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MD880-61 Series Single-phase Braking Unit

User Guide

Industrial Automation | Intelligent Elevator | New Energy Vehicle | Industrial Robot | Rail Transit

Data code 19012239A00

Preface

Thank you for purchasing MD880 series single-phase braking unit.

The MD880 series braking units mainly apply to applications where AC drives or servo drives (hereinafter referred to as drives) require rapid speed reduction, positioning, and braking. When the drive brakes, the kinetic energy is converted to the electric energy which is fed back to the drive due to the mechanical inertia of the load. This will cause rising of the DC bus voltage of the drive. To ensure normal operation of the drive, a braking unit is required. Therefore, the regenerative energy can be consumed by the braking resistor, preventing the drive from stop due to overvoltage protection.

The MD880 series braking unit provides comprehensive protective functions, such as protection against overcurrent, overvoltage, overtemperature, and braking resistor open circuit and short circuit. It allows you to set parameters including braking start/stop voltage and braking rate. Multiple braking units can be deployed in master/slave mode to meet the braking requirements of high power drives.

Braking units are required for applications requiring large inertia and fast stop, such as oil rigs, textile machines, paper machines, centrifuges, wire drawing machines, wire winding machines, proportional linkage systems, overhead traveling cranes, and other systems.

Before use (installation, wiring, operation, maintenance, inspection), read this user guide carefully and follow the rules below. Failure to comply may result in personal injury or even death.

Precautions
◆ The drawings in the user guide are sometimes shown without covers or protective guards. Install the covers or protective guards as specified first, and then perform operations in accordance with the user guide. ◆ The drawings in this user guide are for illustration only. Actual products may vary. ◆ The user guide is subject to change due to product upgrade, specification modification as well as efforts to the accuracy and convenience of the guide. ◆ If the user guide is damaged or missing, contact Inovance agent in your region.

Revision history

Date	Version	Description
June 2023	A00	First release

Contents

Fundamental Safety Instructions

Safety Precautions

1) Before installing, using, and maintaining this equipment, read the safety information and precautions thoroughly, and comply with them during operations.

2) To ensure the safety of humans and equipment, follow the signs on the equipment and all the safety instructions in the user guide.

3) The "CAUTION", "WARNING", and "DANGER" signs are only supplements to the safety instructions.

4) Use this equipment according to the designated environment requirements. Damage caused by improper usage is not covered by warranty.

5) Inovance shall take no responsibility for any personal injuries or property damage caused by improper usage.

Safety Levels and Definitions

Indicates that failure to comply with the notice can result in death or severe personal injury.

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

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

Safety Instructions

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

WARNING

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

Storage and Transportation

CAUTION

- Store and transport this equipment based on the storage and transportation requirements for humidity and temperature.
- Avoid storing or transporting the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing this equipment for more than 3 months. Long-term storage requires stricter protection and necessary inspections.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Never transport this equipment with other equipment or materials that may harm or have negative impacts on this equipment.

WARNING

- Use professional loading and unloading equipment to carry large-scale or heavy equipment.
- When carrying this equipment with bare hands, hold the equipment casing firmly with care to prevent parts falling. Failure to comply may result in personal injuries.
- Handle the equipment with care during transportation and mind your step to prevent personal injuries or equipment damage.
- When the equipment is lifted by a lifting gear, do not stay under it.

Installation

WARNING

- Thoroughly read the safety instructions and user guide before installation.
- Do not modify this equipment.
- Do not rotate the equipment components or loosen fixed bolts (especially those marked in red) on equipment components.
- Do not install this equipment in places with strong electric or magnetic fields.
- When this equipment is installed in a cabinet or final equipment, protection measures such as a fireproof enclosure, electrical enclosure, or mechanical enclosure must be provided. The IP rating must meet IEC standards and local laws and regulations.

DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must only be performed by professionals.
- Installation, wiring, maintenance, inspection, or parts replacement must be performed by only experienced personnel who have been trained with necessary electrical information.
- Installation personnel must be familiar with equipment installation requirements and relevant technical materials.
- Before installing equipment with strong electromagnetic interference, such as a transformer, install an electromagnetic shielding device for this equipment to prevent malfunctions.

Wiring

DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must only be performed by professionals.
- Never perform wiring with power ON. Failure to comply will result in an electric shock.
- Before wiring, cut off all the power supplies of the equipment. Wait for at least 15 minutes before further operations because residual voltage exists after power-off.
- Make sure that the equipment is well grounded. Failure to comply will result in an electric shock.
- During wiring, follow the proper electrostatic discharge (ESD) procedures, and wear an antistatic wrist strap. Failure to comply will result in damage to internal equipment circuits.

WARNING

- Never connect the power cable to output terminals of the equipment. Failure to comply may cause equipment damage or even a fire.
- When connecting a drive to the motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Cables used for wiring must meet cross sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- After wiring, make sure that no fallen screws and exposed cables in the equipment.

Power-on

DANGER

- Before power-on, make sure that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Check that the power supply meets equipment requirements before power-on to prevent equipment damage or a fire.
- During power-on, unexpected operations may be triggered on the equipment. Therefore, stay away from the equipment.
- After power-on, do not open the cabinet door and protective cover of the equipment. Failure to comply will result in an electric shock.
- Do not touch any wiring terminals after power-on. Failure to comply will result in an electric shock.
- After power-on, do not remove any part of the equipment. Failure to comply will result in an electric shock.

Operation

DANGER

- Do not touch any wiring terminals during operation. Failure to comply can result in an electric shock.
- Do not remove any part of the equipment during operation. Failure to comply will result in an electric shock.
- Do not touch the equipment enclosure, fan, or resistor to sense the temperature. Failure to comply may result in burns.
- Signal detection must be performed by only professionals during operation. Failure to comply will result in personal injuries or equipment damage.

WARNING

- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in a fire or equipment damage.
- Do not start or stop the equipment by turning on or off the contactor. Failure to comply will result in equipment damage.

Maintenance

DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must only be performed by professionals.
- Do not perform maintenance on the equipment with power on. Failure to comply can result in the risk of electric shock.
- Before maintenance, cut off all the power supplies of the equipment and wait for at least 15 minutes.

WARNING

- Perform daily and periodic inspection and maintenance for the equipment according to maintenance requirements and keep a maintenance record.

Disposal
DANGER ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must only be performed by professionals. ◆ Do not repair the equipment after power-on. Failure to comply can result in the risk of electric shock. ◆ Before inspection and repair, cut off all the power supplies of the equipment and wait for at least 15 minutes.
WARNING ◆ Require for repair services according to the product warranty agreement. ◆ When the equipment is faulty or damaged, require professionals to perform troubleshooting and repair by following repair instructions and keep a repair record. ◆ Replace quick-wear parts of the equipment according to the replacement guide. ◆ Do not use damaged equipment. Failure to comply may result in more damages. ◆ After replacing the equipment, perform wiring inspection and parameter setting again.
Disposal
WARNING ◆ Retire the equipment by following local regulations or standards. Failure to comply may result in property damage, personal injuries, or even death. ◆ Dispose of and recycle the retired equipment by following industry waste disposal standards to avoid environmental pollution.

Safety Sign

■ Description of safety signs on the equipment

For safe equipment operation and maintenance, comply with safety signs on the equipment, and do not damage or remove the safety labels. See the following table for descriptions of the safety labels.

Safety Sign	Description
	◆ This equipment can be serviced by qualified personnel only. ◆ Disconnect all the power supplies and wait for at least 15 min before removing the cover. ◆ Observe the instructions described in the user guide. ◆ This equipment must only be serviced by qualified personnel. ◆ Disconnect all the power supplies before maintenance and wait for at least 15 minutes before opening the cover. ◆ Read the maintenance instructions before maintenance.

1 Product Information

1.1 Model and Nameplate

MD880 - 61M – 0400 - 7

Code	Product Family
MD880	MD880 series

Code	Name
61M	Single-phase braking unit

Code	Voltage Class
7	690 VAC

Code	Rated Braking Power
0400	404 kW

Nameplate

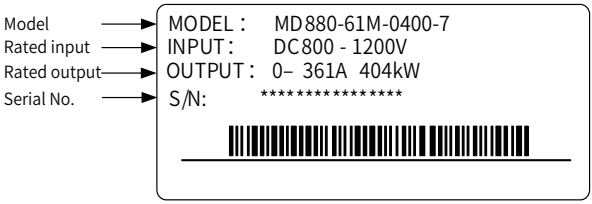


Figure 1 1 Model and nameplate description

1.2 Rated Specifications

Table 1-1 Specifications of the braking unit

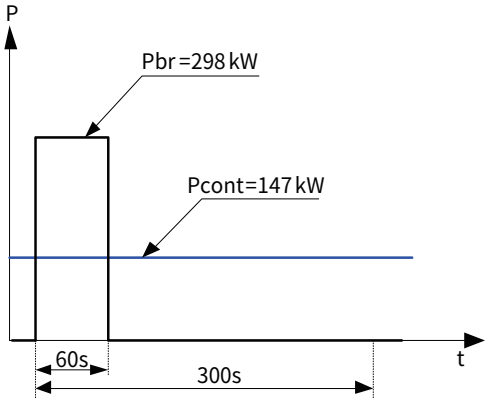
Model	Min. braking resistance R_{min} (Ω)	Without overload		Overload for 1 min/5 min [1]		Overload for 10s/60s [2]	
		I_{rms} (A)	P_{cont} (kW)	I_{rms} (A)	P_{br} (kW)	I_{rms} (A)	P_{br} (kW)
MD880-61M-0400-7	2.72	131 A	147	267	298	361	404

NOTE

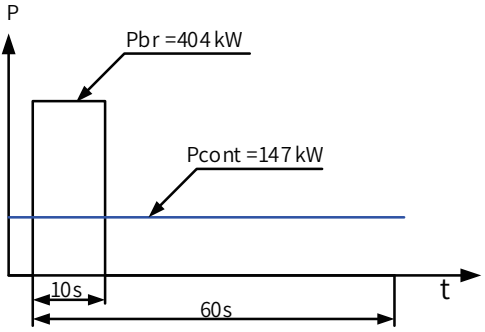
- [1] Operating for 1 minute every 5 minutes
- [2] Operating for 10 seconds every 60 seconds

1.3 Load Curve Diagrams

■ Overload for 1 min/5 min



■ Overload for 10s/60s



1.4 Operating Principles

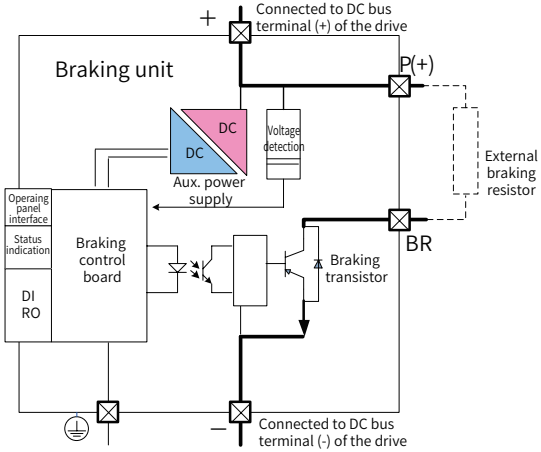


Figure 1 2 Application schematics of the braking unit

The braking unit consumes the electric energy fed back from the external load to the drive to limit the voltage of the drive to a safe range.

Before normal operation of the braking unit, set the brake starting voltage (A5-07) and brake stop hysteresis voltage (A5-08) based on the AC power supply voltage class of the drive. The following diagram shows the voltage relationship.

