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PS00006241A05

# Easy501/Easy502 Series Programmable Controller

## User Guide

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# 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:**<br>EN 61131-2<br>**220 VAC products:**<br>EN 61131-2<br>EN 61000-3-2<br>EN 61000-3-3 |
| | LVD | 2014/35/EU | EN 61010-1<br>EN 61010-2-201 |
| | RoHS Directive | 2011/65/EU amended by (EU) 2015/863 | EN IEC 63000 |
| UL/cUL | - | | UL 61010-1<br>UL 61010-2-201<br>CAN/CSA-C22.2 No. 61010-1<br>CSA-C22.2 No. 61010-2-201 |
| KCC | - | | - |
| EAC | - | | - |
| UKCA | Safety Regulations | Electrical Equipment (Safety) Regulations 2016 | EN 61010-1<br>EN 61010-2-201 |
| | EMC Regulations | Electromagnetic Compatibility Regulations 2016 | **24 VDC products:**<br>EN 61131-2<br>**220 VAC products:**<br>EN 61131-2<br>EN 61000-3-2<br>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**<br>Added the I/O terminal wiring in *"3.2 Terminal Wiring" on page 29*<br>**Change**<br>• Updated the program data capacity in *"1.2 Components" on page 12*<br>• Updated the program data capacity in *"1.3.1 General Specifications" on page 14*<br>• Updated the number of axes supported in *"1.3.1 General Specifications" on page 14*<br>• Updated the rated current of bus input power for the GL20-3232ETN-M expansion module in *"1.3.2 Power Supply Specifications" on page 16* |
| March 2024 | A04 | **Addition**<br>Added the Easy50X series programmable controller models and the GL20 series expansion module models in *" Appendix" on page 41*<br>**Change**<br>• Updated the descriptions of status indicators in *"1.2 Components" on page 12*<br>• Updated the power supply specifications in *"1.3.2 Power Supply Specifications" on page 16*<br>• Updated the overcurrent protection device specifications in *"2.1 Installation Environment Requirements" on page 19* |
| February 2024 | A03 | Corrected minor errors |

| Date | Version | Description |
| --- | --- | --- |
| December 2023 | A02 | • Updated the "input common terminal" and "output common terminal" in *"3.1 Terminal Arrangement" on page 28*<br>• Updated *" Appendix" on page 41* |
| 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.

# General Safety Precautions

## ■ Safety Disclaimer

1. Read the safety precautions before installing, operating, and maintaining this product.
2. To ensure personal and equipment safety, follow all safety precautions marked on the product and described in the user guide when installing, operating, and maintaining this product.
3. "CAUTION", "WARNING", and "DANGER" messages in the guide are only examples and do not cover all safety precautions.
4. 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.
5. Inovance shall not be liable for any physical injuries or property loss caused by improper use.

## ■ Safety Categories and Definitions




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




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




"CAUTION" indicates that failure to comply with the notice may result in minor or moderate physical injuries or equipment damage. Keep this guide properly for future reference and forward it to the end user.

### Control System Design




- Design a safety circuit to ensure that the control system can still work safely when the external power supply is cut off or the programmable controller fails.
- The product may catch fire or emit smoke in case of prolonged overcurrent due to overload or short circuit of load. Therefore, configure an external safety device such as a fuse or circuit breaker.

WARNING

- Design an external emergency stop circuit, protective circuit, forward and reverse rotation interlock circuit, as well as up and down limit interlock circuit to be connected to the programmable controller.
- Design an external protective circuit and a safety mechanism for output signals that may cause major incidents.
- When the programmable controller CPU detects a system exception, it may turn off all outputs. When partial circuit of the controller malfunctions, the controller outputs may become uncontrollable. To ensure proper operation, it is necessary to design an appropriate external control circuit.
- If a programmable controller output unit such as the relay or transistor is damaged, its output cannot be controlled to turn ON or OFF.
- The programmable controller is intended for use in an indoor electrical environment with an overvoltage class of II. The power system must contain a lightning arrester to prevent lightening from causing overvoltage on the power supply input, signal input, and control output terminals of the programmable controller and damaging the equipment.

