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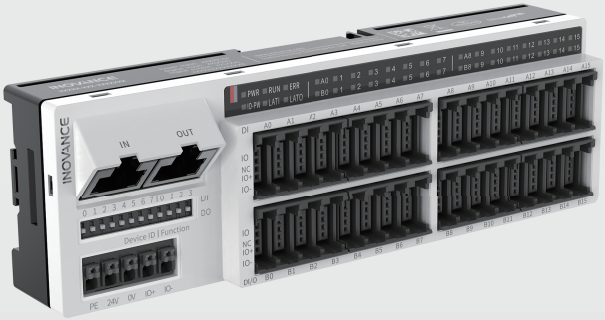

PS00017521A00

GR20T-ECT-1616EMN-E

Digital Input and Output Module

User Guide

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Preface

■ Introduction

The GR20T-ECT-1616EMN-E is a transistor NPN module with 32 digital inputs and outputs. The module adapts to AM600 series products.

This guide describes the product information, mechanical installation, electrical installation, programming, and commissioning of the product.

■ Standards compliance

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

Certification name	Directive name		Standards compliance
CE	EMC	2014/30/EU	**24 VDC models:** EN 61131-2 **220 VAC models:** EN 61131-2 EN 61000-3-2 EN 61000-3-3
	LVD	2014/35/EU	EN 61010-1 EN 61010-2-201
	RoHS	2011/65/EU amended by (EU) 2015/863	EN IEC 63000
UL/cUL	-		UL 61010-1 UL 61010-2-201 CAN/CSA-C22.2 No. 61010-1 CSA C22.2 NO. 61010-2-201
KCC	-		-
EAC	-		-

Certification name	Directive name		Standards compliance
UKCA	Safety regulations	Electrical Equipment (Safety) Regulations 2016	EN 61010-1 EN 61010-2-201
	EMC regulations	Electromagnetic Compatibility Regulations 2016	**24 VDC models:** EN 61131-2 **220 VAC models:** EN 61131-2 EN 61000-3-2 EN 61000-3-3
	RoHS regulations	Directive (RoHS) Regulations 2012	EN IEC 63000

■ More data

Data name	Data code	Description
AM600 Series Programmable Controller (NPN Output) User Guide	19010723	The guide describes the product information, electrical and mechanical design, communication connection, programming tools, operation and maintenance, indicators, MFK keys, and module connection of the product.
GR20T-ECT-1616EMN-E Digital Input and Output Module User Guide	PS00017521	The guide describes the product information, mechanical installation, electrical installation, programming, and commissioning of the product.

■ Revision history

Date	Version	Description
July, 2024	A00	Initial release

■ Access to the guide

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

- Do keyword search under Service and Support at *http://www.inovance.com*.
- Scan the QR code on the product with your smart phone.
- My Inovance APP: Scan the QR code below to install the app, where you can search for and download user guides.

■ Warranty disclaimer

Inovance provides warranty service within the warranty period (as specified in your order) for faults or damage that occur during normal operation. Maintenance will be charged after the warranty expires.

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

- Damage caused by operations not following the instructions in the user guide
- Damage caused by fire, flood, or unusual 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 is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see Product Warranty Card.

General Safety Precautions

■ Safety precautions

1. Read and follow the safety instructions when installing, operating, and maintaining the equipment.
2. To ensure personal and equipment safety, observe the notes indicated on the product labels and all the safety instructions in the user guide.
3. "CAUTION", "WARNING", and "DANGER" in the user guide only indicate some of the precautions that need to be followed; they just supplement the safety precautions.
4. Use this equipment according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
5. Inovance shall take no responsibility for any personal injury or property damage caused by improper use.

■ Safety levels and definitions

"DANGER" indicates that failure to comply with the notice can result in severe personal injury or even death.

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

"CAUTION" indicates that failure to comply with the notice may result in minor or moderate personal injury or equipment damage. Keep this user guide properly for future use and deliver it to the end user.

Control system design

DANGER

- Provide a safety circuit outside the controller so that the control system can still work safely once external power failure or controller fault occurs.
- Add a fuse or circuit breaker because the module may smoke or catch fire due to long-time overcurrent caused by operation above rated current or load short-circuit.

WARNING

- An emergency stop circuit, a protection circuit, a forward/reverse operation interlocked circuit, and an upper position limit and lower position limit interlocked circuit must be set in the external circuits of controller to prevent damage to the machine.
- To ensure safe operation, for the output signals that may cause critical accidents, use external protection circuits and safety mechanism.
- Once the CPU of the controller detects an exception in the system, all outputs may be closed. When a fault occurs in the controller circuit, the output may not be under control. Therefore, it is necessary to set up an external control circuit to ensure normal operation.
- If the output units such as relays or transistors are damaged, the output may fail to switch between ON and OFF states according to the commands.
- The controller is designed to be used in an indoor electrical environment that is compliant with overvoltage category II. The power supply must have a system-level surge protection device to ensure that overvoltage caused by lightning shock cannot be applied to the controller power supply input terminals, signal input terminals, and control output terminals, preventing damage to the equipment.

Installation

WARNING

- Installation must be carried out by qualified professionals.
- Disconnect all external power supplies of the system before disassembling the module. Failure to do so may result in electric shock, module fault or malfunction.
- Do not use the controller in environments with dust, greasy smoke, conductive dust, corrosive or combustible gases, exposed to high temperature, condensation, wind & rain, or subject to vibration and shock. Electric shock, fire and malfunction may also damage the product.
- The controller is open-type equipment that must be installed in a control cabinet with lock (IP rating of the control cabinet enclosure > IP20). Only qualified professionals can open the cabinet.

Installation

- Prevent metal filings and wire ends from dropping into ventilation holes of the PLC during installation. Failure to comply may result in fire, fault and malfunction.
- Ensure there are no unwanted matters on ventilation surface. Failure to comply may result in poor ventilation, which may cause fire, fault and malfunction.
- Ensure the module is connected to the respective connector securely and hook the module firmly. Improper installation may result in malfunction, fault or fall-off.

