INOVANCE

AM500 Series
Programmable Logic Controller
Function Guide

PS00008837A00

Preface

■ Introduction

The AM500 is a new generation of medium-sized PLC which supports EtherCAT bus control and dual-port network switching function, FB/FC-based technology encapsulation and reuse, and multi-level network communication through RS485, Ethernet and EtherCAT interfaces. It support 16 expansion modules. RS485/RS232/DI/DO/AI/AO/RTC clock/TF card functions can be provided through the expansion cards.

This guide describes installation and wiring of the PLC, including product information, mechanical installation, and electrical installation.

■ Standard

The following table lists the certifications, directives, and standards that the product may comply with. For details about the acquired certificates, see the certification marks on the product nameplate.

Certification	Directive		Standard
CE Certification	EMC Directive	2014/30/EU	**24 VDC products** EN 61131-2 **24 VAC products** EN 61131-2 EN 61000-3-2 EN 61000-3-3
	LVD Directive	2014/35/EU	EN 61010-1 EN 61010-2-201
	RoHS Directive	2011/65/EU amended by (EU) 2015/863	EN IEC 63000
UL/cUL certification	-		UL 61010-1 UL 61010-2-201 UL 61010-2-030 CAN/CSA-C22.2 No. 61010-1 CSA C22.2 NO. 61010-2-201 CSA C22.2 NO. 61010-2-030

Certification	Directive	Standard
KCC Certification	-	-
EAC certification	-	-

■ More Documents

Name	Data Code	Description
Medium-Sized PLC Software User Guide	19010334	Introduces the basic functions, quick start, network configuration, programming basics, and more of the PLC software.
Medium-Sized PLC Programming Guide (Motion Control)	19010539	Introduces the composition of PLC motion control system, motion control program mechanism, detailed explanation of MC instructions, simulation and debugging related operations.
Medium-Sized PLC Instruction Guide	19011700	Introduces the basic instructions.

■ Revision History

Date	Version	Description
June 2023	A00	First release

■ Access to the Guide

This guide is not delivered with the product. You can obtain the PDF version in the following way:

- Visit *http://www.inovance.com*, go to Support > Download, search by keyword, and then download the PDF file.

- Scan the QR code on the product with your mobile phone.

■ Warranty

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is not caused by improper operation of the user. You will be charged for any repair work after the warranty period expires.

Within the warranty period,maintenance fee will be charged for the following damage:

- Damage caused by operations not following the instructions in the user 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 (natural disaster, earthquake, and lightning strike)
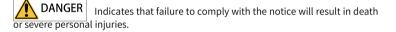
The maintenance fee is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see the Product Warranty Card.

General Safety Instructions

■ Safety Precautions

- This chapter presents essential safety instructions for a proper use of the equipment. Before operating the equipment, read through the guide and comprehend all the safety instructions. Failure to comply with the safety precautions may result in death, serious injury, or equipment damage.

- "CAUTION", "WARNING", and "DANGER" items in the guide only indicate some of the precautions that need to be followed; they just supplement the safety precautions.

- Use this equipment according to the designated environment requirements. Damage caused by improper use is not covered by warranty.

- Inovance shall take no responsibility for any personal injuries or property damage caused by improper use.

■ Safety Levels and Definitions

⚠ DANGER Indicates that failure to comply with the notice will result in death or severe personal injuries.

⚠ WARNING Indicates that failure to comply with the notice may result in death or severe personal injuries.

⚠ CAUTION Indicates that failure to comply with the notice may result in minor or moderate personal injuries or equipment damage.

■ General Safety Instructions

- Drawings in the guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions.

- The drawings in the guide are shown for illustration only and may be different from the product you purchased.

Unpacking

⚠ WARNING

- Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories upon unpacking.
- Do not install the equipment if you find water seepage or missing or damaged components upon unpacking.
- Do not install the equipment if you find the packing list does not conform to the equipment you received.

