "PLCProgram" directory.
3. Insert the Micro SD card into a GE20-TF expansion card, and then install the expansion card onto the PLC.
4. Power on the PLC again. The PLC starts loading the user program from the Micro SD card, and the RUN indicator blinks quickly at 4 Hz during the download process.
5. After successful downloading, the RUN indicator blinks slowly at 1 Hz. Remove the GE20-TF expansion card after the PLC enters the "STOP" state.
If the ERR indicator blinks slowly, downloading fails. Check whether the PLC model that downloads the file is the same as the actual PLC model. If the problem persists, contact Inovance for technical support.
6. Power off and then power on the PLC and check whether it restores to normal.

6.3 Firmware Programming with a TF Card

Prerequisites

- A TF (Micro SD) card with a capacity of 32 GB or less and a FAT32 file system is prepared.
- The product is powered off.

Procedure

1. Insert the Micro SD card for firmware programming into a GE20-TF expansion card, and then install the expansion card onto the PLC.
2. Power on the PLC again.
 - If the RUN and ERR indicators on the PLC blink quickly, firmware programming is in progress.
 - If the RUN and ERR indicators on the PLC are OFF, firmware programming succeeds.
 - If the RUN and ERR indicators on the PLC blink slowly, firmware programming fails.
3. Power off the PLC after firmware programming is complete, and then remove the GE20-TF expansion card.
4. Power on the PLC again.

7 Appendix

■ GE20 expansion cards

Type	Model	Description	Code	Slot	ID
Digital input/output	GE20-4DI-INT	4-channel input 24 VDC input Source/Sink	01480130	A/B	13
	GE20-4DO-TN-INT	4-channel sink transistor output 24 VDC output	01480115	A/B	5
Analog input/output	GE20-2AD1DA-I-INT	2-channel analog input and 1-channel analog output (current type)	01480138	A/B	11
	GE20-2AD1DA-V-INT	2-channel analog input and 1-channel analog output (voltage type)	01480107	A/B	3
Communication	GE20-CAN-485-INT	CAN and RS485 communication (RJ45)	01480114	A	15
	GE20-232/485-INT	RS232 or RS485 communication	01480119	A/B	7
	GE20-232/485-RTC-INT	RS232 or RS485 communication (with RTC)	01480122	B	14
Storage	GE20-TF-INT	TF expansion card	01480109	B	1
	GE20-TF-RTC-INT	Memory expansion card (with integrated RTC)	01480132	B	6
Clock	GE20-RTC-INT	Clock expansion card	01480099	B	9

Note

The ID is "0" when there is no expansion card. For expansion card IDs, see the relevant expansion card user guides.

■ GL20 extension module

Module	Model	Description	Code
Digital	GL20-0016ETP-INT	16-channel digital output (PNP)	01441069
	GL20-1600END-INT	16-channel digital input	01441085
	GL20-0016ETN-INT	16-channel digital output (NPN)	01441063
	GL20-0800END-INT	8-channel digital input	01441054
	GL20-0008ETP-INT	8-channel digital output (PNP)	01441062
	GL20-0008ETN-INT	8-channel digital output (NPN)	01441058
	GL20-0808ETN-INT	8-channel digital input and 8-channel digital output (NPN)	01441072
	GL20-0008ER-INT	8-channel relay output module	01441064
	GL20-3200END-INT	32-channel digital input	01441067
	GL20-0032ETN-INT	32-channel digital output (NPN)	01441079
	GL20-0404ETP-5V-INT	5 VDC, 4-channel digital input and 4-channel digital output (about to release)	01441070
	GL20-3232ETN-M-INT	32-channel digital input and 32-channel digital output (NPN), with external terminal block wiring	01441080
Analog	GL20-4AD-INT	4-channel analog input	01441075
	GL20-4DA-INT	4-channel analog output	01441089
	GL20-8ADV-INT	8-channel analog input	01441086
	GL20-8ADI-INT	8-channel analog input	01441092
Temperature measurement	GL20-4PT-INT	4-channel thermistor input type	01441074
	GL20-4TC-INT	4-channel thermocouple input type	01441066

Module	Model	Description	Code
Communication	GL20-2SCOM-INT	2-channel serial module (third-party products not supported)	01441084
	GL20-2S485-INT	2-channel RS485 expansion module, currently only supporting EtherCAT couplers (third-party products not supported)	01441071
Process module	GL20-2SSI-INT	2-channel SSI communication	01441056

Service and Support

Should you encounter a safety accident during the use or operation of the product, or face challenges in operating and maintaining the equipment, which remain unresolved after the relevant documentation is consulted, we provide multiple channels to ensure prompt resolution:

- Channel #1: Contact service@inovance.com.
- Channel #2: Visit <https://www.inovance.com/global> to access document downloads, after-sales support, spare parts ordering, repair applications, and authenticity verification services.
- Channel #3: Download My Inovance app (<https://zshc-eu.inovance.com/download-pc/>) where you can access products info and documentation, and query product parameters.

We are committed to providing you with quick and professional technical support, and we look forward to your satisfaction and trust.