INOVANCE

FORWARD, ALWAYS PROGRESSING

PS00006444A04

Easy Series Programmable Logic Controller

User Guide

Suzhou Inovance Technology Co., Ltd.

Add.:No.52, Tian'e Dang Road, Wuzhong District,
Suzhou 215104, P.R. China
Tel: (0512) 6637 6666 Fax: (0512) 6285 6720
www.inovance.com

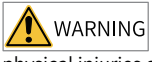
General Safety Precautions

■ Safety Disclaimer

- This chapter presents essential safety instructions for 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 equipment damage, severe physical injuries, or even death.
- "CAUTION", "WARNING", and "DANGER" items in the guide only indicate some of the instructions that need to be followed; they just supplement the safety instructions.
- Use this product in an environment that complies with the design specifications. Malfunctions or component damage caused by improper use is not covered by warranty.
- Inovance shall not be held liable for any physical injuries or property damage caused by improper use.

■ Safety Categories and Definitions

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



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

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

■ General Safety Precautions

- Some drawings in this guide show the equipment without covers or protective guards to display more details. Be sure to install the covers and protective guards before using the equipment and operate the equipment in accordance with this guide.
- The drawings in the guide are shown for illustration only and may be different from the product you purchased.

- Operators must take mechanical protective measures to protect personal safety. For example, wear and use necessary protective equipment, such as crush-resistant shoes, safety clothing, safety glasses, protective gloves, and sleeves.

Unpacking

- Do not install the product if you find damage, rust, or signs of use on it or its accessories upon unpacking.
- Do not install the product if you find water seepage or any components being missing or damaged upon unpacking.
- Do not install the product if the packing list does not match the product you received.

- 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

- Handle the equipment with care and mind your steps. Failure to comply may result in 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 physical injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Avoid storage and transportation in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storage for more than three months. Long-term storage requires stricter protection and necessary inspections.
- Pack the product properly before transportation by vehicle. Use an enclosed box for long-distance transportation.
- Never transport the product with devices or materials that may damage or negatively impact the product.

Installation

- 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.

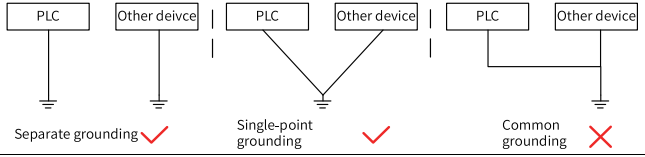
- Read through the guide and safety instructions before installation.
- Do not install the product in places with strong electric or magnetic fields.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result 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.
- Do not modify the product.
- Do not fiddle with the bolts used to fix parts and components or the bolts marked in red.
- 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.
- If any equipment with strong electromagnetic interference, such as a transformer, is needed, install a shielding device to prevent malfunction of this product.
- Install the equipment on metal or other incombustible objects. Keep the equipment away from combustible objects. Failure to comply will result in fire.

- 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 a machine supposed to run at a constant speed is running at variable speeds. In this case, install the vibration-proof rubber under the motor frame or use the vibration suppression function to reduce resonance.

Wiring

DANGER

- Never allow non-skilled personnel to carry out installation, wiring, maintenance, inspection, or part replacement.
- 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. 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 while power is on. Failure to comply will result in an electric shock.
- Ensure that the equipment is well 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 may result in equipment damage or even 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.
- Use cables with required diameter and shield. Properly ground one end of the shield if a shielded cable is used.
- 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.

- During wiring, follow the proper electrostatic discharge (ESD) procedures and wear an anti-static wrist strap. Failure to comply will result in damage to the equipment or internal circuits 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

- 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 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.

- 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.
- 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

- 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 will result in an electric shock.

- Do not touch the equipment casing, fan, or resistor to check the temperature. Failure to comply may result in burns.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in fire or equipment damage.

Maintenance

- Never allow non-skilled personnel to carry out installation, wiring, maintenance, inspection, or part replacement.
- Do not maintain the equipment while power is 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.

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

Repair

- Never allow non-skilled personnel to carry out installation, wiring, maintenance, inspection, or part replacement.
- Do not repair the equipment while power is 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 equipment damage, physical injuries, or even death.
- 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 product according to the replacement instructions.
- Do not use damaged equipment. Failure to comply may result in further equipment damage, physical injuries, or even death.
- After equipment replacement, 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, physical injuries, or even death.
- Recycle retired equipment in accordance with waste disposal standards of the industry 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 safety labels.

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

1 Easy301 Programmable Logic Controller

User Guide

1.1 Preface

■ Introduction

This product is a new generation of small-sized, ultra-thin programmable logic controller (PLC) independently developed by Inovance. It supports RS485 and RS232 communication features and implements multi-layer network communication through the RS485 and RS232 ports. It allows process encapsulation and reuse through the Function Block (FB) and Function (FC) features. This product can accommodate a maximum of eight expansion modules. For module types supported, see the section of "Local Expansion Modules" in the "H5U and Easy Series Programmable Logic Controller Programming and Application Guide".

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

■ 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 Directive	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 Directive	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 Documents

Doc Name	Data Code	Description
GE20 Series Expansion Card User Guide	PS00006443	Describes the product information, installation and wiring, and programming examples of the GE20 series expansion card
H5U and Easy Series Programmable Logic Controller Programming and Application Guide	19012249	Describes the basics of PLC programming, quick start guide, communication, motion control, and high-speed counter usage
H5U and Easy Series Programmable Logic Controller Instruction Guide	19011939	Describes the basic instructions and complex instructions used for programming applications, as well as examples of these instructions
Easy301 Programmable Logic Controller User Guide (this guide)	PS00006239	Describes the installation and wiring of the product, including product information, mechanical installation, and electrical installation

■ Revision History

Date	Version	Description
July 2024	A05	**Addition** • Added the I/O terminal wiring in *"1.4.2 Terminal Wiring" on page 32* **Change** • Updated the note for power-off and restart in *"1.2.2 Components" on page 16* • Updated the program data capacity in *"1.2.3.1 General Specifications" on page 18* • Updated the number of axes supported in *"1.2.3.1 General Specifications" on page 18* • Updated the rated current of bus input power for the GL20-3232ETN-M expansion module in *"1.2.3.2 Power Supply Specifications" on page 19*
March 2024	A04	**Addition** Added the Easy301 series programmable controller models and the GL20 series expansion module models in *" Appendix" on page 38* **Change** • Updated the descriptions of status indicators in *"1.2.2 Components" on page 16* • Updated the power supply specifications in *"1.2.3.2 Power Supply Specifications" on page 19* • Updated the overcurrent protection device specifications in *"1.3.1 Installation Environment Requirements" on page 22*

Date	Version	Description
February 2024	A03	Corrected minor errors
March 2023	A02	Updated the diagram of DIN rail buckles; added some product specification data
October 2022	A01	Corrected minor errors
August 2022	A00	First release

■ Access to the Guide

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

- **Inovance website:** Visit *www.inovance.com*, go to "Support" > "Download", search by keyword, and then download the PDF file.
- **QR code:** Scan the QR code on the product with your smart phone to obtain the corresponding guide.
- **My Inovance app:** Scan the QR code below to install the My Inovance app, and search for the corresponding guide in the app.

■ Warranty

Inovance provides an 18-month free warranty (subject to information indicated by the barcode on the product if not otherwise specified in the contract) from the date of manufacturing for product failure or damage under normal use conditions. A maintenance fee will be charged out of the 18-month warranty period.

Even in the 18-month 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 (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.

1.2 Product Information

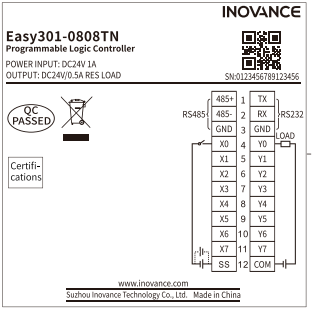
1.2.1 Model Number and Nameplate

■ Model number

Easy ① 301 ② – 0808 ③ TN ④

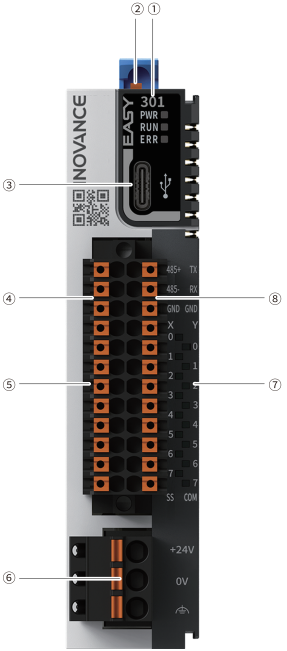
① **Product series** Easy: Easy series programmable logic controller	③ **Input and output channels** 08: 8-channel input 08: 8-channel output
② **Series** 3: 300 series platform 0: No Ethernet 1: Model serial number	④ **Output type** TN: Sink transistor

■ Nameplate



Model	Description	Code
Easy301-0808TN	Easy300 series 8-input 8-output programmable controller	01440323

1.2.2 Components



No.	Port Type	Mark	Meaning	Indicator Color	Description
①	Operation status indicator	PWR	Power supply normal	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
②	DIP switch	RUN/ STOP	Run/Stop control	-	-
③	Type-C port		Communication with PC	-	-
④	RS485	RS485+	RS485 communication signal+	-	-
		RS485–	RS485 communication signal–	-	-
		GND	RS485 communication ground	-	-
⑤	I/O terminal	-	8-channel input and 8-channel output	-	For details, see *"1.4.1 Terminal Arrangement" on page 31*.
⑥	Power terminal	+24V	24 VDC power supply+	-	-
		0V	24 VDC power supply–	-	-
			PE	-	-

No.	Port Type	Mark	Meaning	Indicator Color	Description
⑦	I/O indicator	X/Y	I/O status	Yellow-green	• Steady ON: Input or output active • OFF: Input or output inactive
⑧	RS232	TX	RS232 transmit signal	-	-
		RX	RS232 receive signal	-	-
		GND	RS232 communica-tion ground	-	-

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

1.2.3 Product Specifications

1.2.3.1 General Specifications

Item	Specifications
Program data capacity	• User program: 128 kB steps • Customized variables: 1 MB (including 128 kB retentive at power failure) • Soft elements: approx. 150 kB (retentive at power failure after No. 1000; non-retentive at power failure when only powered by USB)
Instruction processing speed	20,000 steps executed in 2 ms
Bit operation	0.144 μs/instruction

Item	Specifications
Word transmission	0.338 μs/instruction
Floating point operation	0.779 μs/instruction
Ethernet	-
EtherCAT communication	-
Number of axes supported	Maximum 4 axes (maximum 4 local pulse axes and 16 virtual axes)
Serial communication	One RS485 port and one RS232 port
CAN communication	-
High-speed input	Single-phase: 8 channels at 200 kHz
High-speed output	4 axes at 200 kHz; PWM supported
Expansion module	Maximum 8 local expansion modules
Expansion card	-
Programming language	LD, SFC; FB/FC supported (LD)
Type-C	Support for program upload/download and firmware upgrade
IP rating	IP20
Dimensions (W x H x D)	24 mm x 100 mm x 83 mm
Weight	Approx. 135 g

1.2.3.2 Power Supply Specifications

Item	Specifications
Rated voltage of terminal input power	24 VDC±10% (21.6 VDC to 26.4 VDC)
Rated current of terminal input power	1 A (maximum value at 24 V)
Rated voltage of bus output power	5 VDC (4.75 VDC to 5.25 VDC)
Rated current of bus output power[1]	1 A (typical value at 5 V)

Item	Specifications
24 V input power protection	Protection against short circuit and reverse connection
Hot swapping	Not supported

Note

[1]: Expansion modules are powered by the Easy 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 (⩽ 1 A). For example, the rated current of the bus input power for the GL20-3232ETN-M expansion module is 250 mA, so at most four such modules can be connected to the Easy series programmable logic controller (1 A/250 mA = 4).

1.2.3.3 Input Specifications

Item		Specifications
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 to X7)	Input current when input is ON	> 4 mA
	Input current when input is OFF	< 2.5 mA
	Hardware response time	2 μs (RC time)
	Maximum input frequency	200 kHz
	Input impedance	2.7 kΩ
ON voltage		⩾ 15 VDC
OFF voltage		⩽ 5 VDC
Software filter time		• Low-speed: 2 ms to 1,000 ms • High-speed: 2 μs to 1,000 μs
Isolation mode		Capacitive isolation for integrated chip

Item	Specifications
Common terminal mode	8-point/common terminal (positive/ negative polarity of input power being changeable)
Input action display	The input indicator lights up (controlled by software) when the input is in drive state.

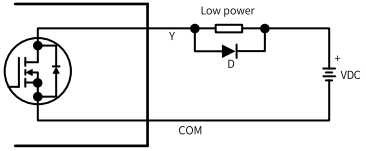
1.2.3.4 Output Specifications

Item		Specifications
Output type		Transistor NPN output
Number of output channels		8
Output voltage class		24 VDC±10% (21.6 VDC to 26.4 VDC)
High-speed output (Y0 to Y3)	Output load (resistive load)	0.5 A/point; 2 A/8-point
	Output load (inductive load)	7.2 W/point; 24 W/8-point
	Output load (lamp load)	5 W/point; 18 W/8-point
	Hardware response time (ON/ OFF)	< 1 μs (OFF→ON); < 2 μs (ON→OFF)
	Load current requirements	Load current ⩾ 12 mA when the output is greater than 10 kHz
	Maximum output frequency	200 kHz for resistive load; 0.5 Hz for inductive load; 10 Hz for lamp load
Normal output (Y4 to Y7)	Output load (resistive load)	0.5 A/point; 1 A/common terminal
	Output load (inductive load)	6 W/24 VDC (total)
	Output load (lamp load)	1 W/24 VDC (total)
	Hardware response time (ON/ OFF)	< 100 μs (OFF→ON, ON→OFF)
	Load current requirements	⩾ 5 mA
	Maximum output frequency	100 Hz for resistive load; 0.5 Hz for inductive load; 10 Hz for lamp load

Item	Specifications
PWM output (Y0 to Y3)	Maximum frequency 200 kHz; minimum pulse width 2.5 μs; minimum resolution 2.5 μs; adjustable duty cycle[1] 0.01% to 99.99%
Leakage current during OFF	< 30 μA at rated 24 V
Maximum residual voltage during ON	< 0.5 VDC
Isolation mode	Photocoupler isolation
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	A flywheel diode[2] 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.

[1]: The duty cycle setting is frequency dependent, and the pulse width corresponding to the duty cycle must not be less than the minimum pulse width.

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

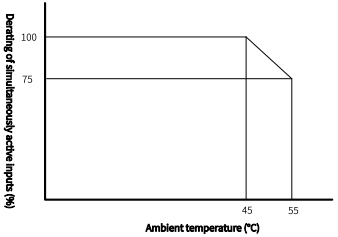


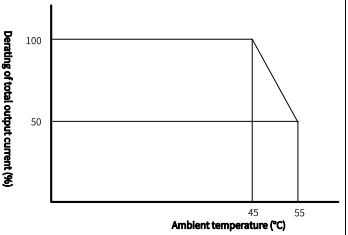
1.3 Mechanical Installation

1.3.1 Installation Environment Requirements

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

Item	Specifications
Operating environment	Places without corrosive or inflammable gas or severe conductive dust
Altitude	Maximum 2,000 m (80 kPa)
Pollution degree	PD2
Interference immunity	2 kV on power supply line (IEC 61000-4-4)
Overvoltage category	I
EMC immunity level	Zone B, IEC 61131-2
Vibration resistance	IEC 60068-2-6; 5 Hz to 8.4 Hz: 3.5 mm; 8.4 Hz to 150 Hz: 1·g; three axes: X, Y, and Z; 10 sweeps/axis
Shock resistance	IEC 60068-2-27; 150 m/s^2; 11 ms; six directions: ±X, ±Y, and ±Z; 3 cycles/direction, totaling 18 cycles
Overcurrent protection device	1.5 A fuse
Storage temperature and humidity	• Temperature: –20°C to +60°C • Relative humidity: < 90%, non-condensing
Transportation temperature and humidity	• Temperature: –40°C to +70°C • Relative humidity: < 95%, non-condensing
Ambient temperature and humidity	• Temperature: –20°C to +55°C (for horizontal installation), –20°C to +45°C (for non-horizontal installation) • Relative humidity: < 95%, non-condensing **Note: When the ambient temperature exceeds the upper limit, a forced draft fan or air conditioner must be installed in the heat dissipation hole direction.**

Item	Specifications
Installation position and limit	Installation position: The PLC can be installed in four directions. For details, see *"1.3.2 Installation Position Requirements" on page 25*. Limit: Horizontal installation: • Input derating: When the ambient temperature is 45°C, the PLC can work at full load. When the ambient temperature is 55°C, the number of simultaneously active inputs shall be reduced to 75% (that is, no more than six inputs), at a derating rate of 2.5% per 1°C of temperature rise.  (To be continued)

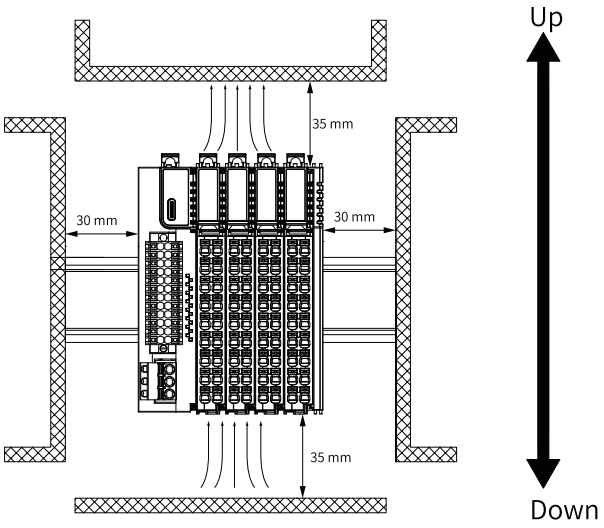
Item	Specifications
Continued	(Continued) • Output derating: When the ambient temperature is 45°C, the PLC can work at full load (that is, the total current of the eight outputs not higher than 2 A). When the ambient temperature is 55°C, the total current of simultaneously active outputs shall be reduced to 50% (that is, the total current of the eight outputs not higher than 1 A), at a derating rate of 5% per 1°C of temperature rise.  Non-horizontal installation: A maximum of six inputs can be in active state simultaneously, and the maximum allowed output current is 1 A.

1.3.2 Installation Position Requirements

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 *"1.3.1 Installation Environment Requirements" on page 22*.

■ 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 product, as shown in the following figure.

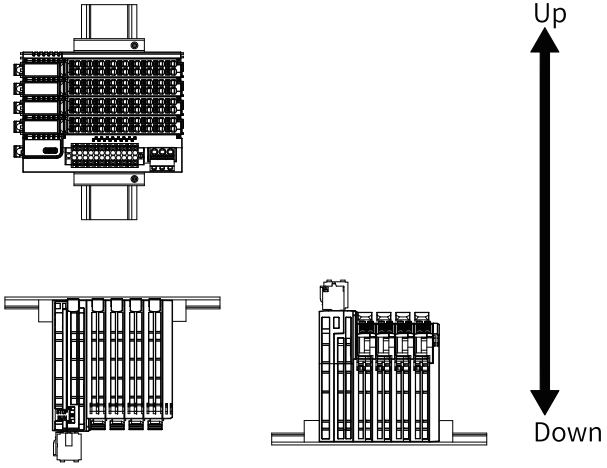


Note

Keep the PLC away from high-temperature heating sources (heater, transformer, large resistor, etc.) 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:

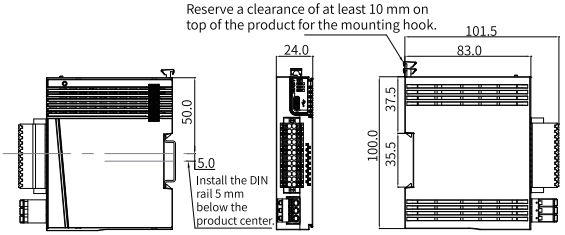
- Install the PLC below all I/O modules.
- Hold the cables with a cable duct to prevent the weight of cables being applied to the lower end plate. Failure to comply may cause displacement of the PLC from the DIN rail, leading to maloperation of the PLC.

1.3.3 Installation Precautions

- Before installing or removing the PLC and modules, ensure that they are powered off.
- Do not hot-swap the modules, as hot-swapping may cause reboot of the PLC and loss or damage of user data.
- To avoid damage to the PLC and modules, prevent their enclosures and terminals from falling off or being impacted.

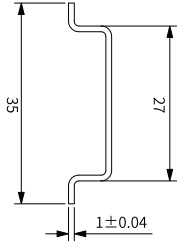
1.3.4 Installation Dimensions

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



1.3.5 Installation Methods

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

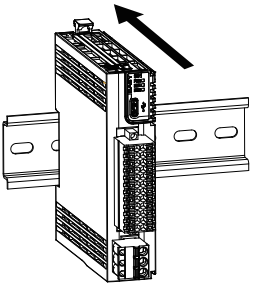


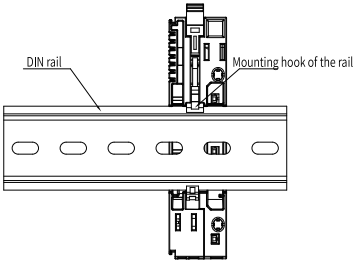
Caution

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.

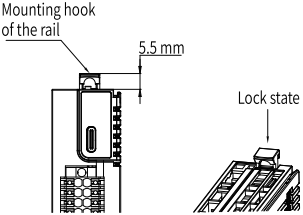
■ Installing the master

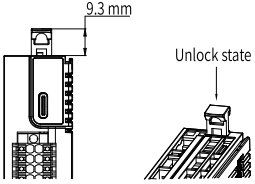
1. Align the controller with the DIN rail and push the controller in the direction indicated by the arrow until you hear a clicking sound, as shown below.





2. Make sure the DIN rail mounting hook of the controller 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.

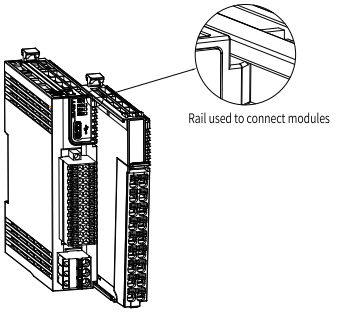
Press down the mounting hook to lock the controller to the DIN rail.