⚠ CAUTION

- Check whether the packing is intact and whether there is damage, water seepage, dampness, and deformation before unpacking.
- Unpack the package by following the unpacking sequence. Do not strike the package violently.
- Check whether there is damage, rust, or injuries on the surface of the equipment and equipment accessories before unpacking.
- Check whether the package contents are consistent with the packing list before unpacking.

Storage and Transportation

> ⚠️ **CAUTION**
>
> - Handle the equipment with care during transportation and mind your steps to prevent personal 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 will result in equipment damage.
> - Avoid storing or transporting the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
> - Avoid storing the equipment for more than three months. Long-term storage requires stricter protection and necessary inspections.
> - Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
> - Never transport the equipment with other equipment or materials that may harm or have negative impacts on this equipment.

Installation

> ⚠️ **DANGER**
>
> - The equipment must be operated only by professionals with electrical knowledge. Non-professionals are not allowed.

⚠ WARNING

- Read through the guide and safety instructions before installation.
- Do not install this 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 a fire.
- Do not retrofit the equipment.
- When the equipment is installed in a cabinet or final assembly, a fireproof enclosure providing both electrical and mechanical protections must be provided. The IP rating must meet IEC standards and local laws and regulations.
- Before installing equipments with strong electromagnetic interference, such as a transformer, install a shielding equipment for the equipment to prevent malfunction.
- Install the equipment onto an incombustible object such as a metal. Keep the equipment away from combustible objects. Failure to comply will result in a fire.
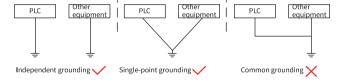
⚠ CAUTION

- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal chippings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper on the 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 only by professionals.
- Before wiring, cut off all the power supplies of the equipment, and wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. After waiting for the designated time, measure the DC voltage in the main circuit to ensure the DC voltage is within the safe voltage range. 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.
- Check that the equipment is grounded properly. Failure to comply can result in electric shock.Separate grounding or single-point grounding, other than common grounding, is recommended.

| PLC | Other equipment | | PLC | Other equipment | | PLC | Other equipment |

Independent grounding ✓   Single-point grounding ✓   Common grounding ✗

⚠ 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 a fire.
- When connecting a drive to the 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

- Follow the proper electrostatic discharge (ESD) procedure and wear an anti-static wrist strap to perform wiring. Failure to comply may result in damage to the equipment or to the internal circuit of the product.
- 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.
- Check that the power supply meets equipment requirements before power-on to prevent equipment damage or a fire.
- After power-on, do not open the cabinet door or protective cover of the equipment, touch any terminal, or disassemble any unit or component of the equipment. Failure to comply will 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 personal 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 a fire.
- Before power-on, check that no one is near the equipment, motor, or machine. Failure to comply may result in death or personal injuries.

Operation

⚠ DANGER

- The equipment must be operated only by professionals. Failure to comply will result in death or personal injuries.
- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply will 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 a fire or equipment damage.

Maintenance

⚠ DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by 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.
- In case of a permanent magnet motor, do not touch the motor terminals immediately after power-off because the motor terminals will generate induced voltage during rotation even after the equipment power supply is off. Failure to comply will result in an electric shock.

⚠ WARNING

- Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.

Repair

⚠ DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not repair the equipment with power ON. Failure to comply will 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.

> ⚠️ **WARNING**
>
> - 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 injuries or equipment damage.
> - When the equipment is faulty or damaged, the troubleshooting and repair work must be performed by professionals that follow the repair instructions, with repair records kept properly.
> - Replace quick-wear parts of the equipment according to the replacement instructions.
> - Do not use damaged equipment. Failure to comply may result in death, personal injuries, or severe equipment damage.
> - After the equipment is replaced, check the wiring and set parameters again.

Disposal

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

■ Safety label

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 meaning of the safety labels.