## Installation

WARNING

- Only allow trained professionals with electrical expertise to install this product.
- Cut off all external power sources before you install or remove this product. Failure to comply may result in electric shock or faults or malfunctions of this product.
- Do not use the programmable controller in places with dirt, oily fume, conductive dust, corrosive gas, flammable gas, high temperature, condensation, wind and rain, vibration, or shock. Electric shock, fire, and improper operation will lead to damage and deterioration of the product.
- The programmable controller is an open-type device to be installed in a control cabinet with a door lock (housing IP rating higher than IP20). Only allow trained operators with electrical expertise to open the cabinet.

CAUTION

- During installation, prevent metal chippings and cable ends from falling into the vent of the product. Failure to comply may result in fire, faults, or malfunctions.
- After installation, ensure that no unwanted objects exist on the ventilation surface. Failure to comply may result in poor heat dissipation, fire, faults, or malfunctions.
- During installation, tightly connect the product and its connectors and firmly lock its hooks. Improper module installation may lead to malfunctions, faults, and detachment.

**Wiring**




- Only allow trained professionals with electrical expertise to conduct wiring for this product.
- Cut off all external power sources before wiring. Failure to comply may result in electric shock or equipment faults or malfunctions.
- Properly insulate the cable terminals and ensure a proper insulation distance between the cables connected to the terminal block. Failure to comply will result in electric shock or equipment damage.




- Turn off the main power supply before connecting it to the product. Failure to comply may result in electric shock.
- Select a proper power supply according to the power supply specifications of the product in the "Technical Specifications" section. If the selected power supply is beyond the required range, the product may be damaged. Regularly check whether the DC power provided by the switching-mode power supply unit is stable.

**Operation and Maintenance**




- Only allow trained professionals with electrical expertise to operate and maintain this product.
- Do not touch terminals when the power is on. Failure to comply may result in electric shock or malfunctions.
- Cut off all external power sources before you clean the product. Failure to comply may result in electric shock.
- Cut off all external power sources before you install or remove the product or communication cables. Failure to comply may result in electric shock or malfunctions.

**Safety suggestions**

- In places where operators have direct contact with mechanical parts, such as loading and unloading places and areas with automatic machinery operation, carefully configure an on-site manual operating device or alternative means that works independently of the programmable controller and can start or stop the automatic operation.
- If programs need to be modified when the system is running, apply a lock or take other necessary measures to ensure that only authorized personnel can perform such modification.

**Disposal**




- Dispose of this product as industrial wastes. Dispose of the battery separately in accordance with local laws and regulations.
- Recycle retired equipment in accordance with waste disposal standards of the industry to avoid environmental pollution.

# 1 Product Information

## 1.1 Model Number and Nameplate

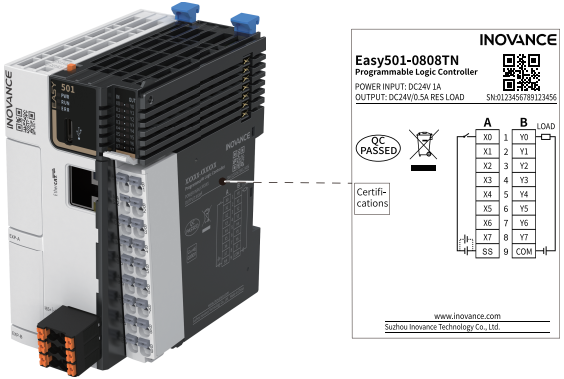
### ■ Model number

Easy 50*X* – 0808 TN

① ② ③ ④

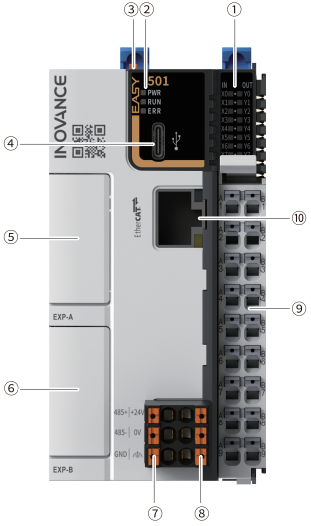
| | |
|---|---|
| ① **Product series**<br>Easy: Easy series programmable logic controller | ③ **Input and output channels**<br>08: 8-channel input<br>08: 8-channel output |
| ② **Series**<br>5: 500 series platform<br>0: No Ethernet<br>X: Number of EtherCAT axes. "1" means 8 axes and "2" means 16 axes.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