Caution

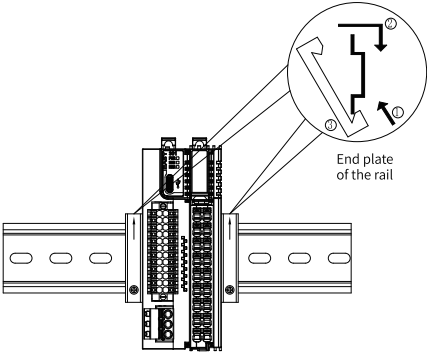
Keep the mounting hook locked when the controller is not mounted on the rail. If the mounting hook is kept unlocked for an extended period of time, it may malfunction.

■ Installing the module to the master

Install the extension module to the master through top and bottom rails, as shown below.

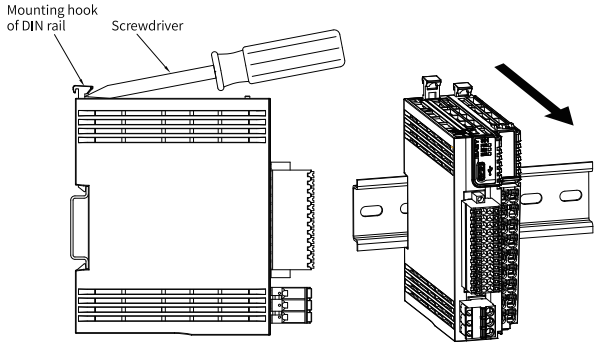


Install an DIN rail end plate to both sides of the master or module. To mount the end plate, hook the bottom of it to the bottom of the DIN rail, rotate the end plate to hook the top of it to the top of the DIN rail, and then tighten the screw to lock the end plate in place, as shown below.



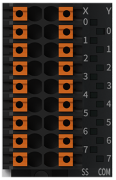
■ Removing the module

Pry the mounting hook upwards with a tool such as a straight screwdriver or similar, and pull out the module forwardly. Then press down the top of the mounting hook.



1.4 Electrical Installation

1.4.1 Terminal Arrangement



Left Signal	Left Terminal	Right Terminal	Right Signal
X0 input	X0	Y0	Y0 output
X1 input	X1	Y1	Y1 output
X2 input	X2	Y2	Y2 output
X3 input	X3	Y3	Y3 output
X4 input	X4	Y4	Y4 output
X5 input	X5	Y5	Y5 output
X6 input	X6	Y6	Y6 output

Left Signal	Left Terminal	Right Terminal	Right Signal
X7 input	X7	Y7	Y7 output
Input common terminal	SS	COM	Output common terminal

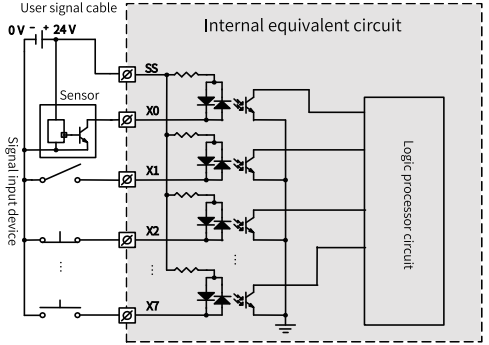
Caution

- Check the silk print on both sides of the terminals to prevent wrong connection. Failure to comply may result in short circuit and damage to the device.
- 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 and non-parallel routes.

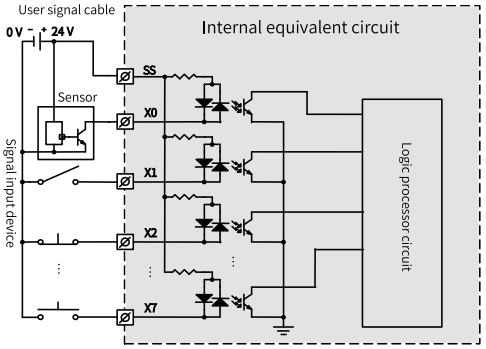
1.4.2 Terminal Wiring

■ Input terminal circuit diagram

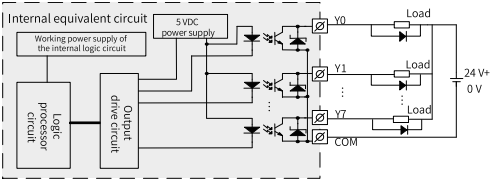
- **Input terminal circuit diagram for sink wiring**



- **Input terminal circuit diagram for source wiring**



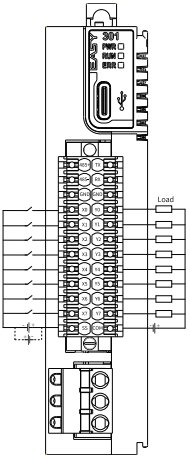
■ Output terminal circuit diagram



Note

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

■ **Input and output terminal wiring diagram**



1.5 Communication Connection

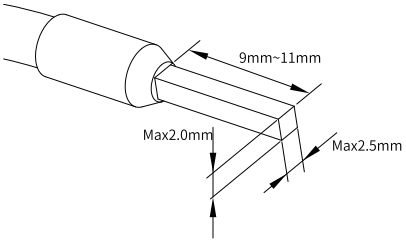
1.5.1 Cable Selection

- Power cable

  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	17
	1.5	16

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

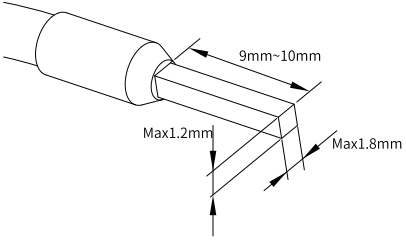


- Communication cable

  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

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



1.5.2 Cable Connection

■ RS485&RS232 communication

The RS485 communication port and the RS232 communication port share the same terminal block, with RS485 communication port on the left and RS232 communication port on the right.

■ RS485&RS232 terminal assignment

Description	Left terminal	Right terminal	Description
RS485 differential pair (+)	485+	TX	RS232 signal transmission
RS485 differential pair (-)	485-	RX	RS232 signal reception
RS485 ground	GND	GND	RS232 ground

Caution

Check the silk print on both sides of the terminal to prevent wrong connection. Do not connect the GND cable to the lower I/O terminal. Failure to comply can result in short circuit and damage to the device.

■ RS485 communication specifications

Item	Description
Number of channel supported	1
Hardware interface	2 x 12-pin terminal (shared with DI/DO)
Isolation mode	Non-isolation
Termination resistor	Without termination resistor
Number of slaves connected	Up to 31 slaves (The length of each slave branch must be shorter than 3 m.)
Communication baud rate	9600 bit/s, 19200 bit/s, 38400 bit/s, 57600 bit/s, and 115200 bit/s
Short circuit protection	Providing protection against improper connection of 24 V power supply

■ RS232 communication specifications

Item	Description
Number of channel supported	1
Hardware interface	2 x 12-pin terminal (shared with DI/DO)
Isolation mode	Non-isolation
Communication baud rate	9600 bit/s, 19200 bit/s, 38400 bit/s, 57600 bit/s, and 115200 bit/s

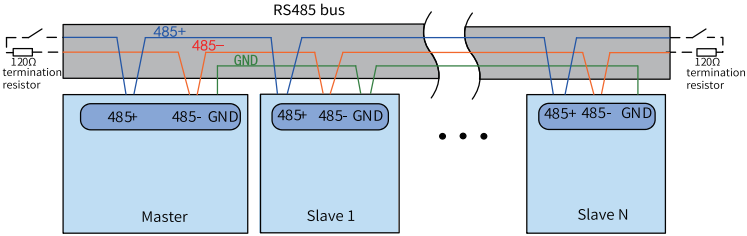
■ Wiring

Select the communication cable according to *"1.5.1 Cable Selection" on page 34*. Insert the communication cable to the communication port.

1.5.3 Instructions on RS485 Communication

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

The RS485 bus topology is shown in the figure below.



1.6 Operation and Maintenance

1.6.1 Program Run and Stop

After writing a program while the PLC is in the "STOP" state, execute the shutdown operation as described in the following table.

Status	Operation
To run the system	1. Set the system to the "RUN" state. 2. Confirm that the RUN indicator is yellow-green and steady on.
To stop running	Set the system to the "STOP" state, or stop the PLC in the background by using the host controller.

1.7 Appendix

■ Easy301 series programmable controllers

Model	Description	Code
Easy301-0808TN	Easy300 series 8-input 8-output programmable controller	01440323

■ GE20 series expansion cards

Type	Model	Description	Code	Slot	ID
Digital input/ output	GE20-4DI	4-channel input 24 VDC input Source/Sink	01480032	A/B	13
	GE20-4DO-TN	4-channel sink transistor output 24 VDC output	01480033	A/B	5
Analog input/ output	GE20-2AD1DA-I	2-channel analog input and 1-channel analog output (current type)	01480027	A/B	11
	GE20-2AD1DA-V	2-channel analog input and 1-channel analog output (voltage type)	01480028	A/B	3
Commu-nication	GE20-CAN-485	CAN and RS485 communication (RJ45)	01480034	A	15
	GE20-232/ 485	RS232 or RS485 communication	01480029	A/B	7
	GE20-232/ 485-RTC	RS232 or RS485 communication (with RTC)	01480035	B	14

Type	Model	Description	Code	Slot	ID
Storage	GE20-TF	TF expansion card	01480030	B	1
	GE20-TF-RTC	Memory expansion card (with integrated RTC)	01480050	B	6
Clock	GE20-RTC	Clock expansion card	01480031	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 series expansion modules

Module	Model	Description	Code
Digital	GL20-0016ETP	16-channel digital output (PNP)	01440292
	GL20-1600END	16-channel digital input	01440291
	GL20-0016ETN	16-channel digital output (NPN)	01440293
	GL20-0800END	8-channel digital input	01440381
	GL20-0008ETP	8-channel digital output (PNP)	01440380
	GL20-0008ETN	8-channel digital output (NPN)	01440379
	GL20-0808ETN	8-channel digital input and 8-channel digital output (NPN)	01440339
	GL20-0008ER	8-channel relay output module	01440334
	GL20-3200END	32-channel digital input	01440378
	GL20-0032ETN	32-channel digital output (NPN)	01440377
	GL20-0404ETP-5V	5 VDC; 4-channel digital input and 4-channel digital output (available soon)	01440506
	GL20-3232ETN-M	32-channel digital input and 32-channel digital output (NPN), with external terminal block wiring	01440290
Analog	GL20-4AD	4-channel analog input	01440288
	GL20-4DA	4-channel analog output	01440287
	GL20-8ADV	8-channel analog input	01440482
	GL20-8ADI	8-channel analog input	01440489

Module	Model	Description	Code
Temperature measurement	GL20-4PT	4-channel thermistor input type	01440337
	GL20-4TC	4-channel thermocouple input type	01440338
Communication	GL20-2SCOM	2-channel serial module (third-party products not supported)	01440463
	GL20-2S485	2-channel RS485 expansion module, currently only supporting EtherCAT couplers (third-party products not supported)	01440398
Process module	GL20-2SSI	2-channel SSI communication	01440445

2 Easy302 Programmable Logic Controller

User Guide

2.1 Preface

■ Introduction

This product is a new generation of small-sized programmable logic controller (PLC) independently developed by Inovance. It supports RS485 and RS232 communication features and implements multi-layer network communication through the RS485 and RS232 ports. It allows process encapsulation and reuse through the Function Block (FB) and Function (FC) features. This product can accommodate a maximum of 16 expansion modules. For module types supported, see the section of "Local Expansion Modules" in the "H5U and Easy Series Programmable Logic Controller Programming and Application Guide". 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 installation and wiring of the product, including product information, mechanical installation, and electrical installation.

■ 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 Directive	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 Directive	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 Documents

Doc Name	Data Code	Description
GE20 Series Expansion Card User Guide	PS00006443	Describes the product information, installation and wiring, and programming examples of the GE20 series expansion card
H5U and Easy Series Programmable Logic Controller Programming and Application Guide	19012249	Describes the basics of PLC programming, quick start guide, communication, motion control, and high-speed counter usage
H5U and Easy Series Programmable Logic Controller Instruction Guide	19011939	Describes the basic instructions and complex instructions used for programming applications, as well as examples of these instructions
Easy302 Programmable Logic Controller User Guide (this guide)	PS00006240	Describes the installation and wiring of the product, including product information, mechanical installation, and electrical installation

■ Revision History

Date	Version	Description
July 2024	A05	**Addition** Added the I/O terminal wiring in *"2.4.2 Terminal Wiring" on page 65* **Change** • Updated the note for power-off and restart in *"2.2.2 Components" on page 49* • Updated the program data capacity in *"2.2.3.1 General Specifications" on page 51* • Updated the number of axes supported in *"2.2.3.1 General Specifications" on page 51* • Updated the rated current of bus input power for the GL20-3232ETN-M expansion module in *"2.2.3.2 Power Supply Specifications" on page 52*
March 2024	A04	**Addition** Added the Easy302 series programmable controller models and the GL20 series expansion module models in *" Appendix" on page 73* **Change** • Updated the descriptions of status indicators in *"2.2.2 Components" on page 49* • Updated the power supply specifications in *"2.2.3.2 Power Supply Specifications" on page 52* • Updated the overcurrent protection device specifications in *"2.3.1 Installation Environment Requirements" on page 55*

Date	Version	Description
February 2024	A03	Corrected minor errors
March 2023	A02	Updated the diagram of DIN rail buckles; added some product specification data
October 2022	A01	• Added support for CAN communication • Corrected minor errors
August 2022	A00	First release

■ Access to the Guide

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

- **Inovance website:** Visit www.inovance.com, go to "Support" > "Download", search by keyword, and then download the PDF file.
- **QR code:** Scan the QR code on the product with your smart phone to obtain the corresponding guide.
- **My Inovance app:** Scan the QR code below to install the My Inovance app, and search for the corresponding guide in the app.

■ Warranty

Inovance provides an 18-month free warranty (subject to information indicated by the barcode on the product if not otherwise specified in the contract) from the date of manufacturing for product failure or damage under normal use conditions. A maintenance fee will be charged out of the 18-month warranty period.

Even in the 18-month 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 (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.

2.2 Product Information

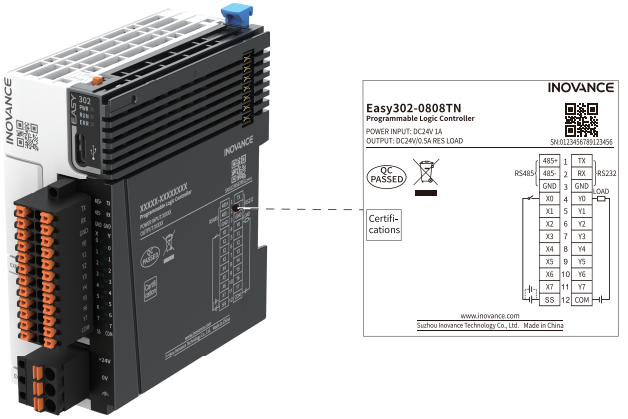
2.2.1 Model Number and Nameplate

■ **Model number**

Easy ① 302 ② – 0808 ③ TN ④

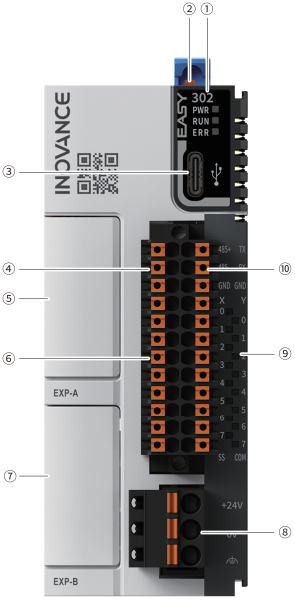
① **Product series** Easy: Easy series programmable logic controller	③ **Input and output channels** 08: 8-channel input 08: 8-channel output
② **Series** 3: 300 series platform 0: No Ethernet 2: Model serial number	④ **Output type** TN: Sink transistor

■ Nameplate



Model	Description	Code
Easy302-0808TN	Easy300 series 8-input 8-output programmable controller	01440324

2.2.2 Components



No.	Port Type	Mark	Meaning	Indicator Color	Description
①	Operation status indicator	PWR	Power supply normal	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
②	DIP switch	RUN/STOP	Run/Stop control	-	-

No.	Port Type	Mark	Meaning	Indicator Color	Description
③	Type-C port		Communication with PC	-	-
④	RS485	RS485+	RS485 communication signal+	-	-
		RS485–	RS485 communication signal–	-	-
		GND	RS485 communication ground	-	-
⑤/-⑦	Expansion card slot	EXP-A/ EXP-B	Expansion card slots, used to expand features	-	For expansion card options, see *"Appendix" on page 73*.
⑥	I/O terminal	-	8-channel input and 8-channel output	-	For details, see *"2.4.1 Terminal Arrangement" on page 64*.
⑧	Power terminal	+24V	24 VDC power supply+	-	-
		0V	24 VDC power supply–	-	-
			PE	-	-
⑨	I/O indicator	X/Y	I/O status	Yellow-green	• Steady ON: Input or output active • OFF: Input or output inactive

No.	Port Type	Mark	Meaning	Indicator Color	Description
⑩	RS232	TX	RS232 transmit signal	-	-
		RX	RS232 receive signal	-	-
		GND	RS232 communica-tion ground	-	-

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

2.2.3 Product Specifications

2.2.3.1 General Specifications

Item	Specifications
Program data capacity	• User program: 128 kB steps • Customized variables: 1 MB (including 128 kB retentive at power failure) • Soft elements: approx. 150 kB (retentive at power failure after No. 1000; non-retentive at power failure when only powered by USB)
Instruction processing speed	20,000 steps executed in 2 ms
Bit operation	0.144 μs/instruction
Word transmission	0.338 μs/instruction
Floating point operation	0.779 μs/instruction

Item	Specifications
Ethernet	-
EtherCAT communication	-
Number of axes supported	Maximum 5 axes (maximum 5 local pulse axes and 16 virtual axes)
Serial communication	Support for a maximum of three channels (two on the PLC itself and one through the expansion cards)
CAN communication	Support for one master through an expansion card (requiring the firmware version of 5.65.2.0 or later and AutoShop version of 4.6.5.0 or later) • CANlink: Maximum 62 slaves • CANopen: Maximum 30 slaves and 16 axes
High-speed input	Single-phase: 8 channels at 200 kHz
High-speed output	5 axes at 200 kHz; PWM supported
Expansion module	Maximum 16 local expansion modules
Expansion card	Maximum two expansion cards
Programming language	LD, SFC; FB/FC supported (LD)
Type-C	Support for user program upload and download and firmware upgrade through the Type-C port or a GE20-TF memory expansion card
IP rating	IP20
Dimensions (W x H x D)	40 mm x 100 mm x 83 mm
Weight	Approx. 157 g

2.2.3.2 Power Supply Specifications

Item	Specifications
Rated voltage of terminal input power	24 VDC±10% (21.6 VDC to 26.4 VDC)
Rated current of terminal input power	1 A (maximum value at 24 V)
Rated voltage of bus output power	5 VDC (4.75 VDC to 5.25 VDC)

Item	Specifications
Rated current of bus output power[1]	2 A (typical 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 Easy 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 Easy series programmable logic controller (2 A/250 mA = 8).

2.2.3.3 Input Specifications

Item		Specifications
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 to X7)	Input current when input is ON	> 4 mA
	Input current when input is OFF	< 2.5 mA
	Hardware response time	2 μs (RC time)
	Maximum input frequency	200 kHz
	Input impedance	2.7 kΩ
ON voltage		⩾ 15 VDC
OFF voltage		⩽ 5 VDC
Software filter time		• Low-speed: 2 ms to 1,000 ms • High-speed: 2 μs to 1,000 μs

Item	Specifications
Isolation mode	Capacitive isolation for integrated chip
Common terminal mode	8-point/common terminal (positive/ negative polarity of input power being changeable)
Input action display	The input indicator lights up (controlled by software) when the input is in drive state.

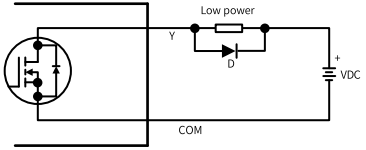
2.2.3.4 Output Specifications

Item		Specifications
Output type		Transistor NPN output
Number of output channels		8
Output voltage class		24 VDC±10% (21.6 VDC to 26.4 VDC)
High-speed output (Y0 to Y7)	Output load (resistive load)	0.5 A/point; 2 A/8-point
	Output load (inductive load)	7.2 W/point; 24 W/8-point
	Output load (lamp load)	5 W/point; 18 W/8-point
	Hardware response time (ON/ OFF)	< 1 μs (OFF→ON); < 2 μs (ON→OFF)
	Load current requirements	Load current ⩾ 12 mA when the output is greater than 10 kHz
	Maximum output frequency	200 kHz for resistive load; 0.5 Hz for inductive load; 10 Hz for lamp load
PWM output		Maximum frequency 200 kHz; minimum pulse width 2.5 μs; minimum resolution 2.5 μs; adjustable duty cycle[1] 0.01% to 99.99%
Leakage current during OFF		< 30 μA 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)

Item	Specifications
Short circuit protection	Protection against short circuit of each channel, recovered after power-off
External inductive load protection	A flywheel diode[2] 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.

[1]: The duty cycle setting is frequency dependent, and the pulse width corresponding to the duty cycle must not be less than the minimum pulse width.