Wiring

- Wiring must be carried out by qualified professionals.
- Disconnect all external power supplies of the system before wiring. Failure to comply may result in electric shock, module fault or malfunction.
- Install the terminal cover attached to the product before power-on or operation after wiring is done. Failure to comply may result in electric shock.
- Insulate the cable terminals properly to ensure the insulation distance between cables will not be shortened after cables are connected to the terminal block. Failure to comply may result in electric shock or damage to the equipment.

- To avoid electric shock, cut off the power supply before connecting the product to the power supply.
- The input power supply of the HMI must be 24 VDC. Power supplies outside ±20% of 24 VDC can cause severe damage to the product. Therefore, check whether the DC power supply provided by the switching-mode power supply is stable at a regular interval.

Operation and maintenance

- Operation and maintenance must be carried out by qualified professionals.
- Do not touch the terminals with power on. Failure to comply may result in electric shock or malfunction.
- Disconnect all external power supplies of the system before cleaning the module or re-tightening screws on the terminal block or screws of the connector. Failure to comply may result in electric shock.
- Disconnect all external power supplies of the system before disassembling the module or connecting/disconnecting the communication cables. Failure to comply may result in electric shock or malfunction.

Safety recommendations

- In the position where the operator directly touches the machinery part, for example, where a machinery tool is loaded/unloaded, or where a machine runs automatically, the on-site manual operating devices and any other alternative means must be carefully arranged and designed so that they are independent of the programmable controller and can start or terminate the automatic running of the system.
- If you need to modify the program while the system is running, use the lock function or other protective measures. Ensure that only authorized personnel can make the necessary modifications.

Disposal

- Treat the scrapped product as industrial waste. Dispose of the battery according to local laws and regulations.
- Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

1 Product Information

1.1 Naming Rules and Nameplate

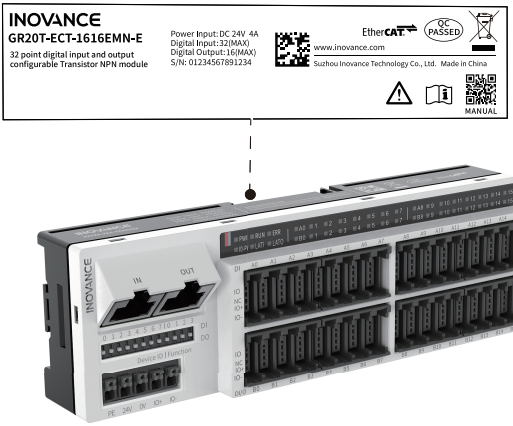
■ Naming rules

G R 20 T - ECT - 1616 E MN - E

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① **Product family** G: Inovance controller general-purpose module	⑤ **Communication protocol** ECT: EtherCAT
② **Product type** R: Remote module	⑥ **Number of inputs/outputs** 1616: 16–channel inputs, inputs/outputs configurable for 16 channels
③ **Series** 20: 20 series	⑦ **Product type** E: Logic I/O expansion module
④ **Product form** T: Horizontal	⑧ **Function type** MN: Sink output configurable for inputs/outputs
⑨ **Function type** E: ECON terminal	-

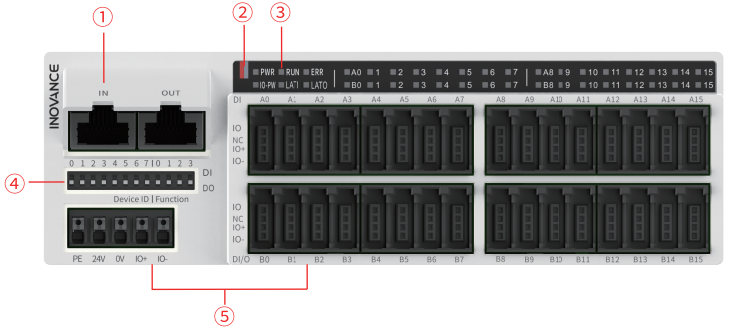
■ Nameplate



The following table shows the order data of the product.

Model	Description	Product code	Applicable model
GR20T-ECT-1616EMN-E	GR20T series transistor NPN module with configurable 32 digital outputs and inputs (ECON)	01440528	AM600 series

1.2 Components



No.	Name	Description		
①	EtherCAT communication interface	IN	EtherCAT communication input	EtherCAT communication data is input through the IN interface with connection to the PLC, communication interface module, or the upstream slave.
		OUT	EtherCAT communication output	The OUT interface outputs EtherCAT communication data with connection to the downstream slave.
②	Color identification	Red: Digital output	Orange: Analog output	
		Gray: Digital input	Green: Analog input	
		White: Communication	Blue: Other modules	

No.	Name	Description		
③	Signal indicator	PWR	System power supply indicator	The indicator is steady on for power-on and off for power-off (24 VDC).
		RUN	Running state indicator	The ECT communication status indicator indicates status of the ECT simple slave. • OFF: The ECT module is in the INIT state. • Flashing: The ECT module is in the PREOP state. • Single flashing: The ECT module is in the SafeOP state. • Steady ON: The ECT module is in the operational state. • Double flashing: The ECT module is in the bootstrap state.
		ERR	Fault indicator	The indicator is on when the module is faulty.
		IO-PW	I/O power indicator	The indicator is steady on for power-on and off for power-off (24 VDC).
		LATI	ECT_IN network port indicator	• Off: No connection • Flashing: Connected with data being exchanged • Steady on: Connected with no data exchange
(Continued)		LATO	ECT_OUT network port indicator	• Off: No connection • Flashing: Connected with data being exchanged • Steady on: Connected with no data exchange
		A0 to A15	Signal indicator of DI0 to DI15	The indicator turns green when there is DI input.
		B0 to B15	Signal indicator of DI/00 to DI/015	• DIO configured as DI mode: The indicator turns green when the DI signal is active. • DIO configured as DO mode: The indicator turns green when the DO signal is active.

Note

- Flashing: The indicator shall flash at an interval of 200 ms.
- Single flashing: The indicator shall flash at an interval of 1000 ms.
- Double flashing: The indicator shall show a sequence of two short flashes, separated by an off phase, and followed by a long off phase (1000 ms).