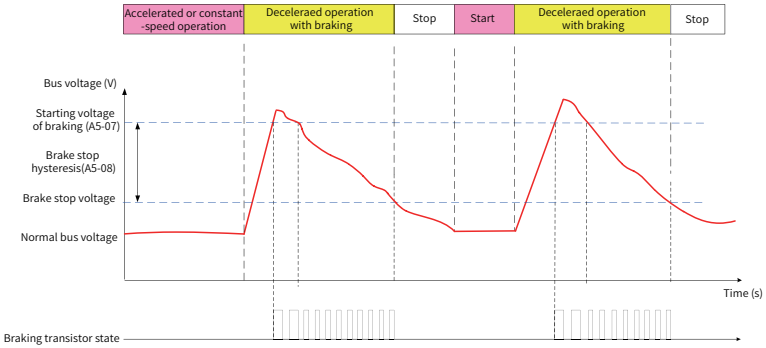


Figure 1 3 Operation schematics of MD880 series single-phase braking unit

As shown in the preceding figure, the starting voltage of the brake > stop voltage of the brake > normal bus voltage. When the braking unit is in the master mode, the control circuit detects the bus voltage in real time. If the bus voltage reaches the set braking start voltage, the braking transistor starts to work and discharges the electricity in the main capacitor of the drive through the external braking resistor until the bus voltage drops below the brake stop voltage.

2 Mechanical and Electrical Installation

2.1 Mechanical Installation

2.1.1 Installation Environment

- The environmental requirements for the braking unit and the drive are the same. The ambient temperature and humidity of the braking unit cannot exceed the permitted range of the design, as shown in *"Table 2-1 Environment requirements"*.
- Install the braking unit and external braking resistor on the surface of incombustible objects with sufficient space reserved for heat dissipation.
- Ensure that the installation environment is free of corrosive, combustible, and explosive gas.
- Ensure that the installation environment is free from excessive dust and metal powder.

Table 2-1 Environment requirements

Item	Requirement
Altitude	Below 1000 m (Derate 1% for every additional 100 m above 1000 m. The maximum altitude is 3000 m.)
Ambient temperature.	-10° C to +40° C (Derate by 1% for every additional 1° C above 40° C. The maximum ambient temperature is 50° C.)
Relative humidity	Less than 95% RH, without condensation
Vibration	Below 10 m/s^2 (1 g)
Storage temperature	-20°C to +60°C
Pollution degree	PD2 or below
Cooling method	Air cooling
IP rating	IP20

2.1.2 Outline Dimensions and Installation Clearance

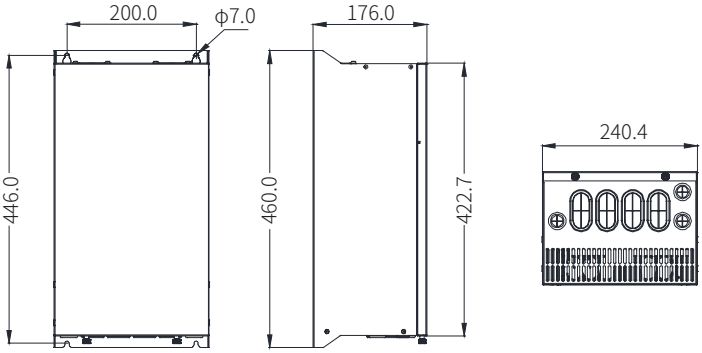


Figure 2 1 Braking unit outline and installation dimensions (unit: mm)

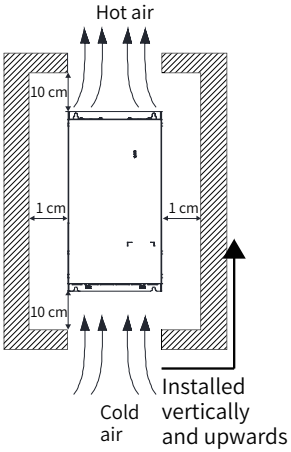


Figure 2 2 Mounting clearance of the braking unit

2.1.3 Mechanical Installation Precautions

- Install the braking resistor in a place with good ventilation. The braking resistor will be heated when consuming the regenerative energy generated during braking.
- Install the braking unit upright to facilitate heat dissipation. Do not lay it upside-down or horizontally.
- If multiple braking units are connected to the drive, install them side by side. If one row of the braking unit needs to be installed above another row, install an air guide plate to prevent heat generated by braking units in the lower row from being transmitted to those in the upper row.
- Ensure that the distance between the braking unit, drive, and other electric device

meets the requirements shown in "Figure 2 2 Mounting clearance of the braking unit".

2.2 Electrical Installation

Remove the braking unit cover and then wire the main circuit and control circuit of the braking unit. Terminals are shown in the following figure.

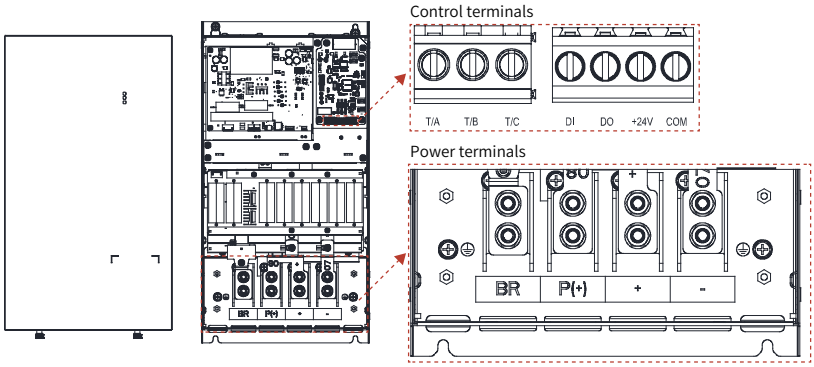


Figure 2 3 Terminal layout of the braking unit

2.2.1 Terminal Functions

1 Functions of power terminals

Table 2-2 Functions of power terminals

Symbol	Name	Description
+ and -	Positive and negative terminals of the DC bus input	Used as the input point of the common DC bus.
P(+), BR	Braking resistor terminals	Used to connect the braking resistor.
⏚	Used for grounding purpose.	Used for grounding purpose.

NOTE

- Do not reverse the polarity of the DC bus terminals (+) and (-). Otherwise, the drive and braking unit will be damaged.
- Do not connect the grounding terminal ⏚ to the neutral conductor of the power supply.
- PE terminal ⏚ : Ground the PE terminal properly with the grounding cable resistance lower than 4 Ω.
- The cable connecting the braking unit and the drive must be a twisted pair cable not longer than 5 m. The cable connecting the braking unit and the braking resistor must be a twisted pair cable not longer than 10 m.

2 Functions of control terminals

Symbol	Name	Description
DI	Digital input (DI)	The input is blocked upon external faults.
TA/TB/TC	Fault relay output	Normally open/normally closed contacts, acting in case of braking unit failure
COM	Common terminal	Reference GND of internal auxiliary power supply

The following figure describes the internal equivalent circuit of the control signal terminal.

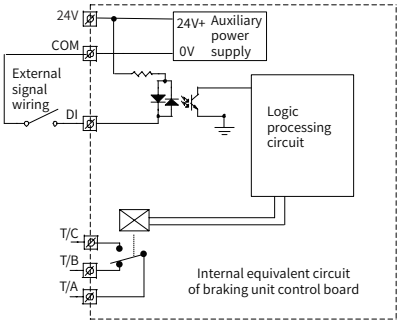


Figure 2 4 Internal equivalent circuit of the control signal terminal

NOTE

- The braking unit can operate upon low level input when DI is used to block input.
- TA/TB is NC contact and TA/TC is NO contact. Specifications of the relay contacts used by TA/TB/TC terminals are as follows:

  NC: 3 A, 250 VAC/1 A, 30 VDC

  NO: 3 A, 250 VAC/1 A, 30 VDC
- Pay attention to the control power of the control coil of the main circuit contactor.

2.2.2 Description of DIP Function

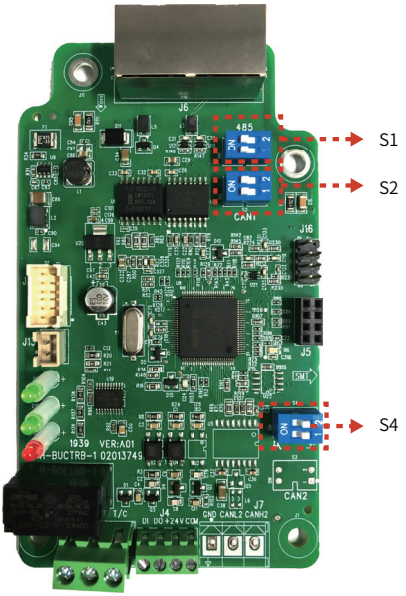


Figure 2 5 DIP function of the braking unit

Symbol	Name	Description
S1	RS485 communication termination resistor	Set 1 and 2 of the DIP switch to ON when connecting the braking unit to the operating panel.
S2	CAN1 communication termination resistor	Set 1 and 2 of the DIP switch on the first and the last units to ON when more than two braking units are connected in parallel.
S4	Master/Slave selection	The slave applies when you set 1 and 2 of the DIP switch to ON. Otherwise, the master applies.

NOTE

- When one braking unit is running, this braking unit must be set as the master.
- When two or more braking units are running in parallel, one of them must be set as the master and the rest as the slave.

2.2.2 Wiring of the Braking Unit

1 Standard wiring scheme 1 (single unit)

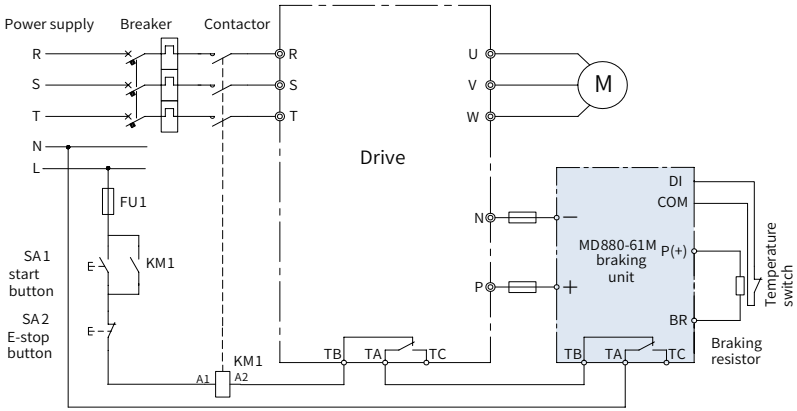


Figure 2 6 Standard wiring scheme 1 (single machine scheme)

NOTE

- Install a fuse to where the bus is connected when using the braking unit.
- In the preceding wiring scheme, TA/TB/TC on the drive side are used for relay fault signal output of the drive, and TA/TB/TC on the braking unit side are used for relay fault signal output of the braking unit.
- In this wiring scheme, the temperature switch is a NC temperature switch used for overtemperature protection of the braking resistor.
- The input voltage class of the contactor control coil is 220 VAC.