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



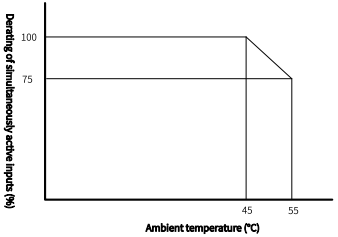
2.3 Mechanical Installation

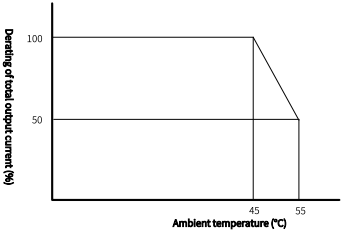
2.3.1 Installation Environment Requirements

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

Item	Specifications
Operating environment	Places without corrosive or inflammable gas or severe conductive dust
Altitude	Maximum 2,000 m (80 kPa)
Pollution degree	PD2
Interference immunity	2 kV on power supply line (IEC 61000-4-4)
Overvoltage category	I
EMC immunity level	Zone B, IEC 61131-2
Vibration resistance	IEC 60068-2-6; 5 Hz to 8.4 Hz: 3.5 mm; 8.4 Hz to 150 Hz: 1·g; three axes: X, Y, and Z; 10 sweeps/axis

Item	Specifications
Shock resistance	IEC 60068-2-27; 150 m/s^2; 11 ms; six directions: ±X, ±Y, and ±Z; 3 cycles/direction, totaling 18 cycles
Overcurrent protection device	1.5 A fuse
Storage temperature and humidity	• Temperature: –20°C to +60°C • Relative humidity: < 90%, non-condensing
Transportation temperature and humidity	• Temperature: –40°C to +70°C • Relative humidity: < 95%, non-condensing
Ambient temperature and humidity	• Temperature: –20°C to +55°C (for horizontal installation), –20°C to +45°C (for non-horizontal installation) • Relative humidity: < 95%, non-condensing **Note: When the ambient temperature exceeds the upper limit, a forced draft fan or air conditioner must be installed in the heat dissipation hole direction.**

Item	Specifications
Installation position and limit	Installation position: The PLC can be installed in four directions. For details, see *"2.3.2 Installation Position Requirements" on page 58*. Limit: Horizontal installation: • Input derating: When the ambient temperature is 45°C, the PLC can work at full load. When the ambient temperature is 55°C, the number of simultaneously active inputs shall be reduced to 75% (that is, no more than six inputs), at a derating rate of 2.5% per 1°C of temperature rise.  (Continued)

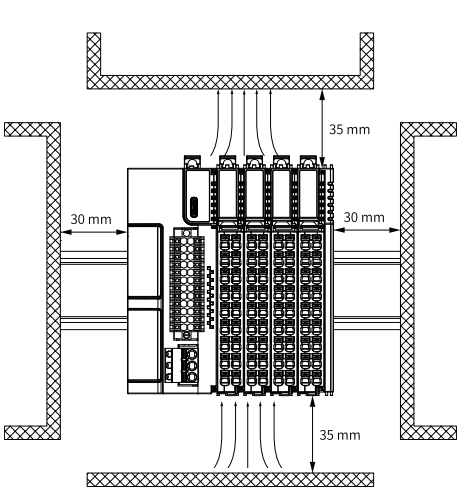
Item	Specifications
Continued	(To be continued) • Output derating: When the ambient temperature is 45°C, the PLC can work at full load (that is, the total current of the eight outputs not higher than 2 A). When the ambient temperature is 55°C, the total current of simultaneously active outputs shall be reduced to 50% (that is, the total current of the eight outputs not higher than 1 A), at a derating rate of 5% per 1°C of temperature rise.  Non-horizontal installation: A maximum of six inputs can be in active state simultaneously, and the maximum allowed output current is 1 A.

2.3.2 Installation Position Requirements

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 *"2.3.1 Installation Environment Requirements" on page 55*.

■ 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 product, as shown in the following figure.

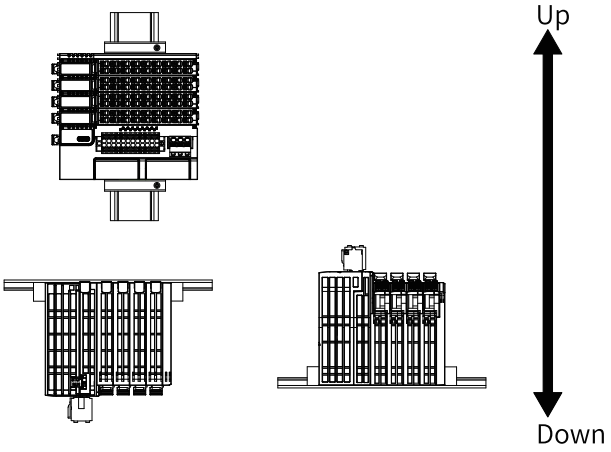


Note

Keep the PLC away from high-temperature heating sources (heater, transformer, large resistor, etc.) 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:

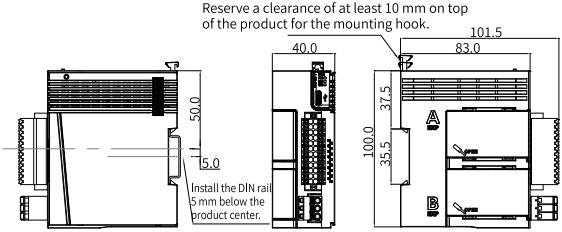
- Install the PLC below all I/O modules.
- Hold the cables with a cable duct to prevent the weight of cables being applied to the lower end plate. Failure to comply may cause displacement of the PLC from the DIN rail, leading to maloperation of the PLC.

2.3.3 Installation Precautions

- Before installing or removing the PLC and modules, ensure that they are powered off.
- Do not hot-swap the modules, as hot-swapping may cause reboot of the PLC and loss or damage of user data.
- To avoid damage to the PLC and modules, prevent their enclosures and terminals from falling off or being impacted.

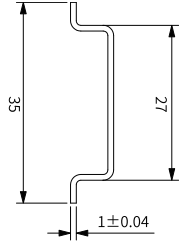
2.3.4 Installation Dimensions

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



2.3.5 Installation Methods

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

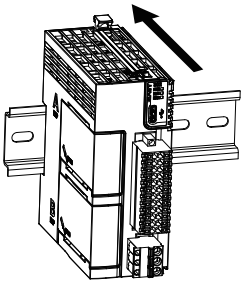


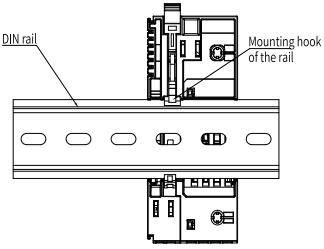
Caution

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

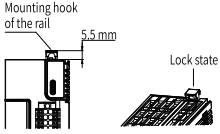
■ Installing the master

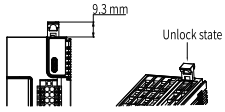
1. Align the master with the DIN rail and push the module in the direction indicated by the arrow until you hear a clicking sound, as shown below.





2. Make sure the DIN rail mounting hook of the master 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.

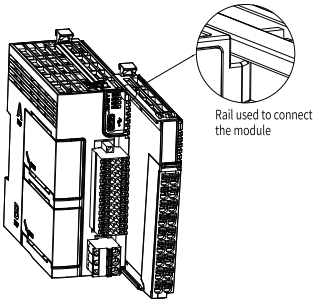
Press down the mounting hook to lock the master to the DIN rail.

Caution

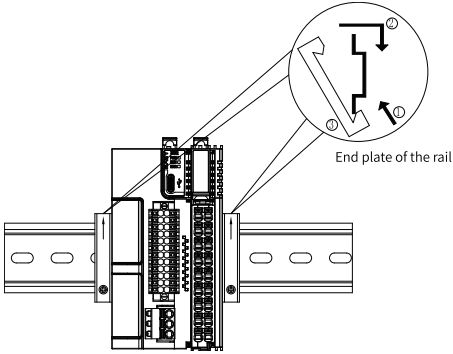
Keep the mounting hook locked when the controller is not mounted on the rail. If the mounting hook is kept unlocked for an extended period of time, it may malfunction.

■ Installing the module to the master

Install the extension module to the master through top and bottom rails, as shown below.

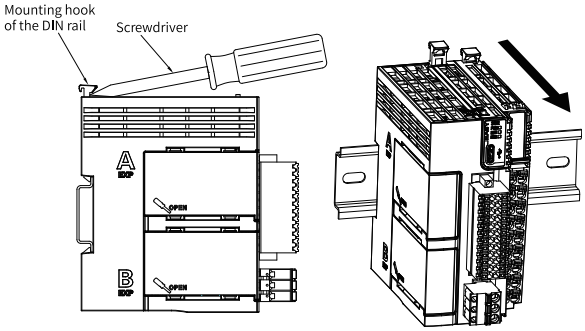


Install an DIN rail end plate to both sides of the master or module. To mount the end plate, hook the bottom of it to the bottom of the DIN rail, rotate the end plate to hook the top of it to the top of the DIN rail, and then tighten the screw to lock the end plate in place, as shown below.



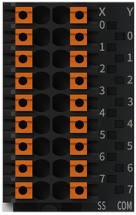
■ Removing the module

Pry the mounting hook upwards with a tool such as a straight screwdriver or similar, and pull out the module forwardly. Then press down the top of the mounting hook.



2.4 Electrical Installation

2.4.1 Terminal Arrangement



Left Signal	Left Terminal	Right Terminal	Right Signal
X0 input	X0	Y0	Y0 output
X1 input	X1	Y1	Y1 output
X2 input	X2	Y2	Y2 output
X3 input	X3	Y3	Y3 output
X4 input	X4	Y4	Y4 output
X5 input	X5	Y5	Y5 output

Left Signal	Left Terminal	Right Terminal	Right Signal
X6 input	X6	Y6	Y6 output
X7 input	X7	Y7	Y7 output
Input common terminal	SS	COM	Output common terminal

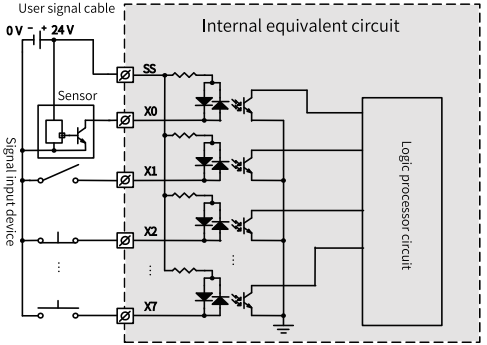
Caution

- Check the silk print on both sides of the terminal to prevent wrong cable connection. Failure to comply may lead to short circuit, which can damage the components.
- The total extended length of high-speed I/O interface extension cable must be within 3 m.
- To prevent interference, route the I/O interface extension cable and the power cable (high-voltage/high-current cables) through different and non-parallel routes.

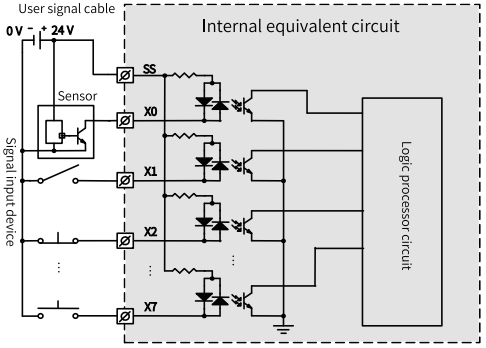
2.4.2 Terminal Wiring

■ Input terminal circuit diagram

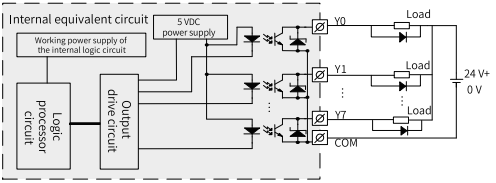
- **Input terminal circuit diagram for sink wiring**



- **Input terminal circuit diagram for source wiring**



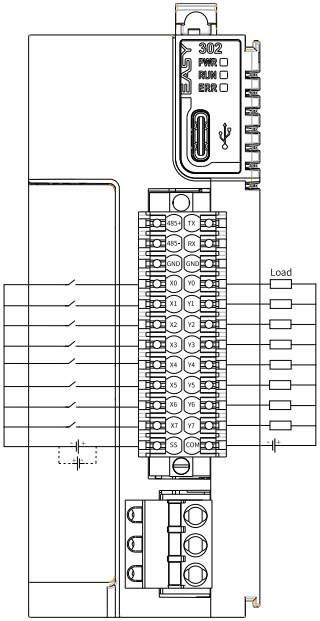
■ Output terminal circuit diagram



Note

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

■ **Input and output terminal wiring diagram**



2.5 Communication Connection

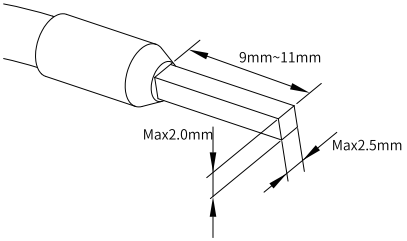
2.5.1 Cable Selection

- Power cable

  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	17
	1.5	16

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

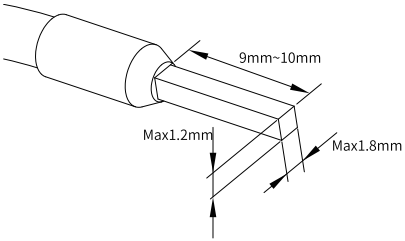


- Communication cable

  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

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



2.5.2 Cable Connection

■ RS485&RS232 communication

The RS485 communication port and the RS232 communication port share the same terminal block, with RS485 communication port on the left and RS232 communication port on the right. The signal on the left side of the terminal is RS485 communication, and the signal on the right side is RS232 communication.

■ RS485&RS232 terminal assignment

Description	Terminals on the left	Terminals on the right	Description
RS485 differential pair (+)	485+	TX	RS232 signal transmission
RS485 differential pair (-)	485-	RX	RS232 signal reception
RS485 ground	GND	GND	RS232 ground

Check the silk print on both sides of the terminal to prevent wrong cable connection. Do not connect the GND cable to the I/O terminal on the lower side. Failure to comply can lead to short circuit and damage the components.

■ RS485 communication specifications

Item	Description
Number of channels supported	Two channels at most (one built-in and one extended in the extension card, three serial ports can be connected at most including RS232)
Hardware interface	2 x 12-pin terminal (shared with the DIDO)
Isolation mode	Non-isolated
Termination resistor	Without termination resistor
Number of slaves connected	Up to 31 slaves (The length of each slave branch must be shorter than 3 m.)
Communication baud rate	9600 bit/s, 19200 bit/s, 38400 bit/s, 57600 bit/s, and 115200 bit/s
Short circuit protection	Providing protection against improper connection of 24 V power supply

■ RS232 communication specifications

Item	Description
Number of channels supported	Two channels at most (one built-in and one extended in the extension card, three serial ports can be connected at most including RS232)
Hardware interface	2 x 12-pin terminal (shared with the DIDO)
Isolation mode	Non-isolated
Communication baud rate	9600 bit/s, 19200 bit/s, 38400 bit/s, 57600 bit/s, and 115200 bit/s

■ Wiring

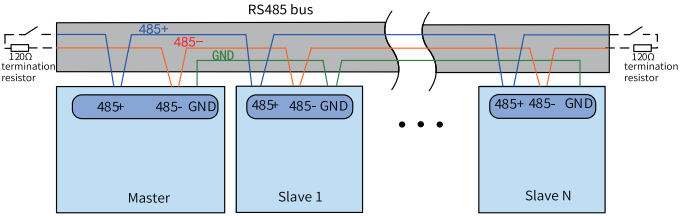
See *"2.5.1 Cable Selection" on page 67* to select the communication cable and insert it into the communication port.

2.5.3 RS485 Communication

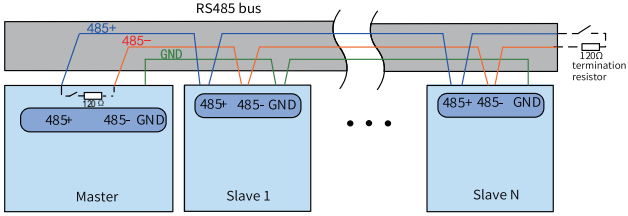
It is recommended to use a shielded twisted pair cable as the RS485 bus, and use twisted pair cables to connect the RS485+ and RS485– terminals. Connect a 120 Ω termination resistor to each end of the bus to prevent signal reflection. Connect the RS485 signal reference grounds of all nodes together. A maximum of 31 nodes can be connected and the cable length of any node branch must be less than 3 m.

The following figure shows the RS485 bus topology.

Local RS485 communication of Easy series PLC



RS485 communication of GE20 series extension card



2.6 Operation and Maintenance

2.6.1 Program Run and Stop

After writing a program while the PLC is in the "STOP" state, execute the shutdown operation as described in the following table.

Status	Operation
To run the system	1. Set the system to the "RUN" state. 2. Confirm that the RUN indicator is yellow-green and steady on.
To stop running	Set the system to the "STOP" state, or stop the PLC in the background by using the host controller.

2.6.2 User Program Download with an SD Card

Prerequisites

An SD (TF) card is prepared (requirements: SD card capacity ⩽ 32 GB; FAT32 file system).

Procedure

1. Generate a "Down/Updown" file with AutoShop (For details, see Chapter 20 "Application of the Download File Generation Feature" in the *H5U and Easy Series Programmable Logic Controller Programming and Application Guide*).
2. Create a "PLCProgram" directory in the root directory of the SD card and copy the "Down/Updown" file to the "PLCProgram" directory.
3. Insert the SD card into a TF expansion card, and then install the TF expansion card onto the PLC.

Install the TF extension card with power off.

4. Re-power on the PLC. The PLC starts downloading the user program from the SD card, and the RUN indicator blinks fast at 4 Hz during the download process.
5. After successful download, the RUN indicator blinks slowly at 1 Hz and the PLC enters the "STOP" state. Then, remove the SD card.
   If the ERR indicator blinks slowly, it is indicated that the download has failed. Check whether the downloaded file is applicable to the PLC model and whether the login password of the downloaded file is the same as the login password of the

PLC. If all the check items are correct, but the download still fails, contact our technical support for help.

6. Re-power on the PLC and the PLC restores normal operation.

2.6.3 Firmware Programming with an SD Card

1. Load a firmware programming SD card (maximum capacity of 32 GB, file format of FAT32) onto a TF expansion card and install the TF card onto the PLC.

- Keep the PLC powered-off while installing the TF expansion card.
- The original application will be deleted after firmware programming is completed.

2. Re-power on the PLC.

   The RUN and ERR indicators on the PLC blink fast for three seconds, indicating the start of firmware programming. Then, the RUN and ERR indicators are steady on, indicating that the firmware programming is in progress. Finally, the RUN and ERR indicators start to blink slowly, indicating that the firmware programming is completed.

3. After the firmware programming is completed, power off the PLC and remove the SD card.
4. Re-power on the PLC.

2.7 Appendix

■ Easy302 series programmable controllers

Model	Description	Code
Easy302-0808TN	Easy300 series 8-input 8-output programmable controller	01440324

■ GE20 series expansion cards

Type	Model	Description	Code	Slot	ID
Digital input/ output	GE20-4DI	4-channel input 24 VDC input Source/Sink	01480032	A/B	13
	GE20-4DO-TN	4-channel sink transistor output 24 VDC output	01480033	A/B	5
Analog input/ output	GE20-2AD1DA-I	2-channel analog input and 1-channel analog output (current type)	01480027	A/B	11
	GE20-2AD1DA-V	2-channel analog input and 1-channel analog output (voltage type)	01480028	A/B	3
Commu-nication	GE20-CAN-485	CAN and RS485 communication (RJ45)	01480034	A	15
	GE20-232/ 485	RS232 or RS485 communication	01480029	A/B	7
	GE20-232/ 485-RTC	RS232 or RS485 communication (with RTC)	01480035	B	14
Storage	GE20-TF	TF expansion card	01480030	B	1
	GE20-TF-RTC	Memory expansion card (with integrated RTC)	01480050	B	6
Clock	GE20-RTC	Clock expansion card	01480031	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 series expansion modules

Module	Model	Description	Code
Digital	GL20-0016ETP	16-channel digital output (PNP)	01440292
	GL20-1600END	16-channel digital input	01440291
	GL20-0016ETN	16-channel digital output (NPN)	01440293
	GL20-0800END	8-channel digital input	01440381
	GL20-0008ETP	8-channel digital output (PNP)	01440380
	GL20-0008ETN	8-channel digital output (NPN)	01440379
	GL20-0808ETN	8-channel digital input and 8-channel digital output (NPN)	01440339
	GL20-0008ER	8-channel relay output module	01440334
	GL20-3200END	32-channel digital input	01440378
	GL20-0032ETN	32-channel digital output (NPN)	01440377
	GL20-0404ETP-5V	5 VDC; 4-channel digital input and 4-channel digital output (available soon)	01440506
	GL20-3232ETN-M	32-channel digital input and 32-channel digital output (NPN), with external terminal block wiring	01440290
Analog	GL20-4AD	4-channel analog input	01440288
	GL20-4DA	4-channel analog output	01440287
	GL20-8ADV	8-channel analog input	01440482
	GL20-8ADI	8-channel analog input	01440489

Module	Model	Description	Code
Temperature measurement	GL20-4PT	4-channel thermistor input type	01440337
	GL20-4TC	4-channel thermocouple input type	01440338
Communication	GL20-2SCOM	2-channel serial module (third-party products not supported)	01440463
	GL20-2S485	2-channel RS485 expansion module, currently only supporting EtherCAT couplers (third-party products not supported)	01440398
Process module	GL20-2SSI	2-channel SSI communication	01440445

3 Easy300 Series Programmable Logic Controller User Guide

3.1 Preface

■ Introduction

This product is a new generation of small-sized programmable logic controller (PLC) independently developed by Inovance. It supports 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 and Ethernet ports. This product can accommodate a maximum of 16 expansion modules. For module types supported, see the section of "Local Expansion Modules" in the "H5U and Easy Series Programmable Logic Controller Programming and Application Guide". 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 installation and wiring of the product, including product information, mechanical installation, and electrical installation.

■ 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 Directive	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 Directive	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 Documents

Doc Name	Data Code	Description
GE20 Series Expansion Card User Guide	PS00006443	Describes the product information, installation and wiring, and programming examples of the GE20 series expansion card
H5U and Easy Series Programmable Logic Controller Programming and Application Guide	19012249	Describes the basics of PLC programming, quick start guide, communication, motion control, and high-speed counter usage
H5U and Easy Series Programmable Logic Controller Instruction Guide	19011939	Describes the basic instructions and complex instructions used for programming applications, as well as examples of these instructions
Easy320 Programmable Controller User Guide (this guide)	PS00005850	Describes the installation and wiring of the product, including product information, mechanical installation, and electrical installation

■ Revision History

Date	Version	Description
July 2024	A05	**Addition** Added the I/O terminal wiring in *"3.4.2 Terminal Wiring" on page 100* **Change** • Updated the note for power-off and restart in *"3.2.2 Components" on page 83* • Updated the program data capacity in *"3.2.3.1 General Specifications" on page 87* • Updated the number of axes supported in *"3.2.3.1 General Specifications" on page 87*
March 2024	A04	Corrected minor errors

Date	Version	Description
February 2024	A03	• Added the PNP model in *"3.2.1 Model Number and Nameplate" on page 82* • Updated the descriptions of status indicators in *"3.2.2 Components" on page 83* • Added the PNP specifications in the high-speed input item in *"3.2.3.1 General Specifications" on page 87* • Updated the power supply specifications in *"3.2.3.2 Power Supply Specifications" on page 88* • Added the PNP specifications in the high-speed input (X0 to X7) item in *"3.2.3.3 Input Specifications" on page 89* • Added the PNP specifications in the output type item in *"3.2.3.4 Output Specifications" on page 89* • Added the PNP output terminal wiring in 3.2 Terminal Wiring. • Added the Easy320 series programmable controller models and the GL20 series expansion module models in *" Appendix" on page 112*
March 2023	A02	Updated the diagram of DIN rail buckles; added some product specification data
October 2022	A01	• Added support for CAN communication • Corrected minor errors
August 2022	A00	First release

■ Access to the Guide

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

- **Inovance website:** Visit www.inovance.com, go to "Support" > "Download", search by keyword, and then download the PDF file.
- **QR code:** Scan the QR code on the product with your smart phone to obtain the corresponding guide.
- **My Inovance app:** Scan the QR code below to install the My Inovance app, and search for the corresponding guide in the app.