No.	Name	Description		
④	DIP switch	Device ID (0 to 7)	Slave address DIP switch	The DIO0 to DIO15 can be set through the 4-bit DIP switch, four DIO channels can be set through the 1-bit DIP switch, and DIO0 to DIO3 can be set through Function0, and so on.
		Function (0 to 3)	DIP switch for DIO switchover	
⑤	User terminal	For details, see *"3.2 Terminal Assignment" on page 30*		

1.3 Technical Specifications

■ General specifications

Item	Specification
IP rating	IP20
Dimensions (W x H x D)	160 mm × 50 mm × 35.9 mm
Weight	Approx. 185 g

■ Power supply specifications

Item	Specification
Rated voltage of US power supply	24 VDC (20.4 VDC to 28.8 VDC)
Maximum current of US power supply	1 A (@24 V)
US reverse polarity protection	Supported
Rated voltage of UA power supply	24 VDC (20.4 VDC to 28.8 VDC, common ground with US) reverse polarity protection

Item	Specification
Maximum current of UA power supply	4 A
UA reverse polarity protection	Supported
Reversed polarity protection of system power supply	Supported
Short circuit protection of system power supply	Supported
Reversed polarity protection of I/O power supply	Supported
Short circuit protection of I/O power supply	Supported
DO overcurrent protection	Supported
DO short circuit protection	Supported

■ EtherCAT specifications

Item	Specification
Communication protocol	EtherCAT protocol (SDO not supported)
Communication speed	100 Mbps (100Base-TX)
Work mode	Full duplex
Transmission media	Shielded cables of Cat 5e or higher
Transmission distance	100 m
Terminal type	RJ45

■ Input specifications

Item	Specification
Configuration of inputs	Unavailable
Input type	Digital input

Item	Specification
Input mode	NPN
Input channel	Max. 32
Input voltage class	24 VDC (20.4 VDC to 28.8 VDC)
Input current (typical)	4 mA (@24 V)
ON voltage	< 5 VDC
OFF voltage	> 15 VDC
Hardware response time ON/OFF	100 µs/100 µs
Input impedance	6.6 kΩ to 7.6 kΩ
Isolation	Yes
Input action display	When the input is in the driving state, the input indicator becomes on.
Input derating	Full load when working at 45°C (specifically, when all input channels are ON at the same time), and 50% derating when working at 55°C (specifically, the number of input channels that are ON at the same time is no more than 16).

■ Output specifications

Item	Specification
Configuration of outputs	Input/output configurable for 16 channels (DIO configurable)
Output type	Digital output, low side
Output mode	NPN
Output channel	Max. 16
Output Voltage Class	24 VDC (20.4 VDC to 28.8 VDC)
Output load (resistive load)	0.5 A/channel, 2 A /8 channels
Output load (inductive load)	7.2 W/channel; 12 W/module

Item	Specification
Output load (lamp load)	5 W/channel; 9 W/module
Hardware response time ON/OFF	100 μs/100 μs
Leakage current upon OFF	10 μA
Switching frequency	Resistive load: 100 Hz; inductive load: 0.5 Hz; lamp load: 10 Hz
Isolation	Yes
Output action display	When the DO circuit is in the driving state, the output indicator becomes on.
Output derating	Full load when working at 45°C (that is, the output current does not exceed 4 A when all output channels are ON at the same time), and 50% derating when working at 55°C (that is, the output current does not exceed 2 A when all output channels are ON at the same time).

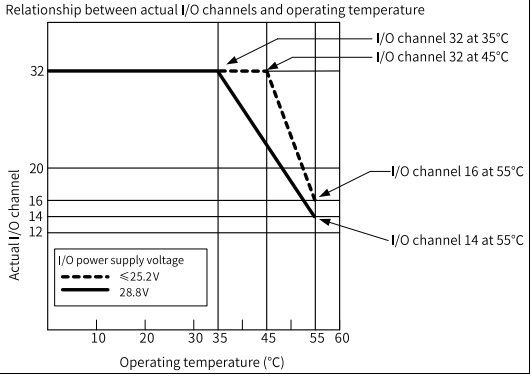
■ Software specifications

Item	Specification
ECT simple slave	Meets ECT certification requirements of conformance
Basic ECT function	Supports the ECT ring-type networking
Channel configuration	Use the DIP switch to configure channels near the switch as inputs and outputs. Each DIP switch supports configurations for four channels.
Output preset value (0)	Configure the output preset value through PDO.
Output maintaining (0)	Configure the output maintaining function through PDO.
PDO data size: input	6 Bytes
PDO data size: output	8 Bytes

Item	Specification
Input filter (I)	Configure an input filter through PDO. The filter can be set to a value including no-filter, 0.25 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, and 32 ms. The default value is 1 ms and adopted when the module is enabled.
I/O indicator management	Indicates input and output signals; the indicator becomes on upon input or output.
Station number setting	Set the station number through the DIP switch. When one of the DIP switches is at non-zero position, station number can be set to a value ranging from 1 to 255.
	Set the station number through the software tool. When all DIP switches are at zero position, station number can be set to a value ranging from 1 to 65535.

1.4 Environmental Specifications

Item	Specification
Operating environment	No corrosive and flammable gas and no excessive conductive dust
Maximum altitude	⩽ 2000 m
Pollution degree	Degree 2
Noise immunity	2 kV on power supply cable (compliant with IEC 61000-4-4)
Overvoltage category	I
EMC immunity level	Zone B, IEC61131-2
Vibration resistance	• Operating scenario: Tested according to IEC 60068-2-6. Test conditions: 5 Hz to 8.4 Hz, 3.5 mm, 8.4 Hz to 200 Hz, 1g, 10 cycles each in X, Y and Z directions. • Transport scenario: Tested according to IEC 60068-2-64. Test conditions: 5 Hz to 100 Hz, $0.01g^2$/Hz; 200Hz, $0.001g^2$/Hz, 1.14g, 30 min each in X, Y and Z directions.
Shock resistance	• Operating scenario: Tested according to IEC 60068-2-27. Test conditions: 15 g peak acceleration, 11 ms pulse width, total 18 shocks in X, Y and Z directions. • Transport scenario: Tested according to IEC 60068-2-27. Test conditions: 15 g peak acceleration, 11 ms pulse width, total 18 shocks in X, Y and Z directions.