2 Standard wiring scheme 2 (paralleled units)

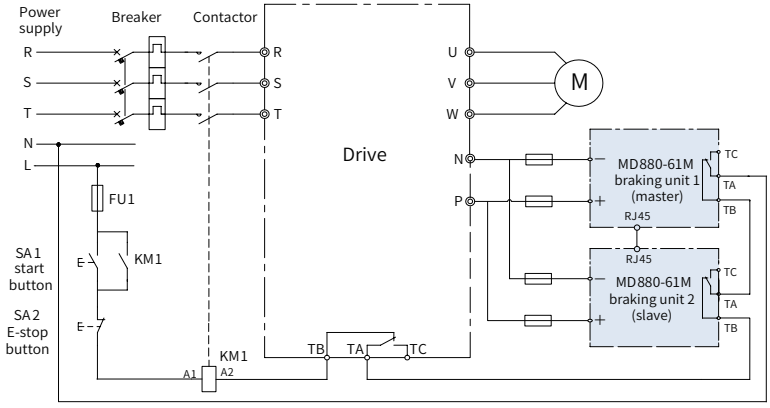


Figure 2 7 Standard wiring scheme 2 (paralleled units)

NOTE

- When multiple braking units are paralleled, each braking unit must be configured with a unique fuse.
- When multiple braking units are connected in parallel, each braking unit must be equipped with a separate braking resistor. Do not connect the output terminals of the braking unit together.
- This wiring scheme is suitable for parallel use of multiple braking units. Wire the braking resistor and temperature switch based on the standard wiring scheme.
- In this wiring scheme, the input voltage class of the contactor control coil is 220 VAC.
- When multiple braking units are used in parallel, one of the braking units must be set as the master and the other braking units must be set as the slave. The master and slaves must be connected in the ring mode using network cables.
- The maximum number of paralleled units is 6.

2.2.3 Recommended Power Cables and Fuses

Table 2-3 2.2.3 Recommended power cables and fuses

Model	R_{min} (Ω)	Cable (Copper)	DC fuse			
		Single-conductor (mm^2)	Model	Quantity	U_n(V)	I_n(A)
MD880-61M-0400-7	2.72	70	170M5146	2	1250	630

3 Commissioning

3.1 Commissioning Procedure

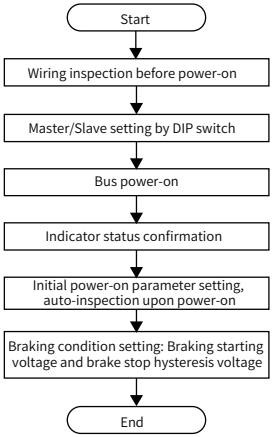


Figure 3-1 Commissioning flowchart

Warning	
	◆ Ensure that an inverter unit is connected to the DC bus before power-on. Generally, the sum of the inverter unit power must be at least 1/3 of the rated power of the braking system (P brmax value).

3.1.1 Inspection Before Wiring

Figure 3-1 Electrical wiring checklist

Compliance (✓)	No.	Description
☐	1	Ensure that the user power line voltage range matches the braking unit voltage class.
☐	2	Check that the incoming line specifications and fuse specifications meet the requirements.
☐	3	Check that the bus input wiring (+/-) is correct and secure.
☐	4	Check that braking unit is connected to the resistor (P(+)/R) properly.
☐	5	Check whether the bus input (+/-) or the resistor (P(+)/R) is short-circuited to ground.
☐	6	Check whether the CAN/RS485 communication cable is short-circuited to ground.
☐	7	Check that the brake resistor temperature switch is wired properly.

3.1.2 Master/Slave Setting Through DIP Switch

Symbol	Name	Description
S1	RS485 communication termination resistor	Set 1 and 2 of the DIP switch to ON when connecting the braking unit to the operating panel.
S2	CAN1 communication termination resistor	Set 1 and 2 of the DIP switch on the first and the last units to ON when more than two braking units are connected in parallel.
S4	Master/Slave selection	The slave applies when you set 1 and 2 of the DIP switch to ON. Otherwise, the master applies.

3.1.3 LED Status Indicators

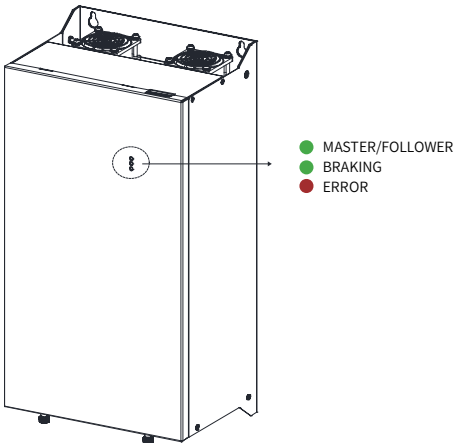


Figure 3-2 Panel of the braking unit

Status		Description
Master/Slave indicator	Flashing	The braking unit is a slave and the LED flashes quickly. The braking unit is in auto-inspection/test mode and the LED flashes slowly.
	ON	The braking unit is the master.
Braking indicator	OFF	The braking unit is in the stop state.
	ON	The braking unit is in the operational state.
Error indicator	OFF	No fault or alarm occurs at present.
	Flashing	The braking unit is in the undervoltage state and the LED flashes slowly. An alarm occurs at present and the LED flashes quickly.
	ON	A fault occurs at present.
Three LEDs flashing simultaneously		The device is being called.

3.1.4 Parameter Setting Upon Initial Power-on

1 Auto-inspection

When using the machine for the first time, connect the braking unit to the drive and braking resistor properly. Then power on the drive to energize the braking unit.

It is recommended to perform auto-detection on the system before use for the first time. This is to check whether the braking unit and peripherals are connected properly. Measure the resistance of the braking resistor.

Param.	Name	Description
A5-10	Auto-detection/test mode enable	0: Disable 1: Enable
A5-13	Auto-detection mode	0: No action 1: Detect the braking resistor
A5-14	Auto-detection request	0: No action 1: Enable
A5-15	Braking resistance measured value	0.00 to 655.35

Set the following in the preparation state:

1) Confirm that the braking unit is not faulty and is in S5 preparation state.

2) Set A5-10 to 1 to enable auto-detection /test mode .

3) Set A5-13 to 1 to detect the braking resistor.

4) Set A5-14 to 1 to perform auto-detection. After the auto-detection is done, the braking unit enters S5 preparation state, and A5-15 displays the measured value of the braking resistor.

5) Finally, set A5-10 to 0 to make the braking unit exit from the auto-detection mode and enter the master/slave operation mode.

2 Setting the actuating threshold of the braking unit

Before normal operation of the braking unit, set the brake starting voltage and brake stop hysteresis voltage properly. The relationship between the actuating threshold of the braking unit and the duty ratio is shown below.

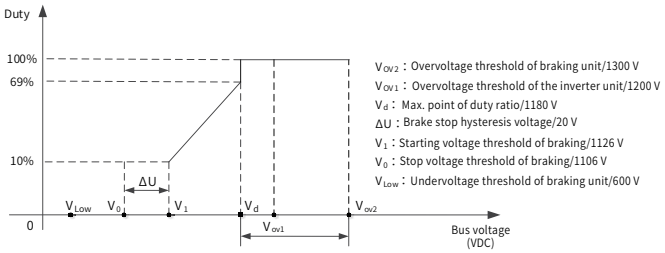


Figure 3-3 Actuating point of the braking unit and the duty ratio

No.	Param.	Description
1	A5-07	Set the starting voltage (V1) of the braking unit in the stop state.
2	A5-08	Set the brake stop hysteresis voltage (ΔU) in the stop state.
3	A8-08	Parameters are copied from RAM to ROM [1].

NOTE

◆ After A5-07 and A5-08 are set properly, the setpoints need to be saved manually through A8-08.

3.2 SOP-20-880 Smart Operating Panel

The braking unit can be connected to an external SOP-20-880 smart operating panel, which allows you to set parameters, monitor status, and locate fault causes, and perform other operations. The following shows the connection with the braking unit.

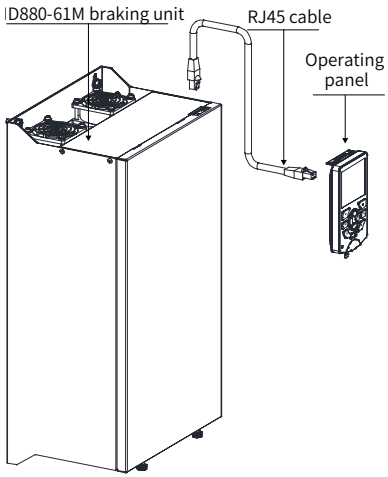


Figure 3-4 Diagram for connecting with the operating panel

3.2.1 Keys and Display

1 Description of Keys

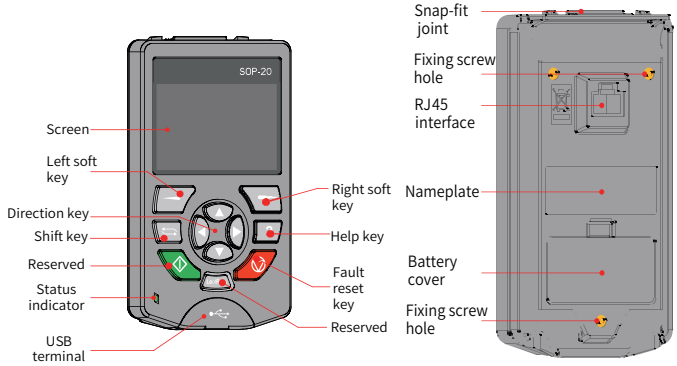
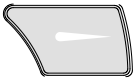
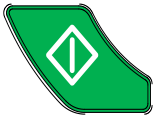
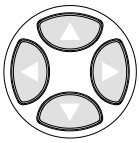


Figure 3-5 Appearance and keys of SOP-20-880

Figure 3-2 Description of SOP-20-880 keys

Key	Name	Function
	Left soft key	Used for exit or cancellation. The soft key at the lower left corner features different functions in different interfaces. For example, this key on the homepage is used to enter the device selection interface.

Key	Name	Function
	Right soft key	Used for selection or confirmation. The soft key at the lower right corner features different functions in different interfaces. For example, this key on the homepage is used to enter the menu interface.
	Reserved	-
	Fault Reset	Used to reset a fault when the device is in the faulty state.
	Reserved	-
	Arrow keys	The up and down keys are used to select options in a displayed menu and list, scroll up and down a text page, and adjust a value (such as setting time, entering a password, or changing a parameter value). The left and right keys are used to move the cursor left and right.

2 Main interface

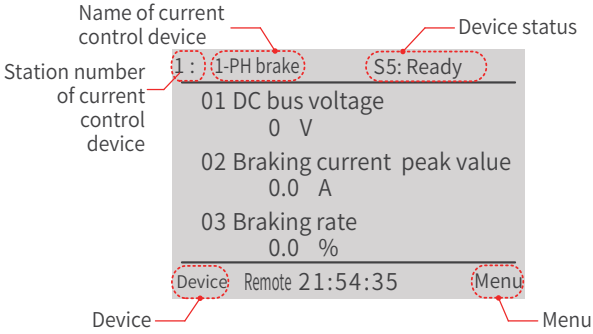


Figure 3-6 Main interface

- Current control device name: Displays the name of the device currently being controlled by SOP-20-880.
- Current control device name: Displays the station number of the device currently being controlled by SOP-20-880.
- Device status: Displays the status of the current device, including state machine, faults, and alarms.

- Device: Used to access the list of devices that are connected to SOP-20-880.
- Menu: Used to access the SOP-20-880 function menu option.

3 Status indicator

Figure 3-3 Status indicator

Indicator	Example	Meaning
Solid green		The device runs normally.
Flashing in green		SOP-20-880 is transmitting data as a relay.
Solid red		SOP-20-880 communicates with the device normally, but the device is faulty.
Flashing in red		The communication between SOP-20-880 and the device has been interrupted.