■ Warranty

For faults and damage incurred during normal use in the warranty period, Inovance provides free repair service. (For details of the warranty period, see the purchase order.) A maintenance fee will be charged out of the warranty period.

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 (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.

3.2 Product Information

3.2.1 Model Number and Nameplate

■ Model number

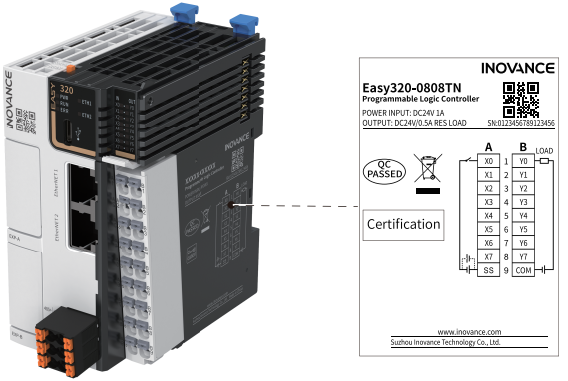
Easy ① 320 ② – 0808 ③ TX ④

① **Product series** Easy: Easy series programmable logic controller	③ **Input and output channels** 08: 8-channel input 08: 8-channel output
② **Model code** 3: 300 series platform 2: Two Ethernet ports 0: Model serial number	④ **Output type** X indicates N or P. TN: Sink transistor TP: Source transistor

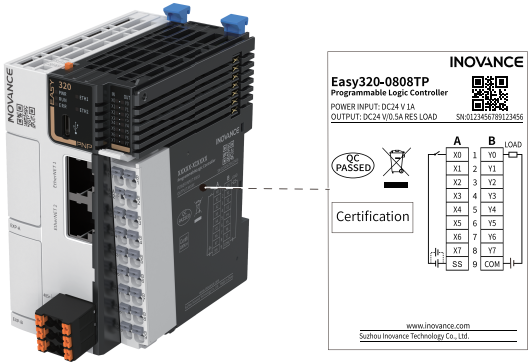
■ Nameplate

The Easy300 series have identical nameplates except for the model number and SN code. This section uses the Easy320 model as an example.

Easy320-0808TN



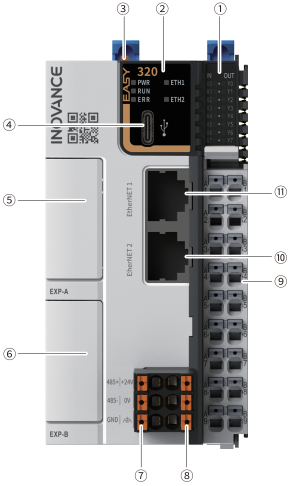
Easy320-0808TP



Model	Description	Code
Easy320-0808TN	Easy300 series 8-input 8-output programmable controller	01440325
Easy320-0808TP	Easy300 series 8-input 8-output programmable controller	01440607

3.2.2 Components

Components are identical for the Easy320-0808TX and Easy320-0808TN models. This section uses the Easy320-0808TN model as an example for illustration.


③
②
①
INOVANCE
EASY 320
PWR
RUN
ERR
ETH1
ETH2
IN
OUT
④
⑤
EtherNET1
EtherNET2
⑪
⑩
⑨
EXP-A
⑥
485+/+24V
485-/0V
GND/PE
EXP-B
⑦
⑧

No.	Port Type	Mark	Meaning	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 normal	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
		ETH1	Ethernet 1 link	Yellow-green	• Steady ON: Connected • Blinking: Communication in progress • OFF: Disconnected
		ETH2	Ethernet 2 link	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	EXP-A/EXP-B	Expansion card slots, used to expand features	-	For expansion card options, see *"Appendix" on page 112*.

No.	Port Type	Mark	Meaning	Indicator Color	Description
⑦	RS485	RS485+	RS485 communication signal+	-	-
		RS485–	RS485 communication signal–	-	-
		GND	RS485 communication ground	-	-
⑧	Power terminal	+24V	24 VDC power supply+	-	-
		0V	24 VDC power supply–	-	-
		⏚	PE	-	-
⑨	I/O terminal	-	8-channel input and 8-channel output	-	For details, see *"3.4.1 Terminal Arrangement" on page 99*.
⑩/-⑪	Ethernet port	EtherNET1/ EtherNET2	RJ45 ports used for Ethernet communication	-	-

Caution

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

3.2.3 Product Specifications

3.2.3.1 General Specifications

Item	Specifications
Program data capacity	• User program: 128 kB steps • Customized variables: 1 MB (including 128 kB retentive at power failure) • Soft elements: approx. 150 kB (retentive at power failure after No. 1000; non-retentive at power failure when only powered by USB)
Instruction processing speed	20,000 steps executed in 2 ms
Bit operation	0.144 μs/instruction
Word transmission	0.338 μs/instruction
Floating point operation	0.779 μs/instruction
Ethernet	Support for EtherNet/IP, Modbus TCP, Socket, and PROFINET slaves, FINS TCP and FINS UDP slaves, program upload and download, and firmware upgrade
EtherCAT communication	-
Number of axes supported	Maximum 5 axes (maximum 5 local pulse axes and 16 virtual axes)
Serial communication	Support for a maximum of three channels (one on the PLC itself and two through the expansion cards) **Note**: Expansion with the GL20-2S485 and GL20-2SCOM serial modules is supported.
CAN communication	Support for one master through an expansion card (requiring the firmware version of 5.65.2.0 or later and AutoShop version of 4.6.5.0 or later) • CANlink: Maximum 62 slaves • CANopen: Maximum 30 slaves and 16 axes
High-speed input	• Easy320-0808TN: Single-phase 8-channel at 200 kHz • Easy320-0808TP: Single-phase 8-channel at 100 kHz
High-speed output	5 axes at 200 kHz; PWM supported

Item	Specifications
Expansion module	Maximum 16 local expansion modules
Expansion card	Maximum two expansion cards
Programming language	LD, SFC; FB/FC supported (LD)
Type-C	Support for user program upload and download and firmware upgrade through the Type-C port or a GE20-TF memory expansion card
IP rating	IP20
Dimensions (W x H x D)	53 mm x 100 mm x 80 mm
Weight	Approx. 184 g

3.2.3.2 Power Supply Specifications

Item	Specifications
Rated voltage of terminal input power	24 VDC±10% (21.6 VDC to 26.4 VDC)
Rated current of terminal input power	1 A (maximum value at 24 V)
Rated voltage of bus output power	5 VDC (4.75 VDC to 5.25 VDC)
Rated current of bus output power[1]	2 A (typical 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 Easy 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 Easy series programmable logic controller (2 A/250 mA = 8).

3.2.3.3 Input Specifications

Item		Specifications
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 to X7)	Input current when input is ON	• Easy320-0808TN: > 4 mA • Easy320-0808TP: > 2.5 mA
	Input current when input is OFF	• Easy320-0808TN: < 2.5 mA • Easy320-0808TP: < 1.5 mA
	Hardware response time	2 μs (RC time)
	Maximum input frequency	200 kHz
	Input impedance	3.4 kΩ
ON voltage		⩾ 15 VDC
OFF voltage		⩽ 5 VDC
Software filter time		• Low-speed: 2 ms to 1,000 ms • High-speed: 2 μs to 1,000 μs
Isolation mode		Capacitive isolation for integrated chip
Common terminal mode		8-point/common terminal (positive/ negative polarity of input power being changeable)
Input action display		The input indicator lights up (controlled by software) when the input is in drive state.

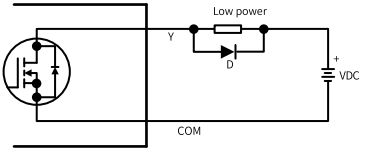
3.2.3.4 Output Specifications

Item	Specifications
Output type	• TN: Transistor NPN output • TP: Transistor PNP output
Number of output channels	8
Output voltage class	24 VDC±10% (21.6 VDC to 26.4 VDC)

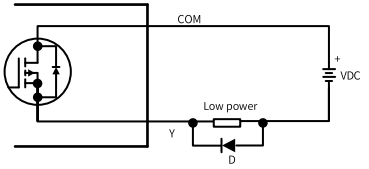
Item		Specifications
High-speed output (Y0 to Y7)	Output load (resistive load)	0.5 A/point; 2 A/8-point
	Output load (inductive load)	7.2 W/point; 24 W/8-point
	Output load (lamp load)	5 W/point; 18 W/8-point
	Hardware response time (ON/OFF)	< 1 μs (OFF→ON); < 2 μs (ON→OFF)
	Load current requirements	Load current ⩾ 12 mA when the output is greater than 10 kHz
	Maximum output frequency	200 kHz for resistive load; 0.5 Hz for inductive load; 10 Hz for lamp load
Leakage current during OFF		< 30 μA 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		A 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.

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

- **Easy320-0808TN**



- **Easy320-0808TP**

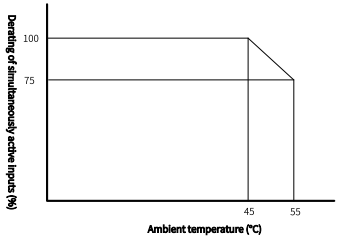


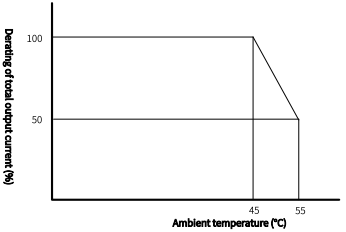
3.3 Mechanical Installation

3.3.1 Installation Environment Requirements

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

Item	Specifications
Operating environment	Places without corrosive or inflammable gas or severe conductive dust
Altitude	Maximum 2,000 m (80 kPa)
Pollution degree	PD2
Interference immunity	2 kV on power supply line (IEC 61000-4-4)
Overvoltage category	I
EMC immunity level	Zone B, IEC 61131-2
Vibration resistance	IEC 60068-2-6; 5 Hz to 8.4 Hz: 3.5 mm; 8.4 Hz to 150 Hz: 1·g; three axes: X, Y, and Z; 10 sweeps/axis
Shock resistance	IEC 60068-2-27; 150 m/s^2; 11 ms; six directions: ±X, ±Y, and ±Z; 3 cycles/direction, totaling 18 cycles
Overcurrent protection device	1.5 A fuse
Storage temperature and humidity	• Temperature: –20°C to +60°C • Relative humidity: < 90%, non-condensing
Transportation temperature and humidity	• Temperature: –40°C to +70°C • Relative humidity: < 95%, non-condensing

Item	Specifications
Ambient temperature and humidity	• Temperature: –20°C to +55°C (for horizontal installation), –20°C to +45°C (for non-horizontal installation) • Relative humidity: < 95%, non-condensing **Note: When the ambient temperature exceeds the upper limit, a forced draft fan or air conditioner must be installed in the heat dissipation hole direction.**
Installation position and limit	Installation position: The PLC can be installed in four directions. For details, see *"3.3.2 Installation Position Requirements" on page 93*. Limit: Horizontal installation: • Input derating: When the ambient temperature is 45°C, the PLC can work at full load. When the ambient temperature is 55°C, the number of simultaneously active inputs shall be reduced to 75% (that is, no more than six inputs), at a derating rate of 2.5% per 1°C of temperature rise.  (To be continued)

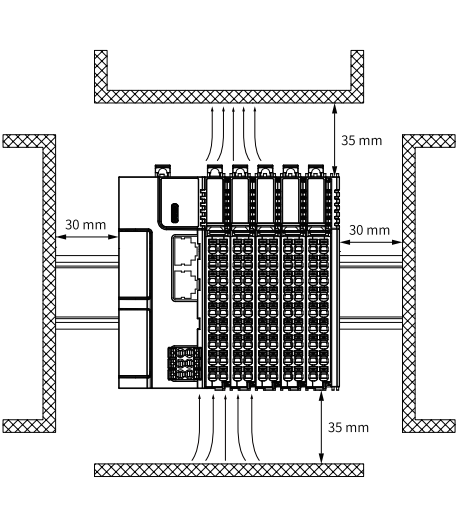
Item	Specifications
Continued	(Continued) • Output derating: When the ambient temperature is 45°C, the PLC can work at full load (that is, the total current of the eight outputs not higher than 2 A). When the ambient temperature is 55°C, the total current of simultaneously active outputs shall be reduced to 50% (that is, the total current of the eight outputs not higher than 1 A), at a derating rate of 5% per 1°C of temperature rise.  Non-horizontal installation: A maximum of six inputs can be in active state simultaneously, and the maximum allowed output current is 1 A.

3.3.2 Installation Position Requirements

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 *"3.3.1 Installation Environment Requirements" on page 91*.

■ 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 product, as shown in the following figure.

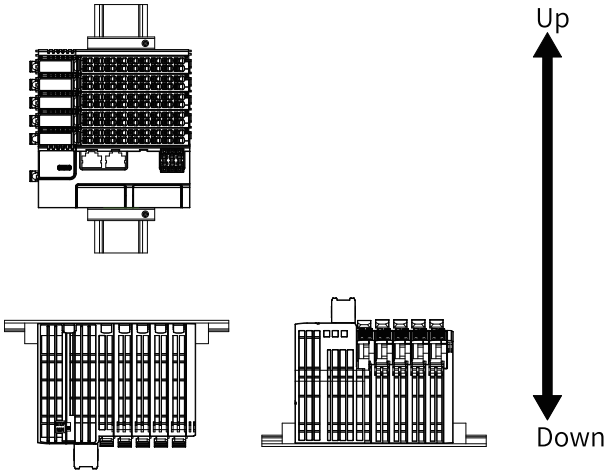


Note

Keep the PLC away from high-temperature heating sources (heater, transformer, large resistor, etc.) 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:

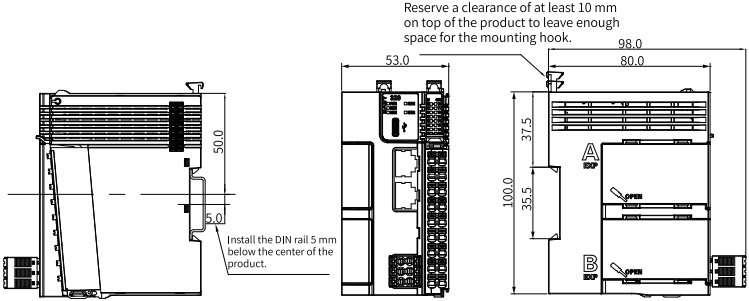
- Install the PLC below all I/O modules.
- Hold the cables with a cable duct to prevent the weight of cables being applied to the lower end plate. Failure to comply may cause displacement of the PLC from the DIN rail, leading to maloperation of the PLC.

3.3.3 Installation Precautions

- Before installing or removing the PLC and modules, ensure that they are powered off.
- Do not hot-swap the modules, as hot-swapping may cause reboot of the PLC and loss or damage of user data.
- To avoid damage to the PLC and modules, prevent their enclosures and terminals from falling off or being impacted.

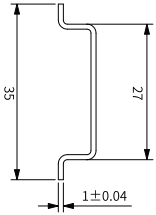
3.3.4 Installation Dimensions

Installation dimensions are shown below in millimeters (mm).



3.3.5 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.

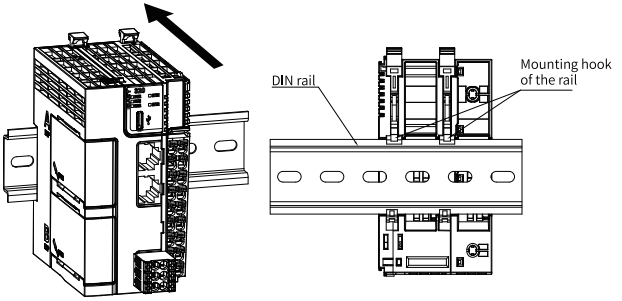


Caution

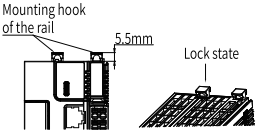
When installed on a DIN rail other than the recommended one (especially the one whose thickness is not 1.0 mm), the module will not fit in place as the mounting hook does not work.

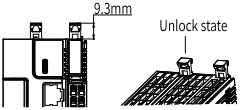
■ Installing the PLC

1. Align the PLC with the DIN rail and push the PLC toward 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.

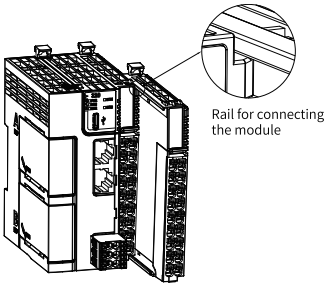
Pressing the buckles locks them.

Caution

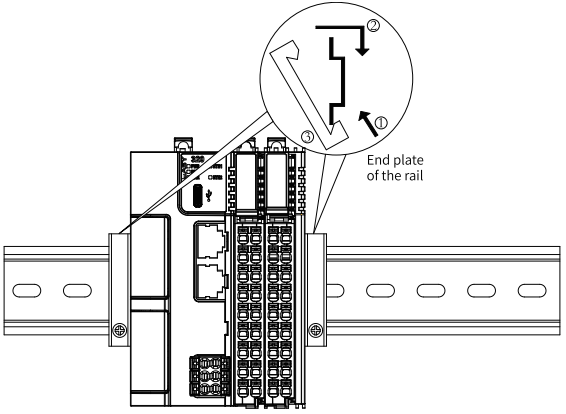
Keep the mounting hook locked when the controller is not mounted on the rail. If the mounting hook is kept unlocked for an extended period of time, it may malfunction.

■ Inserting modules to the PLC

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

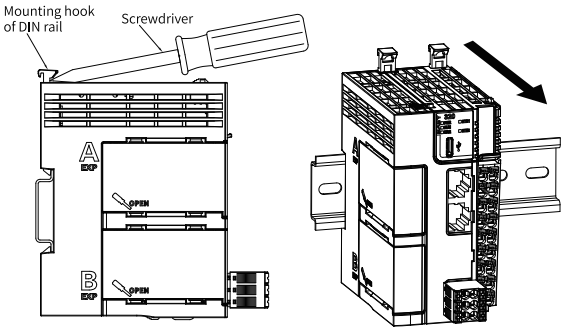


Install a DIN rail retainer on each side of the PLC or the PLC and module assembly. When you install a rail retainer, hook the bottom of the retainer to the bottom of the rail, rotate the retainer to make its top hook the top of the rail, and then tighten the screw to fasten the rail retainer, as shown in the figure below.



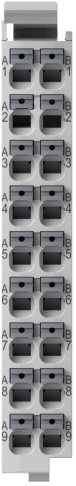
■ Removal

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



3.4 Electrical Installation

3.4.1 Terminal Arrangement



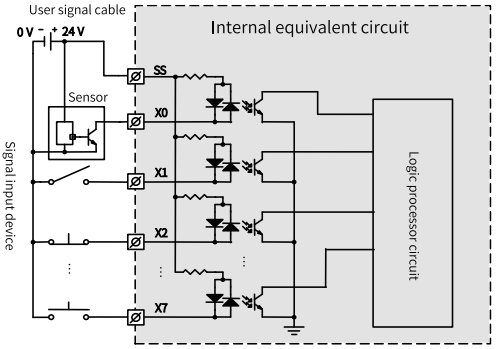
Left Signal	Left Terminal	Right Terminal	Right Signal
X0 input	1A	1B	Y0 output
X1 input	2A	2B	Y1 output
X2 input	3A	3B	Y2 output
X3 input	4A	4B	Y3 output
X4 input	5A	5B	Y4 output
X5 input	6A	6B	Y5 output
X6 input	7A	7B	Y6 output
X7 input	8A	8B	Y7 output
Input common terminal	9A	9B	Output common terminal

- During wiring, be sure to check the silkscreen marks for the left and right terminals to prevent incorrect cable connections, which may cause short circuits and burnout of the device.
- The total length of a high-speed I/O interface extension cable must be within 3 m.
- Do not bundle any expansion card cable with power cables (featuring high voltage and large current) or other cables transmitting strong interfering signals. Route the expansion card cable away from such cables and avoid parallel routing with them.

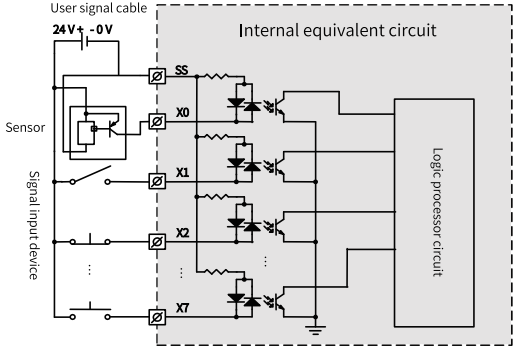
3.4.2 Terminal Wiring

■ Input terminal circuit diagram

- **Input terminal circuit diagram for sink wiring**

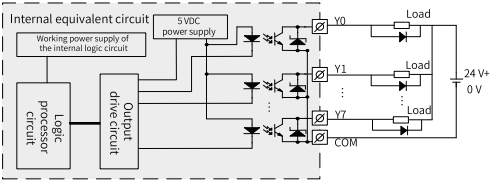


- **Input terminal circuit diagram for source wiring**



■ Output terminal circuit diagram

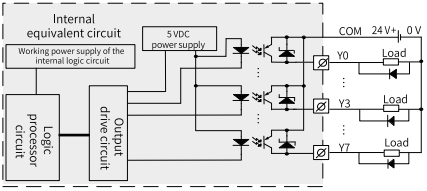
- **Easy320-0808TN**



Note

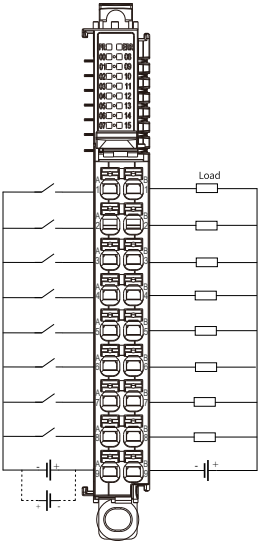
An external flywheel diode is required when an inductive load is connected. In this case, use a 1N4001 or similar diode.