## 1.2 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<br>• OFF: Input or output inactive |
| ② | Operation status indicator | PWR | Power supply normal | Yellow-green | • Steady ON: Power supply normal<br>• OFF: Power supply off or abnormal |
| | | RUN | Normal running | Yellow-green | • Steady ON: User program running<br>• OFF: User program stopped |
| | | ERR | Running error | Red | • OFF: No major error<br>• Blinking[1]: Major error |
| 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 41. |
| ⑦ | RS485 | RS485+ | RS485 communication signal+ | - | - |
| | | RS485– | RS485 communication signal– | - | - |
| | | GND | RS485 communication ground | - | - |

| No. | Port Type | Mark | Meaning | Indicator Color | Description |
|---|---|---|---|---|---|
| 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 *"3.1 Terminal Arrangement" on page 28* |
| 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.

# 1.3 Product Specifications

## 1.3.1 General Specifications

| Item | Easy501-0808TN specifications | Easy502-0808TN specifications |
|---|---|---|
| Program data capacity | • User program: 200 kB steps<br>• Customized variables: 2 MB (including 128 kB retentive at power failure)<br>• 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 | Easy501-0808TN specifications | Easy502-0808TN specifications |
| --- | --- | --- |
| 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) | |
| 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)<br>• CANlink: Maximum 62 slaves<br>• 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 | |

### 1.3.2 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).

### 1.3.3 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 |

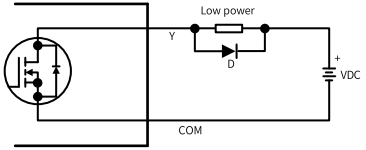
| Item | Specifications |
| --- | --- |
| Software filter time | • Low-speed: 2 ms to 1,000 ms<br>• High-speed: 2 μs to 1,000 μs |
| Isolation mode | Capacitive isolation for integrated chip |
| Common terminal mode | 8-point/common terminal (positive/negative polarity of input power being changeable) |
| Input action display | The input indicator lights up (controlled by software) when the input is in drive state. |

### 1.3.4 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) |

| Item | Specifications |
| --- | --- |
| 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.

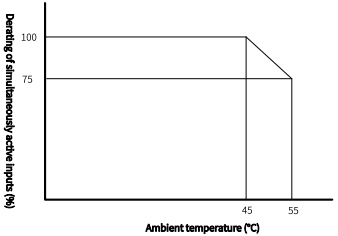


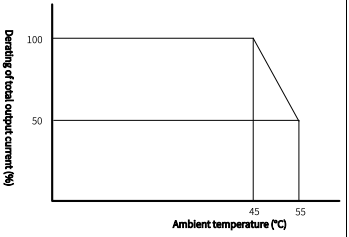
# 2 Mechanical Installation

## 2.1 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<br>• Relative humidity: < 90%, non-condensing |
| Transportation temperature and humidity | • Temperature: –40°C to +70°C<br>• 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)<br>• Relative humidity: < 95%, non-condensing<br>**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 *"2.2 Installation Position Requirements" on page 21*.<br>Limit:<br>Horizontal installation:<br>• 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.<br><br><br>(To be continued) |

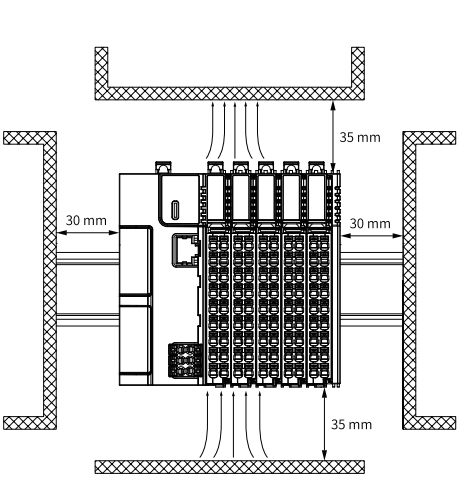
| Item | Specifications |
| --- | --- |
| Continued | (Continued)<br>• Output derating: When the ambient temperature is 45°C, the PLC can work at full load (that is, the total current of the eight outputs not higher than 2 A). When the ambient temperature is 55°C, the total current of simultaneously 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.<br><br><br>Non-horizontal installation: A maximum of six inputs can be in active state simultaneously, and the maximum allowed output current is 1 A. |