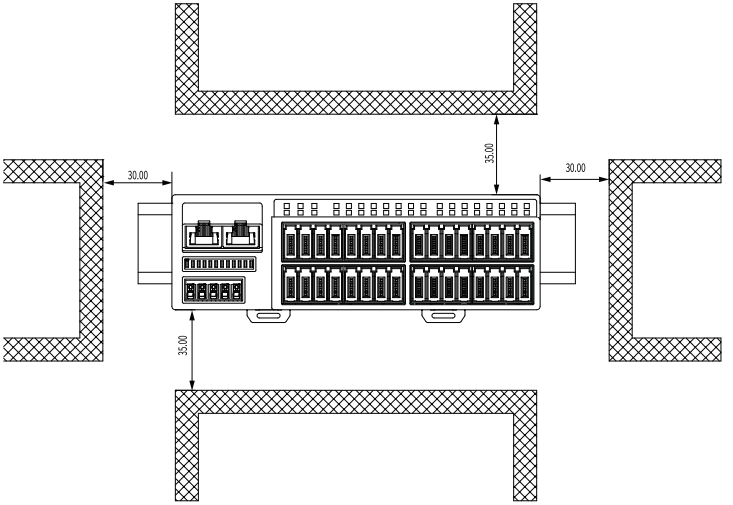
Item		Specification
Operating temperature/ humidity		• Temperature: -20°C to +55°C • Relative humidity: 10% to 90% RH, non-condensing **Note:** Install a fan or air conditioner in the direction of the ventilation holes when the operating temperature is greater than the maximum allowable temperature.
Storage temperature/ humidity		• Temperature: -40°C to +70°C • Relative humidity: <90% RH, non-condensing
Installation position and limit	Installation position	For requirements on installation position, see *"2.1 Requirements on Mounting Options" on page 18*.
	Limits	Derating is performed based on the actual I/O channels (D0+DI), as shown in the following figure. Relationship between actual I/O channels and operating temperature 

2 Mechanical Installation

2.1 Requirements on Mounting Options

■ Recommended mounting option

It is recommended to install the product horizontally. To ensure normal ventilation and heat dissipation and allow sufficient wiring space, reserve enough clearance around the product, as shown in the following figure (Unit: mm).

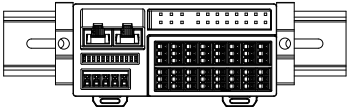


Note

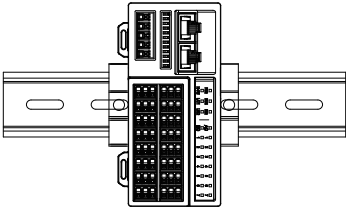
If there is a high-temperature heat source (heater, transformer, large resistor, etc.) in vicinity of the product, keep the product away from the heat source by at least 100 mm.

■ Other mounting options

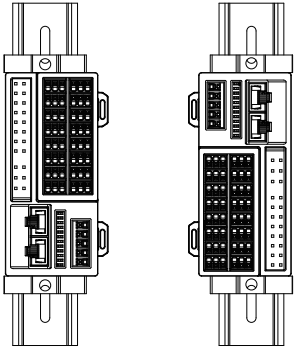
Other mounting options require the same clearance as the recommended mounting option, as shown in the following figure.



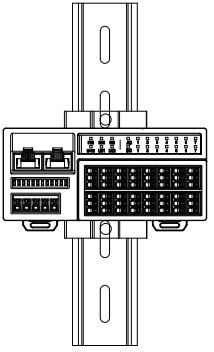
Horizontal DIN rail+Horizontal module



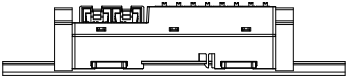
Horizontal DIN rail+Vertical module



Vertical DIN rail+Vertical module



Vertical DIN rail+Horizontal module



Bottom of the electrical cabinet

Note

The preceding mounting options allow the installation of external screws.

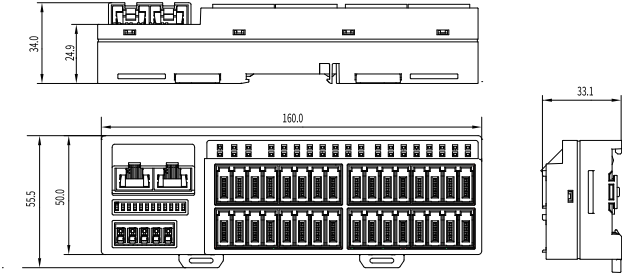
2.2 Installation Precautions

- Before installing or removing the module, ensure that the module is powered off.
- Do not hot swap the modules. Otherwise, the modules may be damaged by overcurrent or overvoltage, and the communication interface module or PLC may be subject to restart, user data loss or corruption.
- Prevent the enclosure or terminals of the module from dropping or suffering from impact or shock.

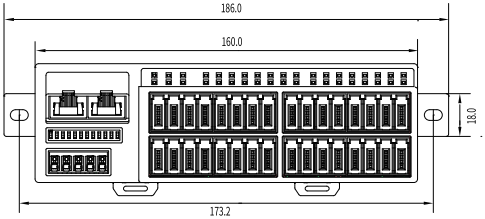
2.3 Mounting Dimensions

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

- Outline dimensions of the module



- Mounting dimensions of external screws

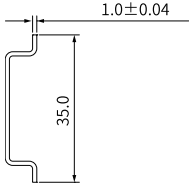


2.4 Installation Method

■ Installing the module

The module can be installed in three modes including horizontal module mounting with horizontal DIN rail, vertical module mounting with horizontal DIN rail, and screw mounting.

The module is mounted onto a DIN rail in conformity with IEC 60715 (width: 35 mm, thickness: 1 mm). The dimensions (in mm) are as shown in the following figure.

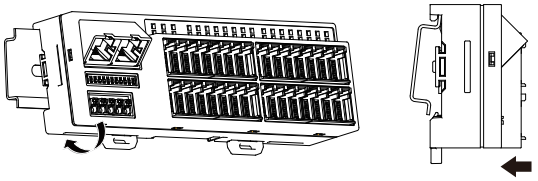


Caution

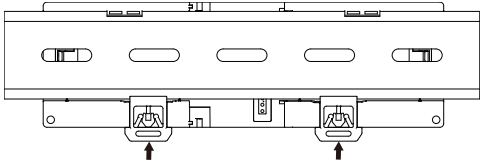
The module is mounted onto a DIN rail in conformity with IEC 60715 (thickness: 1 mm). When installed on a DIN rail with thickness other than 1.0 mm, the product will not fit in place as the snap-fit joint does not work.