- **Easy320-0808TP**

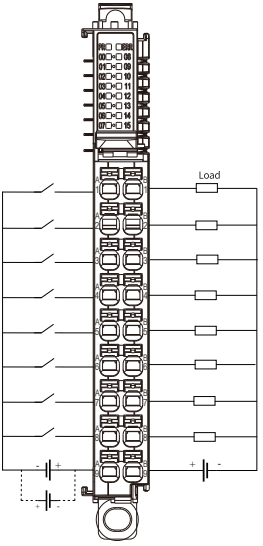


■ Input and output terminal wiring diagram

- **Easy320-0808TN**



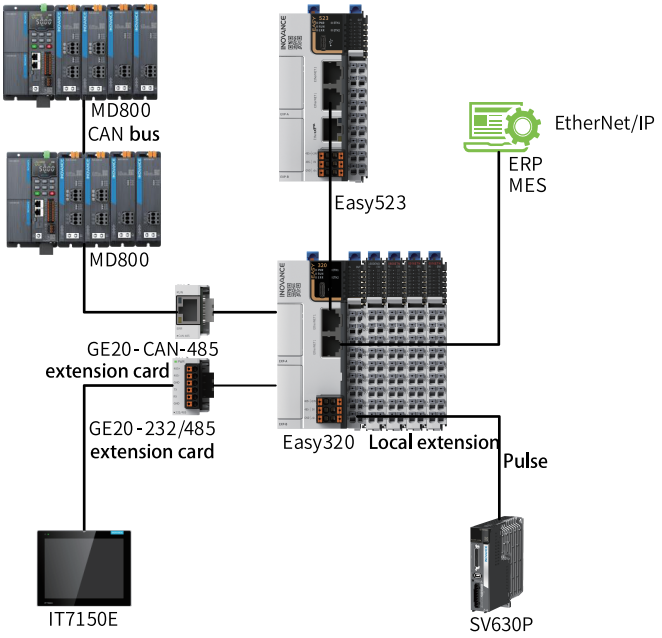
- **Easy320-0808TP**



3.5 Communication Connection

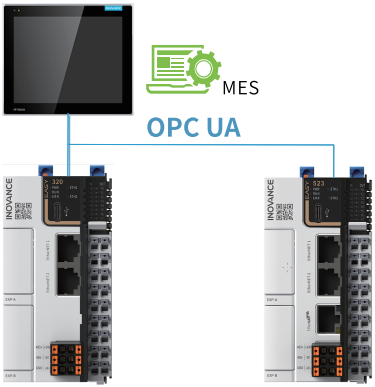
3.5.1 Communication Networking

This product uses the Ethernet port to connect to other stations or ERP or MES systems. It uses the GE20-232/485 expansion card for communication with a computer or HMI. It uses the GE20-CAN-485 expansion card and CAN bus communication to connect to the MD800 series AC drives, as shown in the following figure.



■ OPC UA topology

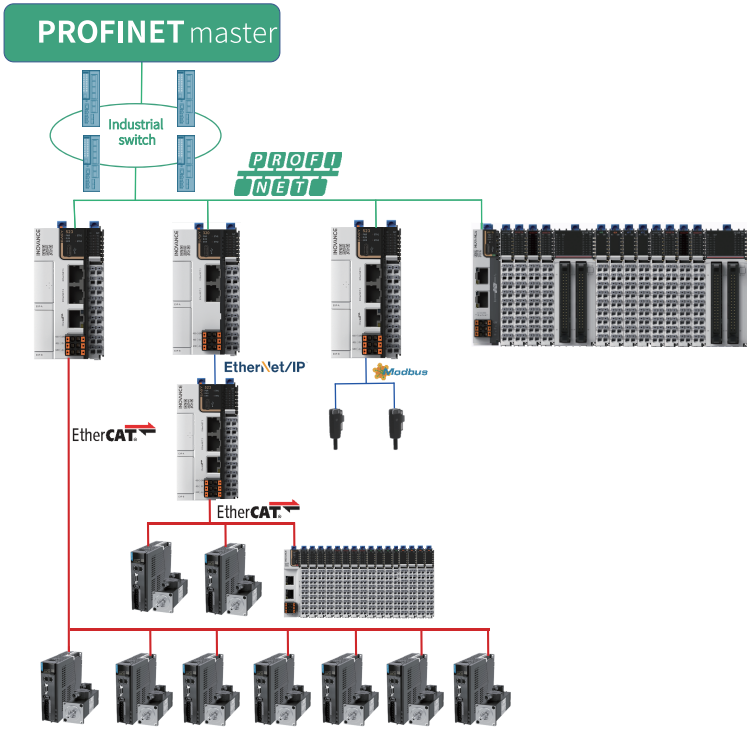
The MES system connects to the Easy320 and Easy52X series PLCs through the OPC UA server, as shown in the following figure.



Easy300 seires Easy500 seires

■ PROFINET topology

The PROFINET master connects to the Easy523 and Easy320 series PLCs and the GL20 series modules through PROFINER. It connects to other slaves, such as SV630N, SV660N, and other servos, as well as other EtherCAT-enabled modules through the EtherCAT port, as shown in the following figure.

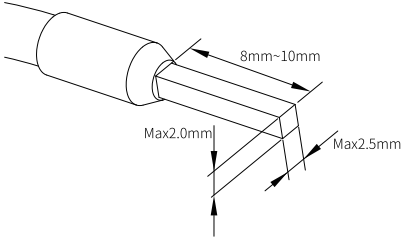


3.5.2 Cable Selection

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	17
	1.5	16

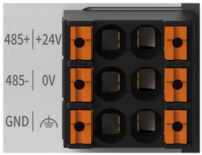
If other tubular lugs are used, crimp them to twisted cables. The following figure shows requirements of the shape and size.



3.5.3 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 assignment

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

- Communication specifications

Item	Description
Number of channels	Three (The PLC itself supports one channel and can support two more channels including RS232 through expansion cards.)
Hardware port	Two 3-pin terminals (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	Maximum 31 (The cable length for each slave branch must be less than 3 m.)
Baud rate	9,600 bps, 19,200 bps, 38,400 bps, 57,600 bps, 115,200 bps
Short circuit protection	Protection against incorrect connection to the 24 V terminal

- Wiring

  Select proper communication cables according to *"3.5.2 Cable Selection" on page 107* 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.

- Connection: Insert the cable connector into the Ethernet port (RJ45 connector) until you hear a click sound.

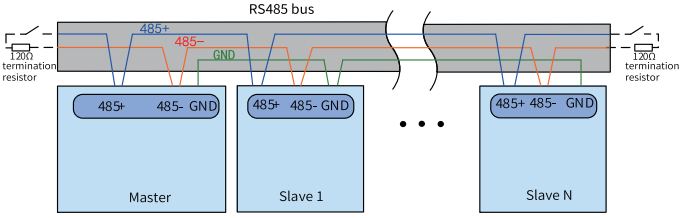
- Removal: Press the retaining latch of the cable connector while pulling out the connector in the direction parallel to the port.

3.5.4 RS485 Communication

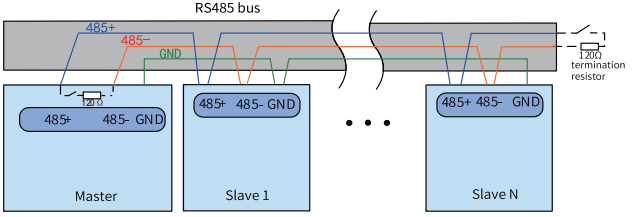
It is recommended to use a shielded twisted pair cable as the RS485 bus, and use twisted pair cables to connect the RS485+ and RS485– terminals. Connect a 120 Ω termination resistor to each end of the bus to prevent signal reflection. Connect the RS485 signal reference grounds of all nodes together. A maximum of 31 nodes can be connected and the cable length of any node branch must be less than 3 m.

The following figure shows the RS485 bus topology.

Local RS485 communication of Easy series PLC



RS485 communication of GE20 series extension card



3.6 Operation and Maintenance

3.6.1 Program Run and Stop

After writing a program while the PLC is in the "STOP" state, execute the shutdown operation as described in the following table.

Status	Operation
To run the system	1. Set the system to the "RUN" state. 2. Confirm that the RUN indicator is yellow-green and steady on.
To stop running	Set the system to the "STOP" state, or stop the PLC in the background by using the host controller.

3.6.2 User Program Download with an SD Card

Prerequisites

An SD (TF) card is prepared (requirements: SD card capacity ⩽ 32 GB; FAT32 file system).

Procedure

1. Generate a "Down/Updown" file with AutoShop (For details, see Chapter 20 "Application of the Download File Generation Feature" in the *H5U and Easy Series Programmable Logic Controller Programming and Application Guide*).
2. Create a "PLCProgram" directory in the root directory of the SD card and copy the "Down/Updown" file to the "PLCProgram" directory.
3. Insert the SD card into a TF expansion card, and then install the TF expansion card onto the PLC.

Install the TF extension card with power off.

4. Re-power on the PLC. The PLC starts downloading the user program from the SD card, and the RUN indicator blinks fast at 4 Hz during the download process.
5. After successful download, the RUN indicator blinks slowly at 1 Hz and the PLC enters the "STOP" state. Then, remove the SD card.
   If the ERR indicator blinks slowly, it is indicated that the download has failed. Check whether the downloaded file is applicable to the PLC model and whether the login password of the downloaded file is the same as the login password of the

PLC. If all the check items are correct, but the download still fails, contact our technical support for help.

6. Re-power on the PLC and the PLC restores normal operation.

3.6.3 Firmware Programming with an SD Card

1. Load a firmware programming SD card (maximum capacity of 32 GB, file format of FAT32) onto a TF expansion card and install the TF card onto the PLC.

- Keep the PLC powered-off while installing the TF expansion card.
- The original application will be deleted after firmware programming is completed.

2. Re-power on the PLC.

   The RUN and ERR indicators on the PLC blink fast for three seconds, indicating the start of firmware programming. Then, the RUN and ERR indicators are steady on, indicating that the firmware programming is in progress. Finally, the RUN and ERR indicators start to blink slowly, indicating that the firmware programming is completed.

3. After the firmware programming is completed, power off the PLC and remove the SD card.
4. Re-power on the PLC.

■ Easy320 series programmable controllers

Model	Description	Code
Easy320-0808TN	Easy300 series 8-input 8-output programmable controller	01440325
Easy320-0808TP	Easy300 series 8-input 8-output programmable controller	01440607

■ GE20 series expansion cards

Type	Model	Description	Code	Slot	ID
Digital input/ output	GE20-4DI	4-channel input 24 VDC input Source/Sink	01480032	A/B	13
	GE20-4DO-TN	4-channel sink transistor output 24 VDC output	01480033	A/B	5
Analog input/ output	GE20-2AD1DA-I	2-channel analog input and 1-channel analog output (current type)	01480027	A/B	11
	GE20-2AD1DA-V	2-channel analog input and 1-channel analog output (voltage type)	01480028	A/B	3
Commu-nication	GE20-CAN-485	CAN and RS485 communication (RJ45)	01480034	A	15
	GE20-232/ 485	RS232 or RS485 communication	01480029	A/B	7
	GE20-232/ 485-RTC	RS232 or RS485 communication (with RTC)	01480035	B	14
Storage	GE20-TF	TF expansion card	01480030	B	1
	GE20-TF-RTC	Memory expansion card (with integrated RTC)	01480050	B	6
Clock	GE20-RTC	Clock expansion card	01480031	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 series expansion modules

Module	Model	Description	Code
Digital	GL20-0016ETP	16-channel digital output (PNP)	01440292
	GL20-1600END	16-channel digital input	01440291
	GL20-0016ETN	16-channel digital output (NPN)	01440293
	GL20-0800END	8-channel digital input	01440381
	GL20-0008ETP	8-channel digital output (PNP)	01440380
	GL20-0008ETN	8-channel digital output (NPN)	01440379
	GL20-0808ETN	8-channel digital input and 8-channel digital output (NPN)	01440339
	GL20-0008ER	8-channel relay output module	01440334
	GL20-3200END	32-channel digital input	01440378
	GL20-0032ETN	32-channel digital output (NPN)	01440377
	GL20-0404ETP-5V	5 VDC; 4-channel digital input and 4-channel digital output (available soon)	01440506
	GL20-3232ETN-M	32-channel digital input and 32-channel digital output (NPN), with external terminal block wiring	01440290
Analog	GL20-4AD	4-channel analog input	01440288
	GL20-4DA	4-channel analog output	01440287
	GL20-8ADV	8-channel analog input	01440482
	GL20-8ADI	8-channel analog input	01440489

Module	Model	Description	Code
Temperature measurement	GL20-4PT	4-channel thermistor input type	01440337
	GL20-4TC	4-channel thermocouple input type	01440338
Communication	GL20-2SCOM	2-channel serial module (third-party products not supported)	01440463
	GL20-2S485	2-channel RS485 expansion module, currently only supporting EtherCAT couplers (third-party products not supported)	01440398
Process module	GL20-2SSI	2-channel SSI communication	01440445

4 Easy501/Easy502 Programmable Logic Controller User Guide

4.1 Preface

■ Introduction

This product is a new generation of small-sized programmable logic controller (PLC) independently developed by Inovance. It supports the EtherCAT bus control and RS485 features and implements multi-layer network communication through the RS485 and EtherCAT ports. It allows process encapsulation and reuse through the Function Block (FB) and Function (FC) features. This product can accommodate a maximum of 16 expansion modules. For module types supported, see the section of "Local Expansion Modules" in the "H5U and Easy Series Programmable Logic Controller Programming and Application Guide". 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 installation and wiring of the product, including product information, mechanical installation, and electrical installation.

■ 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 Directive	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 Directive	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 Documents

Doc Name	Data Code	Description
GE20 Series Expansion Card User Guide	PS00006443	Describes the product information, installation and wiring, and programming examples of the GE20 series expansion card
H5U and Easy Series Programmable Logic Controller Programming and Application Guide	19012249	Describes the basics of PLC programming, quick start guide, communication, motion control, and high-speed counter usage
H5U and Easy Series Programmable Logic Controller Instruction Guide	19011939	Describes the basic instructions and complex instructions used for programming applications, as well as examples of these instructions
Easy501/Easy502 Programmable Logic Controller User Guide (this guide)	PS00006241	Describes the installation and wiring of the product, including product information, mechanical installation, and electrical installation

■ Revision History

Date	Version	Description
July 2024	A05	**Addition** Added the I/O terminal wiring in *"4.4.2 Terminal Wiring" on page 139* **Change** • Updated the program data capacity in *"4.2.2 Components" on page 123* • Updated the program data capacity in *"4.2.3.1 General Specifications" on page 125* • Updated the number of axes supported in *"4.2.3.1 General Specifications" on page 125* • Updated the rated current of bus input power for the GL20-3232ETN-M expansion module in *"4.2.3.2 Power Supply Specifications" on page 126*
March 2024	A04	**Addition** Added the Easy50X series programmable controller models and the GL20 series expansion module models in *" Appendix" on page 150* **Change** • Updated the descriptions of status indicators in *"4.2.2 Components" on page 123* • Updated the power supply specifications in *"4.2.3.2 Power Supply Specifications" on page 126* • Updated the overcurrent protection device specifications in *"4.3.1 Installation Environment Requirements" on page 129*
February 2024	A03	Corrected minor errors

Date	Version	Description
December 2023	A02	• Updated the "input common terminal" and "output common terminal" in *"4.4.1 Terminal Arrangement" on page 138* • Updated *" Appendix" on page 150*
March 2023	A01	Updated the diagram of DIN rail buckles; added some product specification data
October 2022	A00	First release

■ Access to the Guide

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

- **Inovance website:** Visit *www.inovance.com*, go to "Support" > "Download", search by keyword, and then download the PDF file.
- **QR code:** Scan the QR code on the product with your smart phone to obtain the corresponding guide.
- **My Inovance app:** Scan the QR code below to install the My Inovance app, and search for the corresponding guide in the app.

■ Warranty

Inovance provides an 18-month free warranty (subject to information indicated by the barcode on the product if not otherwise specified in the contract) from the date of manufacturing for product failure or damage under normal use conditions. A maintenance fee will be charged out of the 18-month warranty period.

Even in the 18-month 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 (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.

4.2 Product Information

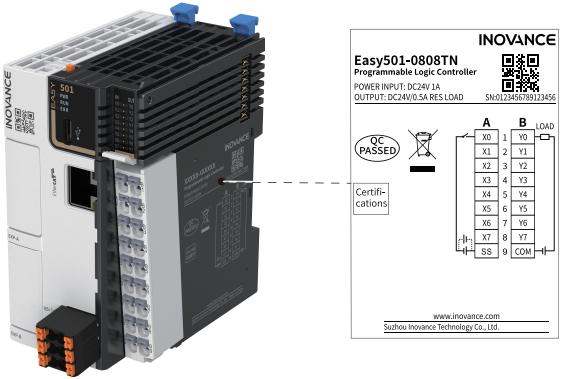
4.2.1 Model Number and Nameplate

■ **Model number**

Easy 50*X* – 0808 TN
① ② ③ ④

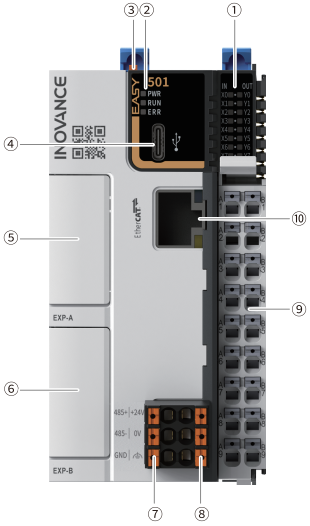
① **Product series** Easy: Easy series programmable logic controller	③ **Input and output channels** 08: 8-channel input 08: 8-channel output
② **Series** 5: 500 series platform 0: No Ethernet X: Number of EtherCAT axes. "1" means 8 axes and "2" means 16 axes.	④ **Output type** TN: Sink transistor

■ Nameplate



Model	Description	Code
Easy501-0808TN	Easy500 series 8-input 8-output 8-axis programmable controller	01440384
Easy502-0808TN	Easy500 series 8-input 8-output 16-axis programmable controller	01440336

4.2.2 Components



No.	Port Type	Mark	Meaning	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 normal	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

No.	Port Type	Mark	Meaning	Indicator Color	Description
③	DIP switch	RUN/STOP	Run/Stop control	-	-
④	Type-C port		Communication with PC	-	-
⑤/-⑥	Expansion card slot	EXP-A/ EXP-B	Expansion card slots, used to expand features	-	For expansion card options, see *"Appendix" on page 150*.
⑦	RS485	RS485+	RS485 communication signal+	-	-
		RS485–	RS485 communication signal–	-	-
		GND	RS485 communication ground	-	-
⑧	Power terminal	+24V	24 VDC power supply+	-	-
		0V	24 VDC power supply–	-	-
			PE	-	-
⑨	I/O terminal	-	8-channel input and 8-channel output	-	For details, see *"4.4.1 Terminal Arrangement" on page 138*
⑩	EtherCAT port	EtherCAT	EtherCAT communication	-	-

Caution

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

4.2.3 Product Specifications

4.2.3.1 General Specifications

Item	Easy501-0808TN specifications	Easy502-0808TN specifications
Program data capacity	• User program: 200 kB steps • Customized variables: 2 MB (including 128 kB retentive at power failure) • Soft elements: approx. 150 kB (retentive at power failure after No. 1000; non-retentive at power failure when only powered by USB)	
Instruction processing speed	20,000 steps executed in 2 ms	
Bit operation	0.144 μs/instruction	
Word transmission	0.338 μs/instruction	
Floating point operation	0.779 μs/instruction	
Ethernet	-	
EtherCAT communication	Support for one EtherCAT master and a maximum of 72 EtherCAT slaves	
Number of axes supported	Maximum 8 axes (maximum 8 bus axes, 8 profile axes, 5 local pulse axes, and 16 virtual axes)	Maximum 16 axes (maximum 16 bus axes, 16 profile axes, 5 local pulse axes, and 16 virtual axes)
Serial communication	Support for a maximum of three channels (one on the PLC itself and two through the expansion cards)	

Item	Easy501-0808TN specifications	Easy502-0808TN specifications
CAN communication	Support for one master through an expansion card (requiring the firmware version of 5.65.2.0 or later and AutoShop version of 4.6.5.0 or later) • CANlink: Maximum 62 slaves • CANopen: Maximum 30 slaves and 16 axes	
High-speed input	Single-phase: 8 channels at 200 kHz	
High-speed output	5 axes at 200 kHz; PWM supported	
Expansion module	Maximum 16 local expansion modules	
Expansion card	Maximum two expansion cards	
Programming language	LD, SFC; FB/FC supported (LD)	
Type-C	Support for user program upload and download and firmware upgrade through the Type-C port or a GE20-TF memory expansion card	
IP rating	IP20	
Dimensions (W x H x D)	53 mm x 100 mm x 80 mm	
Weight	Approx. 177 g	

4.2.3.2 Power Supply Specifications

Item	Specifications
Rated voltage of terminal input power	24 VDC±10% (21.6 VDC to 26.4 VDC)
Rated current of terminal input power	1 A (maximum value at 24 V)
Rated voltage of bus output power	5 VDC (4.75 VDC to 5.25 VDC)
Rated current of bus output power[1]	2 A (typical value at 5 V)
24 V input power protection	Protection against short circuit and reverse connection
Hot swapping	Not supported

[1]: Expansion modules are powered by the Easy 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 Easy series programmable logic controller (2 A/250 mA = 8).