## 2.2 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 *"2.1 Installation Environment Requirements" on page 19*.

### ■ 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.

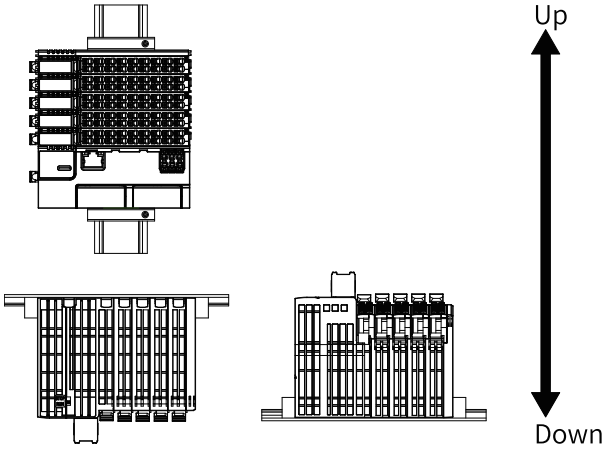



## *Note*

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:

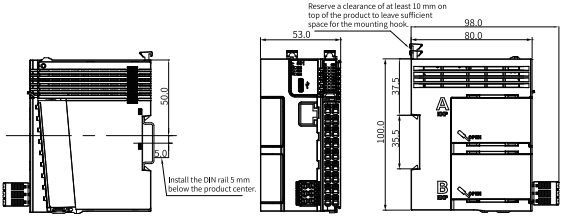
- Install the PLC below all I/O modules.
- Hold the cables with a cable duct to prevent the weight of cables being applied to the lower end plate. Failure to comply may cause displacement of the PLC from the DIN rail, leading to maloperation of the PLC.

## 2.3 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.

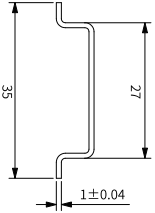
## 2.4 Installation Dimensions

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




## 2.5 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.

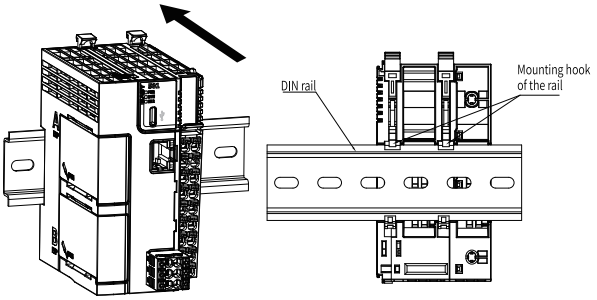



Caution

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.

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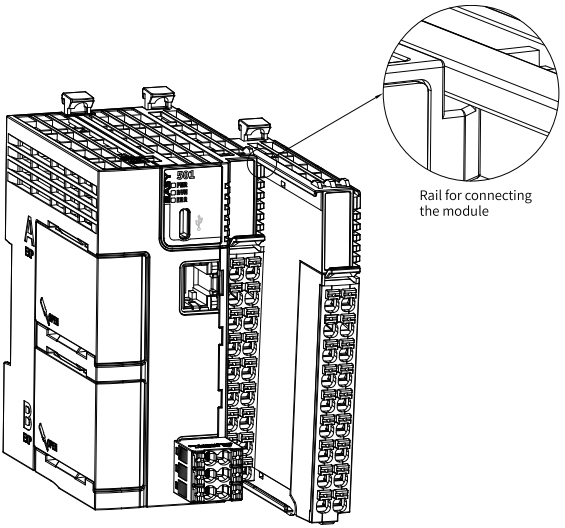
**Caution**

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.

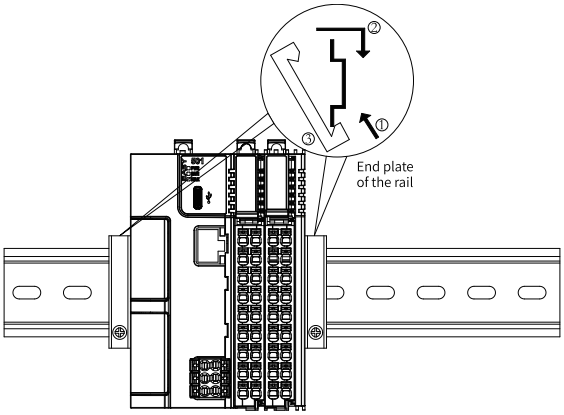
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## ■ Installing the module to the master