- **Horizontal DIN rail + Horizontal module mounting**

Hang the slot at the top of the module on the rail, rotate the module, and press down the bottom until you hear a click of the DIN rail snap-fit joint rebounding, as shown in the following figure.

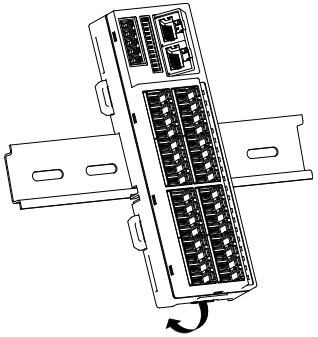


After the module is installed, the DIN rail snap-fit joint will automatically move upwards to lock the module to the rail. If the snap-fit joint does not move upwards, press the bottom of the snap-fit joint upwards to lock the module, as shown in the following figure.

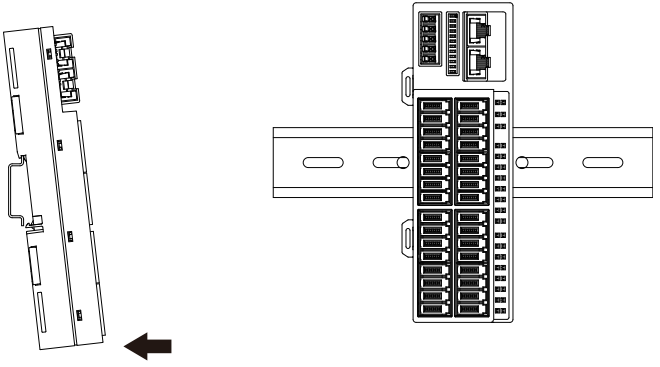


- **Horizontal DIN rail + Vertical module mounting**

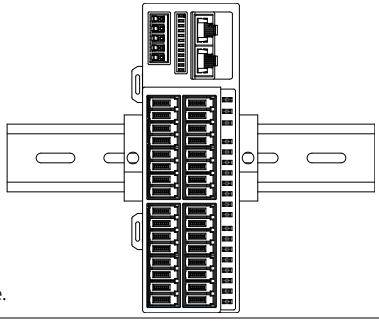
1. Hang the slot at the upper part of the module on the rail, rotate the module, and press down the bottom until you hear a click of the DIN rail snap-fit joint rebounding, as shown in the following figure.



The click sound is as indicated in the following figure.



2. Install and secure the side plates on guide rails on both sides of the module properly,



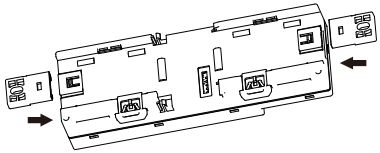
as shown in the following figure.

Note

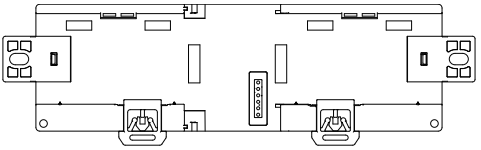
- After the module is installed in place, the snap-fit joint will automatically rebound to lock the module to the rail.
- Ensure that the network port faces up when the module is mounted vertically onto the horizontal DIN rail.

- **Installing the screws**

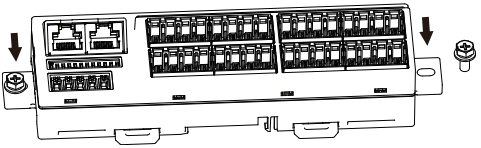
1. Take out the snap-fit joints (standard by default) from the accessory kit, and push them into the bottom of the module in the direction indicated by the following figure.



2. Push the snap-fit joints into the module until you hear a click of the joint rebounding, as shown in the following figure.



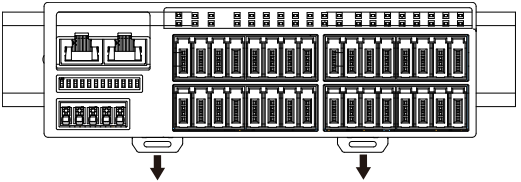
3. Secure the snap-fit joints with M4 screws, as shown in the following figure.



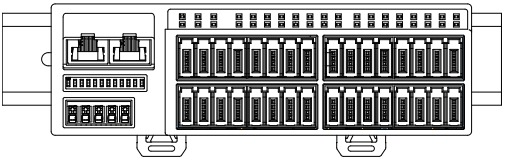
■ Removing the module

- **Horizontal DIN rail + Horizontal module removal**

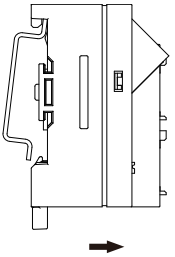
1. Pry the DIN snap-fit joint downwards with a disassembly tool such as screwdriver to release the joint, as shown in the following figure.



The following figure indicates that the snap-fit joint has been released.

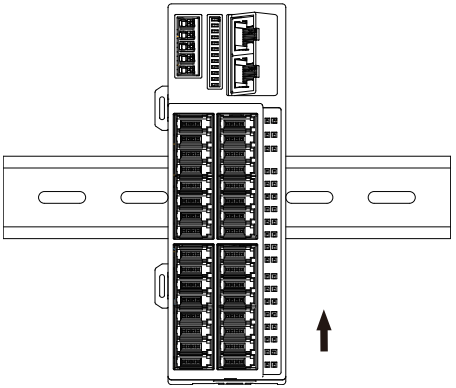


2. Rotate and remove the module out of the guide rail, as shown in the following figure.

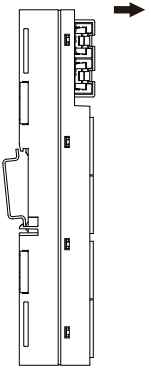


- **Horizontal DIN rail + Vertical module removal**

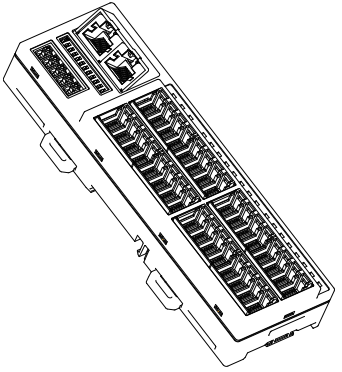
1. Remove all cables from the module.
2. Push the module upwards in the direction indicated by the arrow, as shown in the following figure.