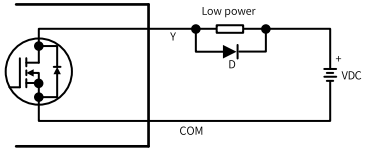
4.2.3.3 Input Specifications

Item		Specifications
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 to X7)	Input current when input is ON	> 4 mA
	Input current when input is OFF	< 2.5 mA
	Hardware response time	2 μs (RC time)
	Maximum input frequency	200 kHz
	Input impedance	3.4 kΩ
ON voltage		⩾ 15 VDC
OFF voltage		⩽ 5 VDC
Software filter time		• Low-speed: 2 ms to 1,000 ms • High-speed: 2 μs to 1,000 μs
Isolation mode		Capacitive isolation for integrated chip
Common terminal mode		8-point/common terminal (positive/negative polarity of input power being changeable)
Input action display		The input indicator lights up (controlled by software) when the input is in drive state.

4.2.3.4 Output Specifications

Item		Specifications
Output type		Transistor NPN output
Number of output channels		8
Output voltage class		24 VDC±10% (21.6 VDC to 26.4 VDC)
High-speed output (Y0 to Y7)	Output load (resistive load)	0.5 A/point; 2 A/8-point
	Output load (inductive load)	7.2 W/point; 24 W/8-point
	Output load (lamp load)	5 W/point; 18 W/8-point
	Hardware response time (ON/OFF)	< 1 μs (OFF→ON); < 2 μs (ON→OFF)
	Load current requirements	Load current ⩾ 12 mA when the output is greater than 10 kHz
	Maximum output frequency	200 kHz for resistive load; 0.5 Hz for inductive load; 10 Hz for lamp load
PWM output		Maximum frequency 200 kHz; minimum pulse width 2.5 μs; minimum resolution 2.5 μs; adjustable duty cycle 0.01% to 99.99%
Leakage current during OFF		< 30 μA 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		A 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.

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

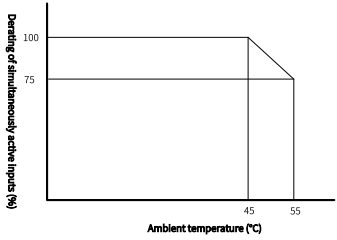


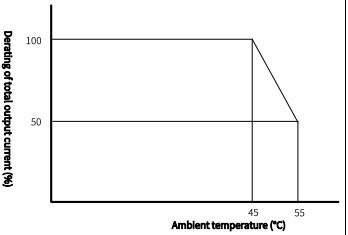
4.3 Mechanical Installation

4.3.1 Installation Environment Requirements

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

Item	Specifications
Operating environment	Places without corrosive or inflammable gas or severe conductive dust
Altitude	Maximum 2,000 m (80 kPa)
Pollution degree	PD2
Interference immunity	2 kV on power supply line (IEC 61000-4-4)
Overvoltage category	I
EMC immunity level	Zone B, IEC 61131-2
Vibration resistance	IEC 60068-2-6; 5 Hz to 8.4 Hz: 3.5 mm; 8.4 Hz to 150 Hz: 1·g; three axes: X, Y, and Z; 10 sweeps/axis
Shock resistance	IEC 60068-2-27; 150 m/s^2; 11 ms; six directions: ±X, ±Y, and ±Z; 3 cycles/direction, totaling 18 cycles
Overcurrent protection device	1.5 A fuse
Storage temperature and humidity	• Temperature: –20°C to +60°C • Relative humidity: < 90%, non-condensing
Transportation temperature and humidity	• Temperature: –40°C to +70°C • Relative humidity: < 95%, non-condensing

Item	Specifications
Ambient temperature and humidity	• Temperature: –20°C to +55°C (for horizontal installation), –20°C to +45°C (for non-horizontal installation) • Relative humidity: < 95%, non-condensing **Note: When the ambient temperature exceeds the upper limit, a forced draft fan or air conditioner must be installed in the heat dissipation hole direction.**
Installation position and limit	Installation position: The PLC can be installed in four directions. For details, see *"4.3.2 Installation Position Requirements" on page 131*. Limit: Horizontal installation: • Input derating: When the ambient temperature is 45°C, the PLC can work at full load. When the ambient temperature is 55°C, the number of simultaneously active inputs shall be reduced to 75% (that is, no more than six inputs), at a derating rate of 2.5% per 1°C of temperature rise.  (To be continued)

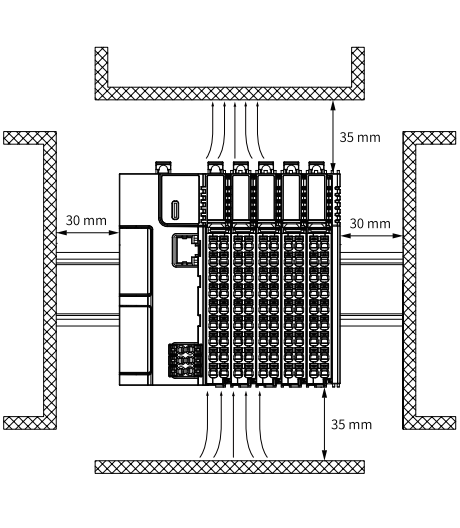
Item	Specifications
Continued	(Continued) • Output derating: When the ambient temperature is 45°C, the PLC can work at full load (that is, the total current of the eight outputs not higher than 2 A). When the ambient temperature is 55°C, the total current of simultaneously active outputs shall be reduced to 50% (that is, the total current of the eight outputs not higher than 1 A), at a derating rate of 5% per 1°C of temperature rise.  Non-horizontal installation: A maximum of six inputs can be in active state simultaneously, and the maximum allowed output current is 1 A.

4.3.2 Installation Position Requirements

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 *"4.3.1 Installation Environment Requirements" on page 129*.

■ 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 product, as shown in the following figure.

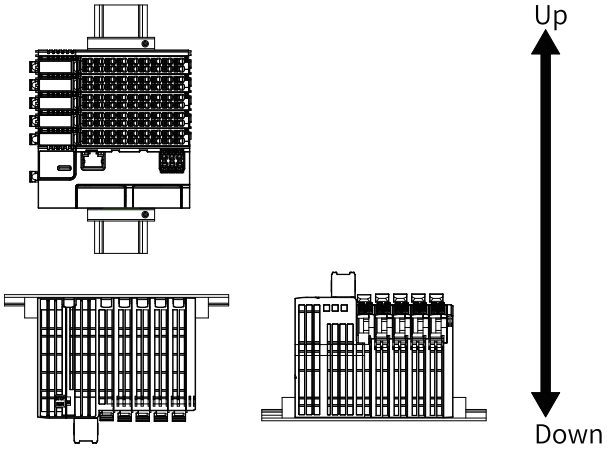


Note

Keep the PLC away from high-temperature heating sources (heater, transformer, large resistor, etc.) 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:

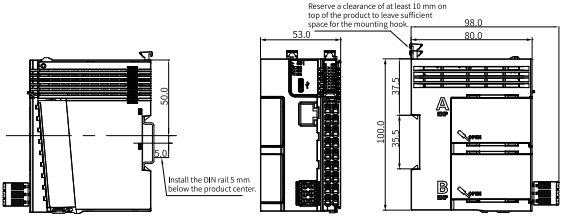
- Install the PLC below all I/O modules.
- Hold the cables with a cable duct to prevent the weight of cables being applied to the lower end plate. Failure to comply may cause displacement of the PLC from the DIN rail, leading to maloperation of the PLC.

4.3.3 Installation Precautions

- Before installing or removing the PLC and modules, ensure that they are powered off.
- Do not hot-swap the modules, as hot-swapping may cause reboot of the PLC and loss or damage of user data.
- To avoid damage to the PLC and modules, prevent their enclosures and terminals from falling off or being impacted.

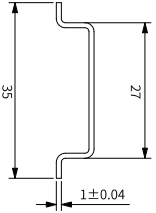
4.3.4 Installation Dimensions

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



4.3.5 Installation Methods

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

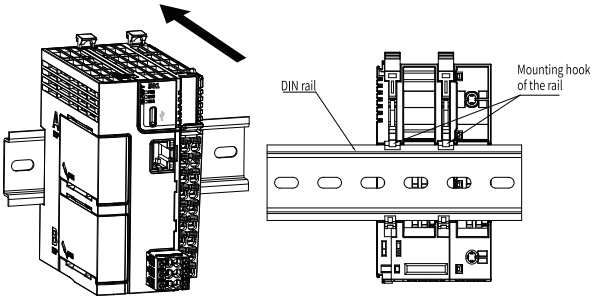


Caution

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

■ Installing the master

1. Align the module with the DIN rail and push the module in the direction indicated by the arrow until you hear a clicking sound, as shown below.



2. Make sure the DIN rail mounting hook of the module 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.

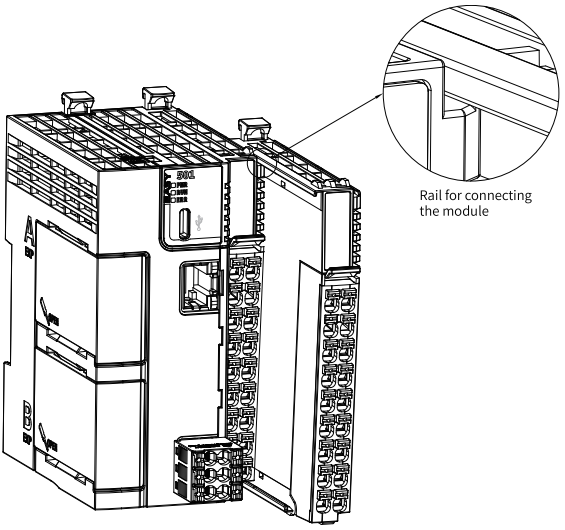
When the mounting look is unlocked, press it down to lock the module to the DIN rail.

Caution

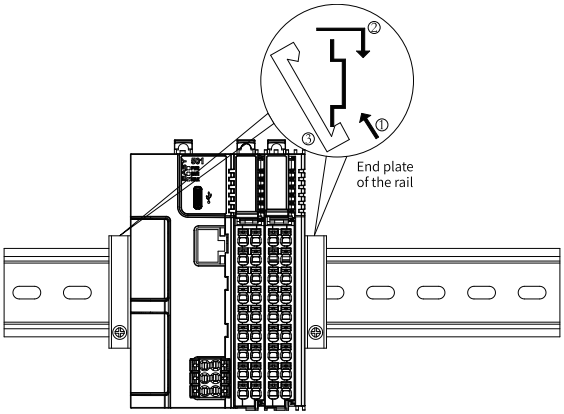
Keep the mounting hook locked when the controller is not mounted on the rail. If the mounting hook is kept unlocked for an extended period of time, it may malfunction.

■ Installing the module to the master

Install the extension module to the master through top and bottom rails, as shown below.

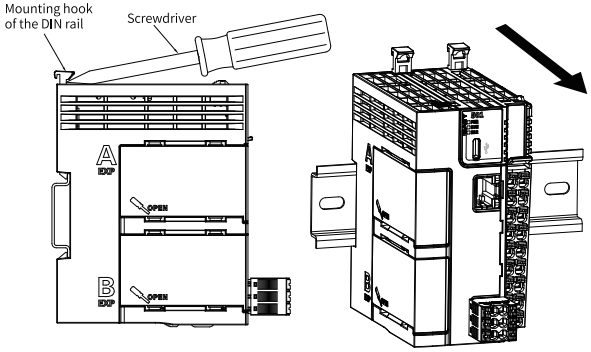


Install an DIN rail end plate to both sides of the master or module. To mount the end plate, hook the bottom of it to the bottom of the DIN rail, rotate the end plate to hook the top of it to the top of the DIN rail, and then tighten the screw to lock the end plate in place, as shown below.



■ Removing the module

Pry the mounting hook upwards with a tool such as a straight screwdriver or similar, and pull out the module forwardly. Then press down the top of the mounting hook.



4.4 Electrical Installation

4.4.1 Terminal Arrangement

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 (SS)	9A	9B	Output common terminal (COM)

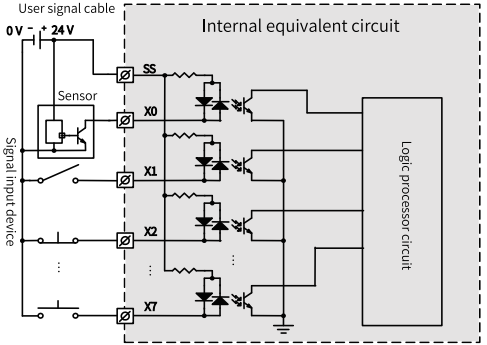
Caution

- Check the silk print on both sides of the terminal to prevent wrong cable connection. Failure to comply may lead to short circuit, which can damage the components.
- The total extended length of high-speed I/O interface extension cable must be within 3 m.
- To prevent interference, route the I/O interface extension cable and the power cable (high-voltage/high-current cables) through different and non-parallel routes.

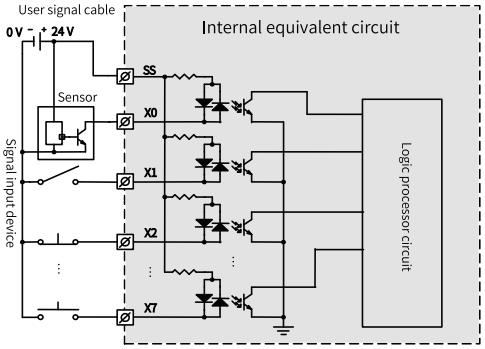
4.4.2 Terminal Wiring

■ Input terminal circuit diagram

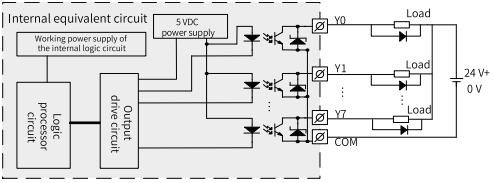
- **Input terminal circuit diagram for sink wiring**



- **Input terminal circuit diagram for source wiring**



■ Output terminal circuit diagram

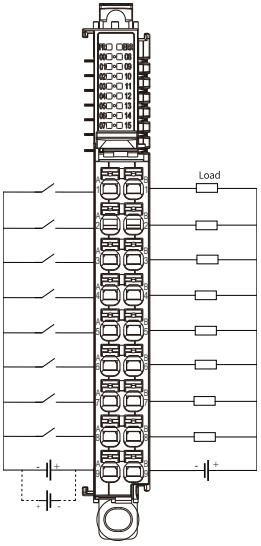


Note

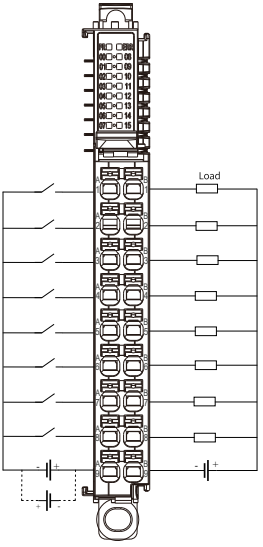
An external flywheel diode is required when an inductive load is connected. In this case, use a 1N4001 or similar diode.

■ Input and output terminal wiring diagram

- **Easy501-0808TN**



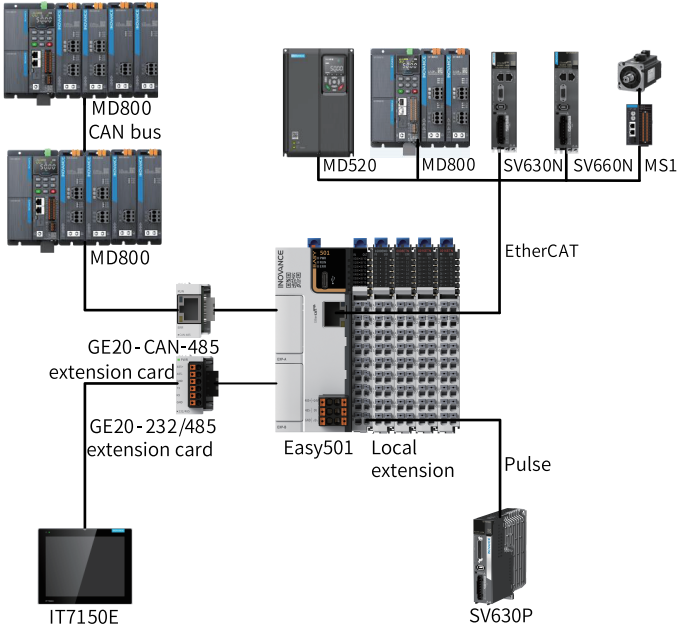
- **Easy502-0808TN**



4.5 Communication Connection

4.5.1 Networking

This PLC can be connected to other slaves (such as MD520/MD800 AC drives and SV630N/SV660N servo drives) through the EtherCAT interface or connected to other modules with EtherCAT. With GE20-CAN-485 extension card and CAN bus communication, an all-in-one network can be achieved in MD800. Meanwhile, the point-to-point communication can be realized between the PLC and PC/HMI through GE20-232/485 extension card, as shown below.

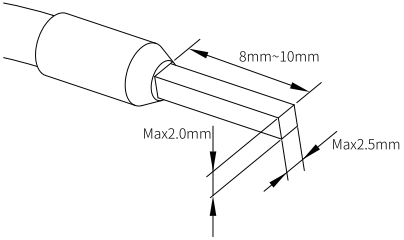


4.5.2 Cable Selection

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	17
	1.5	16

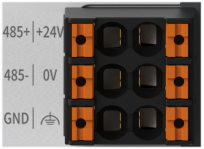
If other tubular lugs are used, crimp them to twisted cables. The following figure shows requirements of the shape and size.



4.5.3 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.



- Assignment

Description	Terminals on the left	Terminals on the right	Description
RS485 differential pair (+)	485+	+24V	24 VDC power supply (+)
RS485 differential pair (-)	485-	0V	24 VDC power supply (-)
Communication grounding terminal of RS485	GND	⏚	PE

- Communication specifications

Item	Description
Number of channels supported	Three channels at most (one built-in and two extended in the extension card, including RS232)
Hardware interface	2 x 3-pin terminal (shared with the power supply)
Isolation mode	Non-isolated
Termination resistor	Without termination resistor, can be master or slave
Number of slaves connected	Up to 31 slaves (The length of each slave branch must be shorter than 3 m.)
Communication baud rate	9600 bit/s, 19200 bit/s, 38400 bit/s, 57600 bit/s, and 115200 bit/s
Short circuit protection	Providing protection against improper connection of 24 V power supply

- Wiring
  See *"4.5.2 Cable Selection" on page 143* when selecting the communication cable. Insert the communication cable into the communication port.

■ EtherCAT Communication

- Connection: Insert the registered jack on the cable into the Ethernet port (RJ45 interface) until hearing a clicking sound.
- Disconnection: Pull out the connector by pressing the tail of the registered jack.

4.5.4 EtherCAT Communication

■ EtherCAT Specifications

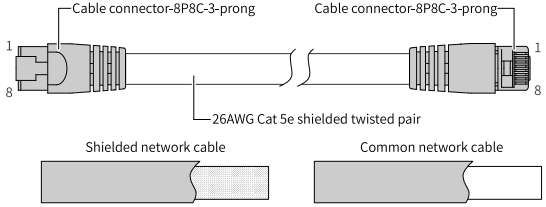
Item	Description
Communication protocol	EtherCAT
Available services	CoE (PDO, SDO)
Synchronization mode	Distributed clock for the drive and synchronous input/output for I/O
Physical layer	100BASE-TX
Baud rate	100 Mbit/s (100Base-TX)
Duplex mode	Full duplex

Item	Description
Topology	Linear topology
Transmission medium	Network cable
Transmission distance	Less than 100 m between two nodes
Number of slaves	Up to 72 (8-axis supported by Easy501; 16-axis supported by Easy502)
EtherCAT Frame length	44 to 1498 bytes
Process data	1486 bytes at most for an individual Ethernet frame

■ Wiring

The PLC enables EtherCAT bus communication through CN3, which requires the following communication cable:

Communication cable requirements



Signal pin assignment

Pin	Signal	Signal direction	Description
1	TD+	Output	Data transmission+
2	TD-	Output	Data transmission-
3	RD+	Input	Receive data (+)
4	-	-	Not used
5%	-	-	Not used
6	RD-	Input	Receive data (-)
7	-	-	Not used
08	-	-	Not used

Length requirement

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

Short circuit, open circuit, misalignment, or poor contact does not occur during 100% continuity test. Cables compliant with the following specifications are recommended.

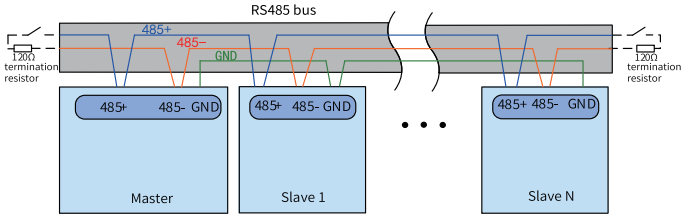
Item	Specification
Cable type	Flexible crossover cable, S-FTP, Cat5e
Standards compliance	EIA/TIA568A, EN50173, ISO/IEC11801 EIA/TI Abulletin TSB EIA/TIA SB40-A&TSB36
Cross sectional area of the cable	26AWG
Cable category	Twisted pair
Number of pairs	4

4.5.5 RS485 Communication

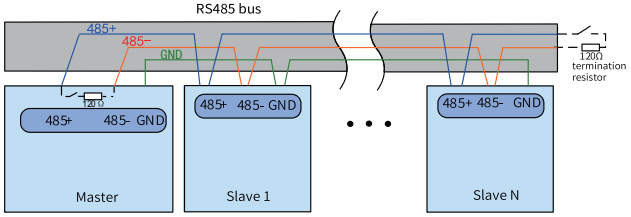
It is recommended to use a shielded twisted pair cable as the RS485 bus, and use twisted pair cables to connect the RS485+ and RS485– terminals. Connect a 120 Ω termination resistor to each end of the bus to prevent signal reflection. Connect the RS485 signal reference grounds of all nodes together. A maximum of 31 nodes can be connected and the cable length of any node branch must be less than 3 m.

The following figure shows the RS485 bus topology.

Local RS485 communication of Easy series PLC



RS485 communication of GE20 series extension card



4.6 Operation and Maintenance

4.6.1 Program Run and Stop

After writing a program while the PLC is in the "STOP" state, execute the shutdown operation as described in the following table.

Status	Operation
To run the system	1. Set the system to the "RUN" state. 2. Confirm that the RUN indicator is yellow-green and steady on.
To stop running	Set the system to the "STOP" state, or stop the PLC in the background by using the host controller.

4.6.2 User Program Download with an SD Card

Prerequisites

An SD (TF) card is prepared (requirements: SD card capacity ⩽ 32 GB; FAT32 file system).