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

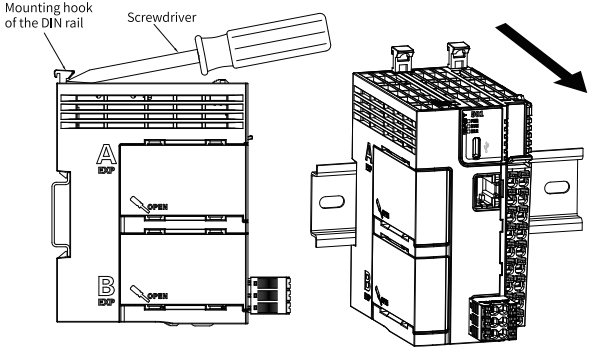



Install an DIN rail end plate to both sides of the master or module. To mount the end plate, hook the bottom of it to the bottom of the DIN rail, rotate the end plate to hook the top of it to the top of the DIN rail, and then tighten the screw to lock the end plate in place, as shown below.




## ■ 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.



# 3 Electrical Installation

## 3.1 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) |

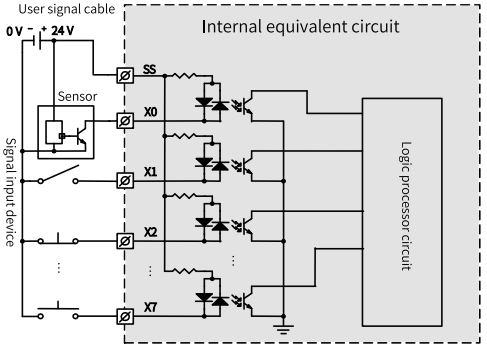
**Caution**

- 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.

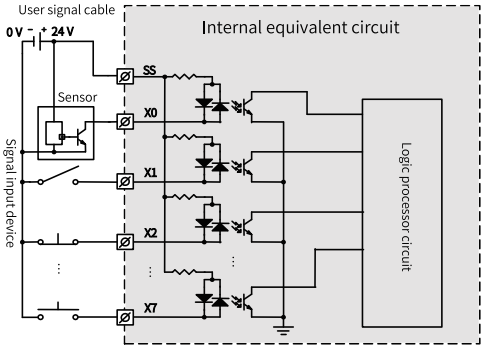
## 3.2 Terminal Wiring

### ■ Input terminal circuit diagram

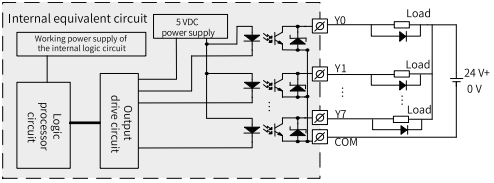
- **Input terminal circuit diagram for sink wiring**




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




## ■ Output terminal circuit diagram




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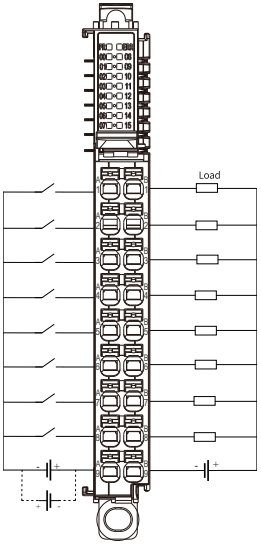
# *Note*

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

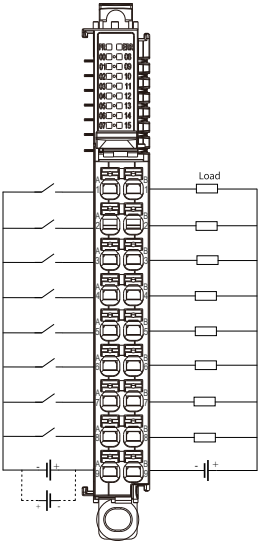
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## ■ Input and output terminal wiring diagram