3. When pushing the module upwards, move the top of the module away from the guide rail in the direction indicated by the arrow, as shown in the following figure.

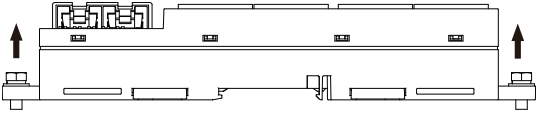


4. Rotate and remove the module out of the guide rail, as shown in the following figure.

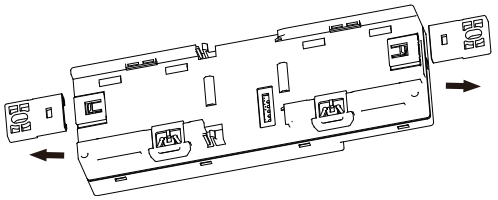


- **Removing the screws**

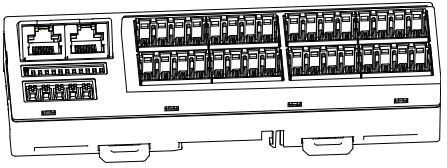
1. Remove the two M4 screws using a screwdriver, as shown in the following figure.



2. Remove the snap-fit joints manually, as shown in the following figure.



The module is then removed successfully, as shown in the following figure.



3 Electrical Installation

3.1 ECON Connector Selection

It is recommended to use a TE connector or a Weifeng connector. Select the cables of proper diameter.

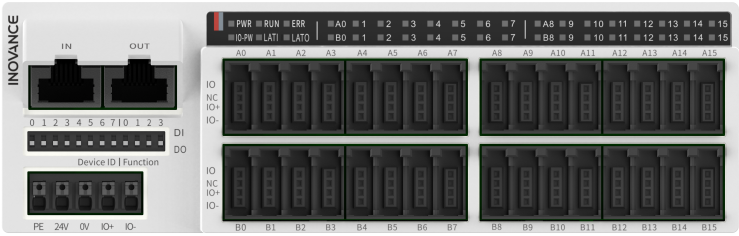
- For TE connector selection, see the following table.

Model	Type	Description	Color	Cable diameter
1473562-4	Connector	1-bar, 4-pin, gold-plated	Yellow	1.0 mm to 1.15 mm
1-1473562-4	Connector	1-bar, 4-pin, gold-plated	Red	0.9 mm to 1.0 mm
2-1473562-4	Connector	1-bar, 4-pin, gold-plated	Blue	1.15 mm to 1.35 mm
3-1473562-4	Connector	1-bar, 4-pin, gold-plated	Orange	0.6 mm to 0.9 mm
4-1473562-4	Connector	1-bar, 4-pin, gold-plated	Green	1.35 mm to 1.6 mm

- For Weifeng connector selection, see the following table.

Model	Cable diameter
5371-104S3Y10WT01W	#24-26AWG: 1.0 mm to 1.2 mm
5371-104S3R08WT01W	#24-26AWG: 0.8 mm to 1.0 mm
5371-104S3U12WT01W	#20-22AWG: 1.2 mm to 1.6 mm
5371-104S3O12WT01W	#24-26AWG: 1.2 mm to 1.6 mm
5371-104S3E10WT01W	#20-22AWG: 1.0 mm to 1.2 mm

3.2 Terminal Assignment



Signal	Terminal	Terminal	Signal
DI0	A0	B0	DI/O0
DI1	A1	B1	DI/O1
DI2	A2	B2	DI/O2
DI3	A3	B3	DI/O3
DI4	A4	B4	DI/O4
DI5	A5	B5	DI/O5
DI6	A6	B6	DI/O6
DI7	A7	B7	DI/O7
DI8	A8	B8	DI/O8
DI9	A9	B9	DI/O9
DI10	A10	B10	DI/O10
DI11	A11	B11	DI/O11
DI12	A12	B12	DI/O12
DI13	A13	B13	DI/O13
DI14	A14	B14	DI/O14
DI15	A15	B15	DI/O15

Refer to the following table for the correspondence between power supply terminals and signal indicators.

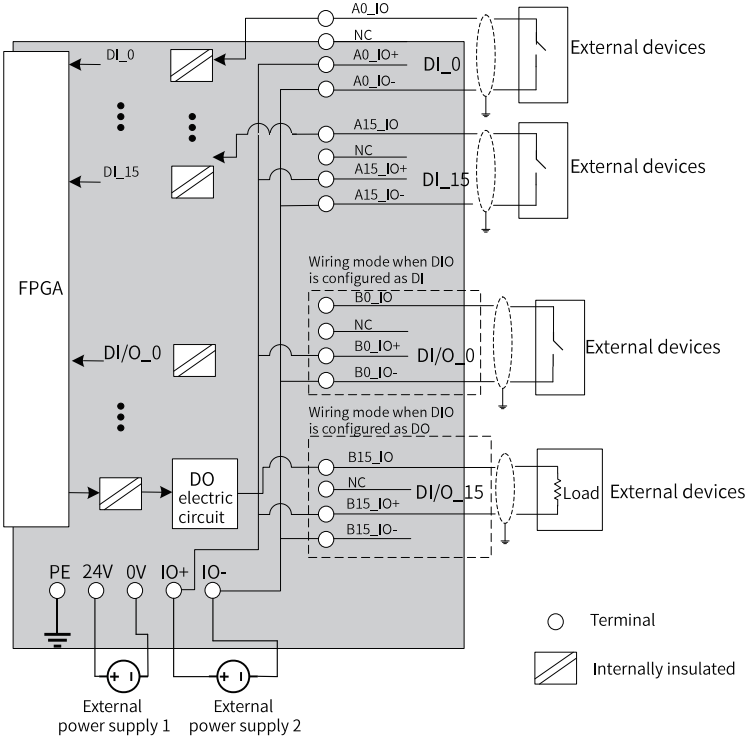
Power supply terminal	Description	Signal indicator
PE	Protective grounding	-
24 V	System power supply +	PWR
0 V	System power supply -	PWR
IO+	Field power supply +	IO-PW
IO-	Field power supply -	IO-PW

3.3 Terminal Wiring

■ Precautions

- Do not bundle the extension cable together with power cables (high voltage, large current) which produce strong interference signals; otherwise, it may be influenced by noise, surge and induction. Separate it from other cables and avoid cabling in parallel.
- Select recommended cables and pinboards for connection. It is recommended that shielded cables be used as extension cables to enhance capacity of resisting interference.
- Apply single-point grounding for the shielding of shielded cable and solder sealed cable.