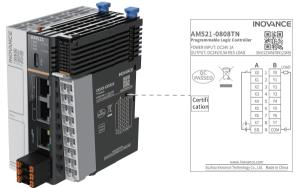| Safety label	Description
⚠️ 📖 ⚠️ ⏱10min	Read through the safety instructions before operating the equipment. Failure to comply may result in death, personal injuries, or equipment damage.

1 Product Information

1.1 Description of the Model and Nameplate
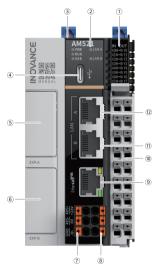
■ Description of the Model

$$\underset{①}{\underline{AM}}\ \underset{②}{\underline{52X}} - \underset{③}{\underline{0808}}\ \underset{④}{\underline{TN}}$$

①	**Series** AM: AM series programmable logic controller	3	**Inputs/Outputs** 08: 8 inputs 08: 8 outputs
②	**Model code** 5: EtherCAT 2: 2 x Ethernet X: Number of EtherCAT axes, 1 indicating 8 axes, 2 indicating 16 axes	④	**Output type** TN: Sink transistor

■ Description of the nameplate

Model	Description	Code
AM521-0808TN	AM500 Series 8-input 8-output PLC (8 axes)	01440477
AM522-0808TN	AM500 Series 8-input 8-output PLC (16 axes)	01440475

1.2 Components

No.	Terminal Type	Sign	Description	Indicator Color	Description
①	I/O indicator	IN/OUT	I/O status display	Yellow green	• ON: Input/Output active • OFF: Input/Output inactive
②	Operation state indicator	PWR	Power	Yellow green	• ON: The power supply is normal. • OFF: The power supply is abnormal.
		RUN	Running	Yellow green	• ON: The user program is running. • OFF: The user program has been stopped.
		ERR	Error	Red	• OFF: No critical errors occurs. • Flashing: A critical error has occurred.
		LAN A	LAN A status indication	Yellow green	• ON: The link has been successfully established. • Flashing: Communication is in progress. • OFF: The link is not established.
		LAN B	LAN B status indication	Yellow green	• ON: The link has been successfully established. • Flashing: Communication is in progress. • OFF: The link is not established.
③	DIP switch	RUN/STOP	Controls start/ stop of the PLC.	-	-

No.	Terminal Type	Sign	Description	Indicator Color	Description
④	Type-C interface	⚡	Enables communication with PC.	-	-
⑤/-⑥	Expansion card slot	01/02	Receives expansion card for extended functions.	-	Expansion card options are available in *" Appendix: Expansion Card Options" on page 43*
⑦	RS485	485+	485 communication signal+	-	-
		485-	485 signal-	-	-
		GND	485 GND	-	-
⑧	Power supply interface	+24V	24 VDC (+)	-	-
		0V	24 VDC (-)	-	-
		⏚	PE	-	-
⑨	EtherCAT interface	EtherCAT	For EtherCAT communication	-	-
⑩	I/O terminal	–	8 inputs and 8 outputs	-	For detailed definition, see *"3.1 Terminal Layout" on page 32*
⑪/-⑫	Ethernet port	LAN B/A	RJ45 interface	-	-

1.3   Product Specifications

1.3.1   General Specifications

Item		Specification
Key items	Program capacity	10 MB
	Data capacity	20 MB, of which 512 KB is retentive at power failure
	EtherCAT	• AM521: 8 axes • AM522: 16 axes
	Axis control performance	4-axis synchronization within 1ms 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 9 types of expansion cards. Up to 2 expansion cards can be installed simultaneously. For the type of expansion card, see *" Appendix: Expansion Card Options" on page 43*
Program-ming	Programming platform	InoProShop (CODESYS)
	Programming language	IEC 61131-3 programming language (LD, ST, SFC, CFC)