- **Easy501-0808TN**



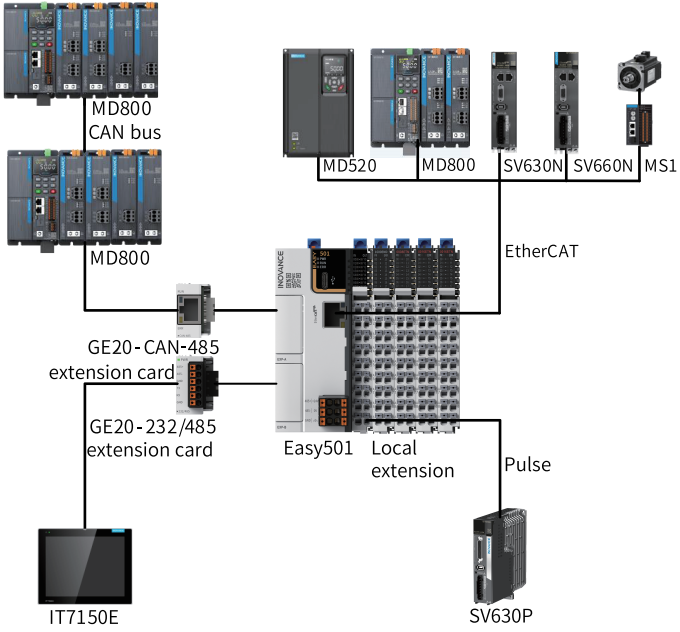

- **Easy502-0808TN**


Load

# 4 Communication Connection

## 4.1 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.

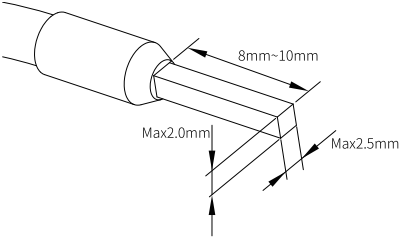


## 4.2 Cable Selection

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 |

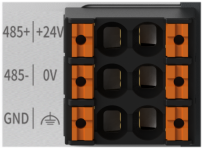
If other tubular lugs are used, crimp them to twisted cables. The following figure shows requirements of the shape and size.




## 4.3 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 *"4.2 Cable Selection" on page 34* 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.

## 4.4 EtherCAT Communication

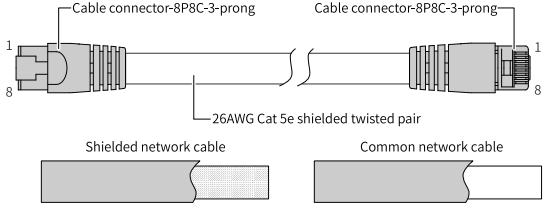
### ■ EtherCAT Specifications

| 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 |
| 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.

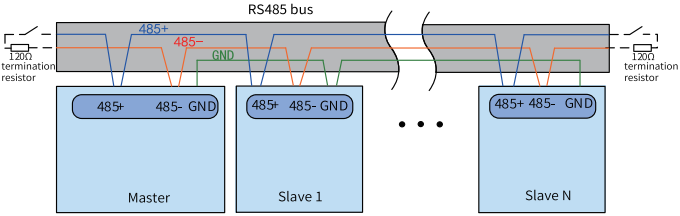
| Item | Specification |
|---|---|
| Cable type | Flexible crossover cable, S-FTP, Cat5e |
| Standards compliance | EIA/TIA568A, EN50173, ISO/IEC11801<br>EIA/TI Abulletin TSB<br>EIA/TIA SB40-A&TSB36 |
| Cross sectional area of the cable | 26AWG |
| Cable category | Twisted pair |
| Number of pairs |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

## 4.5 RS485 Communication

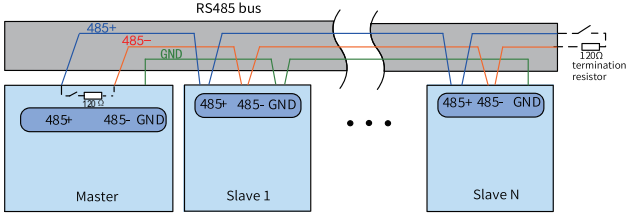
It is recommended to use a shielded twisted pair cable as the RS485 bus, and use twisted pair cables to connect the RS485+ and RS485– terminals. Connect a 120 Ω termination resistor to each end of the bus to prevent signal reflection. Connect the RS485 signal reference grounds of all nodes together. 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 Operation and Maintenance

## 5.1 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.<br>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. |

## 5.2 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.

## 5.3 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.

# 6 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<br>24 VDC input<br>Source/Sink | 01480032 | A/B | 13 |
| | GE20-4DO-TN | 4-channel sink transistor output<br>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 |
| 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 |