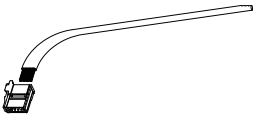
■ Circuit block diagram and wiring diagram



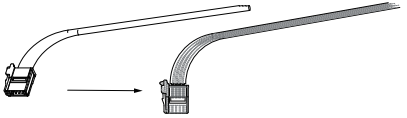
■ Cable connection

1. Crimp the ECON connector.

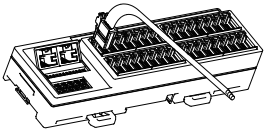
   a. Insert the cable into the connector (see *"3.1 ECON Connector Selection" on page 29*), as shown in the following figure.



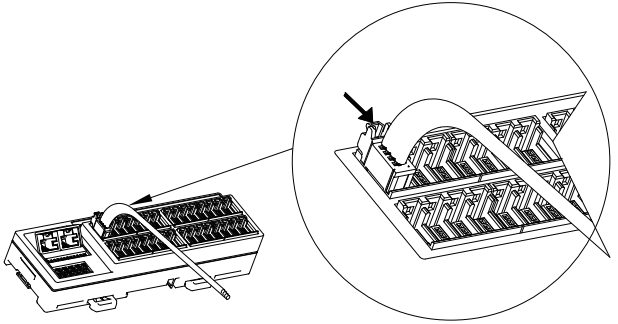
b. Crimp the connector with a specific crimping tool to ensure that the cable is connected in place, as shown in the following figure.



2. Insert the crimped cable connector into the module until you hear a click of the snap-fit joint, as shown in the following figure.



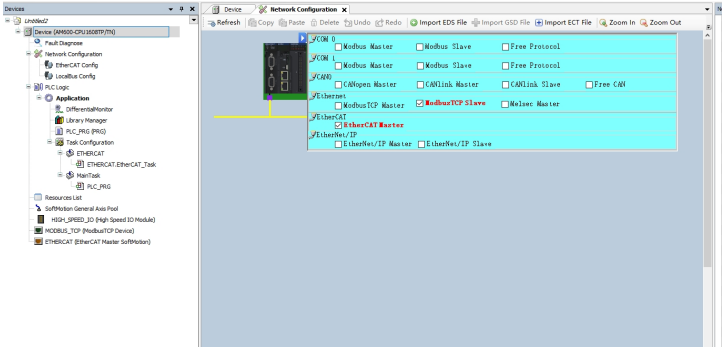
3. (Optional) Press the snap-fit joint in the direction indicated by the arrow and pull the connector upwards to remove the cable, as shown in the following figure.



4 Program Commissioning

The following is an example where AM600 master is used as the primary control module.

1. In the **Device** pane, double-click **Network Configuration**, then check **EtherCAT Master** checkbox to enable the controller as an EtherCAT master.



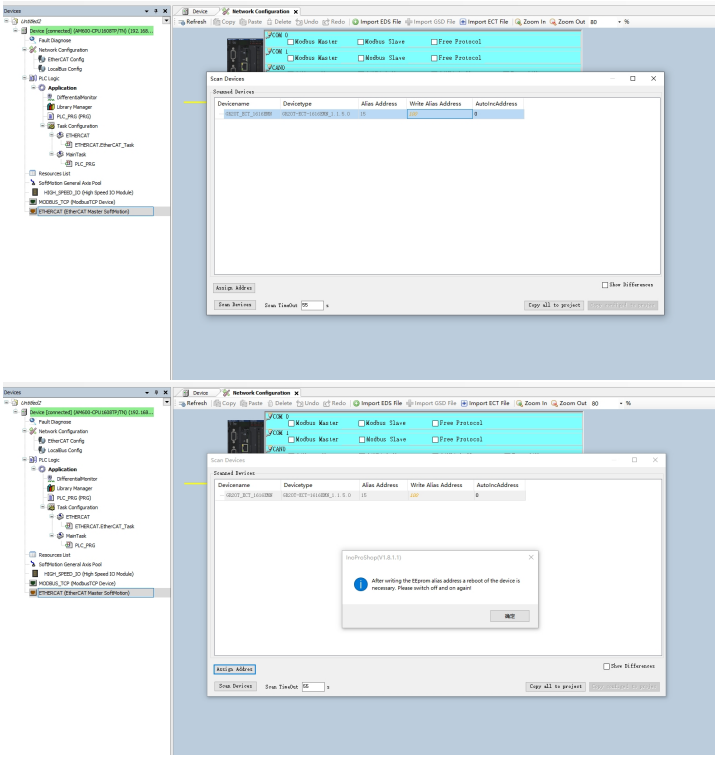
2. In the **Device** pane, right-click **EtherCAT(EtherCAT Master SoftMotion)** and select **Scan Devices**. The **Scan Devices** dialog pops up, as shown in the following figure.

   a. Click **Scan Devices**. After the module is successfully scanned, click **Copy all to device**.

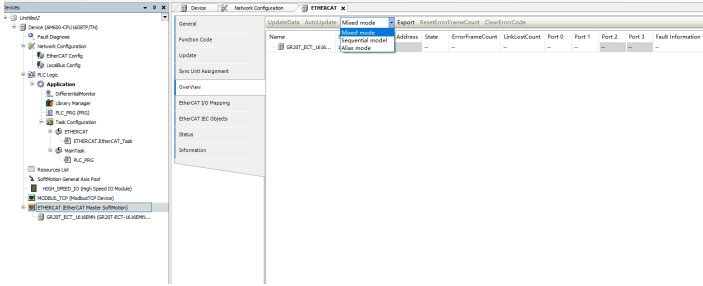
   b. Set the slave alias.

   Slave alias can be set through the DIP switch and software.