Item		Specification
Communi-cation	EtherCAT	• Supports up to 127 EtherCAT slaves, with a minimum synchronization cycle of 1ms • Supports disabling and scanning of slaves
	Ethernet	Two Ethernet ports share one IP address, network switching function supported
		Supports Ethernet/IP master/slave: 16 slaves supported when used as a master; 16 masters supported when used as a slave
		Supports Modbus-TCP master/slave: 63 slaves supported when used as a master; 16 masters supported when used as a slave
		OPC-UA server, 16 clients supported
		TCP/UDP protocol, 16 connections supported
	RS485	Number of channels supported: 3 at most (one channel in the main unit and two channels extended in the expansion card)
		Hardware interface: 2 x 3-pin terminal (shared with the power supply)
		Isolation mode: Non-isolated
		Termination resistor: No termination resistor, can act as a master or slave
		Number of slaves: Up to 31 Modbus-RTU slaves supported
		Baud rate: 9600 bit/s, 19200 bit/s, 38400 bit/s, 57600 bit/s, 115200 bit/s
		Short circuit protection against 24V mis-wiring
		Serial protocol supported
	USB	Number: 1
		USB cable length: 1.5 m
		Version: USB 2.0, full-speed
		Interface: Type-C
		Host/Device option: The PLC can only act as a device when connected to PC via the USB.
		Power supply option: Can be used to provide power to PLC and download user programs (excluding the expansion modules connected)

Item		Specification
High-speed I/O	Pulse input	8-channel hardware inputs
		Maximum input frequency: 200 kHz
		Supports up to 4 encoder axes
		Supports A/B phase, pulse/direction, CW/CCW, single-phase pulse signal
	Pulse output	8-channel hardware outputs
		Output frequency: 5 Hz to 200 kHz
		Supports up to 4 pulse axes, which share motion control instructions with the bus axis
		Supports A/B phase, pulse/direction, CW/CCW, single-phase pulse signal
		PWM supported
User program upgrade	Ethernet	Supports PLC monitoring and user program uploading or downloading via Ethernet interface
	TF card	Supports user program uploading or downloading via GE20-TF card
	Type-C	Supports PLC monitoring and user program uploading or downloading via Type-C interface
Firmware upgrade	Ethernet	Supports firmware upgrade via Ethernet interface
	TF card	Supports firmware upgrade via GE20-TF storage expansion card
	FPGA upgrade	FPGA is upgraded together with MCU firmware
Dimensions and weight	Dimensions	53 mm × 100 mm × 80 mm
	Weight	Approx. 197g
IP rating		IP20

1.3.2 Power Supply Specifications

Item	Specification
Rated terminal input voltage	24 VDC±10% (21.6 VDC to 26.4 VDC)
Rated terminal input current	1 A (max@24 VDC)

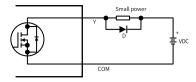| Item	Specification
Rated bus output voltage	5 VDC (4.75 VDC to 5.25 VDC)
Rated bus output current	2A (max@5 V)
24 V input power supply protection	Protection against short circuit and reverse connection
Hot swap	Not supported

1.3.3 Input Specifications

Item		Specification
Input type		Digital input
Number of input channels		8
Input mode		Sink/Source
Input voltage class		24 VDC±10% (21.6 VDC to 26.4 VDC)
High-speed input (X0-X7)	Input current at input ON	>4 mA
	Input current at input OFF	<2.5 mA
	Hardware response time	2 μs (RC time)
	Max. input frequency	200kHz
	Input impedance	3.4 k
ON voltage		≥15 VDC
OFF voltage		≤5 VDC
Software filter time		• Low speed: 2 ms to 1000 ms • High speed: 100 ns to 100 μs
Isolation mode		Isolated by digital isolator chip
Common terminal		8-point/common terminal (The polarity +/- of input power supply is changeable.)