Procedure

1. Generate a "Down/Updown" file with AutoShop (For details, see Chapter 20 "Application of the Download File Generation Feature" in the *H5U and Easy Series Programmable Logic Controller Programming and Application Guide*).
2. Create a "PLCProgram" directory in the root directory of the SD card and copy the "Down/Updown" file to the "PLCProgram" directory.
3. Insert the SD card into a TF expansion card, and then install the TF expansion card onto the PLC.

Install the TF extension card with power off.

4. Re-power on the PLC. The PLC starts downloading the user program from the SD card, and the RUN indicator blinks fast at 4 Hz during the download process.
5. After successful download, the RUN indicator blinks slowly at 1 Hz and the PLC enters the "STOP" state. Then, remove the SD card.

   If the ERR indicator blinks slowly, it is indicated that the download has failed. Check whether the downloaded file is applicable to the PLC model and whether the login password of the downloaded file is the same as the login password of the PLC. If all the check items are correct, but the download still fails, contact our technical support for help.
6. Re-power on the PLC and the PLC restores normal operation.

4.6.3 Firmware Programming with an SD Card

1. Load a firmware programming SD card (maximum capacity of 32 GB, file format of FAT32) onto a TF expansion card and install the TF card onto the PLC.

- Keep the PLC powered-off while installing the TF expansion card.
- The original application will be deleted after firmware programming is completed.

2. Re-power on the PLC.

   The RUN and ERR indicators on the PLC blink fast for three seconds, indicating the start of firmware programming. Then, the RUN and ERR indicators are steady on, indicating that the firmware programming is in progress. Finally, the RUN and ERR indicators start to blink slowly, indicating that the firmware programming is completed.

3. After the firmware programming is completed, power off the PLC and remove the SD card.
4. Re-power on the PLC.

4.7 Appendix

■ Easy50X series programmable controllers

Model	Description	Code
Easy501-0808TN	Easy500 series 8-input 8-output 8-axis programmable controller	01440384
Easy502-0808TN	Easy500 series 8-input 8-output 16-axis programmable controller	01440336

■ GE20 series expansion cards

Type	Model	Description	Code	Slot	ID
Digital input/ output	GE20-4DI	4-channel input 24 VDC input Source/Sink	01480032	A/B	13
	GE20-4DO-TN	4-channel sink transistor output 24 VDC output	01480033	A/B	5
Analog input/ output	GE20-2AD1DA-I	2-channel analog input and 1-channel analog output (current type)	01480027	A/B	11
	GE20-2AD1DA-V	2-channel analog input and 1-channel analog output (voltage type)	01480028	A/B	3
Commu-nication	GE20-CAN-485	CAN and RS485 communication (RJ45)	01480034	A	15
	GE20-232/ 485	RS232 or RS485 communication	01480029	A/B	7
	GE20-232/ 485-RTC	RS232 or RS485 communication (with RTC)	01480035	B	14
Storage	GE20-TF	TF expansion card	01480030	B	1
	GE20-TF-RTC	Memory expansion card (with integrated RTC)	01480050	B	6
Clock	GE20-RTC	Clock expansion card	01480031	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 series expansion modules

Module	Model	Description	Code
Digital	GL20-0016ETP	16-channel digital output (PNP)	01440292
	GL20-1600END	16-channel digital input	01440291
	GL20-0016ETN	16-channel digital output (NPN)	01440293
	GL20-0800END	8-channel digital input	01440381
	GL20-0008ETP	8-channel digital output (PNP)	01440380
	GL20-0008ETN	8-channel digital output (NPN)	01440379
	GL20-0808ETN	8-channel digital input and 8-channel digital output (NPN)	01440339
	GL20-0008ER	8-channel relay output module	01440334
	GL20-3200END	32-channel digital input	01440378
	GL20-0032ETN	32-channel digital output (NPN)	01440377
	GL20-0404ETP-5V	5 VDC; 4-channel digital input and 4-channel digital output (available soon)	01440506
	GL20-3232ETN-M	32-channel digital input and 32-channel digital output (NPN), with external terminal block wiring	01440290
Analog	GL20-4AD	4-channel analog input	01440288
	GL20-4DA	4-channel analog output	01440287
	GL20-8ADV	8-channel analog input	01440482
	GL20-8ADI	8-channel analog input	01440489

Module	Model	Description	Code
Temperature measurement	GL20-4PT	4-channel thermistor input type	01440337
	GL20-4TC	4-channel thermocouple input type	01440338
Communication	GL20-2SCOM	2-channel serial module (third-party products not supported)	01440463
	GL20-2S485	2-channel RS485 expansion module, currently only supporting EtherCAT couplers (third-party products not supported)	01440398
Process module	GL20-2SSI	2-channel SSI communication	01440445

5 Easy52X Series Programmable Logic Controller User Guide

5.1 Preface

■ Introduction

This product is a new generation of small-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. For module types supported, see the section of "Local Expansion Modules" in the "H5U and Easy Series Programmable Logic Controller Programming and Application Guide". 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 installation and wiring of the product, including product information, mechanical installation, and electrical installation.

■ 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 Directive	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 Directive	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 Documents

Doc Name	Data Code	Description
GE20 Series Expansion Card User Guide	PS00006443	Describes the product information, installation and wiring, and programming examples of the GE20 series expansion card
H5U and Easy Series Programmable Logic Controller Programming and Application Guide	19012249	Describes the basics of PLC programming, quick start guide, communication, motion control, and high-speed counter usage
H5U and Easy Series Programmable Logic Controller Instruction Guide	19011939	Describes the basic instructions and complex instructions used for programming applications, as well as examples of these instructions
Easy52X Series Programmable Logic Controller User Guide (this guide)	PS00005506	Describes the installation and wiring of the product, including product information, mechanical installation, and electrical installation

■ Revision History

Date	Version	Description
July 2024	A04	**Addition** Added the I/O terminal wiring in *"5.4.2 Terminal Wiring" on page 179*. **Change** • Updated the note for power-off and restart in *"5.2.2 Components" on page 161*. • Updated the program data capacity in *"5.2.3.1 General Specifications" on page 165*. • Updated the number of axes supported in *"5.2.3.1 General Specifications" on page 165*. • Updated the rated current of bus input power for the GL20-3232ETN-M expansion module in *"5.2.3.2 Power Supply Specifications" on page 166*.

Date	Version	Description
February 2024	A03	**Addition** • Added the PNP model in *"5.2.1 Model Number and Nameplate" on page 160*. • Added the PNP specifications in the high-speed input item in *"5.2.3.1 General Specifications" on page 165*. • Added the PNP specifications in the high-speed input (X0 to X7) item in *"5.2.3.3 Input Specifications" on page 167*. • Added the PNP specifications in the output type item in *"5.2.3.4 Output Specifications" on page 168*. • Added the PNP output terminal wiring in 3.2 Terminal Wiring. • Added the Easy52X series programmable controller models and the GL20 series expansion module models in *" Appendix" on page 192*. **Change** • Updated the descriptions of status indicators in *"5.2.2 Components" on page 161*. • Updated the power supply specifications in *"5.2.3.2 Power Supply Specifications" on page 166*.
March 2023	A02	Updated the diagram of DIN rail buckles; added some product specification data
October 2022	A01	• Added support for CAN communication • Corrected minor errors
August 2022	A00	First release

■ Access to the Guide

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

- **Inovance website:** Visit www.inovance.com, go to "Support" > "Download", search by keyword, and then download the PDF file.
- **QR code:** Scan the QR code on the product with your smart phone to obtain the corresponding guide.
- **My Inovance app:** Scan the QR code below to install the My Inovance app, and search for the corresponding guide in the app.

■ Warranty

For faults and damage incurred during normal use in the warranty period, Inovance provides free repair service. (For details of the warranty period, see the purchase order.) A maintenance fee will be charged out of the warranty period.

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 (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.

5.2 Product Information

5.2.1 Model Number and Nameplate

■ Model number

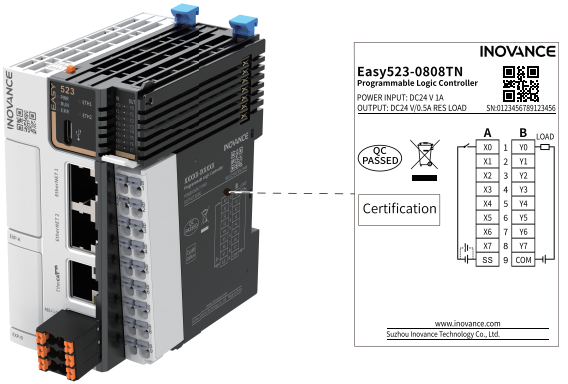
Easy 52*X* – 0808 T*X*
① ② ③ ④

① **Product series** Easy: Easy series programmable logic controller	③ **Input and output channels** 08: 8-channel input 08: 8-channel output
② **Model code** 5: 500 series platform 2: Two Ethernet ports X: Number of EtherCAT axes. "1" means 8 axes, "2" means 16 axes, and "3" means 32 axes.	④ **Output type** X indicates N or P. TN: Sink transistor TP: Source transistor

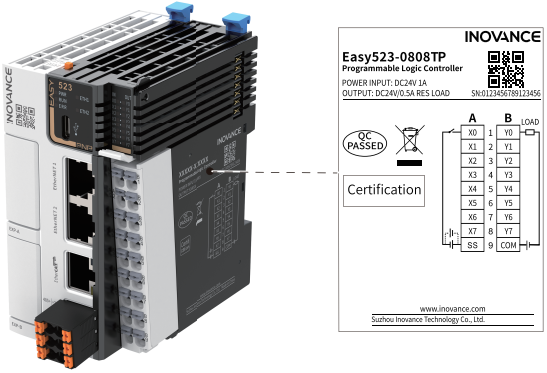
■ Nameplate

The Easy52X series have identical nameplates except for the model number and SN code. This section uses the Easy523 model as an example.

Easy523-0808TN



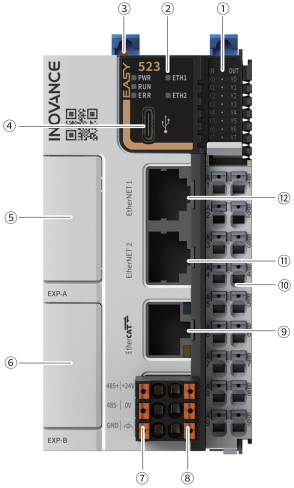
Easy523-0808TP



Model	Description	Code
Easy521-0808TN	Easy500 series 8-input 8-output 8-axis programmable controller	01440385
Easy522-0808TN	Easy500 series 8-input 8-output 16-axis programmable controller	01440383
Easy523-0808TN	Easy500 series 8-input 8-output 32-axis programmable controller	01440326
Easy521-0808TP	Easy500 series 8-input 8-output 8-axis programmable controller	01440606
Easy522-0808TP	Easy500 series 8-input 8-output 16-axis programmable controller	01440605
Easy523-0808TP	Easy500 series 8-input 8-output 32-axis programmable controller	01440604

5.2.2 Components

Components are identical for the entire Easy52X series. This section uses the Easy523-0808TN model as an example for illustration.


③
②
①
INOVANCE
EASY 523
PWR
RUN
ERR
ETH1
ETH2
OUT
④
⑤
⑫
⑪
⑩
⑨
⑥
EtherNET 1
EtherNET 2
EtherCAT
EXP-A
EXP-B
485+ | +24V
485- | 0V
GND | /S
⑦
⑧

No.	Port Type	Mark	Meaning	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 normal	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
		ETH1	Ethernet 1 link	Yellow-green	• Steady ON: Connected • Blinking: Communication in progress • OFF: Disconnected
		ETH2	Ethernet 2 link	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	-	For expansion card options, see "*Appendix*" on page 192.

No.	Port Type	Mark	Meaning	Indicator Color	Description
⑦	RS485	RS485+	RS485 communication signal+	-	-
		RS485–	RS485 communication signal–	-	-
		GND	RS485 communication ground	-	-
⑧	Power terminal	+24V	24 VDC power supply+	-	-
		0V	24 VDC power supply–	-	-
		⏚	PE	-	-
⑨	EtherCAT port	EtherCAT	EtherCAT communication	-	-
⑩	I/O terminal	-	8-channel input and 8-channel output	-	For details, see *"5.4.1 Terminal Arrangement" on page 178*.
⑪/-⑫	Ethernet port	EtherNET1/ EtherNET2	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 unplug the USB power cable, and wait for at least 10 seconds after the power indicator is off before proceeding with the power-on and startup operation.

5.2.3 Product Specifications

5.2.3.1 General Specifications

Item	Easy521-0808TX	Easy522-0808TX	Easy523-0808TX
Program data capacity	• User program: 200 kB steps • Customized variables: 2 MB (including 128 kB retentive at power failure) • Soft elements: approx. 150 kB (retentive at power failure after No. 1000; non-retentive at power failure when only powered by USB)		
Instruction processing speed	20,000 steps executed in 1.6 ms		
Bit operation	0.113 μs/instruction		
Word transmission	0.232 μs/instruction		
Floating point operation	0.578 μs/instruction		
Ethernet	Support for EtherNet/IP, Modbus TCP, Socket, and PROFINET slaves, FINS TCP and FINS UDP slaves, program upload and download, and firmware upgrade		
EtherCAT communication	Support for one EtherCAT master and a maximum of 72 EtherCAT slaves		
Number of axes supported (pulse + EtherCAT bus)	Maximum 8 axes Maximum 8 bus axes, 8 profile axes, 5 local pulse axes, and 16 virtual axes	Maximum 16 axes Maximum 16 bus axes, 16 profile axes, 5 local pulse axes, and 16 virtual axes	Maximum 32 axes Maximum 32 bus axes, 32 profile axes, 5 local pulse axes, and 32 virtual axes
Serial communication	Support for a maximum of three channels (one on the PLC itself and two through the expansion cards) **Note**: Expansion with the GL20-2S485 and GL20-2SCOM serial modules is supported.		
CAN communication	Support for one master through an expansion card (requiring the firmware version of 5.66.0.0 or later and AutoShop version of 4.8.0.0 or later) • CANlink: Maximum 62 slaves • CANopen: Maximum 30 slaves and 16 axes		

Item	Easy521-0808TX	Easy522-0808TX	Easy523-0808TX
High-speed input	• Easy52X-0808TN: Single-phase 8-channel at 200 kHz • Easy52X-0808TP: Single-phase 8-channel at 100 kHz		
High-speed output	5 axes at 200 kHz; PWM supported		
Expansion module	Maximum 16 local expansion modules		
Expansion card	Maximum two expansion cards		
Programming language	LD, SFC; FB/FC supported (LD)		
Type-C	Support for user program upload and download and firmware upgrade through the Type-C port or a GE20-TF memory expansion card		
IP rating	IP20		
Dimensions (W x H x D)	53 mm x 100 mm x 80 mm		
Weight	Approx. 197 g		

5.2.3.2 Power Supply Specifications

Item	Specifications
Rated voltage of terminal input power	24 VDC±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 VDC (4.75 VDC to 5.25 VDC)
Rated current of bus output power[1]	2 A (typical 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 Easy 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 Easy series programmable logic controller (2 A/250 mA = 8).

5.2.3.3 Input Specifications

Item		Specifications
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 to X7)	Input current when input is ON	• Easy52X-0808TN: > 4 mA • Easy52X-0808TP: > 2.5 mA
	Input current when input is OFF	• Easy52X-0808TN: < 2.5 mA • Easy52X-0808TP: < 1.5 mA
	Hardware response time	2 μs (RC time)
	Maximum input frequency	• Easy52X-0808TN: 200 kHz • Easy52X-0808TP: 100 kHz
	Input impedance	• Easy52X-0808TN: 3.4 kΩ • Easy52X-0808TP: 5.7 kΩ
ON voltage		⩾ 15 VDC
OFF voltage		⩽ 5 VDC
Software filter time		• Low-speed: 2 ms to 1,000 ms • High-speed: 2 μs to 1,000 μs
Isolation mode		Capacitive isolation for integrated chip

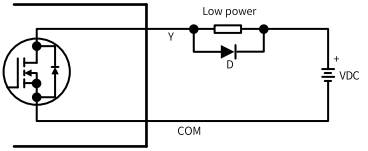
Item	Specifications
Common terminal mode	8-point/common terminal (positive/negative polarity of input power being changeable)
Input action display	The input indicator lights up (controlled by software) when the input is in drive state.

5.2.3.4 Output Specifications

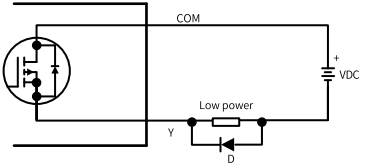
Item		Specifications
Output type		• TN: Transistor NPN output • TP: Transistor PNP output
Number of output channels		8
Output voltage class		24 VDC±10% (21.6 VDC to 26.4 VDC)
High-speed output (Y0 to Y7)	Output load (resistive load)	0.5 A/point; 2 A/8-point
	Output load (inductive load)	7.2 W/point; 24 W/8-point
	Output load (lamp load)	5 W/point; 18 W/8-point
	Hardware response time (ON/OFF)	< 1 μs (OFF→ON); < 2 μs (ON→OFF)
	Load current requirements	Load current ⩾ 12 mA when the output is greater than 10 kHz
	Maximum output frequency	200 kHz for resistive load; 0.5 Hz for inductive load; 10 Hz for lamp load
Leakage current during OFF		< 30 μA 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		A 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.

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

- **Easy52X-0808TN**



- **Easy52X-0808TP**



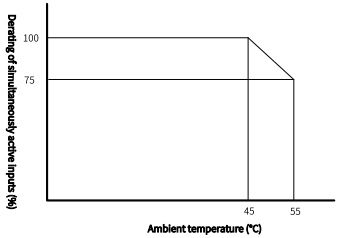
5.3 Mechanical Installation

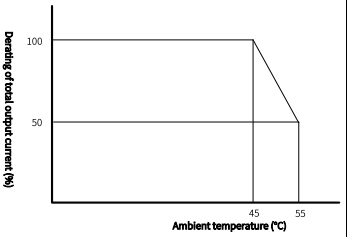
5.3.1 Installation Environment Requirements

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

Item	Specifications
Operating environment	Places without corrosive or inflammable gas or severe conductive dust
Altitude	Maximum 2,000 m (80 kPa)
Pollution degree	PD2
Interference immunity	2 kV on power supply line (IEC 61000-4-4)
Overvoltage category	I
EMC immunity level	Zone B, IEC 61131-2
Vibration resistance	IEC 60068-2-6; 5 Hz to 8.4 Hz: 3.5 mm; 8.4 Hz to 150 Hz: 1·g; three axes: X, Y, and Z; 10 sweeps/axis

Item	Specifications
Shock resistance	IEC 60068-2-27; 150 m/s^2; 11 ms; six directions: ±X, ±Y, and ±Z; 3 cycles/direction, totaling 18 cycles
Overcurrent protection device	1.5 A fuse
Storage temperature and humidity	• Temperature: –20°C to +60°C • Relative humidity: < 90%, non-condensing
Transportation temperature and humidity	• Temperature: –40°C to +70°C • Relative humidity: < 95%, non-condensing
Ambient temperature and humidity	• Temperature: –20°C to +55°C (for horizontal installation), –20°C to +45°C (for non-horizontal installation) • Relative humidity: < 95%, non-condensing **Note: When the ambient temperature exceeds the upper limit, a forced draft fan or air conditioner must be installed in the heat dissipation hole direction.**

Item	Specifications
Installation position and limit	Installation position: The PLC can be installed in four directions. For details, see *"5.3.2 Installation Position Requirements" on page 172*. Limit: Horizontal installation: • Input derating: When the ambient temperature is 45°C, the PLC can work at full load. When the ambient temperature is 55°C, the number of simultaneously active inputs shall be reduced to 75% (that is, no more than six inputs), at a derating rate of 2.5% per 1°C of temperature rise.  (To be continued)

Item	Specifications
(Continued)	Continued • Output derating: When the ambient temperature is 45°C, the PLC can work at full load (that is, the total current of the eight outputs not higher than 2 A). When the ambient temperature is 55°C, the total current of simultaneously active outputs shall be reduced to 50% (that is, the total current of the eight outputs not higher than 1 A), at a derating rate of 5% per 1°C of temperature rise.  Non-horizontal installation: A maximum of six inputs can be in active state simultaneously, and the maximum allowed output current is 1 A. A maximum of six modules can be installed.

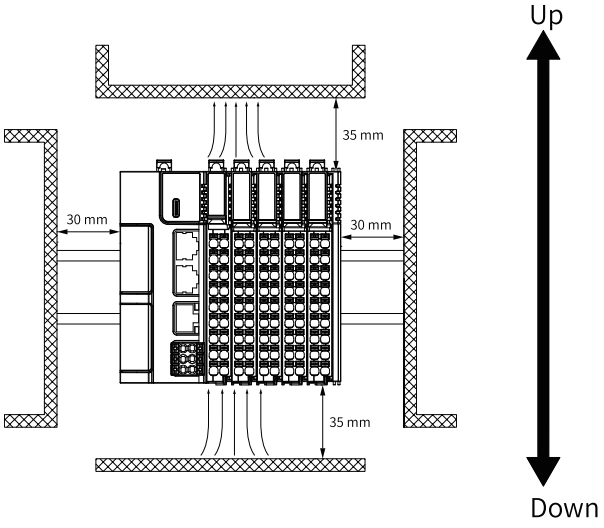
5.3.2 Installation Position Requirements

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 *"5.3.1 Installation Environment Requirements" on page 169*.

■ 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 product, as shown in the following figure.

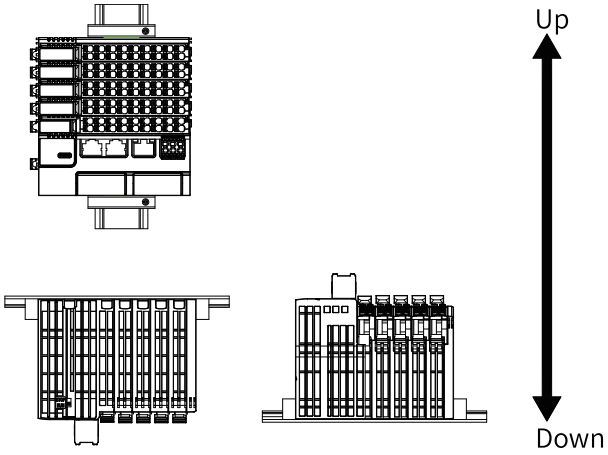


Note

Keep the PLC away from high-temperature heating sources (heater, transformer, large resistor, etc.) 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:

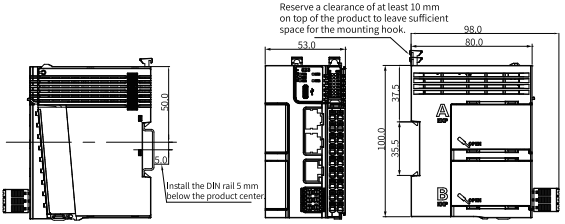
- Install the PLC below all I/O modules.
- Hold the cables with a cable duct to prevent the weight of cables being applied to the lower end plate. Failure to comply may cause displacement of the PLC from the DIN rail, leading to maloperation of the PLC.