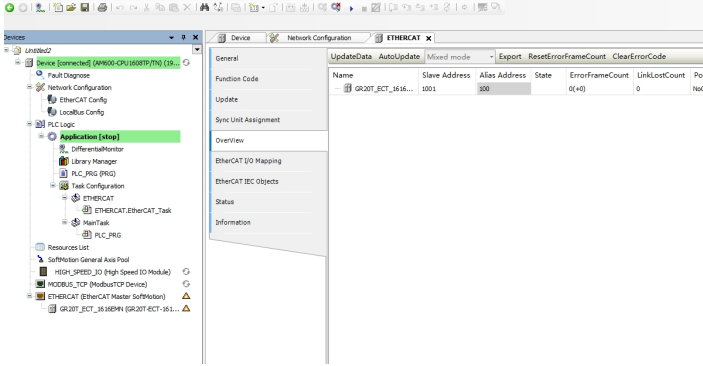
   - When the DIP switch is at non-zero position, use the alias set by the DIP switch. Otherwise, use the slave alias set by the software.
   - To set slave alias through the software, write the alias address in **Write Alias Address**, click **Assign Address**, and select **OK**. Power on the slave again and scan the device.



3. After the module is added successfully, the slave is configured in **Mixed mode** by default. To configure a slave in **Alias mode**, double-click **EtherCAT (EtherCAT Master SoftMotion)** in the **Device** pane. Then, click **Overview** on the **EtherCAT** tab to select the alias mode. Fill in the alias address for each slave and click in the toolbar, as shown in the following figure.



4. Configure EtherCAT. Click ▶ to start the module, as shown in the following figure.



5. Double-click the EtherCAT slave that has been scanned and successfully added in the **Device** pane. Then, click **EtherCAT I/O Mapping** on the **GR20T-ECT-1616EMN-E** tab to configure parameters and read the uploaded data of the module.
   The following table describes functions of each variables when the DIO channel is configured as output.

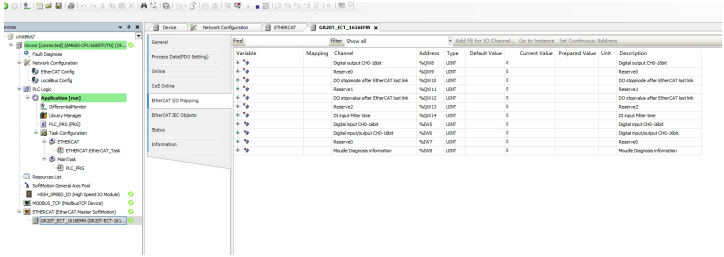
Parameter name	Description
DO output channel set value	The parameter indicates the set value of the DO output channel. The 16 DIO outputs are determined by Bit0-15.
DO stopmode after EtherCAT lost link	The parameter indicates the out status after disconnection of the output channel. The 16 DIO output modes are determined by Bit0-15. The preset value is outputted when the value is 1, and the output retains when the value is 0.
DO stopvalue after EtherCAT lost link	The parameter indicates the output preset value after disconnection of the output channel. The preset value of 16 DIO output is determined by Bit0-15. The value 1 indicates that the output is high level, and the value 0 indicates that the output is low level.

The DI input filter time represents the input filter time of the DI channel and DIO channel, as shown in the following table.

Filter time	Description	Filter time	Description
0x0000	Retain	0x0010	The filter time is 2 ms.
0x0001	No filter	0x0020	The filter time is 4 ms.
0x0002	The filter time is 0.25 ms.	0x0040	The filter time is 8 ms.
0x0004	The filter time is 0.5 ms.	0x0080	The filter time is 16 ms.
0x0008	The filter time is 1 ms.	0x00100	The filter time is 32 ms.

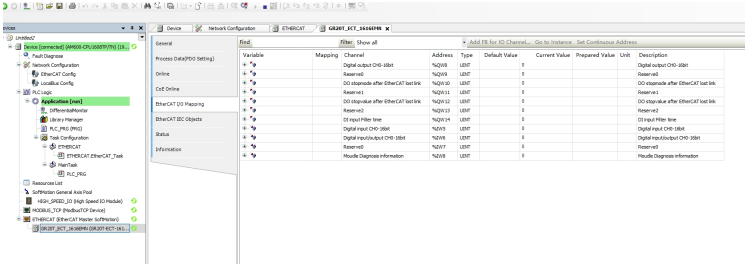
The following table describes the upload parameters of the DI or DIO channel.

Parameter name	Description
DI channel input value	The parameter indicates the signal value of DI input. 16 DI input: Corresponds to Bit0 to Bit15.
DIO channel input value	The parameter indicates the signal value of DIO input. 16 DIO input: Corresponds to Bit0 to Bit15.


Device
Network Configuration
ETHERCAT
GR20T_ECT_1616EPR
General
Process Data(PDO Setting)
Online
CoE-Online
EtherCAT I/O Mapping
EtherCAT IEC Objects
Status
Information
Find
Filter: Show all
Add FB for IO Channel...
Go to Instance
Set Continuous Address
Variable
Mapping
Channel
Address
Type
Default Value
Current Value
Prepared Value
Unit
Description
Digital output CH0-16bit
%QW0
UINT
0
Reserve0
%QW9
UINT
0
DO stopmode after EtherCAT lost link
%QW10
UINT
0
Reserve1
%QW11
UINT
0
DO stopvalue after EtherCAT lost link
%QW12
UINT
0
Reserve2
%QW13
UINT
0
DI input Filter time
%QW14
UINT
0
Digital input CH0-16bit
%IW5
UINT
0
Digital input/output CH0-16bit
%IW6
UINT
0
Reserve0
%IW7
UINT
0
Moudle Diagnosis information
%IW8
UINT
0

5 Fault Diagnosis

When the ERR indicator is ON, it indicates that the module encounters a fault. In this case, a fault code is reported and can be accessed through **Module Diagnosis information** in **EtherCAT I/O Mapping**, as shown in the following figure.



The following table describes the fault codes of the module.

Fault code	Description	Solution
0x0000	No fault	-
0x0001	24 V power supply not connected	Check whether the 24 V power supply of the module is connected properly.
0x0002	DO output overcurrent	Check whether the output connection is short-circuited.