1.3.4 Output Specifications

Item	Specification
Output type	Transistor NPN
Number of output channels	8

Item		Specification
Output voltage class		24 VDC±10% (21.6 VDC to 26.4 VDC)
High-speed output (Y0-Y7)	Output load (resistive load)	0.5 A/point; 2 A/8 points
	Output load (inductive load)	7.2 W/point; 24 W/8 points
	Output load (lamp load)	5 W/point; 18 W/8 points
	ON/OFF hardware response time	< 1 μs (OFF→ON); < 2 μs (ON→OFF)
	Load current requirements	Load current ⩾ 12 mA when used with outputs greater than 10 kHz
	Max. output frequency	200 kHz with resistive load, 0.5 Hz with inductive load, 10 Hz with lamp load
PWM output		Maximum frequency 200 kHz, minimum pulse width 5 μs, minimum resolution 5 μs, adjustable duty cycle 0.01% to 99.99%
Leakage current at OFF		Less than 30 μA at 24 V
Max. residual voltage during ON		Less than 0.5 VDC
Isolation mode		Digital isolator
Common terminal		8-point/common terminal ("-" of power supply)
Short circuit protection		Short circuit protection per channel, recovered after power failure
External inductive load protection		Connect a flywheel diode [1] when connecting the external inductive load.
Output action display		Output indicators are turned ON (via software control) when the outputs are in the driving state

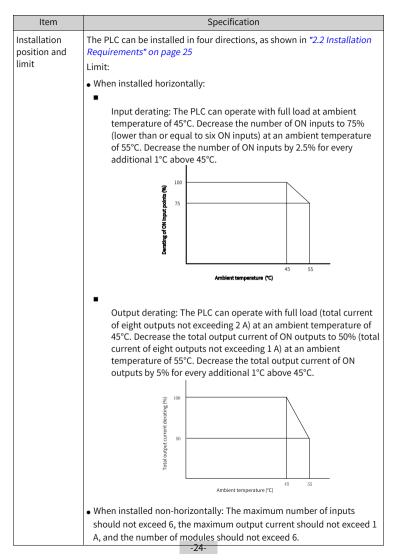[1]: D: 1N4001 or similar diodes are shown in the following figure.

Small power

Y

D

VDC

COM

2 Mechanical Installation

2.1 Installation Environment

Take the operability, serviceability, and adaptability to environment into account when installing the PLC.

Item	Specification
Operating environment	No corrosive and flammable gas and no excessive conductive dust
Altitude	≤2000 m (80 kPa)
Pollution degree	2 or less
Immunity	2 kV on power supply line (Conforms to IEC 61000-4-4)
Overvoltage category	I
EMC immunity level	Zone B, IEC61131-2
Vibration resistance	IEC 60068-2-6 5 Hz to 8.4 Hz, 3.5 mmp, 8.4 Hz to 150Hz, 1g, 10 times each in X, Y and Z directions
Shock resistance	IEC 60068-2-27 150 m/s^2, 11 ms, 3 times each in $\pm$X, $\pm$Y and $\pm$Z directions, 18 times in total
Overcurrent protection device	1.1 A fuse
Storage temperature/ humidity	• Temperature: -20°C to 60°C • Relative humidity: <90% RH, non-condensing
Transportation temperature/ humidity	• Transportation temperature: -40°C to 70°C • Relative humidity: <95% RH, non-condensing

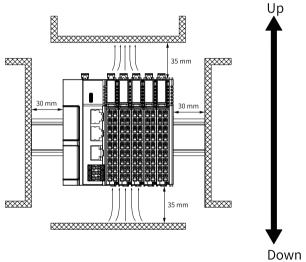| Item	Specification
Operating humidity	• Operating humidity: -20°C to +55°C (when installed horizontally), -20°C to +45°C (when installed non-horizontally) • Relative humidity: <95% RH, non-condensing **Note: Install a fan or air conditioner in the direction of the ventilation holes when the operating temperature is greater than the maximum allowable temperature.**

Item	Specification
Installation position and limit	The PLC can be installed in four directions, as shown in *"2.2 Installation Requirements" on page 25* Limit: ● When installed horizontally: ■ Input derating: The PLC can operate with full load at ambient temperature of 45°C. Decrease the number of ON inputs to 75% (lower than or equal to six ON inputs) at an ambient temperature of 55°C. Decrease the number of ON inputs by 2.5% for every additional 1°C above 45°C. ■ Output derating: The PLC can operate with full load (total current of eight outputs not exceeding 2 A) at an ambient temperature of 45°C. Decrease the total output current of ON outputs to 50% (total current of eight outputs not exceeding 1 A) at an ambient temperature of 55°C. Decrease the total output current of ON outputs by 5% for every additional 1°C above 45°C. ● When installed non-horizontally: The maximum number of inputs should not exceed 6, the maximum output current should not exceed 1 A, and the number of modules should not exceed 6.