3.2.2 Connecting to PC in the Relay Mode

You can connect SOP-20-880 to the PC through the type-B mini USB terminal at the bottom. The length of the cable cannot exceed 3 m. USB 2.0 communication protocol is used for communication between SOP-20-880 and PC.

1 Open the USB cover.

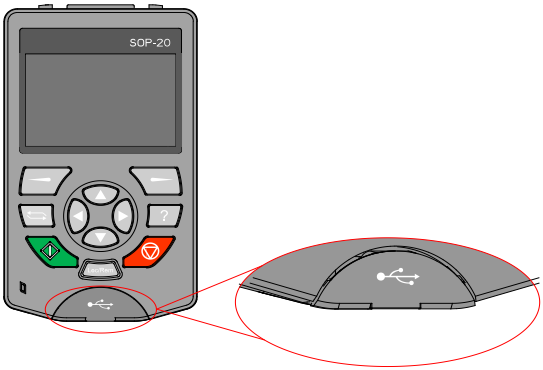


Figure 3-7 Opening the cover of the connecting terminal

2 Plug in the USB cable and connect the cable to the PC. It is recommended to use cables with ferrite magnetic rings.

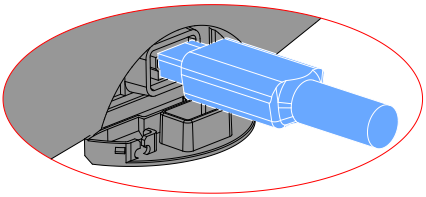


Figure 3-8 Connecting to PC with an USB cable

NOTE

◆ After SOP-20-880 is connected to the PC through an USB cable, the USB relay mode and USB mass storage mode are available.

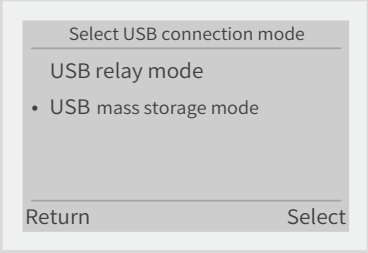


Figure 3-9 SOP-20-880 display after connecting the PC

When "USB relay" is selected, SOP-20-880 can be used as a relay to enable communication between the device and PC. To perform commissioning with InoDriveStudio, use the USB relay mode.
When "USB mass storage" is selected, SOP-20-880 can be used for storage.

◆ For details, see the user guide for SOP-20-880.

4 Parameters

Parameters of the braking unit are grouped by functions and displayed in 3 levels: Axx-nn.

- A indicates the level-I menu, which is represented by a letter, corresponding to a group of functions.
- XX indicates the level-II menu, which is represented by one or two digits, corresponding to the function category when combined with level-I menus.
- nn indicates the level-III menu, which is represented by a 2-digit number, corresponding to a certain parameter when combined with level-I and level-II menus.

Level-II and level-III menus are usually separated by the symbol "-".

4.1 Parameter Groups

Level I Menu No.	Level I Menu Name	Level II Menu No.	Level II Menu Name
A	System	A0	Status monitoring
		A1	Faults and alarms
		A2	Drive information
		A4	Power unit control
		A5	Braking control
		A8	Environment setting
		A10	Commissioning software and operating panel
F	Input/Output	F0	DI
		F1	RO
H	Fault and protection	H0	Fault Handling
		H2	Current fault record
		H3	Record of the latest fault
		H4	Record of the 2nd latest fault
		H5	Record of the 3rd latest fault
		H6	Record of the 4th latest fault
		H7	Record of the 5th latest fault
U	Connector	U0	Bit connector 1
		U1	Bit connector 2
		U5	Word connector 1
		U9	Double-word connector 1

4.2 List of Parameters

There are four different symbols in the column "Change" in the parameter table. The specific meaning of each symbol is as follows:

" ☆ ": The parameter can be changed when the drive is either in stop or running state.

" ★ ": The parameter cannot be changed when the drive is in the running state.

" ● ": The value of the parameter cannot be changed.

"*": The parameter is a factory parameter and can be set only by the manufacturer.

4.2.1Group A System Parameters

Param.	Name	Value range	Unit	Default	Change	Address
Group A0: Status monitoring						
A0-00	Current state machine	0: Invalid 1: Initializing 2: Fault 3: Switch-on blocked 4: Ready to switch on 5: Ready to run 6: Forward run 7: Test run	-	-	●	16603
A0-02	Braking current active value	0.0 to 6553.5	A	-	●	16605
A0-03	DC bus voltage	0.0 to 6553.5	V	-	●	16606
A0-04	Braking current peak value	0.0 to 6553.5	A	-	●	16607
A0-05	Braking power	0.0 to 6553.5	kW	-	●	16608
A0-08	Braking rate	0.0 to 6553.5	%	-	●	16611
A0-11	IGBT module 1 overtemperature	-32767 to +32767	° C	-	●	16614
A0-12	IGBT module 2 overtemperature	-32767 to +32767	° C	-	●	16615
Group A1: Faults and Alarms						
A1-00	Master code of current fault code 1	0 to 65535	-	-	●	16458
A1-01	Sub-code of current fault code 1	0 to 65535	-	-	●	16459
A1-02	Information of current fault code 1	0 to 65535	-	-	●	16460
…	Master code of current fault code *	0 to 65535	-	-	●	By analogy
…	Sub-code of current fault code *	0 to 65535	-	-	●	By analogy

Param.	Name	Value range	Unit	Default	Change	Address
…	Information of current fault code *	0 to 65535	-	-	●	By analogy
A1-15	Master code of current fault code 6	0 to 65535	-	-	●	16473
A1-16	Sub-code of active fault code 6	0 to 65535	-	-	●	16474
A1-17	Information of current fault code 6	0 to 65535	-	-	●	16475
A1-36	Master code of current alarm code 1	0 to 65535	-	-	●	16476
A1-37	Sub-code of active alarm code 1	0 to 65535	-	-	●	16477
A1-38	Information of current alarm code 1	0 to 65535	-	-	●	16478
…	Master code of current alarm code *	0 to 65535	-	-	●	By analogy
…	Sub-code of current alarm code *	0 to 65535	-	-	●	By analogy
…	Information of current alarm code *	0 to 65535	-	-	●	By analogy
A1-51	Master code of current alarm code 6	0 to 65535	-	-	●	16491
A1-52	Sub-code of active alarm code 6	0 to 65535	-	-	●	16492
A1-53	Information of current alarm code 6	0 to 65535	-	-	●	16493
Group A2: Drive information						
A2-00	Product type	7: Single-phase braking	-	-	●	16512
A2-01	Rated power of the module	0.0 to 6553.5	kW	-	●	16513
A2-02	Rated voltage of the module	0 to 65535	V	-	●	16514
A2-03	Rate current of the module	0.0 to 6553.5	A	-	●	16515
A2-09	Software type	0: Standard software 1: Customized software	-	-	●	16536
A2-10	Main software version	0.00 to 655.35	-	-	●	16537
A2-23	Parameter version	0 to 65535	-	-	●	16545
Group A4: Power unit control						
A4-02	Carrier frequency setpoint	1.0	kHz	1	●	237
A4-07	Online correction of AD sampling zero-drift	0: Disable 1: Enable	-	0	☆	145

Param.	Name	Value range	Unit	Default	Change	Address
A4-13	Fan working mode	0: Switched on automatically 1: Switched on forcibly upon power-on	-	0	★	232
A4-16	Low-temperature detection threshold of the module	-20 to -10	° C	-15	★	220
Group A5: Braking control						
A5-00	Braking enable	1: DI	-	1	●	243
A5-01	OFF2 source 1	0: Braking blocked 1: Braking allowed	-	1	☆	241
A5-02	OFF2 source 2	0: Braking blocked 1: Braking allowed Other: B connector	-	1	☆	242
A5-03	Recommended braking resistance	0.00 to 655.35	Ω	0	●	16525
A5-05	Minimum braking resistance	0.00 to 655.35	Ω	0	●	16523
A5-06	Maximum braking resistance	0.00 to 655.35	Ω	0	●	16524
A5-07	Brake starting voltage	1000.0 to 1180.0	V	1126	★	234
A5-08	Brake stop hysteresis voltage	5.0 to 30.0	V	20	★	235
A5-09	Starting brake rate	10.0	%	10	●	236
A5-10	Automatic detection/ test mode enable	0: Disable 1: Enable	-	0	★	129
A5-13	Automatic detection mode	0: No action 1: Detect the braking resistor	-	0	☆	16528
A5-14	Automatic detection request	0: No action 1: Enable	-	0	☆	16529
A5-15	Braking resistance measured value	0.00 to 655.35	Ω	0	●	16530
A5-16	Fault reset source 1	0: Inactive 1: Active Other: B connector	-	0	★	239

Param.	Name	Value range	Unit	Default	Change	Address
A5-17	Fault reset source 2	0: Inactive 1: Active Other: B connector	-	0	★	240
A5-19	Test mode duty ratio	0: Fixed duty ratio 1: Variable duty ratio	-	1	☆	245
A5-20	Test mode start	0: End test 1: Start test	-	0	☆	16527
A5-21	Total test duration of the test mode	0 to 65535	s	0	☆	246
A5-22	Remaining test time of the test mode	0 to 65535	s	0	●	16535
A5-23	Starting braking rate of the test mode	10.0 to 100.0	%	10	☆	247
A5-24	Braking starting voltage of the test mode	600.0 to 1500.0	V	1126	☆	248
A5-25	Brake ON voltage at 100% duty ratio in test mode	600.0 to 1500.0	V	1180	☆	233
A5-29	Permissible continuous braking time	0 to 65000	s	0	★	238
A5-30	Detection on excessive resistance of braking resistor	0: Disable 1: Enable	-	1	☆	221
A5-31	Automatic reset of braking faults	0: Disable 1: Enable	-	1	●	230
A5-32	Automatic braking fault reset interval	0.10 to 600.00	s	5	★	231
A5-35	Braking resistor loss detection	0: Disable 1: Enable	-	1	☆	597
A5-40	CAN baud rate for master/slave control	0: 1 Mbps 1: 500 kbps	-	1	★	128
A5-43	Master/Slave control type source	0: Parameter setting 1: DIP switch	-	1	★	130
A5-44	Master/Slave control type parameter setting	0: Master 1: Slave	-	0	★	131
A5-45	Slave CAN address setting	0: Set by parameter 1: Assigned automatically	-	1	★	132
A5-46	Slave CAN address parameter setting	2 to 15	-	2	★	133
A5-47	Effective CAN address	0 to 65535	-	0	●	16552

Param.	Name	Value range	Unit	Default	Change	Address
A5-48	Master/Slave control PWM carrier synchronization	0: Disable 1: Enable	-	1	★	134
A5-49	Excessive master/ slave DC bus deviation detection threshold	20.0 to 600.0	V	50	☆	144
Group A8: Environment setting						
A8-00	Parameter operation mode	0: No operation 1: Restore partial default settings 2: Restore all default settings 3: Clear records	-	0	★	180
A8-01	Parameter confirmation	0: Cancel 1: Confirm	-	0	★	181
A8-02	Parameter access level	0: Monitoring parameter 1: Basic parameter 2: Expert parameter 3: Maintenance parameter	-	1	☆	65
A8-03	Factory password	0 to 65535	-	0	☆	66
A8-08	Parameters copied from RAM to ROM	0: No action 1: Save all parameters	-	0	★	68
Group A10: Commissioning software and operating panel						
A10-03	SOP-20/Relay communication address	1 to 128	-	1	☆	158
A10-04	SOP-20/Relay communication rate	0: 115200 bps 1: 1 Mbps	-	1	☆	159