5.3.3 Installation Precautions

- Before installing or removing the PLC and modules, ensure that they are powered off.
- Do not hot-swap the modules, as hot-swapping may cause reboot of the PLC and loss or damage of user data.
- To avoid damage to the PLC and modules, prevent their enclosures and terminals from falling off or being impacted.

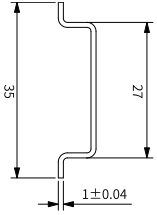
5.3.4 Installation Dimensions

Installation dimensions are shown below in millimeters (mm).



5.3.5 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.

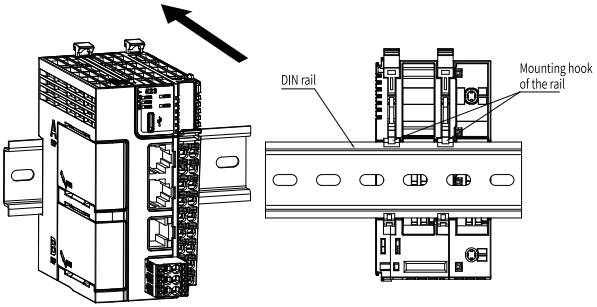


Caution

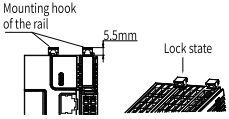
When installed on a DIN rail other than the recommended one (especially the one whose thickness is not 1.0 mm), the module will not fit in place as the mounting hook does not work.

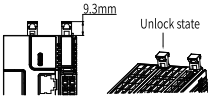
■ Installing the PLC

1. Align the PLC with the DIN rail and push the PLC toward 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.

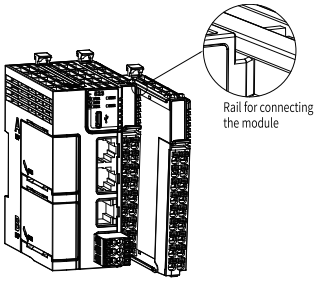
Pressing the buckles locks them.

Caution

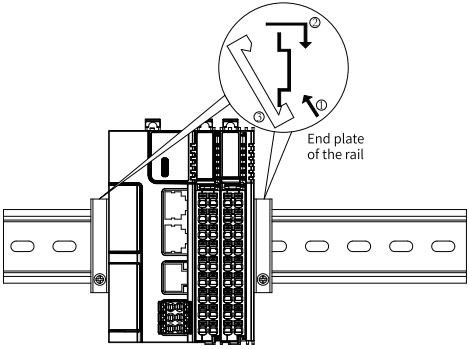
Keep the mounting hook locked when the controller is not mounted on the rail. If the mounting hook is kept unlocked for an extended period of time, it may malfunction.

■ Inserting modules to the PLC

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

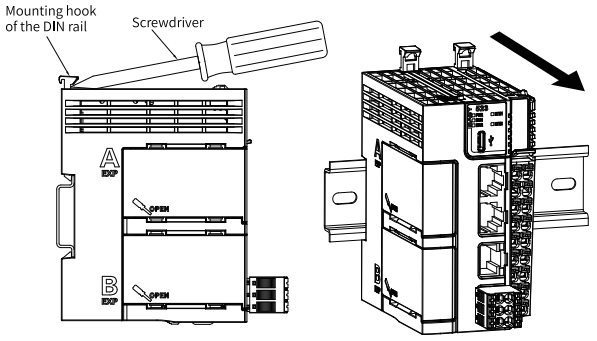


Install a DIN rail retainer on each side of the PLC or the PLC and module assembly. When you install a rail retainer, hook the bottom of the retainer to the bottom of the rail, rotate the retainer to make its top hook the top of the rail, and then tighten the screw to fasten the rail retainer, as shown in the figure below.



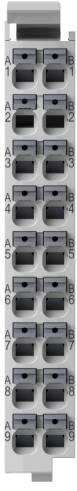
■ Removal

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



5.4 Electrical Installation

5.4.1 Terminal Arrangement



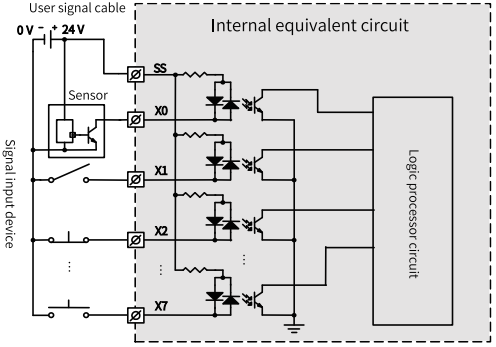
Left Signal	Left Terminal	Right Terminal	Right Signal
X0 input	1A	1B	Y0 output
X1 input	2A	2B	Y1 output
X2 input	3A	3B	Y2 output
X3 input	4A	4B	Y3 output
X4 input	5A	5B	Y4 output
X5 input	6A	6B	Y5 output
X6 input	7A	7B	Y6 output
X7 input	8A	8B	Y7 output
Input common terminal	9A	9B	Output common terminal

- 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.

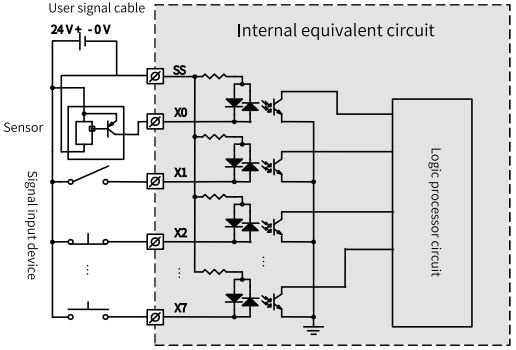
5.4.2 Terminal Wiring

■ Input terminal circuit diagram

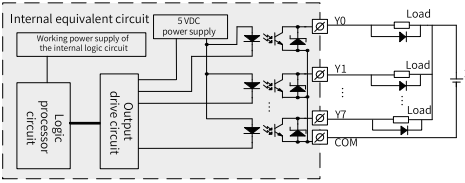
- **Input terminal circuit diagram for sink wiring**



- **Input terminal circuit diagram for source wiring**



■ Output terminal circuit diagram

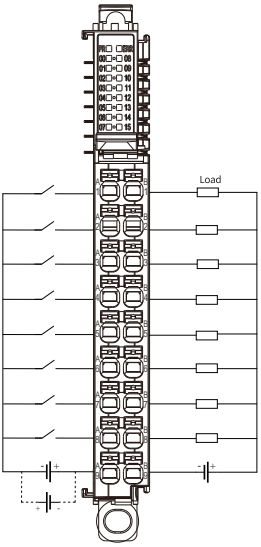


Note

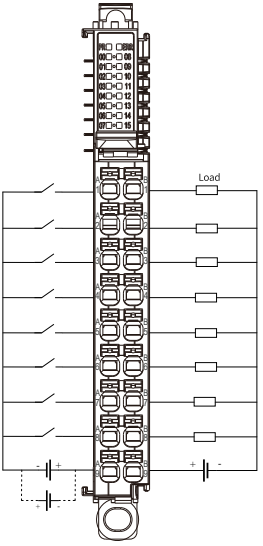
An external flywheel diode is required when an inductive load is connected. In this case, use a 1N4001 or similar diode.

■ Input and output terminal wiring diagram

- **Easy52X-0808TN**



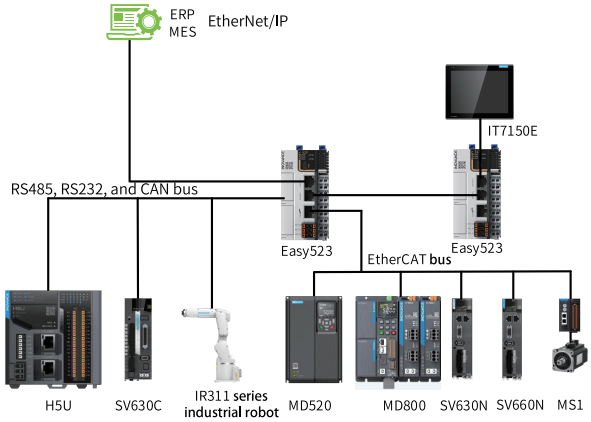
- **Easy52X-0808TP**



5.5 Communication Connection

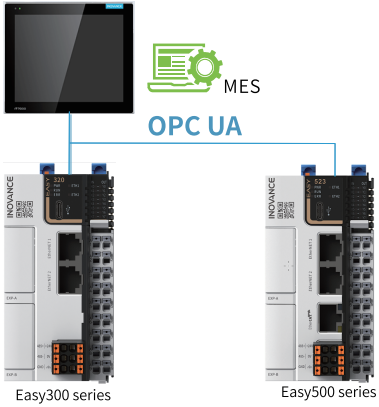
5.5.1 Communication Networking

This product uses the Ethernet port to connect to other stations or ERP or MES systems. It uses the EtherCAT port to connect to other slaves, such as the MD520 and MD800 series AC drives, SV630N and SV660N series servos, and other EtherCAT-enabled modules. It uses the GE20 series expansion card and RS485, RS232, or CAN communication to connect to the H5U, SV630C, and IR311 series robots. The schematic diagram is shown below.



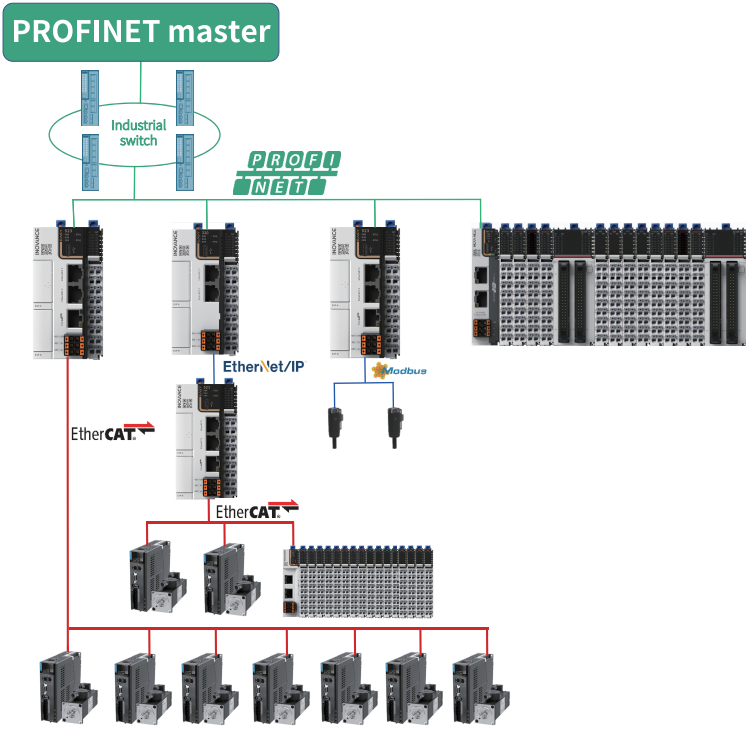
■ OPC UA topology

The MES system connects to the Easy320 and Easy52X series PLCs through the OPC UA server, as shown in the following figure.



■ PROFINET topology

The PROFINET master connects to the Easy523 and Easy320 series PLCs and the GL20 series modules through PROFINER. It connects to other slaves, such as SV630N, SV660N, and other servos, as well as other EtherCAT-enabled modules through the EtherCAT port, as shown in the following figure.

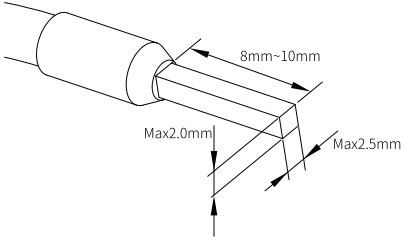


5.5.2 Cable Selection

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	17
	1.5	16

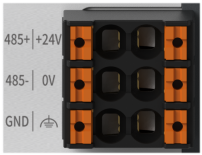
If other tubular lugs are used, crimp them to twisted cables. The following figure shows requirements of the shape and size.



5.5.3 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 assignment

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

- Communication specifications

Item	Description
Number of channels	Three (The PLC itself supports one channel and can support two more channels including RS232 through expansion cards.)
Hardware port	Two 3-pin terminals (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	Maximum 31 (The cable length for each slave branch must be less than 3 m.)
Baud rate	9,600 bps, 19,200 bps, 38,400 bps, 57,600 bps, 115,200 bps
Short circuit protection	Protection against incorrect connection to the 24 V terminal

- Wiring

  Select proper communication cables according to *"5.5.2 Cable Selection" on page 184* 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.

- Connection: Insert the cable connector into the Ethernet port (RJ45 connector) until you hear a click sound.

- Removal: Press the retaining latch of the cable connector while pulling out the connector in the direction parallel to the port.

5.5.4 EtherCAT Communication

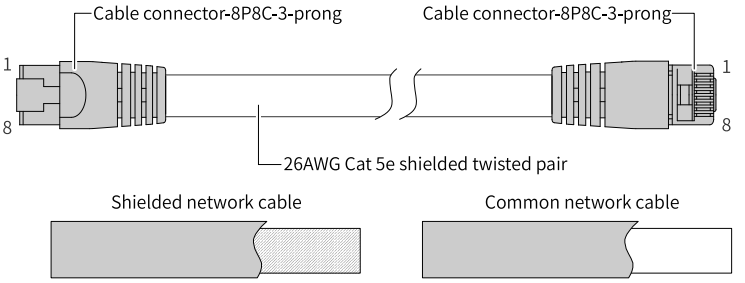
■ EtherCAT specifications

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 Mbps (100BASE-TX)
Duplex mode	Full duplex
Topology	Linear topology
Transmission media	Network cable (For details, see "Wiring".)
Transmission distance	Less than 100 m between two nodes
Number of slaves	Maximum 72
EtherCAT frame length	44 bytes to 1,498 bytes
Process data	Maximum 1,486 bytes per Ethernet frame

■ Wiring

The PLC can communicate with the EtherCAT bus through the CN3 port. The following describes requirements of the communication network cables.

Communication network cable requirements



Signal pin assignment

Pin	Signal	Signal Direction	Signal Description
1	TD+	Output	Data transmission+
2	TD-	Output	Data transmission–
3	RD+	Input	Data receive+
4	-	-	Reserved
5	-	-	Reserved
6	RD-	Input	Data receive–
7	-	-	Reserved
8	-	-	Reserved

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; no short circuit, open circuit, misalignment or poor contact. Cables of the following specifications are recommended.

Item	Specifications
Cable type	Flexible crossover cable, S-FTP, Cat 5e
Compliance	EIA/TIA568A, EN50173, ISO/IEC11801 EIA/TIA Bulletin TSB EIA/TIA SB40-A&TSB36

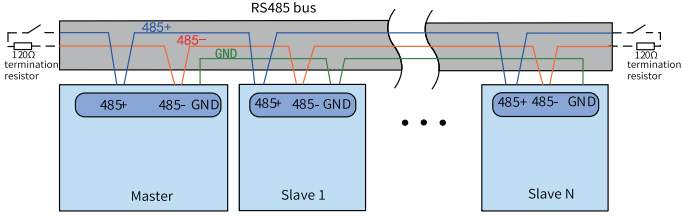
Item	Specifications
Conductor size	26 AWG
Conductor type	Twisted pair
Number of pairs	4

5.5.5 RS485 Communication

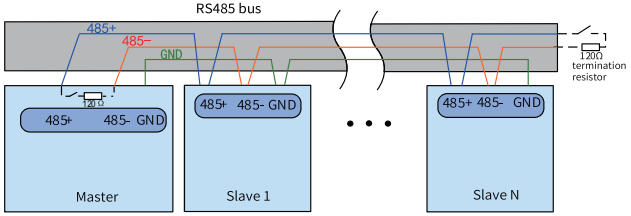
It is recommended to use a shielded twisted pair cable as the RS485 bus, and use twisted pair cables to connect the RS485+ and RS485– terminals. Connect a 120 Ω termination resistor to each end of the bus to prevent signal reflection. Connect the RS485 signal reference grounds of all nodes together. A maximum of 31 nodes can be connected and the cable length of any node branch must be less than 3 m.

The following figure shows the RS485 bus topology.

Local RS485 communication of Easy series PLC



RS485 communication of GE20 series extension card



5.6 Operation and Maintenance

5.6.1 Program Run and Stop

After writing a program while the PLC is in the "STOP" state, execute the shutdown operation as described in the following table.

Status	Operation
To run the system	1. Set the system to the "RUN" state. 2. Confirm that the RUN indicator is yellow-green and steady on.
To stop running	Set the system to the "STOP" state, or stop the PLC in the background by using the host controller.

5.6.2 User Program Download with an SD Card

Prerequisites

An SD (TF) card is prepared (requirements: SD card capacity ⩽ 32 GB; FAT32 file system).

Procedure

1. Generate a "Down/Updown" file with AutoShop (For details, see Chapter 20 "Application of the Download File Generation Feature" in the *H5U and Easy Series Programmable Logic Controller Programming and Application Guide*).
2. Create a "PLCProgram" directory in the root directory of the SD card and copy the "Down/Updown" file to the "PLCProgram" directory.
3. Insert the SD card into a TF expansion card, and then install the TF expansion card onto the PLC.

Install the TF extension card with power off.

4. Re-power on the PLC. The PLC starts downloading the user program from the SD card, and the RUN indicator blinks fast at 4 Hz during the download process.

5. After successful download, the RUN indicator blinks slowly at 1 Hz and the PLC enters the "STOP" state. Then, remove the SD card.

   If the ERR indicator blinks slowly, it is indicated that the download has failed. Check whether the downloaded file is applicable to the PLC model and whether the login password of the downloaded file is the same as the login password of the PLC. If all the check items are correct, but the download still fails, contact our technical support for help.

6. Re-power on the PLC and the PLC restores normal operation.

5.6.3 Firmware Programming with an SD Card

1. Load a firmware programming SD card (maximum capacity of 32 GB, file format of FAT32) onto a TF expansion card and install the TF card onto the PLC.

- Keep the PLC powered-off while installing the TF expansion card.
- The original application will be deleted after firmware programming is completed.

2. Re-power on the PLC.

   The RUN and ERR indicators on the PLC blink fast for three seconds, indicating the start of firmware programming. Then, the RUN and ERR indicators are steady on, indicating that the firmware programming is in progress. Finally, the RUN and ERR indicators start to blink slowly, indicating that the firmware programming is completed.

3. After the firmware programming is completed, power off the PLC and remove the SD card.
4. Re-power on the PLC.

5.7 Appendix

■ Easy52X series programmable controllers

Model	Description	Code
Easy521-0808TN	Easy500 series 8-input 8-output 8-axis programmable controller	01440385
Easy522-0808TN	Easy500 series 8-input 8-output 16-axis programmable controller	01440383
Easy523-0808TN	Easy500 series 8-input 8-output 32-axis programmable controller	01440326
Easy521-0808TP	Easy500 series 8-input 8-output 8-axis programmable controller	01440606
Easy522-0808TP	Easy500 series 8-input 8-output 16-axis programmable controller	01440605
Easy523-0808TP	Easy500 series 8-input 8-output 32-axis programmable controller	01440604

■ GE20 series expansion cards

Type	Model	Description	Code	Slot	ID
Digital input/ output	GE20-4DI	4-channel input 24 VDC input Source/Sink	01480032	A/B	13
	GE20-4DO-TN	4-channel sink transistor output 24 VDC output	01480033	A/B	5
Analog input/ output	GE20-2AD1DA-I	2-channel analog input and 1-channel analog output (current type)	01480027	A/B	11
	GE20-2AD1DA-V	2-channel analog input and 1-channel analog output (voltage type)	01480028	A/B	3

Type	Model	Description	Code	Slot	ID
Communication	GE20-CAN-485	CAN and RS485 communication (RJ45)	01480034	A	15
	GE20-232/485	RS232 or RS485 communication	01480029	A/B	7
	GE20-232/485-RTC	RS232 or RS485 communication (with RTC)	01480035	B	14
Storage	GE20-TF	TF expansion card	01480030	B	1
	GE20-TF-RTC	Memory expansion card (with integrated RTC)	01480050	B	6
Clock	GE20-RTC	Clock expansion card	01480031	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 series expansion modules

Module	Model	Description	Code
Digital	GL20-0016ETP	16-channel digital output (PNP)	01440292
	GL20-1600END	16-channel digital input	01440291
	GL20-0016ETN	16-channel digital output (NPN)	01440293
	GL20-0800END	8-channel digital input	01440381
	GL20-0008ETP	8-channel digital output (PNP)	01440380
	GL20-0008ETN	8-channel digital output (NPN)	01440379
	GL20-0808ETN	8-channel digital input and 8-channel digital output (NPN)	01440339
	GL20-0008ER	8-channel relay output module	01440334
	GL20-3200END	32-channel digital input	01440378
	GL20-0032ETN	32-channel digital output (NPN)	01440377
	GL20-0404ETP-5V	5 VDC; 4-channel digital input and 4-channel digital output (available soon)	01440506
	GL20-3232ETN-M	32-channel digital input and 32-channel digital output (NPN), with external terminal block wiring	01440290
Analog	GL20-4AD	4-channel analog input	01440288
	GL20-4DA	4-channel analog output	01440287
	GL20-8ADV	8-channel analog input	01440482
	GL20-8ADI	8-channel analog input	01440489

Module	Model	Description	Code
Temperature measurement	GL20-4PT	4-channel thermistor input type	01440337
	GL20-4TC	4-channel thermocouple input type	01440338
Communication	GL20-2SCOM	2-channel serial module (third-party products not supported)	01440463
	GL20-2S485	2-channel RS485 expansion module, currently only supporting EtherCAT couplers (third-party products not supported)	01440398
Process module	GL20-2SSI	2-channel SSI communication	01440445