2.2 Installation Requirements

The PLC can be mounted horizontally or vertically, on top or at the bottom of the electric cabinet. Different mounting options require different operating temperatures, see .

■ Optimal mounting option

The PLC is most preferably installed horizontally. The heat dissipation is realized by natural convection mode. To ensure normal ventilation and heat dissipation and to allow sufficient wiring space, reserve minimum clearance around the PLC, as shown in the following figure.
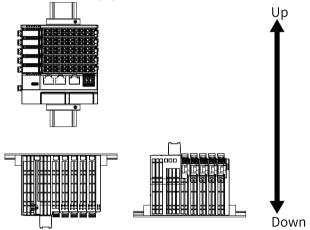
⚠ Caution

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 mounting options

Other mounting options require the same clearance as the optimal mounting option and 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.

2.3   Installation Precautions

- Before installing or removing the master and module, ensure that the master and module 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.

- Prevent the master, module enclosure, or terminals from dropping or suffering from impact or shock.

2.4   Mounting Dimensions

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

At least 10 mm space shall be reserved above the product to ensure the movement of the mounting hook

53. 0

98. 0

80. 0

37. 5

100. 0

35. 5

5. 0

The installation position of DIN rail is 5 mm below the product center

A

B

OPEN

OPEN

2.5 Installation Method

The PLC is mounted onto a DIN rail in conformity with IEC 60715 (width: 35 mm, thickness: 1 mm). The dimensions (unit: mm) are shown below.
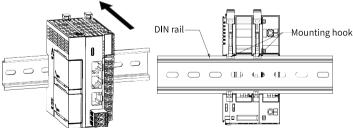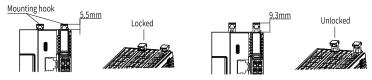

 Caution

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 it in the direction indicated by the arrow until you hear a click,

2. Make sure the DIN rail mounting hook of the PLC is locked. The locked and unlocked states of the mounting hook are shown below.

- If the mounting hook is pressed down, it is locked.
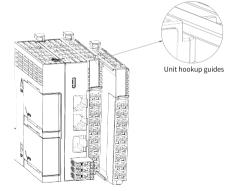- If the mounting hook is lifted up, it is unlocked.

Press down the mounting hook to lock the PLC to the DIN rail.

⚠ 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.
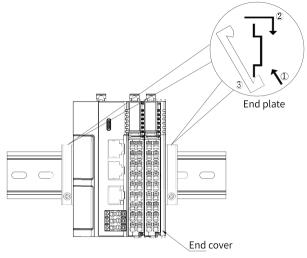
■ Installing expansion module to the PLC

You can install an expansion module to the PLC with the help of top and bottom guides on them, as shown below.

Unit hookup guides

Mount an end plate on a side of the PLC or expansion module. To mount the end plate, hook the bottom of it to the bottom of the DIN rail, rotate the end plate to hook
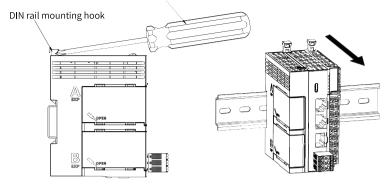
the top of it to the top of the DIN rail, and then tighten the screw to lock the end plate in place, as shown below.