4.2.2Group F Inputs/Outputs

Param.	Name	Value range	Unit	Default	Change	Address
Group F0: DI parameters						
F0-00	DI physical state value	0 to 65535	-	0	●	16622
F0-01	Processed DI state value	0 to 65535	-	0	●	16623

Param.	Name	Value range	Unit	Default	Change	Address
F0-02	Forced DI	0 to 1	-	0	☆	538
F0-03	Forced DI data	0 to 1	-	0	☆	539
F0-04	DI positive and negative logic	0 to 1	-	0	☆	537
F0-05	DI filter time	0.000 to 10.000	s	0.01	☆	542
F0-06	DI switch-on delay	0.00 to 360.00	s	0	☆	540
F0-07	DI switch-off delay	0.00 to 360.00	s	0	☆	541
Group F1: RO parameters						
F1-00	RO signal source state value	0 to 65535	-	0	●	16624
F1-01	Processed RO state value	0 to 65535	-	0	●	16625
F1-02	RO positive and negative logic	0 to 1	-	0	☆	548
F1-03	RO signal source	0: Low level 1: High level 2: Customized source combination Other: B connector	-	2	●	551
F1-04	RO switch-on delay	0.00 to 360.00	s	0	☆	549
F1-05	RO switch-off delay	0.00 to 360.00	s	0	☆	550
F1-06	RO output customized source 1	0: Low level 1: High level Other: B connector	-	1120	☆	576
F1-07	RO output customized source 2	0: Low level 1: High level Other: B connector	-	1122	☆	577
F1-08	RO output customized source 3	0: Low level 1: High level Other: B connector	-	1128	☆	578
F1-09	RO output customized source 4	0: Low level 1: High level Other: B connector	-	1137	☆	579
F1-10	RO output customized source 5	0: Low level 1: High level Other: B connector	-	1138	☆	580
F1-11	RO output customized source 6	0: Low level 1: High level Other: B connector	-	0	☆	581

Param.	Name	Value range	Unit	Default	Change	Address
F1-12	RO output customized source 7	0: Low level 1: High level Other: B connector	-	0	☆	582
F1-13	RO output customized source 8	0: Low level 1: High level Other: B connector	-	0	☆	583
F1-14	RO output customized source 9	0: Low level 1: High level Other: B connector	-	0	☆	584
F1-15	RO output customized source 10	0: Low level 1: High level Other: B connector	-	0	☆	585
F1-16	RO output customized source 11	0: Low level 1: High level Other: B connector	-	0	☆	586
F1-17	RO output customized source 12	0: Low level 1: High level Other: B connector	-	0	☆	587
F1-18	RO output customized source 13	0: Low level 1: High level Other: B connector	-	0	☆	588
F1-19	RO output customized source 14	0: Low level 1: High level Other: B connector	-	0	☆	589
F1-20	RO output customized source 15	0: Low level 1: High level Other: B connector	-	0	☆	590
F1-21	RO output customized source 16	0: Low level 1: High level Other: B connector	-	0	☆	591

4.2.3 Group H Faults and Protection

Param.	Name	Value range	Unit	Default	Change	Address
Group H0: Troubleshooting parameters						

Param.	Name	Value range	Unit	Default	Change	Address
H0-00	Source of external fault 1	0: Inactive 1: Active Other: B connector	-	0	☆	249
H0-01	Source of external fault 2	0: Inactive 1: Active Other: B connector	-	0	☆	250
H0-05	Source of external alarm 1	0: Inactive 1: Active Other: B connector	-	0	☆	251
H0-06	Source of external alarm 2	0: Inactive 1: Active Other: B connector	-	0	☆	252
H0-08	Source of customized fault 1	0: Inactive 1: Active Other: B connector	-	0	☆	253
H0-09	Source of customized fault 2	0: Inactive 1: Active Other: B connector	-	0	☆	254
H0-10	Source of customized fault 3	0: Inactive 1: Active Other: B connector	-	0	☆	255
H0-11	Source of customized fault 4	0: Inactive 1: Active Other: B connector	-	0	☆	256
H0-13	Source of customized alarm 1	0: Inactive 1: Active Other: B connector	-	0	☆	257
H0-14	Source of customized alarm 2	0: Inactive 1: Active Other: B connector	-	0	☆	258
H0-15	Source of customized alarm 3	0: Inactive 1: Active Other: B connector	-	0	☆	259
H0-16	Source of customized alarm 4	0: Inactive 1: Active Other: B connector	-	0	☆	260

Param.	Name	Value range	Unit	Default	Change	Address
Group H2: Current fault log						
H2-00	Master code of current fault 1	0 to 65535	-	0	●	269
H2-01	Sub-code of current fault 1	0 to 65535	-	0	●	270
H2-02	Information of current fault 1	0 to 65535	-	0	●	271
H2-03	Master code of current fault 2	0 to 65535	-	0	●	272
H2-04	Sub-code of current fault 2	0 to 65535	-	0	●	273
H2-05	Information of current fault 2	0 to 65535	-	0	●	274
H2-06	Master code of current fault 3	0 to 65535	-	0	●	275
H2-07	Sub-code of current fault 3	0 to 65535	-	0	●	276
H2-08	Information of current fault 3	0 to 65535	-	0	●	277
H2-09	Master code of current fault 4	0 to 65535	-	0	●	278
H2-10	Sub-code of current fault 4	0 to 65535	-	0	●	279
H2-11	Information of current fault 4	0 to 65535	-	0	●	280
H2-12	Master code of current fault 5	0 to 65535	-	0	●	281
H2-13	Sub-code of current fault 5	0 to 65535	-	0	●	282
H2-14	Information of current fault 5	0 to 65535	-	0	●	283
H2-15	Master code of current fault 6	0 to 65535	-	0	●	284
H2-16	Sub-code of current fault 6	0 to 65535	-	0	●	285
H2-17	Information of current fault 6	0 to 65535	-	0	●	286
H2-18	DC bus voltage of current fault	0.0 to 6553.5	V	0	●	287
H2-19	Braking current of current fault	0.0 to 6553.5	A	0	●	288
H2-20	Braking rate of current fault	0.0 to 6553.5	%	0	●	289
H2-21	Temperature of current fault module 1	-32768 to +32676	° C	0	●	290
H2-22	Temperature of current fault module 2	-32768 to +32676	° C	0	●	291

Param.	Name	Value range	Unit	Default	Change	Address
H2-23	Status word of current fault	0x0000 to 0xFFFF	-	0	●	292
H2-24	Accumulative power-on hours of current fault	0 to 65535	h	0	●	293
H2-25	Accumulative power-on seconds of current fault	0 to 65535	s	0	●	294
H2-26	Reserved	0 to 65535	-	0	●	295
Group H3: Log of the latest fault						
H3-00	Master code of the latest fault 1	0 to 65535	-	0	●	301
H3-01	Sub-code of the latest fault 1	0 to 65535	-	0	●	302
H3-02	Information of the latest fault 1	0 to 65535	-	0	●	303
H3-03	Master code of the latest fault 2	0 to 65535	-	0	●	304
H3-04	Sub-code of the latest fault 2	0 to 65535	-	0	●	305
H3-05	Information of the latest fault 2	0 to 65535	-	0	●	306
H3-06	Master code of the latest fault 3	0 to 65535	-	0	●	307
H3-07	Sub-code of the latest fault 3	0 to 65535	-	0	●	308
H3-08	Information of the latest fault 3	0 to 65535	-	0	●	309
H3-09	Master code of the latest fault 4	0 to 65535	-	0	●	310
H3-10	Sub-code of the latest fault 4	0 to 65535	-	0	●	311
H3-11	Information of the latest fault 4	0 to 65535	-	0	●	312
H3-12	Master code of the latest fault 5	0 to 65535	-	0	●	313
H3-13	Sub-code of the latest fault 5	0 to 65535	-	0	●	314
H3-14	Information of the latest fault 5	0 to 65535	-	0	●	315
H3-15	Master code of the latest fault 6	0 to 65535	-	0	●	316
H3-16	Sub-code of the latest fault 6	0 to 65535	-	0	●	317
H3-17	Information of the latest fault 6	0 to 65535	-	0	●	318
H3-18	DC bus voltage of the latest fault	0.0 to 6553.5	V	0	●	319
H3-19	Braking current of the latest fault	0.0 to 6553.5	A	0	●	320

Param.	Name	Value range	Unit	Default	Change	Address
H3-20	Braking rate of the latest fault	0.0 to 6553.5	%	0	●	321
H3-21	Module 1 temperature upon the latest fault	-32768 to +32676	° C	0	●	322
H3-22	Module 2 temperature upon the latest fault	-32768 to +32676	° C	0	●	323
H3-23	Status of the latest fault	0x0000 to 0xFFFF	-	0	●	324
H3-24	Accumulative power-on hours of the latest fault	0 to 65535	h	0	●	325
H3-25	Accumulative power-on seconds of the latest fault	0 to 65535	s	0	●	326
H3-26	Reserved	0 to 65535	-	0	●	327
Group H4: Log of the 2nd latest fault						
H4-00	Master code of the 2nd latest fault 1	0 to 65535	-	0	●	333
H4-01	Sub-code of the 2nd latest fault 1	0 to 65535	-	0	●	334
H4-02	Information of the 2nd latest fault 1	0 to 65535	-	0	●	335
H4-03	Master code of the 2nd latest fault 2	0 to 65535	-	0	●	336
H4-04	Sub-code of the 2nd latest fault 2	0 to 65535	-	0	●	337
H4-05	Information of the 2nd latest fault 2	0 to 65535	-	0	●	338
H4-06	Master code of the 2nd latest fault 3	0 to 65535	-	0	●	339
H4-07	Sub-code of the 2nd latest fault 3	0 to 65535	-	0	●	340
H4-08	Information of the 2nd latest fault 3	0 to 65535	-	0	●	341
H4-09	Master code of the 2nd latest fault 4	0 to 65535	-	0	●	342
H4-10	Sub-code of the 2nd latest fault 4	0 to 65535	-	0	●	343
H4-11	Information of the 2nd latest fault 4	0 to 65535	-	0	●	344
H4-12	Master code of the 2nd latest fault 5	0 to 65535	-	0	●	345
H4-13	Sub-code of the 2nd latest fault 5	0 to 65535	-	0	●	346
H4-14	Information of the 2nd latest fault 5	0 to 65535	-	0	●	347
H4-15	Master code of the 2nd latest fault 6	0 to 65535	-	0	●	348