End plate

End cover

■ Removing the PLC

Pry the DIN rail mounting hook upwards with a tool such as slotted screwdriver, hold the protrusions and pull the PLC out straight forward, and then press down the top of the DIN rail mounting hook.
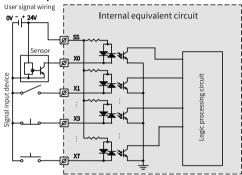
Screwdriver

DIN rail mounting hook

3 Electrical Installation

3.1 Terminal Layout

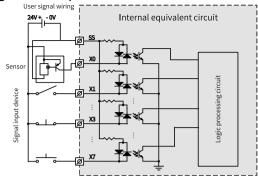| Left Signal	Left Terminal	Right Terminal	Right Signal
X0 input	1A	1B	Y0 output
X1 input	2A	2B	Y1 output
X2 input	3A	3B	Y2 output
X3 input	4A	4B	Y3 output
X4 input	5A	5B	Y4 output
X5 input	6A	6B	Y5 output
X6 input	7A	7B	Y6 output
X7 input	8A	8B	Y7 output
Input common terminal	9A	9B	Output common terminal

⚠ 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.
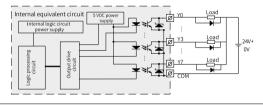
3.2 Wiring of Input Terminals

■ Wiring of sink input

■ **Wiring of source input**
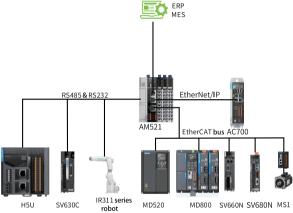

3.3 Output terminal wiring

Note

Connect a flywheel diode when connecting the external inductive load. Diodes can be 1N4001 or similar.

4　Communication Wiring

4.1　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, SV660N and SV680N 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 or RS232 communication, as shown below.
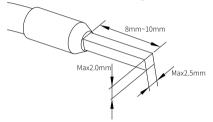

4.2　Cable Selection

The cable lug and cable diameter included in the following table are only for reference.

Material Name	Applicable Cross Sectional Area of the Cable		KST		Suzhou Yuanli	
	mm²	AWG	Model	Crimping Tool	Model	Crimping Tool
Tubular lug	0.3	22	E0308	KST2000L	0308	YAC-5
	0.5	20	E0508		0508	
	0.75	18	E7508		7508	
	1.0	18	E1008		1008	
	1.5	16	E1508		1508	

If you use other types of tubular lug, crimp the lug to the cables according to the shape and dimension requirements shown in the figure below.

4.3   Cable Connection

■   RS485 communication

The RS485 communication port and power supply port share the same terminal block, with RS485 communication port on the left and 24 V power supply port on the right.

● Terminal definition

Description	Left Terminal	Right Terminal	Description
RS485 differential pair (+)	485+	+24V	24 VDC (+)
RS485 differential pair (-)	485-	0V	24 VDC (-)
RS485 ground	GND	⏚	PE

- Wiring

  Select tubular cables referring to *"4.2 Cable Selection" on page 35* and insert the cables into the communication ports.

■ Ethernet communication

To improve the reliability of communication, Cat5 shielded twisted pair cables with an iron shell must be used.

- Insert the registered jack on the cable into the Ethernet port (RJ45 interface) 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 module.

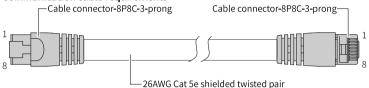## 4.4 EtherCAT Communication

■ EtherCAT specifications

Item	Description
Communication protocol	EtherCAT protocol
Service supported	CoE (PDO, SDO)
Synchronization mode	The servo comes with a distributed clock for synchronized inputs and outputs.
Physical layer	100BASE-TX
Baud rate	100 Mbit/s (100Base-TX)
Duplex mode	Full duplex
Topology	Linear
Transmission medium	Network cables, see the Wring section
Transmission distance	Less than 100 m between two nodes

Item	Description
Number of slaves	Up to 127
EtherCAT frame length	44 to 1,498 bytes
Process data	A maximum of 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 cable requirements

Cable connector-8P8C-3-prong

Cable connector-8P8C-3-prong

26AWG Cat 5e shielded twisted pair

Shielded network cable

Common network cable

Signal pin assignment

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

Length requirements

The cable between devices cannot exceed 100 m when the EtherCAT bus is used, exceeding of which may attenuate the signal and affect normal communication.
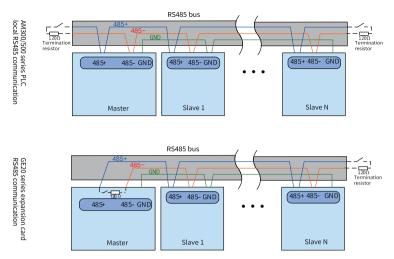
Technical requirements

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

Item	Specification
Cable type	Flexible crossover cable, S-FTP, Cat5e
Standard compliance	EIA/TIA568A, EN50173, ISO/IEC11801 EIA/TI Abulletin TSB EIA/TIA SB40-A&TSB36
Cross sectional area	AWG26
Cable category	Twisted pair
Number of pairs	4

4.5   RS485 Communication

It is recommended to use a shielded twisted pair cable for the RS485 bus. Connect a 120 Ω termination resistor to both ends of the bus to prevent signal reflection. Connect the signal reference grounds of all nodes together. Up to 31 nodes can be connected and the distance between branches must be less than 3 m.

The RS485 bus topology is shown in the figure below.

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

5 Operation and Maintenance

5.1 Start and Stop

After the PLC is programmed, start and stop it as follows.

To run the PLC:

1. Set the system to RUN.

2. Check that the RUN indicator light is solid ON in green

3. To stop the PLC, set the system to STOP. Alternatively, you can stop it in the software tool of the host controller.

5.2 Burning User Program via SD Card

1. Save the program file created through InoProShop to the root directory of the SD card (maximum capacity 32 GB, file formate FAT32).

2. Load the SD card into the TF expansion card and mount the TF expansion card to the PLC.

⚠ Caution

Install the TF extension card with power off.

3. Power on the PLC again and burn the user program in the SD card into the PLC. The RUN indicator flashes quickly at a frequency of 4 Hz during burning.

4. After the burning is done, the RUN indicator flashes slowly at a frequency of 1 Hz and the PLC enters the STOP state. You can remove the SD card now.

   If the ERR indicator flashes slowly, it indicates the burning fails. Check that the PLC model configured in the program file is consistent with the actual PLC model. If the problem persists, contact Inovance for technical support.

5. Power off and on the PLC again.

5.3 Upgrading Firmware via SD Card

1. Load the SD card (maximum capacity 32 GB, file format FAT32) to the TF expansion card and then mount the TF card to the PLC.

> ⚠️ **Caution**
>
> Install the TF extension card with power off.

2. Power on the PLC again.

   If the RUN and ERR indicators flash quickly, it indicates that the firmware upgrade is in progress. If the RUN and ERR indicators are OFF, it indicates that the firmware is successfully upgraded. If the RUN and ERR indicators flash slowly, it indicates that the firmware upgrade failed.

3. After firmware upgrade is done, power off the PLC and remove the SD card.

4. Power on the PLC again.

Appendix: Expansion Card Options

Model	Category	Description	Slot	ID
GE20-4DI	Digital input and output	4-channel input 24 VDC input Sink/Source	A/B	13
GE20-4DO-TN		4-channel transistor sink output 24 VDC output	A/B	5
GE20-2AD1DA-I	AI and AO	2-channel analog input and 1-channel analog output (current type)	A/B	11
GE20-2AD1DA-V		2-channel analog input and 1-channel analog output (voltage type)	A/B	3
GE20-232/485	Communication expansion	RS232 or RS485 communication	A/B	7
GE20-232/485-RTC		RS232 or RS485 communication (with RTC)	B	14
GE20-TF	Storage expansion	TF expansion card	B	1
GE20-RTC	Clock expansion	Clock expansion card	B	9

Note

The ID is "0" when there is no expansion card.