Param.	Name	Value range	Unit	Default	Change	Address
H4-16	Sub-code of the 2nd latest fault 6	0 to 65535	-	0	●	349
H4-17	Information of the 2nd latest fault 6	0 to 65535	-	0	●	350
H4-18	DC bus voltage upon the 2nd latest fault	0.0 to 6553.5	V	0	●	351
H4-19	Braking current upon the 2nd latest fault	0.0 to 6553.5	A	0	●	352
H4-20	Braking rate upon the 2nd latest fault	0.0 to 6553.5	%	0	●	353
H4-21	Module 1 temperature upon the 2nd latest fault	-32768 to +32676	° C	0	●	354
H4-22	Module 2 temperature upon the 2nd latest fault	-32768 to +32676	° C	0	●	355
H4-23	Status word of the 2nd latest fault	0x0000 to 0xFFFF	-	0	●	356
H4-24	Accumulative power-on hours of the 2nd latest fault	0 to 65535	h	0	●	357
H4-25	Accumulative power-on seconds of the 2nd latest fault	0 to 65535	s	0	●	358
H4-26	Reserved	0 to 65535	-	0	●	359
Group H5: Log of the 3rd latest fault						
H5-00	Master code of the 3rd latest fault 1	0 to 65535	-	0	●	365
H5-01	Sub-code of the 3rd latest fault 1	0 to 65535	-	0	●	366
H5-02	Information of the 3rd latest fault 1	0 to 65535	-	0	●	367
H5-03	Master code of the 3rd latest fault 2	0 to 65535	-	0	●	368
H5-04	Sub-code of the 3rd latest fault 2	0 to 65535	-	0	●	369
H5-05	Information of the 3rd latest fault 2	0 to 65535	-	0	●	370
H5-06	Master code of the 3rd latest fault 3	0 to 65535	-	0	●	371
H5-07	Sub-code of the 3rd latest fault 3	0 to 65535	-	0	●	372
H5-08	Information of the 3rd latest fault 3	0 to 65535	-	0	●	373
H5-09	Master code of the 3rd latest fault 4	0 to 65535	-	0	●	374
H5-10	Sub-code of the 3rd latest fault 4	0 to 65535	-	0	●	375
H5-11	Information of the 3rd latest fault 4	0 to 65535	-	0	●	376

Param.	Name	Value range	Unit	Default	Change	Address
H5-12	Master code of the 3rd latest fault 5	0 to 65535	-	0	●	377
H5-13	Sub-code of the 3rd latest fault 5	0 to 65535	-	0	●	378
H5-14	Information of the 3rd latest fault 5	0 to 65535	-	0	●	379
H5-15	Master code of the 3rd latest fault 6	0 to 65535	-	0	●	380
H5-16	Sub-code of the 3rd latest fault 6	0 to 65535	-	0	●	381
H5-17	Information of the 3rd latest fault 6	0 to 65535	-	0	●	382
H5-18	DC bus voltage upon the 3rd latest fault	0.0 to 6553.5	V	0	●	383
H5-19	Braking current upon the 3rd latest fault	0.0 to 6553.5	A	0	●	384
H5-20	Braking rate upon the 3rd latest fault	0.0 to 6553.5	%	0	●	385
H5-21	Module 1 temperature upon the 3rd latest fault	-32768 to +32676	° C	0	●	386
H5-22	Module 2 temperature upon the 3rd latest fault	-32768 to +32676	° C	0	●	387
H5-23	Status word of the 3rd latest fault	0x0000 to 0xFFFF	-	0	●	388
H5-24	Accumulative power-on hours of the 3rd latest fault	0 to 65535	h	0	●	389
H5-25	Accumulative power-on seconds of the 3rd latest fault	0 to 65535	s	0	●	390
H5-26	Reserved	0 to 65535	-	0	●	391
Group H6: Log of the 4th latest fault						
H6-00	Master code of the 4th latest fault 1	0 to 65535	-	0	●	397
H6-01	Sub-code of the 4th latest fault 1	0 to 65535	-	0	●	398
H6-02	Information of the 4th latest fault 1	0 to 65535	-	0	●	399
H6-03	Master code of the 4th latest fault 2	0 to 65535	-	0	●	400
H6-04	Sub-code of the 4th latest fault 2	0 to 65535	-	0	●	401
H6-05	Information of the 4th latest fault 2	0 to 65535	-	0	●	402
H6-06	Master code of the 4th latest fault 3	0 to 65535	-	0	●	403

Param.	Name	Value range	Unit	Default	Change	Address
H6-07	Sub-code of the 4th latest fault 3	0 to 65535	-	0	●	404
H6-08	Information of the 4th latest fault 3	0 to 65535	-	0	●	405
H6-09	Master code of the 4th latest fault 4	0 to 65535	-	0	●	406
H6-10	Sub-code of the 4th latest fault 4	0 to 65535	-	0	●	407
H6-11	Information of the 4th latest fault 4	0 to 65535	-	0	●	408
H6-12	Master code of the 4th latest fault 5	0 to 65535	-	0	●	409
H6-13	Sub-code of the 4th latest fault 5	0 to 65535	-	0	●	410
H6-14	Information of the 4th latest fault 5	0 to 65535	-	0	●	411
H6-15	Master code of the 4th latest fault 6	0 to 65535	-	0	●	412
H6-16	Sub-code of the 4th latest fault 6	0 to 65535	-	0	●	413
H6-17	Information of the 4th latest fault 6	0 to 65535	-	0	●	414
H6-18	DC bus voltage upon the 4th latest fault	0.0 to 6553.5	V	0	●	415
H6-19	Braking current upon the 4th latest fault	0.0 to 6553.5	A	0	●	416
H6-20	Braking rate of the 4th latest fault	0.0 to 6553.5	%	0	●	417
H6-21	Module 1 temperature of the 4th latest fault	-32768 to +32676	° C	0	●	418
H6-22	Module 2 temperature of the 4th latest fault	-32768 to +32676	° C	0	●	419
H6-23	Status word of the 4th latest fault	0x0000 to 0xFFFF	-	0	●	420
H6-24	Accumulative power-on hours of the 4th latest fault	0 to 65535	h	0	●	421
H6-25	Accumulative power-on seconds of the 4th latest fault	0 to 65535	s	0	●	422
H6-26	Reserved	0 to 65535	-	0	●	423
Group H7: Log of the 5th latest fault						
H7-00	Master code of the 5th latest fault 1	0 to 65535	-	0	●	429
H7-01	Sub-code of the 5th latest fault 1	0 to 65535	-	0	●	430
H7-02	Information of the 5th latest fault 1	0 to 65535	-	0	●	431

Param.	Name	Value range	Unit	Default	Change	Address
H7-03	Master code of the 5th latest fault 2	0 to 65535	-	0	●	432
H7-04	Sub-code of the 5th latest fault 2	0 to 65535	-	0	●	433
H7-05	Information of the 5th latest fault 2	0 to 65535	-	0	●	434
H7-06	Master code of the 5th latest fault 3	0 to 65535	-	0	●	435
H7-07	Sub-code of the 5th latest fault 3	0 to 65535	-	0	●	436
H7-08	Information of the 5th latest fault 3	0 to 65535	-	0	●	437
H7-09	Master code of the 5th latest fault 4	0 to 65535	-	0	●	438
H7-10	Sub-code of the 5th latest fault 4	0 to 65535	-	0	●	439
H7-11	Information of the 5th latest fault 4	0 to 65535	-	0	●	440
H7-12	Master code of the 5th latest fault 5	0 to 65535	-	0	●	441
H7-13	Sub-code of the 5th latest fault 5	0 to 65535	-	0	●	442
H7-14	Information of the 5th latest fault 5	0 to 65535	-	0	●	443
H7-15	Master code of the 5th latest fault 6	0 to 65535	-	0	●	444
H7-16	Sub-code of the 5th latest fault 6	0 to 65535	-	0	●	445
H7-17	Information of the 5th latest fault 6	0 to 65535	-	0	●	446
H7-18	DC bus voltage of the 5th latest fault	0.0 to 6553.5	V	0	●	447
H7-19	Braking current of the 5th latest fault	0.0 to 6553.5	A	0	●	448
H7-20	Braking rate of the 5th latest fault	0.0 to 6553.5	%	0	●	449
H7-21	Module 1 temperature of the 5th latest fault	-32768 to +32676	° C	0	●	450
H7-22	Module 2 temperature of the 5th latest fault	-32768 to +32676	° C	0	●	451
H7-23	Status word of the 5th latest fault	0x0000 to 0xFFFF	-	0	●	452
H7-24	Accumulative power-on hours of the 5th latest fault	0 to 65535	h	0	●	453
H7-25	Accumulative power-on seconds of the 5th latest fault	0 to 65535	s	0	●	454

Param.	Name	Value range	Unit	Default	Change	Address
H7-26	Reserved	0 to 65535	-	0	●	455

4.2.4 GroupU Connector Parameters

The connector refers specifically to group U parameters, which are used to save and display intermediate variables in system control. Connectors can be divided into digital type (corresponding to groups U0 and U1) and analog type (corresponding to groups U5 and U9) according to the data type.

Analog connectors can be divided into single-word (16-bit, accounting for one storage address, corresponding to group U5) and double-word (32-bit, accounting for two storage addresses, corresponding to group U9) types according to the data type.The double-word connector can represent more valid digits to improve the value precision.

Analog connectors can be divided into three main categories by unit: the per unit value (expressed as a percentage relative to a certain reference value), the actual value (in V/A/kW, with actual physical significance), and the unitless value (for example, the data received through communication can only be displayed as original values, which means the actual physical meaning cannot be determined).

For representation of the per unit value system, the following rules are used:

(1) Corresponding to single-word connector: 0x1000 (decimal 4096) represents 100%. You can choose to display the actual value (Value) or per unit value (Percent) for display. The conversion relationship is as follows: Percent= Value/4096.

(2) Corresponding to double-word connector: 0x1000 0000 (4096 x 65536) represents 100%. You can choose to display the actual value (Value) or per unit value (Percent) for display. The conversion relationship is as follows: Percent= Value/4096/65536.

(3) The value ranges of per unit values that can be represented by single-word and double-word connectors are the same, both of which are -799.99% to +799.99%.

Single-word and double-word connectors can be converted mutually. When assigning a single-word connector value to a double-word connector, the low word is 0 and the high word is the value of a single-word connector; when assigning a double-word connector value to a single-word connector, the low word is discarded, and the high word is directly assigned to the single-word connector, which is equivalent to a decrease in the number of valid digits of the value, but the range of values has not changed.

1 Connector groups

Group No.	Name	Range	Description
U0	Bit connector 1	1-bit	I/O digital status of DI and RO

Group No.	Name	Range	Description
U1	Bit connector 2	1-bit	(1) System state (2) Braking unit operation status (3) Fault status bit (4) DIP switch state of the master/slave
U5	Word connector 1	16-bit	(1) Including system internal control words, internal status words, state machine, working modes (2) Basic monitoring variables of operation state (3) Including DC bus voltage, braking current, braking power, module temperature (4) Including AD sampling value such as DC bus voltage, braking current, and module temperature (5) Present fault and alarm (6) Including SOP-20 control words, InoDriveStudio control words
U9	Double-word connector 1	32-bit	Time statistics

2 List of connectors

■ Bit connector

Param.	Name	Unit	Address
Group U0: Bit connector 1			
U0-00	Logic 0	-	30720
U0-01	Logic 1	-	30721
U0-02	DI	-	30722
U0-03	RO	-	30723
U0-06	DI inversion	-	30726
U0-07	RO inversion	-	30727
U0-10	Original DI status	-	30730
U0-11	Original RO status	-	30731
Group U1: Bit connector 2			
U1-00	Ready to switch on	-	30820
U1-01	Switch-on blocked	-	30821
U1-02	Ready to run	-	30822
U1-03	Forward run	-	30823
U1-04	Not running	-	30824
U1-05	Fault activated	-	30825
U1-06	Alarm activated	-	30826
U1-07	No fault	-	30827
U1-08	No alarm	-	30828

Param.	Name	Unit	Address
U1-09	DC bus charged flag	-	30829
U1-10	Zero drift detection on braking current completed	-	30830
U1-11	OFF2 activated	-	30831
U1-12	Braking enable	-	30832
U1-13	Braking resistor detection completion flag	-	30833
U1-14	Fan control command	-	30834
U1-15	FLASH operation busy	-	30835
U1-16	Reserved	-	30836
U1-17	Reserved	-	30837
U1-18	Reserved	-	30838
U1-19	Reserved	-	30839
U1-20	Current sampling zero drift too large	-	30840
U1-21	Overvoltage fault	-	30841
U1-22	Hardware overcurrent	-	30842
U1-23	Software overcurrent	-	30843
U1-24	Drive overload	-	30844
U1-25	Reserved	-	30845
U1-26	Braking resistor deviation too large	-	30846
U1-27	Resistance of braking resistor too large	-	30847
U1-28	Resistance of braking resistor too small	-	30848
U1-29	IGBT module 1 overtemperature	-	30849
U1-30	IGBT module 2 overtemperature	-	30850
U1-31	IGBT module 1 low temperature	-	30851
U1-32	IGBT module 2 low temperature	-	30852
U1-33	External fault	-	30853
U1-34	External alarm	-	30854
U1-35	Customized fault	-	30855
U1-36	Customized alarm	-	30856
U1-37	Continuous braking timeout	-	30857
U1-38	Braking not enabled (DI)	-	30858
U1-39	Reserved	-	30859
U1-40	Reserved	-	30860
U1-41	DIP switch status of the master/slave	-	30861
U1-42	DIP switch status of the master/slave (filter)	-	30862

■ Single-word connector

Param.	Name	Unit	Address
Group U5: Word connector 1			
U5-00	DC bus voltage (filtered with 200 ms)	V	24576
U5-01	Braking current peak value	A	24577
U5-02	Braking power	kW	24578
U5-03	DC bus voltage	V	24579
U5-04	Braking rate	%	24580
U5-05	Working mode	-	24581
U5-06	Reserved	-	24582
U5-07	Reserved	-	24583
U5-08	IGBT module 1 overtemperature	° C	24584
U5-09	IGBT module 2 overtemperature	° C	24585
U5-15	Master code of current fault	-	24591
U5-16	Sub-code of current fault	-	24592
U5-19	Master code of current alarm	-	24595
U5-20	Sub-code of current alarm	-	24596
U5-21	Internal status word 1	-	24597
U5-22	Internal status word 2	-	24598
U5-23	Internal status word 3	-	24599
U5-24	Internal status word 4	-	24600
U5-25	SOP-20 command word	-	24601
U5-26	IDS command word	-	24602
U5-27	System status word	-	24603
U5-28	Reserved	-	24604
U5-29	Reserved	-	24605
U5-30	Current state machine	-	24606
U5-31	Last state machine	-	24607
U5-32	Second to last state machine	-	24608
U5-33	Third to last state machine	-	24609
U5-34	Fourth to last state machine	-	24610
U5-35	Zero drift of braking current	A	24611
U5-36	AD sampling voltage of DC bus voltage	V	24612
U5-37	AD sampling voltage of braking current	V	24613
U5-38	AD sampling value of DC bus voltage	-	24614
U5-39	AD sampling value of braking current	-	24615
U5-40	AD sampling value of module temperature 1	-	24616

Param.	Name	Unit	Address
U5-41	AD sampling value of module temperature 2	-	24617
U5-42	AD sampling value based on 0 V	-	24618
U5-43	AD sampling value based on 1.5 V	-	24619
U5-44	Original value of braking current	A	24620
U5-45	NTC resistance of IGBT module 1 temperature	Ω	24621
U5-46	NTC resistance of IGBT module 2 temperature	Ω	24622
U5-47	Voltage value after correction of IGBT module 1 temperature	V	24623
U5-48	Voltage value after correction of IGBT module 2 temperature	V	24624
U5-49	DC bus voltage (filtered with 2 ms)	V	24625
U5-50	Reserved	-	24626

■ Double-wordconnector

Param.	Name	Unit	Address
Group U9: Double-word connector 1			
U9-00	Duration of operation	s	28672
U9-01	Accumulative operation time	s	28674
U9-02	Power-on time of main circuit of current operation	s	28676
U9-03	Accumulative power-on time of main circuit	s	28678

5 Troubleshooting

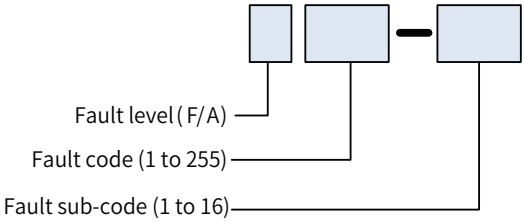
5.1 Fault Mechanism

5.1.1 Fault Levels

Depending on the degree of urgency, failures can be divided into faults and alarms:

- Fault: Used to indicate that a major fault or error has occurred and the device stops running immediately.
- Alarm: Used to indicate that an error has occurred, without affecting operation state.

Fault codes are represented by three segments, in which F represents Fault, and A represents Alarm, as shown below:



5.1.2 Fault View

Faults are represented by fault codes and fault sub-codes, which indicate the classification of faults. Fault sub-codes are used to locate specific faults.

1 Active Fault

The braking unit can record up to six faults that occur at the same time. When more than six faults occur at the same time, the subsequent faults will not be recorded. Faults activated currently can be viewed in group A1.

Param.	Description
A1-00 to A1-17	Current fault
A1-36 to A1-53	Current alarm

2 Previous faults and fault data

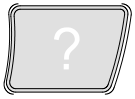
The braking unit records the information, time, and operation data upon occurrence of the latest six faults.

Param.	Description
H2 group	Information and data of current fault
H3 group	Information and data of the latest fault
H4 group	Information and data of the 2nd latest fault

Param.	Description
H5 group	Information and data of the 3rd latest fault
H6 group	Information and data of the 4th latest fault
H7 group	Information and data of the 5th latest fault

3 Viewing fault through the SOP-20-880

The SOP-20-880 allows you to view the fault information through previous parameters or the fault menu.

Function	Key	Description
Viewing current fault	Key operations	Go to Menu > Fault status > Fault.
Viewing current alarm	Key operations	Go to Menu > Fault status > Alarm.
Viewing the help information of the fault		Select a fault and press the help key. The help information about the fault is displayed.
Viewing previous faults	Key operations	Go to Menu > Fault status > History fault.

4 Viewing faults through the InoDriveStudio

When using InoDriveStudio, you can view the fault on the Fault/Alarm table interface.

On the Fault/Alarm table interface, you can view the fault descriptions, fault causes and solutions, and data recorded when the fault occurs.

5.1.3 Fault Reset

The braking unit supports four fault reset modes: power cycling, reset of SOP-20-880, reset of InoDriveStudio, and automatic reset of parameter setting.

Method	Description
Power cycling	The device control board can be powered on again.
SOP-20-880	After connecting to the SOP-20, press the STOP key on any interface to reset the fault. See details in *"3.2.1 Keys and Display"*.
InoDriveStudio	After connection, click the Reset Current Fault button in the Fault/Alarm table to reset the fault.
Setting	Set A5-31 to 1 (Non-modifiable). Set A5-32 properly to automatically reset the fault.

5.2 List of Faults

Fault Code	Fault Name	Possible Cause	Solution	Fault Reset
1-1	Current detection circuit error	1. The current zero drift detected in the stop state is too large. 2. The current detection module is abnormal. 3. You can check the current detection value through U5-44 in the stop state.	1. Check whether the cable connecting the control board and power module is disconnected or loose. 2. Replace the power module. 3. Ask for technical support.	Manual reset
2-1	Hardware overcurrent	1. The resistance of the brake is too low or the braking resistor is short circuited. 2. The braking resistor is short-circuited.	1. Select a proper braking resistor. 2. Check whether the braking resistor is short-circuited. 3. The driver board or Hall element may be faulty if not other interference sources exist. 4. Ask for technical support.	Reset by power-off
2-2	Software overcurrent	1. A4-09 is set improperly. 2. The resistance of the brake is too low. 3. The braking resistor is short-circuited.	1. Set A4-09 properly. 2. Select a proper braking resistor. 3. Check whether the braking resistor is short-circuited. 4. The driver board or Hall element may be faulty if not other interference sources exist. 5. Ask for technical support.	Reset by power-off/ manually (A5-16 changed from 0 → 1/ A5-17 changed from 0 → 1)

Fault Code	Fault Name	Possible Cause	Solution	Fault Reset
5-1	DC bus voltage too high	1. The regenerative energy is too high 2. The braking resistor is improper. 3. The power of the brake is too low. 4. A5-07 is set improperly. 5. A3-13...A3-16 are set improperly.	1. Check whether the regenerative energy of the DC bus device is too large. 2. Check whether the braking resistor carries the recommended resistance. 3. Check whether the braking energy calculated by the system matches the power of the brake. 4. Set A5-07 properly. 5. Set A3-13...A3-16 properly. 6. Ask for technical support.	Reset automatically
10-1	Drive overload	1. The load is too heavy. 2. The power of the drive is too low. 3. The braking resistor is set improperly.	1. Reduce the load. 2. Select the drive of the matching power rating. 3. Use a proper braking resistor. 4. Ask for technical support.	Reset automatically
11-1	Braking resistor overload	The braking resistor used is improper.	1. Configure a braking resistor with the recommended resistance. 2. Contact the agent or Inovance.	Reset automatically
14-1	Module 1 overtemperature	1. The ambient temperature is high. 2. The air filter is clogged. 3. The fan is damaged. 4. The thermistor is faulty. 5. The module is damaged.	1. Reduce the ambient temperature. 2. Clean the air filter. 3. Replace the fan. 4. Ask for technical support.	Reset automatically

Fault Code	Fault Name	Possible Cause	Solution	Fault Reset
14-2	Module 2 overtemperature	1. The ambient temperature is high. 2. The air filter is clogged. 3. The fan is damaged. 4. The thermistor is faulty. 5. The module is damaged.	1. Reduce the ambient temperature. 2. Clean the air filter. 3. Replace the fan. 4. Ask for technical support.	Reset automatically
15-1	External fault 1	1. H0-00 is set improperly. 2. The setting source of H0-00 is active.	1. Set H0-00 to 0. 2. Set a proper value for H0-00. 3. Check whether the setting source is active.	Reset automatically
15-2	External fault 2	1. H0-01 is set incorrectly. 2. The setting source of H0-01 is active.	1. Set H0-01 to 0. 2. Set H0-01 properly. 3. Check whether the setting source is active.	Reset automatically
15-3	DI (brake enable) not activated	The DI signal is in inactive state.	1. Check whether the DI (brake enable) is inactive. 2. Check whether the DI wiring is proper.	Automatic reset/Reset by power-off (as defined by A5-33)
22-1	Braking resistance too high (A5-30 is used to set whether to enable the fault.)	1. The braking circuit is disconnected. 2. The braking resistor is too large. 3. The braking current sampling is abnormal.	1. Replace with proper braking resistor. 2. Check whether the braking resistor circuit is disconnected. 3. Check whether the resistance of the braking resistor is too large. 4. Check whether the current sampling during braking	Reset by power-off

Fault Code	Fault Name	Possible Cause	Solution	Fault Reset
22-2	Braking resistance too low	1. The braking resistance detected is too low. 2. The braking current sampling is abnormal.	1. Replace with a proper braking resistor. 2. Check whether the current sampling during braking is normal. If not, replace the power module. 3. Ask for technical support.	Reset by power-off
22-3	Braking resistor detection loss	1. The braking circuit is disconnected. 2. The braking resistance is too high. 3. The braking current sampling is abnormal.	1. Check whether the brake resistor circuit is disconnected. 2. Check whether the resistance of the braking resistor is too high. 3. Check whether current sampling is normal during braking. If not, replace the power module. 4. Ask for technical support.	Reset by power-off/ automatically (A5-35 = 0)
27-1	Customized fault 1	1. H0-08 is set improperly. 2. The setting source of H0-08 is active.	1. Set H0-08 to 0. 2. Set a proper value for H0-08. 3. Check the setting source.	Reset automatically
27-2	Customized fault 2	1. H0-09 is set incorrectly. 2. The setting source of H0-09 is active.	1. Set H0-09 to 0. 2. Set a proper value for H0-09. 3. Check the setting source.	Reset automatically
27-3	Customized fault 3	1. H0-10 is set incorrectly. 2. The setting source of H0-10 is active.	1. Set H0-10 to 0. 2. Set a proper value for H0-10. 3. Check the setting source.	Reset automatically
27-4	Customized fault 4	1. H0-11 is set incorrectly. 2. The setting source of H0-11 is active.	1. Set H0-11 to 0 2. Set a proper value for H0-11 3. Check the setting source	Reset automatically

Fault Code	Fault Name	Possible Cause	Solution	Fault Reset
28-1	Customized alarm 1	1. H0-13 is set incorrectly. 2. The setting source of H0-13 is active.	1. Set H0-13 to 0. 2. Set a proper value for H0-13. 3. Check the setting source.	Reset automatically
28-2	Customized alarm 2	1. H0-14 is set incorrectly. 2. The setting source of H0-14 is active.	1. Set H0-14 to 0. 2. Set a proper value for H0-14. 3. Check the setting source.	Reset automatically
28-3	Customized alarm 3	1. H0-15 is set incorrectly. 2. The setting source of H0-15 is active.	1. Set H0-15 to 0 2. Set a proper value for H0-15 3. Check the setting source	Reset automatically
28-4	Customized alarm 4	1. H0-16 is set incorrectly. 2. The setting source of H0-16 is active.	1. Set H0-16 to 0 2. Set a proper value for H0-16 3. Check the setting source	Reset automatically
46-1	Parameter setting error	Double-click to see detailed fault descriptions.	-	Reset automatically
50-3	The FLASH memory is faulty.	1. The FLASH memory is abnormal.	Contact Inovance for technical support.	Reset by power-off
59-1	Module 1 temperature too low	1. The ambient temperature is too low. 2. A4-16 is set to an excessively high value. 3. The thermistor is faulty or the thermistor circuit is disconnected. 4. The module is damaged.	1. Increase the ambient temperature. 2. Set A4-16 properly. 3. Ask for technical support.	Reset automatically
59-2	Module 2 temperature too low	1. The ambient temperature is too low. 2. A4-16 is set to an excessively high value. 3. The thermistor is faulty or the thermistor circuit is disconnected. 4. The module is damaged.	1. Increase the ambient temperature. 2. Set A4-16 properly. 3. Ask for technical support.	Reset automatically

Fault Code	Fault Name	Possible Cause	Solution	Fault Reset
63-1	External alarm 1	1. H0-05 is set incorrectly. 2. The setting source of H0-05 is active.	1. Set H0-05 to 0. 2. Set a proper value for H0-05. 3. Check whether the setting source is active.	Reset automatically
63-2	External alarm 2	1. H0-06 is set incorrectly. 2. The setting source of H0-06 is active.	1. Set H0-06 to 0. 2. Set a proper value for H0-06. 3. Check whether the setting source is active.	Reset automatically
63-4	OFF2 activated	The OFF2 signal set by A5-01 or A5-02 has been activated.	Check whether the OFF2 signal set by A5-01 or A5-02 is inactive.	Reset automatically
82-1	RS485 communication timeout	Timeout occurred during normal communication between the braking unit and external device.	Check the wiring between the braking unit and external device.	Reset automatically
83-1	Master offline	1. The slave fails to receive synchronization signal from the master.	1. Check whether the CAN network of the master/slave is connected properly. 2. Check whether the baud rate of the master/slave is consistent. 3. Check whether CANH and CANL are connected reversely. 4. Check whether multiple masters exist in the network. 5. Check whether the termination resistor of the master/slave CAN network is connected properly. 6. Ask for technical support.	Reset automatically

Fault Code	Fault Name	Possible Cause	Solution	Fault Reset
83-2	Multiple masters existed	1. Multiple masters exist in the network.	1. Check whether multiple masters exist in the network. The master can be set by DIP switch or parameters.	Reset automatically
83-4	Master/Slave DC bus voltage deviation too large	1. The slave detects that the deviation between the slave DC bus voltage and master DC bus voltage is too large.	2. Check whether the master and slave are in the same DC bus network. 2. Check whether the DC bus voltage correction coefficient of the master/slave is proper. 3. Correct the master/slave DC bus voltage through A3-13...A3-16. 4. Ask for technical support.	Reset automatically
85-1	ADC interrupted	1. The software is executed improperly.	1. Power on again. 2. Ask for technical support.	Reset by power-off
117-1	Continuous braking of the brake timeout	1. The continuous braking time exceeds the time set by A5-29. 2. A5-07 is set to an excessively low value. 3. A5-08 is set to an excessively high value. 4. The power of the brake is too low, resulting in excessive load energy. 5. A5-29 is set improperly. 6. The DC bus voltage is not calibrated, resulting in excessive difference from the actual bus voltage.	1. Set A5-29 properly. 2. Set A5-07 properly. 3. Set A5-08 properly. 4. Select a brake with sufficient power. 5. Set A5-29 properly. 6. Set A3-13...A3-16 to correct the DC bus voltage. 7. Ask for technical support.	Reset by power-off

6 Maintenance

DANGER	
	◆ Do not repair or maintain the equipment with power on. Failure to comply can result in the risk of electric shock. ◆ Perform maintenance on the drive only when the input bus voltage of the braking unit is lower than 36 VDC (measured 5 min after power-off). Otherwise, the residual charge on the capacitor will result in personal injury. ◆ Only well-trained professionals are allowed to perform maintenance on the braking unit. Failure to comply will result in personal injury or equipment damage. ◆ Ensure that all screws are secured after repair or maintenance. Never leave any tools or screws inside the machine. ◆ Reset parameters after the braking unit is replaced. All the pluggable parts must be plugged or removed only after power-off.

6.1 Routine Inspection

The service life of components inside the braking unit is affected by the ambient temperature, humidity, dust, and vibration, leading to potential faults and shorter service life. Therefore, it is necessary to carry out routine and regular maintenance.

Routine checklist:

- Check whether the installation environment of the braking unit changes.
- Check whether the cooling fan of the braking unit works properly.
- Check whether the barking unit vibrates improperly.
- Check whether the braking unit is overheated .

Routine cleaning list:

- Keep the braking unit clean all the time.
- Remove the dust, especially metal powder on the surface of the braking unit, to prevent the dust from entering the braking unit.
- Clear the oil stain on the cooling fan of the braking unit.

6.2 Regular Inspection

Check the less accessible areas regularly.

Regular checklist:

- Check and clean the air filter periodically.

- Whether the screws become loose.
- Check whether the braking unit is corroded.
- Check for arcing signs on the wiring terminals.
- Perform insulation test on the main circuit.

Note: Before measuring insulation resistance with a megameter (500 V megameter recommended), disconnect the main circuit from the braking unit. Do not use the insulation resistance meter to test the insulation of the control circuit. The high voltage test is not required because it has been done before delivery.

6.3 Replacing Quick-Wear Parts

The quick-wear part of the braking unit is the cooling fan, whose service life is related to the operating environment and maintenance status. The following table describes the general service life of the cooling fan.

Part	Service Life
Fan	2 to 3 years

You can determine the replacement interval based on the operating time.

The cooling fan may be damaged due to bearing worn-out or blade aging.

You can determine when to replace the cooling fan based on whether cracks exist on the blade and whether abnormal vibration noise exists upon start.

6.4 Storage of the Braking Unit

For storage of the braking unit, pay attention to the following two aspects:

1) Pack the braking unit into the original packing box provided by Inovance.
2) Long-time storage will degrade the electrolytic capacitor. Thus, the AC drive must be energized once every 2 years, each time lasting for at least 5 hours. The input voltage must be increased slowly to the rated value with a regulator.

6.5 Warranty

The warranty service only covers the braking unit.

1) Inovance provides an 18-month warranty (subject to the barcode on the equipment) from the date of manufacturing for failures or damage that occur during normal use of the equipment.
2) Within the warranty period, maintenance will be charged for damage caused by:

- Operations not following the instructions in the user guide
- Fire, flood, abnormal voltage, or other disasters

■ Use of the braking unit for non-intended functions

The maintenance fee is charged according to the latest Maintenance Price List of Inovance. If otherwise agreed upon, the agreed terms and conditions shall prevail.

Appendix A Options

Table A 1 Models of network cable options

Cable type	Model
Communication cable	MD880-cable-0.55 m
	MD880-cable-1 m
	MD880-cable-1.5 m
	MD880-cable-3 m
	MD880-cable-5 m

Appendix B Selection of Braking Units and Braking Resistors

B.1 Selection of Braking Unit

Select a braking unit based on the following principles.

1. Select the braking unit based on the input voltage class of the drive.

2. Select the braking unit based on the braking power required by braking of the drive.

The power of the braking unit (Pbmax) must be higher than the braking power Pmax.

Pbmax is the maximum braking power during overload for 1 min/5 min (1 min for braking, 4 min for stop) or overload for 10s/60s (10s for brake, 50s for stop). If the actual braking cycle is different from the reference cycle, the maximum braking power Pbr must be defined as follows:

1) The braking energy delivered within 5 min must be less than the energy delivered within the reference braking cycle.

n x Pbr x Tbr <Pbrmax x 50s

Among which:

n : Number of braking pulses within 5 min

Pbr : Maximum braking power allowed

Tbr : Braking time

Pbrmax : Maximum braking power within reference cycle

2) The braking power is lower than the maximum braking power within the reference cycle.

Pbr ＜ Pbrmax

If the braking power is unknown, calculate the braking power according to the formula:

Pb = P x Td x K.

In the formula:
Pb: braking power
P: motor power
K: mechanical energy conversion efficiency (generally, K = 0.7)
Td: ratio of the braking torque to the rated motor torque

The value of Td varies with the system, as shown in the following table.

- Elevators, lifting machines, and cranes: 100%
- Winding and unwinding machines: 120%
- Large-inertia machines that require quick stop: 120%
- Ordinary inertia load: 80%;

B.2 Braking Resistor Selection

B.2.1 Resistance Calculation

During braking, almost all the regenerative energy of the motor is consumed by the braking resistor.

According to the formula U x U/R = Pb:

U refers to the braking voltage at stable braking of the system
The value of U varies with different systems:
220 VAC system: U = 380 V
380 VAC system: U = 700 V
480 VAC system: U = 1100 V

Note: When the R calculated is lower than the minimum resistance of each voltage class, multiple braking units are needed. The braking resistance of the braking unit must be higher than or equal to the recommended minimum value.

B.2.2 Power of the Braking Resistor

In theory, the power of the braking resistor is consistent with the braking power. Given that the power is derated to 70% during use, you can calculate the power of the braking resistor according to the following formula.

0.7 x Pr = Pb x ED

Pr: power of the braking resistor

ED: braking frequency, that is, percentage of the regenerative process to the whole working process

Elevator : 20% to 30% Winding and unwinding: 20% to 30%

Cranes: 50% to 60% Centrifuges: 50% to 60%

Injection molding machine: 5% to 10% Load with occasional braking: 5%

Normally, the value is 10%.

Note: The braking resistor must be equipped with a temperature switch that has been well insulated from the braking resistor.

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